

Global EMC Inc. Labs EMC & RF Test Report

As per

RSS 210 Issue 8:2010

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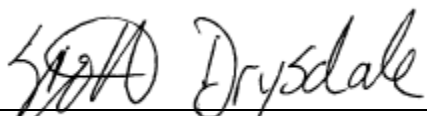
FCC Part 15 Subpart C:2011

Unlicensed Intentional Radiators

on the

Armour Antenna Unit

(SCAN~LINK SAFETY SYSTEM)



Scott Drysdale, Narte Certified

Technician

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Testing produced for



See Appendix A for full customer & EUT details.





Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

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Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Report Scope

This report addresses the EMC verification testing and test results of the Armour Antenna Unit , herein referred to as EUT (Equipment Under Test) performed at Global EMC Labs.

The EUT was tested for compliance against the following standards:


RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011

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 Global EMC Inc.


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

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Summary


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

EUT FCC Certification #, FCC ID:	YUU-SLAU270MR
EUT Industry Canada Certification #, IC:	9283A-SLAU270MR
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Scott Drysdale

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203 RSS 210 Section 5.5	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS 210 Section 6.3 (Table 2)	Restricted Bands for intentional operation	None within chart	Pass See description
FCC 15.207 RSS 210 Section 6.6	Power line conducted emissions	QuasiPeak Average	Pass See Justification
FCC 15.209 RSS 210 Section 6.2.1 (Tables 3 & 7)	Radiated emissions	QuasiPeak Average	Pass
FCC 15.247(a)(1) RSS 210 6.2.2(o)	Channel Separation	> 25 kHz	Pass
FCC 15.247(a)(1)(i) RSS 210 6.2.2(o)	Number of channels	> 50	Pass
FCC 15.247(a)(1)(i) RSS 210 6.2.2(o)	Time of occupancy	< 400 mSec in 20 sec period	Pass
FCC 15.247(b) RSS 210 6.2.2(o)	Max output power	< 1 Watt (- 0.15 dB)	Pass
FCC 15.247(b)(4) RSS 210 6.2.2(o)	Antenna Gain	Adjusted for > 6 dBi	Pass See Justification
FCC 15.247(d) RSS 210 6.2.2(d)	Antenna conducted spurious	> 20 dBc	Pass
FCC 15.247(h)	FHSS Intelligence	No coordination	Pass See Justification
FCC 15.247(i) IC Safety code 6	Maximum Permissible Exposure	> 20 cm separation.	Pass See justification and calculations
Overall Result			PASS

Client	SCAN~LINK TECHNOLOGIES INC.	
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All tests were performed by Scott Drysdale.

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '*'.

Justifications, Descriptions, or Deviations

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

For the Antenna requirement specified in FCC 15.203 (RSS 210 section 5.5), this device has internal antenna(s) and is permanently sealed with no end user serviceable operations.


For the Restricted Bands of operation, the EUT is designed to only operate between 903.2 MHz to 922 MHz.

For the power line conducted emissions requirements, the EUT is DC powered, and this test does not apply.

For the scope of this testing the EUT was pre-scanned in three orthogonal axis to maximize emissions. Maximum emissions were found in the vertical EUT polarization. This setup was used for all testing in this report. Additionally, normally the EUT would be operated in this orientation.


For the Antenna gain, this device is designed to use an antenna with a rated gain of 6.15 dBi. The peak power limits are therefore adjusted by a factor 0.15 dB in accordance with 15.247 (b)(4).

For maximum permissible exposure, this device operates at less than 1 Watt at 903.2-922 MHz and is designed to operate greater than 20 cm from personnel during normal operation. No testing is required, however worst case calculated exposure compliance follows later in this report.

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Applicable Standards, Specifications and Methods

- ANSI C63.4:2003 - Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
- ANSI C63.10:2009 - American national standard for testing unlicensed wireless devices
- CFR 47 FCC 15 - Code of Federal Regulations – Radio Frequency Devices
- CISPR 22:1997 - Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
- FCC Public Notice DA 00-705
Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
- ICES-003:2004 - Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
- ISO 17025:2005 - General Requirements for the competence of testing and calibration laboratories
- RSS 210:2010 - Issue 8: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power Licence-Exempt Radiocommunication Devices

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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

Revision 1 - April 17, 2013

Revision 2 - June 14, 2013

Added reference to FCC Public Notice DA 00-705 as per TCB request.

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Definitions and Acronyms

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

AE – Auxillary Equipment.

BW – Bandwidth. Unless otherwise stated, this is refers to the 6 dB bandwidth.

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity

EUT – Equipment Under Test

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.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs in 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 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. 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 a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

Calibrations and Accreditations


The measurement site used is registered with Federal Communications Commission (FCC) and Industry Canada (IC). This site is 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 semi-anechoic chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test. Global EMC is accredited by A2LA for testing as

Client	SCAN~LINK TECHNOLOGIES INC.	
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Testing Environmental Conditions and Dates

Following were the environmental conditions in the facility during time of testing –

Date	Test	Init.	Temperature (°C)	Humidity (%)	Pressure (kPa)
Mar 13, 2013	Radiated	SD	22.5°C	30-45%	98 -103kPa
Mar 27, 2013	Antenna Conducted	SD	21°C	30-45%	98 -103kPa

Client	SCAN~LINK TECHNOLOGIES INC.	
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Detailed Test Results Section

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Channel Carrier Bandwidth of Frequency Hopping Systems

Purpose

The purpose of this test is to allow for results that is used to help establish other limits. Although there is not specific limit for this requirement, the derived limits dependant on this information helps allow for other spread spectrum devices to co-exist in the same frequency spectrum.. This also helps prevent corruption of data by ensuring adequate channel separation to distinguish the reception of the intended information.

Limits

There is no specified limit. However, an approximate calculated maximum limit can be obtained by dividing the maximum bandwidth of the frequency allocation by the minimum number of channels. Note that this is a maximum bandwidth, and the measurement is used to calculate other limits.


902 to 928 MHz ¹	902 to 928 MHz ²
26 MHz / 50	26 MHz / 25
520 kHz	1.04 MHz

Note 1: When the 20 dB BW is less then 250 kHz

Note 2: When the 20 dB BW is greater then 250 kHz

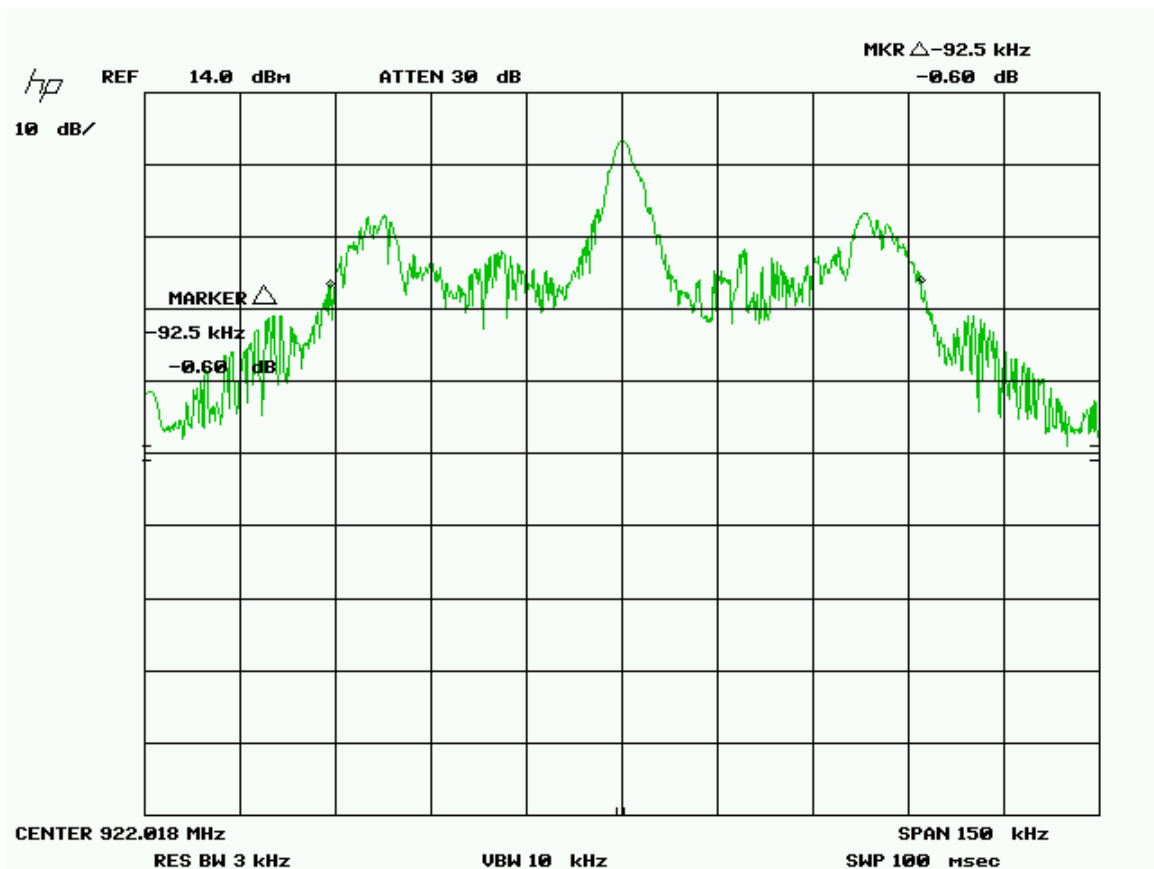
Results

The 20 dB BW measured was 92.5 kHz.


Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Graph(s)

The graphs shown below shows the channel spacing 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 20 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.




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

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Oct-06, 2011	Oct-06, 2013	GEMC 160
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	GEMC 141
BiLog Antenna	3142-C	ETS	Feb 4, 2013	Feb 4, 2015	GEMC 137
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	8/29/2012	8/29/2014	GEMC 6403
Q-Par 1.5-18 GHz Horn	6878/24	Q-par	8/23/2012	8/23/2014	GEMC 6365
1-26G pre-amp	HP 8449B	HP	8/22/2012	8/22/2014	GEMC 6351
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 10m	LMR-400-10M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31
Emission software	0.1.83	Global EMC	NCR	NCR	GEMC 58

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Channel Carrier Separation for Frequency Hopping Systems

Purpose

The purpose of this test is to ensure that the RF energy of frequency hopping systems is sufficiently spread over a spectrum and that the radio energy is not overly dense. This limit helps allow for other spread spectrum devices to co-exist in the same frequency spectrum. This also helps prevent corruption of data by ensuring adequate channel separation to distinguish the reception of the intended information.

Limits


The limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)

	902 to 928 MHz	2.4 to 2.4835 GHz	5.275 to 5.85 GHz
No conditions	25 kHz or 20 dB BW ¹	25 kHz or 20 dB BW ¹	25 kHz or 20 dB BW ¹
< 125 mW	25 kHz or 20 dB BW ¹	25 kHz or 2/3 of 20 dB BW ¹	25 kHz or 20 dB BW ¹

Note 1: Whichever is greater. The 20 dB BW of the system was measured to be 92.5 kHz, so a limit of 92.5 kHz applies.

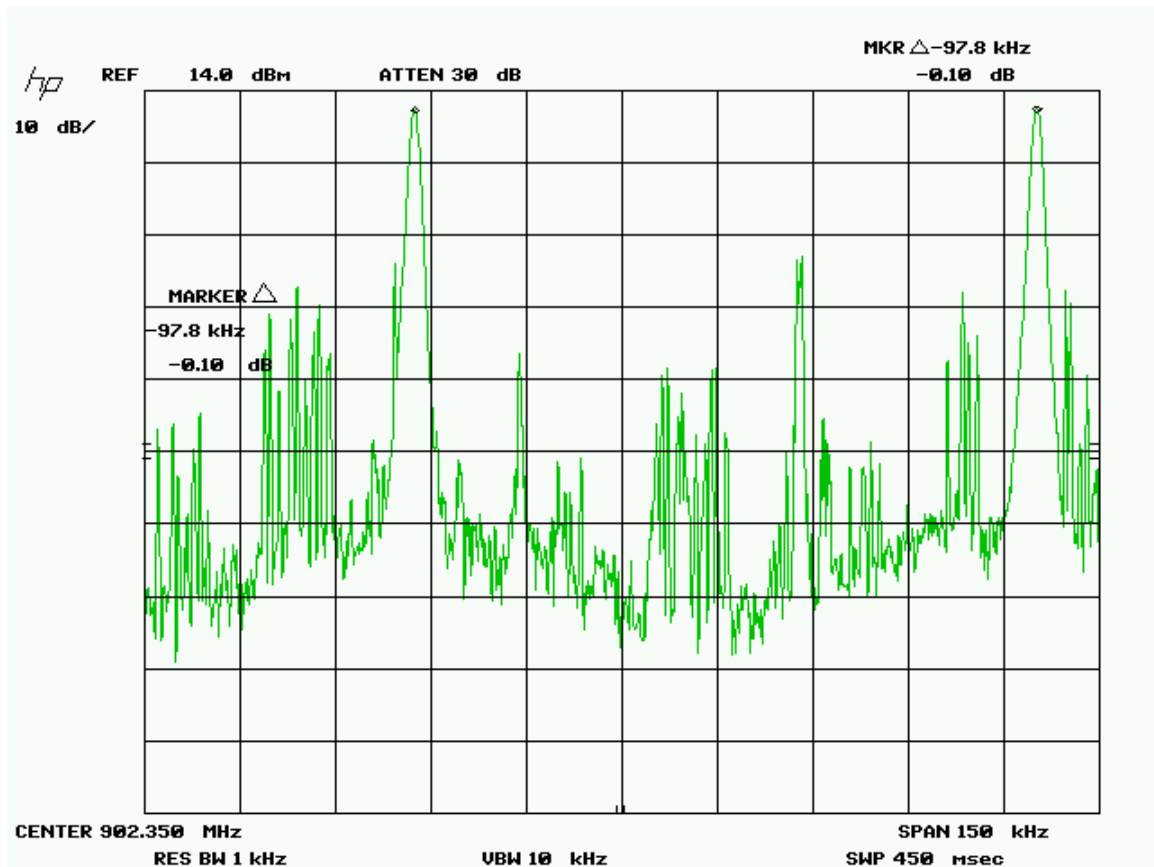
Results

The EUT passed the requirements of channel carrier spacing exceeding the measured 20 dB BW of the EUT. The 20 dB BW previously measured was 92.5 kHz, and the device had a minimum channel spacing of 97.8 kHz (+/- 1 kHz)


Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Graph(s)

The graphs shown below shows the channel spacing 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 channel spacing of the signal being measured. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute, as the device is stepped through two adjacent channels.




