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Amended

FCC/IC Test Report

Includes NCEE Labs report R20150213-20D and its amendment in full

Prepared for:	**Independent Technologies, LLC** **26 1st Ave SE** **New London, MN 56273**
Product:	**WESROC Satellite Tank Monitor**
Model:	**MT-9100STM**
FCC ID:	**RWB-MT9100STM**
IC:	**115A-MT9100STM**
Test Report No:	**R20150213-20E**
Approved By:	**Nic S. Johnson, NCE** **Technical Manager** **iNARTE Certified EMC Engineer #EMC-003337-NE**
DATE:	**1 March 2016**
Total Pages:	**30**

ACCREDITED
TESTING LABORATORY
CERTIFICATE NO. 1953.01

Table of figures

1.0 Summary of test results

The EUT has been tested according to the following specifications:

APPLIED STANDARDS: FCC Part 15, Subpart C			
Standard Section	**Test Type and Limit**	**Result**	**Remark**
FCC 15.203	Unique Antenna Requirement	Pass	Internal Antenna
FCC 15.109 ICES-003 RSS-Gen, 7.1.2 ANSI C63.10 Sec. 6.5 ANSI C63.10 Sec. 6.6.	Radiated Emissions (receiver)	Pass	Meets the requirement of the limit.
FCC 15.247(a)(2) RSS-247, 5.2(1) ANSI C63.10 Sec. 6.9.2	Minimum Bandwidth, Limit: Min. 500kHz	Pass	Meets the requirement of the limit.
FCC 15.247(b) RSS-247, 5.4 RSS-247, 5.5 ANSI C63.10 Sec. 11.9.1.1	Maximum Peak Output Power, Limit: Max. 30dBm Conducted spurious measurements	Pass	Meets the requirement of the limit.
FCC 15.209 RSS-Gen, 8.9 ANSI C63.10 Sec. 6.3.3 ANSI C63.10 Sec. 11.11.3 ANSI C63.10 Sec. 11.12.1	Transmitter Radiated Emissions, Limit:	Pass	Meets the requirement of the limit.
FCC 15.247(e) RSS-247, 5.2(2) ANSI C63.10 Sec. 11.10.2	Power Spectral Density, Limit: Max. 8dBm	Pass	Meets the requirement of the limit.
FCC 15.247(d) RSS-247, 5.5 ANSI C63.10 Sec. 11.13.1	Band Edge Measurement, Limit: 20dB less than the peak value of fundamental frequency	Pass	Meets the requirement of the limit.

1.1 Reason for amendments

-The FCC ID be was changed to "RWB-MT9100STM" and the IC ID was changed to “115A-MT9100STM.”
-2.1 - Antenna type was changed to “1/4 wave on a ground plane.” Not External Dipole.
-Table 8 - The Margin for 8286.6 MHz was corrected to be 27.86dB instead of 120.14dB
-ICES-003 was references for spurious emissions measurements on the receiver.
-Section 2.6 was amended to include a statement that the EUT is only intended to operate in 1 orientation.
-Added ANSI C63.10:2013 references to the summary table in Section 1.0.
- Section 4.5.5, note 3 states that the measurements were performed with a 10MHz RBW, NOT integrated channel power.
-Added specific measurement section from ANSI C63.10 to Table 1.
-Notes were added for clarification on Plots 7 and 8.

2.0 Description

2.1 Equipment under test

The Equipment Under Test (EUT) was WESROC Satellite Tank Monitor from Independent Technologies.

EUT Received Date: 16 September 2015
EUT Tested Date: 16 September 2015

PRODUCT	WESROC Satellite Tank Monitor
MODEL	MT-9100STM
POWER INPUT	3.9 VDC
MODULATION TYPE	FSK
RADIO TECHNOLOGY	Frequency-Shift Keying (FSK)
FREQUENCY RANGE	912MHz – 921MHz
POWER SUPPLY	3.9 VDC (Internal Battery)
ANTENNA TYPE	¼ wave on ground plane
SERIAL NUMBER OF TEST UNIT	For all conducted measurements: 500004 For all radiated measurements: 500001

NOTE:
1. For more detailed features description, please refer to the manufacturer's specifications or User's Manual.

2.2 Laboratory description

All testing was performed at the following Facility:

The Nebraska Center for Excellence in Electronics (NCEE Labs)
4740 Discovery Drive
Lincoln, NE 68521

A2LA Certificate Number:	1953.01
FCC Accredited Test Site Designation No:	US1060
Industry Canada Test Site Registration No:	4294A-1
NCC CAB Identification No:	US0177

Environmental conditions varied slightly throughout the tests:
Relative humidity of 54 ± 4%
Temperature of 23 ± 3° Celsius

2.3 Description of test modes

Channel	Frequency (MHz)
Lowest	911.980
Highest	920.980

2.4 Applied standards

The EUT is a digital transmission device operating in the 902 MHz to 928 MHz amateur band. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C; 15.209 and 15.247
Industry Canada, RSS-247, Issue 1
Industry Canada, RSS-Gen, Issue 4
ANSI C63.10:2013
ANSI C63.4:2014

All test items have been performed and recorded as per the above standards.

2.5 Description of support units

None

2.6 Configuration of system under test

The EUT was powered by 3.9 VDC, internal Battery for all the tests and had no auxiliary devices. The unit would normally be powered by a 3.6VDC battery, but for testing purposes a 3.9VDC battery was used to extend the transmitting time. Because the transmitter has regulated input power, this would not have an effect on the performance. It was tested by itself. The EUT was programmed by the manufacturer to transmit continually for testing purposes only.

The EUT was modified by the manufacturer to test with the device continuously transmitting a series of 1's and 0's, or to set the EUT to continuous receive mode for testing purposes.

The EUT contained a pre-approved transmit-only Globalstar Simplex module with FCC ID:L2V-STX3 IC: 3989A-STX3

The EUT was tested with the antenna pointing upwards only. This is the only orientation to be used.

3.0 Test equipment used

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE	CALIBRATION DUE DATE
Rohde & Schwarz Test Receiver	ES126	100037	20 Jan 2015	20 Jan 2016
EMCO Biconilog Antenna	3142B	1654	26 Jan 2015	26 Jan 2016
EMCO Horn Antenna	3115	6416	14 Jan 2014	14 Jan 2016
Rohde & Schwarz Preamplifier	TS-PR18	3545700803	19 Nov 2014*	19 Nov 2015*
Trilithic High Pass Filter	6HC330	23042	19 Nov 2014*	19 Nov 2015*

*Internal characterization

4.0 Detailed results

4.1 Unique antenna requirement

4.1.1 Standard applicable

For intentional device, according to FCC 47 CFR 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.

4.1.2 Antenna description

The antenna is internal to the unit and is not user replaceable

4.2 Radiated emissions

4.2.1 Limits for radiated emissions measurements

Emissions radiated outside of the specified bands shall be applied to the limits in 15.209 as followed:

FREQUENCIES (MHz)	FIELD STRENGTH (μV/m)	MEASUREMENT DISTANCE (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 * log * Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20dB under any condition of modulation.

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Radiated limits according to 15.209 do not apply within the 902MHz to 928MHz band for transmitters or the unrestricted band between 1722.2 to 2200 MHz.
6. For frequencies not in a restricted band as specified in 15.205, spurious emissions shall be at least 20dB less than the field strength at the fundamental frequency.

4.2.2 Test procedures

a. The EUT was placed on the top of a rotating table 0.8 meters, 1.5 meters above the ground plane in a 10 meter semi-anechoic chamber for frequency ranges 30MHz - 1GHz, 1 – 10GHz respectively. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.

d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.

e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.

2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for peak and average detectors at frequencies above 1GHz.

4.2.3 Deviations from test standard

No deviation.

