



electronic GmbH

a member of the STC



Prüfbericht / Test report

FCC
(Federal Communications Commission)
Test-Firm-Registration-Number: 90870

IC
(Industry Canada)
Company-Number: 6155A
Test site number 6155A-1

RES



**TESTED
IN GERMANY**

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Prüfbericht Nr./
Test report no.: **14/01-0047**

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1. CLIENT INFORMATION:

Name: IDENTEC SOLUTIONS AG
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E-mail: acastrignano@identecsolutions.com

2. EQUIPMENT UNDER TEST (EUT):

2.1 Identification of the EUT

Equipment: ILR Mobile Reader
Model: i-Port-USB-BT
Brand name: -/-
Serial no.: 14031U0004
Manufacturer: IDENTEC SOLUTIONS AG
Country of origin: Austria
Rating: Operated with rechargeable battery, charging with 9 – 24 V DC, 50 mA or by USB.

2.2 Additional information about the EUT: Included Bluetooth module which is already certified (modular certification) with FCC ID: X3ZBTMOD5 and IC: 8828A-MOD4.
The EUT is working on the frequencies:
919 MHz Broadcast (only reception)
920 MHz- Communication (transmitting/receiving of data), Frequency deviation ± 64 kHz @ 115200 bit/s
921 MHz- Wakeup (transmitting), Frequency deviation ± 20 kHz @ 19200 bit/s
Tx power setting: 0x60

3. Conducted emission measurements

Test site

Measurements of conducted emission from EUT was made in the shielded chamber (Siemens DC-1 GHz).

Detector function selection and bandwidth

In conducted emissions measurement CISPR quasi-peak- and average-detector were used. The bandwidth of the detector of instrument is 9 kHz over the frequency range of 150 kHz to 30 MHz. Conducted emissions to be measured are detected in CISPR quasi-peak- and average-mode.

Frequency range to be scanned

For conducted emission measurements, the spectrum in the range of 150 kHz to 30 MHz was investigated.

Test conditions and configuration of EUT

The EUT was configured and operated in transmitting/receiving modes with a host AC adaptor (120 V~, 60 Hz / 21 V DC out), so as to find the maximum conducted emission generated from EUT.

During test the peripherals were operated with rated Power (120 V~, 60 Hz). The EUT has no direct connection to the AC power line.

Measurements on neutral (N)- and live (L1)-wires of the peripherals had been performed.

Applied standards

47 CFR part 15 subpart B, § 15.107 Conducted limits

47 CFR part 15 subpart C, § 15.207 Conducted limits

RSS-210, Issue 8

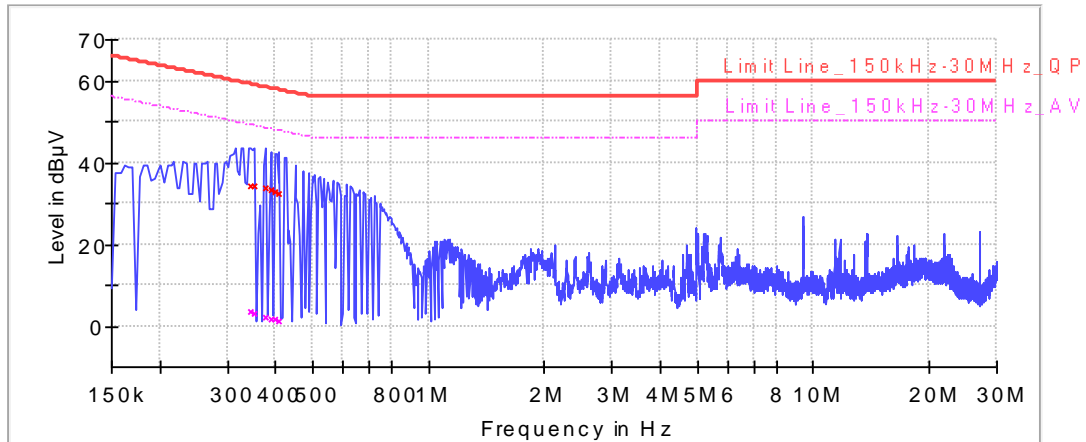
RSS-Gen, Issue 4, clause 8.8 AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus

ANSI C63.10-2009 / ANSI C63.10-2013, clause 6.2 Standard test method for AC power-line conducted emissions from unlicensed wireless devices

Measurements

Receiving 919 MHz:

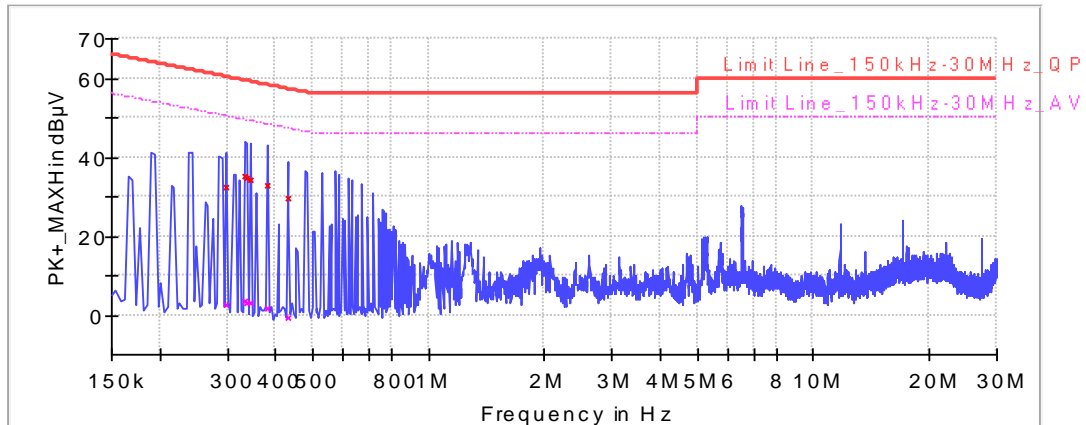
Tested on N



— PK+_MAXH
 - - - Limit Line_150kHz-30MHz_AV
 * Average
 — Limit Line_150kHz-30MHz_QP
 QuasiPeak

Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.346000	43.5	34.3	3.3	1000.0	9.000	45.8	49.1	24.7	59.1
0.354000	43.3	34.2	2.9	1000.0	9.000	46.0	48.9	24.7	58.9
0.378000	43.4	33.8	2.2	1000.0	9.000	46.1	48.3	24.5	58.3
0.390000	42.7	33.3	1.8	1000.0	9.000	46.3	48.1	24.8	58.1
0.398000	42.2	32.9	1.6	1000.0	9.000	46.3	47.9	25.0	57.9
0.410000	42.6	32.5	1.3	1000.0	9.000	46.4	47.6	25.2	57.6

Tested on L1

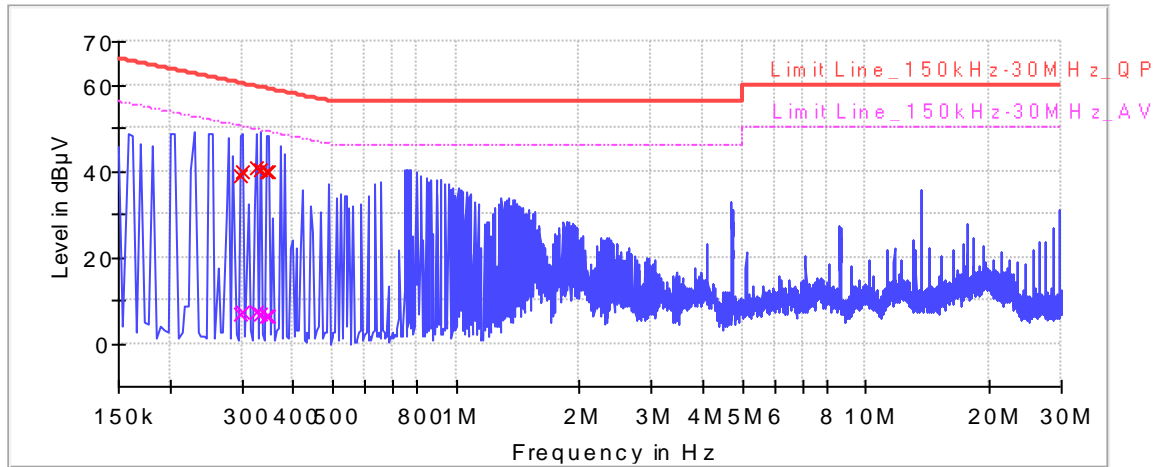


— PK+_MAXH
 - - - Limit Line_150kHz-30MHz_AV
 * Average
 — Limit Line_150kHz-30MHz_QP
 QuasiPeak

Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.298000	41.2	32.2	2.4	1000.0	9.000	47.9	50.3	28.1	60.3
0.334000	43.8	35.0	3.6	1000.0	9.000	45.7	49.4	24.4	59.4
0.338000	43.6	34.7	3.3	1000.0	9.000	46.0	49.3	24.6	59.3
0.346000	43.5	34.4	3.0	1000.0	9.000	46.1	49.1	24.7	59.1
0.382000	42.8	32.9	1.6	1000.0	9.000	46.6	48.2	25.3	58.2
0.430000	39.0	29.8	-0.7	1000.0	9.000	47.9	47.3	27.5	57.3

Receiving 920 MHz:

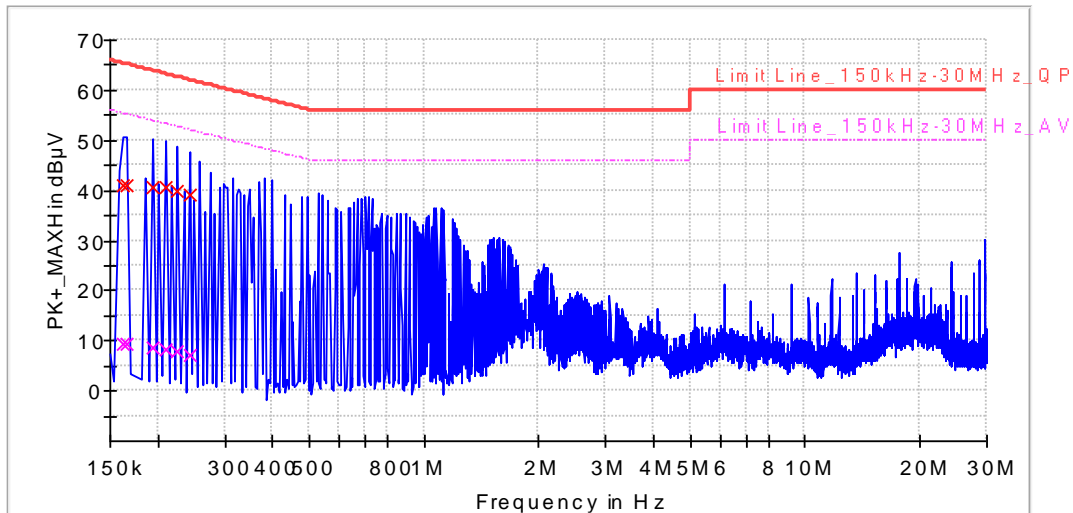
Tested on N



— PK+_MAXH
- - - Limit Line_150kHz-30MHz_AV
— Limit Line_150kHz-30MHz_QP
x QuasiPeak
x Average

Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.298000	48.2	38.7	6.6	1000.0	9.000	43.7	50.3	21.6	60.3
0.302000	48.7	39.6	7.1	1000.0	9.000	43.1	50.2	20.6	60.2
0.326000	48.8	40.5	7.0	1000.0	9.000	42.5	49.6	19.0	59.6
0.334000	49.0	40.3	6.7	1000.0	9.000	42.6	49.4	19.1	59.4
0.346000	48.2	39.7	6.3	1000.0	9.000	42.8	49.1	19.4	59.1
0.350000	48.2	39.6	6.2	1000.0	9.000	42.8	49.0	19.4	59.0

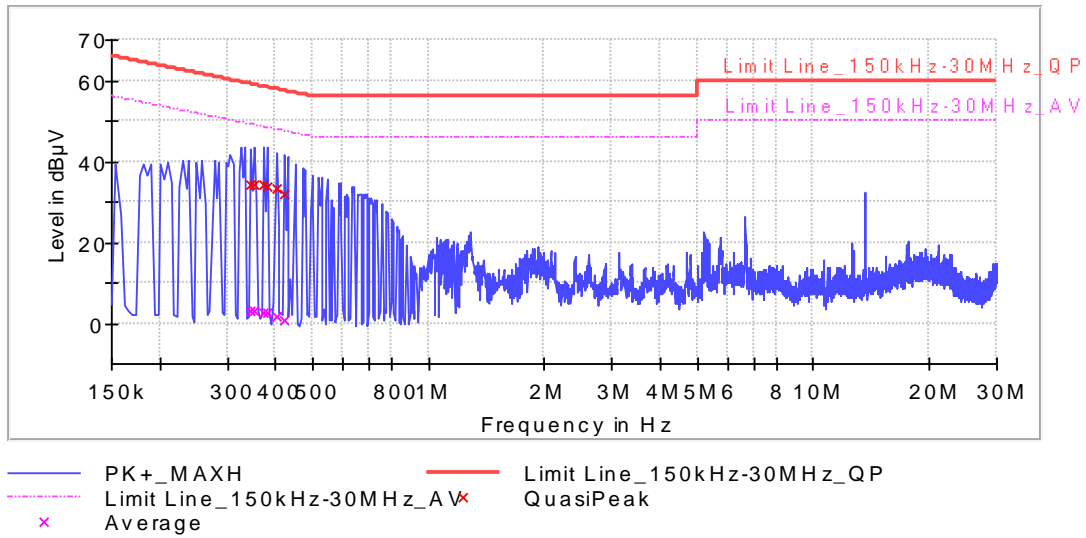
Tested on L1



Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.162000	50.7	41.1	9.4	1000.0	9.000	45.9	55.4	24.2	65.4
0.166000	50.6	41.0	9.3	1000.0	9.000	45.9	55.2	24.1	65.2
0.194000	50.3	40.7	8.8	1000.0	9.000	45.1	53.9	23.2	63.9
0.210000	49.7	40.4	8.3	1000.0	9.000	44.9	53.2	22.8	63.2
0.226000	49.0	39.9	7.9	1000.0	9.000	44.7	52.6	22.7	62.6
0.242000	47.6	39.1	7.1	1000.0	9.000	45.0	52.0	22.9	62.0

