W400

Test Report of the W400 to the requirements of EN 302 961-2 (supersedes EN 300 152-2 & -3) and RTCM SC11901 Annex B. R&TTE Directive, Essential requirement , chapter 3.2

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Issue : 1

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1 Summary of test conditions

1.1 Applied standard and reference

EN 302 961 -2 , V 1.2.1. , (2013-07) (supersedes EN 300152)

RTCM 11901.1 with Amendment 1 & 2, (Feb 5, 2015) , Annex B : 121.5 MHZ MSLD

1.2 Main specification

Operative frequency : 121.5 MHz

Nominal output RF power : > 25 mW , < 100mW

Modulation class : A3X

Power supply : 3 x 3V LiMn batteries , series layout

1.3 Normal and extreme conditions

Unit measurement		Value
Temperature	Standard condition	From +15 to 35 °C
	Extreme condition	From -20 to 55 °C
Humidity	Rated	From 20% to 75%
Voltage (DC supply)	Minimum	5.8 V
	Rated	9 V
	Maximum	9.9 V

1.4 Measurements and test site

- Wamblee laboratories, Faenza (RA), Italy (for almost test and measurement, otherwise specified).
- TecnoLab del Lago Maggiore, Verbania (VB), Italy (for radiated and immunity emission and ESD); FCC reg. Nmbr 868554.

1.5 Test reports

Tested by:

Simone Facchini

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Signed by:

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2 EN302961-2

2.1 Clause 4.2.1: Transmitter frequency Error

Date of test	Jan 13, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.1.1 Definition

The transmitter frequency error shall be as defined in EN 302 961-1 [1], clause 8.1.1.

The frequency error is the difference between the measured carrier frequency and its nominal value (EN 302 961-1 , clause 5.1).

The carrier frequency shall be measured with the equipment placed in the test fixture (EN 302 961-1 ,clause 6.2). The measurement shall be made using the test power source (see EN 302 961-1 , clause 6.4.2) under both normal and extreme test conditions.

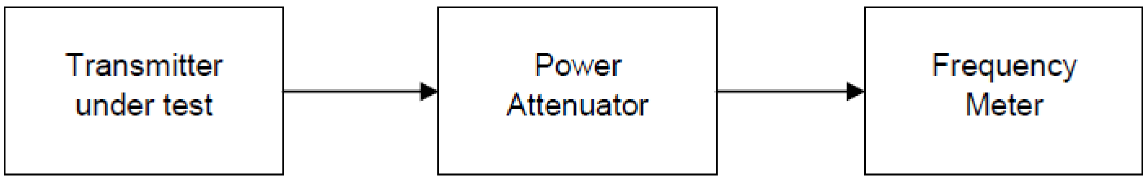

Figure 1: Frequency measurement setup

2.1.2 Results

Channel	**Temperature**	**DC Supply voltage**			**Max Error**	**Result**
		5.9V	**9V**	**9.9V**		
121.5 MHz	+15°C	121.500,771 MHz	121.500,834 MHz	121.500,879 MHz	+879Hz	Pass
	+35°C	121.500,246 MHz	121.500,313 MHz	121.500,398 MHz		
	-20°C	121.501,342 MHz	121.501,411 MHz	121.501,477 MHz	+1477 Hz	Pass
	+55°C	121.499,890 MHz	121.499,937 MHz	121.499,991 MHz		

2.1.3 Limit

The frequency error under normal conditions shall not exceed ±10 ppm, and under extreme test conditions shall not exceed ±15 ppm.

2.1.4 Additional test in accordance with CFR47 2.1055

Temperature	DC Supply	Freq. Error (Hz)
-20°C	5.9 V	1342
-20°C	9 V	1411
-20°C	9.9 V	1477
-10°C	5.9 V	1298
-10°C	9 V	1307
-10°C	9.9 V	1345
0°C	5.9 V	1099
0°C	9 V	1122
0°C	9.9 V	1178
10°C	5.9 V	987
10°C	9 V	1001
10°C	9.9 V	1033
20°C	5.9 V	701
20°C	9 V	657
20°C	9.9 V	621
30°C	5.9 V	331
30°C	9 V	376
30°C	9.9 V	401
40°C	5.9 V	247
40°C	9 V	273
40°C	9.9 V	289
50°C	5.9 V	-31
50°C	9 V	-9
50°C	9.9 V	22
55°C	5.9 V	-110
55°C	9 V	-63
55°C	9.9 V	-8

2.1.5 Equipment used

7, 12, 17, 21

2.2 Clause 4.2.2: Modulation characteristics

Date of test	Jan 13, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.2.1 Definition

The modulation characteristics shall be as defined in EN 302 961-1, clauses 8.2.1.1, 8.2.2.1 and 8.2.3.1. The modulation sequence comprises of cycles of audio and may include non-audio and data modulation as shown in figure 1. In this D.U.T there are no CW or data or non-audio modulation. (see EN 302 961-1, clause 8.2.1.1).

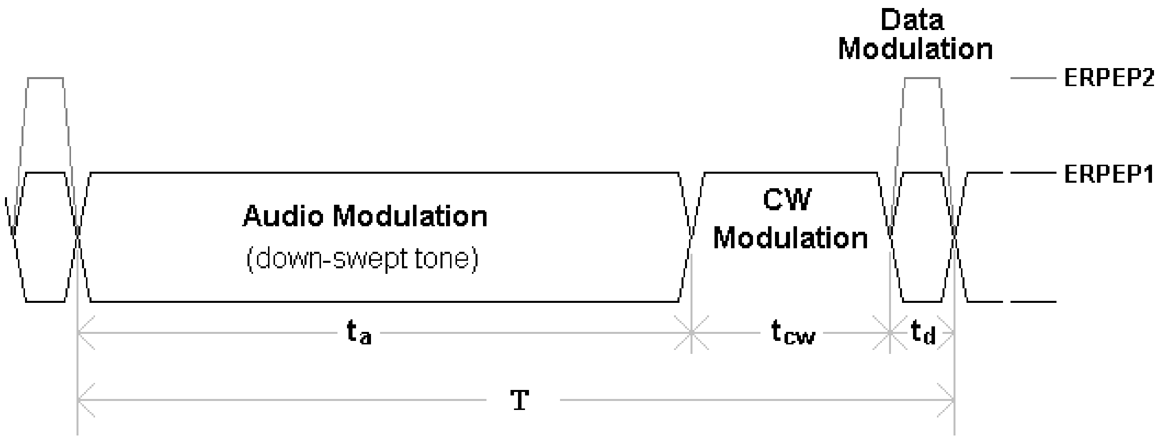

Figure 2: Audio modulation sequence

The depth of modulation is calculated from the formula: $h = \frac{A-B}{A+B} * 100\%$

Where A and B are respectively the maximum and minimum value of the modulation envelope in figure 2.

