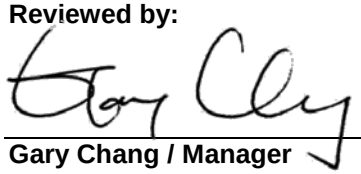
FCC Test Report

Equipment	:	**RF_CC2541 MODULE EXT**
Brand Name	:	**DIGI**
Model No.	:	**TRK-RF-06**
FCC ID	:	**SUFTRKRF06**
Standard	:	**47 CFR FCC Part 15.247**
Operating Band	:	**2400 MHz – 2483.5 MHz**
FCC Classification	:	**DTS**
Applicant **Manufacturer**	:	**Teraoka Weigh System Pte Ltd** **4 Leng Kee Rd, #05-03/04/05&11, SIS Building, Singapore 159088**

The product sample received on Sep. 27, 2013 and completely tested on Oct. 18, 2013. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



Gary Chang / Manager

Testing Laboratory
1190

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Summary of Test Result

Conformance Test Specifications					
Report Clause	**Ref. Std. Clause**	**Description**	**Measured**	**Limit**	**Result**
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	[dBuV]:14.440MHz 28.86 (Margin 21.14dB) - AV 33.16 (Margin 26.84dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	6dB Bandwidth	GFSK:1260.87 kHz	≥500kHz	Complied
3.3	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm] GFSK:14.88	Power [dBm] LE:30	Complied
3.4	15.247(e)	Power Spectral Density	PSD [dBm/3kHz] GFSK: -1.38	PSD [dBm/3kHz]: 8	Complied
3.5	15.247(d)	Emissions in non-restricted frequency bands	Out-of -band emissions are 20dB below the highest power	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied
3.6	15.247(d)	Transmitter Radiated Unwanted Emissions	Restricted Bands [dBuV/m at 3m]:7320.00MHz 52.82 (Margin 1.18dB) –AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied

Revision History

Report No.	Version	Description	Issued Date
FR393006	Rev. 01	Initial issue of report	Oct. 30, 2013

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information					
Frequency Range (MHz)	**Modulation**	**Ch. Frequency (MHz)**	**Channel Number**	**RF Output Power (dBm)**	**Co-location**
2400-2483.5	GFSK	2402-2480	0-78	14.88	N/A
Note 1: RF output power specifies that Maximum Peak Conducted Output Power. Note 2: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)					

1.1.2 Antenna Information

Antenna Category	
☒	Integral antenna (antenna permanently attached)
	☐ Temporary RF connector provided
	☒ No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
☐	External antenna (dedicated antennas)
	☐ RF connector provided
	☐ Unique antenna connector. (e.g., MMCX, U.FL, IPX, and RP-SMA, RP-N type…)
	☐ Standard antenna connector. (e.g., SMA, N, BNC, and TNC type…)

Antenna General Information				
No.	**Ant. Cat.**	**Ant. Type**	**Gain (dBi)**	**Connector**
1	Integral	PCB	3.3	N/A

1.1.3 Type of EUT

Identify EUT	
EUT Serial Number	N/A
Presentation of Equipment	☐ Production ; ☒ Pre-Production ; ☐ Prototype
Type of EUT	
☐	Stand-alone
☐	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.: …
☒	Plug-in radio
☐	Other:

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
☒ Operated normally mode for worst duty cycle	
☒ Operated test mode for worst duty cycle	
Test Signal Duty Cycle (x)	**Power Duty Factor [dB] – (10 log 1/x)**
☒ 100.00% - test mode single channel	0.00

1.1.5 EUT Operational Condition

Supply Voltage	☐ AC mains	☒ DC (3Vdc)	
Type of DC Source	☐ Internal DC supply	☐ External DC adapter	☒ From Host

1.2 Accessories and Support Equipment

Accessories				
No.	**Equipment**	**Brand Name**	**Model Name**	**Spec.**
1	---	---	---	---

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**Spec.**
1	DC Power Supply	Gwinstek	GPC-6030D	---

1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2009
- FCC KDB 558074 v03r01

1.4 Testing Location Information

Testing Location					
☒	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-318-0055			
Test Condition		**Test Site No.**	**Test Engineer**	**Test Environment**	**Test Date**
RF Conducted		TH01-HY	Aaron Liang	23°C / 62%	Oct. 16, 2013
AC Conduction		CO04-HY	Skys Huang	23°C / 53%	Oct. 18, 2013
Radiated Emission		03CH08-HY	Mark Liao	24°C / 63%	Sep. 29, 2013
Test site registered number [636805] with FCC Test site registered number [4086B-2] with IC					

1.5 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			
Test Item		**Uncertainty**	**Limit**
AC power-line conducted emissions		±2.26 dB	N/A
Emission bandwidth, 6dB bandwidth		±1.42 %	N/A
RF output power, conducted		±0.63 dB	N/A
Power density, conducted		±0.81 dB	N/A
Unwanted emissions, conducted	30 – 1000 MHz	±0.51 dB	N/A
	1 – 18 GHz	±0.67 dB	N/A
	18 – 40 GHz	±0.83 dB	N/A
	40 – 200 GHz	N/A	N/A
All emissions, radiated	30 – 1000 MHz	±2.56 dB	N/A
	1 – 18 GHz	±3.59 dB	N/A
	18 – 40 GHz	±3.82 dB	N/A
	40 – 200 GHz	N/A	N/A
Temperature		±0.8 °C	N/A
Humidity		±3 %	N/A
DC and low frequency voltages		±3 %	N/A
Time		±1.42 %	N/A
Duty Cycle		±1.42 %	N/A

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing			
Modulation Mode	**Transmit Chains (N_{TX})**	**Data Rate**	**RF Output Power (dBm)**
GFSK-2Mbps	1	2 Mbps	**14.88**
Note 1: Modulation modes consist below configuration: GFSK (2Mbps) Note 2: RF output power specifies that Maximum Peak Conducted Output Power.			

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration	
Test Mode	**Test Channel Frequencies (MHz)**
GFSK	2402-(F1), 2440-(F2), 2480-(F3)

2.3 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter			
Test Software Version	SmartRF Studio 7		
Modulation Mode	**2402 MHz**	**2440 MHz**	**2480 MHz**
GFSK, 2Mbps	C1	B1	B1

2.4 The Worst Case Measurement Configuration

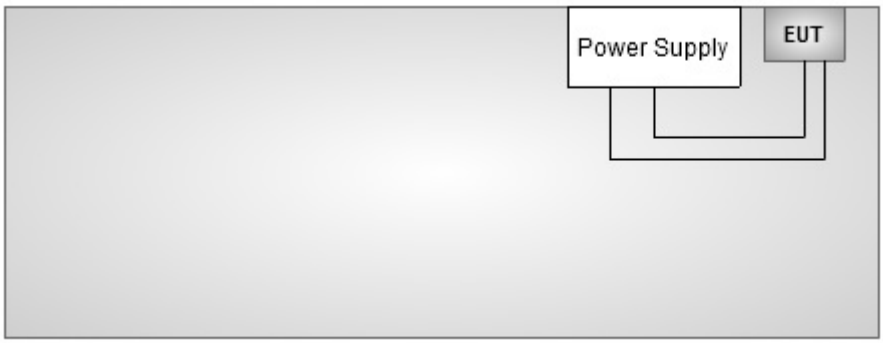
The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	Normal Mode

The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power, Power Spectral Density, 6 dB Bandwidth
Test Condition	Conducted measurement at transmit chains
Modulation Mode	GFSK-2Mbps

