

Test report nr. 21416FCC15

Measurements performed in accordance with:

**FCC Rules: code of Federal Regulations (CFR) no. 47
PART 15 – RADIO FREQUENCY DEVICES**

Product: Transceiver

Tested model: MULTITEC

FCC ID YBU2871X09X

Applicant: elero gmbh Antriebstechnik
Linsenhofer Str. 59-63
D-72660 Beuren

Manufacturer: elero gmbh Antriebstechnik
Linsenhofer Str. 59-63
D-72660 Beuren

Trademark: elero

Testing Laboratory Nice S.p.A.
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Registration number: 771316

Date of receipt sample: 10th March 2015

Testing date: 16th March – 10th June 2015
14th September – 15th September

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Tested by: L. Pastres 

Checked by: E. Campion 

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General Description of Equipment under Test

1.1 Applicant

Name: elero gmbh Antriebstechnik
Address: Linsenhofer Str. 65
D-72660 Beuren
Country: GERMANY

1.2 Manufacturer

Name: elero gmbh Antriebstechnik
Address: Linsenhofer Str. 65
D-72660 Beuren
Country: GERMANY

1.3 Equipment classification

According to definition 15.3 (o) is a intentional Radiator operating within the **Frequencies**:

so it shall fulfil provisions of 47CFR Part 15 Subpart C – international radiators – and Section 15.209.

According to definition 15.3 (z) is a unintentional Radiator:

So it shall fulfil provisions of 47CFR Part 15 Subpart B – Unintentional radiator and section 15.249.

1.4 Basic Description of equipment under test

Parameters	Value
Type of equipment:	Transceiver for screen applications
Model:	MULTITEC
FCC ID:	YBU2871X09X
Trade Name:	Elero GmbH Antriebstechnik
Data cable:	-
Telecom cable:	-
Power supply type:	5Vdc (from USB cable)
AC power input cable:	<i>120V, 60Hz with dedicated power supply</i>
DC power input cable:	-

Model	Description
MULTITEC	The transceiver has a unidirectional transmission at 915.3MHz and bidirectional transmissions at 918.3MHz

1.5 Feature of equipment under test

Parameters	Value
Power specification	5Vdc (from USB Cable)
Operating frequency:	915.3MHz (unidirectional), 918.3MHz (bidirectional)
Maximum RF output power:	56.37dB μ V/m (average), 81.96 dB μ V/m (peak) 918.3MHz and 55.83 dB μ V/m (average), 81.86 dB μ V/m (peak) 915.3MHz
Occupied Bandwidth (99% BW):	127kHz (918.3MHz) 127kHz (915.3MHz)
Emission Designator (ITU):	127KF1D (918.3MHz) 127KF1D (915.3MHz)
Modulation:	FSK (915.3MHz) GSFK (918.3MHz)
Channel spacing:	-
Antenna:	Integral
Rx Sensitivity:	-
Main SW identification:	-
Main HW board identification:	-
Peripherals included (for system application):	-
Interfaces:	-
Integrated interfaces	-
AC adapter:	-

2

Test configuration of equipment under test

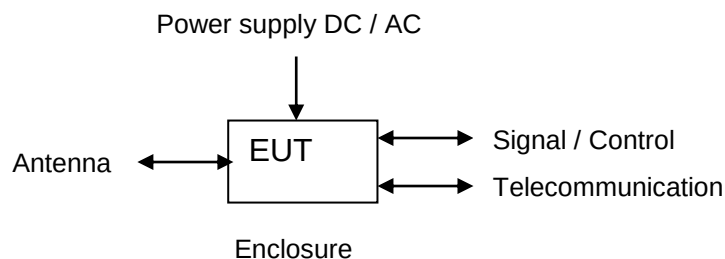
2.1 Environmental conditions

Test conditions	Measured
Ambient temperature:	20 ÷ 25°C
Relative humidity:	50 ÷ 60%
Atmospheric pressure:	900 ÷ 1010mb

2.2 Description of support equipment

Equipment	Manufacturer	Model
-	-	-

2.3 Interface identification and connection diagram of test system



#	Interface	Description	Maximum length	Ref. Document
1	Enclosure	Plastic	-	-
2	AC mains power input	120V, 60Hz	-	-
3	DC power port	5Vdc from USB	-	-
4	Signal / control port	-	-	-
5	Antenna port	-	-	-

3

Operation of equipment under test

3.1 Operating test conditions

#	Description
1	Receiving mode
2	Transmission mode

4

Tests identification and result

CFR47 Part 15 Section	Title	Operating condition	Result
15.203 15.247 (b)(4)(i)	Antenna requirements	-	PASS
15.207 (a)	Conducted emission	#2	PASS
15.209 (a) (f)	Radiated emission	#1, 2	PASS
15.35 (c)	Timing of the transmitter	#2	PASS
15.231 (a)	Transmit behaviour after releasing the TX-button	-	Not Applicable
15.249 (a)	Radiated output power	#2	PASS
15.35 (c)	Typical pulse train of a signal	#2	PASS
15.249 (c)	Compliance with the limit of FCC	#2	PASS
15.249 (a)	Spurious emission - radiated	#2	PASS
15.215 (c)	Occupied bandwidth	#2	PASS

4.1 Methods of measurement

All compliance measurements has been carried out using the procedures described in the standard ANSI C63.4-2009 (excluding sub-par. 4.1.5.2, 5.7.9 and 14), C63.10-2009 and Section 15.31 of CFR47 Part 15 – Subpart A (General).

4.2 Frequency range investigated

- a) Conducted emission tests: from 9kHz to 30MHz.
- b) Radiated emission tests: from 150kHz to tenth harmonic of fundamental.

5 Tests

5.1 Antenna requirements

Specify:

Base standard:	47CFR Part 15 Sections 15.203, 15.204
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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 so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirements does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219 or 15.221. Further, this requirements does not apply to intentional radiators which, in accordance with Section 15.31 (d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

Antenna Specification:

N° of authorized antenna type:	-
Antenna type:	Integral
Maximum total gain:	0dB
External power amplifiers:	-

Antenna description:

No.	Manufacturer	Model Type
-	-	-

Comments:

the antenna is integral to the product
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5.2 Conduced emission

Specify:

Base standard:	47CFR Part 15 Section 15.207
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- 1) The EUT was placed on wooden table size 80cm, raised 80cm in which is located 40cm away from the vertical wall shielded room.
- 2) Each EUT powered input cord was individually connected through a 50Ω/50μH LISN to the input power source.
- 3) Exploratory measurements were made identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
- 4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was than performed over the frequency range of 0,15MHz to 30MHz.
- 5) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 10kHz during the measurements.
- 6) The measurements with Quasi-Peak detector are performed only for frequencies for which the Peak values are $\geq$ (Q.P. limit – 6dB)

Test Requirements:

Test Setup:	ANSI C63.4
Limit of mains terminal disturbance voltage:	15.207 (a)
Frequency range:	9kHz – 150kHz 150kHz – 30MHz
IF Bandwidth:	200Hz 9kHz
EMC class	B

Limits ⁽¹⁾:

Frequency [MHz]	Quasi-Peak (dBμV)	Average (dBμV)
0,15 – 0,5	66 – 56	56 – 46
0,5 – 5	56	46
5 - 30	60	50

Note: (1) The lower limit shall apply at the transition frequencies.

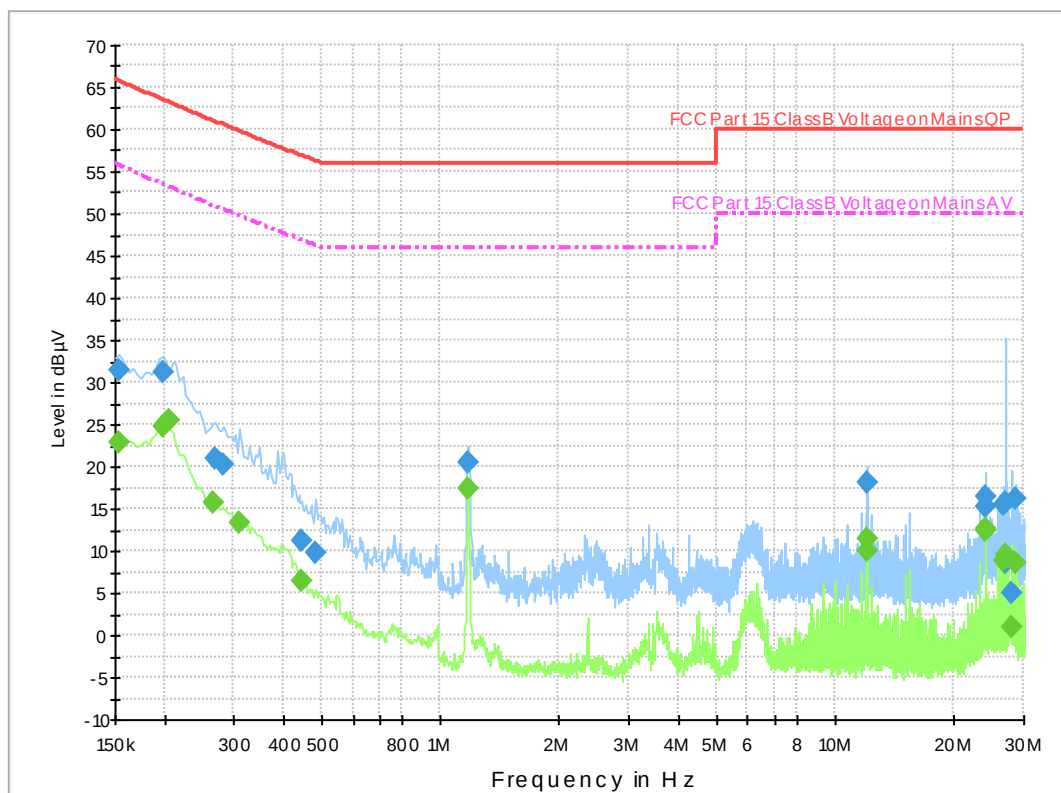
(2) The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.

Test Data:

Port under test	Operating condition	Result
USB power supply 5Vdc	Transmitting (worst case)	Comply
AC power supply	Transmitting (worst case)	Comply

Comments:

FCC test report



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.154000	31.5	1000.0	9.000	GN	N	1.6	34.2	65.8	
0.198000	31.2	1000.0	9.000	GN	N	1.0	32.4	63.5	
0.270000	20.9	1000.0	9.000	GN	N	0.6	40.1	60.9	
0.282000	20.2	1000.0	9.000	GN	L1	0.5	40.3	60.6	
0.446000	11.2	1000.0	9.000	GN	N	0.2	45.7	56.9	
0.482000	9.6	1000.0	9.000	GN	N	0.2	46.6	56.3	
1.174000	20.5	1000.0	9.000	GN	N	0.0	35.5	56.0	
12.002000	18.2	1000.0	9.000	GN	L1	0.5	41.8	60.0	
23.982000	15.3	1000.0	9.000	GN	N	1.2	44.7	60.0	
24.026000	16.3	1000.0	9.000	GN	N	1.2	43.7	60.0	
26.610000	15.6	1000.0	9.000	GN	L1	1.2	44.4	60.0	
27.070000	8.6	1000.0	9.000	GN	N	1.3	51.4	60.0	
27.158000	15.8	1000.0	9.000	GN	L1	1.2	44.2	60.0	
27.910000	5.0	1000.0	9.000	GN	N	1.4	55.0	60.0	
28.686000	16.3	1000.0	9.000	GN	L1	1.3	43.7	60.0	

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.154000	22.8	1000.0	9.000	GN	L1	1.6	33.0	55.8	
0.198000	24.8	1000.0	9.000	GN	L1	1.1	28.7	53.5	
0.206000	25.4	1000.0	9.000	GN	N	0.9	27.7	53.2	
0.266000	15.6	1000.0	9.000	GN	L1	0.6	35.4	51.0	
0.310000	13.2	1000.0	9.000	GN	L1	0.4	36.5	49.7	
0.446000	6.4	1000.0	9.000	GN	N	0.2	40.4	46.9	
1.178000	17.4	1000.0	9.000	GN	N	0.0	28.6	46.0	
11.978000	11.5	1000.0	9.000	GN	N	0.5	38.5	50.0	
12.002000	10.0	1000.0	9.000	GN	L1	0.5	40.0	50.0	
23.982000	12.4	1000.0	9.000	GN	L1	1.1	37.6	50.0	
24.026000	12.5	1000.0	9.000	GN	N	1.2	37.5	50.0	
26.610000	8.7	1000.0	9.000	GN	N	1.3	41.3	50.0	
27.158000	9.4	1000.0	9.000	GN	N	1.3	40.6	50.0	
27.910000	1.0	1000.0	9.000	GN	L1	1.3	49.0	50.0	
28.686000	8.7	1000.0	9.000	GN	N	1.4	41.3	50.0	

5.3 Radiated emission

Specify:

Base standard:	47CFR Part 15 Section 15.209
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- 1) The EUT was placed on turntable which is 0,8m above the ground plane.
- 2) The turntable shall rotate from 0° to 360° degrees to determine the position of maximum emission level.
- 3) The EUT is positioned 3m away from the receiving antenna which varied from 1 to 4m to find the highest emission.
- 4) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 100kHz below 1000MHz and 1MHz above 1000MHz.
- 5) The receiving antenna was positioned in both horizontal and vertical polarization.
- 6) The measurements with Quasi-Peak detector, below 1000MHz are performed only for frequencies for which the Peak values are $\geq$ (Q.P. limit – 6dB).

