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Certification Test Report

FCC ID: ONTJETIR5US
IC: 10491A-JETIR5US

FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210

ACS Report Number: 13.2130.W04.1A

Manufacturer: Esprit Model
Model: JETIR3US

Test Begin Date: **September 21, 2013**
Test End Date: **October 5, 2013**

Report Issue Date: October 17, 2013

ACLASS ACCREDITED TESTING

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

This report must not be used by the client to claim product certification, approval, or endorsement by ACLASS, ANSI, or any agency of the Federal Government.

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This report contains 14 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-210 for a Class II Permissive Change.

The purpose of the Class II Permissive Change is to add a new model variant to the FCC ID: ONTJETIR5US, IC: 10491A-JETIR5US.

1.2 Manufacturer Information

Esprit Model, Inc.
1240 Clearmont St. NW
Palm Bay, FL 32905, USA

1.3 Product description

The JETIR3US is a 2.4 GHz wireless transceiver for remote controlled toys. The unit provides 3 channels for servo connection. The JETIR3US comports two coaxial antennas which alternate based on the received signal strength on each antenna.

Band of Operation:	2405 MHz - 2480 MHz
Number of Channels:	16
Mode of Operation:	FH/DSSS
Modulation Format:	O-QPSK
Antenna Type/Gain:	Coaxial Wire Antenna, 2.1 dBi
Operating Voltage:	5 VDC

The model JETIR3US as an additional model variant to the family models listed under FCC ID: ONTJETIR5US, IC: 10491A-JETIR5US. The PCB for the model JETIR3US is identical to that of the models listed under FCC ID: ONTJETIR5US, IC: 10491A-JETIR5US. The differences between the JETIR3US and the previously listed model variants are mechanical and software related. The attributes unique to the JETIR3US are listed below:

- Servo output connectors limited to support 3 servo output channels
- Software restriction to support 3 servo output channels
- Software change to reduce the RF output power for channels 24, 25, and 26
- Injection molded plastic case
- 20 cm antenna coaxial cable length

Model Numbers: JETIR3US

Test Sample Serial Number(s): ACS# 1

Test Sample Condition: The samples were in good conditions with no observable physical damages.

1.4 Test Methodology and Considerations

The unit was powered using a DC bench power supply set to 5V. The EUT was evaluated for radiated emissions for both antenna paths. When applicable, the data is provided for the worst case configuration.

For the radiated emissions, preliminary measurements were performed for the EUT set in three orthogonal orientations on the table top. The results are reported for the orientation leading to the highest emissions.

The RF level settings used during the evaluation are provided below:
Channel 11 (2405 MHz): 9
Channel 18 (2440 MHz): 9
Channel 26 (2480 MHz): 15

The EUT was also evaluated for unintentional emissions. The results are documented separately in a Verification test report.

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

FCC Test Firm Registration #: 475089
Industry Canada Lab Code: 4175C

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ACLASS program and has been issued certificate number AT-1533 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl floor.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flushed with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1050 Multi-device Controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

