Tecnolab del Lago Maggiore S.r.l.
ISTITUTO DI PROVE, MISURE E RICERCHE, ING. MICHELE SETARO
Via dell'Industria, 20
28924 Verbania Fondotoce (VB) – Italy

CUSTOMER Cliente	**Open Data s.r.l.** Via Anticolana km 0,300 03012 Anagni (FR) Italy
CONTRACT Commessa	**CO018710- 2010/11/30**
TEST REPORT Rapporto di Prova	**RP010711** **EMC test for FCC Certification procedure on remote controller VT1**
APPLICABLE STANDARDS Norme di riferimento	➢ **FCC Rules : Code of Federal Regulations (CFR) no. 47 Ch1 (10-1-09 Edition)** **PART 15 - RADIO FREQUENCY DEVICES**

Data Date	Redazione Redaction	Verifica Tecnica Technical Check	Autorizzazione Authorization
2011/05/19	Assistant Head of Sector *Eng. Marco Mai*	Head of Sector *Eng. Danilo Prina*	Head of Laboratory *Eng. Michele Setaro*
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1. GENERAL REMARKS

1.1 Customer data

Customer:	**Open Data s.r.l.**
Address:	Via Anticolana km 0,300 03012 Anagni (FR) Italy

1.2 Identification of equipment and/or subsystem under test (EUT)

EUT (equipment or subsystem) n°:	1
Mark:	**Open Data**
Model:	VT1
FCC ID	ZMNVT1USA
Acceptance code:	AC017711/2
Receiving date:	2011/03/21
Description:	The VT1 is an RF control device with an LED indicator, used for remotely controlling the VD1 queue system display. See annex 1,2 and 3 of this test report.

1.3 Identification of auxiliary equipment not under test (AE)

EUT does not require auxiliary equipment for its operation.

1.4 Identification of connecting cables

EUT does not have any cable for its operation. EUT is powered by a 9V battery..

1.5 Sampling

The results shown in this Technical Report exclusively refer to the sample under test, taken away from the production by Customer. Extension of test results to the whole production is the responsibility of manufacturer/importer.

2. SCOPE

Scope of the test and the measurement is to supply the Customer with useful indications in order to evaluate EUT compliance with Electromagnetic Compatibility Reference Standards; the performed test plan is required from the manufacturer.

3. APPLICABLE DOCUMENTS

FCC Rules	FCC Rules : Code of Federal Regulations (CFR) no. 47 Ch1 (10-1-09 Edition) PART 15 - RADIO FREQUENCY DEVICES

3.1 Applicability

Applicable parties regarding the certification procedure for intentional radiator operating at frequency 433,9 MHz.
According to the definition 15.3 (o)EUT is an Intentional Radiator with periodic operation at frequency 433,9 MHz so it shall fulfil provisions of 47CFR part 15 Subpart C – intentional radiators – and section 15.231. Section 15.231 is applicable because EUT is a manually operated transmitter who employ a switch that will automatically deactivate the transmitter within not more than 5 seconds after activation.

3.2 Definitions and glossary of terms

Applicable IEC 50 IEV Standard definitions.

AE	Auxiliary Equipment
CE	Conducted Emission
EMC	Electromagnetic Compatibility
EUT	Equipment Under Test
RE	Radiated Emission

3.3 Other definitions and abbreviations

GRP	Ground reference plane
BH	Biconical antenna in horizontal polarization
BV	Biconical antenna in vertical polarization
LH	Log-periodic antenna in horizontal polarization
LV	Log-periodic antenna in vertical polarization
HH	Horn antenna in horizontal polarization
HV	Horn antenna in vertical polarization
Loop F	Loop antenna in frontal position
Loop L	Loop antenna in lateral position
Pass	In compliance with reference Standard
Fail	Not in compliance with reference Standard

4. EUT FUNCTIONAL DESCRIPTION

4.1 EUT description and operating method during tests

The VT1 is an RF control device with an LED indicator, used for remotely controlling the VD1 queue system display.
The main function of the VT1 is to turn feed the numbers displayed by VD1. For this purpose, the VT1 is provided with a transmitter, operating on the ISM 433.92MHz band.
The device was tested by moving forward in a progressive manner the numbers.

4.2 Test set-up and EUT configuration

EUT is powered by a 9V internal battery.

5. TECHNICAL COMPETENCE

Technicians qualified for the execution of the tests are engineers with at least three months of experience in Measurements and Testing.

6. TEST PERFORMED

6.1 General

6.1.1 Test firm identification

Tests were performed at laboratory: Tecnolab del Lago Maggiore S.r.l., Via dell'Industria 20, 28924 Verbania Fondotoce (VB) ITALY.

REGISTRATION NUMBER: **868554**

6.1.2 List and description of tests

Test	Applicable Standard	Port	Paragraph of this test report	Result
Antenna requirement	47 CFR 15.203 /15.204	**/**	/	Use of permanently attached antenna shall be considered sufficient to comply the provisions of this section.
Radiated emissions measurements	47 CFR 15.205 47 CFR 15.209 47 CFR 15.231 (b)	Enclosure port	6.2	Pass
Occupied bandwidth for device operating over 70 MHz and under 900 MHz	47 CFR 15.231 (c)	Enclosure port	6.3	Pass

6.1.3 Uncertainty of measurement

The uncertainty of measurement stated in this document are expressed as expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor K = 2 corresponding to a confidence level of about 95%.

6.2 Radiated Emission measurements

Date:	2011/03/21
Enviromental condition:	Temperature= 18-25 °C – Humidity= 30-50%
Applicable Standard:	47 CFR 15.205 / 47 CFR 15.209 / 47 CFR 15.231 (b)
Test levels/Limits:	The electric field radiated emissions is measured at a distance of 3 m from the EUT. The reference limits at 3 m are: Frequency range — Limits (detector) 5-30 MHz — 69.5 dBμV/m (QP) 30-88 MHz — 40 dBμV/m (QP) 88-216 MHz — 43.5 dBμV/m (QP) 216-960 MHz — 46 dBμV/m (QP) 960-1000 MHz — 54 dBμV/m (QP) In accordance with part 15.231 (b) the field strength of emission from intentional radiator shall not exceed the following average limit: Frequency — Limits (detector) 433,9 MHz — 80.8 dBμV/m (AVG) Spurious emission — 60.8 dBμV/m (AVG) In accordance with part 15.31 (f) 2, where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performer at a separation distance. The applied formula for limits at 30 meter is : Extrapolation (dB)= 40log (300 meter/30 meter) = +80dB Extrapolation (dB)= 40log (30 meter/30 meter) = +40dB
Test procedure:	Measurements are performed with horizontal and vertical polarization of Loop, biconical and log-periodic antennas. The antenna was positioned between 1 and 4 meters high. EUT1 was located on a turntable, the turntable was rotated fully from 0° to 360°. It was recorded the highest level of the electromagnetic radiation disturbance at each frequency.
Test set-up:	ANSI C63.4(2009) See par. 4.2 and annex 4 of this test report. The measures shown in annexes listed below were obtained considering the correction factors of cables and antennas used for the test.
Measurement Uncertainty:	5.2 dB.
Test results:	**PASS** The radiated emissions from the EUT was conducted with PK detector. Because the field strength of emission from intentional radiator is over the limits, it was necessary an investigations with AVG detector, applying 15.231 (b) exception limits. The performed measurements are showed in the annexes: 5. BH: measurement with PK detector in the range 30-216MHz; 6. BV: measurement with PK detector in the range 30-216MHz; 7. LH measurement with PK detector in the range 216-1000 MHz; 8. LV measurement with PK detector in the range 216-1000 MHz; 9. LV measurement with AVG detector in the range 433.5-434.4 MHz; 10. LH measurement with AVG detector in the range 433.5-434.4 MHz; 11. LH measurement with AVG detector in the range 867.5-868.5 MHz; 12. LV measurement with AVG detector in the range 867.3-868.1 MHz;

