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FCC LISTED, REGISTRATION NUMBER: 720267

IC LISTED REGISTRATION NUMBER IC 4621A-1

Informe de ensayo nº:
Test report No:

NIE: 41944RRF.001

Test report

USA FCC Part 15.231, 15.209

Radio Frequency Devices. Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

Identificación del objeto ensayado.....: Identification of item tested	Remote control car key.
Marca .....: Trade	Magneti Marelli SpA
Modelo y/o referencia tipo .....: Model and /or type reference	Model: RKE192_2B, RKE192_3B
Other identification of the product .....:	Commercial name: RKE192 FCC ID: RX2RKE192
Final HW version .....:	ProtoC
Final SW version .....:	---
Serial number .....:	---
Características .....: Features	433.92 MHz Frequency band, 3 V Lithium battery
Peticionario .....: Applicant	MAGNETI MARELLI SPA Strada Torino 50. C.A.P. 10043 Orbassano, (Torino). ITALY. VAT: --- Contact person: Roberto Salemi Telephone: +39 01168 79 931 e-mail: roberto.salemi@magnetimarelli.com
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 15.231 10-1-12 Edition: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz. USA FCC Part 15.209 10-1-13 Edition: Radiated emission limits; general requirements. ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices.
Resultado.....: Summary	IN COMPLIANCE
Aprobado por (nombre / cargo y firma) .....: Approved by (name / position & signature)	A. Llamas RF Lab. Manager  Firmado digitalmente por Alejandro Llamas Rodríguez Fecha: 2014.06.27 13:00:42 +02'00'
Fecha de realización .....: Date of issue	2014-06-26
Formato de informe No. .....: Report template No	FDT08_15

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Competences and guarantees

AT4 wireless is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

AT4 wireless is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621A-1.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the AT4 wireless internal document PODT000.

Usage of samples

Samples undergoing test have been selected by: **the client**

Sample M/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
41944B/007	Remote control car key with integral antenna	RKE192_3B	---	2014-05-20

1. Sample M/01 has undergone following test(s) in appendix A:

   Subclause (a) (1) (2) and Subclause (e). Transmitter deactivation.

   Subclause (c). 20 dB Emission Bandwidth.

Sample M/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
41944B/021	Remote control car key with integral antenna	RKE192_3B	---	2014-06-13

1. Sample M/02 has undergone following test(s) in appendix A:

   Section 15.231 Subclause (e)/15.209. Field strength and Emission limitations radiated (Transmitter).

Test sample description

The test sample consists of a remote control car key with 3 push buttons.

Test samples supplier

MAGNETI MARELLI

Strada Torino 50. C.A.P. 10043 Orbassano, Torino. ITALY.

VAT: ---

Contact person: Roberto Salemi

Telephone: +39 01168 79 931

e-mail: roberto.salemi@magnetimarelli.com

Testing period

The performed test started on 2014-06-16 and finished on 2014-06-23.

The tests have been performed at AT4 wireless.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 20.0 ºC Max. = 24.8 ºC
Relative humidity	Min. = 39.2 % Max. = 44.2 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

In the semianechoic chamber (21 meters x 11 meters x 8 meters), the following limits were not exceeded during the test.

Temperature	Min. = 18.1 ºC Max. = 24.9 ºC
Relative humidity	Min. = 40.3 % Max. = 59.6 %
Air pressure	Min. = 1005 mbar Max. = 1009 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

Remarks and comments

1: Used instrumentation:

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber ETS FACT3 200STP	N.A.	N.A.
2.	BiconicalLog antenna ETS LINDGREN 3142E	2014/03	2017/03
3.	Multi Device Controller EMCO 2090	N.A.	N.A.
4.	Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2013/11	2016/11
5.	EMI Test Receiver R&S ESU 26	2013/08	2015/08
6.	Spectrum analyser Rohde & Schwarz FSW50	2013/10	2015/10
7.	RF pre-amplifier 10 MHz-6 GHz SCHWARZBECK BBV9743	2014/02	2015/02
8.	RF pre-amplifier 1-18 GHz Schwarzbeck BBV 9718	2014/02	2015/02
9.	Spectrum analyser Agilent PSA E4440A	2014/05	2016/05

Testing verdicts

Not applicable ..... :	N/A
Pass ..... :	P
Fail ..... :	F
Not measured ..... :	N/M

FCC PART 15 PARAGRAPH / RSS-210		VERDICT			
		NA	P	F	NM
Section 15.231 Subclause (a) (1).	Transmitter deactivation		P		
Section 15.231 Subclause (c).	20 dB Emission Bandwidth		P		
Section 15.231 Subclause (b)/15.209	Field strength and Emission limitations radiated (Transmitter)		P		

Appendix A – Test result

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TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 3.0 Vdc

Type of power supply = Lithium battery cell

Type of antenna = Integral antenna

TEST FREQUENCIES:

The equipment transmits at the nominal frequency of 433.92 MHz.

