

# NEWS

New developments in CISPR standards

June 2021

## Keeping Up with Changes to EMI Test

This newsletter describes the latest developments in CISPR product standards, arising from recent changes to EMI compliance measurements. The newsletter is published annually and additionally if major changes in CISPR product standards take place. The changes described are the most recent for each standard, and may have been agreed in previous years. The newsletter is structured by the product standard number and describes for each standard:

- the currently valid edition,
- new amendments,
- potential maintenance items,
- whether the amendments shall be published as a European EN standard,
- Date of mandatory use in the European Economic Area (EEA).

## Product Standards in this Issue

### [CISPR 11](#)

EMI - industrial, scientific and medical equipment

### [CISPR 12](#)

EMI - automotive equipment - protection of off-board receivers

### [CISPR 14-1](#)

EMI - household appliances and electric tools

### [CISPR 15](#)

EMI - lighting equipment

### [CISPR 25](#)

EMI - automotive equipment - protection of on-board receivers

### [CISPR 32](#)

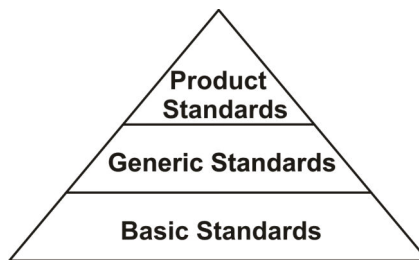
EMI - multimedia equipment

### [CISPR 36](#)

EMI - automotive equipment - protection of off-board receivers

## Which Standard Applies? CISPR Publication Levels

The International Special Committee on Radio Interference (CISPR = "Comité International Spécial des Perturbations Radioélectriques") is a technical committee of the International Electro-technical Commission established in 1933 to protect radio reception from interference. The committee has sub-committees that fulfill both product and basic standardization roles.



**The 3 levels of CISPR publications. On the basic level, CISPR 16 defines the measurement apparatus, and how measurements shall be made. How and when changes in CISPR 16 apply to individual product test, is determined by the appropriate product standard.**

### **Basic Standards: (CISPR sub-committee A)**

The CISPR 16 series, made up of 17 parts. It defines apparatus, methods, uncertainty, and test facilities.

### **Generic Standards: (CISPR sub-committee H)**

The IEC 61000-6 series for both emission measurements and immunity testing. The emission series was restructured in Edition 3; Part 6-3 now comprises residential environments only, commercial and light-industrial environments were moved to the new Part 6-8. Industrial environments remain in Part 6-4. Sets limits via an interference model

### **Product Standards: (CISPR sub-committees B, D, F, I)**

Product and product-family standards for both emission measurements and immunity testing. Provides product-specific requirements, such as operation and arrangement of the EUT, measurement methods, and uncertainty, and permitted deviations for limits.

## Major Changes to Product Standards

- The fast FFT-based time-domain scan for EMI receivers such as the R&S®ESW, ESU and ESR is applicable for EMI compliance measurements for CISPR 11, 14-1, 15, 25, 32 and 36. CISPR 12 will follow in 2022.
- Measuring radiated disturbance from 30 MHz to 1000 MHz becomes mandatory for lighting and similar equipment with application of CISPR 15 Ed.9. Alternatively, use the CDNE method up to 300 MHz if all clock frequencies of the EUT are below or equal to 30 MHz.
- Measuring radiated disturbance in the range from 1 GHz-6 GHz was added to CISPR 14-1 Ed.7 for testing household appliances and electric tools. Only required if the highest internal frequency is larger than 108 MHz. Will also be added to next editions of CISPR 11 testing industrial, scientific and medical equipment of Group 1 and CISPR 15 for testing lighting equipment.
- CISPR 11, 14-1, 15 and 32 need the full treatment of measurement instrumentation uncertainty (MIU) according to CISPR 16-4-2. Requirements to calculate MIU was added to CISPR 36 Ed.1 and will be incorporated in the next editions of CISPR 12 and 25.
- The linear average detector with meter time constant (CISPR-Average) for radiated disturbance measurements above 1 GHz is now required in CISPR 25 and CISPR 32. CISPR 12 will follow in 2022.
- The product family standard for multimedia equipment CISPR 32 was updated in October 2019. It requires a continuous antenna height scan from 1 to 4 m for measuring radiated disturbance from 1 GHz to 6 GHz, tilting of the antenna is not required. The limits were relaxed by 4 dB in the frequency range 1-3 GHz (same as FCC Part 15 now).
- All future CISPR product standards will incorporate requirements for testing radio enabled products. Such equipment needs to be tested with radio function in standby or receive mode (alternatively in transmit mode).

**CISPR 11**

**Industrial, scientific and medical equipment - disturbance measurements**

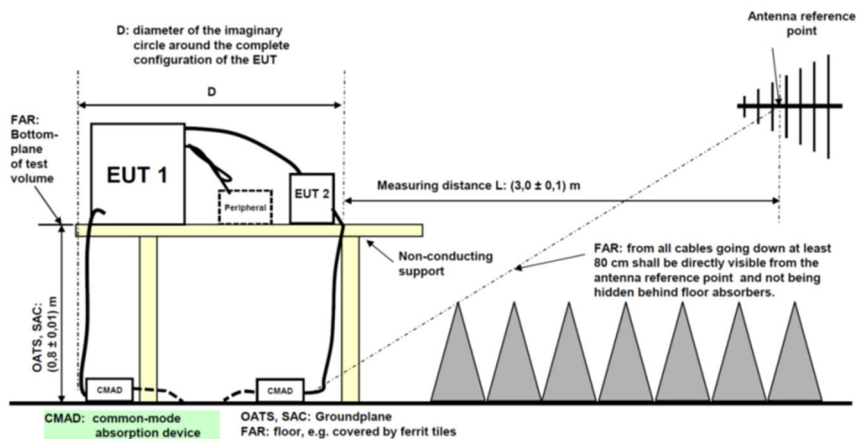
Product committee CISPR/B: Interference relating to industrial, scientific and medical (ISM) radio-frequency apparatus, to other (heavy) industrial equipment; to overhead power lines; to high voltage equipment and to electric traction.

