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Certificate of Calibration

0478

LUMILOOP FIELD STRENGTH ANALYZER
Probe Type: LS Probe 1.2 S/N: 16

FOR: LUMILOOP GmbH
Nöthnitzer Str 64
Dresden
D-01187
Germany

DATE(S) OF CALIBRATION: 8 February 2017

The United Kingdom Accreditation Service (UKAS) is one of the signatories to the International Laboratory Accreditation Co-operation (ILAC) Arrangement for the mutual recognition of calibration certificates.

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Signed:
Name: G J E Pask

(Authorised Signatory)
on behalf of NPLML

DESCRIPTION

A broadband isotropic electric field analyser, type LS Probe 1.2, s/n 16.

The probe has a single full scale range of 0.1 V/m to 10 kV/m and is specified for use over the frequency range of 10 kHz to 6 GHz.

The probe is connected to a computer via a computer interface. The interface provides power to the probe via a laser and also communication.

The computer software provided the display and enabled zeroing of the probe.

MEASUREMENT

The calibration of field strength monitors involves the generation of a calculable linearly polarised electromagnetic field, approximating to a plane wave, into which the probes or sensors are placed.

This type of probe has three independent antennas constructed at right angles to each other. All three antennas are switched on during the calibration as in the normal isotropic mode of operation.

At the frequency of 1.3 GHz the probe is positioned in a low reflectivity mount inside a microwave anechoic chamber on the boresight of a linearly polarised horn antenna. The antenna under test is always perpendicular to the direction of propagation and parallel to the electric field.

See Figure 1 on the next page for measurement diagram.

For each frequency and field strength setting, the X axis sensor is aligned with the electric field.

Table 1 – Continuous Wave (CW) Measurements

For each measurement the input power to the test facility is adjusted so that the field strength is set to a specified actual field strength at the plane of reference of the probe. The indicated field strength on the field strength meter is then determined and the correction factor calculated using the definition 1.

Table 2 – Pulse Measurements

For each measurement, the input power to the test facility is adjusted so that the pulse field strength is set to a specified actual pulse field strength at the plane of reference of the probe. The indicated pulse field strength, at the plane of reference of the probe, is then determined and the correction factor calculated using the definition 1.

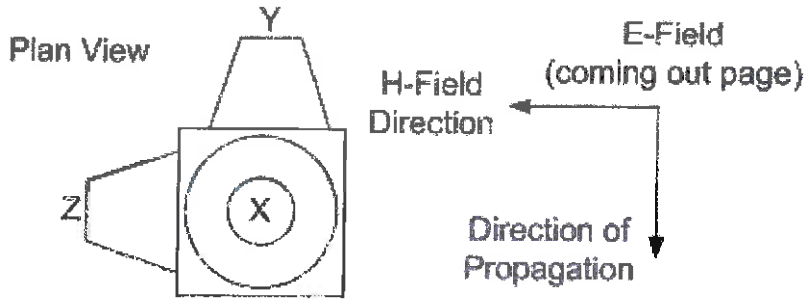
$$\text{Correction Factor} = \frac{\text{Actual Field Strength}}{\text{Indicated Field Strength}} \qquad \textbf{definition 1}$$

The term "field strength" refers to the r.m.s. value of the electric or magnetic wave amplitude.

The following settings were used; low pass filter: 10 Hz, Mode: 0.

The computer software used to control and display the reading of the probe was LSProbe_1.2_GUI, GUI revision 1425.

Figure 1: The orientation used in the Anechoic Chambers



UNCERTAINTIES

The measurement uncertainties apply only when the probe is supported in a low reflectivity mount and used with all three antennas switched on as in the normal isotropic mode of operation.

These lower individual uncertainties apply when the respective sensor is aligned with the incident E-field.

The user should be aware of the effects of reflections from nearby objects, including the human body for hand held applications, and should allow additional measurement uncertainties accordingly.

Table 1 – Continuous Wave (CW) Measurements

These lower uncertainties are summarised in the table below.

± 0.47 dB for the frequency of 1.3 GHz

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements. The results and uncertainties relate to the on-the-day values and make no allowance for drift or operation under other environmental conditions.

Table 2 – Pulse Measurements

The uncertainties apply for a good rectangular pulse. Significant pulse distortion would result in increased uncertainties.

These lower uncertainties are summarised in the table below.

± 0.49 dB for the frequency of 1.3 GHz

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with the ISO Guide to the Expression of Uncertainty in Measurements. The results and uncertainties relate to the on-the-day values and make no allowance for drift or operation under other environmental conditions.

RESULTS

These results have been obtained without any adjustment to the probe sensitivity.

The actual field strength reading must be divided by the appropriate correction factor to give the indicated field strength.

Measurement Temperature 23 °C ± 2 °C

Table 1 - Continuous Wave (CW) Measurements
Probe Type LS Probe 1.2 S/N 16

Frequency GHz	Field Strength V/m		Correction Factor	Uncertainty
	Actual	Indicated		dB
1.30	0.080	0.09	0.93	±0.47
1.30	0.100	0.11	0.95	±0.47
1.30	0.200	0.20	1.01	±0.47
1.30	0.300	0.29	1.02	±0.47
1.30	0.700	0.69	1.02	±0.47
1.30	1.000	0.99	1.01	±0.47
1.30	2.000	1.95	1.03	±0.47
1.30	4.000	3.86	1.04	±0.47
1.30	7.000	6.82	1.03	±0.47
1.30	10.000	9.79	1.02	±0.47
1.30	20.000	19.58	1.02	±0.47
1.30	40.000	38.22	1.05	±0.47
1.30	70.000	67.24	1.04	±0.47
1.30	100.000	95.62	1.05	±0.47
1.30	200.000	192.06	1.04	±0.47
1.30	300.000	288.36	1.04	±0.47
1.30	400.000	394.34	1.01	±0.47
1.30	500.000	485.09	1.03	±0.47
1.30	600.000	583.56	1.03	±0.47
1.30	700.000	682.73	1.03	±0.47

The actual field strength pulse reading must be divided by the appropriate correction factor to give the indicated pulse field strength.

Measurement Temperature 23 °C ± 2 °C

Table 2 - Pulse Measurements
Probe Type LS Probe 1.2 S/N 16

Frequency GHz	Field Strength V/m		Pulse Width	PRF	Correction Factor	Uncertainty
	Actual	Indicated	µS	kHz		dB
1.3	149.2	142.0	3.0	0.30	1.05	±0.49
1.3	249.2	238.0	3.0	0.30	1.05	±0.49
1.3	298.0	286.0	3.0	0.30	1.04	±0.49
1.3	595.5	565.0	3.0	0.30	1.05	±0.49
1.3	598.8	570.2	100.0	0.30	1.05	±0.49

PLEASE NOTE

All Pulse Measurements are outside of our UKAS Scope and accreditation but are traceable to national standards.