Commission for Communications Regulation
An Coimisiún um Rialáil Cumarsáide

1 Dockland Central, Guild St, Dublin 1
1 Lárcheantar na nDugaí, Sráid na nGildeanna, BÁC 1
Tel | Teil +353 1 804 9600
www.comreg.ie

1. Survey Summary

Address of Transmitter Site Surveyed:	Water Tower, Park View, Edenderry, Co. Offaly.
Survey Date:	04/11/2025
Base Station ID's:	EIR_OY_4215, THR_OF0072, VOD_OY403
Network Operators:	Vodafone/ Three/ EIR
Technologies Measured:	GSM / LTE / NR5G / UMTS
Frequency Bands:	700 / 800 / 900 / 1800 / 2100 / 2300 / 2600 / 3600MHz
Technology Bands:	L7 / L8 / G9 / U9 / L18 / L21 / N21 / L23 / N23 / L26 / N36[1]

1

Measurement Location: (at point of maximum non-ionising radiation near site, approximate distance from site.)	In council car park, beside antenna location.

Measurement Location Coordinates (decimal):	**LAT**	**LONG**
	53.340261	- 7.050247

Purpose and Conduct of Survey:

The purpose of this survey was to assess compliance with the limits for general public exposure to non-ionising radiation (**NIR**) set by the International Commission on Non-Ionising Radiation Protection (**ICNIRP) ("ICNIRP Public Exposure Limits")**.

Compliance with the ICNIRP Public Exposure Limits is a condition of a General Authorisation for an electronic communications network/service as well as of various Wireless Telegraphy licences issued by the Commission for Communications Regulation (**ComReg**).

The survey was conducted by:

- measuring the overall electromagnetic field (**EMF**) present at the point of highest exposure in a public area associated with the designated transmitter site;
- identifying the frequency of the principal emissions contributing to the EMF; and
- measuring the intensity (or level) of same.

Overall Conclusions of the Survey	
Frequency Selective Measurements: (Individual emissions measured at specific frequencies)	**Below ICNIRP Public Exposure Limits [Compliant]**
Total Exposure Quotient: (Assessment of cumulative emissions from multiple transmitters)	**Below ICNIRP Public Exposure Limits [Compliant]**

[1] Where the letters refer to a technology G refers to GSM , L refers to LTE, U refers to UMTS, N refers to NR5G, T refers to Tetra , and the numbers refer to a frequency band 7 refers to 700 MHz, 8 refers to 800 MHz , 9 refers to 900 MHz, 18 refers to 1800 MHz , 21 refers to 2100 MHz , 23 refers to 2300 MHz , 26 refers to 2600 MHz, 36 refers to 3600 MHz and the combination to a technology in a frequency band , L21 refers to LTE in the 2100MHz band , N21 refers to NR5G in the 2100 MHz band , L18 refers to LTE in the 1800 MHz band , N18 refers to NR5G in the 1800 MHz band etc. etc.

2. Surveyors

Survey conducted for ComReg by:	**Compliance Engineering Ireland Ltd.**	COMPLIANCE ENGINEERING IRELAND LTD

Survey Engineer(s):	**Report Writer:**	**Report Reviewer:**
Michael Reilly, BEng	Michael Reilly, BEng	John McAuley, MEng

3. Survey Location Details

Designated Transmitter Site Photo

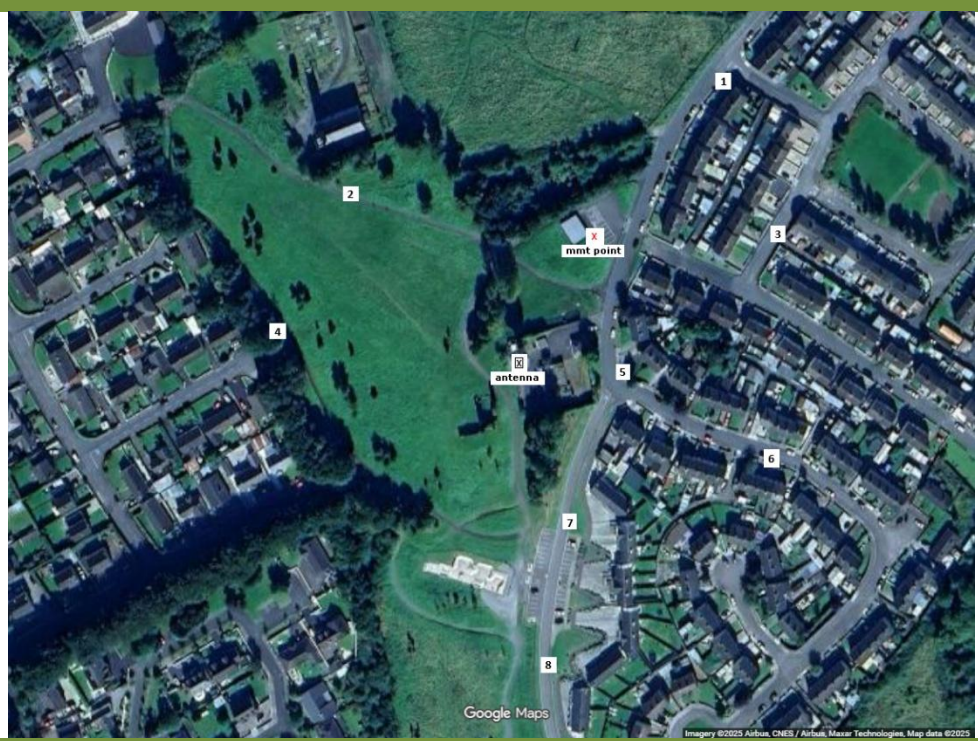
Survey Weather

Sky: Overcast

Temperature:
15° C

Relative Humidity:
52 %

Map(s) of Designated Transmitter Site and Measurement Location (Checks and Final)



Initial measurement point check readings: (approximate)	1. 2.66 V/m 2. 1.46 V/m 3. 1.24 V/m 4. 2.41 V/m	5. 2.06 V/m 6. 2.59 V/m 7. 0.54 V/m 8. 1.04 V/m

4. Introductory Note

Purpose of Survey

The survey of the designated transmitter site (**"Designated Site"**) was commissioned by ComReg as part of its Programme of Measurement of Non-Ionising Radiation. The purpose of the survey was to assess whether NIR (occurring within the radio frequency part of the electromagnetic spectrum) from the Designated Site complied with the limits for general public exposure specified in the guidelines published by ICNIRP ("**ICNIRP Public Exposure Limits"**).[2] Compliance with the ICNIRP Public Exposure Limits is a condition of a General Authorisation for the provision of an electronic communications network/service (e.g. mobile phone and broadcasting networks) as well as of various Wireless Telegraphy licences (in respect of transmitting stations) issued by ComReg.

Survey Methodology

Measurements of the NIR from the Designated Site were conducted in accordance with the methodology outlined in ComReg Document 08/51R4[3]. Once standardised, these methodologies are to be incorporated. Methodologies used in conducting this site reports are listed below;

- European Electronic Communications Committee (**ECC**) Recommendation (02)04[4];
- European Committee for Electrotechnical Standardisation (**CENELEC**) measurement standard EN 50492:2008[5], and
- Measurement techniques developed by the Institut für Mobil- und Satellitenfunktechnik (**IMST**) and the EM-Institut on behalf of the German Federal Office for Radiation Protection.[6]

Additional methodologies to be used in conducting this site report are listed below:

- Measurement techniques as published by Dr. Helmut Keller on behalf of Narda Safety Test Solutions.[7]

Note re this Report Version

If you have downloaded this report from ComReg's Siteviewer[8] or from www.comreg.ie, you are reading an abbreviated version. The full technical version of this report also contains a comprehensive technical record of the measurements and any calculations performed, a list of equipment used, and a technical appendix. A copy of the full report is available upon request from ComReg.