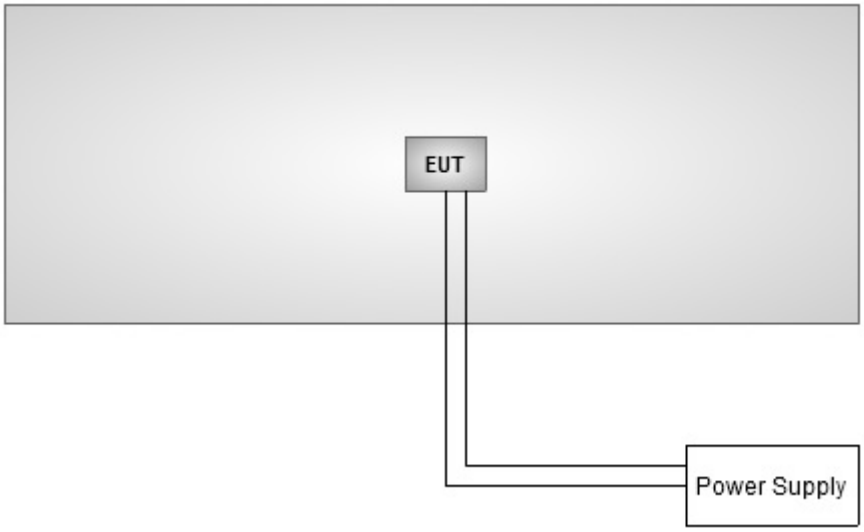
The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge Emissions		
Test Condition	Radiated measurement		
User Position	☐ EUT will be placed in fixed position.		
	☐ EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two orthogonal planes. The worst planes is X.		
	☒ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed two or three orthogonal planes. The worst plane is Z.		
Pretesting Mode	☒ 1. Radio Link		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			

2.5 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



Test Setup Diagram - Radiated Test



3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line 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 Measuring Instruments

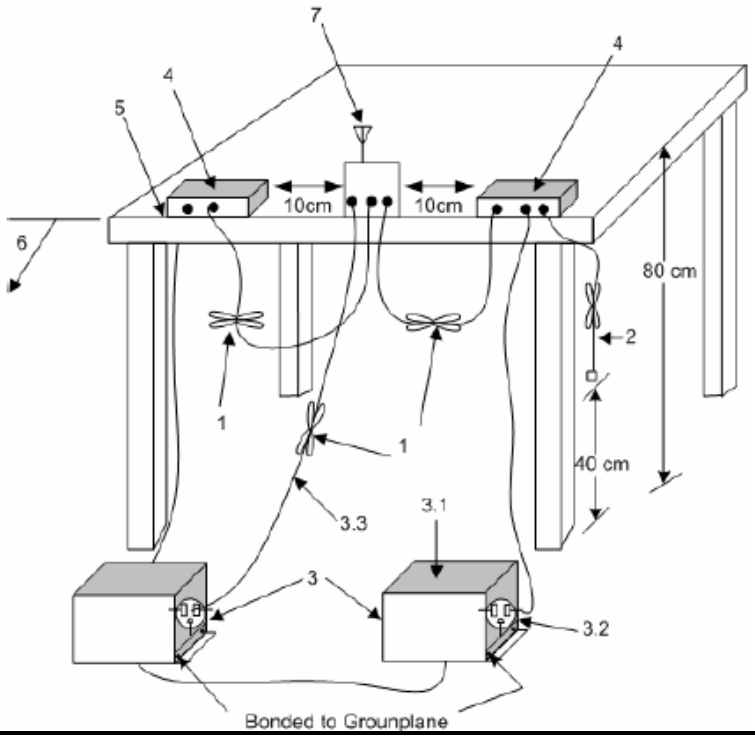
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

Test Method
☒ Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

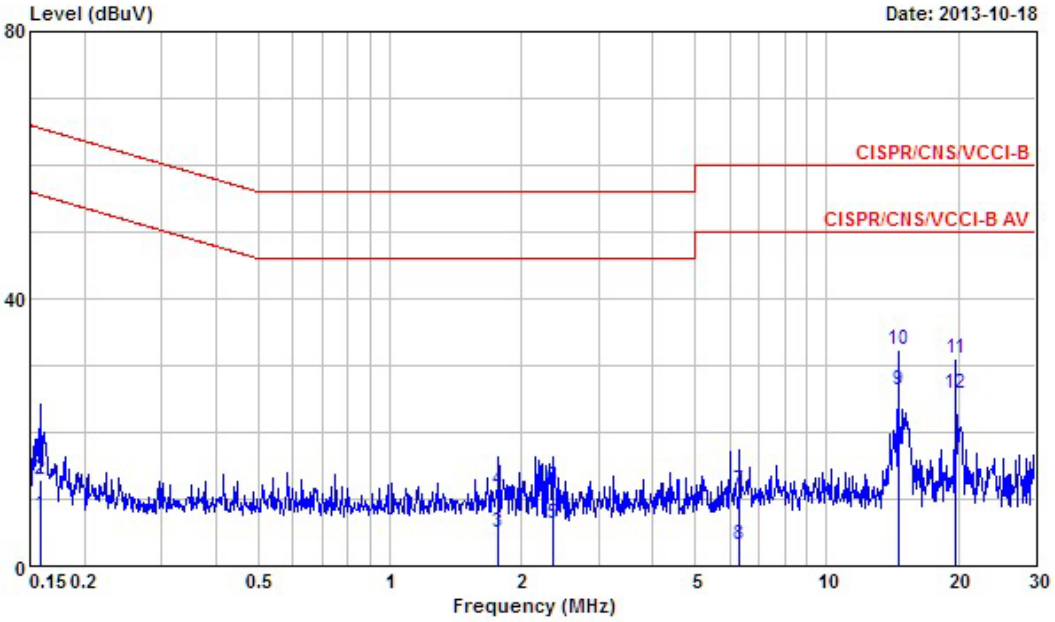
3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

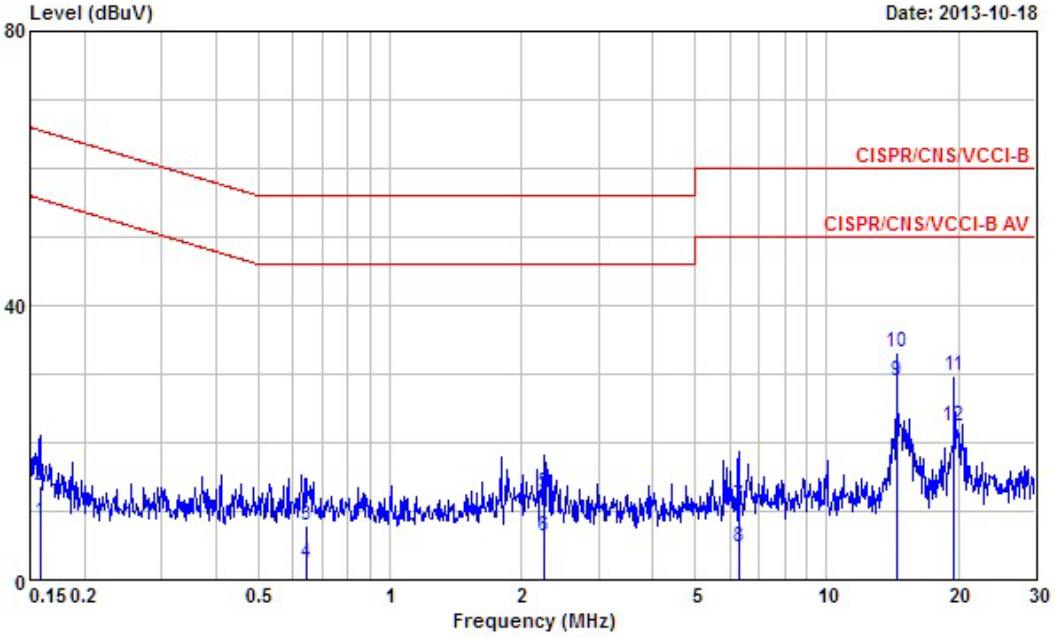
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	Normal Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1590020	7.54	-47.98	55.52	7.43	0.11	0.00	Average
2	0.1590020	13.01	-52.51	65.52	12.90	0.11	0.00	QP
3	1.770	5.13	-40.87	46.00	5.00	0.13	0.00	Average
4	1.770	11.27	-44.73	56.00	11.14	0.13	0.00	QP
5	2.370	6.32	-39.68	46.00	6.19	0.13	0.00	Average
6	2.370	11.83	-44.17	56.00	11.70	0.13	0.00	QP
7	6.320	11.35	-48.65	60.00	11.16	0.19	0.00	QP
8	6.320	3.21	-46.79	50.00	3.02	0.19	0.00	Average
9	14.590	26.32	-23.68	50.00	26.04	0.28	0.00	Average
10	14.590	32.46	-27.54	60.00	32.18	0.28	0.00	QP
11	19.740	31.08	-28.92	60.00	30.77	0.31	0.00	QP
12	19.740	25.88	-24.12	50.00	25.57	0.31	0.00	Average