**What's New in the 6th Edition (June 2015)?**

- This sixth edition of CISPR 11 cancels and replaces the fifth edition published in 2009 and its Amendment 1 (2010).
- The publication of EN 55011:2016 (sixth edition) was ratified by the European Commission on 15 February 2016. The date of withdrawal of the fifth Edition was set as 15 February 2019; **this means the sixth Edition became mandatory on 15 February 2019 in the European Economic Area.**

**What's New in Amendment 1 to the 6th Edition? (June 2016)**

- Fully anechoic room (FAR) according to CISPR 16-1-4 and measurement method according to CISPR 16-2-3 were added for field measurements of frequencies below 1 GHz.
- The method is applicable for small table top equipment ( $D_{max} 1.2 m, H_{max} 1.5m$ ) measured at a distance of 3 m, see Figure.
- **Amendment 1 was published on 23 June 2016 and date of withdrawal of the European EN 55011:2016/AMD1:2017 was set as 21 April 2020.**

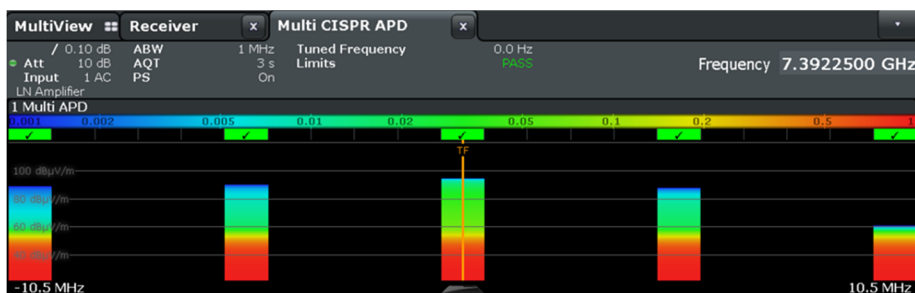


**EUT arrangement and routing of cables in FAR including the use of common mode absorption devices (CMADs), Source: AMD1:2016 to CISPR 11:2015.**

**Amplitude Probability Distribution or Log-AV Detector?**

In CISPR 11 the **APD measurement function** is applicable as alternative to the established Log-AV detector for final weighted measurements on microwave ovens from 1-18 GHz. Log-AV means that the weighted (average) value is measured by reducing the VBW to 10 Hz. Therefore, the result does not give a true average value and does not represent the true impact of impulse noise on the radio spectrum above 1 GHz. The APD is the cumulative distribution of the amplitudes of a disturbance within a defined time interval and bandwidth. Therefore, it indicates how strongly the EUT disturbs digital communications systems and provides **an adequate weighting of impulse noise.**

With the recent changed requirements in AMD2:2019 to CISPR 11:2015 there will be a high demand **for receivers with APD Multi-Channel function such as R&S®ESW.**



**The R&S®ESW acquires the five required channels in parallel and presents them in a 2D diagram with a color-coded probability distribution, along with the test case verdict PASS, MARGIN or FAIL.**

**What's New in Amendment 2 to Edition 6? (January 2019)**

- Adds a new definition for power conversion equipment (PCE) to cover non-grid power converters, such as d.c. to d.c. converters. Requirements apply only to the following types of equipment:
  - PCE intended for assembly into photovoltaic power generating systems, such as grid connected power converters (GPCCs) **and** d.c. to d.c. converters.
  - GPCCs intended for assembly into energy storage systems.
- **For measurements at low voltage d.c. (LV d.c.) power ports of a PCE the following applicability criteria apply:**
  - No measurements are required if the cable connected to a LV d.c. power port is less shorter 3 m,
  - For cables longer than 3 m but less than 30 m, the start frequency of the measurement range is limited to  $f(MHz) = 60 / \text{length in meters}$ , e.g. 6 to 30 MHz for a 10 m cable.
  - For a cable of 30 m or longer, the entire frequency range from 150 kHz to 30 MHz has to be measured.
- **Revision of APD measurement method:**
  - Generally, final weighted measurements shall be carried out only when the peak limit was exceeded during the preliminary measurement.
  - Measure in 7 subranges instead of at the frequency of the two highest, as before.
  - The Frequency span of 10 MHz will be increased to 20 MHz, which means measure on 5 final frequencies, (the critical frequency itself, +/- 5 MHz and +/- 10 MHz).
- **Publication of Amendment 2 was on 18 January 2019 and date of withdrawal of the European EN 55011:2016/AMD2:2021 was set as 9 April 2024.**



**R&S®ESW; the right choice for APD measurements.**

**CISPR 11**

**Industrial, scientific and medical equipment - disturbance measurements**

Product committee CISPR/B: Interference relating to industrial, scientific and medical (ISM) radio-frequency apparatus, to other (heavy) industrial equipment; to overhead power lines; to high voltage equipment and to electric traction.

**What's Coming in Edition 7?**

**General maintenance items:**

- Definition for small equipment to align with CISPR 16-2-3; i.e. a cylindrical volume of 1,5 m x 1,5 m.
- Automated Guided Vehicle (AGV) for sole use in industrial environment will be added to scope.
- Adds wired network port – conducted emission with AAN as in CISPR 32.
- Annex B on use of spectrum analyzers now in CISPR 16-2-x.
- Annex H on statistical assessment of series produced equipment can be considered as regulatory statement and will be deleted.
- Annex I on artificial network for d.c. port (DC-AN) now in CISPR 16-2-1.

