



# YOUR SOURCE FOR LISN'S, PROBES, TRANSIENT GENERATORS, LOOPS, AND AUDIO AMPLIFIERS



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# OPHIR<sub>EMC</sub>



Welcome to **OPHIR<sub>EMC</sub>**

**OPHIR<sub>RF</sub>**, long known for manufacturing top quality, high power, solid state, broadband and band-specific RF amplifiers for over 20 years has expanded its product line with the creation of its newest division, **OPHIR<sub>EMC</sub>**.

**OPHIR<sub>EMC</sub>** specializes in products for making EMI/EMC measurements. **OPHIR<sub>EMC</sub>**'s extensive line of products include Line Impedance Stabilization Networks (LISN's), Current Probes, Injection Probes, Transient Generators, Transformers, Loops and Coupling/Decoupling Networks (CDN's).

The EMC line is continuously expanding. Contact us for the latest product updates and

informationThe **OPHIR<sub>EMC</sub>** product line offers the same outstanding quality, performance and service you have come to expect from **OPHIR<sub>RF</sub>**.

**OPHIR** is ISO: 9001:2008 Registered with TUV Rheinland.



5300 Beethoven Street, Los Angeles, California 90066, Phone: 310-306-5556, Fax: 310-577-9887

Email: [sales@ophirrf.com](mailto:sales@ophirrf.com)



## **EMC Product Overview**

### **Model OTG106 Transient Generator**

The **Model OTG106 Transient Generator** is designed to meet the requirements of CS106 susceptibility testing as specified in Mil-Std-461F. The generator provides a 5  $\mu$ S pulse with a 1.5  $\mu$ S rise time. Amplitude is adjustable from 10 volts to 400 volts peak. Adjustable repetition rate from 1 to 10 p.p.s. Generator is capable of being computer controlled.

### **Model OTG617 Transient Generator**

The **Model OTG617 Transient Generator** is designed to meet the requirements for Section 17 Voltage Spike tests of RTCA DO-160G. The generator provides a  $\geq 10$   $\mu$ S pulse with a  $\leq 2$   $\mu$ S rise time. Amplitude is adjustable from 10 volts to 600 volts peak with an output impedance of 50  $\Omega$ 's. The repetition rate is adjustable from 1 to 10 p.p.s. Generator is capable of being computer controlled.

### **Model OPG115 Pulse Generator**

The **Model OPG115 Pulse Generator** meets the requirements of CS115 susceptibility testing of Mil-Std-461E/F/G. The generator provides a 30 nS pulse, adjustable amplitude between 0-2000 volts, repetition rate 1-50 p.p.s. Generator is capable of being computer controlled.

### **Model OTG116 Sinusoidal Damping Transient Generator System**

The **Model OTG116 Transient Generator** is specifically designed to provide the damped sinusoidal pulses required by Mil-Std-461E/F/G CS116 susceptibility testing. The generator provides the six required frequencies as specified in CS116 through a single output. The **OTG116** is capable of single Pulse, auto pulsing of one frequency or all frequencies. Pulse rate is adjustable from 0.5 to 1 pulse per second. Generator is capable of being computer controlled. System includes injection clamp, monitoring probe, calibration fixture, 50 ohm high voltage load and cables.

### **Model OTG116A Sinusoidal Damping Transient Generator**

The **Model OTG116A Transient Generator** is especially designed for the performance of pulse susceptibility tests in accordance with Mil-Std-461E/F/G section CS116. The solid state generator provides the six required frequencies through six individual outputs. The **OTG116** is capable of a single pulse or auto pulsing of each of the frequencies at a rate of 1 p.p.s. Open loop voltage is displayed for each frequency being tested.

### **Model OAA101 Audio Power Amplifier**

The **Model OAA101 Audio Power Amplifier** is designed for conducted audio susceptibility testing as specified in EMC standards Mil-Std-461E/F/G, RTCA DO-160 and additional EMC specifications. DC to 300 kHz bandwidth, Up to 1000 watts power, Amplifier is capable of being computer controlled.

## Model OCT101 Coupling Transformer

The **Model OCT101 Coupling Transformer** is designed for making conducted audio susceptibility measurements as required by Mil-Std-461E/F/G and various automotive and aviation EMC specifications. Used with **Model OAA101 Audio Power Amplifier**. Frequency bandwidth: 10 Hz to 250 kHz, Power rating: 200 watts, Current rating: 50 amps AC or DC.

## Loops

The **Model OLS110 Loop Sensor** was designed to meet the requirements of radiated emissions and susceptibility testing as specified in Mil-Std-461E/F/G, RE101 and RS101, Def Stan 59-411 as well as additional EMC specifications. The **Model OLS110** is 13.3 cm in diameter, has 36 turns of #7-41 Litz Wire with a DCR of  $\approx 10\Omega$ 's. Loop has electrostatic shielding. Frequency range is 20 Hz to 100 kHz. The **Models ORL110 Radiating Loop and OLS112 Loop Sensor** were designed to meet the radiated susceptibility testing per Mil-Std-461E/F/G RS101, Def Stan 59-411, ECSS-T-ST-07C as well as additional EMI/EMC specifications. The **Model ORL110** has a 12 cm diameter, 20 turns of #12 insulated copper wire. The **Model OLS112** has 51 turns of #7-14 Litz wire, diameter of 4 cm. The **OLS112** is electrostatic shielded. The frequency range of **Model ORL110 and OLS112** is 30 Hz to 100 kHz.

## Line Impedance Stabilization Networks

Line Impedance Stabilization Networks (LISN's) are low pass filters used for conducted emissions measurements. LISN's stabilize line impedance for repeatable measurements and isolate equipment under test (EUT) from external power sources as well as providing a 50 ohm RF connection to measure EMI voltage generated by the EUT. Ophir EMC provides a wide selection of LISN's for pre-compliance and compliance testing in accordance with various EMC standards such as Mil-Std-461, RTCA DO-160, CISPR, IEC, ANSI and others.

## Current and Injection Probes

**OPHIR<sub>EMC</sub>** is developing an extensive line of Current and Injection Probes for various EMC standards such as Mil-Std-461, RTCA DO-160 and others. The Current Probes cover the frequency range of 20 Hz to 1 GHz. The Injection Probes frequency range coverage is 10 KHz to 1GHz. Probe Calibration Fixtures are also available.

## Coupling/Decoupling Networks

Coupling/Decoupling Networks (CDN's) are used for RF conducted immunity testing per IEC/EN 61000-4-6, CISPR 15, CISPR 22 and other standards. **OPHIR<sub>EMC</sub>** will be following up on its initial release of EMI/EMC products with the release of a full line of CDN's within the coming months.



