FCC Test Report (Wireless Serial Radio Modem)

FCC ID	:	**2ABEO-EZ50B**
Applicant	:	Shenzhen Jizhuo Technology Co. LTD Rm811-813, Building212,Tairan Industrial Area, Futian district, Shenzhen, Guangdong, China
Sample Description		
Product Name	:	**Wireless Serial Radio Modem**
Model No.	:	EZ50B
Serial No.	:	N/A
Trademark	:	JZ
Receipt Date	:	2014-08-05
Test Date	:	2014-08-05 to 2014-08-15
Issue Date	:	2014-08-16
Test Standard(s)	:	**FCC CFR Title 47 Part 15 Subpart C Section 15.249**
Conclusions	:	**PASSED***

*In the configuration tested, the EUT complied with the standards specified above.

Test/Witness Engineer : Jason Deng

Approved & Authorized : Frank Zhang

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

Contents

CONTENTS....2
1 GENERAL INFORMATION....3
1.1. Client Information....3
1.2. General Description of EUT (Equipment Under Test)....3
1.3. Block Diagram Showing The Configuration of System Tested....4
1.4. Description of Support Units....4
1.5. External I/O Cable....4
1.6. Description of Test Mode....4
1.7. Test Instruments List....5
1.8. Laboratory Location....5
2 TEST SUMMARY....6
3 ANTENNA REQUIREMENT....7
3.1. Standard Requirement....7
3.2. Antenna Connected Construction....7
4 CONDUCTED EMISSION TEST....8
4.1. Test Standard and Limit....8
4.2. Test Setup....8
4.3. Test Procedure....8
4.4. Test Data....9
5 20DB OCCUPY BANDWIDTH TEST....11
5.1 Test Standard and Limit....11
5.2 Test Setup....11
5.3 Test Procedure....11
5.4 Test Data....11
6 SPURIOUS EMISSION....12
6.1 Test Standard and Limit....12
6.3 Test Setup....12
6.4 Test Procedure....13
6.5 Test Data....14

1 General Information

1.1. Client Information

Applicant	:	Shenzhen Jizhuo Technology Co. LTD
Address	:	Rm811-813, Building212,Tairan Industrial Area, Futian district, Shenzhen, Guangdong, China
Manufacturer	:	Shenzhen Jizhuo Technology Co. LTD
Address	:	Rm811-813, Building212,Tairan Industrial Area, Futian district, Shenzhen, Guangdong, China

1.2. General Description of EUT (Equipment Under Test)

Product Name	:	Wireless Serial Radio Modem	
Models No.	:	EZ50B	
Serial No.	:	N/A	
Trademark	:	JZ	
Product Description	:	Operation Frequency:	912.2~916.694MHz
		Transfer Rate:	1/2/3 Mbits/s
		Number of Channel:	8 Channels
		Modulation Type:	GFSK
		Antenna Type:	Unique Antenna
		Antenna Gain:	3 dBi
Power Supply	:	DC 5V by USB Port	

Note:

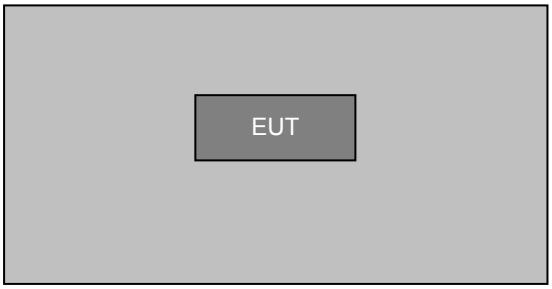
(1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

(2) Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	912.2000	05	916.6940	---	---
02	913.4288	06	916.2332	---	---
03	913.7360	07	915.1580	---	---
04	912.5072	08	915.9260	---	---

Remark: Channel 01, 07 &05 were selected for testing.

