ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C AND INDUSTRY CANADA RSS 210 REQUIREMENT

OF

Applicant:	Siemens AG Gleiwitzer Str. 555, 90475 Nuremberg
Product Name:	SIMATIC RF350M
Brand Name:	SIMATIC
Model No.:	6GT2803-1BA00
Model Difference:	N/A
FCC ID:	NXW-RF350M02
IC:	267X-RF350M02
Report Number:	ER/2017/90034
FCC Rule Part:	Part 15.225
IC Rule:	RSS-210 issue 9 Aug. 2016 Annex B
Issue Date:	Feb. 27, 2018
Date of Test:	Sep. 04, 2017 ~ Feb. 05, 2018
Date of EUT Received:	Sep. 04, 2017

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Prepared By: Yuri Tsai

Yuri Tsai / Clerk

Approved By: Jim Chang

Jim Chang / Manager

Revision History

Report Number	Revision	Description	Issue Date
ER/2017/90034	Rev.00	Initial creation of document	Feb. 27, 2018

Contents

1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	SIMATIC RF350M	
Brand Name:	SIMATIC	
Model No.:	6GT2803-1BA00	
Model Difference:	N/A	
Product SW/HW version:	N/A/ N/A	
Radio SW/HW version:	N/A / N/A	
Test SW Version:	N/A	
RF power setting in TEST SW:	N/A	
Power Supply:	7.26Vdc from Rechargeable Li-ion Battery or 24Vdc from AC/DC Adapter	
	Battery:	Model No.: BB1; Supplier: NORDICID
	Adapter:	Model No.: EA10402M-240; Supplier: EDACPOWER

RFID:

Operating Frequency:	13.56MHz
Transmit Power:	< 123.90dBuV/m at 3m.
Number of Channels:	1
Antenna Type:	Loop Antenna
Modulation Type:	ASK

1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.225

IC RSS 210 issue 9 Aug.2016 Annex B

RSS-Gen. issue 5 Apr. 2018

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 (TAF code 0513)

FCC Registration Numbers are: 509634 / TW0001

Canada Registration Number: 4620A-5.

1.4 Special Accessories

There is no special accessory used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plan. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plan. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission & Conducted (AC power line) Configuration

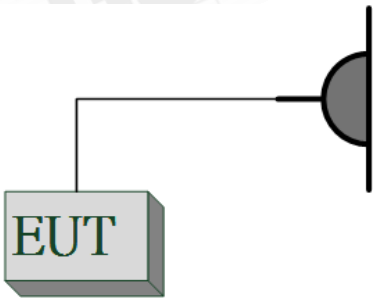


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model / Type No.	Series No.	Data Cable	Power Cord
1.	RFID Test Software	N/A	N/A	N/A	N/A	N/A

3 SUMMARY OF TEST RESULTS

FCC Rules	IC Rules	Description Of Test	Result
§15.207	RSS-Gen § 8.8	AC Power Line Conducted Emission	Compliant
§15.225 (a)-(d)	RSS210 Annex 2 A2.6	Radiated Emission	Compliant
§15.209	RSS-Gen § 8.9	Radiated Emission Limits, general requirement	Compliant
§15.225 (e)	RSS-Gen § 8.11	Frequency Stability	Compliant
§2.1049 §15.215 (c)	RSS-Gen § 6.6	99% & 20 dB OCCUPIED BANDWIDTH	Compliant
§15.203	RSS-Gen § 6.7, § 8.3	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 The Worst Test Modes and Channel Details

1. The EUT stay in continuous transmitting mode.
2. The frequency 13.56 MHz is the default channel to test, where it is the only manipulative channel as this application supports.
3. Investigation has been done on all the possible configurations for searching the worst case.

RADIATED EMISSION TEST			
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION
NFC	1	1	ASK
FREQUENCY STABILITY			
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION
NFC	1	1	ASK
20dB BANDWIDTH			
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION
NFC	1	1	ASK

The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode), the worst case H position was reported.

The data rate as the lowest supported is selected while tests are conducted.

5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Frequency Stability	+/- 51.33 Hz
20 dB OCCUPIED BANDWIDTH	+/- 51.33 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : **Vertical**)	9kHz - 30MHz: +/- 2.87dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB

Measurement uncertainty (Polarization : **Horizontal**)	9kHz - 30MHz: +/- 2.87dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

6 CONDUCTED EMISSION TEST

6.1 Standard Applicable:

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

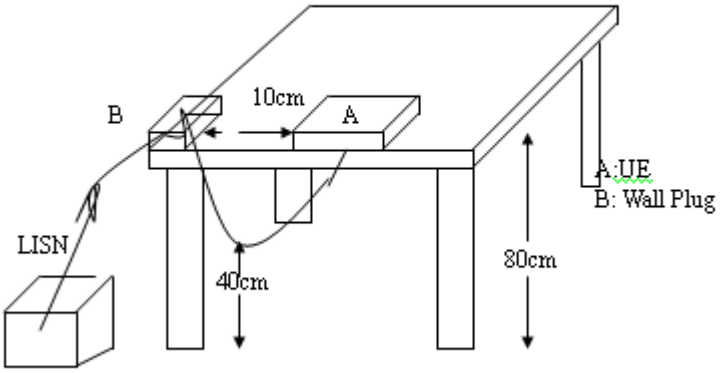
6.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
EMI Test Receiver	R&S	ESCI7	100760	05/11/2017	05/10/2018
LISN	SCHWARZBECK	NSLK 8127	8127-649	05/22/2017	05/21/2018
LISN	MESS TEC	FCC-LISN-50/250-25-2-01	4034	03/19/2017	03/18/2018
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2017	11/25/2018

6.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plan.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

6.6 Measurement Result:

Note: Refer to next page for measurement data and plots.
Note2: The * reveals the worst-case results that closet to the limit

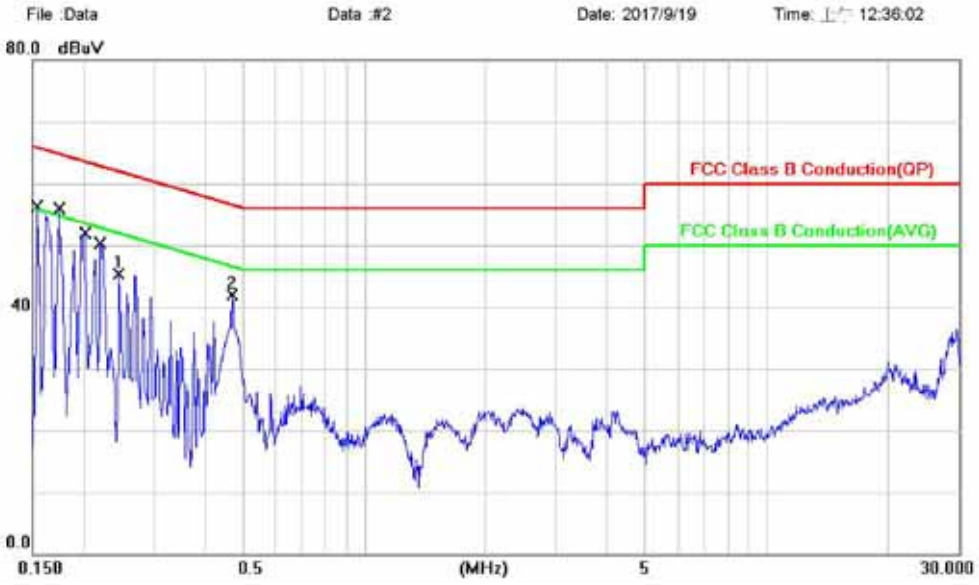
AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test By:	Tin
Temperature:	20 ℃	Humidity:	58 %		

