

TEST REPORT

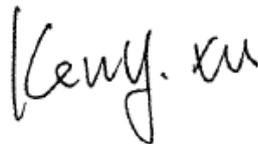
Application No.: SZEM2103002421CR
Applicant: Uniden America Corporation
Address of Applicant: 6225 N. State Highway 161 Suite 300, Irving, Texas 75038 United States
Manufacturer: Uniden Holding Corporation
Address of Manufacturer: 2-12-7, Hacchobori, Chuo-ku, Tokyo, Japan, 104-8512
Factory: Uniden Vietnam Limited
Address of Factory: Lot 5. 1, Tan Truong Industrial Zone, Cam Giang District, Hai Duong Province, Vietnam

Equipment Under Test (EUT):

EUT Name: VHF Marine Radio with GPS and Bluetooth
Model No.: UM725GBT
Trade Mark: Uniden
Standard(s) : IEC 60945:2002
 EN 60945:2002
Date of Receipt: 2021-03-05
Date of Test: 2021-03-08 to 2021-04-03
Date of Issue: 2021-04-06

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.



Keny Xu
 EMC Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-04-06		Original

Authorized for issue by:			
		<i>Edison Li</i>	
		Edison Li/Project Engineer	
		<i>Eric Fu</i>	
		Eric Fu/Reviewer	



2 Test Summary

Emission Part				
Item	Standard	Method	Requirement	Result
Conducted Emissions at DC Power Input Port (150kHz-30MHz)	IEC 60945:2002 EN 60945:2002	EN 60945:2002/IEC 60945:2002 clause 9.2.2	EN 60945:2002/IEC 60945:2002 clause 9.2	Pass
Radiated Emissions (Below 1GHz)		EN 60945:2002/IEC 60945:2002 clause 9.3.2	EN 60945:2002/IEC 60945:2002 clause 9.3	Pass
Radiated Emissions (Above 1GHz)		EN 60945:2002/IEC 60945:2002 clause 9.3.2	EN 60945:2002/IEC 60945:2002 clause 9.3	Pass
Radiated Emissions (Below 30MHz)		EN 60945:2002/IEC 60945:2002 clause 9.3.2	EN 60945:2002/IEC 60945:2002 clause 9.3	Pass

Immunity Part				
Item	Standard	Method	Requirement	Result
Electrostatic Discharge	IEC 60945:2002 EN 60945:2002	EN 61000-4-2:2009	EN 60945:2002/IEC 60945:2002 clause 10.9	Pass
Radiated Immunity (80MHz-2GHz)		EN 61000-4-3:2006+A1:2008+A2:2010	EN 60945:2002/IEC 60945:2002 clause 10.4	Pass
Electrical Fast Transients-Burst at Power Port		EN 61000-4-4:2012	EN 60945:2002/IEC 60945:2002 clause 10.5	Pass
Conducted Immunity at Power port (150kHz-80MHz)		EN 61000-4-6:2014	EN 60945:2002/IEC 60945:2002 clause 10.3	Pass
Power Supply Failure		EN 61000-4-11:2004 +A1:2017	EN 60945:2002/IEC 60945:2002 clause 10.3	Pass
Acoustic noise and signals		EN 60945:2002/IEC60945:2002 clause 11.1.2	EN 60945:2002/IEC60945:2002 clause 11.1	Pass
Compass safe distance		EN 60945:2002/IEC 60945:2002 clause 11.2.2	EN 60945:2002/IEC 60945:2002 clause 11.2	Pass
Protection against accidental access to dangerous voltages		EN 60945:2002/IEC 60945:2002 clause 12.1.2	EN 60945:2002/IEC 60945:2002 clause 12.1	Pass



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Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Electromagnetic radio frequency radiation	IEC 60945:2002/EN 60945:2002	EN 60945:2002/IEC 60945:2002 clause 12.2.2	EN 60945:2002/IEC 60945:2002 clause 12.2	Pass



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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 13.8V
Cable(s):	DC Cable: 150cm Unshielded; NMEA0183+Ext Speaker Cable: 100cm Unshielded;
Sample Type:	Mobile device
Internal Source:	More than 108MHz
Transceiver frequency Range:	156.025MHz-161.60MHz(TX) 156.050MHz-163.275MHz(RX, includes WX band)
DSC Transmitter Frequency Range:	156.525MHz(CH70), Meets Global DSC Class D standards.
Modulation Type:	VHF:FM for Analog DSC:FSK
Frequency Spacing:	VHF: 25KHz
Emission Type:	16K0G3E for VHF 16K0G2B for DSC
Rated Output Power:	25W/1W for VHF/DSC;
VHF/DSC Antenna Connectors:	SO-239(50 ohm, External Antenna)
VHF/DSC Antenna Gain:	3dBi
Type of Equipment:	Ship stations

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
DC power	ZHAOXIN	RXN-305D	REF. No.SEA2700
Coaxial Attenuator	Provided by client	TS4	HYT168793



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4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at DC Power Input Port (150kHz-30MHz)	± 3.0dB
Radiated Emissions (Below 1GHz)	± 4.5dB
Radiated Emissions (Above 1GHz)	± 4.8
Radiated Emissions (Below 30MHz)	± 3.1dB
Electrostatic Discharge	± 6 %
Radiated Immunity (80MHz-2GHz)	± 1.64dB
Electrical Fast Transients-Burst at Power Port	± 5 %
Conducted Immunity at Power port (150kHz-80MHz)	± 0.96dB
Power Supply Failure	± 4 %
Acoustic noise and signals	± 1.64dB
Compass safe distance	± 5 %
Protection against accidental access to dangerous voltages	± 5 %
Electromagnetic radio frequency radiation	± 0.75dB



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4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

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

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

4.8 EMS Monitor

Visual: Monitored the signaling lamps and data throughput.

Audio: None.



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5 Equipment List

Conducted Emissions at DC Power Input Port (150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2019-06-13	2022-06-12
EMI Test Receiver	Rohde&Schwarz	ESCI	SEM004-02	2020-03-24	2021-03-23
Switch	WEINSCHL ENGINEERING	1506A	SEN009-01	N/A	N/A
Matching Pad	anzac	PT-75	SEN009-02	N/A	N/A
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2020-07-10	2021-07-09
LISN	Schwarzebck	NNBM8124	SEM007-08	2020-09-23	2021-09-22
LISN	Schwarzebck	NNBM8124	SEM007-09	2020-09-23	2021-09-22

Radiated Emissions (Below 30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018-03-31	2021-03-30
MXE EMI receiver(3Hz-3.6GHz)	KEYSIGHT	N9038A	SEM004-16	2019-12-16	2020-12-15
Trilog-Broadband Antenna(25MHz-2GHz)	Schwarzbeck	VULB9168	SEM003-18	2019-08-08	2022-08-07
Pre-amplifier (9kHz-1GHz)	Sonoma Instrument Co	310N	SEM005-04	2020-04-09	2021-04-08
Loop Antenna (9kHz-30MHz)	ETS-Lindgren	6502	SEM003-08	2020-08-14	2023-08-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2020-07-10	2021-07-09

Radiated Emissions (Below 1GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2020-07-19	2023-07-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2020-11-02	2021-11-01
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-02	2019-05-24	2022-05-23
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2020-04-01	2021-03-31
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2020-07-10	2021-07-09



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Radiated Emissions (Above 1GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
EXA Signal Analyzer	Agilent Technologies Inc	N9010A	SEM004-12	2020-04-09	2021-04-08
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2020-09-23	2021-09-22
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2020-07-10	2021-07-09
Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2020-11-14	2023-11-13
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2020-04-01	2021-03-31

Electrostatic Discharge					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
ESD Generator	TESEQ AG	NSG 437	SEM019-02	2020-04-17	2021-04-16
ESD Ground Plane	SGS(3m*3m)	N/A	SEN006-01	N/A	N/A
ESD Simulator	SCHAFFNER	NSG 438	SEM019-01	2020-04-07	2021-04-06

Radiated Immunity (80MHz-2GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Fully-Anechoic Chamber 2	Chang Zhou Zhong Shuo	854	SEM001-05	2020-07-10	2021-07-09
Power Sensor	Rohde&Schwarz	NRP-Z91	SEM009-09	2020-03-23	2021-03-22
Stacked Log.-Per.-Broadband Antenna	Schwarzbeck	STLP 9129	SEM003-25	N/A	N/A
Signal Generator	Rohde&Schwarz	SMB100A	SEM006-11	2020-03-23	2021-03-22
Broadband Amplifier	Rohde&Schwarz	BBA150-BC250	SEM005-12	2020-09-23	2021-09-22
Broadband Amplifier	Rohde&Schwarz	BBA150-D110	SEM005-13	2020-04-01	2021-03-31
Broadband Amplifier	Rohde&Schwarz	BBA150-E60	SEM005-16	2020-05-21	2021-05-20
Measurement Software	Rohde&Schwarz	EMC32 V9.25.00	N/A	N/A	N/A
Amplifier	Amplifier Research	75A250A	SEM005-11	2020-04-01	2021-03-31
Wire ISN	Rohde&Schwarz	ENY 22	EMC0114	N/A	N/A
Audio Analyzer	Rohde&Schwarz	UPL	SEM008-01	2020-09-23	2021-09-22
Conditioning Amplifier	Brüel&Kjaer	2690-OS2	SEM005-10	2020-04-14	2021-04-13
Mouth Simulator	Brüel&Kjaer	4227	SEM017-01	2020-04-14	2021-04-13



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Signal Source	Brüel&Kjaer	4231	SEM017-02	2020-03-25	2021-03-24
Coupling/Decoupling Network	SCHLODER	CDN-M2+3	SEM007-10	2020-09-23	2021-09-22
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	SEM010-06	2019-09-23	2021-09-22

Electrical Fast Transients-Burst at Power Port					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	AUDIX	N/A	SEM001-08	2019-06-13	2022-06-12
Ultra Compact Simulator	EM Test	UCS 500N7	SEM018-02	2020-03-26	2021-03-25
Capacitive Coupling Clamp	EM Test	HFK	SEM018-03	2020-03-26	2021-03-25

