TEST REPORT # EMCC-140591ABE, 2015-04-30

This report replaces Test Report # EMCC-140591AB, 2015-03-25

EQUIPMENT UNDER TEST:

Device:	FSC1/7
Serial Number:	021
FCC ID:	2ADM7FSC1-7
Application:	Paint thickness gauge
Manufacturer:	FI Test- und Messtechnik GmbH
Address:	Breitscheidstraße 17 39114 Magdeburg Germany
Phone:	+49 391 503894-35
Fax:	+49 391 503894-39

RELEVANT STANDARD(S): 47 CFR § 15.249

MEASUREMENT PROCEDURE:

☒ ANSI C63.10-2009 ☐ RSS-Gen Issue 3 ☐ Other

TEST REPORT PREPARED BY:

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TEST PERSONNEL:

Patrick Reusch

HEAD OF COMMERCIAL EMC AND RADIO DEPT.:

Wolfgang Döring

CONTENTS

1 GENERAL INFORMATION

1.1 Purpose

The purpose of this report is to show compliance with the 47 CFR § 15.249 requirements for the certification of licence-exempt 15C Intentional Radiator.

1.2 Limits and Reservations

The test results in this report apply only to the particular equipment under test (EUT) as declared in this report. This test report shall not be reproduced except in full without the written permission of EMCCons DR. RAŠEK GmbH & Co. KG.

1.3 Test Location

Test Laboratory:	EMCCons DR. RAŠEK GmbH & Co. KG
Accreditation No.:	D-PL-12067-01-00
Address of Labs I, II, III and Head Office:	EMCCons DR. RAŠEK GmbH & Co. KG Moggast, Boelwiese 8 91320 Ebermannstadt GERMANY
Address of Labs IV and V:	EMCCons DR. RAŠEK GmbH & Co. KG Stoernhofer Berg 15 91364 Unterleinleiter GERMANY
Laboratory:	Test Laboratory IV The 3 m & 10 m semi-anechoic chamber site has been fully described in a report submitted to the FCC and accepted in the letter dated December 24, 2013, Registration Number 878769.
Phone:	+49 9194 9016
Fax:	+49 9194 8125
E-Mail:	emc.cons@emcc.de
Web:	www.emcc.de

1.4 Manufacturer

Company Name:	FI Test- und Messtechnik GmbH
Street:	Breitscheidstraße 17
City:	39114 Magdeburg
Country:	Germany
Name for contact purposes:	Mr Maik Richter
Phone:	+49 391 503894-35
Fax:	+49 391 503894-39
E-Mail:	maik.richter@fitm.de

1.5 Dates and Test Location

Date of receipt of EUT: 2015-03-16
Test Date: CW 12/2015
Test Location: Lab IV

1.6 Ordering Information

Purchase Order and Date: E-Mail, dated 2015-02-06
Vendor Number: none

1.7 Climatic Conditions

Date	Temperature [°C]	Relative Humidity [%]	Air Pressure [hPa]	Lab	Customer attended tests
2015-03-16	22	29	981	IV	yes
2015-03-17	23	31	983	IV	yes
2015-03-18	23	29	982	IV	yes
2015-03-19	23	29	983	IV	yes

Note: Mr Maik Richter as a representative of FI Test- und Messtechnik GmbH attended the tests.

2 PRODUCT DESCRIPTION

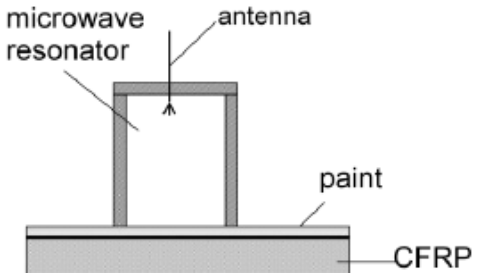
2.1 Equipment Under Test (EUT)

Trade Name:	FSC1/7
Serial Number:	021
FCC ID:	2ADM7FSC1-7
Application:	Paint thickness gauge
Transmit Frequency:	24.005 – 24.245 GHz
Modulation:	No Modulation, Sweep of CW-Signals
Power Supply:	5 VDC from USB-Connector
Ports:	USB-Connector
Antenna:	internal
Variants:	None
Remarks:	None

The following information was delivered by the customer:

The system consists of a hand-held module and a control and display module (e.g. Laptop or similar device).

The hand-held module includes the microwave components. It is intended for measuring a resonant frequency which is determined by a dielectric layer on a base substrate. The main part of the measure system, the resonator, and its application is shown in the picture below.



A cylindrical resonant cavity having a circular cylindrical wall and a plane wall on one end thereof, wherein the opposite end is open to be placed up on the dielectric layer on the substrate to form a wall of the resonant cavity on the opposite end.

- *An antenna located within said resonant cavity and adapted to excite an electromagnetic field in the resonant cavity.*

- *A reflection meter connected to said antenna and adapted to measure the resonant frequency of the resonant cavity. In this case, the reflection meter is a FMCW Transceiver. The FMCW Transceiver is driven, that only frequencies in the range from 24.005 to 24.245 GHz are adjustable.*

- *The Output-Power from the FMCW Transceiver is 10mW.*

- *A processor connected to said reflection meter and adapted to determine the resonant frequency of the resonant cavity.*

The FMCW Transceiver is on constantly whilst power is supplied.

2.2 Intended Use

The following information was delivered by the customer:

The FSC1/7 is suitable to measure the paint thickness (dielectric layer) on CFRP with and without lightning protection as well as on metal.

2.3 EUT Peripherals/Simulators

The EUT was tested being connected via USB to a notebook type Acer Aspire E15, series E5-571-32FU, model Z5WAH, S/N NXML8EG005422196VF3400.

Photo 2.3-1: Customer's notebook to operate EUT

Photo 2.3-2: Label of the notebook

2.4 Mode of operation during testing and test set-up

The equipment under test (EUT) was operated during the tests under the following conditions:

Sweep mode:
the frequency was swept continuously sawtooth-shaped from the lowest to the highest settable frequency. This mode was applicable for measurements up to 18 GHz and replaced by mode Fmid for measurements above 18 GHz.

Fixed CW frequency:
- Fmin = the transmitting frequency was set to the lowest settable frequency (24.005 GHz)
- Fmax = the transmitting frequency was set to the highest settable frequency (24.245 GHz)
- Fmid = the transmitting frequency was set in the center of the operating band (24.125 GHz). This mode was used to replace the sweep-mode for measurements above 18 GHz.

2.5 Modifications required for compliance

None.

3 TEST RESULTS SUMMARY

Summary of test results for the following EUT:

Manufacturer: FI Test- und Messtechnik GmbH
Device: FSC1/7
Serial No: 021

Requirement	47 CFR Section	Report Section	Result
Conducted AC Power Line Emissions 150 kHz – 30 MHz	15.207	4	Passed
Radiated Emissions 9 kHz – 30 MHz	15.209, 15.249	5	Passed
Radiated Emissions 30 MHz – 1000 MHz	15.209, 15.249	6	Passed
Radiated Emissions 1 GHz – 100 GHz	15.209, 15.249	7	Passed

N.A. – not applicable; N.T. – Not tested acc. to applicant's order.

The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units and meet the requirements of the specifications referenced herein.
Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.
The measurements contained in this report were made in accordance with the procedures described in ANSI C63.10-2009. All requirements were found to be within the limits outlined in this report.
The test results in this report apply only to the particular equipment under test (EUT) as declared in this report.

Test Personnel: Patrick Reusch
Issuance Date: 2015-04-30

4 POWER LINE CONDUCTED EMISSIONS TEST

Test Requirement: FCC 47 CFR, § 15.207
Test Procedure: ANSI C63.10-2009

4.1 Regulation

FCC § 15.207

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission [MHz]	**Conducted limit [dBµV]**	
	Quasi-peak	**Average**
0.15-0.5	66 to 56*	56 to 46*
0.5–5	56	46
0.5-30	60	50

*Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:
(1) For carrier current system containing their fundamental emission within the frequency band 535–1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.
(2) For all other carrier current systems: 1000 µV within the frequency band 535–1705 kHz, as measured using a 50 µH/50 ohms LISN.
(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in § 15.205, § 15.209, § 15.221, § 15.223, or § 15.227, as appropriate.
(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

4.2 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
EMI Test Receiver	R&S / ESU8	3846	2014-07	2015-07
V-LISN 50 Ω//(50 uH + 5 Ω)	R&S / ESH2-Z5	1901	2013-10	2015-10
Protector Limiter	R&S / ESH3-Z2	1519	2014-09	2015-09
AC Power Source	AEG / DAMK4/DAGK4	0001	n.a	n.a
Multimeter	Agilent / U1241B	3880	2014-04	2016-04

4.3 Test Procedures

The EUT was placed on a wooden table of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting wall of the screened room was located 40 cm to the rear of the EUT.
The excess length of the power cord of the ac adapter to the EUT was folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
LISN housing, measuring instrument case, reference ground plane and the vertical conducting wall of the screened room was bonded together.

4.4 Test Result

Mode: Fmin

Line: N			
Freq. [MHz]	Detector	Result [dBµV]	Margin [dB]
0.165	CISPR QP	48.2	17.0
0.170	CISPR AV	34.0	21.0
0.175	CISPR QP	47.5	17.2
0.175	CISPR AV	34.5	20.2
0.235	CISPR AV	29.5	22.8
0.340	CISPR QP	37.4	21.8
0.425	CISPR QP	40.7	16.7
0.425	CISPR AV	30.9	16.4
0.435	CISPR QP	38.3	18.9
0.435	CISPR AV	26.5	20.7
0.665	CISPR QP	34.0	22.0
0.965	CISPR AV	22.8	23.2

Line: L			
Freq. [MHz]	Detector	Result [dBµV]	Margin [dB]
0.160	CISPR QP	47.2	18.2
0.170	CISPR AV	32.6	22.3
0.175	CISPR QP	46.5	18.2
0.180	CISPR AV	32.7	21.8
0.215	CISPR QP	39.6	23.4
0.345	CISPR QP	36.4	22.7
0.360	CISPR AV	24.9	23.8
0.395	CISPR QP	36.8	21.1
0.425	CISPR AV	28.1	19.3
0.435	CISPR QP	35.4	21.7
0.435	CISPR AV	24.1	23.1
3.030	CISPR AV	21.3	24.7

Mode: Sweep

Line: N			
Freq. [MHz]	Detector	Result [dBµV]	Margin [dB]
0.165	CISPR QP	48.8	16.4
0.170	CISPR AV	34.5	20.4
0.175	CISPR QP	48.3	16.4
0.175	CISPR AV	35.2	19.5
0.220	CISPR QP	40.8	22.1
0.230	CISPR QP	41.2	21.3
0.230	CISPR AV	29.6	22.8
0.420	CISPR QP	40.7	16.7
0.430	CISPR AV	30.0	17.2
0.435	CISPR QP	38.5	18.6
0.435	CISPR AV	26.5	20.6
0.965	CISPR AV	22.8	23.2

Line: L			
Freq. [MHz]	Detector	Result [dBµV]	Margin [dB]
0.150	CISPR AV	35.2	20.8
0.155	CISPR QP	45.2	20.5
0.180	CISPR QP	42.0	22.5
0.180	CISPR AV	29.5	25.0
0.225	CISPR QP	37.3	25.4
0.350	CISPR AV	27.4	21.6
0.370	CISPR QP	37.0	21.5
0.390	CISPR QP	37.8	20.3
0.395	CISPR AV	29.7	18.3
0.490	CISPR AV	23.0	23.2
0.495	CISPR QP	31.3	24.8
0.495	CISPR AV	22.7	23.4

Mode: Fmax

Line: N			
Freq. [MHz]	Detector	Result [dBµV]	Margin [dB]
0.170	CISPR QP	47.3	17.7
0.170	CISPR AV	33.5	21.5
0.175	CISPR QP	46.9	17.8
0.175	CISPR AV	33.9	20.8
0.240	CISPR AV	28.9	23.2
0.330	CISPR QP	37.4	22.1
0.340	CISPR QP	37.6	21.6
0.425	CISPR AV	31.3	16.0
0.430	CISPR QP	40.4	16.8
0.435	CISPR QP	38.2	18.9
0.435	CISPR AV	26.3	20.8
0.970	CISPR AV	22.6	23.4

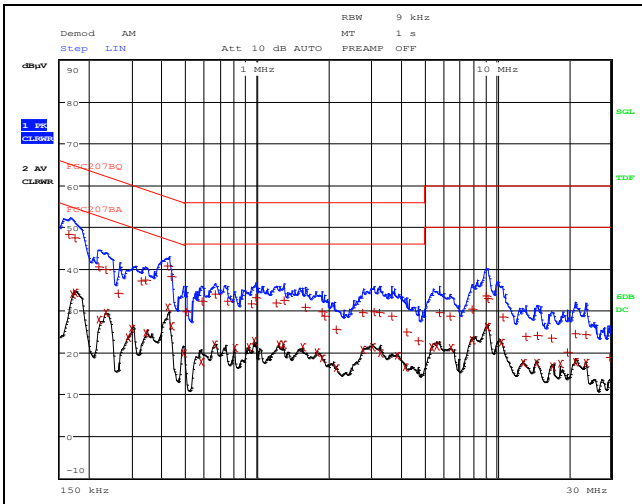
Line: L			
Freq. [MHz]	Detector	Result [dBµV]	Margin [dB]
0.160	CISPR QP	46.9	18.6
0.170	CISPR AV	32.5	22.5
0.180	CISPR AV	32.7	21.8
0.185	CISPR QP	44.0	20.2
0.330	CISPR QP	35.7	23.7
0.345	CISPR QP	36.5	22.6
0.360	CISPR AV	25.0	23.7
0.400	CISPR QP	38.1	19.8
0.420	CISPR AV	27.1	20.3
0.435	CISPR QP	35.4	21.8
0.435	CISPR AV	24.1	23.1
2.995	CISPR AV	21.0	25.0

The tables above contain worst-case emissions, only. For further details refer to the test plots.