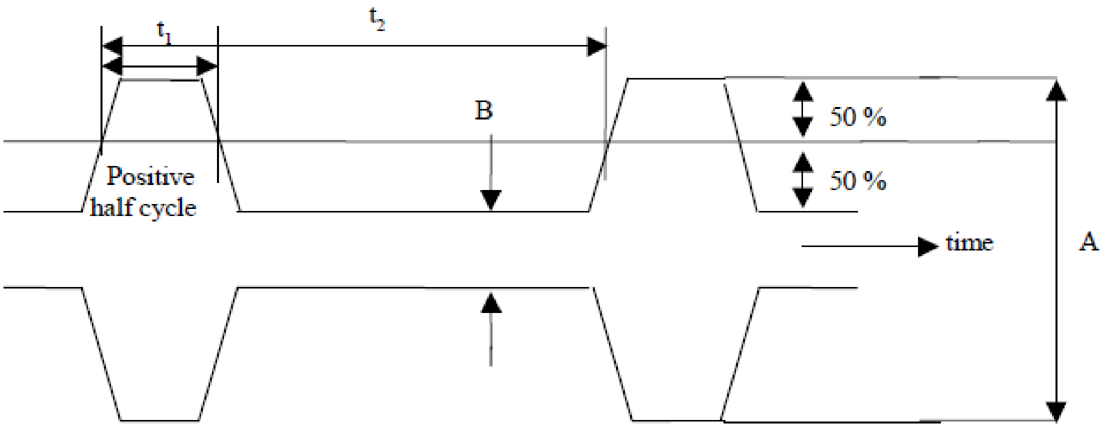

Figure 3: Audio modulation sequence (cont.)

The modulation duty cycle is the ratio: $\frac{T_1}{T_2} * 100\%$ where t_1 is the duration of the positive half cycle of the audio modulation measured at the half amplitude points of the modulation envelope, and t_2 is the period of the fundamental of the audio modulation, in figure 2.

The modulation sequence timings (ta only), depth of modulation and the modulation duty cycle shall be measured with the radio beacon placed in the test fixture (see EN 302 961-1 , clause 6.2). The demodulated signal is suitably applied to the input of a storage oscilloscope. A display of the type shown in figures 1 and 2 can be obtained on the storage oscilloscope.

Figure 4: Modulation measurement setup

The modulation sequence timings are calculated as depicted in figure 1 with the storage scope time-base set to an appropriately long period (e.g. 5 S /div or more adequate). The modulation duty cycle and the depth of modulation are calculated as depicted in figure 2 with the storage scope time-base set to an appropriate period (e.g. 250 uS /div or more adequate).

2.2.2 Results

Measurement	Values	Result
Deep modulation	A = 3.1 Vpp, B = 0.14 Vpp, % = 91.3 %	Pass
Duty cycle	t_1 = 376 uS, t_2 = 714 uS, % = 52.7 %	Pass

2.2.3 Limit

The modulation characteristics limits shall be as stated in EN 302 961-1 [1], clause 8.2.5.

The depth of audio modulation shall be at least 85 %.

The audio modulation duty cycle shall be between 33 % and 55 %.

2.2.4 Equipment used

6, 12, 17

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2.3 Clause 4.2.3: Audio sweep characteristics

Date of test	Jan 13, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.3.1 Definition

The audio sweep characteristics shall be as defined in EN 302 961-1 [1], clauses 8.2.6.1 and 8.2.6.2.

The audio part of modulation shall be a down-swept tone.

The audio sweep range is defined by the upper and lower frequencies with which the carrier is amplitude modulated.

The sweep repetition rate is defined as the rate at which the audio sweep is repeated.

The sweep range and repetition rate shall be measured with the radio beacon placed in the test fixture (clause 6.2). The emission shall be applied to the input of a suitable receiver or analyzer. If a spectrum analyzer is used, it shall be tuned to the emission center frequency and with the following settings:

- Resolution bandwidth: 30 kHz;
- Frequency span: 0 Hz;
- Vertical scale: Linear.

The reference line shall be set as close to full scale deflection as practicable. The video output of the spectrum analyzer shall be applied to the input of a digital storage oscilloscope. The oscilloscope shall have deep memory capability (in the order of 50 K samples) such that a complete sweep cycle can be captured without losing waveform detail.

2.3.2 Results

Measurement	Values	Result
Sweep sequence	Downwards	Pass
High Frequency sweep	1400 Hz	Pass
Low Frequency sweep	500 Hz	Pass
Total sweep range	900 Hz	Pass
Repetition rate	2.1 Hz	Pass

2.3.3 Limit

The audio sweep characteristics limit shall be as stated in EN 302 961-1 [1], clause 8.2.6.4.

The sweep shall be downwards (high frequency to low frequency).

The highest frequency shall not exceed 1 600 Hz.

The lowest frequency shall be greater than 300 Hz.

The total swept range shall be at least 700 Hz.

The sweep repetition rate shall be between 2 Hz and 4 Hz.

2.3.4 Equipment used

2, 6, 12, 17

2.4 Clause 4.2.4: Spectral carrier power ratio

Date of test	Jan 13, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.4.1 Definition

The spectral carrier power ratio shall be as defined in EN 302 961-1, clause 8.3.1.

The spectral carrier power ratio is the ratio of the total power of the emission to the power centered on the carrier in a specified bandwidth, both measurements taken under normal audio modulated conditions.

The measurement shall be performed under normal test conditions with the radio beacon placed in the test fixture (EN 302 961-1 , clause 6.2).

Figure 5: Spectral carrier measurement setup

The manufacturer shall supply a sample with only audio modulation.

To determine the total power, the emission is suitably applied to the input of a spectrum analyzer with the following preferred settings:

- Resolution bandwidth: 10 kHz;
- Video filter: off;
- Scan time: 100 ms/division (div);
- Center frequency: Carrier frequency as measured in EN 302 961-1 , clause 8.1.

The total power is determined by noting the power measured from the amplitude reading on the spectrum analyzer expressed in logarithmic form and adding it to the modulation duty cycle previously measured and converted to a figure in dB, i.e. 10 log10 (spectrum analyzer power) +10 log10 (t1/t2) using relevant units. (For the definition of t_1 and t_2 see figure 3). To determine the power in the specified bandwidth, the preferred spectrum analyzer settings are as follows:

- Resolution bandwidth: 100 Hz or less;
- Video filter: off;
- Scan time: 10 s/div;

- Center frequency: Carrier frequency as measured in EN 302 961-1 , clause 8.1.

The power in the specified bandwidth is determined from the amplitude reading on the spectrum analyzer. The difference between the total power and the power in the specified bandwidth in dB is the spectral carrier power ratio.

2.4.2 Results

Measurement	Values	Result
Spectral carrier power ratio	4 dB	Pass

2.4.3 Limit

The spectral carrier power ratio limit shall be as stated in EN 302 961-1 [1], clause 8.3.3.

The spectral carrier power ratio shall be less than 5,2 dB.