4.2.4 Test setup

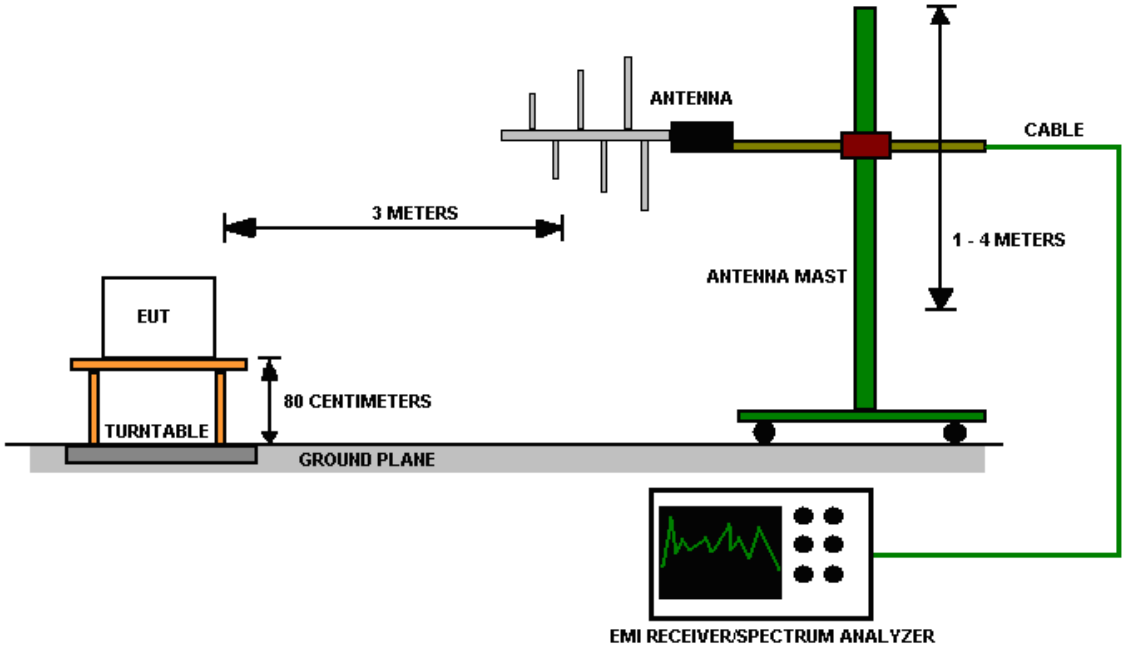

Figure 1 - Radiated Emissions Test Setup

For the actual test configuration, please refer to Appendix A for photographs of the test configuration.

4.2.5 EUT operating conditions

See section 2.6.

4.2.6 Test results

EUT MODULE	WESROC Satellite Tank Monitor	MODE	Receive
INPUT POWER	3.9 VDC	FREQUENCY RANGE	30MHz – 10GHz
ENVIRONMENTAL CONDITIONS	50 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

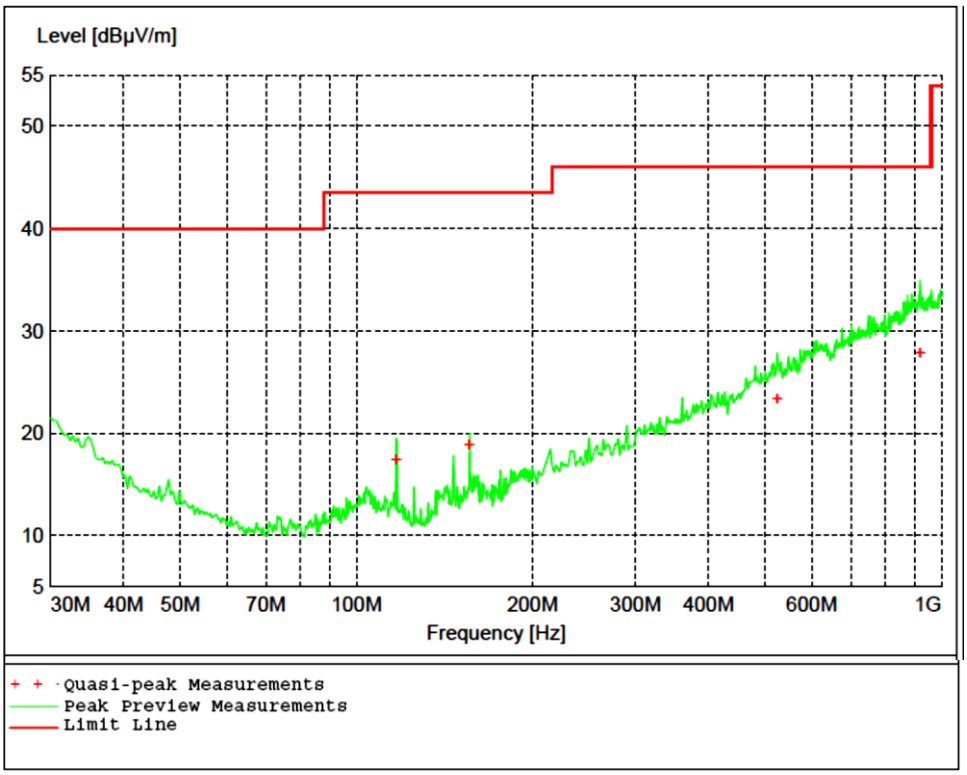

Figure 2 - Radiated Emissions Plot, Receive

Table 1 - Radiated Emissions Quasi-peak Measurements, Receive

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
117.000000	17.35	43.50	26.20	99	114	VERT
156.000000	18.82	43.50	24.70	100	0	VERT
524.220000	23.39	46.00	22.60	139	277	HORI
919.440000	27.77	46.00	18.20	100	214	VERT

Table 2 - Radiated Emissions Peak Measurements, Receive

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
1822.600000	35.76	54.00	18.20	400	62	VERT
2722.800000	38.90	54.00	15.10	400	114	HORI
3648.000000	41.90	54.00	12.10	99	0	HORI
4564.600000	41.85	54.00	12.20	365	43	VERT
5476.600000	44.57	54.00	9.40	400	19	HORI

Peak measurements were compared to average limit and found to be compliant so average measurements were not performed

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Since peak measurements were compliant with the average limit, average measurements were not required.

EUT MODULE	WESROC Satellite Tank Monitor	MODE	Transmit, Low Channel
INPUT POWER	3.9 VDC	FREQUENCY RANGE	30MHz – 10GHz
ENVIRONMENTAL CONDITIONS	50 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