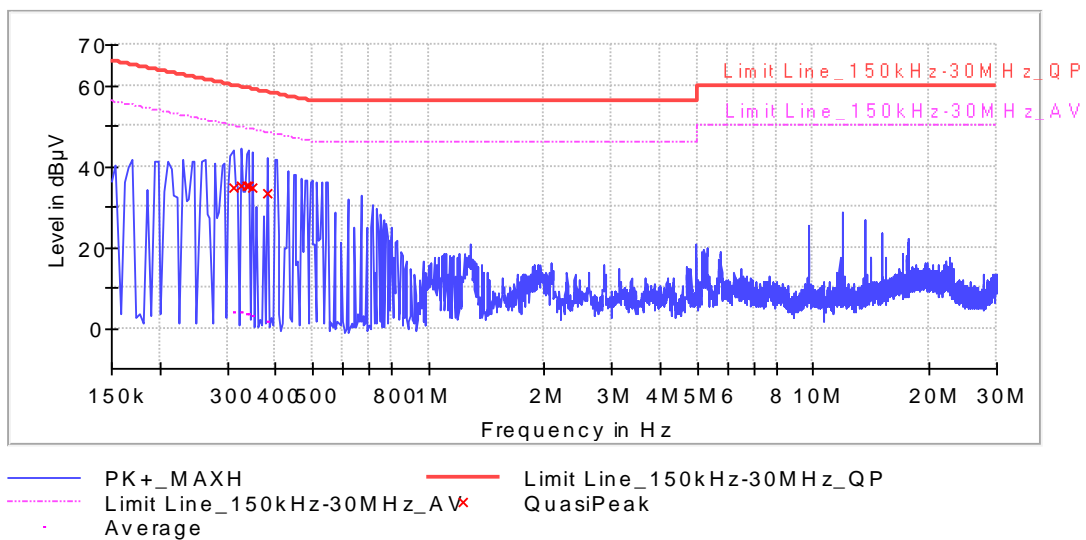
Transmitting 920 MHz:

Tested on N



Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.346000	43.2	34.0	3.1	1000.0	9.000	45.9	49.1	25.0	59.1
0.354000	43.3	34.3	3.1	1000.0	9.000	45.8	48.9	24.5	58.9
0.374000	43.4	34.2	2.6	1000.0	9.000	45.8	48.4	24.2	58.4
0.382000	43.3	33.9	2.3	1000.0	9.000	45.9	48.2	24.4	58.2
0.402000	42.3	33.1	1.6	1000.0	9.000	46.2	47.8	24.7	57.8
0.422000	41.6	32.1	0.8	1000.0	9.000	46.6	47.4	25.3	57.4

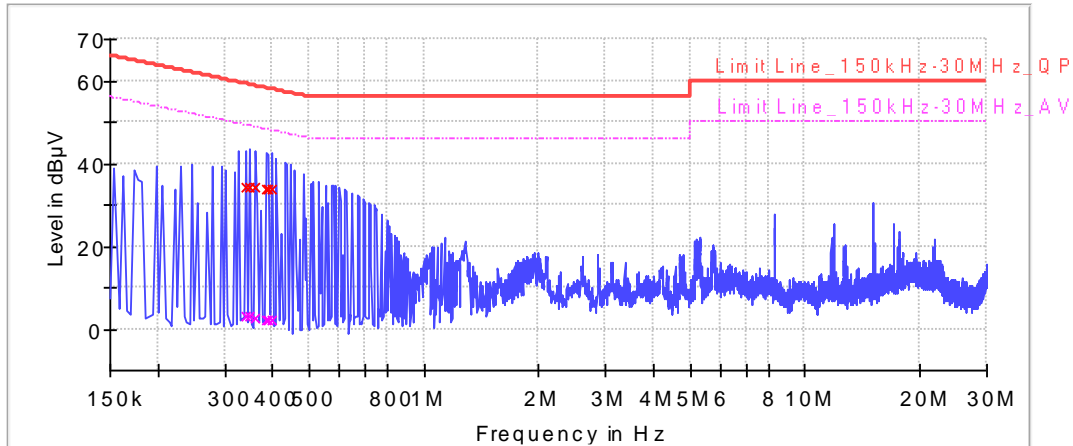
Tested on L1



Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.310000	43.9	34.7	3.8	1000.0	9.000	46.2	50.0	25.3	60.0
0.326000	44.2	35.1	3.9	1000.0	9.000	45.6	49.6	24.4	59.6
0.338000	43.1	35.0	3.6	1000.0	9.000	45.6	49.3	24.2	59.3
0.342000	43.9	35.0	3.4	1000.0	9.000	45.7	49.2	24.2	59.2
0.350000	43.6	34.7	3.0	1000.0	9.000	45.9	49.0	24.3	59.0
0.382000	42.3	33.4	1.8	1000.0	9.000	46.4	48.2	24.8	58.2

Transmitting 921 MHz:

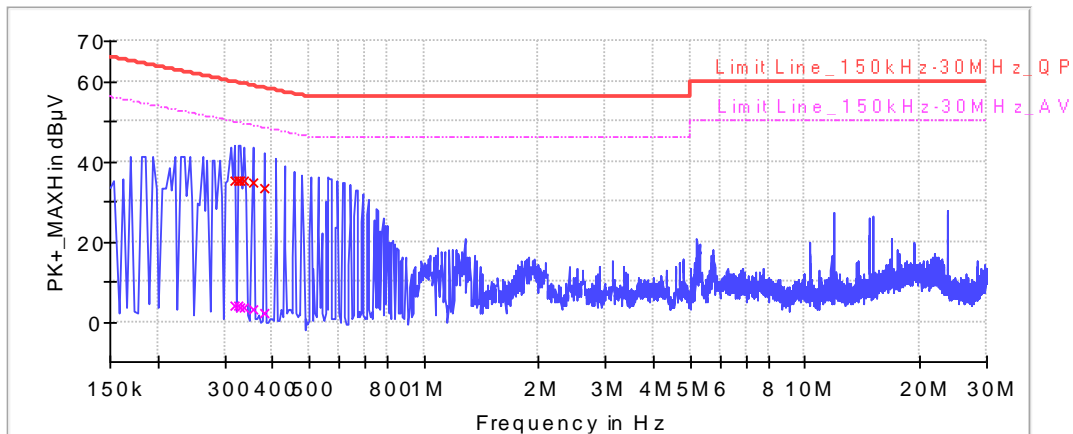
Tested on N



— PK+_MAXH
 - - - Limit Line_150kHz-30MHz_AV
 x Average
 — Limit Line_150kHz-30MHz_QP
 QuasiPeak

Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.342000	43.1	34.1	3.2	1000.0	9.000	46.0	49.2	25.1	59.2
0.350000	43.3	34.0	3.0	1000.0	9.000	46.0	49.0	25.0	59.0
0.362000	42.8	34.1	2.7	1000.0	9.000	46.0	48.7	24.5	58.7
0.386000	42.5	33.5	2.0	1000.0	9.000	46.2	48.1	24.6	58.1
0.390000	42.1	33.7	2.1	1000.0	9.000	45.9	48.1	24.3	58.1
0.398000	42.6	33.5	2.0	1000.0	9.000	45.9	47.9	24.4	57.9

Tested on L1

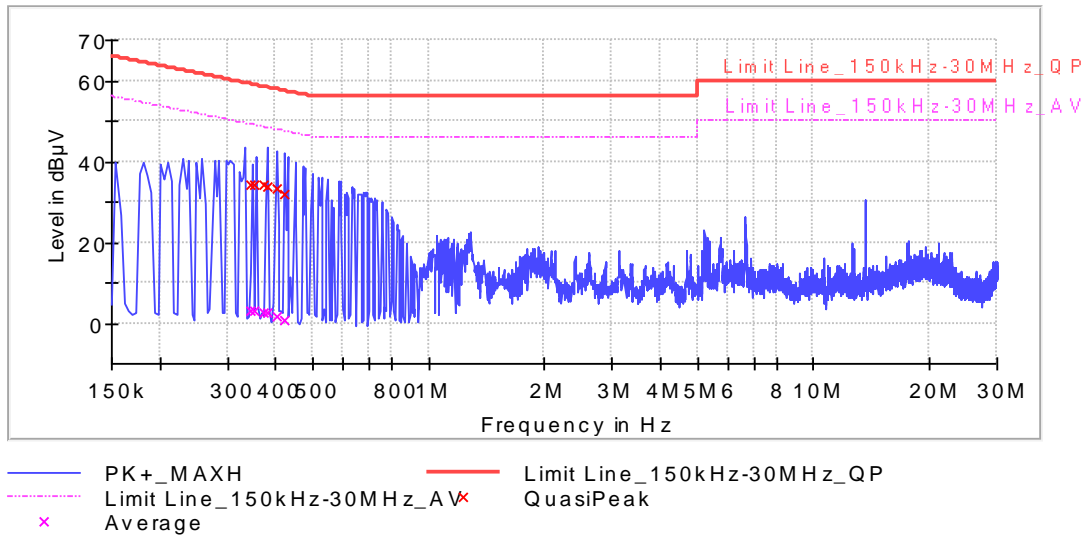


— PK+_MAXH
 - - - Limit Line_150kHz-30MHz_AV
 x Average
 — Limit Line_150kHz-30MHz_QP
 QuasiPeak

Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.318000	43.7	35.1	4.1	1000.0	9.000	45.7	49.8	24.7	59.8
0.326000	43.9	35.1	3.8	1000.0	9.000	45.8	49.6	24.5	59.6
0.330000	43.9	35.1	3.7	1000.0	9.000	45.7	49.5	24.4	59.5
0.338000	43.6	35.1	3.5	1000.0	9.000	45.7	49.3	24.2	59.3
0.358000	43.5	34.7	3.0	1000.0	9.000	45.7	48.8	24.1	58.8
0.382000	42.1	33.4	2.0	1000.0	9.000	46.2	48.2	24.8	58.2

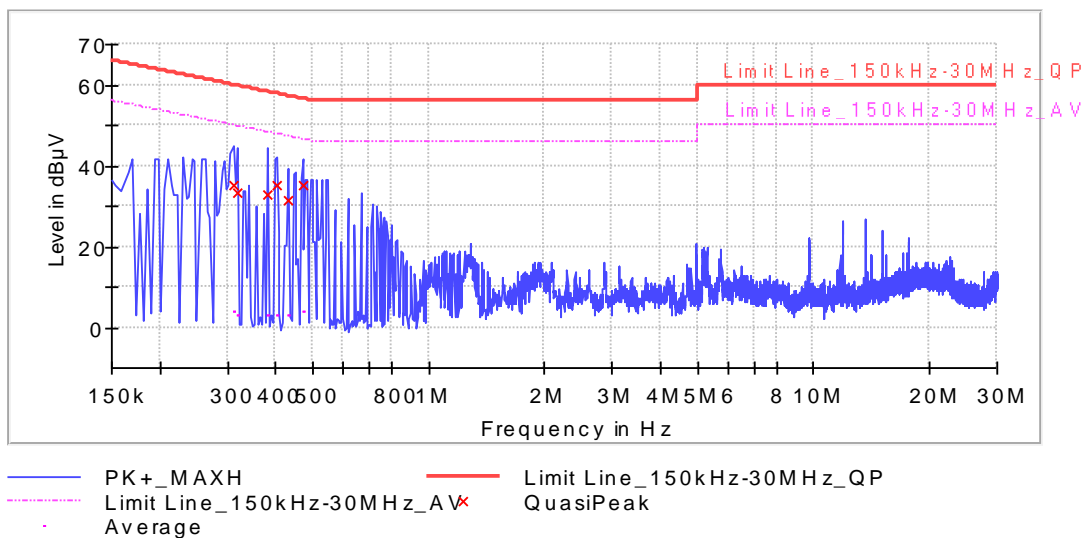
Transmitting 920 MHz and Bluetooth:

Tested on N



Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.350000	39.1	31.9	2.7	1000.0	9.000	46.4	49.0	27.2	59.0
0.358000	41.1	33.3	1.5	1000.0	9.000	47.4	48.8	25.6	58.8
0.382000	43.3	34.1	2.4	1000.0	9.000	45.8	48.2	24.1	58.2
0.402000	42.7	30.1	1.6	1000.0	9.000	46.2	47.8	27.7	57.8
0.422000	42.2	32.1	1.8	1000.0	9.000	45.6	47.4	25.3	57.4
0.430000	41.1	30.2	2.1	1000.0	9.000	45.2	47.3	27.1	57.3

Tested on L1



Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.310000	45.0	34.9	4.1	1000.0	9.000	45.9	50.0	25.1	60.0
0.318000	44.2	33.1	3.2	1000.0	9.000	46.6	49.8	26.7	59.8
0.382000	44.3	32.8	2.8	1000.0	9.000	45.6	48.2	25.4	58.2
0.402000	42.0	35.2	3.1	1000.0	9.000	45.7	47.8	24.2	57.8
0.430000	39.1	31.6	3.0	1000.0	9.000	44.3	47.3	25.7	57.3
0.470000	41.8	35.1	3.9	1000.0	9.000	42.6	46.5	21.4	56.5

Results

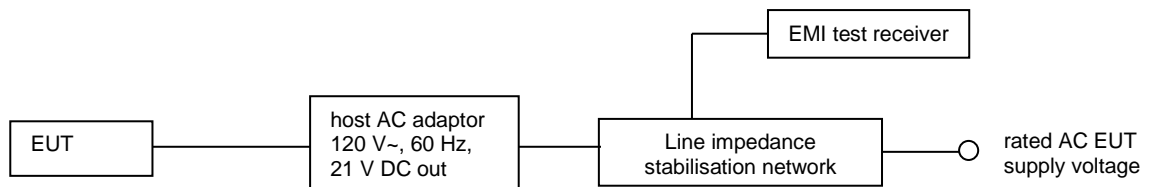
From the measurement data obtained, the tested sample was considered to have **COMPLIED** with the requirements for the conducted emission measurements.

Test equipment used:

Bezeichnung/ Kind of equipment	Hersteller/ Manufacturer	Typ/ Type	PKM-Ident-Nr./ PKM-ident no.
EMI-Test-Receiver	Rohde & Schwarz	ESR7	11505
Line impedance stabilisation network	Rohde&Schwarz	ESH2-Z5	10139
Shielded room	Siemens	(3,7 x 3,4 x 2,1) m (l x w x h) DC – 1 GHz	10111

All measurements were made with measuring instruments, including any accessories that may affect test results, calibrated according to the requests of ISO/IEC 17025 according to which the test site is accredited. Measurement of conducted emissions was made with instruments conforming to American National Standard Specification, ANSI C63.4-2009.

