



Alcon Research LLC

Unity VCS/CS

FCC 15.225:2023

13.56 MHz Radio

Report: ALCO0421.21 Rev. 0, Issue Date: November 27, 2023



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CERTIFICATE OF TEST



Last Date of Test: November 13, 2023
Alcon Research LLC
EUT: Unity VCS/CS

Radio Equipment Testing

Standards

Specification	Method
FCC 15.225:2023	ANSI C63.10:2013

Results

Test Description	Result	Specification Section(s)	Method Section(s)	Comments
Powerline Conducted Emissions	Pass	15.207	6.2	
Field Strength of Fundamental	Pass	15.225(a)-(c)	6.4	
Field Strength of Spurious Emissions (Less Than 30 MHz)	Pass	15.225(d), 15.209	6.4	
Field Strength of Spurious Emissions (Greater Than 30 MHz)	Pass	15.225(d), 15.209	6.5	
Frequency Stability	Pass	15.225(e), 15.31(e), 15.215(c), 2.1055	6.8	
Emissions Bandwidth (20 dB)	Pass	15.215(c)	6.9.2	

Deviations From Test Standards

None

Approved By:

Johnny Candelas, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

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](#)

[Oregon](#)

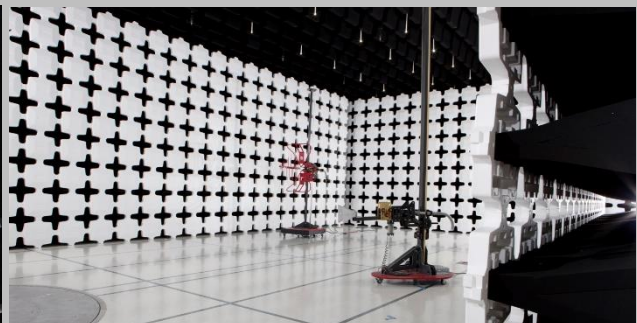
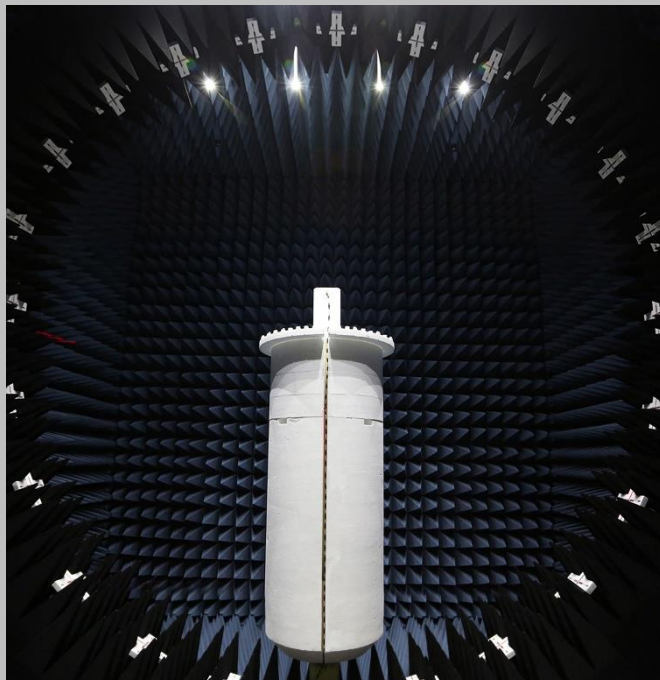
[Texas](#)

[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/RRR, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157



MEASUREMENT UNCERTAINTY

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty ($k=2$) can be found in the table below. A lab specific value may also be found in the applicable test description section. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test Location: California

Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	3.2 dB	-3.2 dB

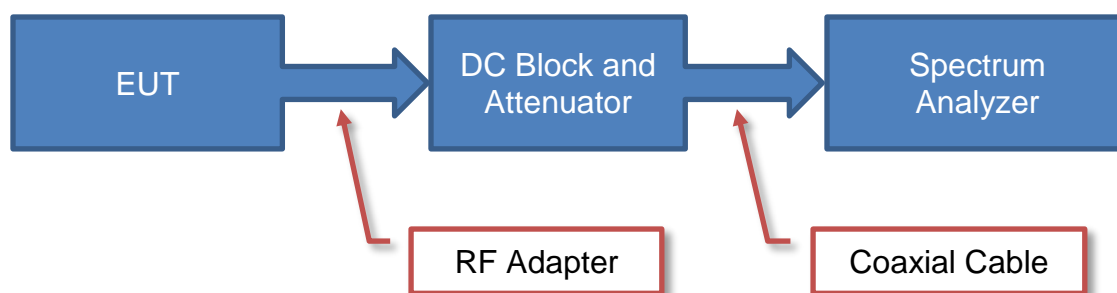
TEST SETUP BLOCK DIAGRAMS

Measurement Bandwidths

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Unless otherwise stated, measurements were made using the bandwidths and detectors specified. No video filter was used.

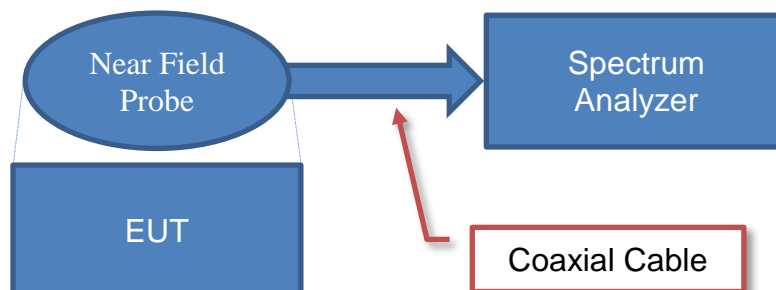
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

Near Field Test Fixture Measurements



Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

Measured Level (Amplitude)	Factor				Distance Adjustment Factor	External Attenuation		Field Strength
	Antenna Factor	Cable Factor	Amplifier Gain					
42.6	28.6	3.1	40.8	+	0.0	+	0.0	= 33.5

Conducted Emissions:

Measured Level (Amplitude)	Factor			External Attenuation		Adjusted Level
	Transducer Factor	Cable Factor				
26.7	0.3	0.1	+	20.0	=	47.1

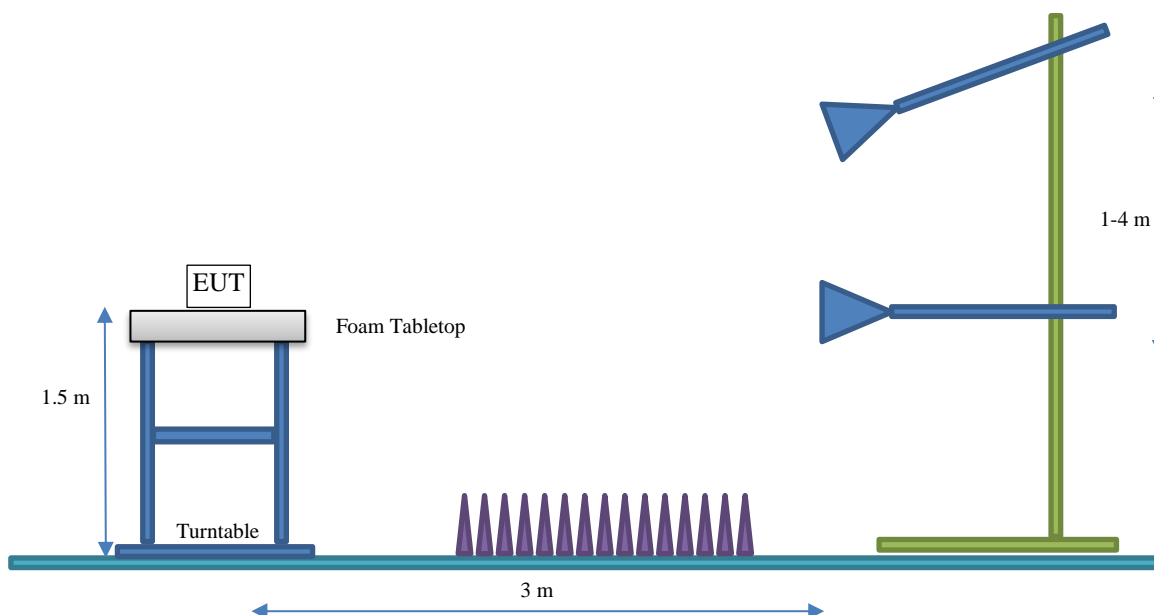
Radiated Power (ERP/EIRP) – Substitution Method:

Measured Level into Substitution Antenna (Amplitude dBm)		Substitution Antenna Factor (dBi)		EIRP to ERP (if applicable)		Measured power (dBm ERP/EIRP)
10.0	+	6.0	-	2.15	=	13.9/16.0

TEST SETUP BLOCK DIAGRAMS

Bore Sighting (>1GHz)

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. Above 1 GHz, when required by the measurement standard, the antenna is pointed for both azimuth and elevation to maintain the receive antenna within the cone of radiation from the EUT. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.



