



TEST REPORT

Application No.: SZEM2009008718CR
Applicant: SAGEMCOM BROADBAND SAS
Address of Applicant: 250 Route de l'Empereur - 92848 RUEIL MALMAISON CEDEX- FRANCE
Manufacturer: SAGEMCOM BROADBAND SAS
Address of Manufacturer: 250 Route de l'Empereur - 92848 RUEIL MALMAISON CEDEX- FRANCE
Factory: AGEMCOM BROADBAND SAS
Address of Factory: 250 Route de l'Empereur - 92848 RUEIL MALMAISON CEDEX- FRANCE
Equipment Under Test (EUT):
EUT Name: Home Hub 4000(FAST 5689)
Model No.: FAST 5689
FCC ID: VW3FAST5689
Trade mark: SAGEMCOM
Standard(s) : 47 CFR Part 15, Subpart C 15.249
Date of Receipt: 2020-09-02
Date of Test: 2020-09-03 to 2020-09-30
Date of Issue: 2020-11-19

Test Result:

Pass*

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu

Keny Xu
EMC Laboratory Manager



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

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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2020-11-19		Original

Authorized for issue by:			
			
		Leo Lai/Project Engineer	
			
		Eric Fu/Reviewer	

2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.249	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
20dB Bandwidth	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass
Field Strength of the Fundamental Signal (15.249(a))	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.5&6.6	47 CFR Part 15, Subpart C 15.249(a)	Pass
Restricted Band Around Fundamental Frequency	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209	Pass
Radiated Emissions	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass



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4 General Information

4.1 Details of E.U.T.

Test voltage:	120V~60Hz
Power adapter:	Model: MSA-Z5000IS12.0-60A-P Input: 100-120V~50/60Hz 1.5A Max, Output: DC 12V 5A
Antenna Gain:	0dBi
Channels:	908.4MHz, 908.42MHz, 916MHz
Modulation:	FSK
Antenna Type:	Internal Antenna

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	T430u	REF. No.SEA1800

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	$\pm 3.0\text{dB}$ (150kHz to 30MHz)
20dB Bandwidth	$\pm 3\%$
Field Strength of the Fundamental Signal (15.249(a))	$\pm 4.5\text{dB}$ (Below 1GHz); $\pm 4.8\text{dB}$ (Above 1GHz)
Restricted Band Around Fundamental Frequency	$\pm 4.5\text{dB}$ (Below 1GHz); $\pm 4.8\text{dB}$ (Above 1GHz)
Radiated Emissions	$\pm 4.5\text{dB}$ (Below 1GHz); $\pm 4.8\text{dB}$ (Above 1GHz)

Remark:

The U_{lab} (lab Uncertainty) is less than U_{CISPR} (CISPR Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

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 ISCED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Emissions at AC Power Line (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
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	Rohde & Schwarz	ENV216	SEM007-01	2019-09-24	2021-09-22
LISN	ETS-LINDGREN	3816/2	SEM007-02	2020-04-01	2021-03-31
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2020-03-24	2021-03-23

20dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2021-09-22
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2021-09-22
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2021-09-22
Electric and Magnetic Field Analyzer	Narda	EHP-50F	SEM022-05	2019-11-28	2020-11-27

Field Strength of the Fundamental Signal (15.249(a))					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2021-09-22
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2021-09-22
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2021-09-22
Electric and Magnetic Field Analyzer	Narda	EHP-50F	SEM022-05	2019-11-28	2020-11-27

Restricted Band Around Fundamental Frequency					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2021-09-22
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2021-09-22
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2021-09-22
Electric and Magnetic Field Analyzer	Narda	EHP-50F	SEM022-05	2019-11-28	2020-11-27

Radiated Spurious Emissions (30MHz-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	2019-12-16	2020-12-15
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

Radiated Emissions					
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	2017-10-17	2020-10-16
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2020-04-01	2021-03-31
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2020-08-14	2023-08-13



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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	SEM002-03	2019-09-26	2021-09-14
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2019-09-26	2021-09-14
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2019-09-26	2021-09-14
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2020-04-07	2021-04-06



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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

Limit:

Standard 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 shall be considered sufficient to comply with the provisions of this section. 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 on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.

Antenna location: Refer to Internal photos.

7 Radio Spectrum Matter Test Results

7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15. 215

Test Method: ANSI C63.10 (2013) Section 6.9

7.1.1 E.U.T. Operation

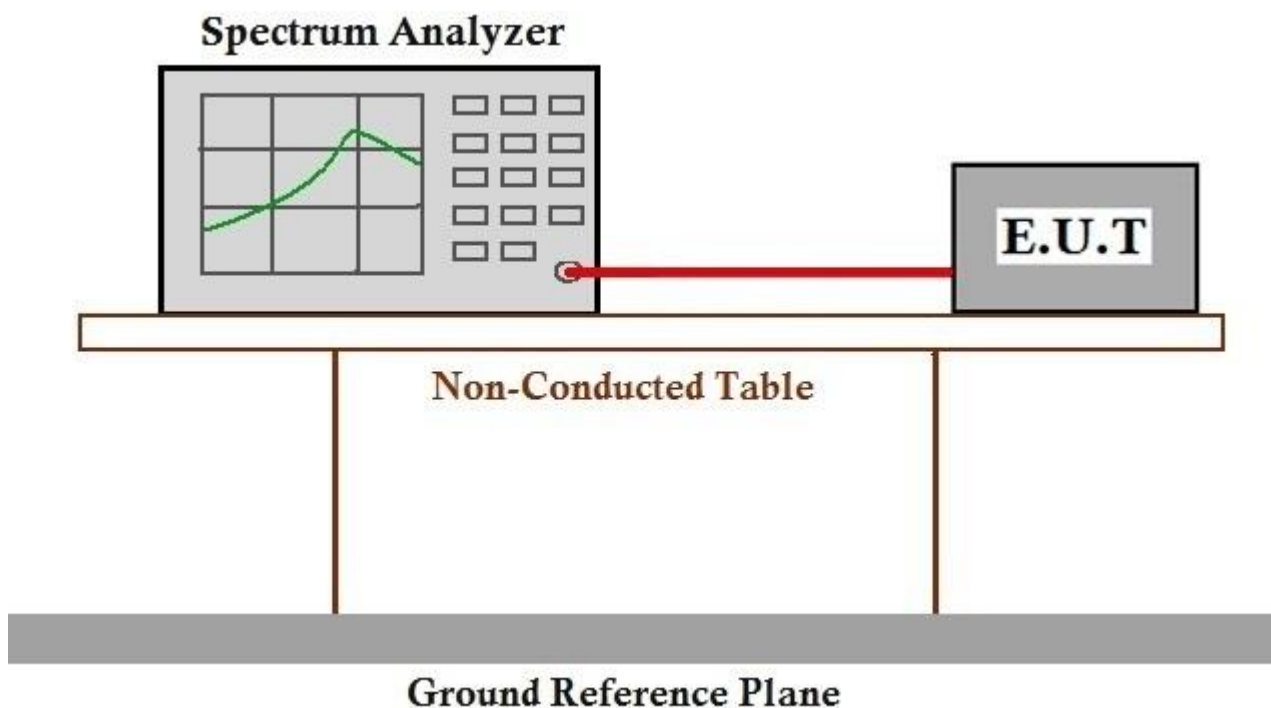
Operating Environment:

Temperature: 23.5 °C Humidity: 56.3 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX mode_Keep the EUT in transmitting with modulation mode.

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.2 Field Strength of the Fundamental Signal (15.249(a))

Test Requirement 47 CFR Part 15, Subpart C 15.249
 Test Method: ANSI C63.10 (2013) Section 6.5&6.6

Limit:

Fundamental frequency(MHz)	Field strength of fundamental(millivolts/meter)	Field strength of harmonics(microvolts/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

Remark: The frequencies above 1000MHz are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

For fundamental frequency in "902-928MHz", the field strength of fundamental is based on Quasi-Peak.