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

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	GEMC 141
BiLog Antenna	3142-C	ETS	Feb 4, 2013	Feb 4, 2015	GEMC 137
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 10m	LMR-400-10M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31
Emission software	0.1.83	Global EMC	NCR	NCR	GEMC 58

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Frequency Occupancy for Frequency Hopping Systems

Purpose

The purpose of this test is to ensure that the RF energy of frequency hopping systems is hopping at a minimum defined rate. This helps ensure sufficient time off to enable other frequency hopping devices to co-operate within this allocated band.

Limits

For 902-928 MHz systems, the limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)(i).

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period

Results


The EUT passed the requirements.

The EUT passed the requirements. The EUT cycles through its pseudo-random generated list of hopping frequencies. There are channels 189 occupied in total. The average occupancy time is 4 ms per channel hop and each channel is repeated on average a maximum every 756 milliseconds.

Maximum number of time a channel is occupied in 20 s = $20\text{ s} / 756\text{ milliseconds} = 27$ times

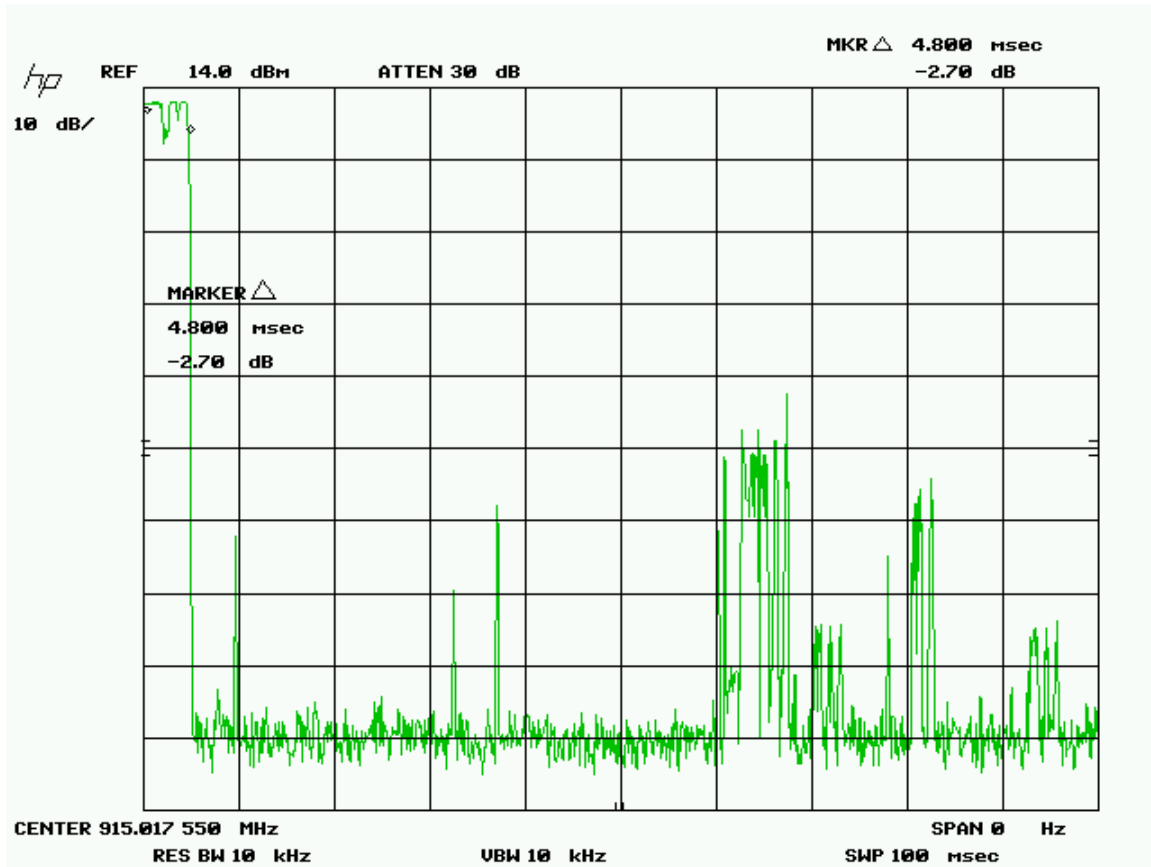
The maximum total occupancy time in 20 s is
= 4ms x 27
= 108 ms


The EUT has a maximum occupancy of 108 msec within a 20 second period. This is under the 400 msec limit as per 15.247 (a) 1 (i)

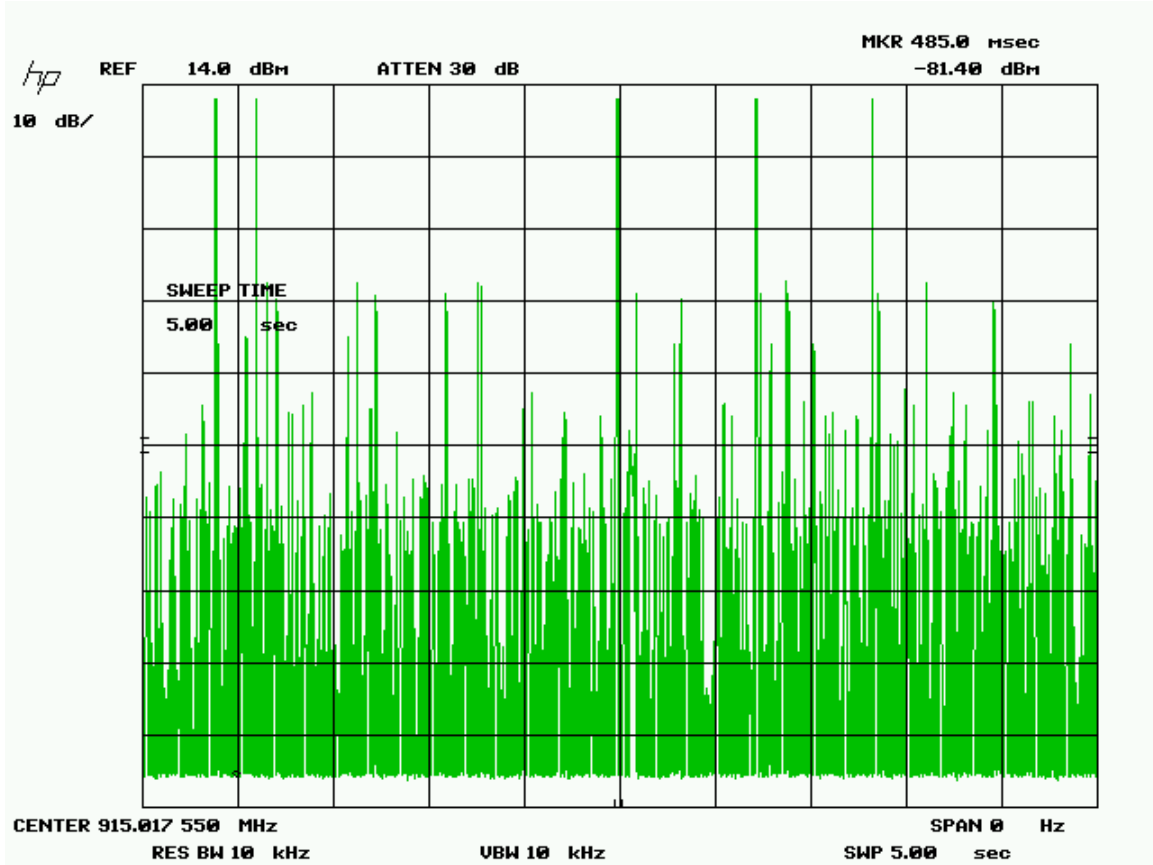
Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Graph(s)


On time

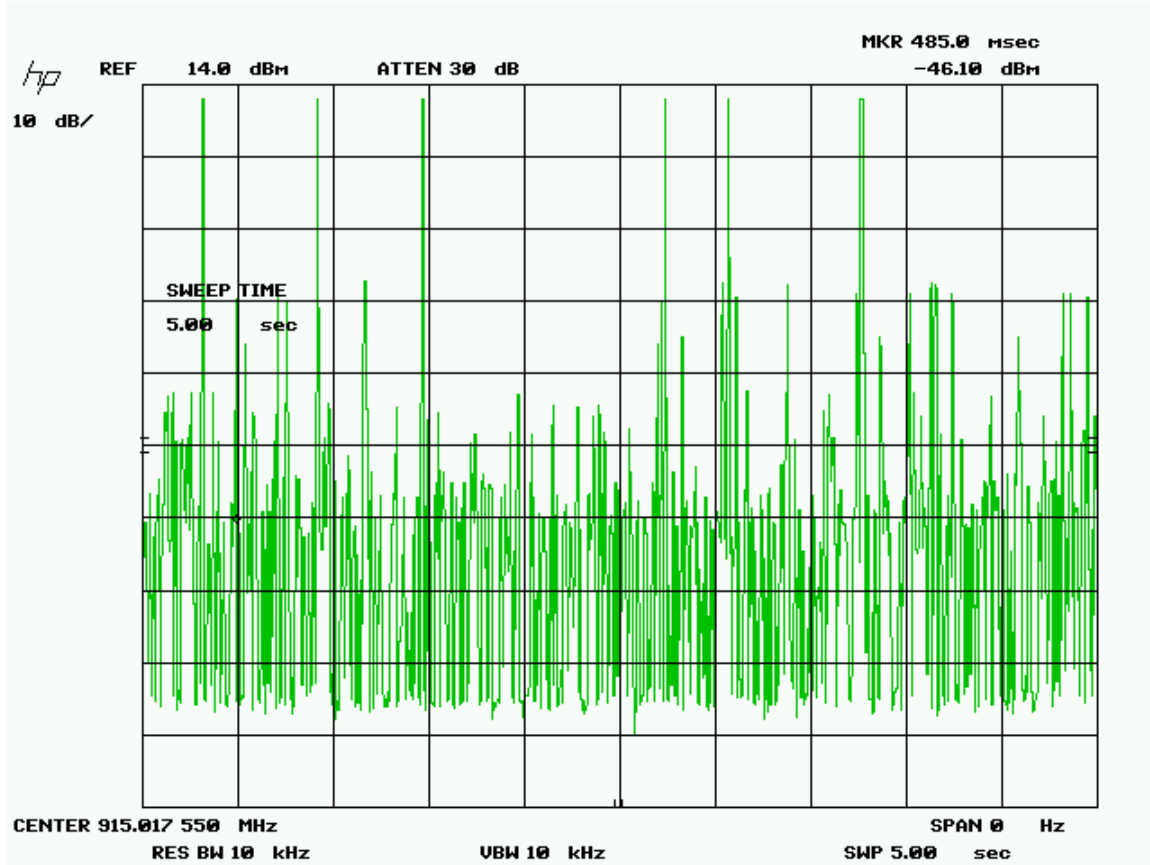


Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	




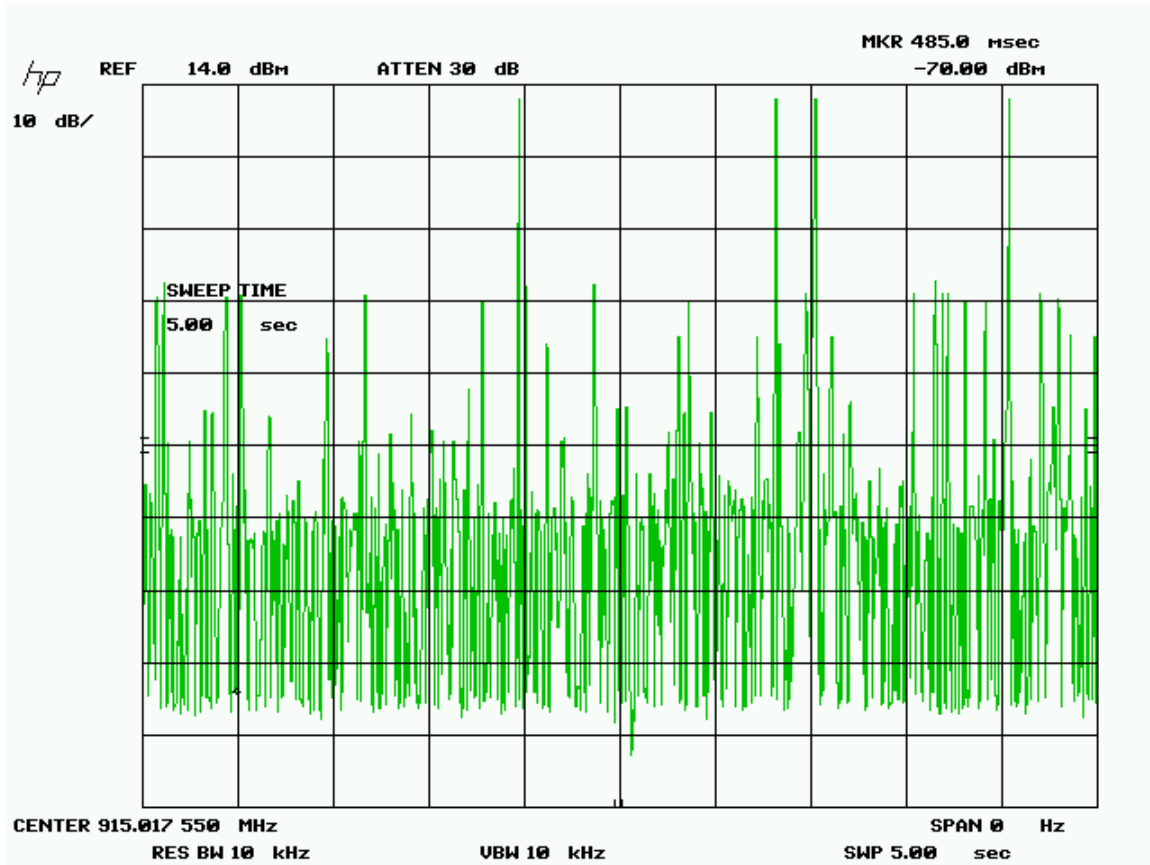
Representative Graph 1 - 0 to 5 seconds - 5 times on.

