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FCC/IC TEST REPORT

Applicant:	Communications Systems Solutions
Address:	6030 S. 58th St. STE C Lincoln, NE 68516
Product:	Baby Vida
FCC ID:	QQIBV2014
Test Report No:	R20140505A-23-FCC
Approved By:	Nic S. Johnson, NCE Technical Manager iNARTE Certified EMC Engineer #EMC-003337-NE
Date:	13 November 2014
Total Pages:	45

ACCREDITED
TESTING LABORATORY
CERTIFICATE NO. 1953.01

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1.0 Summary of test results

1.1 Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARDS: FCC Part 15, Subpart C Industry Canada RSS-Gen, RSS-210 Issue 8			
Standard Section	**Test Type and Limit**	**Result**	**Remark**
15.203 RSS-Gen	Unique Antenna Requirement	Pass	Permanently attached antenna
15.209 RSS-Gen	Radiated Emissions	Pass	Meets the requirement of the limit.
15.247(a)(1) RSS-210 Issue 8	Minimum Bandwidth, Limit Min. 500kHz	Pass	Meets the requirement of the limit.
15.249 RSS-210 Issue 8	Minimum Bandwidth	Pass	Meets the requirement of the limit.
15.247(b), 15.247 RSS-210 Issue 8	Maximum Peak Output Power, Limit:	Pass	Meets the requirement of the limit.
15.247(c) , 15.247 RSS-210 Issue 8	Transmitter Radiated Emissions, Limit: Table 15.209	Pass	Meets the requirement of the limit.
15.247(c) RSS-210 Issue 8	Band Edge Measurement, Limit: 20dB less than the peak value of fundamental frequency	Pass	Meets the requirement of the limit.
15.247(a), 15.247 RSS-210 Issue 8	Power Spectral Density	Pass	Meets the requirement of the limit.

2.0 Description

2.1 Equipment under test

The Equipment Under Test (EUT) was Baby Vida which operates from 2400 to 2483.5 MHz, this radio is intended to communicate with an external remote.

EUT Received Date: 21 July 2014
EUT Tested Dates: 21 July 2014 – 23 July 2014

PRODUCT	Baby Vida
POWER SUPPLY	4.2 VDC Battery (non-rechargeable)
ANTENNA TYPE	Internal Dipole

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 42 $\pm$ 4%
Temperature of 23 $\pm$ 3° Celsius

2.3 Description of test modes

The EUT operates on, and was tested at the frequencies below:

Channel	Frequency
1	2402
2	2442
3	2480

2.4 Applied standards and regulations

The EUT uses digital modulation and operates in the 2400.0MHz to 2483.5MHz band. It has no provisions for connection to the AC mains connection. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and regulations:

1. **FCC Part 15, Subpart C (15.247)**
2. **FCC Part 15, Subpart C (15.209)**
3. **ANSI C63.4:2009**
4. **ANSI C63.10:2013**
5. **Industry Canada RSS-Gen Issue 3**
6. **Industry Canada RSS-210 Issue 8**

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

2.5 Description of support units

None

2.6 Configuration of system under test

This EUT was set to transmit in a worse-case scenario with modulation on. The manufacturer modified the unit to transmit continuously on Channel 1, 2 or 3.

3.0 Test equipment used

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE	CALIBRATION DUE
Rohde & Schwarz Test Receiver	ES126	100037	21 Jan 2014	21 Jan 2015
EMCO Biconilog Antenna	3142B	1647	07 Aug 2014	07 Aug 2015
EMCO Horn Antenna	3115	6416	14 Jan 2014	14 Jan 2016
EMCO Horn Antenna	3116	2576	31 Mar 2014	31 Mar 2016
Rohde & Schwarz Preamp	TS-PR18	NCEEPAHF20	26 Mar 2014*	26 Mar 2015*
Trilithic High Pass Filter*	6HC330	23042	26 Mar 2014*	26 Mar 2015*

*Internal Characterization
The preamplifier was used for measurements above 1 GHz

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 permanently attached and internal to the EUT and not 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 (μV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on peak detector values with duty cycle correction, 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.

4.2.2 Test procedures

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground plane in a 10 meter semi-anechoic chamber. 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.

g. The EUT was measured in both the horizontal and vertical orientation. It was found that the vertical position produced the highest emissions, and this orientation was used for all testing. See Annex A for test photos.

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 1 MHz for all measurements and at frequencies above 1GHz, The video bandwidth was 1MHz for peak measurements and 10Hz for average measurements. A peak detector was used for all measurements above 1GHz. Measurements were made with an EMI Receiver.

4.2.3 Deviations from test standard

No deviation.

4.2.4 Test setup

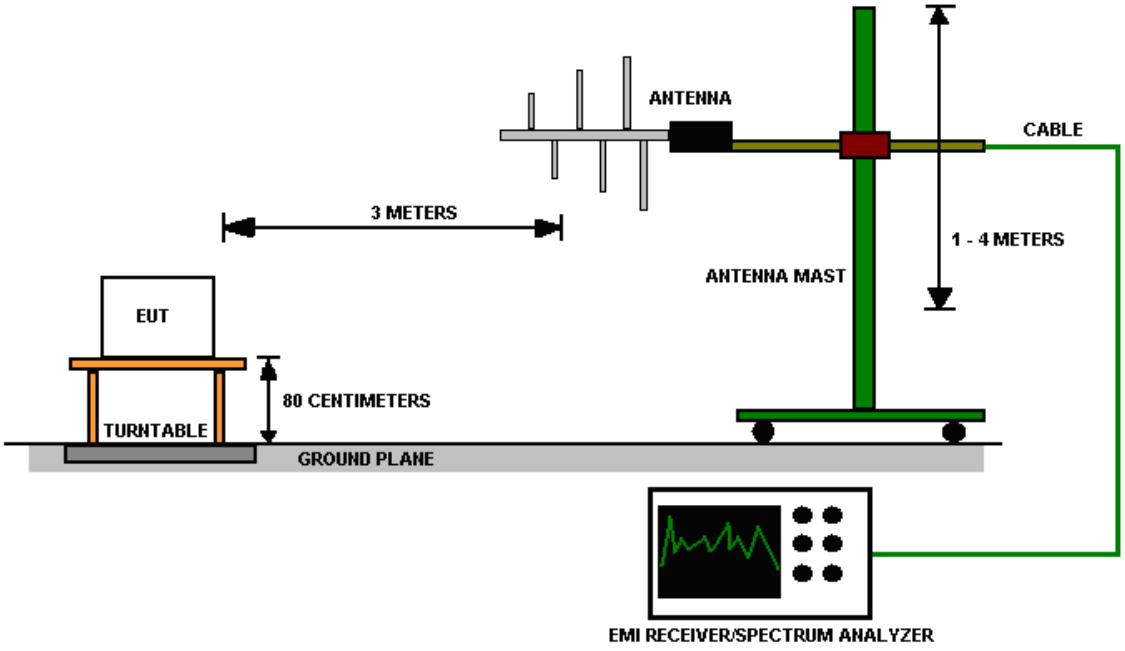

Figure 1 - Radiated Emissions Test Setup

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

4.2.5 EUT operating conditions

The EUT was powered by a 4.2 VDC internal battery unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

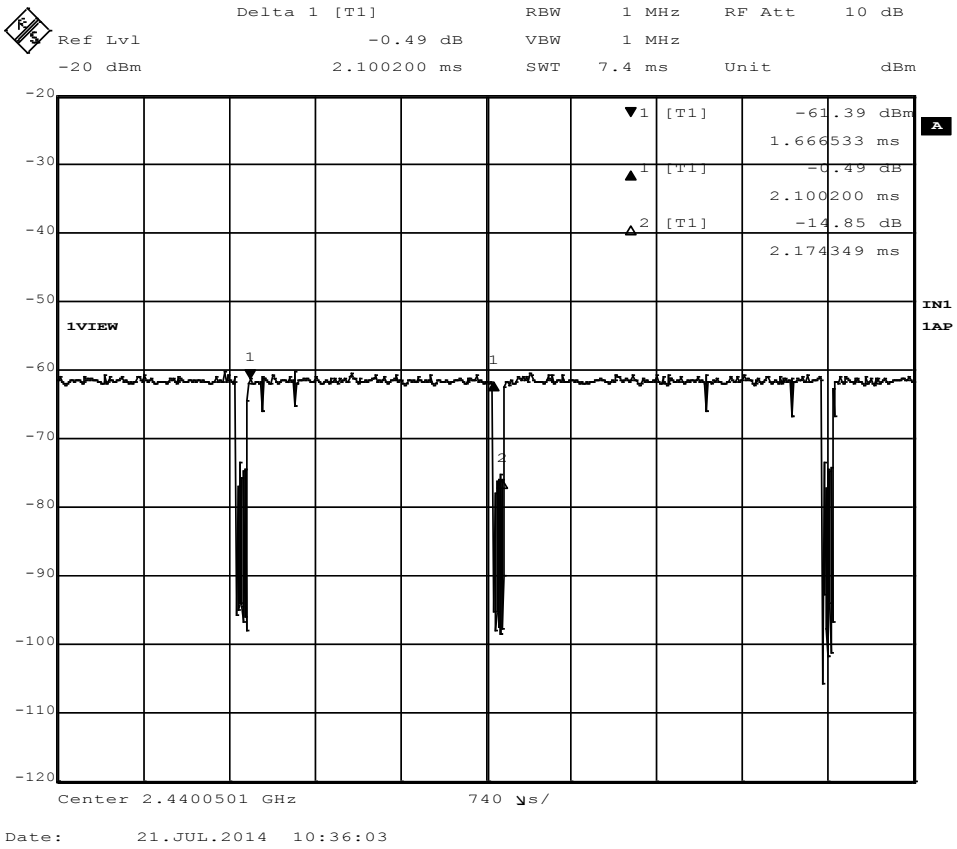

Figure 2 – Baby Vida Duty Cycle

Transmit time per period = 2.10 ms (delta marker 1 above)
Period time = 2.17 ms (delta marker 2 above)
Duty cycle = Transmit time / period = 2.10 / 2.17 = 0.97
Averaging factor = 20 × log(duty cycle) = 20 × log(0.97) = -0.28

Note: Average measurements are calculated by taking the peak measurements and applying the averaging factor based on the measured duty cycle above.