Site Conduction Room
Limit: FCC Class B Conduction(QP)
Mode: Operation
Note: Adapter:EA10402M-240

Phase: L1
Power: AC 120V/60Hz

Temperature: 20 ℃
Humidity: 58 %

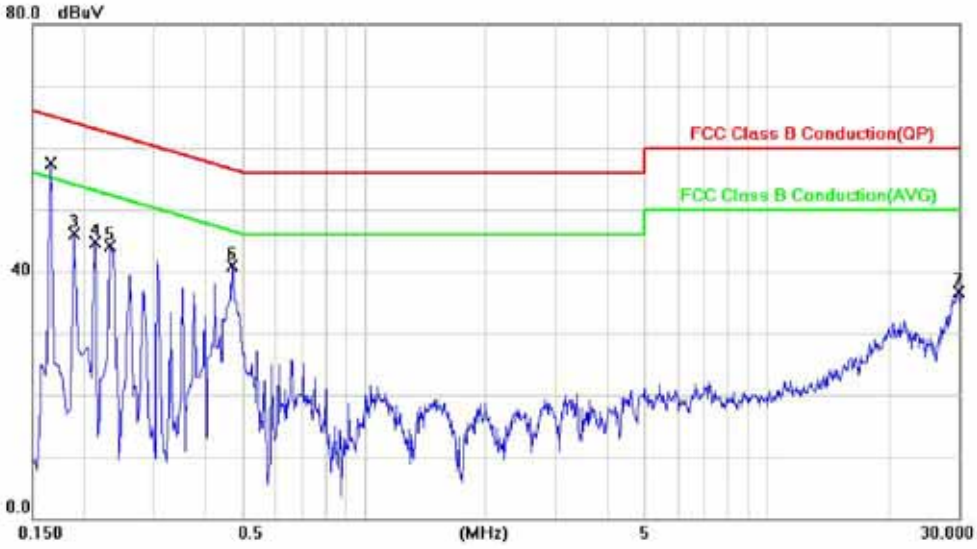


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2460	45.15	0.12	45.27	61.89	-16.62	peak	
2		0.4700	41.72	0.11	41.83	56.51	-14.68	peak	
3	*	0.1540	53.60	0.12	53.72	65.78	-12.06	QP	
4		0.1540	29.10	0.12	29.22	55.78	-26.56	AVG	
5		0.1740	27.50	0.12	27.62	54.77	-27.15	AVG	
6		0.1740	52.10	0.12	52.22	64.77	-12.55	QP	
7		0.2020	49.80	0.12	49.92	63.53	-13.61	QP	

Site Conduction Room	Phase: N	Temperature: 20 ℃
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 58 %
Mode: Operation		
Note: Adapter:EA10402M-240		

Conducted Emission

File :Data Data :#1 Date: 2017/9/19 Time: 上午 12:34:57



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1660	55.00	0.12	55.12	65.16	-10.04	QP	
2		0.1660	34.90	0.12	35.02	55.16	-20.14	AVG	
3		0.1900	46.08	0.12	46.20	64.04	-17.84	peak	
4		0.2140	44.51	0.12	44.63	63.05	-18.42	peak	
5		0.2340	43.98	0.12	44.10	62.31	-18.21	peak	
6		0.4700	40.75	0.11	40.86	56.51	-15.65	peak	
7		29.8980	35.85	0.88	36.73	60.00	-23.27	peak	

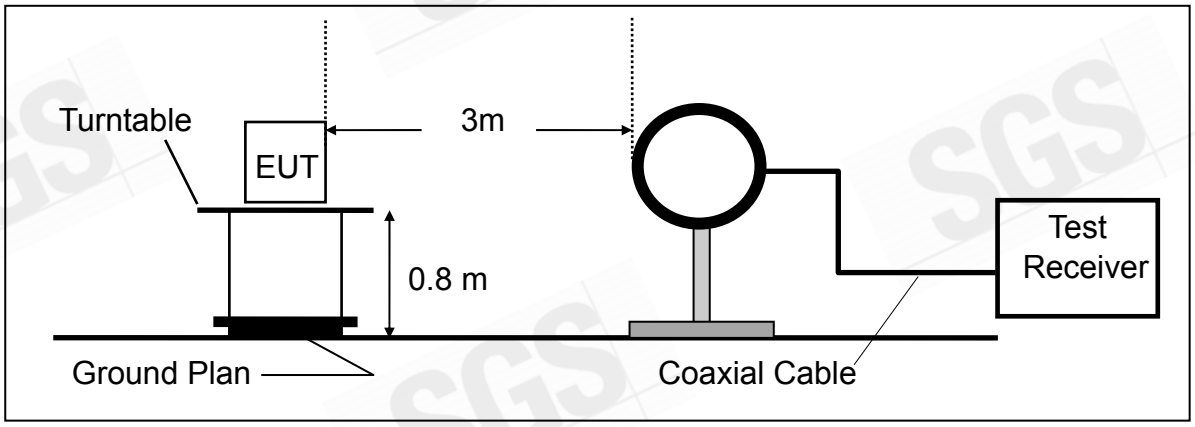
7 RADIATED TEST ITEMS

7.1 Measurement Procedure

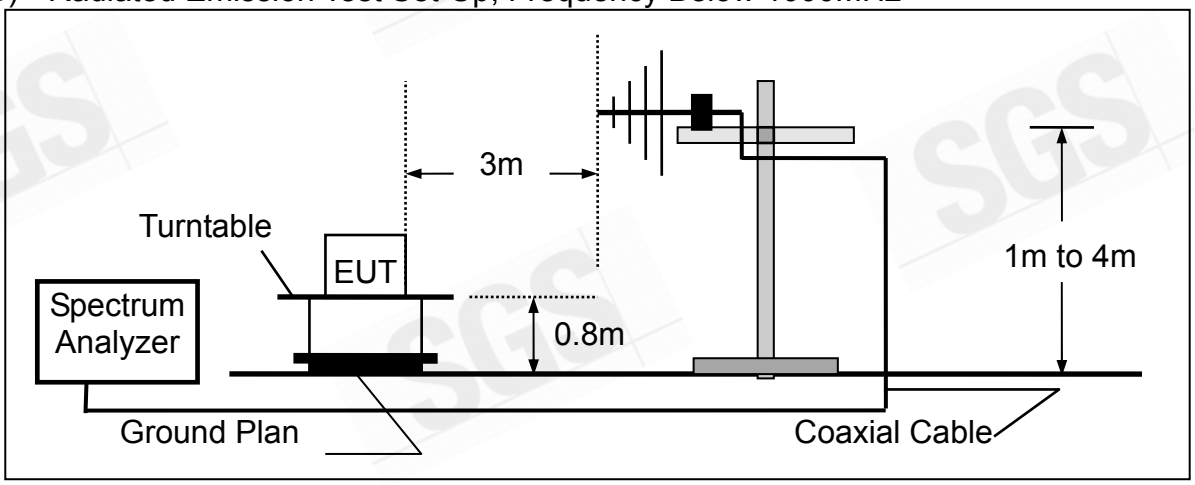
1. Configure the EUT according to ANSI C63.4.
2. The EUT was placed on a turn table which is 0.8m above ground plan.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all default test channel measured were complete