Conducted Immunity at Power port (150kHz-80MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	AUDIX	N/A	SEM001-08	2019-06-13	2022-06-12
RF-Generator	SCHAFFNER	NSG 2070	SEM006-01	2020-10-22	2021-10-21
Coupling/Decoupling Network	SCHAFFNER	CDN M016	SEM007-03	2020-04-09	2021-04-08
EM Clamp	SCHAFFNER	KEMZ 801	SEM013-01	2020-09-23	2021-09-22

Power Supply Failure					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	AUDIX	N/A	SEM001-08	2019-06-13	2022-06-12
Ultra Compact Simulator	EM Test	UCS 500N7	SEM018-02	2020-03-26	2021-03-25
Capacitive Coupling Clamp	EM Test	HFK	SEM018-03	2020-03-26	2021-03-25
High Speed Coupling/Decoupling Network	EM Test	CNI 508N2	SEM018-05	2020-07-01	2021-06-30

Compass safe distance					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	AUDIX	N/A	SEM001-08	2019-06-13	2022-06-12
Magnetic Field Test Antenna	EM Test	MS100N	SEM018-04	2020-03-26	2021-03-25



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General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2020-09-15	2021-09-14
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2020-09-15	2021-09-14
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2020-04-07	2021-04-06



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6 Radio Spectrum Matter Test Results

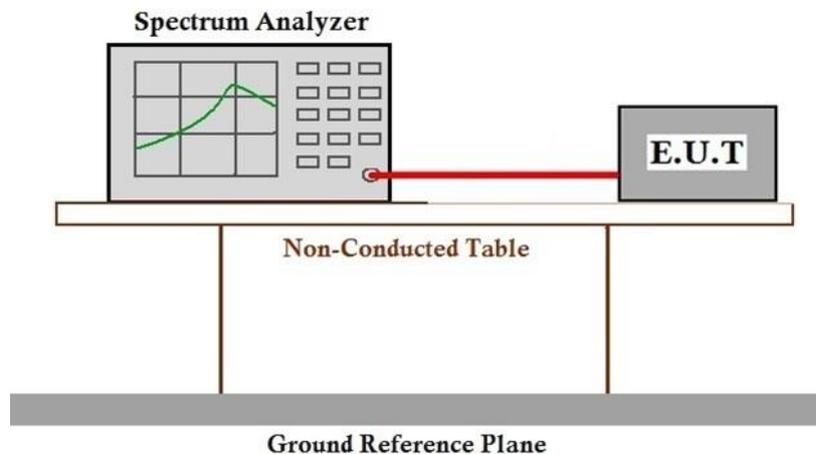
6.1 Electromagnetic radio frequency radiation

Test Requirement	EN 60945:2002/IEC 60945:2002 clause 12.2
Test Method:	EN 60945:2002/IEC 60945:2002 clause 12.2.2
Limit:	Where appropriate, the maximum distance from the EUT at which the power density level of 100 W/m ² and 10 W/m ² of the radio frequency radiation has been measured shall be included in the equipment manual.

6.1.1 E.U.T. Operation

Operating Environment:			
Temperature:	25.1 °C	Humidity:	53.8 % RH
		Atmospheric Pressure:	1010 mbar

6.1.2 Test Setup Diagram



6.1.3 Measurement Procedure and Data

Please refer to the test report SZEM210300242105.



7 Emission Test Results

7.1 Conducted Emissions at DC Power Input Port (150kHz-30MHz)

Test Requirement: IEC 60945:2002/EN 60945:2002
 Test Method: EN 60945:2002/IEC 60945:2002 clause 9.2.2
 Limit:
 0.01MHz-0.15MHz 96dB(μV)-50dB(μV) quasi-peak
 0.15MHz-0.35MHz 60dB(μV)-50dB(μV) quasi-peak
 0.35MHz-30MHz 50dB(μV) quasi-peak
 Detector: Peak for pre-scan (200Hz resolution bandwidth) 0.01MHz to 0.15MHz and (9kHz resolution bandwidth) 0.15MHz to 30MHz

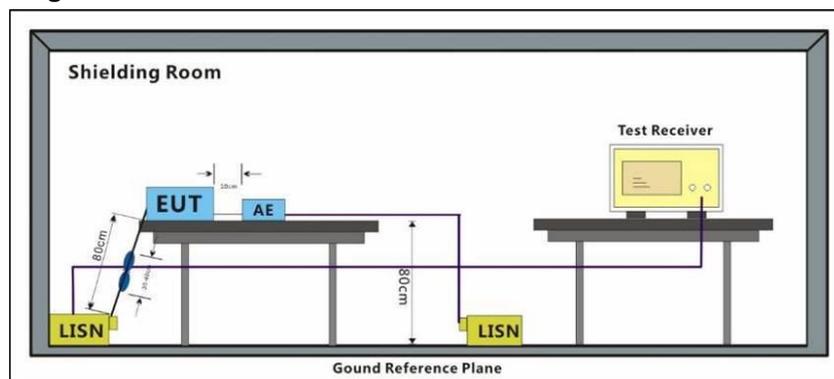
7.1.1 E.U.T. Operation

Operating Environment:
 Temperature: 23.5 °C Humidity: 40.1 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	On mode, keep EUT working normally.
Pre-scan	04	Idle mode, Keep the EUT at standby mode.

7.1.3 Test Setup Diagram

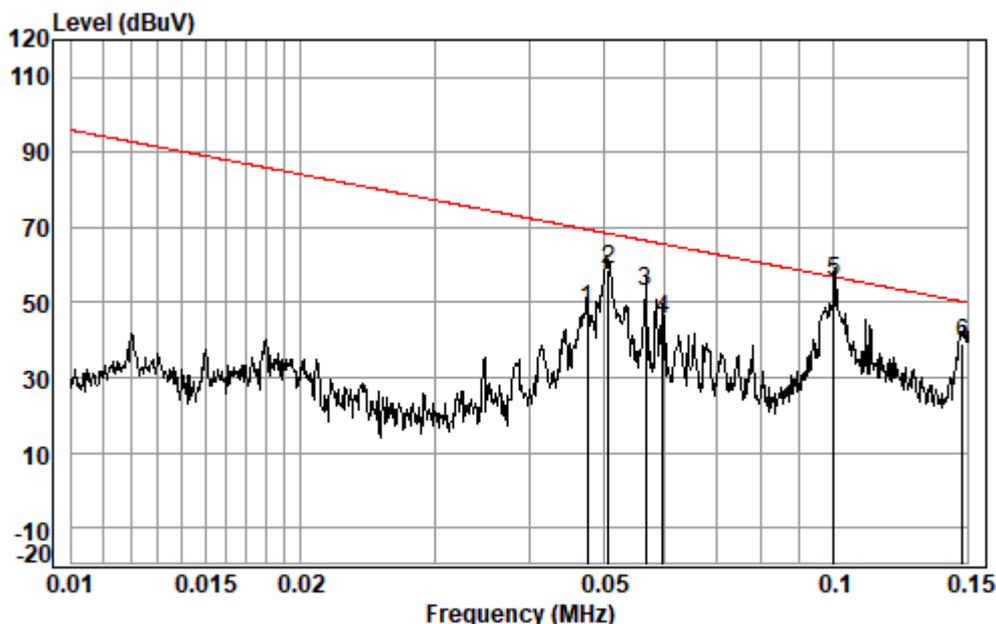


7.1.4 Measurement Procedure and Data

An initial pre-scan was performed with peak detector. Quasi-Peak measurement were performed at the frequencies with maximized peak emission were detected.



Test Mode: 00; Line: Live line



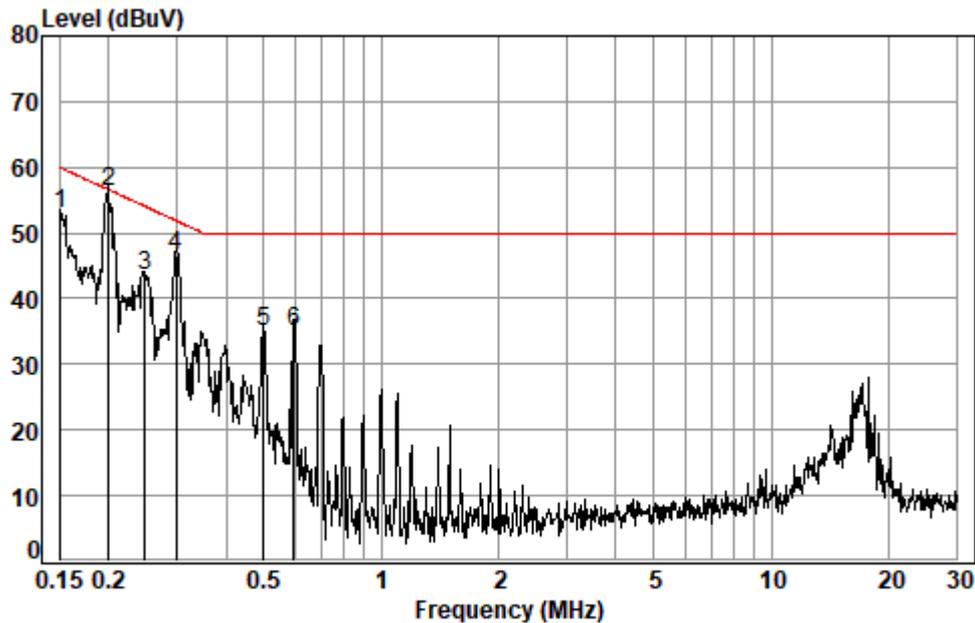
Site : Shielding Room
Condition: Line
Job No. : 02421CR
Test mode: 00

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.0476	0.01	9.54	38.49	48.04	69.50	-21.46	QP
2	0.0506	0.01	9.54	49.06	58.61	68.45	-9.84	QP
3	0.0567	0.01	9.54	43.30	52.85	66.51	-13.66	QP
4	0.0597	0.01	9.54	36.12	45.67	65.64	-19.97	QP
5	0.1000	0.01	9.59	46.20	55.80	56.89	-1.09	QP
6	0.1476	0.03	9.62	29.42	39.07	50.28	-11.21	QP



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Test Mode: 00; Line: Live line



