THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

TEKTRONIX INC.

Beaverton, OR

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets any additional program requirements in the field of calibration. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 18 June 2005*).

Presented this 9th day of September 2008.

President
For the Accreditation Council
Certificate Number 2357.01
Valid to August 31, 2010

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO 17025:2005

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CALIBRATION

Valid To: August 31, 2010 Certificate Number: 2357.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1]:

I. Electrical – High Frequency

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
DC Voltage – Generate	0.0 V (0 to 320) mV 320 mV to 3.2 V (3.2 to 32) V (32 to 320) V (320 to 1050) V	4.2 µV 0.12 % 0.037 % 0.037 % 0.077 % 0.34 %	Wavetek 9100
DC Voltage – Measure	0.001 V 0.019 V 0.0023 V 0.005 V 0.006 V 0.019 V 0.023 V 0.05 V 0.06 V	9.4 µV 9.5 µV 9.7 µV 8.8 µV 7.3 µV 7.6 µV 7.7 µV 7.0 µV 6.8 µV	Agilent / HP 3458A

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Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
DC Voltage – Measure (cont)	0.19 V	9.0 µV	Agilent / HP 3458A
	0.23 V	10 µV	
	0.5 V	18 µV	
	0.6 V	22 µV	
	1.9 V	74 µV	
	2.3 V	73 µV	
	5 V	170 µV	
	6 V	570 µV	
	19 V	720 µV	
	23 V	970 µV	
	50 V	1.9 mV	
	60 V	2.3 mV	
	190 V	6.5 mV	
AC Voltage – Generate, Sinewave, (V_{rms})			
500 Hz	320 mV to 3.2 V (3.2 to 32) V (32 to 320) V (320 to 800) V	0.13 % 0.11 % 0.076 % 0.084 %	Wavetek 9100
AC Voltage – Measure			
Square wave at 1 kHz	0.006 V	12 µV	Agilent / HP 3458A
	0.06 V	20 µV	
	0.6 V	160 µV	
	6 V	1.7 mV	
	60 V	24 mV	

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
AC Voltage – Measure (cont)			
Sine wave			Agilent / HP 3458A
at 1 kHz	100 mV	890 µV	
	300 mV	2.7 mV	
	1 V	9.4 mV	
	1.9 V	11 mV	
	4.8 V	27 mV	
at 45 kHz	1.9 V	11 mV	
	4.8 V	26 mV	
at 50 kHz	30 mV	110 µV	
	100 mV	200 µV	
	300 mV	1.1 mV	
	1 V	3.8 mV	
	3 V	11 mV	
at 100 kHz	30 mV	120 µV	
	100 mV	410 µV	
	300 mV	1.5 mV	
	1 V	5 mV	
	3 V	13 mV	
Resistance – Generate	(40 to 400) Ω 400 Ω to 4 kΩ (4 to 40) kΩ (40 to 400) kΩ 400 kΩ to 4 MΩ (4 to 40) MΩ	0.056 % 0.055 % 0.056 % 0.097 % 0.061 % 0.32 %	Wavetek 9100

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Resistance – Generate	50 Ω 1 MΩ	0.018 Ω 420 Ω	ESI DB877
RF Flatness – Measure	100 mV, 10 MHz to 550 MHz 100 mV, 550 MHz to 1.5 GHz 100 mV, 1.5 GHz to 3 GHz 300 mV, 10 MHz to 1.5 GHz 300 mV, 1.5 GHz to 3 GHz 1 V, 10 MHz to 550 MHz 1 V, 550 MHz to 1.5 GHz 1 V, 1.5 GHz to 3 GHz 3 V, 10 MHz to 2 GHz 3 V, 2.5 GHz	1.4 % of Reading 2.1 % of Reading 2.7 % of Reading 1.4 % of Reading 2.6 % of Reading 1.4 % of Reading 2.0 % of Reading 2.6 % of Reading 1.7 % of Reading 2.0 % of Reading	Rhode &Schwarz NRVS and NRV-Z5
Capacitance – Generate	(20 to 25) pF (80 to 90) pF	0.28 pF 0.57 pF	Fixed capacitor

Parameter/Equipment	Range	CMC[2, 3, 5] (±)	Comments
Oscilloscopes –			
DC Voltage – Generate[4]			
50 Ω, 1 MΩ Load	0 V (0 to 100) mV 100 mV to 1.0 V (1.0 to 5.6) V	15 µV 0.05 % + 26 µV 0.022 % + 65 µV 0.026 % + 50 µV	Wavetek 9500, Fluke 9500/B
1 MΩ Load	(5.6 to 222.4) V	0.03 %	
Sinewave Flatness – Generate, 50 Ω load, 50 kHz to 10 MHz reference, $V_{(p-p)}$			
1 Hz to 100 MHz[4] (100 to 550) MHz[4] 550 MHz to 1.1 GHz[4] (1.1 to 2.5) GHz[4] (2.5 to 3.2) GHz[4] (3.2 to 6.0) GHz	4.4 mV to 5.6 V 4.4 mV to 5.6 V 4.4 mV to 3.4 V 4.4 mV to 3.4 V 4.4 mV to 2.2 V 4.4 mV to 2.2 V	0.22 dB 0.29 dB 0.37 dB 0.48 dB 0.48 dB 0.71 dB	Wavetek 9500, Fluke 9500/B, Wavetek/Fluke 9530; (1 Hz to 3.2 GHz); synthesized signal generator with amplitude correction table, (10 MHz to 6 GHz)
AC Voltage – Generate, 50 Ω, Sinewave, $V_{(p-p)}$			
1 Hz to 550 MHz[4] 550 MHz to 2.5 GHz[4] (2.5 to 3.2) GHz[4] (3.2 to 6.0) GHz	4.4 mV to 5.6 V 4.4 mV to 3.4 V 4.4 mV to 2.2 V 4.4 mV to 2.2 V	0.033 V/V 0.063 V/V 0.11 V/V 0.11 V/V	
Resistance – Measure[4]	50 Ω 1 MΩ	0.13 % 0.12 %	Wavetek 9500, Fluke 9500/B, Wavetek/Fluke 9530
DC Voltage – Measure[4]	(0 to ± 5) V	0.014 % of output + 90 µV	Keithley 2000
Risetime –			
Measure Generate	≥ 7 ps ≥ 7 ps	2.2 ps 2.3 ps	Tektronix 80E06 Picosecond Pulse Labs 4005
Timebase Jitter	18 ns to 100 µs	0.14 ps	Efratom PTB100

II. Time and Frequency

Parameter/Equipment	Range	CMC[2, 3] (±)	Comments
Frequency and Period	12 kHz to 3.2 GHz	1.3 parts in 10^9	Efratom PTB100
	12 kHz to 3.2 GHz	0.27 parts in 10^6	See Footnote 4, Fluke 9500/opt 100 or Fluke 9500B
	(3.2 to 6.0) GHz	1.4 parts in 10^6	R&S SMT06

[1] This laboratory offers commercial calibration service and field calibration service.

[2] Calibration and Measurement Capability (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. Calibration and Measurement Capabilities represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

[3] Field calibration service is available for this calibration and this laboratory meets A2LA *R104 – General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

[4] Field calibrations are performed for these parameters and ranges. The best uncertainty stated for calibrations performed in the laboratory is applicable for calibrations performed in the field.

[5] In the statement of best uncertainty, the given percentages are percent of reading.