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Confidential Report

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Quotation	Q21-1401-1
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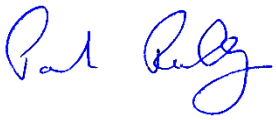
Test Report By	Michael Kirby
FCC Test Firm Registration	409640
ISED CAB identifier:	IE0001
Date	6th Sept 2021
EUT Description	Asset Tracker
FCC ID	2AT4VSKALLI1RM
IC ID	26629-SKALLI1RM
Authorised by	**Paul Reilly**
Authorised Signature:	

TEST SUMMARY

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

15.-247 Section	RSS-247 Section	TEST PARAMETERS	Test Result
15.247(a)	5.1(a)	20dB bandwidth of hopping Channel	Pass
15.247(a)	5.1(b)	Hopping Frequency Separation	Pass
1.247(a)	5.1(c)	Number of Hopping Channels	Pass
15.247(a)	5.1(c)	Average Time of Occupancy	Pass
15.247(b)	5.4	Output power	Pass
15.247(d)	5.5	Conducted Spurious Emissions	Pass
	RSS Gen 6.7	99% bandwidth	Pass
15.205 15.209	RSS Gen 8.9 and 8.10	Radiated Spurious Emissions for restricted bands	Pass

RSS 247 Issue 2 Mar16 2017
RSS-Gen Issue 5 Amd2 Feb 2021

Exhibit A – Technical Report

Table of Contents

1.0 EUT Description

FCC ID	2AT4VSKALLI1RM
IC ID	26629-SKALLI1RM
Model:	2EE-02707AB
HVIN:	2EE-02707AB
PMN:	Skalli1RM
Type:	Asset Tracker
Type of radio:	Stand-alone
Power configuration:	3.6 VDC Internal Battery (non rechargeable)

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
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
Ports:	None
Classification:	DTS
Antenna:	Integral
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 Sigfox transmitter.

1.1 EUT Operation

Operating Conditions during Test:

Conducted measurements were carried out on a sample 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.

Radiated measurements were performed on a sample with standard internal antenna.

The EUT was powered from its internal battery for all tests (and a new battery was used).

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, 13th Aug and 6th Sept 2021.

1.4 Special Test Software

Tests were performed manually and no special test software was used

2.0 Emissions Measurements

2.1 Conducted Emissions Measurements

Conducted emissions were performed on a sample where the antenna was replaced by a cable and SMA connector.

2.2 Radiated Emissions Measurements

2.2.1 General

Emissions below 1GHz were measured using resolution bandwidth 100kHz at a measurement distance of 3 metres with EUT on a motorised turntable which allowed 360 degrees rotation.

Emissions above 1GHz were measured with resolution bandwidth of 1MHz at a measurement distance of 3 metres with EUT on a motorised turntable which allowed 360 degrees rotation.

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.
Significant peaks from the EUT were then recorded to determine margin to the limits.

Tests were carried out as per Ansi C63.10 -2013

2.2.2 Measurements in Transmit mode

A radiated emissions pre-scan was performed which covered the x, y and z orientations in horizontal and vertical polarizations. In each case the emission was maximised.
The result of this pre-scan showed that the highest emission for vertical polarization was with the EUT vertical (orientation2 O2)
The EUT in a horizontal orientation (orientation1 O1) gave the highest emissions for vertical polarization.
A full scan for radiated emission was performed in orientation O2 for vertical polarization and in orientation O3 for horizontal polarization.

Ref Appendix C for Orientations

3. Conducted Emissions on the fundamental

3.1 Occupied Bandwidth

3.1.1 20dB Bandwidth

Requirement FCC 15.247(a) IC RSS-247 5.1a

The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The maximum 20 dB bandwidth of the hopping channel shall be 500 kHz

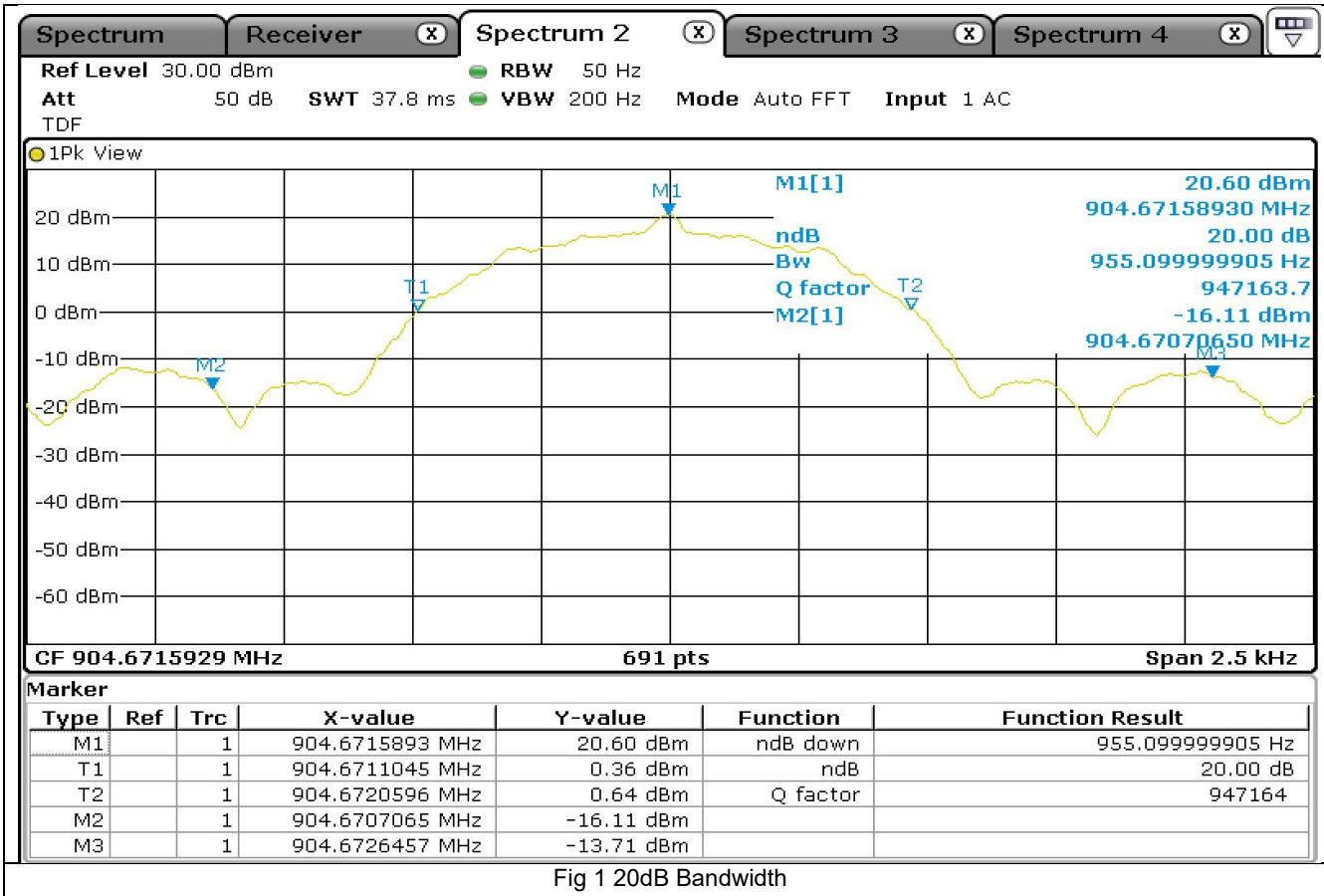


Fig 1 20dB Bandwidth

Frequency	20dB Bandwidth	Limit Min	Margin
GHz	Hz	KHz	MHz
902.147	973.2	500	499.03
903.388	995.7	500	499
904.663	955.099	500	499.04

Test Result Pass

3.1.2 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).

TEST PROCEDURE
The test was performed as a conducted measurement

RESULTS

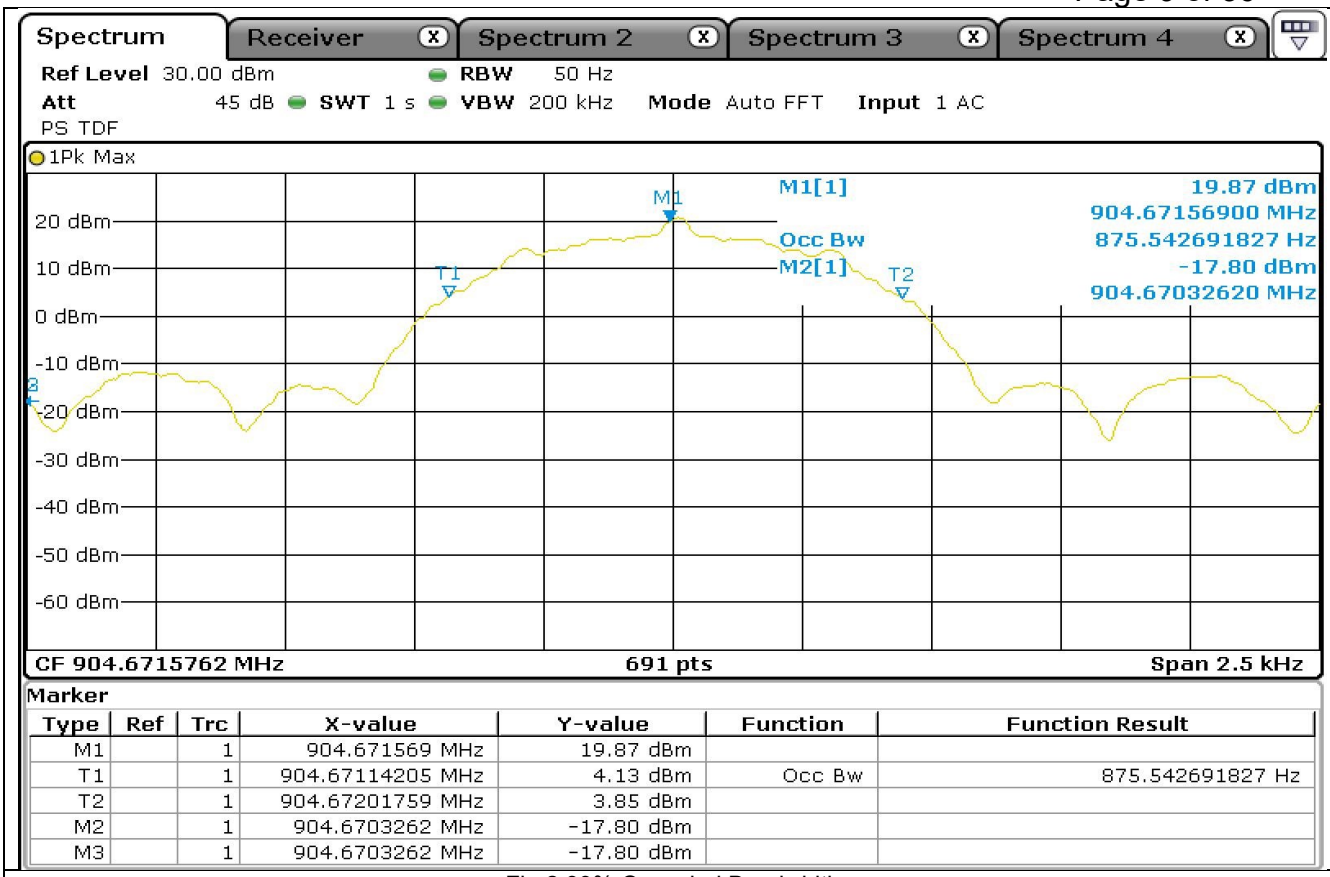


Fig 2 99% Occupied Bandwidth

Frequency	99% Bandwidth
GHz	Hz
902.147	859.624
903.388	871.925
904.663	875.543

No Limit

Test Result Pass

3.2 Hopping Frequency Separation

Requirement FCC 15.247(a) IC RSS-247 5.1b

FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Number of hopping channels =
9 macro channels containing 6 micro channels each.
⇨ Total of 54 micro channels