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Line
Operating Function	Normal Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1590020	8.47	-47.05	55.52	8.23	0.24	0.00	Average
2	0.1590020	13.63	-51.89	65.52	13.39	0.24	0.00	QP
3	0.6439830	7.83	-48.17	56.00	7.60	0.23	0.00	QP
4	0.6439830	2.39	-43.61	46.00	2.16	0.23	0.00	Average
5	2.260	12.59	-43.41	56.00	12.33	0.26	0.00	QP
6	2.260	6.31	-39.69	46.00	6.05	0.26	0.00	Average
7	6.290	10.87	-49.13	60.00	10.52	0.35	0.00	QP
8	6.290	4.65	-45.35	50.00	4.30	0.35	0.00	Average
9 @	14.440	28.86	-21.14	50.00	28.37	0.49	0.00	Average
10	14.440	33.16	-26.84	60.00	32.67	0.49	0.00	QP
11	19.530	29.67	-30.33	60.00	29.11	0.56	0.00	QP
12	19.530	22.31	-27.69	50.00	21.75	0.56	0.00	Average

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

3.2 6dB Bandwidth

3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit
Systems using digital modulation techniques:
☒ 6 dB bandwidth ≥ 500 kHz.

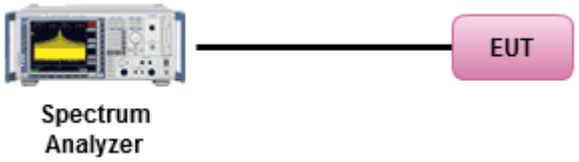
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method	
☒	For the emission bandwidth shall be measured using one of the options below:
	☒ Refer as FCC KDB 558074 v03r01, clause 8.1 Option 1 for 6 dB bandwidth measurement.
	☐ Refer as FCC KDB 558074 v03r01, clause 8.2 Option 2 for 6 dB bandwidth measurement.
	☐ Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
☒	For conducted measurement.
	☒ The EUT supports single transmit chain and measurements performed on this transmit chain.
	☐ The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.2.4 Test Setup

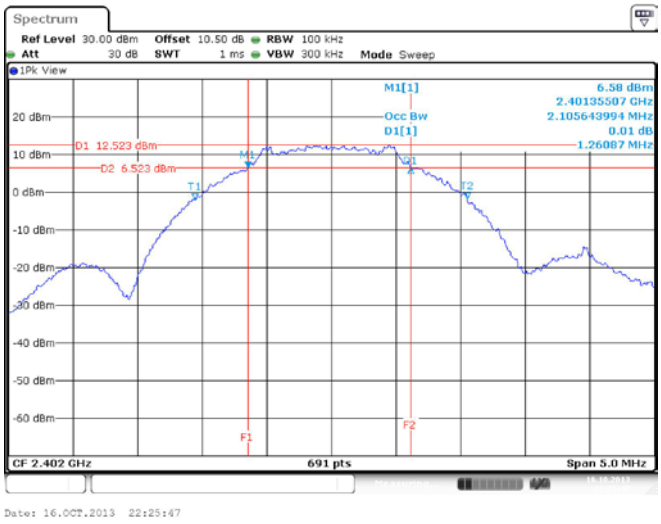
Emission Bandwidth


3.2.5 Test Result of Emission Bandwidth

Emission Bandwidth Result			
Modulation Mode	**Freq. (MHz)**	**99% Bandwidth (kHz)**	**6dB Bandwidth (kHz)**
GFSK-2Mbps	2402	2112.87	1260.87
GFSK-2Mbps	2440	2091.17	1297.10
GFSK-2Mbps	2480	2083.93	1347.83
Limit		**N/A**	**≥500 kHz**
Result		**Complied**	

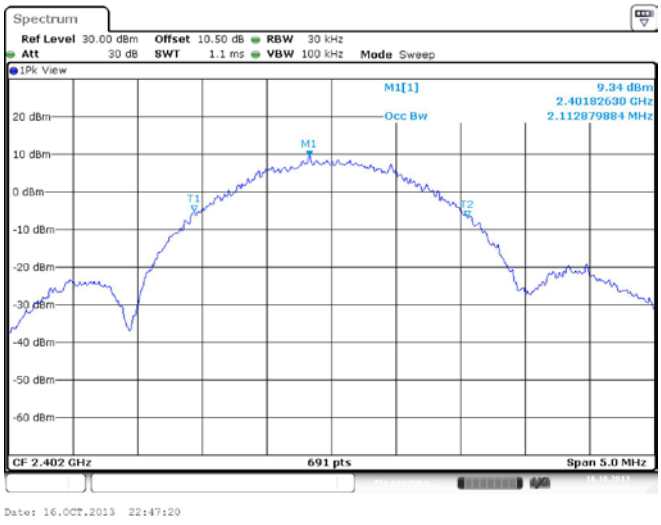
Worst 6dB Bandwidth Plots

GFSK-2Mbps



Worst 99% Bandwidth Plots

GFSK-2Mbps



3.3 RF Output Power

3.3.1 RF Output Power Limit

RF Output Power Limit for Digital Modulation Systems	
Maximum Peak Conducted Output Power or Maximum Conducted Output Power Limit	
☒	2400-2483.5 MHz Band:
☒	If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)
☐	Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)$ dBm
e.i.r.p. Power Limit:	
☒	2400-2483.5 MHz Band
☒	Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)
P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, **G_{TX}** = the maximum transmitting antenna directional gain in dBi. **P_{eirp}** = e.i.r.p. Power in dBm.	