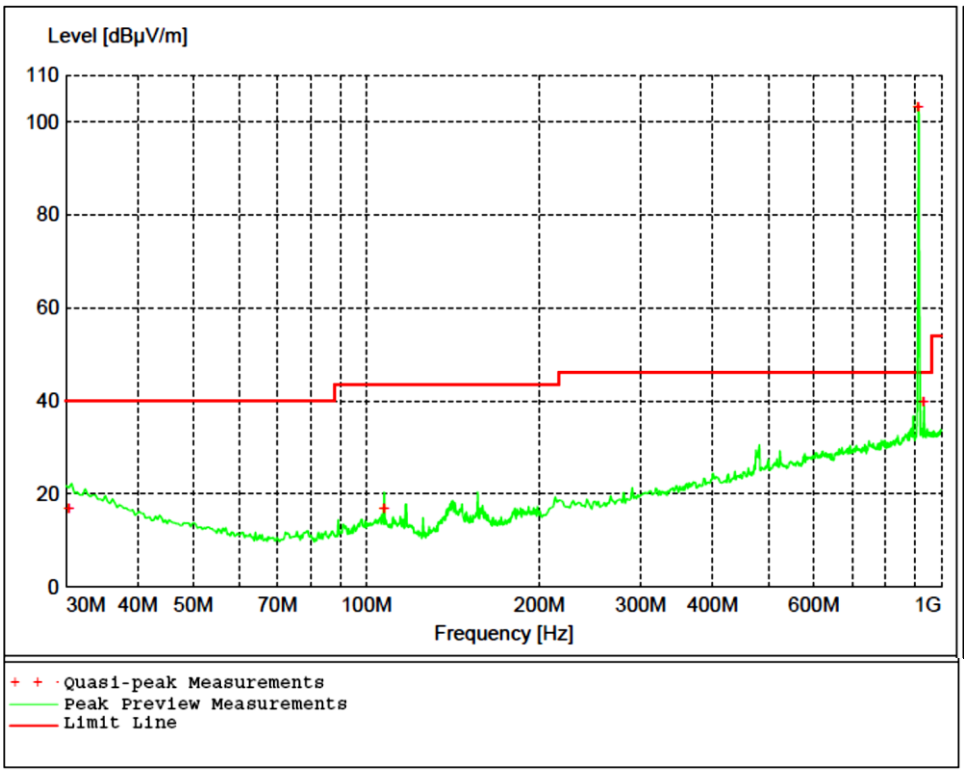

Figure 3 - Radiated Emissions Plot, Lowest Channel

Table 3 - Radiated Emissions Quasi-peak Measurements, Lowest Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
30.360000	16.95	40.00	23.10	183	22	VERT
107.280000	16.73	43.50	26.80	165	330	VERT
912.000000	103.12	NA	NA	120	17	VERT
931.440000	39.77	46.00	6.20	109	153	VERT

Table 4 - Radiated Emissions Average Measurements, Lowest Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
1823.500000	41.97	83.12*	41.15	100	55	VERT
2728.500000	39.43	54.00	14.57	155	297	HORI
3656.000000	28.15	54.00	25.85	400	301	HORI
4548.400000	40.43	54.00	13.57	145	327	HORI
5473.600000	30.80	54.00	23.20	400	174	VERT
6395.000000	31.58	54.00	22.42	400	240	VERT
7277.000000	31.08	54.00	22.92	234	163	VERT
8190.200000	32.74	54.00	21.26	400	246	VERT
9097.400000	32.88	54.00	21.12	199	26	VERT

Table 5 - Radiated Emissions Peak Measurements, Lowest Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
1823.500000	52.89	103.12*	50.23	100	55	VERT
2728.500000	52.59	74.00	21.41	155	297	HORI
3656.000000	42.09	74.00	31.91	400	301	HORI
4548.400000	42.47	74.00	31.53	145	327	HORI
5473.600000	44.04	74.00	29.96	400	174	VERT
6395.000000	44.91	74.00	29.09	400	240	VERT
7277.000000	44.18	74.00	29.82	234	163	VERT
8190.200000	46.25	74.00	27.75	400	246	VERT
9097.400000	46.23	74.00	27.77	199	26	VERT

*The limits in bands not restricted by FCC Part 15.205, emissions are required to be 20dB below the field strength at the fundamental frequency.

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Since peak measurements were compliant with the average limit, average measurements were not required.

EUT MODULE	WESROC Satellite Tank Monitor	MODE	Transmit, High Channel
INPUT POWER	3.9 VDC	FREQUENCY RANGE	30MHz – 10GHz
ENVIRONMENTAL CONDITIONS	50 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

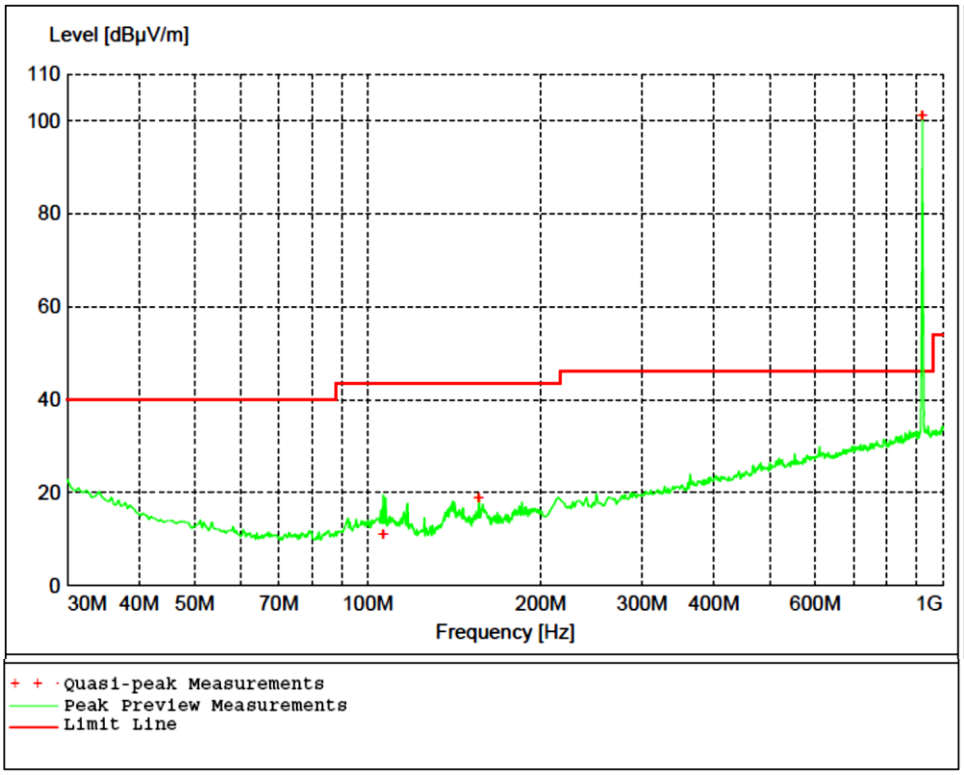

Figure 4 - Radiated Emissions Plot, Highest Channel

Table 6 - Radiated Emissions Quasi-peak Measurements, Highest Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
106.320000	11.13	43.50	32.40	100	288	VERT
156.000000	18.97	43.50	24.60	100	95	VERT
921.000000	101.06	NA	NA	109	229	VERT

Table 7 - Radiated Emissions Average Measurements, Highest Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
1842.000000	42.76	81.06*	38.30	258	13	VERT
2759.000000	39.57	54.00	14.43	244	206	VERT
3672.000000	28.25	54.00	25.75	399	23	HORI
4605.800000	28.45	54.00	25.55	100	243	VERT
5518.000000	31.27	54.00	22.73	399	222	HORI
6436.600000	30.75	54.00	23.25	399	60	HORI
7390.200000	33.69	54.00	20.31	343	360	HORI
8286.600000	32.14	54.00	21.86	267	0	VERT
9229.200000	33.51	54.00	20.49	115	116	VERT

Table 8 - Radiated Emissions Peak Measurements, Highest Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
1842.000000	53.06	101.06*	48.00	258	13	VERT
2759.000000	52.93	74.00	21.07	244	206	VERT
3672.000000	41.45	74.00	32.55	399	23	HORI
4605.800000	42.01	74.00	31.99	100	243	VERT
5518.000000	45.72	74.00	28.28	399	222	HORI
6436.600000	44.48	74.00	29.52	399	60	HORI
7390.200000	46.81	74.00	27.19	343	360	HORI
8286.600000	46.14	74.00	27.86	267	0	VERT
9229.200000	46.55	74.00	27.45	115	116	VERT

*The limits in bands not restricted by FCC Part 15.205, emissions are required to be 20dB below the field strength at the fundamental frequency.

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

4.4 Bandwidth

4.4.1 Limits of bandwidth measurements

The 6dB bandwidth of the signal must be greater than 500 kHz

4.4.2 Test procedures

The transmitter output was connected to the spectrum analyzer directly. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 300 kHz VBW. The 6 dB bandwidth is defined as the bandwidth of which is higher than peak power minus 6dB.

