FCC TEST REPORT No. 14/649	**2014**
for 47 CFR Part 90	July, 02

Model name:	**ALLEGRO WALL MOUNT**
Product description	The Water Meter
FCC ID	NTA2WREP1
Applicant	Telematics Wireless Ltd., Israel
Manufacturer	Telematics Wireless Ltd., Israel

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Approved by
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Chief TC of PE TC "OMEGA"

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1 EQUIPMENT UNDER TEST

1.1 Basic description

Equipment Category	**Transceiver**
Model name	**ALLEGRO WALL MOUNT**
Destination	**a compact RF Receiver/Transmitter unit for the Water Meter**
Configuration	**stand-alone device**
Serial numbers	**n/a**

1.2 Technical characteristics declared by manufacturer

Transmit Narrow Channel, complies Part 90

Parameter	Value
Transmit frequency band	450-470MHz
Channel Separation	6.25kHz
Modulation	4GFSK
Max Frequency deviation	±1.2kHz
Max Data rate	4.8kbps
Frequency stability (including initial stability, temperature)	<0.5 ppm
Peak output power	35.2dBm
Antenna	Internal, 1dBi
Harmonics	< -62dBc

Transmit Narrow Channel, complies Part 15.231

Parameter	Value
Transmit frequency band	450-470MHz
Channel Separation	6.25kHz
Modulation	4GFSK
Max Frequency deviation	±1.2kHz
Max Data rate	6kbps
Frequency stability (including initial stability, temperature)	<0.5 ppm
Peak output power	-17dBm
Antenna	Internal, 1dBi
Harmonics	< -62dBc

Receiver

Parameter	Value
Receive frequency	Programmable in the range 450-470MHz
Sensitivity (BER 1E-3)	-120 dBm
Modulation	4GFSK
Frequency deviation	1.2kHz

1.3 Photos

Figure 1.3.1 External photo

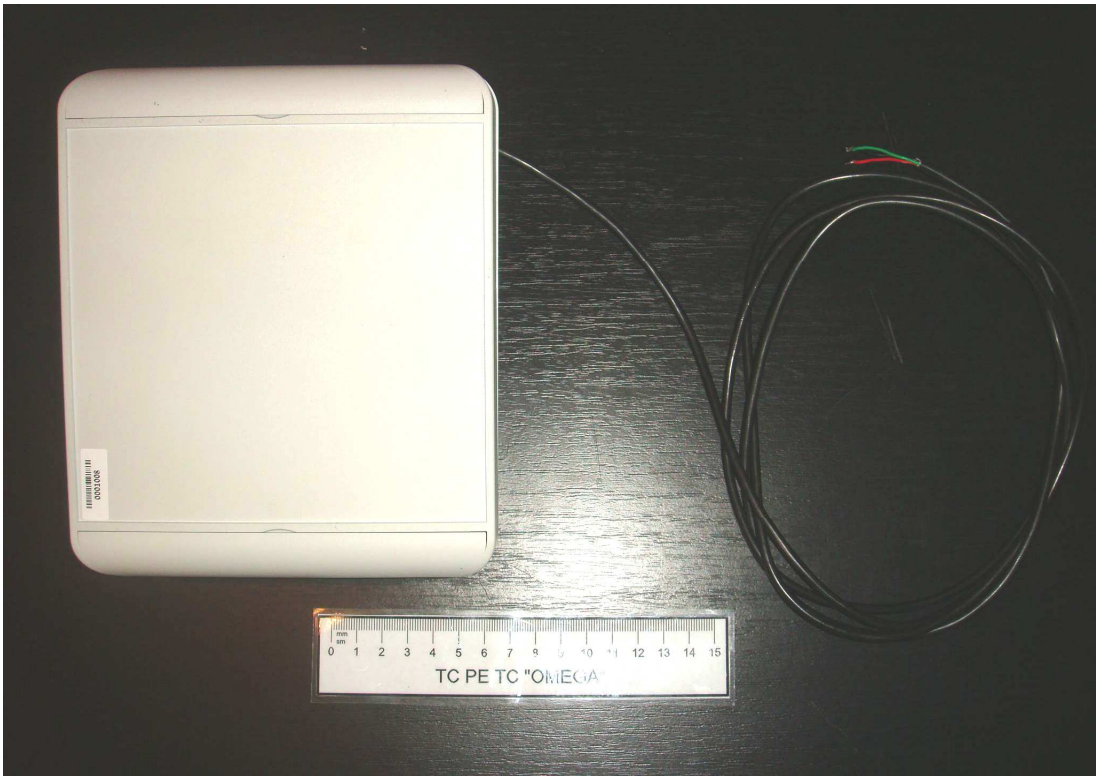


Figure 1.3.2 External photo

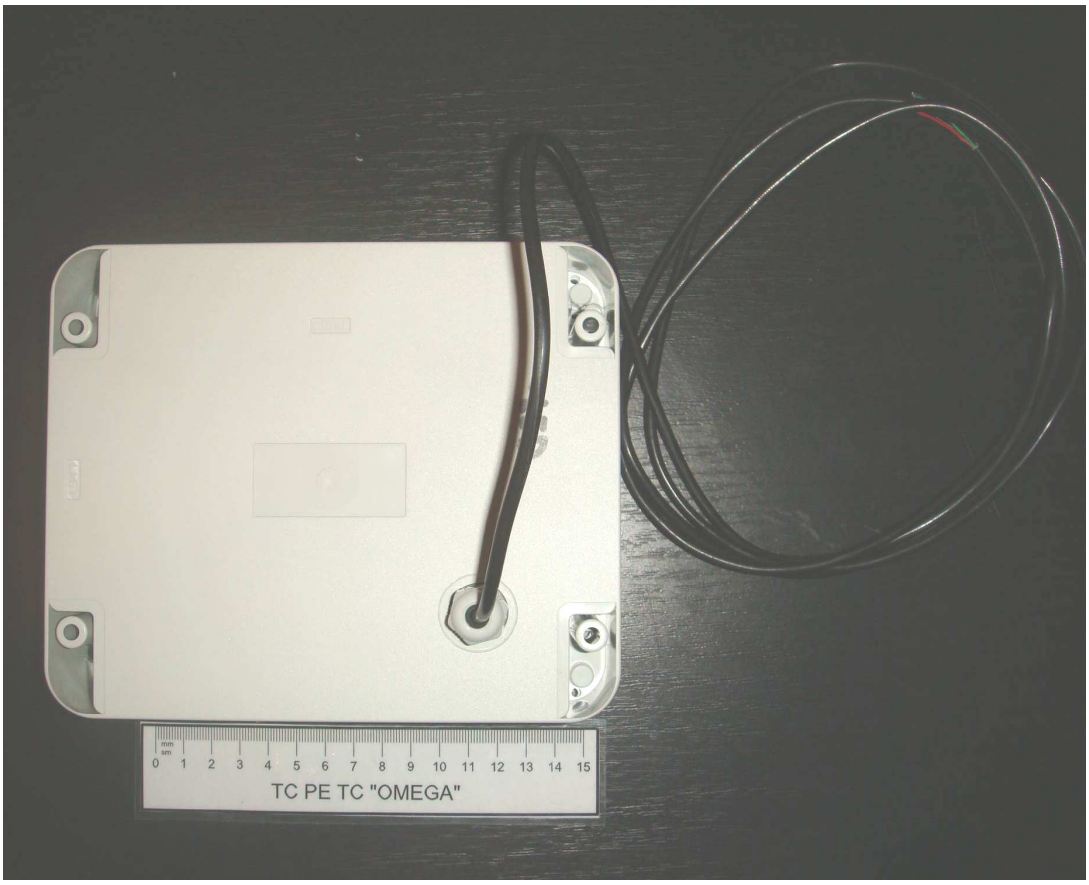
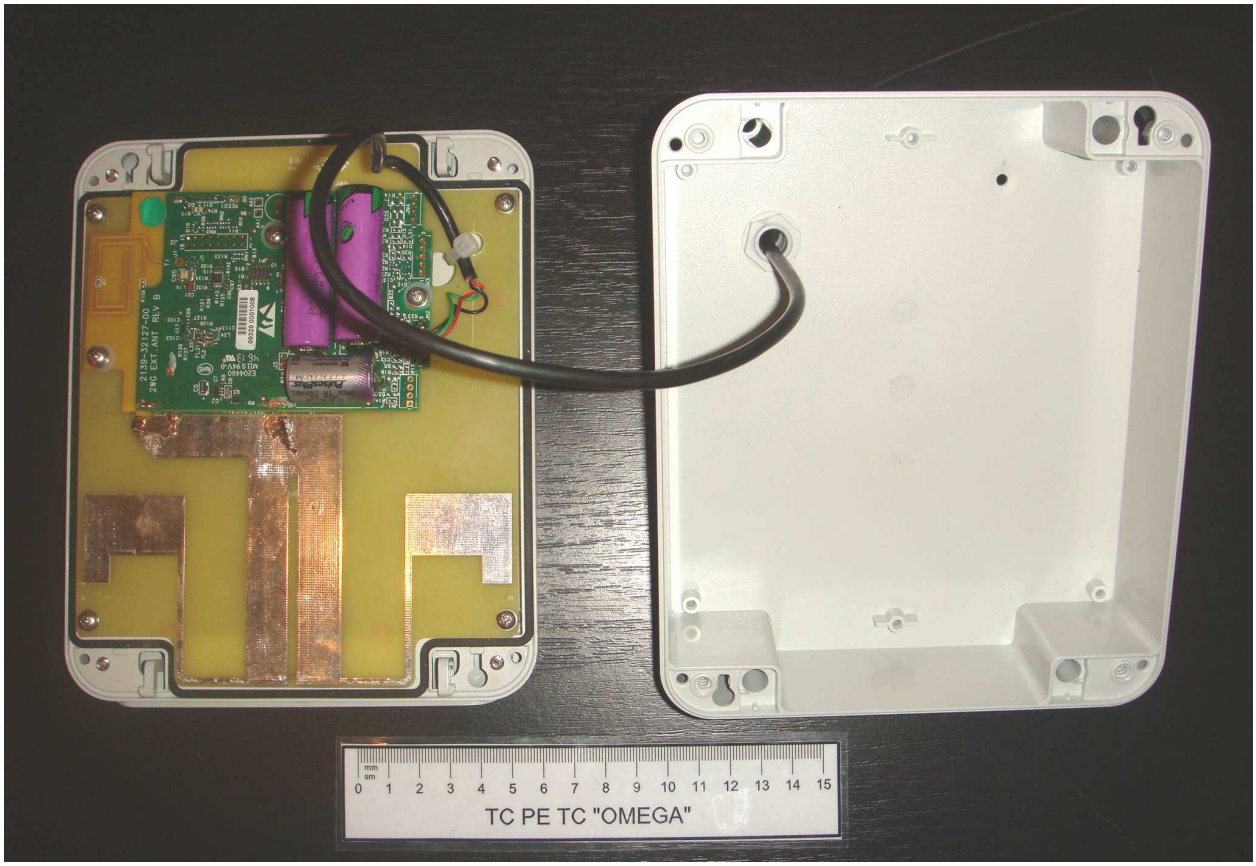


