SGS-CSTC Standards Technical Services
(Shanghai) Co., Ltd.

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1 Cover Page

RF TEST REPORT

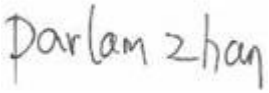
Application No.:	SHEM1608005395CR
Applicant:	MINE SITE TECHNOLOGIES PTY LTD
FCC ID:	N73-PRX-TX
IC:	7449B-PRXTX
Equipment Under Test (EUT): **NOTE:** The following sample(s) was/were submitted and identified by the client as	
Product Name:	Proximity Transmitter
Model No.(EUT):	PRX-TX
Standards:	FCC PART 15 Subpart C RSS-Gen Issue 4
Date of Receipt:	2015-10-10
Date of Test:	2017-12-29 to 2018-03-15
Date of Issue:	2018-03-23
Test Result:	**Pass***

*In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Parlam Zhan
E&E Section Manager
SGS-CSTC (Shanghai) Co., Ltd.

2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
00	/	2018-03-23	/	Original

Authorized for issue by:				
Engineer		Vincent zhu **Print Name**		
Reviewer		Parlam Zhan **Print Name**		

3 Test Summary

Test Item	Test Requirement	IC Test Requirement	Test Method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203	RSS-Gen 7.1.2	/	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	RSS-Gen Section 7.2.4	ANSI C63.10 (2013) Section 6.2	N/A
20dB Bandwidth	47 CFR Part 15, Subpart C Section 15.215	RSS Gen 4.6	ANSI C63.10 (2013) Section 6.9.1	PASS
Radiated Emissions	47 CFR Part 15, Subpart C Section 15.209	RSS-Gen section 4.9	ANSI C63.10 (2013) Section 6.4&6.5&6.6	PASS
99% Occupied Bandwidth	---	RSS-Gen section 4.6.1	RSS-Gen Issue 3 Clause 4.6.1	PASS

N/A: This EUT is powered by battery only; therefore the test on mains terminals is not applicable.

4 Contents

5 General Information

5.1 Client Information

Applicant: MINE SITE TECHNOLOGIES PTY LTD

Address of Applicant: Level 5, 113 Wicks Rd., North Ryde NSW 2113

5.2 General Description of E.U.T.

Product Description: mobile product with 125kHz function

Power Supply: DC 24V by Battery

5.3 Technical Specifications:

Operation Frequency: 125kHz

Modulation Technique: OOK

Antenna Type: Integral

5.4 E.U.T Operation Mode

Engineering mode: Keeps EUT working in continuous transmitting mode.

5.5 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Supplied by
Proximity Detection System Controller	MINE SITE TECHNOLOGIES PTY LTD	Proximity Detection System Controller	Client
Proximity Detection System Transmitter	MINE SITE TECHNOLOGIES PTY LTD	Proximity Detection System Transmitter	Client

5.6 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China.

Tel: +86 21 6191 5666

Fax: +86 21 6191 5678

No tests were sub-contracted.

5.7 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• **NVLAP (Certificate No. 201034-0)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the National Voluntary Laboratory Accreditation Program(NVLAP). Certificate No. 201034-0.

• **FCC –Designation Number: CN5033**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

Designation Number: CN5033. Test Firm Registration Number: 479755.

- **Industry Canada (IC) – IC Assigned Code: 8617A**

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A-1.

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-3868, C-4336, T-12221, G-10830 respectively.