PRODUCT DESCRIPTION

Client and Equipment under Test (EUT) Information

Company Name:	Alcon Research LLC
Address:	20511 Lake Forest Drive
City, State, Zip:	Lake Forest, CA 92630
Test Requested By:	Hakan Gokdogan
EUT:	Unity VCS/CS
First Date of Test:	September 19, 2023
Last Date of Test:	November 13, 2023
Receipt Date of Samples:	September 19, 2023
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

The UNITY VCS is a multifunctional surgical instrument for use in anterior and posterior segment ophthalmic surgeries. The product's capabilities include driving a variety of handpieces that provide the ability to cut vitreous and tissues, emulsify the crystalline lens, illuminate the posterior segment of the eye, and apply diathermy to stop bleeding. Major operating modes are Cataract, VIT, Diathermy, Laser.

UNITY VCS foot controller has wireless connection feature that uses 802.15.4 radio frequency (RF) to communicate with the UNITY system console.

The UNITY remote control is a battery-operated component that uses Bluetooth radio frequency (RF) to communicate with the UNITY VCS system console.

The UNITY VCS has Wi-Fi 802.11ac radio module for communication link with hospital network or UVO at 2.4GHz and 5GHz frequency bands.

UNITY foot control battery wirelessly charging at 50 kHz when position on the hooks of UNITY VCS console.

The UNITY VCS contains several modules, some of which include connectors for connecting surgical probes and handpieces. Connecting ports equipped with Radio Frequency Identification (RFID) to read passive tag in the probes and handpieces at frequency 13.56 MHz

Client Justification:

VCS and CS configurations are almost identical electrically, the only difference being the absence of the functionality of Illuminator and Laser in CS configuration. Accessory connections have been mechanically shortened to facilitate installation of plastic console skins to hide these connections from view. On the rear of the console the external air/Nitrogen pressure source connection has been removed.

Testing Objective:

To demonstrate compliance of Unity VCS/CS RFID to the requirements of FCC part 15.225 requirements.

POWER SETTINGS AND ANTENNAS



The power settings, antenna gain value(s) and cable loss (if applicable) used for the testing contained in this report were provided by the customer and will affect the validity of the results. Element assumes no responsibility for the accuracy of this information. The power settings below reflect the maximum power that the EUT is allowed to transmit at during normal operation.

ANTENNA INFORMATION

(Provided by Manufacturer)

NGI Antennas (Illuminator):

Type	ID	Frequency	Outside Diameter	Average Diameter	Inside Diameter
PCB Trace	NGI (x3)	13.56 MHz	24 mm	22 mm	20 mm

NGTL Antennas (Laser):

Type	ID	Frequency	Outside Diameter	Average Diameter	Inside Diameter
PCB Trace	NGTL_LEGACY (x1)	13.56 MHz	27 mm	26 mm	24 mm
PCB Trace	NGTL_MSLP (x1)	13.56 MHz	24 mm	23 mm	21 mm

PNU Antennas (Pneumatics):

Type	ID	Frequency	Outside Diameter	Average Diameter	Inside Diameter
PCB Trace	PNU_1 (x3)	13.56 MHz	25 mm	24 mm	22 mm
PCB Trace	PNU_2 (x2)	13.56 MHz	40 mm	38 mm	36 mm

SETTINGS FOR ALL TESTS IN THIS REPORT

Radio	Modulation	Protocol	Power Setting (mW)
RFID	ASK	ISO/IEC 15693	285

CONFIGURATIONS



Configuration ALCO0421-3

Software/Firmware Running During Test	
Description	Version
UVCS System Software	REL_01.00 (BLD_0024e)

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
UNITY™ VCS System (Anterior/Posterior) - Wireless	Alcon Research LLC	8065000296	2301157201X

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable	No	5m	No	UVCS System	AC Mains

Configuration ALCO0426-1

Software/Firmware Running During Test	
Description	Version
UVCS System Software	REL_01.00 (BLD_0024e)

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
UNITY™ VCS System (Anterior/Posterior) - Wireless	Alcon Research LLC	8065000296	2301157201X

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable	No	5m	No	UVCS System	AC Mains

CONFIGURATIONS



Configuration ALCO0426-2

Software/Firmware Running During Test	
Description	Version
UVCS System Software	REL_01.00 (BLD_0024e)

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
UNITY™ CS System (Anterior/Posterior) - Wireless	Alcon Research LLC	100285388	2301010901X

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable	No	5m	No	UCS System	AC Mains

Configuration ALCO0426-3

Software/Firmware Running During Test	
Description	Version
UVCS System Software	REL_01.00 (BLD_0024e)

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
UNITY™ VCS System (Anterior/Posterior) - Unintentional	Alcon Research LLC	8065000296	2202329401X

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable	No	5m	No	UVCS System	AC Mains

CONFIGURATIONS

Configuration ALCO0426-4

Software/Firmware Running During Test	
Description	Version
UVCS System Software	REL_01.00 (BLD_0024e)

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
UNITY™ CS System (Anterior/Posterior) - Wireless	Alcon Research LLC	100285388	2301010901X

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
UNITY™ VRC Footswitch	Alcon Research LLC	100285389	2202657903X

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
UNITY 4 Button Foot Pedal Cable	Yes	3.7m	No	UVCS System	Unity 4B Foot Pedal
AC Cable	No	5m	No	UCS System	AC Mains

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2023-09-19	Frequency Stability	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2023-11-09	Field Strength of Fundamental	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2023-11-09	Field Strength of Spurious Emissions (Less Than 30 MHz)	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2023-11-10	Field Strength of Spurious Emissions (Greater Than 30 MHz)	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2023-11-13	Emissions Bandwidth (20 Db)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2023-11-13	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS – UNITY CS (PNEUMATIC)

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
LISN	Solar Electronics	9252-50-24-BNC	LIA	2023-09-12	2024-09-12
Cable - Conducted Cable Assembly	Northwest EMC	OCP, HFP, AWC	OCPA	2023-03-07	2024-03-07
Power Supply	Pacific Power	3120AFX-2L	SMT	NCR	NCR
Receiver	Gauss Instruments	TDEMI 30M	ARO	2023-04-25	2024-04-25

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.2 dB	-3.2 dB

CONFIGURATIONS INVESTIGATED

ALCO0426-4

MODES INVESTIGATED

Transmitting RFID 13.56 MHz. Pneumatic RFID Module, 1x port populated with probe and transmitting.

POWERLINE CONDUCTED EMISSIONS – UNITY CS (PNEUMATIC)

EUT:	Unity CS	Work Order:	ALCO0426
Serial Number:	2301010901X	Date:	2023-11-13
Customer:	Alcon Research LLC	Temperature:	19.6°C
Attendees:	Hakan Gokdogan	Relative Humidity:	36%
Customer Project:	None	Bar. Pressure (PMSL):	1017 mb
Tested By:	Nolan De Ramos	Job Site:	OC06
Power:	120VAC/60Hz	Configuration:	ALCO0426-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	16	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

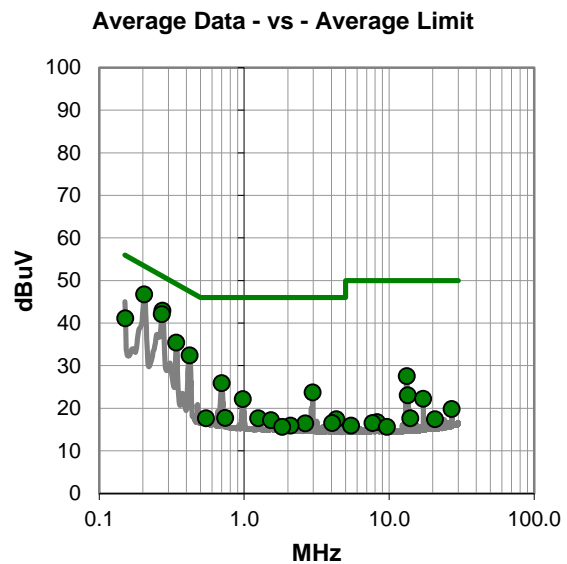
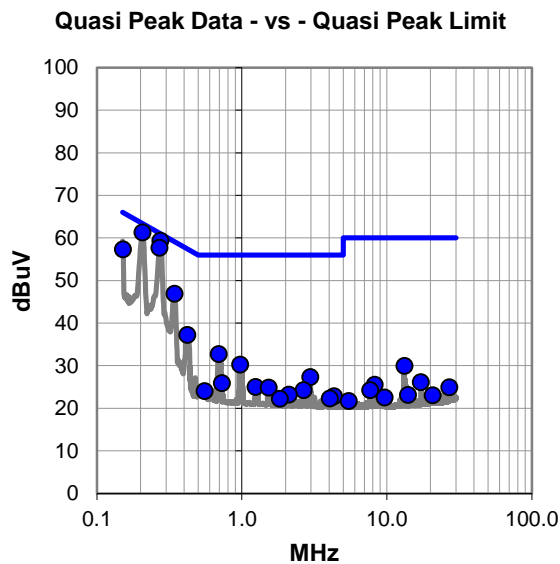
Unity CS only has 1x available port on the Pneumatic RFID Module

EUT OPERATING MODES

Transmitting RFID 13.56 MHz. Pneumatic RFID Module, 1x port populated with probe and transmitting.