The 99% occupied is defined as the bandwidth at which 99% of the signal power is found. This corresponds to 20dB down from the maximum power level. The maximum power was measured with the largest resolution bandwidth possible (10MHz) and this value was recorded. The signal was then captured with a 100kHz resolution bandwidth and the frequencies where the measurements were 20dB below the maximum power were marked. The bandwidth between these frequencies was recorded as the 99% occupied bandwidth.

4.4.3 Deviations from test standard

No deviation.

4.4.4 Test setup

The cable used to go from the spectrum analyzer to the EUT had a loss of 0.25dB. This was not taken into account on the plot below because it is a relative measurement.

4.4.5 EUT operating conditions

See section 2.6.

4.4.6 Test results

EUT MODULE	WESROC Satellite Tank Monitor	MODE	Transmit
INPUT POWER	3.9 VDC	FREQUENCY RANGE	902 MHz – 928 MHz
ENVIRONMENTAL CONDITIONS	50 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BW (kHz)	6dB MINIMUM LIMIT (kHz)	99% Occupied BW (kHz)	RESULT
1	912	617.23	500.00	869.73	PASS
2	921	620.04	500.00	866.93	PASS

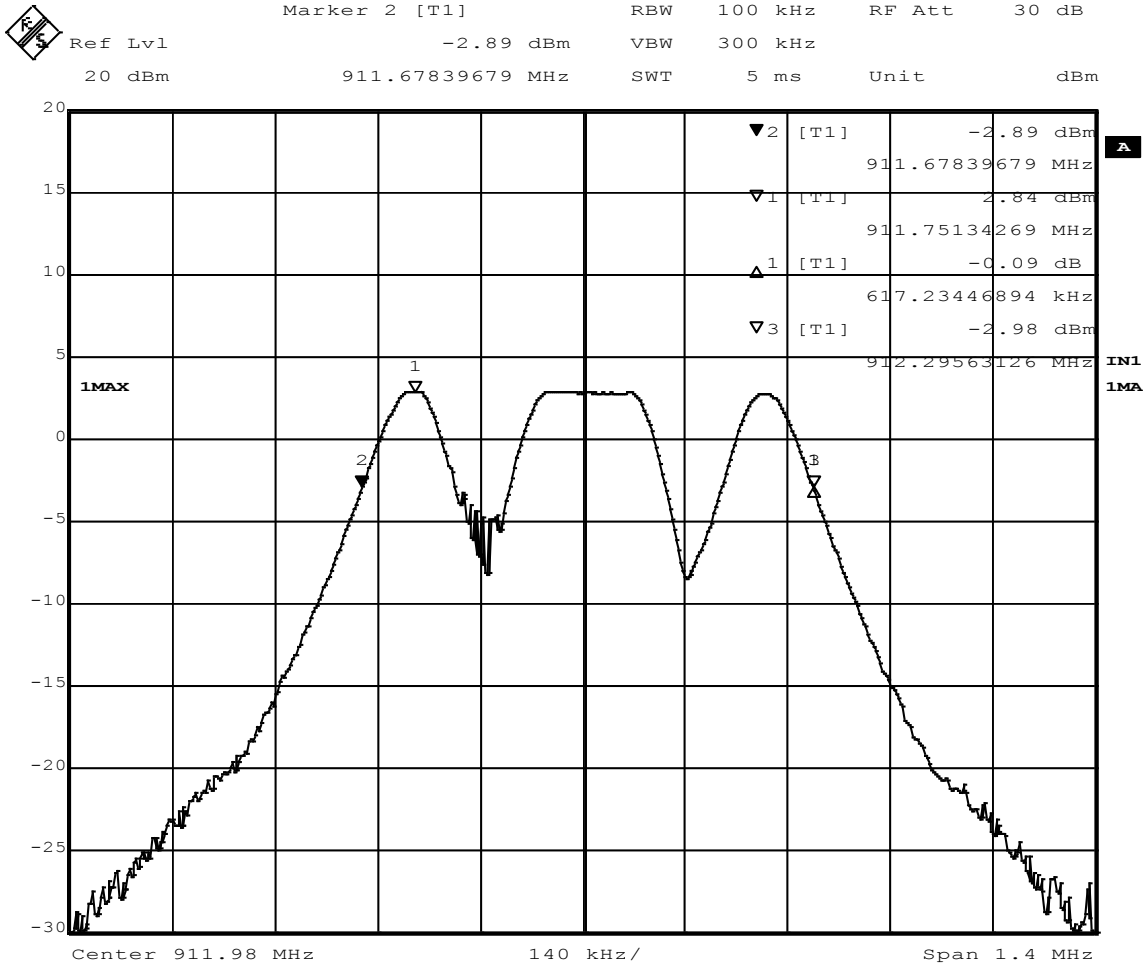

Figure 5 - 6dB Bandwidth, Lowest Channel

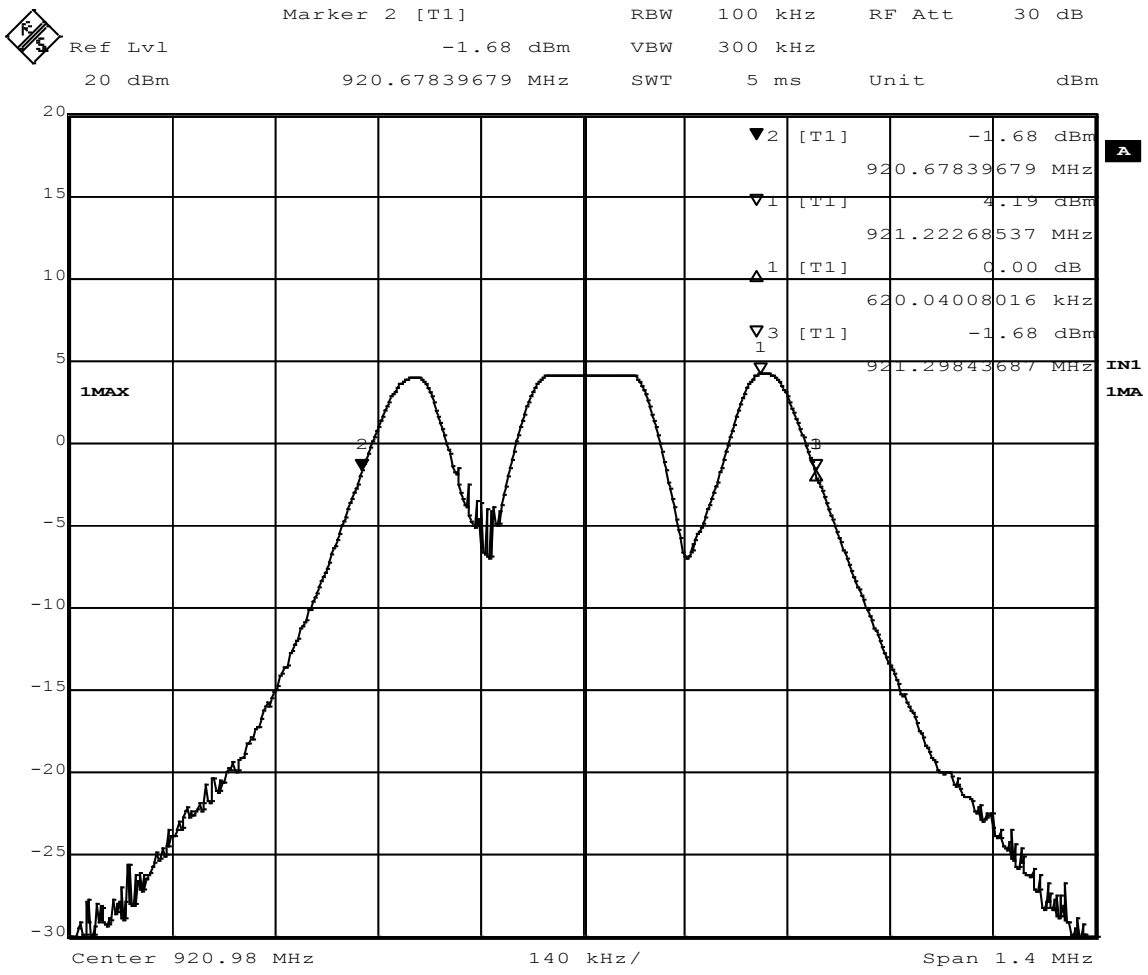

Figure 6 - 6dB Bandwidth, Highest Channel

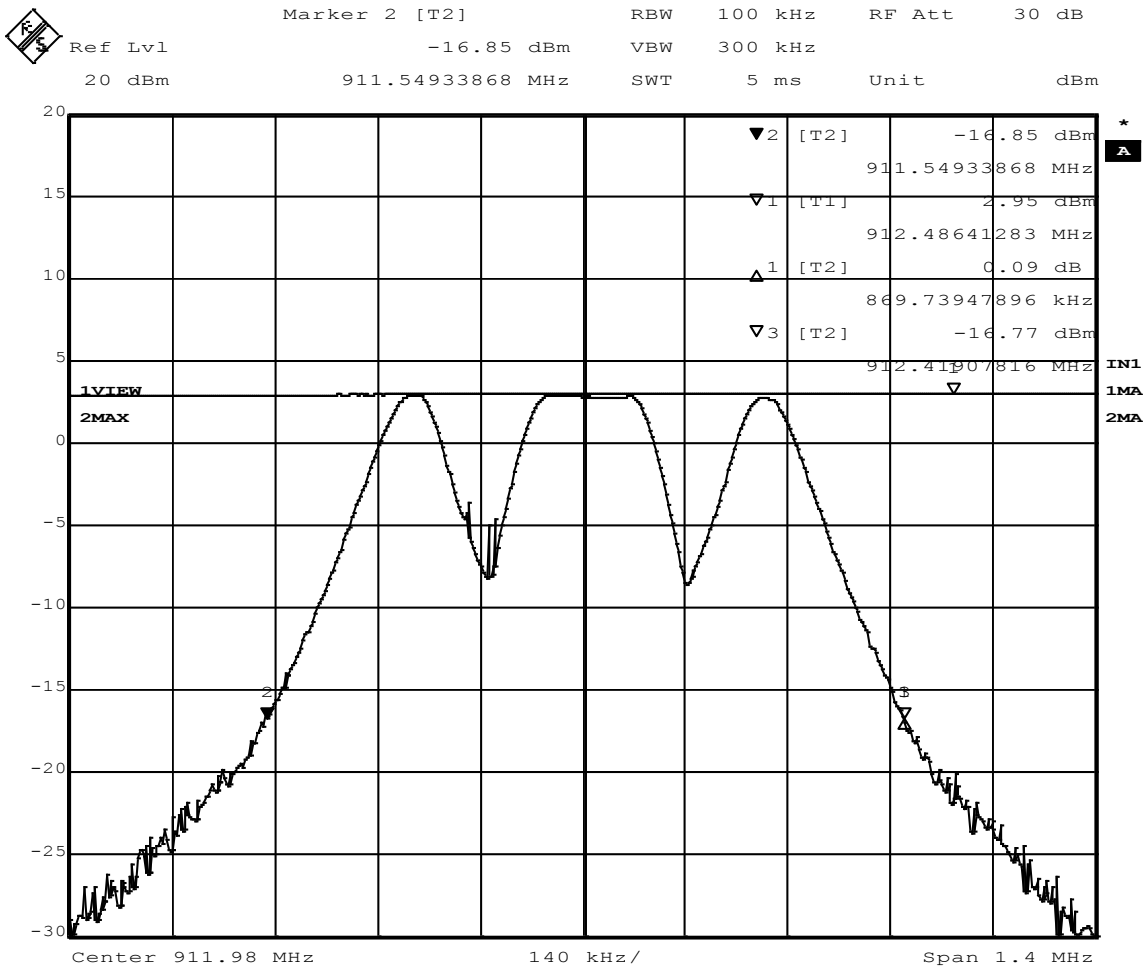

Figure 7 - 99% Occupied Bandwidth, Lowest Channel

Note: The plot above shows a peak measurement performed using a 10MHz resolution bandwidth as well as a bandwidth measurement using a 100 kHz Bandwidth. The 10MHz trace was saved on the screen and the the RBW was changed to 100 kHz. This was done to compare the peak output power to the 99% level on the 100kHz bandwidth trace.

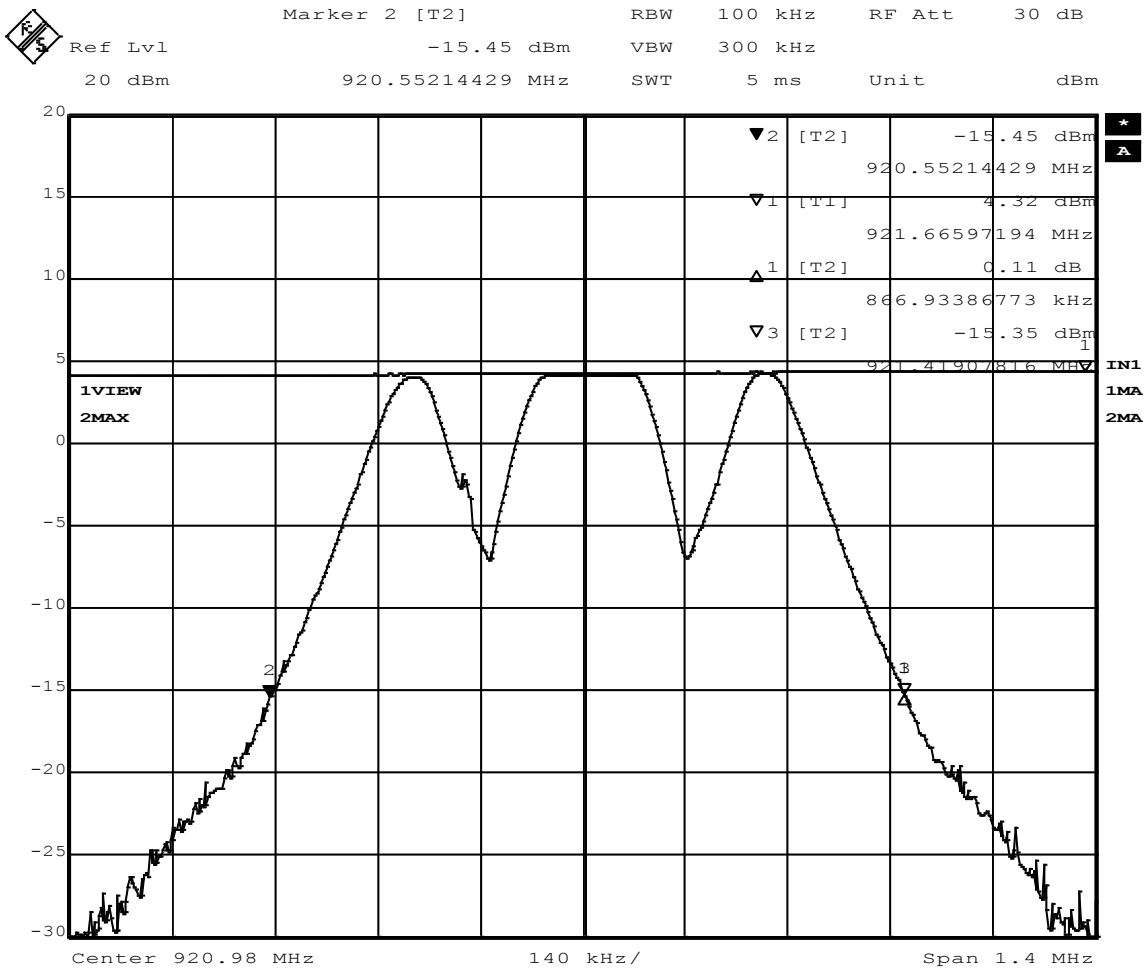

Figure 8 - 99% Occupied Bandwidth, Highest Channel

Note: The plot above shows a peak measurement performed using a 10MHz resolution bandwidth as well as a bandwidth measurement using a 100 kHz Bandwidth. The 10MHz trace was saved on the screen and the the RBW was changed to 100 kHz. This was done to compare the peak output power to the 99% level on the 100kHz bandwidth trace.