3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

Test Method	
☒	Maximum Peak Conducted Output Power
	☐ Refer as FCC KDB 558074 v03r01, clause 9.1.1 Option 1 (RBW ≥ EBW method).
	☐ Refer as FCC KDB 558074 v03r01, clause 9.1.2 Option 2 (integrated band power method).
	☒ Refer as FCC KDB 558074 v03r01, clause 9.1.3 Option 2 (peak power meter for VBW ≥ DTS BW)
☒	Maximum Conducted Output Power (For reference only)
	[duty cycle ≥ 98% or external video / power trigger]
	☐ Refer as FCC KDB 558074 v03r01, clause 9.2.2.2 Method AVGSA-1 (spectral trace averaging).
	☐ Refer as FCC KDB 558074 v03r01, clause 9.2.2.3 Method AVGSA-1 Alt. (slow sweep speed)
	☐ Refer as FCC KDB 558074 v03r01, clause 9.2.2.4 Method AVGSA-2 (spectral trace averaging).
	☐ Refer as FCC KDB 558074 v03r01, clause 9.2.2.5 Method AVGSA-2 Alt. (slow sweep speed)
	RF power meter and average over on/off periods with duty factor or gated trigger
	☒ Refer as FCC KDB 558074 v03r01, clause 9.2.3 Method AVGPM (using an RF average power meter).
☒	For conducted measurement.
	☒ The EUT supports single transmit chain and measurements performed on this transmit chain.
	☐ The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
	☐ The EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
	☒ If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \ldots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$

3.3.4 Test Setup

RF Output Power (Peak Power Meter)


3.3.5 Test Result of Maximum Peak Conducted Output Power

Maximum Peak Conducted Output Power Result						
Condition		RF Output Power (dBm)				
Modulation Mode	Freq. (MHz)	RF Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
GFSK-2Mbps	2402	14.88	30	3.30	18.18	36
GFSK-2Mbps	2440	11.74	30	3.30	15.04	36
GFSK-2Mbps	2480	10.52	30	3.30	13.82	36
Result		Complied				

Maximum Average Conducted Output Power Result						
Condition		RF Output Power (dBm)				
Modulation Mode	Freq. (MHz)	RF Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
GFSK-2Mbps	2402	14.52	Na	3.30	17.82	Na
GFSK-2Mbps	2440	11.22	Na	3.30	14.52	Na
GFSK-2Mbps	2480	10.01	Na	3.30	13.31	Na
Result		Complied				

Note: Average power is for reference only.

3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

Power Spectral Density Limit
☒ Power Spectral Density (PSD) ≤ 8 dBm/3kHz

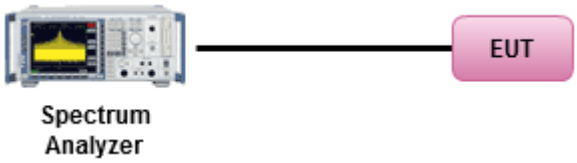
3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method		
☒	Power spectral density procedures that the same method as used to determine the conducted output power shall be used to determine the power spectral density. In addition, the use of a peak PSD procedure will always result in a “worst-case” measured level for comparison to the limit. Therefore, whenever the DTS bandwidth exceeds 500 kHz, it is acceptable to utilize the peak PSD procedure to demonstrate compliance to the PSD limit, regardless of how the fundamental output power was measured. For the power spectral density shall be measured using below options:	
	☒	Refer as FCC KDB 558074 v03r01, clause 10.2 Method PKPSD (RBW=3kHz;detector=peak).
	☐	Refer as FCC KDB 558074 v03r01, clause 10.3 Method AVGPSD-1 (spectral trace averaging).
	☐	Refer as FCC KDB 558074 v03r01, clause 10.4 Method AVGPSD-1 Alt. (slow sweep speed)
	☐	Refer as FCC KDB 558074 v03r01, clause 10.5 Method AVGPSD-2 (spectral trace averaging).
	☐	Refer as FCC KDB 558074 v03r01, clause 10.6 Method AVGPSD-2 Alt. (slow sweep speed)
☒	Conducted measurement.	
	☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
	☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

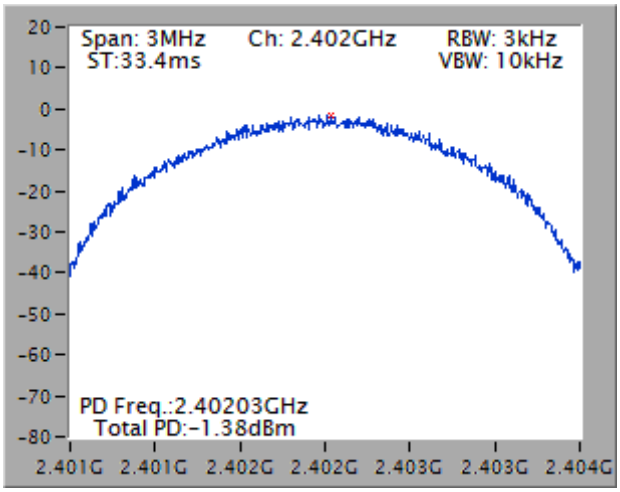
3.4.4 Test Setup

Power Spectral Density


3.4.5 Test Result of Power Spectral Density

Power Spectral Density Result (dBm/3kHz)			
Modulation Mode	**Freq. (MHz)**	**PSD**	**PSD Limit**
GFSK-2Mbps	2402	-1.38	8
GFSK-2Mbps	2440	-3.11	8
GFSK-2Mbps	2480	-5.55	8
Result		**Complied**	

Worst Power Spectral Density Plots
GFSK-2Mbps



3.5 Emissions in non-restricted frequency bands

3.5.1 Emissions in non-restricted frequency bands limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz

3.5.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Reference level measurement

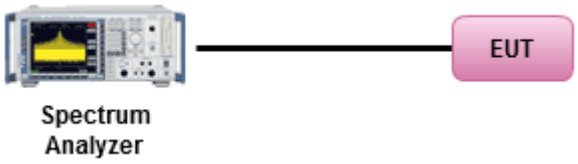
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

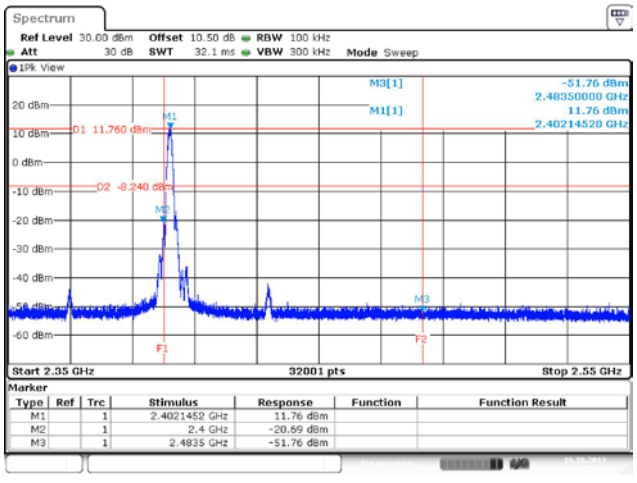
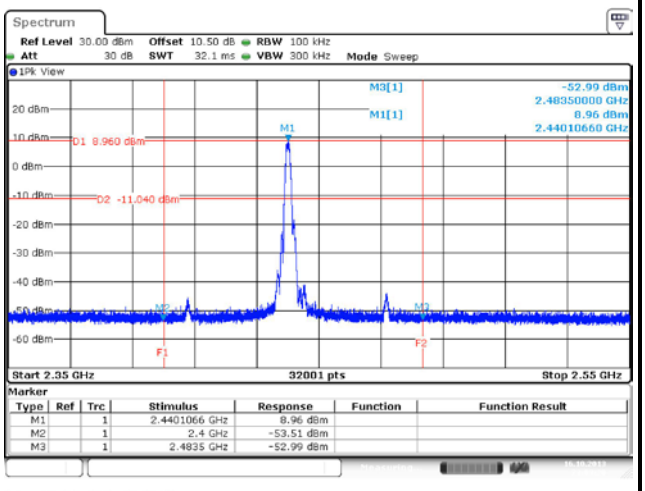
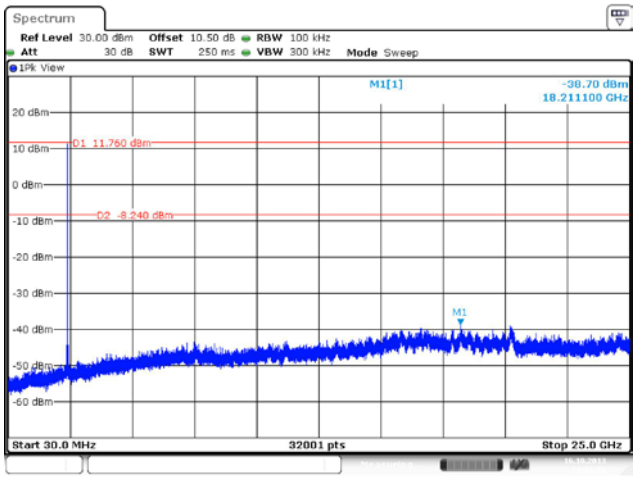
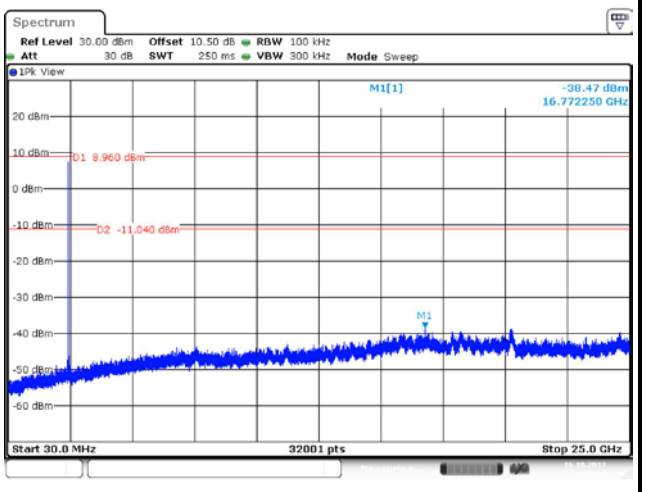
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

