ANTICSS Project
Deliverable D20a (D4.7a):

Basis report summarizing in anonymous form the identified circumvention 'habits'

Document published:
Organisation name of lead author of this document: AEA
Project coordinator: Kathrin Graulich

Horizon 2020 programme
Project acronym: ANTICSS
Project full name:
ANTI-Circumvention of Standards for better market Surveillance

Co-funded by the Horizon 2020 Programme of the European Union

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122.
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.

Project Title	**Anti-Circumvention of Standards for better market Surveillance**
Deliverable Title	Basis report summarizing in anonymous form the identified circumvention "habits"
Due Date for Deliverable:	31 October 2020
Actual Submission date:	17.11.2020
Lead Beneficiary	<AEA>
Author(s)	Christian Praher (AEA); Mathias Stadler (AEA); Thomas Bogner (AEA); Kathrin Graulich (OEKO); Milena Presutto (ENEA); Nerea Ruiz-Fuente (ECOS); Ina Rüdenauer (OEKO); Rainer Stamminger (UBONN)
Dissemination level	< Public>
Keywords	Standards, Circumvention, Market Surveillance, Testing, Europe, Energy, Ecodesign Directive, Energy Labels
Project duration	April 2018 – September 2021

Co-funded by the Horizon 2020 Programme of the European Union
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.

Table of Content

Co-funded by the Horizon 2020 Programme of the European Union
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.

List of figures

List of tables

Co-funded by the Horizon 2020 Programme of the European Union
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.

Abbreviations

CV	Circumvention
EC	European Commission
ED	Ecodesign
EEI	Energy Efficiency Index
EHTS	European Harmonised Test Standards
EL	Energy labelling
GWh	Gigawatt hour
kWh	kilowatt hour
MSA	Market Surveillance Authority
ps	place setting
TVs	Televisions
W	Watt
WP	Work Package

Co-funded by the Horizon 2020 Programme of the European Union
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122.
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.

1 About the ANTICSS project

Objective of the research project 'Anti-Circumvention of Standards for better market Surveillance (ANTICSS)' is to assess and clearly define 'circumvention' in relation to EU Ecodesign and Energy labelling legislation and relevant harmonised standards.

The analysis of 'circumvention (CV)' was based on collecting and learning from cases of 'circumvention' by literature research and dedicated expert interviews, as well as analysing existing EU Ecodesign and Energy labelling legislation and standardisation for possible loopholes. Also, the potential relation between CV and so called 'smart' products with specific embedded software was addressed by the project. Alternative test procedures to better detect CV by testing were developed and through testing a certain number of appliances within the ANTICSS project, the impacts 'if' and 'how much' energy consumption and/or functional performance modifications could be ascribed to CV were assessed.

Based on the results, ANTICSS will provide practical capacity building measures for key actors of market surveillance and test laboratories, support communication and collaboration platforms between major stakeholders and provide policy recommendations for policy makers and standardisation bodies to prevent future 'circumvention' under EU Ecodesign and Energy labelling. The ANTICSS project is also designed to provide reliability to manufacturers by specifying potentially vague legislation and standards, which might be interpreted, differently by market actors and some of them taking unfair advantages so far.

By overall awareness raising on the topic of 'circumvention' among stakeholders, ANTICSS is supporting an effective EU legislation enforcement and thus increasing acceptance and trust of market actors and civil society into the Ecodesign and Energy labelling legislation.

ANTICSS Work Packages (WPs) are summarised in Figure 1 as follows:

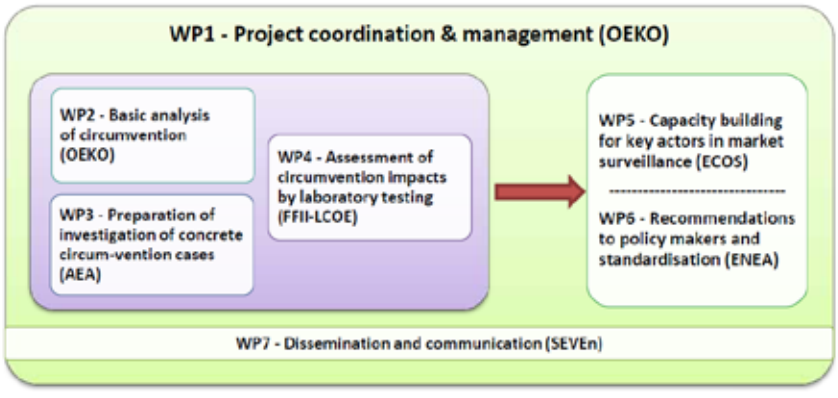

Figure 1: ANTICSS Work Packages

2 Goal and approach of this deliverable

The underlying report summarizes and consolidates the various results of the previous ANTICSS working packages (WP2, WP3, WP4) which includes the outcomes of the ANTICSS product testing. The specific test results of product categories and products are analysed in a way to check if certain 'circumvention habits' can be identified that can be generalized, i.e. being applicable also to other product categories not tested within the ANTICSS project. Aim of this report is being the basis for the preparation of technical guidelines for capacity building of Market Surveillance Authorities (MSAs) and test laboratories as well as derivation of recommendations for policy makers and standardisation organisations. The report is structured as follows:

- Section 3 explains the ANTICSS understanding and definitions[1] of 'circumvention'.
- Section 4 provides a clear delimitation of 'circumvention' from other effects to facilitate unambiguous public (media) communication due to the fact that the term 'circumvention' is still understood and used differently by various stakeholders.
- Section 5 summarizes the outcomes of the ANTICSS laboratory testing[2] mainly in respect to categorisation according to ANTICSS definitions of 'circumvention'.
- Section 6 summarizes the outcomes of the ANTICSS impact assessment[3].
- Section 7 analyses if certain findings can be generalized or even 'circumvention habits' can be derived, i.e. systematics being applicable also to other product types or product categories besides those tested within the ANTICSS project.

The general results will be further fed into the next ANTICSS work packages as follows:

- WP5: Capacity building for key actors in market surveillance;
- WP6: Conclusions from 'circumvention' investigation and policy recommendations;
- WP7: Dissemination and communications.

[1] For more information see: https://www.anti-circumvention.eu/storage/app/media/uploaded-files/D08_ANTICSS_Final-definitions_circumvention.pdf
[2] For more information see: https://www.anti-circumvention.eu/storage/app/media/D14_ANTICSS_Alternative-test-procedures_final.pdf; https://www.anti-circumvention.eu/storage/app/media/D15_ANTICSS_Model-selection_final.pdf; various ANTICSS test reports https://www.anti-circumvention.eu/about-project/documents-and-deliverables
[3] For more information see Deliverable D19 'Impact Assessment of circumvention under EU Ecodesign and Energy labelling', https://www.anti-circumvention.eu/storage/app/media/D19a_ANTICSS_Circumvention_Impact_Assessment_final.pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

3 ANTICSS definition of 'circumvention'

3.1 ANTICSS process of elaborating a definition of 'CV'

So far, current Ecodesign and Energy labelling legislation as well as related harmonised standards use various terms and explanations to describe the undesirable acts in the context of 'circumvention' that shall be avoided or prohibited. Also, the basic understanding of 'circumvention' and delimitation to certain other effects is quite different between different stakeholders. Thus, one of the main objectives of the ANTICSS project was to elaborate a clear and comprehensive definition of 'CV' to serve as basis for the analyses and recommendations within and beyond the project.

In a first step, through literature research and analysis of existing legislation and measurement standards on ecodesign and energy labelling, possible gaps and loopholes were identified. Collection of 25 'suspicious' cases within ANTICSS project team members regarding potential 'circumvention' of Ecodesign and Energy labelling legislation was used as starting point to elaborate a comprehensive picture and initial categorisation of certain acts that might affect the resource consumption and/or performance of appliances during testing. The ANTICSS project team analysed these cases in detail to assess their allocation to the categories 'circumvention', 'jeopardy effects', 'non-compliant' or 'compliant'. The ANTICSS project team introduced the category of 'jeopardy effects' for those cases that formally might not be found 'non-compliant' to legislation but nevertheless do not follow the goal of the EU Ecodesign and/or Energy labelling legislation, for example by exploiting loopholes or other weaknesses in standards or regulations.

Taking into account feedback of the ANTICSS Advisory Board[4], the preliminary categorisation was adapted, and the initial definition of 'circumvention' was also better aligned to the new article on 'circumvention' which has been included in Ecodesign regulations since December 2019.

Circumvention [and software updates]

The manufacturer, importer or authorised representative shall not place on the market products designed to be able to detect they are being tested (e.g. by recognising the test conditions or test cycle), and to react specifically by automatically altering their performance during the test with the aim of reaching a more favourable level for any of the parameters declared by the manufacturer, importer or authorised representative in the technical documentation or included in any of the documentation provided.

[…]

Figure 2: Article on 'circumvention' [and software updates] included in Ecodesign regulations since December 2019

[4] https://www.anti-circumvention.eu/contacts/advisory-board

In order to obtain further evidence from the market, the team organised a stakeholder consultation, approaching in total 278 experts[5] from manufacturers, market surveillance authorities, test laboratories as well as consumer and environmental NGOs to gain evidence or further insight into 'circumvention' cases and feedback to the preliminary ANTICSS definitions of 'circumvention' and 'jeopardy effects'. In total, 38 organisations provided their feedback; 39 'suspect' product cases have been reported[6] and more than 10 stakeholders used the possibility to provide feedback on the ANTICSS definitions of 'circumvention' and 'jeopardy effects'.

The reported cases clearly show that the aim of reaching a more favourable level for parameters under EU Ecodesign and Energy labelling cannot only be achieved by automatic detection of the test situation and alteration of the product performance specifically during testing as already included in some Ecodesign and Energy label regulations (see Figure 2) and prohibited accordingly.

In addition, better test results can also be achieved by certain pre-settings or manual alterations to the product – exclusively for the purpose of performing the test. Such 'manufacturer's instructions' are sometimes necessary for the implementation of the standard procedures, e.g. for safety reasons, and therefore officially included in some test standards. However, if instructions are solely provided for test laboratories and at the same time lead to more favourable results specifically under testing, this could be categorized as 'circumvention' in the opinion of the ANTICSS project.

A third way of 'circumvention' could be by programming products to achieve very good energy efficiency or resource consumption values specifically for the period in which the conformity test is usually performed or for a predefined number of test cycles. At the time of delivery, the product is already programmed in a way to automatically change its performance sometime after the product is put into service, to make it more attractive to users but at the expense of the officially labelled energy or resource consumption which is usually measured directly after the product is put into service. The automatic alteration does not take place during the test but only afterwards, and the algorithm is already installed in the delivered product, i.e. not provided afterwards via external software update[7].

Against this background, the ANTICSS project developed a more comprehensive definition of 'circumvention' including all three possible routes, see following section 3.2.

[5] In total, 39 Market Surveillance Authorities, 61 industry representatives (associations, manufacturers, technical committees) and 178 consumer organisations, test organisations and environmental NGOs at European level were approached.
[6] ANTICSS partners conducted a quality check of the cases received in WP3 to avoid double counting with cases received in WP2, disregard cases not sufficiently substantiated or being out of scope. In total, the information received on 22 cases has been used for further analysis in relation to the ANTICSS definitions of circumvention and jeopardy effects.
[7] Software updates in the context of circumvention are regulated in most recent Ecodesign regulations, see also section 4.5

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

3.2 ANTICSS definitions of 'circumvention' and 'jeopardy effects'

The ANTICSS project team agreed on the following definitions for 'circumvention' and 'jeopardy effects' in relation to EU Ecodesign and Energy labelling legislation and related harmonised standards[8]. These definitions built the basis for the further research within the ANTICSS project, namely the categorisation of collected suspect behaviour cases and tested products. In this context it must be noted that parts b) and c) of the ANTICSS definition of 'circumvention' as well as the definition of 'jeopardy effects' are not included in the latest Ecodesign regulations.

3.2.1 Definition of 'circumvention'

„Circumvention is the act of designing a product or prescribing test instructions, leading to an alteration of the behaviour or the properties of the product, specifically in the test situation, in order to reach more favourable results for any of the parameters specified in the relevant delegated or implemented act, or included in any of the documentations provided for the product."

The act of circumvention is relevant only under test conditions and can be executed e.g.

a) by automatic detection of the test situation and alteration of the product performance and/or resource consumption during test, or

b) by pre-set or manual alteration of the product, affecting performance and/or resource consumption during test or

c) by pre-set alteration of the performance within a short period after putting the product into service.

3.2.2 Definition of 'jeopardy effects'

"Jeopardy effects encompass all aspects of products or test instructions, or interpretation of test results, which do not follow the goal of the EU ecodesign and/or energy labelling legislation of setting ecodesign requirements and providing reliable information about the resource consumption and/or performance of a product. These effects may not be classified as circumvention, but become possible due to loopholes or other weaknesses in standards or regulations."

[8] Further details and examples can be found in the ANTICSS Deliverable D8 "Definition of 'circumvention' and 'jeopardy effects' in relation to EU Ecodesign and Energy labelling legislation" https://www.anti-circumvention.eu/storage/app/media/uploaded-files/D08_ANTICSS_Final-definitions_circumvention.pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

3.3 ANTICSS categorisation of cases and tested models

The ANTICSS definitions of 'circumvention' and 'jeopardy effects' were also taken as basis to categorize the test results of selected products that were tested within WP4 of the ANTICSS project[9]. However, during interpretation and categorisation of the test results it became apparent that the category of 'jeopardy effects' is not sufficiently reflecting the results at product level in those cases where the test results revealed more favourable results *specifically* in the test situation but the ANTICSS definition of 'circumvention' could nevertheless not be applied as it was not applied *exclusively* during testing, but was – even if extremely infrequent or only theoretically – also applicable during consumers' usage of the appliance.

Therefore, the ANTICSS project team decided to differentiate between the general level ('case') detected or reported, and the specific product level based on the test results of models tested within ANTICSS.

Figure 3 illustrates the underlying approach for the categorisation of reported cases and tested models within ANTICSS.

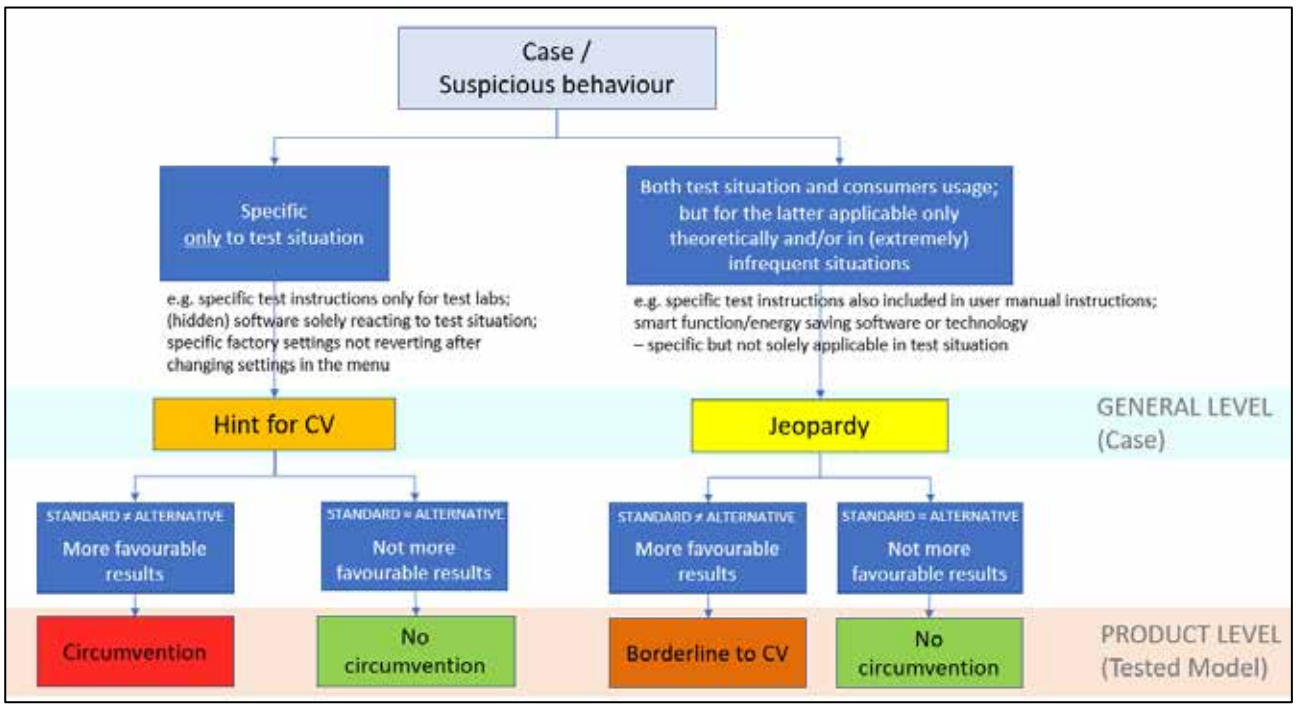

Figure 3: ANTICSS categorisation of cases and tested models to 'CV' and 'jeopardy effects'

[9] For more information see also: https://www.anti-circumvention.eu/storage/app/media/uploaded-files/D13_ANTICSS_List-of-product-categories-for-testing.pdf

- **Cases** specific *only* to the test situation are providing '**hints for circumvention**': e.g. specific test instructions only for test labs, or (hidden) software solely reacting to the test situation, or specific factory settings not reverting after changing the settings in the menu. If the test result of the **tested model** leads to relevant [10], more favourable deviations of the standard test result compared to the alternative testing, the 'tested model' is categorised as '**circumvention**'.
- **Cases** applicable in both the test situation and consumers' usage, but for the latter only theoretically or in (extremely) infrequent situations are called '**jeopardy effects**': e.g. specific test instructions which are also included in the user manual instructions, or smart functions / energy or resource saving software or technologies being specific but not solely applicable in the test situation. If the test result of the **tested model** leads to relevant, more favourable deviations of the standard test result compared to the alternative testing, the 'tested model' is categorised as '**borderline to circumvention**'. Although the current ANTICSS definition of 'circumvention' does not apply as these acts are *not exclusively* relevant under test conditions, still, the design of the product or the test instructions are utilized in a way to reach more favourable results *specifically* in the test situation.

