



**FINAL REPORT  
ON THE 4<sup>TH</sup> JOINT CROSS-BORDER  
EMC MARKET SURVEILLANCE CAMPAIGN  
(2011)**

**LED LIGHTING PRODUCTS**



**CONTENTS**

| <b>S/N</b> | <b>ITEM</b>  | <b>PAGE</b> |
|------------|--|-------------|
| <b>A.</b>  | <b>EXECUTIVE SUMMARY</b>   | <b>3</b>    |
| <b>B.</b>  | <b>ELEMENTS OF THE CAMPAIGN</b>  | <b>5</b>    |
| 1.         | Reasons for the campaign   | 5           |
| 2.         | Scope of the campaign  | 5           |
| 3.         | Participation in the campaign  | 5           |
| 4.         | Timing   | 5           |
| 5.         | Selected product types   | 6           |
| 6.         | Sampling   | 6           |
| 7.         | Documents  | 6           |
| 8.         | Testing performed  | 6           |
| <b>C.</b>  | <b>RESULTS</b>   | <b>7</b>    |
| 1.         | Number and origin of products  | 7           |
| 2.         | Technical compliance   | 7           |
| 2.1        | Emission requirements  | 7           |
| 2.2        | Immunity requirements  | 8           |
| 2.3        | Technical compliance with emissions and immunity                       | 8           |
| 3.         | Study of Harmonics; technical compliance with scope extended standards | 8           |
| 4.         | Administrative compliance  | 8           |
| 4.1        | CE marking   | 9           |
| 4.2        | EC Declaration of conformity   | 9           |
| 5.         | Other evaluations  | 10          |
| 5.1        | DoC compliance vs. compliance with emissions requirements              | 10          |
| 5.2        | CE marking compliance vs. compliance with emissions requirements       | 10          |
| 6.         | Overview of compliance   | 10          |
| <b>D.</b>  | <b>CONCLUSIONS AND RECOMMENDATIONS</b>                                 | <b>11</b>   |
| 1.         | Conclusions  | 11          |
| 2.         | Recommendations  | 12          |



### A. EXECUTIVE SUMMARY

As a result of discussions at the 29<sup>th</sup> EMC Administrative Cooperation Working Group (EMC ADCO) held on the 5<sup>th</sup> and 6<sup>th</sup> of October 2010 in Budapest, and following an impact assessment procedure it was agreed that the fourth joint cross-border EMC market surveillance campaign should assess the compliance of LED lighting products.

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

The primary purpose of the campaign was to determine

1. Compliance with the harmonised standards on emission applicable for LED lighting equipment;
2. Compliance with some administrative requirements of the EMC Directive;
3. Study the technically relevant emissions for power levels and frequency bands presently not addressed by the harmonised standard.

It was decided that determination of immunity levels should be optional.

For 3), this Study was carried out for LED lighting equipment using the reference standard applicable for fluorescent lighting equipment because evidence of interferences caused by harmonics was reported. Thus, it is up to the participants to draw their conclusions regarding regulatory measures considering their respective legal environment.

Eighteen national market surveillance authorities (MSAs) involved in EMC ADCO participated in the campaign which was conducted between the 1<sup>st</sup> of January and the 30<sup>th</sup> of June 2011.

A hundred and sixty-eight (168) products were obtained and evaluated. Ninety one (91) LED lighting equipment products were of Chinese origin, whereas the origin of sixty-five (65) products could not be determined.

#### **Technical compliance with harmonised standards**

The notion of “compliance” is to be understood as compliance with an applicable harmonised standard.

The results of the technical compliance with the applicable harmonised standards showed large differences:

- Rather low compliance with the emissions limits: 61.5% of the tested, one hundred and sixty-six (166) products were found to be compliant
- There was a better level of compliance with the immunity limits: 91.5% of the tested, forty-six (46) products were found to be compliant.

Within this market surveillance campaign an additional study on harmonic current emissions (EN61000-3-2) was carried out. When applying the same harmonic limits as those for compact fluorescent lamps, one out of two samples, 46% of the assessed LED lighting equipment failed. This is clear evidence for the need of a prompt amendment of EN61000-3-2.



### **Administrative compliance**

The overall administrative compliance was only 28.8% and, mainly regarded the CE marking and the Declaration of Conformity (DoC) requirements.

Almost 9% of the assessed LED lighting equipment did not carry the CE marking, whereas almost 24% were either not CE marked or did not carry a correct CE marking (format and size) as required.

