FCC/IC Test Report

FOR:

Manufacturer: Wi-MM Corp.

Model: BP200-2-2-1

FCC ID: 2ABUE-BP200-2-2-1
IC ID: 11915A-BP200221

FCC Part 15B

ICES-003

TEST REPORT #: EMC-WIMML-004-15001-15B

DATE: 04/14/2015

ACCREDITED
TESTING LABORATORY
Certificate #2135.01

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC:
Accredited

IC recognized #
3462B-1

***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
Phone: + 1 (408) 586 6200 ◆ Fax: + 1 (408) 586 6299 ◆ E-mail: info@cetecomusa.com ◆ http://www.cetecom.com
CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

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1 Assessment

The following device, as identified in chapter 3 of this test report, was evaluated against the applicable criteria specified in the following standards and no deviations were ascertained during the course of the tests performed.

Standard	Version
FCC Part 15B	Current as of [04/14/2015]
ICES-003	Issue 5
ANSI C63.4	2013

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2015-04-16	Compliance	Franz Engert (Compliance Manager)	Digitally signed by Franz Engert DN: cn=Franz Engert, c=US, o=CETECOM, ou=Complience, email=franz.engert@cetecom.com Date: 2015.04.30 09:42:39 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2015-04-16	Compliance	Douglas Antioco (EMC Engineer)	Douglas Antioco 2015.04.30 10:20:39 -07'00'

The test results of this test report relate exclusively to the test item specified in Section 3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name	CETECOM Inc.
Department	Compliance
Address	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone	+1 (408) 586 6200
Fax	+1 (408) 586 6299
Test Lab Manager	Josie Sabado
Project Manager	Franz Engert
Test Engineer	Douglas Antioco

2.2 Identification of the Client

Client Company	Wi-MM Inc.
Street Address	1885 De La Cruz Blvd. Suite 205
City, State, Zip Code	Santa Clara, CA, 95050
Country	USA

2.3 Identification of the Manufacturer

Manufacturer Company	Same as client
Street Address	
City, State, Zip Code	
Country	

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Model Number	BP200-2-2-1
Technical Product Description	battery powered asset tracker and sensor platform
Digital Device Class	Class B
FCC ID	2ABUE-BP200-2-2-1
IC Certification Number	11915A-BP200221
Radios Included	1. U-Blox LISA-C200 Pre-certified Wireless Module FCC ID R5Q -LISAC200 2. Bluegiga BLE-113 Pre-certified module Antenna integrated on module FCC ID QQQBLE113 3. U-Blox MAX-7C Dual SAW filter + LNA front end Assisted GPS capability for fast start
Lowest Frequency Generated/Used	9kHz
Highest Frequency Generated/Used	2462MHz
Rated Operating Voltage Range	AC: 5V-50V DC: 5V-10V
Prototype / Production Unit	Prototype
Operating Temperature Range	-20degC to +65degC
Date of Testing	03/24/2015

3.2 Description of Functions and Data Ports

Function #	Type	Exercise Method
1	NA	USB port is used for charging only.

3.3 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	Hardware Version	Software Version	Comments
1	3158 4214 0117	BP200 HW-2-2-1	BP200 SW-1.0	

3.4 Identification of Accessory equipment (AE)

AE #	Type	Serial Number	Manufacturer	Model	Comments
1	Shielded USB cable				Type A to micro USB
2	USB charger	13221001004	Salcomp	SC1402	

3.5 Identification of Test Support Equipment (TSE)

TSE #	Type	Serial Number	Manufacturer	Model	Comments
1					

3.6 Environmental Conditions during test

The following environmental conditions were maintained during the course of testing:

Ambient Temperature: 22degC
Relative humidity: 15%

3.7 Miscellaneous Testing Information

The test software used to exercise the EUT is the standard SW from 3.3 with all the sensors actively measuring and storing data in the devices internal memory.

The USB was connected for charging purpose only as there is no data transfer via USB defined in the product.

4 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
FCC §15.109 ICES-003, §6.2	RX Spurious Emissions Radiated	Nominal	RX Mode	☒	☐	☐	☐	Complies
FCC §15.107 ICES-003, §6.1	Conducted Emissions	Nominal	RX Mode	☒	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.

5 Radiated Emissions

5.1 Limits

Limits according to FCC §15.109/ICES-003 §6.2 and extrapolated to 3 meter measurement distance according to FCC §15.31/ICES-003 §6.2.

Class B Limits:

Frequency of emission (MHz)	Field Strength @ 3 m (µV/m)	Field Strength @ 3 m (dBµV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

For measurements below 1 GHz, the limits above use a quasi-peak detector.
For measurements above 1 GHz, the limits above use an average detector. An additional limit is applied according to FCC 15.35 where the limit is 20 dB above the average detector limit and uses a peak detector.

5.2 Measurement Procedure

1. The EUT and accessories are placed in an anechoic chamber on a turntable, 80 cm above the ground plane.
2. Cables that hang closer than 40 cm to the ground plane are gathered into a 30 cm to 40 cm long bundle.
3. The data ports of the EUT are exercised.
4. The measurement antenna is oriented initially for horizontal polarization.
5. The EUT is rotated through 360° about a vertical axis to maximize the received signal.
6. The measurement antenna is raised or lowered from 1 m to 4 m until the maximum signal level is detected on the measuring receiver.
7. Steps 3-4 are repeated for the measurement antenna in the vertical polarization.
8. Steps 3-5 are repeated for each EUT orthogonal orientation.
9. The 6 highest emissions within 20 dB of the limit are noted.

