Electromagnetic Compatibility
Test Report

Test Report No: SAE 140711
Issued on: July 14, 2011

Product Name
Transceiver for Antenna Tag Identification
Model: Ideal Atmega 358/200 kHz

Tested According to
FCC CFR 47 Part 15 Subpart C

Tests Performed for
S.A.E. Computerized Dairy Management Systems
Kibbutz Afikim, Jordan Valley 15148, Israel
Tel: 972-04-6756463

QualiTech EMC Laboratory, ECI Telecom
30 Hasivim Street,
Petah-Tikva, 49517, Israel
Tel: +972-3-926 8443
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ELECTRICAL TESTING
CERT #1633.01

Test Personnel

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Report Reviewed By: ----------

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EMC Lab. Manager
QualiTech EMC Laboratory

Test Report details:

Test commencement date:	11.07.2011
Test completion date:	11.07.2011
Customer's representative:	Neer Haray
Issued on:	14.07.2011

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

Table of Contents

1. General Description

The *AfiMilk*® AFI ID System is a livestock identification system. The AFI ID uses active animal tags (containing batteries).

The System Description:

1. IDeal controller: with communication to *AfiMilk*® afifarm which is the database and report application.
2. Switch box: Up to 6 Switches Box can be connected to the IDeal Controller.
3. Antenna: up to 16 Antennas can be connected to each Switch Box. Maximum is 96 antenna connected.
4. Tag id on the livestock animal.

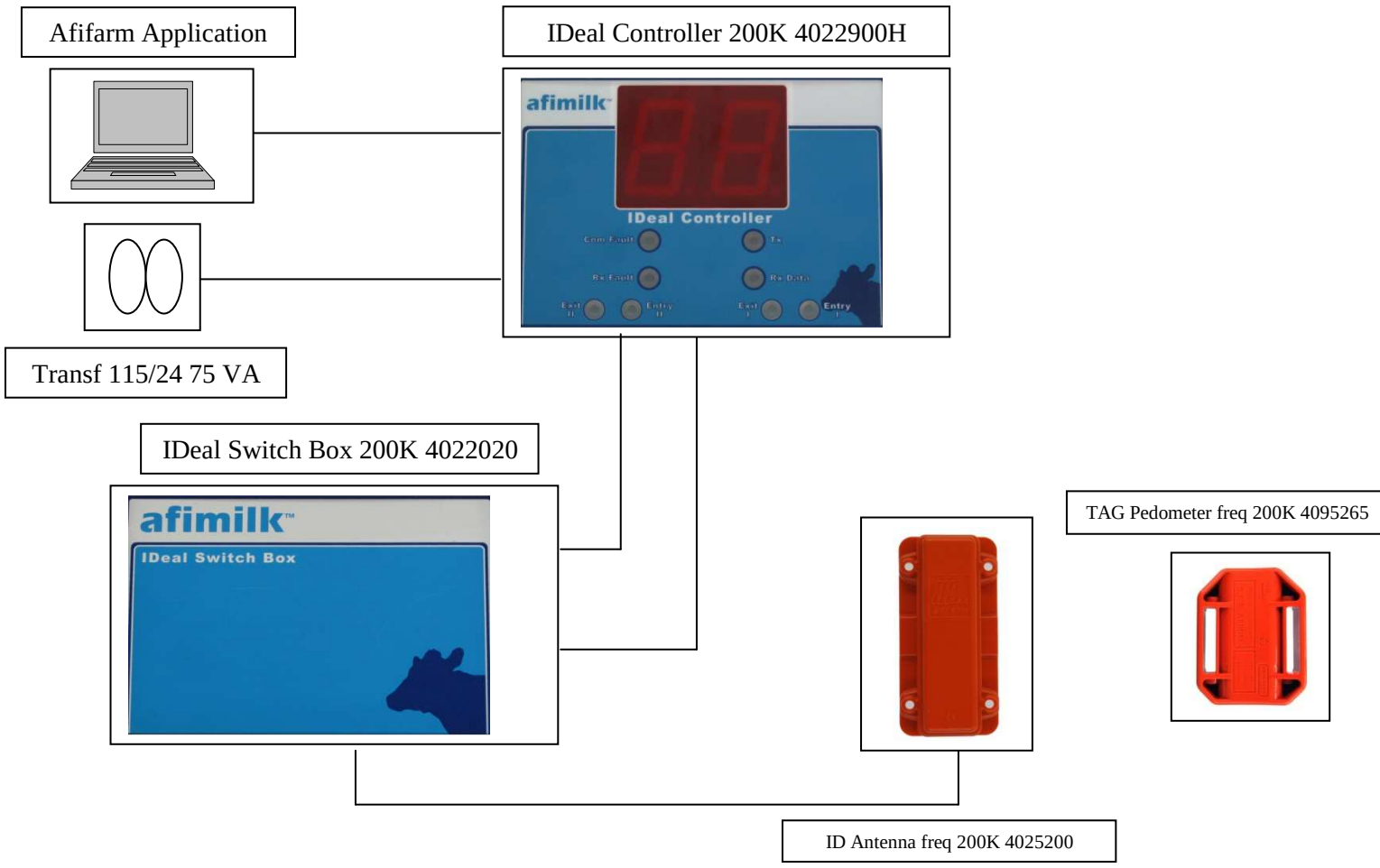
Detailed Description

RF Module frequencies are of the Antenna and the ID Tag.
Transmit frequency is 358 kHz consist of 2 data request pulse of 0.5 ms wide.
Receive frequency is 200 kHz consist of up to 264 data ID Tag protocol pulse of 3ms wide.

Antenna & ideal controller updates:

- Ideal controller update- CPU changed to ATMEGA 128.
- Clock frequency changed according to table 1.1.4.

EUT set-up for Emission Measurements:



1.1.1. EUT Cards/Modules List:

No	Hardware Component	Manufacturer's Catalog Number	Serial Number	Hardware Revision	Quantity
1	IDeal controller freq 200K	4022900H	02458	04	1
2	Ideal Switch Box	4022020	01428	02	1
3	ID Antenna freq 200K	4025200	200024	03	1
4	TAG Pedometer plus freq 200K	4095265	4002	02.XX	1
5	TRANSF. 115/24V 75VA		-	-	1

1.1.2. Cables Identification:

Port/Line Name @ EUT	Type	Indoor/ outdoor	Typical Length [m]	# of ports/ boards available	# of ports/ boards connected	From	To
230 VAC	Unshielded	Outdoor	1.5	1	1	Transformer	AC mains
24 VAC	Unshielded	Outdoor	6.0*	1	1	Transformer	Controller
RS 485	Shielded	Outdoor	15.0**	1	1	PC	Controller
Antenna	Shielded	Outdoor	10***	16	1	Switch box	Antenna
Select	Shielded	Outdoor	3.0*	3	1	Controller	Switch box
Signal	Shielded	Outdoor	3.0*	1	1	Controller	Switch box
GND	AWG10	Outdoor	3.0*	1	1	Controller	Reference Ground plane
230 VAC	Unshielded	Indoor	1.5	1	1	PC	AC mains
Keyboard	Unshielded	Indoor	2.0	1	1	PC	Keyboard
Mouse	Unshielded	Indoor	2.0	1	1	PC	Mouse
Video	Unshielded	Indoor	1.5	1	1	PC	Monitor

*May be from 3 to 10m length
** May be longer than 30m
*** May be longer up to 35m

1.1.3. Clock Frequencies Table:

Frequency [MHz]	Location
200 KHz	Receiver
358 KHz	Transmitter
7.3728 MHz	Main Clock
3.579545 MHz	RF Clock before deviation

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.

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 ≥80dB at 15 kHz ≥90dB at 100 kHz Electric field >120dB from 1MHz to 1GHz >110dB 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	±3.49dB, 30MHz to 1GHz
Transmission Loss measured at 5 positions, at 1.5m height	±3dB, 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 ≥80dB at 15 kHz ≥90dB at 100 kHz Electric field >120dB from 1MHz to 1GHz >110dB 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	±3dB 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

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: *Frequency [MHz]* — *Field Strength [µV/m]* — *Measurement distance[m]* — *Extrapolation Factor 3m [dB]* 0.009 – 0.490 — 2400/F — 300 — 80 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.		
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 – 4.6	

Test results:

Position 1

Frequency [MHz]	Loop Antenna orientation	Peak detector measurement [dBµV/m]	Average detector measurement [dBµV/m]	Peak Limit extrapolated to 3m [dBµV/m]	Average Limit extrapolated to 3m [dBµV/m]	Peak Margin [dB]	Average Margin [dB]	Result
0.357700	coaxial	100.40	52.10	116.53	96.53	-16.13	-44.43	Pass

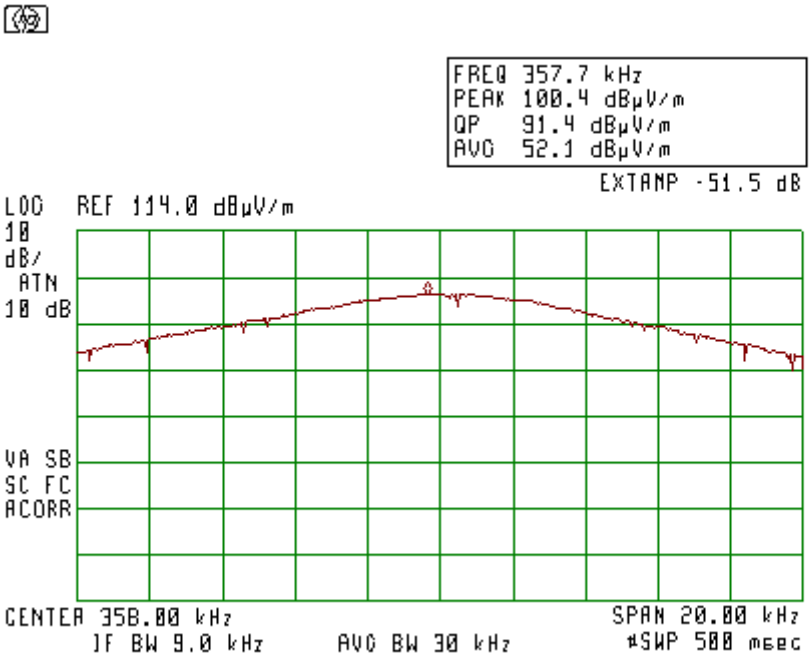
Position 2

Frequency [MHz]	Loop Antenna orientation	Peak detector measurement [dBµV/m]	Average detector measurement [dBµV/m]	Peak Limit extrapolated to 3m [dBµV/m]	Average Limit extrapolated to 3m [dBµV/m]	Peak Margin [dB]	Average Margin [dB]	Result
0.358000	coaxial	114.60	65.90	116.53	96.53	-1.93	-30.63	Pass

