FCC Test Report

Equipment	:	**Residential Fire and Burglar Control Unit**
Brand Name	:	**technicolor**
Model No.	:	**DLC-200C US**
FCC ID	:	**D6XDLC200**
Standard	:	**47 CFR FCC Part 15.247**
Operating Band	:	**902 MHz – 928 MHz**
Applicant	:	**TECOM CO., LTD.** No. 23 R&D Road 2, Science-Based Industrial Park, Hsin-Chu Taiwan
Manufacturer	:	**Global Brands Manufacture (DongGuan) Ltd.** Yue Yuan Industrial Estate, Huang Jiang Zhen, DongGuan City, GuangDong Province, China

The product sample received on May 11, 2015 and completely tested on Jun. 03, 2015. 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:

Kevin Liang / Assistant Manager

Testing Laboratory
1190

Table of Contents

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]:0.1883800MHz 27.79 (Margin 26.32dB) - AV 50.32 (Margin 13.79dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	20dB Bandwidth	208.39 kHz	≤ 500 kHz	Complied
3.2	15.247(a)	Carrier Frequency Separation (ChS)	250 kHz	ChS ≥ MAX(25kHz,BW_{20dB})	Complied
3.3	15.247(a)	Number of Hopping Frequencies (N)	Max:89	N ≥ 6	Complied
3.4	15.247(a)	Time of Occupancy (Dwell Time)	0.1466 s	0.4 s within 0.4 x N	Complied
3.5	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm]: 9.69	Power [dBm]: 27	Complied
3.6	15.247(c)	Transmitter Bandedge Emissions	901.960MHz 21.92 dBc	Non-Restricted Bands: > 20 dBc	Complied
3.7	15.247(c)	Transmitter Unwanted Emissions	[dBuV/m at 3m]:2744.19MHz 52.87 (Margin 1.13dB) - AV 54.70 (Margin 19.30dB) - PK	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied

Revision History

Report No.	Version	Description	Issued Date
FR542319	Rev. 02	Initial issue of report	Jul. 22, 2015
FR630406AF	Rev. 01	1. Add LED controller 2. Add 3G hot-swap 3. Change Brand Name 4. Change appearance	Jun. 30, 2016
FR630406AF	Rev. 02	1. LED controller. 2. 3G unit hot-swap. (3G unit FCC ID: D6XDLC200C) 3. Add conductive foam on RF main board. 4. Add vents on the bottom of enclosure. 5. Change brand name, update label accordingly. 6. Change RTC battery (B2) position. 7. Remove redundant connectors of JTAG (j4000) & boot configuration (p7000) & wifi ipex (j9305 & j9304). 8. 2nd source of resistor (R11027).	Aug. 01, 2016

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information				
Frequency Range (MHz)	**Ch. Frequency (MHz)**	**Modulation Mode**	**Channel Number**	**RF Output Power (dBm)**
902-928	902.2497-927.7155	FSK	89	9.69
Note 1: RF output power specifies that Maximum Peak Conducted Output Power.				

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.

Antenna General Information			
No.	**Ant. Cat.**	**Ant. Type**	**Gain (dBi)**
1	Integral	PCB	2

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 (EUT intended for a variety of host systems) Host System - Brand Name / Model No.: …
☐	Other:

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
☐ Operated normally hopping 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)**
☒ 5.27% - test mode single channel	12.78

1.1.5 EUT Operational Condition

Supply Voltage	☒ AC mains	☐ DC	
Type of DC Source	☐ Internal DC supply	☒ From PoE	☐ Battery

1.2 Support Equipment

Support Equipment - RF Conducted			
No.	**Equipment**	**Brand Name**	**Model Name**
1	Notebook	Dell	E5540

Support Equipment - Radiated Emission & AC Conduction			
No.	**Equipment**	**Brand Name**	**Model Name**
1	Notebook	Dell	E5530
2	PoE	PHIHONG	POE31U-1AT

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 Public Notice DA 00-705

1.4 Testing Location Information

Testing Location					
☒	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.			
		TEL : 886-3-327-3456	FAX : 886-3-318-0055		
Test Site Registration Number: FCC 636805					
Test Condition		**Test Site No.**	**Test Engineer**	**Test Environment**	
AC Conduction		CO04-HY	Zeus	22 °C / 45 %	
RF Conducted		TH01-HY	Shiming	22.5 °C / 65 %	
Radiated Emission		03CH03-HY	Terry	24.2 °C / 49.5 %	

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**
AC power-line conducted emissions		±2.3 dB
Emission bandwidth, 6dB bandwidth		±0.6 %
RF output power, conducted		±0.1 dB
Power density, conducted		±0.6 dB
Unwanted emissions, conducted	9 – 150 kHz	±0.4 dB
	0.15 – 30 MHz	±0.4 dB
	30 – 1000 MHz	±0.6 dB
	1 – 18 GHz	±0.5 dB
	18 – 40 GHz	±0.5 dB
	40 – 200 GHz	N/A
All emissions, radiated	9 – 150 kHz	±2.5 dB
	0.15 – 30 MHz	±2.3 dB
	30 – 1000 MHz	±2.6 dB
	1 – 18 GHz	±3.6 dB
	18 – 40 GHz	±3.8 dB
	40 – 200 GHz	N/A
Temperature		±0.8 °C
Humidity		±5 %
DC and low frequency voltages		±0.9 %
Time		±1.4 %
Duty Cycle		±0.6 %

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing	
Modulation Mode	**RF Output Power (dBm)**
AFM-Transmit	9.69

2.2 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter			
Test Software Version	**RFID Regulatory Test**		
Modulation Mode	**902.2497 MHz**	**914.7329 MHz**	**927.7155 MHz**
AFM-Transmit	Default	Default	Default

2.3 The Worst Case Measurement Configuration

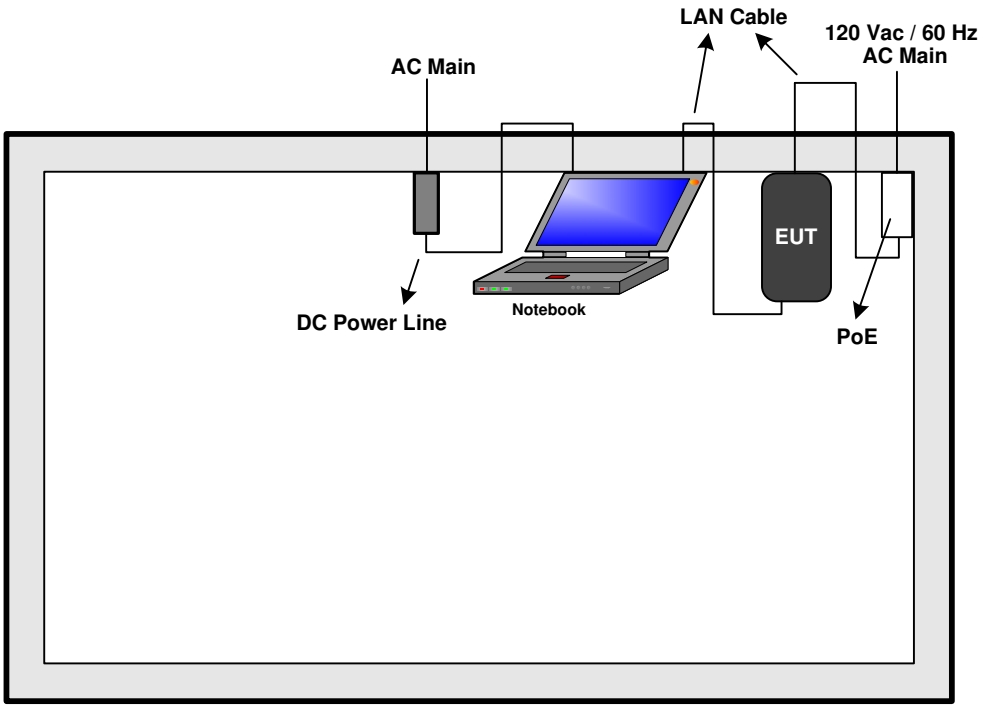
The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	PoE & Transmit

