

EMC

TEST REPORT

Report No. : TS13090056-EME
Model No. : S7200HRT
Issued Date : Dec. 04, 2013

Applicant: Johnson Health Tech. Co., Ltd
No. 26, Ching Chung Rd., Taya District, Taichung City
428, Taiwan

Test Method/ Standard: 47 CFR FCC Part 15.249 & ANSI C63.4 2003

Registration No.: 93910
Test By: Intertek Testing Services Taiwan Ltd.
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Summary of Tests

Test	Reference	Results
Radiated Emission test	15.249(c), 15.209	Pass
Emission on the Band Edge	15.249(d)	Pass
Conducted Emission of AC Power	15.207	Pass
20dB Bandwidth	15.215(c)	Pass



1. General information

1.1 Identification of the EUT

Product:	LED Console for Exercise Machine
Model No.:	S7200HRT
FCC ID.:	TN7VEPS7200
Frequency Range:	2405MHz~2475MHz
Channel Number:	8 channels for 2405MHz~2475MHz
Frequency of Each Channel:	Channel 0: 2410 MHz, Channel 1: 2420 Mhz, Channel 2: 2430 MHz, Channel 3: 2450 MHz, Channel 4: 2460 MHz, Channel 5: 2405 Mhz, Channel 6: 2475 MHz, Channel 7: 2440 MHz
Type of Modulation:	GFSK
Rated Power:	DC 12 V from Display test
Power Cord:	N/A
Data Cable:	RJ-45 UTP Cat.5 0.5 meter × 1
Sample Received:	Jul. 25, 2013
Test Date(s):	Sep. 25, 2013~Nov. 29, 2013
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Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.



1.2 Additional information about the EUT

The EUT is LED Console for Exercise Machine, and was defined as information technology equipment.

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : 0 dBi
Antenna Type : Monopole antenna
Connector Type : Fixed

1.4 Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Description of Data Cable
Display Test	N/A	960701	N/A	RJ-45 UTP Cat.5 0.5 meter × 1
Adapter	Elementech Internation Co	Au-7991n	R53240	N/A



2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

TX-Mode base on main board connect display test with RJ-45, and execute directly when power on.

With individual verifying, the maximum output power was found out 1 Mbps data rate in GFSK mode.The final tests were executed under the conditions recorded in this report individually.

2.4 Test equipment

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100018	2012/11/30	2013/11/29
Spectrum Analyzer	Rohde&schwarz	FSP30	100137	2013/06/21	2014/06/20
Spectrum Analyzer	Rohde&schwarz	FSEK30	100186	2013/01/23	2014/01/22
Loop Antenna	RolfHeine	LA-285	02/10033	2012/03/20	2014/03/20
Horn Antenna (1-18G)	Schwarzbeck	BBHA 9120 D	9120D-456	2012/09/03	2014/09/02
Horn Antenna (14-42G)	SHWARZBECK	BBHA 9170	BBHA9170159	2012/09/05	2014/09/04
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-172	2013/08/08	2015/08/07
Pre-Amplifier	MITEQ	AFS44-00102650 --42-10P-44	1495287	2011/10/27	2013/10/26
Pre-Amplifier	MITEQ	JS4-26004000--2 7-8A	828825	2012/09/18	2014/09/17
Power Meter	Anritsu	ML2495A	0844001	2012/10/09	2013/10/08
Power Sensor	Anritsu	MA2411B	0738452	2012/10/09	2013/10/08
Temperature&Humidity Test Chamber	TERCHY	MHU-225LRU (SA)	950838	2013/06/14	2014/06/13
Two-Line V-Network	Rohde&schwarz	ESH3-Z5	838979/014	2012/10/29	2013/10/28

Note: The above equipments are within the valid calibration period.