4.2.6 Test results

EUT MODULE	Baby Vida	MODE	Receive
INPUT POWER	4.2 VDC Battery	FREQUENCY RANGE	30MHz – 26 GHz
ENVIRONMENTAL CONDITIONS	42 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

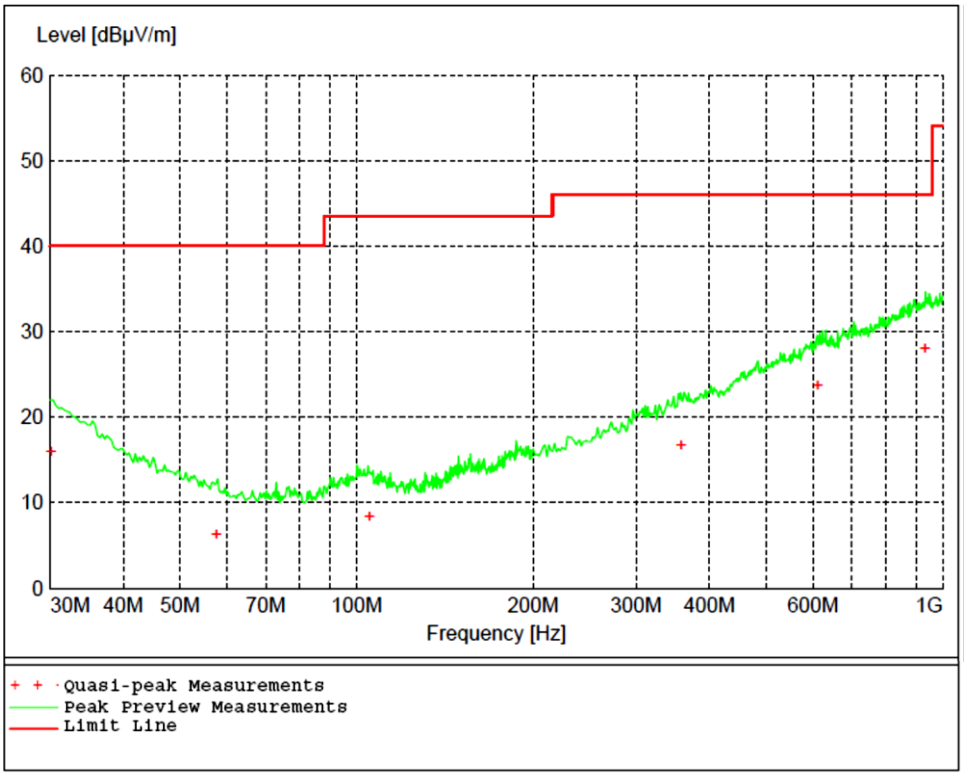

Figure 3 - Radiated Emissions Plot, Receive

Table 1 - Radiated Emissions Quasi-peak Measurements, Receive

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
30.120000	16.02	40.00	24.00	236	191	VERT
57.720000	6.39	40.00	33.60	158	187	VERT
105.180000	8.46	43.50	35.10	121	260	VERT
358.080000	16.70	46.00	29.30	264	359	VERT
611.700000	23.73	46.00	22.30	200	203	VERT
933.420000	28.09	46.00	17.90	133	106	HORI

Table 2 - Radiated Emissions Peak Measurements, Receive

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
1868.800000	37.06	54.00	17.22	399	357	VERT
2438.600000	37.67	54.00	16.61	380	12	VERT
2747.400000	47.12	54.00	7.16	99	228	HORI
4901.600000	46.34	54.00	7.94	400	45	HORI
7338.600000	48.85	54.00	5.43	291	196	HORI

Note: peak measurements are compliant with the average limit, so average measurements are not required.

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.

EUT MODULE	Baby Vida	MODE	Transmit, Ch 1
INPUT POWER	4.2 VDC Battery	FREQUENCY RANGE	30MHz – 26 GHz
ENVIRONMENTAL CONDITIONS	42 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

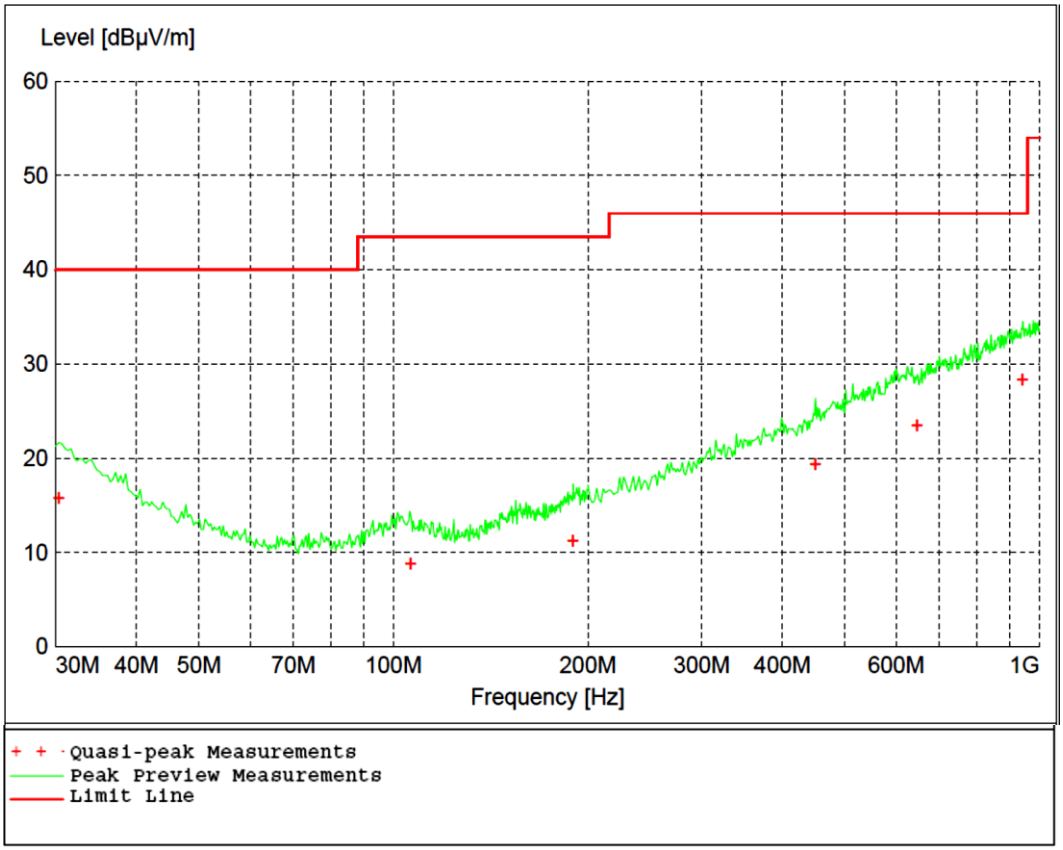

Figure 4 - Radiated Emissions Plot, Channel 1

Table 3 - Radiated Emissions Quasi-peak Measurements, Channel 1

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
30.360000	15.78	40.00	24.20	278	104	VERT
106.380000	8.83	43.50	34.70	390	139	VERT
189.720000	11.21	43.50	32.30	123	83	VERT
450.060000	19.43	46.00	26.60	236	340	HORI
646.140000	23.46	46.00	22.50	400	131	VERT
940.620000	28.32	46.00	17.70	213	264	HORI

Table 4 - Radiated Emissions Average Measurements, Channel 1

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2402.000000	92.64	NA	NA	115	216	HORI
4801.200000	46.06	54.00	7.94	328	277	VERT
7182.400000	47.94	54.00	6.06	244	125	VERT
9593.000000	51.03	54.00	2.97	100	346	HORI

Note: Average measurements are calculated by taking the peak measurements and applying the averaging factor based on the measured duty cycle in Figure 2.

Table 5 - Radiated Emissions Peak Measurements, Channel 1

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2402.000000	92.92	NA	NA	115	216	HORI
4801.200000	46.34	74.00	27.66	328	277	VERT
7182.400000	48.22	74.00	25.78	244	125	VERT
9593.000000	51.31	74.00	22.69	100	346	HORI

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.

EUT MODULE	Baby Vida	MODE	Transmit, Ch 2
INPUT POWER	4.2 VDC Battery	FREQUENCY RANGE	30MHz – 26 GHz
ENVIRONMENTAL CONDITIONS	36 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

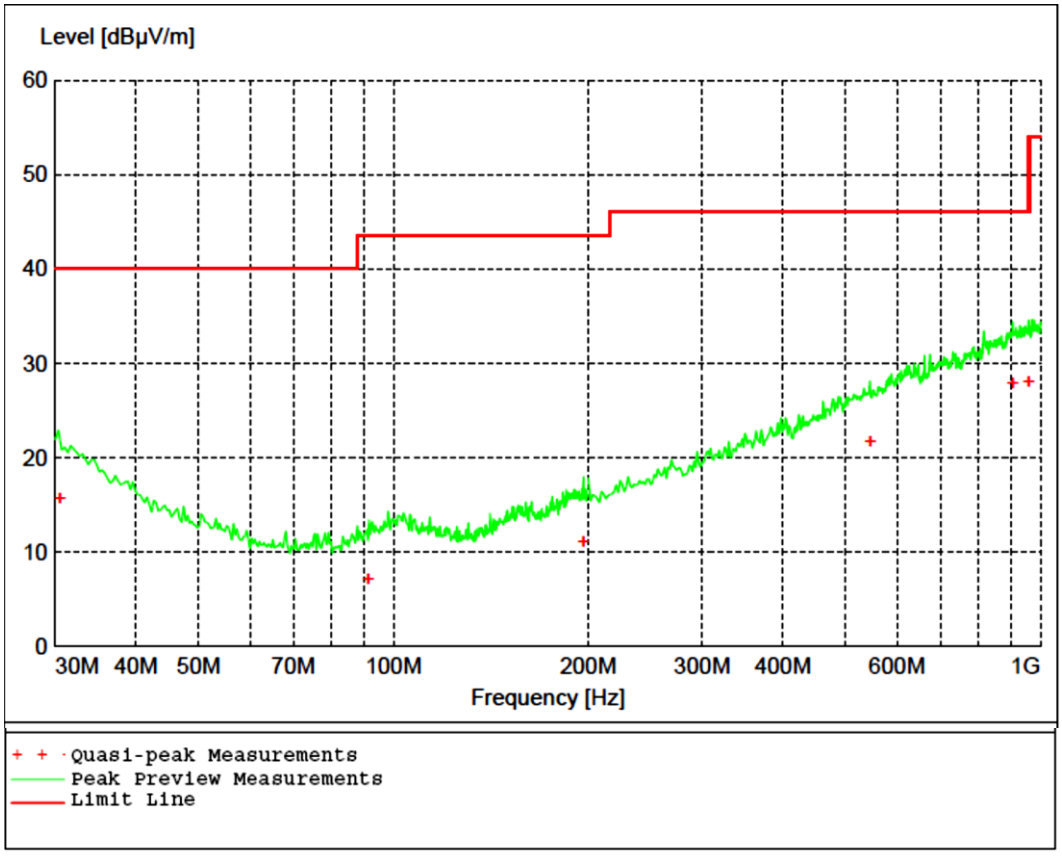

Figure 5 - Radiated Emissions Plot, Channel 2

Table 6 - Radiated Emissions Quasi-peak Measurements, Channel 2

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
30.540000	15.66	40.00	24.30	305	157	HORI
91.440000	7.09	43.50	36.40	233	251	VERT
196.800000	11.02	43.50	32.50	100	281	HORI
546.240000	21.66	46.00	24.30	193	221	HORI
907.080000	27.93	46.00	18.10	250	204	HORI
959.220000	28.08	46.00	17.90	151	47	VERT

Table 7 - Radiated Emissions Average Measurements, Channel 2

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2442.000000	92.07	NA	NA	99	220	HORI
4883.400000	45.89	54.00	8.11	399	280	VERT
7350.400000	48.22	54.00	5.78	220	26	HORI
9785.200000	52.17	54.00	1.83	130	177	HORI

Note: Average measurements are calculated by taking the peak measurements and applying the averaging factor based on the measured duty cycle in Figure 2.

Table 8 - Radiated Emissions Peak Measurements, Channel 2

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2442.000000	92.35	NA	NA	99	220	HORI
4883.400000	46.17	74.00	27.83	399	280	VERT
7350.400000	48.50	74.00	25.50	220	26	HORI
9785.200000	52.45	74.00	21.55	130	177	HORI

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.

