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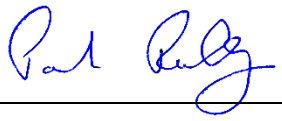
Test Report By	Michael Kirby
FCC Test Firm Registration	409640
ISED CAB identifier:	IE0001
Date	26th Aug 2021
EUT Description	Asset Tracker
FCC ID	2AT4VSKALLI1RM
IC ID	26629-SKALLIR2
Authorised by	**Paul Reilly**
Authorised Signature:	

TEST SUMMARY

The equipment complies with the requirements according to the following standards.

FCC 15.247 Section	RSS-247 Section	TEST PARAMETERS	Test Result
15.247 (a)2	RSS-247 5.2a	6dB bandwidth	Pass
15.247 (e)	RSS-247 5.2b	Power Spectral Density	Pass
15.247 (b)3	RSS-247 5.4d	Output power Conducted	Pass
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions	Pass
15.205 15.209	RSS Gen 8.9 RSS Gen 8.10	Radiated Spurious Emissions	Pass
	RSS Gen 6.7	99% bandwidth	Pass

RSS 247-2 (Feb 2017)
RSS Gen Issue5 Amd 2 (Feb 2021)

Exhibit A – Technical Report

Table of Contents

1.0 EUT Description

FCC ID	2AT4VSKALLI1RM
IC ID	26629-SKALLI1RM
Model:	2EE-2707AB
HVIN:	2EE-2707AB
PMN:	Skalli1RM
Type:	Asset Tracker
Type of radio:	Stand-alone

Sigfox

Transmitter Type:	D-BPSK
Classification:	DSS
Operating Frequency Range(s):	902.138MHz -904.663 MHz
Number of Channels:	Hopping on 54 channels (902.138 – 904.663 MHz)
Antenna:	Integral
Transmitter power configuration:	3.6 VDC Internal Battery (non-rechargeable)
Sigfox Antenna Type :	Folded metal antenna
Sigfox Antenna Gain Max:	3.86dBi
Sigfox Antenna Impedance:	50 ohms
Test Standards:	15.247 RSS-247
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2013 KDB 558074 V5 R02

BLE

Type of radio:	Stand-alone
Transmitter Type:	BLE
Operating Frequency Range(s):	2.402 GHz - 2.480GHz
Number of Channels:	40
Power configuration:	3.7v Battery.
Ports:	None
Classification:	DTS
BLE Antenna Type :	Pcb printed antenna
BLE Antenna Gain Max:	0.9 dBi
Antenna Impedance:	50 ohms
Test Standards:	15.247 RSS-247
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2013 KDB 558074 V5 R02

The EUT was an asset tracker reporting on the 915 MHz band over the Sigfox network

The EUT also contained a custom BLE radio.
This report details test carried out on the BLE transmitter.

1.1 EUT Operation

Operating Conditions during Test:

Conducted measurements were carried out on a sample (Sample #Y) where the antenna was replaced by cable and SMA.

The EUT was operated in test mode where the channel and modulation was set via USB connection from the EUT to a laptop.
The EUT was powered from a bench PSU set to 3.6Vdc. for all conducted tests

Radiated measurements were performed on a sample (Sample #Z) with standard internal antenna with the EUT powered from its (new) internal battery.

Environmental conditions

	Temperature	Relative Humidity
Test	°C	%
Conducted Emissions	21.2	49
Radiated Emissions <1GHz	18	42
Radiated Emissions >1GHz	19	47

1.2 Modifications

No modifications were required in order to pass the test specifications.

1.3 Date of Test

The tests were carried out on 7th 8th 27th Jul and 13th Aug 2021.

1.4 Description of Test modes

Channel List

Channel	Channel	Freq MHz
Low	1	2402
	2	2404
Mid	19	2440
High	39	2480

All tests were performed with the EUT on the low mid and high channels.

2 Emissions Measurements

2.1 Conducted Emissions Measurements

Radio Conducted measurements were carried out on the EUT as per section 1.1 above.

All results were measured as conducted on the antenna except radiated spurious emissions.

2.2 Radiated Emissions Measurements

Radiated Power measurements were made at the Compliance Engineering Ireland Ltd anechoic chamber located in Dunshaughlin, Co. Meath, Ireland to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.
The EUT was centred on a motorized turntable, which allows 360 degree rotation.

Emissions below 1GHz were measured using a test antenna positioned at a distance of 3 metres from the EUT (as measured from the closest point of the EUT). The radiated emissions were maximised by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 metres. In this case the resolution bandwidth was 100kHz.
Emissions in the 1GHz-3.6GHz range were measured using a horn antenna located at 3 metres distance from the EUT in a fully anechoic chamber.
The radiated emissions were maximised by configuring the EUT and by rotating the EUT, and by raising and lowering the test antenna from 1 to 4 metres.
Emissions above 3.6GHz were measured using a horn antenna located at 1 metre distance from the EUT in a fully anechoic chamber. The radiated emissions were maximised by configuring the EUT and by rotating the EUT and raising the test and antenna from 1 to 4 metres.
In this case the resolution bandwidth was 1MHz and video bandwidth was 3 MHz. for peak measurements. The Video bandwidth was changed to 10Hz for Average measurements (as per ANSI 63.10 2013 Section 4.1.4.2.3)

A pre-scan was performed to determine the worst case EUT orientation for the radiated measurements.
All radiated tests were performed with the EUT in orientation O3 for Horizontal polarization measurements and with the EUT in orientation O2 for Vertical polarisation measurements.
Ref Appendix D for orientations.

3.0 Results for Conducted emissions on the mains

Test not performed as the host for the EUT is battery powered only

4. Conducted Measurements

4.1 Bandwidth

4.1.1 6dB bandwidth

Test Method
As per Ansi 63.10 Section 11.8.2

Ansi63.10 Section **11.8.2 Option 2**
The automatic bandwidth measurement capability of an instrument may be employed using the *X* dB bandwidth mode with *X* set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz, VBW ≥ 3 × RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥6 dB.
Limit for 6dB Bandwidth = 500KHz min

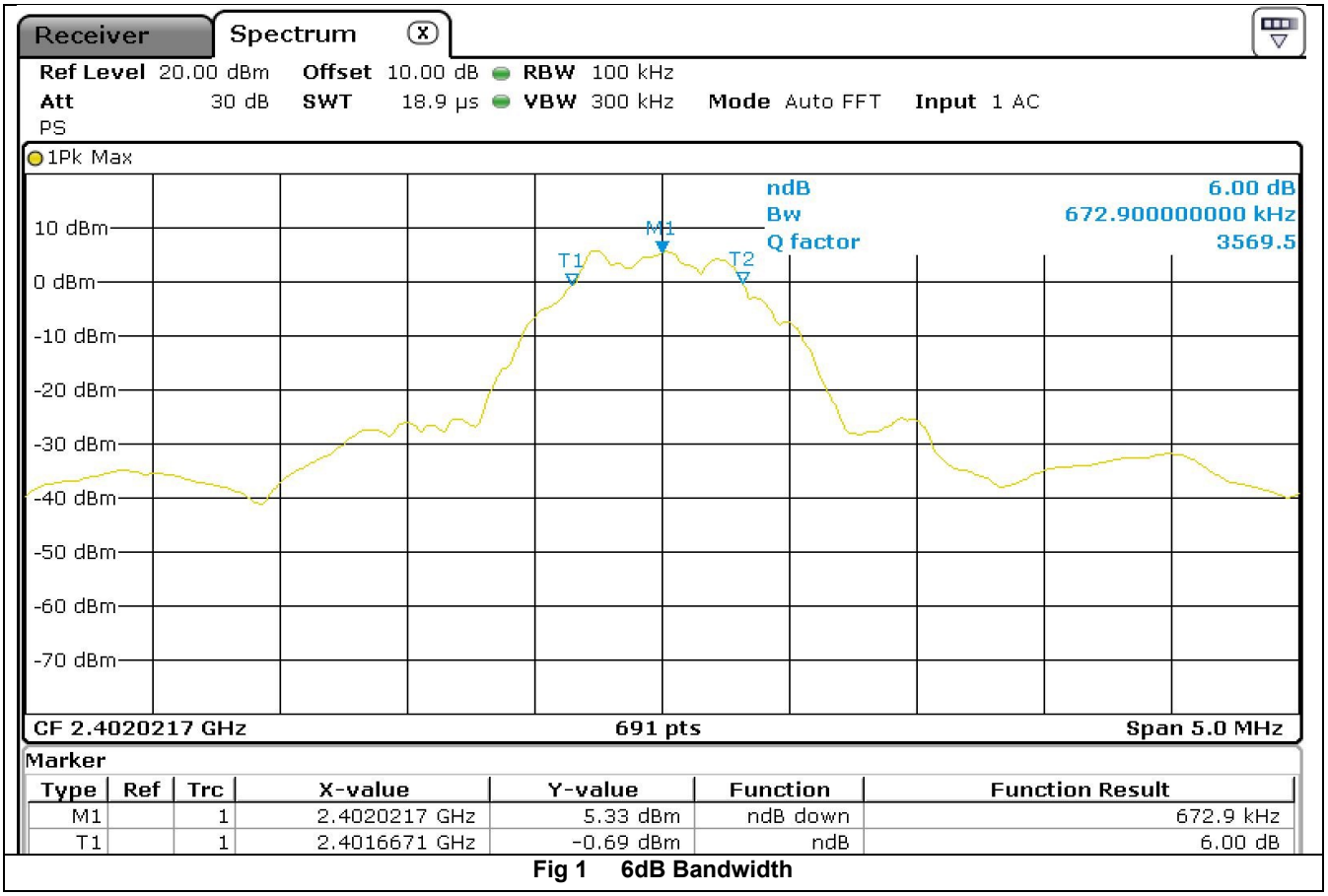


Fig 1 6dB Bandwidth

Frequency	6dB Bandwidth	Limit Min	Margin
GHz	KHz	KHz	KHz
2.402	672.9	500	172.9
2.44	665.7	500	165.7
2.48	672.9	500	172.9

Result :- Pass

4.1.2 99% bandwidth

Test Method
As per Ansi 63.10 Section 6.9.3

Ansi63.10 Section **6.9.3 Occupied bandwidth—power bandwidth (99%) measurement procedure**
The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.
The following procedure shall be used for measuring 99% power bandwidth:
a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.
d) Step a) through step c) might require iteration to adjust within the specified range.
e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.
h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

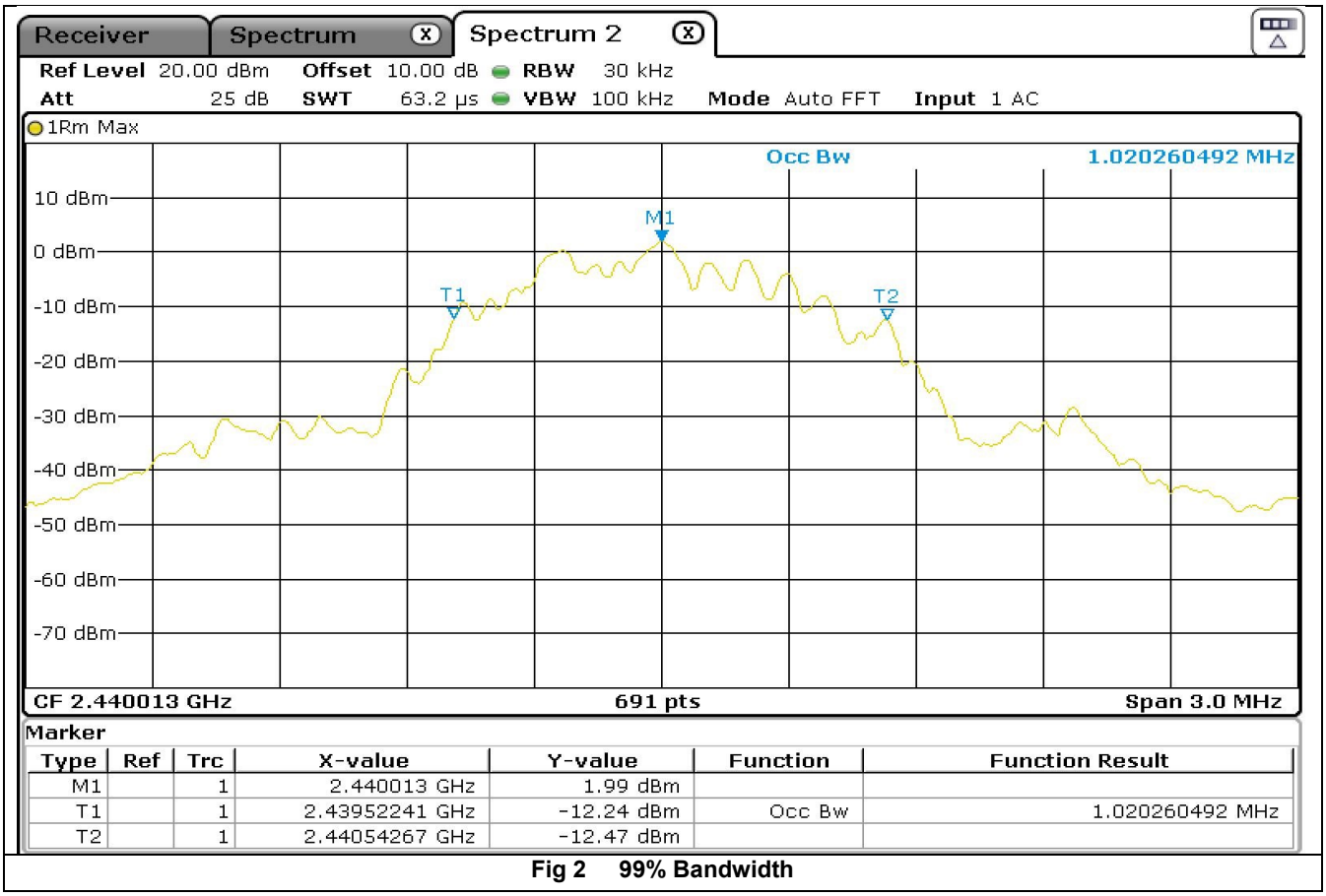


Fig 2 99% Bandwidth

Frequency	99% Bandwidth
GHz	MHz
2.402	1.016
2.44	1.020
2.48	1.020

Result :- Pass

4.2 Duty Cycle

Test Method
As per Ansi 63.10 Section 11.6 KDB 558074 zero span measurement method

Ansi63.10 Section **11.6 Duty cycle (*D*), transmission duration (*T*), and maximum power control level**

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (*T*) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed *T* at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).

KDB 558074 D01 FAQ section

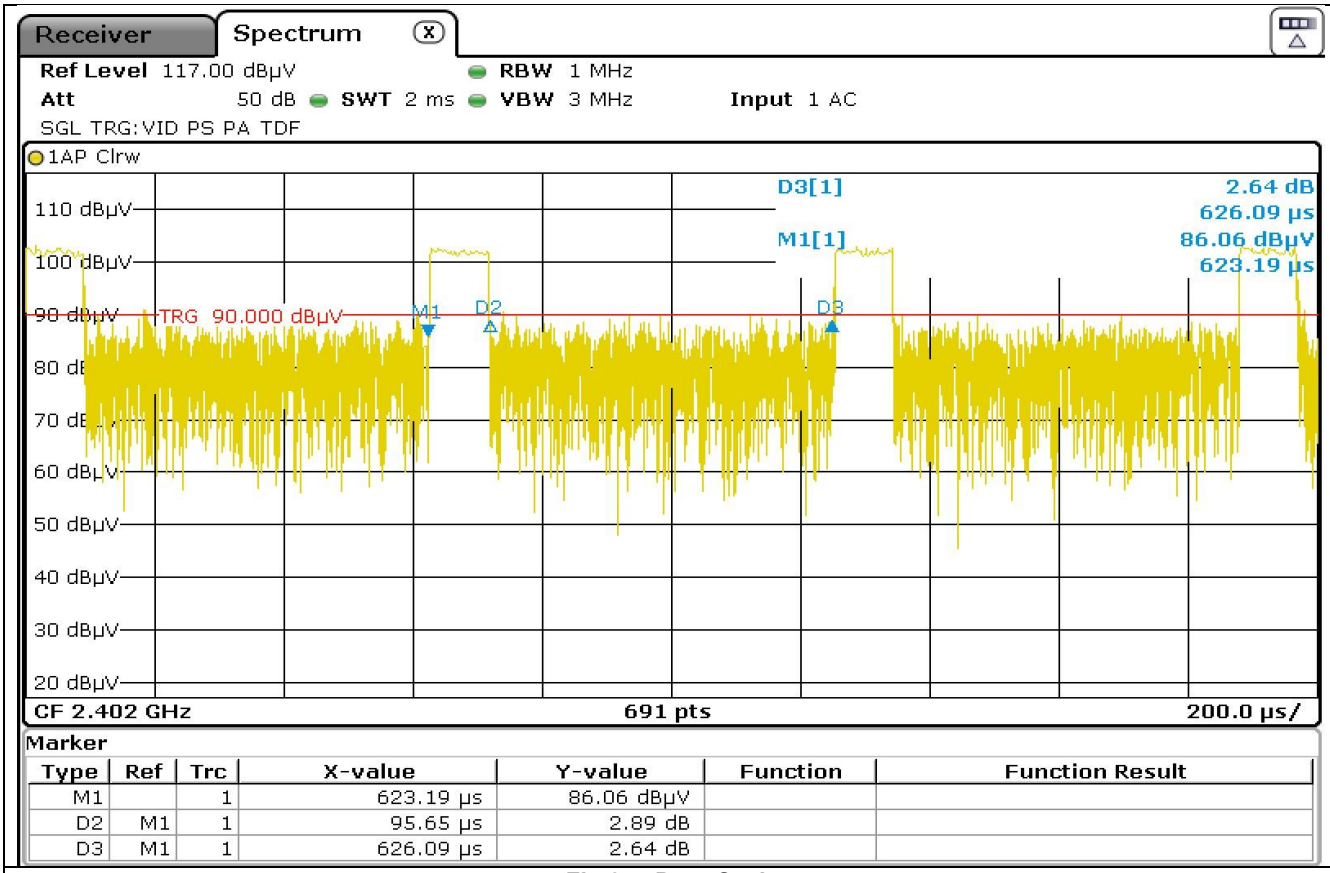


Fig 3 Duty Cycle

Duty Cycle =
Note the duty cycle results above shows how the sample operated during testing.

