



Application Note 33A

Equipment Packages configured for **RADIATED IMMUNITY TESTING** per the European Union's **EMC DIRECTIVES (2004/108/EC & 89/336/EEC)** and the **MEDICAL DEVICES DIRECTIVE (MDD 93/42/EEC)**

To test for either of the two EMC DIRECTIVES, select package A, B, C, or D

PACKAGE A

Use to test for the Generic Immunity of Residential and Light Industrial equipment at a distance of **1 meter** from an antenna per EN 61000-6-1

| | | | |
|-----------------|----------------|---------------|-----------------|
| Frequency range | 80 MHz - 1 GHz | 1 GHz - 2 GHz | 2 GHz - 2.7 GHz |
| Field Level | 3 V/m | 3 V/m | 1 V/m |
| Modulation | 80% 1 kHz AM | 80% 1 kHz AM | 80% 1 kHz AM |

| <u>Model</u> | <u>Description</u> | <u>Frequency</u> | <u>Power</u> |
|--------------|--------------------------|--------------------|----------------|
| 10W1000C | RF Power Amplifier | 500 kHz - 1000 MHz | 10 Watts |
| 1S1G4A | RF Power Amplifier | 0.8 - 4.2 GHz | 1 Watt |
| DC3001A | Dual Directional Coupler | 100 kHz - 1000 MHz | 100 Watts |
| DC7144A | Dual Directional Coupler | 0.8 - 4.2 GHz | 400 Watts |
| AT6080 | Log-Periodic Antenna | 80 MHz - 6 GHz | 3000 Watts |
| PM2002 | Power Meter | | |
| PH2000 | Power Head | 10 kHz - 8 GHz | -60 to +20 dBm |
| MP06000 | Field Monitoring Package | 100 kHz - 6 GHz | |
| SG6000 | Signal Generator | 100 kHz - 6 GHz | |
| SW1006 | EMC Test Software | | |

PACKAGE B

Use to test for the Generic Immunity of Residential and Light Industrial equipment at a distance of **3 meters** from an antenna per EN 61000-6-1

| | | | |
|-----------------|----------------|---------------|-----------------|
| Frequency range | 80 MHz - 1 GHz | 1 GHz - 2 GHz | 2 GHz - 2.7 GHz |
| Field Level | 3 V/m | 3 V/m | 1 V/m |
| Modulation | 80% 1 kHz AM | 80% 1 kHz AM | 80% 1 kHz AM |

| <u>Model</u> | <u>Description</u> | <u>Frequency</u> | <u>Power</u> |
|--------------|--------------------------|--------------------|----------------|
| 30W1000B | RF Power Amplifier | 1 - 1000 MHz | 30 Watts |
| 10S1G4A | RF Power Amplifier | 0.8 - 4.2 GHz | 10 Watts |
| DC3001A | Dual Directional Coupler | 100 kHz - 1000 MHz | 100 Watts |
| DC7144A | Dual Directional Coupler | 0.8 - 4.2 GHz | 400 Watts |
| AT6080 | Log-Periodic Antenna | 80 MHz - 6 GHz | 3000 Watts |
| PM2002 | Power Meter | | |
| PH2000 | Power Head | 10 kHz - 8 GHz | -60 to +20 dBm |
| MP06000 | Field Monitoring Package | 100 kHz - 6 GHz | |
| SG6000 | Signal Generator | 100 kHz - 6 GHz | |
| SW1006 | EMC Test Software | | |

PACKAGE C

Use to test for the Generic Immunity of Heavy Industrial equipment
at a distance of **1 meter** from an antenna per EN 61000-6-2

| Frequency range | 80 MHz - 1 GHz | 1 GHz - 2 GHz | 2 GHz - 2.7 GHz |
|-----------------|----------------|---------------|-----------------|
| Field Level | 10 V/m | 3 V/m | 1 V/m |
| Modulation | 80% 1 kHz AM | 80% 1 kHz AM | 80% 1 kHz AM |

| <u>Model</u> | <u>Description</u> | <u>Frequency</u> | <u>Power</u> |
|--------------|--------------------------|--------------------|----------------|
| 30W1000B | RF Power Amplifier | 1 - 1000 MHz | 30 Watts |
| 1S1G4 | RF Power Amplifier | 0.8 - 4.2 GHz | 1 Watt |
| DC3001A | Dual Directional Coupler | 100 kHz - 1000 MHz | 100 Watts |
| DC7144A | Dual Directional Coupler | 0.8 - 4.2 GHz | 400 Watts |
| AT6080 | Log-Periodic Antenna | 80 MHz - 6 GHz | 3000 Watts |
| PM2002 | Power Meter | | |
| PH2000 | Power Head | 10 kHz - 8 GHz | -60 to +20 dBm |
| MP06000 | Field Monitoring Package | 100 kHz - 6 GHz | |
| SG6000 | Signal Generator | 100 kHz - 6 GHz | |
| SW1006 | EMC Test Software | | |