EUT MODULE	Baby Vida	MODE	Transmit, Ch 3
INPUT POWER	4.2 VDC Battery	FREQUENCY RANGE	30MHz – 26 GHz
ENVIRONMENTAL CONDITIONS	42 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

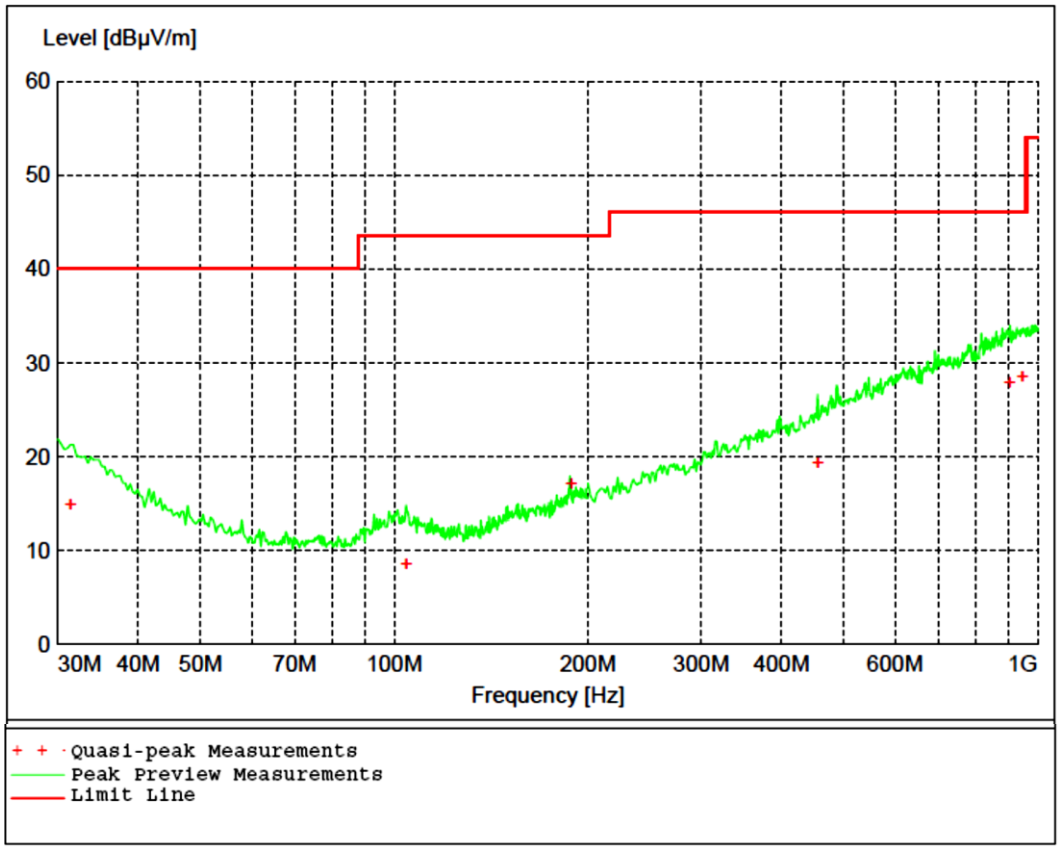

Figure 6 - Radiated Emissions Plot, Channel 3

Table 9 - Radiated Emissions Quasi-peak Measurements, Channel 3

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
31.380000	14.94	40.00	25.10	120	80	HORI
104.520000	8.54	43.50	35.00	250	223	VERT
188.400000	17.10	43.50	26.40	334	345	VERT
455.460000	19.34	46.00	26.70	100	160	HORI
904.920000	27.94	46.00	18.10	100	43	HORI
947.160000	28.43	46.00	17.60	304	167	VERT

Table 10 - Radiated Emissions Average Measurements, Channel 3

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2480.000000	93.01	NA	NA	115	38	HORI
4956.600000	45.75	54.00	8.25	400	45	HORI
7438.400000	48.09	54.00	5.91	153	103	HORI
9932.600000	51.88	54.00	2.12	247	165	HORI

Note: Average measurements are calculated by taking the peak measurements and applying the averaging factor based on the measured duty cycle in Figure 2.

Table 11 - Radiated Emissions Peak Measurements, Channel 3

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2480.000000	93.29	NA	NA	115	38	HORI
4956.600000	46.03	74.00	27.97	400	45	HORI
7438.400000	48.37	74.00	25.63	153	103	HORI
9932.600000	52.16	74.00	21.84	247	165	HORI

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

4.3 Bandwidth

4.3.1 Limits of bandwidth measurements

The 6dB bandwidth of the signal must be greater than 0.500MHz.

4.3.2 Test procedures

All measurements were taken at a distance of 3m from the EUT. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 1 MHz 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.

4.3.3 Deviations from test standard

No deviation.

4.3.4 Test setup

See Section 4.2

4.3.5 EUT operating conditions

The EUT was powered by a 4.2 VDC internal battery unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

4.3.6 Test results

EUT MODULE	Baby Vida	MODE	Cont. Transmit
INPUT POWER	4.2 VDC Battery	FREQUENCY RANGE	2400.0MHz - 2483.5MHz
ENVIRONMENTAL CONDITIONS	42 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BW (kHz)	6dB Limit Min (kHz)	RESULT
1	2402	536.37	500.00	PASS
2	2442	513.18	500.00	PASS
3	2480	514.73	500.00	PASS

REMARKS:
None

CHANNEL	CHANNEL FREQUENCY (MHz)	99% Occupied BW (MHz)
1	2402	1.74
2	2442	1.57
3	2480	1.17

