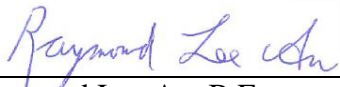


TÜV SÜD Canada EMC & RF Test Report

As per

**RSS 247 Issue 1: 2015
&
FCC Part 15 Subpart C: 2016**
For
**Unlicensed Intentional Radiators
Frequency Hopping Systems
Operating in the 2.4-2.4835 GHz band
on the
ARMOUR ANTENNA UNIT**



Raymond Lee Au, B.Eng
Project Engineer
TÜV SÜD Canada
11 Gordon Collins Dr,
Gormley, Ontario
Canada, L0H 1G0
Ph: (905) 883-8189

Testing produced for



See *Appendix A* for full customer & EUT details.



Registration #
6844A-3



R-4023, G-506
T-1246, C-4498



Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Table of Contents

Table of Contents	2
Report Scope	3
Summary	4
Results Summary	5
Notes, Justifications, or Deviations	6
Applicable Standards, Specifications and Methods	8
Sample calculation(s)	9
Document Revision Status	9
Definitions and Acronyms	10
Testing Facility	11
Calibrations and Accreditations	11
Testing Environmental Conditions and Dates	12
Detailed Test Results Section	13
6 dB & 20 dB Bandwidths	14
Maximum Peak Conducted Output Power	20
Maximum Peak E.I.R.P Output	26
Antenna Spurious Conducted Emissions (-20 dBc)	35
Power Spectral Density	42
Spurious Radiated Emissions & Restricted Bands	47
Appendix A – EUT Summary	77
Appendix B – EUT and Test Setup Photographs	79

Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Report Scope

This report addresses the EMC certification testing and test results of the **Armour Antenna Unit** from **Scan~Link Technologies Inc.** This unit is herein referred to as EUT (Equipment Under Test) performed at TÜV SÜD Canada Labs.

The EUT was tested for compliance against the following standards:


RSS 247 Issue 1:2015
 FCC Part 15 Subpart C 15.247:2016

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by A2LA or any other accreditation agency, any government, or TÜV SÜD Canada.


Opinions/interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada accreditation. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada, unless otherwise stated.

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Summary

The results contained in this report relate only to the item(s) tested.

FCC Certification # (FCC ID):	YUU-SLAU270NB
ISED Certification # (IC):	9283A-SLAU270NB
EUT passed all tests performed.	Yes
Tests conducted by	Raymond Lee Au

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Results Summary

Standard/Method	Description	Limit/Requirement	Result
FCC 15.203	Antenna requirement	Unique	Pass ^a
FCC 15.205 RSS-Gen (Table 6)	Restricted bands of operation	QuasiPeak Average	Pass
FCC 15.209 RSS- Gen (Table 4)	Spurious Radiated emissions	QuasiPeak Average	Pass
FCC 15.247(a)(2) RSS-247 5.2(1)	6 dB Bandwidth	≥ 500 kHz	Pass
FCC 15.247(b)(3) RSS-247 5.4(4)	Max peak conducted output power	≤ 1 W (≤ 30 dBm)	Pass
RSS-247 5.4(4)	Max peak E.I.R.P output	≤ 4 W (≤ 36 dBm)	Pass
FCC 15.247(b)(4)	Antenna Gain	≤ 6 dBi	Pass
FCC 15.247(d) RSS-247 5.5	Unwanted emissions (Antenna Spurious Conducted Emissions)	≤ 20 dBc in 100 kHz bandwidths outside transmission band	Pass
FCC 15.247(e) RSS-247 5.2(2)	Power spectral density	≤ 8 dBm per 3 kHz bandwidth	Pass
FCC 15.247(i) RSS-102	Maximum RF exposure	> 20 cm separation.	Pass
Overall Result			PASS

^a See *Notes, Justifications, or Deviations* section.

All tests were performed by Raymond Lee Au.

If the product as tested or evaluated complies with the specification, the EUT is deemed to comply with the requirement, and is allotted a result of “Pass.” If not, a “Fail” will be issued. Note that a “Pass” or “Fail” status is independent of any measurement uncertainties.

Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Notes, Justifications, or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:

The EUT is part of a supplementary safety system for installation on heavy mobile equipment (such as vehicles used on construction sites) which can detect the presence of ground workers or other entities outfitted with the appropriate RFID tag. It is also known as the “Antenna Unit.” The RFID system operates using the 902 – 928 MHz frequency band. All other communication with the EUT is done using the 2.4 – 2.4835 GHz band. If entities are detected by this “Antenna Unit,” communication is done using the 2.4 GHz frequency band to a “Display Unit” which will give an audible and visual warning. However, these two frequency bands are never utilized at the same time, (i.e. only 1 transmitter will be on at a time, and will never be used simultaneously). Therefore, testing is only done with 1 transmitter operating at a time. The unit is to be powered using the vehicle’s power supply, and does not have a means to connect to mains power.

The 2.4 GHz communication is provided using a Synapse Wireless Inc. SM220 module, which had been modularly approved with FCC ID: U9O-SM220, and IC: 7084A-SM220. However, for usage in the EUT, an Ethertronics Prestta WLAN Embedded Antenna Part Number 1000423, is used in place of the approved antenna. Therefore FCC Part 15 Subpart C 15.247 and RSS 247 testing has been performed on this device.

The “Display Unit” uses the Synapse wireless module mentioned above unaltered. As such, no further certification is required.


The 2.4 GHz antenna has a peak gain of < 6 dBi.

This report (*TUV-FCCIC-7169000926BR1*) contains testing of the 2.4 GHz transmitter portion only. See report number *TUV-FCCIC-7169000926AR1* for testing of the 900 MHz portion.

For the antenna requirement specified in FCC 15.203, the antenna used for the 900 MHz transmission is a custom PCB trace antenna. The 2.4 GHz antenna is a stamped metal antenna on a PCB. Both are completely enclosed within the unit’s enclosure, and is not accessible or replaceable by the end user.

The EUT is not a hybrid system; FCC 15.247 (f) does not apply.


The EUT was tested positioned in the 3 orthogonal axis for 900 MHz and 2.4 GHz. Worst case results are presented. (Worst cases are upright for 900 MHz, flat for 2.4 GHz. See test photos).

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

The EUT's 2.4 GHz output level is set to the maximum output setting.


The EUT is to be used at a distance of at least 20 cm from any personnel during normal operation.

For maximum permissible exposure, this device operates at less than 1 Watt at 2400 – 2483.5 MHz and is designed to operate greater than 20 cm from any personnel during normal operation. It will be mounted onto machinery used in construction sites during its use. The device meets maximum permissible exposure requirements.

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Applicable Standards, Specifications and Methods

ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2013	American national standard for testing unlicensed wireless devices
CFR 47 FCC 15:2016	Code of Federal Regulations – Radio Frequency Devices
CISPR 22:2008	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
FCC KDB 558074	FCC KDB 558074 Digital Transmission Systems, measurements and procedures
ISO 17025:2005	General Requirements for the competence of testing and calibration laboratories
RSS-Gen Issue 4:2014	General Requirements and Information for the Certification of Radio Apparatus
RSS 102 Issue 5:2015	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
RSS-247 Issue 1:2015	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Sample calculation(s)


Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)

Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)

Margin = 8.5 dB

Document Revision Status

Release 1 - August 16, 2016
Initial release

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AE – Auxillary Equipment.

BW – Bandwidth.

DTs – Digital Transmission Systems.

E.I.R.P. – Equivalent Isotropically Radiated Power.

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity

EUT – Equipment Under Test


FHSs – Frequency Hopping Systems

ITE – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

LISN – Line impedance stabilization network

NCR – No Calibration Required

RF – Radio Frequency


Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Testing Facility

Testing for EMC on the EUT was carried out at TÜV SÜD Canada near Toronto, Ontario, Canada. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for a variety of input voltages, including 120 and 240 Vac single phase, and 208 Vac 3 phase. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using Loop, Bilog, or Horn antennas as applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

Calibrations and Accreditations


The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, CA6844), Industry Canada (IC, 6844A-3) and VCCI (R-4023, G-506, T-1246, and C-4498). This semi-anechoic chamber complies with the requirements of EN55016-2-3:2006, section 7.5 and the site attenuation requirements of EN55016-1-4. This chamber was additionally calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at TÜV SÜD Canada. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at TÜV SÜD Canada. TÜV SÜD Canada is accredited to ISO 17025 by A2LA with Testing Certificate #2955.02. The laboratories current scope of accreditation listing can be found as listed on the A2LA website. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Testing Environmental Conditions and Dates

Following are the environmental conditions in the facility during time of testing.

Date	Test(s)	Init.	Temperature (°C)	Humidity (%)	Pressure (kPa)
June 24, 2016	6 dB Bandwidth 20 dB bandwidth. Max peak conducted output power.	RA	20-24°C	39 - 50%	96 -102kPa
July 4, 2016	Max peak E.I.R.P output. Radiated emissions. Restricted bands of operation. Spurious Radiated emissions.	RA	20-24°C	39 - 50%	96 -102kPa
July 5, 2016	Unwanted emissions in 100 kHz bandwidths outside transmission band.	RA	20-24°C	39 - 50%	96 -102kPa

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Detailed Test Results Section

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

6 dB& 20 dB Bandwidths

Purpose

The purpose of this test is to ensure that the bandwidth occupied exceeds the stated minimum. This helps ensure the utilization of the frequency allocation is sufficiently wide, and helps prevent corruption of data by ensuring adequate separation to distinguish the reception of the intended information.

Limits & Method

The Limit is as specified in FCC Part 15.247(a)2 and RSS-247 5.2(1).


The minimum 6 dB bandwidth shall be at least 500 kHz.

There is no requirement for the 20 dB bandwidth for DTSSs.

The method is described in ANSI C63.10, 6.9.

Results

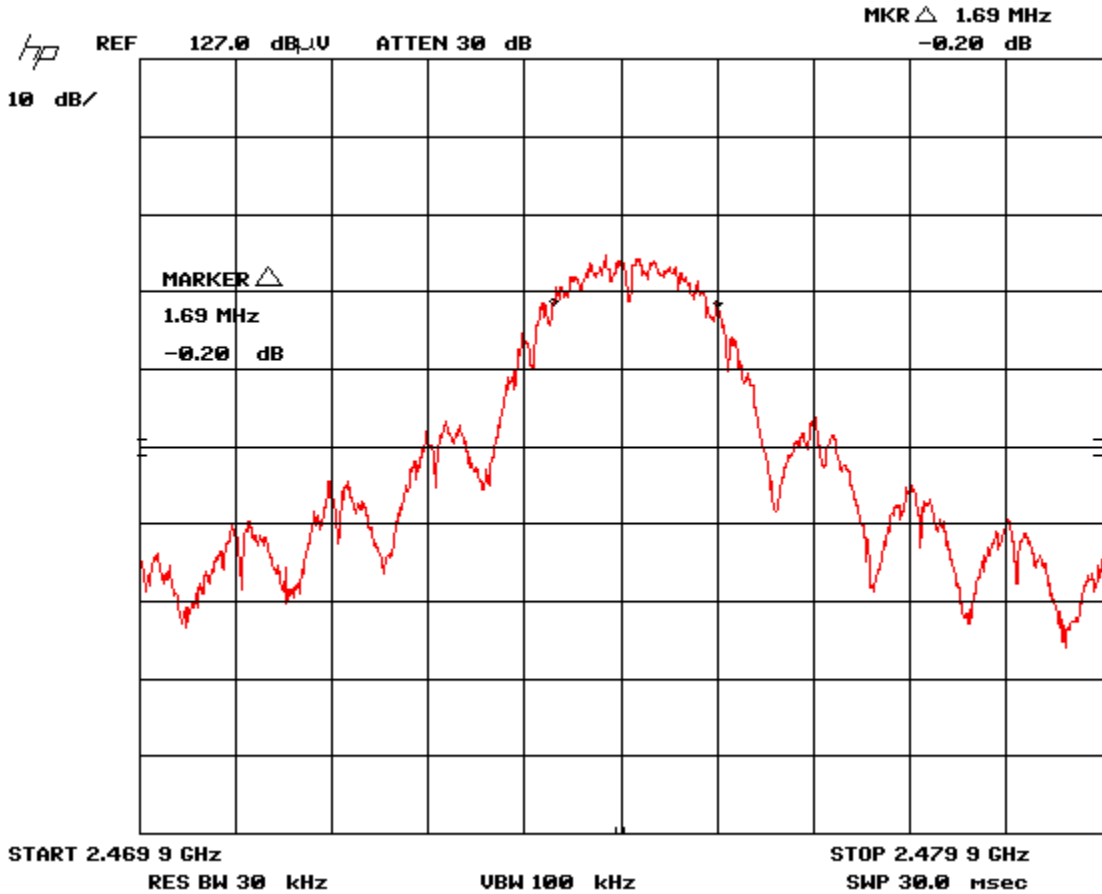
The EUT passed. The minimum 6 dB BW measured was 1.55 MHz.


Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Graph(s)

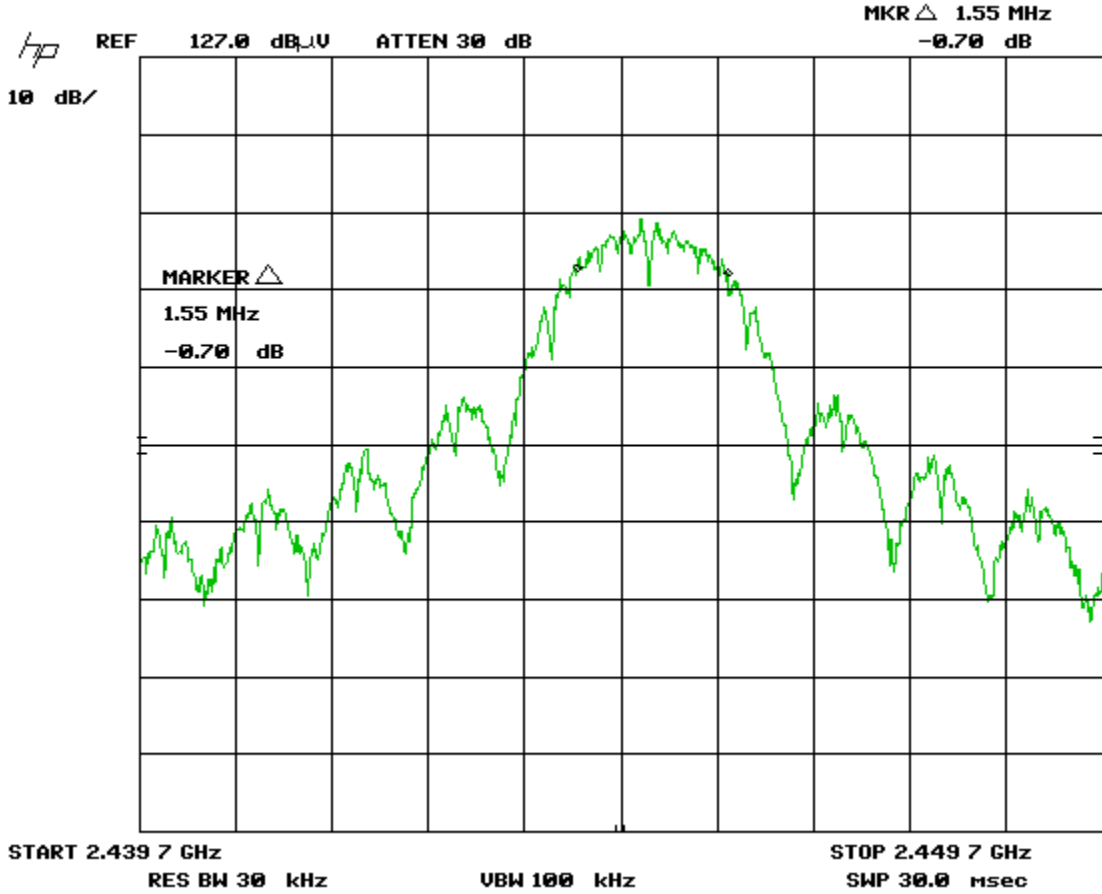
The graphs below show the 6dB bandwidth during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the 6 dB bandwidth of a channel during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute. Worst case results obtained are shown.


High Channel
6 dB Bandwidth = 1.69 MHz



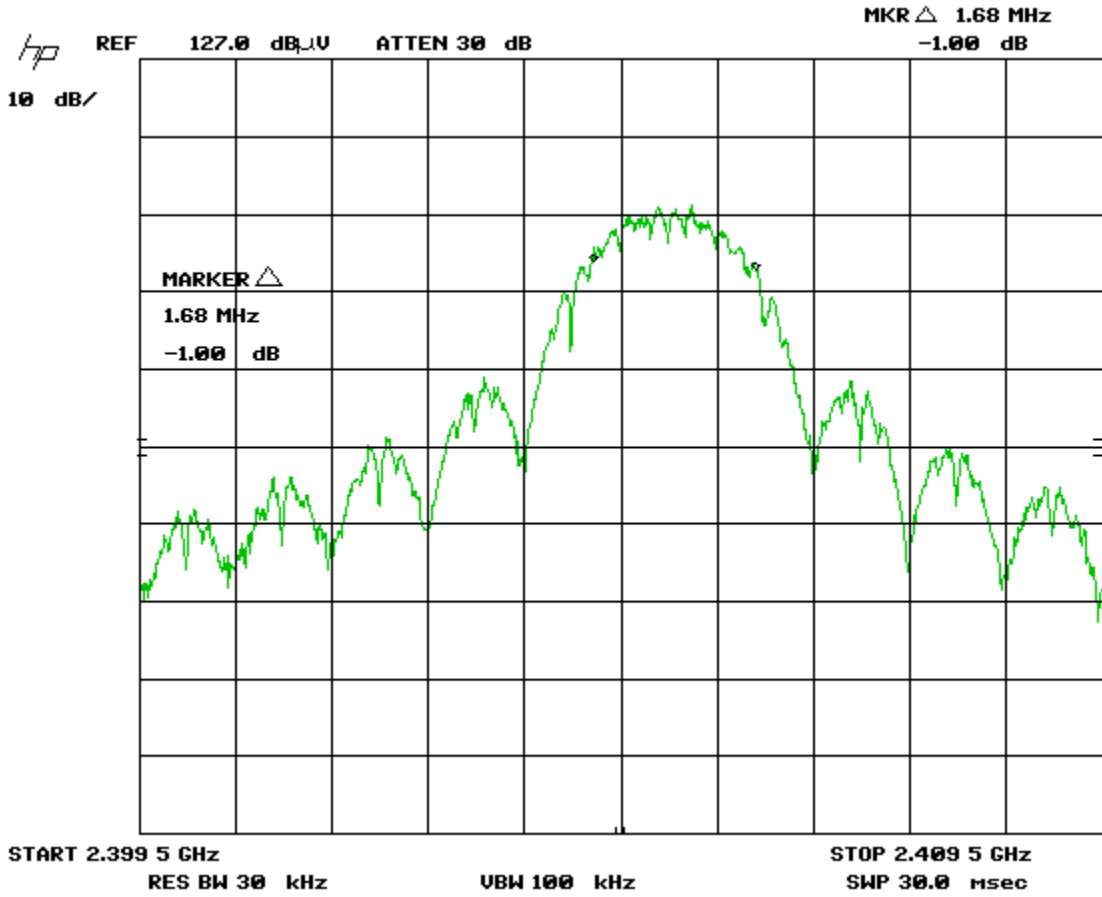
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Middle Channel
 6 dB Bandwidth = 1.55 MHz



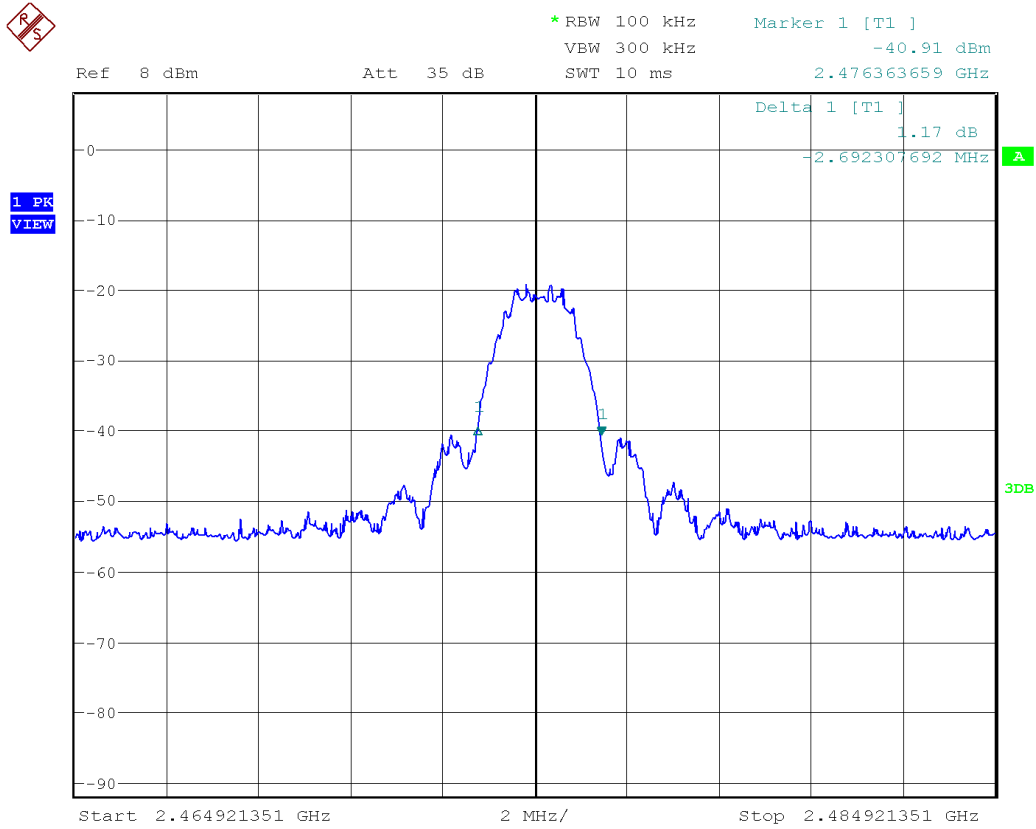
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Low Channel
 6 dB Bandwidth = 1.68




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

For information purposes, the maximum 20 dB bandwidth is 2.69 MHz.




Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Nov 27, 2015	Nov 27, 2017	GEMC 190
Quasi-Peak Adapter	85650A	HP	Nov 27, 2015	Nov 27, 2017	GEMC 191
Horn Antenna 2 – 10 GHz	WBH218HN	Q-par	Feb. 12, 2016	Feb. 12, 2018	GEMC 6375
Pre-amp 1 – 10 GHz	HP 8449B	HP	Sept. 9, 2014	Sept. 9, 2016	GEMC 6351
RF Cable 7m	LMR-400-7M- 50OHM-MN- MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M- 50OHM-MN- MN	LexTec	NCR	NCR	GEMC 29

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Maximum Peak Conducted Output Power

Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified. This ensures that if the end-user replaces the antenna, that the maximum power does not exceed an amount which may create an excessive power level.


Limits

The limits are defined in FCC Part 15.247(b)3 and RSS-247 5.4(4).

For systems using digital modulation in the 2400-2483.5 MHz band, the peak conducted limit is 1 watt (or 30 dBm = 125.2 dB μ V at 3m distance).

Results

The EUT passed. The peak power measured is 18.5 dBm (70.8 mW).


Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Table(s)

The table below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. Peak detector was used with max hold. The EUT was transmitting continuous modulated data at the maximum output power used by the manufacturer.

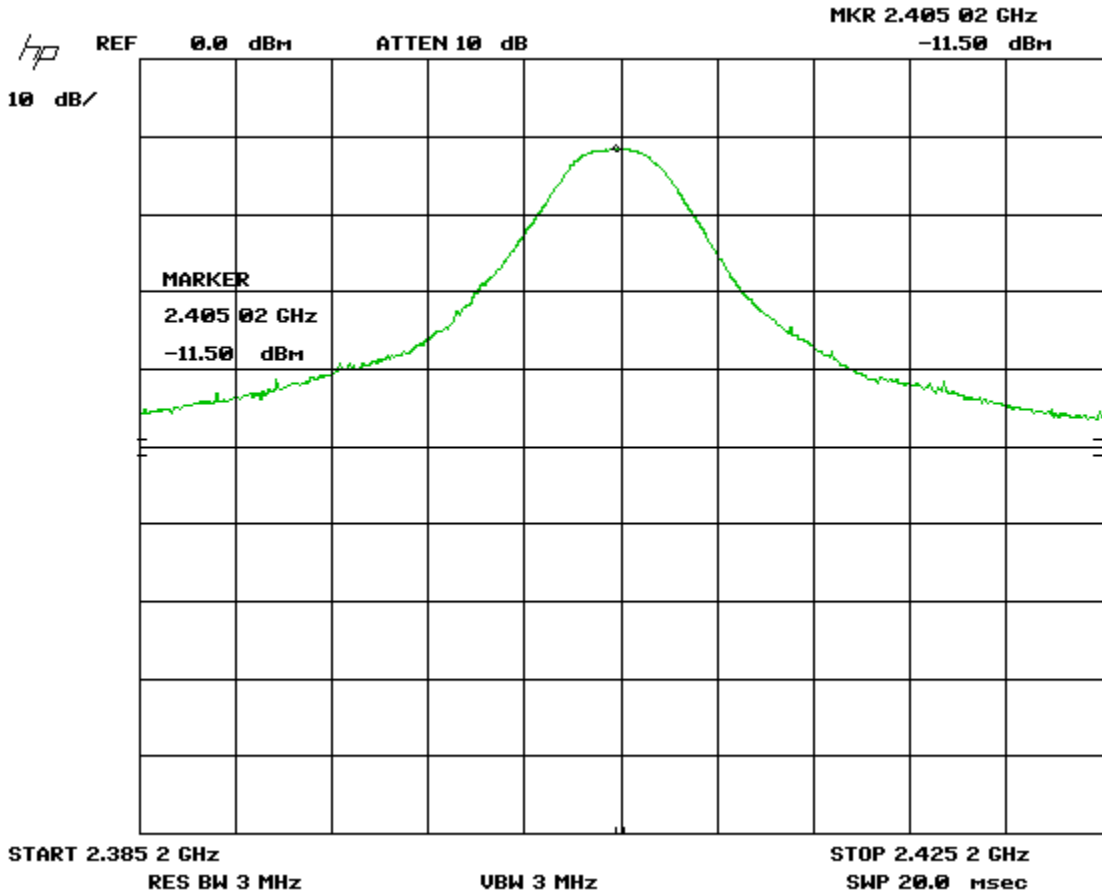
Table 1 - Max peak conducted output power


Test Frequency (MHz)	Channel	Measured Reading (dBm)	External Attenuator (dB)	Output Power (dBm)	Output Limit (dBm)	Margin (dB)	Result
2405.0	Low	-11.5	30.0	18.5	30.0	11.5	Pass
2445.5	Middle	-12.6	30.0	17.4	30.0	12.6	Pass
2475.3	High	-15.3	30.0	14.7	30.0	15.3	Pass

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Low Channel

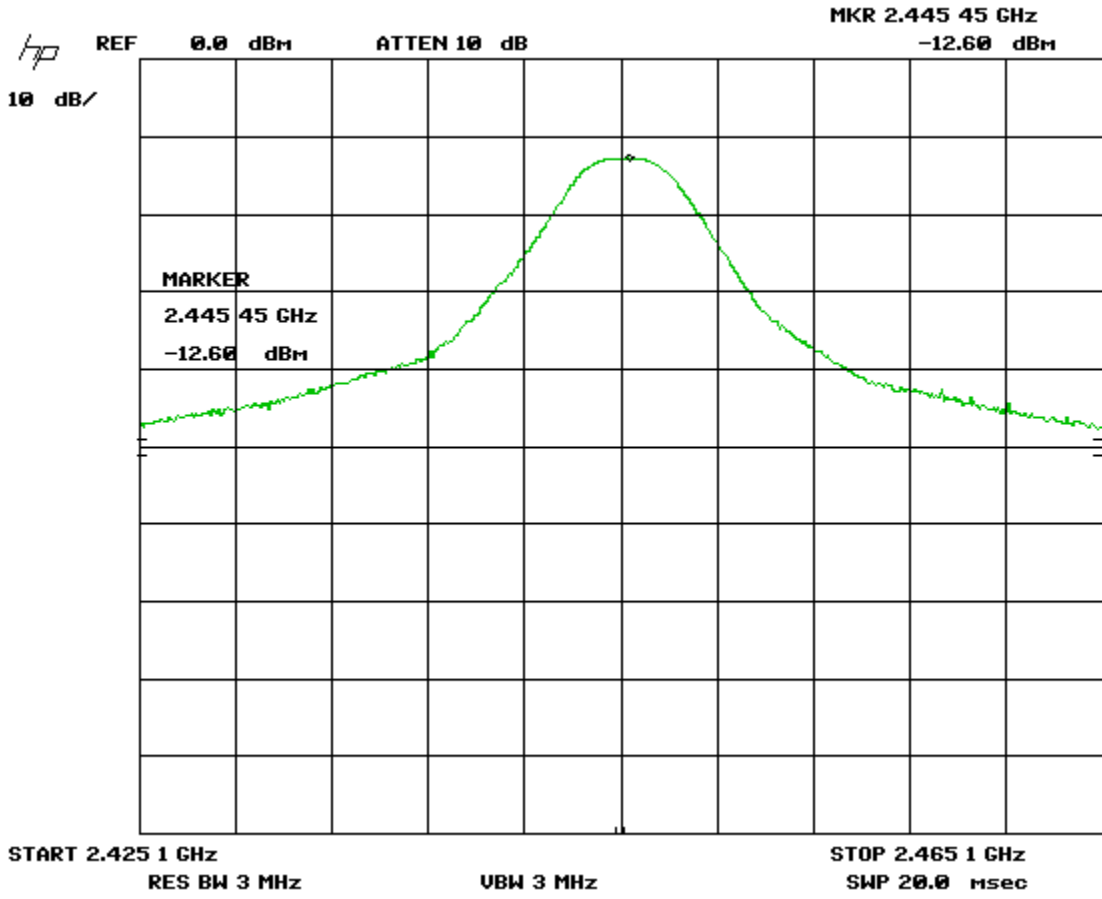
Note: 30 dB attenuator used when making measurements shown below.