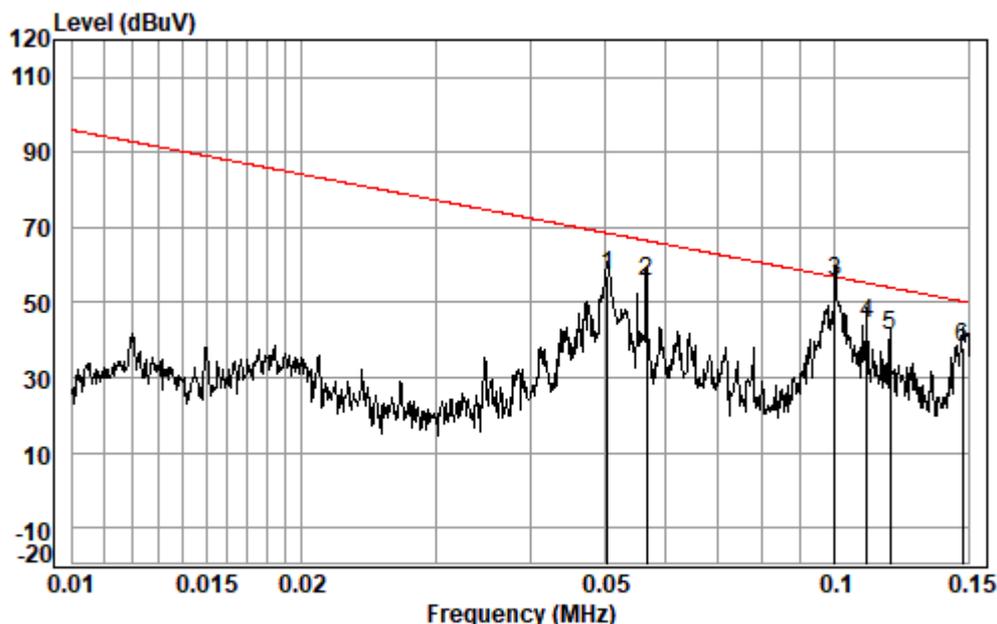
Site : Shielding Room
Condition: Line
Job No. : 02421CR
Test mode: 00

	Freq	Cable Loss	LISN Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1508	0.03	9.62	43.20	52.85	59.94	-7.09	QP
2	0.1998	0.04	9.64	46.61	56.29	56.62	-0.33	QP
3	0.2481	0.05	9.65	33.73	43.43	54.06	-10.63	QP
4	0.2987	0.05	9.66	36.82	46.53	51.87	-5.34	QP
5	0.4994	0.07	9.69	25.35	35.11	50.00	-14.89	QP
6	0.5979	0.08	9.68	25.20	34.96	50.00	-15.04	QP



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Test Mode: 00; Line: Neutral Line



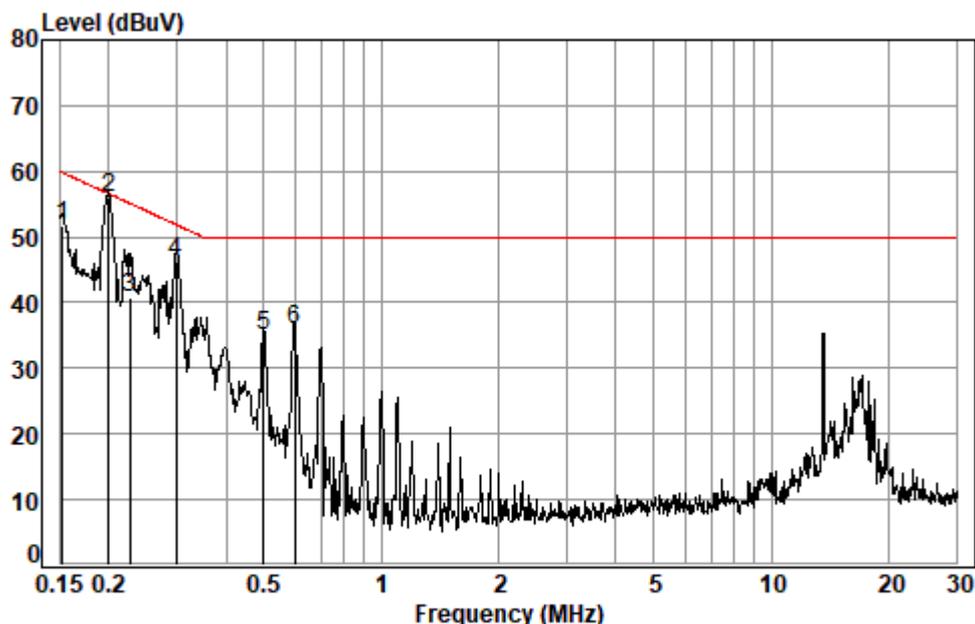
Site : Shielding Room
Condition: Neutral
Job No. : 02421CR
Test mode: 00

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.0504	0.01	9.53	47.49	57.03	68.54	-11.51	QP
2	0.0567	0.01	9.54	45.79	55.34	66.51	-11.17	QP
3	0.1000	0.01	9.59	46.00	55.60	56.89	-1.29	QP
4	0.1102	0.01	9.60	35.00	44.61	55.24	-10.63	QP
5	0.1182	0.02	9.60	31.84	41.46	54.05	-12.59	QP
6	0.1472	0.03	9.62	28.56	38.21	50.32	-12.11	QP



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Test Mode: 00; Line: Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 02421CR
Test mode: 00

	Freq	Cable Loss	LISN Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1524	0.03	9.62	42.21	51.86	59.81	-7.95	QP
2	0.2001	0.04	9.63	46.30	55.97	56.60	-0.63	QP
3	0.2265	0.04	9.64	31.10	40.78	55.14	-14.36	QP
4	0.2987	0.05	9.65	36.62	46.32	51.87	-5.55	QP
5	0.4994	0.07	9.67	25.13	34.87	50.00	-15.13	QP
6	0.6011	0.08	9.67	26.01	35.76	50.00	-14.24	QP



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7.2 Radiated Emissions (Below 30MHz)

Test Requirement: IEC 60945:2002/EN 60945:2002
 Test Method: EN 60945:2002/IEC 60945:2002 clause 9.3.2
 Measurement Distance: 3m
 Limit:
 150KHz-300KHz 80 dB(μV/m) to 52 dB(μV/m) quasi-peak
 300KHz-30MHz 52 dB(μV/m) to 34 dB(μV/m) quasi-peak
 Detector: Peak for pre-scan (9KHz resolution bandwidth) 150KHz to 30MHz.

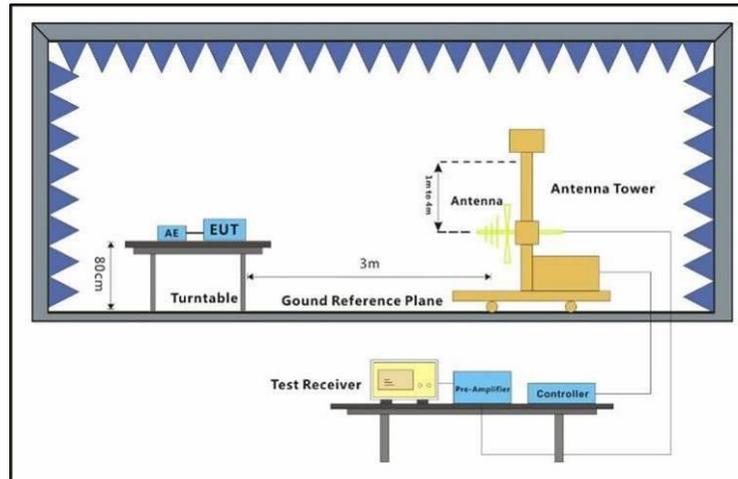
7.2.1 E.U.T. Operation

Operating Environment:
 Temperature: 22.5 °C Humidity: 48.6 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	On mode, keep EUT working normally.
Pre-scan	04	Idle mode, Keep the EUT at standby mode.

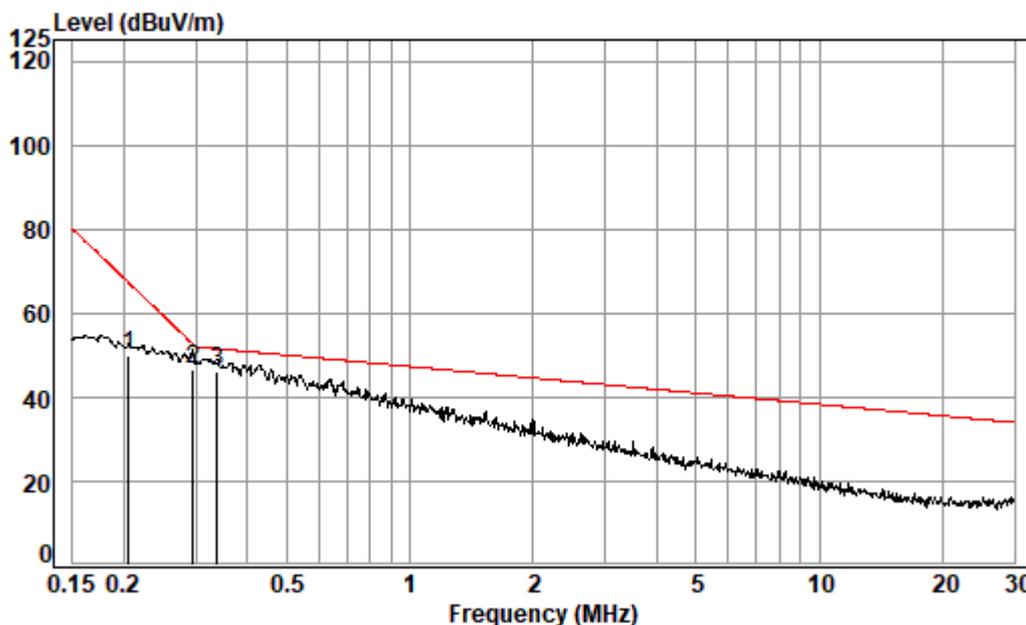
7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

An initial pre-scan was performed in the chamber using the spectrum analyser in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by BiConiLog antenna with 2 orthogonal polarities.