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS – UNITY CS (PNEUMATIC)

RESULTS - Run #16

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.275	39.3	20.0	59.3	61.0	-1.7
0.206	41.3	20.0	61.3	63.3	-2.0
0.271	37.7	20.0	57.7	61.1	-3.4
0.152	37.1	20.2	57.3	65.9	-8.6
0.344	26.9	20.0	46.9	59.1	-12.2
0.422	17.3	19.9	37.2	57.4	-20.2
0.693	12.7	20.0	32.7	56.0	-23.3
0.974	10.2	20.0	30.2	56.0	-25.8
2.967	7.1	20.2	27.3	56.0	-28.7
13.229	9.0	20.9	29.9	60.0	-30.1
0.728	5.9	20.0	25.9	56.0	-30.1
1.247	5.0	20.0	25.0	56.0	-31.0
1.531	4.7	20.1	24.8	56.0	-31.2
2.669	4.0	20.2	24.2	56.0	-31.8
0.553	4.1	19.9	24.0	56.0	-32.0
2.108	3.1	20.1	23.2	56.0	-32.8
4.319	2.5	20.3	22.8	56.0	-33.2
4.050	2.0	20.3	22.3	56.0	-33.7
1.834	2.1	20.1	22.2	56.0	-33.8
17.231	4.8	21.3	26.1	60.0	-33.9
8.251	4.9	20.6	25.5	60.0	-34.5
27.077	2.7	22.2	24.9	60.0	-35.1
7.689	3.6	20.6	24.2	60.0	-35.8
14.039	2.1	21.0	23.1	60.0	-36.9
20.788	1.4	21.6	23.0	60.0	-37.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.205	26.7	20.0	46.7	53.4	-6.7
0.274	22.9	20.0	42.9	51.0	-8.1
0.271	22.1	20.0	42.1	51.1	-9.0
0.341	15.4	20.0	35.4	49.2	-13.8
0.152	20.9	20.2	41.1	55.9	-14.8
0.420	12.5	19.9	32.4	47.4	-15.0
0.699	5.9	20.0	25.9	46.0	-20.1
2.970	3.5	20.2	23.7	46.0	-22.3
13.229	6.6	20.9	27.5	50.0	-22.5
0.979	2.1	20.0	22.1	46.0	-23.9
13.432	2.1	20.9	23.0	50.0	-27.0
17.230	0.9	21.3	22.2	50.0	-27.8
0.740	-2.3	20.0	17.7	46.0	-28.3
0.545	-2.3	19.9	17.6	46.0	-28.4
1.253	-2.4	20.0	17.6	46.0	-28.4
4.320	-2.9	20.3	17.4	46.0	-28.6
1.532	-2.9	20.1	17.2	46.0	-28.8
4.050	-3.8	20.3	16.5	46.0	-29.5
2.645	-3.8	20.2	16.4	46.0	-29.6
2.086	-4.2	20.1	15.9	46.0	-30.1
27.077	-2.4	22.2	19.8	50.0	-30.2
1.834	-4.5	20.1	15.6	46.0	-30.4
14.039	-3.4	21.0	17.6	50.0	-32.4
20.790	-4.2	21.6	17.4	50.0	-32.6
8.247	-3.9	20.6	16.7	50.0	-33.3

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS – UNITY CS (PNEUMATIC)

EUT:	Unity CS	Work Order:	ALCO0426
Serial Number:	2301010901X	Date:	2023-11-13
Customer:	Alcon Research LLC	Temperature:	19.6°C
Attendees:	Hakan Gokdogan	Relative Humidity:	36%
Customer Project:	None	Bar. Pressure (PMSL):	1017 mb
Tested By:	Nolan De Ramos	Job Site:	OC06
Power:	120VAC/60Hz	Configuration:	ALCO0426-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	17	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

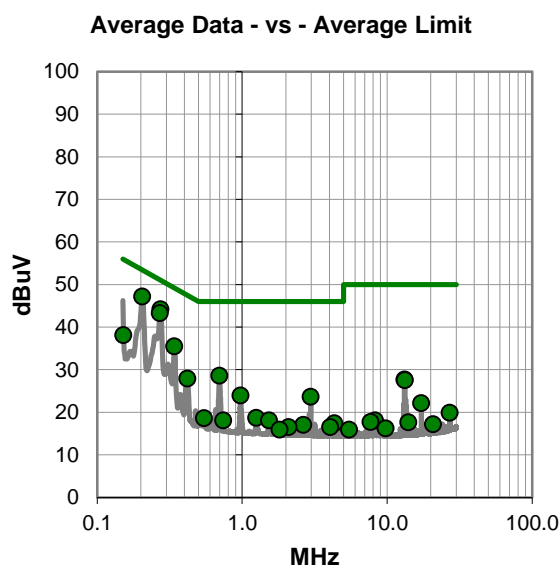
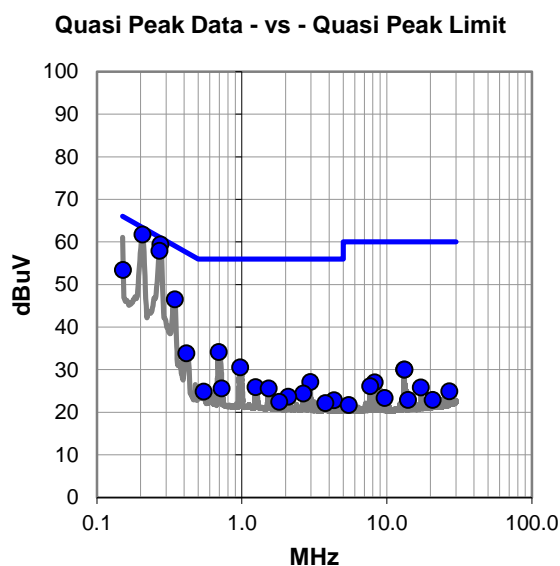
Unity CS only has 1x available port on the Pneumatic RFID Module

EUT OPERATING MODES

Transmitting RFID 13.56 MHz. Pneumatic RFID Module, 1x port populated with probe and transmitting.

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS – UNITY CS (PNEUMATIC)

RESULTS - Run #17

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.206	41.7	20.0	61.7	63.3	-1.6
0.275	39.4	20.0	59.4	61.0	-1.6
0.271	37.9	20.0	57.9	61.1	-3.2
0.152	33.2	20.2	53.4	65.9	-12.5
0.345	26.5	20.0	46.5	59.1	-12.6
0.693	14.1	20.0	34.1	56.0	-21.9
0.415	13.9	19.9	33.8	57.5	-23.7
0.974	10.5	20.0	30.5	56.0	-25.5
2.970	6.9	20.2	27.1	56.0	-28.9
13.162	9.1	20.9	30.0	60.0	-30.0
13.229	9.1	20.9	30.0	60.0	-30.0
1.247	5.9	20.0	25.9	56.0	-30.1
0.727	5.6	20.0	25.6	56.0	-30.4
1.531	5.5	20.1	25.6	56.0	-30.4
0.545	4.9	19.9	24.8	56.0	-31.2
2.655	4.2	20.2	24.4	56.0	-31.6
2.088	3.5	20.1	23.6	56.0	-32.4
8.249	6.4	20.6	27.0	60.0	-33.0
4.320	2.5	20.3	22.8	56.0	-33.2
1.816	2.3	20.1	22.4	56.0	-33.6
3.780	1.8	20.3	22.1	56.0	-33.9
7.689	5.5	20.6	26.1	60.0	-33.9
17.230	4.5	21.3	25.8	60.0	-34.2
27.077	2.7	22.2	24.9	60.0	-35.1
9.697	2.6	20.7	23.3	60.0	-36.7

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.205	27.2	20.0	47.2	53.4	-6.2
0.274	24.2	20.0	44.2	51.0	-6.8
0.271	23.3	20.0	43.3	51.1	-7.8
0.341	15.5	20.0	35.5	49.2	-13.7
0.698	8.6	20.0	28.6	46.0	-17.4
0.152	17.9	20.2	38.1	55.9	-17.8
0.419	8.0	19.9	27.9	47.5	-19.6
0.974	3.9	20.0	23.9	46.0	-22.1
13.162	6.8	20.9	27.7	50.0	-22.3
2.970	3.4	20.2	23.6	46.0	-22.4
13.229	6.6	20.9	27.5	50.0	-22.5
1.253	-1.3	20.0	18.7	46.0	-27.3
0.545	-1.3	19.9	18.6	46.0	-27.4
17.230	0.8	21.3	22.1	50.0	-27.9
0.740	-1.9	20.0	18.1	46.0	-27.9
1.532	-2.0	20.1	18.1	46.0	-27.9
4.320	-2.9	20.3	17.4	46.0	-28.6
2.645	-3.2	20.2	17.0	46.0	-29.0
2.086	-3.6	20.1	16.5	46.0	-29.5
4.050	-3.8	20.3	16.5	46.0	-29.5
1.816	-4.2	20.1	15.9	46.0	-30.1
27.077	-2.3	22.2	19.9	50.0	-30.1
8.247	-2.5	20.6	18.1	50.0	-31.9
7.689	-2.9	20.6	17.7	50.0	-32.3
14.039	-3.4	21.0	17.6	50.0	-32.4

