



Electromagnetic Compatibility Test Report

Test Report No: SAE 181010

Issued on: January 31, 2011

Product Name
Afi2GO (High-F)

Tested According to
FCC CFR 47 Part 15 Subpart C

Tests Performed for
S.A.E. Computerized Dairy Management Systems

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ELECTRICAL TESTING
CERT #1633.01

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Bina Talkar



Report Reviewed By: _____

Y. Zucker
QA and Lab. Manager
QualiTech EMC Laboratory

Test Report details:

Test commencement date: 03.10.2010
Test completion date: 03.10.2010
Customer's representative: Neer Haray
Issued on: 31.01.2011

Assessment information:

This report contains an assessment of the EUT against Electromagnetic Compatibility based upon tests carried out on the samples submitted. The results contained in this report relate only to the items tested. Manufactured products will not necessarily give identical results due to production and measurement tolerances. QualiTech, EMC Lab does not assume responsibility for any conclusion and generalization drawn from the test results with regards to other specimens or samples of type of the equipment represented by test item.

The EUT was set up and exercised using the configuration, modes of operation and arrangements defined in this report only.

Modifications:

Modifications made to the EUT

None

Modifications made to the Test Standard

None

Summary of Compliance Status

Test Spec. Clause	Test Case	Remarks
47 CFR §15.209 (a)/(d)/(e)	Field Strength of Fundamental Frequency Emission	Comply
47 CFR §15.209 (c)/(d)/(e)	Field Strength of Unwanted Emissions	Comply



ELECTRICAL TESTING
CERT #1633.01

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1. General Description

Description of the EUT system/test Item:

Product name: Afi2GO, portable LF RFID Reader for livestock application.

Frequency range: 358kHz - 358kHz

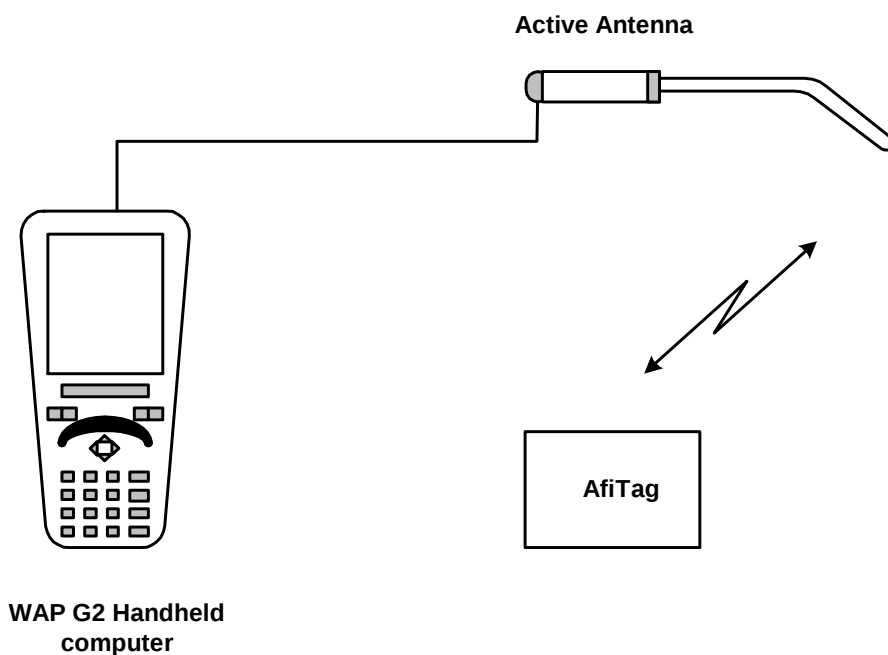
Antenna Type: Internally installed coil wound on a ferrite rod.

2. Method of Measurements

Radiated Emission measurements:

Measurements were performed at a 3-meter measurement distance in the semi-anechoic chamber in order to evaluate the radiated electromagnetic interference characteristics of the EUT. The EUT was placed on a non-metallic table, 0.8m above the turntable, was configured, arranged and operated in a manner consistent with typical application and load conditions. The test program of exercising the equipment ensured that various parts of the EUT were exercised to permit detection of all EUT disturbances. An appropriate antenna depending upon the frequency range and according to the requirements of ANSI C63.4-2009 Sec.4.5.2 & Sec. 4.5.3 was used. The amplitudes of worst-case emission were measured with the QP detector or Average detector according to the frequency range, using resolution-bandwidth according to the requirements of ANSI C63.4-2003.

EUT set-up for Emission Measurements:



3. Test Facility & Uncertainty of Measurement

3.1. Accreditation/ Registration reference:

- A2LA Certificate Number: 1633.01

3.2. Test Facility description

The tests were performed at the EMC Laboratory, QualiTech Division, ECI Telecom Group

Address: 30, Hasivim St., Petah Tikva, Israel.
 Tel: 972-3-926-8443

3m Anechoic Chamber:

The 3m-screened chamber is used in two configurations: the semi-anechoic configuration for Radiated Emission measurements and the full-anechoic configuration for Radiated Immunity tests.

Semi Anechoic Configuration:

Measurement distance	3m
Chamber dimensions	9.5m x 6.5m x 5.2m
Antenna height	1 - 4m
Shielding Effectiveness	Magnetic field ≥ 80 dB at 15 kHz ≥ 90 dB at 100 kHz Electric field > 120 dB from 1MHz to 1GHz > 110 dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Frankonia hybrid absorbing material in selected positions on the walls
Normalized Site Attenuation measured at 5 positions	± 3.49 dB, 30MHz to 1GHz
Transmission Loss measured at 5 positions, at 1.5m height	± 3 dB, 1GHz to 18GHz

Full-Anechoic Configuration:

Measurement distance	3m
Chamber dimensions	7m x 4m x 3m
Antenna height	1.55m at Horizontal & Vertical polarizations
Shielding Effectiveness	Magnetic field ≥ 80 dB at 15 kHz ≥ 90 dB at 100 kHz Electric field > 120 dB from 1MHz to 1GHz > 110 dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Frankonia hybrid absorbing material in selected positions on the walls and floor
Field Uniformity to EN61000-4-3	± 3 dB 80MHz to 18GHz

3.3. Uncertainty of Measurement:

Test Name	Test Method & Range	Uncertainty	
		Combined std. Uc(y) [dB]	Expanded U [dB]
Radiated Emission	30MHz÷230MHz, Horiz. polar.	1.8	3.6
	30MHz÷230MHz, Ver. polar.	2.0	3.9
	230MHz÷1000MHz, Horiz. polar.	1.5	3.0
	230MHz÷1000MHz, Vert. polar.	1.5	3.0
Conducted Emission	9 kHz÷150 kHz	1.4	2.8
	150 kHz÷30MHz	1.1	2.2