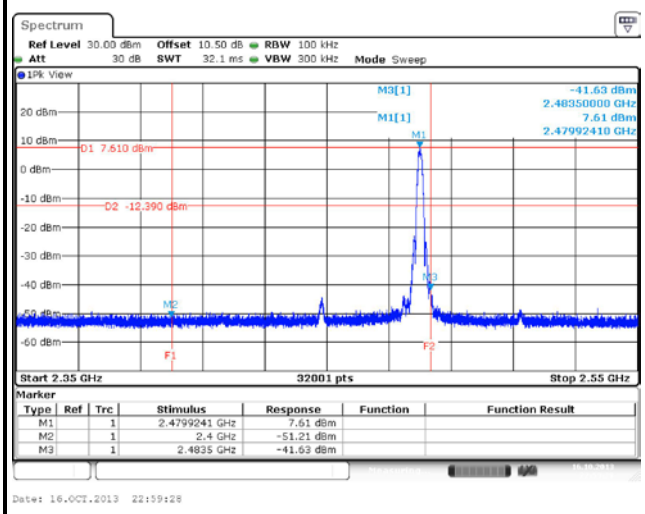
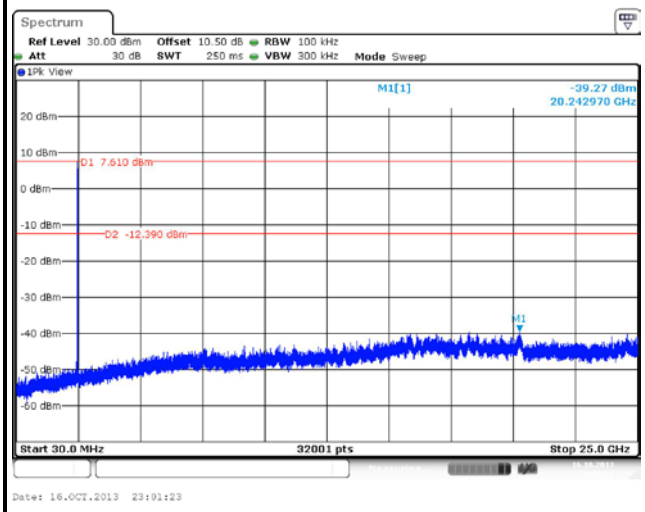
3.5.4 Test Setup

Transmitter Radiated Bandedge Emissions



3.5.5 Test Result of Emissions in non-restricted frequency bands

Tx 2402MHz / 30MHz~25GHz (down 20dBc)	Tx 2440MHz / 30MHz~25GHz (down 20dBc)
	
	

Tx 2480MHz / 30MHz~25GHz (down 20dBc)	
	--
	--

3.6 Transmitter Radiated Unwanted Emissions

3.6.1 Transmitter Radiated Unwanted Emissions Limit

Restricted Band Emissions Limit			
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: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Un-restricted Band Emissions Limit	
RF output power procedure	**Limit (dB)**
Peak output power procedure	20
Average output power procedure	30

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

3.6.2 Measuring Instruments

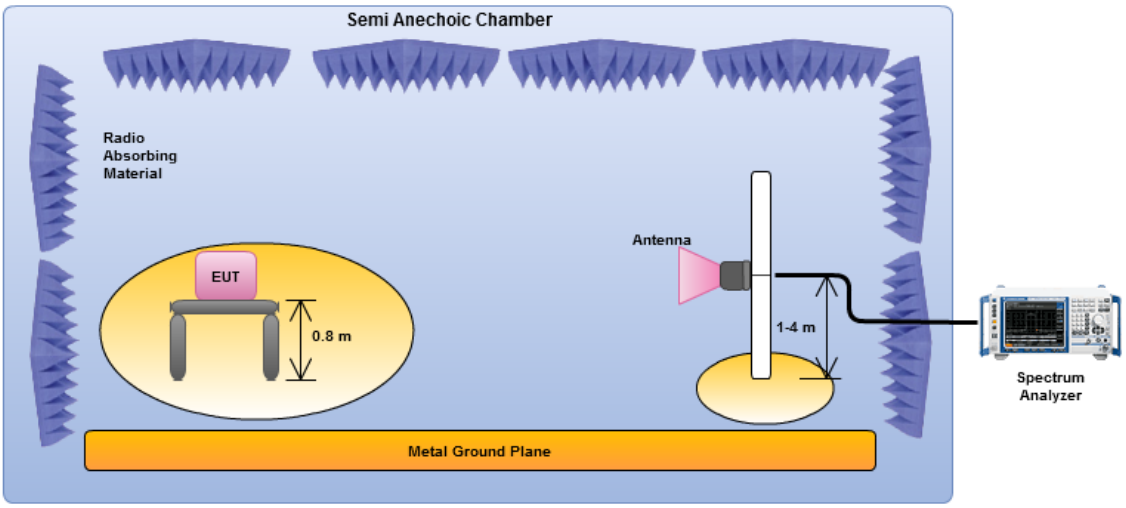
Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

Test Method – General Information			
☒	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).		
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	For unwanted emissions into non-restricted bands. Peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.	
	☒	For unwanted emissions into restricted bands.	
		☒	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
		☐	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
		☒	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
☒	For radiated measurement.		
	☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz.	
	☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.	
	☒	Refer as ANSI C63.10, clause 6.6 for radiated emissions from above 1 GHz.	