2.4.4 Equipment used

2, 12, 17

2.5 Clause 4.2.5: Maximum Effective Radiated Peak Envelope Power

Date of test	Feb. 4, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.5.1 Definition

The maximum effective radiated peak envelope power shall be as defined in EN 302 961-1 [1], clause 8.4.1.

The maximum ERPEP is defined as the ERPEP in the direction of maximum field strength under specific conditions of measurement.

The peak envelope power is the average power supplied to the antenna transmission line by a transmitter during one radio cycle at the crest of the modulation envelope taken under normal operating conditions of audio modulation (ERPEP1 in figure 2).

The measurements shall be made under normal test conditions and under extreme test conditions.

2.5.1.1 Method of measurement under normal test conditions

On a test site selected from annex A, the equipment shall be placed on the support and according to the requirements of clause A.4 for equipment intended to be worn on a person. The equipment shall then be activated. Note that 121,5 MHz shall not be used when testing in an open area.

The receiver shall be tuned to the transmitter carrier frequency. The test antenna shall be orientated for vertical polarization. The test antenna shall be raised or lowered through the specified range of heights until a maximum signal level is detected on the measuring receiver.

The transmitter shall be rotated through 360° around a vertical axis in order to find the direction of the maximum signal.

The maximum signal level detected by the measuring receiver shall be noted.

The transmitter shall be replaced by a substitution antenna as defined in annex A.

The substitution antenna shall be connected to a calibrated signal generator.

The frequency of the calibrated signal generator shall be adjusted to the transmit carrier frequency.

The input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver, if necessary.

The test antenna shall be raised or lowered through the specified range of heights to ensure that the maximum signal is received.

The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver that is equal to the level noted to that detected from the equipment under test corrected for the change in input attenuator setting of the measuring receiver.

The maximum ERPEP is equal to the power supplied by the signal generator, increased by the gain of the substitution antenna and corrected for the change in the attenuator.

2.5.1.2 Method of measurement under extreme test conditions

The equipment shall be placed in the test fixture connected to the artificial load with a means of measuring the power delivered to the load. The equipment shall be operated from the test power source (clause 6.4.2).

The measurement shall be made under normal test conditions initially with the equipment on the support in the standard position (annex A or clause A.4 for equipment intended to be worn on a person) to enable a reference measurement to be made. This enables a reference factor to be determined. The measurement shall be repeated with the test fixture placed in the chamber under extreme test conditions (clause 6.6).

2.5.2 Results

Test	Value	Result
Max ERPEP	+20.9 dBm	Pass

Data derived from TecnoLab Test Report RP003016

2.5.3 Limit

The ERPEP shall be at least 25 mW, and not more than 500 mW.

2.5.4 Equipment used

From 23 to 41, as needed

2.6 Clause 4.2.6: Effective Radiated Power during CW modulation (ERP(CW))

Date of test	Not execute
Temperature	-
Humidity	-

2.6.1 Definition

The ERP(CW) is defined as the ERP in the direction of maximum field strength under specific conditions of measurement during the CW transmission.

2.6.2 Statement

The DUT have no CW transmission.

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2.7 Clause 4.2.7: Transmitter spectrum mask

Date of test	Jan 13, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.7.1 Definition

The transmitter spectrum mask shall be as defined in EN 302 961-1 [1], clause 8.6.1.

The transmitter spectrum mask defines the limits within the range fc ±75 kHz for the peak power of all modulated signals including all side bands associated with the carrier.

The equipment shall be placed in the test fixture connected to the artificial load with a means of measuring the power delivered to the load. The equipment shall be operated from the test power source (clause 6.4.2).

Figure 6: Spectrum mask measurement setup

The measurement shall be made under normal test conditions.

To determine the reference peak power and measure the emissions in the adjacent channels, the emission is suitably applied to the input of a spectrum analyzer with the following preferred settings:

- Resolution bandwidth: 3 kHz;
- Video filter: off;
- Scan bandwidth: 150 Khz;
- Center frequency: Carrier frequency as measured in clause 8.1;
- Detector type: Peak hold.

At least 10 minutes of emissions shall be measured and a reference carrier power calculated as being the maximum power within the frequency limits set in clause 8.1.3. The emission profile shall then be normalized so that the reference carrier power is set to 0 dBc. The result is compared to the mask given in Figure 7. The modulation sequence and the data content (if employed) during the test shall be representative of normal operation.

The mask comprises a set of straight lines determined as follows:

A straight line from (-75 KHz, -70 dBc) to (-17 KHz, -40 dBc), a straight line from (-17 KHz, -40 dBc) to (-

5 Khz, 0 dBc), a straight line from (-5 KHz, 0 dBc) to (+5 KHz, 0 dBc), a straight line from (+5 KHz, 0 dBc) to (+17 KHz, -40 dBc), a straight line from (+17 KHz, -40 dBc) to (+75 KHz, -70 dBc). Where the mask falls below the line Sp then the line Sp shall be used as the mask.

Sp is the normalized spurious emission limit (clause 8.8.3): Sp = -37 - ERPEP (as measured in clause 8.4.2) dBc.

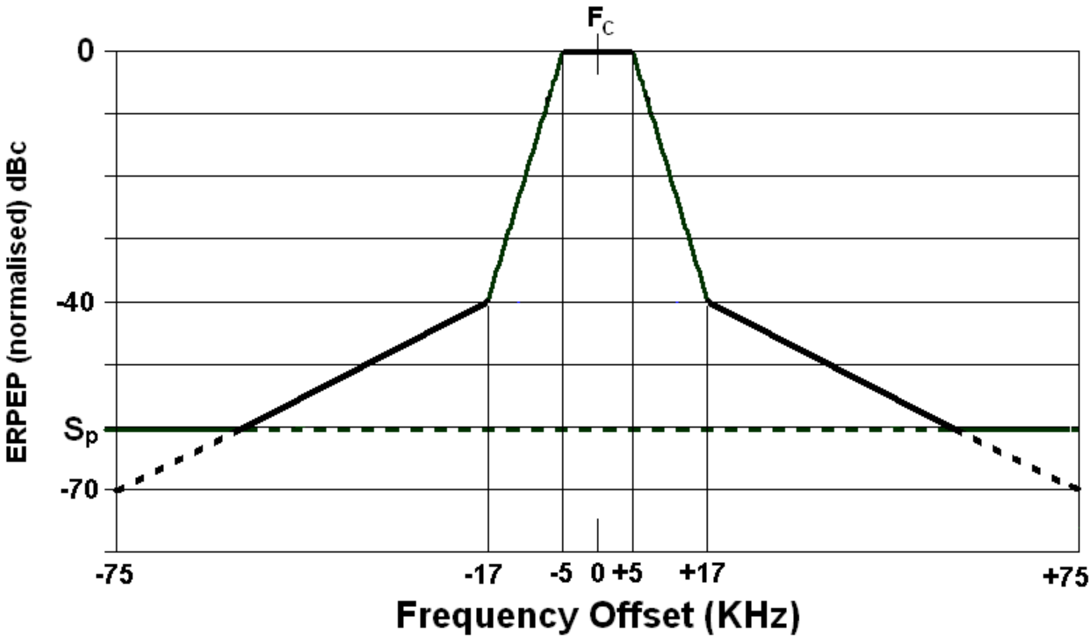

Figure 7: Spectrum mask

2.7.2 Results

Transmitter spectrum mask	Pass (see Figure 8)

2.7.3 Limit

The normalized emission profile shall not exceed the mask of figure 7.