7.2.1 E.U.T. Operation

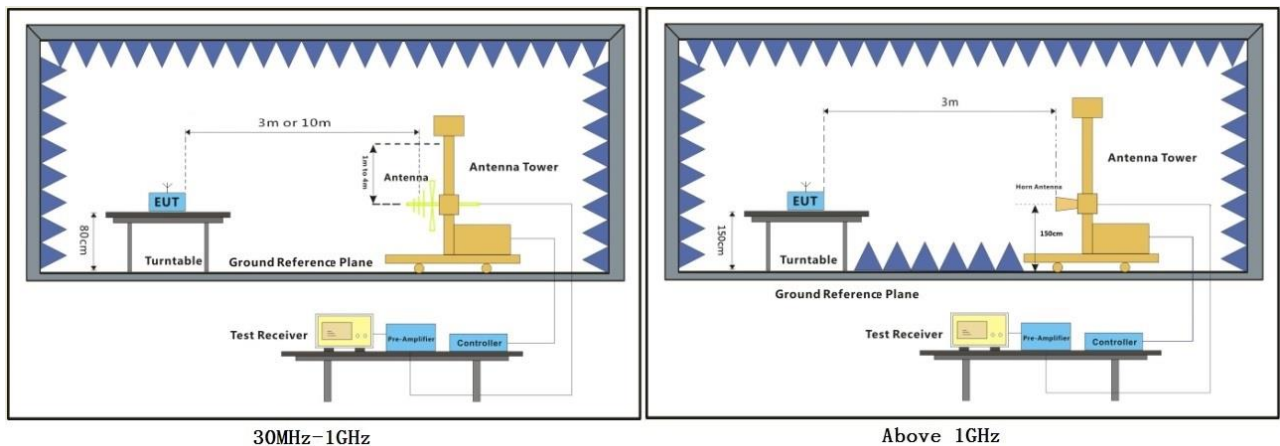
Operating Environment:

Temperature: 23.5 °C Humidity: 56.3 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX mode_Keep the EUT in transmitting with modulation mode.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. 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.
- e. 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.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. 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.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Freq (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Gain (dB)	Read_Level (dBuV)	Level (dBuV/m)	Limit_Line (dBuV/m)	Over_Limit (dB)	Remark	Pol/Phase
908.400	3.61	29.84	27.12	87.52	93.85	94	-0.15	QP	H
908.400	3.61	29.84	27.12	84.9	91.23	94	-2.77	QP	V
908.416	3.61	29.84	27.12	87.3	93.63	94	-0.37	QP	H
908.416	3.61	29.84	27.12	84.49	90.82	94	-3.18	QP	V
916.008	3.62	29.88	27.08	84.3	90.72	94	-3.28	QP	H
916.008	3.62	29.88	27.08	87.4	93.82	94	-0.18	QP	V

7.3 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Limit:

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
Above 1GHz	74.0	Peak Value

Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

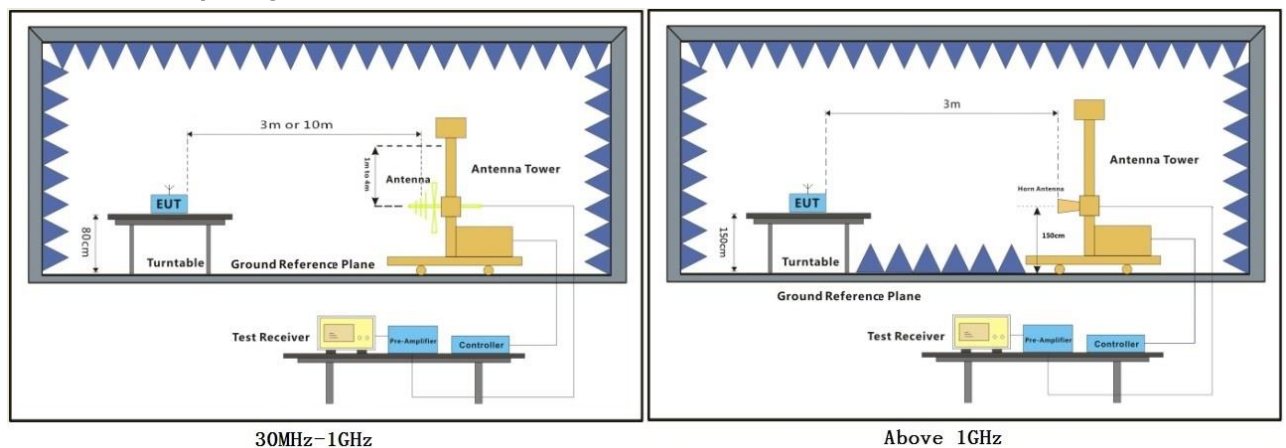
Humidity: 56.2 % RH

Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX mode_Keep the EUT in transmitting with modulation mode.

7.3.3 Test Setup Diagram

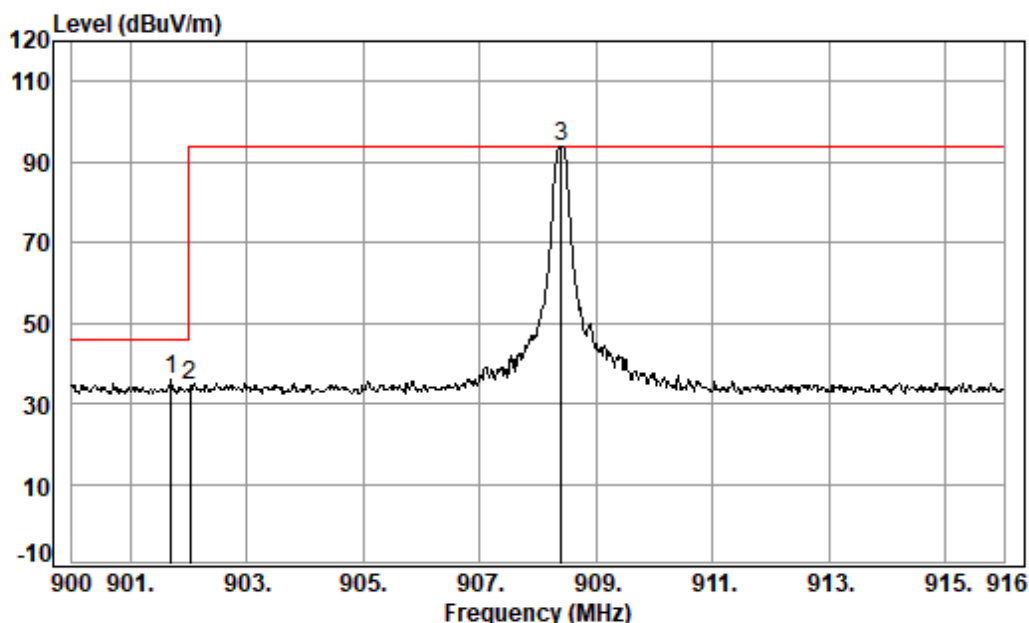


7.3.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. 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.
- e. 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.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. 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.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Test Mode: 06; Polarity: Horizontal; Modulation:FSK; Channel:Low



