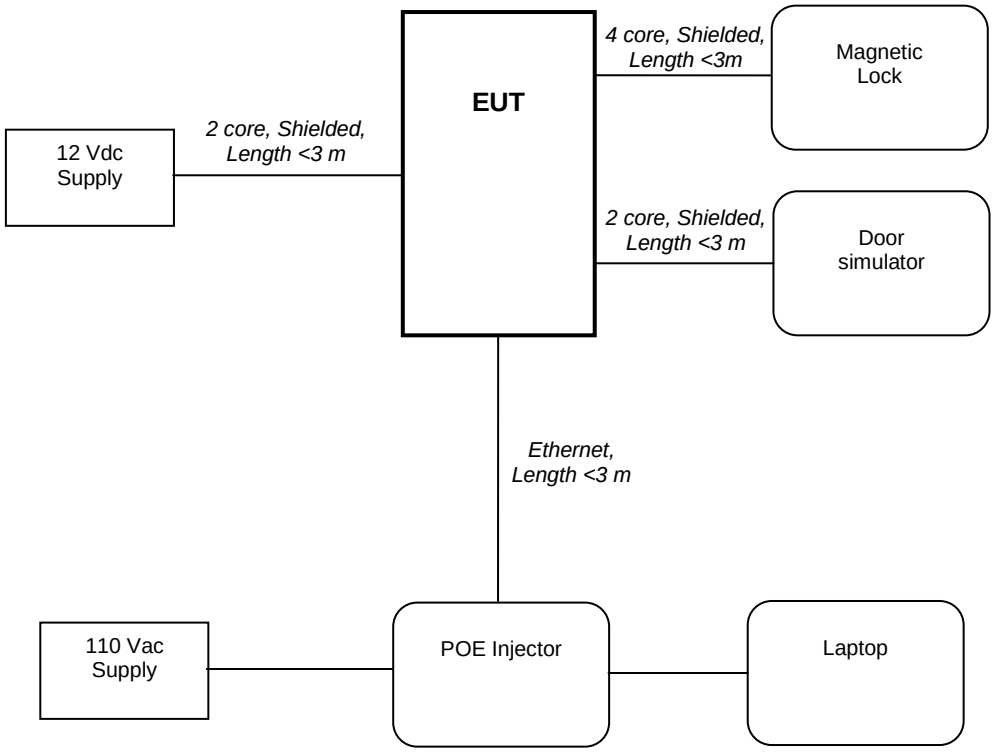
9 EUT Test Setup

9.1 Block Diagram

The following diagram shows basic EUT interconnections with cable type and cable lengths identified.



Note: The EUT was tested in two different configurations. The above diagram illustrates both modes with the equipment powered via an external 12 Vdc power supply and via POE. When EUT is powered from POE injector, 12 V dc supply was not connected and the connecting cable was not present. When it is powered by 12 V dc supply, power supply of POE injector was not connected.

9.2 General Set-up Photographs

The following photograph shows basic EUT set-up:

11.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure i, the EUT fundamental frequency was maximised by rotating the EUT through 360º, in three orthogonal planes, and adjusting the measurement antenna azimuth.

Radiated electromagnetic emissions from the EUT are checked first by preview scans. Preview scans for all spectrum and modulation characteristics are checked, using a peak detector and where applicable worst-case determined for function, operation, orientation, etc. for both vertical and horizontal polarisations. Pre-scan plots are shown with a peak detector and 9 kHz RBW.

If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.10 are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed, (see EUT setup photographs for more detail).

Emissions between 9 kHz and 30 MHz are measured using a calibrated 60cm active loop antenna. Pre-amplifiers and filters are used where required. Care is taken to ensure that test receiver resolution bandwidth, video bandwidth and detector type(s) meet the regulatory requirements.

