



TESTING LABORATORY
CERTIFICATE #4820.01



FCC PART 15.249
RSS-GEN ISSUE 4, NOVEMBER 2014
RSS-210, ISSUE 9, AUGUST 2016

TEST REPORT

For

Flyability SA

Flyability SA, Avenue de Sevelin 20, Lausanne, Switzerland, CH-1004

FCC ID: 2AL7M-MAGICREMOTE
IC: 22887-MAGICREMOTE

Report Type: Class II permissive change	Product Name: Range Extender (REx) Remote Control
Report Number: RDG180417005-00BA2	
Report Date: 2018-05-08	
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. * This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “*”.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Range Extender (REx) Remote Control
EUT Model:	No.3
FCC ID:	2AL7M-MAGICREMOTE
IC:	22887-MAGICREMOTE
Rated Input Voltage:	DC 7.4V from lithium rechargeable battery DC 26.3V/26.1V from DC port
External Dimension:	18.2cm (L) x17.14 cm (W) x 10.52 cm(H)
Serial Number:	180417005
EUT Received Date:	2018-04-17

Objective

This type approval report is prepared on behalf of *Flyability SA* in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules, RSS-210, Issue 9, AUGUST 2016 of the Innovation, Science and Economic Development Canada.

The tests were performed in order to determine compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.249 rules.

This is Class II permissive change Application, the difference with the original is:

1. Changed the 2.4GHz antenna type from PCB to Dipole,
2. Changed the 5.8GHz antenna and it's location
3. The interface board.

The changes are not related with the other RF parameters, only RF exposure and radiation emissions were retested.

Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: 2AL7M-MAGICREMOTE .
ISED RSS-247 submissions with IC: 22887-MAGICREMOTE

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices, and the RSS-210, Issue 9, AUGUST 2016. Applicable Standard: Licence-Exempt Radio Apparatus: Category I Equipment

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	$\pm 5\%$
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB, 200M~1GHz: 5.92 dB, 1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB, 18G~26.5G: 5.47 dB, 26.5G~40G: 5.63 dB
Temperature	$\pm 1^{\circ}\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 0.4\%$
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062D.

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing in an engineering mode which was provided by the manufacturer.

The system employed 17 channels in the frequency range 5738-5808MHz, which were provided by the manufacturer:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5738	6	5762	11	5783	16	5803
2	5743	7	5763	12	5788	17	5808
3	5748	8	5768	13	5793	/	/
4	5753	9	5773	14	5796	/	/
5	5758	10	5778	15	5798	/	/

EUT was tested with Channel 5738 MHz, 5773 MHz and 5808 MHz

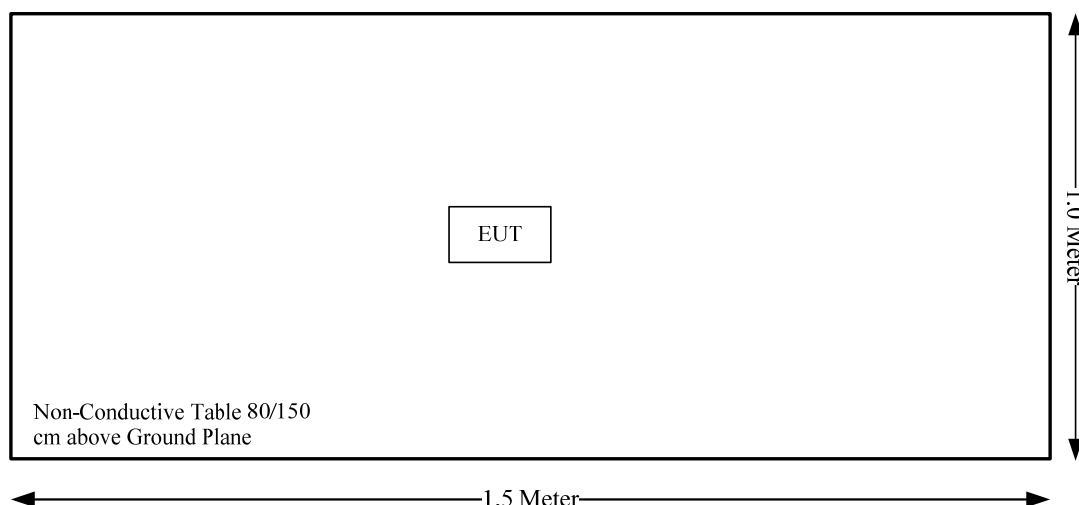
EUT Exercise Software

The software: SScom32 was used in the test. The system configured maximum power as default setting and switched the channel by software commands.