<b>EMC Products Listing</b>	
<b>Model Number</b>	
<b>INSTRUMENTATION</b>	
<b>OTG106 Transient Generator</b>	<i>Mil Std 461F CS106</i>
<b>OTG116 Transient System (Automated)</b>	Includes generator, clamps, loads, cables <i>Mil Std 461F/G CS116</i>
<b>OTG116A Transient Generator</b>	<i>Mil Std 461F/G CS116</i>
<b>OPG115 Pulse Generator</b>	<i>Mil Std 461F/G CS115</i>
<b>OTG617 Transient Generator</b>	<i>RTCA DO-160G Section 17</i> <i>Boeing D6-16050-4 (7.5)</i>
<b>OAA101 Audio Power Amplifier</b>	<i>Mil Std 461F/G CS101, CS109, RE101</i> <i>RTCA DO-160G Section 18</i> <i>ECSS-E-ST-07C (A.2, A.10)</i> <i>Ford EMC-C-2009, FMC1278</i> <i>Def Stan 59-411</i>
<b>ANTENNA</b>	
<b>OLS110 Loop Sensor 13.3 cm</b>	<i>Mil Std 461F/G RE101, RS101</i> <i>Def Stan 59-411</i>
<b>ORL110 Radiating Loop 12 cm</b>	<i>Mil Std 461F/G RS101</i> <i>ECSS-E-ST-07C (A.13)</i> <i>Ford EMC-C-2009, FMC1278</i> <i>Def Stan 59-411</i>
<b>OLS112 Loop Sensor 4 cm</b>	<i>Mil Std 461F/G RS101</i> <i>ECSS-E-ST-07C (A.13)</i> <i>Def Stan 59-411</i>

**TRANSFORMER****OCT101 Coupling Transformer**

*Mil Std 461F/G CS101, CS109*  
*RTCA DO-160G Section 18*  
*Boeing D6-16050-4 (7.2)*  
*ECSS-E-ST-20-07C (A.10)*  
*Ford EMC-ST-07C, FMC1278*  
*Def Stan 59-411*

**Model Number****LINE IMPEDANCE STABILIZATION NETWORKS**

See LISN listing

**CURRENT AND INJECTION PROBES**

**OCP212 Current Probe**, 1MHz-1GHz, 32mm window

**OCP217 Current Probe**, 20Hz-150MHz, 32mm window

**OCP218 Current Probe**, 10kHz-500MHz, 32mm window

**OCP219 Current Probe**, 10kHz-150MHz, 32mm window

**OCP220 Current Probe**, 10kHz-100MHz, 32mm window

**OCP321 Current Probe**, 100kHz-500MHz, 67mm window

**OCP324 Current Probe**, 10kHz-300MHz, 67mm window

**OCP405 Current Probe**, 10kHz-400MHz, 51mm window

**OIP257 Bulk Current Injection Probe**, 100kHz-1GHz, 38mm window

**OIP400 Bulk Current Injection Probe**, 10kHz-400MHz, 51mm window

**CALIBRATION FIXTURES**

**OFC120 BCI Calibration Fixture**, 20Hz-500MHz, 10" x 7" x 6"

**OFC121 BCI Calibration Fixture**, 100kHz-1GHz, 10" x 7" x 7"

**OFC123 BCI Calibration Fixture**, 10kHz-400MHz, 12" x 7" x 7"

**OFC403 Dual Wide Calibration Fixture**, 10kHz-400MHz, 6.5" x 6" x 6.5"



## **Mil-Std-461F/461G Product List**

CE101 Conducted Emissions, Power Leads, 30 Hz to 10 kHz

OCP217 Current Probe, 20 Hz-150 MHz

2014M-50-1-P-50-N LISN

2114D-5-1-P-50-N LISN (alternate)

CE102 Conducted Emission, Power Leads. 10 kHz-10 MHz

2014M-50-1-P-50-N LISN

2114D-5-1-P-50-N LISN (alternate)

CS101 Conducted Susceptibility, Power Leads, 30 Hz-150 kHz

OAA101 Audio Amplifier

OCT101 Coupling Transformer

2014M-50-1-P-50-N LISN

CS106 Conducted Susceptibility, Power Lead, Transients (461F)

OTG106 Transient Generator, 5  $\mu$ S, 400 V peak

2014M-50-1-P-50-N LISN

CS109 Conducted Susceptibility, Structure Current, 60 Hz-100 kHz

OAA101 Audio Amplifier

OCP217 Current Probe 20 Hz-150 kHz

OCT101 Coupling Transformer

CS114 Conducted Susceptibility, Bulk Current Injection, 10 kHz-200 MHz

OIP400 Current Injection Probe, 10 kHz-400 MHz

OCP405 Current Probe 10 kHz-400 MHz

OFC403 Calibration Fixture

**Ophir RF Power Amplifier**

OAA101 Audio Amplifier

2014M-50-1-P-50-N LISN

CS 115 Conducted Susceptibility, Bulk Current Injection, Impulse Excitation

OPG115 Pulse Generator, 30 ns

OIP400 Current Injection Probe, 10 kHz-400 MHz

OCP405 Current Probe, 10 kHz-400 MHz

OFC403 Calibration Fixture

2014M-50-1-P-50-N LISN



**CS116 Conducted Susceptibility, Damped Sinusoidal Transients**

**OTG116 Transient Generator (automated)\***

**OTG116A Transient Generator**

**OIP400 Current Injection Probe, 10 kHz-400 MHz\***

**OFC403 Calibration Fixture\***

**OCP405 Current Probe, 10 kHz-500 MHz\***

**2014M-50-1-P-50-N LISN**

**ORL101 50 Ohm Resistive Load\***

**\* sold as system**

**RE101 Radiated Emissions. Magnetic Field, 30 Hz- 100 kHz**

**OLS110 Loop Sensor 13.3 cm**

**2014M-50-1-P-50-N LISN**

**RE102 Radiated Emissions, Electrical Field, 10 kHz-18 GHz**

**2014M-50-1-P-50-N LISN**

**RS101 Radiated Susceptibility 30 Hz-100 MHz**

**ORL110 Radiating Loop**

**OLS112 Loop Sensor**

**OCP217 Current Probe 20 Hz-150 MHz**

**2014M-50-1-P-50-N LISN**

**OLS110 Loop Sensor, 13.3 cm**

**RS103 Radiated Susceptibility, Electrical Field, 2 MHz-40 GHz**

**Ophir RF Power Amplifiers**

**2014M-50-1-P-50-N LISN**

**RS105 Radiated Susceptibility, EM Field, Transient**

**2014M-50-1-P-50-N LISN**

**Ophir EMC**

**Ophir RF**



## **Def-Std-59-411 Preliminary Product List**

DCE01 Conducted Emissions Primary Power 20 Hz-150 MHz

OCP217 Current Probe

2514D-5-1-P-100-N LISN

DCE02 Conducted Emissions Signal, Control & Secondary Power 20 Hz-150 MHz

OCP217 Current Probe

2514D-5-1-P-100-N LISN

DCE02 Exported Transients Primary Power

2514D-5-1-P-100 LISN

DCS01 Conducted Susceptibility Primary Power 20 Hz- 50kHz

OAA101 Audio Amplifier

OCT101 Coupling Transformer

2514D-5-1-P-100-N LISN

DCS02 Conducted Susceptibility Signal, Control and Power 50 kHz-400 MHz

**Ophir RF Amplifier**

OIP400 Current Injection Probe, 10kHz -400MHz

OCP405 Current Probe, 10kHz-400MHz

OFC403 Calibration Fixture

2514D-5-1-P-100-N LISN

DCS03 Conducted Susceptibility, Control and Signal 20 Hz-50 kHz

OAA101 Audio Amplifier

2514D-5-1-P-100-N LISN

DCS04 Imported Transient Susceptibility (Air)

