FCC Test Report

FCC ID	:	**P27NA502S**
Equipment	:	**Multiple RF Home Gateway**
Model No.	:	**NA502S**
Brand Name	:	**Sercomm**
Multiple Listing	:	**Refer to item 1.1.1 for more details**
Applicant	:	**Sercomm Corporation**
Address	:	**8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan, R.O.C.**
Standard	:	**47 CFR FCC Part 15.249**
Received Date	:	**Nov. 21, 2016**
Tested Date	:	**Nov. 29 ~ Dec. 12, 2016**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by: **Approved by:**

Along Chen / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
FR6N2103ZW	Rev. 01	Initial issue	Mar. 03, 2017

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.400MHz 41.54 (Margin -6.32dB) - AV	Pass
15.249(a)	Field Strength of Fundamental	Meet the requirement of limit	Pass
15.249(a)(d)	Field Strength of Harmonics and Emissions Radiated outside of the Specified Frequency Bands	Meet the requirement of limit	Pass
15.215(c)	20dB bandwidth	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

1 General Description

1.1 Information

1.1.1 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product Name	Description
Sercomm	NA502Sxxxxxxxx	Multiple RF Home Gateway	the 1st x should be "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-" , for marketing purpose.
MiOS	G550xxxxx	Multiple RF Home Gateway	
Nortek	GC1xxxxxxxx	Multiple RF Home Gateway	
Vera	VeraSecurexxxxx	Multiple RF Home Gateway	
Vera	VeraSecurexxxxx	Advanced Smart Home Security Controller	

- ✦ All models are electrically identical, different model names are for marketing purpose.
- ✦ The above models, model **NA502S** was selected as a representative one for the final test and only its data was recorded in this report.

1.1.2 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (MHz)	**Mode**	**Ch. Freq. (MHz)**	**Modulation Type**	**Data Rate**
902~928	Z-Wave	908.40	FSK	40kbps
		908.42	FSK	9.6kbps
		916.00	GFSK	100kbps

1.1.3 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	Monopole	No	-2.6	---

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from adapter

1.1.5 Accessories

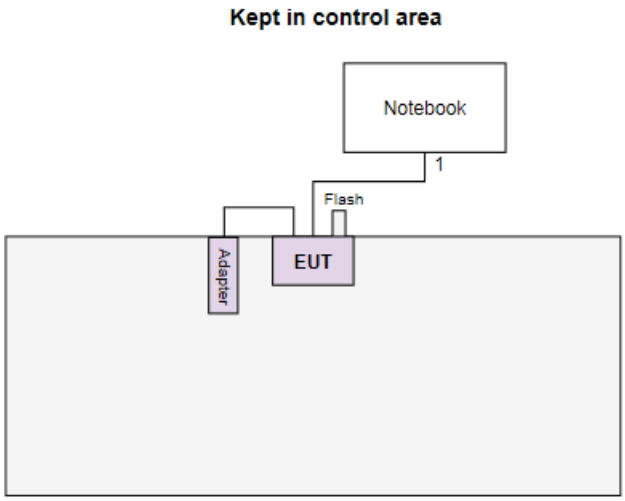
Accessories		
No.	**Equipment**	**Description**
1	Adapter	Brand: LEI Model: MU24-Y120200-A2 I/P: 100-240Vac, 50/60Hz, 0.7A O/P: 12Vdc, 2A Power line: 1.5m non-shielded without core
2	Adapter	Brand: APD Model: WA-24Q12FU I/P: 100-240Vac, 50-60Hz, 0.7A O/P: 12Vdc, 2A Power line: 1.5m non-shielded without core
3	Lithium-ion Battery	Brand: Simplo Technology Co. LTD. Model: A3EQ2009H Rating: 7.5Vdc, 2400mAh

1.2 Local Support Equipment List

Support Equipment List						
No.	**Equipment**	**Brand**	**Model**	**S/N**	**FCC ID**	**Signal cable / Length (m)**
1	Notebook	DELL	Latitude E6430	9ZFB4X1	DoC	RJ45, 10m non-shielded.
2	USB Flash	SONY	USM16GU	0000020	---	---

1.3 Test Setup Chart

Test Setup Diagram



1. RJ45, 10m non-shielded

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Dec. 12, 2016				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101657	Jan. 12, 2016	Jan. 11, 2017
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 08, 2016	Nov. 07, 2017
RF Cable-CON	EMC	EMCCFD300-BM-BM-6000	50821	Dec. 21, 2015	Dec. 20, 2016
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Nov. 29 ~ Dec. 06, 2016				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Nov. 25, 2016	Nov. 24, 2017
Receiver	R&S	ESR3	101658	Nov. 24, 2016	Nov. 23, 2017
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Aug. 04, 2016	Aug. 03, 2017
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 16, 2015	Dec. 15, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Oct. 25, 2016	Oct. 24, 2017
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 10, 2016	Nov. 09, 2017
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 10, 2015	Dec. 09, 2016
Preamplifier	EMC	EMC02325	980225	Aug. 05, 2016	Aug. 04, 2017
Preamplifier	Agilent	83017A	MY39501308	Oct. 06, 2016	Oct. 05, 2017
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 10, 2015	Dec. 09, 2016
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	16052	Dec. 10, 2015	Dec. 09, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 10, 2015	Dec. 09, 2016
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 10, 2015	Dec. 09, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	Dec. 06, 2016				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101063	Feb. 17, 2016	Feb. 16, 2017
Power Meter	Anritsu	ML2495A	1241002	Oct. 06, 2016	Oct. 05, 2017
Power Sensor	Anritsu	MA2411B	1207366	Oct. 06, 2016	Oct. 05, 2017
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.249
ANSI C63.10-2013

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty	
Parameters	**Uncertainty**
Bandwidth	±34.134 Hz
AC conducted emission	±2.90 dB
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.63 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	22°C / 60%	Howard Huang
Radiated Emissions	03CH01-WS	21-22°C / 61%	Vincent Yeh Kevin Lee
RF Conducted	TH01-WS	22°C / 63%	Alex Huang

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Data Rate
AC Power Line Conducted Emissions	FSK FSK GFSK	908.40 908.42 916.00	40kbps 9.6kbps 100kbps
Field Strength of Fundamental			
Radiated Emissions ≤ 1GHz			
Radiated Emissions > 1GHz			
20dB bandwidth			

NOTE:

1. Two adapters (LEI & APD) had been covered during the pretest and found that **LEI adapter** was the worst case and was selected for final test.
2. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.

3 Transmitter Test Results

3.1 Conducted Emissions

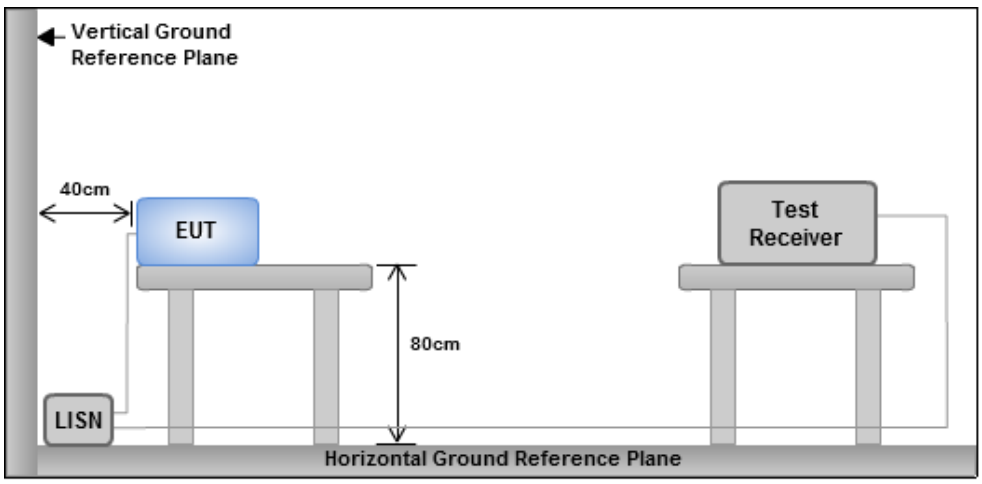
3.1.1 Limit of Conducted Emissions

Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

3.1.3 Test Setup

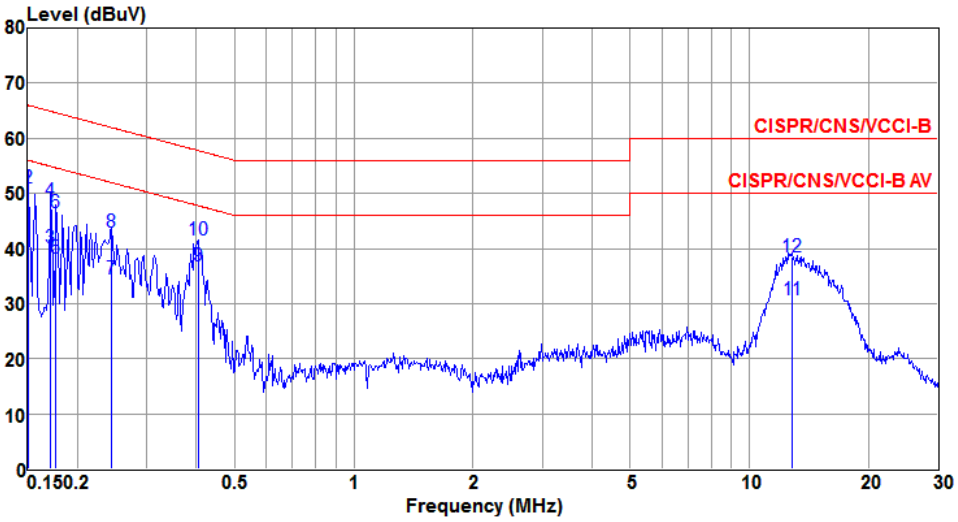


Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

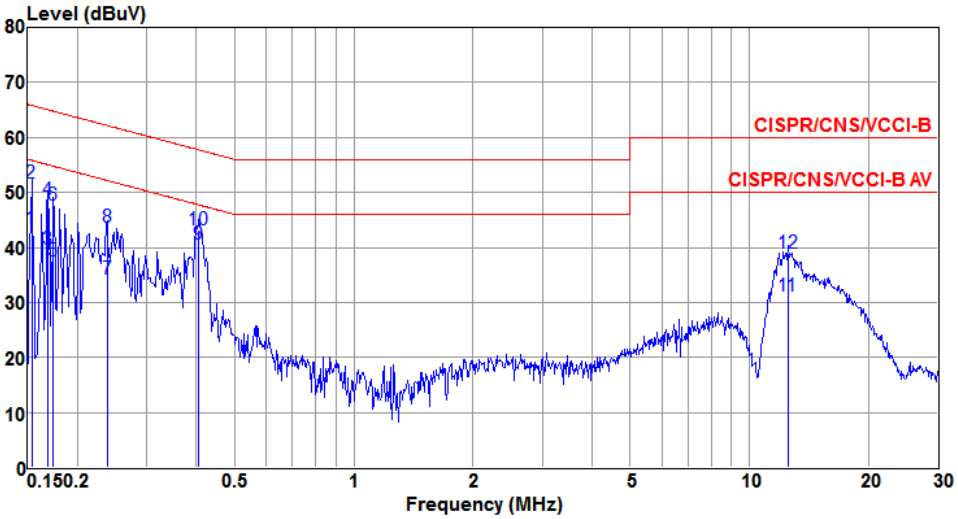
Power Phase	Line	Test Freq. (MHz)	908.4



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.150	42.30	56.00	-13.70	42.21	0.07	0.02	Average
2	0.150	51.09	66.00	-14.91	51.00	0.07	0.02	QP
3	0.171	40.11	54.90	-14.79	40.01	0.08	0.02	Average
4	0.171	48.60	64.90	-16.30	48.50	0.08	0.02	QP
5	0.177	38.34	54.64	-16.30	38.23	0.09	0.02	Average
6	0.177	46.51	64.64	-18.13	46.40	0.09	0.02	QP
7	0.244	34.53	51.95	-17.42	34.42	0.09	0.02	Average
8	0.244	42.92	61.95	-19.03	42.81	0.09	0.02	QP
9@	0.404	36.78	47.77	-10.99	36.69	0.06	0.03	Average
10	0.404	41.61	57.77	-16.16	41.52	0.06	0.03	QP
11	12.852	30.69	50.00	-19.31	30.23	0.27	0.19	Average
12	12.852	38.59	60.00	-21.41	38.13	0.27	0.19	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