Manufacturer: FI Test- und Messtechnik GmbH
Device: FSC1/7
Serial No: 021

The EUT meets the requirements of this section.

4.5 Measurement Plots



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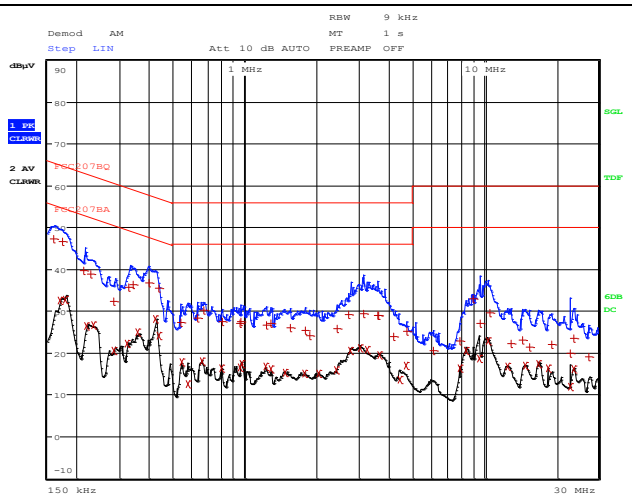
Date: 17.MAR.2015



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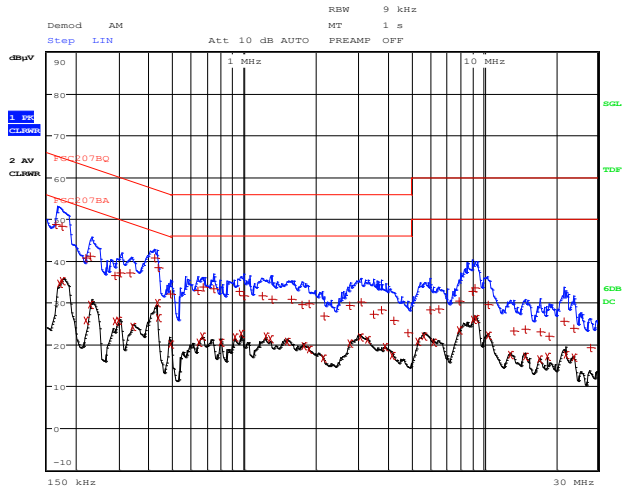

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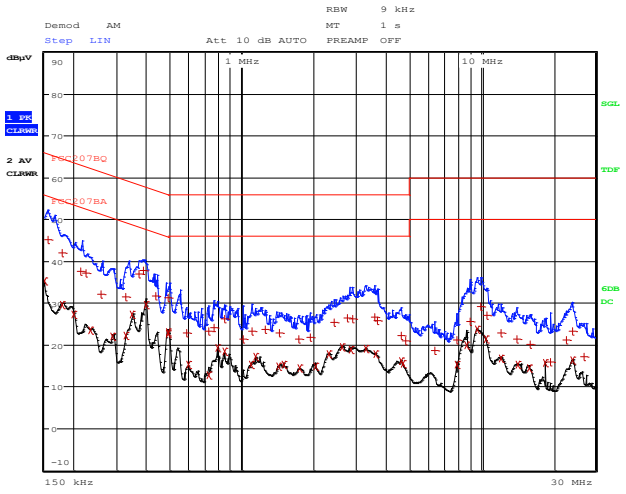
Date: 17.MAR.2015



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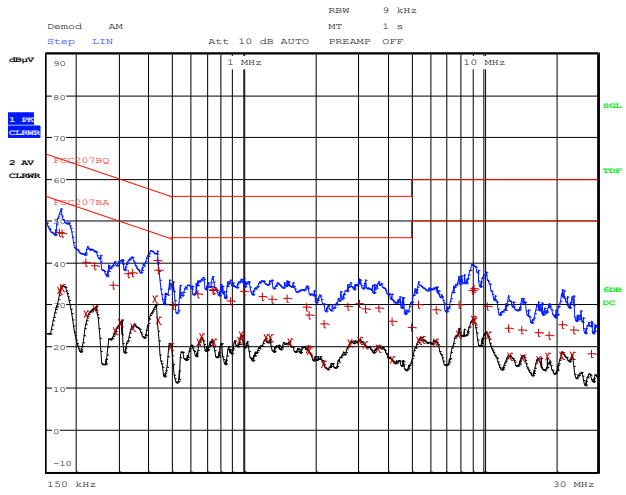
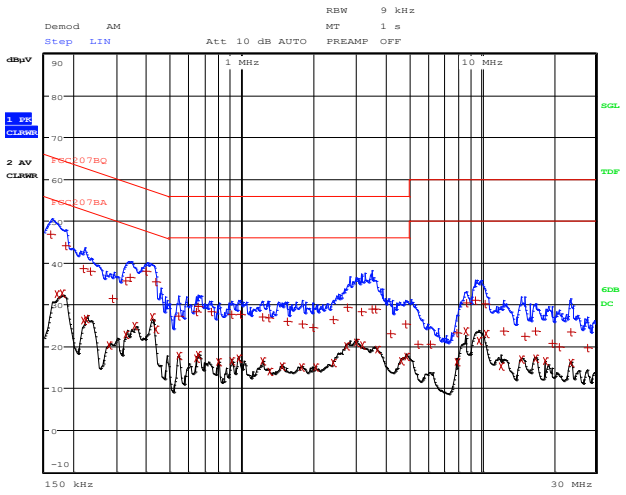
Date: 17.MAR.2015



Mode: Fmax, Line: N
Date: 17.MAR.2015



Mode: Fmax, Line: L
Date: 17.MAR.2015

5 RADIATED EMISSIONS 9 kHz – 30 MHz

Test requirement: FCC 47 CFR, §§ 15.205, 15.209, 15.249
Test procedure: ANSI C63.10-2009

5.1 Regulation

FCC § 15.31
(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle.
1 to 10 MHz	2	1 near top and 1 near bottom.
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom.

FCC § 15.33
(a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:
(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

FCC § 15.35
The conducted and radiated emission limits shown in this Part are based on the following, unless otherwise specified elsewhere in this Part:
(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.
Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

FCC § 15.205

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in § 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35 apply to these measurements.

FCC § 15.209

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency	Field Strength		Measurement distance
[MHz]	[µV/m]	[dB(µV/m)]	[m]
0.009–0.490	2400/F[kHz]	67.6 – 20 logF[kHz]	300
0.490–1.705	24000/F[kHz]	87.6 – 20 logF[kHz]	30
1.705–30.0	30	29.5	30

(b) In the emission table above, the tighter limit applies at the band edges.
(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
(e) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

FCC § 15.249

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

5.2 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
EMI/RFI Test Receiver	R&S / ESS	264	2014-04	2015-04
Loop Antenna	R&S / HFH-Z2	374	2014-06	2016-06
AC Power Source	AEG / DAMK4/DAGK4	0001	n.a	n.a
Multimeter	Agilent / U1241B	3880	2014-04	2016-04

5.3 Test Procedures

Measurement was performed in a semi-anechoic room at a test distance of 3 m. A calibrated loop antenna as specified in ANSI C63.10 was positioned with its plane vertical at the test distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. For certain applications, the loop antenna may also need to be positioned horizontally at the specified distance from the EUT. Instead of changing the loop antenna polarization to horizontal the EUT antenna was rotated by 90 degrees. I.e. tests performed for 2 EUT antenna polarizations. The center of the loop antenna was 1 m above the ground.
The EUT was tested on a 0.8 meter high tabletop.
The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter.
In certain applications, a remotely located device may be connected to the EUT. In these cases, it is permissible for cabling from the remotely located device to the EUT or accessories to be placed directly on the reference ground plane or, if normally installed beneath the reference ground plane, beneath it. The remotely located device shall be located at a distance sufficient to ensure that it does not contribute to the measured level. This procedure evaluates the interference potential of the EUT, its accessories, and interconnecting cables or wires standing apart from the remotely located device, which in turn shall be evaluated separately, if required.
Measurement initially performed as a pre-scan in the full frequency range in order to find worst case emissions. Final measurement performed at worst-case emission frequencies in a FCC semi-anechoic room at the specified 3 m test distance.
Worst case emissions are listed under chapter: Final test results.

Radiated Emissions Test Characteristics	
Frequency range	9 kHz - 30 MHz
Test distance	3 m*
Test instrumentation resolution bandwidth	200 Hz (9 kHz - 150 kHz)
	10 kHz (150 kHz - 30 MHz)
Receive antenna height	1 m
Receive antenna polarization	Vertical

* According to Section 15.31 (f)(2): At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The 40 dB/decade factor was used.

5.4 Calculation of Field Strength Limits

E.g. radiated spurious emissions field strength limits for the band 1.705–30.0 MHz:

µV/m at 30 meters = 30

30 µV/m corresponds with 29.5 dBµV/m.

5.5 Field Strength Calculation

All emission measurements performed using the test receiver's transducer factor setting capability, i.e. the field strength value measured directly without the necessity of additional correction factors.
For test distance other than what is specified, but fulfilling the requirements of Section 15.31 (f)(2) the field strength is calculated by adding additionally an extrapolation factor of 40 dB/decade (inverse linear-distance for field strength measurements). The basic equation with a sample calculation is as follows:

FS = FST + DF
where
FS = Field Strength in dBµV/m
FST = Field Strength at test distance in dBµV/m
DF = Distance Extrapolation Factor in dB,
where DF = 40 log (Dtest/Dspec) where Dtest = Test Distance and Dspec = Specified distance

Assume the tests performed at a reduced Test Distance of 3 m instead of the Specified Distance of 30 m giving a Distance Extrapolation Factor of DF = 40 log (3 m/30 m) = -40 dB.
Assuming a measured field strength level of 58.8 dBµV/m is obtained. The Distance Factor of -40 dB is added, giving a field strength of 18.8 dBµV/m. The 18.8 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

FS = 58.8 - 40 = 18.8 [dBµV/m]
Level in µV/m = Common Antilogarithm (18.8/20) = 8.7

5.6 Final Test Results

Mode: Fmin

Frequency [kHz]	3m Result [dB(µV/m)]	Distance Correction [dB]	300m / 30m Result [dB(µV/m)]	300m / 30m Limit [dB(µV/m)]	Margin [dB]
18.70	49.1	- 80	-30.9	42.2	73.1
68.70	57.2	- 80	-22.8	30.9	53.7
137.40	54.1	- 80	-25.9	24.8	50.7
380.00	42.0	- 80	-38.0	16.0	54.0
715.00	42.8	- 40	2.8	30.5	27.7
1435.00	36.5	- 40	-3.5	24.5	28.0

Mode: Sweep

Frequency [kHz]	3m Result [dB(µV/m)]	Distance Correction [dB]	300m / 30m Result [dB(µV/m)]	300m / 30m Limit [dB(µV/m)]	Margin [dB]
18.7	49.2	-80	-30.8	42.2	73.0
68.7	57	-80	-23.0	30.9	53.9
117	31.2	-80	-48.8	26.2	75.0
590	31.6	-40	-8.4	12.2	20.6
720	41.6	-40	1.6	30.5	28.9
1430	36.6	-40	-3.4	24.5	27.9

Mode: Fmax

Frequency [kHz]	3m Result [dB(µV/m)]	Distance Correction [dB]	300m / 30m Result [dB(µV/m)]	300m / 30m Limit [dB(µV/m)]	Margin [dB]
18.70	48.3	-80	-31.7	42.2	73.9
50.60	34.2	-80	-45.8	33.5	79.3
97.50	30.6	-80	-49.4	27.8	77.2
365.00	41.4	-80	-38.6	16.4	55.0
720.00	41.4	-40	1.4	30.5	29.1
1430.00	35.6	-40	-4.4	24.5	28.9

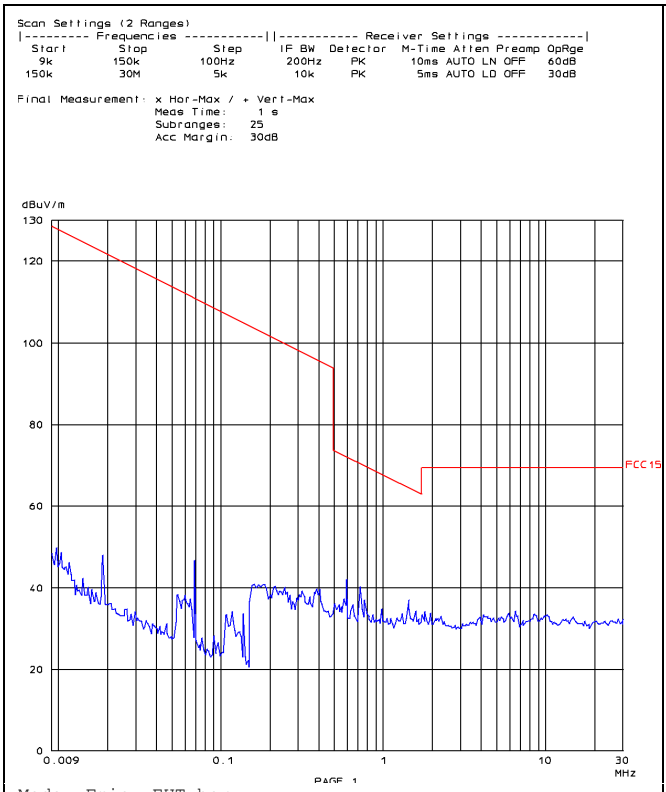
The table above contains worst-case emissions, only. For further details refer to the measurement plot.

