

FCC ID: SR5-17100040

# EMI – TEST REPORT

- FCC Part 15.247 -

<b>Test Report No. :</b>	<b>T36852-00-00HU</b>	20. June 2013
		Date of issue

**Type / Model Name** : Data logger

**Product Description** : Floor identification system – Fidbox V.5

**Applicant** : B&M TRICON GmbH

**Address** : Rautenweg 37

A – 1220 Wien

**Manufacturer** : B&M TRICON GmbH

**Address** : Rautenweg 37

A – 1220 Wien

**Licence holder** : B&M TRICON GmbH

**Address** : Rautenweg 37

A – 1220 Wien

<b>Test Result</b> according to the standards listed in clause 1 test standards:	<b>POSITIVE</b>
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The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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## 1 TEST STANDARDS

The tests were performed according to following standards:

### **FCC Rules and Regulations Part 15, Subpart A - General (October, 2012)**

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

### **FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2012)**

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

### **FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969**

Part 1, Subpart I, Section 1.1310	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1093	Radiofrequency radiation exposure evaluation: portable device

### **OET Bulletin 65, 65A, 65B, 65C Edition 97-01, August 1997 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.**

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C95.1:1992	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005 EN 55022: 2006	Information technology equipment

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## 2 SUMMARY

### GENERAL REMARKS:

The software of the test sample was modified, so the sample was in operation mode as soon the battery contact was closed.

The complete tests were performed with an original sample. The EuT has no external antenna connector. All tests were performed radiated.

The EuT works with a fixed output power.

The EuT is declared as Class B digital device.

### FINAL ASSESSMENT:

The equipment under test **fulfills** the EMC requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 21. May 2013

Testing concluded on : 29. May 2013

Checked by:

Tested by:

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Klaus Gegenfurtner  
Dipl. Ing.(FH)  
Manager: Radio Group

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Markus Huber

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### 3 EQUIPMENT UNDER TEST

#### 3.1 Photo documentation of the EUT – Detailed photos see attachment A1

#### 3.2 Power supply system utilised

Power supply voltage : 3.0 V / DC Lithium Cell

#### 3.3 Short description of the equipment under test (EUT)

The Datalogger system is a floor identification system which measure temperature and humidity between the upper side of the floor pavement and the undersurface of the floor covering. The device is sealed into the pavement and internal supplied from a Lithium battery.

Number of tested samples: 2  
Serial number: Prototype

#### EUT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- TX mode at CH 1 (2426.00 MHz)

- RX mode at CH 1 (2426.00 MHz)

-

#### EUT configuration:

The following peripheral devices and interface cables were connected during the measurements:

- _____	Model : _____
- _____	Model : _____
- _____	Model : _____
- _____	Model : _____
- _____	Model : _____
- _____	Model : _____

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## 4 TEST ENVIRONMENT

### 4.1 Address of the test laboratory

**mikes-testingpartners gmbh**  
**Ohmstrasse 2-4**  
**94342 STRASSKIRCHEN**  
**GERMANY**

### 4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

### 4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners gmbh, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component diversity and modifications in production process of devices may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for the specific test. The manufacturer has the sole responsibility of continued compliance of the EUT.

### 4.4 Measurement protocol for FCC, VCCI and AUSTEL

#### 4.4.1 GENERAL INFORMATION

##### 4.4.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

##### 4.4.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

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## **5 TEST CONDITIONS AND RESULTS**

### **5.1 Conducted emissions**

For test instruments and accessories used see section 6 Part A 4.

#### **5.1.1 Description of the test location**

Test location: NONE

#### **5.1.2 Photo documentation of the test set-up**

#### **5.1.3 Applicable standard**

According to FCC Part 15, Section 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 given limits.

#### **5.1.4 Description of Measurement**

The measurements are performed following the procedures set out in ANSI C63.4 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

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### 5.1.5 Test result

Frequency range:

Min. limit margin

Limit according to FCC Part 15, Section 15.207(a):

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
5-30	60	50

\* Decreases with the logarithm of the frequency

Remarks: The measurement is not applicable.

The EuT is battery powered.



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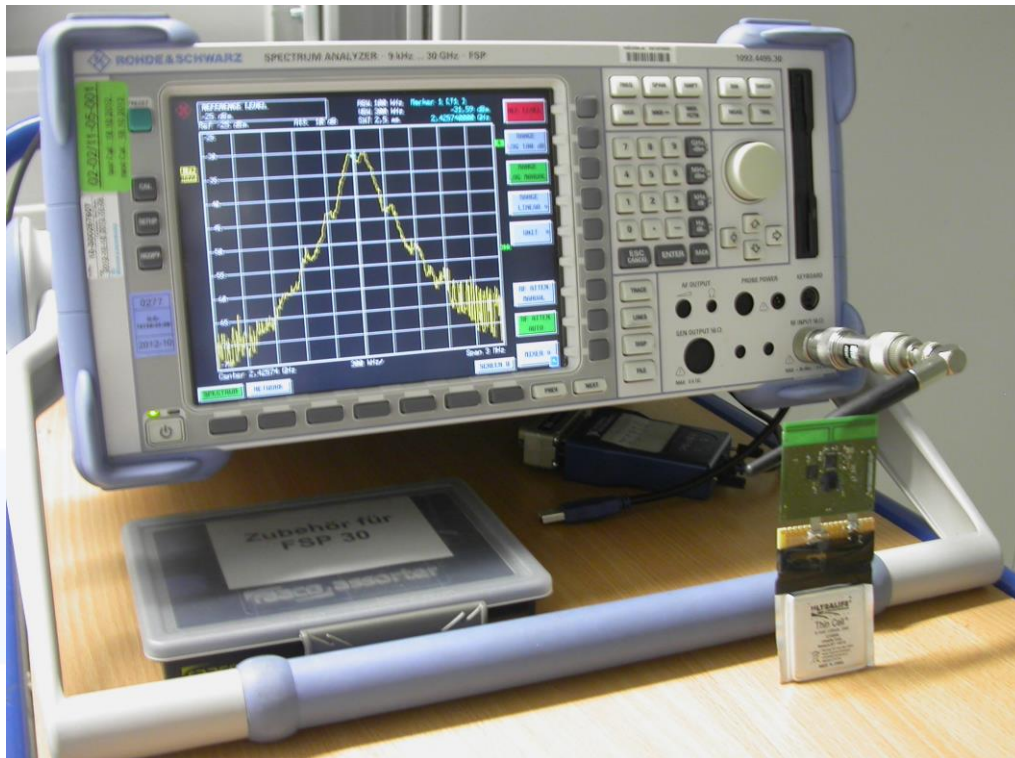
## 5.2 Emission bandwidth

For test instruments and accessories used see section 6 Part MB.

### 5.2.1 Description of the test location

Test location: Shielded Room S4

### 5.2.2 Photo documentation of the test set-up



### 5.2.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(2):

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 5.2.4 Description of Measurement

The bandwidth was measured at an amplitude level reduced from the reference level of a modulated channel by a ratio of -6 dB. The reference level is the level of the highest signal amplitude observed at the transmitter at either the fundamental frequency or the first order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. An alternative is to use the bandwidth measurement of the analyzer.

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The table below shows the settings according to ANSI C63.4:

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1kHz
30 to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

### 5.2.5 Test result

Channel number	Fundamental frequency (MHz)	6 dB Bandwidth (kHz)	Minimum limit (kHz)
1	2426.0	546	500

The requirements are **FULFILLED**.

