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CERTIFICATE OF COMPLIANCE FCC PART 15.239 Class II Permissive Change

Applicant Name:

Ki Ryung Electronics Co., Ltd.
219-6, Gasan-Dong, Kumchun-Ku,
Seoul, 153-023
South Korea

Date of Testing:

12/21-22/2006

Test Site/Location:

PCTEST Lab. Columbia, MD, USA

Test Report Serial No.:

0612211139

FCC ID:

P3HSP4

APPLICANT:

Ki Ryung Electronics Co., Ltd.

Model(s):

SP4

EUT Type:

Automobile Digital Satellite Radio FM Transmitter

Trade Name:

Sirius

Frequency Range:

88.1 – 107.9 MHz

FCC Classification:

FCC Part 15 Low Power Communication Device TX (DXX)

FCC Rule Part(s):

Part 15 Subpart C (15.239)

Original Grant Date:

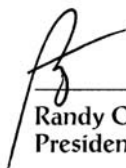
May 4, 2006

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

NOTE: This Class II Permissive Change report is to show compliance with the new antenna (with ferrite core). This is the only change as reported by the applicant.


Randy Ortanez
President



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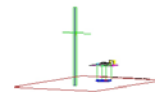
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MEASUREMENT REPORT



FCC Part 15.239

A. § 2.1033 General Information

APPLICANT: Ki Ryung Electronics Co., Ltd.
APPLICANT ADDRESS: 219-6, Gasan-Dong, Kumchun-Ku,
 Seoul, 153-023, South Korea
TEST SITE: PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS: 6660-B Dobbin Road, Columbia, MD 21045 USA
FCC RULE PART(S): Part 15 Subpart C (15.239)
MODEL NAME: SP4
FCC ID: P3HSP4
Test Device Serial No.: S3M061100740430 ☐ Production ☒ Pre-Production ☐ Engineering
FCC CLASSIFICATION: FCC Part 15 Low Power Communication Device TX (DXX)
Method/System: Part 15 Subpart C (15.239)
DATE(S) OF TEST: 12/21-22/2006
TEST REPORT S/N: 0612211139

A.1 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21045, U.S.A.



- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (IC-2451).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (IC-2451) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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1.0 INTRODUCTION

1.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2003) and FCC Section 15.239 were used in the measurement of the **SIRIUS Automobile Digital Satellite Radio FM Transmitter FCC ID: P3HSP4**.

Deviation from measurement procedure.....None

1.2 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

1.3 PCTEST Lab Facility Location

The map at the right shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity are, the Baltimore-Washington Intern'l (BWI) airport, the city of Baltimore and the Washington, DC area. (see Figure 1.3-1).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2003 on January 27, 2006 and Industry Canada.

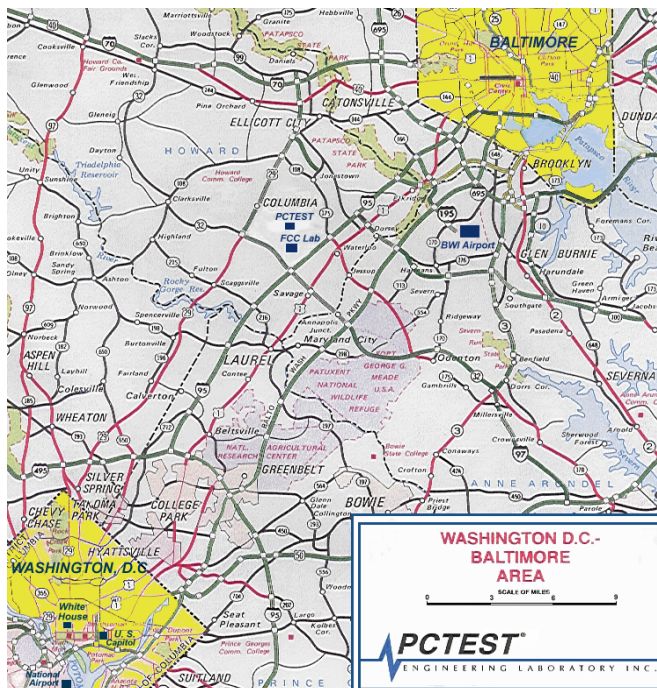


Figure 1.3-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **SIRIUS Automobile Digital Satellite Radio FM Transmitter FCC ID: P3HSP4**.