Each micro channel is active for 300mS per 20sec window

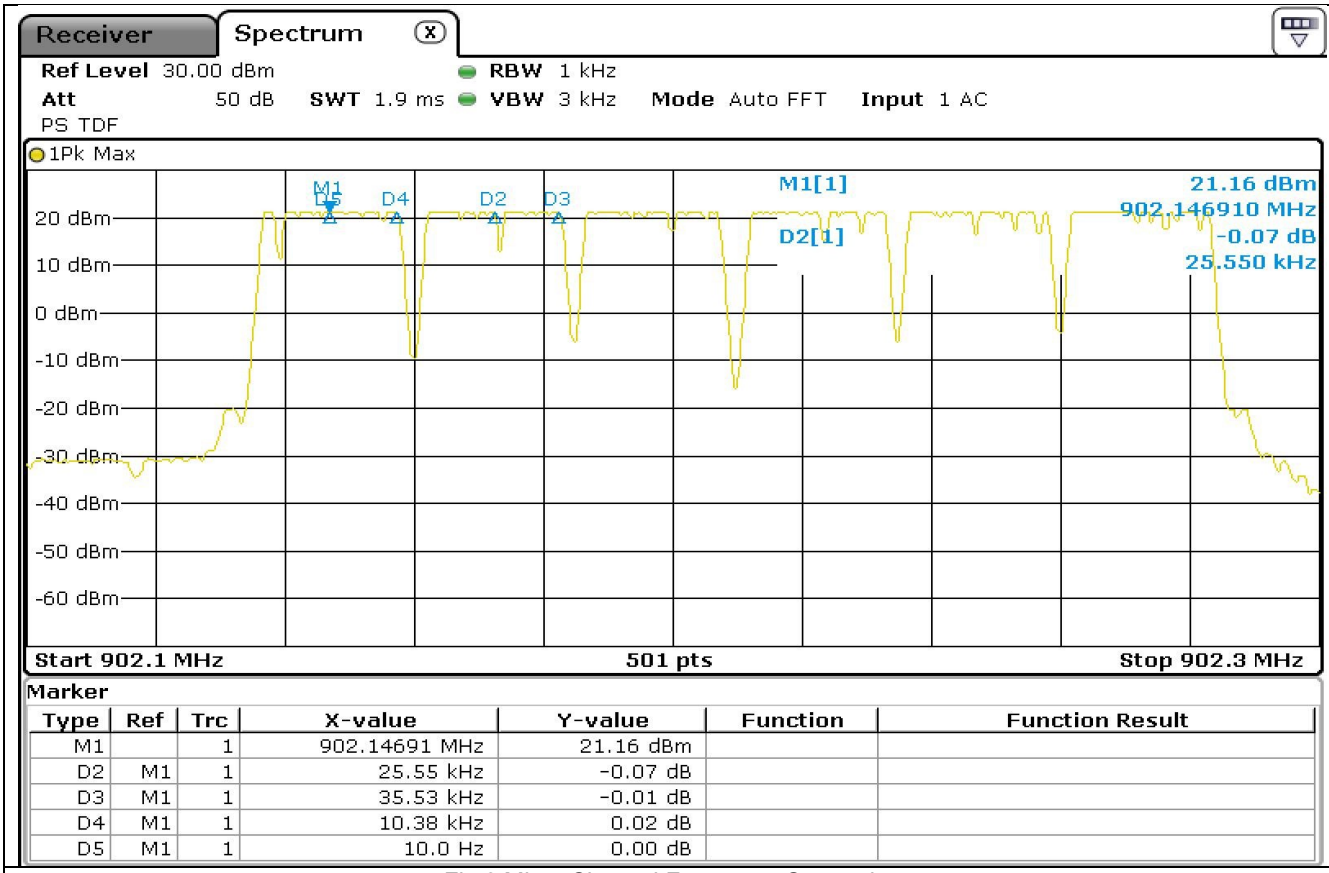


Fig 3 Micro Channel Frequency Separation

Micro Channel Separation (measured from channel centres) =25.55KHz

Test Result Pass

3.3 Number of Hopping Channels

Requirement FCC 15.247(a) IC RSS-247 5.1c

For FHSs in the band 902-928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20-second period. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum 20 dB bandwidth of the hopping channel shall be 500 kHz

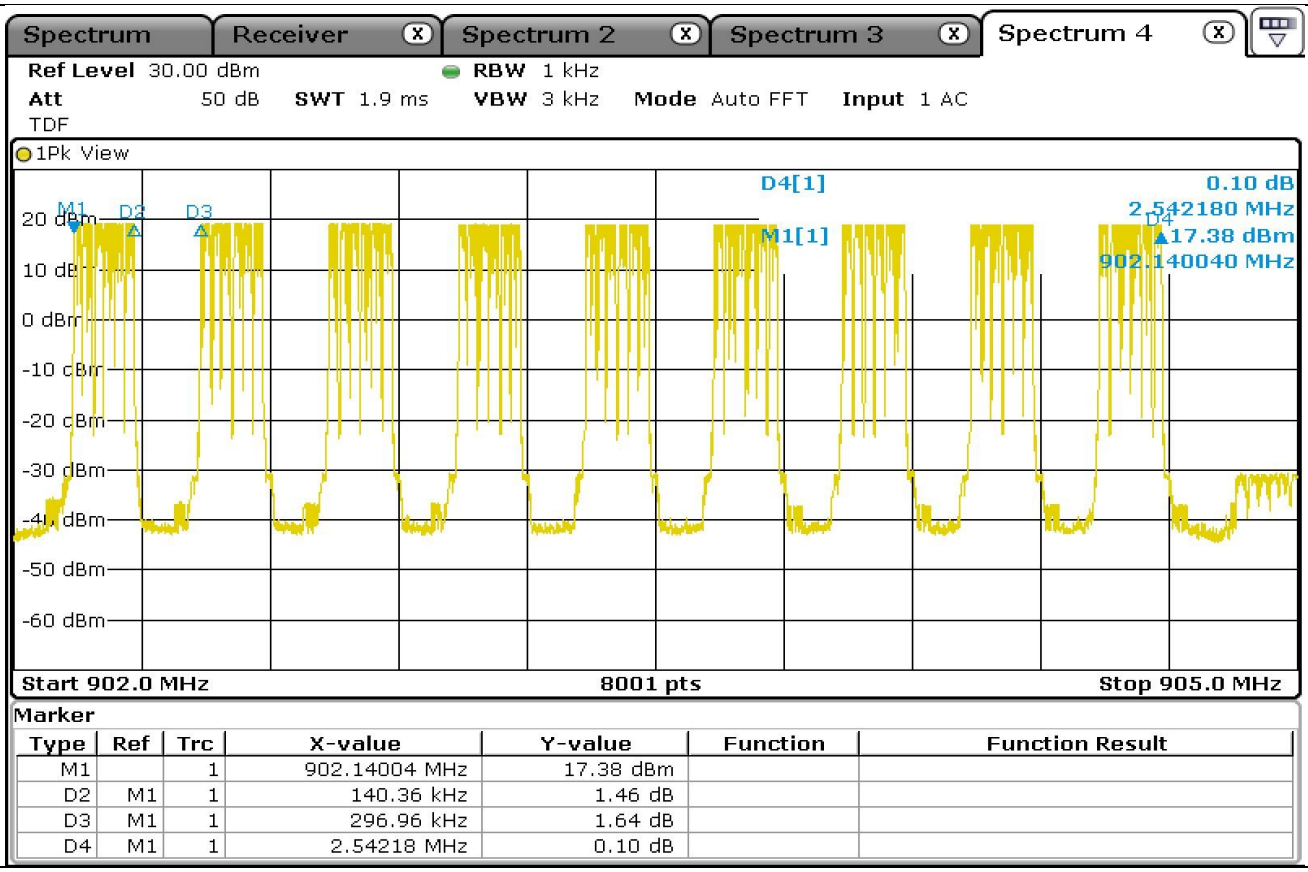


Fig 4 Scan showing 9 Macro Channels

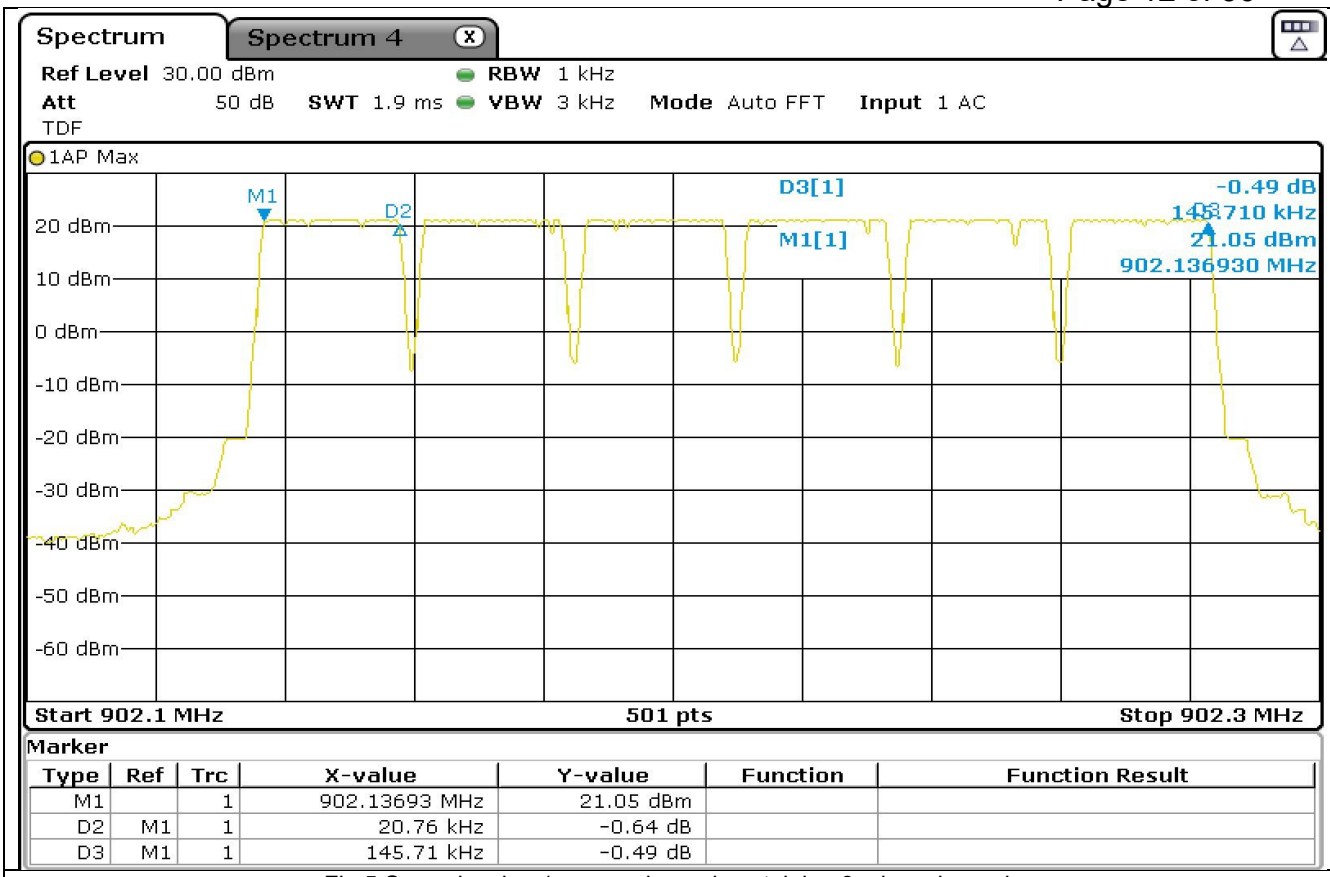


Fig 5 Scan showing 1 macro channel containing 6 micro channels

Number of hopping channels =
9 macro channels containing 6 micro channels each.

⇨ Total of 54 micro channels

Limit = Min 50 channels

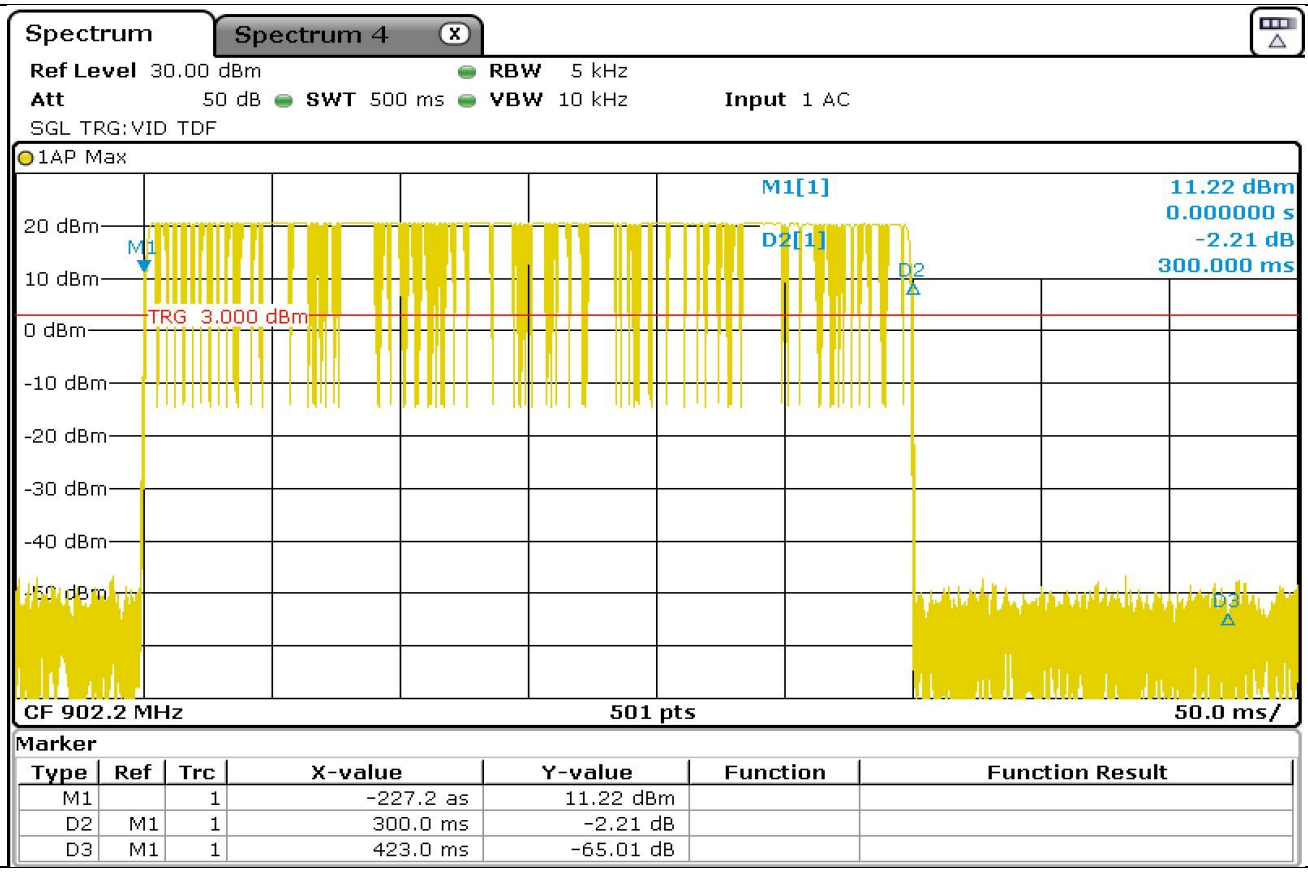
Test Result Pass

3.4 Occupancy

Requirement FCC 15.247(a) IC RSS-247 5.1c

For FHSs in the band 902-928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20-second period. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The