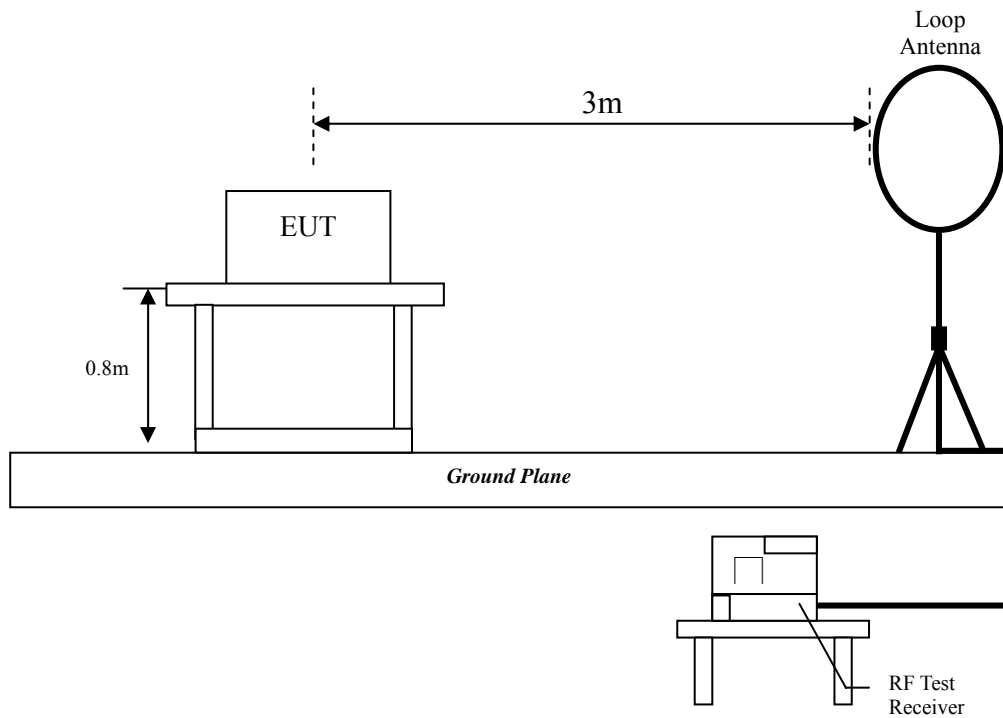
3. Radiated emission test FCC 15.249 (C)

3.1 Operating environment

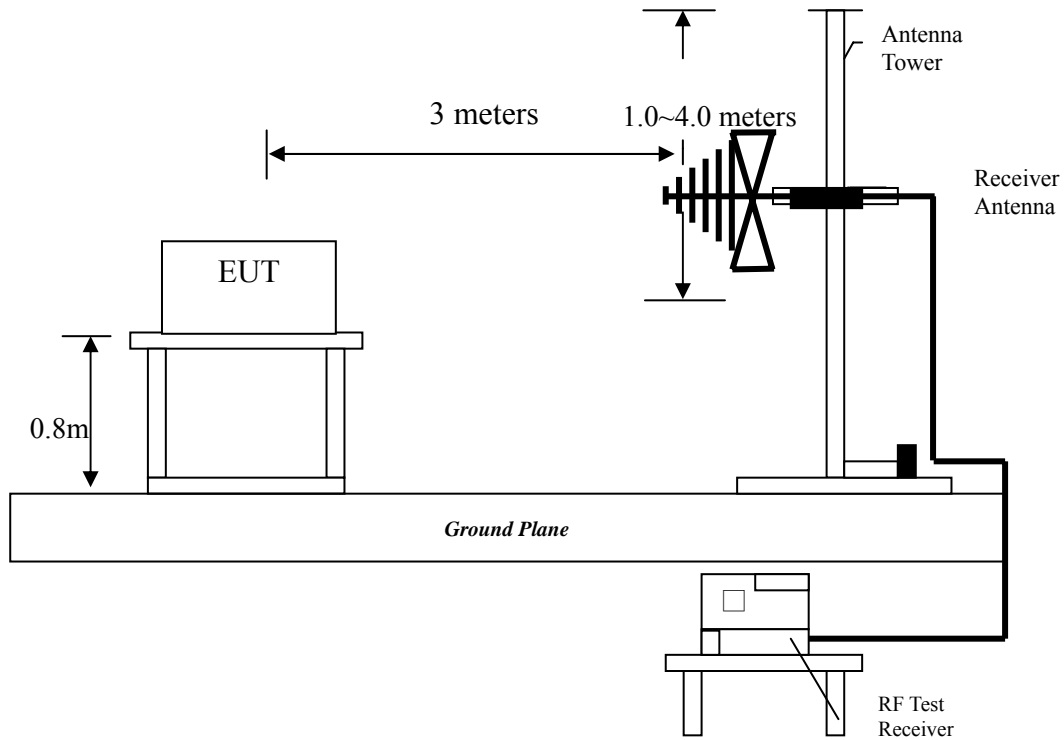
Temperature: 25 °C
Relative Humidity: 55 %
Atmospheric Pressure 1008 hPa

