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Report On

Class II Permissive Change Verification of the
IPS Group, Inc.
MK5 Single Space Parking Meter

FCC Part 15 Subpart C §15.225
IC RSS-210 Issue 8 December 2010

Report No. SD72104835-0415A

April 2015

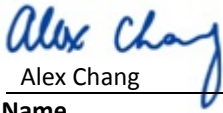


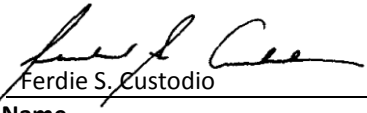
REPORT ON Class II Permissive Change Verification of the
IPS Group, Inc.
Single Space Parking Meter

TEST REPORT NUMBER SD72104835-0415A

REPORT DATE April 2015

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DATED April 28, 2015



Revision History

SD72104835-0415A
IPS Group, Inc.
3G SSPM
Single Space Parking Meter

DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
04/28/2015	Initial Release				Ferdie Custodio

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SECTION 1

REPORT SUMMARY

Class II Permissive Change Verification of the
IPS Group, Inc.
Single Space Parking Meter



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the IPS Group, Inc. Single Space Parking Meter to the requirements of FCC Part 15 Subpart C §15.225 and IC RSS-210 Issue 8 December 2010.

Objective	To perform Class II Permissive Change Verification in order to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	IPS Group, Inc.
Model Name	3G SSPM
Model Number(s)	MK5
FCC ID Number	SGWIPS2007SSPM
IC Number	11583A-IPS2006SSPM
Serial Number(s)	600229326 (3G GSM) 600220373 (3G CDMA)
Number of Samples Tested	2
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.225 (October 1, 2014). • RSS-210 - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment (Issue 8, December 2010). • RSS-Gen - General Requirements for Compliance of Radio Apparatus (Issue 4, November 2014).
Start of Test	April 23, 2015
Finish of Test	April 28, 2015
Name of Engineer(s)	Ferdinand S. Custodio
Related Document(s)	• Certification Test Report Number 2013 05237011 FCC. Issued by Nemko USA Inc. 2210 Faraday Avenue, Suite 150, Carlsbad, CA 92008. (760) 444-3500.



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.225 with cross-reference to the corresponding IC RSS standard is shown below.

Section	FCC Part 15	§15.225 Spec Clause	RSS	Test Description	Result	Comments/ Base Standard
-	§15.31(e)			Voltage Requirement	N/P	§15.225(e)
-	§15.203 and 204		RSS-Gen 8.3	Antenna Requirements	N/P	
2.1		§15.225(e)	RSS-210 A2.6 RSS-Gen 6.11 RSS-Gen 8.11	Frequency Stability	N/P	
2.2	§15.215(c)			20dB Bandwidth	N/P	
2.3			RSS-Gen 6.6	99% Emission Bandwidth	N/P	
2.4		§15.225(a)(b)(c)	RSS-210 A2.6(a)(b)(c)	Emission Mask	Compliant	
2.5	§15.209	§15.225(d)	RSS-210 A2.6(d)	Spurious Radiated Emissions	Compliant	
-			RSS-Gen 7.1	Receiver Spurious Emissions	N/P	
2.6		§15.207(a)	RSS-Gen 8.8	Conducted Emissions	N/P	

N/P: Not Performed. Test result/assessment from original filing applies. Modifications made to the EUT which is being assessed with this Class II Permissive Change were deemed not to impact the test/requirement.

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

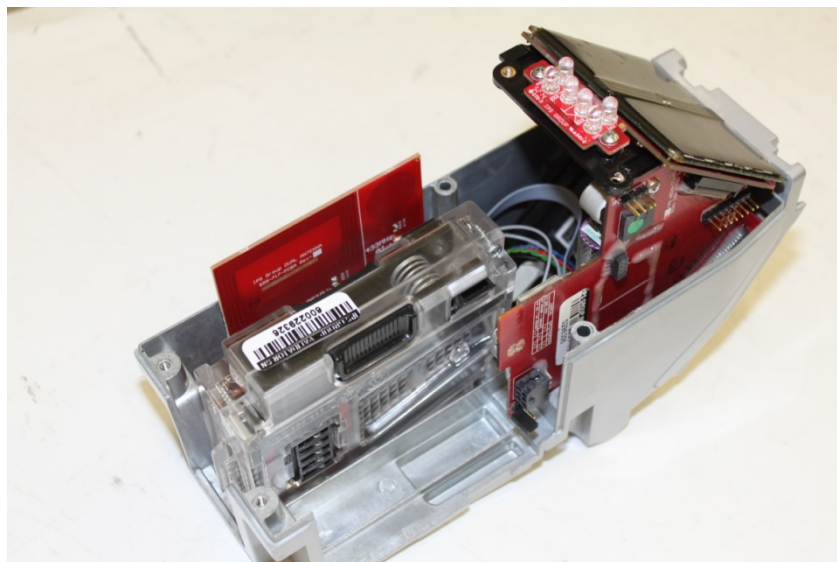
The Equipment Under Test (EUT) was an IPS Group, Inc. MK5 Single Space Parking Meter as shown in the photograph below. The EUT is a revolutionary product designed to enhance a city's current single space system by providing additional payment options and access to real-time data without disruption of current parking meter operations. The IPS MK5 Single Space Parking Meter is capable of accepting payment via coins, tokens, credit cards, debit card, smart cards, and optional contactless payment at the meter terminal. They are wirelessly networked and connected to a web-based management system that can notify parking operations staff of any meter faults via a text message, email, or both. They are powered by a rechargeable battery pack that is charged via a built in solar panel. Two versions of the EUT were assessed, a 3G GSM version and a 3G CDMA version.