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[2] Current ICNIRP guidelines:

- *"Guidelines for Limiting Exposure to Electromagnetic Fields (100 kHz to 300 GHz)",* ICNIRP, published in 'Health Physics', March 2020, Volume 118, No. 5: https://www.icnirp.org/cms/upload/publications/ICNIRPrfgdl2020.pdf
- *"Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz to 100 kHz)"*, ICNIRP, published in 'Health Physics', December 2010, Volume 99, No. 6: https://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf

[3] https://www.comreg.ie/publication/programme-of-measurement-of-non-ionising-radiation-methodology-for-the-conduct-of-surveys-to-measure-non-ionising-radiation-from-transmission-sites

[4] ECC RECOMMENDATION (02)04, *"Measuring Non-Ionising Electromagnetic Radiation (9 kHz – 300 GHz)"*, ECC, (revised Bratislava 2003, Helsinki 2007): http://www.erodocdb.dk/Docs/doc98/official/pdf/REC0204.PDF

[5] EN 50492:2008, *"Basic standard for the in-situ measurement of electromagnetic field strength related to human exposure in the vicinity of base stations"*, CENELEC, November 2008: http://www.cenelec.eu

[6] See: http://www.bfs.de .

[7] *"On the Assessment of Human Exposure to Electromagnetic Fields Transmitted by 5G NR Base Stations", published in 'Health Physics', November 2019 Volume 117, No.5: https://journals.lww.com/health-physics/fulltext/2019/11000/on_the_assessment_of_human_exposure_to.7.aspx*

8 https://siteviewer.comreg.ie/

5. Survey Overview

Survey Stages

In accordance with the methodology outlined in ComReg Document 08/51R4, this survey was conducted in three stages:

1. **Initial Site Survey**
2. **Full Survey – Broadband Measurements**
3. **Full Survey – Frequency Selective Measurements**

An outline of each stage, along with the results and conclusions of the measurements, are presented in the following three sections.

Measurement of Electromagnetic Fields

Electromagnetic fields (**EMFs**) can be sub-divided into two components:

- Electric field (**E-field**) (measured in volts per metre or "V/m"]; and
- Magnetic field (**H-field)** (measured in amperes per metre or "A/m"].

The E-field and the H-field are mathematically interdependent[9] in the **radiating near-field**[10] and the **far-field**[11]**,** which are located before and beyond a distance of at least the wavelength of the radiated EMF respectively. The measurement locations for most transmitter installations lie well within the far-field, as the wavelengths of the transmitted signals are relatively short, and the antennas are typically located many metres from any public area.

The following table gives examples of wavelengths for some commonly transmitted signals:

Transmitter Type	Frequency	Wavelength
PMR Low Band VHF	68 MHz	4.41 m
UHF TV	470 MHz	0.64 m
GSM 900 (2G mobile base station)	925 MHz	0.32 m
LTE 1800 (4G mobile base station)	1805 MHz	0.17 m
UMTS (3G mobile base station)	2110 MHz	0.14 m
5G NR (5G Mobile base station)	3500 MHz	0.09 m

In the radiating near-field and far-field, only one component needs to be measured, as the other component can be readily derived from it. Normally, it is the E-field which is measured.

In the case of transmitters of very long wavelength signals, such as long wave radio (1.19 km wavelength), the H-field and E-field must be measured separately as the point of measurement will most likely lie within the **reactive near-field**[12] region. In this region, located within a distance of at least the wavelength of the radiated EMF, the relationship between E and H becomes very complex and there is no direct correlation between both components of the EMF.

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[9] $E \approx H \times Z_0$ (Radiating Near Field) and $E = H \times Z_0$ (Far Field), where Z_0 (characteristic impedance of free space) $\approx 377\ \Omega$

[10] Beyond a distance of max(λ, D, $D^2/4\lambda$), where λ is the wavelength and D is the antenna's largest dimension

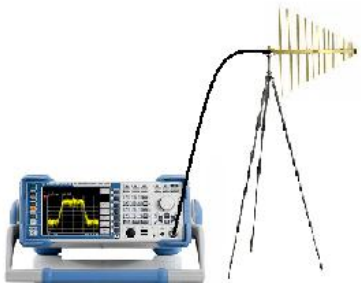
[11] Beyond a distance of max(5λ, 5D, $0.6D^2/\lambda$)

[12] Within a distance of max (λ, D, $D^2/4\lambda$)

Measurement Equipment

The measurement of EMFs is a complex process which involves the use of various meters, spectrum analysers, probes and antennas, appropriate to the frequencies of the emissions being measured.

The table below shows examples of equipment typically used to measure EMFs in NIR surveys.

Initial Site Survey and Broadband Measurements	**Frequency Selective Measurements**	
	**SPECTRUM ANALYSER WITH TRIPOD MOUNTED ANTENNA CONNECTED** 	**PORTABLE SPECTRUM ANALYSER WITH ANTENNA DIRECTLY CONNECTED** 
Used to measure the overall electric or magnetic field present over a range of frequencies (e.g. 100kHz to 3GHz).	Spectrum analysers are used to measure individual emissions at specific frequencies. Individual emissions contribute to the overall EMF. Examples of individual emissions are a TV signal, and a mobile phone signal for a particular mobile operator. There may be a number of emissions from different transmitters contributing to the overall EMF at a particular location.	

6. Initial Site Survey

An initial survey was carried out in the area around the Designated Site in order to determine the point of maximum NIR. This is the location at which the overall E-field strength level measured was somewhat higher than that measured in other areas around the site and represents the highest level of exposure to which a member of the general public might be subjected in the vicinity of the transmitter.

For this initial survey a calibrated field strength meter fitted with a **3 GHz isotropic probe** was used. The meter and probe were used to measure the sum of all electrical fields present at **all frequencies from 100 kHz up to 3 GHz**.

Once the point of maximum NIR was determined, broadband and frequency-selective measurements were conducted at that location (see following two sections). For the duration of those measurements, the various instruments, antennas and probes used were mounted on non-metallic supports.

7. Full Survey – Broadband Measurements

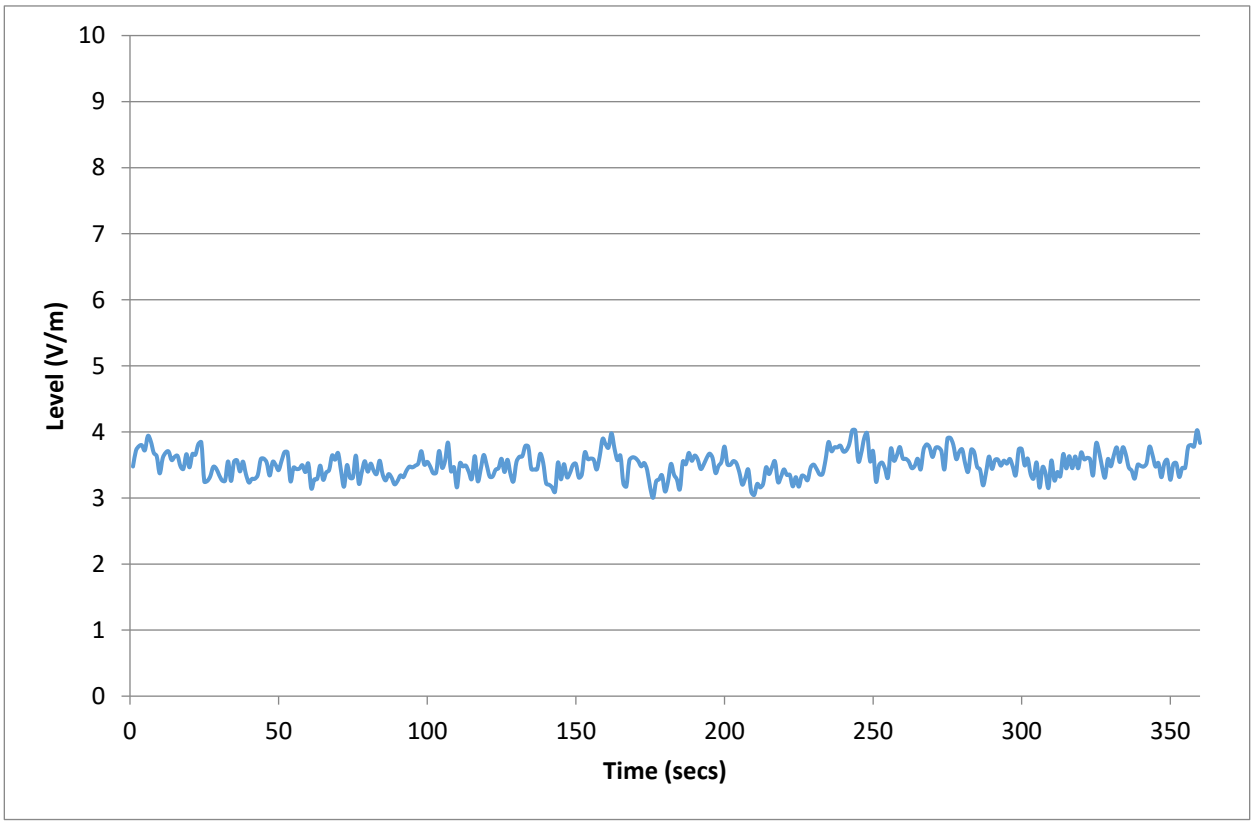
The purpose of these measurements was to get an overview of the intensity of the EMF present at the point of maximum NIR near the Designated Site.