Figure 1.3.3 Internal photo



2 GENERAL INFORMATION ABOUT TESTS

2.1 Test program and results of the tests

Number of test	FCC rule	Description of test	Result (Pass, Fail, N/A)
1	90.210(e)	Radiated Spurious Emissions	**Pass**
2	15.231(b)	Field strength of emissions	**Pass**
3	90.209(b)	99% Occupied Bandwidth	**Pass**

Tested by:
tests No. 1,2: Laboratory engineer

Vladimir Osaulko

Checked by:
Leading engineer

Fjodor Shubin

2.2 Test conditions and test modes

Operating Temperature: -30 °C to + 85 °C
Storage Temperature: -40 °C to +85 °C
Humidity: Up to 95%

Normal power source:
- Unom = 3.6 DC

Extreme temperature:
- minimum temperature Tmin = minus 30 °C;
- maximum temperature Tmax = +85 °C.

Extreme power source:
- minimum voltage Umin: 2.7 DC
- maximum voltage Umax : 3.6 DC

The frequencies for the testing

Channel, No.	Frequency, MHz
Low	450
Mid	460
High	470

2.3 Test equipment used

№	Name	Model	Inventory or serial No.
1.	EMI Test receiver/spectrum analyzer	R&S ESU-26	100260
2.	Spectrum analyzer	R&S FSV40	105763
3.	Signal Generator	SMB100A	100217
4.	Attenuator	Agilent 8496B	100103
5.	Attenuator	6N25W	100196
6.	Attenuator	PE7014-10	101692
7.	Antenna (30 – 1000) MHz	Schwarzbeck UBAA 9114	9111-214
8.	Antenna (30 – 1000) MHz	Schwarzbeck VULB9163	9163244
9.	Antenna (1000 - 6000) MHz	HP11966 model 3115	9903-5701
10.	Antenna (1000 - 6000) MHz	ETS-Lindgren 3117	100200
11.	Antenna (1000 - 6000) MHz	ETS-Lindgren 3117	100201
12.	Digital multimeter	FLUKE 189	89750179
13.	Preamplifier (0.1-18) GHz	Agilent 87405c	MY47010400
14.	Psychrometer	ВИТ-2	В931
15.	Shielded Semi-Anechoic Chamber	"DON"	1

All listed above test equipment is calibrated and certified in accordance with established procedure. The equipment has certificates currently in force.

Ancillary equipment

№	Name	Model
1.	Transceiver	Telematics Wireless RTU_S
2.	Notebook	IBM ThinkPad
3.	RF Trigger	-

2.4 Measurement uncertainty

Parameter	Maximum uncertainty
Radiated emission	± 4.7 dB
Frequency	$\pm 1.5 \times 10^{-7}$
Temperature	± 1 °C
Humidity	± 2 %
Voltage supply AC	± 2 %

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

2.5 Photo of test site

Figure 2.5.1 Radiated measurements below 1 GHz

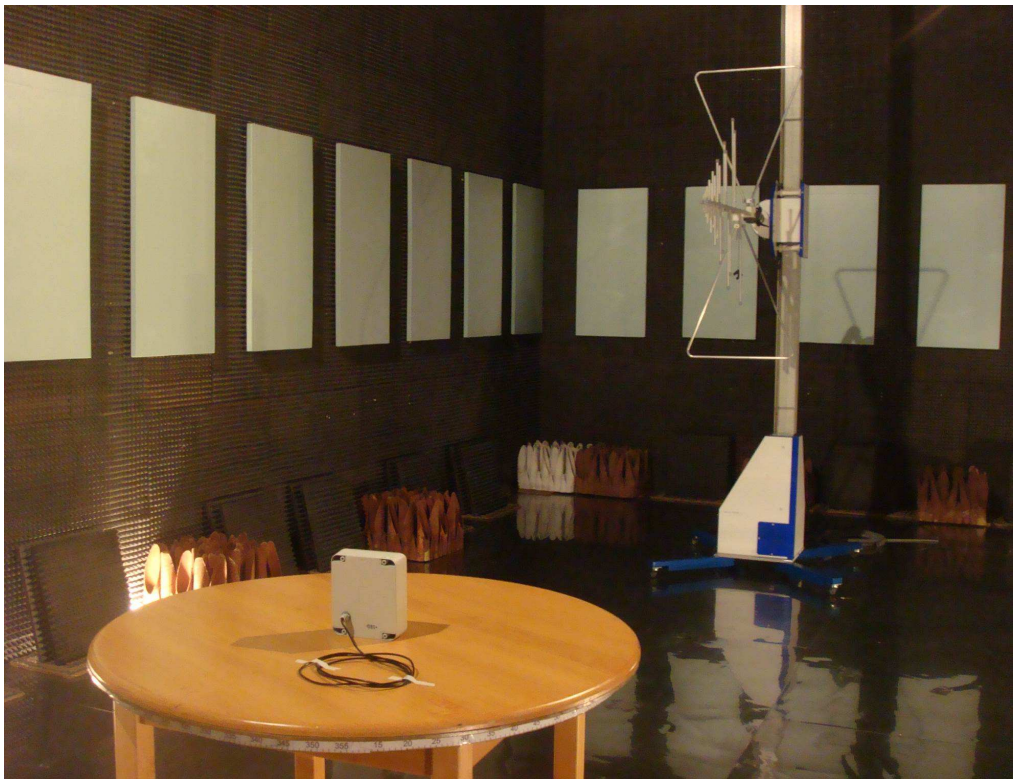
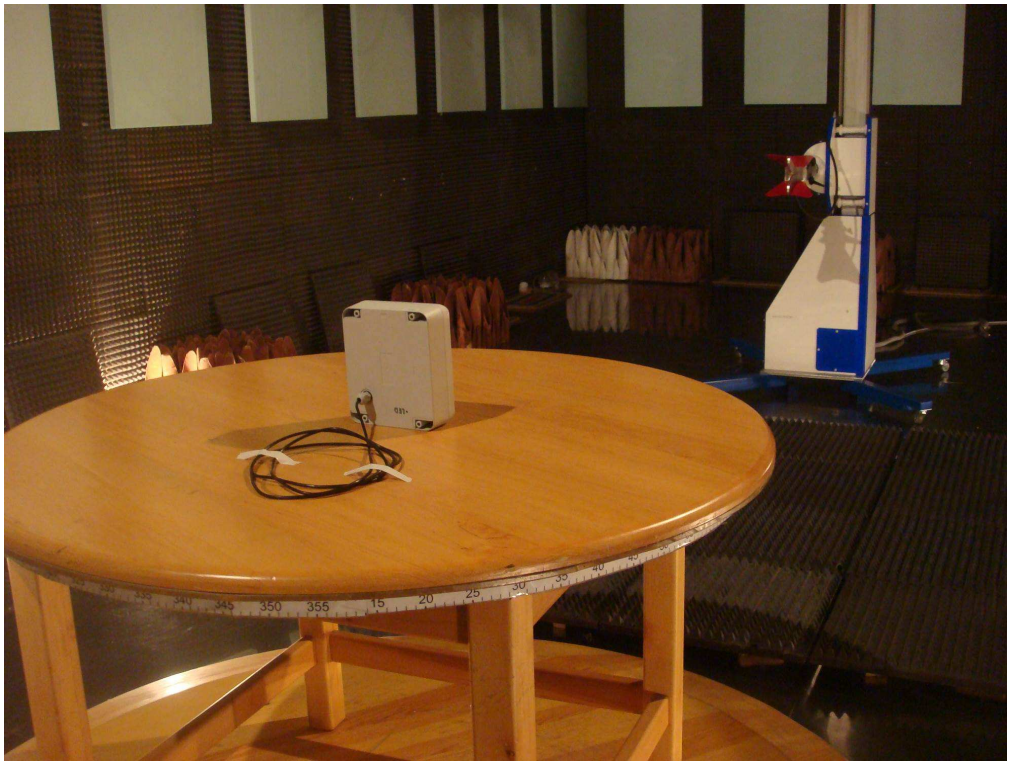


