S-CEM/EMCD/2007-2008/TR/L&TEM-458

EMI/EMC TEST REPORT FOR EZ-READER-HF MANUFACTURED BY M/s. L&T EMSYS, MYSORE

FCC ID: UL4EZReaderHF

SAMEER - CENTRE FOR ELECTROMAGNETICS
(An Institution Setup by Ministry of Communications and Information Technology, Government of India)
2nd Cross Road, CIT Campus, Taramani, Chennai - 600 113

March 2008

EMI/EMC TEST REPORT FOR EZ-READER- HF MANUFACTURED BY M/s. L&T EMSYS, MYSORE

Test Request Particulars

01. Test request from	: M/s. L&T EmSyS, Mysore
02. Equipment Under Test (EUT)	: EZ-READER- HF
03. Number of test sample(s)	: One
04. Types of tests requested	: 1. Radiated Emission Test with Auto Tune HF Antenna 5"X16" as per FCC 15.209, FCC 15.225(a) (d) 2. Radiated Emission Test with Auto Tune HF Antenna 5"X7" as per FCC 15.209, FCC 15.225(a) (d) 3. Occupied Bandwidth/Radiated emission Test within the band 13.110MHz- 14.010MHz as per FCC 15.225(b) (c) 4. Conducted Emission Test as per FCC 15.207
05. Manufacturer	: M/s. L&T EmSyS, Mysore
06. Model Number	: 1000065715
07. Test plan concurred by	: Mr. S. Ramesh Babu, Project Manager L&T EmSyS, Mysore
08. EUT Arrived on	: 9th November, 2007
09. Test date(s)	: 9th November, 2007 - 11th March, 2008
10. Test Venue	: SAMEER-CEM, Chennai

Certified that the data reported in this report are valid only for the test sample(s) mentioned above at the time of and under the stated conditions of measurement. Particulars on Manufacturer / Supplier, given in this report, are based on the information given by the customer, along with test request and SAMEER-CEM does not assume any responsibility for the correctness of that information for the above mentioned equipment under test.

Test Conducted by:	***Test Plan & Reviewed by:***	***Approved by:***	***Office Seal***
(J. Anitha) Project Assistant	**(P. Salil)** Scientist-C	**(Dr. B. Subbarao)** Head, EMC Division	

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SUMMARY

Preface

This report documents products testing conducted to verify compliance of the specified EUT with applicable standards and requirements as identified herein. EUT, test instrument configurations, test procedures and recorded data are generally described in this report. The reader is referred to the applicable test standards for detailed procedures. The following table summarizes the test results obtained during this evaluation.

EZ-Reader HF was tested to the standards listed below, and found to have the following characteristics:

Emission Tests:

Test Description	47-CFR Part	Test Range	RESULT
Radiated Emissions, Intentional Radiator, Harmonics	15.209	9KHz – 30MHz 30MHz-1GHz	Below Max permissible Limits
Conducted Emissions, Intentional Radiators	15.207	150kHz-30MHz	
Occupied Bandwidth	FCC 15.225	13 MHz to 14 MHz	
Antenna Requirement	FCC 15.203		Compliant

Applicable requirements, Methods and procedures
The results of the measurement of the radio disturbance characteristics of the EUT described herein may be applied, and where appropriate provide a presumption of compliance to one or more of the following requirements or to other requirement at the discretion of the client, regulatory agencies or other entities.

47 CFR, Part 15, Subpart C, "Intentional Radiators"

Basic Test Methods and procedures
The applicable regulatory product family or generic standards require that radio disturbance/ interference and immunity tests be performed in accordance with the following:

ANSI C63.4, 2003 "American National Standard for Methods of measurement of Radio-Noise Emissions from low-Voltage Electrical and Electronic Equipment in the range of 9KHz to 40GHz".

CISPR 22:1993, A1/1995, A2/1996 "Limits and Methods of measurements of Radio Disturbance Characteristics of Information Technology Equipment.

Deviations or Exclusions from the requirements and Standards

There were no deviations or exclusions from the specified requirements and standards

1. Description of Equipment Under Test (EUT)

Equipment Identification	EZ-READER-HF
Model No Number	1000065715
Manufacturer	Accu-Sort Systems, Inc
Technical Contact	Ramesh babu S
Condition Received	Acceptable for test
Date received	9th November 2007
Sample Type	Pre-production
Equipment Classification	Non-residential, Information Technology Equipment (ITE)
SAMEER Test Personnel	Ms .Vanitha,Mr.Santhosh Kumar& Ms. Anitha

1.1 General Description

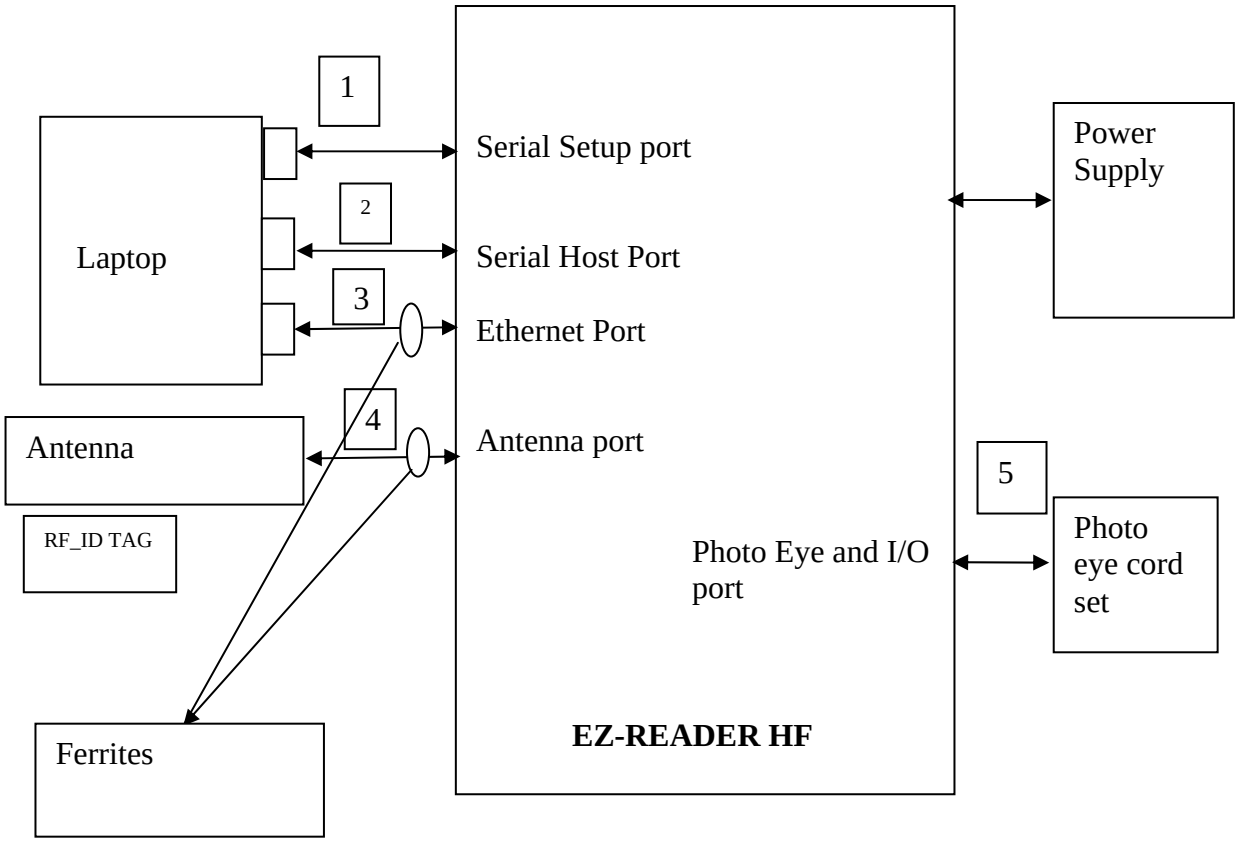
The EZ-READER- HF is a RFID reader operating in the 13.56MHz ISM frequency range. The unit was powered with 24V DC supply.

1.2 Test Configuration:

The EZ-READER- HF is a RFID reader is tested with the input of 24V DC supply. The reader operates in the 13.56MHz ISM frequency range. Two different style antennae will be tested they are Auto-Tuning HFAntenna, 5" x 16"and 5" x 7", 13.56 MHz (includes 6 FT cable) was connected to antenna port. The unit has two RS232 ports and one Ethernet link for external interface. An I/O port consisting of two Photo eye modules will be used for providing the trigger. The measurements for conducted emissions were made with the antenna port terminated with a 50-ohm load, The measurements for radiated emissions were made with the Auto-Tuning HFAntenna, 5" x 16"/ 5" x 7" 13.56 MHz (includes 6 FT cable) was connected to antenna port, with One RS232 [Serial host port connected to the laptop and the other RS 232 port [Serial setup port] left open with a hanging cable and Ethernet port connected to a LAPTOP computer.

The Block diagram of the EUT with I/O and Power cable connections is presented on the following diagram

EZ-Reader-HF Setup



Cable Details:

1. RS232 Serial Cable [Shielded 20']
2. RS232 Serial Cable [Shielded 20']
3. CAT 5 Ethernet cable [Shielded 50'] with a clamp on Ferrite on Ethernet Patch cable: ASI Part # 1000066954, MFG WURTH #742 711 31S
4. Antenna cable Shielded [with three turns of [ASI Part # 1000066953 WE 742 715 5S] towards the EZ-reader side
5. Photo Eye Cord Set – ASI part # 1000065713
   – With Photo Eye Kit, part # 1000065571

1.3 Equipment Description:

Description	Manufacturer	Model Description	Accu-sort Part No's
13.56MHz RFID reader	ACCU-SORT SYSTEMS, INC.	EZREADER-HF	1000065715
13.56MHz Antenna	ACCU-SORT SYSTEMS, INC.	Auto-Tuning HFAntenna, 5" x 16"	1000066915-Side entry 1000065706-Bottom entry
13.56MHz Antenna	ACCU-SORT SYSTEMS, INC	Auto-Tuning HFAntenna, 5" x 7"	1000065705
Power Supply	SINPRO	24V DC, 40W	0111020001

1.4 Operation of the EUT under testing

The Unit was auto tuned and was set to Max power (31dBm at the antenna output port measured with a spectrum analyzer) using the EZ reader GUI. The reader was put into continuous read mode with TAG placed on the Antenna. The Laptop monitors EZ-READER-HF operation and the onboard LED's provide visual indication for continuous read.

1.5 Selection of AC Power Voltage / Frequencies

The Radiated and Conducted Emission tests were performed with the EUT operating at 24V DC Supply. The DC source was powered by an A/C power of 110V, 60Hz.

1.6 Operating Mode:

1.6.1 Rationale for the chosen mode of operation

Continuous read mode was chosen as there will be continuous RF-ID operations and also there will be continuous transfer of RF-ID Tag data over serial port and Ethernet, This mode is chosen as the emission will be MAX due to continuous operation.

2. Radiated Emission Test Results

Test Standard	FCC 15.209,15.225 (a)-(d)	
Frequency Range	9KHz – 30MHz	30 MHz - 1 GHz
Test Distances	10 meters,	3meters
Antenna Polarity and Height	Active loop Antenna in three orthogonal axes at 1meter, Active Monopole at 1meter,	Ultra log antenna Horizontal and Vertical at a height of 1Meters to 4Meters
EUT type	Table Top	
Highest Oscillator Frequency	40MHz	
Field strength calculations	Field Strength (dbµV/m) = Actual reading (dbµV) + Antenna factor (dB/m) + cable Loss (dB)	

2.1 Test Instrumentation

Description	Make	Model Number	Serial number
EMI Receiver	R&S	ESIB7	100319
Ultralog Antenna	R&S	HL562	100100
Shielded Anechoic chamber	Siepel	--	F276
Active monopole Antenna	A.H Systems	SAS-550-1B	F276
Active loop Antenna	EMCO	6507	1484

2.2 Test Observation:

2.2.1 Radiated Emissions [FCC 15.209]

The Radiated Emissions in the frequency range of 9 KHz - 1 GHz were measured from the EUT. The frequency range of 9 KHz to 30MHz was measured at a distance of 10m using an active monopole antenna as well as with an active Loop Antenna. The emissions from 30MHz to 1GHz were picked up at a distance of 3m using Ultra Log Antenna. The 5x16 and 5x7 EZ tune antenna were placed in three positions for measurements: standing vertically, standing horizontally and lying horizontally. The measurement was carried out inside a shielded anechoic chamber. The EUT was rotated 0 - 360º and the antenna height varied from 1m to 4m for emissions above 30MHz to maximize the picked up emission. The measurement was done, in peak detection mode, in both vertical and horizontal polarizations. The emissions of considerable amplitude and their corresponding frequencies were noted down and analyzed thoroughly in quasi peak detection mode.

Test Frequency Range and Limits at 3 m Distance for emissions in band 30MHz to 1GHz

Frequency (MHz)	Class B limit (dBµV/m)
30-88	40
88-216	43.5
216-960	46
960-1000	53.97

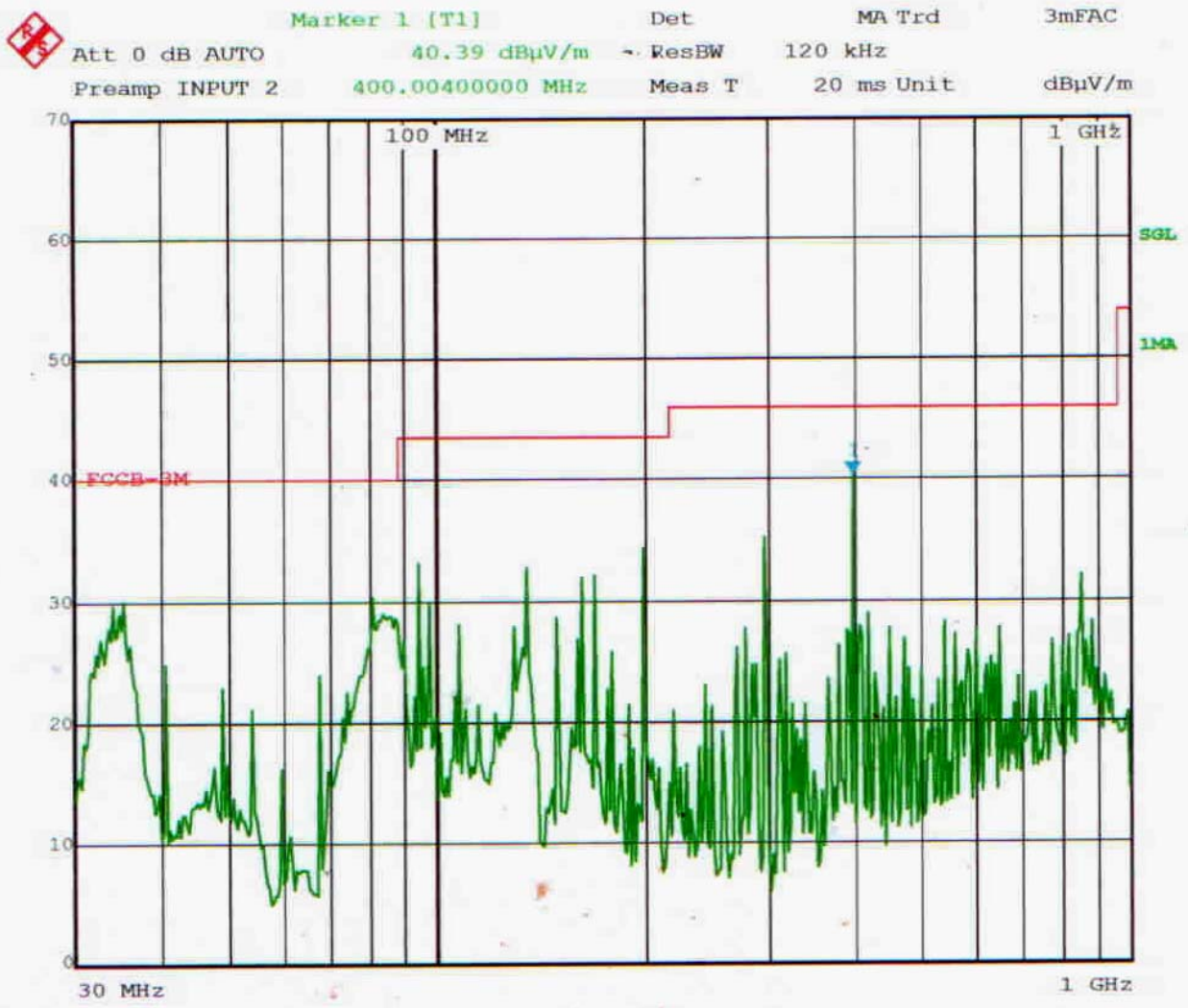
2.2.1.1 Readings with Auto-Tuning HF Antenna, 5" x 16", 30MHz – 1GHz

The Radiated Emission from the EUT was found to be within the limit of specified standard in the frequency range of 30 MHz - 1 GHz for both vertical and horizontal polarizations. The readings were tabulated and given below:

Frequency (MHz)	Table Pos in deg	Antenna Ht in meter	Qp level in dBµV/m (A)	Limit Level in dBµV/m (B)	Delta Limit in dBµV/m (B-A)	Result
VERTICAL POLARISATION						
33.84	30	1	21.5	40	18.5	Within the Limit
81.36	150	1	28.34	40	11.66	
94.924	150	1	31.6	43.5	11.9	
135.6	200	1	31.5	43.5	12	
162.72	300	1	30.2	43.5	13.3	
200	100	1	39.1	43.5	4.4	
298.328	150	1	34.81	46	11.19	
400	150	1	40.3	46	5.7	
400.004	150	1	40.15	46	5.85	
HORIZONTAL POLARISATION						
135.6	260	2.6	34.5	43.5	9	Within the Limit
200	290	1.6	42	43.5	1.5	
311.888	230	1	34.8	46	11.2	
400	230	1	44.6	46	1.4	
400.004	230	1	44.6	46	1.4	
420.372	230	1	34.88	46	11.12	

Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot cannot be compared against the quasipeak levels mentioned in the standard

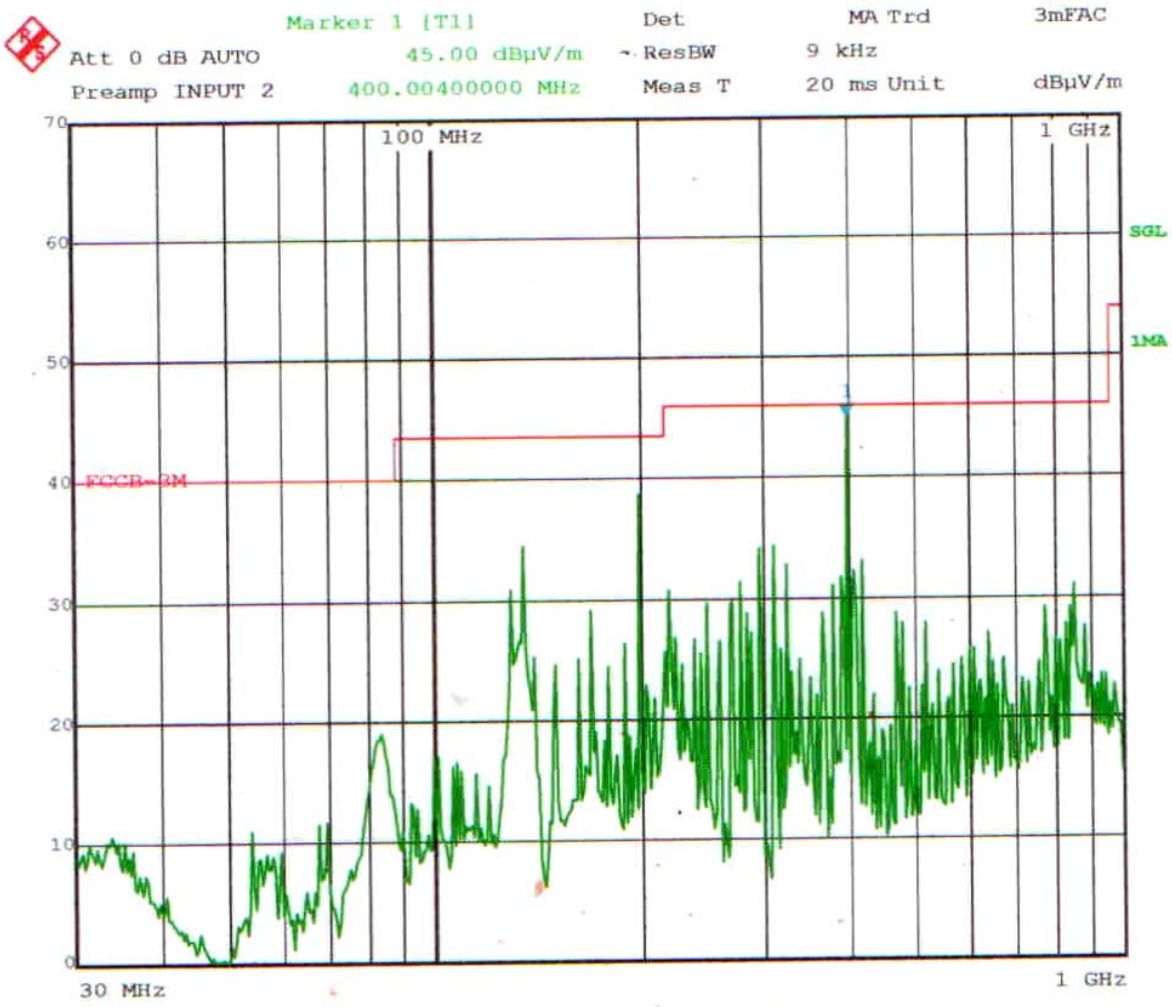
PLOT-1 - Radiated Emission with 5” x 16” Antenna (Vertical Polarization)



Title: RADIATED EMISSION TEST AS PER FCC PART 15 CLASS B
Comment B: EUT:EZ-READER-HF,MAKE:ASI,MODEL:1000065715,POS:150°,ANT Ht:1 m,POL:VERTICAL
Date: 9.NOV.2007 19:41:18

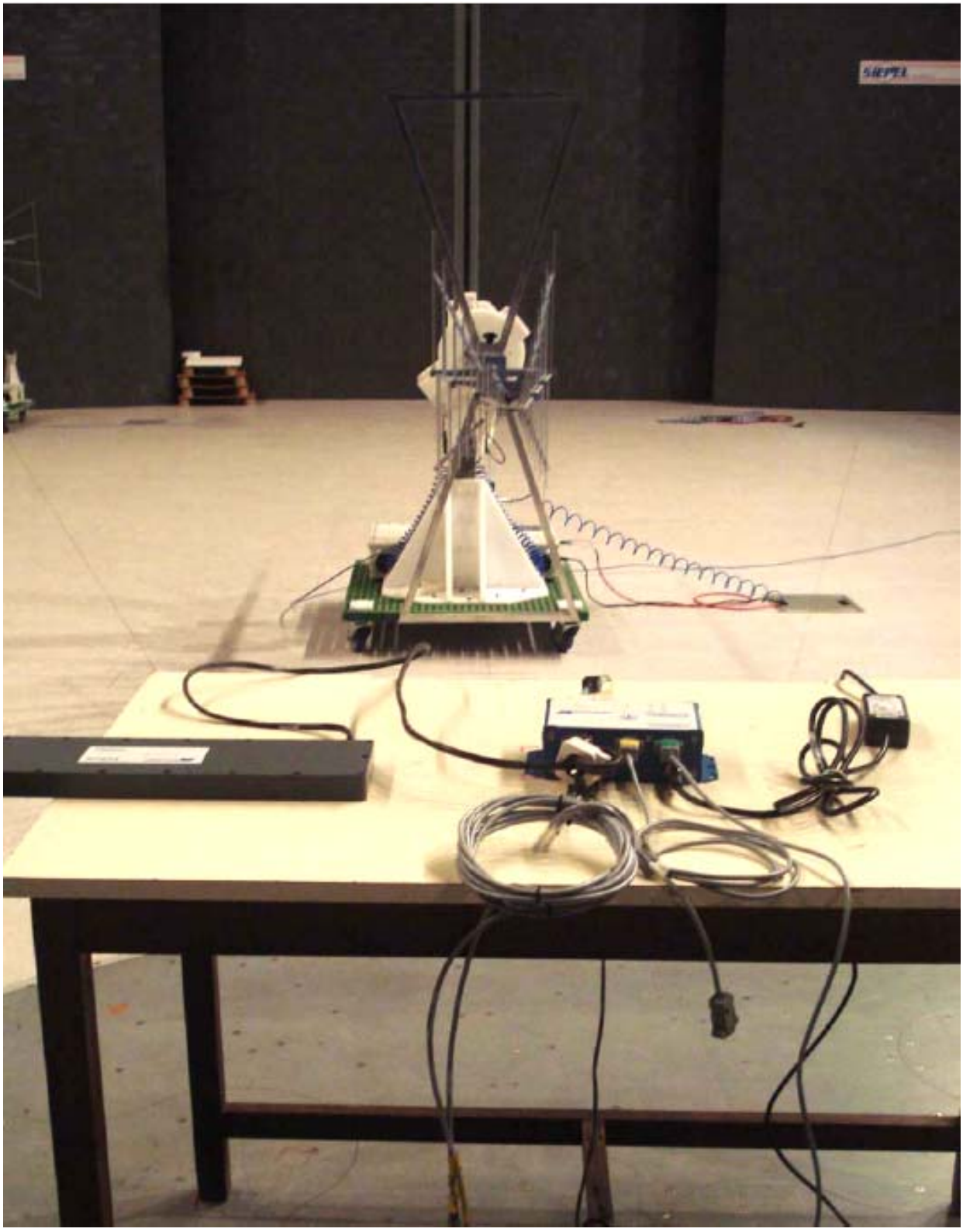
Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot are not maximized emission as required by standard. For maximized emission please refer table.

PLOT-2 - Radiated Emission with 5” x 16” Antenna (Horizontal Polarization)

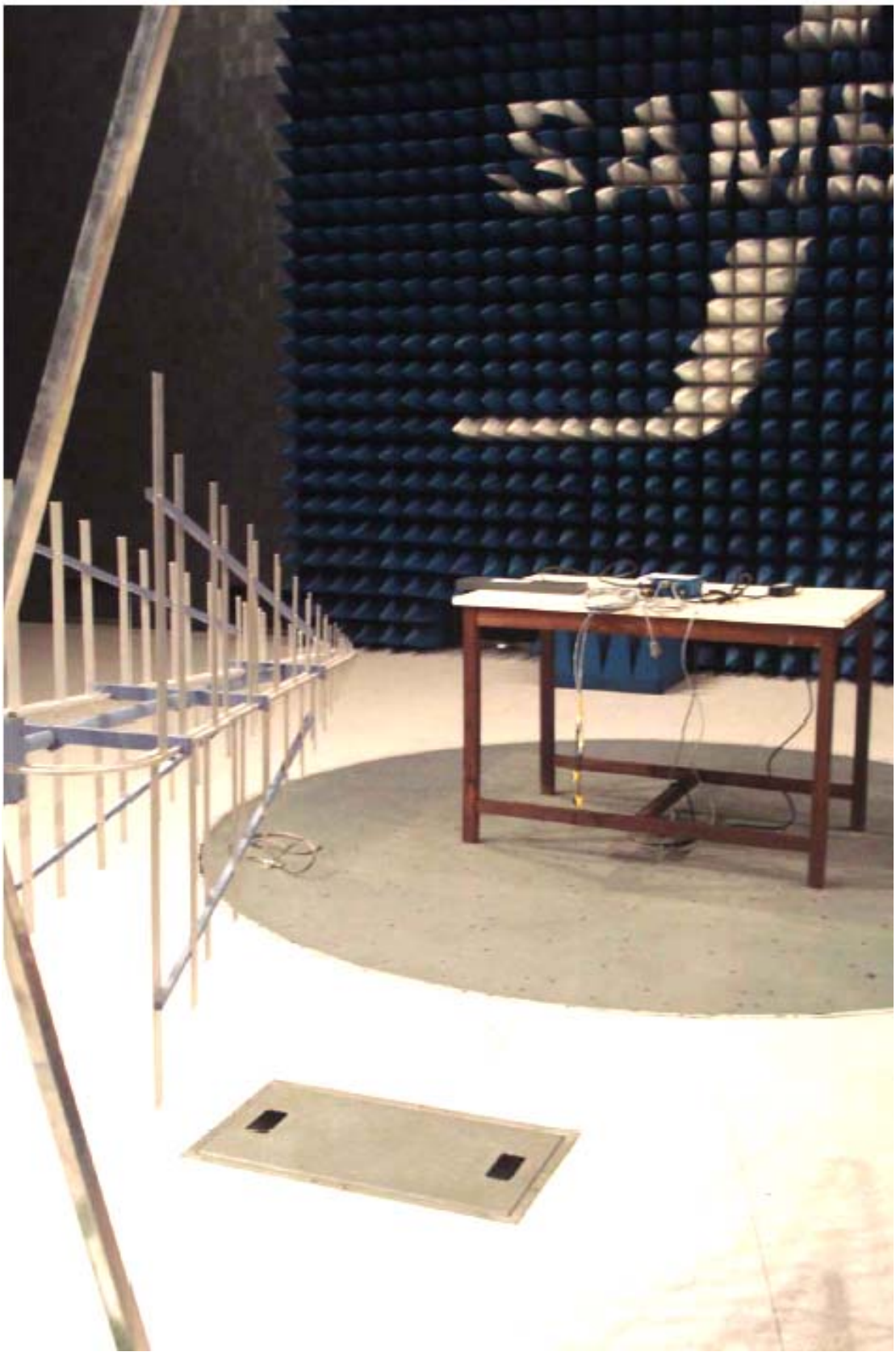


Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot are not maximized emission as required by standard. For maximized emission please refer table.

Radiated Emissions Test Setup with 5” x 16” Antenna, 30MHz – 1GHz (Rear View)



Radiated Emissions Test Setup with 5” x 16” Antenna, 30MHz – 1GHz (Front View)



2.2.1.2 Readings with Auto-Tuning HF Antenna, 5" x 16", 9 KHz – 30MHz

The Radiated Emission from the EUT was found to be within the limit of specified standard in the frequency range of 9 KHz – 30MHz. Only the frequencies with significant emissions are given in table. No significant emissions were found at frequencies other than the ones given in the table. The results are tabulated below.

Emissions captured using an active monopole antenna

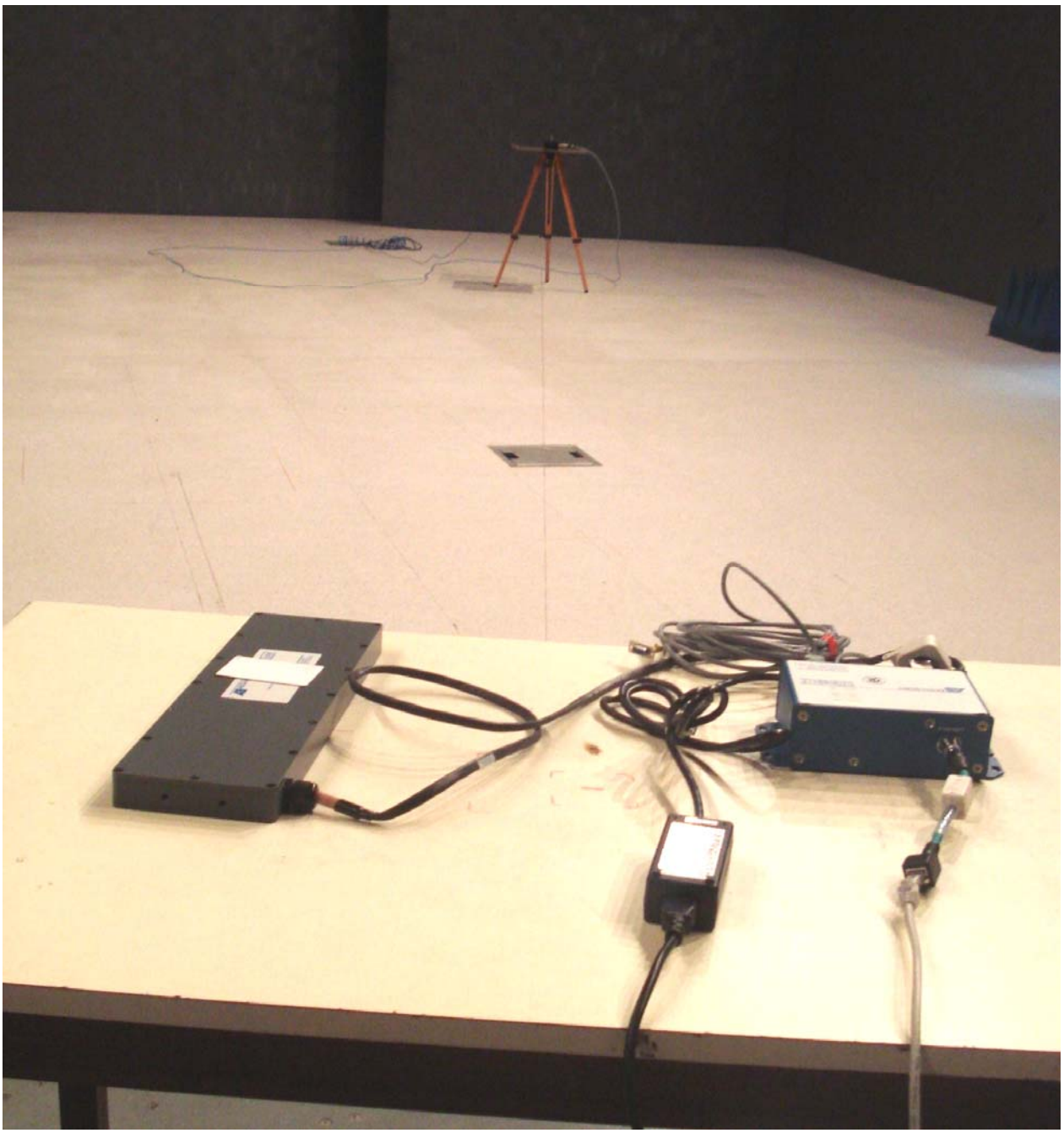
Frequency (MHz)	Signal strength @ 10m (dBµV/m)	Extrapolated measurements for 30m(A)	Limit at 30m (dBµV/m)(B)	Delta (B-A)	Results
13.5604	71.08	61.54	83.99	22.45	Within the limit
27.1208	26.53	16.99	29.54	12.55	