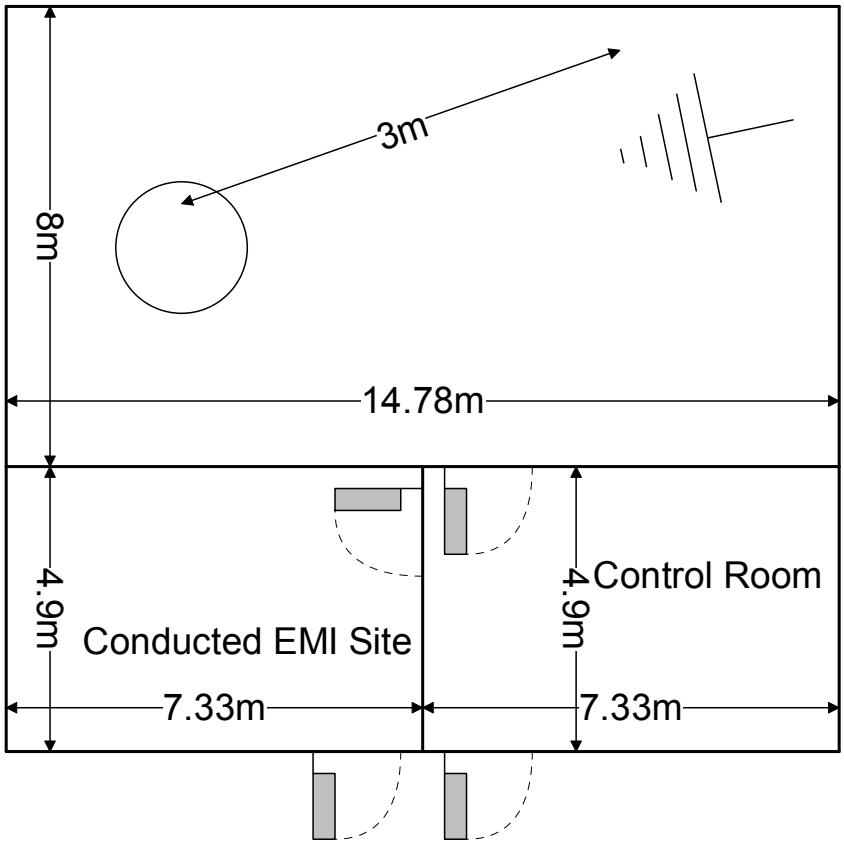

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m^3. As per ANSI C63.4 2003 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825, which are installed as shown in Photograph 3. For 220 V, 50 Hz, a Polarad LISN (S/N 879341/048) is used in conjunction with a 1 kVA, 50 Hz/220 V EDGAR variable frequency generator, Model 1001B, to filter conducted noise from the generator.

A diagram of the room is shown below in figure 2.3.2-1:

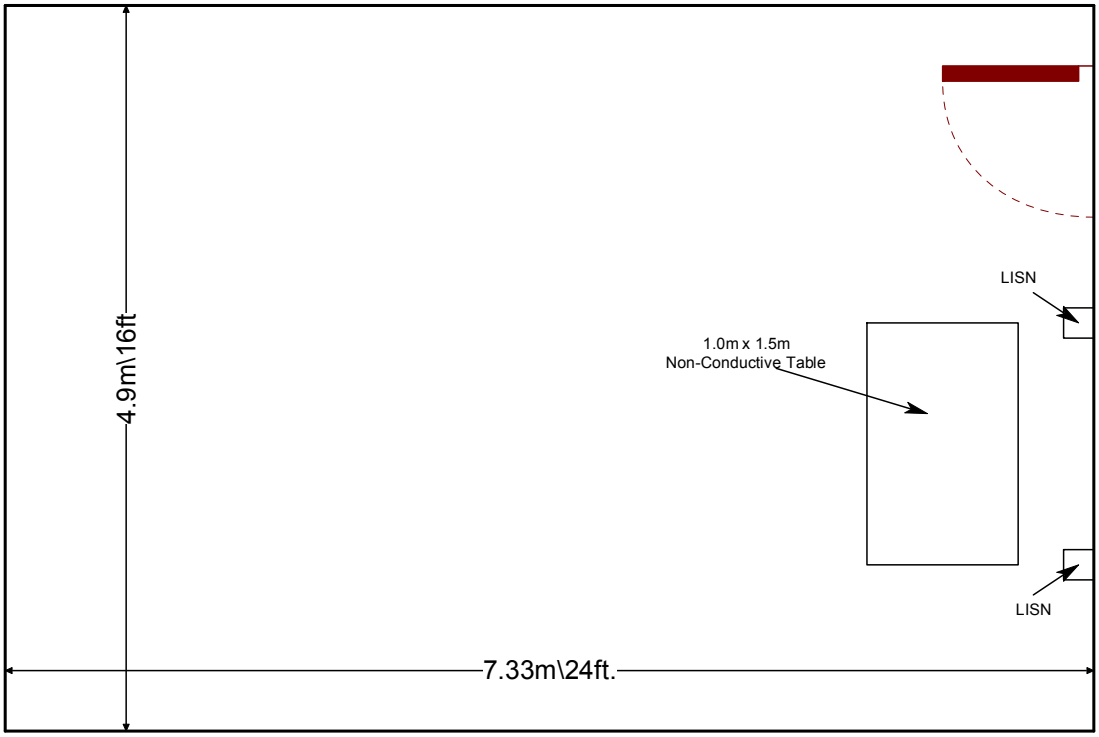

Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- ANSI C63.10-2009: Standard for Testing Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2013
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2013
- FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, March 30, 2000
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8 December 2010.
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3, December 2010.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/8/2013	1/8/2015
524	Chase	CBL6111	Antennas	1138	1/7/2013	1/7/2015
2006	EMCO	3115	Antennas	2573	4/24/2013	4/24/2015
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	12/31/2012	12/31/2013
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/1/2013	1/1/2014
2044	QMI	N/A	Cables	2044	12/31/2012	12/31/2013
2070	Mini Circuits	VHF-8400+	Filter	2070	12/31/2012	12/31/2013
2072	Mini Circuits	VHF-3100+	Filter	30737	12/31/2012	12/31/2013
2076	Hewlett Packard	HP5061-5458	Cables	2076	12/29/2012	12/29/2013
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	12/29/2012	12/29/2013
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/20/2012	12/20/2013
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR

NCR=No Calibration Required

5 SUPPORT EQUIPMENT

Table 5-1: Ancillary and Supporting Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Servo Motor	Hitec	HS-225BB	N/A
2	Servo Motor	Hitec	HS-225BB	N/A
3	DC Power Supply	MPJA	HY5003	003700278

Table 5-2: EUT Test Setup Cable Configuration

Item #	Description	Length (m)	From - To	Shielded/ Unshielded
A	Twisted Power Cable	0.12	EUT – RC Power Cable	Unshielded
B	RC Servo Cable	0.32	Servo Motor - EUT	Unshielded
C	RC Servo Cable	0.32	Servo Motor - EUT	Unshielded
D	RC Extension Cable	2.25	Twisted Pair – RC Extension Cable	Unshielded
E	Banana Power Cable	0.15	RC Extension Cable - Power Supply	Unshielded
F	Power Cable	2.5	Power Supply – AC Mains	Unshielded