Figure 2.5.2 Radiated measurements above 1 GHz



3 REPORT OF MEASUREMENTS AND EXAMINATIONS

3.1 Radiated Spurious Emissions

3.1.1 Test requirements 90.210 (e)

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

Table 3.1.1

Frequency band (MHz)	Mask for equipment with Audio low pass filter	Mask for equipment without audio low pass filter
Below 25 [1]	A or B	A or C
25-50	B	C
72-76	B	C
150-174 [2]	B, D, or E	C, D, or E
150 Paging-only	B	C
220-222	F	F
421-512 [2]	B, D, or E	C, D, or E
450 Paging-only	B	G
806-809/851-854	B	H
809-824/854-869 [3]	B	G
896-901/935-940	I	J
902-928	K	K
929-930	B	G
4940-4990 MHz	L or M	L or M.
5850-5925 [4]		
All other bands	B	C

[2] Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.

(e) Emission Mask E—6.25 kHz or less channel bandwidth equipment. For transmitters designed to operate with a 6.25 kHz or less bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f0 to 3.0 kHz removed from f0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least 30 + 16.67(fd −3 kHz) or 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

(3) On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two to three times the channel bandwidth) to capture the true peak emission of the equipment under test. In order to show compliance with the emissions

mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of the authorized bandwidth, see paragraph (m) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, then an alternate procedure may be used provided prior Commission approval is obtained.

3.1.2 Test procedure

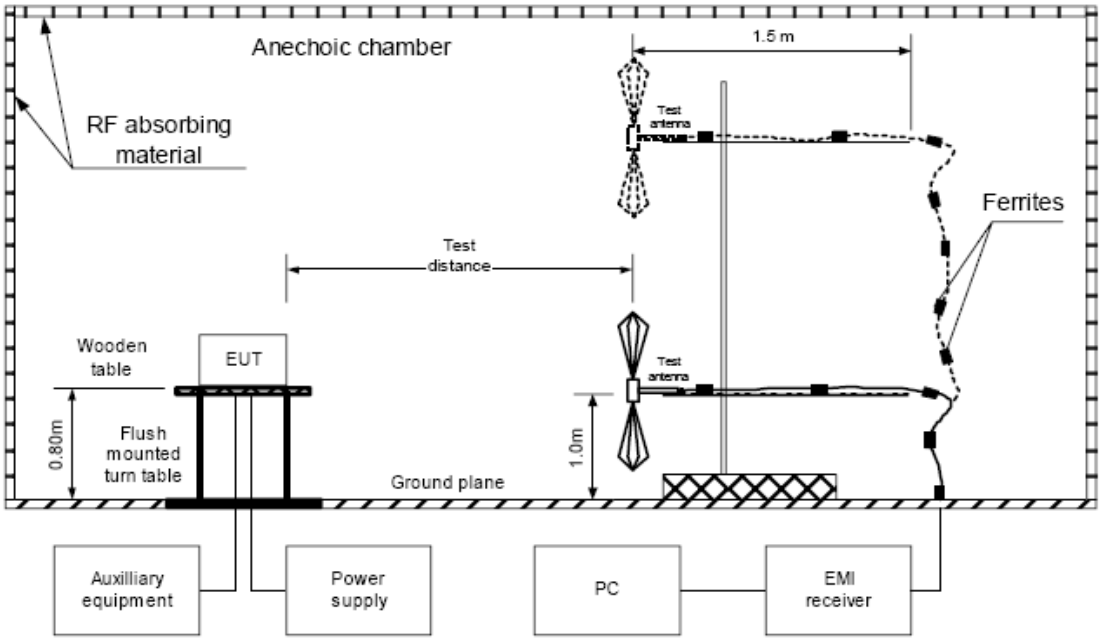
The transmitter was set up to the normal operational mode with maximum output power.

1) Radiated spurious emissions were measured using substitution method for radiated measurements in the anechoic shielded chamber with metal floor in the band of 30 MHz - 1000 MHz and in fully anechoic chamber in the band of 1000 MHz - 10000 MHz. The transmitter was set to the normal operational mode with the maximum output power rating.
2) EUT was placed on the non-conductive surface at the height of 0.8 m above the floor.
3) Measurement antenna was placed at the distance of 3m away from the EUT with vertical polarization.
4) The spurious emissions were observed in the band of 30 MHz - 10000 MHz excluding the central frequency of transmitter ±10 kHz using following spectrum analyzer settings: RBW= 10 kHz, VBW = 300 kHz (range 30 MHz – 1000 MHz) and RBW= 1 MHz, VBW = 3 MHz (range 1000 MHz – 10000 MHz), Video Detector = Peak, Trace = Max Hold.
5) The EUT was rotated around it's axis to obtain maximum result on the spectrum analyzer.
6) The height of measurement antenna was changed from 1m to 4m in 10 cm steps to obtain maximum result on the spectrum analyzer in the chamber with metal floor. In the fully anechoic chamber the height of antenna remained unchanged.
7) Measurement was repeated for horizontal polarization of measurement antenna.
8) Maximum reading of $P_{Gen.\ Output}$ was noted from substitutional generator.
9) Then the EUT was substituted by substitution antenna with it's phase center placed in the middle of the EUT position and the polarization obtained on the step of 8).
10) The Peak output power of each spurious component found was calculated using equation:

$$ERP = P_{Gen.\ Output} + Ga - L, \quad \text{where}$$

$P_{Gen.\ Output}$ - power obtained on step 8), dBm
Ga - gain of substitution antenna on frequency of interest, dBi
L - attenuation in the substitution cable on the frequency of interest, dB

3.1.3 Test setup layout



3.1.4 Test result

Temperature: +21 ^{o}C Relative humidity: 68 %

Table 3.1.2 Radiated Spurious Emissions (Frequency 450 MHz, vertical polarization):

F, MHz	Gen. Output, dBm	Coax Loss, dB	Ant. Gain, dBi	Ant. Gain, dBd	Dipole Eq. Power, dBm	Diffe-rence, dB	Limit, dBc	Test result (Pass, Fail, N/A)
450					**34,15**			
900	-28,8	3,2	-6,9	-9,05	-41,05	75,2	60	**Pass**
1350	-45,4	3,9	4,5	2,35	-46,95	81,1	60	**Pass**
1800	-48,5	5,7	5,5	3,35	-50,85	85,0	60	**Pass**
2250	-46,5	5,9	5,4	3,25	-49,15	83,3	60	**Pass**
2700	-47,3	7,2	6,2	4,09	-50,41	84,6	60	**Pass**
3150	-48,2	7,5	7,1	4,95	-50,75	84,9	60	**Pass**
3600	-47,5	8,1	7,5	5,35	-50,25	84,4	60	**Pass**
4050	-51,8	8,9	7,9	5,75	-54,95	89,1	60	**Pass**
4500	-53,5	9,5	7,3	5,15	-57,85	92,0	60	**Pass**

Table 3.1.3 Radiated Spurious Emissions (Frequency 450 MHz, horizontal polarization):

F, MHz	Gen. Output, dBm	Coax Loss, dB	Ant. Gain, dBi	Ant. Gain, dBd	Dipole Eq. Power, dBm	Diffe-rence, dB	Limit, dBc	Test result (Pass, Fail, N/A)
450					**34,15**			
900	-35,5	3,2	-6,9	-9,05	-47,75	81,9	60	**Pass**
1350	-56,5	3,9	4,5	2,35	-58,05	92,2	60	**Pass**
1800	-54,5	5,7	5,5	3,35	-56,85	91,0	60	**Pass**
2250	-53,4	5,9	5,4	3,25	-56,05	90,2	60	**Pass**
2700	-53,6	7,2	6,2	4,09	-56,71	90,9	60	**Pass**
3150	-46,3	7,5	7,1	4,95	-48,85	83,0	60	**Pass**
3600	-51,5	8,1	7,5	5,35	-54,25	88,4	60	**Pass**
4050	-53,2	8,9	7,9	5,75	-56,35	90,5	60	**Pass**
4500	-55,0	9,5	7,3	5,15	-59,35	93,5	60	**Pass**