The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power, 20dB Bandwidth, Carrier Frequency Separation (ChS) Number of Hopping Frequencies (N), Time of Occupancy (Dwell Time)
Test Condition	Conducted measurement at transmit chains
Modulation Mode	AFM-Transmit

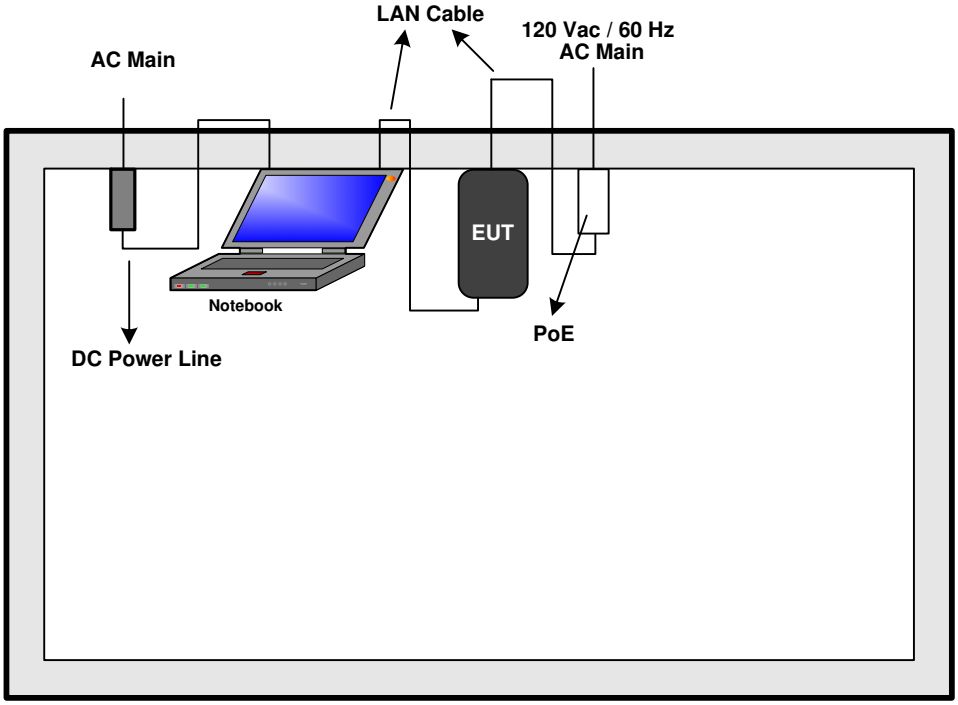
The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge Emissions		
Test Condition	Radiated measurement		
User Position	☐ EUT will be placed in fixed position.		
	☒ EUT will be placed in mobile position and operating multiple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

2.4 Test Setup Diagram

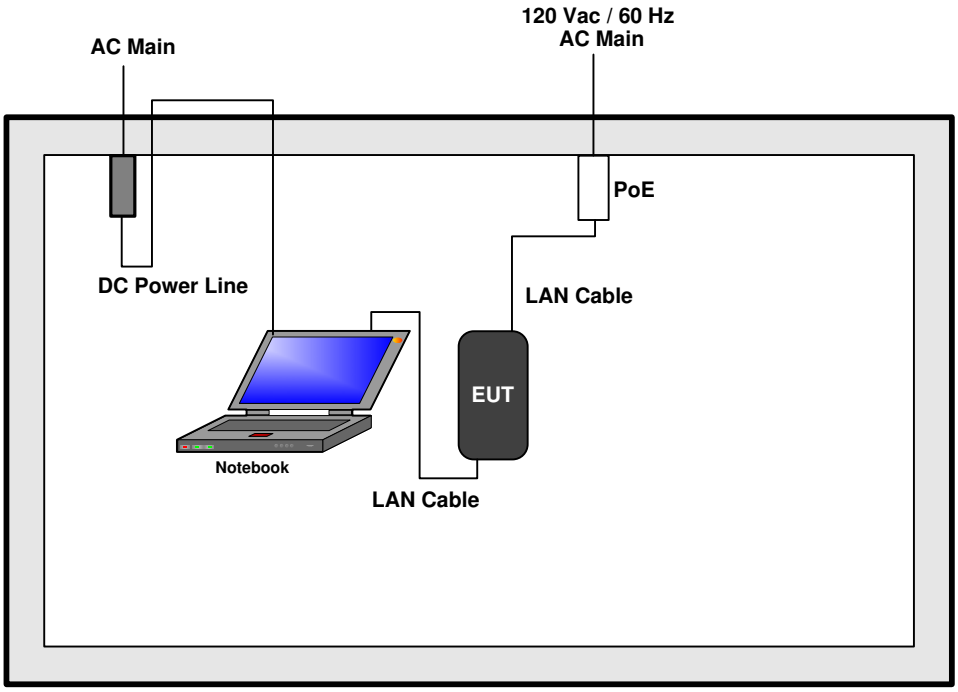
Test Setup Diagram – AC Line Conducted Emission Test



Test Setup Diagram - Radiated Test (Below 1GHz)



Test Setup Diagram - Radiated Test (Above 1GHz)



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

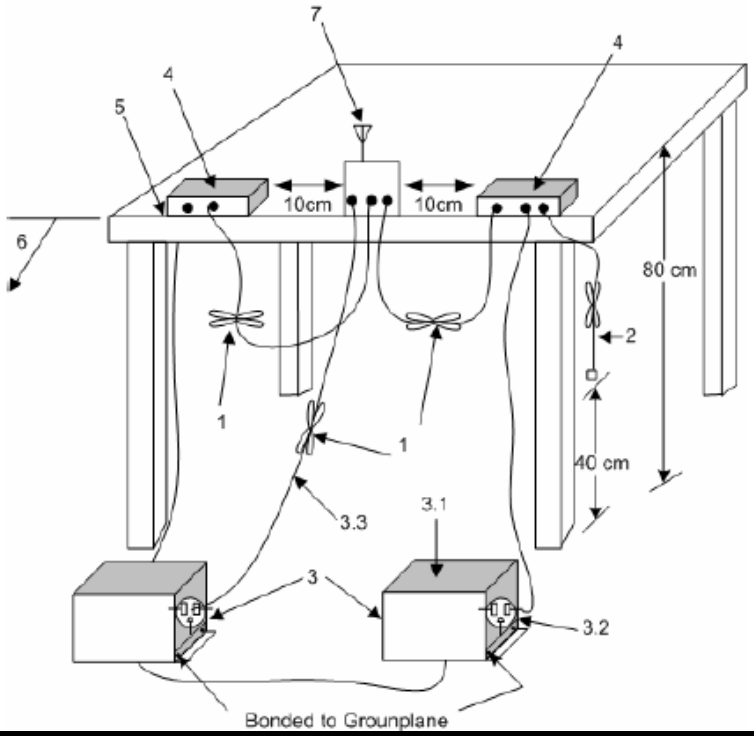
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

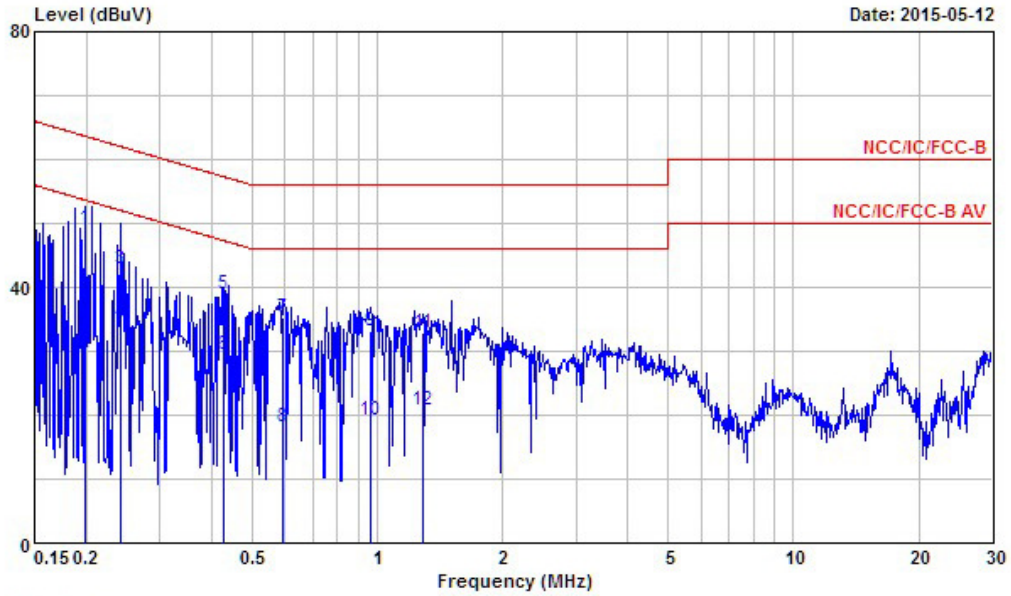
3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