Test Requirements:

Test Setup:	ANSI C63.4
Test facility:	Anechoic chamber
Test distance:	3m
Limits for radiated disturbances:	15.209 (a)
Frequency range:	150kHz to 1GHz
IF bandwidth (below 30MHz):	9kHz
IF bandwidth (below 1000MHz):	120kHz
IF bandwidth (above 1000MHz):	1MHz
EMC class:	B

Limits ⁽¹⁾:

Frequency [MHz]	Field Strength (μ V/m)	Measurement distance (m)
0,0009 – 0,490	2400/F(kHz)	300
0,490 – 1,750	24000/F(kHz)	30
1,750 - 30	30	30
30 - 88	100	30
88 - 216	150	3
216 - 960	200	3
above 960	500	3

Note: ⁽¹⁾ to convert the measuring distance from 3m to 300m and 30m to 300m a correction factor from 40dB/decade was used

Test Data.:

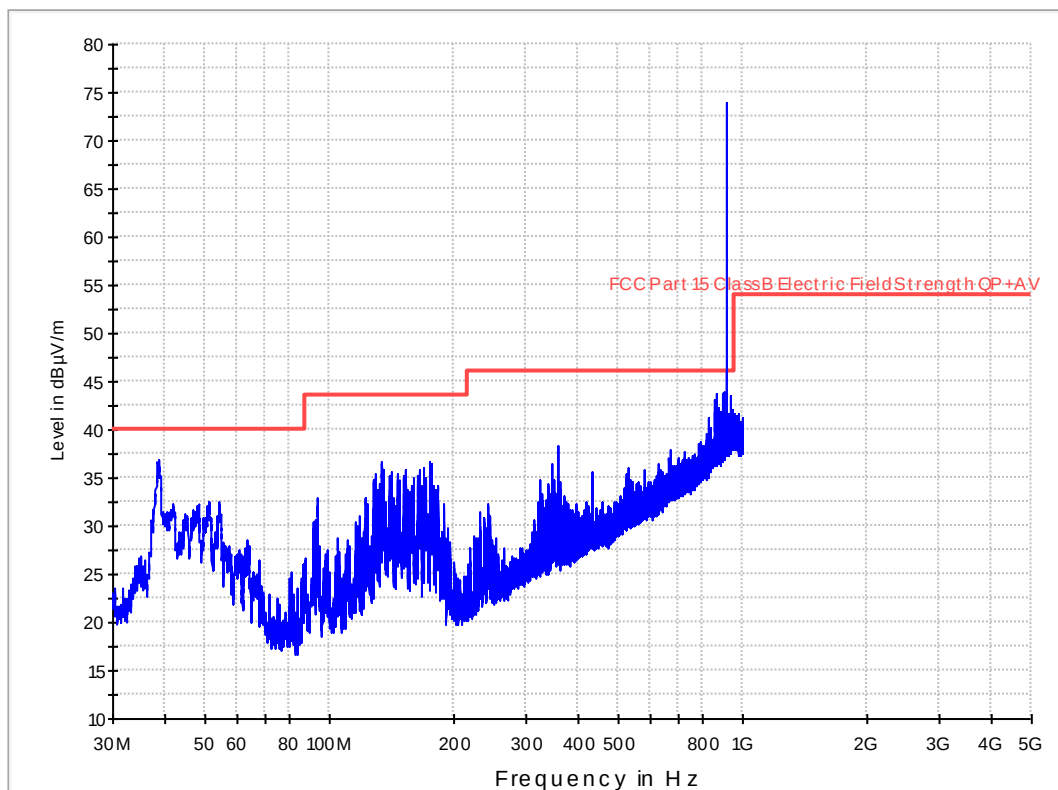
Port under test	Operating condition	Result
Enclosure	#1, #2	Complies

Comments:

The results represent the worst case of emissions between three polarizations verified (X, Y and Z). The table was rotate of 360° and antenna receiving moved from 1m to 4m to find the maximum emission.

Note: the frequency 918.24MHz is the CW for test. **For frequency 915.3MHz the result is same.**

Transmission (30MHz to 1GHz)



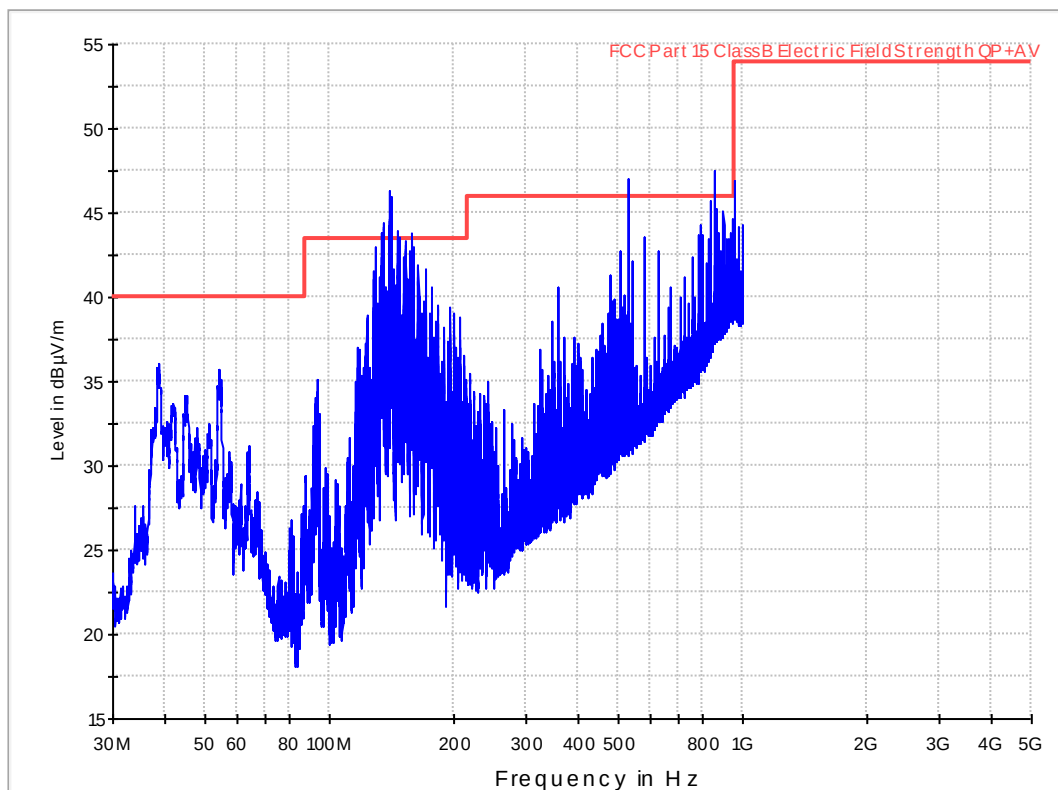
Result Table_Single

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Comment
37.800000	28.7	1000.0	120.000	120.0	V	0.0	13.3	
38.720000	32.5	1000.0	120.000	120.0	V	0.0	13.3	
51.120000	28.1	1000.0	120.000	120.0	V	0.0	14.2	
63.680000	23.0	1000.0	120.000	120.0	V	0.0	12.6	
93.280000	25.9	1000.0	120.000	120.0	V	0.0	10.4	
118.120000	23.4	1000.0	120.000	120.0	V	0.0	13.7	
134.640000	31.5	1000.0	120.000	120.0	V	0.0	15.3	
142.120000	36.6	1000.0	120.000	120.0	H	0.0	15.9	
176.080000	27.9	1000.0	120.000	120.0	V	0.0	15.1	
224.040000	19.9	1000.0	120.000	120.0	V	0.0	14.1	
310.160000	22.5	1000.0	120.000	120.0	V	0.0	18.1	
360.040000	36.6	1000.0	120.000	120.0	V	0.0	19.2	
432.040000	33.0	1000.0	120.000	120.0	V	0.0	21.3	
624.120000	33.5	1000.0	120.000	120.0	V	0.0	25.0	
780.120000	33.9	1000.0	120.000	120.0	V	0.0	27.9	
828.120000	44.5	1000.0	120.000	120.0	H	0.0	28.6	
852.120000	45.1	1000.0	120.000	120.0	H	0.0	29.0	
918.240000	73.8	1000.0	120.000	120.0	V	0.0	30.0	

Result Table_Single Eval

Frequency (MHz)	Margin (dB)
37.800000	-11.3
38.720000	-7.5
51.120000	-11.9
63.680000	-17.0
93.280000	-17.6
118.120000	-20.1
134.640000	-12.0
142.120000	-6.9
176.080000	-15.6
224.040000	-26.1
310.160000	-23.5
360.040000	-9.4
432.040000	-13.0
624.120000	-12.5
780.120000	-12.1
828.120000	-1.5
852.120000	-0.9
918.240000	27.8

Receiving (30MHz to 1GHz)