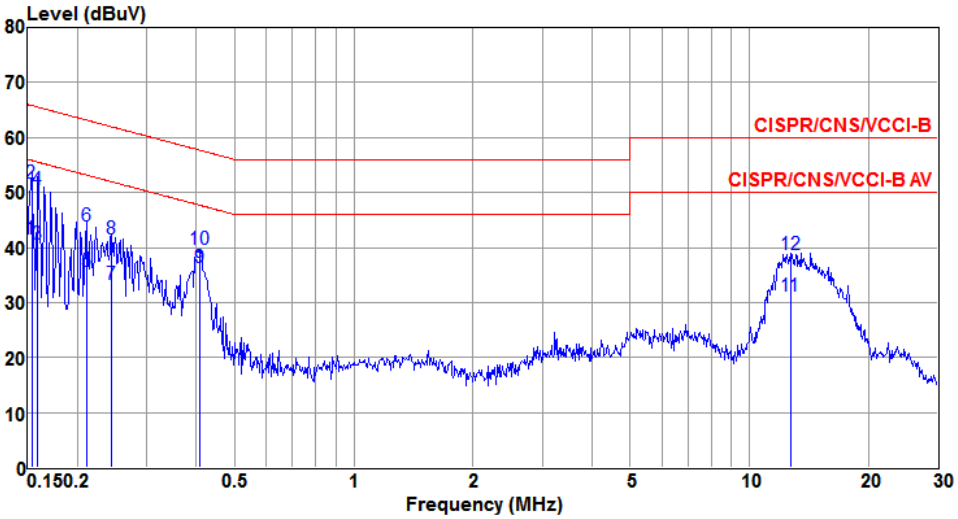
Power Phase	Neutral	Test Freq. (MHz)	908.4



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.153	43.46	55.82	-12.36	43.34	0.10	0.02	Average
2	0.153	51.61	65.82	-14.21	51.49	0.10	0.02	QP
3	0.169	39.69	55.03	-15.34	39.57	0.10	0.02	Average
4	0.169	48.60	65.03	-16.43	48.48	0.10	0.02	QP
5	0.174	37.63	54.77	-17.14	37.52	0.09	0.02	Average
6	0.174	47.69	64.77	-17.08	47.58	0.09	0.02	QP
7	0.238	34.23	52.17	-17.94	34.11	0.10	0.02	Average
8	0.238	43.57	62.17	-18.60	43.45	0.10	0.02	QP
9@	0.406	40.67	47.73	-7.06	40.51	0.13	0.03	Average
10	0.406	43.25	57.73	-14.48	43.09	0.13	0.03	QP
11	12.516	31.26	50.00	-18.74	30.73	0.34	0.19	Average
12	12.516	39.00	60.00	-21.00	38.47	0.34	0.19	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

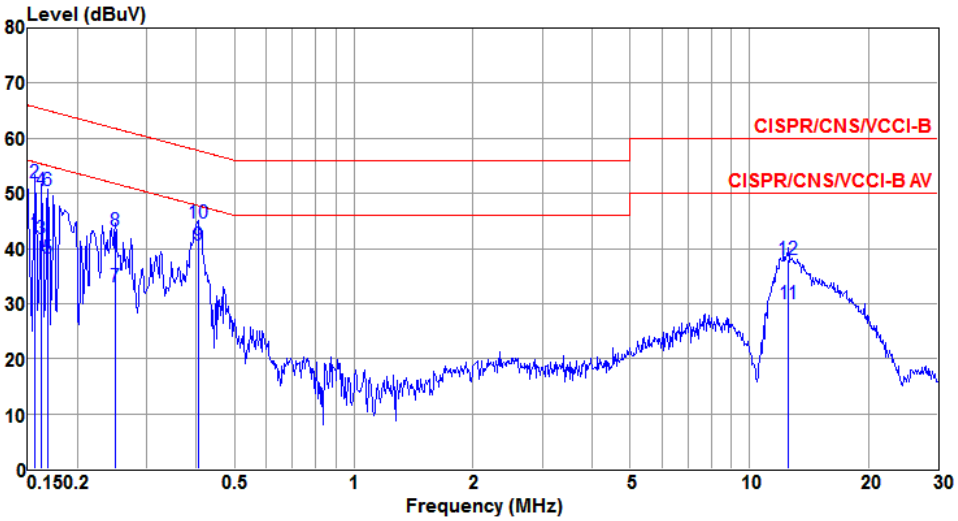
Power Phase	Line	Test Freq. (MHz)	908.42



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.153	41.47	55.82	-14.35	41.38	0.07	0.02	Average
2	0.153	51.71	65.82	-14.11	51.62	0.07	0.02	QP
3	0.159	40.63	55.52	-14.89	40.53	0.08	0.02	Average
4	0.159	50.45	65.52	-15.07	50.35	0.08	0.02	QP
5	0.211	35.74	53.18	-17.44	35.62	0.10	0.02	Average
6	0.211	43.98	63.18	-19.20	43.86	0.10	0.02	QP
7	0.244	33.40	51.95	-18.55	33.29	0.09	0.02	Average
8	0.244	41.46	61.95	-20.49	41.35	0.09	0.02	QP
9@	0.408	36.37	47.68	-11.31	36.28	0.06	0.03	Average
10	0.408	39.66	57.68	-18.02	39.57	0.06	0.03	QP
11	12.716	31.19	50.00	-18.81	30.73	0.27	0.19	Average
12	12.716	38.63	60.00	-21.37	38.17	0.27	0.19	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

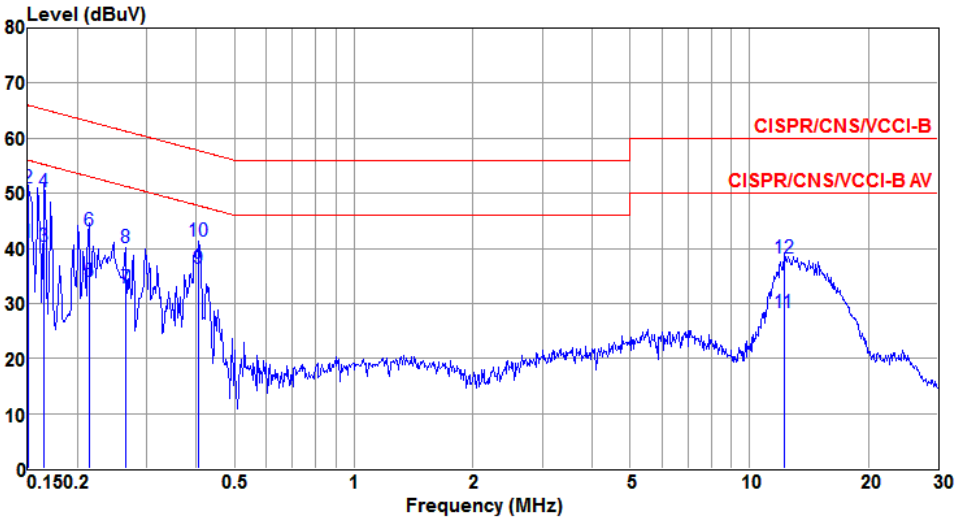
Power Phase	Neutral	Test Freq. (MHz)	908.42



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.156	42.70	55.65	-12.95	42.58	0.10	0.02	Average
2	0.156	52.04	65.65	-13.61	51.92	0.10	0.02	QP
3	0.162	41.85	55.34	-13.49	41.73	0.10	0.02	Average
4	0.162	50.59	65.34	-14.75	50.47	0.10	0.02	QP
5	0.169	38.25	55.03	-16.78	38.13	0.10	0.02	Average
6	0.169	50.58	65.03	-14.45	50.46	0.10	0.02	QP
7	0.249	33.02	51.78	-18.76	32.90	0.10	0.02	Average
8	0.249	43.16	61.78	-18.62	43.04	0.10	0.02	QP
9@	0.404	40.70	47.77	-7.07	40.54	0.13	0.03	Average
10	0.404	44.58	57.77	-13.19	44.42	0.13	0.03	QP
11	12.582	30.03	50.00	-19.97	29.50	0.34	0.19	Average
12	12.582	38.04	60.00	-21.96	37.51	0.34	0.19	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

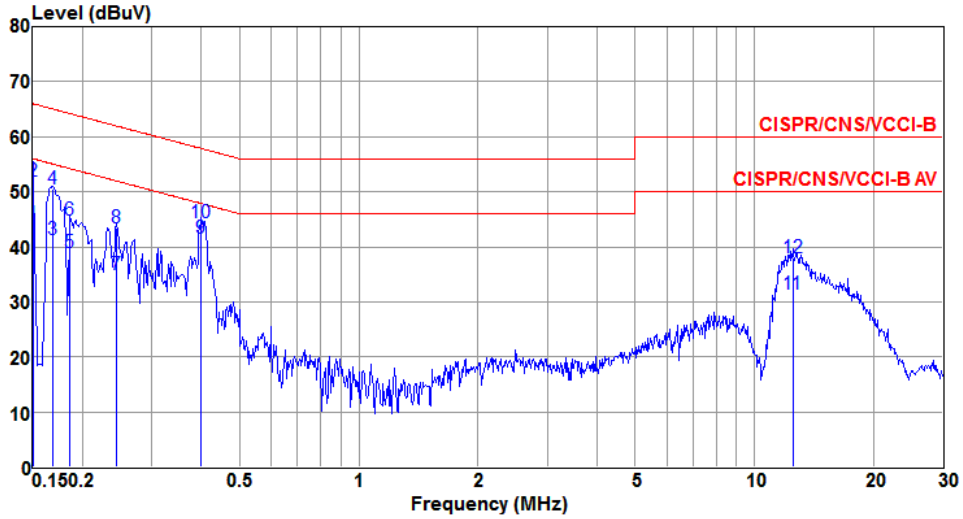
Power Phase	Line	Test Freq. (MHz)	916



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.150	41.08	56.00	-14.92	40.99	0.07	0.02	Average
2	0.150	50.98	66.00	-15.02	50.89	0.07	0.02	QP
3	0.165	40.41	55.21	-14.80	40.31	0.08	0.02	Average
4	0.165	50.35	65.21	-14.86	50.25	0.08	0.02	QP
5	0.214	34.03	53.05	-19.02	33.91	0.10	0.02	Average
6	0.214	43.17	63.05	-19.88	43.05	0.10	0.02	QP
7	0.264	32.81	51.29	-18.48	32.71	0.08	0.02	Average
8	0.264	40.19	61.29	-21.10	40.09	0.08	0.02	QP
9@	0.406	36.24	47.73	-11.49	36.15	0.06	0.03	Average
10	0.406	41.23	57.73	-16.50	41.14	0.06	0.03	QP
11	12.253	28.33	50.00	-21.67	27.88	0.26	0.19	Average
12	12.253	38.16	60.00	-21.84	37.71	0.26	0.19	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Power Phase	Neutral	Test Freq. (MHz)	916