One Period uS	Pulse Width uS	Duty Cycle	10 log duty cycle for Power Averaging (dB)
626.09	**95.65**	**0.153**	**-8.16**

4.3 Power Spectral Density

Test Method
As per Ansi 63.10 Section 11.10.2

Ansi63.10 Section **Section 11.10.2 Method PKPSD (peak PSD)**
The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:
a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

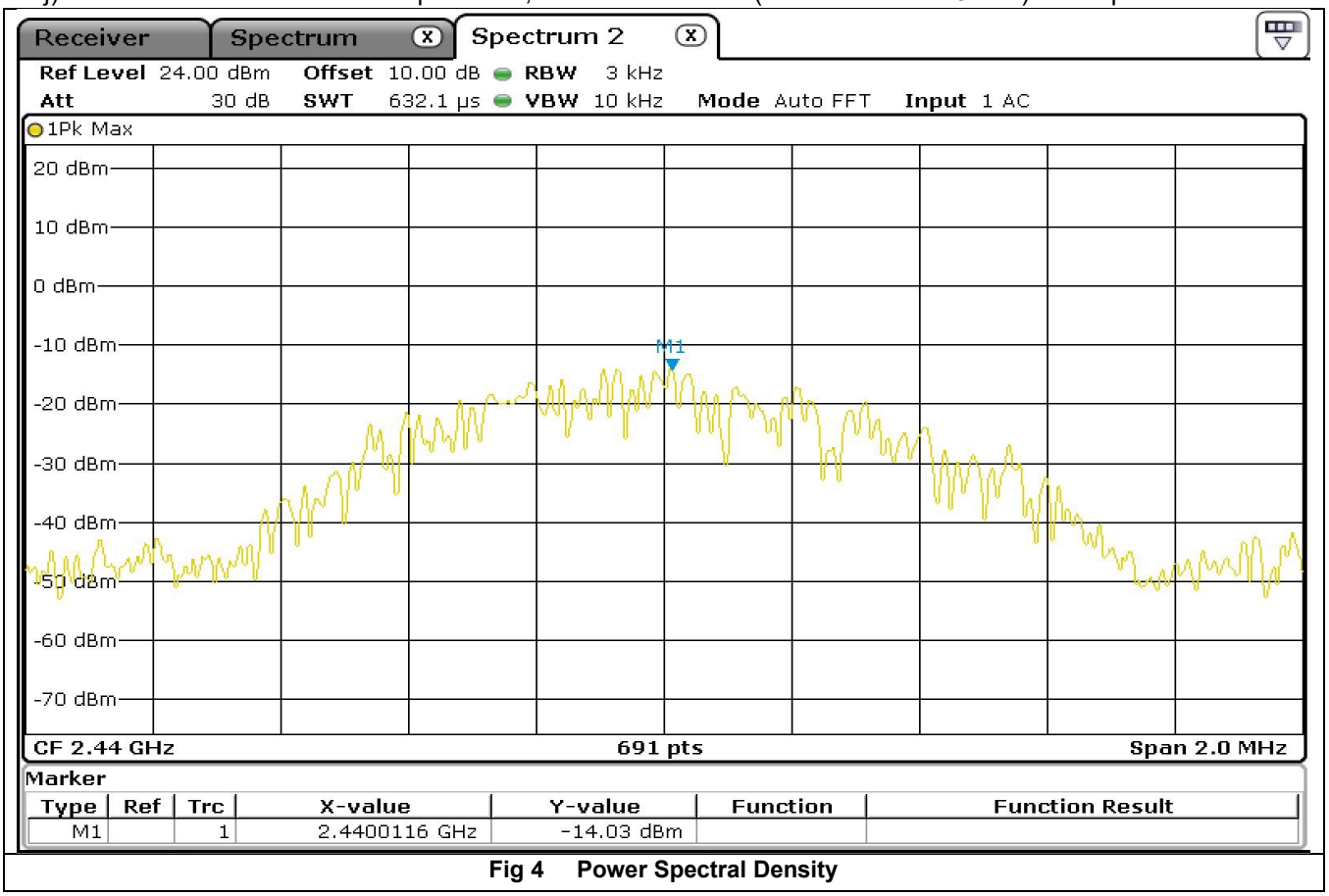


Fig 4 Power Spectral Density

Frequency	Measurement	Conducted Peak	Limit	Margin
GHz	dBm	dBm	dBm	dB
2.402	-14.22	-14.22	8	22.22
2.44	-14.03	4.67	8	3.33
2.48	-13.03	4.49	8	3.51

Result :- Pass

4.4 Output power Conducted

4.4.1 Test Method
As per Ansi 63.10 Section 11.9..1.1

Ansi63.10 Section **11.9.1.1 RBW ≥ DTS bandwidth**
The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:
a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ [3 × RBW].
c) Set span ≥ [3 × RBW].
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

4.4.2 Results

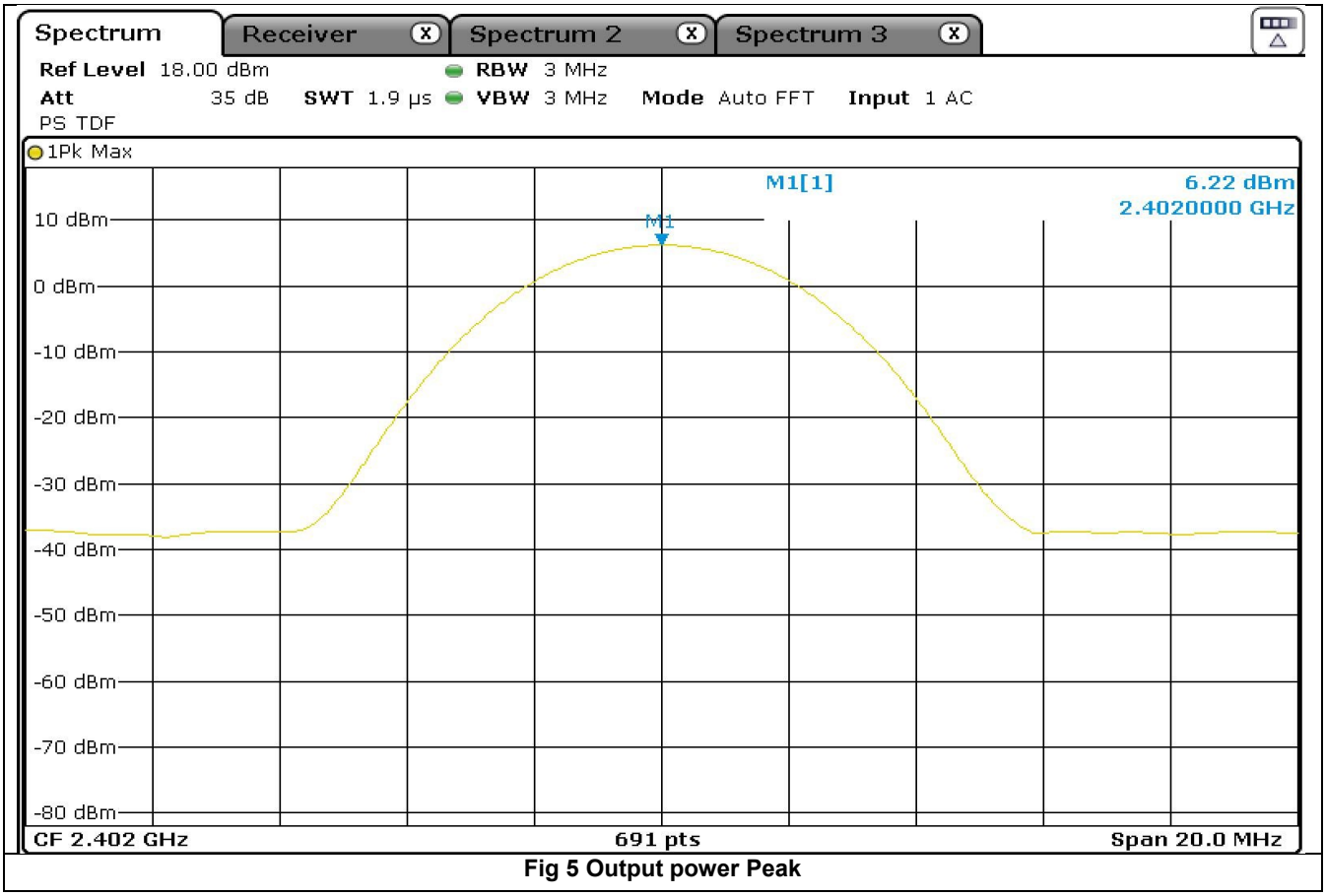


Fig 5 Output power Peak

Frequency	Conducted Measurement Peak	Limit	Margin
GHz	dBm	dBm	dB
2.402	6.22	30	23.78
2.44	6.19	30	23.81
2.48	6.38	30	23.62

Test Result :- Pass

5. Spurious Emissions Measurements

5.1 Conducted Emissions

5.1.1 Test Method
As per Ansi63.10 Section 11.11.1 and 6.10.4

Ansi63.10 Section **11.11.1 General**
Typical regulatory requirements specify that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions[89]:
a) If the maximum peak conducted output power procedure was used to determine compliance as described in 11.9.1, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

Ansi63.10 Section **6.10.4 Authorized-band band-edge measurements (relative method)**
These procedures are applicable for determining compliance at authorized-band band-edges where the requirements are expressed as a value relative to the in-band signal level. Procedures for determining compliance with field strength limits at or close to the band-edges are given in 6.10.6 (see also Table A.2).

5.1.2 Results

Frequency	Peak 100KHz RBW	Measured	Limit Min	Margin
GHz	dBm	dBc	dBc	dB
2.402	6.15	0	20	-
4.804	-60.3	66.45	20	46.45
7.206	-54.12	60.27	20	40.27
9.608	-66.49	72.64	20	52.64
12.01	-54.85	61	20	41

Frequency	Peak 100KHz RBW	Limit Min	Limit Min	Margin
GHz	dBm	dBc	dBc	dB
2.44	6.05	0	20	-
4.88	-59.85	65.9	20	45.9
7.32	-56.19	62.24	20	42.24
9.76	-65.29	71.34	20	51.34
12.2	-57.18	63.23	20	43.23

Frequency	Peak 100KHz RBW	Limit Min	Limit Min	Margin
GHz	dBm	dBc	dBc	dB
2.48	6.24	0	20	-
4.96	-56	62.24	20	42.24
7.44	-57.53	63.77	20	43.77
9.92	-62.55	68.79	20	48.79
12.4	-57.93	64.17	20	44.17
14.878	-53.86	60.1	20	40.1

Ref Appendix A for Scans

Test Result: - Pass

5.2 Radiated Spurious Emissions in Restricted bands

5.2.1 Test Method
As per Ansi63.10 Section 11.12.1 and 6.10.5

Ansi63.10 Section **11.12.1 Radiated emission measurements**
Because the typical emission requirements are specified in terms of radiated field strength levels, measurements performed to determine compliance have traditionally relied on a radiated test configuration.92 Radiated measurements remain the principal method for determining compliance to the specified requirements; however antenna-port conducted measurements are also now acceptable to determine compliance (see 11.12.2 for details). When radiated measurements are utilized, test site requirements and procedures for maximizing and measuring radiated emissions that are described in 6.3, 6.5, and 6.6 shall be followed

6.10.5 Restricted-band band-edge measurements
These procedures are applicable for determining compliance at band edges of restricted bands.
6.10.5.1 Test setup
Restricted-band band-edge tests shall be performed as radiated measurements, on a test site meeting the specifications in 5.2 at the measurement distances specified in 5.3.57
The instrumentation shall meet the requirements in 4.1.1 using the bandwidths and detectors specified in 4.1.4.2. Considering the requirements of 5.8, the antenna(s) shall be connected to the antenna ports. When performing radiated measurements, the measurement antenna(s) shall meet the specifications in 4.3. The EUT shall be connected to an antenna and operated at the highest power settings following procedures in 6.3, and the relevant procedure in 6.4, 6.5, or 6.6

As per Ansi 63.10 Section 11.12.2.5.2

11.12.2.5.2 Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction
If continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and the duty cycle is constant (duty cycle variations are less than ±2%), then the following procedure shall be used:
a) The EUT shall be configured to operate at the maximum achievable duty cycle.
b) Measure the duty cycle *D* of the transmitter output signal as described in 11.6.
c) RBW = 1 MHz (unless otherwise specified).
d) VBW ≥ [3 *RBW].
e) Detector = RMS (power averaging), if span / (# of points in sweep) ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
f) Averaging type = power (i.e., rms):
1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
g) Sweep time = auto.
h) Perform a trace average of at least 100 traces.
i) A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
1) If power averaging (rms) mode was used in step f), then the applicable correction factor is [10 log (1 / *D*)], where *D* is the duty cycle.
2) If linear voltage averaging mode was used in step f), then the applicable correction factor is [20 log (1 / *D*)], where *D* is the duty cycle.
3) If a specific emission is demonstrated to be continuous ($D \geq 98\%$) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.
Reduction of the measured emission amplitude levels to account for operational duty cycle is not permitted. Determining compliance is based on emission levels occurring during transmission; it is not based on an average across ON and OFF times of the transmitter

One Period uS	Pulse Width uS	Duty Cycle	10 log duty cycle for Power Averaging (dB)
626.09	95.65	0.153	-8.16

Duty cycle correction factor =8.16dB for average measurements

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
4.804	47.7	32.4	37.1	5.2	Vertical	0.00	48.2	74	25.8
12.010	40.8	40.3	36.5	7.8	Vertical	0.00	52.4	74	21.6
4.804	47.4	32.4	37.1	5.2	Horizontal	0.00	47.9	74	26.2
12.010	39.8	40.3	36.5	7.8	Horizontal	0.00	51.4	74	22.7

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
4.880	47.2	32.4	37.3	5.2	Vertical	0.00	47.5	74	26.5
7.320	50.1	37.7	38	6.7	Vertical	0.00	56.5	74	17.5
12.200	39.5	40.3	37.7	8.9	Vertical	0.00	51.0	74	23.0
4.880	47.4	32.4	37.3	5.2	Horizontal	0.00	47.7	74	26.3
7.320	49.2	37.7	38	6.7	Horizontal	0.00	55.6	74	18.4
12.200	39.5	40.3	37.7	8.9	Horizontal	0.00	51.0	74	23.0

Frequency	Measured Average Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Average Level	Average Limit	Margin
7.320	33.6	37.7	38	6.7	Vertical	8.16	48.2	54	5.8
7.320	26.9	37.7	38	6.7	Horizontal	8.16	41.5	54	12.5

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
4.960	47.7	33.5	37.4	5.4	Vertical	0.00	49.2	74	24.8
7.440	50.6	37.7	37.5	6.3	Vertical	0.00	57.1	74	17.0
12.400	39.6	40.3	36.4	8.0	Vertical	0.00	51.5	74	22.5
4.960	48.3	33.5	37.4	5.4	Horizontal	0.00	49.8	74	24.2
7.440	48.6	37.7	37.5	6.3	Horizontal	0.00	55.1	74	18.9
12.400	39.2	40.3	36.4	8.0	Horizontal	0.00	51.1	74	23.0

Frequency	Measured Average Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Average Level	Average Limit	Margin
7.440	34.0	37.7	37.5	6.3	Vertical	8.16	48.6	54	5.4
7.440	27.6	37.7	37.5	6.3	Horizontal	8.16	42.2	54	11.8

Note the final average measurements include the duty cycle correction factor (which has been added to the measured result)
Test Result: - Pass

5.3 Radiated Band Edge / Restricted band Measurements

11.13.3.2 Peak detection

When using a peak detector to measure unwanted emissions at or near the band edge (within 2 MHz of the authorized band), the following integration procedure can be used:

a) Set instrument center frequency to the frequency of the emission to be measured (must be within 2 MHz of the authorized band edge).
b) Set span to 2 MHz.
c) RBW = 100 kHz.
d) VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto.
g) Trace mode = max hold.
h) Allow sweep to continue until the trace stabilizes (required measurement time may increase for low-duty-cycle applications).
i) Compute the power by integrating the spectrum over 1 MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency ($f_{emission}$) ± 0.5 MHz. If the instrument does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by $f_{emission}$ ± 0.5 MHz.

11.13.3.4 Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (D ≥ 98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less ±2%), then the following procedure may be used to measure the average power of unwanted emssions within 2 MHz of the authorized band edge:

a) The EUT shall be configured to operate at the maximum achievable duty cycle.
b) Measure the duty cycle D of the transmitter output signal as described in 11.6.
c) Set instrument center frequency to the frequency of the emission to be measured.
d) Set span to 2 MHz.
e) RBW = 100 kHz.
f) VBW ≥ 3 × RBW.
g) Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
h) Averaging type = power (i.e., rms):
1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
i) Sweep time = auto.
j) Perform a trace average of at least 100 traces.
k) Compute the power by integrating the spectrum over 1 MHz using the instrument's band power measurement function with band limits set equal to the emission frequency ($f_{emission}$) ± 0.5 MHz. If the spectrum analyzer does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by $f_{emission}$ ± 0.5 MHz.
l) A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
1) If power averaging (rms) mode was used in step f), then the applicable correction factor is [10 log (1 / D)], where D is the duty cycle.
2) If linear voltage averaging mode was used in step f), then the applicable correction factor is [20 log (1 / D)], where D is the duty cycle.
3) If a specific emission is demonstrated to be continuous (D ≥ 98%) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Reduction of the measured emission amplitude levels to account for operational duty cycle is not permitted. Determining compliance is based on emission levels occurring during transmission—it is not based on an average across ON and OFF times of the transmitter.

