



element

NextGen RF Design **Titan Gateway and Titan Sensor**

Report: NGRF0059.0, Issue Date: November 22, 2022



REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS



United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

European Union

European Commission – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIT / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

For details on the Scopes of our Accreditations, please visit:

[California](#)

[Minnesota](#)

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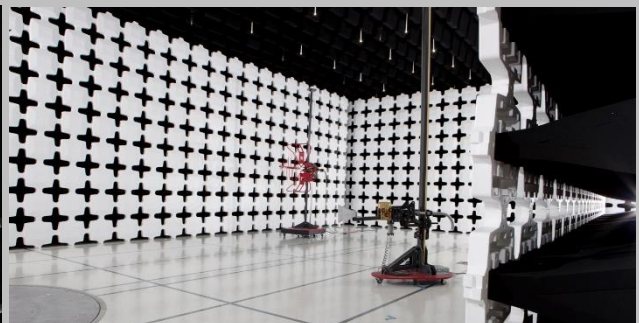
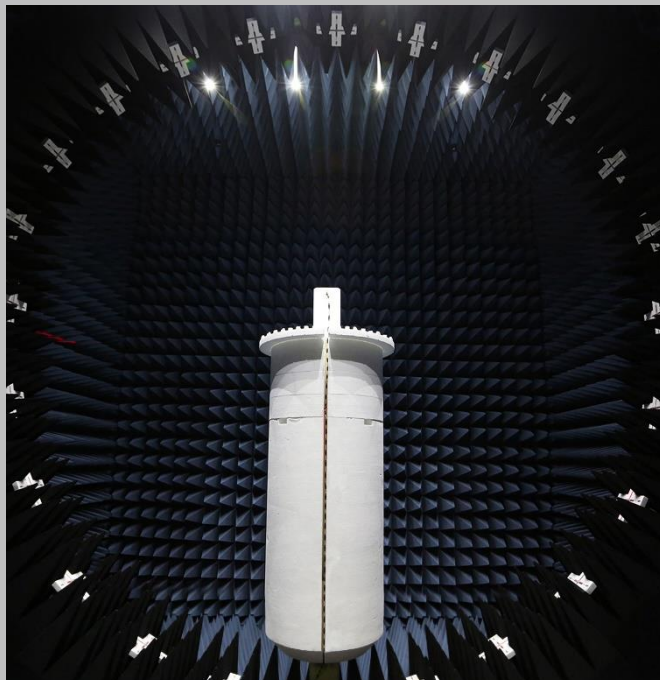
[Texas](#)

[Washington](#)

FACILITIES



California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011 (425)984-6600
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157



PRODUCT DESCRIPTION

Client and Equipment under Test (EUT) Information

Company Name:	NextGen RF Design
Address:	2130 Howard Drive West
City, State, Zip:	North Mankato, MN 56003
Test Requested By:	Ross Loven
EUT:	Titan Gateway and Titan Sensor
First Date of Test:	November 11, 2022
Last Date of Test:	November 11, 2022
Receipt Date of Samples:	November 11, 2022
Equipment Design Stage:	Preproduction
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

Gateway system containing a 2.4 GHz LoRa and a pre-approved 802.11bgn 20 MHz SISO radio module.
 Sensors containing a 2.4 GHz LoRa radio. EAPRO-GTWY, ENVIROALERT Professional Gateway, EAPRO-WTS, ENVIROALERT Professional Wireless Temperature Sensor, EAPRO-WHS, ENVIROALERT Professional Wireless Humidity Sensor, EAPRO-WMFT, ENVIROALERT Professional Wireless Multi-Function Transmitter, EAPRO-WMFT-R, ENVIROALERT Professional Wireless Multi-Function Transmitter with Relay

Testing Objective:

To obtain 2D antenna pattern measurements and calculated antenna performance values.

CONFIGURATIONS



Configuration NGRF0059- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Sensor	WINLAND Electronics, Inc	Titan Sensor	None

Configuration NGRF0059- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Gateway	WINLAND Electronics, Inc	Titan Gateway	None

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2022-11-07	2D Polar Plots	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

2D POLAR PLOTS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

CW - 2440 MHz

CONFIGURATIONS INVESTIGATED

NGRF0059 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	2440 MHz	Stop Frequency	2440 MHz
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SAMPLE CALCULATIONS

Max Absolute Gain of AUT = $G_{ref} - (E_{ref} - E_{aut}) + L_c$

Where:

G_{ref} = gain of reference antenna (dBi)

E_{ref} = electric field strength in dBuV/m

E_{aut} = electric field strength in dBuV/m

L_c = AUT setup loss

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	N/A	Double Ridge Horn Cables	EVB	2022-05-03	2023-05-03
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	2021-12-09	2022-12-09
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	2022-03-02	2024-03-02
Generator - Signal	Keysight	N5182B	TFU	2020-11-20	2022-11-20
Attenuator	S.M. Electronics	SA18H-06	REM	2021-12-02	2022-12-02
Antenna - Double Ridge	EMCO	3115	AHC	2022-07-08	2024-07-08

TEST DESCRIPTION

Measurements were performed in a semi-anechoic chamber. RF absorbing cones were placed on the floor between the measurement antenna and the AUT. The AUT was placed on a 1.8 m high block of foam.

The reference antenna was placed at the center of the 1.8 m block of foam. A CW signal was provided to the reference antenna from a calibrated signal generator through a length of RF Cable. To reduce the effects of the RF cable, the RF cable was lined with ferrite cores running down the length of the cable with a spacing of 10cm between each ferrite. A reference plot was collected.

The AUT was then put into the chamber in place of the reference antenna. The AUT was connected to the signal generator using the RF same cable and connector setup. A polar plot was then collected at the antenna height of maximum field strength. This plot was then compared to the reference antenna scan, and, using the antenna gain (dBi) of the reference antenna the absolute gain of the AUT was calculated.

SUMMARY OF RESULTS

Type	Frequency Range (MHz)	Gain (dBi)
PCB Trace Monopole Antenna 1	2440	2.21
PCB Trace Monopole Antenna 2	2440	1.8

2D POLAR PLOTS

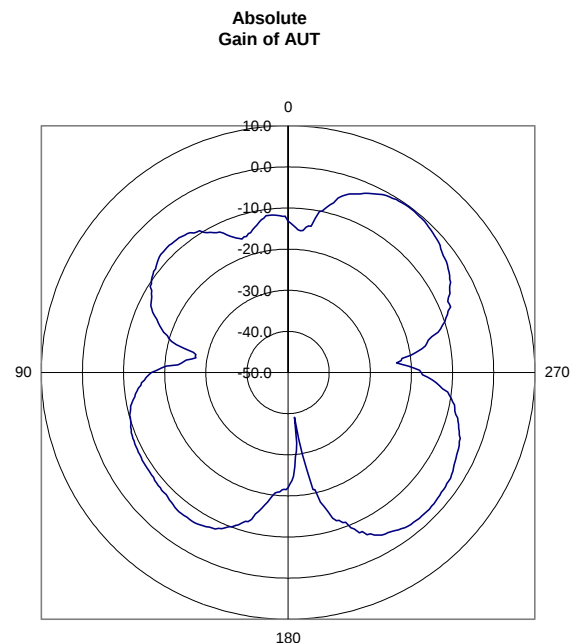
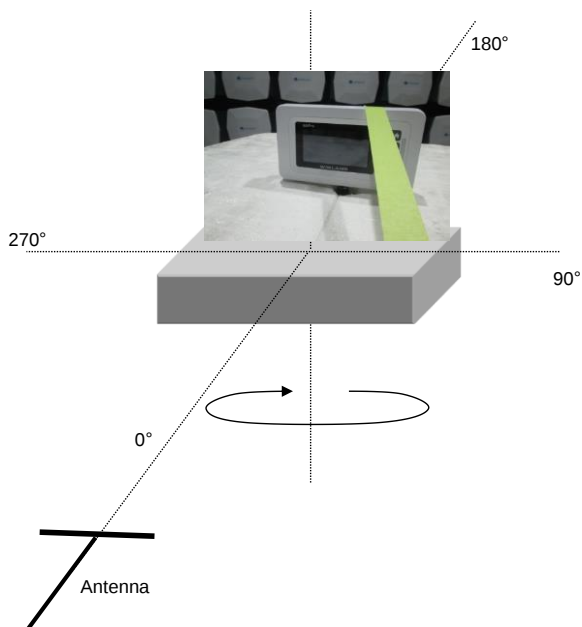


EmiR5 2022.07.06.0

PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07	
Project:	None	Temperature:	20.7 °C	
Job Site:	EV01	Humidity:	39.1% RH	
Serial Number:	None	Barometric Pres.:	1006 mbar	
EUT:		Titan Gateway		
Configuration:		2		
Customer:		NextGen RF Design		
Attendees:		None		
EUT Power:		None		
Operating Mode:		CW - 2440 MHz		
Deviations:		None		
Comments:		Antenna 1		

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Horizontal	Reference Antenna Relative Gain Max (dBuV/m)	111.39
Antenna Under Test (AUT) Polarity	Horizontal	AUT Relative Gain Max (dBuV/m)	101.49
Maximum Absolute Gain of AUT (dBi)	-0.19	Difference (Reference Antenna - AUT) (dB)	9.90
Average Absolute Gain of AUT (dBi)	-10.50	AUT Setup Loss (dB)	0.16
		Correction Factor (Convert Relative to Absolute Gain) (dB)	101.68
3 dB Beamwidth	34°		