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Middle Channel

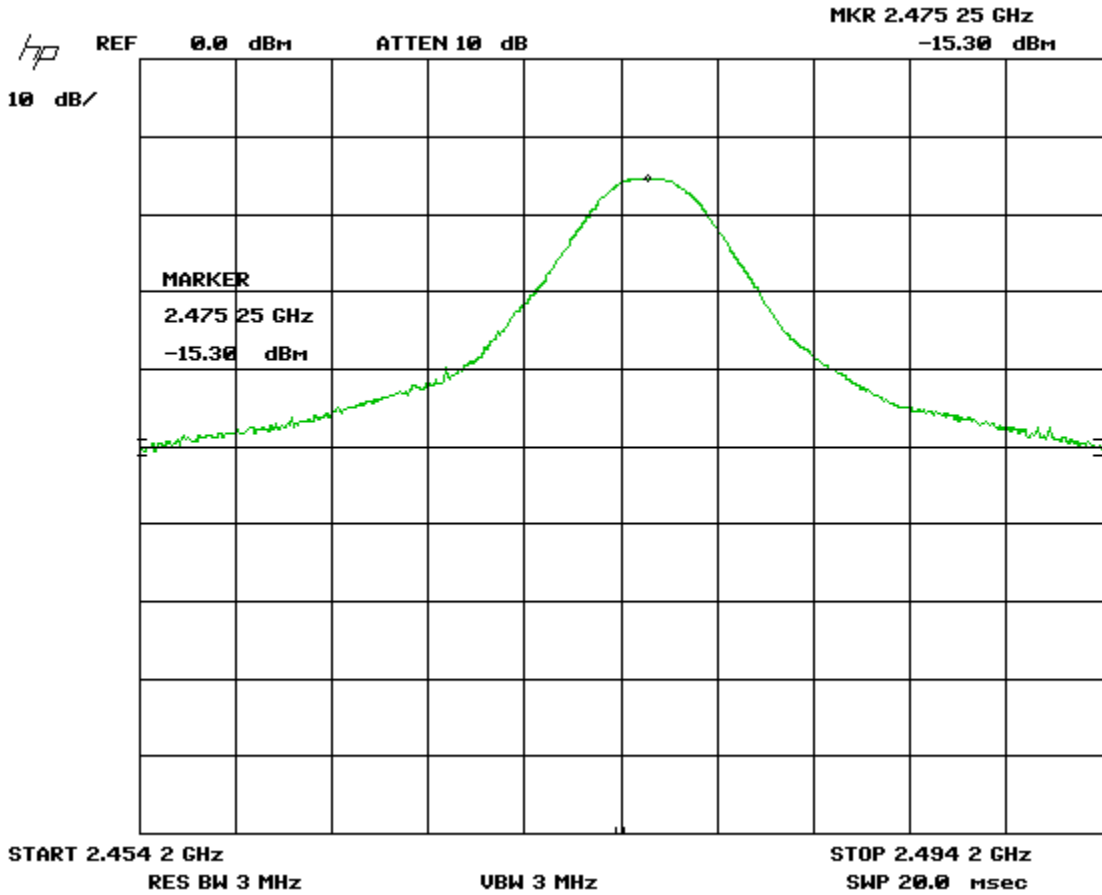
Note: 30 dB attenuator used when making measurements shown below.




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

High Channel


Note: 30 dB attenuator used when making measurements shown below.



Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Nov 27, 2015	Nov 27, 2017	GEMC 190
Quasi-Peak Adapter	85650A	HP	Nov 27, 2015	Nov 27, 2017	GEMC 191
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Maximum Peak E.I.R.P Output

Purpose

The purpose of this test is to ensure that the maximum power output does not exceed the limits specified when used with the antenna, which may provide gain. This ensures that the maximum power does not exceed an amount which may create an excessive power level.

Limits


The limits are defined in RSS-247 5.4(4).

For DTSs operating in the 2400-2483.5 MHz band, the peak E.I.R.P. limit is 4 Watts (or 36 dBm = 131.2 dB μ V at a 3m distance).

Results

The EUT passed. The peak E.I.R.P. is 19.3 dBm (85.1 mW, or 114.5 dB μ V/m at 3 m).

Calculated antenna gain = (Peak E.I.R.P) – (Peak Conducted Power Output)
= 19.3 dBm – 18.5 dBm = 0.8 dBi


Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Table(s)

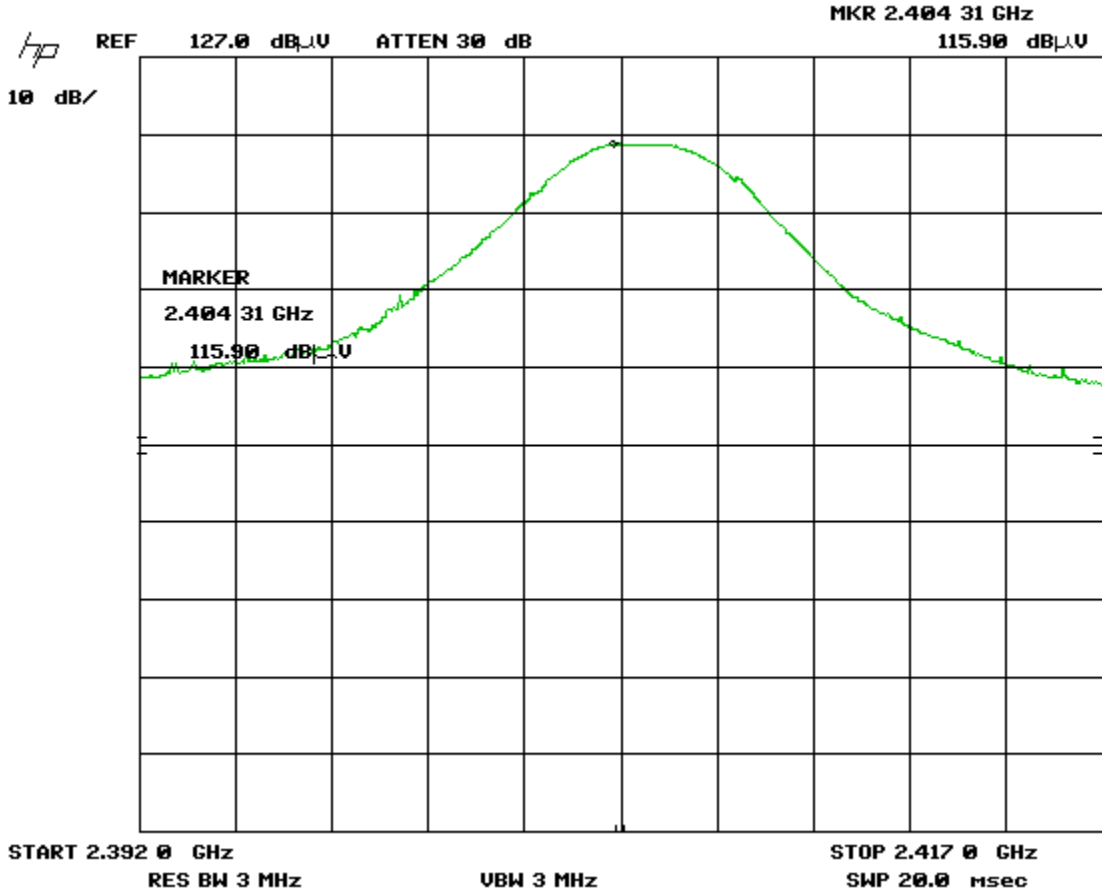
The table below shows the measured peak power output of the device. Peak measurements were made during transmit operation of the EUT with continuous modulated data at the maximum output power used by the manufacturer. Worst case plots are shown.


Table 2 – Max peak E.I.R.P. output

Test Frequency (MHz)	Channel	Antenna polarity	Received Reading dB(μV)	Antenna factor (dB)	Cable Loss (dB)	Pre-Amp Gain dB	Received signal at 3m (dBμV)	Emission limit dB(μV)	Margin dB(μV)	Result
2404.3	Low	Vertical	115.9	28.3	4.1	33.8	114.5	125.20	10.7	Pass
2405.1	Low	Horizontal	114.0	28.3	4.1	33.8	112.6	125.20	12.6	Pass
2445.5	Middle	Vertical	113.8	28.6	4.1	33.8	112.7	125.20	12.5	Pass
2445.2	Middle	Horizontal	110.6	28.6	4.1	33.8	109.5	125.20	15.7	Pass
2475.4	High	Vertical	110.5	28.9	4.1	33.8	109.7	125.20	15.5	Pass
2475.3	High	Horizontal	110.1	28.9	4.1	33.8	109.3	125.20	15.9	Pass

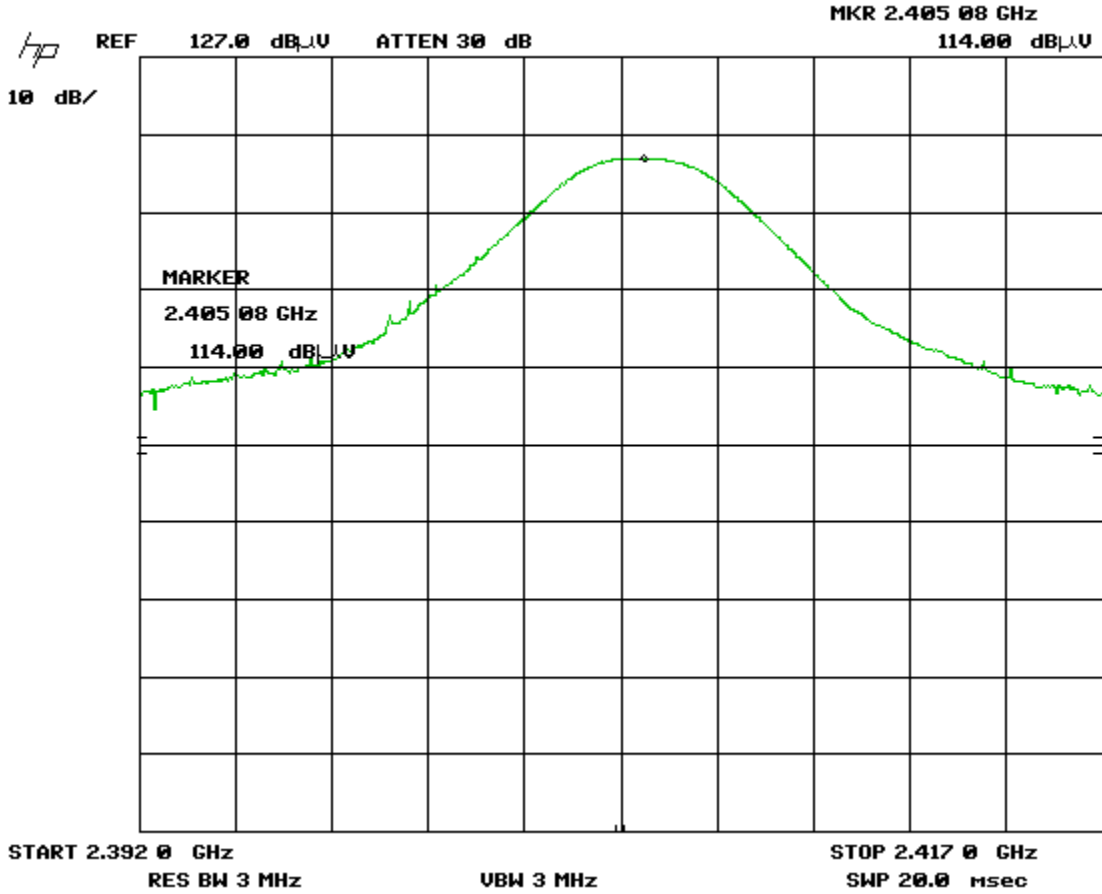
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Low Channel
Vertical Antenna Polarity



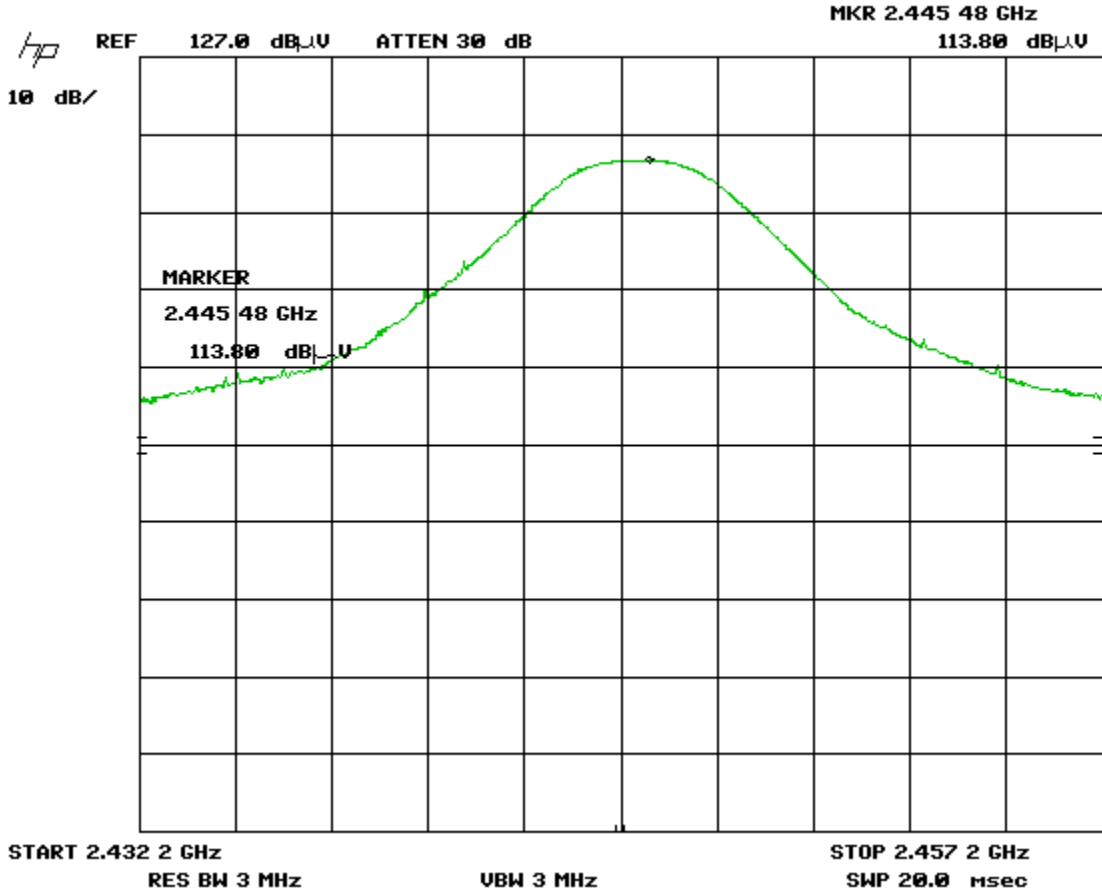
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Low Channel
Horizontal Antenna Polarity



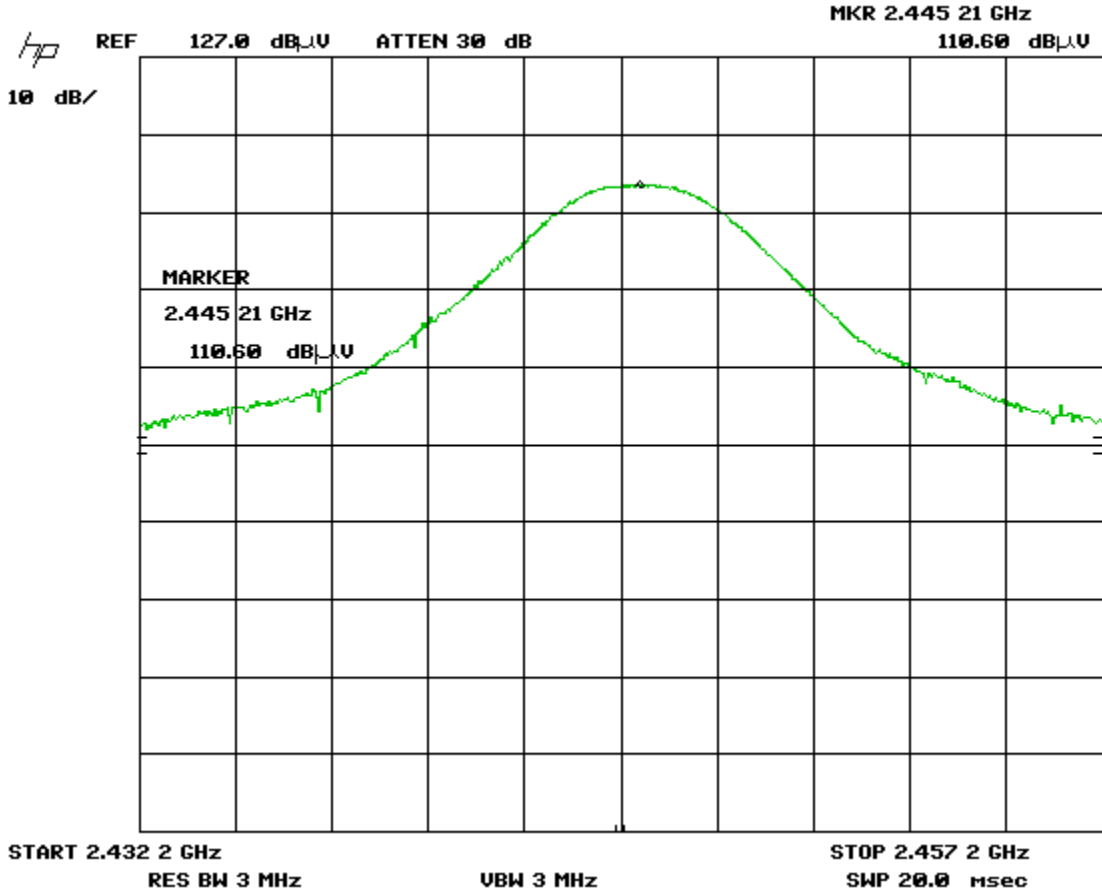
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Middle Channel
Vertical Antenna Polarity



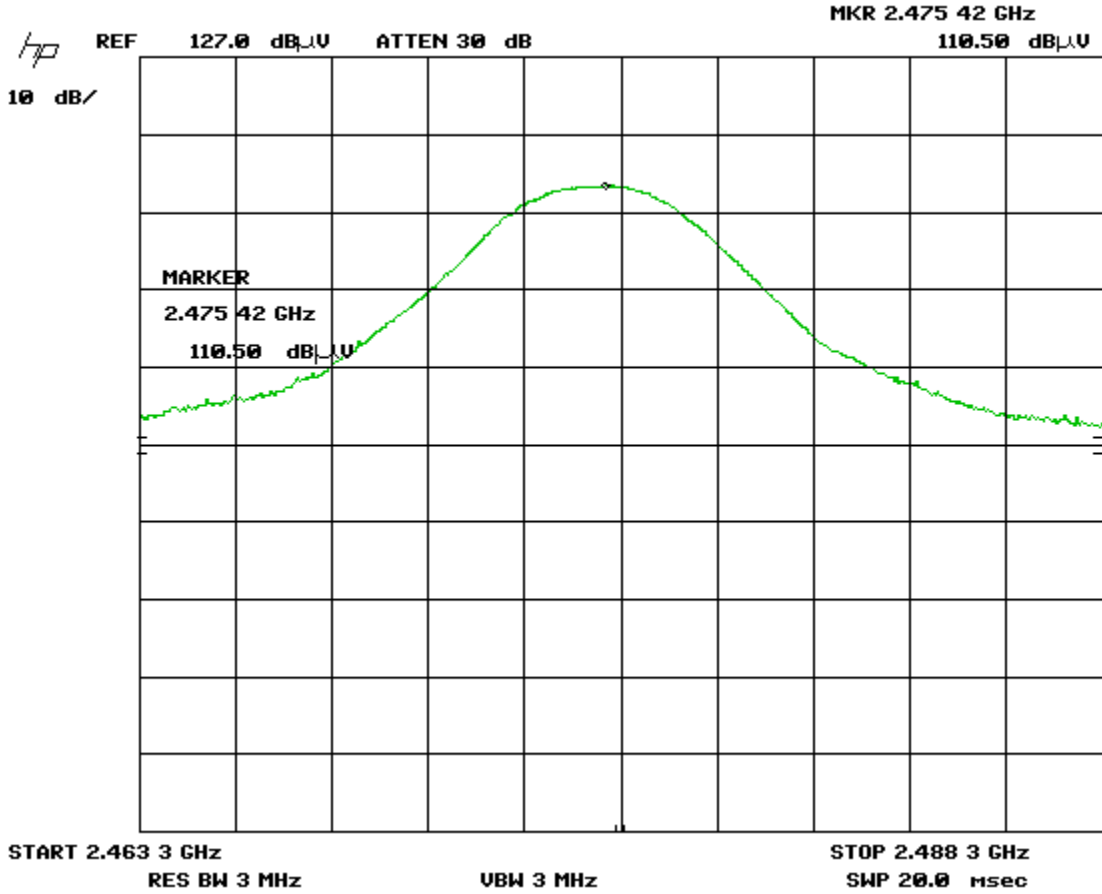
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Middle Channel
Horizontal Antenna Polarity



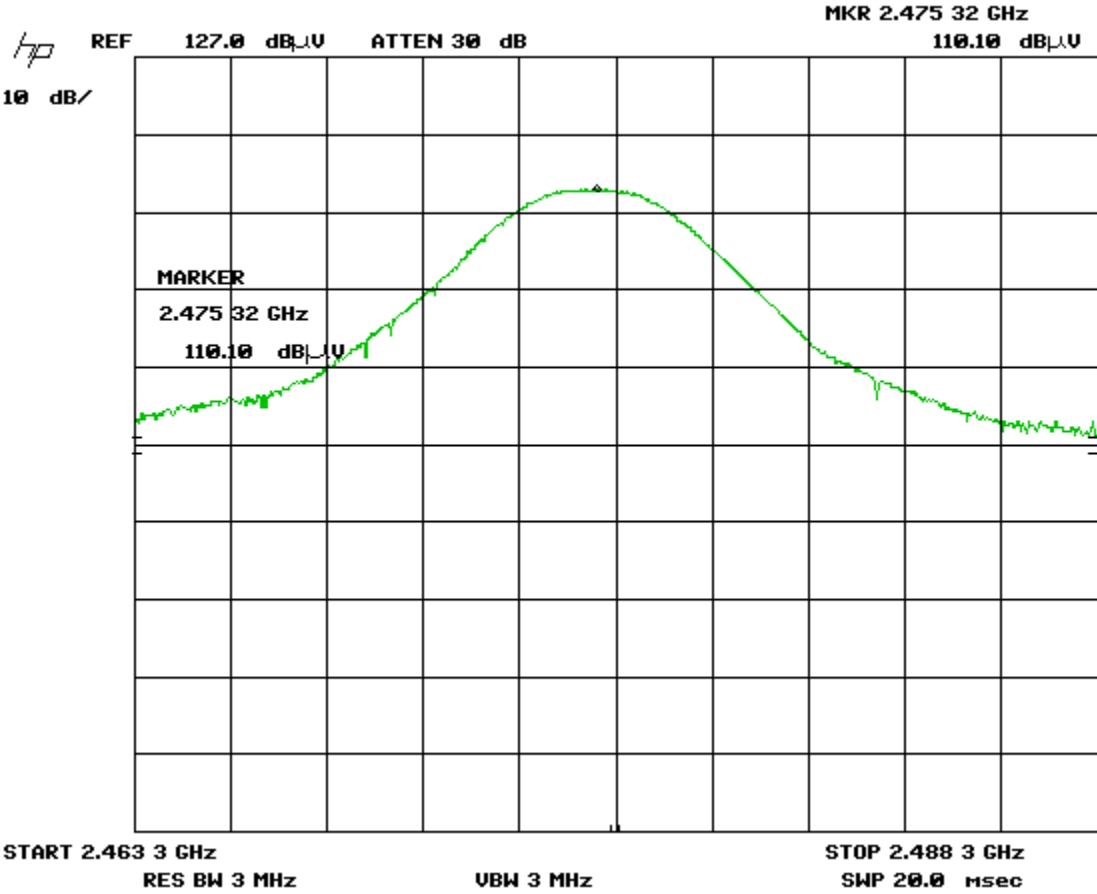
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

High Channel
Vertical Antenna Polarity




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

High Channel
Horizontal Antenna Polarity




Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Nov. 27, 2015	Nov. 27, 2017	GEMC 190
Quasi-Peak Adapter	85650A	HP	Nov. 27, 2015	Nov. 27, 2017	GEMC 191
Horn Antenna 2 – 10 GHz	WBH218HN	Q-par	Feb. 12, 2016	Feb. 12, 2018	GEMC 6375
Pre-amp 1 – 10 GHz	HP 8449B	HP	Sept. 9, 2014	Sept. 9, 2016	GEMC 6351
RF Cable 7m	LMR-400-7M- 50OHM-MN- MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M- 50OHM-MN- MN	LexTec	NCR	NCR	GEMC 29

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Antenna Spurious Conducted Emissions (-20 dBc)

Purpose


The purpose of this test is to ensure that the maximum power conducted to the radiating element at frequencies outside of the authorized spectrum does not exceed the limits specified. This ensures that the only the intended signal is delivered to the radiating element.

Limits

The limits are defined in FCC Part 15.247(d) and RSS-247 5.5. In any 100 kHz band outside the frequency band in which the intentional radiator is operating, the peak spurious harmonics emissions must be at least 20 dB below the fundamental. Spurious conducted emissions are to be evaluated up to the 10th harmonic. This -20 dBc requirement also applies at the ‘band edge’ or 2.4 GHz and 2.4835 GHz.

Results

The EUT passes. Low, middle and high channels were measured. The worst case is presented as a graph for the spectrum. The -20 dBc requirement is shown for the lower band edge at 2.4 GHz in the low band, and for the high band edge at 2.4835 GHz in the high band.

