THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

GULF CALIBRATION SERVICES INC. (GCS)

Lake Mary, FL

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 the requirements of ANSI/NCSL Z540-1-1994 and 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 8th day of February 2008.

President
For the Accreditation Council
Certificate Number 1473.01
Valid to February 28, 2010

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

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid To: February 28, 2010 Certificate Number: 1473.01

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 – DC/Low Frequency

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
DC Resistance – Measure and Generate	1 μΩ to 100 mΩ	2.1 μΩ/Ω + 100 pΩ	Guildline 9975 and standard resistors
	100 mΩ to 1 Ω	0.37 part in 10^6	
	(1 to 10) Ω	0.25 part in 10^6	
	(10 to 100) Ω	0.66 part in 10^6	Guildline 6675 and standard resistors
	100 Ω to 1 kΩ	0.76 part in 10^6	
	(1 to 10) kΩ	0.3 parts in 10^6	
	(10 to 100) kΩ	0.36 part in 10^6	
	100 kΩ to 1 MΩ	2.0 parts in 10^6	
	(1 to 10) MΩ	5.6 parts in 10^6	
	(10 to 100) MΩ	7.6 parts in 10^6	
	100 MΩ to 1 GΩ	13 parts in 10^6	
	(1 to 10) GΩ	0.06 % reading (rdg)	
	(10 to 100) GΩ	0.08 % rdg	Guildline 6520A
	100 GΩ to 1 TΩ	0.1 % rdg	
	(1 to 10) TΩ	0.2 % rdg	
	(10 to 100) TΩ	0.3 % rdg	
	100 TΩ to 1 PΩ	1 % rdg	
	(1 to 10) PΩ	5 % rdg	
DC Voltage – Measure and Generate	(0 to 1) μV	0.012 % rdg + 1 nV	Guildline 9930 potentiometer, Zener voltage reference and Fluke 752A voltage divider
	1 μV to 2 V	0.71 part in 10^6	
	(2 to 100) V	0.74 part in 10^6	
	(100 to 1000) V	0.87 part in 10^6	
Fixed Points	1.018 V	0.72 part in 10^6	Guildline 4410
	10 V	0.71 part in 10^6	

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
DC Current – Measure and Generate	100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 10 mA 10 mA to 100 A	4.9 parts in 10^6 7.2 parts in 10^6 4.7 parts in 10^6 4.5 parts in 10^6 4.8 parts in 10^6	HP 3458A opt 002 and standard resistors/current shunts
Capacitance – 4 terminal at 1 kHz	(1 to 1000) pF	5.5 parts in 10^6	Andeen-Hagerling 2500A
Phase	0° to 360°	0.02°	Agilent 53132A

Parameter/Range	Frequency	Best Uncertainty[2, 3] (±)	Comments
AC Voltage Transfer System – Measure and Generate			
2 mV	10 Hz	0.038 % rdg	Fluke 792 AC/DC transfer standard and HP 3458A opt 002
	20 Hz	0.088 % rdg	
	40 Hz	0.083 % rdg	
	100 Hz	0.086 % rdg	
	1 kHz	0.034 % rdg	
	10 kHz	0.085 % rdg	
	20 kHz	0.084 % rdg	
	50 kHz	0.037 % rdg	
	100 kHz	0.11 % rdg	
	300 kHz	0.13 % rdg	
	500 kHz	0.21 % rdg	
	800 kHz	0.25 % rdg	
	1 MHz	0.25 % rdg	
6 mV	10 Hz	0.033 % rdg	
	20 Hz	0.03 % rdg	
	40 Hz	0.027 % rdg	
	100 Hz	0.018 % rdg	
	1 kHz	0.027 % rdg	
	10 kHz	0.026 % rdg	
	20 kHz	0.025 % rdg	
	50 kHz	0.034 % rdg	
	100 kHz	0.054 % rdg	
	300 kHz	0.076 % rdg	
	500 kHz	0.091 % rdg	
	800 kHz	0.058 % rdg	
	1 MHz	0.061 % rdg	