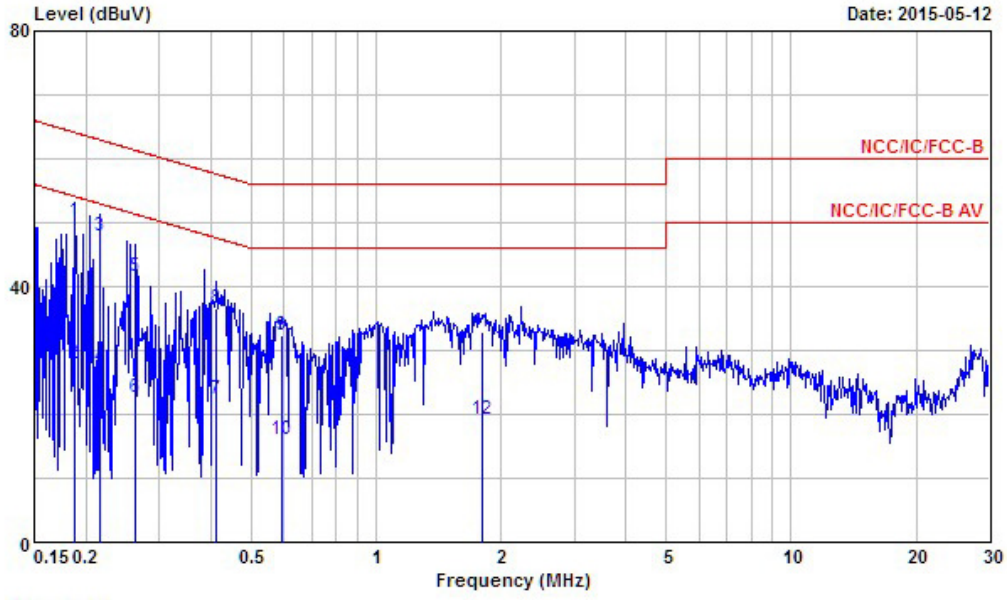
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	PoE & Transmit		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	@0.1986310	49.13	-14.54	63.67	48.56	0.07	0.50	QP
2	0.1986310	29.82	-23.85	53.67	29.25	0.07	0.50	Average
3	0.2416480	42.89	-19.15	62.04	42.29	0.07	0.53	QP
4	0.2416480	34.50	-17.54	52.04	33.90	0.07	0.53	Average
5	0.4259850	38.93	-18.40	57.33	38.25	0.07	0.61	QP
6	0.4259850	29.48	-17.85	47.33	28.80	0.07	0.61	Average
7	0.5916410	35.20	-20.80	56.00	34.44	0.08	0.68	QP
8	0.5916410	18.24	-27.76	46.00	17.48	0.08	0.68	Average
9	0.9632810	33.26	-22.74	56.00	32.38	0.09	0.79	QP
10	0.9632810	19.11	-26.89	46.00	18.23	0.09	0.79	Average
11	1.290	32.77	-23.23	56.00	31.88	0.09	0.80	QP
12	1.290	20.91	-25.09	46.00	20.02	0.09	0.80	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	PoE & Transmit		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	@0.1883800	50.32	-13.79	64.11	49.79	0.06	0.47	QP
2	0.1883800	27.79	-26.32	54.11	27.26	0.06	0.47	Average
3	0.2150610	47.95	-15.06	63.01	47.38	0.06	0.51	QP
4	0.2150610	27.35	-25.66	53.01	26.78	0.06	0.51	Average
5	0.2630270	41.61	-19.73	61.34	41.01	0.06	0.54	QP
6	0.2630270	22.63	-28.71	51.34	22.03	0.06	0.54	Average
7	0.4126560	22.40	-25.19	47.59	21.72	0.07	0.61	Average
8	0.4126560	36.58	-21.01	57.59	35.90	0.07	0.61	QP
9	0.5916410	32.41	-23.59	56.00	31.66	0.07	0.68	QP
10	0.5916410	15.99	-30.01	46.00	15.24	0.07	0.68	Average
11	1.800	32.99	-23.01	56.00	32.09	0.10	0.80	QP
12	1.800	19.16	-26.84	46.00	18.26	0.10	0.80	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 20dB Bandwidth and Carrier Frequency Separation

3.2.1 20dB Bandwidth and Carrier Frequency Separation Limit

20dB Bandwidth and Carrier Frequency Separation Limit for Frequency Hopping Systems	
☒	902-928 MHz Band:
	☒ ChS ≥ MAX (20 dB bandwidth, 25 kHz).
	☒ 20 dB bandwidth ≤ 250 kHz
N: Number of Hopping Frequencies; **ChS**: Hopping Channel Separation	

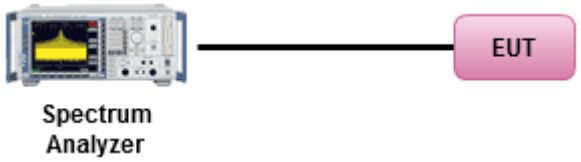
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 6.9.1 for 20 dB bandwidth measurement.
☒	Refer as ANSI C63.10, clause 7.7.2 for carrier frequency separation measurement.
☒	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.

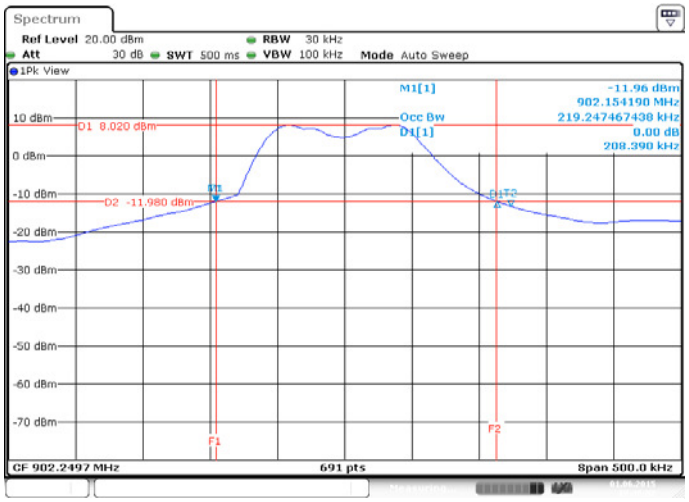
3.2.4 Test Setup

20dB Bandwidth and Carrier Frequency Separation
 Spectrum Analyzer

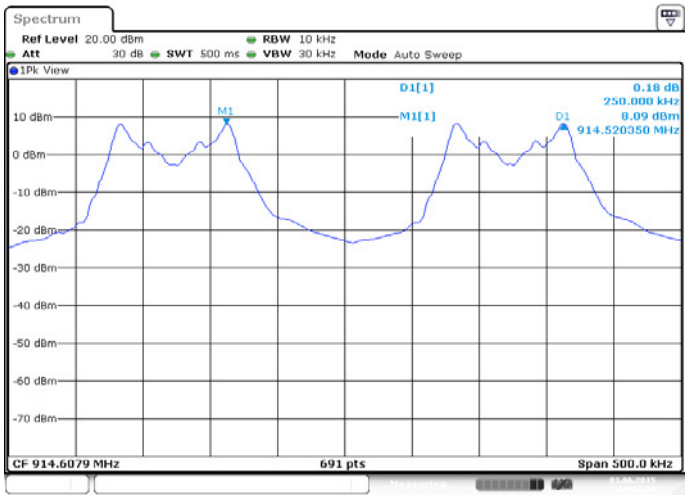
3.2.5 Test Result of 20dB Bandwidth and Carrier Frequency Separation