2D POLAR PLOTS

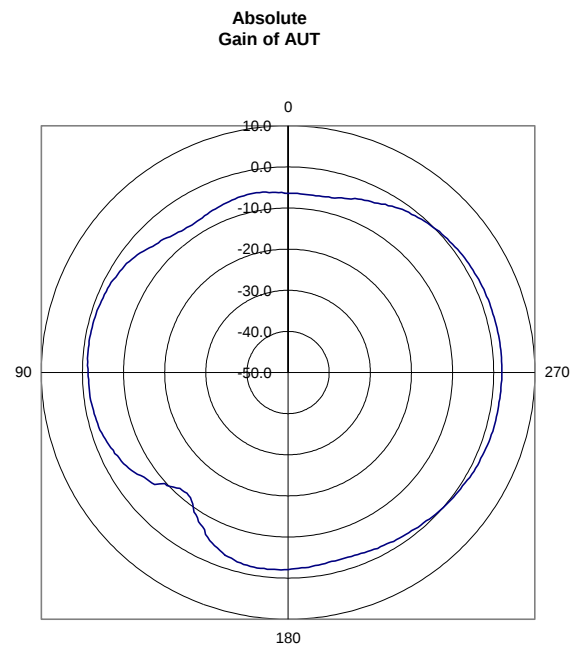
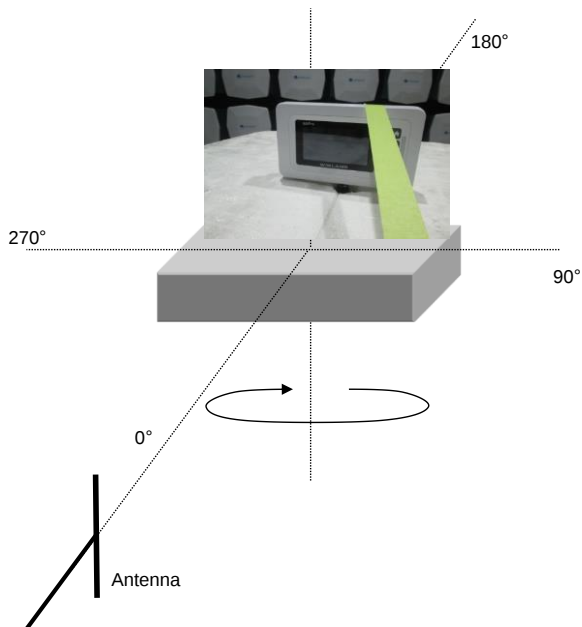


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PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07		
Project:	None	Temperature:	20.7 °C		
Job Site:	EV01	Humidity:	39.1% RH		
Serial Number:	None	Barometric Pres.:	1006 mbar	Tested by:	Jeff Alcock
EUT:	Titan Gateway				
Configuration:	2				
Customer:	NextGen RF Design				
Attendees:	None				
EUT Power:	None				
Operating Mode:	CW - 2440 MHz				
Deviations:	None				
Comments:	Antenna 1				

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Vertical	Reference Antenna Relative Gain Max (dBuV/m)	110.39
Antenna Under Test (AUT) Polarity	Horizontal	AUT Relative Gain Max (dBuV/m)	102.69
Maximum Absolute Gain of AUT (dBi)	2.01	Difference (Reference Antenna - AUT) (dB)	7.70
Average Absolute Gain of AUT (dBi)	-2.67	AUT Setup Loss (dB)	0.16
		Correction Factor (Convert Relative to Absolute Gain) (dB)	100.68
3 dB Beamwidth	103°		



2D POLAR PLOTS

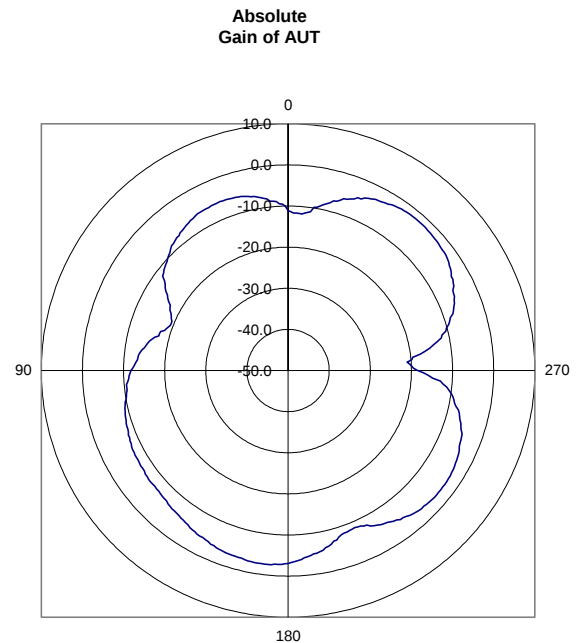
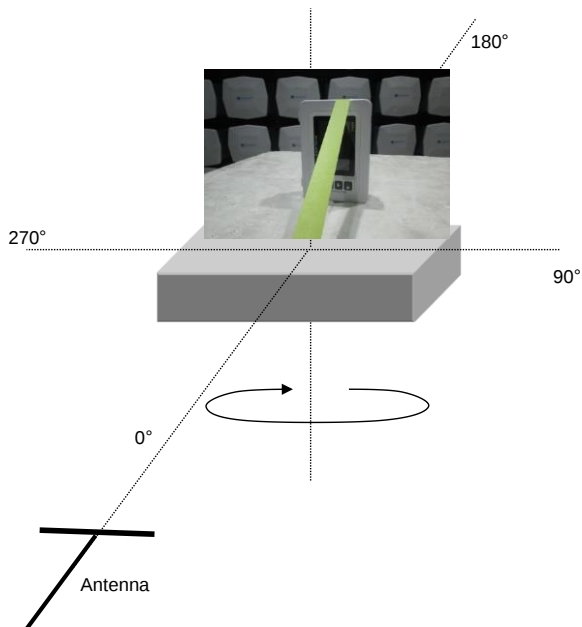


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PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07		
Project:	None	Temperature:	20.7 °C		
Job Site:	EV01	Humidity:	39.1% RH		
Serial Number:	None	Barometric Pres.:	1006 mbar	Tested by:	Jeff Alcock
EUT:	Titan Gateway				
Configuration:	2				
Customer:	NextGen RF Design				
Attendees:	None				
EUT Power:	None				
Operating Mode:	CW - 2440 MHz				
Deviations:	None				
Comments:	Antenna 1				

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Horizontal	Reference Antenna Relative Gain Max (dBuV/m)	111.39
Antenna Under Test (AUT) Polarity	on Side	AUT Relative Gain Max (dBuV/m)	99.89
Maximum Absolute Gain of AUT (dBi)	-1.79	Difference (Reference Antenna - AUT) (dB)	11.50
Average Absolute Gain of AUT (dBi)	-7.63	AUT Setup Loss (dB)	0.16
		Correction Factor (Convert Relative to Absolute Gain) (dB)	101.68
3 dB Beamwidth	42°		



2D POLAR PLOTS

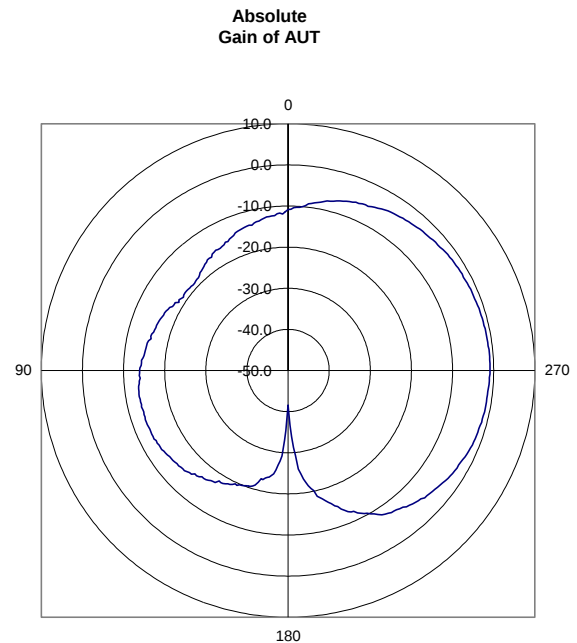
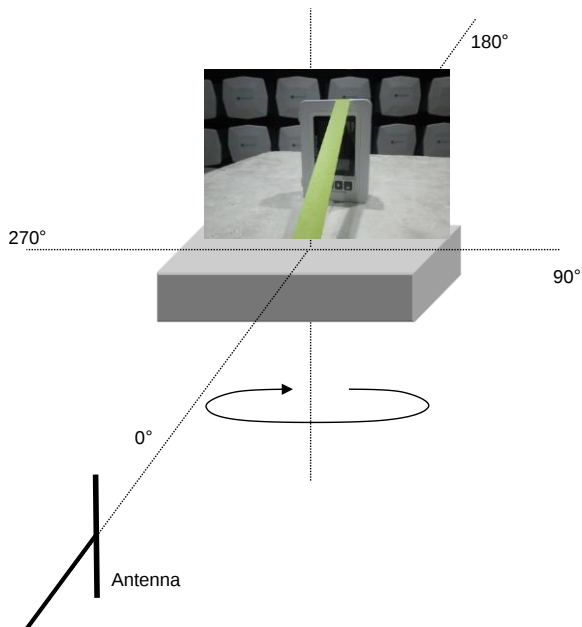


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Work Order:	NGRF0059	Date:	2022-11-07	
Project:	None	Temperature:	20.7 °C	
Job Site:	EV01	Humidity:	39.1% RH	
Serial Number:	None	Barometric Pres.:	1006 mbar	
EUT:	Titan Gateway			Tested by: Jeff Alcock
Configuration:	2			
Customer:	NextGen RF Design			
Attendees:	None			
EUT Power:	None			
Operating Mode:	CW - 2440 MHz			
Deviations:	None			
Comments:	Antenna 1			