The equipment under test was scanned for spurious emissions in the frequency range 30 to 5000 MHz.

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-5 GHz (1 GHz-18 GHz Double ridge horn antenna).

For radiated emissions in the range 1 GHz-5 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance. The sample is prepared so that transmits continuously when the batteries are connected

The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

Section 15.231 Subclause (a) (1). Transmitter deactivation.

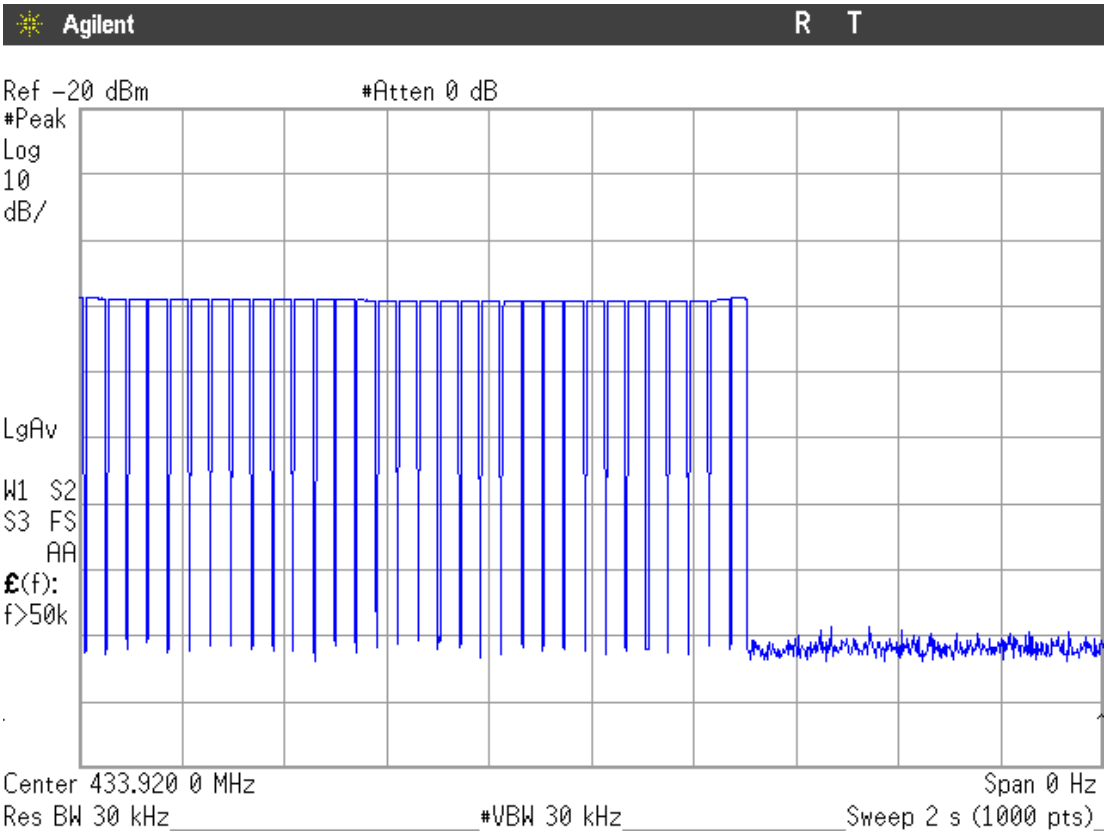
SPECIFICATION

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

RESULTS

The equipment can only operate in manual mode.

The transmission is activated by pressing a button and ceases after releasing it in less than 5 seconds (see next plot).