3.2 Test setup & procedure

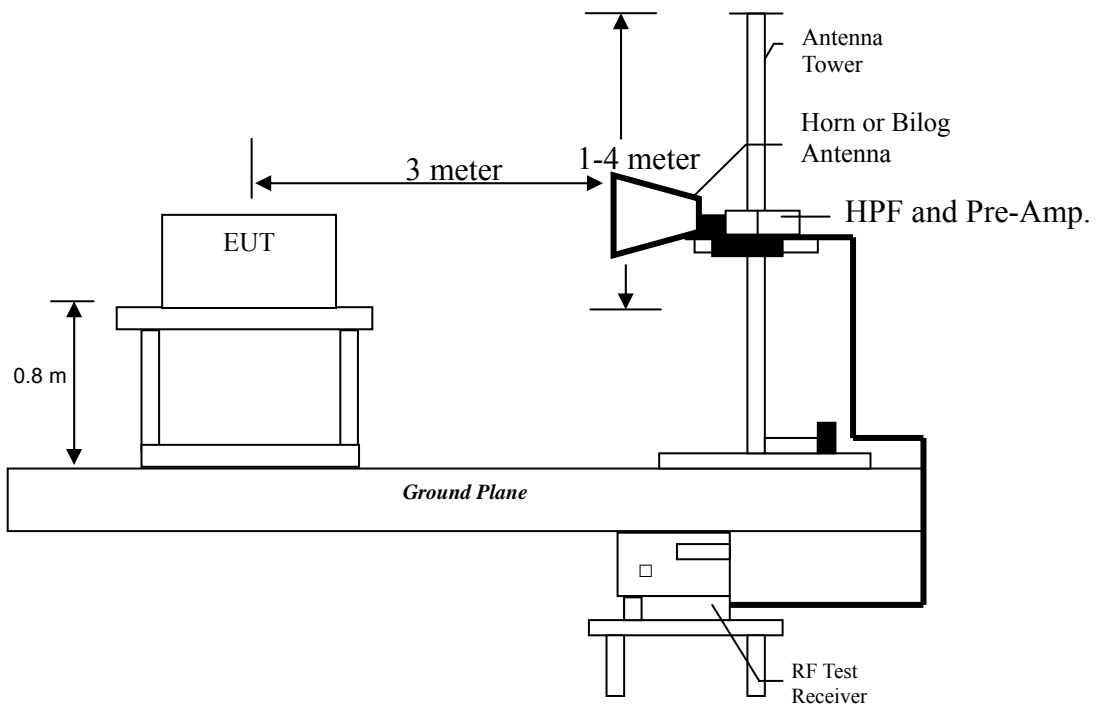
Radiated emission from 9kHz to 30MHz uses Loop Antenna:



Radiated emission from 30MHz to 1GHz uses Bilog Antenna:



Radiated emission above 1GHz uses Horn Antenna:



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report. The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

3.3 Emission limit

3.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
2400-2483.5	50	94	500	54

3.3.2 General radiated emission limits

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

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Measurement uncertainty was calculated in accordance with TR 100 028-1.

Parameter	Uncertainty
Radiated Emission	Vertical: 4.13 dB Horizontal: 3.85 dB
Conducted Emission	2.08 dB.

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

3.4 Radiated spurious emission test data

3.4.1 Measurement results: frequency range from 9kHz to 30MHz

Freq. (kHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBUV)	Corrected Level (dBUV/m)	Limit @ 3 m (dBUV/m)	Margin (dB)
30	QP	-28.52	51.36	22.84	38.1	-15.26
350	QP	-62.15	35.44	-26.71	16.71	-43.42
710	QP	-22.85	30.75	7.90	30.8	-22.90
920	QP	-23.10	28.66	5.56	28.32	-22.76

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



3.4.2 Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under GFSK continuously transmitting mode. Channel 0, 20, 39 were verified. The worst case occurred at GFSK TX Middle Channel.