Client	SCAN~LINK TECHNOLOGIES INC.	
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Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	




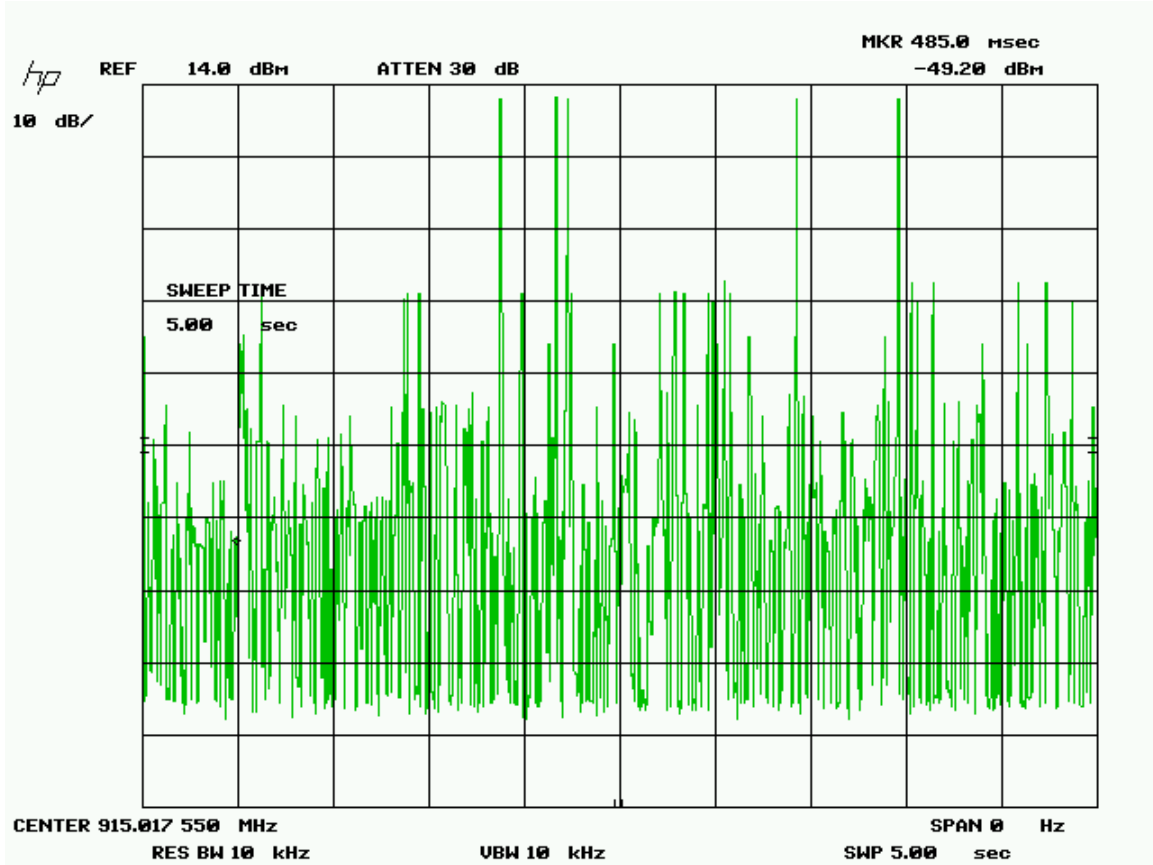
Representative Graph 2 – 5 to 10 seconds - 6 times on.

Client	SCAN~LINK TECHNOLOGIES INC.	
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Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	




Representative Graph 3 - 10 to 15 seconds - 4 times on.

Client	SCAN~LINK TECHNOLOGIES INC.	
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Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	



Representative Graph 4 - 15 to 20 seconds - 5 times on.


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

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	GEMC 141
BiLog Antenna	3142-C	ETS	Feb 4, 2013	Feb 4, 2015	GEMC 137
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	8/29/2012	8/29/2014	GEMC 6403
Q-Par 1.5-18 GHz Horn	6878/24	Q-par	8/23/2012	8/23/2014	GEMC 6365
1-26G pre-amp	HP 8449B	HP	8/22/2012	8/22/2014	GEMC 6351
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 10m	LMR-400-10M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31
Emission software	0.1.83	Global EMC	NCR	NCR	GEMC 58

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Number of Channels for Frequency Hopping Systems

Purpose

The purpose of this test is to ensure that the RF energy of frequency hopping systems is sufficiently spread over a spectrum and that the radio energy is not overly dense. This limit helps allow for other spread spectrum devices to co-exist in the same frequency spectrum. This also helps prevent corruption of data by ensuring adequate channel separation to distinguish the reception of the intended information.


Limits

The limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)

	902 to 928 MHz	2.4 to 2.4835 GHz	5.275 to 5.85 GHz
No conditions	>= 50 channels	>= 15 channels	>= 75 channels
20 dB BW exceeds 250 kHz	>= 25 channels	>= 15 channels	>= 75 channels

Results

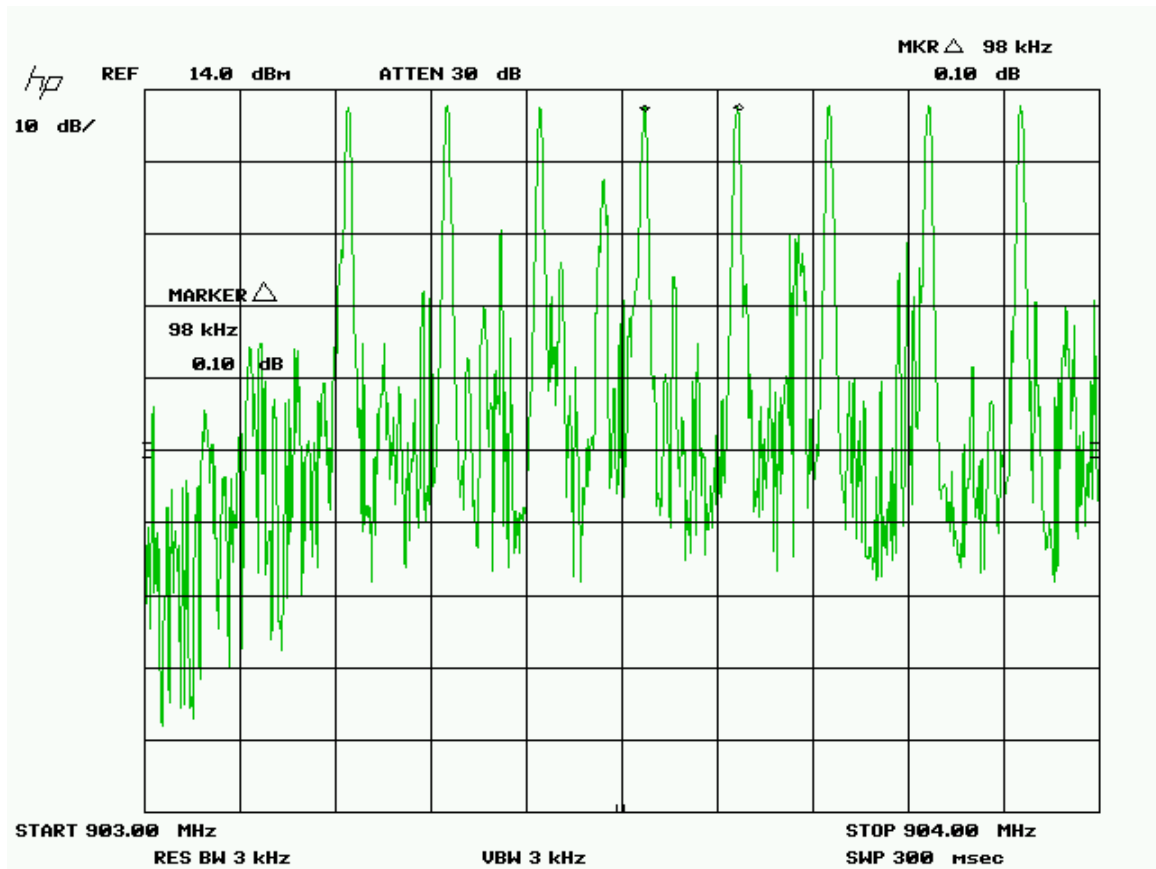
The EUT passed the requirements of the number of channels. The number of channels the device occupies is 189, (1x8+18x10+1x1) channels in the allocation band of 902 MHz to 928 MHz.


Client	SCAN~LINK TECHNOLOGIES INC.	
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Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Graph(s)

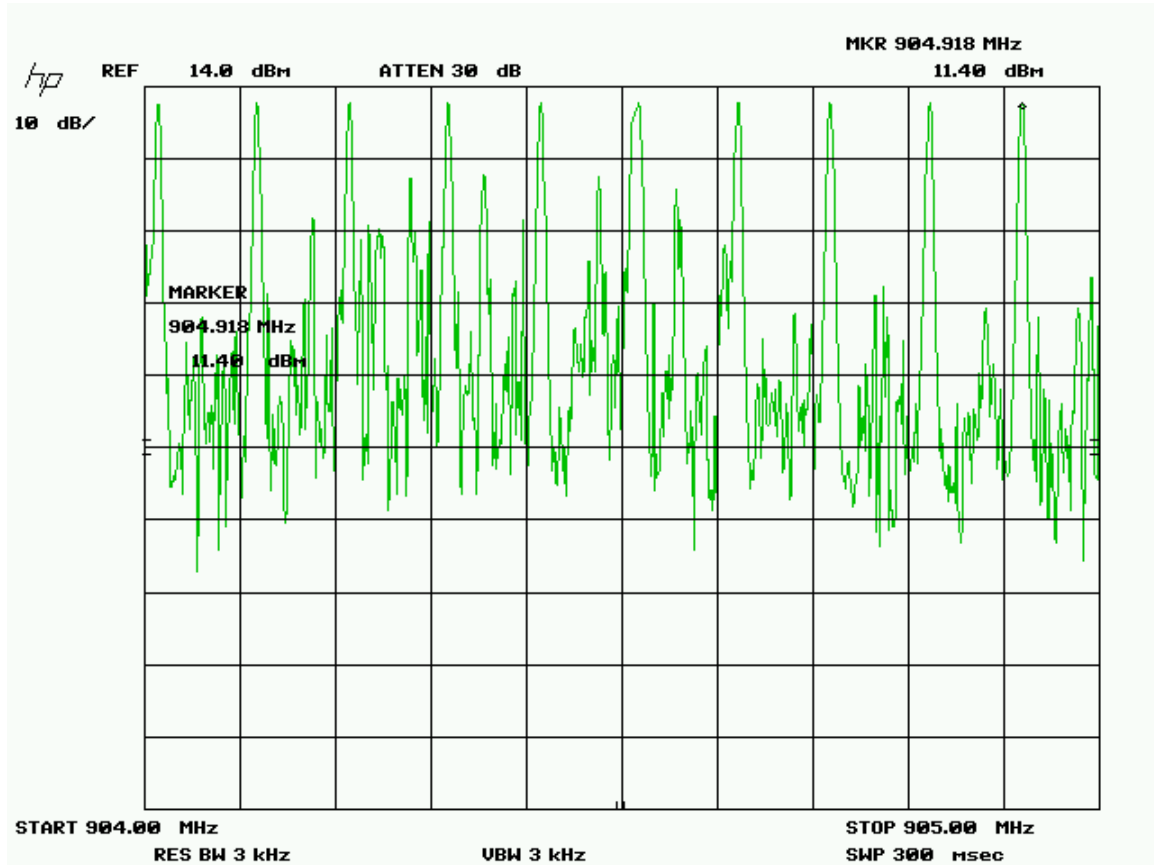
The graphs shown below shows the number of occupied channels during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the channel spacing of the signal being measured. This measurement is a peak measurement. Max hold is performed for a duration of not less than 10 minutes, or as sufficient to capture the channels occupied.