Verdict: Pass

Section 15.231 Subclause (c). 20 dB Emission Bandwidth

SPECIFICATION

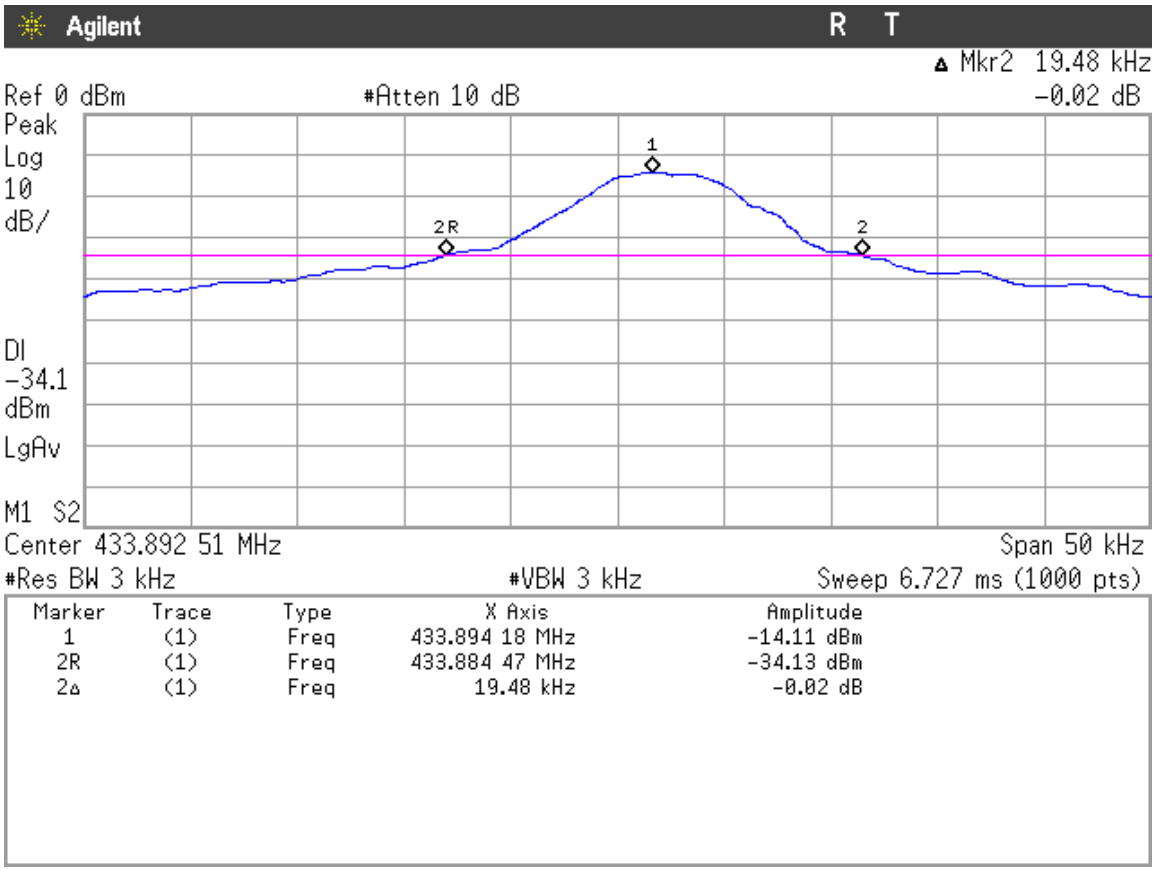
The bandwidth of the emission shall be no wider than 0.25 % of the centre frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

RESULTS (see next plot)