**Adds new normative Annex X on radio enabled equipment**

Devices including one or more embedded or plug-in radio modules. Not applicable to the intended transmissions from a radio transmitter as defined by ITU including their spurious emissions:

- Radiated emission with radio function in standby or receive mode (alternatively in transmit mode).
- EUT with antenna port for connecting to external antennas via coaxial cable longer than 3 m – conducted emission on antenna port according to CISPR 32.

**Measuring radiated disturbance to 6 GHz for Group 1 equipment will be according to the highest clock frequency  $F_x$  used in the EUT:**

- 1 GHz if  $F_x \leq 108$  MHz.
- 2 GHz if  $108 \text{ MHz} < F_x \leq 500$  MHz.
- 5 GHz if  $500 \text{ MHz} < F_x \leq 1$  GHz.
- $\{5 \times F_x$  up to 6 GHz if  $F_x > 1$  GHz or 6 GHz if  $F_x$  is unknown.

Use FSOATS (free-space-open-area test site) according to CISPR 16-1-4 FAR or SAC/OATS with RF absorbers on the RGP and measurement method according to CISPR 16-2-3. Peak and Average limits for Classes A and B; the same as in generic standards IEC 61000-6-3/6-4.

Group 1 equipment includes Laboratory equipment, Medical electrical equipment Scientific equipment, Semiconductor converters, Industrial electroheating equipment with operating frequencies less than or equal to 9 kHz, Machine tools, Industrial process measurement and control equipment and Semiconductor manufacturing equipment.

**Adds ISM Robots:**

Conducted and radiated emissions. Limits as for Group 1 equipment.

Fixed robots operation modes:

- Mode 1: Static (waiting for task).
- Mode 2: Use rated load and speed at maximum pose and trajectory.
- Mode 3 (Optional): Self-defining mode (special performance).

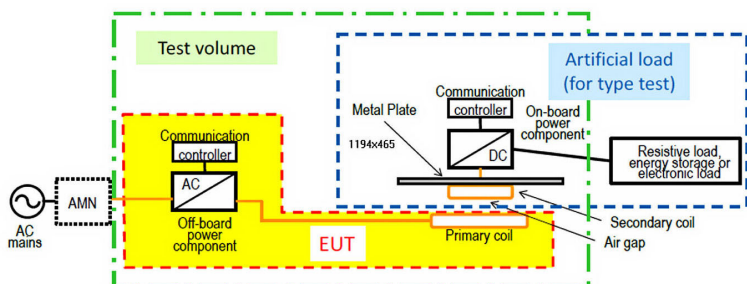
Mobile robots shall be tested in charging mode and operating modes 2 and 3 with driving system moving freely (may need a dynamometer).

**Adds requirements for testing Wireless Power Transfer (WPT)**

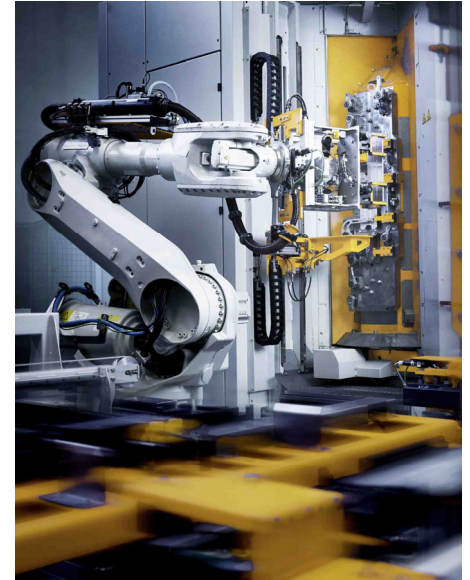
Equipment such as off-board charging equipment for electric vehicles and industrial equipment with operation frequency <150 kHz. Comprises:

- Magnetic field measurements from 9 kHz–30 MHz with 60 cm loop antenna (such as R&S®HFH2-Z2E) in three orthogonal directions (X,Y,Z), centred at a height of 1.3 m. Measurement distance 10 m.
- Electric field measurements from 150 kHz–30 MHz with a 1 m Rod Antenna (such as R&S®HFH2-Z6E), if the cable between the off-board power component and primary coil is less than 3 m in length.

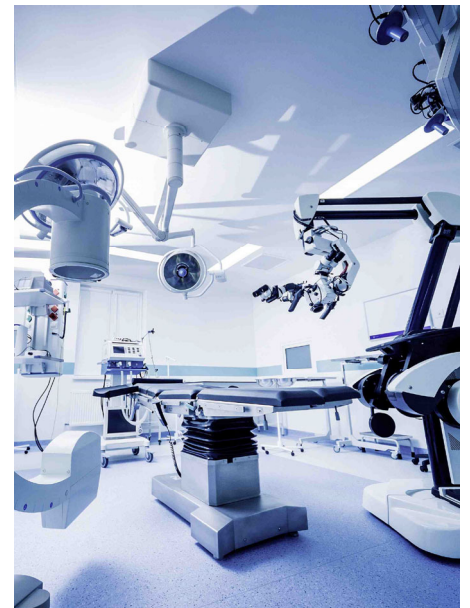
WPT equipment covered by other CISPR standards will be excluded from CISPR 11, e.g. wireless tooth brushes are covered by CISPR 14-1.