- Operating Frequency: 88.1 – 107.9 MHz
- Power: Input: Car Battery 12V DC
- Number of Channels: 100
- The EUT consisted of the following components(s):

Manufacturer / Description	FCC ID	Serial Number
SIRIUS Automobile Digital Satellite Radio FM Transmitter	P3HSP4	S3M061100740430

Table 2-1. EUT Equipment Description

2.2 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing.

- None

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3.0 DESCRIPTION OF TEST

3.1 Conducted Emissions – N/A (for Automotive use only)

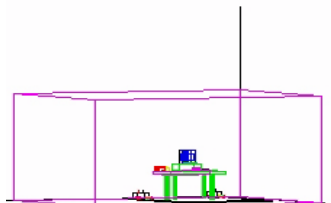


Figure 3.1-1. Shielded Enclosure Line-Conducted Test Facility

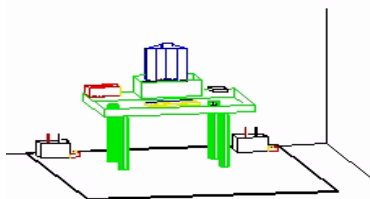


Figure 3.1-2. Line Conducted Emission Test Set-Up

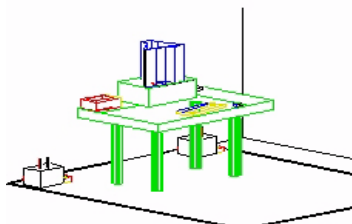


Figure 3.1-3. Wooden Table & Bonded LISNs

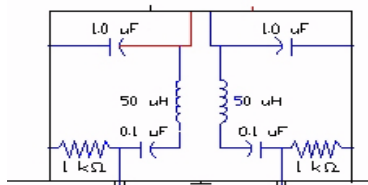


Figure 3.1-4. LISN Schematic Diagram

The line-conducted facility is located inside a 16'x20'x10' shielded enclosure, manufactured by Ray Proof Series 81 (see *Figure 3.1-1*). The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 1.5m away from the sidewall of the shielded room (see *Figure 3.1-2*). Solar Electronics and EMCO Model 3725/2 (10kHz-30MHz) 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room (See *Figure 3.1-3*). The EUT is powered from the Solar LISN and the support equipment is powered from the EMCO LISN. Power to the LISNs are filtered by a high-current high-insertion loss Ray Proof power line filter (100dB 14Hz-10GHz). The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure. All electrical cables are shielded by braided tinned copper zipper tubing with an inner diameter of ½". If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the Solar LISN. The LISN schematic diagram is shown (See *Figure 3.1-4*). All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion). Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.

The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to CISPR quasi-peak and average mode. The bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission. Each emission was maximized by: switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Exhibit B. Each EME reported was calibrated using the Agilent E8257D (250kHz – 20GHz) PSG Signal Generator.

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3.2 Radiated Emissions

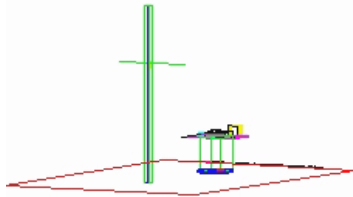


Figure 3.2-1. 3-Meter Test Site

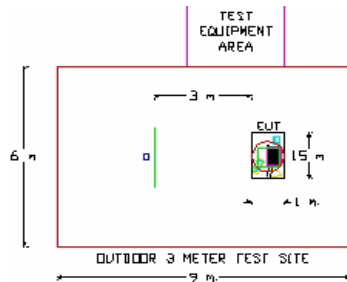


Figure 3.2-2. Dimensions of Outdoor Test Site

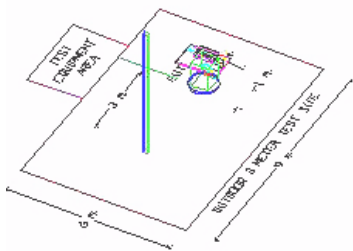


Figure 3.2-3. Turntable and System Setup

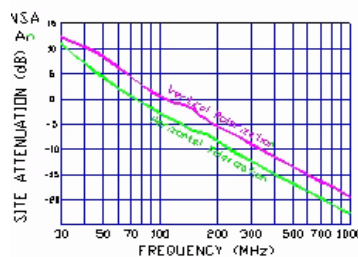


Figure 3.2-4. Normalized Site Attenuation Curves (H&V)

Preliminary measurements were made indoors at 1-meter using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, and turntable azimuth with respect to the antenna was noted for each frequency found. The spectrum was scanned from 30 to 200 MHz using a bi-conical antenna and from 200 to 1000 MHz using a log-spiral antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used.