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.150	44.08	56.00	-11.92	43.96	0.10	0.02	Average
2	0.150	51.89	66.00	-14.11	51.77	0.10	0.02	QP
3	0.169	41.37	55.03	-13.66	41.25	0.10	0.02	Average
4	0.169	50.52	65.03	-14.51	50.40	0.10	0.02	QP
5	0.186	39.00	54.20	-15.20	38.89	0.09	0.02	Average
6	0.186	44.94	64.20	-19.26	44.83	0.09	0.02	QP
7	0.244	34.95	51.95	-17.00	34.83	0.10	0.02	Average
8	0.244	43.41	61.95	-18.54	43.29	0.10	0.02	QP
9@	0.400	41.54	47.86	-6.32	41.38	0.13	0.03	Average
10	0.400	44.47	57.86	-13.39	44.31	0.13	0.03	QP
11	12.516	31.34	50.00	-18.66	30.81	0.34	0.19	Average
12	12.516	38.06	60.00	-21.94	37.53	0.34	0.19	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

3.2 Radiated Emission

This section includes field strength of fundamental, field strength of harmonics and emissions radiated outside of the operating frequency bands.

3.2.1 Limit of field strength of fundamental and field strength of harmonics

Fundamental Frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902~928 MHz	50	500

3.2.2 Limit of Unwanted Emissions

Emissions 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 below table, whichever is the lesser attenuation.

Radiated emission limits			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.2.3 Test Procedures

1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

1. Radiated emission below 1GHz
120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission
2. Radiated emission above 1GHz / Peak value except fundamental
RBW=1MHz, VBW=3MHz and Peak detector
3. Radiated emission above 1GHz / Average value for field strength of fundamental and harmonics
The average value is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

908.40MHz: $20\log(\text{Duty cycle}) = 20\log\frac{3\text{x } 7.8986\text{ ms}}{100\text{ ms}} = -12.51\text{dB}$

908.42MHz: $20\log(\text{Duty cycle}) = 20\log\frac{2\text{x } 23.9130\text{ ms}}{100\text{ ms}} = -6.41\text{dB}$

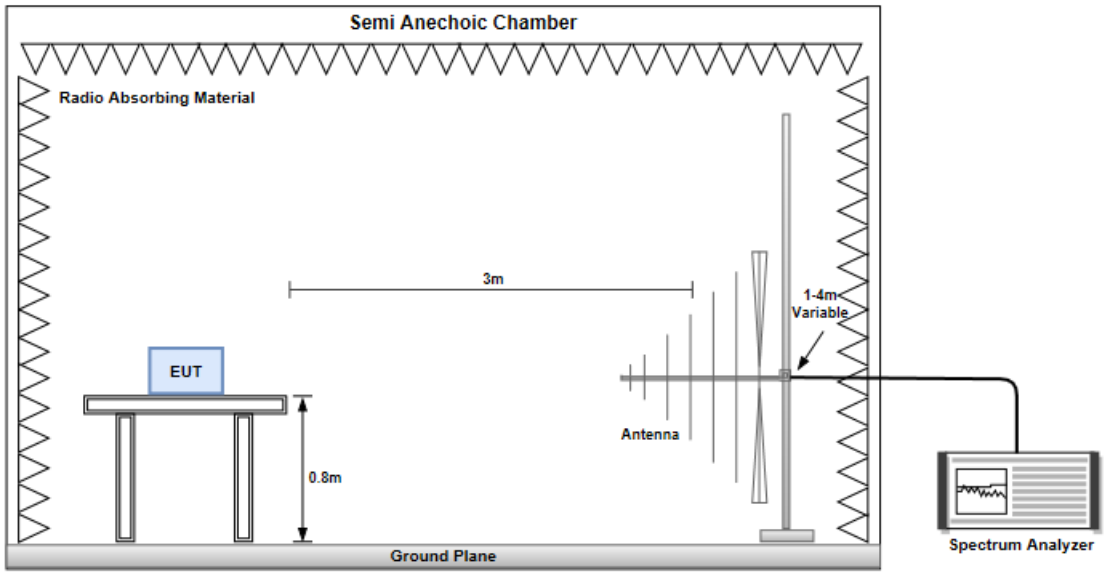
916.00MHz: $20\log(\text{Duty cycle}) = 20\log\frac{4\text{x } 3.2609\text{ ms}}{100\text{ ms}} = -17.69\text{dB}$

Please see page 33-35 for plotted duty

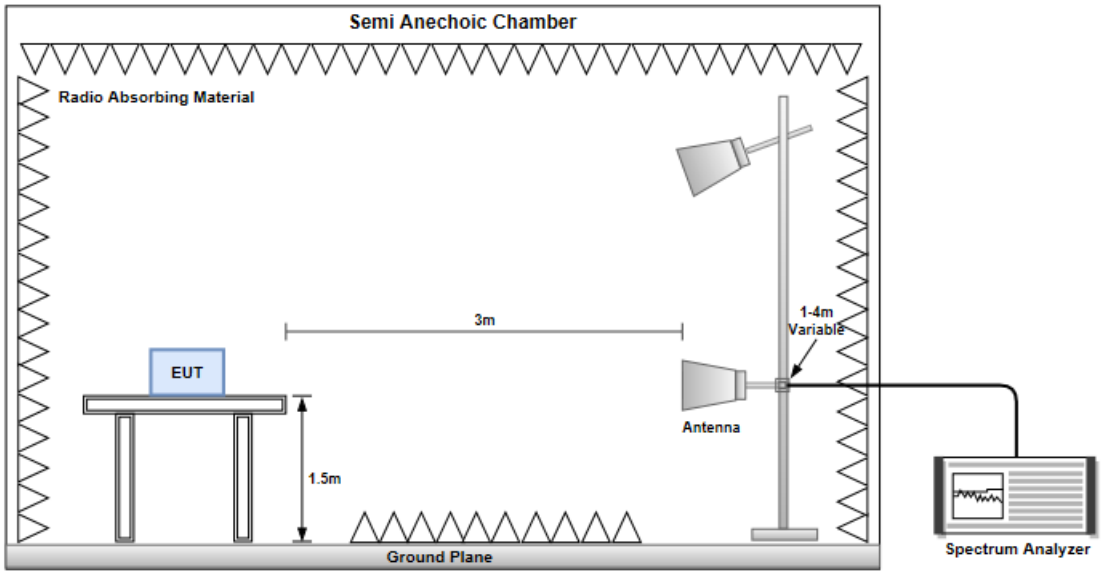
4. Radiated emission above 1GHz / Average value for other emissions
RBW=1MHz, VBW=10Hz and Peak detector
5. Radiated emission Peak value for fundamental
RBW=1MHz, VBW=3MHz and Peak detector

3.2.4 Test Setup

Radiated Emissions below 1 GHz

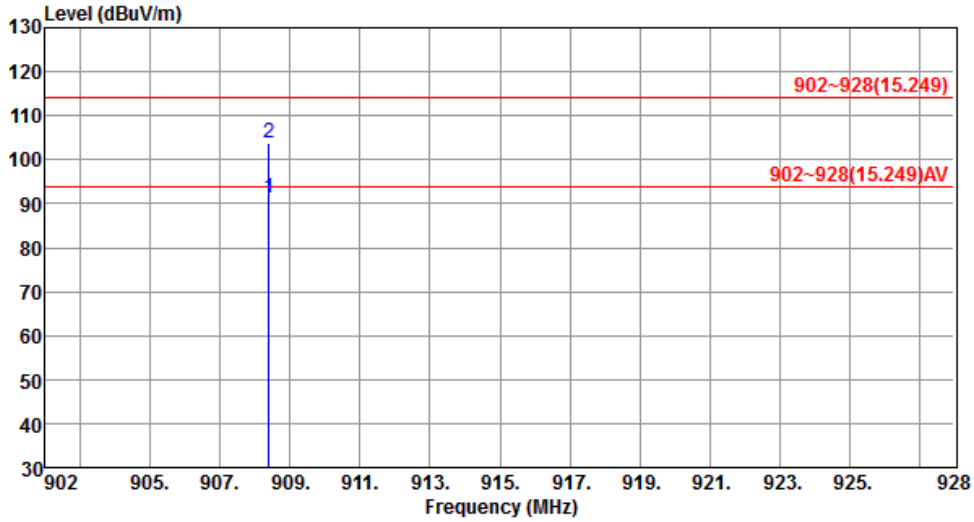


Radiated Emissions above 1 GHz



3.2.5 Transmitter Field Strength of Fundamental

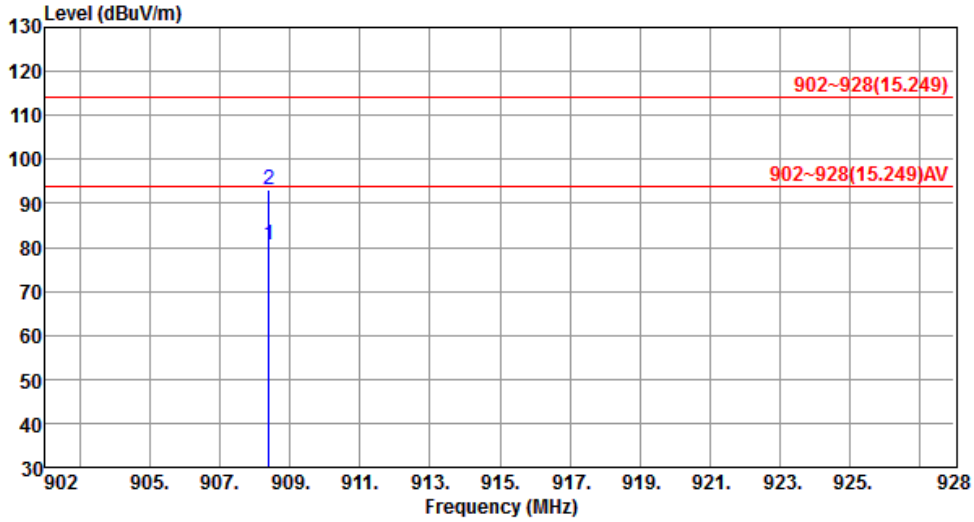
Modulation	FSK	Test Freq. (MHz)	908.40
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	908.40	91.36	94.00	-2.64	59.50	31.86	Average	100	315
2	908.40	103.87	114.00	-10.13	72.01	31.86	Peak	100	315

