

EMC Regulatory Update

Dear Colleague,

We have provided typical questions and answers that represent in most cases technical opinions with justification in FCC and CE requirements. The particulars of the product for certification must be considered with respect to the applicability of these questions and answers. We hope you find our update valuable and welcome your feedback if you have any special needs or questions. Call at 703-689-0368 or view archived issues of MultiPoint at our [web site](#).

FCC 47 CFR Section 27 Measurements

QUESTION: We are making measurements on a device that falls under 47 CFR Section 27. What are the procedures for measuring the emissions limit in 47 CFR Sections 27.53 of the FCC's rules for devices operating under Part 27 in the frequency bands 746-764 MHz and 776- 794 MHz?

1. 47 CFR 27.53(b)(3) states that emissions on all frequencies between 764 to 776 MHz and 794 to 806 MHz shall be attenuated below the transmitter power by a factor not less than $76 + 10 \log(P)$ dB in a 6.25 kHz segment. Does this mean that all emissions shall be measured in 6.25 kHz segments and compared to the total transmitted power in a licensee's frequency band? Therefore, if a licensee occupies a 5 MHz band and transmits a wide-band signal with equal power across the band, then relative to a 6.25 kHz segment in-band (on a per Hz basis), the emissions must be attenuated by $76 + 10 \log(P) - 10 \log(5 \text{ MHz}/6.25 \text{ kHz}) = 47 + 10 \log(P)$ dB?
2. 47 CFR 27.53(b)(5), states that measurement instrumentation for measuring emissions outside the licensee's band should employ resolution of 100 kHz or greater, except 30 kHz should be employed within the nearest 100 kHz. Suppose that emissions are being measured in 100 kHz or 30 kHz segments and are being compared to the total power inside the licensee's band. Is it correct that for the above example of a 5 MHz wide signal on a per Hz basis the required attenuation is $43 + 10 \log(P) - 10 \log(5 \text{ MHz}/100 \text{ kHz}) = 26 + 10 \log(P)$ dB?

ANSWER:

1. Yes, the term P as used in the attenuation formula $76 + 10 \log(P)$ is the total power of the transmitter. The net effect of the above-cited formula is that the levels (in dB) of the undesired emissions relative to the level of the desired emissions are less than the dB figure given in the above-cited formula. On a spectrum analyzer, the levels of the desired emissions for a modulated signal with uniform spectral distribution appear in proportion to the ratio of the occupied bandwidth of the modulated spectrum to the spectrum analyzer resolution bandwidth (RBW) used. Several factors will affect the reading - including the measurement RBW used, the actual shape of the modulated signal and the modulation method used. The actual specification remains as written: $76 + 10 \log(P)$ for emissions in a 6.25 kHz band segment.
2. The response in the first question also applies to the second question. Compliance with the emissions limit at the frequency block edges are a function of the placement of the desired emission with respect to the frequency block edge. The FCC's Grant of Certification will list the highest and lowest operating (center) frequency that will enable compliance with the emissions limit at the frequency block edges. All readings of emissions are to be adjusted by the ratio of the specified measurement band (width) or segment to the actual resolution bandwidth used.

Operation of Transmitters During Alarm Conditions

QUESTION: We have a question regarding CFR 47 Section 15.231(a)(4) that states the following:

Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

Can you explain if ANY alarm condition on this type of transmitter may operate beyond 5 seconds per this paragraph? We manufacture a gas detector and we would like to set the following alarm conditions that will cause transmission:

1. Detection of gas
2. Tampering of the alarm
3. Sensor malfunction
4. Sensor end-of-life

Can all of these conditions operate under CFR 47 Section 15.231(a)(4)?

ANSWER: The transmitter, when activated to signal an alarm, may operate during the pendency of the alarm condition only when the gas detector detects gas. The other three cases (tamper of the alarm, sensor malfunctioning, sensor end-of-life) would fall under Section 15.231(a)(3). Polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

Modification of FCC Approved Modular Device

QUESTION: We manufacture a modular device and it was previously approved under the FCC's modular approval device policy several years ago. We have redesigned the module to remove the voltage regulator and placed it on motherboard of the host. The FCC allowed the approval with the constraint that the Limited Modular Approval (LMA) had to be controlled such that it was incorporated only into the applicant's own products to ensure that the design was controlled. Does the FCC require that we test the module in each particular host and limit the LMA to each host tested or can we test the module stand-alone or on an extender board and have it approved for several hosts? What is the FCC's position today?

ANSWER: The FCC's position is that stand-alone testing is still applicable if the level of responsibility is maintained by the Grantee and the Grantee can control future designs and ensure the voltage in this instance was maintained at the required regulated value. Approval is limited to installation only within the grantee's device that also provides proper regulated VDC to the module to guarantee stable power supply. If the Grantee will not maintain control of the module installations, then they will be required to test each module in the specific host and limit the LMA to each host tested.