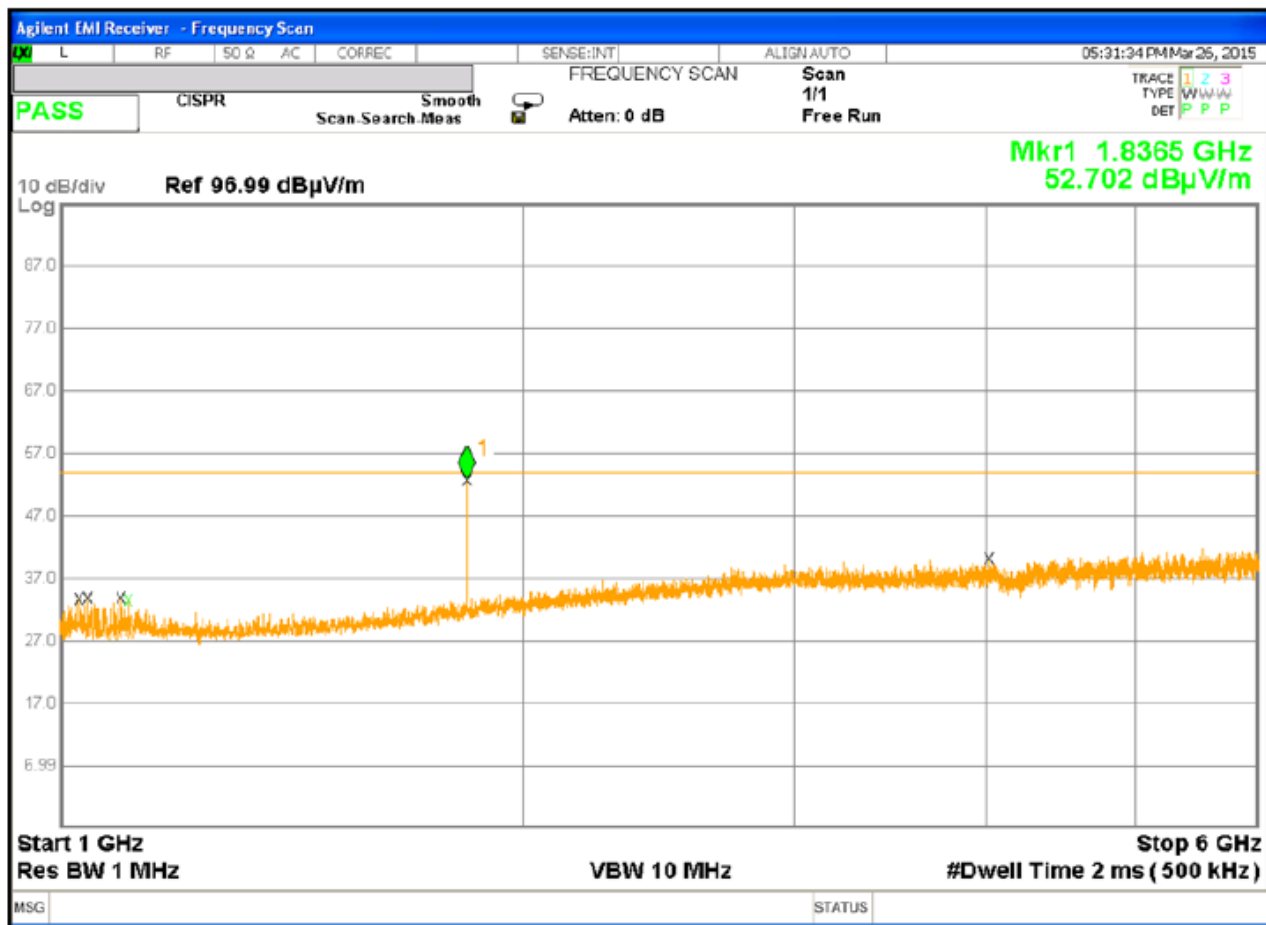
Result Table_Single

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Comment
38.960000	28.7	1000.0	120.000	100.0	V	0.0	13.3	
54.240000	23.5	1000.0	120.000	100.0	V	0.0	14.0	
63.840000	22.4	1000.0	120.000	100.0	V	0.0	12.6	
116.680000	30.4	1000.0	120.000	100.0	H	45.0	13.6	
140.680000	39.4	1000.0	120.000	120.0	H	0.0	15.7	
176.720000	34.0	1000.0	120.000	120.0	H	0.0	15.1	
348.040000	37.3	1000.0	120.000	120.0	V	45.0	18.9	
480.080000	40.6	1000.0	120.000	100.0	H	45.0	22.0	
528.080000	46.0	1000.0	120.000	100.0	H	45.0	23.1	
852.120000	44.6	1000.0	120.000	100.0	H	0.0	29.0	

Result Table_Single Eval

Frequency (MHz)	Margin (dB)
38.960000	-11.3
54.240000	-16.5
63.840000	-17.6
116.680000	-13.1
140.680000	-4.1
176.720000	-9.5
348.040000	-8.7
480.080000	-5.4
528.080000	-0.1
852.120000	-1.4

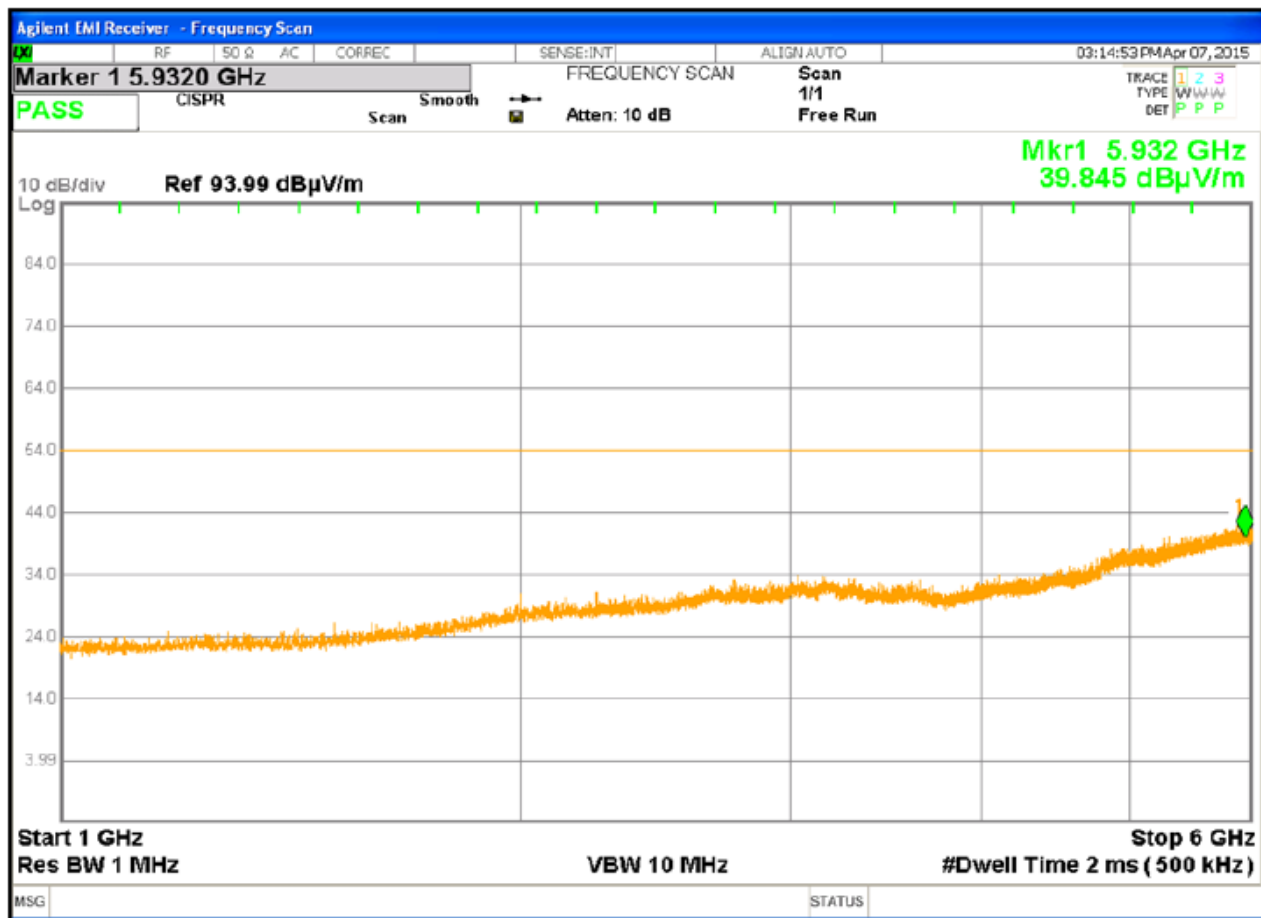
Transmission (1GHz-6GHz)



Sig	Trc	Freq	PEAK Amptd	QPD Amptd	EAVG Amptd	PEAK vs LL1	QPD vs LL3	EAVG vs LL2	RBW	RBW Type
1	1	1.0285 GHz	34.707 dBuV/m	27.356 dBuV/m	17.474 dBuV/m	---	-26.623 dB	---	1.00 MHz	CISPR
2	1	1.0412 GHz	35.205 dBuV/m	28.365 dBuV/m	17.651 dBuV/m	---	-25.615 dB	---	1.00 MHz	CISPR
3	1	1.0950 GHz	35.521 dBuV/m	28.822 dBuV/m	17.896 dBuV/m	---	-25.158 dB	---	1.00 MHz	CISPR
4	1	1.1075 GHz	34.391 dBuV/m	27.743 dBuV/m	17.675 dBuV/m	---	-26.237 dB	---	1.00 MHz	CISPR
5	1	1.8365 GHz	53.004 dBuV/m	52.402 dBuV/m	51.710 dBuV/m	---	-1.578 dB	---	1.00 MHz	CISPR
6	1	4.0085 GHz	41.426 dBuV/m	35.929 dBuV/m	28.095 dBuV/m	---	-18.051 dB	---	1.00 MHz	CISPR

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Receiving (1GHz to 6GHz)



5.4 Timing of the transmitter

Specify:

Base standard:	CFR47 Part 15 Section 15.35 (c)
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Unless otherwise specified, e.g. Section 15.225 (b), when the radiated emission limits are expressed in term of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0,1 seconds. As an alternative (provided the transmitter operates for longer than 0,1 seconds) or in cases where the pulse exceeds 0,1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0,1 second interval strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subjected to notification or verification.

Test requirements:

Test Setup:	CFR47 Part 15 Section 15.35 (c)
RBW:	1MHz
VBW:	3MHz

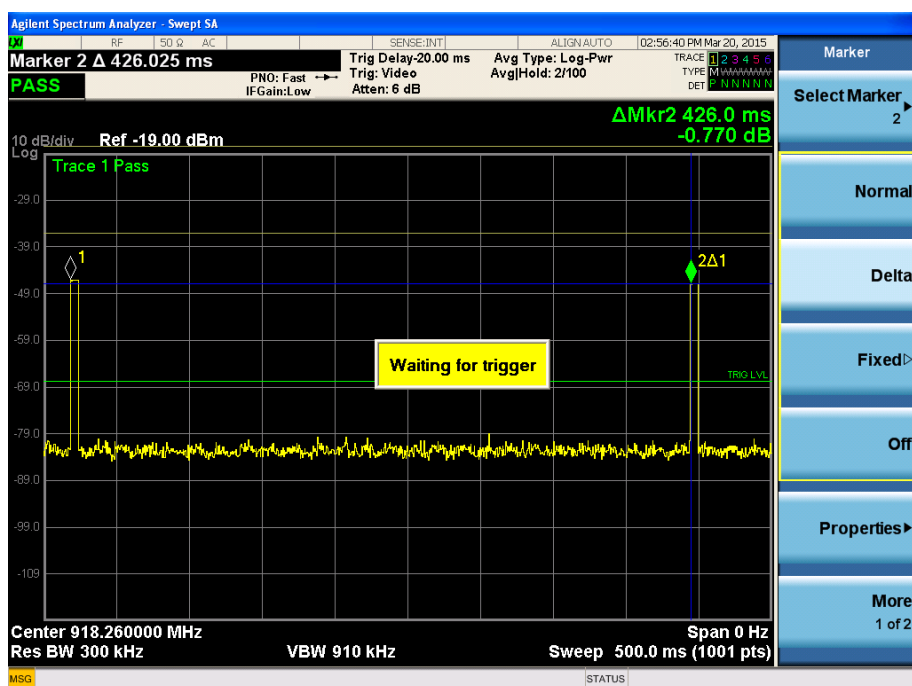
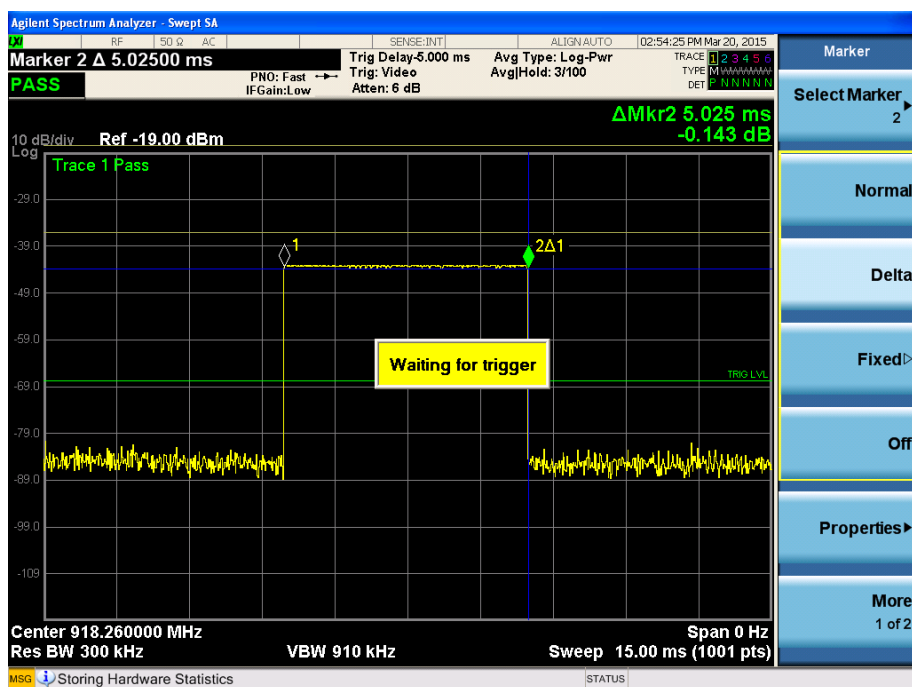
Test Data:

Frequency:	918.3MHz
Frame period:	100ms
Pause:	-
Pulse train length:	-
ON Time:	5.025ms
OFF Time:	426ms

Comments:

Every 100ms is present a single impulse with duration of 5.025ms.
The duty-cycle is: $5.025/100 = 0.0525$, therefore the correction is $20 \times \log(0.0525) = -25.59\text{dB}$

FCC test report



FCC test report

Specify:

Base standard: CFR47 Part 15 Section 15.35 (c)

Unless otherwise specified, e.g. Section 15.225 (b), when the radiated emission limits are expressed in term of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0,1 seconds. As an alternative (provided the transmitter operates for longer than 0,1 seconds) or in cases where the pulse exceeds 0,1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0,1 second interval strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subjected to notification or verification.

Test requirements:

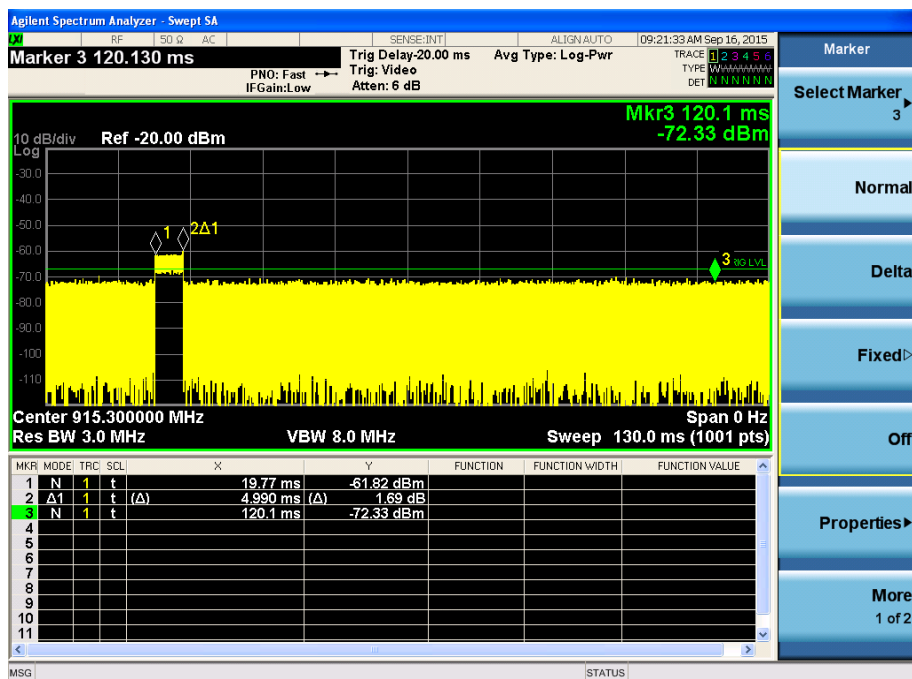
Test Setup: CFR47 Part 15 Section 15.35 (c)
 RBW: 1MHz
 VBW: 3MHz

Test Data:

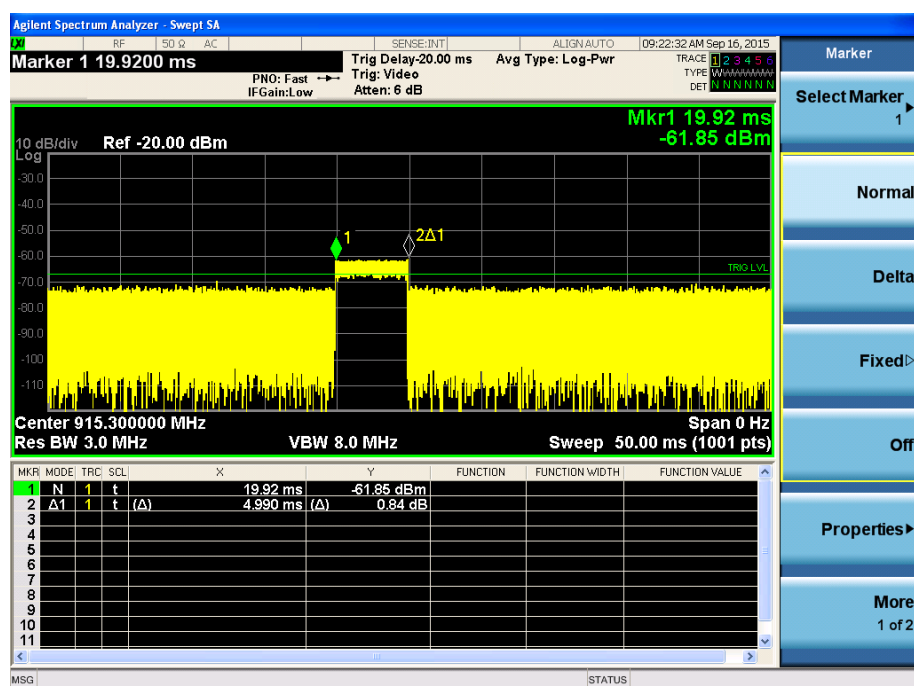
Frequency: 915.3MHz
 Frame period: 100ms
 Pause: -
 Pulse train length: -
 ON Time: 4.990
 OFF Time: > 100ms

Comments:

Every 100ms is present a single impulse with duration of 4.990ms.
 The duty-cycle is: $4.990/100 = 0.04990$, therefore the correction is $20 \times \log(0.05025) = -26.03\text{dB}$



FCC test report



5.5 Transmit behaviour after releasing the TX-button

Specify:

Base standard:	47CFR Part 15 Section 15.231(a)
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Test requirements:

Test Setup:	47CFR Part 15 Section 15.35 (c)
-------------	---------------------------------

RBW:	1MHz
------	------

VBW:	3MHz
------	------

Test data:

T1:	-
-----	---

T2:	-
-----	---

T2-T1:	-
--------	---

Comments:

-

5.6 Radiated output power

Specify:

Base standard: FCC 15.249 (a)

Test Requirements:

RBW / VBW:

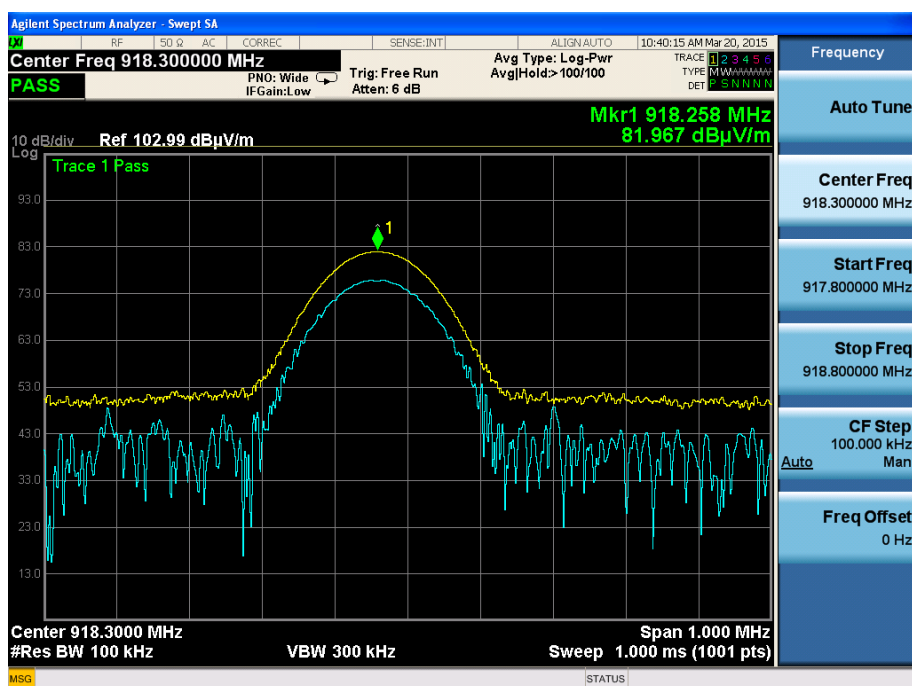
200Hz ($f < 150\text{kHz}$)
 9kHz ($150\text{kHz} < f < 30\text{MHz}$)
 120kHz ($30\text{MHz} < f < 1000\text{MHz}$)
 1MHz ($f > 1000\text{MHz}$)

Test data:

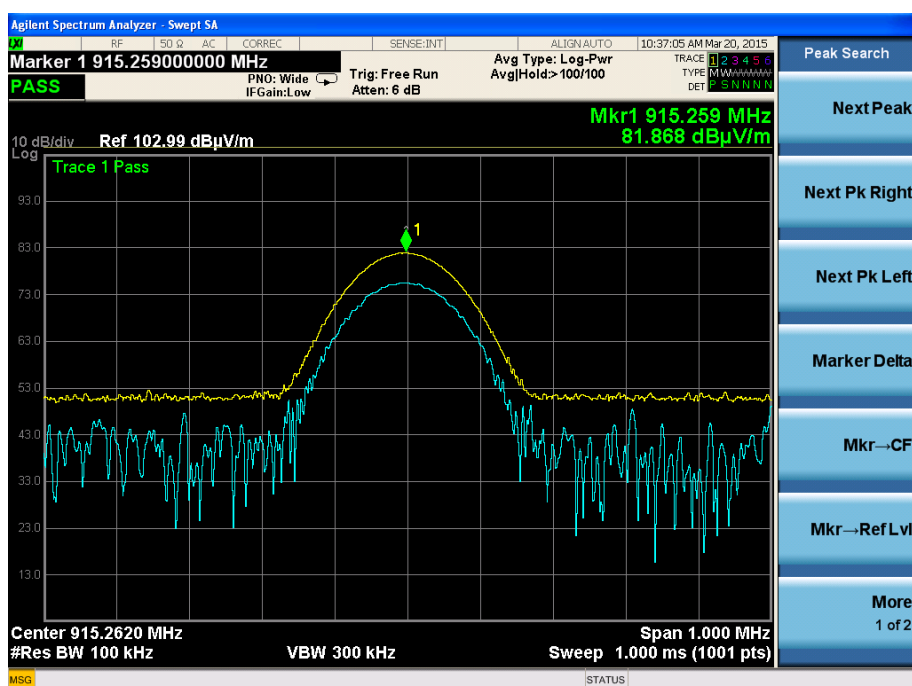
Output radiated power (3m of distance):
 $(81.96 - 25.59) \text{ dB}\mu\text{V/m} = 56.37\text{dB}\mu\text{V/m} < 94\text{dB}\mu\text{V/m} (918.3\text{MHz})$
 $(81.86 - 26.03) \text{ dB}\mu\text{V/m} = 55.83\text{dB}\mu\text{V/m} < 94\text{dB}\mu\text{V/m} (915.3\text{MHz})$

Comments:

The results represent the worst case of emissions between three polarizations verified (X, Y and Z). The table was rotate of 360° and antenna receiving moved from 1m to 4m to find the maximum emission.