Block diagram



Measurement uncertainty

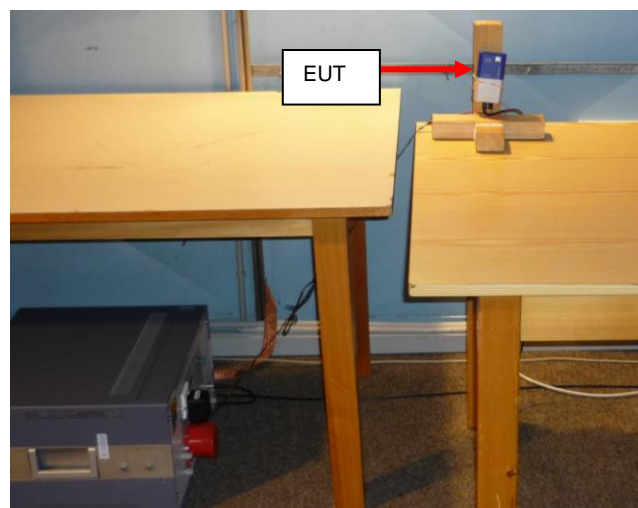
Parameter	PKM measurement uncertainty
Emissions conducted	±3.2 dB
Temperature	±0.72 °C
Humidity	±2.54 %
DC and low frequency voltages	±0.76 % (DC up to 40 V) ±1.74 % (AC 50 Hz/60 Hz up to 400 V)

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above mentioned way.

The measurements uncertainty was calculated in accordance with CISPR 16-4-2, NAMAS NIS 81: "The treatment of uncertainty in EMC measurement" and "Guide to the Expression of Uncertainty in Measurement (GUM)".

The measurement uncertainty was given with a confidence of 95 %.

Photo(s) of test setup



4. Radiated emission measurements

Test site

Measurement of radiated emissions from EUT was made in the semi-anechoic chamber that has been found in compliance with Federal Communications Commissions (FCC) requirements of 47CFR2.948 according to ANSI C63.10-2009, ANSI C63-4-2009 on March 11, 2015 and which comply with the requirements in CISPR 16-1-4:2007 referenced in CAN/CSA-CISPR 22-10.

Detector function selection and bandwidth

In radiated emissions measurement below or equal to 1000 MHz, a field strength meter that have CISPR quasi-peak was used, except for the frequency bands 9-90 kHz and 110-490 kHz. Radiated emission in these two bands are based on measurements employing an average detector, as well as in the frequency band above 1 GHz. The bandwidth of the detector of instrument was 9 kHz below 30 MHz, 120 kHz over the frequency range of 30 MHz to 1000 MHz and 1000 kHz above 1 GHz.

Antennas

Measurements were made using a calibrated active loop antenna in the range of 9 kHz to 30 MHz to determine the emission characteristics of the EUT. The EUT was rotated through the three orthogonal axes to find the position in which the EUT produces the highest emissions relative to the limits.

The horizontal distance between the receiving antenna and the EUT was 3 meters and the limit had been corrected accordingly by using the square of an inverse linear distance extrapolation factor (40 dB/decade) according to ANSI C63.10-2009 clause 5.3.2.

In the range of 30 to 1000 MHz the measurements were made using a calibrated bilog antenna to determine the emission characteristics of the EUT. Measurements were also made for both horizontal and vertical polarization.

The horizontal distance between the receiving antenna and the EUT was 3 meters and the limit had been corrected accordingly with 10 dB.

Measurements for frequencies above 1 GHz were made using a calibrated horn antenna to determine the emission characteristics of the EUT. Measurements were also made for both horizontal and vertical polarization.

The horizontal distance between the receiving antenna and the EUT was 3 meters

Frequency range to be scanned

For radiated emissions measurements, the spectrum in the range of 9 kHz to 10 GHz was investigated as the highest frequency generated is 921 MHz.

Test conditions and configuration of EUT

The EUT was configured and operated in the modes transmitting and receiving, so as to find the maximum radiated emission generated from EUT.

During test the EUT was battery operated with built-in battery pack. The EUT was placed on a 80 cm high non metallic 1 m diameter turntable. The EUT was rotated and the antenna height was varied between 1 m to 4 m to find the maximum RF energy generated from EUT.

The measurements above 1 GHz were repeated at the height of 150 cm according to the ANSI C63.10-2013 but no significant changes at the frequencies of interest were found.

Applied standards

47 CFR part 15 subpart B, § 15.109 Radiated limits

47 CFR part 15 subpart C, § 15.209 Radiated emission limits; general requirements

47 CFR part 15 subpart C, § 15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz

RSS-210 issue 8, clause 2.5 General Field Strength Limits

RSS-210 issue 8, Annex 2 Devices Operating in Frequency Bands for Any Application

RSS-Gen issue 4, clause 7.1 Receiver Emission Limits

RSS-Gen issue 4, clause 8.9 Transmitter Emission Limits for Licence-Exempt Radio Apparatus

ANSI C63.10-2009 / ANSI C63.10-2013, clause 5 General measurement and setup considerations

ANSI C63.10-2009 / ANSI C63.10-2013, clause 6.3 Radiated emissions testing—general requirements

ANSI C63.10-2009 / ANSI C63.10-2013, clause 6.4 Standard test method for radiated emissions from unlicensed wireless devices below 30 MHz

ANSI C63.10-2009 / ANSI C63.10-2013, clause 6.5 Standard test method for radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz

ANSI C63.10-2009 / ANSI C63.10-2013, clause 6.6 Standard test method for radiated emissions from unlicensed wireless devices above 1 GHz

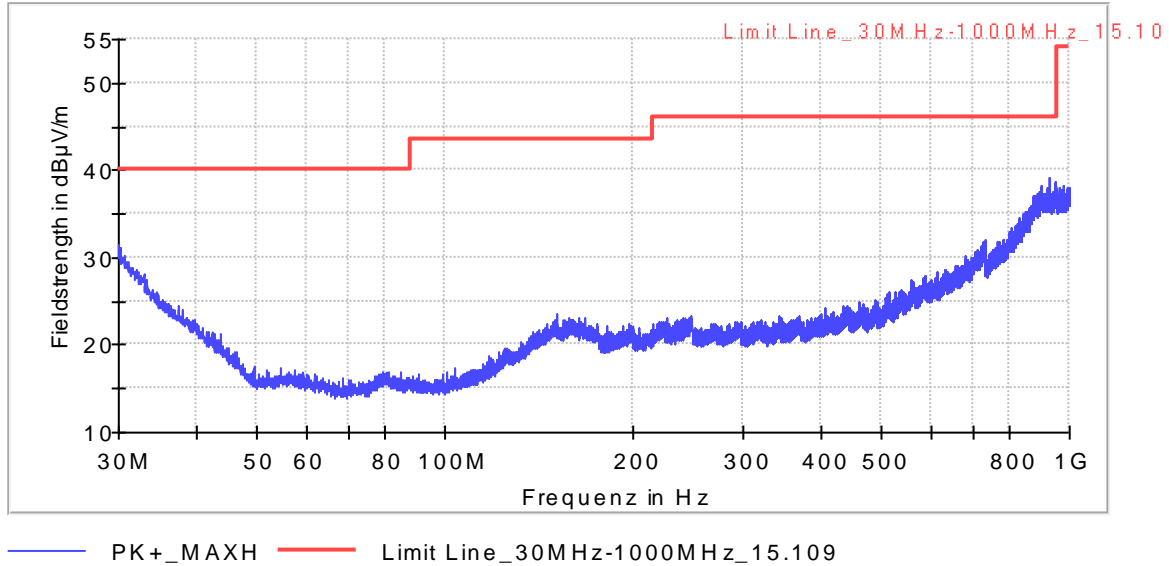
ANSI C63.10-2009, clause 6.10 Output power testing for certain unlicensed wireless devices

ANSI C63.10-2013, clause 11.9 Fundamental emission output power

Measurements

Receiving 919 MHz

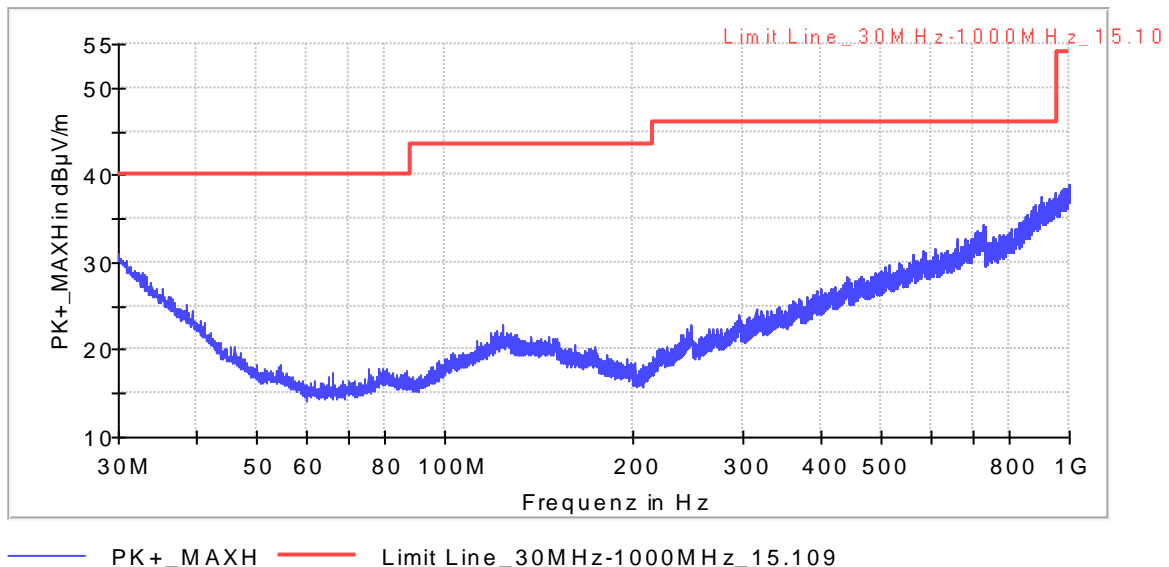
Radiated Emission - Horizontal



Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30-230	<34	--	1000.0	120.000	H	--	40.0
>230	<41	--	1000.0	120.000	H	--	47.0

No significant emission found above the noise threshold, all peak emissions at least or more than 6 dB below the Quasipeak limit.

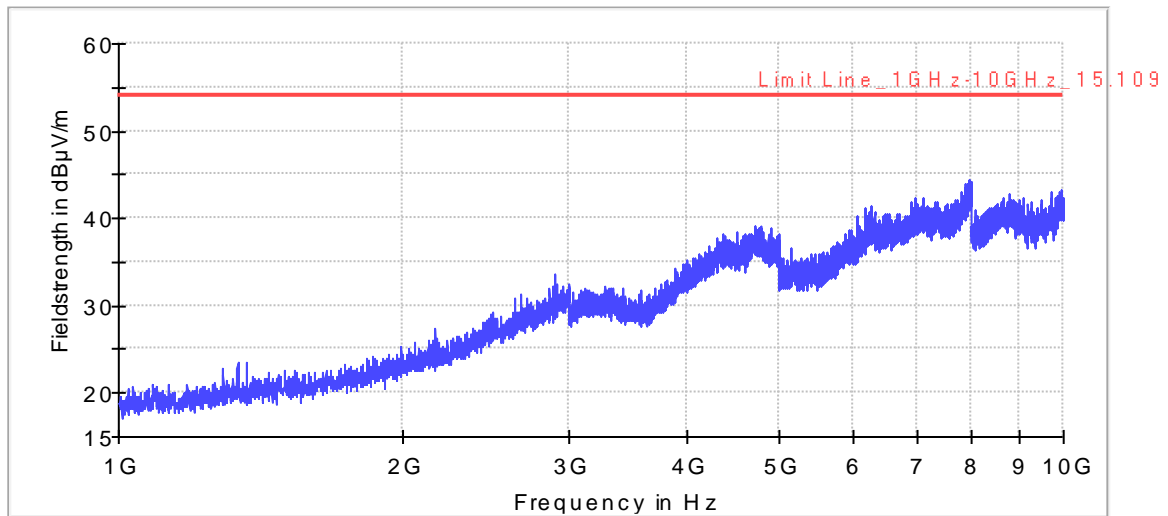
Radiated Emmission - Vertical



Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30-230	<34	--	1000.0	120.000	V	--	40.0
>230	<41	--	1000.0	120.000	V	--	47.0

No significant emission found above the noise threshold, all peak emissions at least or more than 6 dB below the Quasipeak limit.

Radiated vertical

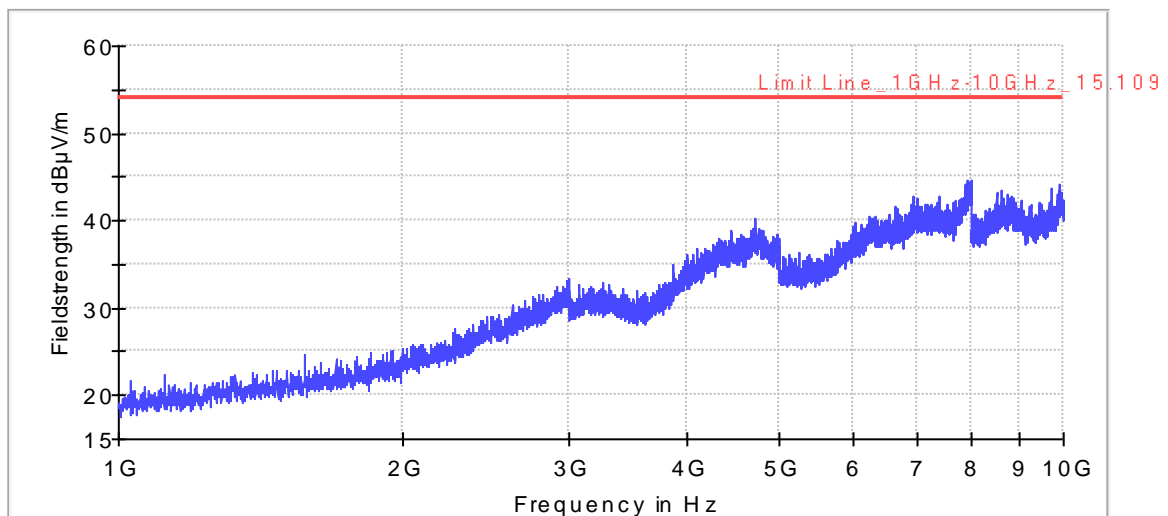


— PK+_MAXH — Limit Line_1GHz-10GHz_15.109

Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
>1000	<44.0	--	1000	--	54

No significant emission found above the noise threshold, all peak emissions at least or more than 6 dB below the average limit.