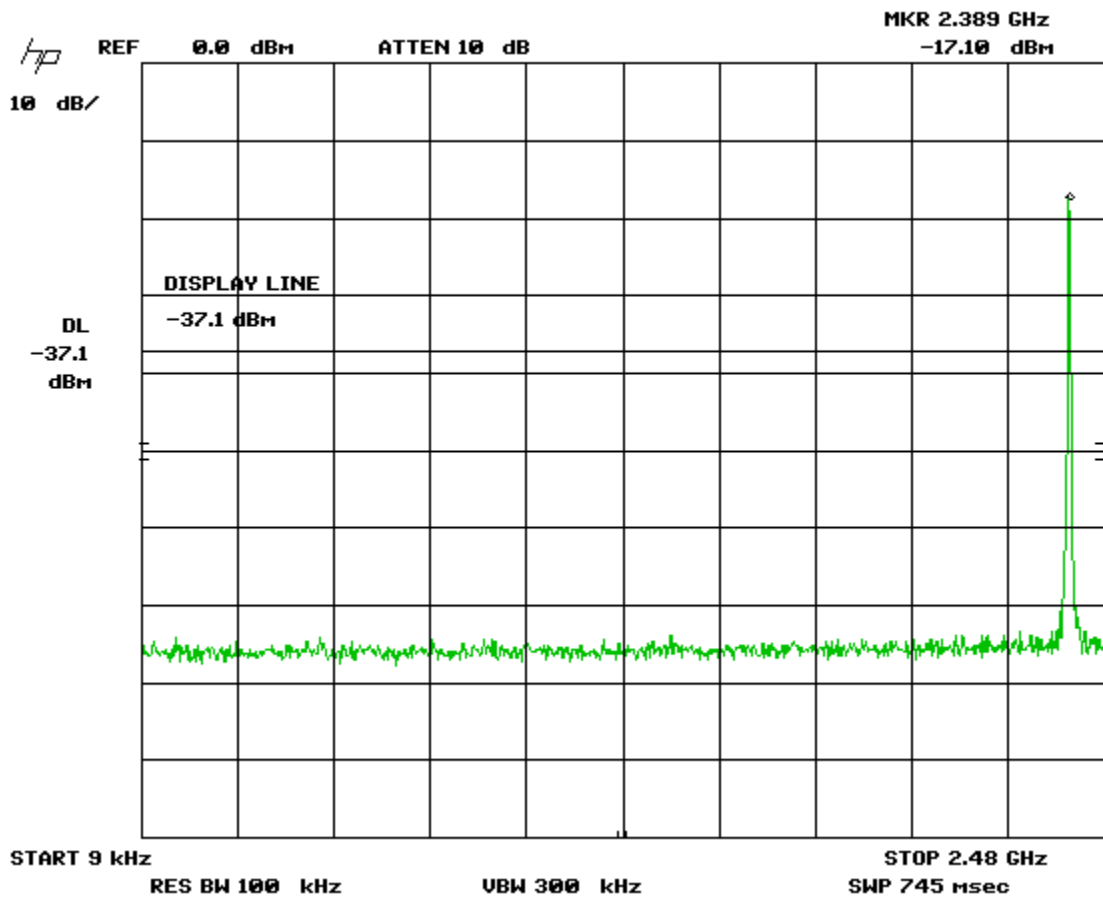
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Graph(s)

The graphs shown below shows the peak conducted power output of the device during transmit operation of the EUT at max output power, continuous transmission of data.

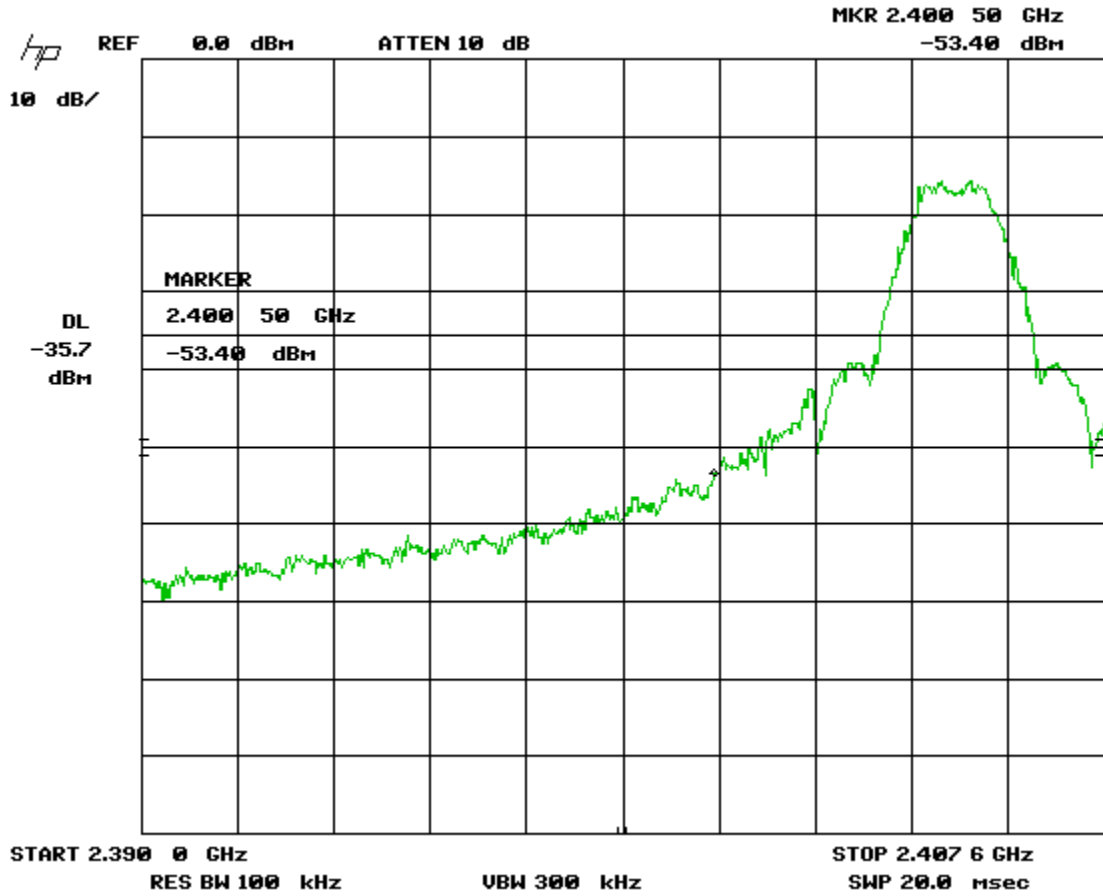
Note: 30 dB of external attenuation is used during these measurements.


9 kHz – 2480 MHz, Low Channel



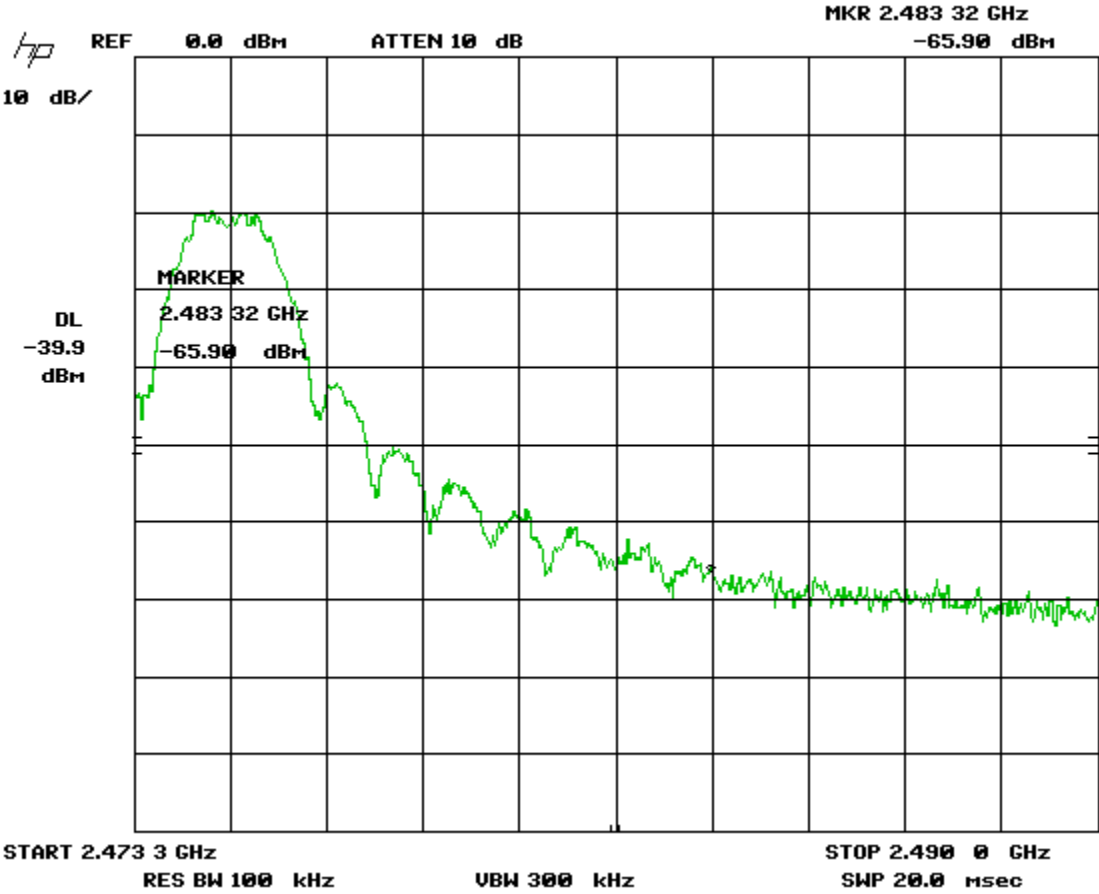
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


2390 MHz – 2407.6 MHz, Low Channel
2.4 GHz Lower Band Edge



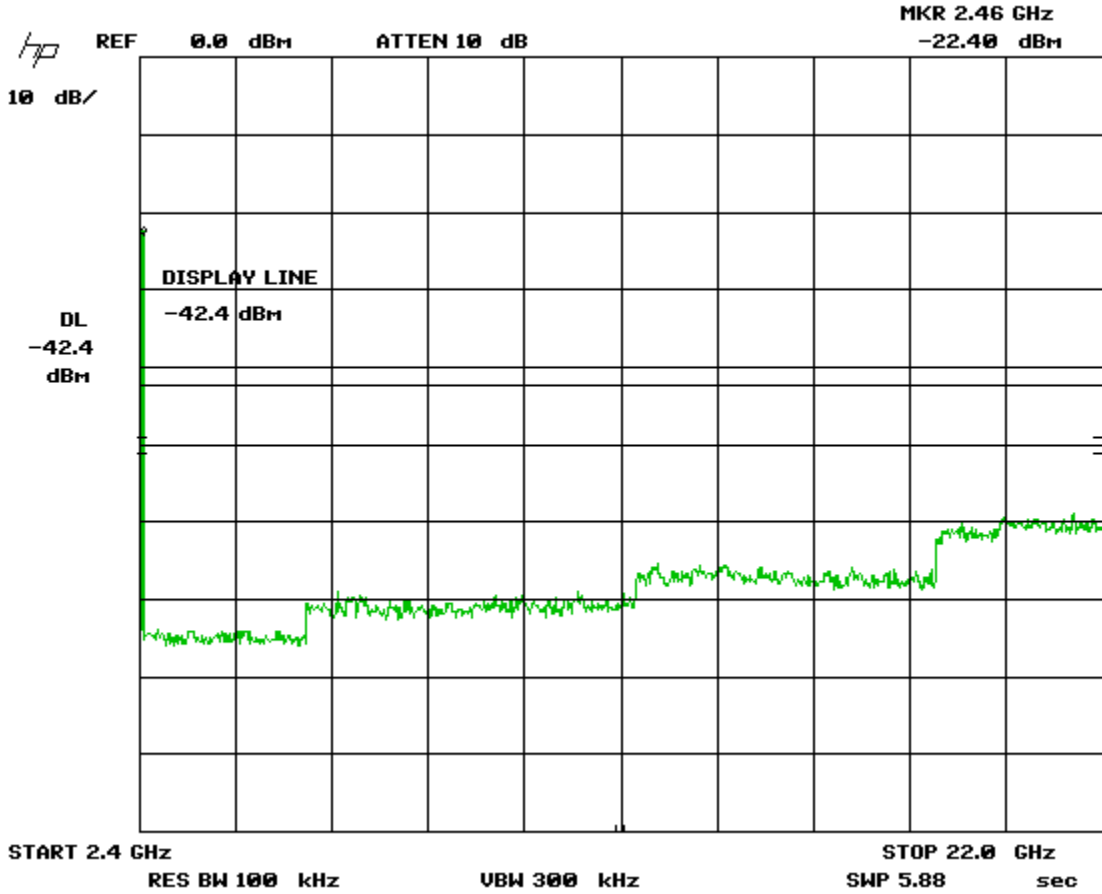
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


2473.3 MHz – 2490.0 MHz, High Channel
 2.4835 GHz Upper Band Edge



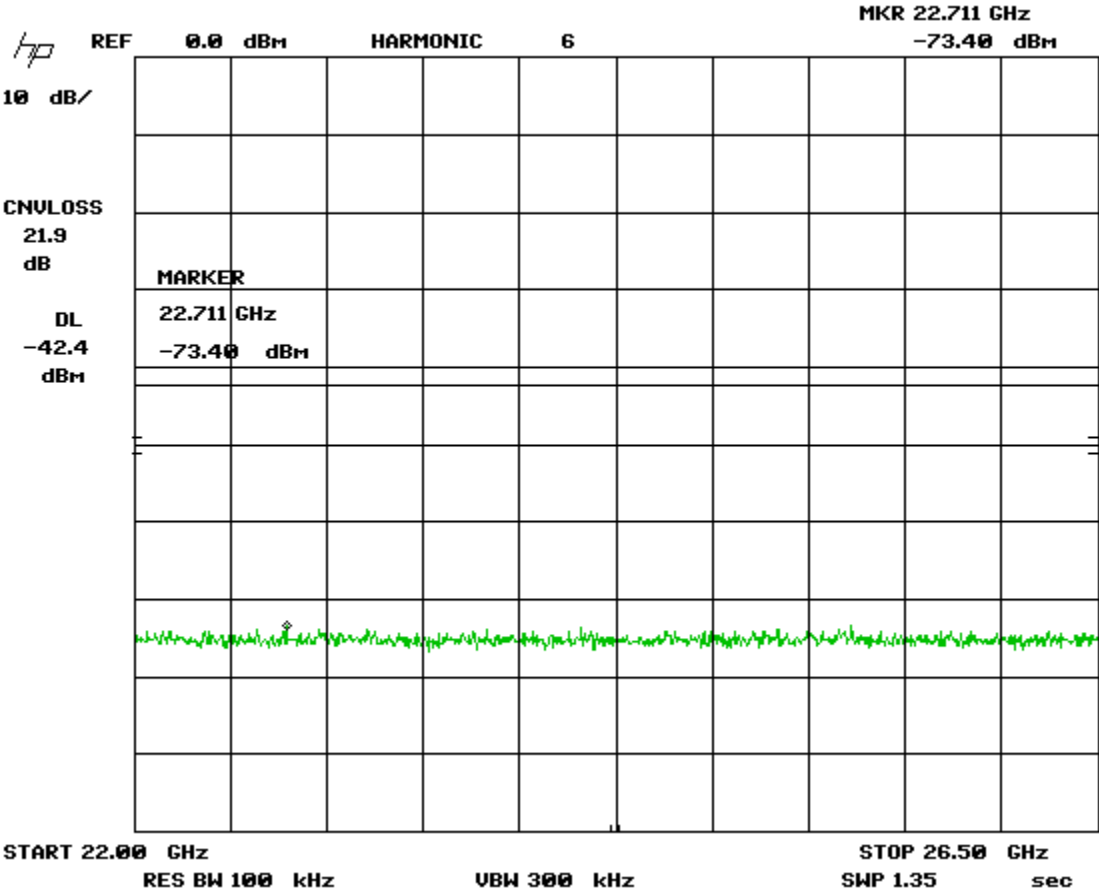
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


2.4 GHz – 22 GHz, High Channel



Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


22 GHz – 26.5 GHz, High Channel



Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Nov. 27, 2015	Nov. 27, 2017	GEMC 190
Quasi-Peak Adapter	85650A	HP	Nov. 27, 2015	Nov. 27, 2017	GEMC 191
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Power Spectral Density

Purpose

The purpose of this test is to ensure that the maximum power spectral density to the radiating element does not exceed the limits specified. This ensures that the modulation is significantly wide enough, or low enough in power that it will allow for co-operation of other wireless devices operating within this frequency allocation.

Limits

The limits are defined in FCC Part 15.247(e) and RSS-247 5.2(2).


For digitally modulated systems, the Power Spectral Density (PSD) conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Results

The EUT passed. Low, middle, and high channel was tested. Peak measurements were made for each with a 3 kHz resolution bandwidth, during transmit operation of the EUT with continuous modulated data. The power spectral density is < 8dBm.

Table 3: Maximum Power Spectral Density

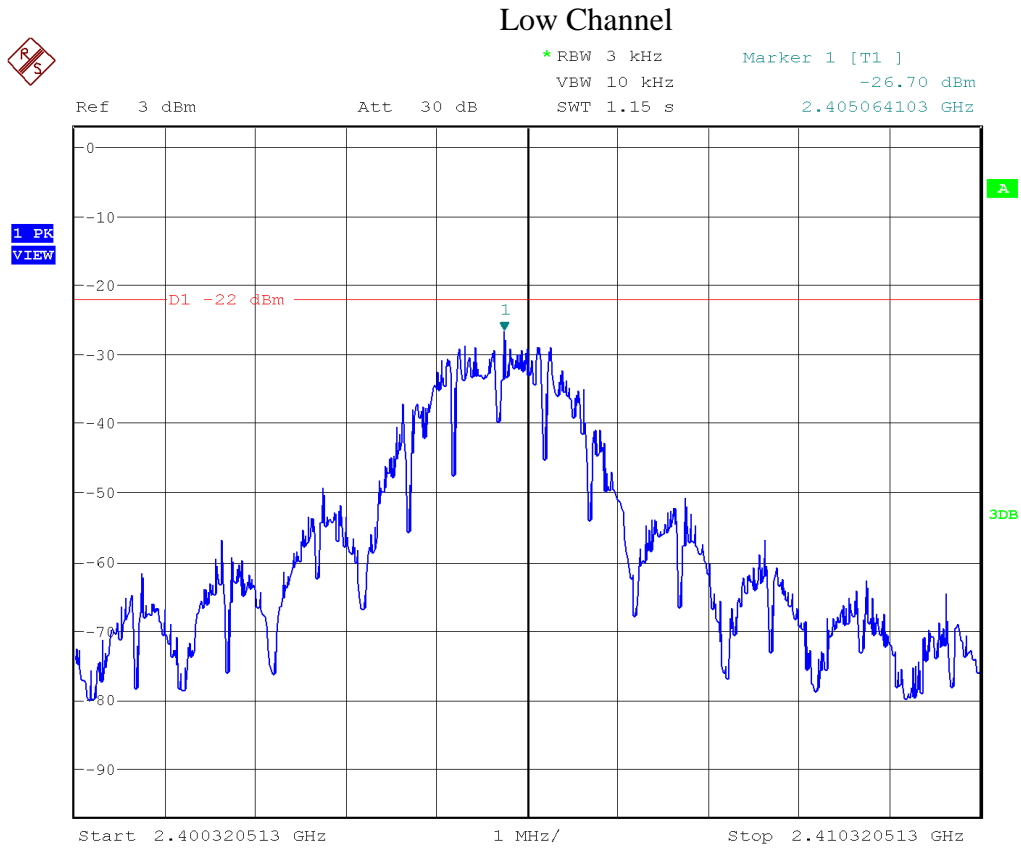
Test Frequency (MHz)	Channel	Received Reading (dBm)	External Attenuator (dB)	Output Power (dBm)	PSD Limit (dBm)	Margin (dB)	Result
2405.0	Low	-26.7	30.0	3.3	8.00	4.7	Pass
2445.5	Middle	-27.8	30.0	2.2	8.00	5.8	Pass
2475.3	High	-29.8	30.0	0.2	8.00	7.8	Pass


Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Graph(s)

The graphs shown below show the power spectral density of the device during the operation of the EUT. Low, middle, and high channels were investigated.


Note: 30 dB attenuator was used to make the measurements shown below.



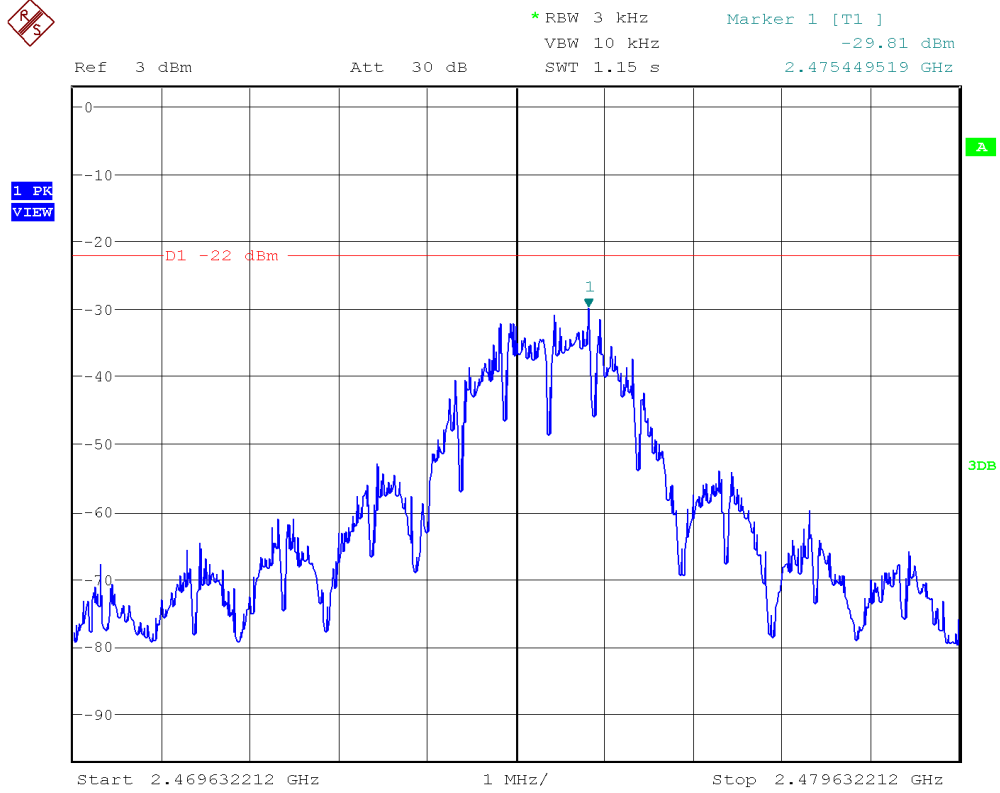
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Middle Channel



Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


High Channel



Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	FSU	Rohde & Schwarz	Jan. 19, 2015	Jan. 19, 2017	GEMC 198

Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Spurious Radiated Emissions & Restricted Bands

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit(s) and Method

The method is as defined in ANSI C63.4.

The restricted bands are defined in 47 CFR FCC Part 15.205 and RSS-Gen (Table 6).

The limits are as defined in 47 CFR FCC Part 15.209 and RSS- Gen (Table 4).

The requirement is stated in 47 CFR FCC Part 15 Section FCC 15.247(d), and RSS-247 5.5.

The limits for unintentional radiated emissions apply for those emissions that fall in the restricted bands. These limits are as follows:

0.009 MHz – 0.490 MHz, 2400/F(kHz) uV/m at 300 m ¹

0.490 MHz – 1.705 MHz, 24000/F(kHz) uV/m at 30 m ¹

1.705 MHz – 30 MHz, 30 uV/m at 30 m ¹

30 MHz – 88 MHz, 100 uV/m (40.0 dBuV/m ¹) at 3 m

88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m ¹) at 3 m

216 MHz – 960 MHz, 200 uV/m (46.0 dBuV/m¹) at 3 m

Above 960 MHz, 500 uV/m (54.0 dBuV/m ¹) at 3 m


Above 1000 MHz, 500 uV/m (54 dBuV/m ²) at 3m

Above 1000 MHz, 5011.9 uV/m (74 dBuV/m ³) at 3m

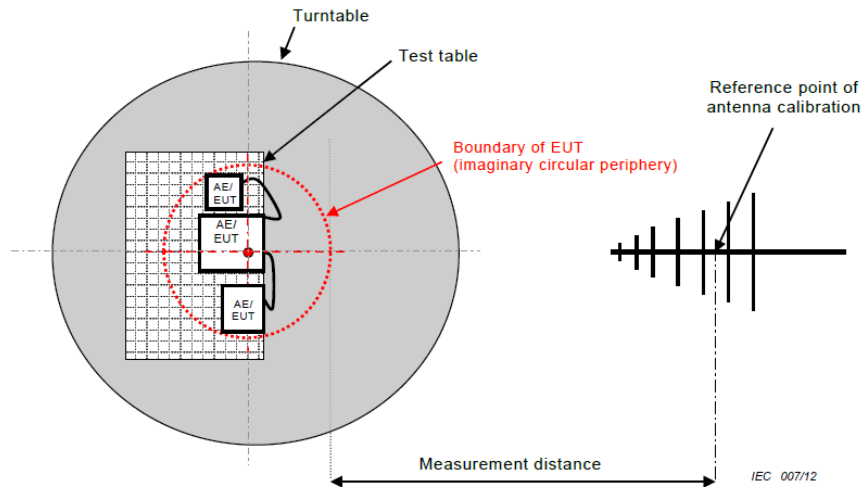
¹Limit is with Quasi Peak detector with bandwidths as defined in CISPR-16-1-1.

²Limit is with 1 MHz measurement bandwidth and using an Average detector.

³Limit is with 1 MHz measurement bandwidth and using a Peak detector.

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Typical Radiated Emissions Setup



Measurement Uncertainty


The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-4.4 dB with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graphs shown below are maximized peak measurement graphs, measured with a resolution bandwidth greater than or equal to, the final required detector and over a full 0-360° rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement, and provides considerable time savings.

In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10th harmonic.


Devices scanned may be scanned at alternate test distances, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above 30 MHz and 40 dB/decade below 30 MHz. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m/3m) is applied.

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

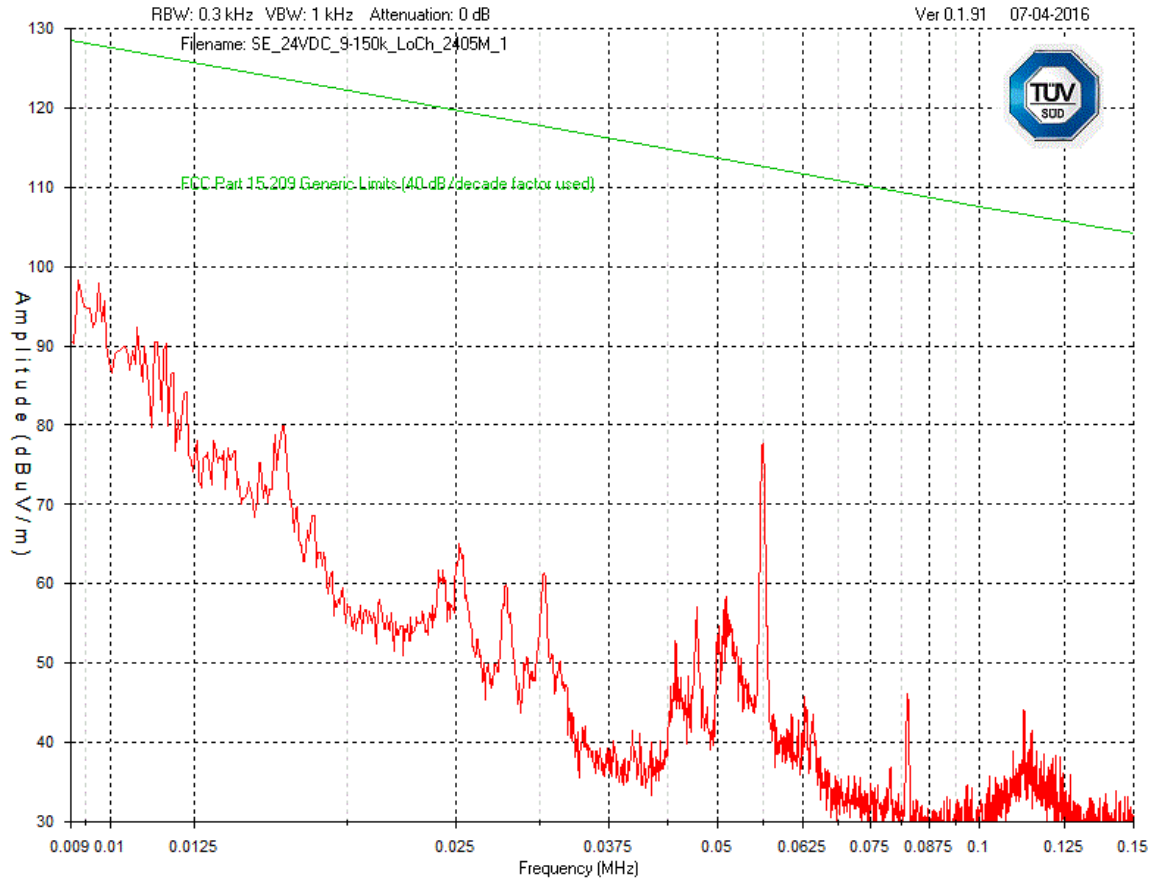
See *Final Measurements* section for measurement data.