Distinguishing between product and case level allows also the flexibility for those cases where the act of 'circumvention' or 'borderline to circumvention' might not have been found in the tested model(s), however, it might still be considered applicable to other models of the respective product category not yet tested, i.e. the general level ('case') is still classified either as 'jeopardy effect' or 'hints for CV'.

The final interpretation of the test results (see section 5.5) by the ANTICSS project team is based on the ANTICSS definitions of 'circumvention' and 'jeopardy effects' as described in section 3.2 and the flowchart as illustrated in Figure 3 above. The following Table 1 shows the respective colour code used for the graphic representation of the categorisations of the ANTICSS test results.

Table 1: ANTICSS colour code for the categorisation of reported cases and tested models

General level (=> reported case)	Product level (=> tested model)
Yellow: Jeopardy effect	Green: No circumvention
Orange: Hints for circumvention	Dark orange: Borderline to circumvention
	Red: Circumvention

[10] i.e. exceeding the verification tolerances for market surveillance purposes; see also section 5.3

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

4 Delimitation of 'circumvention' from other effects

One of the core objectives of ANTICSS is to elaborate a clear delimitation of the acts of 'circumvention' to 'non-compliance' and other effects, not only to facilitate unambiguous classification of cases in laboratory testing and for market surveillance activities but also to achieve a better understanding and clearer picture in public (media) communication.

4.1 Delimitation to 'non-compliance'

Checking compliance is an interplay between the product, the (harmonised) standard(s) and the Ecodesign and Energy labelling regulations and their requirements.

Energy labelling and Ecodesign regulations use the presumption of compliance; this means that a product model that is declared compliant by the supplier is compliant until it is found to be non-compliant. 'Non-compliance' can only be determined by MSAs, by following the procedures in the so-called Verification Annexes included in every Ecodesign and Energy labelling regulation.

Apart from document checks (checking of the data and information provided in the technical documentation and/or any other information provided by the manufacturer or supplier against the requirements and conditions as defined in the legislation and standards), the procedure to be followed by MSAs includes testing according to harmonised standards published in the Official Journal of the European Union[11]. If the results[12] of any of these laboratory tests differ from the declared values more than the tolerances given in the Verification Annexes of the regulations, and in some cases also in the harmonised standard, the model is considered 'non-compliant'.

Non-compliance can be found in any phase of the compliance verification, for example:

- The measured value of one or more parameters in the manufacturer/supplier test report does no support the respective declared value, i.e. the declared value is more favourable for the manufacturer/supplier than the measured value due to a misuse of the verification tolerance.

[11] According to the Ecodesign regulations, MSAs can also use other reliable, accurate and reproducible methods beyond harmonised European standards, which take into account the generally recognised state-of-the-art.

[12] For most products, a two-step procedure is prescribed: first 1 unit is tested; if any result differs from the declared value more than the tolerance, 3 other units are tested. The average of the results of the 3 units should not differ more than the tolerance from the declared value. As an alternative, the three additional units selected may be of one or more different models that have been listed as equivalent models in the supplier's technical documentation. The tests are done according to the approach of 1+3 units, whereas the conclusion is valid for the model (i.e. all units that are placed on the market).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122.
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

- Mandatory information is missing in the booklet of instruction or free access website of the manufacturer/supplier.
- The declared values are not confirmed by the determined value in the Market Surveillance Authority test report.

One of the most important findings of the ANTICSS project is that 'circumvention' goes far beyond more traditional 'non-compliance' and is at the same time much more difficult to be detected. Whereas non-compliance can be detected by MSAs by inspecting product documentation and/or through laboratory tests, in case of 'circumvention' the product does not appear 'non-compliant' during testing which makes the detection of 'circumvention' rather difficult.

At first glance, the products appear to meet all requirements and having respected the conditions according to (harmonised) standards in the laboratory test. However, the product or the test situation is influenced in such a way that the test results are more favourable under the harmonised test conditions. As result, a product that is 'circumventing' the regulations only meets the Ecodesign and/or Energy labelling requirements during the standard test, but not when used under comparable conditions in practice. In other words, 'circumvention' means that the product would not meet the requirements in practice, even if the conditions in practice would exactly match the conditions in the standard.

As described above, when products are specifically pre-set or manually altered or are able to detect to be under test with the aim of 'circumvention', or if specific loopholes or weaknesses in standards and/or legislation are exploited, the products appear to conform to the legal requirements when tested with the standardised test methods. Therefore, within the ANTICSS project, alternative test methods to detect the 'circumvention' behaviour or 'jeopardy effects' were developed for 18 different cases and their applicability and effectiveness was checked through specific tests in the partner test laboratories (for details see section 5.3). Only the aspects of the test conditions considered as being detected or exploited are varied in the alternative test methods to check the response of the tested product. At the same time, the alternative procedures are still designed as close as possible to the standard procedures with the aim to ensure a sufficient comparability with the standard measurement results. However, the ANTICSS project did not verify that those alternative methods deliver repeatable and reproducible results comparable to the original standardised methods. The aim of the alternative test methods was to detect inexplicable changes in the measurement results due the variation of one of the test conditions that may indicate a circumventing behaviour of the tested product.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

4.2 Delimitation to 'missing representativeness of standards'

'Circumvention' acts and 'jeopardy effects' according to the ANTICSS definitions given in section 3.2 are not to be confused with the fact that (harmonised) standards might not always reflect on one side the typical consumer usage in 'real-life' and on the other side the effects of the latest technological developments of the products. For these reasons the measured values of products during consumers' usage in 'real-life' might be different from the declared performance parameters measured under standard conditions.

According to article 13 of Regulation (EU) 2017/1369 setting a framework for energy labelling, harmonised standards, have to fulfil the following conditions[13]:

- Measurement and calculation methods included in the harmonised standards shall be reliable, accurate and reproducible.
- Harmonised standards shall aim to simulate real-life usage as far as possible while maintaining a standard test method.

For applying harmonised standards, there is the need to obtain the same results when tests are repeated in the same test laboratory at different time (repeatability) as well when the same test is conducted in another laboratory (reproducibility). Having this in mind, it has to be considered that to produce a repeatable and reproducible test, some test conditions need to be optimised and controlled. To fulfil these requirements, in general standards require a specific preparation of the product or the conditions under which a test has to be conducted, e.g. the use of a standardised 'dust' for testing vacuum cleaners, and standard loads (laundry or dishes) for testing household washing machines and dishwashers. In addition, (harmonised) standards and/or legislations explicitly refer to the manufacturer's instructions for either safety reasons and/or to achieve accurate results in terms of repeatability and reproducibility.

Although standard test methods should reflect 'real-life' conditions as much as possible, 'real-life' conditions cannot be easily reproduced because tests cannot replicate 100% the variety of 'real-life' conditions and of the users. The so called "average European usage patterns" (e.g. average number of use cycles per year) and programme modes[14] in harmonised standards might deviate from local appliance use due to country-specific differences in usage behaviour.

[13] European Parliament, "Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU," 2017. Online available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R1369&from=EN, last accessed on 21 Oct 2020

[14] Specific 'Eco-modes' to be used as basis for the performance measurements in harmonized standards, might sometimes be somehow artificial (e.g. washing machine programmes lasting several hours; TVs with a very dark

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

For example, in some countries washing is usually done at lower temperatures than applied in the standard tests. If these standard conditions, being to a certain extent different from 'real-life', result in different outcomes of standard test results compared to 'real-life' testing, this cannot be classified as 'circumvention' but is rather the case of a standard test being less consumer relevant, categorized as 'missing representativeness of standards' within ANTICSS. This is a well-known issue for harmonised standards, in which the best balance between standardised conditions necessary to ensure repeatability and reproducibility and good simulation of 'real-life' usage has to be found[15]. In addition, standards that do not keep pace with technological progress can prevent the measurement of energy used by these new features and fail to incentivise manufacturers to make those features energy efficient.

Indeed, often it is not easy to distinguish the impact of the 'missing representativeness of standards' from 'circumvention' on Ecodesign and Energy labelling regulation, because it is very similar. On one hand, 'missing representativeness of standards' means that the energy consumption might be higher in 'real-life' than in the declaration of the manufacturer, on the other hand, under a 'circumvention' behaviour the energy consumption would be lower (only) under test conditions than in 'real-life'. If the deviations described above are the same, the effect is equal.

Although 'missing representativeness' of some test standards is unsatisfactory, it cannot be classified as 'circumvention' if manufacturers strictly follow the harmonised standard tests for determining the product performance values to be declared e.g. on the Energy label, although the consumer use in 'real-life' deviates from these measurement conditions and results. However, the more harmonised standards are not able to represent the typical user behaviour or include ambiguities, the higher is the likelihood that manufacturers design products to adapt to these test conditions in a way to achieve more favourable results for their products.

Another element to be taken into consideration is the case when 'specific manufacturer's test instructions' do not serve the purpose of achieving repeatable and reproducible test results, but are instead provided exclusively for test labs or – if included in the user manual instructions – they are applicable for consumers only theoretically or in (extremely) infrequent situations. These cases could be classified as 'circumvention' or 'borderline to circumvention' if these instructions are rather utilized to reach more favourable results *specifically* in the test situation.

display and no sound on). Although being energy-efficient these modes might not be used often in 'real-life'. Thus, the actual energy use under 'real-life' conditions will be different from claimed on the energy label due to using different (less energy-efficient) programmes or settings instead.

[15] According to (Spiliotopoulos 2016), 'unrealistic measurement methods (standards)' are defined as methods which, in the case utilised for implementation of regulations, fail to reflect the best achievable representativeness of 'real-life' conditions and normal operation of the tested appliances. Such methods (standards) may fail to take into consideration settings or functionalities of a product, which influence its energy consumption or any other performance parameter of the relevant regulation, or not take into account the full range of modes and cycles offered by a product, thus providing a skewed representation of the efficiency based on only a single mode or function. Source: Spiliotopoulos, C., How product testing practices contribute to the loss of energy savings and how to prevent it, Brussels, 2016

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

4.3 Delimitation to 'golden samples'

The so called 'golden sample' is an optimised product used for compliance assessment testing that is not representative for the whole production of the assessed model. The use of advanced prototypes for compliance assessment is unavoidable in Ecodesign and Energy labelling legislation, as well as in other EU legislation, since they are needed in order to secure approvals or compliance in time for full production. However, manufacturers may exploit this possibility to achieve better results for the model represented by this sample during the compliance assessment test.

Considering the definition of 'circumvention' given in the ANTICSS project the use of 'golden samples' cannot be considered as a 'circumvention' behaviour. Apart from the fact that 'golden samples' are not designed to alter the behaviour of the product specifically in the test situation, they cannot be considered as a way to 'pre-set or manual alteration of a product', affecting performance and/or resource consumption only during test because as being prototypes they are never placed on the market and therefore are never used for compliance verification by MSA.

Finally, the suspected use of a 'golden sample' for achieving a better positioning during the compliance assessment phase of a new model can be easily detected by a Market Surveillance Authority when testing the units of that model placed on the market for compliance verification. If the verification fails the model is considered 'non-compliant', and this 'non-compliance' can be the result of the use of a wrong prototype (or of a golden sample) at the time of the initial compliance verification by the manufacturer.

4.4 Delimitation to products designed for being 'out of scope'

Within ANTICSS, cases were reported where products were designed or declared in a way that they are not falling under the scope of existing Ecodesign and Energy labelling regulations, i.e. the minimum requirements and/or energy label do not apply. From a legal point of view, when a product is 'out of scope' of a regulation, it cannot be tested for compliance verification – only the exclusion clause is checked.

On the other hand, manufacturers might misuse the **criteria** on which products are excluded from the scope of the regulations to deliberately design or declare products in a way that they would not be covered by the regulations, or to declare them in a way that they fall into a different sub-category of the relevant regulation so that requirements to be followed are less stringent or more favourable. Cases were reported for a product sold as 'wine storage appliance' (category 2) instead of a multi-use refrigerator (category 10) under Regulations (EU) 1060/2010 and 643/2019. In such cases the legislation is not followed correctly, due to ignorance of the legislation or deliberate misinterpretation or wrong reference to a legislation by the manufacturer. These acts, if encountered by Market Surveillance Authorities, are classified as 'non-compliance' (see section 4.1).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

4.5 Delimitation to 'software updates'[16]

Product functioning can be modified through a software update installed sometime after placing on the market and installation through external communication between the appliance and the manufacturer, third parties or even other users. This requires a communication channel, i.e. the product is connected to a network, or manual updating via for example a USB memory. Software updates have multiple purposes, e.g. security updates, fault elimination or software enhancement, improving the operation of hardware, peripherals, the performance or lifetime, as well as adding new programmes, functions and features. The potential benefits of installing or drawbacks when rejecting them might be different depending on consumers' needs. For example, ensuring that the device remains cyber-secure after newly discovered cyber security vulnerabilities is rather important and might have severe consequences, if the update is not installed, whereas the availability of new convenience features might not be so relevant for some consumers.

Software updates are mainly executed in 'real-life' *after* the product has been placed on the market, thus they cannot be misused for 'circumvention' in the sense of automatic detection of the test situation and alteration of the product performance and/or resource consumption *during* the compliance testing of products that have just been placed on the market, i.e. point a) of the ANTICSS definition of 'circumvention'. Nevertheless, process changes due to software updates might not sufficiently reflect performance or use of resources anymore as originally measured and declared for the product at the time of placing the product on the market when tested according to the standard for the relevant delegated or implementing act. To tackle this issue, software updates have been explicitly addressed in the article 'circumvention and software updates' included in product-specific Ecodesign regulations since 2019.

[Circumvention and] software updates

[…]

A software update shall never have the effect of changing the product's performance in a way that makes it non-compliant with the ecodesign requirements applicable for the declaration of conformity.

The energy consumption[17] of the product and any of the other declared parameters shall not deteriorate after a software or firmware update when measured with the same test standard originally used for the declaration of conformity, except with explicit consent of the end-user prior to update.

Figure 4: Article on [circumvention and] software updates included in Ecodesign regulations since December 2019

Also, Regulation (EU) 2017/1369, setting a framework for the energy labelling, addresses software updates within article 3 (4) on 'General obligations of suppliers'.

[16] For a detailed analysis see https://www.anti-circumvention.eu/storage/app/media/uploaded-files/ANTICSS_Working-paper_Smart-products-and-circumvention.pdf

[17] For water-using product categories like household washing machines and dishwashers, the article says "The consumption of energy and water of the product and any of the other declared parameters…"

General obligations of suppliers

[…]

4. Once a unit of a model is in service, the supplier shall request explicit consent from the customer regarding any changes intended to be introduced to the unit by means of updates that would be detrimental to the parameters of the energy efficiency label for that unit, as set out in the relevant delegated act. The supplier shall inform the customer of the objective of the update and of the changes in the parameters, including any change in the label class. For a period proportionate to the average lifespan of the product, the supplier shall give the customer the option of refusing the update without avoidable loss of functionality.

[…]

Figure 5: Article related to software updates in Energy labelling regulation (EU) 2017/1369

According to these articles in the Ecodesign and Energy label regulations, the deterioration of the energy consumption and any of the other declared parameters after a software or firmware update is 'compliant' to legislation provided that the explicit consent of the end-user prior to update is obtained and the magnitude of increasing energy consumption does not exceed the applicable Ecodesign minimum requirements. On the other hand, software updates would be 'non-compliant' if the obligation to obtain explicit consent of the end-user prior to an update is not fulfilled; also, software updates would be 'non-compliant' if the magnitude of increasing energy consumption would exceed the applicable Ecodesign minimum requirements.

The requirements on software updates including confirmation by the end-user as stated in the regulations apply to products when being placed on the market. However, verification would be needed also when the product is already for some or even a long time on the market. 'Software updates' constitute a 'new model' by the update, which would have to be tested again by MSAs for verifying the conformity with the applicable legal provision. In that case, the current software update has to be downloaded during the verification; energy consumption and performance will be measured and checked if any of the parameters deteriorate after the update. It is also assessed whether the user is asked for confirmation.