UWB Questions and Answers

QUESTION: We have the following questions regarding Ultra Wide Band (UWB) devices:

1. What constitutes the bandwidth of a UWB emission?
2. How is the UWB emission bandwidth determined?
3. What portion of the UWB emission spectrum is required to be within the authorized frequency bands? Is it adequate for just the center frequency to be within the authorized band?
4. Can a device be certified under the UWB rules if its emission bandwidth resides outside of the authorized frequency bands when all of its emissions are below the prescribed limits?
5. What other subtleties should be considered when determining the bandwidth of a UWB device emission spectrum?
6. How are the emissions limits to be applied in determining compliance of a UWB device?
7. Is any specialized test equipment necessary for performing UWB compliance measurements?
8. What compliance information should be included with the application for certification?
9. What type of measurement antenna should be used for performing radiated emissions measurements on UWB devices when assessing compliance to the UWB rules?
10. Is there a provision for operating wireless tank level gauges under the UWB rules?

ANSWER:

1. The points on the emission spectrum define the bandwidth of a UWB emission where the amplitude is 10 dB below the maximum emission amplitude (i.e., the -10 dB points). In cases where the measured emission spectrum contains multiple (more than two) -10 dB points, the outermost points define the bandwidth (i.e., the widest bandwidth is assumed).
2. The bandwidth of a UWB emission must be determined from a radiated measurement with the device using the antenna with which it is designed to operate (i.e., the antenna frequency characteristics may define the radiated bandwidth of a UWB device and is thus considered an integral part of the system). It is recommended that this measurement be performed using the spectrum analyzer peak detector with a resolution bandwidth of 1 MHz or greater and the maximum-hold function. The device under test should be measured for maximum bandwidth by varying the antenna height between 1 to 4 meters, varying antenna polarization between horizontal and vertical and rotating the device 360 degrees several times.
3. For a UWB emission spectrum, the entire fundamental bandwidth (that portion of the spectrum between the outermost -10 dB points) must be contained within the authorized frequency band. For example, the emissions spectrum from a ground penetrating radar (GPR) applying for authorization under CFR47 Section 15.509 must have its fundamental bandwidth located below 960 MHz.
4. It is presumed that this question refers to a scenario whereby the frequencies associated with the maximum emission and the -10 dB points are located within a frequency band that is outside of those bands authorized for UWB operation (e.g., 960-3100 MHz), but are less than the applicable emissions limit. Under these conditions, the requirement that the -10 dB bandwidth be fully contained within the authorized frequency bands is not realized and thus the device cannot be authorized.
5. When measuring the bandwidth of a UWB device using a radiated test set-up, it is imperative that appropriate adjustments be made to the measured amplitude levels to account for the frequency-dependent components of the measurement system (e.g., antenna gain or factor, pre-amplifier gain, cable loss, etc). Since UWB emissions can have bandwidths several GHz wide, these frequency-dependent characteristics can vary dramatically over the fundamental emission.
6. In each rule section pertaining to specific UWB applications, a table is included listing the emission limit applicable in each frequency band. The device under test must comply with all applicable limits accounting for all specified frequency bands. For example, an application for authorization of a device under CFR47 Section 15.509 (low frequency imaging device) must demonstrate compliance not only to the emission limits provided for the 960-1610 MHz band, but also to those limits specified for both the 1610-1990 MHz and the above 1990 MHz band.