**AC Conceptual diagram of test setup of WPT power source supply and charging equipment for electric vehicles. Source: CISPR/B/737/CDV**



**ISM Robots shall be added to CISPR 11, and require both conducted and radiated emission measurements.**



**Medical radio enabled equipment is also included.**

**CISPR 12**

**Automotive equipment - protection of off-board receivers - disturbance measurements**

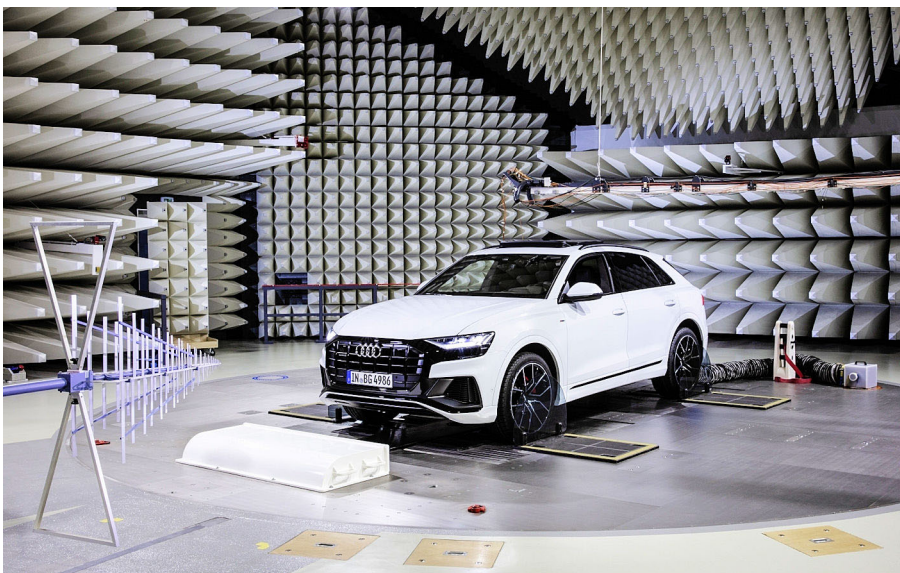
Product committee CISPR/D: Electromagnetic disturbances related to electric/electronic equipment on vehicles and internal combustion engine powered devices.

**What's New in the 6th Edition? (May 2007)**

- This sixth edition cancels and replaces the fifth edition published in 2001 and its Amendment 1 (2005).
- It has deleted the determination of narrowband/broadband disturbances. Instead measurements are now performed with both an average detector and a peak or quasi-peak detector. **Both the CISPR-AV detectors with meter time constant, and the linear AV detector are applicable.**
- CISPR 12 was published in Europe as EN 55012:2007, and ratified by the European Commission on 1 September 2007. The date of withdrawal of the 5th edition was set to 1 September 2010, this means the **6th edition became mandatory on 1 September 2010 in the European Economic Area.** It has legal status only for devices equipped with internal combustion engines, e.g. chainsaws, water pumps, snow blowers, air compressors, etc.

**Amendment 1 to 6th Edition of CISPR 12 (January 2009)**

- Industrial floor cleaning machines (battery and internal combustion powered) covered by IEC 60335-2-72 are added to the scope of CISPR 12 by this amendment. The flowchart in Annex G for checking the applicability has been adopted accordingly. Radio disturbance measurement for such machines are required for the first time.
- In addition, the amendment includes an explicit exclusion for floor cleaning machines used in residences, and other household appliances as such equipment is covered by CISPR 14-1.
- The amendment was published in Europe as Amendment 1:2009 to EN 55012:2007, and was ratified by the European Commission on 1 July 2009. The date of withdrawal was set to 1 July 2012, this means the amendment became mandatory on 1 July 2012 in the European Economic Area. Again, it has legal status only for devices equipped with internal combustion engines, e.g. chainsaws, water pumps, snow blowers, air compressors, etc.



**A vehicle being tested to CISPR 12, for interference to objects outside the vehicle.**

**What's Coming in Edition 7?**

- The references to the basic standard series CISPR 16 will be updated to make the **fast FFT-based time-domain scan of EMI receivers such as the R&S@ESW, ESU or ESR** applicable for EMI compliance measurements.
- For the limits given in CISPR 12, the appropriate average detector is the **CISPR-AV detector** with meter time constant. The alternative pure linear AV detector will be deleted.
- The antenna position for emission measurements on vehicles and other devices will be aligned. Proposed is to define the centre position of the EUT as the reference point if the 3 dB beam of the antenna covers the entire EUT; otherwise multiple antenna positions are necessary.
- Measurements in engine running mode of electric and hybrid vehicles: Constant speed 40 km/h  $\pm$  20%, or top speed if under 40 km/h, without load, on a dynamometer. But speed and load may have significant influence on the emission result.
- **Additional measurements are made in charging mode**, if the charger is a part of the vehicle;
  - Conducted emission of on-board chargers is part of IEC 61851-21-1,
  - Radiated emission (CISPR 12) from 30 MHz to 1000 MHz.
  - The engine and all other equipment shall be switched off.
- Artificial mains networks for measurements in charging mode:
  - AC power mains lines (no communication); **50 $\mu$ H//50 $\Omega$  AMN (eg: R&S@ENV216, ENV432 or ENV4200).**
  - DC power mains lines (no communication). Use a 5 $\mu$ H//50 $\Omega$  DC-charging AN.
  - Symmetric communication lines (eg CAN) use an **asymmetric artificial network (AAN) according to CISPR 16-1-2 (eg: R&S@ENY family)**, between the vehicle and charging station, or any associated equipment.
  - Communication on power lines with AMN/DC-charging-AN and decoupling unit. Use an AAN between PLC modem and power mains if the AMN/AN blocks communication.
  - Communication on control pilot line with special decoupling unit. Use an AAN between Pilot/PLC modem and vehicle. (AAN is to ensure correct communication, not used for the measurements.)
- New normative Annex F will be added on the **consideration of measurement instrumentation uncertainty (MIU)**, uncertainty budget (sample calculation) is given in informative Annex G.
- **Edition 7 failed at the final voting stage. A revised Draft is expected in 2021, Publication expected in 2022.**