REMARKS:
None

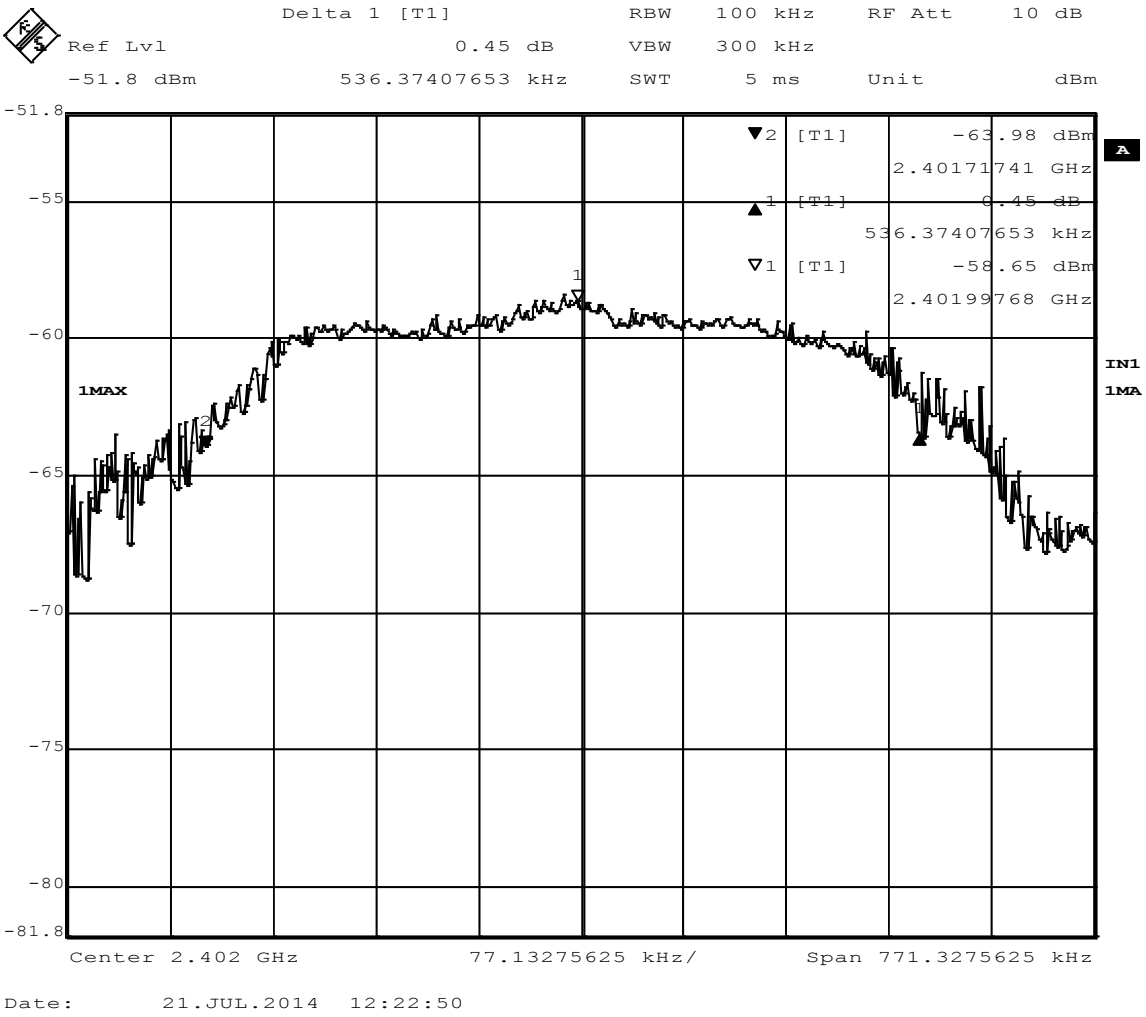

Figure 7 - 6dB Bandwidth, Low Channel

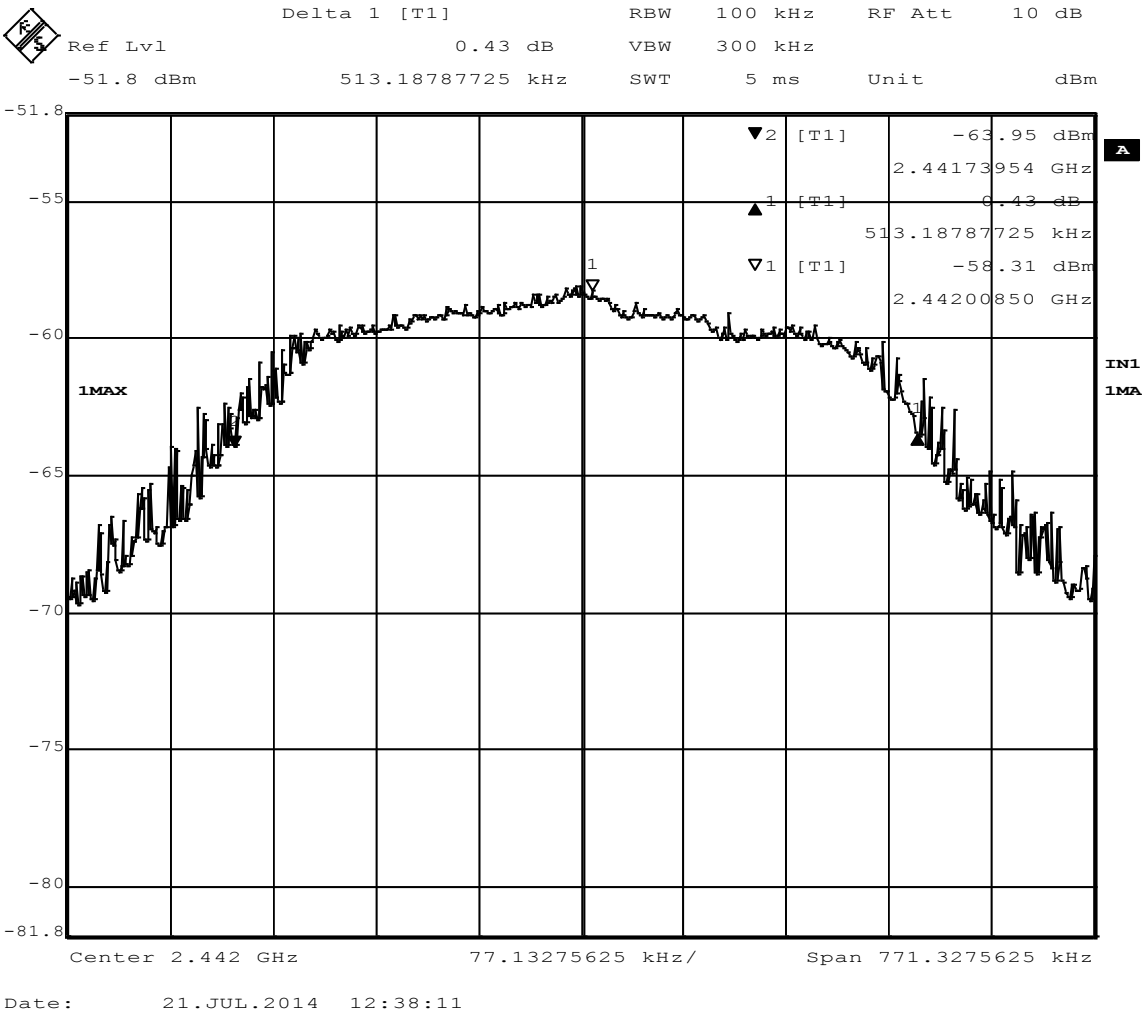

Figure 8 - 6dB Bandwidth, Middle Channel

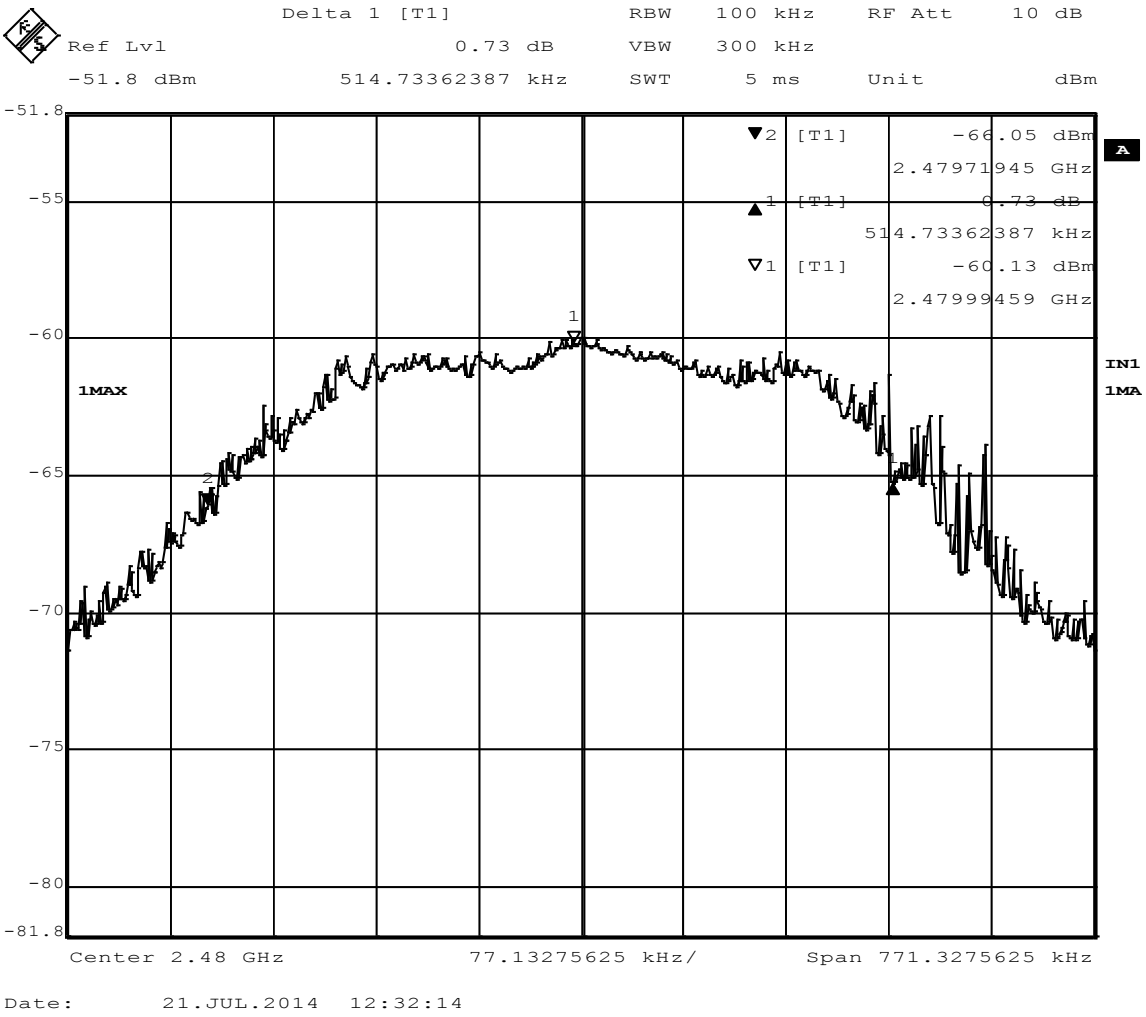

Figure 9 - 6dB Bandwidth, High Channel

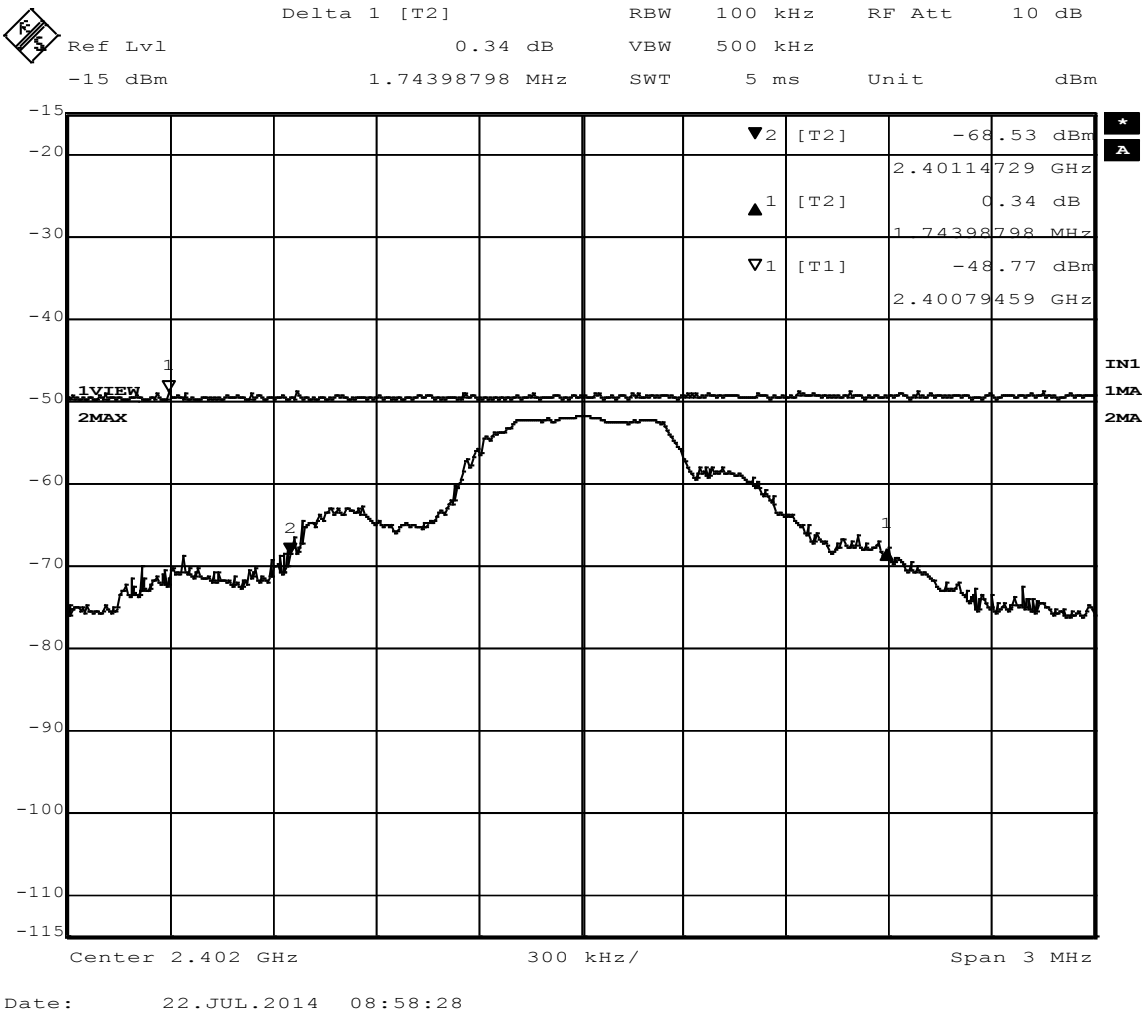

Figure 10 - 99% Occupied Bandwidth, Low Channel

Maximum power = -48.77 dBm + 107 + CL + AF - 95.23 = 2.60 dBm

CL = cable loss = 11.20 dB
AF = antenna factor = 28.40 dB
107 = conversion from dBm to dBµV on a 50Ω measurement system
-95.23 = Conversion from field strength (dBµV/m) to EIRP (dBm) at a 3m measurement distance.

Note: the trace at the top where Marker 1 is located was made with a 10MHz resolution bandwidth and saved on the screen.