Equipment Modifications

No modifications were made to the EUT.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
FCC§15.203 RSS-GEN§8.3	Antenna Requirement	Compliance
RSS-102 §4	RF Exposure	Compliance
FCC§15.207(a) & RSS-Gen §8.8	Conduction Emissions	Not Applicable*
FCC15.205, §15.209, §15.249& RSS-210 §B10, RSS-Gen§8.9	Radiated Emissions	Compliance
FCC§15.215 (c)	20 dB Bandwidth	Compliance*
RSS-Gen §6.6	99% Occupied Bandwidth	Compliance*

Note:

Not applicable*: The device was powered by battery when user operates the device.

Compliance*: The Class II permissive change Application have not effected the result.

FCC §15.203 ,RSS-GEN§8.3- ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
 - b. Antenna must use a unique type of connector to attach to the EUT.
- Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

According to RSS-Gen §8.3, The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.⁹ When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

Antenna Connector Construction

The EUT has an internal PCB antenna for 5.8GHz, the antenna gain is 1.5 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

RSS-102 §4- RF EXPOSURE

Applicable Standard

According to RSS-102 §4 Table 3, SAR limits for device used by the general public

Body Region	Average SAR (W/Kg)	Averaging Time (minutes)	Mass Average (g)
Whole Body	0.08	6	Whole Body
Localized Head, Neck and Trunk	1.6	6	1
Localized Limbs	4	6	10

Test Result

Compliant, please refer to the SAR report: RDG180417005-20A2.

FCC§15.205, §15.209&§15.249 & RSS-210 §B10&RSS-GEN§8.9 - RADIATED EMISSIONS

Applicable Standard

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, 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

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

According to RSS-210 §B10

Devices shall comply with the following requirements:

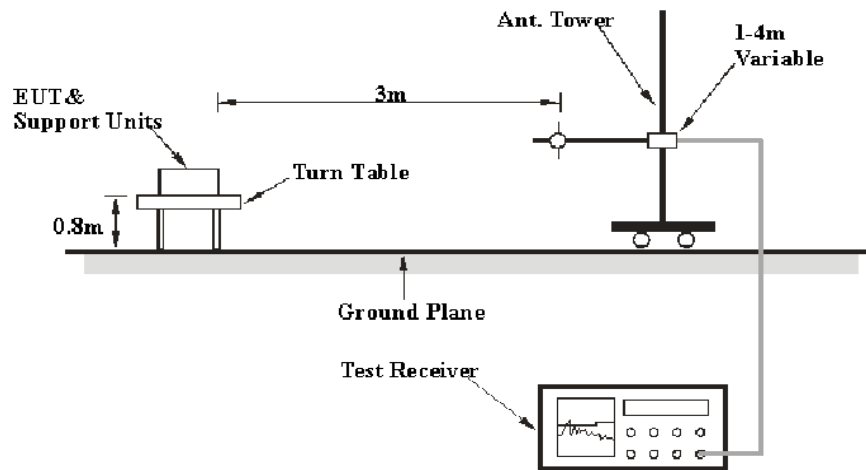
The field strength of fundamental and harmonic emissions, measured at 3 m, shall not (a)exceed 50 mV/m and 0.5 mV/m respectively.

The field strength limits shall be measured using an average detector, except for the fundamental emission in the frequency band 902-928 MHz, which is based on measurements using an International Special Committee on Radio Interference (CISPR) quasi-peak detector.