Manufacturer: FI Test- und Messtechnik GmbH
Device: FSC1/7
Serial No: 021

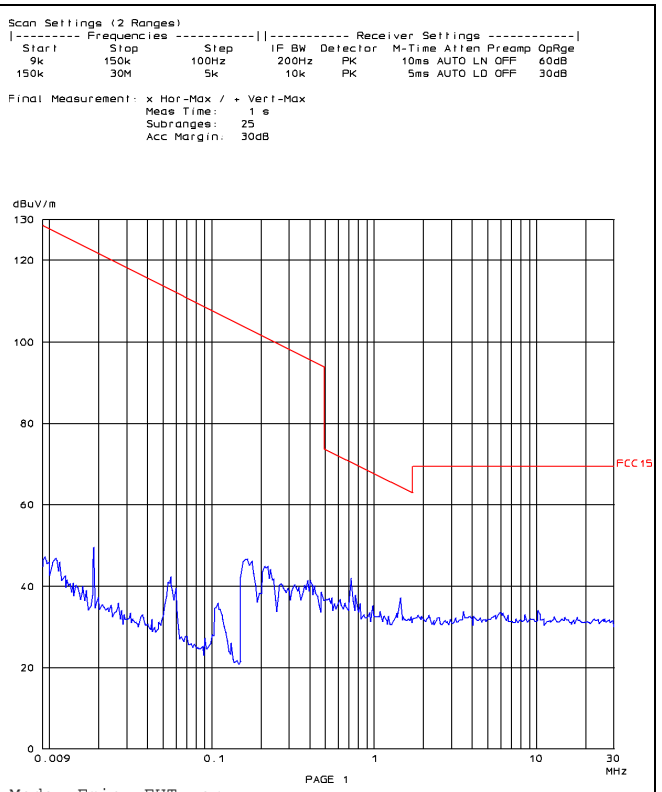
All measured emissions in the range 9 kHz to 30 MHz are below the specified limits.

The EUT meets the requirements of this section.

5.7 Measurement Prescan-Plots



Mode: Fmin, EUT hor
Date: 17.MAR.2015



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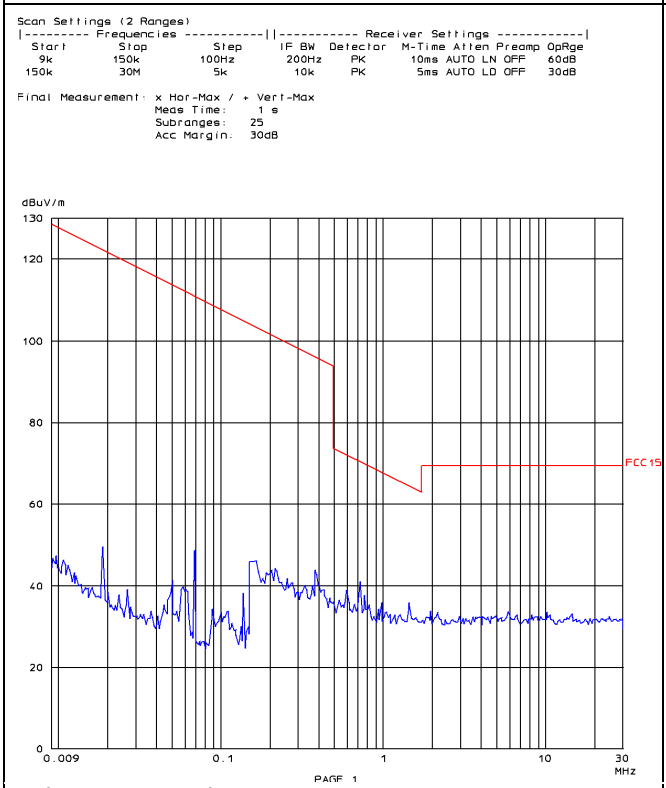
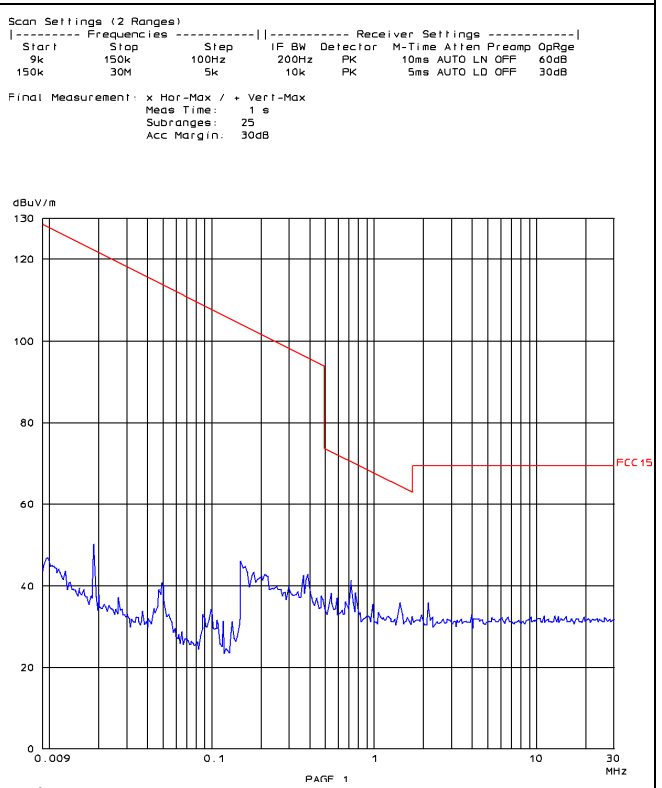
Date: 17.MAR.2015

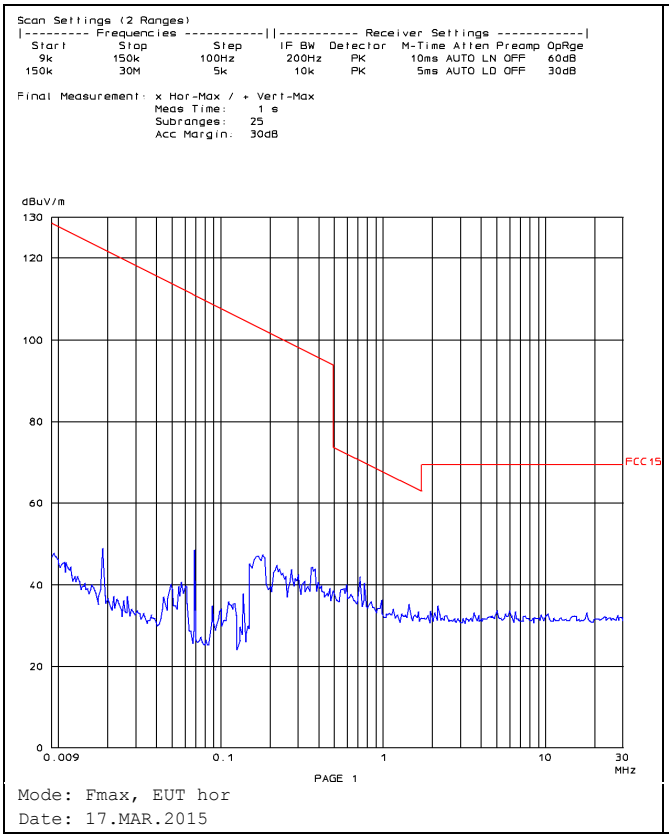


Mode: Sweep, EUT hor
Date: 17.MAR.2015

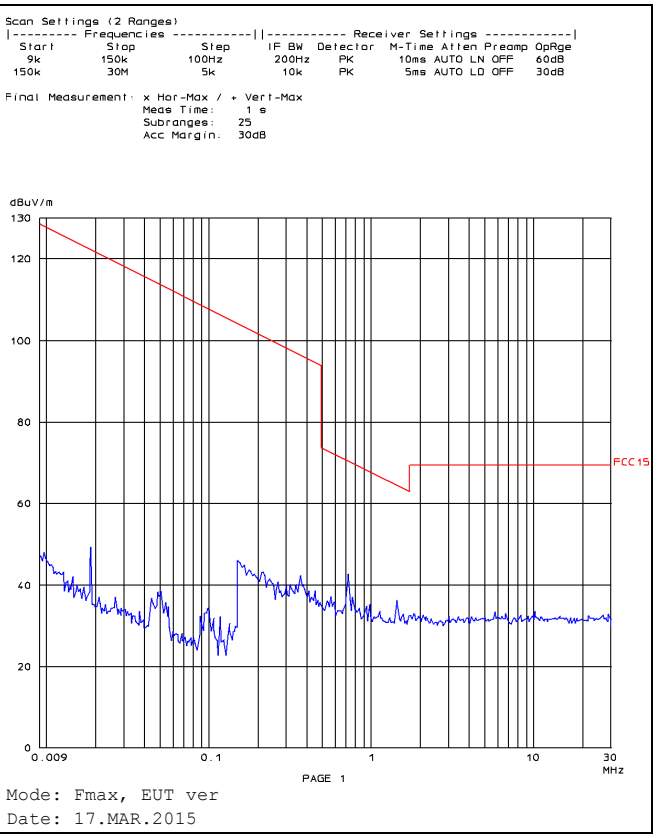


Mode: Sweep, EUT ver
Date: 17.MAR.2015

Test of FI Test- und Messtechnik FSC1/7 to 47 CFR § 15.249



Mode: Fmax, EUT hor
Date: 17.MAR.2015



Mode: Fmax, EUT ver
Date: 17.MAR.2015

6 RADIATED EMISSIONS 30 MHz – 1000 MHz

Test Requirement: FCC 47 CFR, §§ 15.205, 15.209, 15.249
Test Procedure: ANSI C63.10-2009

6.1 Regulation

FCC § 15.31
(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle.
1 to 10 MHz	2	1 near top and 1 near bottom.
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom.

FCC § 15.33
(a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:
(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

FCC § 15.35
The conducted and radiated emission limits shown in this Part are based on the following, unless otherwise specified elsewhere in this Part:
(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.
Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

FCC § 15.205

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in § 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35 apply to these measurements.

FCC § 15.209

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency	Field Strength		Measurement distance
[MHz]	[µV/m]	[dB(µV/m)]	[m]
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(e) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

FCC § 15.249

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

6.2 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
EMI/RFI Test Receiver	R&S / ESS	264	2014-04	2015-04
Biconilog. Antenna	EMCO / 3143	898	2014-02	2016-02
Preamplifier 0.01..1000 MHz	Miteq / AM-1431-N	343	2014-01	2016-01
DC Power Supply	Kniel / n.a.	434	n.a.	n.a.
AC Power Source	AEG / DAMK4/DAGK4	0001	n.a	n.a
Multimeter	Agilent / U1241B	3880	2014-04	2016-04

6.3 Test Procedures

The EUT was tested on a 0.8 meter high tabletop.
In certain applications, a remotely located device may be connected to the EUT. In these cases, it is permissible for cabling from the remotely located device to the EUT or accessories to be placed directly on the reference ground plane or, if normally installed beneath the reference ground plane, beneath it. The remotely located device shall be located at a distance sufficient to ensure that it does not contribute to the measured level. This procedure evaluates the interference potential of the EUT, its accessories, and interconnecting cables or wires standing apart from the remotely located device, which in turn shall be evaluated separately, if required.
With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions. All tests performed with the EUT placed in both vertical and horizontal polarizations on the nonconductive table.

Measurement initially performed as a pre-scan in the full frequency range in order to find worst case emissions. Final measurement performed at worst-case emission frequencies in a FCC listed semi-anechoic room at the specified 3 m test distance.
Worst case emissions are listed under chapter: test results.

Radiated Emissions Test Characteristics	
Frequency range	30 MHz – 1000 MHz
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz
Receive antenna height	1 m - 4 m
Receive antenna polarization	Vertical/Horizontal

6.4 Calculation of Field Strength Limits

E.g. radiated spurious emissions field strength limits for the restricted band 108-121.94 MHz:

µV/m at 3 meters = 150

150 µV/m corresponds with 43.5 dBµV/m.