EUT was scanned at low, middle, and high channels. Worst case data is presented.

All transmitters in EUT are on and transmitting continuous modulated data at maximum power setting used by the manufacturer.

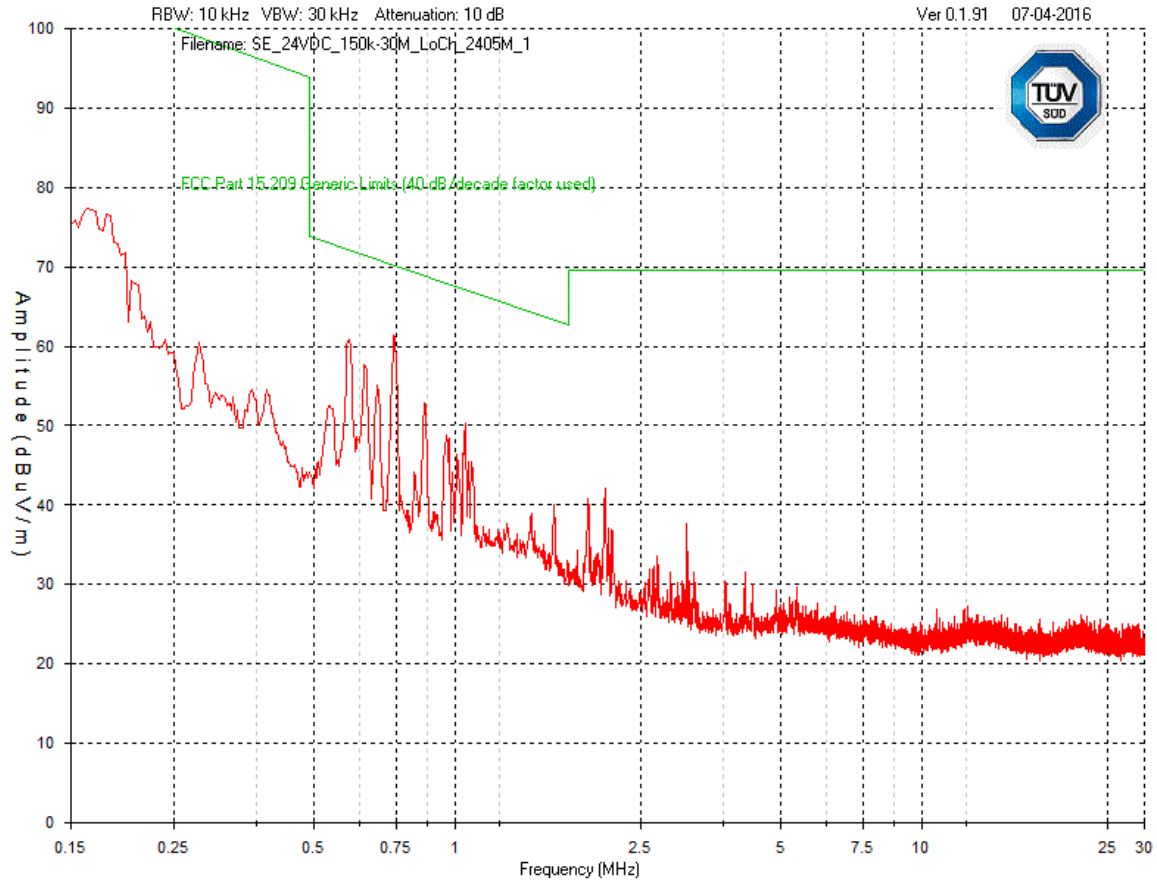
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Peak Emissions Graph 9 kHz to 150 kHz



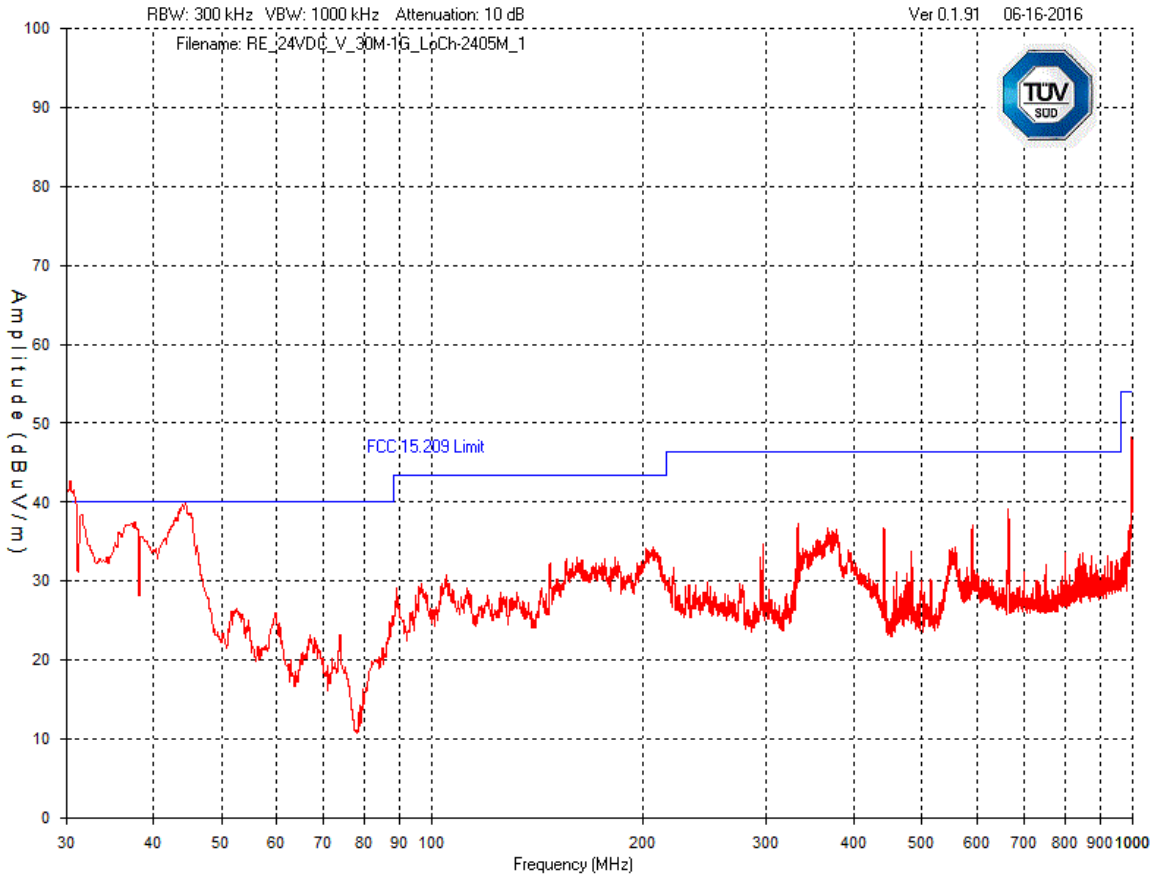
Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Peak Emissions Graph 150 kHz to 30 MHz



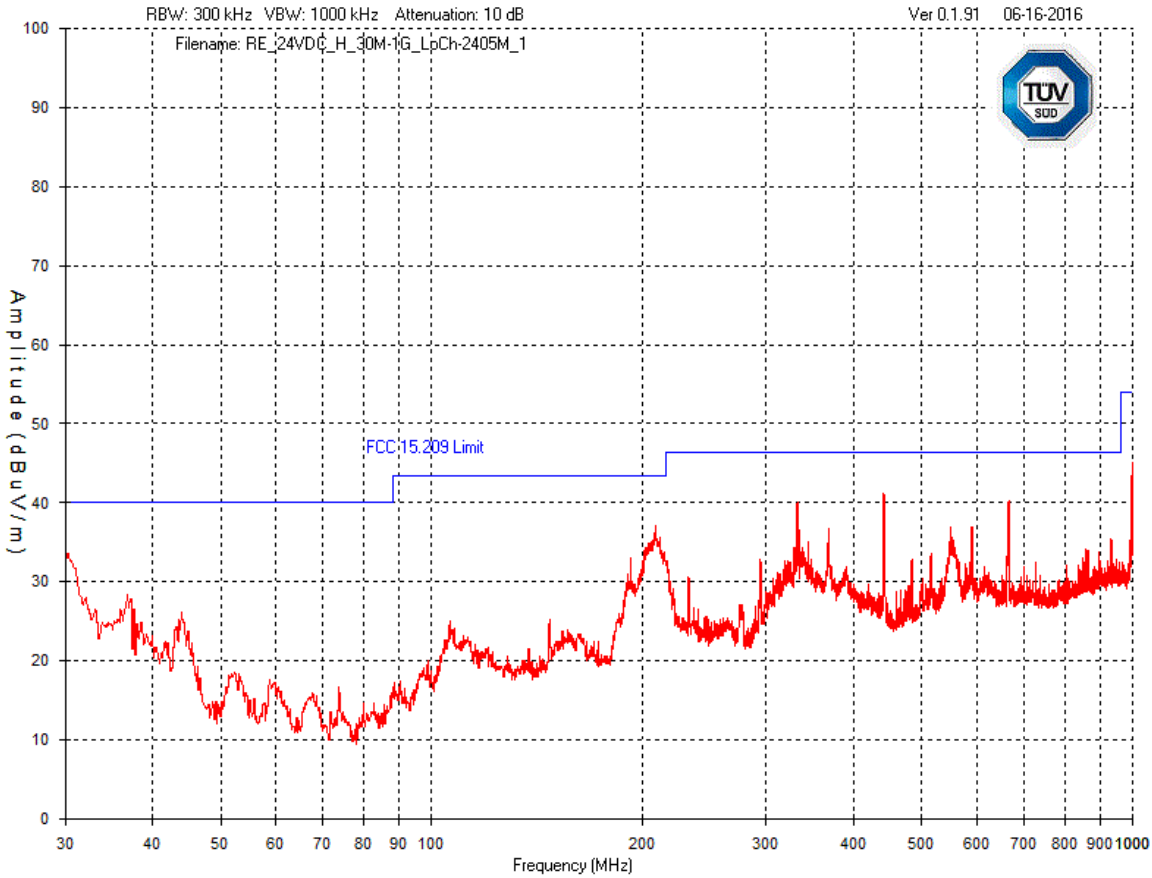
Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Peak Emissions Graph
Vertical Antenna Polarity
30 MHz to 1 GHz



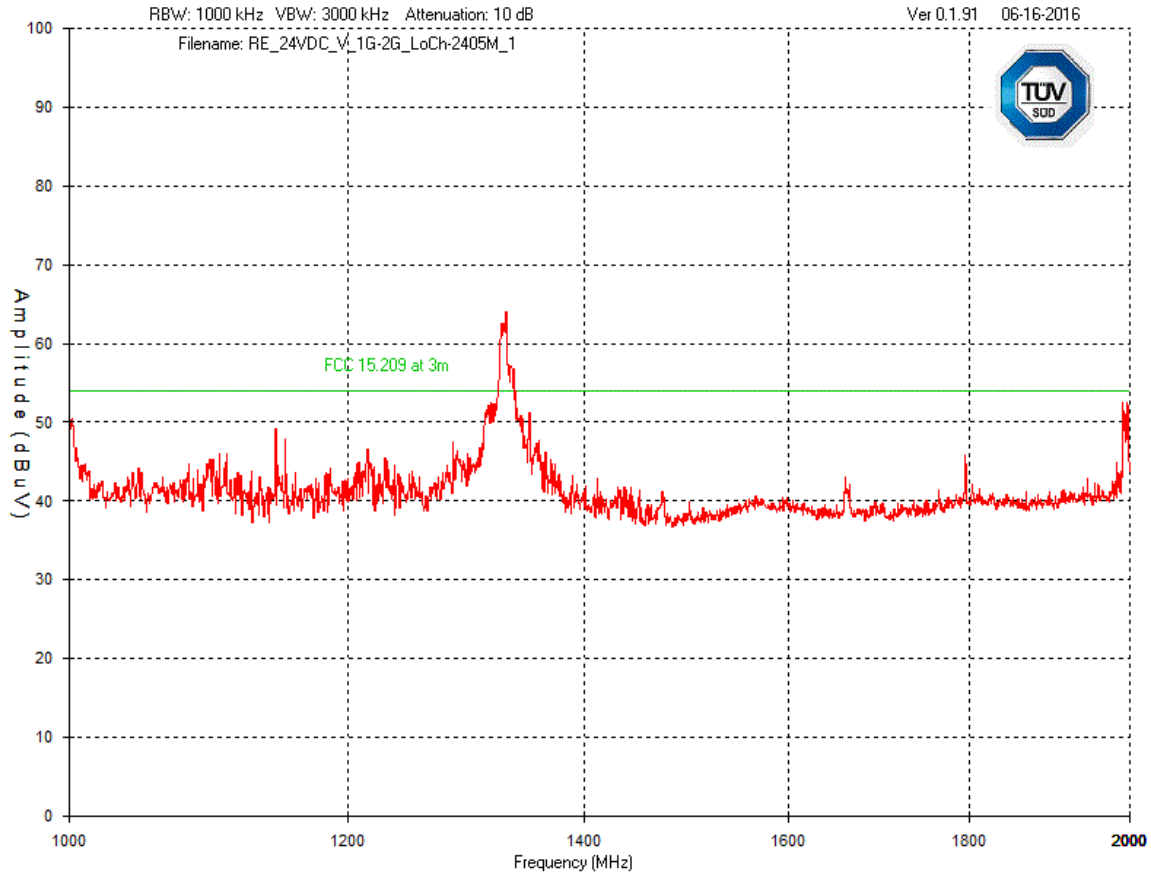
Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Peak Emissions Graph
Horizontal Antenna Polarity
30 MHz to 1 GHz



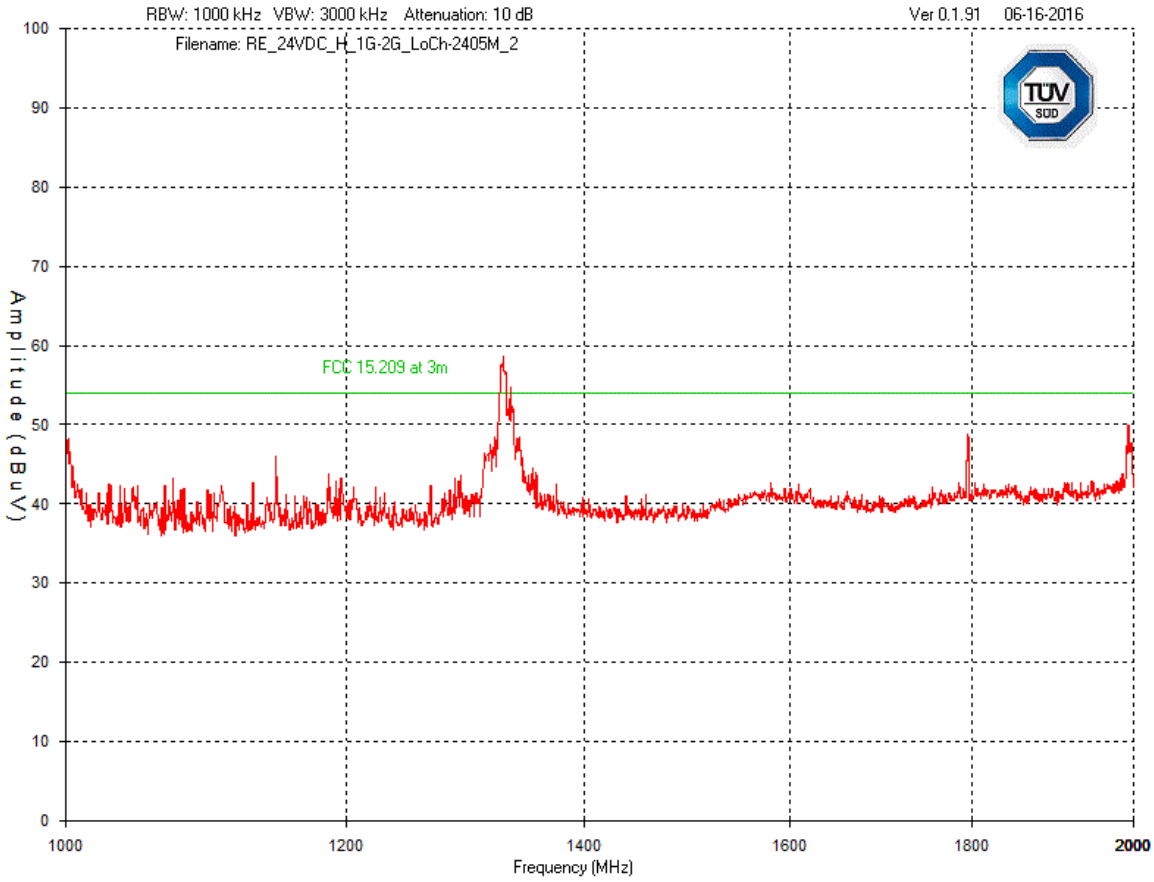
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Peak Emissions Graph
Vertical Antenna Polarity
1 GHz to 2 GHz



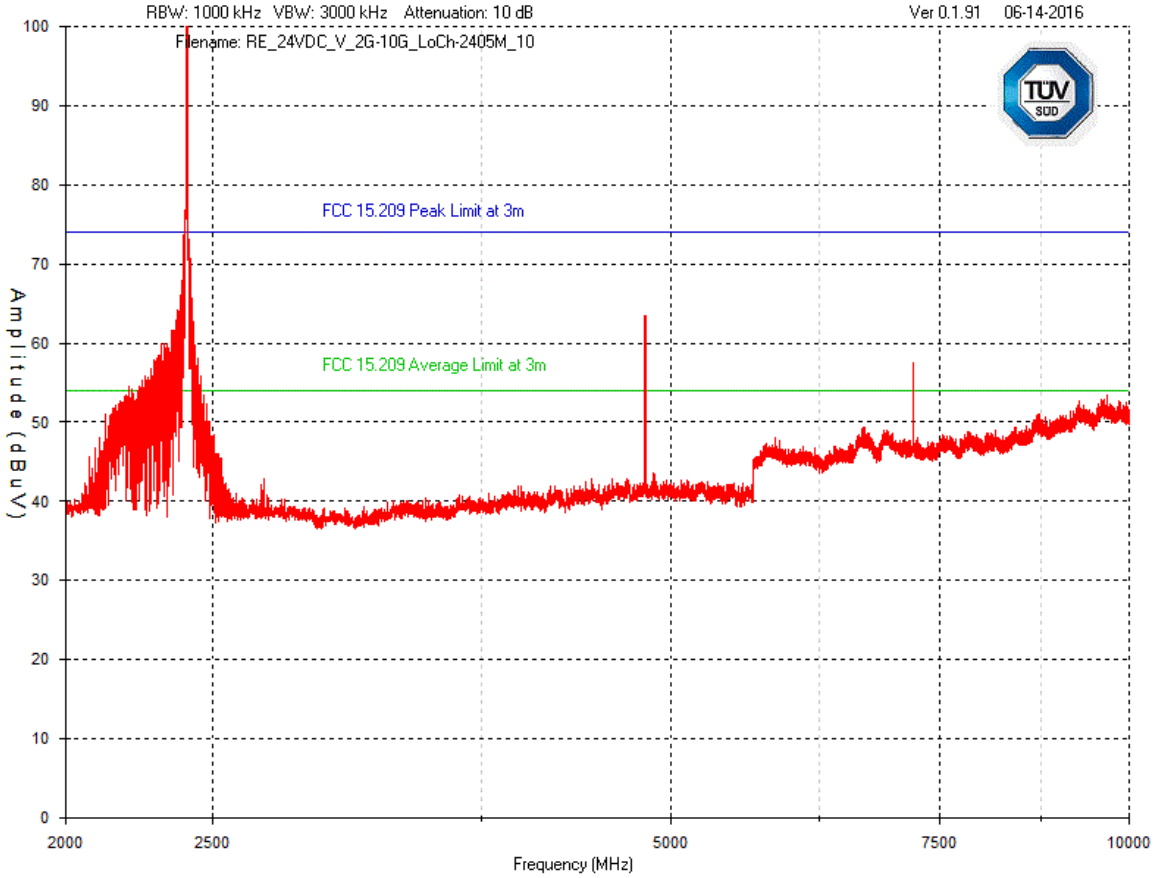
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Peak Emissions Graph
Horizontal Antenna Polarity
1 GHz to 2 GHz



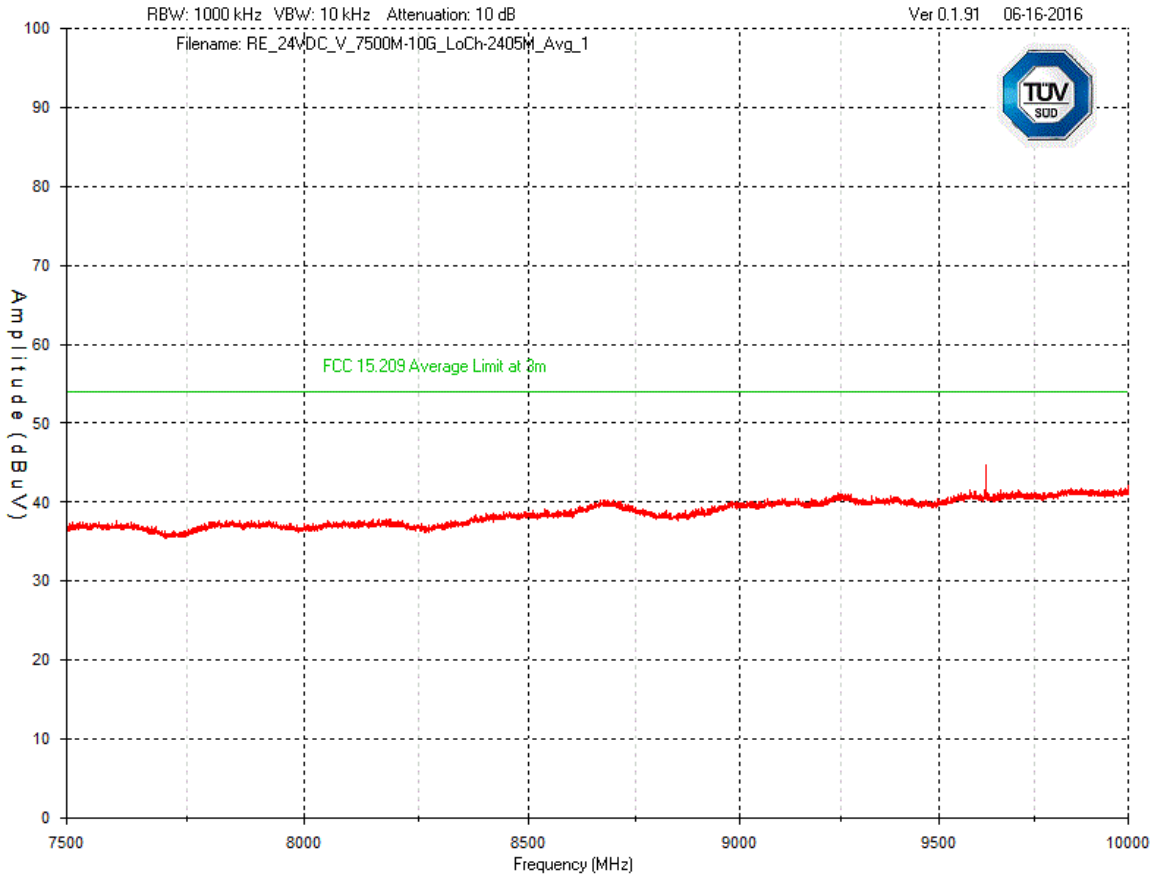
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Peak Emissions Graph
Vertical Antenna Polarity
2 GHz to 10 GHz



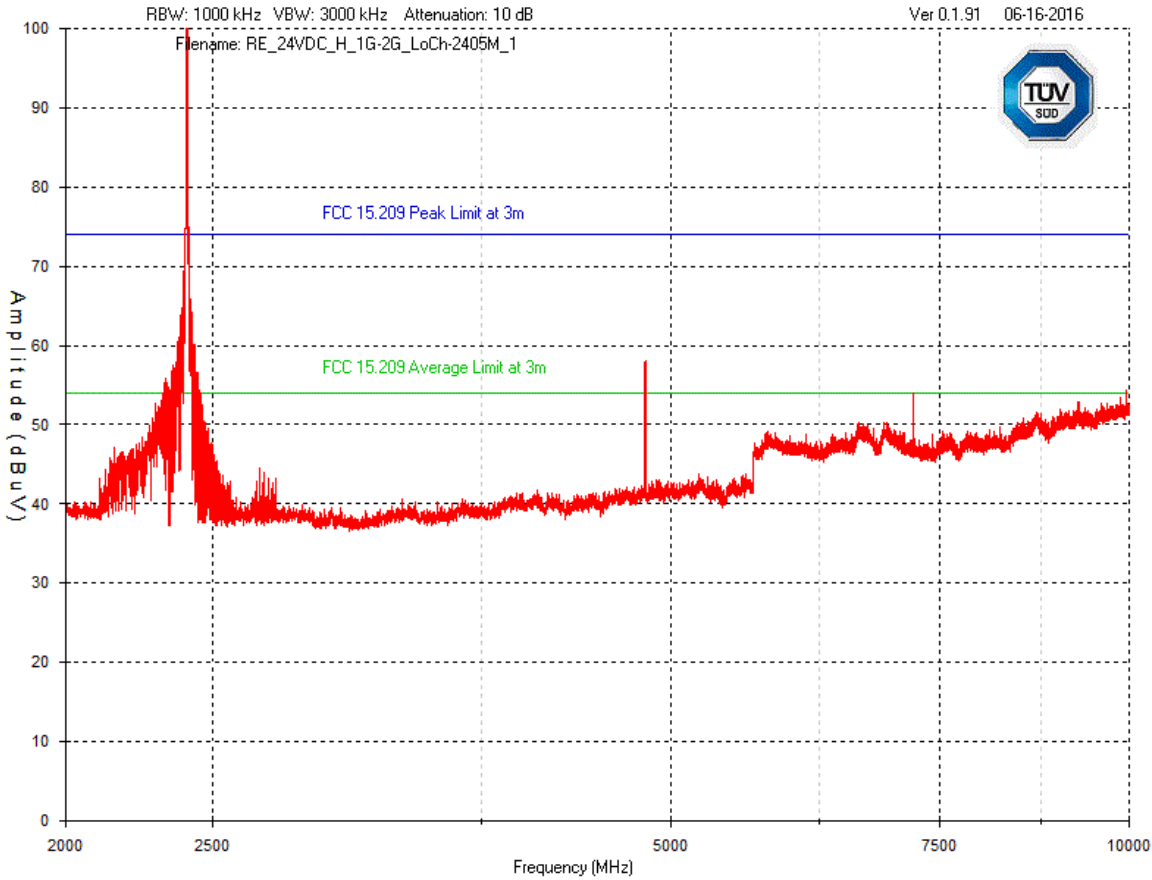
Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Average Emissions Graph
Vertical Antenna Polarity
7.5 GHz to 10 GHz