4. Report of Measurements and Examinations

4.1. Field Strength of Fundamental Frequency Emission

Reference document:	47 CFR §15.209 (a)/(d)/(e)										
Test Requirements:	The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table: <table> <tr> <th>Frequency [MHz]</th><th>Field Strength [$\mu\text{V/m}$]</th><th>Measurement distance [m]</th><th>Extrapolation Factor 3m [dB]</th></tr> <tr> <td>0.009 – 0.490</td><td>2400/F</td><td>300</td><td>80</td></tr> </table> F – fundamental in kHz The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.			Frequency [MHz]	Field Strength [$\mu\text{V/m}$]	Measurement distance [m]	Extrapolation Factor 3m [dB]	0.009 – 0.490	2400/F	300	80
Frequency [MHz]	Field Strength [$\mu\text{V/m}$]	Measurement distance [m]	Extrapolation Factor 3m [dB]								
0.009 – 0.490	2400/F	300	80								
Test Method:	See Sec 2	Comply									
Method of testing:	Radiated										
Operating conditions:	Under normal test conditions										
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa								
Test Result:	See below	See Plot 4.1 – 4.3									

Test results

Position 1

Frequency [MHz]	Measured Emission [dB $\mu\text{V/m}$]	Detector	Limit extrapolated to 3m [dB $\mu\text{V/m}$]	Margin [dB]	Result
0.359200	37.4	AVR	96.50	-59.10	Pass

Position 2

Frequency [MHz]	Measured Emission [dB $\mu\text{V/m}$]	Detector	Limit extrapolated to 3m [dB $\mu\text{V/m}$]	Margin [dB]	Result
0.358500	37.2	AVR	96.51	-59.31	Pass

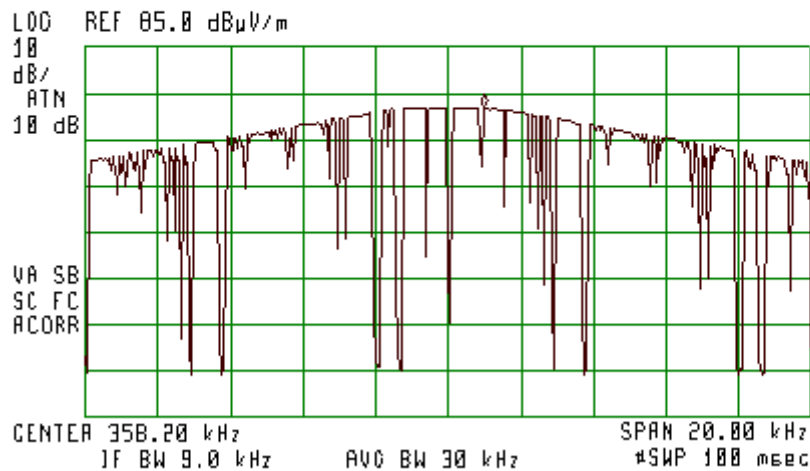
Position 3

Frequency [MHz]	Measured Emission [dB $\mu\text{V/m}$]	Detector	Limit extrapolated to 3m [dB $\mu\text{V/m}$]	Margin [dB]	Result
0.359100	39.7	AVR	96.5	-56.8	Pass