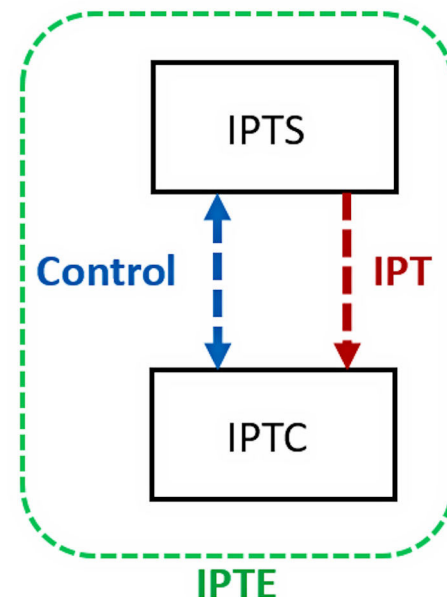
## CISPR 14-1 Household appliances and electric tools - disturbance measurements

Product committee CISPR/F: Interference relating to household appliances, tools, lighting equipment and similar apparatus

### What's New in the 7th Edition? (September 2020)

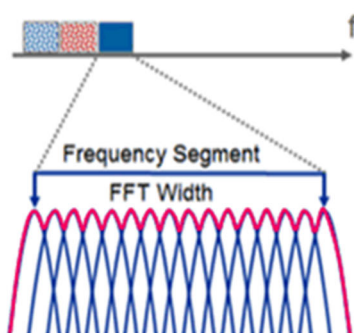
This seventh edition of CISPR 14-1 cancels and replaces the sixth edition published in 2016. The publication of EN 55014-1:2021 (seventh Edition) was ratified by the European Commission on 12 October 2020. The date of withdrawal of the fifth Edition was set as 12 October 2023; this means **the seventh Edition becomes mandatory on 12 October 2023 in the European Economic Area.**

- Extending the maximum frequency to 6 GHz for radiated disturbance measurements.** However, this extension will be conditional. The highest clock frequency  $F_x$  used in the EUT is the criterium for selecting the maximum measurement frequency:
  - 1 GHz if  $F_x \leq 108$  MHz
  - 2 GHz if  $108 \text{ MHz} < F_x \leq 500$  MHz
  - 5 GHz if  $500 \text{ MHz} < F_x \leq 1$  GHz
  - $5 \times F_x$  up to 6 GHz if  $F_x > 1$  GHz or 6 GHz if  $F_x$  is unknown
- Use a fully anechoic room (FAR) or SAC/OATS with RF absorbers on the RGP in accordance with CISPR 16-1-4 and measurement method according to CISPR 16-2-3 for field measurements above 1 GHz. In addition, FAR according to IEC 61000-4-22 is applicable. The highest clock frequency shall be stated in the test report.
- Adds inductive power transfer equipment (IPT)** and apparatus other than induction cooking appliances, e.g. for heating and charging.
  - Inductive power transfer source (IPTS):** Device that transfers electric energy to an IPTC through IPT, e.g. induction powering equipment and cooking appliances.
  - Inductive power transfer client (IPTC):** device which receives electric energy through IPT, e.g. vessel on induction cooking appliances.
  - Inductive power transfer equipment (IPTE):** Combination of a specific IPTS and specific IPTC(s), e.g. shaver or tooth brush provided with a dedicated charging cradle.
- Clarification on click measurements:**
  - FFT-based click analyzers** such as the R&S@ESW or ESR are applicable,
  - Use of 4-channel versus 1-channel-analyser,
  - The click rate shall be calculated for each of the four frequencies separately,
  - The upper quartile method shall be applied at each of the four frequencies individually.

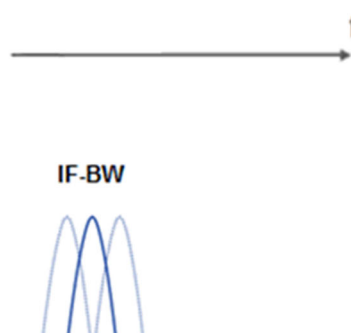


Inductive power transfer equipment components.

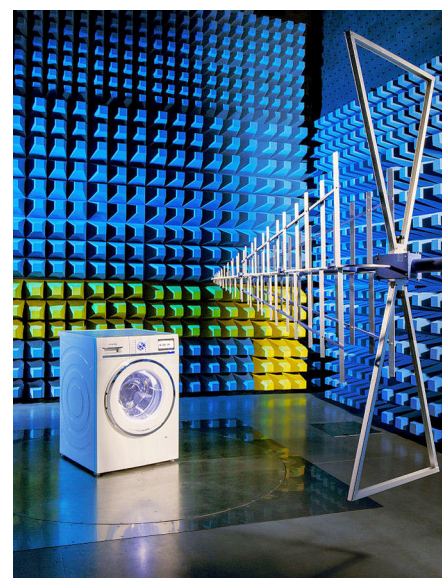
#### FFT-based Measurement



#### Classic Scan



FFT-based receivers make measurements several thousand times faster than a conventional stepped frequency scan. For this purpose, FFT-based receivers are measuring spectral segments much wider than the resolution bandwidth during the measurement time by parallel calculation at several frequencies.



Washing away EMC; testing for compliance to CISPR 14-1.

