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TEST AND MEASUREMENT REPORT

For

Mobile Communications Inc.

230 Earl Steward Drive,

Aurora, Ontario L4G 6V8, Canada

FCC ID: S4RBBU672
IC: 3585A-BBC675

Report Type:	**Product Type:**
Original Report	Consumer Wide-Band Booster

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Report Number:	R1611091-AMP
Report Date:	2016-12-05
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1611091-AMP	Original	2016-12-05

1 General Information

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Mobile Communications Inc.* and their product: FCC ID: S4RBBU672, FCC models: BBUZ660, BBUZ665, BBUZ672, BBUX660, BBUX665, BBUX672, and IC: 3585A-BBC675, ISED models: BBCZ660, BBCZ665, BBCZ670, BBCZ675, BBCX660, BBCX665, BBCX670, and BBCX675, which will henceforth be referred to as the EUT (Equipment under Test). The EUT is a Wideband Consumer Signal Booster.

Note: BBUX672 (or ISED model number BBCX675) was used for testing. Please refers to the DOS for details.

1.2 Mechanical Description

The EUT measures approximately 127 mm (L) x 120 mm (W) x 31 mm (H), and weighs approximately 0.55 kg.

The test data gathered are from typical production sample, serial number: 3720112, assigned by Mobile Communications Inc.

1.3 Objective

This type approval report was prepared on behalf of *Mobile Communications Inc.* in accordance with Part 2, Subpart J, Part 20.21, Part 22 Subpart H, Part 24 Subpart E, and Part 27 of the Federal Communication Commission's rules and ISED RSS-131 Issue 2, July 2003.

The objective was to determine compliance with FCC/ISED Rules for Spurious Radiated Emissions.

1.4 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J and as well as the following parts:

Part 20.21 – Signal Boosters
Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E – Broadband PCS
Part 27 –Miscellaneous Wireless Communications Services

ANSI C63.26 -2015
ISED RSS 131- Zone Enhancers for the Land Mobile Service

Applicable Standards: TIA/EIA603-D, ANSI C63.26 -2015, & FCC KDB 935210

All radiated emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Related Submittal(s)/Grant(s)

NA

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Parameter	Measurement uncertainty
All emissions, radiated	±4.0 dB
Temperature	±2 º C
Humidity	±5 %
DC and low frequency voltages	±1.0 %
Time	±2 %
Duty Cycle	±3 %

1.7 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.8 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3279.02),*** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..
BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.03)*** to certify
- For the USA (Federal Communications Commission):
    1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
    2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
    3- All Telephone Terminal Equipment within FCC Scope C.
- For the Canada (Industry Canada):
    1 All Scope 1-Licence-Exempt Radio Frequency Devices;
    2 All Scope 2-Licensed Personal Mobile Radio Services;
    3 All Scope 3-Licensed General Mobile & Fixed Radio Services;
    4 All Scope 4-Licensed Maritime & Aviation Radio Services;
    5 All Scope 5-Licensed Fixed Microwave Radio Services
    6 All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.
- For Singapore (Info-Communications Development Authority (IDA)):
    1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
    2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2
- For the Hong Kong Special Administrative Region:
    1 All Radio Equipment, per KHCA 10XX-series Specifications;
    2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
    3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.
- For Japan:
    1 MIC Telecommunication Business Law (Terminal Equipment):
    - All Scope A1 - Terminal Equipment for the Purpose of Calls;
    - All Scope A2 - Other Terminal Equipment
    2 Radio Law (Radio Equipment):
    - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
    - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
    - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

C- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.01)*** to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

1 Electronics and Office Equipment:
- for Telephony (ver. 3.0)
- for Audio/Video (ver. 3.0)
- for Battery Charging Systems (ver. 1.1)
- for Set-top Boxes & Cable Boxes (ver. 4.1)
- for Televisions (ver. 6.1)
- for Computers (ver. 6.0)
- for Displays (ver. 6.0)
- for Imaging Equipment (ver. 2.0)
- for Computer Servers (ver. 2.0)

2 Commercial Food Service Equipment
- for Commercial Dishwashers (ver. 2.0)
- for Commercial Ice Machines (ver. 2.0)
- for Commercial Ovens (ver. 2.1)
- for Commercial Refrigerators and Freezers

3 Lighting Products
- For Decorative Light Strings (ver. 1.5)
- For Luminaires (including sub-components) and Lamps (ver. 1.2)
- For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
- For Integral LED Lamps (ver. 1.4)