Table 3.1.4 Radiated Spurious Emissions (Frequency 460 MHz, vertical polarization):

F, MHz	Gen. Output, dBm	Coax Loss, dB	Ant. Gain, dBi	Ant. Gain, dBd	Dipole Eq. Power, dBm	Diffe-rence, dB	Limit, dBc	Test result (Pass, Fail, N/A)
460					**33,34**			
920	-27,2	3,2	-7,1	-9,27	-39,67	73,01	60	**Pass**
1380	-41,4	3,9	4,6	2,45	-42,85	76,19	60	**Pass**
1840	-50,5	5,7	5,0	2,85	-53,35	86,69	60	**Pass**
2300	-46,0	5,9	5,4	3,25	-48,65	81,99	60	**Pass**
2760	-52,3	7,2	6,4	4,25	-55,25	88,59	60	**Pass**
3220	-47,4	7,5	7,1	4,97	-49,93	83,27	60	**Pass**
3680	-51,3	8,1	7,6	5,45	-53,95	87,29	60	**Pass**
4140	-52,5	8,9	7,7	5,55	-55,85	89,19	60	**Pass**
4600	-54,6	9,5	7,5	5,35	-58,75	92,09	60	**Pass**

Table 3.1.5 Radiated Spurious Emissions (Frequency 460 MHz, horizontal polarization):

F, MHz	Gen. Output, dBm	Coax Loss, dB	Ant. Gain, dBi	Ant. Gain, dBd	Dipole Eq. Power, dBm	Diffe-rence, dB	Limit, dBc	Test result (Pass, Fail, N/A)
460					**33,34**			
920	-32,0	3,2	-7,1	-9,27	-44,47	77,81	60	**Pass**
1380	-52,5	3,9	4,6	2,45	-53,95	87,29	60	**Pass**
1840	-54,1	5,7	5,0	2,85	-56,95	90,29	60	**Pass**
2300	-49,0	5,9	5,4	3,25	-51,65	84,99	60	**Pass**
2760	-50,5	7,2	6,4	4,25	-53,45	86,79	60	**Pass**
3220	-52,8	7,5	7,1	4,97	-55,33	88,67	60	**Pass**
3680	-53,6	8,1	7,6	5,45	-56,25	89,59	60	**Pass**
4140	-54,3	8,9	7,7	5,55	-57,65	90,99	60	**Pass**
4600	-54,7	9,5	7,5	5,35	-58,85	92,19	60	**Pass**

Table 3.1.6 Radiated Spurious Emissions (Frequency 470 MHz, vertical polarization):

F, MHz	Gen. Output, dBm	Coax Loss, dB	Ant. Gain, dBi	Ant. Gain, dBd	Dipole Eq. Power, dBm	Diffe-rence, dB	Limit, dBc	Test result (Pass, Fail, N/A)
470					**32,95**			
940	-29,7	3,2	-7,3	-9,44	-42,34	75,29	60	**Pass**
1410	-48,3	3,9	4,8	2,65	-49,55	82,50	60	**Pass**
1880	-49,5	5,7	5,0	2,85	-52,35	85,30	60	**Pass**
2350	-49,9	5,9	5,5	3,35	-52,45	85,40	60	**Pass**
2820	-46,2	7,2	6,5	4,35	-49,05	82,00	60	**Pass**
3290	-47,1	7,5	7,2	5,05	-49,55	82,50	60	**Pass**
3760	-48,3	8,1	7,7	5,51	-50,89	83,84	60	**Pass**
4230	-53,7	8,9	7,6	5,47	-57,13	90,08	60	**Pass**
4700	-58,5	9,5	7,7	5,55	-62,45	95,40	60	**Pass**

Table 3.1.7 Radiated Spurious Emissions (Frequency 470 MHz, horizontal polarization):

F, MHz	Gen. Output, dBm	Coax Loss, dB	Ant. Gain, dBi	Ant. Gain, dBd	Dipole Eq. Power, dBm	Diffe-rence, dB	Limit, dBc	Test result (Pass, Fail, N/A)
470					**32,95**			
940	-32,3	3,2	-7,3	-9,44	-44,94	77,89	60	**Pass**
1410	-47,5	3,9	4,8	2,65	-48,75	81,70	60	**Pass**
1880	-53,5	5,7	5,0	2,85	-56,35	89,30	60	**Pass**
2350	-48,4	5,9	5,5	3,35	-50,95	83,90	60	**Pass**
2820	-52,5	7,2	6,5	4,35	-55,35	88,30	60	**Pass**
3290	-44,7	7,5	7,2	5,05	-47,15	80,10	60	**Pass**
3760	-58,3	8,1	7,7	5,51	-60,89	93,84	60	**Pass**
4230	-54,0	8,9	7,6	5,47	-57,43	90,38	60	**Pass**
4700	-50,1	9,5	7,7	5,55	-54,05	87,00	60	**Pass**

3.2 Field strength of emissions

3.2.1 Test requirements § 15.109 Class B

Frequency of emission (MHz)	**Field strength (microvolts/meter)**	**Field Strength (dBµV/m)**
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

3.2.2 Test requirements § 15.231 (b)

Fundamental frequency	Field strength of fundamental		Field strength of spurious emissions	
(MHz)	(µV/m)	(dBµV/m)	(µV/m)	(dBµV/m)
40.66–40.70	2,250	67	225	47
70–130	1,250	61.9	125	41.9
130–174	1,250 to 3,750*	61.9 to 71.5*	125 to 375*	41.9 to 51.5*
174–260	3,750	71.5	375	51.5
260–470	3,750 to 12,500*	71.5 to 81.9*	375 to 1,250*	51.5 to 61.9*
Above 470	12,500	81.9	1,250	61.9
Notes: * Linear interpolations				

3.2.3 Test procedure (ANSI C63.4)

The test was performed to measure radiated emissions from the equipment under test enclosure. The measurement was made in the anechoic chamber at measurement distance of 3m in two bands: (30 - 1000) MHz, (1000 - 6000) MHz.

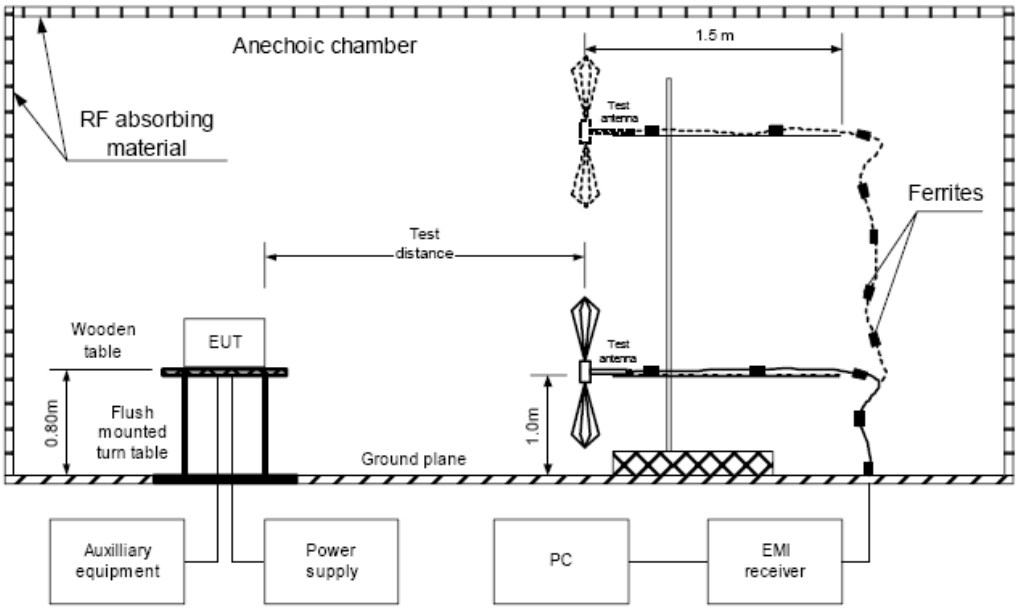
1) The equipment under test was set to transmission mode Pout = - 17 dBm.

2) In the band of (30 - 1000) MHz the measurement was made in anechoic chamber with metal floor. The turntable was rotated, the antenna height was altered in the range of 1m - 4m, the polarization of biconical antenna was changed from horizontal to vertical in a process of seeking for the maximum result. Settings of the test receiver: RBW = 120 kHz; Video Detector = Positive Peak during prequalification measurement, Quasi-Peak - during final measurement.

3) In the band of (1000 - 6000) MHz the measurement was made in fully anechoic chamber. The height of test antenna was fixed while the turntable was rotated and the polarization of horn test antenna was changed from horizontal to vertical in a process of seeking for the maximum result. Settings of the test receiver: RBW = 1000 kHz; Video Detector = Positive Peak during prequalification measurement, Average - during final measurement.

4) The worst test results (the lowest margins) were recorded and shown in the associated plots.