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

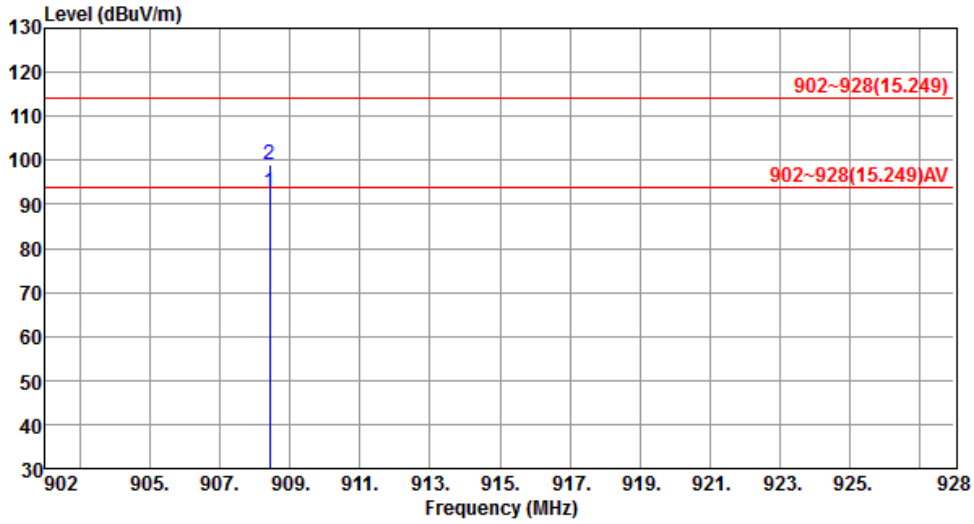
Modulation	FSK	Test Freq. (MHz)	908.40
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	908.40	80.60	94.00	-13.40	48.74	31.86	Average	100	215
2	908.40	93.11	114.00	-20.89	61.25	31.86	Peak	100	215

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

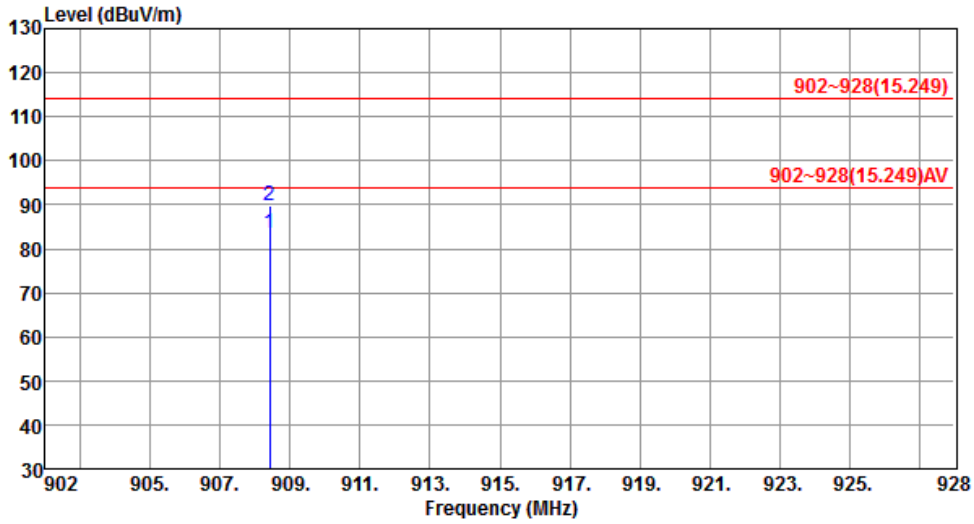
Modulation	FSK	Test Freq. (MHz)	908.42
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	908.42	92.69	94.00	-1.31	60.83	31.86	Average	100	315
2	908.42	99.10	114.00	-14.90	67.24	31.86	Peak	100	315

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

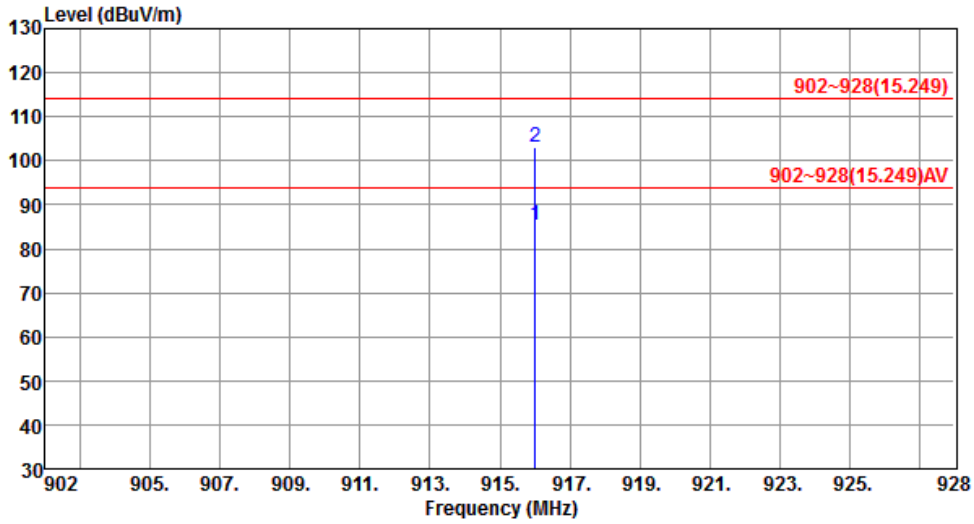
Modulation	FSK	**Test Freq. (MHz)**	908.42
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	908.42	83.50	94.00	-10.50	51.64	31.86	Average	100	262
2	908.42	89.91	114.00	-24.09	58.05	31.86	Peak	100	262

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

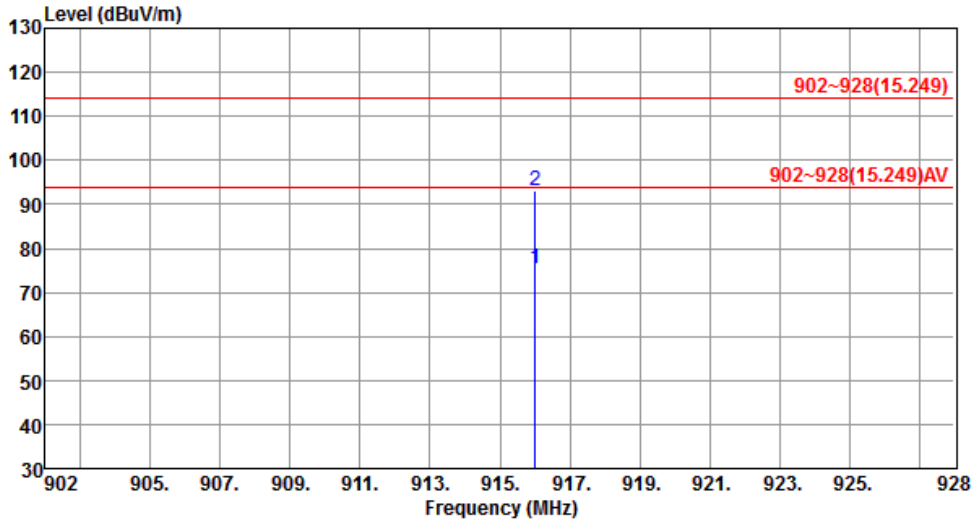
Modulation	GFSK	**Test Freq. (MHz)**	916.00
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	916.00	85.48	94.00	-8.52	53.55	31.93	Average	100	318
2	916.00	103.17	114.00	-10.83	71.24	31.93	Peak	100	318

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	GFSK	**Test Freq. (MHz)**	916.00
Polarization	Vertical		

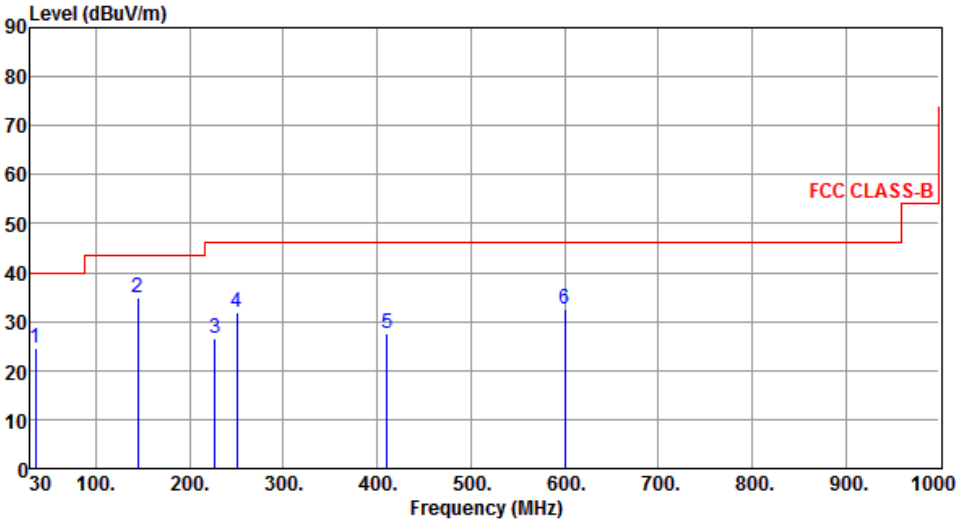


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	916.00	75.32	94.00	-18.68	43.39	31.93	Average	100	262
2	916.00	93.01	114.00	-20.99	61.08	31.93	Peak	100	262

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.2.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

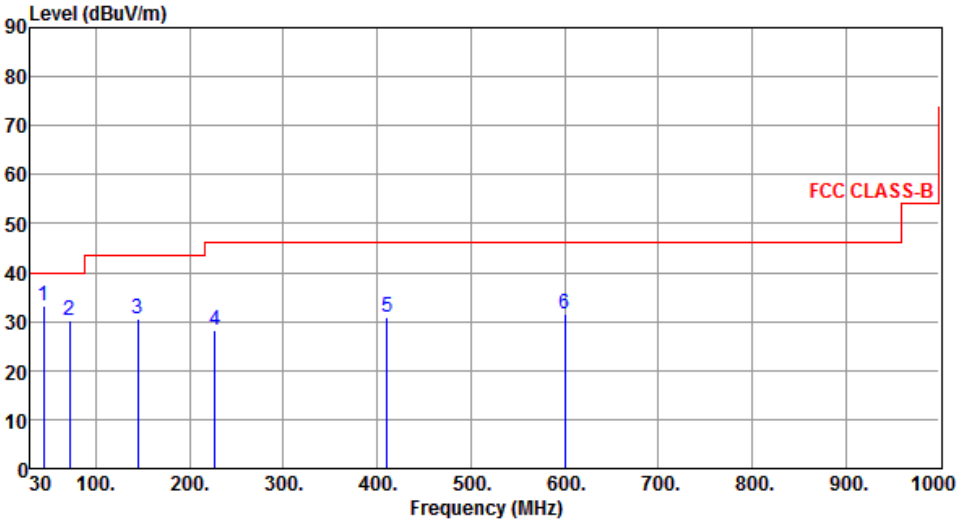
Modulation	FSK	Test Freq. (MHz)	908.40
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	35.82	24.48	40.00	-15.52	32.86	-8.38	Peak	---	---
2	144.46	34.98	43.50	-8.52	43.27	-8.29	Peak	---	---
3	226.91	26.62	46.00	-19.38	36.37	-9.75	Peak	---	---
4	250.19	31.76	46.00	-14.24	40.96	-9.20	Peak	---	---
5	410.24	27.72	46.00	-18.28	32.45	-4.73	Peak	---	---
6	600.36	32.53	46.00	-13.47	33.25	-0.72	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

