

# DEPARTMENT OF THE NAVY



## CERTIFICATE OF COMPETENCY

### NAVY PRIMARY STANDARDS LABORATORY

is recognized by the Joint Naval Audit Certification Team (JNACT) for satisfactory compliance to criteria set forth in the Naval and Marine Corps Calibration Laboratory Audit Certification Manual, NAVAIR 17-35QAC-01, NAVSEA 04-4734, and USMC TI-4733-35/23. These criteria encompass the relevant requirements of Naval Fleet and SYSCOM Commander directives. Certification is issued for specific measurement areas and ranges listed on the attached Scope of Competency.

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S/N 32110.043

R. P. Nassar  
NAVAIR METCAL Program Manager

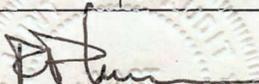
Expiration Date:  
18 July 2011

# SCOPE OF COMPETENCY

## NAVY PRIMARY STANDARDS LABORATORY

ELECTRICAL AREA	MEASUREMENT RANGE
Attenuation, Type N Connectors	0 to 60 dB from 10 MHz to 18 GHz
Attenuation, 7 mm Connectors	0 to 60 dB from 10 MHz to 26.5 GHz
Attenuation, 3.5 mm	0 to 60 dB from 10 MHz to 18 GHz
Attenuation, 2.4 mm	0 to 60 dB from 45 MHz to 50 GHz
Attenuation, Fixed Waveguide	0 to 20 dB from 2.6 to 40 GHz
Attenuation, Variable Waveguide	0 to 50 dB from 2.6 to 40 GHz
Capacitance	0.5 aF to 1.0 $\mu$ F at discrete steps between 50 Hz to 20 kHz
Current, AC (Measure)	1 A at 60 Hz, 300 Hz, 1 kHz, 3 kHz, and 5 kHz 10 A at 60 Hz, 300 Hz, 1 kHz, 3 kHz, and 5 kHz 20 A at 60 Hz, 300 Hz, 1 kHz, 3 kHz, and 5 kHz
Voltage, AC (Measure)	700 $\mu$ V to 1 kV, from 10 Hz to 20 MHz
Current, DC (Generate)	10 and 20 A
Voltage, DC (Measure)	1 Vdc, 1.018 Vdc, 10 Vdc
Current Shunt Phase	0° at 500 Hz and 1 kHz
Frequency (Standards)	1, 5, and 10 MHz
Impedance (VSWR) – Type N Connector	1.0 to 4.0 VSWR from 10 MHz to 18 GHz
Impedance (VSWR) – Type 14 mm Connector	1.0 to 4.0 VSWR from 10 MHz to 8.5 GHz
Impedance (VSWR) – Type 7 mm Connector	1.0 to 4.0 VSWR from 10 MHz to 18 GHz
Impedance (VSWR) – Type 3.5 mm Connector	1.0 to 4.0 VSWR from 45 MHz to 26.5 GHz
Impedance (VSWR) – Type 2.4 mm Connector	1.0 to 4.0 VSWR from 45 MHz to 50 GHz
Inductance	100 $\mu$ H to 10 H (in decade steps)
Magnetics	1 x 10 <sup>-3</sup> to 18 x 10 <sup>3</sup> gauss
Microwave – Noise, Coaxial	ENR from 10 MHz to 26.5 GHz
Microwave - Noise, Waveguide	ENR from 9 to 17 GHz
Power, RF – Type N Connector	0.2 to 10 mW from 10 MHz to 18 GHz
Power, RF – 14 mm Connector	0.2 to 10 mW from 10 MHz to 8.5 GHz

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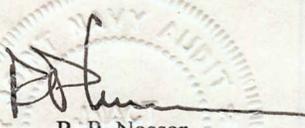
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## NAVY PRIMARY STANDARDS LABORATORY