Graph 1 of 20 (8 channels)



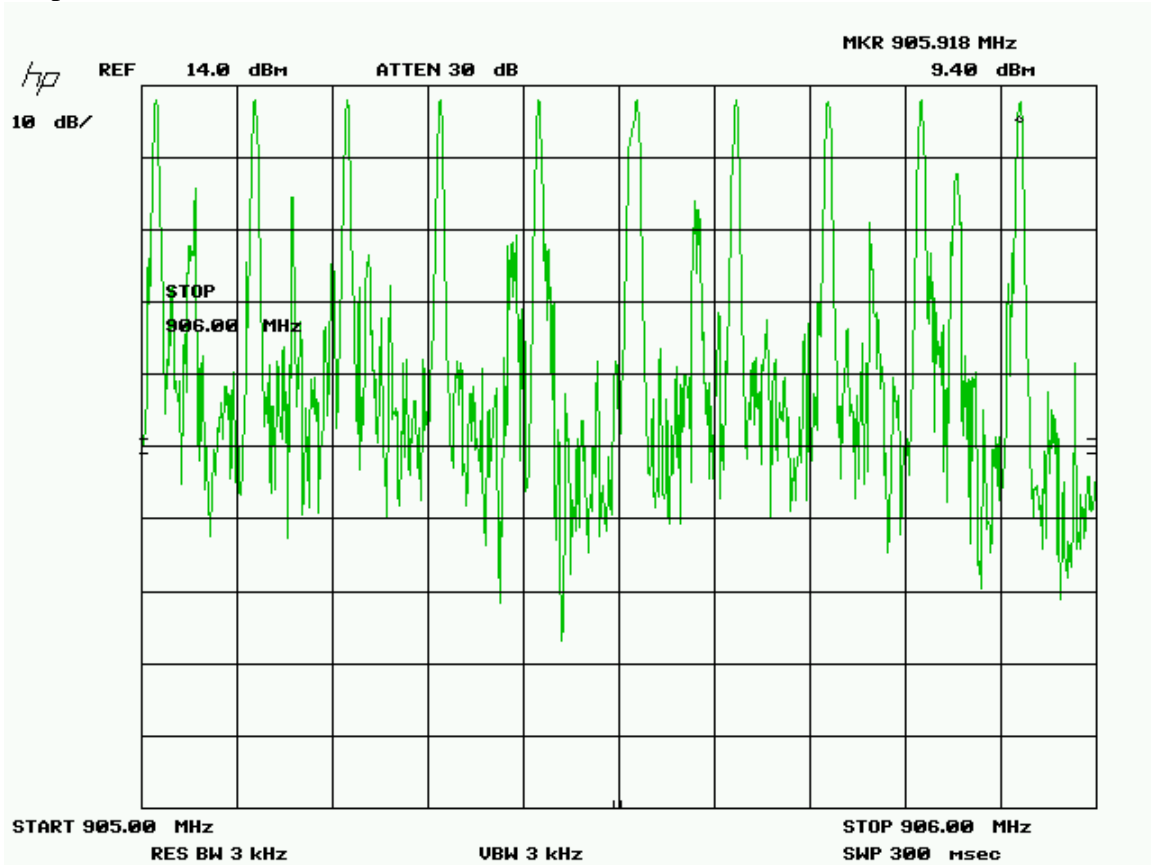
Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 2 of 20 (10 channels)



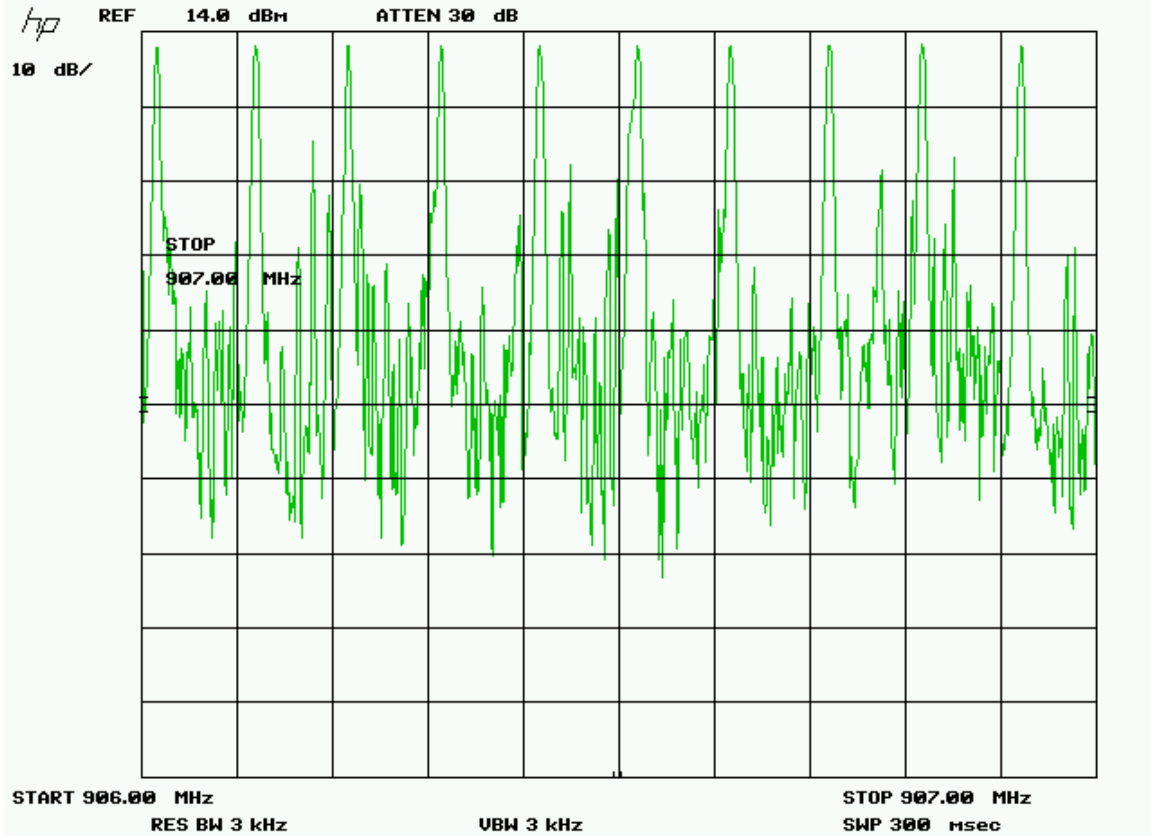
Client	SCAN-LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 3 of (10 channels)



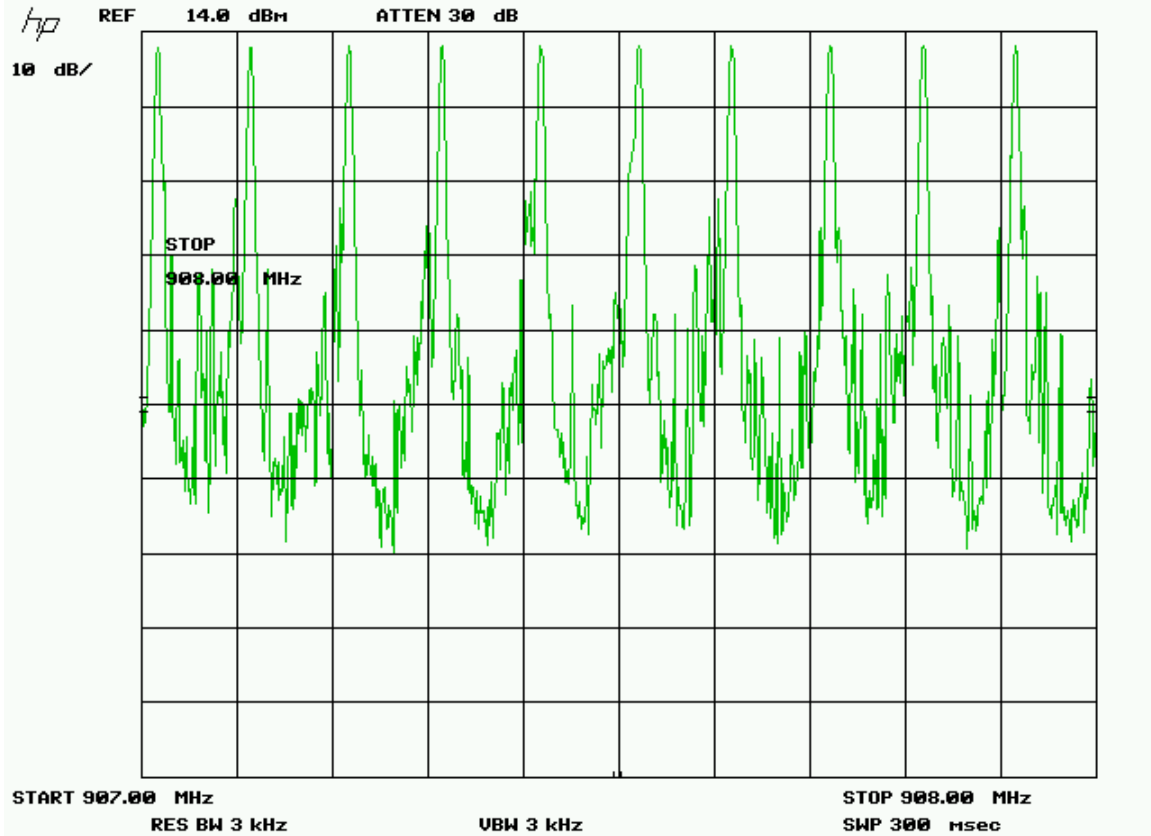
Client	SCAN-LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 4 of 20 (10 channels)



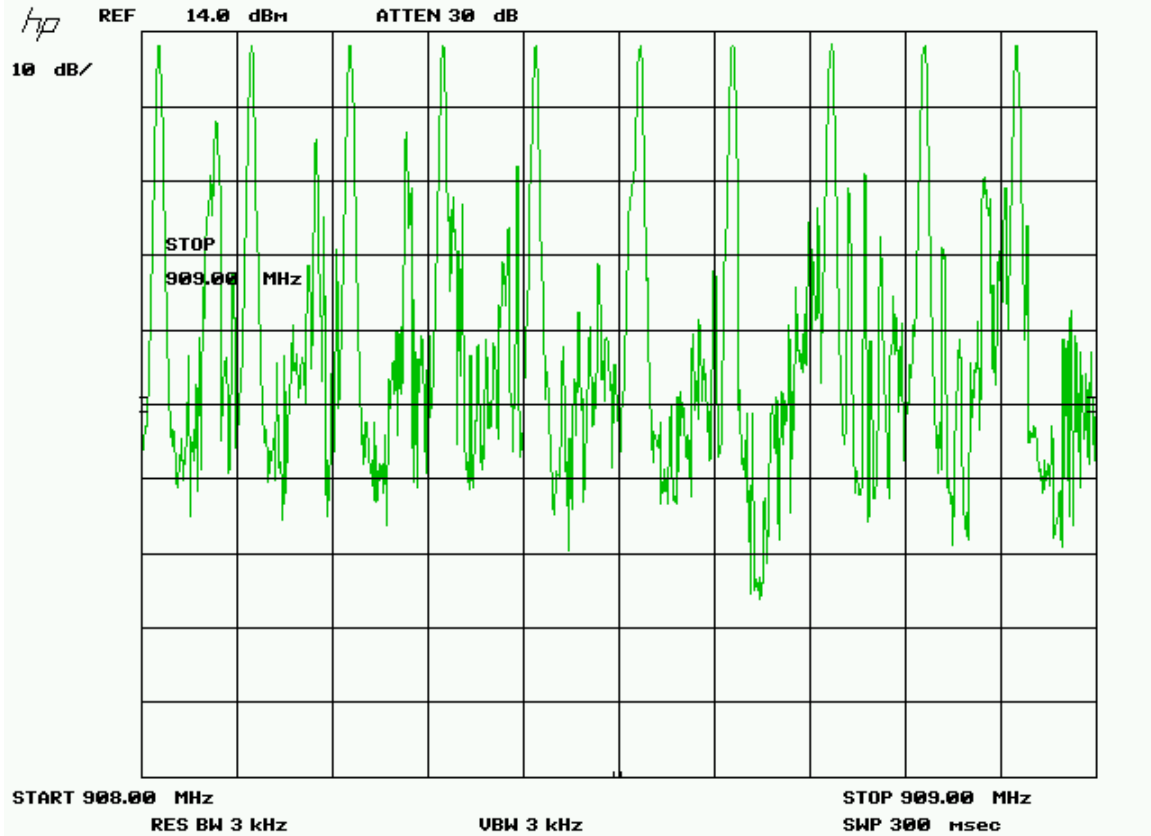
Client	SCAN-LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 5 of 20 (10 channels)



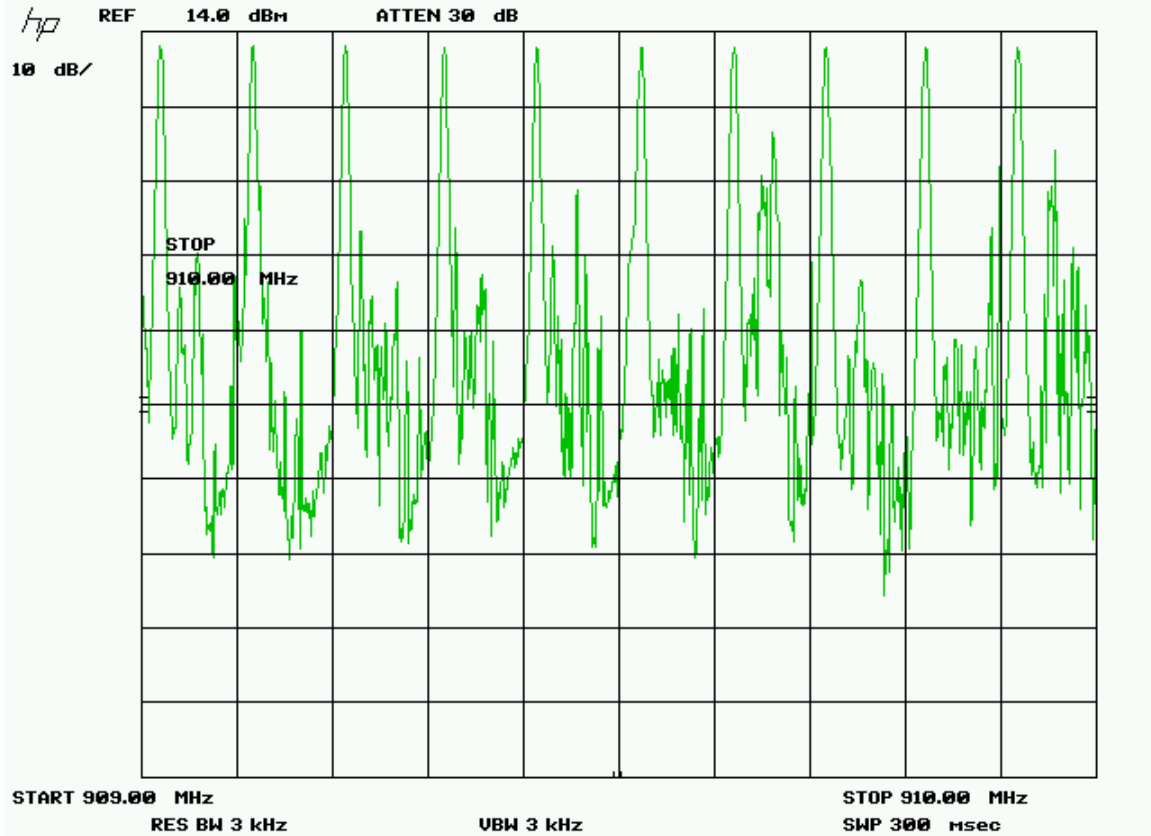
Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 6 of 20 (10 channels)