1.3. Block Diagram Showing The Configuration of System Tested



1.4. Description of Support Units

Name	Model	Serial Number	Manufacturer
Printer	HP1020	CNCJ410726	HP
LCD Monitor	G205HV	10306738385	ACER
PC	ASPIREM1830	PTSF90C00305005CAC3000	ACER
Keyboard	SK-9625	KBUSB1580500037E0100	ACER
Mouse	MS.11200.014	M-UAY-ACR2	ACER

1.5. External I/O Cable

N/A

1.6. Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

Test Mode	Description
Transmitting mode	Keep the EUT in Transmitting mode with worst case data rate
Remark	NIL

Remark: The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

1.7. Test Instruments List

Item	Test Equipment	Manufacturer	Model No.	Cal. Date	Cal. Due date
1	Bilog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	Mar. 28, 2014	Mar. 27, 2015
2	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	Mar. 28, 2014	Mar. 27, 2015
3	Coaxial Cable	N/A	N/A	Mar. 28, 2014	Mar. 27, 2015
4	Coaxial Cable	N/A	N/A	Mar. 28, 2014	Mar. 27, 2015
5	Coaxial cable	N/A	N/A	Mar. 28, 2014	Mar. 27, 2015
6	Coaxial Cable	N/A	N/A	Mar. 28, 2014	Mar. 27, 2015
7	Coaxial Cable	N/A	N/A	Mar. 28, 2014	Mar. 27, 2015
8	Amplifier (10kHz-1.3GHz)	HP	8447D	Mar. 28, 2014	Mar. 27, 2015
9	Amplifier (1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	Mar. 28, 2014	Mar. 27, 2015
10	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	Mar. 28, 2014	Mar. 27, 2015
11	Horn Antenna	ETS-LINDGREN	3160	Mar. 28, 2014	Mar. 27, 2015
12	Positioning Controller	UC	UC3000	N/A	N/A
13	Spectrum analyzer 9kHz-30GHz	Rohde & Schwarz	FSP	Mar. 28, 2014	Mar. 27, 2015
14	EMI Test Receiver	Rohde & Schwarz	ESPI	Mar. 28, 2014	Mar. 27, 2015
15	Loop antenna	Laplace instrument	RF300	Mar. 28, 2014	Mar. 27, 2015
16	Universal radio communication tester	Rhode & Schwarz	CMU200	Mar. 28, 2014	Mar. 27, 2015
17	Signal Analyzer	Rohde & Schwarz	FSIQ3	Mar. 28, 2014	Mar. 27, 2015
18	EMI Test Receiver	Rohde & Schwarz ESCI	ESCI	Mar. 28, 2014	Mar. 27, 2015
19	LISN	CHASE	MN2050D	Mar. 28, 2014	Mar. 27, 2015

1.8. Laboratory Location

Shenzhen Certification Technology Service Co., Ltd.
Address: 2F, Building B, East Area of Nanchang Second Industrial Zone, Gushu 2nd Road, Bao'an District, Shenzhen 518126, P.R. China

At the time of testing, the Laboratory is accredited. It is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 197647.
Tel:86-755-86375552 Fax: 86-755-26736857

2 Test Summary

Standard Section	Test Item	Judgment
15.203	Antenna Requirement	PASSED
15.207(a)	Conducted Emission	PASSED
15.215(c)	20dB Bandwidth	PASSED
15.205/15.209/15.249	Spurious Emission	PASSED
Remark: “N/A” is an abbreviation for Not Applicable.		

3 Antenna Requirement

3.1. Standard Requirement

3.1.1 Test standard

FCC Part15 Section 15.203

3.1.2 Requirement

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

3.2. Antenna Connected Construction

The Wireless Serial Radio Modem antenna is an unique antenna connector, which shall be installed with, unique antenna, and the best case gain of the antenna is 3 dBi. It complies with the standard requirement.

4 Conducted Emission Test

4.1. Test Standard and Limit

4.1.1 Test Standard

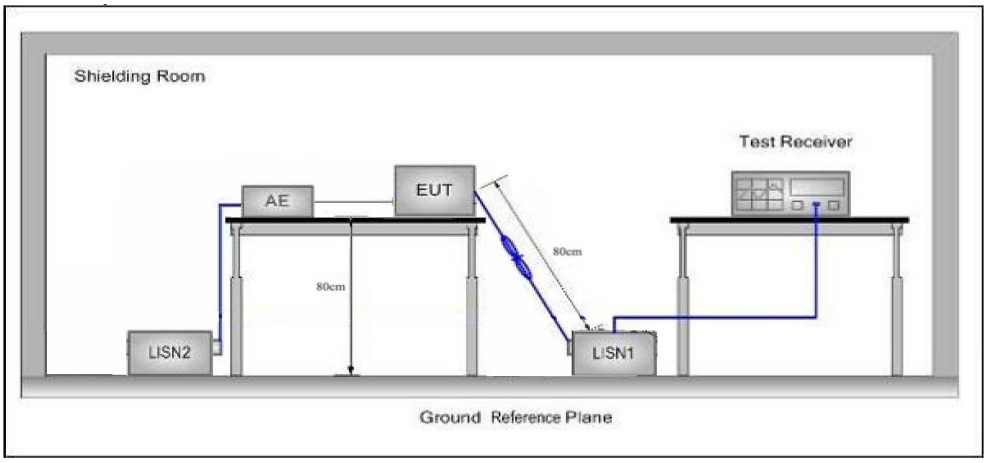
FCC Part15 Section 15.207

4.1.2 Test Limit

Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dBμV)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequencies.		