**Remarks:** For detailed test results please refer to following test protocols.

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## 5.2.6 Test protocols

Channel 1

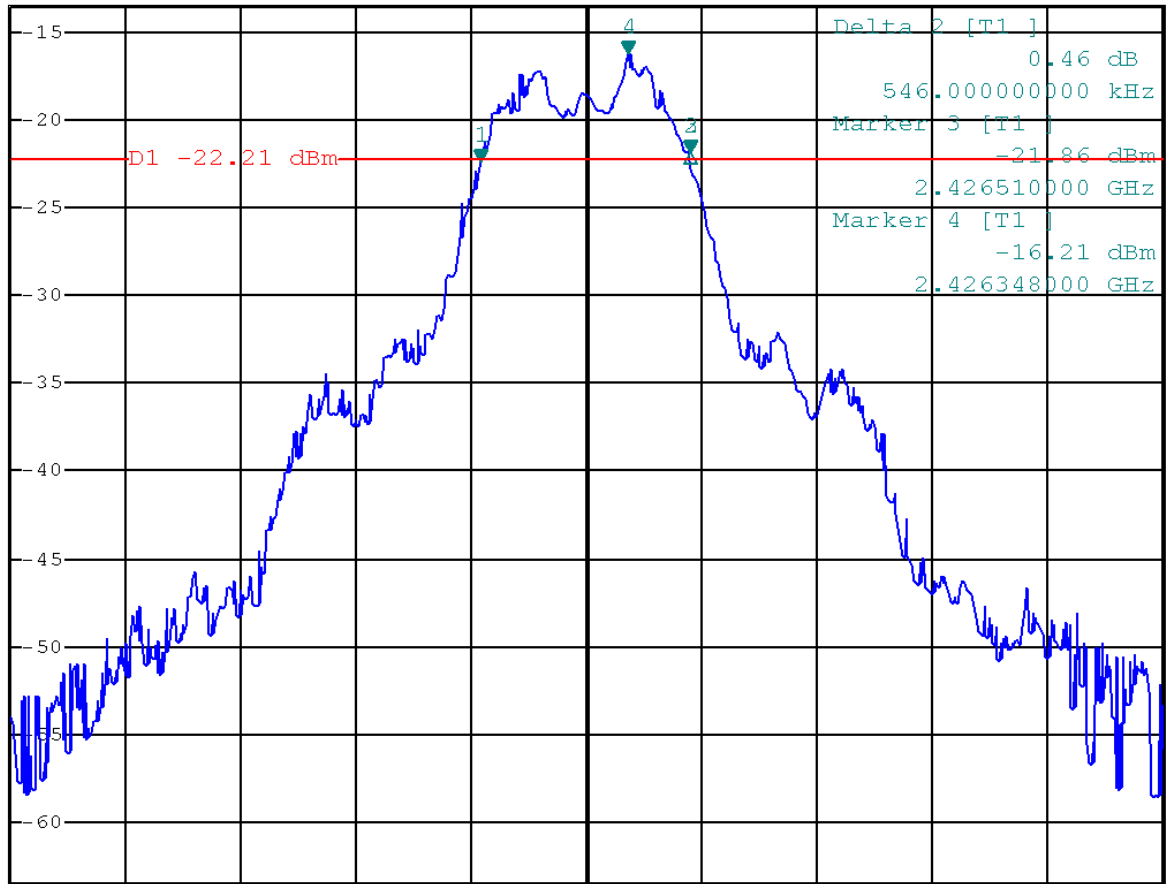


RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -22.32 dBm  
SWT 2.5 ms 2.425964000 GHz

Ref -13.5 dBm

Att 20 dB

1 PK  
VIEW



Center 2.42624 GHz

300 kHz/

Span 3 MHz

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### 5.3 Radiated emission of the fundamental wave

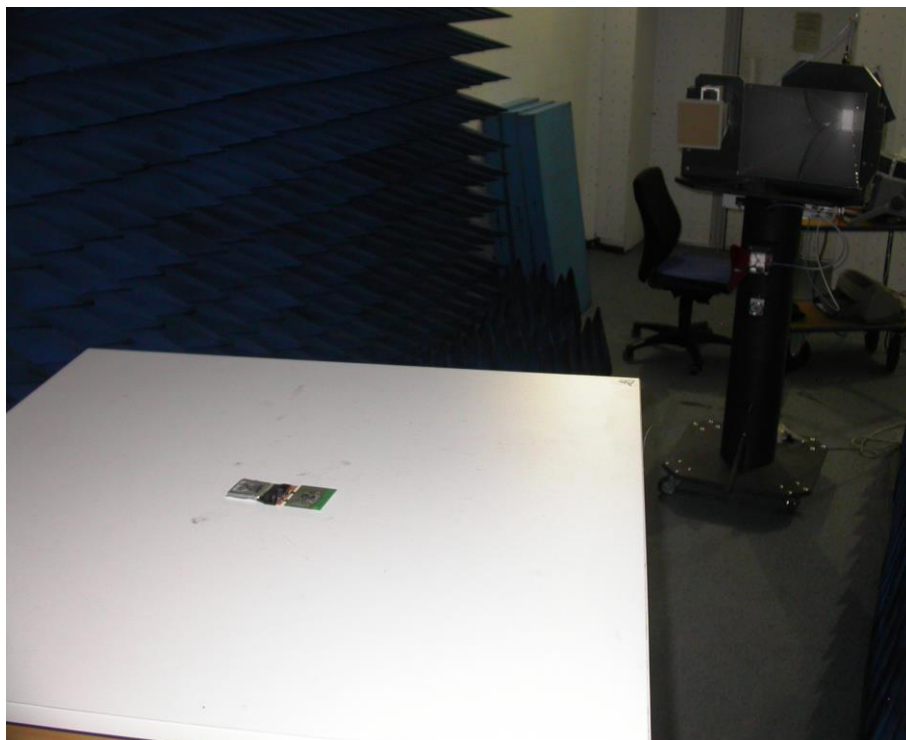
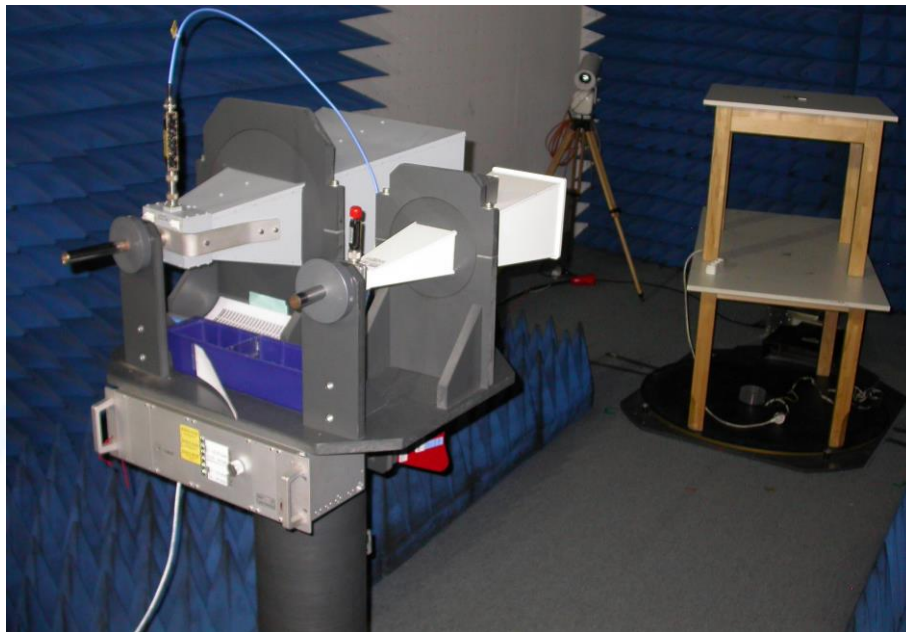
For test instruments and accessories used see section 6 Part CPR 3.

#### 5.3.1 Description of the test location

Test location: Anechoic Chamber A2

Test distance: 3 metres

#### 5.3.2 Photo documentation of the test set-up



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### 5.3.1 Applicable standard

According to FCC Part 15, Section 15.247(b)(3):

For systems using digital modulation in the 2400-2483.5 MHz and 5725 – 5850 MHz bands, the maximum peak output power of the transmitter shall not exceed 1 Watt. The limit is based on transmitting antennas of directional gain that do not exceed 6 dBi.

### 5.3.2 Description of Measurement

The radiated emission of the fundamental wave from the EUT is measured using a spectrum analyser and appropriate linear polarized antennas.

Analyser settings:

Peak measurement: RBW: 1 MHz

VBW: 1 MHz

Detector: Max peak

### 5.3.3 Test result

Frequency (MHz)	Reading level Pk (dBµV)	Bandwidth (kHz)	Correction factor (dB)	Corrected level Pk (dBm)	Limit Pk (dBm)	Delta (dB)
2426.0	-14.11	1000	7.1	-7.0	30.0	-37.0

Peak Power Limit according to FCC Part 15, Section 15.247(b)(3):

Frequency (MHz)	Peak Power Limit	
	(dBm)	(Watt)
902-928	30	1.0
<b>2400-2483.5</b>	<b>30</b>	<b>1.0</b>
5725-5850	30	1.0

The requirements are **FULFILLED**.