Condition: 3m HORIZONTAL

Job No. : 08718CR

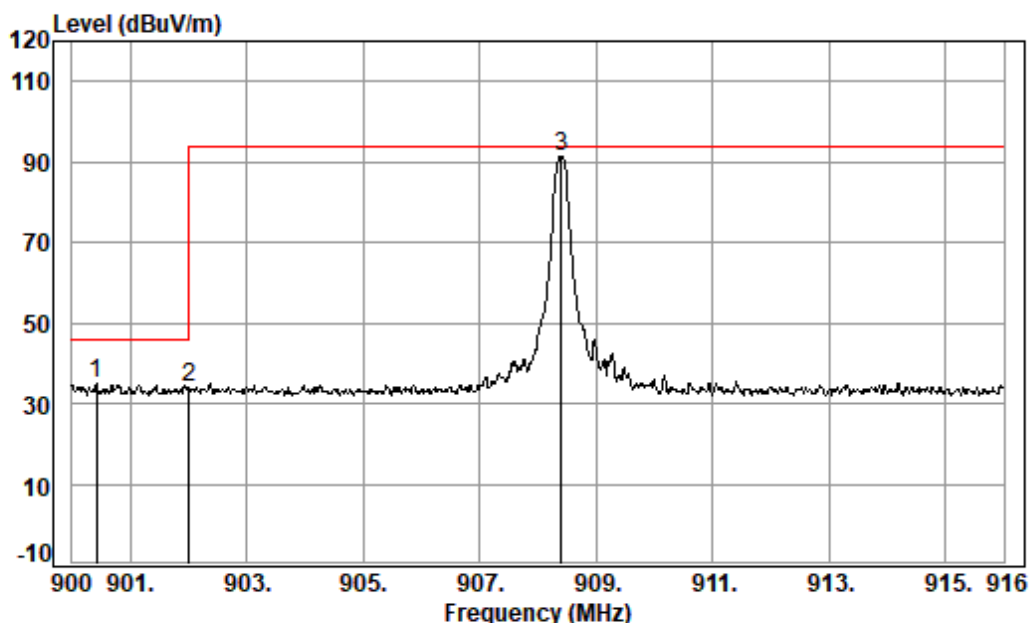
Test mode: TX

: 908.4M

		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	901.70	3.60	29.81	27.16	29.72	35.97	46.00	-10.03 QP
2	902.03	3.60	29.81	27.15	28.13	34.39	94.00	-59.61 QP
3 pp	908.40	3.61	29.84	27.12	87.52	93.85	94.00	-0.15 QP



Test Mode: 06; Polarity: Vertical; Modulation:FSK; Channel:Low



Condition: 3m VERTICAL

Job No. : 08718CR

Test mode: TX

: 908.4M

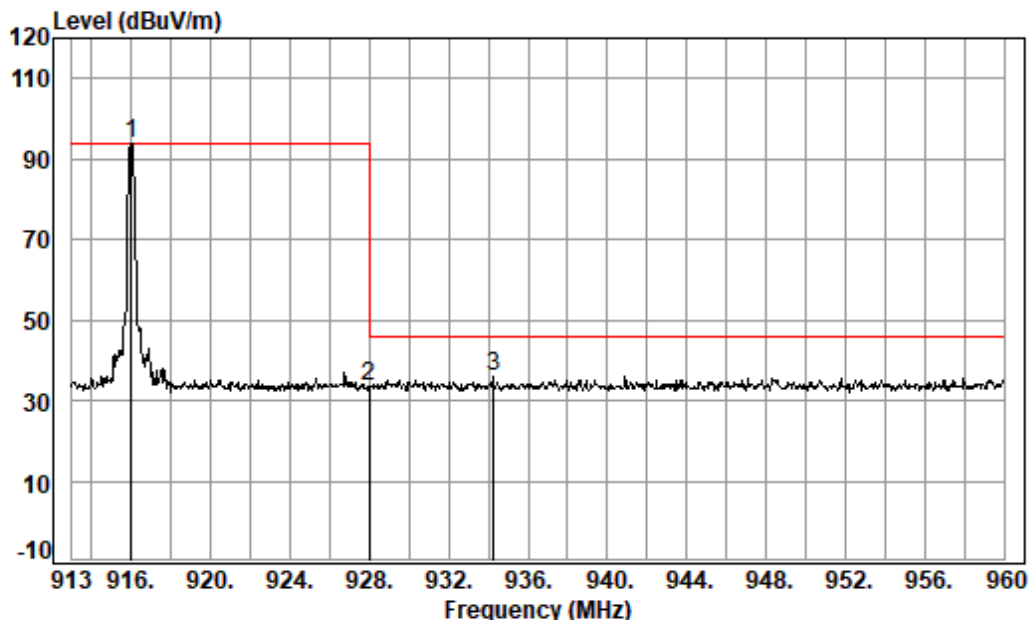
		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	900.42	3.60	29.80	27.16	28.82	35.06	46.00	-10.94 QP
2	902.02	3.60	29.81	27.15	27.54	33.80	94.00	-60.20 QP
3 pp	908.40	3.61	29.84	27.12	84.90	91.23	94.00	-2.77 QP



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Test Mode: 06; Polarity: Horizontal; Modulation:FSK; Channel: High



Condition: 3m HORIZONTAL

Job No. : 08718CR

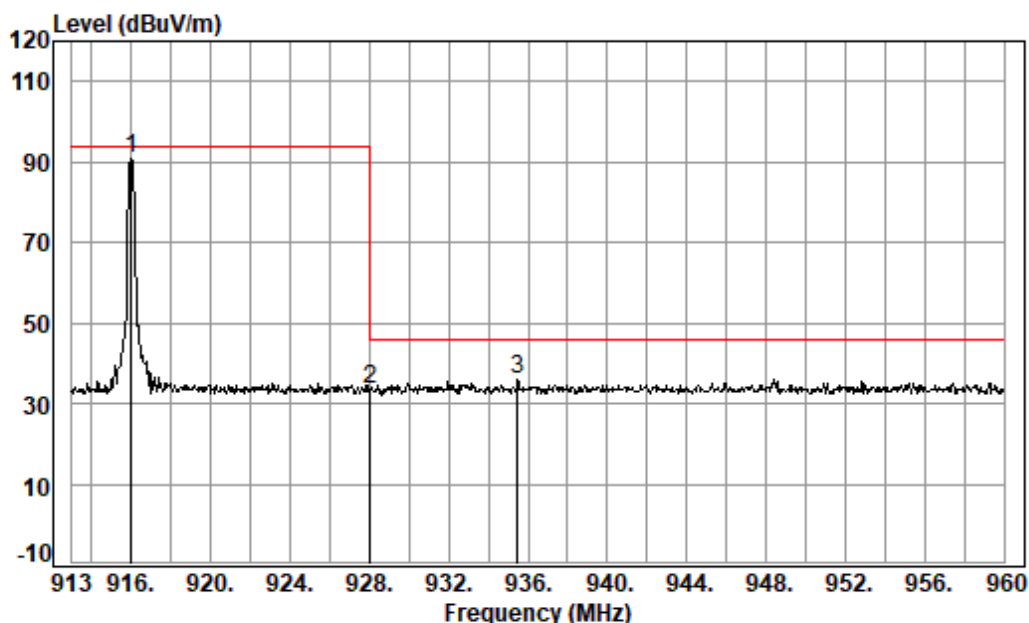
Test mode: TX

: 916M

		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 pp	916.01	3.62	29.88	27.08	87.40	93.82	94.00	-0.18	QP
2	927.99	3.63	29.95	27.02	27.10	33.66	94.00	-60.34	QP
3	934.24	3.63	29.98	26.99	29.56	36.18	46.00	-9.82	QP



Test Mode: 06; Polarity: Vertical; Modulation:FSK; Channel: High



Condition: 3m VERTICAL

Job No. : 08718CR

Test mode: TX

: 916M

		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 pp	916.01	3.62	29.88	27.08	84.30	90.72	94.00	-3.28	QP
2	928.04	3.63	29.95	27.02	27.17	33.73	46.00	-12.27	QP
3	935.47	3.64	29.98	26.98	29.14	35.78	46.00	-10.22	QP

7.4 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)

Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	Detector	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	-	300
0.490-1.705	24000/F(kHz)	-	-	30
1.705-30	30	-	-	30
30-88	100	40.0	QP	3
88-216	150	43.5	QP	3
216-960	200	46.0	QP	3
960-1000	500	54.0	QP	3
Above 1000	500	54.0	AV	3