3.6.4 Test Setup

Transmitter Radiated Unwanted Emissions



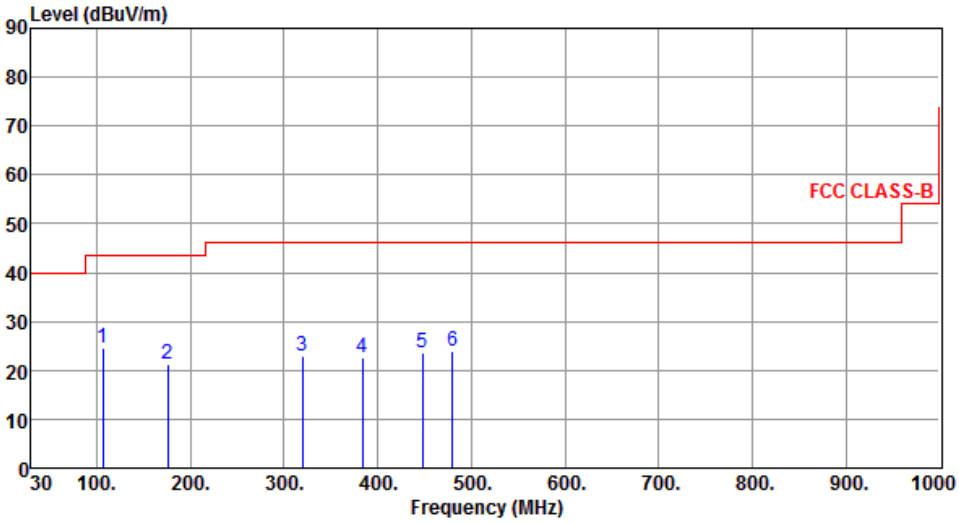
Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna and the frequency range of 1 GHz to 40 GHz using a calibrated horn antenna.

3.6.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.6.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

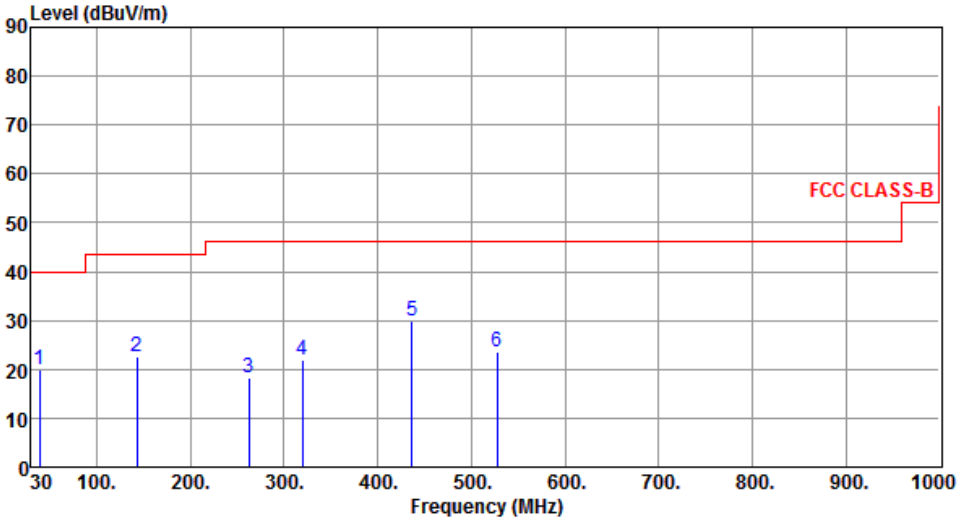
Radiated Emissions (Below 1GHz)			
Operating Mode	1	**Polarization**	H
Operating Function	Radio Link		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	106.63	24.67	43.50	-18.83	45.21	-20.54	Peak	100	0
2	175.50	21.23	43.50	-22.27	39.05	-17.82	Peak	100	0
3	320.03	22.88	46.00	-23.12	38.59	-15.71	Peak	100	0
4	384.05	22.61	46.00	-23.39	36.67	-14.06	Peak	100	0
5	448.07	23.50	46.00	-22.50	35.98	-12.48	Peak	100	0
6	480.08	23.82	46.00	-22.18	35.80	-11.98	Peak	100	0

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Radiated Emissions (Below 1GHz)			
Operating Mode	1	**Polarization**	V
Operating Function	Radio link		

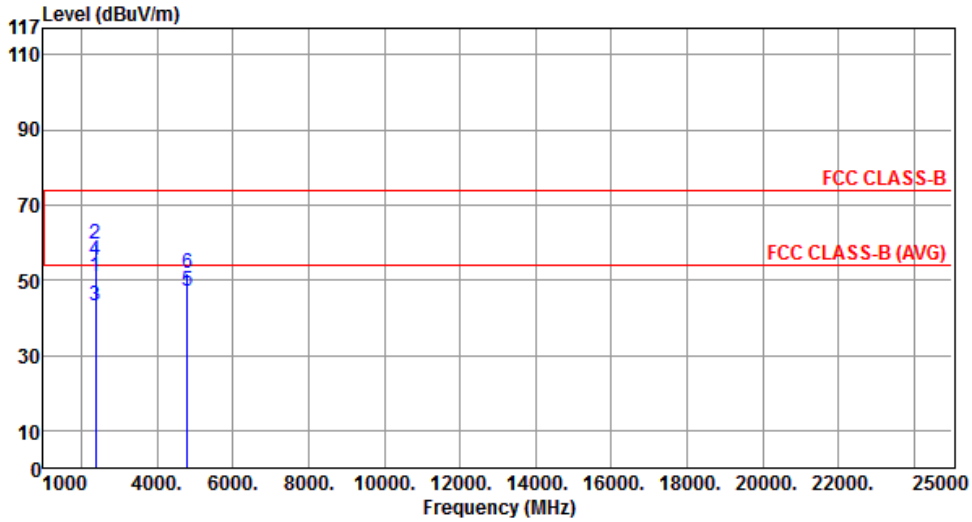


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	38.73	19.91	40.00	-20.09	36.99	-17.08	Peak	200	0
2	142.52	22.44	43.50	-21.06	39.57	-17.13	Peak	200	0
3	262.80	18.25	46.00	-27.75	35.68	-17.43	Peak	200	0
4	320.03	21.89	46.00	-24.11	37.60	-15.71	Peak	200	0
5	436.43	30.02	46.00	-15.98	42.79	-12.77	Peak	200	0
6	527.61	23.51	46.00	-22.49	34.60	-11.09	Peak	200	0

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

3.6.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

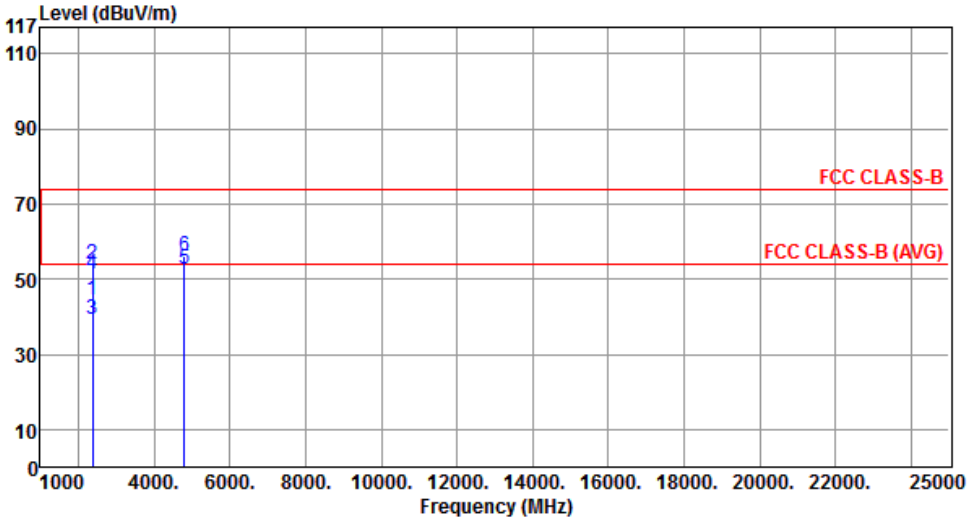
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	GFSK-2Mbps	**Test Freq. (FX)**	F1
Operating Mode	1	**Polarization**	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2369.80	50.79	54.00	-3.21	54.08	-3.29	Average	---	---
2	2369.80	59.58	74.00	-14.42	62.87	-3.29	Peak	---	---
3	2390.00	43.08	54.00	-10.92	46.30	-3.22	Average	---	---
4	2390.00	55.05	74.00	-18.95	58.27	-3.22	Peak	---	---
5	4804.00	47.24	54.00	-6.76	42.96	4.28	Average	---	---
6	4804.00	51.69	74.00	-22.31	47.41	4.28	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: Average emission setting: RBW=1MHz; VBW ≥ 1/T, where T is "Pulse On Time", e.g., LE VBW≥1/625us, VBW=3kHz.