Position 1
Fundamental frequency
Plot 4.1



FREQ 359.2 kHz
PEAK 72.1 dBμV/m
QP 69.4 dBμV/m
AVG 37.4 dBμV/m

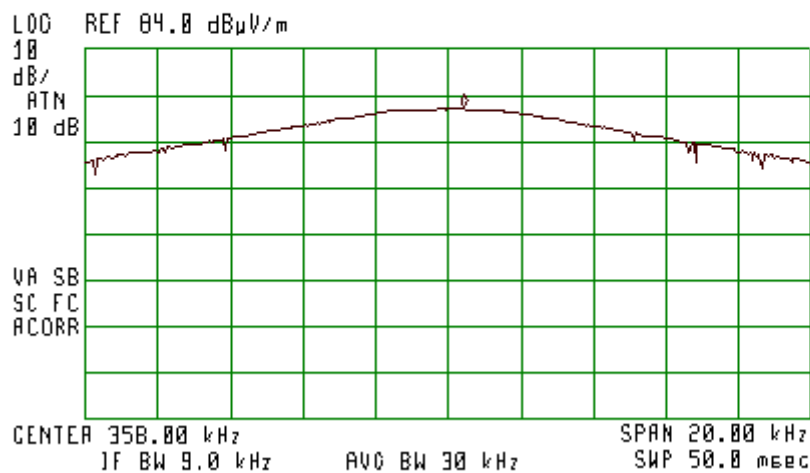


Position 2
Fundamental frequency
Plot 4.2



P1

FREQ 358.5 kHz
PEAK 72.0 dBμV/m
QP 69.3 dBμV/m
AVG 37.2 dBμV/m

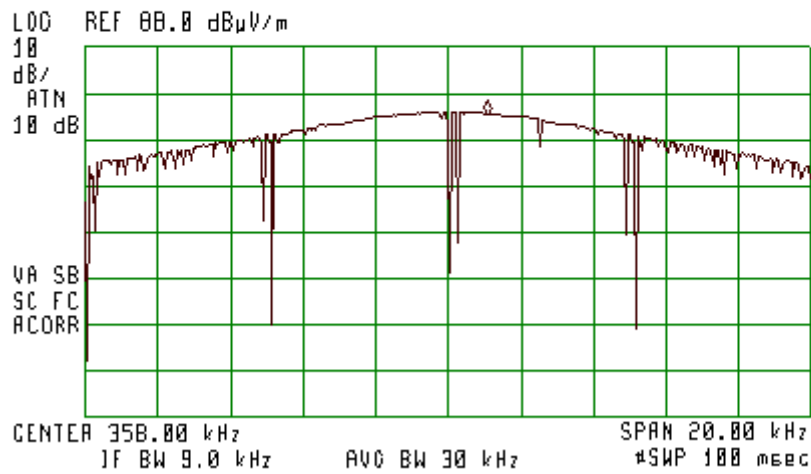


Position 3
Fundamental frequency
Plot 4.3



P2

FREQ	359.1 kHz
PEAK	74.2 dB μ V/m
QP	71.7 dB μ V/m
AVG	39.7 dB μ V/m



4.2. Field Strength of Unwanted Emissions

Reference document:	47 CFR §15.209 (c)/(d)/(e)																																		
Test Requirements:	The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. <table> <tr> <th><i>Frequency [MHz]</i></th><th><i>Field Strength [μV/m]</i></th><th><i>Measurement distance[m]</i></th><th><i>Extrapolation Factor 3m [dB]</i></th></tr> <tr> <td>0.009 – 0.490</td><td>2400/F</td><td>300</td><td>80</td></tr> <tr> <td>0.490 – 1.705</td><td>24000/F</td><td>30</td><td>40</td></tr> <tr> <td>1.705 – 30.0</td><td>30</td><td>30</td><td>40</td></tr> <tr> <td>30 - 88</td><td>100</td><td>3</td><td>-</td></tr> <tr> <td>88 - 216</td><td>150</td><td>3</td><td>-</td></tr> <tr> <td>216 - 960</td><td>200</td><td>3</td><td>-</td></tr> <tr> <td>> 960</td><td>500</td><td>3</td><td>-</td></tr> </table> F – the frequency of the unwanted emission in kHz The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.			<i>Frequency [MHz]</i>	<i>Field Strength [μV/m]</i>	<i>Measurement distance[m]</i>	<i>Extrapolation Factor 3m [dB]</i>	0.009 – 0.490	2400/F	300	80	0.490 – 1.705	24000/F	30	40	1.705 – 30.0	30	30	40	30 - 88	100	3	-	88 - 216	150	3	-	216 - 960	200	3	-	> 960	500	3	-
<i>Frequency [MHz]</i>	<i>Field Strength [μV/m]</i>	<i>Measurement distance[m]</i>	<i>Extrapolation Factor 3m [dB]</i>																																
0.009 – 0.490	2400/F	300	80																																
0.490 – 1.705	24000/F	30	40																																
1.705 – 30.0	30	30	40																																
30 - 88	100	3	-																																
88 - 216	150	3	-																																
216 - 960	200	3	-																																
> 960	500	3	-																																
Test Method:	See Sec 2	Comply																																	
Method of testing:	Radiated																																		
Operating conditions:	Under normal test conditions																																		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa																																
Test Result:	See below	See Plot 4.2.1 to 4.2.24																																	

Test results

Position 1

Frequency [MHz]	Measured Emission [dBμV/m]	Detector	Limit extrapolated to 3m [dBμV/m]	Margin [dB]	Result
0.714600	61.7	QP	70.52	-8.82	Pass
1.434000	56.8	QP	64.47	-7.67	Pass
1.790000	52.3	QP	69.5	-17.2	Pass
2.506000	52.8	QP	69.5	-16.7	Pass
15.820000	52.7	QP	69.5	-16.8	Pass
28.060000	51.7	QP	69.5	-17.8	Pass

Position 2

Frequency [MHz]	Measured Emission [dBμV/m]	Detector	Limit extrapolated to 3m [dBμV/m]	Margin [dB]	Result
0.715600	61.9	QP	70.51	-8.61	Pass
1.432000	57.4	QP	64.49	-7.09	Pass
1.790000	51.5	QP	69.54	-18.04	Pass
2.506000	51.5	QP	69.54	-18.04	Pass
15.820000	51.3	QP	69.54	-18.24	Pass
28.060000	48.9	QP	69.54	-20.64	Pass

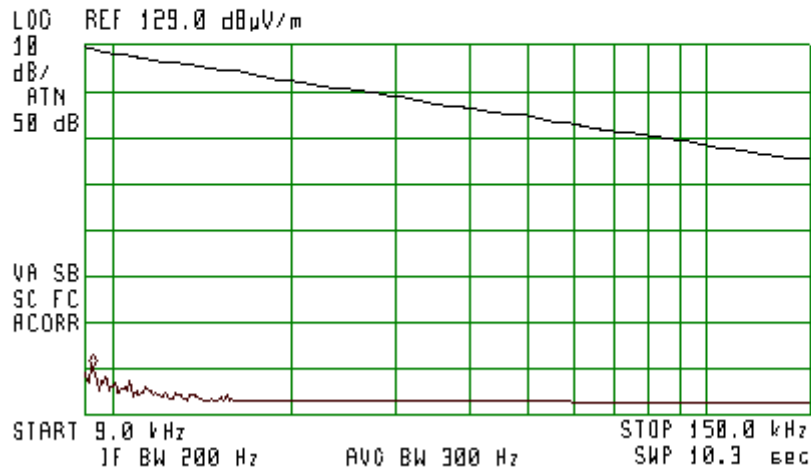
Position 3

Frequency [MHz]	Measured Emission [dBμV/m]	Detector	Limit extrapolated to 3m [dBμV/m]	Margin [dB]	Result
0.716000	65.3	QP	70.51	-5.21	Pass
1.432000	60.4	QP	64.49	-4.09	Pass
1.789000	54.9	QP	69.54	-14.64	Pass
2.505000	54.4	QP	69.54	-15.14	Pass
15.820000	58.7	QP	69.54	-10.84	Pass
27.340000	62.7	QP	69.54	-6.84	Pass

Position 1
Plot 4.2.1



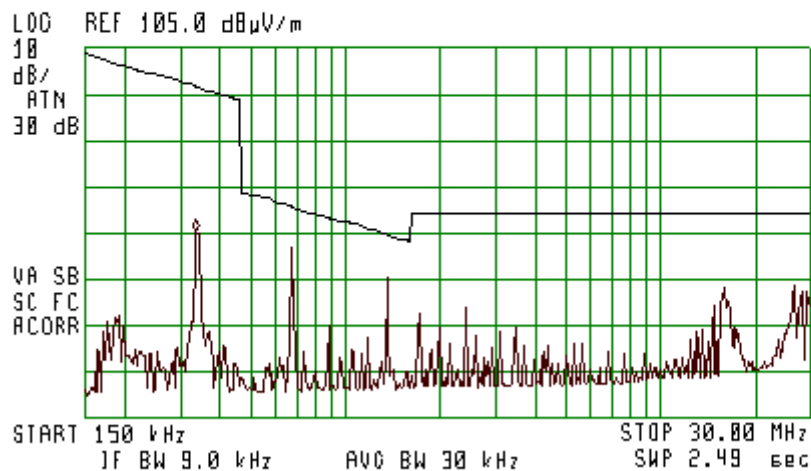
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 9.3 kHz
59.09 dB μ V/m



Position 1
Plot 4.2.2



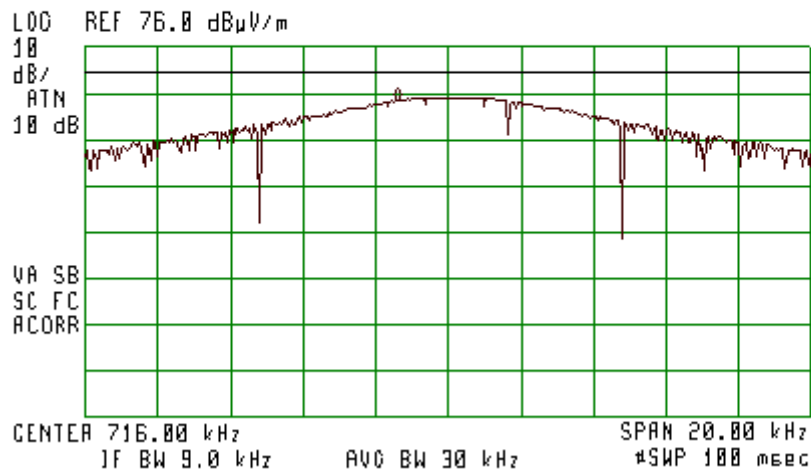
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 350 kHz
65.10 dB μ V/m