5.3.1 Result Radiated Restricted Band and band edge near 2.4 GHz band

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
2.310	53.3	27.4	39.2	3.4	Vertical	0.00	44.9	74	29.1
2.390	62.4	27.4	38.5	3.5	Vertical	0.00	54.8	74	19.2
2.400	79.3	27.4	38.5	3.5	Vertical	0.00	71.7	74	2.3
2.310	49.3	27.4	39.2	3.4	Horizontal	0.00	40.9	74	33.1
2.390	62.3	27.4	38.5	3.5	Horizontal	0.00	54.7	74	19.3
2.400	79.1	27.4	38.5	3.5	Horizontal	0.00	71.5	74	2.5

Frequency	Measured Average Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Average Level	Average Limit	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
2.310	39.0	27.4	39.2	3.4	Vertical	8.16	38.8	54	15.3
2.338	39.9	27.4	39.2	3.4	Vertical	8.16	39.6	54	14.4
2.369	39.5	27.4	38.5	3.5	Vertical	8.16	40.1	54	13.9
2.390	39.0	27.4	38.5	3.5	Vertical	8.16	39.6	54	14.4
2.400	51.2	27.4	38.5	3.5	Vertical	8.16	51.8	54	2.2
2.310	39.0	27.4	39.2	3.4	Horizontal	8.16	38.8	54	15.2
2.338	42.6	27.4	39.2	3.4	Horizontal	8.16	42.3	54	11.7
2.369	42.2	27.4	38.5	3.5	Horizontal	8.16	42.7	54	11.3
2.390	39.4	27.4	38.5	3.5	Horizontal	8.16	39.9	54	14.1
2.400	52.3	27.4	38.5	3.5	Horizontal	8.16	52.8	54	1.2

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
2.4835	67.2	28.7	38.3	3.4	Vertical	0.00	61.0	74	13.0
2.500	54.0	28.7	38.3	3.4	Vertical	0.00	47.8	74	26.2
2.4835	66.8	28.7	38.3	3.4	Horizontal	0.00	60.6	74	13.4
2.500	53.8	28.7	38.3	3.4	Horizontal	0.00	47.6	74	26.4

Frequency	Measured Average Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Average Level	Average Limit	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
2.4835	49.3	28.7	38.3	3.4	Vertical	8.16	51.3	54	2.7
2.500	39.3	28.7	38.3	3.4	Vertical	8.16	41.2	54	12.8
2.4835	48.6	28.7	38.3	3.4	Horizontal	8.16	50.5	54	3.5
2.500	40.1	28.7	38.3	3.4	Horizontal	8.16	42.1	54	11.9

Note the final average measurements include the duty cycle correction factor (which has been added to the measured result)

Test Result: - Pass

5.4 Radiated Power at fundamental

Frequency	Measured Peak Level	Antenna Polarity	Antenna Factor	Preamp Gain	Cable Loss	Final Peak Level	Power	Limit	Margin
GHz	dBuV/m	V/H	dB	dB	dB	dBuV/m	dBm	dB	dB
2.402	14.3	Vertical	27.4	38.5	3.5	101.9	6.7	36	29.3
2.402	14.5	Horizontal	27.4	38.5	3.5	102.1	6.9	36	29.1
2.440	14.4	Vertical	27.4	38.5	3.5	102	6.8	36	29.2
2.440	14.7	Horizontal	27.4	38.5	3.5	102.3	7.1	36	28.9
2.480	13.0	Vertical	28.7	38.3	3.4	102	6.8	36	29.2
2.480	13.4	Horizontal	28.7	38.3	3.4	102.4	7.2	36	28.8

Note the Radiated field strength was measured at 3 metres and
the conversion formula below was used to determine the EIRP in dBm

$$EIRP\ (dBm) = E_{3m}\ (dBuV/m) - 95.2$$

6 List of Test Equipment

Instrument	Manufacturer	Model	Serial Num	CEI Ref	Cal Due Date	Cal Interval Months
Spectrum Analyser 30Hz-40GHz	Rohde & Schwarz	FSP40	100053	850	11-Dec-21	36
Test Receiver 3.6GHz	Rohde & Schwarz	ESR	1316.3003k03-101625-s	869	28-May-23	36
Antenna Biconical	Schwarzbeck	VHBB 9124	9124 667	871	30-Sep-21	36
Antenna Horn	EMCO	3115	9905-5809	655	13-Dec-21	24
Anechoic Chamber	CEI	SAR 10M	845	845	16-May-22	36
Antenna Log Periodic	Chase	UPA6108	1072	609	03-Sep-21	36
Fully Anechoic Chamber	CEI	FAR 3M	906	906	23-Jul-22	36
Microwave Preamplifier	Hewlett Packard	83017A	3123A00175	805	30-Sep-21	12
Antenna Horn Standard Gain 18-26.5GHz	A-Info	LB-42-25-C-KF	J2021091103028	877	16-May-22	12

7 Measurement Uncertainties

Measurement	Uncertainty
Radio Frequency	+/- $5x10^{-7}$
Maximum Frequency Deviation	+/- 1.7 %
Conducted Emissions	+/- 1 dB
Radiated Emission 30MHz-100MHz	+/- 5.3 dB
Radiated Emission 100MHz-300MHz	+/- 4.7 dB
Radiated Emission 300MHz-1GHz	+/- 3.9 dB
Radiated Emission 1GHz-40GHz	+/- 3.8 dB
Modulation bandwidth	+/- $5x10^{-7}$
Duty Cycle	+/- 5 %
Power supply	±0.1 VDC
Temperature	±0.2 °C
Frequency	±0.01 ppm

The measurement uncertainties stated were calculated with a k=2 for a confidence level of over 95% as per ETS TR100 028.

The test data can be compared directly to the specification limit to determine compliance, as the calculated measurement uncertainty meets the requirements of the applicable specification.