6.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF
where
FS = Field Strength in dBµV/m
RA = Receiver Amplitude in dBµV
AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB
Assume a receiver reading of 23.5 dBµV is obtained. The Antenna Factor of 7.4 dB(1/m) and a Cable Factor of 1.1 dB are added, giving a field strength of 32 dBµV/m. The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

FS = 23.5 + 7.4 + 1.1 = 32 [dBµV/m]

Level in µV/m = Common Antilogarithm (32/20) = 39.8

6.6 Final Test Results

Mode: Fmin

Frequency [MHz]	Reading [dB(µV)]	Ant. factor [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Polarisation h / v
38.96	12.5	11.2	23.7	40	16.3	v
168.00	12.3	11.4	23.7	43.5	19.8	h
207.76	7.7	13.0	20.7	43.5	22.8	h
264.05	8.7	16.3	25.0	46	21.0	h
480.00	16.2	21.7	37.9	46	8.1	h
96.03	14.9	9.4	24.3	43.5	19.2	h

Mode: Sweep

Frequency [MHz]	Reading [dB(µV)]	Ant. factor [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Polarisation h / v
41.86	11.1	10.3	21.4	40	18.6	v
96.01	14.7	9.4	24.1	43.5	19.4	v
108.04	8.0	9.0	17.0	43.5	26.5	v
168.00	12.5	11.4	23.9	43.5	19.6	h
473.63	7.7	21.5	29.2	46	16.8	v
480.00	16.7	21.7	38.4	46	7.6	h

Mode: Fmax

Frequency [MHz]	Reading [dB(µV)]	Ant. factor [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Polarisation h / v
39.04	14.1	11.2	25.3	40	14.7	v
96.01	15.5	9.4	24.9	43.5	18.6	h
168.00	12.3	11.4	23.7	43.5	19.8	v
211.46	8.4	13.2	21.6	43.5	21.9	h
443.63	12.4	20.5	32.9	46	13.1	h
480.00	17.1	21.7	38.9	46	7.1	h

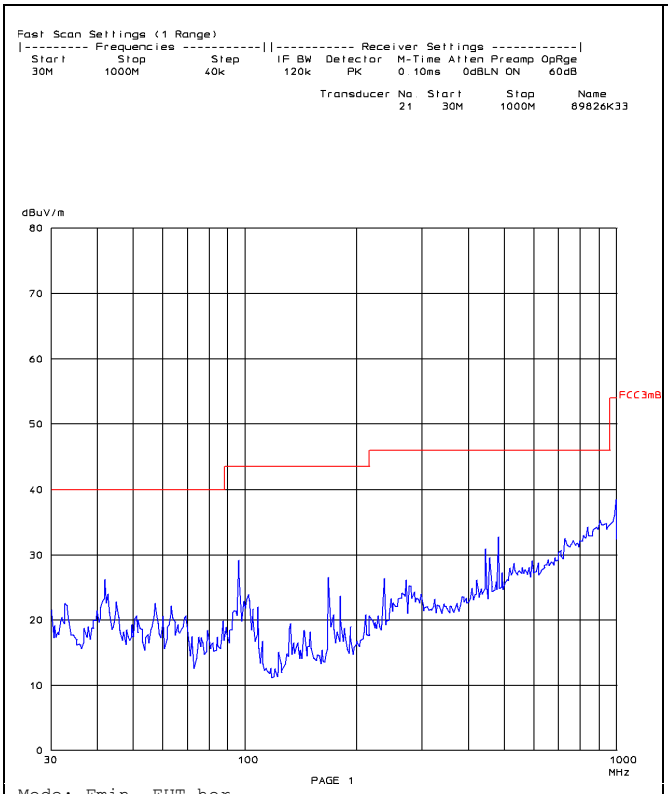
All tests performed at 3 m distance. The table above contains worst-case emissions, only. For further details refer to the pre-scan test plots.

Manufacturer: FI Test- und Messtechnik GmbH
Device: FSC1/7
Serial No: 021

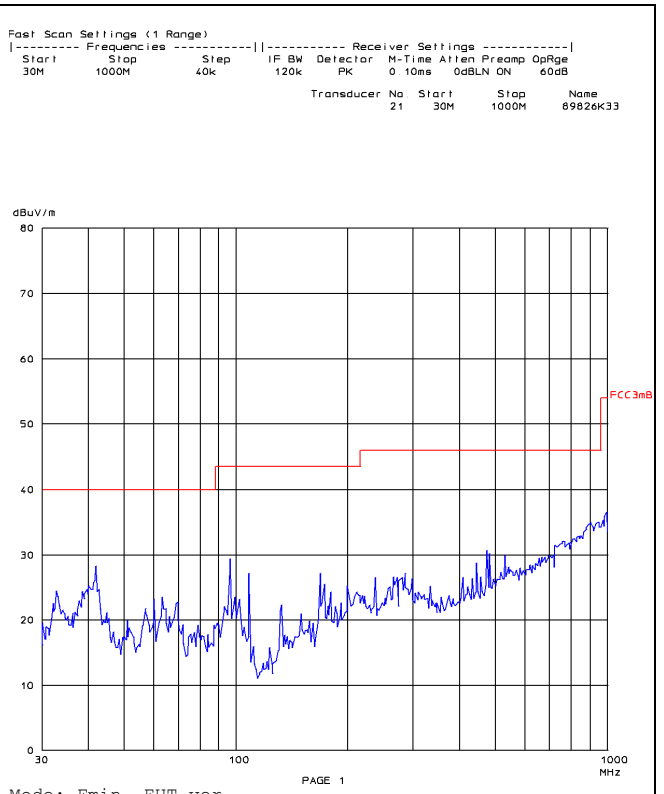
All measured emissions in the range 30 MHz to 1000 MHz are below the specified limits.

The EUT meets the requirements of this section.

6.7 Measurement Prescan-Plots



Mode: Fmin, EUT hor
Date: 16.MAR.2015



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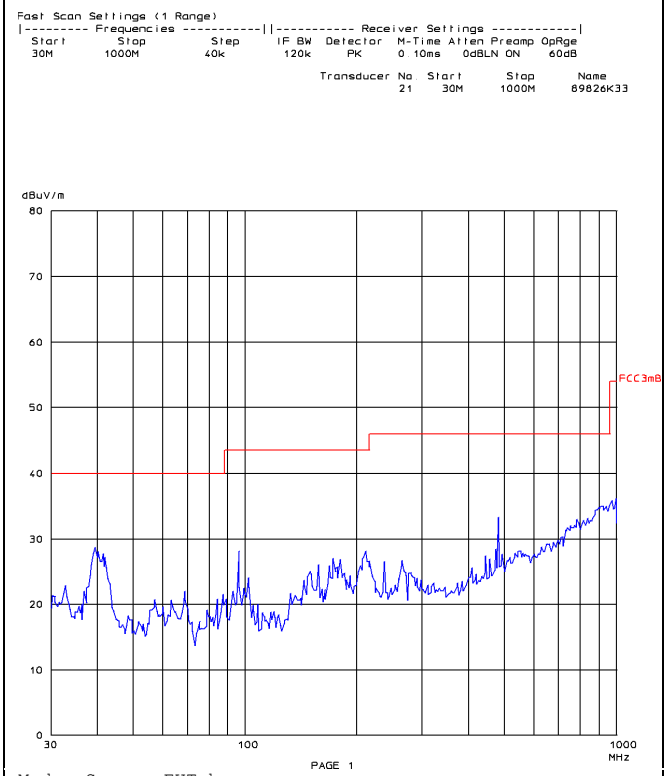
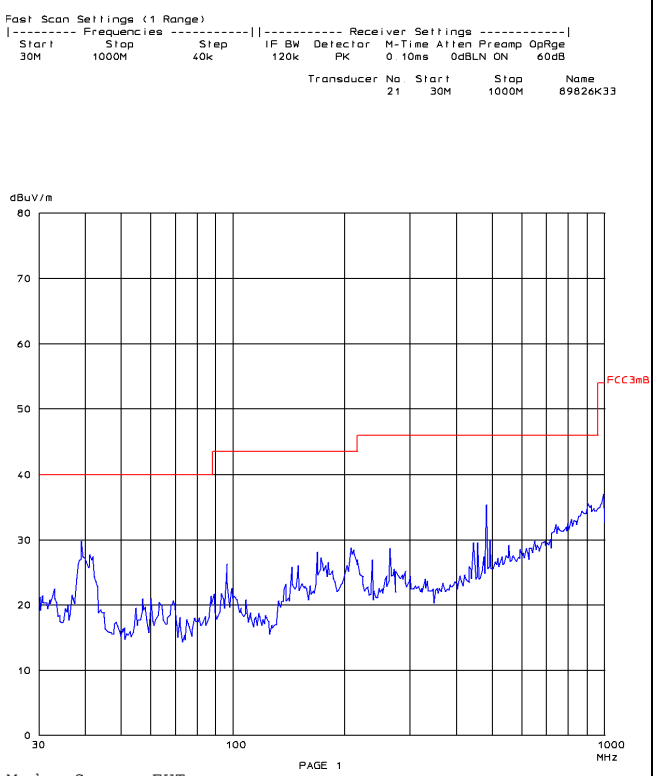
Date: 16.MAR.2015

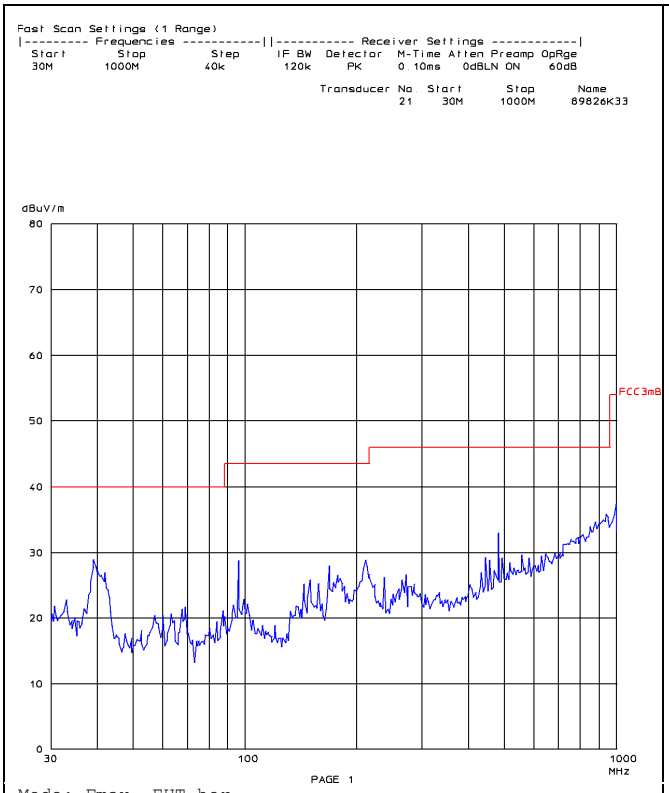


Mode: Sweep, EUT hor
Date: 16.MAR.2015

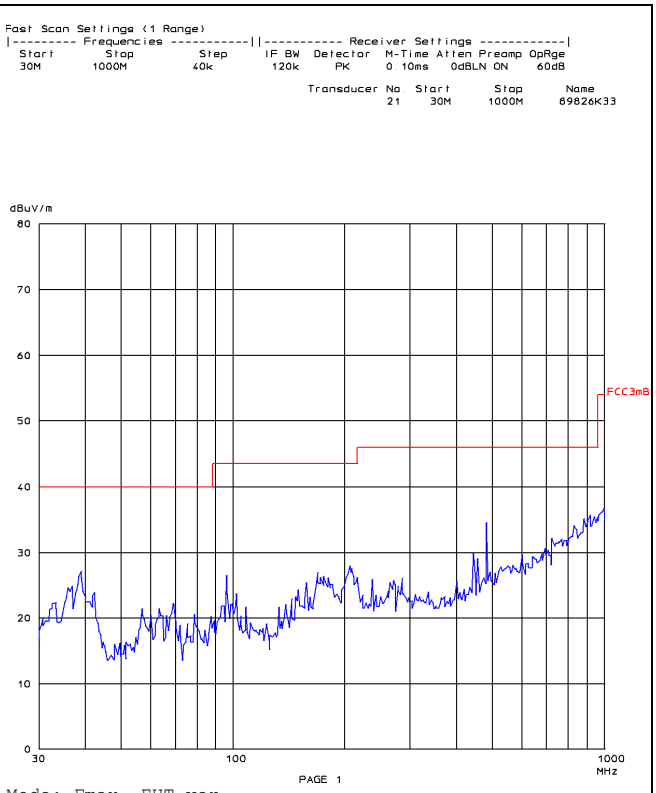


Mode: Sweep, EUT ver
Date: 16.MAR.2015

Test of FI Test- und Messtechnik FSC1/7 to 47 CFR § 15.249



Mode: Fmax, EUT hor
Date: 16.MAR.2015



Mode: Fmax, EUT ver
Date: 16.MAR.2015

7 RADIATED EMISSIONS 1 GHz – 100 GHz

Test Requirement: FCC 47 CFR, §§ 15.205, 15.209, 15.249
Test Procedure: ANSI C63.10-2009

7.1 Regulation

FCC § 15.31
(f)(1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).
(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle.
1 to 10 MHz	2	1 near top and 1 near bottom.
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom.

FCC § 15.33
(a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:
(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

FCC § 15.35
The conducted and radiated emission limits shown in this Part are based on the following, unless otherwise specified elsewhere in this Part:
(b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is

a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

FCC § 15.205

c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.
(d) The following devices are exempt from the requirements of this section:
(9) Devices operated in the 24.0-24.25 GHz band under § 15.249 are exempt from complying with the requirements of this section for the 48.0-48.5 GHz and 72.0-72.75 GHz bands only, and shall not exceed the limits specified in § 15.249(a).