Position 1
714.6 kHz
Plot 4.2.3



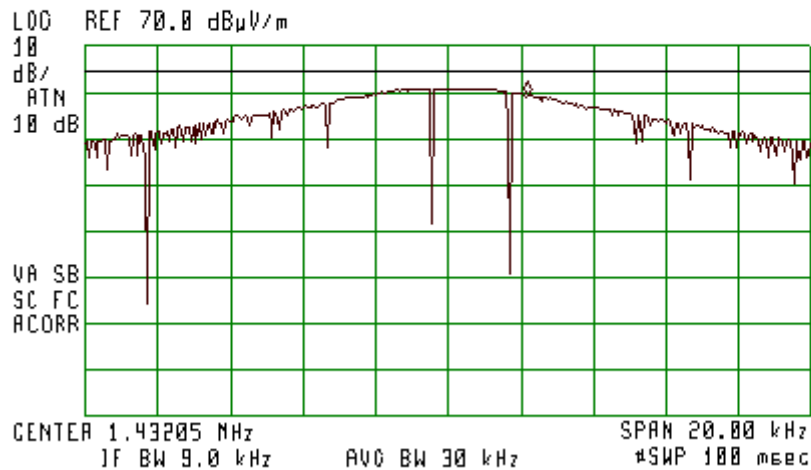
FREQ	714.6 kHz
PEAK	64.4 dB μ V/m
QP	61.7 dB μ V/m
AVG	29.9 dB μ V/m



Position 1
1.434 MHz
Plot 4.2.4



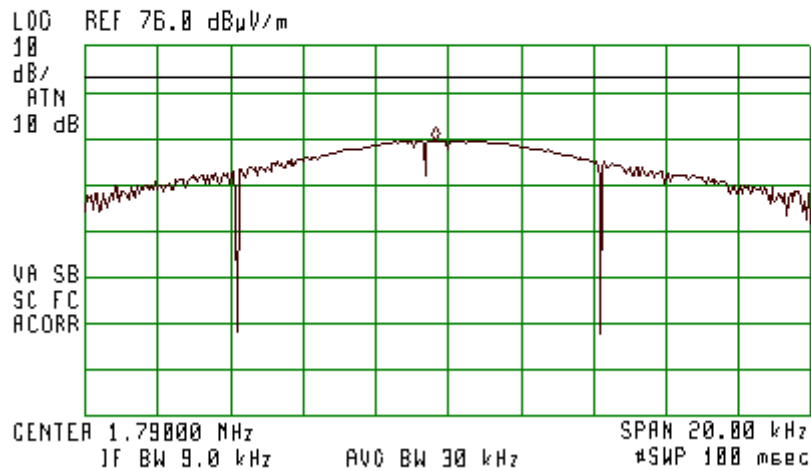
FREQ	1.434 MHz
PEAK	59.4 dB μ V/m
QP	56.8 dB μ V/m
AVG	25.8 dB μ V/m



Position 1
1.790 MHz
Plot 4.2.5



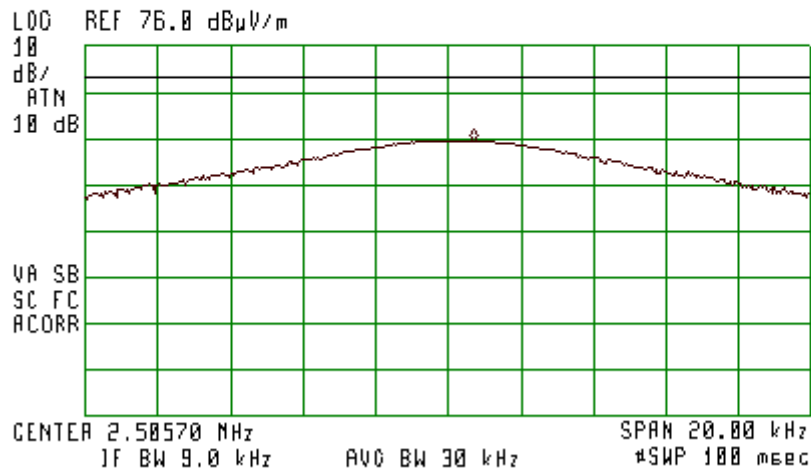
FREQ	1.790 MHz
PEAK	55.6 dB μ V/m
QP	52.3 dB μ V/m
AVG	20.4 dB μ V/m



Position 1
2.506 MHz
Plot 4.2.6



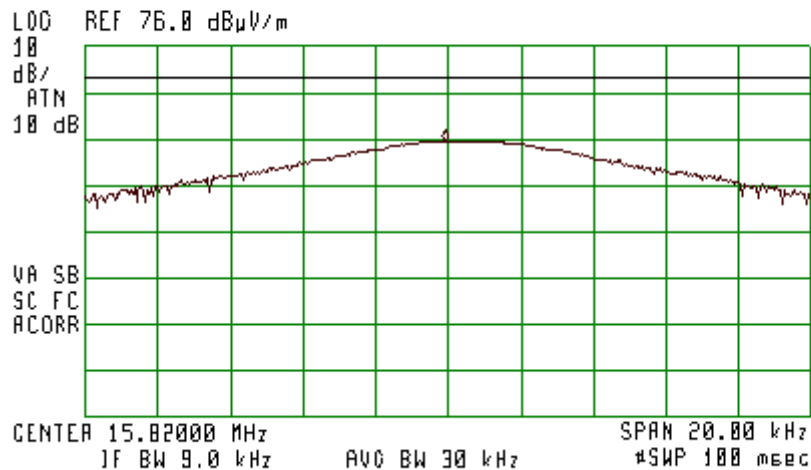
FREQ	2.506 MHz
PEAK	55.5 dB μ V/m
QP	52.0 dB μ V/m
AVG	20.8 dB μ V/m



Position 1
15.82 MHz
Plot 4.2.7



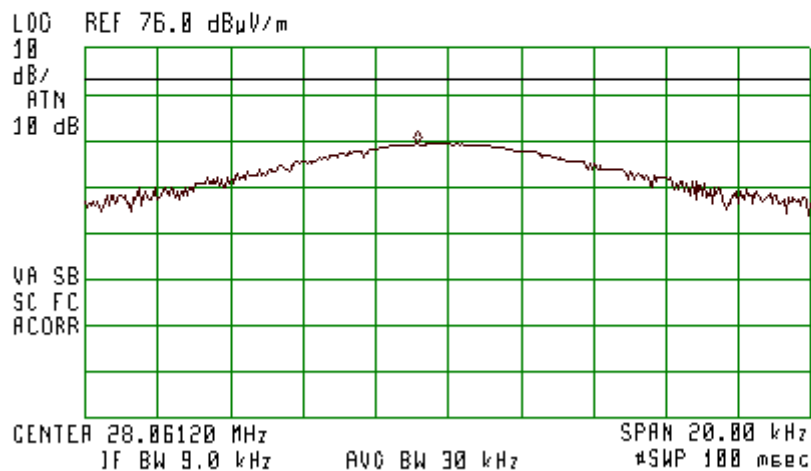
FREQ	15.82 MHz
PEAK	55.3 dB μ V/m
QP	52.7 dB μ V/m
AVG	20.8 dB μ V/m