Theoretically, a certain kind of 'software update' might still be categorised as 'circumvention' if following part c) of the ANTICSS definition (see section 3.2.1). In these cases, the product is specifically designed in a way to reach favourable results specifically for the period in which the conformity test is usually performed or for a predefined number of test cycles.
However, at the time of delivery the product is already programmed in a way to automatically change its performance *a certain time after the product is put into service*, to make it more attractive to users but at the expense of the officially labelled energy or resource consumption which is usually measured directly after the product is put into service.
The automatic alteration does not take place *during* the test but only afterwards, and the *update algorithm is already installed in the delivered product*, i.e. not provided via *external* software update.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

4.6 Relation between 'smart' products and 'circumvention'

The ANTICSS project also analysed the potential of so called 'smart' products that might be using software for 'circumvention' of regulatory requirements in the context of Ecodesign[18].

There is no standard definition of 'smart' appliances. For example, the Ecodesign Preparatory Study on 'Smart Appliances'[19] decided to set the final focus on demand side flexibility with regard to the electricity grid only. In a broader approach related to the context of 'circumvention', however, the ANTICSS project distinguished between products *marketed* as 'smart' and products *acting* 'smart', see Figure 6 below:

Products marketed as 'smart'	Products acting 'smart' (= intelligent)
For products marketed as 'smart appliances', there seems to be no clear definition. Often, either the utility or the possibilities for external communication via internet connection are highlighted under this term. Products are marketed as smart when for example providing automatic software updates, remote control function via smartphone app or for the purpose of demand side flexibility, as well as communication between appliances or to a smart home network. Also computer functions for appliances other than computers (e.g. smart TVs), additional functions like a webcam for controlling and communicating the status (e.g. smart fridge), as well as learning or AI-enabled appliances are promoted as smartness. These functionalities, however, do not necessarily provide the technical configuration to circumvent compliance testing.	Products with the technical operation principle and configuration to circumvent compliance testing, i.e. with the ability to detect being in a test situation and altering the product performance and/or resource consumption specifically during test in order to reach more favourable test results, are not necessarily marketed as smart products, for example the function 'internal adjustment'. Further, if a standard test situation is clearly differing from real-life conditions, e.g. through dedicated parameters such as stable ambient conditions over a certain time (apparent for refrigerators with no door openings under test), or a certain sequence of cycles, a more sophisticated or smart (= 'intelligent') processing might even not be necessary for the product to detect being under test; simple control logic programmed explicitly towards recognizing these test conditions and adjusting might be sufficient.

Figure 6: Different approaches: Products marketed as 'smart' and products acting 'smart'

Appliances *marketed* as 'smart' seem to be characterized mainly by the offered services (utilities), a connection to internet, as well as the communication level (focus on external communication, i.e. between different appliances and/or the possibility of being controlled via internet). On the other hand, products designed in a way to be able to circumvent, i.e. altering their characteristics specifically during testing (*acting* 'smart'), might have to be characterized in a different way.

[18] For a detailed analysis see Graulich et al. (2019): Analysis of the relation between 'smart' products and circumvention, 2019. Online available at https://www.anti-circumvention.eu/storage/app/media/uploaded-files/ANTICSS_Working-paper_Smart-products-and-circumvention.pdf, last accessed on 21 Oct 2020.
[19] See https://eco-smartappliances.eu/en

While the presence of software within the appliance seems to be the precondition of smartness, the act of 'circumvention' might go beyond simple control logic which is implemented in nearly all appliances: sensor, processing software and actuator reacting to (only) one input parameter. In comparison, 'smartness' related to 'circumvention' seems to be a more sophisticated or 'intelligent' processing.

In summary, the ANTICSS project draws the following conclusions regarding the relation between 'smart' products and 'circumvention':

- Ø Appliances with functions *marketed* as 'smart' do not provide per se an indicator for 'circumvention'.
- Ø Products being able to *act* smart (= intelligent) in a way of circumventing under testing are not necessarily *marketed* as smart.
- Ø Software is a precondition for being smart.
- Ø The act of software-related 'circumvention' relevant only under test conditions in the compliance verification tests can be executed either by automatic detection of the test situation and alteration of the product performance and/or resource consumption during test, or by pre-set alteration of the performance within a short period after putting the product into service.
- Ø If some kind of 'intelligent' software is already implemented at the moment the product is placed on the market, those appliances might be more prone to use this software also for 'circumvention'. On the other hand, if standard test conditions clearly differ from real-life conditions, also simple control logic might be sufficient to program appliances in a way to recognize these test conditions and adjust certain parameters accordingly.
- Ø Not all 'smart appliances' are circumventing per se under EU Ecodesign and Energy label compliance verification testing:
  => On the one hand, some of the products' smartness is not at all related to the energy labelling or ecodesign regulated parameters, and/or the smart function even results in higher instead of lower energy consumption.
  => On the other hand, manufacturers explicitly have to use the smartness and program appliances in a way that they detect being in a test situation as well as alter the product performance and/or resource consumption specifically during test in order to reach more favourable test results.

Figure 7: Conclusions regarding the relation between smart products and 'circumvention'

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

5 Outcomes of the ANTICSS alternative product testing

5.1 Selection of product categories and cases for testing within ANTICSS

One of the main tasks within ANTICSS is testing a number of product models from selected product categories by developing and applying alternative test procedures with the aim of analysing their potential for better detection of 'circumvention'. Further, based on the test results the impacts 'if' and 'how much' energy consumption and/or functional performance modifications could be ascribed to 'circumvention' shall be assessed. Within ANTICSS work package WP4 ("Assessment of 'circumvention' impacts in laboratory testing"), the ANTICSS project team implemented a semi-qualitative methodology for the selection of the maximum of ten[20] product categories from the initial full list of product categories to be tested within the project. The following exclusion and selection criteria were applied to decide upon the ten product categories to be selected for testing[21].

Exclusion criteria – product categories not tested within ANTICSS

1. **Product categories excluded from the ANTICSS scope**
   Product groups which are not covered by product specific delegated or implementing regulation on Ecodesign or energy labelling, and product groups which no longer have market relevance (i.e. sales from 2020 onwards = zero).
2. **Product categories lacking harmonised standards or transitional methods**
   Only product types for which there is a measurement method in the form of a harmonised standard, or a transitional method were considered. Laboratories testing a product need to have a reference protocol to conduct testing, to make the calculations accordingly and to potentially propose alternative methods to the set procedures.
3. **Product categories with no reported suspicious cases within WP2 or WP3 of ANTICSS**
   The main selection criteria are linked to the stakeholder input that the ANTICSS project collected through the consultations run in WP2 and WP3. Product categories for which no suspicious behaviour cases were reported at all were disregarded for testing purposes.
4. **Product categories with only 'compliant' or 'non-compliant' cases reported within WP2/WP3**
   The project partners analysed all reported suspicious behaviour cases and agreed on the categorisations of 'circumvention' or 'jeopardy effects' according to the ANTICSS definitions, as

[20] Based on the maximum budget available for testing within ANTICSS.
[21] For more information see Deliverable D13 (D3.3): ANTICSS Project List of product groups to be tested

well as 'compliant' and 'non-compliant'. The team decided to focus only on those cases classified as 'circumvention' and 'jeopardy effects'.

Selection criteria for product categories to be tested within ANTICSS

Once the exclusion criteria were applied, for the remaining product categories the following selection criteria were applied so that a list of ten product categories remained.

- **Product categories with cases classified as 'circumvention'**
  All reported cases categorised as 'circumvention' by the ANTICSS project team were selected for further analysis in the laboratories.

- **Product categories with cases classified as 'jeopardy effects'**
  For reported cases categorised as 'jeopardy effects', a semi-quantitative approach was applied in order to rank the product categories. Scored with a multiplying factor were the parameters number of 'jeopardy effects' cases, lab testing capacity within ANTICSS consortium and existence of an energy label for the product.

- **Product category cluster representation**
  Product categories of the same cluster have similarities in terms of product behaviour, way of operation or type of fuel used. Testing product categories from different clusters would allow for a better understanding of variable 'circumvention' practices.

From the initially pre-selected ten product categories, during the development of alternative test methods (see section 5.3 below)[22], two further product categories were finally not taken into account in the final selection due to the following reasons:

- ENER 13 / Domestic refrigerators: It was not possible to detect refrigerators on the market equipped with the technical features related to Case COLD 3, but only refrigerator-freezers models; thus, it was decided to test this case on refrigerators-freezers instead.
- ENER 20 / Solid fuel local space heaters: After more detailed analysis of the reported case, which was initially categorized as 'circumvention' by the ANTICSS team, the case was finally considered within this work package as being 'non-compliant' for which no alternative testing will be proposed in ANTICSS anymore.

The following table summarizes the product categories and cases finally chosen for applying the alternative test methods developed within the ANTICSS project.

[22] For more information see Deliverable D14 (D.4.1): Alternative test methods and approaches to unmask circumvention under EU Ecodesign and Energy labelling, online available at https://www.anti-circumvention.eu/storage/app/media/D14_ANTICSS_Alternative-test-procedures_final.pdf

Table 2: Overview of product categories and cases tested in ANTICSS

Deliverable D18	Lot	Product category	Case
Part 1	ENER 1	Space heaters	Heaters 2 – Variable speed compressor
Part 2	ENER 5	Televisions	TV 1 – Setting of brightness TV 2/3 – Test loop recognition
Part 3	ENER 10	Room air conditioning	RAC 2 – 1) Defrost 2) Variable speed compressor
Part 4	ENER 13	Domestic freezers and refrigerators-freezers	COLD 2/4 – Multiple operation modes / holiday mode COLD 3 – Display is continuously activated
Part 5	ENER 14	Domestic dishwashers	DISH 1 – Separate bowl support DISH 2 – Specific pre-treatment before testing DISH 3 – Removal / alteration of accessories DISH 4 – Dishwasher with water tank
Part 6	ENER 14	Domestic washing machines	WASH 1.2 – Loading capacity WASH 3 – Hidden software
Part 7	ENER 16	Household tumble driers	DRIER 1 – Special preparation before testing DRIER 2 – Hidden Software
Part 8	ENER 22	Domestic ovens	OVEN 1 – Volume without shelf guides OVEN 2 – Maximum temperature in centre of oven OVEN 3 – Electronic control

5.2 Specific model selection procedure for testing appliances within ANTICSS

From the selected product categories (see section 5.1 above), each three specific models were selected for testing. For this purpose, different methods were considered. The chosen method is a combination of models identified in reported cases of 'circumvention' and 'jeopardy effects' and a semi-random, risk-based selection, which relies on framework technical/characteristics-based criteria in order to maximise the chances of identifying 'circumvention'.

In order to avoid unnecessary redundancy, it was necessary to ensure that the three models are **not too similar** (e.g. variations of the same product model within the same brand), or equivalent (e.g. same model sold under different brand/model names). The selected models should be **sufficiently easy to procure**, and **accessible via standard delivery** within the country in which the testing facilities are based in order to reduce the risks of transport damage and other associated risks. The models should still be **available when the purchasing tasks starts** and ideally be still **relevant after the termination of the project**. Models that have a **higher energy efficiency class were favoured** as part of the exercise, as they were deemed to be more likely prone to 'circumvention' practices due to higher pressure on the manufacturer to achieve the best possible positioning of these models. The suspected 'circumvention' aspects should be detectable by the alternative test methodologies.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.

Description of the methodology for the selection of models within ANTICSS

The implementation of the specific approach be it targeted or semi-random was applied on a case-by-case basis, depending mainly on the background information and expert analysis available. In general, the following overarching principles applied:

1. A targeted selection was implemented in those cases where specific brands and/or models had been identified as part of the ANTICSS consultation of stakeholders.

2. Alternatively, when no specific brand/model had been referred to in the reported case, a semi-random selection was applied. The main search focus was on the technical features or peculiarities associated with the reported act of 'circumvention' or 'jeopardy effect' based on an assessment of the test laboratory partners within ANTICSS.

3. Lastly, should the previous approaches still not have delimited the necessary shortlist, other selection criteria based on expert judgement and if necessary, full randomization was utilised.

The sequence for the final selection of three models was implemented through the following steps, taking into account the considerations outlined above:

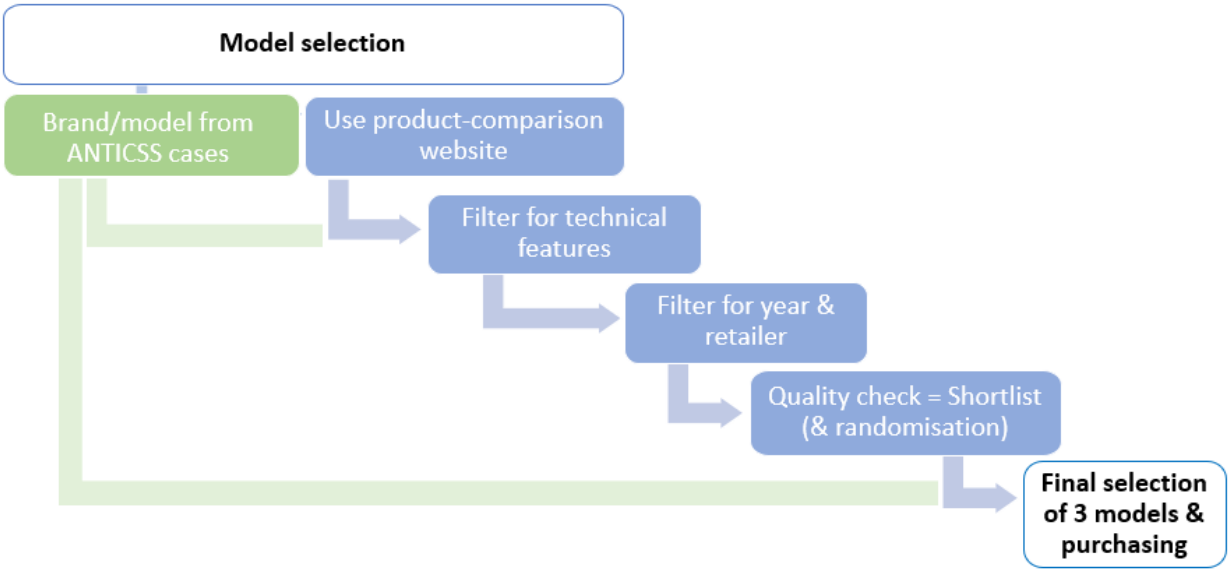

Figure 8: Methodology for the selection of the models to be tested in ANTICSS

Framework criteria for the model selection

The most valid and relevant criteria which were used for the purpose of model selection are shown in the following table:

Table 3: Criteria included in the model selection

Criteria	Justification for inclusion in the model selection
Brands and/or models identified in ANTICSS-reported cases	Project knowledge on hints of 'circumvention'.
Presence of technical features and/or functionalities identified as risks for 'circumvention' in ANTICSS cases[23,24]	Such features are likely to increase the risk of 'circumvention' devices or techniques. The assessment of the ANTICSS cases by the testing laboratory partners in the project (i.e. FFII-LCOE, Re/gent, VDE and IMQ) identified key technical features and/or functionalities as possible hints for 'circumvention'.
Presence of components that increase the risks of 'circumvention' potentialities (e.g. electronics, smartness, sensors, etc.)	Such components are likely to increase the risk of 'circumvention' devices or techniques.
Presence of suspicious programmes, modes, and/or settings	Certain programmes or modes might be used as cover up for 'circumvention' or jeopardy strategies.
Models at high energy performance claims (e.g. energy class)	It is assumed that 'circumvention' is more likely to occur in products that claim high performance than for models at the bottom end of the market, as the race for the top classes often remains fierce between manufacturers. Furthermore, products in the highest classes are frequently more sophisticated (with more controls, electronics, etc.) which increases the risks of circumventing features. For the low-end products, meanwhile, the cost of including a circumventing system is likely not to be recovered via the purchasing price.
Models put on the market recently[25]	Due to their potential to remain on the market for a longer period as compared to older models and thus to have relevance after the termination of the project.
Geographical coverage: models sold in the country where test labs are located	For this exercise in particular, products will be bought within the countries where the testing labs are located in order to avoid possible issues due to the shipment, namely: Spain (FFII-LCOE), The Netherlands (Regent), Germany (VDE), and Italy (IMQ).

[23] In the ideal case, the researched feature/mode can be filtered through the online product platforms. When this is not the case, the feature/mode/programme may be indicated in the technical product fiche. Lastly, in those cases where the sought feature/mode/programme is not indicated in the technical fiche neither filterable online, then a case-by-case detailed manual check of all the product-related information available online is applied.

[24] See *D4.1 Alternative test methods and approaches to unmask circumvention under EU Ecodesign and Energy labelling* where testing laboratories partners in the project have analysed in detail all the 'circumvention' and 'jeopardy effects' cases in each of the product categories to facilitate the model selection.

[25] There are some indications that can help identifying this: sometimes online shops provide the date of introduction of the model or there are filters for catalogues of different years. Furthermore, the price might be an indication: if the model seems to be sold at a particularly cheap price on several online shops, then it is probably close to discontinuation. Also, if the model is only found on one online shop and nowhere else, it may be an indication of end of commercial life.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122.
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

By applying these approach and criteria, for each product category to be tested within ANTICSS, three different appliance models were selected, and one unit of each model was purchased.