7. A spectrum analyzer with a quasi-peak detector is required for measuring UWB emissions below 960 MHz to verify compliance with the emissions limits in that portion of the spectrum. An analyzer with a true RMS detector is recommended, but not required, for measuring UWB emissions above 960 MHz. An alternative is provided in procedure (3) contained in Appendix F of the UWB First Report and Order (ET Docket No.98-153) for performing the emissions measurements with an analyzer that does not include an RMS detector. In addition, a low-noise preamplifier is required to measure emissions to the levels necessary to determine compliance with the limits specified in the frequency band 960 to 1610 MHz for some UWB applications (e.g., indoor UWB devices authorized under Section 15.517). If the radiated measurements are not conducted in an anechoic chamber, then the use of this pre-amplifier may also require that a pre-select filter be inserted ahead of the pre-amplifier to prevent saturation from strong ambient RF signals.
8. At a minimum, the following information is required for processing a UWB application for certification:
 - a) The UWB application category (e.g., imaging device, indoor system, handheld device, etc.) and the applicable rule section - The lower and upper -10 dB frequencies (fL and fH, respectively) and the frequency of the maximum observed emission level (fM).
 - b) A description of the procedure used to determine the UWB bandwidth.
 - c) The maximum radiated emissions (including narrowband emissions) and the associated frequencies observed in each frequency band identified in the applicable emission limits tables.
 - d) In the event that no emissions are observed in the above frequency bands, report the measurement system's minimum sensitivity (noise floor) in these bands (i.e., show that the measurement system was capable of detecting emissions down to the level dictated by the applicable emissions limit).
 - e) A complete description of the measurement system including antenna, pre- amplifier, etc. should be provided. This should include information such as antenna gain/factor, preamplifier noise figure and gain, particularly at each frequency for which a data point is provided (peak emission frequency, -10 dB points, etc.).
 - f) Calibration information for the measurement system at each frequency for which a data point is reported.
 - g) If applicable, report all digital circuitry emissions exceeding the applicable UWB limits and provide a complete description of the process used to justify invoking the exception stated in Section 15.521(c).
 - h) A description of the technique used to determine RMS average emission levels.
 - i) Provide a description of the test site used, specifying whether the measurements were performed in a test chamber, outdoor test site, with or without a ground screen, and any other pertinent information.
 - j) Where applicable, indicate the presence of required labels and/or a manual disable switch.
 - k) Describe the pulse characteristics (PRF, pulse width, etc.). Is the pulse pseudo random (dithered) or periodic? Provide an oscilloscope plot for clarity.
 - l) Supporting photographs depicting the measurement system set-up and the device under test must be provided.
9. Two measurement antennas will likely be necessary for performing these tests. A log- periodic antenna is recommended for performing the necessary radiated measurements below 960 MHz, although other types of measurement antennas (e.g., biconical) can be used. For the radiated measurements above 960 MHz, a broadband horn antenna or a broadband log periodic antenna may be used. When using a horn antenna to measure emissions from a device that is not placed on a turntable (e.g., a ground penetrating radar placed near the ground to replicate actual operating conditions), the antenna should be pointed in the direction of the radiating head. This is consistent with ANSI C63.4 Section 8.3.1.2, which states that the antenna must point to the direction of radiating head to be kept within the cone of radiation and pointed at the area of the device under test.
10. CFR47 Section 15.517(a)(4) authorizes the use of tank level gauges as indoor UWB devices only if they are used within metal or underground storage tanks, and the emissions are directed downward.

INTERNATIONAL UPDATE

EU: NEW CENELEC STANDARDS RELEASED THIS MONTH

This is a shortened list of the CENELEC standards published during the past month:

- **EN 55015:2006 / A1:2007** (5/16/2007) Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
- **EN 60061-1:1993 / A39:2007** (5/15/2007) Lamp caps and holders together with gauges for the control of interchangeability and safety -- Part 1: Lamp caps
- **CLC/TR 50507:2007** (5/9/2007) Railway applications - Interference limits of existing track circuits used on European railways
- **EN 61000-4-34:2007** (5/4/2007) Electromagnetic compatibility (EMC) -- Part 4-34: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current more than 16 A per phase
- **EN 62272-2:2007** (4/26/2007) Digital radio mondiale (DRM) -- Part 2: Digital radio in the bands below 30 MHz - Methods of measurement for DRM transmitters
- **EN 60730-1:2000 / A16:2007** (4/20/2007) Automatic electrical controls for household and similar use -- Part 1: General requirements

See www.cenelec.org for additional information.

EU: NEW IEC STANDARDS RECENTLY RELEASED

This is a shortened list of the new IEC standards published during the past month:

- **IEC 62353** (May 15, 2007) Medical electrical equipment - Recurrent test and test after repair of medical electrical equipment
- **IEC 60364-7-709** (May 10, 2007) Low-voltage electrical installations - Part 7-709: Requirements for special installations or locations - Marinas and similar locations
- **CISPR 16-SER** (April 27, 2007) Specification for radio disturbance and immunity measuring apparatus and methods - ALL PARTS
- **IEC 60335-2-27** (April 27, 2007) Household and similar electrical appliances - Safety - Part 2-27: Particular requirements for appliances for skin exposure to ultraviolet and infrared radiation
- **IEC 60364-7-721** (April 27, 2007) Low-voltage electrical installations - Part 7-721: Requirements for special installations or locations - Electrical installations in caravans and motor caravans
- **IEC 61988-4** (April 26, 2007) Plasma display panels - Part 4: Climatic and mechanical testing methods

See [IEC](http://www.iec.ch) for additional information.