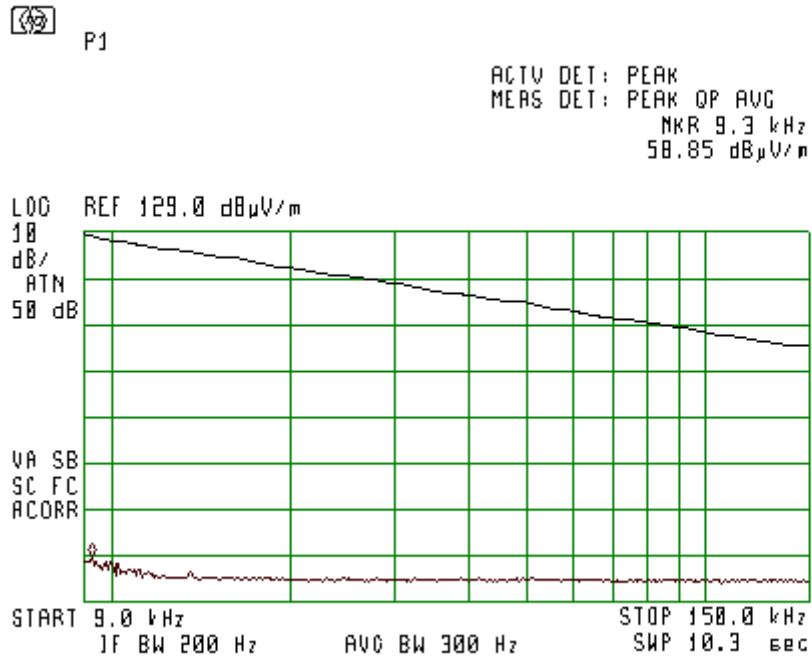
Position 1
28.06 MHz
Plot 4.2.8



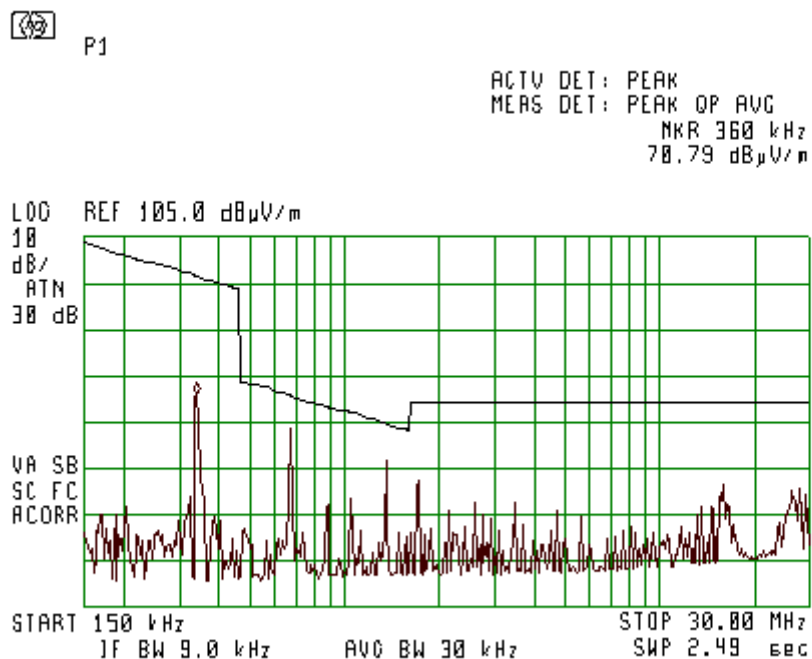
FREQ	28.06 MHz
PEAK	55.2 dB μ V/m
QP	51.7 dB μ V/m
AVG	19.3 dB μ V/m