Disclaimer: The model selection procedure was specifically targeted at finding appliances with a high probability of a 'circumvention' behaviour. Therefore, the results of the tests within the ANTICSS project (see section 5.5) do not provide, and must not be considered as providing, a representative overview of the tested product categories on the market. This selection procedure is preparatory to the achievement of the ANTICSS project objective that is learning how to improve current harmonised standards and regulations in order to better detect and prevent CV in future.

5.3 Development and use of alternative test procedures within ANTICSS

Within the ANTICSS project, alternative test methods[26] to detect the 'circumvention' or 'jeopardy effects' were developed for 18 different cases (see Table 2) and tested for their applicability and effectiveness by the test laboratories in the project for the following goals:

- Analyse whether the suspected 'circumvention' behaviour can be confirmed in laboratory tests through the application of the alternative test method, and
- Assess the magnitude of the impact of 'circumvention' in terms of effects on energy consumption and functional performance.

It has to be noted that the ANTICSS alternative test methods differ from those test methods that have been alternatively developed by other organisations to better reflect real life usage conditions for products, i.e. addressing the 'missing representativeness' of test standards (see section 4.2), for the following reason: as described before, when products are specifically pre-set or manually alterated or are able to detect to be under test or specific loopholes or weaknesses in standards and/or legislation are exploited they result to be compliant with the applicable requirements when tested with the standardised test methods. Therefore, within ANTICSS only the conditions of the standard tests considered as being detected or exploited were varied in the alternative test methods to check the response of the tested product. At the same time, the alternative procedures were still designed as close as possible to the standard procedures with the aim to ensure a sufficient comparability with the original measurement results (although, it was not proven within the ANTICSS project that those alternative methods deliver repeatable and reproducible results comparable to the original standardised methods). If, however, the alternative approach leads to inexplicably variations in the measurement results, this may indicate that the appliance might have been specifically altered for the standard test.

[26] see Deliverable D14: *Alternative test methods and approaches to unmask circumvention under EU Ecodesign and Energy labelling;* online available at https://www.anti-circumvention.eu/storage/app/media/D14_ANTICSS_Alternative-test-procedures_final.pdf

Disclaimer: The values declared for the compliance with the Ecodesign and Energy labelling requirements are measured with harmonised standards published in the *EU Official Journal* for the related regulations. The use of other measurement methods – as for the ANTICSS alternative test methods – may lead to different results. In addition, it was not proven in the project (and was not the task to do so) that the alternative test method does deliver results with the same *repeatability* and *reproducibility* as the test methodology of the harmonised standards.

Nevertheless, according to the ANTICSS project experts the specifically chosen and well documented deviations of the ANTICSS test methods from the harmonised standards do not generally result into substantial deviations of the results from those obtained when tested according to the harmonised standard test conditions. Therefore, the ANTICSS project considers that the harmonised standard and the alternative test method as well as the achieved test results, although not usable for compliance verification, are in principle broadly comparable for the purposes of the project.

5.4 Interpretation of results based on the ANTICSS alternative testing procedures

The measurement results of the alternative test procedure were compared to the declared values as well as to the measurement results of the tests conducted using the harmonised standard. The verification tolerances for market surveillance purposes related to the tested parameters as provided in the Ecodesign and Energy labelling regulations of the respective product category were used as a reference for determining the importance of the deviation between the results achieved under the 'standard' and the 'alternative' test conditions. In general, if the deviation between the values obtained with the standard and the alternative test method exceeded the verification tolerance, the specific result of the alternative test was considered as being 'different' from that of the harmonised standard and a possible indication for 'circumvention'.

Disclaimer: The scope of the ANTICSS project is to define, detect the presence, and find ways to avoid in future 'circumvention' and 'jeopardy effects'. The project is not meant to verify the compliance of the models selected for laboratory testing. In this respect, the ANTICSS project team has on purpose avoided using expressions like 'compliance verification' or 'model compliance'.

When the results of laboratory testing conducted using a *harmonised standard* deviate more than the established verification tolerance from the declared values for the involved parameters the model is indicated as 'non-conforming', in a contrary case the model is indicated as 'conforming'. Only the MSA partners of ANTICSS, to whom the test results are forwarded, will be in charge of any decision about launching, outside the project development, an action to verify the compliance of the models.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.

For models that turned out being 'non-conforming' with the requirements of the Ecodesign and Energy labelling regulations according to the test results of the harmonised standard procedure, still the ANTICSS alternative test procedures were applied and test results of the harmonised and the alternative test procedure were analysed in terms of relevant deviations. The main purpose of the testing in ANTICSS is in fact the detection of possible 'circumvention', and this effect can well happen independently from the model compliance to the EU legislation requirements.

Specific models that turned out being non-conform with requirements of the Ecodesign and Energy labelling regulations according to the test results of the harmonised standard were reported to the Market Surveillance Authorities (MSAs) partners in the ANTICSS project for further follow up outside the development of the project.

5.5 Testing of the models – summary of approaches and test results

The detailed test reports for each of the tested product categories and cases can be found in the ANTICSS Deliverable D18 (Test Reports – Parts 2, 4, 5, 7 and 8)[27].

The following sections provide a summary of the test reports especially with focus on the description of the case, the applied alternative testing procedure as well as the test results and respective conclusions and categorisations of the tested models according to the ANTICSS definitions.

[27] Online available at https://www.anti-circumvention.eu/about-project/documents-and-deliverables. The test results of the product categories Part 1 (space heaters), Part 3 (room air conditioning) and Part 6 (domestic washing machines) and will be released and included in this report at a later stage of the project

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.

5.5.1 Televisions

5.5.1.1 Description of the cases

Case TV1 – Setting of brightness

According to standard IEC 62087-2:2015, TVs power input is measured at factory setting. In the reported case, it was observed that the power consumption increased if the factory setting was adjusted manually for the first time. The brightness value was 45 in factory settings, corresponding to 71 W. If the brightness setting was decreased by one point to a value of 44, TV's power increased to 90 W. Even if the brightness was set back manually to the factory settings (45), the power consumption remained high.

Case TV2/3 – Test loop recognition

According to standard IEC 62087-2:2015, the energy consumption of TVs is tested with factory settings. The standardised test movie, which is used for measuring the energy consumption, only consists of fast-moving images. Before the start of the standardised test movie, a countdown clip is shown. This countdown lasts for 10 seconds and does not contain any fast-moving images. After the 10 seconds, the movie content is played. In the appliance of the reported case, an automatic brightness adjustment function was implemented. This function analyses the broadcast programme, and when fast moving images are detected, the brightness of the television is reduced automatically. As a result, the measured power consumption of the television is significantly lower, compared to a broadcast video without fast moving images (reduction of the input power up to approx. 35 % are possible.).

5.5.1.2 Description of the alternative testing procedures

Case TV1 – Setting of brightness

The purpose of alternative testing method for Case TV1 is to evaluate if the factory settings are possibly targeted to meet the requirements of the standard testing only and to find out if a manufacturer has a special setting for the first installation, which cannot be restored after changing settings in the menu.

Table 4: Standard and alternative testing procedure applied in ANTICSS for Case TV1

Standard testing procedure	Alternative testing procedure
The tests were conducted according to the harmonised standard IEC 62087-2:2015.	
The brightness controls of the television were in the position adjusted by the manufacturer.	The settings of luminance and backlight were changed and then reset to the position adjusted by the manufacturer.
All parameters required in Regulation (EU) 642/2009 and Regulation (EU) 1062/2010 were measured.	

Case TV2/3 – Test loop recognition

The purpose of the alternative testing method for Case TV2/3 is to evaluate if televisions have a function which reduces the brightness of the television automatically when the fast moving images of the standard video test sequence according to IED 62087-2 (that rarely apply in real television programmes) are detected, resulting in significantly lower energy consumption of the TVs compared to a broadcast video without fast-moving images.

Table 5: Standard and alternative testing procedures applied in ANTICSS for Case TV2/3

Standard testing procedure	Alternative testing procedures
The tests were conducted according to the harmonised standard IEC 62087-2:2015. The brightness controls of the television were in the position adjusted by the manufacturer.	
The power consumption was measured using the standard test video.	*Alternative test "50/50":* Assuming that the trigger for a possible brightness adjustment function might be the specific start sequence of the test video, the standard test video of the IEC 62087-2 was divided into two parts. Measurement of power consumption is running first for the last 5 min and then the first 5 min of the standard test video. Finally, the test result is compared to the regular 10 min sequence. *Alternative test "measurement starting after 3 minutes":* Assuming that the trigger for a possible brightness adjustment function might be the specific start sequence of the test video, the power consumption was measured using the standard video loop but the measurement was started only 3 minutes after the video has started, i.e. 3 minutes later compared to the standard measurement. To ensure a 10-minute measurement and to keep the Average Picture Level (APL) of 34% it was necessary to fit the missing first 3 minutes directly to the end of the video.
All parameters required in Regulation (EU) 642/2009 and Regulation (EU) 1062/2010 were measured.	

5.5.1.3 Summary of the results

Case TV1 – Setting of brightness

Comparison of standard test with the declaration

Three different TV models were tested. There were no relevant differences between the values obtained in the standard test and the declared values. All three tested models came back to the initial tested factory settings after changing brightness/backlight and resetting.

In the standard test procedure, Models A, B and C reached the requirements of the Ecodesign / Energy label regulation, since the measured parameters were within the verification tolerances for market surveillance authorities as listed in Annex VIII of Commission Regulation (EU) No. 1062/2010 (-7% for the power consumption). Thus, Model A, B and C were considered conform.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

In all tested models the original settings could be restored. As the deviations of the results in the alternative testing compared to the standard test results were not significant, no 'circumvention' could be detected for the tested models.

ANTICSS categorisation of the general case level

Although no 'circumvention' was found for the tested models, it cannot be excluded that other appliances do not exploit specific factory settings for 'circumvention'. Therefore, the general case, i.e. specific factory settings not reverting after changing settings in the menu (leading to increased power consumption when default brightness setting is changed), is categorised as 'hints for circumvention'.

Review of the alternative test method

The proposed ANTICSS alternative test method is deemed at generally suitable for disclosing the suspicious behaviour and is easy to apply by MSA.

Case TV2/3 – Test loop recognition

Comparison of the standard test with the declaration

In the standard test procedure, Models A, B and C reached the requirements of the Ecodesign / Energy label regulation, since the measured parameters were within the verification tolerances for market surveillance authorities as listed in Annex VIII of Commission Regulation (EU) No. 1062/2010 (-7% for the power consumption). Thus, Model A, B and C were considered conform.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

The results of the alternative test measures did not lead to relevant deviations to the test results of the standard measurement. That means that not the specific start sequence of the standard test video triggered the backlight reduction but rather the general detection of fast-moving images.

Model B and Model C did not have a smart function to detect fast-moving content. The test results did not reveal any recognition of fast-changing content and subsequent decreasing the backlight and respectively the power. Therefore, no 'circumvention' has been detected for these Models.

For Model A, the ANTICSS testing revealed that it uses a technology for detecting fast-changing content as applied in the standard test video and activated an automatic backlight reduction function under test. However, for Model A it was not made use of it in the sense of the ANTICSS definition of 'circumvention' to reach more favourable results. On the contrary, the *declared* values

were significantly higher (23%) compared to the measured values which even resulted in a lower energy efficiency class (declared A instead of measured A+). According to the manufacturer, this is a safety margin added because of variation between units resulting of the construction process to ensure all units being compliant when MSA test their TV with regard to the power consumption.

ANTICSS categorisation of the general case level

Although the act of 'circumvention' could not be found in the models tested within ANTICSS, the exploitation of the automatic backlight reduction function for 'circumvention', i.e. for achieving more favourable results during the standard testing, can still be considered potentially applicable to other television models on the market.

The general case could either be classified as 'jeopardy effect' (following the manufacturer's explanation that the function is also applicable to fast moving pictures of real-life broadcasting content), or as 'hint for circumvention' (following the experience of the test lab that such fast moving pictures never apply in real-life and therefore the software solely reacts to the specific test video – which, however, could not be proven in ANTICSS).

Review of the alternative test method

The proposed ANTICSS alternative test method has not proven to be suitable to disclose the suspicious behaviour as the trigger for starting the backlight reduction function seemed not to be the specific start sequence of the standard test video but rather in general the fast-moving images of the standard test video. The application of a backlight reduction function was already visible under standard testing.

Summary of the ANTICSS categorisations for the product category televisions

Table 6: Overview of the ANTICSS standard test results of cases and models tested in the product category televisions

Standard test	Model A	Model B	Model C
Standard test	Conforming	Conforming	Conforming

Table 7: Overview of the ANTICSS alternative test results of cases and models tested in the product category televisions

Alternative test		Model A	Model B	Model C
Case TV1	(hints for CV)	no CV	no CV	no CV
Case TV2/3	(jeopardy effect)	no CV	no CV	no CV

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

5.5.2 Domestic freezers and refrigerators-freezers

5.5.2.1 Description of the cases

Case COLD 2/4 – Multiple operation modes / holiday mode

The reported case refers to some frost-free refrigerator-freezers with two or more operation modes programmed. The 'normal' mode is mostly active when door openings are detected, and an 'ECO' mode is activated when the door is kept closed for a longer period. The appliance reported in the case switches to the 'ECO' mode during the standard energy consumption tests, since it reacts on the lack of door openings which is prescribed by the EN62552:2013 standard. The measured energy consumption is reduced by 12 % when the 'ECO' mode is activated.

Case COLD 3 – Display is continuously activated

In the reported case, the display is activated each time the door of the appliance is opened, and it remains active for a longer period unless it is switched off by pressing a button. The display cannot be deactivated permanently. The user manual states that the energy consumption increases when the display of the controller is lit up.

The appliance tested in ANTICSS deviated on some points compared to the appliance reported in the case as described above. The appliance used for the ANTICSS alternative testing did not have a functionality to turn off the display immediately; instead it was turned off automatically after 24 hours without door opening. As the standard energy consumption measurement is performed without door openings, during the conformity testing the display is not activated. Therefore, the additional electricity consumption of the display is not included in the measurement results used for calculating the Energy Efficiency Index which is the basis for the Energy labelling class.

5.5.2.2 Description of the alternative testing procedures

Case COLD 2/4 – Multiple operation modes / holiday mode

The alternative test methods aimed to verify if the appliance is operating in a different operating mode compared to the standard test. Parameters for the alternative tests were detection of the door opening (door switch) and unstable input voltage.

Table 8: Standard and alternative testing procedure applied in ANTICSS for Case COLD2/4

Standard testing procedure	Alternative testing procedures
The tests were conducted according to the harmonised standard EN IEC 62552:2013. The appliance was installed inside a climate room that controls the environmental temperature of 25 °C. The temperature inside the appliance was measured with thermocouples inserted in a tylose package or a small cylinder.	
The energy consumption measurement is performed	*Alternative test 'Door switch':* The energy consumption measurement was performed with three simulated door openings by covering the sensor with a large metal plate to obstruct the magnetic field, if

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

Standard testing procedure	Alternative testing procedures
without door openings from defrost to defrost cycle	possible. For appliances where this was not possible, the door was opened just enough to trigger the door switch. *Alternative test 'Unstable input voltage':* For the energy consumption measurement, the appliance was plugged in to an unstable power supply as found in households. *Alternative test 'Unstable ambient conditions':* unstable ambient conditions were applied, preferably the average temperature of the test period was equal to the ambient temperature used during the reference test *Alternative test 'Internal temperature fluctuations':* irregular fluctuating internal compartment temperatures were introduced by physically opening the door of the appliance
All parameters required in Regulation (EU) 643/2009 and Regulation (EU) 1060/2010 were measured.	

Case COLD 3 – Display is continuously activated

The purpose of the alternative test method was to determine the additional electricity consumption due to the activity of the display.

Table 9: Standard and alternative testing procedure applied in ANTICSS for Case COLD3

Standard testing procedure	Alternative testing procedure
The tests were conducted according to the harmonised standard EN IEC 62552:2013. The appliance was installed inside a climate room that controls the environmental temperature of 25 °C. The temperature inside the appliance was measured with thermocouples inserted in a tylose package or a small cylinder.	
The energy consumption measurement was performed without door openings from defrost to defrost cycle	The power consumption of the display was measured while switching from the 24 h automatically turn-off to 'display activated' after door opening. The difference of the measured input power was accounted to the display.
All parameters required in Regulation (EU) 643/2009 and Regulation (EU) 1060/2010 were measured.	

Co-funded by the Horizon 2020 Programme of the European Union
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

5.5.2.3 Summary of the results

Case COLD 2/4 – Multiple operation modes / holiday mode

Comparison of the standard test with the declaration

For this case, three different appliances were tested. The deviations for the fluctuating voltage supply test of the standard test results for all tested appliances were not relevant. The deviations found for the physical door opening test in Model C were further analysed in case COLD 3.

In the standard test procedure, Models A and C did not reach the requirements of the Ecodesign / Energy label regulation, since the measured parameters were not within the verification tolerances for market surveillance authorities as listed in Annex V of Commission Regulation (EU) No. 643/2009 (-10% for the power consumption). Thus, Model A and C were not considered conform.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

The Models A and B did not react differently when being supplied with fluctuating voltage and no relevant alteration of the behaviour during the door opening tests could be observed. Therefore, no 'circumvention' could be confirmed for these models. For Model C relevant deviations for the physical door opening were detected, which however were further analysed in case COLD 3.