7.2 Test SET-UP

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



7.3 Measurement Equipment Used

SGS SAC-III					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
EMI Test Receiver	R&S	ESCI7	100760	05/11/2017	05/10/2018
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/25/2017	04/24/2018
Loop Antenna	ETS-Lindgren	6502	148045	09/20/2017	09/19/2018
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/29/2017	12/30/2018
Bilog Antenna	SCHWAZBECK	VULB9168	300	12/20/2017	12/19/2018
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/04/2017	08/03/2018
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2018	01/01/2019
Pre-Amplifier	EMC Instruments Corp.	EMC012653 0	980038	01/02/2018	01/01/2019
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500 -B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2018	01/01/2019
3m Site NSA	SGS	966 chamber	N/A	01/02/2018	01/01/2019
Low Loss Cable	Huber Suhner	966 TX	1	01/02/2018	01/01/2019
Horn Antenna	Schwarzbeck	BBHA9170	184	12/12/2017	12/11/2018

Note: N.C.R refers to Not Calibrated Required.

7.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

The limit of the emission level is expressed in dBuV/m, which converts 20*log(uV/m)

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note :

"**F**" : denotes Fundamental Frequency. ; "**H**" : denotes Harmonic Frequency.

"**E**" : denotes Band Edge Frequency. ; "**S**" : denotes Spurious Frequency.

7.5 Field Strength of Fundamental Emissions and Mask Measurement

7.5.1 Standard Applicable

Limit:

Rules and specifiactions	CFR 47 Part 15 section 15.225(a)-(d)		
Frequency of Emission (MHz)	Field Strength (μV/m)at 30m	Field Strength (dBμV/m)at 30m	Field Strength (dBμV/m)at 3m
1.705~13.110	30	29.5	69.5
13.110~13.410	106	40.5	80.5
13.410~13.553	334	50.5	90.47
13.553~13.567	15848	84	123.9
13.567~13.710	334	50.5	90.47
13.710~14.010	106	40.5	80.5
14.010~30.00	30	29.5	69.5

Field strength of fundamental emissions limit:
The field strength of fundamental emissions shall not exceed 15848 micorvolts/meter at 30 meters. The Limit is converted to 124.00dBuV/m by offsetting the distance extrapolation factor as measurement distance is taken place at 3 meters.

Distance extrapolation = 40 *log (30/3) = 40 dB

Limit is re-adjusted in terms of limit taken in 3m = 20 *log (15848 uV/m) + 40 = 124.00dBuV/m

1. Emission level in dBuV/m=20 log (μV/m)
2. Distance extrapolation factor = 40 log (required distance/ test distance) (dB)
3. The lower limit shall apply at the transition frequencies.
4. The measurement was undertaken in closer distance at 3m, where extrapolation factor is offset to convert the limit of the measurement.

Radiated Mask for RSS 210 Annex 2 A2.6

(a) 15.848 millivolts/m (84 dBµV/m) at 30 m, within the band 13.553-13.567 MHz.
(b) 334 microvolts/m (50.5 dBµV/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz.
(c) 106 microvolts/m (40.5 dBµV/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz.

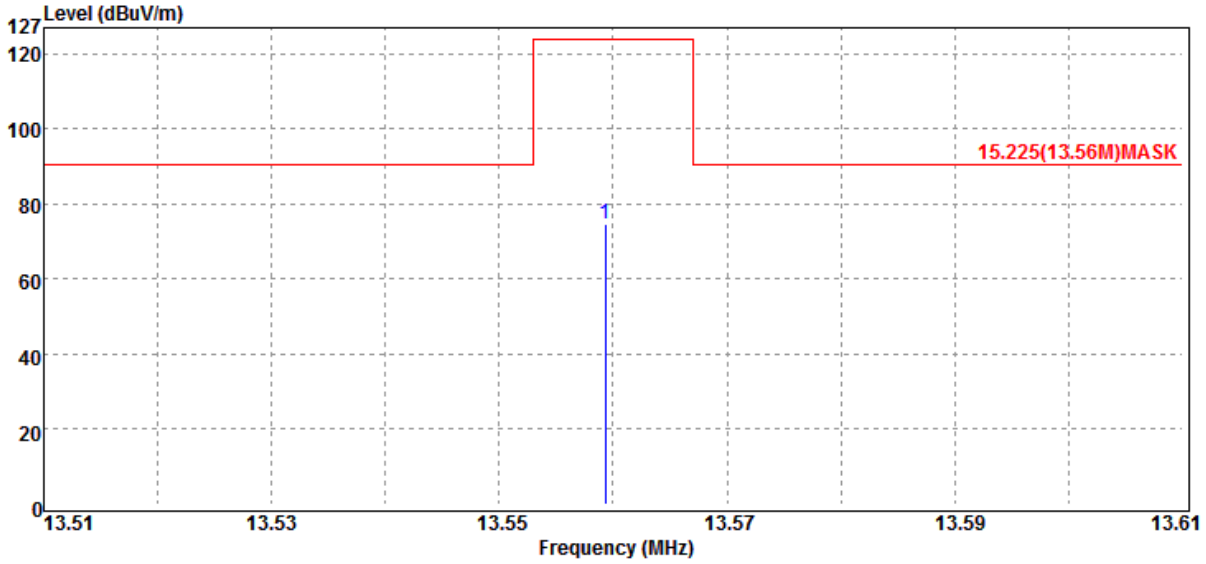
Distance extrapolation = 40 *log (30/3) = 40 dB

Limit is re-adjusted in terms of limit taken in 3m for the following frequency segment of the interest:

a) 20 *log (15848uV/m) + 40dB = 124.00dBuV/m
b) 20 *log(334uV/m) + 40dB = 90.47dBuV/m
c) 20*log(106uV/m) + 40dB = 80.50dBuV/m