Remarks:

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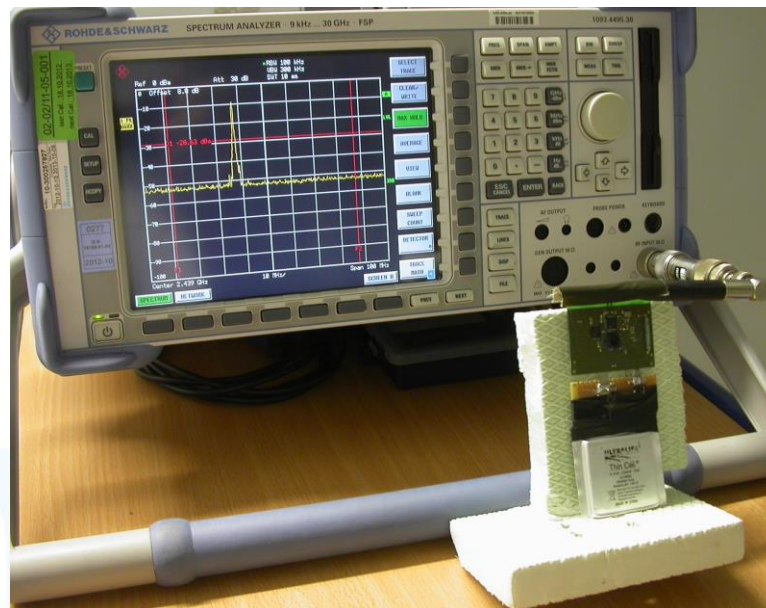
## 5.4 Maximum peak conducted output power

For test instruments and accessories used see section 6 Part CPC 3.

### 5.4.1 Description of the test location

Test location: Shielded Room S4

### 5.4.2 Photo documentation of the test set-up



### 5.4.3 Applicable standard

According to FCC Part 15, Section 15.247(b)(3):

For systems using digital modulation in the 2400-2483.5 MHz and 5725 – 5850 MHz bands, the maximum peak output power of the transmitter shall not exceed 1 Watt. The limit is based on transmitting antennas of directional gain that do not exceed 6 dBi.

### 5.4.4 Description of Measurement

The EuT was fixed mounted on the receiving antenna of the spectrum analyzer to find out the maximum power. An analyzer offset was tried to see the compliance to the measured radiated value.

The transmitter output was directly connected to the spectrum analyzer. The center frequency of the spectrum analyzer is set to the fundamental frequency. The span of the spectrum analyzer should be larger than the emission bandwidth (EBW). The channel bandwidth has been set to EBW. With peak detector and power mode "Max Hold" the result is the summed maximum output power of the EBW.



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### 5.4.5 Test result

Channel	Frequency (MHz)	Measured power (dBm)	Peak power limit (dBm)	Delta (dB)
1	2426.0	-7.0	30	-37.0

Peak Power Limit according to FCC Part 15, Section 15.247(b)(3):

Frequency (MHz)	Peak Power Limit	
	(dBm)	(Watt)
902-928	30	1.0
<b>2400-2483.5</b>	<b>30</b>	<b>1.0</b>
5725-5850	30	1.0

The requirements are **FULFILLED**.

**Remarks:** For detailed test results please refer to following test protocols.

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Channel 1

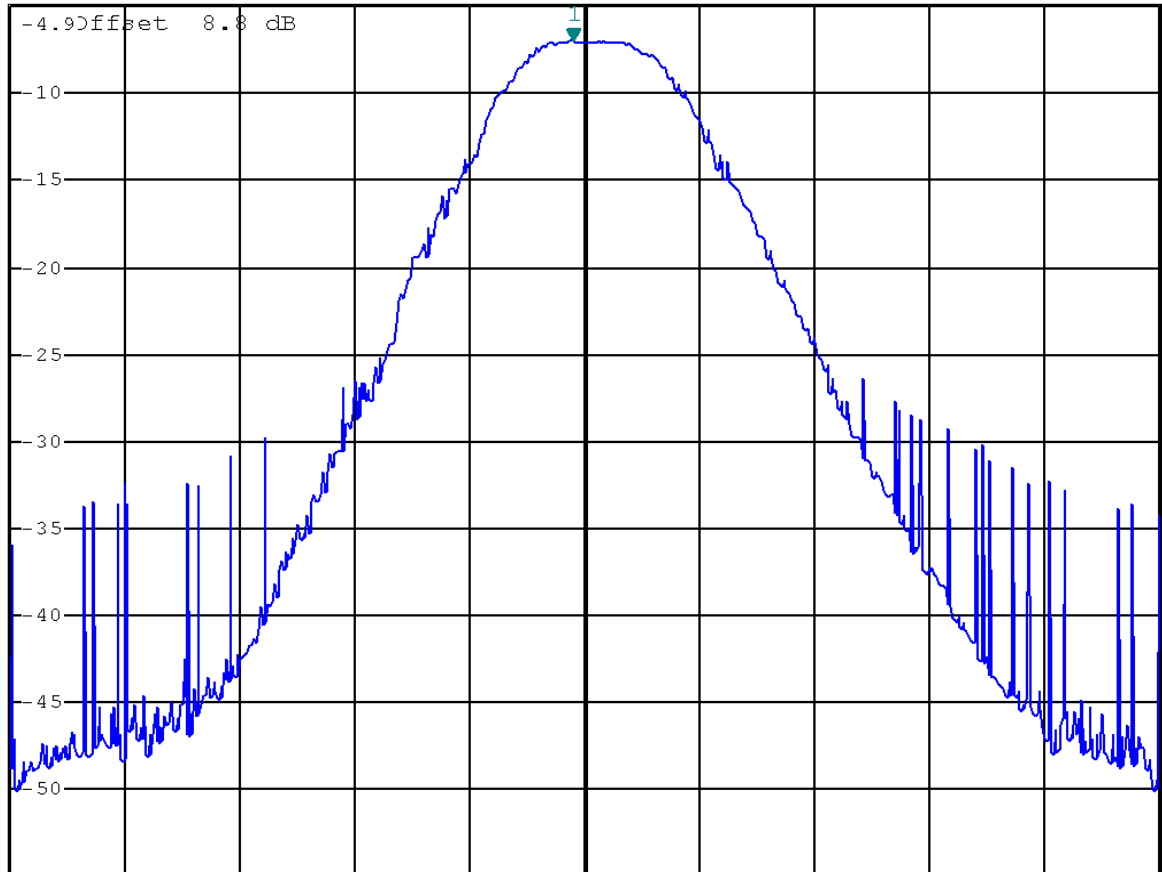


\*RBW 1 MHz Marker 1 [T1]  
\*VBW 1 MHz -6.97 dBm  
SWT 2.5 ms 2.426100000 GHz

Ref -4.9 dBm

Att 20 dB

1 PK  
VIEW



Center 2.4262 GHz

1 MHz/

Span 10 MHz



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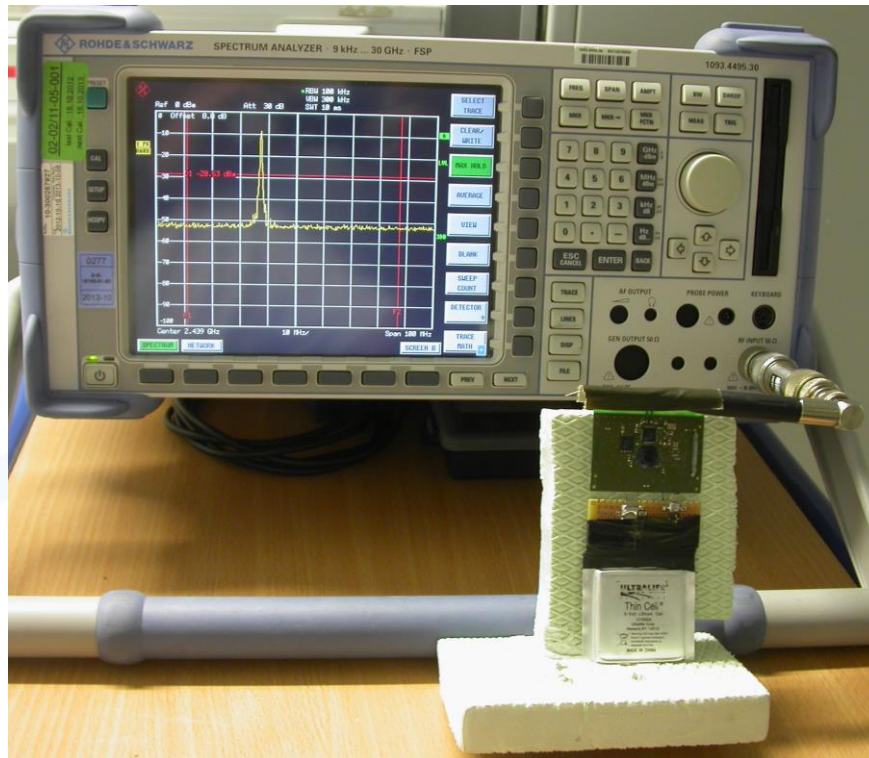
## 5.5 Spurious emissions conducted

For test instruments and accessories used see section 6 Part SEC1, SEC2 and SEC3.