Nominal centre frequency = 433.92 MHz

Limit of spectrum bandwidth = 0.25 % of 433.92 MHz = 1084.80 kHz

Measured 20 dB Bandwidth (kHz)	19.48
Measurement uncertainty (Hz)	±319



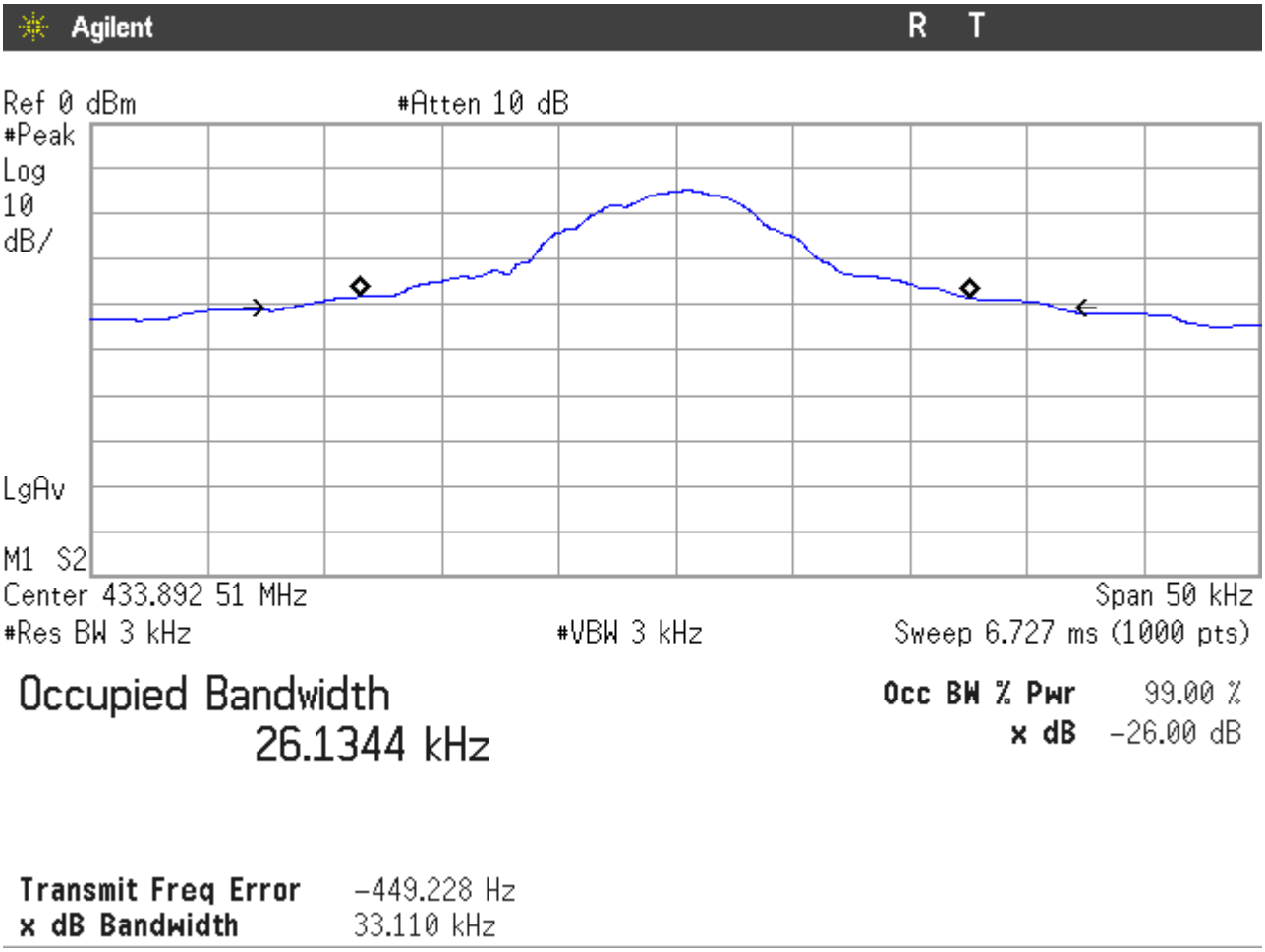
Verdict: PASS

Occupied Bandwidth

RESULTS

(see next plot).

99% bandwidth (kHz)	26.1344
-26 dBc bandwidth (kHz)	33.1100
Measurement uncertainty (Hz)	±319



Section 15.231 Subclause (b)/15.209. Field strength and Emission limitations radiated (Transmitter)

SPECIFICATION

The field strength of emissions from intentional radiators shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (µV/m)	Field strength of spurious emissions (µV/m)
40.66 – 40.70	2,250	225
70 – 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

**: Linear Interpolations. The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level.

Spurious emissions shall be attenuated to the limits shown in the above table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength.

RESULTS:

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

The equipment transmits continuously in the selected channel so it is not necessary a duty cycle correction factor.

Frequency range 30 MHz-1000 MHz (see next plots).