**CISPR 15**

**Lighting equipment - disturbance measurements**

Product committee CISPR/F: Interference relating to household appliances, tools, lighting equipment and similar apparatus

**What's New in Edition 9? (May 2018)**

This ninth edition of CISPR 15 cancels and replaces the eighth edition published in 2013 and its Amendment 1 published in 2015. The European Commission ratified the publication of EN 55015:2019 on 19 June 2018. The date of withdrawal of the fifth Edition was set as 30 August 2022; this means the ninth Edition becomes **mandatory on 30 August 2022 in the European Economic Area.**

Full editorial revision and restructuring. That includes introduction of:

- Three basic ports (wired network, local wired and enclosure),
- Term 'module' instead of independent auxiliary,
- More technology-independent approach (number of applications has been reduced significantly).
- **Maximum frequency extended to 1 GHz for radiated disturbance measurements.** Use SAC/OATS or fully anechoic room (FAR) in accordance with CISPR 16-1-4 and measurement method according to CISPR 16-2-3. TEM waveguide in accordance with IEC 61000-4-20 is usable for battery-operated equipment without cables. As an alternative use the conducted CDNE method.
- The CDNE method is restricted in use, only applicable if:
  - **All clock frequencies of the EUT are below or equal to 30 MHz,** statement in test report required!,
  - EUT size less than 3 m x 1 m x 1 m (L x W x H) without wiring.
- The CDNE (Coupling Decoupling Network Emission) has replaced the formerly used CDN (in IEC 61000-4-6) as the latter one is unsuited to radio frequency disturbance measurements from 30 MHz to 300 MHz. **The CDNE comes with an enhanced specification,** e.g. CDNE-M2 or CDNE-M3 with reduced common mode (CM) impedance tolerance and additional parameters for CM phase tolerance and differential mode impedance equal to 100 Ω. A minimum 20 dB for longitudinal conversion loss shall prevent symmetrical voltage influencing measurement results.
- The CDNE limits between 200 MHz and 300 MHz are more stringent than the limits given in CISPR 15 Ed.8 (2013). That incorporates an increasing margin of up to 10 dB at 300 MHz.
- In OATS or SAC **use CDNE for termination of the mains cable** to improve the reproducibility of radiated disturbance measurements.
- Deletion of the insertion-loss requirements and the associated Annex A.
- New conducted disturbance measurement method for GU10 self-ballasted lamp.
- Addition of current probe measurement method and limits for various types of ports (in addition to voltage limits and measurement method).
- For large EUT (> 1,6 m), addition of the magnetic field measurement method using a 60 cm loop antenna **like R&S®HFH2-Z2E** at 3 m distance (method from CISPR 14-1) as alternative to 3 m and 4 m LLAS.



**R&S®HM020** with a loop diameter of 2 m. Such LLAS can be used for EUT with a largest dimension of up to 1.6 m.



**CISPR 15 applies to all lighting equipment such as luminaires, LEDs, self-ballasted lamps, ELV-lamps and modules used for general purpose lighting.**

**What's Coming in Amendment 1 to Edition 9?**

**Radiated disturbance measurements up to 6 GHz.** This extension will be conditional with the highest clock frequency  $F_c$  used in the EUT as criteria:

- 1 GHz if  $F_c \leq 108$  MHz
- 2 GHz if  $108 \text{ MHz} < F_c \leq 500$  MHz
- 5 GHz if  $500 \text{ MHz} < F_c \leq 1$  GHz
- 5 x  $F_c$  up to 6 GHz if  $F_c > 1$  GHz or 6 GHz if  $F_c$  is unknown

**Use FSOATS (free-space-open-area test site)** according to CISPR 16-1-4, e.g. FAR or SAC/OATS with RF absorbers on the RGP and measurement method acc. to CISPR 16-2-3. Peak and Average limits are the same as in generic standard IEC 61000-6-3 for residential environments.

Voltage probe method will be limited to power supply interface of ELV lamps (deletes clause 8.5.2.2).

For wired network interface use AAN method acc. to CISPR 16-2-1 with an extended cable length of 1 m.

Test set-up for the conical metal housing for single capped lamps will be rotated.

**CISPR 25****Automotive equipment - protection of on-board receivers - disturbance measurements**

Product committee CISPR/D: Electromagnetic disturbances related to electric/electronic equipment on vehicles and internal combustion engine powered devices

**What's New in the 4th Edition? (October 2016)**

- This fourth edition cancels and replaces the third edition published in 2008.
- References to the basic standard series CISPR 16 were updated so that the **fast FFT-based time-domain scan of EMI receivers such as the R&S®ESW, ESU, and ESR apply to EMI compliance measurements.**
- The appropriate average detector for measurements above 1 GHz is the **CISPR -AV detector with meter time constant.** Below 1 GHz the pure linear AV detector as alternative was deleted.
- Using the minimum dwell time as defined in Table 2 with a measuring receiver can result in enormous measurement result errors. **Therefore, the minimum dwell time in Table 2 shall be longer than the pulse repetition interval of the disturbance signal.**
- Dielectric material is no longer used between the cable harness and table in the measurement setup for alternators and generators (Fig. 8).
- Requirements for ignoring correction factors for the Artificial Network (AN) such as the R&S®ESH3-Z6 were deleted; applying correction factors for the AN and estimating the associated uncertainty is well known and used in test laboratories. The FM band limits affected have not be revised.
- **New measurements are added for the charging mode of electric and hybrid vehicles, if the charger is part of the vehicle;**
  - Vehicle test by measuring voltage at the internal antenna with impedance matching unit such as **R&S®EZ-12.**
  - The engine and all other equipment shall be switched off.
- Artificial mains networks for measurements in charging mode;
  - AC power mains lines (no communication). Use a 50µH//50 Ω AMN (eg; R&S ENV 216, 432, or 4200).
  - DC power mains lines (no communication). Use a 5µH//50 Ω AN (eg; ESH3-Z6).
  - Symmetric communication lines through **asymmetric artificial network (AAN) according to CISPR 16-1-2** (eg; R&S ENY family) between vehicle and charging station or any associated equipment.
  - Communication on power lines with **AMN/AN and decoupling unit.** Use **AAN** between PLC modem and power mains if the AMN/AN blocks communication
  - Communication on control pilot line with a special decoupling unit. Use AAN between Pilot/PLC modem and vehicle (AAN is to ensure correct communication, **not used for measurements**).
- Test requirements for shielded power supply systems for **high voltages in electric and hybrid vehicles were added;**
  - Conducted disturbance voltage and current measurements. Voltage measurement needs specific 5µH//50 Ohm high voltage artificial network (HV-AN), i.e. adaption for the connection of shielded cables and additional resistor for discharging to <50 V within 60 seconds.
  - Radiated disturbance measurement for components – ALSE method (150 kHz to 2500 MHz).
  - Coupling between high voltage (HV) and low voltage (LV) system by direct S-parameter measurements (coupling attenuation) or based on existing CISPR 25 test set-up (with measurement of voltage, current and electric field).
- A new informative annex on chamber validation was added. It contains two alternative validation methods ("long wire" and "reference site method") to provide flexibility.
- **Edition 4 of CISPR 25 was published on 27 October 2016. In early 2017 corrigendum COR1 was added.**
- CISPR 25:2016 was published in Europe on national level only, e.g. as BS EN 55025:2017 in Great Britain or DIN EN 55025:2018 in Germany. The national standards have been incorporated the corrigendum. **EN 55025 is not listed in the Official Journal of the EU and has no legal status.** Therefore, the car component manufacturer has to apply the specific company standards of