Test Mode: 00



Condition: 3m

Job No. : 02421AT

Test Mode: 00

	Freq	Read Level	Ant Factor	Cable Loss	Preamp Factor	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	0.206	70.98	10.95	0.14	32.22	49.85	67.16	-17.31	QP
2	0.296	67.75	10.89	0.25	32.23	46.66	52.60	-5.94	QP
3 pp	0.337	67.18	10.88	0.30	32.23	46.13	51.54	-5.41	QP



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7.3 Radiated Emissions (Below 1GHz)

Test Requirement: IEC 60945:2002/EN 60945:2002
 Test Method: EN 60945:2002/IEC 60945:2002 clause 9.3.2
 Measurement Distance: 3m
 Limit:
 30MHz-1GHz 54 dB(μV/m) quasi-peak
 156MHz-165MHz 24 dB(μV/m) quasi-peak, 30 dB(μV/m) peak
 Detector: Peak for pre-scan (9KHz resolution bandwidth) 156MHz to 165MHz,
 (120kHz resolution bandwidth) 30MHz to 1000MHz.

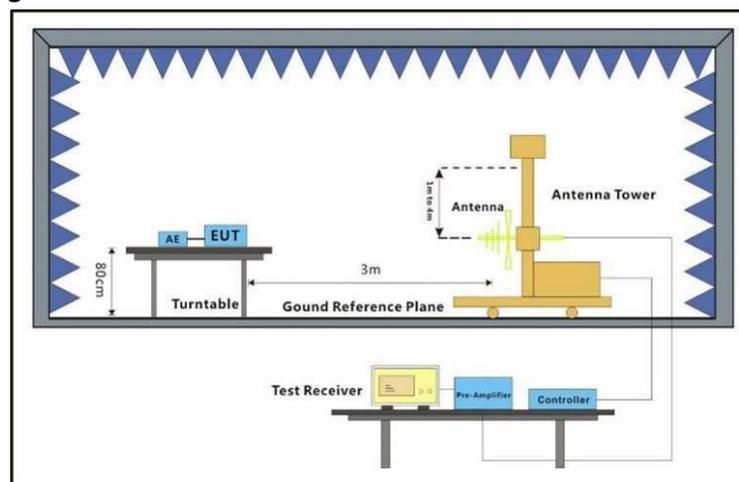
7.3.1 E.U.T. Operation

Operating Environment:
 Temperature: 22.5 °C Humidity: 48.6 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	On mode, keep EUT working normally.
Pre-scan	04	Idle mode, Keep the EUT at standby mode.

7.3.3 Test Setup Diagram

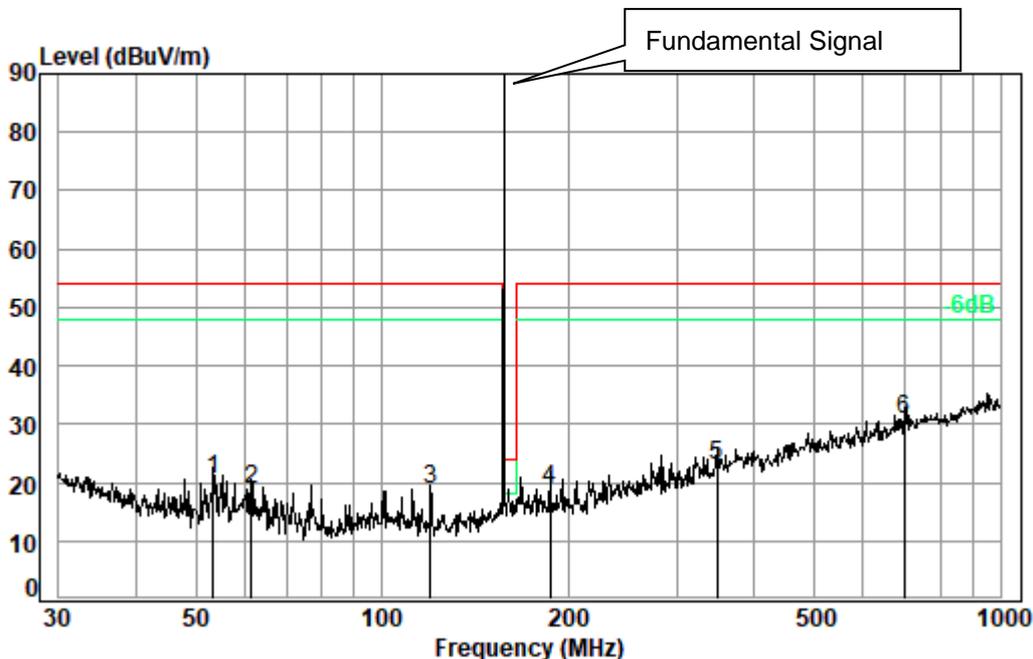


7.3.4 Measurement Procedure and Data

An initial pre-scan was performed in the chamber using the spectrum analyser in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by BiConiLog antenna with 2 orthogonal polarities.



Test Mode: 00; Polarity: Horizontal



Condition: 3m VERTICAL

Job No. : 02421CR

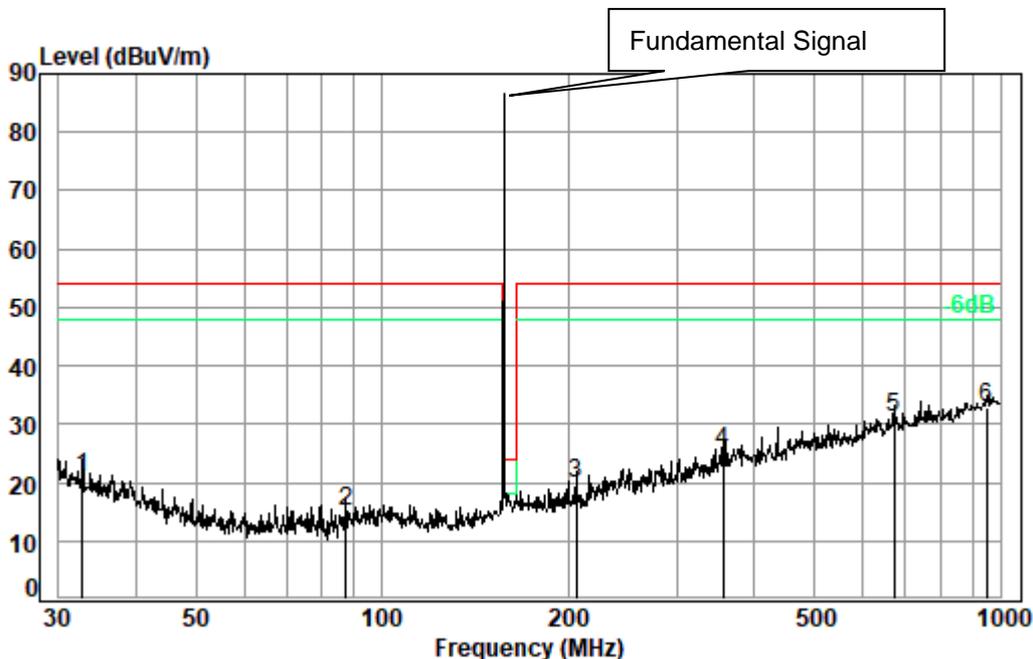
Test Mode: 00

	Cable	Ant	Preamp	Read	Limit	Over		
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	0.74	13.50	27.68	33.87	20.43	54.00	-33.57	QP
2	0.80	12.96	27.66	32.59	18.69	54.00	-35.31	QP
3	1.13	13.01	27.49	32.02	18.67	54.00	-35.33	QP
4	1.19	15.47	27.19	29.30	18.77	54.00	-35.23	QP
5	2.15	20.88	27.14	27.06	22.95	54.00	-31.05	QP
6 pp	2.90	27.11	27.92	28.86	30.95	54.00	-23.05	QP



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Test Mode: 00; Polarity: Vertical



Condition: 3m HORIZONTAL

Job No. : 02421CR

Test Mode: 00

	Cable	Ant	Preamp	Read	Limit	Over		
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	0.63	21.27	27.73	26.87	21.04	54.00	-32.96	QP
2	1.28	12.78	27.62	28.73	15.17	54.00	-38.83	QP
3	1.26	15.48	27.12	30.30	19.92	54.00	-34.08	QP
4	2.18	21.47	27.18	28.70	25.17	54.00	-28.83	QP
5	2.85	27.13	27.97	29.12	31.13	54.00	-22.87	QP
6 pp	3.55	29.33	26.91	27.05	33.02	54.00	-20.98	QP



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7.4 Radiated Emissions (Above 1GHz)

Test Requirement: IEC 60945:2002/EN 60945:2002
 Test Method: EN 60945:2002/IEC 60945:2002 clause 9.3.2
 Measurement Distance: 3m
 Limit:
 1GHz-2GHz 54 dB(μV/m) peak
 Detector: Peak for pre-scan (120KHz resolution bandwidth) 1GHz to 2GHz

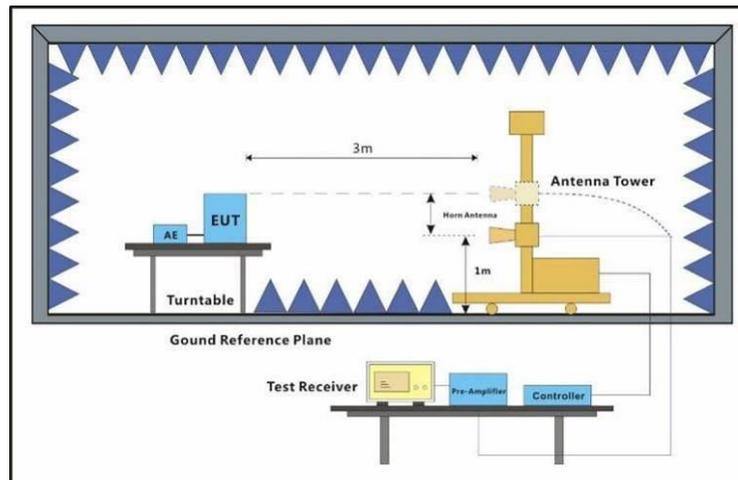
7.4.1 E.U.T. Operation

Operating Environment:
 Temperature: 23.5 °C Humidity: 40.1 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	On mode, keep EUT working normally.
Pre-scan	04	Idle mode, Keep the EUT at standby mode.