20dB Bandwidth and Carrier Frequency Separation Result					
Modulation Mode	**Freq. (MHz)**	**20dB Bandwidth (kHz)**	**99% Bandwidth (kHz)**	**Channel Spacing (kHz)**	**20dB Bandwidth Limits (kHz)**
AFM-Transmit	902.2497	208.39	219.24	250	250
AFM-Transmit	914.7329	204.78	222.14	250	250
AFM-Transmit	927.7155	196.82	209.84	250	250
Result		**Complied**			

Worst 20dB Bandwidth Plots



Worst Carrier Frequency Separation Plots



3.3 Number of Hopping Frequencies

3.3.1 Number of Hopping Frequencies Limit

Number of Hopping Frequencies Limit for Frequency Hopping Systems	
☒	902-928 MHz Band:
	☐ If 20 dB bandwidth < 250 kHz, then N ≥ 50.
	☒ If 20 dB bandwidth ≧ 250 kHz, then N ≥ 25.
N: Number of Hopping Frequencies.	

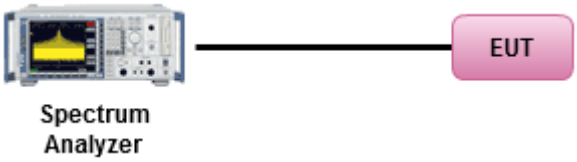
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 7.7.3 for number of hopping frequencies measurement.
☒	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.

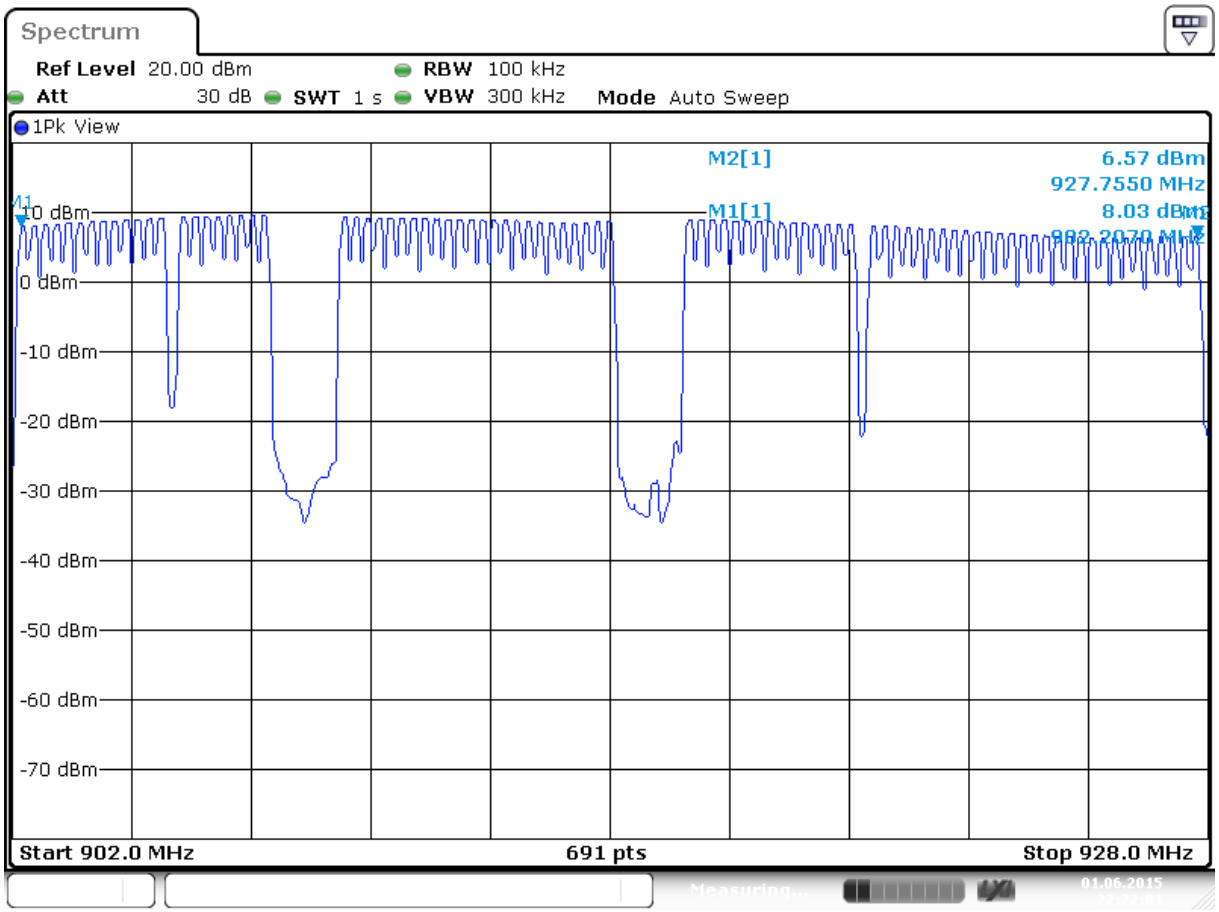
3.3.4 Test Setup

Number of Hopping Frequencies


3.3.5 Test Result of Number of Hopping Frequencies

Number of Hopping Frequencies Result			
Modulation Mode	**Freq. (MHz)**	**Hopping Channel Number (N)**	**Hopping Channel Number Limits**
AFM-Transmit	902-928	89	50
Result	**Complied**		

Number of Hopping Frequencies Plots



3.4 Time of Occupancy (Dwell Time)

3.4.1 Time of Occupancy (Dwell Time) Limit

Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems
☒ 902-928 MHz Band: Dwell time ≤ 0.4 second within 0.4 x N
N: Number of Hopping Frequencies

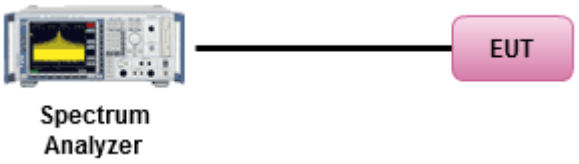
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 7.7.4 for dwell time measurement.
☒	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.

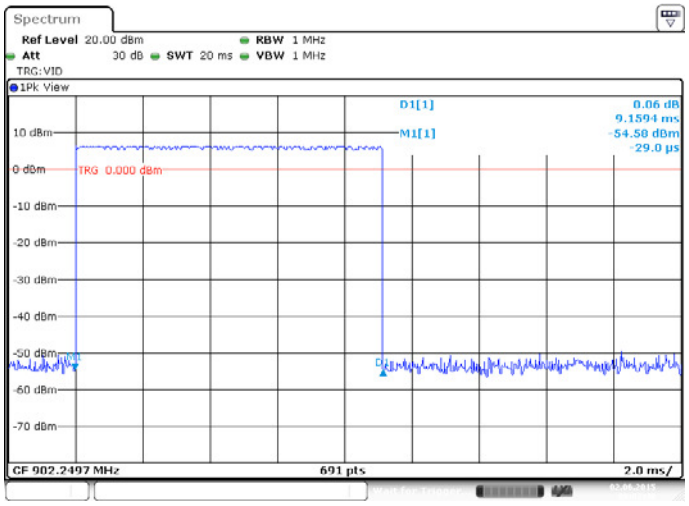
3.4.4 Test Setup

Time of Occupancy (Dwell Time)


