

REPORT
ON THE 13TH JOINT CROSS-BORDER
EMC MARKET SURVEILLANCE CAMPAIGN
(2020-2021)

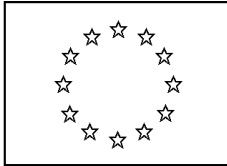
MICROWAVE OVENS

26 October 2021



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A. EXECUTIVE SUMMARY

During the EMC Administrative Cooperation Working Group (EMC ADCO) 46 meeting in Bucharest, MSA proposed and voted for the possible target of the next 13th EMC Market surveillance Campaign (MSC-EMC-13), and the three most interesting targets for the forthcoming campaign were proposed: electric tools (incl. electrical garden equipment), charger for mobile phones and microwave ovens.

At the 47th EMC Administrative Cooperation Working Group (EMC ADCO) meeting in Athens, during the EMC ADCO preliminary meeting, six MSA (DE, FI, NL, SE, LT and UK), carried out an impact assessment to determine a most suitable target for a forthcoming campaign. The results of impact assessment were very close together, and microwave ovens have had a highest assessment. Following impact assessment results, it was decided that the thirteenth joint cross-border EMC market surveillance campaign would assess the compliance of microwave ovens.

For the purposes MSC-EMC-13 campaign only microwave ovens for domestic use and catering are included. The products selected for this campaign are within the scope of **EN 55011** "Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement" – for **emissions aspect**, and **EN 55014-2** *Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity - Product family standard* – for **immunity aspect**.

The MSC-EMC-13 was carried out according to the **Code of Practice** on the 13th joint cross-border market surveillance campaign (final version of 2020-06-18).

Microwave oven, appliance that cooks food by means of high-frequency electromagnetic waves called microwaves. A microwave oven is a relatively small, boxlike oven that raises the temperature of food by subjecting it to a high-frequency electromagnetic field. The microwaves are absorbed by water, fats, sugars, and certain other molecules, whose consequent vibrations produce heat. The heating thus occurs inside the food, without warming the surrounding air; this greatly reduces cooking time, and baking and other cooking tasks that require hours in a conventional oven can be completed in minutes in a microwave oven. Microwave ovens generate radiation at a frequency of about 2,450 MHz by means of a magnetron, which is a kind of electron tube.

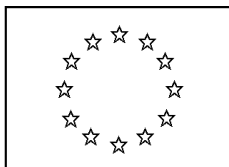
Typical output power for consumer devices ranges from 650 to 1200 watts. To ensure even heating, the magnetron directs its waves at a rotating metal disk with offset vanes, which scatters the waves through the oven cavity; a rotating platform for the food is sometimes used in addition. Power settings may reduce the amount of radiation by cycling a constant-output magnetron on and off for varying lengths of time, or may reduce the level of radiation constantly produced by an inverter magnetron. The magnetron may be supplemented by quartz and halogen bulbs or other means for browning food, which microwaves do poorly.

Microwave ovens could also fall within the scope of:

Low Voltage Directive - 2014/35/EU;

Ecodesign requirements Directive - 2009/125/EC;

Restriction of the use of certain hazardous substances (RoHS) Directive - 2011/65/EU.



This report provides an overview of the findings and makes recommendations on next steps and future actions.

The primary purpose of the campaign is to assess the compliance of the equipment under test ('EUT'), samples taken from the European market, with the essential requirements and also with the formal requirements of the EMC Directive 2014/30/EU.

Administrative compliance

The results of the administrative assessment of EUT showed:

- 73% of EUT were considered administratively compliant.
- 100% of EUT had the correct CE marking.
- Declarations of Conformity (DoC) were available for 58 EUT; and 52 of them were compliant.
- From the requested 23 Technical Documentation ('TD'), 2 not made available, and 15 were found to be compliant (65%).

Technical compliance with harmonised standards

For the purposes of this campaign, technical compliance is to be understood as compliance with an applicable harmonised standard.

The results of the technical assessment of microwave ovens showed that no issues were found for 79% of tested EUT for disturbance emissions.

Summary of Results

Ten national Market Surveillance Authorities ('MSA') EMC ADCO members participated in the campaign. 62 types of products were assessed between the 1st July 2020 and the 31th March 2021. In general, the level of compliance with the administrative and technical requirements was considered as satisfactory. Overall, 61 % of the Equipment Under Test ('EUT') were assessed as compliant.

Based on this campaign EMC ADCO has formulated conclusions and recommendations which can be found in Chapter D of this report.