There, the field strength meter (which was mounted on a tripod and fitted with **3GHz isotropic probe)**, was set to record, over a six-minute period, simultaneous measurements of the sum of all received signals within the frequency range of the probe. This measurement was then repeated using a **40 GHz isotropic probe**.

The broadband measurement results presented below show the levels in volts per metre (V/m) recorded during the six-minute period. The average and maximum levels can be compared to the lowest maximum ICNIRP Public Exposure Limits which is 27.7 V/m.

If a broadband measurement is higher than 27.7 V/m, it does not necessarily follow that the ICNIRP Public Exposure Limits have been exceeded because the limits are frequency dependent. A more detailed investigation involving frequency selective measurement is necessary to assess compliance with the ICNIRP Public Exposure Limits (see following section).

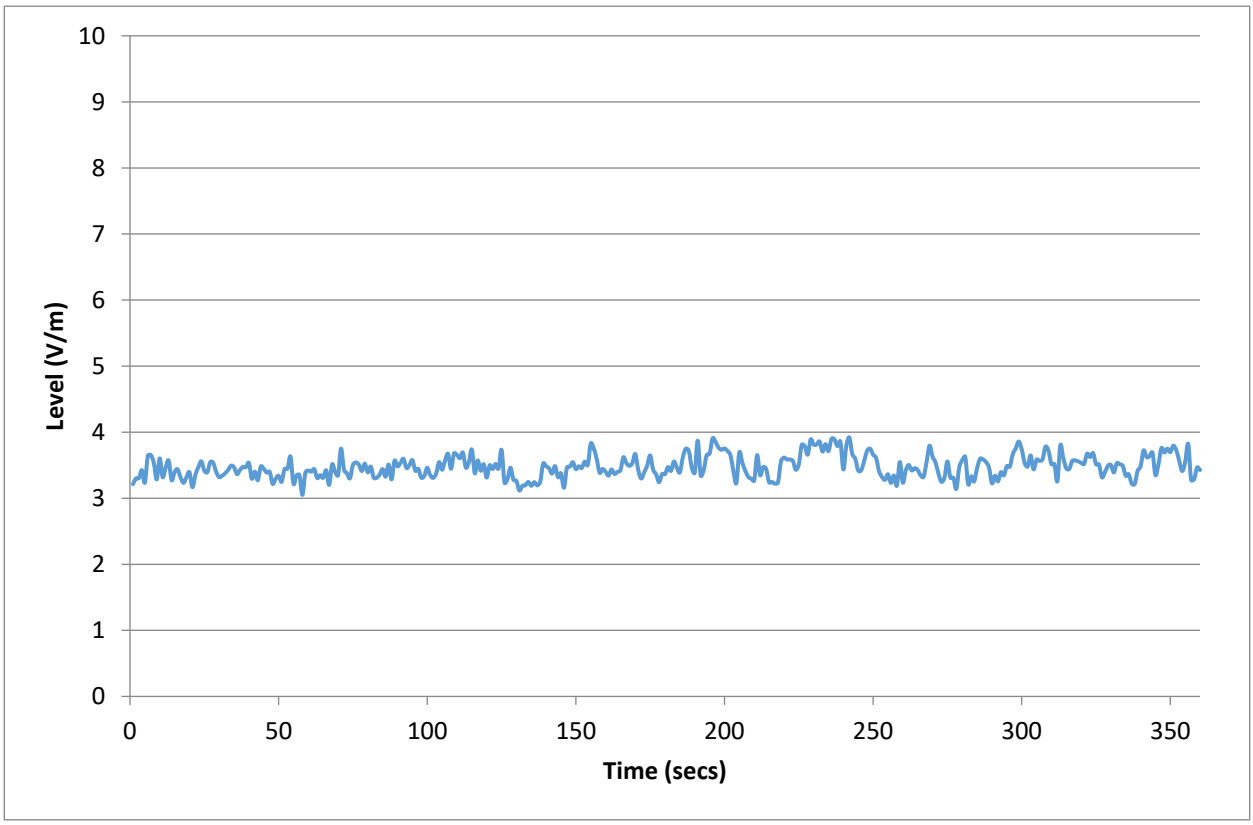
Electric field strengths recorded over 6-minute period using 3 GHz probe at point of maximum NIR



Acquisition Mode: 1 Sec. Sampling

Mean Measurement V/m:	3.50 V/m	**Peak Measurement V/m:**	4.03 V/m
Date:	04/11/2025	**Start Time:**	13:56
Meter:	NBM-550	**Probe:**	EF3091
Frequency Range:	100 kHz – 3 GHz		

Electric field strengths recorded over 6 min period using 40 GHz probe at point of maximum NIR



Acquisition Mode: 1 Sec. Sampling

Mean Measurement V/m:	3.48 V/m	**Peak Measurement V/m:**	3.92 V/m
Date:	04/11/2025	**Start Time:**	14:03
Meter:	NBM-550	**Probe:**	EF 4091
Frequency Range:	27 MHz – 40 GHz		

Conclusion of the Broadband Measurements

The mean and peak measurements were below the lowest ICNIRP guideline limit of 27.7 V/m.

8. Full Survey – Frequency Selective Measurements

Basic Measurement Procedure

A more detailed survey was performed at the point of maximum NIR near the Designated Site to identify the individual transmit frequencies and field strengths of each type of emission - e.g. mobile (GSM, UMTS, LTE and 5G NR), wireless broadband (BWA), television (DVB-T), FM radio - and their contribution to the total EMF.

The measurements were performed using spectrum analyser equipment and a range of antennas to match the frequency bands in which emissions were measured.

Table of Measurement Results

A list of the measurements made is presented in the table on the following page. For each emission measured, the table shows:

- **Emission Type** (e.g. GSM, UMTS, LTE, 5G NR, DVB-T etc);
- Transmission **frequency** of the signal;
- **Measured Level** (in volts per metre (V/m));
- **Adjusted Level** (if applicable to account for the characteristics of certain signal types or to compensate for limitations of measurement equipment or to estimate emissions for maximum call or data traffic); and
- **ICNIRP Public Limit**.

Further details of Adjusted Level/s and ICNIRP Public Exposure Limits are in the explanatory notes which follow the table of measurement results.