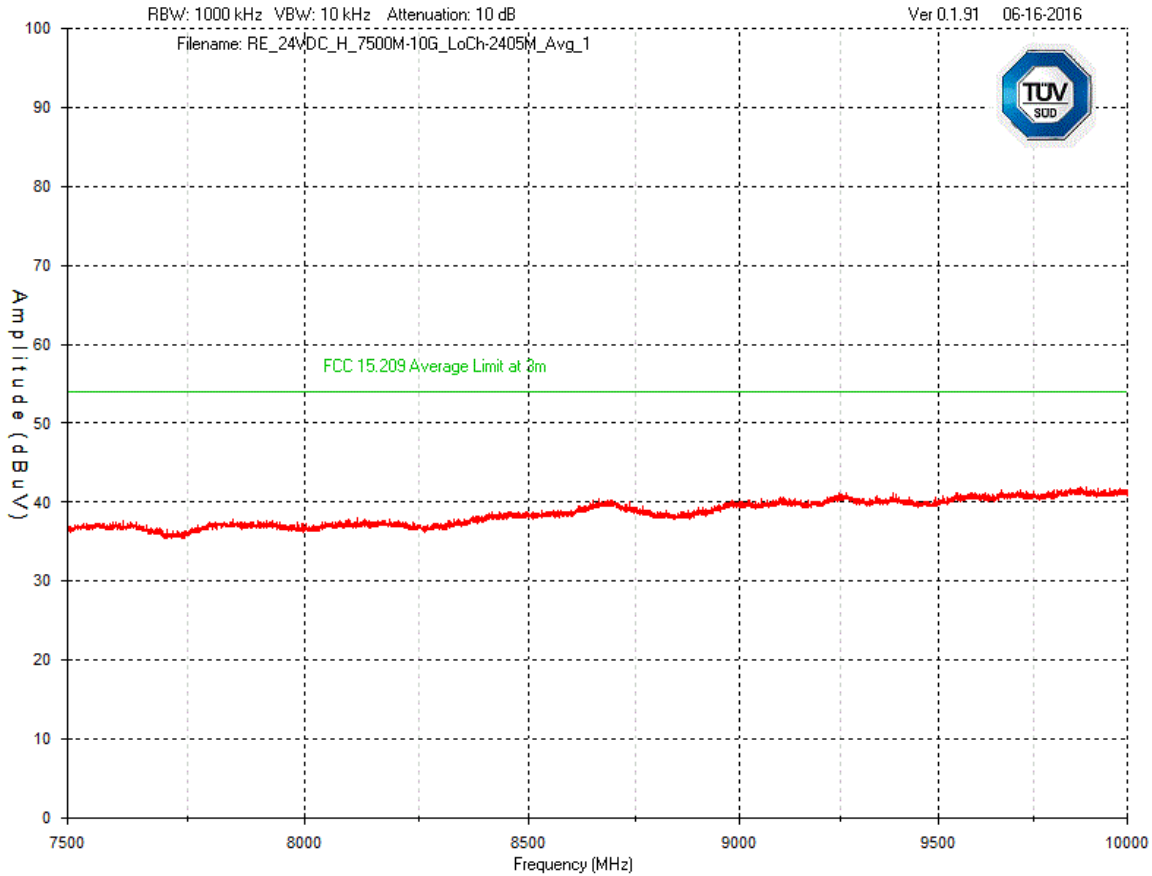
Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Peak Emissions Graph
Horizontal Antenna Polarity
2 GHz to 10 GHz



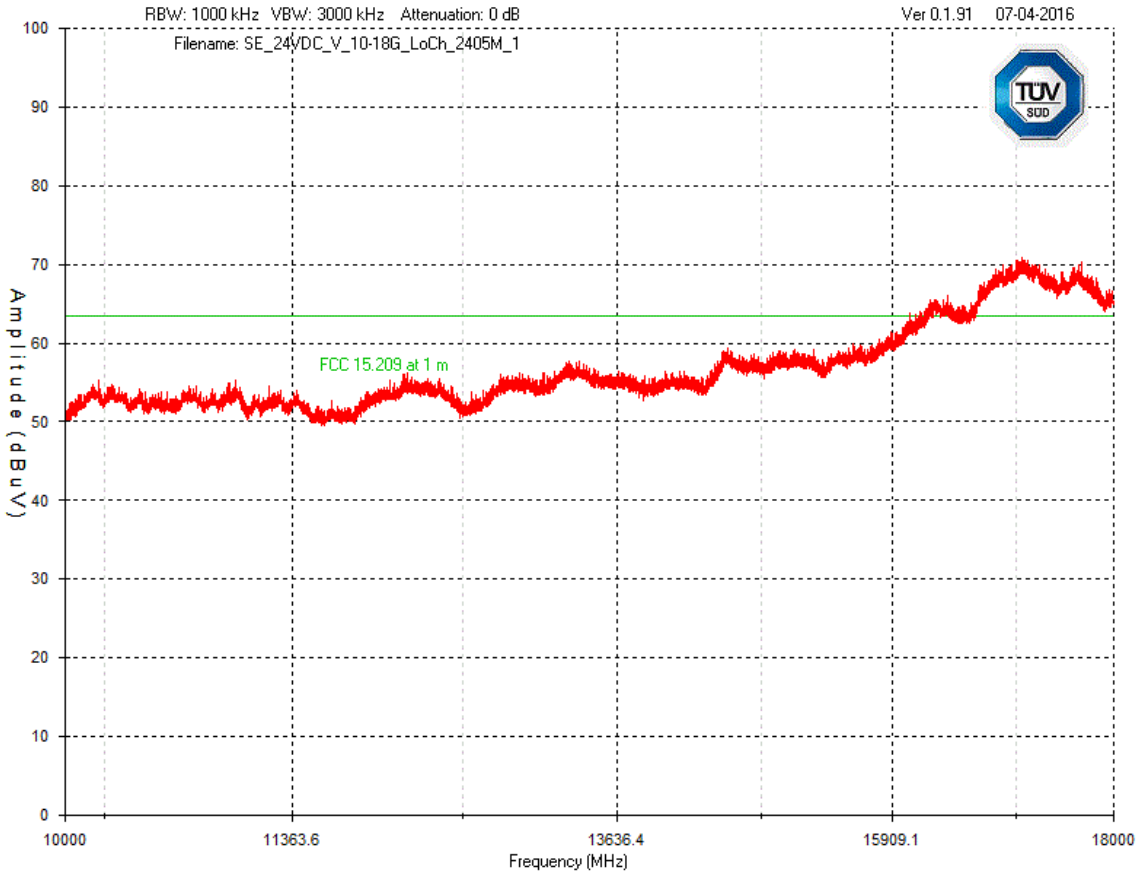
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Average Emissions Graph
Horizontal Antenna Polarity
7.5 GHz to 10 GHz



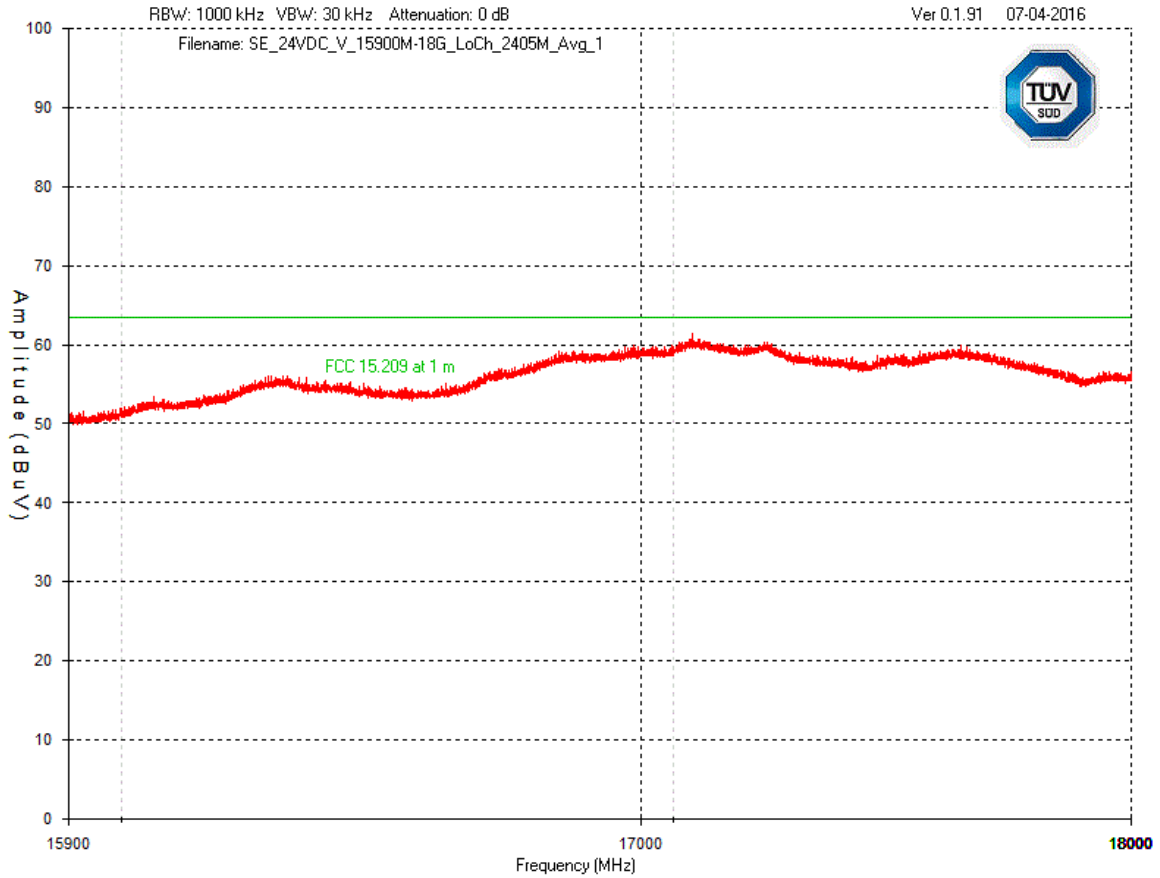
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Peak Emissions Graph
Vertical Antenna Polarity
10 GHz to 18 GHz



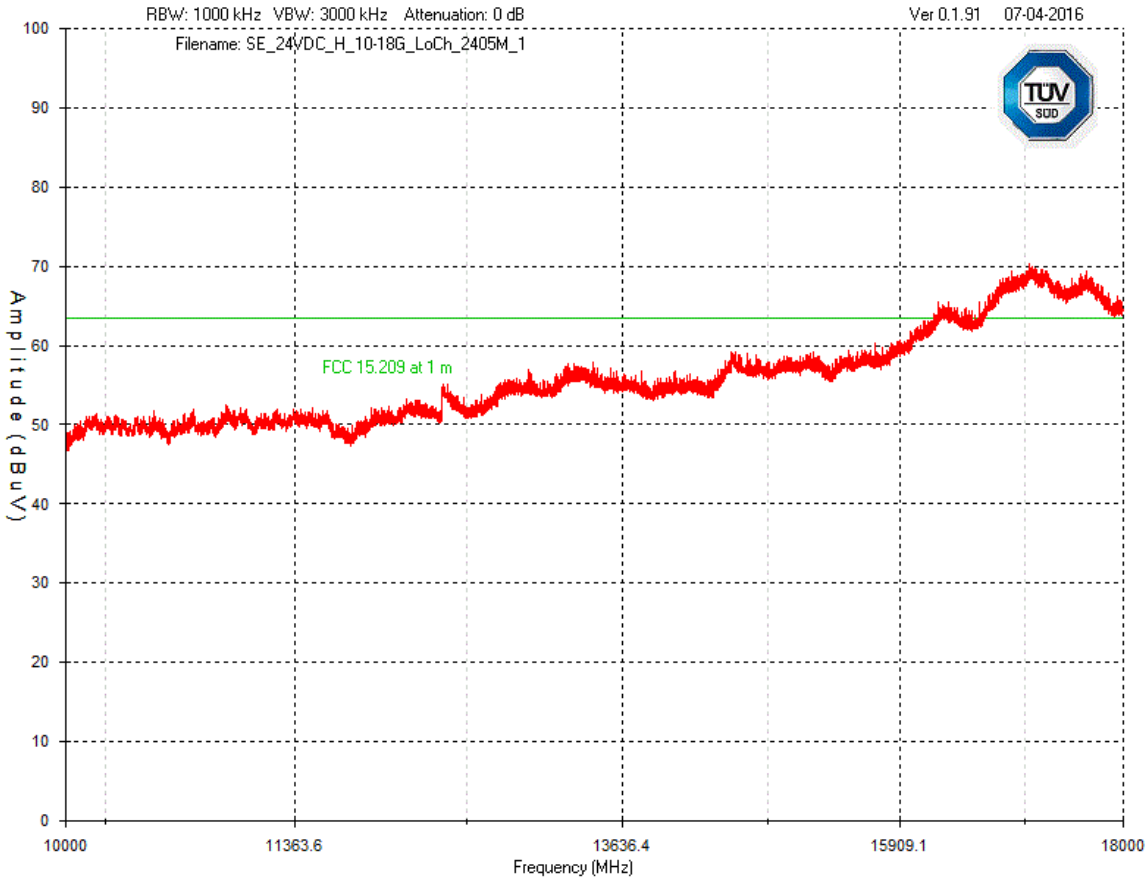
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Average Emissions Graph
 Vertical Antenna Polarity
 15.9 GHz to 18 GHz



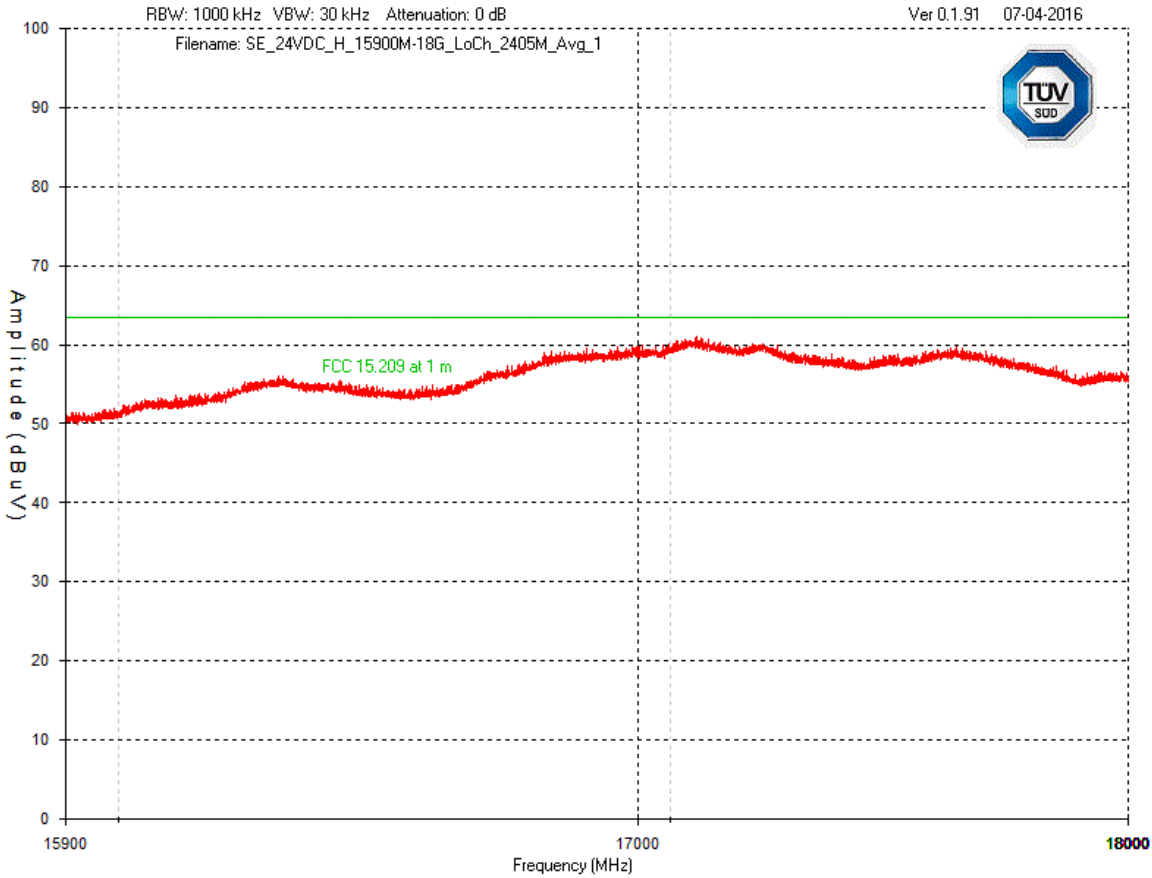
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Peak Emissions Graph
Horizontal Antenna Polarity
10 GHz to 18 GHz



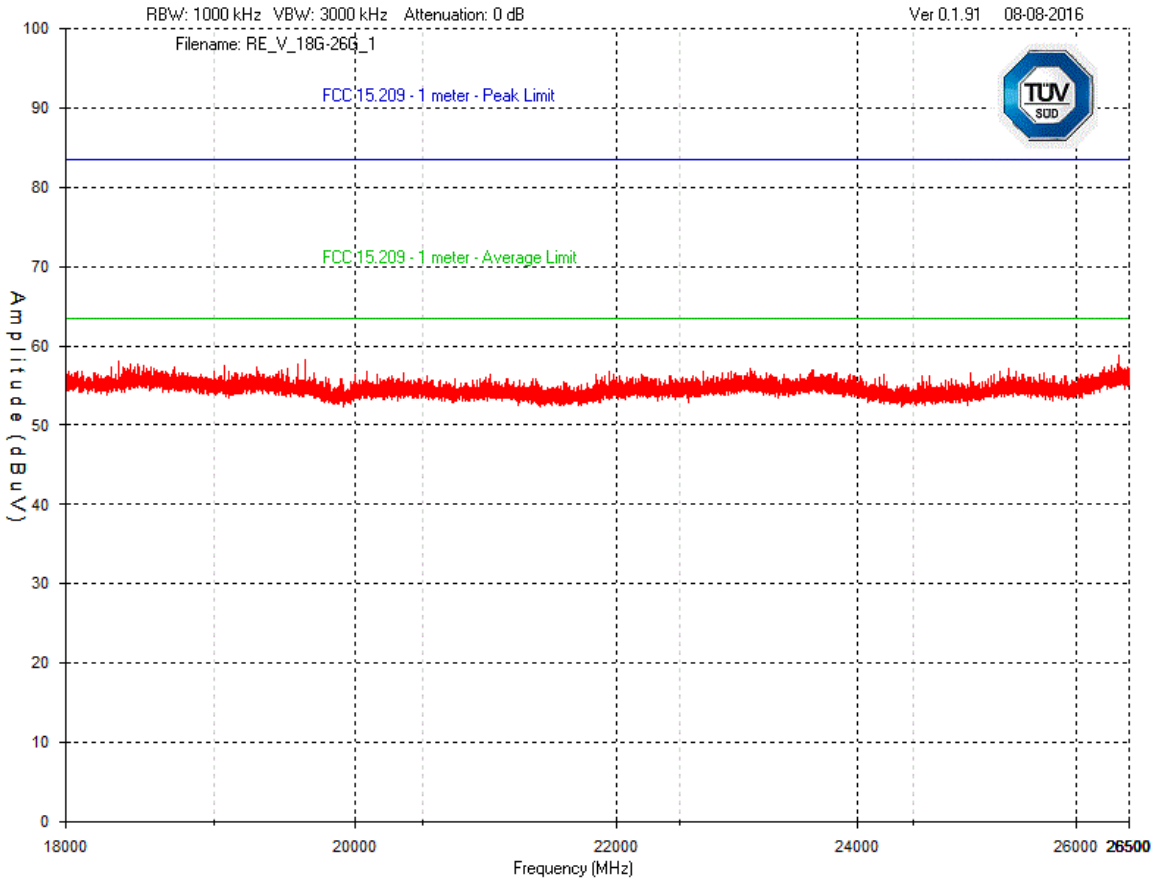
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Average Emissions Graph
 Horizontal Antenna Polarity
 15.9 GHz to 18 GHz



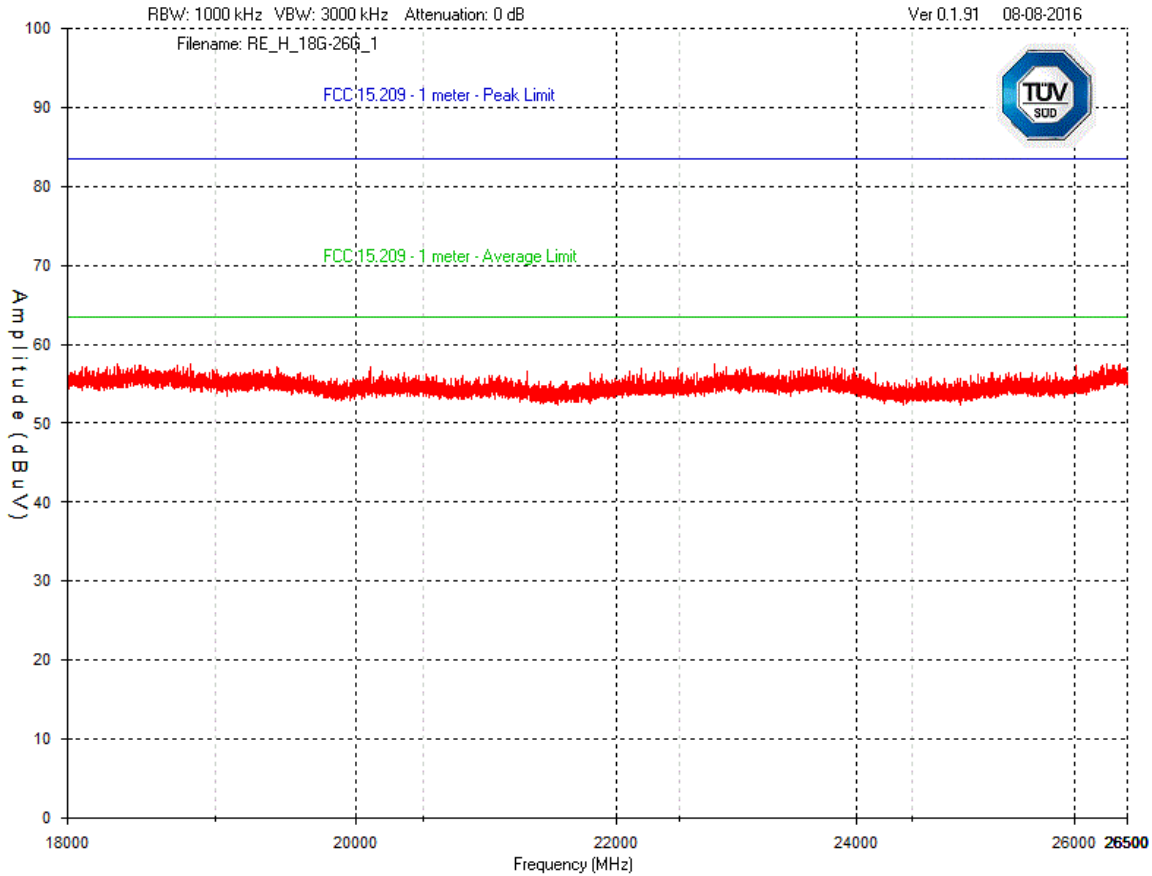
Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	


Peak Emissions Graph
Vertical Antenna Polarity
18 GHz to 26.5 GHz



Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

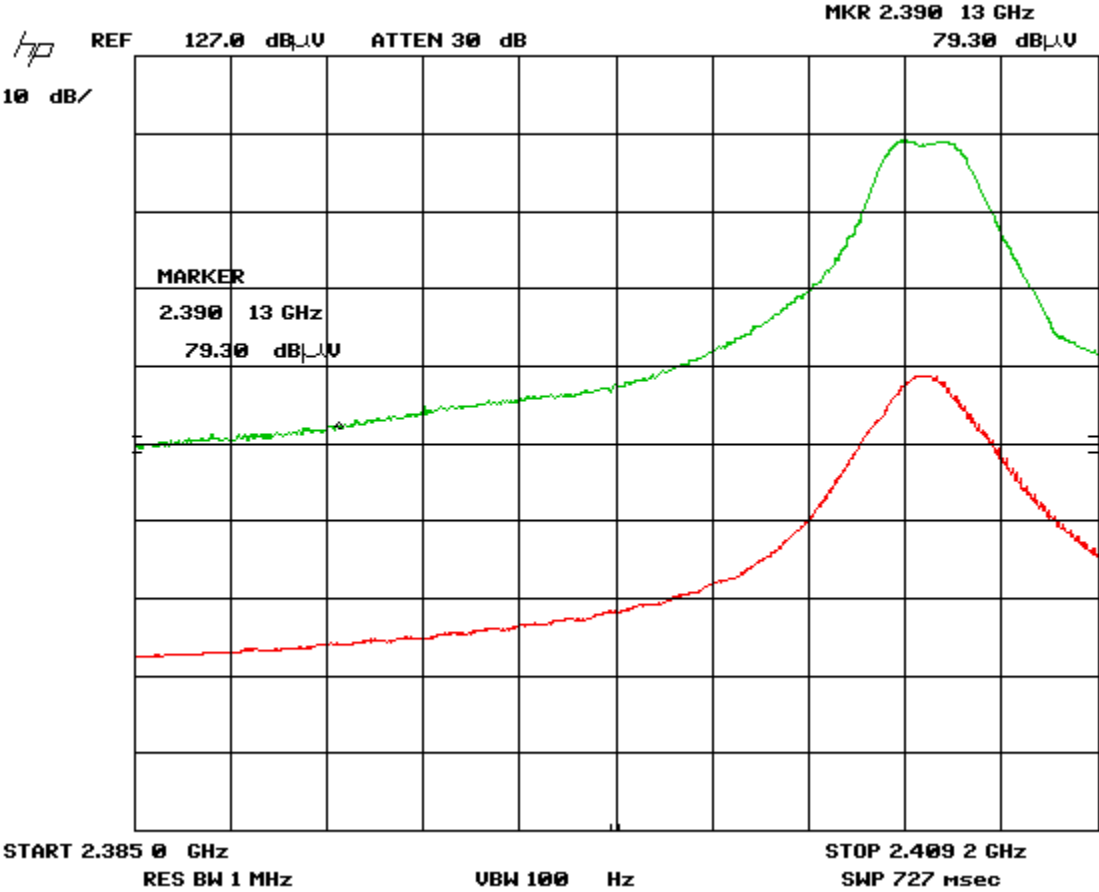
Peak Emissions Graph
Horizontal Antenna Polarity
18 GHz to 26.5 GHz




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Restricted Band Edges Emissions Graph (Peak)
 At 2.390 GHz, Vertical Antenna Polarity
 Low Channel1

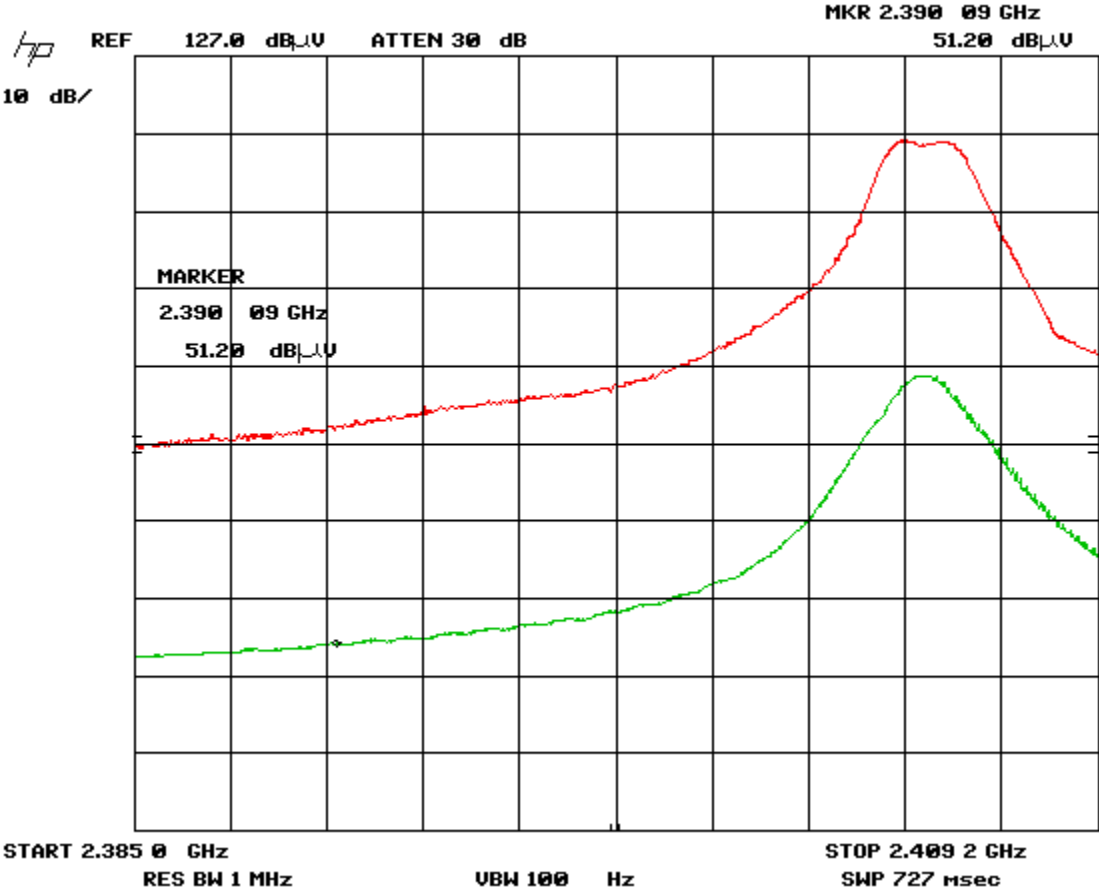
Note: Factors not incorporated. See table in *Final Measurements* for final factored values.