Equipment Under Test

1.3.2 Modification Requiring Class II Permissive Change

The 400MHz antenna and RFID antenna are now combined in a single board (IPS Group Dual Antenna 555-717-PCBA Rev. 0).



Equipment Under Test



1.3.3 EUT General Description

EUT Description	Single Space Parking Meter
Model Number(s)	3G SSPM
Power Source	7 VDC
EUT RFID Field Strength	62.6 dB μ V/m @ 3 meters
Frequency Range	13.56 MHz in the 13.110 to 14.0101 MHz band
Number of Operating Frequencies	1
Antenna Type	Integral
RFID Antenna Connector	IPX U.FL RF Coaxial Connector (Integral)
Modulation Used	ISO 15693 Compliant

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	EUT in Diagnostic Mode polling RFID. A support plastic RFID tag was placed near the EUT to enable RFID polling every 1 second.

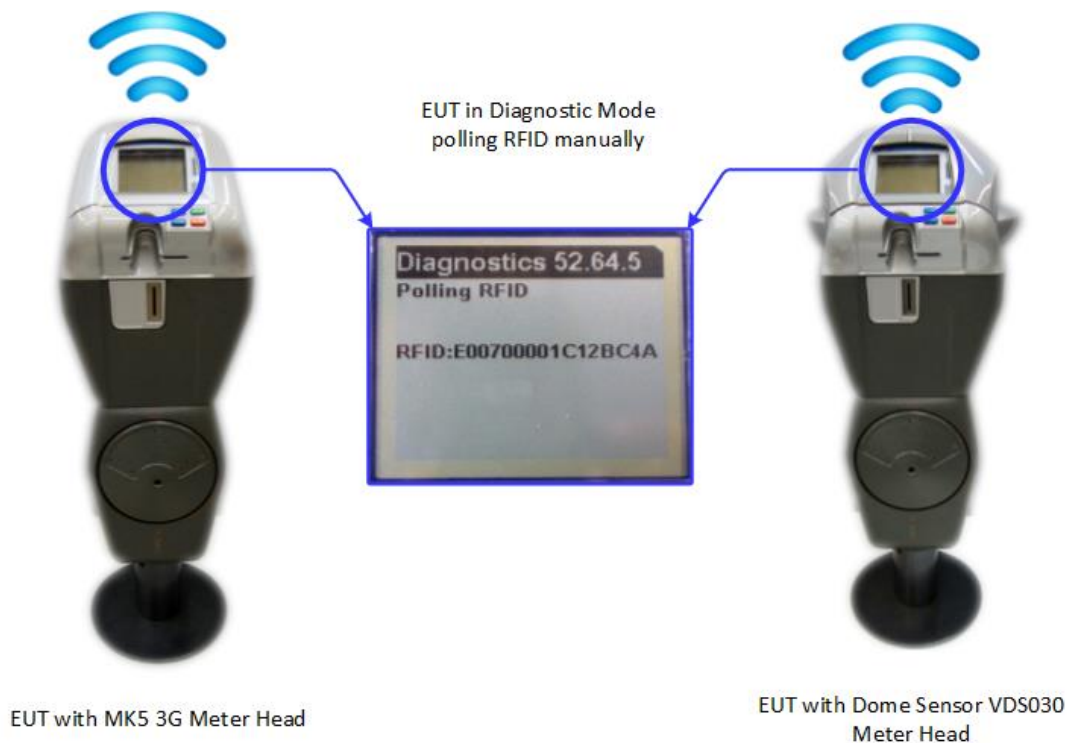
1.4.2 EUT Exercise Software

None. No special software was used during evaluation.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
IPS Group, Inc.	Support Meter Head	MK5 3G Meter Head
IPS Group, Inc.	Support Meter Head	Dome Sensor VDS030 Meter Head
IPS Group, Inc.	Support Plastic RFID Tag	IPS Group, Inc Meter ID