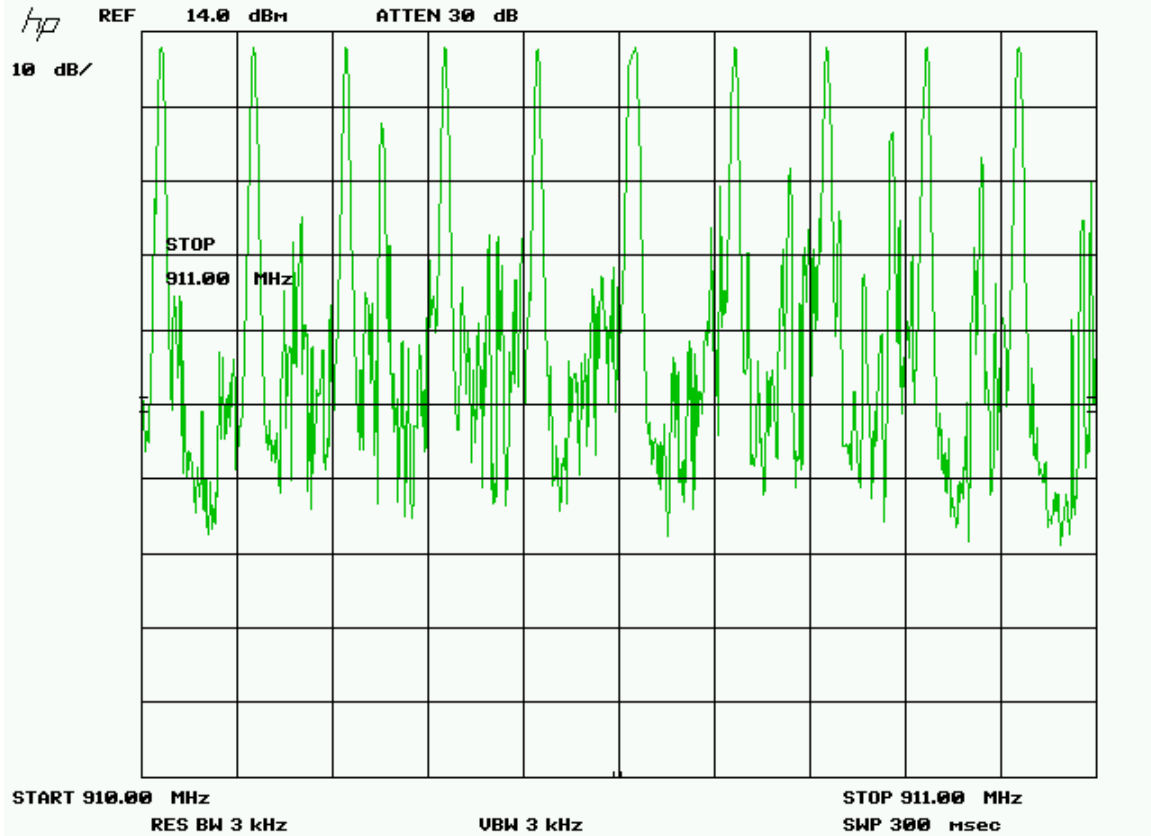
Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 7 of 20 (10 channels)



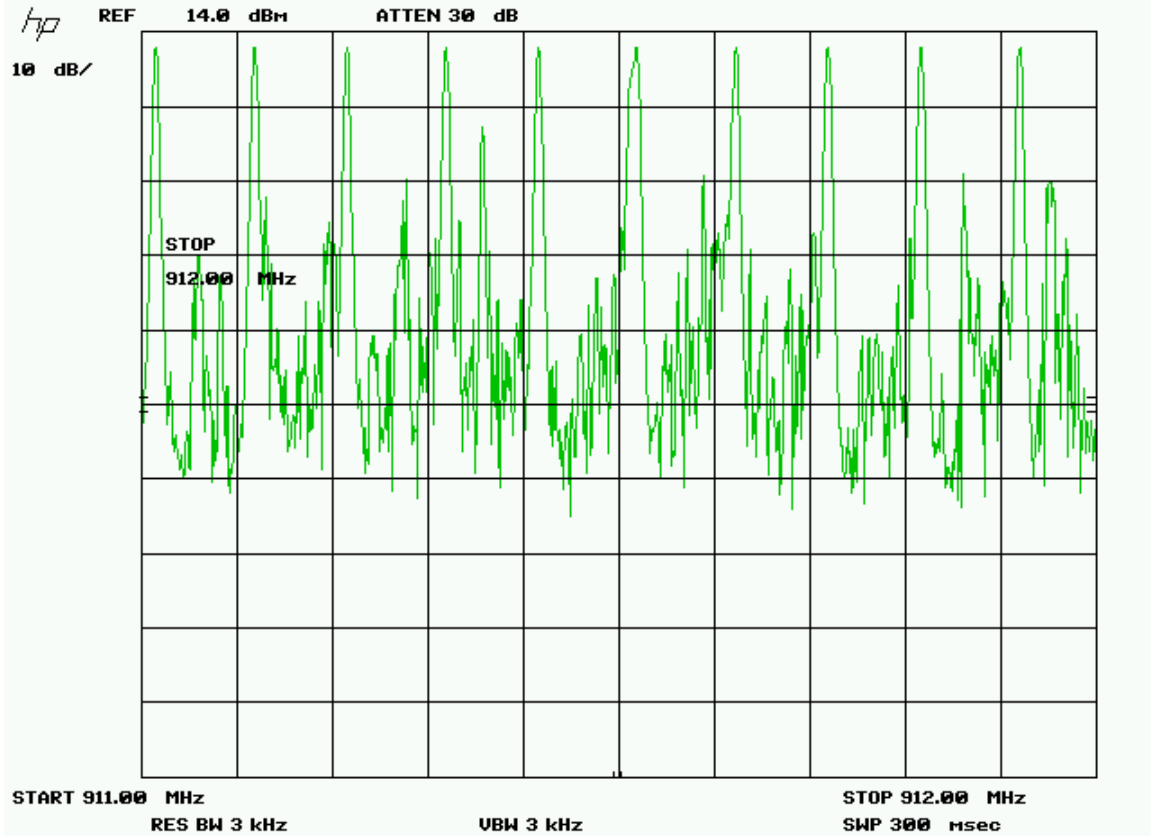
Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 8 of 20 (10 channels)



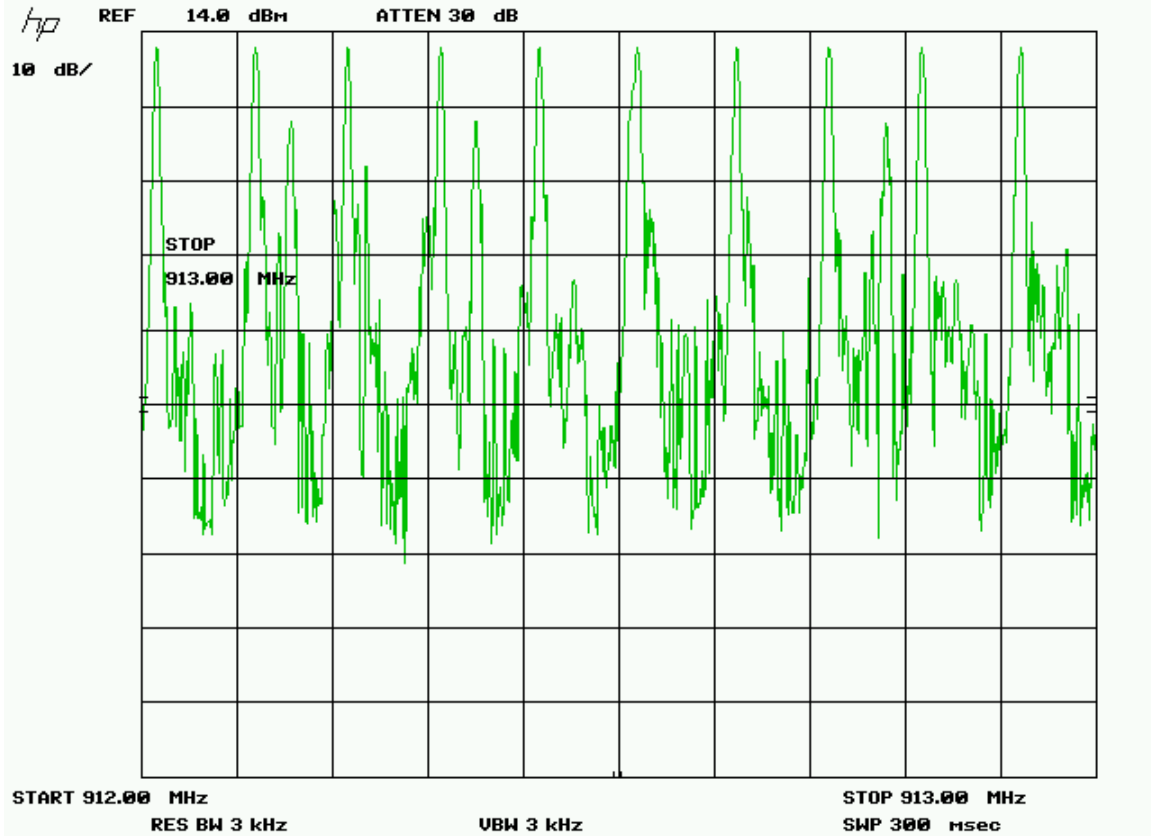
Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 9 of 20 (10 channels)



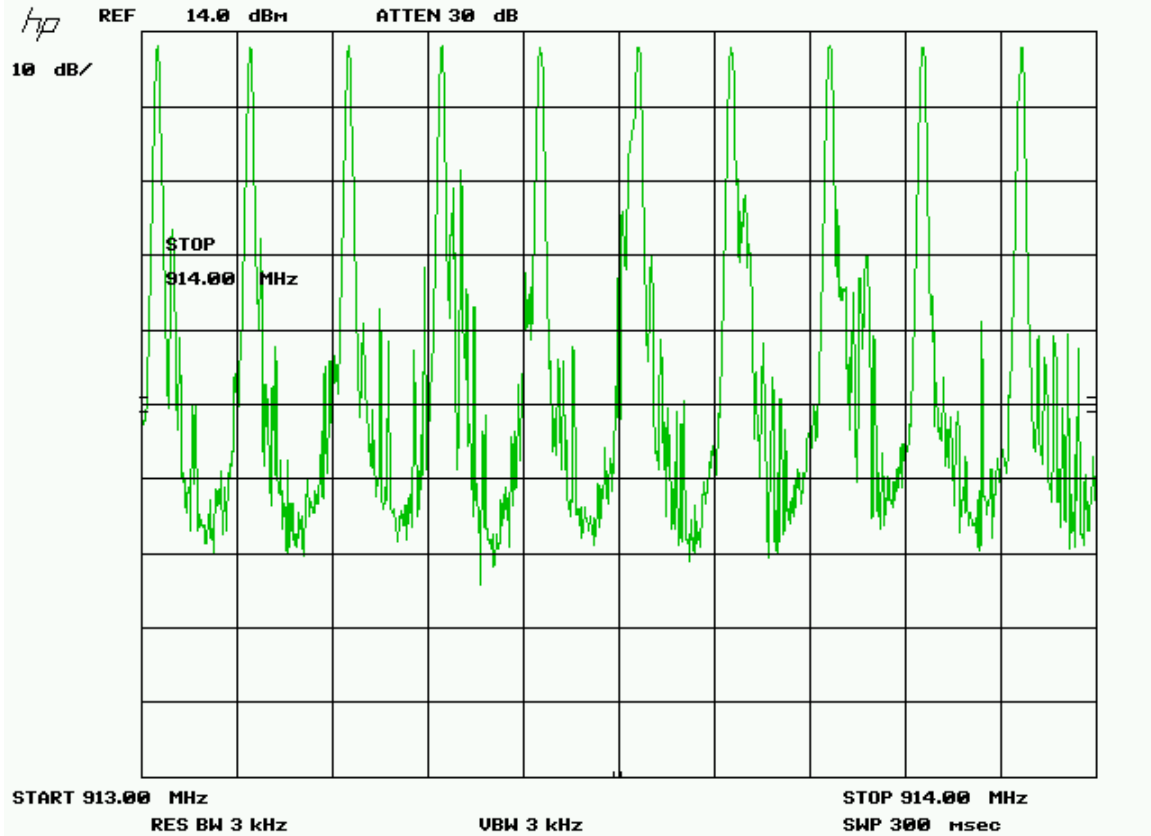
Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 10 of 20 (10 channels)



