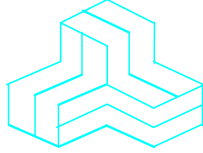


ENGINEERING TEST REPORT



SITRANS LR250
Model: 7ML5431
FCC ID: NJA-LR250

Applicant:

Siemens Canada Ltd. - Siemens Milltronics Process Instruments
1954 Technology Drive
Peterborough, ON
Canada K9J 6X7

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.256

UltraTech's File No.: SIE-008F15C256

This Test report is Issued under the Authority of
Tri M. Luu
Vice President of Engineering
UltraTech Group of Labs

Date: July 28, 2014

Report Prepared by: Dan Huynh

Tested by: Hung Trinh

Issued Date: July 28, 2014

Test Dates: April 30, May 18 & 19, 2014

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

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91038



1309



Approved Test Facility

46390-2049



NVLAP LAB
CODE 200093-0



SL2-IN-E-
1119R



Korea
KCC-RRR

CA2049



TL363_B



TPTDP
DA1300

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Sec. 15.256 - Operation of level probing radars within the bands 5.925-7.250 GHz, 24.05-29.00 GHz, and 75-85 GHz.
Title:	Code of Federal Regulations (CFR), Title 47 Telecommunication, Part 15, Subpart C - Intentional Radiators
Purpose of Test:	To gain FCC Equipment Certification for FCC Part 15.256.
Test Procedures:	ANSI C63.4, ANSI C63.10 and KDB 890966 D01 Meas Level Probing Radars v01
Environmental Classification:	Commercial, industrial or business environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC 47 CFR 15	2013	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 Radio Frequency Devices
ANSI C63.4	2009	American National Standard for 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
KDB 890966 D01 Meas Level Probing Radars v01	2014	Measurement Procedure for Level Probing Radars
CISPR 22 & EN 55022	2008-09, Edition 6.0 2006	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement
CISPR 16-1-1 +A1 +A2	2006 2006 2007	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-1-2 +A1 +A2	2003 2004 2006	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-2: Conducted disturbances
CISPR 16-1-2 +A1 +A2	2003 2004 2006	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-2: Conducted disturbances

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

Applicant	
Name:	Siemens Canada Ltd. - Siemens Milltronics Process Instruments
Address:	1954 Technology Drive Peterborough, ON Canada K9J 6X7
Contact Person:	Thoai Bui Phone #: 705-740-7005 Fax #: 705-741-0466 Email Address: Thoai.bui@siemens.com

Manufacturer	
Name:	Siemens Canada Ltd. - Siemens Milltronics Process Instruments
Address:	1954 Technology Drive Peterborough, ON Canada K9J 6X7
Contact Person:	Thoai Bui Phone #: 705-740-7005 Fax #: 705-741-0466 Email Address: Thoai.bui@siemens.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Siemens
Product Name:	SITRANS LR250
Model Name or Number:	7ML5431
Serial Number:	Test sample
Type of Equipment:	Level Probing Radar
Input Power Supply Type:	24V DC
Primary User Functions of EUT:	Level probing radars operate in open-air and inside an enclosure containing the substance being measured

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	Fixed
Intended Operating Environment:	Commercial, light industry & heavy industry
Power Supply Requirement:	24 V DC
Field Strength:	103.86 dB μ V/m Peak at 3 m
Operating Frequency Range:	25.1 GHz
RF Output Impedance:	50 Ω
10 dB Bandwidth:	1423 MHz
Modulation Type:	Pulse radar
Oscillator Frequencies:	25 GHz
Antenna Connector Type:	Integral

2.4. ASSOCIATED ANTENNA DESCRIPTIONS

The EUT is equipped with the 3 inch or 4 inch antenna, the unit with highest gain antenna will be used for compliance testing.