Appendix A

Conducted Measurements on the Antenna Port

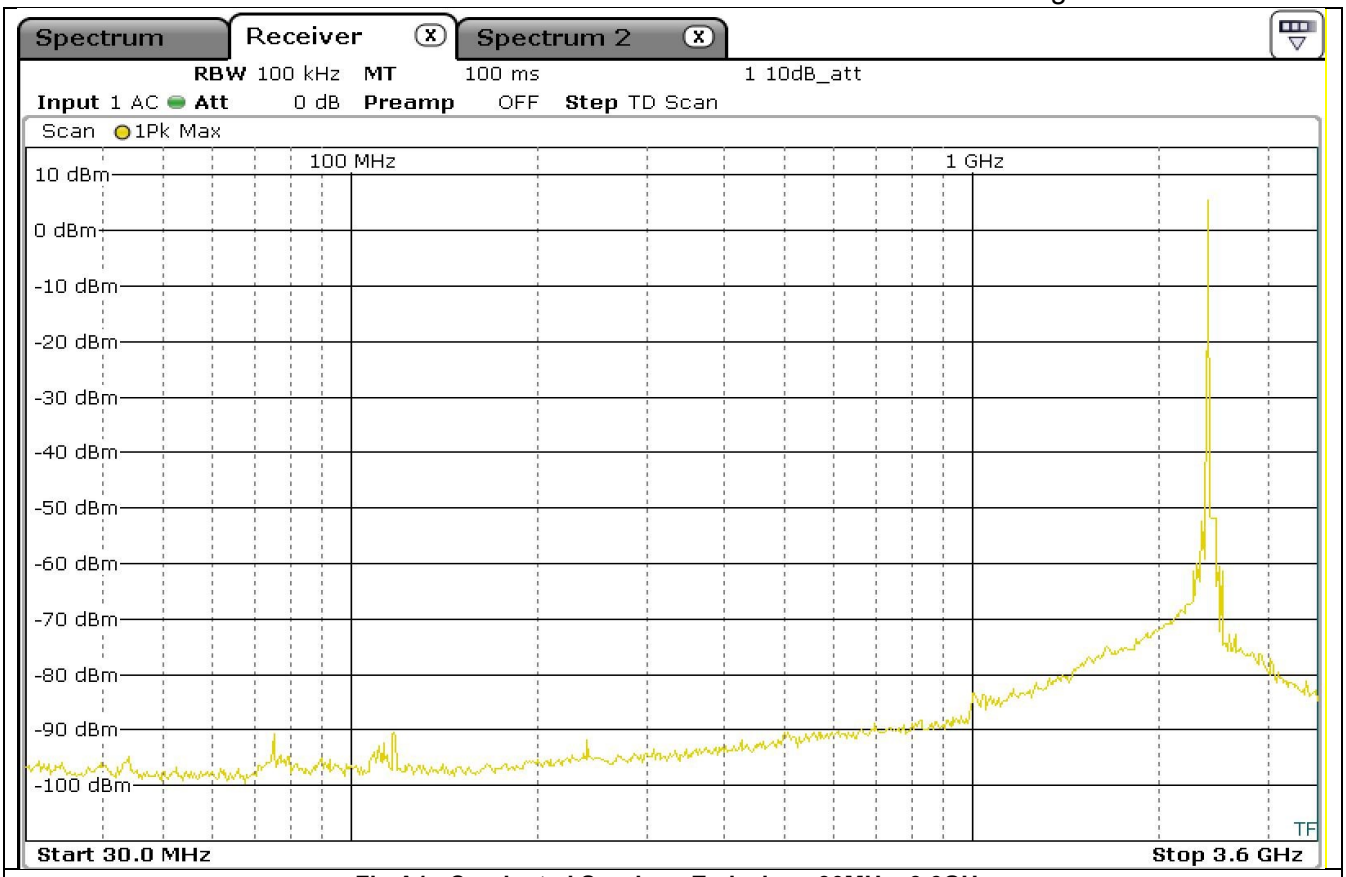


Fig A1 Conducted Spurious Emissions 30MHz -3.6GHz

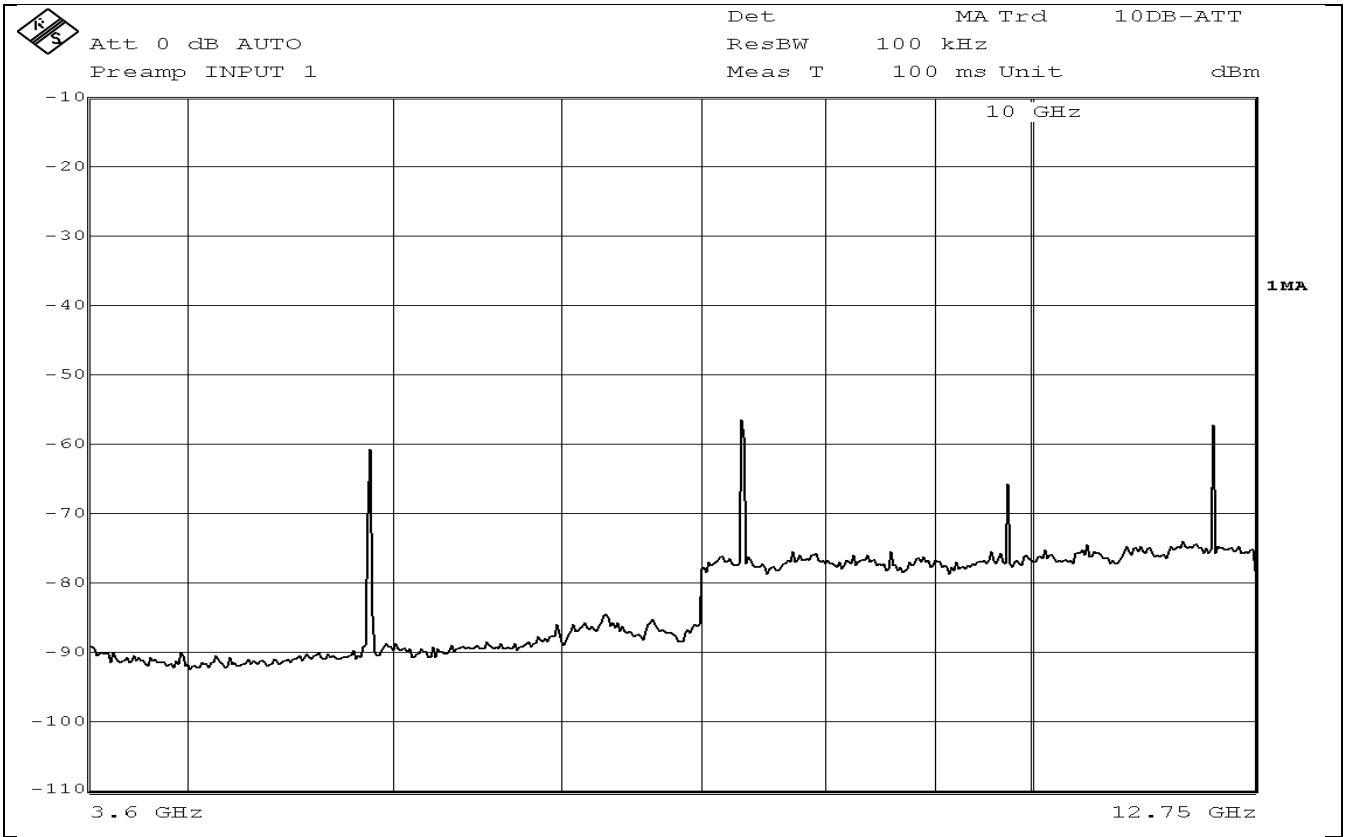


Fig A2 Conducted Spurious Emissions 3.6GHz-12.75GHz

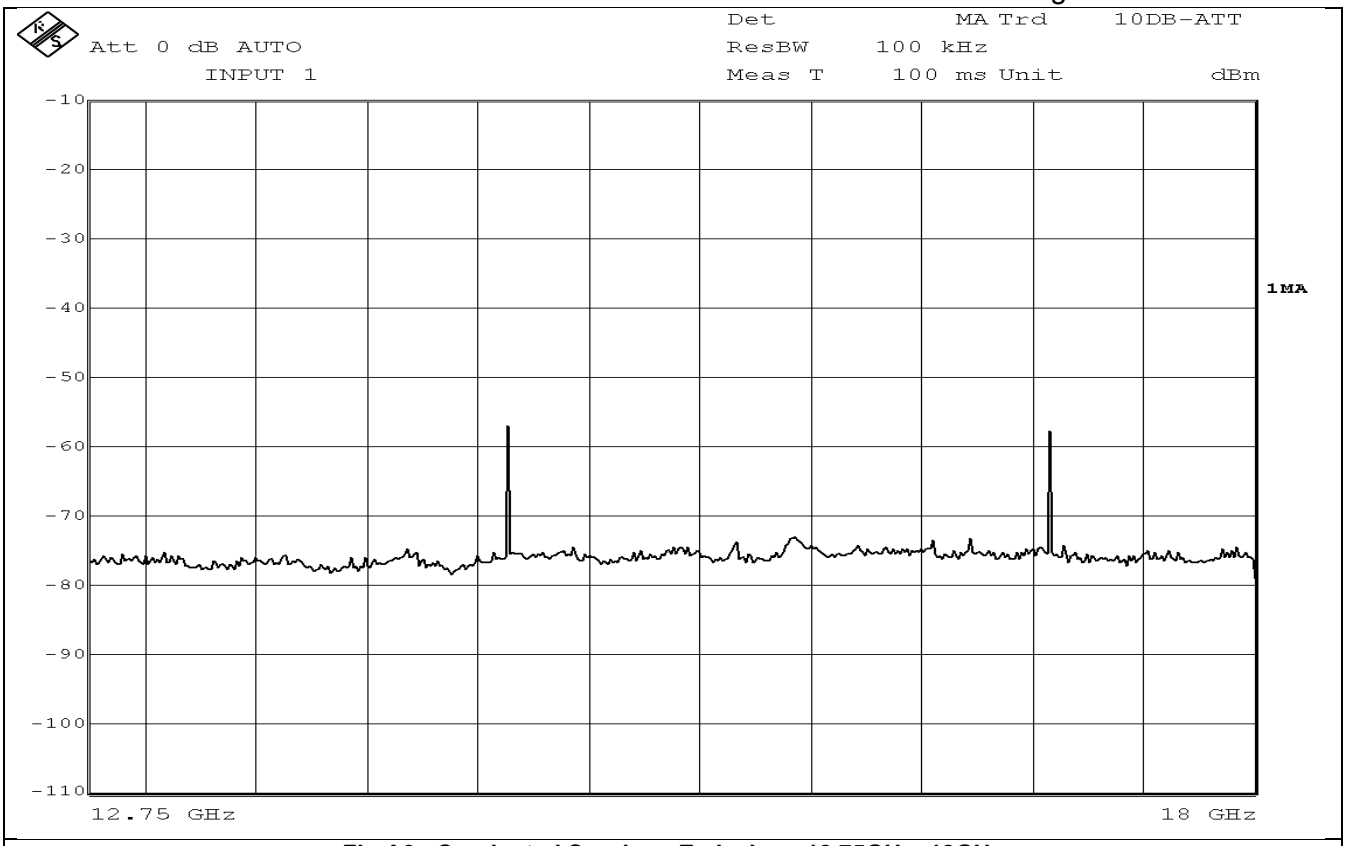


Fig A3 Conducted Spurious Emissions 12.75GHz -18GHz

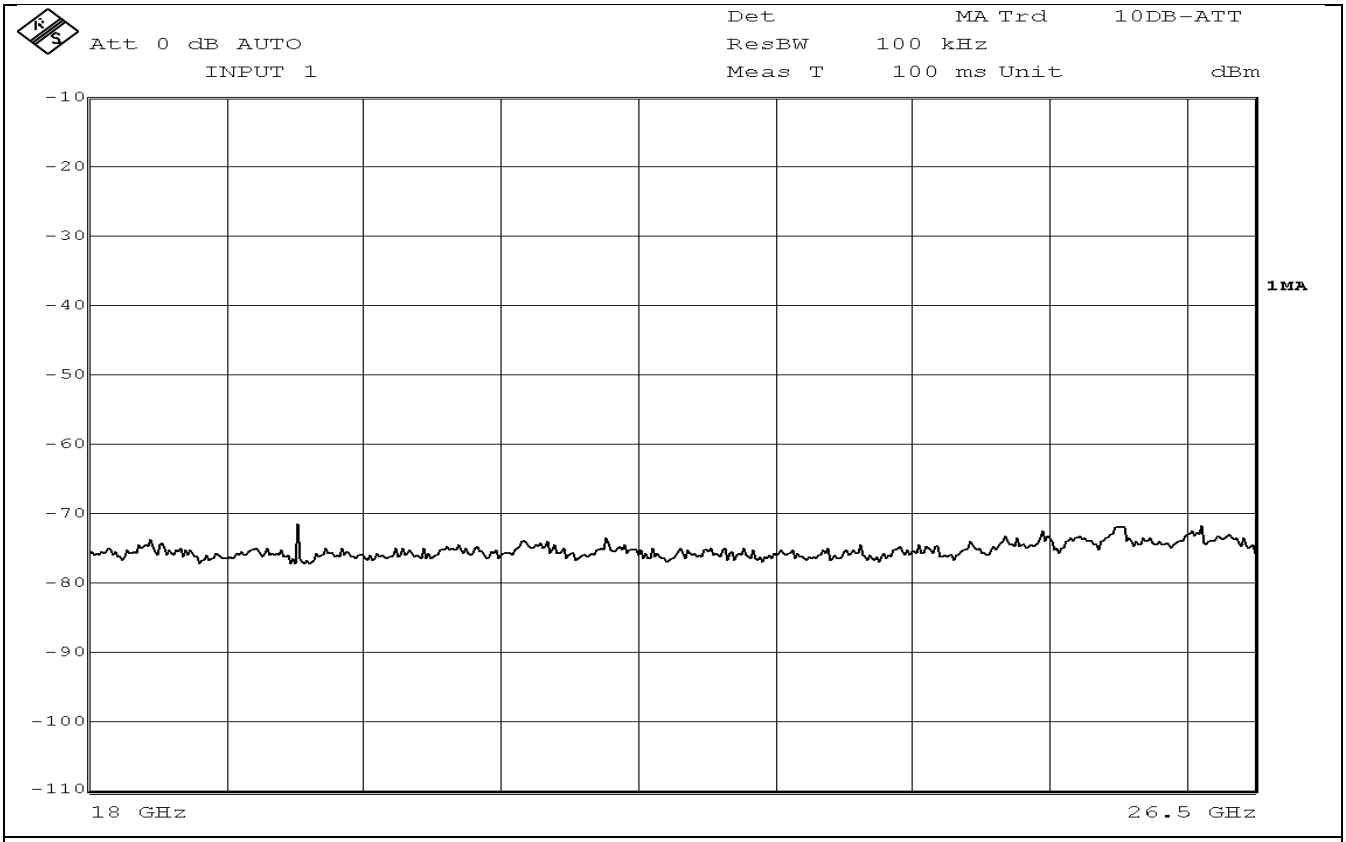


Fig A4 Conducted Spurious Emissions 18GHz -26.5GHz

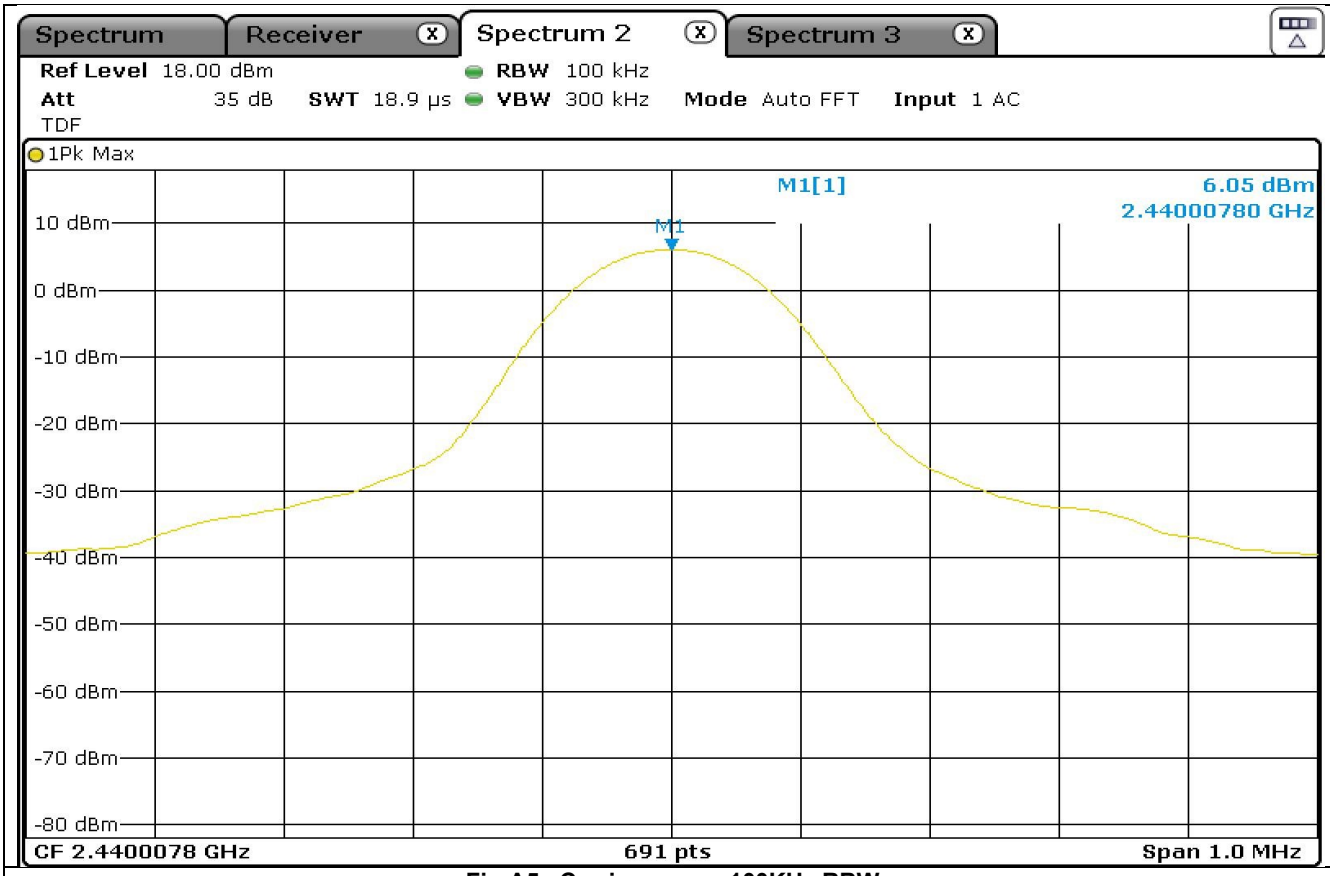


Fig A5 Carrier power 100KHz RBW

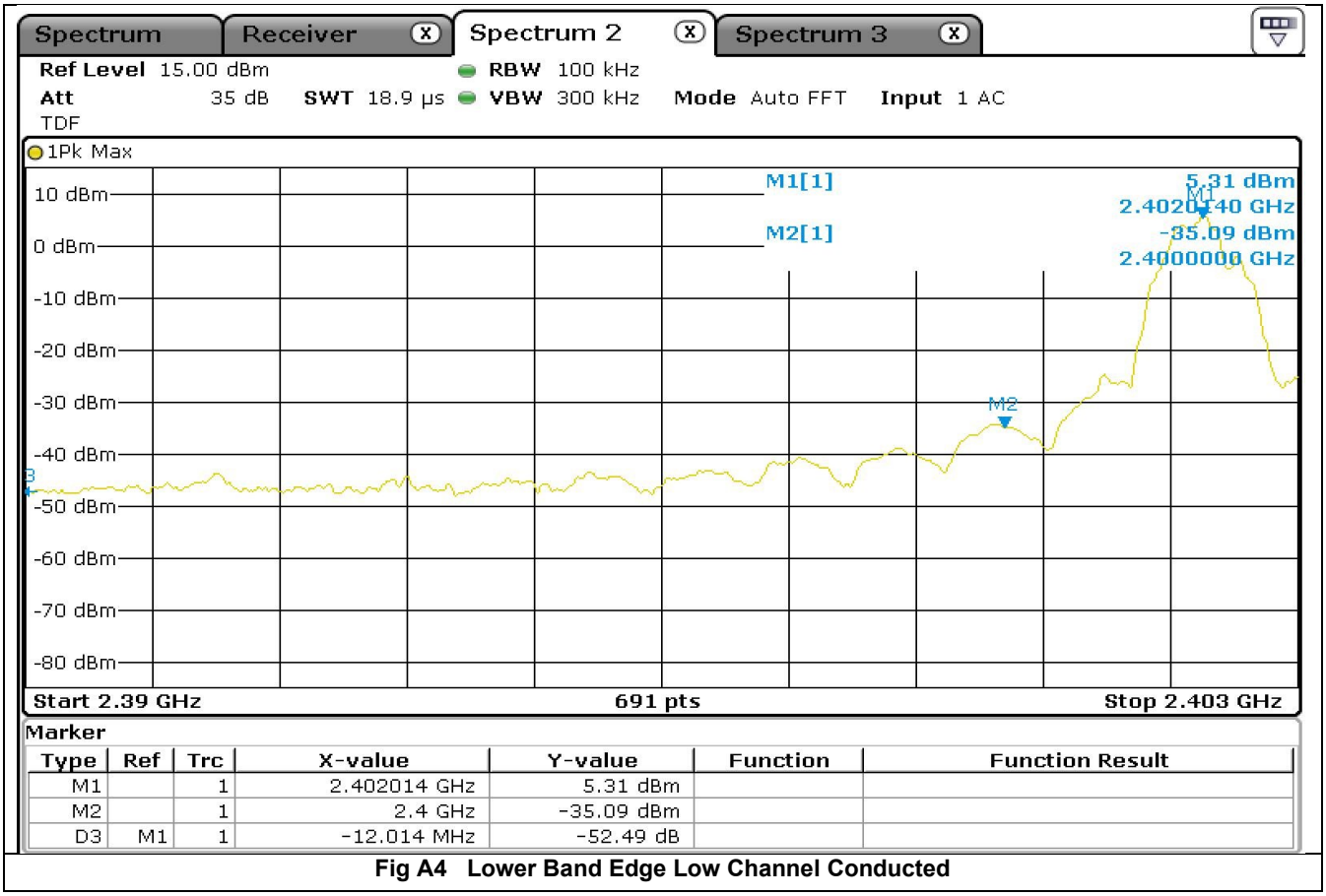


Fig A4 Lower Band Edge Low Channel Conducted

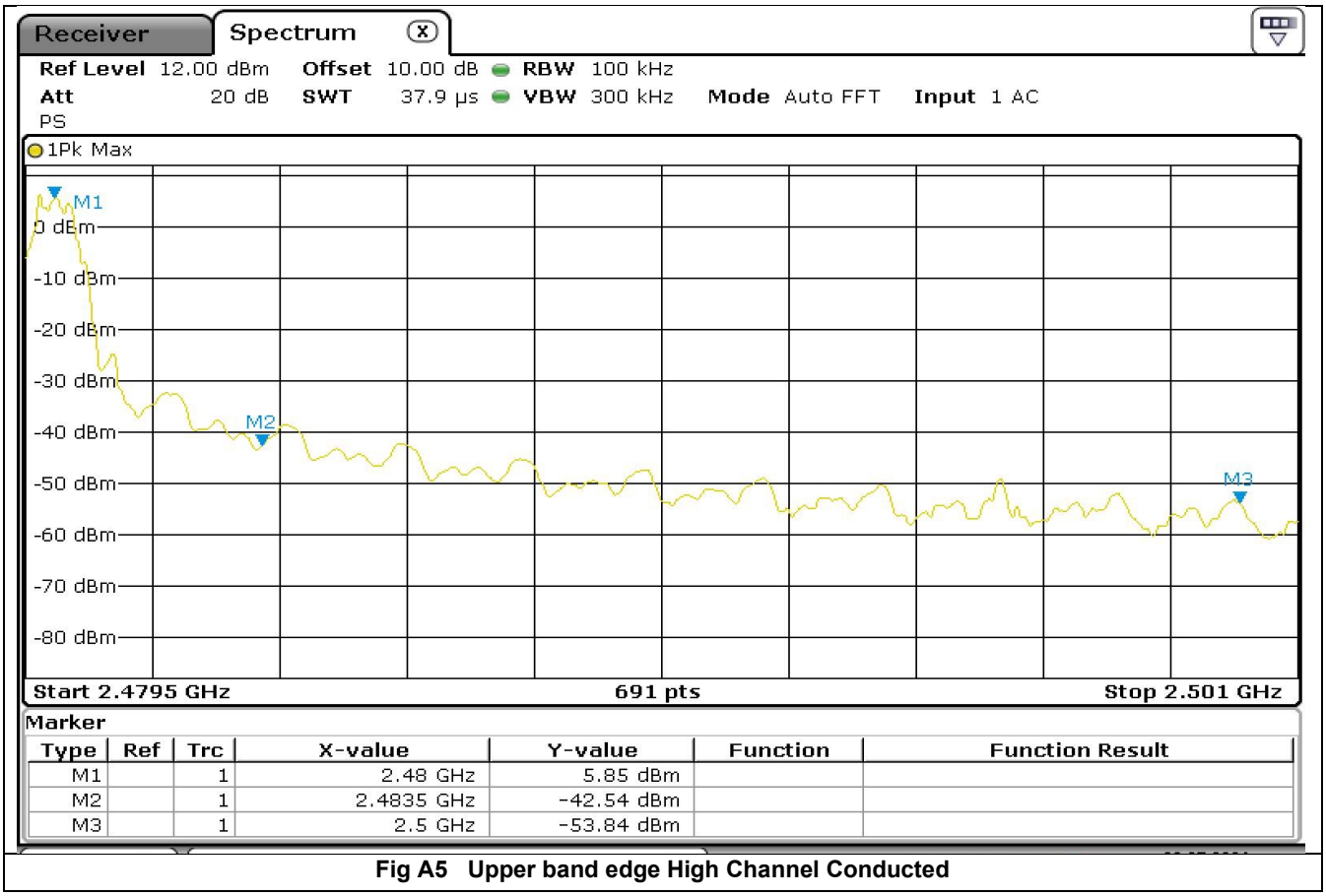


Fig A5 Upper band edge High Channel Conducted

Appendix B

Radiated tests for Band Edges /Restricted band