FCC test report



FCC test report

5.7 Typical pulse train of a signal

Specify:

Base standard: 47CFR Part 15 Section 15.35 (c)

Test Setup:

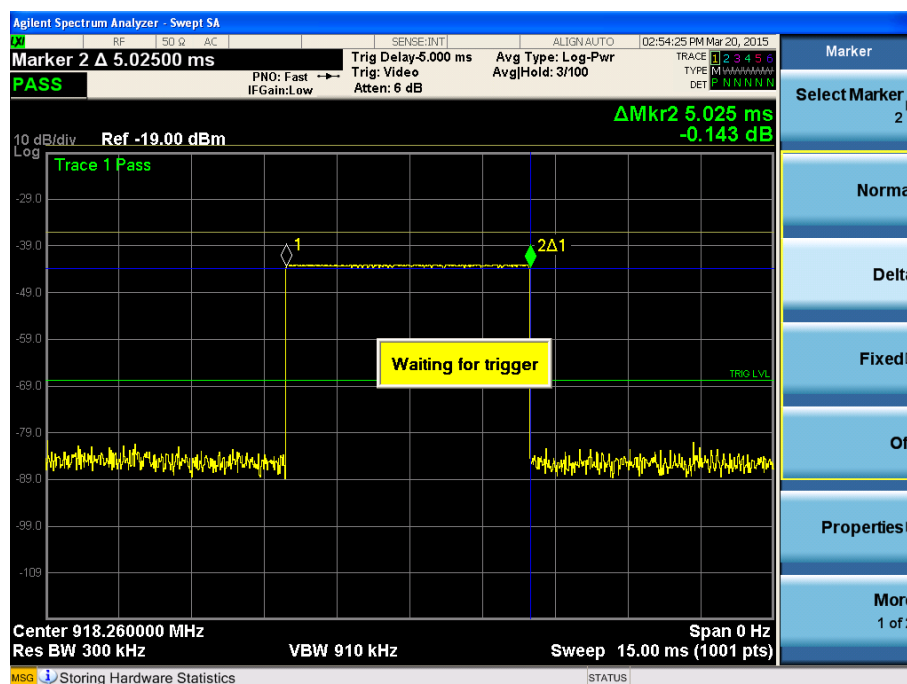
RBW: 1MHz
VBW: 3MHz

Test Data:

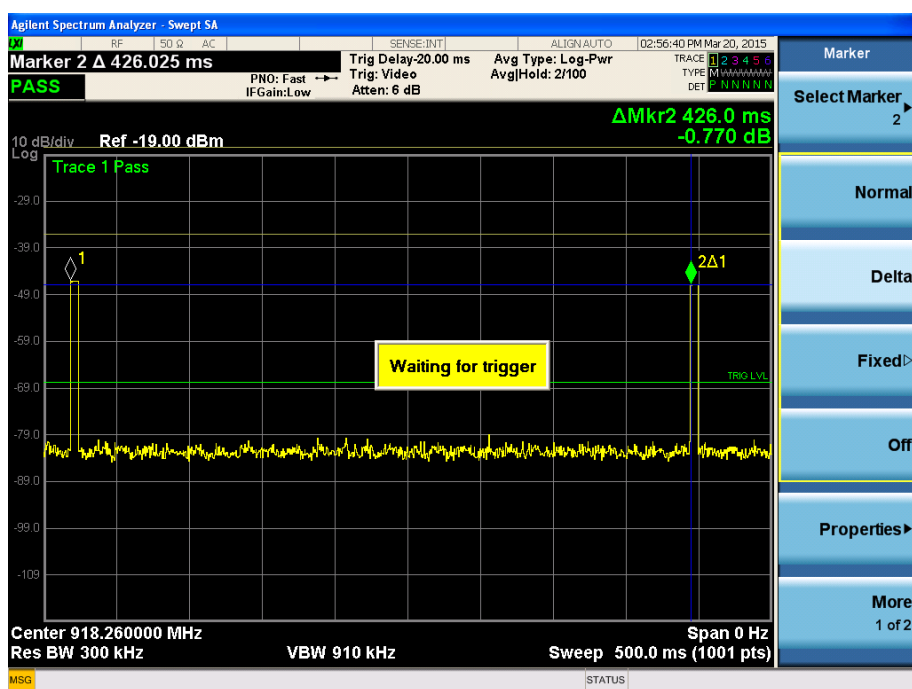
Frequency	918.3MHz
Duty-cycle	0.0525
TX on	5.025ms
TX off	100ms
Average correction factor (20*log(duty cycle)):	20 log (5.025 / 100ms) = -25.97dB

Comments:

Every 100ms is present a single impulse with duration of 5.025ms.
The duty-cycle is: $5.025/100 = 0.05025$, therefore the correction is $20 \times \log(0.05025) = -25.97\text{dB}$



FCC test report



FCC test report

Specify:

Base standard: 47CFR Part 15 Section 15.35 (c)

Test Setup:

RBW: 1MHz

VBW: 3MHz

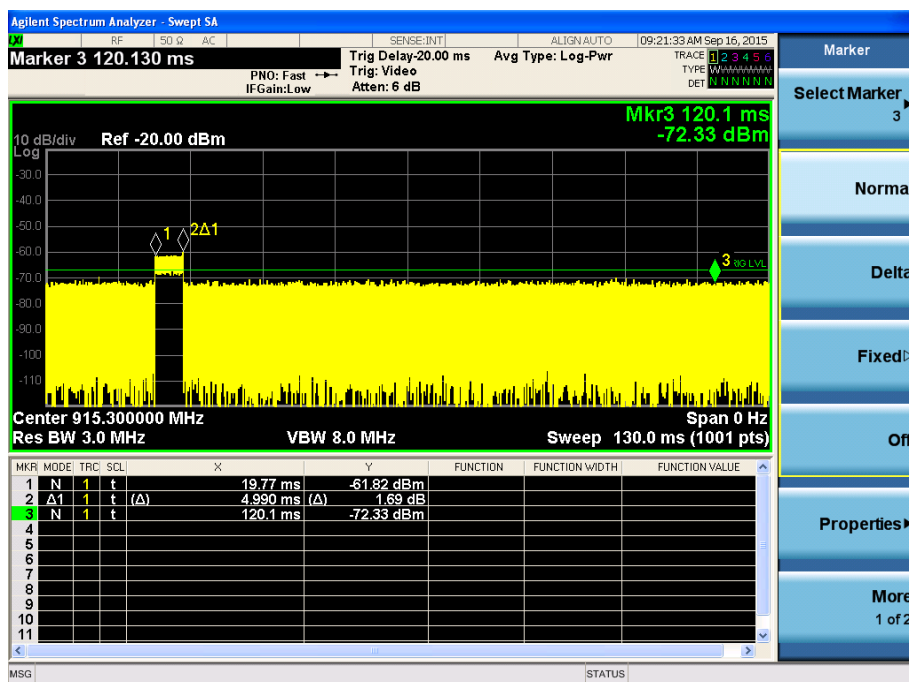
Test Data:

Frequency	915.3MHz
Duty-cycle	0.04990
TX on	4.990ms
TX off	> 100ms
Average correction factor ($20 \cdot \log(\text{duty cycle})$):	$20 \log (4.990 / 100\text{ms}) = -26.03\text{dB}$

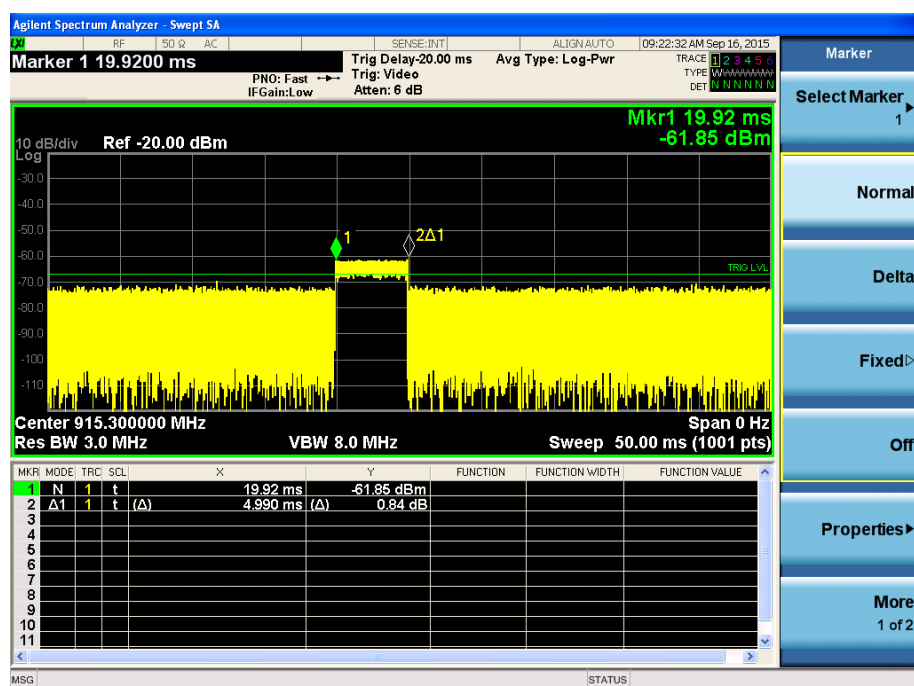
Comments:

Every 100ms is present a single impulse with duration of 4.990ms.

The duty-cycle is: $4.990/100 = 0.04990$, therefore the correction is $20 \times \log (0.05025) = -26.03\text{dB}$



FCC test report



5.8 Compliance with the limit of FCC

Specify:

Base standard:	47CFRF Part 15 Section 15.249 (c)
----------------	-----------------------------------

Test Setup:

RBW / VBW:	200Hz ($f < 150\text{kHz}$) 9kHz ($150\text{kHz} < f < 30\text{MHz}$) 120kHz ($30\text{MHz} < f < 1000\text{MHz}$) 1MHz ($f > 1000\text{MHz}$)
------------	---

Limits:

Frequency [MHz]	Field Strength of the fundamental	Field Strength of spurious emissions
902 - 928	50mV/m / 94dB μ V/m	500 μ V/m / 54dB μ V/m
Note: -		

Test Result:

Frequency:	
Calculated average (3m of distance):	(81.96 – 25.59) dB μ V/m = 56.37dB μ V/m < 94dB μ V/m (918.3MHz) (81.86 – 26.03) dB μ V/m = 55.83dB μ V/m < 94dB μ V/m (915.3MHz)

Comments:

The results represent the worst case of emissions between three polarizations verified (X, Y and Z). The table was rotate of 360° and antenna receiving moved from 1m to 4m to find the maximum emission.