	13. HH measurement with AVG detector in the range 1000-5000 MHz; 14. HV measurement with AVG detector in the range 1000-5000 MHz; Transmitter activated manually Duty cycle factor (dB) = 20 log (37.5ms/100ms) = -8.5 dB For fundamental: highest peak value = 81.9 dBuV/m Average value: 81.9 -8.5 = 73.4 dBuV/m < 80.8 dBuV/m (reference limit for fundamental) For spurious emission: highest peak value = 57.8 dBuV/m Average value: 57.8 -8.5 = 49.3 dBuV/m < 60.8 dBuV/m (reference limit for spurious emission) The radiated emissions are under reference limits.

Test instrumentation:

code	type	mark	model	Calibration until
STRIC001	EMI receiver	Hewlett-Packard	8542E	29/03/2012
STANT019	log-periodic antenna	Emco	3148	04/01/2013
STANT020	biconical antenna	Emco	3110B	09/08/2011
STANT023	Horn antena	SCHAFFNER	BBHA9120D	04/01/2013
STANT009	Loop Antenna	EMCO	6507	19/10/2013
STCAM001	semi-anechoic chamber	Panashield-TDK-Protecno	-	-

6.3 Occupied bandwidth

Date:	2011/03/21
Enviromental condition:	Temperature= 18-25 °C – Humidity= 30-50%
Applicable Standard:	47 CFR 15.231(c)
Test levels/Limits:	The bandwith of the emission shall be no wider than 0,25% of the center frequency for device operating above 70 MHz and under 900 MHz: Frequency: 433.9 MHz. Maximum Bandwidth allow at -20dB: 1,08 MHZ
Test procedure:	Measured performed at 3m.
Test set-up:	ANSI C63.4(2009)
Measurement Uncertainty:	<1.5 dB.
Test results:	**PASS** The performed measure is shown in annex: 15. L: measurement with PK detector in the range 432.9-434.9 MHz; Maximum Bandwidth measured at -20dB: 0.460 MHZ

Test instrumentation:

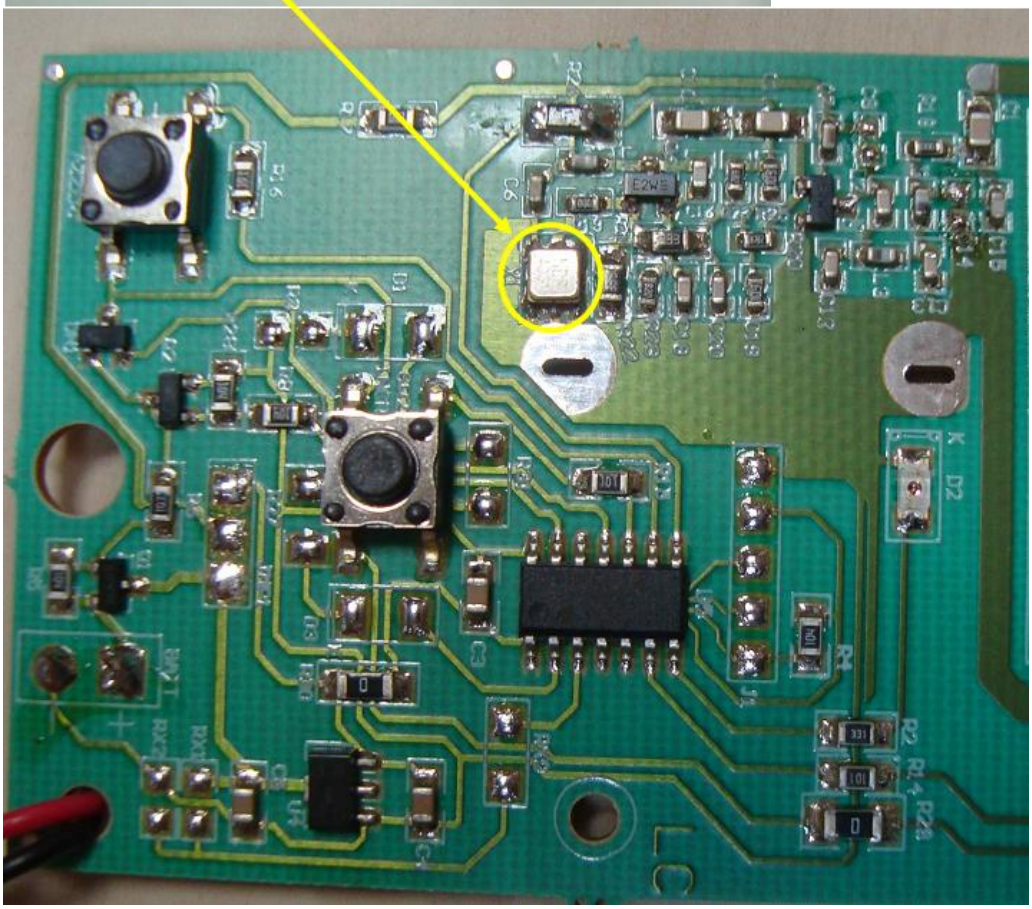
code	type	mark	model	Calibration until
STRIC016	EMC Analyzer	Hewlett-Packard	E7405A	11/11/2013
STANT019	log-periodic antenna	Emco	3148	04/01/2013
STCAM001	Semi-anechoic chamber	Panashield-TDK-Protecno	-	-

7. ANNEXES

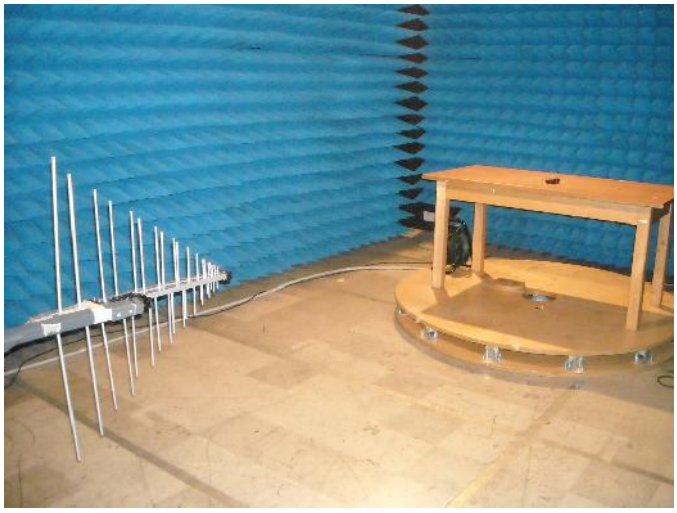
Nr.	Description
1	External view description
2-3	Internal view description
4	Radiated emission set-up
5-14	Radiated emission results
15	Occupied bandwidth