Emissions captured using an active loop antenna

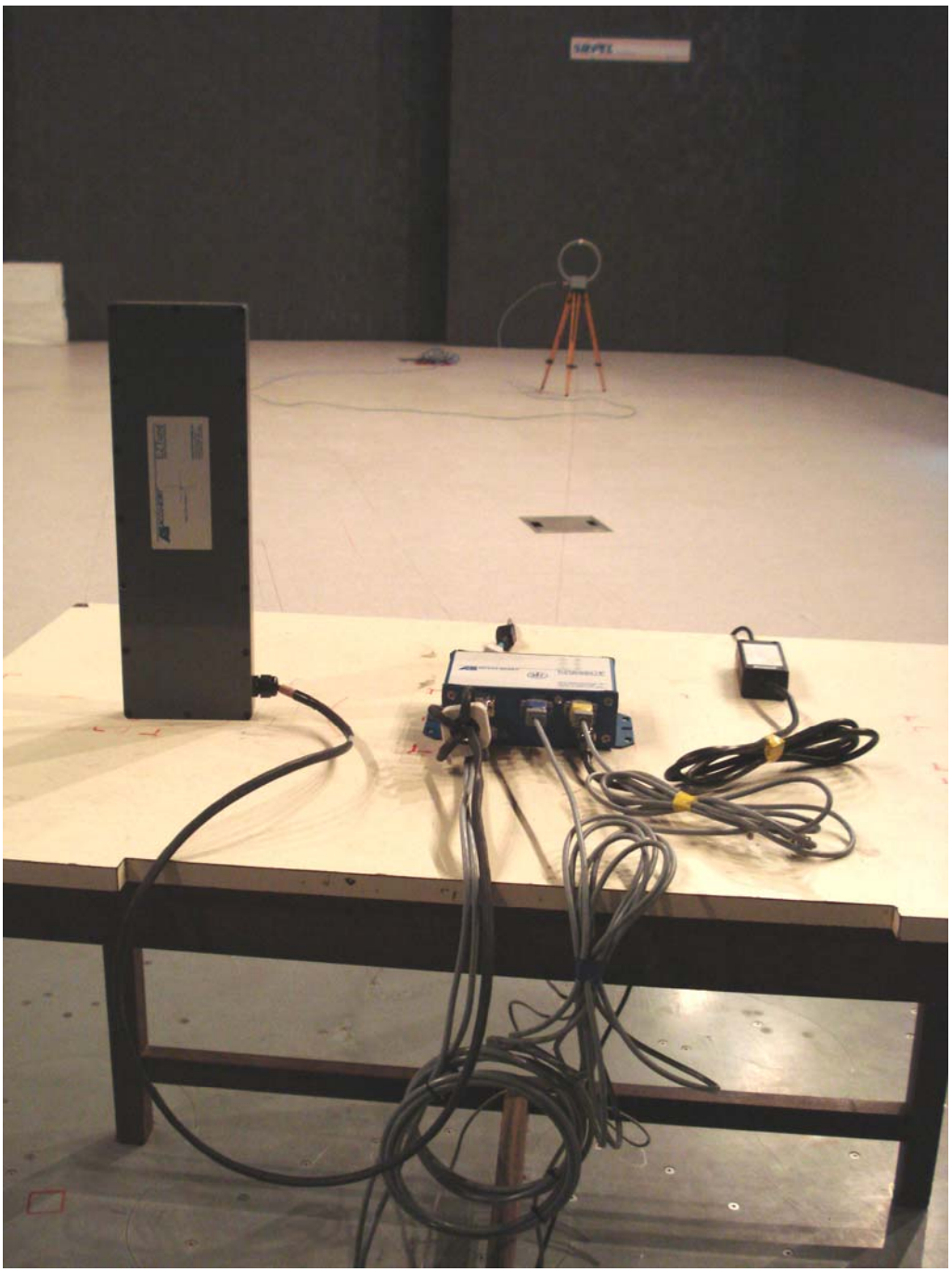
Frequency (MHz)	Loop Antenna orientation	Signal strength @ 10m (dBµV/m)	Extrapolated measurements for 30m(A)	Limit at 30m (dBµV/m)(B)	Delta (B-A)	Results
13.5604	perpendicular	71.31	61.77	83.99	22.22	Within the limit
27.1208	perpendicular	12.15	2.61	29.54	26.93	

The emissions captured at other orientations of loop antenna i.e. Parallel to the path as well as horizontal orientations were found to be less than the emissions for the perpendicular orientation as given in the table above**.**

9 kHz to 30MHz Radiated Emissions measurement test setup with 5”X16” Antenna using an Active Monopole Antenna.
[FCC 15.209, FCC 15.225(a) (d)]



9 kHz to 30MHz Radiated Emissions measurement test setup with 5”X16” Antenna using an Active Loop Antenna.
[FCC 15.209, FCC 15.225(a) (d)]



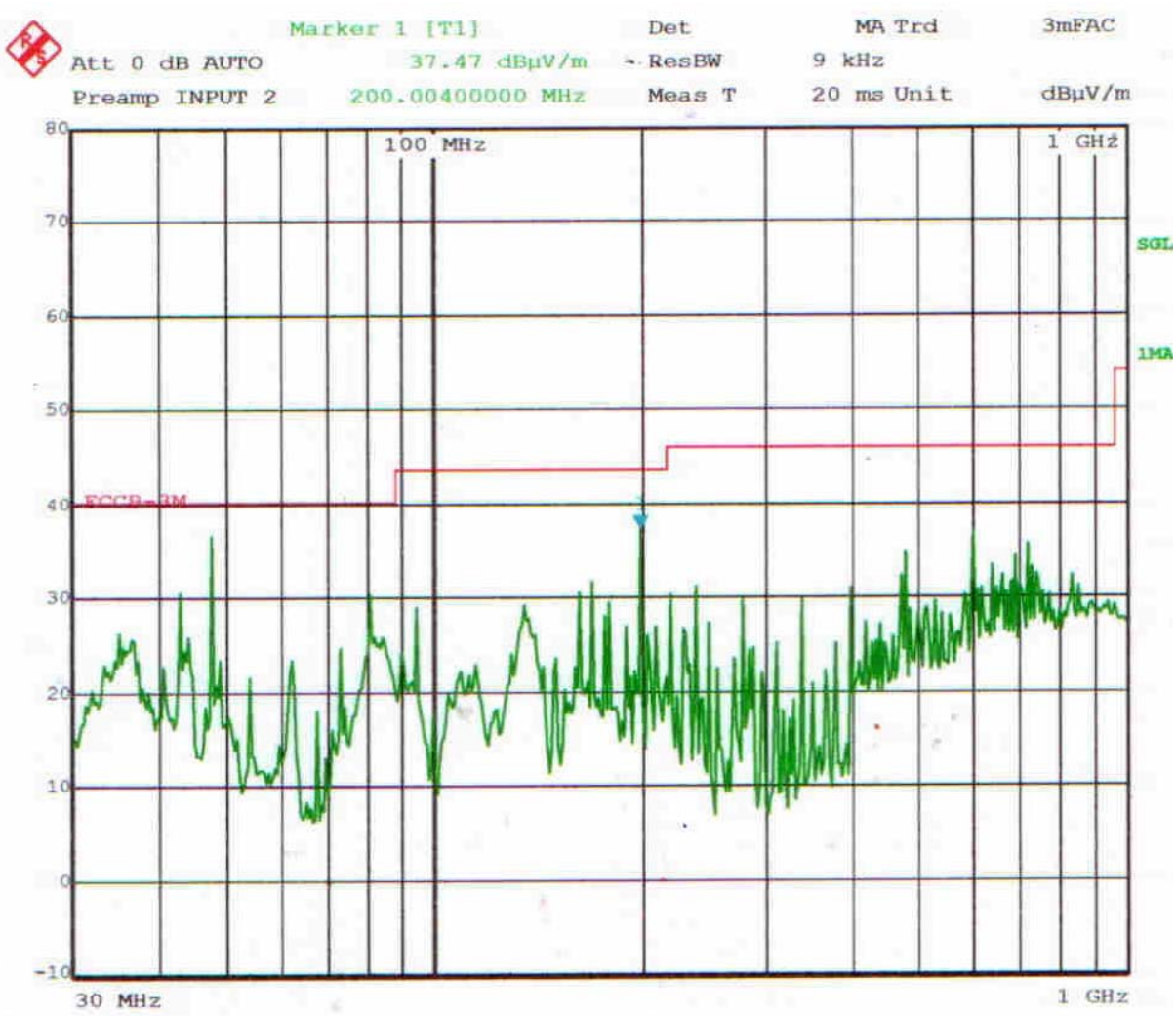
2.2.1.3 Readings with Auto-Tuning HF Antenna, 5" x 7", 30MHz – 1GHz

The Radiated Emission from the EUT was found to be within the limit of specified standard in the frequency range of 30 MHz - 1 GHz for horizontal polarization. The readings were tabulated and given below:

Frequency (MHz)	Table Pos in deg	Antenna Ht in meter	Qp level in dBµV/m (A)	Limit Level in dBµV/m (B)	Delta Limit in dBµV/m (B-A)	Result
VERTICAL POLARISATION						
42.956	220	1	28.57	40	11.43	Within the Limit
48	220	1	34.78	40	5.22	
81.36	265	1.2	30.07	40	9.93	
162.724	260	1	31.35	43.5	12.15	
189.844	165	1	30.31	43.5	13.19	
200.004	220	1	35.86	43.5	7.64	
400	65	1	33.29	46	12.71	
433.932	20	1	27.26	46	18.74	
600	220	1	35.92	46	10.08	
HORIZONTAL POLARISATION						
135.6	310	2.45	29.51	43.5	13.99	Within the Limit
200	90	1.65	38.87	43.5	4.63	
311.888	50	1	43.15	46	2.85	
325.448	50	1	40.56	46	5.44	
379.68	30	1	19.1	46	26.9	
400	50	1	44.5	46	1.5	
400.004	50	1	44.32	46	1.68	
420.372	50	1	35.75	46	10.25	

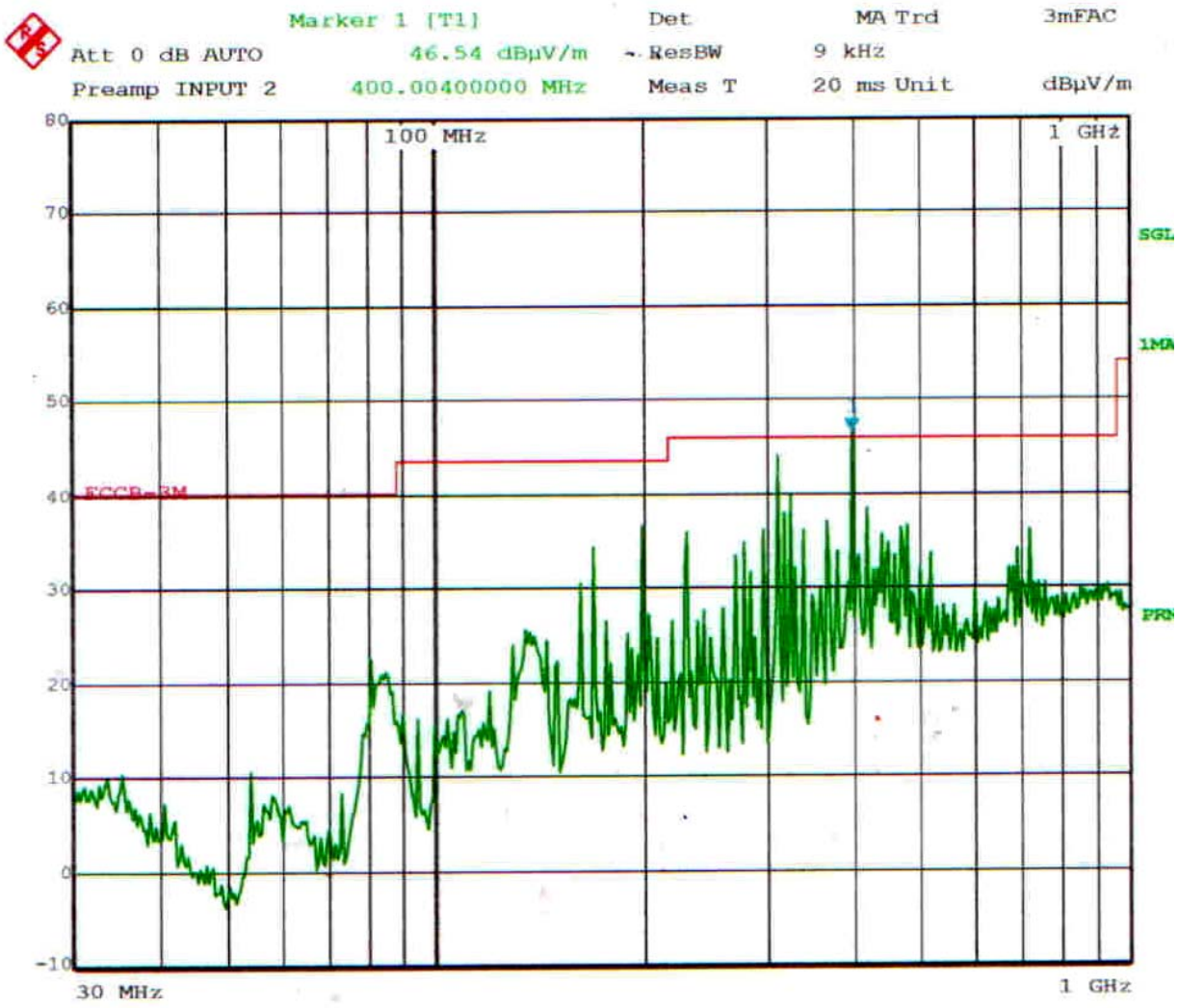
Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot cannot be compared against the Quasipeak levels mentioned in the standard

PLOT-3 - Radiated Emission with 5" x 7"Antenna, 30MHz – 1GHz (Vertical Polarization)



Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot are not maximized emission as required by standard. For maximized emission please refer table.

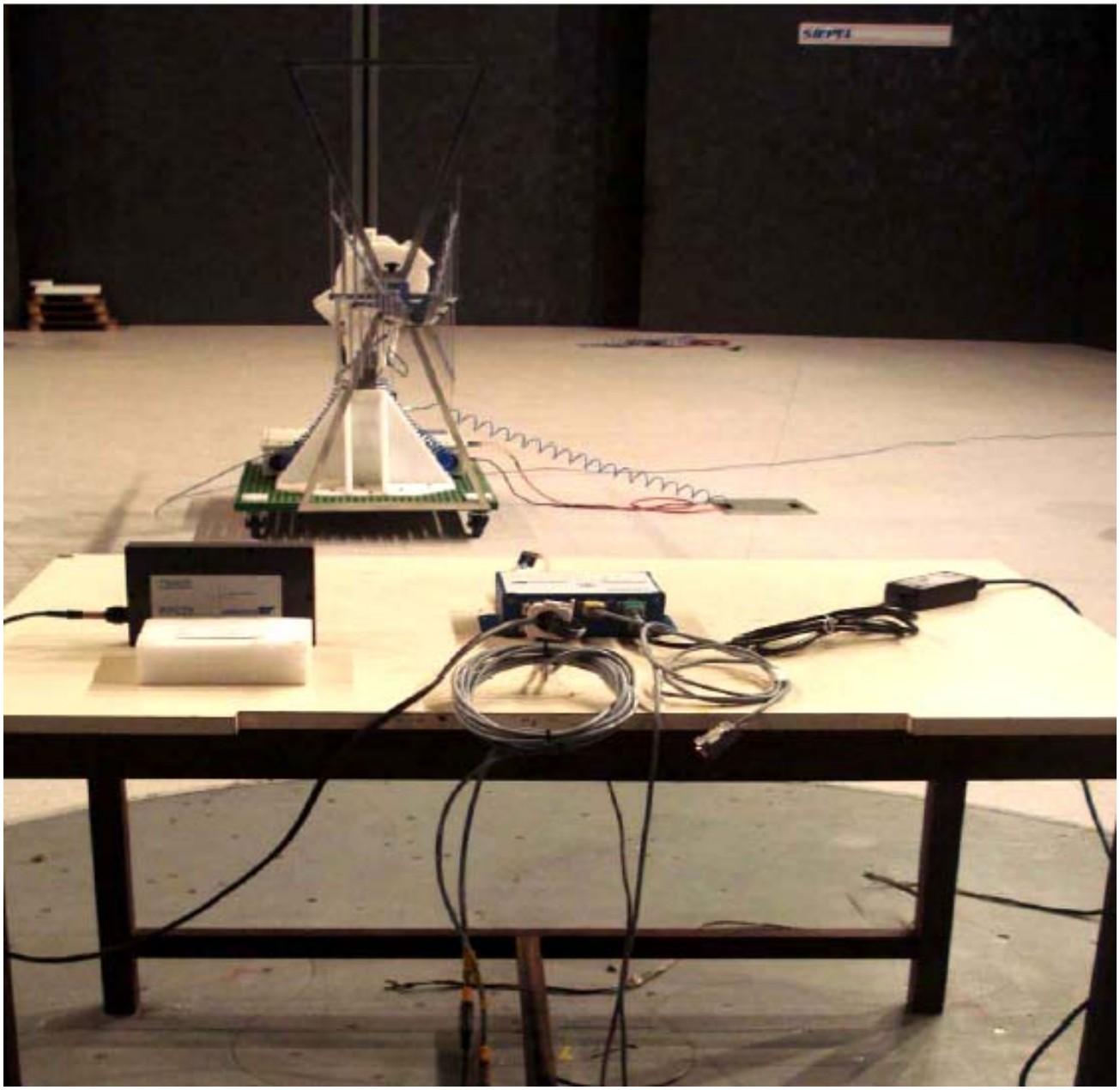
PLOT-4 - Radiated Emission with 5" x 7" Antenna, 30MHz – 1GHz
(Horizontal Polarization)