ELECTRICAL AREA	MEASUREMENT RANGE
Power, RF – 7 mm Connector	0.2 to 10 mW from 10 MHz to 18 GHz
Power, RF – 3.5 mm Connector	0.2 to 10 mW from 10 MHz to 26.5 GHz
Power, RF – 2.4 mm Connector	0.2 to 10 mW from 45 MHz to 50 GHz
Power, RF – “R” Type Waveguide	1 $\mu$ W to 10 mW from 2.6 to 40 GHz
Power, RF – “Q” Type Waveguide	1 $\mu$ W to 10 mW from 33 to 50 GHz
Power, RF – “K” Type Waveguide	1 $\mu$ W to 10 mW from 18 to 26.5 GHz
Power, RF – “J” Type Waveguide	1 $\mu$ W to 10 mW from 7 to 10 GHz
Power, RF – “S” Type Waveguide	1 $\mu$ W to 10 mW from 2.6 to 3.95 GHz
Resistance	1 mohm to 1.9 kohm 10 kohm to 1 Mohm 1 x 10 <sup>8</sup> ohm - 1 x 10 <sup>11</sup> ohm
Power, RF Density – TEM Cell	1, 5, 10 mW/cm <sup>2</sup> from 0.2 to 300 MHz
Power, RF Density – Anechoic Chamber	0 to 10, mW/cm <sup>2</sup> at 2.45, 3, 8.2, 9, 10, 11, 18, 26.5 GHz
Thermal Voltage Converters	400 mV to 10 V at 20 kHz, 100 kHz, 1, 10, 20, 30, 50, 70, and 100 MHz
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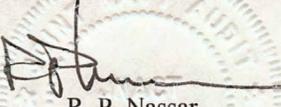


# SCOPE OF COMPETENCY

## NAVY PRIMARY STANDARDS LABORATORY

PHYS / DIM AREA	MEASUREMENT RANGE
Acceleration	2 Hz to 20 kHz, to 50 g 10 Hz to 10 kHz, to 75 g 1 to 160 Hz, to 1 g 10 to 20 kHz, to 10 g 10 Hz to 20 kHz, to 10 g
Air Velocity	50 to 5,000 fpm
Angle Blocks	1 sec to 45°
Autocollimation	± 1,000 arcseconds
Flatness	To 10 in
Flow, Laminar	0.0018 to 1.1 Std ft <sup>3</sup> /min, 0.05 to 31 Std lpm
Flow, Liquid	0.001 to 250 gpm, 1.1 to 35 cSt
Force	0 to 300,000 lbf
Gage Blocks	0.01 to 20 in 0.5 to 500 nm
Gas Flow	1 to 500 cm <sup>3</sup> /min 0.001 to 1700 std lpm 0.0018 to 60 ft <sup>3</sup> /min
Gear Wires	2 to 80 pitch
Helium Leak	1 x 10 <sup>-8</sup> to 3 x 10 <sup>-6</sup> cc/sec
Humidity – Frost Point/Dew Point Relative Humidity	-70° C to +20° C, 10 to 95 % rH
Hydrometry	0.65 to 1.85 s.g.
Mass	1 to 50 kg 1/8 oz to 110 lbs
Master Balls and Cylinders	To 1 in
Optical Wedges, Cubes, and Prisms	All
Pressure	0 to 110 inHg 0.7 to 40,000 psi
Rotary Indexing Tables and Polygons	0 to 360° in 1° increments

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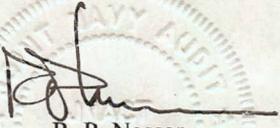
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PHYS / DIM AREA (continued)	MEASUREMENT RANGE
Sonic Nozzles	12 to 220 Std ft <sup>3</sup> /min 340 to 6230 Std lpm
Temperature – other than Liquid in Glass Thermometers	-196° to +660° C
Temperature – Liquid in Glass Thermometers	-30 to 40° C
Thread Wires	4 to 80 pitch, 0.2 to 10 mm
Vacuum	0.7 to 25.4 psi 0 to 112 Torr
Viscometry	1 to 30,000 cSt, 68° F to 210° F
Radiometry	1 aJ to 50 pJ at 1064 nm
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