Results



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-227.2 as	11.22 dBm		
D2	M1	1	300.0 ms	-2.21 dB		
D3	M1	1	423.0 ms	-65.01 dB		

Fig 6 Micro channel pulse width

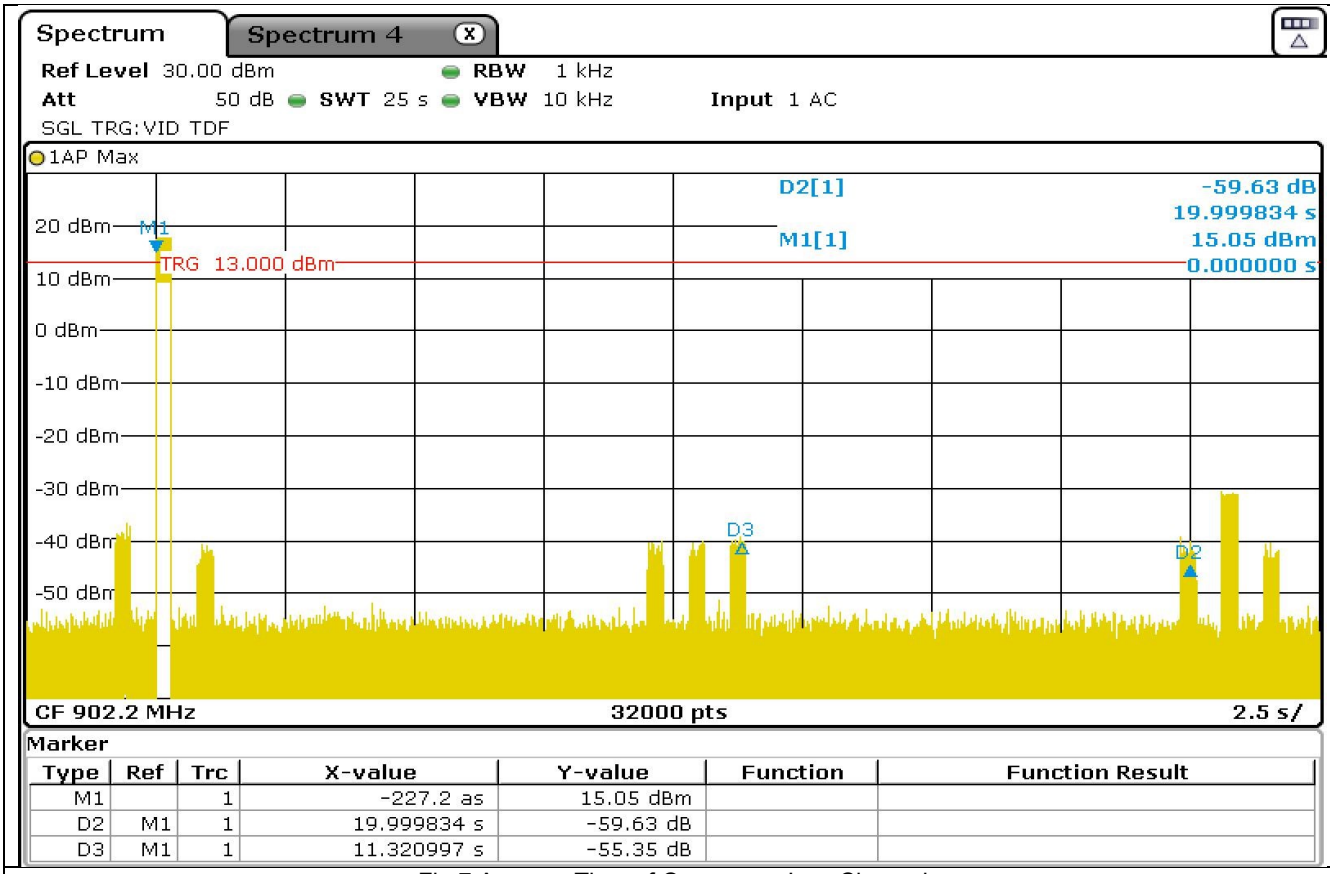


Fig 7 Average Time of Occupancy Low Channel

The scans show that each micro channel on-time is 0.3 secs and the occupancy is less than 0.4secs per 20sec window.

Test Result Pass

3.5 Output Power Conducted

Requirement FCC 15.247(b) IC RSS-247 5.4

For FHSs operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W and the e.i.r.p. shall not exceed 1 W if the hopset uses less than 50 hopping channels.

3.5.1 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.

Test
The test was performed as a conducted measurement

Results
The maximum antenna gain is less than 6dBi therefore the limit is 30dBm

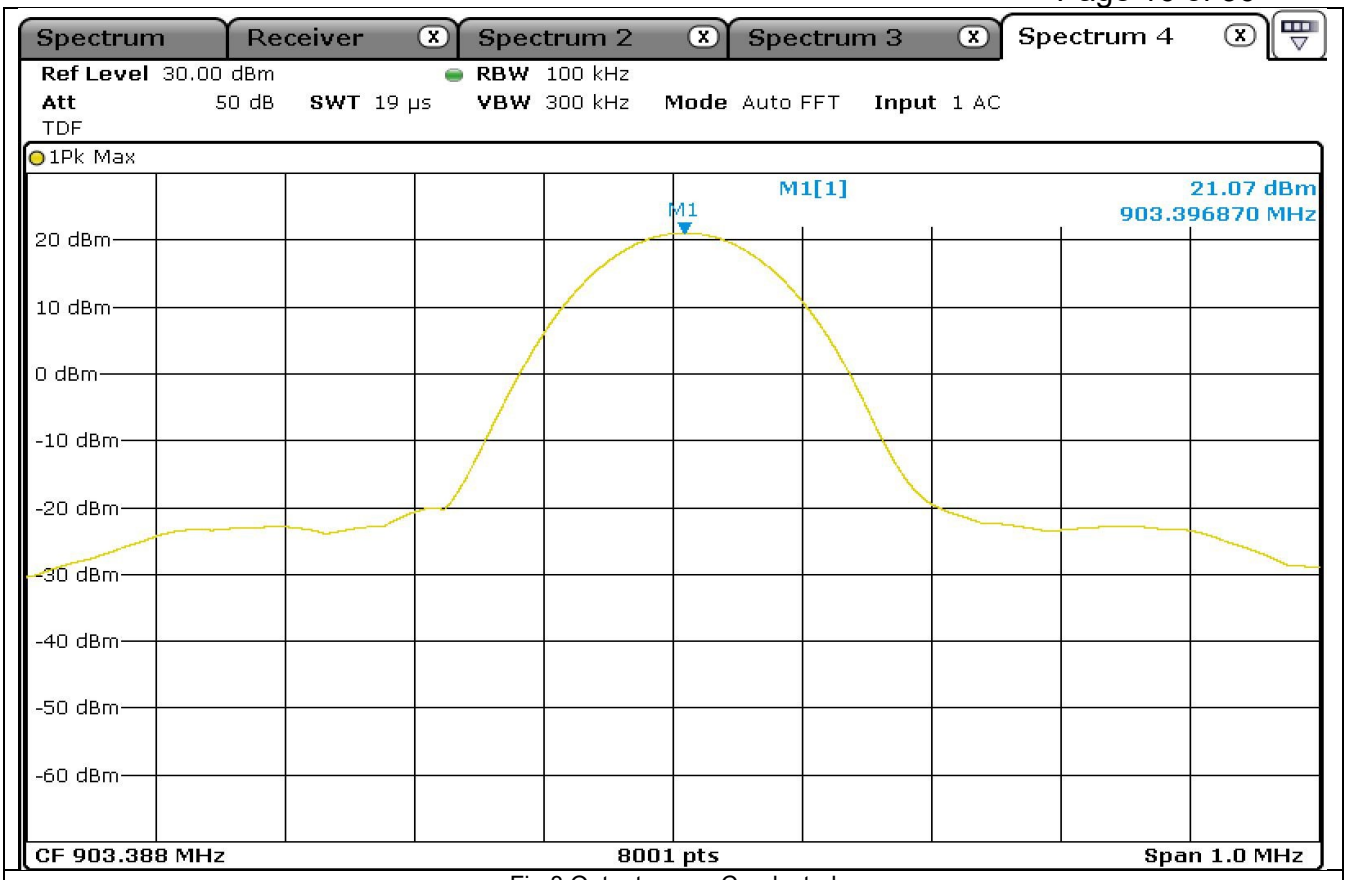


Fig 8 Output power Conducted

Frequency	Measurement	Limit	Margin
MHz	dBm	dBm	dB
902.147	21.04	30	8.93
903.388	21.07	30	8.93
904.663	21.17	30	8.83

Test Result Pass

4. Spurious Emissions Measurements

4.1 Conducted Emissions

Requirement FCC 15.247(d) IC RSS-247 5.5

4.1.1 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).

Test Specification: FCC 15.247(d) IC RSS-247 5.5

4.1.2 Results

Frequency	Peak 100KHz RBW	Measured	Limit Min	Margin
GHz	dBm	dBc	dBc	dB
0.902138	21.04	0	20	-
1.804275	-34.7	55.74	20	35.74
2.7064	-63.1	84.14	20	64.14
3.6086	-74.13	95.17	20	75.17
4.51076	-74.13	95.17	20	75.17
5.41288	-68.73	89.77	20	69.77
6.31504	-68.2	89.24	20	69.24
7.2172	-63.3	84.34	20	64.34
8.11932	-56.88	77.92	20	57.92

Frequency	Peak 100KHz RBW	Measured	Limit Min	Margin
GHz	dBm	dBc	dBc	dB
0.903388	21.07	0	20	-
1.807	-36.57	57.64	20	37.64
2.71	-74.12	95.19	20	75.19
3.6135	-76.5	97.57	20	77.57
4.517	-75.2	96.27	20	76.27
5.42	-67.3	88.37	20	68.37
6.323	-72	93.07	20	73.07
7.227	-63	84.07	20	64.07
8.13	-58.5	79.57	20	59.57
9.034	-61	82.07	20	62.07

Frequency	Peak 100KHz RBW	Measured	Limit Min	Margin
GHz	dBm	dBc	dBc	dB
0.904675	21.17	0	20	-
1.80935	-34.9	56.07	20	36.07
2.7139	-62.9	84.07	20	64.07
3.61864	-74.59	95.76	20	75.76
4.52332	-78.41	99.58	20	79.58
5.42796	-70.24	91.41	20	71.41
7.23728	-63.96	85.13	20	65.13
8.14196	-57.46	78.63	20	58.63

Ref scans in Appendix B

Result Pass

4.2 Radiated Spurious Emissions in Restricted bands

4.2.1 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

Spurious Emissions restricted bands

Test Specification: FCC 15.205 15.209 RSS Gen 8.9 and 8.10

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
2.706	55.4	28.7	38.4	3.8	Vertical	0.00	49.5	74	24.5
3.608	47.7	31.3	37.6	4.6	Vertical	0.00	46.0	74	28.0
4.511	46.4	32.4	37	5.0	Vertical	0.00	46.8	74	27.2
5.412	48.4	33.5	37.5	5.6	Vertical	0.00	50.0	74	24.0
8.119	41.0	37.3	37.5	6.8	Vertical	0.00	47.6	74	26.4
9.021	43.0	37.9	37.1	7.5	Vertical	0.00	51.3	74	22.7
2.706	55.6	28.7	38.4	3.8	Horizontal	0.00	49.7	74	24.3
3.608	49.4	31.3	37.6	4.6	Horizontal	0.00	47.7	74	26.3
4.511	49.5	32.4	37	5.0	Horizontal	0.00	49.9	74	24.1
5.412	49.1	33.5	37.5	5.6	Horizontal	0.00	50.7	74	23.3
8.119	42.4	37.3	37.5	6.8	Horizontal	0.00	49.0	74	25.0
9.021	43.4	37.9	37.1	7.5	Horizontal	0.00	51.7	74	22.3