7.4.3 Test Setup Diagram

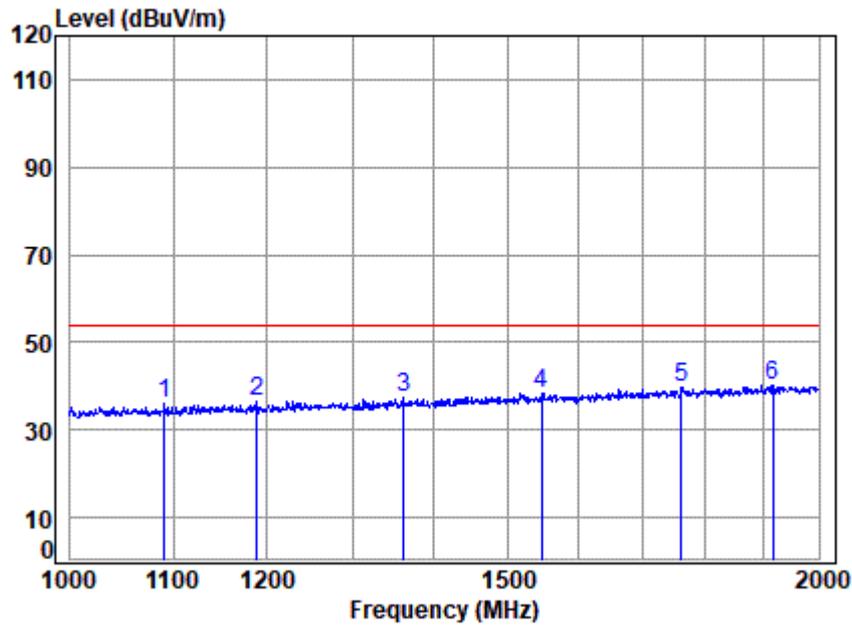


7.4.4 Measurement Procedure and Data

An initial pre-scan was performed in the chamber using the spectrum analyser in peak detection mode. The EUT was measured by Horn antenna with 2 orthogonal polarities.



Test Mode: 00; Polarity: Horizontal



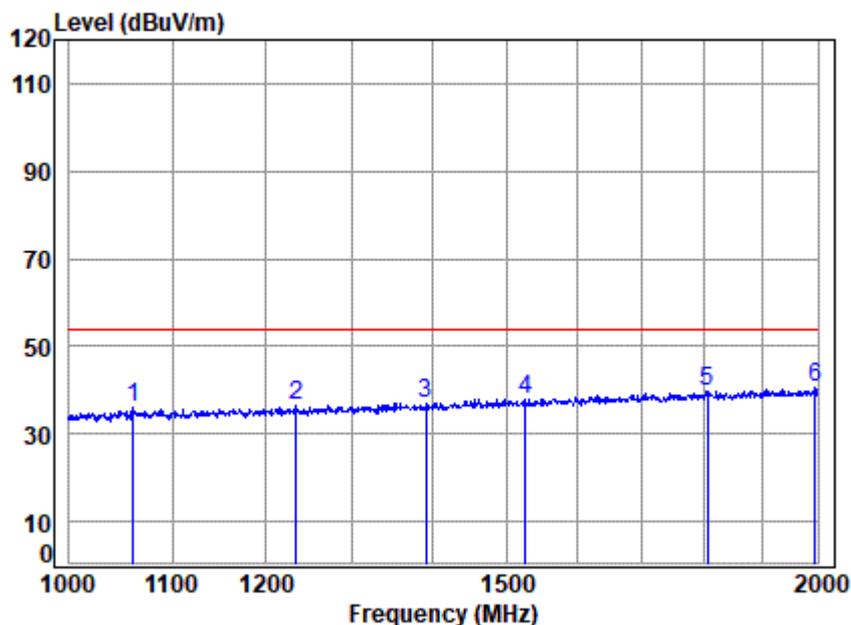
Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 02421CR
 Mode : 00
 Note :

	Cable	Ant	Preamp	Read	Limit	Over		
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2.55	24.07	39.68	48.99	35.93	54.00	-18.07	Peak
2	2.74	24.54	39.75	49.20	36.73	54.00	-17.27	Peak
3	3.05	25.28	39.87	48.98	37.44	54.00	-16.56	Peak
4	3.30	26.01	39.98	48.97	38.30	54.00	-15.70	Peak
5	3.48	26.91	40.09	49.24	39.54	54.00	-14.46	Peak
6	3.59	27.51	40.16	49.29	40.23	54.00	-13.77	Peak



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Test Mode: 00; Polarity: Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No : 02421CR
 Mode : 00
 Note :

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	1061.423	2.49	23.92	39.65	49.30	36.06	54.00	-17.94 Peak
2	1233.707	2.83	24.74	39.78	48.52	36.31	54.00	-17.69 Peak
3	1391.846	3.09	25.39	39.89	48.55	37.14	54.00	-16.86 Peak
4	1525.202	3.28	25.92	39.97	48.74	37.97	54.00	-16.03 Peak
5	1806.253	3.51	27.09	40.11	49.37	39.86	54.00	-14.14 Peak
6	1994.463	3.65	27.78	40.20	49.27	40.50	54.00	-13.50 Peak



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8 Immunity Test Results

- Performance criteria A the EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer;
- Performance criteria B the EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer.
 During the test, degradation or loss of function or performance which is self-recoverable is however, allowed, but no change of actual operating state or stored data is allowed.
- Performance criteria C temporary degradation or loss of function or performance is allowed during the test, provided the function is self-recoverable, or can be restored at the end of the test by the operation of the controls, as defined in the relevant equipment standard and in the technical specification published by the manufacturer.



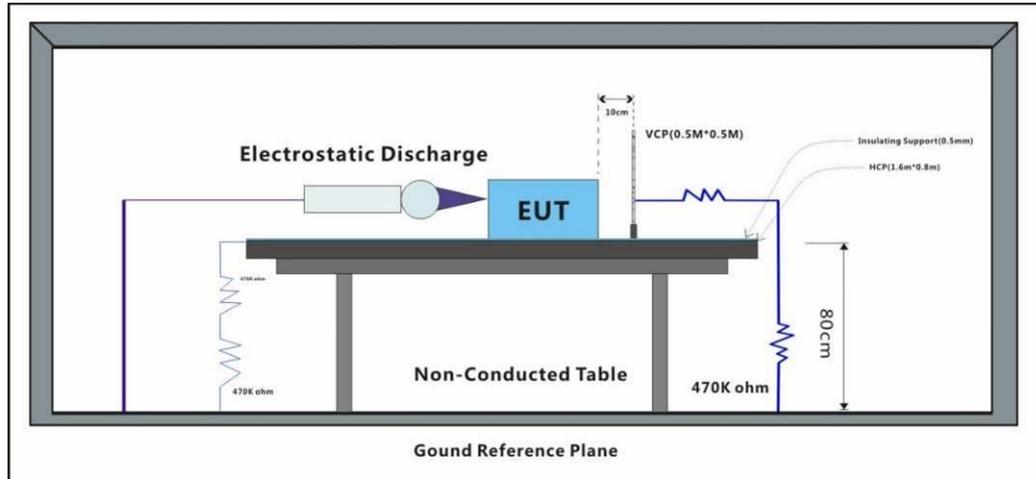
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8.1 Electrostatic Discharge

Test Requirement: IEC 60945:2002/EN 60945:2002

Test Method: EN 61000-4-2:2009

8.1.1 Test Setup Diagram



8.1.2 E.U.T. Operation

Operating Environment:

Temperature: 20.2 °C

Humidity: 56.3 % RH

Atmospheric Pressure: 1010 mbar

8.1.1 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	On mode, keep EUT working normally.
Final test	04	Idle mode, Keep the EUT at standby mode.

8.1.2 Test Condition and Results:

Performance Criterion: B

Discharge Impedance: 330Ω/150pF

Number of Discharge: Minimum 10 times at each test point

Discharge Mode: Single Discharge

Discharge Period: 1 second minimum

Test Point: 1. All insulated enclosure and seams.

2. All accessible metal parts of the enclosure.

3. All side.



Discharge type	Level (kV)	Polarity	Test Point	Result / Observations
Air Discharge	2,4,8	+	1	A
Air Discharge	2,4,8	-	1	A
Contact Discharge	6	+	2	A
Contact Discharge	6	-	2	A
Horizontal Coupling	6	+	3	A
Horizontal Coupling	6	-	3	A
Vertical Coupling	6	+	3	A
Vertical Coupling	6	-	3	A

Results:

A: No degradation in the performance of the EUT was observed.

No false alarms or other malfunctions were observed during or after the test.

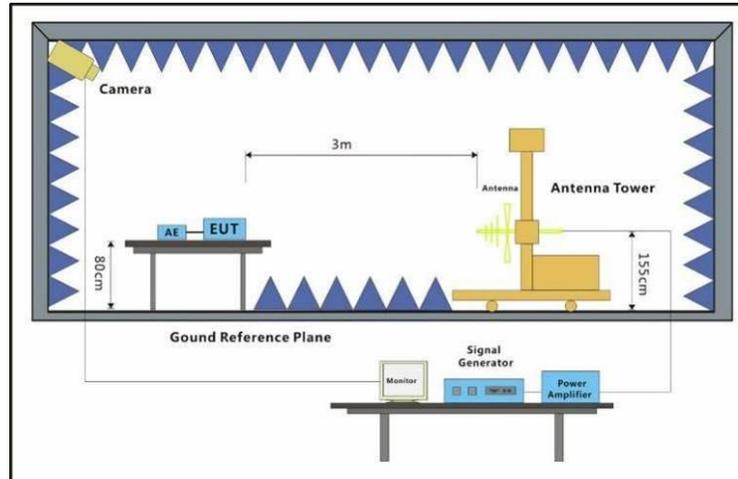


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8.2 Radiated Immunity (80MHz-2GHz)

Test Requirement: IEC 60945:2002/EN 60945:2002
 Test Method: EN 61000-4-3:2006+A1:2008+A2:2010

8.2.1 Test Setup Diagram



8.2.2 E.U.T. Operation

Operating Environment:
 Temperature: 20.2 °C Humidity: 56.3 % RH Atmospheric Pressure: 1010 mbar

8.2.3 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	On mode, keep EUT working normally.
Final test	04	Idle mode, Keep the EUT at standby mode.