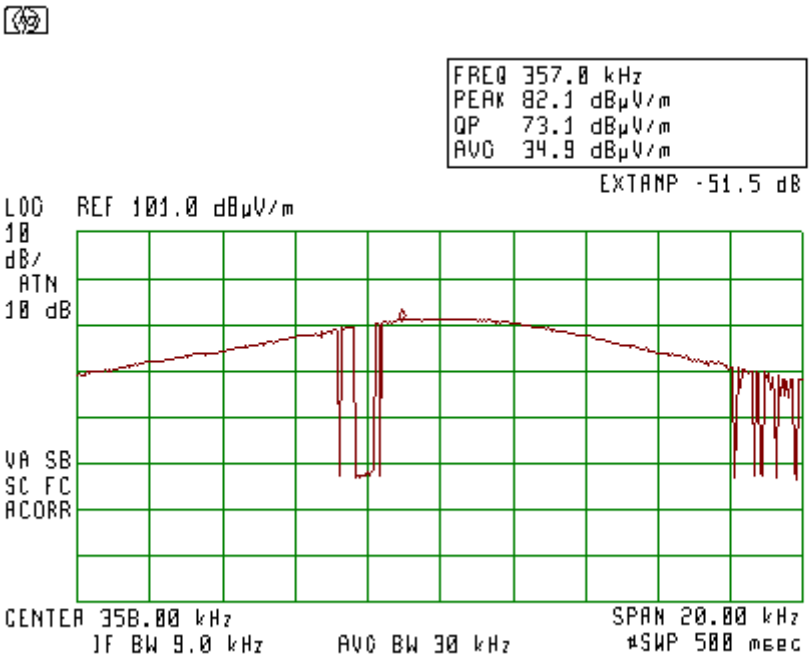
Position 3

Frequency [MHz]	Loop Antenna orientation	Peak detector measurement [dBµV/m]	Average detector measurement [dBµV/m]	Peak Limit extrapolated to 3m [dBµV/m]	Average Limit extrapolated to 3m [dBµV/m]	Peak Margin [dB]	Average Margin [dB]	Result
0.358200	coaxial	114.10	65.40	116.53	96.53	-2.43	-31.13	Pass

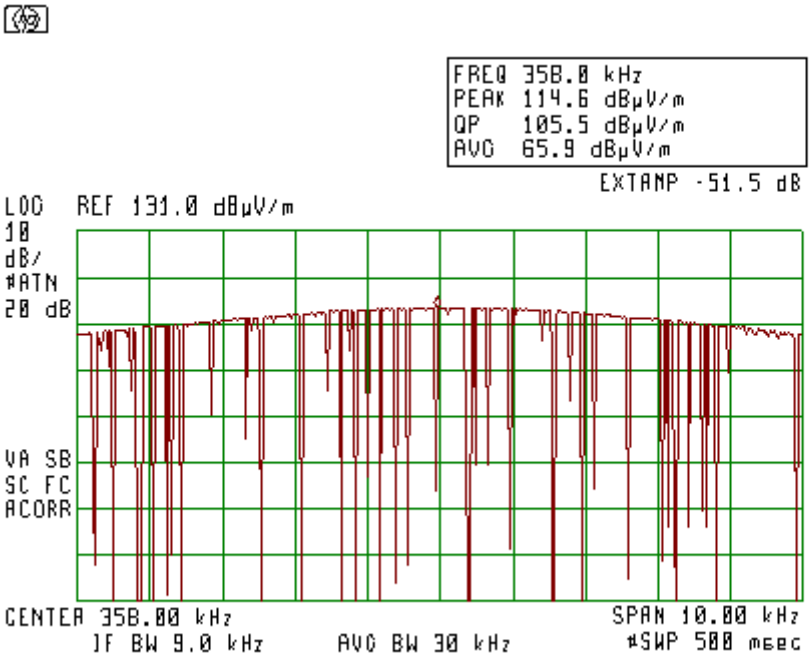
Position 1
Fundamental frequency
Coaxial orientation
Plot 4.1.1



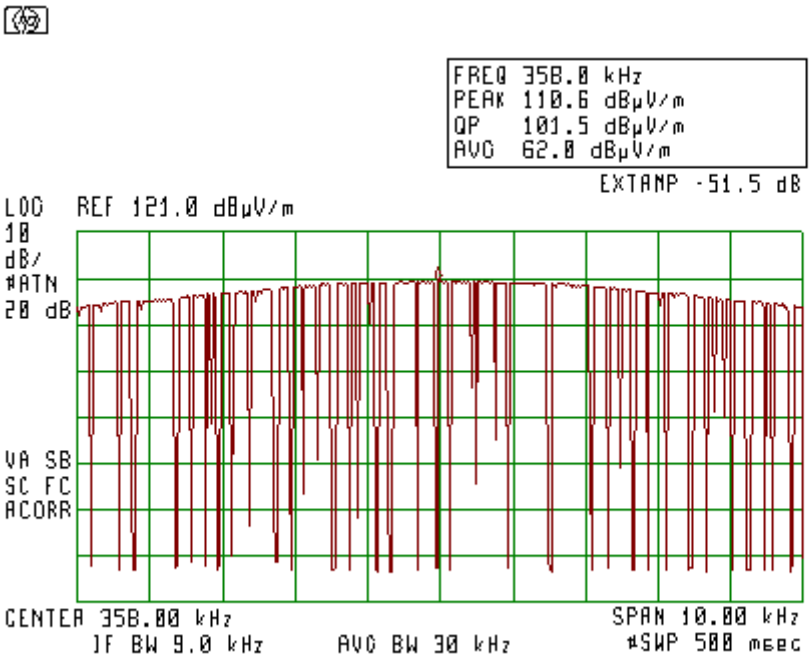
Planar orientation
Plot 4.1.2



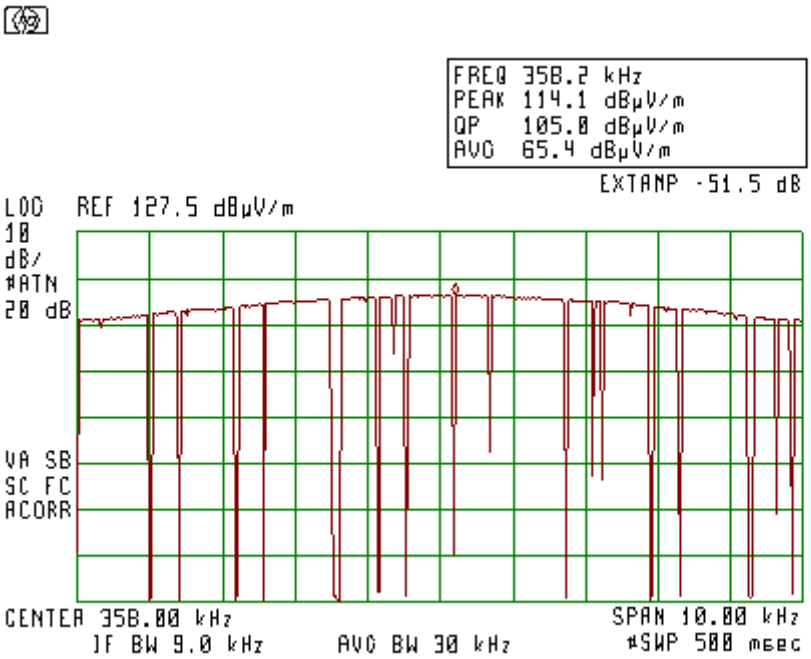
Position 2
Fundamental frequency
Coaxial orientation
Plot 4.1.3



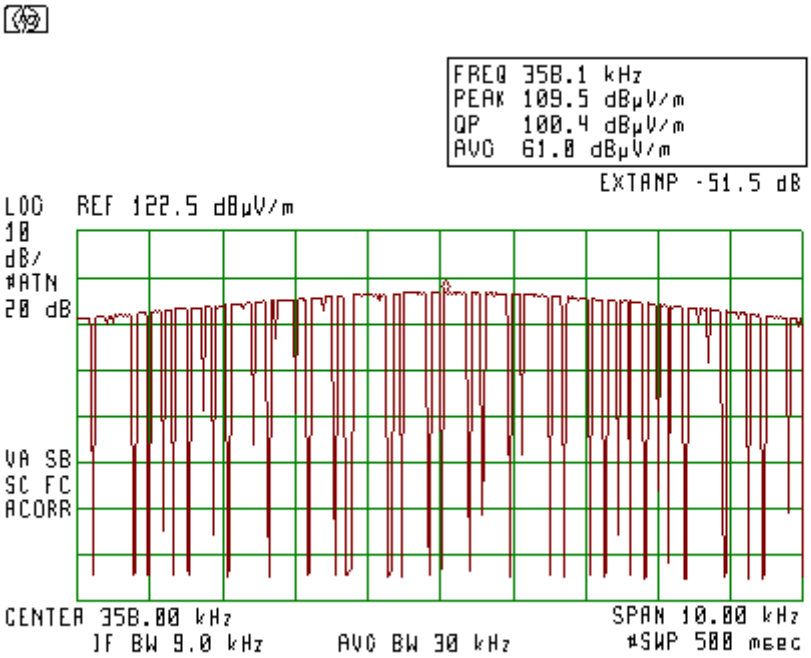
Planar orientation
Plot 4.1.4



Position 3
Fundamental frequency
Coaxial orientation
Plot 4.1.5



Planar orientation
Plot 4.1.6



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.		
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 4.2.26	

Frequency [MHz]	*Field Strength [µV/m]*	*Measurement distance[m]*	*Extrapolation Factor 3m [dB]*
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	-

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.