Position 2
Plot 4.2.9



Position 2
Plot 4.2.10

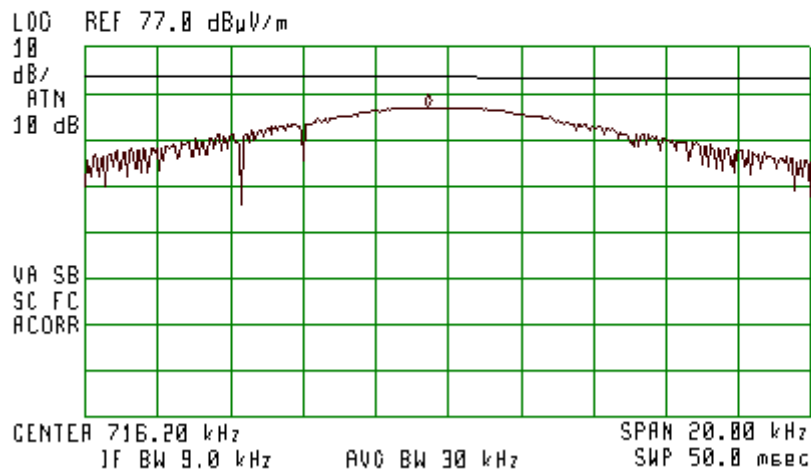


Position 2
715.6 kHz
Plot 4.2.11



P1

FREQ	715.6 kHz
PEAK	64.6 dB μ V/m
QP	61.9 dB μ V/m
AVG	29.9 dB μ V/m

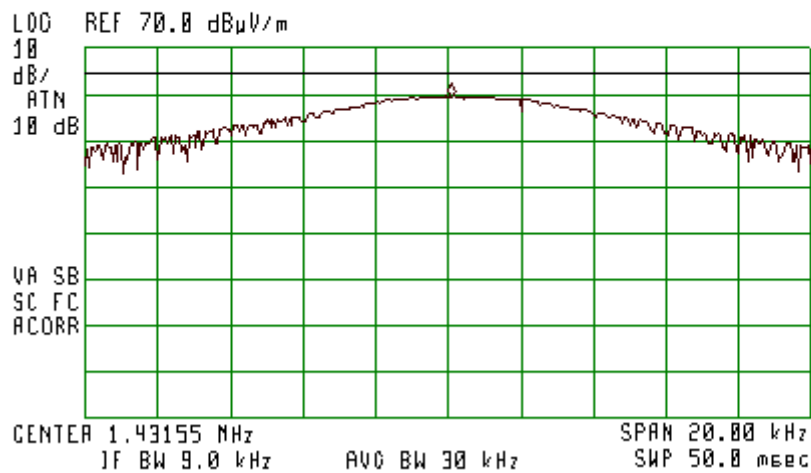


Position 2
1.432 MHz
Plot 4.2.12



P1

FREQ	1.432 MHz
PEAK	60.1 dB μ V/m
QP	57.4 dB μ V/m
AVG	25.5 dB μ V/m

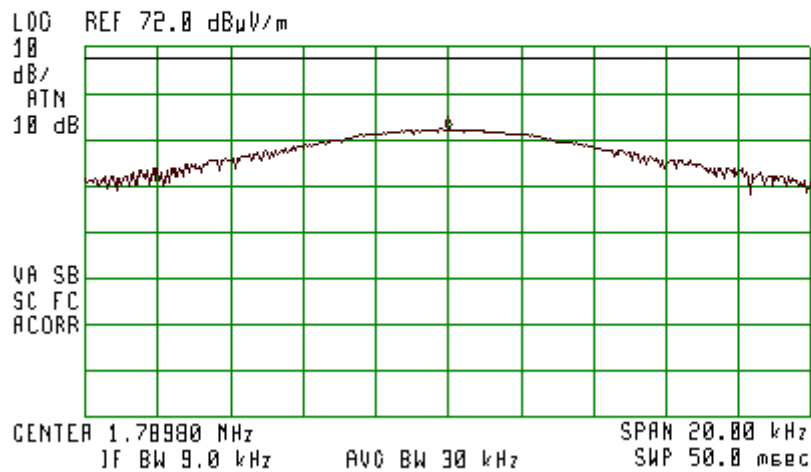


Position 2
1.790 MHz
Plot 4.2.13



P1

FREQ	1.790 MHz
PEAK	54.8 dB μ V/m
QP	51.5 dB μ V/m
AVG	19.7 dB μ V/m