Antenna Description		
Antenna:	# 1	#2
Manufacturer:	SIEMENS	SIEMENS
Type:	Horn	Horn
Model:	3"	4"
Frequency Range:	24.05 - 29.00 GHz	24.05 - 29.00 GHz
Impedance:	50 Ohm	50 Ohm
Gain (dBi):	21.5 dBi	22.5 dBi

2.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Loop power (Hart or Profibus PA)	1	Terminal block	Non-shielded, >3m

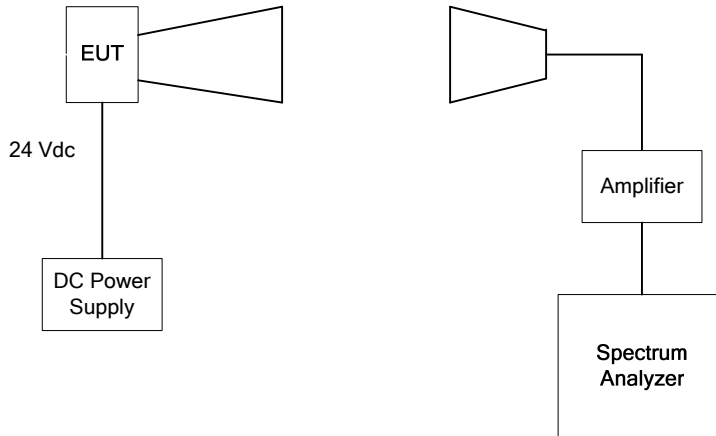
2.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

None.

2.7. GENERAL TEST SETUP

2.7.1. Fundamental Emissions, Unwanted Emissions and Emissions Bandwidth Test Setup



2.7.2. Frequency Stability Test Setup

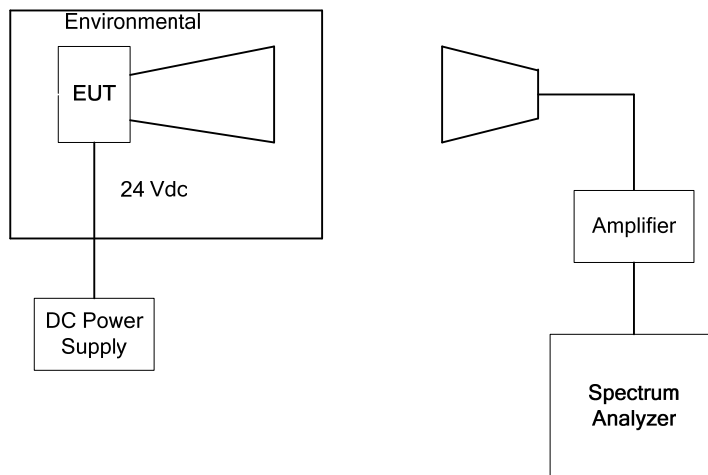


EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	24 VDC

3.2. OPEPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	The EUT was configured for continuous transmission for the duration of testing.
Special Test Software:	N/A
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT was tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment.

Transmitter Test Signals:	
Frequency Band(s):	25.1 GHz
Test Frequency(ies):	25.1 GHz
Transmitter Wanted Output Test Signals:	
▪ RF Power Output (measured maximum output power):	103.86 dBµV/m Peak at 3 m
▪ Normal Test Modulation:	Pulse radar
▪ Modulating signal source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).
- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2017-04-02.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Regulations	Test Requirements	Compliance (Yes/No)
15.203, 15.204 & 15.256(b)	The transmitter shall utilize a dedicated or integrated transmit antenna and installation requirement of LPR	Yes*
15.209	Emissions from Digital Circuitry	Yes
15.256(f)	Fundamental Emission Bandwidth	Yes
15.215(c) & 15.256(f)(2)	Frequency Stability	Yes
15.256(g)	Fundamental Emission	Yes
15.256(h)	Unwanted Emissions	Yes

* The EUT complies with the requirements; it employs integral antenna and is in compliance with the installation requirement.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 5. TEST DATA

5.1. RADIATED EMISSION FROM UNINTENTIONAL RADIATORS (DIGITAL CIRCUITRY) [47 CFR §15.209]

5.1.1. Limit(s)

The equipment shall meet the limits of the following table:

§15.209(a) Radiated emission limits; general requirements

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

5.1.2. Method of Measurements

Refer to Ultratech Test Procedures ULTR-P001-2004 & ANSI C63.4 for method of measurements. The spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency specified in §15.33(a).