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
2.710	55.7	28.7	38.4	3.8	Vertical	0.00	49.8	74	24.2
3.614	48.2	31.3	37.6	4.6	Vertical	0.00	46.5	74	27.5
4.517	46.0	32.4	37	5.0	Vertical	0.00	46.4	74	27.6
5.420	48.6	33.5	37.5	5.6	Vertical	0.00	50.2	74	23.8
8.130	41.2	37.3	37.5	6.8	Vertical	0.00	47.8	74	26.3
9.033	43.6	37.9	37.1	7.5	Vertical	0.00	51.9	74	22.1
2.710	55.6	28.7	38.4	3.8	Horizontal	0.00	49.7	74	24.3
3.614	49.1	31.3	37.6	4.6	Horizontal	0.00	47.4	74	26.6
4.517	49.3	32.4	37	5.0	Horizontal	0.00	49.7	74	24.3
5.420	48.9	33.5	37.5	5.6	Horizontal	0.00	50.5	74	23.5
8.130	41.4	37.3	37.5	6.8	Horizontal	0.00	48.0	74	26.0
9.033	42.9	37.9	37.1	7.5	Horizontal	0.00	51.2	74	22.8

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
2.713	56.4	28.7	38.4	3.8	Vertical	0.00	50.5	74	23.5
3.618	47.8	31.3	37.6	4.6	Vertical	0.00	46.1	74	27.9
4.523	45.6	32.4	37	5.0	Vertical	0.00	46.0	74	28.0
5.428	48.3	33.5	37.5	5.6	Vertical	0.00	49.9	74	24.1
8.141	40.7	37.3	37.5	6.8	Vertical	0.00	47.3	74	26.7
9.047	42.4	37.9	37.1	7.5	Vertical	0.00	50.7	74	23.4
2.713	55.6	28.7	38.4	3.8	Horizontal	0.00	49.7	74	24.3
3.618	48.5	31.3	37.6	4.6	Horizontal	0.00	46.8	74	27.2
4.523	49.4	32.4	37	5.0	Horizontal	0.00	49.8	74	24.2
5.428	37.7	33.5	37.5	5.6	Horizontal	0.00	39.3	74	34.7
8.141	45.9	37.3	37.5	6.8	Horizontal	0.00	52.5	74	21.5
9.047	40.1	37.9	37.1	7.5	Horizontal	0.00	48.4	74	25.6

Result: Pass

5. Radiated Power at fundamental

For FHSs operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W and the e.i.r.p. shall not exceed 1 W if the hopset uses less than 50 hopping channels.

Results

Frequency	Peak Level	Antenna Polarity	Antenna Factor	Cable loss	Final Field Strength Peak	Power	Power Limit	Margin
MHz	dBuV/m	V/H	dB	dB	dBuV/m	dBm	dBm	dB
902.147	94.49	Vertical	23.2	2.3	119.99	24.79	36.0	11.2
902.147	93.32	Horizontal	23.2	2.3	118.82	23.62	36.0	12.4
903.388	94.57	Vertical	23.2	2.3	120.07	24.87	36.0	11.1
903.388	93.23	Horizontal	23.2	2.3	118.73	23.53	36.0	12.5
904.663	94.63	Vertical	23.3	2.3	120.23	25.03	36.0	11.0
904.663	93.15	Horizontal	23.3	2.3	118.75	23.55	36.0	12.5

Hopset uses >50 channels =>EIRP power limit =36dBm

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

$$EIRP\ (dBm) = E3m\ (dBuV/m) - 95.2$$

Result: Pass

6 List of Test Equipment

Instrument	Manufacturer	Model	Serial Num	CEI Ref	Cal Due Date	Cal Interval Months
Microwave Preamplifier	Hewlett Packard	83017A	3123A00175	805	30-Sep-21	12
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
Fully Anechoic Chamber	CEI	FAR 3M	906	906	23-Jul-22	36
Anechoic Chamber	CEI	SAR 10M	845	845	16-May-22	36
Antenna Biconical	Schwarzbeck	VHBB 9124	9124 667	871	03-Sep-21	36
Antenna Log Periodic	Chase	UPA6108	1072	609	03-Sep-21	36
Antenna Horn	EMCO	3115	9905-5809	655	13-Dec-21	24