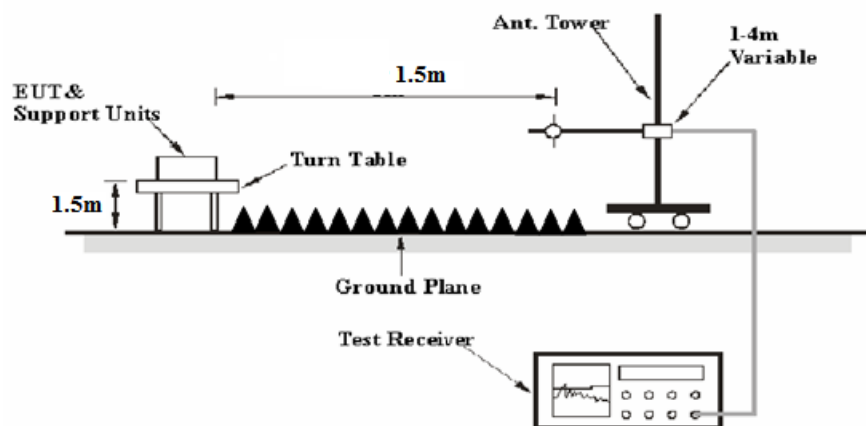
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, RSS-Gen, whichever are the lesser attenuation.

EUT Setup

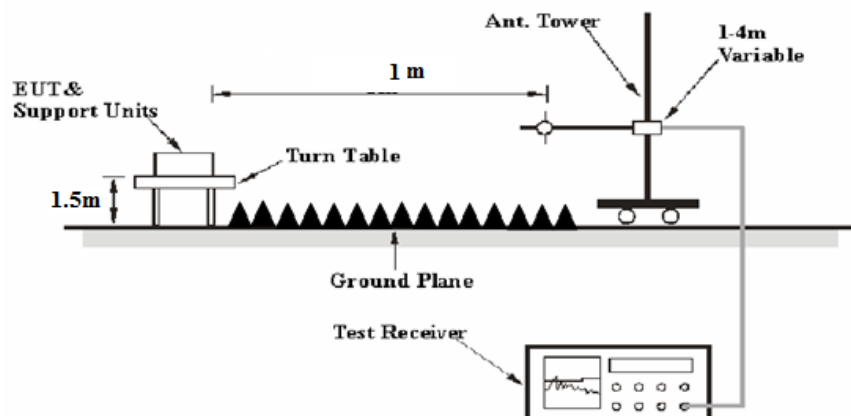
Below 1 GHz:



1-26.5 GHz:



26.5-40 GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, FCC 15.249 and RSS-210, RSS-Gen limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

Test Equipment Setup

The system was investigated from 30 MHz to 40 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1GHz, peak and average detection mode above 1 GHz.

According to C63.10, the above 1G test result shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1.5m or 1m

Distance extrapolation factor = $20 \log (\text{specific distance [3m]}/\text{test distance [1.5m]})$ dB = 6.02 dB
or

Distance extrapolation factor = $20 \log (\text{specific distance [3m]}/\text{test distance [1m]})$ dB = 9.54 dB

All emissions under the average limit and under the noise floor have not recorded in the report.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2018-11-10
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2018-01-04	2019-01-04
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
Ducommun	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-01 1302	2016-11-18	2019-11-18
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-06-27	2018-06-27
Sinoscite	Bandstop Filters	BSF5150-5850MN-0899-003	0899003	2017-05-06	2018-05-06
Mini Circuits	High Pass Filter	VHF-6010+	31118	2017-06-16	2018-06-16
N/A	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2017-06-27	2018-06-27
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