Assessment of ICNIRP Compliance of Individual Emissions

The levels for each measured emission (as adjusted where necessary) are compared to the relevant ICNIRP Public Exposure Limit which applies for the particular frequency of the emission. It should be again noted that the ICNIRP Public Exposure Limit varies according to frequency - the limits for the different measurements presented in the tables will vary as the measurements have been performed at different frequencies.

Assessment of ICNIRP Compliance of Cumulative Emissions

The levels measured for individual emissions are used to calculate **Total Exposure Quotients** to assess the cumulative effect of individual emissions from multiple transmitters. Further details of these quotients are in the explanatory notes which follow the table of measurement results.

The calculated values of the Total Exposure Quotients must be ≤ 1 in order for the aggregate of multiple measurements to satisfy the criteria of the ICNIRP Public Exposure Limit.

Table of Frequency Selective Measurement Results					
Emission Type	**Frequency (MHz)**	**Measured Level (V/m)**	**Adjusted Level (V/m)**	**ICNIRP Exposure Limit (V/m)**	**Times below Limit** [adjusted Values]
FM Radio	98.700	0.01449	0.01449	27.7	1911.663
FM Radio	91.300	0.01224	0.01224	27.7	2263.072
FM Radio	93.499	0.00955	0.00955	27.7	2899.613
FM Radio	100.899	0.00841	0.00841	27.7	3295.657
FM Radio	89.100	0.00832	0.00832	27.7	3330.928
FM Radio	101.350	0.00244	0.00244	27.7	11347.808
FM Radio	94.000	0.00214	0.00214	27.7	12949.977
FM Radio	99.250	0.00201	0.00201	27.7	13794.821
FM Radio	91.900	0.00187	0.00187	27.7	14820.760
FM Radio	89.650	0.00177	0.00177	27.7	15632.054
FM Radio	106.175	0.00177	0.00177	27.7	15676.287
FM Radio	103.500	0.00160	0.00160	27.7	17355.890
FM Radio	100.300	0.00153	0.00153	27.7	18116.416
FM Radio	103.750	0.00140	0.00140	27.7	19771.592
FM Radio	90.700	0.00133	0.00133	27.7	20905.660
FM Radio	96.700	0.00119	0.00119	27.7	23316.498
FM Radio	94.900	0.00114	0.00114	27.7	24255.692
FM Radio	94.600	0.00111	0.00111	27.7	24865.350
FM Radio	97.600	0.00108	0.00108	27.7	25671.918
FM Radio	102.700	0.00107	0.00107	27.7	26009.390
T-DAB	214.940	0.00479	0.00479	27.7	5786.505
T-DAB	192.410	0.00415	0.00415	27.7	6677.917
TETRA	redacted	0.04917	0.08516	27.7	325.251
TETRA	redacted	redacted	redacted	redacted	7213.623
TETRA	redacted	redacted	redacted	redacted	7359.688
TETRA	redacted	redacted	redacted	redacted	8364.332
TETRA	redacted	redacted	redacted	redacted	10173.411
TETRA	redacted	redacted	redacted	redacted	10251.668
TETRA	redacted	redacted	redacted	redacted	10726.092
TETRA	redacted	redacted	redacted	redacted	11358.382
TETRA	redacted	redacted	redacted	redacted	11828.848
TETRA	redacted	redacted	redacted	redacted	13141.004
TETRA	redacted	redacted	redacted	redacted	14835.438
TETRA	redacted	redacted	redacted	redacted	15481.706
TETRA	redacted	redacted	redacted	redacted	16072.967
PMR	redacted	0.08713	0.08713	29.4	337.958
PMR	redacted	0.00037	0.00037	29.4	79595.480
PMR	redacted	0.00030	0.00030	29.4	99460.979
DVB-T	587.200	0.00421	0.00496	33.3	6713.430
DVB-T	679.280	0.00413	0.00488	35.8	7346.401
DVB-T	576.880	0.00346	0.00408	33.0	8098.222
DVB-T	640.880	0.00318	0.00375	34.8	9270.622

DVB-T	666.480	0.00307	0.00362	35.5	9792.488
DVB-T	656.240	0.00279	0.00329	35.2	10714.476
DVB-T	492.400	0.00234	0.00276	30.5	11050.040
DVB-T	512.880	0.00217	0.00256	31.1	12160.987
LTE	763.000	0.08650	0.24739	38.0	153.526
LTE	773.000	0.08320	0.23795	38.2	160.658
LTE	783.000	0.11010	0.31489	38.5	122.188
LTE	796.000	0.05630	0.16102	38.8	240.927
LTE	806.000	0.07720	0.22079	39.0	176.802
LTE	816.000	0.11400	0.32604	39.3	120.469
GSM	926.548	1.16300	2.32600	41.9	17.994
GSM	955.798	0.37040	0.74080	42.5	57.383
GSM	947.000	0.35610	0.71220	42.3	59.412
UMTS FDD	932.500	1.56000	5.82554	42.0	7.208
UMTS FDD	937.000	0.56610	2.11400	42.1	19.910
LTE	1815.000	0.11310	0.39622	58.6	147.845
LTE	1830.000	0.20620	0.83412	58.8	70.518
LTE	1855.000	0.22170	0.89682	59.2	66.034
LTE	1875.000	0.28630	1.00298	59.5	59.362
LTE	2160.000	0.27550	1.17363	61.0	51.975
5G NR	2120.000	0.05570	1.43800	61.0	42.420
5G NR	2140.000	0.06320	1.63200	61.0	37.377
LTE	2350.000	0.26050	1.10973	61.0	54.968
5G NR	2320.000	0.01916	0.69971	61.0	87.179
WiFi	2480.050	0.02659	0.04326	61.0	1410.102
WiFi	2426.390	0.02044	0.03325	61.0	1834.375
WiFi	2457.110	0.01968	0.03202	61.0	1905.215
WiFi	2467.350	0.01880	0.03059	61.0	1994.395
WiFi	2439.190	0.01823	0.02966	61.0	2056.754
WiFi	2400.790	0.01803	0.02933	61.0	2079.569
WiFi	2416.150	0.01415	0.02302	61.0	2649.797
WiFi	2411.030	0.01253	0.02039	61.0	2992.388
LTE	2630.000	0.11390	0.48521	61.0	125.718
LTE	2645.000	0.09670	0.35682	61.0	170.953
5G NR	3750.000	0.04449	2.56900	61.0	23.745
WiFi	5661.857	0.00369	0.01571	61.0	3882.852

Total Exposure Quotients [calculated from Adjusted Levels]			
Quotient	**Frequency Range**	**Calculated Quotient Value**	**Limit**
Electrical Stimulation Effects (as per ICNIRP 2010)	**1 Hz to 10 MHz**	n/a	1
Thermal Effects etc. (as per ICNIRP 2020)	**100 kHz and above**	0.030471	1

Overall Conclusions of the Survey	
Frequency Selective Measurements: (Individual emissions measured at specific frequencies)	**Below ICNIRP Public Exposure Limits (Compliant)**
Total Exposure Quotient: (Assessment of cumulative emissions from multiple transmitters)	**Below ICNIRP Public Exposure Limits (Compliant)**

Explanatory Notes

Adjusted Levels

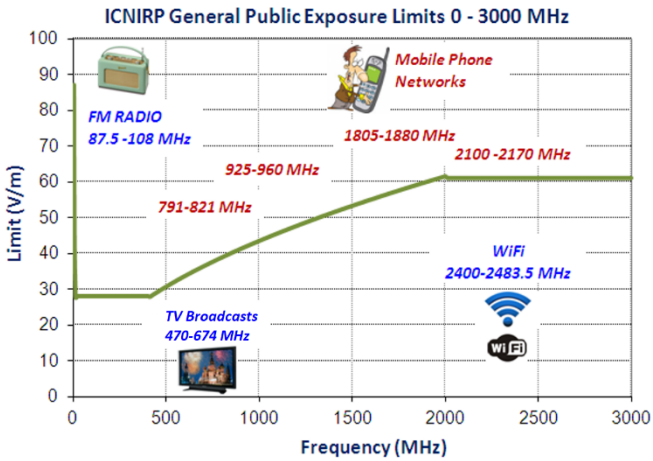
For some emissions, an adjusted level may be required to be derived from the measured level:

(1) to compensate for the limited measurement resolution of the spectrum analyser. For example, a measurement of a DVB-T (digital TV) signal performed with a resolution of 5 MHz needs to be adjusted upwards using a correction factor to account for the energy present within the full 7.61 MHz bandwidth of the signal; and/or

(2) to extrapolate to an estimate of the level under maximum traffic or duty cycle from the transmitter. For example, the base stations of mobile phone networks produce emissions which vary according to the changing volume of calls or data traffic over the course of the day.