4 Heating, Ventilation, and AC Products
- for Residential Ceiling Fans (ver. 3.0)
- for Residential Ventilating Fans (ver. 3.2)

5 Other
- For Water Coolers (ver. 3.0)

D- ***A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:***

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Innovation, Science and Economic Development Canada - ISED) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - EMC Directive 2014/30/EC US-EU EMC & Telecom MRA CAB
  - Radio & Teleterminal Equipment (R&TTE) Directive 1995/5/EC US -EU EMC & Telecom MRA CAB
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Development Authority - IDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - ENERGY STAR Recognized Test Laboratory – US EPA
  - Telecommunications Certification Body (TCB) – US FCC;
- Vietnam: APEC Tel MRA -Phase I;

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to TIA/EIA603-D and ANSI C63.26 -2015.
The final qualification test was performed with the EUT operating at normal mode.

2.2 EUT Exercise Software

There was no exercise software with the EUT; signal was sent through EUT using a signal generator.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 EUT Internal Configuration

Manufacturer	Description	Model	Serial Number
Mobile Communication	PCB	BBUX672	-

2.5 Local Support Equipment List and Details

No local Support Equipment utilized.

2.6 Power Supply and Line Filters

Manufacturers	Descriptions	Models	Serial Numbers
Smooth Talker	AC/DC Adapter	BLC240603000WU	-

2.7 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RF cable	< 1	Signal Generator	Input/EUT

3 Summary of Test Results

FCC & ISED Rules	Description of Tests	Results
FCC §2.1053, §22.917(a), §24.238(a), §27.53 ISED RSS-131 §6.4	Spurious Radiated Emissions	Compliant
FCC §2.1091 ISED RSS-102	RF Exposure Evaluation	Compliant

Note: Please refers to Report number: BBU672 and BBC675 by Mobile Communications, Inc. for other testing results. FCC ID: S4RBBU672, IC: 3585A-BBC675

4 FCC §2.1053, §22.917, §24.238, §27.53 & ISED RSS-131 §6.4 - Spurious Radiated Emissions

4.1 Applicable Standards

According to FCC §22.917 the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

According to FCC §24.238(a) the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

According to FCC §27.53,

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 +10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands mobile and portable stations;

(h) AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

According to ISED-RSS 131 §6.4, Spurious Emissions:

Spurious emissions of zone enhancers and translators shall be suppressed as much as possible. Spurious emissions shall be attenuated below the rated power of the enhancer by at least: 43 + 10 Log10(P_{rated} in watts), or 70 dB, whichever is less stringent.

Note: If the minimum standard is not met, check to see if the input signal generators have a high harmonic content.

4.2 Test Procedure

The transmitter was place onto a Styrofoam block. The EUT transmitted into a 50 ohm terminator connected to the antenna terminal.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna's height and polarization as well as EUT's azimuth were varied to identify the maximum level of emissions.