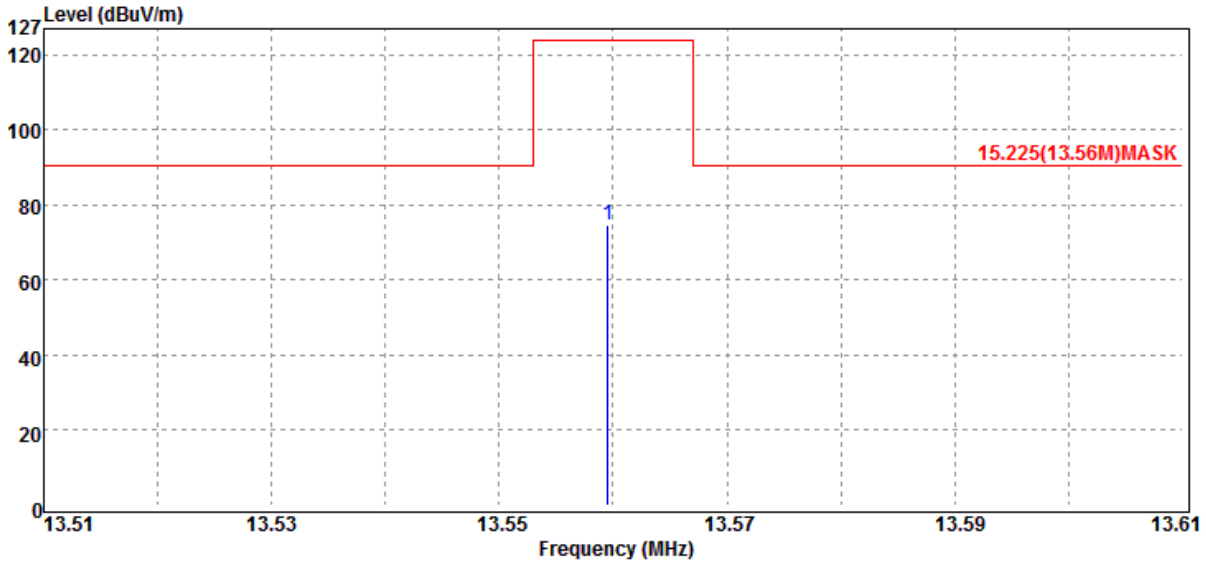
7.5.2 Field Strength of Fundamental Emission Measurement Result

Operation Band	:RFID	Test Date	:2018-02-05
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:23.8 deg_C/59 RH
Operation Mode	:Main	Engineer	:Kane
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Safe Margin dB
13.56	F	Peak	63.13	11.43	74.56	123.90	-49.34

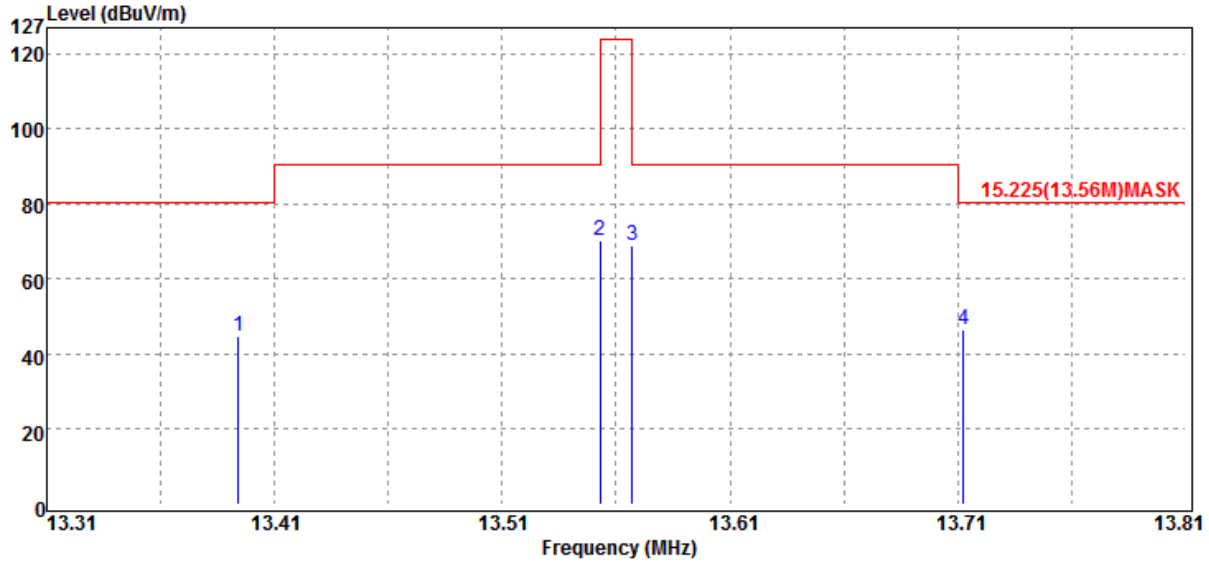
Operation Band	:RFID	Test Date	:2018-02-05
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:23.8 deg_C/59 RH
Operation Mode	:Main	Engineer	:Kane
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
13.56	F	Peak	63.35	11.43	74.78	123.90	-49.12

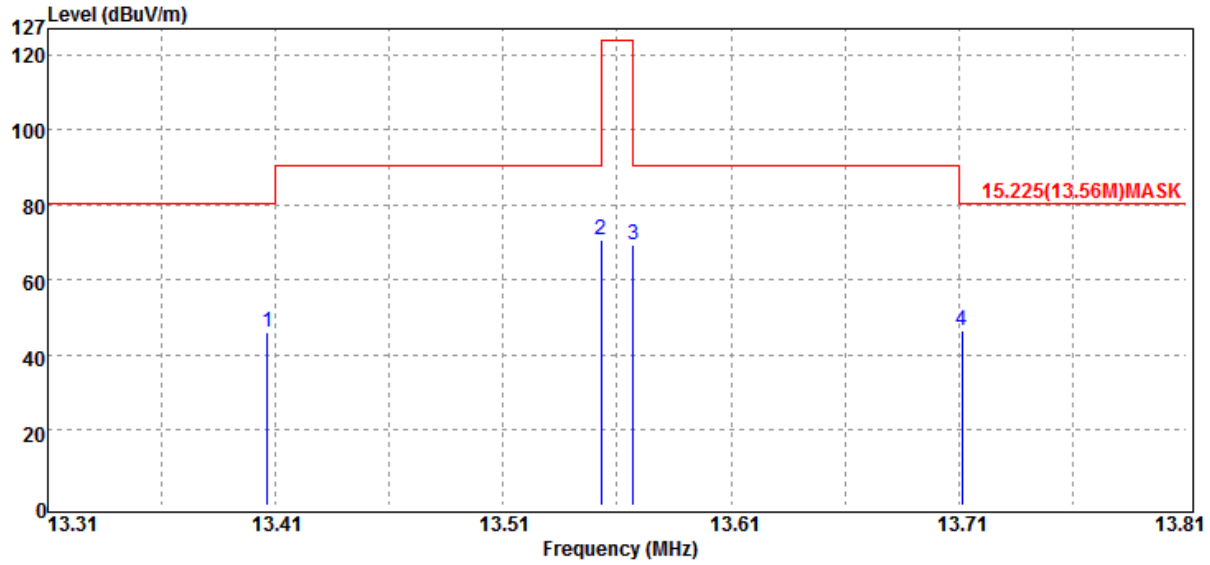
7.5.3 Mask Measurement Result

Operation Band	:RFID	Test Date	:2018-02-05
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:23.8 deg_C/59 RH
Operation Mode	:Mask	Engineer	:Kane
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Safe Margin dB
13.39	S	Peak	33.40	11.43	44.83	80.50	-35.67
13.55	S	Peak	58.98	11.43	70.41	90.47	-20.06
13.57	S	Peak	57.55	11.43	68.98	90.47	-21.49
13.71	S	Peak	35.01	11.44	46.45	80.50	-34.05

Operation Band	:RFID	Test Date	:2018-02-05
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:23.8 deg_C/59 RH
Operation Mode	:Mask	Engineer	:Kane
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Safe Margin dB
13.41	S	Peak	34.72	11.43	46.15	80.50	-34.35
13.55	S	Peak	59.28	11.43	70.71	90.47	-19.76
13.57	S	Peak	57.84	11.43	69.27	90.47	-21.20
13.71	S	Peak	35.23	11.44	46.67	80.50	-33.83

7.6 Radiated Emission Measurement

7.6.1 Standard Applicable

The field strength of any emission which appear outside of 13.553~13.567MHz Band shall not exceed the general radiated emissions limits.