Radiated horizontal



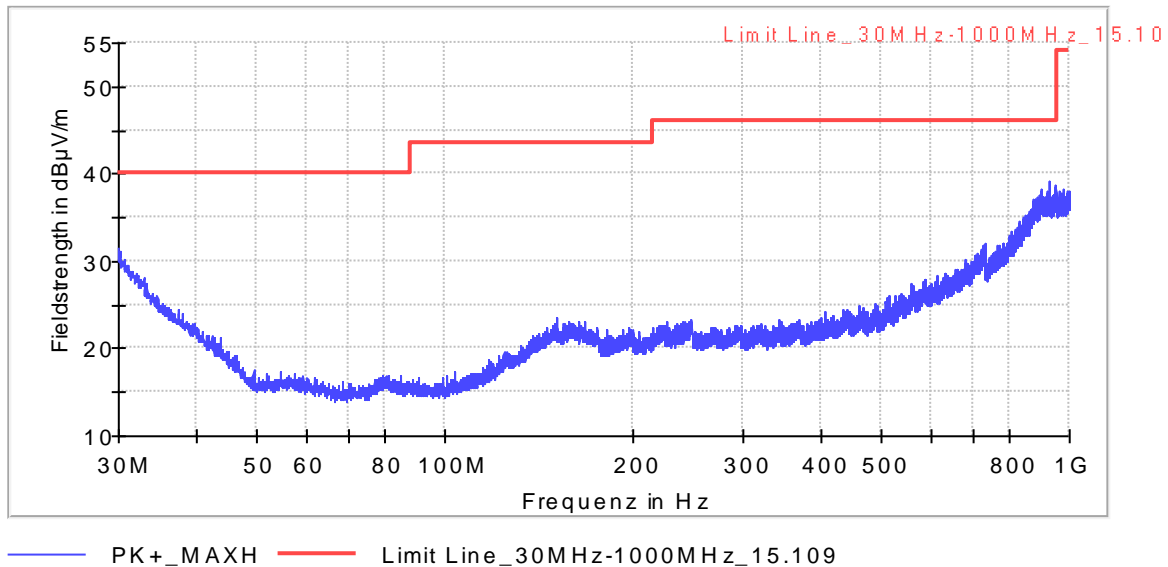
— PK+_MAXH — Limit Line_1GHz-10GHz_15.109

Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
>1000	<44.0	--	1000	--	54.0

No significant emission found above the noise threshold, all peak emissions at least or more than 6 dB below the average limit.

Receiving 920 MHz

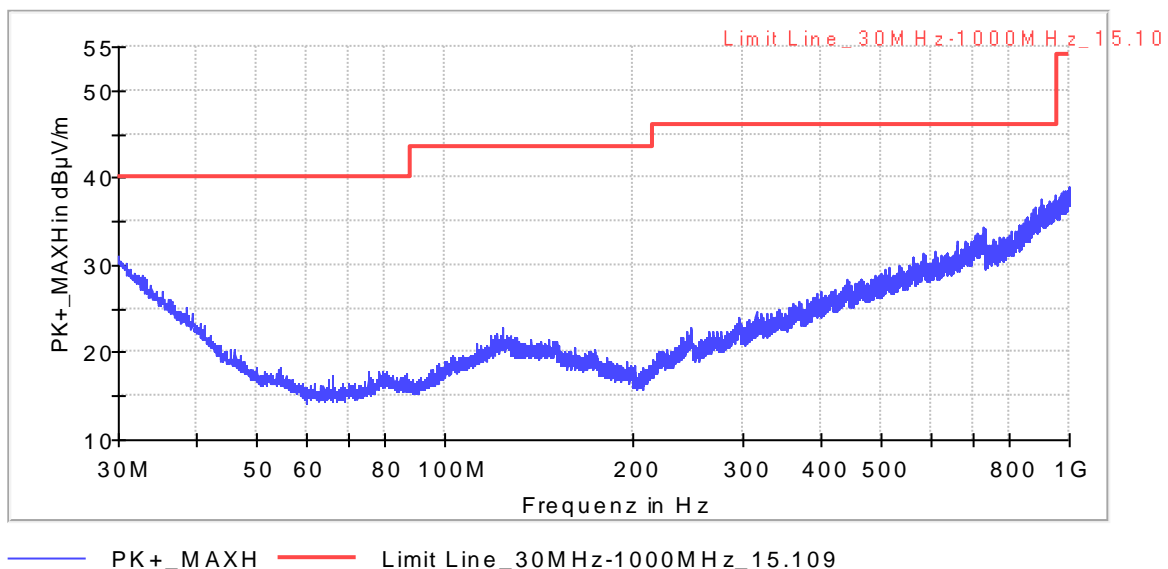
Radiated Emission - Horizontal



Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30-230	<34	--	1000.0	120.000	H	--	40.0
>230	<41	--	1000.0	120.000	H	--	47.0

No significant emission found above the noise threshold, all peak emissions at least or more than 6 dB below the Quasipeak limit.

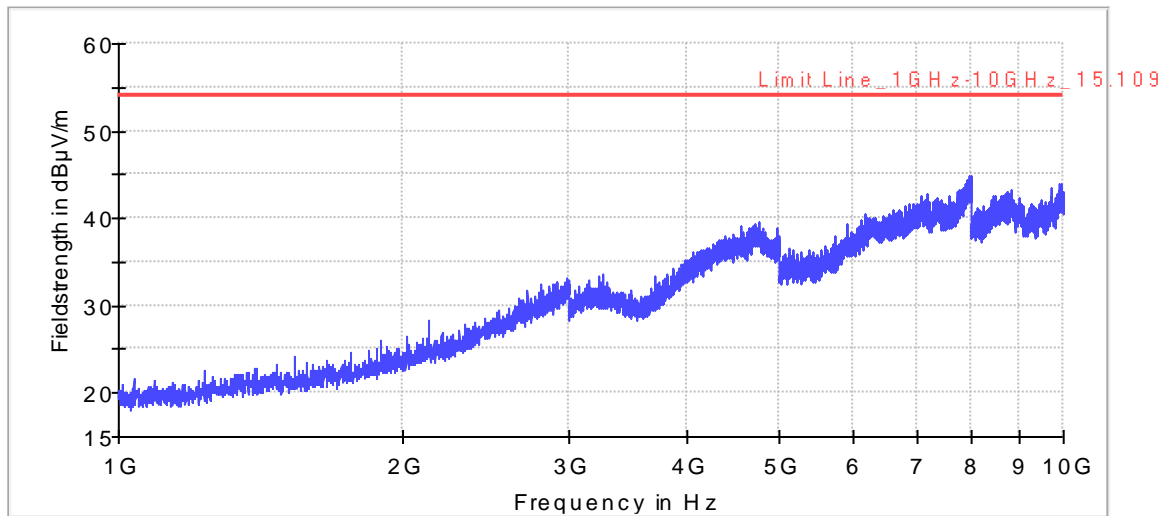
Radiated Emission - Vertical



Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30-230	<34	--	1000.0	120.000	V	--	40.0
>230	<41	--	1000.0	120.000	V	--	47.0

No significant emission found above the noise threshold, all peak emissions at least or more than 6 dB below the Quasipeak limit.

Radiated vertical

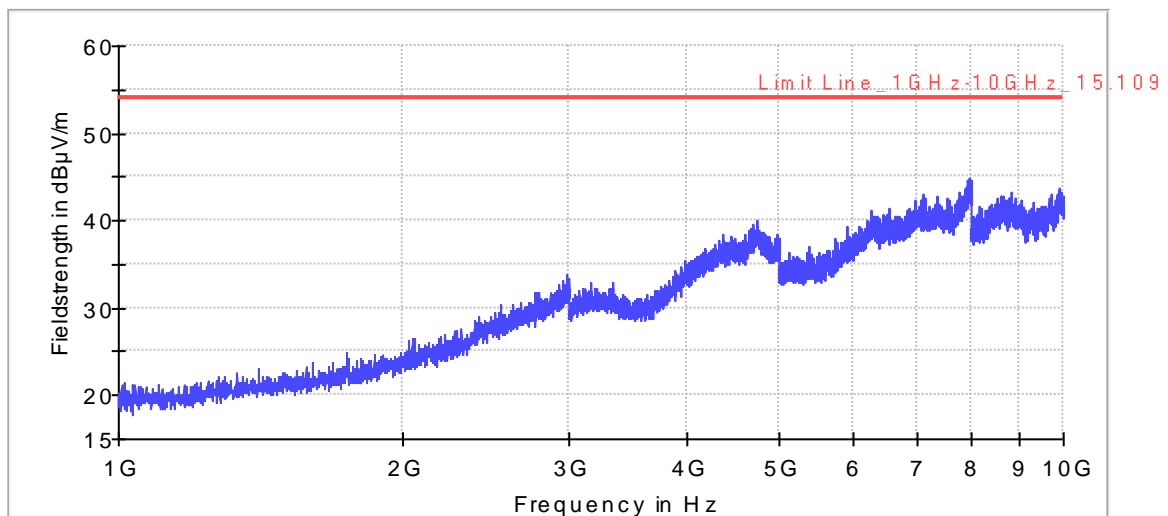


— PK+_MAXH — Limit Line_1GHz-10GHz_15.109

Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
>1000	<44.0	--	1000	--	54

No significant emission found above the noise threshold, all peak emissions at least or more than 6 dB below the average limit.

Radiated horizontal



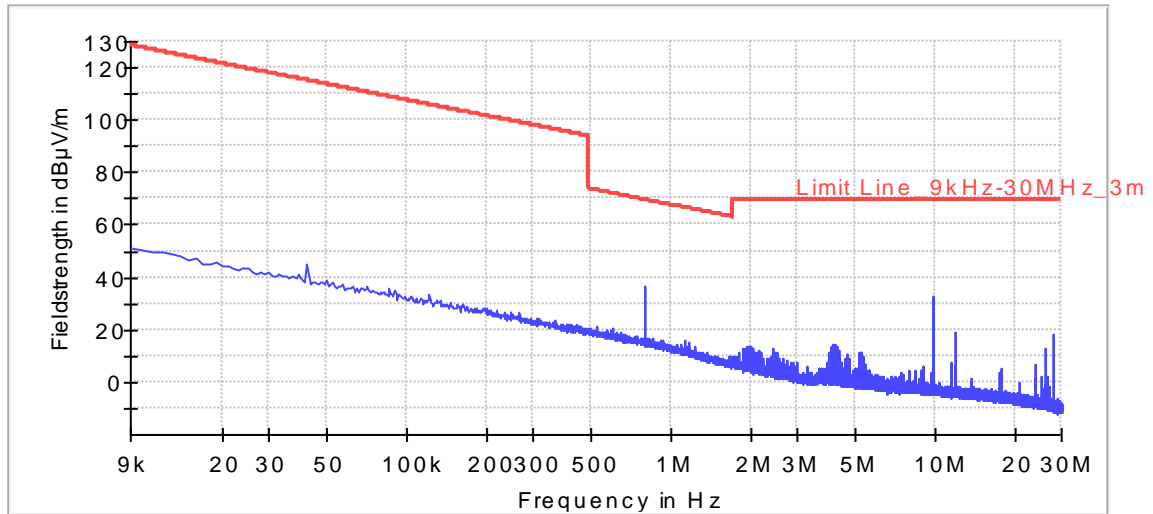
— PK+_MAXH — Limit Line_1GHz-10GHz_15.109

Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
>1000	<44.0	--	1000	--	54.0

No significant emission found above the noise threshold, all peak emissions at least or more than 6 dB below the average limit.

Transmitting 920MHz

Radiated_9kHz-30MHz

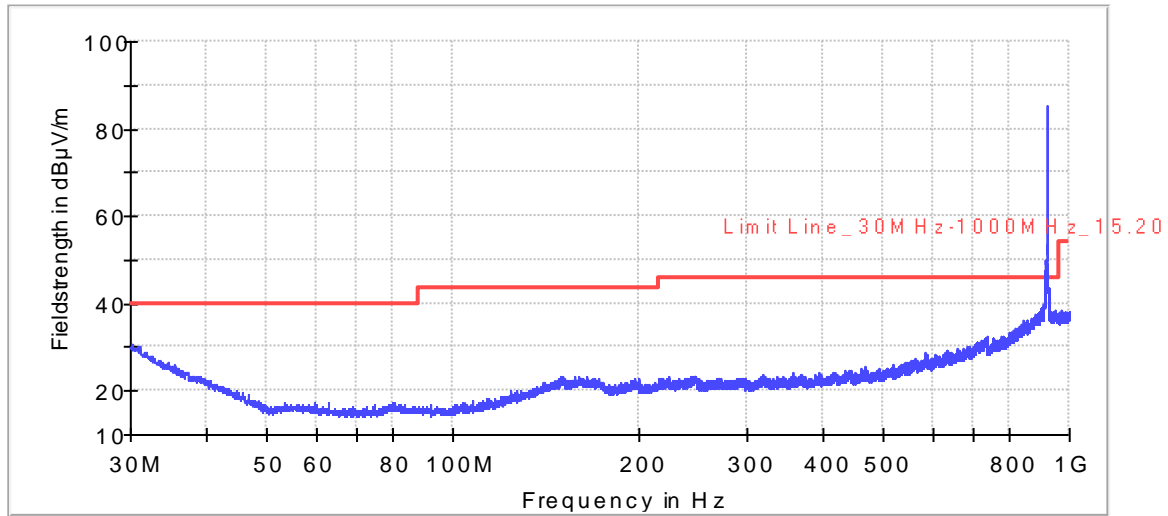


— Limit — PK+_MAXH-PK+

Frequency (MHz)	MaxPeak at 3 m (dBµV/m)	MaxPeak corrected (dBµV/m)	AVG (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Distance (m)
0.009-0.490	<80	<0	--	1000.0	9.000	--	67.6 - 20 x log(f [kHz])	300
0.490-1.705	<50	<10	--	1000.0	9.000	--	87.6 - 20 x log(f [kHz])	30
1.705-30	<50	<10	--	1000.0	9.000	--	29.5	30

No significant spurious emission found, all peak emissions at least or more than 10 dB below the Average limit.