**What's Coming in Edition 5?**

- **Maximum frequency will be extended beyond 2500 MHz for both component (ALSE method) and vehicle (voltage at internal antenna) testing. This will add new frequency bands up to 6 GHz:**
  - 4G: 2496 to 2690 MHz, 3300 to 3800 MHz and 5150 to 5925 MHz,
  - WiFi: 5150 to 5350 MHz and 5470 to 5725 MHz,
  - C2X (Car-to-X Communication): 5850 to 5925 MHz.
- Adds new GNSS band: 1553 to 1569 MHz to cover BDS (BeiDou Navigation Satellite System, China).
- Revision of measurement methods in charging mode of electric and hybrid vehicles based on charging mode concept as defined in IEC-1 (Mode 1 to 4).
- Deletion of Annex F on TEM cell method.
- New Annexes will be added on the consideration of measurement instrumentation uncertainty (MIU), also uncertainty budget (sample calculation) is given.



CISPR 25 covers interference caused by the vehicle to equipment mounted within the vehicle, such as a radio or GPS receiver.

## CISPR 32 Multimedia equipment - disturbance measurements

Product committee CISPR/I: Electromagnetic compatibility of information technology equipment, multimedia equipment and receivers

### What's in CISPR 32 Edition 2.0? (March 2015)

#### CISPR 13

Sound and television broadcast receivers - Radio disturbance characteristics

#### CISPR 22

Information technology equipment - Radio disturbance characteristics

#### EN 55103-1

Audio, video and entertainment lighting control apparatus for professional use- Part 1 - Emissions



#### CISPR 32

Multimedia equipment - Radio disturbance characteristics

The new product family standard for multimedia equipment CISPR 32 has replaced existing CISPR 13, CISPR 22 and EN 55103. The 2<sup>nd</sup> Edition was published on 31 March 2015. Published in Europe as EN 55032:2015, and was ratified by the European Commission on 5 May 2015. The date of withdrawal was set to 5 May 2018; **this means the standard became mandatory on 5 May 2018 in the European Economic Area (EEA).**

- For the limits given in CISPR 32 the appropriate average detector is the linear average detector with meter time constant as defined in CISPR 16-1-1; **CISPR-Average Detector**.
- Outdoor units of home satellite receivers are added to the scope (from CISPR 13).
- **Fully anechoic room (FAR)** in accordance with CISPR 16-1-4 and measurement method according to CISPR 16-2-3 for measurements under 1GHz were added.
- Emission-test arrangement for measurements < 1GHz for EUTs with different ways of mounting (floor standing, table-top, wall mounted, handheld) was revised to be measured as table-top even if intended for standing use.
- No need to measure differential voltage emission at each reception channel of broadcast receivers. Use channels that produced highest emission during preview scan.
- **TEM waveguide** in accordance with IEC 61000-4-20 for battery-operated equipment without cables was added (informative Annex).
- **RVC (reverberation chamber)** in accordance with IEC 61000-4-21 for radiated disturbance measurements >1 GHz was added (informative Annex).



Conducted EMI test in accordance with CISPR 32 for a computer monitor.

### What's Coming in Edition 3?

- **Requirements for testing MME with Wireless Power Transfer (WPT)** ports.
- **Termination of cables** leaving the test area for radiated disturbance measurements in semi-anechoic chambers (SAC, VHF-LISN on single phase mains cable (solution for FAR, DC, three-phase and other cables still open).
- **In-situ measurement methods and requirements.**
- **Specify wanted signal level for TV Tuner Port (Revision of C4.2.1 and Table B.3).**
- **APD measurement function > 1 GHz**, applied when peak value exceeds the peak limit.
- **Revision of measurement method above 1 GHz in FAR, may not require antenna height scan for small table-top EUT.**
- **Satellite Receivers** - Conducted emission requirements 30 MHz to 950 MHz.
- **Further work items:** Alignment of scope with CISPR 35, Radio enabled Products, Warm-up time, RVC and Radiated Emission 6-40 GHz.