8.2.4 Test Condition and Results:

Performance Criterion: A
 Frequency Range: 80MHz to 2GHz
 Antenna Polarisation: Vertical and Horizontal
 Modulation: 400Hz,80% Amp. Mod,10% increment



Frequency	Level (V/m)	EUT Face	Dwell time	Result / Observations
80MHz-2GHz	10	Front	2s	A
80MHz-2GHz	10	Back	2s	A
80MHz-2GHz	10	Left	2s	A
80MHz-2GHz	10	Right	2s	A
80MHz-2GHz	10	Top	2s	A
80MHz-2GHz	10	Underside	2s	A

A: No degradation in the performance of the EUT was observed.
 No false alarms or other malfunctions were observed during or after the test.



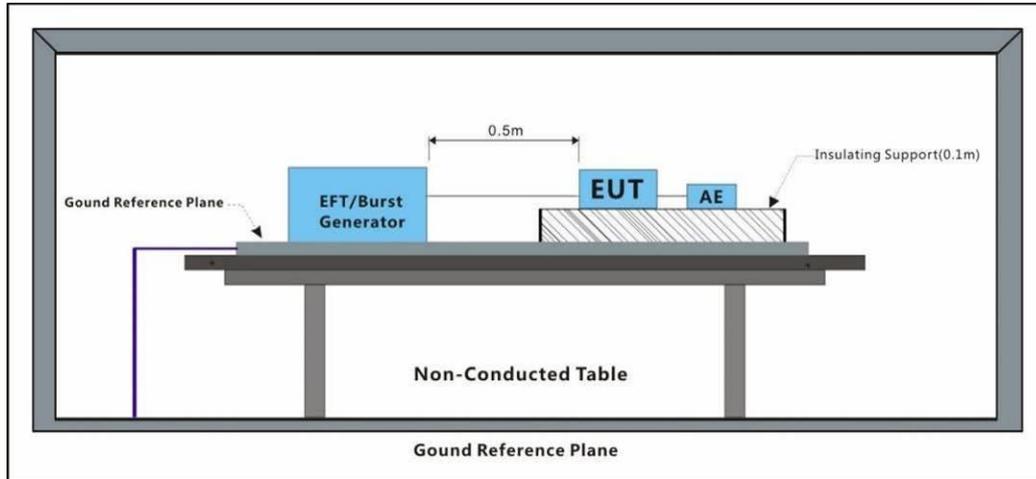
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8.3 Electrical Fast Transients-Burst at Power Port

Test Requirement: IEC 60945:2002/EN 60945:2002

Test Method: EN 61000-4-4:2012

8.3.1 Test Setup Diagram



8.3.2 E.U.T. Operation

Operating Environment:

Temperature: 22.3 °C

Humidity: 32.9 % RH

Atmospheric Pressure: 1010 mbar

8.3.1 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	On mode, keep EUT working normally.
Final test	04	Idle mode, Keep the EUT at standby mode.

8.3.2 Test Condition and Results:

Performance Criterion: B

Repetition Frequency: 5kHz

Burst Period: 300ms

Test Duration: 3 minute per level & polarity



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Test Line	Level (kV)	Polarity	CDN/Clamp	Result / Observations
DC power port	1	+	CDN	A
DC power port	1	-	CDN	A

A: No degradation in the performance of the EUT was observed.
 No false alarms or other malfunctions were observed during or after the test.



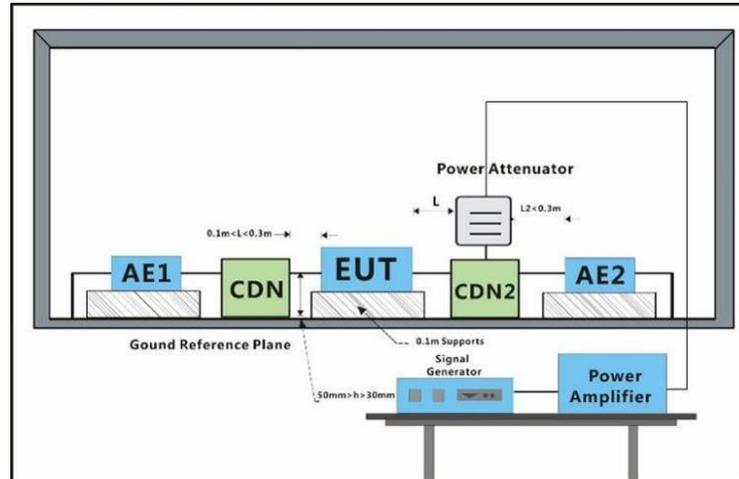
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8.4 Conducted Immunity at Power port (150kHz-80MHz)

Test Requirement: IEC 60945:2002/EN 60945:2002

Test Method: EN 61000-4-6:2014

8.4.1 Test Setup Diagram



8.4.2 E.U.T. Operation

Operating Environment:

Temperature: 22.3 °C

Humidity: 33.0 % RH

Atmospheric Pressure: 1010 mbar

8.4.3 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	On mode, keep EUT working normally.
Final test	04	Idle mode, Keep the EUT at standby mode.

8.4.4 Test Condition and Results:

Performance Criterion: A

Frequency Range: 0.15MHz to 80MHz

Modulation: 80%, 400Hz Amplitude Modulation

Step Size: 1%



Frequency Range	Level (Vrms)	CDN/Clamp	Dwell time	Result / Observations
150KHz to 80MHz	3	CDN	2s	A
2MHz	10	CDN	2s	A
3MHz	10	CDN	2s	A
4MHz	10	CDN	2s	A
6.2MHz	10	CDN	2s	A
8.2MHz	10	CDN	2s	A
12.6MHz	10	CDN	2s	A
16.5MHz	10	CDN	2s	A
18.8MHz	10	CDN	2s	A
22MHz	10	CDN	2s	A
25MHz	10	CDN	2s	A

A: No degradation in the performance of the EUT was observed.
 No false alarms or other malfunctions were observed during or after the test.

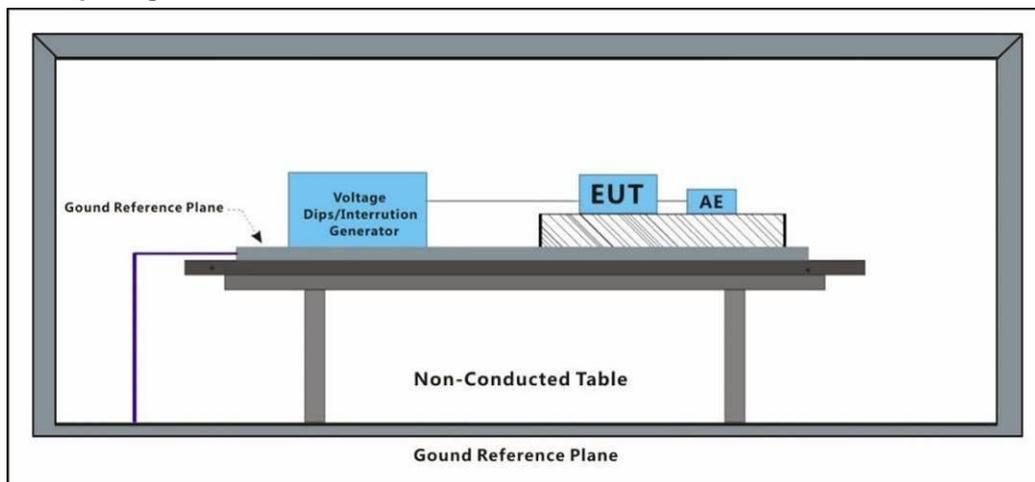


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8.5 Power Supply Failure

Test Requirement: IEC 60945:2002/EN 60945:2002
 Test Method: EN 61000-4-11:2004 +A1:2017

8.5.1 Test Setup Diagram



8.5.2 E.U.T. Operation

Operating Environment:
 Temperature: 22.3 °C Humidity: 33.0 % RH Atmospheric Pressure: 1010 mbar

8.5.3 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	On mode, keep EUT working normally.
Final test	04	Idle mode, Keep the EUT at standby mode.

8.5.4 Test Condition and Results:

Performance Criterion: C
 Test duration time: 60s
 Requirement: 3Times

Voltage (& Reduction)	Duration(Sec)	Performance Criterion	Observation	Test Result
13.8	60	C	Note1	A

Note1: During power supply failure tests, EUT operates automatically and normally each time after power is restored.

A: No degradation in the performance of the EUT was observed

No false alarms or other malfunctions were observed during or after the test.



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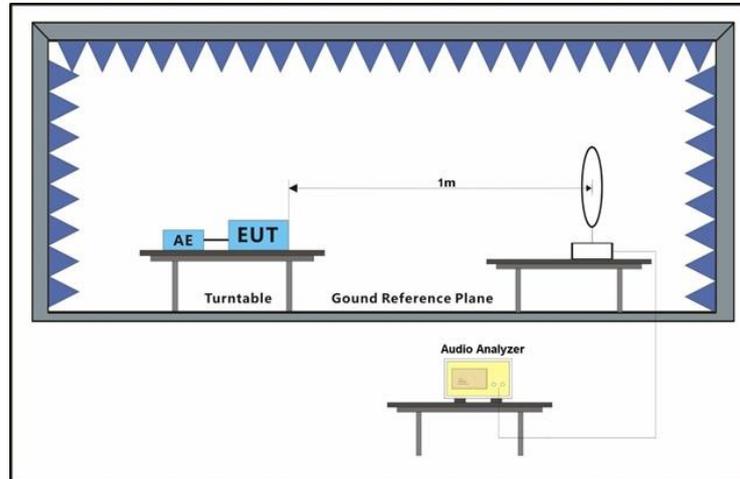
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8.6 Acoustic noise and signals

Test Requirement: IEC 60945:2002/EN 60945:2002
 Test Method: EN 60945:2002/IEC60945:2002 clause 11.1.2

8.6.1 Test Setup Diagram



8.6.2 E.U.T. Operation

Operating Environment:
 Temperature: 22.3 °C Humidity: 33.0 % RH Atmospheric Pressure: 1010 mbar

8.6.1 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	On mode, keep EUT working normally.
Final test	04	Idle mode, Keep the EUT at standby mode.