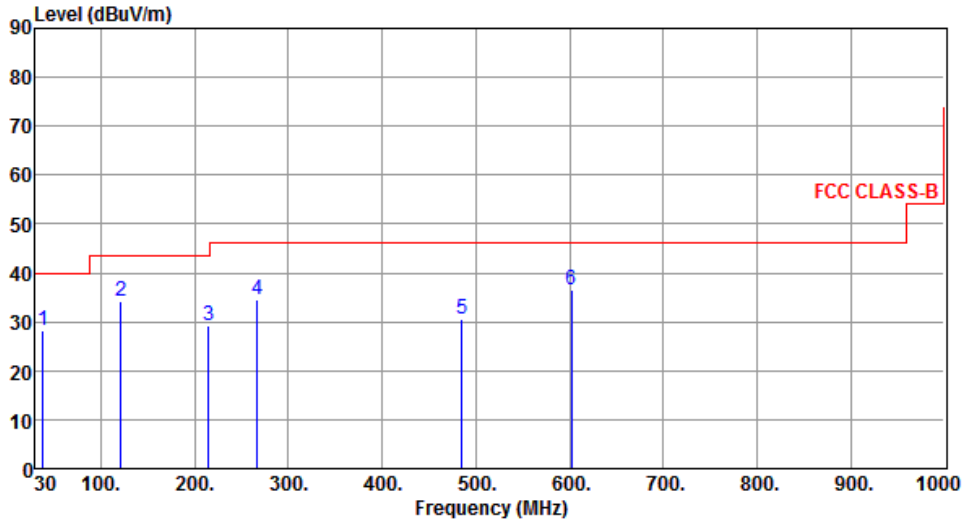
Modulation	FSK	Test Freq. (MHz)	908.40
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	44.55	33.34	40.00	-6.66	40.89	-7.55	Peak	---	---
2	71.71	30.15	40.00	-9.85	41.10	-10.95	Peak	---	---
3	144.46	30.59	43.50	-12.91	38.88	-8.29	Peak	---	---
4	226.91	28.09	46.00	-17.91	37.84	-9.75	Peak	---	---
5	410.24	30.83	46.00	-15.17	35.56	-4.73	Peak	---	---
6	600.36	31.40	46.00	-14.60	32.12	-0.72	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

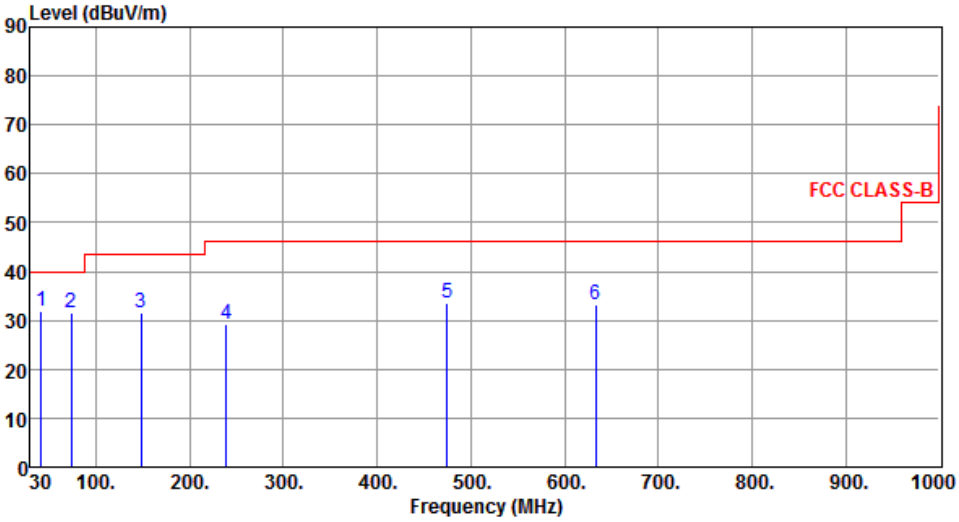
Modulation	FSK	Test Freq. (MHz)	908.42
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	38.43	28.38	40.00	-11.62	36.37	-7.99	Peak	---	---
2	121.13	34.32	43.50	-9.18	44.38	-10.06	Peak	---	---
3	214.91	29.08	43.50	-14.42	39.74	-10.66	Peak	---	---
4	267.12	34.51	46.00	-11.49	43.05	-8.54	Peak	---	---
5	485.15	30.44	46.00	-15.56	33.58	-3.14	Peak	---	---
6	601.85	36.46	46.00	-9.54	37.16	-0.70	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

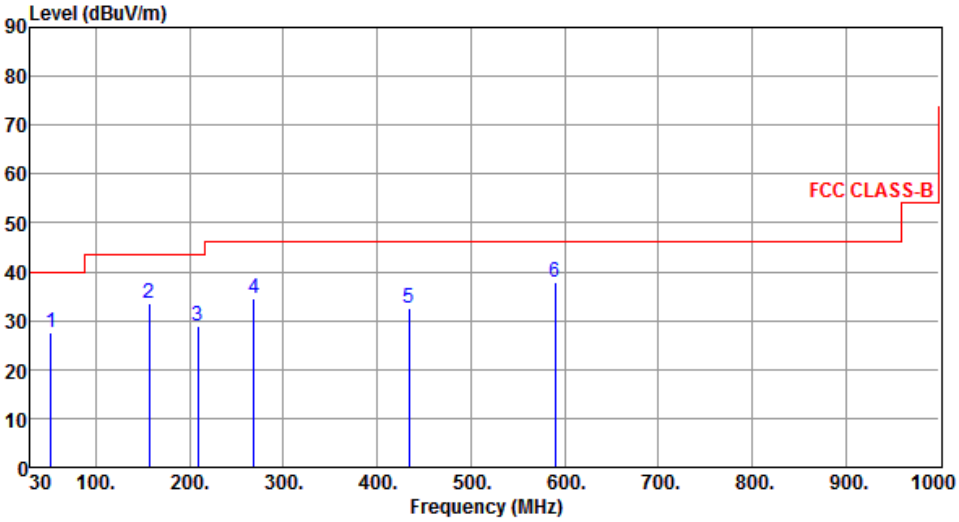
Modulation	FSK	Test Freq. (MHz)	908.42
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	41.82	31.91	40.00	-8.09	39.58	-7.67	Peak	---	---
2	73.82	31.70	40.00	-8.30	43.06	-11.36	Peak	---	---
3	147.97	31.63	43.50	-11.87	39.89	-8.26	Peak	---	---
4	239.47	29.09	46.00	-16.91	38.50	-9.41	Peak	---	---
5	474.36	33.42	46.00	-12.58	36.76	-3.34	Peak	---	---
6	633.57	33.08	46.00	-12.92	33.40	-0.32	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

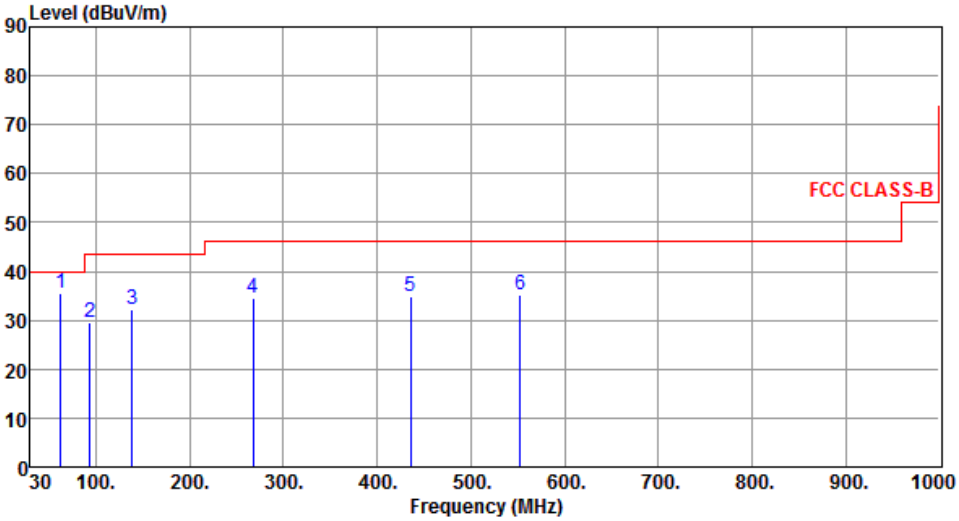
Modulation	GFSK	**Test Freq. (MHz)**	916.00
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	52.36	27.58	40.00	-12.42	35.48	-7.90	Peak	---	---
2	156.38	33.62	43.50	-9.88	41.83	-8.21	Peak	---	---
3	208.86	28.78	43.50	-14.72	39.51	-10.73	Peak	---	---
4	268.42	34.39	46.00	-11.61	42.84	-8.45	Peak	---	---
5	434.06	32.61	46.00	-13.39	36.78	-4.17	Peak	---	---
6	589.64	37.86	46.00	-8.14	38.82	-0.96	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	GFSK	Test Freq. (MHz)	916.00
Polarization	Vertical		

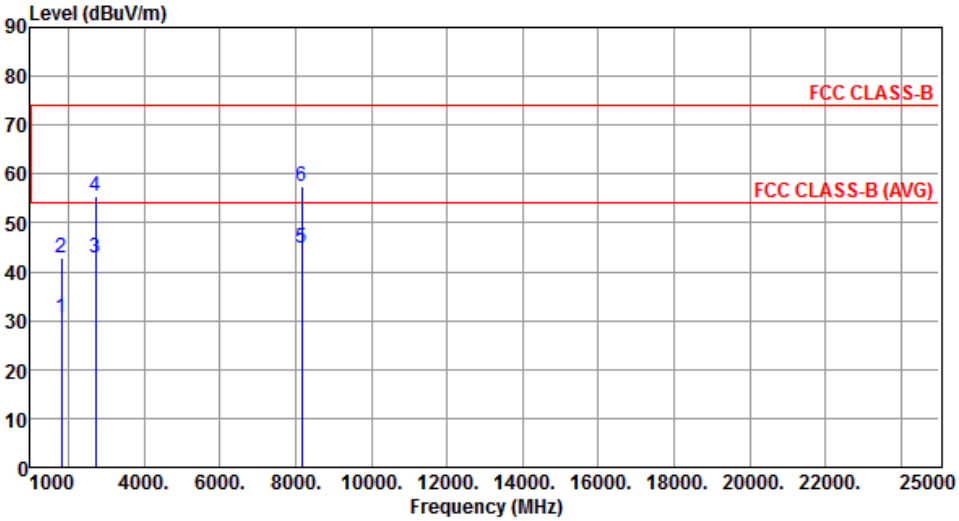


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	62.08	35.51	40.00	-4.49	44.75	-9.24	Peak	---	---
2	93.47	29.41	43.50	-14.09	43.28	-13.87	Peak	---	---
3	138.31	32.29	43.50	-11.21	40.73	-8.44	Peak	---	---
4	267.48	34.57	46.00	-11.43	43.09	-8.52	Peak	---	---
5	435.37	34.80	46.00	-11.20	38.93	-4.13	Peak	---	---
6	552.84	35.05	46.00	-10.95	36.87	-1.82	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.2.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