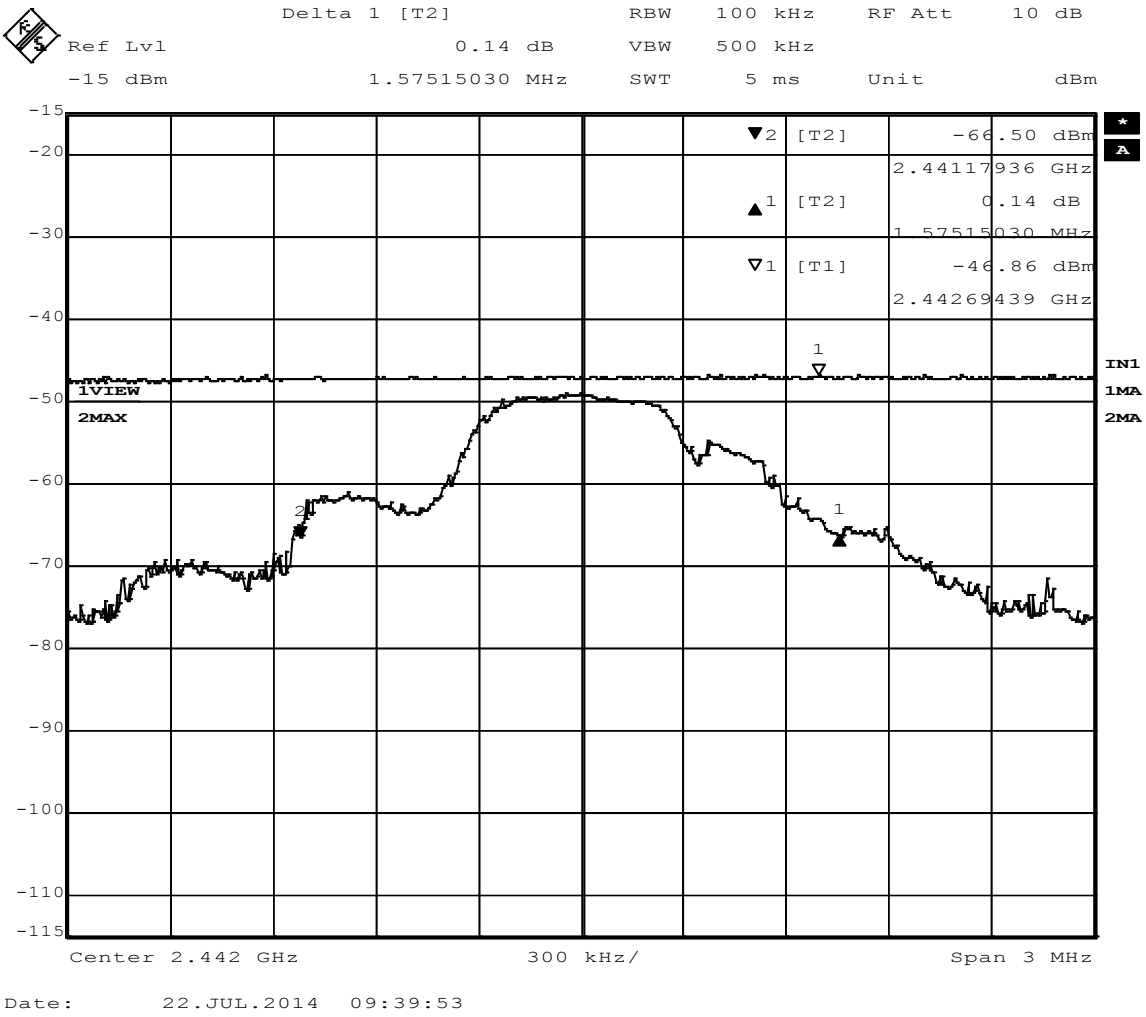

Figure 11 - 99% Occupied Bandwidth, Mid Channel

Maximum power = -46.86 dBm + 107 + CL + AF - 95.23 = 4.51 dBm

CL = cable loss = 11.20 dB
AF = antenna factor = 28.40 dB
107 = conversion from dBm to dBµV on a 50Ω measurement system
-95.23 = Conversion from field strength (dBµV/m) to EIRP (dBm) at a 3m measurement distance.

Note: the trace at the top where Marker 1 is located was made with a 10MHz resolution bandwidth and saved on the screen.

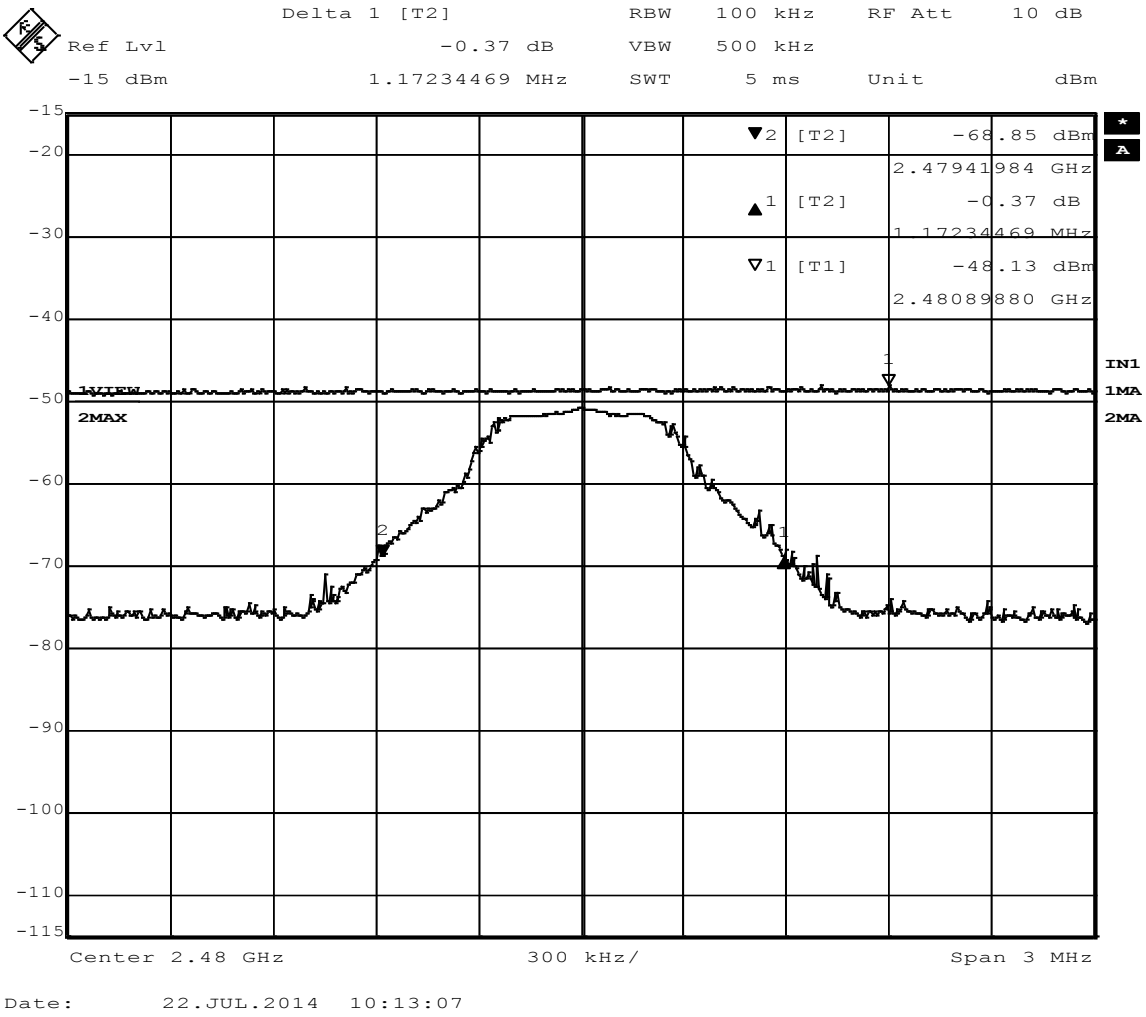

Figure 12 - 99% Occupied Bandwidth, High Channel

Maximum power = -48.13 dBm + 107 + CL + AF - 95.23 = 3.24 dBm

CL = cable loss = 11.20 dB
AF = antenna factor = 28.40 dB
107 = conversion from dBm to dBµV on a 50Ω measurement system
-95.23 = Conversion from field strength (dBµV/m) to EIRP (dBm) at a 3m measurement distance.

Note: the trace at the top where Marker 1 is located was made with a 10MHz resolution bandwidth and saved on the screen.

4.4 Maximum peak output power

4.4.1 Limits of power measurements

The maximum peak output power allowed is 30dBm (1000mW).

4.4.2 Test procedures

1. All measurements were taken at a distance of 3m from the EUT.

2. 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.

3. See Annex B for an example of how the EIRP is calculated in order to report maximum power output.

4.4.3 Deviations from test standard

No deviation.

4.4.4 Test setup

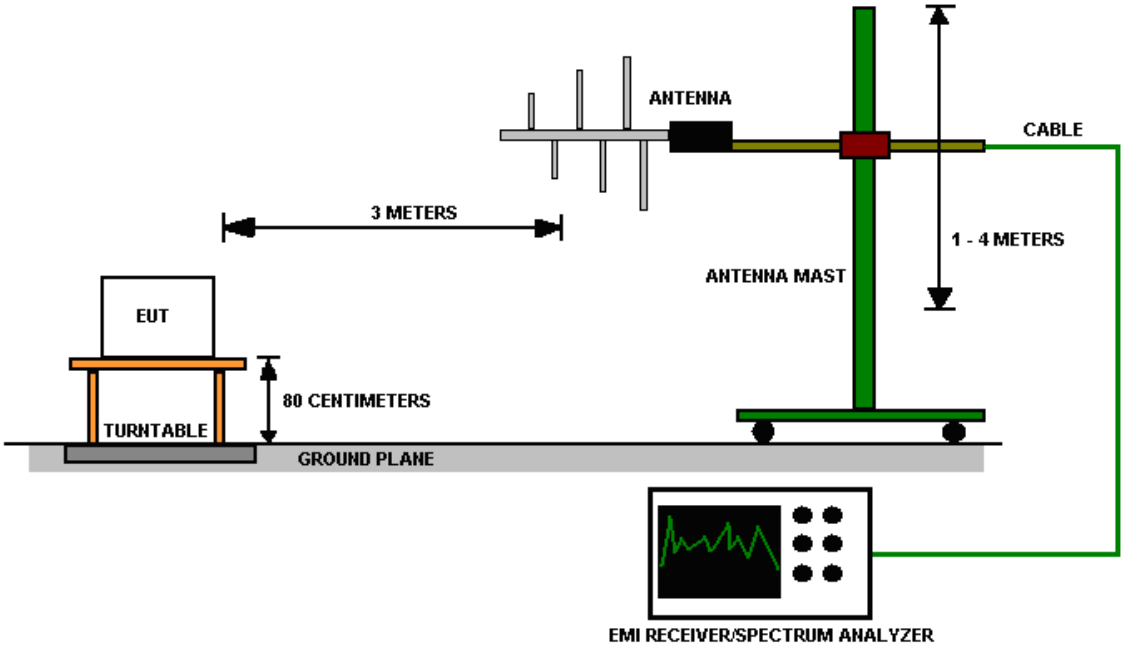

Figure 13 - Power Measurements Test Setup

4.4.5 EUT operating conditions

The EUT was powered by a 4.2 VDC internal battery unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

4.4.6 Test results

EUT MODULE	Baby Vida	MODE	Cont. Transmit
INPUT POWER	4.2 VDC Battery	FREQUENCY RANGE	2400.0MHz - 2483.5MHz
ENVIRONMENTAL CONDITIONS	42 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

Maximum peak output power

CHANNEL	CHANNEL FREQUENCY (MHz)	EIRP PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	RESULT
1	2402	2.60	30	PASS
2	2442	4.51	30	PASS
3	2480	3.24	30	PASS

All measurements were taken from the 99% occupied bandwidth screen captures in Section 4.3. Calculations are also shown in Section 4.3.

REMARKS:
None

4.5 Bandedges

4.5.1 Limits of bandedge measurements

For emissions outside of the allowed band of operation (2400.0MHz – 2483.5MHz), 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.

4.5.2 Test procedures

The EUT was tested in the same method as described in section *4.3 - Bandwidth*. The EUT was oriented as to produce the maximum emission levels. The resolution bandwidth was set to 30 kHz and the EMI receiver was used to scan from the bandedge 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. If the out of band emission falls with a restricted band from 15.205, then it is required that the emission be below the limits from 15.209.

4.5.3 Deviations from test standard

No deviation.

4.5.4 Test setup

See Section 4.4

4.5.5 EUT operating conditions

The EUT was powered by a 4.2 VDC internal battery unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

4.5.6 Test results

EUT MODULE	Baby Vida	MODE	Cont. Transmit
INPUT POWER	4.2 VDC Battery	FREQUENCY RANGE	2400.0MHz - 2483.5MHz
ENVIRONMENTAL CONDITIONS	42 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

Highest Out of Band Emissions
30kHz RBW, Marker-Delta method from KDB 558074:2014

CHANNEL	Band edge /Measurement Frequency (MHz)	Highest out of band level (dBµv/m)	Fundamental Level (dBµv/m)	Delta	Min (dBc)	Result
1	2390.0	37.38	89.28	51.90	35.28*	PASS
3	2483.5	89.27	37.75	51.52	35.27*	PASS

*Minimum delta = [highest fundamental peak field strength from Section 4.2] – [Part 15.209 radiated emissions limit.]

