

# Radiated & Conducted Immunity Requirements & Solutions

## Radiated Susceptibility

MIL-STD-461 E/F/G & Beyond

RS103 Radiated Susceptibility  
20 V/m electric field, 10 kHz - 40 GHz  
Applicable Categories: surface ships, submarines, aircraft, army, & including flight line

AR Products Combinations Capable of Producing 200 V/m

Frequency	Amplifier	Antenna	EUT Placement
10 kHz - 100 MHz	2500A225B	ATP10K100M	Between Elements
80 MHz - 1 GHz	1000W1000G	ATR80M6G	1 Meter
1 GHz - 6 GHz	250S1G6C	ATH800M6G	1 Meter
6 GHz - 18 GHz	40S6G18A-L	ATH6G18A	1 Meter
18 GHz - 26.5 GHz	40T18G26A	ATH18G27A	1 Meter
26.5 GHz - 40 GHz	40T26G40A	ATH27G40A	1 Meter

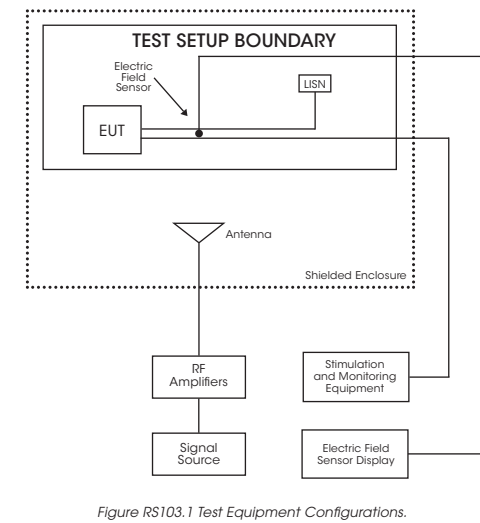


Figure RS103.1 Test Equipment Configurations

## Automotive Radiated Susceptibility

AR Products Capable of Producing Field Strengths of: ISO 11452-2, SAE J551-11, 95/54 EC, Company Specific Radiated Immunity Requirements

Frequency	Level	Amplifier	Antenna
10 kHz - 30 MHz	200 V/m	250U1000A	Stripline or TEM Cell
30 MHz - 100 MHz	200 V/m	2500A225C	High Power Broadband Antenna
100 MHz - 1 GHz	200 V/m	2000W1000D	ATR80M6G
1 GHz - 6 GHz	200 V/m	250S1G6C	ATT700M8G
6 GHz - 18 GHz	200 V/m	75S1G18C	ATH6G18A