Declarations of Conformity were available for 125 (74.4%) of the assessed LED lighting equipment with almost half of them having major deficiencies (e.g. missing reference to the Directive, incorrect Directive, identification of the product, incorrect standards, not issued by the manufacturer and/or authorised representative, etc.). Overall, for 67 (39.9%) of these products an acceptable Declaration of Conformity was presented.

### **General**

In general, the level of compliance of the LED lighting equipment with the technical and administrative requirements was considered insufficient. Overall, only 29 (17.3%) of the products were in line with both technical and administrative requirements. The assessment of the technical documentation and of the immunity requirements were performed on an optional basis, the results of this assessment have not been taken in account in the overall level of compliance. This means that the overall level of compliance could be lower if both requirements had been assessed.



## **ELEMENTS OF THE CAMPAIGN**

### *1. Reasons for the campaign*

As with most new and emerging technology, LED lighting equipment is becoming more and more popular and the numbers sold to consumers has been increasing over the last four to five years.

Numerous complaints have been received by several MSAs, reporting severe and visible interference on radio and broadcast reception. Concerns regarding the compliance of these products with the requirements of the EMC Directive have also been raised.

As a result of discussions at the 29<sup>th</sup> EMC Administrative Cooperation Working Group (EMC ADCO) held on the 5<sup>th</sup> and 6<sup>th</sup> of October 2010 in Budapest, and after an impact assessment procedure was carried out for several different possible target products, it was decided that the fourth joint cross-border EMC market surveillance campaign should check the compliance of LED lighting products.

### *2. Scope of the campaign*

The primary purpose of the campaign was to assess the compliance of a limited range of LED lighting products with the administrative and technical requirements of the EMC Directive. Administrative compliance was checked against the CE marking and Declaration of Conformity (DoC) requirements of the Directive. General marking requirements and user information were checked on an optional basis. Technical compliance was checked against the emission requirements of the Directive.

The assessment of technical documentation and immunity characteristics of the products were not part of the campaign. However, the results of immunity assessment that was voluntarily performed by some MSAs on a limited number of products are presented in the report.

LED T8 replacement tubes were excluded from the scope of the campaign.

The campaign was also intended to give MSAs a chance to participate in EMC market surveillance, to provide the opportunity to improve the exchange of information between MSAs, and to raise economic operator and public awareness of the need for conformity with the requirements of the EMC Directive.

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 and published on the [ec.europa.eu](http://ec.europa.eu). 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.

Eighteen European countries participated in the campaign: Belgium, Cyprus, Czech Republic, Finland, Germany, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovenia, Sweden, Switzerland and the United Kingdom.

### *4. Timing*

The campaign commenced on the 1<sup>st</sup> of January 2011. The information gathering, testing and data reporting phases of the campaign were of six months duration, ending on the 30<sup>th</sup> of June 2011. Within that period, MSAs carried out their actions to their own timescales.



One further month, ending on the 31<sup>st</sup> of July 2011, was allowed for results to be uploaded to CIRCA.

5. *Selected product types*

MSAs had full flexibility in the selection of LED lighting equipment across the European market.

The selected LED lighting products were within the scope of EN 55015 “Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment”, EN 61000-3-2 “Electromagnetic compatibility (EMC) - Part 3-2: Limits – Limits for harmonic current emissions (equipment input current  $\leq$  16 A per phase), and EN 61547 “Equipment for general lighting purposes - EMC immunity requirements”.

6. *Sampling*

The aim was to obtain the broadest possible view of the products in the European marketplace. Therefore, a quasi-random sampling was performed by taking products over the whole price range, and from all origins (national, EEA, and imported from third countries). However, to avoid the double sampling of the same product in several countries, participating MSAs were encouraged to upload details of their selections to CIRCA as early in the campaign as possible. The exact type and number of samples that were investigated was left to the discretion of the participating MSAs.

7. *Documents*

A Code of Practice has been 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 product were recorded on a common electronic data input form.

8. *Tests performed*

The measurement of the emissions on the selected LED lighting products used the appropriate tests from EN 55015 and/or EN 61000-3-2. For the measurement of the immunity aspects of products, EN 61547 was applied.

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

Therefore, the measured result was compared directly with the limit in the harmonized standard without taking into account the measurement uncertainty.

Since 2009-12-01 the current edition of EN 55015 (EN 55015:2006 + A1:2007) has been superseded by EN 55015:2006 + A1:2007 + A2:2009. The date of cessation of presumption of conformity of the current standard is 2012-03-01.

Although most of the products have been placed on the market with the application of A2:2009 some were accompanied with DoC making reference to EN 55015:2006 + A1:2007 only. Checks and emission tests were carried out according to the standard referenced on the Docs.