The fluctuating ambient conditions test showed two possible effects on the energy consumption of the appliance. With changing ambient temperature conditions, the appliance started to act differently a) by increasing the compressor speed at warmer ambient temperatures, resulting in an overall electrical efficiency decrease and b) by increasing the activation time of an unidentified component during the energy consumption test.[28]

Based on these two points the alternating behaviour leads to 'missing representativeness'. It is positive that the appliance is optimised at several ambient conditions, but according to the conformity test, only one ambient temperature needs to be tested for the energy consumption value.

[28] The increase of the compressor speed was a result that the required cooling capacity increased at higher ambient temperatures. It was in line that at cold ambient temperatures the speed is lower compared to the warmer ambient temperatures. With a variable speed compressor, manufacturers have the possibility to optimize the energy efficiency of the appliance for multiple ambient conditions while fixed speed compressors can only be optimized at one ambient condition. However, since the declared energy consumption is only measured at one ambient condition it cannot take into account any required higher compressor speeds at warmer ambient temperatures compared to the ambient temperature of the standard energy consumption test. For the second point observed, it was quite possible that some components needed to be activated more often to achieve the desired performance at lower ambient temperatures. For example, an internal fan needed to be activated more often to achieve a better temperature distribution.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

ANTICSS categorisation of general case level

Although no 'circumvention' was found for the tested models, it cannot be excluded that other appliances do not show this behaviour. Therefore the general case, i.e. the energy-saving function 'ECO' or 'holiday mode', activated when the door is kept closed for a longer period, was classified as 'jeopardy effect' as this function applies both in the test situation and in consumer usage but for the latter applicable only in rather infrequent situations.

Review of the alternative test methods

Regarding the applicability of the proposed alternative test methods, in general, the resources and/or time required to identify multiple operating modes was extensive. Technical experts were required to analyse the alternative test results properly and to make a statement if a certain alteration of the behaviour was acceptable or not.

Overall, it is recommended to perform at least the physical door openings alternative test method after the standardized energy consumption testing to look for any 'circumvention'. It will cost an additional few days extra testing time, but it will provide a good indication if circumvention may be present or not. In case the appliance reacts on the door openings, more extensive testing and detailed analysing should be conducted.

Case COLD 3 – Display is continuously activated

Comparison of the standard test with the declaration

In the standard test procedure, Model C exceeded the declared value by 13.2 % and therefore did not reach the requirements of the Ecodesign / Energy label regulation, since the measured parameters were not within the verification tolerances for market surveillance authorities as listed in Annex V of Commission Regulation (EU) No. 643/2009 (-10% for the power consumption). Thus, Model C was not considered conform.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

Model C automatically disables the display only after 24 hours without door openings, without any possibility to disable it at an earlier time. The power input measured under alternative test conditions that could be accounted to the display was 2.1 W, leading to an increased annual energy consumption of 17.39 kWh/year[29] (+10.3 %); based on these values, the energy efficiency class of the appliance would change from A^{+++} to A^{++}. For the tested Model C, the deviations of the standard and alternative test results were relevant which led to the ANTICSS categorisation of 'borderline to circumvention'.

[29] Based on an average holiday period of 20 days per year where the door isn't being opened and thus the appliance deactivates the display.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122.
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

ANTICSS categorisation of general case level

For Case COLD3, the general case, i.e. the energy saving function of a display automatically switched off only after a period of 24 hours of no door openings, is classified as 'jeopardy effect' as this function applies both in the test situation (no door openings under standard test) and in consumer usage but for the latter applicable only in rather infrequent situations.

Review of the alternative test method

The proposed ANTICSS alternative test method is deemed as generally suitable for disclosing the suspicious behaviour, being easy applicable by MSAs and not requiring a lot of extra resources/time.

Summary of the ANTICSS categorisations for the category domestic freezers / refrigerator-freezers

Table 10: Overview of the ANTICSS standard[30] test results of cases and models tested in the product category domestic freezers and refrigerator-freezers

Standard test	Model A	Model B	Model C
Standard test	Not conforming	Conforming	Not conforming

Table 11: Overview of the ANTICSS alternative test results of Case COLD2/4 and models tested in the product category domestic freezers and refrigerator-freezers

Case COLD 2/4 – Alternative test	Model A	Model B	Model C
Fluctuating voltage supply test			
Physical door opening test			door opening test, cf. Case COLD3
Fluctuating ambient conditions test	Missing representativeness of the standard		Undisclosed

Table 12: Overview of the ANTICSS alternative test results of cases and models tested in the product category domestic freezers and refrigerator-freezers

Alternative test	Model A	Model B	Model C
Case COLD 2/4 (jeopardy effect)	no CV	no CV	Door opening test, cf. Case Cold 3
Case COLD 3 (jeopardy effect)	Not tested	Not tested	Borderline to CV

[30] Not the complete set of standard tests are performed. The conforming and non-conforming only relates to the energy consumption test result.

5.5.3 Domestic dishwashers

5.5.3.1 Description of the cases

Case DISH 1 – separate bowl support

For energy consumption and performance tests, automatic dishwashers have to be loaded with the indicated number of place settings, which are soiled in accordance with standard EN 50242. Concerning the loading and the settings of the machine, the standard requests to follow the manufacturer's instructions. In the reported case, a separate 'bowl' support, which is marked as 'only for standard tests' or similar on the packaging, is supplied with the machine. This support is attached to the saucer support prongs in the upper rack when loading to the full number of place settings (standard load as specified by the manufacturer). The support is not mentioned anywhere else than in the standard loading plan supplied separately by the manufacturer. That means consumers do not intend it for use. These specific instructions might lead to an alteration of the cleaning and drying performance, as well as energy consumption.

Case DISH 3 – removal / alteration of accessories

Tests are conducted according to the standard conditions and manufacturer's instructions. In many dishwashers (from multiple manufacturers) it is necessary to remove or alter the position of many of the 'accessories' fitted to the appliance as supplied. It is highly unlikely that a consumer would do the same. If the parts are not removed, the 'standard' load do not fit in the appliance and the dishwasher as supplied cannot be loaded with the claimed full capacity. Instructions on the removal of all the relevant parts are only given in the 'Instructions for Test Laboratories' and are unlikely to be carried out by the consumer in day to day use. These special preparations might affect the energy and water consumption during operation.

Case DISH 2 – specific pre-treatment before testing

In the reported case, specific instruction on how to adjust the appliance for tests is given in the instruction information for test institutes only. The three pre-treatment cycles described should be done within one day, whereas the standard tests shall be started the next day. After 12 hours, it is ensured that the appliance has reached ambient temperature. These specific instructions might serve as indicator for the appliance to detect being under the test situation. As the manufacturer specifies in the instructions that the machine shall be disconnected from the power supply after the third pre-conditioning cycle, this aspect of potential power failures was examined more closely concerning the filling of the water tank.

Case DISH 4 – dishwasher/ water tank

Some dishwashers are fitted with a water storage tank that temporarily stores water (rinsing water or water coming from the mains supply) inside the appliance after the test. The water is used during the pre-wash of the next wash cycle to save water. The water in the tank will be discarded after a certain time if the dishwasher is not operated.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

An additional tank cleaning operation may cause an even higher water and energy consumption. Resource-saving effects can only be realized, if the dishwasher is run on an almost daily basis, which is the case during performance tests but may not reflect household conditions.

5.5.3.2 Description of the alternative testing procedure

For the testing in ANTICSS, for both the standard and the alternative testing, the procedure foreseen in the standard was modified in order to simplify and shorten the total duration of testing. Instead of five to eight cycles, only three cycles were conducted to determine average consumption and performance values. The reference dishwasher was not running in parallel to the test machine. Low power mode consumption and noise emission were not measured within the framework of this particular case. Energy consumption of Left-On and Off Mode were taken from the product fiche of the manufacturer in order to calculate the annual energy consumption, Energy Efficiency Index and Class. Cleaning and Drying Performance Indices were calculated by means of average values for the reference machine, which were gained during previous performance tests of the reference machine. A cleaning performance score of 3.50 was assumed for the reference machine, the drying performance score was set at 0.85 for the calculation of indices.

Case DISH 1 – separate bowl support

The purpose of the alternative test method is the evaluation of the possible effects of not using the additional bowl support on the cleaning and drying performance, as well as potential increase of the specific energy consumption per dish.

Table 13: Standard and alternative testing procedure applied in ANTICSS for Case DISH1

Standard testing procedure	Alternative testing procedure
Tests are conducted according to harmonised standard EN 50242:2016 with certain modifications as listed above.	
The instructions of the manufacturer are applied. This includes installation of a separate 'bowl' support, which is marked as 'only for laboratory tests' on the packaging.	The separate bowl support mentioned in the manufacturer instructions is not used. Energy consumption is calculated based on the number of usable place settings without using the bowl support.
All parameters required in Regulation (EU) 1016/2010 and Regulation (EU) 1059/2010 are measured within 3 cycles (i.e. energy and water consumption, programme duration, cleaning and drying efficiency).	

Case DISH 3 – removal / alteration of accessories

The purpose of the alternative test method is the evaluation of the possible effects of not removing or altering the accessories, which might imply e.g. a possible reduction of the rated capacity and possible changes in the energy and water consumption.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

Table 14: Standard and alternative testing procedure applied in ANTICSS for Case DISH3

Standard testing procedure	Alternative testing procedure
Tests are conducted according to harmonised standard EN 50242:2016 with certain modifications as listed above.	
The instructions of the manufacturer are applied. This includes removing and/or altering the position of the accessories as described by the manufacturer. The machine is loaded with the declared number of place settings.	Tests are done without removing or altering accessories. An alternative loading scheme is designed, fitting the maximum number of place settings and corresponding serving pieces. Energy consumption is calculated based on this alternative loading scheme. The dishwasher as supplied only can be loaded with 12 place settings instead of 16 place settings.
All parameters required in Regulation (EU) 1016/2010 and Regulation (EU) 1059/2010 are measured within 3 cycles (i.e. energy and water consumption, programme duration, cleaning and drying efficiency).	

Case DISH 2 – specific pre-treatment before testing

Analysis of whether the dishwasher recognizes the test condition utilizing the fixed pre-treatment and the programme course and adjusts accordingly to reduce energy and/or water consumption or increase the performance.

Table 15: Standard and alternative testing procedure applied in ANTICSS for Case DISH2

Standard testing procedure	Alternative testing procedure
Tests are conducted according to harmonised standard EN 50242:2016 with certain modifications as listed above and manufacturer's instructions, which includes the following prescribed preconditioning method:	
Run three *pre-conditioning cycles* within one day: 1. Intensive programme (connected), 2. Pre-Rinse programme (connected), 3. Eco programme, and then disconnect the machine from the electricity supply. After each of the following three *test cycles*, the machine is disconnected from the mains.	Run three (different) pre-conditioning cycles within one day: 1. Machine care programme, 2. Daily quick programme, 3. Eco programme *Alternative test 1:* Three cycles with disconnecting the machine after each *pre-conditioning* and each *test* cycle *Alternative test 2:* The machine is kept connected to the mains permanently after each *pre-conditioning* and each *test* cycle
Next day/ at least 12 h later: start measurement of energy consumption as per EN 50242:2016. All parameters required in Regulation (EU) 1016/2010 and Regulation (EU) 1059/2010 are measured within 3 cycles (i.e. energy and water consumption, programme duration, cleaning and drying efficiency).	

Co-funded by the Horizon 2020 Programme of the European Union
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

Case DISH 4 – dishwasher/ water tank

The purpose of the alternative test method is the analysis of the potential water- and energy-saving effects of a water tank, which may only be reached by daily usage, as considered by the harmonised standard. The results shall be compared to the energy- and water consumption if the interval between test runs exceeds 36 hours (alternative test procedure).

Table 16: Standard and alternative testing procedure applied in ANTICSS for Case DISH4

Standard testing procedure	Alternative testing procedure
Tests are conducted according to harmonised standard EN 50242:2016 with certain modifications as listed above and manufacturer's instructions.	
The pre-conditioning and test cycles are performed on consecutive days.	The Pre-Conditioning cycles are carried out three days in advance of the first test cycle, to guarantee equivalent conditions of the water tank for each cycle. The test cycles are performed each three days.
All parameters required in Regulation (EU) 1016/2010 and Regulation (EU) 1059/2010 were measured within 3 cycles (i.e. energy and water consumption, programme duration, cleaning and drying efficiency).	

5.5.3.3 Summary of the results

Case DISH 1 – separate bowl support

Comparison of the standard test with the declaration

The measured energy consumption of the (modified) standard test within ANTICSS was lower than declared by the manufacturer. Either the declared Energy Efficiency Class, or the annual energy consumption of 271 kWh seems to be wrong since this would lead to an EEI of 56 (class A^{+}), while the manufacturer declares Energy Efficiency Class A^{++}. On the other hand, the measured energy consumption in the standard test leads to an EEI of 53 which corresponds to the Energy Efficiency Class A^{++} as declared.

In the standard test procedure, the cleaning and drying performance indices reached the minimum requirements of the Ecodesign / Energy label regulations, since both parameters were within the verification tolerances for market surveillance authorities as listed in Annex III of Commission Regulation (EU) No. 1016/2010 (-10 % for the cleaning performance index, -19 % for the drying performance index). Thus, the tested Model was considered conform.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

The bowl support did not have an influence on the loading scheme and on consumption values of the tested programme. In the alternative test procedure, the values for the energy and water

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

consumption, drying performance index and programme duration were deviating within the verification tolerance from the test results of the standard procedure. The cleaning performance was worse compared to the values of the standard test scenario, however, still within the verification tolerances, thus not considered relevant.

For the tested Model, no 'circumvention' could be detected as the deviations of the standard and alternative test results were not relevant, i.e. the additional bowl support did not have a relevant effect on the performance or consumption of the dishwasher. It remains still unclear why the accessory 'bowl support' is supplied only for test institutes at all.

ANTICSS categorisation of the general case level

Although in the tested Model, the additional bowl support did not have a relevant influence on the results, the general case, i.e. the provision of specific test instructions (in this case an additional bowl support to be used solely for standard testing purposes) is categorised as 'hint for circumvention' as it has the general potential to alter test results in favour of the manufacturer and could be applied to other models on the market.

Review of the alternative test method

The alternative test method, which was applied for this case, can be adopted for similar cases, in order to disclose suspicious behaviour. The procedure is applicable for MSAs without additional burden or effort, merely adjustments of the loading scheme may be necessary.

Case DISH 3 – removal / alteration of accessories

Comparison of the standard test with the declaration

The results of the tests according to the standard procedure for energy consumption, cleaning efficiency index and programme time were within the verification tolerances[31]. However, the drying performance index of the standard measurement exceeded the verification tolerance of -19% and thus was not conform with minimum requirements according to Regulation (EU) 1016/2010.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

With the alternative loading scheme and all accessories kept included, only 12 instead of 16 place settings as declared could be fitted into the dishwasher. Even though a higher number of cutlery items, saucers, cups and glasses would fit into the machine, their amount was adjusted to the number of plates, to work with complete sets of place settings.

[31] 10% for energy consumption, cleaning efficiency index and programme time

For the tested Model, the drying performance index and the total energy consumption were only slightly lower compared to the standard test results, due to the reduced weight of the load. The EEI and the resulting Energy Efficiency Class were hardly affected by the reduction of the loading capacity. The most relevant changes of the alternative test results compared to the standard test results were found for the *specific* energy and water consumption per place setting (around +30%). As for the tested Model C, the deviations between the standard and alternative test results were relevant, which leads to the ANTICSS categorisation of 'circumvention'.

The manufacturer of the tested dishwasher declared a high maximum loading capacity and numerous accessories supplied with the appliance; however, the only way to achieve the claimed loading capacity was removing all the relevant parts and applying a loading scheme which is only given in the 'instructions for test laboratories'. This alteration is just applied for the test procedure; thus, the resulting resource consumptions apply to this special test situation only. Since the declared loading capacity is used to calculate the EEI, a higher loading capacity might help to reach a better EEI, although this was not the case for the model tested within ANTICSS.

ANTICSS categorisation of the general case level

For Case DISH3, the general case, i.e. provision of specific test instructions solely for test laboratories (removal of accessories only in the test situation), is categorised as 'hint for circumvention' which could also apply to other models on the market.

Review of the alternative test method

The proposed ANTICSS alternative test method is deemed suitable for disclosing the suspicious behaviour and easy to apply by MSAs. Some additional time is required to find a suitable and reasonable loading scheme and to determine the most realistic loading capacity.

Case DISH 2 – specific pre-treatment before testing

Comparison of the standard test with the declaration

In the standard test procedure, the cleaning and drying performance were within the verification tolerances for market surveillance authorities as listed in Annex III of Commission Regulation (EU) 1016/2010 (-10 % for the cleaning performance index, -19 % for the drying performance index). Also, the other parameters measured under standard test conditions were within the verification tolerances[32], thus the tested Model B was considered as conform.