Radiated horizontal

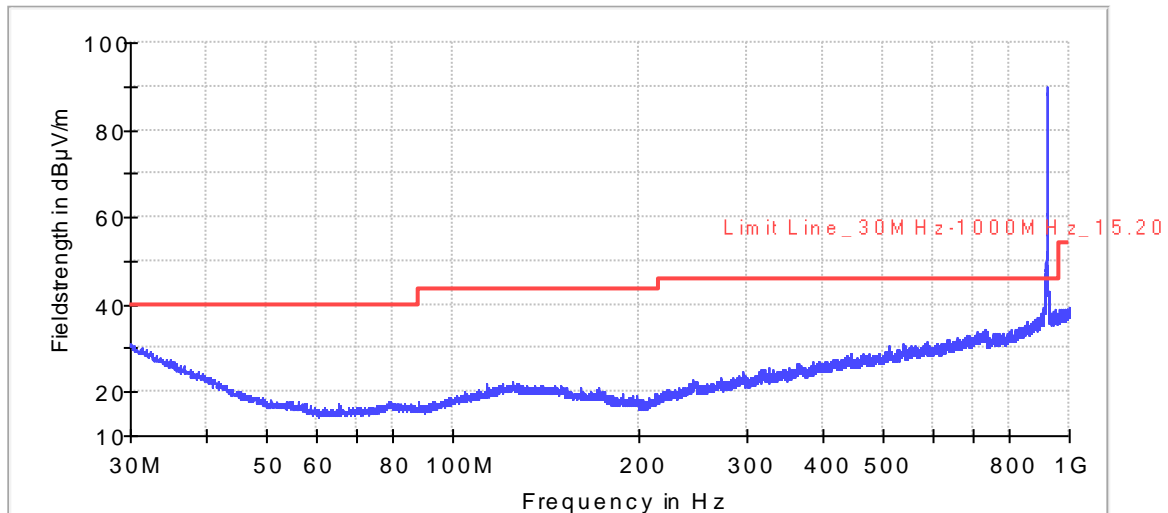


— Limit Line_30MHz-1000MHz_15.209 — PK+_MAXH-PK+

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30-88	<34	--	1000.0	120.000	H	--	40.0
88-216	<34	--	1000.0	120.000	H	--	43.5
216-902	<40	--	1000.0	120.000	H	--	46.0
920	86.1	85.8	1000.0	120.000	H	8.2	94.0
928-960	<40	--	1000.0	120.000	H	--	46.0
960-1000	<40	--	1000.0	120.000	H	--	54.0

No significant spurious emission (other than fundamental) found above the noise threshold, all peak emissions at least or more than 6 dB below the Quasipeak limit.

Radiated vertical

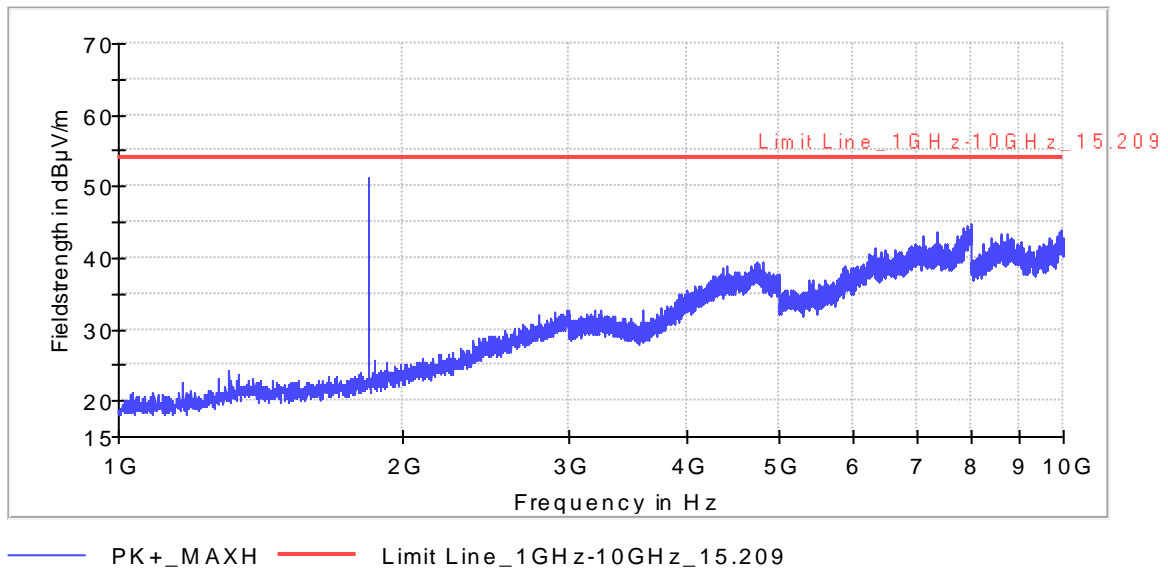


— PK+_MAXH-PK+ — Limit Line_30MHz-1000MHz_15.209

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30-88	<34	--	1000.0	120.000	V	--	40.0
88-216	<34	--	1000.0	120.000	V	--	43.5
216-902	<40	--	1000.0	120.000	V	--	46.0
920	90.4	90.2	1000.0	120.000	V	3.8	94.0
928-960	<40	--	1000.0	120.000	V	--	46.0
960-1000	<40	--	1000.0	120.000	V	--	54.0

No significant spurious emission (other than fundamental) found above the noise threshold, all peak emissions at least or more than 6 dB below the Quasipeak limit.

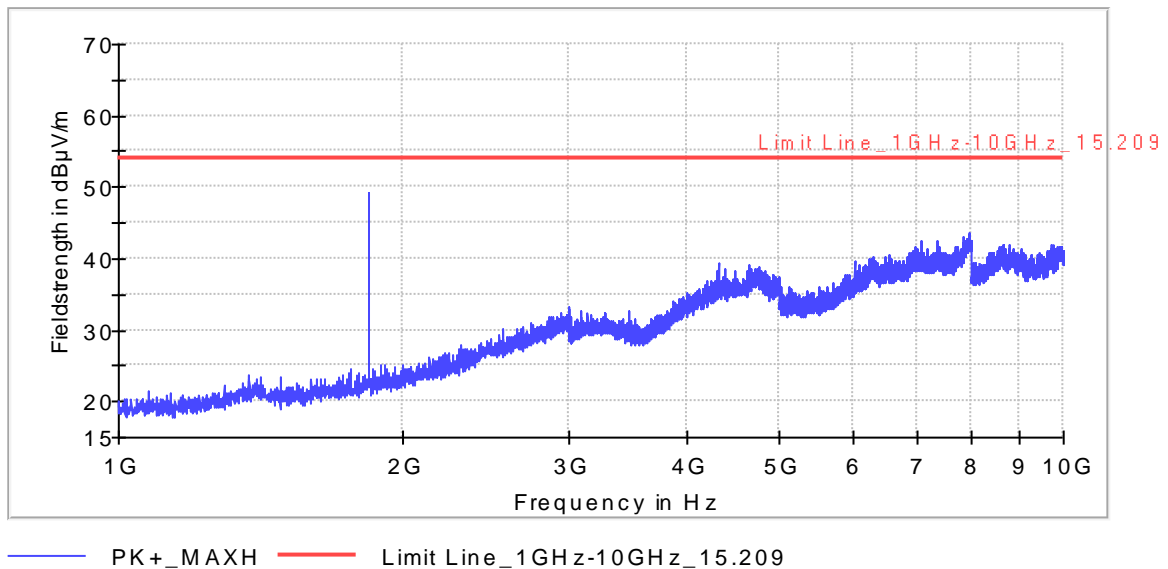
Radiated vertical



Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
>1000	<44.0	--	1000	--	54.0
1840	52.1	51.2	1000	2.8	54.0

No significant emission found (other than harmonics) above the noise threshold, all peak emissions at least or more than 6 dB below the average limit.

Radiated horizontal

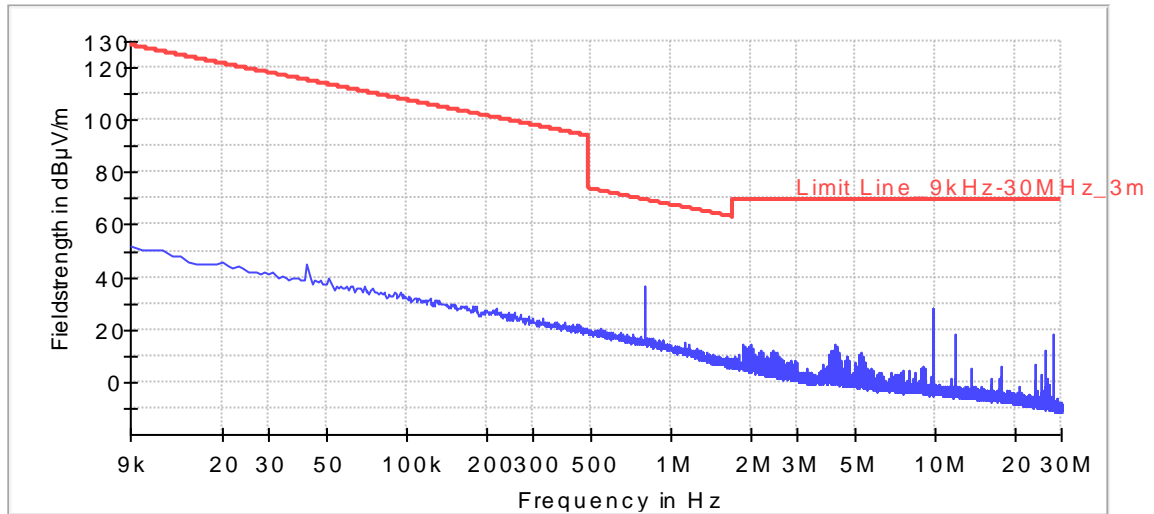


Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
>1000	<44.0	--	1000	--	54.0
1840	48.8	48.1	1000	5.9	54.0

No significant emission found (other than harmonics) above the noise threshold, all peak emissions at least or more than 6 dB below the average limit.

Transmitting 921MHz

Radiated_9kHz-30MHz

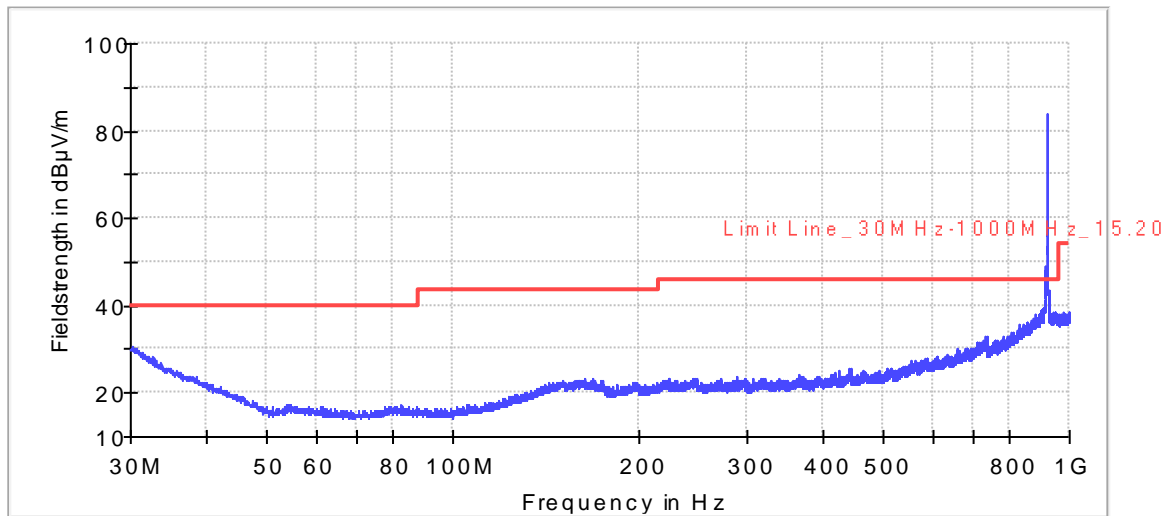


— Limit — PK+_MAXH-PK+

Frequency (MHz)	MaxPeak at 3 m (dBµV/m)	MaxPeak corrected (dBµV/m)	AVG (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Distance (m)
0.009-0.490	<80	<0	--	1000.0	9.000	--	67.6 - 20 x log(f [kHz])	300
0.490-1.705	<50	<10	--	1000.0	9.000	--	87.6 - 20 x log(f [kHz])	30
1.705-30	<50	<10	--	1000.0	9.000	--	29.5	30

No significant spurious emission found, all peak emissions at least or more than 10 dB below the Average limit.

Radiated horizontal

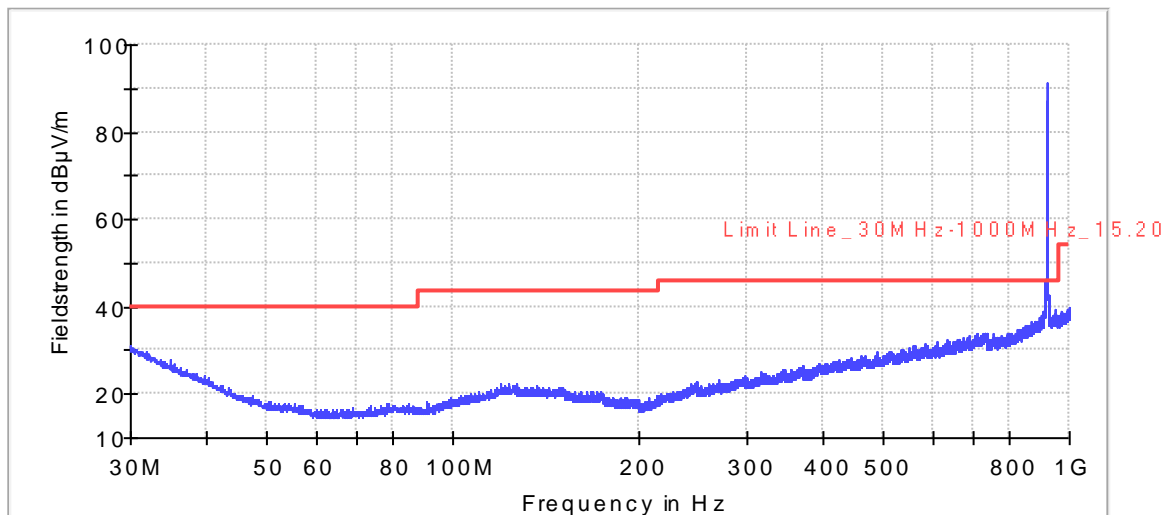


— PK+_MAXH-PK+ — Limit Line_30MHz-1000MHz_15.209

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30-88	<34	--	1000.0	120.000	H	--	40.0
88-216	<34	--	1000.0	120.000	H	--	43.5
216-902	<40	--	1000.0	120.000	H	--	46.0
921	86.2	85.9	1000.0	120.000	H	8.1	94.0
928-960	<40	--	1000.0	120.000	H	--	46.0
960-1000	<40	--	1000.0	120.000	H	--	54.0

No significant spurious emission (other than fundamental) found above the noise threshold, all peak emissions at least or more than 6 dB below the Quasipeak limit.