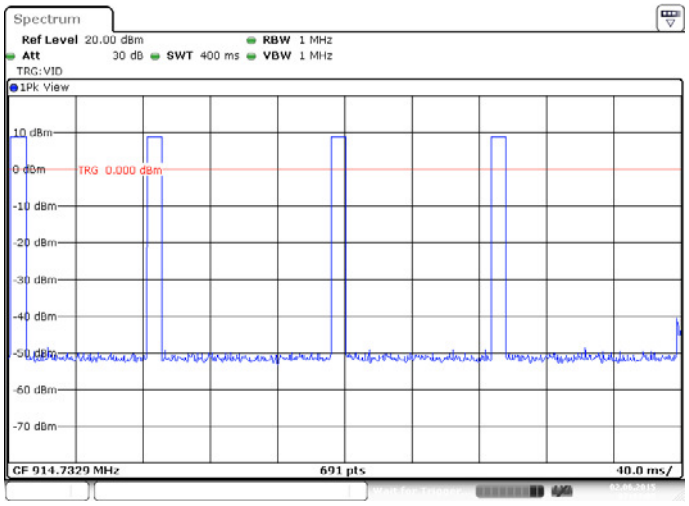
3.4.5 Test Result of Time of Occupancy (Dwell Time)

Time of Occupancy (Dwell Time) Result					
Modulation Mode	**Freq. (MHz)**	**Pulse Time per Hop (ms)**	**Number of Pulse in [0.4 x N sec]**	**Dwell Time in [0.4 x N sec] (s)**	**Dwell Time Limits (s)**
AFM-Transmit	902.2497	9.1594	12	0.1099	0.4000
AFM-Transmit	914.7329	9.1594	16	0.1466	0.4000
AFM-Transmit	927.7155	9.1594	9	0.0824	0.4000
Result		**Complied**			

Worst Pulse Time per Hop Plot



Number of Pulse in [0.4 x N sec] Plot



3.5 RF Output Power

3.5.1 RF Output Power Limit

RF Output Power Limit for Frequency Hopping Systems			
Maximum Peak Conducted Output Power Limit			
☒	902-928 MHz Band:		
	☒	For systems employing at least 50 hopping channels : 1W (30dBm)	
		☒	If G_{TX} ≤ 6 dBi, then P_{Out} ≤ 30 dBm (1 W)
		☐	If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6) dBm
	☐	For systems employing less than 50 hopping channels : 250mW (24dBm)	
		☐	If G_{TX} ≤ 6 dBi, then P_{Out} ≤ 30 dBm (1 W)
		☐	If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6) dBm
e.i.r.p. Power Limit: P_{eirp} ≤ 36 dBm (4 W)			
G_{TX} = the maximum transmitting antenna directional gain in dBi. **P_{eirp}** = e.i.r.p. Power in dBm.			

3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method		
☒	Maximum Peak Conducted Output Power	
	☐	Refer as FCC DA 00-0705, spectrum analyzer for peak power.
	☒	Refer as FCC DA 00-0705, peak power meter for peak power.
	☐	Refer as ANSI C63.10, clause 6.10.2.1 a) for peak power meter.
	☐	Refer as ANSI C63.10, clause 6.10.2.1 a) for spectrum analyzer - (RBW ≥ EBW).
☒	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.

3.5.4 Test Setup

RF Output Power (Peak Power Meter)

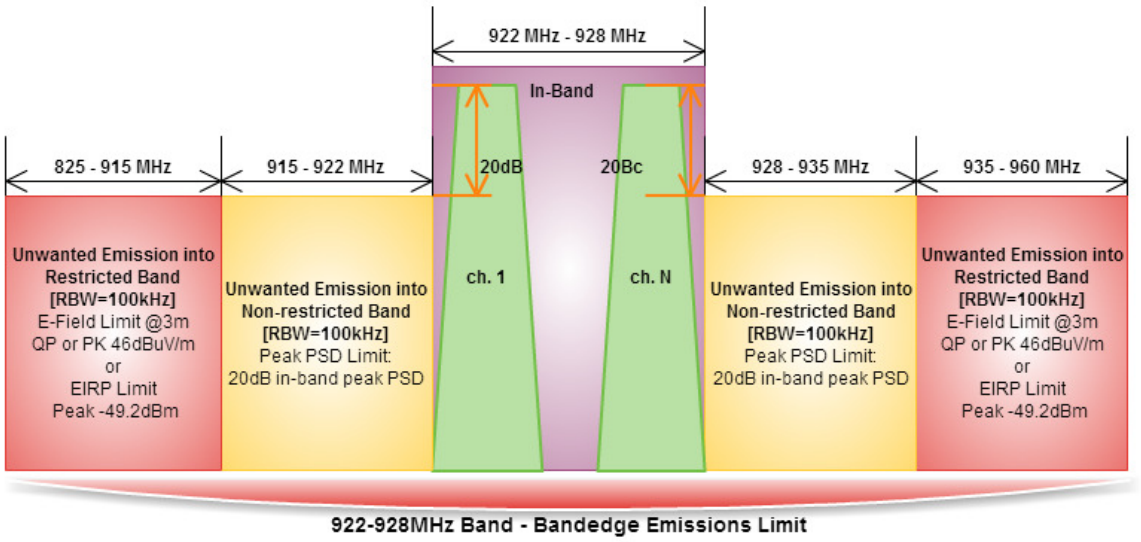

3.5.5 Test Result of Maximum Peak Conducted Output Power

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
AFM-Transmit	902.2497	9.21	30	2	11.21	36
AFM-Transmit	914.7329	9.69	30	2	11.69	36
AFM-Transmit	927.7155	7.56	30	2	9.56	36
Result		Complied				

3.6 Transmitter Bandedge Emissions

3.6.1 Transmitter Radiated Bandedge Emissions Limit

Transmitter Radiated Bandedge Emissions Limit



3.6.2 Measuring Instruments

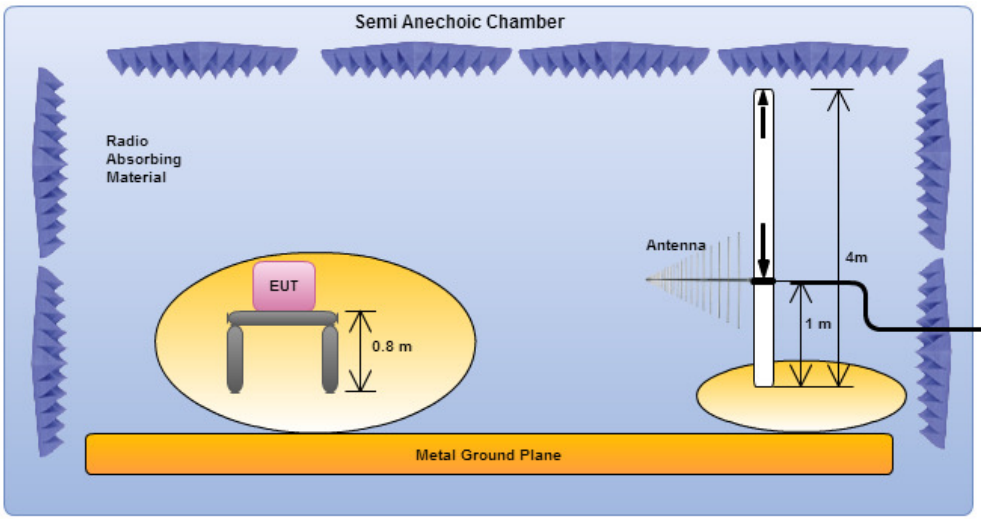
Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

Test Method – General Information		
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].	
☒	Refer as ANSI C63.10, clause 6.9.2.2 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.	
☒	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 4.2.3.2.2 measurement procedure QP or Peak.
☒	For the transmitter bandedge emissions shall be measured using following options below:	
	☒	Refer as ANSI C63.10, clause 6.9.2 for band-edge testing.
	☐	Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.
	☒	Refer as ANSI C63.10, clause 7.7.9 for band-edge testing into non-restricted bands.
☒	Refer as ANSI C63.10, clause 6.6 for radiated emissions and test distance is 3m.	

3.6.4 Test Setup

Transmitter Radiated Bandedge Emissions



Electric field tests shall be performed in transmitter bandedge emissions using a calibrated bi-log antenna.

3.6.5 Transmitter Radiated Bandedge Emissions

922-928MHz Transmitter Radiated Bandedge Emissions (Non-restricted Band)							
Modulation	**Test Freq. (MHz)**	**In-band PSD [i] (dBuV/100kHz)**	**Freq. (MHz)**	**Out-band PSD [o] (dBuV/100kHz)**	**[i] – [o] (dB)**	**Limit (dB)**	**Pol.**
AFM-Transmit	902.2497	105.93	901.960	84.01	21.92	20	H
AFM-Transmit	914.7329	106.84	901.600	50.20	56.64	20	H
AFM-Transmit	927.7155	102.65	928.000	75.23	27.42	20	H
Note : Measurement worst emissions of receive antenna polarization							

3.7 Transmitter Unwanted Emissions

3.7.1 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

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.