Figure 3.2.1 Test setup layout (above 30 MHz and below 10 GHz)



3.2.4 Test result

Temperature: + 21 ^{o}C Relative humidity: 68 %

EUT OPERATING MODE: transmission mode
Pout = - 17 dBm

Table 3.2.1 Radiated emission test result (450 MHz)

Frequency, MHz	Turn-table position, degrees	Antenna height, cm	Antenna polarization	Quasi-Peak Detector Emission, dBµV/m	Average detector emission, dBµV/m	Limit, dBµV/m	Result (Pass, Fail, N/A)
42.520000	90	400.0	V	8.0	-	61.0	Pass
50.880000	90	150.0	H	7.8	-	61.0	Pass
62.920000	90	150.0	H	6.5	-	61.0	Pass
87.160000	0	350.0	H	6.3	-	61.0	Pass
130.040000	180	400.0	V	4.7	-	61.0	Pass
209.640000	180	300.0	H	6.6	-	61.0	Pass
347.920000	0	100.0	H	11.3	-	61.0	Pass
360.000000	270	100.0	H	22.0	-	61.0	Pass
400.000000	270	100.0	H	20.3	-	61.0	Pass
450.000000	0	150.0	H	79.2	-	81.0	Pass
677.320000	0	350.0	H	17.6	-	61.0	Pass
949.480000	0	100.0	H	21.1	-	61.0	Pass
1142.800000	0	250.0	V	-	21.5	61.0	Pass
1430.400000	90	150.0	H	-	22.1	61.0	Pass
1699.600000	0	400.0	V	-	24.8	61.0	Pass
2033.200000	180	100.0	H	-	27.8	61.0	Pass
2390.000000	270	150.0	V	-	30.3	61.0	Pass
2803.600000	90	150.0	V	-	32.5	61.0	Pass
3468.000000	90	100.0	H	-	37.1	61.0	Pass
3518.800000	0	100.0	H	-	36.3	61.0	Pass
4921.600000	0	100.0	V	-	32.9	61.0	Pass
5904.800000	0	100.0	H	-	37.8	61.0	Pass

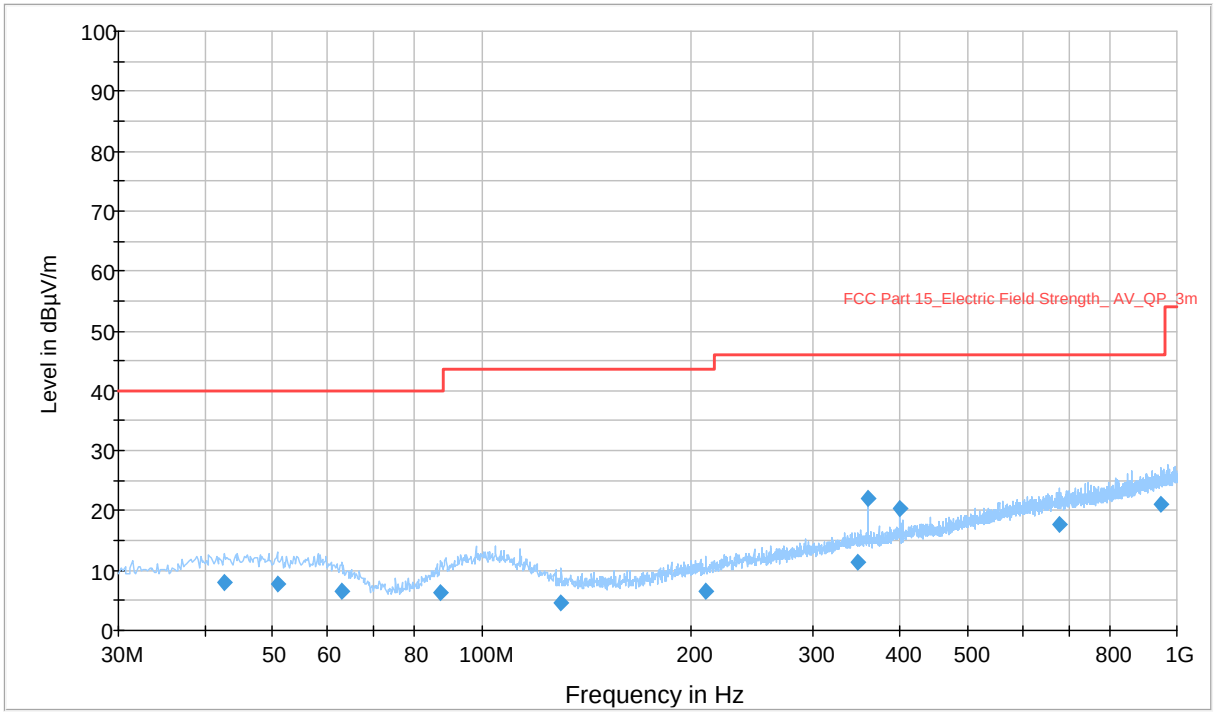
Table 3.2.2 Radiated emission test result (460 MHz)

Frequency, MHz	Turn-table position, degrees	Antenna height, m	Antenna polarization	Quasi-Peak Detector Emission, dBμV/m	Average detector emission, dBμV/m	Limit, dBμV/m	Result (Pass, Fail, N/A)
38.520000	90	350.0	V	7.7	-	61.4	Pass
43.640000	0	100.0	V	8.1	-	61.4	Pass
62.120000	0	250.0	V	6.7	-	61.4	Pass
87.440000	0	250.0	H	6.4	-	61.4	Pass
107.160000	270	250.0	H	8.1	-	61.4	Pass
122.080000	90	400.0	H	5.9	-	61.4	Pass
212.160000	0	250.0	V	6.8	-	61.4	Pass
346.200000	180	250.0	V	11.2	-	61.4	Pass
360.000000	0	100.0	H	20.5	-	61.4	Pass
400.000000	0	100.0	H	21.5	-	61.4	Pass
460.000000	0	1.00	V	78.5	-	81.4	Pass
703.480000	0	100.0	V	17.8	-	61.4	Pass
933.800000	180	200.0	H	27.9	-	61.4	Pass
1190.000000	0	250.0	V	-	21.4	61.4	Pass
1423.200000	90	300.0	H	-	22.1	61.4	Pass
1697.600000	90	150.0	V	-	24.8	61.4	Pass
2043.600000	180	100.0	H	-	27.9	61.4	Pass
2423.600000	0	100.0	H	-	30.3	61.4	Pass
2842.000000	270	350.0	V	-	32.6	61.4	Pass
3474.000000	90	150.0	H	-	37.0	61.4	Pass
3569.200000	0	200.0	H	-	36.1	61.4	Pass
4568.800000	180	350.0	H	-	32.7	61.4	Pass
5852.000000	0	350.0	H	-	37.7	61.4	Pass

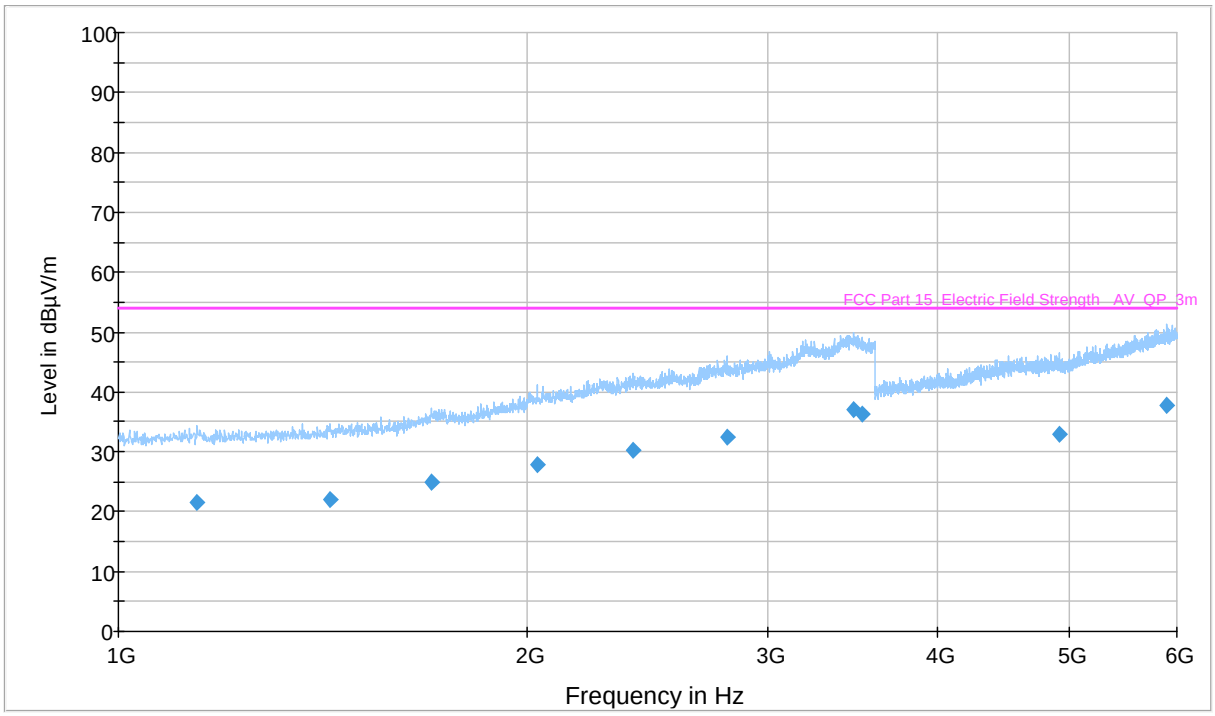
Table 3.2.3 Radiated emission test result (470 MHz)