### 5.5.1 Description of the test location

Test location: Shielded Room S4

### 5.5.2 Photo documentation of the test set-up



### 5.5.3 Applicable standard

According to FCC Part 15C, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency band 902 to 928 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

### 5.5.4 Description of measurement

A spectrum analyzer is connected to the output of the transmitter while EUT was operating in transmit mode at the assigned frequency.

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### 5.5.5 Test result

Signal levels which are located in restricted band.

Tx mode @ CH1, max. level -28.63 dBm			
Frequency (MHz)	Peak power * (dBm)	Limit (-20 dB) (dBm)	Delta (dB)
128.94	-68.90	-28.63	-40.3
167.74	-67.56	-28.63	-28.9
247.28	-69.44	-28.63	-40.8
258.92	-64.52	-28.63	-35.9
326.82	-65.77	-28.63	-37.1
8236.0	-67.35	-28.63	-38.7
9370.0	-67.31	-28.63	-38.7

The requirements are **FULFILLED**.

**Remarks:** All spurious emissions falling in restricted bands have been measured radiated.

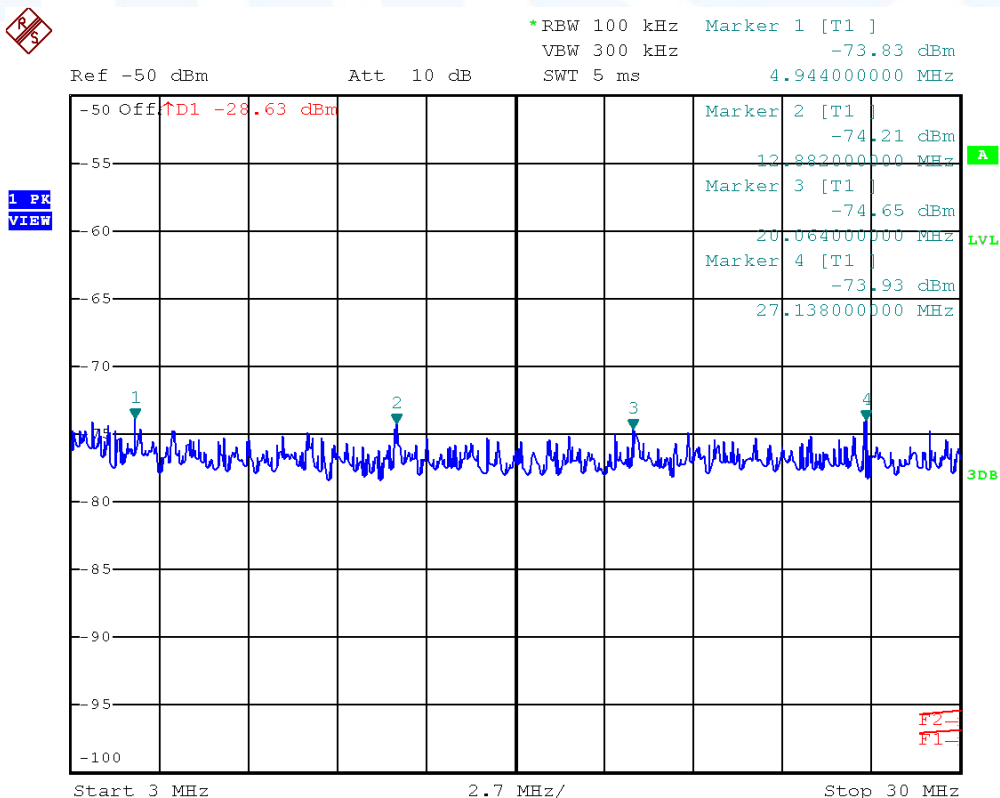
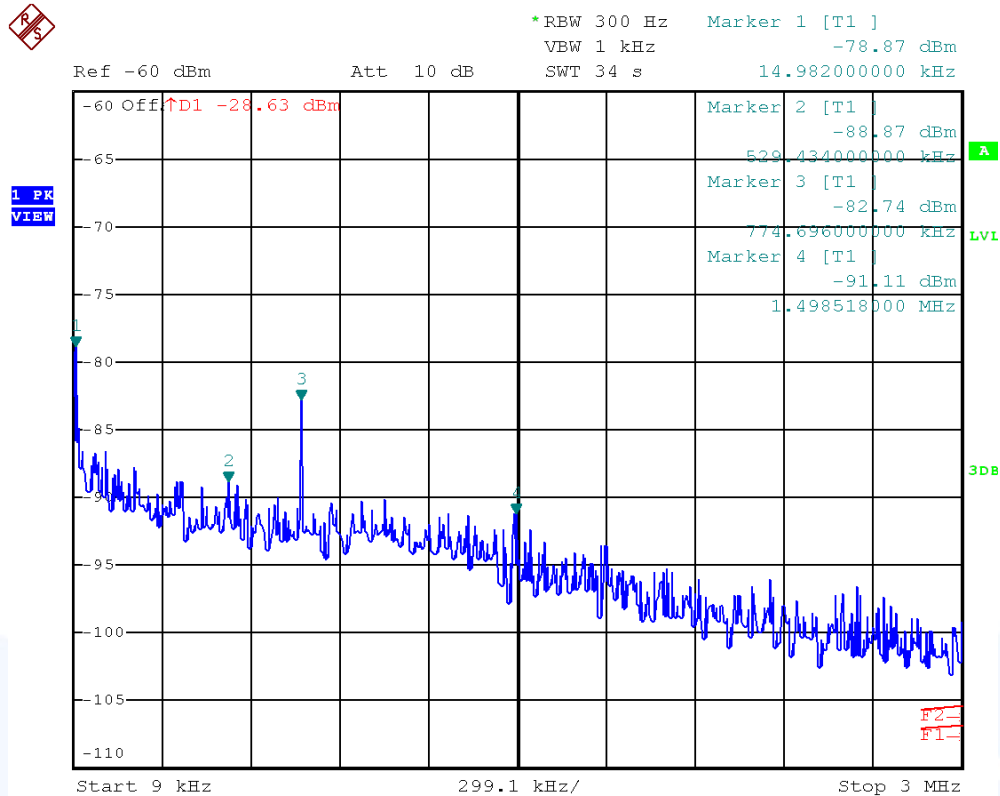
For detailed results please refer to following test protocol.

In the frequency range from 10 GHz up to 25 GHz no emissions could be measured.