[32] 10% for energy consumption and programme time, no verification tolerance provided for water consumption.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

The tested dishwasher model generally needs three cycles within a short period until the water tank is fully filled. Further, the dishwasher is programmed in a way that after disconnection, when being in the Eco programme (which is the third pre-conditioning cycle) the tank is not emptied. This shall ensure that the water in the tank can be used throughout the whole testing which is especially relevant when the pre-conditioning cycles end on a Friday and the testing cycles only start on the following Monday; in this setting, the tank would otherwise be emptied as it is automatically foreseen after 36 hours (probably due to hygienic reasons).

Alternative testing (disconnected): In the alternative testing, when the machine was disconnected at the end of each pre-conditioning and each test cycle, the water tank was not filled, or emptied again after the first two pre-conditioning cycles. This means that the tank was not filled after the third pre-conditioning cycle and fresh water had to be used for the following test cycles which resulted in higher water consumption compared to the standard test. The third pre-conditioning cycle (Eco programme) and the first and second test cycle (each Eco programmes) had to be used to fill the tank. Thus, only the third test cycle had a lower water consumption as the water of the filled tank could then be utilized.

As disconnecting after each cycle is not usual for real life conditions at all, the ANTICSS project team decided not taking this alternative test scenario (disconnected) as basis for the categorisation with regard to 'circumvention'.

Alternative testing (connected): When dishwasher was kept connected to the mains, the tank was filled after the third pre-conditioning cycle and the following test cycles could utilize the water from the filled tank; no additional freshwater had to be used. In this setting, the results of the alternative test procedure were rather similar to the standard test results. It has to be noted, however, that the test cycles started within 36 hours after pre-conditioning. If the last pre-conditioning cycle would have taken place on a Friday and the test cycles started on Monday only, then the alternative testing 'connected' would have resulted in a higher water consumption as the tank would have been emptied and refilled in that situation.

For the tested Model B, no 'circumvention' has been detected for the alternative test setting 'connected'.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

ANTICSS categorisation of the general case level

Cases DISH4, i.e. a water saving technology – specific but presumably not solely applicable in the standard test situation, in combination with specific test instructions (also included in the user manual instructions) was initially categorized as 'jeopardy effect'. After revisiting this case, however, it cannot be stated that the water saving function is only applied in rather exceptional situations but it approximately corresponds to the European average use cycles used as total number of standard cleaning cycles per year according to the current EU Ecodesign and Energy label regulations. Therefore, the initial categorisation of the case as 'jeopardy effect' could not be maintained anymore.

The case can be rather classified as 'missing representativeness of the standard'. There is still a loophole in the current harmonised test standard as the programme(s) for pre-conditioning are not further specified in the standard thus the procedure can be provided by the manufacturer which might be exploited. To some extent, this loophole will be closed with the upcoming test standard EN 60436:2020. Additionally, the current harmonised test procedure has a weakness as it does not take into account water tank machines appropriately. Also, under the new test standard EN 60436:2020, the additional water consumption due to emptying and refilling of the tank will not be included in the mean annual consumption value that is declared on the energy label.

Review of the alternative test method

The proposed ANTICSS alternative test method of slightly changing settings compared to the manufacturers' instructions is deemed generally suitable for disclosing the suspicious behaviour, however, the test burden increases if various alternative test procedures are applied.

Case DISH 4 – dishwasher/ water tank

Comparison of the standard test with the declaration

In the standard test procedure, the cleaning and drying performance were within the verification tolerances for market surveillance authorities as listed in Annex III of Commission Regulation (EU) 1016/2010 (-10 % for the cleaning performance index, -19 % for the drying performance index). Also, the other parameters measured under standard test conditions were within the verification tolerances[33], thus the tested Model B was considered as conform.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

In the alternative test procedure, with a break of more than 36 hours between the test cycles, the tank was emptied automatically after 36 hours and tap water was taken up at the beginning of the next cycle. Accordingly, the water consumption considerably increased compared to the results of

[33] 10% for energy consumption and programme time, no verification tolerance provided for water consumption.

the standard testing (+ 64.9 %). The energy consumption also slightly increased, which led to a higher Energy Efficiency Index (EEI) and a lower Efficiency Class (A^{++} instead of A^{+++} as declared). For the programme duration, cleaning and drying performance, no influence of the alternative test procedure was observed.

The case was initially categorized as 'jeopardy effect' as the water saving technology would be both applicable for the test situation and the consumers usage, assuming that for the latter only applicable in *rather infrequent or exceptional situations*, i.e. the advantage explicitly gained in the test situation. Initial suspect was that the available settings for the tank storage duration (12 h, 24 h, 36 h according to the user instructions) might be too short to benefit from this special feature in real life on a large scale. Therefore, the alternative procedure was chosen to show the effect if the water tank would be emptied more often in case of less frequent usage. Indeed, the effect of this alternative procedure was a higher water consumption of the tested Model.

The water is stored in the tank for a maximum of 36 hours and therefore the dishwasher can be used around 243 cycles per year (around 4 to 5 cycles per week). In comparison, according to the current Ecodesign and Energy labelling regulations, a total number of 280 standard cleaning cycles per year (i.e. about 5 cycles per week) is used for the calculation of the annual energy consumption of dishwashers. Thus, the initial categorisation of the case as 'jeopardy effect' was not maintained anymore as the water-saving function is not only applied in 'rather exceptional situations'. In that sense, also no 'circumvention' could be ascribed to the tested Model.

However, when it comes to household conditions, the water tank might be used efficiently, but this is applicable only in those cases where the dishwasher is run on a nearly daily basis (4-5 times per week. When the dishwasher is less frequently used, the annual water consumption of the machine will increase compared to the declared values due to the emptying and refilling of the water tank after 36 hours. In this respect, there is a shortcoming in the user manual as it does not give any hint that the water consumption will increase in case of lower frequency usage of the dishwasher. Further, the tank is only filled if three cycles are run within a maximum duration of 36 hours, thus water-saving effects cannot be realized until the fourth cycle; this information is also not provided to consumers, but only in the notes for test institutes.

<u>ANTICSS categorisation of the general case level</u>

At the general level, this case, i.e. water-saving technology – specific but presumably not solely applicable in a test situation, in combination with specific test instructions (also included in the user manual instructions) was initially categorised as 'jeopardy effect'. As described above, this initial categorisation cannot be maintained anymore. The case can rather be classified as 'missing representativeness' of the standard as the current harmonised test procedure does not take into account water tank machines appropriately.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

The current harmonized standard is not requiring information or measures how to cope with additional water consumption or fluctuating water intakes of modern machines. Water stored in tanks, heat exchangers, regeneration water or water for tank cleaning activities cannot be handled appropriately with the current test standard, even though it is contributing to the annual water consumption noticeably.

The upcoming test standard EN60436:2020 will include a method by which manufacturers are urged to provide information to the user about regeneration and associated resource consumption; however, additional water consumption due to emptying and refilling of the tank is still difficult to handle and will not be included in the mean annual consumption value that is declared on the energy label.

Review of the alternative test method

It can be concluded that for this case the alternative test procedure was not suitable to detect 'circumvention'.

Summary of the ANTICSS categorisations for the product category domestic dishwashers

Table 17: Overview of the ANTICSS standard test results of cases and models tested in the product category domestic dishwashers

Standard test	Model A	Model B	Model C
Standard test	Conforming	Conforming	**Not conforming (Drying Efficiency Index)**

Table 18: Overview of the ANTICSS alternative test results of cases and models tested in the product category domestic dishwashers

Alternative test		Model A	Model B	Model C
Case DISH1	(hints for CV)	no CV	Not tested	Not tested
Case DISH3	(hints for CV)	Not tested	Not tested	CV
Case DISH2	(hints for CV)	Not tested	no CV	Not tested
Case DISH4		Not tested	missing representativeness of the standard	Not tested

5.5.4 Household tumble driers

5.5.4.1 Description of the cases

Case DRIER 1 – Special preparations before testing

Some tumble dryers have a statement in the instructions regarding special preparation before commencing tests according to EN 61121:2013. In the reported case it was said in the manufacturer instructions that before the test, a cycle with a load of 3 kg and 70 % of initial moisture content in the cotton normal-dry programme has to be performed. It might be possible that this specific set of requirements could trigger a different performance profile compared to the 'normal profile'.

Case DRIER 2 – Hidden Software

White goods may theoretically comprise hidden software/sensors that detect the specific ambient testing conditions of the standard and run specific algorithms that might result in e.g. lower resource consumption or better performance values. In the reported case it was assumed that an electronic control could determine the test situation due to the stable supply voltage of 230 V ± 1 % requested by the harmonised standard.

5.5.4.2 Description of the alternative testing procedures

Case DRIER 1 – Special preparations before testing

The purpose of the alternative test method is to analyse how the special preparation of the tumble drier before the appliance is tested according to the standard affects the energy and functional performance of the appliance.

Table 19: Standard and alternative testing procedure applied in ANTICSS for Case DRIER1

Standard testing procedure	Alternative testing procedure
The tests were conducted according to the harmonised standard EN 61121:2013 with 4 cycles half load and 3 cycles full load.	
Following the manufacturer's instructions, a drying cycle with a 3 kg load, prepared to 70 % residual moisture was run before the test cycles were started.	The tests were performed according to the standard without applying the special preparation required by the manufacturer but including instead the conditioning of the tumble drier as described in the standard. The alternative procedure was performed before the standard test to avoid that the special preparation required by the manufacturer could influence the alternative test.
All parameters required in Regulation (EU) 932/2012 and Regulation (EU) 392/2012 were measured.	

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

Case DRIER 2 – Hidden Software

The purpose of the alternative test method was to analyse if the rather stricter ambient conditions (stable voltage supply) in the harmonised standard might trigger the activation of any possible hidden software/sensors that can cause lower resource consumption (energy, water, etc.) and to see how the variation of the supply voltage of the alternative testing, more likely to happen in real life conditions, can influence the energy and functional performance of the tumble drier.

Table 20: Standard and alternative testing procedure applied in ANTICSS for Case DRIER2

Standard testing procedure	Alternative testing procedure
The tests were conducted according to the harmonised standard EN 61121:2013 with 4 cycles half load and 3 cycles full load.	The alternative tests were conducted according to the harmonised standard EN 61121:2013 with 2 cycles half load and 2 cycles full load.
Following the standard test instructions, a voltage of 230 V ± 1 % has been supplied.	The supply voltage has been maintained at 230 V + 6% = 243.8 V ± 2%, which is more likely under 'real-life' conditions.
All parameters required in Regulation (EU) 932/2012 and Regulation (EU) 392/2012 were measured.	

5.5.4.3 Summary of the results

Case DRIER 1 – Special preparations before testing

Comparison of the standard test with the declaration

The annual energy consumption of the standard test method only slightly differed to the declared value. The condensation efficiency of standard test corresponded with the declared value. The programme time in the standard test was shorter than declared. All values obtained in the standard test conformed to the requirements of the Energy Labelling and Ecodesign regulations.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

The difference between the values obtained in the standard and the alternative procedure was not relevant. For any of the parameters the manufacturer did not reach more favourable results under testing. So, the no 'circumvention' could be confirmed for this specific model.

ANTICSS categorisation of the general case level

Although 'circumvention' has not been confirmed for specific tested model, the inclusion of indications solely for testing labs in the user manual resulting in a better positioning in the laboratory testing could still be used in other tumble drier models on the market for circumventing. Therefore, the general case, i.e. provision of specific test instructions (specific pre-treatment) solely for test laboratories, is still categorised as 'hint for circumvention'.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

Review of the alternative test method

The proposed ANTICSS alternative test method is deemed generally suitable for disclosing the suspicious behaviour in cases similar to this one.

Case DRIER 2 – Hidden Software

Comparison of the standard test with the declaration

For Model A the differences between the values obtained in the standard test and the declared ones were not relevant. The Model was conforming to the requirements of the Ecodesign and Energy labelling regulations

Model B showed an insufficient capacity of the condensate water container to run the full-load cycle. Thus, for this model it was not possible to perform the test according to the harmonised standard. This model does not comply with the requirements of the harmonised standard and does not conform the requirements of the EL/ED regulations.

For Model C the measured energy consumption as well as the programme duration of the tumble under standard test procedure were lower than declared. Condensation efficiency under standard test was slightly higher than declared. The deviations were not relevant, i.e. the tested Model C conformed to the requirements of the Energy Labelling and Ecodesign regulations.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

For Models A and C, the difference between the values obtained in the standard and the alternative procedure were not relevant, i.e. within the verification tolerances for MSAs concerning energy consumption and programme time.

For Model A, the condensation efficiency was highly affected by the alternative testing procedure. The results obtained in the alternative tests for this parameter would not conform with the requirements of the EL/ED regulations. The observed fluctuations in the condensation efficiency might be caused by the presence of some condensed water corresponding to the previous cycle when beginning the test. For clarification, it would have been necessary to repeat the tests which was not possible within the project.

The values obtained for Model C in the standard and alternative test procedures performed for ANTICSS project were more favourable for the consumer, i.e. 'better' than the declared ones.

No 'circumvention' could be confirmed for both tested models.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

ANTICSS categorisation of the general case level

Although no 'circumvention' was confirmed for the tested models, it cannot be excluded that other driers might take advantage of this. The general case, i.e. suspicion of specific software to detect and react to the standard measurement, is still categorised as 'hint for circumvention'.

Review of the alternative test method

The proposed ANTICSS alternative test method, i.e. the variation of the supply voltage providing a test condition that is more likely to happen in real life conditions than the test condition required by the harmonised standard, is deemed generally suitable for disclosing the suspicious behaviour in cases similar to this one.

The number of tests runs in the alternative testing method was reduced from 7 as required by the harmonised standard to 4 test runs which is considered sufficient for comparing the results with the results of the tests according to the harmonised standard.

Summary of the ANTICSS categorisations for the product category household tumble driers

Table 21: Overview of the ANTICSS standard test results of cases and models tested in the product category household tumble driers

Standard test	Model A	Model B	Model C
Standard test	Conforming	**Not conforming**	Conforming

Table 22: Overview of the ANTICSS alternative test results of cases and models tested in the product category household tumble driers

Alternative test		Model A	Model B	Model C
Case DRIER1	(hints for CV)	no CV	Not tested	Not tested
Case DRIER2	(hints for CV)	no CV	no CV	no CV

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

5.5.5 Domestic ovens

5.5.5.1 Description of the cases

Case OVEN 1 – Volume without shelf guides

The harmonised standard EN 60350-1:2016 states that removable items specified in the user instructions and not essential for the operation of the appliance, shall be removed before the energy measurement is carried out. In some ovens, the measurement of the volume is done with removed shelf guides, because according to some recipes included in the user manual the cooking compartment must be empty. Higher volume implies better EEI.

Case OVEN 2 – Maximum temperature in centre of oven

According to EN 60350-1:2016 point 7.4, to measure the energy consumption of the oven, the temperature rise in the centre of the oven has to reach the following temperatures (D*T*1: 140°C (Conventional) resp. 135°C (forced air circulation) +/- 10 K; D*T*2: 180°C resp. 155 C +/- 10 K; D*T*3: 220°C resp. 175°C +/- 10 K). In case the oven is not capable to perform the D*T*3 temperature rise in the centre of the oven, a smaller D*T* than requested by the standard is accepted. This situation implies lower energy consumption results for those ovens that are not able to reach these temperatures – a situation of which manufacturers might take advantage.

Case OVEN 3 – Electronic control

The test cycle according to EN 60350-1 consists of an energy consumption measurement followed by a consecutive temperature measurement of the empty oven. The first step of the test cycle (measurement of the energy consumption) is done with the oven loaded with a brick; for the second step (temperature measurement of the empty oven), necessarily the door has to be opened to remove the brick.
In the reported case it seems that an electronic control detects the first opening of the oven door as a test situation. During the first step, the energy consumption measurement, the temperature in the oven was considerably lower than the temperature setting. The opening (and re-closing) of the oven door caused a significant increase of the temperature in the interior of the oven and the set temperature value was reached. The same measurements were performed in a non-ECO mode and there was no difference between the temperatures of the two steps of the test cycle.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

5.5.5.2 Description of the alternative testing procedures

Case OVEN 1 – Volume without shelf guides

The purpose of the alternative test method was to quantify, if and how the difference in the measurement of the volume affects the EEI and the corresponding Energy Efficiency Class.

Table 23: Standard and alternative testing procedure applied in ANTICSS for Case OVEN1

Standard testing procedure	Alternative testing procedure
The tests were conducted according to the harmonised standard EN 60350-1:2016 and manufacturer's instructions.	The tests were conducted according to the harmonised standard EN 60350-1:2016.
Due to the given recipes specified in the user instructions, the volume of the oven cavern was measured without shelf guides.	The volume of the oven was measured with the shelf guides in their position.
All parameters required in Regulation (EU) 66/2014 and Regulation (EU) 65/2014 were measured.	

Case OVEN 2 – Maximum temperature in centre of oven

The purpose of the alternative test method was to analyse if there is a difference in the EEI if the oven is tested with a lower D*T*3 in comparison to the requested temperature rise (D*T*3). This is accepted in the standard, if the oven cannot reach the requested temperature D*T*3 difference in the centre of the oven cavity.