5.1.3. Test Data

Remark(s):					
▪ All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.					
Frequency (MHz)	RF Level (dB μ V/m)	Detector Used (Peak/QP/Avg)	Antenna Plane (H/V)	Limit at 3 m (dB μ V/m)	Margin (dB)
47.88	33.96	QP	V	40.0	-6.0
47.88	25.00	Peak	H	40.0	-15.0
79.61	35.48	QP	V	40.0	-4.5
79.61	30.15	Peak	H	40.0	-9.9
120.16	35.19	Peak	V	43.5	-8.3
120.16	34.55	Peak	H	43.5	-9.0

5.2. FUNDAMENTAL EMISSION BANDWIDTH [47 CFR §15.256(f)]

5.2.1. Limit(s)

§15.256(f) The fundamental bandwidth of an LPR emission is defined as the width of the signal between two points, one below and one above the center frequency, outside of which all emissions are attenuated by at least 10 dB relative to the maximum transmitter output power when measured in an equivalent resolution bandwidth.

§15.256(f)(1) The minimum fundamental emission bandwidth shall be 50 MHz for LPR operation under the provisions of this section.

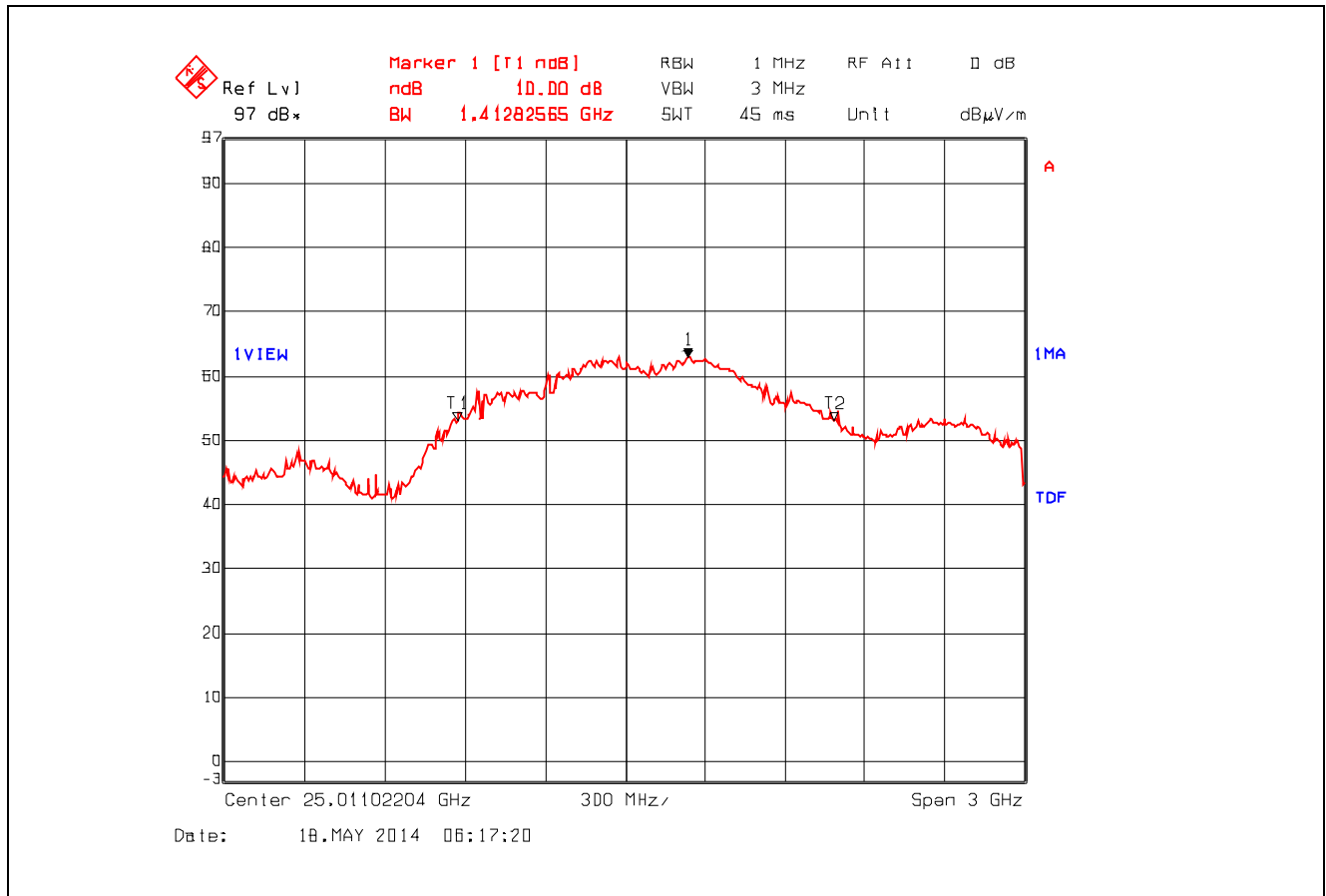
5.2.2. Method of Measurements

890966 D01 Meas Level Probing Radars v01, Clause D.

5.2.3. Test Data

Test Frequency (GHz)	10 dB Bandwidth (MHz)	Minimum Limit (MHz)
25.1	1423	50

Plot 5.2.3.1. 10 dB Bandwidth, Fc: 25.1 GHz



5.3. FREQUENCY STABILITY [47 CFR§§ 15.215(c) & 15.256]

5.3.1. Limit(s)

15.256(f)(2) LPR devices operating under this section must confine their fundamental emission bandwidth within the 5.925-7.250 GHz, 24.05-29.00 GHz, and 75-85 GHz bands under all conditions of operation.