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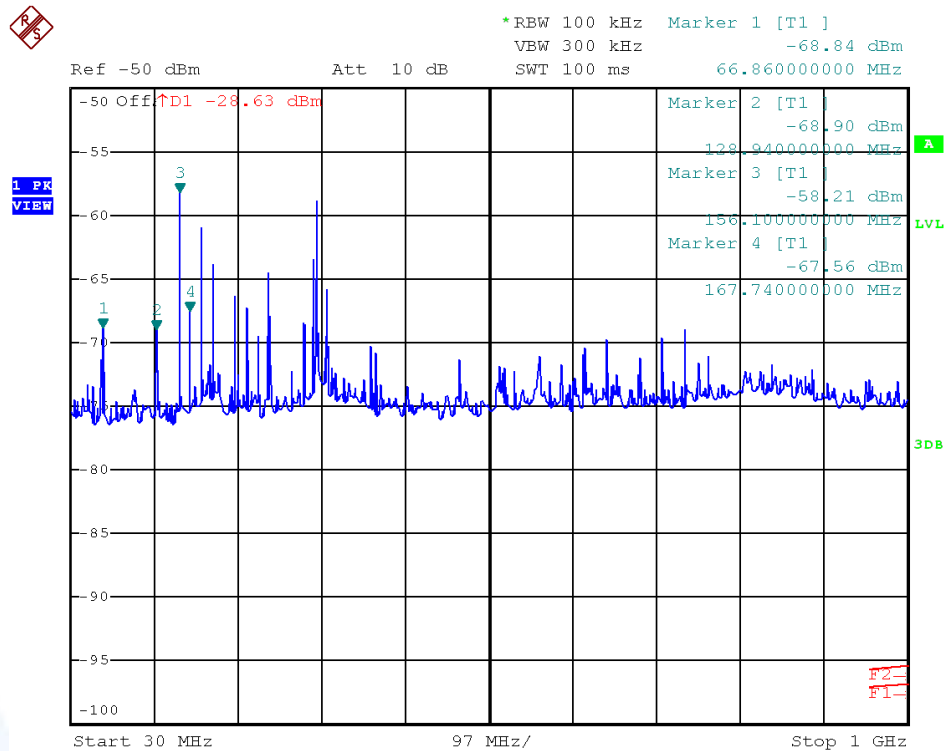
## 5.5.6 Test protocols

### Conducted RF emission from 9 kHz to 30 MHz

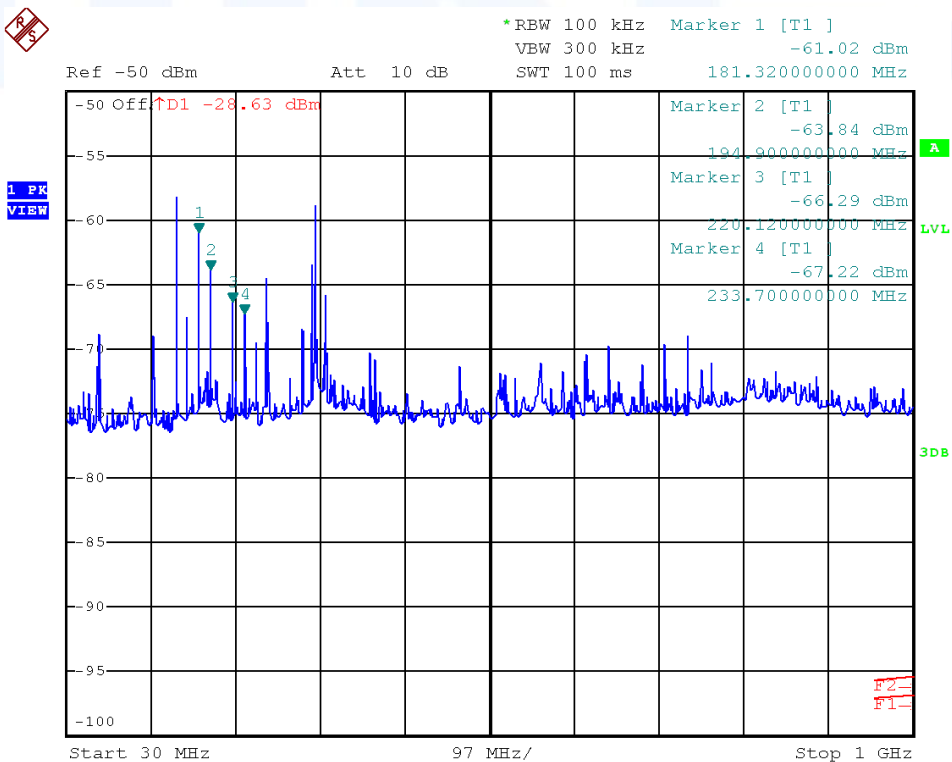


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## Conducted RF emission from 30 to 1000 MHz