Final measurements were made outdoors at 3-meter test range using RobertsTM Dipole antennas or horn antennas (see Figure 3.2-1). The test equipment was placed on a wooden and plastic bench situated on a 1.5m x 2m area adjacent to the measurement area (see Figure 3.2-2). Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 100kHz for frequencies below 1GHz or 1MHz for frequencies above 1GHz. Above 1GHz the detector function was set to average mode (RBW = 1MHz, VBW = 10Hz).

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1 x 1.5 meter table (see Figure 3.2-3). The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Exhibit B. Each EME reported was calibrated using the Agilent E8257D (250kHz – 20GHz) PSG Signal Generator. The Theoretical Normalized Site Attenuation Curves for both horizontal and vertical polarization are shown in Figure 3.2-4.

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4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

Antenna Construction:

- The tested antenna of the SIRIUS Automobile Digital Satellite Radio FM Transmitter is an **FM Transmitter Antenna** based on a vertical monopole design.
- Satellite Receiver.

The FM Transmitter Antenna is unique and can only be replaced with the same design.

Conclusion:

The **SIRIUS Automobile Digital Satellite Radio FM Transmitter FCC ID: P3HSP4** unit complies with the requirement of §15.203.

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5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model / Equipment	Calibration Date	Cal Interval	Calibration Due	Serial No.
Agilent	E4404B/E4407B ESA Spectrum Analyzer	04/20/06	Annual	04/20/07	US39210313
Agilent	N4010A Wireless Connectivity Test Set	06/11/06	Annual	06/11/07	GB46170464
EMCO	Model 3115 (1-18GHz) Horn Antenna	08/24/06	Biennial	08/23/08	9203-2178
EMCO	Model 3115 (1-18GHz) Horn Antenna	08/25/06	Biennial	08/24/08	9704-5182
Gigatronics	8657A Universal Power Meter	04/07/06	Annual	04/07/07	8650319
Gigatronics	80701A (0.05-18GHz) Power Sensor	04/11/06	Annual	04/11/07	1833460
Rohde & Schwarz	NRVS Power Meter	06/01/05	Biennial	06/01/07	835360/079
Rohde & Schwarz	NRV-Z53 Power Sensor	06/01/05	Biennial	06/01/07	846076/007
Rohde & Schwarz	CMU200 Base Station Simulator	04/20/06	Annual	04/20/07	836371/079
Agilent	HP 8566B (100Hz-22GHz)	12/22/05	Annual	12/22/06	3638A08713
Agilent	HP 8591A (9kHz-1.8GHz)	09/20/06	Annual	09/20/07	3144A02458
Agilent	E4448A (3Hz-50GHz)	09/22/06	Annual	09/22/07	US42510244
Agilent	E8257D (250kHz-20GHz) Signal Generator	02/11/06	Annual	02/11/07	MY45470194
Agilent	E8257D (250kHz-20GHz) Signal Generator	03/30/06	Annual	03/30/07	MY44320964
Gigatronics	8651A (50MHz-18GHz)	07/28/06	Annual	07/28/07	1834052
Gigatronics	80701A (0.05-18GHz) Power Sensor	08/04/06	Annual	08/04/07	1835299
Ailtech/Eaton	NM 37/57A (30MHz-1GHz)	06/07/06	Annual	06/07/07	0805-03334
Agilent	HP 85650A Quasi-Peak Adapter	12/22/05	Annual	12/22/06	2043A00301
Agilent	HP 8449B (1-26.5GHz) Pre-Amplifier	12/22/05	Annual	12/22/06	3008A00985
Agilent	HP 11713A Attenuation/Switch Driver	12/22/05	Annual	12/22/06	N/A
Agilent	HP 85685A (20Hz-2GHz) Preselector	12/22/05	Annual	12/22/06	N/A
Agilent	HP 8586 Opt. 462 Impulse Bandwidth	12/22/05	Annual	12/22/06	3701A22204
EMCO	3115 (1-18GHz) Horn Antenna	04/04/05	Biennial	04/04/07	9205-3874
Compliance Design	A100 Roberts Dipoles	08/31/05	Biennial	08/31/07	5118
EMCO	Dipole Pair	09/21/06	Biennial	09/20/08	23951
SOLAR	8012-50 LISN (2)	11/18/05	Biennial	11/18/07	0313233, 0310234