FCC test report

5.9 Spurious emission - radiated

Specify:

Base standard: 47CFR Part 15 Section 15.249 (c)

Test Setup:

-

Limits:

Frequency [MHz]	Field Strength of the fundamental	Field Strength of spurious emissions
above 470	50mV/m / 94dB μ V/m	500 μ V/m / 54dB μ V/m
Note: -		

Test Result:

Frequency [MHz]	Peak Amplitude of emission (dB μ V/m)	Average Amplitude of emission (dB μ V/m)	Limit maximum allowed emission power	Actual attenuation below frequency of operation (dB)	Results
918.258	81.96	56.37	94dB μ V/m	37.63	operating frequency
1836.516	43.47	23.27	54	30.73	Complies
2754.787	34.27	14.27	54	39.73	Complies
3673.041	32.71	12.71	54	41.49	Complies
4591.299	32.43	12.43	54	41.57	Complies
5509.551	44.12	24.12	54	29.88	Complies
6427.816	28.12	> 10	54	> 44	Complies
7346.101	38.74	18.74	54	35.26	Complies
8264.331	38.54	18.54	54	35.46	Complies
9182.596	48.33	28.33	54	25.67	Complies

Comments:

The results represent the worst case of emissions between three polarizations verified (X, Y and Z). The table was rotate of 360° and antenna receiving moved from 1m to 4m to find the maximum emission.

FCC test report

Specify:

Base standard: 47CFR Part 15 Section 15.249 (c)

Test Setup:

-

Limits:

Frequency [MHz]	Field Strength of the fundamental	Field Strength of spurious emissions
above 470	50mV/m / 94dB μ V/m	500 μ V/m / 54dB μ V/m

Note: -

Test Result:

Frequency [MHz]	Peak Amplitude of emission (dB μ V/m)	Average Amplitude of emission (dB μ V/m)	Limit maximum allowed emission power	Actual attenuation below frequency of operation (dB)	Results
915.259	81.86	55.63	94dB μ V/m	38.37	operating frequency
1830.525	51.05	31.05	54	22.95	Complies
2745.540	35.99	15.99	54	38.01	Complies
3662.815	33.94	13.94	54	40.06	Complies
4576.210	30.68	10.68	54	43.32	Complies
5491.540	43.22	23.22	54	30.78	Complies
6406.645	37.95	17.95	54	36.05	Complies
7321.735	37.39	17.39	54	36.61	Complies
8237.215	36.58	16.58	54	37.42	Complies
9152.555	38.76	18.76	54	35.24	Complies

Comments:

The results represent the worst case of emissions between three polarizations verified (X, Y and Z). The table was rotate of 360° and antenna receiving moved from 1m to 4m to find the maximum emission.

5.10 Occupied bandwidth

Specify:

Base standard:	47CFR Part 15.15 (c)
----------------	----------------------

The bandwidth of the emission shall be no wider than 0,25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0,5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.

Test Setup:

RBW:	1kHz
------	------

VBW:	3kHz
------	------

Limits:

< 0,5% of the centre frequency, here 4.57MHz
--

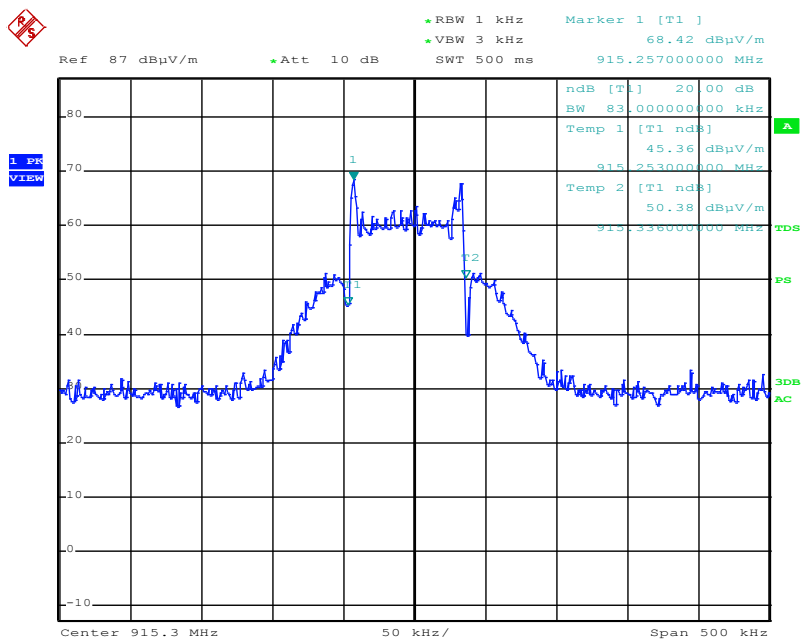
Test Data:

Occupied bandwidth at -20dB:	83kHz < 4.57MHz (918.3MHz) 83kHz < 4.57MHz (915.3MHz)
------------------------------	--

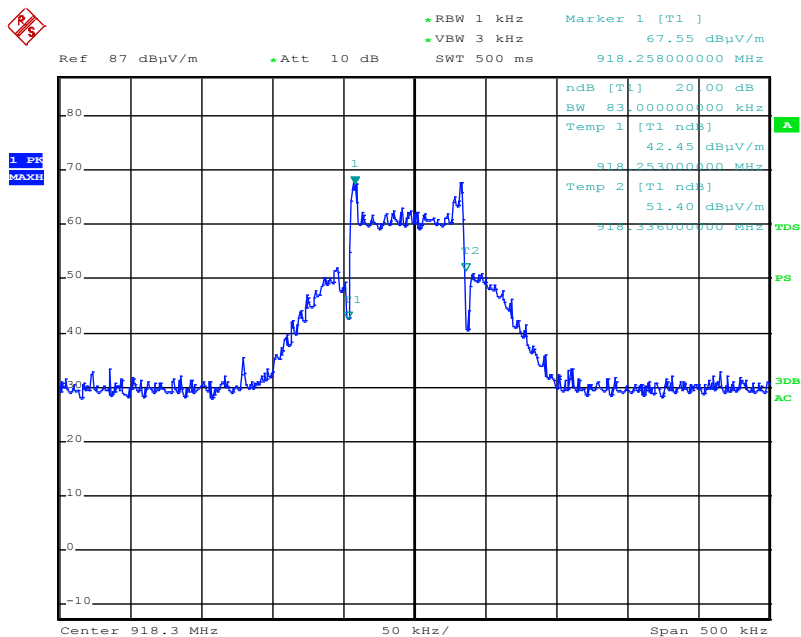
Comments:

-

FCC test report

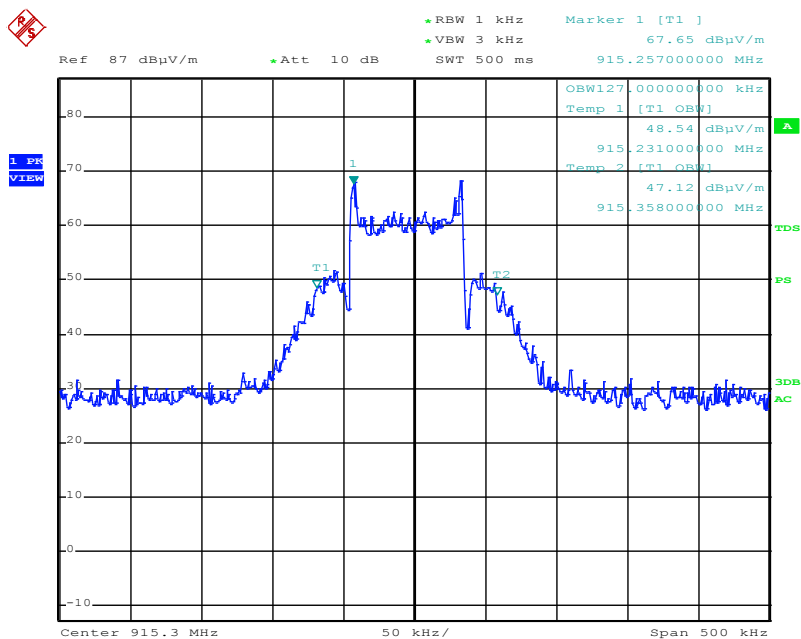


Date: 2.NOV.2015 15:46:37

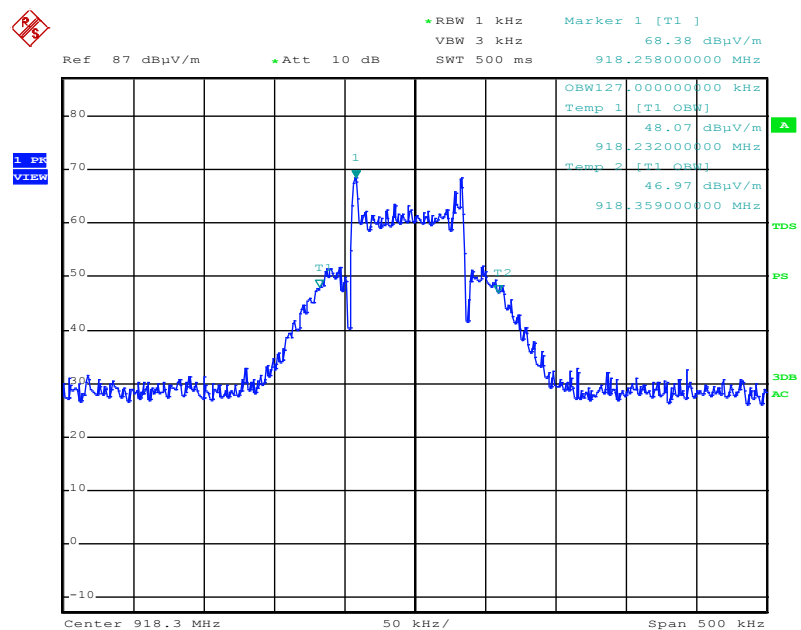


Date: 2.NOV.2015 15:42:12

FCC test report



Date: 2.NOV.2015 15:47:36



Date: 18.NOV.2015 08:57:47

6

Measurement and Test Equipment instrumentation

Code	nr.	Manufacturer	Model	Serial number	Date of Calibration	Calibration Due
ANA	7	Agilent	N9020A	MY48011101	19/03/2014	18/03/2016
ANT	1	EMCO	3121C DB-4	9312-901		
ANT	3	Schwarzbeck	VULB9160	3180	24/07/2015	23/07/2017
ANT	4	AH System	SAS-571	684	23/07/2015	22/07/2017
ANT	5	AH System	SAS-562B	236	24/07/2015	23/07/2019
ANT	6	AH System	SAS-571	1025	23/07/2015	22/07/2017
ANT	7	Aaronia	BicoLOG 30100	1293	23/07/2015	22/07/2017
ATT	1	-	PE7021-6			
ATT	2	Tyco Electronics Co.	50WCW	-		
ATT	5	RADIAL	R414.710.000	-		
ATT	6	RADIAL	R414.710.000	-		
ATT	7	RADIAL	R414.720.000	-		

CAV	1	Rohde & Schwarz	HFU2-Z5	-	18/09/2013	18/09/2015
CAV	2	Rohde & Schwarz	HFU2-Z4	-	18/09/2013	18/09/2015
CAV	3	TESEO	CAVO A	-	18/09/2013	18/09/2015
CAV	5	TESEO	CAVO C	-	18/09/2013	18/09/2015
CAV	6	TESEO	CAVO D	-	18/09/2013	18/09/2015
CAV	7	TESEO	CAVO E	-	18/09/2013	18/09/2015
CAV	13	TESEO	CAVO G	-	18/09/2013	18/09/2015
CAV	14	TESEO	CAVO H	-	18/09/2013	18/09/2015
CAV	15	TESEO	CAVO I	-	18/09/2013	18/09/2015
CAV	16	Rohde & Schwarz	9111505/200 (CAVO J)	5995-12-161- 6890	18/09/2013	18/09/2015
CAV	17	Nice	CAVO K	-	18/09/2013	18/09/2015
CAV	18	Nice	CAVO L	-	18/09/2013	18/09/2015
CAV	19	Nice	Cavo M	-	18/09/2013	18/09/2015