## Basic Test Standard

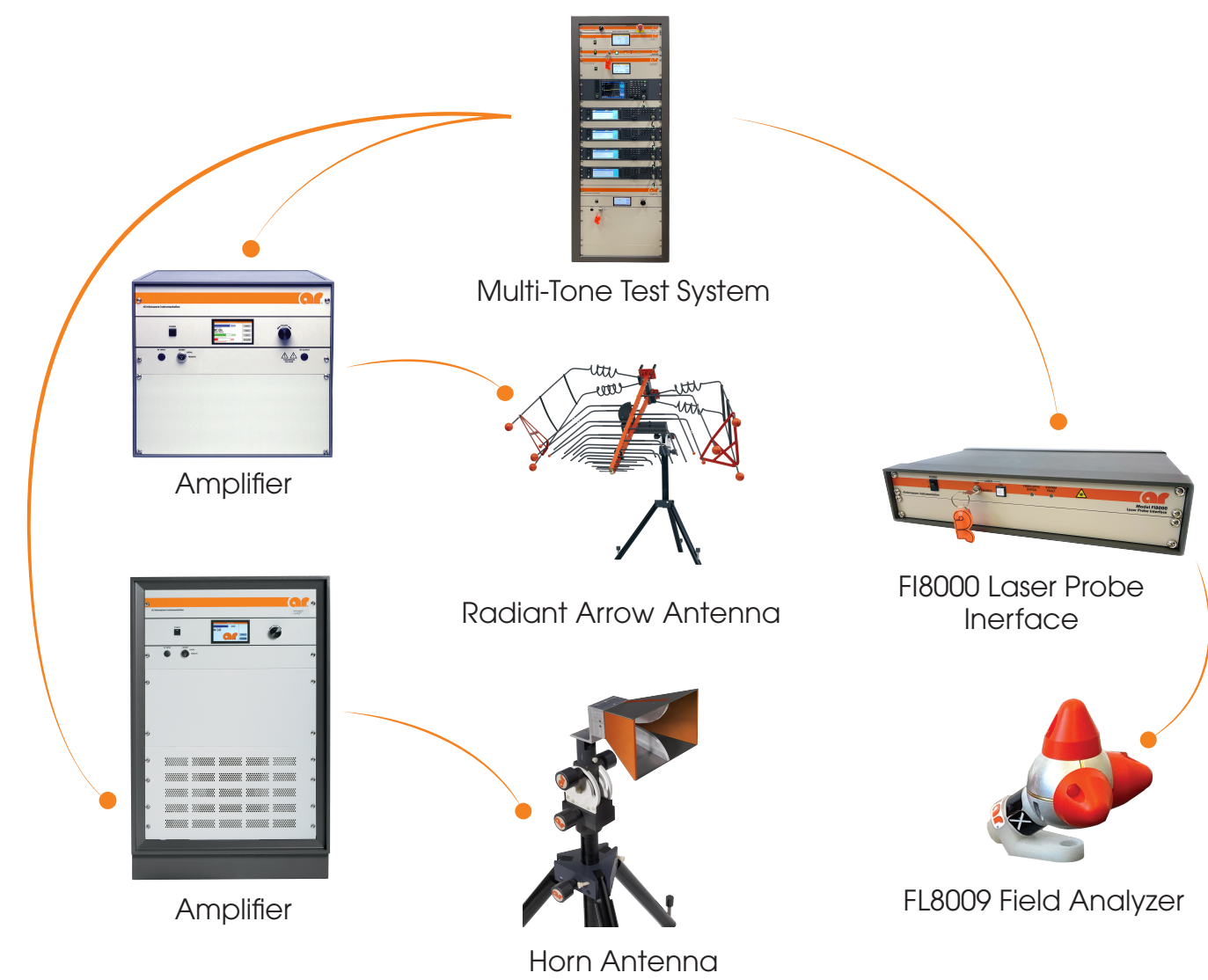
Radiated Immunity  
IEC 61000-4-3

Level	Test Field Strength
1	1 V/m
2	3 V/m
3	10 V/m
4	30 V/m
x <sup>a</sup>	Special

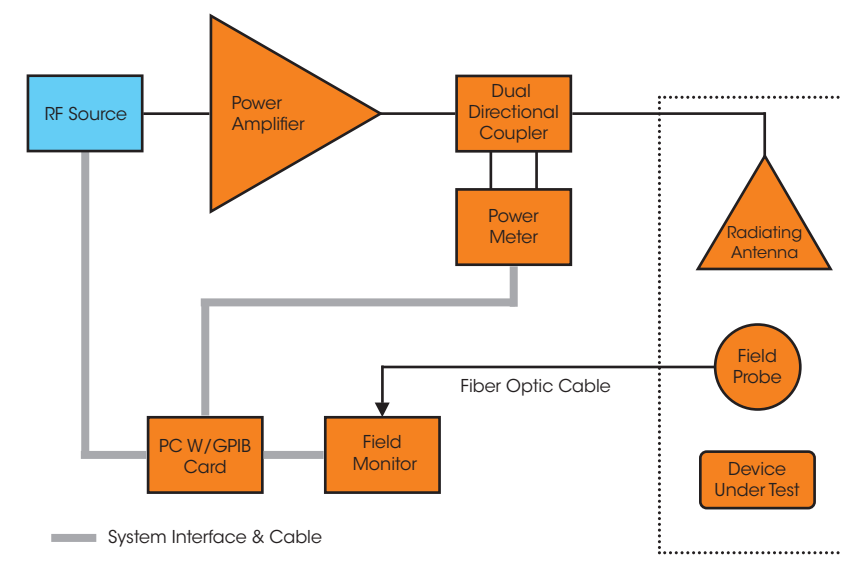
The test field strength column gives values of the unmodulated carrier signal. For testing of equipment, this carrier signal is 80% amplitude modulation with a 1 kHz sine wave to simulate actual threats.