5.3 Sample Calculations for Radiated Measurements

Measurements from the spectrum analyzer or receiver are used to calculate the field strength, taking into account the following parameters:

1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and spectrum analyzer or receiver in dB and
3. Antenna factor in dB/m

FS (dBµV/m) = Measured Value on SA (dBµV) + Cable Loss (dB) + Antenna Factor (dB/m)
Ex:

Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

All radiated measurement plots in this report are taken from test software that calculates the field strength based on the above equation.

5.4 Receiver Settings

The following settings are used by the measurement receiver

Radiated Spurious Emissions		
	30 MHz – 1 GHz	**1 GHz – 40 GHz**
Resolution Bandwidth	120 kHz	1 MHz
Detector (Exploratory Measurements)	Peak	Peak, Average
Detector (Final Measurements)	Quasi-Peak	Peak, Average
Trace Mode	Max Hold	Max Hold
Step Size	40 kHz	800 kHz
Measurement Time (Exploratory Measurements)	2 ms	2 ms
Measurement Time (Final Measurements)	100 ms	100 ms

5.5 Measurement Uncertainty

	Uncertainty in dB Radiated < 30MHz	**Uncertainty in dB Radiated 30MHz - 1GHz**	**Uncertainty in dB Radiated > 1GHz**
Standard Deviation k=1	2.48	1.94	2.16
95% Confidence Interval in dB	4.86	3.79	4.24
95% Confidence Interval in dB in Delta to Result	+/-2.5 dB	+/-2.0 dB	+/- 2.3dB

5.6 Testing Notes

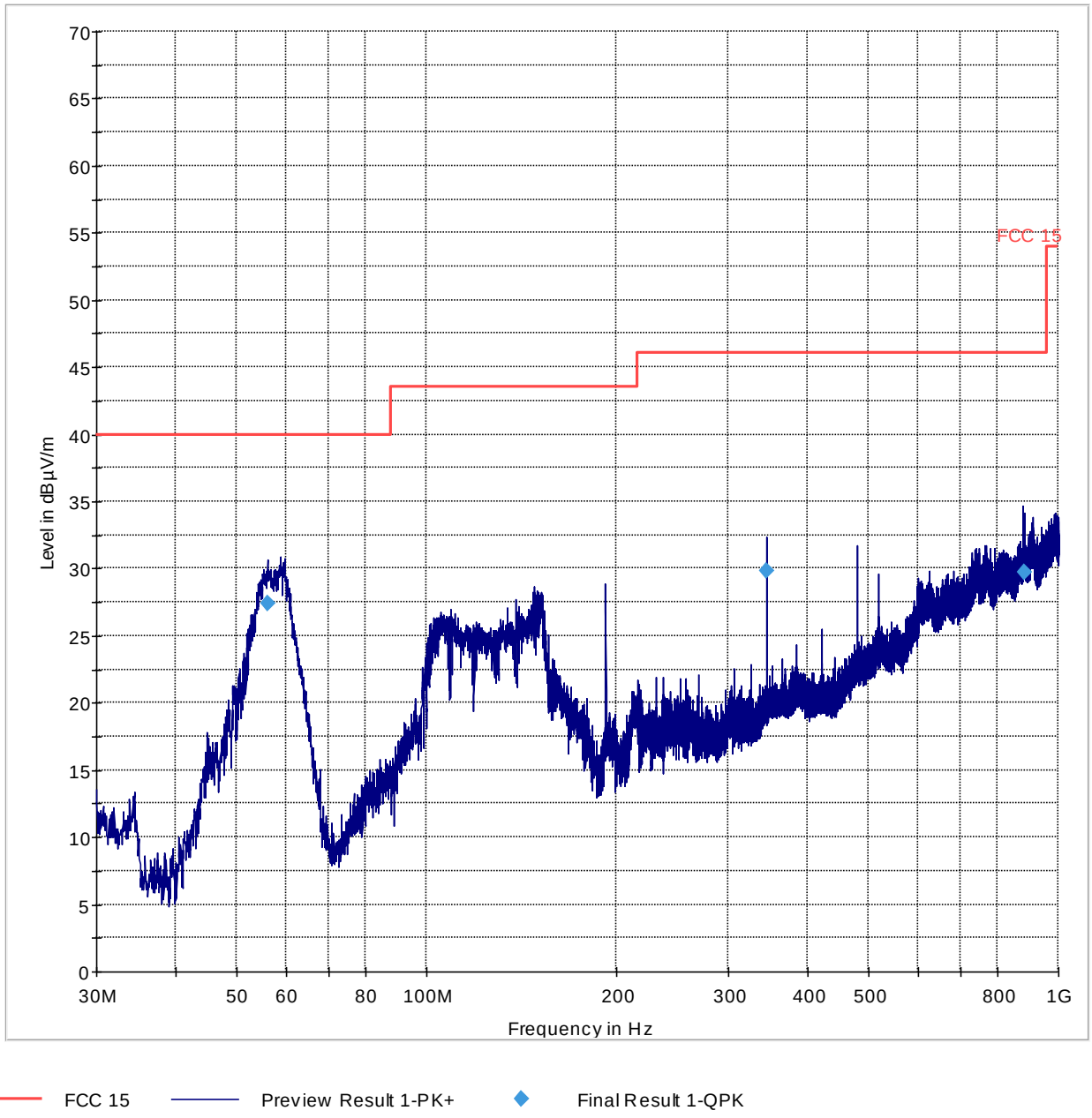
The relevant procedures of ANSI C63.4: 2013 have been followed.
The following test plots show the worst case emissions for horizontal and vertical measurement antenna polarizations and for all three orthogonal orientations of the EUT.

