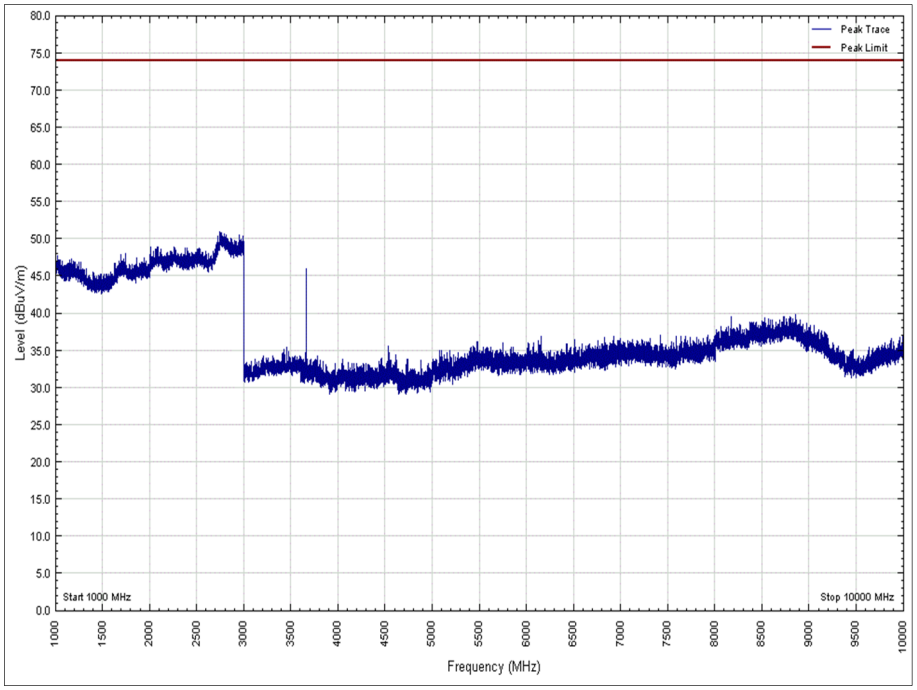

Figure 18 - 914.5 - 1 GHz to 10 GHz - Z Orientation – Vertical - Peak

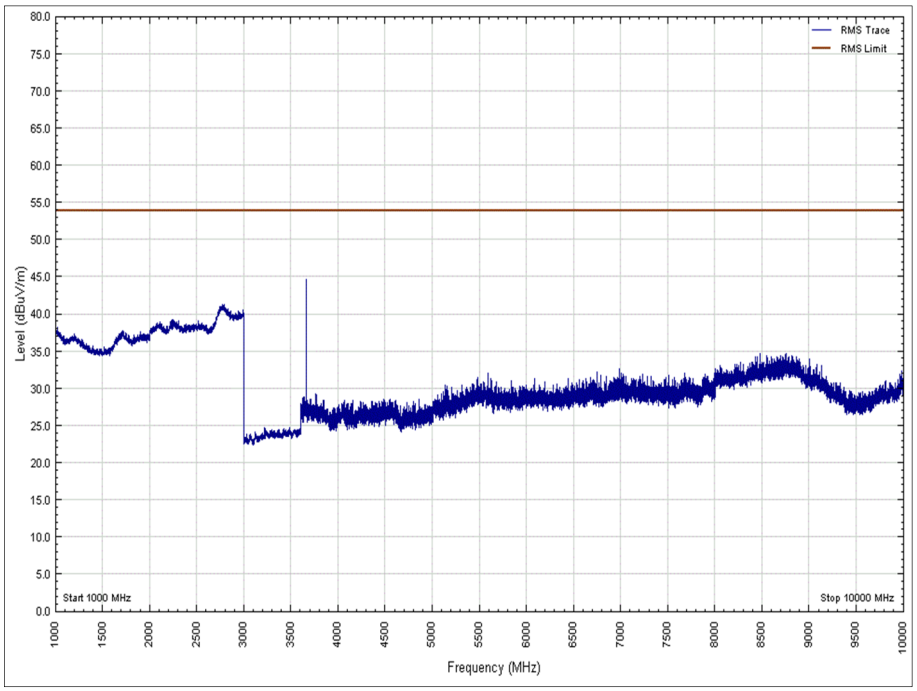

Figure 19 - 914.5 - 1 GHz to 10 GHz - Z Orientation – Vertical – Average

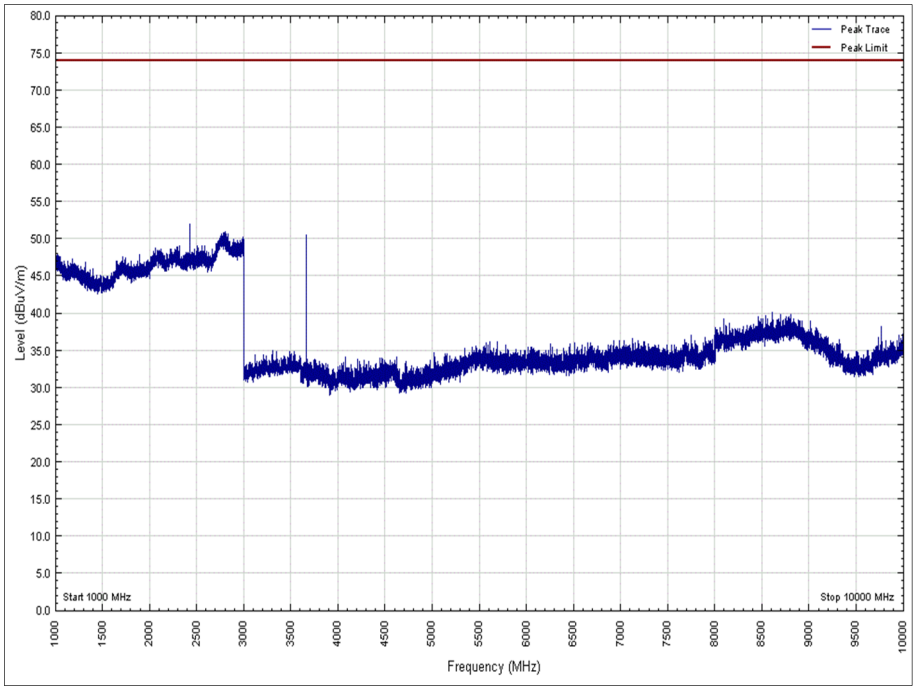

Figure 20 - 914.5 - 1 GHz to 10 GHz - Z Orientation – Horizontal - Peak