Highest In-Band Emissions
30kHz RBW, Marker-Delta method from KDB 558074:2014

CHANNEL	Band edge /Measurement Frequency (MHz)	Highest in-band level (dBµv/m)	Fundamental Level (dBµv/m)	Delta	Min (dBc)	Result
1	2400.0	58.31	91.26	32.95	20.0	PASS
3	2483.5	37.75	89.27	51.52	20.0	PASS

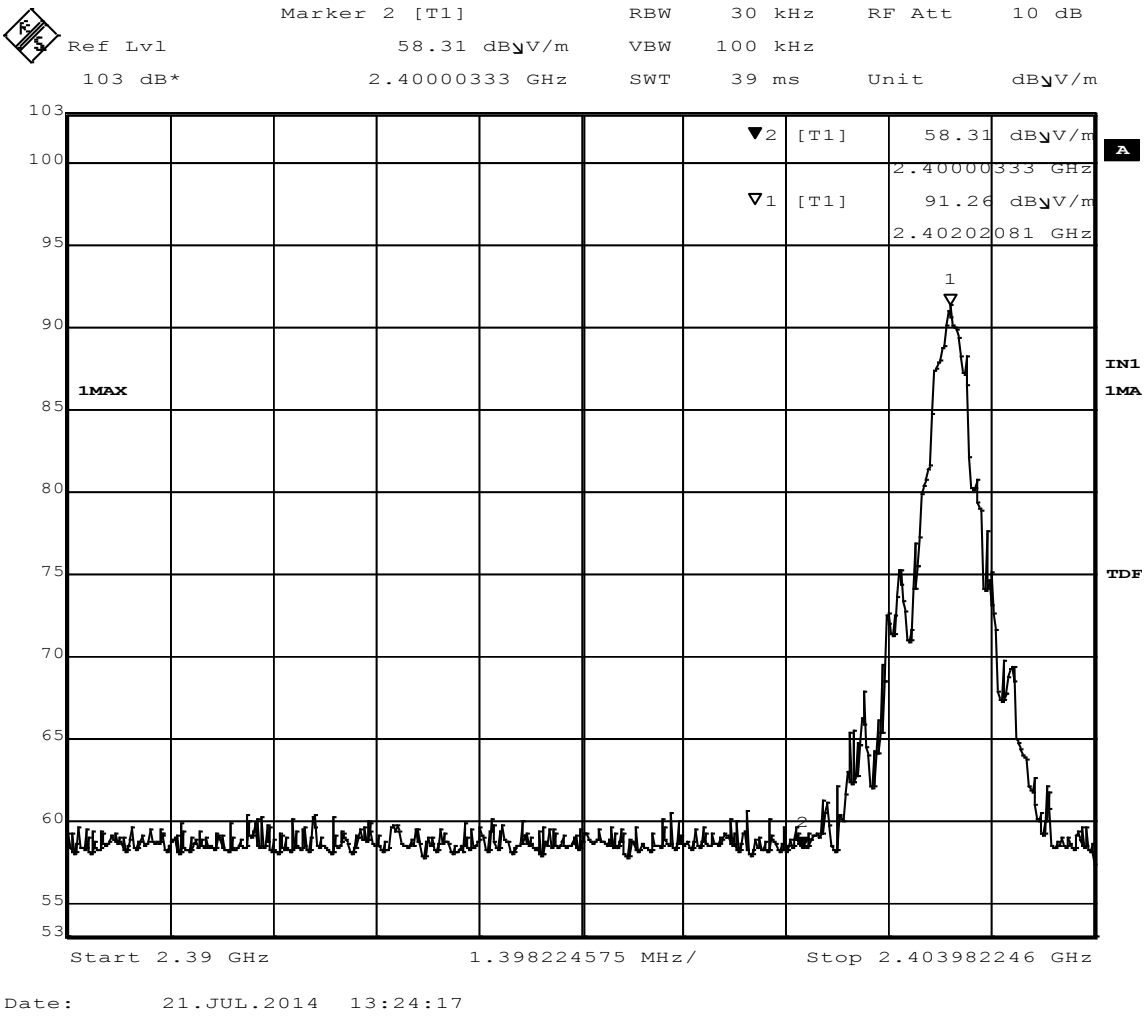

Figure 14 - Band-edge Measurement, Low Channel, Un-Restricted

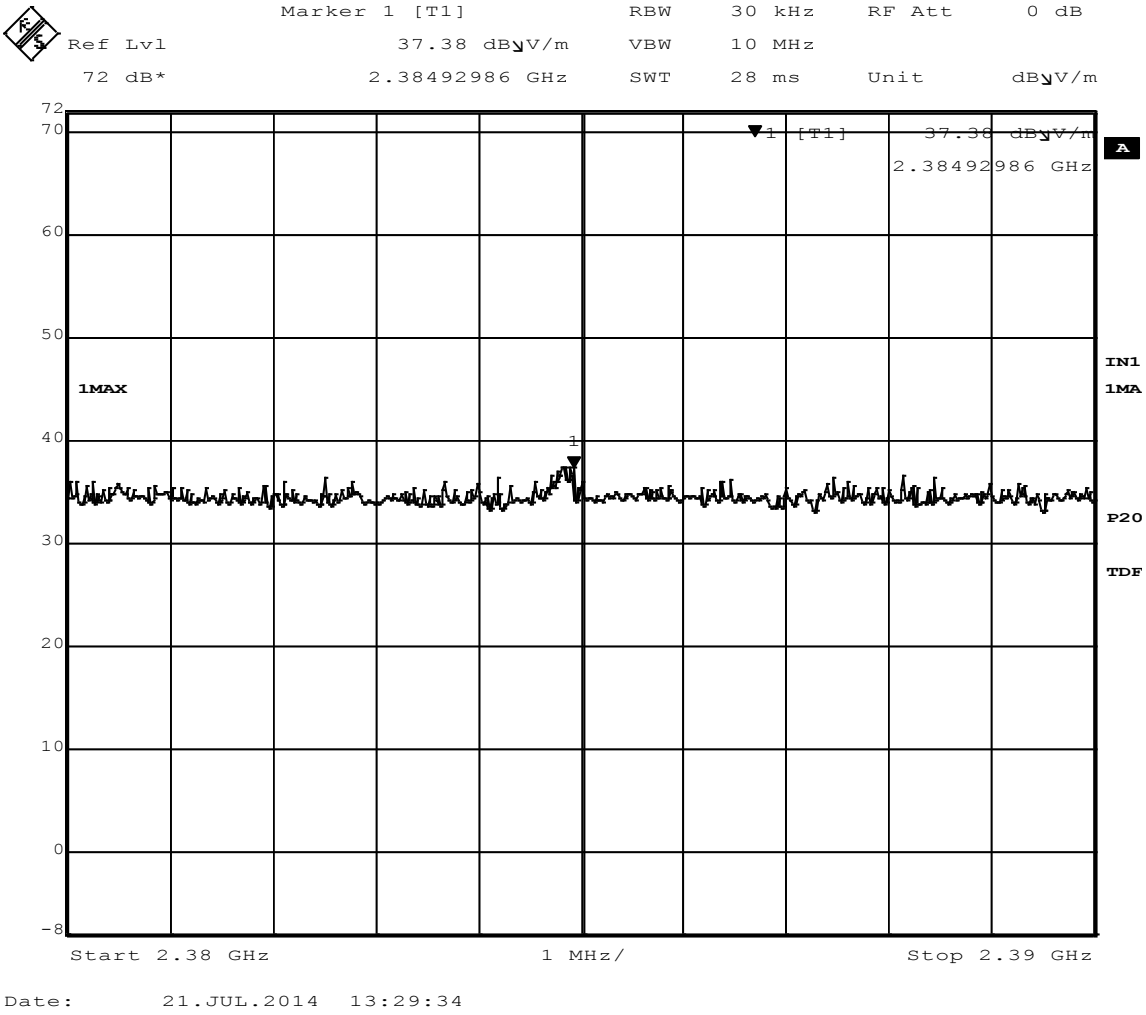

Figure 15 - Band-edge Measurement, Low Channel, Restricted

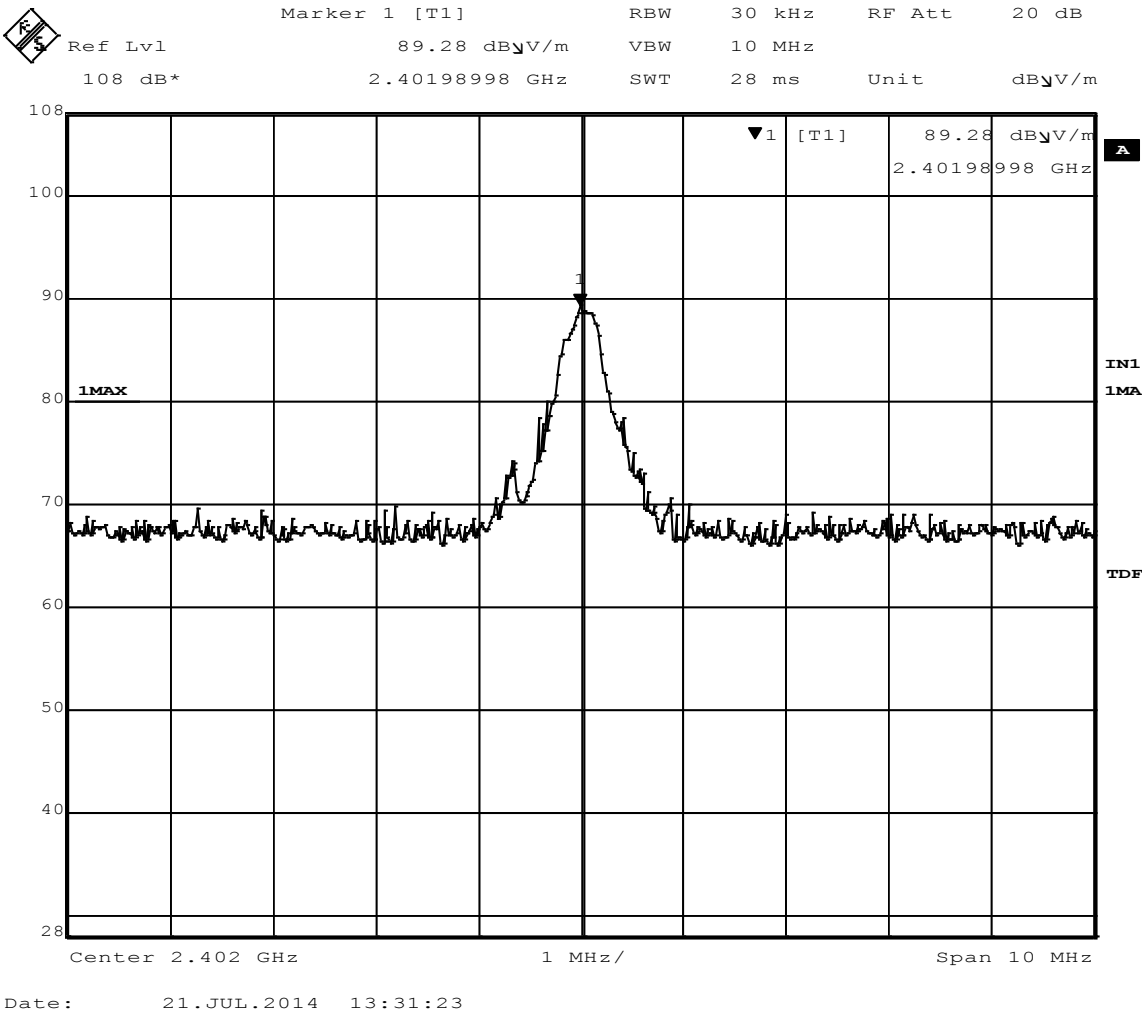

Figure 16 - Band-edge Measurement, Low Channel, Restricted

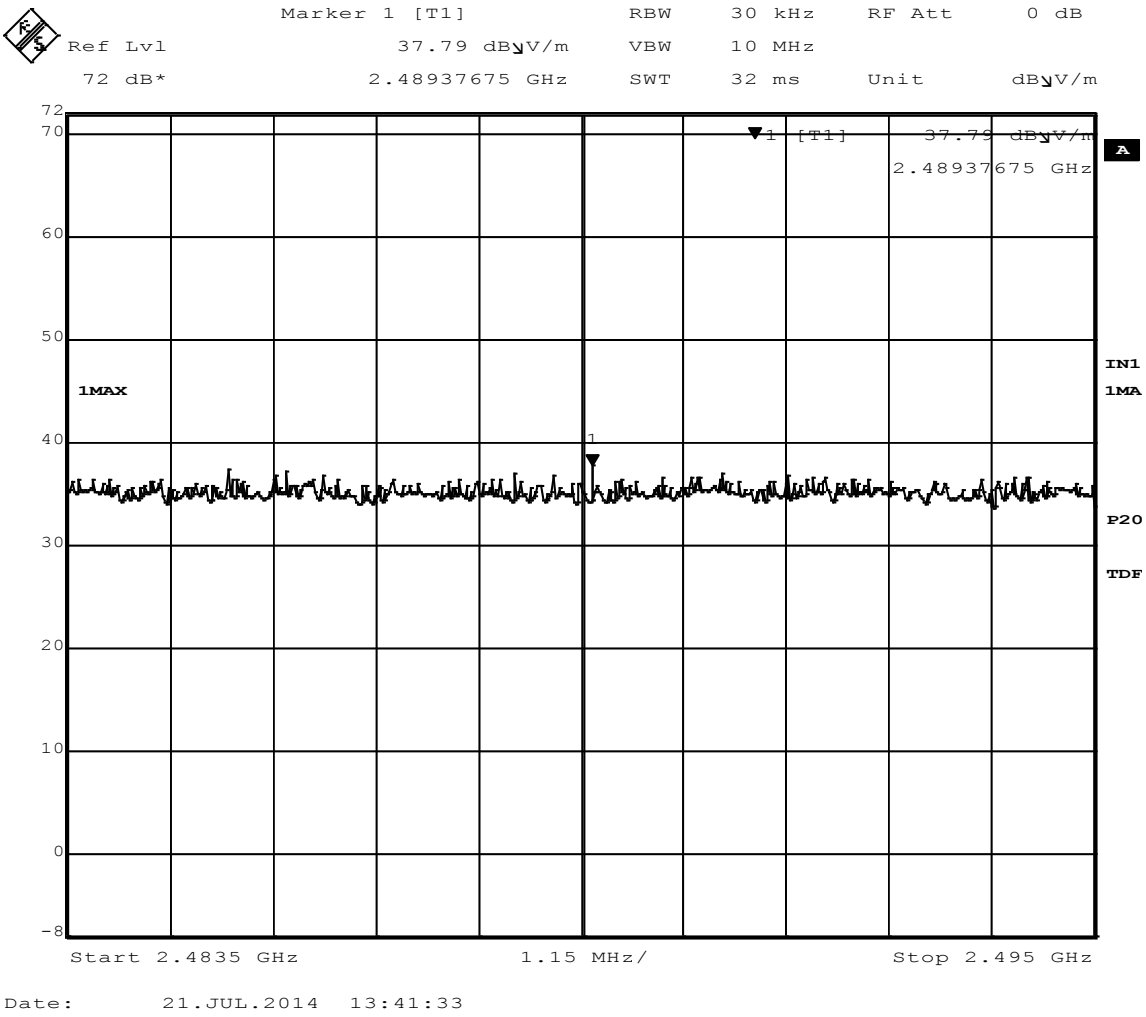

Figure 17 - Band-edge Measurement, High Channel, Restricted

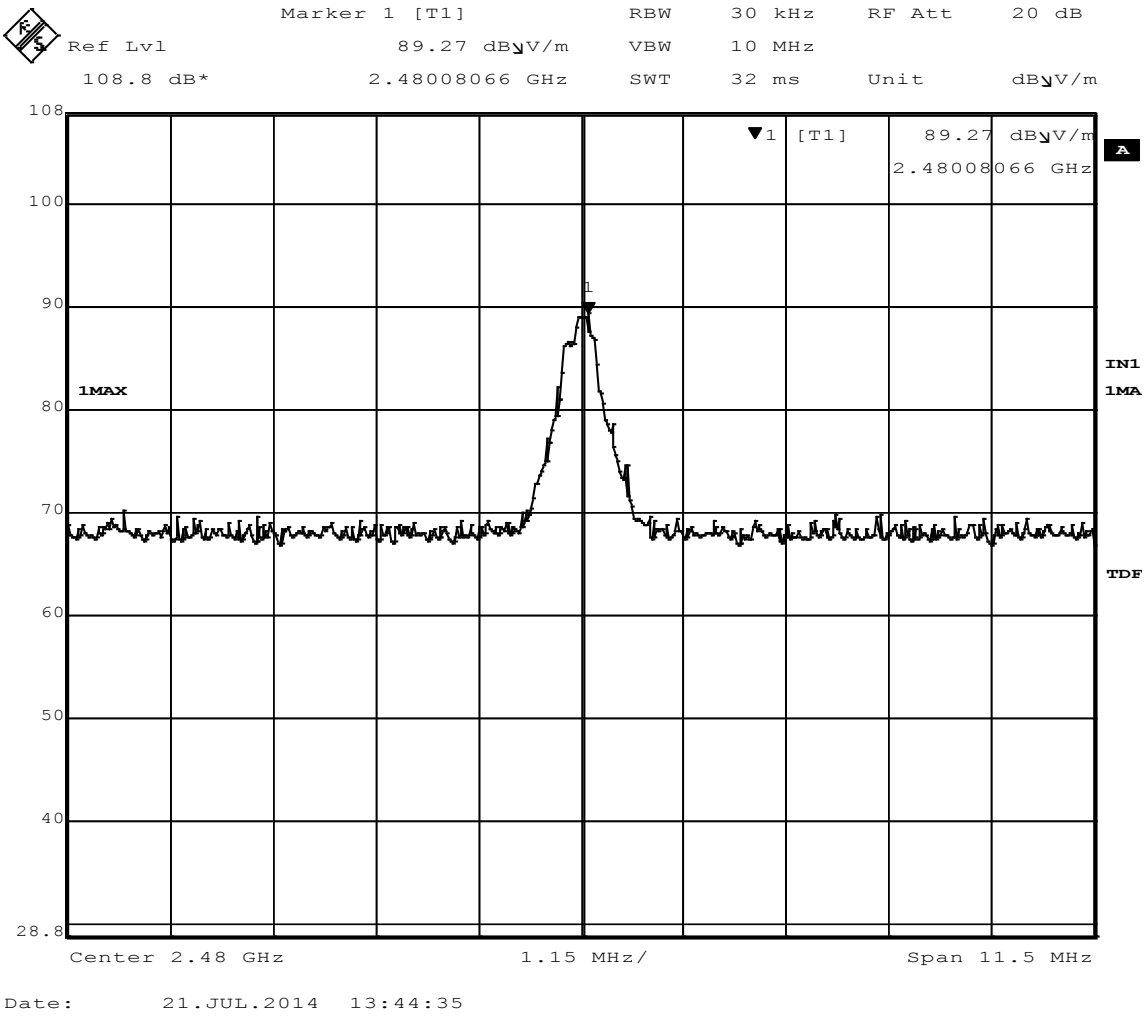

Figure 18 - Band-edge Measurement, High Channel, Restricted

4.6 Power Spectral Density

4.6.1 Power spectral density measurements

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.6.2 Test procedures

All measurements were taken at a distance of 3m from the EUT. The spectrum analyzer was set to 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.

See Annex B for an example of how the EIRP is calculated in order to report maximum power output.

4.6.3 Deviations from test standard

No deviation.

4.6.4 Test setup

See section 4.3

4.6.5 EUT operating conditions

The EUT was powered by a 4.2 VDC internal battery unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

EUT MODULE	Baby Vida	MODE	Cont. Transmit
INPUT POWER	4.2 VDC Battery	FREQUENCY RANGE	2400.0MHz - 2483.5MHz
ENVIRONMENTAL CONDITIONS	42 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

Power Spectral Density

CHANNEL	CHANNEL FREQUENCY (MHz)	EIRP RF POWER LEVEL IN # KHz BW (dBm)	MAXIMUM POWER LIMIT (dBm)	RESULT
1	2402	-13.97	8.00	PASS
2	2442	-12.22	8.00	PASS
3	2480	-13.38	8.00	PASS