5.7 Test Results

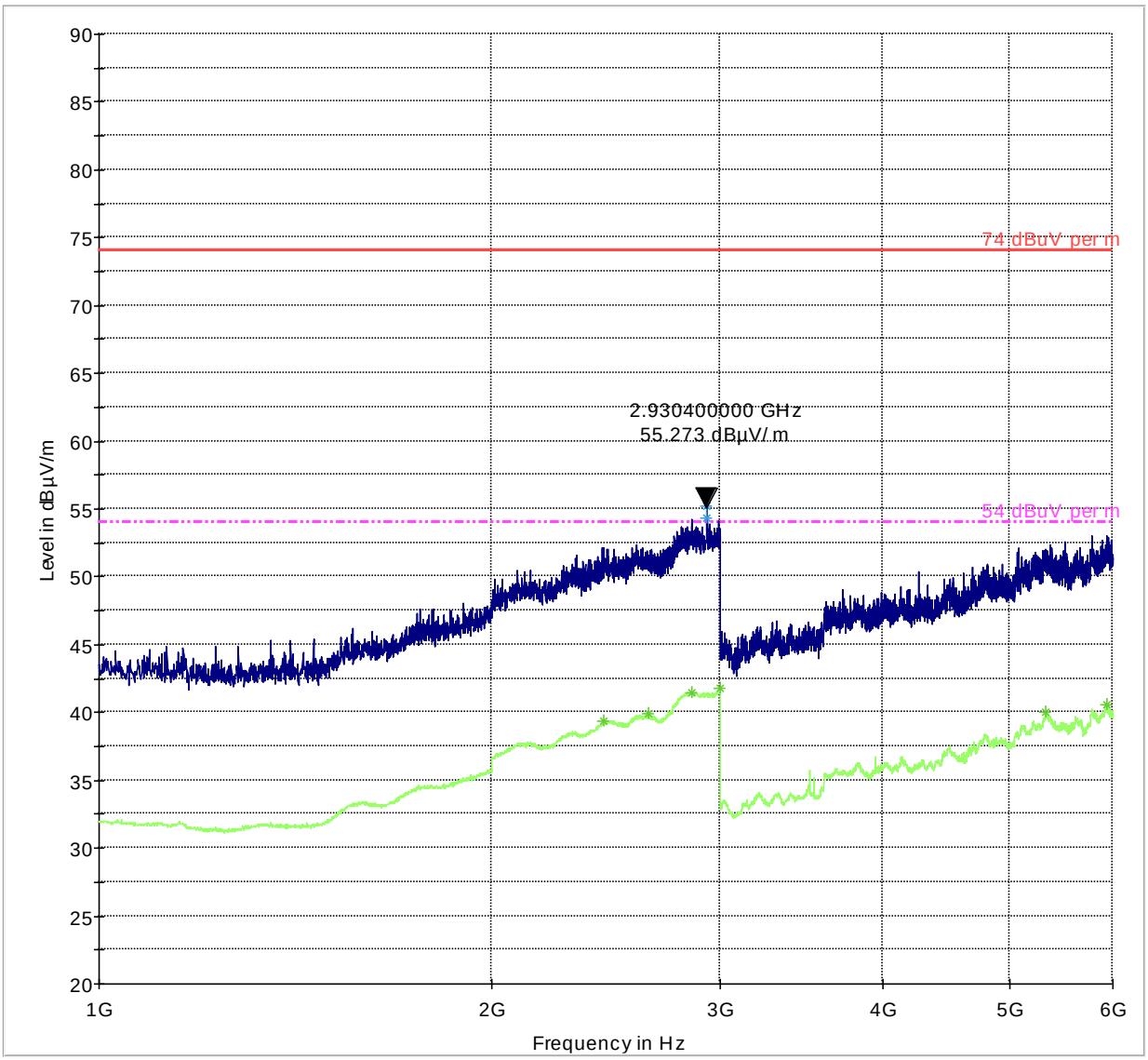
Summary of highest emissions									
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
56.000000	27.4	100.0	120.000	123.0	V	75.0	6.4	12.6	40.0
345.600000	29.9	100.0	120.000	123.0	V	94.0	17.5	16.1	46.0
881.680000	29.7	100.0	120.000	100.0	H	108.0	26.5	16.3	46.0