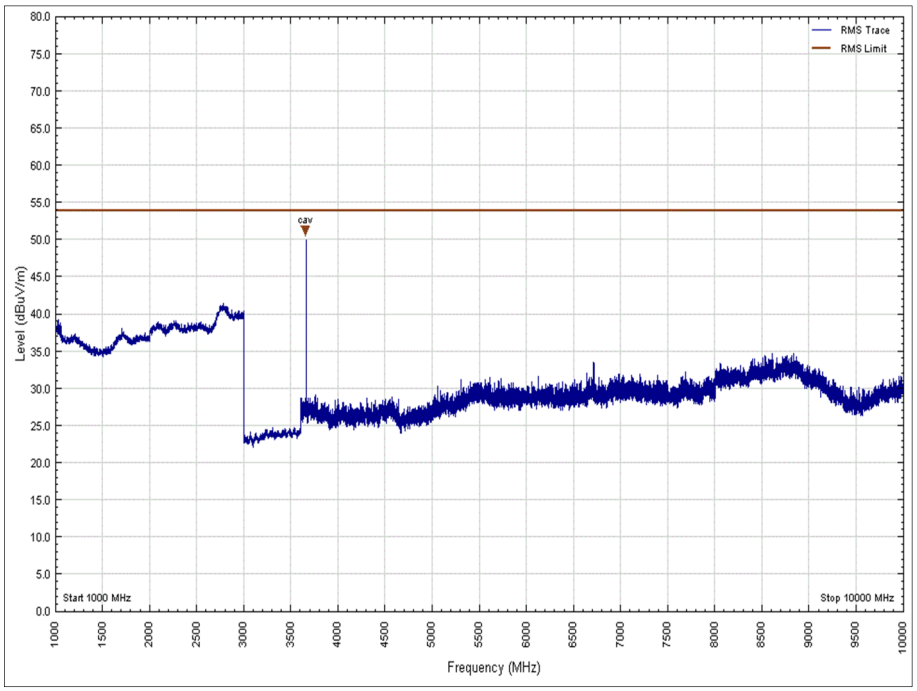

Figure 21 - 914.5 - 1 GHz to 10 GHz - Z Orientation – Horizontal - Average

FCC 47 CFR Part 15, Limit Clause 15.249 (d)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength (µV/m at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 18