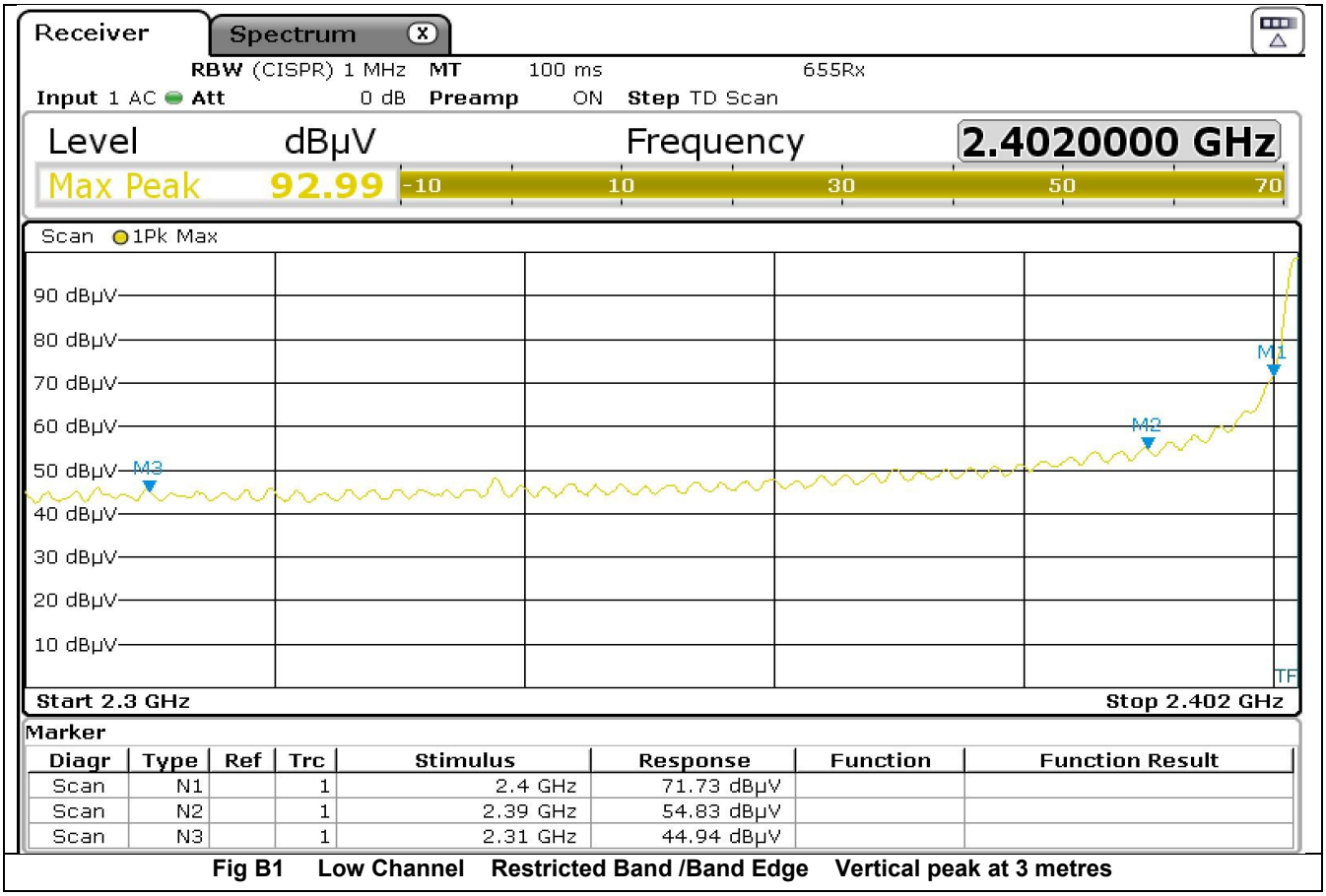


Fig B1 Low Channel Restricted Band /Band Edge Vertical peak at 3 metres

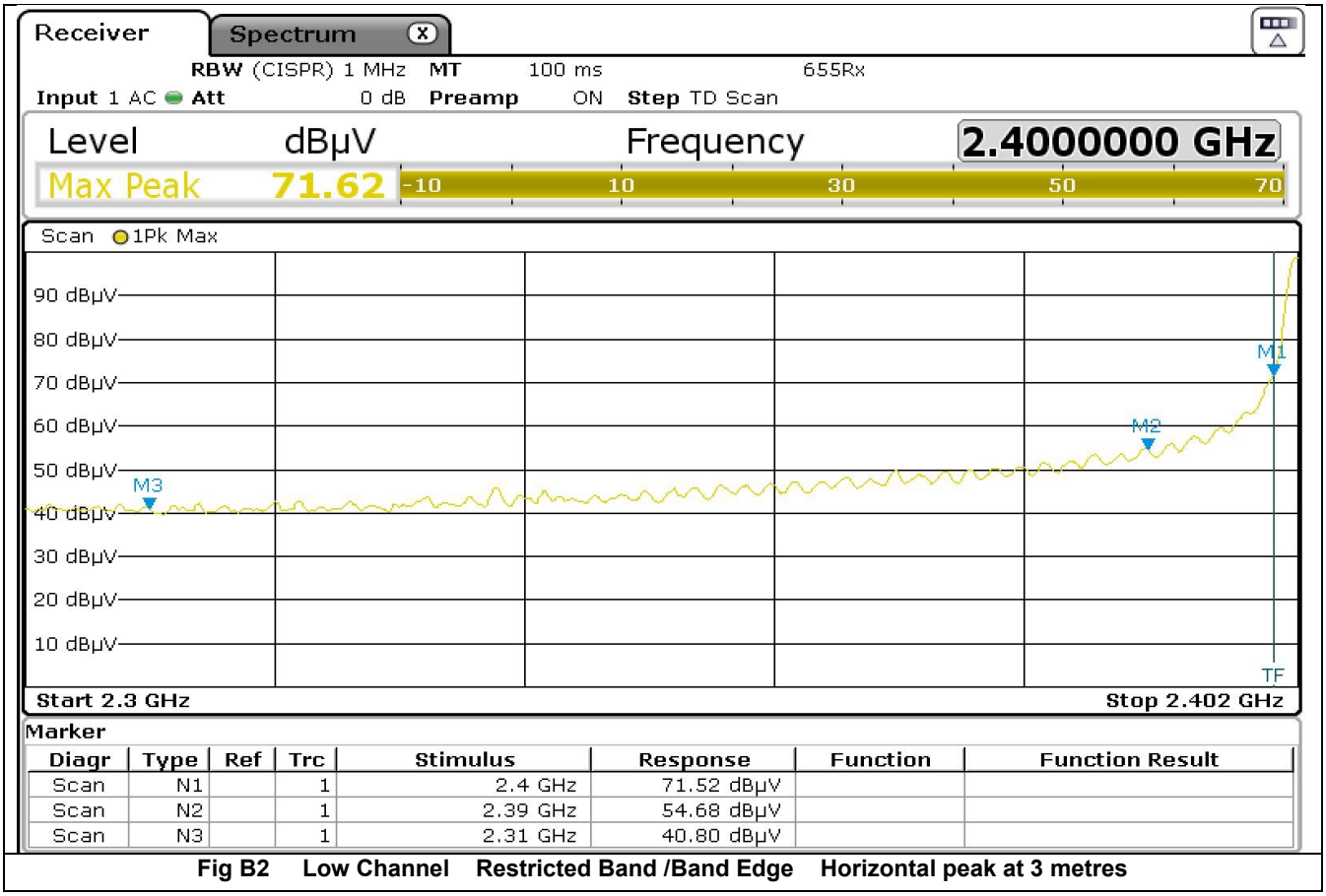
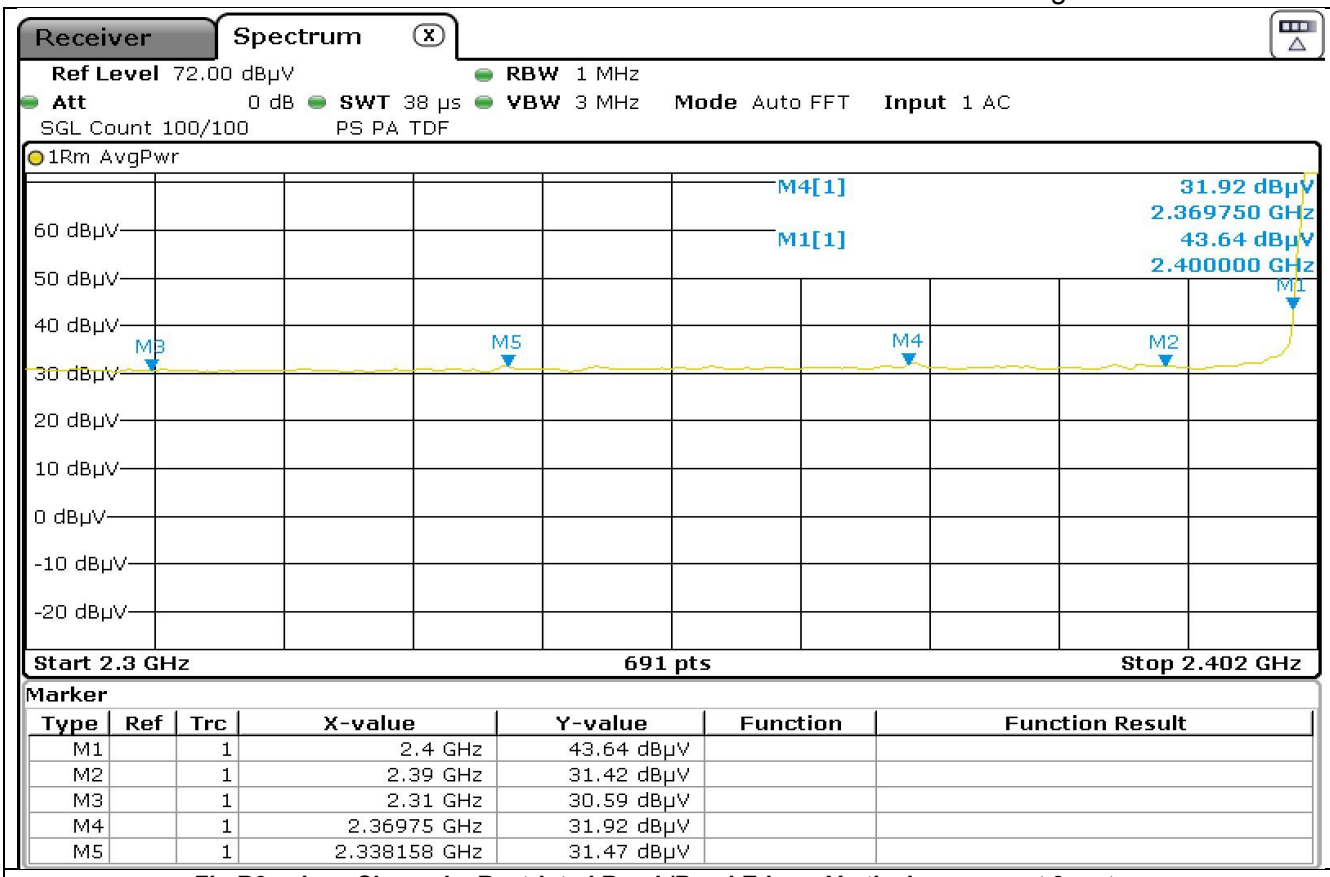


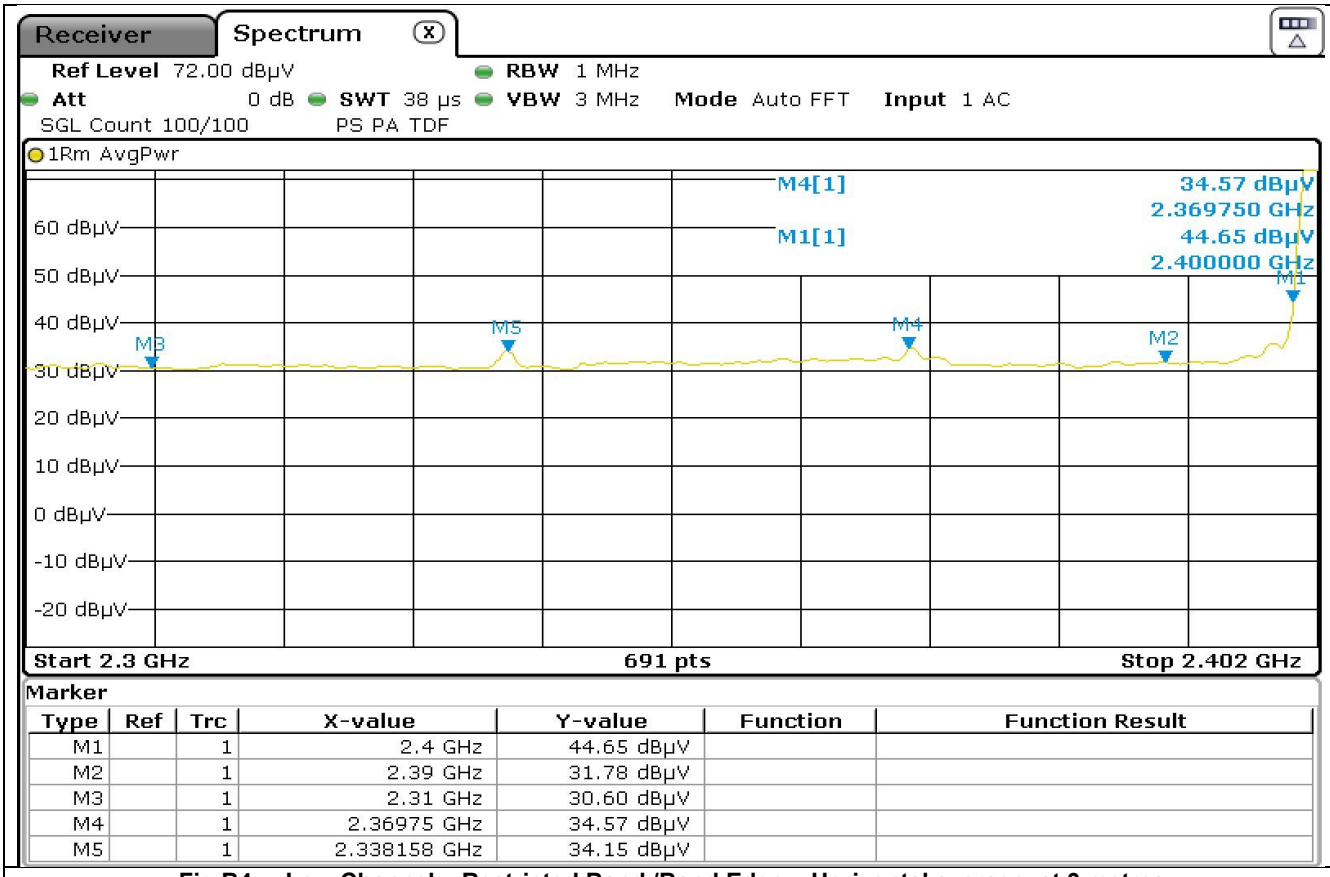
Fig B2 Low Channel Restricted Band /Band Edge Horizontal peak at 3 metres



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4 GHz	43.64 dBµV		
M2		1	2.39 GHz	31.42 dBµV		
M3		1	2.31 GHz	30.59 dBµV		
M4		1	2.36975 GHz	31.92 dBµV		
M5		1	2.338158 GHz	31.47 dBµV		

Fig B3 Low Channel Restricted Band /Band Edge Vertical average at 3 metres



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4 GHz	44.65 dBµV		
M2		1	2.39 GHz	31.78 dBµV		
M3		1	2.31 GHz	30.60 dBµV		
M4		1	2.36975 GHz	34.57 dBµV		
M5		1	2.338158 GHz	34.15 dBµV		