4.2. Test Setup



4.3. Test Procedure

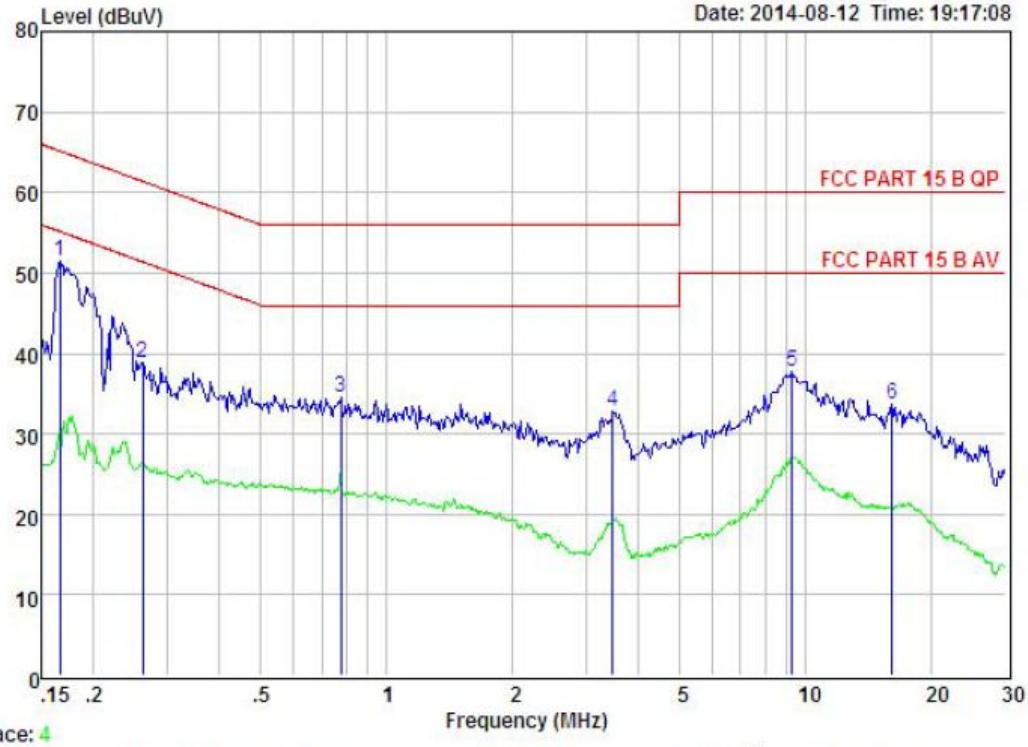
1) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50 Ω /50μH + 5 Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

2) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

The Test Receiver setup: RBW=9kHz, VBW=30kHz, Sweep time= auto

4.4. Test Data

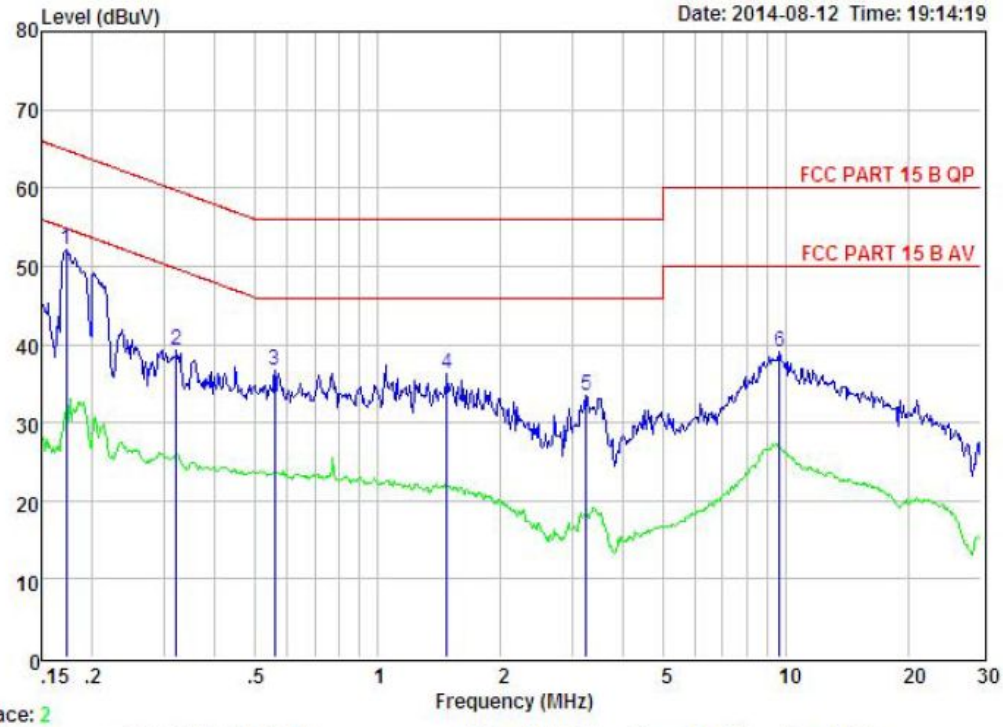


Trace: 4

Condition : FCC PART 15 B QP POL: LINE Temp:24 ℃ Hum:56 %
EUT :
Model No :
Test Mode : Normal Working
Power : AC 120V/60Hz
Test Engineer:
Remark :

Item	Freq	Read	LISN Factor	Preamp Factor	Cable Lose	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	0.166	41.67	0.03	-9.72	0.10	51.52	65.16	-13.64	Peak
2	0.262	28.95	0.03	-9.72	0.10	38.80	61.38	-22.58	Peak
3	0.779	24.63	0.00	-9.71	0.10	34.44	56.00	-21.56	Peak
4	3.472	22.89	0.08	-9.69	0.12	32.78	56.00	-23.22	Peak
5	9.302	28.08	0.17	-9.39	0.19	37.83	60.00	-22.17	Peak
6	16.055	23.70	0.25	-9.40	0.27	33.62	60.00	-26.38	Peak

Remarks: Level = Read + LISN Factor - Preamp Factor + Cable loss



Trace: 2

Condition : FCC PART 15 B QP POL: NEUTRAL Temp:24 ℃ Hum:56 %
EUT :
Model No :
Test Mode : Normal Working
Power : AC 120V/60Hz
Test Engineer:
Remark :

Item	Freq	Read	LISN Factor	Preamp Factor	Cable Lose	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	0.172	42.31	0.03	-9.72	0.10	52.16	64.86	-12.70	Peak
2	0.322	29.30	0.03	-9.72	0.10	39.15	59.66	-20.51	Peak
3	0.558	26.90	0.03	-9.72	0.10	36.75	56.00	-19.25	Peak
4	1.480	26.43	0.05	-9.71	0.10	36.29	56.00	-19.71	Peak
5	3.241	23.65	0.07	-9.69	0.12	33.53	56.00	-22.47	Peak
6	9.654	29.32	0.17	-9.36	0.20	39.05	60.00	-20.95	Peak

Remarks: Level = Read + LISN Factor - Preamp Factor + Cable loss

5 20dB Occupy Bandwidth Test

5.1 Test Standard and Limit

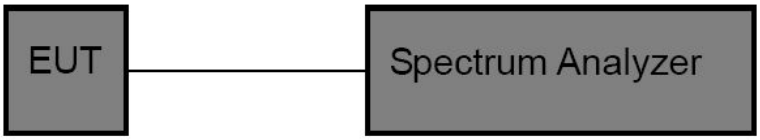
5.3.2. Test Standard

FCC Part15 C Section 15.215 (c)

5.3.2. Test Limit

FCC Part 15 Subpart C(15.249)		
Test Item	Limit	Frequency Range (MHz)
Bandwidth	20dB bandwidth	902-928

5.2 Test Setup



5.3 Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:

Bandwidth: RBW=30 kHz, VBW=100 kHz, detector= Peak

5.4 Test Data

Channel Number	Channel Frequency (MHz)	20dB Bandwidth (kHz)
		GFSK
CH 01	912.2000	47.3
CH 07	915.1580	47.3
CH 05	916.6940	46.8
Remark: NIL		

6 Spurious Emission

6.1 Test Standard and Limit

6.1.1 Test Standard

FCC Part15 C Section 15.205 & 15.209 & 15.249 (a) &15.249(c) & 15.249(d)