2.3.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Antenna with permanent attenuator (Bilog)	Schaffner	CBL6143	287	24	15-May-2020
Pre-Amplifier	Phase One	PS04-0086	1533	12	08-Feb-2020
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygromer	Rotronic	A1	2677	12	20-Feb-2020
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	17-Dec-2019
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	25-Oct-2019
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	11-Dec-2019
Mast Controller	Maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	11-Mar-2020
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5093	12	04-Oct-2019
EmX Emissions Software	TUV SUD	EmX	5125	-	Software
1.5m 40GHz RF Cable	Scott Cables	KPS-1501-2000-KPS	5127	6	11-Dec-2019

Table 19

TU - Traceability Unscheduled

2.4 Frequency Tolerance Under Temperature Variations

2.4.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.249 (b)(2)

2.4.2 Equipment Under Test and Modification State

Patroller 4, S/N: Unit 2.4 - Modification State 0

2.4.3 Date of Test

09-October-2019

2.4.4 Test Method

The frequency tolerance test was performed using an unmodulated carrier output from the EUT and measured on a spectrum analyser. The spectrum analyser was set to the transmit frequency, span 1 kHz, RBW 9.1 Hz, VBW 9.1 Hz. The signal was monitored for >1 minute and a frequency marker was placed on the worst case frequency deviation and recorded. The test was performed inside a temperature chamber and was monitored using a calibrated thermometer. The temperature was adjusted between -20 °C and +50 °C in 10° steps as per 15.249 (b)(2).

2.4.5 Environmental Conditions

Ambient Temperature	21.9 - 22.0 °C
Relative Humidity	44.0 - 44.1 %

2.4.6 Test Results

914.5 MHz SRD

Temperature	Voltage	Frequency Deviation (%)
		914.5 MHz
-20.0 °C	3.7 V DC	-0.000018
-10.0 °C	3.7 V DC	+0.000002
0 °C	3.7 V DC	+0.000015
+10.0 °C	3.7 V DC	+0.000022
+20.0 °C	3.2 V DC	+0.000009
+20.0 °C	3.7 V DC	+0.000009
+20.0 °C	4.2 V DC	+0.000009
+30.0 °C	3.7 V DC	-0.000006
+40.0 °C	3.7 V DC	-0.000006
+50.0 °C	3.7 V DC	+0.000001

Table 20

FCC 47 CFR Part 15, Limit Clause 15.249 (b)(2)

± 0.001%

2.4.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	16-Apr-2020
Digital Temperature Indicator	Fluke	51	1385	12	17-Jan-2020
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	17-Jul-2020
True RMS Multimeter	Fluke	179	4006	12	22-Jan-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	16-Apr-2020
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	21-Oct-2020
Quad Power Supply	Rohde & Schwarz	HMP4040	4955	-	O/P Mon
Network Analyser	Keysight Technologies	E5063A	5018	12	20-May-2020

Table 21

O/P Mon – Output Monitored using calibrated equipment

2.5 20 dB Bandwidth

2.5.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.215 (c)

2.5.2 Equipment Under Test and Modification State

Patroller 4, S/N: Unit 2.4 - Modification State 0

2.5.3 Date of Test

05-November-2019

2.5.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.9.1.

The modulation bandwidth tests were performed using a modulated carrier output from the EUT and measured on a spectrum analyser. The spectrum analyser was set to the transmit frequency, span 200 kHz, RBW 1 kHz (to establish greater accuracy and demonstrate compliance with the standard of the EUT's modulation bandwidth) and VBW 3 kHz. The signal was stabilised for >1 minute and the 20 dB modulation bandwidth was measured using the delta marker function of the spectrum analyser. The trace was recorded. The 99 % Occupied Bandwidth was measured using the measurement function of the spectrum analyser.and the trace recorded.

2.5.5 Environmental Conditions

Ambient Temperature	23.2 °C
Relative Humidity	34.6 %

2.5.6 Test Results

<u>914.5 MHz SRD</u>

Frequency (MHz)	20 dB Bandwidth (Hz)	99% Occupied Bandwidth (Hz)	F_{LOWER} (MHz)	F_{UPPER} (MHz)
914.50	121153.846	124198.718	914.438782	914.559936