2.7.4 Equipment used

2, 12, 17

2.8 Clause 4.2.8: Radiation produced by operation of the test facility

Date of test	Feb. 4, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.8.1 Definition

The radiation produced by operation of the test facility shall be as defined in EN 302 961-1 [1], clause 8.7.1.

Radiation produced by operation of the test facility is the radiation at the nominal frequencies when the equipment is being tested.

The radio beacon shall be tested with the switch in the test position.

The method of measurement described in clause 8.4 shall be used, however, the test shall be performed at normal test conditions only.

The transmitter shall be rotated in all directions until the maximum radiation is detected.

2.8.2 Results

Test	Value	Result
Radiation level in test mode	20 nW	Pass

Data derived from TecnoLab Test Report RP003016

2.8.3 Limit

The test facility provided to indicate the correct functioning of the radio beacon shall not produce an ERPEP greater than 5 uW.

2.8.4 Equipment used

From 23 to 41, as needed

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2.9 Clause 4.2.9: Spurious emission

Date of test	Feb. 4, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.9.1 Definition

The spurious emissions are defined in EN 302 961-1 [1], clause 8.8.1.

Emission(s) on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products, and frequency conversion products.

Spurious emissions shall be measured using a test site described in annex A.

The measurement shall be performed with the radio beacon in its standard position (annex A) and according to the requirements of clause A.4 for equipment intended to be worn on a person.

The method of measurement described in clause 8.4 shall be used to search for spurious emissions in the frequency band 30 MHz to 2 GHz, excluding the frequency band tested in clause 8.6.

The measuring receiver shall have a bandwidth of 100 kHz to 120 kHz.

The measurement shall only be performed under normal test conditions, the radio beacon being rotated until the maximum emission is detected. The measurement is made for all modulation types in the modulation sequence (clause 8.2.1). The measurement is then made for test transmission (clause 8.7.1). The measurement is also made when the radio beacon has been activated but is not transmitting.

2.9.2 Results

Test	Value	Result
In transmitting mode	< 0,2 µW	Pass (see Figure 10 & 11)
In stand-by mode	< 2 nW	Pass (see Figure 12 & 13)

2.9.3 Limit

The power of any spurious emission component when transmitting shall not exceed 0,2 µW.

The power of any spurious emission component when not transmitting shall not exceed 2 nW between 30 MHz and 1 GHz and 20 nW between 1 GHz and 2 GHz.

2.9.4 Equipment used

From 23 to 41, as needed

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3 RTCM STANDARD 11901.1 with with Amendment 1 & 2

3.1 Clause B.3.5.1.10 ; Peak Effective Radiated Power

Date of test	Feb. 4, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

3.2 Definition

The Peak Effective Radiated Power (PERP) is the Peak Envelope Power (PEP)3 multiplied by the gain of the antenna.

This test is only required to be performed at ambient temperature and should use an EUT that has been ON for a minimum of 91.7% of its stated operational life. If the test length exceeds the remaining 8.3% of operational life, the battery may be replaced with another which has been preconditioned with at least 91.7% of its stated operational life discharged.

The measurement procedure consists in a determination of 12 values of PERP made by direct measurement of radiated power. The measurements are taken at an azimuth angle of 30º ± 3º. All PERP measurements should be made at the same elevation angle; the elevation used should be the angle between 5º and 20º for which the EUT exhibits a maximum antenna gain. The median value of PERP should be between 25 mW and 100 mW; the ratio of maximum to minimum of the 11 highest values of PERP should not exceed 2 to 1 (3 dB).

3.3 Test conditions

The test site should be on level ground which has uniform electrical characteristics. The site should be clear of metal objects, overhead wires, etc., and as free as possible from undesired signals such as ignition noise or other RF carriers. The distance from the EUT, or the search antenna to reflecting objects should be at least 30 m. The EUT should be placed in the center of a ground plane with a radius of no less than 75 cm ± 5 cm. The EUT should be positioned vertically.

The ground plane should be resting on the ground and should be extended so that it completely encloses and presents a snug fit to the EUT. Measurement of the radiated signals should be made at a point 5 m or more from the EUT. At this point, a wooden pole or insulated tripod with a movable horizontal boom should be arranged so that a search antenna can be raised and lowered through an elevation angle of 5º to 20º. The search antenna should be mounted on the end of the boom with its cable lying horizontally on the boom and run back to the supporting mast. The other end of the search antenna cable should be connected to a spectrum analyzer located at the foot of the mast.

3.4 Method of measurement

The elevation angle between 5º and 20º which produces a maximum gain is determined with the EUT at an arbitrary azimuth. The PEP should be measured and the elevation angle should be noted and should remain fixed for the remainder of the test. The remaining 11 measurements of PERP may be obtained by rotating the EUT in increments of 30º ± 3º. For each measurement the EUT PERP should be computed using the following equation:

$$PERP = \log^{-1} \frac{P_{rec} - P_{rec} + L_C + L_P}{10}$$, where:

P_{rec} = Measured Power level from spectrum analyzer (dBm)

G_{rec} = Antenna gain of search antenna (dB)

L_c = Receive system attenuator and cable loss (dB)

L_p = Free space propagation loss (dB)

3.4.1 Result

	Angle	Value	Result
PERP	0 Degree	34.5 mW	Pass
	30 Degree	35.2 mW	Pass
	60 Degree	36.7 mW	Pass
	90 Degree	37 mW	Pass
	120 Degree	36.6 mW	Pass
	150 Degree	35.4 mW	Pass
	180 Degree	34.0 mW	Pass
	210 Degree	35.3 mW	Pass
	240 Degree	36.4 mW	Pass
	270 Degree	36.8 mW	Pass
	300 Degree	36.3 mW	Pass
	330 Degree	35.1 mW	Pass
	Nominal (median of 11 highest values)	35.9 mW	Pass
	Minimum	34.0 mW	Pass
	Maximum	37 mW	Pass
	Ratio	1.1 dB	Pass

Data derived from TecnoLab Test Report RP003016

3.4.2 Limit

The median value of PERP should be between 25 mW and 100 mW; the ratio of maximum to minimum of the 11 highest values of PERP should not exceed 2 to 1 (3 dB).

3.4.3 Note

The difference in results achieved here compared with paragraph 2.5 is due to the different application of the standard (RTCM vs ETSI), especially in EN 302 961-1 [1] clause 8.4.1 the use of 'Salty-man' support (see EN 302 961-1, Annex A, A.4) change the antenna resonance of the DUT and consequently changes the value of radiated power (DUT antenna is tuned with 'Salty-man').