4.5 Maximum peak output power and conducted spurious emissions

4.5.1 Limits of power measurements

The maximum peak output power allowed is 30dBm

4.5.2 Test procedures

1. The EUT was connected to the spectrum analyzer directly with a low-loss shielded coaxial cable.

2. The maximum output power was taken as the peak value as measured with a resolution bandwidth of 10MHz. This trace is shown on top of the plots from Section 4.5.6.

3. The resolution bandwidth was set to 10MHz and the video bandwidth was set to 10MHz to capture the maximum amount of signal. The analyzer used a peak detector in max hold mode. This represented the maximum output power.

4.5.3 Deviations from test standard

No deviation.

4.5.4 Test setup

The cable used to go from the spectrum analyzer to the EUT had a loss of 0.25dB. The plot shows the uncorrected value. The corrected value was recorded from this plot with 0.25dB added.

4.5.5 EUT operating conditions

See Section 2.6

4.5.6 Test results

Maximum peak output power

EUT MODULE	WESROC Satellite Tank Monitor	MODE	Transmit
INPUT POWER	3.9 VDC	FREQUENCY RANGE	902 MHz – 928 MHz
ENVIRONMENTAL CONDITIONS	50 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	RESULT
1	912	3.20	30	PASS
2	921	4.57	30	PASS

*Corrected (0.25dB of attenuation added to account for RF cable)

Note: Screen captures of the measurements can be found in Section 4.4. The maximum power measurement with a 10MHz resolution bandwidth can be seen in the 99% occupied bandwidth plots.

4.6 Power spectral density (PSD)

4.6.1 Limits of PSD measurements

The maximum power spectral density allowed is 8dBm.

4.6.2 Test procedures

The transmitter output was connected directly to the spectrum analyzer. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3 kHz RBW and 30 kHz VBW, the sweep time was set to auto. The power spectral density was measured and recorded at the frequency with the highest emission. The sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.

4.6.3 Deviations from test standard

No deviation.

4.6.4 Test setup

The cable used to go from the spectrum analyzer to the EUT had a loss of 0.25dB. The plot shows the uncorrected value. The corrected value was recorded from this plot with 0.25dB added.

4.6.5 EUT operating conditions

See Section 2.6.

4.6.6 Test results

Power Spectral Density

EUT MODULE	WESROC Satellite Tank Monitor	MODE	Transmit
INPUT POWER	3.9 VDC	FREQUENCY RANGE	902 MHz – 928 MHz
ENVIRONMENTAL CONDITIONS	50 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL (dBm)	MAXIMUM POWER LIMIT (dBm)	RESULT
1	912	2.38	8.0	PASS
2	921	3.58	8.0	PASS

Table shows corrected measurements
(0.25dB of attenuation added to account for RF cable)