There is evidence of interference caused by harmonics and this issue was also assessed during this campaign. This effect was included in the investigation though measurements are presently not foreseen by EN 61000-3-2 clause 7.3 for LED lamps (see Ch. 3).



C. RESULTS

1. Number and origin of products

Participating MSAs had to report on the country where LED lighting equipment has been manufactured; the information “Made in” present either on the LED lighting equipment 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.

Most of the LED lighting equipment has been manufactured in China, only a few sets of equipment were manufactured in Europe. It showed that information on the country of origin couldn't be related to the country of origin of the responsible person for placing the product on the market.

MSAs have also noticed that much LED lighting equipment is imported by dealers/salesmen from third countries and sold under their brand name. These dealers are not always aware about or ignore the fact that these products should fulfil the EMC requirements.

A total of a hundred and sixty-eight (168) products were selected and evaluated, as follows

| <b>Country of origin</b> | <b>Number tested LED lighting equipment</b> | <b>Level of fulfilling the standards and administrative requirements %</b> |
|--------------------------|---|--|
| China/<br>Taiwan*        | 91  | 54   |
| Unknown                  | 65  | 39   |
| EU                       | 12  | 7  |
| <b>All origins</b>       | <b>168</b>                                  | <b>100</b>   |

\*Note: Only one (1) product from Taiwan

Conclusion: LED lighting equipment was mainly of Chinese and unknown origin. Due to the small number of European products coming from six (6) different European countries, no statistically valid conclusions can be extracted on this group.

2. Technical compliance with harmonised standards

Participating MSAs have assessed the technical compliance with the essential requirement applying EN 55015 (EN 55015:2006 + A1:2007 + A2:2009) and/or EN 61000-3-2 for emission and EN 61547 for immunity. If the DoC of the product had a reference to the previous version of the EN 55015 (EN 55015:2006 + A1:2007), the market surveillance authority assessed the compliance according to this version because the date of cessation of presumption of conformity for the previous standard is 1<sup>st</sup> March 2012.

2.1 Emission requirements

The measured result was compared directly with the limit in the harmonised standard without taking into account the measurement uncertainty. A failure was recorded if any emission exceeded a certain limit when measured with the appropriate detector.



A hundred and sixty-six (166) samples were tested for emissions. Of these, one hundred and two (102) met the emission requirements, representing 61.5% of the products. Five of twelve European products fulfilled the emission requirements only.

The technical compliance rate of the products tested for emissions was as follows:

| <b>Table 2: Technical compliance with the emissions requirements</b> |                         |                    |
|--|-------------------------|--------------------|
| <b>Number tested</b>   | <b>Number compliant</b> | <b>% compliant</b> |
| <b>166</b>   | <b>102</b>              | <b>61,5</b>        |

## 2.2 *Immunity requirements*

As the immunity compliance tests were performed on an optional basis, forty-six (46) samples were tested for immunity. Forty-two (42) or 91.3% of these samples met the immunity requirements.

## 2.3 *Technical compliance with emissions and immunity*

Overall technical compliance for both emissions and immunity against harmonised standards was assessed for 28.6% that is, for forty-six (46) of the samples that was tested for emissions. Of them, thirty-one (31), representing 67.4%, were found to be technically compliant with the requirements.

## 3. *Study on harmonics: technical compliance with extended scope standards*

EN61000-3-2 clause 7.3 (harmonics) requirements for lighting equipment  $\leq 25W$ , are restricted to discharge lighting equipment, There is no plausible technical reason to differ between LED and discharge lighting equipment in respect of emissions and the provisions seem historically motivated.

For these reasons, EMC ADCO decided to read “discharge” as well “LED” and extend the application of the standards accordingly (“discharge equals LED”) for the purpose of the campaign.

Discussions showed that this assumption was not recognised by all stakeholders and therefore separate results are given for the application of the harmonised standards and for the extension with harmonics measurements.

In this section, the notion of “compliance” is to be understood as compliance with an applicable harmonised standard.

| <b>Table 3: Compliance with extended scope emissions requirements</b> |                         |                      |
|---|-------------------------|----------------------|
| <b>Number tested</b>  | <b>Number compliant</b> | <b>Compliant (%)</b> |
| <b>116</b>  | <b>62</b>               | <b>53.4</b>          |

## 4. *Administrative compliance*

Products were mainly checked for the presence and compliance of CE marking, and the availability and compliance of the Declaration of Conformity. General marking requirements and user information were partially checked on a voluntary basis. The outcome of this partial check is reflected in the results of the overall administrative compliance shown below.