6 Equipments List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Conducted Emission at AC Power Line					
EMI test receiver	R&S	ESR7	SHEM162-1	2017-12-20	2018-12-19
LISN	Schwarzbeck	NSLK8127	SHEM061-1	2017-12-20	2018-12-19
LISN	EMCO	3816/2	SHEM019-1	2017-12-20	2018-12-19
Pulse limiter	R&S	ESH3-Z2	SHEM029-1	2017-12-20	2018-12-19
CE test Cable	/	CE01	/	2017-12-26	2018-12-25
Conducted Test					
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2017-12-20	2018-12-19
Spectrum Analyzer	Agilent	N9020A	SHEM181-1	2017-09-26	2018-09-25
Power meter	R&S	NRP	SHEM057-1	2017-12-26	2018-12-25
Power Sensor	R&S	NRP-Z22	SHEM136-1	2017-07-22	2018-07-21
Power Sensor	R&S	NRP-Z91	SHEM057-2	2017-12-26	2018-12-25
Signal Generator	R&S	SMR40	SHEM058-1	2017-07-03	2018-07-02
Signal Generator	Agilent	N5182A	SHEM182-1	2017-09-26	2018-09-25
Communication Tester	R&S	CMW270	SHEM183-1	2017-10-22	2018-10-21
Switcher	Tonscend	JS0806	SHEM184-1	2017-09-26	2018-09-25
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2017-09-26	2018-09-25
AC Power Stabilizer	WOCEN	6100	SHEM045-1	2017-12-26	2018-12-25
DC Power Supply	QJE	QJ30003SII	SHEM046-1	2017-12-26	2018-12-25
Conducted test Cable	/3/	RF01, RF 02	/	2017-12-26	2018-12-25
Radiated Test					
EMI test receiver	R&S	ESU40	SHEM051-1	2017-12-20	2018-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2017-12-20	2018-12-19
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2017-04-10	2020-04-09
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2017-02-28	2020-02-27
Antenna (25MHz-3GHz)	Schwarzbeck	HL562	SHEM010-1	2017-02-28	2020-02-27
Horn Antenna (1-8GHz)	Schwarzbeck	HF906	SHEM009-1	2017-10-24	2020-10-23
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2017-01-14	2020-01-13
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2017-12-03	2020-12-02
Pre-amplifier (9KHz-2GHz)	CLAVIIO	BDLNA-0001-412010	SHEM164-1	2017-08-22	2018-08-21
Pre-amplifier (1-18GHz)	CLAVIIO	BDLNA-0118-352810	SHEM050-2	2017-08-22	2018-08-21
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2017-12-20	2018-12-19
Band filter	LORCH	9BRX-875/X150-SR	SHEM156-1	/	/
Band filter	LORCH	13BRX-1950/X500-SR	SHEM083-2	/	/
Band filter	LORCH	5BRX-2400/X200-SR	SHEM155-1	/	/
Band filter	LORCH	5BRX-5500/X1000-SR	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G-100SS	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700-3SS	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2017-07-22	2020-07-21
RE test Cable	/	RE01, RE02, RE06	/	2017-12-26	2018-12-25

7 Test results and Measurement Data

7.1 Antenna Requirement

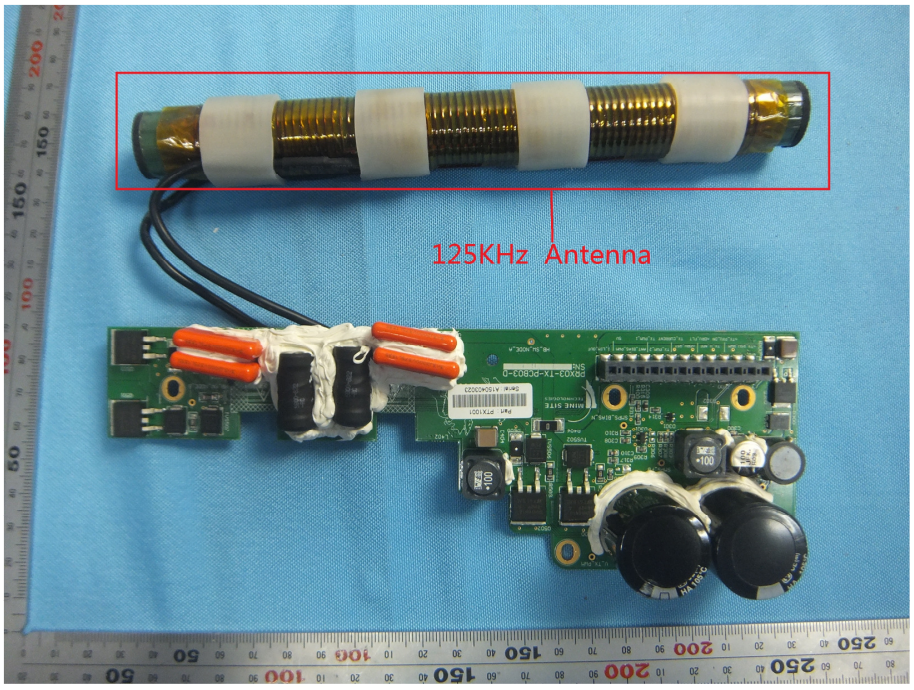
Standard requirement: 47 CFR Part 15C Section 15.203

15.203 Requirement: 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated loop antenna and no consideration of replacement.