3.7.2 Measuring Instruments

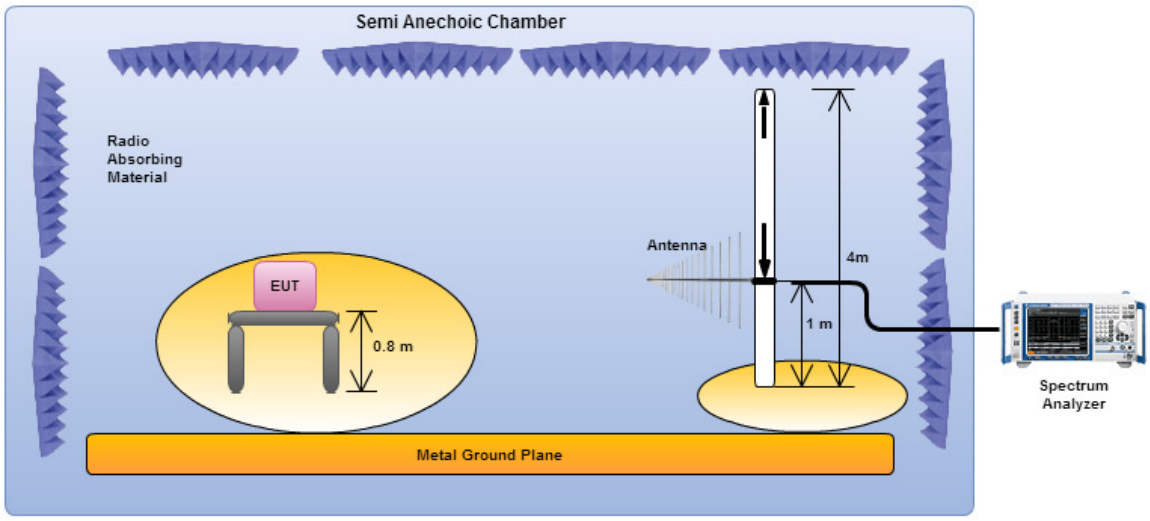
Refer a test equipment and calibration data table in this test report.

3.7.3 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).		
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].		
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as FCC DA 00-0705, for spurious radiated emissions. The dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log (dwell time/100 ms)	
	☒	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 below 30 MHz and test distance is 3m.	
	☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.	
	☒	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1 GHz and test distance is 3m.	
☒	The any unwanted emissions level shall not exceed the fundamental emission level.		
☒	All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.		

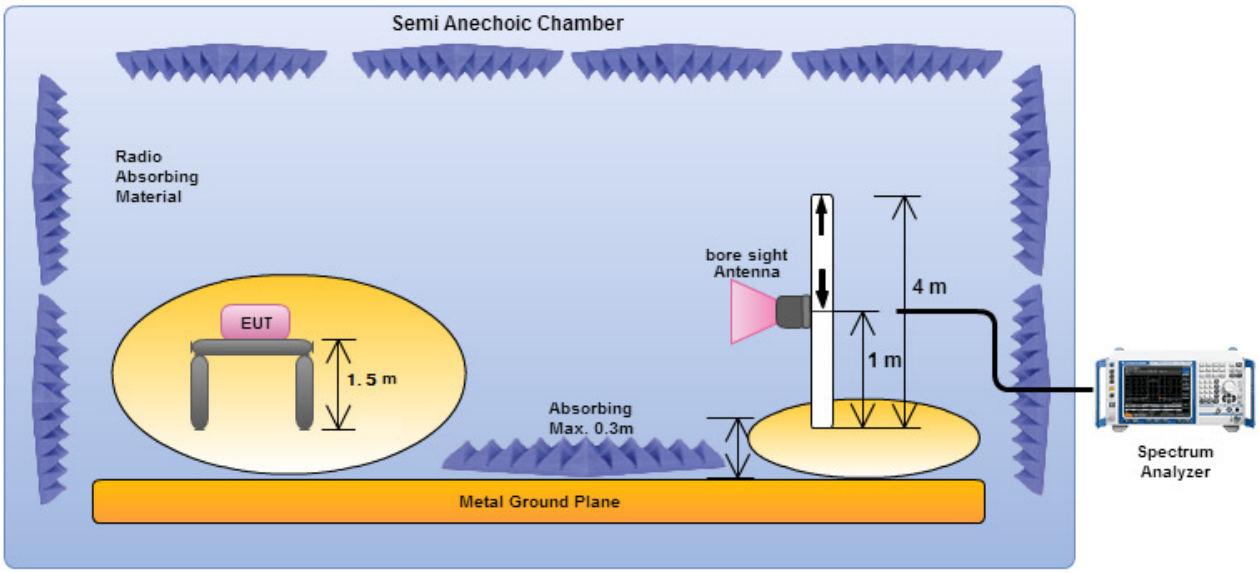
3.7.4 Test Setup

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.

Transmitter Radiated Unwanted Emissions (Above 1GHz)



Electric field tests shall be performed in the frequency range of 1 GHz to 10th harmonic of highest fundamental frequency or 40 GHz using a calibrated horn antenna.

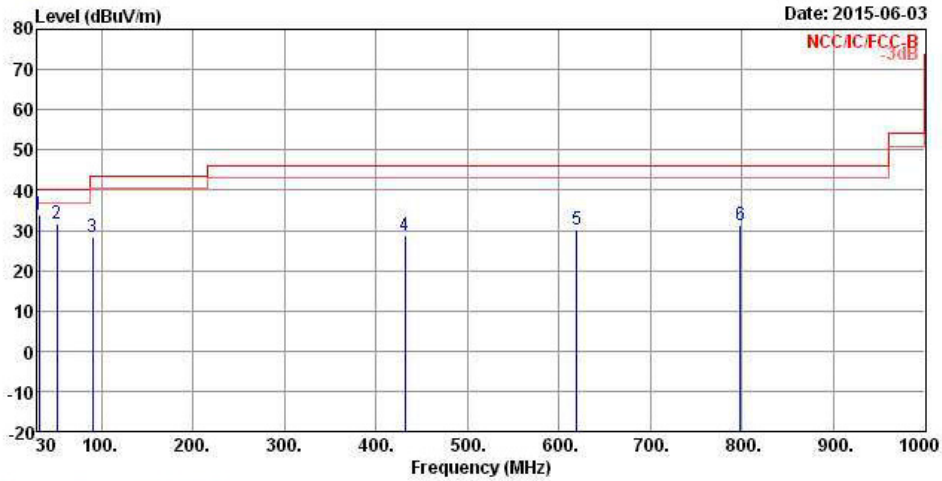
Note: FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 02, 2014.

3.7.5 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.