28.8% of the products fulfilled the administrative requirements and four of the twelve European products were found to be compliant.





| <b>Table 3: Compliance with administrative requirements</b> |                         |                      |
|---|-------------------------|----------------------|
| <b>Number checked</b>                                       | <b>Number compliant</b> | <b>Compliant (%)</b> |
| <b>168</b>  | <b>46</b>               | <b>28.8</b>          |

#### 4.1 CE marking

Fifteen (15) products did not carry the CE marking and twenty-four (24) CE marked products did not fulfil the CE marking requirements (format and size). Overall, a hundred and twenty-nine (129) products were found to comply with the CE marking requirements. This represents a 76.8% compliance level.

| <b>Table 4: Compliance with CE marking requirements</b> |                         |                             |                                      |  |
|---|-------------------------|-----------------------------|--------------------------------------|--|
| <b>Number assessed</b>                                  | <b>Number CE marked</b> | <b>Number CE marked (%)</b> | <b>Overall CE marking compliance</b> | <b>Overall CE marking compliance (%)</b> |
| <b>168</b>  | <b>153</b>              | <b>91.1</b>                 | <b>129</b>                           | <b>76.8</b>                              |

#### 4.2 EC Declarations of Conformity

Forty-three (43) out of one hundred and sixty-eight (168) assessed LED lighting equipment's Declarations of Conformity (DoC) were not made available. Of the hundred and twenty-five (125) DoC that were obtained, fifty-eight (58) have showed one or more major deficiencies, as shown in Table 5b. Overall, sixty-seven (67) products were found to fulfil the DoC requirements. This represents 39.9% of the total number of products checked. A DoC accompanied all twelve European products, but only five of them were correct.

| <b>Table 5a: Compliance with DoC requirements</b> |                      |                          |                      |                                   |
|---|----------------------|--------------------------|----------------------|-----------------------------------|
| <b>Number checked</b>                             | <b>DoC available</b> | <b>DoC available (%)</b> | <b>DoC compliant</b> | <b>Overall DoC compliance (%)</b> |
| <b>168</b>  | <b>125</b>           | <b>74.4</b>              | <b>67</b>            | <b>39.9</b>                       |

| <b>Table 5b - Categories of DoC deficiencies</b>   |                         |
|--|-------------------------|
| <b>Major deficiency</b>  | <b>Minor deficiency</b> |
| Missing reference to the Directive<br>Incorrect Directive<br>Inadequate identification of the product<br>Missing or incomplete identification of manufacturer and/or authorised representative<br>Not issued by the manufacturer and/or authorised representative<br>Incorrect standards applied<br>Missing signature and/or date of issue | Editorial errors        |



5. *Other evaluations*

5.1 *DoC compliance vs. compliance with emissions requirements*

Table 6 below has been elaborated to check if there was a relationship between technical non-compliance (especially emission requirements) and the availability and correctness of the DoC. Products with a correct DoC had a higher compliance rate than products with no available DoC or product with a DoC which is not correct.

| <b>Table 6: DoC compliance vs. compliance with emissions requirements</b> |                           |   |   |
|---|---------------------------|---|---|
| <b>DoC</b>  | <b>Number of products</b> | <b>Number of emissions compliant products</b> | <b>Emissions compliant products (%)</b> |
| <b>Not available</b>  | 43                        | 24  | 55.8                                    |
| <b>Available-<br/>Not correct</b>   | 57                        | 31  | 54.4                                    |
| <b>Available- correct</b>   | 66                        | 45  | 68.2                                    |

5.2 *CE marking compliance vs. compliance with emissions requirements*

Table 7 below, shows the differentiation between products that had a compliant CE marking, and products whose CE marking was not compliant, with respect to conformity with the emissions requirements. It can be seen that the percentage of emissions compliant products that had compliant CE marking was almost two times higher than that of products that did not have compliant CE marking. However, the emissions compliance level of CE-marked products was 68.8%.

| <b>Table 7: CE marking compliance vs. compliance with emissions requirements</b> |                           |   |   |
|--|---------------------------|---|---|
| <b>CE marking</b>  | <b>Number of products</b> | <b>Number of emissions compliant products</b> | <b>Emissions compliant products (%)</b> |
| <b>Not compliant</b>   | 38                        | 14  | 36.8                                    |
| <b>Compliant</b>   | 128                       | 88  | 68.8                                    |

6. *Overview of compliance*

Table 8 summarises the overall compliance of the LED lighting equipment in terms of emissions against harmonised standards, overall administrative, CE marking and Declaration of Conformity requirements.