1.4.4 Simplified Test Configuration Diagrams



1.5 DEVIATIONS FROM THE STANDARD

All deviations made during testing from the applicable test standards or test plan are detailed under Section 1.2 of this test report.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number Error! Reference source not found. and 600220373		
N/A		

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2009. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858-546 0364

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

Sony Electronics Inc., Building #8 16530 Via Esprillo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 942 5542 FAX: 858-546 0364

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Registration No.: US1146

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.498 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.



1.9.2 Industry Canada (IC) Registration No.: 3067A

The 10m Semi-anechoic chamber of TÜV SÜD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.

1.9.3 BSMI – Laboratory Code: SL2-IN-E-028R (US0102)

TÜV Product Service Inc. (San Diego) is a recognized EMC testing laboratory by the BSMI under the MRA (Mutual Recognition Arrangement) with the United States. Accreditation includes CNS 13438 up to 6GHz.

1.9.4 VCCI – Registration No. A-0132

TÜV SÜD America Inc. (San Diego) is a VCCI registered measurement facility which includes radiated field strength measurement, radiated field strength measurement above 1GHz, mains port interference measurement and telecommunication port interference measurement.



SECTION 2

TEST DETAILS

Class II Permissive Change Verification of the
IPS Group, Inc.
Single Space Parking Meter



2.1 FREQUENCY STABILITY

2.1.1 Specification Reference

Part 15 Subpart C §15.225(e)

2.1.2 Standard Applicable

(e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

2.1.3 Equipment Under Test and Modification State

Test not performed. Test result/assessment from original filing applies. Modifications made to the EUT which is being assessed with this Class II Permissive Change were deemed not to impact this test/requirement.



2.2 20 dB BANDWIDTH

2.2.1 Specification Reference

Part 15 Subpart C §15.215(c)

2.2.2 Standard Applicable

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

2.2.3 Equipment Under Test and Modification State

Test not performed. Test result/assessment from original filing applies. Modifications made to the EUT which is being assessed with this Class II Permissive Change were deemed not to impact this test/requirement.



2.3 99% EMISSION BANDWIDTH

2.3.1 Specification Reference

RSS-Gen Clause 4.6.1

2.3.2 Standard Applicable

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

2.3.3 Equipment Under Test and Modification State

Test not performed. Test result/assessment from original filing applies. Modifications made to the EUT which is being assessed with this Class II Permissive Change were deemed not to impact this test/requirement.



2.4 EMISSION MASK

2.4.1 Specification Reference

Part 15 Subpart C §15.225(a)(b)(c)

2.4.2 Standard Applicable

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

2.4.3 Equipment Under Test and Modification State

Serial No: 600229326 and 600220373 / Default Test Configuration

2.4.4 Date of Test/Initial of test personnel who performed the test

April 28, 2015/FSC

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.6 °C
Relative Humidity	36.9 %
ATM Pressure	100.0 kPa

2.4.7 Additional Observations

- This is a radiated test. The spectrum was searched from 9kHz to 30MHz. Only 13.110 MHz to 14.010 MHz presented. There are no significant emissions observed other than the fundamental frequency (13.56 MHz) measured at 3 meters.
- In order to have meaningful measurement for RFID, the EUT was removed from the metal meter housing (worst case) for this test.
- Limits were converted from 30 meters to 3 meters using worst case 20 dB/decade extrapolation rules.
- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.4.8 for sample computation.



2.4.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 13.56MHz			15.0
Correction Factor (dB)	Asset# 1026 (cable)	0.6	21.5
	Asset# 1057 3m (cable)	0.7	
	Asset# 6628 (antenna)	19.9	
	Asset# 1187(cable)	0.3	
Reported QuasiPeak Final Measurement (db μ V/m) @ 30MHz			36.5