B. ELEMENTS OF THE CAMPAIGN

1. Reasons for the campaign

At the 47th EMC Administrative Cooperation Working Group (EMC ADCO) meeting in Athens, an impact assessment to determine a most suitable target for a forthcoming campaign was carried out. Following impact assessment results, it was decided that the thirteenth joint cross-border EMC market surveillance campaign would assess the compliance of microwave ovens.

This campaign has several goals, which include:

The primary purpose of the campaign is to assess the compliance of the equipment under test ('EUT'), samples taken from the European market, with the essential requirements of the EMC Directive 2014/30/EU (for apparatus placed on the market from 20 April 2016).

This campaign has several goals, which include:

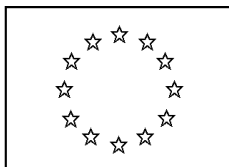
- to determine the administrative and technical compliance levels of microwave ovens available within the EU market;
- to apply the measures of new EMC Directive 2014/30/EU (including safeguard procedure) for microwave ovens placed on the market from 20 April 2016.
- to take appropriate compliance actions to rectify non-compliances;
- to propose further actions;
- to improve cooperation and information exchange between MSA's;
- to increase knowledge of the microwave ovens industry;
- to improve the knowledge of manufacturers; importers; distributors; and economic operators of their obligations under the EMC Directive;
- to use the new ICSMS DRPI and become familiar with it.

2. Scope of the campaign

The primary purpose of the campaign was to assess the compliance of samples taken from the market with the provisions of the EMC Directive 2014/30/EU. Administrative compliance was checked against the CE marking, Declaration of Conformity, traceability. Technical documentation of the acquired EUT were assessed on voluntary basis. For the purposes of this campaign, it was decided to assess compliance with the EMC essential requirements (i.e. generated electromagnetic disturbances of EUT) by testing against a relevant harmonised standard¹. Immunity aspects were assessed on a voluntary basis.

The campaign was also intended to provide MSA with the opportunity to participate in EMC market surveillance, to improve the exchange of information and to raise economic operator and consumer's awareness of the need for conformity with the requirements of the EMC Directive.

¹ EUT were assessed against harmonised standards as stated in the DoC (if available). See chapter 7 for the applicable standards.



It was agreed that following the analysis of the results of the campaign, a report would be prepared and presented to the EMC Working Party for subsequent publication by the Commission. The present document constitutes the report of the campaign.

3. Participation in the campaign

Participation in the campaign was voluntary, and was open to all members of EMC ADCO. Each MSA was responsible for the costs of obtaining the EUT and electromagnetic compatibility tests.

Ten European countries participated in the campaign: Cyprus, Finland, Germany, Hungary, Lithuania, Netherlands, Poland, Romania, Sweden and the Switzerland.

4. Timing

The campaign commenced on the 1st July 2020. The information gathering, testing and data reporting phases of the campaign were of nine months duration, ending on the 31st of March 2021. Within that period, MSA carried out their actions to their own timescales. During the last months all results of testing and administrative assessment were collected together and the final report of the joint action was prepared.

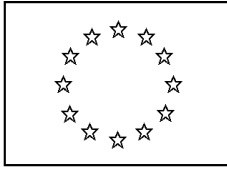
5. Sampling

The aim was to obtain the broadest possible view of the investigated product group in the European marketplace. Therefore, a quasi-random sampling was performed over the whole price range, and from all origins (national, EEA, and imported from third countries). However, to avoid double sampling, participating MSA were encouraged to upload details of their selections into ICSMS as early in the course of campaign as possible.

The number of selected EUT is recommended 5 different individual types for each participating MSA, but MS were free to select any number of EUT for this campaign. Preferably, microwave ovens that were placed on the market after 20 April 2016 (i.e. date of start of application of 2014/30/EU) should be sampled for the purposes of this Campaign. Selections may include products purchased on the internet (from eBay, Amazon, Aliexpress, wish etc.). In order to maximise the value of this campaign and increase knowledge of the marketplace the aim is to select products from the broadest range possible.

6. Documents

A **Code of Practice** on the 13th joint cross-border market surveillance campaign (final version of 2020-06-18) was drawn up to provide guidance and a common understanding of the purpose of the campaign and to ensure, as far as possible, the adoption of harmonised practices during the carrying out of the campaign. The results of the assessment of each EUT were uploaded to ICSMS (the campaign criterion **MSC-EMC-13**).



7. Tests performed

For the purposes of the campaign, it was agreed to assess compliance to the EMC essential requirements by measuring against the harmonised standards according to the DoC issued by the manufacturer. If DoC was not available for the EUT, then the assessment for the RF emissions was done against actual harmonised standards.