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

Spurious Emissions Radiated

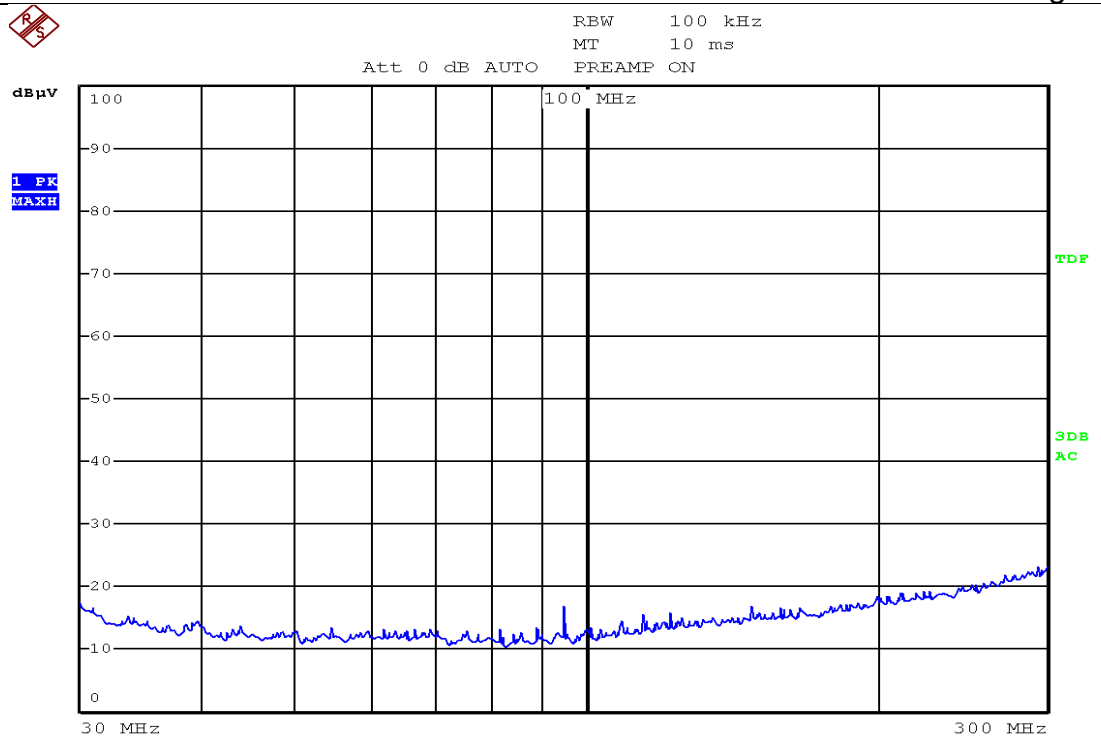


Fig A1 Scan 30MHz – 300MHz Vertical 3metres

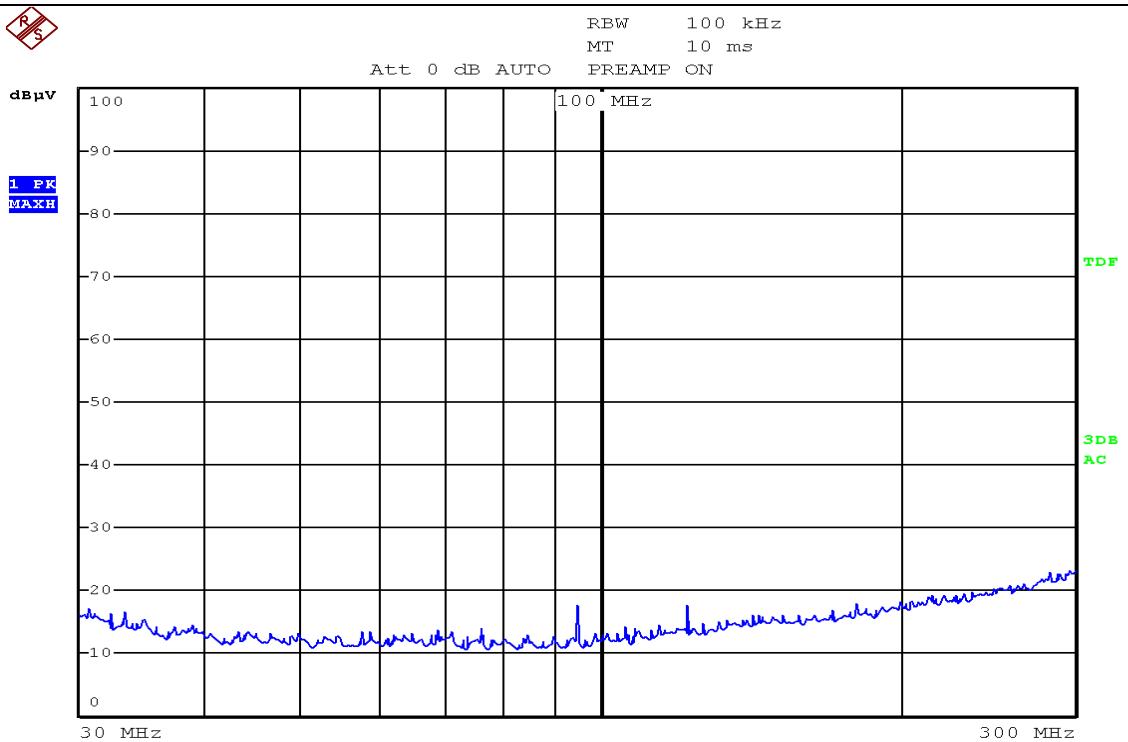


Fig A2 Scan 30MHz – 300MHz Horizontal 3metres

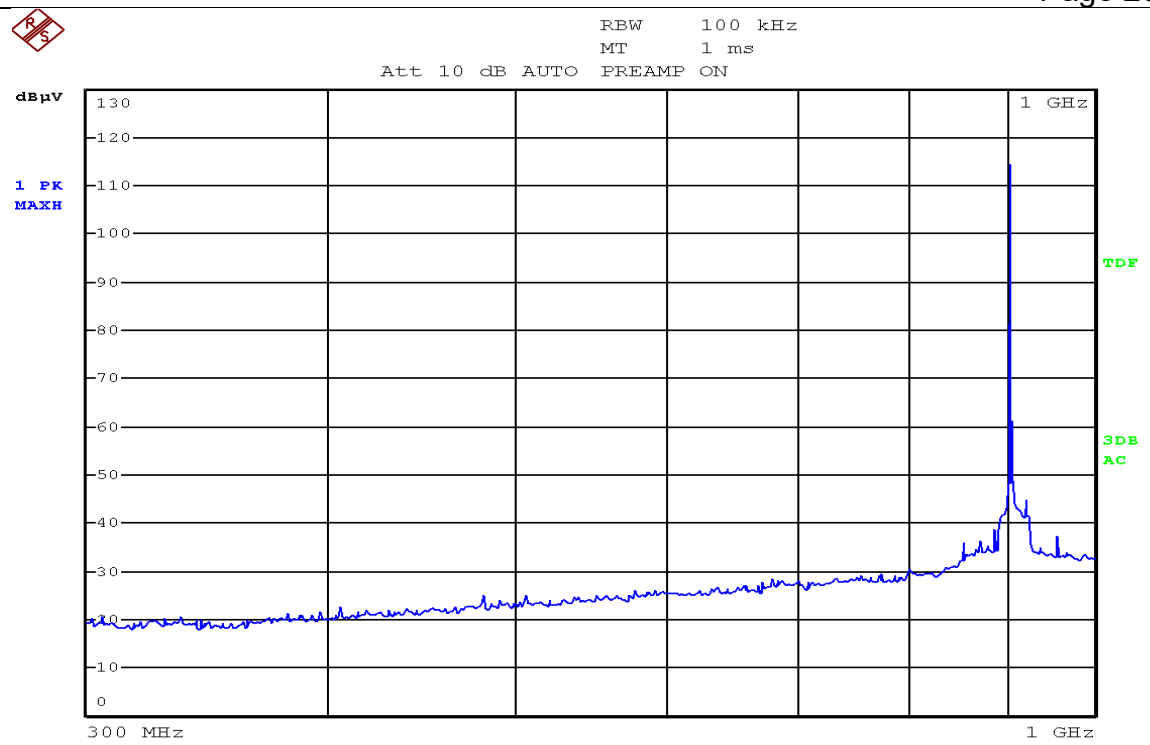


Fig A3 Scan 300MHz – 1GHz 3metres

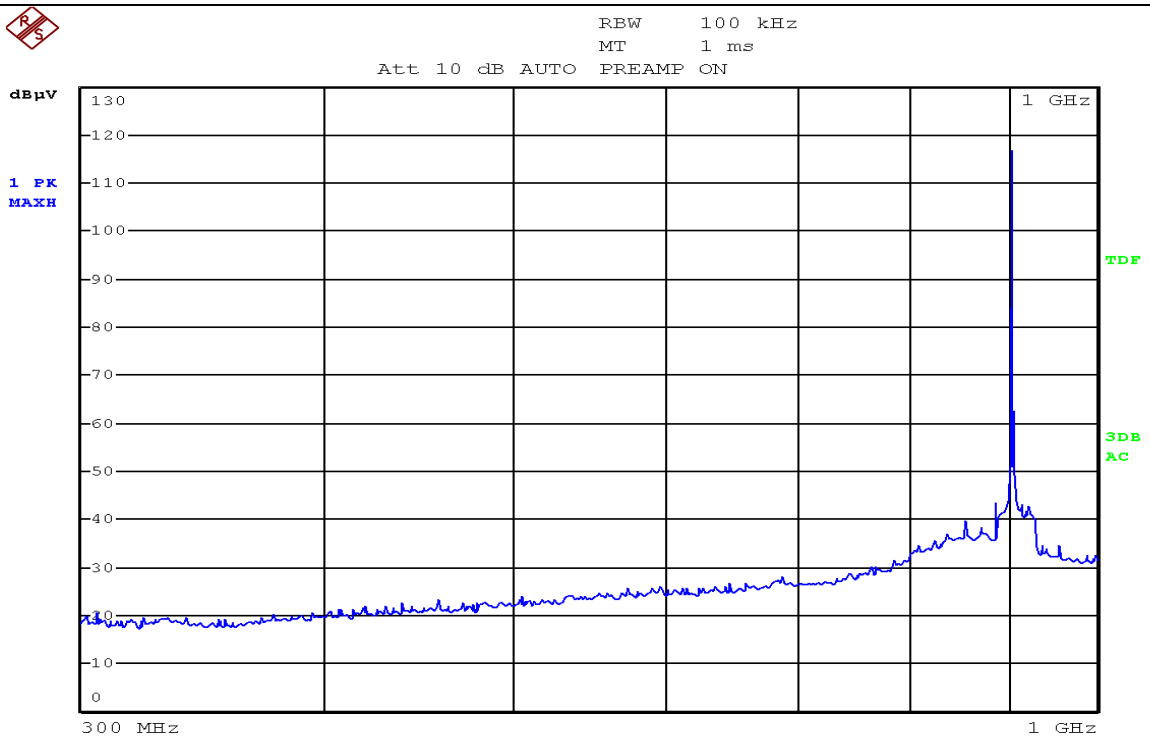


Fig A4 Scan 300MHz – 1GHz Horizontal 3metres