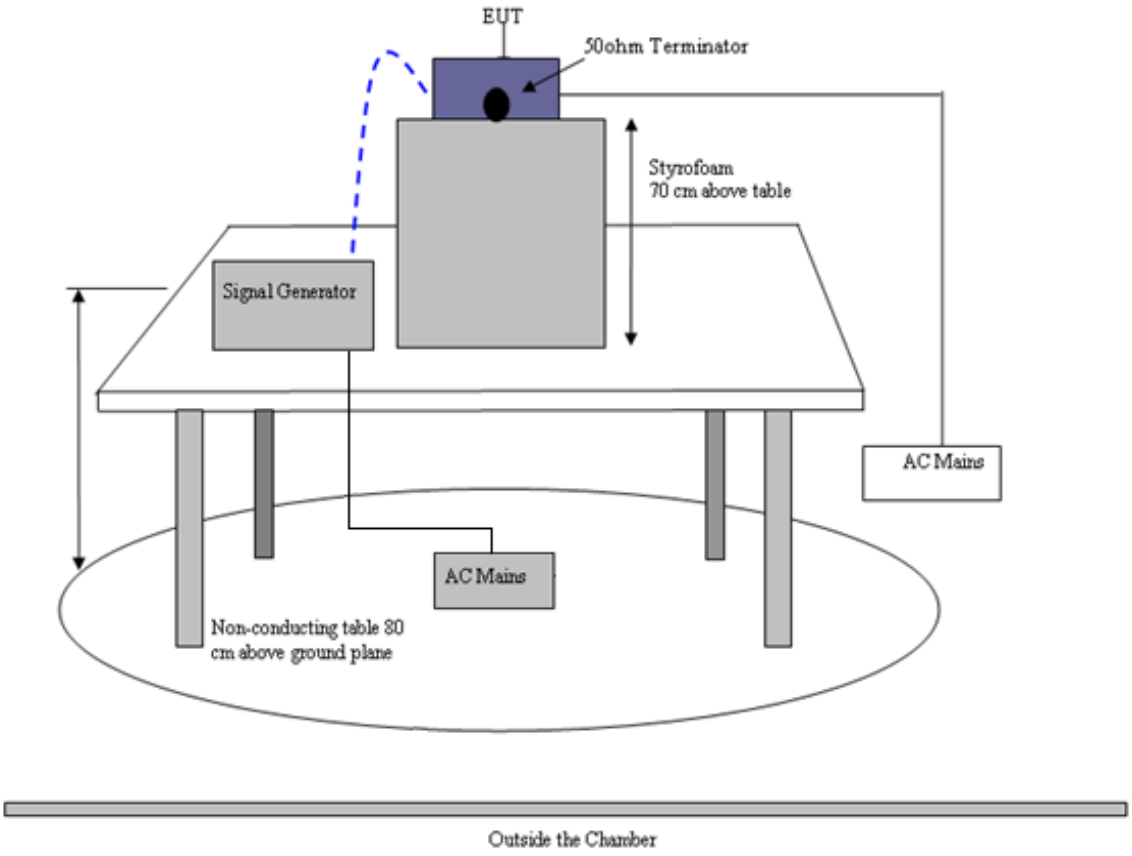
Emissions were investigated up to the tenth harmonic of the fundamental frequency.

After the emissions were found, the EUT was removed and replaced by a substituting antenna. A signal generator was connected to the substituting antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 log (TXpwr in Watts/0.001) – the absolute level
Spurious attenuation limit in dB = 43 + 10 $\log_{10}$ (power out in Watts)

4.3 Test Setup Block Diagram

Radiated Emissions Testing



Note: For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on the Non-conducting table at a nominal height of 80 cm above the reference ground plane.

4.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	US45303156	2016-01-19	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2015-07-11	2 years
EMCO	Antenna, Horn	3115	9511-4627	2016-01-28	2 years
HP	Amplifier, Pre	8449 OPT HO2	3008A0113	2016-05-23	1 year
-	SMA cable	-	C#0010	Each time[1]	Each time[1]
-	SMA cable	-	C#0011	Each time[1]	Each time[1]
-	N-Type Cable	-	C00013	2016-04-28	1 year
-	N-Type Cable	-	C00014	2016-05-28	1 year
IW	Armored High Frequency Cable	DC 1531	KPS-1501A3960KPS	2016-08-05	1 year
HP	Pre-Amplifier	8447D	2443A04374	2016-06-28	1year
COM-POWER	Antenna, Dipole	AD-100	721033DB1, 2, 3, 4	2014-11-03	N/R
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2015-03-09	2 years
HP	Pre-Amplifier	8447D	2443A04374	2016-06-28	1year
Agilent	Generator, Signal	E4438C	MY45091309	2016-10-03	1year

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

4.5 Test Environmental Conditions

Temperature:	20-22° C
Relative Humidity:	44-46 %
ATM Pressure:	101.5 kPa

The testing was performed by Xiao Lin on 2016-11-17 in 5m Chamber 3.

4.6 Test Results

Band 12 &17 Uplink: 707.5 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBµV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)	Absolute Level (dBm)		
85	52.58	0	100	H	85	-61.77	0.00	0.03	-61.8	-13	-48.80
85	52.44	0	100	V	85	-61.78	0.00	0.03	-61.81	-13	-48.81
230.5	38.39	0	100	H	230.5	-73.63	0.00	0.18	-73.81	-13	-60.81
230.5	38.33	0	100	V	230.5	-73.75	0.00	0.18	-73.93	-13	-60.93
1070	50.46	55	100	H	1070	-63.52	7.13	0.41	-56.8	-13	-43.80
1070	50.57	43	100	V	1070	-63.22	7.13	0.41	-56.5	-13	-43.50
1945	49.18	66	100	H	1945	-60.09	8.21	0.54	-52.42	-13	-39.42
1945	49.55	44	100	V	1945	-59.94	8.21	0.54	-52.27	-13	-39.27