Parameter/Range	Frequency	Best Uncertainty[2, 3] (±)	Comments
AC Voltage Transfer System – Measure and Generate (cont)			
10 mV	10 Hz	0.011 % rdg	Fluke 792 AC/DC transfer standard and HP 3458A opt 002
	20 Hz	0.017 % rdg	
	40 Hz	88 parts in 10^6	
	100 Hz	0.018 % rdg	
	1 kHz	0.019 % rdg	
	10 kHz	0.017 % rdg	
	20 kHz	0.017 % rdg	
	50 kHz	0.021 % rdg	
	100 kHz	0.03 % rdg	
	300 kHz	0.024 % rdg	
	500 kHz	0.064 % rdg	
	800 kHz	0.038 % rdg	
	1 MHz	0.041 % rdg	
20 mV	10 Hz	78 parts in 10^6	
	20 Hz	69 parts in 10^6	
	40 Hz	63 parts in 10^6	
	100 Hz	63 parts in 10^6	
	1 kHz	63 parts in 10^6	
	10 kHz	63 parts in 10^6	
	20 kHz	64 parts in 10^6	
	50 kHz	0.013 % rdg	
	100 kHz	0.021 % rdg	
	300 kHz	0.031 % rdg	
	500 kHz	0.046 % rdg	
	800 kHz	0.034 % rdg	
	1 MHz	0.038 % rdg	
60 mV	10 Hz	0.011 % rdg	
	20 Hz	66 parts in 10^6	
	40 Hz	54 parts in 10^6	
	100 Hz	47 parts in 10^6	
	1 kHz	36 parts in 10^6	
	10 kHz	46 parts in 10^6	
	20 kHz	51 parts in 10^6	
	50 kHz	71 parts in 10^6	
	100 kHz	0.014 % rdg	
	300 kHz	0.027 % rdg	
	500 kHz	0.035 % rdg	
	800 kHz	0.041 % rdg	
	1 MHz	0.041 % rdg	

Parameter/Range	Frequency	Best Uncertainty[2, 3] (±)	Comments
AC Voltage Transfer System – Measure and Generate (cont)			
100 mV	10 Hz	33 parts in 10^6	Fluke 792 AC/DC transfer standard and HP 3458A opt 002
	20 Hz	35 parts in 10^6	
	40 Hz	21 parts in 10^6	
	100 Hz	31 parts in 10^6	
	1 kHz	29 parts in 10^6	
	10 kHz	30 parts in 10^6	
	20 kHz	30 parts in 10^6	
	50 kHz	41 parts in 10^6	
	100 kHz	75 parts in 10^6	
	300 kHz	0.016 % rdg	
	500 kHz	0.02 % rdg	
	800 kHz	0.027 % rdg	
	1 MHz	0.019 % rdg	
200 mV	10 Hz	38 parts in 10^6	
	20 Hz	22 parts in 10^6	
	40 Hz	27 parts in 10^6	
	100 Hz	18 parts in 10^6	
	1 kHz	18 parts in 10^6	
	10 kHz	18 parts in 10^6	
	20 kHz	17 parts in 10^6	
	50 kHz	40 parts in 10^6	
	100 kHz	80 parts in 10^6	
	300 kHz	0.013 % rdg	
	500 kHz	0.011 % rdg	
	800 kHz	0.025 % rdg	
	1 MHz	0.019 % rdg	
600 mV	10 Hz	25 parts in 10^6	
	20 Hz	35 parts in 10^6	
	40 Hz	17 parts in 10^6	
	100 Hz	12 parts in 10^6	
	1 kHz	28 parts in 10^6	
	10 kHz	11 parts in 10^6	
	20 kHz	11 parts in 10^6	
	50 kHz	21 parts in 10^6	
	100 kHz	11 parts in 10^6	
	300 kHz	95 parts in 10^6	
	500 kHz	75 parts in 10^6	
	800 kHz	80 parts in 10^6	
	1 MHz	80 parts in 10^6	

Parameter/Range	Frequency	Best Uncertainty[2, 3] (±)	Comments
AC Voltage Transfer System – Measure and Generate (cont)			
1 V	10 Hz	85 parts in 10^6	Fluke 792 AC/DC transfer standard and HP 3458A opt 002
	20 Hz	37 parts in 10^6	
	40 Hz	20 parts in 10^6	
	100 Hz	11 parts in 10^6	
	1 kHz	12 parts in 10^6	
	10 kHz	12 parts in 10^6	
	20 kHz	9 parts in 10^6	
	50 kHz	18 parts in 10^6	
	100 kHz	13 parts in 10^6	
	300 kHz	70 parts in 10^6	
	500 kHz	90 parts in 10^6	
	800 kHz	95 parts in 10^6	
	1 MHz	75 parts in 10^6	
2 V	10 Hz	26 parts in 10^6	
	20 Hz	36 parts in 10^6	
	40 Hz	22 parts in 10^6	
	100 Hz	11 parts in 10^6	
	1 kHz	8 parts in 10^6	
	10 kHz	8 parts in 10^6	
	20 kHz	7 parts in 10^6	
	50 kHz	15 parts in 10^6	
	100 kHz	12 parts in 10^6	
	300 kHz	90 parts in 10^6	
	500 kHz	90 parts in 10^6	
	800 kHz	75 parts in 10^6	
	1 MHz	75 parts in 10^6	
6 V	10 Hz	27 parts in 10^6	
	20 Hz	37 parts in 10^6	
	40 Hz	18 parts in 10^6	
	100 Hz	10 parts in 10^6	
	1 kHz	7 parts in 10^6	
	10 kHz	9 parts in 10^6	
	20 kHz	7 parts in 10^6	
	50 kHz	20 parts in 10^6	
	100 kHz	11 parts in 10^6	
	300 kHz	90 parts in 10^6	
	500 kHz	90 parts in 10^6	
	800 kHz	75 parts in 10^6	
	1 MHz	75 parts in 10^6	