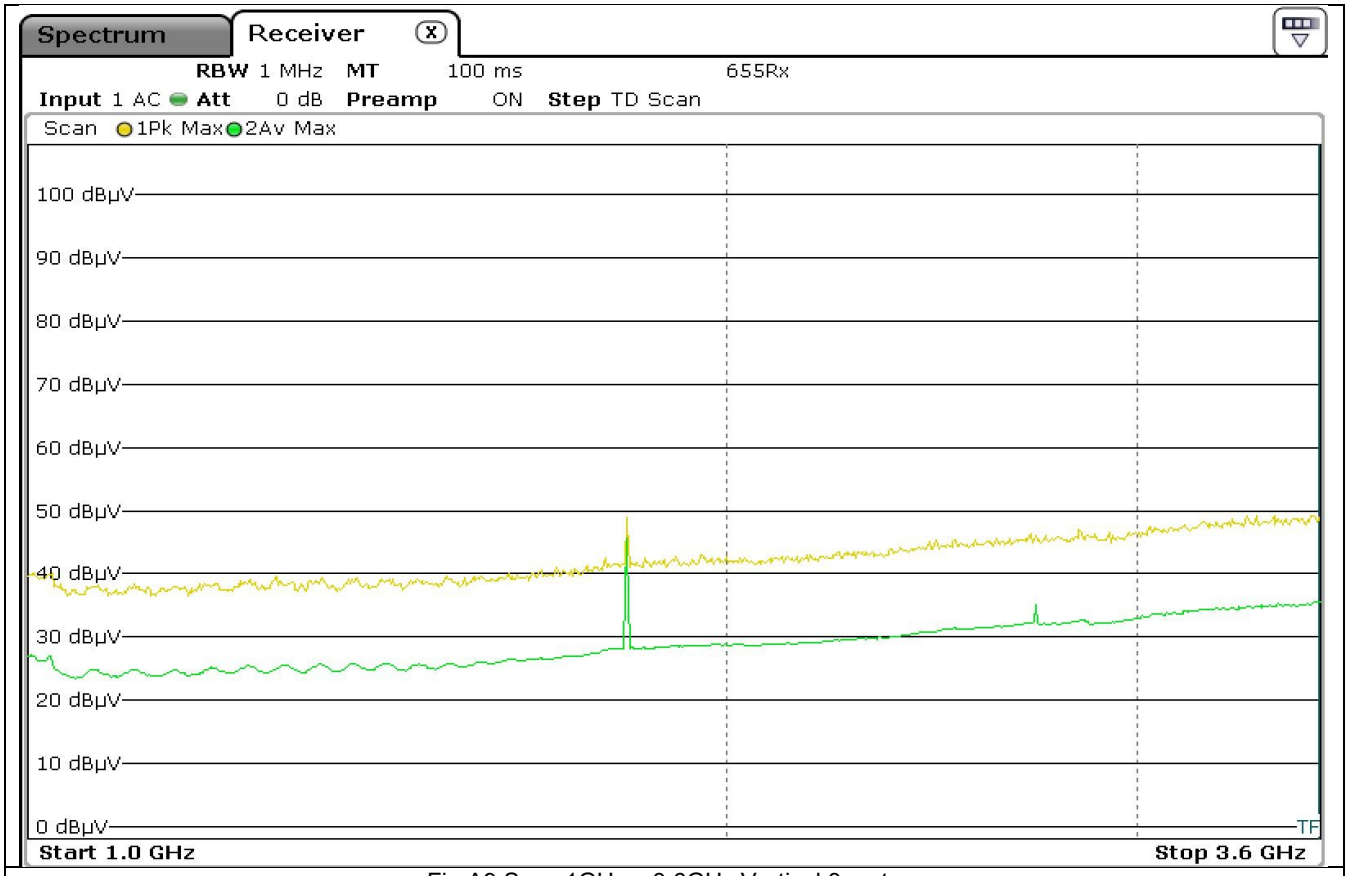


Fig A9 Scan 1GHz – 3.6GHz Vertical 3 metres

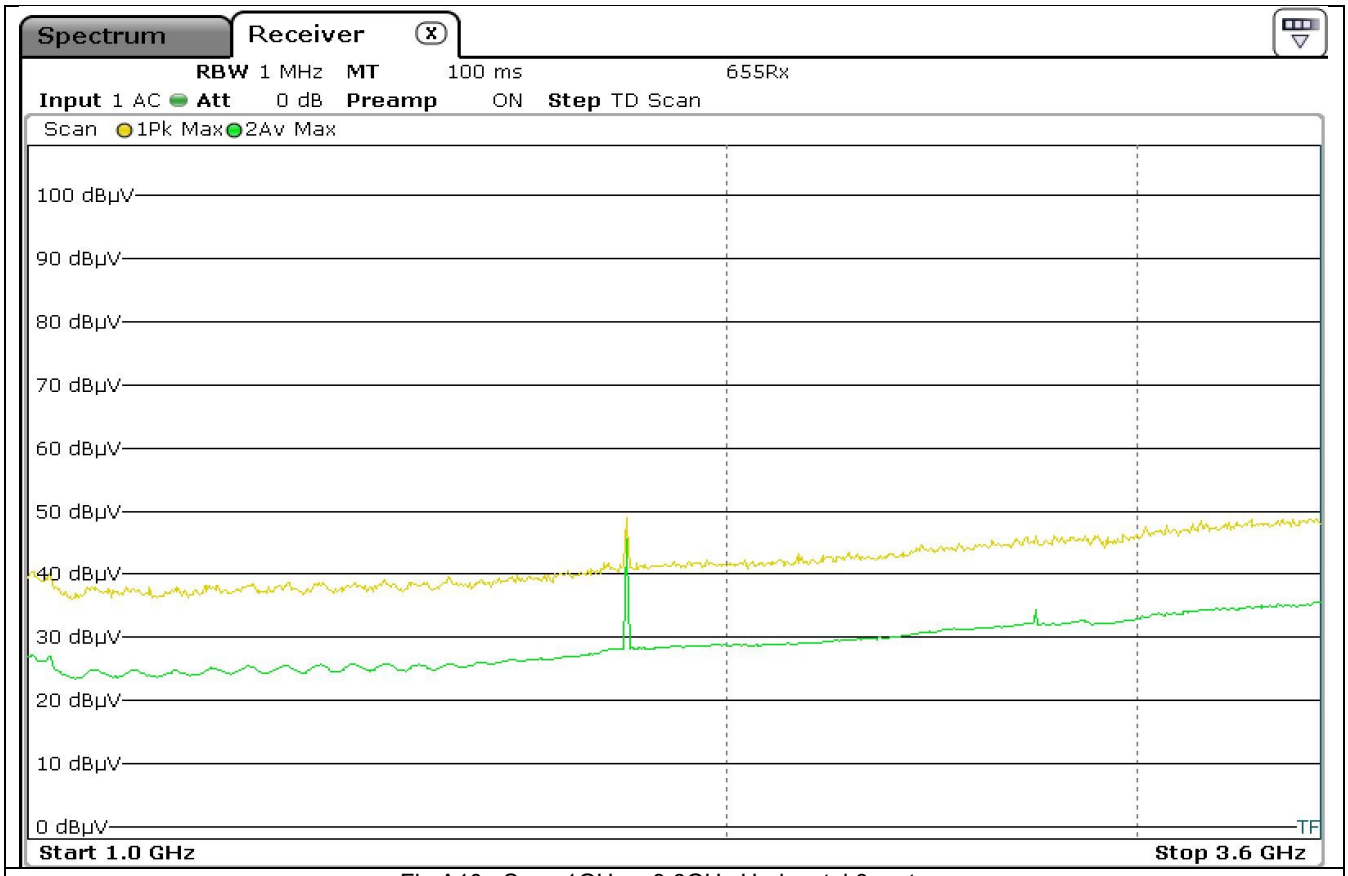


Fig A10 Scan 1GHz – 3.6GHz Horizontal 3 metres

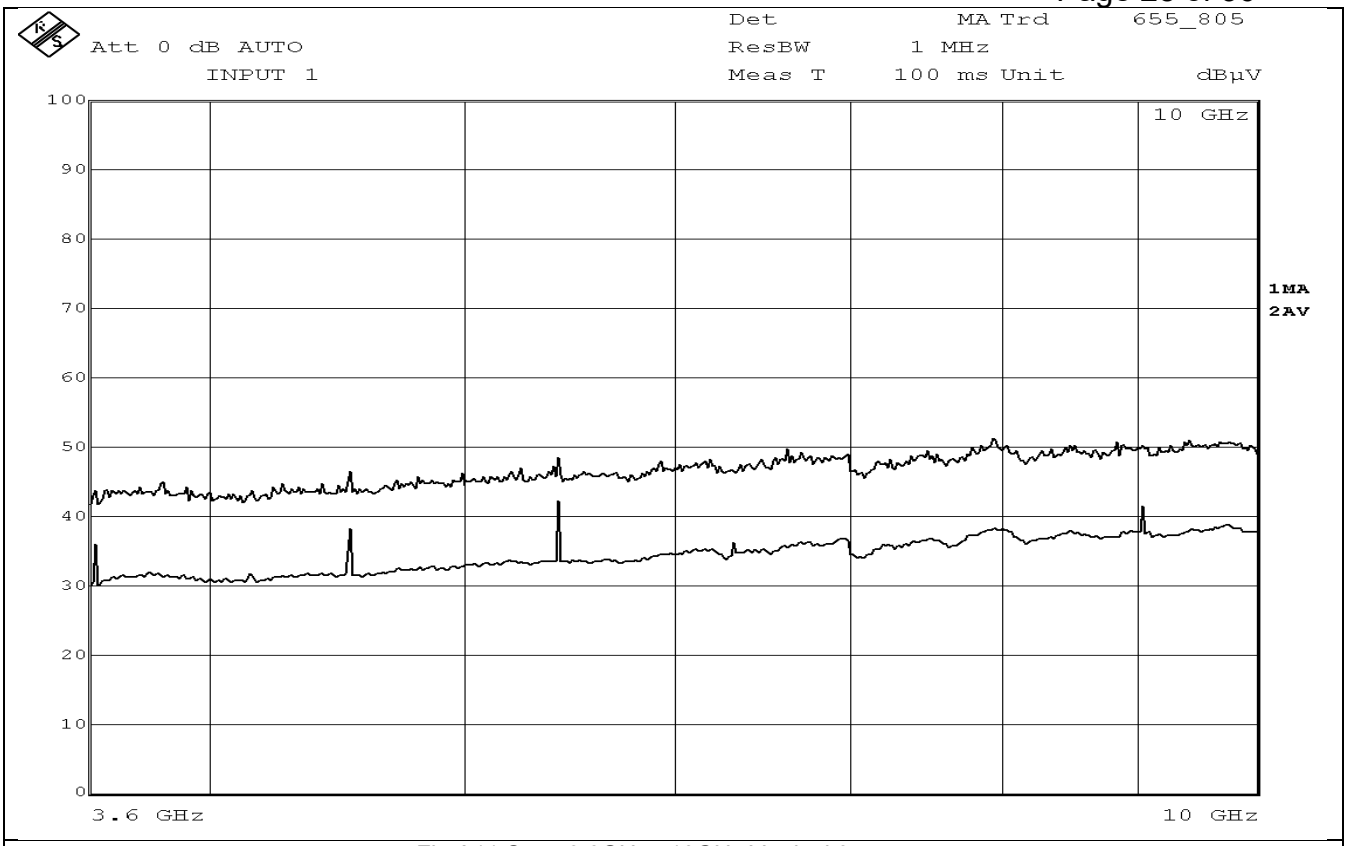


Fig A11 Scan 3.6GHz –10GHz Vertical 3 metres

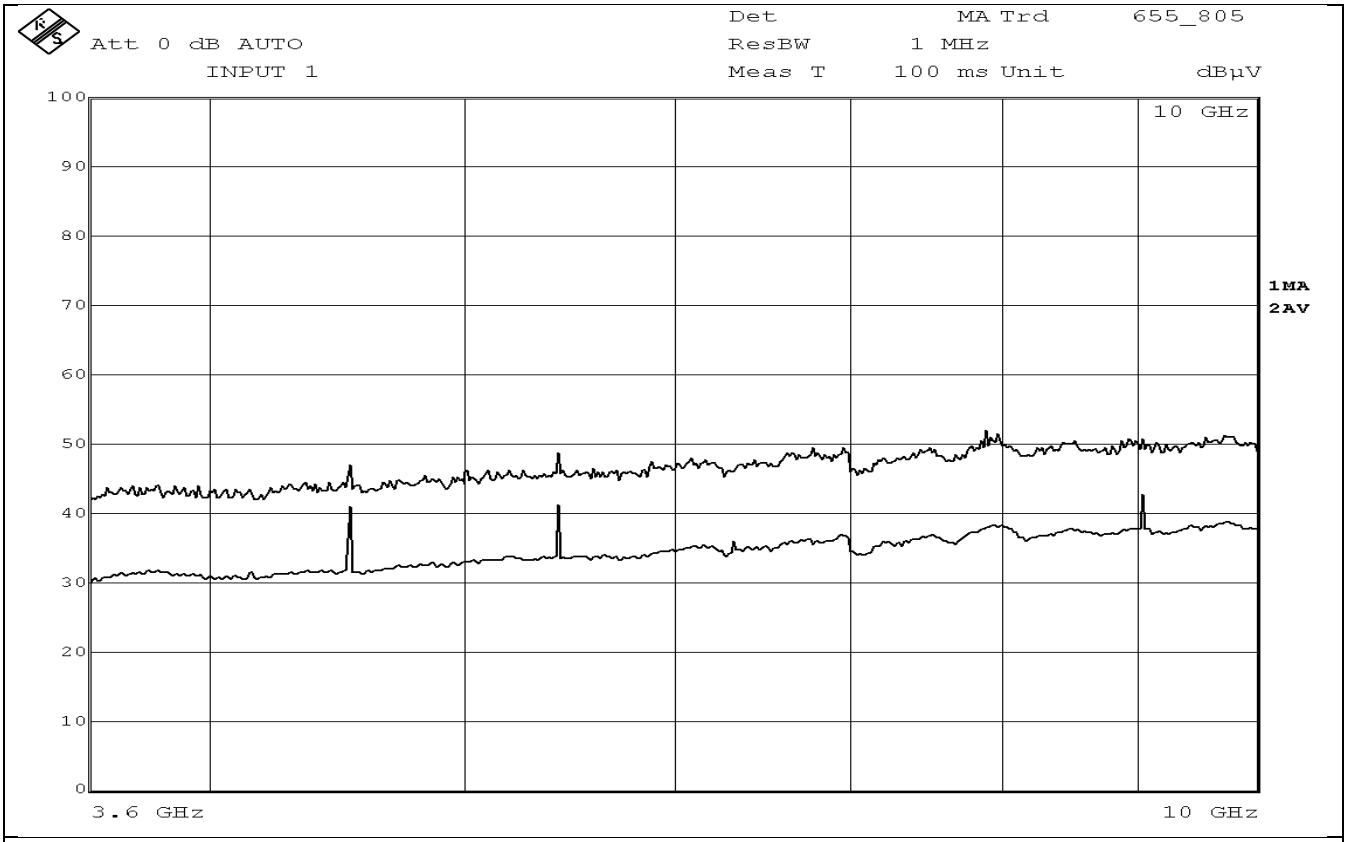


Fig A12 Scan 3.6GHz – 10GHz Horizontal 3 metres

Appendix B

Conducted Emissions

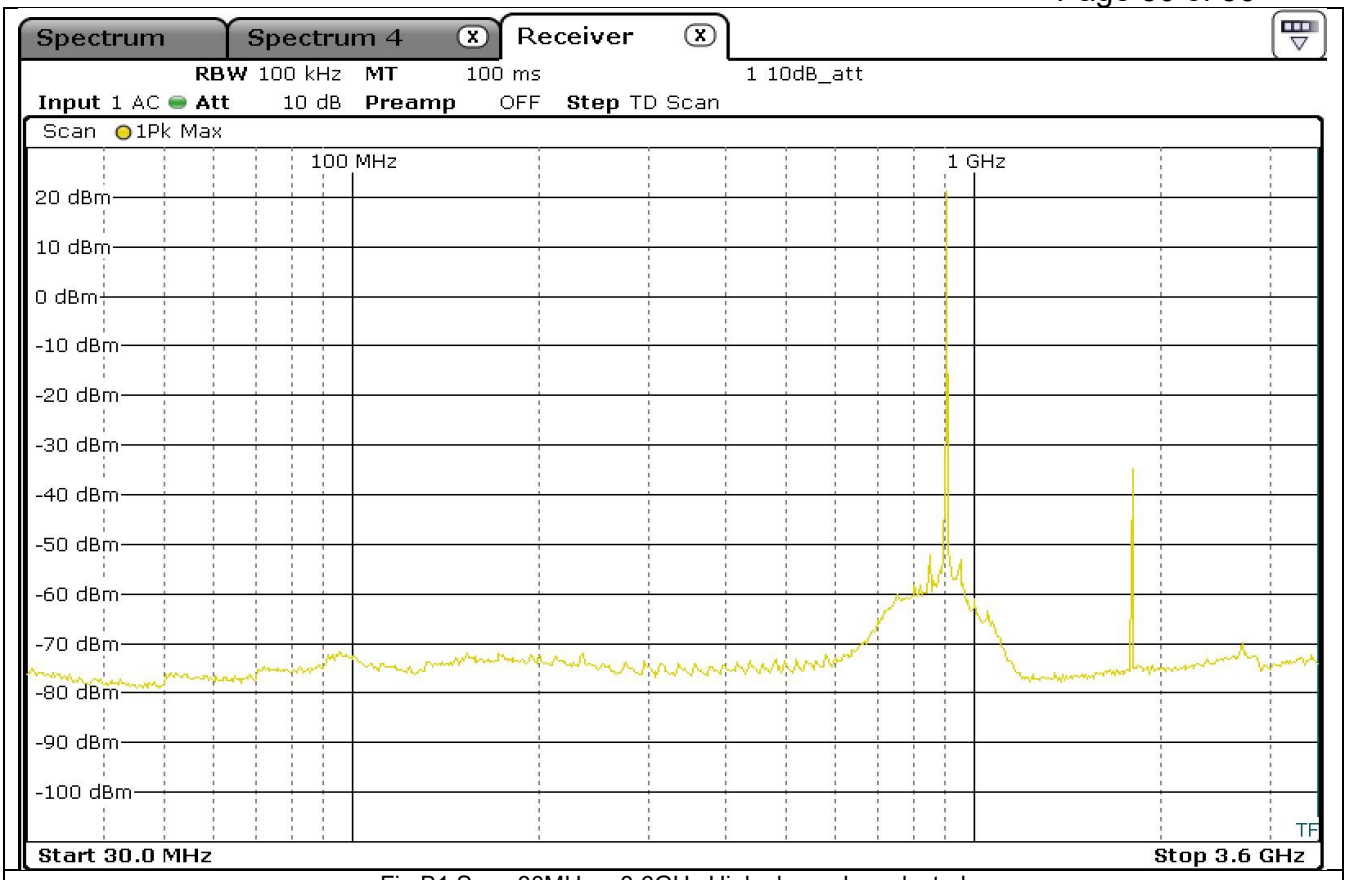