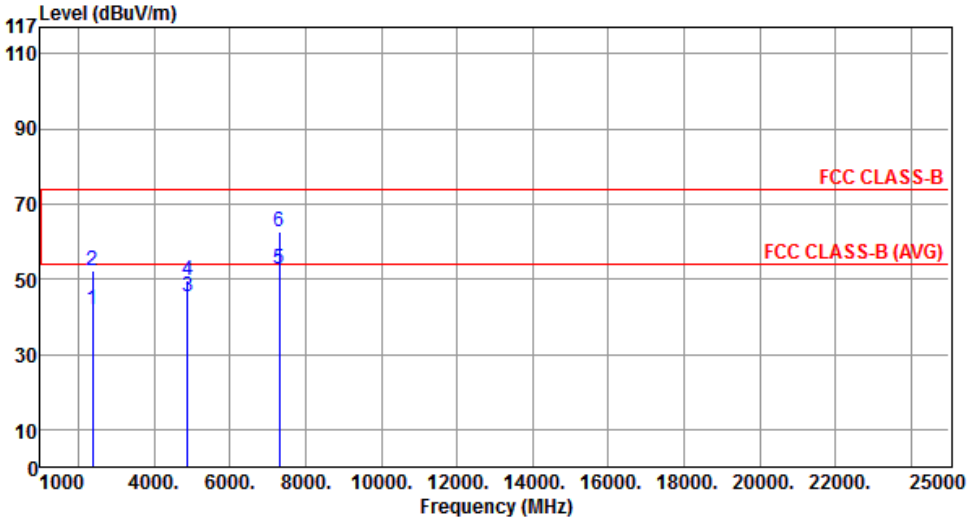
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	GFSK-2Mbps	**Test Freq. (FX)**	F1
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2369.80	44.52	54.00	-9.48	47.81	-3.29	Average	---	---
2	2369.80	53.91	74.00	-20.09	57.20	-3.29	Peak	---	---
3	2390.00	39.08	54.00	-14.92	42.30	-3.22	Average	---	---
4	2390.00	51.43	74.00	-22.57	54.65	-3.22	Peak	---	---
5	4804.00	52.65	54.00	-1.35	48.37	4.28	Average	---	---
6	4804.00	56.14	74.00	-17.86	51.86	4.28	Peak	---	---

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: Average emission setting: RBW=1MHz; VBW ≥ 1/T, where T is “Pulse On Time”, e.g., LE VBW≥1/625us, VBW=3kHz.

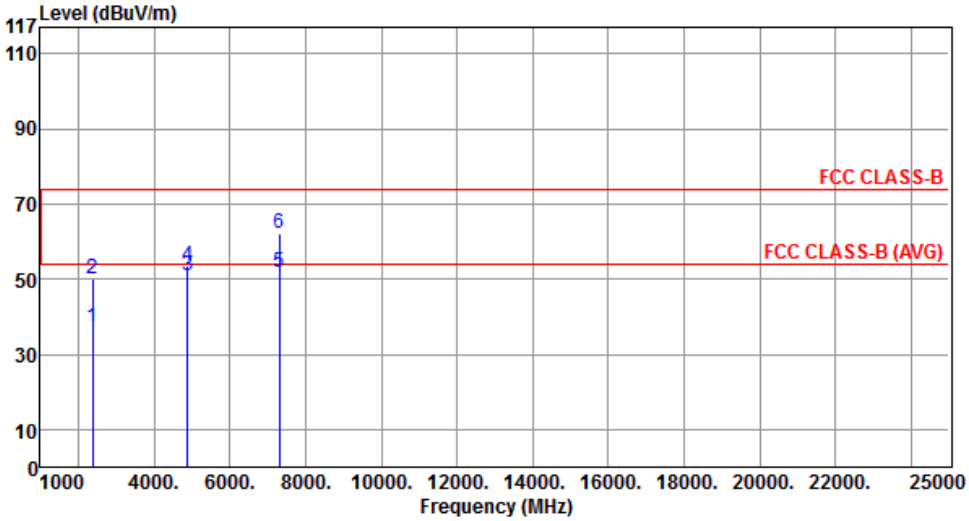
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	GFSK-2Mbps	**Test Freq. (FX)**	F2
Operating Mode	1	**Polarization**	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2375.00	41.85	54.00	-12.15	45.13	-3.28	Average	---	---
2	2375.00	52.37	74.00	-21.63	55.65	-3.28	Peak	---	---
3	4880.00	45.13	54.00	-8.87	40.73	4.40	Average	---	---
4	4880.00	49.69	74.00	-24.31	45.29	4.40	Peak	---	---
5	7320.00	52.82	54.00	-1.18	43.89	8.93	Average	---	---
6	7320.00	62.39	74.00	-11.61	53.46	8.93	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: Average emission setting: RBW=1MHz; VBW ≥ 1/T, where T is "Pulse On Time", e.g., LE VBW≥1/625us, VBW=3kHz.

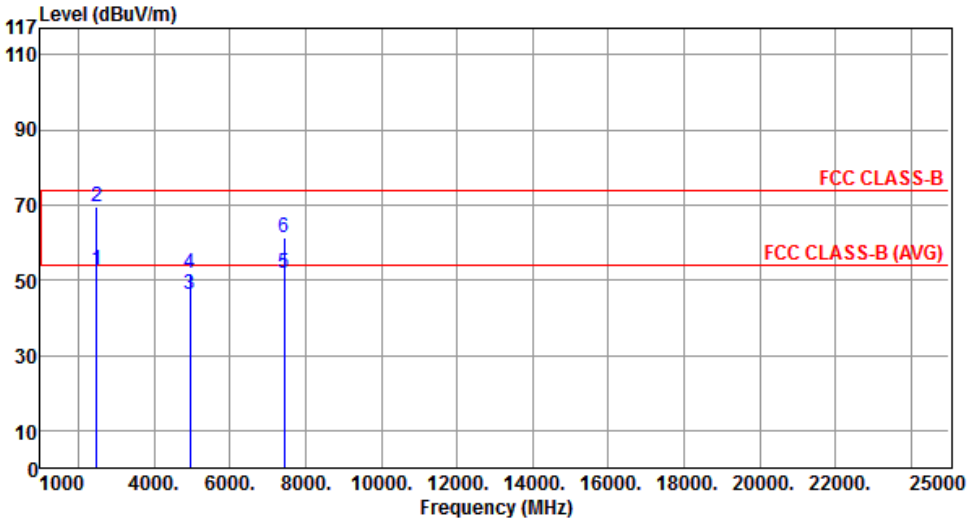
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	GFSK-2Mbps	**Test Freq. (FX)**	F2
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2375.00	37.23	54.00	-16.77	40.51	-3.28	Average	---	---
2	2375.00	50.14	74.00	-23.86	53.42	-3.28	Peak	---	---
3	4880.00	50.87	54.00	-3.13	46.47	4.40	Average	---	---
4	4880.00	53.69	74.00	-20.31	49.29	4.40	Peak	---	---
5	7320.00	51.79	54.00	-2.21	42.86	8.93	Average	---	---
6	7320.00	62.06	74.00	-11.94	53.13	8.93	Peak	---	---

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: Average emission setting: RBW=1MHz; VBW ≥ 1/T, where T is “Pulse On Time”, e.g., LE VBW≥1/625us, VBW=3kHz.