ICNIRP Public Exposure Limits

These are set out in the ICNIRP Guidelines as reference levels for the practical assessment of exposure to electric and magnetic fields, as experienced by the general public (excluding occupational exposure and exposure during medical procedures). The limits vary according to the frequency of the emissions as illustrated in the adjacent diagram. For example, the limits for Wi-Fi in the 2400-2483.5 MHz frequency band are higher than those for FM Radio transmissions in the much lower 87.5-108 MHz frequency band.



Total Exposure Quotients

The Total Exposure Quotients (which must be ≤ 1) are calculated in accordance with mathematical formulas specified in the ICNIRP Guidelines to assess the cumulative effect of emissions from multiple transmitters. The quotients in this report are calculated from the Adjusted Levels rather than from the Measured Levels to account for total potential public exposure under maximum traffic conditions.

The two quotients are as follows:

(1) Quotient for Electrical Stimulation Effects (1 Hz to 10 MHz)
This quotient is calculated only in a small number of cases where strong emissions in the frequency range between 1 Hz and 10 MHz are present at the survey location (e.g. near a long wave radio transmitter site). This essentially involves summing the ratios (measured field strength/applicable limit) for each emission.

(2) Quotient for Thermal Effects etc. (100 kHz and above)
The measurements of any emissions above 100 kHz are used to calculate a quotient to assess any thermal (heat) and other effects as per ICNIRP 2020. This essentially involves summing the squares of the ratios (measured field strength/applicable limit) for each emission.

1. Measurement Equipment List

Field Strength Meter

Manufacturer:	Narda
Model:	NBM-550
Serial Number:	A-0068
Calibration Date:	15/04/2025

3 GHz Probe

Manufacturer:	Narda
Model:	EF 0391
Serial Number:	A-0119
Calibration Date:	15/04/2025
Frequency Range:	100 kHz – 3 GHz

40 GHz Probe

Manufacturer:	Narda
Model:	EF 4091
Serial Number:	A-0110
Calibration Date:	15/04/2025
Frequency Range:	27 MHz – 40 GHz

Frequency Selective Measurements

See individual band scans in previous section for details of antennas and spectrum analysers used.

2. Site Photographs

Photo 1. Broadband Measurement location looking towards antennas

Photo 2. Frequency selective measurement location looking towards antennas

APPENDIX 1 – SUMMARY OF THE ICNIRP GUIDELINES

SUMMARY OF THE ICNIRP GUIDELINES FOR LIMITING EXPOSURE TO TIME-VARYING ELECTRIC, MAGNETIC, AND ELECTROMAGNETIC FIELDS (UP TO 300 GHz)

ICNIRP

The International Commission on Non-Ionizing Radiation Protection (**ICNIRP**)[13] is a non-governmental organisation formally recognised by the World Health Organisation. ICNIRP lists among its membership scientific experts in fields relating to non-ionising radiation (**NIR**) protection, such as medicine, dermatology, ophthalmology, epidemiology, biology, photobiology, physiology, physics, electrical engineering and dosimetry.

The functions of ICNIRP are to investigate the hazards that may be associated with the different forms of NIR, develop international guidelines on NIR exposure limits, and deal with all aspects of NIR protection.

ICNIRP provides guidance and recommendations on protection from exposure to NIR. ICNIRP's exposure limits were developed following reviews of peer-reviewed scientific literature, including thermal and non-thermal effects. The standards are based on evaluations of biological effects that have been established to have health consequences.

ICNIRP Guidelines

In relation to time-varying electric, magnetic, and electromagnetic fields (**EMF**) (up to 300 GHz) ICNIRP has published two sets of guidelines:

- *"Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz - 100 kHz)"*, Health Physics 99(6):818-836; 2010[14]. **("ICNIRP 2010 Guidelines")**; and
- *"Guidelines for Limiting Exposure to Electromagnetic Fields (100 kHz to 300 GHz)"*, Health Physics 118 (5): 483-524; 2020[15]. (**"ICNIRP 2020 Guidelines")**.

The ICNRIP 2010 Guidelines and ICNIRP 2020 Guidelines replace the previous recommendations given in the ICNIRP 1998 Guidelines for the frequency range 1 Hz to 300GHz.

In each of the above guidelines, ICNIRP has defined two sets of guideline exposure limits: (i) for members of the general public and (ii) for people classified as occupational (e.g. engineers working on a

[13] For further information see www.icnirp.org.
[14] https://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf
[15] https://www.icnirp.org/cms/upload/publications/ICNIRPrfgdl2020.pdf

transmitter). The occupationally exposed population consists of adults who are generally exposed under known conditions and are trained to be aware of potential risk and to take appropriate precautions.

In contrast, the general public comprises individuals of all ages and of varying health status and may include particularly susceptible groups or individuals. In many cases, members of the public are unaware of their exposure to EMF. Moreover, individual members of the public cannot reasonably be expected to take precautions to minimise or avoid exposure. It is these considerations that underlie the adoption of more stringent exposure restrictions for the public than for the occupationally exposed population.

ICNIRP Limits - Basic Restrictions and Reference Levels

ICNIRP has defined exposure limits in terms of “basic restrictions” and “reference levels”.

Depending on frequency, the physical quantities used to specify the **basic restrictions** on exposure to EMFs are current density, specific absorption rate (SAR), and power density. As SAR is not easily measurable in living people, reference levels have been obtained from the basic restrictions by mathematical modelling and by extrapolation from the results of laboratory investigations at specific frequencies.

Reference levels are provided for comparison with measured values of physical quantities. Compliance with all reference levels identified in the ICNIRP guidelines ensure compliance with the basic restrictions. If measured values are higher than reference levels, it does not necessarily follow that the basic restrictions have been exceeded, but a more detailed analysis is necessary to assess compliance with the basic restrictions.

The reference levels specified in the ICNIRP 2020 Guidelines relating to limiting exposure to electromagnetic fields are listed in Table 1 **- ICNIRP 2020 Guidelines** reference levels for **occupational** exposure, averaged over 30 minutes and the whole body, to electromagnetic fields from 100 kHz to 300 GHz (unperturbed rms values)

(Occupational Exposure) and **Table 2 - ICNIRP 2020 Guidelines** reference levels for **general public** exposure, averaged over 30 minutes and the whole body, to electromagnetic fields from 100 kHz to 300 GHz (unperturbed rms value) (General Public Exposure). The reference levels specified in the ICNIRP 2010 guidelines relating to protection against electrical stimulation effects of NIR are listed in Table 3 - ICNIRP 2010 Guidelines reference levels for **occupational** exposure to time-varying electric and magnetic fields (unperturbed rms values)

(Occupational Exposure) and Table 4 (General Public Exposure).