Frequency, MHz	Turn-table position, degrees	Antenna height, cm	Antenna polarization	Quasi-Peak Detector Emission, dBμV/m	Average detector emission, dBμV/m	Limit, dBμV/m	Result (Pass, Fail, N/A)
41.360000	0	100.0	H	8.1	-	61.9	Pass
42.800000	90	150.0	V	8.2	-	61.9	Pass
61.960000	180	400.0	H	6.8	-	61.9	Pass
85.800000	90	200.0	V	5.8	-	61.9	Pass
87.440000	0	100.0	V	6.5	-	61.9	Pass
122.680000	270	250.0	V	5.9	-	61.9	Pass
215.400000	90	250.0	H	6.9	-	61.9	Pass
335.960000	90	250.0	H	10.8	-	61.9	Pass
360.000000	90	100.0	H	20.9	-	61.9	Pass
400.000000	270	100.0	H	21.3	-	61.9	Pass
470.000000	0	150.0	V	78.6	-	81.9	Pass
697.520000	0	350.0	V	17.8	-	61.9	Pass
927.000000	0	400.0	H	20.8	-	61.9	Pass
1044.000000	0	200.0	V	-	21.3	61.9	Pass
1312.800000	90	350.0	V	-	21.9	61.9	Pass
1700.000000	180	250.0	V	-	24.9	61.9	Pass
2020.400000	270	150.0	H	-	27.8	61.9	Pass
2396.400000	180	150.0	V	-	30.3	81.9	Pass
2904.800000	0	300.0	H	-	33.0	61.9	Pass
3421.600000	90	100.0	V	-	37.3	61.9	Pass
3572.400000	180	250.0	V	-	36.1	61.9	Pass
4978.400000	270	150.0	H	-	32.9	61.9	Pass
5965.600000	180	100.0	H	-	38.3	61.9	Pass

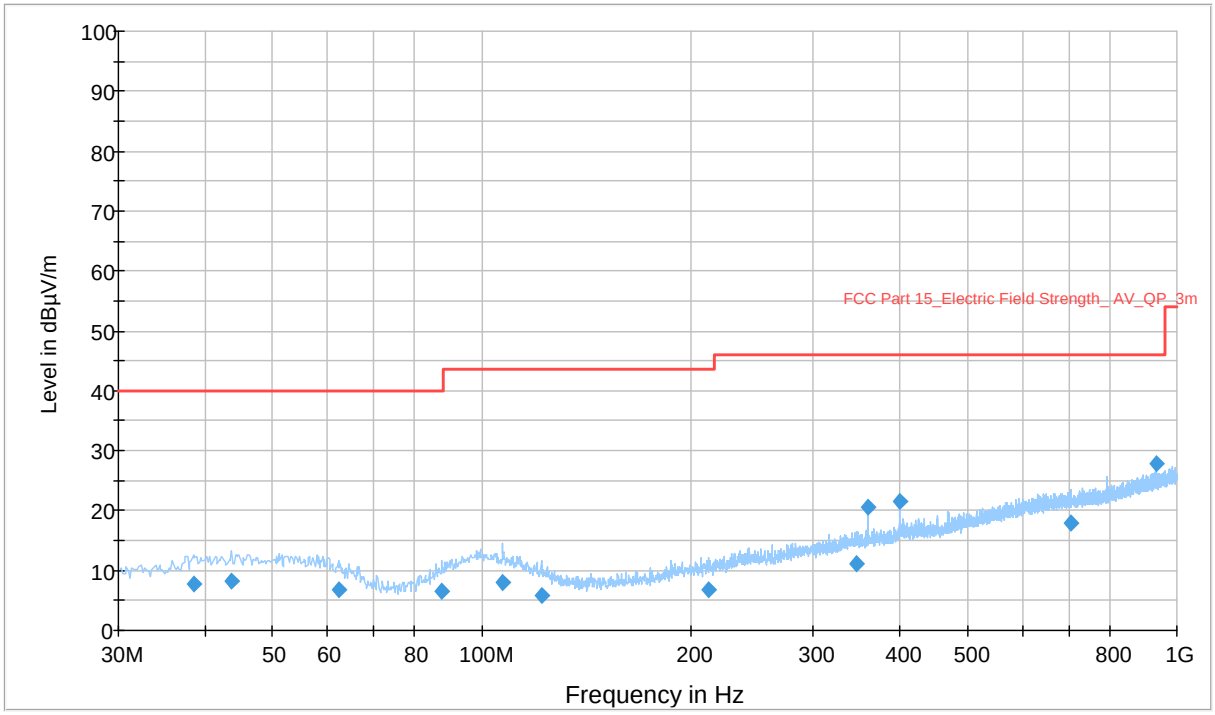
Plot 3.2.1 Radiated emission measurements in (30 – 1000) MHz range, vertical and horizontal polarization (450 MHz)



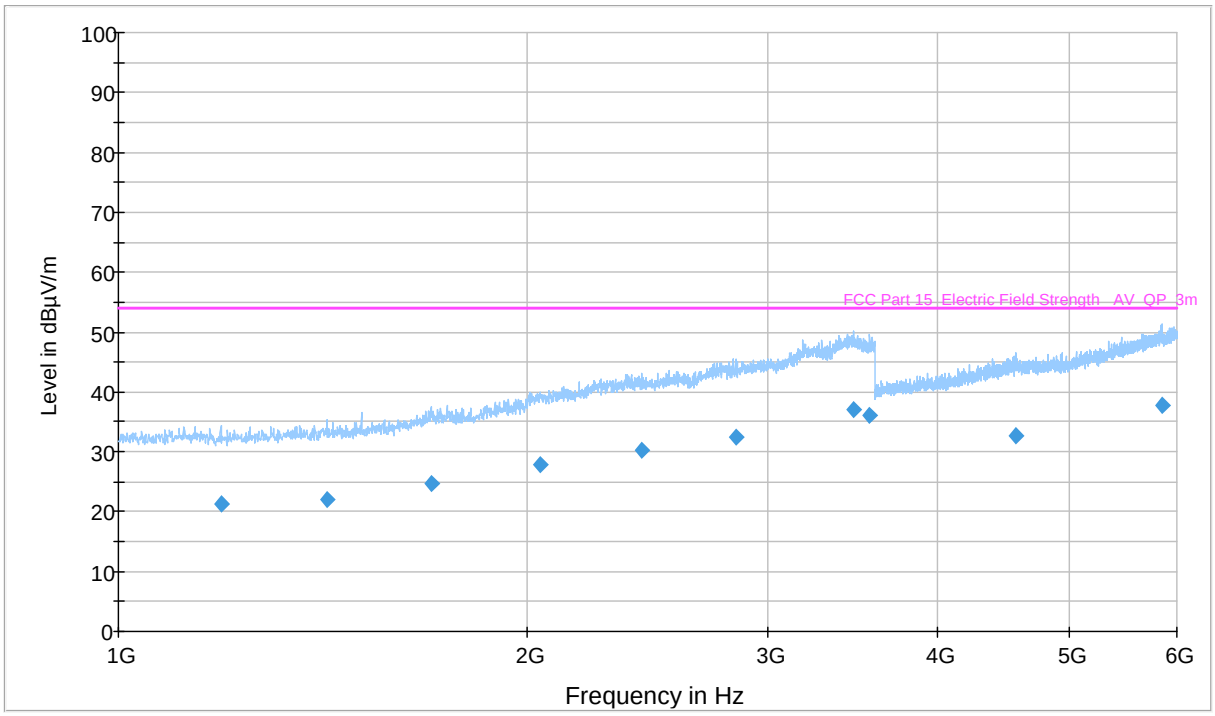
Plot 3.2.2 Radiated emission measurements in (1000 – 6000) MHz range, vertical and horizontal polarization (450 MHz)