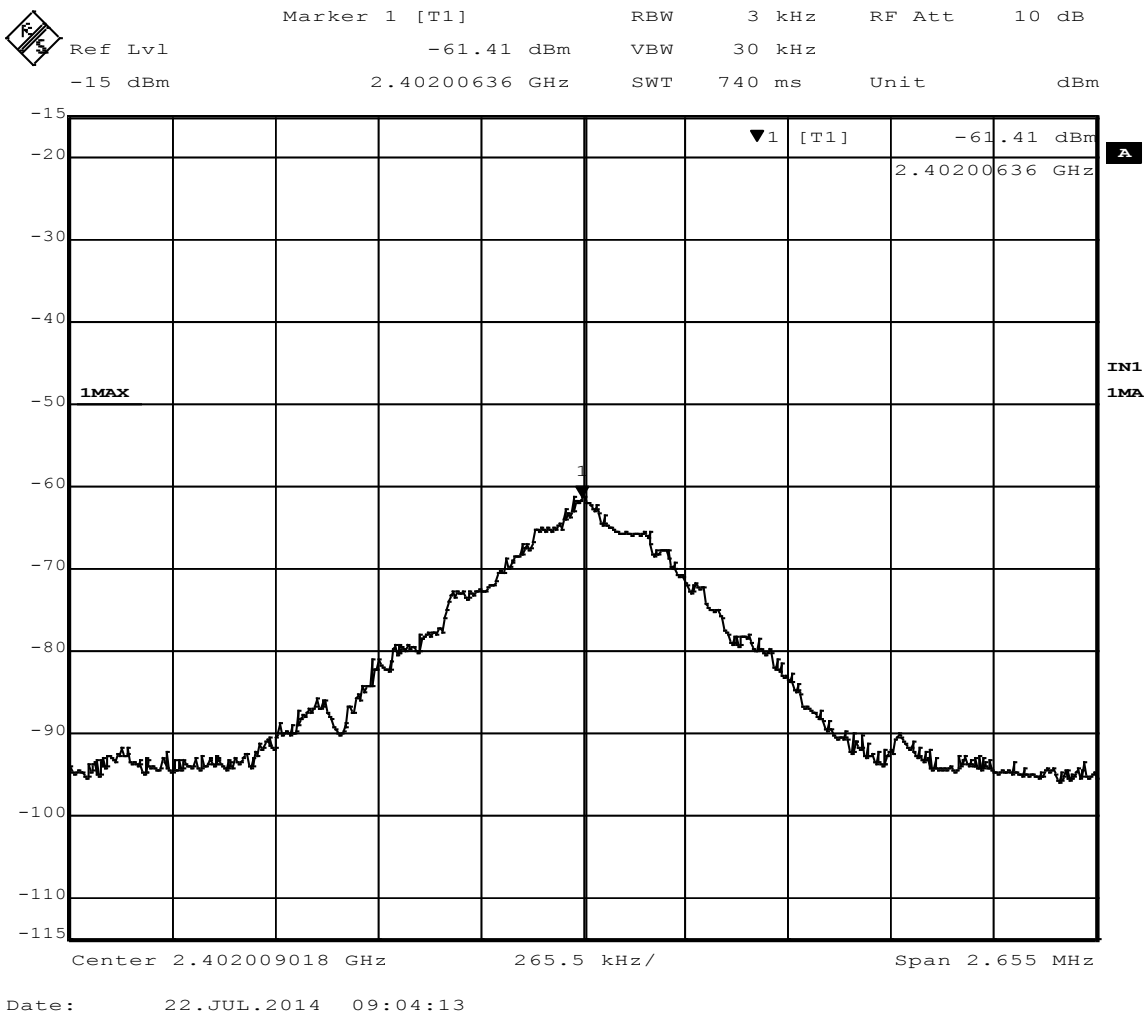

Figure 19 - Power Spectral Density Measurement, Low Channel

Maximum power = -61.41 dBm + 107 + CL + AF - 95.23 = -10.04 dBm

CL = cable loss = 11.20 dB
AF = antenna factor = 28.40 dB
107 = conversion from dBm to dBµV on a 50Ω measurement system
-95.23 = Conversion from field strength (dBµV/m) to EIRP (dBm) at a 3m measurement distance.

Note: the trace at the top where Marker 1 is located was made with a 3kHz resolution bandwidth and saved on the screen.

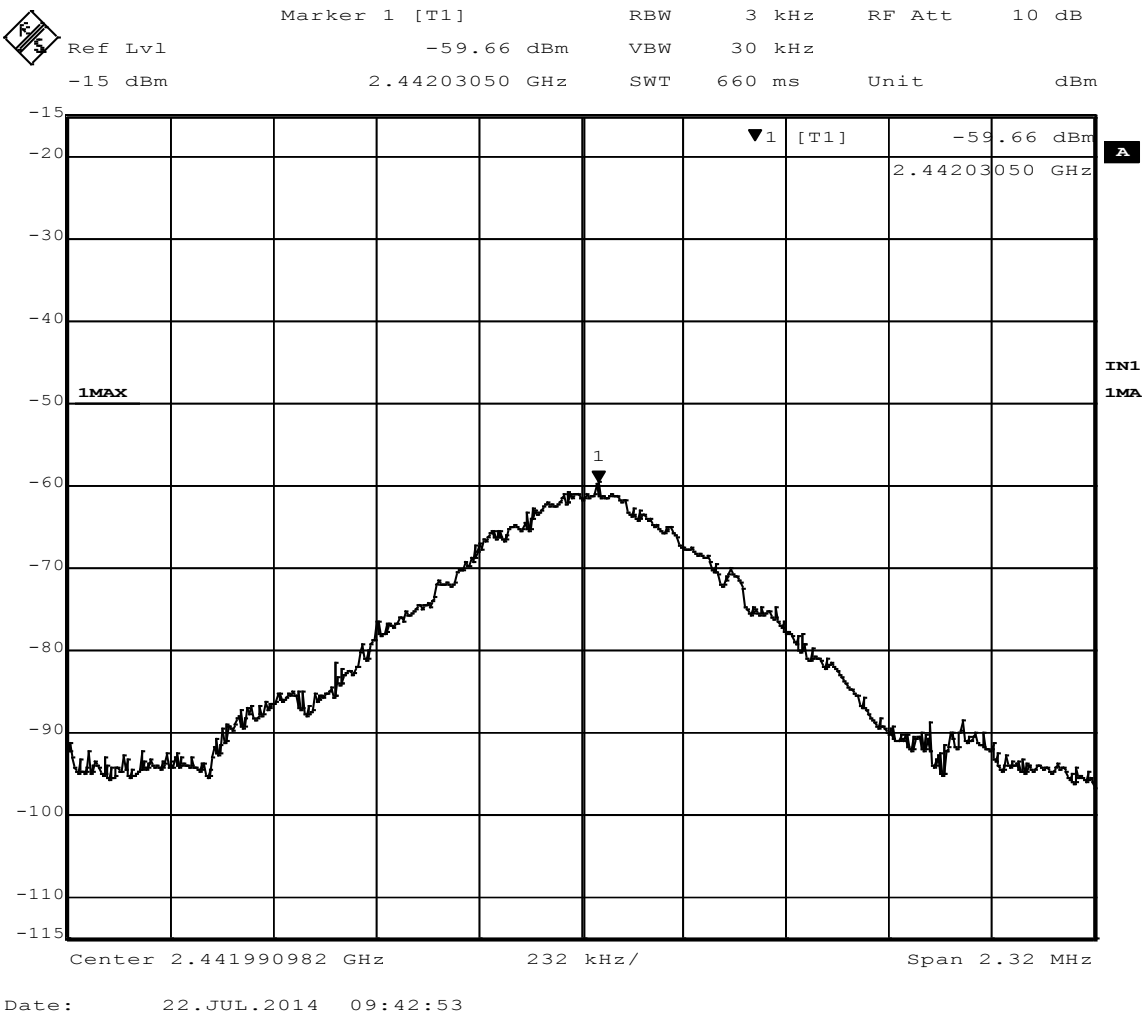

Figure 20 - Power Spectral Density Measurement, Mid Channel

Maximum power = -59.66 dBm + 107 + CL + AF - 95.23 = -8.29 dBm

CL = cable loss = 11.20 dB
AF = antenna factor = 28.40 dB
107 = conversion from dBm to dBµV on a 50Ω measurement system
-95.23 = Conversion from field strength (dBµV/m) to EIRP (dBm) at a 3m measurement distance.

Note: the trace at the top where Marker 1 is located was made with a 3kHz resolution bandwidth and saved on the screen.

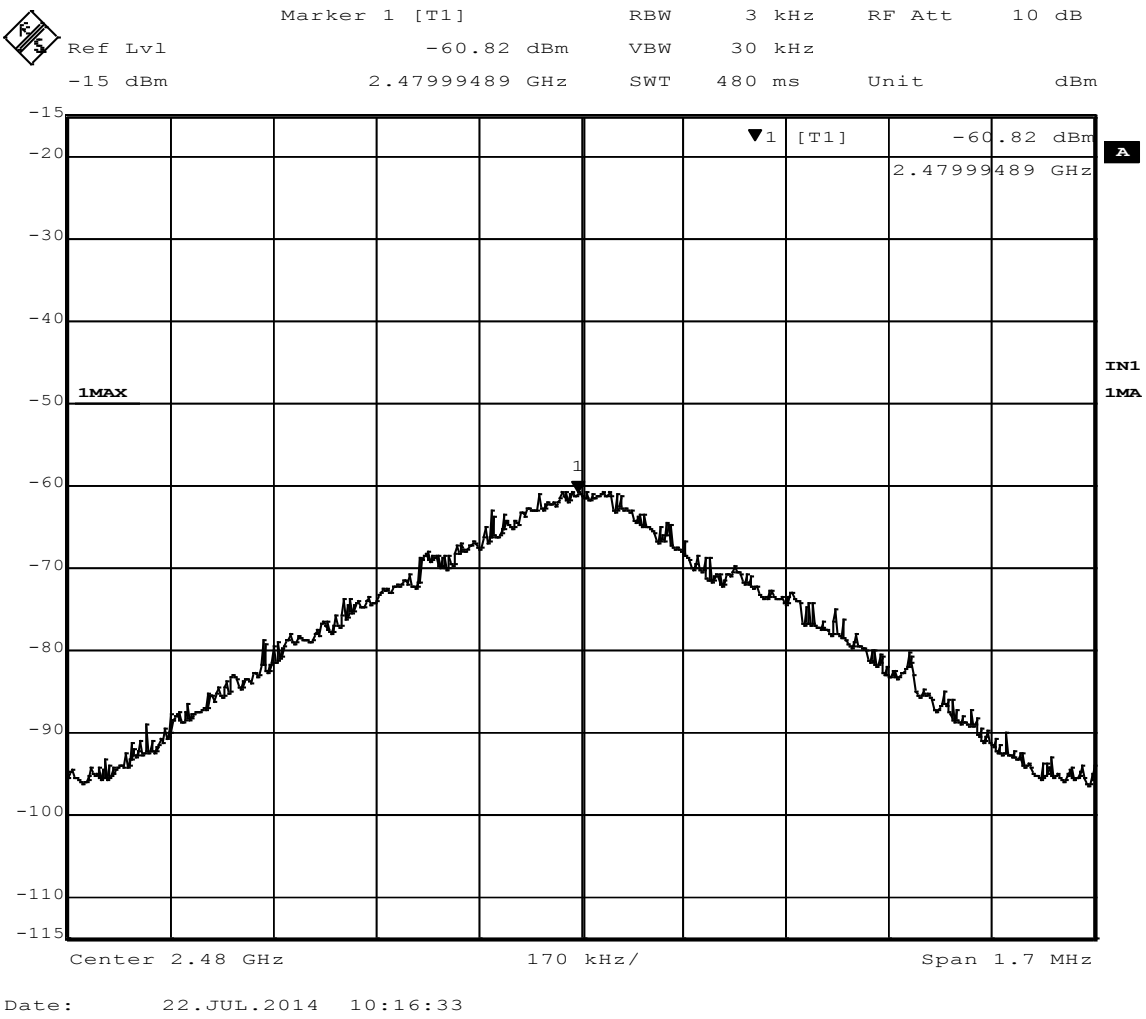

Figure 21 - Power Spectral Density Measurement, High Channel

Maximum power = -60.82 dBm + 107 + CL + AF - 95.23 = -9.45 dBm

CL = cable loss = 11.20 dB
AF = antenna factor = 28.40 dB
107 = conversion from dBm to dBµV on a 50Ω measurement system
-95.23 = Conversion from field strength (dBµV/m) to EIRP (dBm) at a 3m measurement distance.

Note: the trace at the top where Marker 1 is located was made with a 3kHz resolution bandwidth and saved on the screen.

Appendix A: Test Photos

Figure 22 – Radiated Emissions Test Setup

Figure 23 - Radiated Emissions Test Setup

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

AV is calculated by the taking the 20*log(T_{on}/100) where T_{on} is the maximum transmission time in any 100ms window.

EIRP Calculations

In cases where direct antenna port measurement is not possible or would be inaccurate, output power is measured in EIRP. The maximum field strength is measured at a specified distance and the EIRP is calculated using the following equation;

EIRP (Watts) = [Field Stregnth (V/m) x antenna distance (m)]^2 / [30 x Gain (numeric)]

Power (watts) = 10^[Power (dBm)/10] x 1000

Field Strength (dBµV/m) = Field Stregth (dBm) = 107 (for 50Ω measurement systems)

Field Stregnth (V/m) = 10^[Field Stregnth (dBµV/m) / 20] / 10^6

Gain = 1 (numeric gain for isotropic radiator