Fig B4 Low Channel Restricted Band /Band Edge Horizontal average at 3 metres

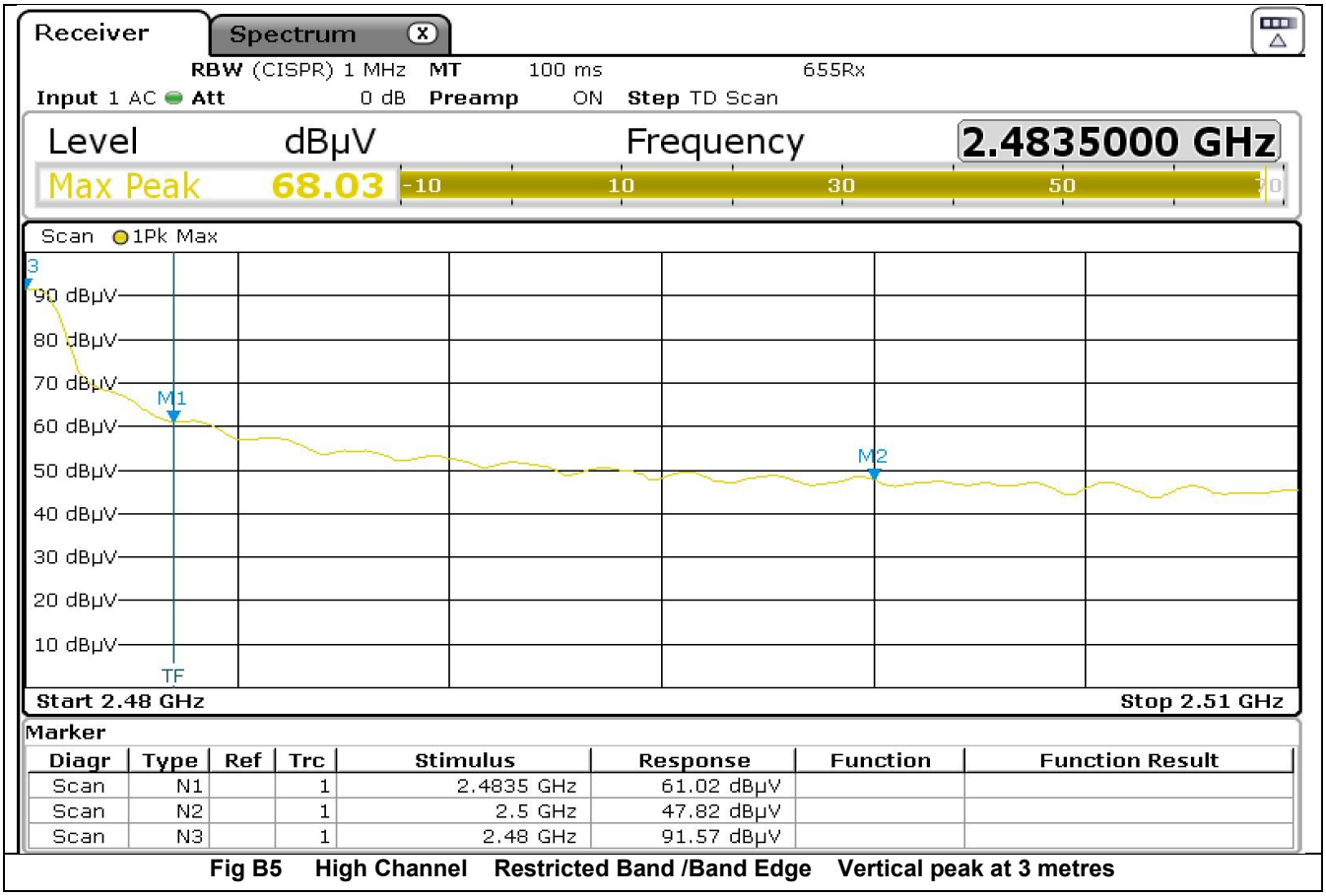


Fig B5 High Channel Restricted Band /Band Edge Vertical peak at 3 metres

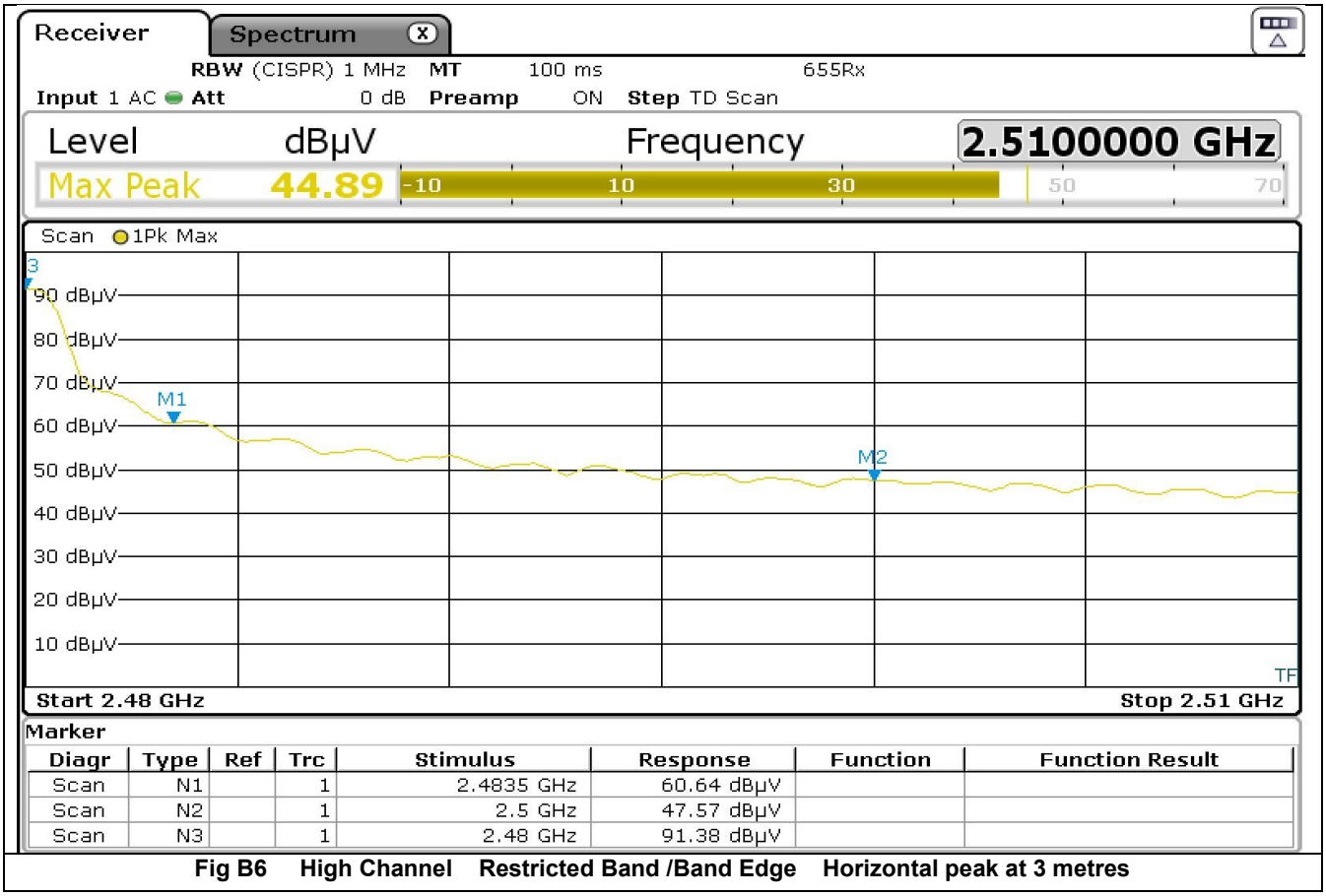


Fig B6 High Channel Restricted Band /Band Edge Horizontal peak at 3 metres

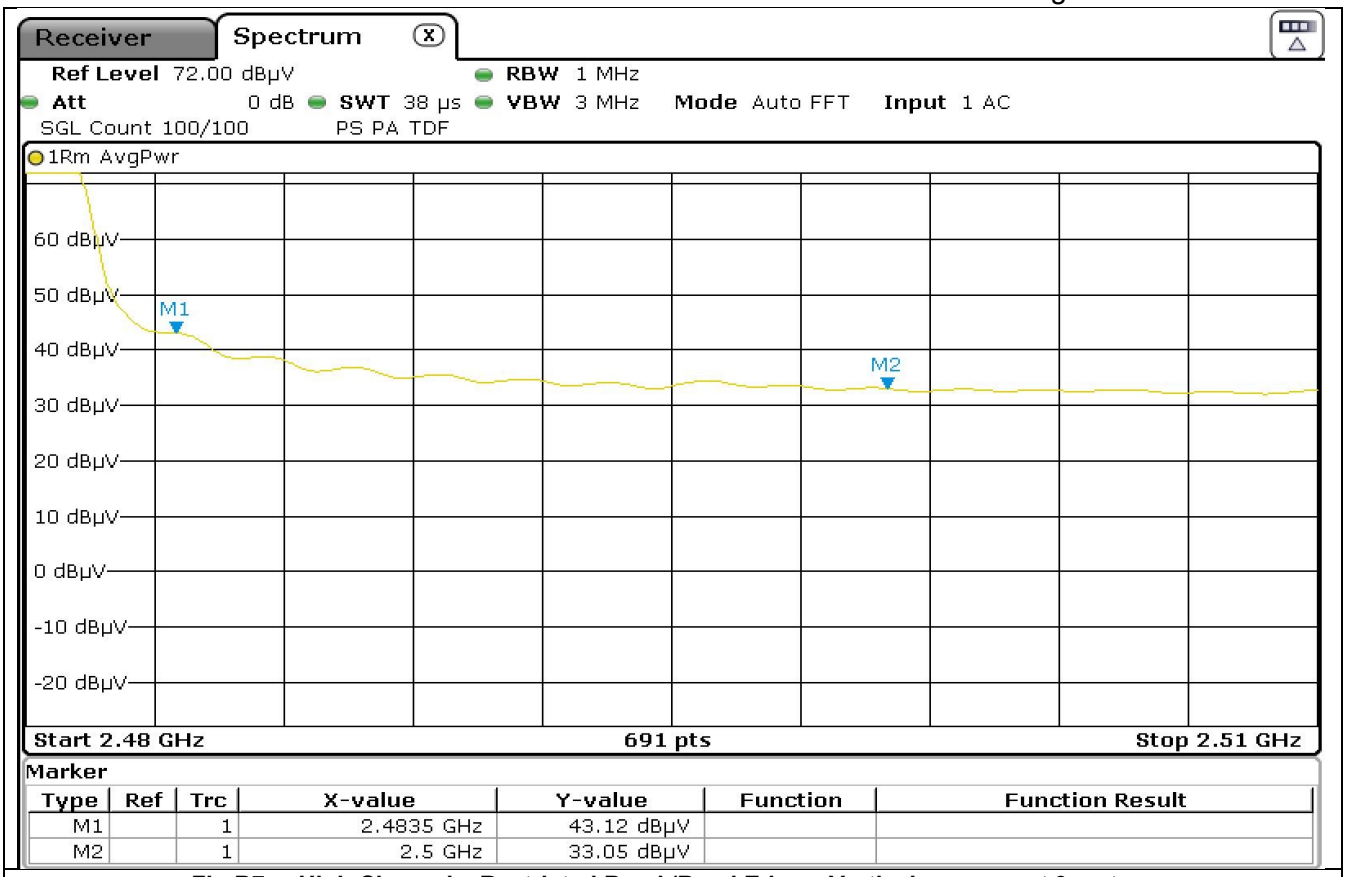


Fig B7 High Channel Restricted Band /Band Edge Vertical average at 3 metres

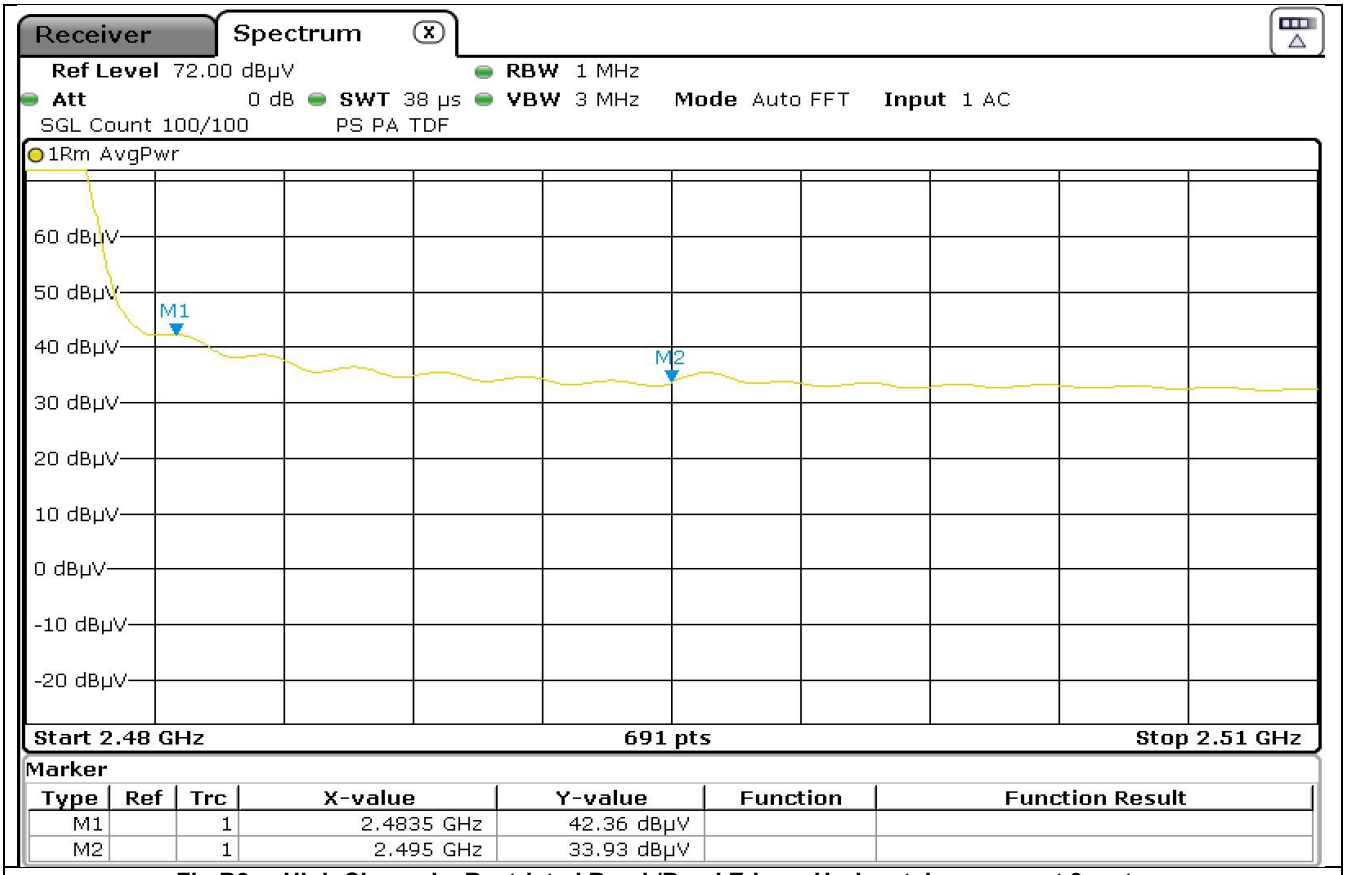


Fig B8 High Channel Restricted Band /Band Edge Horizontal average at 3 metres

Appendix C

Radiated Spurious Emissions

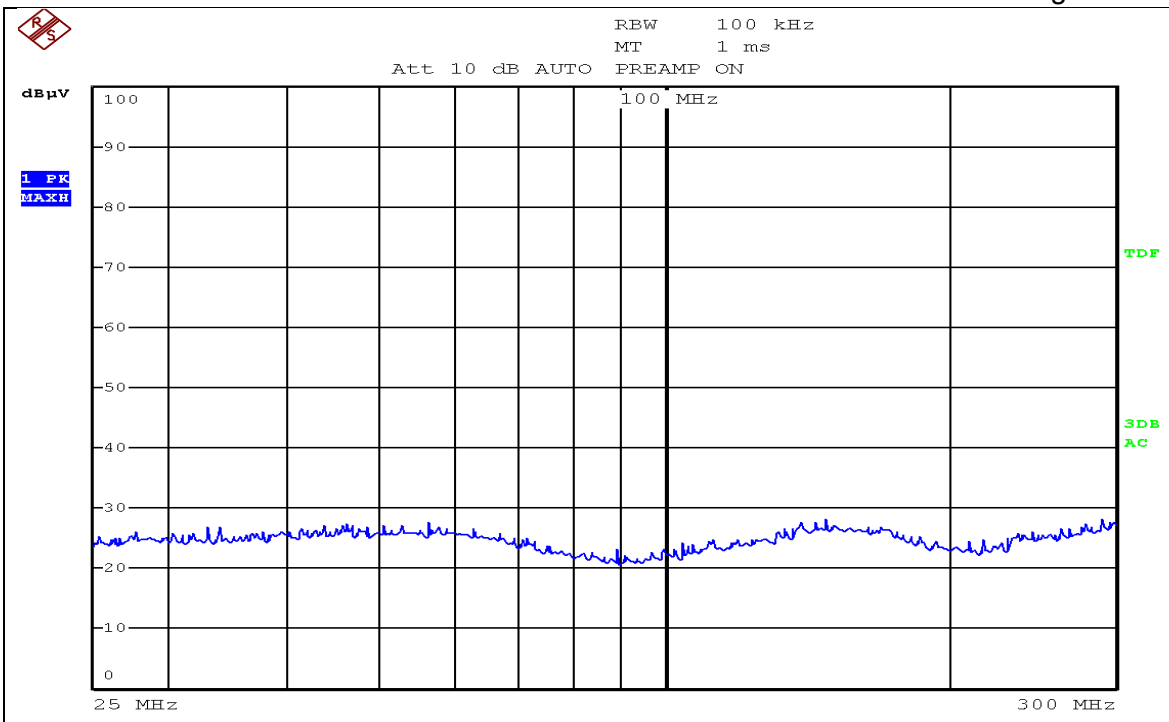


Fig C1 High Channel Radiated Emissions 30MHz -300MHz Vertical 3metres

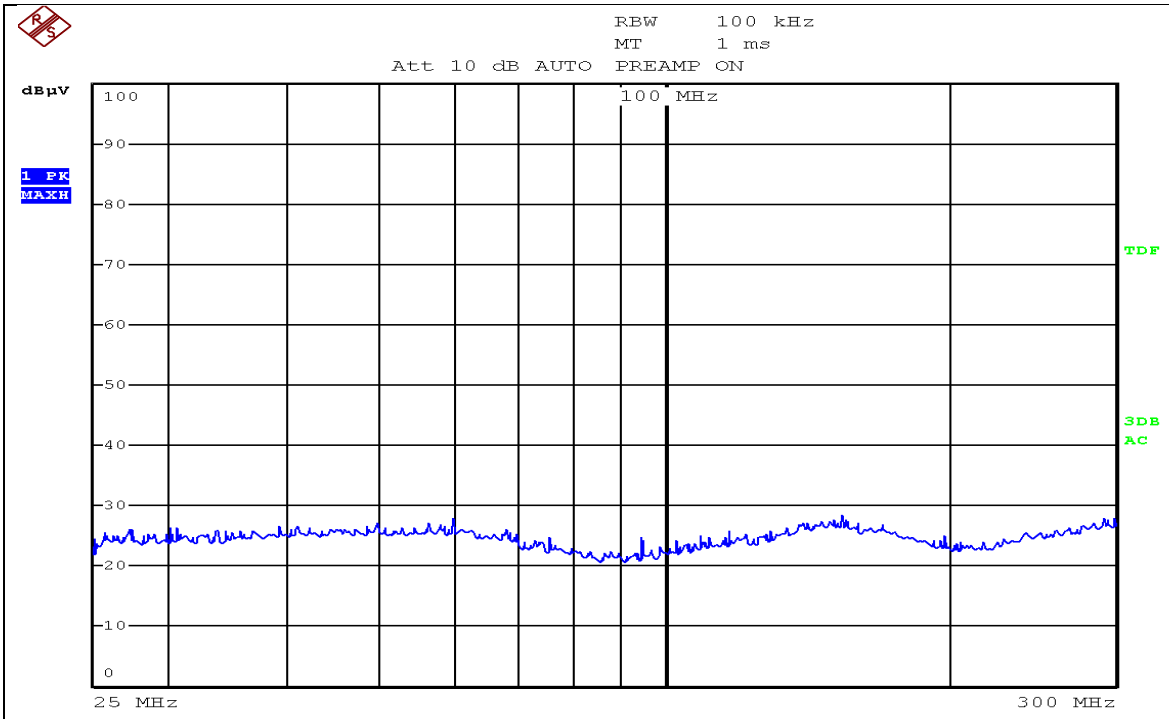