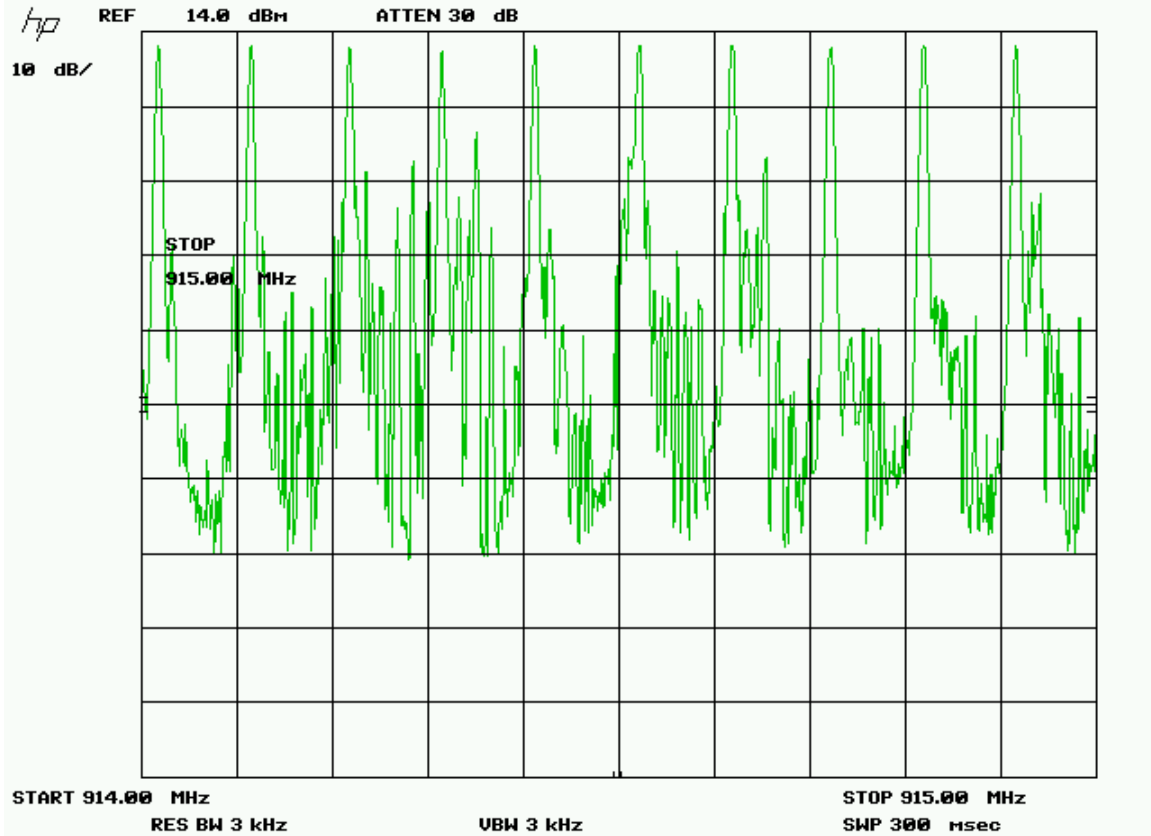
Client	SCAN-LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 11 of 20 (10 channels)



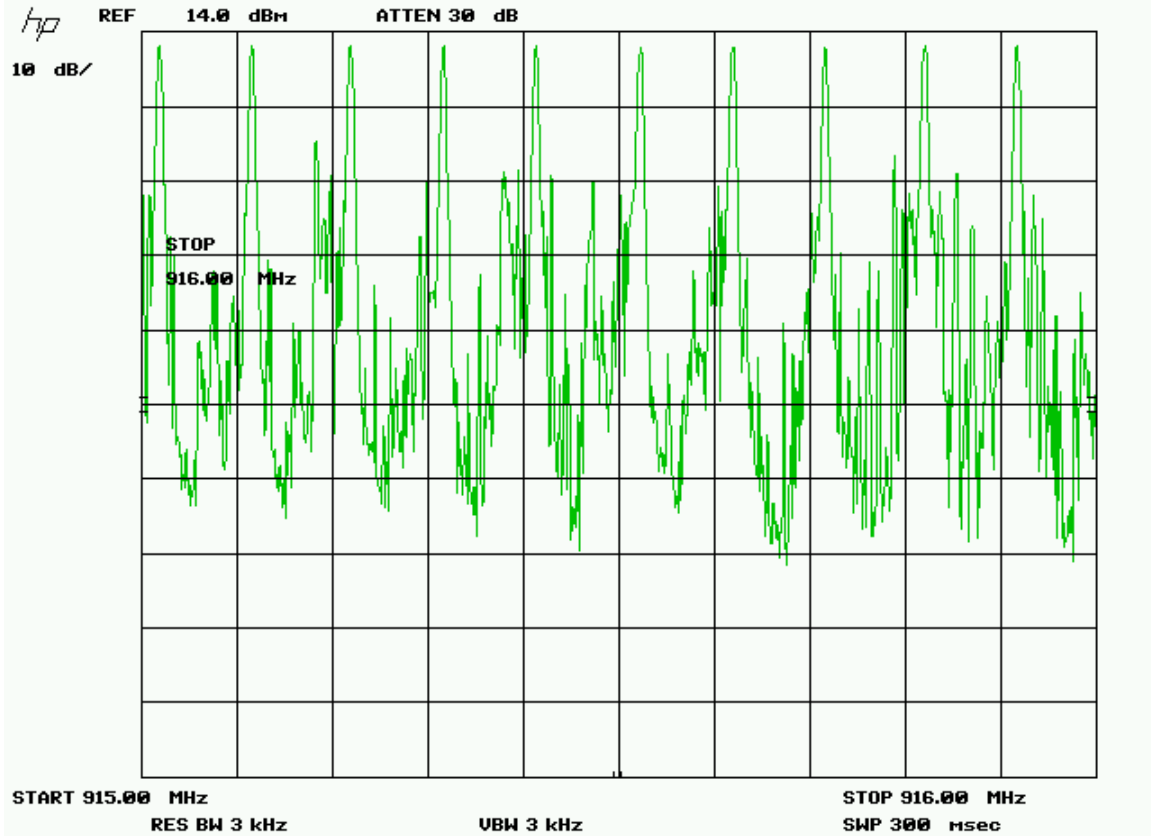
Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 12 of 20 (10 channels)



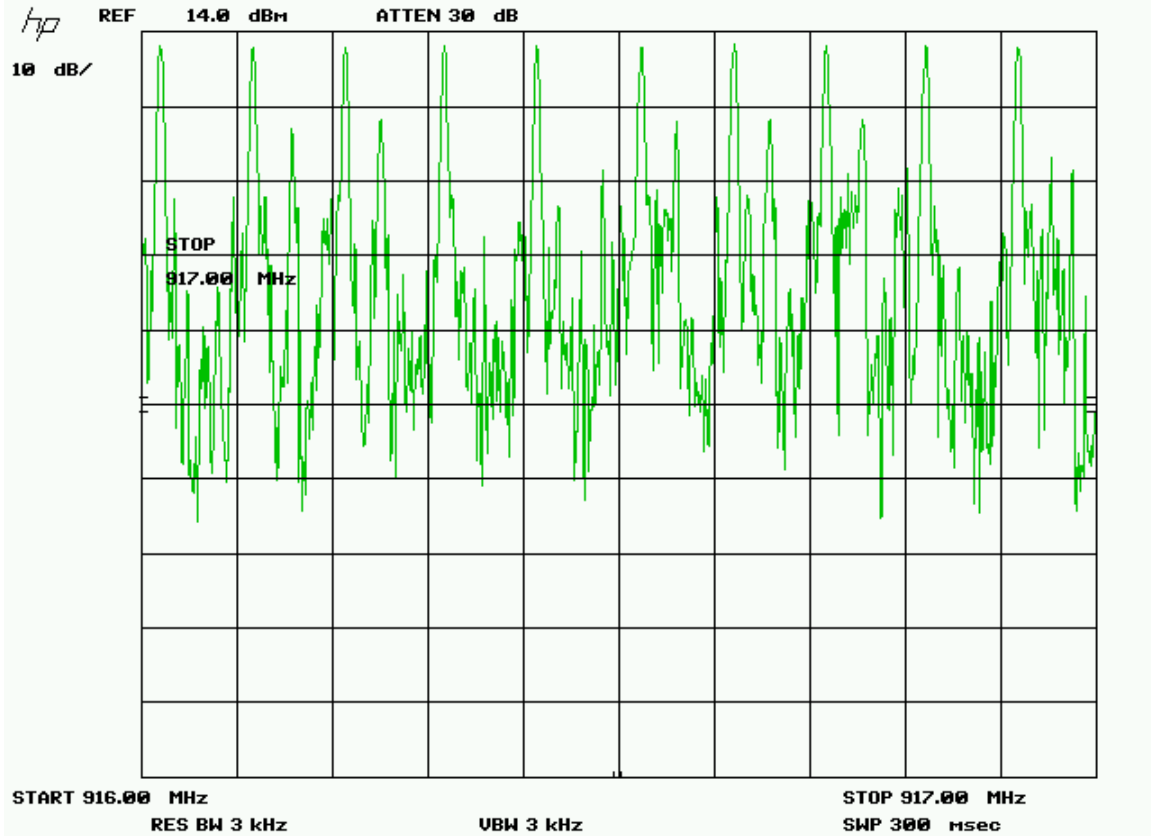
Client	SCAN-LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 13 of 20 (10 channels)



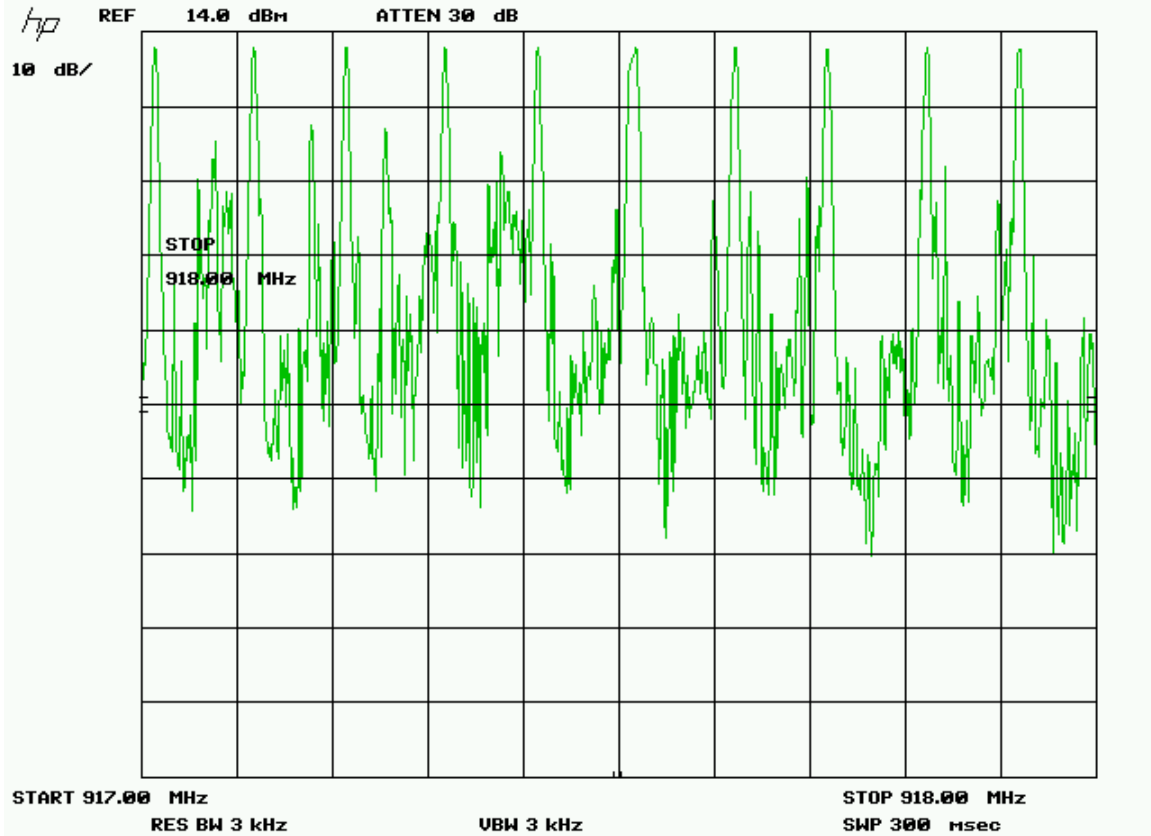
Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 14 of 20 (10 channels)



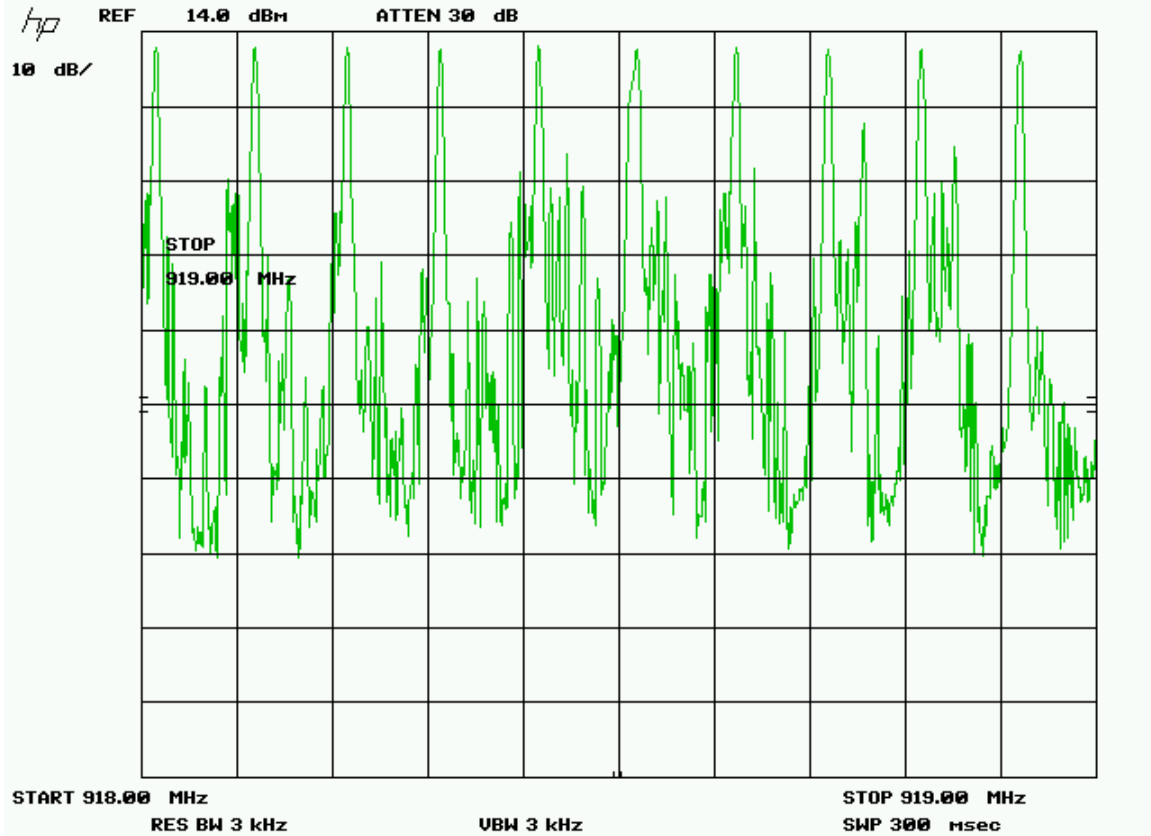
Client	SCAN-LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 15 of 20 (10 channels)