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

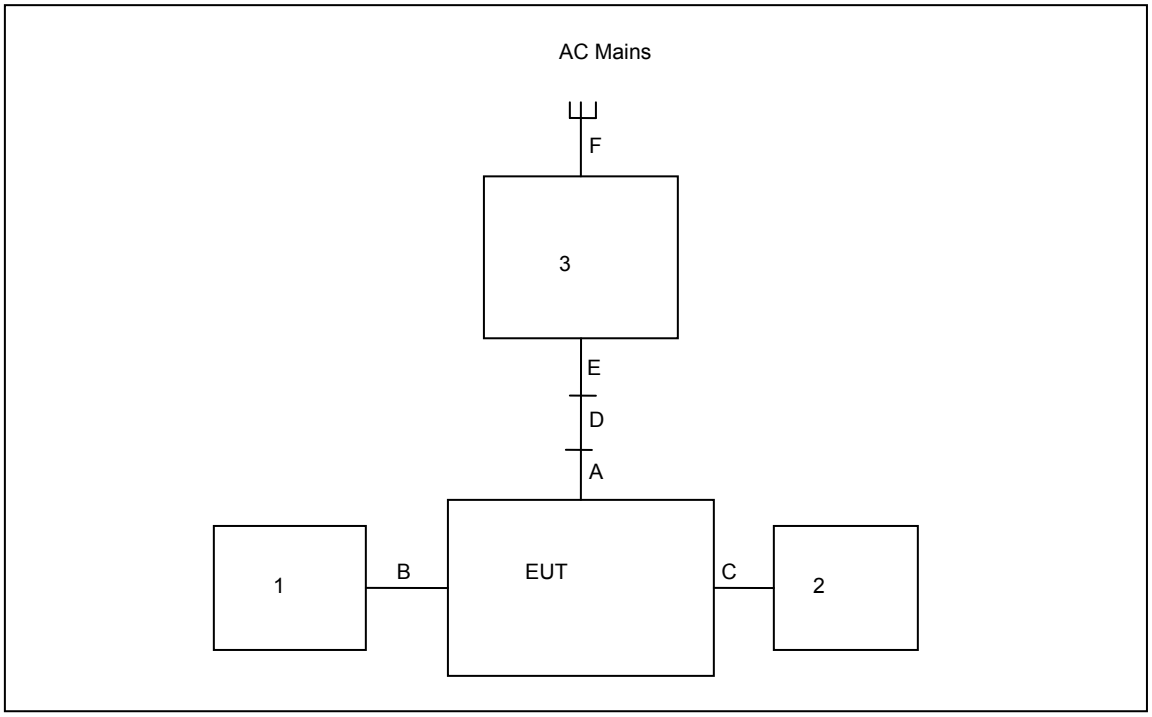

Figure 6-1: Radiated Emissions Setup

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: Section 15.203

The JETIR5LUS uses 2.1 dBi coaxial wire antennas which are directly soldered to the PCB, hence meeting the requirements of Section 15.203.

7.2 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d) IC:RSS-210 A8.5

7.2.1 Radiated Spurious Emissions - FCC Sections 15.205, 15.209; IC: RSS-Gen 7.2.2, 7.2.5

7.2.1.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30 MHz to 26 GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak and average measurements made with RBW and VBW of 1 MHz and 3 MHz respectively.

The EUT was caused to generate a continuous carrier signal on the hopping channel. The average measurements were corrected using the logarithm of the dwell time over 100 ms period. The dwell time/duty cycle information can be found in the original certification filing documents.

7.2.1.2 Measurement Results

Radiated band-edge and spurious emissions found in the band of 30 MHz to 26 GHz are reported in the tables below.

Table 7.2.1.2-1: Radiated Spurious Emissions Tabulated Data – Antenna Path 1

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel = 2405 MHz										
2390	82.03	58.94	H	-8.65	73.38	16.56	74.0	54.0	0.6	37.4
2390	79.23	56.00	V	-8.65	70.58	13.62	74.0	54.0	3.4	40.4
4810	66.21	59.08	H	-0.87	65.34	24.48	74.0	54.0	8.7	29.5
4810	69.84	62.80	V	-0.87	68.97	28.20	74.0	54.0	5.0	25.8
12025	56.48	47.96	H	11.34	67.82	25.56	83.5	63.5	15.7	37.9
12025	54.68	46.10	V	11.34	66.02	23.70	83.5	63.5	17.5	39.8
19240	44.76	33.45	H	9.25	54.01	8.96	83.5	63.5	29.5	54.5
19240	48.73	37.75	V	9.25	57.98	13.26	83.5	63.5	25.5	50.2
Middle Channel = 2440 MHz										
4880	58.08	50.26	H	-1.18	56.90	15.34	74.0	54.0	17.1	38.7
4880	61.72	54.21	V	-1.18	60.54	19.29	74.0	54.0	13.5	34.7
7320	61.48	53.67	H	3.44	64.92	23.37	74.0	54.0	9.1	30.6
7320	66.51	59.23	V	3.44	69.95	28.93	74.0	54.0	4.1	25.1
12200	56.42	48.17	H	9.80	66.22	24.24	83.5	63.5	17.3	39.3
12200	54.13	45.60	V	9.80	63.93	21.67	83.5	63.5	19.6	41.8
19520	42.96	29.73	H	9.51	52.47	5.51	83.5	63.5	31.0	58.0
19520	45.01	34.24	V	9.51	54.52	10.02	83.5	63.5	29.0	53.5
High Channel = 2480 MHz										
2483.5	80.06	69.51	H	-8.26	71.80	27.51	74.0	54.0	2.2	26.5
2483.5	78.68	67.21	V	-8.26	70.42	25.21	74.0	54.0	3.6	28.8
4960	48.34	37.40	H	-0.43	47.91	3.24	74.0	54.0	26.1	50.8
4960	50.57	40.48	V	-0.43	50.14	6.32	74.0	54.0	23.9	47.7