5.8 Test Plots

5.8.1 Radiated Emissions: 30 MHz – 1 GHz

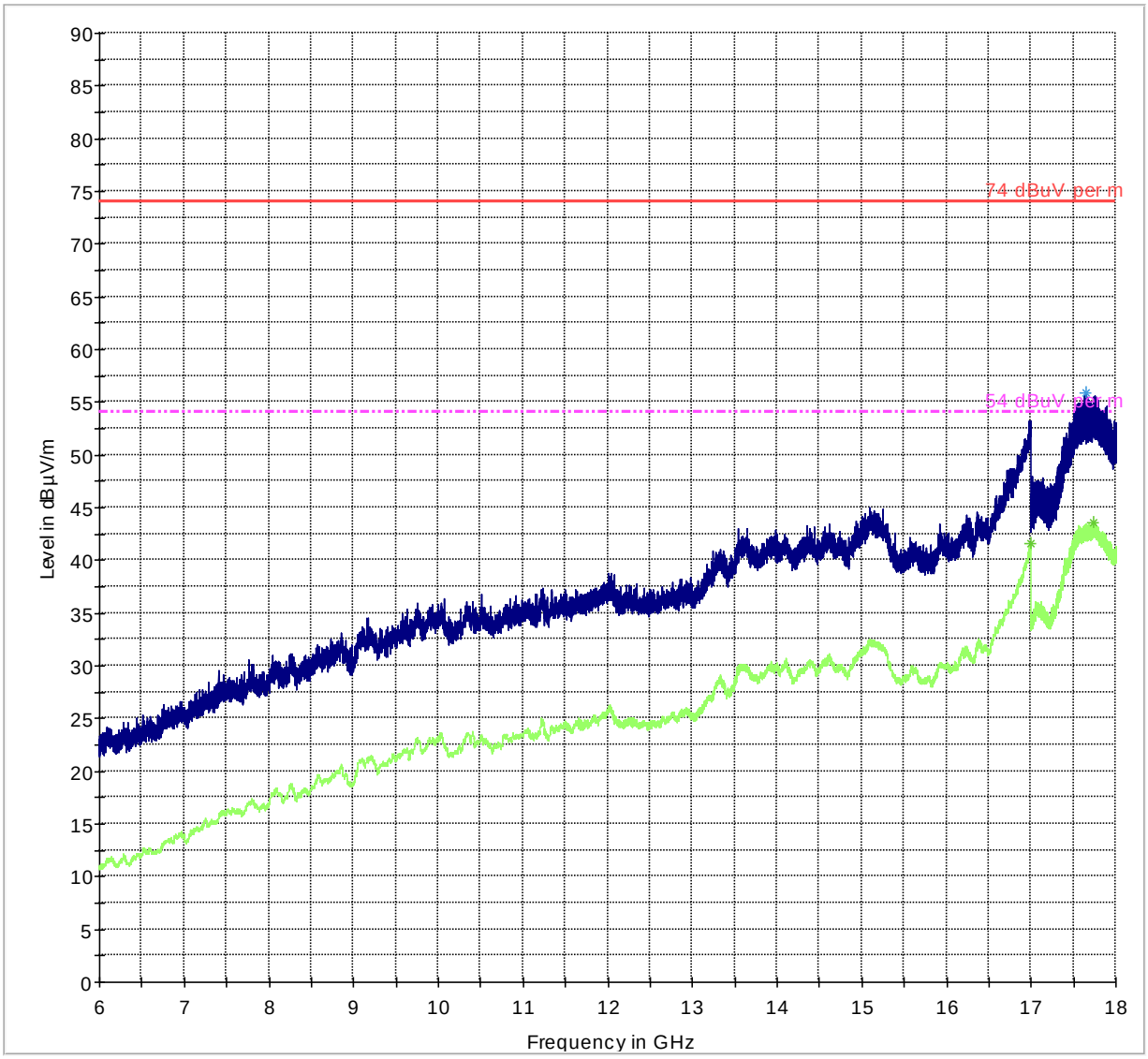


5.8.2 Radiated Emissions: 1 GHz - 6 GHz



74 dBuV per m
Preview Result 1-PK+
Data Reduction Result 1 [3]-PK+
54 dBuV per m
Preview Result 2-AVG
Data Reduction Result 2 [3]-AVG

5.8.3 Radiated Emissions: 6 GHz - 18 GHz



6 AC Power Line Conducted Emissions

6.1 Limits

Limits are according to FCC §15.107/ICES-003 §6.1.

Class B Limits:

Frequency of emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency

6.2 Measurement Procedure

1. The EUT and accessories are placed on a non-conducting table 80 cm above the horizontal ground plane and 40 cm from the vertical ground plane.
2. Cables that hang closer than 40 cm to the ground plane are gathered into a 30 cm to 40 cm long bundle.
3. The data ports of the EUT are exercised.
4. The power cable of the EUT is connected to the LISN.
5. The 6 highest emissions within 20 dB of the limit are noted.

6.3 Receiver Settings

The following settings are used by the measurement receiver

AC Power Line Conducted Emissions	
	150 kHz – 30 MHz
Resolution Bandwidth	9 kHz
Detector (Exploratory Measurements)	Peak, Average
Detector (Final Measurements)	Quasi-Peak, Average
Trace Mode	Max Hold
Step Size	4 kHz
Measurement Time	20 ms

6.4 Measurement Uncertainty

	Uncertainty in dB Conducted measurement
Standard Deviation k=1	0.64
95% Confidence Interval in dB	1.25
95% Confidence Interval in dB in Delta to Result	+/- 0.7dB