Radiated vertical

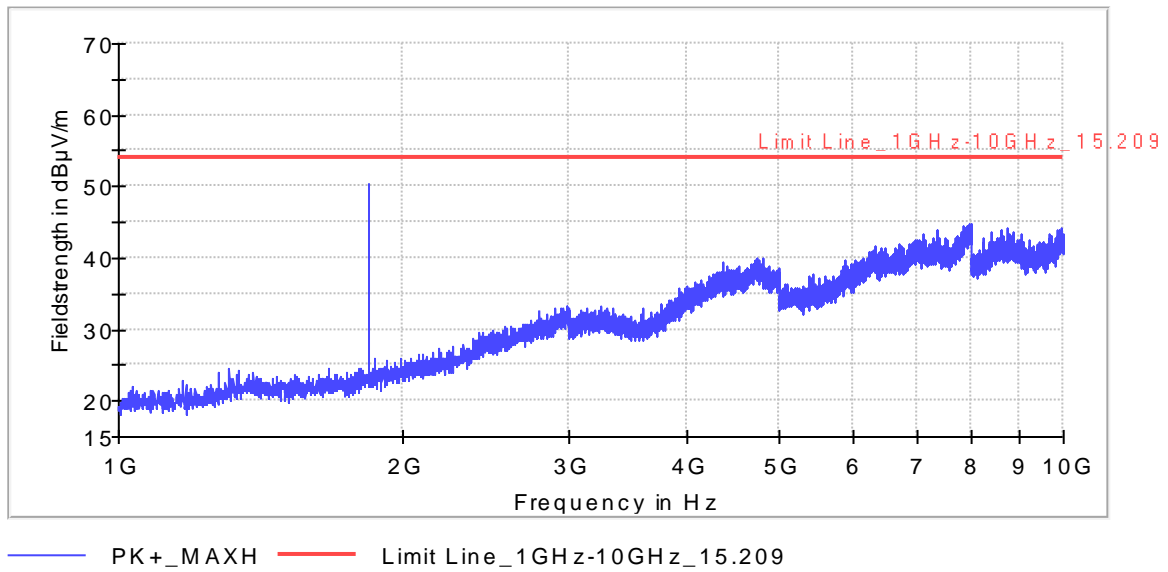


— PK+_MAXH-PK+ — Limit Line_30MHz-1000MHz_15.209

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30-88	<34	--	1000.0	120.000	V	--	40.0
88-216	<34	--	1000.0	120.000	V	--	43.5
216-902	<40	--	1000.0	120.000	V	--	46.0
921	90.6	90.3	1000.0	120.000	H	3.7	94.0
928-960	<40	--	1000.0	120.000	V	--	46.0
960-1000	<40	--	1000.0	120.000	V	--	54.0

No significant spurious emission (other than fundamental) found above the noise threshold, all peak emissions at least or more than 6 dB below the Quasipeak limit.

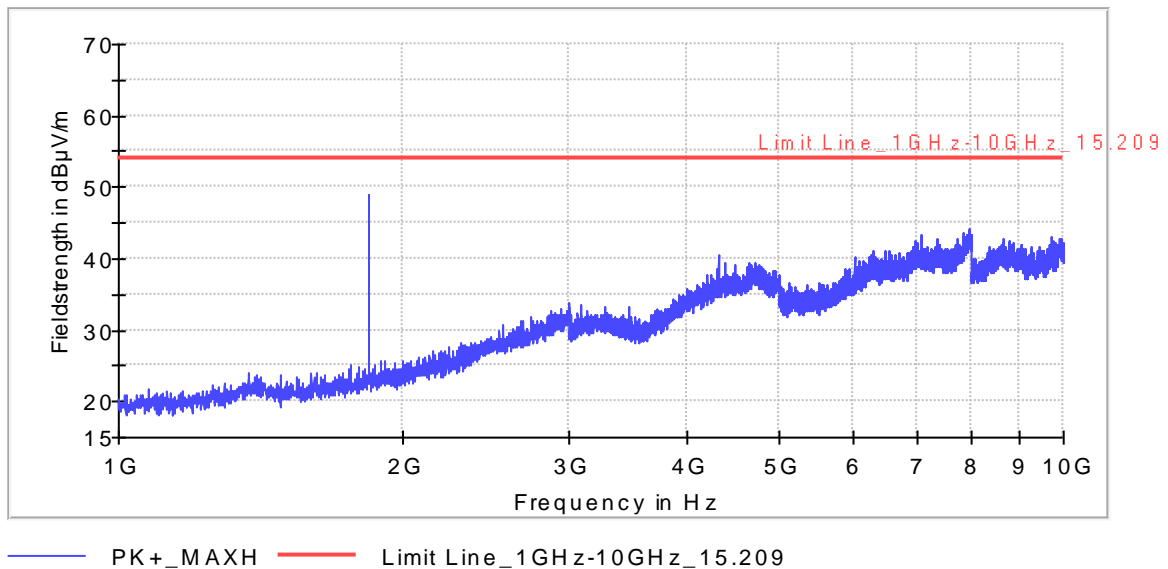
Radiated vertical



Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
>1000	<44.0	--	1000	--	54.0
1842	50.2	49.8	1000	4.2	54.0

No significant emission found (other than harmonics) above the noise threshold, all peak emissions at least or more than 6 dB below the average limit.

Radiated horizontal

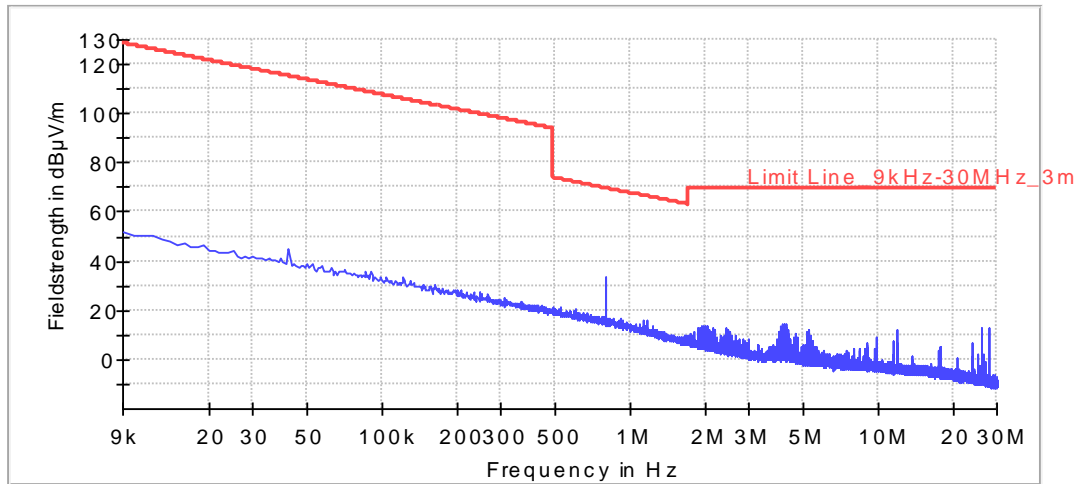


Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
>1000	<44.0	--	1000	--	54.0
1842	48.4	46.9	1000	7.1	54.0

No significant emission found (other than harmonics) above the noise threshold, all peak emissions at least or more than 6 dB below the average limit.

Transmitting 920MHz and Bluetooth:

Radiated_9kHz-30MHz

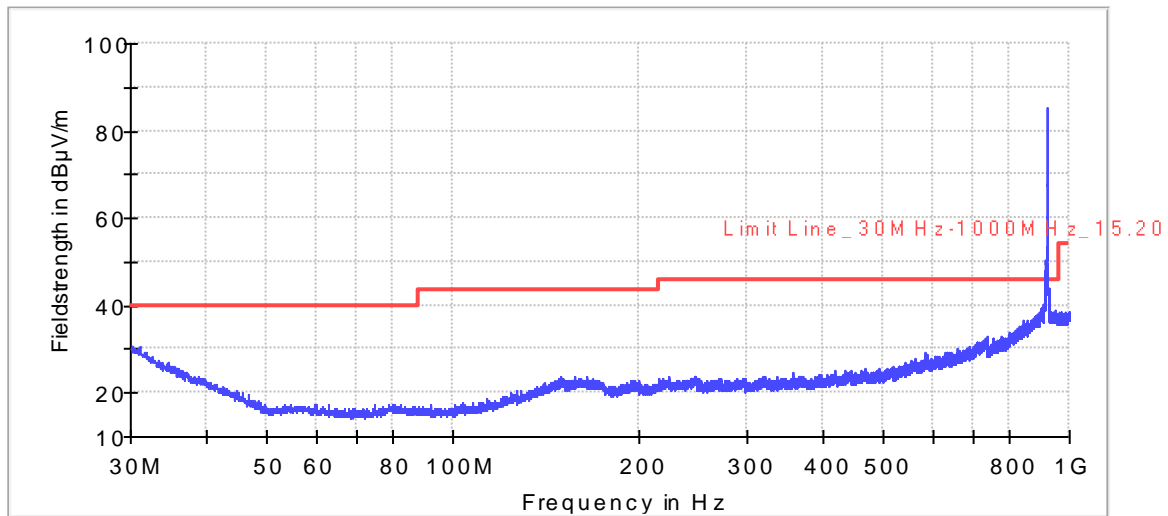


— Limit — PK+_MAXH-PK+

Frequency (MHz)	MaxPeak at 3 m (dBµV/m)	MaxPeak corrected (dBµV/m)	AVG (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Distance (m)
0.009-0.490	<80	<0	--	1000.0	9.000	--	67.6 - 20 x log(f [kHz])	300
0.490-1.705	<50	<10	--	1000.0	9.000	--	87.6 - 20 x log(f [kHz])	30
1.705-30	<50	<10	--	1000.0	9.000	--	29.5	30

No significant spurious emission found, all peak emissions at least or more than 10 dB below the Average limit.

Radiated horizontal

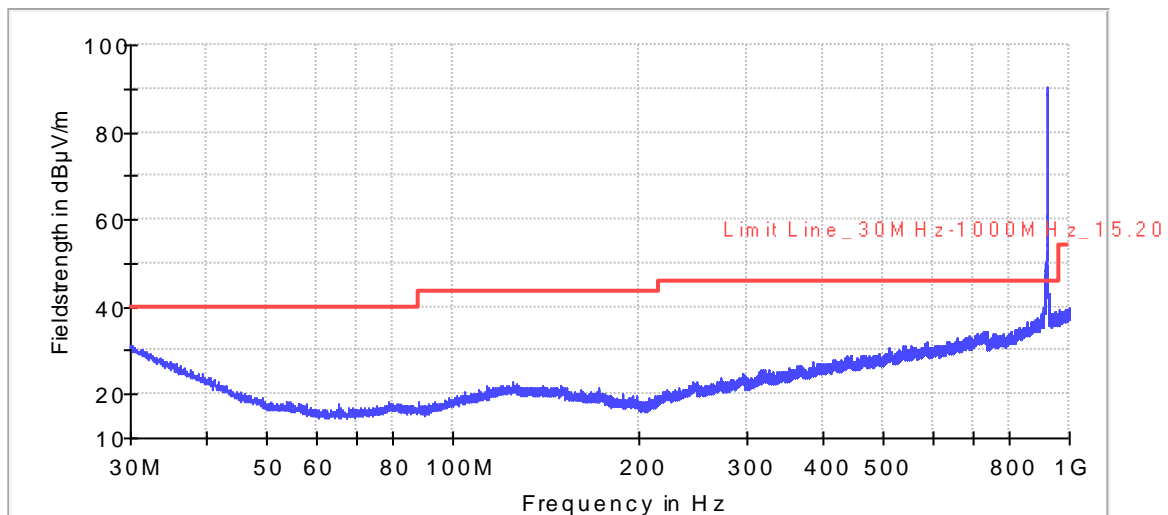


— Limit Line_30MHz-1000MHz_15.209 — PK+_MAXH-PK+

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30-88	<34	--	1000.0	120.000	H	--	40.0
88-216	<34	--	1000.0	120.000	H	--	43.5
216-902	<40	--	1000.0	120.000	H	--	46.0
920	86.1	85.8	1000.0	120.000	H	8.2	94.0
928-960	<40	--	1000.0	120.000	H	--	46.0
960-1000	<40	--	1000.0	120.000	H	--	54.0

No significant spurious emission (other than fundamental) found above the noise threshold, all peak emissions at least or more than 6 dB below the Quasipeak limit.