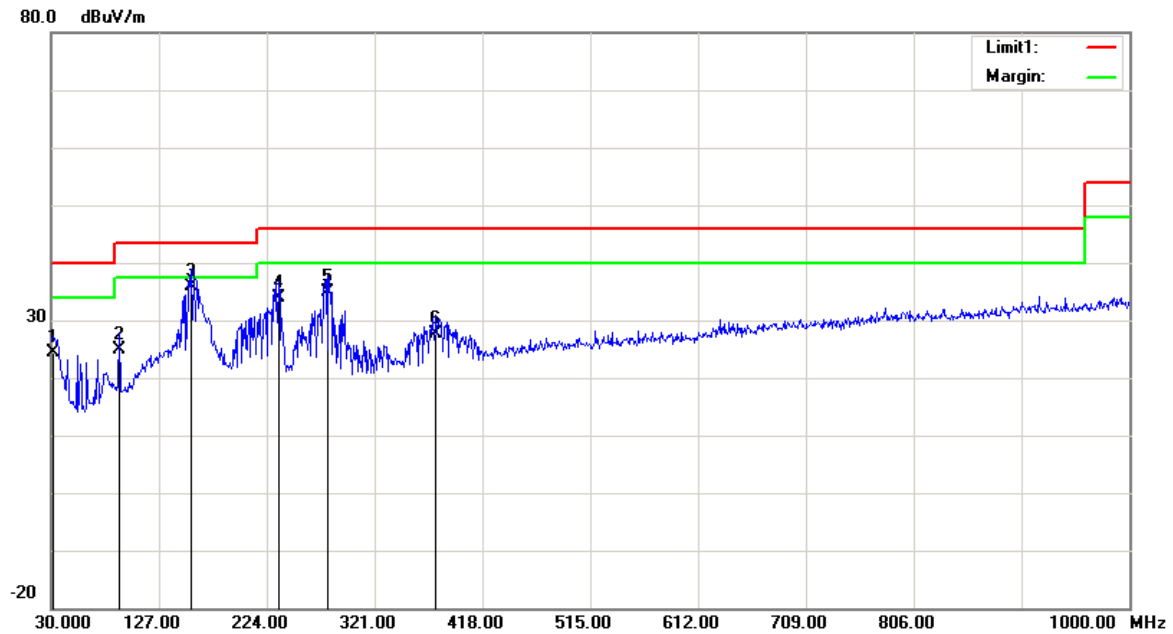
Temperature:	28.3 °C
Relative Humidity:	60 %
ATM Pressure:	100.8 kPa

The testing was performed by Blake Yang on 2018-05-04.

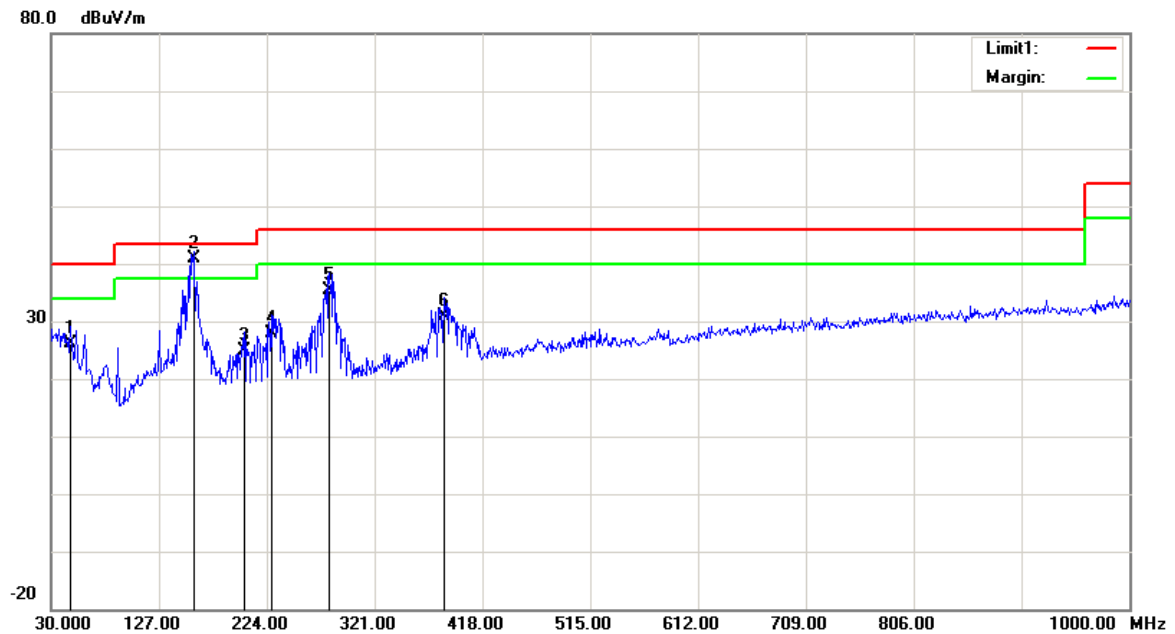
Test Mode: Transmitting

1) 30MHz-1GHz(Worst Case at Middle Channel)

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
31.9400	24.20	QP	0.10	24.30	40.00	15.70
91.1100	36.08	QP	-11.18	24.90	43.50	18.60
156.1000	41.84	QP	-5.94	35.90	43.50	7.60
234.6700	40.34	QP	-6.44	33.90	46.00	12.10
279.2900	38.94	QP	-4.14	34.80	46.00	11.20
376.2900	30.33	QP	-2.63	27.70	46.00	18.30