## Multi-Tone Test System

Control Radiated Immunity Tests & Reduce Test Time by Producing Up To 10 Tones At Once



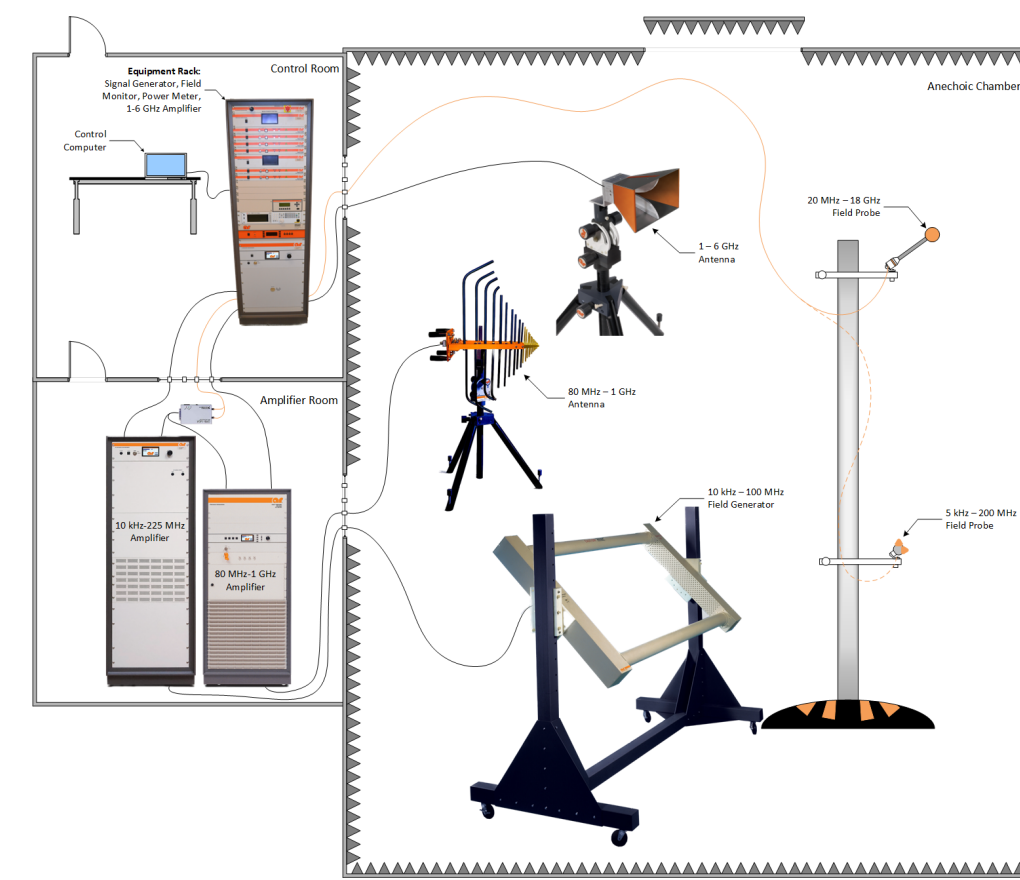
## Typical Radiated Immunity Test Configuration



Field Level	Frequency	Amplifier	Antenna	Test Distance
30 V/m	80 MHz - 1 GHz 1 GHz - 6 GHz	500W10000G 250S1G6C	ATR80M6G ATT700M8G	3 m
10 V/m	80 MHz - 1 GHz 1 GHz - 6 GHz	150W1000B 75S1G6C	ATR80M6G ATT700M12G	3 m
3V/m	80 MHz - 1 GHz 1 GHz - 6 GHz	150W1000B 30S1G6C	ATR80M6G ATT700M12G	3 m
1 V/m	80 MHz - 1 GHz 1 GHz - 6 GHz	50W1000D 30S1G6C	ATR80M6G ATT700M12G	3 m

The test field strength column gives values of the unmodulated carrier signal. For testing of equipment, this carrier signal is 80% amplitude modulation with a 1 kHz sine wave to simulate actual threats.