Notes:

- All emissions above 19520 MHz were attenuated below the limits and the noise floor of the measurement equipment.
- The measurements above 10 GHz were performed at a distance of 1m. The limits were corrected accordingly using a distance factor of 20*log(3/1) ≈ 9.5 dB.
- The average measurements were further corrected using a duty cycle correction factor corresponding to the logarithm of the dwell time over 100 ms = 20*log(2.057/100) ≈ -33.74 dB.

Table 7.2.1.2-2: Radiated Spurious Emissions Tabulated Data – Antenna Path 2

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel = 2405 MHz										
2390	75.61	52.11	H	-8.65	66.96	9.73	74.0	54.0	7.0	44.3
2390	78.08	54.56	V	-8.65	69.43	12.18	74.0	54.0	4.6	41.8
4810	67.17	60.18	H	-1.38	65.79	25.06	74.0	54.0	8.2	28.9
4810	69.42	62.53	V	-1.38	68.04	27.41	74.0	54.0	6.0	26.6
12025	56.15	47.74	H	10.07	66.22	24.07	83.5	63.5	17.3	39.4
12025	54.54	45.64	V	10.07	64.61	21.97	83.5	63.5	18.9	41.5
19240	44.18	32.71	H	9.25	53.43	8.22	83.5	63.5	30.1	55.3
19240	47.80	37.60	V	9.25	57.05	13.11	83.5	63.5	26.5	50.4
Middle Channel = 2440 MHz										
4880	57.77	49.66	H	-1.18	56.59	14.74	74.0	54.0	17.4	39.3
4880	59.96	51.94	V	-1.18	58.78	17.02	74.0	54.0	15.2	37.0
7320	61.22	53.23	H	3.44	64.66	22.93	74.0	54.0	9.3	31.1
7320	64.77	57.39	V	3.44	68.21	27.09	74.0	54.0	5.8	26.9
12200	56.35	47.99	H	9.80	66.15	24.06	83.5	63.5	17.3	39.4
12200	54.14	45.48	V	9.80	63.94	21.55	83.5	63.5	19.6	42.0
19520	42.92	30.34	H	9.51	52.43	6.12	83.5	63.5	31.1	57.4
19520	46.00	34.56	V	9.51	55.51	10.34	83.5	63.5	28.0	53.2
High Channel = 2480 MHz										
2483.5	72.38	61.77	H	-8.26	64.12	19.77	74.0	54.0	9.9	34.2
2483.5	74.86	64.03	V	-8.26	66.60	22.03	74.0	54.0	7.4	32.0
4960	47.65	36.32	H	-0.43	47.22	2.16	74.0	54.0	26.8	51.8
4960	50.38	40.49	V	-0.43	49.95	6.33	74.0	54.0	24.0	47.7

Notes:

- All emissions above 19520 MHz were attenuated below the limits and the noise floor of the measurement equipment.
- The measurements above 10 GHz were performed at a distance of 1m. The limits were corrected accordingly using a distance factor of 20*log(3/1) ≈ 9.5 dB.
- The average measurements were further corrected using a duty cycle correction factor corresponding to the logarithm of the dwell time over 100 ms = 20*log(2.057/100) ≈ -33.74 dB.

7.2.1.3 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Duty Cycle Correction Factor
DC = 20*log(2.057/100) = -33.74 dB

Example Calculation: Peak
Corrected Level: 82.03+ (-8.65) = 73.38 dBµV/m
Margin: 74 dBuV/m – 73.38 dBµV/m = 0.6 dB

Example Calculation: Average
Corrected Level: 58.94 + (-8.65) – 33.74= 16.55 dBµV/m
Margin: 54 dBuV/m – 16.55 dBµV/m = 37.4 dB

8 CONCLUSION

In the opinion of ACS, Inc., the JETIR3US manufactured by Esprit Model meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210 for the specific tests performed.

END REPORT