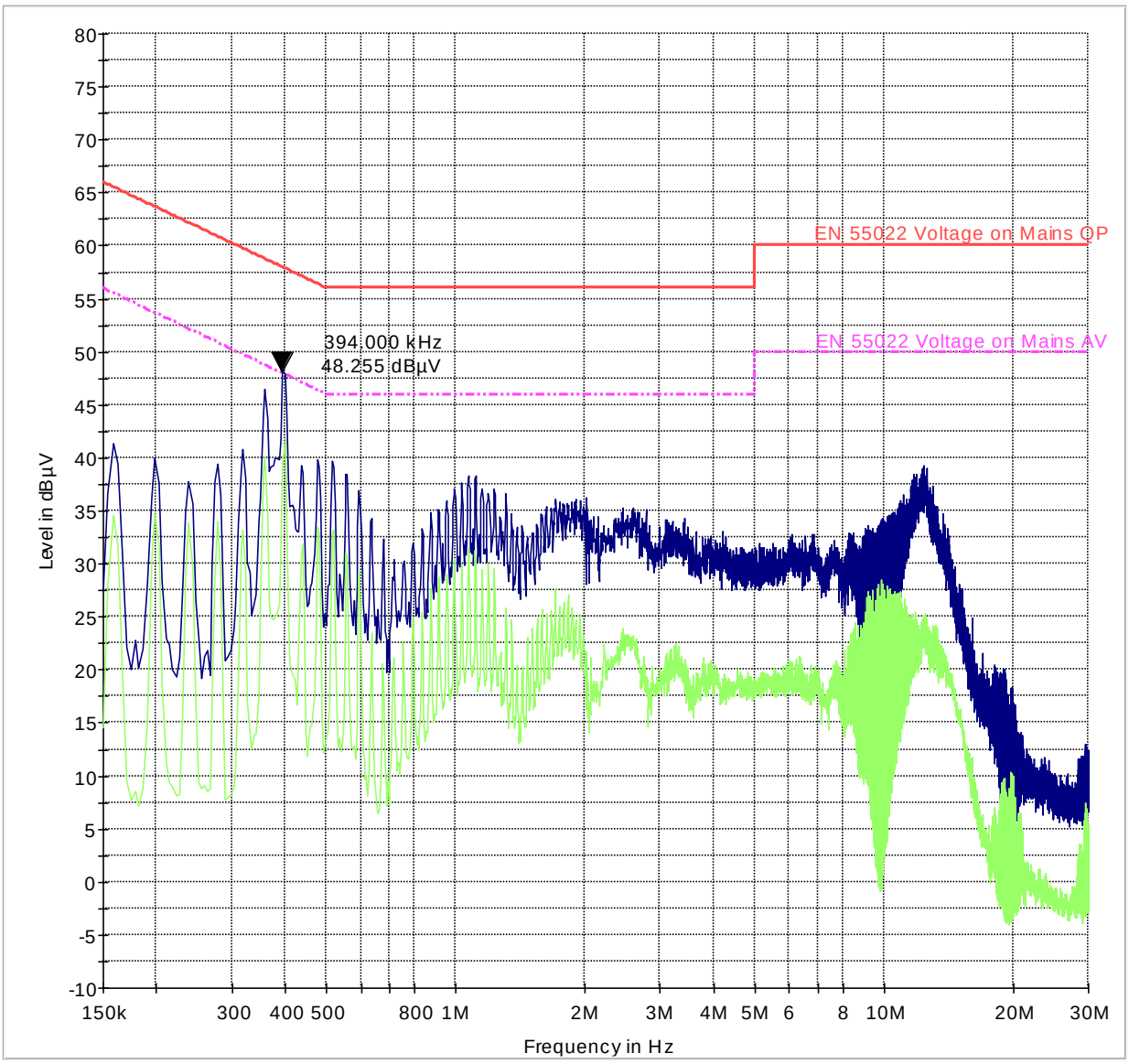
6.5 Testing Notes

The relevant procedures of ANSI C63.4:2013 have been followed.
The following test plots show the worst case emissions for both power lines.

6.6 Test Results

Summary of six highest emissions			
Frequency of emission (MHz)	**Combined Antenna and Attenuation Correction Factor (dB/m)**	**Corrected Measurement Result (dBµV/m)**	**Margin to Limit (dB)**
0.394		48.3 peak	10