EU: NEW ETSI STANDARDS RELEASED THIS MONTH

This is a shortened list of the new ETSI standards published during the past month:

- [ETSI TS 101 842 V1.1.1](#) (May 2007) Electromagnetic compatibility and Radio spectrum Matters (ERM); VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment; VDL4 ground-based constituent requirement traceability with the SES 552/2004 interoperability Regulation
- [ETSI TS 102 587-5 V1.1.1](#) (April 2007) Electromagnetic compatibility and Radio spectrum Matters (ERM); Interoperability testing for the Peer-to-Peer Digital Private Mobile Radio; Part 5: Interoperability Test Suite Structure and Test Purposes (TSS&TP) specification
- [ETSI TS 102 587-3 V1.1.1](#) (April 2007) Electromagnetic compatibility and Radio spectrum Matters (ERM); Peer-to-Peer Digital Private Mobile Radio; Part 3: Requirements catalogue
- [ETSI TS 102 587-2 V1.1.1](#) (April 2007) Electromagnetic compatibility and Radio spectrum Matters (ERM); Conformance testing for the Peer-to-Peer Digital Private Mobile Radio; Part 2: Test Suite Structure and Test Purposes (TSS & TP) specification
- [ETSI TS 102 587-1 V1.1.1](#) (April 2007) Electromagnetic compatibility and Radio spectrum Matters (ERM); Conformance testing for the Peer-to-Peer Digital Private Mobile Radio; Part 1: Protocol Implementation Conformance Statement (PICS) proforma
- [ETSI TS 102 490 V1.3.1](#) (April 2007) Electromagnetic compatibility and Radio spectrum Matters (ERM); Peer-to-Peer Digital Private Mobile Radio using FDMA with a channel spacing of 6,25 kHz with e.r.p. of up to 500 mW

See [ETSI](http://www.etsi.org) for additional information.

CANADA: AMENDMENT TO CS-03 PART VIII, ISSUE 9

On April 21, 2007, Industry Canada released Amendment 3 to Issue 9 of Compliance Specification 03, Part VIII. The amendment introduces the following change: Addition of technical requirements for VDSL2 equipment intended for connection at the user end. [Link](#)

US: FCC ADDRESSES 700 MHz BAND REGULATIONS

On April 25, 2007, the FCC adopted a Report and Order and Further Notice of Proposed Rulemaking that addresses rules governing wireless licenses in the 698-806 MHz spectrum band, commonly referred to as the "700 MHz Band." This spectrum is currently occupied by television broadcasters during the digital television (DTV) transition and will be made fully available for wireless services, including public safety and commercial services, when the DTV transition is completed on February 17, 2009. [Link](#)

US: FCC MODIFIES MODULAR TRANSMITTER RULES

On April 17, 2007, the FCC adopted Part 15 rules that allow the use of split modular RF devices in equipment without requiring new certification each time the devices are used in different products. The amendment of the rules should provide for more efficient equipment authorization of both existing modular transmitter devices and emerging partitioned (or 'split') modular transmitter devices and also benefit manufacturers by allowing greater flexibility in certifying equipment and providing relief from the need to obtain a new equipment authorization each time the same transmitter is installed in a different final product.

Manufacturers of split modular transmitters must ensure that only control elements and RF front-end components that have been approved together are capable of operating together. The FCC rules require manufacturers to use methods such as coding in hardware and electronic signals to meet these requirements and must be described in the application for equipment authorization. [Link](#)

EU: SINGLE REFERENCE POINT FOR UNIFORM RADIO SPECTRUM INFORMATION

On May 16, 2007, The EU Commission adopted a decision which specifies the format and level of detail of the information that Member States should provide on the use of radio spectrum, as well as other practicalities such as reliability and regular updates. This common approach allows for the setting up a single information point containing comparable data. The European Radiocommunications Office's Frequency Information System (EFIS) was chosen as a good basis for further enhancements to cover the full scope of the Decision. In addition to information on spectrum allocations and applications, which is already provided by EFIS today based on input from a majority of Member States, the Decision requires all Member States also to upload important information relevant for equipment manufacturing (so-called Radio Interface Specifications) and for identifying current licensed spectrum users (so-called Rights of Use).

The Commission Decision was prepared in consultation with the EU Member States' radio spectrum experts and is part of the Commission's drive for a common European radio spectrum policy (see IP/05/1199). It was adopted in accordance with the Radio Spectrum Decision which allows for a coordinated EU approach on technical radio spectrum matters. [Link to press release](#)
[EU's Radio Spectrum Policy Link](#)

ABOUT US

RTL has provided EMC compliance engineering & testing services since 1988 and has a superior reputation with both the Federal Communications Commission and others in the industry. RTL provides testing services to meet the emissions, immunity, and safety requirements of the European EMC Directive and the EU R&TTE Directive, all FCC rules and regulations, VCCI (Japan), ACMA (Australia), and other international standards.

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Last revised: May 17, 2007