Actual situation of HS for conducted and radiated emissions tests:

Harmonised standards under 2014/30/EU directive applicable for this Campaign (actual situation as for 7 April 2021 of harmonised standards published in the Official Journal):

7.1. For RF disturbance emissions (conducted and radiated) tests:

Presumption of conformity from 2016-04-20 until 2022-05-04:

EN 55011:2009 Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement
EN 55011:2009/A1:2010

Date of start of presumption of conformity: 2020-11-04:

EN 55011:2016 Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement
EN 55011:2016/A1:2017,
EN 55011:2016/A11:2020

7.2. For harmonic emissions tests:

Date of start of presumption of conformity: 2016-04-20:

EN 61000-3-2:2014 Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

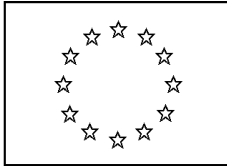
Presumption of conformity from 2016-04-20 until 2017-06-30:

EN 61000-3-2:2006 Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
EN 61000-3-2:2006/A1:2009
EN 61000-3-2:2006/A2:2009

7.3 For voltage fluctuations and flicker tests:

Date of start of presumption of conformity: 2016-04-20:

EN 61000-3-3:2013 Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection



Presumption of conformity from 2016-04-20 until 2016-06-18:

EN 61000-3-3:2008 Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection

Actual situation of HS for immunity to disturbances tests:

Date of start of presumption of conformity: 2016-04-20:

EN 55014-2:1997 Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity - Product family standard

EN 55014-2:1997/A1:2001,

EN 55014-2:1997/A2:2008,

EN 55014-2:1997/AC:1997

For the purposes of the Campaign it is agreed to assess compliance with the EMC essential requirements (only emission, immunity aspects could be assessed on voluntary basis) by measuring against the appropriate standards according to the DoC issued by the manufacturer.

If DoC is not available for the EUT, then the assessment for the RF emissions should be done against actual applicable harmonised standards under 2014/30/EU directive.

MSA assessed:

1. Disturbance voltage at low voltage a.c. mains power ports in the frequency range 150 kHz to 30 MHz (limits – Table 7 of EN 55011:2009+A1, or Table 9 of EN 55011:2016+A1);
2. Electromagnetic radiation disturbance, magnetic field, in the frequency range 9 kHz to 30 MHz (limits – Table 11 of EN 55011:2009+A1, or Table 12 of EN 55011:2016+A1);
3. Electromagnetic radiation disturbance, electric field, in the frequency range 30 MHz to 1000 MHz (limits – Table 11 of EN 55011:2009+A1, or Table 12 of EN 55011:2016+A1)
4. Electromagnetic radiation disturbance in the frequency range 1 GHz to 18 GHz (limits – Tables 14-16 of EN 55011:2009+A1, or Table 13 to Table 15 (if microwave oven do not pass table 13 limits, measurements should be done according to the limits in Table 14, or Table 15 (see Figure 12. Decision tree).
5. Harmonic current emissions injected into the public supply system (limits for Class A equipment – Table 1. See EN 61000-3-2, B.9 test conditions for microwave ovens).
6. Voltage changes, voltage fluctuations and flicker impressed on the public low-voltage system (see EN 61000-3-3, A.1.6 test conditions for microwave ovens)

NOTES 1. Microwave ovens fall within group 2, class B equipment (according to EN 55011).
2. Microwave ovens fall within class A equipment (according to EN 61000-3-2).

Additionally, on the voluntary basis:

7. Radiation levels on the 2.4-2.5 GHz frequency band.



To assist in achieving the maximum consistency of results between different testing laboratories and to simplify reporting procedures, products should be tested to the full and exact testing procedures of the appropriate parts of the relevant standards.

8. Administrative requirements

8.1. Checking for CE marking

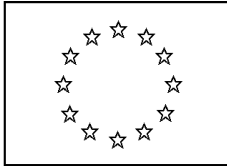
The EUT were checked for the presence and correctness of the CE marking.

8.2. Declarations of Conformity

MSA shall seek to obtain a copy of the DoC for the EUT checked. The results of the assessment and all standards used by manufacturer were filled in the ICSMS. As the DoC and its content are important key elements for this Campaign, an entry “not checked” in the ICSMS is not acceptable.

8.3. Technical Documentation

Technical documentation was assessed on voluntary basis. The relevant parts of the technical documentation of the acquired EUT were requested from the responsible economic operators.



C. RESULTS

1. Number and origin of products

MSA had to report on the country where EUT has been manufactured; the information “Made in” present either on the EUT itself, on its packaging or on the accompanying documents and finally from the DoC (where available). The “country of origin” therefore refers not generally to the economic operator who is responsible for placing the product on the EU market.