VT1USA


TL016-A
TRANSMITTER

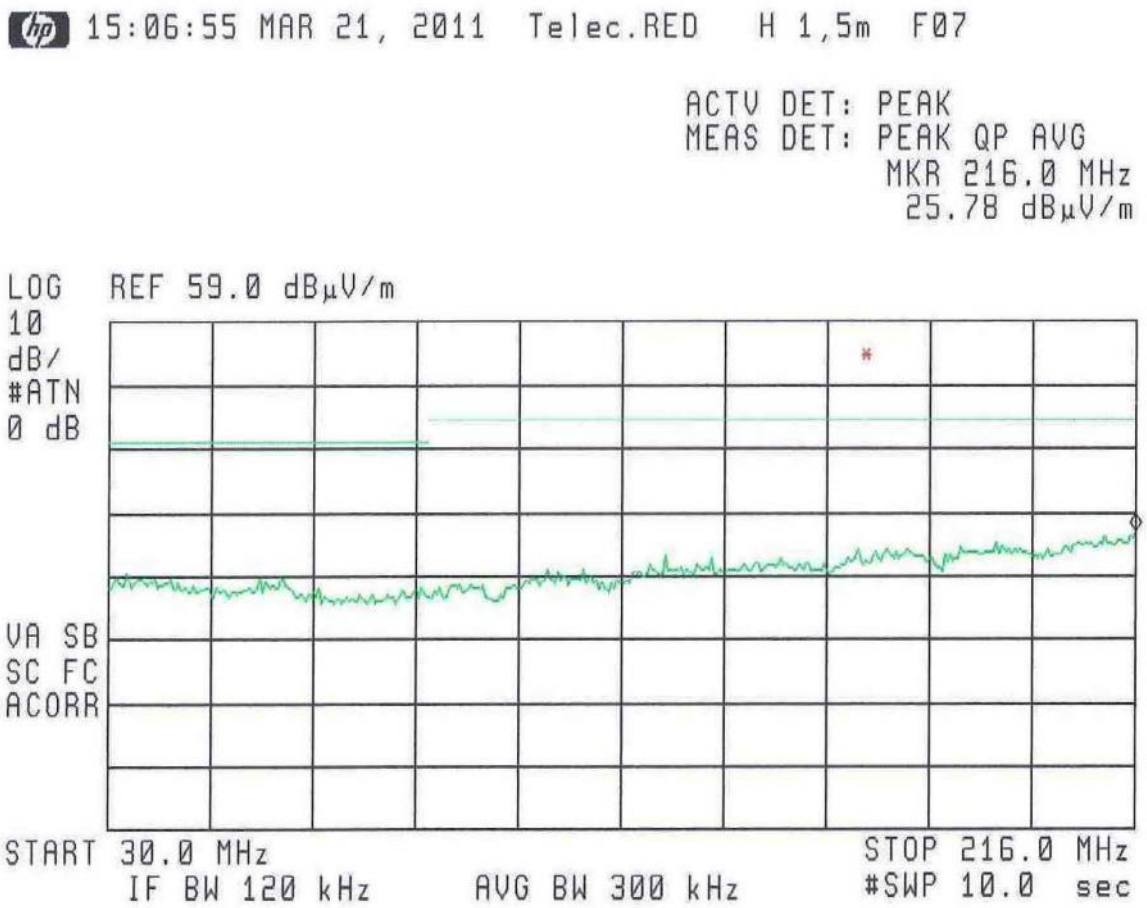


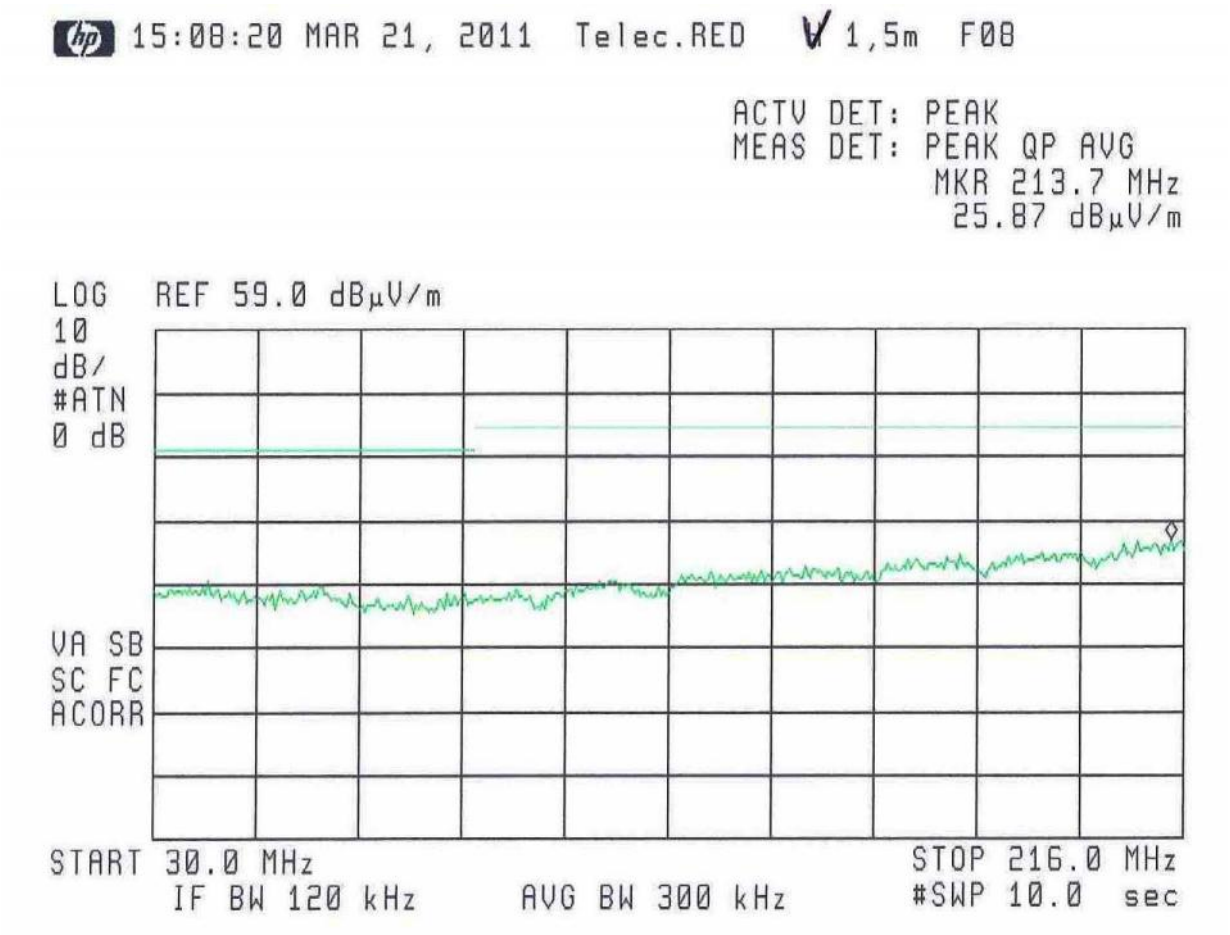
30-216 MHz

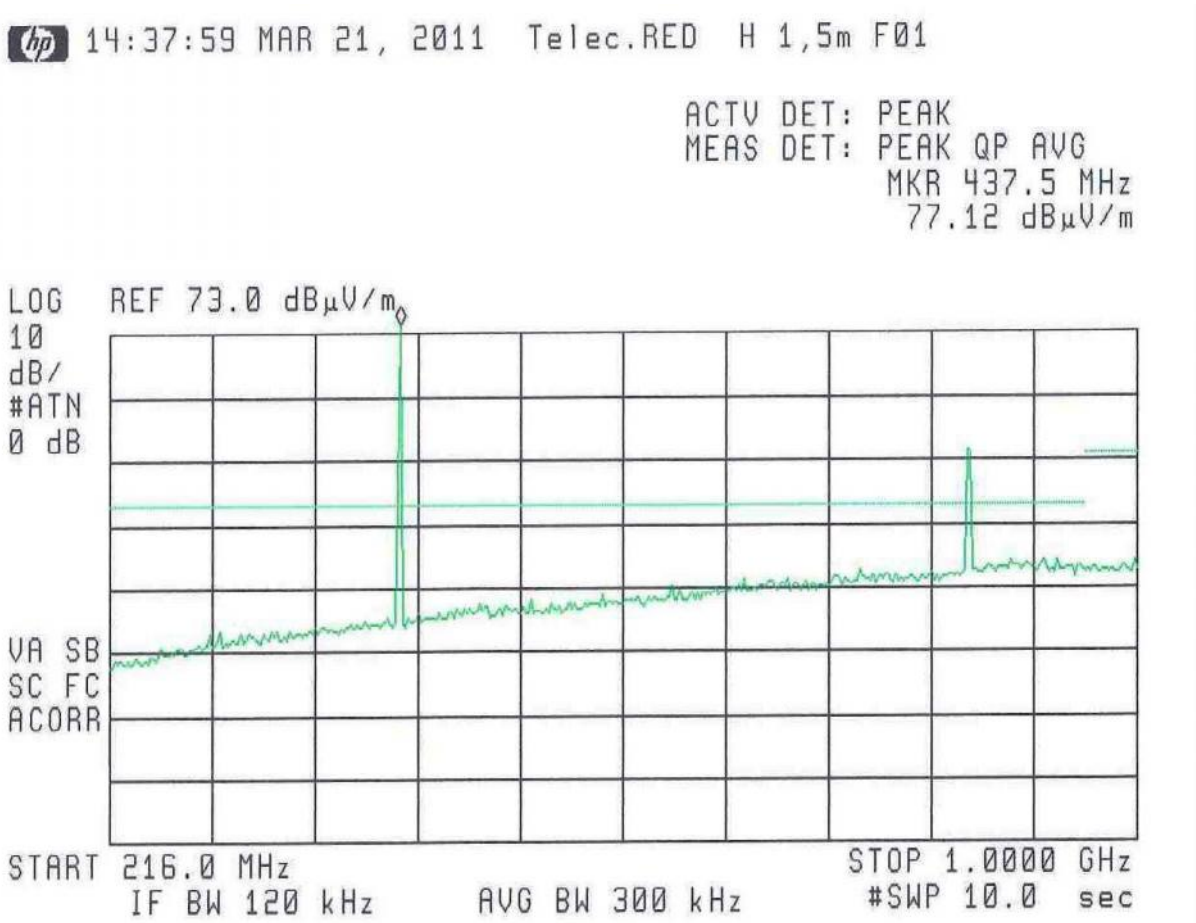


216-1000 MHz

1000-5000 MHz


15:06:55 MAR 21, 2011 Telec.RED H 1,5m F07
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 216.0 MHz
25.78 dBµV/m
LOG REF 59.0 dBµV/m
10
dB/
#ATN
0 dB
VA SB
SC FC
ACORR
START 30.0 MHz
IF BW 120 kHz
AVG BW 300 kHz
STOP 216.0 MHz
#SWP 10.0 sec