Frequency Range	E – Field Strength E_{inc} (Vm^{-1})	H – Field H_{inc} (Am^{-1})	Incident Power density; S_{inc} (Wm^{-2})
0.1 - 30 MHz	$660/f_M^{0.7}$	$4.9/f_M$	-
>30 – 400 MHz	61	0.16	10
>400 – 2000 MHz	$3f_M^{0.5}$	$0.008f_M^{0.5}$	$f_M/40$
2 – 300 GHz	-	-	50
Note: f in units as indicated in the Frequency Range column			

Table 1 - ICNIRP 2020 Guidelines reference levels for **occupational** exposure, averaged over 30 minutes and the whole body, to electromagnetic fields from 100 kHz to 300 GHz (unperturbed rms values)

Frequency Range	E – Field Strength (Vm^{-1})	H – Field (Am^{-1})	Equivalent plane wave power S (Wm^{-2})
0.1 - 30 MHz	$300/f_M^{0.7}$	$2.2/f_M$	-
>30 – 400 MHz	27.7	0.073	2
>400 – 2000 MHz	$1.375\ f_M^{0.5}$	$0.0037f_M^{0.5}$	$f_M/200$
2 – 300 GHz	-	-	10
Note: f in units as indicated in the Frequency Range column			

Table 2 - ICNIRP 2020 Guidelines reference levels for **general public** exposure, averaged over 30 minutes and the whole body, to electromagnetic fields from 100 kHz to 300 GHz (unperturbed rms value)

Frequency Range	E – Field Strength E ($kV\ m^{-1}$)	Magnetic Field Strength H ($A\ m^{-1}$)	Magnetic Flux Density B (T)
1 Hz – 8 Hz	20	$1.63 \times 10^5/f^2$	$0.2/f^2$
8 Hz – 25 Hz	20	$2 \times 10^4/f$	$2.5 \times 10^{-2}/f$
25 Hz – 300 Hz	$5 \times 10^2/f$	8×10^2	1×10^{-3}
300 Hz -3 kHz	$5 \times 10^2/f$	$2.4 \times 10^5/f$	$0.3/f$
3 kHz – 10 MHz	1.7×10^{-1}	80	1×10^{-4}
Notes:- f in Hz. - In the frequency range above 100 kHz, RF specific reference levels need to be considered additionally.			

Table 3 - ICNIRP 2010 Guidelines reference levels for **occupational** exposure to time-varying electric and magnetic fields (unperturbed rms values)

Frequency Range	E – Field Strength E ($kV\ m^{-1}$)	Magnetic Field Strength H ($A\ m^{-1}$)	Magnetic Flux Density B (T)
1 Hz – 8 Hz	5	$3.2 \times 10^4/f^2$	$4 \times 10^{-2}/f^2$
8 Hz – 25 Hz	5	$4 \times 10^3/f$	$5 \times 10^{-3}/f$
25 Hz – 50 Hz	5	1.6×10^2	2×10^{-4}
50 Hz -400 Hz	$2.5 \times 10^2/f$	1.6×10^2	2×10^{-4}

400 Hz – 3 kHz	$2.5 \times 10^2/f$	$6.4 \times 10^4/f$	$8 \times 10^{-2}/f$
3 kHz – 10 MHz	8.3×10^{-2}	21	2.7×10^{-5}
Notes: - f in Hz. - In the frequency range above 100 kHz, RF specific reference levels need to be considered additionally.			

Table 4 - ICNIRP 2010 Guidelines reference levels for **general public** exposure to time-varying electric and magnetic fields (unperturbed rms values)

Simultaneous Exposure to Multiple Frequency Fields (Total Exposure Quotients)

ICNIRP has specified a means of assessing additivity of exposures in situations of simultaneous exposure to fields of different frequencies. Additivity is examined separately for ICNIRP 2020 (thermal and other effects) and ICNIRP 2010 (electrical stimulation effects). As such, ICNIRP has set out basic restrictions which should be met for both considerations.

For practical application of the basic restrictions, ICNIRP has advised that the following criteria[16] regarding reference levels of field strengths should be applied.

Electromagnetic Fields (ICNIRP 2020)

For thermal considerations, relevant for frequencies above 100 kHz, measured levels for multiple fields of different frequencies must be additively assessed in accordance with the reference levels from the ICNIRP 2020 Guidelines as follows. And for calculations of practical applications of the whole-body average reference levels, incident electric field strength, incident magnetic field strength and incident power density values should be added accordingly with Table 1 or Table 2;

$$\sum_{i>100\ kHz}^{30\ MHz} MAX\left\{\left(\frac{E_{inc,i}}{E_{inc,RL,i}}\right)^2, \left(\frac{H_{inc,i}}{H_{inc,RL,i}}\right)^2\right\}$$
$$+ \sum_{i>30\ GHz}^{2\ GHz} MAX\left\{\left(\frac{E_{inc,i}}{E_{inc,RL,i}}\right)^2, \left(\frac{H_{inc,i}}{H_{inc,RL,i}}\right)^2, \left(\frac{S_{inc,i}}{S_{inc,RL,i}}\right)\right\}$$
$$+ \sum_{i>2\ GHz}^{300\ GHz} \left(\frac{S_{inc,i}}{S_{inc,RL,i}}\right) \leq 1$$

Where;

$E_{inc,i}$ and $E_{inc,RL,i}$ = are the whole-body average incident electric field strength and whole-body average incident electric field strength reference level given in **Error! Reference source not found.** at frequency i, respectively.

$E_{inc,i}(t)$ = is the whole-body average E_{inc} level over time t.

[16] *The calculated values are referred to as '**Total Exposure Quotients**' elsewhere in this report.*

$H_{inc,i}$ and $H_{inc,RL,i}$ = are the whole-body average incident magnetic field strength and whole-body average incident magnetic field strength reference level given in table **Error! Reference source not found.** at frequency i, respectively.
$H_{inc,i}(t)$ = is the whole-body average H_{inc} level over time t.

$S_{inc,i}$ and $S_{inc,RL,i}$ = and the whole-body average incident power density and whole-body average incident power density strength reference level given in table Table 1 - **ICNIRP 2020 Guidelines** reference levels for **occupational** exposure, averaged over 30 minutes and the whole body, to electromagnetic fields from 100 kHz to 300 GHz (unperturbed rms values)
at frequency i, respectively.
$S_{inc,i}(t)$ = is the whole-body average $S_{inc,i}$ level over time t.

Electrical Stimulation (ICNIRP 2010)

For electrical stimulation effects, relevant for frequencies up to 10 MHz, measured levels for multiple fields of different frequencies must be additively assessed in accordance with the reference levels from ICNIRP 2010 Guidelines as follows:

$$\sum_{j=1\ Hz}^{10\ MHz} \left(\frac{E_j}{E_{R,j}}\right) \leq 1,$$

And

$$\sum_{j=1\ Hz}^{10\ MHz} \left(\frac{H_j}{H_{R,j}}\right) \leq 1,$$

where

E_j = the electric field strength at frequency *j*;

$E_{R,\,j}$ = the electric field strength reference level at frequency j as given in Table 3 - **ICNIRP 2010 Guidelines** reference levels for **occupational** exposure to time-varying electric and magnetic fields (unperturbed rms values)

or Table 4 - **ICNIRP 2010 Guidelines** reference levels for **general public** exposure to time-varying electric and magnetic fields (unperturbed rms values)

;

H_j = the magnetic field strength at frequency j;

$H_{R,\,j}$ = the magnetic field strength reference level at frequency j as given in Table 3 - **ICNIRP 2010 Guidelines** reference levels for **occupational** exposure to time-varying electric and magnetic fields (unperturbed rms values)

or Table 4 - **ICNIRP 2010 Guidelines** reference levels for **general public** exposure to time-varying electric and magnetic fields (unperturbed rms values)

.

APPENDIX 2 - GLOSSARY

Antenna: A conductive structure specifically designed to couple or to radiate electromagnetic energy.

BCCH: Broadcast control channel. BCCH is a constant carrier on GSM base stations. Essentially it is the 'always on' pilot channel. The constant signal level of the BCCH allows for extrapolation to a maximum traffic signal level for a base station.