6.7 Test Plots

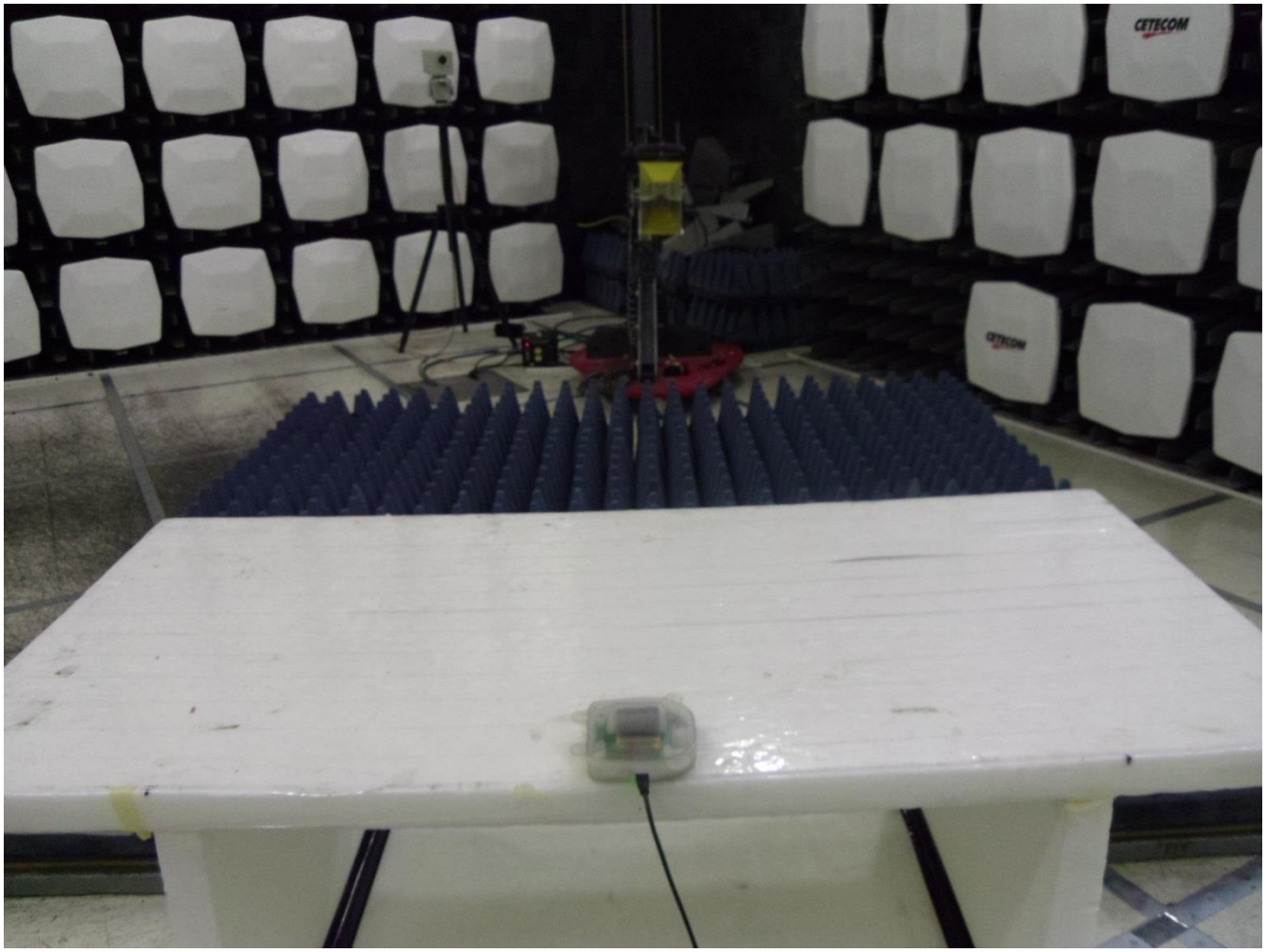


EN 55022 Voltage on Mains QP
Preview Result 1-PK+
EN 55022 Voltage on Mains AV
Preview Result 2-AVG