15:08:20 MAR 21, 2011 Telec.RED V 1,5m F08
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 213.7 MHz
25.87 dBµV/m
LOG REF 59.0 dBµV/m
10
dB/
#ATN
0 dB
VA SB
SC FC
ACORR
START 30.0 MHz
IF BW 120 kHz
AVG BW 300 kHz
STOP 216.0 MHz
#SWP 10.0 sec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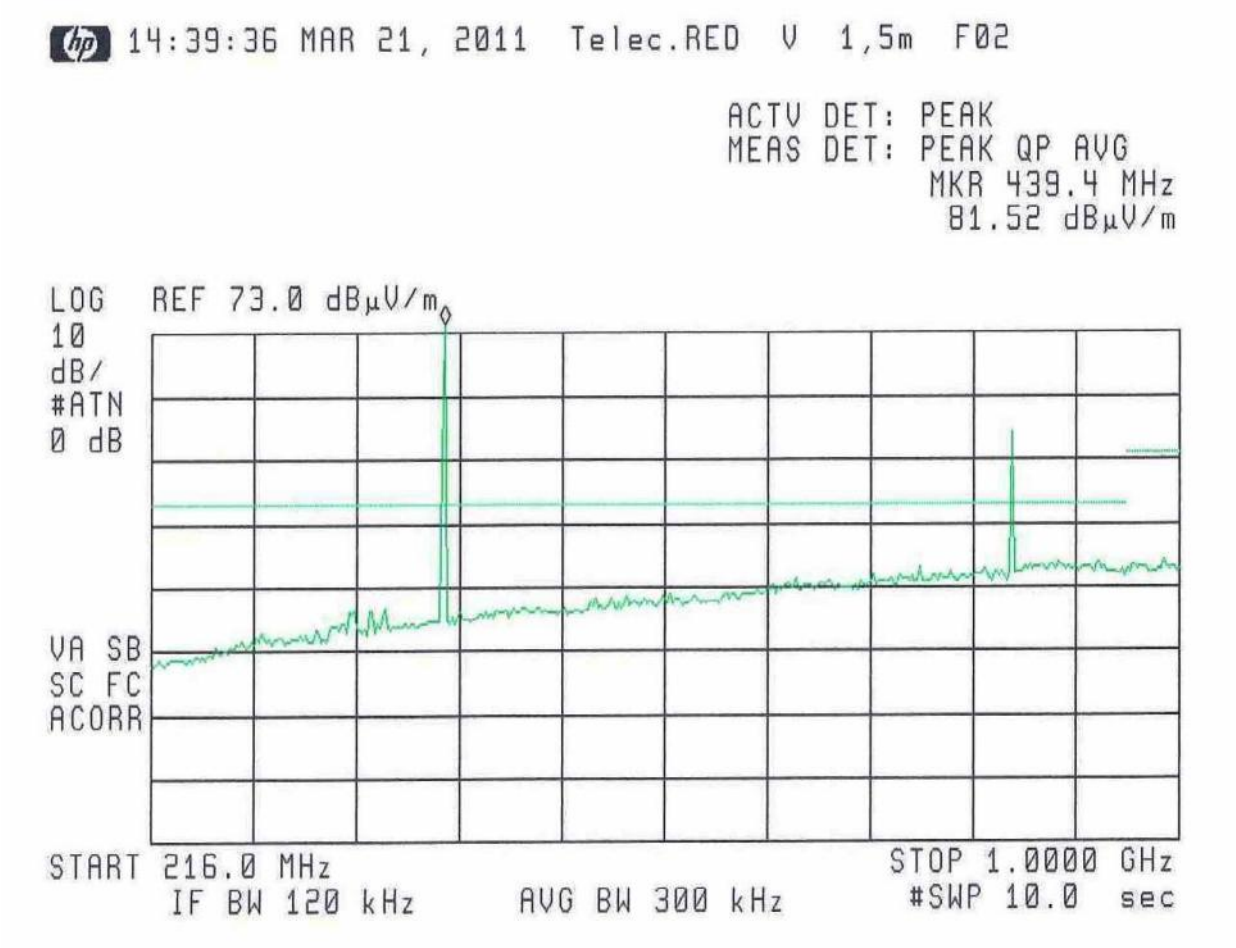
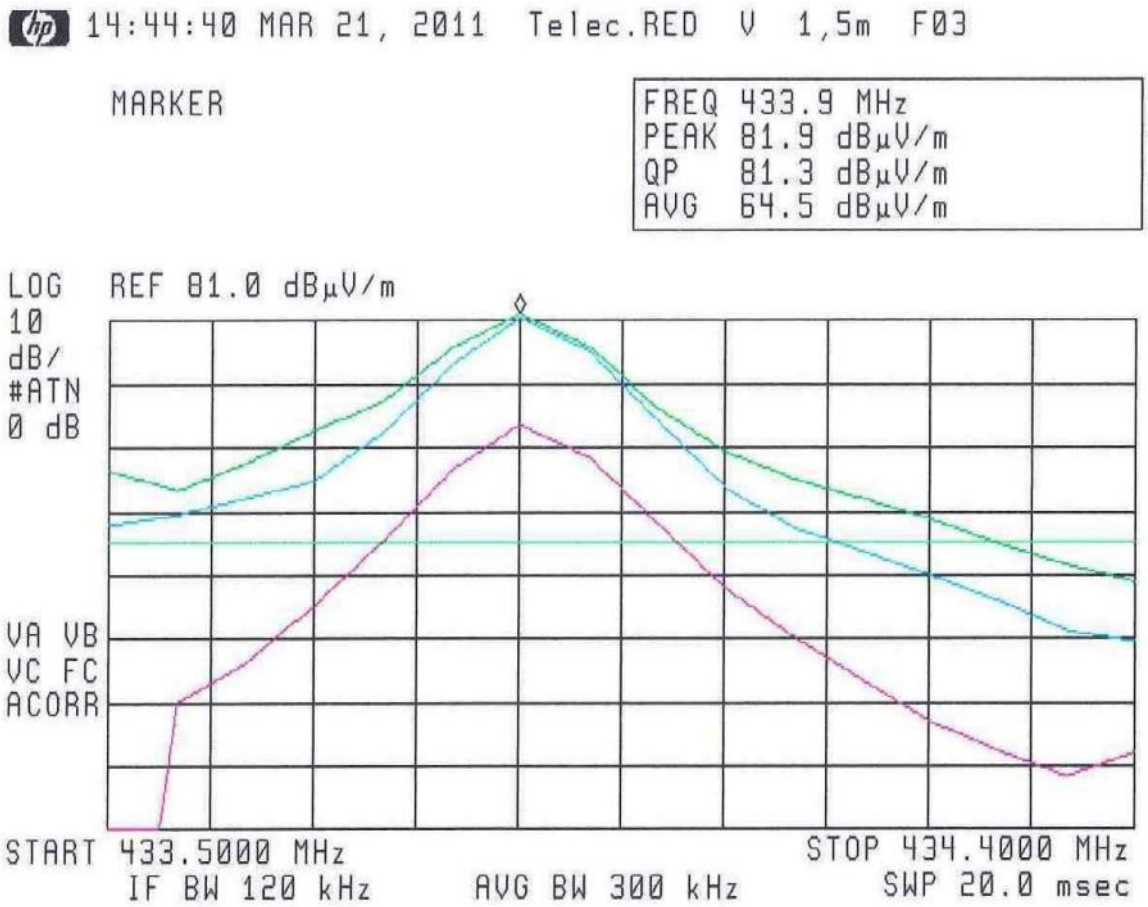
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 437.5 MHz
77.12 dBµV/m
LOG REF 73.0 dBµV/m
10
dB/
#ATN
0 dB
VA SB
SC FC
ACORR
START 216.0 MHz
IF BW 120 kHz
AVG BW 300 kHz
STOP 1.0000 GHz
#SWP 10.0 sec