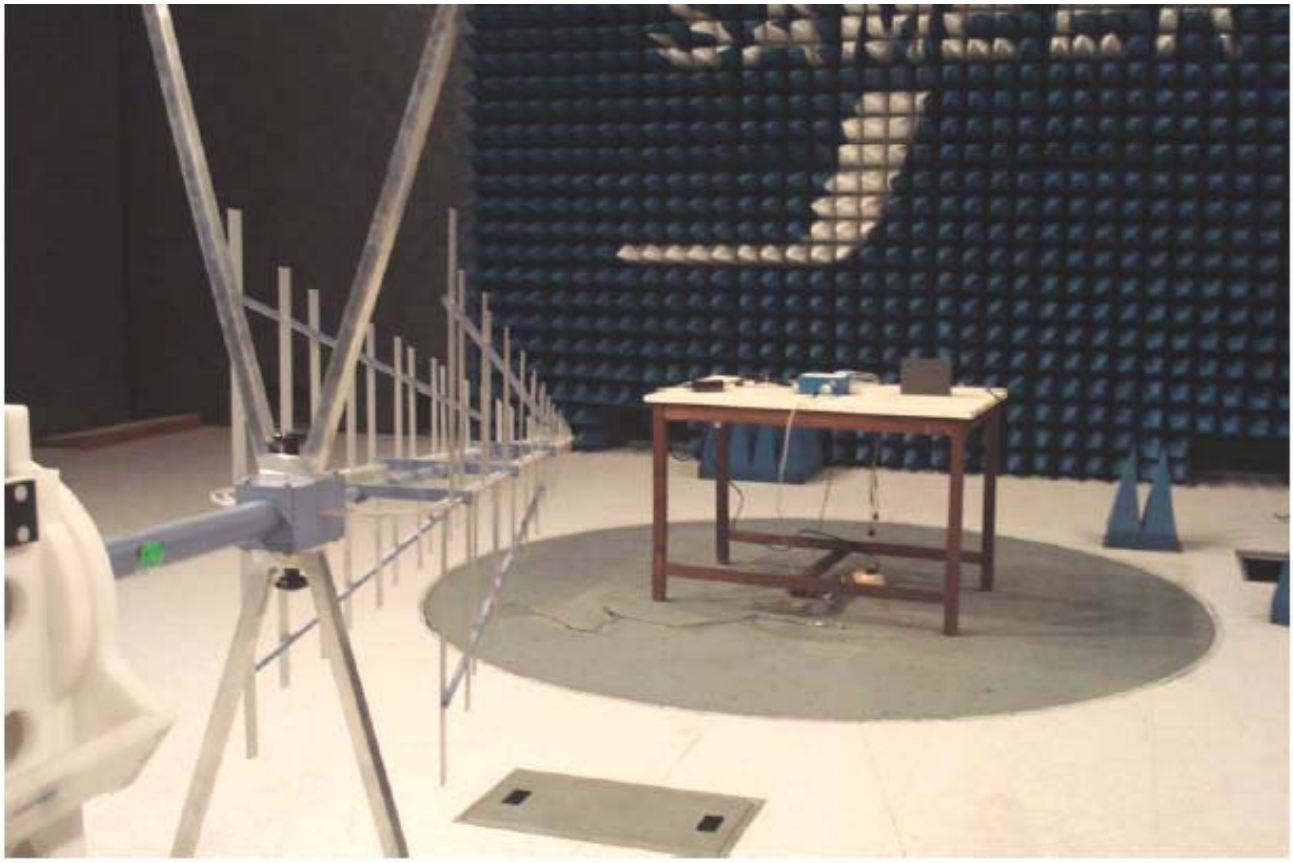
Title: RADIATED EMISSION TEST AS PER FCC CLASS B (3m)
Comment B: EUT:EZ-READER-HF,MAKE:ASI, SL NO:1000065705,POL:HOR,POS:50°,
ANT HT:1m
Date: 16.NOV.2007 09:46:40

Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot are not maximized emission as required by standard. For maximized emission please refer table.

Radiated Emissions Test Setup with 5” x 7” Antenna, 30MHz –1GHz (Rear View)



Radiated Emissions Test Setup with 5” x 7” Antenna, 30MHz –1GHz (Front View)



2.2.1.4 Readings with Auto-Tuning HF Antenna, 5" x 7", 9 KHz – 30MHz

The Radiated Emission from the EUT was found to be within the limit of specified standard in the frequency range of 9 KHz – 30MHz.Only the frequencies with significant emissions are given in table. No significant emissions were found at frequencies other than the ones given in the table. The results are tabulated below.

Emissions captured using an active Monopole Antenna

Frequency (MHz)	Signal strength @ 10m (dBµV/m)	Extrapolated measurements for 30m(A)	Limit at 30m (dBµV/m)(B)	Delta (B-A)	Results
13.5604	63.66	54.12	83.99	29.87	Within the limit
27.1208	35.74	26.2	29.54	3.34	

Emissions captured using an active loop Antenna

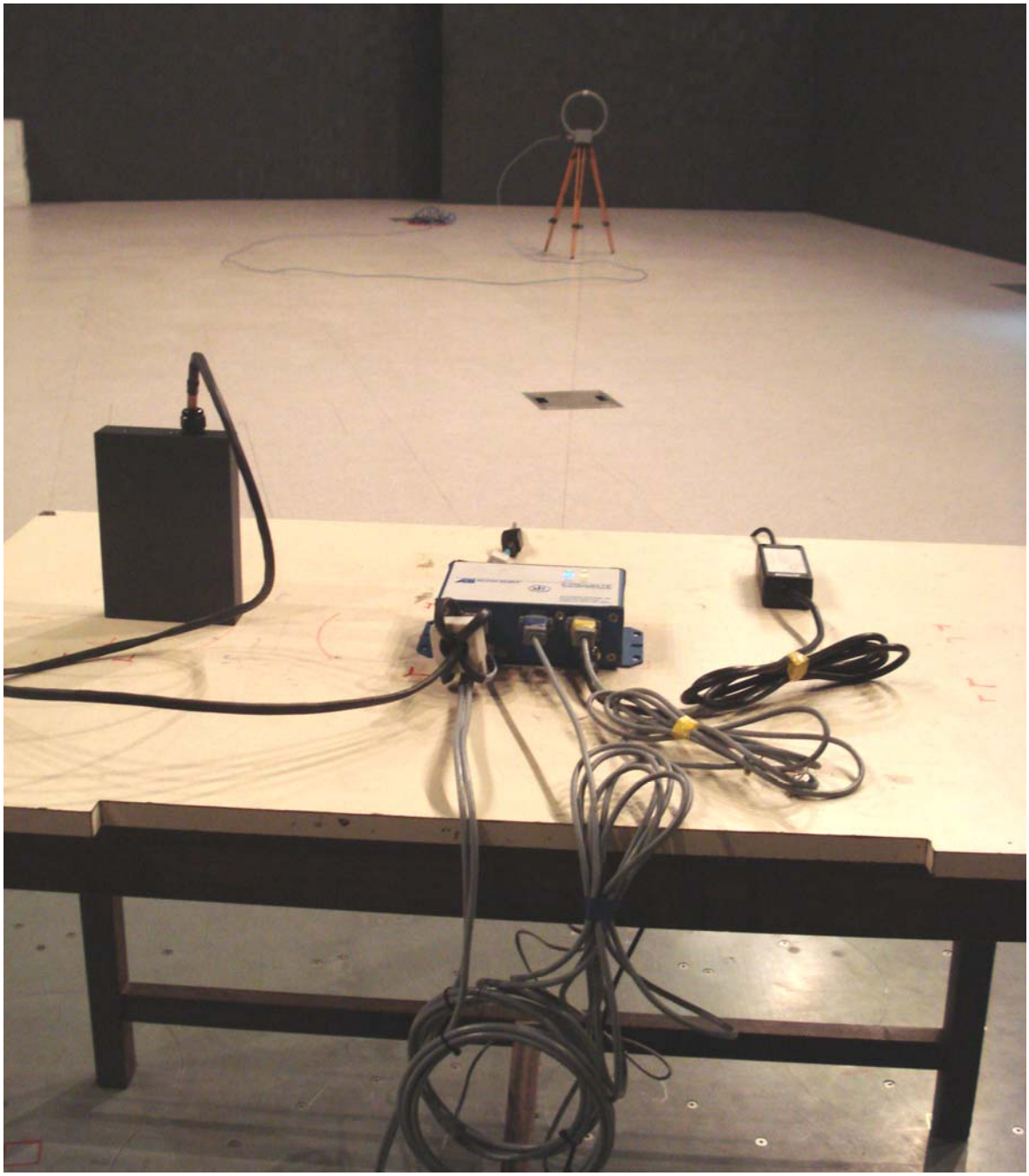
Frequency (MHz)	Loop Antenna orientation	Signal strength @ 10m (dBµV/m)	Extrapolated measurements for 30m(A)	Limit at 30m (dBµV/m)(B)	Delta (B-A)	Results
13.5604	perpendicular	58.03	48.49	83.99	35.5	Within the limit
27.1208	perpendicular	13.84	4.3	29.54	25.24	

The emissions captured at other orientations of loop antenna i.e. Parallel to the path as well as horizontal orientations were found to be less than the emissions for the perpendicular orientation as given in the table above**.**

9 kHz to 30MHz Radiated Emissions measurement test setup with 5”X7” Antenna using an Active Monopole Antenna

[FCC 15.209, FCC 15.225(a) (d)]

9 kHz to 30MHz Radiated Emissions measurement test setup with 5”X7” Antenna using an Active Loop Antenna
[FCC 15.209, FCC 15.225(a) (d)]



2.2.2 Radiated Emissions in 9 KHz to 30MHz band [15.225 (a) and (d)]

The radiated emissions in the 9KHz to 30MHz band were measured at a distance of 10meters using both active Monopole antenna as well as an active Loop antenna. The emissions were measured using both 5"X16" and 5"X7" antenna configurations with the antenna placed in three positions for measurements: standing vertically, standing horizontally and lying horizontally. The measurement was done, in peak detection mode with the EMI receiver using resolution bandwidth of 1 kHz, the emissions of considerable amplitude and their corresponding frequencies were noted down. No significant emissions were found in the band 9KHz to 30MHz other than the frequencies mentioned in the table below. The measured value at 10 m extrapolated to 30 m by subtracting a factor of 9.54 dB. Only the max-peak values are indicated in the table below.

2.2.2.1 Observation: EZ reader HF with 5" X 16" Antenna

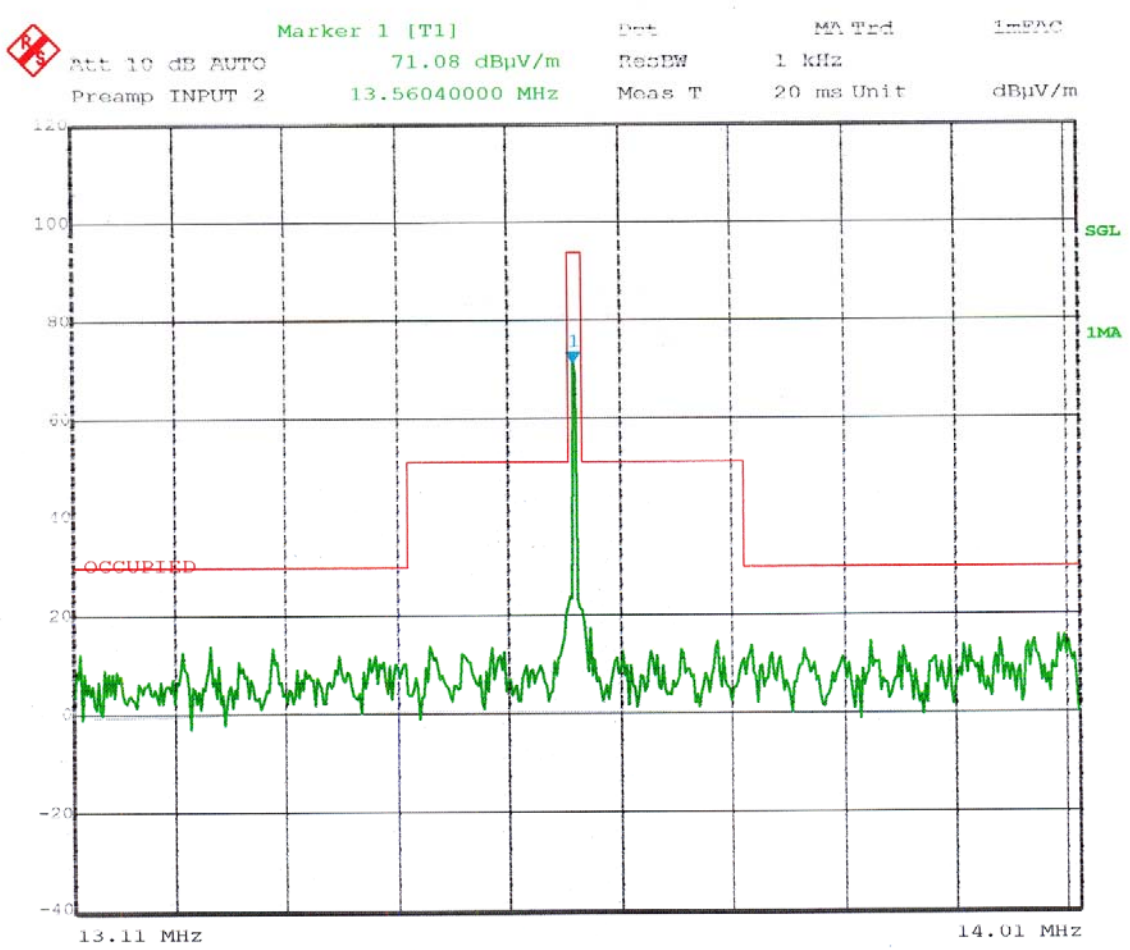
Measurements using an active monopole antenna

Frequency (MHz)	Signal strength @ 10m (dBµV/m)	Extrapolated measurements for 30m(A)	Limit at 30m (dBµV/m)(B)	Delta (B-A)	Results
13.5604	71.08	61.54	83.99	22.45	Within the limit
27.1208	26.53	16.99	29.54	12.55	

Measurements using an active loop antenna

Frequency (MHz)	Loop Antenna orientation	Signal strength @ 10m (dBµV/m)	Extrapolated measurements for 30m(A)	Limit at 30m (dBµV/m)(B)	Delta (B-A)	Results
13.5604	perpendicular	71.31	61.77	83.99	22.22	Within the limit
27.1208	perpendicular	12.15	2.61	29.54	26.93	

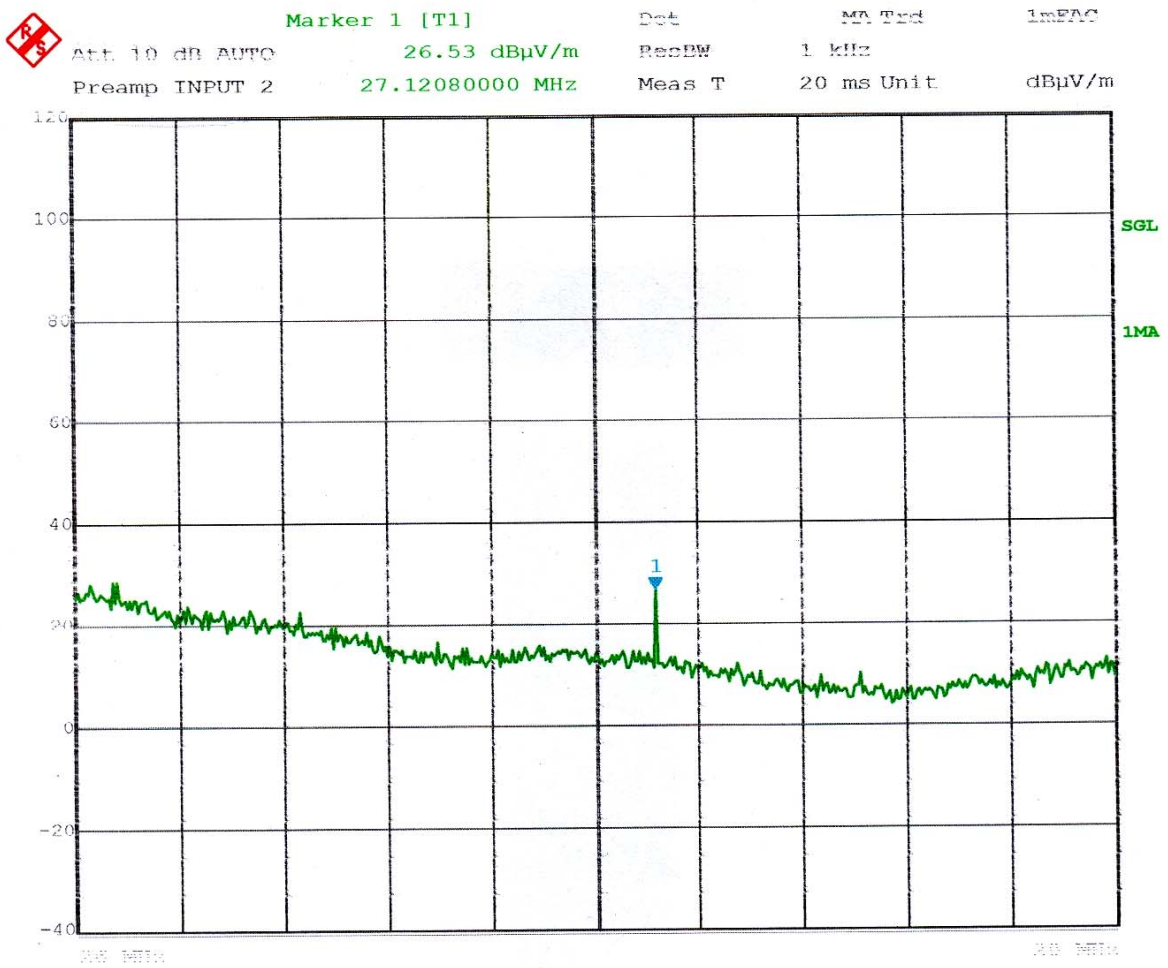
PLOT - 5 - Emissions near 13.5604MHz frequency range with 5”X16” antenna measured using an active Monopole antenna
[FCC 15.209, FCC 15.225 (a) (d)]