Band 12 &17 Downlink: 737.5 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBµV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)	Absolute Level (dBm)		
73.6	47	0	100	H	73.6	-67.76	0.00	0.03	-67.79	-13	-54.79
73.6	46.81	0	100	V	73.6	-67.78	0.00	0.03	-67.81	-13	-54.81
1070	51.17	62	100	H	1070	-62.81	7.13	0.41	-56.09	-13	-43.09
1070	51.86	78	100	V	1070	-61.93	7.13	0.41	-55.21	-13	-42.21
1980	49.59	91	100	H	1980	-59.07	8.98	0.54	-50.63	-13	-37.63
1980	49.35	77	100	V	1980	-59.44	8.98	0.54	-51.00	-13	-38.00

Band 13 Uplink: 782 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBµV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)	Absolute Level (dBm)		
85	52.61	0	100	H	85	-61.74	0.00	0.03	-61.77	-13	-48.77
85	52.4	0	100	V	85	-61.82	0.00	0.03	-61.85	-13	-48.85
230.5	38.38	0	100	H	230.5	-73.64	0.00	0.18	-73.82	-13	-60.82
230.5	38.35	0	100	V	230.5	-73.73	0.00	0.18	-73.91	-13	-60.91
1105	50.96	76	100	H	1105	-62.88	7.13	0.42	-56.17	-13	-43.17
1105	50.88	93	100	V	1105	-62.78	7.13	0.42	-56.07	-13	-43.07
1980	50.23	65	100	H	1980	-58.43	8.98	0.54	-49.99	-13	-36.99
1980	50.11	46	100	V	1980	-58.68	8.98	0.54	-50.24	-13	-37.24

Band 13 Downlink: 751 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBµV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)	Absolute Level (dBm)		
73.6	47.21	0	100	H	73.6	-67.55	0.00	0.03	-67.58	-13	-54.58
73.6	47.05	0	100	V	73.6	-67.54	0.00	0.03	-67.57	-13	-54.57
1070	50.84	61	100	H	1070	-63.14	7.13	0.41	-56.42	-13	-43.42
1070	50.79	52	100	V	1070	-63.00	7.13	0.41	-56.28	-13	-43.28
1980	49.22	74	100	H	1980	-59.44	8.98	0.54	-51.00	-13	-38.00
1980	49.47	85	100	V	1980	-59.32	8.98	0.54	-50.88	-13	-37.88

Band 5 Uplink: 836.5 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBµV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)	Absolute Level (dBm)		
85	52.64	0	100	H	85	-61.71	0	0.03	-61.74	-13	-48.74
85	52.55	0	100	V	85	-61.67	0	0.03	-61.7	-13	-48.7
230.5	38.56	0	100	H	230.5	-73.46	0	0.18	-73.64	-13	-60.64
230.5	38.31	0	100	V	230.5	-73.77	0	0.18	-73.95	-13	-60.95
1105	50.89	45	100	H	1105	-62.95	7.13	0.42	-56.24	-13	-43.24
1105	50.77	74	100	V	1105	-62.89	7.13	0.42	-56.18	-13	-43.18
1980	50.35	65	100	H	1980	-58.31	8.98	0.54	-49.87	-13	-36.87
1980	50.3	69	100	V	1980	-58.49	8.98	0.54	-50.05	-13	-37.05

Band 5 Downlink: 881.5 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBµV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)	Absolute Level (dBm)		
73.6	47.45	0	100	H	73.6	-67.31	0.00	0.03	-67.34	-13	-54.34
73.6	47.31	0	100	V	73.6	-67.28	0.00	0.03	-67.31	-13	-54.31
1070	50.77	65	100	H	1070	-63.21	7.13	0.41	-56.49	-13	-43.49
1070	50.91	71	100	V	1070	-62.88	7.13	0.41	-56.16	-13	-43.16
1980	50.01	86	100	H	1980	-58.65	8.98	0.54	-50.21	-13	-37.21
1980	49.83	52	100	V	1980	-58.96	8.98	0.54	-50.52	-13	-37.52