EUT : S7200HRT
Worst Case : GFSK TX at Middle Channel

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
V	30.00	QP	12.60	19.80	32.40	40.00	-7.60
V	76.56	QP	10.39	23.41	33.80	40.00	-6.20
V	115.36	QP	8.19	16.80	24.99	43.50	-18.51
V	161.92	QP	15.70	11.64	27.34	43.50	-16.16
V	518.88	QP	18.56	8.44	26.99	46.00	-19.01
V	806.00	QP	23.29	8.23	31.52	46.00	-14.48
H	76.56	QP	11.29	19.41	30.69	40.00	-9.31
H	161.92	QP	13.84	14.40	28.23	43.50	-15.27
H	216.24	QP	11.10	12.41	23.50	46.00	-22.50
H	305.48	QP	14.32	14.21	28.52	46.00	-17.48
H	520.82	QP	18.77	14.83	33.60	46.00	-12.40
H	755.56	QP	23.02	9.73	32.75	46.00	-13.25

Remark: 1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

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



3.4.3 Measurement results: frequency above 1GHz

EUT : S7200HRT
Test Condition : GFSK TX at Low Channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4810	PK	V	35.1	38.54	46.09	49.53	54	-4.47
7200	PK	V	33	44.6	35.92	47.52	54	-6.48
4810	PK	H	35.1	38.54	47.6	51.04	54	-2.96
7200	PK	H	33	44.6	36.24	47.84	54	-6.16

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : S7200HRT
Test Condition : GFSK TX at Middle Channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4880	PK	V	35.1	38.54	52.31	55.75	74	-18.25
4880	AV	V	35.1	38.54	50.26	53.7	54	-0.30
4880	PK	H	35.1	38.54	50.19	53.63	54	-0.37
4880	AV	H	35.1	38.54	49.34	52.78	54	-1.22
7320	PK	H	33	44.6	36.64	48.24	54	-5.76

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.



EUT : S7200HRT
Test Condition : GFSK TX at High Channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4950	PK	V	35.1	38.54	50.29	53.73	54	-0.27
4950	AV	V	35.1	38.54	49.12	52.56	54	-1.44
4950	PK	H	35.1	38.54	47.29	50.73	54	-3.27

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the system noise floor.



3.4.4 Measurement results: Fundamental and harmonics emission

EUT : S7200HRT
Test Condition : Tx at Low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2405	PK	V	31.93	55.59	87.52	94	-6.48
2405	PK	H	31.93	54.20	86.13	94	-7.87

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : S7200HRT
Test Condition : Tx at Middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2440	PK	V	32.1	58.63	90.73	94	-3.27
2440	PK	H	32.1	54.76	86.86	94	-7.14

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.



EUT : S7200HRT
Test Condition : Tx at High channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2475	PK	V	32.01	56.31	88.32	94	-5.68
2475	PK	H	28.18	55.99	84.17	94	-9.83

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.



4. Radiated emission on the band edge FCC 15.249(d)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental (2405~2475 MHz) or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

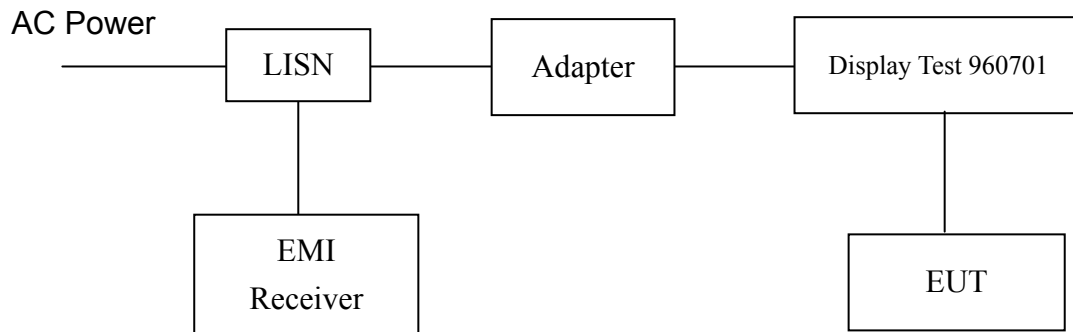
Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Restricted band (MHz)
2340.03	PK	V	38.01	31.61	64.92	58.52	74	-15.48	2310~2390
2340.03	AV	V	38.01	31.61	51.93	45.53	54	-8.47	
2405.00	PK	V	38.03	31.92	97.62	91.52		91.52	
2405.00	AV	V	38.03	31.92	97.35	91.25		91.25	
2475.00	PK	V	38.04	32.25	94.35	88.56		88.56	
2475.00	AV	V	38.04	32.25	94.03	88.24		88.24	
2499.34	PK	V	38.05	32.37	64.04	58.36	74	-15.64	2483.5~2500
2499.34	AV	V	38.05	32.37	51.52	45.84	54	-8.16	

5. Conducted emission test FCC 15.207

5.1 Operating environment

Temperature:	25	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa

5.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.

Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/1992 on conducted measurement. The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

The EUT configuration please refer to the “Conducted set-up photo.pdf”.



5.3 Emission limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

*Decreases with the logarithm of the frequency.

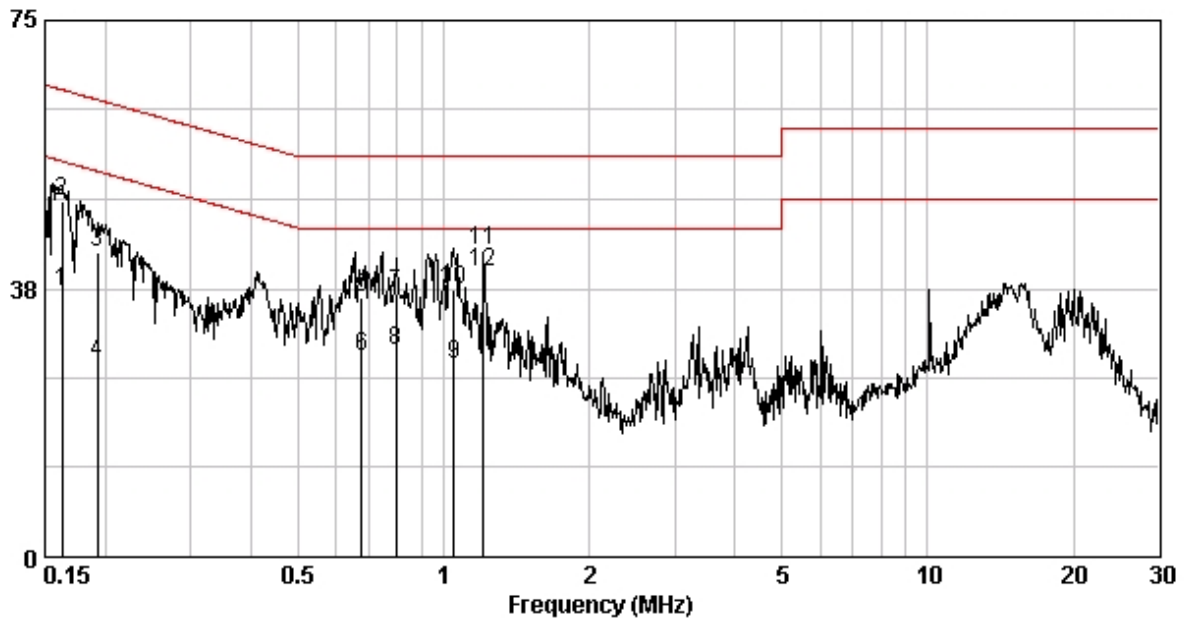
5.4 Conducted emission data FCC 15.207

Phase: Line
 Model No.: S7200HRT
 Test Condition: Adapter mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.162	9.55	49.75	65.34	37.22	55.34	-15.59	-18.12
0.192	9.56	42.71	63.93	27.15	53.93	-21.22	-26.78
0.676	9.61	36.21	56.00	28.05	46.00	-19.79	-17.95
0.796	9.62	36.71	56.00	28.75	46.00	-19.29	-17.25
1.049	9.62	37.30	56.00	26.81	46.00	-18.70	-19.19
1.207	9.64	42.93	56.00	39.85	46.00	-13.07	-6.15

Remark:

1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



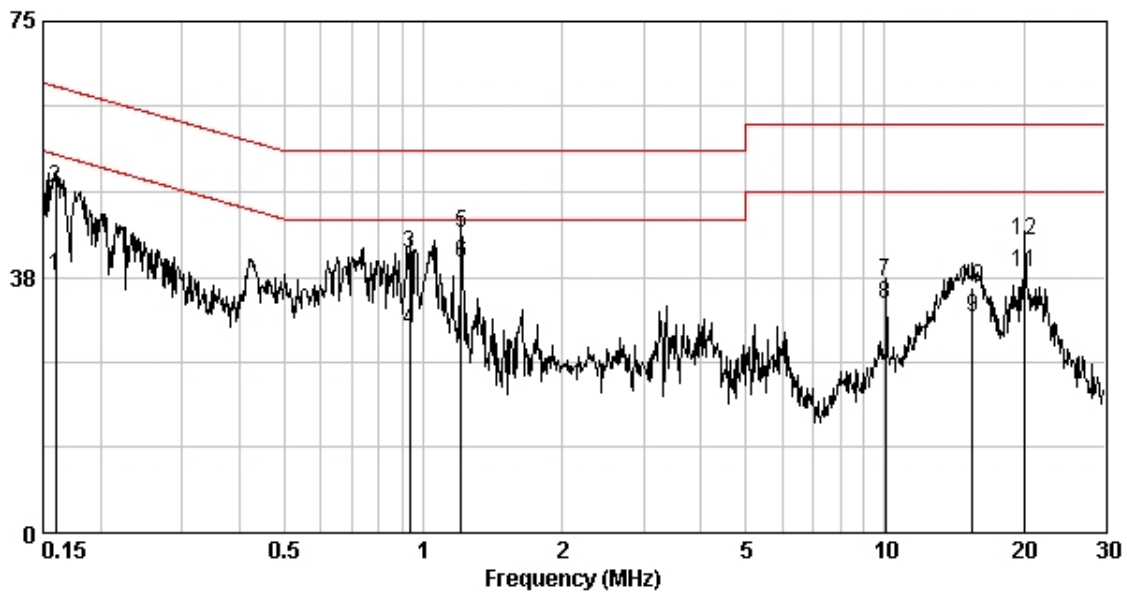


Phase: Line
Model No.: S7200HRT
Test Condition: Adapter mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.160	9.55	50.42	65.47	37.71	55.47	-15.05	-17.76
0.933	9.62	40.90	56.00	29.72	46.00	-15.10	-16.28
1.205	9.63	44.02	56.00	39.64	46.00	-11.98	-6.36
10.040	9.79	36.81	60.00	33.53	50.00	-23.19	-16.47
15.470	9.88	36.11	60.00	31.50	50.00	-23.89	-18.50
20.077	9.95	42.81	60.00	38.25	50.00	-17.19	-11.75

Remark:

1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)





6. 20dB Bandwidth test

6.1 Operating environment

Temperature: 22 °C
Relative Humidity: 56 %
Atmospheric Pressure: 1008 hPa

6.2 Test setup & procedure

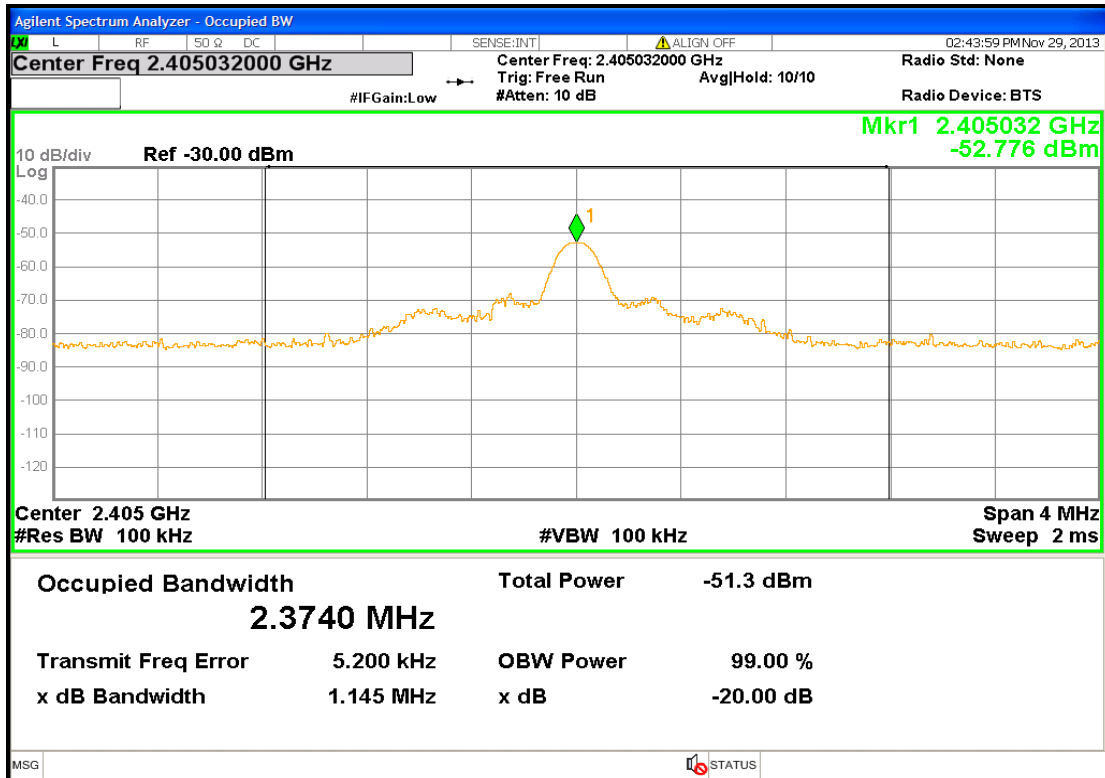
The 20dB bandwidth was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 100 kHz, the video bandwidth \geq RBW, and the SPAN may equal to approximately 2 to 3 times the 20dB bandwidth. The test was performed at 3 channels (lowest, middle and highest channel). The maximum 20dB modulation bandwidth is in the following Table.