| <b>Table 8: Overview of compliance</b> |                    |                       |                         |                       |                |
|--|--------------------|-----------------------|-------------------------|-----------------------|----------------|
| <b>Number assessed</b>                 | <b>Overall (%)</b> | <b>Emissions (%)*</b> | <b>Administrative</b>   |                       |                |
|  |                    |                       | <b>Overall adm. (%)</b> | <b>CE marking (%)</b> | <b>DoC (%)</b> |
| <b>168</b>                             | <b>17.3</b>        | <b>61.5</b>           | <b>28.8</b>             | <b>76.8</b>           | <b>39.9</b>    |

\*Note: 166 technical assessment



#### *D. CONCLUSIONS AND RECOMMENDATIONS*

##### *1. Conclusions*

- 54% of products sampled from the market are produced by Chinese manufactures, 39% were of unknown origin and seven percent were produced by EU manufacturers. The number of unknown origin products is surprisingly high and shows the problem of traceability.
- The overall technical emissions compliance levels of the tested LED lighting equipment were low, with only 61.5% of the products passing the relevant standards tests.
- Immunity compliance level was much higher than that for emissions. Although only forty-six (46) products were assessed against immunity requirements this constitutes a statistically significant sample, and validates the outcome of the immunity assessment. Immunity requirements were fulfilled by forty-two (42) that is 91.3% of the tested products
- Technical compliance of the forty-six (46) samples assessed for both the emissions and immunity requirements, was 67.3% which is (6%) better than the overall emissions compliance level above.
- The study on harmonics demonstrated that almost one out of two samples (46.6%) exceeded the limits that would have been applicable for discharge lighting equipment. This is clear evidence for the need to revise harmonised standard EN61000-3-2. CENELEC should be informed about the results of the study and the Commission should mandate CENELEC to revise this harmonised standard to include LED lighting equipment with a power smaller or equal than 25W. In the meantime, a footnote in the list of harmonised standards should be included by the Commission to improve legal certainty (see recommendations).
- The administrative compliance level, mainly regarding CE marking and DoC requirements, was low compared to previous campaigns<sup>1</sup>; 28.8% of the LED lighting equipment fulfilled the assessed administrative requirements.
- Almost 9% of the assessed LED lighting equipment did not carry the required CE marking, whereas almost 24% were either not CE marked or did not carry a compliant CE marking.
- The success level in the emission tests of products bearing a compliant CE marking was 69.1%, as compared to that of products with non-compliant CE-marking of 36.8%.
- DoC were available for 74.4% of the products. However, only 39.9% of these DoC were correct.
- Products with a correct DoC performed slightly better in the emission tests compared to products without a DoC or without a correct DoC. The former have shown a compliance level of 67.2%, as compared to the compliance levels of 55.8% and 54.8% of the other two categories that were without a DoC or without a correct DoC.
- Overall, the level of compliance of the LED lighting equipment with technical and administrative requirements was very poor. Only 17.3% of the LED lighting equipment fulfilled both the emissions and administrative requirements.
- The low compliance level with emissions requirements suggest that either EMC has not been taken in account when some products have been designed or that those products have been modified as compared to the initial design.
- Much remains to be done by manufacturers in terms of the technical compliance of LED lighting equipment.

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<sup>1</sup> Campaign 1: 39.09%, campaign 2: 62.72% and campaign 3: 79.25%



- The impact assessment procedure has proven to be an effective method in the selection of the appropriate product for the campaign.
- The campaign showed a good level of support between Market surveillance authorities. However, it should be noted that the number of participating MSA's has remained constant across all three cross-border EMC campaigns.

### 2. *Recommendations*

#### **It is recommended that:**

- The results of the campaign should be publicised widely throughout Europe and the other countries where the products originate. Publicity should target all economic operators in the area of lighting equipment;
- The Commission should mandate CENELEC to amend the standard and to add the following foot note to the next publication of EMC harmonised standards: *For LED lighting equipment with the power smaller than or equal to 25W (also in other chapter), EN 61000-3-2 covers the essential requirements of directive 2004/108/EC only if clause 7.3 is applied;*
- MSAs are encouraged to investigate the reasons for non-conformity of those products found in their territory and to take appropriate action against the non-compliant product;
- Due to the low conformity level of LED lighting equipment, MSAs are asked to increase the amount of controls in the LED sector until the situation has been improved;
- It should be clarified to economic operators that the correct application of an applicable harmonised standard gives a presumption of conformity only for those phenomena described in the standard. Other phenomena not included in the standard could lead to non-compliance against the essential requirements.
- An impact assessment procedure should be adopted for future campaigns, for the selection of suitable products;
- A similar campaign should be considered on the same basis after a certain period to assess the effect on the market.