Vertical:

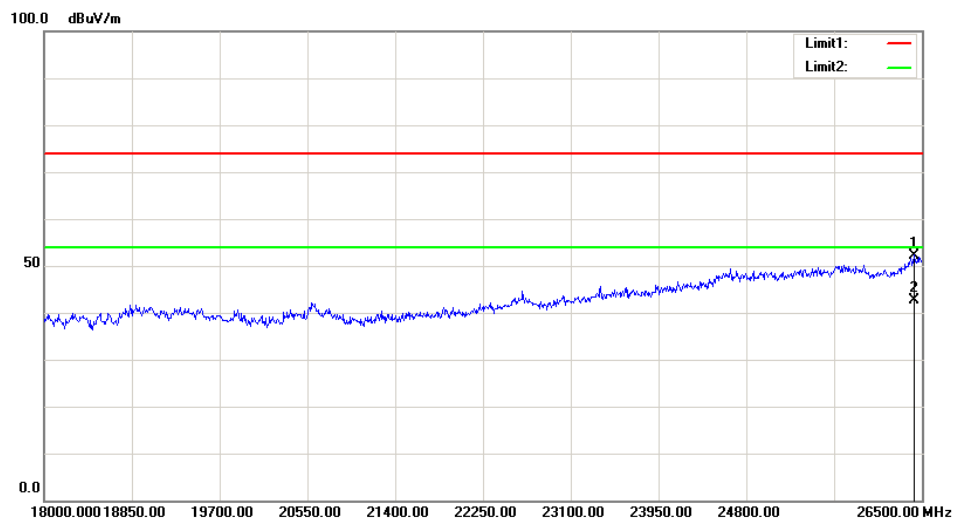
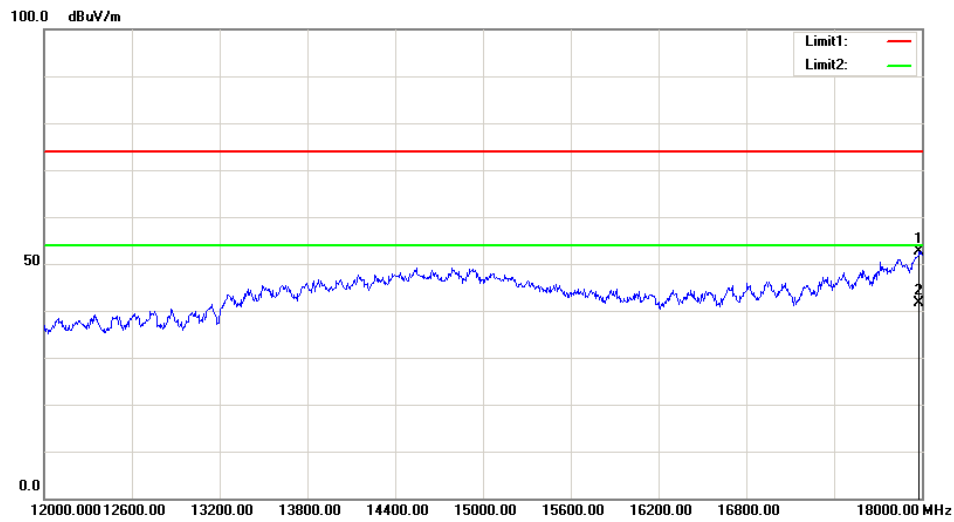
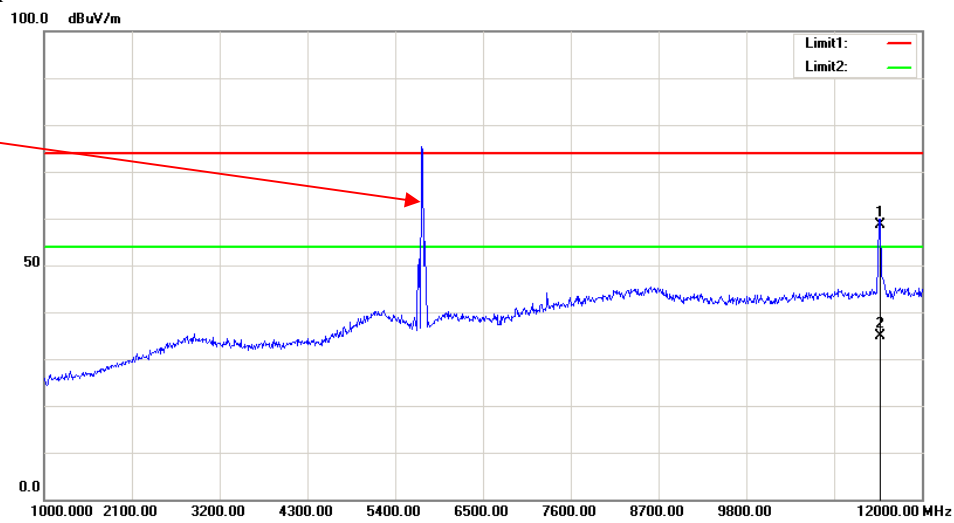
Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
47.4600	36.50	QP	-10.40	26.10	40.00	13.90
158.0400	46.89	QP	-5.89	41.00	43.50	2.50
203.6300	31.36	QP	-6.36	25.00	43.50	18.50
227.8800	34.67	QP	-6.67	28.00	46.00	18.00
280.2600	39.53	QP	-4.13	35.40	46.00	10.60
383.0800	33.48	QP	-2.48	31.00	46.00	15.00