Table 5.0. Annual Test Equipment Calibration Schedule

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6.0 TEST RESULTS

Summary

The intentional radiator has been bench tested to demonstrate compliance with the relevant FCC performance and procedural standards. The satellite radio was transmitting at full power on the specified frequency and at a data rate(s) specified above. The frequencies tested are high, middle and low of the allocated bands. Final system data was gathered in a mode that tended to maximize emissions by varying the orientation of the EUT, orientation of antenna and I/O cabling, antenna search height, and antenna polarization. This unit was tested with all possible configuration and the worst case is reported with the unit transmitting.

Method/System: Digital Satellite Receiver / FM Transmitter

Number of Channels: 100

FCC Part Section(s)	RSS Section	Test Description	Test Limit	Test Condition	Test Result
TRANSMITTER MODE (TX)					
15.239(a)	RSS-210 [A.2.8]	20dB Bandwidth	< 200 kHz	Radiated	PASS
15.239(b)	RSS-210 [A.2.8]	Field Strength	< 250 uV/m @ 3 meters		PASS
15.239(a)	RSS-210 [A.2.8]	Number of Channels	100 Channels		PASS
15.205 15.209	RSS-210 [A.2.8]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< FCC 15.209 limits or < RSS-210 table 3 limits Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS
15.207	RSS-Gen [7.2.2]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits or < RSS-Gen table 2 limits	Line Conducted	n/a (car battery only)
RF EXPOSURE (SAR OR MPE)					
2.1093 / 2.1091	RSS-102	SAR Test or MPE	1.6 W/kg (SAR Limit) 1 mW/cm ² (MPE Limit)	3 Channels	n/a

Table 6.0. Summary of Test Results

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6.1 20dB Bandwidth Measurement