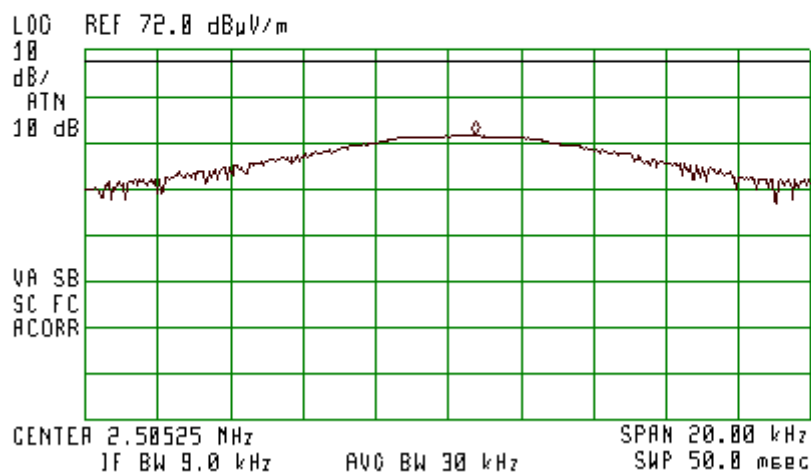


Position 2
2.506 MHz
Plot 4.2.14



P1

FREQ	2.506 MHz
PEAK	54.1 dB μ V/m
QP	51.5 dB μ V/m
AVG	19.6 dB μ V/m

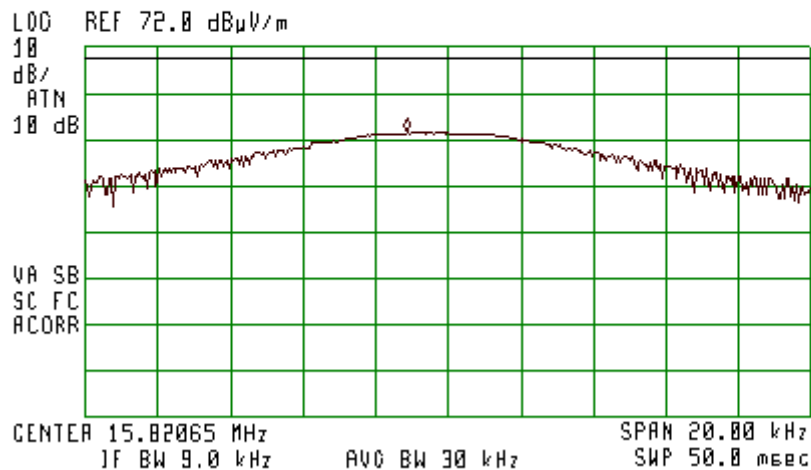


Position 2
15.82 MHz
Plot 4.2.15



P1

FREQ	15.82 MHz
PEAK	53.9 dBμV/m
QP	51.3 dBμV/m
AVG	19.5 dBμV/m

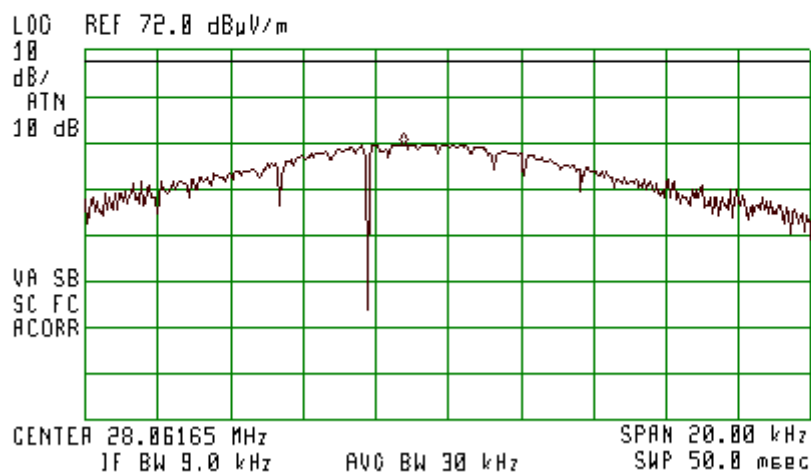


Position 2
28.06 MHz
Plot 4.2.16

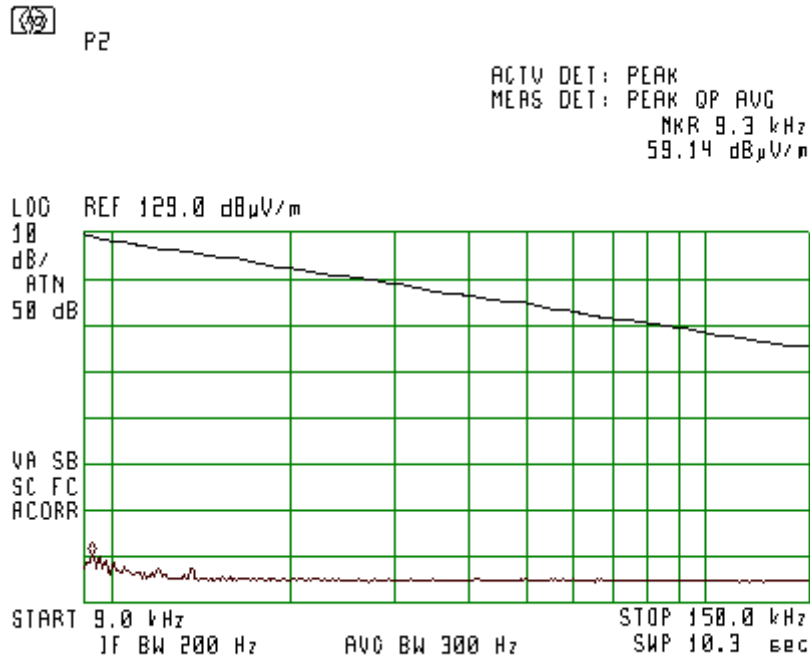


P1

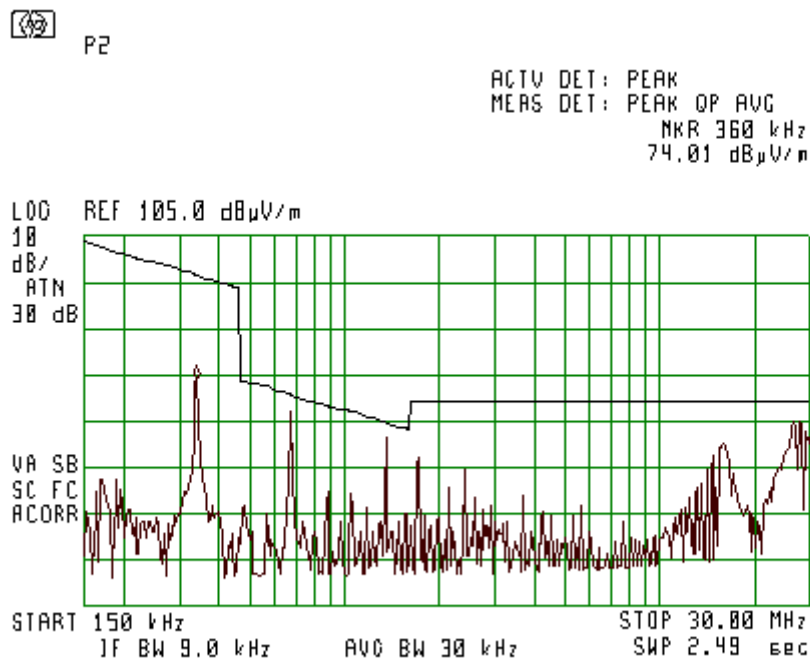
FREQ	28.06 MHz
PEAK	52.4 dBμV/m
QP	48.9 dBμV/m
AVG	16.4 dBμV/m