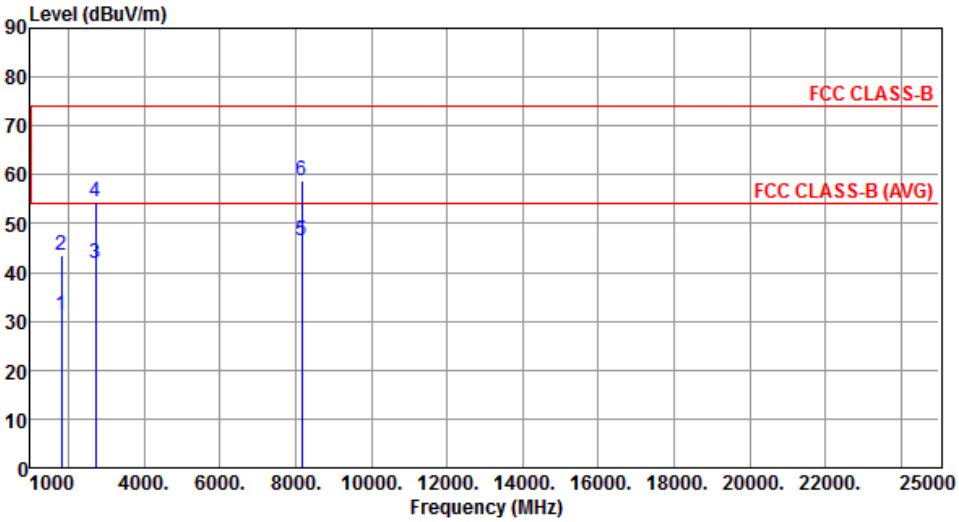
Modulation	FSK	**Test Freq. (MHz)**	908.40
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1816.80	30.43	54.00	-23.57	35.91	-5.48	Average	100	285
2	1816.80	42.94	74.00	-31.06	48.42	-5.48	Peak	100	285
3	2725.20	43.00	54.00	-11.00	45.05	-2.05	Average	100	291
4	2725.20	55.51	74.00	-18.49	57.56	-2.05	Peak	100	291
5	8175.60	45.00	54.00	-9.00	35.31	9.69	Average	100	286
6	8175.60	57.51	74.00	-16.49	47.82	9.69	Peak	100	286

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

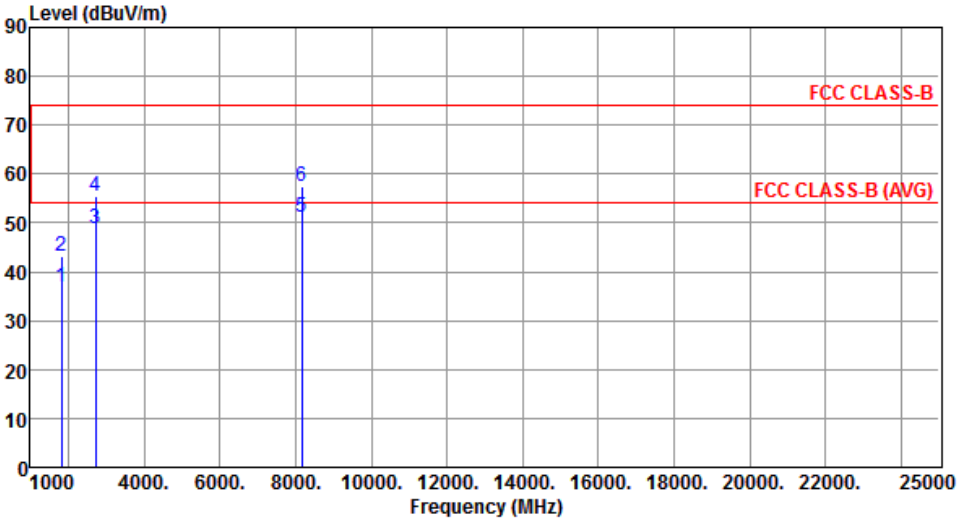
Modulation	FSK	**Test Freq. (MHz)**	908.40
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1816.80	31.07	54.00	-22.93	36.55	-5.48	Average	114	233
2	1816.80	43.58	74.00	-30.42	49.06	-5.48	Peak	114	233
3	2725.20	41.89	54.00	-12.11	43.94	-2.05	Average	100	201
4	2725.20	54.40	74.00	-19.60	56.45	-2.05	Peak	100	201
5	8175.60	46.38	54.00	-7.62	36.69	9.69	Average	100	208
6	8175.60	58.89	74.00	-15.11	49.20	9.69	Peak	100	208

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

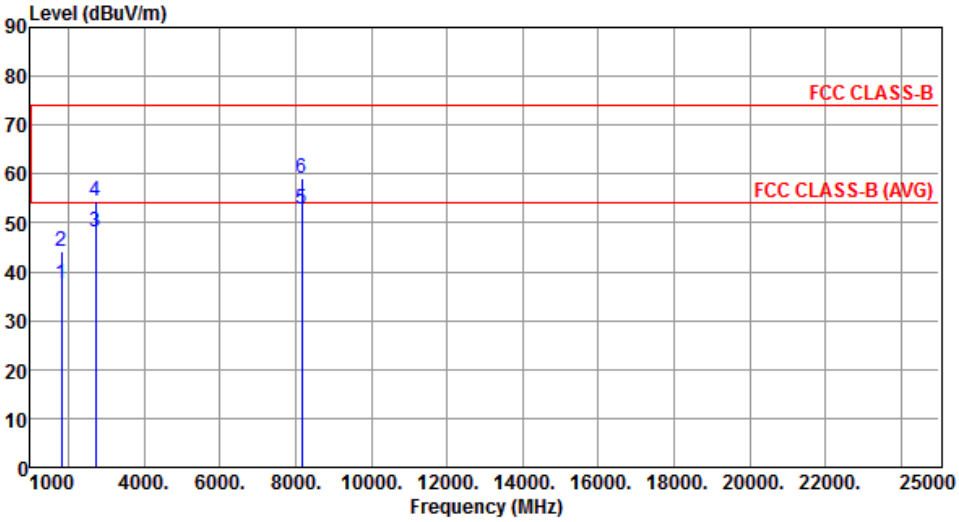
Modulation	FSK	**Test Freq. (MHz)**	908.42
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1816.84	36.70	54.00	-17.30	42.18	-5.48	Average	100	287
2	1816.84	43.11	74.00	-30.89	48.59	-5.48	Peak	100	287
3	2725.26	48.95	54.00	-5.05	51.00	-2.05	Average	100	290
4	2725.26	55.36	74.00	-18.64	57.41	-2.05	Peak	100	290
5	8175.78	51.19	54.00	-2.81	41.50	9.69	Average	100	285
6	8175.78	57.60	74.00	-16.40	47.91	9.69	Peak	100	285

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

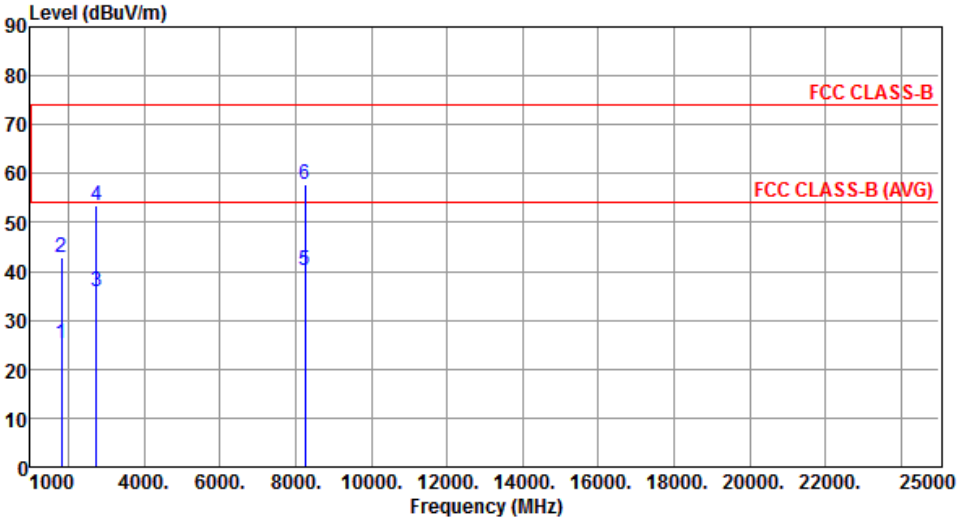
Modulation	FSK	**Test Freq. (MHz)**	908.42
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1816.84	37.60	54.00	-16.40	43.08	-5.48	Average	116	235
2	1816.84	44.01	74.00	-29.99	49.49	-5.48	Peak	116	235
3	2725.26	48.04	54.00	-5.96	50.09	-2.05	Average	100	201
4	2725.26	54.45	74.00	-19.55	56.50	-2.05	Peak	100	201
5	8175.78	52.74	54.00	-1.26	43.05	9.69	Average	100	208
6	8175.78	59.15	74.00	-14.85	49.46	9.69	Peak	100	208

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

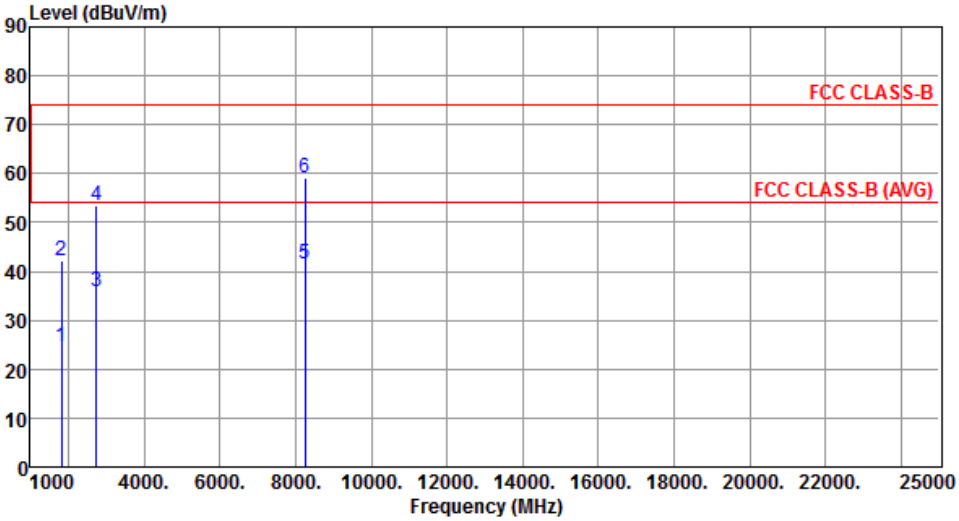
Modulation	GFSK	**Test Freq. (MHz)**	916.00
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1832.00	25.19	54.00	-28.81	30.62	-5.43	Average	100	288
2	1832.00	42.88	74.00	-31.12	48.31	-5.43	Peak	100	288
3	2748.00	35.94	54.00	-18.06	37.91	-1.97	Average	100	328
4	2748.00	53.63	74.00	-20.37	55.60	-1.97	Peak	100	328
5	8244.00	40.15	54.00	-13.85	30.42	9.73	Average	100	284
6	8244.00	57.84	74.00	-16.16	48.11	9.73	Peak	100	284