Title: RE TEST AS PER FCC 15.225
Comment B: EUT: EZ-READER HF WITH 5X 16 EZTUNE ANTENNA, MAKE ACCUSORT IN C, MODEL: 1000065715, SN: PILOT 5
Date: 11.MAR.2008 19:10:56

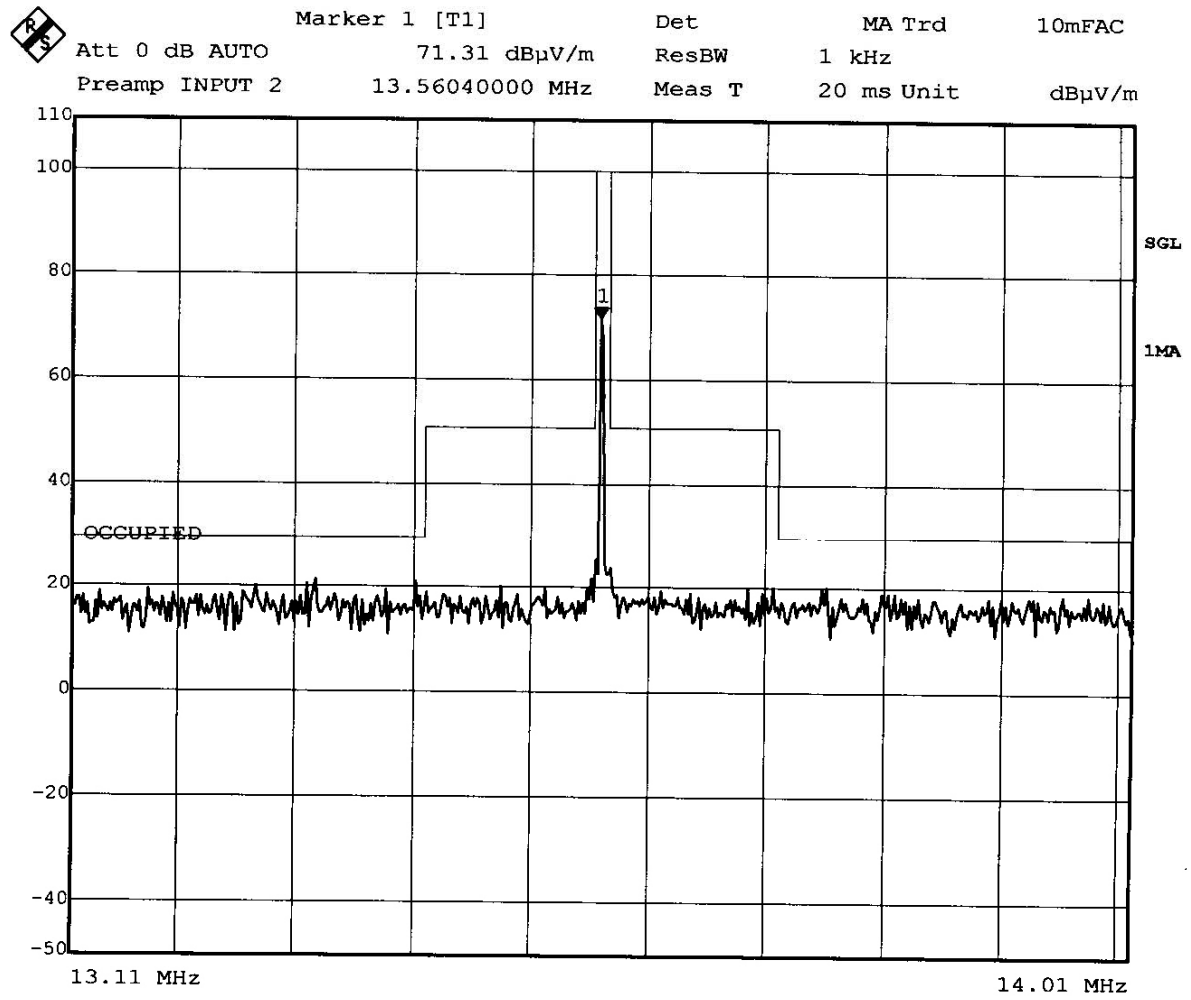
PLOT - 6 - Emissions near 27.1208MHz frequency range with 5”X16” antenna measured using an active Monopole antenna

[FCC 15.209, FCC 15.225 (a) (d)]



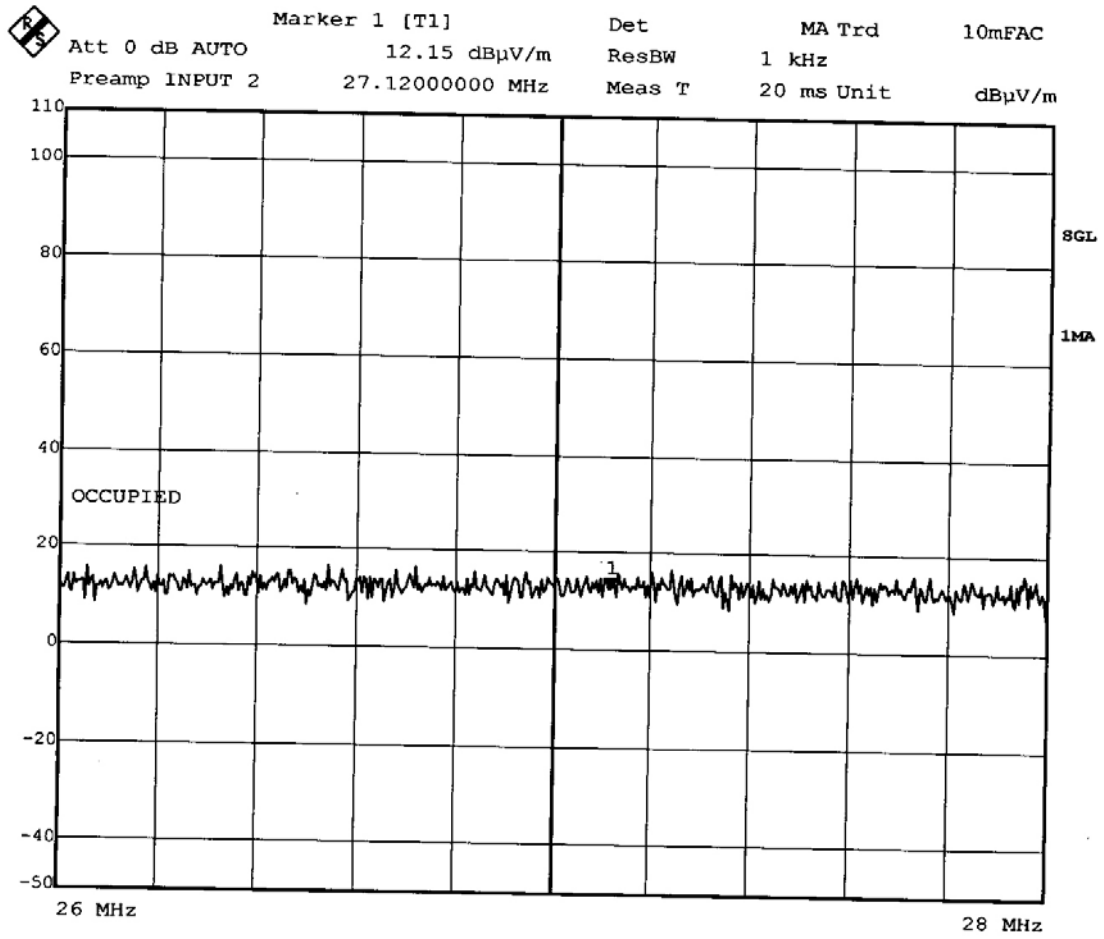
Title: RE TEST AS PER FCC 15.225
Comment B: EUT: EZ-READER HF WITH 5X 16 EZTUNE ANTENNA, MAKE ACCUSORT IN C, MODEL: 1000065715, SN: PILOT 5
Date: 11.MAR.2008 19:16:07

PLOT - 7 - Emissions near 13.5604MHz frequency range with 5”X16” antenna measured using an active Loop antenna
[FCC 15.209, FCC 15.225 (a) (d)]

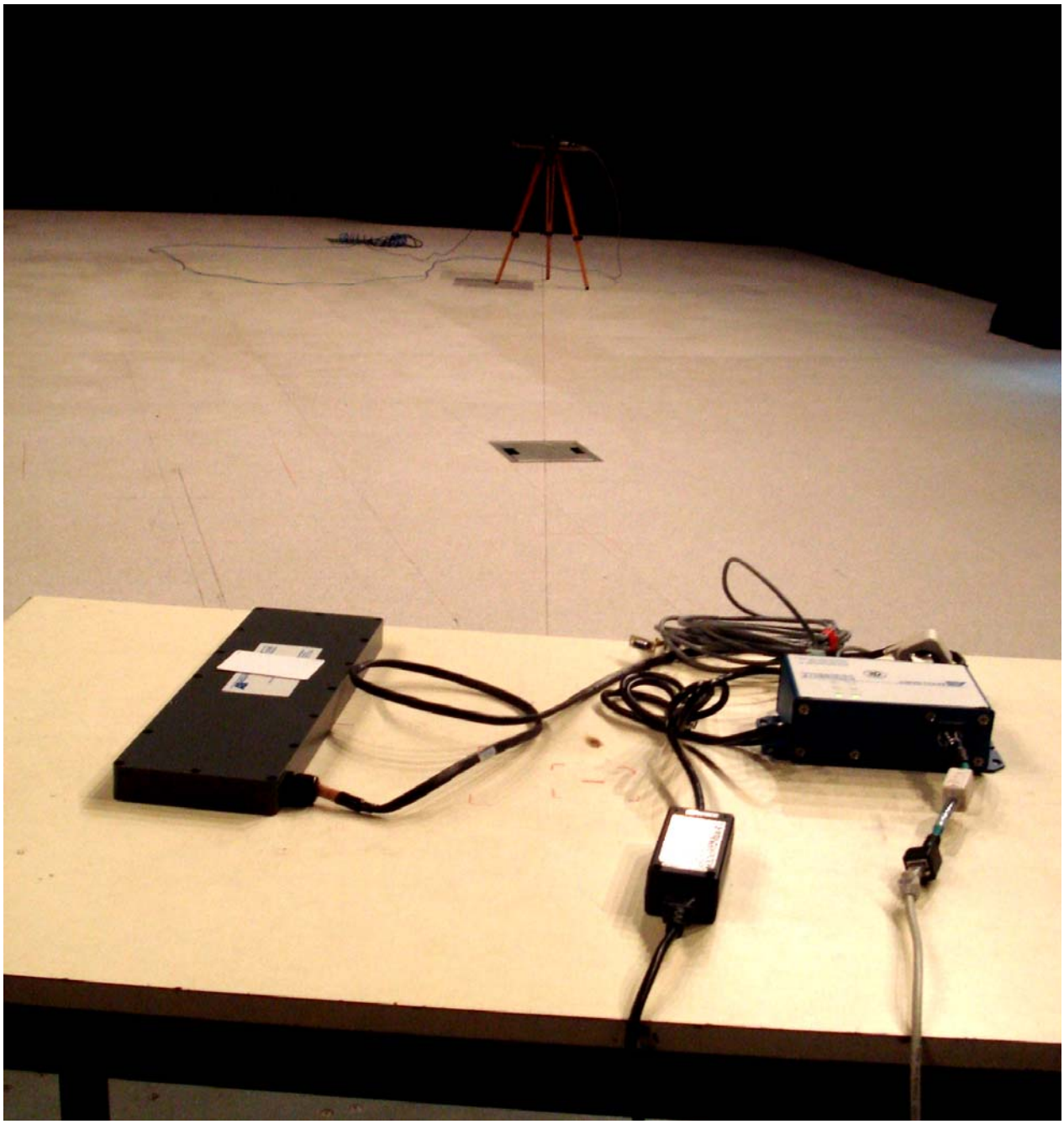


Title: RADIATED EMISSION TEST AS PER FCC 15.225
Comment B: EUT:EZ READER,MAKE:L&T,MODEL:1000065715,SN:PILOT 5,5X16 ANT
Date: 25.APR.2008 14:25:10

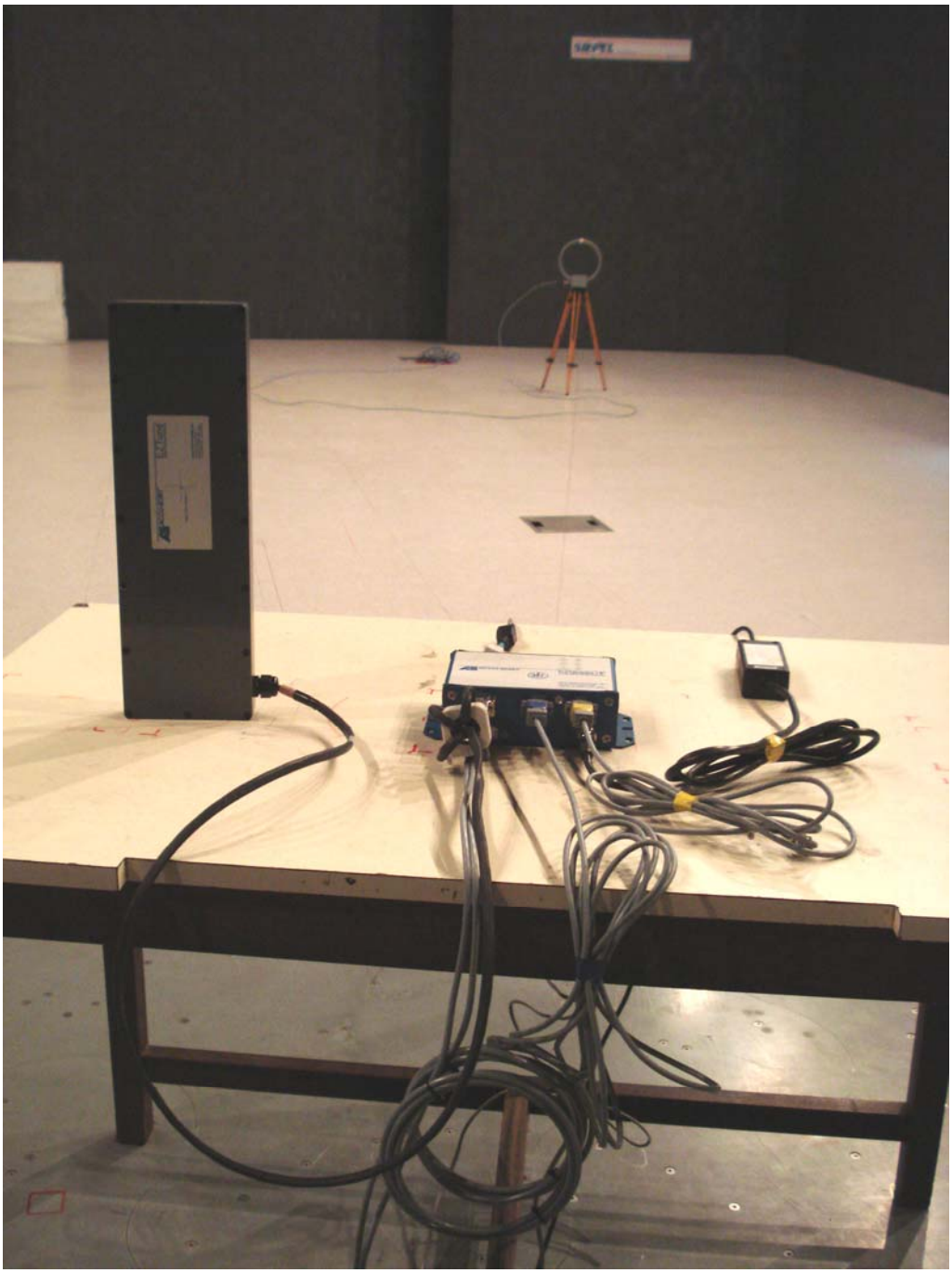
PLOT - 8 - Emissions near 27.1208MHz frequency range with 5”X16” antenna measured using an active Loop Antenna
[FCC 15.209, FCC 15.225 (a) (d)]



9 kHz to 30MHz Radiated Emissions measurement test setup with 5”X16” Antenna using an Active Monopole Antenna
[FCC 15.209, FCC 15.225(a) (d)]



9 kHz to 30MHz Radiated Emissions measurement test setup with 5”X16” Antenna using an Active Loop Antenna
[FCC 15.209, FCC 15.225(a) (d)]