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS – UNITY CS (PNEUMATIC)



POWERLINE CONDUCTED EMISSIONS – UNITY CS (PNEUMATIC)



POWERLINE CONDUCTED EMISSIONS – UNITY VCS (ILLUMINATOR, LASER, PNEUMATIC)



TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
LISN	Solar Electronics	9252-50-24-BNC	LIA	2023-09-12	2024-09-12
Cable - Conducted Cable Assembly	Northwest EMC	OCP, HFP, AWC	OCPA	2023-03-07	2024-03-07
Power Supply	Pacific Power	3120AFX-2L	SMT	NCR	NCR
Receiver	Gauss Instruments	TDEMI 30M	ARO	2023-04-25	2024-04-25

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.2 dB	-3.2 dB

CONFIGURATIONS INVESTIGATED

ALCO0426-3

MODES INVESTIGATED

Transmitting RFID 13.56 MHz. Illuminator RFID Module, all 3x ports populated with probes and transmitting. Laser RFID Module, all 2x ports populated with probes and transmitting. Pneumatic RFID Module, all 5x ports populated with probes and transmitting

POWERLINE CONDUCTED EMISSIONS – UNITY VCS (ILLUMINATOR, LASER, PNEUMATIC)



EUT:	Unity VCS	Work Order:	ALCO0426
Serial Number:	2202329401X	Date:	2023-11-10
Customer:	Alcon Research LLC	Temperature:	20.1°C
Attendees:	Hakan Gokdogan	Relative Humidity:	0.332%
Customer Project:	None	Bar. Pressure (PMSL):	1017 mb
Tested By:	Nolan De Ramos	Job Site:	OC06
Power:	120VAC/60Hz	Configuration:	ALCO0426-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	7	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

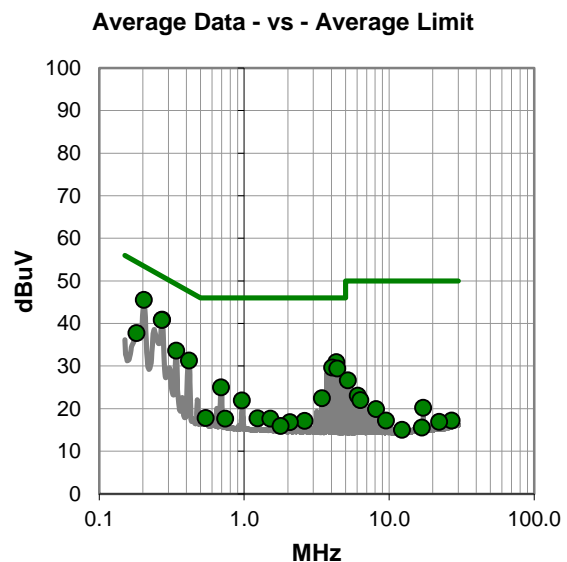
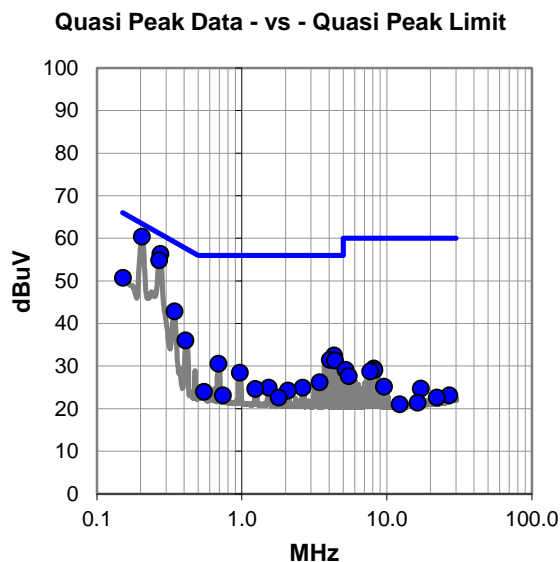
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz. Illuminator RFID Module, all 3x ports populated with probes and transmitting. Laser RFID Module, all 2x ports populated with probes and transmitting. Pneumatic RFID Module, all 5x ports populated with probes and transmitting

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS – UNITY VCS (ILLUMINATOR, LASER, PNEUMATIC)

RESULTS - Run #7

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.205	40.4	20.0	60.4	63.4	-3.0
0.275	36.3	20.0	56.3	61.0	-4.7
0.269	34.8	20.0	54.8	61.1	-6.3
0.152	30.5	20.2	50.7	65.9	-15.2
0.344	22.8	20.0	42.8	59.1	-16.3
0.409	16.1	19.9	36.0	57.7	-21.7
4.320	12.2	20.3	32.5	56.0	-23.5
4.050	11.1	20.3	31.4	56.0	-24.6
4.387	11.0	20.3	31.3	56.0	-24.7
0.689	10.5	20.0	30.5	56.0	-25.5
0.969	8.4	20.0	28.4	56.0	-27.6
3.443	6.0	20.2	26.2	56.0	-29.8
8.135	8.8	20.6	29.4	60.0	-30.6
5.197	8.7	20.4	29.1	60.0	-30.9
8.209	8.4	20.6	29.0	60.0	-31.0
1.537	4.8	20.1	24.9	56.0	-31.1
2.631	4.7	20.2	24.9	56.0	-31.1
7.687	8.1	20.6	28.7	60.0	-31.3
1.241	4.6	20.0	24.6	56.0	-31.4
2.077	4.1	20.1	24.2	56.0	-31.8
0.550	4.0	19.9	23.9	56.0	-32.1
5.467	7.2	20.4	27.6	60.0	-32.4
0.739	3.1	20.0	23.1	56.0	-32.9
1.792	2.5	20.1	22.6	56.0	-33.4
9.555	4.4	20.7	25.1	60.0	-34.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.203	25.5	20.0	45.5	53.5	-8.0
0.272	20.9	20.0	40.9	51.1	-10.2
0.271	20.8	20.0	40.8	51.1	-10.3
4.320	10.6	20.3	30.9	46.0	-15.1
0.339	13.6	20.0	33.6	49.2	-15.6
0.417	11.4	19.9	31.3	47.5	-16.2
4.050	9.3	20.3	29.6	46.0	-16.4
4.387	9.1	20.3	29.4	46.0	-16.6
0.181	17.6	20.1	37.7	54.5	-16.8
0.692	5.0	20.0	25.0	46.0	-21.0
5.197	6.2	20.4	26.6	50.0	-23.4
3.443	2.2	20.2	22.4	46.0	-23.6
0.966	1.9	20.0	21.9	46.0	-24.1
6.075	2.5	20.5	23.0	50.0	-27.0
6.345	1.5	20.5	22.0	50.0	-28.0
0.544	-2.1	19.9	17.8	46.0	-28.2
1.241	-2.3	20.0	17.7	46.0	-28.3
0.739	-2.4	20.0	17.6	46.0	-28.4
1.520	-2.5	20.1	17.6	46.0	-28.4
2.619	-3.1	20.2	17.1	46.0	-28.9
2.069	-3.3	20.1	16.8	46.0	-29.2
17.230	-1.1	21.3	20.2	50.0	-29.8
1.790	-4.2	20.1	15.9	46.0	-30.1
8.135	-0.7	20.6	19.9	50.0	-30.1
9.512	-3.5	20.7	17.2	50.0	-32.8

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS – UNITY VCS (ILLUMINATOR, LASER, PNEUMATIC)



EUT:	Unity VCS	Work Order:	ALCO0426
Serial Number:	2202329401X	Date:	2023-11-10
Customer:	Alcon Research LLC	Temperature:	20.1°C
Attendees:	Hakan Gokdogan	Relative Humidity:	0.332%
Customer Project:	None	Bar. Pressure (PMSL):	1017 mb
Tested By:	Nolan De Ramos	Job Site:	OC06
Power:	120VAC/60Hz	Configuration:	ALCO0426-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	8	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