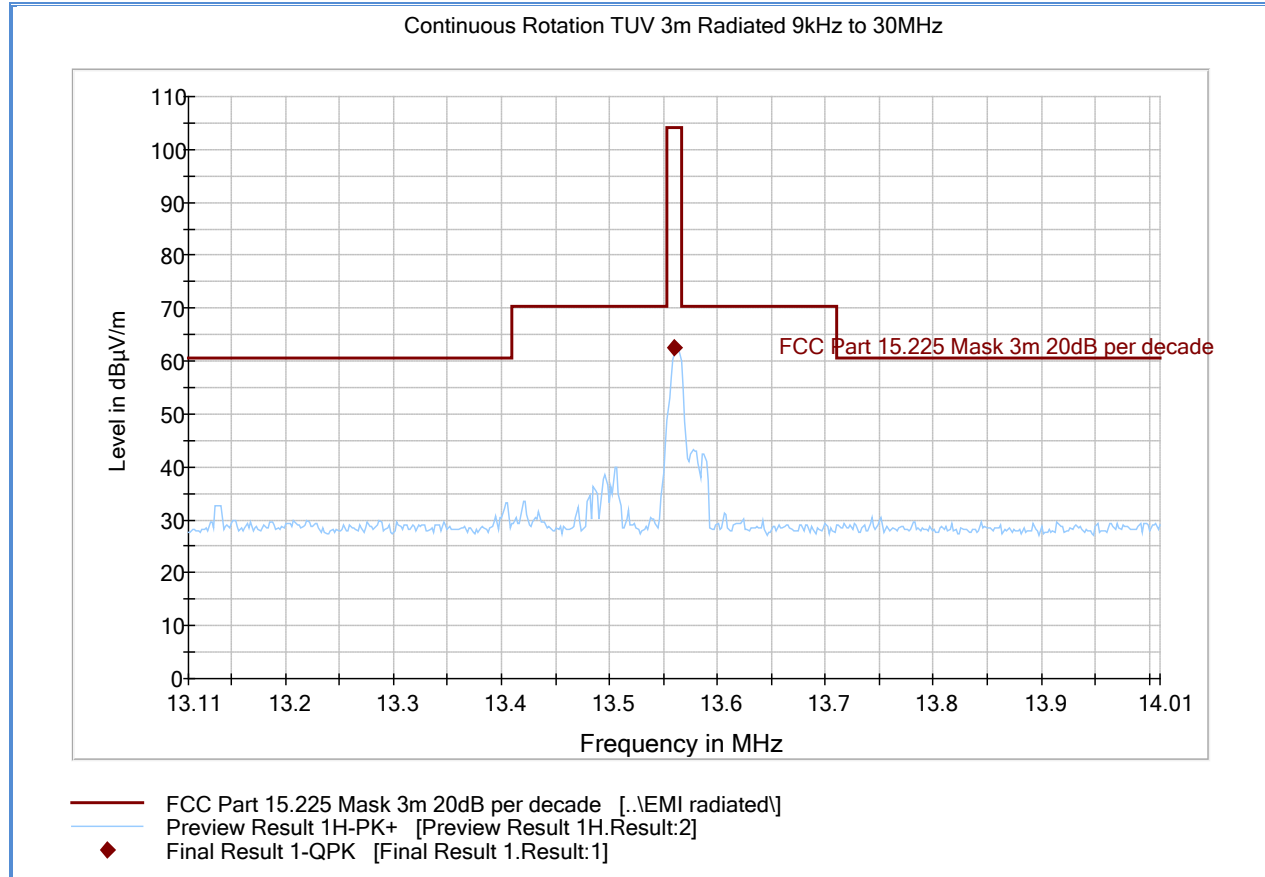
2.4.9 Sample Computation (Limits)

Limit @ 13.553–13.567 MHz:	= 15,848 μ V/m @30 meters
	= 20 log(15,848 μ V/m)
	= 84 dB μ V/m @30 meters
Using 20dB/decade extrapolation rule:	= 20 log (30m/3m)
Measuring distance correction factor:	= 20 dB
Calculated limit @ 3 meters:	= 84 dB μ V/m + 20 dB
	= 104 dB μ V/m

2.4.10 Test Results

See attached plots.

2.4.11 Test Results



Quasi Peak Data (§15.225 Limits)

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
13.560384	62.6	1500.0	9.000	100.0	H	263.0	20.7	41.4	104.0



2.5 SPURIOUS RADIATED EMISSIONS

2.5.1 Specification Reference

Part 15 Subpart C §15.225(d)

2.5.2 Standard Applicable

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

2.5.3 Equipment Under Test and Modification State

Serial No: 600229326 and 600220373 / Default Test Configuration

2.5.4 Date of Test/Initial of test personnel who performed the test

April 23, 2015 /FSC

2.5.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.9°C
Relative Humidity	48.6%
ATM Pressure	99.1 kPa

2.5.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to 1GHz.
- There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.
- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.5.8 for sample computation.