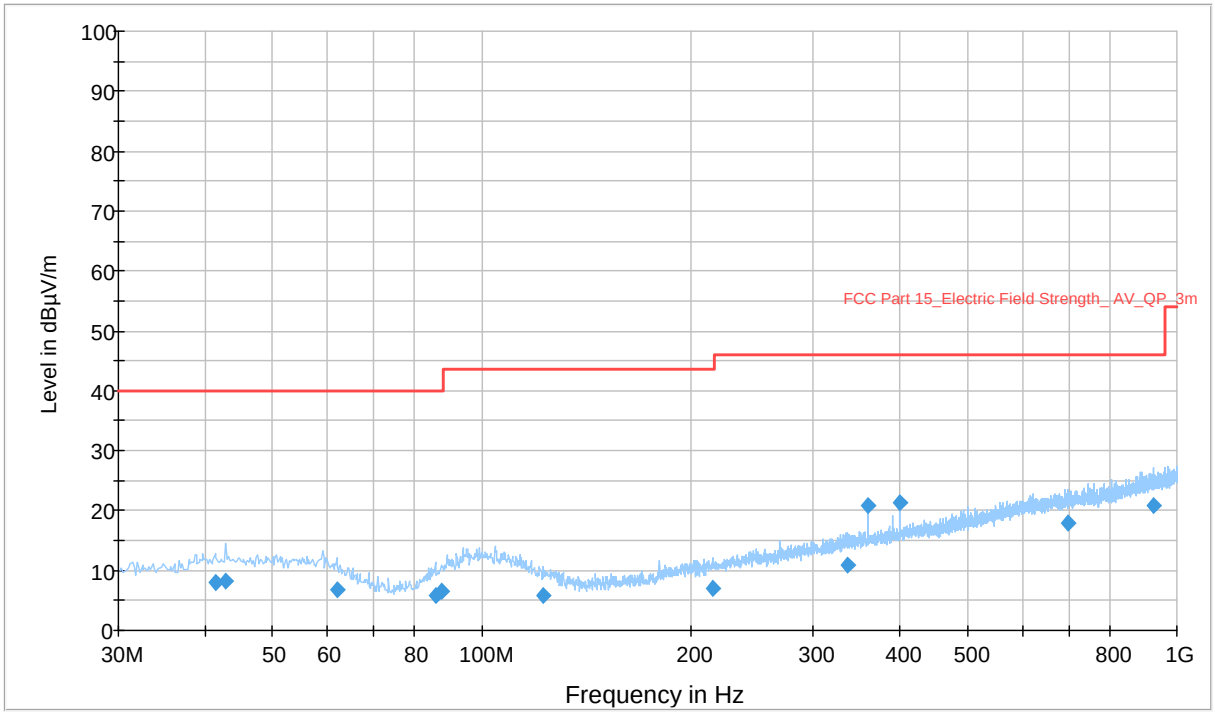
Plot 3.2.3 Radiated emission measurements in (30 – 1000) MHz range, vertical and horizontal polarization (460 MHz)



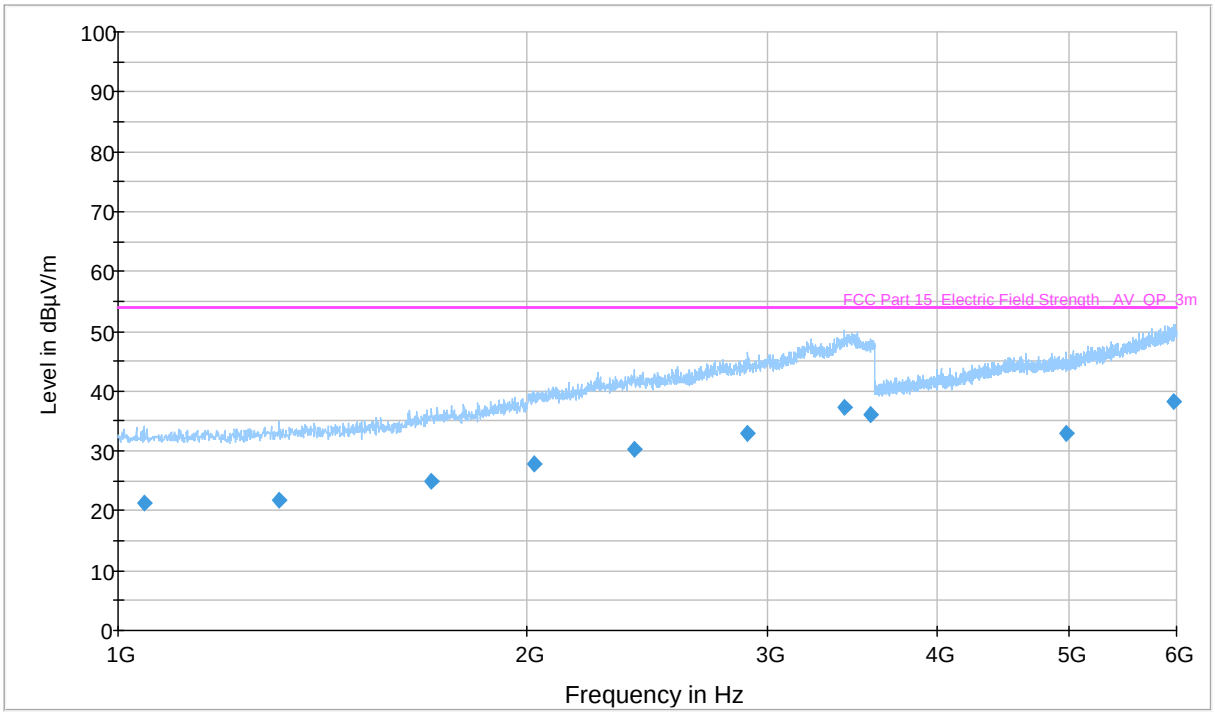
Plot 3.2.4 Radiated emission measurements in (1000 – 6000) MHz range, vertical and horizontal polarization (460 MHz)



Plot 3.2.5 Radiated emission measurements in (30 – 1000) MHz range, vertical and horizontal polarization (470 MHz)



Plot 3.2.6 Radiated emission measurements in (1000 – 6000) MHz range, vertical and horizontal polarization (470 MHz)

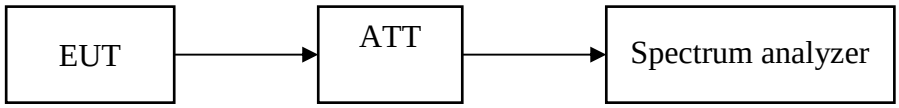


3.3 Operating Frequencies

Assignment and use of the frequencies in the band 450-470 MHz for fixed operations regulates by paragraph 47 CFR Part 90.261 and authorized in an individual license for the radio.

3.4 99% Occupied Bandwidth

3.4.1 Test Setup



3.4.2 Limit

According to §90.209(b)(5) the maximum occupied bandwidth for a 6.25 kHz channel spacing is 6 kHz.

3.4.3 Test Procedure

The following procedure according to ANSI C63.10-2013 shall be used for measuring 99% power bandwidth.

Settings for the spectrum analyzer:

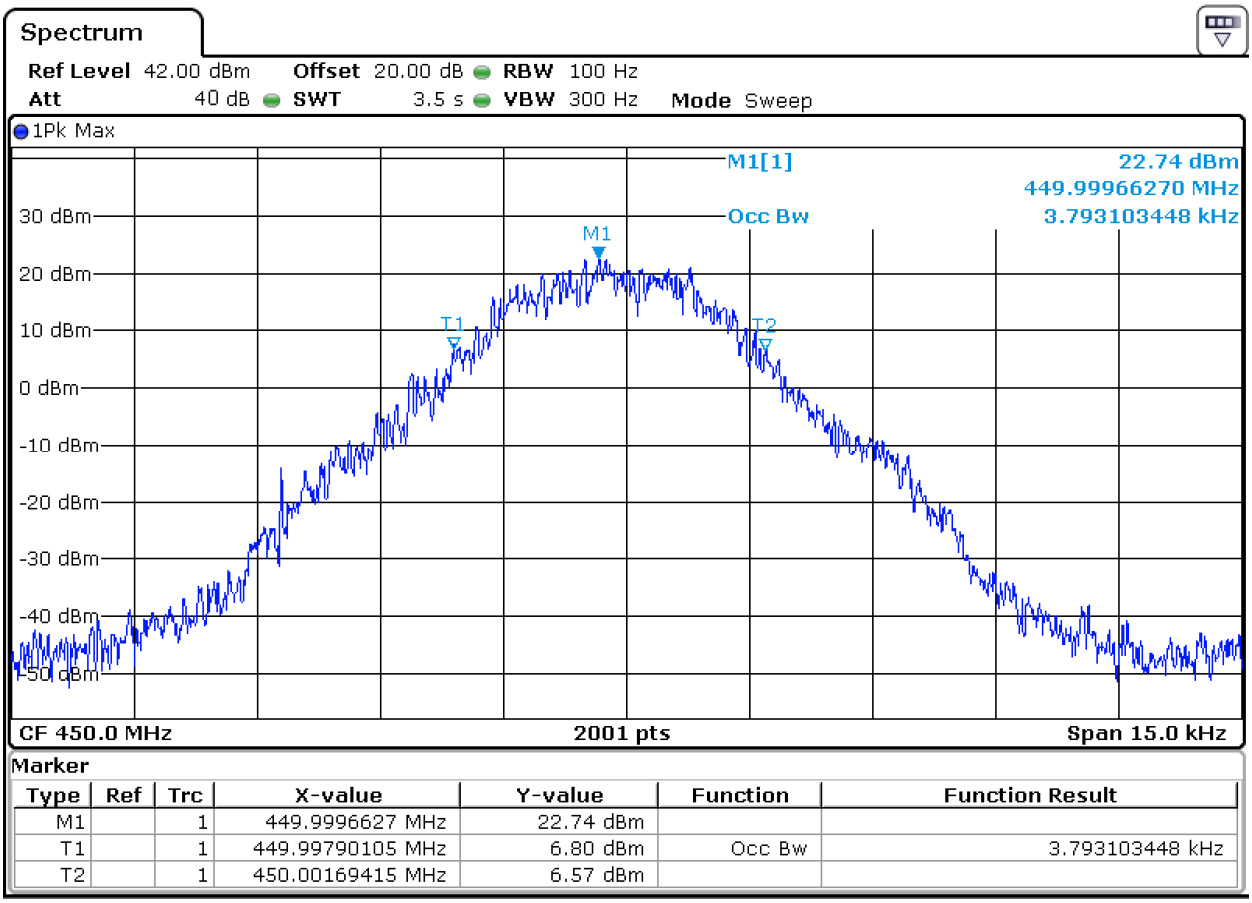
- center frequency is set to the nominal EUT channel center frequency;
- frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the occupied bandwidth (OBW);
- RBW shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW;
- Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. The peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level.
- Peak detection and max hold mode (until the trace stabilizes) shall be used.
- The 99% power bandwidth function of the spectrum analyzer shall be used.