A total of number of sixty-two products were selected and evaluated, as follows:

Table 1 – Number and origin of products (i.e. ‘made in’)		
Country of origin	Number of evaluated microwave ovens	Compliance to assessed administrative and technical requirements: number and (%)
China	37	25 (68 %)
EU	4	2 (50%)
Malaysia	3	3 (100%)
No information	18	12 (67%)
All origins	62	42 (68 %)

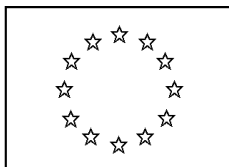
NOTE. Country of origin is not necessary the same as the location country of the legal manufacturer selling products under his brand name.

Conclusion: the microwave ovens were made mainly in China (60%). There was considerable number of cases when no information was provided by the MS about the country of origin (29%).

2. Administrative compliance

The EUT were assessed for the presence and format of CE marking, the availability and compliance of the DoC, traceability (issues of non-compliance were found only with manufacturer name and address), and technical documentation.

Table 2 – Overall compliance with administrative requirements		
Number checked	Number compliant	Compliant (%)
62	43	69



2.1 CE marking

All 62 EUT were affixed with CE marking according to requirements.

2.2 EC Declarations of Conformity (DoC)

MSA assessed 62 EUT against the DoC requirements. DoC for 4 EUT were not made available. From 58 DoC available, 52 DoC has no issues found.

Table 3 – Compliance with DoC requirements				
Number of EUT assessed	DoC available	DoC not made available	DoC with no issues found	Overall DoC compliance (%) *
62	58	4	52	84

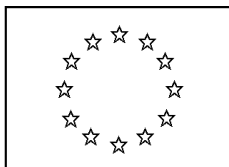
* overall compliance of DoC (not made available = non compliant).

Table 4 – Compliance rate of the DoC requirements	
Requirements for DoC	Compliance rate for 58 available DoC (%) *
Reference to EMCD	100
Identification of the apparatus	100
Name and address of the manufacturer	98
Dated reference to the specifications	98
Signature of the person empowered to bind the manufacturer	97

2.3 Technical documentation (TD)

On voluntary basis MSA requested TD for 23 of the 62 EUT. Of those 15 were found to be compliant.

Table 5 – Compliance with TD requirements		
Number assessed	TD compliant	Overall TD compliance (%)
23	15	65



2.4 Traceability Requirements

Manufacturers shall ensure that products which they have placed on the market bear a type, batch or serial number or other element allowing its identification. Manufacturers and importers (if manufacturer is not established in the EU) shall indicate, on the product, their name, registered trade name or registered trade mark and the postal address at which they can be contacted.

Requirement of traceability	Number checked	Number compliant	Compliance (%)
Identification requirements (type designation)	62	62	100
Name and address of the manufacturer	62	58	94
Name and address of the importer (if needed)	36	36	100

3. Compliance with harmonised standards

3.1 Emission requirements

The measured result was compared directly with the limit in the harmonised standard without taking into account the measurement uncertainty (if U_{lab} was less than or equal to U_{cispr} of Table 1 CISPR 16-4-2).

62 EUT were assessed for the emissions and the compliance rate of the products tested for emissions was as follows:

Number tested	No issues found	% no issues found
62	49	79

5 products exceeded the limits of electromagnetic radiation disturbance in the frequency range 30 MHz to 1000 MHz;

3 products exceeded the limits of disturbance voltage at low voltage a.c. mains power ports in the frequency range 150 kHz to 30 MHz;

4 products exceeded the limits of voltage changes, voltage fluctuations and flicker impressed on the public low-voltage system.



1 product exceeded the limits of electromagnetic radiation disturbance, magnetic field, in the frequency range 9 kHz to 30 MHz

3.2 Emissions in 2,4-2,5 GHz frequency band

The EN 55011 harmonised standard does not prescribe the limits for emissions in the 2,4 – 2,5 GHz frequency band. However such emissions generated by the magnetron of microwave oven can cause disturbances to RLAN equipment (especially to 2,4 GHz Wi-Fi), and also other electronic equipment placed at the distances approximately up to 3 m from the microwave oven. The measured levels from 26 types of microwave ovens presented in the Table 8 are quite high. The measured levels at 3 m distance, exceed the limit 60 dBuV/m ((EN 55011 standard) for other frequencies allowed in the 1-18 GHz range by 52 dB on average (i.e. 400 times more than the limit) Testing of emissions levels of microwave ovens in 2,4-2,5 GHz frequency band were performed on voluntary basis:

Table 8 – Results with emissions at 2,4 -2,5 GHz		
Number tested	Average level of emissions, dBuV/m	Max emissions, dBuV/m
26	112	122

4. Other evaluations

4.1 DoC compliance vs. compliance with disturbance emissions requirements

EUT with a correct DoC had approximately the same level of compliance than those with available but not correct DoC.