Antenna Configuration:



7.2 Conducted Emissions

Test Frequency Range: 150kHz to 30MHz

Limit:

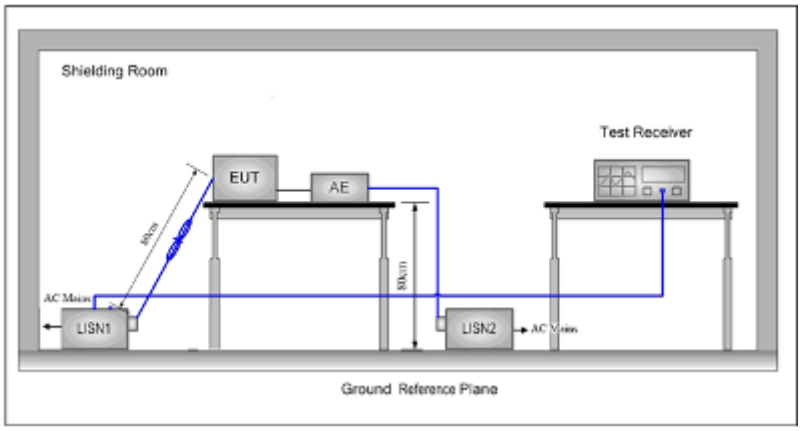
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Procedure:

1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2009 on conducted measurement.

Test Setup:



Test Results: Pass

Measurement Data:

This EUT is powered by battery only; therefore the test on mains terminals is not applicable.

7.3 Radiated Emissions

Test frequency range: 9KHz – 1GHz

Test Site: Measurement Distance: 3m

Receiver Setup:

Frequency (MHz)	RBW	VBW	Detector
0.009-0.015	200Hz	1KHz	Quasi-peak
0.015-30	9kHz	30KHz	Quasi-peak
30-1000	120 kHz	300KHz	Quasi-peak

Note: The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector. For the frequency bands 9~90 kHz, 110~490 kHz and above 1000 MHz, the radiated emission limits are based on measurements employing an average detector.

Limit:

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)	Limit (dBμV/m)	Limit @3m (dBμV/m)
0.009-0.490	2400/F(kHz)	300	48.5 ~ 13.8	128.5 ~ 93.8
0.490-1.705	24000/F(kHz)	30	33.8 ~ 23.0	73.8 ~ 63.0
1.705-30	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
960-1000	500	3	54.0	54.0

NOTE:

(1) For test distance other than what is specified, but fulfilling the requirements of section 15.31(f) (2) the field strength is calculated by adding additionally an extrapolation factor of 40dB/decade (inverse linear distance for field strength measurements).

So the Distance Extrapolation Factor in dB is 40*log (D_{TEST} / D_{SPEC}) where D_{TEST} = Test Distance and D_{SPEC} = Specified Distance.

Field strength limit (dBμV/m)@test distance= Field strength limit (dBμV/m)@specified distance -Distance Extrapolation Factor

(2) The lower limit shall apply at the transition frequencies.

Test Procedure:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. 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 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 set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

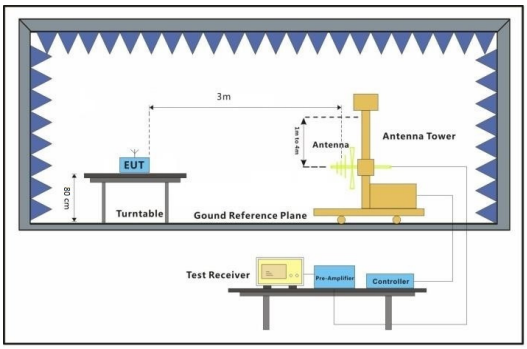
e. The test-receiver system was set to Peak Detect Function and Specified

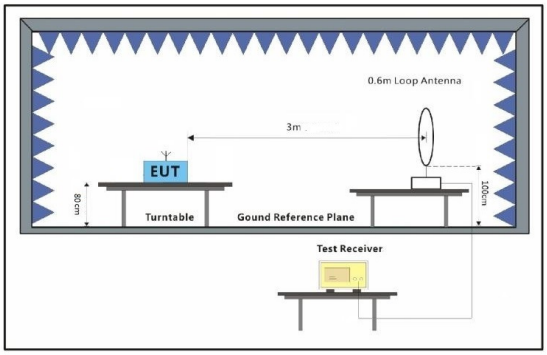
Bandwidth with Maximum Hold Mode.