Frequency (MHz)	Field strength (μV/m)	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	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

1. Emission level in dBμV/m=20 log (μV/m)
2. Distance extrapolation factor = 40 log (required distance/ test distance) (dB)
3. The lower limit shall apply at the transition frequencies.
4. The measurement was undertaken in closer distance at 3m, where extrapolation factor is offset to convert the limit of the measurement.

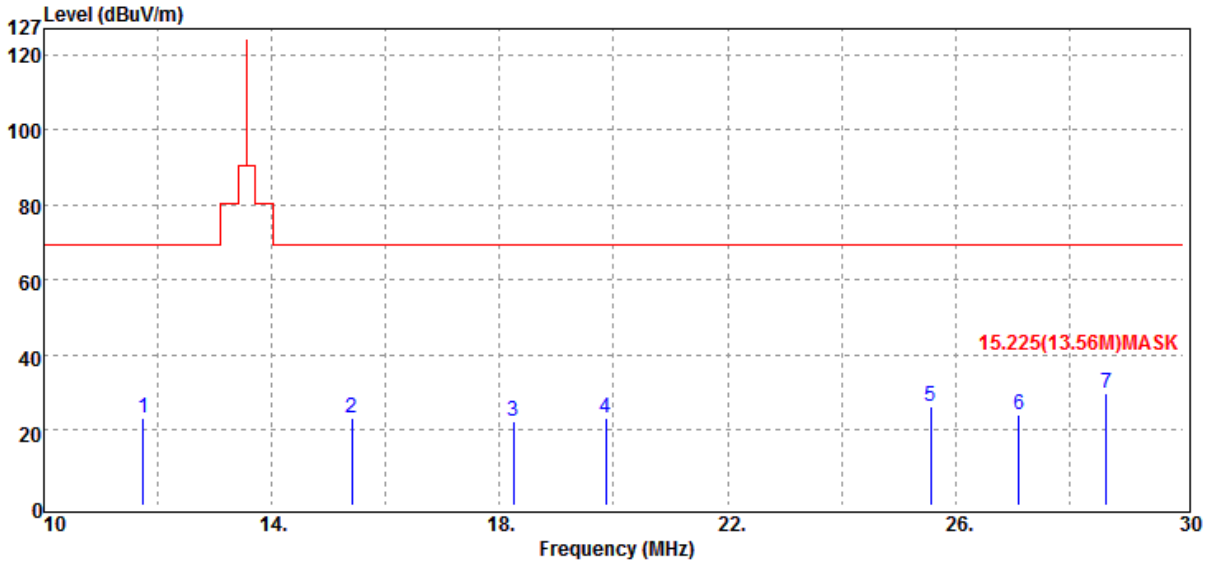
According to § RSS-210 A2.6

(d) 30 microvolts/m (29.4 dBμV/m) at 30 m, outside the band 13.110-14.010 MHz. Limit is converted by adding the distance extrapolation factor as the measurement distance was to place at 3m.

a) 20*log(30uV/m) + 40dB = 69.54 dBuV/m

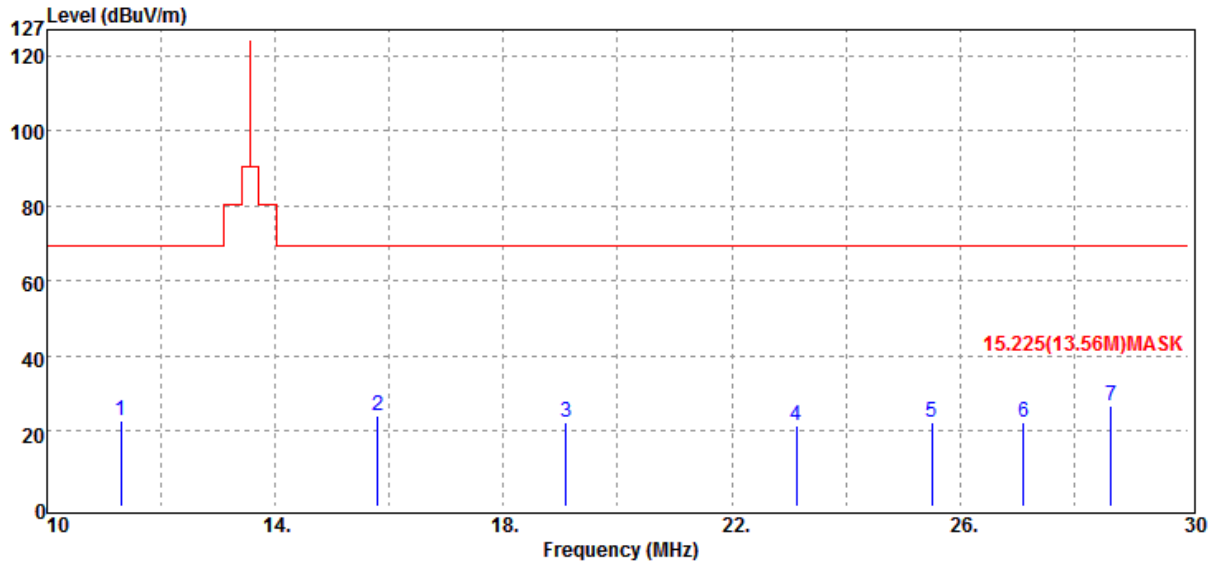
Radiated Emission Measurement Result

Operation Band	:RFID	Test Date	:2018-02-05
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:23.8 deg_C/59 RH
Operation Mode	:Tx	Engineer	:Kane
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



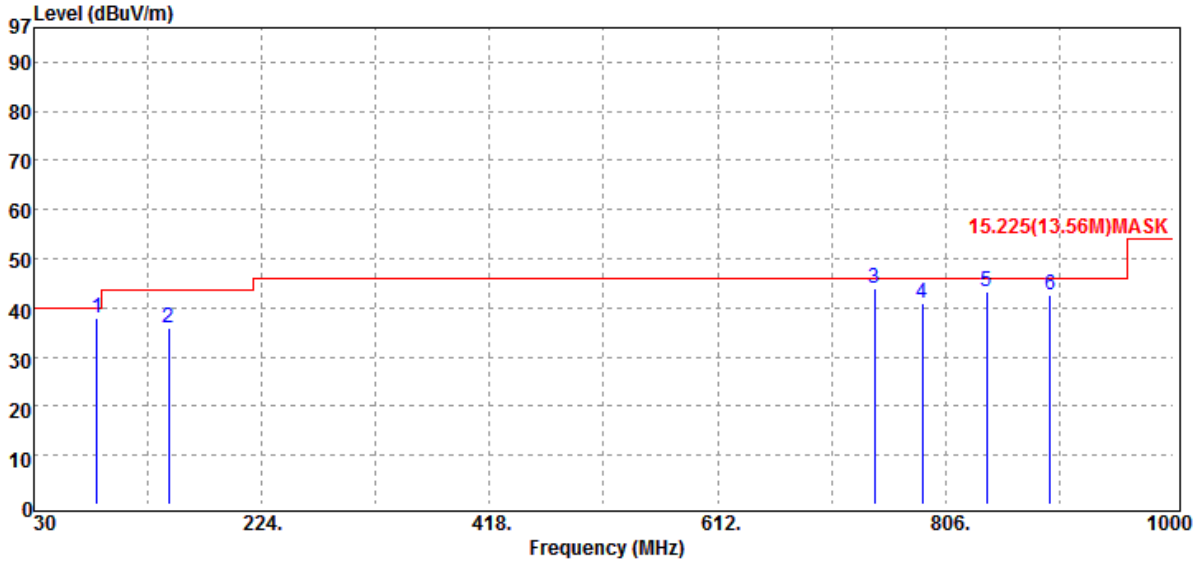
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
11.74	S	Peak	11.91	11.39	23.30	69.54	-46.24
15.40	S	Peak	12.01	11.47	23.48	69.54	-46.06
18.24	S	Peak	11.05	11.55	22.60	69.54	-46.94
19.86	S	Peak	11.52	11.58	23.10	69.54	-46.44
25.56	S	Peak	16.48	10.06	26.54	69.54	-43.00
27.12	H	Peak	14.34	9.70	24.04	69.54	-45.50
28.64	S	Peak	20.72	9.37	30.09	69.54	-39.45