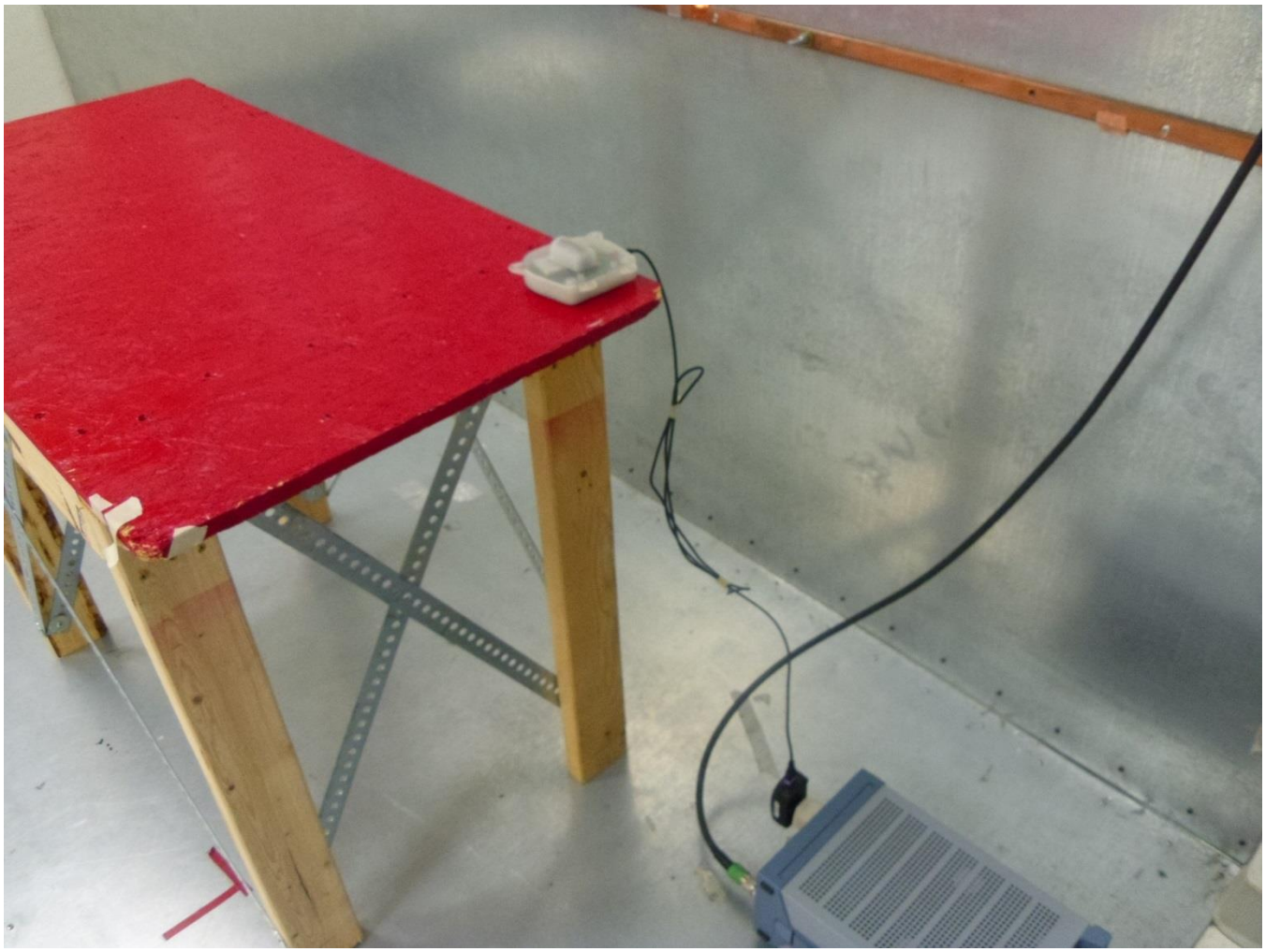
7 Test Setup Photos

7.1 Radiated Emissions: 30 MHz – 1 GHz

7.2 **Radiated Emissions: 1 GHz – 18 GHz**



7.3 AC Power Line Conducted Emissions

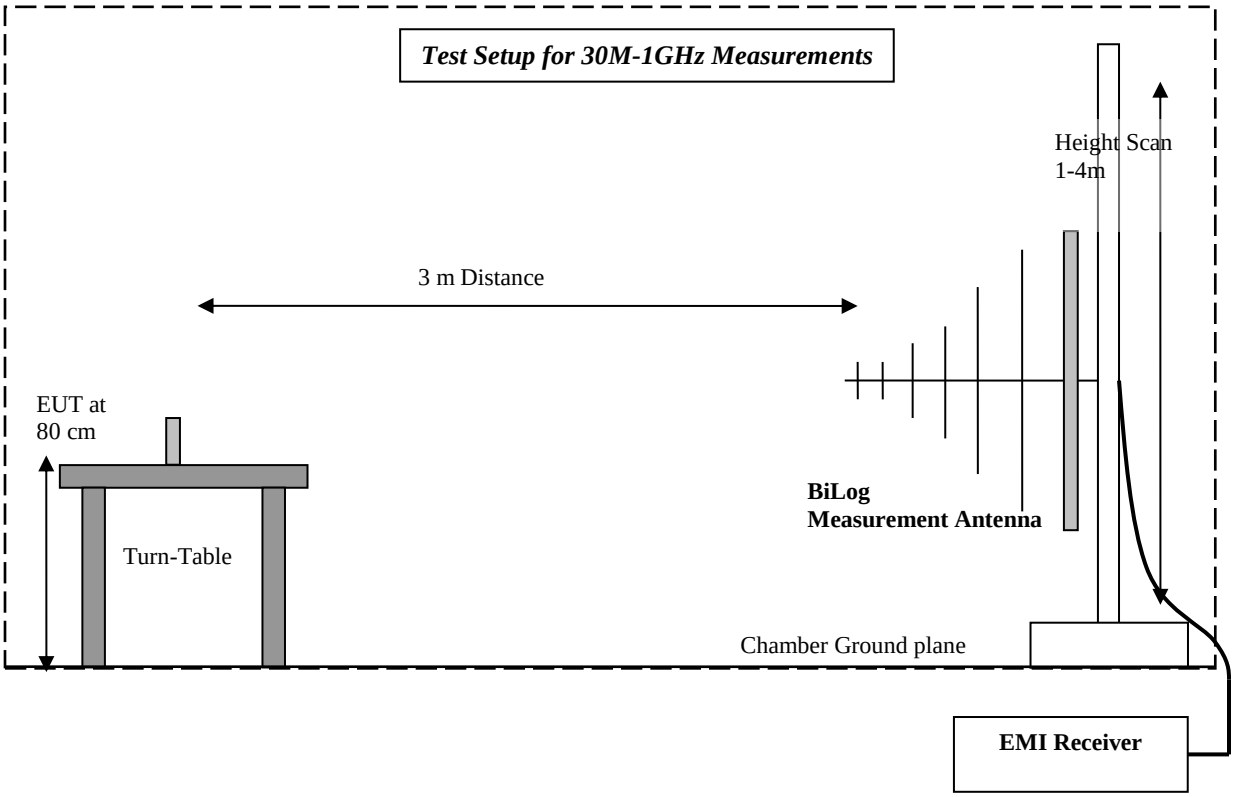


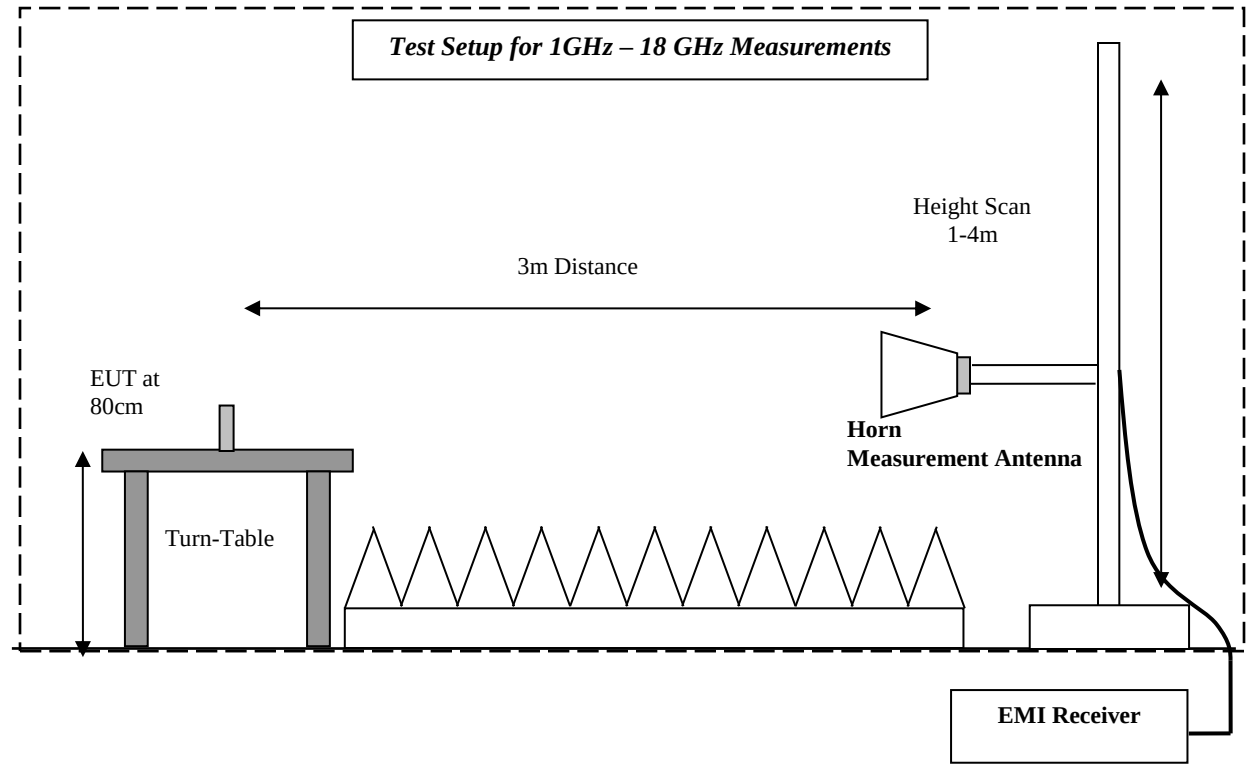
Test Equipment and ancillaries used for tests