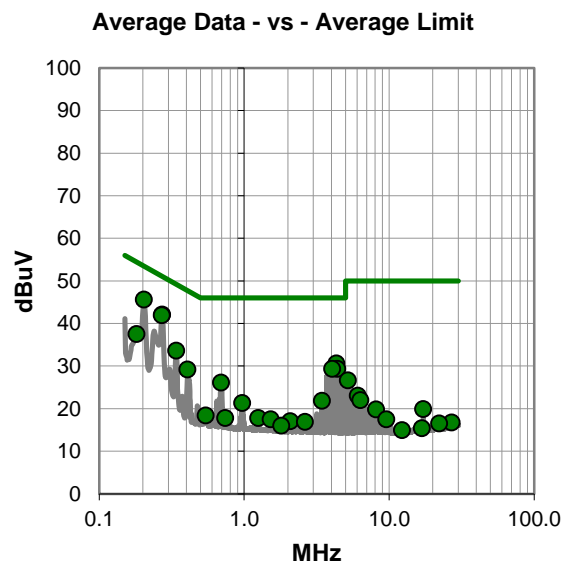
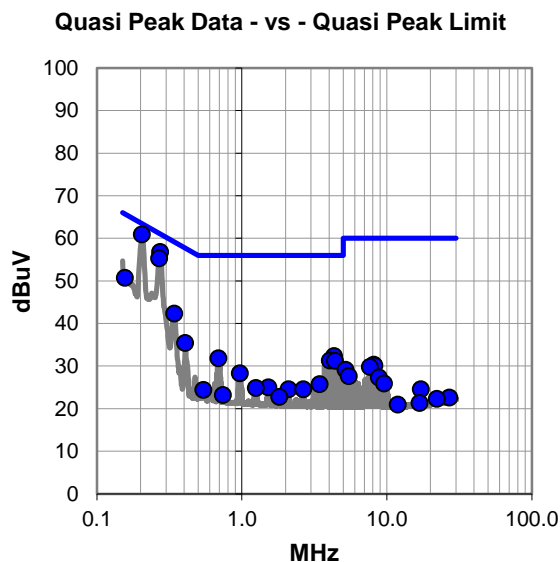
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz. Illuminator RFID Module, all 3x ports populated with probes and transmitting. Laser RFID Module, all 2x ports populated with probes and transmitting. Pneumatic RFID Module, all 5x ports populated with probes and transmitting

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS – UNITY VCS (ILLUMINATOR, LASER, PNEUMATIC)

RESULTS - Run #8

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.205	40.9	20.0	60.9	63.4	-2.5
0.274	36.8	20.0	56.8	61.0	-4.2
0.269	35.3	20.0	55.3	61.1	-5.8
0.156	30.5	20.2	50.7	65.7	-15.0
0.342	22.3	20.0	42.3	59.1	-16.8
0.406	15.5	19.9	35.4	57.7	-22.3
4.320	12.0	20.3	32.3	56.0	-23.7
0.690	11.8	20.0	31.8	56.0	-24.2
4.050	11.0	20.3	31.3	56.0	-24.7
4.387	10.9	20.3	31.2	56.0	-24.8
0.969	8.3	20.0	28.3	56.0	-27.7
8.136	9.7	20.6	30.3	60.0	-29.7
8.211	9.5	20.6	30.1	60.0	-29.9
7.654	9.2	20.6	29.8	60.0	-30.2
3.443	5.5	20.2	25.7	56.0	-30.3
5.197	8.7	20.4	29.1	60.0	-30.9
1.523	4.9	20.1	25.0	56.0	-31.0
1.253	4.8	20.0	24.8	56.0	-31.2
2.097	4.4	20.1	24.5	56.0	-31.5
2.655	4.3	20.2	24.5	56.0	-31.5
0.542	4.5	19.9	24.4	56.0	-31.6
5.467	7.2	20.4	27.6	60.0	-32.4
8.849	6.7	20.6	27.3	60.0	-32.7
0.739	3.2	20.0	23.2	56.0	-32.8
1.818	2.6	20.1	22.7	56.0	-33.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.203	25.6	20.0	45.6	53.5	-7.9
0.272	22.1	20.0	42.1	51.1	-9.0
0.271	21.9	20.0	41.9	51.1	-9.2
4.320	10.3	20.3	30.6	46.0	-15.4
0.339	13.6	20.0	33.6	49.2	-15.6
4.387	9.0	20.3	29.3	46.0	-16.7
4.050	9.0	20.3	29.3	46.0	-16.7
0.181	17.4	20.1	37.5	54.5	-17.0
0.406	9.3	19.9	29.2	47.7	-18.5
0.693	6.1	20.0	26.1	46.0	-19.9
5.197	6.2	20.4	26.6	50.0	-23.4
3.443	1.6	20.2	21.8	46.0	-24.2
0.969	1.3	20.0	21.3	46.0	-24.7
6.075	2.5	20.5	23.0	50.0	-27.0
0.544	-1.5	19.9	18.4	46.0	-27.6
6.345	1.5	20.5	22.0	50.0	-28.0
0.740	-2.2	20.0	17.8	46.0	-28.2
1.249	-2.2	20.0	17.8	46.0	-28.2
1.523	-2.6	20.1	17.5	46.0	-28.5
2.077	-3.1	20.1	17.0	46.0	-29.0
2.631	-3.3	20.2	16.9	46.0	-29.1
1.802	-4.1	20.1	16.0	46.0	-30.0
17.231	-1.4	21.3	19.9	50.0	-30.1
8.136	-0.8	20.6	19.8	50.0	-30.2
9.560	-3.2	20.7	17.5	50.0	-32.5

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS – UNITY VCS (ILLUMINATOR, LASER, PNEUMATIC)



POWERLINE CONDUCTED EMISSIONS – UNITY VCS (ILLUMINATOR, LASER, PNEUMATIC)



FIELD STRENGTH OF FUNDAMENTAL – ILLUMINATOR RFID MODULE

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

As outlined in 15.209(e) and 15.31(f)(2), measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Loop	EMCO	6502	AZB	2023-09-06	2025-09-06
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2023-05-26	2024-05-26
Receiver	Rohde & Schwarz	ESCI	ARG	2023-08-31	2024-08-31

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	1.8 dB	-1.8 dB

FREQUENCY RANGE INVESTIGATED

12.56 MHz TO 14.56 MHz

POWER INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

ALCO0426-1

MODES INVESTIGATED

Transmitting RFID 13.56 MHz. Illuminator RFID Module, all 3x ports populated with probes and transmitting

FIELD STRENGTH OF FUNDAMENTAL – ILLUMINATOR RFID MODULE

EUT:	Unity VCS	Work Order:	ALCO0426
Serial Number:	2301157201X	Date:	2023-11-08
Customer:	Alcon Research LLC	Temperature:	22.7°C
Attendees:	Hakan Gokdogan	Relative Humidity:	39.6%
Customer Project:	None	Bar. Pressure (PMSL):	1015 mb
Tested By:	Nolan De Ramos	Job Site:	OC08
Power:	120VAC/60Hz	Configuration:	ALCO0426-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	12	Test Distance (m):	10	Ant. Height(s) (m):	1(m)
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COMMENTS

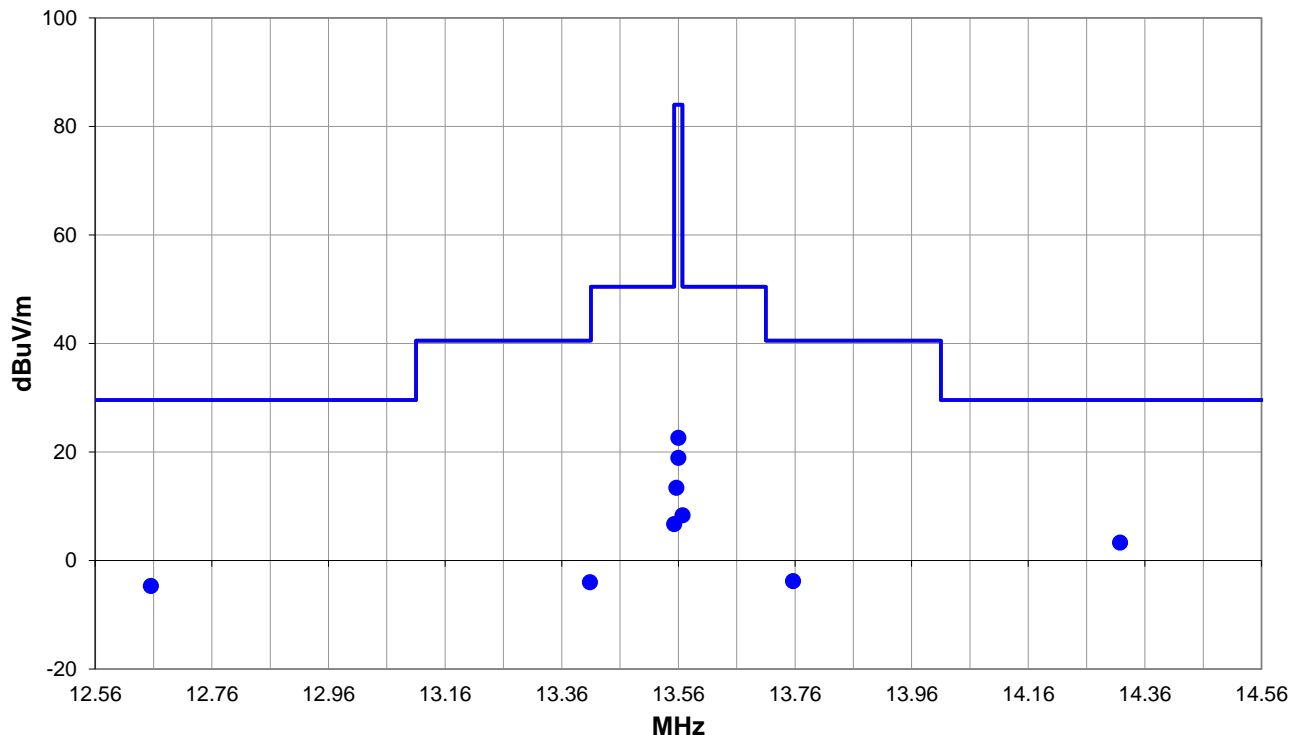
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz. Illuminator RFID Module, all 3x ports populated with probes and transmitting