Frequency (MHz)	Polarization	Detector	Emission Level (µV/m)	Limits (µV/m) 15.231 (b) / 15.209
433.92 (Fundamental)	V	Quasi-peak	7,915.90	10,997.25 / ---
807.802	V	Quasi-peak	707.95	1,099.725 / 200

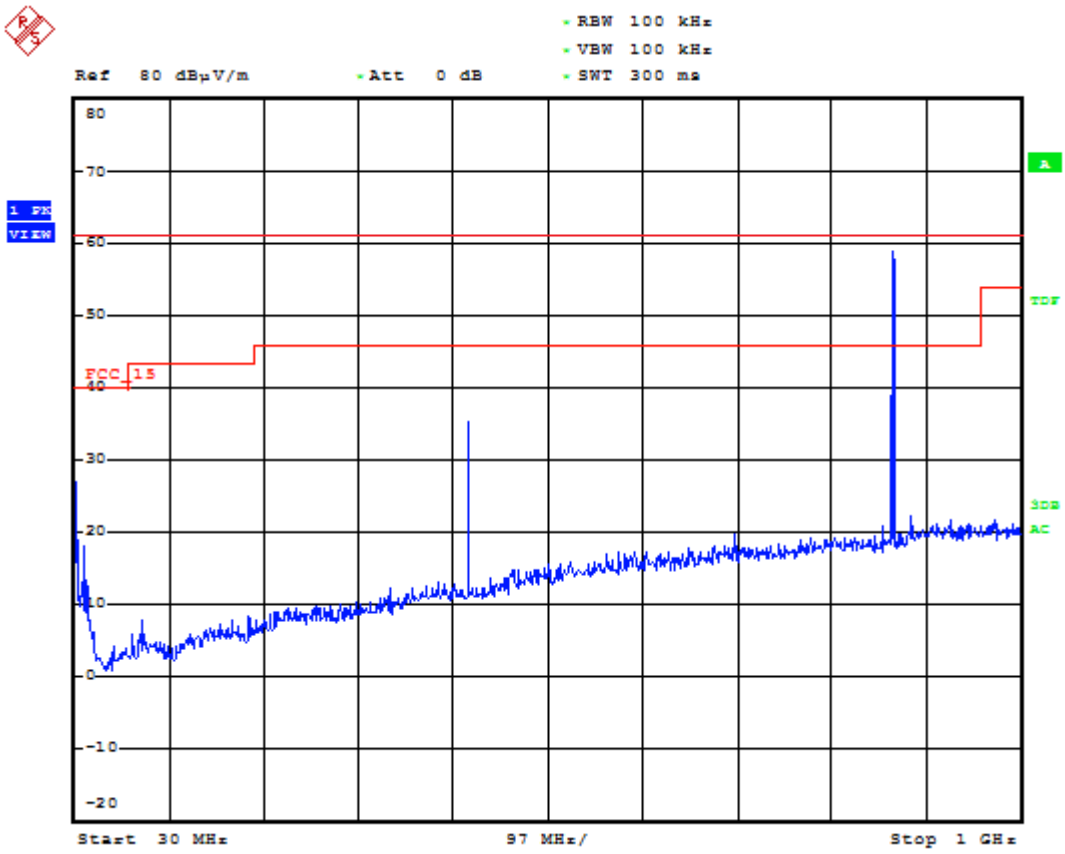
Measurement uncertainty (dB): ±3.8 dB

Frequency range 1 GHz-5 GHz (see next plots).

Frequency (GHz)	Polarization	Detector	Emission Level (µV/m)	Limits (µV/m) 15.231 (b) / 15.209
1.3020	V	Average	140.60	1,099.725 / 500
1.7353	V	Average	326.21	1,099.725 / 500
2.1700	V	Average	219.03	1,099.725 / 500
2.6033	V	Average	659.93	1,099.725 / 500
3.0380	V	Average	488.09	1,099.725 / 500
3.4713	V	Average	195.66	1,099.725 / 500
3.9047	V	Average	61.87	1,099.725 / 500
4.3393	V	Average	169.63	1,099.725 / 500
4.7727	V	Average	40.50	1,099.725 / 500

Verdict: PASS.

FREQUENCY RANGE 30 MHz-1000 MHz.



Note: The carrier frequency (fundamental) was attenuated using a notch filter.

FREQUENCY RANGE 1 GHz to 5 GHz.