Position 3
Plot 4.2.17



Position 3
Plot 4.2.18

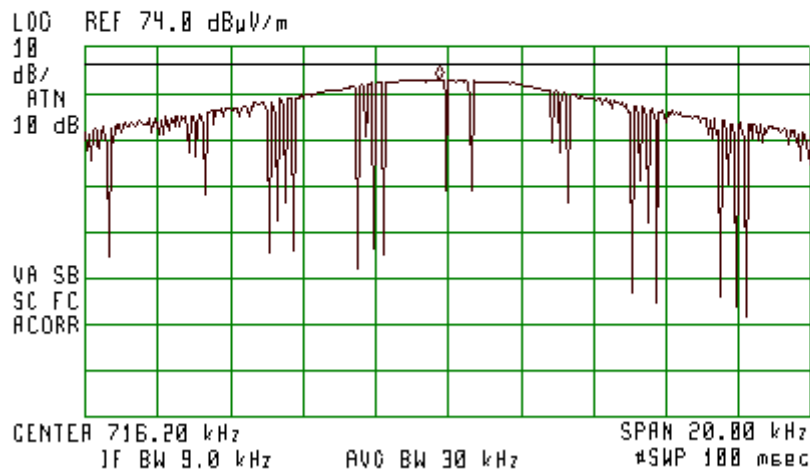


Position 3
716.0 kHz
Plot 4.2.19



P2

FREQ	716.0 kHz
PEAK	68.0 dB μ V/m
QP	65.3 dB μ V/m
AVC	33.2 dB μ V/m

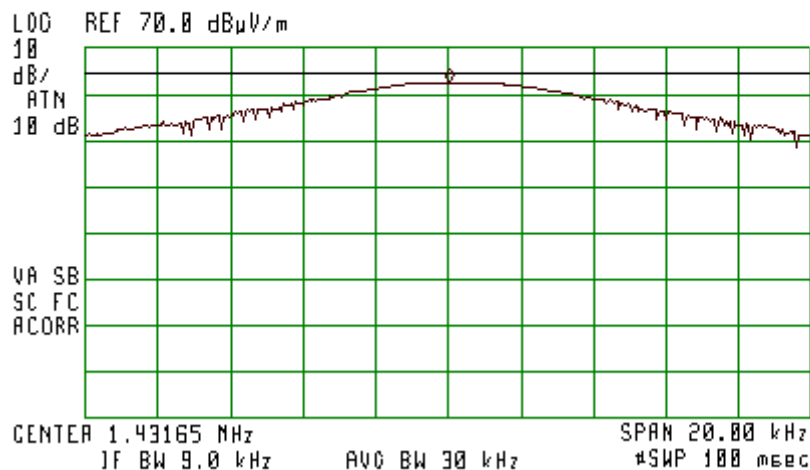


Position 3
1.432 MHz
Plot 4.2.20



P2

FREQ	1.432 MHz
PEAK	63.1 dB μ V/m
QP	60.4 dB μ V/m
AVC	28.5 dB μ V/m

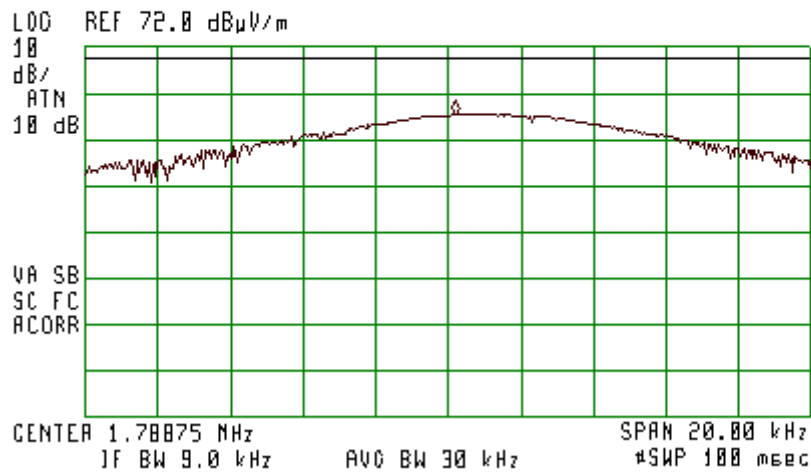


Position 3
1.789 MHz
Plot 4.2.21



P2

FREQ	1.789 MHz
PEAK	58.1 dB μ V/m
QP	54.9 dB μ V/m
AVG	23.1 dB μ V/m

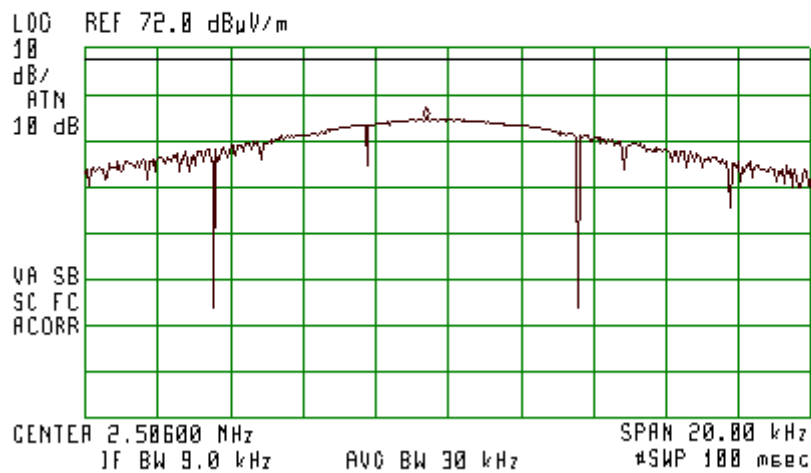


Position 3
2.505 MHz
Plot 4.2.22



P2

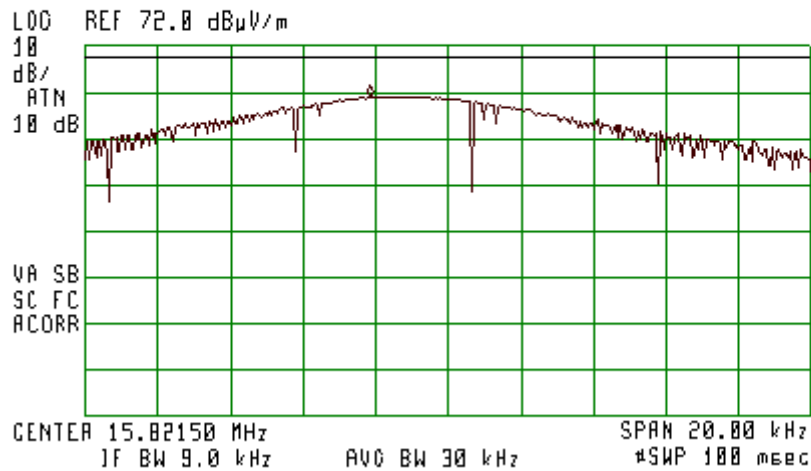
FREQ	2.505 MHz
PEAK	57.1 dB μ V/m
QP	54.4 dB μ V/m
AVG	22.6 dB μ V/m



Position 3
15.82 MHz
Plot 4.2.23

 P2

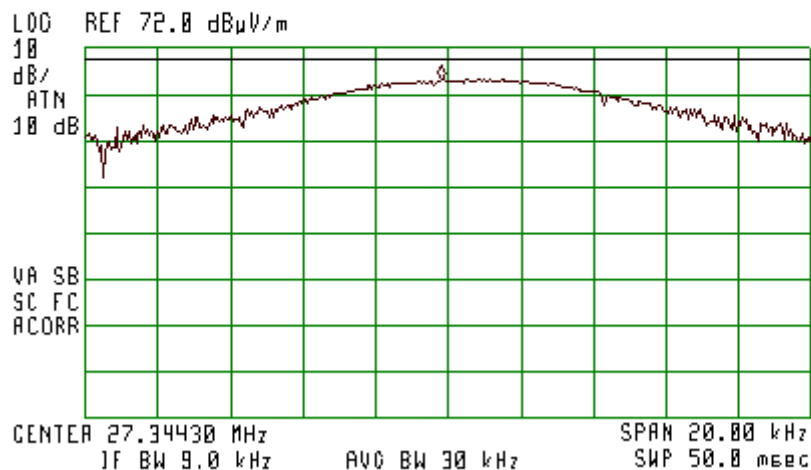
FREQ	15.82 MHz
PEAK	61.3 dB μ V/m
QP	58.7 dB μ V/m
AVG	26.8 dB μ V/m



Position 3
27.34 MHz
Plot 4.2.24

 P2

FREQ	27.34 MHz
PEAK	66.2 dB μ V/m
QP	62.7 dB μ V/m
AVG	30.1 dB μ V/m



5. Appendix

Appendix A: List of Measuring Equipment used:

Equipment	Manufacturer/ Model	Serial Number	Due date
CISPR 16 EMI Receiver, 9 kHz - 6.5 GHz	HP 8546A	3710A00392	30-06-2011
Spectrum Analyzer, 9 kHz - 22 GHz	HP 8593EM	3536A00131	30-06-2011
Spectrum Analyzer, 100 Hz - 26.5 GHz	Agilent E7405A	US41160436	30-06-2011
Low-Noise Amplifier, 0.1 - 18 GHz	MITEQ, AMF-7D-00101800-30-10P	1544443	30-06-2011
Low-Noise Amplifier, 18 - 26.5 GHz	MITEQ, AMF-5F-18002650-30-10P	945372	16-05-2011
Biconical Antenna, 20 - 200 MHz	Schwarzbeck VHBB 9124	9124/0255	16-05-2011
Log-Periodic Antenna, 200 - 1000 MHz	Schwarzbeck VUSLP 9111	VUSLP9111184	16-05-2011
Double Ridged Guide Antenna, 1 - 18 GHz	A.R.A., DRG-118/A	17188	30-06-2011
SHF-EHF Horn, 15 - 40 GHz	Schwarzbeck BBHA 9170	BBHA9170214	30-06-2011
Turn table	HD 100	100/693	-
Antenna Mast	HD 100	100/693	-
LISN	Fischer 50/250-25-2	-	30-06-2011
Transient Limiter, 9 kHz ÷ 200 MHz	HP 11947A	3107A04119	30-06-2011
Notch Filter	Micro-Tronics, BRM50702-05	0001	16-05-2011
Tunable Bandreject Filter	K&L, 3TNF-800/1000-0.2-N/N	336	16-05-2011
Tunable Bandreject Filter	K&L, 5TNF-1700/2000-0.1-N/N	212	16-05-2011
Highpass Filter, 1.2 ÷ 15 GHz	WAINWRIGHT, WHK1.2/15G-10EF	SN 3	16-05-2011
Highpass Filter, 2.4 ÷ 18 GHz	WAINWRIGHT, WHK2.4/18G-10EF	SN 1	16-05-2011
Highpass Filter, 7 ÷ 18 GHz	WAINWRIGHT, WHKX7.0/18G-8SS	SN 12	16-05-2011

Appendix B: Accreditation Certificate



End of the Test Report