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Vertical	Reference Antenna Relative Gain Max (dBuV/m)	110.39
Antenna Under Test (AUT) Polarity	on Side	AUT Relative Gain Max (dBuV/m)	99.79
Maximum Absolute Gain of AUT (dBi)	-0.89	Difference (Reference Antenna - AUT) (dB)	10.60
Average Absolute Gain of AUT (dBi)	-11.55	AUT Setup Loss (dB)	0.16
		Correction Factor (Convert Relative to Absolute Gain) (dB)	100.68
3 dB Beamwidth	93°		



2D POLAR PLOTS

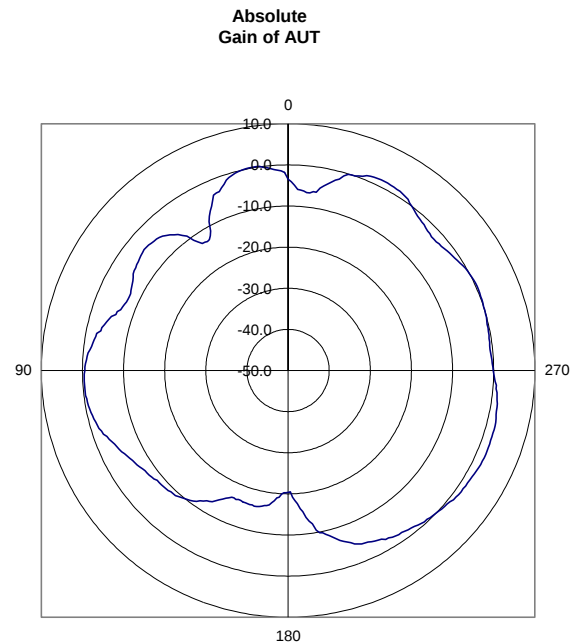
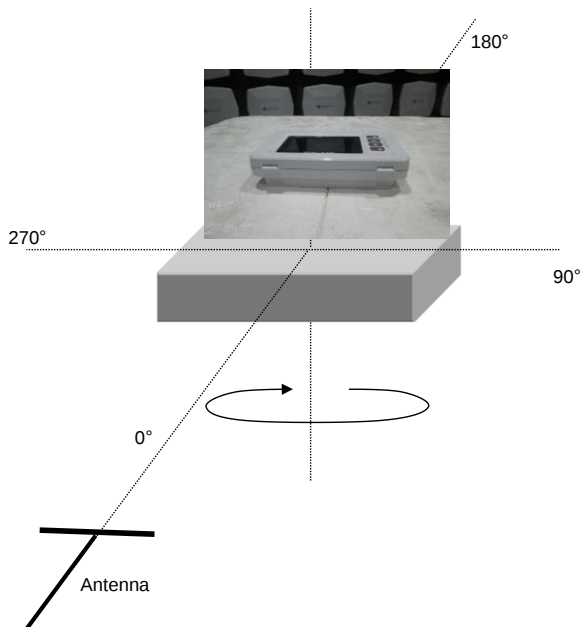


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PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07	
Project:	None	Temperature:	20.7 °C	
Job Site:	EV01	Humidity:	39.1% RH	
Serial Number:	None	Barometric Pres.:	1006 mbar	
EUT:	Titan Gateway			Tested by: Jeff Alcock
Configuration:	2			
Customer:	NextGen RF Design			
Attendees:	None			
EUT Power:	None			
Operating Mode:	CW - 2440 MHz			
Deviations:	None			
Comments:	Antenna 1			

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Horizontal	Reference Antenna Relative Gain Max (dBuV/m)	111.39
Antenna Under Test (AUT) Polarity	Vertical	AUT Relative Gain Max (dBuV/m)	103.89
Maximum Absolute Gain of AUT (dBi)	2.21	Difference (Reference Antenna - AUT) (dB)	7.50
Average Absolute Gain of AUT (dBi)	-4.43	AUT Setup Loss (dB)	0.16
		Correction Factor (Convert Relative to Absolute Gain) (dB)	101.68
3 dB Beamwidth	83°		



2D POLAR PLOTS

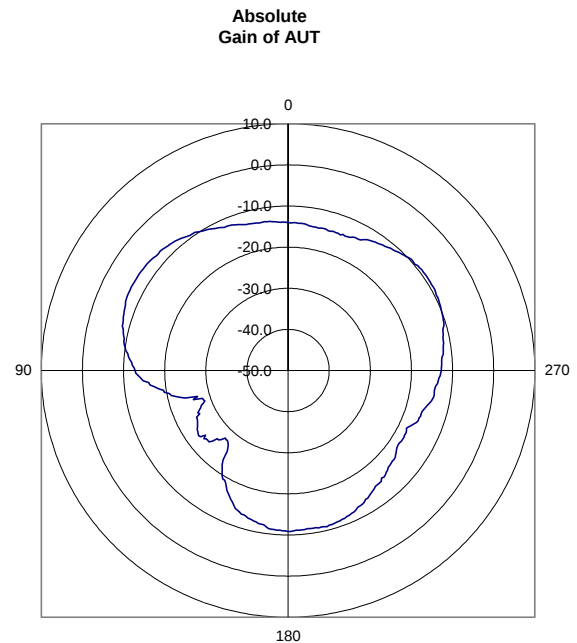
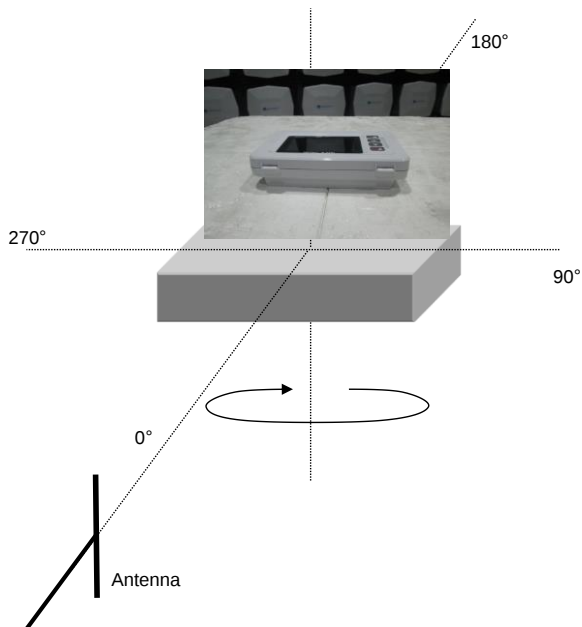


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PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07	
Project:	None	Temperature:	20.7 °C	
Job Site:	EV01	Humidity:	39.1% RH	
Serial Number:	None	Barometric Pres.:	1006 mbar	
EUT:	Titan Gateway			Tested by: Jeff Alcock
Configuration:	2			
Customer:	NextGen RF Design			
Attendees:	None			
EUT Power:	None			
Operating Mode:	CW - 2440 MHz			
Deviations:	None			
Comments:	Antenna 1			

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Vertical	Reference Antenna Relative Gain Max (dBuV/m)	110.39
Antenna Under Test (AUT) Polarity	Vertical	AUT Relative Gain Max (dBuV/m)	93.89
Maximum Absolute Gain of AUT (dBi)	-6.79	Difference (Reference Antenna - AUT) (dB)	16.50
Average Absolute Gain of AUT (dBi)	-13.99	AUT Setup Loss (dB)	0.16
		Correction Factor (Convert Relative to Absolute Gain) (dB)	100.68
3 dB Beamwidth	49°		



2D POLAR PLOTS

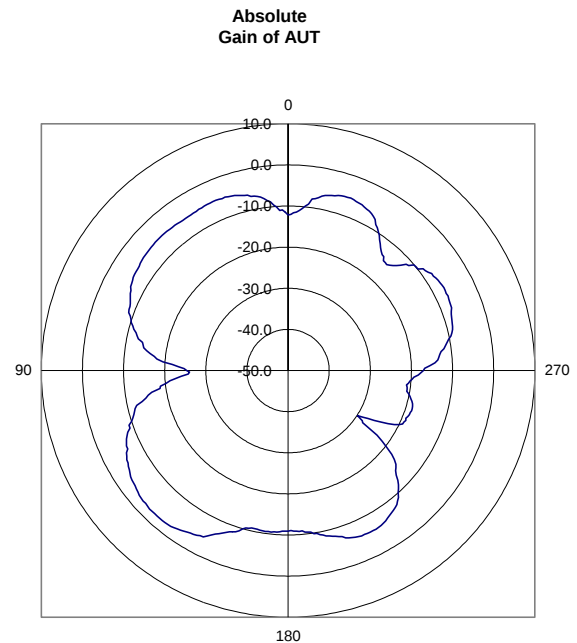
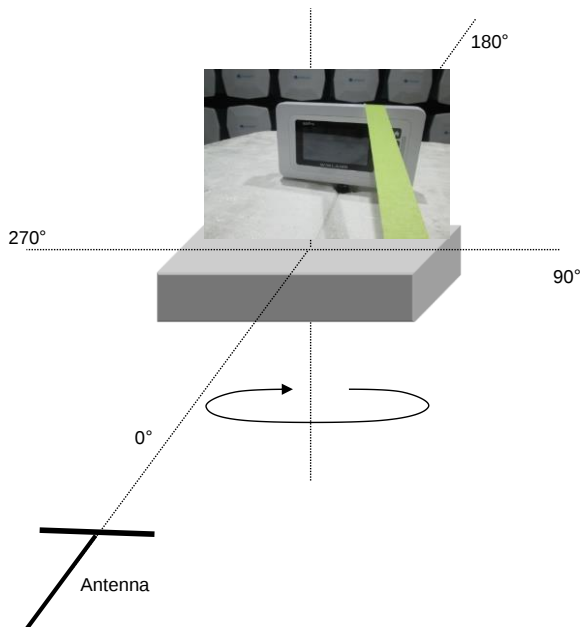