Fig B1 Scan 30MHz – 3.6GHz High channel conducted

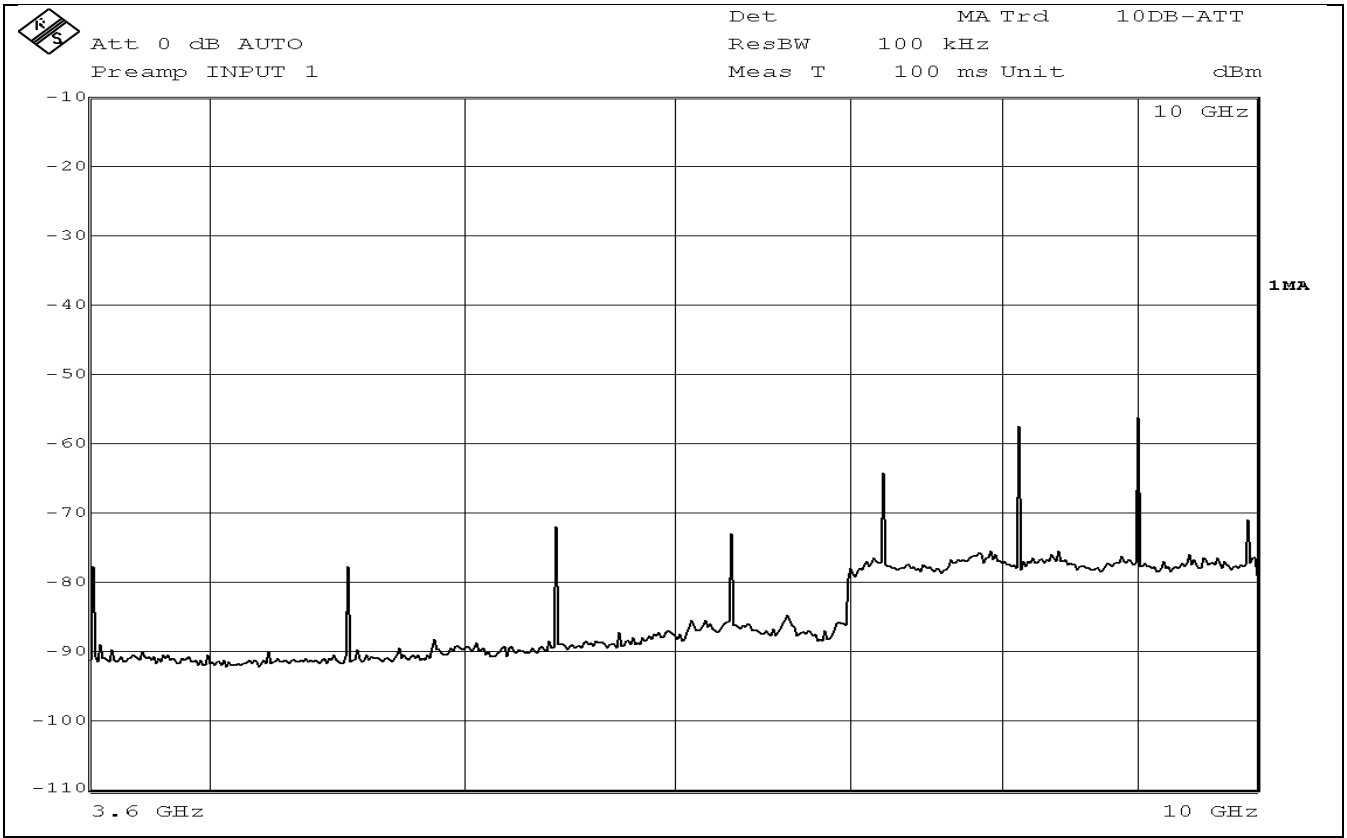


Fig B2 Scan 3.6GHz – 10GHz High channel conducted

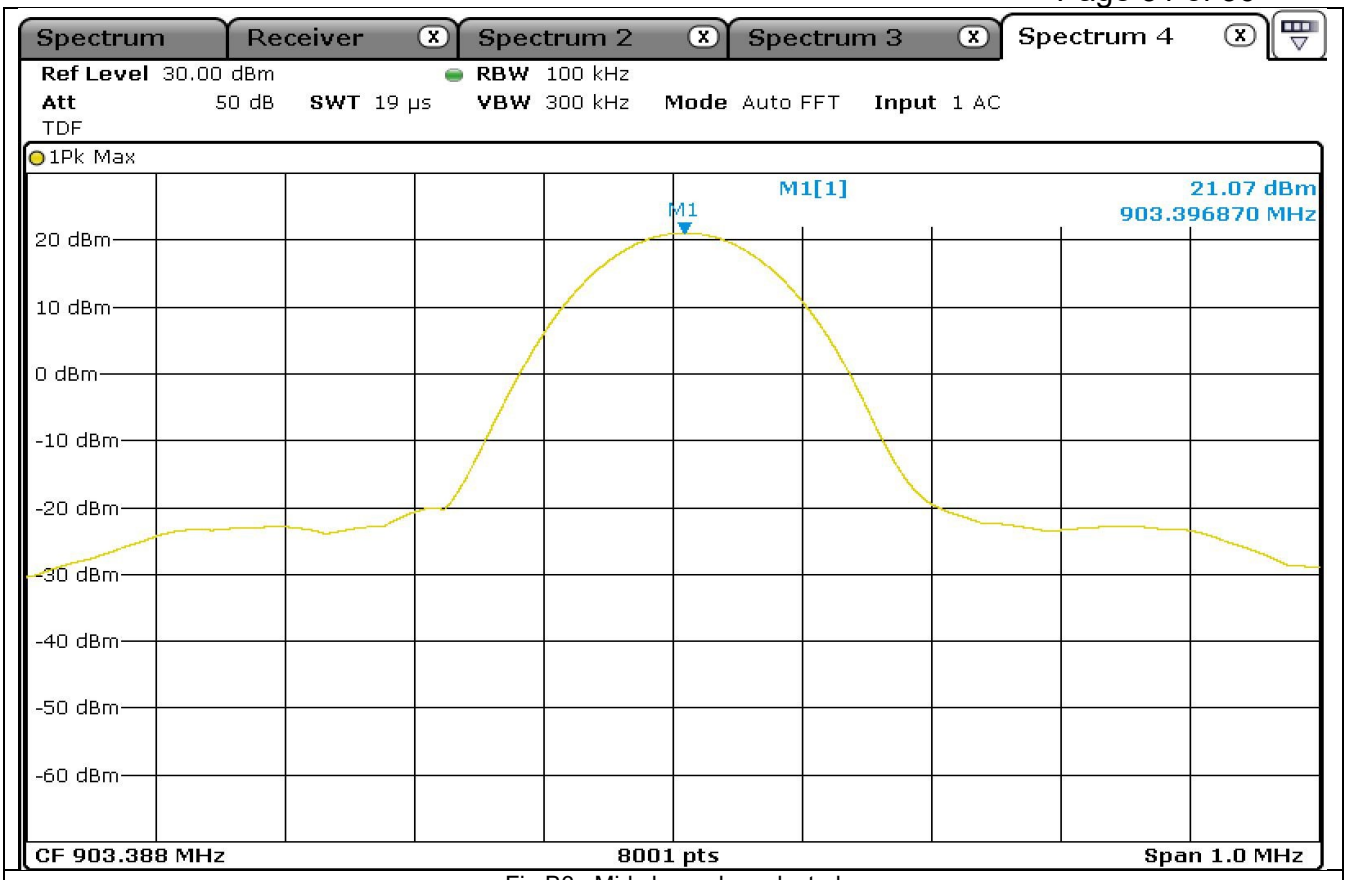
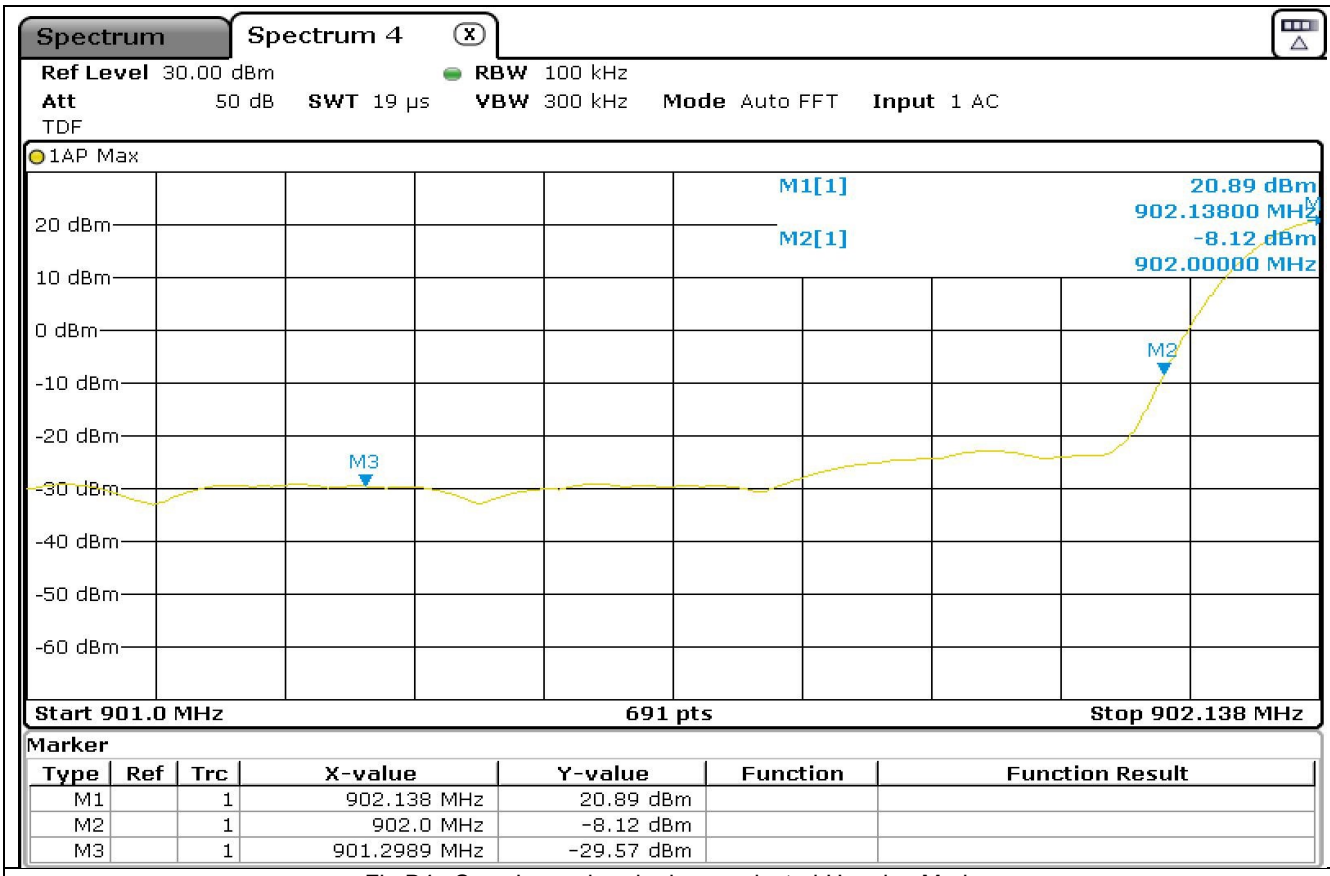


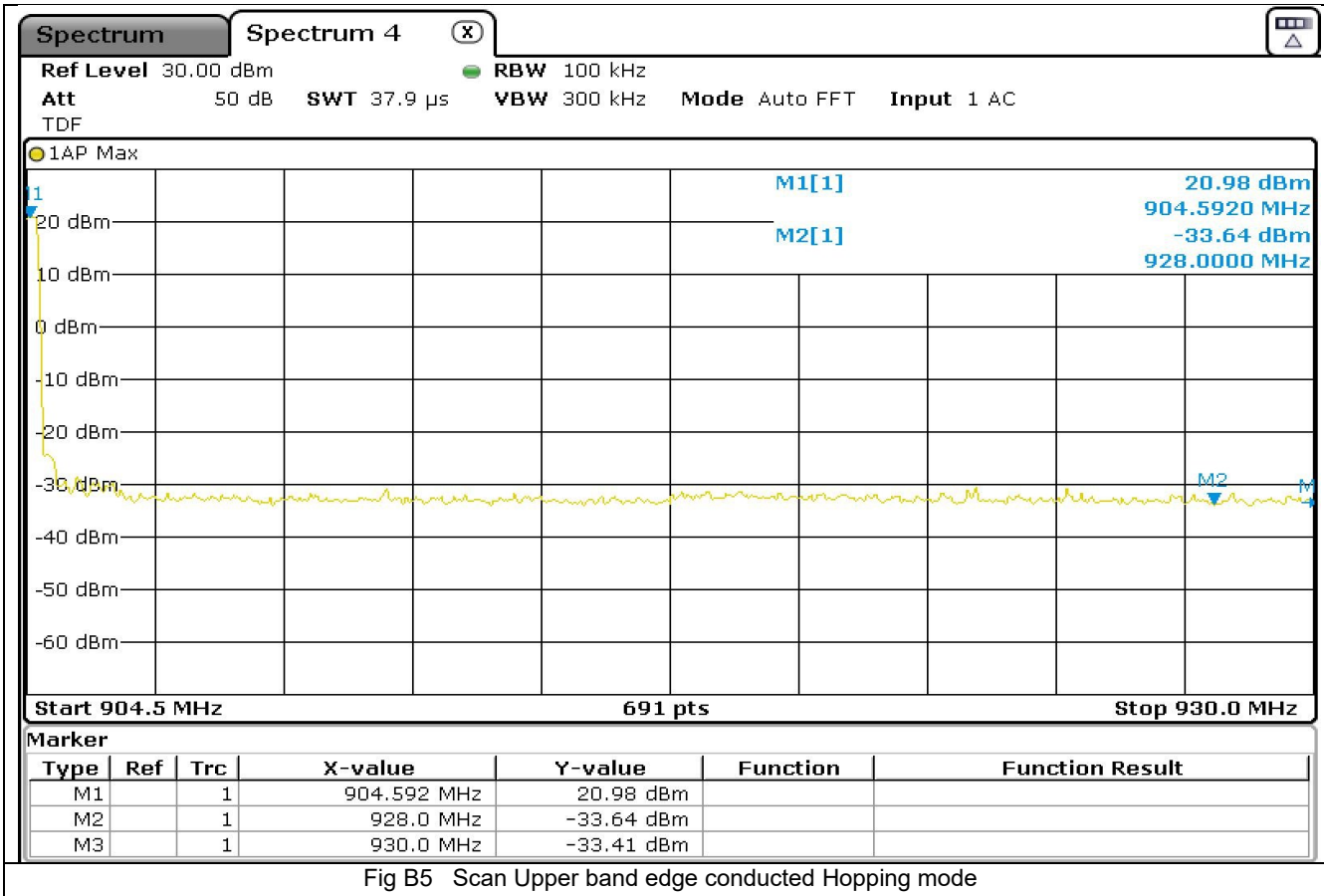
Fig B3 Mid channel conducted



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	902.138 MHz	20.89 dBm		
M2		1	902.0 MHz	-8.12 dBm		
M3		1	901.2989 MHz	-29.57 dBm		