Fig C2 High Channel Radiated Emissions 30MHz -300MHz Horizontal 3metres

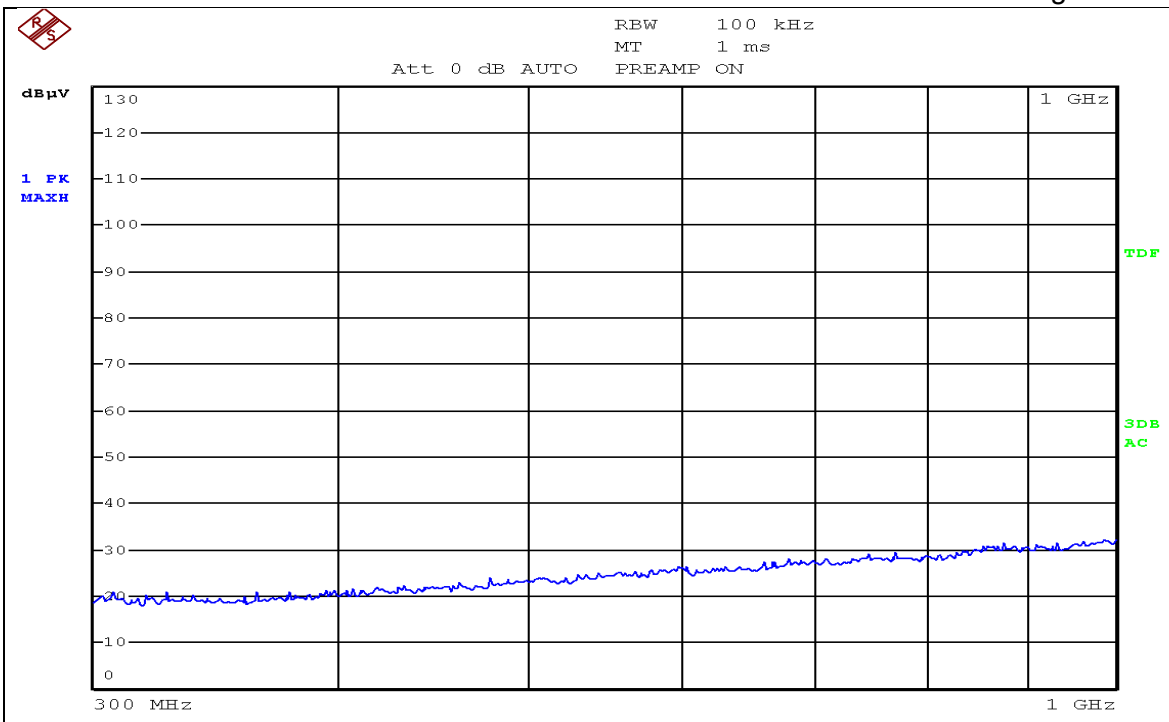


Fig C3 High Channel Radiated Emissions 300MHz -1GHz Vertical 3metres

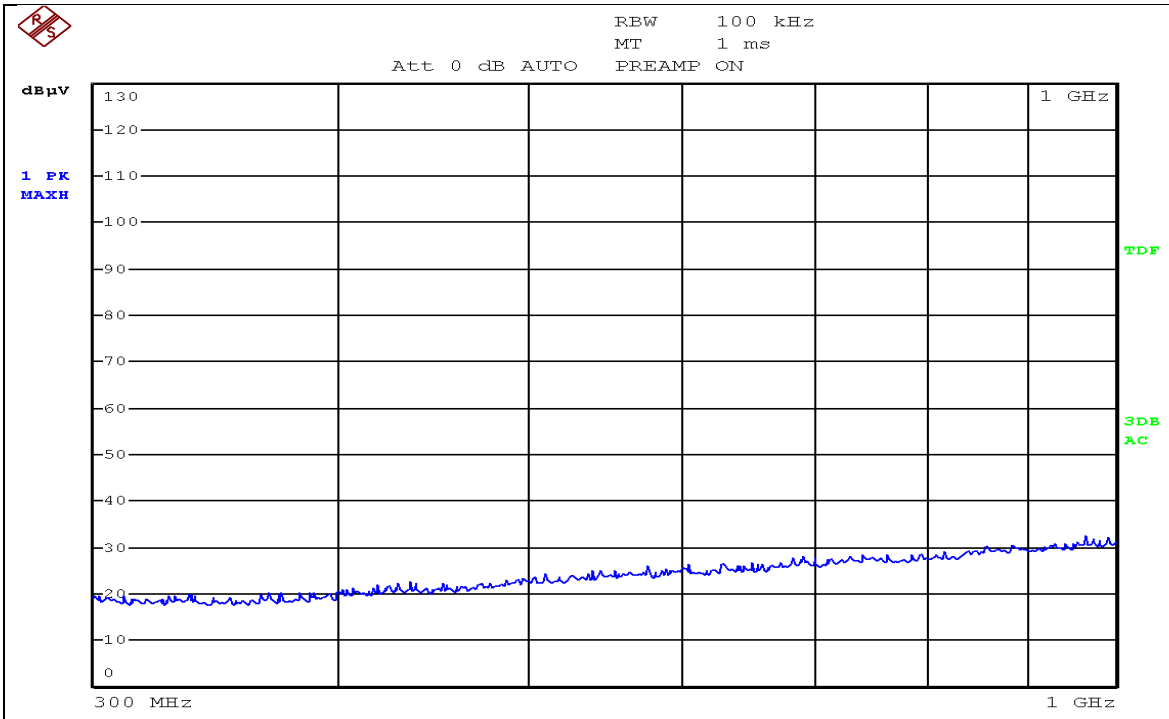


Fig C4 High Channel Radiated Emissions 300MHz -1GHz Horizontal 3metres

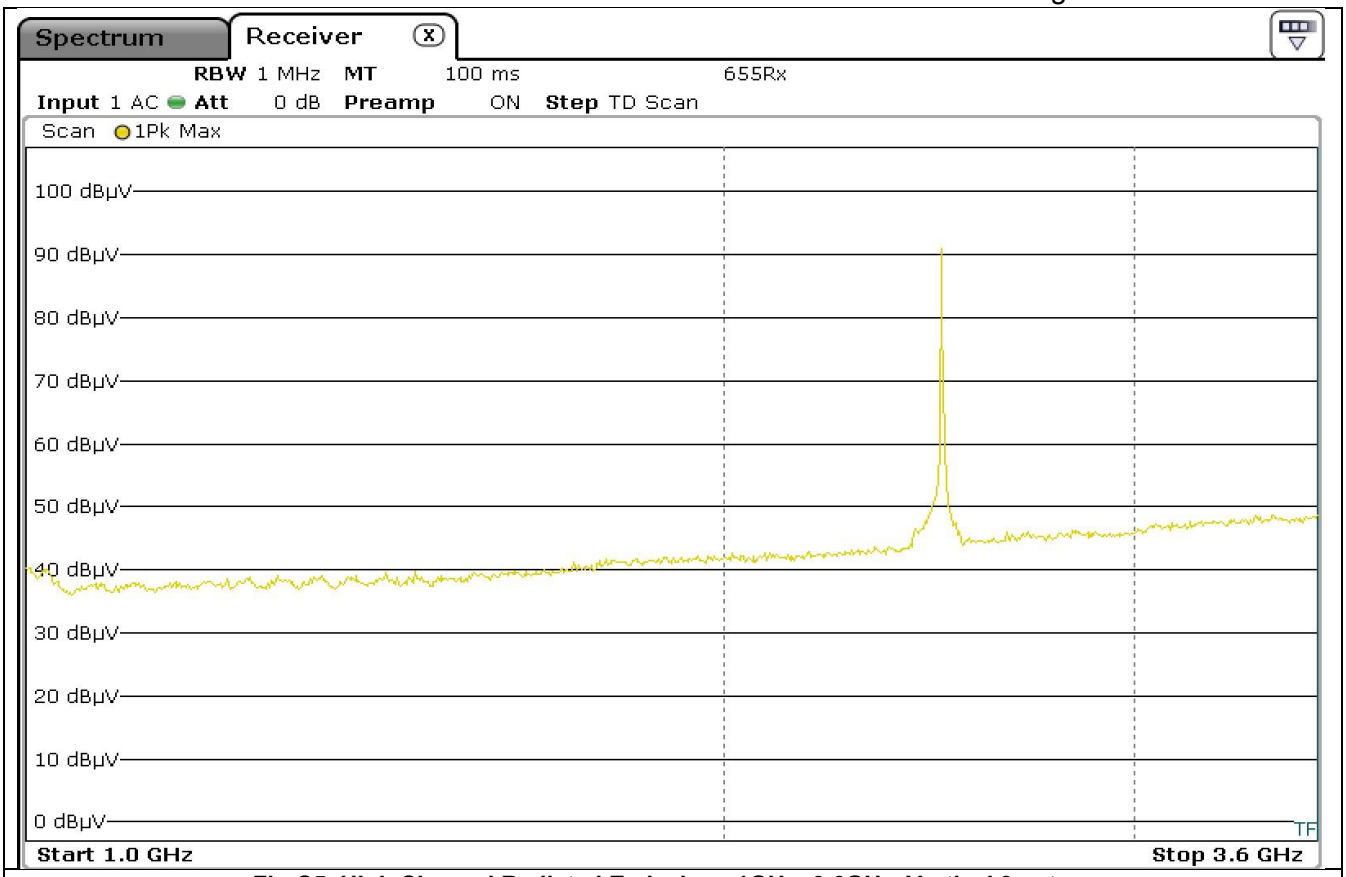


Fig C5 High Channel Radiated Emissions 1GHz -3.6GHz Vertical 3metres

Fig C6 High Channel Radiated Emissions 1GHz -3.6GHz Horizontal 3metres

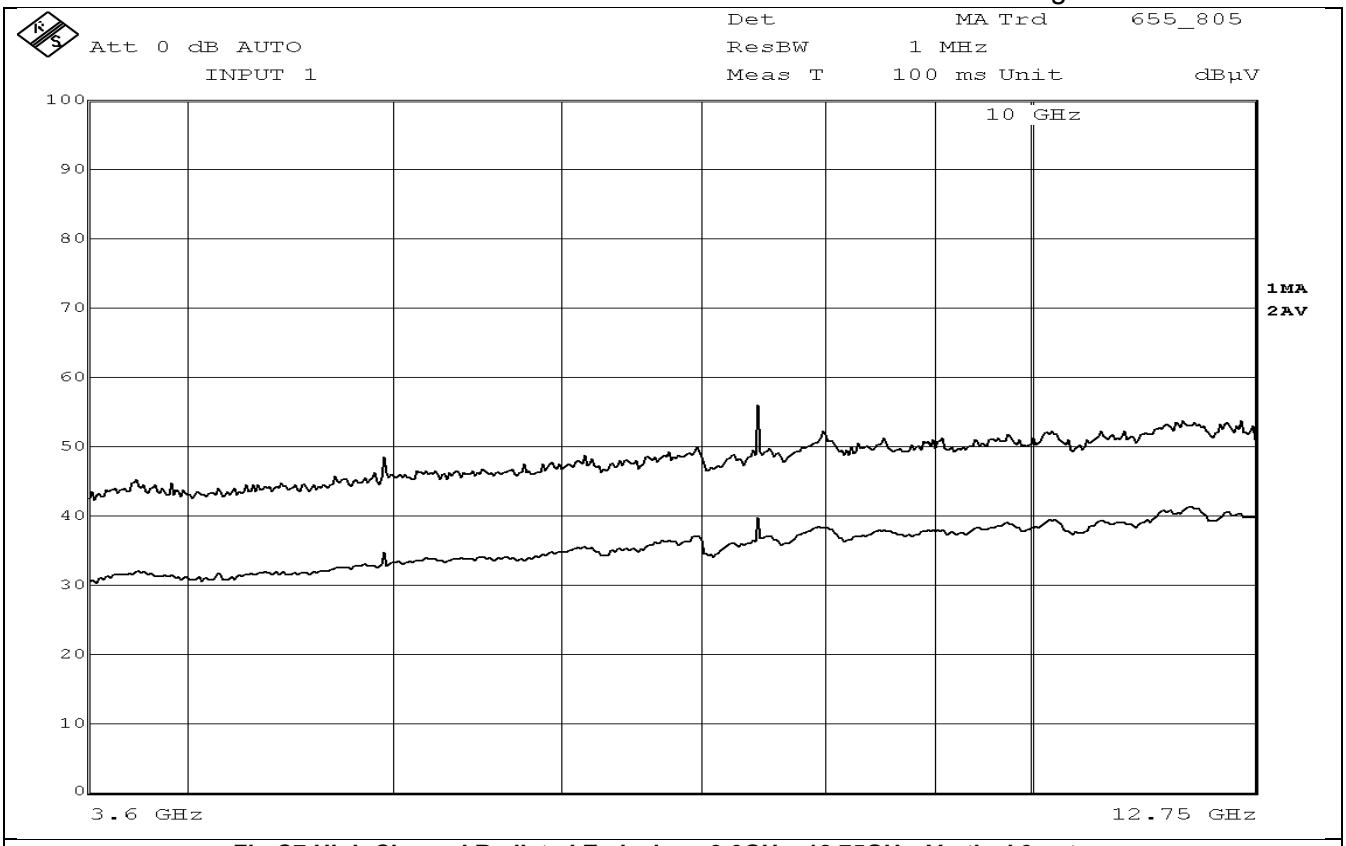


Fig C7 High Channel Radiated Emissions 3.6GHz -12.75GHz Vertical 3metres

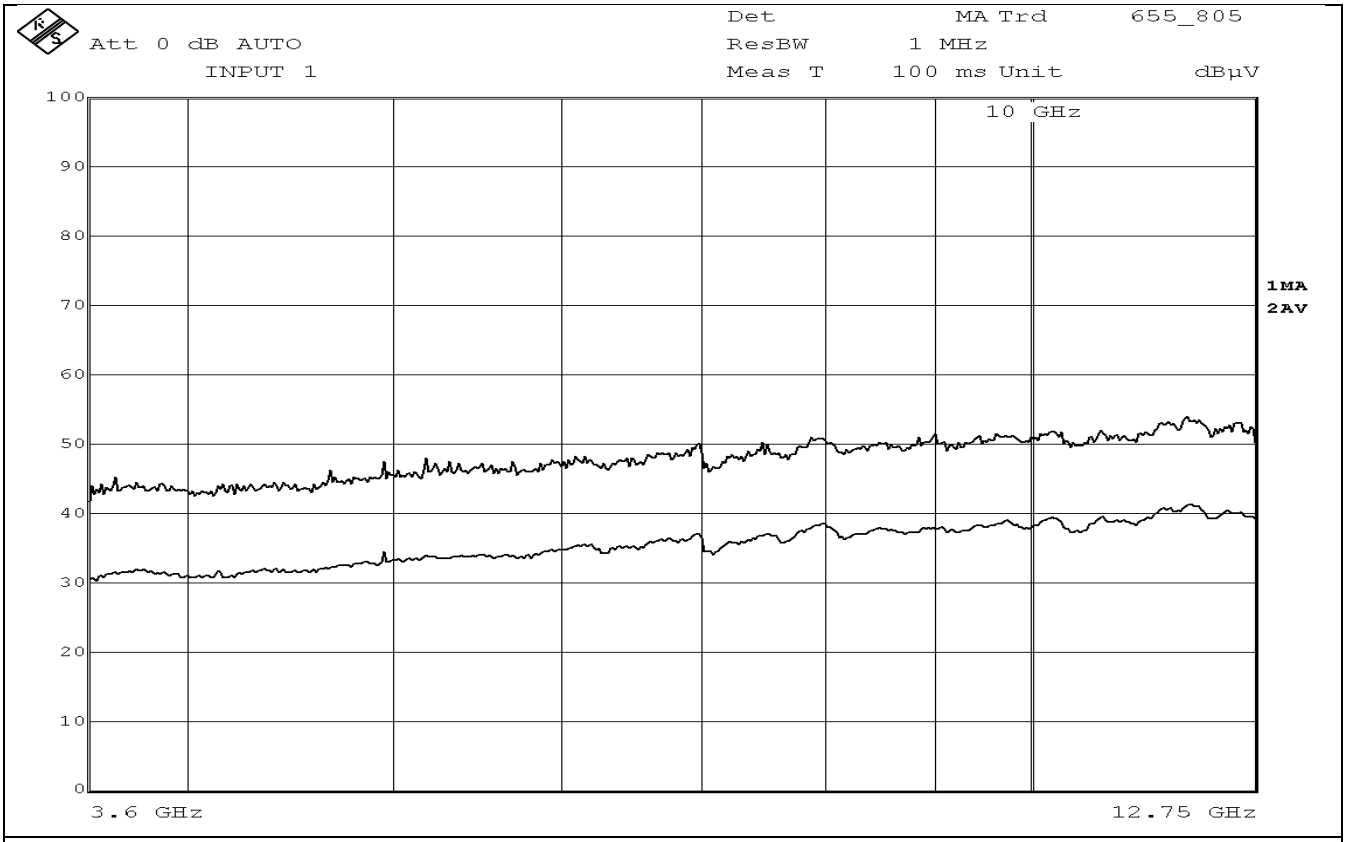


Fig C8 High Channel Radiated Emissions 7GHz -18GHz Horizontal 3metres

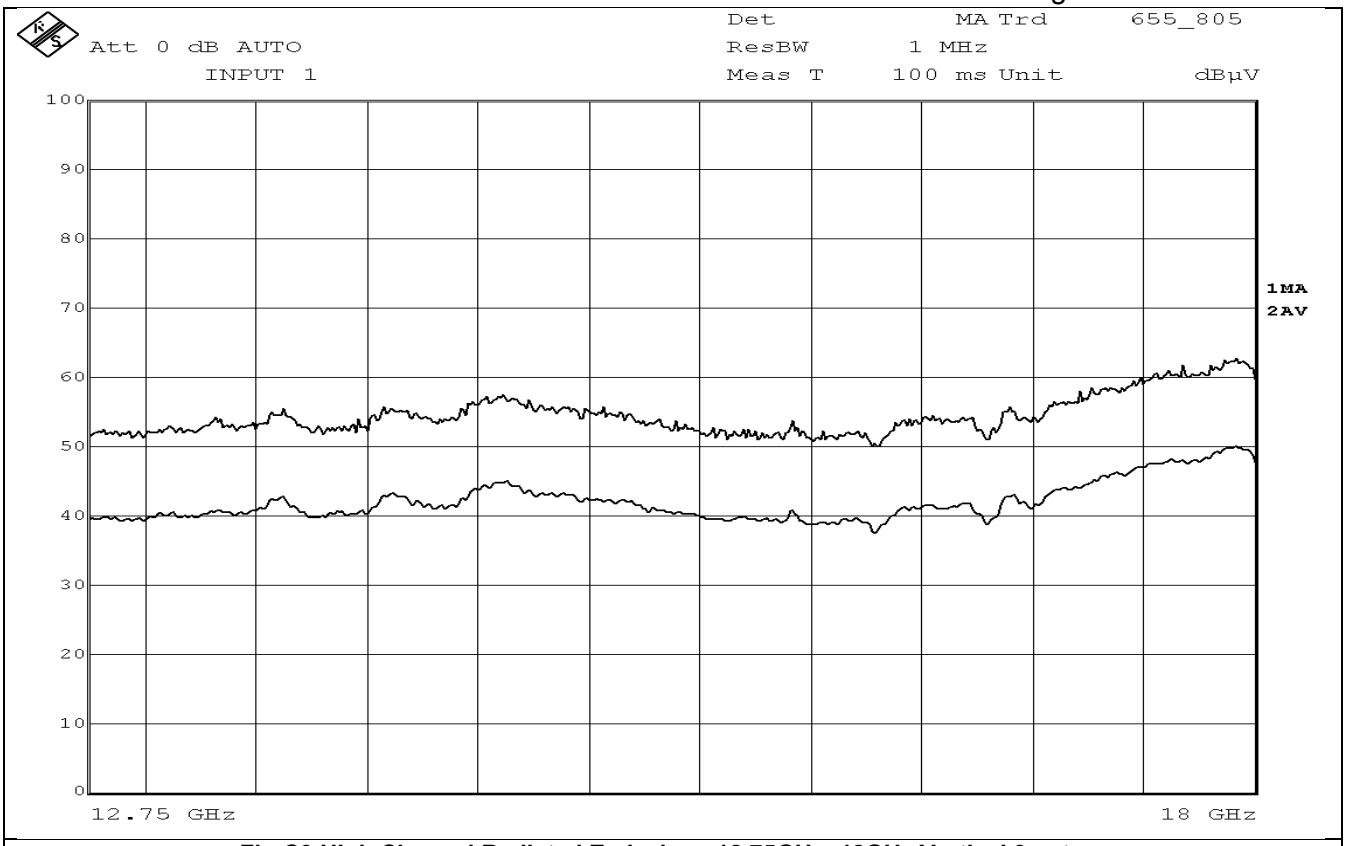


Fig C9 High Channel Radiated Emissions 12.75GHz -18GHz Vertical 3metres