## Fully Integrated Test System



## AR Amplifier Line Up Identification

- "A" Solid-State Series: 10 kHz - 400 MHz
- "W" Solid-State Series: 80 MHz - 1 GHz
- "U" Solid-State Series: 10 kHz - 1 GHz
- "S" Solid-State Series: 1.0 - 18 GHz
- "T" Series - TWTAs: 1 - 45 GHz & CW from 15 - 2000 W
- "TP" Series - Pulsed TWTAs: 1 - 18 GHz, from 1000 - 10,000 W

AR Products For High Field Strength Applications				
Frequency	Amplifier Model	Amplifier Power (W)	Modulation Capabilities	Antenna
10 kHz - 225 MHz	12500A225A-L	12,500	CW, AM, FM Pulse	ATR26M1G
80 MHz - 1 GHz	2000W1000A	2,000		ATH800M6G
1 - 6 GHz	750S1G6C	750 (1 - 4.2 GHz) 500 (4.2 - 6 GHz)		ATH6G18A
6 - 18 GHz	250T6G18	250		ATH18G27A
18 - 26.5 GHz	200T18G26z5A	200		ATH26G40A
26.5 - 40 GHz	200T26z5G40A	200		ATH33G50
1 - 2 GHz	8000SP1G2	8,000	Pulse Only	Contact AR for Info
2 - 4 GHz	10000SP2G4	10,000		ATH2G4
4 - 8 GHz	7400TP4G8	7,400		ATH4G8M2
8 - 12 GHz	20000TP8G12	20,000		Contact AR for Info
12 - 18 GHz	5700TP12G18	5,700		Contact AR for Info

## Conducted Susceptibility

MIL-STD-461 E/F/G

Conducted Susceptibility  
Bulk Cable Injection, 4 kHz - 200 MHz  
Max Level (dBuA) per Platform

Aircraft (External or Safety Critical)	Aircraft Internal	All Ships (Above Decks) & Submarine (External) *	Ships (Metallic) (Below Deck)	Ships (Non-Metallic) (Below Deck) **	Submarine (Internal)	Ground	Space
109	109	109	83	97	83	97	89

\* For equipment located external to the pressure hull of a submarine but within the superstructure, use SHPS (Metallic) (Below Decks).  
\*\* For equipment located in hanger deck of Aircraft Carriers

## MIL-STD-461/CS114 Bulk Cable Injection Test Configuration

Figure CS114.4 Bulk Cable Injection Evaluation

## Basic Test Standard

IEC 61000-4-6

Level	Voltage Level (e.m.f.)			
	U <sub>1</sub> dB (μV)	U <sub>2</sub> V	U <sub>3</sub> V	U <sub>4</sub> V
1	120	1.20	1	1
2	129.5	3	3	3
3	140	10	10	10
x <sup>a</sup>	Special			

\*x is an open level

## Automotive High Level

Conducted Susceptibility Requirements

ISO 11452-4 Bulk Current Injection (BCI) Example of Test Severity Level				
Test Severity Level	Test Level (mA) for Given Frequency Range			
	0.1 - 1 MHz	1 - 3 MHz	3 - 200 MHz	200 - 400 MHz
I	20	60 x f <sup>1/3</sup>	60	60 x 200/f <sup>2</sup>
II	33	100 x f <sup>1/3</sup>	100	100 x 200/f <sup>2</sup>
III	50	150 x f <sup>1/3</sup>	150	150 x 200/f <sup>2</sup>
IV	66	200 x f <sup>1/3</sup>	200	200 x 200/f <sup>2</sup>
V	Specific values agreed between the users of ISO 11452-4			

\*frequency (f) is in MHz

## AR Products Capable of Producing IEC 61000-4-6 Conducted Levels

Conducted Immunity Selection Guide					
Device Type	Application	Model	Calibration Fixture	Attenuators	Probe
Bulk Current Injection	IEC Commercial Testing	BI00250	CF00250	AF06250, AF10050, AF20050	BP00250, BP00251
Bulk Current Injection	Military Testing to MIL-STD-461 CS114 & DO-160 (10 kHz - 400 MHz)	BI00400	CF00400	AF06250, AF10050, AF20050	BP0400 & BP00100
Bulk Current Injection	Automotive Testing 1 MHz - 400 MHz	BI00401	CF00400	AF10050, AF20050	BP00400
EM Clamp	IEC Commercial Testing	EM10123 (100 Wmax)	EM10123CF	AF06250, AF10050, AF20050	BP00250, BP00251
EM Clamp	IEC Commercial Testing	EM10132 (125 Wmax)	EM10132CF	AF06250, AF10050, AF20050	BP00250, BP00251

## IEC 61000-4-6 Conducted Immunity CDN Test Setup