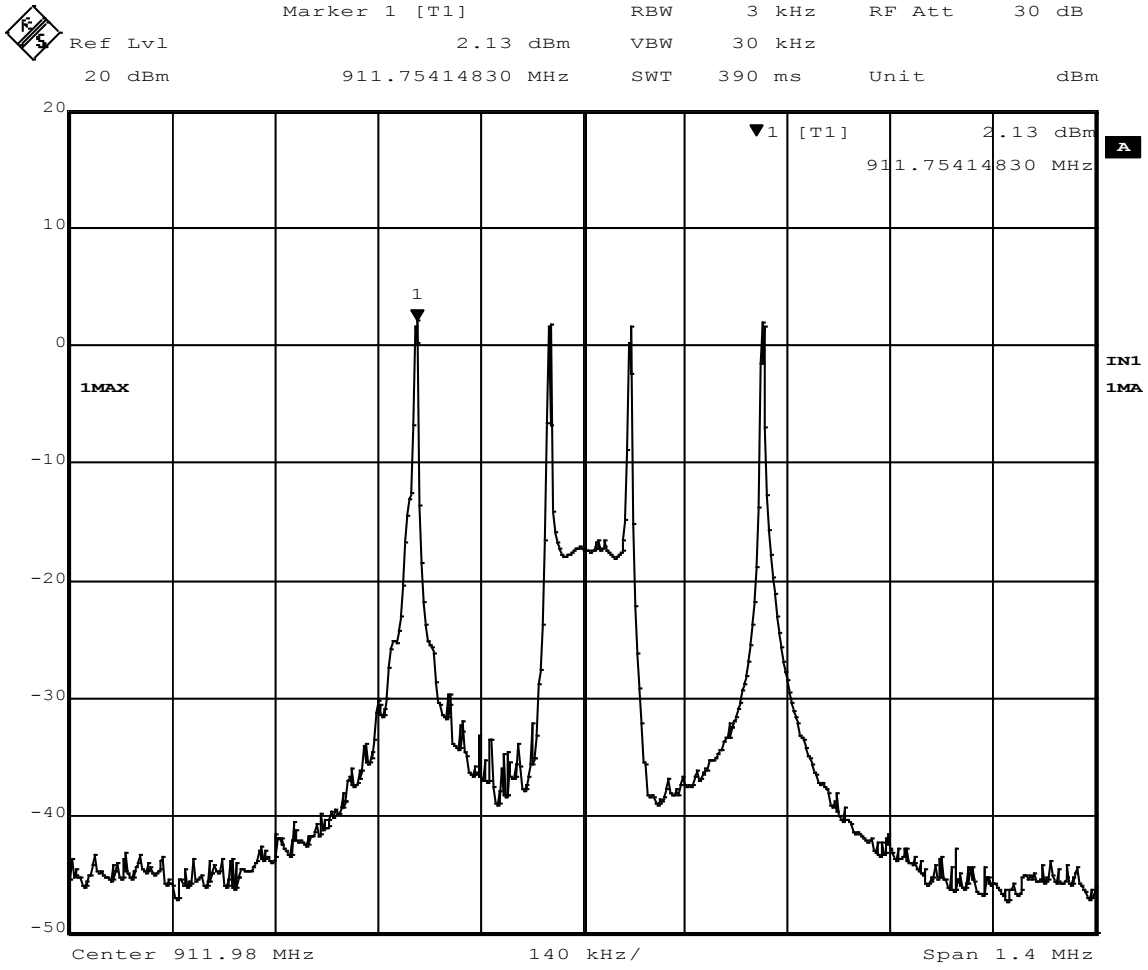

Figure 9 - Power Spectral Density Measurement, Lowest Channel

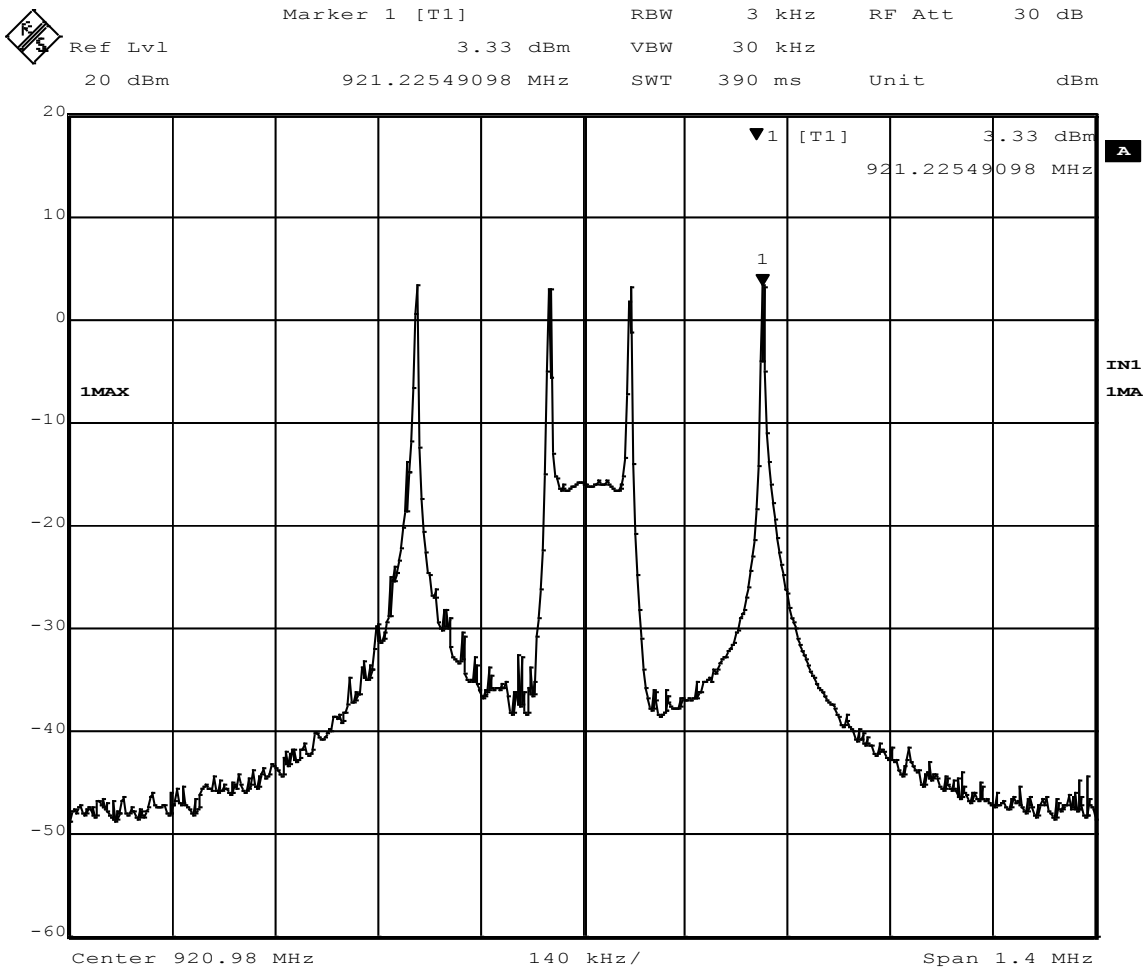

Figure 10 - Power Spectral Density Measurement, Highest Channel

4.7 Bandedges

4.7.1 Limits of bandedge measurements

For emissions outside of the allowed band of operation (902MHz – 928MHz), the emission level needs to be 20dB under the maximum fundamental field strength. However, if the emissions fall within one of the restricted bands from 15.205 the field strength levels need to be under that of the limits in 15.209.

4.7.2 Test procedures

The transmitter output was connected directly to the spectrum analyzer. The resolution bandwidth was set to 100kHz and the spectrum analyzer was used at bandedges to the fundamental frequency with a peak detector. The highest emissions level beyond the bandedge was measured and recorded. If the out of band emissions do not fall within a restricted band from 15.205, then it is required that the out of band emission be 20dB below that of the fundamental emission level.

4.7.3 Deviations from test standard

No deviation.

4.7.4 Test setup

The cable used to go from the spectrum analyzer to the EUT had a loss of 0.25dB. This was not taken into account on the plot below because it is a relative measurement.

4.7.5 EUT operating conditions

See Section 2.6.

4.7.6 Test results

EUT MODULE	WESROC Satellite Tank Monitor	MODE	Transmit
INPUT POWER	3.9 VDC	FREQUENCY RANGE	902 MHz – 928 MHz
ENVIRONMENTAL CONDITIONS	50 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

Highest Out of Band Emissions

CHANNEL	Bandedge/Measurement Frequency (MHz)	Level (dBm)	Fund. Level (dBm)	Delta	Minimum per 15.247	Result
1	912 MHz	-57.29	2.74	60.03	20.00	PASS
2	921 MHz	-59.27	4.11	63.38	20.00	PASS

