EFG-3 and EFG-3B E-Field Generating Antennas

10 kHz – 220 MHz • 1000-2000 watts, Minimum Rated Power

The EFG-3 E-Field generating antenna is designed to generate strong electric field intensities within its vicinity for use in radiated susceptibility testing systems. The EFG-3 provides a means for dissipating any unused power through the use of a conventional coaxial 50 ohm termination of appropriate power handling capability. This allows the EFG-3 to handle up to 1000 watts of continuous power and 2000 watts for the EFG-3B.

The EFG-3 is able to perform in such an efficient manner due to its physical configuration as a radiating transmission line. Highly efficient and conservatively rated broadband transformers are used for impedance matching. This unique matching configuration allows the best possible power to field conversion efficiency by stepping up the source voltage to twice the input value.

The EFG-3 can be rotated on its boom axis for both vertical and horizontal polarization and can be combined in multiple bank arrays for an increased useable test area. Pivoting extensions of the top and bottom edges provide access to the area of highest voltage differential such that E-Field intensity can be maximized for testing small objects under extreme field conditions, typically several hundred volts per meter. The EFG-3 offers a matched load to the driving source over its entire useable frequency range.

Features Include:

- **Presents a uniform load to driving power source**
- **Provides broad area of useful field**
- **High RF power to E-Field conversion efficiency**
- **Parallel plate mode for high E-Field testing**
- **Ideal for automatic swept field susceptibility testing**
- **Suitable for intensive testing for small objects less than 1/2 meter in their longest dimension.**

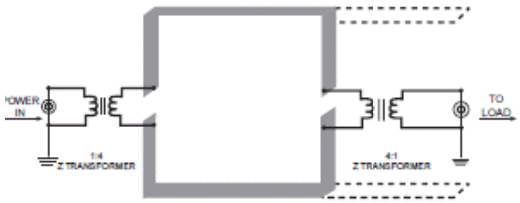


Fig. 1

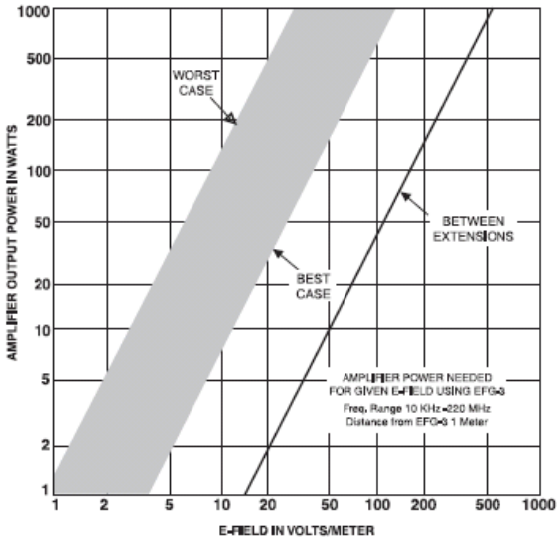
IFI EFG Antenna Specifications	
Power Handling Capability	EFG-3 up to 1000 watts continuous CW input EFG-3B up to 2000 watts continuous CW input
Frequency Range	10kHz to 220 MHz
Input Impedance	50 ohms nominal
Output Port Impedance	50 ohms nominal
VSWR	Less than 4:1 at all frequencies, reflections included
Physical Size	Main antenna element: 1 meter x 1 meter x 10 centimeters (LxWxD)
Load Required	50 Ohm, standard coaxial termination, with power rating appropriate for source
Connectors	EFG-3 Type N Female EFG-3B Type SC Female

EFG-3 and EFG-3B E-Field Generating Antennas

10 kHz – 220 MHz • 1000-2000 watts, Minimum Rated Power

Additional Specifications

Fig. 2



The EFG-3 radiating system is small enough to be physically manageable and portable, but large enough to provide efficient conversion of RF power into a uniform electric field over a useful physical area. This high efficiency is obtained in several ways. As shown in Fig. 1, broadband transformers are used to step up the 50 ohm input impedance to 200 ohms. This is the design impedance of the terminated loop antenna system. Voltage between the upper and lower edges of the antenna system then becomes approximately twice that of the driving source. For example, a 25 watt power source will cause a 54 volt rms differential, after passing through the step up transformer. Since the upper and lower edges of the antenna are spaced at 1 meter, any point in the plane of the antenna (and between these two edges) will have an E-Field gradient of twice the applied voltage, measured in volts per meter. Furthermore, the upper and lower edges of the EFG-3 are equipped with pivoting projections that can be used to form an extended transmission line mode of operation at the outer surface of the antenna. Small objects (less than 1/2 meter in size) can be placed between the opening and will be subjected to the corresponding field intensity as a function of the applied voltage.

For objects too large to be placed between these extensions, the EFG-3 may be used in an E-Field radiating mode. Fig. 2 shows the typical power required to generate a given field strength at a distance of 1 meter from the plane surface of the antenna. E-Field radiation is a non-linear function of frequency, which accounts for the wide band of related power and field strength, taking into account best and worst case conditions. Reflections can cause perturbations in the field distribution and widen the effective curve width for a given power input and desired E-Field. In selecting a power source for use with the EFG-3, allowances should be made for these effects. The source should be capable of supplying sufficient power for the worst case conditions, under given use for the full frequency spectrum. Furthermore, there should be sufficient control over the power source to permit attenuation for use under best case conditions. Unlike similar high power antennas intended for EMC/Susceptibility testing, the unused power is not dissipated in the EFG-3 itself. A second set of broadband transformers are employed to return the balanced loop 200 ohm termination impedance to an unbalanced 50 ohm output; this allows system termination with a conventional coaxial load. This output port can be connected directly to a termination capable of dissipating the appropriate power levels. The actual antenna pattern is a cardioid with the null at the feed point where the antenna attaches to its horizontal pipe support. Both input and output connectors are located near this point. The input port of the EFG-3 system does not present an objectionable VSWR for most normal wide band laboratory grade amplifiers over the full rated frequency spectrum. Fig. 3 shows a VSWR plot with respect to frequency for a standard installation.

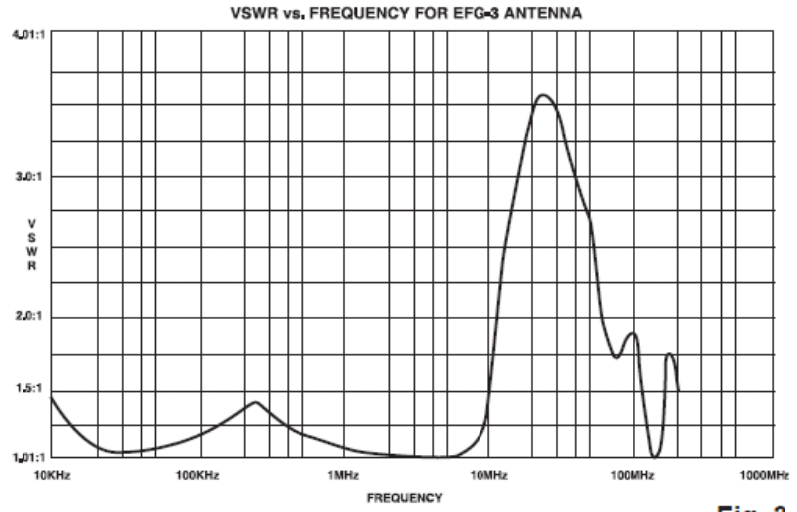


Fig. 3