Transient Generator

Injection Clamps

OCP220 Current Probe, 10kHz-100MHz

2514D-5-1-P-100-N LISN

DCS05 Externally Generated Transient (Land/Sea)

Transient Generator

Injection Clamps

10 Ohm Calibration Jig

OCP220 Current Probe, 10kHz-100MHz

2514D-5-1-P-100-N LISN

**DCS06 Imported Long Transients AC/DC (land/Sea)**

Transient Generator

Injection Clamp

5 ohm Calibration Jig

Monitor Probe

2514D-5-1-P-100-N LISN

**DCS08 Externally Generated Transient (Air)**

Transient Generator

Injection Clamp

Monitor Probe

Voltage Probe

2514D-5-1-P-100-N LISN

**DCS09 Imported Lightning Transient (Air)**

Lightning Generator

2514D-5-1-P-100-N LISN

**DCS10 ESD**

ESD Generator Gun

**DCS12 Imported Low Frequency Transient Power Line (Sea)**

Transient Generator

2514D-5-1-P-100-N LISN

**DRE01 Radiated Emissions E-Field 10KHz-18GHz**

Antennas

2514D-5-1-P-100-N LISN

**DRE02 Radiated Emissions H-Field 20Hz-250kHz**

OLS110 Loop Sensor, 13.3 cm

2514D-5-1-P-100-N LISN

**DRE03 Radiated Emission E-Field Tuned Antenna**

2514D-5-1-P-100-N LISN

**DRS01 Radiated Susceptibility H-Field 20Hz-100kHz**

ORL110 Radiating Loop

OAA101 Audio Amplifier

2514D-5-1-P-100-N LISN

**DRS02 Radiated Susceptibility E-Field 10kHz-18MGHz**

**Ophir RF Amplifier**

2514D-5-1-P-100-N LISN

**DRS02 Magnetic Field (DC) Susceptibility**

Helmholtz Coil

**Ophir EMC**

**Ophir RF**

Future Projects



## **RTCA DO-160G Preliminary Product List**

### **Section 17: Voltage Spike**

OTG617 Transient Generator, 10  $\mu$ S, 50  $\Omega$

### **Section 18: Audio Frequency Susceptibility**

OAA101 Audio Amplifier

OCT101 Coupling Transformer

### **Section 20: Conducted Susceptibility 10 kHz-400 MHz**

2114D-5-1-P-50-N LISN

2514D-5-1-P-50-N LISN w/10  $\mu$ F Capacitor

**Ophir RF Amplifier**

OIP400 Injection Probe, 10 kHz-400 MHz

OCP405 Monitor Probe, 10 kHz-400 MHz

OFC403 Calibration Fixture

2514D-5-1-P-50-N LISN w/10  $\mu$ F Capacitor

2114D-5-1-P-50-N LISN

### **Section 21: Conducted 150kHz-30MHz**

OCP220 Current Probe

2114D-5-1-P-50-N LISN

2514D-5-1-P-50-N LISN w/internal 10  $\mu$ F Capacitor

### **Section 22: Lightning Induced Transients**

**OTG622 Induced Lightning Generator**

2114D-5-1-P-50-N LISN

**Ophir EMC**

**Ophir RF**

Under development



# LISN Product List

Style P shown

P/N	Current	Inductance	Voltage				Circuits	Frequency Range
			60 Hz	400 Hz	800 Hz	DC		
<b>for Mil-Std-461F/461G</b>								
2014M-50-2-P1-15-B	15	50µH	270	130	n/a	400	dual	10kHz-50MHz
2014M-50-2-P2-25-B	30	50µH	270	130	n/a	400	dual	10kHz-50MHz
2014M-50-2-P-50-N	50	50µH	270	130	n/a	400	dual	10kHz-50MHz
2014M-50-1-P-100-N	100	50µH	270	130	n/a	400	single	10kHz-50MHz
2114D-5-2-P1-15-B	15	5µH	480	240	130	800	dual	150kHz-400 MHz
2114D-5-2-P1-25-B	30	5µH	480	240	130	800	dual	150kHz-400 MHz
2114D-5-2-P-50-N	50	5µH	480	240	130	800	dual	150kHz-400 MHz
2114D-5-1-P-100-N	100	5µH	480	240	130	800	single	150kHz-400 MHz
<b>for DO-160G</b>								
2114D-5-2-P1-15-B	15	5µH	480	240	130	800	dual	150kHz-400 MHz
2114D-5-2-P2-25-B	30	5µH	480	240	130	800	dual	150kHz-400 MHz
2114D-5-2-P-50-N	50	5µH	480	240	130	800	dual	150kHz-400 MHz
2114D-5-1-P-100-N	100	5µH	480	240	130	800	single	150kHz-400 MHz
2514D-5-2-P1-15-B	15	5µH	480	240	130	800	dual	9kHz-400MHz*
2514D-5-2-P2-25-B	30	5µH	480	240	130	800	dual	9kHz-400MHz*
2514D-5-2-P-50-N	50	5µH	480	240	130	800	dual	9kHz-400MHz*
2514D-5-1-P-100-N	100	5µH	480	240	130	800	single	9kHz-400MHz*
<b>for Def Std 59-411, Euro Fighter</b>								
2514D-5-2-P1-15-B	15	5µH	480	240	130	800	dual	1kHz-400MHz*
2514D-5-1-P-100-N	100	5µH	480	240	130	800	single	1kHz-400MHz*
2514D-5-1-T-500-N	500	5µH	480	240	130	800	single	1kHz-400MHz*
<b>for CISPR 25</b>								
2314C-5-1-P1-10-B	10	5µH	240	130	n/a	400	single	100kHz-108MHz
2314C-5-1-P2-25-B	25	5µH	240	130	n/a	400	single	100kHz-108MHz
2314C-5-1-P-50-N	50	5µH	240	130	n/a	400	single	100kHz-108MHz
2314C-5-1-P-100-N	100	5µH	240	130	n/a	400	single	100kHz-108MHz
<b>for ISO-7637-2</b>								
2414I-5-1-P1-10	10	5µH	240	130	n/a	400	single	100kHz-108MHz
2414I-5-1-P2-25	25	5µH	240	130	n/a	400	single	100kHz-108MHz
2414I-5-1-P-50	50	5µH	240	130	n/a	400	single	100kHz-108MHz
2414I-5-1-P-100	100	5µH	240	130	n/a	400	single	100kHz-108MHz
<b>for CISPR 16-1-2, CISPR 22, ANSI 63.4</b>								
2214C-50-2-P1-15-B	15	50µH	240	130	n/a	400	dual	150kHz-30MHz
2214C-50-2-P2-25-B	25	50µH	240	130	n/a	400	dual	150kHz-30MHz
2214C-50-2-P-50-N	50	50µH	240	130	n/a	400	dual	150kHz-30MHz
2214C-50-2-P-100-N	100	50µH	240	130	n/a	400	dual	150kHz-30MHz
<b>for CISPR 16-1-2, CISPR 15</b>								
2214C-50/250-2-P1-15-B	15	250µH/50µH	240	130	n/a	400	dual	9kHz-30MHz
2214C-50/250-2-P2-25-B	25	250µH/50µH	240	130	n/a	400	dual	9kHz-30MHz
2214C-50/250-2-P-50-N	50	250µH/50µH	240	130	n/a	400	dual	9kHz-30MHz
2214C-50/250-2-P-100-N	100	250µH/50µH	240	130	n/a	400	dual	9kHz-30MHz