14:39:36 MAR 21, 2011 Telec.RED V 1,5m F02
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 439.4 MHz
81.52 dBµV/m
LOG REF 73.0 dBµV/m
10
dB/
#ATN
0 dB
VA SB
SC FC
ACORR
START 216.0 MHz
IF BW 120 kHz
AVG BW 300 kHz
STOP 1.0000 GHz
#SWP 10.0 sec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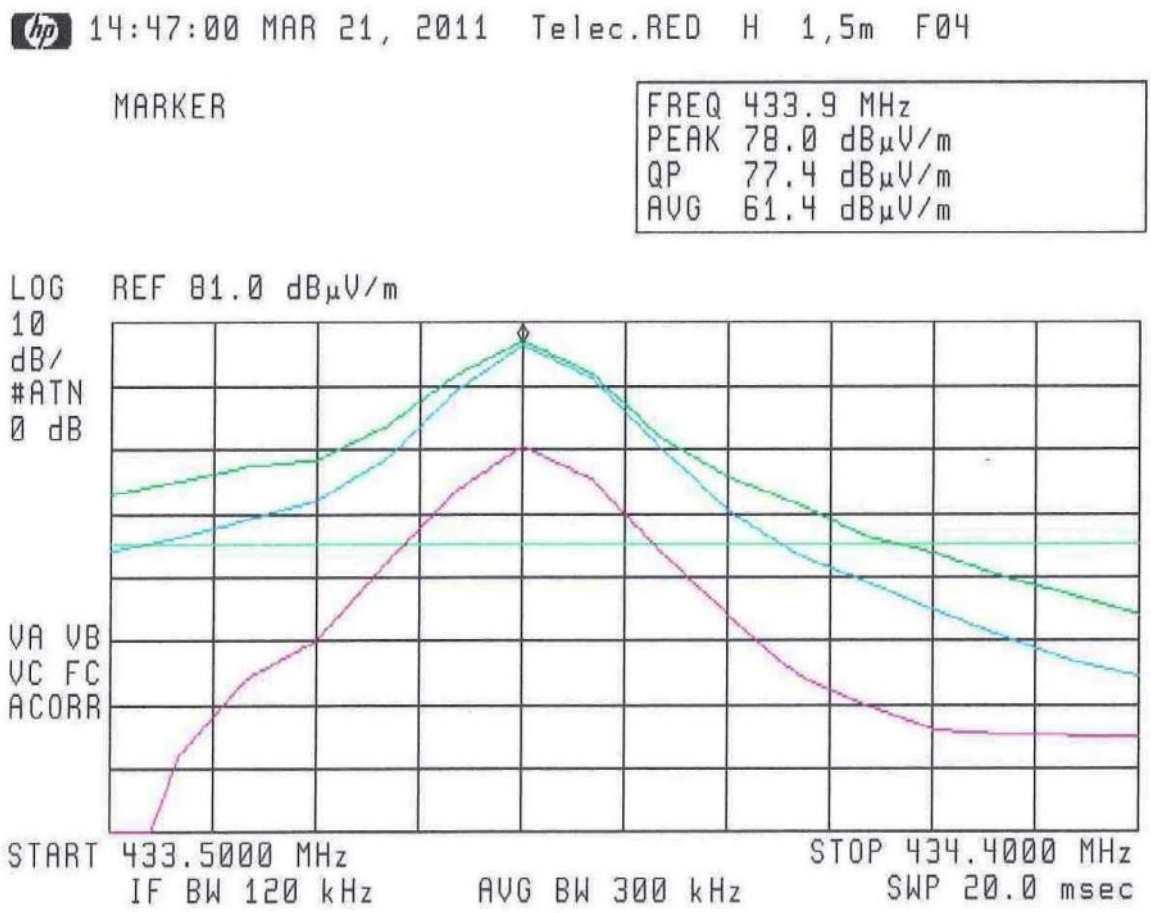
MARKER
FREQ 433.9 MHz
PEAK 81.9 dBµV/m
QP 81.3 dBµV/m
AVG 64.5 dBµV/m
LOG REF 81.0 dBµV/m
10
dB/
#ATN
0 dB
VA VB
VC FC
ACORR
START 433.5000 MHz
IF BW 120 kHz