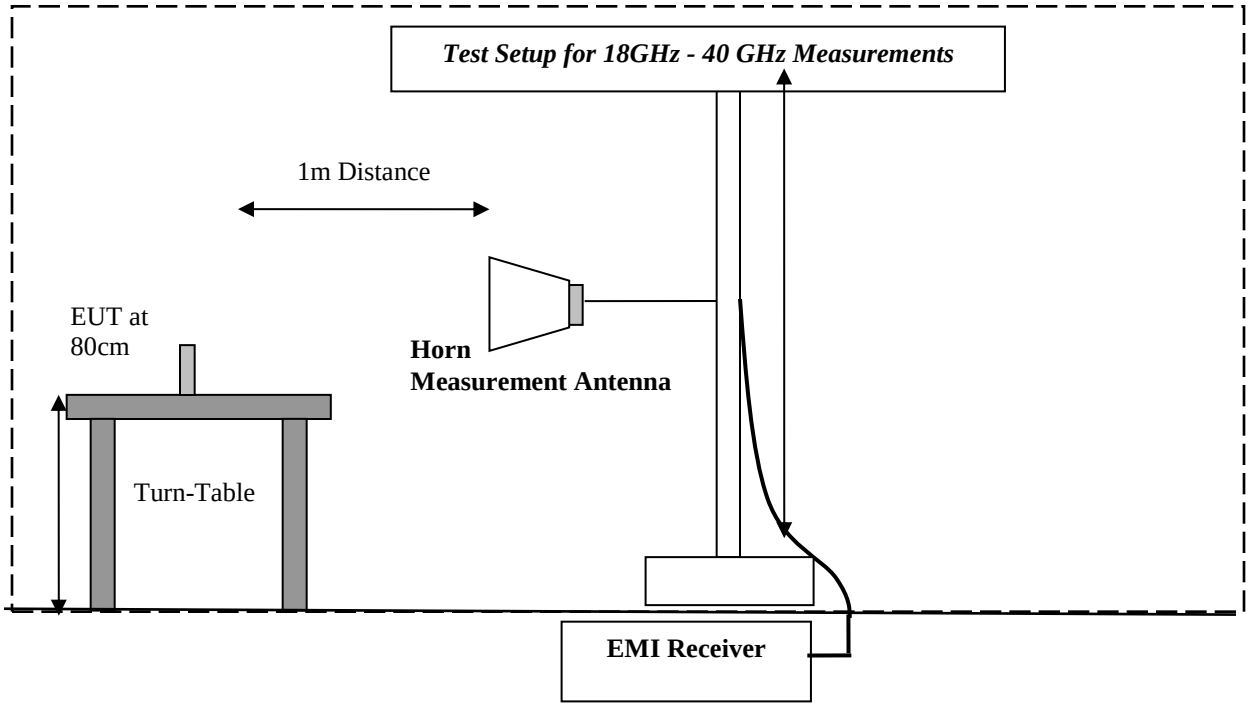
No.	Equipment Name	Manufacturer	Type/model	Serial No.	Cal Date	Cal Interval
3m Semi- Anechoic Chamber:						
	Turn table	EMCO	2075	N/A	N/A	N/A
	MAPS Position Controller	ETS Lindgren	2092	0004-1510	N/A	N/A
	Antenna Mast	EMCO	2075	N/A	N/A	N/A
	Relay Switch Unit	Rohde&Schwarz	RSU	338964/001	N/A	N/A
	EMI Receiver/Analyzer	Rohde&Schwarz	ESU 40	100251	Sept 2013	2 Years
	1500MHz HP Filter	Filtek	HP12/1700	14c48	N/A	N/A
	2800 MHz HP Filter	Filtek	HP12/2800	14C47	N/A	N/A
	3000 MHz HP Filter	RF-Lambda	RHPF23603612	11060100015	N/A	N/A
	Pre-Amplifier	Miteq	JS40010260	340125	N/A	N/A
	Pre-Amplifier	Rohde&Schwarz	TS-PR18	100053	N/A	N/A
	Binconilog Antenna	EMCO	3141	0005-1186	Apr 2012	4 Years
	Binconilog Antenna	ETS	3149	J000123908	Feb 2012	4 years
	Horn Antenna	EMCO	3115	35114	Mar 2012	4 Years
	LISN	FCC	50-25-2-08	08014	Jul 2012	3 Year
Ancillary equipment						
	Humidity Temperature Logger	Dickson	TM320	03280063	April 2014	2 Year
	DC Power Supply	HP	E3610A	KR83023316	N/A	N/A
	DC Power Supply	Protek	3003B	H012771	N/A	N/A
	Communication Antenna	IBP5-900/1940	Kathrein	N/A	N/A	N/A

Calibration details valid at the time of testing.
Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.
Calibration due dates, unless defined specifically, falls on the last day of the month.
Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

8 Test Setup Diagrams




Test Setup for 1GHz – 18 GHz Measurements
Height Scan
1-4m
3m Distance
EUT at
80cm
Horn
Measurement Antenna
Turn-Table
EMI Receiver


Test Setup for 18GHz - 40 GHz Measurements
1m Distance
EUT at
80cm
Horn
Measurement Antenna
Turn-Table
EMI Receiver

9 Revision History

Date	Report Number – Changes to Report	Report prepared by
04/16/2015	EMC-WIMML-004-15001-15B 1. First Version	Franz Engert