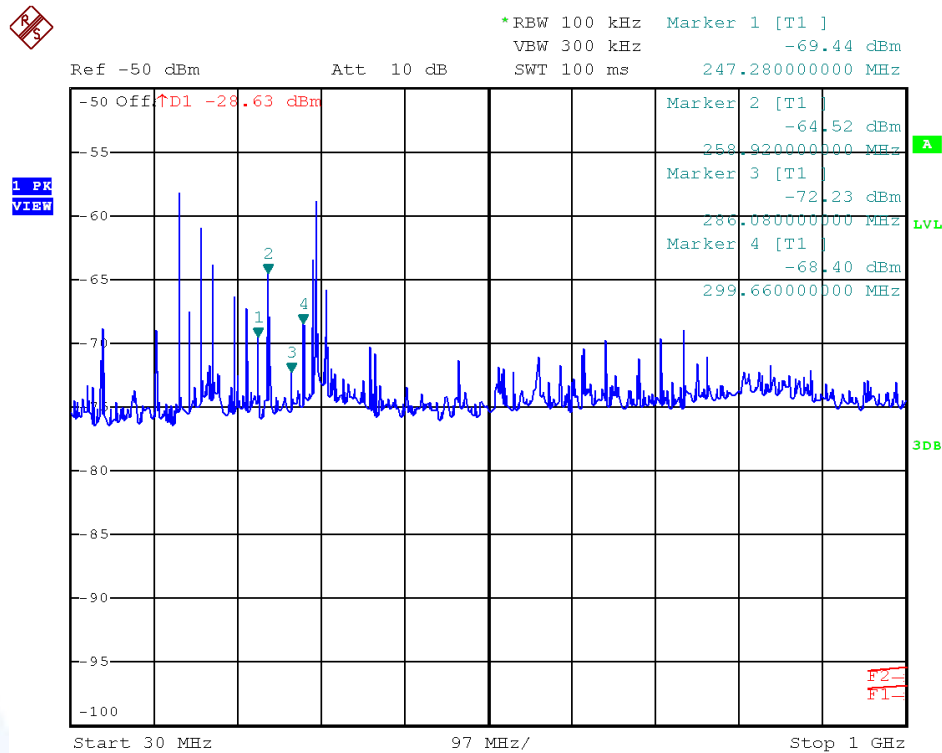


**Note:** Signal level no. 3 and no. 4 are located in restricted band.

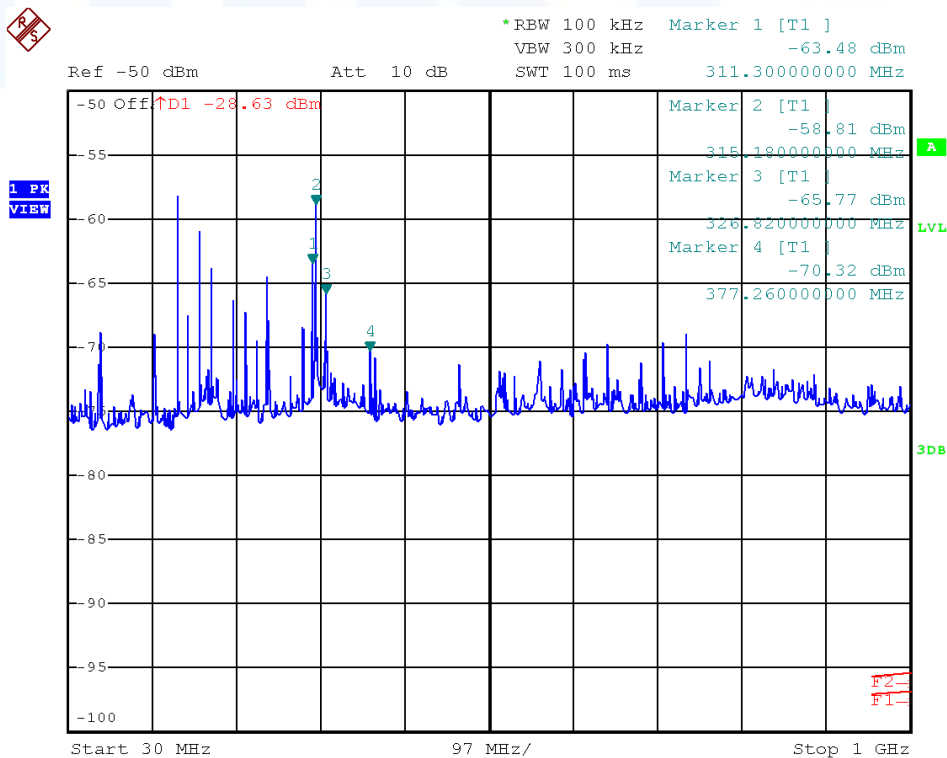


# FCC ID: SR5-17100040

## Conducted RF emission from 30 to 1000 MHz



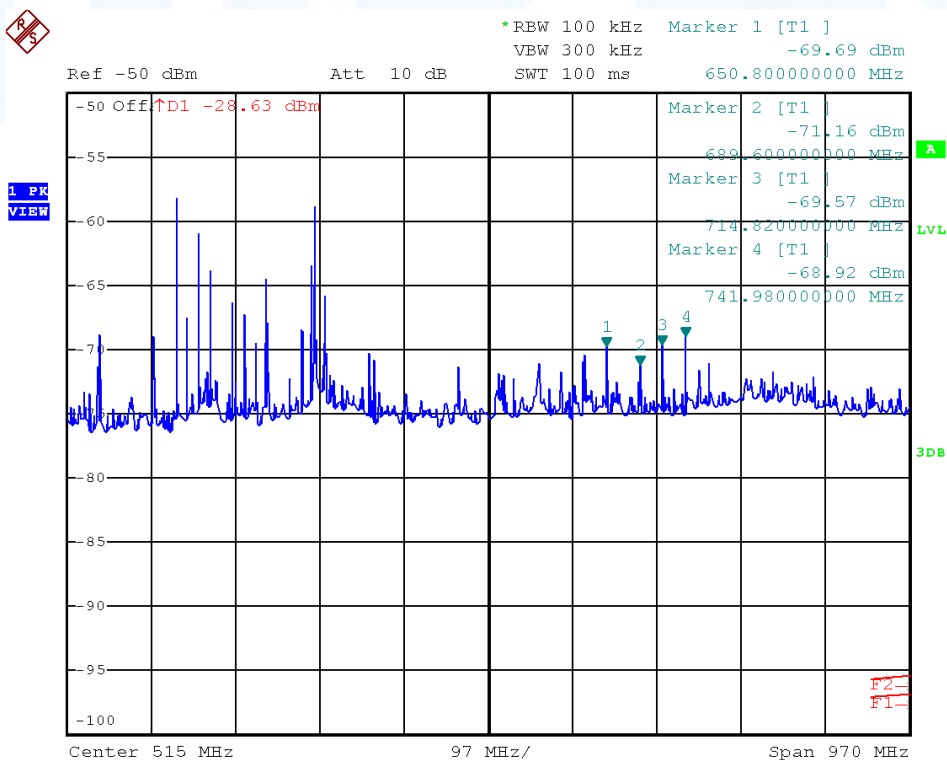
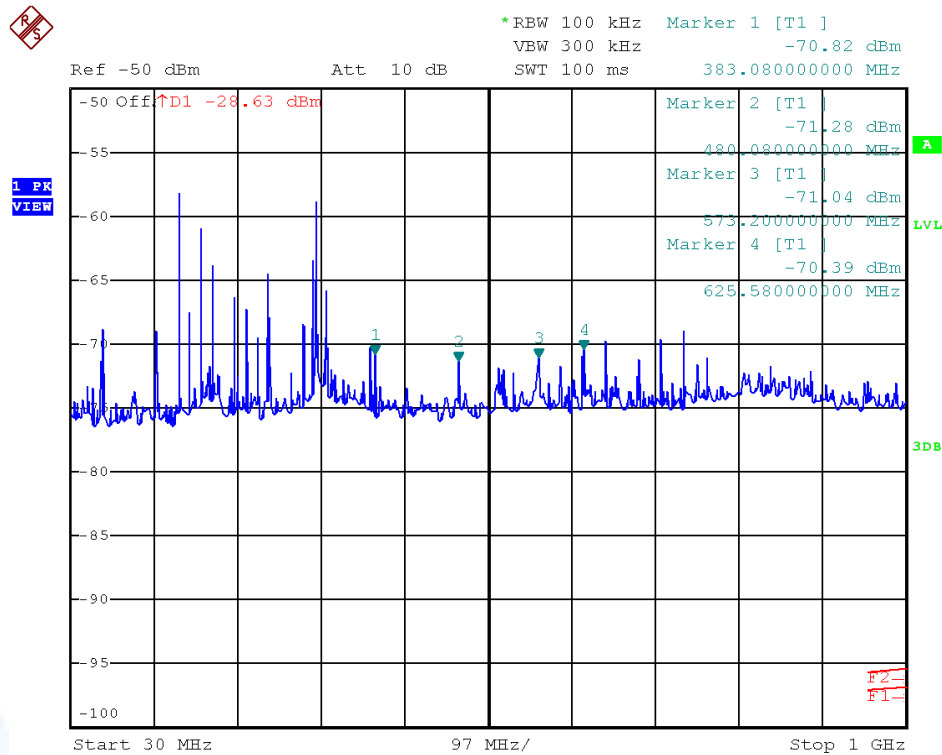
Note: Signal level no. 1 and no. 2 are located in restricted band.



Note: Signal level no. 3 is located in restricted band.