3.4.4 Equipment used

From 23 to 41, as needed

4 Pictures

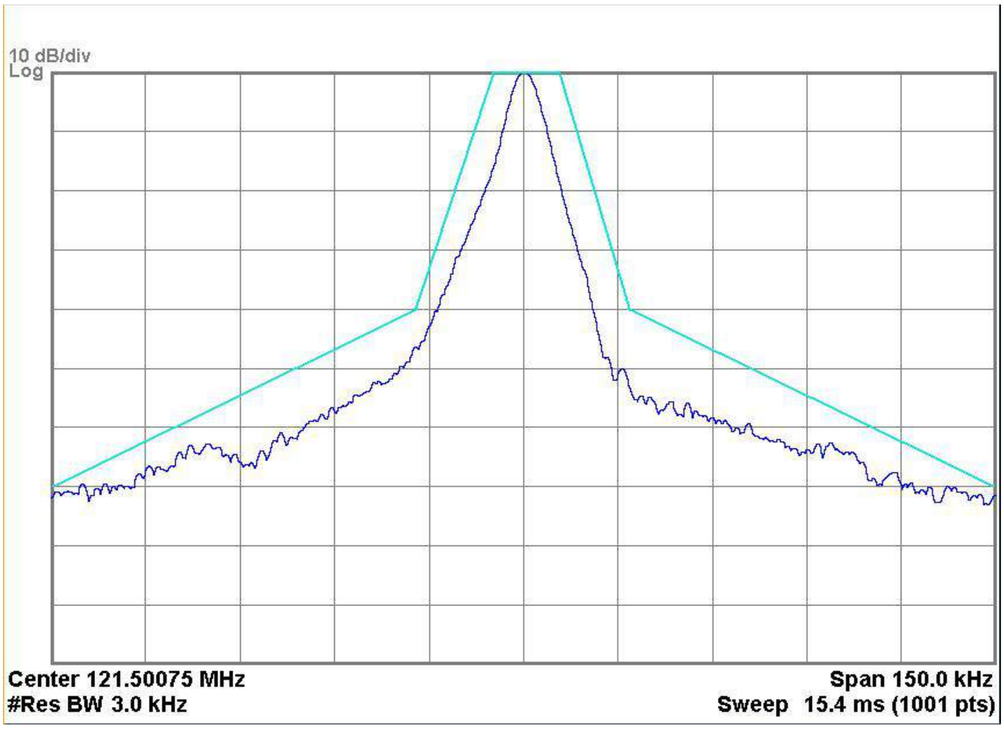

Figure 8: EN 302961-2 , 4.2.7 , Transmitter spectrum mask

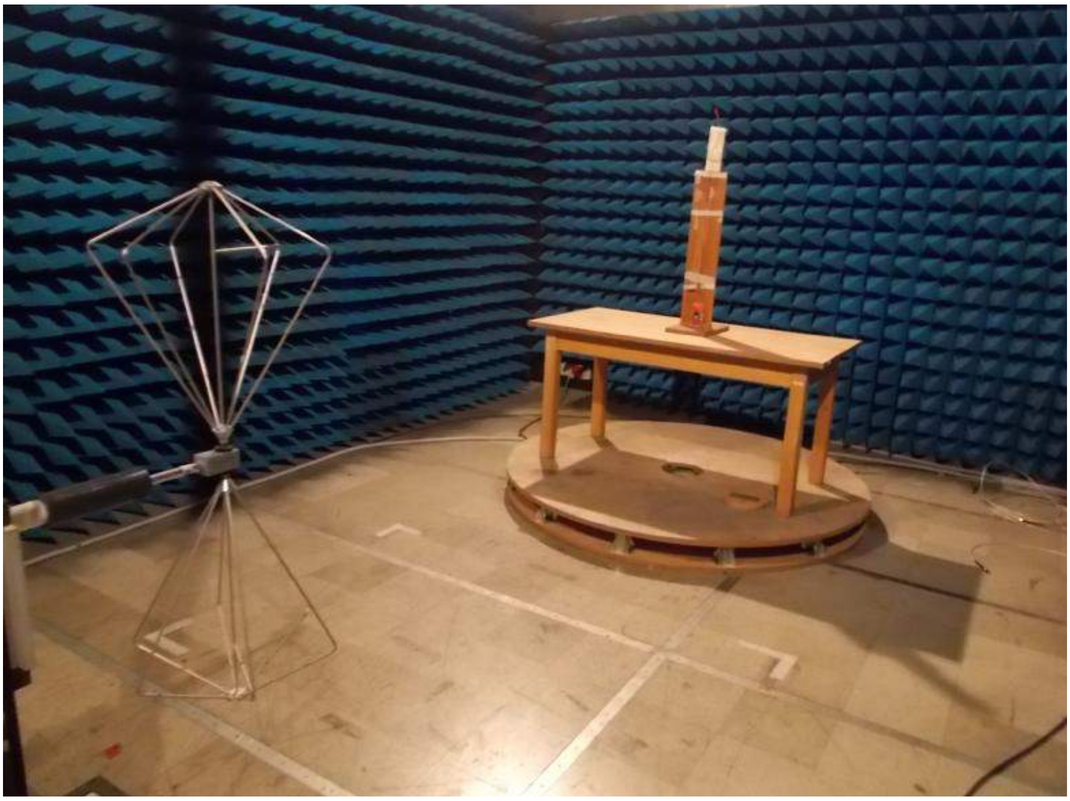
Figure 9: RF Emission test

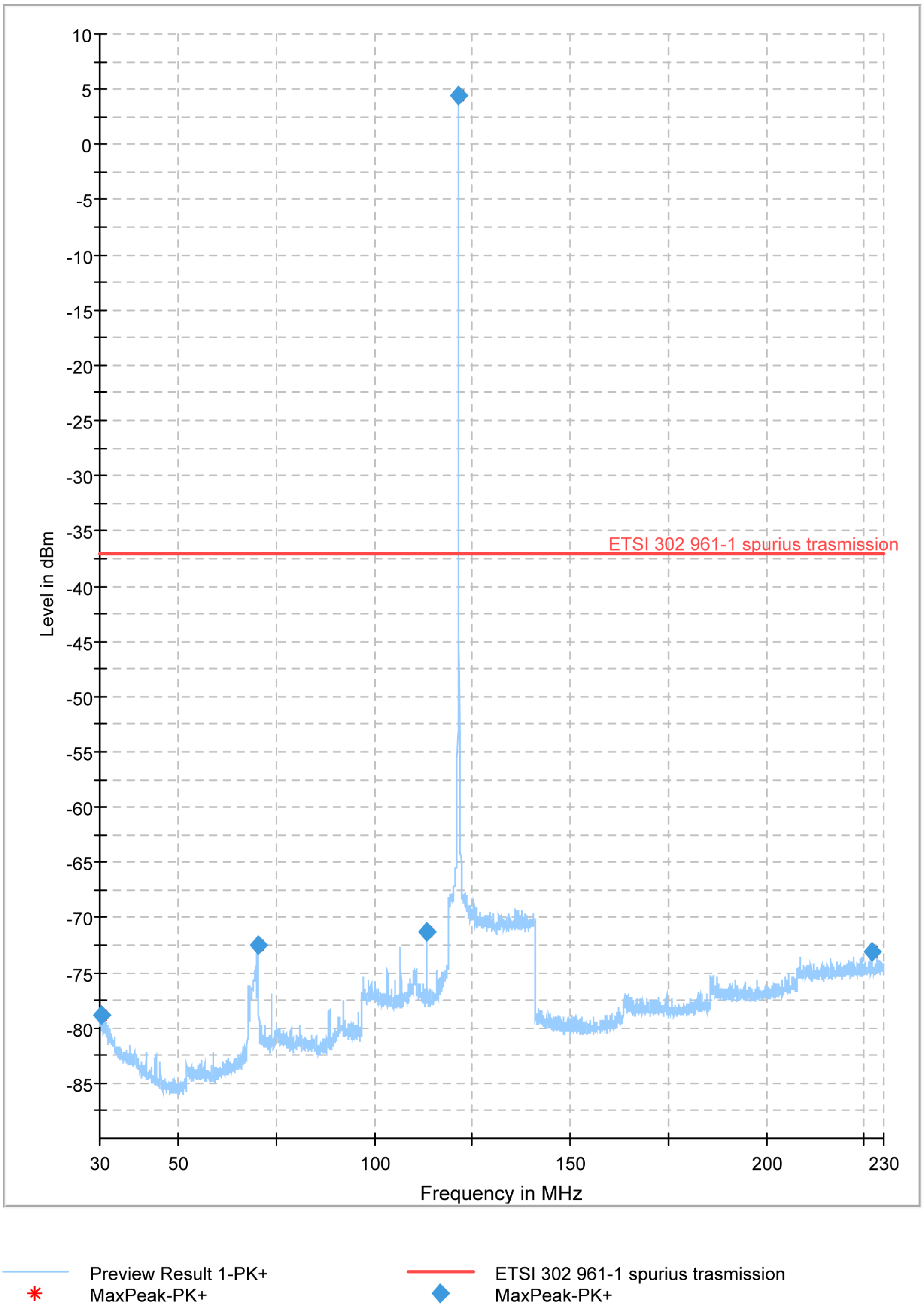

Figure 10: Spurious emission, device on transmission, 30 - 230 MHz

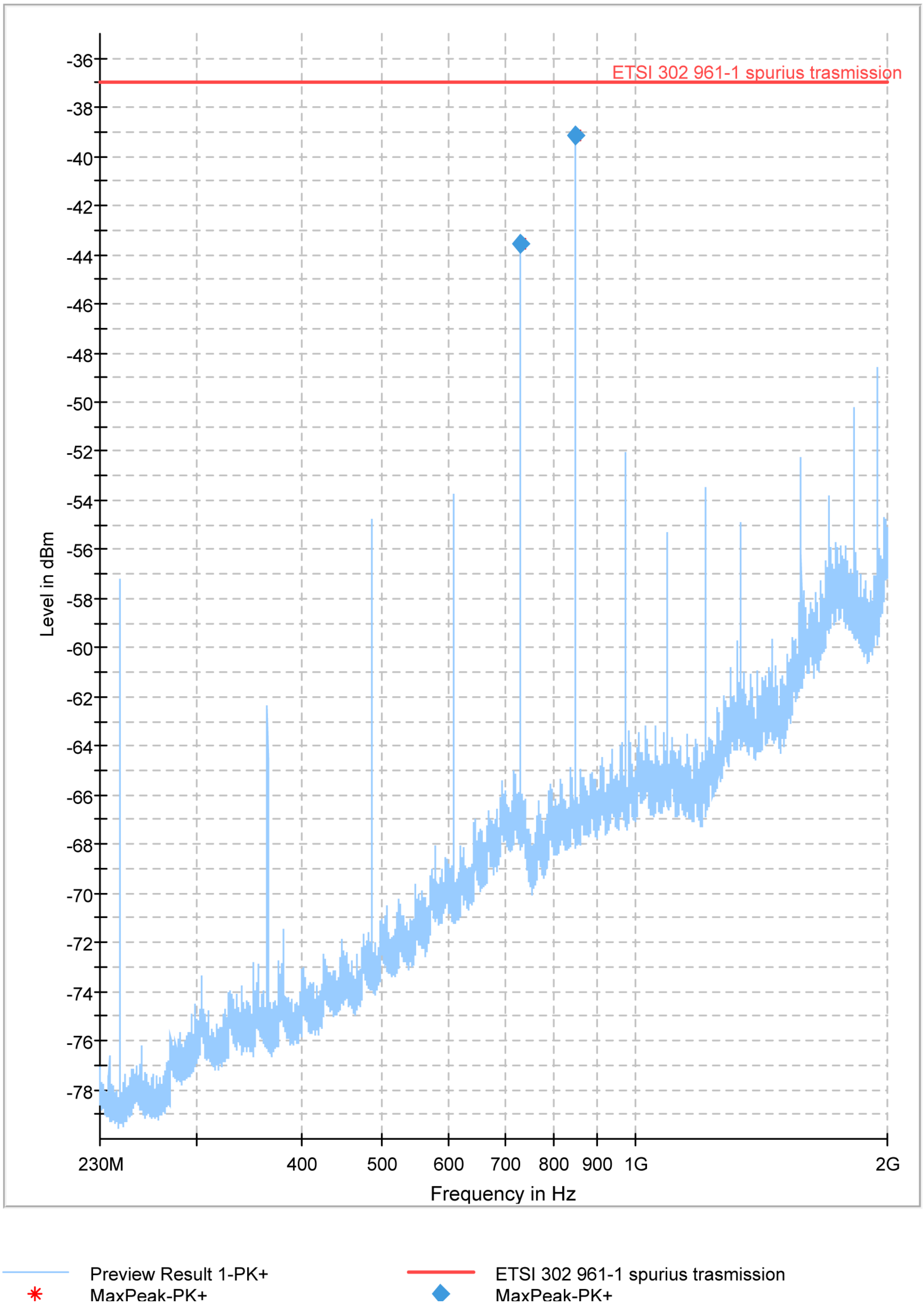

Figure 11: Spurious emission, device on transmission, from 230 to 2000 MHz

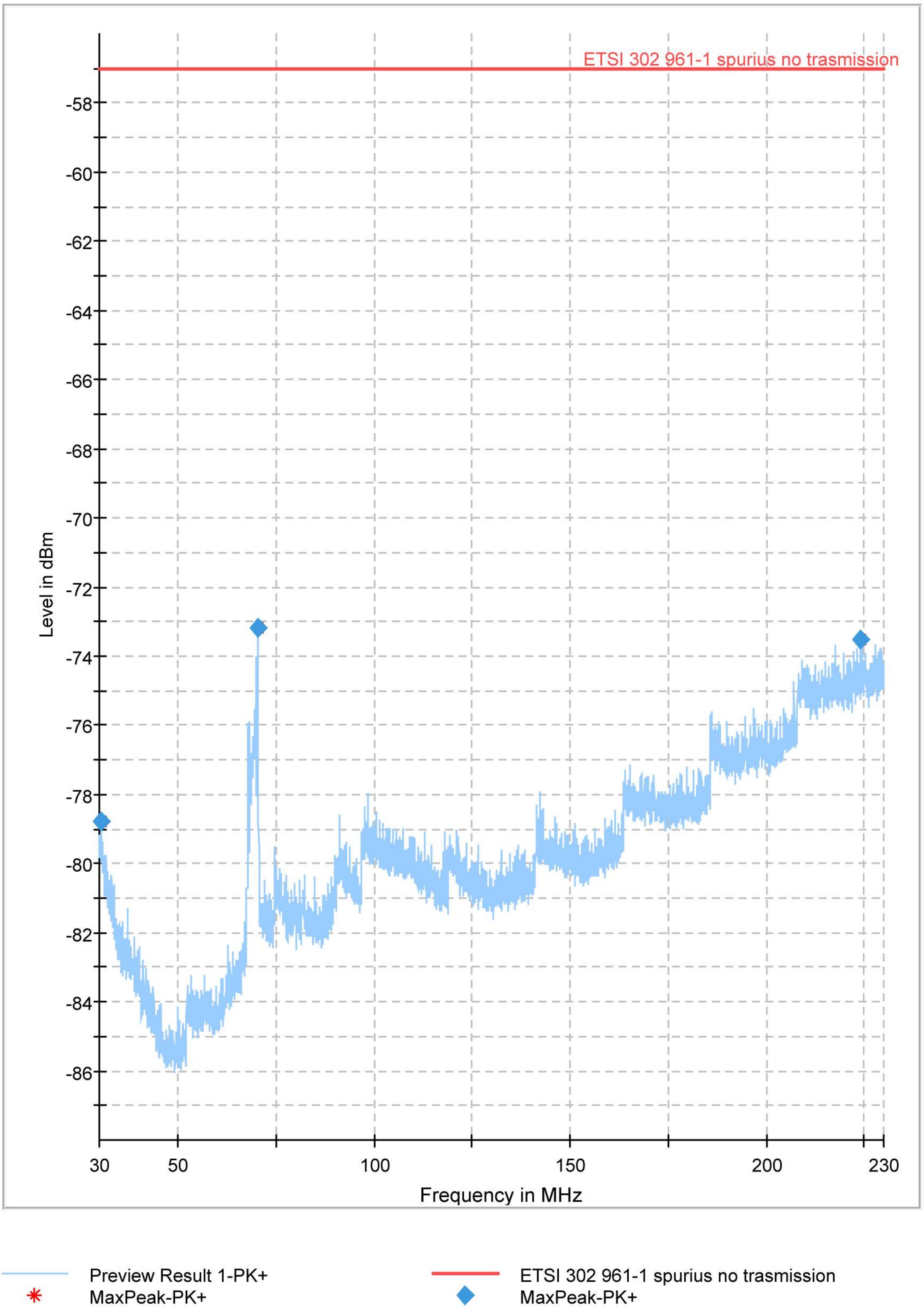

Figure 12: Spurious emission, device on stand-by, from 30 to 230 MHz

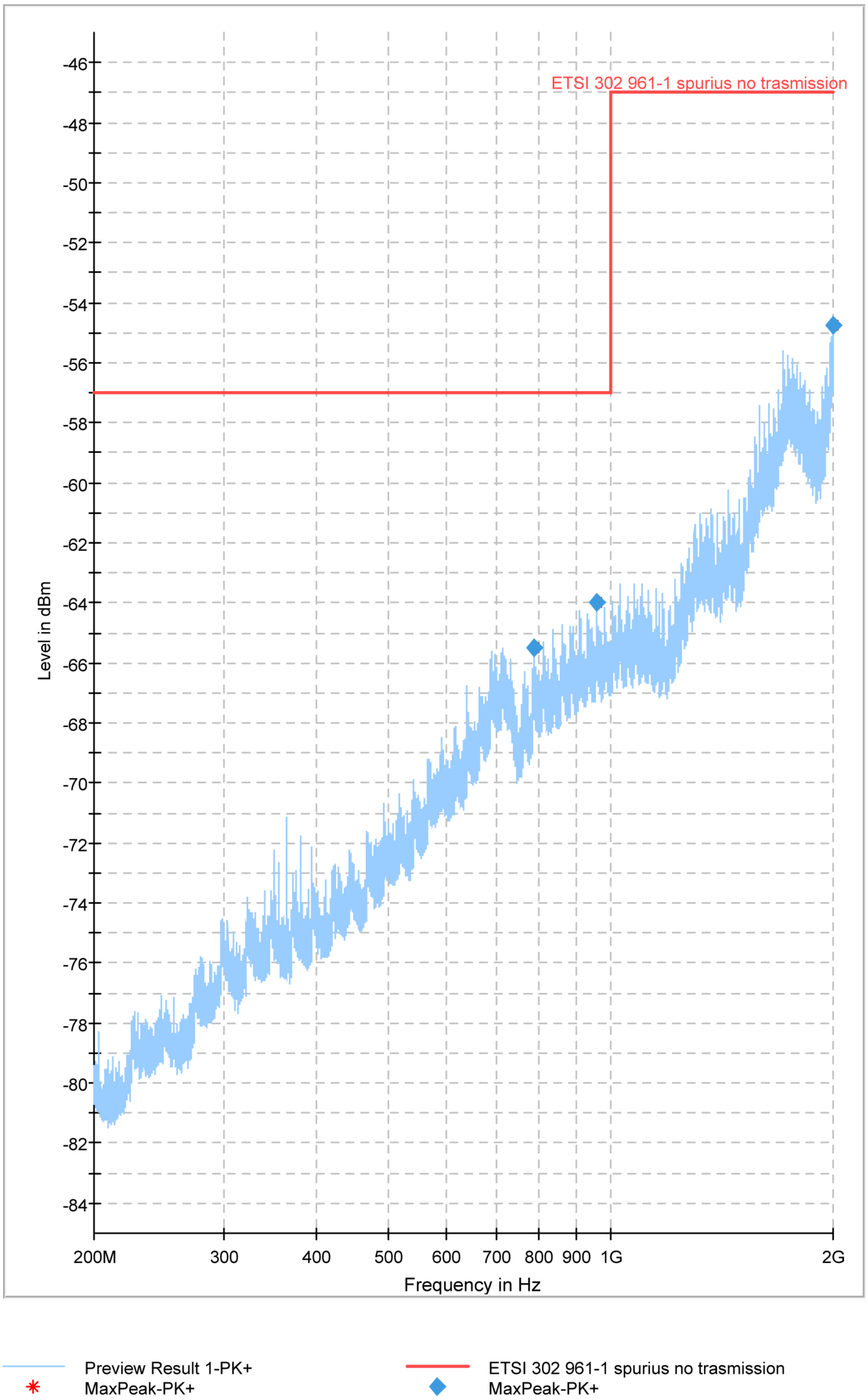

Figure 13: Spurious emission, device on stand-by, from 200 to 2000 MHz

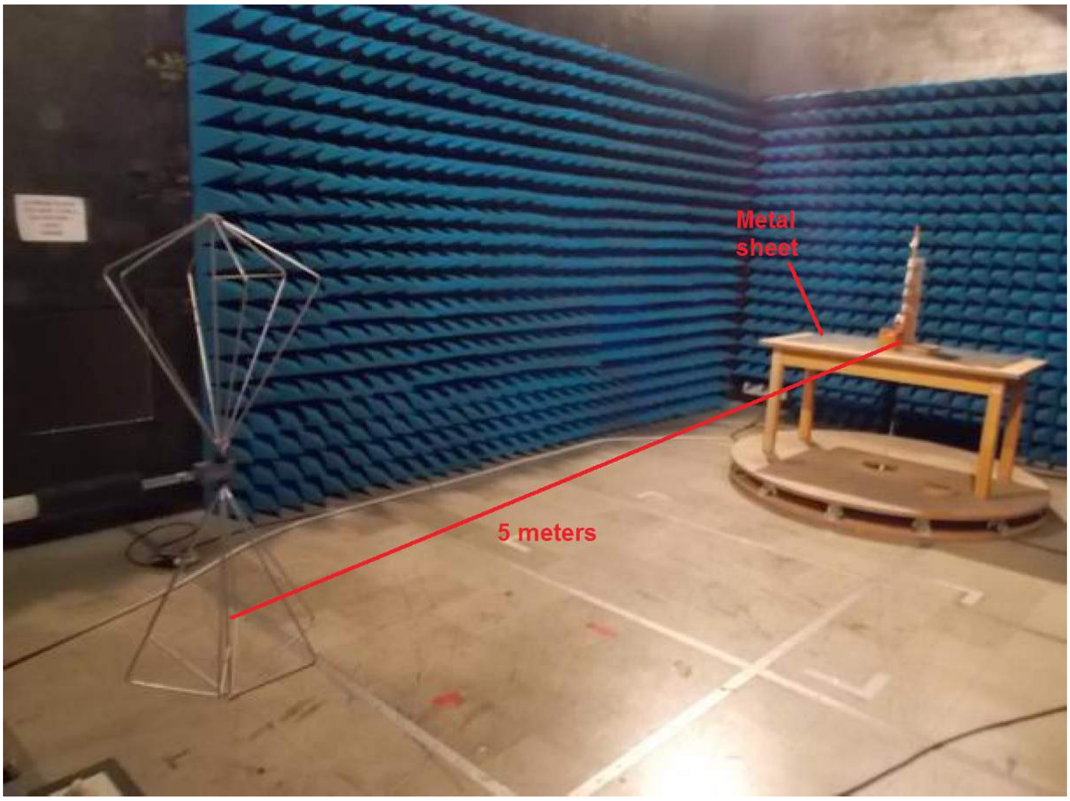

Figure 14: RTCM 11901.1 test


Figure 15: Wamblee's lab facilities