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency	Field Strength		Measurement distance
[MHz]	[µV/m]	[dB(µV/m)]	[m]
Above 960	500	54	3

(b) In the emission table above, the tighter limit applies at the band edges.
(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
(e) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

FCC § 15.249

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(c) Field strength limits are specified at a distance of 3 meters.
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.
(e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. [..]

7.2 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
AC Power Source	AEG / DAMK4/DAGK4	0001	n.a	n.a
Standard Gain Horn Ant.	Mid Century / MC22/31B	1229	2014-07	2016-07
Semi-Flex-Cable	IW / KPS-1501-354-KPS	1229	2014-12	2015-12
Standard Gain Horn Ant.	Mid Century / MC 20/31B	1300	2014-07	2016-07
Standard Gain Horn Ant.	FMI/Pro NOVA / 2424-25	1333	n.a.	n.a.
Precis.Var.Waveg.Attn.	FMI / 2611	1441	n.a.	n.a.
Waveguide Mixer	R&S / FS-Z110/WM782W	1546	n.a	n.a
Waveguide Mixer	R&S / FS-Z60/WM782U	1547	n.a	n.a
Waveguide Mixer	R&S / FS-Z75/WM782V	1548	n.a	n.a
Tripler 60...90 GHz	Spacek Labs / AE-3X	1799	n.a	n.a
Doubler 40...60 GHz	Spacek Labs / AU-2X	1800	n.a	n.a
Thermistor Mount	Millitech / THM-22-RF000	2110	2010-09	2015-04
RF Power Meter	HP / 432 A	2112	2008-02	2015-04
Precis.Var.Waveg.Attn.	FMI / 2411	2114	n.a	n.a
Signal Generator	Anritsu / 68369B	2286	2013-08	2015-08
Standard Gain Horn Ant.	Electrof./Tho / WG27-25	2588	n.a	n.a
Thermistor Mount	Millitech / THM-15-RF000	2597	2008-02	2015-04
Standard Gain Horn Ant.	Electrof./Tho / WG25-25	2599	n.a	n.a
K-Cable K/50	IW / KPS-1501-600-KPS	3061	2014-12	2015-12
Double Ridged Guide Ant.	Schwarzb. / BBHA 9120D	3236	2013-06	2015-06
Spectrum Analyzer	R&S / FSU50	3831	2014-06	2015-06
50 GHz Cable, 2.4 mm	IW / 2PS-1401-400-2PS	3969	2014-12	2015-12
Multimeter	Agilent / U1241B	3880	2014-04	2016-04
HF-Cable	IW / NPS-2801N-2756-NPS	4391	2014-07	2014-07

7.3 Test Procedures

ANSI C63.10-2009: 6.6.4 Radiated emissions tests

Radiated emission tests shall be performed on a test site per 5.2, with the exception of the test table as described in 6.6.2.

The EUT should be setup in its typical configuration and arrangement, and operated in its various modes as shown in Figure 5 of this standard. An antenna shall be connected to the EUT. If the EUT is equipped with or uses an adjustable antenna, the EUT antenna shall be manipulated through typical positions and lengths during exploratory testing to maximize emission levels.

For tabletop systems, cables or wires should be manipulated within the range of likely arrangements. For floor-standing equipment, the cables or wires should be located in the same manner as the user would install them and no further manipulation is made. For combination EUTs, the tabletop and floor-standing portions of the EUT shall follow the procedures for representative setups and cable manipulation for typical use. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions.

For each required mode of operation to be tested, the frequency spectrum shall be monitored. Variations in antenna height between 1 m and 4 m [note: not useful due to antenna's small beam and the short measuring distance], antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified in Clause 6 and 6.3) shall be explored to produce the emission that has the highest amplitude relative to the limit.

The frequencies of emission from the EUT should first be detected. Then the amplitudes of the emissions are measured at the specified test distance using the required antenna height, orientation, polarization, and detector characteristics

The EUT was tested on a 0.8 meter high tabletop for measurements up to 18 GHz and a 1.0 meter high tabletop for measurements above 18 GHz.

In certain applications, a remotely located device may be connected to the EUT. In these cases, it is permissible for cabling from the remotely located device to the EUT or accessories to be placed directly on the reference ground plane or, if normally installed beneath the reference ground plane, beneath it. The remotely located device shall be located at a distance sufficient to ensure that it does not contribute to the measured level. This procedure evaluates the interference potential of the EUT, its accessories, and interconnecting cables or wires standing apart from the remotely located device, which in turn shall be evaluated separately, if required.

With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions. All tests performed with the EUT placed in both vertical and horizontal polarizations on the nonconductive table.

Measurement initially performed as a pre-scan in the full frequency range in order to find worst case emissions. Final measurement performed at worst-case emission frequencies in a FCC listed semi-anechoic room at the specified 3 m test distance. Worst case emissions are listed under chapter: test results.

Radiated Emissions Test Characteristics	
Frequency range	1 GHz – 100 GHz
Test distance	3 m*
Test instrumentation resolution bandwidth	1 MHz **
Receive antenna height	0.8 – 1.5 m (for 1 GHz – 18 GHz) 1 m (for 18 GHz – 100 GHz)
Receive antenna polarization	Vertical/Horizontal

* Test distance was reduced in order to fulfil the limit requirements, refer to final measurement table for details.

** Test instrumentation resolution bandwidth was reduced in order to fulfil the limit requirements, refer to final measurement table for details.

7.4 Calculation of Field Strength Limits

E.g. radiated spurious emissions field strength limits for frequencies above 960 MHz:

µV/m at 3 meters = 500

500 µV/m corresponds with 54 dBµV/m.

7.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF
where
FS = Field Strength in dBµV/m
RA = Receiver Amplitude in dBµV
AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB
Assume a receiver reading of 23.5 dBµV is obtained. The Antenna Factor of 7.4 dB(1/m) and a Cable Factor of 1.1 dB are added, giving a field strength of 32 dBµV/m. The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

FS = 23.5 + 7.4 + 1.1 = 32 [dBµV/m]

Level in µV/m = Common Antilogarithm (32/20) = 39.8

For a test distance other than what is specified, but fulfilling the requirements of Section 15.21 (f)(1) the field strength is calculated by adding additionally an extrapolation factor of 20 dB/Decade (inverse linear distance for field strength measurements). The basic equation with a sample calculation is as follows:

FS = FST + DF
where
FS = Field Strength in dBµV/m
FST = Field Strength at test distance on dBµV/m
DF = Distance Extrapolation Factor in dB
where DF = 20 log (Dtest/Dspec) where Dtest = Test Distance and Dspec = Specified Distance

Assume the tests performed at a reduced distance of 1.0 m instead of the Specified Distance if 3.0 m giving a Distance Extrapolation Factor of DF = 20 log (1.0 m / 3.0 m) = -9.5 dB.

7.6 Final Test Results

Mode: Fmin

Freq. [GHz]	Dtest [m]	BW [kHz]	RA [dBm]	CF [dB]	AF [dB]	DF [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]
6.000	1	1000	-82.2	2.7	33.9	-9.5	51.9	54	2.1
12.000	1	1000	-90.7	4.0	39.5	-9.5	50.3	54	3.7
18.003	3	1	-104.2	2.8	35.4	0	40.9	54	13.1
24.005	3	1	-65.5	3.3	37.9	0	82.7	108	25.3
30.006	3	0.2	-114.4	3.9	39.8	0	36.3	54	17.7
36.007	3	0.2	-116.4	4.3	41.4	0	36.3	54	17.7
42.008	3	0.1	-108.7	3.3	37.7	0	39.3	54	14.7
48.010	1	3	-121.2	21.2	38.9	-9.5	36.4	68	31.6
54.011	1	3	-118.2	16.5	39.9	-9.5	35.6	54	18.4
60.012	1	3	-123.7	28.0	40.8	-9.5	42.5	54	11.5
72.014	1	3	-129.7	25.7	42.4	-9.5	35.8	68	32.2

Mode: Sweep/Fmid

Freq. [GHz]	Dtest [m]	BW [kHz]	RA [dBm]	CF [dB]	AF [dB]	DF [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]
6.008	1	1000	-92.4	2.7	33.9	-9.5	41.6	54	12.4
12.050	1	1000	-97.4	4.0	39.6	-9.5	43.7	54	10.3
18.094	3	1	-104.7	2.8	35.4	0	40.5	54	13.5
24.125	3	1	-69.2	3.3	37.9	0	79.0	108	29.0
30.156	3	0.2	-113.5	3.9	39.8	0	37.3	54	16.7
36.187	3	0.2	-116.5	4.3	41.4	0	36.2	54	17.8
42.218	3	0.1	-106.8	3.3	37.8	0	41.3	54	12.7
48.250	1	3	-119.8	22.7	38.9	-9.5	39.2	68	28.8
54.281	1	3	-117.9	16.5	39.9	-9.5	36.0	54	18.0
60.312	1	3	-125.9	27.6	40.9	-9.5	39.9	54	14.1
72.374	1	3	-133.4	25.7	42.4	-9.5	32.2	68	35.8

Mode: Fmax

Freq. [GHz]	Dtest [m]	BW [kHz]	RA [dBm]	CF [dB]	AF [dB]	DF [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]
6.061	1	1000	-83.4	2.7	33.9	-9.5	50.6	54	3.4
12.122	1	1000	-90.5	4.0	39.6	-9.5	50.5	54	3.5
18.184	3	1	-105.0	2.8	35.4	0	40.3	54	13.7
24.245	3	1	-69.1	3.3	37.9	0	79.1	108	28.9
30.306	3	0.2	-114.3	3.9	39.9	0	36.5	54	17.5
36.367	3	0.2	-115.3	4.3	41.5	0	37.5	54	16.5
42.428	3	0.1	-109.6	3.3	37.8	0	38.5	54	15.5
48.490	1	3	-118.8	21.8	39.0	-9.5	39.4	68	28.6
54.551	1	3	-117.3	16.7	40.0	-9.5	36.9	54	17.1
60.612	1	3	-126.8	27.9	40.9	-9.5	39.4	54	14.6
72.734	1	3	-132.8	25.6	42.5	-9.5	32.7	68	35.3

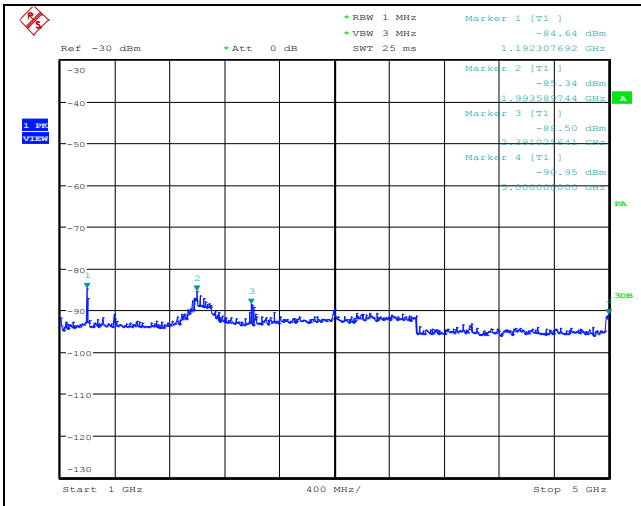
All tests performed at the denoted distance with the denoted resolution bandwidth. The table above contains worst-case emissions, only. For further details refer to the pre-scan and final measurement test plots.

Manufacturer: FI Test- und Messtechnik GmbH
Device: FSC1/7
Serial No: 021

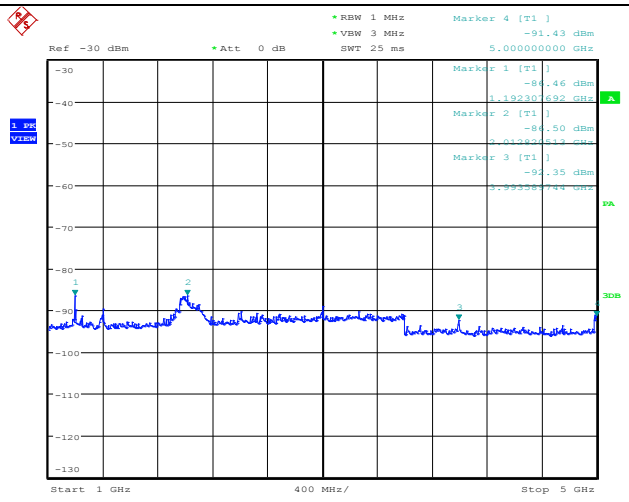
All measured emissions in the range 1 GHz to 100 GHz are below the specified limits.

The EUT meets the requirements of this section.