Radiated vertical

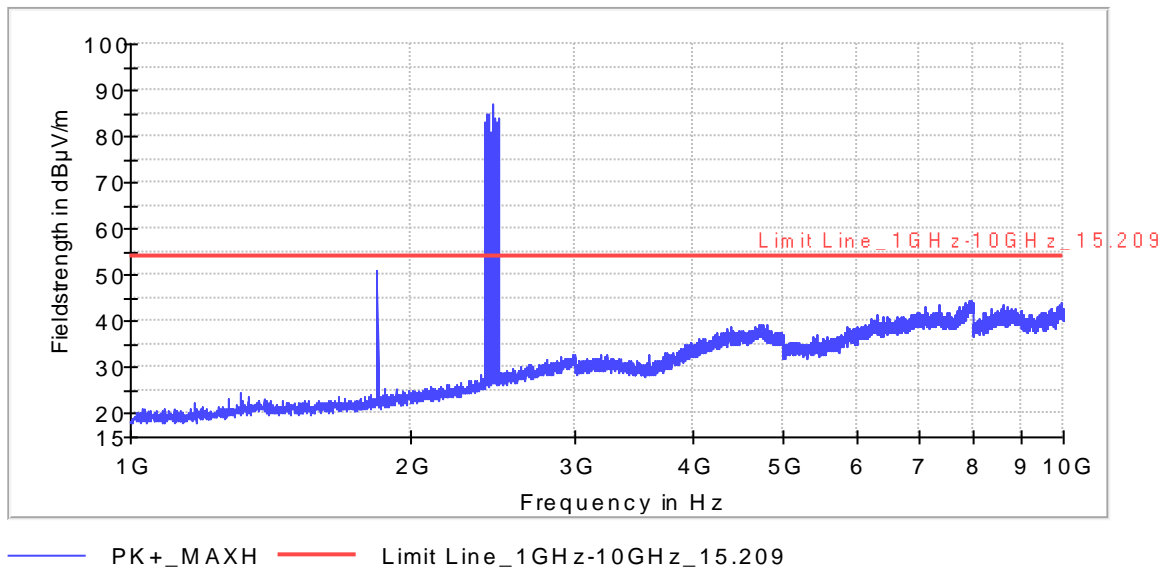


— PK+_MAXH-PK+ — Limit Line_30MHz-1000MHz_15.209

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30-88	<34	--	1000.0	120.000	V	--	40.0
88-216	<34	--	1000.0	120.000	V	--	43.5
216-902	<40	--	1000.0	120.000	V	--	46.0
920	90.4	90.2	1000.0	120.000	V	3.8	94.0
928-960	<40	--	1000.0	120.000	V	--	46.0
960-1000	<40	--	1000.0	120.000	V	--	54.0

No significant spurious emission (other than fundamental) found above the noise threshold, all peak emissions at least or more than 6 dB below the Quasipeak limit.

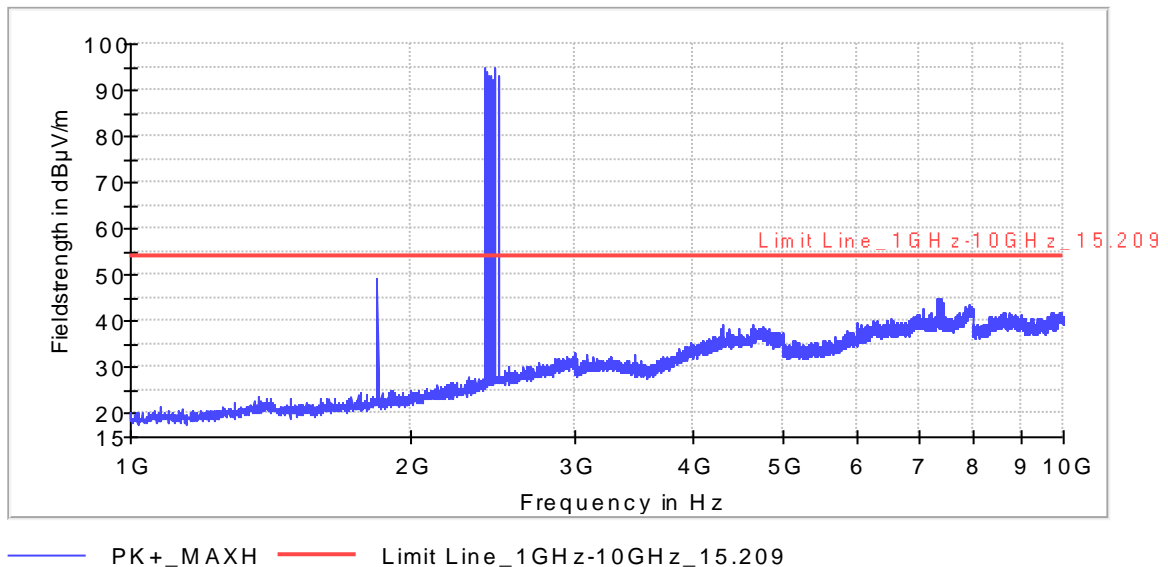
Radiated vertical



Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1000 - 2400	<44.0	--	1000	--	54.0
1840	52.1	51.0	1000	3.0	54.0
2483.5 - 25000	<48.0	--	1000	--	54.0

No significant emission found (other than harmonics) above the noise threshold, all peak emissions at least or more than 6 dB below the average limit.

Radiated horizontal



Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1000 - 2400	<44.0	--	1000	--	54.0
1840	48.8	48.3	1000	5.7	54.0
2483.5 - 25000	<48.0	--	1000	--	54.0

No significant emission found (other than harmonics) above the noise threshold, all peak emissions at least or more than 6 dB below the average limit.

Results

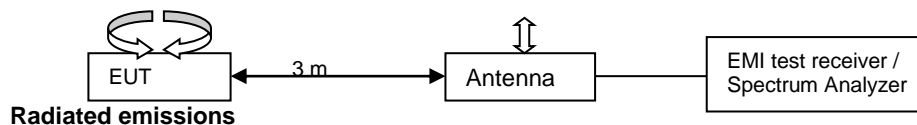
From the measurement data obtained, the tested sample was considered to have COMPLIED with the requirements for the radiated emission measurements.

Test equipment used:

Bezeichnung/ Kind of equipment	Hersteller/ Manufacturer	Typ/ Type	PKM-Ident-Nr./ PKM-ident no.
EMI-Test-Receiver	Rohde & Schwarz	ESR7	11505
Spectrum analyzer	Rohde & Schwarz	FSW26	11571
Antenna	EMCO	6502	10546
Antenna	Schaffner	CBL6111C	10977
Antenna	Electro Metric	RGA50/60	10273
Antenna	FMI	2024-25	10017
Broadband-Preamplifier 1-18 GHz	Schwarzbeck	BBV9718	11231
Antenna mast system	Schwarzbeck	AM9104	10099
Shielded room	Siemens	Semi-Anechoic-Chamber (13 x 10 x 5,1) m (l x w x h)	10114
Turntable	Heinrich Deisel	DT312	10774
AC-linefilter	Timonta	FV2-10-D	10755

All measurements were made with measuring instruments, including any accessories that may affect test results, calibrated according to the requests of ISO/IEC 17025 according to which the test site is accredited. Measurement of radiated emissions was made with instruments conforming to American National Standard Specification, ANSI C63.4-2009.

Block diagram



Measurement uncertainty

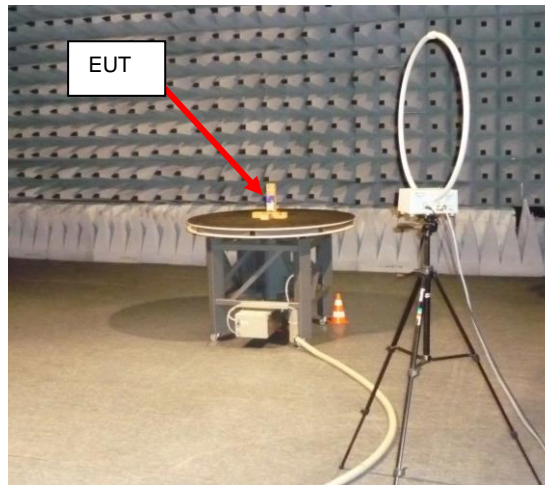
Parameter	PKM measurement uncertainty
Emissions radiated	±4.2 dB
Temperature	±0.72 °C
Humidity	±2.54 %
DC and low frequency voltages	±0.76 % (DC up to 40 V) ±1.74 % (AC 50 Hz/60 Hz up to 400 V)

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above mentioned way.

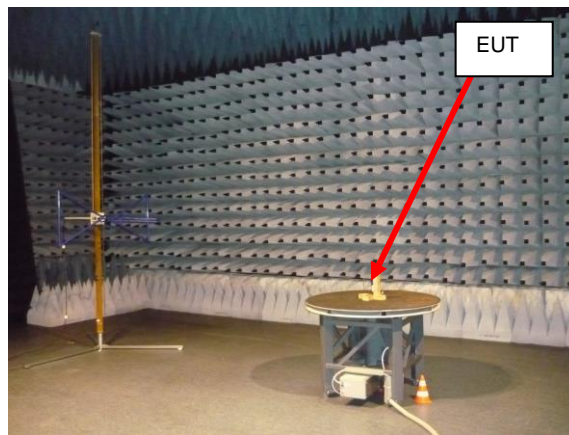
The measurements uncertainty was calculated in accordance with CISPR 16-4-2, NAMAS NIS 81: "The treatment of uncertainty in EMC measurement" and "Guide to the Expression of Uncertainty in Measurement (GUM)".

The measurement uncertainty was given with a confidence of 95 %.

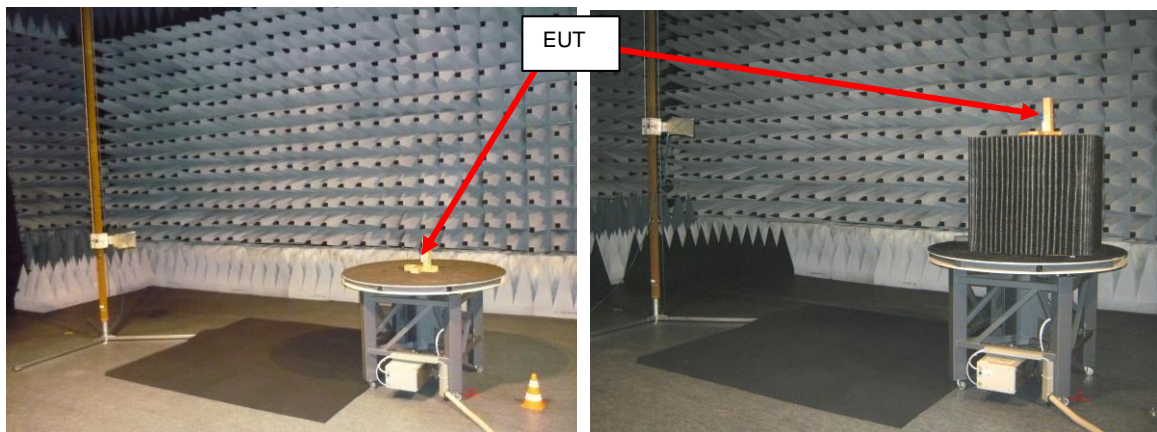
Photo(s) of test setup



frequency range 9 kHz – 30 MHz



frequency range 30 MHz – 1000 MHz



ANSI C63.10-2009 (height = 80cm)

ANSI C63.10-2013 (height = 150cm)

frequencies above 1 GHz

5. Bandwidth

5.1 Occupied bandwidth

Test description

The occupied bandwidth is measured as the 99% emission bandwidth, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Detector function selection and bandwidth

The measurement was performed with a peak detector with max hold function.

The span of the analyzer was set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) was in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) was 3x RBW.

Test conditions and configuration of EUT

The EUT was configured and operated in the mode transmitting with maximum carrier power. During test the EUT was battery operated with built-in battery pack.

Applied standards

47 CFR part 15 subpart C, § 2.202 Bandwidths

RSS-Gen issue 4, clause 6.6 Occupied Bandwidth

ANSI C63.10-2009, clause 6.9 Occupied bandwidth and band-edge tests

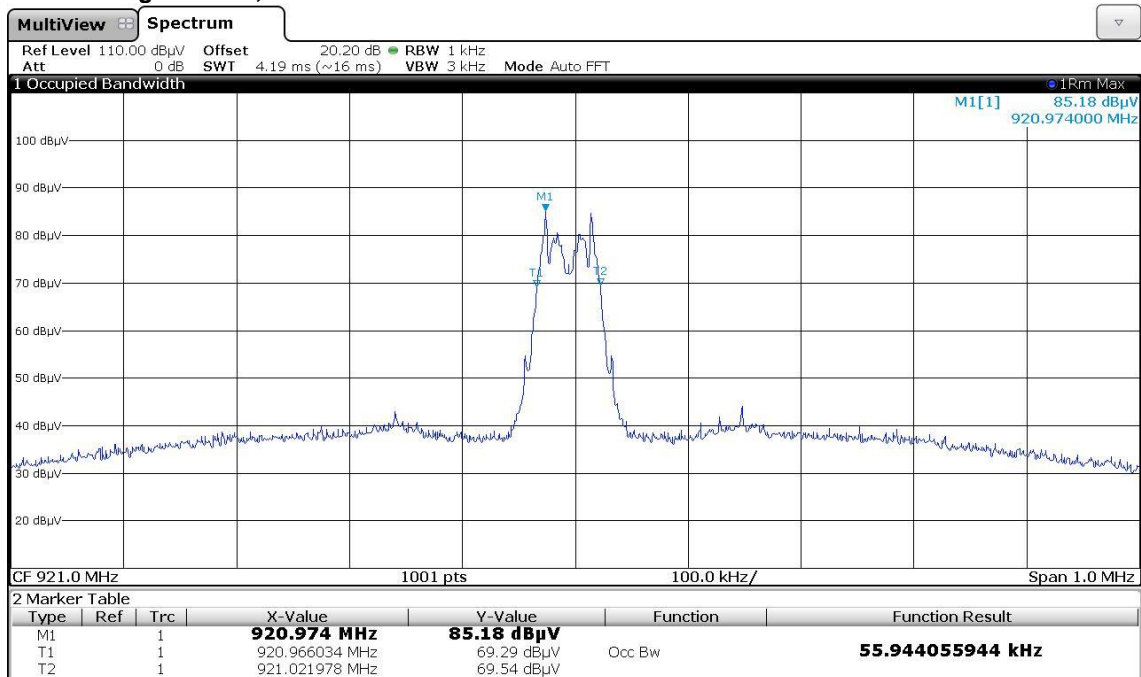
ANSI C63.10-2013, clause 6.9 Occupied bandwidth tests



Transmitting 920 MHz, 115200bit/s



Transmitting 921 MHz, 19200bit/s



5.2 Bandwidth of the Emission

Test description

The 20 dB bandwidth of the emission is measured as the frequency range defined by the points that are 20 dB down to the maximum level of the modulated carrier.

For intentional radiators operating under the alternative provisions to the general emission limits the requirements to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Detector function selection and bandwidth

The measurement was performed with a peak detector with max hold function.

The resolution bandwidth (RBW) was 10 kHz and video bandwidth (VBW) was 3x RBW.