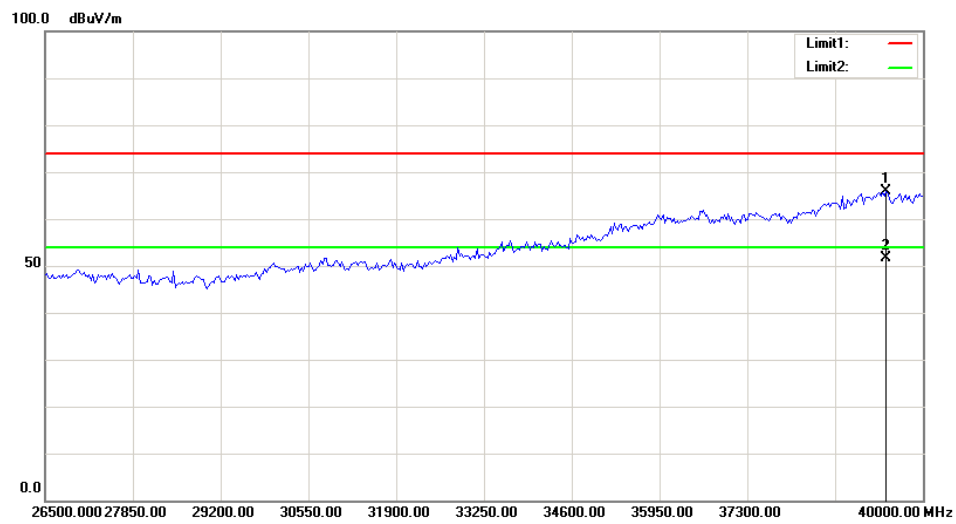
2) 1GHz-25GHz:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Extrapolation result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)						
Low Channel: 5738 MHz										
5738.00	73.11	PK	H	34.20	3.69	0.00	111.00	104.98	113.98	9.00
5738.00	45.07	AV	H	34.20	3.69	0.00	82.96	76.94	93.98	17.04
5738.00	69.51	PK	V	34.20	3.69	0.00	107.40	101.38	113.98	12.60
5738.00	41.67	AV	V	34.20	3.69	0.00	79.56	73.54	93.98	20.44
5725.00	29.44	PK	H	34.19	3.69	0.00	67.32	61.3	74.00	12.70
5725.00	15.46	AV	H	34.19	3.69	0.00	53.34	47.32	54.00	6.68
11476.00	63.53	PK	H	38.98	6.59	37.35	71.75	65.73	74.00	8.27
11476.00	38.72	AV	H	38.98	6.59	37.35	46.94	40.92	54.00	13.08
17214.00	56.12	PK	H	41.44	8.78	38.62	67.72	61.7	74.00	12.30
17214.00	31.87	AV	H	41.44	8.78	38.62	43.47	37.45	54.00	16.55
Middle Channel: 5773 MHz										
5773.00	73.82	PK	H	34.21	3.70	0.00	111.73	105.71	113.98	8.27
5773.00	45.68	AV	H	34.21	3.70	0.00	83.59	77.57	93.98	16.41
5773.00	71.04	PK	V	34.21	3.70	0.00	108.95	102.93	113.98	11.05
5773.00	43.27	AV	V	34.21	3.70	0.00	81.18	75.16	93.98	18.82
11546.00	63.15	PK	H	39.00	6.60	37.41	71.34	65.32	74.00	8.68
11546.00	37.16	AV	H	39.00	6.60	37.41	45.35	39.33	54.00	14.67
17319.00	57.61	PK	H	42.05	8.80	38.55	69.91	63.89	74.00	10.11
17319.00	32.84	AV	H	42.05	8.80	38.55	45.14	39.12	54.00	14.88
High Channel: 5808 MHz										
5808.00	70.90	PK	H	34.22	3.72	0.00	108.84	102.82	113.98	11.16
5808.00	42.91	AV	H	34.22	3.72	0.00	80.85	74.83	93.98	19.15
5808.00	68.08	PK	V	34.22	3.72	0.00	106.02	100	113.98	13.98
5808.00	40.73	AV	V	34.22	3.72	0.00	78.67	72.65	93.98	21.33
5875.00	25.58	PK	H	34.25	3.77	0.00	63.60	57.58	74.00	16.42
5875.00	15.11	AV	H	34.25	3.77	0.00	53.13	47.11	54.00	6.89
11616.00	63.30	PK	H	39.00	6.63	37.49	71.44	65.42	74.00	8.58
11616.00	38.24	AV	H	39.00	6.63	37.49	46.38	40.36	54.00	13.64
17424.00	58.46	PK	H	42.66	8.83	38.47	71.48	65.46	74.00	8.54
17424.00	33.27	AV	H	42.66	8.83	38.47	46.29	40.27	54.00	13.73