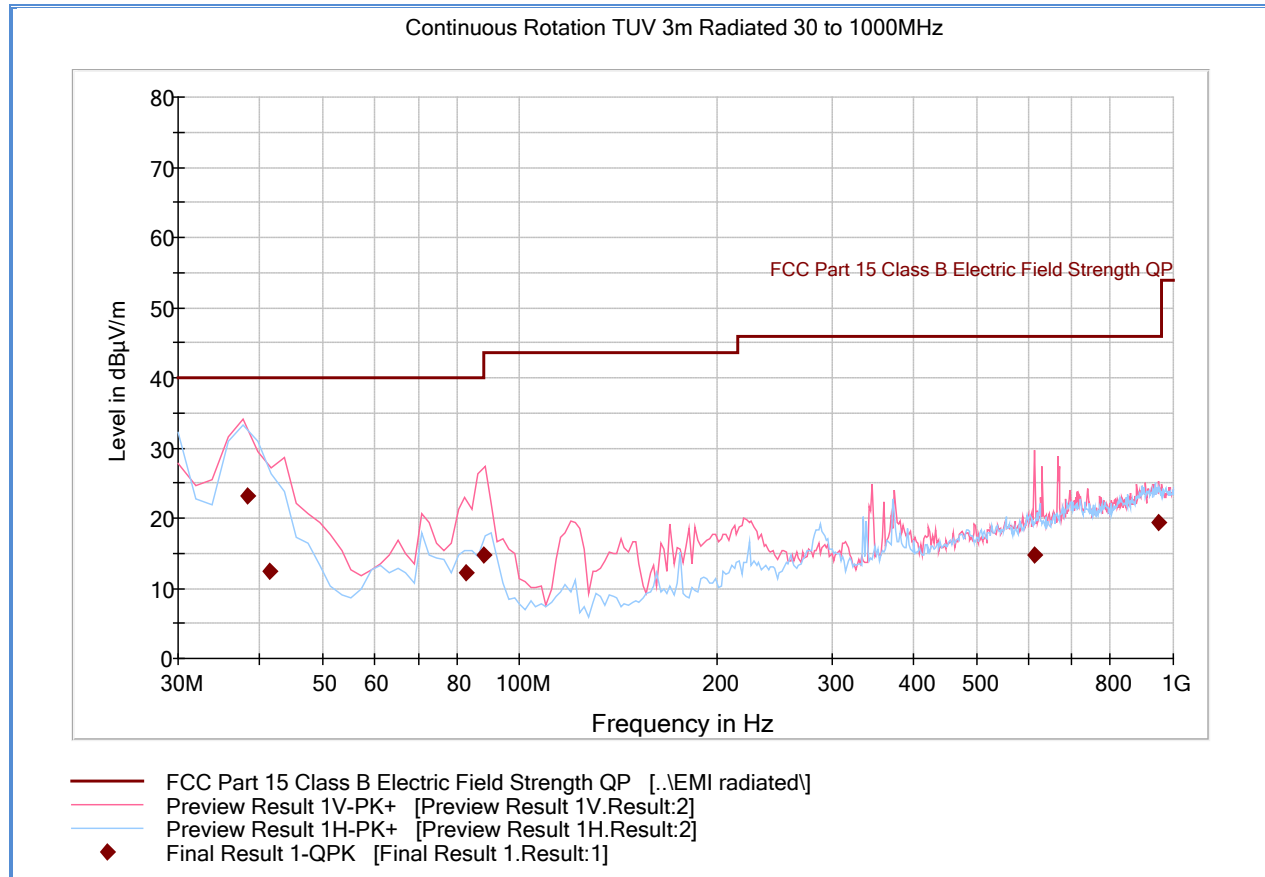
2.5.1 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (db μ V/m) @ 30MHz			11.8

2.5.2 Test Results

See attached plots.