DEVIATIONS FROM TEST STANDARD

None



Run #: 12

PK AV QP

FIELD STRENGTH OF FUNDAMENTAL – ILLUMINATOR RFID MODULE

RESULTS - Run #12

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
14.317	10.8	11.6	1.0	360.0	10.0	0.0	Par to GND	QP	-19.1	3.3	29.5	-26.2
12.655	2.8	11.6	1.0	277.0	10.0	0.0	Par to GND	QP	-19.1	-4.7	29.5	-34.2
13.567	15.8	11.6	1.0	178.0	10.0	0.0	Par to GND	QP	-19.1	8.3	50.5	-42.2
13.553	14.2	11.6	1.0	170.0	10.0	0.0	Par to GND	QP	-19.1	6.7	50.5	-43.8
13.757	3.7	11.6	1.0	188.0	10.0	0.0	Par to GND	QP	-19.1	-3.8	40.5	-44.3
13.408	3.5	11.6	1.0	298.0	10.0	0.0	Par to GND	QP	-19.1	-4.0	40.5	-44.5
13.560	30.1	11.6	1.0	174.0	10.0	0.0	Par to GND	QP	-19.1	22.6	84.0	-61.4
13.560	26.4	11.6	1.0	174.0	10.0	0.0	Perp to EUT	QP	-19.1	18.9	84.0	-65.1
13.556	20.9	11.6	1.0	151.0	10.0	0.0	Par to EUT	QP	-19.1	13.4	84.0	-70.6

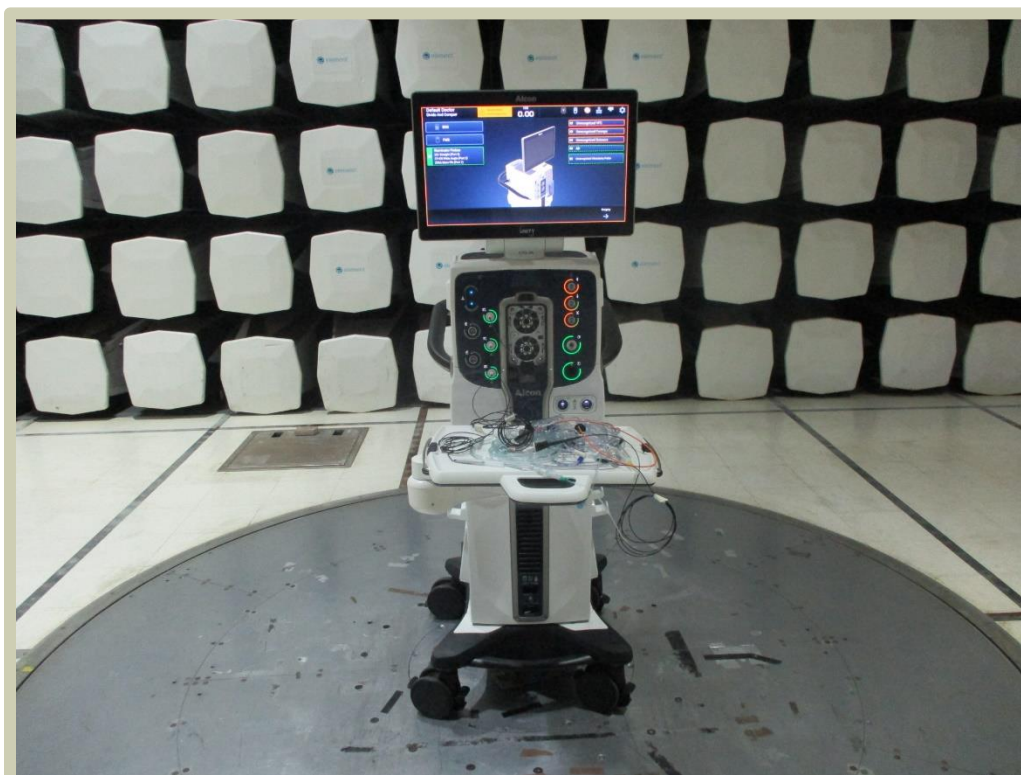
CONCLUSION

Pass

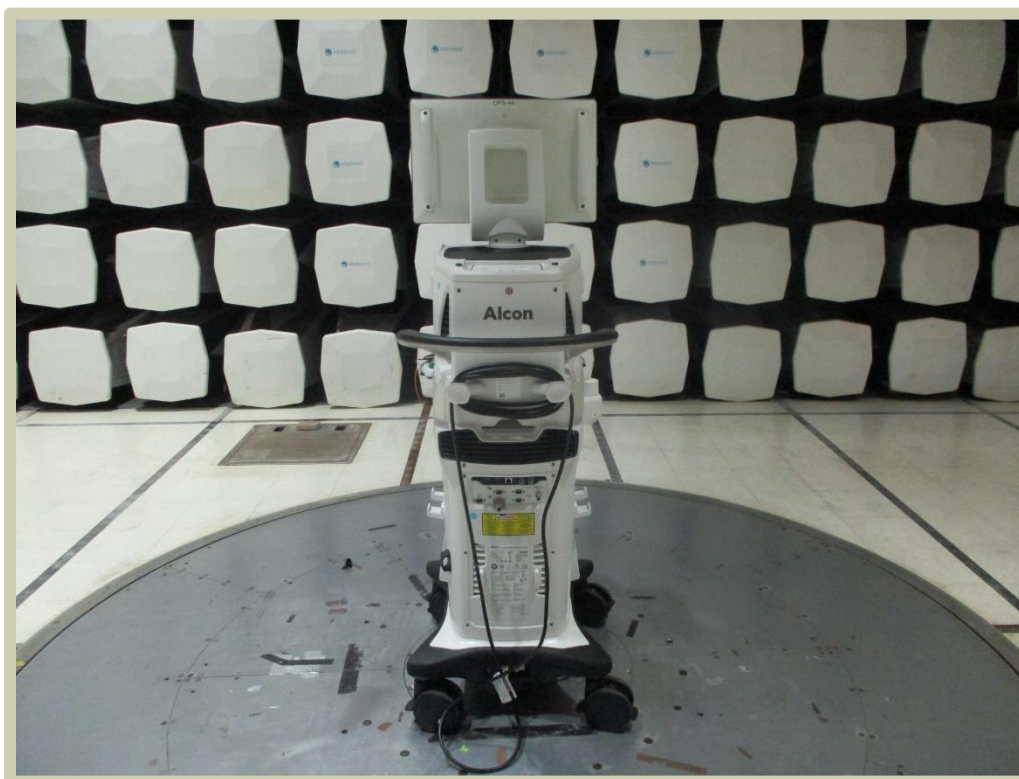


Tested By

FIELD STRENGTH OF FUNDAMENTAL – ILLUMINATOR RFID MODULE



FIELD STRENGTH OF FUNDAMENTAL – ILLUMINATOR RFID MODULE



FIELD STRENGTH OF FUNDAMENTAL – LASER RFID MODULE

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

As outlined in 15.209(e) and 15.31(f)(2), measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Loop	EMCO	6502	AZB	2023-09-06	2025-09-06
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2023-05-26	2024-05-26
Receiver	Rohde & Schwarz	ESCI	ARG	2023-08-31	2024-08-31

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	1.8 dB	-1.8 dB

FREQUENCY RANGE INVESTIGATED

12.56 MHz TO 14.56 MHz

POWER INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

ALCO0426-1

MODES INVESTIGATED

Transmitting RFID 13.56 MHz. Laser RFID Module, all 2x ports populated with probes and transmitting

FIELD STRENGTH OF FUNDAMENTAL – LASER RFID MODULE

EUT:	Unity VCS	Work Order:	ALCO0426
Serial Number:	2301157201X	Date:	2023-11-08
Customer:	Alcon Research LLC	Temperature:	21.3°C
Attendees:	Hakan Gokdogan	Relative Humidity:	44.5%
Customer Project:	None	Bar. Pressure (PMSL):	1016 mb
Tested By:	Nolan De Ramos	Job Site:	OC08
Power:	120VAC/60Hz	Configuration:	ALCO0426-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	6	Test Distance (m):	10	Ant. Height(s) (m):	1(m)
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COMMENTS