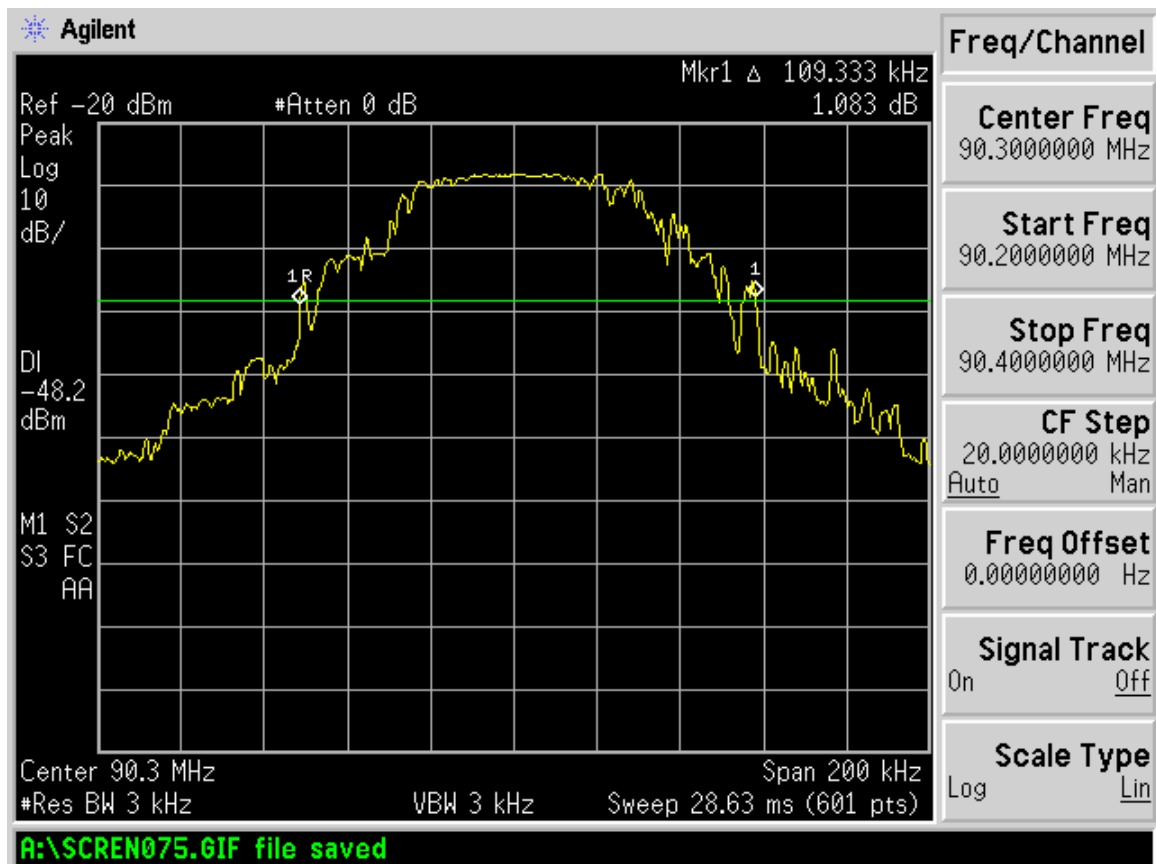
§15.239(a); RSS-210

The bandwidth at 20dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies. ***The maximum permissible 20dB bandwidth is 200 kHz.***

FREQUENCY (kHz)	20db BW (kHz)	Limit (kHz)	Results
90.3	109.3	200	Pass
98.3	105.0	200	Pass
103.9	111.0	200	Pass

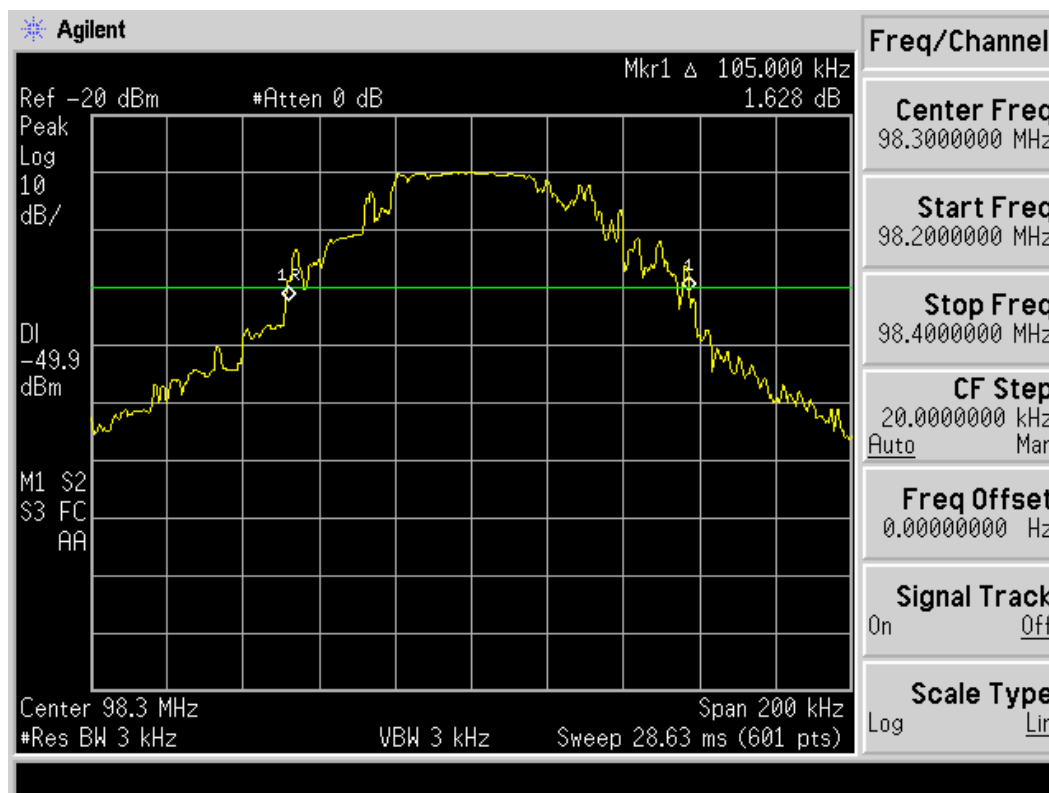
Table 6.1. Occupied Bandwidth Measurements