\*internal 10 µF Capacitor

### Terminal Styles Available

Plug & Sockets
P1- Binding Post, 5-way contact
P2-Supercon Plug and Safety Socket
P-Supercon Plug and Safety Socket

RF Connector Styles
B - Type BNC
N - Type N
Blank - none

Receptacles
R0-NEMA 5-15 15 amp receptacle
R1-Schuko CEE7 outlet
R2-French/Belgian 16 amp outlet
R3-Australian 16 amp outlet
R4-UK 13 amp outlet
R5-India/South Africa outlet
R6-Denmark outlet
R7-NEMA L6-30 30 amp outlet
R8-IEC-60309 30 amp outlet
R9-IEC-60309-60 amp outlet
R10-IEC-60309-100 amp outlet

Threaded Terminals
10 amp - 10-32 threaded stud
15 amp - 10-32 threaded stud
25 amp - 1/4-20 threaded stud
50 amp - 1/4-20 threaded stud
100 amp - 3/8-16 threaded stud
500 amp - 750 MCM threaded stud



## CISPR 16-1-2 Line Impedance Stabilization Network

OPHIR<sub>EMC</sub> offers a wide selection of Line Impedance Stabilization Networks (LISN's) also referred to as Artificial Mains Networks for CISPR 16-1-2 compliance testing requirements. LISN's also meet suitable for CISPR 22, CISPR 15, ANSI 63.4 and other EMC specifications. LISN's are available in three and four circuit configurations. Additional current and voltage ratings are available.

P/N	Current	Ind	Voltage			Circuit	Frequency Range	Opt							
			60 Hz	400 Hz	DC				R2	R3	R3	R5	R6		
<b>for CISPR 16-1-2, CISPR 22, ANSI 63.4 (50Ω/50μH Circuit)</b>															
2214C-50-2-P1-15-B	15	50μH	240	130	400	dual	150kHz-30MHz	P2							
2214C-50-2-P1-25-B	25	50μH	240	130	400	dual	150kHz-30MHz	P2							
2214C-50-2-P-50-N	50	50μH	240	130	400	dual	150kHz-30MHz								
2214C-50-2-P-100-N	100	50μH	240	130	400	dual	150kHz-30MHz								
2214C-50-1-P1-15-B	15	50μH	240	130	400	single	150kHz-30MHz	P2							
2214C-50-1-P1-25-B	25	50μH	240	130	400	single	150kHz-30MHz	P2							
2214C-50-1-P-50-N	50	50μH	240	130	400	single	150kHz-30MHz								
2214C-50-1-P-100-N	100	50μH	240	130	400	single	150kHz-30MHz								
2214C-50-2-R0-15-B	15	50μH	240	130	400	dual	150kHz-30MHz	R1	R2	R3	R3	R5	R6		
2214C-50-2-R7-25-B	25	50μH	240	130	400	dual	150kHz-30MHz	R8							
2214C-50-2-R9-50-N	50	50μH	240	130	400	dual	150kHz-30MHz								
2214C-50-2-R10-100-N	100	50μH	240	130	400	dual	150kHz-30MHz								
<b>for CISPR 16-1-2, CISPR 15 (50Ω/50μH+5Ω Circuit)</b>															
2214C-50/250-2-P1-15-B	15	250μH/50μH	240	130	400	dual	9kHz-30MHz	P2							
2214C-50/250-2-P1-25-B	25	250μH/50μH	240	130	400	dual	9kHz-30MHz	P2							
2214C-50/250-2-P-50-N	50	250μH/50μH	240	130	400	dual	9kHz-30MHz								
2214C-50/250-2-P-100-N	100	250μH/50μH	240	130	400	dual	9kHz-30MHz								
2214C-50/250-1-P1-15-B	15	250μH/50μH	240	130	400	single	9kHz-30MHz	P2							
2214C-50/250-1-P1-25-B	25	250μH/50μH	240	130	400	single	9kHz-30MHz	P2							
2214C-50/250-1-P-50-N	50	250μH/50μH	240	130	400	single	9kHz-30MHz								
2214C-50/250-1-P-100-N	100	250μH/50μH	240	130	400	single	9kHz-30MHz								
2214C-50/250-2-R0-15-B	15	250μH/50μH	240	130	400	dual	9kHz-30MHz	R1	R2	R3	R4	R5	R6		
2214C-50/250-2-R7-25-B	25	250μH/50μH	240	130	400	dual	9kHz-30MHz	R8							
2214C-50/250-2-R9-50-N	50	250μH/50μH	240	130	400	dual	9kHz-30MHz								
2214C-50/250-2-R10-100-N	100	250μH/50μH	240	130	400	dual	9kHz-30MHz								



**Legend:**

Termination	Ckts	RF Conn		R Style	
P Insulated Plug	1	B-Type BNC		Current Rating	Load
R-AC Receptacle	2	N-Type N	R0	15	NEMA 5 -15
	3		R1	15	Schuko CEE7
	4		R2	15	French/Belgian
			R3	15	Australian
			R4	15	UK
			R5	15	India/South Africa
			R6	15	Denmark
			R7	25	NEMA L6-30
			R8	25	IEC-60309 30 amp
			R9	50	IEC-60309 60 amp
			R10	100	IEC-60309 100 amp

	P Styles	Current Rating	
	Load		Line
	BP30R10R	10	BP30R10R
P1	BP30R10R	15	BP30R10R
P2	RP25GR	25	RS25GR
	RP50GR	50	RS50GR
	RP100GR	100	RS100GR



## Mil-Std-461F/G Line Impedance Stabilization Network

OPHIR<sub>EMC</sub> manufactures a wide selection of Line Impedance Stabilization Networks (LISN's) for pre-compliance and compliance conducted emissions testing in accordance with various EMC standards. The 2014M series of LISN's meet the requirements of Mil-Std-461F and 461G as well as earlier versions of the specification. The 2114D series meet the requirement for a 5μH LISN as specified in Appendix A of Mil-Std-461F/G. Additionally, the 2114D series of LISN are compliant with RTCA DO-160G when used with an external 10μF capacitor. LISN's are available in three and four circuit configurations. Additional current and voltage ratings are available.