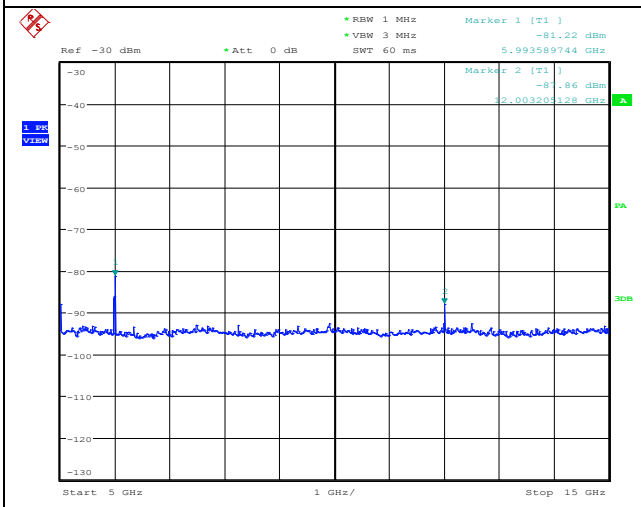
7.7 Measurement Prescan-Plots



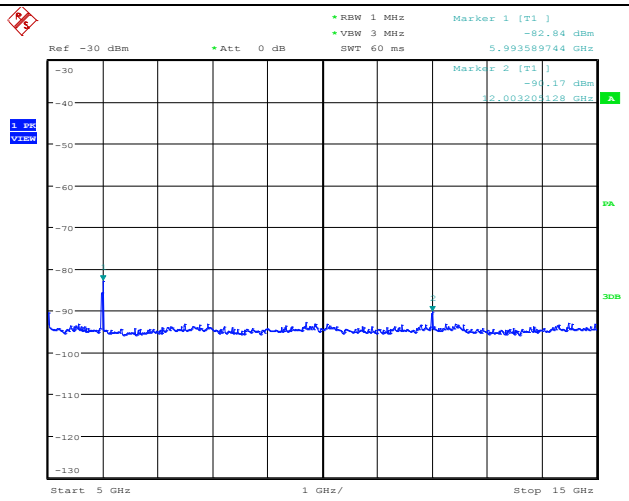
Mode: Fmin, EUT hor, Prescan 1 – 5 GHz, distance 3m
Date: 17.MAR.2015



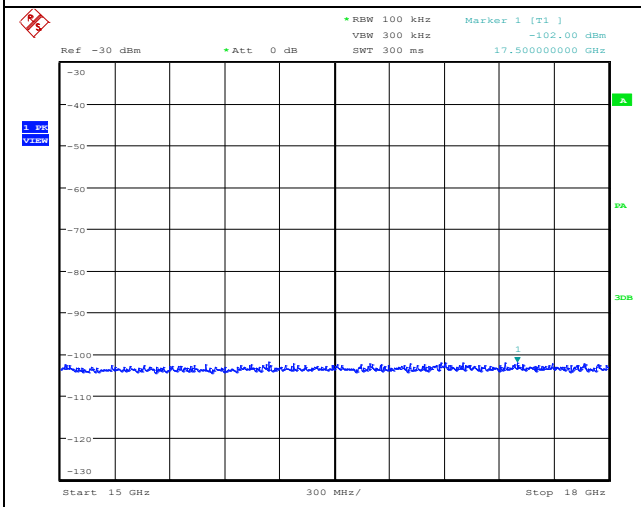
Mode: Fmin, EUT ver, Prescan 1 – 5 GHz, distance 3m
Date: 17.MAR.2015



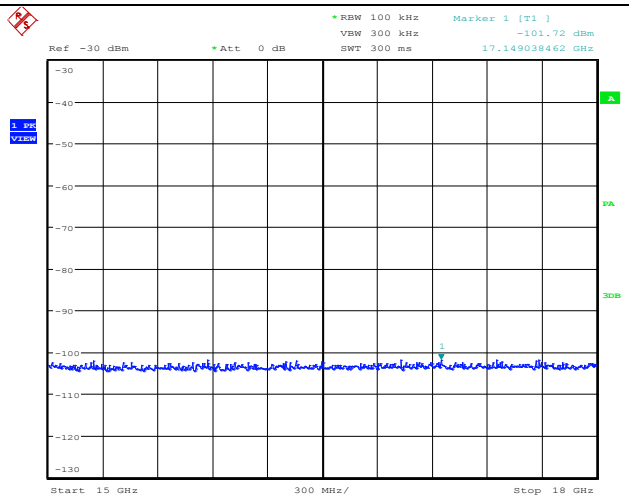
Mode: Fmin, EUT hor, Prescan 5 – 15 GHz, distance 1m
Date: 17.MAR.2015



Mode: Fmin, EUT ver, Prescan 5 – 15 GHz, distance 1m
Date: 17.MAR.2015



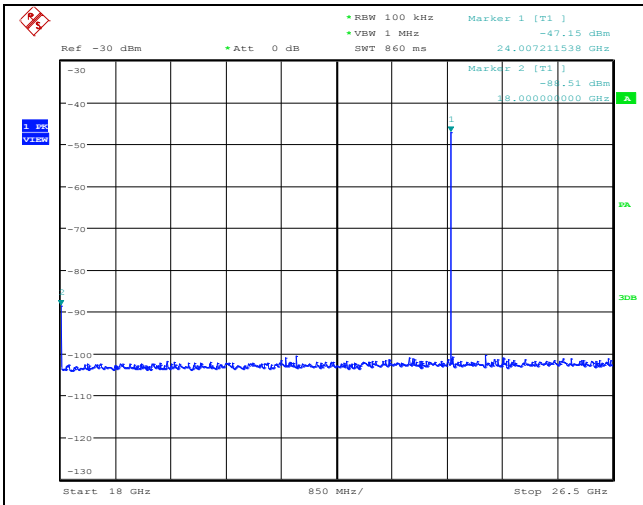
Mode: Fmin, EUT hor, Prescan 15 – 18 GHz, distance 1m
Date: 17.MAR.2015



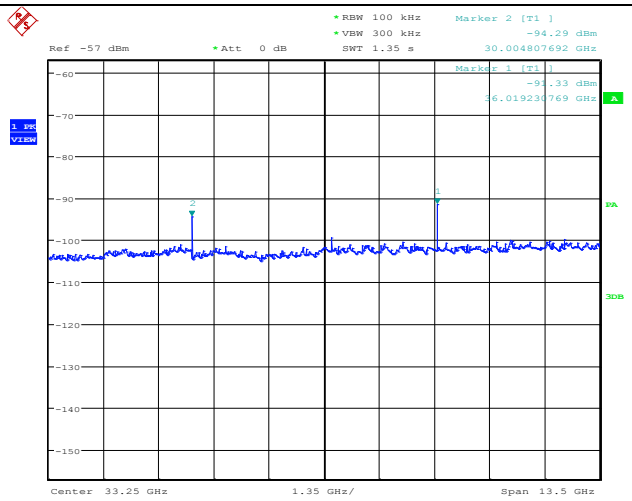
Mode: Fmin, EUT ver, Prescan 15 – 18 GHz, distance 1m
Date: 17.MAR.2015

Note: Prescan measurements performed at reported distance with no additional correction factors, therefore the plots are just showing the measurement receiver's reading.

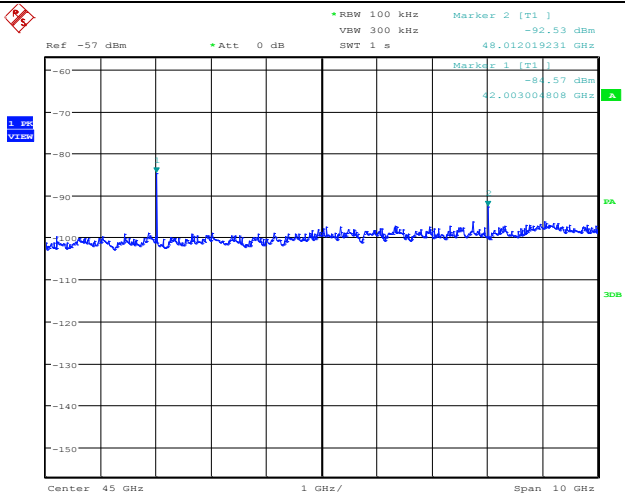
Test of FI Test- und Messtechnik FSC1/7 to 47 CFR § 15.249



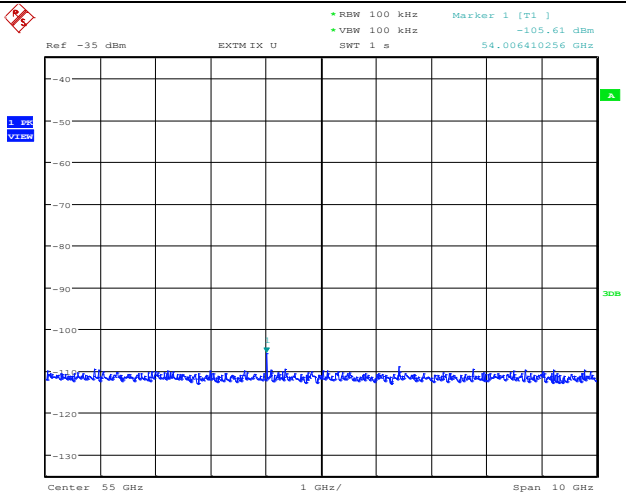
Mode: Fmin, Prescan 18 – 26.5 GHz, distance 0.1m
Date: 18.MAR.2015



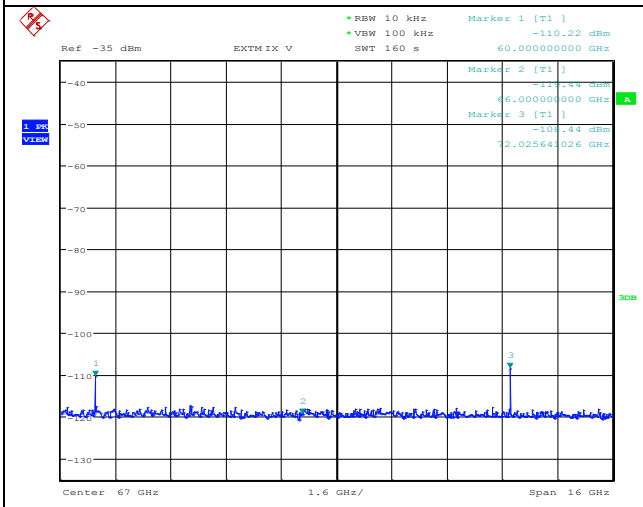
Mode: Fmin, Prescan 26.5 – 40 GHz, distance 0.1m
Date: 18.MAR.2015



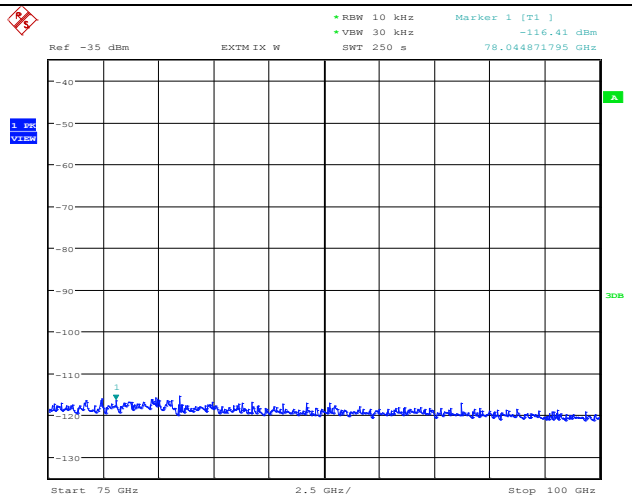
Mode: Fmin, Prescan 40 – 50 GHz, distance 0.05m
Date: 18.MAR.2015



Mode: Fmin, Prescan 50 – 60 GHz, distance 0.05m
Date: 19.MAR.2015

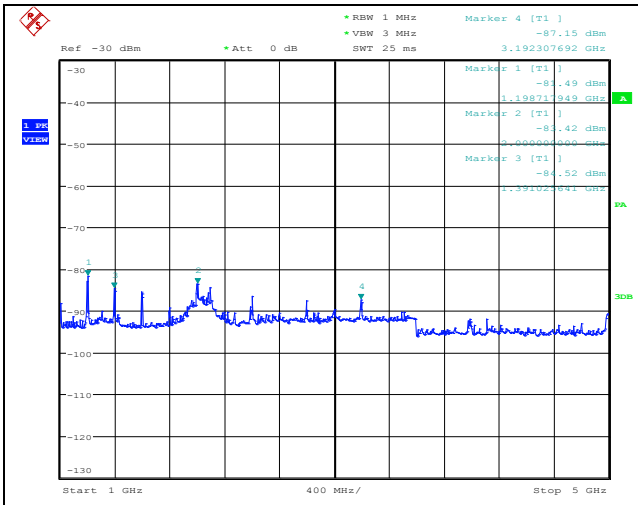


Mode: Fmin, Prescan 60 – 75 GHz, distance 0.01m
Date: 19.MAR.2015

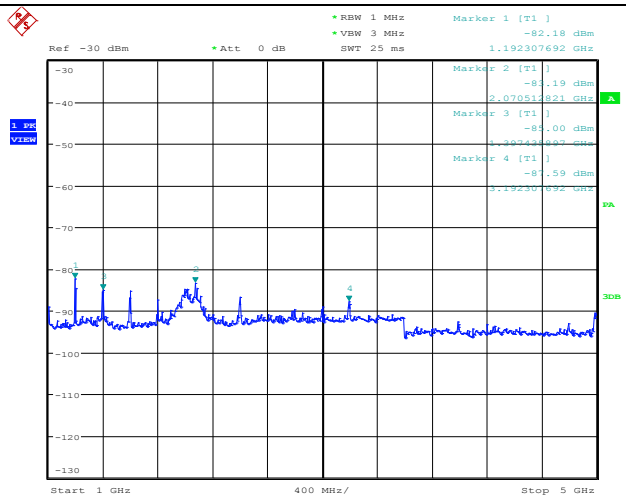


Mode: Fmin, Prescan 75 – 100 GHz, distance 0.01m
Date: 19.MAR.2015

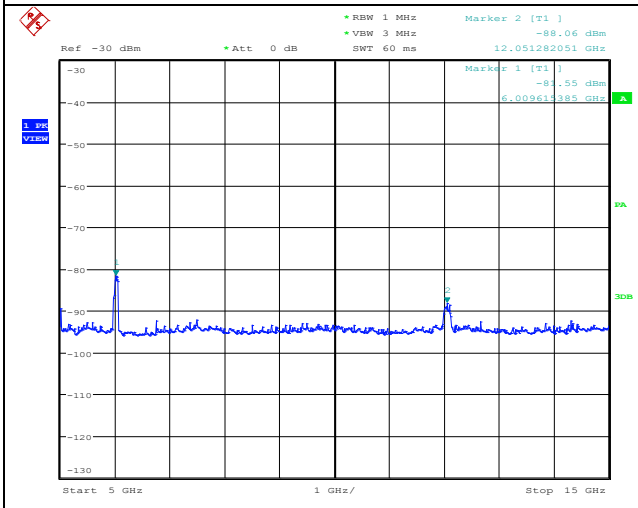
Note: Prescan measurements performed at reported distance with no additional correction factors, therefore the plots are just showing the measurement receiver's reading.