Operation Band	:RFID	Test Date	:2018-02-05
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:23.8 deg_C/59 RH
Operation Mode	:Tx	Engineer	:Kane
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



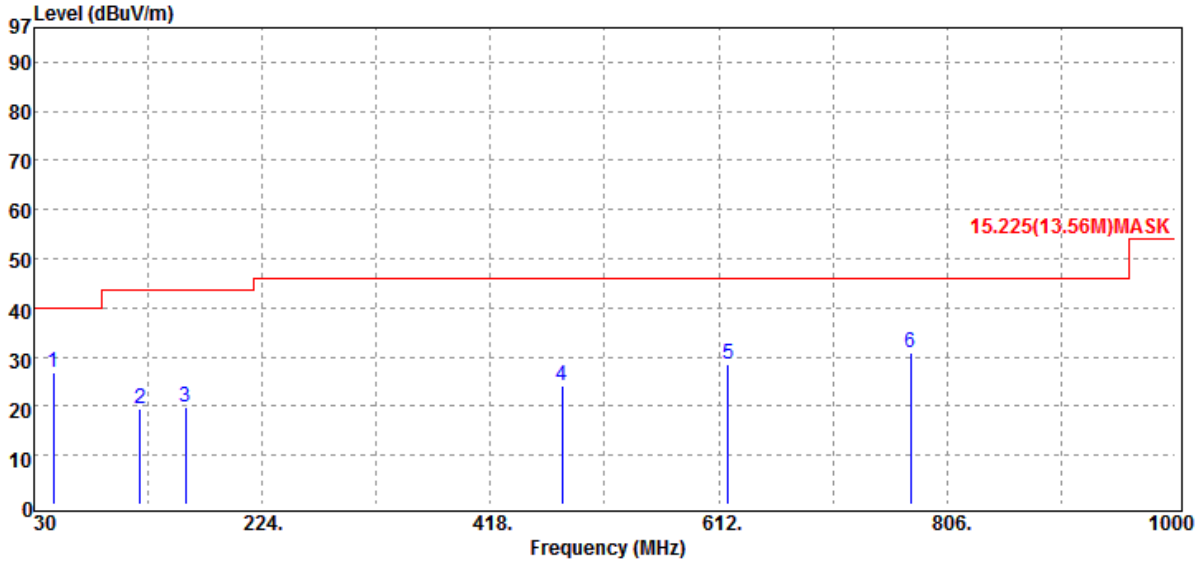
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
11.30	S	Peak	11.54	11.38	22.92	69.54	-46.62
15.80	S	Peak	12.79	11.49	24.28	69.54	-45.26
19.10	S	Peak	10.94	11.56	22.50	69.54	-47.04
23.14	S	Peak	10.93	10.66	21.59	69.54	-47.95
25.50	S	Peak	12.40	10.07	22.47	69.54	-47.07
27.12	H	Peak	12.77	9.70	22.47	69.54	-47.07
28.64	S	Peak	17.31	9.37	26.68	69.54	-42.86

Operation Band	:RFID	Test Date	:2018-02-05
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:23.8 deg_C/59 RH
Operation Mode	:Tx	Engineer	:Kane
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
83.35	S	Peak	50.28	-12.32	37.96	40.00	-2.04
144.46	S	Peak	43.30	-7.46	35.84	43.50	-7.66
745.86	H	Peak	41.49	2.45	43.94	46.00	-2.06
786.48	H	Peak	37.01	3.85	40.86	46.00	-5.14
840.72	H	Peak	38.18	4.98	43.16	46.00	-2.84
894.96	H	Peak	36.96	5.81	42.77	46.00	-3.23

Operation Band	:RFID	Test Date	:2018-02-05
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:23.8 deg_C/59 RH
Operation Mode	:Tx	Engineer	:Kane
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
46.49	S	Peak	34.77	-7.82	26.95	40.00	-13.05
120.21	S	Peak	29.11	-9.53	19.58	43.50	-23.92
159.01	S	Peak	26.80	-7.03	19.77	43.50	-23.73
479.11	S	Peak	26.29	-2.16	24.13	46.00	-21.87
619.76	S	Peak	28.13	0.28	28.41	46.00	-17.59
774.96	S	Peak	27.65	3.07	30.72	46.00	-15.28

8 FREQUENCY STABILITY

8.1 Standard Applicable

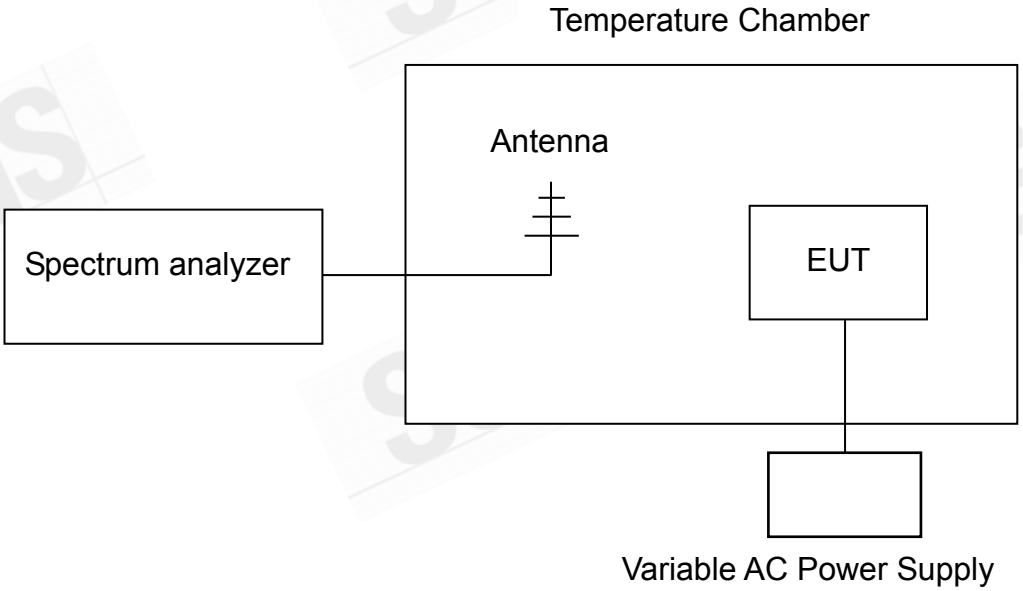
The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).
For licence-exempt radio apparatus, the frequency stability shall be measured at temperatures of -20°C (-4°F), +20°C (+68°F) and +50°C (+122°F).