P/N	Current	Ind	60 Hz	400 Hz	800 Hz	DC	Circuit	Frequency Range	Opt						
2014M-50-1-P1-15-B	15	50μH	270	130	n/a	400	single	10kHz-50MHz	P2						
2014M-50-1-P1-25-B	25	50μH	270	130	n/a	400	single	10kHz-50MHz	P2						
2014M-50-1-P-50-N	50	50μH	270	130	n/a	400	single	10kHz-50MHz							
2014M-50-1-P-100-N	100	50μH	270	130	n/a	400	single	10kHz-50MHz							
2114D-5-1-P1-15-B	15	5μH	480	240	130	800	single	150kHz-400 MHz	P2						
2114D-5-1-P1-25-B	25	5μH	480	240	130	800	single	150kHz-400 MHz	P2						
2114D-5-1-P-50-N	50	5μH	480	240	130	800	single	150kHz-400 MHz							
2114D-5-1-P-100-N	100	5μH	480	240	130	800	single	150kHz-400 MHz							
2014M-50-2-P1-15-B	15	50μH	270	130	n/a	400	dual	10kHz-50MHz	P2						
2014M-50-2-P1-25-B	25	50μH	270	130	n/a	400	dual	10kHz-50MHz	P2						
2014M-50-2-P-50-N	50	50μH	270	130	n/a	400	dual	10kHz-50MHz							
2014M-50-2-P-100-N	100	50μH	270	130	n/a	400	dual	10kHz-50MHz							
2114D-5-2-P1-15-B	15	5μH	480	240	130	800	dual	150kHz-400 MHz	P2						
2114D-5-2-P1-25-B	25	5μH	480	240	130	800	dual	150kHz-400 MHz	P2						
2114D-5-2-P-50-N	50	5μH	480	240	130	800	dual	150kHz-400 MHz							
2114D-5-2-P-100-N	100	5μH	480	240	130	800	dual	150kHz-400 MHz							
2014M-50-2-R0-15-B	15	50μH	270	130	n/a	400	dual	10kHz-50MHz	R1	R2	R3	R4	R5	R6	
2014M-50-2-R7-25-B	25	50μH	270	130	n/a	400	dual	10kHz-50MHz	R8						
2014M-50-2-R9-50-N	50	50μH	270	130	n/a	400	dual	10kHz-50MHz							
2014M-50-2-R10-100-N	100	50μH	270	130	n/a	400	dual	10kHz-50MHz							
2114D-5-2-R0-15-B	15	5μH	480	240	130	800	dual	150kHz-400 MHz	R1	R2	R3	R4	R5	R6	
2114D-5-2-R7-25-B	25	5μH	480	240	130	800	dual	150kHz-400 MHz	R8						
2114D-5-2-R9-50-N	50	5μH	480	240	130	800	dual	150kHz-400 MHz							
2114D-5-2-R10-100-N	100	5μH	489	240	130	800	dual	150kHz-400 MHz							



### Legend:

Termination	Ckts	RF Conn		R Style	
P Insulated Plug	1	B-Type BNC		Current Rating	Load
R-AC Receptacle	2	N-Type N	R0	15	NEMA 5 -15
T-Threaded Stud	3		R1	15	Schuko CEE7
	4		R2	15	French/Belgian
			R3	15	Australian
			R4	15	UK
			R5	15	India/South Africa
			R6	15	Denmark
			R7	25	NEMA L6-30
			R8	25	IEC-60309 30 amp
			R9	50	IEC-60309 60 amp
			R10	100	IEC-60309 100 amp

	P Styles	Current Rating	
	Load		Line
	BP30R10R	10	BP30R10R
P1	BP30R10R	15	BP30R10R
P2	RP25GR	25	RS25GR
	RP50GR	50	RS50GR
	RP100GR	100	RS100GR



## RTCA-DO-160G Line Impedance Stabilization Networks

OPHIR<sub>EMC</sub> 2114D series and 2514D series of Line Impedance Stabilization Networks (LISN's) are designed to meet the requirements of commercial aviation specification RTCA-DO-160G. The 2114D series require the use of an external 10 $\mu$ F capacitor for DO-160 applications. The 2514D series LISN include the 10 $\mu$ F capacitor internally and additionally meets the requirements of Def-Std 59-411 and Euro Fighter specifications. 2114D series of LISN's is compliant with the requirements for optional 5  $\mu$ H LISN as specified in Mil-Std-461F/G Appendix A. LISN's are available in three and four circuit configurations. Additional current and voltage ratings are available.

P/N	Current	Ind	Voltage				Circuit	Frequency Range	Opt								
			60 Hz	400 Hz	800 Hz	DC				R01	R02	R1	R2	R3	R4	R5	R6
2114D-5-1-P1-15-B	15	5 $\mu$ H	480	240	130	800	single	150kHz-400 MHz	P2								
2114D-5-1-P1-25-B	25	5 $\mu$ H	480	240	130	800	single	150kHz-400 MHz	P2								
2114D-5-1-P-50-N	50	5 $\mu$ H	480	240	130	800	single	150kHz-400 MHz									
2114D-5-1-P-100-N	100	5 $\mu$ H	480	240	130	800	single	150kHz-400 MHz									
2514D-5-1-P1-15-B	15	5 $\mu$ H	480	240	130	800	single	9kHz-400MHz*	P2								
2514D-5-1-P1-25-B	25	5 $\mu$ H	480	240	130	800	single	9kHz-400MHz*	P2								
2514D-5-1-P-50-N	50	5 $\mu$ H	480	240	130	800	single	9kHz-400MHz*									
2514D-5-1-P-100-N	100	5 $\mu$ H	480	240	130	800	single	9kHz-400MHz*									
2114D-5-2-P1-15-B	15	5 $\mu$ H	480	240	130	800	dual	150kHz-400 MHz	P2								
2114D-5-2-P1-25-B	25	5 $\mu$ H	480	240	130	800	dual	150kHz-400 MHz	P2								
2114D-5-2-P-50-N	50	5 $\mu$ H	480	240	130	800	dual	150kHz-400 MHz									
2114D-5-2-P-100-N	100	5 $\mu$ H	480	240	130	800	dual	150kHz-400 MHz									
2514D-5-2-P1-15-B	15	5 $\mu$ H	480	240	130	800	dual	9kHz-400 MHz*	P2								
2514D-5-2-P1-25-B	25	5 $\mu$ H	480	240	130	800	dual	9kHz-400 MHz*	P2								
2514D-5-2-P-50-N	50	5 $\mu$ H	480	240	130	800	dual	9kHz-400 MHz*									
2514D-5-2-P-100-N	100	5 $\mu$ H	480	240	130	800	dual	9kHz-400 MHz*									
2114D-5-2-R0-15-B	15	5 $\mu$ H	480	240	130	800	dual	150kHz-400 MHz	R01	R02	R1	R2	R3	R4	R5	R6	
2114D-5-2-R7-25-B	25	5 $\mu$ H	480	240	130	800	dual	150kHz-400 MHz	R8								
2114D-5-2-R9-50-N	50	5 $\mu$ H	480	240	130	800	dual	150kHz-400 MHz									
2114D-5-2-R10-100-N	100	5 $\mu$ H	480	240	130	800	dual	150kHz-400 MHz									
2514D-5-2-R0-15-B	15	5 $\mu$ H	480	240	130	800	dual	9kHz-400 MHz*	R01	R02	R1	R2	R3	R4	R5	R6	
2514D-5-2-R7-25-B	25	5 $\mu$ H	480	240	130	800	dual	9kHz-400 MHz*	R8								
2514D-5-2-R9-50-N	50	5 $\mu$ H	480	240	130	800	dual	9kHz-400 MHz*									
2514D-5-2-R10-100-N	100	5 $\mu$ H	480	240	130	800	dual	9kHz-400 MHz*									