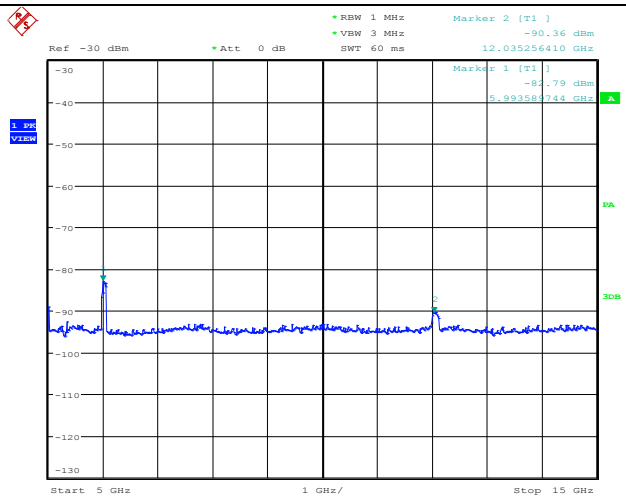
Mode: Sweep, EUT hor, Prescan 1 – 5 GHz, distance 3m
Date: 17.MAR.2015



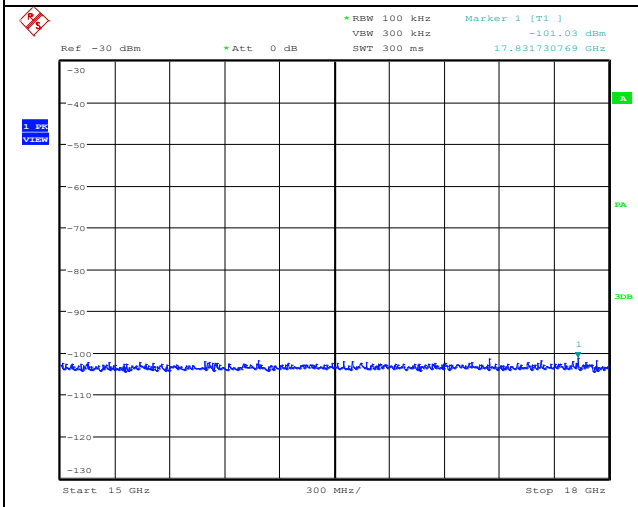
Mode: Sweep, EUT ver, Prescan 1 – 5 GHz, distance 3m
Date: 17.MAR.2015



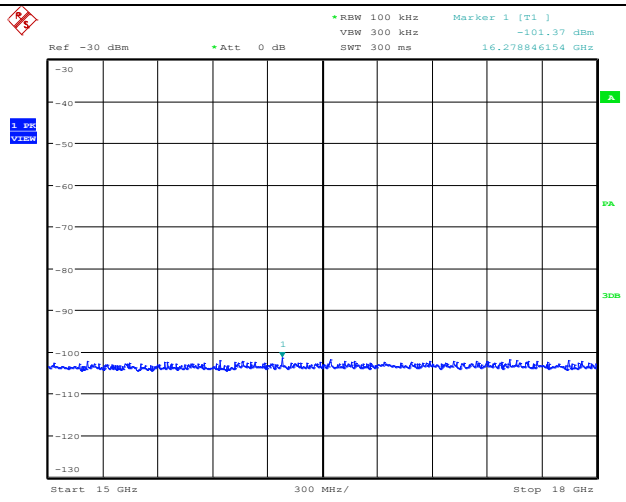
Mode: Sweep, EUT hor, Prescan 5 – 15 GHz, distance 1m
Date: 17.MAR.2015



Mode: Sweep, EUT ver, Prescan 5 – 15 GHz, distance 1m
Date: 17.MAR.2015



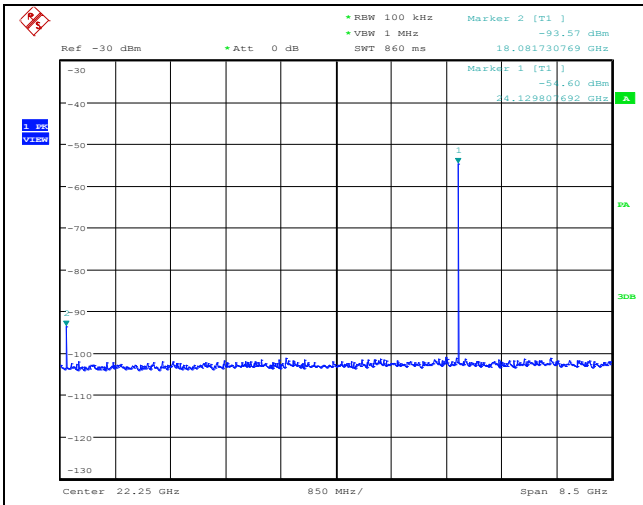
Mode: Sweep, EUT hor, Prescan 15 – 18 GHz, distance 1m
Date: 17.MAR.2015



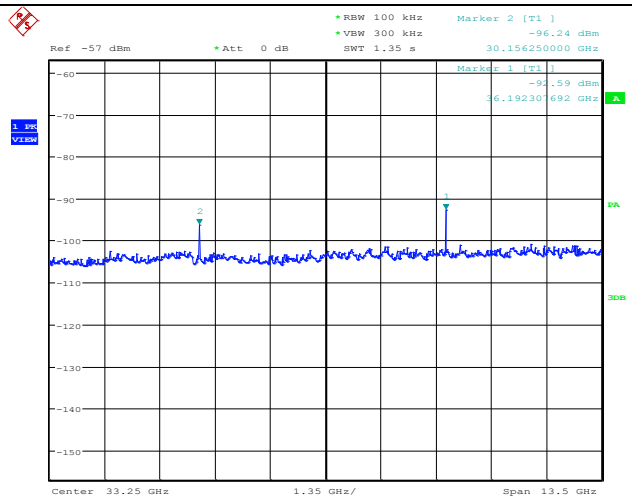
Mode: Sweep, EUT ver, Prescan 15 – 18 GHz, distance 1m
Date: 17.MAR.2015

Note: Prescan measurements performed at reported distance with no additional correction factors, therefore the plots are just showing the measurement receiver's reading.

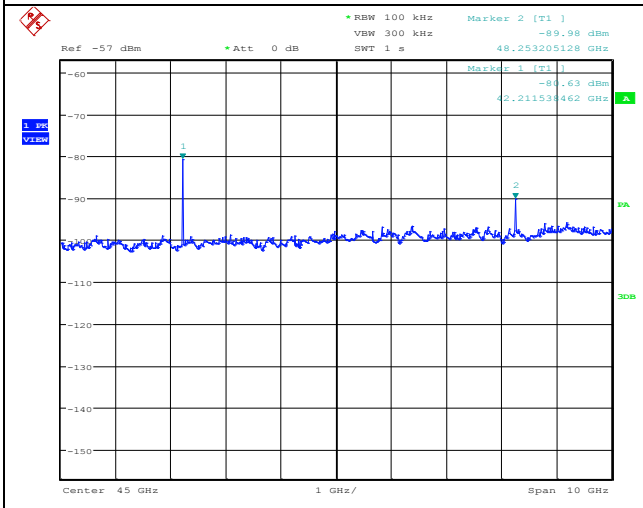
Test of FI Test- und Messtechnik FSC1/7 to 47 CFR § 15.249



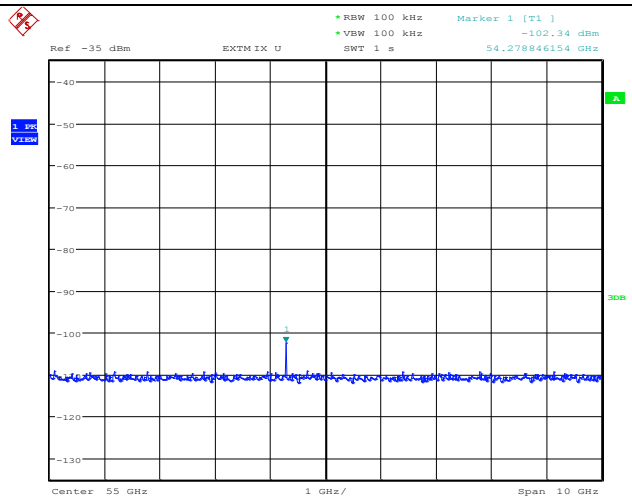
Mode: Fmid, Prescan 18 - 26.5 GHz, distance 0.1m
Date: 18.MAR.2015



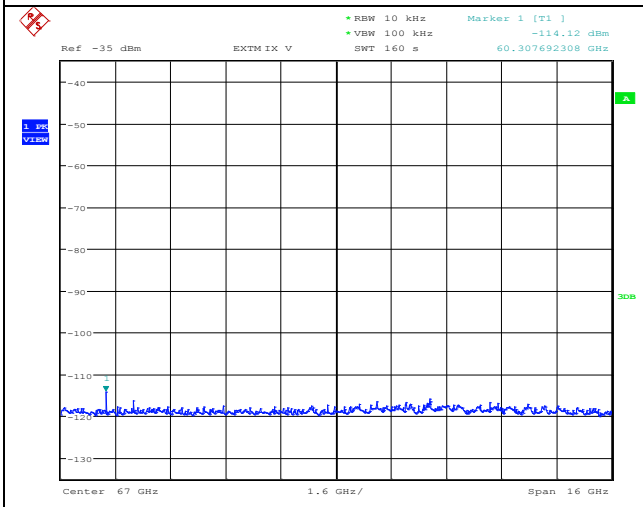
Mode: Fmid, Prescan 26.5 - 40 GHz, distance 0.1m
Date: 18.MAR.2015



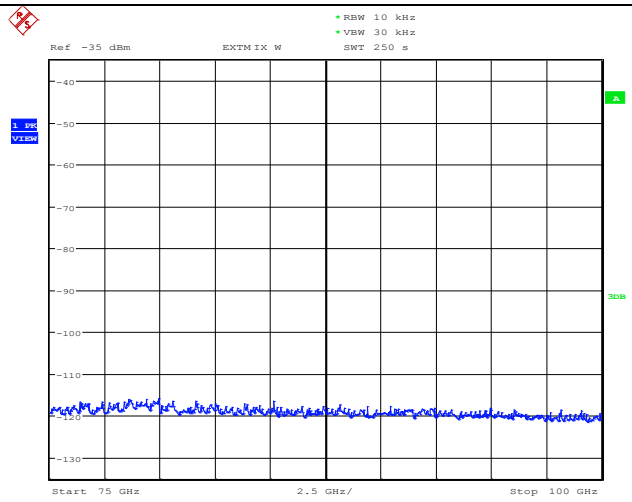
Mode: Fmid, Prescan 40 - 50 GHz, distance 0.05m
Date: 18.MAR.2015