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Restricted Band Edges Emissions Graph (Average)
 At 2.390 GHz, Vertical Antenna Polarity
 Low Channel1

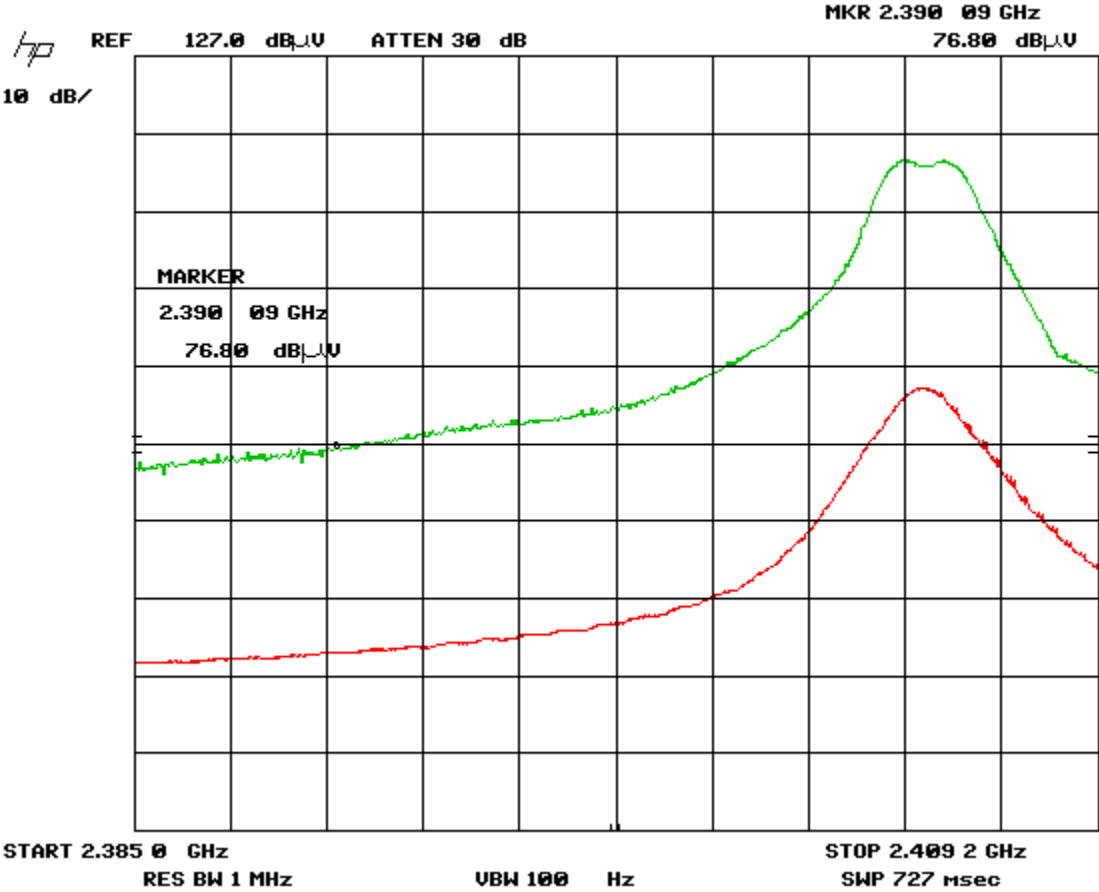
Note: Factors not incorporated. See table in *Final Measurements* for final factored values.




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Restricted Band Edges Emissions Graph (Peak)
 At 2.390 GHz, Horizontal Antenna Polarity
 Low Channel 1

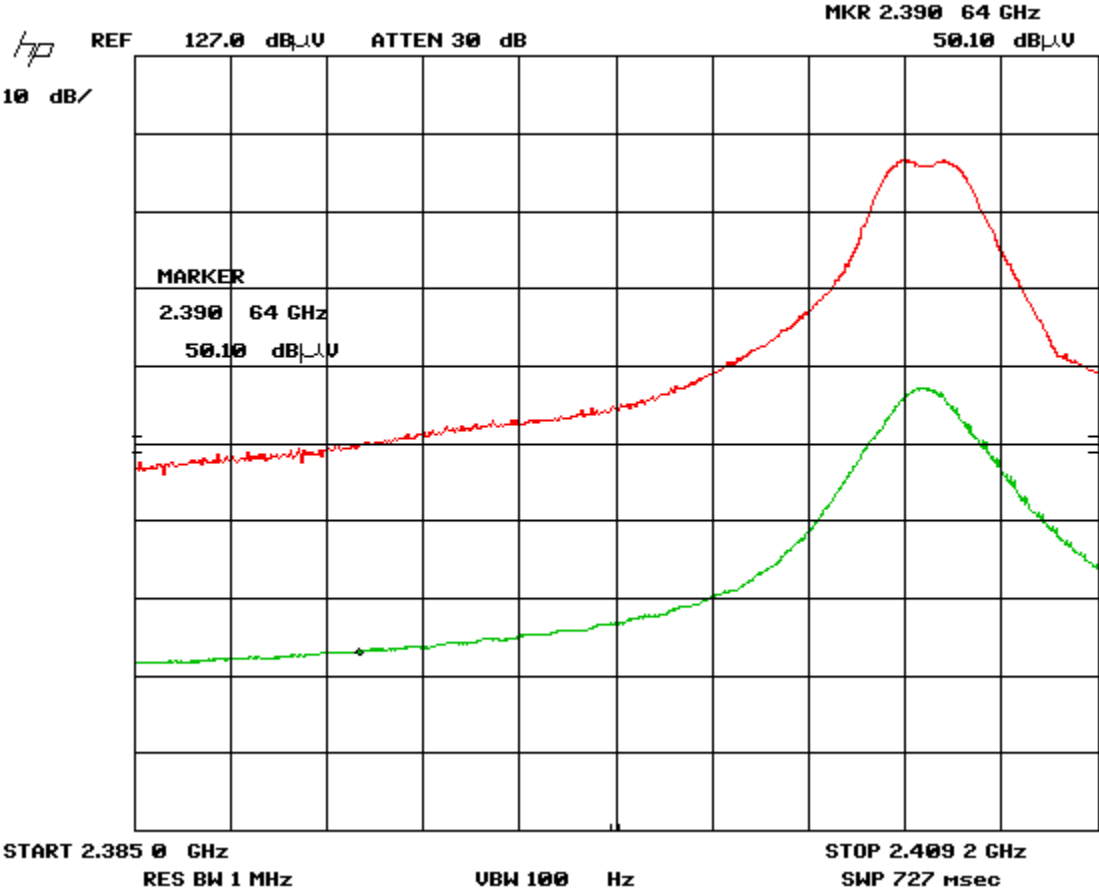
Note: Factors not incorporated. See table in *Final Measurements* for final factored values.




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Restricted Band Edges Emissions Graph (Average)
 At 2.390 GHz, Horizontal Antenna Polarity
 Low Channel 1

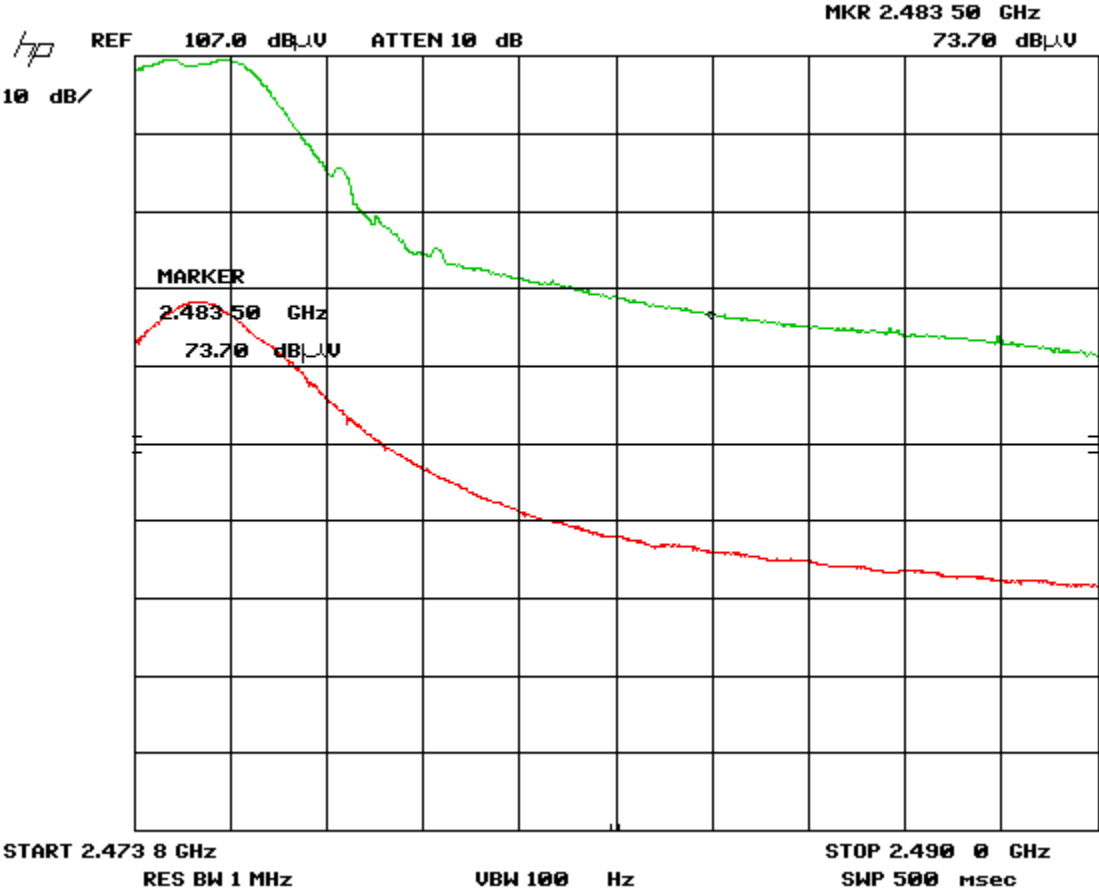
Note: Factors not incorporated. See table in *Final Measurements* for final factored values.




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Restricted Band Edges Emissions Graph (Peak)
 At 2.4835 GHz, Vertical Antenna Polarity
 High Channel1 (2480 MHz)

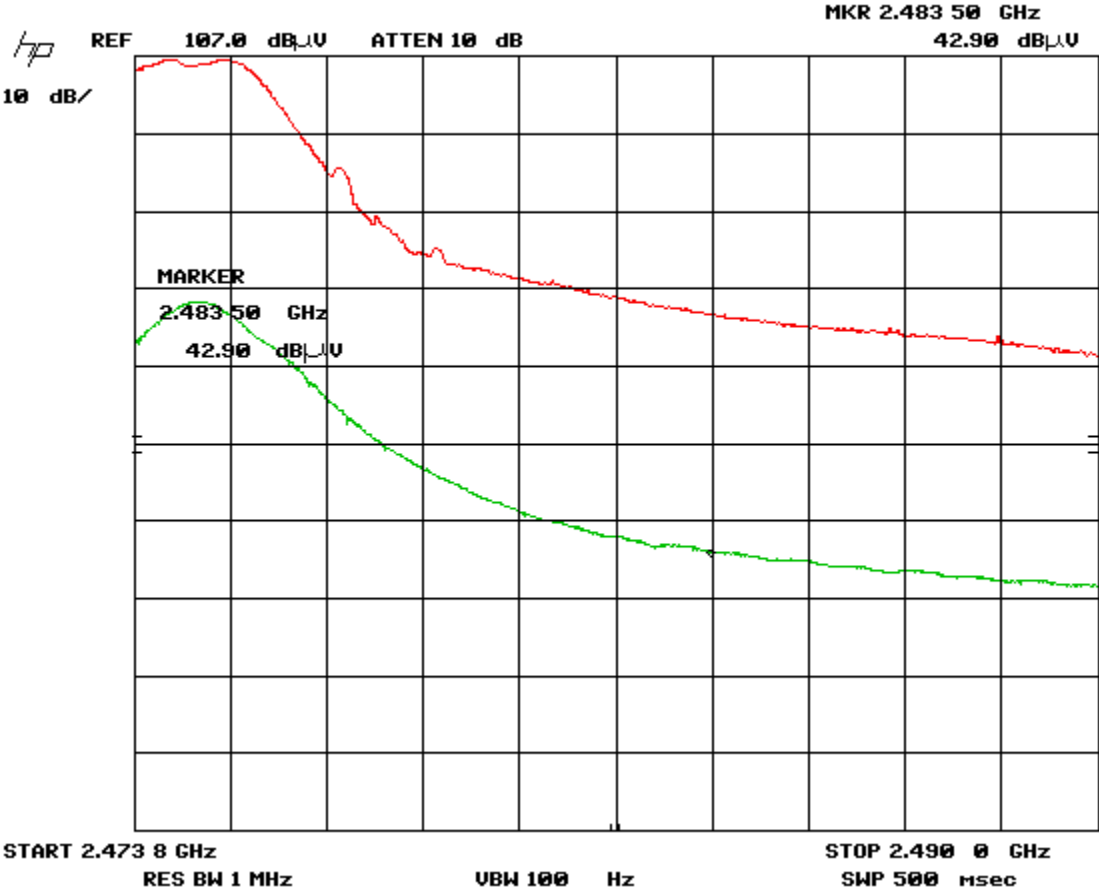
Note: Factors not incorporated. See table in *Final Measurements* for final factored values




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Restricted Band Edges Emissions Graph (Average)
 At 2.4835 GHz, Vertical Antenna Polarity
 High Channel1 (2480 MHz)

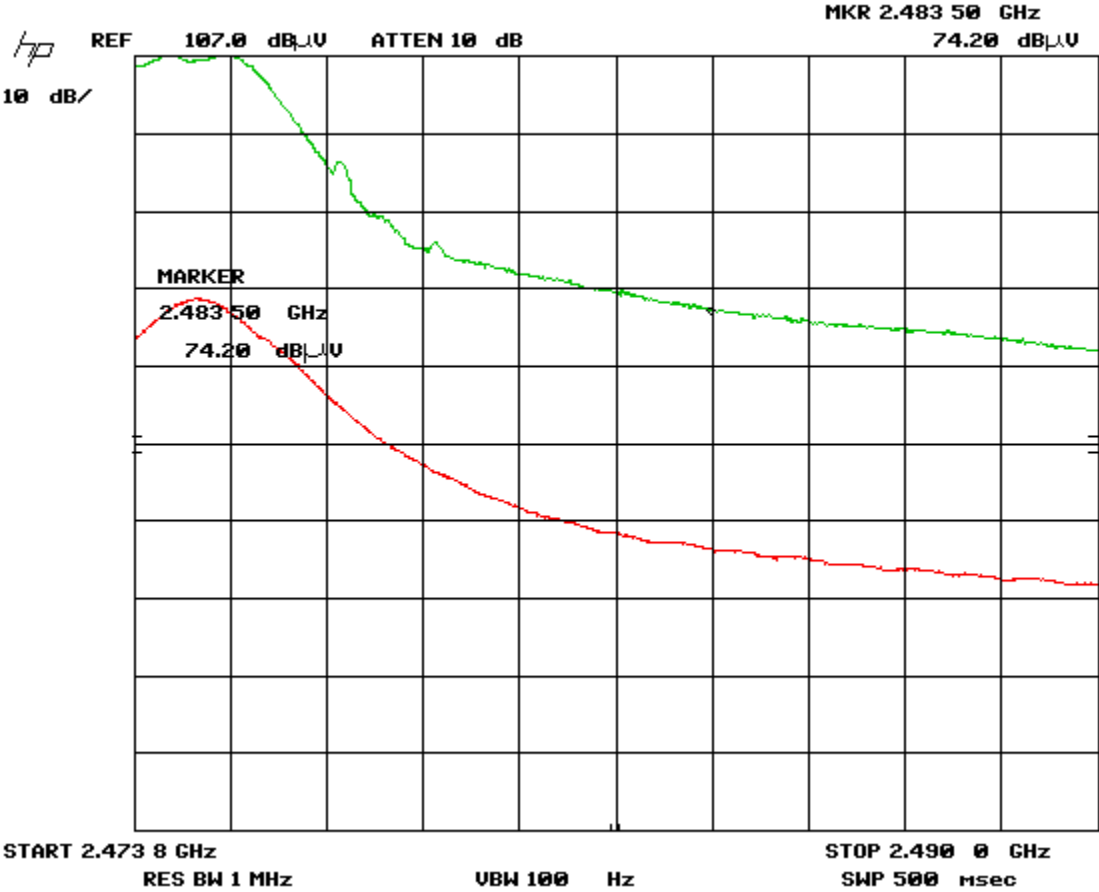
Note: Factors not incorporated. See table in *Final Measurements* for final factored values




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Restricted Band Edges Emissions Graph (Peak)
 At 2.4835 GHz, Horizontal Antenna Polarity
 High Channel1 (2480 MHz)

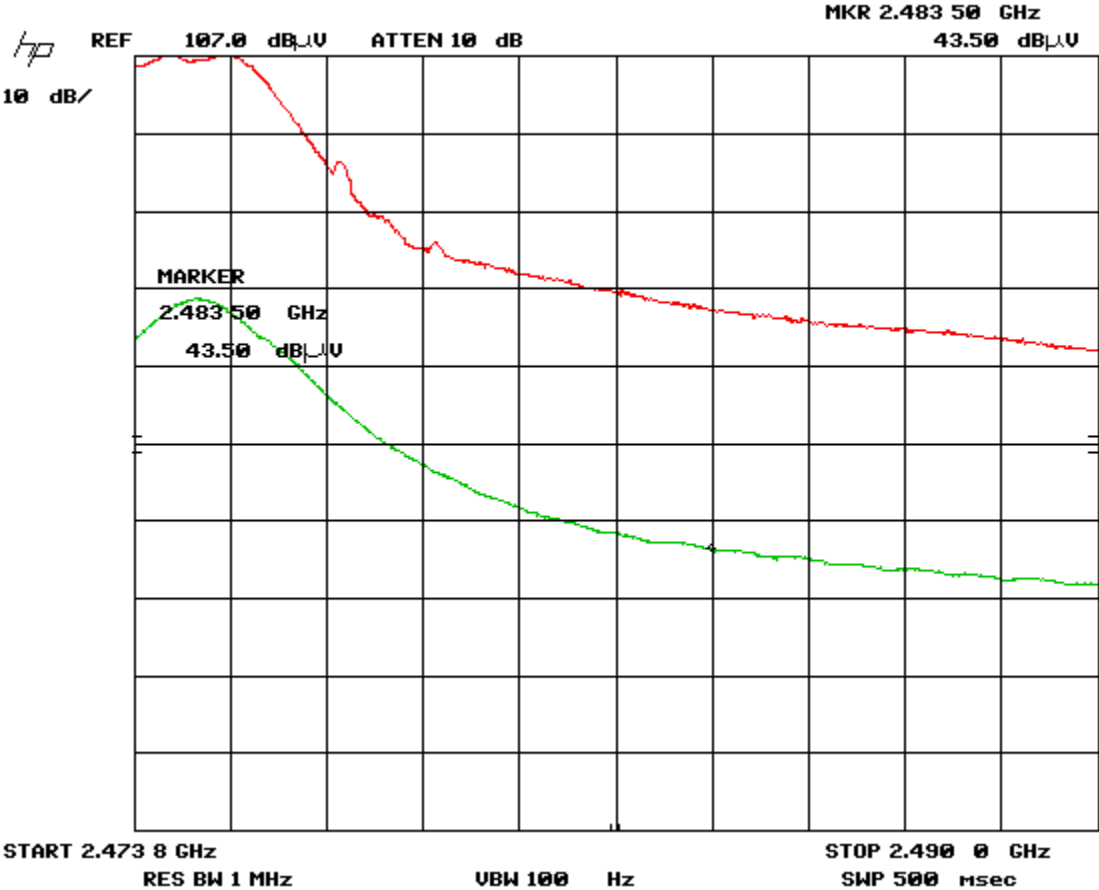
Note: Factors not incorporated. See table in *Final Measurements* for final factored values.




Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Restricted Band Edges Emissions Graph (Average)
 At 2.4835 GHz, Horizontal Antenna Polarity
 High Channel1 (2480 MHz)

Note: Factors not incorporated. See table in *Final Measurements* for final factored values.




Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Final Measurements

Table 4: Spurious Radiated Emissions

Test Frequency MHz	Detection mode	Measured signal dB(μV)	Antenna factor dB	Cable loss + Pre-selector dB	Pre-Amp Gain dB	Received signal dB(μV/m)	Emission limit dB(μV/m)	Margin dB(μV)	Result
Vertical Antenna Polarity									
10	QP	45.18	15.3	0.4	-33.1	27.78	40	12.22	Pass
44.4	QP	52.28	9.2	0.5	-33.1	28.88	40	11.12	Pass
31.6	QP	40.93	14.7	0.4	-33.1	22.93	40	17.07	Pass
37.6	QP	45.68	11.4	0.5	-33.1	24.48	40	15.52	Pass
995.4	QP	42.46	22.6	2.8	-31.2	36.66	54	17.34	Pass
664.7	Peak	50.7	19.7	2.2	-33.5	39.1	46.4	7.3	Pass
1331.0	Peak	72.6	25.2	2.6	-36.4	64	74	10	Pass
1331.0	Avg.	47.1	25.2	2.6	-36.4	38.5	54	15.5	Pass
1996.3	Peak	56.5	28.8	3.2	-35.9	52.6	74	21.4	Pass
1996.3	Avg.	37.6	28.8	3.2	-35.9	33.7	54	20.3	Pass
1000.3	Peak	63.7	22.7	2.8	-36.9	52.3	74	21.7	Pass
1000.3	Avg.	39.6	22.7	2.8	-36.9	28.2	54	25.8	Pass
1351.7	Peak	59.3	25.8	2.6	-36.4	51.3	74	22.7	Pass
1351.7	Avg.	40.1	25.8	2.6	-36.4	32.1	54	21.9	Pass
4808.3	Peak	69.4	27.7	5.8	-35.3	67.6	74	6.4	Pass
4808.3	Avg.	47.2	27.7	5.8	-35.3	45.4	54	8.6	Pass
7212.7	Peak	60.3	29	7.2	-35.5	61	74	13	Pass
7212.7	Avg.	44.5	29	7.2	-35.5	45.2	54	8.8	Pass
Horizontal Antenna Polarity									
441.0	Peak	56.5	17	1.7	-33.9	41.3	46.4	5.1	Pass
665.4	Peak	50.6	21	2.2	-33.5	40.3	46.4	6.1	Pass
332.3	Peak	57.9	14.6	1.4	-33.7	40.2	46.4	6.2	Pass
208.8	Peak	58.8	10.8	1	-33.4	37.2	43.5	6.3	Pass
30.2	Peak	48.5	17.8	0.4	-33.1	33.6	40	6.4	Pass
998.7	Peak	49.8	23.7	2.8	-31.2	45.1	54	8.9	Pass
1329.0	Peak	66	26.4	2.6	-36.4	58.6	74	15.4	Pass
1329.0	Avg.	41.8	26.4	2.6	-36.4	34.4	54	19.6	Pass
1993.0	Peak	52.1	30.5	3.2	-35.9	49.9	74	24.1	Pass

Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

1993.0	Avg.	33.1	30.5	3.2	-35.9	30.9	54	23.1	Pass
4809.0	Peak	59.9	27.7	5.7	-35.3	58	74	16	Pass
4809.0	Avg.	45.3	27.7	5.7	-35.3	43.4	54	10.6	Pass
7212.7	Peak	53	29	7.6	-35.5	54.1	74	19.9	Pass
7212.7	Avg.	41.1	29	7.6	-35.5	42.2	54	11.8	Pass

Table 5: Restricted Band Edges Emissions

Test Frequency MHz	Detection mode	Measured signal dB(μ V)	Antenna factor dB	Cable loss + Pre-selector dB	Pre-Amp Gain dB	Received signal dB(μ V/m)	Emission limit dB(μ V/m)	Margin dB(μ V)	Result
Vertical Antenna Polarity									
2390	Peak	79.3	26.4	4	-35.8	73.9	74	0.1	Pass
2390	Avg.	51.2	26.4	4	-35.8	45.8	54	8.2	Pass
2483.5	Peak	73.7	26.2	4.6	-33.3	71.2	74	2.8	Pass
2483.5	Avg.	42.9	26.2	4.6	-33.3	40.4	54	13.6	Pass
Horizontal Antenna Polarity									
2390	Peak	76.8	26.4	3.6	-35.8	71	74	3	Pass
2390	Avg.	50.1	26.4	3.6	-35.8	44.3	54	9.7	Pass
2483.5	Peak	74.2	26.2	4.6	-33.3	71.7	74	2.3	Pass
2483.5	Avg.	43.5	26.2	4.6	-33.3	41	54	13	Pass

Notes.


All harmonics are under the limits defined in FCC 15.209.

Peak = Peak measurement

QP = Quasi-Peak measurement


Avg. = Average measurement

Where peak values are under the quasi-peak and/or average limit, the emission passes the corresponding limit, and no measurement with the respective detector is required


Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Nov 27, 2015	Nov 27, 2017	GEMC 190
Quasi-Peak Adapter	85650A	HP	Nov 27, 2015	Nov 27, 2017	GEMC 191
Loop Antenna 9 – 150 kHz	EM 6871	Electro-Metrics	Feb. 3, 2015	Feb. 3, 2017	GEMC 70
Loop Antenna 150 kHz – 30 MHz	EM 6872	Electro-Metrics	Feb. 3, 2015	Feb. 3, 2017	GEMC 71
BiLog Antenna 30 MHz – 2 GHz	3142-C	ETS	Feb. 10, 2015	Feb. 10, 2017	GEMC 137
Horn Antenna 2 – 18 GHz	WBH218HN	Q-par	Feb. 12, 2016	Feb. 12, 2018	GEMC 6375
Horn Antenna 18 GHz – 26.5 GHz	SAS-572	A.H. Systems	Sept. 9, 2014	Sept. 9, 2016	GEMC 6371
Preamp 9 kHz - 1 GHz	CPA9231A	Chase	Sept. 9, 2014	Sept. 9, 2016	GEMC 6403
Pre-amp 1 – 26.5 GHz	HP 8449B	HP	Sept. 9, 2014	Sept. 9, 2016	GEMC 6351
Leveled Amplifier 18 GHz – 26.5 GHz	11975A	HP	Feb. 8, 2016	Feb. 8, 2018	GEMC 157
Harmonic Mixer 18 GHz – 26.5 GHz	11970K	HP	Feb. 8, 2016	Feb. 8, 2018	GEMC 158
RF Cable 7m	LMR-400-7M- 50OHM-MN- MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M- 50OHM-MN- MN	LexTec	NCR	NCR	GEMC 29

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Appendix A – EUT Summary


Client	Scan~Link Technologies Inc.	
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

For further details for filing purposes, refer to filing package.