AVG BW 300 kHz
STOP 434.4000 MHz
SWP 20.0 msec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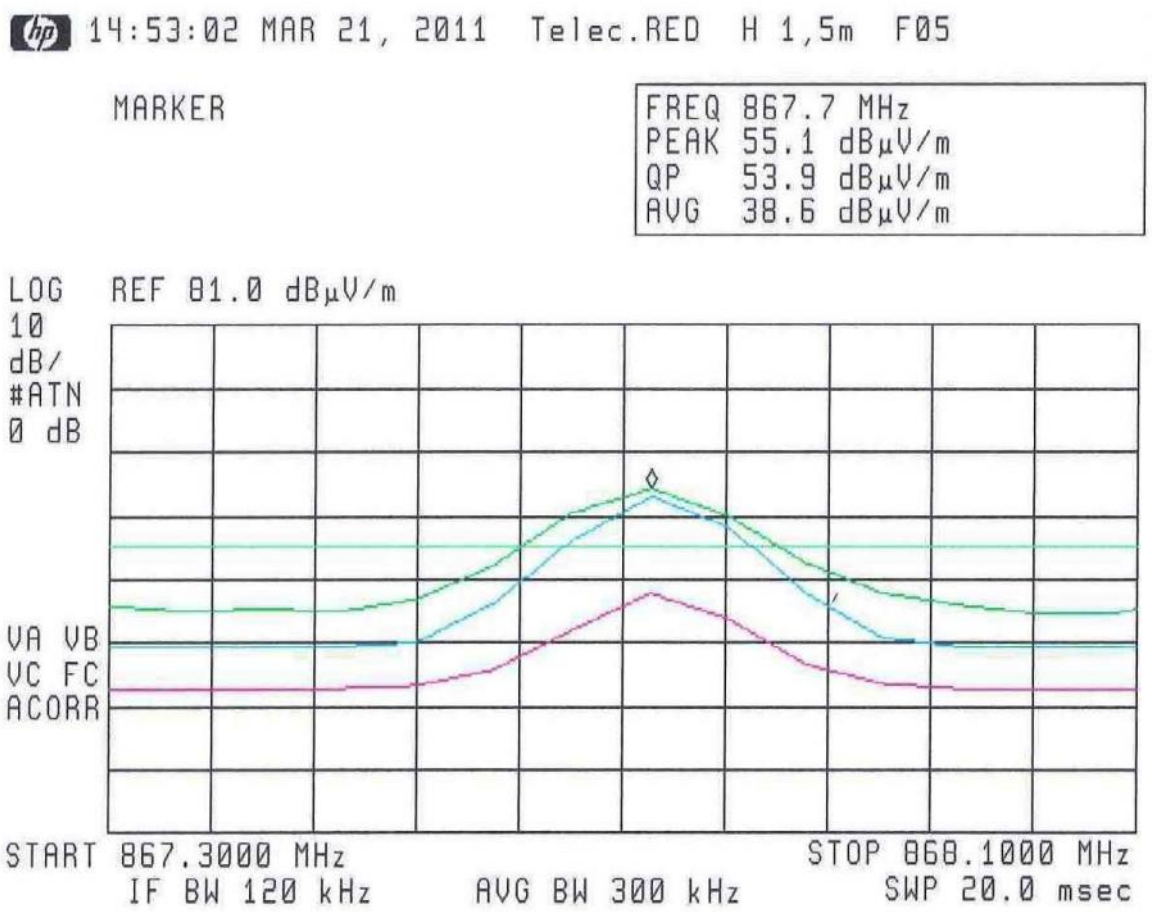
MARKER
FREQ 433.9 MHz
PEAK 78.0 dBµV/m
QP 77.4 dBµV/m
AVG 61.4 dBµV/m
LOG REF 81.0 dBµV/m
10
dB/
#ATN
0 dB
VA VB
VC FC
ACORR
START 433.5000 MHz
IF BW 120 kHz
AVG BW 300 kHz
STOP 434.4000 MHz
SWP 20.0 msec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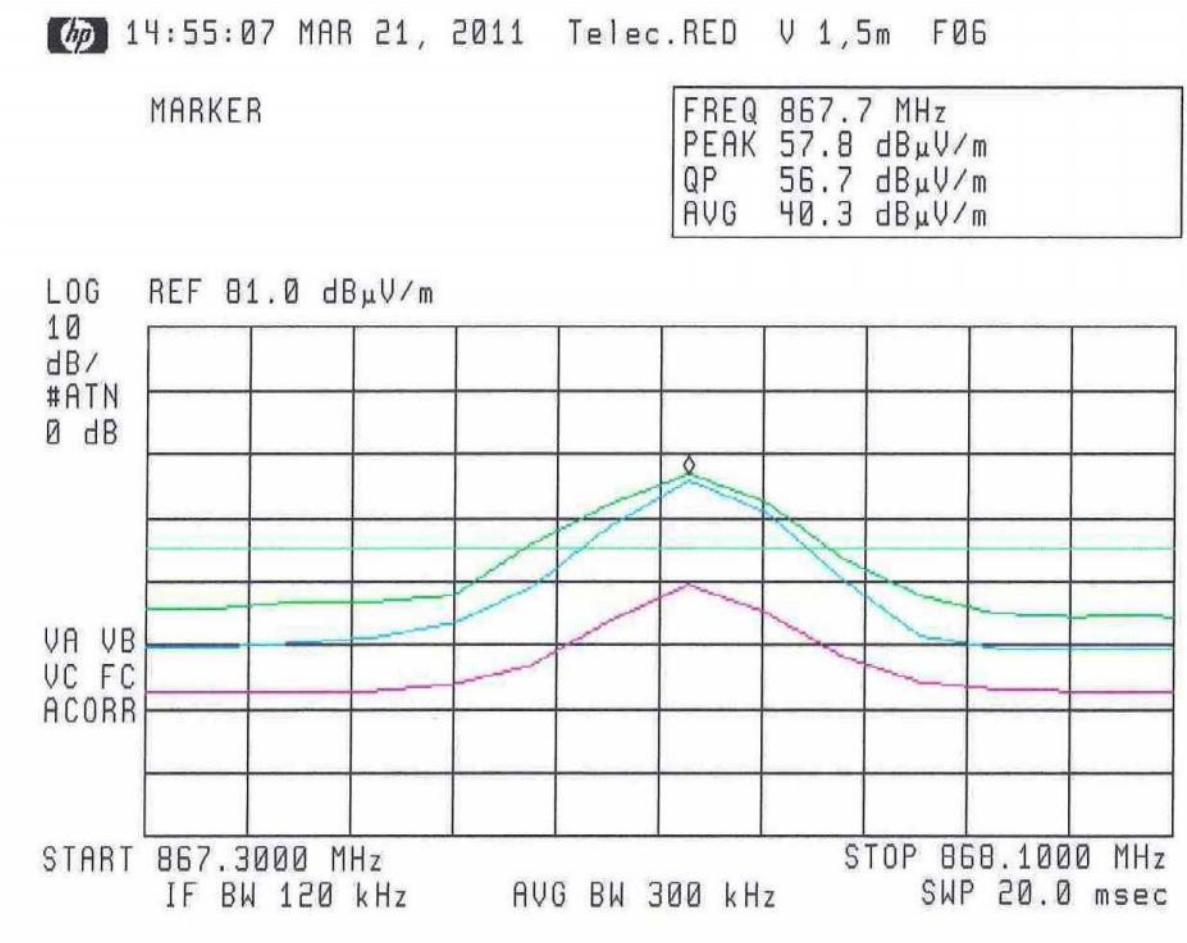
MARKER
FREQ 867.7 MHz
PEAK 55.1 dBµV/m
QP 53.9 dBµV/m