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

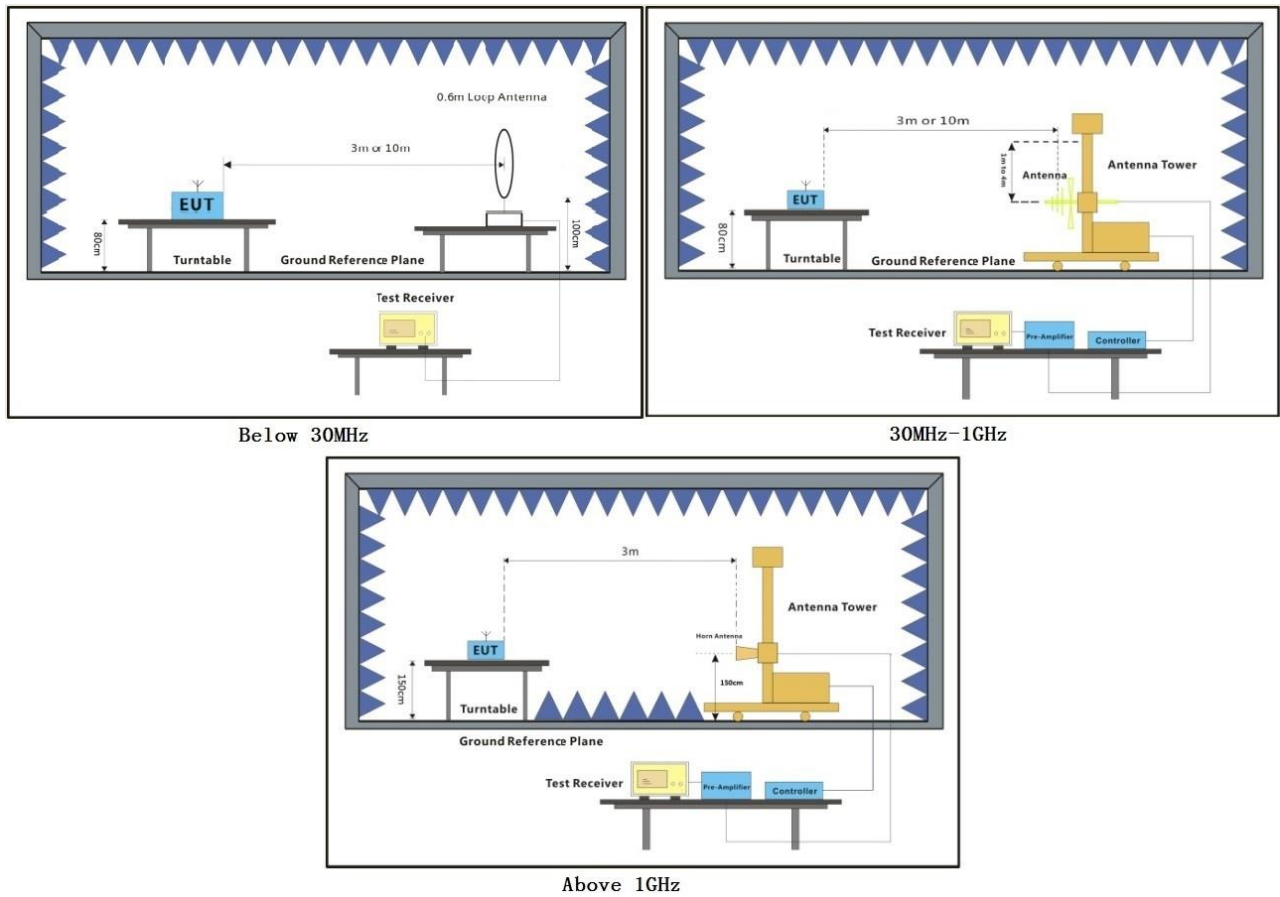
Humidity: 56.3 % RH

Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX mode_Keep the EUT in transmitting with modulation mode.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. 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.
- e. 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.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. 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.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark:

1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

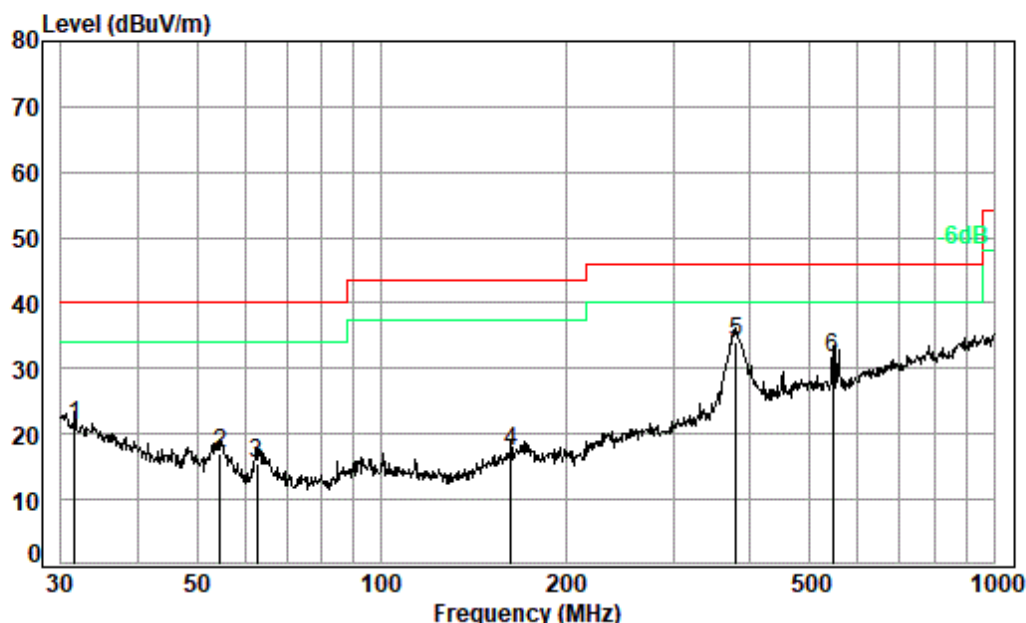
2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

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

3) Scan from 9kHz to 10GHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Test Mode: 06; Polarity: Horizontal



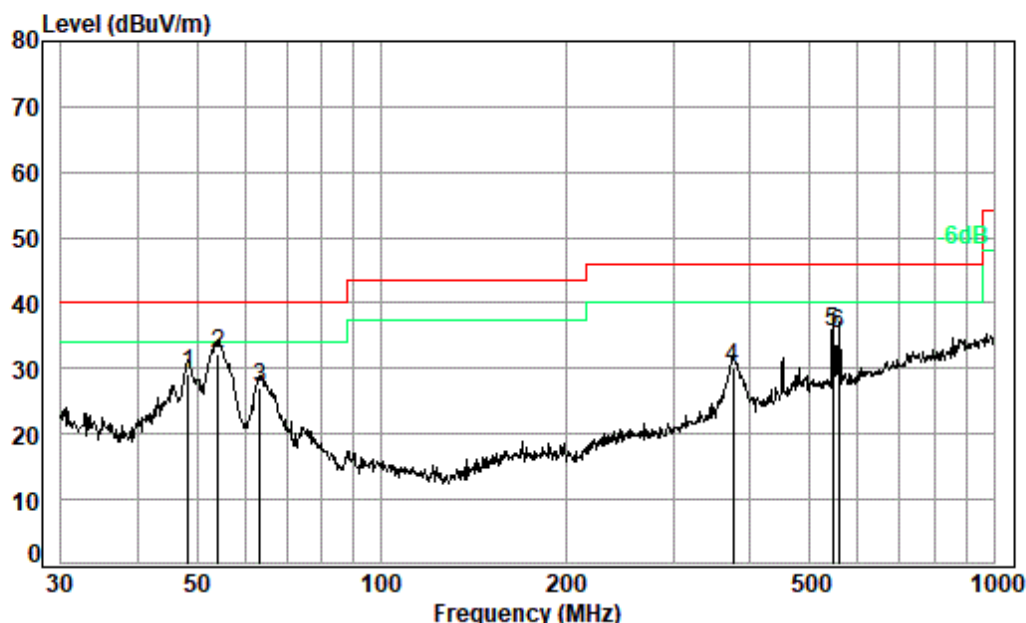
Condition: 3m HORIZONTAL

Job No. : 08718CR/08719CR

Test Mode: 06

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	31.62	0.62	21.78	27.73	26.72	21.39	40.00	-18.61	QP
2	54.64	0.75	13.30	27.67	30.65	17.03	40.00	-22.97	QP
3	62.65	0.80	12.90	27.66	29.62	15.66	40.00	-24.34	QP
4	162.61	1.17	15.45	27.28	27.95	17.29	43.50	-26.21	QP
5 pp	379.91	2.25	22.20	27.30	36.93	34.08	46.00	-11.92	QP
6	545.18	2.59	25.05	27.96	31.90	31.58	46.00	-14.42	QP