Test plots at Low Channel Horizontal

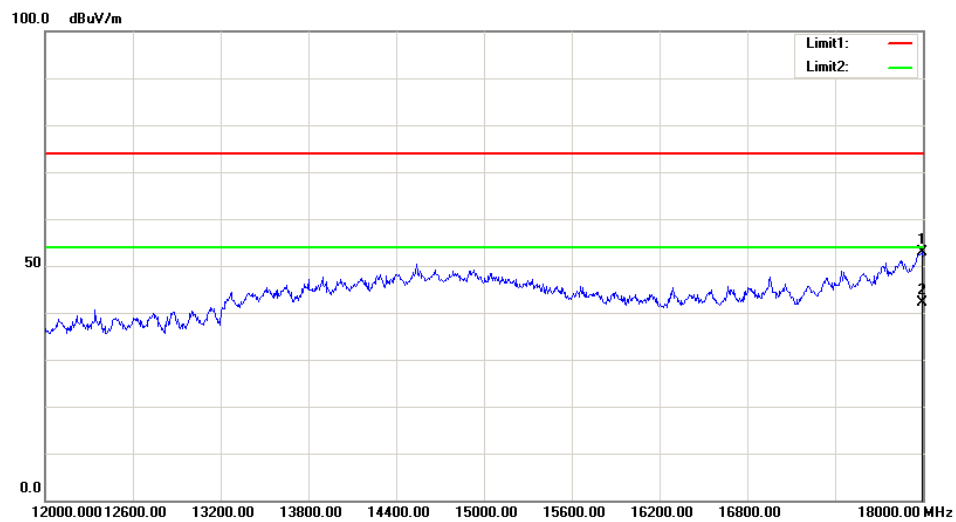
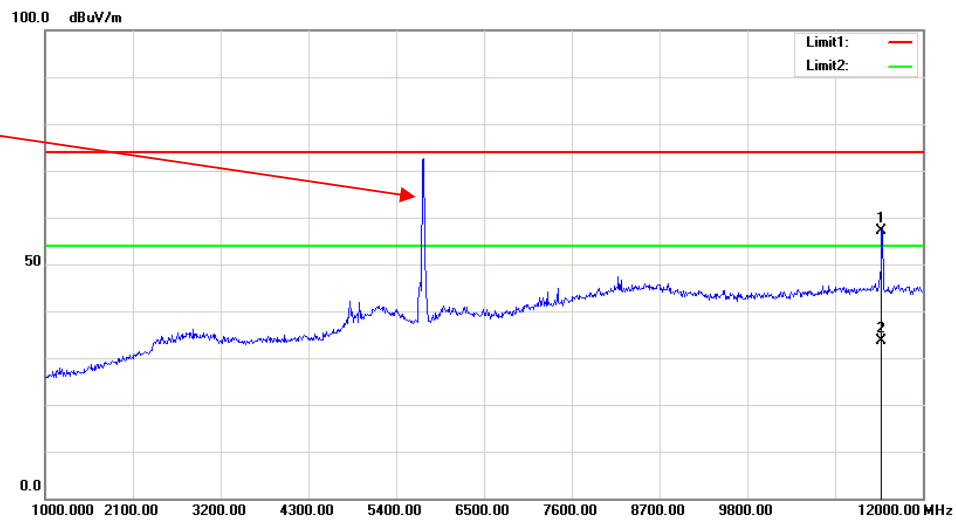
Fundamental
Test with Band
Rejection Filter