FCC ID: P3HSP4	 FCC Pt. 15.239 SATELLITE FM RADIO TEST REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
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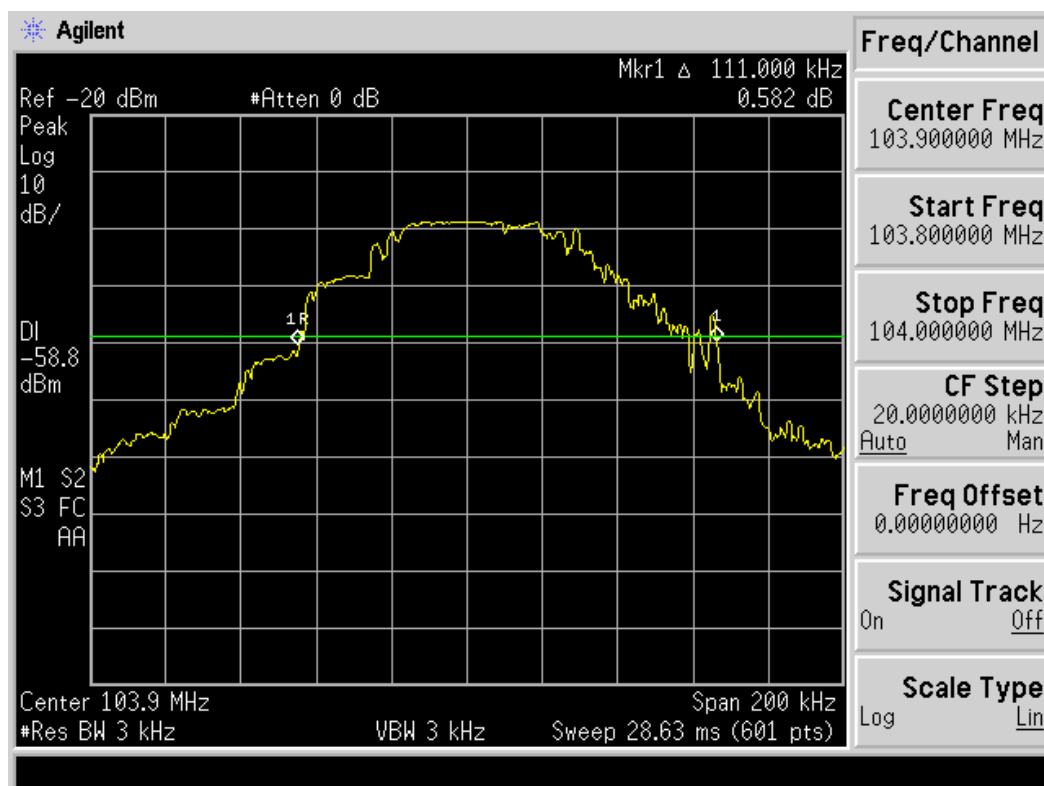


Plot 6.1.1. 20dB Bandwidth Plot (Low Channel: 90.3MHz)

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Plot 6.1.2. 20dB Bandwidth Plot (Mid Channel: 98.3MHz)



Plot 6.1.3. 20dB Bandwidth Plot (High Channel: 103.9MHz)

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6.2 Field Strength Measurements

§15.239; RSS-210

Note:

This unit was tested with all possible configuration and the worst case is reported with the unit transmitting.

Radiated @ 3m

Unit #4 PSN: SPM061100740430

FREQ (MHz)	Level (dBm)	AFCL (dB/m)	POL (H/V)	Height (m)	Azimuth (□angle)	F/S (μV/m)	Margin (dB)
90.30	-71.07	8.63	H	1.75	45	101.21	-3.4
98.30	-71.74	9.43	H	1.75	45	102.73	-3.3
103.90	-73.03	9.99	H	1.75	45	94.46	-4.0

Table 6.2. Field Strength Measurements at 3 meters

FCC ID: P3HSP4	 FCC Pt. 15.239 SATELLITE FM RADIO TEST REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
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6.3 Number of Channels (Tuning Range)

§15.239 (a); RSS-210

Measurement is made while EUT is operating in transmitting mode.