6.1.2 Test Limit

(1):

As 15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

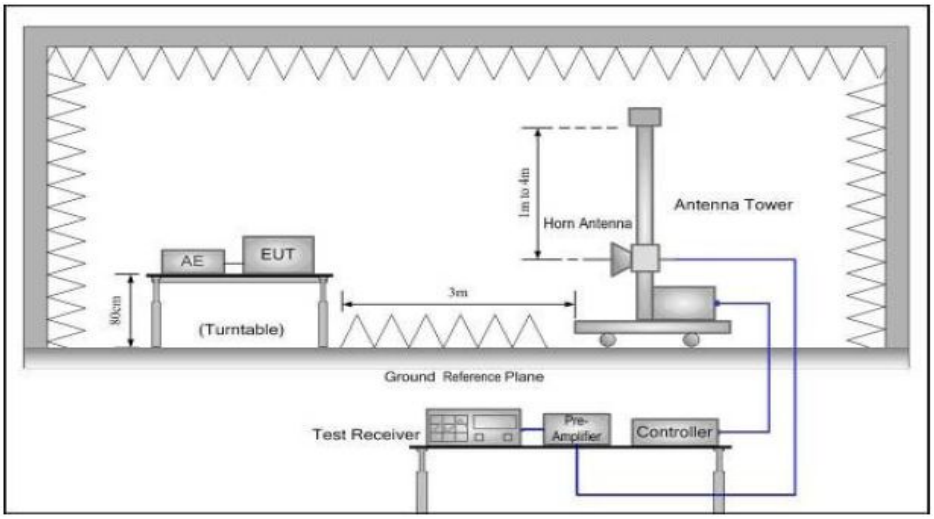
(2):

As 15.249(c), Field strength limits are specified at a distance of 3 meters.

(3):

As 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 or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

6.3 Test Setup



6.4 Test Procedure

1 1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

2 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

3 3) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

4 4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

5 5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. Peak Value: RBW=1MHz, VBW=3MHz; Average value: RBW=1MHz, VBW=10Hz

6 6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

6.5 Test Data

Test mode: GFSK					Test channel: Lowest				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Remark
912.2	83.58	21.18	3.84	30.08	78.52	94.0	---	H	Fundamental
61.32	33.2	12.44	1.39	29.28	17.75	40.0	-22.25	H	QP
92.15	34.5	12.5	2.02	30.08	18.94	43.5	-24.56	H	QP
223.53	32.9	11.05	2.86	29.76	17.05	43.5	-26.45	H	QP
321.57	36.9	13.63	3.01	29.58	23.96	46.0	-22.04	H	QP
456.47	33.2	18.07	3.16	30.26	24.47	46.0	-21.53	H	QP
1824.4	48.7	25.37	5.67	32.64	47.1	74.00	-26.90	H	PEAK/Harmonic
1824.4	35.2	25.37	5.67	32.64	41.6	54.00	-20.40	H	AVG./ Harmonic
2736.6	*	*	*	*	*	74.00	*	H	PEAK/Harmonic
2736.6	*	*	*	*	*	54.00	*	H	AVG./ Harmonic
3648.8	*	*	*	*	*	74.00	*	H	PEAK/Harmonic
3648.8	*	*	*	*	*	54.00	*	H	AVG./ Harmonic
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Level
912.20	86.79	21.18	3.84	30.08	86.79	94.0	---	V	Fundamental
92.17	35.1	12.5	2.02	30.08	35.1	43.5	-23.96	V	QP
223.69	32.9	11.05	2.86	29.76	32.9	43.5	-26.45	V	QP
322.08	37.4	13.63	3.01	29.58	37.4	46.0	-21.54	V	QP
456.41	34.1	18.07	3.16	30.26	34.1	46.0	-20.93	V	QP
1824.4	49.6	25.37	5.67	32.64	49.6	74.00	-26.00	V	PEAK/Harmonic
1824.4	35.9	25.37	5.67	32.64	35.9	54.00	-19.70	V	AVG./ Harmonic
2736.6	*	*	*	*	*	74.00	*	V	PEAK/Harmonic
2736.6	*	*	*	*	*	54.00	*	V	AVG./ Harmonic
3648.8	*	*	*	*	*	74.00	*	V	PEAK/Harmonic
3648.8	*	*	*	*	*	54.00	*	V	AVG./ Harmonic