\*internal 10 $\mu$ F capacitor

### Legend:

Termination	Ckts	RF Conn		R Style	
P Insulated Plug	1	B-Type BNC		Current Rating	Load
R-AC Receptacle	2	N-Type N	R0	15	NEMA 5 -15
T-Threaded Stud	3		R1	15	Schuko CEE7
	4		R2	15	French/Belgian
			R3	15	Australian
			R4	15	UK
			R5	15	India/South Africa
			R6	15	Denmark
			R7	25	NEMA L6-30
			R8	25	IEC-60309 30 amp
			R9	50	IEC-60309 60 amp
			R10	100	IEC-60309 100 amp

	P Styles	Current Rating	
	Load		Line
	BP30R10R	10	BP30R10R
P1	BP30R10R	15	BP30R10R
P2	RP25GR	25	RS25GR
	RP50GR	50	RS50GR
	RP100GR	100	RS100GR



## Line Impedance Stabilization Networks for Automotive Specifications

OPHIR<sub>EMC</sub> 2414I and 2314C series Line Impedance Stabilization Networks (LISN's) are designed for vehicular conducted emissions testing in accordance with ISO-7637-2, CISPR 25 and various automotive EMC standards. The 2314C series includes a measurement port and 1 $\mu$ F as specified in CISPR 25. 2414I series is compliant with ISO-7637-2.

Additional current and voltage ratings are available.

P/N	Current	Ind	60 Hz	Voltage 400 Hz	DC	Circuit	Frequency Range	Opt
<b>for ISO-7637-2</b>								
2414I-5-1-P-10	10	5 $\mu$ H	240	130	400	single	100kHz-108MHz	
2414I-5-1-P1-25	25	5 $\mu$ H	240	130	400	single	100kHz-108MHz	P2
2414I-5-1-P-50	50	5 $\mu$ H	240	130	400	single	100kHz-108MHz	
2414I-5-1-P-100	100	5 $\mu$ H	240	130	400	single	100kHz-108MHz	
<b>for CISPR 25</b>								
2314C-5-1-P-10-N	10	5 $\mu$ H	240	130	400	single	100kHz-108MHz	
2314C-5-1-P1-25-N	25	5 $\mu$ H	240	130	400	single	100kHz-108MHz	P2
2314C-5-1-P-50-N	50	5 $\mu$ H	240	130	400	single	100kHz-108MHz	
2314C-5-1-P-100-N	100	5 $\mu$ H	240	130	400	single	100kHz-108MHz	

Legend:

	P Styles	Current Rating	
	Load		Line
	BP30R10R	10	BP30R10R
P1	BP30R10R	15	BP30R10R
P2	RP25GR	25	RS25GR
	RP50GR	50	RS50GR
	RP100GR	100	RS100GR



## Model OCT101 Audio Coupling Transformer

OPHIR<sub>EMC</sub> **Model OCT101** Audio Coupling Transformer designed for making conducted audio frequency susceptibility tests as required by Mil-Std-461F/G and various automotive and aviation EMI specifications. Transformer is CE certified.

### Specifications:

Frequency Response:	10 Hz to 250 kHz
Audio Power:	200 Watts
Secondary Saturation:	50 Amps, AC or DC
Turns Ratio:	2:1 Step down
Primary Impedance:	< 5 Ohms
Secondary Impedance:	¼ of primary impedance
Primary Connectors:	5-way insulated binding posts
Secondary Connectors:	50 amp insulated plug receptacle
Dielectric Voltage:	4,000 Volts
Secondary Inductance:	Approximately 1 mH.
Dimensions:	13.65cm (5 <sup>3</sup> / <sub>8</sub> " ) x 22.22cm ( 8 <sup>3</sup> / <sub>4</sub> " ) x 15.24cm (5 <sup>1</sup> / <sub>4</sub> " )
Weight:	Approximately 20 pounds



## Model OAA101 Audio Power Amplifier

OPHIR<sub>EMC</sub> Model OAA101 Audio Power Amplifier is designed for conducted susceptibility testing as specified in EMC standard Mil-Std-461, RTCA DO-160 and additional EMC specifications. The Audio Amplifier is used in conjunction with OPHIR<sub>EMC</sub> Model OCT101 Coupling Transformer. The Model OAA101 provides a DC to 300 kHz bandwidth and up to 1000 watts power. Amplifier has protection circuitry from input overloads, improper outputs (including shorted and improper loads), over-temperature, over-currents and over-voltages. There is a Digital Voltmeter display on the front panel along with LED's displaying ready, over-temperature, over-voltage and over load conditions. Forced air cooling. Capable of being computer controlled. Designed to stand alone or be rack mounted.

### Specifications:

Frequency Range:	DC to 300 kHz
Output Power:	1000 Watts
AC Input Power:	115/230 V, 50/60 Hz
Input Signal:	0.5-2.0 Volts RMS
Input Impedance:	50 Ohms
Output Impedance:	2.0 Ohms
Output Voltage:	>40 V RMS, 0-150 kHz
Distortion:	≤ 0.3%
DC Drift:	>±1.5 mV (after 30 minutes of operation)
Phase Response:	±5 degrees
Residual Noise:	300 μV
Signal-to Noise Ratio:	-100 dB
Voltage Gain:	20 volts/volts
Gain Linearity:	0.15% (over input signal, from 0.2V to 5V)
Common Mode Rejection:	-60dB with 5 v input
Input Connector:	Type BNC
Output Connections:	Standard ¼" Binding Post (or barrier strip)
Size:	TBD
Weight:	TBD



## Model OLS110 Loop Sensor

OPHIR<sub>EMC</sub> Model OLS110 Loop Sensor was designed to meet the requirements of Mil-Std-461E/F/G RE101 for the measurements of radiated magnetic field emissions from 30 Hz to 100 kHz. Model OLS110 is also used for radiated susceptibility testing as specified in RS101 alternative test procedure using AC Helmholtz coil. The Model OLS110 meets the requirements for compliance testing of other specifications and standards.

### Specifications

Frequency Range:	20 Hz to 100 kHz
Connector:	Type BNC female
Coil Diameter:	13.3 cm (5.24")
Turns:	36
Wire:	#7-41 Litz wire
DC Resistance:	Approximately 10 ohms
Shielding:	Electrostatic



## **Model ORL110 Radiating Loop and Model OLS112 Loop Sensor**

OPHIR<sub>EMC</sub> Model ORL110 Radiating Loop and Model OLS112 Loop Sensor are designed to meet the requirements for radiated magnetic field susceptibility testing from 30 Hz to 100 kHz as specified in Mil-Std-461F/G for RS101 testing. The ORL110 Radiating Loop is used in conjunction with the OLS112 Loop Sensor to verify the magnetic field generated by the ORL110 as required by RS101 of Mil-Std-461F/G. The ORL110 coil form positions the coil 5 cm from the EUT when placed against the EUT.