Test results:

Position 1

Frequency [MHz]	Loop antenna orientation	Measured Emission [dBµV/m]	Detector	Limit extrapolated to 3m [dBµV/m]	Margin [dB]	Result
0.715600	Coaxial	45.10	QP	70.51	-25.41	Pass
2.147000	Planar	43.30	QP	69.54	-26.24	Pass
3.580000	Planar	47.90	QP	69.54	-21.64	Pass
29.850000	Planar	32.80	QP	69.54	-36.74	Pass

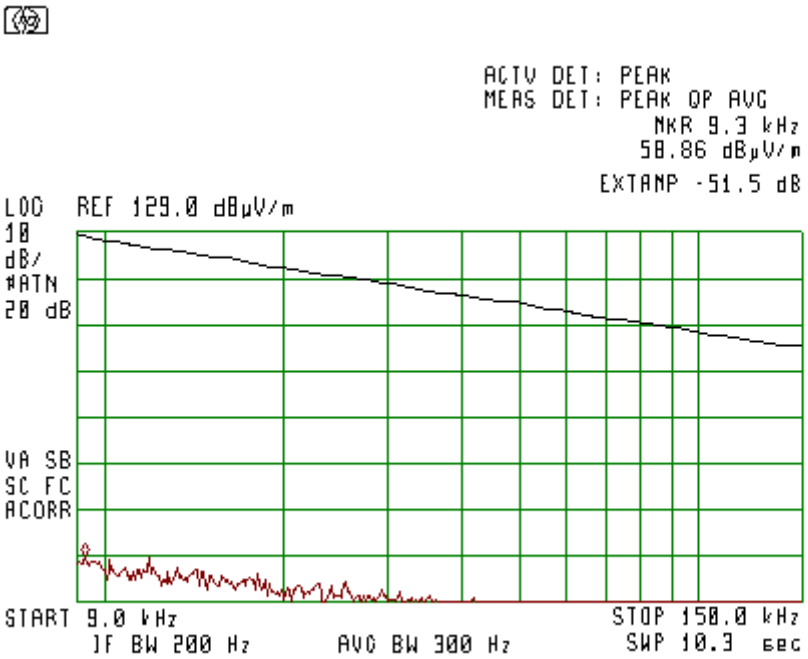
Position 2

Frequency [MHz]	Loop antenna orientation	Measured Emission [dBµV/m]	Detector	Limit extrapolated to 3m [dBµV/m]	Margin [dB]	Result
0.199700	Coaxial	61.80	AVG	101.60	-39.80	Pass
0.716300	Coaxial	50.50	QP	70.50	-20.00	Pass
3.435000	Planar	48.40	QP	69.54	-21.14	Pass
5.583000	Planar	42.20	QP	69.54	-27.34	Pass
28.420000	Planar	40.60	QP	69.54	-28.94	Pass

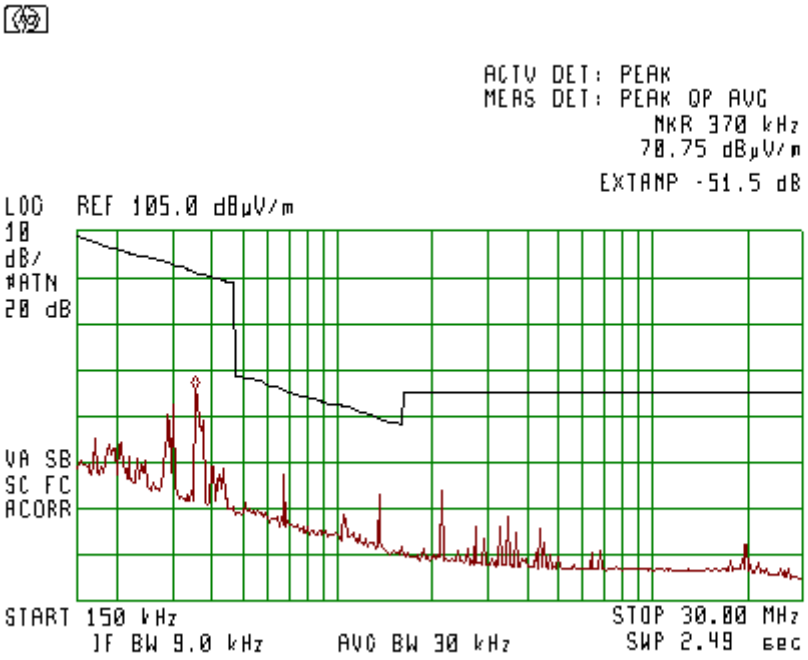
Position 3

Frequency [MHz]	Loop antenna orientation	Measured Emission [dBµV/m]	Detector	Limit extrapolated to 3m [dBµV/m]	Margin [dB]	Result
0.198800	Coaxial	61.20	AVG	101.64	-40.44	Pass
0.502000	Coaxial	55.70	QP	73.59	-17.89	Pass
3.793000	Coaxial	31.70	QP	69.54	-37.84	Pass
5.940000	Planar	40.30	QP	69.54	-29.24	Pass
29.130000	Planar	37.20	QP	69.54	-32.34	Pass

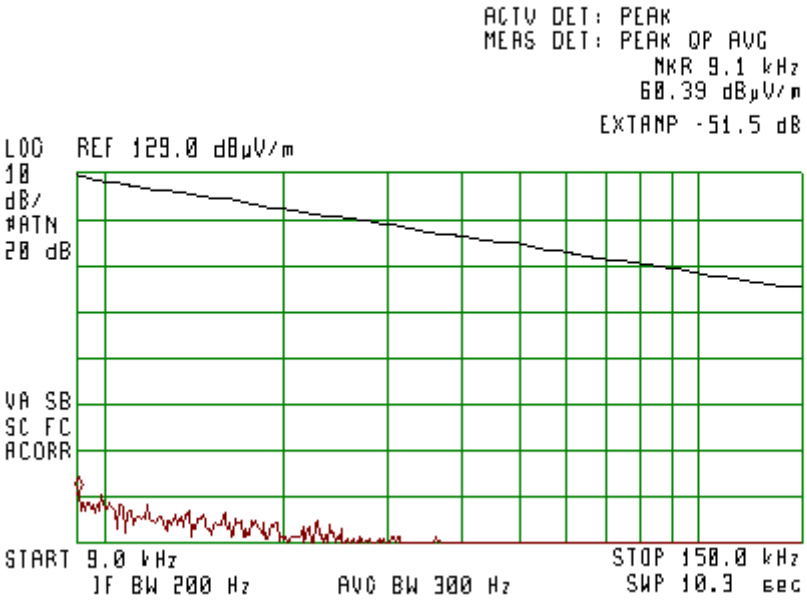
Position 1
Coaxial orientation
Plot 4.2.1



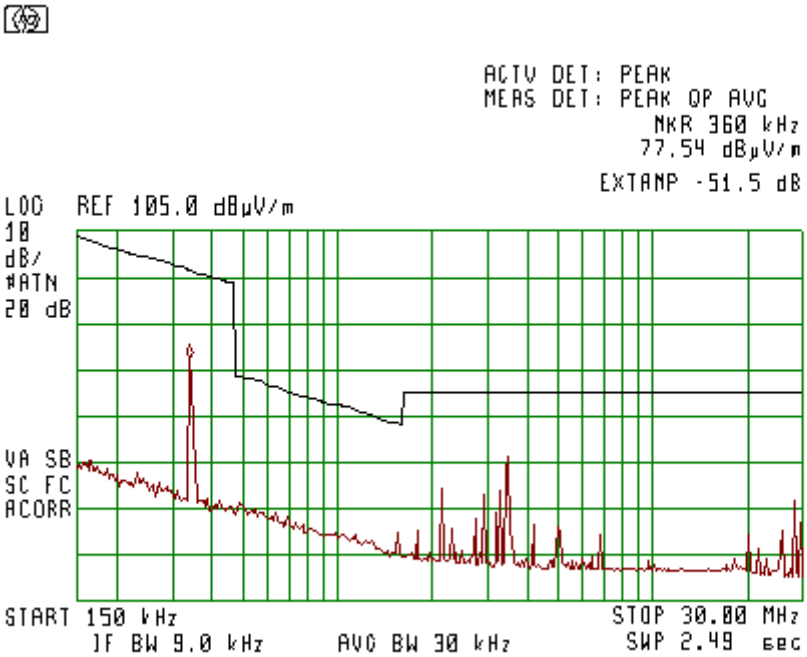
Plot 4.2.2



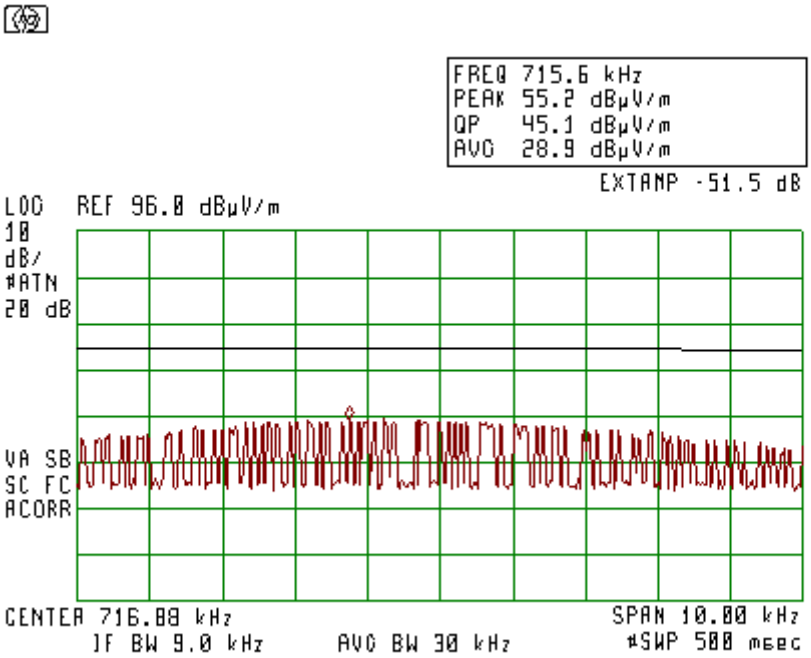
Position 1
Planar orientation
Plot 4.2.3