AVG 38.6 dBµV/m
LOG REF 81.0 dBµV/m
10
dB/
#ATN
0 dB
VA VB
VC FC
ACORR
START 867.3000 MHz
STOP 868.1000 MHz
IF BW 120 kHz
AVG BW 300 kHz
SWP 20.0 msec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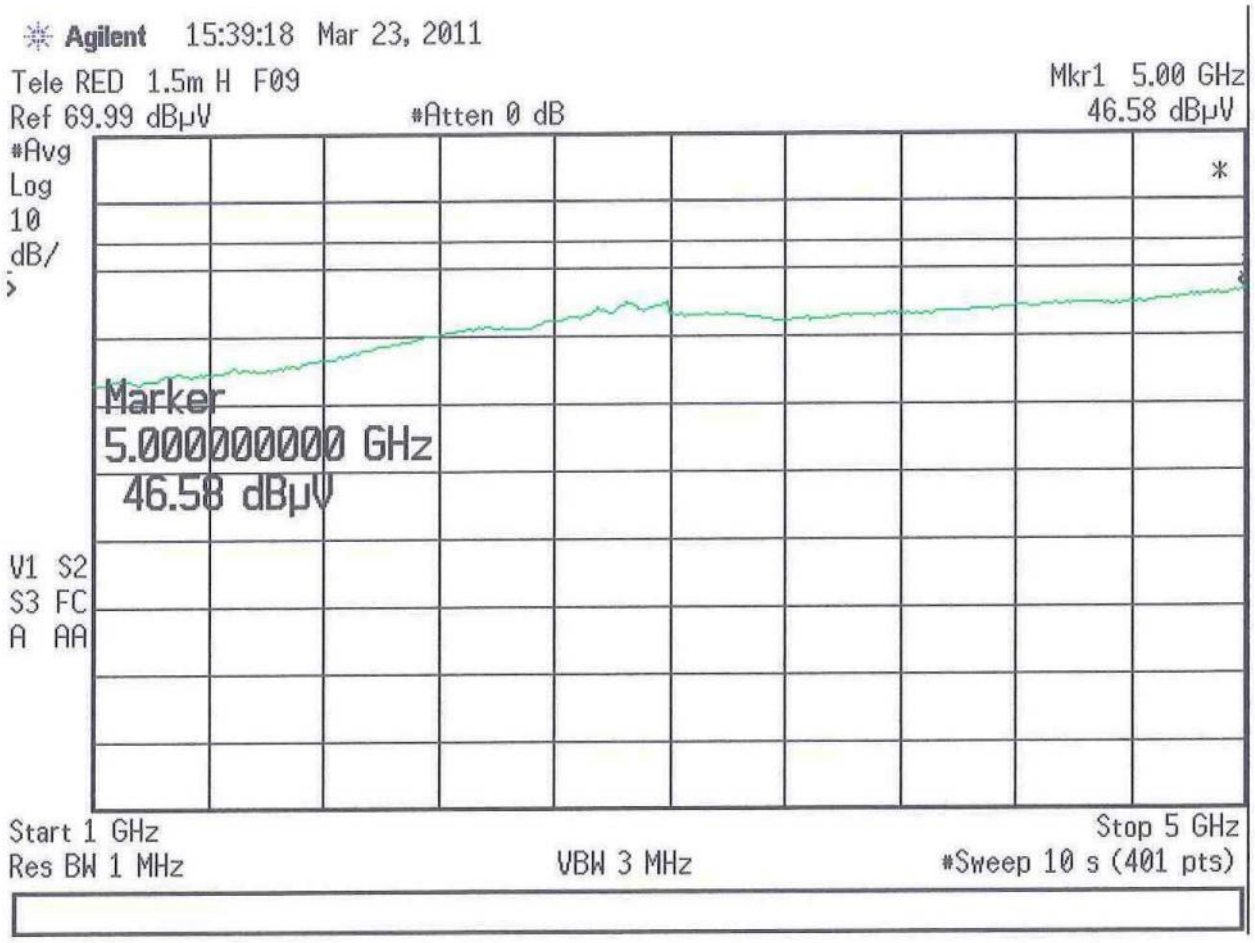
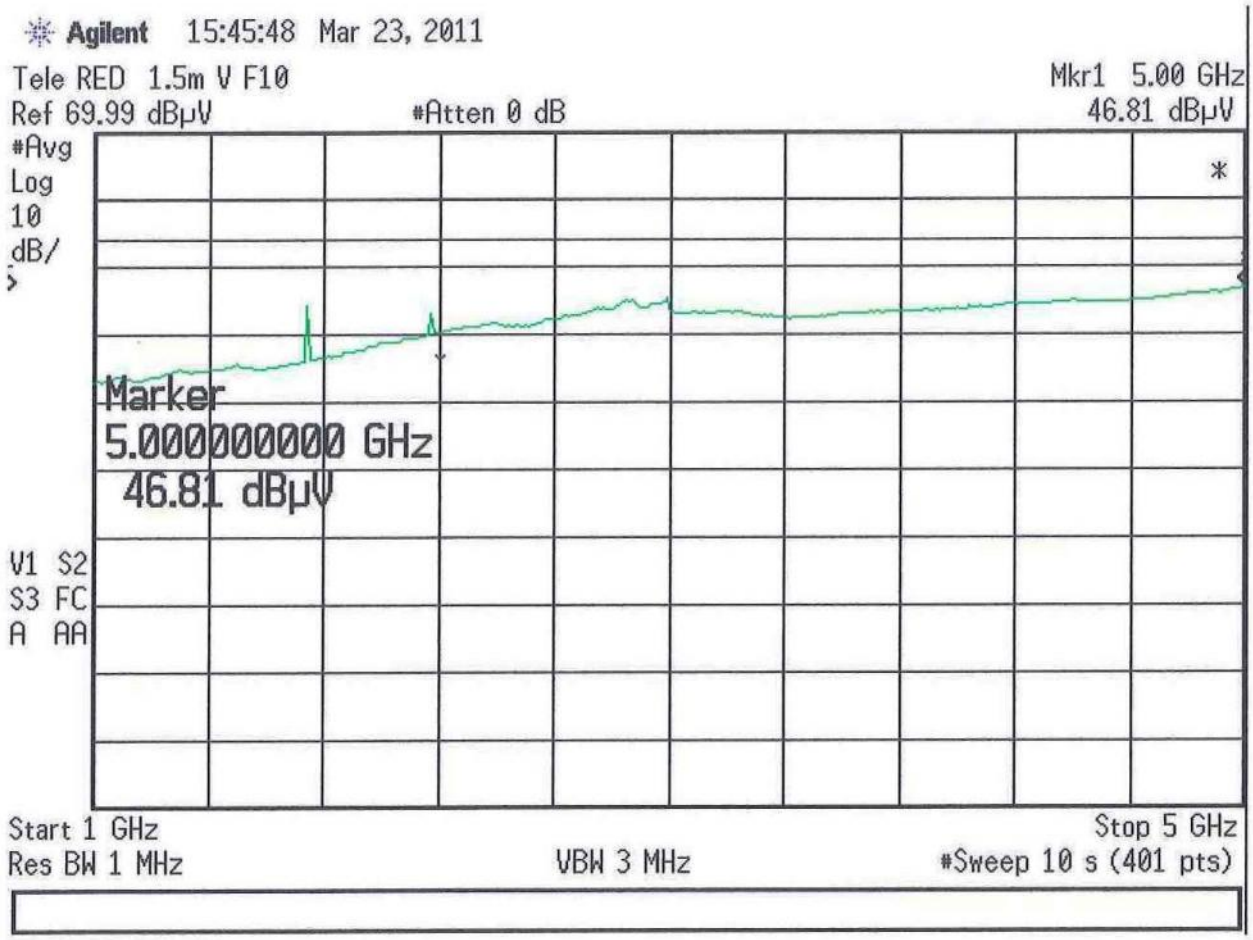
MARKER
FREQ 867.7 MHz
PEAK 57.8 dBµV/m
QP 56.7 dBµV/m
AVG 40.3 dBµV/m
LOG REF 81.0 dBµV/m
10
dB/
#ATN
0 dB
VA VB
VC FC
ACORR
START 867.3000 MHz
STOP 868.1000 MHz
IF BW 120 kHz
AVG BW 300 kHz
SWP 20.0 msec