Broadband Measurement: A measurement carried out using a meter and probe combination that simultaneously measures and sums all received signals within the frequency range of the probe. Generally this meter and probe combination is not as sensitive as the equipment used for narrowband measurements but is useful for getting an overall picture of the level of electromagnetic fields present at a site.

ComReg: the Commission for Communications Regulation. Established under the Communications Regulation Act 2002 (as amended), ComReg is the statutory body responsible for the regulation of the electronic communications sector (telecommunications, radiocommunications and broadcasting transmission) and the postal sector in Ireland.

Electric Field Strength: Electric field strength is a quantitative expression of the intensity of an electric field at a particular location. The standard unit is the volt per meter (V/m). A field strength of 1 V/m represents a potential difference of one volt between points separated by one meter.

Electromagnetic Field (EMF): Combined electric and magnetic fields, in this case radiating from an antenna.

Electromagnetic Spectrum: The complete range of the wavelengths of electromagnetic radiation, beginning with the radio waves and extending through microwaves and visible light (a very small part of the spectrum) all the way to the extremely short gamma rays that are a product of radioactive atoms. The electromagnetic spectrum contains both non-ionizing and ionizing radiation

Frequency: The number of cycles completed in one second by an electromagnetic wave. It is expressed in Hertz (Hz) or a multiple of Hertz, e.g. kHz (kilohertz, 1,000 Hertz), MHz (MegaHertz, 1,000,000 Hertz) and GHz (GigaHertz, 1,000,000,000 Hertz).

Frequency Range: A group of frequencies between a selected start and stop frequency. E.g. the frequency range of the FM broadcast band includes all frequencies between 88 and 108 MHz.

Frequency Selective Measurement: A measurement carried out using a receiver and an antenna which measures the received signal strength at specific frequencies. A spectrum analyser is usually used as the receiver, and a range of antennas is used which are suitable for reception of all the frequencies to be measured.

ICNIRP: the International Commission on Non-Ionising Radiation Protection.

Ionising radiation: Ionising radiation, also called radioactivity, includes electromagnetic radiation whose waves contain energy sufficient to overcome the binding energy of electrons in atoms or molecules, thus creating ions. It occurs at frequencies within the range of ultraviolet light and higher, and includes x-rays and gamma rays. The sources of EMFs measured in this survey do not produce any ionising radiation.

Isotropic probe: Receives electromagnetic signals regardless of polarisation or direction of travel. An isotropic probe is designed to give the same reading, no matter which way it is pointed.

Non-ionising radiation (NIR): Includes all radiations and fields of the electromagnetic spectrum that do not normally have sufficient energy to produce ionisation in matter; characterized by energy per photon less than approximately 12 electron Volts, wavelengths greater than 100 nm, and frequencies lower than 3×10^{15} Hz.

Occupational Exposure: All exposure to EMF experienced by individuals who are exposed under known conditions in the course of performing their work and who are trained to be aware of potential risk and to take appropriate precautions.

Public Exposure: All exposure to EMF experienced by members of the general public, excluding occupational exposure and exposure during medical procedures.

Primary Common Pilot Channel (P-CPICH): A downlink channel broadcast by UMTS Node-Bs (i.e. 3G base stations) with constant power. It allows extrapolation to a maximum traffic signal level for a UMTS channel.

Radio frequency spectrum: In physics the radio frequency spectrum is commonly defined as that part of the electromagnetic spectrum at frequencies between 3 kHz and 300 GHz.

Spectrum analyser: An instrument that displays signal amplitude (strength) as it varies by signal frequency. The frequency appears on the horizontal axis and the amplitude is displayed on the vertical axis. It can be set to sweep a frequency band where the amplitude of the received signals show up as spikes on the recorded trace.

APPENDIX 3 – Equipment Calibration Certificates

SEIBERSDORF LABORATORIES

Kalibrierstelle für Antennen und Feldsonden
Calibration Body for Antennas and Field Probes

Akkreditiert durch / *accredited by*
AKKREDITIERUNG AUSTRIA

Kalibrierschein nach ISO/IEC 17025
Calibration Certificate according to ISO/IEC 17025

Kalibrierzeichen
Calibration mark

EH-A616/25
0612
15.04.2025

Gegenstand *Object*	Isotropic Electric Field Probe (a) with Field Analyzer (b)
Hersteller & Typ *Manufacturer & Type*	Narda a) EF0391 + b) NBM550
Herstellernummer *Serial number*	a) A-0119 + b) A-0068
Auftraggeber *Customer*	Compliance Engineering Ireland Ltd. Clonross Lane, Dunshaughlin, Co. Meath. A85 XN59 IRELAND
Auftragsnummer *Order No.*	L.L7.00059.0.0–A-12737_1 Ext. Order No.: 2025-013
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	1 - 6
Datum und Ort der Kalibrierung *Date and place of calibration*	15.04.2025 Seibersdorf

Akkreditierung Austria ist Vollmitglied bei der International Laboratory Accreditation Cooperation ILAC und Unterzeichner der MRAs für die Bereiche „Testing, Calibration and Inspection".

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Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

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This calibration certificate documents the traceability to national standards, which realize the physical units or measurements according to the International System of Units (SI).

The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein gilt ausschließlich für den kalibrierten Gegenstand und darf nur vollständig und unverändert weiterverarbeitet werden. Auszüge oder Änderungen sind unzulässig. Kalibrierscheine ohne Unterschrift haben keine Gültigkeit.

This calibration certificate is valid only for the calibrated object and may not be reproduced other than in full. Calibration certificates without signature are not valid.

Datum Date	Zeichnungsberechtigter Authorized person	Bearbeiter Person responsible
15.04.2025	Patrick Preiner	Michael Nehyba

Figure 1. NBM-550 with EF 0391 E-Field Probe Calibration Certificate

SEIBERSDORF LABORATORIES

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Kalibrierschein nach ISO/IEC 17025
Calibration Certificate according to ISO/IEC 17025

Kalibrierzeichen
Calibration mark

EH-A617/25
0612
15.04.2025

Gegenstand *Object*	Isotropic Electric Field Probe (a) with Field Analyzer (b)
Hersteller & Typ *Manufacturer & Type*	Narda a) EF4091 + b) NBM-550
Herstellernummer *Serial number*	a) A-0110 + b) A-0068
Auftraggeber *Customer*	Compliance Engineering Ireland Ltd. Clonross Lane, Dunshaughlin, Co. Meath. A85 XN59 IRELAND
Auftragsnummer *Order No.*	L.L7.00059.0.0–A-12737_2 Ext. Order No.: 2025-013
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	1 - 7
Datum und Ort der Kalibrierung *Date and place of calibration*	15.04.2025 Seibersdorf

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Datum Date	Zeichnungsberechtigter Authorized person	Bearbeiter Person responsible
15.04.2025	Patrick Preiner	Michael Nehyba

Figure 2. NBM-550 with EF 4091 E-Field Probe Calibration Certificate

CERTIFICATE OF CALIBRATION

Certificate Number G3080A Issue Date: 17/06/2025

eurofins | Electrical & Electronics

Caddsdown Industrial Park, Clovelly Road, Bideford, Devon, EX39 3DX, United Kingdom
Tel: +44 (0) 1237 423388 | e-mail: EEUKCalibration@cpt.eurofinseu.com

ilac-MRA

UKAS CALIBRATION
0452

Customer Details

Customer
Compliance Engineering Ireland Ltd
Clonross Lane

Derrockstown
County Meath

Instrument Details

Description: Rohde & Schwarz FSH20 Handheld Spectrum Analyzer 9kHz to 20GHz

Serial Number: 120532
ID Number: 910

Date Received: 21 May 2025

Traceability

The following procedure(s) were used to perform the measurements.