8.2 Measurement Procedure

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
2. Set EUT as normal operation.
3. Turn the EUT on and couple its output to spectrum.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
6. Repeat step with the temperature chamber set to the lowest temperature.
7. Set spectrum Center Frequency = fundamental frequency, RBW, VBW= 10 kHz, Span =100 kHz, Detector =Max hold, Mark peak.

8.3 Test SET-UP



8.4 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/10/2017	05/09/2018
DC Power Supply	Agilent	E3640A	MY52410006	11/28/2017	11/27/2018
Loop Antenna	ETS-Lindgren	6502	148045	09/26/2017	09/25/2018

8.5 Measurement Results

Startup

A. Temperature Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (°C)	(MHz)		
7.26	-20	13.56038295	-382.95000	+/- 1.356
7.26	-10	13.56033294	-332.94000	+/- 1.356
7.26	0	13.56012864	-128.64000	+/- 1.356
7.26	10	13.56020392	-203.92000	+/- 1.356
7.26	20	13.56	0.00000	+/- 1.356
7.26	30	13.56028341	-283.41000	+/- 1.356
7.26	40	13.56043046	-430.46000	+/- 1.356
7.26	50	13.56012934	-129.34000	+/- 1.356

B. Supply Voltage Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (°C)	(MHz)		
8.35	20	13.56011538	-115.38000	+/- 1.356
7.26	20	13.56	0.00000	+/- 1.356
6.17	20	13.56017423	-174.23000	+/- 1.356

2 minutes

A. Temperature Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (℃)	(MHz)		
7.26	-20	13.56004213	77.00600	+/- 1.356
7.26	-10	13.56011883	0.30600	+/- 1.356
7.26	0	13.56012126	-2.12400	+/- 1.356
7.26	10	13.56025392	-134.78400	+/- 1.356
7.26	20	13.56011914	0.00000	+/- 1.356
7.26	30	13.56015459	-35.45400	+/- 1.356
7.26	40	13.56032751	-208.37400	+/- 1.356
7.26	50	13.56021817	-99.03400	+/- 1.356

B. Supply Voltage Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (℃)	(MHz)		
8.35	20	13.56023237	-113.23400	+/- 1.356
7.26	20	13.56011914	0.00000	+/- 1.356
6.17	20	13.56020947	-90.33400	+/- 1.356

5 minutes

A. Temperature Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (℃)	(MHz)		
7.26	-20	13.56011313	26.00600	+/- 1.356
7.26	-10	13.56017383	-34.69400	+/- 1.356
7.26	0	13.56015526	-16.12400	+/- 1.356
7.26	10	13.56014392	-4.78400	+/- 1.356
7.26	20	13.56013914	0.00000	+/- 1.356
7.26	30	13.56005459	84.54600	+/- 1.356
7.26	40	13.56052751	-388.37400	+/- 1.356
7.26	50	13.56061817	-479.03400	+/- 1.356

B. Supply Voltage Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (℃)	(MHz)		
8.35	20	13.56000947	129.66600	+/- 1.356
7.26	20	13.56013914	0.00000	+/- 1.356
6.17	20	13.56010832	30.81600	+/- 1.356

10 minutes

A. Temperature Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (℃)	(MHz)		
7.26	-20	13.56003258	90.37000	+/- 1.356
7.26	-10	13.56011824	4.71000	+/- 1.356
7.26	0	13.56012934	-6.39000	+/- 1.356
7.26	10	13.56011923	3.72000	+/- 1.356
7.26	20	13.56012295	0.00000	+/- 1.356
7.26	30	13.56012325	-0.30000	+/- 1.356
7.26	40	13.5602946	-171.65000	+/- 1.356
7.26	50	13.56062794	-504.99000	+/- 1.356

B. Supply Voltage Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (℃)	(MHz)		
8.35	20	13.56003205	90.90000	+/- 1.356
7.26	20	13.56012295	0.00000	+/- 1.356
6.17	20	13.5600846	38.35000	+/- 1.356

9 99% & 20 DB OCCUPIED BANDWIDTH MEASUREMENT

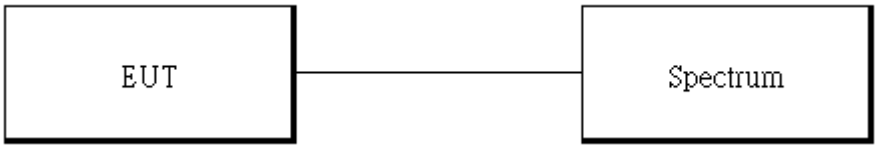
9.1 Standard Applicable:

The 20 dB bandwidth shall be specified in operating frequency band.

9.2 Limit:

None

9.3 Test Set-up



9.4 Measurement Procedure

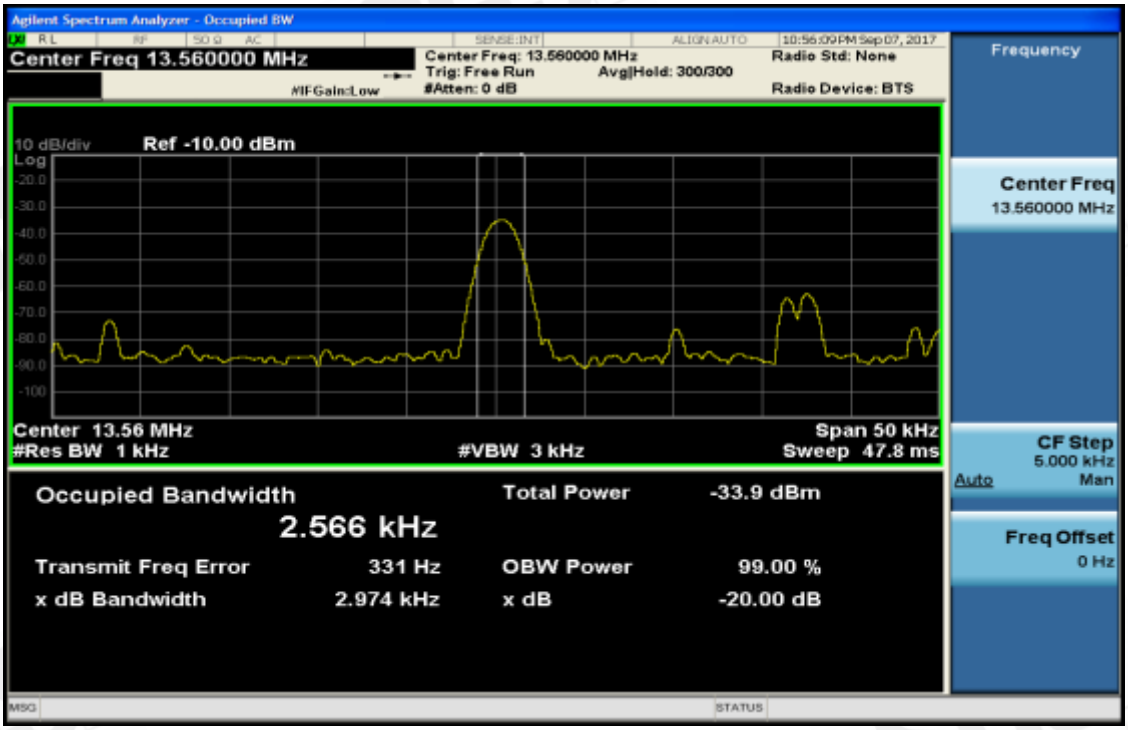
1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak mode.
2. 20dB Bandwidth the resolution bandwidth of 1 kHz and the video bandwidth of 3 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.