The loops are also compliant with other EMC standards and specifications.

### **Specifications**

#### **ORL110 Radiating Loop**

Coil Diameter:	12 cm (4.72")
Overall Dimensions:	13.3 cm (5.25") O.D. x 6 cm (2.37")
Termination:	Standard 3/4" Binding Post
Turns:	20
Wire:	#12 insulated Copper Magnet Wire
Magnetic Flux Density:	9.5x10 <sup>7</sup> pT/ampere of applied current at a distance of 5 cm from the plane of the loop.

#### **OLS112 Loop Sensor**

Coil Diameter:	4 cm (1.57")
Overall Dimensions:	5 cm (2") O.D. x 1.9 cm (.749")
Connector:	Type BNC Receptacle
Turns:	51
Wire:	#7-41 Litz wire
Shielding:	Electrostatic





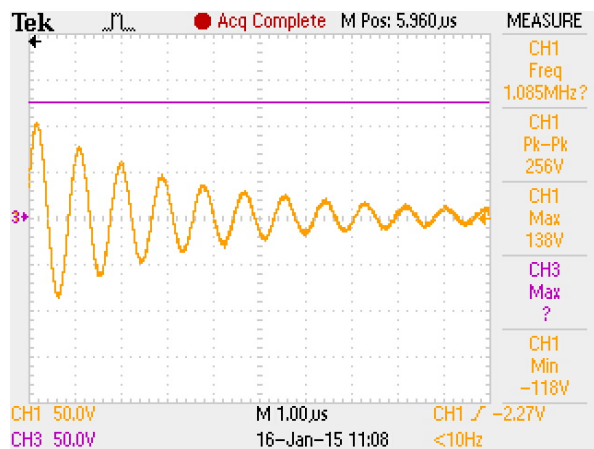
## Model OTG116A Sinusoidal Damping Transient Generator

OPHIR<sub>EMC</sub> Model OTG116A Sinusoidal Damping Transient Generator is especially designed for the performance of a variety of pulse susceptibility tests on subsystems and/or equipment, in accordance with Mil-Std-461E/F/G section CS116.

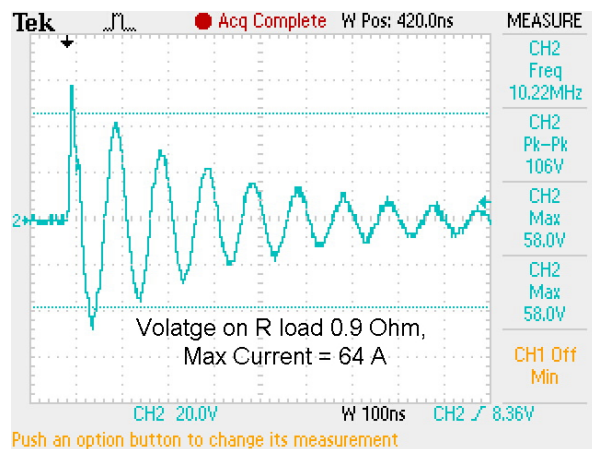
The Model OTG116A provides the six required damped sinusoidal frequencies as specified in Mil-Std-461F/G section CS116 through six individual outputs. The Model OTG116A is capable of a single pulse or auto pulsing of each of the frequencies at a pulse rate of 1 p.p.s. Open Loop Voltage is displayed for each frequency being tested.

### Specifications:

Frequencies:	10 kHz, 100 kHz, 1 MHz, 10 MHz, 30 MHz, 100 MHz
Output Impedance:	≤ 100 ohms
Output Current:	0.1 to 10 Amperes (depending on frequency)
Damping Factor (Q):	15 ± 5
Repetition Rate:	Single, 1.0 p.p.s.
Power:	115V/230V, 50/60Hz
Dimensions:	19" wide x 5.21" high x 20"
Weight:	TBD



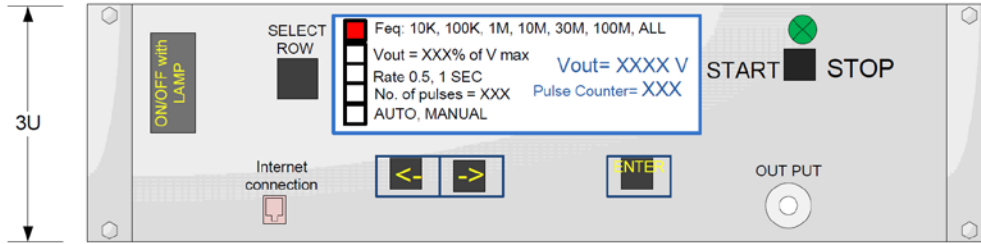
**Typical 1MHz Output**



**Typical 10MHz Output**

- Accessories (sold separately)
- OIP400 Injection Probe
  - OCP405 Monitoring Probe
  - OCF403 Calibration fixture
  - ORL101 50Ω Resistive Load

5300 Beethoven Street, Los Angeles, California 90066, Phone: 310-306-5556, Fax: 310-577-9887



## Model OTG116

### Sinusoidal Damping Transient Generator

OPHIR<sub>EMC</sub> Model OTG116 Sinusoidal Damping Transient Generator is specifically designed to provide the damped sinusoidal pulses required by Mil-Std-461F/G section CS116. The Model OTG116 provides the six required frequencies as specified in Mil-Std-461F/G section CS116 through a single output. The Model OTG116 is capable of single pulse, auto pulsing of one frequency or all frequencies. The pulse rate is adjustable from 0.5 to 1 pulse per second. Open Loop Voltage is displayed for each frequency being tested. Generator can be externally control via computer interface.

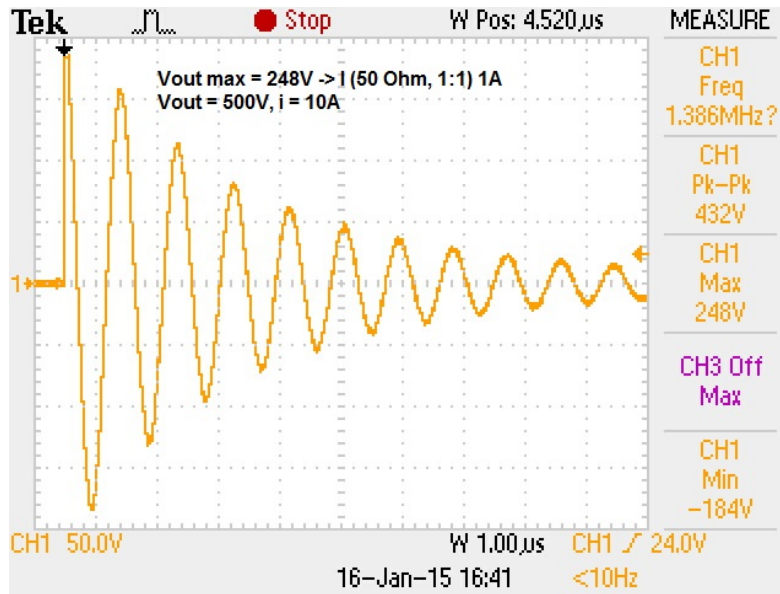
#### Specifications:

Frequencies:	10 kHz, 100 kHz, 1 MHz, 10 MHz, 30 MHz, 100 MHz
Output Impedance:	≤ 100 ohms
Output Current:	0.1 to 10 Amperes (depending on frequency)
Damping Factor (Q):	15 ± 5
Repetition Rate:	Single, 0.5 p.p.s.-1.0 p.p.s.
Power:	115V/230V, 50/60Hz
Dimensions:	19" wide x 5.21" high x 20"
Weight:	TBD

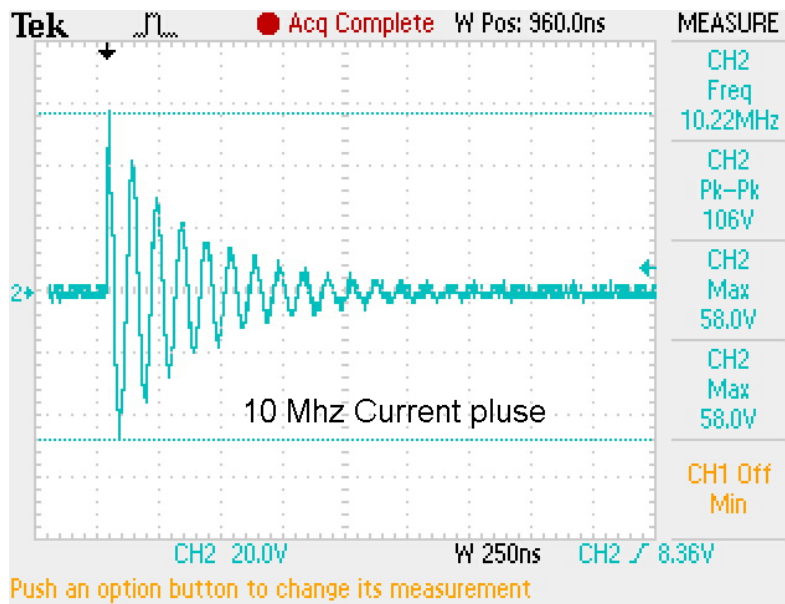
#### System includes:

- OTG 116 Transient Generator
- OIP400 Injection Probe
- ORL101 50 Ohms loads (2)
- OCP403 Monitoring Probe
- Cables
- Instruction Manual

5300 Beethoven Street, Los Angeles, California 90066, Phone: 310-306-5556, Fax: 310-577-9887



Typical 1MHz output



Typical 10 MHz Output

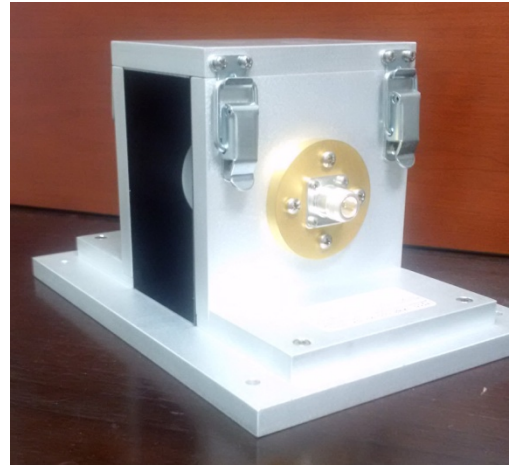


## Model OPG115 Pulse Generator

OPHIR<sub>EMC</sub> Model OPG115 Pulse Generator is designed to meet the requirements for CS115 susceptibility testing as specified in Mil-Std-461F/G. The Model OPG115 is used to provide pulse excitation on interconnecting cables through an injection probe. The Model OPG115 uses a coaxial charge line to generate a  $>30$  ns pulse with rise and fall time of less than 2 ns. Pulse polarity reversible. Charge voltage displayed on front panel. Generator is capable of being computer controlled.

### Specifications:

Charge Voltage:	0-2000 volts
Repetition Rates:	01-50 p.p.s.
Pulse Rise and Fall Times:	$< 2$ ns
Pulse Duration:	$>30$ ns
Output Impedance:	50 $\Omega$
Output Connector	Type N
Power:	115V/230V, 50/60Hz
Dimensions:	TBD
Weight:	TBD



## Model OFC120 Calibration Fixture

The **OPHIR<sub>EMC</sub> Model OFC120** Calibration Fixture is used to calibrate the Bulk Current Injection (BCI) Probe prior to performing compliance testing as required by RTCA/DO-160G, Mil-Std-461F/G, IEC/EN 61000-4-6 and other EMC specifications. Model OFC120 exceeds the VSWR requirements of RTCA/DO-160G Section 20 for a standalone injection probe calibration fixture to 400 MHz

Frequency Range:	20 Hz – 500 MHz
Nominal Impedance:	50 $\Omega$
Connector:	Type N Female
Overall Dimensions: (LxWxH)	254 mm (10") X 177 mm (7") X 152 mm (6")
Window Dimensions:	120 mm (4.72") x 70 mm (2.75")
Center Conductor:	15 mm (0.59") diameter
With centering spacer:	36.5 mm (1.437") diameter
VSWR (w/o probe installed):	$\leq 3.5:1$ @ 400 MHz
Weight:	$\approx 4.5$ kgs (10#)

### Additional Models

- OFC121, 100kHz-1GHz**, 25.4cm (10") x 17.7cm (7") x 15.2cm (6")
- OFC123, 10kHz-400MHz**, 30.48cm (12") x 17.7cm (7") x 17.7cm (7")
- OFC403, 10kHz-400MHz**, 16.51cm (6.5") x 15.24cm (6") x 16.51cm (6.5")



**Current Probe** *(Preliminary-subject to change)*

Part No:	Frequency	Zt	Max A 400Hz	Max CW	Max Pulse	Window
OCP212	1MHz-1GHz	1-7	200	20	50	1.25
OCP217	20Hz-150MHz	1	450	4.2	100	1.25
OCP218	10kHz-500MHz	1-5	200	40	60	1.25
OCP219	10kHz-150MHz	1	350	4.2	100	1.25
OCP220	10kHz-100MHz	5	350	42	100	1.25
OPC405	10kHz-400MHz	6	4	15		2.00
OCP321	100kHz-500MHz	8	200	25	50	2.62
OCP324	10KHz-300MHz	8	300	62	62	2.62

**BCI Probes** *(Preliminary-subject to change)*

Part No	Frequency	Wind A.	Watts	Window
OIP257	100kHz-1GHz		100	1.5
OIP400	10KHz-400MHz		100	2

**Calibration Fixtures**

Part No.	Frequency	Width	Height	Center
OFC120	20Hz-500MHz	10	7	6
OFC121	100kHz-1GHz	10	7	7
OFC403	10kHz-400MHz	6	6.5	6.5





5300 Beethoven St  
Los Angeles, CA 90066 USA  
Tel: 310. 306. 5556  
Fax: 310. 577. 9887  
Email: [sales@ophirrf.com](mailto:sales@ophirrf.com)  
[www.ophirrf.com](http://www.ophirrf.com)