General EUT Description

Client Details	
Organization / Address	SCAN~LINK Technologies Inc. 602 Tradewind Dr. Ancaster, Ontario Canada L9G 4V5
Contact	Uwe Schaible
Phone	905-304-6208 x222
Email	uschaible@scan-link.com
EUT (Equipment Under Test) Details	
EUT Name / Model	ARMOUR ANTENNA UNIT / SLAU-270NB
Input voltage	24 VDC (supplied by vehicle)
Transmit Frequencies	902.7 – 927.3 MHz 2.405 – 2.475 GHz
Basic EUT functionality description	The EUT is typically mounted on the back of a vehicle to detect the presence of ground workers wearing an Armour equipped Safety Vest and/or Hard Hat. This is accomplished using the 900 MHz range. When a tagged ground worker is detected, the Antenna Unit sends a message to the Display Unit mounted inside the cab which then alerts the operator through an audible and visual alarm. This is accomplished through the 2.4 GHz range.
Modes of operation	On mode.
Available connectors on EUT	Power harness Relay
Dimensions of product (approx.)	L: 246mm, W: 165mm, H: 133mm
Separation distance from operator	20cm
EUT Configuration	<ul style="list-style-type: none"> - See <i>Appendix B</i> for pictures of the unit. - The wireless was configured to transmit data continuously, at the highest output power for this frequency. - EUT is powered with 24 VDC. - A PC is connected to the EUT via USB and the cable harness to program the unit's test settings. The PC is auxiliary equipment and not covered in the scope of this report.


Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated.

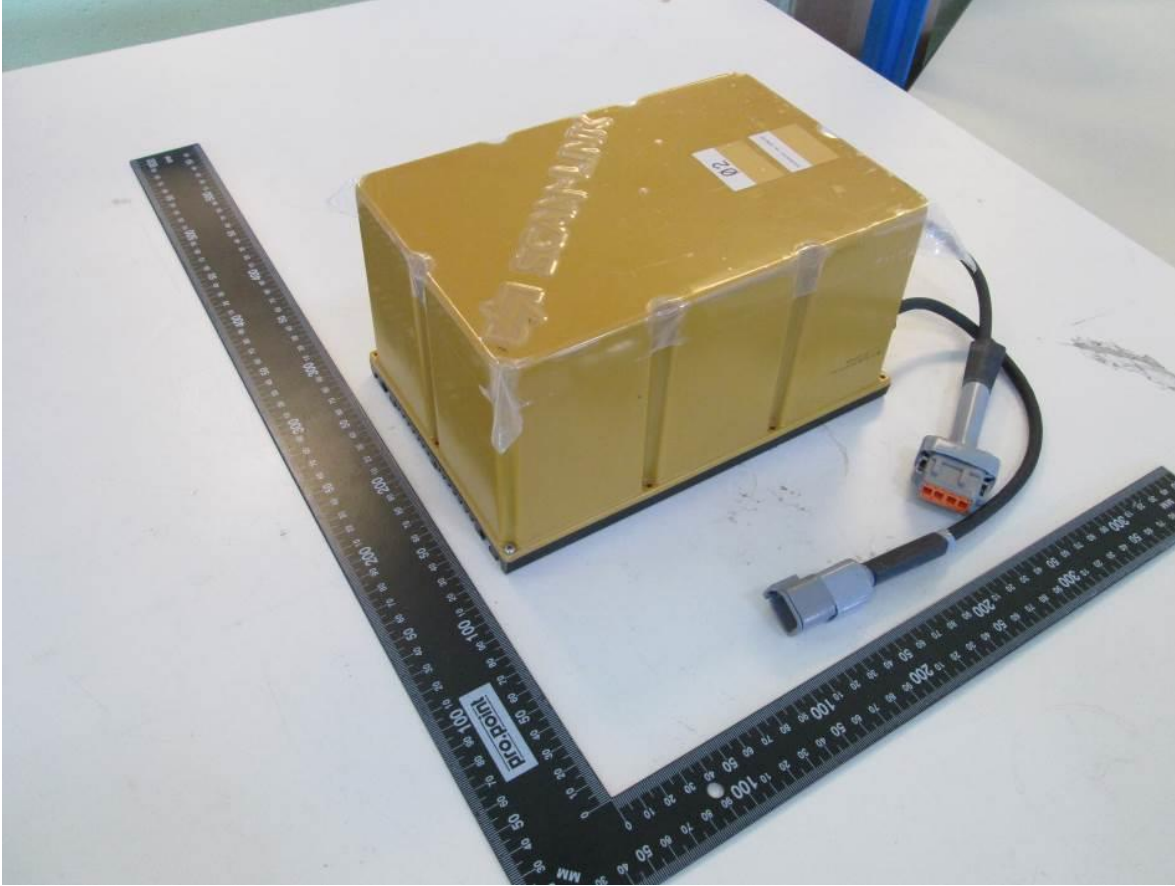
Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

Appendix B – EUT and Test Setup Photographs


Note: These photos are for information purposes only.
Also refer to submitted files that are separate from this test report.

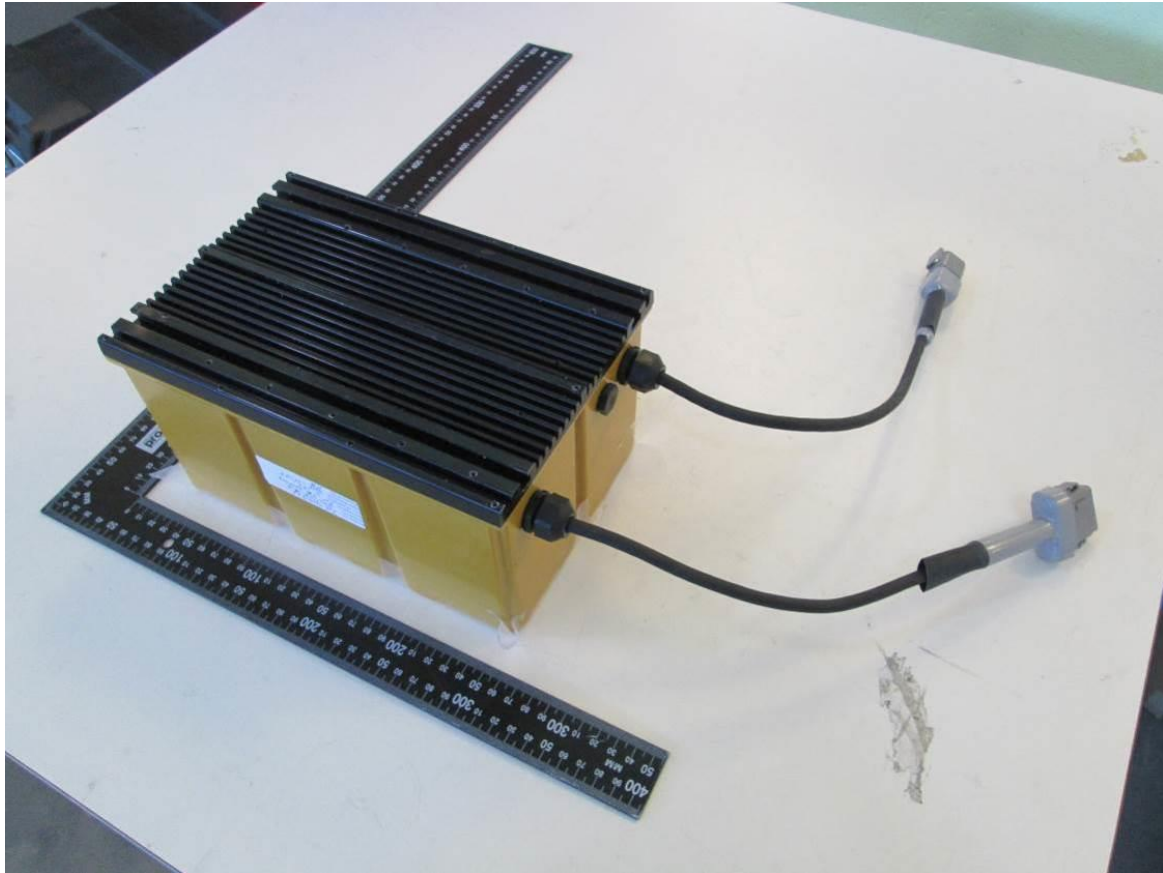
Note the numbers in **red text** are used to reference the same part in subsequent photos.

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




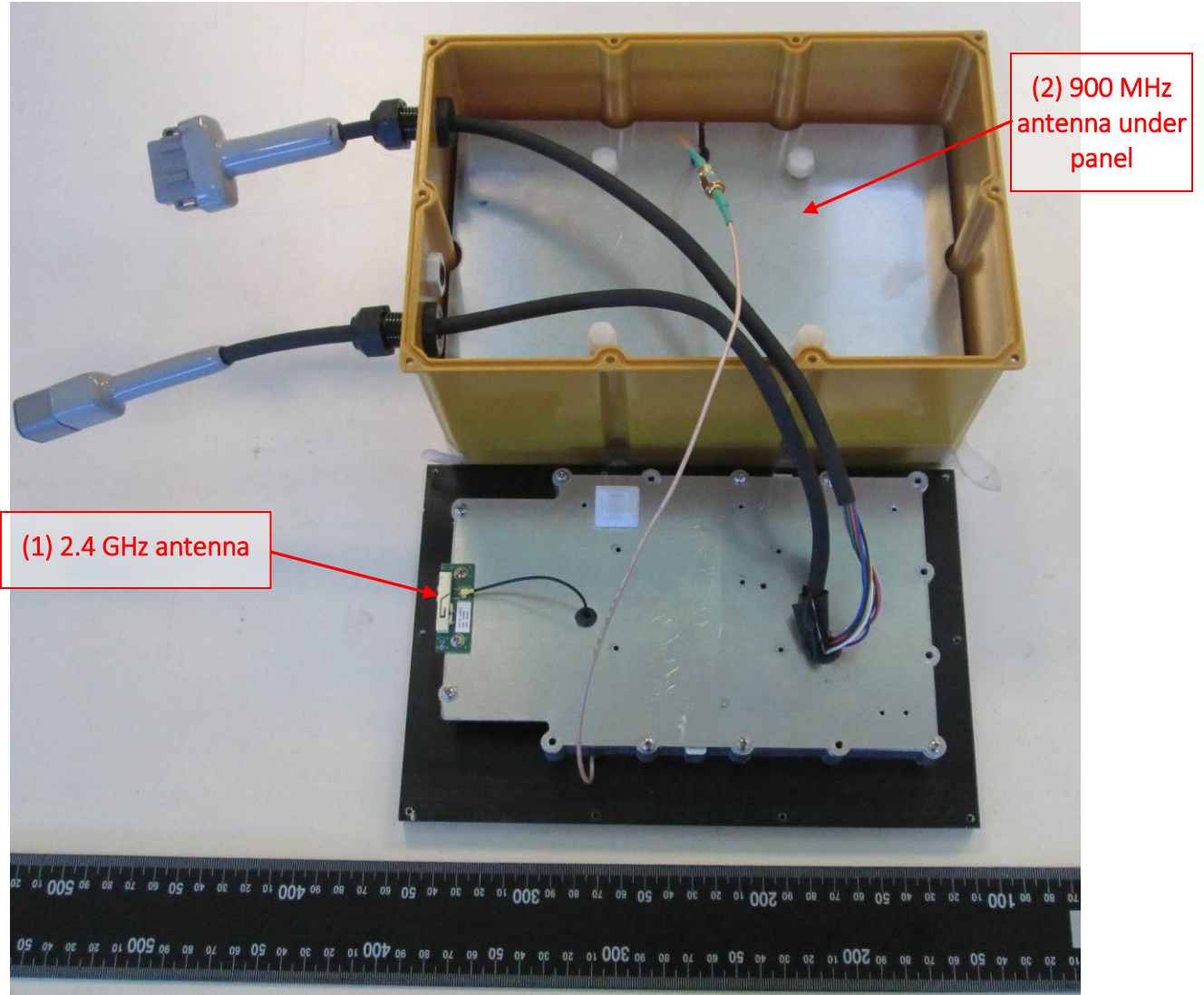
EUT – External view 1

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




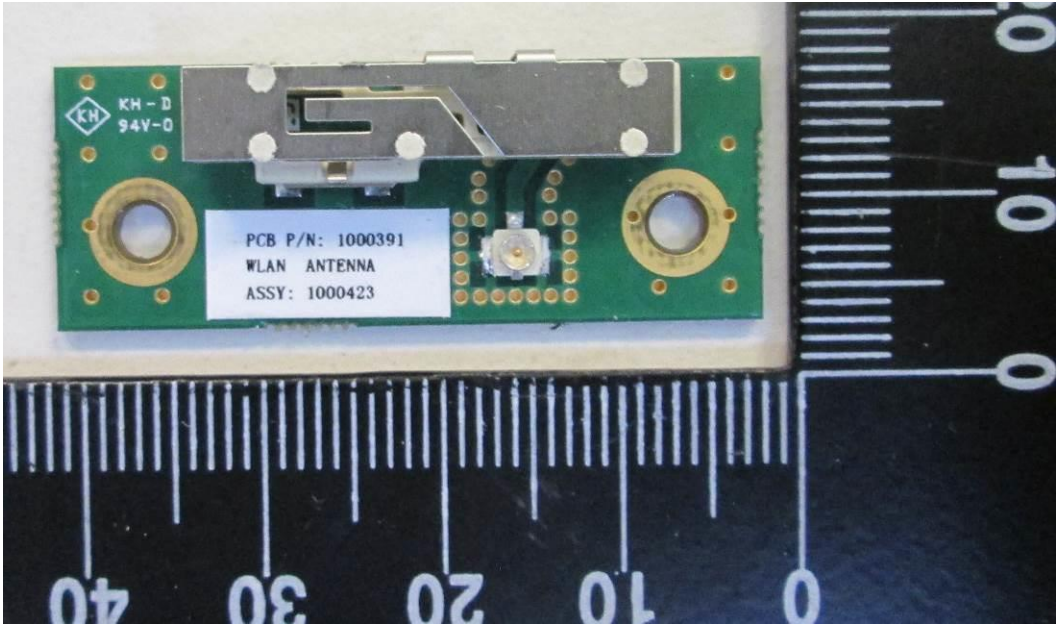
EUT – External view 2

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

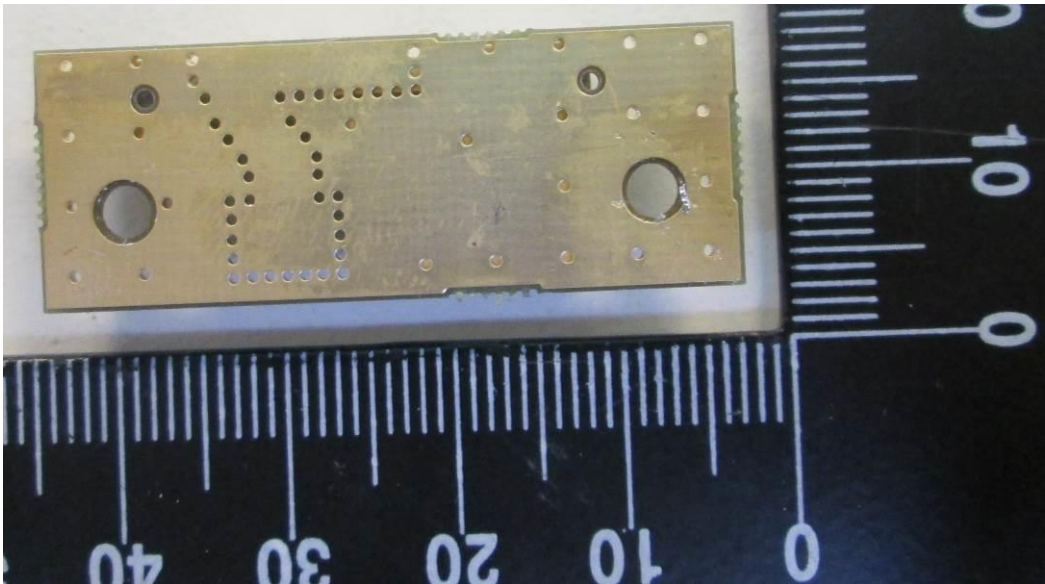


EUT – Internal view 1


Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	

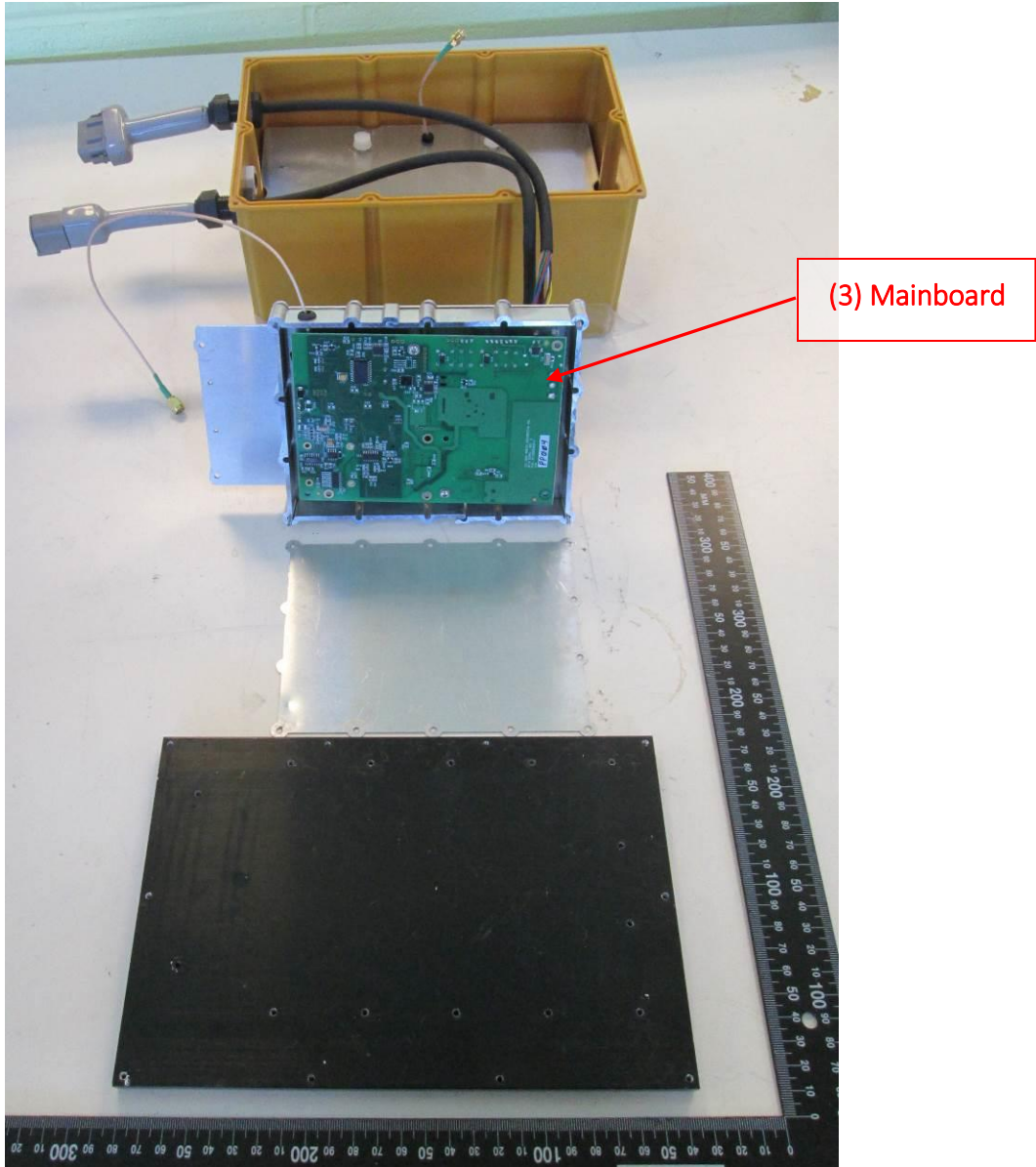


EUT – Internal view 2
 Part (1) – 2.4 GHz antenna close-up, view 1




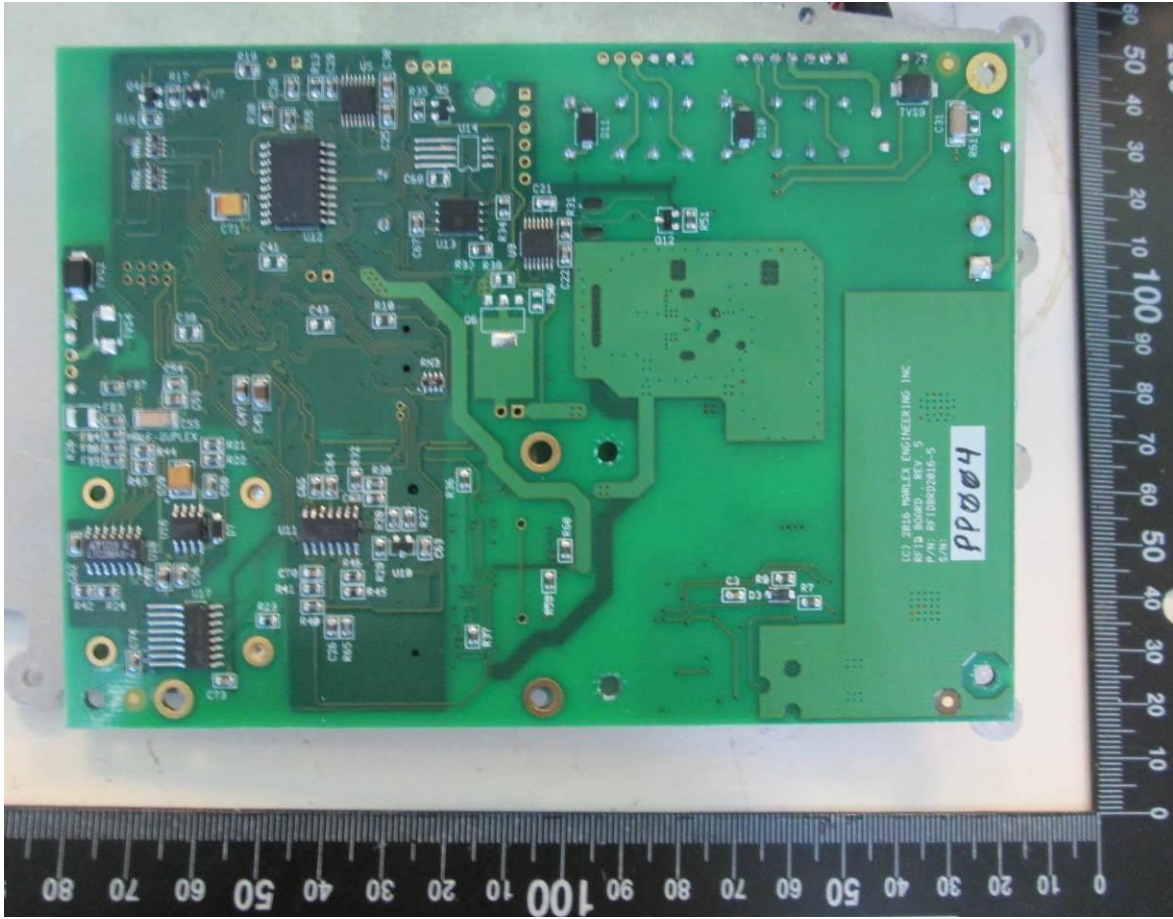
EUT – Internal view 3
 Part (1) – 2.4 GHz antenna close-up, view 2

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




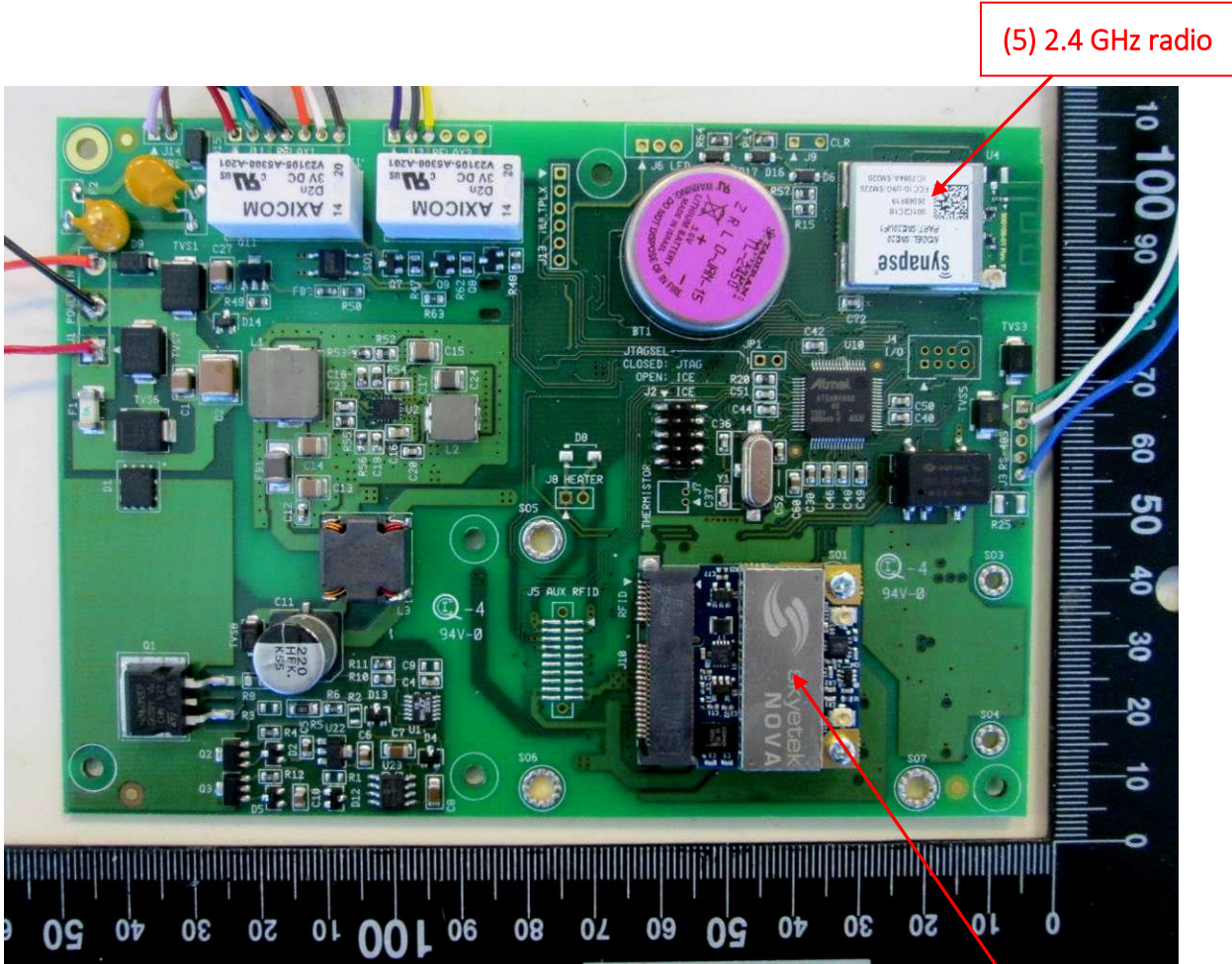
EUT – Internal view 4

Client	Scan-Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




EUT – Internal view 5
Mainboard, view 1

Client	Scan-Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




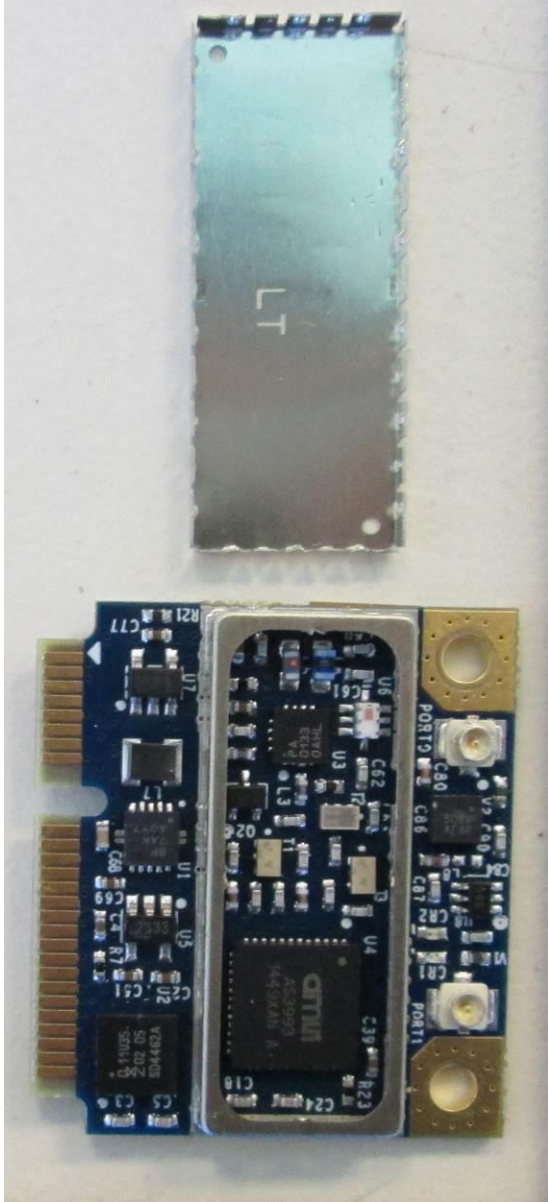
EUT – Internal view 6
Mainboard, view 2

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




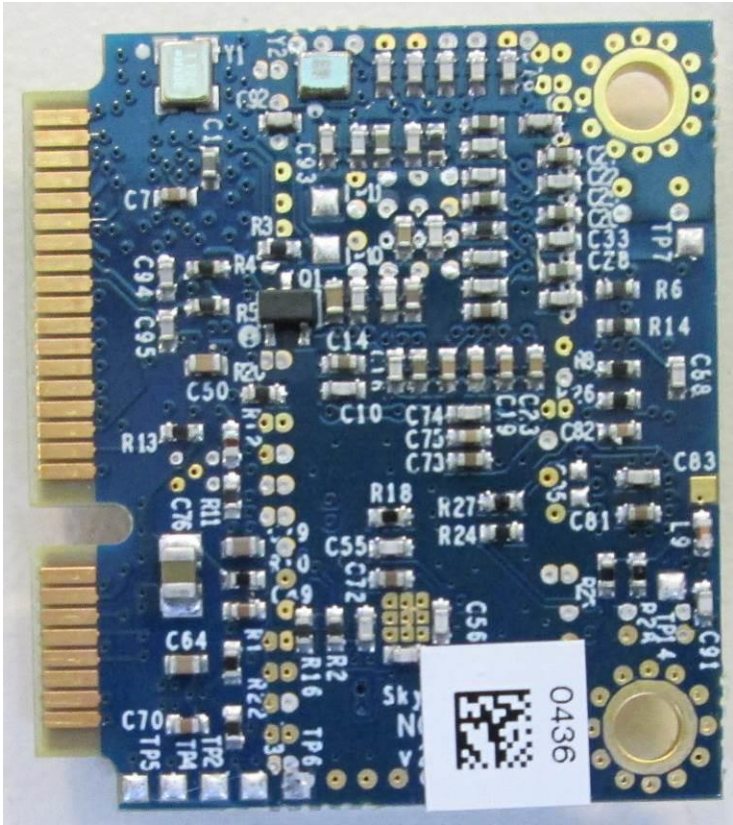
EUT – Internal view 7
Part (4) – 900 MHz radio close-up, view 1