8.6.2 Test Condition and Results:

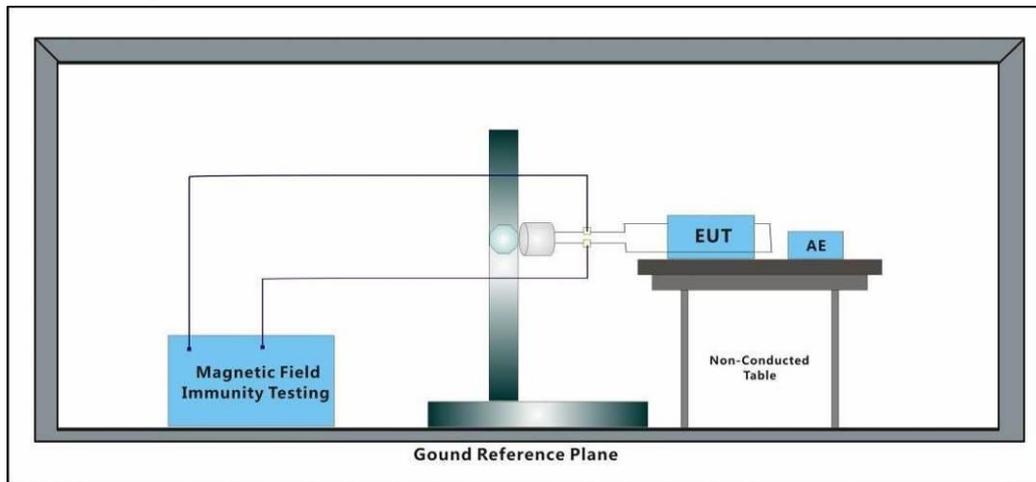
Test Conditions	Test Distance(m)	Acoustic pressure Level(dB(A))	Limit(dB(A))	Test Result
Normal mode	1	50	60	Pass
Audible alarms mode	1	77	75~85	Pass



8.7 Compass safe distance

Test Requirement: IEC 60945:2002/EN 60945:2002
 Test Method: EN 60945:2002/IEC 60945:2002 clause 11.2.2

8.7.1 Test Setup Diagram



8.7.2 E.U.T. Operation

Operating Environment:
 Temperature: 22.3 °C Humidity: 33.0 % RH Atmospheric Pressure: 1010 mbar

8.7.3 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	Power Off, keep the EUT unpowered.
Final test	05	Power On, Keep the EUT powered.
Final test	04	Idle mode, Keep the EUT at standby mode.

8.7.4 Test Condition and Results:

Compass safe distance is the distance between the nearest point of the EUT and the subject compass, where an unacceptable compass deviation occur.

For a standard compass, the horizontal magnetic flux shall be less than 0.942 mGauss (compass deviation of 5.4°/H).

For a steering/standby/emergency compass, the horizontal magnetic flux shall be less than 3.142 mGauss (compass deviation of 18°/H).

The compass safe distance is measured with a DC milligaussmeter. The EUT is first rotated to determine the worst case direction. Secondly the EUT is moved towards/away from the measurement probe until the required field is measured. The distance is then measured.



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All distances rounded up to the nearest 5cm or 10cm.

The EUT was measured before after being normalized, it was normalised by placing it in a Helmholtz coil and applying a a d.c. field of $1 \times 1\,000 / 4\pi$ A/m with a superimposed stabilizing a.c. field of 50 Hz of $18 \times 1\,000 / 4\pi$ A/m r.m.s.

EUT mode	Front	Rear	Left	Right	Top	Bottom
Power Off	5cm	5cm	5cm	5cm	10cm	5cm
Power On	5cm	5cm	5cm	5cm	10cm	5cm
Normalised	5cm	5cm	5cm	5cm	10cm	5cm

Note:

All distances rounded up to the nearest 5cm or 10cm.

The EUT was measured before after being normalized, it was normalised by placing it in a Helmholtz coil and applying a a d.c. field of $1 \times 1\,000 / 4\pi$ A/m with a superimposed stabilizing a.c. field of 50 Hz of $18 \times 1\,000 / 4\pi$ A/m r.m.s.

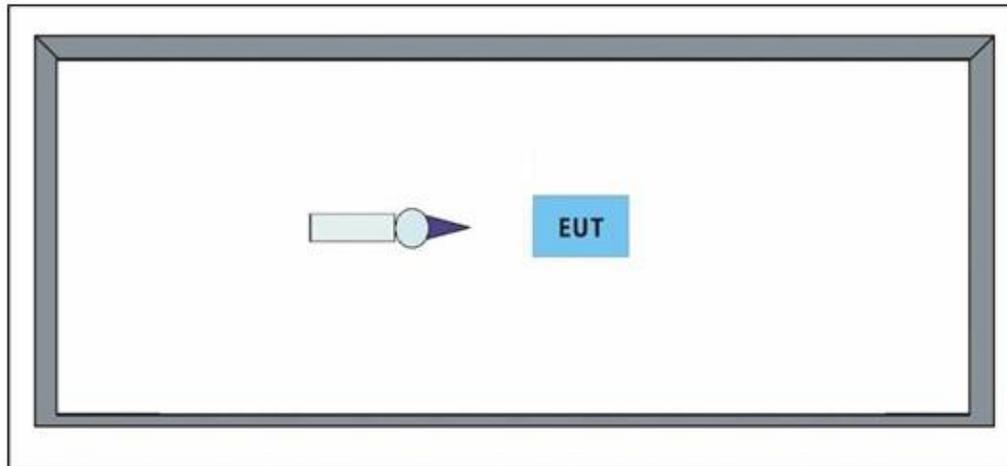


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8.8 Protection against accidental access to dangerous voltages

Test Requirement: IEC 60945:2002/EN 60945:2002
 Test Method: EN 60945:2002/IEC 60945:2002 clause 12.1.2

8.8.1 Test Setup Diagram



8.8.2 E.U.T. Operation

Operating Environment:
 Temperature: 22.3 °C Humidity: 33.1 % RH Atmospheric Pressure: 1010 mbar

8.8.3 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	Power Off, keep the EUT unpowered.
Final test	05	Power On, Keep the EUT powered.
Final test	04	Idle mode, Keep the EUT at standby mode.



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8.8.4 Test Condition and Results:

The EUT shall be subjected to the test corresponding to IEC 60529, table I, first characteristic numeral 2: protected against access to hazardous parts with a finger.

The test shall be carried out by inserting the access probe through any openings of the enclosure of the EUT with the force specified in table VI of IEC 60529.

For the test, the jointed test finger may penetrate to its 80 mm length. Starting from the straight position, both joints of the finger shall be successively bent through an angle of up to 90° with respect to the access of the adjoining section of the finger and shall be placed in every possible position.

For low-voltage equipment (rated voltages not exceeding 1000 V a.c. and 1500 V d.c.) the test finger shall be connected to a low-voltage supply (of not less than 40 V and not more than 50 V) in series with a suitable lamp connected between the access probe and the hazardous parts inside the enclosure.

For high voltage equipment (rated voltages exceeding 1000 V a.c. or 1500 V d.c.), with the access probe placed in the most unfavourable positions, the EUT shall be submitted to the dielectric test as specified in the relevant equipment standard. Verification may be made either by dielectric test or by inspection of the specified clearance dimensions in air which would ensure that the test would be satisfactory under the most unfavourable electric field configuration (see IEC 60071-2).

When an enclosure includes sections at different voltage levels, the appropriate acceptance conditions for adequate clearance shall be applied for each section.

Finally, it shall be verified that any further access to the interior of the EUT is only possible by means of a tool, such as a spanner or screwdriver, and warning labels, if appropriate, are displayed within the EUT and on protective covers.

Test Conditions	Clearances(m)	Working Status	Requirements	Test Result
Low Voltage	0.1	the lamp shall not light	the lamp shall not light	A
High Voltage	0.1	the EUT can withstood the dielectric test.	the EUT shall be capable of withstanding the dielectric test.	A

A: No degradation in the performance of the EUT was observed

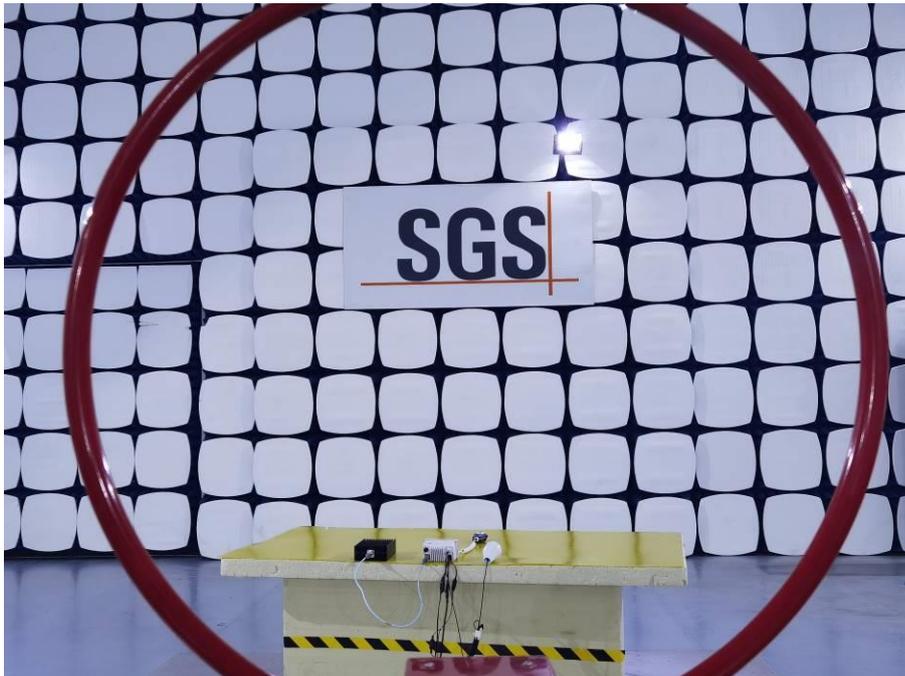


9 Test Setup Photo

Conducted Emissions at DC Power Input Port (150kHz-30MHz)



Radiated Emissions (Below 30MHz)