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PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07		
Project:	None	Temperature:	20.7 °C		
Job Site:	EV01	Humidity:	39.1% RH		
Serial Number:	None	Barometric Pres.:	1006 mbar	Tested by:	Jeff Alcock
EUT:	Titan Gateway				
Configuration:	2				
Customer:	NextGen RF Design				
Attendees:	None				
EUT Power:	None				
Operating Mode:	CW - 2440 MHz				
Deviations:	None				
Comments:	Antenna 2				

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Horizontal	Reference Antenna Relative Gain Max (dBuV/m)	111.39
Antenna Under Test (AUT) Polarity	Horizontal	AUT Relative Gain Max (dBuV/m)	99.29
Maximum Absolute Gain of AUT (dBi)	-2.40	Difference (Reference Antenna - AUT) (dB)	12.10
Average Absolute Gain of AUT (dBi)	-10.09	AUT Setup Loss (dB)	0.15
		Correction Factor (Convert Relative to Absolute Gain) (dB)	101.69
3 dB Beamwidth	37°		



2D POLAR PLOTS

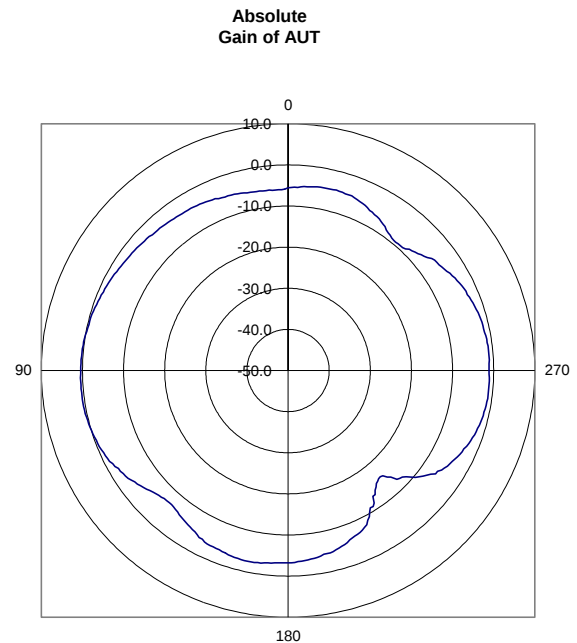
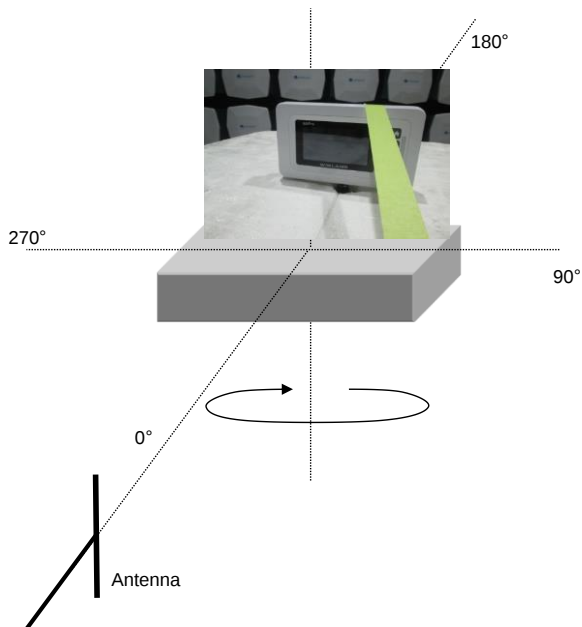


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Project:	None	Temperature:	20.7 °C	
Job Site:	EV01	Humidity:	39.1% RH	
Serial Number:	None	Barometric Pres.:	1006 mbar	Tested by: Jeff Alcock
EUT:	Titan Gateway			
Configuration:	2			
Customer:	NextGen RF Design			
Attendees:	None			
EUT Power:	None			
Operating Mode:	CW - 2440 MHz			
Deviations:	None			
Comments:	Antenna 2			

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Vertical	Reference Antenna Relative Gain Max (dBuV/m)	110.39
Antenna Under Test (AUT) Polarity	Horizontal	AUT Relative Gain Max (dBuV/m)	101.19
Maximum Absolute Gain of AUT (dBi)	0.50	Difference (Reference Antenna - AUT) (dB)	9.20
Average Absolute Gain of AUT (dBi)	-4.17	AUT Setup Loss (dB)	0.15
		Correction Factor (Convert Relative to Absolute Gain) (dB)	100.69
3 dB Beamwidth	68°		



2D POLAR PLOTS

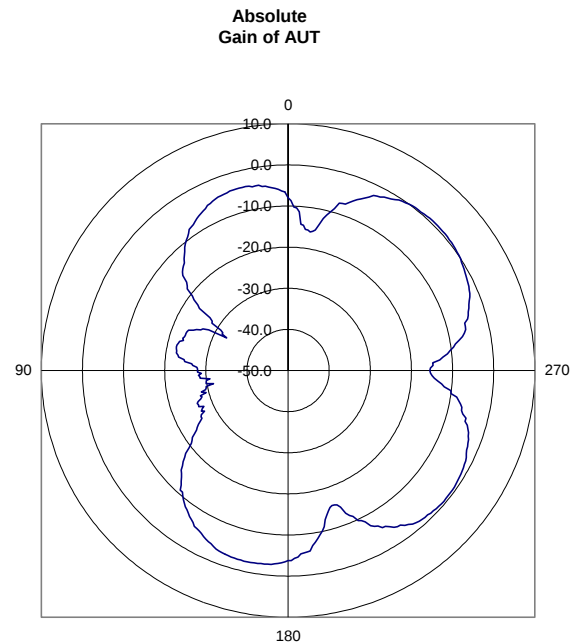
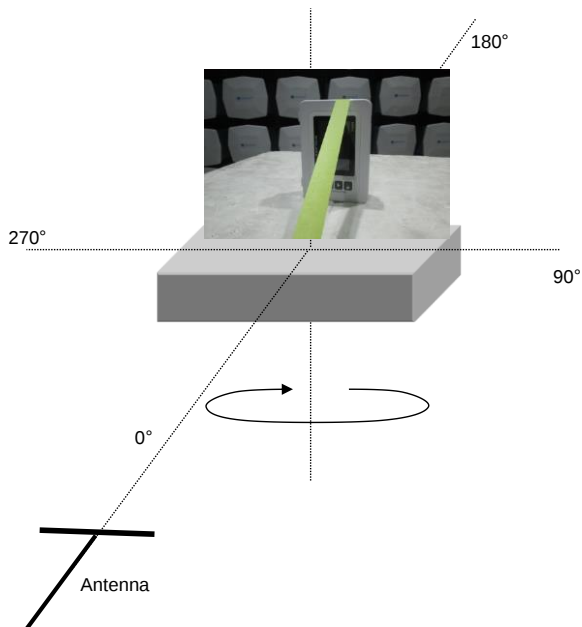


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Project:	None	Temperature:	20.7 °C	
Job Site:	EV01	Humidity:	39.1% RH	
Serial Number:	None	Barometric Pres.:	1006 mbar	Tested by: Jeff Alcock
EUT:	Titan Gateway			
Configuration:	2			
Customer:	NextGen RF Design			
Attendees:	None			
EUT Power:	None			
Operating Mode:	CW - 2440 MHz			
Deviations:	None			
Comments:	Antenna 2			

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Horizontal	Reference Antenna Relative Gain Max (dBuV/m)	111.39
Antenna Under Test (AUT) Polarity	on Side	AUT Relative Gain Max (dBuV/m)	102.29
Maximum Absolute Gain of AUT (dBi)	0.60	Difference (Reference Antenna - AUT) (dB)	9.10
Average Absolute Gain of AUT (dBi)	-10.39	AUT Setup Loss (dB)	0.15
		Correction Factor (Convert Relative to Absolute Gain) (dB)	101.69
3 dB Beamwidth	42°		



2D POLAR PLOTS

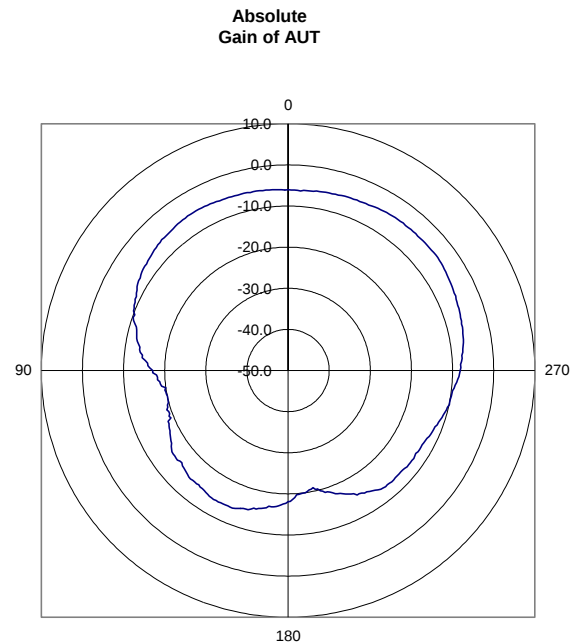
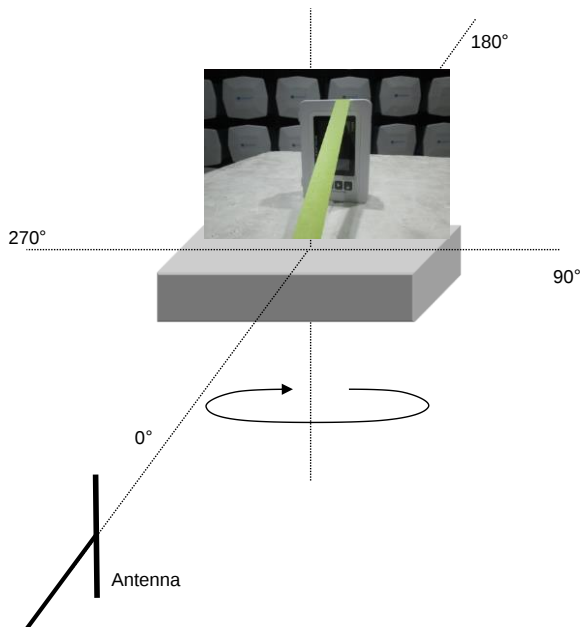