Mode: Fmid, Prescan 50 - 60 GHz, distance 0.05m
Date: 19.MAR.2015

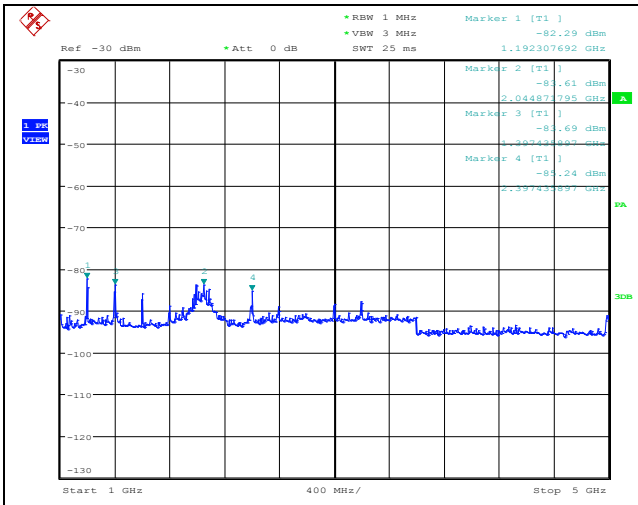


Mode: Fmid, Prescan 60 - 75 GHz, distance 0.01m
Date: 19.MAR.2015

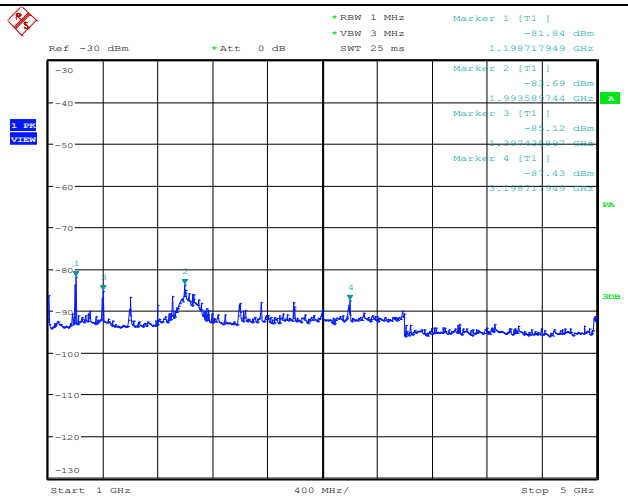


Mode: Fmid, Prescan 75 - 100 GHz, distance 0.01m
Date: 19.MAR.2015

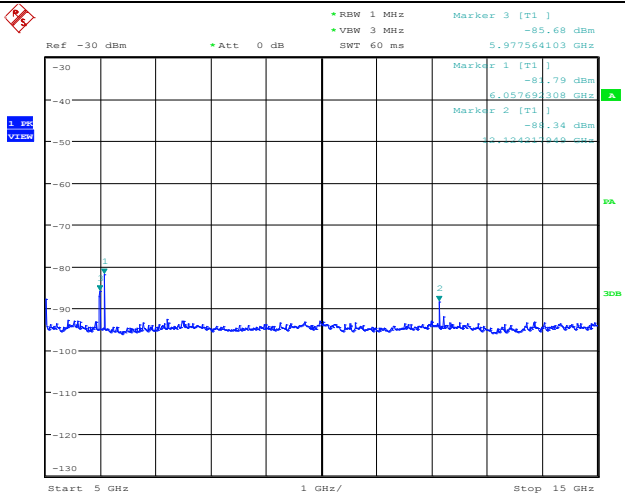
Note: Prescan measurements performed at reported distance with no additional correction factors, therefore the plots are just showing the measurement receiver's reading.



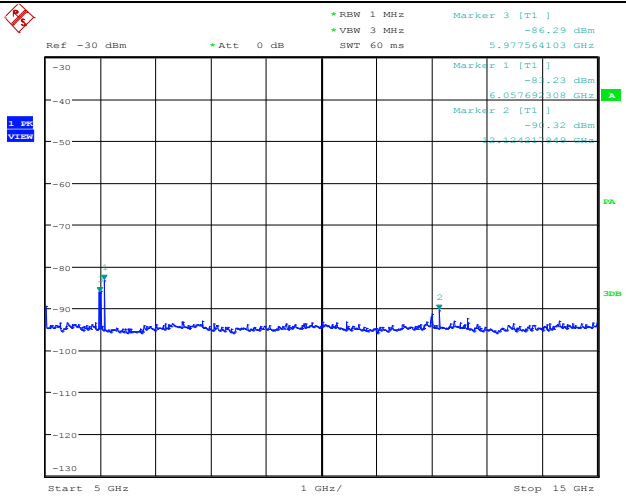
Mode: Fmax, EUT hor, Prescan 1 – 5 GHz, distance 3m
Date: 17.MAR.2015



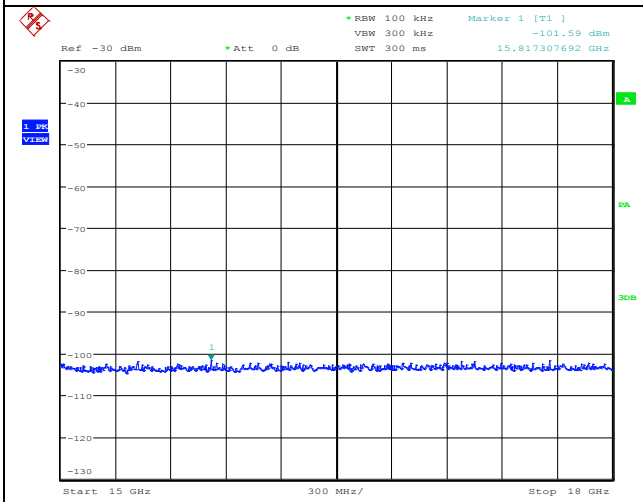
Mode: Fmax, EUT ver, Prescan 1 – 5 GHz, distance 3m
Date: 17.MAR.2015



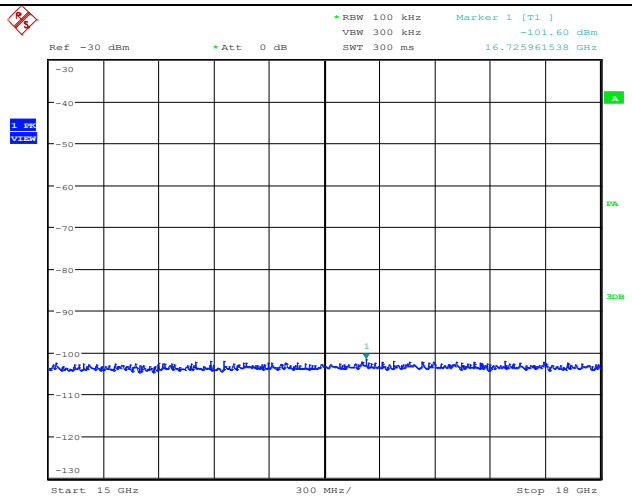
Mode: Fmax, EUT hor, Prescan 5 – 15 GHz, distance 1m
Date: 17.MAR.2015



Mode: Fmax, EUT ver, Prescan 5 – 15 GHz, distance 1m
Date: 17.MAR.2015



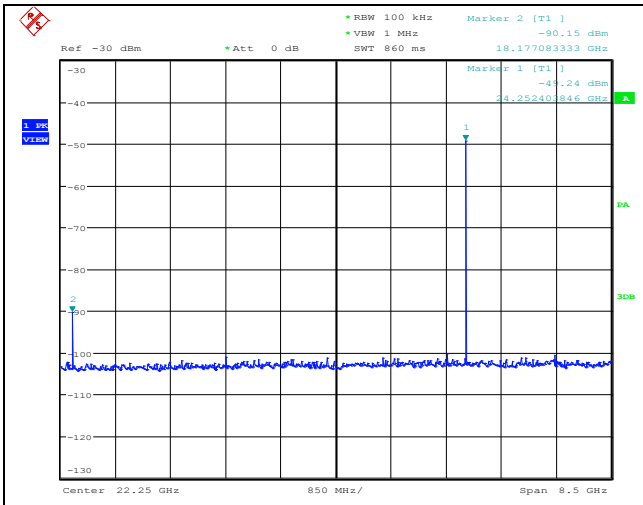
Mode: Fmax, EUT hor, Prescan 15 – 18 GHz, distance 1m
Date: 17.MAR.2015



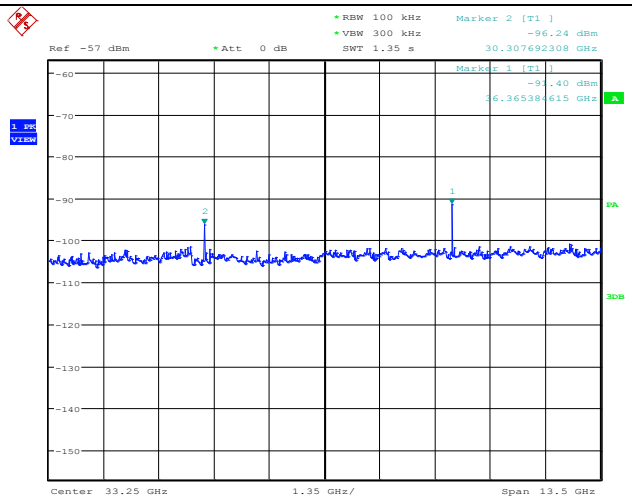
Mode: Fmax, EUT ver, Prescan 15 – 18 GHz, distance 1m
Date: 17.MAR.2015

Note: Prescan measurements performed at reported distance with no additional correction factors, therefore the plots are just showing the measurement receiver's reading.

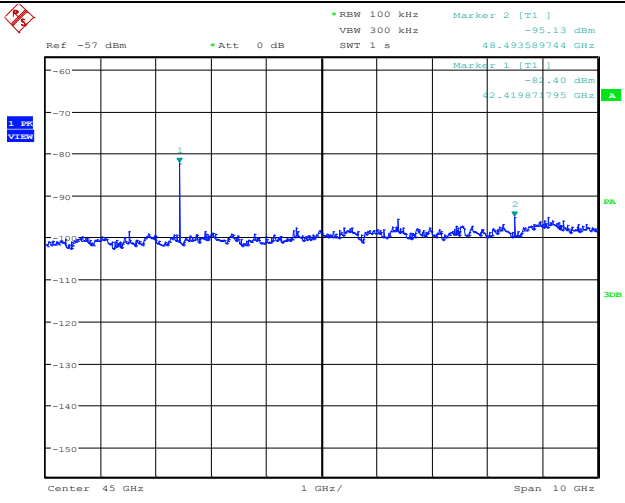
Test of FI Test- und Messtechnik FSC1/7 to 47 CFR § 15.249



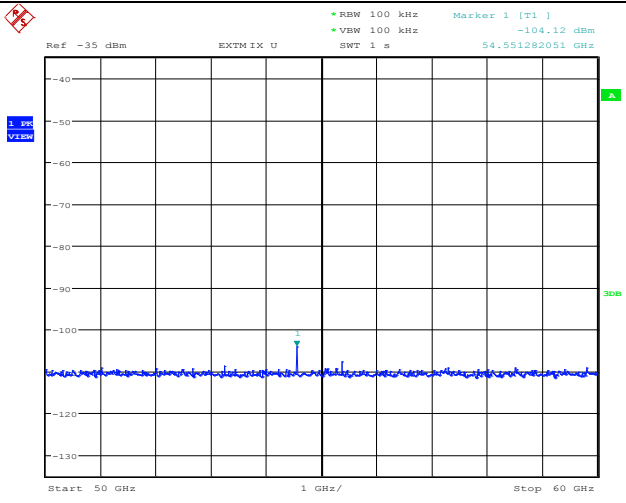
Mode: Fmax, Prescan 18 - 26.5 GHz, distance 0.1m
Date: 18.MAR.2015



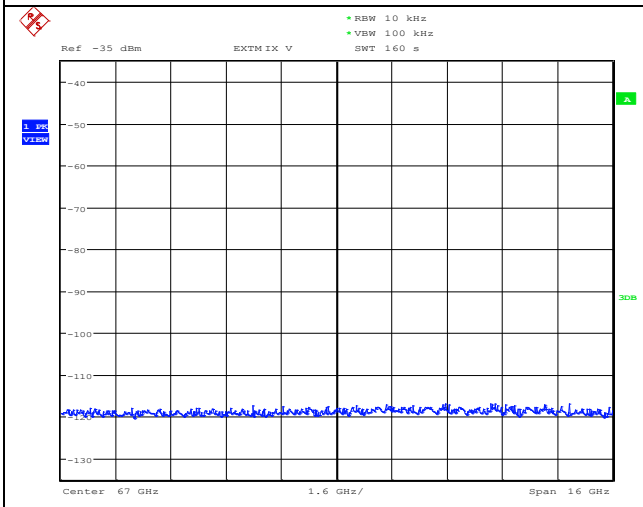
Mode: Fmax, Prescan 26.5 - 40 GHz, distance 0.1m
Date: 18.MAR.2015



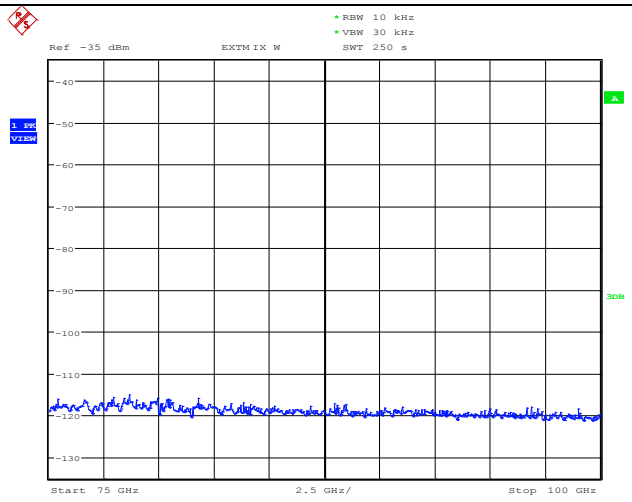
Mode: Fmax, Prescan 40 - 50 GHz, distance 0.05m
Date: 18.MAR.2015



Mode: Fmax, Prescan 50 - 60 GHz, distance 0.05m
Date: 19.MAR.2015



Mode: Fmax, Prescan 60 - 75 GHz, distance 0.01m
Date: 19.MAR.2015



Mode: Fmax, Prescan 75 - 100 GHz, distance 0.01m
Date: 19.MAR.2015

Note: Prescan measurements performed at reported distance with no additional correction factors, therefore the plots are just showing the measurement receiver's reading.

8 LIST OF ANNEXES

Following annexes are separated parts from this test report.

Description	Pages
Annex 1: Photographs of test set-up	4
Annex 2: External photographs of equipment under test (EUT)	4
Annex 3: Internal photographs of equipment under test (EUT)	3