The bandwidth of the fundamental emission must be contained within the frequency band over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage.

5.3.2. Method of Measurements

ETSI EN 302 502 V1.2.1, Clause 5.3.2.2, radiated measurement method.

5.3.3. Test Data

Designated Frequency Band:	24.05 to 29.00 GHz
Nominal Channel Center Frequency:	25.1 GHz
Frequency Tolerance Limit:	Fundamental emission bandwidth shall be within 24.05-29.00 GHz
Max. Frequency Tolerance Measured:	-0.206012 GHz
Input Voltage Rating:	24 VDC

Ambient Temperature (°C)	Frequency Drift (GHz)		
	Supply Voltage (Nominal) 24 VDC	Supply Voltage (Minimal) 17 VDC	Supply Voltage (Maximal) 30 VDC
-40	-0.178958	--	--
-30	-0.175952	--	--
-20	-0.178958	--	--
-10	-0.200000	--	--
0	-0.170140	--	--
+10	-0.173146	--	--
+20	-0.167134	-0.170140	-0.170140
+30	-0.175952	--	--
+40	-0.206012	--	--
+50	-0.190982	--	--
+60	-0.175952	--	--
+70	-0.181964	--	--
+80	-0.203006	--	--

5.4. RADIATED FUNDAMENTAL EMISSIONS [47 CFR 15.256(g)]

5.4.1. Limits

15.256(g)(3) The EIRP limits for LPR operations in the bands authorized by this rule section are provided in Table 1. The emission limits in Table 1 are based on boresight measurements (*i.e.*, measurements performed within the main beam of an LPR antenna).