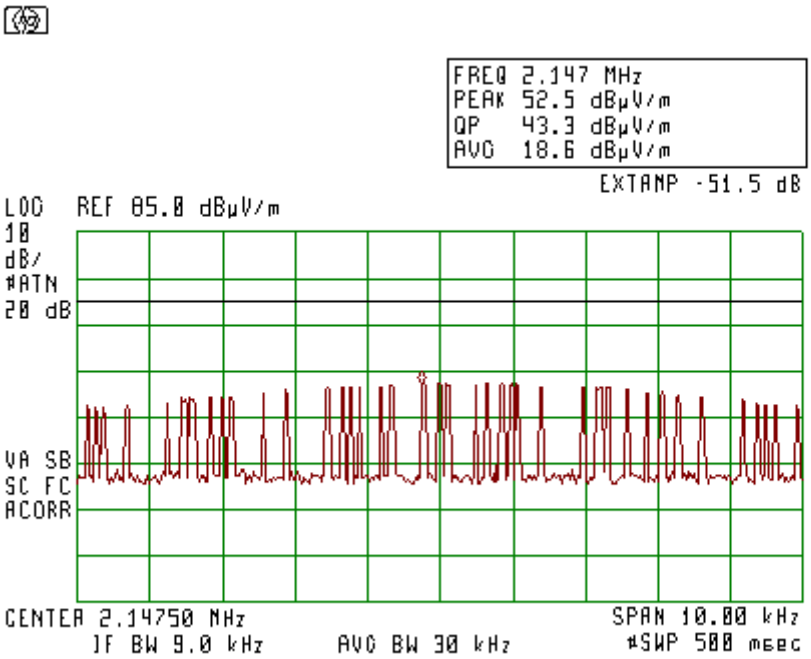
Plot 4.2.4



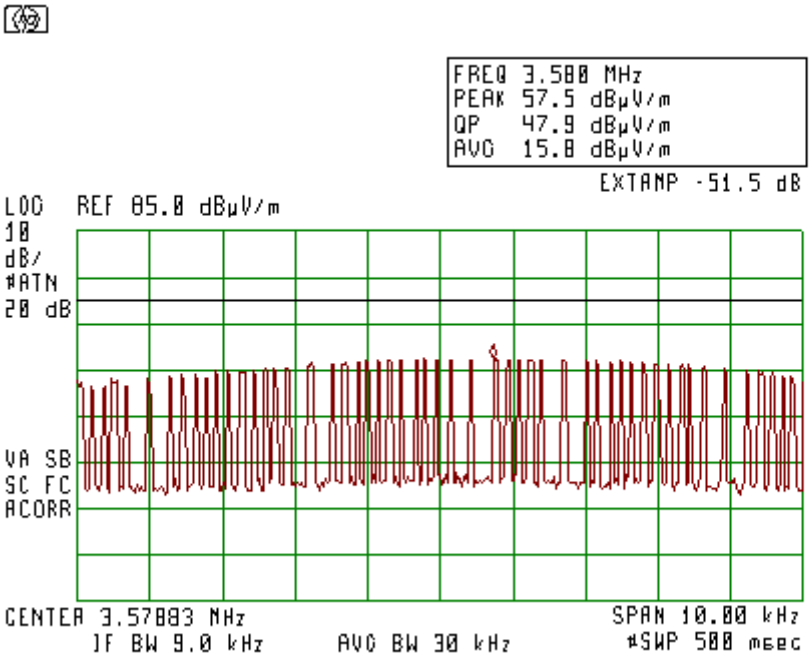
Position 1 - 715.6 kHz
Coaxial orientation
Plot 4.2.5



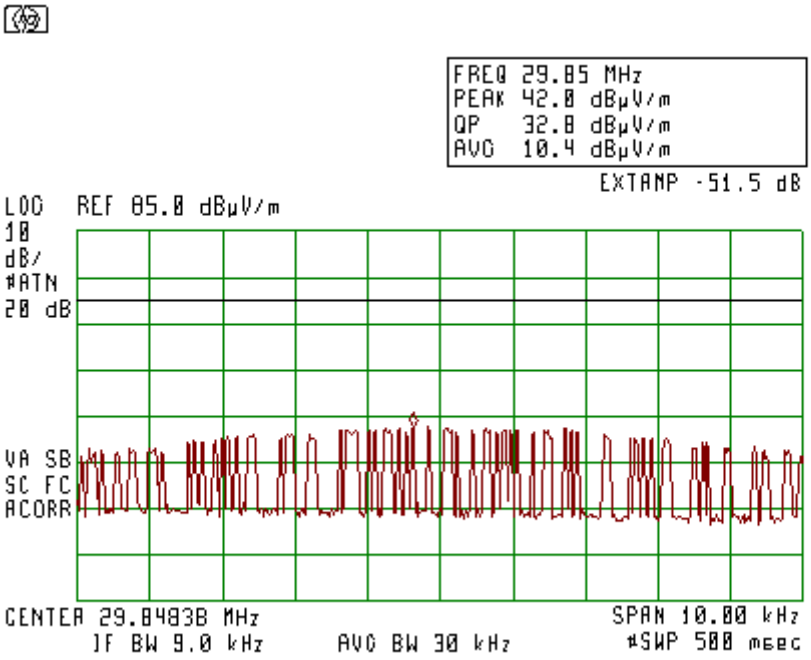
Position 1 - 2.147 MHz
Planar orientation
Plot 4.2.6



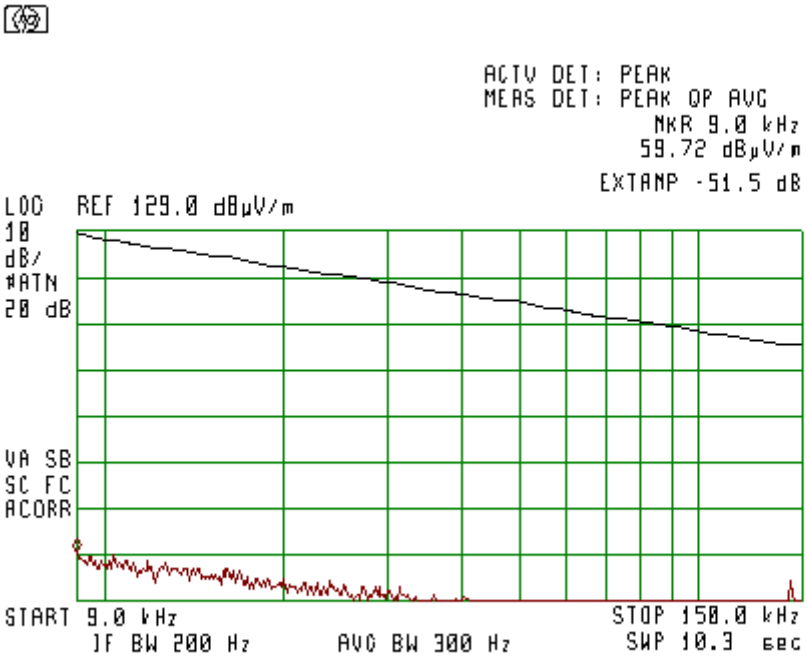
Position 1 - 3.580 MHz
Planar orientation
Plot 4.2.7



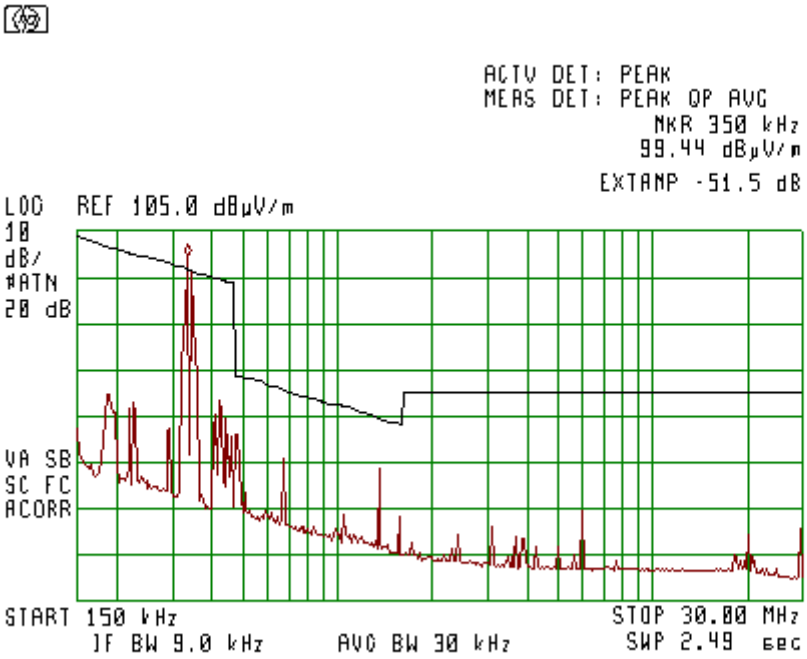
Position 1 - 29.85 MHz
Planar orientation
Plot 4.2.8



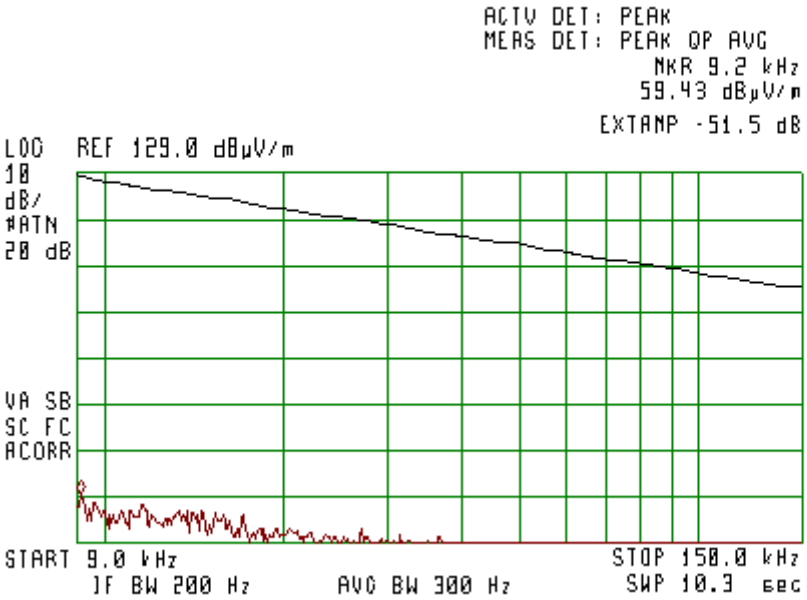
Position 2
Coaxial orientation
Plot 4.2.9