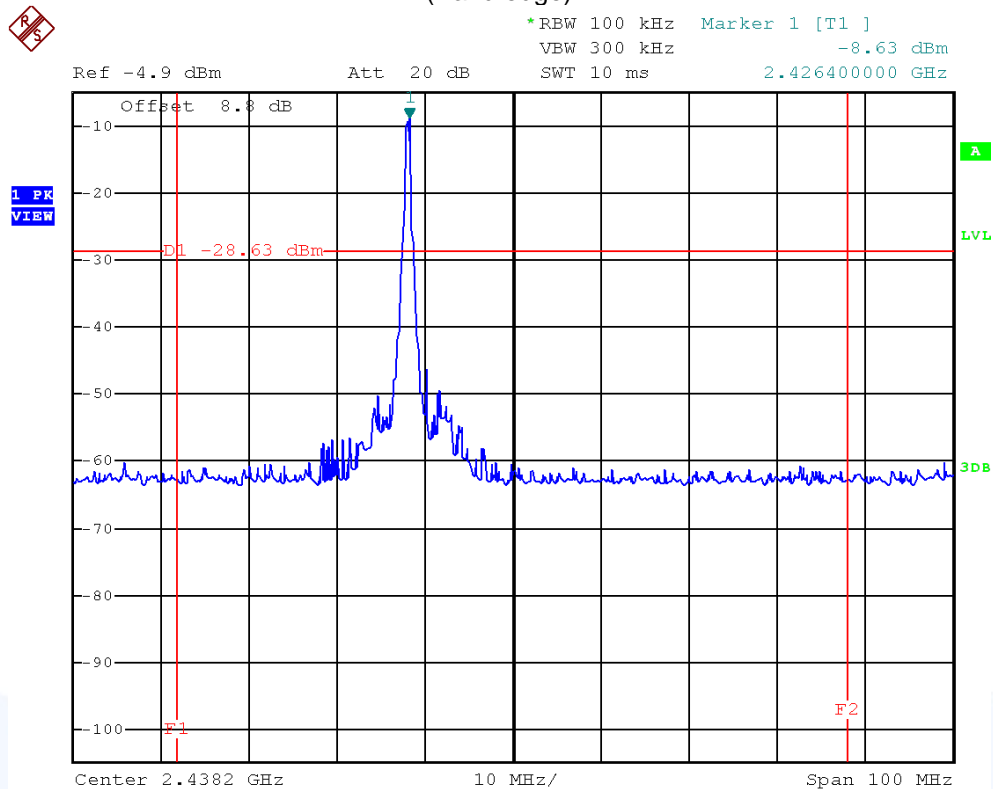
# FCC ID: SR5-17100040

## Conducted RF emission from 30 to 1000 MHz

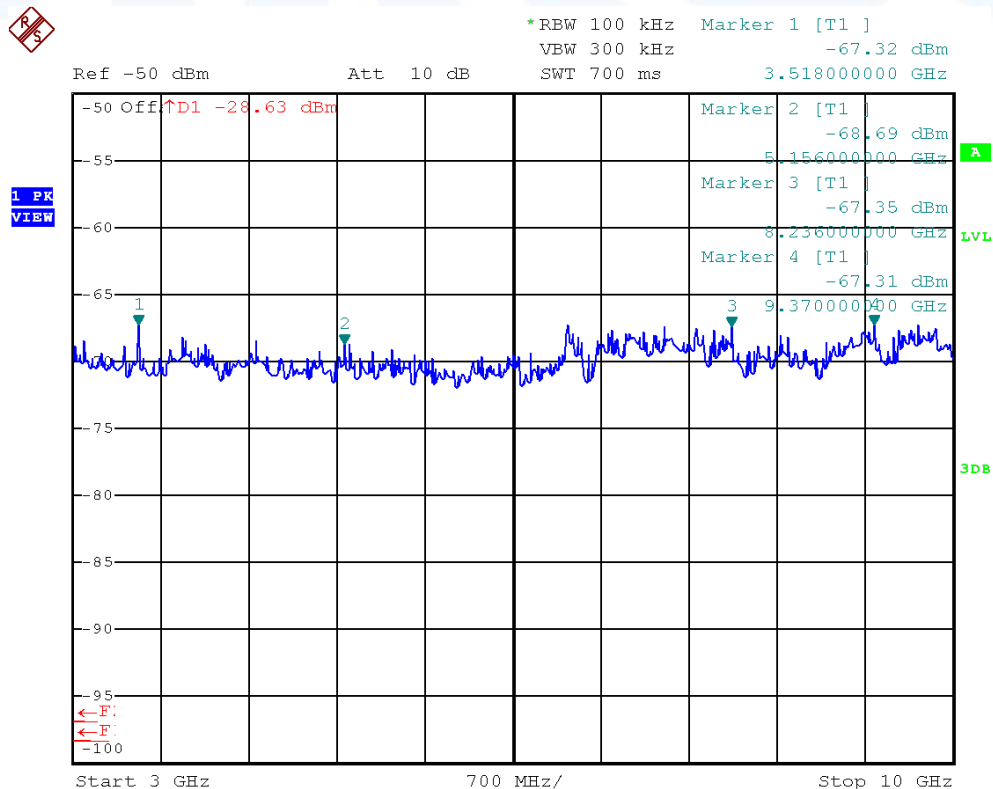


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## Conducted RF emission from 2000 to 2490 MHz (Band edge)



## Conducted RF emission from 3 to 10 GHz



**Note:** Signal level no. 3 and no. 4 are located in restricted band.



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## 5.6 Spurious emissions

For test instruments and accessories used see section 6 Part SER 1, SER 2, SER 3.

### 5.6.1 Description of the test location

Test location: OATS1  
Test distance: 3 metres

Test location: Anechoic Chamber A2  
Test distance: 3 metres

### 5.6.2 Photo documentation of the test set-up





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### 5.6.3 Applicable standard

According to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency bands 2400 – 2483.50 MHz and 5725 – 5850 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

### 5.6.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.4. If the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported.

#### 5.6.4.1 Radiated emission test $f < 1$ GHz

In the frequency range from **9 kHz to 30 MHz** no emissions from the EuT could be measured.

In the frequency range from **30 MHz up to 1 GHz** no emissions from the EuT could be measured.

In both frequency ranges only ambient noises could be detected.

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### 5.6.4.2 Radiated emission test $f > 1\text{GHz}$

Tx mode @ CH1

Frequency (GHz)	L: PK (dB $\mu$ V)	L: AV (dB $\mu$ V)	Bandwidth (kHz)	Correct. (dB)	L: PK dB( $\mu$ V/m)	L: AV dB( $\mu$ V/m)	Limit AV dB( $\mu$ V/m)	Delta (dB)
8236.0	45.5	38.1	1000	8.6	54.1	46.7	54.0	-7.3
9370.0	41.9	30.0	1000	9.8	51.7	39.8	54.0	-14.3

Radiated limits according to FCC Part 15 Section 15.209(a) for spurious emissions which fall in restricted bands:

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	( $\mu$ V/m)	dB( $\mu$ V/m)	
0.009-0.490	2400/F (kHz)		300
0.490-1.705	24000/F (kHz)		30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

### Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

The requirements are **FULFILLED**.

**Remarks:** The measurement was performed up to 18GHz. All emissions not reported in this test report are more than 20 dB below the specified limit.

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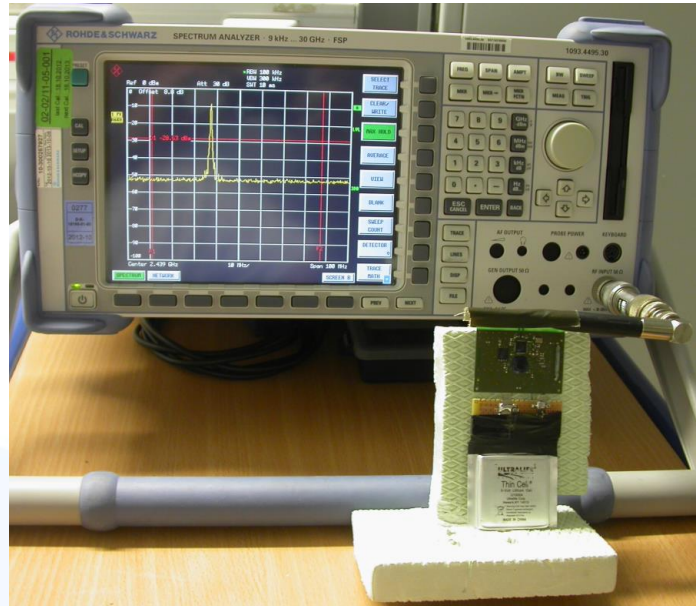
## 5.7 Power spectral density

For test instruments and accessories used see section 6 Part CPC 3.

### 5.7.1 Description of the test location

Test location: Shielded Room S4

### 5.7.2 Photo documentation of the test set-up



### 5.7.3 Applicable standard

According to FCC Part 15, Section 15.247(e):

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### 5.7.4 Description of Measurement

The EUT was connected to the spectrum analyser with a suitable attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyser, set sweep time equal to span/3 kHz. The power spectral density was measured using the analyser function "Channel Power" in dBm/Hz. The result is calculated by adding - 15.2 dB ( $10 \log 3 \text{ kHz}/100 \text{ kHz}$ ) as bandwidth correction factor to the analyser reading.

Spectrum analyzer settings:  
see attached plots

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**5.7.5 Test result**

Channel	Frequency (MHz)	Reading (dBm/Hz)	Correction to 3 kHz (dB)	PSD (dBm)	Limit (dBm)
1	2426.0	-8.6	-15.2	-23.8	8

Power spectral density limit according to FCC Part 15, Section 15.247(e):

Frequency (MHz)	Power spectral density limit
	(dBm/3kHz)
2400 - 2483.5	8

The requirements are **FULFILLED**.

**Remarks:** For detailed test results please refer to following test protocols.

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Power spectral density plots

Channel 1



\*RBW 100 kHz

Marker 1 [T1]