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Job Site:	EV01	Humidity:	39.1% RH		
Serial Number:	None	Barometric Pres.:	1006 mbar	Tested by:	Jeff Alcock
EUT:	Titan Gateway				
Configuration:	2				
Customer:	NextGen RF Design				
Attendees:	None				
EUT Power:	None				
Operating Mode:	CW - 2440 MHz				
Deviations:	None				
Comments:	Antenna 2				

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Vertical	Reference Antenna Relative Gain Max (dBuV/m)	110.39
Antenna Under Test (AUT) Polarity	on Side	AUT Relative Gain Max (dBuV/m)	96.29
Maximum Absolute Gain of AUT (dBi)	-4.40	Difference (Reference Antenna - AUT) (dB)	14.10
Average Absolute Gain of AUT (dBi)	-11.01	AUT Setup Loss (dB)	0.15
		Correction Factor (Convert Relative to Absolute Gain) (dB)	100.69
3 dB Beamwidth	143°		



2D POLAR PLOTS

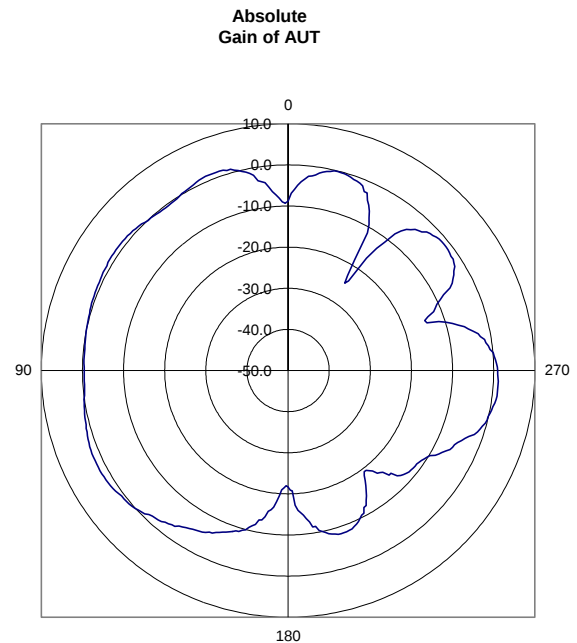
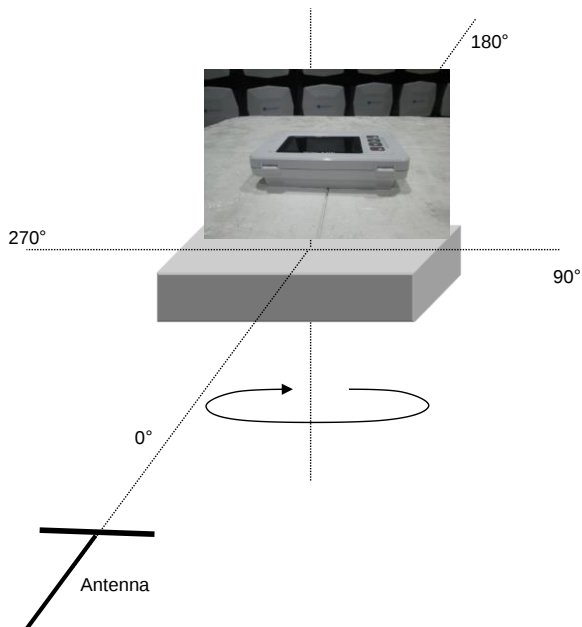


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PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07	
Project:	None	Temperature:	20.7 °C	
Job Site:	EV01	Humidity:	39.1% RH	
Serial Number:	None	Barometric Pres.:	1006 mbar	
EUT:	Titan Gateway			Tested by: Jeff Alcock
Configuration:	2			
Customer:	NextGen RF Design			
Attendees:	None			
EUT Power:	None			
Operating Mode:	CW - 2440 MHz			
Deviations:	None			
Comments:	Antenna 2			

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Horizontal	Reference Antenna Relative Gain Max (dBuV/m)	111.39
Antenna Under Test (AUT) Polarity	Vertical	AUT Relative Gain Max (dBuV/m)	103.49
Maximum Absolute Gain of AUT (dBi)	1.80	Difference (Reference Antenna - AUT) (dB)	7.90
Average Absolute Gain of AUT (dBi)	-4.64	AUT Setup Loss (dB)	0.15
		Correction Factor (Convert Relative to Absolute Gain) (dB)	101.69
3 dB Beamwidth	125°		



2D POLAR PLOTS

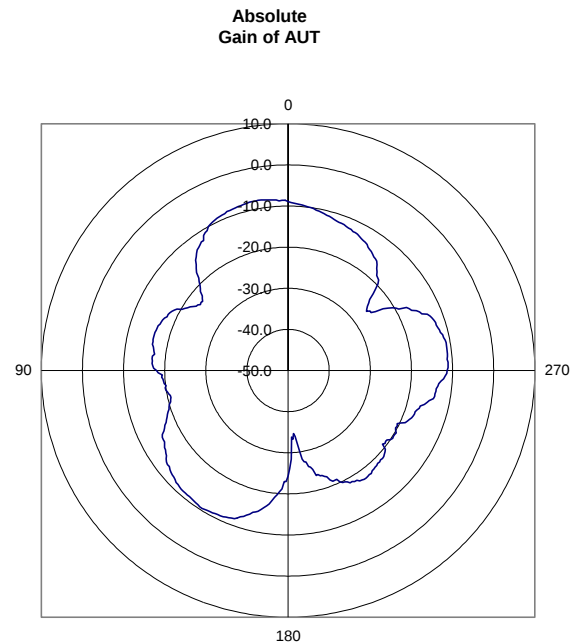
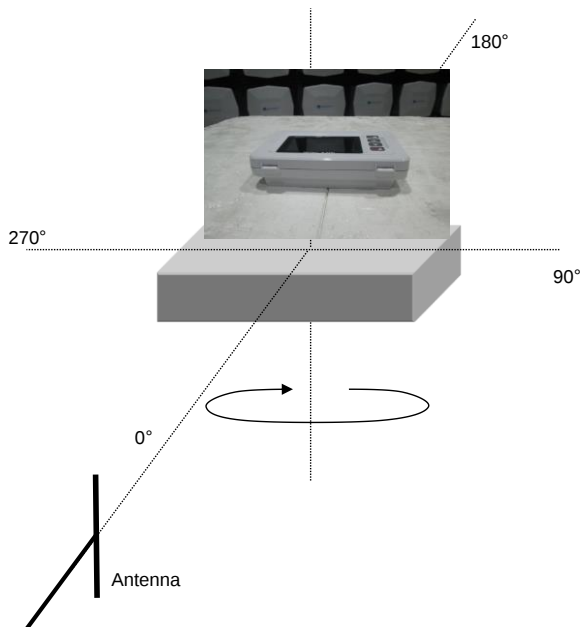


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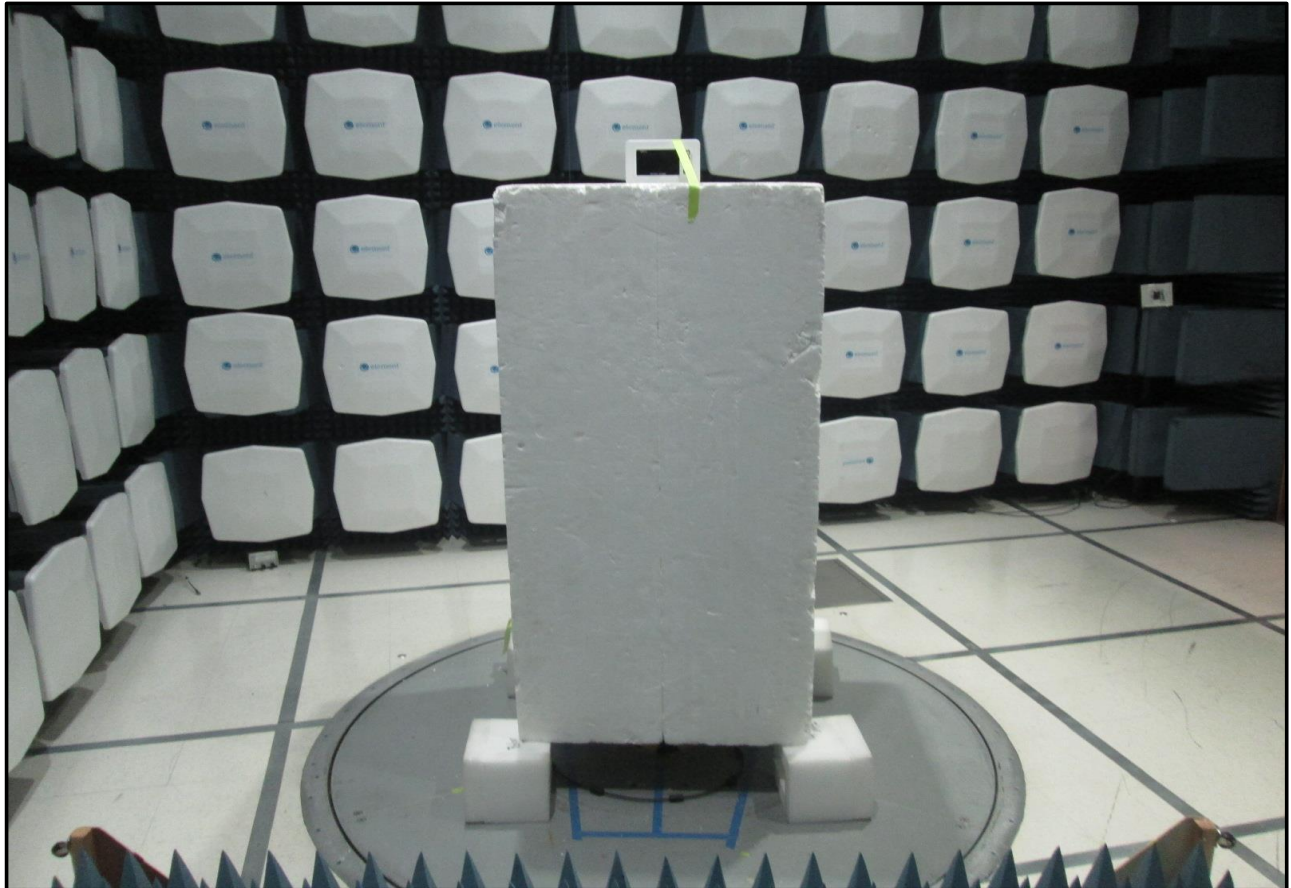
PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07		
Project:	None	Temperature:	20.7 °C		
Job Site:	EV01	Humidity:	39.1% RH		
Serial Number:	None	Barometric Pres.:	1006 mbar	Tested by:	Jeff Alcock
EUT:	Titan Gateway				
Configuration:	2				
Customer:	NextGen RF Design				
Attendees:	None				
EUT Power:	None				
Operating Mode:	CW - 2440 MHz				
Deviations:	None				
Comments:	Antenna 2				