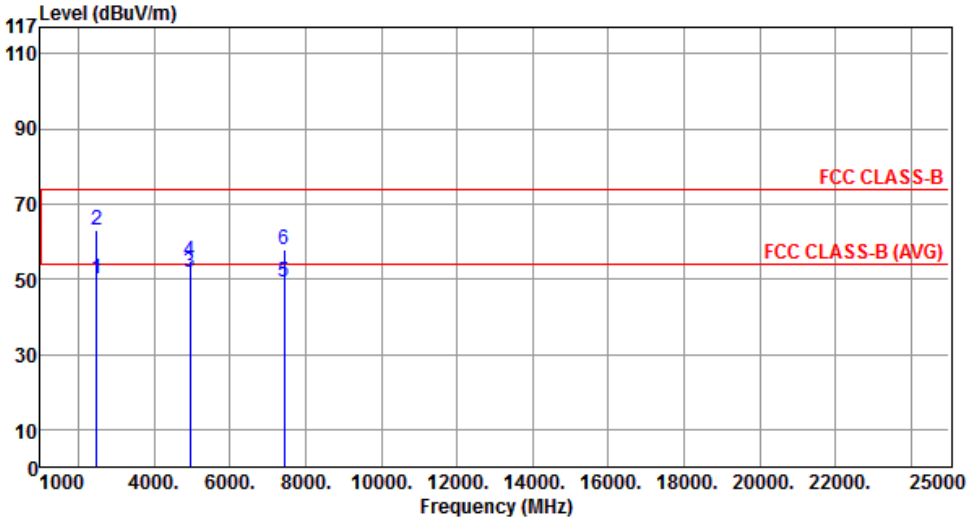
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	GFSK-2Mbps	**Test Freq. (FX)**	F3
Operating Mode	1	**Polarization**	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	52.71	54.00	-1.29	55.54	-2.83	Average	---	---
2	2483.50	69.42	74.00	-4.58	72.25	-2.83	Peak	---	---
3	4960.00	46.03	54.00	-7.97	41.49	4.54	Average	---	---
4	4960.00	51.64	74.00	-22.36	47.10	4.54	Peak	---	---
5	7440.00	51.96	54.00	-2.04	42.84	9.12	Average	---	---
6	7440.00	61.13	74.00	-12.87	52.01	9.12	Peak	---	---

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: Average emission setting: RBW=1MHz; VBW ≥ 1/T, where T is “Pulse On Time”, e.g., LE VBW≥1/625us, VBW=3kHz.

Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	GFSK-2Mbps	**Test Freq. (FX)**	F3
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	50.13	54.00	-3.87	52.96	-2.83	Average	---	---
2	2483.50	63.15	74.00	-10.85	65.98	-2.83	Peak	---	---
3	4960.00	51.94	54.00	-2.06	47.40	4.54	Average	---	---
4	4960.00	54.72	74.00	-19.28	50.18	4.54	Peak	---	---
5	7440.00	49.35	54.00	-4.65	40.23	9.12	Average	---	---
6	7440.00	57.64	74.00	-16.36	48.52	9.12	Peak	---	---

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.
Note 5: Average emission setting: RBW=1MHz; VBW ≥ 1/T, where T is “Pulse On Time”, e.g., LE VBW≥1/625us, VBW=3kHz.

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz ~ 2.75GHz	Mar. 26, 2013	Conduction (CO04-HY)
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 21, 2013	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz ~ 30MHz	Apr. 18, 2013	Conduction (CO04-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	7.61183201e+012	9kHz ~ 30MHz	Nov. 09, 2012	Conduction (CO04-HY)
ISN	TESEQ	ISN T800	30330	9kHz ~ 30MHz	Mar. 15, 2013	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
CDN	TESEQ	M016	25100	150kHz ~ 26MHz	Mar. 11, 2013	Conduction (CO04-HY)
CDN	TESEQ	M016	25103	150kHz ~ 26MHz	Mar. 11, 2013	Conduction (CO04-HY)
50 ohm terminal	N/A	N/A	TM012	N/A	Feb. 26, 2013	Conduction (CO04-HY)
50 ohm terminal	N/A	N/A	CON-04-02	N/A	Feb. 26, 2013	Conduction (CO04-HY)
50 ohm terminal	N/A	N/A	CON-04-01	N/A	Apr. 22, 2013	Conduction (CO04-HY)
50 ohm terminal	N/A	N/A	CON-04-03	N/A	Feb. 26, 2013	Conduction (CO04-HY)
50 ohm terminal	N/A	N/A	CON-01-04	N/A	Feb. 26, 2013	Conduction (CO04-HY)
ISN	TESEQ	ISN T400	21653	N/A	Jun. 25, 2013	Conduction (CO04-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV 40	101013	9KHz~40GHz	Jan. 29, 2013	Conducted (TH06-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jun. 21, 2013	Conducted (TH01-HY)
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	Jul. 16, 2013	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-S	MAB0103-001	-20 ~ 100℃	Nov. 21, 2012	Conducted (TH06-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jun. 27, 2013	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	1027452	300MHz ~ 40GHz	Sep. 11, 2013	Conducted (TH06-HY)
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	Sep. 11, 2013	Conducted (TH06-HY)
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345673/4	30MHz ~ 26.5GHz	Dec. 04, 2012	Conducted (TH06-HY)
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	SN 345668/4	30MHz ~ 26.5GHz	Dec. 04, 2012	Conducted (TH06-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV40	101499	9Kz – 40GHz	Jan. 28, 2013	Radiation (03CH08-HY)
Receiver	R&S	ESR3	101657	9KHz – 3GHz	Jan. 30,2013	Radiation (03CH08-HY)
Amplifier	COM-POWER	PA-103	161241	10MHz ~ 1000MHz	Feb. 26, 2013	Radiation (03CH08-HY)
Amplifier	Agilent	8449B	3008A02665	1GHz – 26.5 GHz	Sep. 04, 2013	Radiation (03CH08-HY)
Horn Antenna	ETS-LINDGREN	3117	66584	1GHz~18GHz	Aug. 07, 2013	Radiation (03CH08-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170517	15GHz~40GHz	Jan. 14, 2013	Radiation (03CH08-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2725	30 MHz - 1 GHz	Oct. 06, 2012	Radiation (03CH08-HY)

Note: Calibration Interval of instruments listed above is one year.

Amplifier	MITEQ	AMF-7D-00101800-30-10P	9121372	26.5GHz ~ 40GHz	Feb. 27, 2013	Radiation (03CH08-HY)
Loop Antenna *(note 1)	R&S	HFH2-Z2	860004/0001	9 kHz - 30 MHz	Jul. 03, 2012	Radiation (03CH08-HY)

Note: Calibration Interval of instruments listed above is two year.