Table 22

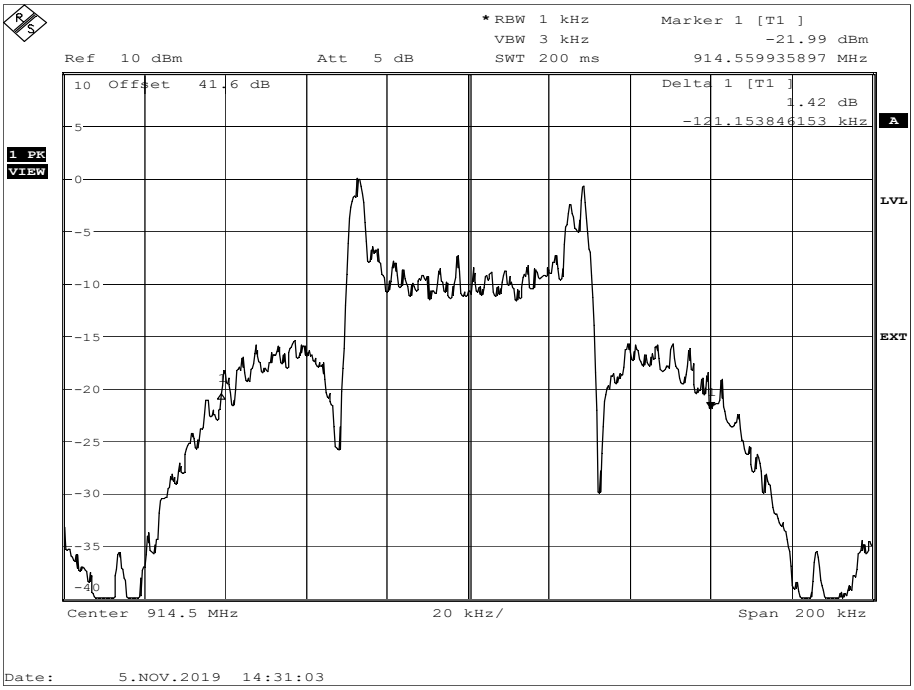

Figure 22 - 20 dB Bandwidth

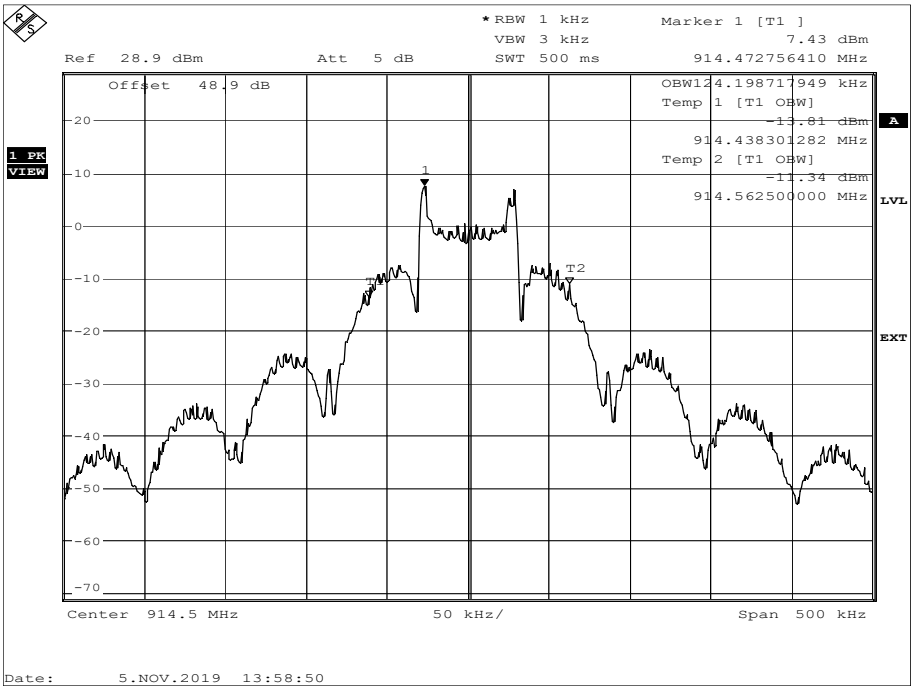

Figure 23 - 99% Occupied Bandwidth

FCC 47 CFR Part 15, Limit Clause 15.215 (c)

The 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

2.5.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
RF Coupler	TUV SUD	TÜV	415	-	TU
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	16-Apr-2020
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	18-Mar-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	16-Apr-2020
Network Analyser	Keysight Technologies	E5063A	5018	12	20-May-2020