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Vertical	Reference Antenna Relative Gain Max (dBuV/m)	110.39
Antenna Under Test (AUT) Polarity	Vertical	AUT Relative Gain Max (dBuV/m)	92.69
Maximum Absolute Gain of AUT (dBi)	-8.00	Difference (Reference Antenna - AUT) (dB)	17.70
Average Absolute Gain of AUT (dBi)	-16.11	AUT Setup Loss (dB)	0.15
		Correction Factor (Convert Relative to Absolute Gain) (dB)	100.69
3 dB Beamwidth	46°		



2D POLAR PLOTS



2D POLAR PLOTS



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Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

CW - 2440 MHz

CONFIGURATIONS INVESTIGATED

NGRF0059 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	2440 MHz	Stop Frequency	2440 MHz
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SAMPLE CALCULATIONS

Max Absolute Gain of AUT = $G_{ref} - (E_{ref} - E_{aut}) + L_c$

Where:

G_{ref} = gain of reference antenna (dBi)

E_{ref} = electric field strength in dBuV/m

E_{aut} = electric field strength in dBuV/m

L_c = AUT setup loss

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	N/A	Double Ridge Horn Cables	EVB	2022-05-03	2023-05-03
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	2021-12-09	2022-12-09
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	2022-03-02	2024-03-02
Generator - Signal	Keysight	N5182B	TFU	2020-11-20	2022-11-20
Attenuator	S.M. Electronics	SA18H-06	REM	2021-12-02	2022-12-02
Antenna - Double Ridge	EMCO	3115	AHC	2022-07-08	2024-07-08

TEST DESCRIPTION

Measurements were performed in a semi-anchoic chamber. RF absorbing cones were placed on the floor between the measurement antenna and the AUT. The AUT was placed on a 1.8 m high block of foam.

The reference antenna was placed at the center of the 1.8 m block of foam. A CW signal was provided to the reference antenna from a calibrated signal generator through a length of RF Cable. To reduce the effects of the RF cable, the RF cable was lined with ferrite cores running down the length of the cable with a spacing of 10cm between each ferrite. A reference plot was collected.

The AUT was then put into the chamber in place of the reference antenna. The AUT was connected to the signal generator using the RF same cable and connector setup. A polar plot was then collected at the antenna height of maximum field strength. This plot was then compared to the reference antenna scan, and, using the antenna gain (dBi) of the reference antenna the absolute gain of the AUT was calculated.

SUMMARY OF RESULTS

Type	Frequency Range (MHz)	PK Gain (dBi)
PCB Trace Monopole Antenna	2440	3.16

2D POLAR PLOTS

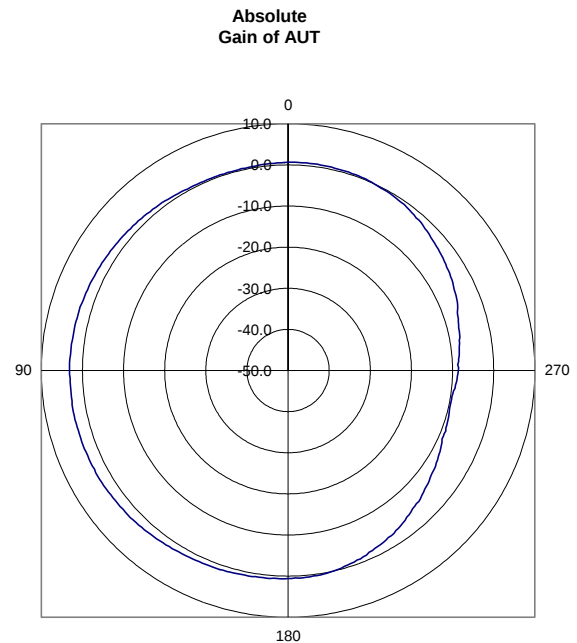
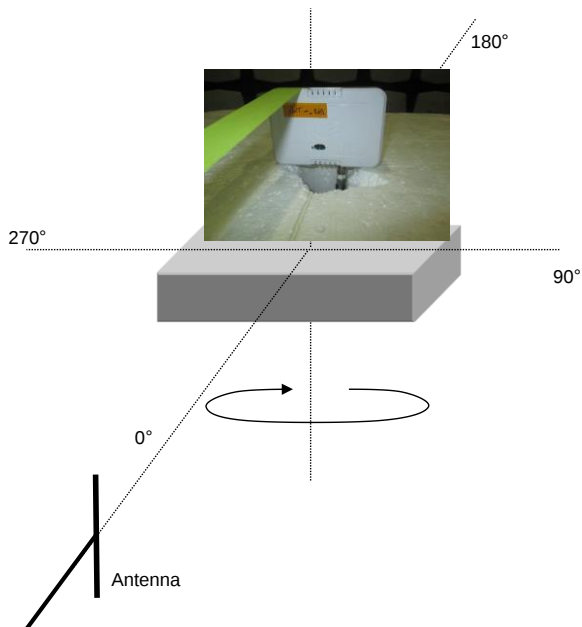


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Work Order:	NGRF0059	Date:	2022-11-07	
Project:	None	Temperature:	20.8 °C	
Job Site:	EV01	Humidity:	39.2% RH	
Serial Number:	None	Barometric Pres.:	1006 mbar	
EUT:	Titan Sensor			Tested by: Jeff Alcock
Configuration:	1			
Customer:	NextGen RF Design			
Attendees:	None			
EUT Power:	None			
Operating Mode:	CW - 2440 MHz			
Deviations:	None			
Comments:	None			

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Vertical	Reference Antenna Relative Gain Max (dBuV/m)	110.39
Antenna Under Test (AUT) Polarity	Horizontal	AUT Relative Gain Max (dBuV/m)	103.89
Maximum Absolute Gain of AUT (dBi)	3.16	Difference (Reference Antenna - AUT) (dB)	6.50
Average Absolute Gain of AUT (dBi)	-1.04	AUT Setup Loss (dB)	0.11
		Correction Factor (Convert Relative to Absolute Gain) (dB)	100.73
3 dB Beamwidth	214°		



2D POLAR PLOTS

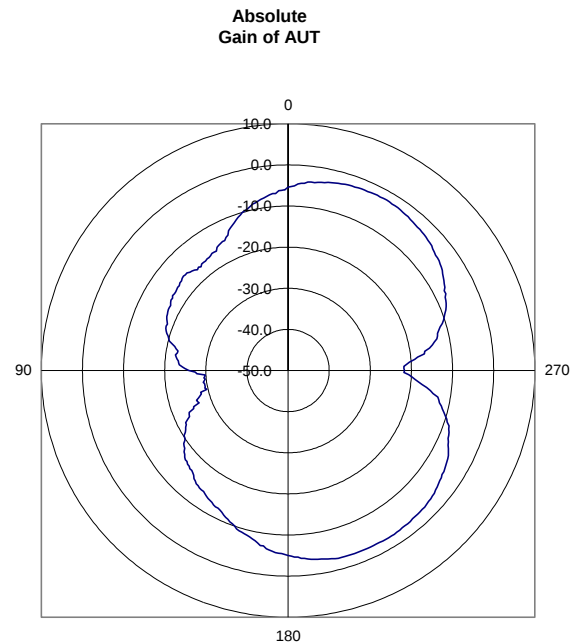
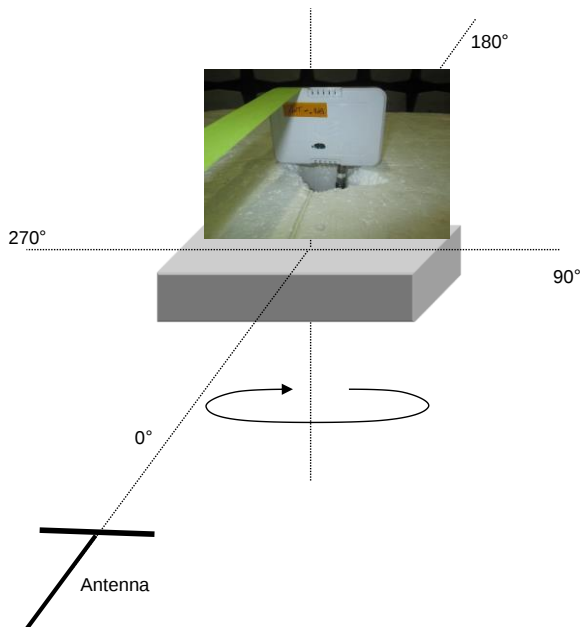