9.5 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/10/2017	05/09/2018
DC Power Supply	Agilent	E3640A	MY52410006	11/28/2017	11/27/2018
Loop Antenna	ETS-Lindgren	6502	148045	09/26/2017	09/25/2018

9.6 Measurement Result

99% & 20dB Bandwidth



10 ANTENNA REQUIREMENT

10.1. Standard Applicable

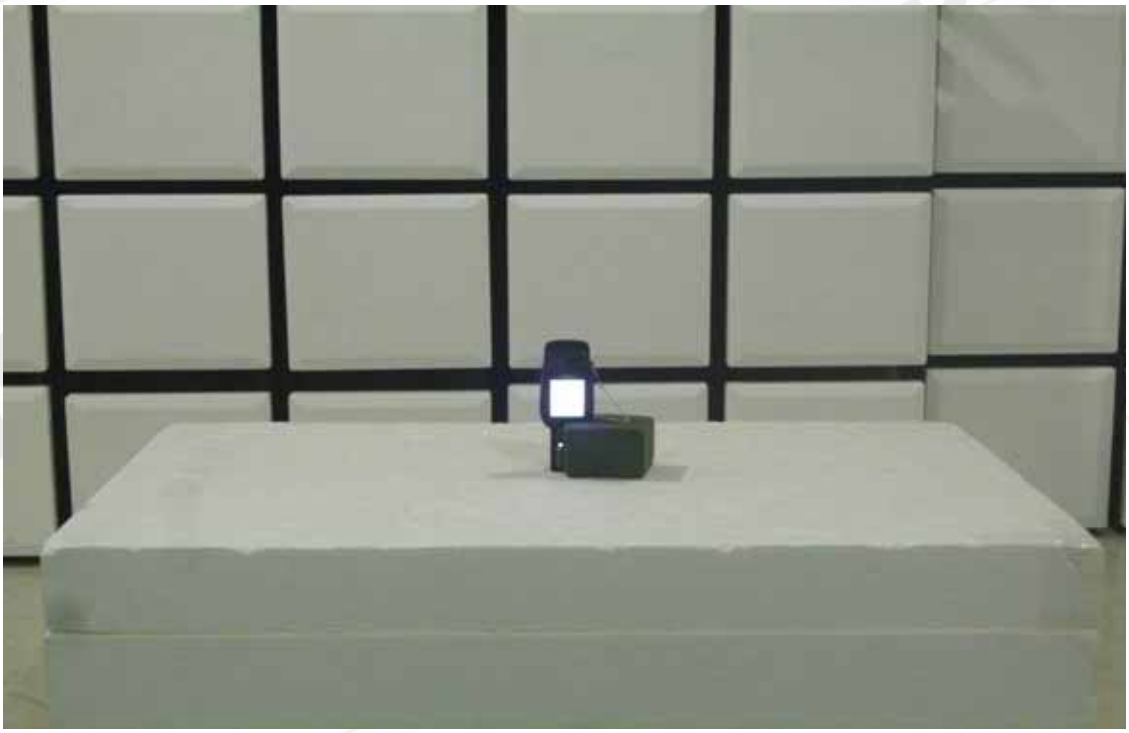
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

10.2. Antenna Connected Construction

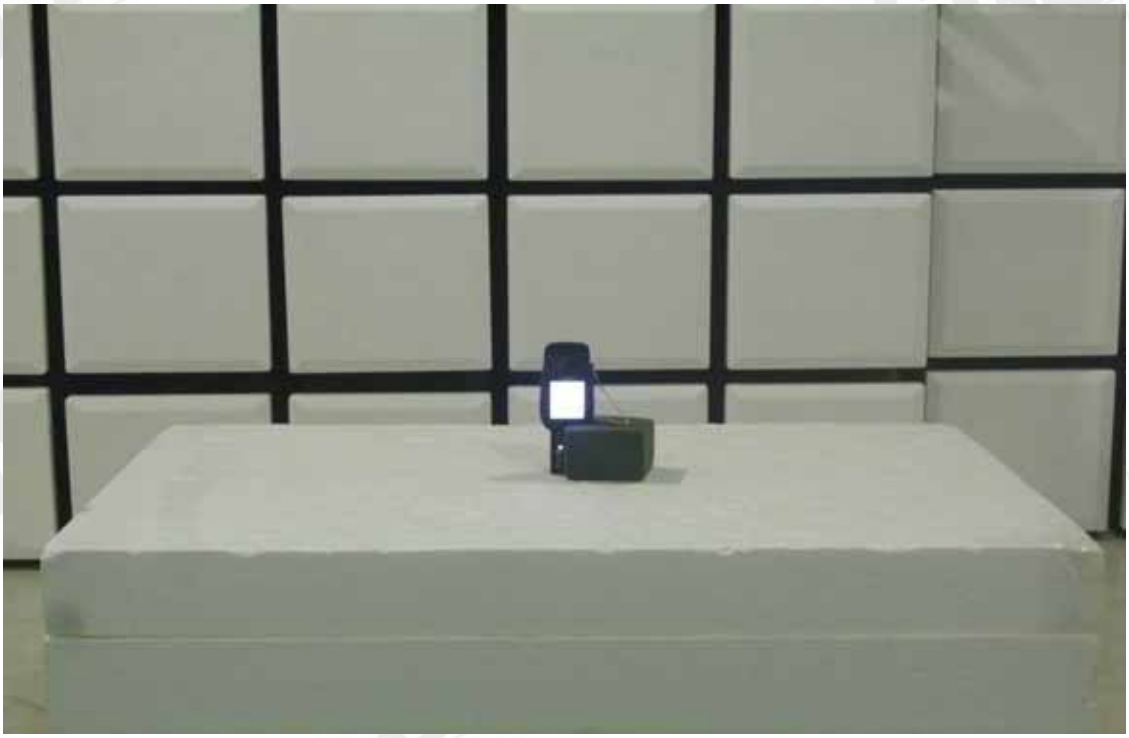
The antenna connector is designed as permanently attached and no consideration of replacement. Please see EUT photo and antenna spec. for details.

PHOTOGRAPHS OF SET UP

Radiated Emission Setup Photos (Below 30MHz)



Radiated Emission Setup Photos (Below 1GHz)



Conduction Setup Photo (Measurement at AC Power Line)

PHOTOGRAPHS OF EUT

Please refer to the attached file(EUT Photo)

~ End of Report ~