Table 9 – DoC compliance vs. compliance with disturbance emissions requirements			
DoC	Number of DoC	Number of products were no issues found for emission	The level of compliance to disturbance emission (%)
DoC – available but not correct	5	4	88
DoC – not made available	4	0	0
DoC – available and correct	53	46	87

All microwave ovens for which DoC are not made available were found to be also not compliant to disturbance emission requirements of harmonised standards.



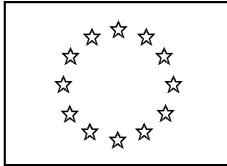
5. Overview of findings

Table 11 summarises the overall compliance of EUT in terms of the emission to the limits of harmonised standards, also overall administrative, CE marking and EU Declaration of Conformity requirements.

Table 10 – Overview								
Campaign	Number of MSA participating	Number assessed (types)	Overall compliance (%)	Compliance with emission limits of HS (%)	No issues found with assessed administrative (formal) requirements			
					Overall administrative compliance (%) *	CE Marking (%)	TD %	DoC (%) **
MSC-13	10	62	61	79	69	100	65	84

* overall administrative compliance = DoC + CE + traceability + TD

** overall compliance of DoC (not made available = non compliant).



D. CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions

- In general, the level of compliance with the administrative and technical requirements was considered as quite satisfactory. Overall, 39 % of the Equipment Under Test ('EUT') were assessed as not compliant, and this is one of the best results comparing with the previous EMC MSC campaigns.
- Results of microwave ovens disturbance emission tests comparing to the limits of harmonised standards were 21% not compliant, this is quite good result comparing with previous EMC campaigns. It is the best comparing it with previous twelve EMC Market surveillance Campaigns results.
- Overall not compliance with administrative requirements 31% (including the presence of CE marking, the availability and compliance of the DoC, traceability (issues of non-compliance were found only with manufacturer name and address), and technical documentation).
- All of 62 types of microwave ovens have had the CE mark.
- 85 % of the DoC were correct. In 4 cases DoC were not made available to authorities, and in 5 cases DoC were not correct
- These results shows that economic operators in EU market in the sector of microwave ovens are much more consistent with appropriate requirements of EMCD in the aspects of essential requirements and also administrative (formal) requirements
- The EUT represented a large sample of the products available on the market and it is clear that some improvements remains to be done by manufacturers in terms of compliance.
- The use of ICSMS for sampling EUT was very helpful.
- The resource in conducting this type of campaign is significant. Activities including preparation (eg. drafting its Code of practice), coordination, tests and analysis of the results and the drafting of the report are carried out by EMC ADCO members supplemental to their national activities.
- At frequencies in the radio-frequency range designated by ITU for use as fundamental ISM frequencies at 2 400 – 2 500 MHz, radiation levels is unrestricted. Actual measurements at the distance 3 m with peak detector showed high levels of radiation from microwave ovens: on average 112 dBuV/m (max 122 dBuV/m). This exceed the limit 60 dBuV/m ((EN 55011 standard) for other frequencies allowed in the 1-18 GHz range by 52 dB on average (i.e. 400 times more than the limit) . As the measured emissions can be considered as quite high, and bearing in mind that microwave ovens are used in residential areas, EMC ADCO ask standardization bodies to consider appropriate limit at 2400 -2500 MHz frequency band for microwave ovens.

2. Recommendations

It is recommended that:

- The results of the campaign should be publicised widely throughout Europe. Publicity should target all economic operators in the area of the microwave ovens industry.



**EMC ADMINISTRATIVE
CO-OPERATION WORKING GROUP**

13th EMC Market Surveillance Campaign 2020-21



- MSA should take the results of this campaign into consideration when making their plans as stated in the Regulation (EU) 2019/1020 of the European Parliament and of the Council of 20 June 2019 on market surveillance and compliance of products.
- The results of this campaign should be forwarded to the European Standardisation bodies in order to take into account in the development of the future EMC standards for the microwave ovens.
- MSA who did not participate should be encouraged to join in future campaigns. Regulation (EU) 2019/1020 in Chapter VI and other articles promotes this type of cooperation and actions between MSA.
- MSA shall increase the use ICSMS in the future campaigns for sampling and exchange of information.