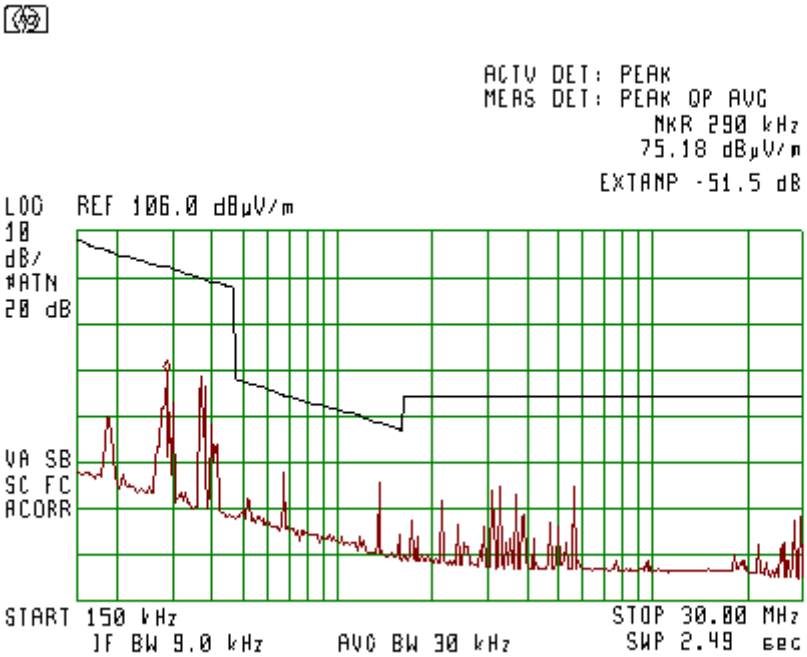
Plot 4.2.10



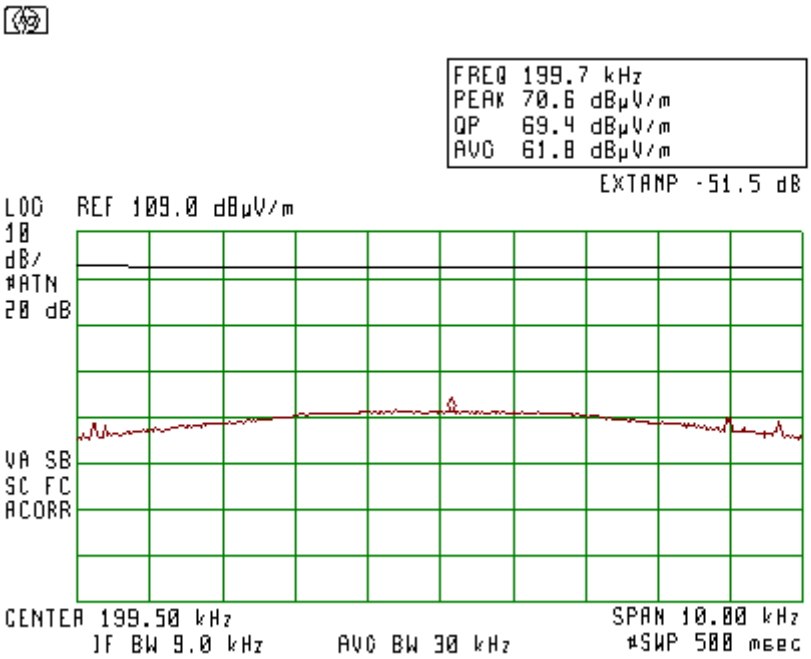
Position 2
Planar orientation
Plot 4.2.11



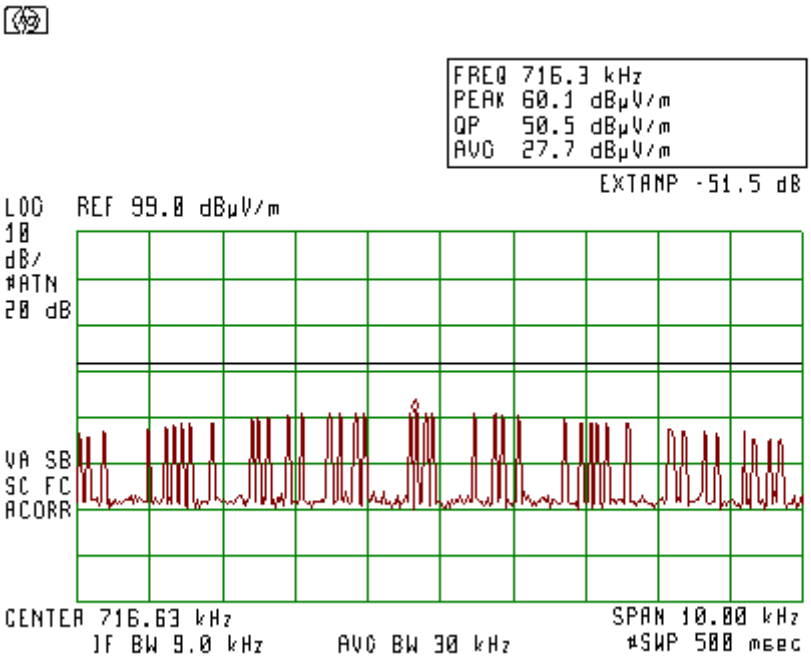
Plot 4.2.12



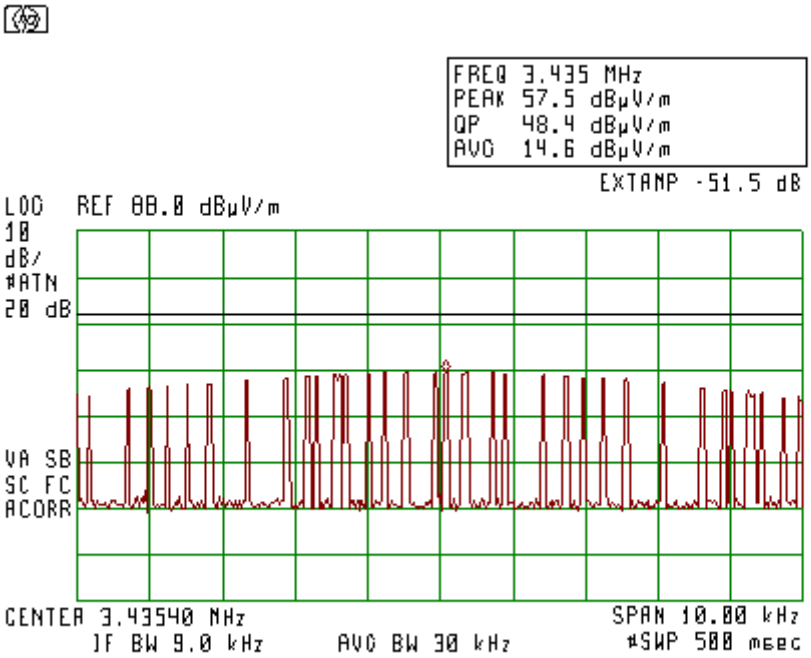
Position 2 - 199.7 kHz
Coaxial orientation
Plot 4.2.13



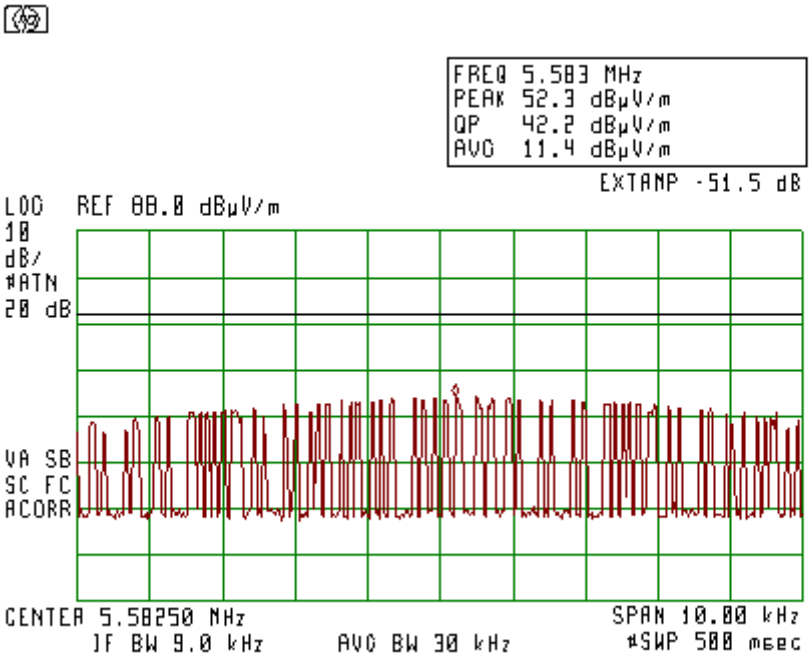
Position 2 - 716.3 kHz
Coaxial orientation
Plot 4.2.14