Test Mode: 06; Polarity: Vertical



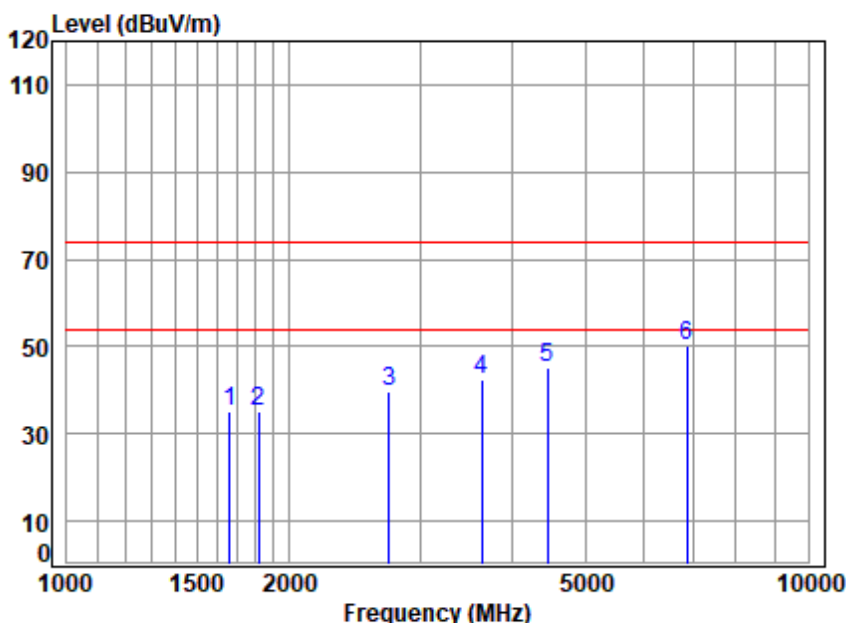
Condition: 3m VERTICAL

Job No. : 08718CR/08719CR

Test Mode: 06

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	48.33	0.70	14.52	27.69	41.80	29.33	40.00	-10.67	QP
2 pp	54.07	0.74	13.48	27.67	45.76	32.31	40.00	-7.69	QP
3	63.31	0.80	12.80	27.66	41.08	27.02	40.00	-12.98	QP
4	374.62	2.23	22.20	27.27	33.07	30.23	46.00	-15.77	QP
5	545.18	2.59	25.05	27.96	35.80	35.48	46.00	-10.52	QP
6	558.73	2.62	25.01	28.00	35.51	35.14	46.00	-10.86	QP

Test Mode: 06; Polarity: Horizontal; Modulation:FSK; Channel:Low



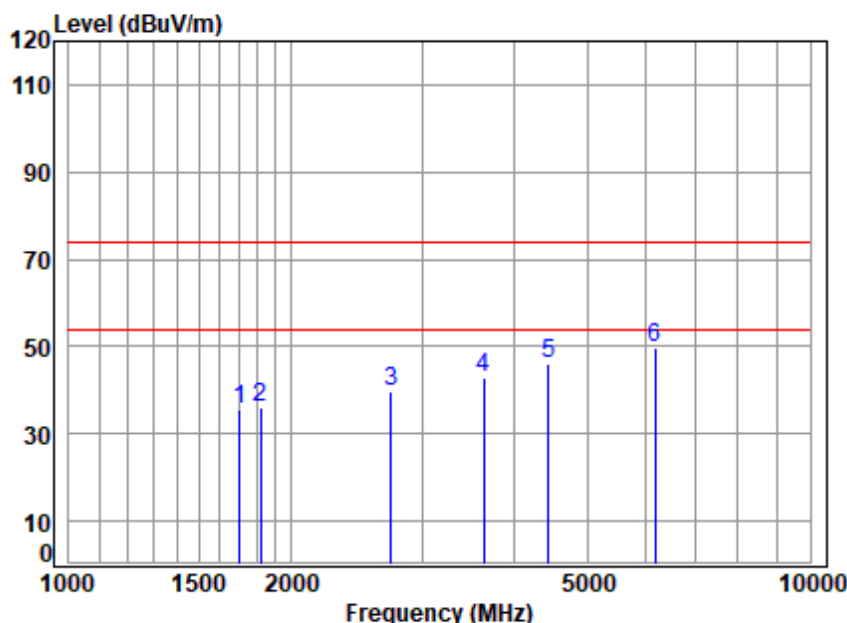
Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 908.4 TX SE
Note : Z-wave

		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	1658.337	3.40	26.50	40.61	45.77	35.06	74.00	-38.94	peak
2	1816.800	3.52	27.13	40.70	45.39	35.34	74.00	-38.66	peak
3	2725.200	4.68	29.74	41.10	46.56	39.88	74.00	-34.12	peak
4	3633.600	5.73	31.98	41.84	46.42	42.29	74.00	-31.71	peak
5	4456.315	6.72	33.53	42.52	47.44	45.17	74.00	-28.83	peak
6	6855.063	8.47	35.82	41.76	47.58	50.11	74.00	-23.89	peak



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Test Mode: 06; Polarity: Vertical; Modulation:FSK; Channel:Low



Site : chamber

Condition: 3m VERTICAL

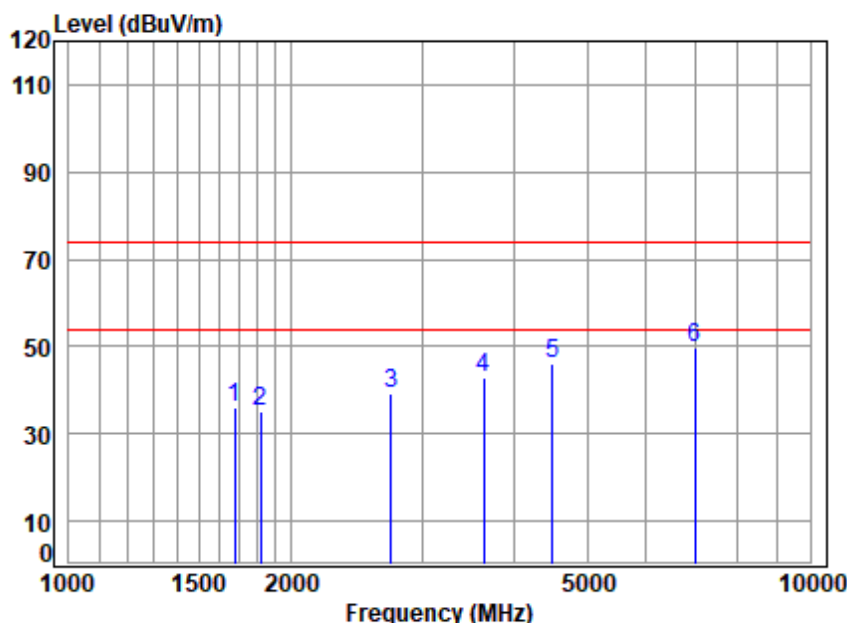
Job No : 08718CR/08719CR

Mode : 908.4 TX SE

Note : Z-wave

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1702.042	3.43	26.68	40.63	46.29	35.77	74.00	-38.23	peak
2	1816.800	3.52	27.13	40.70	46.07	36.02	74.00	-37.98	peak
3	2725.200	4.68	29.74	41.10	46.44	39.76	74.00	-34.24	peak
4	3633.600	5.73	31.98	41.84	47.16	43.03	74.00	-30.97	peak
5	4443.453	6.71	33.50	42.51	48.38	46.08	74.00	-27.92	peak
6	6177.627	8.27	35.28	42.14	48.39	49.80	74.00	-24.20	peak