PACKAGE D

Use to test for the Generic Immunity of Heavy Industrial equipment
at a distance of **3 meters** from an antenna per EN 61000-6-2

| Frequency range | 80 MHz - 1 GHz | 1 GHz - 2 GHz | 2 GHz - 2.7 GHz |
|-----------------|----------------|---------------|-----------------|
| Field Level | 10 V/m | 3 V/m | 1 V/m |
| Modulation | 80% 1 kHz AM | 80% 1 kHz AM | 80% 1 kHz AM |

| <u>Model</u> | <u>Description</u> | <u>Frequency</u> | <u>Power</u> |
|--------------|--------------------------|------------------|---------------|
| 150W1000 | RF Power Amplifier | 80 - 1000 MHz | 150 Watts |
| 10S1G4A | RF Power Amplifier | 0.8 - 4.2 GHz | 10 Watts |
| DC6180A | Dual Directional Coupler | 80 - 1000 MHz | 600 Watts |
| DC7144A | Dual Directional Coupler | 0.8 - 4.2 GHz | 400 Watts |
| AT6080 | Log-Periodic Antenna | 80 MHz - 6 GHz | 3000 Watts |
| PM2002 | Power Meter | | |
| PH2000 | Power Head | 10 kHz - 8 GHz | -60 to +20dBm |
| MP06000 | Field Monitoring Package | 100 kHz - 6 GHz | |
| SG6000 | Signal Generator | 100 kHz - 6 GHz | |
| SW1006 | EMC Test Software | | |

Please note that this application note does not address the conducted immunity testing required of the above standards. The CI00250 RF Conducted Immunity Generator has been designed to address this need. Please contact an applications engineer at AR RF/Microwave Instrumentation 800-933-8181 for guidance in applying this product.

MEDICAL DEVICES DIRECTIVE (MDD 93/42/EEC)
For testing to the Medical Directive select packages E or F

PACKAGE E

Use to conduct EMC testing of Medical **Non-Life Support** Equipment at a distance of **3 meters** from an antenna per EN 60601-1-2, 2nd Edition

| | |
|-----------------|------------------|
| Frequency range | 80 MHz - 2.5 GHz |
| Field Level | 3 V/m |
| Modulation | 80% 1 kHz AM |
| | 80% 2 Hz AM |

| <u>Model</u> | <u>Description</u> | <u>Frequency</u> | <u>Power</u> |
|--------------|--------------------------|--------------------|---------------|
| 30W1000B | RF Power Amplifier | 1 - 1000 MHz | 30 Watts |
| 10S1G4A | RF Power Amplifier | 0.8 - 4.2 GHz | 10 Watts |
| DC3001A | Dual Directional Coupler | 100 kHz - 1000 MHz | 100 Watts |
| DC7144A | Dual Directional Coupler | 0.8 - 4.2 GHz | 400 Watts |
| AT6080 | Log-Periodic Antenna | 80 MHz - 6 GHz | 3000 Watts |
| PM2002 | Power Meter | | |
| PH2000 | Power Head | 10 kHz - 8 GHz | -60 to +20dBm |
| MP06000 | Field Monitoring Package | 100 kHz - 6 GHz | |
| SG6000 | Signal Generator | 100 kHz - 6 GHz | |
| SW1006 | EMC Test Software | | |

PACKAGE F

Use to conduct EMC testing of Medical **Life Support** Equipment at a distance of **3 meters** from an antenna per EN 60601-1-2, 2nd Edition

| | |
|-----------------|------------------|
| Frequency range | 80 MHz - 2.5 GHz |
| Field Level | 10 V/m |
| Modulation | 80% 1 kHz AM |
| | 80% 2 Hz AM |

| <u>Model</u> | <u>Description</u> | <u>Frequency</u> | <u>Power</u> |
|--------------|---------------------------|------------------|---------------|
| 150W1000 | RF Power Amplifier | 80 - 1000 MHz | 150 Watts |
| 50S1G4 | RF Power Amplifier | 0.8 - 4.2 GHz | 50 Watts |
| DC6180A | Dual Directional Coupler | 80 - 1000 MHz | 600 Watts |
| DC7144A | Dual Directional Coupler | 0.8 - 4.2 GHz | 400 Watts |
| AT6080 | Log-Periodic Antenna | 80 MHz - 6 GHz | 3000 Watts |
| AT4418 | Double Ridge Horn Antenna | 1 - 18 GHz | 300 Watts |
| PM2002 | Power Meter | | |
| PH2000 | Power Head | 10 kHz - 8 GHz | -60 to +20dBm |
| MP06000 | Field Monitoring Package | 100 kHz - 6 GHz | |
| SG6000 | Signal Generator | 100 kHz - 6 GHz | |
| SW1006 | EMC Test Software | | |

Please note that this application note does not address the conducted immunity testing required of the above standards. The CI00250 can meet all the above standards as per IEC 61000-4-6 requirements. Please contact an applications engineer at AR RF/Microwave Instrumentation 800-933-8181.