EmiR5 2022.07.06.0

PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07		
Project:	None	Temperature:	20.8 °C		
Job Site:	EV01	Humidity:	39.2% RH		
Serial Number:	None	Barometric Pres.:	1006 mbar	Tested by:	Jeff Alcock
EUT:	Titan Sensor				
Configuration:	1				
Customer:	NextGen RF Design				
Attendees:	None				
EUT Power:	None				
Operating Mode:	CW - 2440 MHz				
Deviations:	None				
Comments:	None				

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Horizontal	Reference Antenna Relative Gain Max (dBuV/m)	111.39
Antenna Under Test (AUT) Polarity	Horizontal	AUT Relative Gain Max (dBuV/m)	99.59
Maximum Absolute Gain of AUT (dBi)	-2.14	Difference (Reference Antenna - AUT) (dB)	11.80
Average Absolute Gain of AUT (dBi)	-11.45	AUT Setup Loss (dB)	0.11
		Correction Factor (Convert Relative to Absolute Gain) (dB)	101.73
3 dB Beamwidth	56°		



2D POLAR PLOTS

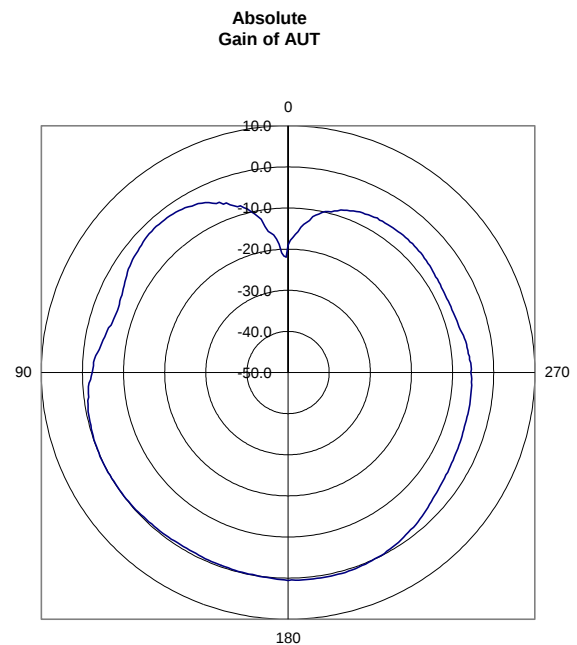
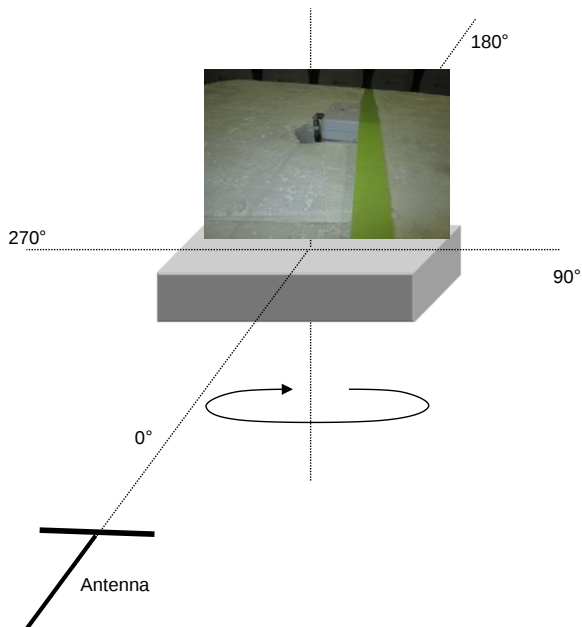


EmiR5 2022.07.06.0

PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07		
Project:	None	Temperature:	20.8 °C		
Job Site:	EV01	Humidity:	39.2% RH		
Serial Number:	None	Barometric Pres.:	1006 mbar	Tested by:	Jeff Alcock
EUT:	Titan Sensor				
Configuration:	1				
Customer:	NextGen RF Design				
Attendees:	None				
EUT Power:	None				
Operating Mode:	CW - 2440 MHz				
Deviations:	None				
Comments:	None				

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Horizontal	Reference Antenna Relative Gain Max (dBuV/m)	111.39
Antenna Under Test (AUT) Polarity	Vertical	AUT Relative Gain Max (dBuV/m)	102.29
Maximum Absolute Gain of AUT (dBi)	0.56	Difference (Reference Antenna - AUT) (dB)	9.10
Average Absolute Gain of AUT (dBi)	-4.16	AUT Setup Loss (dB)	0.11
		Correction Factor (Convert Relative to Absolute Gain) (dB)	101.73
3 dB Beamwidth	135°		

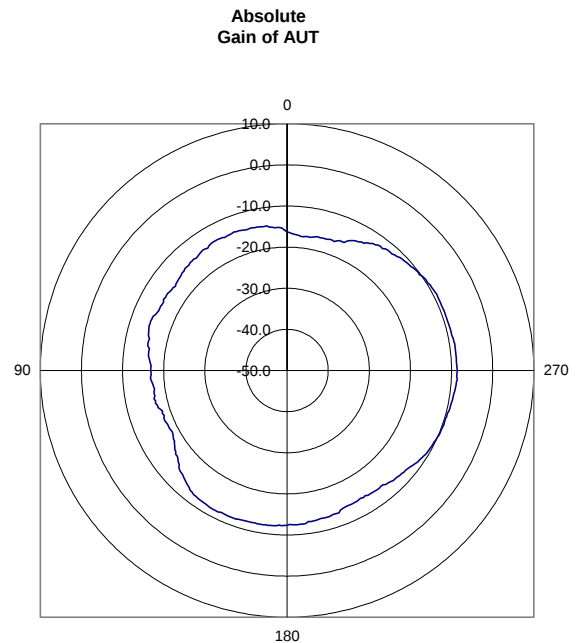
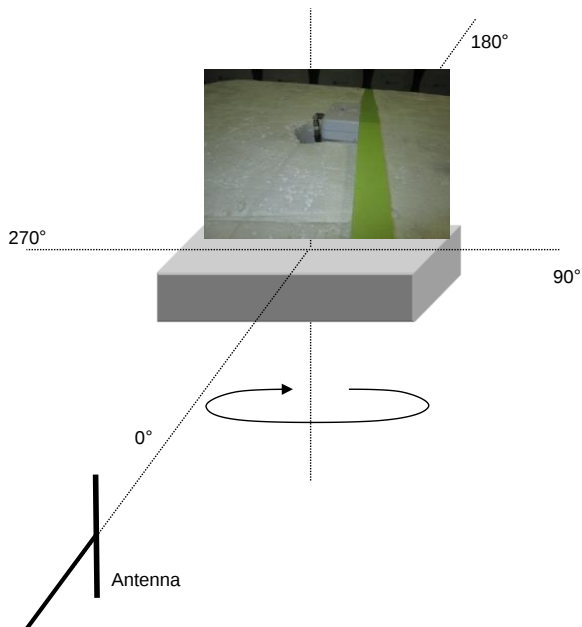


2D POLAR PLOTS



Work Order:	NGRF0059	Date:	2022-11-07	
Project:	None	Temperature:	20.8 °C	
Job Site:	EV01	Humidity:	39.2% RH	
Serial Number:	None	Barometric Pres.:	1006 mbar	
EUT: Titan Sensor				Tested by: Jeff Alcock
Configuration:	1			
Customer:	NextGen RF Design			
Attendees:	None			
EUT Power:	None			
Operating Mode:	CW - 2440 MHz			
Deviations:	None			
Comments:	None			

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Vertical	Reference Antenna Relative Gain Max (dBuV/m)	110.39
Antenna Under Test (AUT) Polarity	Vertical	AUT Relative Gain Max (dBuV/m)	92.19
Maximum Absolute Gain of AUT (dBi)	-8.54	Difference (Reference Antenna - AUT) (dB)	18.20
Average Absolute Gain of AUT (dBi)	-13.42	AUT Setup Loss (dB)	0.11
		Correction Factor (Convert Relative to Absolute Gain) (dB)	100.73
3 dB Beamwidth	83°		