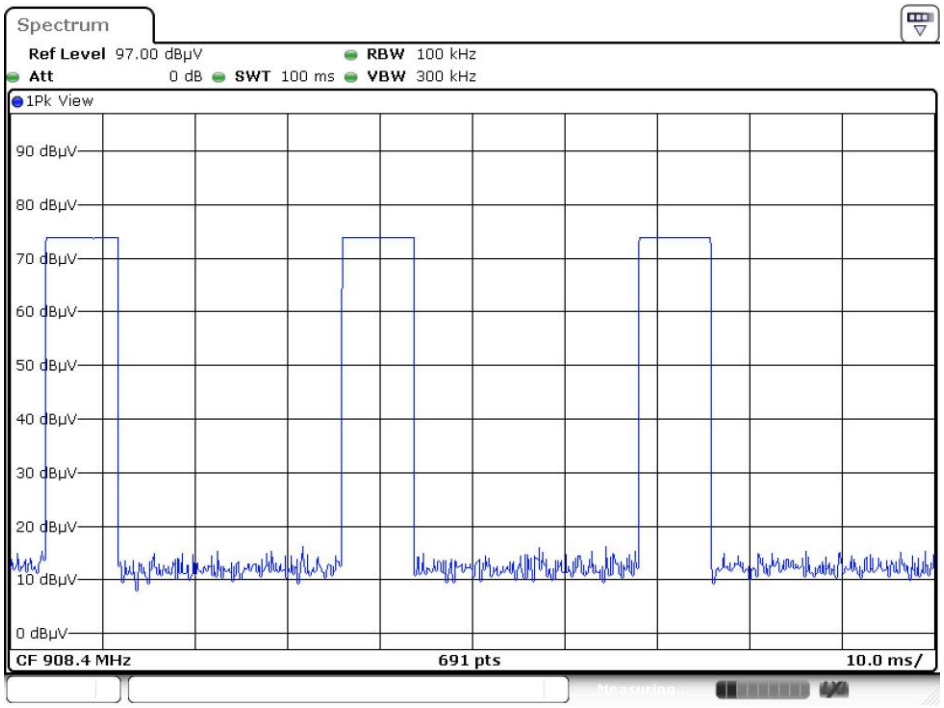
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

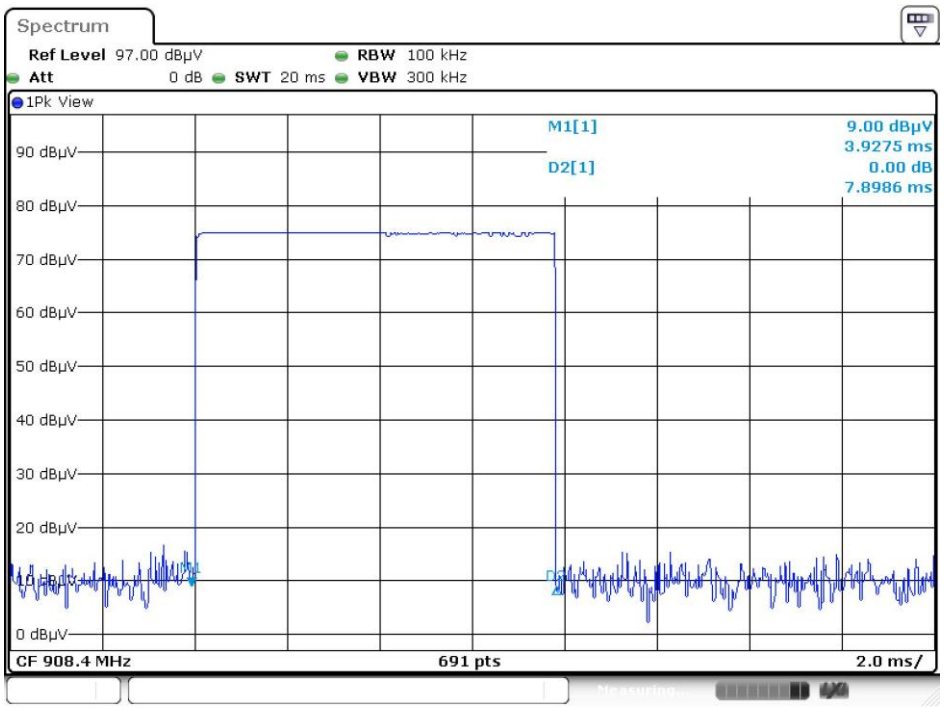
Modulation	GFSK	**Test Freq. (MHz)**	916.00
Polarization	Vertical		



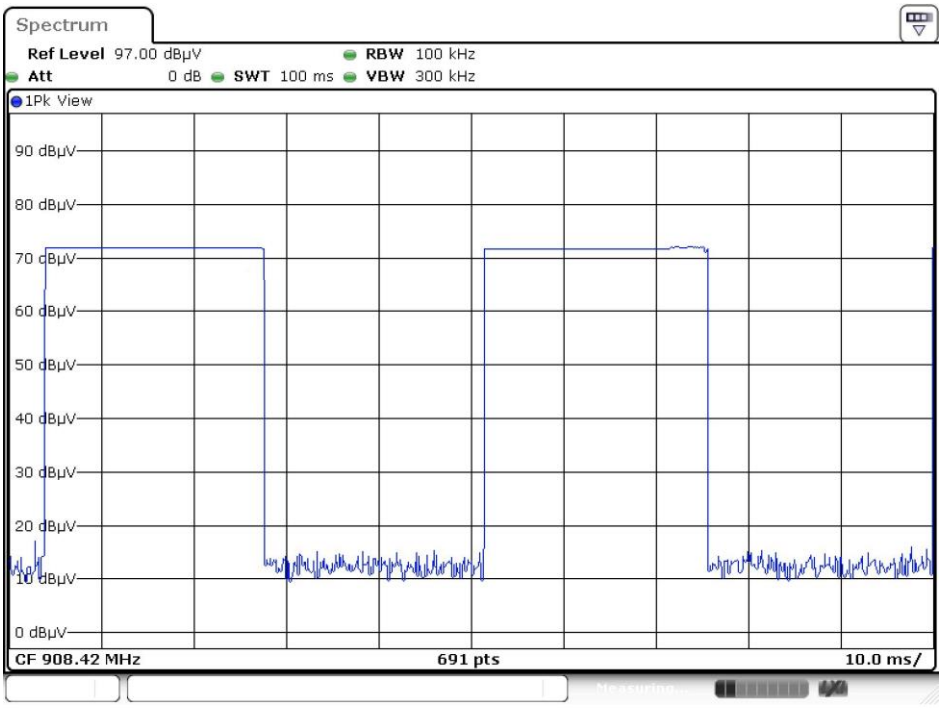
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1832.00	24.44	54.00	-29.56	29.87	-5.43	Average	100	233
2	1832.00	42.13	74.00	-31.87	47.56	-5.43	Peak	100	233
3	2748.00	35.71	54.00	-18.29	37.68	-1.97	Average	100	312
4	2748.00	53.40	74.00	-20.60	55.37	-1.97	Peak	100	312
5	8244.00	41.49	54.00	-12.51	31.76	9.73	Average	100	209
6	8244.00	59.18	74.00	-14.82	49.45	9.73	Peak	100	209

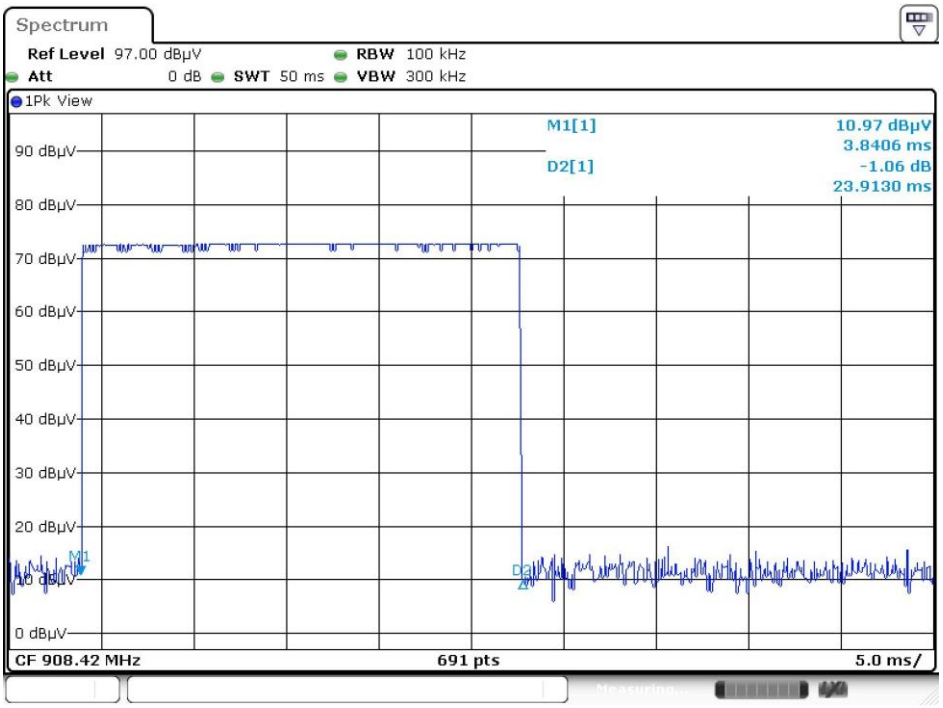
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).