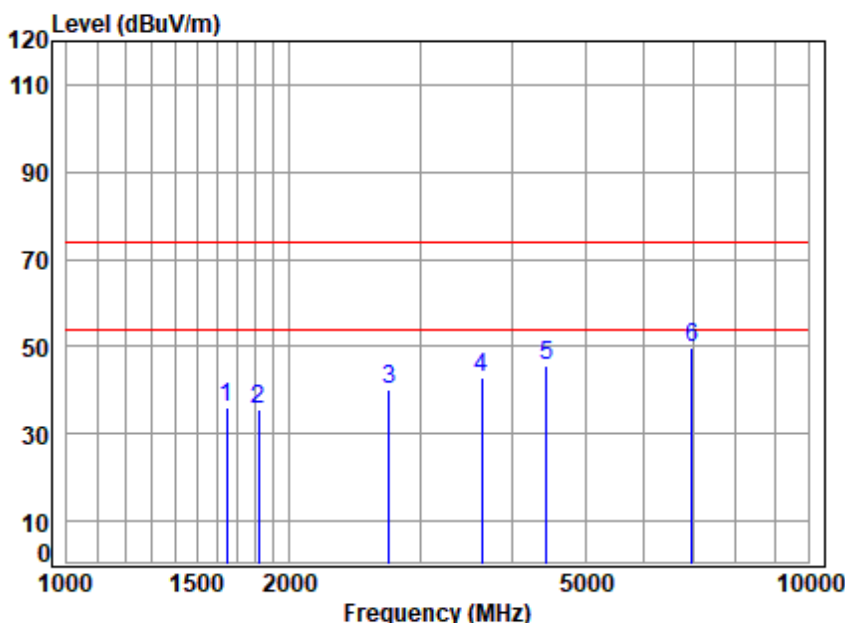
Test Mode: 06; Polarity: Horizontal; Modulation:FSK; Channel:middle



Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 908.42 TX SE
Note : Z-wave

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1672.779	3.41	26.56	40.62	46.75	36.10	74.00	-37.90	peak
2	1816.840	3.52	27.13	40.70	45.35	35.30	74.00	-38.70	peak
3	2725.260	4.68	29.74	41.10	45.96	39.28	74.00	-34.72	peak
4	3633.680	5.73	31.98	41.84	46.97	42.84	74.00	-31.16	peak
5	4495.125	6.76	33.59	42.55	48.20	46.00	74.00	-28.00	peak
6	6995.172	8.54	35.90	41.69	46.84	49.59	74.00	-24.41	peak

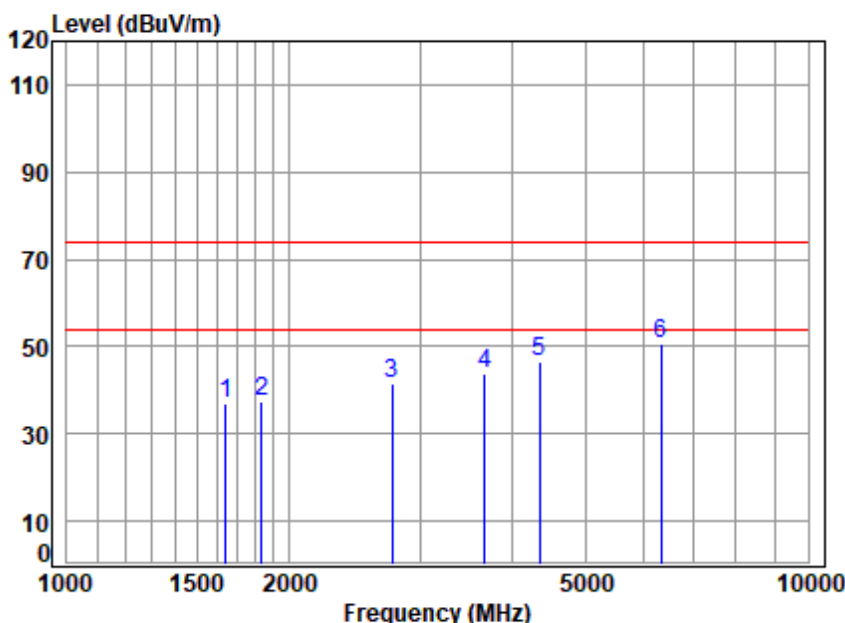
Test Mode: 06; Polarity: Vertical; Modulation:FSK; Channel:middle



Site : chamber
Condition: 3m VERTICAL
Job No : 08718CR/08719CR
Mode : 908.42 TX SE
Note : Z-wave

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1644.019	3.38	26.44	40.60	46.77	35.99	74.00	-38.01	peak
2	1816.840	3.52	27.13	40.70	45.52	35.47	74.00	-38.53	peak
3	2725.260	4.68	29.74	41.10	46.91	40.23	74.00	-33.77	peak
4	3633.680	5.73	31.98	41.84	47.16	43.03	74.00	-30.97	peak
5	4430.628	6.70	33.48	42.50	47.97	45.65	74.00	-28.35	peak
6	6974.982	8.53	35.89	41.70	47.16	49.88	74.00	-24.12	peak

Test Mode: 06; Polarity: Horizontal; Modulation:FSK; Channel:High



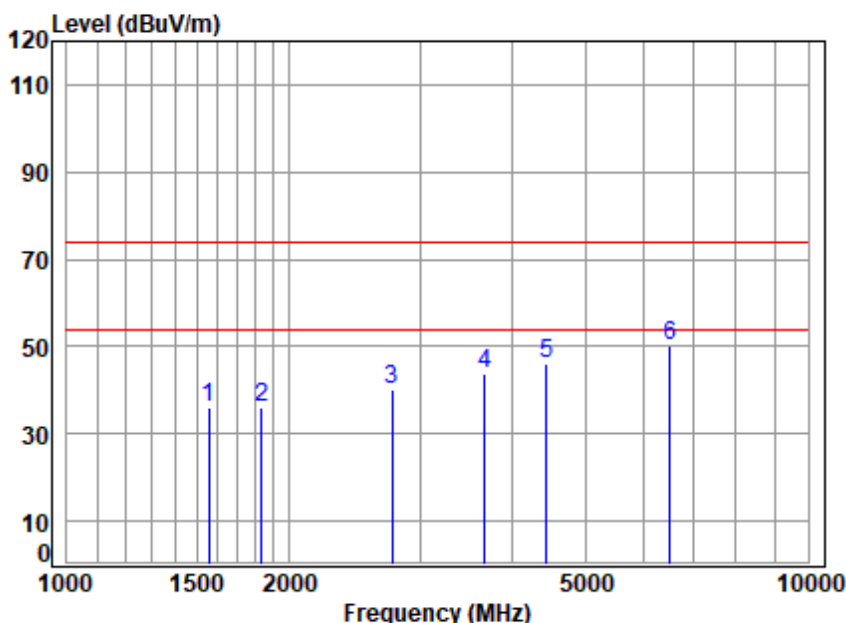
Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 916 TX SE
Note : Z-wave

		Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1639.274	3.38	26.42	40.59	47.68	36.89	74.00	-37.11	peak
2	1832.000	3.53	27.19	40.71	47.54	37.55	74.00	-36.45	peak
3	2748.000	4.70	29.84	41.11	48.25	41.68	74.00	-32.32	peak
4	3664.000	5.78	32.04	41.87	47.94	43.89	74.00	-30.11	peak
5	4341.886	6.61	33.33	42.43	49.25	46.76	74.00	-27.24	peak
6	6340.436	8.27	35.44	42.04	49.13	50.80	74.00	-23.20	peak



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Test Mode: 06; Polarity: Vertical; Modulation:FSK; Channel:High



Site : chamber

Condition: 3m VERTICAL

Job No : 08718CR/08719CR

Mode : 916 TX SE

Note : Z-wave

		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	1556.169	3.31	26.06	40.54	47.22	36.05	74.00	-37.95	peak
2	1832.000	3.56	27.34	40.73	46.00	36.17	74.00	-37.83	Peak
3	2748.000	4.70	29.84	41.11	46.50	39.93	74.00	-34.07	peak
4	3664.000	5.78	32.04	41.87	47.63	43.58	74.00	-30.42	peak
5	4430.628	6.70	33.48	42.50	48.46	46.14	74.00	-27.86	peak
6	6507.536	8.28	35.60	41.95	48.13	50.06	74.00	-23.94	peak



8 Emission Test Results

8.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement: 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	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.

Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz

8.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C

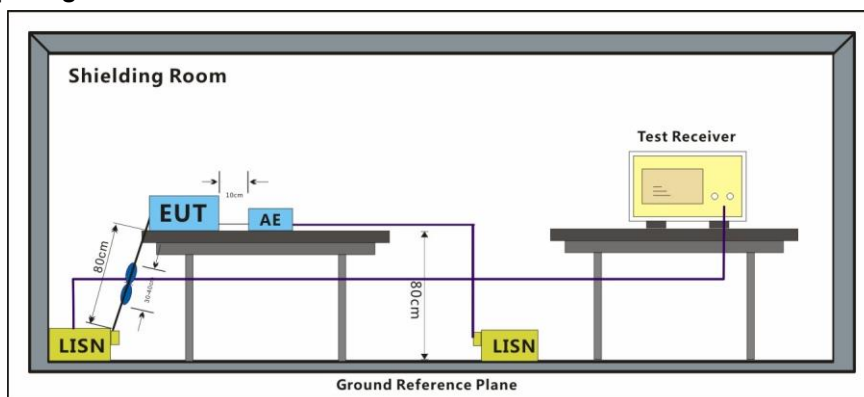
Humidity: 56 % RH

Atmospheric Pressure: 1000 mbar

8.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX mode_Keep the EUT in transmitting with modulation mode.

8.1.3 Test Setup Diagram

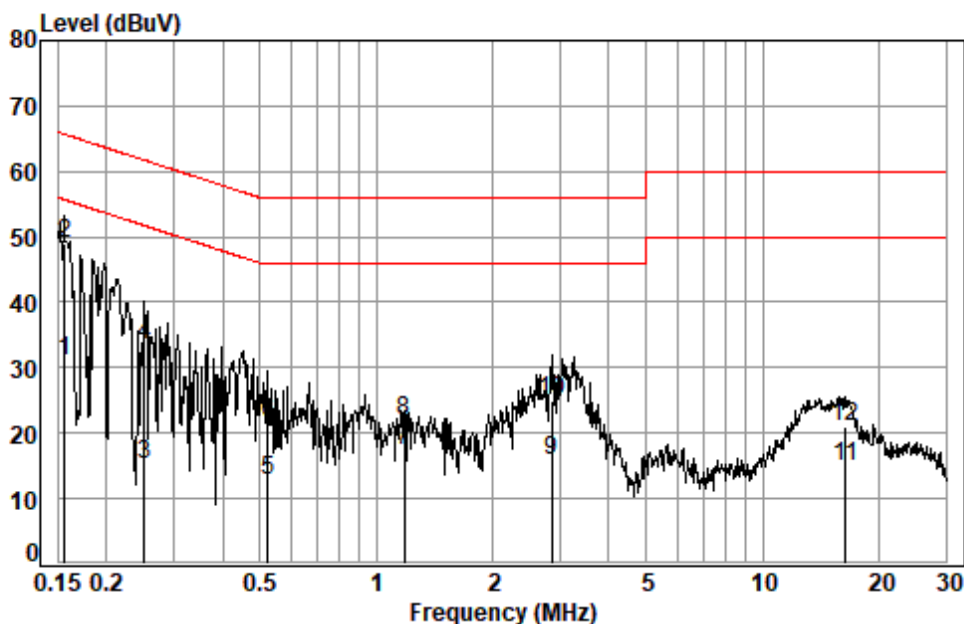


8.1.4 Measurement Procedure and Data

- 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 a 50ohm/50μH + 5ohm 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 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

Test Mode: 06; Line: Live line



Site : Shielding Room

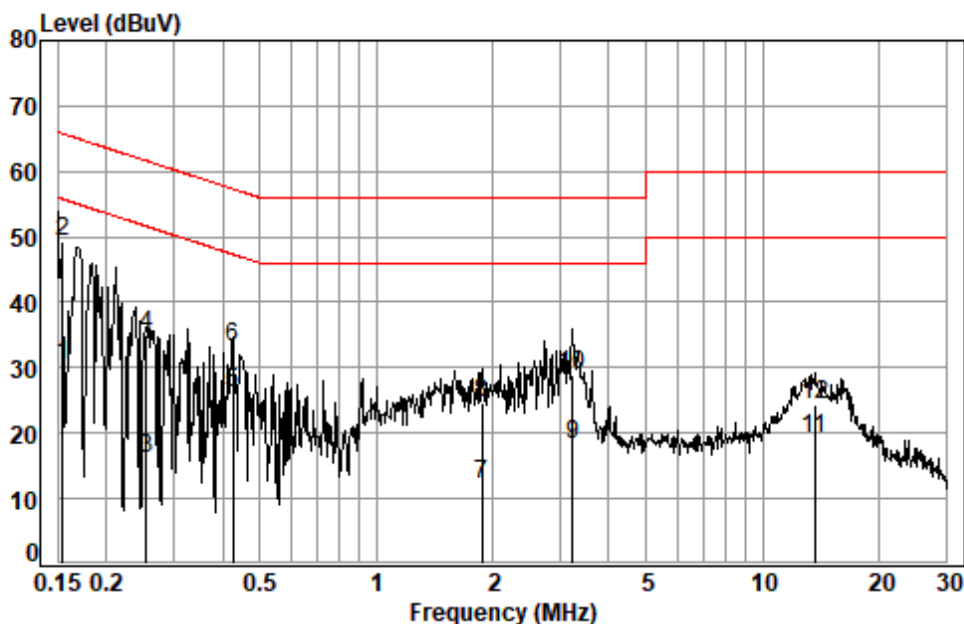
Condition: Line

Job No. : 08718CR

Test mode: 06

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1557	0.01	9.68	21.38	31.07	55.69	-24.62	Average
2	0.1557	0.01	9.68	39.25	48.94	65.69	-16.75	QP
3	0.2508	0.03	9.68	5.46	15.17	51.73	-36.56	Average
4	0.2508	0.03	9.68	23.63	33.34	61.73	-28.39	QP
5	0.5238	0.06	9.69	3.02	12.77	46.00	-33.23	Average
6	0.5238	0.06	9.69	11.98	21.73	56.00	-34.27	QP
7	1.1844	0.11	9.71	7.46	17.28	46.00	-28.72	Average
8	1.1844	0.11	9.71	12.19	22.01	56.00	-33.99	QP
9	2.8390	0.16	9.76	5.90	15.82	46.00	-30.18	Average
10	2.8390	0.16	9.76	14.97	24.89	56.00	-31.11	QP
11	16.3985	0.22	10.67	4.13	15.02	50.00	-34.98	Average
12	16.3985	0.22	10.67	10.13	21.02	60.00	-38.98	QP

Test Mode: 06; Line: Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 08718CR
Test mode: 06