3.7.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

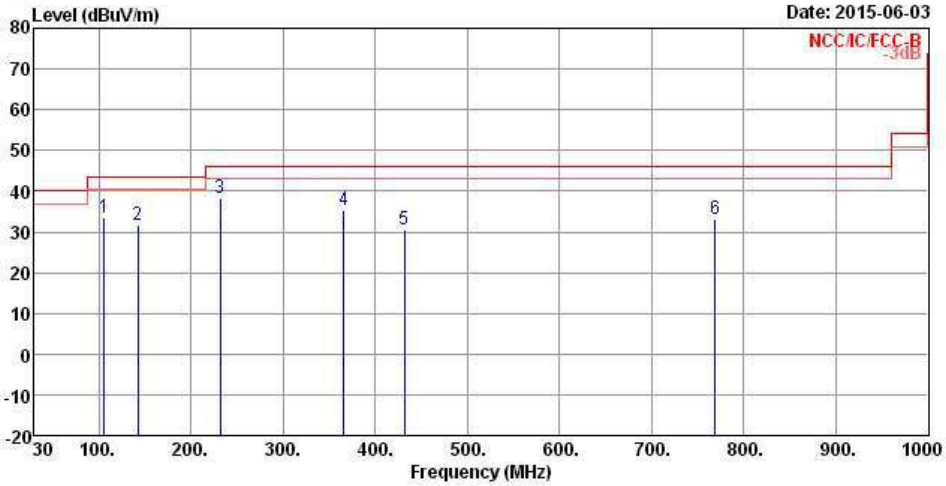
Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Operating Mode	1	**Operating Function**	PoE & Transmit
Polarization	V		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	31.940	34.04	-5.96	40.00	43.83	16.90	0.87	27.56	Peak
2	51.340	31.73	-8.27	40.00	50.26	7.84	1.15	27.52	Peak
3	90.140	28.48	-15.02	43.50	45.60	8.72	1.54	27.38	Peak
4	431.580	28.82	-17.18	46.00	36.89	15.98	3.44	27.49	Peak
5	619.760	30.07	-15.93	46.00	35.37	18.45	4.23	27.98	Peak
6	798.240	31.38	-14.62	46.00	34.81	19.45	4.91	27.79	Peak

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).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Operating Mode	1	**Operating Function**	PoE & Transmit
Polarization	H		

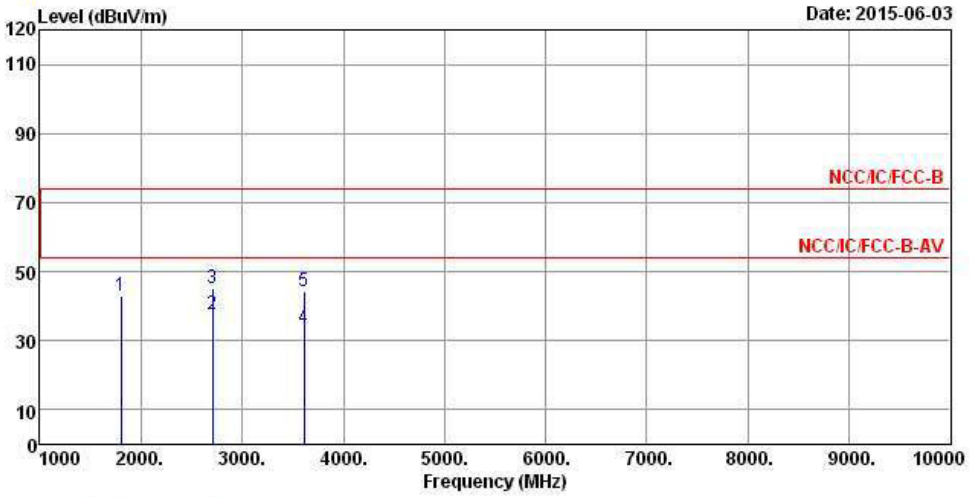


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	105.660	33.52	-9.98	43.50	47.75	11.44	1.65	27.32	Peak
2	142.520	31.81	-11.69	43.50	46.19	10.82	1.98	27.18	Peak
3	231.760	38.33	-7.67	46.00	52.64	10.05	2.51	26.87	Peak
4	365.620	35.42	-10.58	46.00	45.01	14.32	3.19	27.10	Peak
5	431.580	30.60	-15.40	46.00	38.67	15.98	3.44	27.49	Peak
6	769.140	32.97	-13.03	46.00	36.58	19.46	4.76	27.83	Peak

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).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

3.7.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

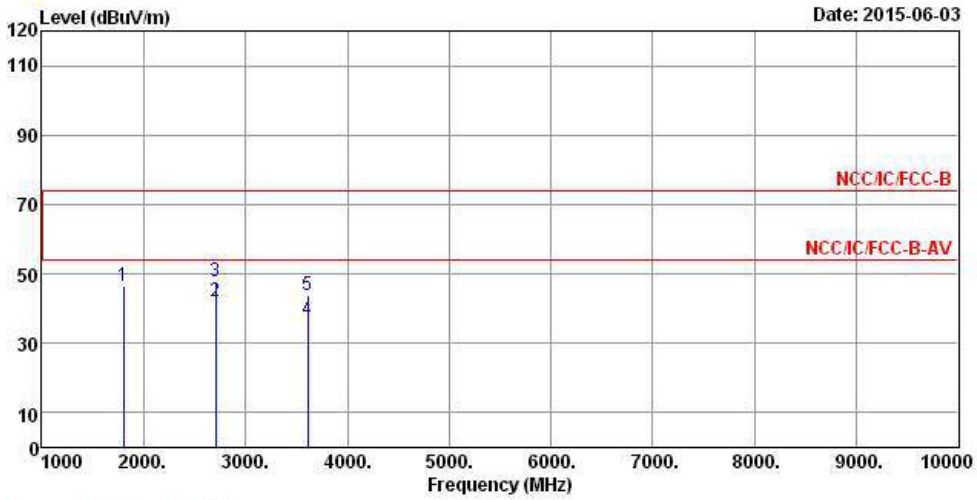
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	AFM-Transmit	**Test Freq. (FX)**	902.2497 MHz
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	1804.480	42.97	-31.03	74.00	46.17	26.74	2.76	32.70	Peak
2	2706.720	37.53	-16.47	54.00	37.43	29.24	3.39	32.53	Average
3	2706.720	45.37	-28.63	74.00	45.27	29.24	3.39	32.53	Peak
4	3608.960	33.72	-20.28	54.00	30.75	31.61	3.89	32.53	Average
5	3608.960	44.25	-29.75	74.00	41.28	31.61	3.89	32.53	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 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: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).
Note 5: No level of unwanted emissions exceeds the level of the fundamental emission.

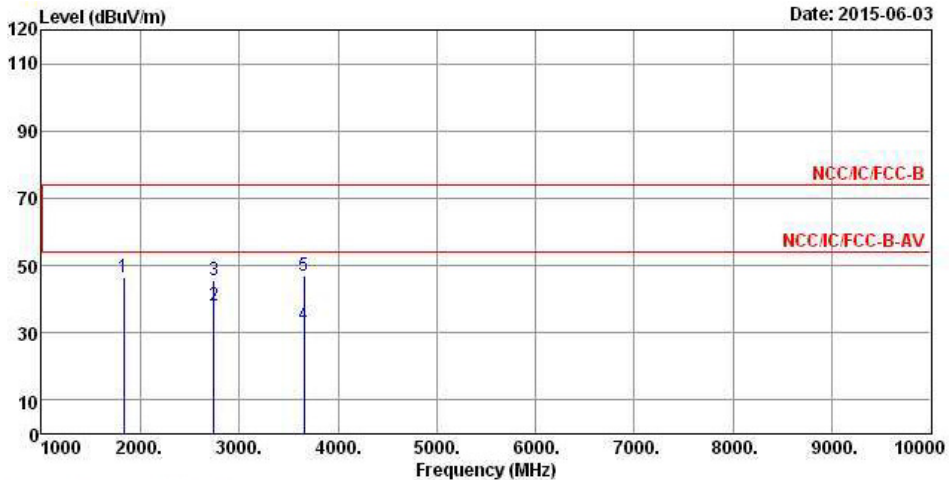
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	AFM-Transmit	**Test Freq. (FX)**	902.2497 MHz
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	1804.480	46.33	-27.67	74.00	49.53	26.74	2.76	32.70	Peak
2	2706.720	42.04	-11.96	54.00	41.94	29.24	3.39	32.53	Average
3	2706.720	47.97	-26.03	74.00	47.87	29.24	3.39	32.53	Peak
4	3608.960	36.81	-17.19	54.00	33.84	31.61	3.89	32.53	Average
5	3608.960	43.99	-30.01	74.00	41.02	31.61	3.89	32.53	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 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: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).
Note 5: No level of unwanted emissions exceeds the level of the fundamental emission.