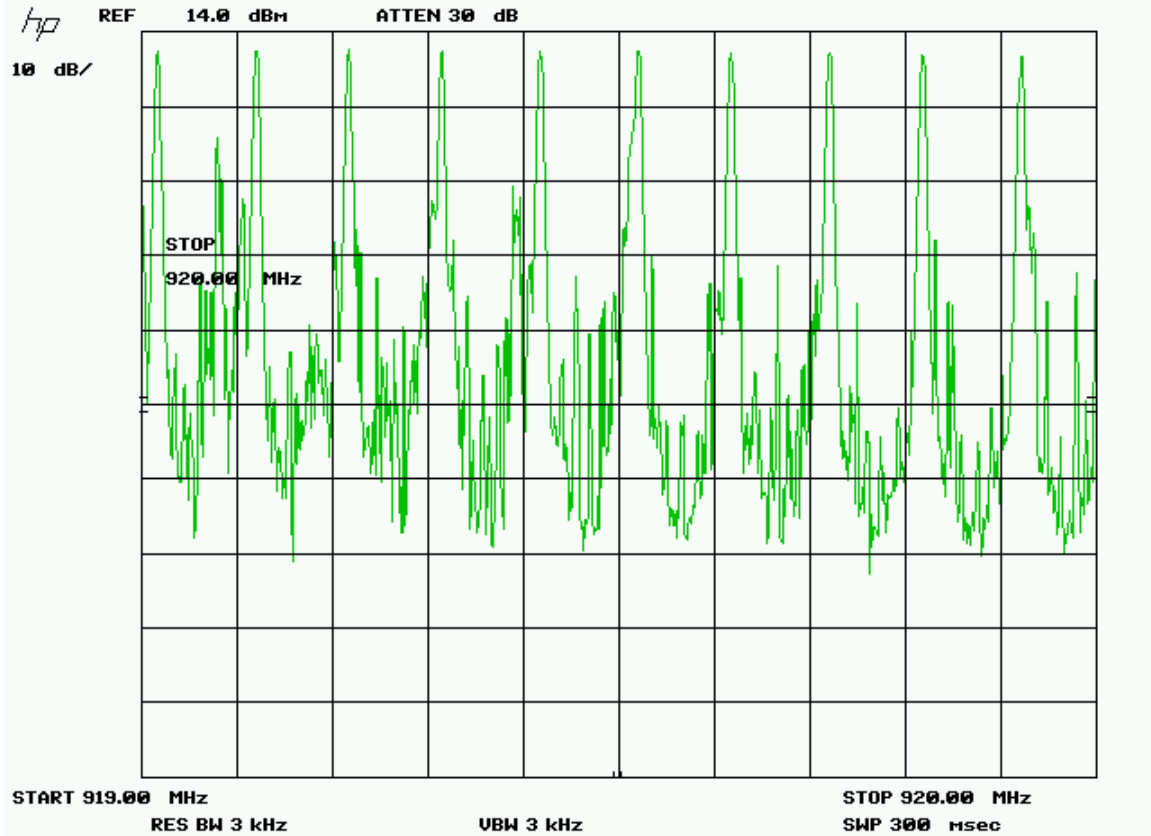
Client	SCAN-LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 16 of 20 (10 channels)



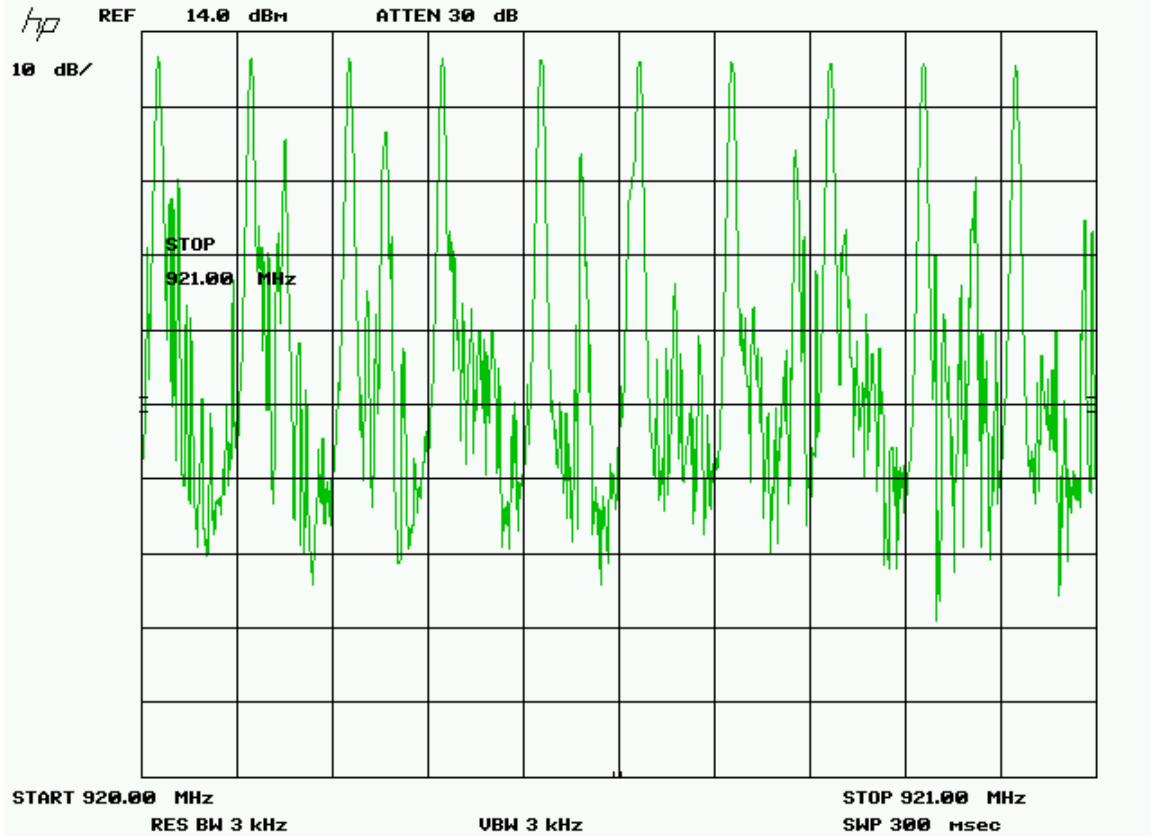
Client	SCAN-LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 17 of 20 (10 channels)



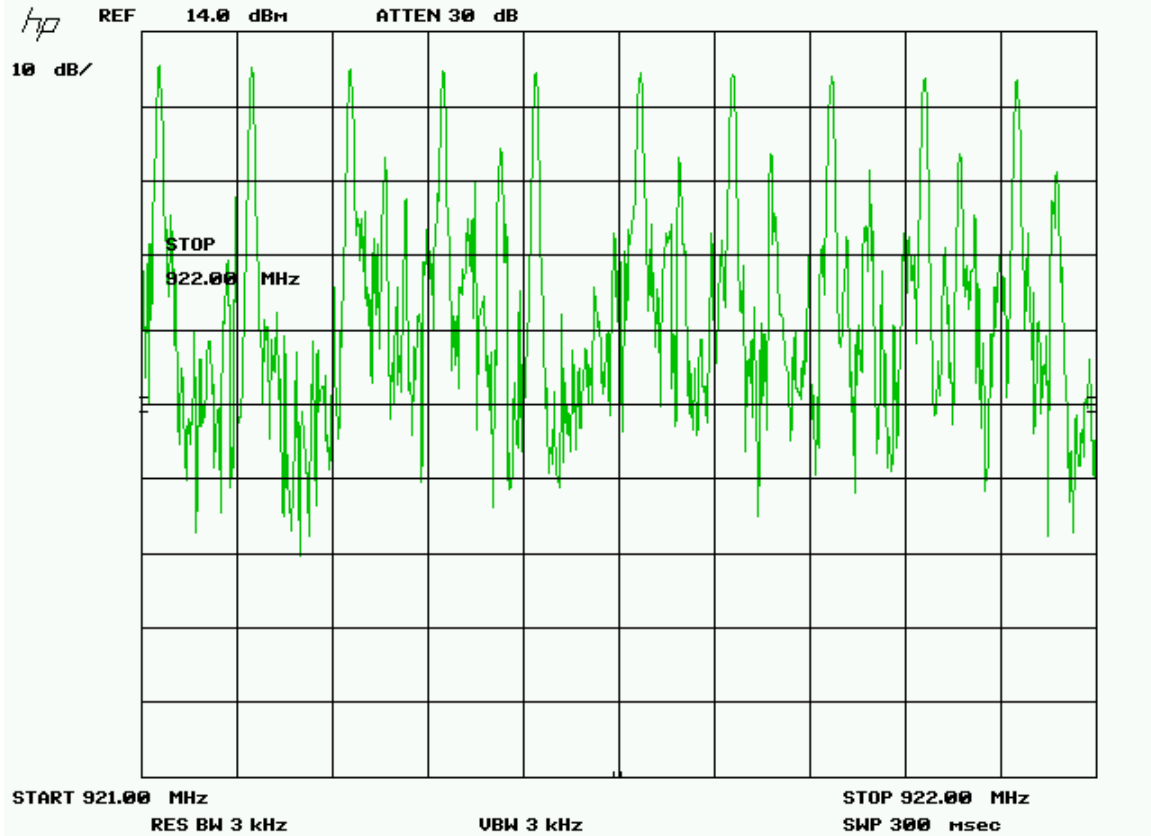
Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 18 of 20 (10 channels)



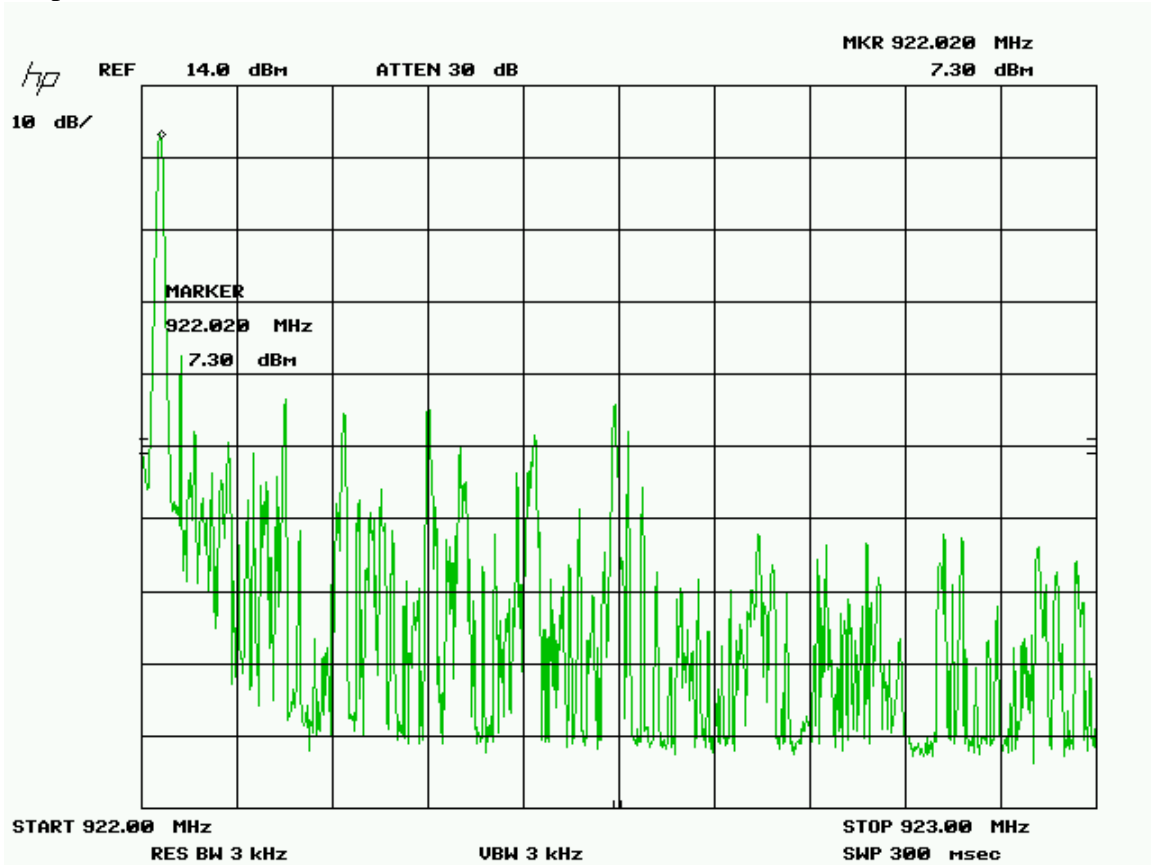
Client	SCAN-LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Graph 19 of 20 (10 channels)



Client	SCAN-LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Graph 20 of 20 (1 channel)




Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

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

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Oct-06, 2011	Oct-06, 2013	GEMC 160
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	GEMC 141
BiLog Antenna	3142-C	ETS	Feb 4, 2013	Feb 4, 2015	GEMC 137
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	8/29/2012	8/29/2014	GEMC 6403
Q-Par 1.5-18 GHz Horn	6878/24	Q-par	8/23/2012	8/23/2014	GEMC 6365
1-26G pre-amp	HP 8449B	HP	8/22/2012	8/22/2014	GEMC 6351
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 10m	LMR-400-10M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Maximum Peak Envelope Conducted Power - FHSS

Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified.