	Freq	Cable Loss	LISN Factor	Read Level	Limit	Over	Remark
	MHz	dB	dB	dBuV	dBuV	dB	
1	0.1540	0.01	9.67	20.78	30.46	55.78	Average
2	0.1540	0.01	9.67	39.61	49.29	65.78	QP
3	0.2535	0.03	9.66	6.54	16.23	51.64	Average
4	0.2535	0.03	9.66	25.38	35.07	61.64	QP
5	0.4260	0.05	9.67	16.44	26.16	47.33	Average
6	0.4260	0.05	9.67	23.35	33.07	57.33	QP
7	1.8779	0.15	9.73	2.37	12.25	46.00	Average
8	1.8779	0.15	9.73	14.77	24.65	56.00	QP
9	3.2239	0.16	9.77	8.21	18.14	46.00	Average
10	3.2239	0.16	9.77	19.12	29.05	56.00	QP
11	13.6228	0.20	10.51	8.49	19.20	50.00	Average
12	13.6228	0.20	10.51	13.67	24.38	60.00	QP



9 Test Setup Photo

Refer to Appendix - Test Setup Photo for SZ009008718CR



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10 EUT Constructional Details (EUT Photos)

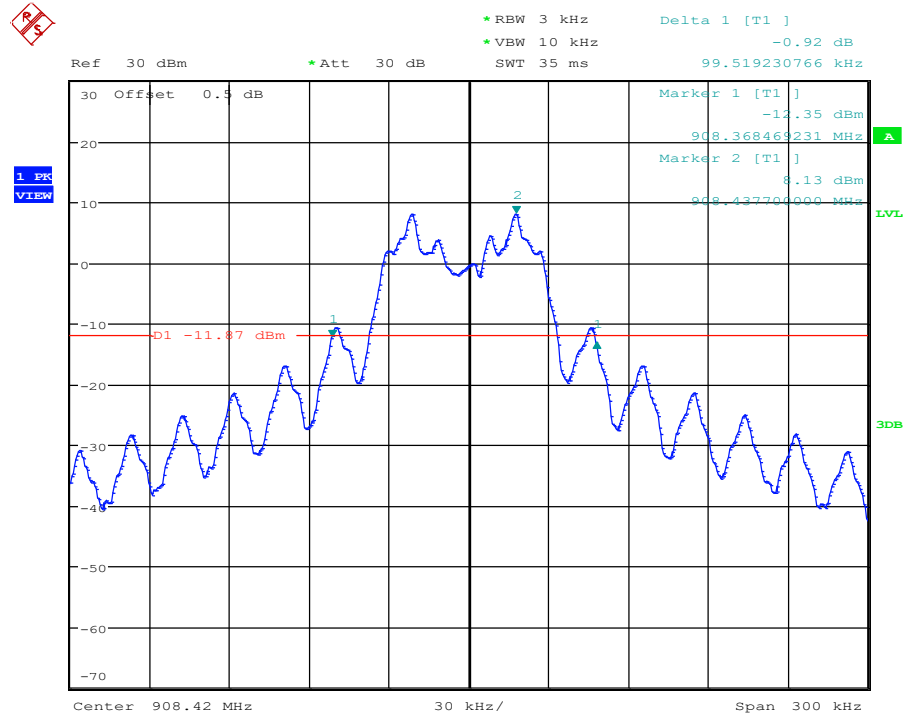
Refer to Appendix - Photographs of EUT Constructional Details for SZEM2009008718CR



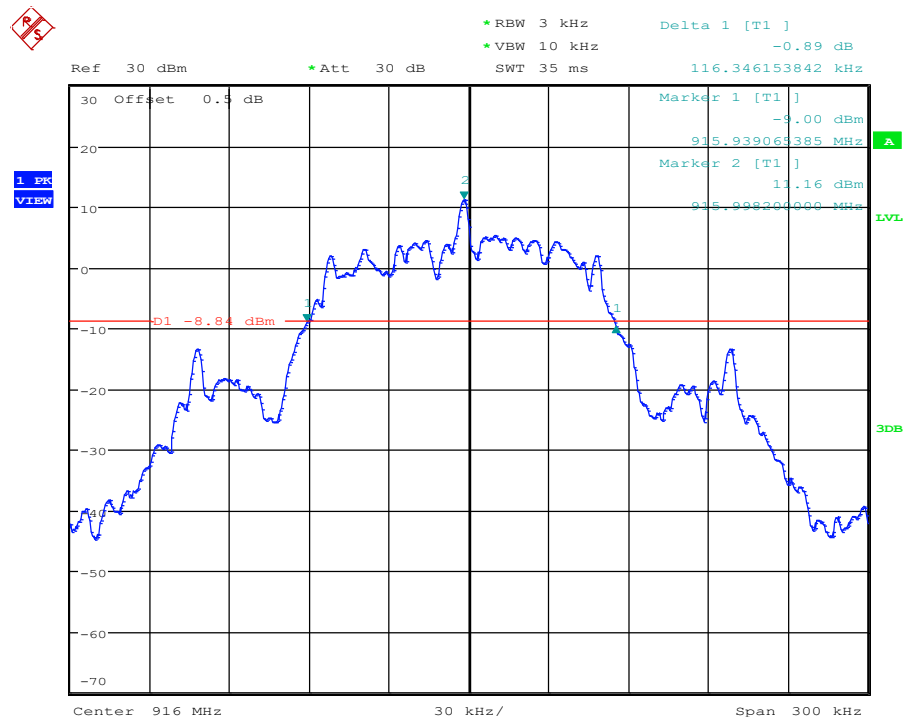
11 Appendix

Appendix for 15.249

20dB Bandwidth-908.42



20dB Bandwidth-916

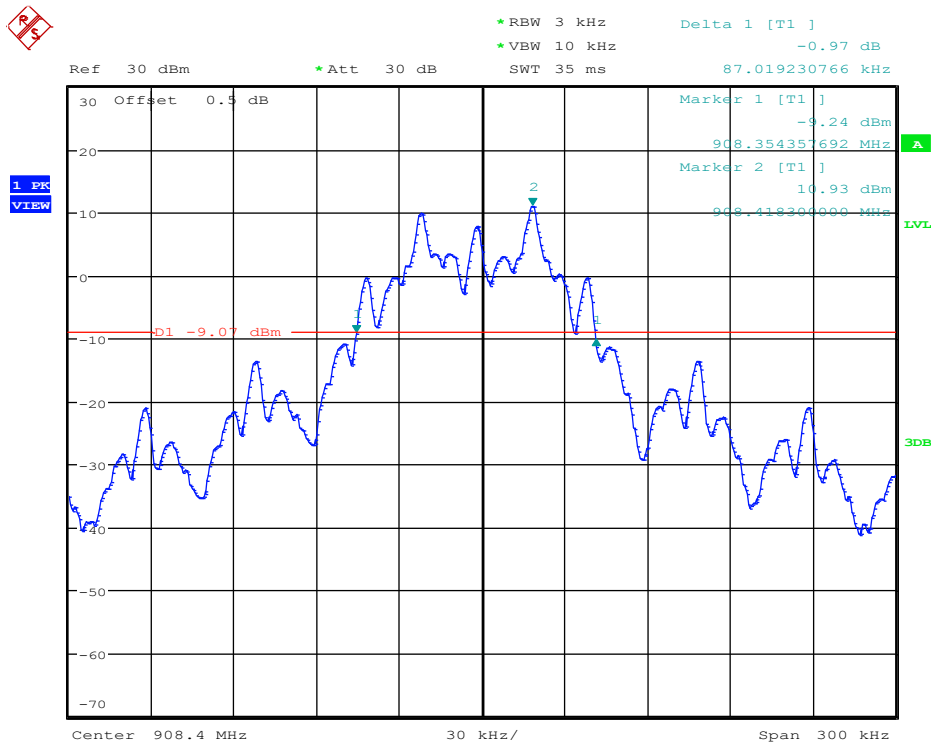


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20dB Bandwidth-908.4



- End of the Report -