

# Radio Frequency Environment Generator



The Radio Frequency Environment Generator (REG) is an open area test site capable of high power radiated susceptibility testing over a wide frequency range. It is available to a wide variety of defence and civil customers under the Long Term Partnering Agreement between QinetiQ and the UK MOD. Its extensive capabilities means that we are able to:

- **Accommodate large systems**, such as civil airliners and large transport aircraft
- **Conduct EMC testing in a safe and secure environment** by a dedicated team of experienced personnel
- Provide a wide range of services including **HF, VHF and UHF testing; electro-explosive device (EED) testing and system malfunction monitoring**

Tests are conducted over the frequency range from 5 MHz to 35 GHz using over 170 licensed frequencies with customer-specific frequencies being available subject to licensing requirements. All test equipment is fully automated under software control, which allows for rapid re-configuration and test conduct. Testing of aircraft and systems under engine running conditions is possible as is rotors engaged ground running for helicopters. Radiated testing is conducted using four systems covering the HF, VHF, UHF and microwave frequency bands under rigorous safety procedures which include CCTV safety cameras and strict control of personnel RF exposure.

## HF Testing

Both horizontal and vertical polarisation testing is conducted using separate aerials, powered by a single 25 kw continuous wave (CW) amplifier. For modulated transmissions, this amplifier can achieve 50 kW, generating vertically polarised field strengths in excess of 200 V/m at a distance of 15 m from the aerial. Field strengths for horizontally polarised radiation can reach in excess of 50 V/m and more if the test object can be elevated.

## VHF Testing

Using a 10 kW amplifier with a twin log-periodic aerial, vertical and horizontal polarisation field strengths in excess of 200 V/m ( $106 \text{ W/m}^2$ ) can be generated. Polarisation change can be achieved rapidly by aerial rotation, saving valuable test time.

## UHF Testing

Using an easily rotated horn aerial, field strengths in excess of 150 V/m ( $60 \text{ W/m}^2$ ) are achieved from a 1 kW amplifier.

## Microwave Radiation Testing

Microwave frequency band testing is conducted using a specialist Microwave Radiating System using magnetron sources to generate very high mean and peak field strengths of over 600 V/m ( $1000 \text{ W/m}^2$ ) and 20,000 V/m ( $1 \text{ MW/m}^2$ ) respectively. These fields are circularly polarised and are generated at a distance of 15 m from the aerial at 20 discrete frequencies with beam widths between 0.3 m and 0.6 m wide. Lateral and vertical targeting of the illuminating beam is achieved via remote CCTV. The field strength can be varied using a 20 dB attenuator (1 dB steps) and the Pulse Repetition Frequency (PRF) can be varied between 200 Hz and 1000 Hz. Testing is supplemented where required by mobile microwave test equipment consisting of Travelling Wave Tube (TWT) amplifiers and horns. This testing can also be conducted within a large Anechoic Test Facility (31 m x 17 m x 7.5 m).

## System Malfunction Monitoring

In addition to the site safety cameras, hardened cameras are provided to monitor for system disturbance. These cameras can be located either internally or externally to the system under test. Communications from the facility control room to test personnel/pilots is by UHF radio link or fibre optic comms adapters. Fibre optic links are also available to measure induced currents in system cables. In order to test system operation a range of system stimuli are available, including IFF test sets. A fibre optic controlled compressed air remote actuation system is available to perform some of the most common and simple switching tasks.

## Electro-explosive Device (EED) Testing

In order to ensure safety in the RF environment, EEDs can be instrumented using a fibre optic system to monitor temperature rise in the EED bridgewire. Results are then scaled to provide a safe operating environment in line with Def Stan 59-411.



*EED testing on a Tornado aircraft*

## Location and Additional Services

The REG is situated on an active airfield, providing direct access from taxiways to the facility, and the availability of all airfield services for towing and supporting aircraft. Road access is also excellent, being situated close to main trunk roads for convenient transport of land systems such as Main Battle Tanks.

Additional services include complete evaluation and test such as system reviews, test design, data analysis and reporting. These services are available as part of a combined test team package or as an independent service.

Customer facilities include a dedicated test monitoring station in the control room, including

Flat panel monitors, DVD recorders and a mirror of the REG control computer display. Additionally, a crew room with full facilities for system support personnel, a meeting room and a secure document/equipment storage cabinet are available. Test systems can be securely stored overnight in a Hardened Aircraft Shelter.

Customer Contact

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## REG Technical Details

Frequencies below 1 GHz

Band	Frequency	Polarisation	Nominal Field Strength
HF	5-30 MHz	Vertical Horizontal	200 V/m 50 V/m
VHF	30-200 MHz	Vertical Horizontal	200 V/m (106 W/m <sup>2</sup> ) 200 V/m (106 W/m <sup>2</sup> )
UHF	200-1000 MHz	Vertical Horizontal	150 V/m (60 W/m <sup>2</sup> ) 150 V/m (60 W/m <sup>2</sup> )

## Modulation

1 Hz or 1 kHz amplitude modulation, or as required

Frequencies above 1 GHz

Frequency	Polarisation	Nominal Field Strength
1-10 GHz	Circular	Mean 600 V/m (1000 W/m <sup>2</sup> ) Peak 20,000 V/m (1 MW/m <sup>2</sup> )
10-35 GHz	Circular	Mean 200 V/m (100 W/m <sup>2</sup> ) Peak 6000 V/m (0.1 MW/m <sup>2</sup> )

**Pulse Repetition Frequency:** 200 Hz – 1000 Hz