Test mode: GFSK					Test channel: Middle				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Remark
915.158	82.68	21.2	3.85	30.1	77.63	94.0	---	H	Fundamental
61.32	34.2	12.44	1.39	29.28	18.75	40.0	-21.25	H	QP
92.15	34.9	12.5	2.02	30.08	19.34	43.5	-24.16	H	QP
223.53	33.1	11.05	2.86	29.76	17.25	43.5	-26.25	H	QP
321.57	36.8	13.63	3.01	29.58	23.86	46.0	-22.14	H	QP
456.47	32.9	18.07	3.16	30.26	23.87	46.0	-22.13	H	QP
1830.316	49.1	25.37	5.67	32.64	47.5	74.00	-26.50	H	PEAK/Harmonic
1830.316	35.6	25.37	5.67	32.64	34	54.00	-20.00	H	AVG./ Harmonic
2745.474	*	*	*	*	*	74.00	*	H	PEAK/Harmonic
2745.474	*	*	*	*	*	54.00	*	H	AVG./ Harmonic
3660.632	*	*	*	*	*	74.00	*	H	PEAK/Harmonic
3660.632	*	*	*	*	*	54.00	*	H	AVG./ Harmonic
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Level
915.158	85.91	21.2	3.85	30.1	80.86	94.0	---	V	Fundamental
92.17	35.3	12.5	2.02	30.08	19.74	43.5	-21.25	V	QP
223.69	33.1	11.05	2.86	29.76	17.25	43.5	-23.76	V	QP
322.08	35.8	13.63	3.01	29.58	22.86	46.0	-26.25	V	QP
456.41	34.3	18.07	3.16	30.26	25.27	46.0	-23.14	V	QP
1830.316	50.3	25.37	5.67	32.64	48.7	74.00	-20.73	V	PEAK/Harmonic
1830.316	38.9	25.37	5.67	32.64	37.3	54.00	-25.30	V	AVG./ Harmonic
2745.474	*	*	*	*	*	74.00	*	V	PEAK/Harmonic
2745.474	*	*	*	*	*	54.00	*	V	AVG./ Harmonic
3660.632	*	*	*	*	*	74.00	*	V	PEAK/Harmonic
3660.632	*	*	*	*	*	54.00	*	V	AVG./ Harmonic

Test mode: GFSK					Test channel: Highest				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Remark
916.694	82.79	21.21	3.85	30.1	77.75	94.0	---	H	Fundamental
61.32	35.6	12.44	1.39	29.28	20.15	40.0	-19.85	H	QP
92.15	34.9	12.5	2.02	30.08	19.34	43.5	-24.16	H	QP
223.53	34.5	11.05	2.86	29.76	18.65	43.5	-24.85	H	QP
321.57	36.3	13.63	3.01	29.58	23.36	46.0	-22.64	H	QP
456.47	37.2	18.07	3.16	30.26	28.17	46.0	-17.83	H	QP
1833.388	48.1	25.37	5.68	32.64	46.51	74.00	-27.49	H	PEAK/Harmonic
1833.388	36.7	25.37	5.68	32.64	35.11	54.00	-18.89	H	AVG./ Harmonic
2750.082	*	*	*	*	*	74.00	*	H	PEAK/Harmonic
2750.082	*	*	*	*	*	54.00	*	H	AVG./ Harmonic
3666.776	*	*	*	*	*	74.00	*	H	PEAK/Harmonic
3666.776	*	*	*	*	*	54.00	*	H	AVG./ Harmonic
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Level
916.694	87.2	21.21	3.85	30.1	82.16	94.0	---	V	Fundamental
92.17	35.3	12.5	2.02	30.08	19.74	43.5	-23.76	V	QP
223.69	34.8	11.05	2.86	29.76	18.95	43.5	-24.55	V	QP
322.08	36.9	13.63	3.01	29.58	23.96	46.0	-22.04	V	QP
456.41	37.1	18.07	3.16	30.26	28.07	46.0	-17.93	V	QP
1833.388	50.5	25.37	5.68	32.64	48.91	74.00	-25.09	V	PEAK/Harmonic
1833.388	40.9	25.37	5.68	32.64	39.31	54.00	-14.69	V	AVG./ Harmonic
2750.082	*	*	*	*	*	74.00	*	V	PEAK/Harmonic
2750.082	*	*	*	*	*	54.00	*	V	AVG./ Harmonic
3666.776	*	*	*	*	*	74.00	*	V	PEAK/Harmonic
3666.776	*	*	*	*	*	54.00	*	V	AVG./ Harmonic