15.256(g)(3) - Table 1 LPR EIRP Emission Limits

Frequency band of operation (GHz)	Average emission limit (EIRP in dBm measured in 1 MHz)	Peak emission limit (EIRP in dBm measure in 50 MHz)
5.925 - 7.250	-33	7
24.05 - 29.00	-14	26
75 - 85	-3	34

5.4.2. Method of Measurements

FCC KDB Publication No. 890966 D01 Meas Level Probing Radars v01

5.4.3. Test Data

5.4.3.1. Radiated Fundamental Emissions, Average EIRP in 1 MHz

Frequency (GHz)	Antenna Plane (H/V)	Average Emissions Measured in 1 MHz (dBµV/m)	¹ EIRP Average Emissions Measured in 1 MHz (dBm)	Limit (dBm)	Margin (dB)
25.1	V	55.64	-39.62	-14	-25.62
25.1	H	57.50	-37.76	-14	-23.76

¹EIRP is calculated by applying the radiated emission measurements equation, $EIRP (dBm) = E (dBµV/m) - 104.8 + 20 \log D$, where $D = 3$

5.4.3.2. Radiated Fundamental Emissions, Peak EIRP in 50 MHz

Frequency (GHz)	Antenna Plane (H/V)	Peak Emissions Measured in 10 MHz (dBµV/m)	¹ Peak Emissions Calculated in 50 MHz (dBµV/m)	² Peak EIRP Emissions Calculated in 50 MHz (dBm)	Limit (dBm)	Margin (dB)
25.1	V	86.27	100.25	4.99	26	-21.01
25.1	H	89.88	103.86	8.60	26	-17.40

¹Convert measurement in 10 MHz to 50 MHz by adding the correction factor $20 \cdot \log(50/10) = 13.98$ dB

²EIRP is calculated by applying the radiated emission measurements equation, $EIRP (dBm) = E (dBµV/m) - 104.8 + 20 \log D$, where $D = 3$

5.5. RADIATED UNWANTED EMISSIONS [47 CFR 15.256(h)]

5.5.1. Limits

Unwanted emissions from LPR devices shall not exceed the general emission limit in §15.209.

§15.209(a) Radiated emission limits; general requirements

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

5.5.2. Method of Measurements

ANSI C63.10-2009.

5.5.3. Test Data

5.5.3.1. Field Strength of Emissions Outside the Permitted Band at or Above 30 MHz at 3 m

Frequency (MHz)	Measured Field Strength @ 3 m (dBµV/m)	Detector Used (Peak/QP/Avg)	Antenna Plane (H/V)	§ 15.209 Field Strength Limits (dBµV/m)	Margin (dB)
30 - 100000	*	Peak	V/H	*	*

* No unwanted emission detected that are in excess of 20 dB below the specified limit, also verified at test distance 30 cm.

EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz	08 Nov 2014
RF Amplifier	Spacek Labs	SLKka-30-6	6D26	18 – 40 GHz	Note 1
DC Power Supply	Tenma	72-7295	490300297	1 – 40 Vdc	Note 1
Environmental Chamber	Envirotronics	SSH32C	11994847-S-11059	-60 to 177 °C	01 May 2015
Antenna	ETS Lindgren	3160-09	118385	18 – 26.5 GHz	30 July 2014
Horn Antenna	ETS Lindgren	3160-10	00102686	26.5 - 40 GHz	30 July 2014
Horn Antenna	OML	M19HWD	U30625-1	40 – 60 GHz	Note 2
Horn Antenna	OML	M12HWD	E30625-1	60 – 90 GHz	Note 2
Horn Antenna	OML	M08HWD	F30625-1	90 – 110 GHz	Note 2

Note 1: Internal Verification/Calibration check
Note 2: Dimensions Verified on use

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

	Line Conducted Emission Measurement Uncertainty (9 kHz – 30 MHz):	Measured	Limit
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.44	± 1.8
U	Expanded uncertainty U: $U = 2u_c(y)$	± 2.89	± 3.6

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.79	± 5.2

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.78	± 5.2

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.87	Under consideration
U	Expanded uncertainty U: $U = 2u_c(y)$	± 3.75	Under consideration