2.2.2.2 Observation EZ reader HF with 5” X 7” Antenna

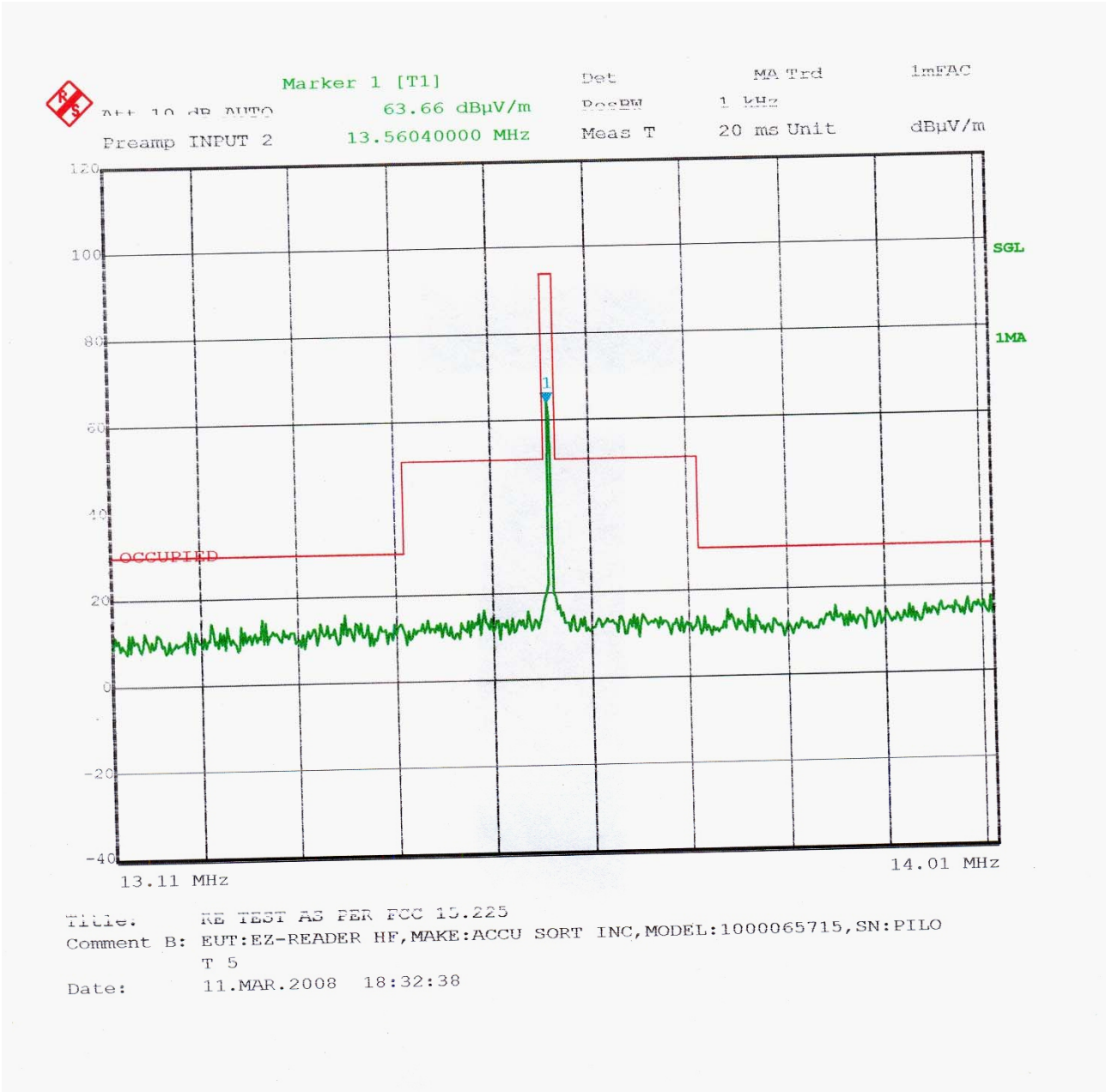
Measurement using Active Monopole Antenna

Frequency (MHz)	Signal strength @ 10m (dBµV/m)	Extrapolated measurements for 30m(A)	Limit at 30m (dBµV/m)(B)	Delta (B-A)	Results
13.5604	63.66	54.12	83.99	29.87	Within the limit
27.1208	35.74	26.2	29.54	3.34	

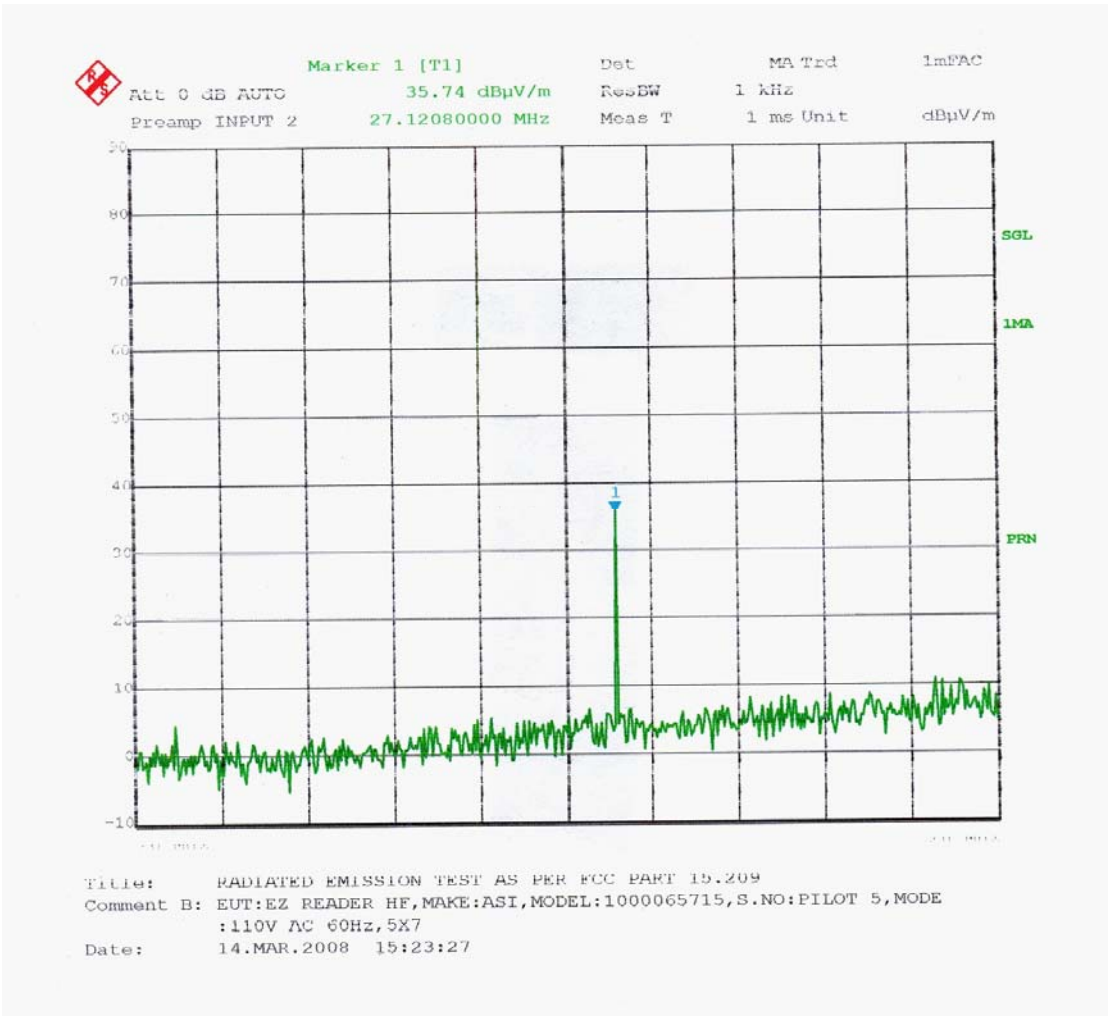
Measurements using an active loop antenna

Frequency (MHz)	Loop Antenna orientation	Signal strength @ 10m (dBµV/m)	Extrapolated measurements for 30m(A)	Limit at 30m (dBµV/m)(B)	Delta (B-A)	Results
13.5604	perpendicular	58.03	48.49	83.99	35.5	Within the limit
27.1208	perpendicular	13.84	4.3	29.54	25.24	

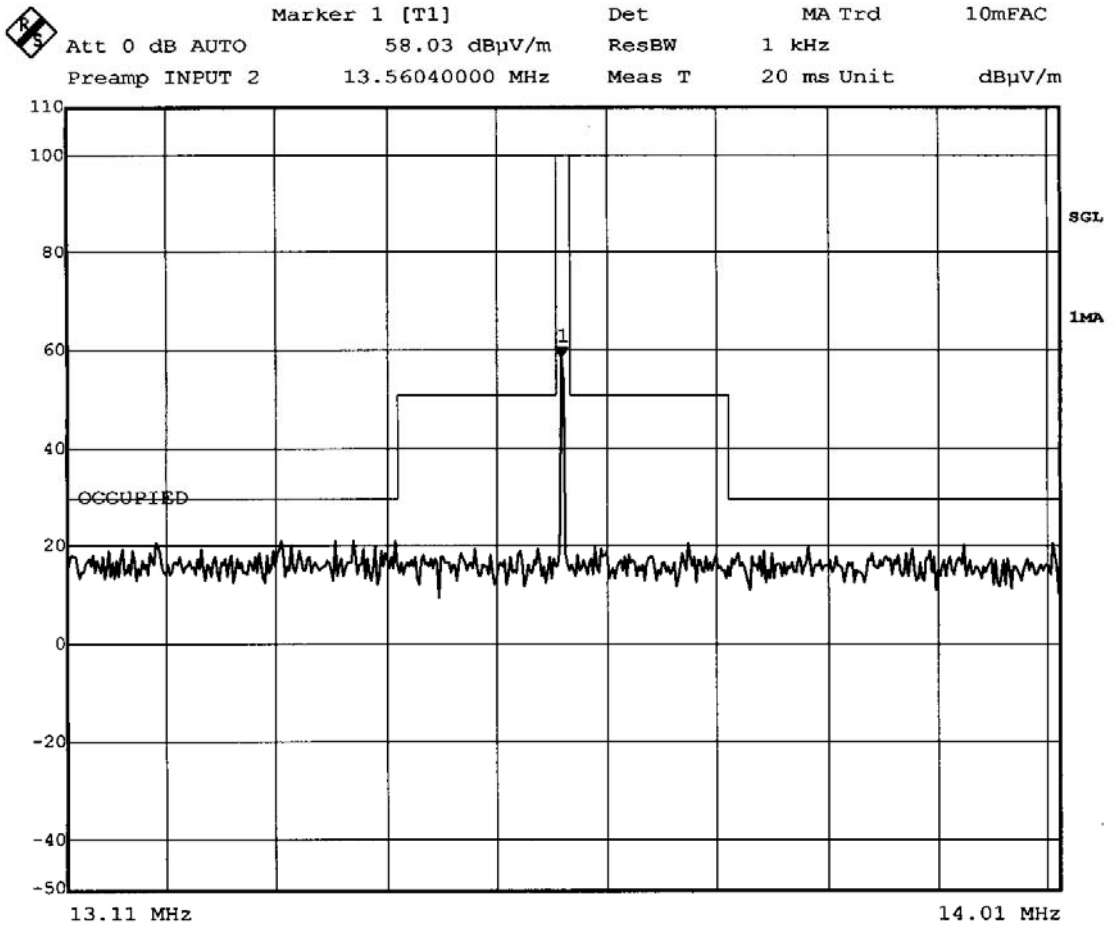
PLOT-9 – Emissions near 13.5604MHz frequency range with 5”X7” antenna using an Active Monopole Antenna
[FCC 15.209, FCC 15.225 (a) (d)]



PLOT-10 – Emissions near 27.1208MHz frequency range with 5”X7” antenna using an Active Monopole Antenna
[FCC 15.209, FCC 15.225 (a) (d)]

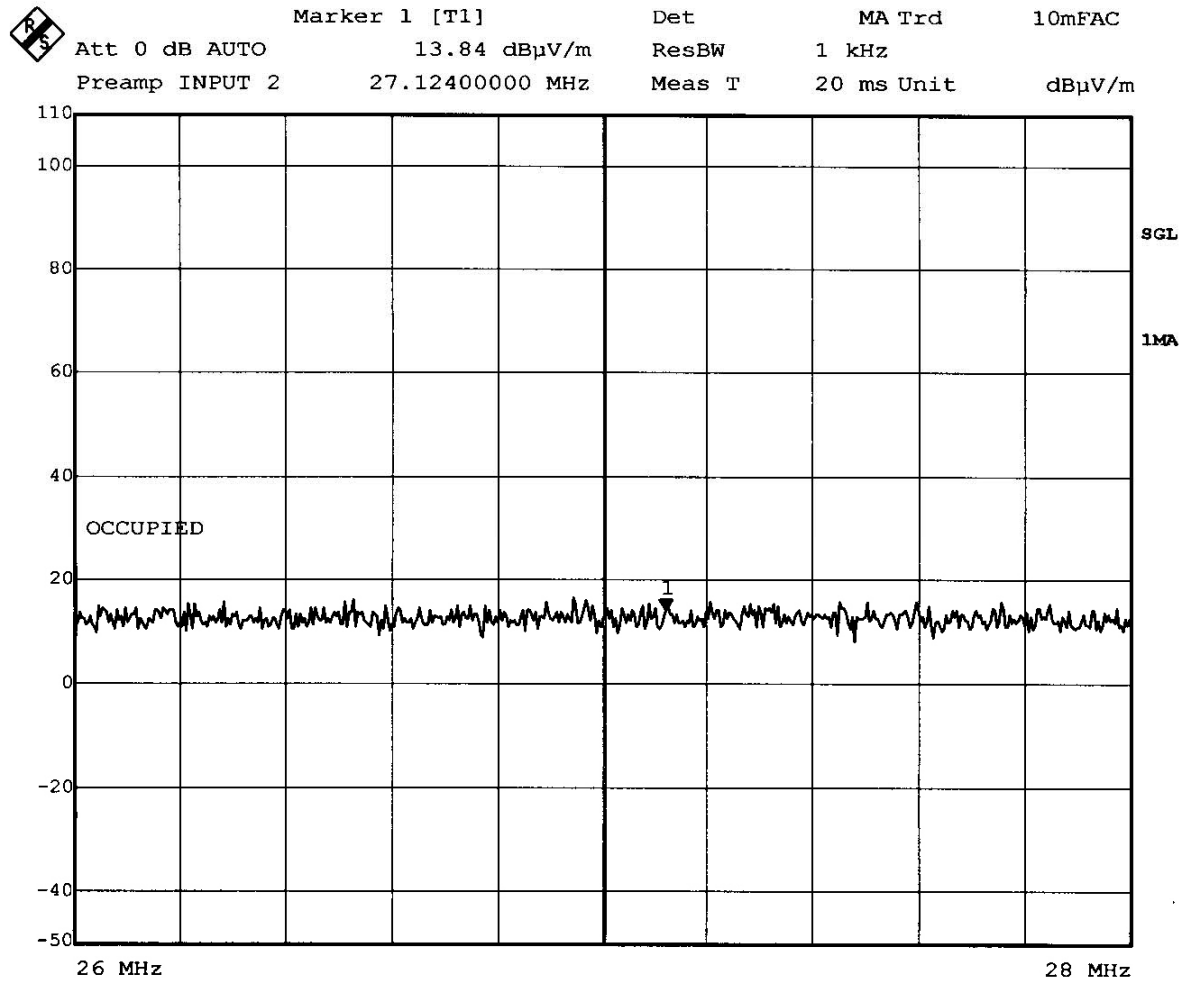


PLOT-11 – Emissions near 13.5604MHz frequency range with 5”X7” antenna using an Active Loop Antenna
[FCC 15.209, FCC 15.225 (a) (d)]



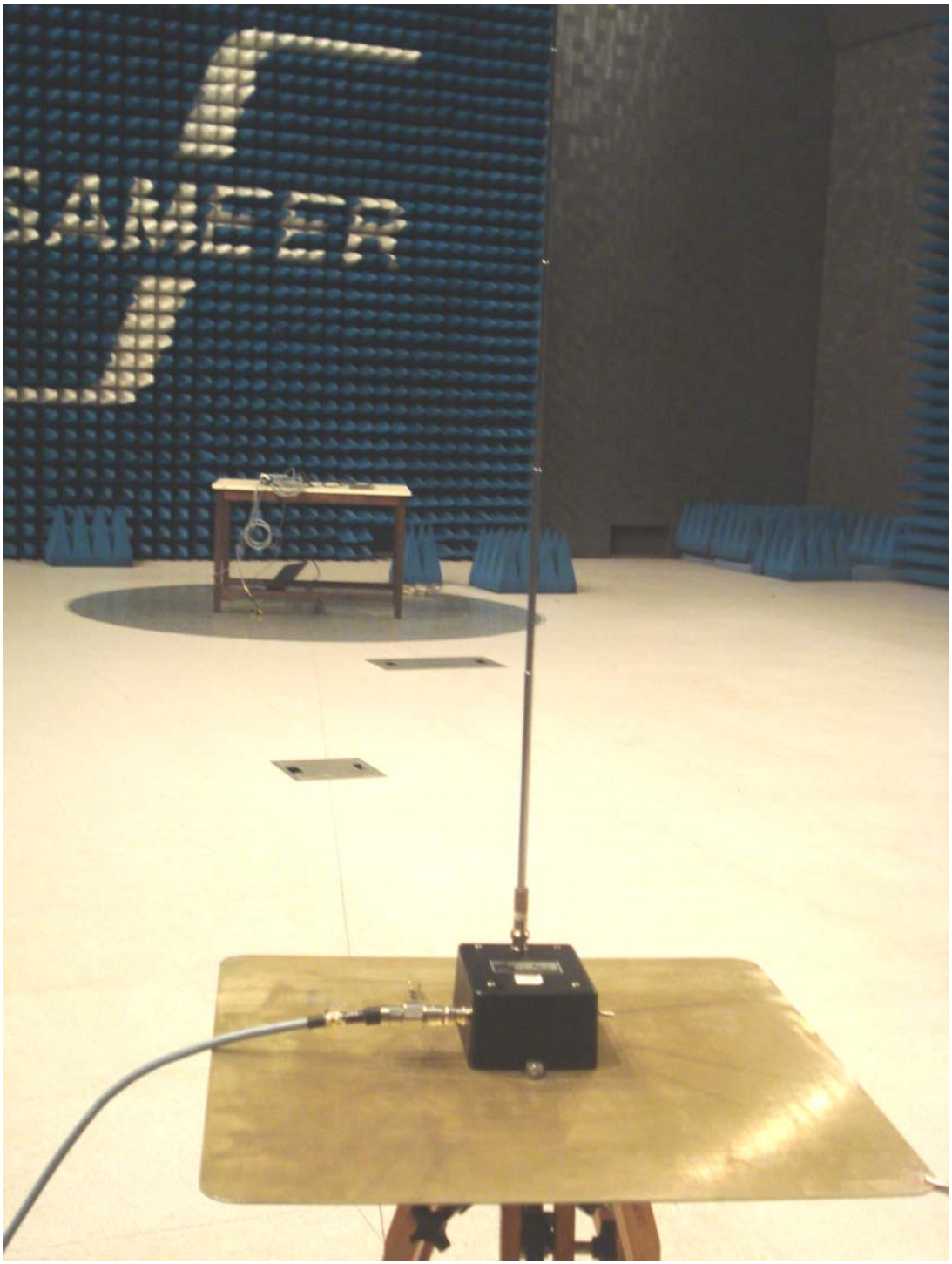
Title: RADIATED EMISSION TEST AS PER FCC 15.225
Comment B: EUT:EZ READER,MAKE:L&T,MODEL:1000065715,SN:PILOT 5,5X7 ANT
Date: 25.APR.2008. 14:35:29

