An Coimisiún um Rialáil Cumarsáide
Commission for Communications Regulation

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1. Survey Summary

Address of Transmitter Site Surveyed:	Market Square, William O'Brien Street, Mallow, Co. Cork.
Survey Date:	11/09/2026
Base Station ID's:	CK_2273 / CK0498
Network Operators:	Three/ EIR
Technologies Measured:	GSM / LTE / NR5G / UMTS
Frequency Bands:	700 / 800 / 900 / 1800 / 2100 / 2300 / 2600 / 3600 MHz
Technology Bands:	L7 / N7 / L8 / G9 / U9 / L9 / L18 / L21 / N21 / L23 / L26 / N36[1]

Measurement Location: (at point of maximum non-ionising radiation near site, approximate distance from site.)	On public footpath at side of William O'Brien Street, close to antenna location.

Measurement Location Coordinates (decimal):	**LAT**	**LONG**
	52.137561	- 8.642072

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: Light Cloud

Temperature:
15° C

Relative Humidity:
48 %

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



Initial measurement point check readings: (approximate)	1. 1.13 V/m 2. 1.46 V/m 3. 0.42 V/m 4. 2.52 V/m 5. 0.28 V/m	6. 1.09 V/m 7. 1.93 V/m 8. 0.89 V/m 9. 2.01 V/m 10. 1.30 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

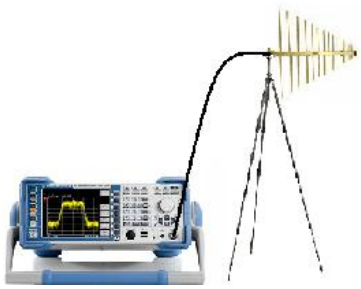
[11] Beyond a distance of max(5λ, 5D, $0.6D^2/\lambda$)

[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.

<table>
<tr><th>Initial Site Survey and Broadband Measurements</th><th colspan="2">Frequency Selective Measurements</th></tr>
<tr><td>
</td><td colspan="2">SPECTRUM ANALYSER WITH TRIPOD MOUNTED ANTENNA CONNECTED

PORTABLE SPECTRUM ANALYSER WITH ANTENNA DIRECTLY CONNECTED
</td></tr>
<tr><td>Used to measure the overall electric or magnetic field present over a range of frequencies (e.g. 100kHz to 3GHz).</td><td colspan="2">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.</td></tr>
</table>

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

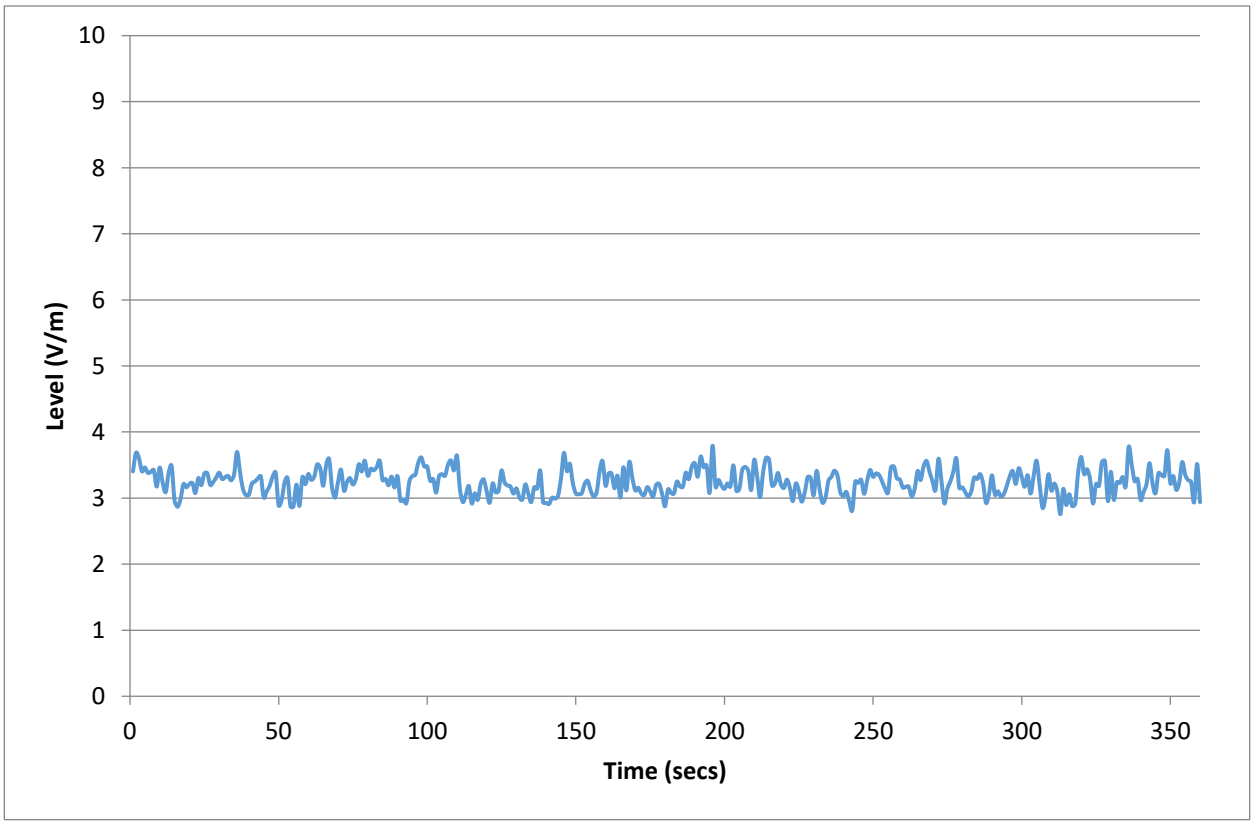
The purpose of these measurements was to get an overview of the intensity of the EMF present at the point of maximum NIR near the Designated Site.