2.5.3 Spurious Emissions (30MHz to 1GHz) GSM Model

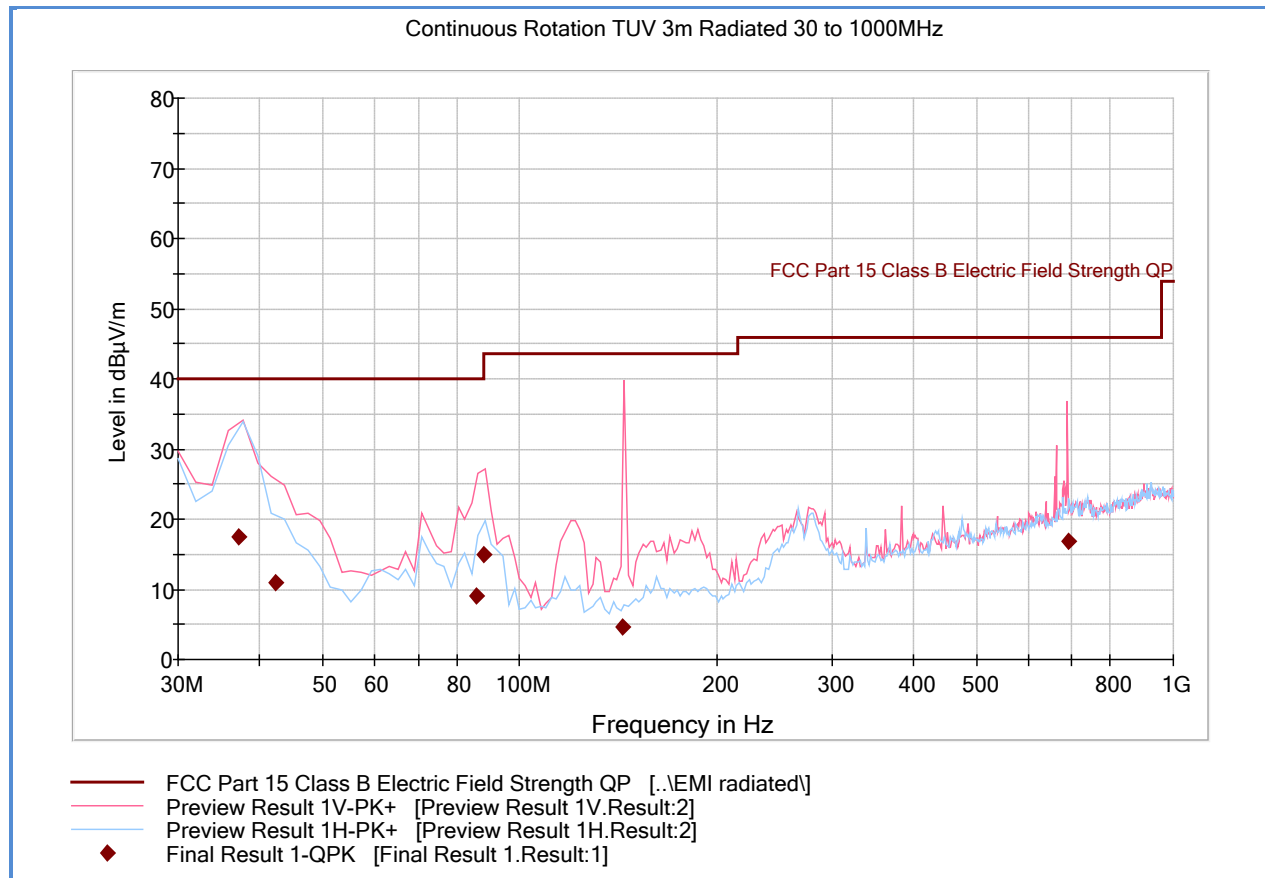


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.335551	23.1	1000.0	120.000	105.0	V	18.0	-15.9	16.9	40.0
41.487214	12.4	1000.0	120.000	150.0	V	259.0	-17.3	27.6	40.0
82.884970	12.1	1000.0	120.000	109.0	V	233.0	-21.7	27.9	40.0
88.052745	14.7	1000.0	120.000	400.0	V	342.0	-21.2	28.8	43.5
614.086333	14.8	1000.0	120.000	184.0	V	177.0	-4.0	31.2	46.0
950.058918	19.3	1000.0	120.000	150.0	V	140.0	1.6	26.7	46.0

Test Notes:

2.5.4 Spurious Emissions (30MHz to 1GHz) CDMA Model



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
37.215551	17.4	1000.0	120.000	100.0	V	15.0	-15.2	22.6	40.0
42.207214	11.0	1000.0	120.000	106.0	V	15.0	-17.6	29.0	40.0
85.828858	9.0	1000.0	120.000	400.0	V	343.0	-21.5	31.0	40.0
88.172745	14.9	1000.0	120.000	400.0	V	342.0	-21.2	28.6	43.5
143.929379	4.6	1000.0	120.000	110.0	V	309.0	-19.6	38.9	43.5
689.977956	16.8	1000.0	120.000	100.0	V	11.0	-2.1	29.2	46.0

Test Notes:



2.6 CONDUCTED EMISSIONS

2.6.1 Specification Reference

Part 15 Subpart C §15.207(a)

2.6.2 Standard Applicable

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	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.*

2.6.3 Equipment Under Test and Modification State

Test not performed. Test result/assessment from original filing applies. Modifications made to the EUT which is being assessed with this Class II Permissive Change were deemed not to impact this test/requirement.



SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Radiated Emission						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/30/14	01/30/16
6628	Loop Antenna	HFH 2 –Z2	880 458/25	Rhode & Schwarz	10/31/13	10/31/15
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	08/29/14	08/29/15
1016	Pre-amplifier	PAM-0202	187	PAM	12/10/14	12/10/15
Miscellaneous						
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/12/14	08/12/15
7560	Barometer/Temperature/Hu midity Transmitter	iBTHX-W	1240476	Omega	01/30/14	01/30/16

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Radiated Measurements (Below 1GHz)

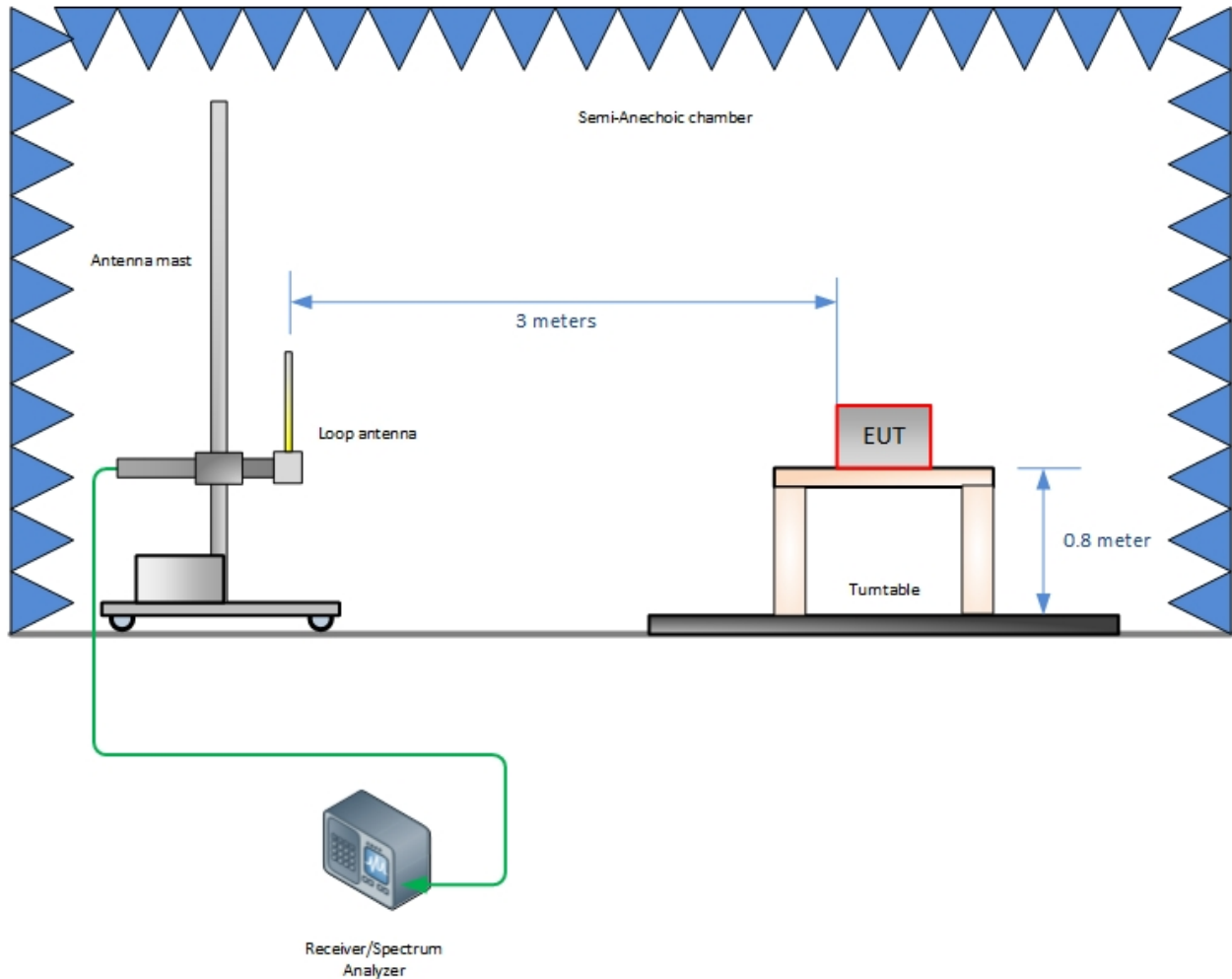
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	3.55	2.05	4.20
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.23
Coverage Factor (k):					2
Expanded Uncertainty:					4.45