Limits

The limits are defined in 15.247(b).

For frequency hopping systems operating in the 902 MHz to 928 MHz band employing more at least 50 hopping channels, the peak limit is 1 watt. This is to be adjusted by -0.15 dB to account for the antenna gain which exceeds 6 dB.

Results


The EUT passed. The peak power measured was 22.2 dBm (166 mW), which is 7.65 dB below the 29.85 dBm limit applies.

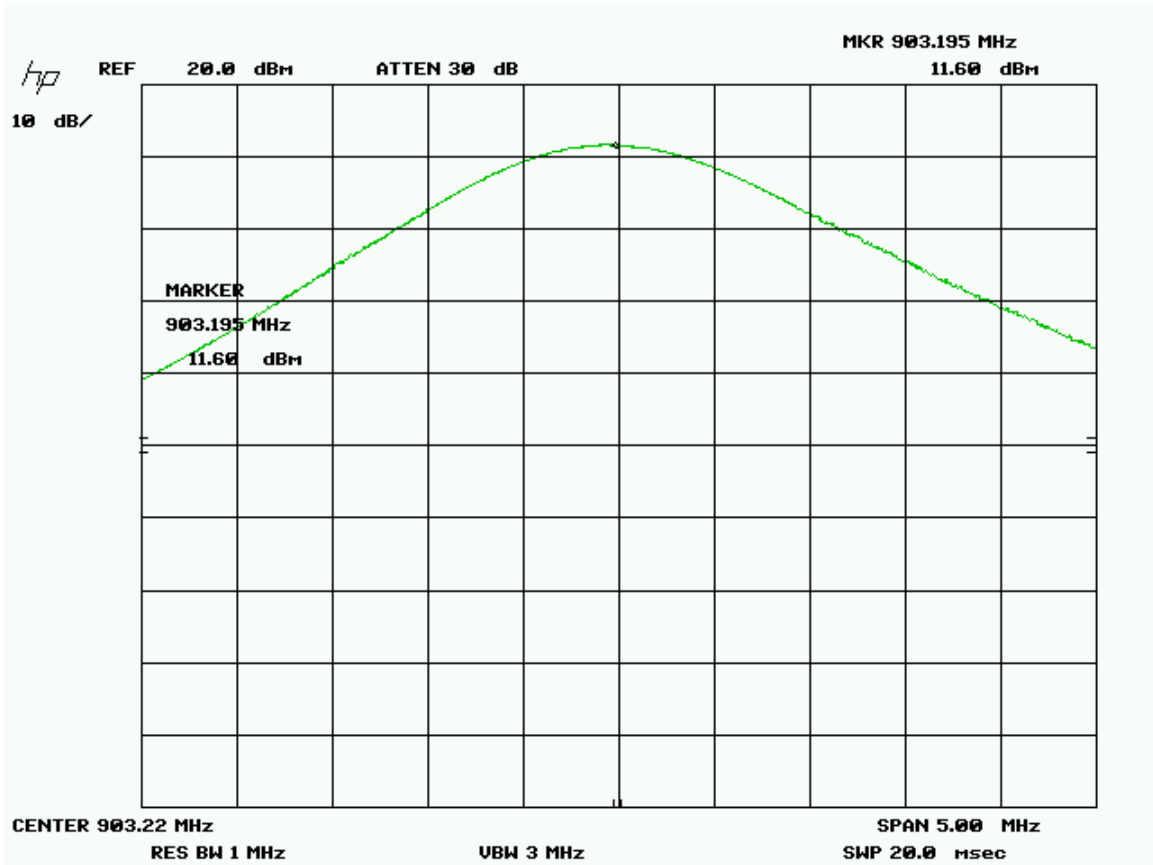
Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Measurement(s)


The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT.

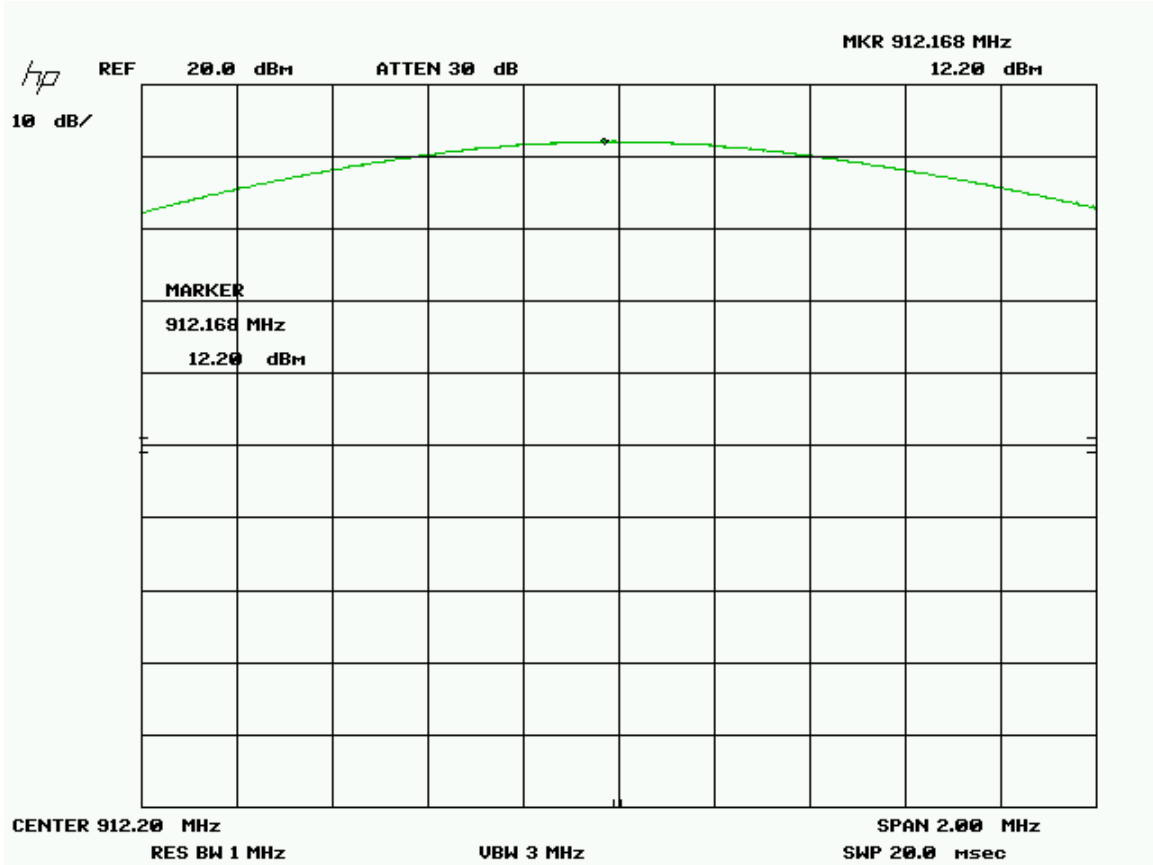
Frequency (GHz)	Reading (dBm)
903.2	21.6
912.2	22.2
922.0	17.7

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	




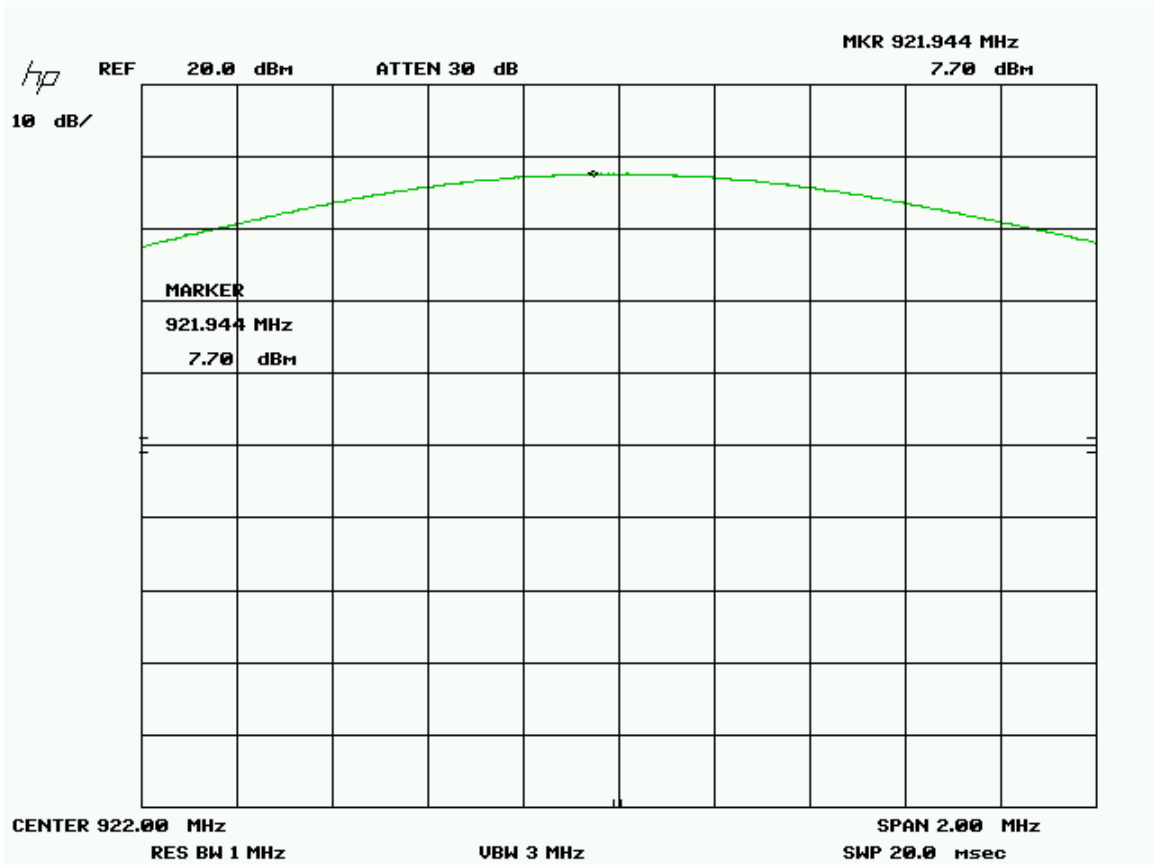
Low channel with 10 dB external attenuation.

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	




Middle channel with 10 dB external attenuation.

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	



High channel with 10 dB external attenuation.


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

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	GEMC 141
RF Cable 10m	LMR-400-10M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31
Emission software	0.1.83	Global EMC	NCR	NCR	GEMC 58

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Maximum Permissible Exposure

Purpose


The purpose of this test is to ensure that the RF energy intentionally transmitted, in terms of power density emitted from the EUT at a stated operating distance does not exceed the limits listed below as defined in the applicable test standard, as calculated based upon readings obtained during testing. This helps protect human exposure to excessive RF fields.

Limit(s) and Method


The limits, as defined in FCC 15.247(i), and FCC 1.1310 Table 1 (B) limits for general public exposure was applied. The limit for the frequency range of <300 MHz to 1500 MHz is $f/1500 \text{ mW/cm}^2$, > where f is the frequency in MHz. For a worst case limit, the lowest frequency used was for limit calculation purposed. The limit was calculated to be 900/1500, or 0.6 mW/cm^2 . The distance used for calculations was 20cm, as this is the minimum distance a nearby person will be from the EUT during normal operation.

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Appendix A – EUT Summary

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

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

General EUT Description

Manufacturer	MARLEX Engineering Inc.
	1374 Sandhill Drive Ancaster, ON Canada L9G 4V5
EUT Name	Armour Antenna Unit
Approximate Size (LxWxH)	
Equipment Category (Commercial / Residential / Medical)	Industrial
Peripherals required for test	Non / Self contained
Minimum Separation distance from operator	20 cm
Types and lengths of all I/O cables	N/A
Description	<p>Upon receiving a reverse input signal, the SCAN~LINK system will begin rapid rate transmission with the SkyeTek M10 RFID module to detect RFID tags. The reverse input signal can be received at the ARMOUR ANTENNA UNIT containing the RFID reader/antenna, or at the DISPLAY UNIT. In this reverse state, the SkyeTek M10 RFID module will transmit at pseudo random intervals. Each read (tag select) attempt is approximately 60ms in duration. These tag select events are spaced by a pseudo random dead time ranging between 60ms and 600ms. This cycle is repeated continuously until the vehicle has exited its reverse state. In the non-reverse state, the SCAN~LINK system will begin transmission with the SkyeTek M10 RFID module to detect tags at a slower rate of approximately one transmission per second</p>


Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see ‘Appendix B – EUT & Test Setup Photographs’.

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Appendix B – EUT and Test Setup Photographs


Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

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

Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Radiated Emissions Below 30 MHz



Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Radiated Emissions 30 MHz to 1 GHz



Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Radiated Emissions above 1 GHz



Client	SCAN~LINK TECHNOLOGIES INC.	
Product	Armour Antenna Unit	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Antenna Conducted Measurements