Table 23

TU – Traceability Unscheduled

3 Photographs

3.1 Test Setup Photographs

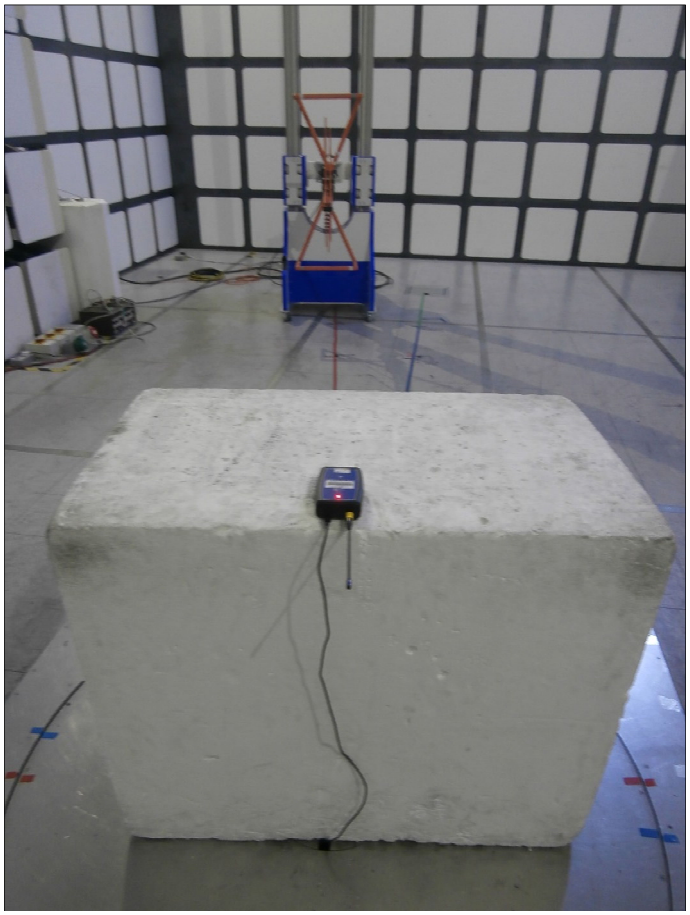

Figure 24 - 30 MHz to 1 GHz

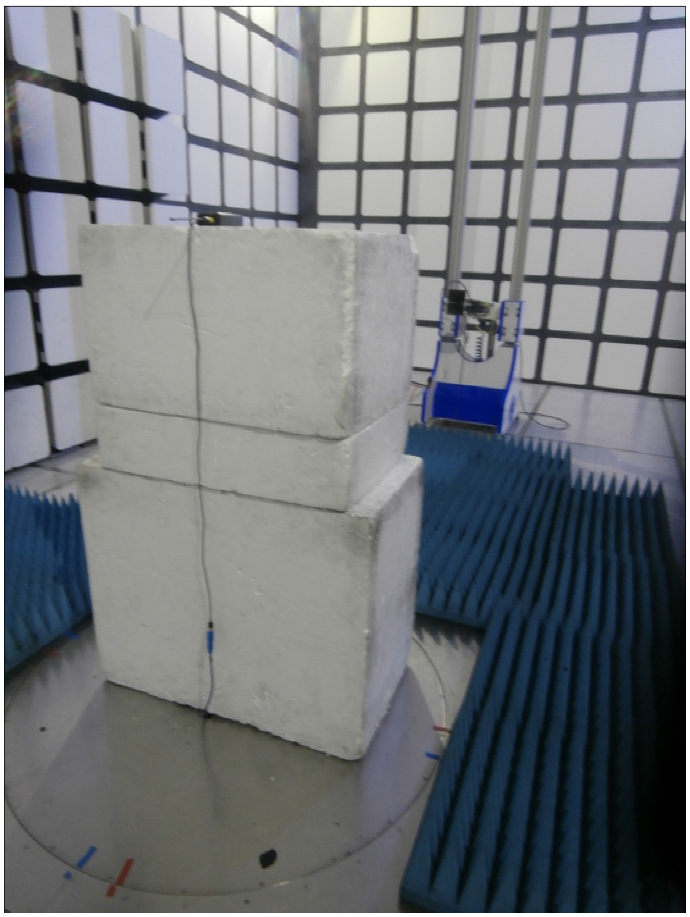

Figure 25 - 1 GHz to 10 GHz

4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Authorised Band Edges	Conducted: ± 3.08 dB Radiated: 30 MHz to 1 GHz: ± 5.1 dB Radiated: 1 GHz to 40 GHz: ± 6.3 dB
Field Strength of Fundamental	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Field Strength of Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Frequency Tolerance Under Temperature Variations	± 3.54 Hz
20 dB Bandwidth	± 1270.5 Hz

Table 24

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the result of the compliance measurement and does not take into account measurement instrumentation uncertainty. Measurement system uncertainty is calculated, as indicated above, in accordance with the appropriate guidelines detailed within the specification of test.