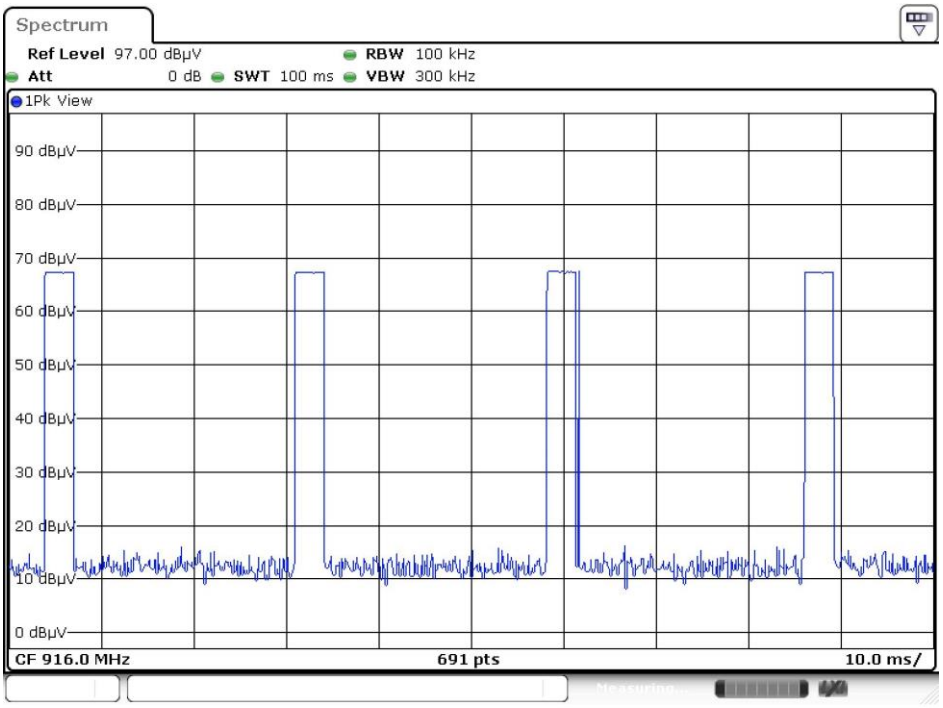


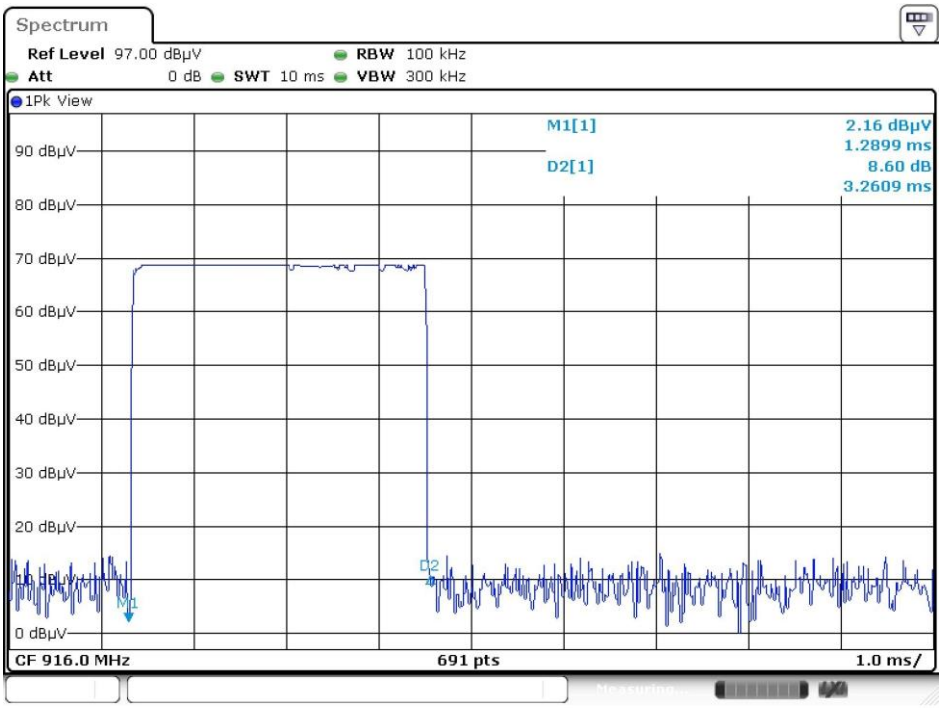
908.40MHz: 20log (Duty cycle) = 20log $\frac{3x\ 7.8986\ ms}{100\ ms}$ = -12.51dB





908.42MHz: 20log (Duty cycle) = $20\log \frac{2\text{x } 23.9130 \text{ ms}}{100 \text{ ms}}$ = -6.41dB





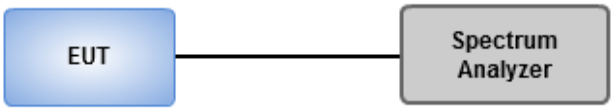
916.00MHz: $20\log(\text{Duty cycle}) = 20\log\frac{4\text{x } 3.2609\text{ ms}}{100\text{ ms}} = -17.69\text{dB}$

3.3 20dB and Occupied Bandwidth

3.3.1 Test Procedures

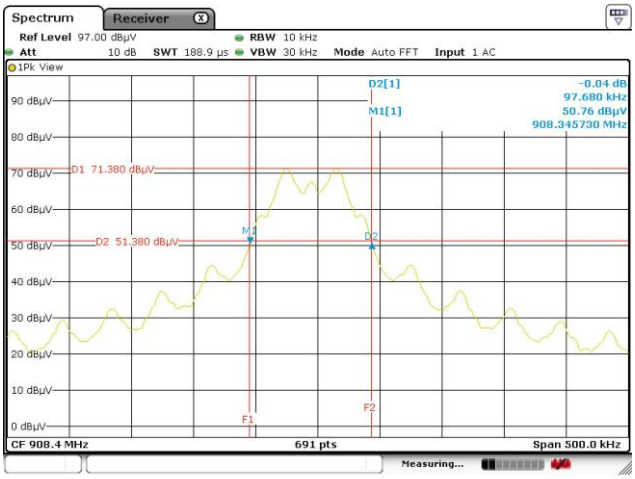
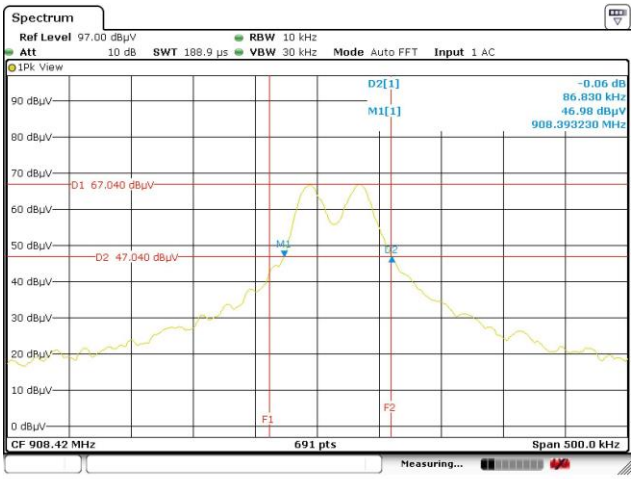
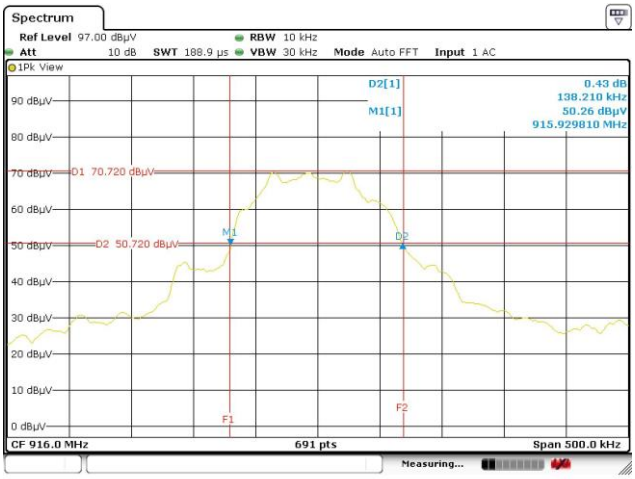
1. Set resolution bandwidth (RBW) = 10 kHz, Video bandwidth = 30 kHz.
2. Detector = Peak(20 dB bandwidth) / Sample(Occupied bandwidth), Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20dB relative to the maximum level measured in the fundamental emission.
5. Use the occupied measurement function of specturm analyzer to measure 99% occupied bandwidth

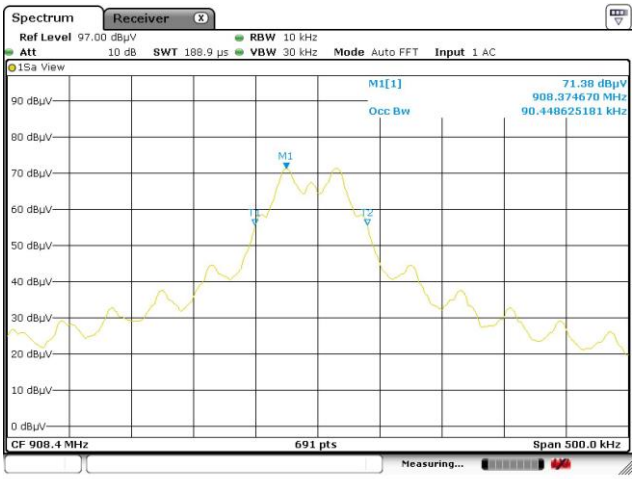
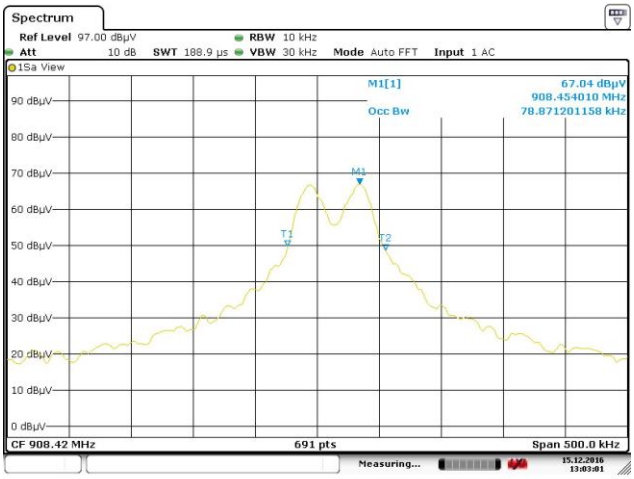
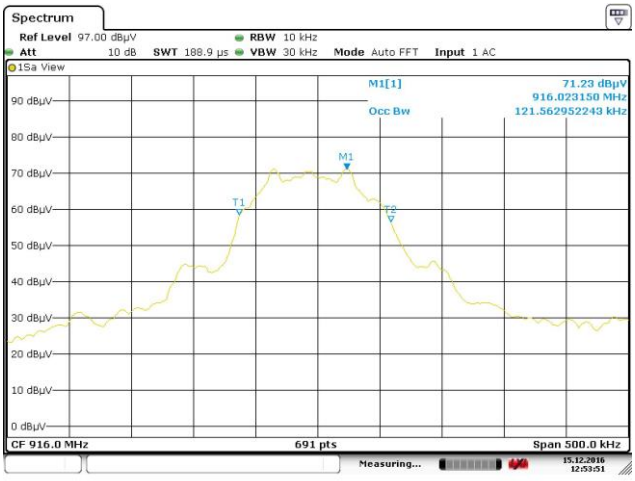
3.3.2 Test Setup



3.3.3 20dB and Occupied Bandwidth

Freq. (MHz)	20dB Bandwidth (MHz)	Occupied Bandwidth (MHz)
908.40	97.68	90.45
908.42	86.83	78.87
916.00	138.21	121.56

20dB Bandwidth / 908.40MHz	20dB Bandwidth / 908.42MHz
	
20dB Bandwidth / 916.00MHz	**---**
	---

Occupied Bandwidth / 908.40MHz	Occupied Bandwidth / 908.42MHz
	
Occupied Bandwidth / 916.00MHz	**---**
	---

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

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