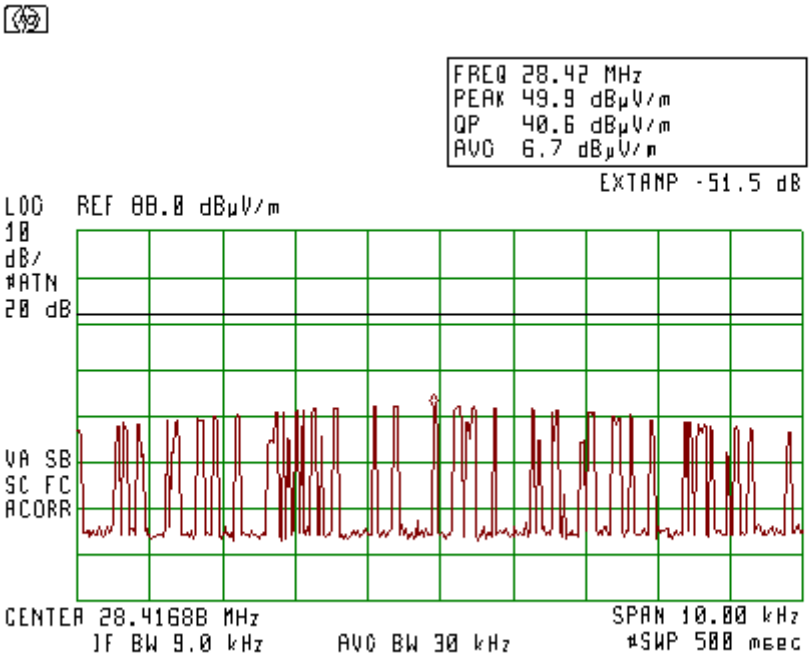
Position 2 - 3.435 MHz
Planar orientation
Plot 4.2.15



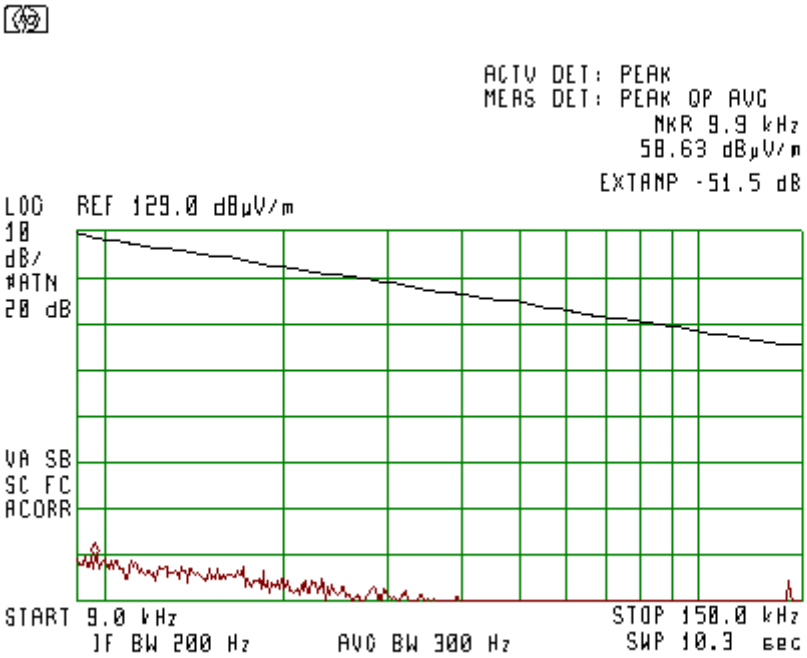
Position 2 - 5.583 MHz
Planar orientation
Plot 4.2.16



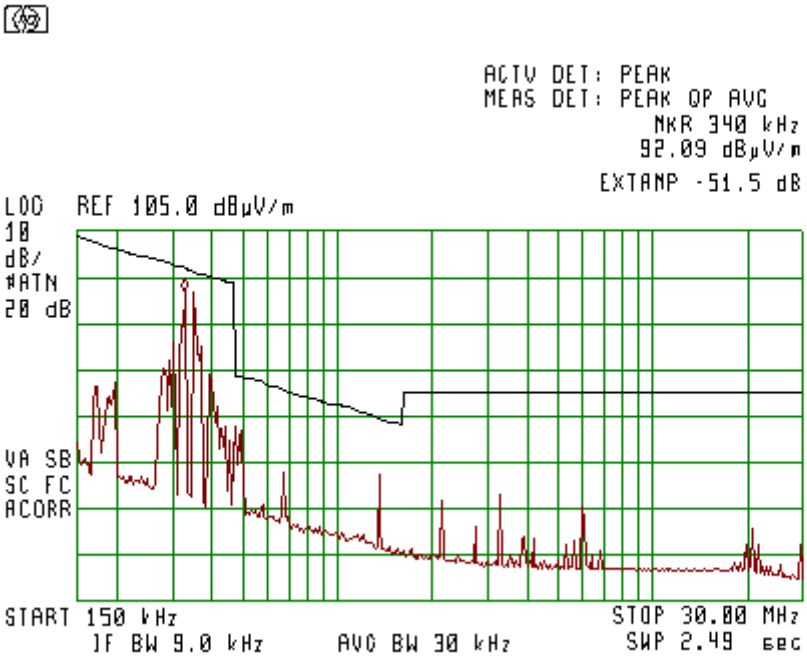
Position 2 - 28.42 MHz
Planar orientation
Plot 4.2.17



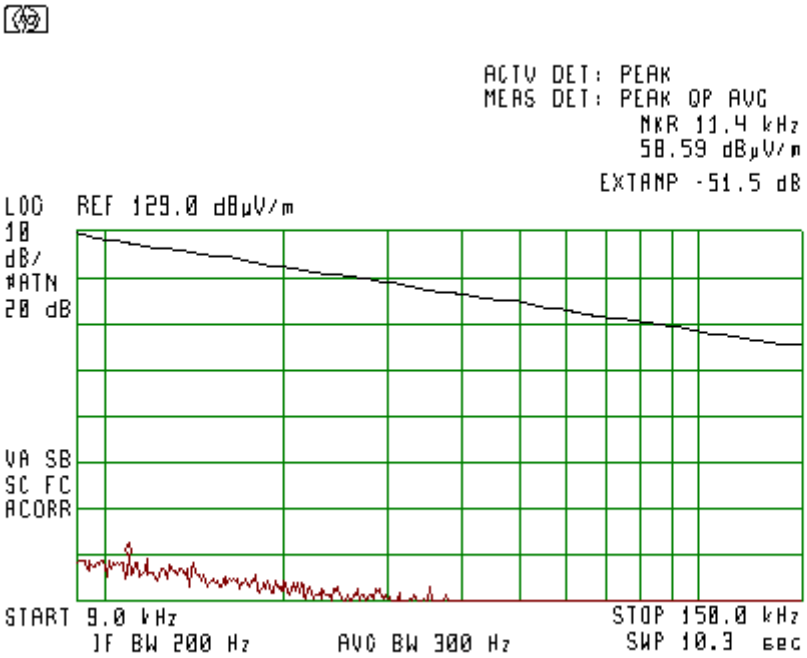
Position 3
Coaxial orientation
Plot 4.2.18



Plot 4.2.19



Position 3
Planar orientation
Plot 4.2.20



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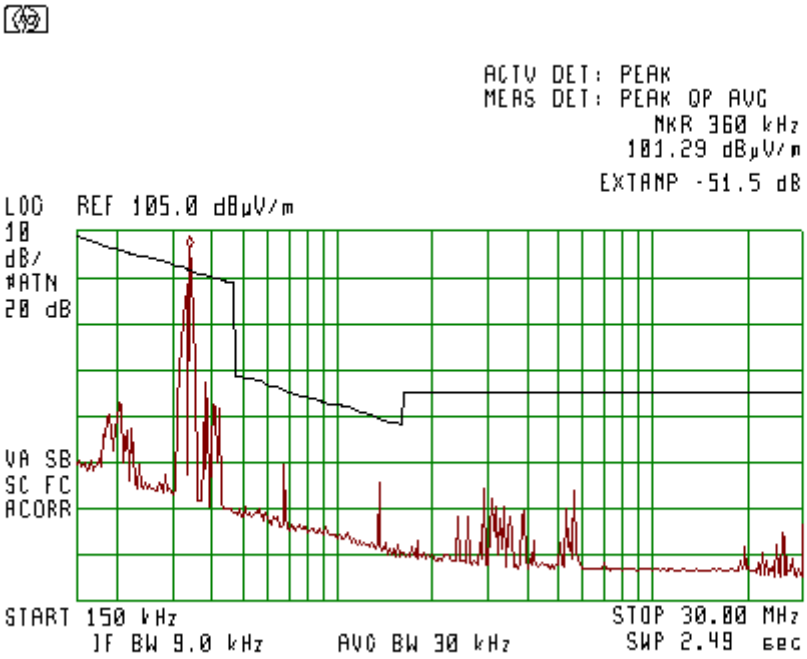
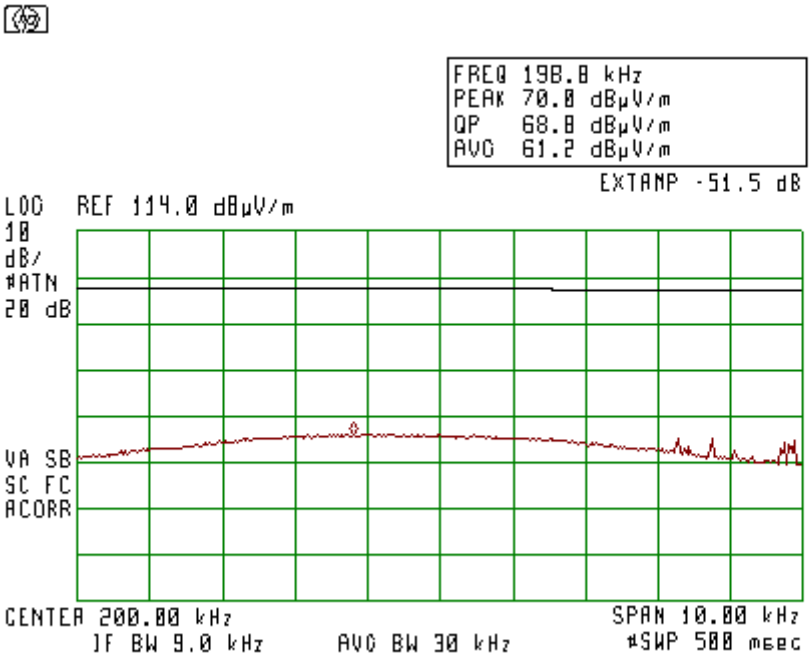
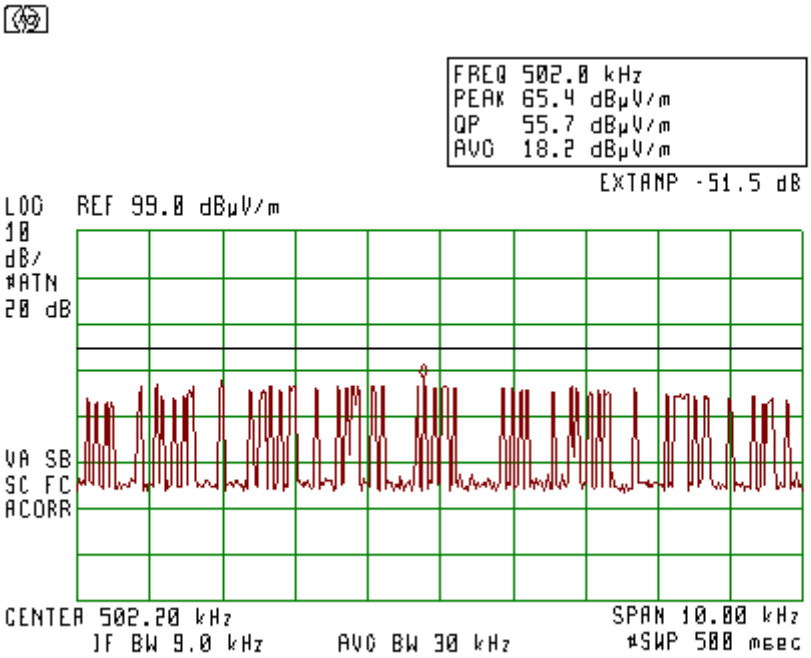