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 10dB 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 radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Test Setup:

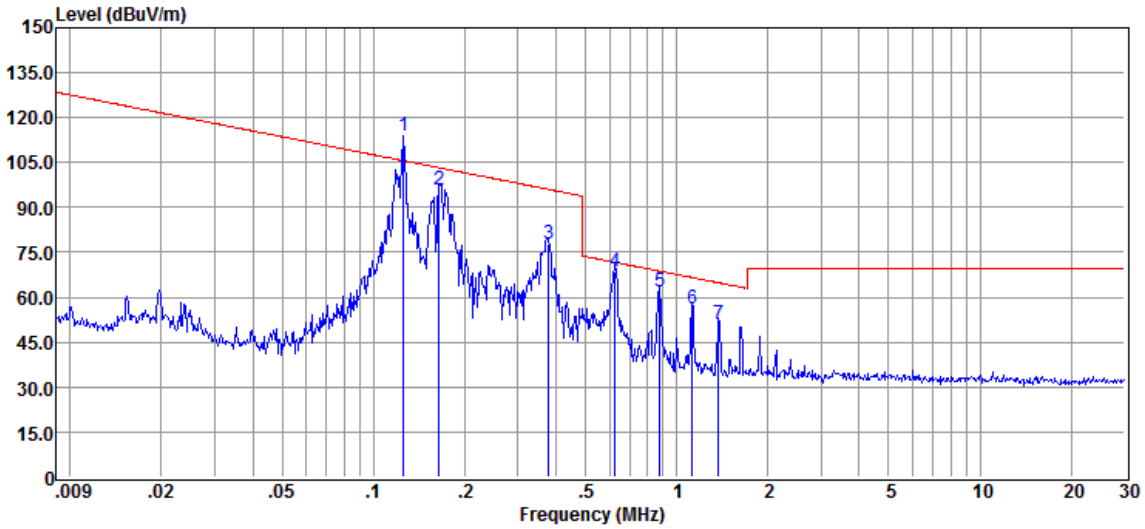




Test Results: Pass

Measurement Data

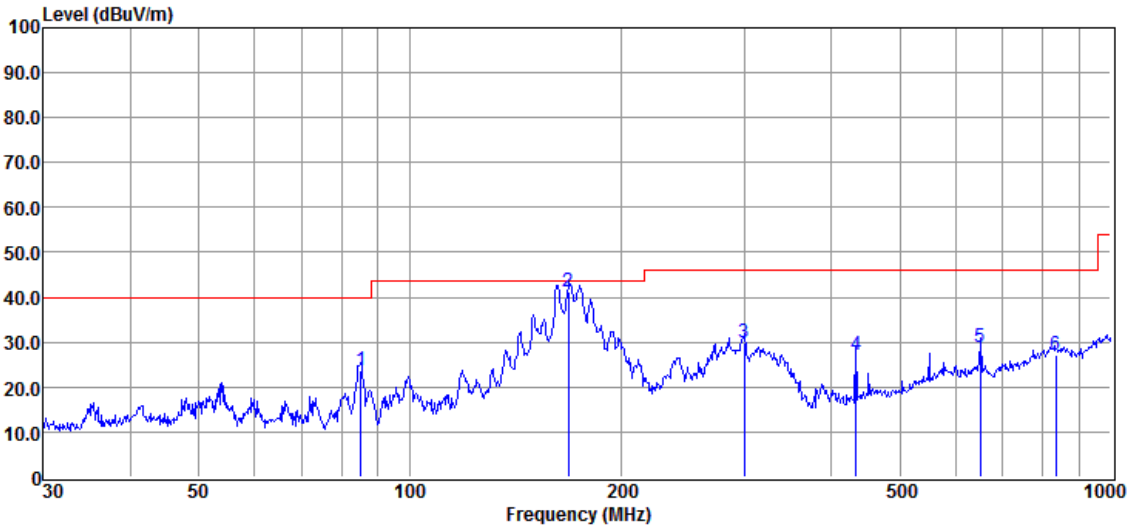
X:



Item	Freq.	Read Level	Antenna Factor	Cable Loss	Result Level@3m	Distance Factor	Result Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBµV)	(dB/m)	(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.125	93.81	19.91	0.10	113.82	80	33.82	45.67	-11.85	PK
1	0.125	84.52	19.91	0.10	104.53	80	24.53	25.67	-1.14	AV
2	0.16	75.92	19.96	0.10	95.98	80	15.98	23.29	-7.31	QP
3	0.38	57.79	19.80	0.10	77.69	80	-2.31	16.04	-18.35	QP
4	0.63	48.81	19.63	0.10	68.54	40	28.54	31.68	-3.14	QP
5	0.88	42.30	19.39	0.10	61.79	40	21.79	28.72	-6.93	QP
6	1.12	36.67	19.32	0.10	56.09	40	16.09	26.62	-10.53	QP
7	1.38	31.79	19.35	0.10	51.24	40	11.24	24.86	-13.62	QP

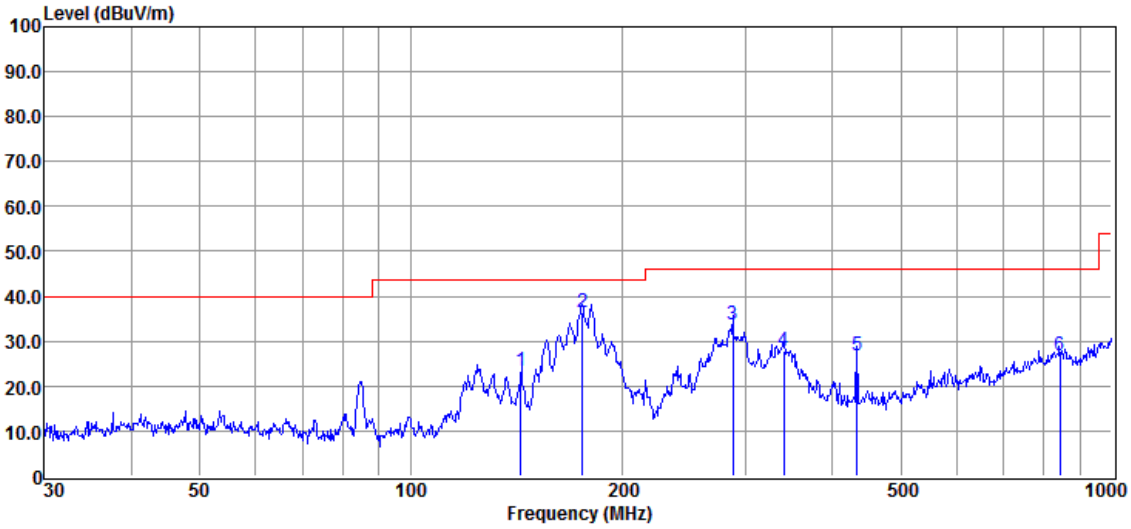
30MHz-1GHz:

Vertical



Item	Freq.	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Result Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
1	85.06	49.74	8.60	35.70	1.02	23.66	40.00	-16.34	QP
2	168.44	63.30	12.18	35.62	1.45	41.31	43.50	-2.19	QP
3	300.42	50.16	13.50	35.79	2.06	29.93	46.00	-16.07	QP
4	433.18	44.15	16.11	35.75	2.54	27.05	46.00	-18.95	QP
5	651.29	39.78	20.35	34.51	3.21	28.83	46.00	-17.17	QP
6	834.17	34.41	23.76	34.75	3.72	27.14	46.00	-18.86	QP