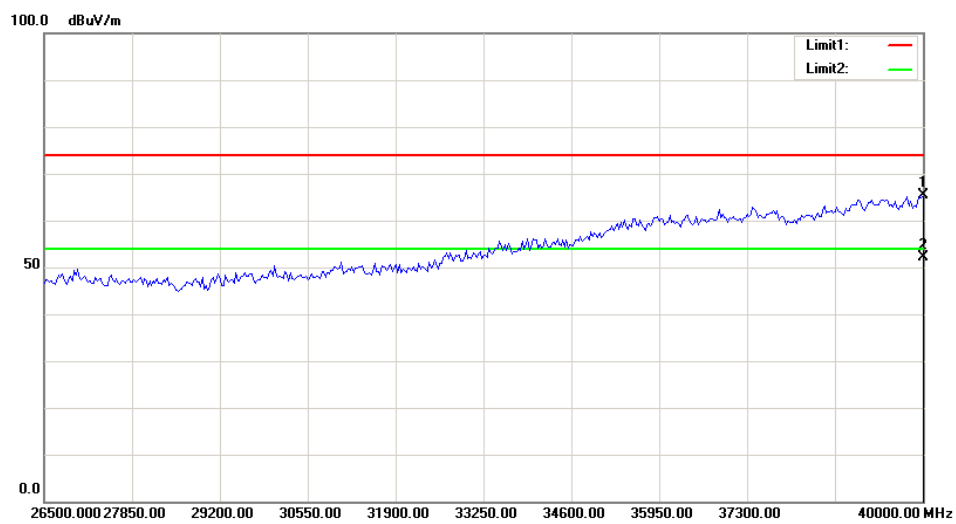
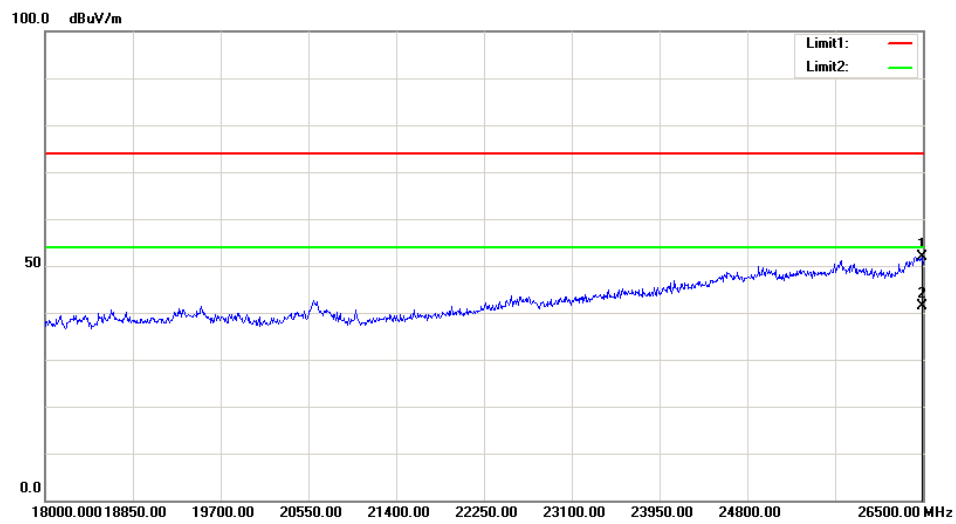




Vertical

Fundamental Test with Band Rejection Filter





***** END OF REPORT *****