6.3 Measured data of modulated bandwidth test results

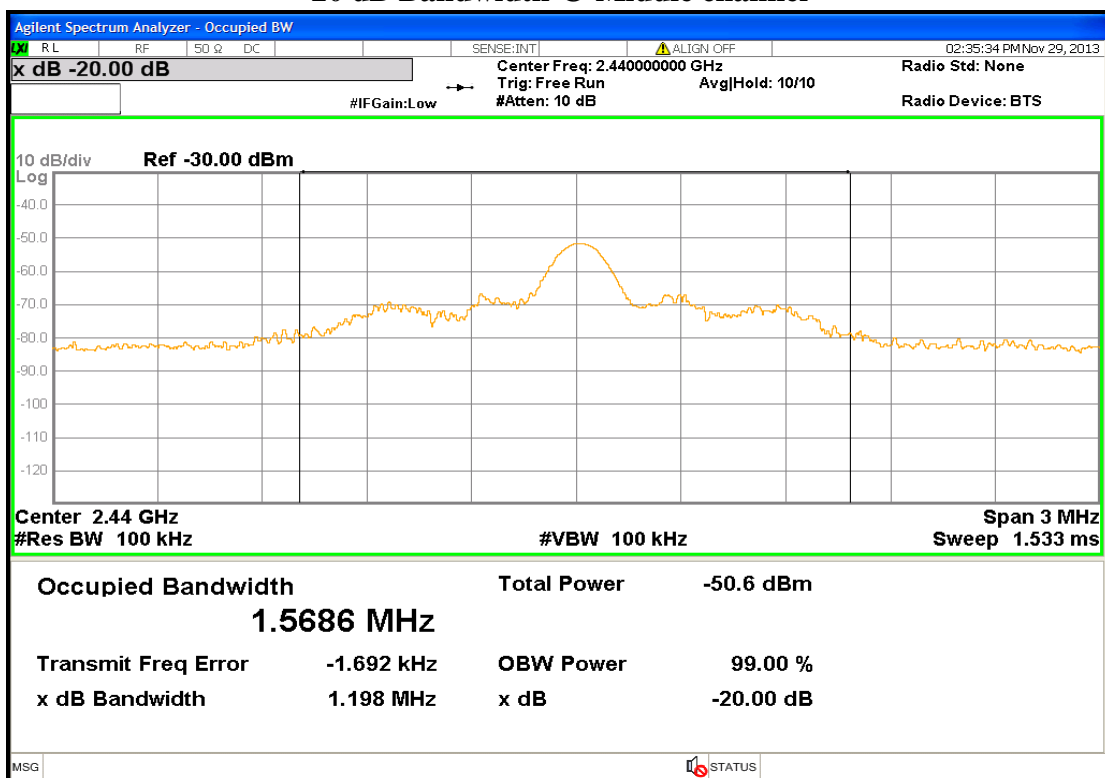
Mode	Channel	Frequency (MHz)	20dB Bandwidth(MHz)
			chain0
GFSK	Low	2405	1.145
	Middle	2440	1.198
	High	2475	1.263

Please see the plot below.

20 dB Bandwidth @ Low channel



20 dB Bandwidth @ Middle channel





20 dB Bandwidth @ High channel