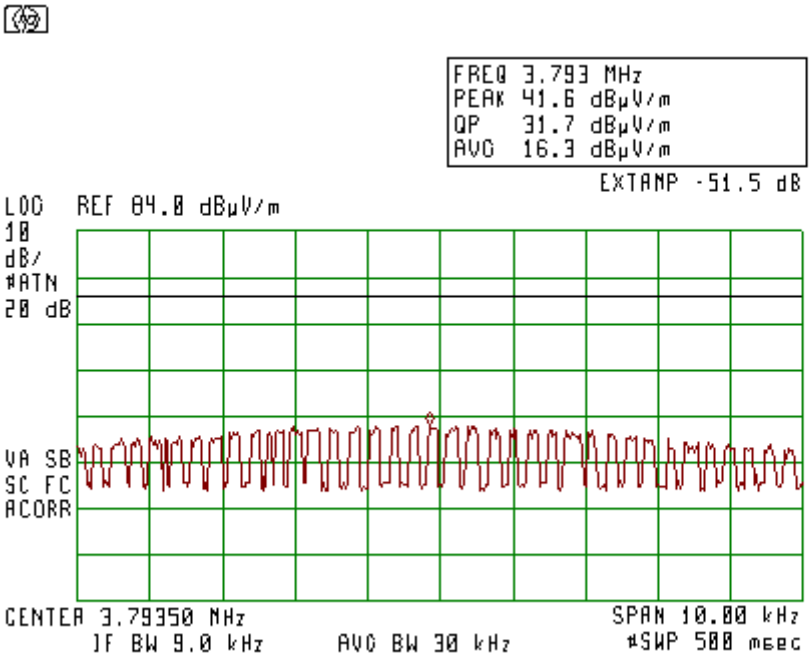
Position 3 - 198.8 kHz
Coaxial orientation
Plot 4.2.22



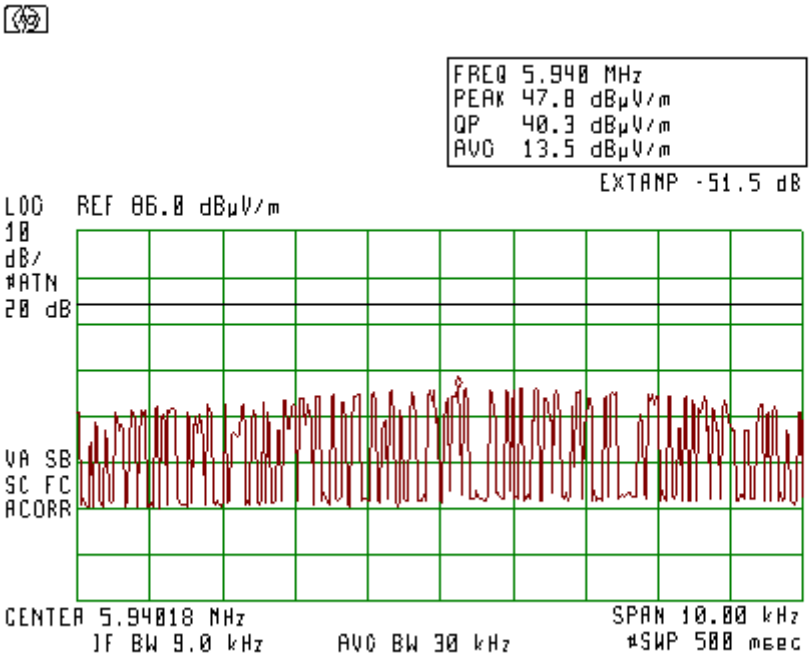
Position 3 - 502.0 kHz
Coaxial orientation
Plot 4.2.23



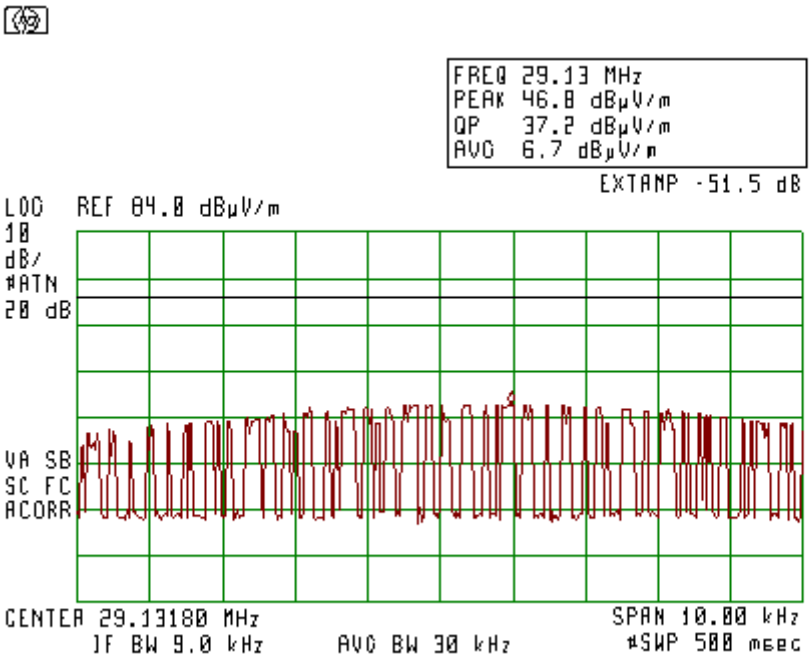
Position 3 - 3.793 MHz
Coaxial orientation
Plot 4.2.24



Position 3 - 5.940 MHz
Planar orientation
Plot 4.2.25



Position 3 - 29.13 MHz
Planar orientation
Plot 4.2.26



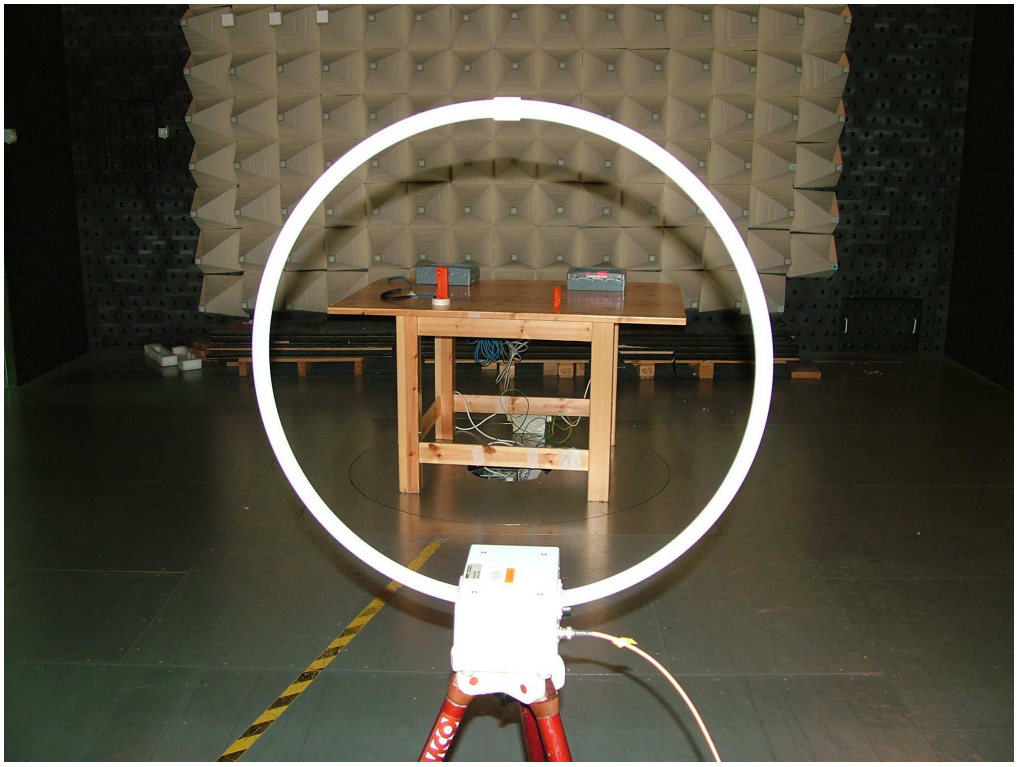
5. Appendix

Appendix A: List of Measuring Equipment used:

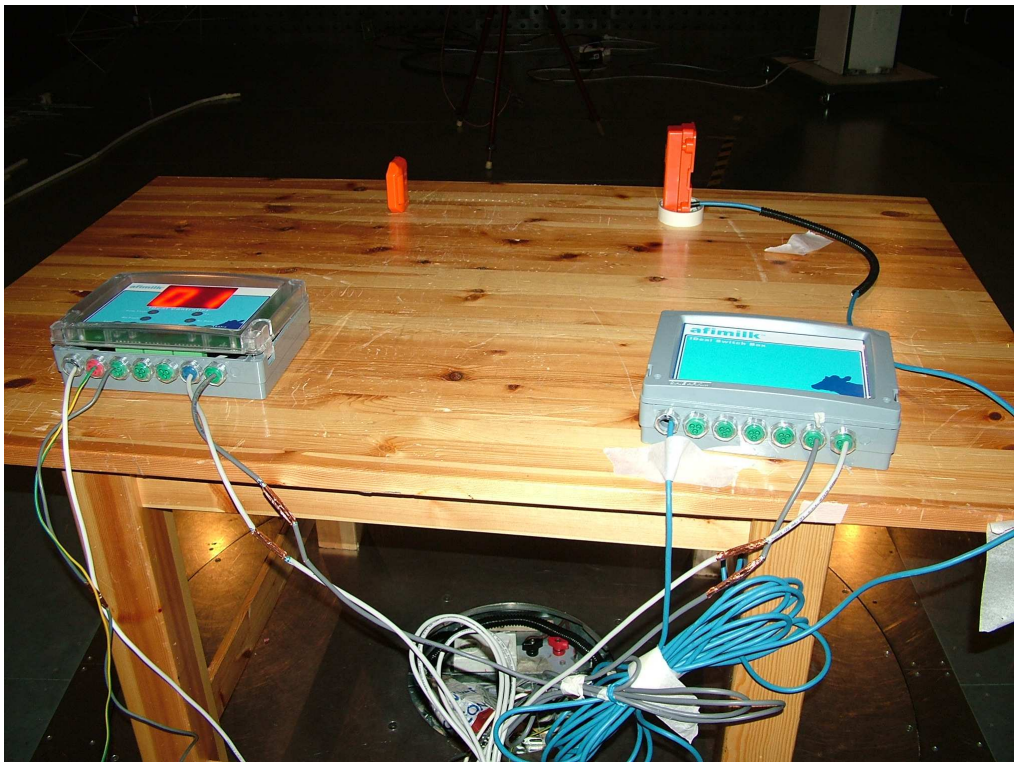
Equipment	Manufacturer/ Model	Serial Number	Due date
CISPR 16 EMI Receiver, 9 kHz - 6.5 GHz	HP 8546A	3710A00392	30-06-2012
Spectrum Analyzer, 9 kHz - 22 GHz	HP 8593EM	3536A00131	30-06-2012
Spectrum Analyzer, 100 Hz - 26.5 GHz	Agilent E7405A	US41160436	30-06-2012
Spectrum Analyzer, 3 Hz - 44 GHz	Agilent E4446A	MY46180602	30-06-2012
Power Meter	Agilent N1911A	MY45100784	30-06-2012
Wideband power sensor	Agilent N1921A	MY45241242	30-06-2012
Low-Noise Amplifier, 0.1 - 18 GHz	MITEQ, AMF–7D-00101800-30-10P	1544443	30-06-2012
Low-Noise Amplifier, 18 - 26.5 GHz	MITEQ, AMF-5F-18002650-30-10P	945372	16-05-2012
Biconical Antenna, 20 - 200 MHz	Schwarzbeck VHBB 9124	9124/0255	16-05-2012
Log-Periodic Antenna, 200 - 1000 MHz	Schwarzbeck VUSLP 9111	VUSLP 9111184	16-05-2012
Double Ridged Guide Antenna, 1 - 18 GHz	A.R.A., DRG-118/A	17188	30-06-2012
SHF-EHF Horn, 15 – 40 GHz	Schwarzbeck BBHA 9170	BBHA9170214	30-06-2012
Turn table	HD 100	100/693	-
Antenna Mast	HD 100	100/693	-
LISN	Fischer 50/250-25-2	9705	30-06-2012
Transient Limiter, 9 kHz ÷ 200 MHz	HP 11947A	3107A04119	30-06-2012
Notch Filter	Micro-Tronics, BRM50702-05	0001	16-05-2012
Tunable Bandreject Filter	K&L, 3TNF-800/1000-0.2-N/N	336	16-05-2012
Tunable Bandreject Filter	K&L, 5TNF-1700/2000-0.1-N/N	212	16-05-2012
Highpass Filter, 1.2 ÷ 15 GHz	WAINWRIGHT, WHK1.2/15G-10EF	SN 3	16-05-2012
Highpass Filter, 2.4 ÷ 18 GHz	WAINWRIGHT, WHK2.4/18G-10EF	SN 1	16-05-2012
Highpass Filter, 7 ÷ 18 GHz	WAINWRIGHT, WHKX7.0/18G-8SS	SN 12	16-05-2012

Appendix B: Test Photographs

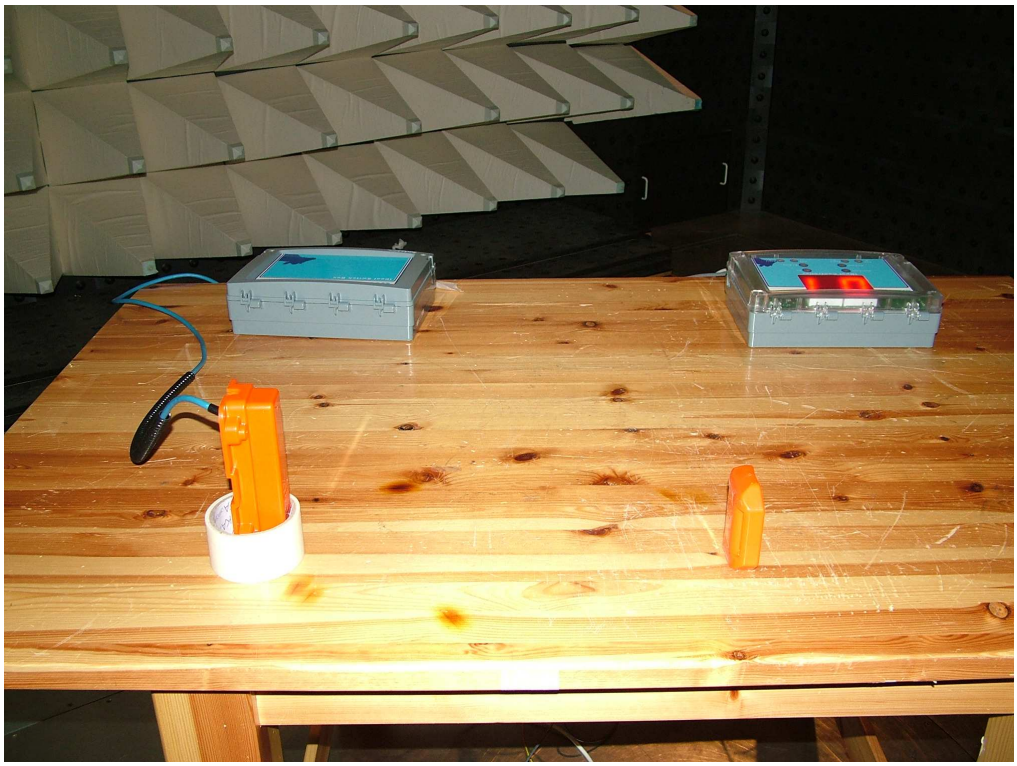
Photograph 1



Photograph 2

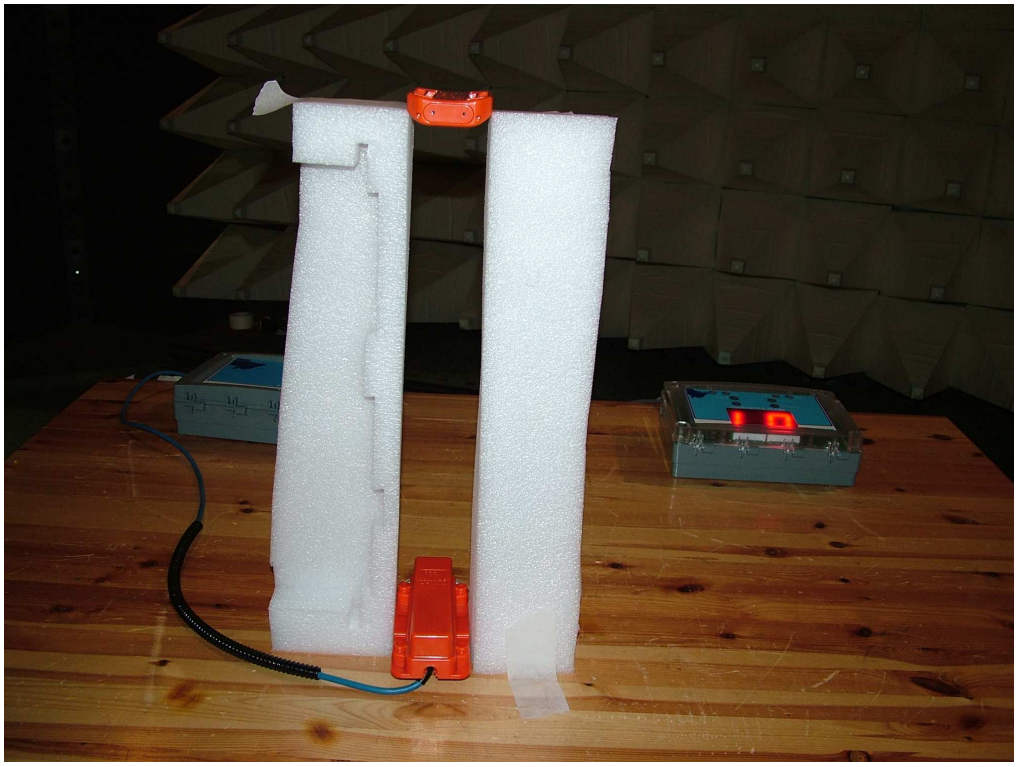


Photograph 3 – Position 1



Photograph 4 – Position 2

Photograph 5 – Position 3



Appendix C: Accreditation Certificate

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Laboratory

A2LA has accredited

QUALITECH (ECI TELECOM)

Petach-Tikva, ISRAEL

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 22nd day of March 2011.

President & CEO
For the Accreditation Council
Certificate Number 1633.01
Valid to September 30, 2012

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

End of the Test Report