Parameter/Range	Frequency	Best Uncertainty[2, 3] (±)	Comments
AC Voltage Transfer System – Measure and Generate (cont)			
10 V	10 Hz	21 parts in 10^6	Fluke 792 AC/DC transfer standard and HP 3458A opt 002
	20 Hz	32 parts in 10^6	
	40 Hz	19 parts in 10^6	
	100 Hz	12 parts in 10^6	
	1 kHz	11 parts in 10^6	
	10 kHz	11 parts in 10^6	
	20 kHz	12 parts in 10^6	
	50 kHz	12 parts in 10^6	
	100 kHz	13 parts in 10^6	
	300 kHz	70 parts in 10^6	
	500 kHz	95 parts in 10^6	
	800 kHz	95 parts in 10^6	
	1 MHz	0.01 % rdg	
20 V	10 Hz	26 parts in 10^6	
	20 Hz	38 parts in 10^6	
	40 Hz	20 parts in 10^6	
	100 Hz	12 parts in 10^6	
	1 kHz	11 parts in 10^6	
	10 kHz	11 parts in 10^6	
	20 kHz	11 parts in 10^6	
	50 kHz	14 parts in 10^6	
	100 kHz	17 parts in 10^6	
	300 kHz	85 parts in 10^6	
	500 kHz	90 parts in 10^6	
	800 kHz	75 parts in 10^6	
	1 MHz	75 parts in 10^6	
60 V	10 Hz	27 parts in 10^6	
	20 Hz	40 parts in 10^6	
	40 Hz	19 parts in 10^6	
	100 Hz	11 parts in 10^6	
	1 kHz	11 parts in 10^6	
	10 kHz	13 parts in 10^6	
	20 kHz	11 parts in 10^6	
	50 kHz	30 parts in 10^6	
	100 kHz	17 parts in 10^6	
	300 kHz	70 parts in 10^6	

Parameter/Range	Frequency	Best Uncertainty[2, 3] (±)	Comments
AC Voltage Transfer System – Measure and Generate (cont)			
100 V	10 Hz	85 parts in 10^6	Fluke 792 AC/DC transfer standard and HP 3458A opt 002
	20 Hz	36 parts in 10^6	
	40 Hz	20 parts in 10^6	
	100 Hz	16 parts in 10^6	
	1 kHz	18 parts in 10^6	
	10 kHz	15 parts in 10^6	
	20 kHz	13 parts in 10^6	
	50 kHz	30 parts in 10^6	
	100 kHz	17 parts in 10^6	
200 V	10 Hz	47 parts in 10^6	
	20 Hz	36 parts in 10^6	
	40 Hz	20 parts in 10^6	
	100 Hz	16 parts in 10^6	
	1 kHz	18 parts in 10^6	
	10 kHz	15 parts in 10^6	
	20 kHz	13 parts in 10^6	
	50 kHz	30 parts in 10^6	
	100 kHz	17 parts in 10^6	
600 V	40 Hz	27 parts in 10^6	
	100 Hz	22 parts in 10^6	
	1 kHz	17 parts in 10^6	
	10 kHz	17 parts in 10^6	
	20 kHz	18 parts in 10^6	
	50 kHz	35 parts in 10^6	
	100 kHz	51 parts in 10^6	
1000 V	40 Hz	21 parts in 10^6	
	100 Hz	21 parts in 10^6	
	1 kHz	18 parts in 10^6	
	10 kHz	18 parts in 10^6	
	20 kHz	19 parts in 10^6	
AC Current – Measure and Generate			
10 µA to 10 mA	10 Hz to 100 kHz	0.05 % rdg	HP 3458A
10 mA to 1 A	10 Hz to 50 kHz	31 parts in 10^6	
(1 to 5) A	10 Hz to 50 kHz	50 parts in 10^6	
(5 to 30) A	10 Hz to 50 kHz	75 parts in 10^6	Holt HCS-1 current shunt set

II. Thermodynamics

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
Temperature Measuring Equipment	-80 °C 0 °C to 419 °C	0.0025 °C 0.0025 °C	Guildline temperature bridge and SPRTs

III. Time and Frequency

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
Frequency – Measure	0.01 Hz to 20 GHz	0.1 parts in 10^6	HP 5352B
Rise Time	10 Hz to 100 MHz	19 ps	HP 54121T

IV. Electrical – RF/Microwave

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
Calibration of Oscilloscope Calibrators –			
RF Power – Measure (-70 to +30) dBm	100 kHz to 2.6 GHz	1.1 % rdg	HP 8902A w/ 11722A

[1] This laboratory offers commercial calibration services.

[2] "Best Uncertainty" 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 of nearly ideal measuring equipment. Best uncertainties represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The best uncertainty of a specific calibration performed by the laboratory may be greater than the best uncertainty due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

[3] The best uncertainty is stated as a percentage or portion of the input voltage.