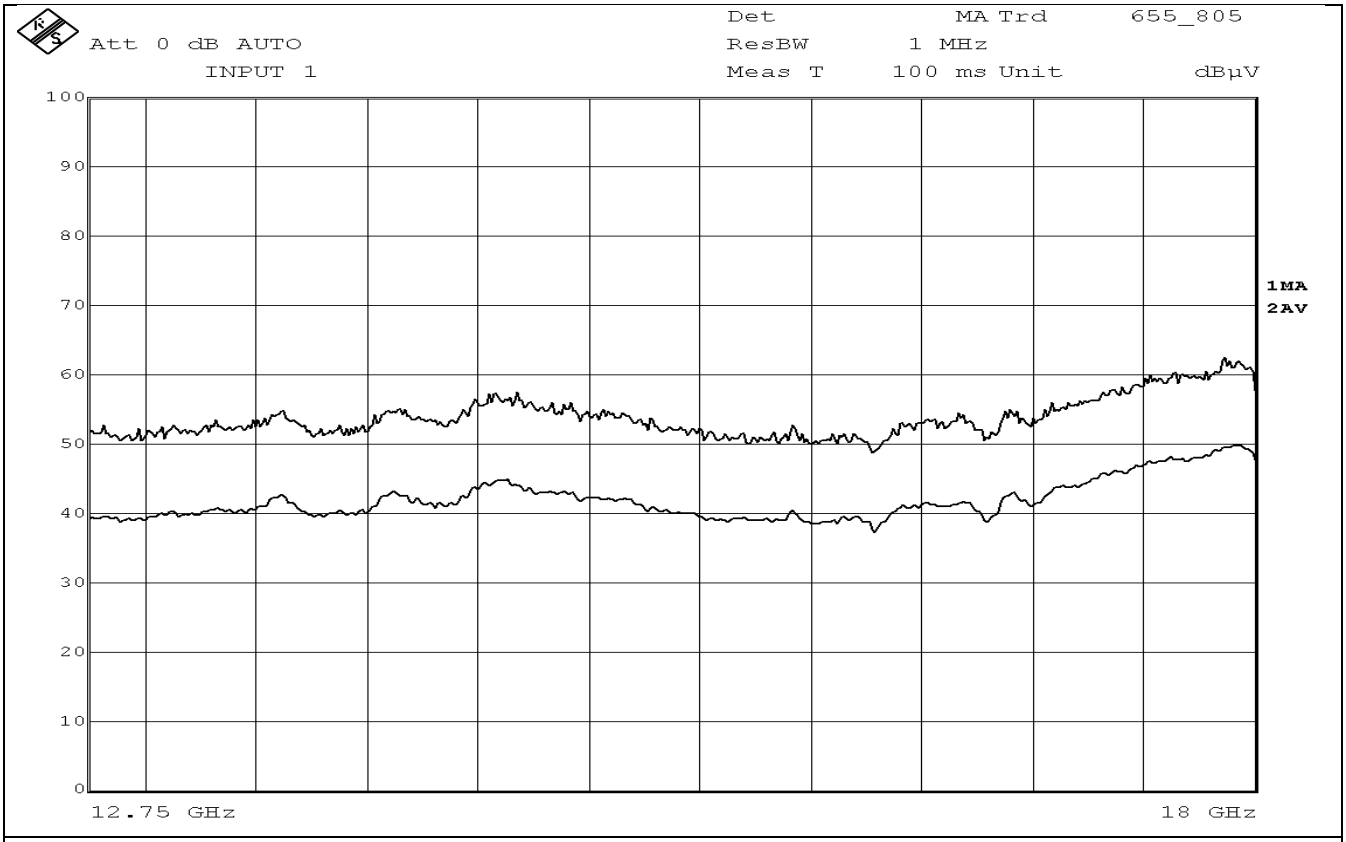


Fig C10 High Channel Radiated Emissions 12.75GHz -18GHz Horizontal 3metres

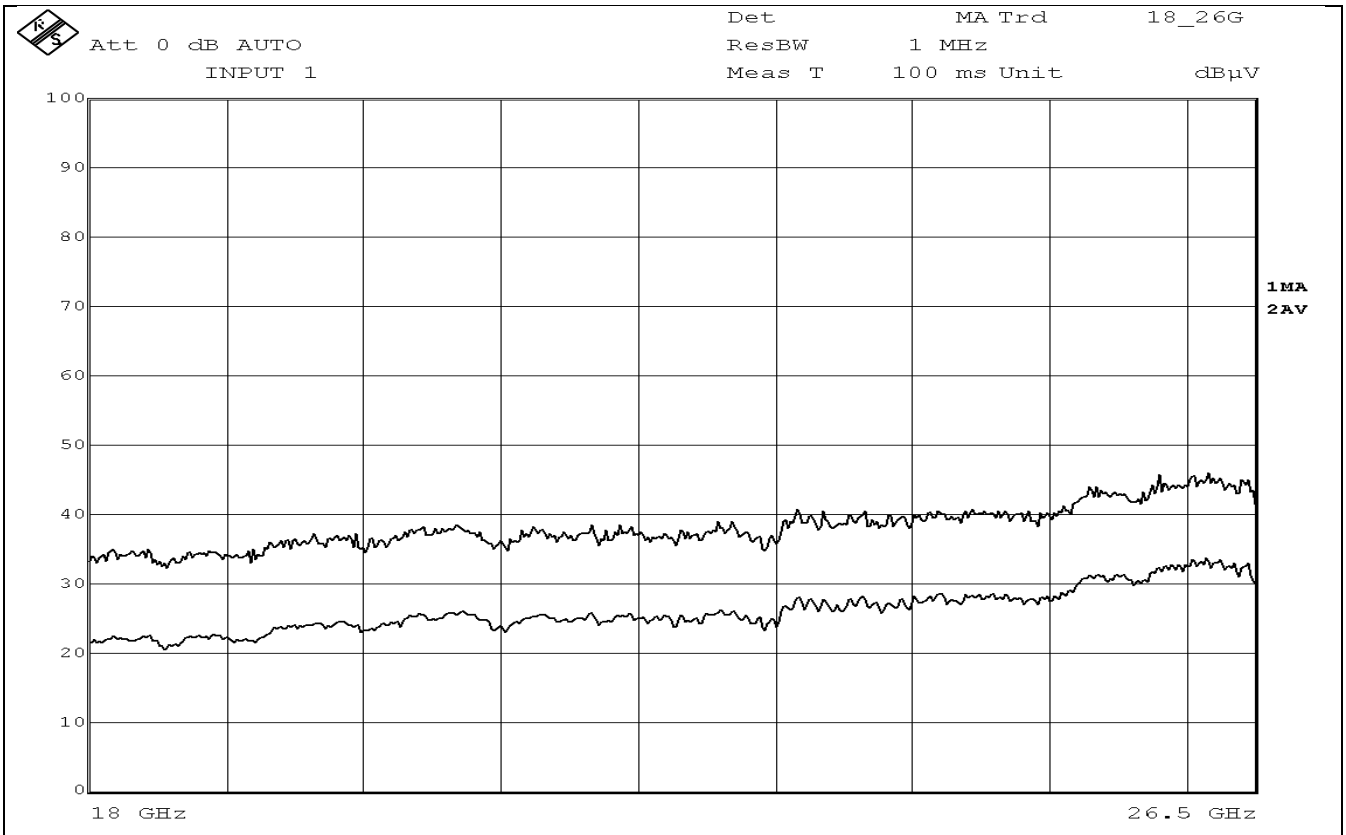


Fig C11 High Channel Radiated Emissions 18GHz -26.5GHz Vertical 1metre

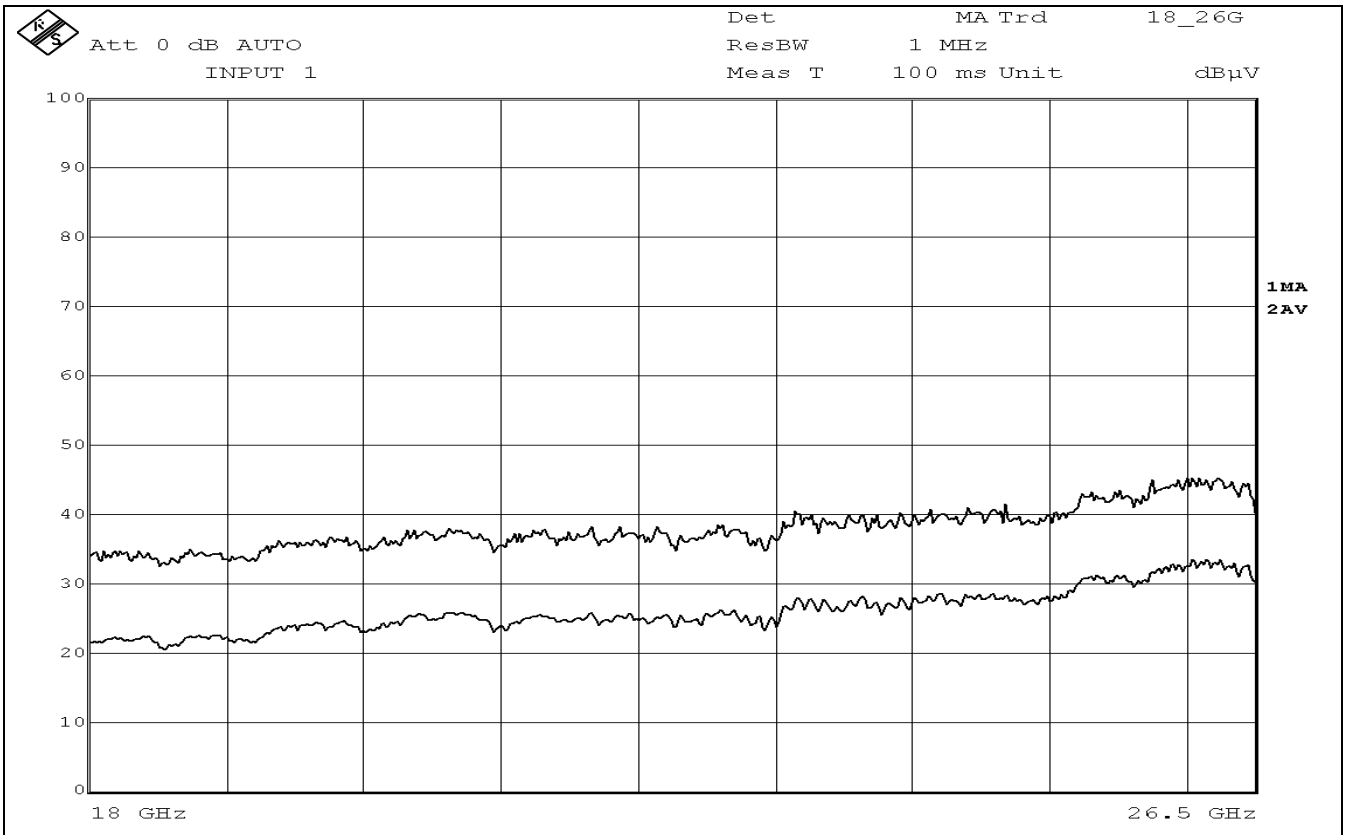


Fig C12 High Channel Radiated Emissions 18GHz -26.5GHz Horizontal 1metre

Appendix D

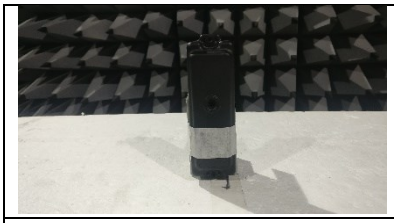
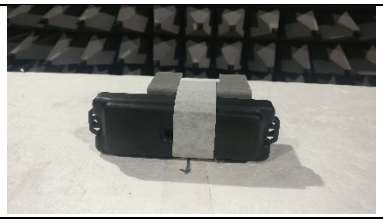
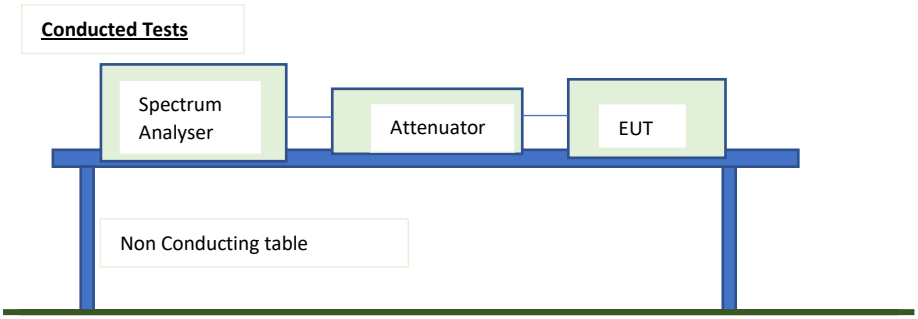
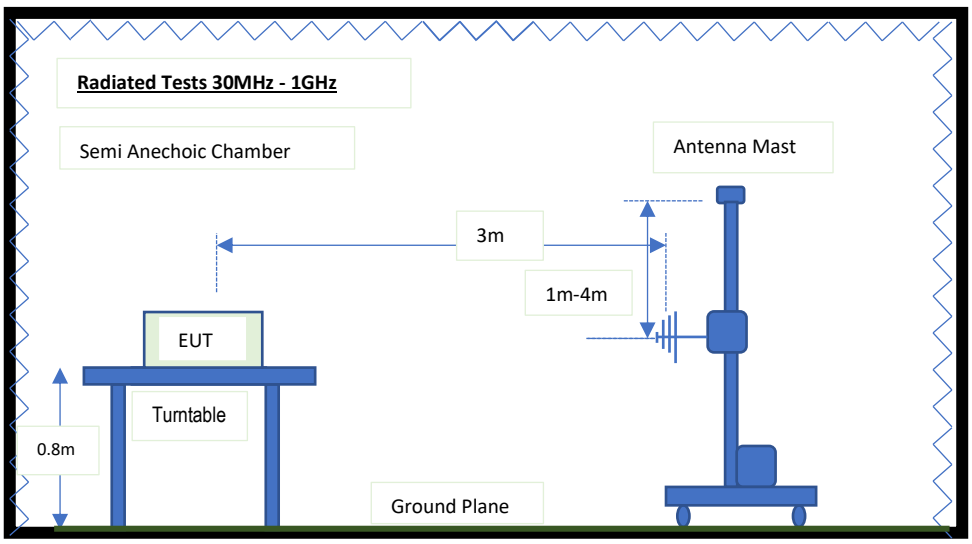
	

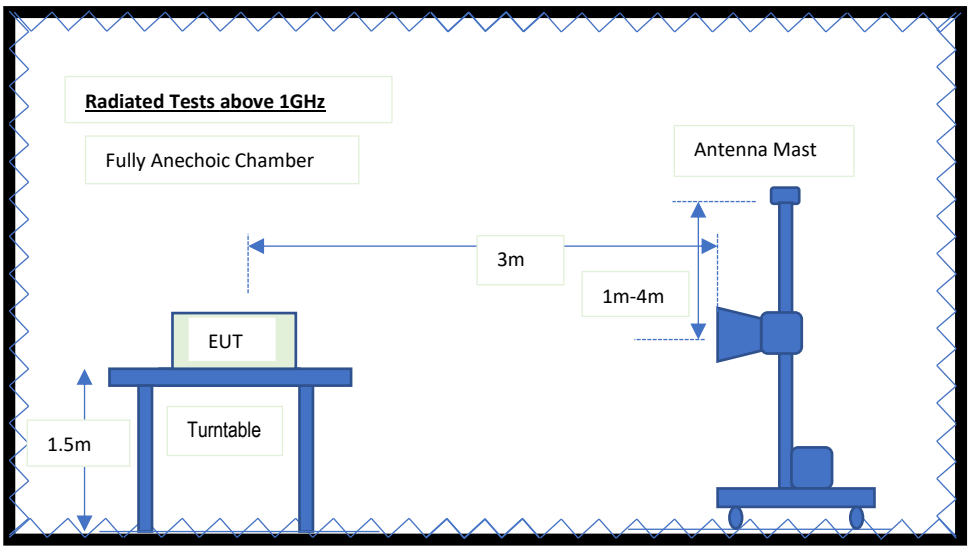
Fig D1 EUT orientation O1”	Fig D2 EUT orientation “O2”	Fig D3 EUT orientation “O3”

Orientations for Radiated Emissions

Appendix E
Block Diagrams of test set up







End of Report