Power values measured on the test receiver / analyzer are converted to field strength, FS, in µV/m at the regulatory distance, using:

$$FS = 10^{(PR - CF) / 20}$$

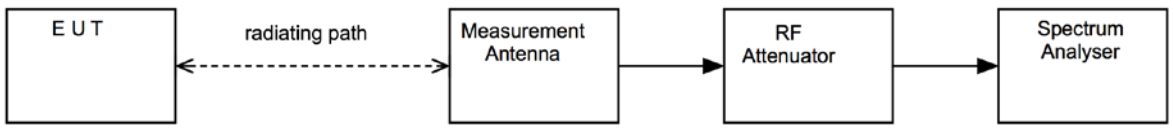
Where,

PR is the power recorded on the receiver / spectrum analyzer in dBµV and includes any cable loss, antenna factor and pre-amplifier gain;
CF is the distance extrapolation factor in dB (where measurement distance different to limit distance);

Per FCC 47CFR15.31(f)(2) / RSS-Gen 6.4, an extrapolation factor of 40 dB per decade was used for measurements at distances closer than specified.

This field strength value is then compared with the regulatory limit.

Figure i Test Setup



Test Setup Photograph(s)

11.4 Test Equipment

Equipment Description	Manufacturer	Equipment Type	TRaC No	Last Cal Calibration	Calibration Period	Due For Calibration
Loop Antenna	R&S	hfh2	L007	10/04/2015	24	10/04/2017
Receiver	R&S	ESHS10	UH003	25/06/2015	12	25/06/2016

12.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure ii, the emissions from the EUT were measured on a spectrum analyzer / EMI receiver.

Radiated electromagnetic emissions from the EUT are checked first by preview scans. Preview scans for all spectrum and modulation characteristics are checked, using a peak detector and where applicable worst-case determined for function, operation, orientation, etc. for both vertical and horizontal polarisations. Pre-scan plots are shown with a peak detector and 100kHz RBW.

If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.10 are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed, (see EUT setup photographs for more detail).

Emissions between 30 MHz and 1 GHz are measured using calibrated broadband antennas. Emissions above 1 GHz are characterized using standard gain horn antennas. Pre-amplifiers and filters are used where required. Care is taken to ensure that test receiver resolution bandwidth, video bandwidth and detector type(s) meet the regulatory requirements.

For both horizontal and vertical polarizations, the EUT is then rotated through 360 degrees in azimuth until the highest emission is detected. At the previously determined azimuth the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected, this maximum value is recorded.

Power values measured on the test receiver / analyzer are converted to field strength, FS, in dBµV/m at the regulatory distance, using:

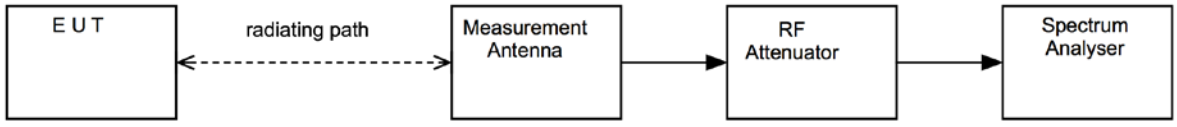
$$FS = PR + CL + AF – PA + DC – CF$$

Where,

PR is the power recorded on the receiver / spectrum analyzer in dBµV;
CL is the cable loss in dB;
AF is the test antenna factor in dB/m;
PA is the pre-amplifier gain in dB (where used);
DC is the duty correction factor in dB (where used, e.g. harmonics of pulsed fundamental);
CF is the distance factor in dB (where measurement distance different to limit distance);

This field strength value is then compared with the regulatory limit.