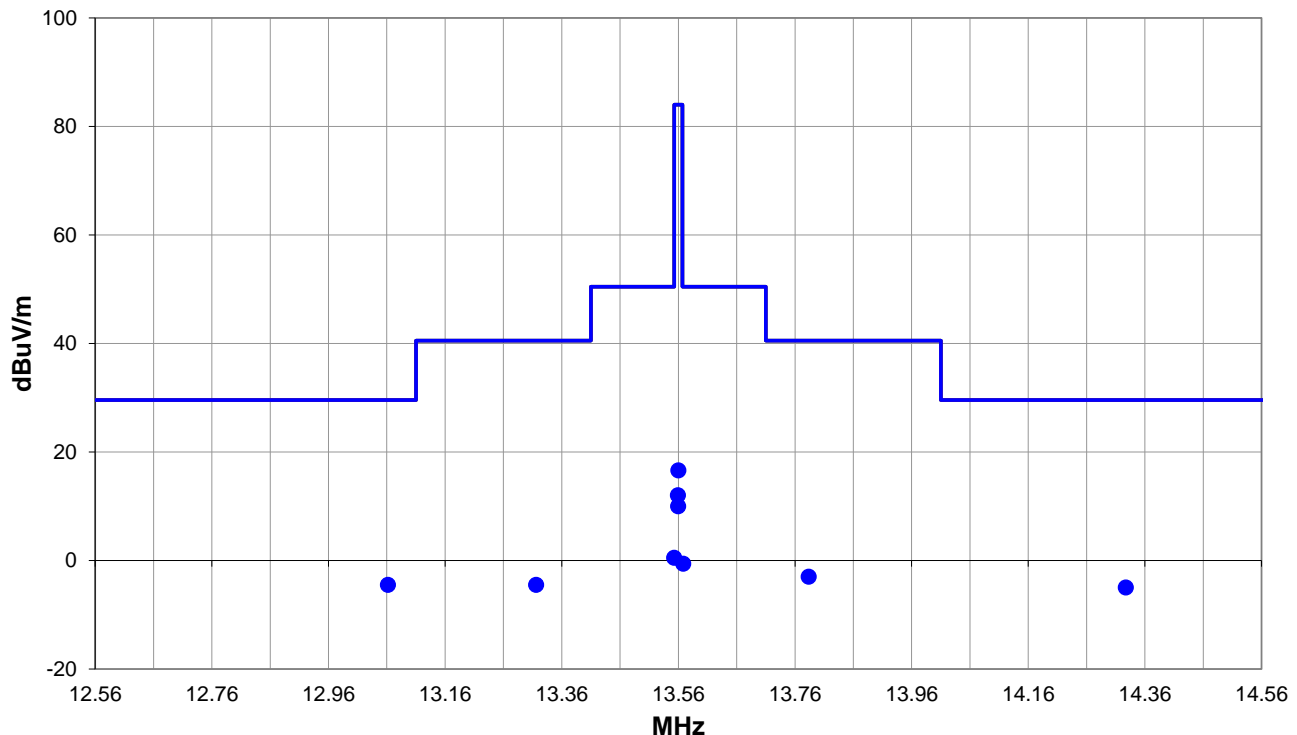
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz. Laser RFID Module, all 2x ports populated with probes and transmitting

DEVIATIONS FROM TEST STANDARD

None



Run #: 6

■ PK ◆ AV ● QP

FIELD STRENGTH OF FUNDAMENTAL – LASER RFID MODULE

RESULTS - Run #6

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
13.062	3.0	11.6	1.0	157.0	10.0	0.0	Par to GND	QP	-19.1	-4.5	29.5	-34.0
14.327	2.5	11.6	1.0	112.0	10.0	0.0	Par to GND	QP	-19.1	-5.0	29.5	-34.5
13.783	4.5	11.6	1.0	193.0	10.0	0.0	Par to GND	QP	-19.1	-3.0	40.5	-43.5
13.316	3.0	11.6	1.0	175.0	10.0	0.0	Par to GND	QP	-19.1	-4.5	40.5	-45.0
13.553	8.0	11.6	1.0	300.0	10.0	0.0	Par to GND	QP	-19.1	0.5	50.5	-50.0
13.568	6.9	11.6	1.0	168.0	10.0	0.0	Par to GND	QP	-19.1	-0.6	50.5	-51.1
13.560	24.1	11.6	1.0	168.0	10.0	0.0	Par to GND	QP	-19.1	16.6	84.0	-67.4
13.559	19.5	11.6	1.0	326.0	10.0	0.0	Perp to EUT	QP	-19.1	12.0	84.0	-72.0
13.560	17.5	11.6	1.0	324.0	10.0	0.0	Par to EUT	QP	-19.1	10.0	84.0	-74.0

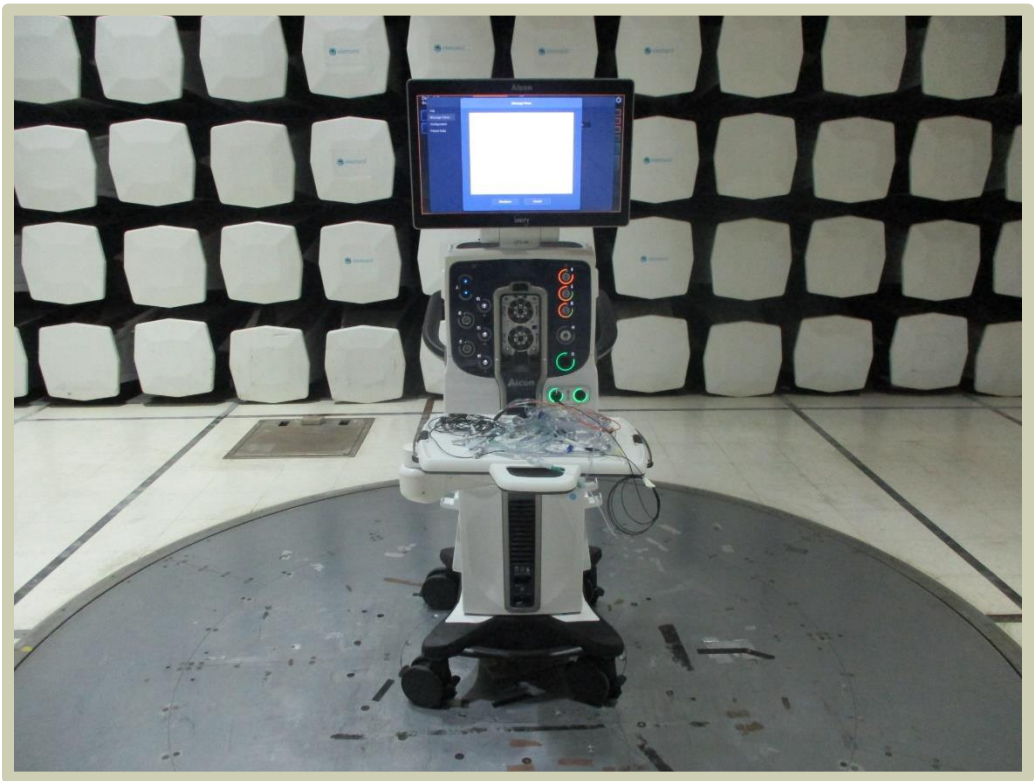
CONCLUSION

Pass

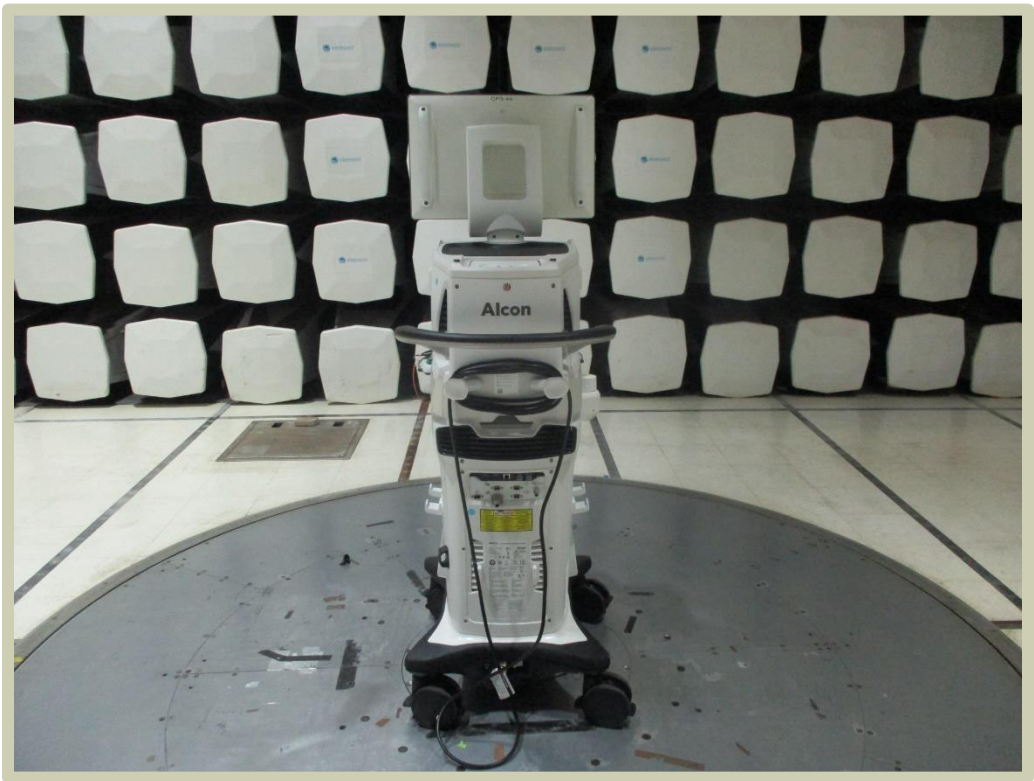


Tested By

FIELD STRENGTH OF FUNDAMENTAL – LASER RFID MODULE



FIELD STRENGTH OF FUNDAMENTAL – LASER RFID MODULE



FIELD STRENGTH OF FUNDAMENTAL – PNEUMATIC RFID MODULE



TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

As outlined in 15.209(e) and 15.31(f)(2), measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Loop	EMCO	6502	AZB	2023-09-06	2025-09-06
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2023-05-26	2024-05-26
Receiver	Rohde & Schwarz	ESCI	ARG	2023-08-31	2024-08-31