Ch.	Frequency (MHz)
00	88.1
01	88.3
...	...
50	97.9
51	98.1
52	98.3
...	...
99	107.7
100	107.9

Table 6.3. Frequency/ Channel Operations

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6.4 Radiated Spurious Measurements

§15.205 / §15.209; RSS-210

- Special attention is paid to the EUT's harmonic and spurious radiated emissions in the restricted bands of operations.

Mode: TX

Measurement Distance: 3 Meters

Operating Frequency: 103.9MHz

Unit #4 PSN: SPM061100740430

FREQ (MHz)	Level (dBm)	AFCL (dB/m)	POL (H/V)	Height (m)	Azimuth (°angle)	F/S (µV/m)	Margin (dB)
169.10	-89.14	14.85	H	1.50	0	43.20	-10.8
204.80	-96.52	16.72	H	1.50	0	22.96	-16.3
311.70	-99.72	21.02	H	1.00	0	26.05	-17.7
415.60	-104.27	24.07	H	1.0	0	21.93	-19.2
519.50	-105.79	26.50	H	1.0	0	24.32	-18.3
623.40	-106.45	28.56	H	1.0	0	28.56	-16.9

Table 6.4.1 Radiated Spurious Measurements at 3-meters

NOTES:

- The antenna is manipulated through typical positions, polarity and length during the testing.
- The EUT is supplied with the nominal DC voltage or/and a new/fully re-charged battery.
- The spectrum is measured from 9kHz up to the 10th harmonic and the worst-case emissions are reported.
- Above 1 GHz the limit is 500µV/m.
- < -135 dBm is below the analyzer measurement floor level.

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Radiated Spurious Measurements (cont.)

§15.205 / §15.209; RSS-210

- Special attention is paid to the EUT's harmonic and spurious radiated emissions in the restricted bands of operations.

Mode: TX

Measurement Distance: 3 Meters

Operating Frequency: 90.3MHz

Unit #4 Tx = 90.3

PSN: S3M061200000001

FREQ (MHz)	Level (dBm)	AFCL (dB/m)	POL (H/V)	Height (m)	Azimuth (□angle)	F/S (μV/m)	Margin (dB)
180.60	-95.69	15.53	H	1.50	0	22.03	-16.7
270.90	-96.75	19.55	H	1.50	0	30.95	-16.2
361.20	-103.91	22.61	H	1.50	0	19.33	-20.3
451.50	-106.49	24.94	H	1.0	0	18.76	-20.6
541.80	-108.83	26.96	H	1.0	0	18.08	-20.9
632.10	-106.91	28.71	H	1.0	0	27.59	-17.2

Table 6.4.2. Radiated Spurious Measurements at 3-meters

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Radiated Spurious Measurements (cont.)

§15.205 / §15.209; RSS-210

- Special attention is paid to the EUT's harmonic and spurious radiated emissions in the restricted bands of operations.

Mode: TX

Measurement Distance: 3 Meters

Operating Frequency: 98.3MHz

Unit #4 Tx = 98.3

PSN: S3M061200000001

FREQ (MHz)	Level (dBm)	AFCL (dB/m)	POL (H/V)	Height (m)	Azimuth (□angle)	F/S (μV/m)	Margin (dB)
196.60	-95.60	16.33	H	1.50	0	24.40	-15.8
294.90	-98.61	20.42	H	1.50	0	27.59	-17.2
393.20	-99.30	23.51	H	1.50	0	36.36	-14.8
491.50	-105.00	25.90	H	1.0	0	24.85	-18.1
589.80	-107.60	27.94	H	1.0	0	23.33	-18.7
688.10	-105.29	29.69	H	1.0	0	37.20	-14.6

Table 6.4.3 Radiated Spurious Measurements at 3-meters

NOTES:

- The antenna is manipulated through typical positions, polarity and length during the testing.
- The EUT is supplied with the nominal DC voltage or/and a new/fully re-charged battery.
- The spectrum is measured from 9kHz up to the 10th harmonic and the worst-case emissions are reported.
- Above 1 GHz the limit is 500μV/m.
- < -135 dBm is below the analyzer measurement floor level.

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6.5 Line-Conducted Test Data – N/A (for Automotive use only)

§15.207; RSS-Gen (7.2.2)

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7.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **SIRIUS Automobile Digital Satellite Radio FM Transmitter** with the Class II permissive Change(s) described in this report FCC ID: **P3HSP4** continues to comply with Part 15 Subpart C (15.239) of the FCC Rules.

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