Table 24: Standard and alternative testing procedure applied in ANTICSS for Case OVEN2

Standard testing procedure	Alternative testing procedure
The tests were conducted according to the harmonised standard EN 60350-1:2016. Three heating functions were tested: - Conventional - Conventional fan assisted - ECO fan assisted	
For the harmonised test the requested temperature difference D*T*3 was 220°C resp. 175°C +/- 10 °K	For the alternative test the requested temperature difference D*T*3 was reduced to 200°C resp. 165°C +/- 10 °K
All parameters required in Regulation (EU) No 66/2014 and Regulation (EU) No 65/2014 are measured.	

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

Case OVEN 3 – Electronic control

The purpose of the alternative test method was to avoid that the electronic control of the oven detects the test situation due to the door opening.

Table 25: Standard and alternative testing procedure applied in ANTICSS for Case OVEN3

Standard testing procedure	Alternative testing procedure
The tests were conducted according to the harmonised standard EN 60350-1:2016.	
The test cycle consisted of the energy consumption measurement (Step I) with a brick in the centre of the oven[34] directly followed by the subsequent temperature measurement (Step II) of the emptied oven.	Step I was done according to the standard procedure. The temperature measurement (Step II) was performed as a separate measurement by starting the test on a different day with the appliance at ambient temperature 23 ± 2 °C.
All parameters required in Regulation (EU) 66/2014 and Regulation (EU) 65/2014 were measured.	

5.5.5.3 Summary of the results

Case OVEN 1 – Volume without shelf guides

Comparison of the standard test with the declaration

Model A

The value of the volume in the standard procedure of Model A corresponded to the declared value. Model A was conforming with the requirements of the Ecodesign and Energy labelling regulations.

Model B

As the user manual of this model did not include a recipe requiring the oven compartment to be empty, the standard measurement of the volume was done with shelf guides. The measured volume was significantly lower compared to the declared volume. Therefore, it might be interpreted that the volume declared by the manufacturer was measured without shelf guides.

As the heating function for performing the standard test was not indicated in the manufacturer's instructions, two possible heating functions were tested. For the 'fan assisted' mode, the measured energy consumption by far exceeded the declared value which led to a significantly higher calculated EEI value and resulted in energy efficiency class C instead of class A as declared. For the ECO mode, the measured energy consumption also exceeded the declared value. The test results of the ECO mode were not valid since the required standard deviation was higher than permitted.

[34] The measurement of the temperature in the centre of the oven in Step I is not required in the standard procedure. In ANTICSS it was measured in parallel in order to observe the behaviour of the oven.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122.
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

Thus, for the standard test procedure, this model does not comply with the requirements of the harmonised standard and does not conform with the EL/ED regulations.

Model C

As the heating function for performing the standard test was not indicated in the manufacturer's instructions, two possible heating functions were tested. For the 'conventional with fan' mode, the measured energy consumption by far exceeded the declared value which led to a significantly higher calculated EEI value and resulted in energy efficiency class B instead of class A+ as declared. For the ECO mode, the measured energy consumption also significantly exceeded the declared value which led to a higher calculated EEI value; the corresponding energy efficiency class would be class A instead of the declared class A+. As for the two tested heating functions the energy value closer to the declared value was the one corresponding to the ECO function, it might be interpreted that the heating function used for the declaration of the energy label was the ECO function.

Regarding energy consumption, this model did not conform with the requirements of the EL/ED regulations under standard test conditions. Also, the value of volume obtained in the tests according to the alternative procedure would not conform with the requirements of the EL/ED regulations.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

The value of the volume in the alternative testing procedure for Models A and C, i.e. with shelf guides included, was significantly lower than the value of the standard procedure with the shelf guides removed. This difference had an impact on the calculated EEI, which was higher than the EEI under standard test conditions. For both Models, the higher EEI did not result in a change of the Energy Efficiency class; the appliance would still be in class A as under standard test conditions.

For the tested Model A and Model C, the deviations of the standard and alternative test results for the volume measurement of the tested were relevant. For both tested Models, the indications in the user manual lead to reaching more favourable results which is classified as 'borderline to circumvention'. For Model B, the alternative test conditions were not applicable as no respective instructions were included in the user manual.

ANTICSS categorisation of the general case level

The inclusion of a recipe where the shelf guides are not needed, which will be the basis for the standard testing, was not exclusively provided in the instructions for test laboratories only, but included in the user instructions which at least theoretically provides the possibility of this setting also in real life. Therefore, the general case is categorized as 'jeopardy effects'. Nevertheless, the use of an oven without shelf guides seems to be an exceptional use and not the operation of the appliance in the manner for which it is usually intended, so it remains suspected that the inclusion of such a recipe is intended for reaching more favourable results specifically under testing.

Review of the alternative test method

The alternative testing method is deemed generally suitable for disclosing the suspicious behaviour in cases similar to this one. The method can easily be applied by MSAs. The duration of the tests is the same as for the standard tests and there are no extra costs.

Case OVEN 2 – Maximum temperature in centre of oven

Comparison of the standard test with the declaration

In both tested Models B and C, for all three tested heating functions the test results of the standard procedure exceed the declared values by more than 5% (verification tolerance for MSAs) concerning the energy consumption according to regulations 66/2014 and 65/2014. Thus, Model B and C were considered 'non-conforming' with the ED/EL regulations. Further, Model B did not comply with the harmonized standard.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

In both tested Models B and C, the differences between the values obtained in the standard and the alternative procedure were not relevant. So, the initial suspicion of a 'jeopardy effect' could not be confirmed for these tested models.

ANTICSS categorisation of the general case level

The general case, i.e. the allowance of setting a lower temperature if the maximum temperature value of the standard test cannot be reached by the oven, was initially categorised as 'jeopardy effect'. The alternative procedure, proposing a reduction of the temperature in the centre of the oven showed that this finally had very low impact on the energy consumption, i.e. the initial classification of a 'jeopardy effect' for this case has not been confirmed.

Review of the alternative test method

In order to gain same conditions for all tested appliances, CEN-CENELEC TC 59X is considering to remove the exemption note, i.e. that ovens not being capable to reach the higher temperatures are allowed using lower temperatures, from the standard and to change the temperatures that have to be reached in the centre of the oven (as applied with the ANTICSS alternative testing procedure) so it is probable that this alternative procedure or a very similar one, will be part of the new harmonised standard.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

Case OVEN 3 – Electronic control

Comparison of the standard test with the declaration

In both tested Models B and C, for all three tested heating functions the test results of the standard procedure exceed the declared values by more than 5% (verification tolerance for MSAs) concerning the energy consumption according to regulations 66/2014 and 65/2014. Thus, Model B and C were considered 'non-conforming' with the ED/EL regulations. Further, Model B did not comply with the harmonized standard.

Comparison of standard test with alternative test results – ANTICSS categorisation of product level

For the tested **Model B**, the behaviour of the oven in ECO mode was always strange within the first hour where usually the standard testing takes place: the temperature according to the setting was maintained only during around 20 minutes, then it decreased and increased again triggered either by the opening of the door or, probably, initiated after a period of around 20 minutes after disconnecting the resistor, whichever comes first. Always after this first hour, i.e. usually when the testing duration is finished, the temperature remained stable in the values according to the setting, complying with the requirements of the harmonised standard, similar to other heating functions. For the ECO mode, in the test according to the alternative testing procedure the temperatures in the centre of the oven required by the standard were by far not reached, the temperatures were deviating significantly between 18,5% and 37% from the standard requirements, a relevant deviation. Due to the relevant deviations of the alternative test results compared to the standard test, the behaviour of this tested model in ECO mode is considered 'borderline to circumvention'.

For the tested **Model C**, the values of the energy consumption and the temperature rises in the centre of the oven in the alternative procedure and in the standard procedure were very similar. The initial suspicion of 'circumvention' has not been confirmed for this tested model.

ANTICSS categorisation of the general case level

The temperature decrease does not apply only to the test situation but takes place always during the first hour in both the test situation and during consumers usage, thus the ANTICSS project team used the categorisation of 'jeopardy effects' for this case according to the ANTICSS categorisation provided in section 3.3, Figure 3. However, although the ECO mode can also be selected by the user and one could theoretically think of the reduced temperature being an energy saving function, this seems very unlikely the expected baking performance will not be reached within the expected programme time due to the reduced temperature. If this happens each time, the consumer will probably not choose the ECO mode anymore at all. Therefore, the ECO mode in Model B seems rather being designed to reach more favourable results in the test situation.

Co-funded by the Horizon 2020 Programme of the European Union
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

Review of the alternative test method

The alternative test method is deemed generally suitable for disclosing suspicious behaviour in cases similar to this one and can be easily applied by MSAs.

Summary of the ANTICSS categorisations for the product category domestic ovens

Table 26: Overview of the ANTICSS standard test results of cases and models tested in the product category domestic ovens

Standard test	Model A	Model B	Model C
Standard test	Conforming	**Not conforming**	**Not conforming**

Table 27: Overview of the ANTICSS alternative test results of cases and models tested in the product category domestic ovens

Alternative test		Model A	Model B	Model C
OVEN1	jeopardy effect	borderline to CV	Results not assessable*	borderline to CV
OVEN2		not tested	no CV	no CV
OVEN3	jeopardy effect	not tested	borderline to CV	no CV

* Alternative test conditions were not applicable.

Co-funded by the Horizon 2020 Programme of the European Union
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122.
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.

5.5.6 Summary: Overview of ANTICSS categorisations for the tested cased and models

The following overview summarizes the test results and respective categorisations for the tested cases and models within ANTICSS.

Table 28: Overview of the ANTICSS results with regard to the categorisation of cases and tested models

		PRODUCT LEVEL (tested Model)		
GENERAL LEVEL (Case)		Model A	Model B	Model C
TV 1	hints for CV	no CV	no CV	no CV
TV 2/3	jeopardy effect	no CV	no CV	no CV
COLD2/4	jeopardy effect	no CV	no CV	door opening test, cf. Case COLD3
COLD 3	jeopardy effect	not tested	not tested	borderline to CV
DISH1	hints for CV	no CV	not tested	not tested
DISH2	hints for CV	not tested	no CV	not tested
DISH3	hints for CV	not tested	not tested	CV
DISH4		not tested	missing representativeness of the standard	not tested
DRIER1	hints for CV	no CV	not tested	not tested
DRIER2	hints for CV	no CV	no CV	no CV
OVEN1	jeopardy effect	borderline to CV	alternative test not applicable	borderline to CV
OVEN2		not tested	no CV	no CV
OVEN3	jeopardy effect	not tested	borderline to CV	no CV

Co-funded by the Horizon 2020 Programme of the European Union
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

6 Impacts: potential losses of energy savings due to 'circumvention'

6.1 Product categories chosen for the impact assessment

Based on the results of the product testing within ANTICSS, for those cases where at product level either 'circumvention' or 'borderline to circumvention' was confirmed, the impacts, i.e. potential losses of energy and/or water savings should be calculated.

For case OVEN3, the results of the testing revealed 'borderline to circumvention' at product level. However, this case was not taken into account in the impact assessment, as the data of the test results were not quantifiable.

On the other hand, case TV 2/3 is included in the impact assessment although it was categorized as no 'circumvention' at product level. However, the measurements revealed that one of the tested models indeed had a special function to detect fast moving images and reduced the energy consumption specifically under test; although this was not exploited by the tested model it cannot be ruled out that other manufacturers or models might use such a technical feature under standard testing to reach more favourable values for the on-mode power consumption or the energy efficiency class on the label.

Table 29: Product categories chosen for the ANTICSS impact assessment

Case	ANTICCS categorisation of the tested models
DISH 3 – Removal / alteration of accessories	'Circumvention' at product level
COLD 3 – Display continuously activated	'Borderline to circumvention' at product level
OVEN 1 – Volume without shelf guides	'Borderline to circumvention' at product level
TV 2/3 – Test loop recognition	No 'circumvention'

6.2 Scenarios for the calculation of impacts

For each case two impact scenarios were estimated, a *realistic scenario* based on a minimum and maximum estimation of models that show this type of 'circumvention', and an *extensive 'circumvention' scenario* including all products which, by virtue of their design, have the technical condition for circumventing in this manner.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

These might be, for example, sensors that help to enhance the efficiency of the appliance but that might also be able to detect a test situation; a display that is switched on for most of the time during real use but, which is not active during testing; or accessories that need to be removed for the appliance test according to manufacturer instructions. The extensive scenario is based on the assumption that 'competitive advantages' through 'circumvention' that are seen or realised in the market, will lead to the fact that this type of 'circumvention' is copied by the competitors rather sooner than later.

- **Realistic scenario**: this scenario aims to show the magnitude of the potential losses of energy savings through 'circumvention' which are considered to be realistic by the project team. As the exact market share of models showing the 'circumvention' behaviour that was confirmed for at least one tested model within ANTICSS is unknown, a range is derived that defines the currently likely minimum or maximum losses. The estimation of these shares is based on the knowledge about the market shares of relevant technical features of the appliances, and estimations of experts (e.g. experts from energy agencies, MSAs, testing institutes or standardisation bodies) about the market share of products showing this kind of behaviour. In case an educated guess based on expert information is not possible, a conservative market share of 5 % is estimated for calculating the realistic minimum scenario.

- **Extensive 'circumvention' scenario**: this scenario shows the impact on the potential losses of energy savings, if all devices that have the technological capability, and are thus theoretically prone to this type of 'circumvention', are considered in the calculations. The estimation of these shares is based on the knowledge about the market shares of relevant technical features of the appliances, and estimations of experts (e.g. experts from energy agencies, MSAs, testing institutes or standardisation bodies) about the market share of products that might take up this kind of behaviour.

The potential losses of energy savings were then calculated taking into account the potential loss per product, the number of appliances expected to be sold in the year 2020 and the respective assumed market share.

The detailed approach and calculations of impact assessment is given in Deliverable D19 'Impact Assessment of 'circumvention' under EU Ecodesign and Energy labelling'[35]. The following sections summarize the input parameters and results for the product categories.

[35] See https://www.anti-circumvention.eu/storage/app/media/D19a_ANTICSS_Circumvention_Impact_Assessment_final.pdf

6.3 Input parameters and results of the impact assessment per product category

6.3.1 Televisions

Table 30: Impact assessment: input parameters and results for case TV2/3

Input parameters	Calculation values of the input parameters and results		
Additional annual electricity consumption without triggered automatic brightness adjustment function of fast-moving images (per product)	13.38 kWh		
Forecast of annual sales of 'smart TVs' in 2020	39,000,000 units (Wierda and Kemna 2018)[36]		
Share of devices showing this behaviour (assumption)	**Realistic scenario min**	**max**	**Extensive circumvention scenario**
	5% *	17.5% **	100% ***
Potential annual loss of electricity savings by all smart TV's sold in 2020	26.1 GWh	91.3 GWh	522.0 GWh

*as no specific expert information was available, a realistic minimum share of 5% of devices sold in 2020 was assumed; **experts from test houses assumed a market share of 15-20% of smart TV's being able to detect fast moving images; the medium is taken for the calculations, ***it was assumed that all smart TV's will adapt the technology in the future.

In the **realistic scenario**, the calculated losses of potential energy savings in the realistic scenario vary between 26.1 GWh when a minimum marked share of 5% is assumed, and 91.3 GWh, if a maximum market share of 17.5% is considered. The realistic minimum scenario considered a share of 5% of all smart TVs sold in the year 2020, as no specific expert information was available in terms of the minimum number of appliances with implemented automatic brightness adjustment function. Despite of this, the share of about 17.5% in the realistic maximum scenario was based on a much sounder assumption, made by experienced experts from test houses, who assumed a market share of 15 to 20% of all smart TVs sold in the year 2020, being able to adjust the brightness of the TV automatically.

The **extensive scenario** assumed that all manufacturers of smart TVs will adapt their products subsequently after the technology is seen in the market. Following this scenario, losses of 522 GWh of potential electricity savings might occur, if an automatic brightness adjustment function is triggered by fast moving images during the standard test situation in all smart TVs on the market.

[36] Wierda, L.; Kemna, R. (2018): Ecodesign Impact Accounting, Status Report 2018. Annex A 'SALESBAU', p. 14

6.3.2 Domestic freezers and refrigerator-freezers

Table 31: Impact assessment: input parameters and results for case COLD3

Input parameters	Calculation values of the input parameters and results		
Annual electricity consumption of a display	17.39 kWh/year		
Forecast of annual sales of all domestic freezers and refrigerator-freezers in 2020	19,799,000 units (Wierda and Kemna 2018)		
Share of devices using the technology (assumption)	**Realistic scenario min**	**max**	**Extensive circumvention scenario**
	2% *	12.5% **	25% ***
Potential annual loss of energy savings by all domestic stand-alone freezers and refrigerators-freezers sold in 2020	6.9 GWh	43.0 GWh	86.1 GWh

*the realistic minimum share of 2% of the devices sold in 2020, is based on a sound educated guess, made by test house experts; **the realistic maximum share of 12.5% is based on the assumption that half of all stand-alone cooling and freezing appliances with integrated display use the technology, ***the extensive circumvention scenario assumes that all devices with integrated display (about 25% of the total sales) adapt the technology in the future.