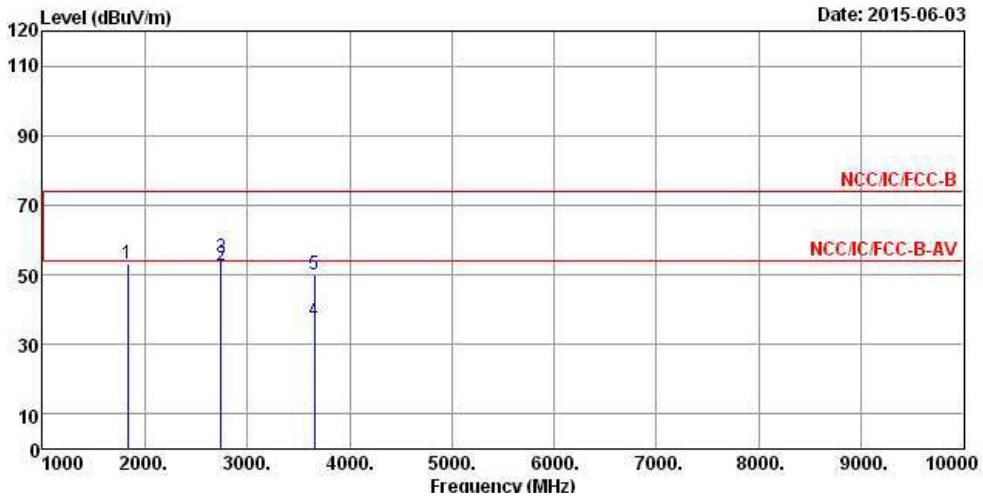
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	AFM-Transmit	**Test Freq. (FX)**	914.7329 MHz
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	1829.460	46.71	-27.29	74.00	49.74	26.90	2.76	32.69	Peak
2	2744.190	38.26	-15.74	54.00	37.96	29.40	3.42	32.52	Average
3	2744.190	45.56	-28.44	74.00	45.26	29.40	3.42	32.52	Peak
4	3658.920	32.33	-21.67	54.00	29.18	31.77	3.91	32.53	Average
5	3658.920	47.05	-26.95	74.00	43.90	31.77	3.91	32.53	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 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: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).
Note 5: No level of unwanted emissions exceeds the level of the fundamental emission.

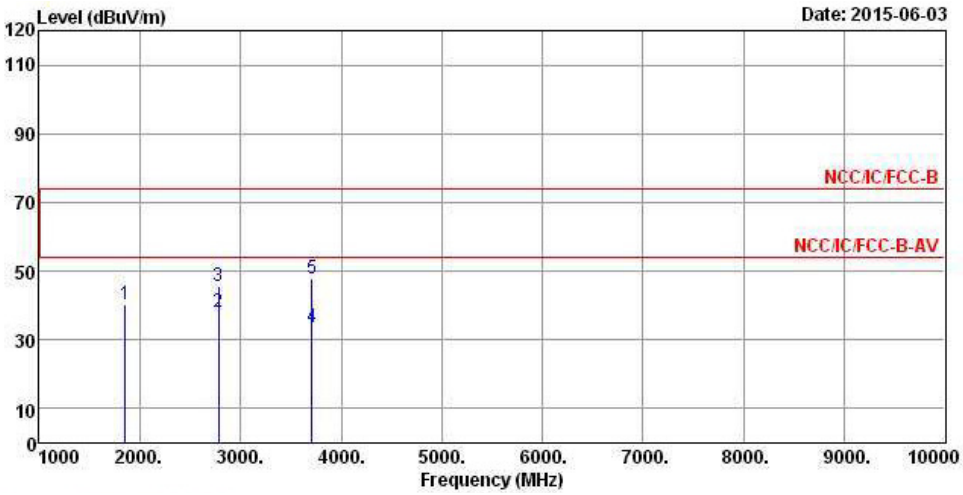
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	AFM-Transmit	**Test Freq. (FX)**	914.7329 MHz
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	1829.460	52.96	-21.04	74.00	55.99	26.90	2.76	32.69	Peak
2	2744.190	52.87	-1.13	54.00	52.57	29.40	3.42	32.52	Average
3	2744.190	54.70	-19.30	74.00	54.40	29.40	3.42	32.52	Peak
4	3658.920	36.82	-17.18	54.00	33.67	31.77	3.91	32.53	Average
5	3658.920	49.96	-24.04	74.00	46.81	31.77	3.91	32.53	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 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: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).
Note 5: No level of unwanted emissions exceeds the level of the fundamental emission.

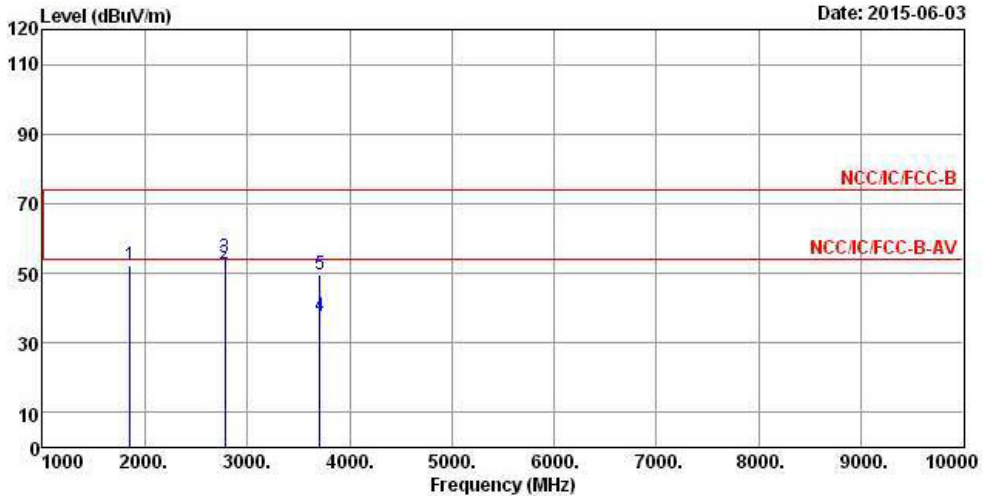
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	AFM-Transmit	**Test Freq. (FX)**	927.7155 MHz
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	1855.420	40.09	-33.91	74.00	42.99	26.98	2.79	32.67	Peak
2	2783.130	37.87	-16.13	54.00	37.44	29.51	3.44	32.52	Average
3	2783.130	45.55	-28.45	74.00	45.12	29.51	3.44	32.52	Peak
4	3710.840	33.63	-20.37	54.00	30.30	31.92	3.95	32.54	Average
5	3710.840	47.66	-26.34	74.00	44.33	31.92	3.95	32.54	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 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: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).
Note 5: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	AFM-Transmit	**Test Freq. (FX)**	927.7155 MHz
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	1855.420	52.22	-21.78	74.00	55.12	26.98	2.79	32.67	Peak
2	2783.130	52.54	-1.46	54.00	52.11	29.51	3.44	32.52	Average
3	2783.130	54.55	-19.45	74.00	54.12	29.51	3.44	32.52	Peak
4	3710.840	37.43	-16.57	54.00	34.10	31.92	3.95	32.54	Average
5	3710.840	49.66	-24.34	74.00	46.33	31.92	3.95	32.54	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 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: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).
Note 5: No level of unwanted emissions exceeds the level of the fundamental emission.

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	Apr. 15, 2015	AC Conduction
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 22, 2015	AC Conduction
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	Oct. 31, 2014	AC Conduction
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	AC Conduction

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	101500	9KHz~40GHz	May 05, 2015	RF Conducted
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jul. 31, 2014	RF Conducted
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	Feb. 17, 2015	RF Conducted
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	Feb. 17, 2015	RF Conducted

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Nov. 29, 2014	Radiation
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May 11, 2015	Radiation
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Sep. 01, 2014	Radiation
Spectrum	R&S	FSP40	100004	9kHz ~ 40GHz	Apr. 02, 2015	Radiation
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 20, 2014	Radiation
Horn Antenna	ETS・LINDGREN	3115	6741	1GHz ~ 18GHz	Jul. 11, 2014	Radiation
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 15, 2014	Radiation
RF Cable-high	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Dec. 12, 2014	Radiation
Turn Table	EM Electronics	EM Electronics	060615	0 ~ 360 degree	N/A	Radiation
Antenna Mast	MF	MF-7802	MF780208179	1 ~ 4 m	N/A	Radiation

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	Feb. 02, 2015	Radiation

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

Appendix A. Test Photos