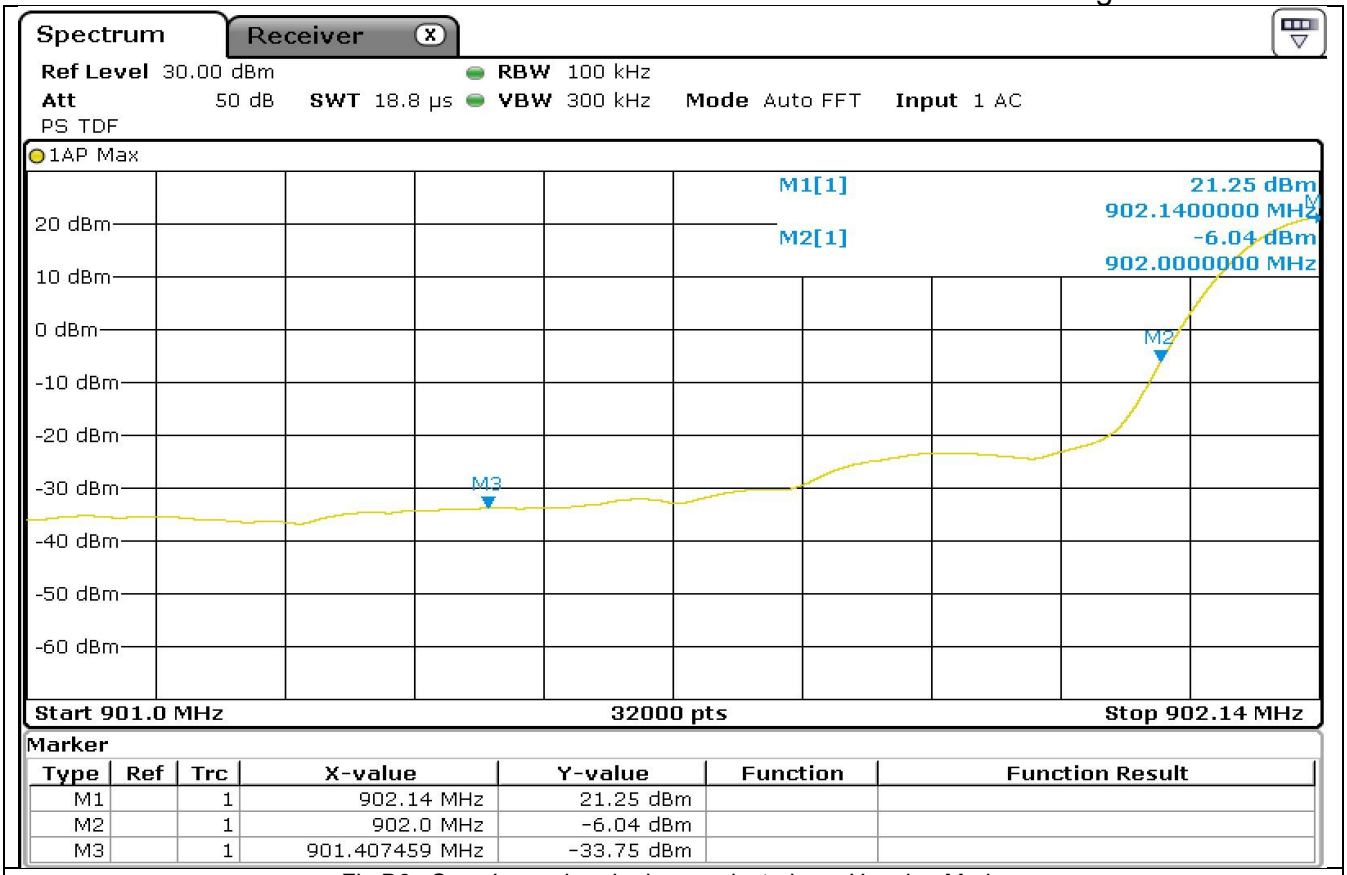
Fig B4 Scan Lower band edge conducted Hopping Mode



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	904.592 MHz	20.98 dBm		
M2		1	928.0 MHz	-33.64 dBm		
M3		1	930.0 MHz	-33.41 dBm		

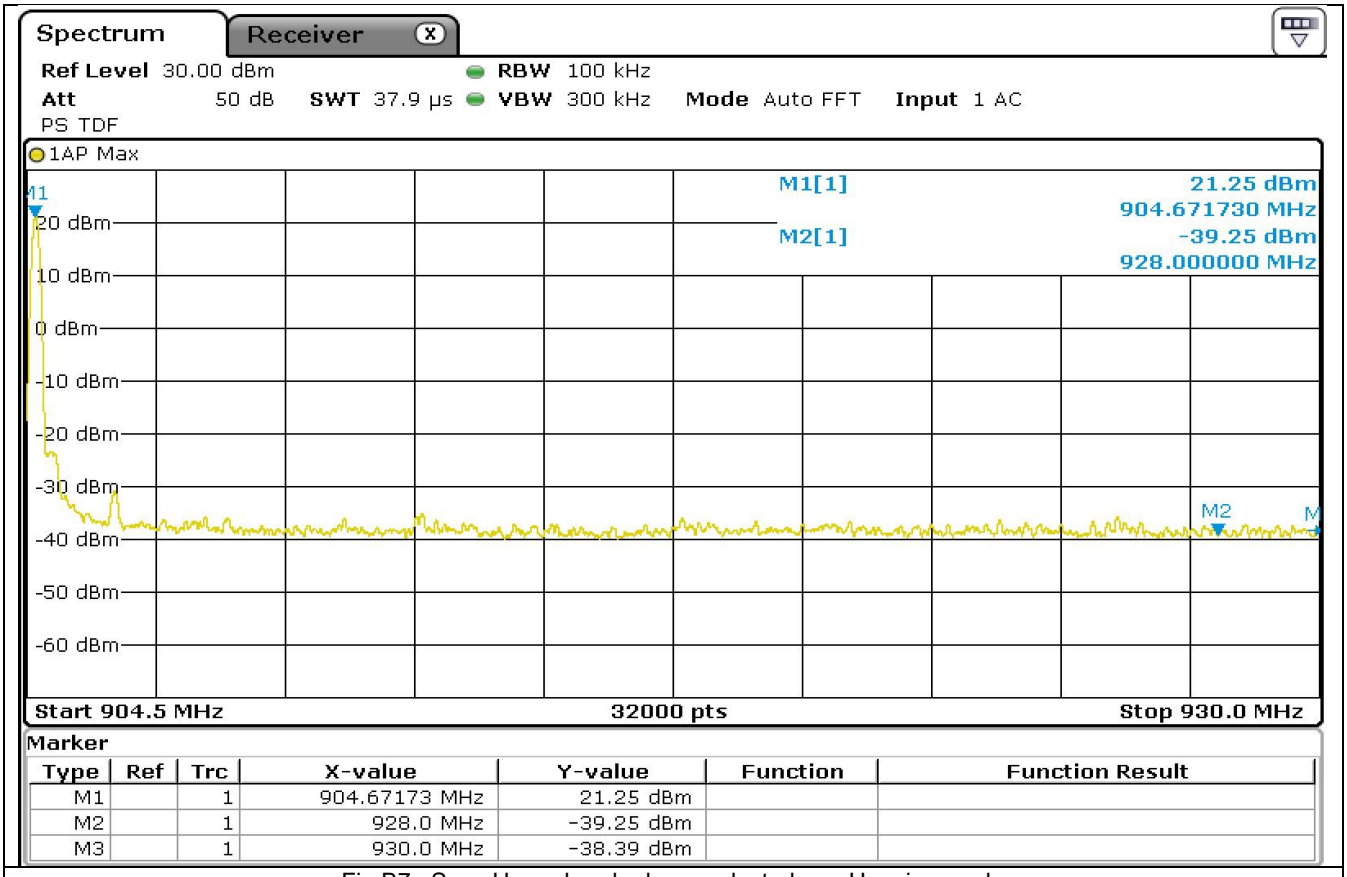
Fig B5 Scan Upper band edge conducted Hopping mode



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	902.14 MHz	21.25 dBm		
M2		1	902.0 MHz	-6.04 dBm		
M3		1	901.407459 MHz	-33.75 dBm		

Fig B6 Scan Lower band edge conducted non Hopping Mode

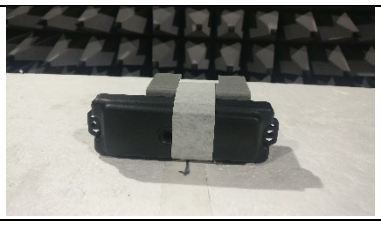


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	904.67173 MHz	21.25 dBm		
M2		1	928.0 MHz	-39.25 dBm		
M3		1	930.0 MHz	-38.39 dBm		

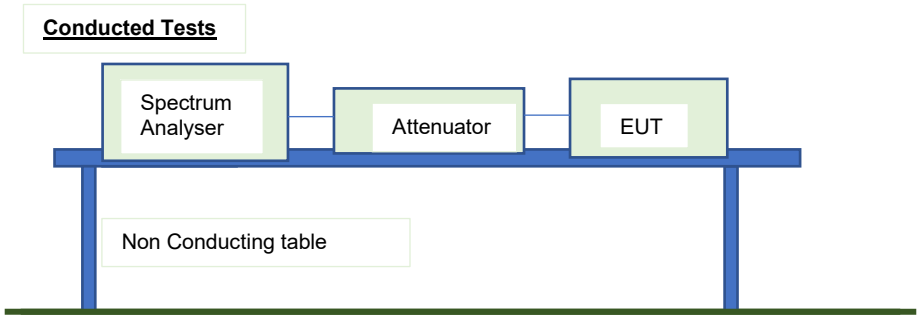
Fig B7 Scan Upper band edge conducted non Hopping mode

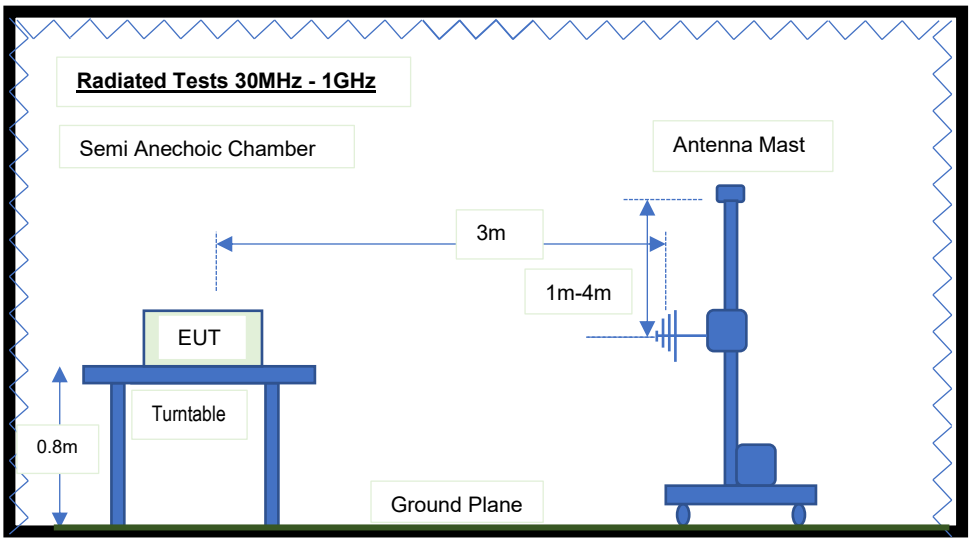
Appendix C

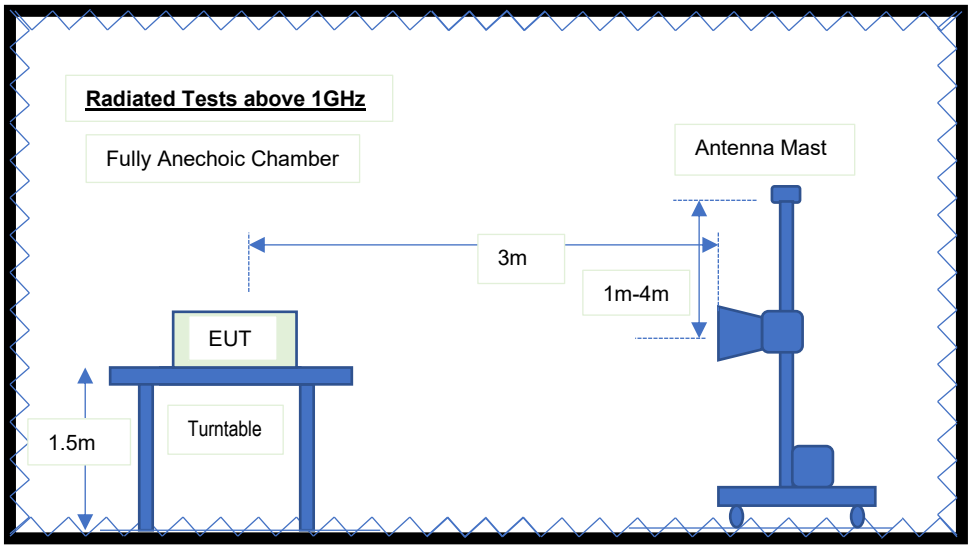
		
Fig C1 EUT orientation O1”	Fig C2 EUT orientation “O2”	Fig C3 EUT orientation “O3”

Orientations for Radiated Emissions

Appendix D
Block Diagrams of test set up







Appendix E
Summary of Antennas and EUT samples

The EUT contained transmitters using Sigfox and BLE technology.
All antennas were internal.
The Sigfox antenna was a folded metal antenna and the BLE antenna was a printed antenna..

All conducted tests were performed on EUT sample labelled “Sample Y”
All radiated tests were performed on EUT sample labelled “Sample Z”

1 Antenna 902-904MHz (Sigfox)

1.1 Antenna Details

Pcb antenna
Gain 3.86 dBi
Impedance 50Ω

1.2 All Radiated tests on Sigfox were performed with the antenna above (unit labelled “Sample Y”)

1.3 All Conducted tests on Sigfox were performed with the antenna above replaced by cable and SMA connector (unit labelled “Sample Z”)

2 Antenna 2.4GHz (BLE antenna on main pcb)

2.1 Antenna Details

Pcb antenna
Gain 0.9dBi
Impedance 50Ω

2.2 All Radiated tests on BLE pcb antenna were performed with the antenna above (unit labelled “Sample Y”)

2.3 All Conducted tests on BLE were performed with the antenna above replaced by cable and SMA connector (unit labelled “Sample Z”)

End of Report