PLOT-12 – Emissions near 27.1208MHz frequency range with 5”X7” antenna using an Active Loop Antenna
[FCC 15.209, FCC 15.225 (a) (d)]



Title: RADIATED EMISSION TEST AS PER FCC 15.225
Comment B: EUT:EZ-READER,MAKE:L&T,MODEL:1000065715,SN:PILOT 5,5-7ANT
Date: 24.APR.2008 15:48:12

9 KHz to 30MHz Radiated Emissions measurement test setup with 5”X7” Antenna using an Active Monopole Antenna
[FCC 15.209, FCC 15.225(a) (d)]



2.3 Occupied Bandwidth [FCC 15.225(b)-(c)]

The Occupied Bandwidth of the carrier from the EUT in 13.56 MHz band was measured using an Active Loop Antenna as well as an Active Monopole antenna. A 5”X16” Auto-Tuning HF Antenna was used for the measurement as the emitted radiations are more with 5x16 antenna as compared to a 5x7 antenna.

The measurements were done in peak detection mode with the EMI receiver using resolution bandwidth of 1 kHz. The measurement with the Active Loop Antenna was repeated using a resolution bandwidth of 1KHz and a video bandwidth of 3KHz. The measured values at 10 m were extrapolated to 30 m by subtracting a factor of 9.54 dB.

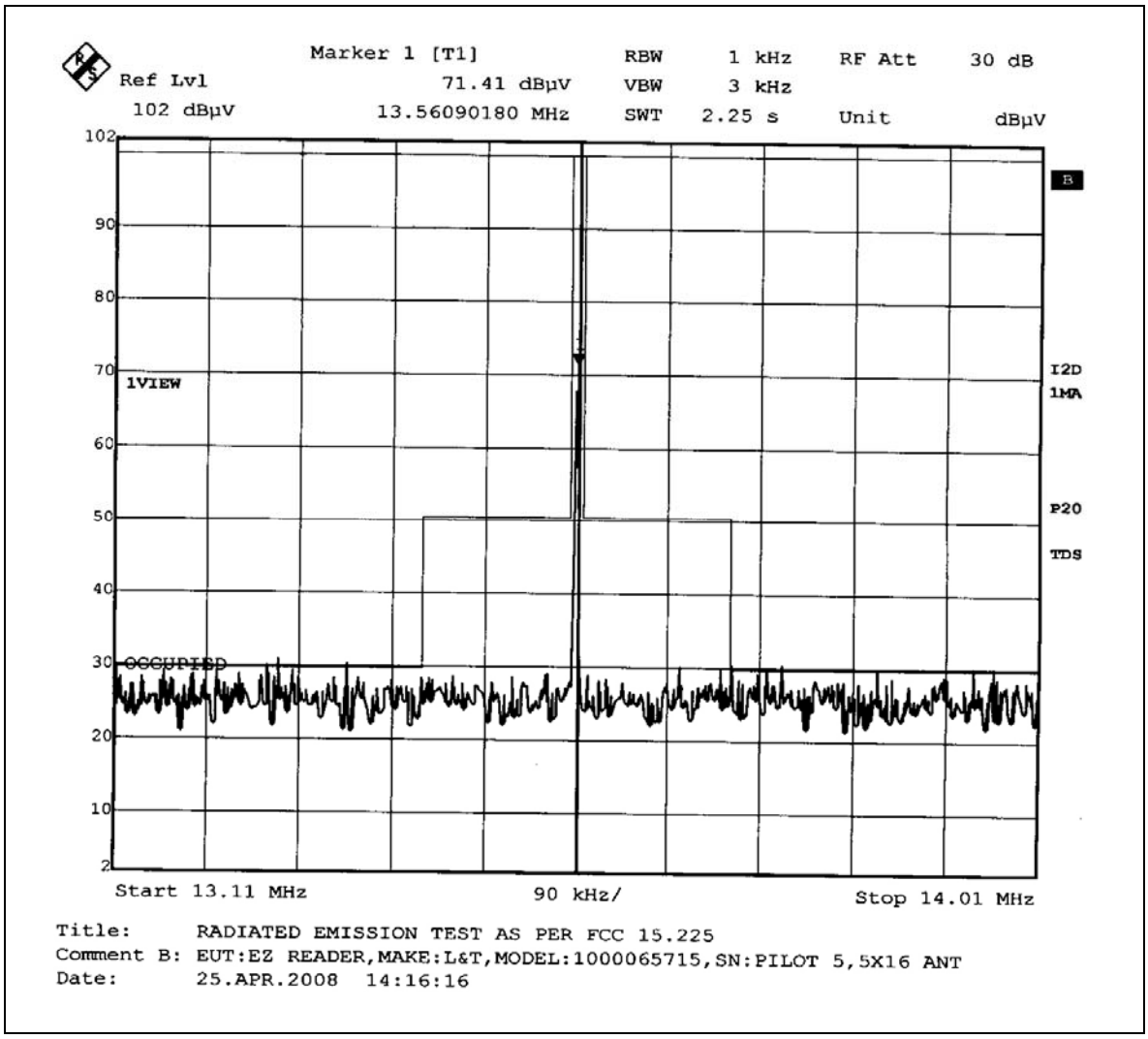
2.3.1 Test Observation:

The emissions are found to be within the specified limits

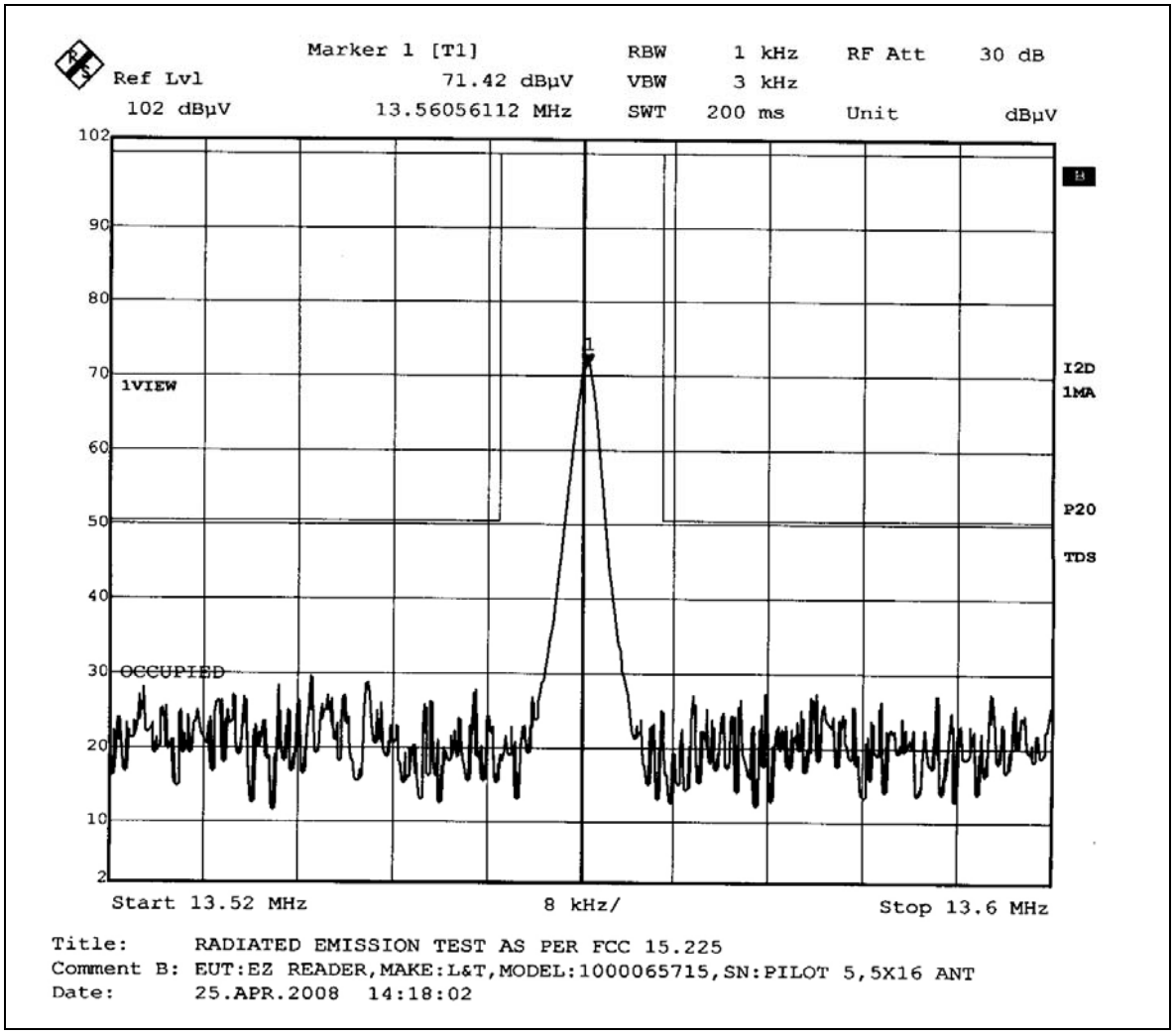
The below plot shows the band between 13.410 -13.553MHz and 13.567-13.710MHz are below the requirements of 50.47dbµV/m, also the band between 13.110-13.410 and 13.710-14.010 MHz is also far less than the requirement of 29.54dbµV/m.

PLOT-13 – Occupied Bandwidth Test using an Active Loop Antenna with resolution BW set at 1 KHz and VBW at 3 KHz

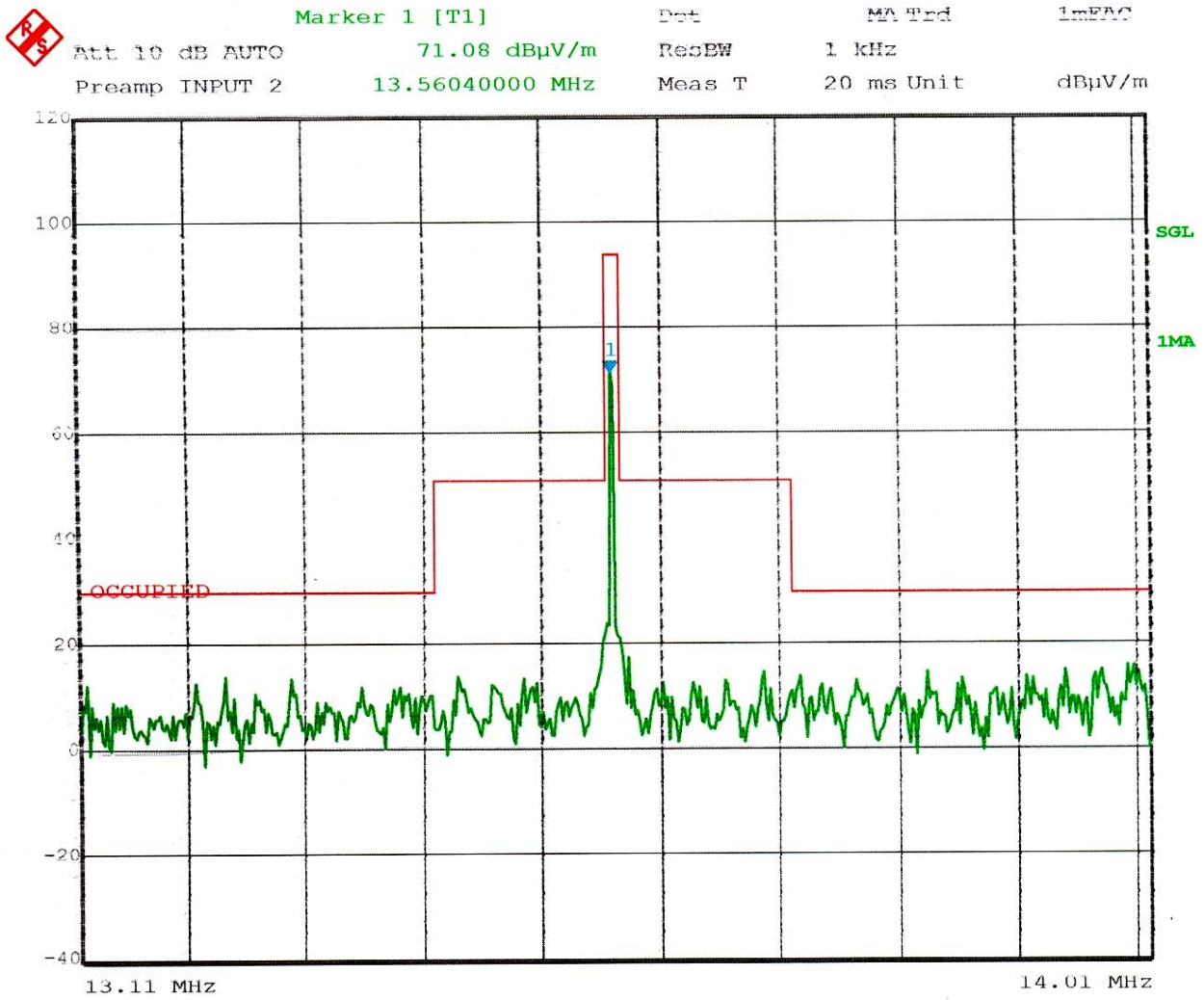
Plot for the band 13.11MHz to 14.01MHz



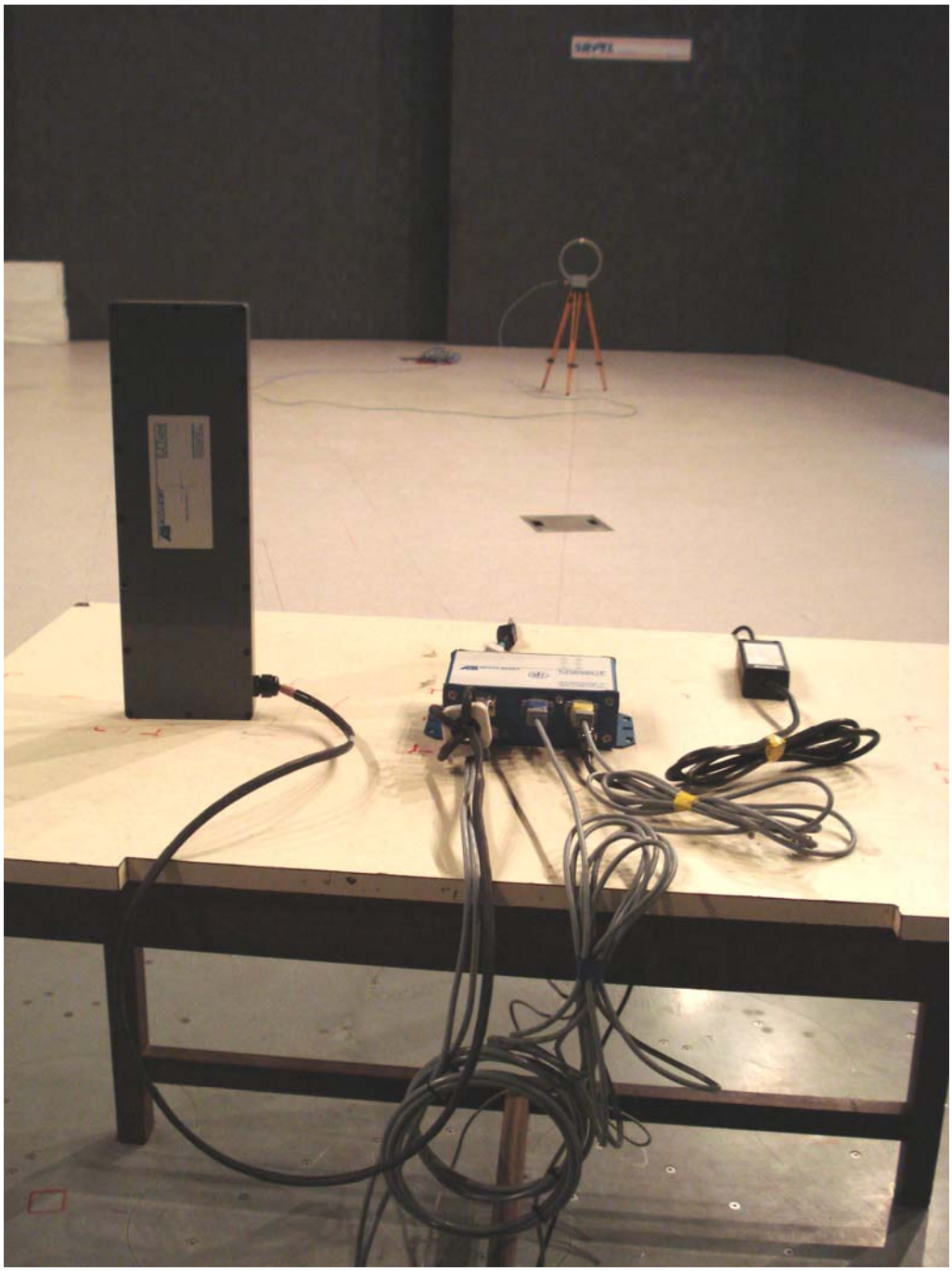
Close-up view near the 13.52MHz to 13.6MHz