VBW 300 kHz

-8.06 dBm

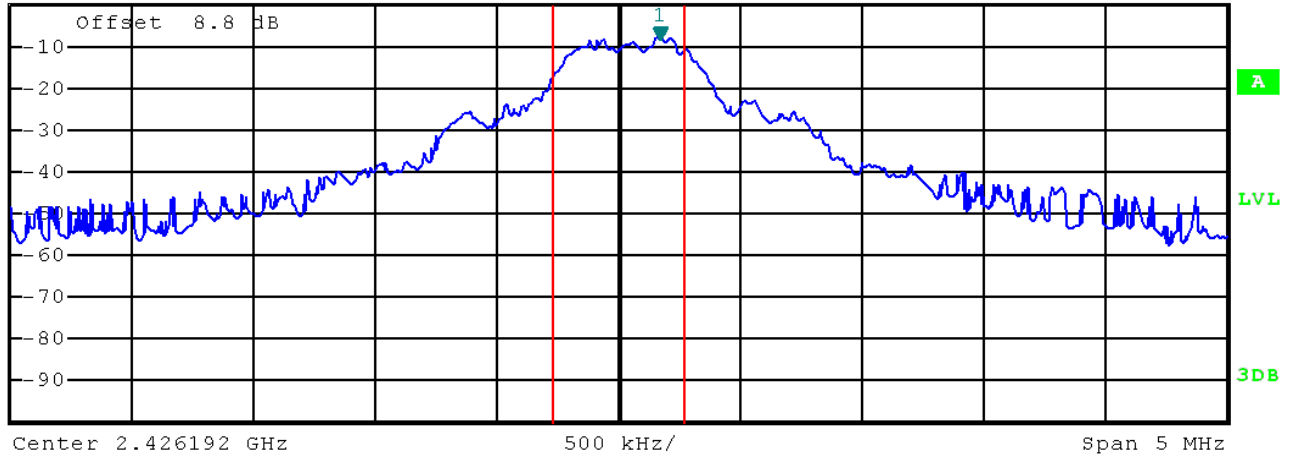
SWT 2.5 ms

2.426352000 GHz

Ref 0 dBm

Att 10 dB

1 PK  
VIEW



Tx Channel

Bandwidth

546 kHz

Power

-60.33 dBm/Hz

mikes

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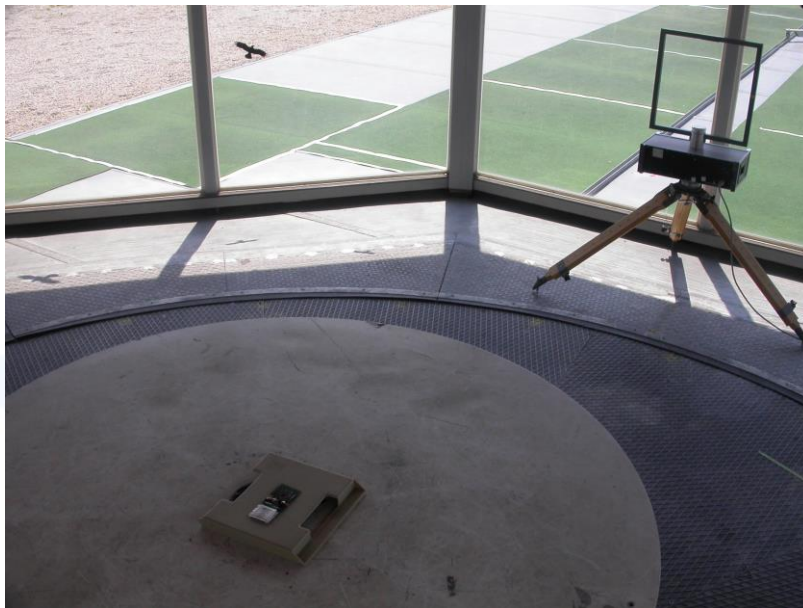
## 5.8 Receiver radiated emissions

For test instruments and accessories used see section 6 Part **SER1**, **SER2** and **SER3**.

### 5.8.1 Description of the test location

Test location: OATS 1  
Test location: Anechoic Chamber A2  
Test distance: 3 metres

### 5.8.2 Photo documentation of the test set-up





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### 5.8.3 Applicable standard

According to FCC Part 15, Section 15.109 (a):  
Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 m shall not exceed the given limit.

### 5.8.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.4. If the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported.

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**5.8.5 Test result**

**5.8.5.1  $f < 1$  GHz)**

In the frequency range from 9 kHz to 30 MHz no radiated emissions could be measured.

In the frequency range from 30 MHz up to 1 GHz no radiated emissions could be measured.

In both frequency ranges only ambient noises could be detected.

**5.8.5.2  $f > 1$ GHz**

In the frequency range from 1 GHz up to 12.75 GHz no radiated emissions could be measured.

In this frequency range only ambient noises could be detected.

Limit according to FCC Section 15.109(a)

Frequency of emission (MHz)	Field strength limit ( $\mu$ V/m)	Field strength limit dB( $\mu$ V/m)
0.009-0.490	2400/F(kHz)	
0.490-1.705	24000/F (kHz)	
1.705-30.0	30	
30-88	100	40
88-216	150	44
216-960	200	46
Above 960	500	54

The requirements are **FULFILLED**.

**Remarks:** During the test, the EUT was set into continuous receiving mode.

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## 5.9 Maximum permissible exposure (MPE)

For test instruments and accessories used see section 6 Part **CPC 3**.

### 5.9.1 Description of the test location

Test location: NONE

### 5.9.2 Applicable standard

According to FCC Part 15, Section 15.247(i):

Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

The test methods used comply with ANSI/IEEE C95.1, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".

This test report shows the compliance with the limits for Maximum Permissible Exposure (MPE) specified in FCC Part 1, Section 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in FCC Part 1, Section 1.1307(b).

### 5.9.3 Description of Measurement

The maximum total power input to the antenna has been measured conducted as described in clause 5.3 of this document. Through the Friis transmission formula, the known maximum gain of the antenna and the maximum power, can be calculated the MPE in a defined distance away from the product.

Friis transmission formula: 
$$P_d = \frac{P_{out} * G}{4 * \pi * r^2}$$

where

$P_d$  = power density (mW/cm<sup>2</sup>)

$P_{out}$  = output power to antenna (mW)

$G$  = gain of antenna (linear scale)

$r$  = distance between antenna and observation point (cm)

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#### 5.9.4 Test result

Limits for maximum permissible exposure (MPE):

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(B) Limits for General Population / Uncontrolled Exposure</b>				
0.3 – 3.0	614	1.63	100	30
3.0 – 30	824/ $f$	2.19/ $f$	180/ $f^2$	30
30 - 300	27.5	0.073	0.2	30
300-1500	---	---	$f/1500$	30
<b>1500-100000</b>	---	---	<b>1.0</b>	<b>30</b>

$f$  = Frequency in MHz

**Remarks:**     The measurement and calculation is accd. **OET Bulletin 65** not necessary. Because the  
antenna of the EuT is an integral part of the device and the max. power is  $\leq 0.2$  W at the  
measured channel. This type of transmitters generally not expected to exceed MPE Limits;  
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\_\_\_\_\_  
\_\_\_\_\_

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## 5.10 Antenna application - Detailed photos see attachment A1

### 5.10.1 Applicable standard

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT has a PCB antenna and can not be replaced by the user.  
This type of antenna meet the requirements of part 15.203 and 15.204.

### 5.10.2 Antenna requirements

According to FCC Part 15C, Section 15.247(b)(4):

The conducted output power limit specified in paragraph (b) of 15.247 is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2) and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The gain of the used PCB antenna is  $\leq 6.0$  dBi.

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## **6 USED TEST EQUIPMENT AND ACCESSORIES**

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

<b>Test ID</b>	<b>Model Type</b>	<b>Equipment No.</b>	<b>Next Calib.</b>	<b>Last Calib.</b>	<b>Next Verif.</b>	<b>Last Verif.</b>
CPC 3	FSP 30 RF Antenna	02-02/11-05-001 02-02/24-05-032	18/10/2013	18/10/2012		
CPR 3	FSP 30 BBHA 9120 E 251 Sucoflex N-2000-SMA Multiflex 141-SMA-N-1500	02-02/11-05-001 02-02/24-05-006 02-02/50-05-075 02-02/50-09-016	18/10/2013 17/05/2014	18/10/2012 17/05/2013	17/11/2013	17/05/2013
MB	FSP 30 RF Antenna	02-02/11-05-001 02-02/24-05-032	18/10/2013	18/10/2012		
SEC 1-3	FSP 30 RF Antenna	02-02/11-05-001 02-02/24-05-032	18/10/2013	18/10/2012		
SER 1	FMZB 1516 ESCI S10162-B KK-EF393-21N-16 NW-2000-NB	01-02/24-01-018 02-02/03-05-005 02-02/50-05-031 02-02/50-05-033 02-02/50-05-113	03/12/2013	03/12/2012	14/02/2014	14/02/2013
SER 2	ESVS 30 VULB 9168 S10162-B NW-2000-NB KK-EF393/U-16N-21N20 m	02-02/03-05-006 02-02/24-05-005 02-02/50-05-031 02-02/50-05-113 02-02/50-12-018	26/06/2013 11/04/2014	26/06/2012 11/04/2013	11/10/2013	11/04/2013
SER 3	FSP 30 AMF-4F-04001200-15-10P AFS5-12001800-18-10P-6 3117 Sucoflex N-1600-SMA Sucoflex N-2000-SMA	02-02/11-05-001 02-02/17-05-004 02-02/17-06-002 02-02/24-05-009 02-02/50-05-073 02-02/50-05-075	18/10/2013 04/04/2014	18/10/2012 04/04/2013		