Agilent 15:39:18 Mar 23, 2011
Tele RED 1.5m H F09
Ref 69.99 dBµV
#Atten 0 dB
Mkr1 5.00 GHz
46.58 dBµV
#Avg
Log
10
dB/
Marker
5.000000000 GHz
46.58 dBµV
V1 S2
S3 FC
A AA
Start 1 GHz
Res BW 1 MHz
VBW 3 MHz
Stop 5 GHz
#Sweep 10 s (401 pts)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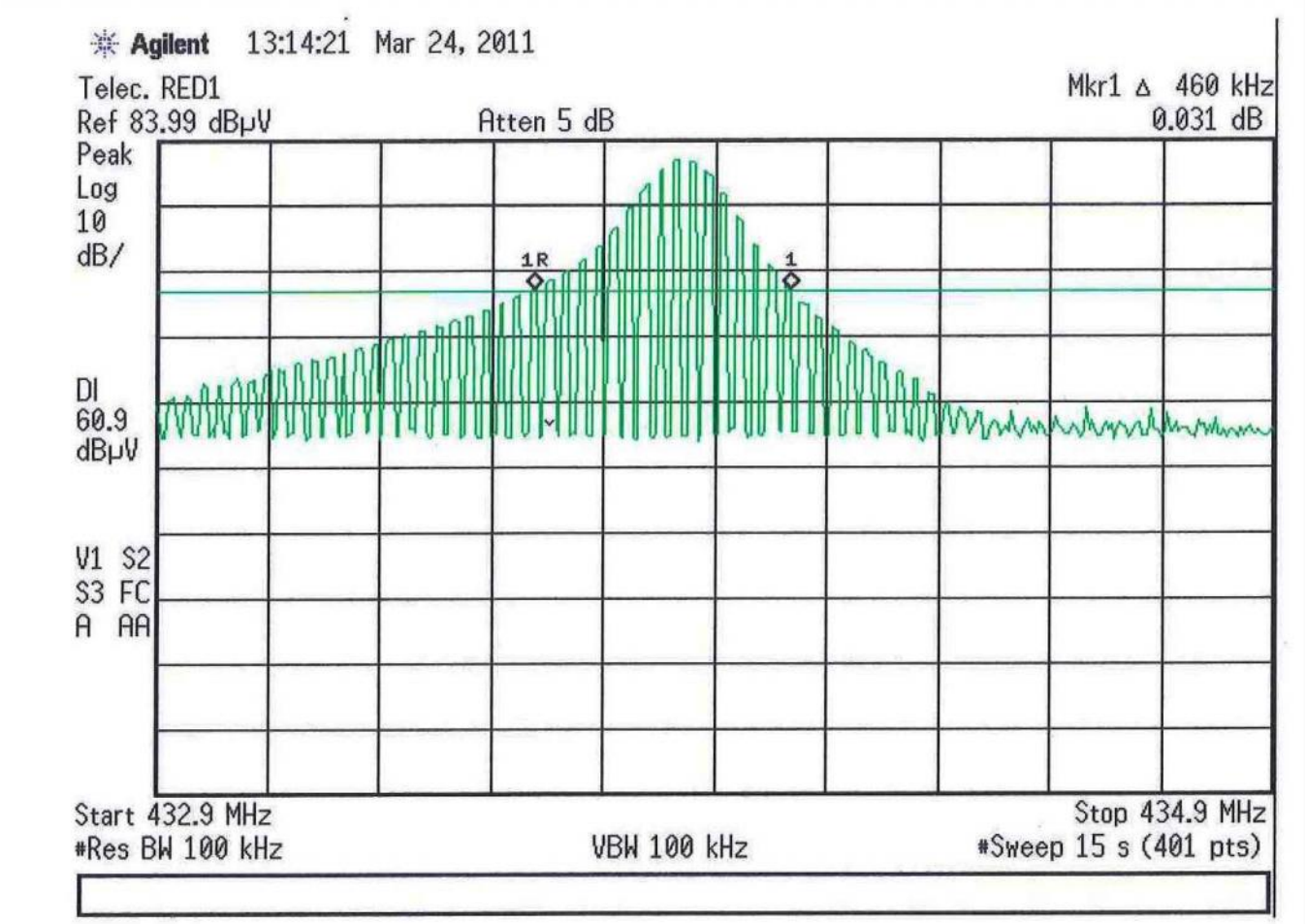
Tele RED 1.5m V F10
Ref 69.99 dBµV
#Atten 0 dB
Mkr1 5.00 GHz
46.81 dBµV
#Avg
Log
10
dB/
Marker
5.000000000 GHz
46.81 dBµV
V1 S2
S3 FC
A AA
Start 1 GHz
Res BW 1 MHz
VBW 3 MHz
Stop 5 GHz
#Sweep 10 s (401 pts)



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