Frequency
RF Intermodulation
RF Power
V Reflection Coeff.

Comments

Functional checks were performed prior to the measurements. No adjustments were made affecting the calibration. This certificate only relates to the items calibrated.

Calibrated 17 June 2025 by Tim Street
PAT Tested 16 June 2025 by TS

APPROVED SIGNATORY
Oliver Sanders

Figure 3. FSH20 Calibration Certificate

Kiwa Dare
Vijzelmolenlaan 7
3447 GX Woerden
The Netherlands

Tel. +31 348 200 950
www.kiwadare.nl
calibrations.kiwadare@kiwa.com

CERTIFICATE OF CALIBRATION

For:	Compliance Engineering Ireland Ltd Clonross Dunshaughlin Co Meaath A58 XN59 Dunshauglin Ireland
Instrument:	Horn Antenna manufacturer Emco type 3115 serial number 9905-5809 asset number 190001440
Calibration method:	The calibration has been carried out in a Full Anechoic Chamber simulating free space conditions according to the 3-antenna method as described in ANSI C63.5-2017. The path-attenuation from one antenna to another has been measured for 3 combinations of the antennas used. The Friis transmission formula and the measured attenuations have been used to calculate the Antenna Factors. The distance between transmit and receive antenna was 3 m nominal, measured between the apertures of the antennas.
Ambient conditions:	Temperature of (23 ± 7) °C and a relative humidity of (50 ± 20) %rh.
Period of calibration:	2025 March, 13.
Results:	The results are listed on page 3 to 5. No adjustments have been made to the instrument. The measured values were calculated from a single sample.
Uncertainty:	The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02 (2022). The uncertainties refer to the measured values only with no account being taken of the ability of the instruments under test to maintain their calibration.
Traceability:	The measurements have been executed using standards for which the traceability to (inter)national standards has been demonstrated towards the RvA.

Date	Calibrated by	Checked by
2025 March, 13	C. Konijn Calibration Engineer	J. van Elburg Team Leader

20/3/25

Certificate number 202501225.00

Figure 4. 3115 Horn Antenna Calibration Certificate

SEIBERSDORF LABORATORIES

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Kalibrierschein nach ISO/IEC 17025
Calibration Certificate according to ISO/IEC 17025

Kalibrierzeichen
Calibration mark

EH-A1573/23
0612
11.08.2023

Gegenstand *Object*	Tri Axis Antenna
Hersteller & Typ *Manufacturer & Type*	R&S TS-EMF-B1
Herstellernummer *Serial number*	100049 | Asset number: 947
Auftraggeber *Customer*	Compliance Engineering Ireland Clonross Lane, Dunshaughlin, Co. Meath. A85 XN59 Ireland
Auftragsnummer *Order Nr.*	L.L7.00059.0.0-A-10994_1 Ext. Ord. No.: PURC2023-024
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	1 - 5
Datum und Ort der Kalibrierung *Date and place of calibration*	11.08.2023 Seibersdorf

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Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

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The user is obliged to have the object recalibrated at appropriate intervals.

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Datum *Date*	Zeichnungsberechtigter *Authorized person*	Bearbeiter *Person responsible*
22.08.2023	Patrick Preiner	Michael Klettner

Figure 5. TS-EMF Antenna Calibration Certificate

1254

Narda Safety Test Solutions GmbH
Sandwiesenstrasse 7 - 72793 Pfullingen - Germany
Phone: +49 7121 9732 0 - Fax: +49 7121 9732 790

narda
Safety Test Solutions

Calibration Certificate

Narda Safety Test Solutions hereby certifies that the object referred to in this certificate has been calibrated by qualified personnel using Narda's approved procedures. The calibration was carried out in accordance with a certified quality management system which conforms to ISO 9001

OBJECT	SignalShark 3310 Handheld
MANUFACTURER	Narda Safety Test Solutions GmbH
PART NUMBER	3310/01
SERIAL NUMBER	AA-0268
Measurement Unit Identifier	*001M0278*
RF Board Identifier	*5784500330*
CUSTOMER	
CALIBRATION DATE (YYYY-MM-DD)	2025-03-20
RESULT ASSESSMENT	within specification (in reference to datasheet NSTS 0322-E0328H)
AMBIENT CONDITIONS	Temperature: (23 ± 3) °C Relative humidity: (20 to 60) %
CALIBRATION PROCEDURE	3310-8701-00A

ISSUE DATE: 2025-03-21
(YYYY-MM-DD)

Schmidt
CALIBRATED BY
Vitali Schmidt

A. Palmieri
AUTHORIZED SIGNATORY
Aldo Palmieri

Figure 6. Narda SignalShark 3310 Handheld Calibration Certificate

Narda Safety Test Solutions GmbH
Sandwiesenstrasse 7 - 72793 Pfullingen - Germany
Phone: +49 7121 9732 0 - Fax: +49 7121 9732 790

1253

narda
Safety Test Solutions

Calibration Certificate

Narda Safety Test Solutions GmbH hereby certifies that the referenced equipment has been calibrated by qualified personnel to Narda's approved procedures. The calibration was carried out within a certified quality management system conforming to ISO 9001.

OBJECT	Three-axis Antenna 200MHz - 8GHz
MANUFACTURER	Narda Safety Test Solutions
PART NUMBER (P/N)	3502/03
SERIAL NUMBER (S/N)	H-0526
CUSTOMER	
CALIBRATION DATE (YYYY-MM-DD)	2025-03-03
AMBIENT CONDITIONS	Temperature: (23 ± 3) °C Relative humidity: (20 to 60) %
CALIBRATION PROCEDURE	3502-8703-00A

ISSUE DATE: 2025-03-03
(YYYY-MM-DD)

CALIBRATED BY
M.Schwörer

AUTHORIZED SIGNATORY

Quality Management
ISO 9001:2015

Figure 7. Narda Three-axis 200MHz – 8GHz Antenna Calibration Certificate

Kiwa Dare
Vijzelmolenlaan 7
3447 GX Woerden
The Netherlands

Tel. +31 348 200 950
www.kiwadare.nl
calibrations.kiwadare@kiwa.com

CERTIFICATE OF CALIBRATION

For: Compliance Engineering Ireland Ltd
Clonross Dunshaughlin Co Meaath
A58 XN59 Dunshaughlin
Ireland

Instrument: E-Field Probe + Readout unit

manufacturer	Narda
type	SRM-3501/02 + SRM-3001/01
serial number	H-0254 + M-0082
asset number	220000152

Period of calibration: 2024 January, 25.

Calibration method: The instrument was allowed to acclimatize for at least 2 hours before any measurements were made.

During calibration, all axis of the field probe are switched on as in the normal isotropic mode of operation of the probe.

Up to 150 MHz, the calibration is performed in a TEM cell. The calculated field method is used for the calibration. The polarization of the E-field is vertical.

The calibration of frequencies from 200 MHz is carried out in a full anechoic room. Over the frequency range of 200 MHz to 1000 MHz and above 18 GHz, the standard transfer method is used. For frequencies above 1000 MHz up to 18 GHz, the calculated field method is used. The polarization of the E-field is horizontal.

During calibrations the probe settings are as follows:

Mode of operation:	Isotropic
Range:	Rangeless

For each frequency and field strength setting, the field probe is rotated so that each position is aligned with the E-field. The position under test is always perpendicular to the direction of propagation and parallel to the E-field.

Page 6 describes the orientation of the DUT during calibration.

checked by:
Loran
McAuley

$$\textit{Correction Factor} = \frac{\textit{Applied field strength}}{\textit{Measured field strength}}$$

Ambient conditions:

	Temperature	Relative humidity
Temcell	(23 ± 7) °C	(50 ± 20) %rh
Anechoic chamber	(23 ± 2) °C	(50 ± 10) %rh

Figure 8. Narda Three-axis H-0254 0.05-3GHz Antenna Calibration Certificate