Test conditions and configuration of EUT

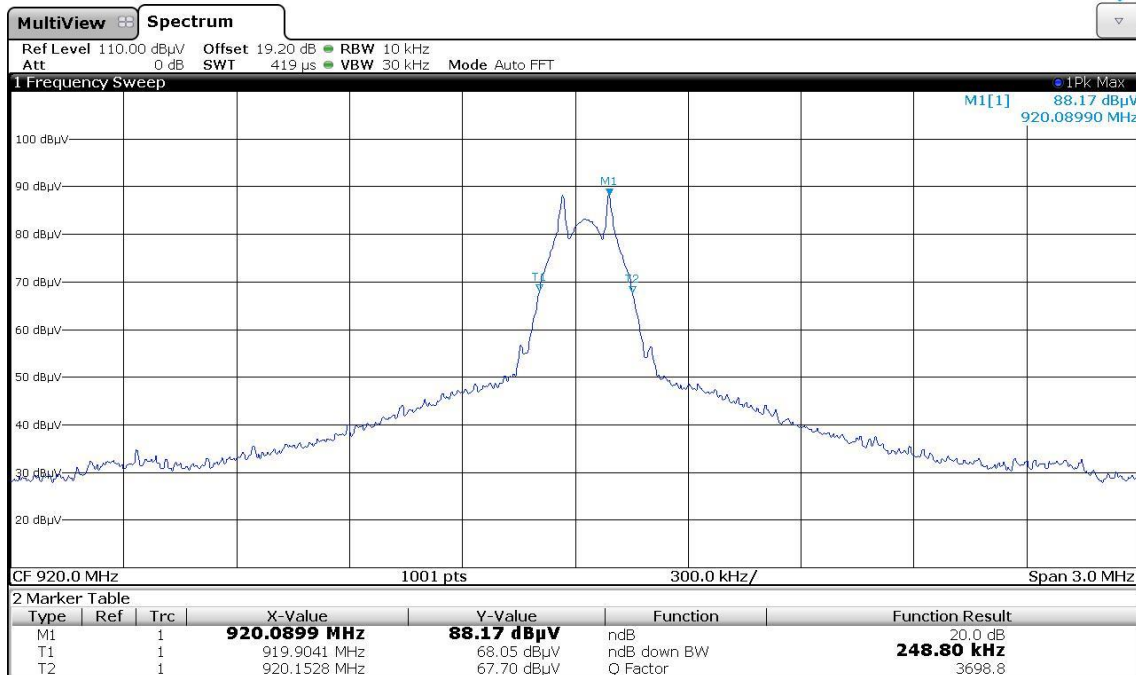
The EUT was configured and operated in the mode transmitting with maximum carrier power. During test the EUT was battery operated with built-in battery pack.

Applied standards

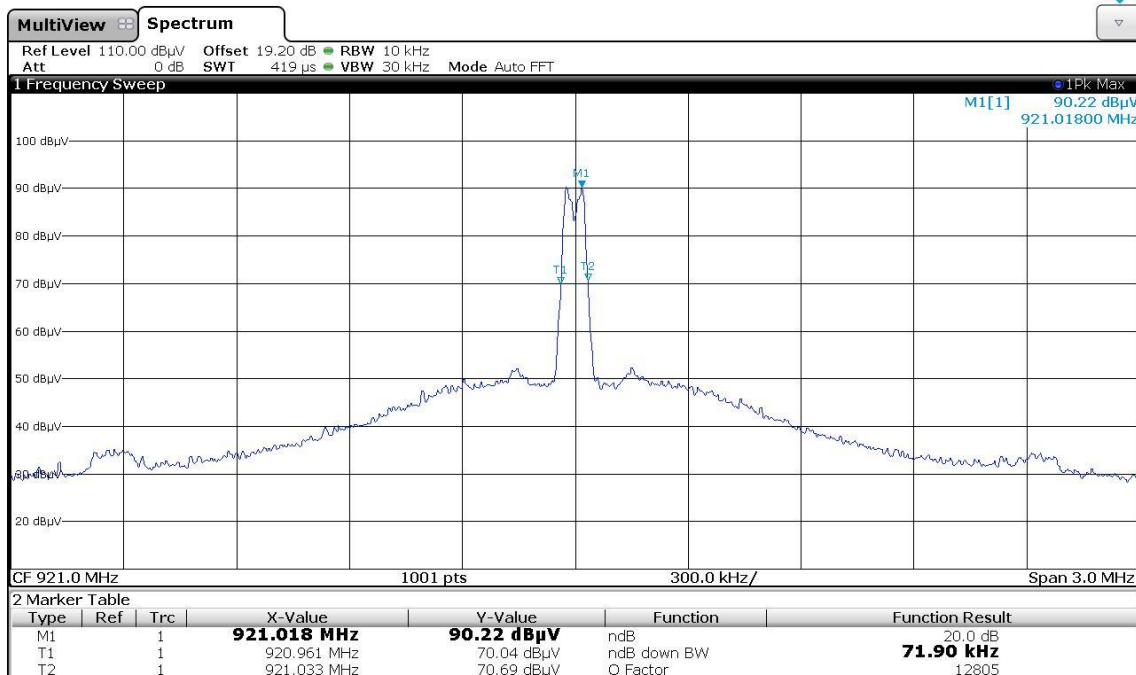
47 CFR part 15 subpart C, § 15.215 Additional provisions to the general radiated emission limitations



Transmitting 920 MHz, 115200bit/s



Transmitting 921 MHz, 19200bit/s



Results

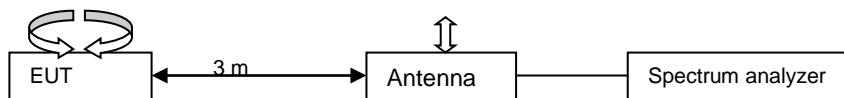
From the measurement data obtained, the tested sample was considered to have **COMPLIED** with the requirements for the bandwidth measurements.

Test equipment used:

Bezeichnung/ Kind of equipment	Hersteller/ Manufacturer	Typ/ Type	PKM-Ident-Nr./ PKM-ident no.
Spectrum analyzer	Rohde & Schwarz	FSW 26	11571
Antenna	Schaffner	CBL6111C	10977
Antenna mast system	Schwarzbeck	AM9104	10099
Shielded room	Siemens	Semi-Anechoic-Chamber (13 x 10 x 5,1) m (l x w x h)	10114
Turntable	Heinrich Deisel	DT312	10774
AC-linefilter	Timonta	FV2-10-D	10755

All measurements were made with measuring instruments, including any accessories that may affect test results, calibrated according to the requests of ISO/IEC 17025 according to which the test site is accredited. Measurement of radiated emissions was made with instruments conforming to American National Standard Specification, ANSI C63.4-2009.

Block diagram



Measurement uncertainty

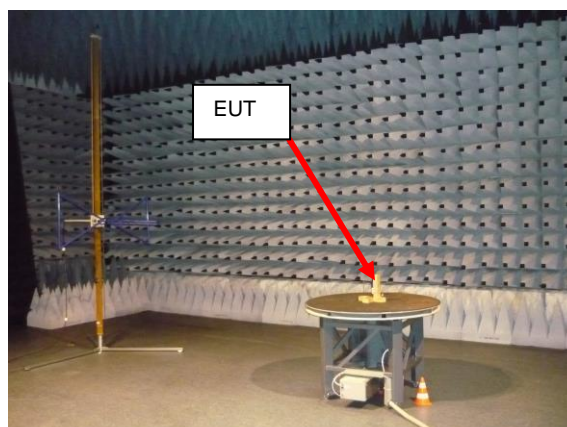
Parameter	PKM measurement uncertainty
Emissions radiated	±4.2 dB
Temperature	±0.72 °C
Humidity	±2.54 %
DC and low frequency voltages	±0.76 % (DC up to 40 V) ±1.74 % (AC 50 Hz/60 Hz up to 400 V)

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above mentioned way.

The measurements uncertainty was calculated in accordance with CISPR 16-4-2, NAMAS NIS 81: "The treatment of uncertainty in EMC measurement" and "Guide to the Expression of Uncertainty in Measurement (GUM)".

The measurement uncertainty was given with a confidence of 95 %.

Photo(s) of test setup





6. CONCLUSIONS

From the measurement data obtained, the tested sample was considered to have **COMPLIED** with the requirements for the relevant clauses of Federal Communications Commission Rules for unintentional radiators 47 CFR part 15 subpart B

- § 15.107 Conducted limits, class B
- § 15.109 Radiated limits, class B


and for intentional radiators 47 CFR subpart C

- § 15.207 Conducted limits
- § 15.209 Radiated emission limits; general requirements
- § 15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz

From the measurement data obtained, the tested sample was considered to have **COMPLIED** with the requirements for the relevant clauses of Canadian RSS-210, issue 8, December 2010 and RSS-Gen, issue 4, November 2014.



electronic GmbH

a member of the STC 

June 18, 2015

Erstellt am/prepared on

W. Eckereder, Laboratory Engineer

(Name/name / Stellung/position)



(Unterschrift/signature)

June 18, 2015

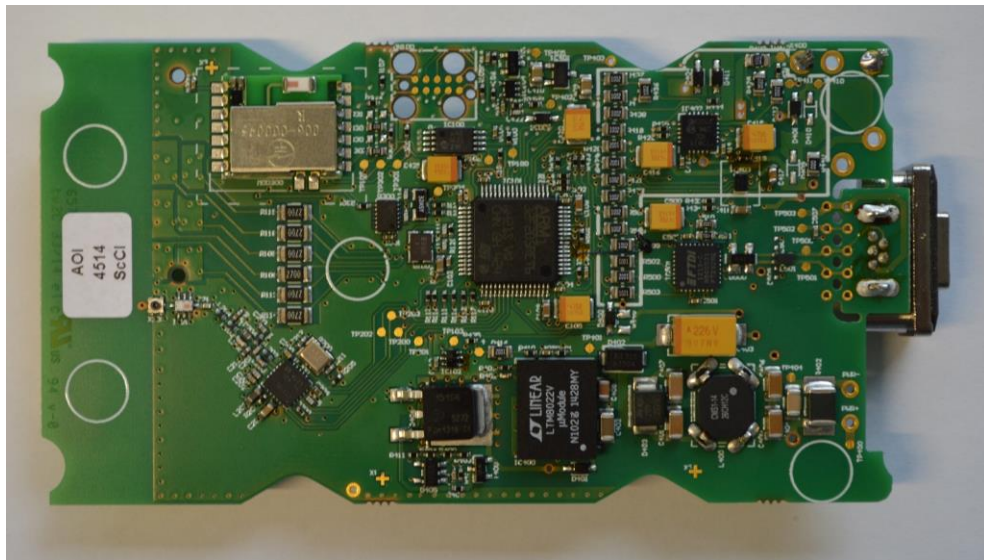
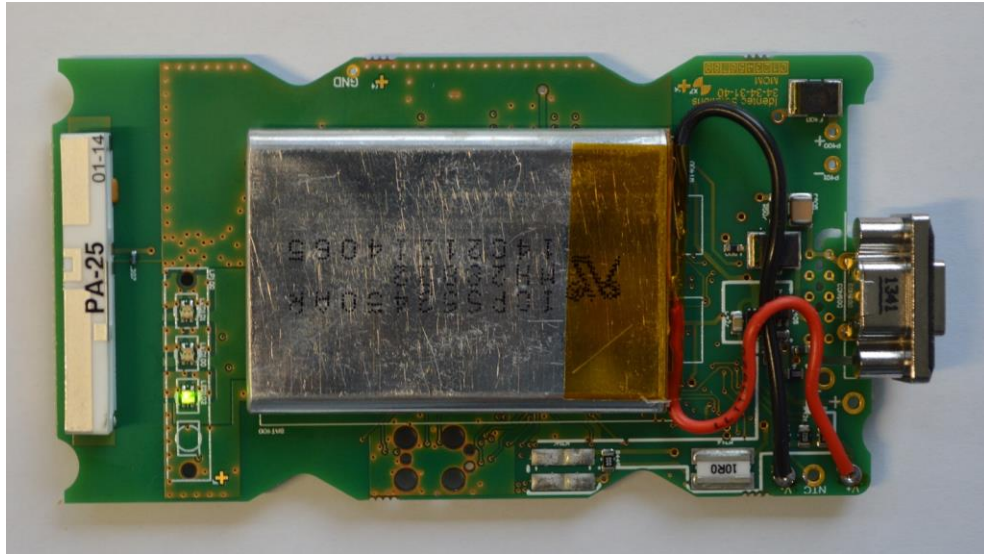
Freigabe am/released on

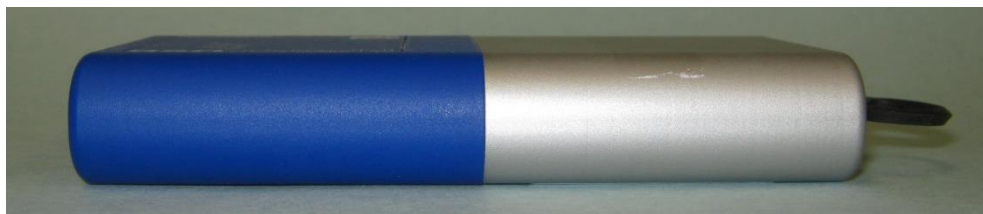
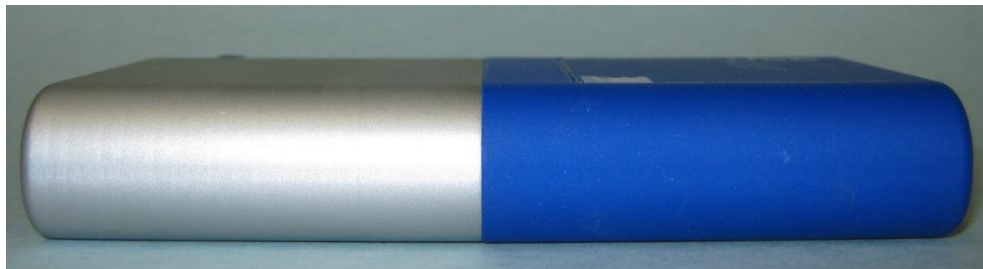
G. Raithel Dipl.-Ing. (FH), Head of Laboratory

(Name/name / Stellung/position)


(Unterschrift/signature)

7. Photos





End of test report