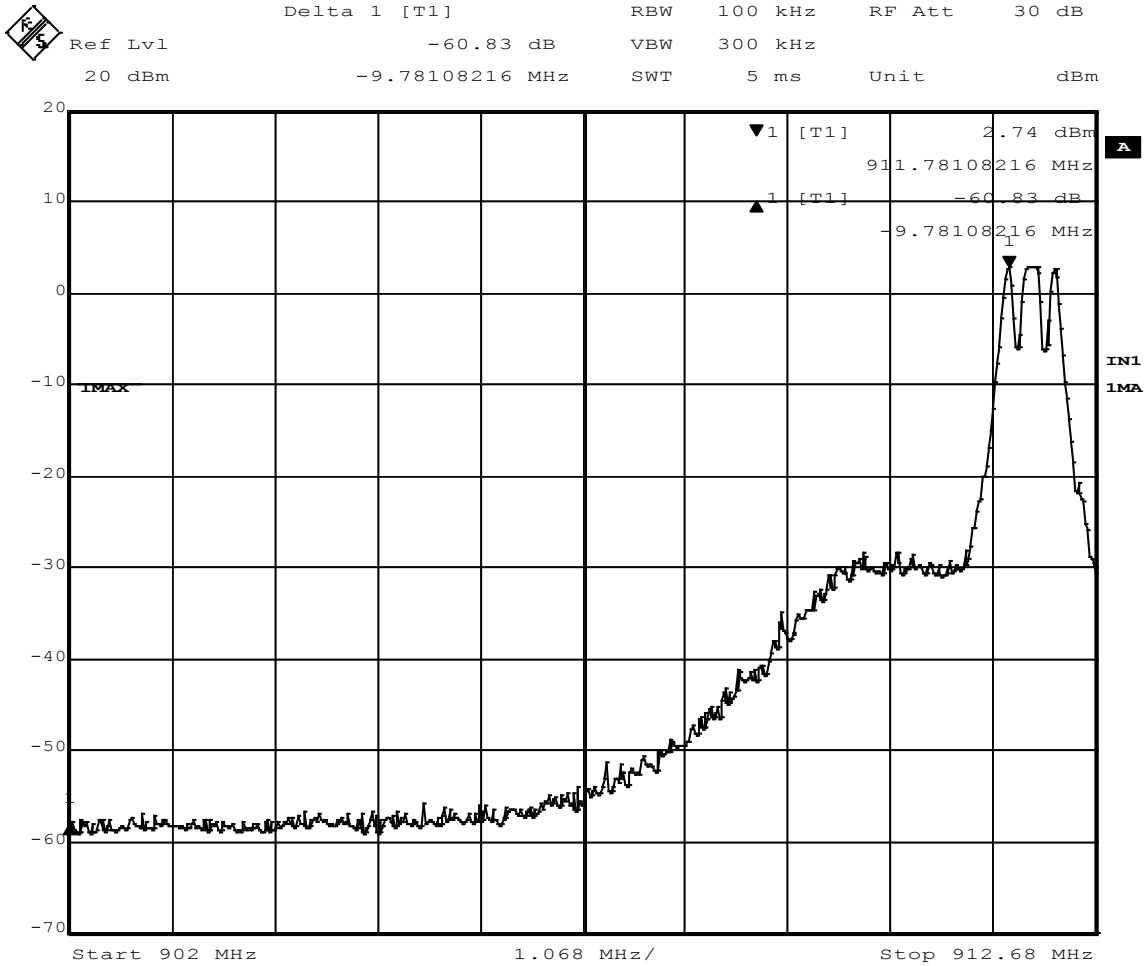

Figure 11 - Lower Band-edge Measurements

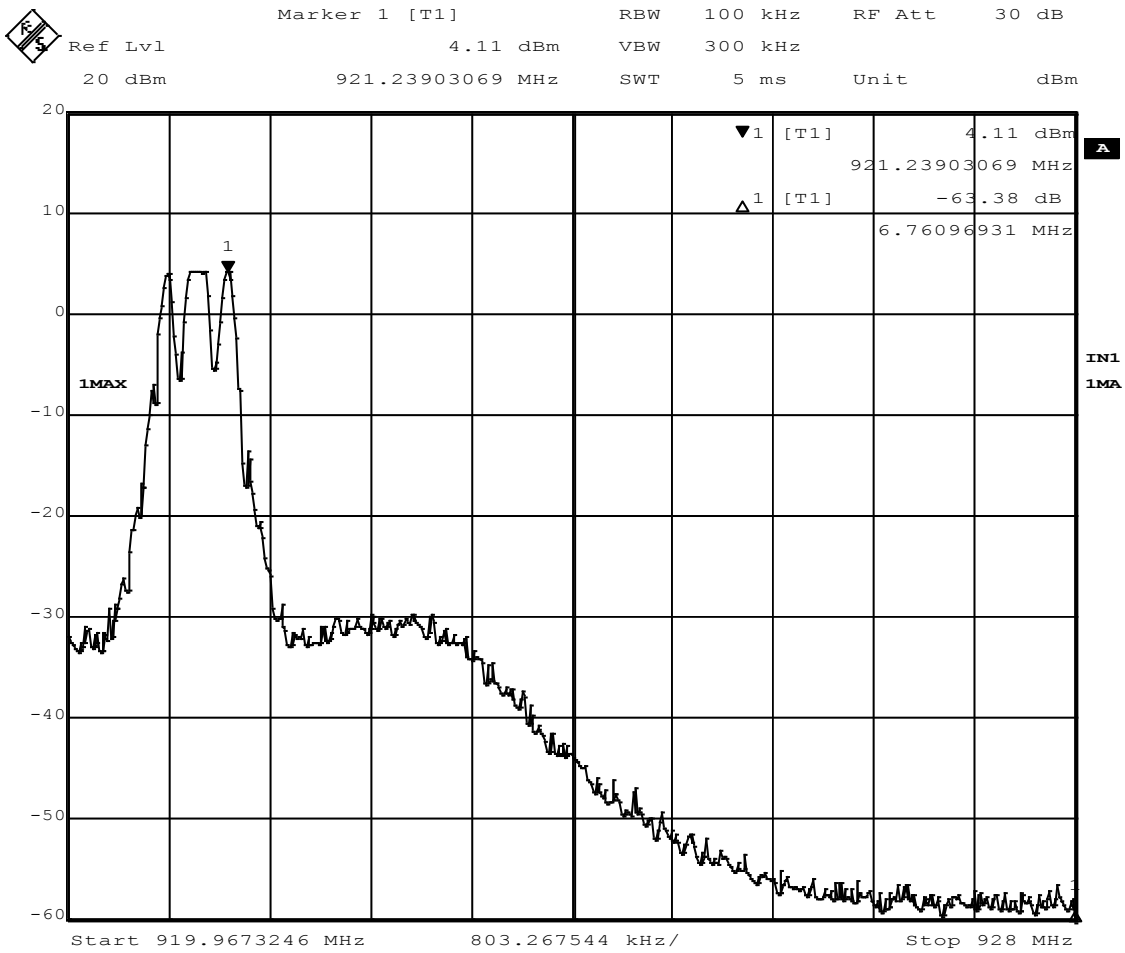

Figure 12 – Higher Band-edge Measurements

Appendix A: Test Photos

Figure 13 - Radiated Emissions Test Setup, 30MHz to 1GHz
Table height was 0.8m

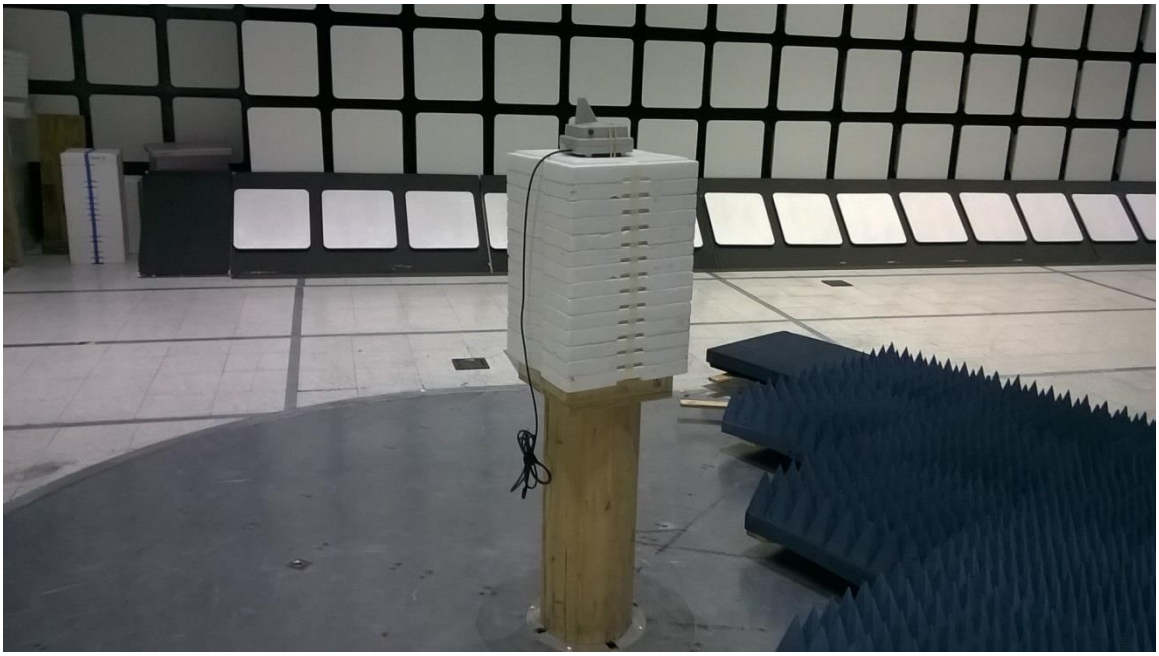

Figure 14 - Radiated Emissions Test Setup, 1 – 10GHz
Table height was 1.5m

Appendix B: Sample Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:
FS = RA + AF – (-CF + AG) + AV

Where;

FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dBμV is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dBμV/m.

FS = 55 + 12 – (-1.1 + 20) + 0 = 48.1 dBμV/m

The 48.1 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

Level in μV/m = Common Antilogarithm [(48.1 dBμV/m)/20]= 254.1 μV/m

Annex C – Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been for tests performed in this test report:

Test	Frequency Range	Uncertainty Value (dB)
Radiated Emissions, 3m	30MHz - 1GHz	3.82
Radiated Emissions, 3m	1GHz - 18GHz	4.44

Expanded uncertainty values are calculated to a confidence level of 95%.