3.4.4 Test Results

Temperature: +25 ^{o}C Relative humidity: 60 %

Channel Frequency, MHz	99% Occupied Bandwidth, kHz	Limit, kHz	Test Result (Pass, Fail, N/A)
450	3.79	6.00	Pass
460	3.82	6.00	Pass
470	3.82	6.00	Pass

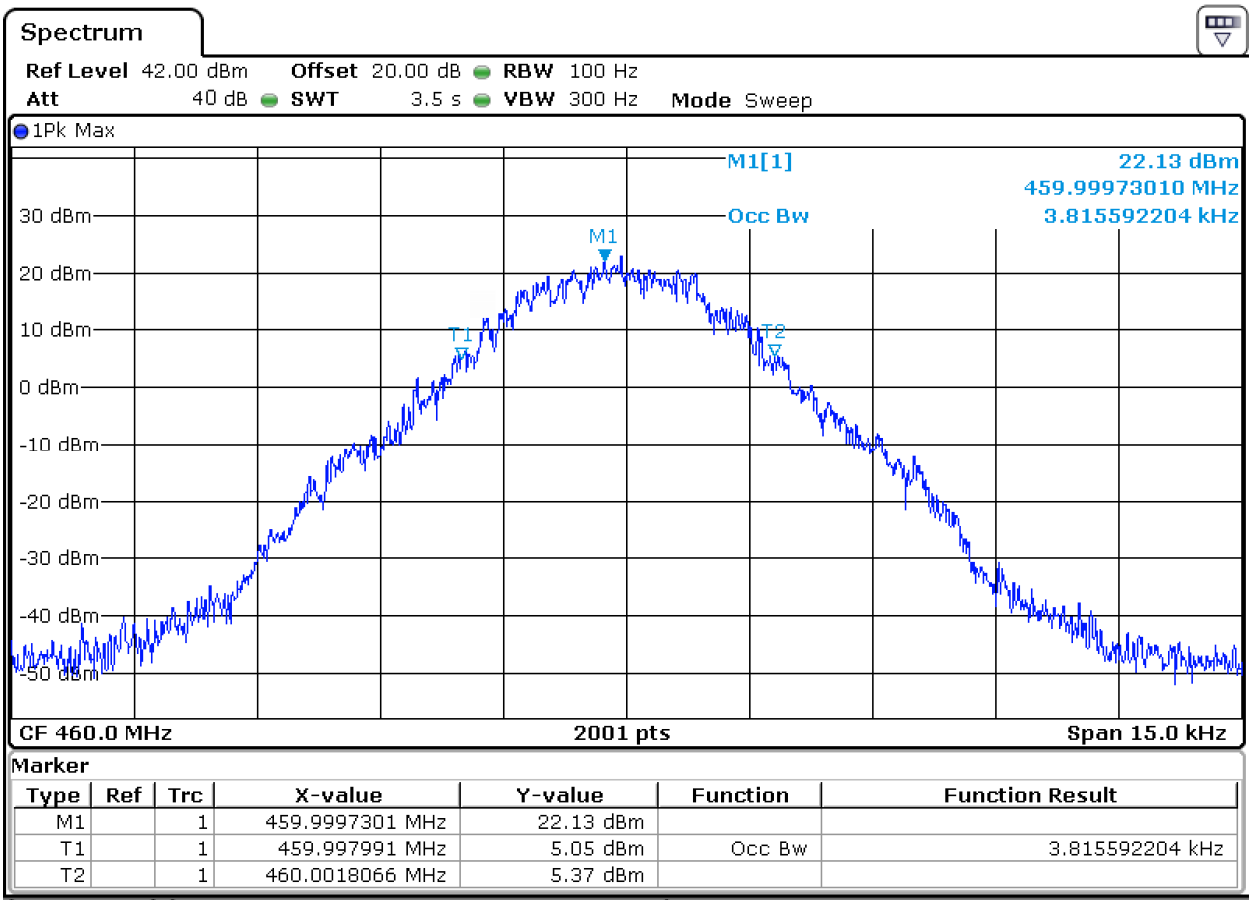
Low Channel Plot



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	449.9996627 MHz	22.74 dBm		
T1		1	449.99790105 MHz	6.80 dBm	Occ Bw	3.793103448 kHz
T2		1	450.00169415 MHz	6.57 dBm		

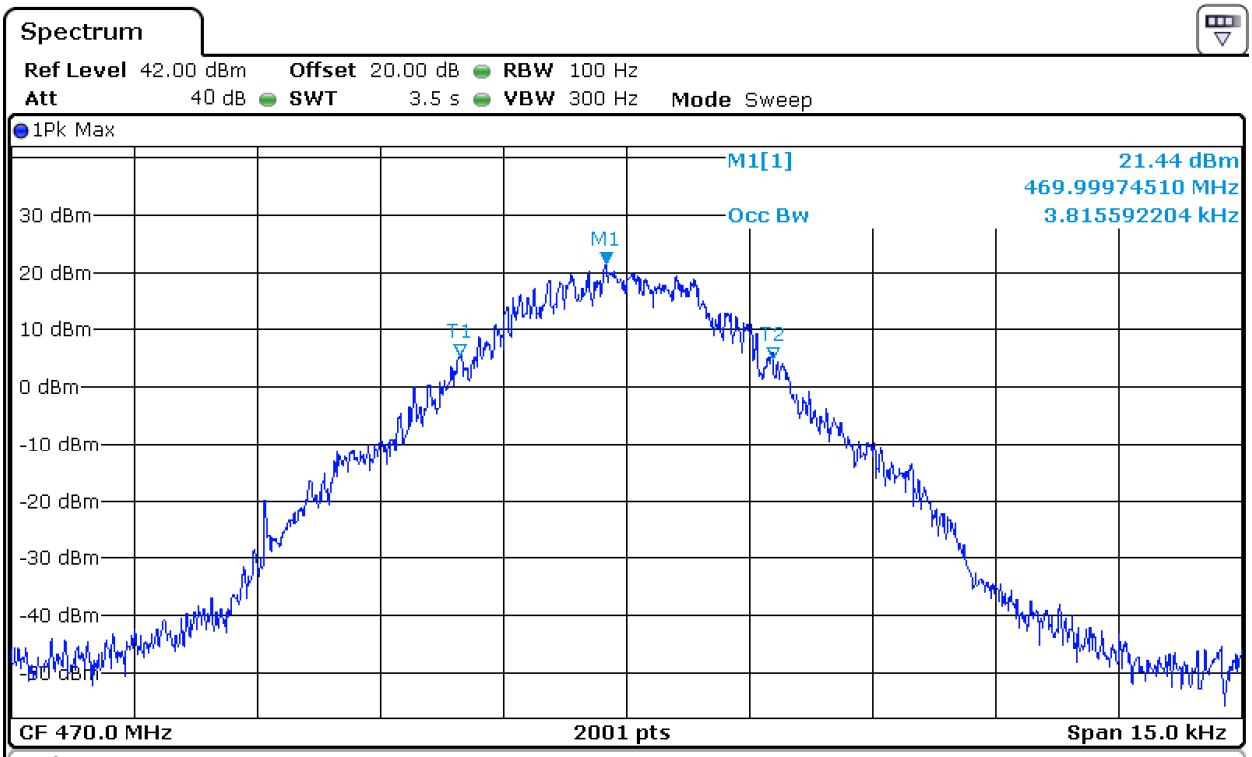
Middle Channel Plot



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	459.9997301 MHz	22.13 dBm		
T1		1	459.997991 MHz	5.05 dBm	Occ Bw	3.815592204 kHz
T2		1	460.0018066 MHz	5.37 dBm		

High Channel Plot



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	469.9997451 MHz	21.44 dBm		
T1		1	469.99796852 MHz	5.47 dBm	Occ Bw	3.815592204 kHz
T2		1	470.00178411 MHz	4.91 dBm		