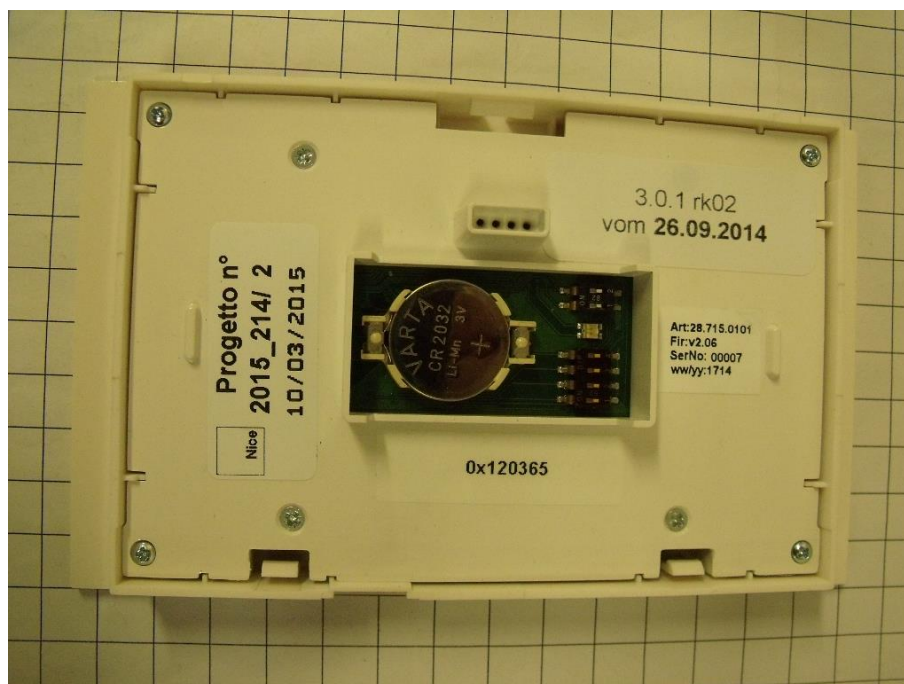
CAV	20	Nice	Cavo N	-	18/09/2013	18/09/2015
CAV	21	Nice	Cavo P	-	18/09/2013	18/09/2015
CAV	22	Nice	Cavo R	-	18/09/2013	18/09/2015
CSA	1	TESEO	EN 55022 EN 610004-3	NSA	11/08/2015	10/08/2016
CSA	1	TESEO	EN 55022 EN 610004-3	CISPR 16-1-4	14/04/2009	14/04/2019
CSA	1	TESEO	EN 55022 EN 610004-3	EN 61000-4-3	14/10/2014	14/10/2015
GEN	7	Rohde & Schwarz	SML 03	102178	22/07/2014	21/07/2016
GEN	8	Agilent	N5182A	MY48180288	23/09/2013	22/09/2016
LIS	2	Rohde & Schwarz	ESH2-Z5	100183	23/07/2015	22/07/2017
PAS	1	FCC	F-202	197	11/06/2012	11/06/2016
POW	1	Rohde & Schwarz	NRVD	101221	12/02/2014	12/02/2016
POW	2	Rohde & Schwarz	NRV-Z5	100314	14/02/2014	14/02/2016
POW	3	Rohde & Schwarz	NRV-Z5	100315	14/02/2014	14/02/2016
PRE	2	Schwarzbeck	BBV 9718	9718-178	30/07/2014	29/07/2016

<i>RIC</i>	<i>1</i>	<i>Rohde & Schwarz</i>	<i>ESCI</i>	<i>100140</i>	<i>18/03/2015</i>	<i>17/03/2016</i>
<i>SOF</i>	<i>1</i>	<i>Rohde & Schwarz</i>	<i>EMC32</i>	<i>V8.54.0</i>		

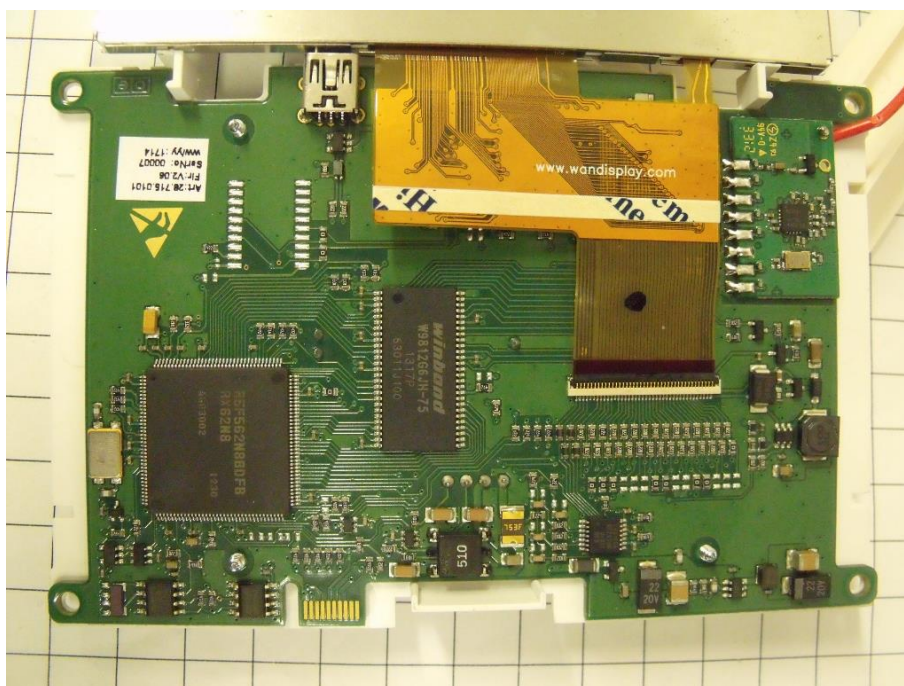
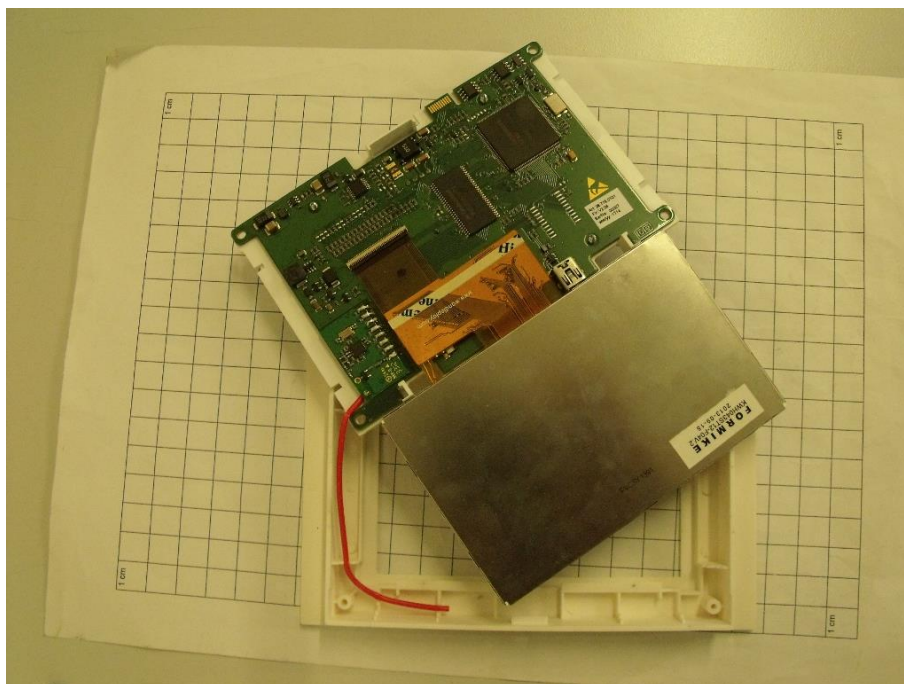
7

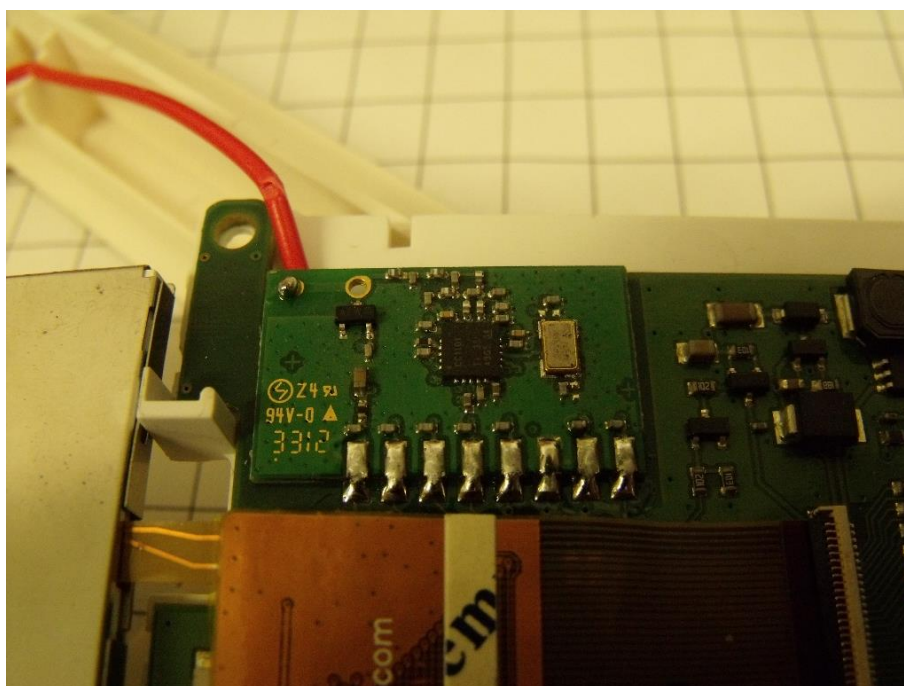
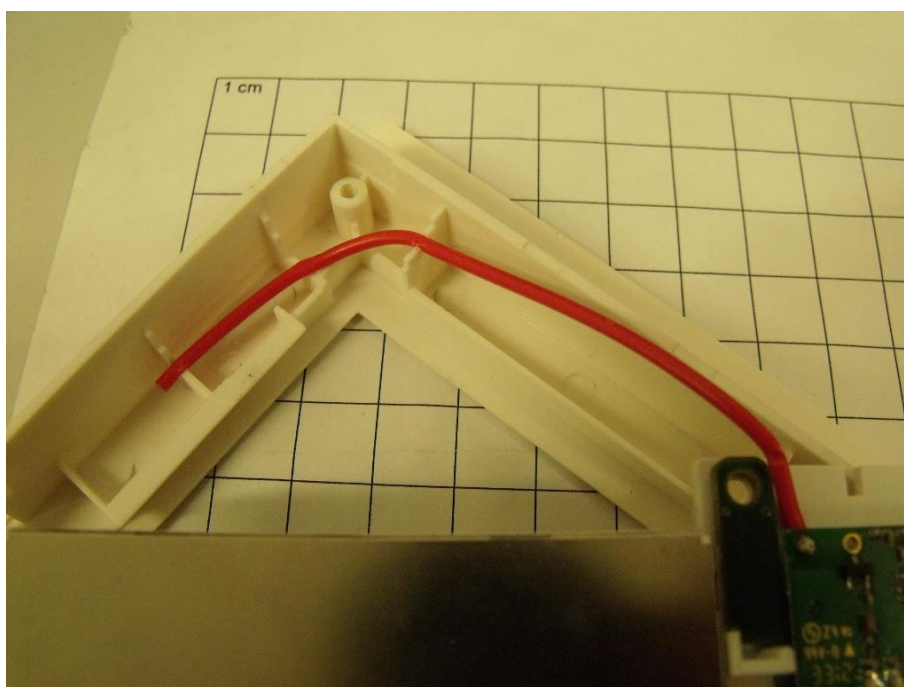
Photographic Documentation