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	1.8 dB	-1.8 dB

FREQUENCY RANGE INVESTIGATED

12.56 MHz TO 14.56 MHz

POWER INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

ALCO0426-1

MODES INVESTIGATED

Transmitting RFID 13.56 MHz. Pneumatic RFID Module, all 5x ports populated with probes and transmitting

FIELD STRENGTH OF FUNDAMENTAL – PNEUMATIC RFID MODULE



EUT:	Unity VCS	Work Order:	ALCO0426
Serial Number:	2301157201X	Date:	2023-11-08
Customer:	Alcon Research LLC	Temperature:	20.1°C
Attendees:	Hakan Gokdogan	Relative Humidity:	50.7%
Customer Project:	None	Bar. Pressure (PMSL):	1019 mb
Tested By:	Nolan De Ramos	Job Site:	OC08
Power:	120VAC/60Hz	Configuration:	ALCO0426-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	4	Test Distance (m):	10	Ant. Height(s) (m):	1(m)
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COMMENTS

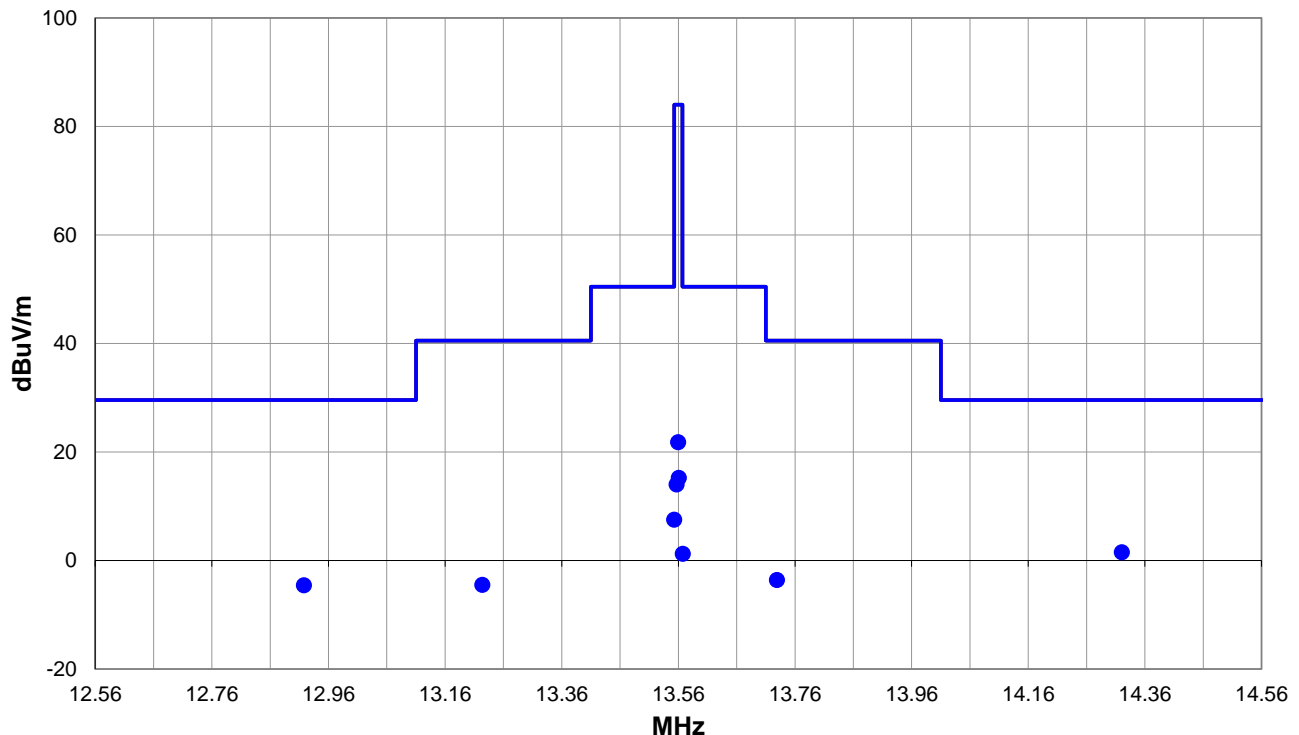
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz. Pneumatic RFID Module, all 5x ports populated with probes and transmitting

DEVIATIONS FROM TEST STANDARD

None



Run #: 4

■ PK ◆ AV ● QP

FIELD STRENGTH OF FUNDAMENTAL – PNEUMATIC RFID MODULE



RESULTS - Run #4

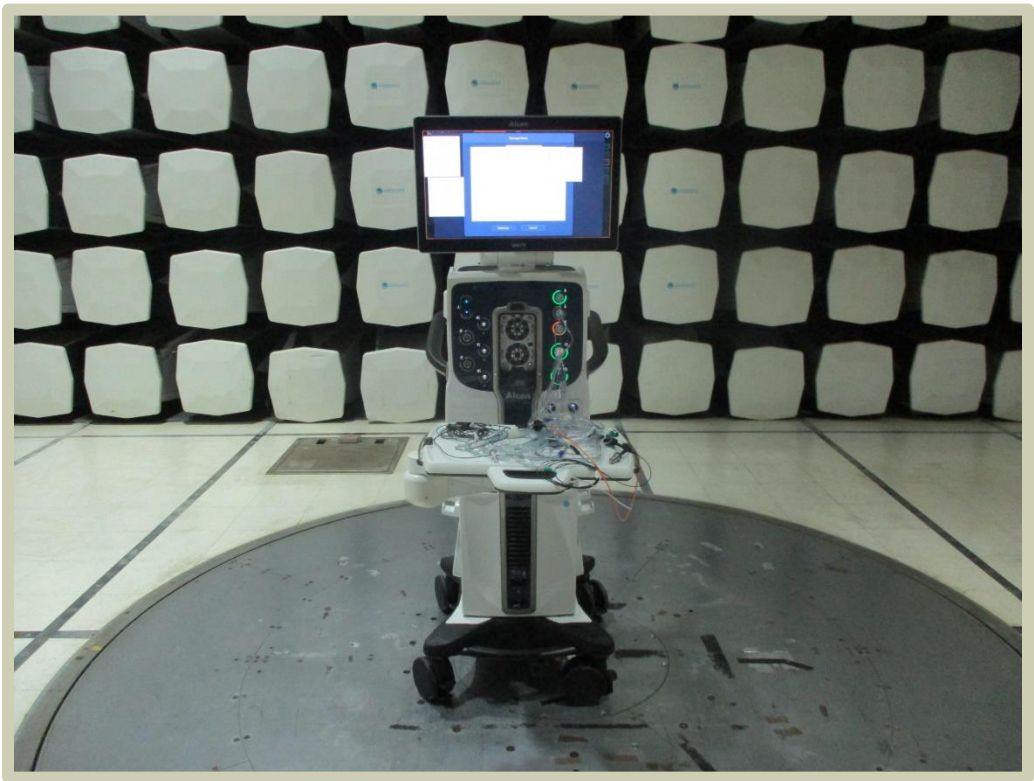
Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
14.320	9.0	11.6	1.0	190.0	10.0	0.0	Par to GND	QP	-19.1	1.5	29.5	-28.0
12.918	2.9	11.6	1.0	24.0	10.0	0.0	Par to GND	QP	-19.1	-4.6	29.5	-34.1
13.553	15.0	11.6	1.0	261.0	10.0	0.0	Par to GND	QP	-19.1	7.5	50.5	-43.0
13.729	3.9	11.6	1.0	316.0	10.0	0.0	Par to GND	QP	-19.1	-3.6	40.5	-44.1
13.224	3.0	11.6	1.0	124.0	10.0	0.0	Par to GND	QP	-19.1	-4.5	40.5	-45.0
13.568	8.7	11.6	1.0	20.0	10.0	0.0	Par to GND	QP	-19.1	1.2	50.5	-49.3
13.559	29.3	11.6	1.0	265.0	10.0	0.0	Par to GND	QP	-19.1	21.8	84.0	-62.2
13.561	22.7	11.6	1.0	243.0	10.0	0.0	Par to EUT	QP	-19.1	15.2	84.0	-68.8
13.557	21.5	11.6	1.0	250.0	10.0	0.0	Perp to EUT	QP	-19.1	14.0	84.0	-70.0

CONCLUSION

Pass

Tested By

FIELD STRENGTH OF FUNDAMENTAL – PNEUMATIC RFID MODULE



FIELD STRENGTH OF FUNDAMENTAL – PNEUMATIC RFID MODULE