Band 2 & 25 Uplink: 1882.5 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBµV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)	Absolute Level (dBm)		
85	52.52	0	100	H	85	-61.83	0.00	0.03	-61.86	-13	-48.86
85	52.26	0	100	V	85	-61.96	0.00	0.03	-61.99	-13	-48.99
230.5	38.29	0	100	H	230.5	-73.73	0.00	0.18	-73.91	-13	-60.91
230.5	38.16	0	100	V	230.5	-73.92	0.00	0.18	-74.1	-13	-61.10
1175	50.43	39	100	H	1175	-62.38	7.04	0.44	-55.78	-13	-42.78
1175	50.51	59	100	V	1175	-62.61	7.04	0.44	-56.01	-13	-43.01
1945	49.03	65	100	H	1945	-60.24	8.21	0.54	-52.57	-13	-39.57
1945	49.22	72	100	V	1945	-60.27	8.21	0.54	-52.6	-13	-39.60

Band 2&25 Downlink: 1962.5 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBµV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)	Absolute Level (dBm)		
73.6	47.32	0	100	H	73.6	-67.44	0.00	0.03	-67.47	-13	-54.47
73.6	47.26	0	100	V	73.6	-67.33	0.00	0.03	-67.36	-13	-54.36
1105	50.66	46	100	H	1105	-63.18	7.13	0.42	-56.47	-13	-43.47
1105	50.72	49	100	V	1105	-62.94	7.13	0.42	-56.23	-13	-43.23
1700	50.79	75	100	H	1700	-61.29	8.31	0.51	-53.49	-13	-40.49
1700	50.45	63	100	V	1700	-61.56	8.31	0.51	-53.76	-13	-40.76

Band 4 Uplink: 1732.5 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBµV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)	Absolute Level (dBm)		
85	52.61	0	100	H	85	-61.74	0.00	0.03	-61.77	-13	-48.77
85	52.33	0	100	V	85	-61.89	0.00	0.03	-61.92	-13	-48.92
230.5	38.44	0	100	H	230.5	-73.58	0.00	0.18	-73.76	-13	-60.76
230.5	38.26	0	100	V	230.5	-73.82	0.00	0.18	-74	-13	-61
1175	50.67	84	100	H	1175	-62.14	7.04	0.44	-55.54	-13	-42.54
1175	50.43	62	100	V	1175	-62.69	7.04	0.44	-56.09	-13	-43.09
1945	48.99	53	100	H	1945	-60.28	8.21	0.54	-52.61	-13	-39.61
1945	49.18	66	100	V	1945	-60.31	8.21	0.54	-52.64	-13	-39.64

Band 4 Downlink: 2132.5 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBµV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)	Absolute Level (dBm)		
73.6	47.62	0	100	H	73.6	-67.14	0.00	0.03	-67.17	-13	-54.17
73.6	47.58	0	100	V	73.6	-67.01	0.00	0.03	-67.04	-13	-54.04
1105	50.78	57	100	H	1105	-63.06	7.13	0.42	-56.35	-13	-43.35
1105	50.62	41	100	V	1105	-63.04	7.13	0.42	-56.33	-13	-43.33
1700	50.62	74	100	H	1700	-61.46	8.31	0.51	-53.66	-13	-40.66
1700	50.1	92	100	V	1700	-61.91	8.31	0.51	-54.11	-13	-41.11

5 FCC §2.1091 & ISED RSS-102 - RF Exposure

5.1 Applicable Standard

According to FCC §2.1091 and FCC §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* ($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

As per ISED RSS-102 §2.5.2, RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

• below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
• at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 4.49/*f*0.5 W (adjusted for tune-up tolerance), where *f* is in MHz;
• at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
• at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10-2 *f*0.6834 W (adjusted for tune-up tolerance), where *f* is in MHz;
• at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

5.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Antennas & Cable Kits

Antenna Part #	Description	Cable	Maximum Antenna Gain (dBi)	Minimum Cable loss Below 0.9 GHz in dB	Minimum Cable loss Above 1.7 GHz in dB	Net gain Below 0.9 GHz (dBi)	Net gain Above 1.7 GHz (dBi)
SEM2THL series	Antenna	25 ft. C205	0	-3.0	-5.1	-3.0	-5.1
SEM11THL series	Antenna	25 ft. C205	2	-3.0	-5.1	-1.0	-2.1
SEM14THL series	Antenna	25 ft. C205	3	-3.0	-5.1	0.0	-2.1
SEM26THL series	Antenna	25 ft. C205	3	-3.0	-5.1	0.0	-2.1
SEMO series	Antenna	20 ft. C205	0	-2.5	-4.1	-2.5	-4.1
SEMDP1 series	Antenna	50 ft. LMR400	3	-2.0	-2.8	1.0	0.2
SEMD1 series	Antenna	50 ft. LMR400	3	-2.0	-2.8	1.0	0.2
SEMDA2 series	Antenna	50 ft. LMR400	3	-2.0	-2.8	1.0	0.2
SEMDYD series	Antenna	100 ft. LMR400	6	-3.9	-5.5	**2.1**	**0.5**