SECTION 4

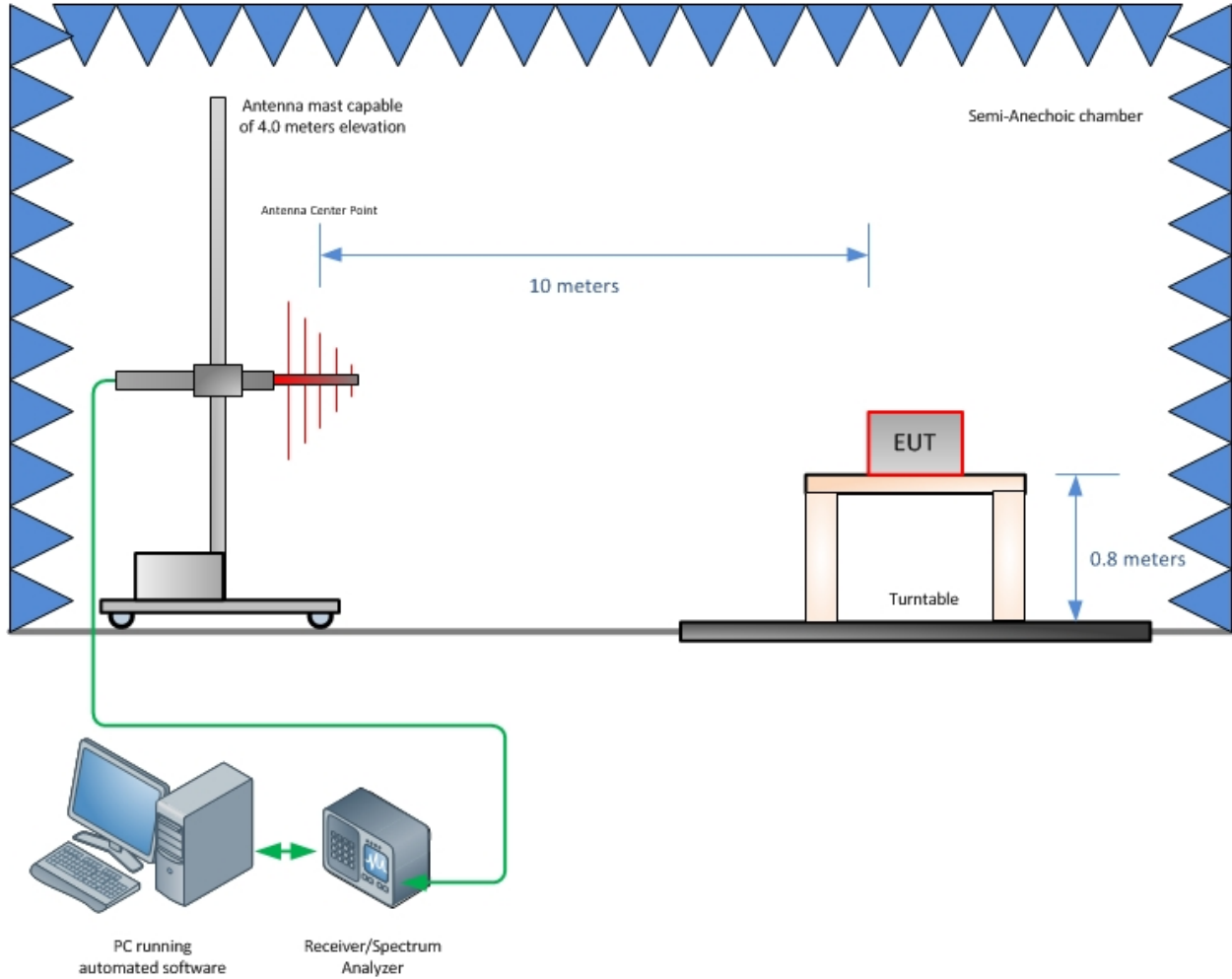
DIAGRAM OF TEST SETUP

4.1 TEST SETUP DIAGRAM (RADIATED EMISSIONS BELOW 30MHZ)



Radiated Emission Test Setup (Below 30 MHz)

4.2 TEST SETUP DIAGRAM (RADIATED EMISSIONS 30 TO 1000MHZ)



Radiated Emission Test Setup (Below 1GHz)



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

TÜV SÜD America Inc.'s reports apply only to the specific sample tested under stated test conditions. It is the manufacturer's responsibility to assure the continued compliance of production units of this model. TÜV SÜD America, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America, Inc.'s issued reports.

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