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




EUT – Internal view 8
Part (4) – 900 MHz radio close-up, view 2
Shield off

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




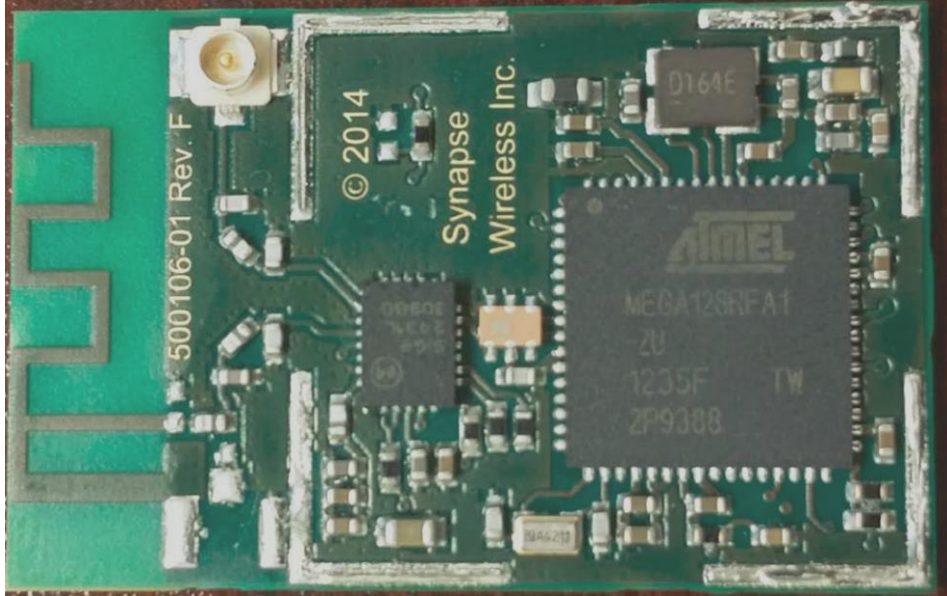
EUT – Internal view 9
Part (4) – 900 MHz radio close-up, view 3

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




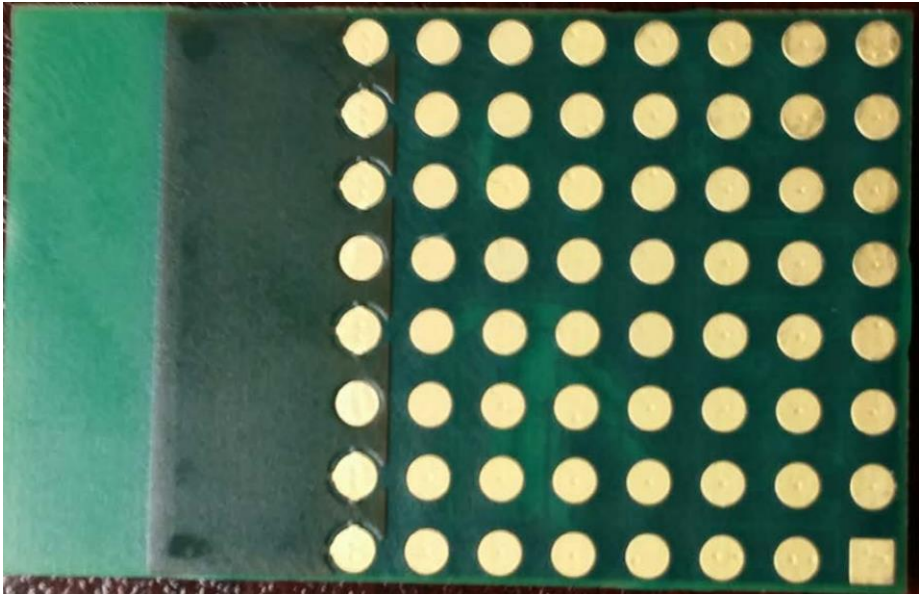
EUT – Internal view 10
Part (5) – 2.4 GHz radio close-up, view 1

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




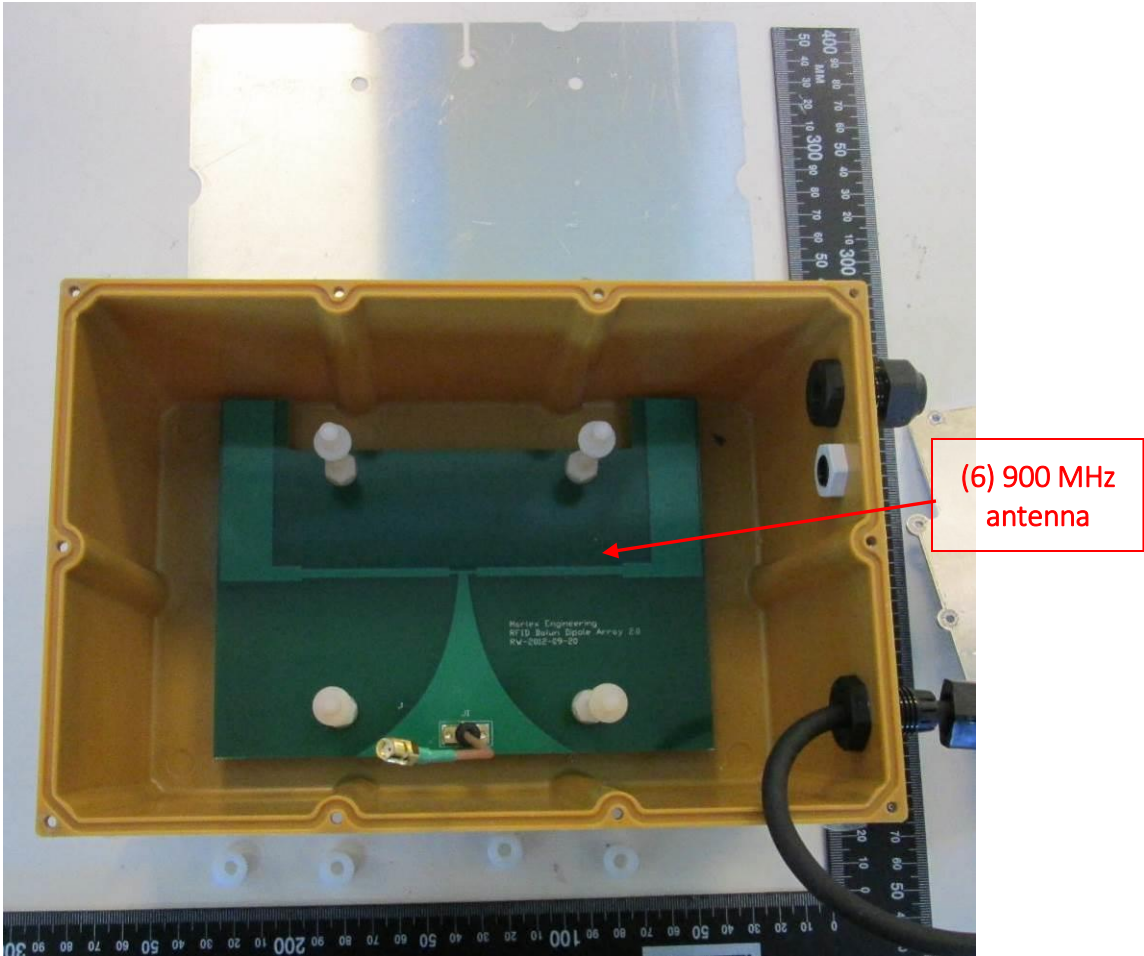
EUT – Internal view 11
Part (5) – 2.4 GHz radio close-up, view 2
Shield off

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




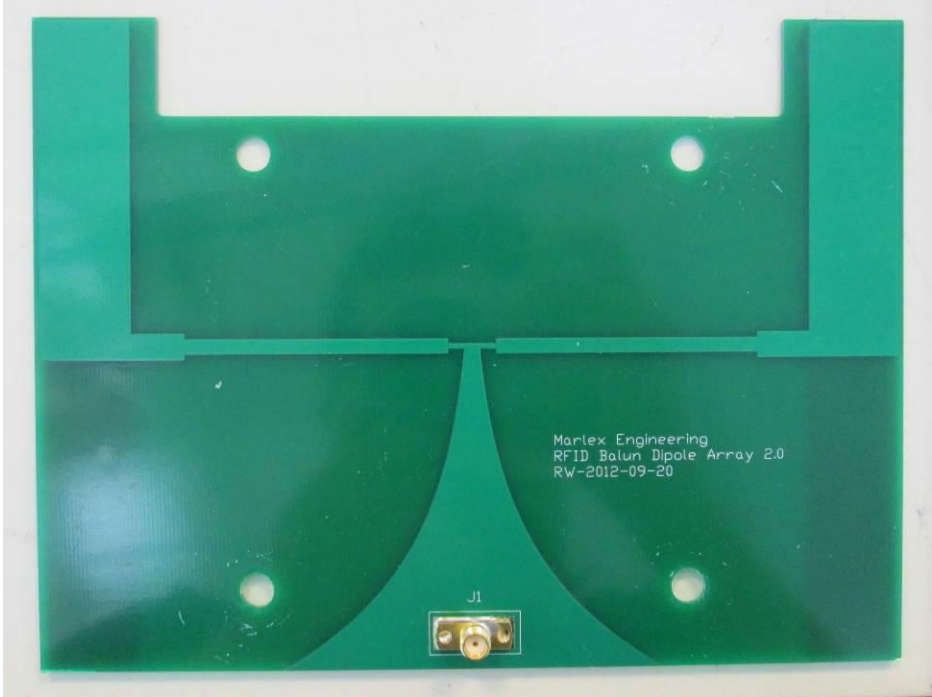
EUT – Internal view 12
Part (5) – 2.4 GHz radio close-up, view 3

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




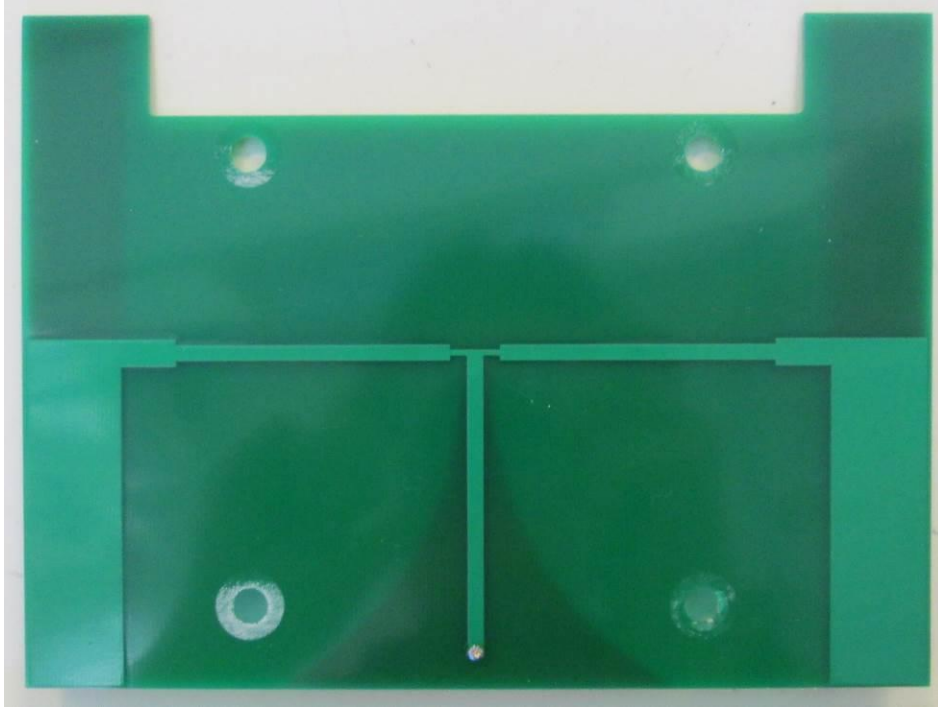
EUT – Internal view 13
900 MHz antenna, within enclosure

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




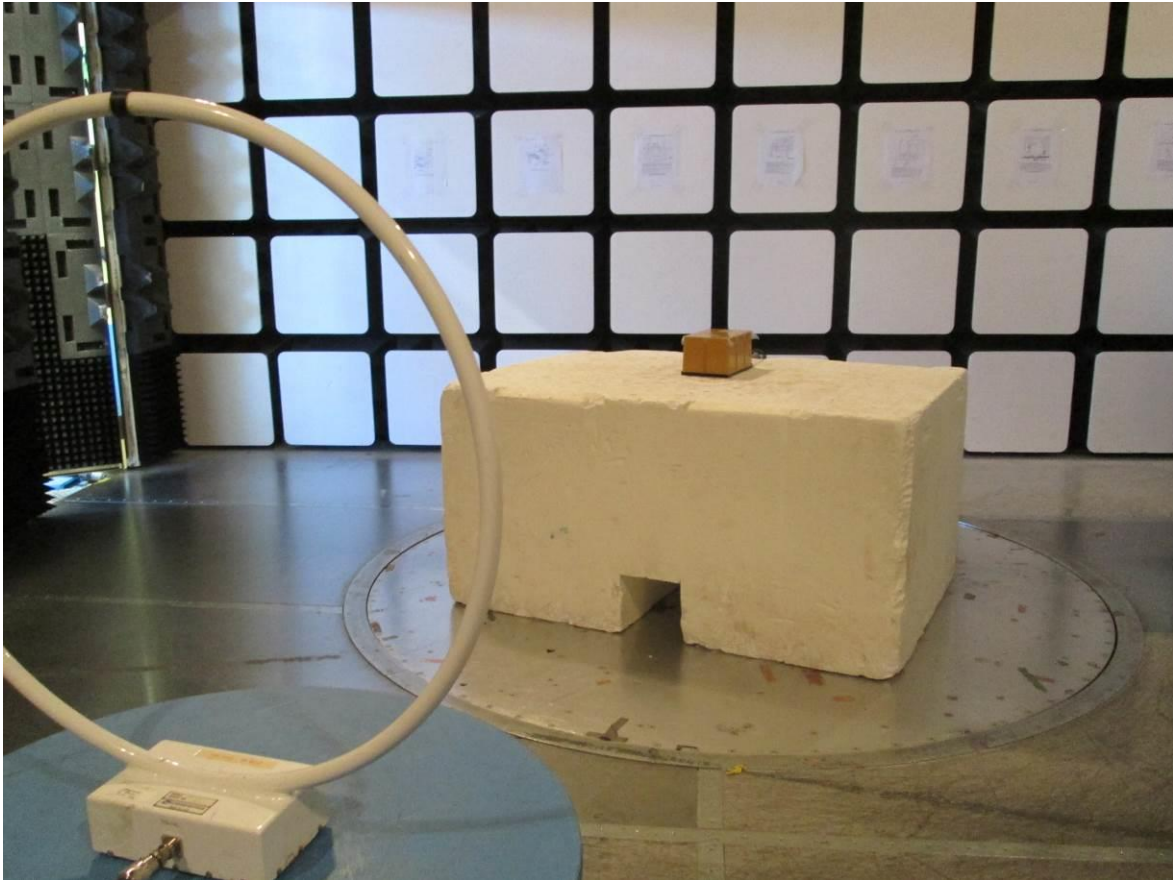
EUT – Internal view 14
Part (6) – 900 MHz antenna, view 1

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




EUT – Internal view 15
Part (6) – 900 MHz antenna, view 2

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




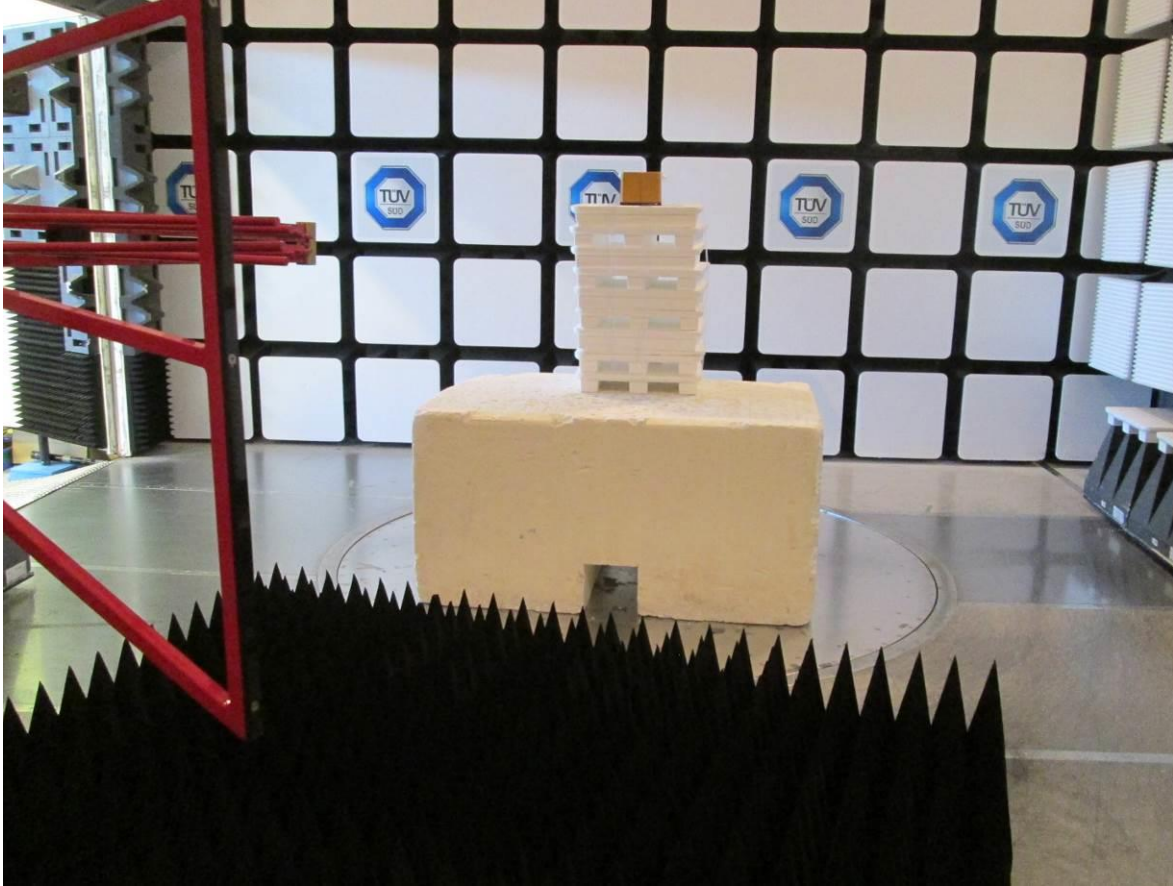
Test setup photo 1
Radiated measurements, 9 kHz – 30 MHz

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




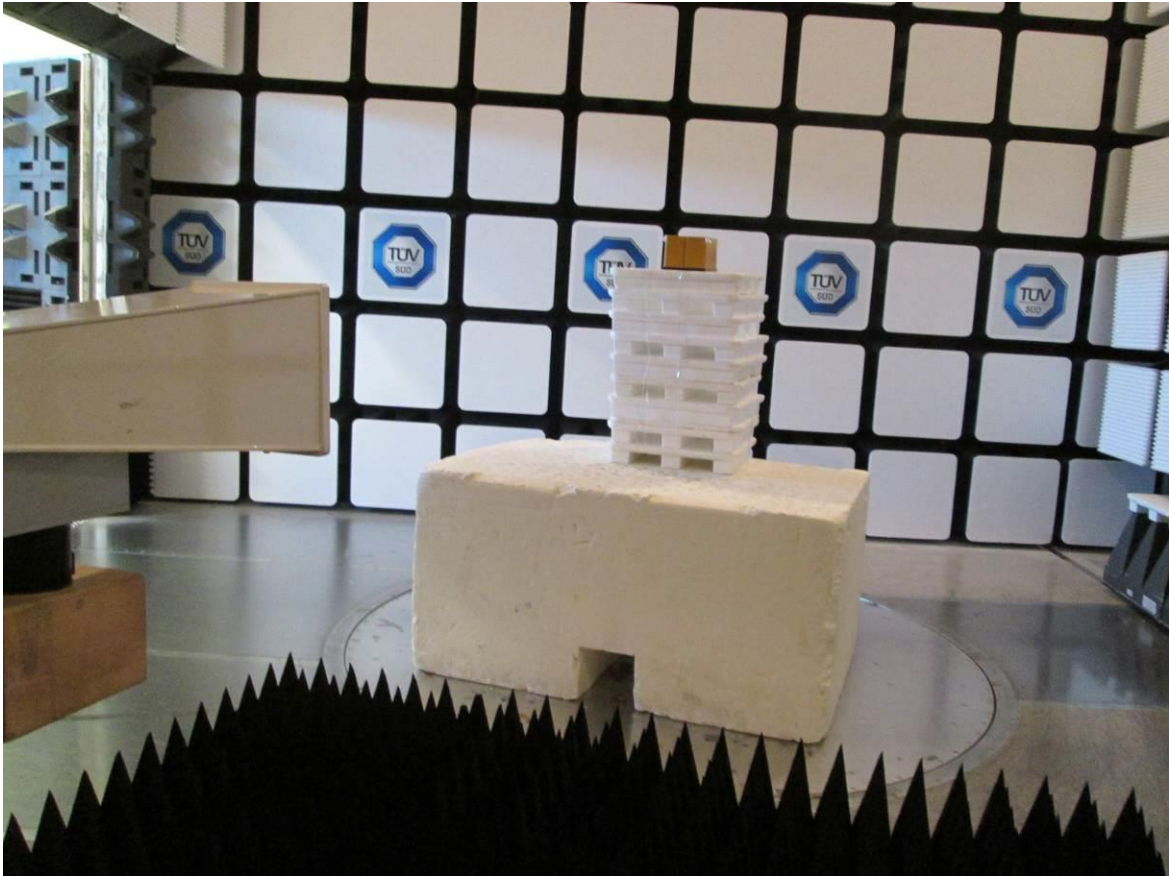
Test setup photo 2
Radiated measurements, 30 MHz – 1 GHz

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




Test setup photo 3
Radiated measurements, 1 GHz – 2 GHz

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




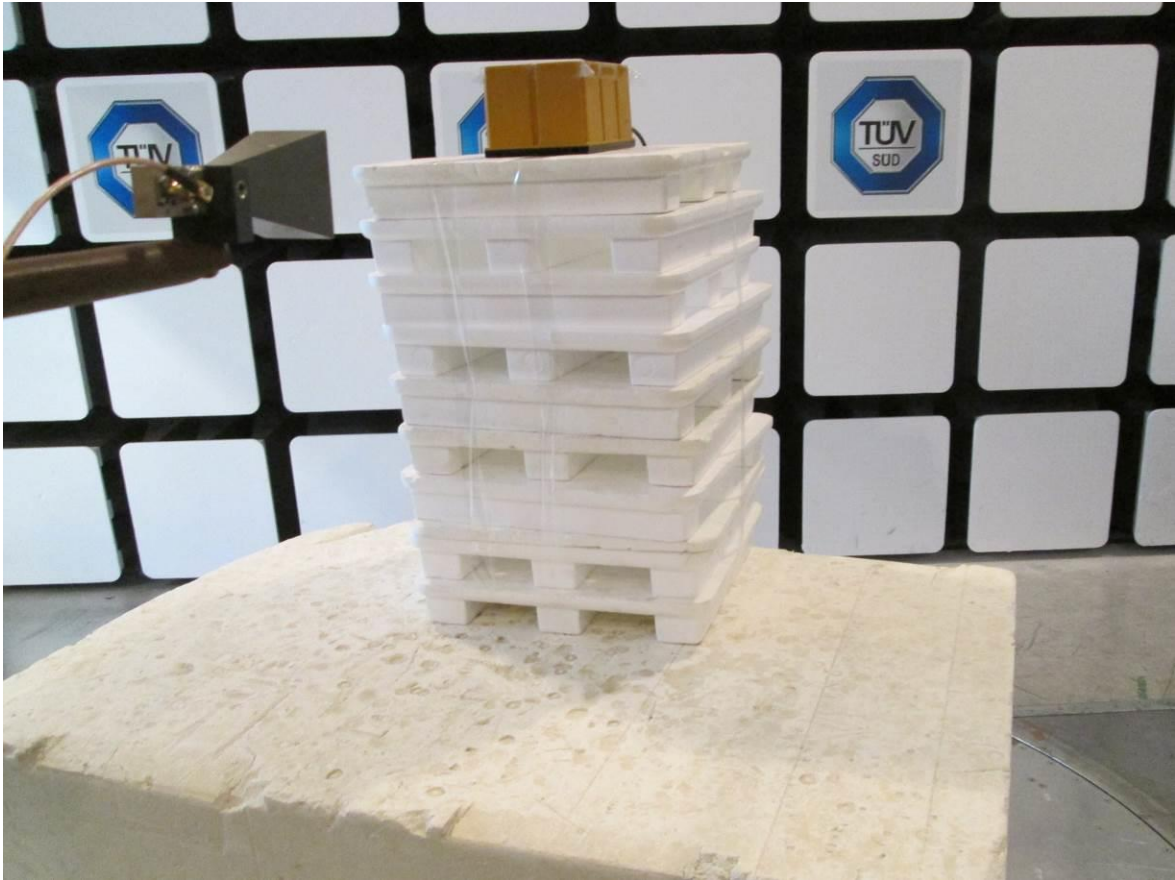
Test setup photo 4
Radiated measurements, 2 GHz – 10 GHz

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	




Test setup photo 5
Radiated measurements, 10 GHz – 18 GHz

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	



Test setup photo 6
Radiated measurements, 18 GHz – 26 GHz

Client	Scan~Link Technologies Inc.	 Canada
Product	Armour Antenna Unit	
Standard(s)	RSS 247 Issue 1 / FCC Part 15 Subpart C 15.247	



Test setup photo 7
Conducted measurements