5.3 MPE Results

Uplink:

Band 5:

Maximum peak output power at antenna input terminal (dBm):	26.1
Maximum peak output power at antenna input terminal (mW):	407.38
Prediction distance (cm):	20
Prediction frequency (MHz):	834
Maximum Antenna Gain, typical (dBi):	2.1
Maximum Antenna Gain (numeric):	1.622
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.1314
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.556

Band 12 & Band 17

Maximum peak output power at antenna input terminal (dBm):	25.9
Maximum peak output power at antenna input terminal (mW):	389.05
Prediction distance (cm):	20
Prediction frequency (MHz):	702.5
Maximum Antenna Gain, typical (dBi):	2.1
Maximum Antenna Gain (numeric):	1.622
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.126
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.468

Band 13:

Maximum peak output power at antenna input terminal (dBm):	25.6
Maximum peak output power at antenna input terminal (mW):	363.08
Prediction distance (cm):	20
Prediction frequency (MHz):	781
Maximum Antenna Gain, typical (dBi):	2.1
Maximum Antenna Gain (numeric):	1.622
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.117
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.5207

Band 2 & Band 25

Maximum peak output power at antenna input terminal (dBm):	28.8
Maximum peak output power at antenna input terminal (mW):	758.58
Prediction distance (cm):	20
Prediction frequency (MHz):	1867
Maximum Antenna Gain, typical (dBi):	0.5
Maximum Antenna Gain (numeric):	1.122
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.169
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

Band 4:

Maximum peak output power at antenna input terminal (dBm):	29.3
Maximum peak output power at antenna input terminal (mW):	851.138
Prediction distance (cm):	20
Prediction frequency (MHz):	1733.5
Maximum Antenna Gain, typical (dBi):	0.5
Maximum Antenna Gain (numeric):	1.122
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.19
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.19 mW/cm^2. Limit is 1.0 mW/cm^2.

For ISED, based on the output power and antenna net gain, routine RF exposure can be exempted.

Downlink:

Band 5:

Maximum peak output power at antenna input terminal (dBm):	10.5
Maximum peak output power at antenna input terminal (mW):	11.22
Prediction distance (cm):	20
Prediction frequency (MHz):	877
Maximum Antenna Gain, typical (dBi):	2.1
Maximum Antenna Gain (numeric):	1.622
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.00362
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.585

Band 12 & Band 17

Maximum peak output power at antenna input terminal (dBm):	5.4
Maximum peak output power at antenna input terminal (mW):	3.47
Prediction distance (cm):	20
Prediction frequency (MHz):	741.6
Maximum Antenna Gain, typical (dBi):	2.1
Maximum Antenna Gain (numeric):	1.622
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0011
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.4944

Band 13:

Maximum peak output power at antenna input terminal (dBm):	4.8
Maximum peak output power at antenna input terminal (mW):	3.02
Prediction distance (cm):	20
Prediction frequency (MHz):	748.5
Maximum Antenna Gain, typical (dBi):	2.1
Maximum Antenna Gain (numeric):	1.622
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.00097
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.499

Band 2 & Band 25

Maximum peak output power at antenna input terminal (dBm):	11.4
Maximum peak output power at antenna input terminal (mW):	13.8
Prediction distance (cm):	20
Prediction frequency (MHz):	1956
Maximum Antenna Gain, typical (dBi):	0.5
Maximum Antenna Gain (numeric):	1.122
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0031
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

Band 4:

Maximum peak output power at antenna input terminal (dBm):	5.8
Maximum peak output power at antenna input terminal (mW):	3.802
Prediction distance (cm):	20
Prediction frequency (MHz):	2120
Maximum Antenna Gain, typical (dBi):	0.5
Maximum Antenna Gain (numeric):	1.122
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.00085
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.19 mW/cm^2. Limit is 1.0 mW/cm^2.

For ISED, based on the output power and antenna net gain, routine RF exposure can be exempted.