8.1 EUT Identification

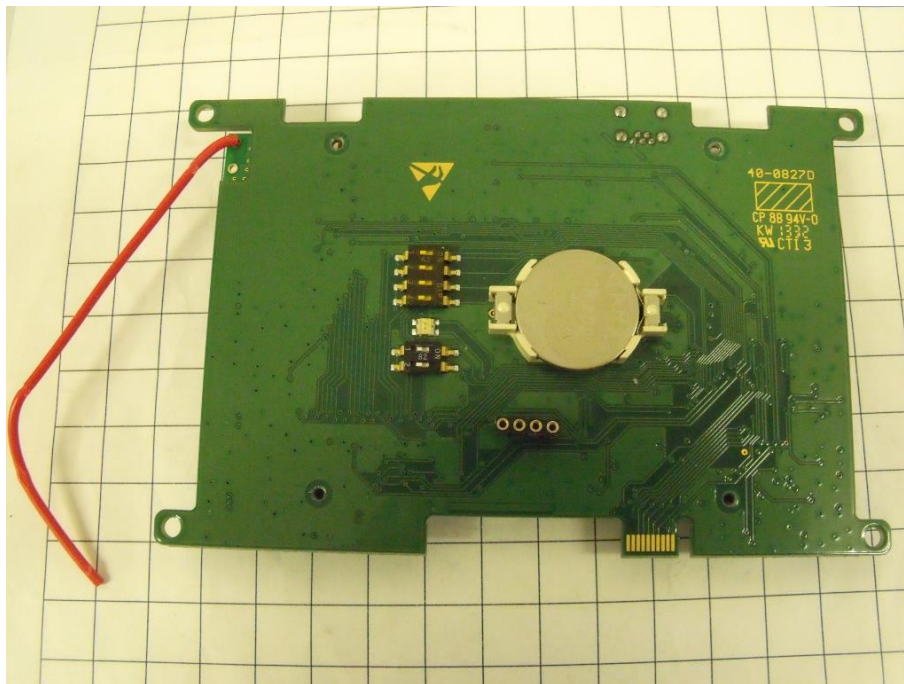


FCC test report



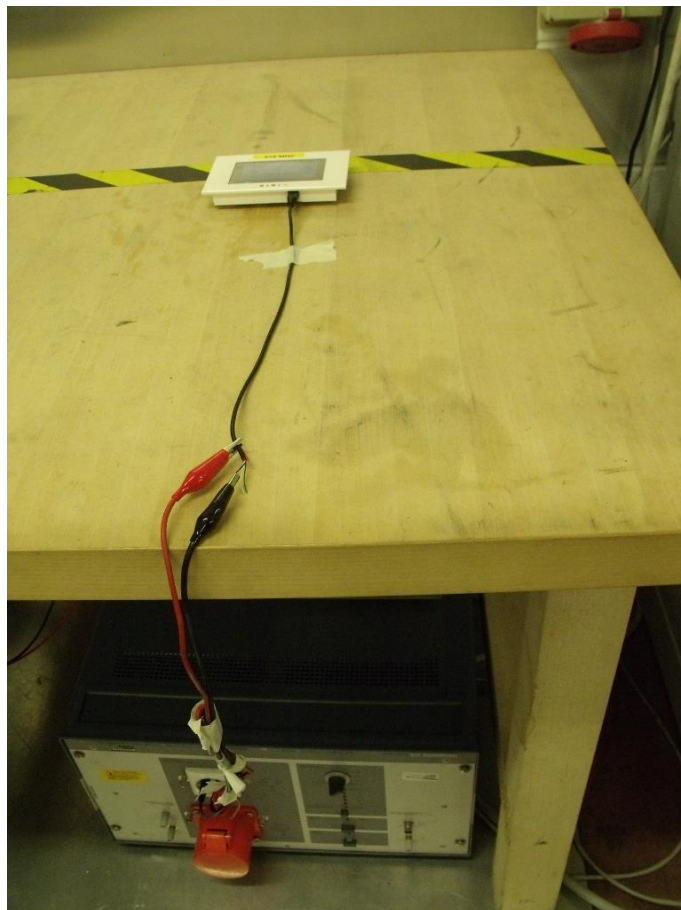


FCC test report

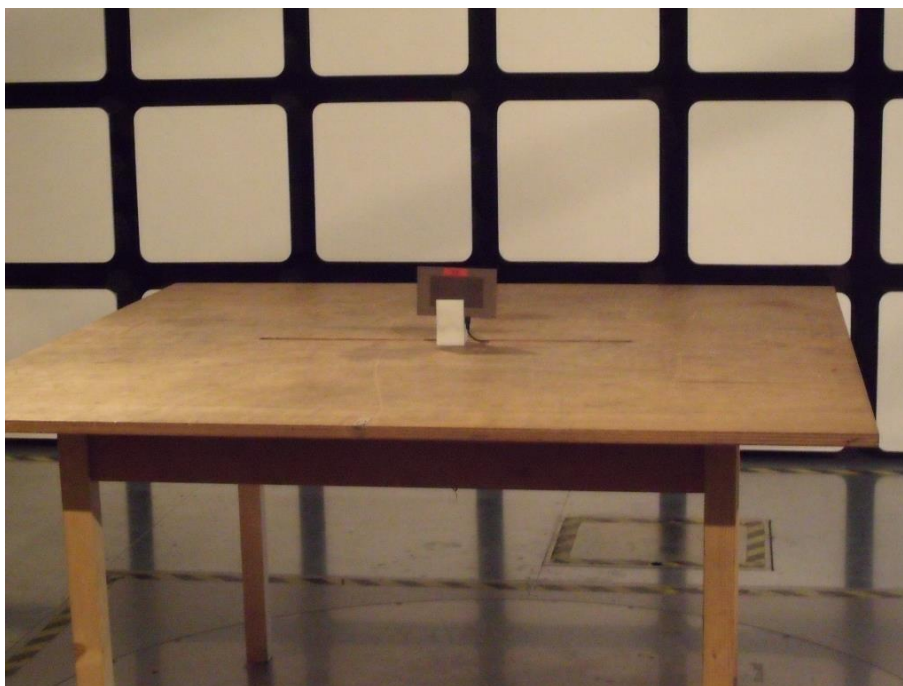


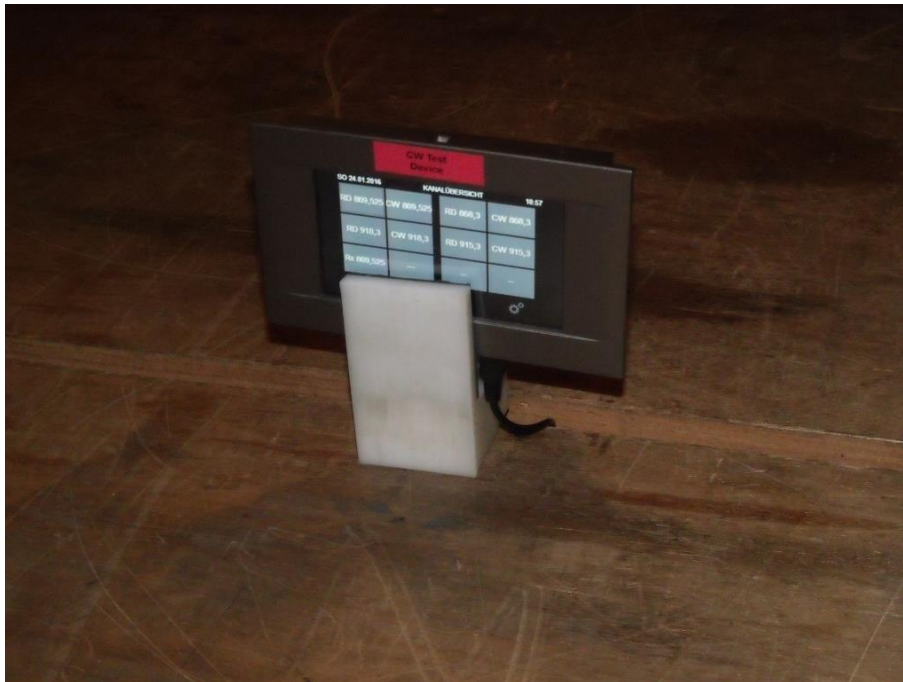
8.2 Test Set-up

Conducted emissions:





Radiated emissions:



Annex 1

Technical files



RF module system "Proline2" for Combio- XXX MHz, RoITop-XXX MHz

For: transceiver modules TMWA for Combio, RoITop

Brand: Elero GmbH Antriebstechnik
Linsenhofstrasse 65
D- 72660 Beuren (Germany)

1. Description of the product

The RF modul for using as transceiver in different products (Combio- XXX MHz, RoITop-XXX MHz) based on the transceiver chip CC1101 (TI) with antenna matching networks .
The CC1101 module is controlled by a application MCU via SPI using a protocol stack for RX and TX mode for the RF communication, only in the bidirectional application mode the CC1101 will be used as transmitter and receiver simultaneously. All TX- and RX transmissions for bidirectional communication are packet oriented for short transmission times and use suitable LBT and CCA processes.

1.1 technical specifications

1.1.1 Duty cycle estimation

a) Transmitting specification Proline2 remote controls

Size of data protocol (including PHY)	41 Byte	min.(1 Destination or Group)
transfer rate packet mode	68 Byte	max. (10 Destinations)
transfer PHY	76.800 Bps	
	869,525 MHz/ deviation 32 kHz /RBW 210 kHz or	
	918,300 MHz/ deviation 32 kHz/ RBW 210 kHz	
Traffictime (time to air)	min. 4,3 ms / data protocol	
	max. 7,1 ms / data protocol	
Normally volume of traffic:	$\leq 8 \times \text{traffic events/d}$ by user about transmitter (= 0,33 traffic events per hour)	

b) Transmission modes

- Broadcast transmission (group > 10 destinations, no routing path)
 - ⇒ transmission of max. 1 * data protocol (4,3 ms)
 - ⇒ **< 5 ms** / user initiated event
- Unicast for 1 destination
 - ⇒ transmission of max. 2 * data protocol (2 * 4,3ms, cut off > 100 ms between sendings)
 - ⇒ **< 9 ms** / user initiated event
- Unicast for 10 destination
 - ⇒ transmission of max. 2 * data protocol (2 * 7,1 ms, cut off > 100 ms between sendings)
 - ⇒ **< 15 ms** / user initiated event

c) Estimation of duty cycle (worst case)

- Broadcast (group)
 - max. traffic time = 5 ms
 - ⇒ max. traffic time * Normally volume of traffic per hour = 5 ms * 0,33 = **0,0016 s / h**
- Unicast for 1 destination
 - max. traffic time = 9 ms
 - ⇒ max. traffic time * Normally volume of traffic per hour = 9 ms * 0,33 = **0,003 s / h**
- Unicast for 10 destinations
 - max. traffic time = 15 ms
 - ⇒ max. traffic time * Normally volume of traffic per hour = 15 ms * 0,33 = **0,005 s / h**

Files	Project	Author	Rev. No.	Rev. Date
technical files_RF system Proline2	Proline2 UL	PRR		11.02.2013

Annex 2

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

May 17, 2013

Registration Number: 771316

NICE S.p.A.
Via Pezza Alta, 13,
,
Oderzo, 31046
Italy

Attention: Enrico Campion, Mr.

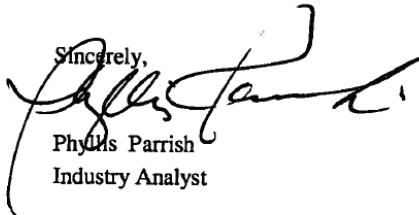
Re: Measurement facility located at Via Pezza Alta, 13 - I-31046 Oderzo
Anechoic chamber (3 meter)
Date of Renewal: May 17, 2013

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,



Phyllis Parrish
Industry Analyst