### What's New in Amendment 1 to Edition 2?

- **Amendment 1 to the 2<sup>nd</sup> Edition was published on 1 October 2019.** The corresponding EN standard has not been published and the date of withdrawal has not been assigned yet. The amendment received a negative assessment by the HAS consultant, **therefore it can be considered as non-harmonized EN standard and will not be listed in the OJEU**
- **Full implementation of Measurement instrumentation uncertainty (MIU)** as specified in CISPR 16-4-2.
- **Wired network port**, measure only launched common mode if wanted signal power is below the power spectral density (PSD) limit as alternative to AAN with appropriate LCL
- **Clarification on color bar test pattern** referenced in Clause B.2.2 of CISPR 32; in addition to ITU-R BT.1729, new informative Annex J describes color bar image for exercising displays, both 100/0/100/0 and 100/0/75/0 leveling will apply.
- **Measurement method and limits > 1 GHz**, will require a continuous antenna height scan from 1 to 4 m, tilting of the receive antenna is not required; the limits were relaxed by 4 dB in the frequency range 1-3 GHz (same as FCC Part 15 now).
- **Antenna calibration in line with CISPR 16-1-6**, for easy transition use methods which emulate those of ANSI C63.5, e.g. Standard Site Method (SSM).



**CISPR 36**

**Automotive equipment - protection of off-board receivers - Radiated disturbance measurements below 30 MHz**

Product committee CISPR/D: Electromagnetic disturbances related to electric/electronic equipment on vehicles and internal combustion engine powered devices

**What's New in CISPR 36 ? (July 2020)**

The limits and methods of measurement are designed for the protection of off-board receivers such as AM receivers in the frequency range of 150 kHz to 30 MHz when used in the residential environment. However, it may not provide adequate protection if the receivers are used less than 10 meters from the vehicle.

- **Applicable to electric and hybrid electric road vehicles** propelled by an internal traction battery. Measuring conducted electromagnetic disturbances while the vehicle is connected to power mains for charging is not covered in this standard.
- Adds Quasi-peak limits for radiated disturbance measurements (magnetic field) in frequency range 150 kHz to 30 MHz.
- Measurements are performed with 60 cm **Loop Antenna such as R&S®HFH2-Z2E** in Transverse (Y) and Radial (X) direction at four positions (see figure), center of loop is positioned at fixed height of 1,30 m. The measurement distance is 3 m taken from the center of the loop antenna to the nearest part of the vehicle body.
- **Measurements in electric propulsion motor running mode** of electric and hybrid electric vehicles: Constant speed 40 km/h  $\pm$  20%, or the top speed if less than 40 km/h, without load, on a dynamometer.
- New normative Annex A was added on the **consideration of measurement instrumentation uncertainty (MIU)**, uncertainty budget (sample calculation) is given in informative Annex B.
- **There is general support to add requirements for operation in charging mode (plug-in and WPT)**, but this will be considered as future work to amend Edition 1 or to be added in other standards, e.g. CISPR 11 for WPT.
- Site validation requirements and correlation between Outdoor Test Site (OTS) and absorber lined shielded enclosure (ALSE) measurements are still under consideration. The OTS is similar to an open area test site as specified in CISPR 16-1-4, however a metallic ground plane is not required.

**Need More Information?**

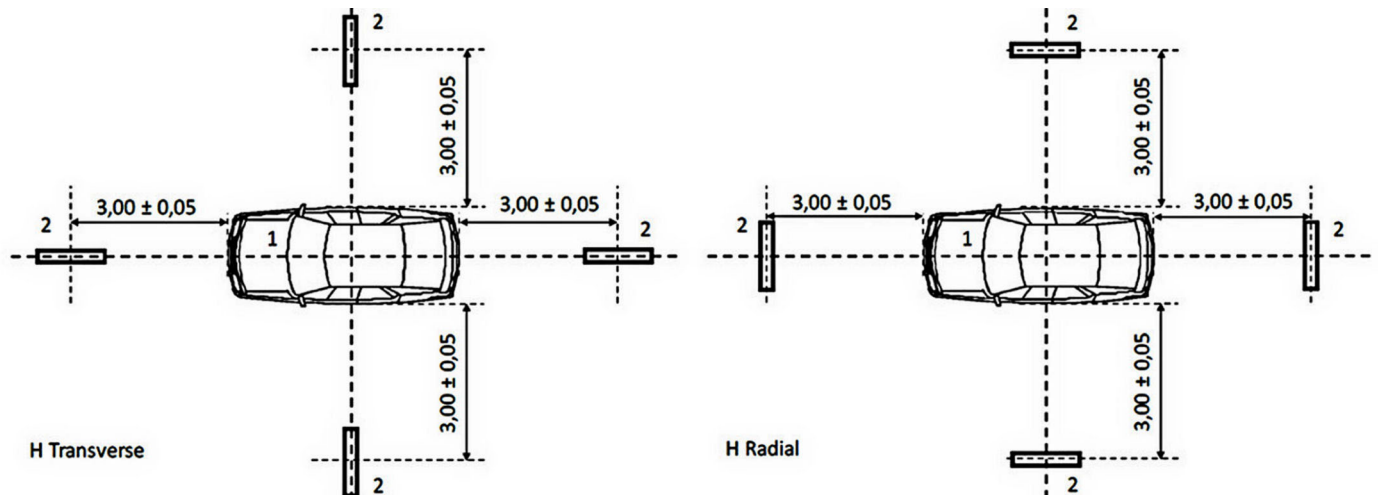
If you have any questions about measuring to any of the standards covered in this document, do not hesitate to contact the author at Rohde & Schwarz:  
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Copies of all the standards are available from the International Electrotechnical Commission webstore:

<http://webstore.iec.ch/>



**Social distancing; for CISPR 36 to protect off board receivers maintain a distance of at least 10 meters.**



Magnetic field measurement in transverse and radial loop orientation at four positions. (Source: CISPR/D/462/CDV)