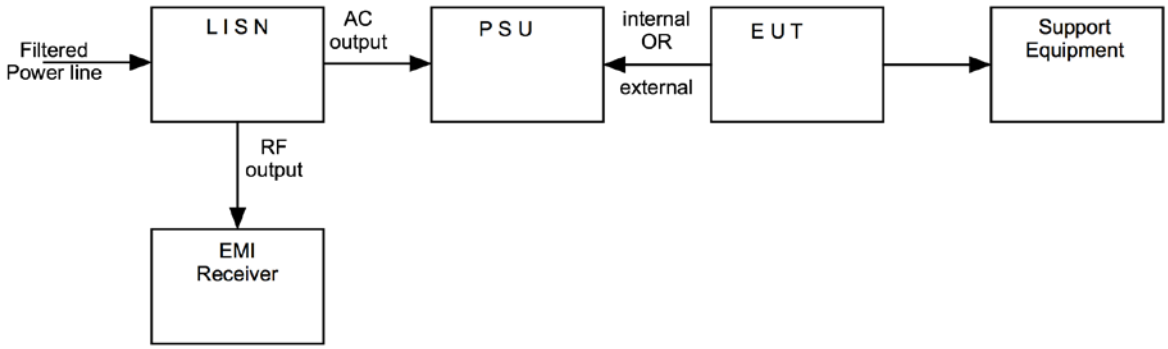
Figure ii Test Setup



Test Setup Photograph(s)

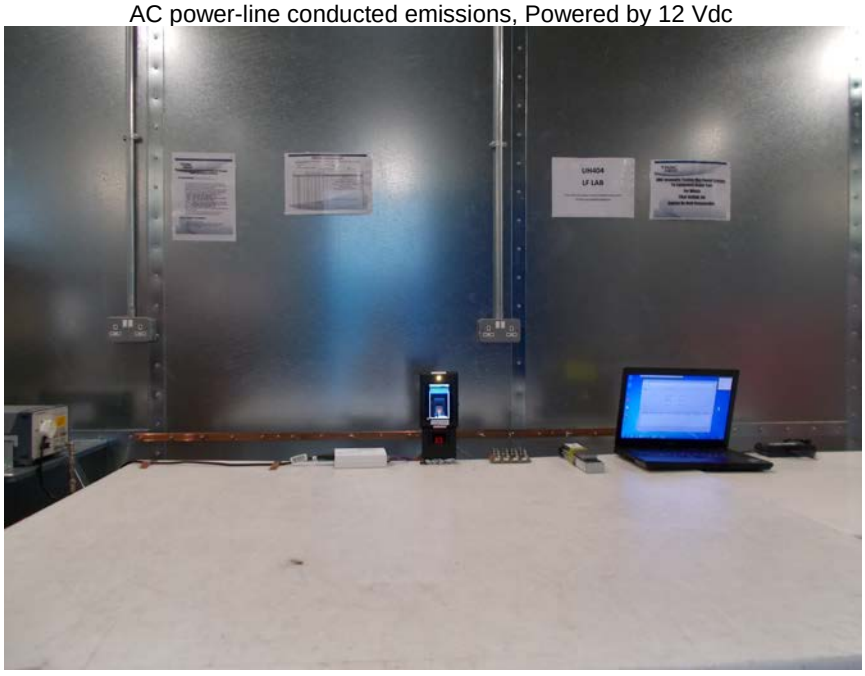
12.4 Test Equipment

Equipment Description	Manufacturer	Equipment Type	TRaC No	Last Cal Calibration	Calibration Period	Due For Calibration
Spectrum Analyser	R&S	FSU26	REF909	13/02/2015	12	13/02/2016
Radio Chamber - PP	Rainford EMC	ATS	REF940	08/09/2014	24	08/09/2016
IC Reg Radio Chamber - PP	Rainford EMC	ATS	REF940	19/11/2014	36	08/09/2017
1-18GHz Horn	EMCO	3115	L138	17/10/2013	24	17/10/2015
Bilog	Chase	CBL611/A	UH191	26/02/2015	24	26/02/2016
Pre Amp	Agilent	8449B	L572	10/02/2015	12	10/02/2016
Receiver	R&S	ESVS10	L317	26/02/2015	12	26/02/2015



Test Setup Photograph(s)

AC power-line conducted emissions, Powered by 12 Vdc



AC power-line conducted emissions, Powered by POE