Horizontal



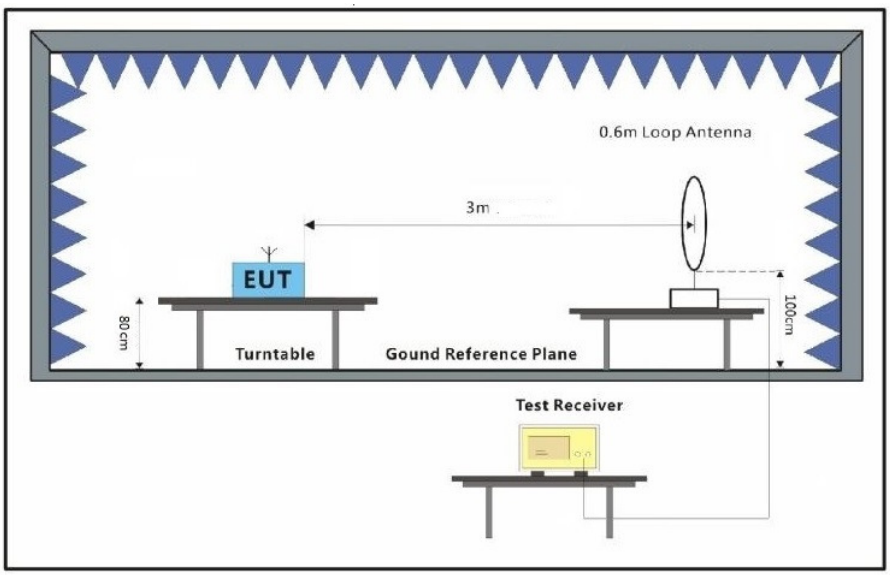
Item	Freq.	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Result Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
1	143.66	45.55	12.50	35.91	1.34	23.48	43.50	-20.02	QP
2	175.95	59.34	11.47	36.00	1.48	36.29	43.50	-7.21	QP
3	288.06	55.19	12.44	35.93	2.02	33.72	46.00	-12.28	QP
4	340.69	48.81	12.70	35.74	2.19	27.96	46.00	-18.04	QP
5	433.63	43.87	16.16	35.74	2.54	26.83	46.00	-19.17	QP
6	842.56	34.16	23.64	34.69	3.74	26.85	46.00	-19.15	QP

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

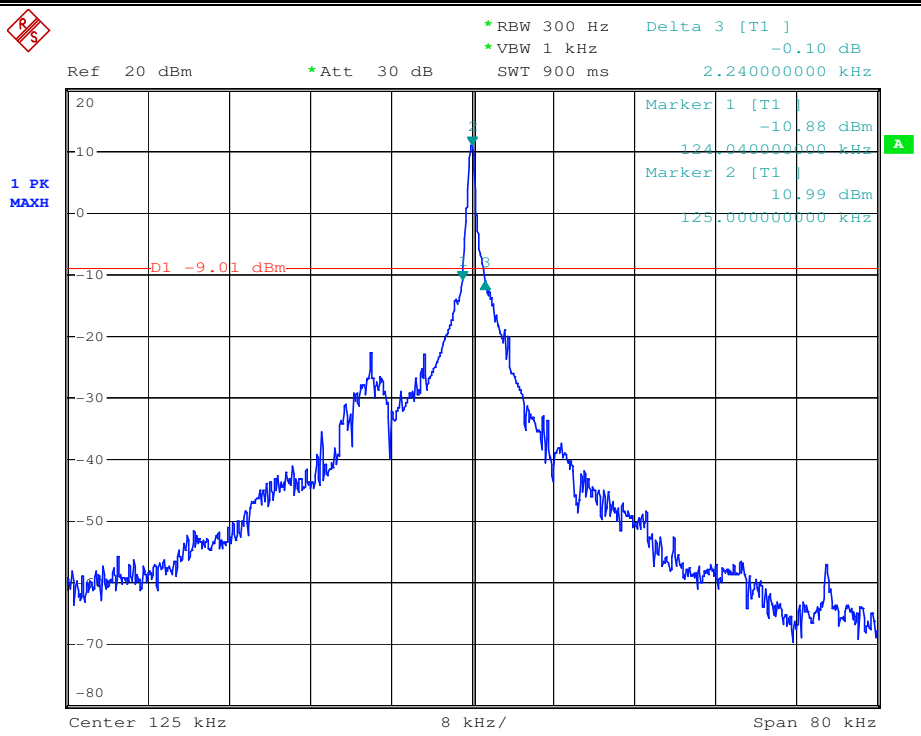
7.4 20dB Bandwidth

Test Setup:	
Frequency Range:	Operation frequency is 125KHz
Requirements:	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through §15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.
Test Result:	Pass

Measurement Data:

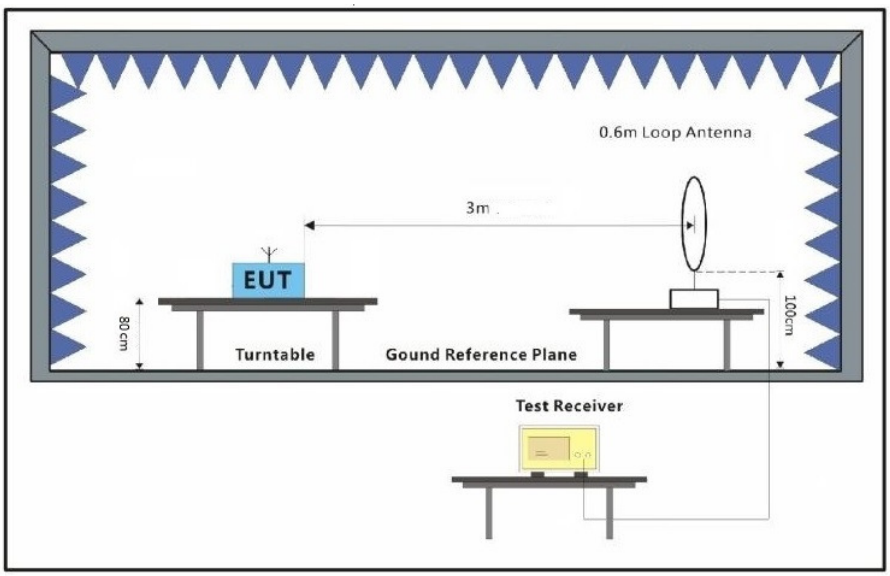
20dB bandwidth (KHz)	Result
2.24	Pass

Test plot as follows:



7.5 99% Occupied Bandwidth Test

Test Configuration:



Test Procedure:

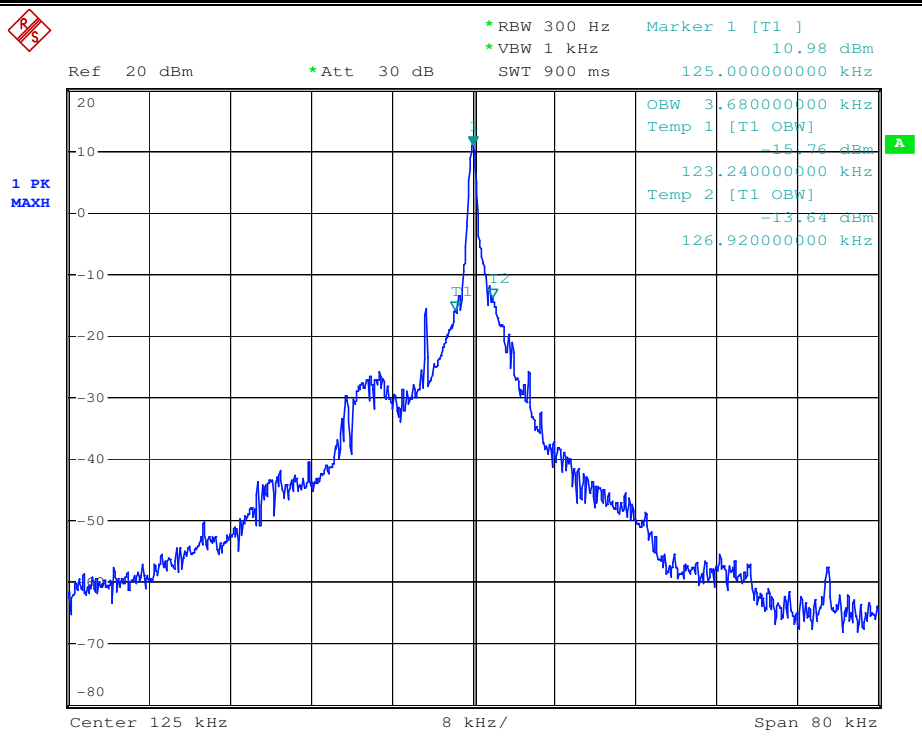
1. Set the spectrum analyzer: Span = approximately 2 to 3 times the 20dB bandwidth, centred on the hopping channel;
2. Set the spectrum analyzer: RBW >= 1% of the selected span (set 300 Hz). VBW >= RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
3. Mark the peak frequency and 99% bandwidth points.

Test Result: Pass

Test Data:

Frequency (kHz)	Bandwidth (kHz)
125	3.68

Test plot as follows:



8 Test Setup Photographs

Refer to the < Test Setup Photos-FCC>

9 EUT Constructional Details

Refer to the <External Photos> & < Internal Photos>.

--End of the Report--