2D POLAR PLOTS

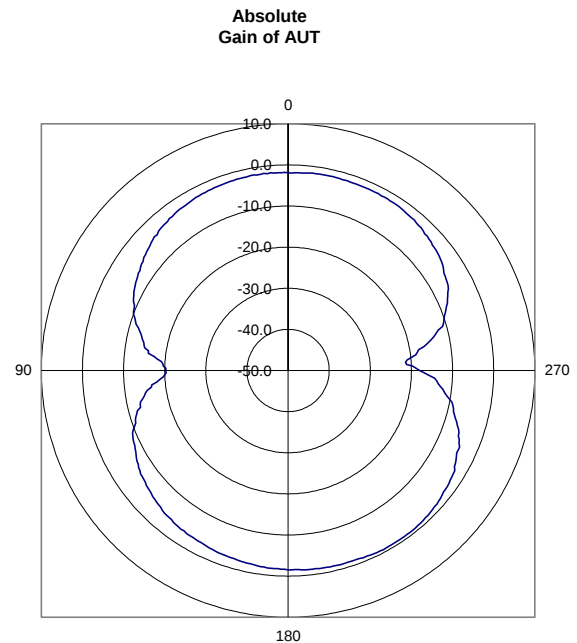
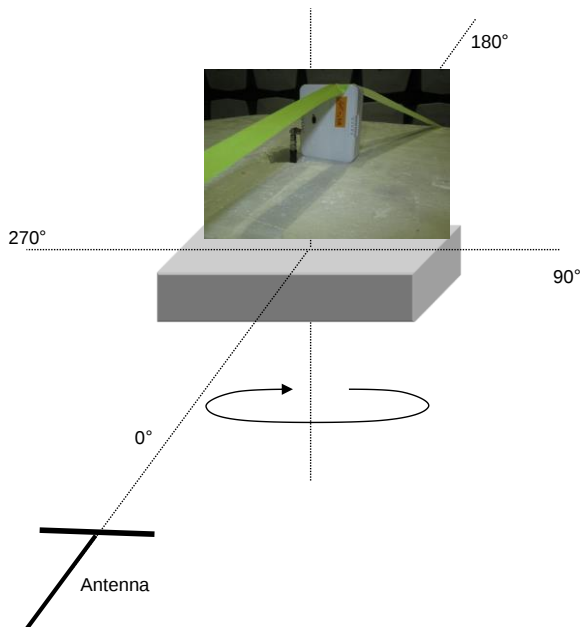


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PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07		
Project:	None	Temperature:	20.8 °C		
Job Site:	EV01	Humidity:	39.2% RH		
Serial Number:	None	Barometric Pres.:	1006 mbar	Tested by:	Jeff Alcock
EUT:	Titan Sensor				
Configuration:	1				
Customer:	NextGen RF Design				
Attendees:	None				
EUT Power:	None				
Operating Mode:	CW - 2440 MHz				
Deviations:	None				
Comments:	None				

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Horizontal	Reference Antenna Relative Gain Max (dBuV/m)	111.39
Antenna Under Test (AUT) Polarity	on Side	AUT Relative Gain Max (dBuV/m)	101.09
Maximum Absolute Gain of AUT (dBi)	-0.64	Difference (Reference Antenna - AUT) (dB)	10.30
Average Absolute Gain of AUT (dBi)	-5.71	AUT Setup Loss (dB)	0.11
		Correction Factor (Convert Relative to Absolute Gain) (dB)	101.73
3 dB Beamwidth	98°		



2D POLAR PLOTS

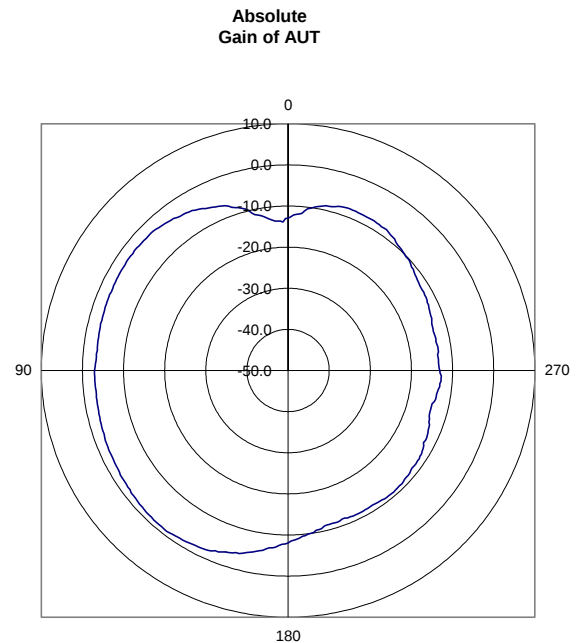
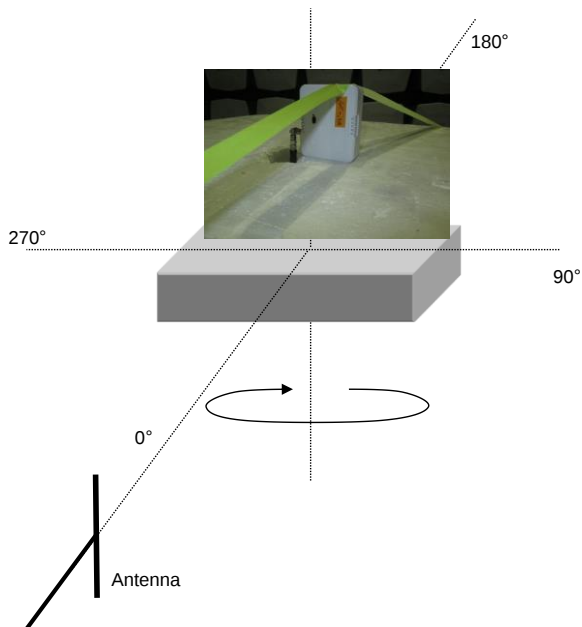


EmiR5 2022.07.06.0

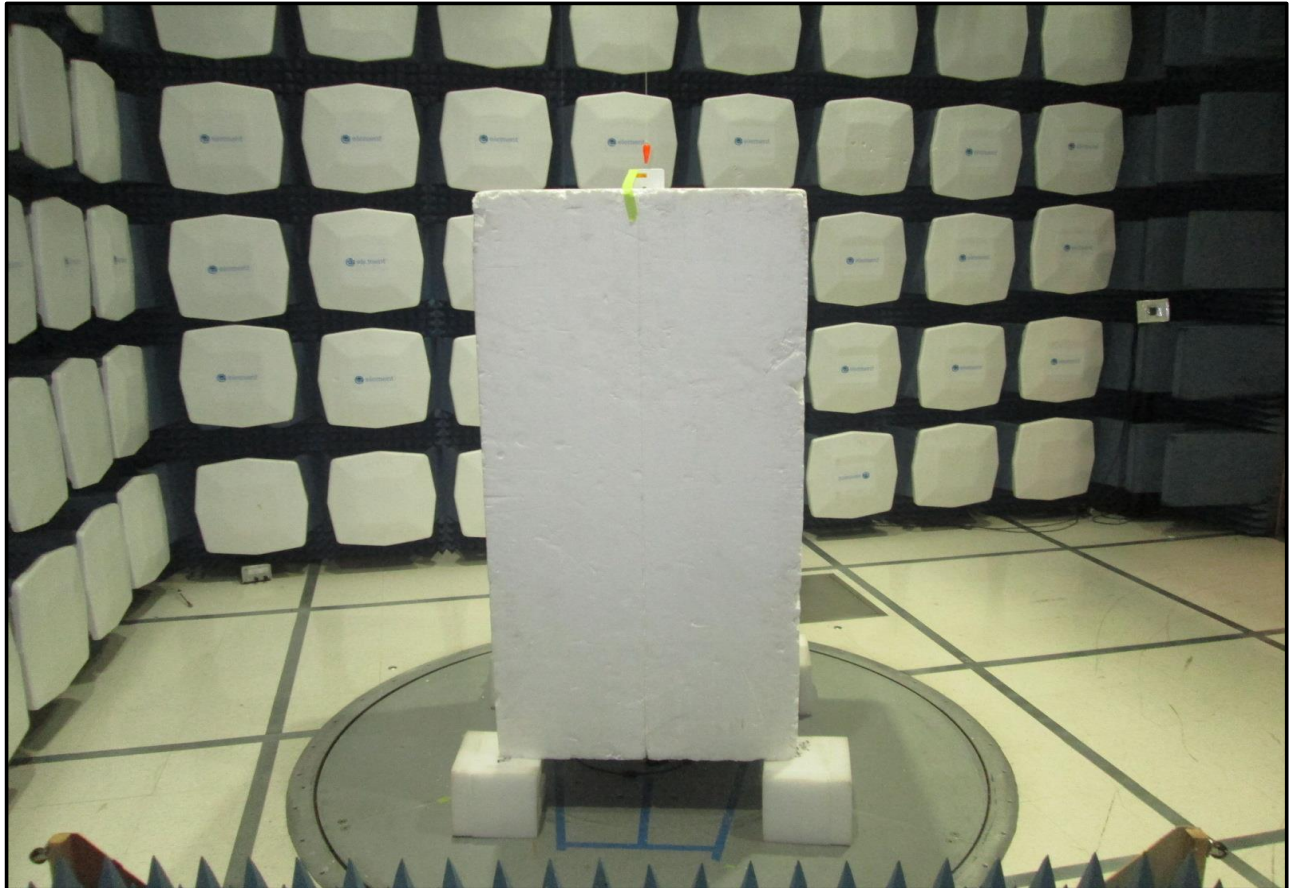
PSA-ESCI 2022.08.23.0

Work Order:	NGRF0059	Date:	2022-11-07	
Project:	None	Temperature:	20.8 °C	
Job Site:	EV01	Humidity:	39.2% RH	
Serial Number:	None	Barometric Pres.:	1006 mbar	
EUT: Titan Sensor				Tested by: Jeff Alcock
Configuration:	1			
Customer:	NextGen RF Design			
Attendees:	None			
EUT Power:	None			
Operating Mode:	CW - 2440 MHz			
Deviations:	None			
Comments:	None			

Frequency	2440	Absolute Gain of Reference Antenna (dBi)	9.55
Measurement Antenna Polarity	Vertical	Reference Antenna Relative Gain Max (dBuV/m)	110.39
Antenna Under Test (AUT) Polarity	on Side	AUT Relative Gain Max (dBuV/m)	99.69
Maximum Absolute Gain of AUT (dBi)	-1.04	Difference (Reference Antenna - AUT) (dB)	10.70
Average Absolute Gain of AUT (dBi)	-7.65	AUT Setup Loss (dB)	0.11
		Correction Factor (Convert Relative to Absolute Gain) (dB)	100.73
3 dB Beamwidth	130°		



2D POLAR PLOTS



End of Test Report