Figure 16: Wamblee's lab facilities (detail)

5 List of instruments and facilities used

Ref	Item	Description	Serial nº	Cal. Date
1	Angelantoni AnyVib 600-15	Climatic chamber	47055	18/10/16
2	Agilent N9020A	Spectrum analyzer	MY47380272	20/11/16
3	R&S FSP	Spectrum analyzer	100581	20/11/16
4	Agilent N5181A	RF generator	MY47400004	20/11/16
5	R&S SMB100M	RF generator	101497	20/11/16
6	Agilent DSO8064A	Oscilloscope	MY45002550	20/11/16
7	Agilent 53131A	Frequenzimeter	MY40021333	20/11/16
8	Agilent 33220A	20 Mhz generator	MY44031999	20/11/16
9	Agilent E5062A	Vector / Network analyzer	MY44204194	20/11/16
10	Agilent N1911A	Bolometer	MY45101308	20/11/16
11	Agilent N1921A	Bolometer (sensor)	MY45200360	20/11/16
12	Agilent 8498A	Power attenuator 30dB	MY39260675	20/11/16
13	Agilent 8491A	6 dB Attenuator	MY39264741	-
14	Agilent 8491A	10 dB Attenuator	MY39264795	-
15	Agilent 8491A	20 dB Attenuator	MY39264776	-
16	Agilent 3645A	DC Power supply	MY40004154	20/11/16
17	Agilent 3644A	DC Power supply	MY40006619	20/11/16
18	Agilent 3644A	DC Power supply	MY40003240	20/11/16
19	Agilent 85092-60010	ECAL calibration Kit	3610	20/11/16
20	Agilent 3499A	Switch control	MY42003902	-
21	Agilent 58503A (Z3805)	GPS Time/Frequency receiver	3710A01191	-
22	Wamblee Salty man	Salty man toolkit	-	-
23[1]	Semi-anechoic chamber	Panashield-TDK-Protecno	-	-
24[1]	R&S ESR26	EMI Test receiver 10Hz / 26.5 Ghz	-	27/09/16
25[1]	BBDA-20/300	Biconical Power Antenna	-	-
26[1]	EMCO 3110B	Biconical Antenna	-	18/06/16
27[1]	EMCO 3148	Log periodic antenna	-	18/06/16
28[1]	Schaffner BBHA9120D	Horn antenna	-	18/06/16
29[1]	TESTO 615	Digital thermoigrometer	-	20/10/16
30[1]	Agilent N5183A	20 GHz RF Generator	-	06/07/17
31[1]	Kalmus 715 FC	200-1000 MHz power amplifier	-	12/03/16
32[1]	Kalmus 116 FC	0,01-225 MHz power amplifier	-	12/03/16
33[1]	MilMega ASO104-30R	1-4 GHz power amplifier	-	12/03/16
34[1]	Booton 4232A	Power meter	-	08/10/16

1 Instruments used in TecnoLab del Lago Maggiore, Verbania (Italy)

Ref	Item	Description	Serial nº	Cal. Date
35[1]	Booton 51013	Power sensor	-	08/10/16
36[1]	HP 773D	Bidirectional coupler	-	24/02/16
37[1]	MEB RK100\	Bidirectional coupler	-	24/02/16
38[1]	LP Instrument CH213-30	Bidirectional coupler	-	24/02/16
39[1]	Narda769-20	20 dB Attenuator	-	02/03/16
40[1]	Schaffner CBL6140A	Bilog antenna	-	-
41[1]	EMTEST ESD30N	ESD gun	-	10/03/16

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