General IEC 61000-4-3 Edition 3: 2006 equipment selection

1 Meter Distance of Antenna from the EUT

| Test Level (cal level) | Product Description | Frequency ranges | | |
|---|---------------------|------------------|-------------|--------------|
| | | 80 - 1000 MHz | 1 - 4.2 GHz | 4.2 - 6+ GHz |
| Level 1 1V/m (1.8V/m) | Amplifier | 10W1000C | 1S1G4A | 1S4G11 |
| | Antenna | AT6080 | AT4418 | ☛Same |
| | Directional coupler | DC3001A | DC7144A | DC7440A |
| Level 2 3V/m (5.4V/m) | Amplifier | 10W1000C | 1S1G4A | 1S4G11 |
| | Antenna | AT6080 | AT4418 | ☛Same |
| | Directional coupler | DC3001A | DC7144A | DC7440A |
| Level 3 10V/m (18V/m) | Amplifier | 50W1000B | 5S1G4 | 5S4G11 |
| | Antenna | AT6080 | AT4418 | ☛Same |
| | Directional coupler | DC3002A | DC7144A | DC7440A |
| Level X: Medical/Scooter 20V/m (36V/m) | Amplifier | 150W1000 | 25S1G4A | 15S4G8A |
| | Antenna | AT6080 | AT4418 | ☛Same |
| | Directional coupler | DC6180A | DC7144A | DC7440A |
| Level 4 30V/m (54V/m) | Amplifier | 250W1000A | 50S1G4A | 35S4G8A* |
| | Antenna | AT6080 | AT4418 | ☛Same |
| | Directional coupler | DC6180A | DC7144A | DC7440A |

3 Meter Antenna Distance from EUT

| Test Level (cal level) | Product Description | Frequency ranges | | |
|---|---------------------|------------------|-------------|--------------|
| | | 80 - 1000 MHz | 1 - 4.2 GHz | 4.2 - 6+ GHz |
| Level 1 1V/m (1.8V/m) | Amplifier | 10W1000C | 1S1G4A | 1S4G11 |
| | Antenna | AT6080 | AT4418 | ☛Same |
| | Directional coupler | DC3001A | DC7144A | DC7440A |
| Level 2 3V/m (5.4V/m) | Amplifier | 10W1000C | 10S1G4A | 5S4G11 |
| | Antenna | AT6080 | AT4418 | ☛Same |
| | Directional coupler | DC3001A | DC7144A | DC7440A |
| Level 3 10V/m (18V/m) | Amplifier | 150W1000 | 50S1G4A | 35S4G8A* |
| | Antenna | AT6080 | AT4418 | ☛Same |
| | Directional coupler | DC6180A | DC7144A | DC7440A |
| Level X: Medical/Scooter 20V/m (36V/m) | Amplifier | 500W1000A | 100S1G4 | 35S4G8A* |
| | Antenna | AT6080 | AT4418 | AT4003A |
| | Directional coupler | DC6180A | DC7144A | DC7440A |
| Level 4 30V/m (54V/m) | Amplifier | 1000W1000C* | 200S1G4A* | 90S4G8* |
| | Antenna | AT6080 | AT4418 | AT4003A |
| | Directional coupler | DC6280AM1 | DC7144A | DC7440A |

Note: All the antennas listed above were chosen for their broad beamwidth to meet the 1.5m x 1.5m uniform field requirement at 3 meters. While there are higher gain antennas available that require less power, their narrowband characteristics result in a uniform field that is less than that required. In general, beamwidth is inversely proportional to antenna gain. A case in point is the AT4003A recommended for level 4 testing from 4.2 GHz to in excess of 6 GHz. It is used without the gain enhancer attached to meet 1.5m x 1.5m field uniformity requirement.

* Please refer to Application Note 40A titled Subampability which explains the ability of these amplifiers to be combined to increase power and/or be separated to use sections in different locations.

Additional recommended equipment

MP06000 RF field monitor and laser power probe for 16 point field calibration

SG6000 Signal generator (100 kHz - 6 GHz)

PM2002 & PH2000 power meter and head for monitoring forward RF power from the amplifier

SC1000 RF System Controller switch matrix to facilitate system integration and reconfiguration

SW1006 RF Test Software to fully automate testing

Complete systems can be custom designed to meet your unique requirements. Please contact an applications engineer at 1-800-933-8181 to discuss your needs.