The **realistic scenario** shows that between 6.9 GWh and 43 GWh of potential electricity savings are lost through the activated display. The realistic minimum scenario considered a share of 2% of all devices sold in the year 2020, based on a sound educated guess made by test house experts. The share of about 12.5% in the realistic maximum scenario was based on the assumption that half of all stand-alone cooling and freezing appliances with integrated display use the technology.

In the **extensive scenario** there could be even 86.1 GWh of potential electricity savings being lost. However, in terms of the current market situation, the assumption that all refrigerators and freezers with an integrated display (about 25% of the total sales), will keep the display switched on for at least 24 hours after door opening, must be considered rather hypothetical.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

6.3.3 Domestic dishwashers

The use of the alternative test method in the ANTICSS testing of case DISH3 showed that the removal of accessories from the dishwasher in order to fit in the rated number of 15 or more standard place settings as declared causes a notable increase in the annual electricity and water consumption for automatic dishwashing in European households. Much more than the 280 wash cycles as declared on the energy label would have to be run per year, if only 12 place settings can be loaded into these devices to clean the stated number of place settings per year.

For the impact assessment of dishwashing machines on the losses of potential energy and water savings, assumptions for the realistic minimum and maximum scenario and the extensive 'circumvention' scenario were made.

- For the realistic maximum scenario, it was assumed that all dishwashing machines with a rated capacity of 16 and 17 standard place setting (ps) could be prone to this type of 'circumvention' (market share 4.1 %). However, it might also be likely that not all dishwashing machines with a rated capacity of 16 and 17 place settings have a notable number of accessories that need to be removed. Thus, the realistic minimum scenario includes only 50% of the respective devices (market share 2.05 %).
- The calculations for the extensive 'circumvention' scenario include also dishwashing machines with a rated capacity of 15 ps (market share 9.1 %).

Table 32: Impact assessment: input for calculations and results for case DISH3 – energy

Input parameters	**Calculation values of the input parameters and results**		
Additional annual energy consumption of the dishwasher if only 12 ps/cycle can be loaded	17 ps 78.8 kWh	16 ps 61.3 kWh	15 ps 44.5 kWh
Forecast of annual sales of dishwashing machines in 2020	9,280,000 units (Wierda und Kemna 2018, Annex A p 15)		
Share of devices showing this behaviour (assumption based on market offer as shown by APPLiA data)	**Realistic scenario circumvention min** 2.05 % *	**max** 4.1 % **	**Extensive scenario** 9.1 % ***
Potential annual losses of energy savings by all dishwashers sold in 2020	11.7 GWh	23.5 GWh	44.1 GWh

*50% of dishwashers with a rated capacity of 16 and 17 place settings, **All dishwashers with a rated capacity of 16 and 17 place settings, ***all dishwashers with a rated capacity of 15, 16 and 17 place settings.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

Table 33: Impact assessment: input for calculations and results for case DISH3 – water

Input parameters	Calculation values of the input parameters and results		
Additional annual water consumption of the dishwasher if only 12 ps/cycle can be loaded	17 ps 1,275.3 L	16 ps 1,013.7 L	15 ps 763 L
Forecast of annual sales of dishwashing machines in 2020	9,280,000 units (Wierda und Kemna 2018)		
Share of devices showing this behaviour (assumption based on market offer as shown by APPLiA data)	**Realistic scenario** **min** 2.05% *	**max** 4.1% **	**Extensive circumvention scenario** 9.1% ***
Potential annual losses of water savings by all dishwashers sold in 2020	194,060 m³	388,120 m³	742,152 m³

*50% of dishwashers with a rated capacity of 16 and 17 place settings, **All dishwashers with a rated capacity of 16 and 17 place settings, ***all dishwashers with a rated capacity of 15, 16 and 17 place settings.

The **realistic scenario** refers to dishwashing machines with a rated capacity of 16 or 17 place settings, which leads to a range between 11.7 GWh and 23.5 GWh of losses of potential energy savings respectively 194 thousand to 388 thousand m³ of losses of potential water savings that could be avoided if the described type of 'circumvention' would not be possible.

The **extensive scenario** takes into account all dishwashing machines with a declared capacity of 15, 16 and 17 place settings assuming that even dishwashing machines with a rated capacity of 15 place settings do not provide enough space for a full load of 15 place settings without taking out certain accessories. In this scenario about 44.1 GWh of losses of potential energy savings and about 742 thousand m³ of losses of potential water savings could be avoided per year.

6.3.4 Domestic ovens

Table 34: Impact assessment: input for calculations and results for case OVEN1

Input parameters	Calculation values of the input parameters		
Additional annual energy consumption if the same EEI should be reached with a lower oven volume	3.52 kWh		
Annual sales of ovens in 2020	12,481,000 units (Wierda und Kemna 2018)		
Share of devices showing this behaviour	**Realistic scenario**		**Extensive circumvention scenario**
	min	**max**	
	5% *	70% **	70% **
Potential annual losses of energy savings by all ovens sold in 2020	2.2 GWh	30.8 GWh	30.8 GWh

*as no specific educated guess is available, the minimum share of 5% is assumed, ** based on observation from test house experts who tested 19 ovens, 13 of which were categorized with the better EEI due to higher oven volume; assumption of identical market shares for the realistic scenario and the extensive scenario.

The **realistic minimum scenario** resulted in 2.2 GWh of losses of potential energy savings that could be avoided if the EEI would be calculated with the lower volume of the oven cavity that is measured with the shelf guides in their place. This result was based on the very conservative consumption that 5% of all oven models in the market would be prone to this type of 'circumvention'. This assumption was made as no specific educated guess was available.

However, during an appliance testing action, initiated by MSAs, experts from test houses observed that 13 out of the tested 19 appliances were categorized with the higher oven volume, without the shelf guides in their place. Taking this data, this would result in a market share of 70% for the **realistic maximum scenario**, which would result in about 30.8 GWh of potential annual losses of energy savings.

In principle all ovens could be reconstructed in a way that e.g. shelf guides, catalytic walls, etc. can be removed from the oven cavity. Thus, it could even be assumed that 100% of ovens would be prone to this type of 'circumvention'. However, it is unlikely that the current production of all ovens will be changed in a way that all items are removable. Assuming that the observation from the MSA appliance testing action already revealed the maximum of oven models with removable items in the market, the market share of 70% probably also describes the **extensive scenario** quite well.

6.4 Summary: total potential losses of savings due to 'circumvention'

The following tables summarize for the analysed product categories the total potential losses of electricity savings, primary energy savings [37] and water savings which could be avoided, if 'circumvention' would not occur during appliance testing.

Table 35: Total potential losses of electricity savings in GWh/year

Total potential losses of electricity savings [GWh/year]			
Case	Realistic circumvention scenario		Extensive circumvention scenario
	min	max	
TV2/3	26.1	91.3	522.0
COLD3	6.9	43.0	86.1
DISH3	11.7	23.5	44.1
OVEN1	2.2	30.8	30.8
TOTAL	**46.9**	**188.6**	**682.9**

Table 36: Total potential losses of primary energy savings in GWh/year

Total potential losses of primary energy savings [GWh/year]			
Case	Realistic circumvention scenario		Extensive circumvention scenario
	min	max	
TV2/3	54.8	191.8	1096.1
COLD3	14.5	90.4	180.7
DISH3	24.6	49.4	92.6
OVEN1	4.6	64.6	64.6
TOTAL	**98.4**	**396.1**	**1434.0**

Table 37: Total potential losses of water savings in m³/year

Total potential losses of water savings [m³/year]			
Case	Realistic circumvention scenario		Extensive circumvention scenario
	min	max	
DISH3	194,060	388,120	742,152

[37] Primary energy factor: 2.1; according to Directive (EU) 2018/ 2002 on energy efficiency

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122.
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

7 Conclusions: cross-cutting aspects regarding 'circumvention'

Aim of this report is providing a consolidated overview of the main ANTICSS results of previous work packages as basis for the preparation of technical guidelines, education content for capacity building as well as policy recommendations of major stakeholders (MSAs and test laboratories, policy makers and standardisation organisations) which will be elaborated in the following WP5 and WP6. In this final section, we will briefly point out from the previous analyses and product specific test results some identified cross-cutting aspects and experiences with regard to 'circumvention'. This might help to sharpen the understanding where to look at when trying to detect, assess and approach 'circumvention' acts.

Broader understanding of acts falling under the definition of 'circumvention'

The reported cases and tested models within ANTICSS clearly show that the aim of reaching a more favourable level for parameters under EU Ecodesign and Energy labelling cannot only be achieved by *automatic detection of the test situation and alteration of the product performance specifically during testing* as currently defined and prohibited in some Ecodesign and Energy label regulations and provided in point a) of the ANTICSS definition (cf. section 3.2.1). Sticking strictly to that definition would restrict the scope for action of MSAs too much.

Most of the reported cases related to Ecodesign and Energy labelling regulations and standards in which more favourable results were achieved specifically in the test situation refer to point b) of the ANTICSS definition, i.e. *pre-set or manual alteration of the product affecting performance or resource consumption during testing*. It seems that especially the reference to manufacturer's instructions given in some standards opens the floor of providing indications for test instructions, specific preparations or pre-treatments of the appliances that might be exploited by some manufacturers to gain more favourable results in standard tests (e.g. DISH1, DISH3, OVEN1, COLD3).

Whereas only in one case of the ANTICSS testing more favourable results were clearly achieved exclusively in standard test conditions, more cases were found where the favourable result applied in both the test situation and consumers' usage, but for the latter only theoretically or in (extremely) infrequent situations. These acts are not only relevant under test conditions, still, the design of the product or the test instructions seem to be utilized in a way to reach more favourable results specifically in the test situation. ANTICSS classified these cases as 'borderline to circumvention'. However, potential losses would be high in terms of expected energy savings not achieved due to these acts. To avoid these overall losses of energy savings under Ecodesign and Energy labelling and to provide MSAs a clear scope for action, it would require a common understanding in legislation and standards that these acts also count as 'circumvention' and should be prevented.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.

Common 'circumvention' approaches applicable also for other product categories and models
· Influencing those parameters that are used for the calculation of the Energy Efficiency Index (EEI) and thus also determining the Energy Efficiency Class (e.g. OVEN1: volume of the oven; DISH3: number of standard place settings). · Providing smart or energy saving functions being only theoretically or rarely applicable in real-life, however, being fully credited in the standard test procedure (e.g. COLD3: display not activated in standard test; TV2/3: backlight reduction function for fast-moving content). · The need for following manufacturer's test instructions for a specific set-up of the standard test procedure which seem to have no comprehensible justification (e.g. technical or safety reasons), and which differ to a large extent from application in 'real-life' and might provide more favourable results compared to other products not using such instructions (e.g. OVEN1: removal of shelf-guides to increase the volume of the oven; DISH3: specific setting of accessories to reach the standard number of place settings).

Weaknesses in harmonized standards and legislation serving as gateway for 'circumvention'
· Harmonised standards entailing very specific conditions and deviating far from typical user behaviour increase the likelihood that manufacturers design products to adapt to these test conditions and to achieve more favourable results (e.g. COLD2/4: testing refrigerators without door openings; TV2/3: standard video with fast-moving pictures rarely applying in real-life broadcasting content) · Decoupled energy and performance measurements, partly even with different test conditions, increase the possibility of defining specific configurations adapting to the different test conditions to gain more favourable results (e.g. OVEN 1: energy consumption test is done with racks, volume measurement can be done without shelf-guides; OVEN3: measurement of energy consumption and temperature in different cycles; measurement of energy consumption without measuring the reached temperature in the oven) · Missing specification and definition in the regulation/standard of standard programme(s) in which energy and performance tests for the compliance verification with Ecodesign and Energy labelling requirements have to be done leave room and full flexibility for manufacturers to decide on their own which programme(s) to test (e.g. OVEN) · Lack of (user-relevant) performance requirements; this can be used to optimize the energy efficiency at the expense of the main performance and functionality of the appliance (e.g. OVEN3: no cooking/baking performance or temperature to be reached in the oven defined).

Co-funded by the Horizon 2020 Programme of the European Union
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

'Circumvention' potential apparent, however without exploiting it to gain more favourable results

- For some of the reported cases, no 'circumvention' could be proven for the selected models analysed in laboratory testing within the ANTICSS project. Still, the cases were classified as hints for 'circumvention' or 'jeopardy effects' as they could apply to other models on the market not yet tested, thus could serve as indicator to MSAs at which cases to look in more detail.
- For one of the cases (case TV2/3), the 'circumvention' potential became apparent in the ANTICSS testing; one of the tested models indeed had a special function to detect fast moving images and the model reduced the energy consumption specifically in the standard test. For the tested model, however, this was not exploited as the declared value for the energy consumption was 'overdeclared' in a way not favourable for the manufacturer [38]. If such 'circumvention' potential becomes apparent, MSAs should pay attention, as it cannot be ruled out that other manufacturers or models might use such a technical feature under standard testing to reach more favourable values for the energy consumption or the energy efficiency class on the label.

Use of alternative test procedures for better detecting 'circumvention'

When products are specifically pre-set or manually altered or are able to detect to be under test or if specific loopholes or weaknesses in standards and/or legislation are exploited, they result to be compliant with the applicable requirements when tested with the standardised test methods. Therefore, within ANTICSS alternative test methods were developed to better detect 'circumvention'. Only the conditions of the standard tests considered as being detected or exploited were varied in the alternative test methods to check the response of the tested product. At the same time, the alternative procedures were still designed as close as possible to the standard procedures with the aim to ensure sufficient comparability with the standard measurement results.

The comparability and applicability of alternative measurement methods was demonstrated by the fact that many of the tested models achieved results comparable to those of the standard tests. According to the ANTICSS project experts the specifically chosen and well documented deviations of the ANTICSS test methods from the harmonised standards do not generally result into substantial deviations of the results from those obtained when tested according to the harmonised standard test conditions. Therefore, an inexplicably variation in the measurement results of the alternative approach was considered as an indication of a possible 'circumvention' behaviour of the tested product.

[38] The power consumption declared by the manufacturer was much higher than the measured value of the standard test, even resulting in a lower energy efficiency class (declared: class A; if the measured value would be taken as basis, it would have been class A+). According to the manufacturer, a safety margin was added to the measured values because of variation between units resulting of the construction process to ensure all units being compliant when MSA test their TV with regard to the power consumption. In this case, the manufacturer did not use the backlight reducing function to reach more favourable results for the parameters to be declared.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

As conclusion, although the test results of the alternative test methods cannot be used for compliance verification, they provide an important indication of the possible presence of a 'circumvention behaviour'.

The approach of using alternative test procedures to detect 'circumvention' has generally proven reasonable and applicable in practice. The alternative tests were designed in a way that they preferably do not put much additional burden (time & costs) to the test laboratories.

Also, for testing possible acts related to part c) of the ANTICSS definition of 'circumvention', i.e. (pre-set[39]) *alteration of the performance within a short period after putting the product into service*, would require a different compliance testing; products would have to be tested for a longer period in order to complete a certain number of cycles runs or hours of use. This behaviour is the most difficult to detect by conducting tests in laboratories because the duration of a test situation or how many cycles should be replicated until a certain algorithm could change the setting of an appliance is unknown.

Finally, it has to be noted that in some cases the suspicious behaviour might even become visible already during the standard testing (cf. case TV2/3), i.e. no alternative test is necessary at all.

[39] i.e. not referring to external software-updates but products including a pre-set algorithm already at the time of being placed on the market.

Contact:

www.anti-circumvention.eu
https://twitter.com/anticircumvent
https://www.linkedin.com/company/anticss/

Project coordinator:

Ms. Kathrin Graulich
Deputy Head of Sustainable Products and Material Flows Division
Oeko-Institut e.V.
P.O. Box 17 71 | 79017 Freiburg Germany
Email: K.Graulich@oeko.de
www.oeko.de

List of project partners:

Austria: AEA - Österreichische Energieagentur
Austria: BMDW - Bundesministerium Digitalisierung und Wirtschaftsstandort
Czech Republic: SEVEn - SEVEn, the Energy Efficiency Center, z.u.
Czech Republic: SEIA - Státní energetická inspekce
EU / Belgium: ECOS - European Environmental Citizens Organisation for Standardisation
Belgium: BHTC - Service public federal sante publique, securite de la chaine alimentaire et environnement
Germany: OEKO – Oeko-Institut e.V., Institut für Angewandte Ökologie
Germany: UBONN - Rheinische Friedrich-Wilhelms-Universitat Bonn
Germany: GRS - Regierung von Schwaben – Gewerbeaufsichtsamt
Germany: VDE - VDE Prüf- und Zertifizierungsinstitut GmbH
Italy: ENEA- Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile
Italy: CCIAA Mi - Camera di commercio industria artigianato agricoltura
Italy: IMQ - Istituto Italiano del Marchio di Qualità S.p.A.
Netherlands: Re/gent - Re/gent B.V.
Netherlands: NVWA - Nederlandse voedsel en warenautoriteit
Portugal: ADENE - Adene-agencia para a energia
Portugal: ASAE - Autoridade seguranca alimentar e economica
Spain: FFII – LCOE - Fundacion para el fomento de la innovacion industrial
Spain: CM - Comunidad de Madrid

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Number 785122
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.
Neither the EASME, nor the European Commission are responsible for any use that may be made of the information contained therein.