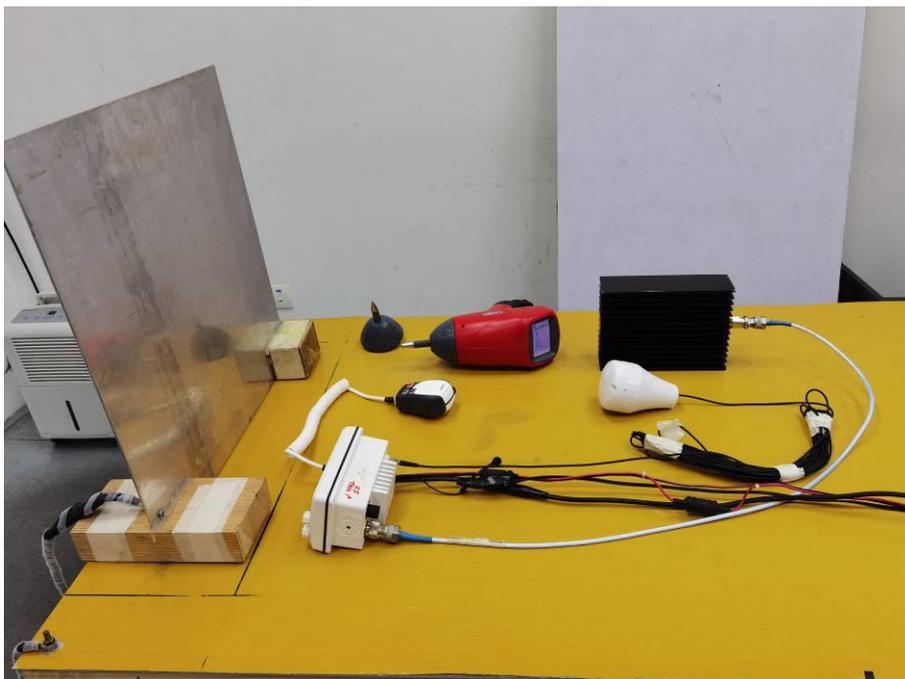
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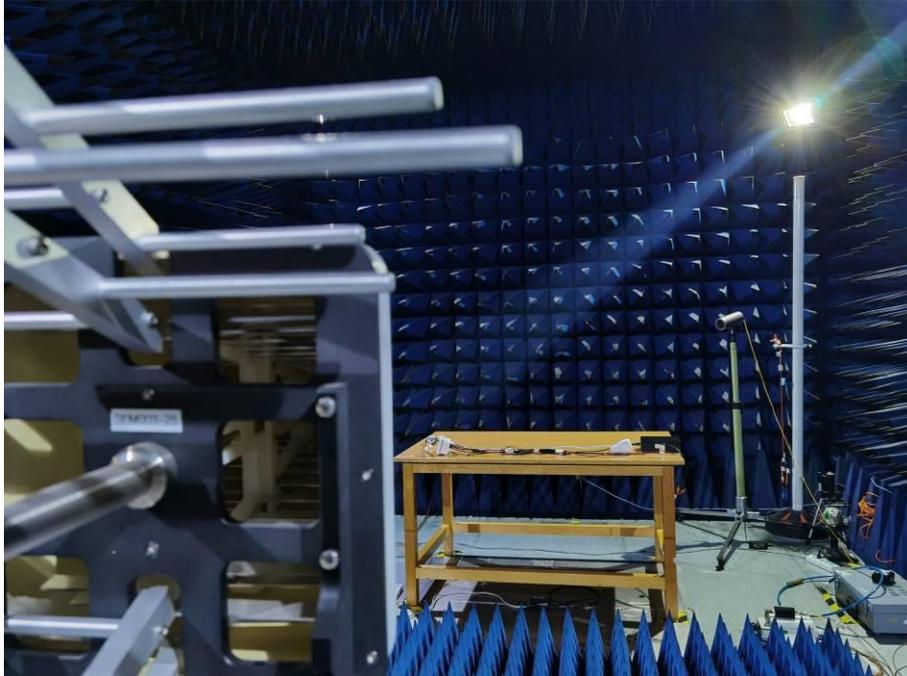
Radiated Emissions (Below 1GHz)



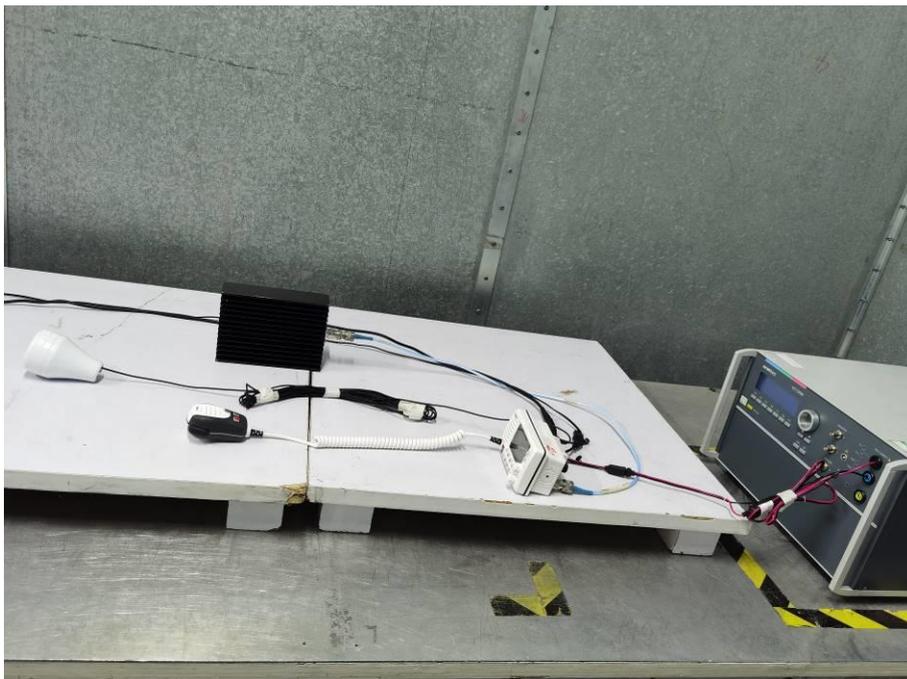
Electrostatic Discharge



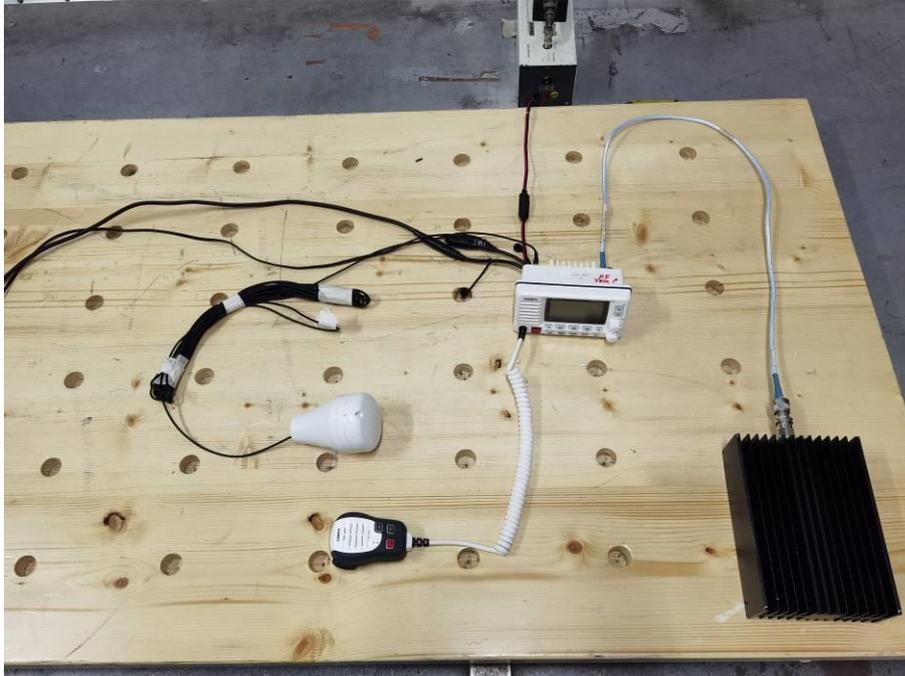
Radiated Immunity (80MHz-2GHz)



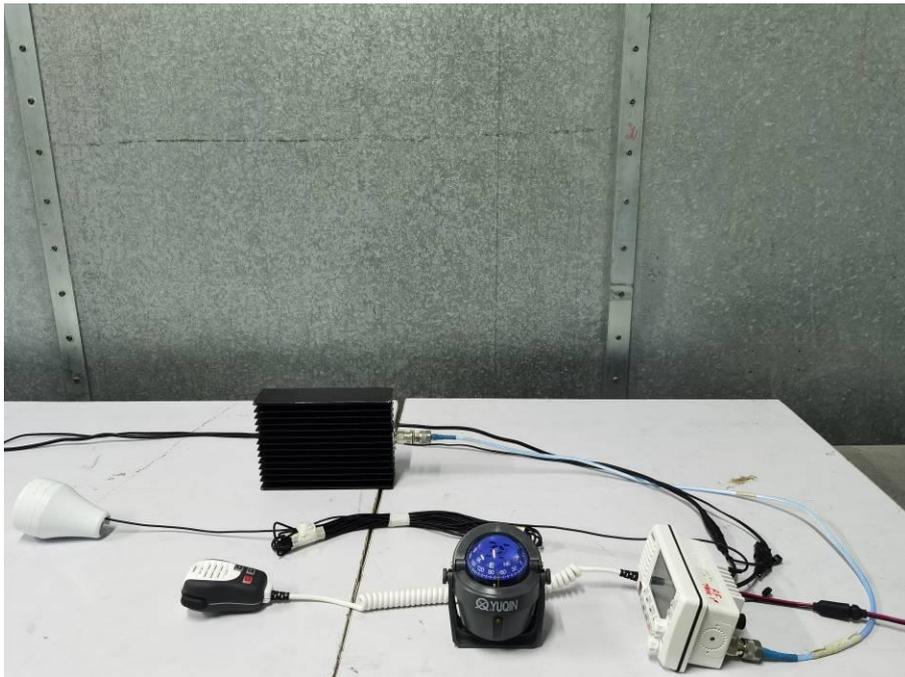
Electrical Fast Transients-Burst at Power Port



Conducted Immunity at Power port (150kHz-80MHz)



Compass safe distance



Protection against accidental access to dangerous voltages



10 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for SZEM210300242102CR

- End of the Report -



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