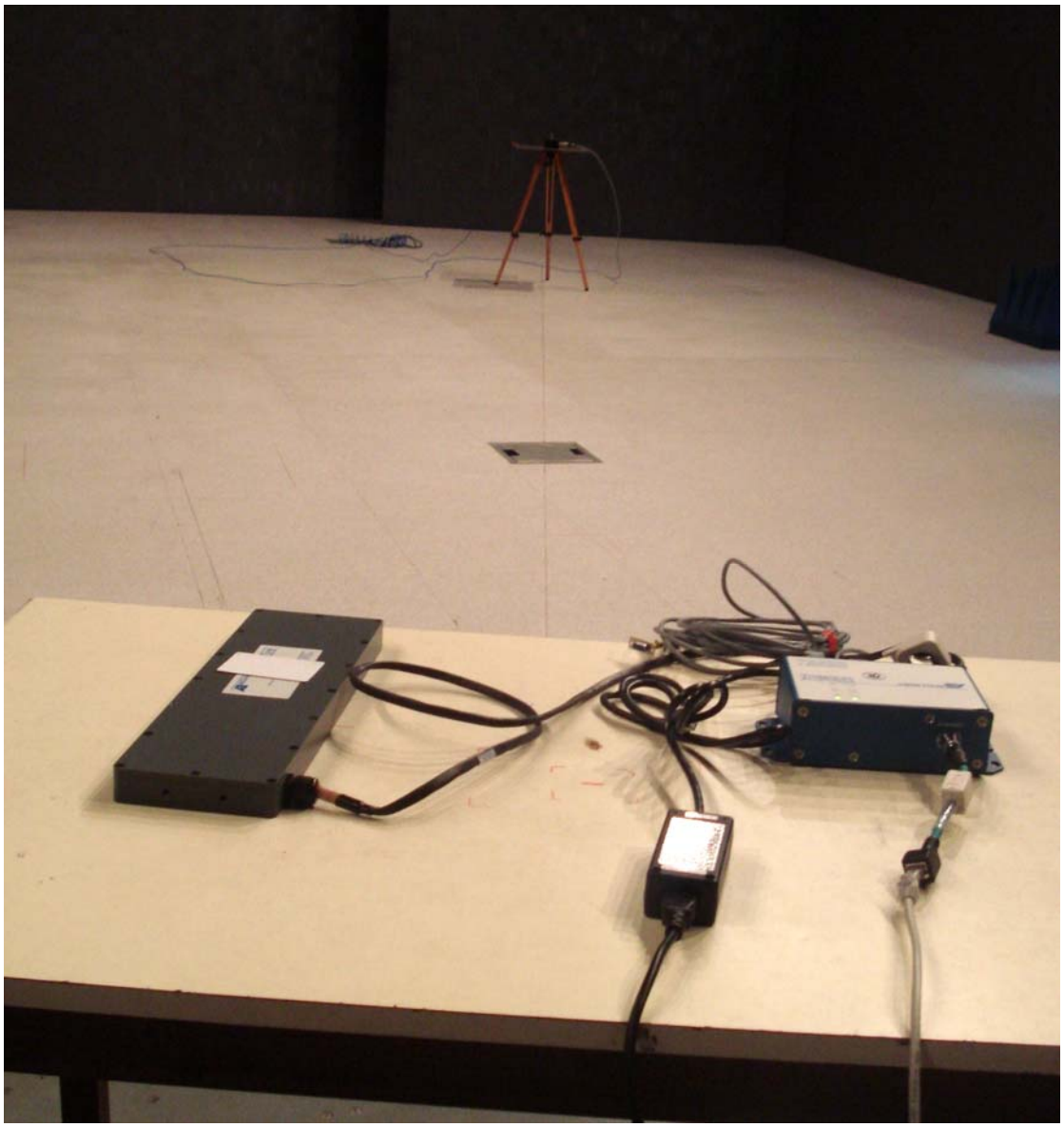
PLOT-14 – Occupied Bandwidth Test using an Active Monopole Antenna



Test Setup for measurement of occupied bandwidth using an Active Loop Antenna [FCC 15.225 (b) (c)]



Test Setup for measurement of occupied bandwidth using an Active Monopole Antenna [FCC 15.225 (b) (c)]



3. Conducted Emission [FCC 15.207]

3.1 Test Instrumentation:

Description	Make	Model Number	Serial Number
EMI Receiver	R&S	ESCS 30	100063
Line Impedance Stabilization Network	R&S	ESH2 Z5	835490/001
Transient Limiter	HP	11947A	3107A01050

3.2 Test Frequency and Limits:

Frequency Range (MHz)	Quasi-peak Limits (dBµV)	Average (dBµV)
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

** Decreasing linearly with the logarithm of the frequency.*

3.3 EUT Configuration:

The EUT, EZREADER HF 13.56MHZ RFID READER is a RFID reader operating in 13.56MHz ISM band. The unit has two RS232 ports and one Ethernet link for external interface. An I/O port consisting of two Photoeye modules will be used for providing the trigger. The unit was energized by 24V DC supply. The DC source was powered by an A/C power of 110V, 60Hz. The measurements were made with the antenna port terminated with a 50-ohm load and RS 232 and ethernet port left open.

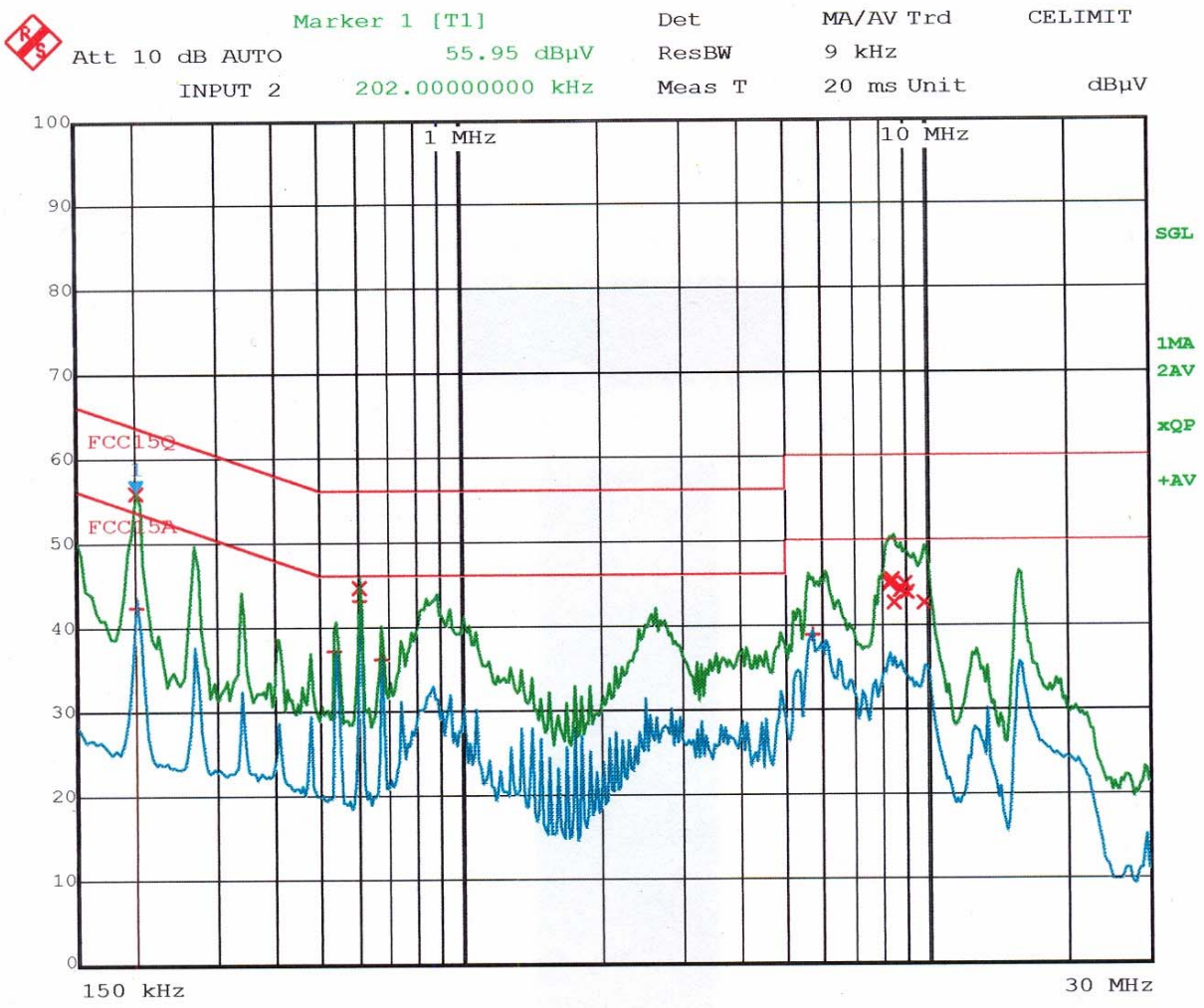
3.4 Test Procedure:

The RF Conducted Emissions from the EUT sent back to the mains input were coupled using a Line Impedance Stabilization Network (LISNs) and measured using an EMI receiver. The measurements were carried out in quasi peak detection mode and average detection mode.

3.5 Test Observation:

The Conducted Emissions from the EUT were observed to be within the specified limit, in the test frequency range of 150 kHz - 30 MHz.

PLOT-15 - Conducted Emission on Line



Title: CONDUCTED EMISSION TEST AS PER FCC PART 15.207
Comment B: EUT:EZ-READER HF 13.56MHz,MAKE:ASI,MODEL:1000065715,SL.NO:PI LOT-5, MEAS.ON LINE
Date: 11.MAR.2008 15:51:36

Table – 1: Conducted Emission on Line

EDIT PEAK LIST (Final Measurement Results)

Trace1: FCC15Q
Trace2: FCC15A
Trace3: ---
Trace4: ---

TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2 Average	610.0000 kHz	42.91	-3.08
1 Quasi Peak	202.0000 kHz	55.51	-8.01
2 Average	542.0000 kHz	36.84	-9.15
2 Average	678.0000 kHz	35.81	-10.18
2 Average	5.7580 MHz	38.73	-11.26
2 Average	202.0000 kHz	42.08	-11.44
1 Quasi Peak	610.0000 kHz	44.44	-11.55
1 Quasi Peak	8.5420 MHz	45.20	-14.79
1 Quasi Peak	8.4340 MHz	44.99	-15.00
1 Quasi Peak	8.4300 MHz	44.87	-15.12
1 Quasi Peak	8.4100 MHz	44.62	-15.37
1 Quasi Peak	9.0620 MHz	44.59	-15.40
1 Quasi Peak	8.9060 MHz	43.84	-16.15
1 Quasi Peak	9.1700 MHz	43.69	-16.30
1 Quasi Peak	9.9780 MHz	42.41	-17.58
1 Quasi Peak	8.6180 MHz	42.41	-17.58

Title: CONDUCTED EMISSION TEST AS PER FCC PART 15.207
Comment B: EUT:EZ-READER HF 13.56MHz,MAKE:ASI,MODEL:1000065715,SL.NO:PILOT-5, MEAS.ON LINE
Date: 11.MAR.2008 15:53:13

PLOT-16 - Conducted Emission on Neutral

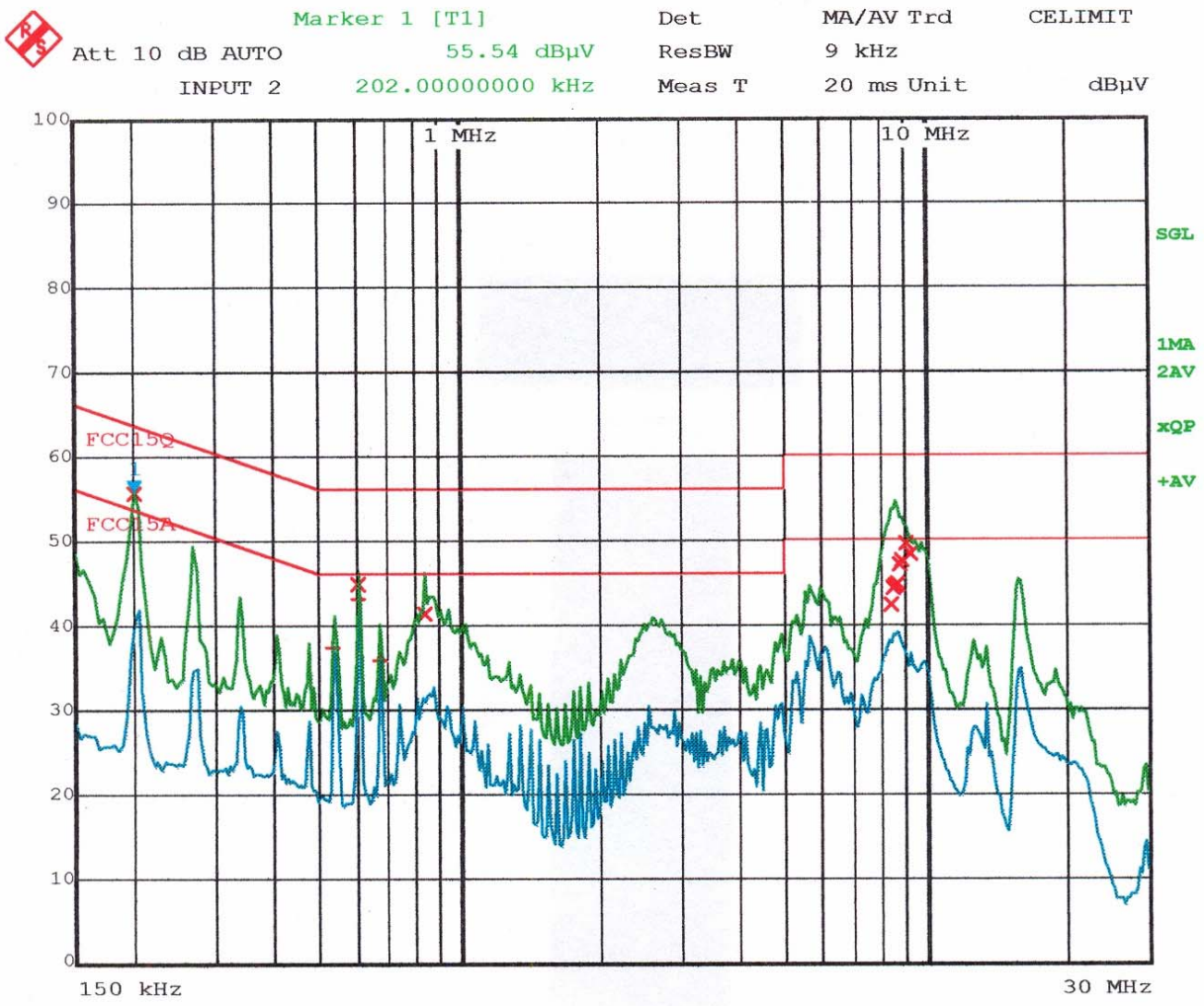


Table – 2: Conducted Emission on Neutral

EDIT PEAK LIST (Final Measurement Results)

Trace1: FCC15Q
Trace2: FCC15A
Trace3: ---
Trace4: ---

TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2 Average	610.0000 kHz	42.94	-3.05
1 Quasi Peak	202.0000 kHz	55.37	-8.14
2 Average	542.0000 kHz	37.09	-8.90
2 Average	678.0000 kHz	35.72	-10.27
1 Quasi Peak	9.2180 MHz	49.38	-10.61
1 Quasi Peak	610.0000 kHz	44.74	-11.25
1 Quasi Peak	9.3380 MHz	48.14	-11.85
1 Quasi Peak	8.9980 MHz	47.30	-12.69
1 Quasi Peak	8.9380 MHz	46.93	-13.06
1 Quasi Peak	850.0000 kHz	41.07	-14.92
1 Quasi Peak	8.8380 MHz	44.59	-15.40
1 Quasi Peak	8.6860 MHz	44.33	-15.66
1 Quasi Peak	8.6300 MHz	44.05	-15.94
1 Quasi Peak	8.5180 MHz	42.21	-17.78
1 Quasi Peak	8.5580 MHz	42.07	-17.93

Title: CONDUCTED EMISSION TEST AS PER FCC PART 15.207
Comment B: EUT:EZ-READER HF 13.56MHz,MAKE:ASI,MODEL:1000065715,SL.NO:PILOT-5, MEAS.ON NEUTRAL
Date: 11.MAR.2008 15:58:08

Conducted Emission Test Setup

Conducted Emission Test Setup