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).

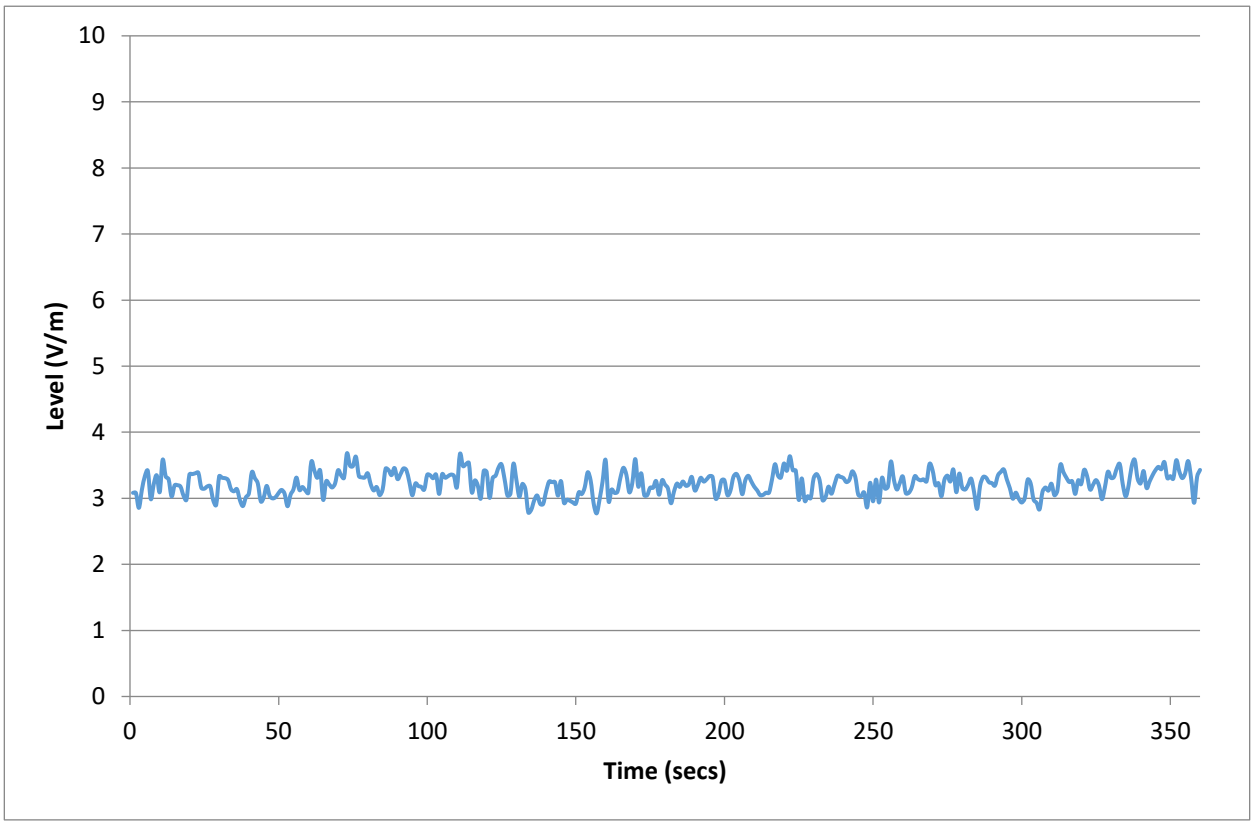
Electric field strengths recorded over 6-minute period using 3 GHz probe at point of maximum NIR



Acquisition Mode: 1 Sec. Sampling

Mean Measurement V/m:	3.24 V/m	**Peak Measurement V/m:**	3.79 V/m
Date:	11/09/2026	**Start Time:**	11:15
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:	3.22 V/m	**Peak Measurement V/m:**	3.68 V/m
Date:	11/09/2026	**Start Time:**	11:22
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	97.399	0.00598	0.00598	27.7	4632.882
FM Radio	105.700	0.00536	0.00536	27.7	5165.983
FM Radio	103.750	0.00242	0.00242	27.7	11451.013
FM Radio	96.100	0.00222	0.00222	27.7	12466.247
FM Radio	94.450	0.00113	0.00113	27.7	24600.355
FM Radio	101.800	0.00106	0.00106	27.7	26107.446
FM Radio	99.550	0.00105	0.00105	27.7	26355.852
FM Radio	106.450	0.00098	0.00098	27.7	28265.306
FM Radio	92.200	0.00094	0.00094	27.7	29343.220
T-DAB	188.900	0.00846	0.00846	27.7	3273.458
TETRA	redacted	redacted	redacted	27.7	redacted
TETRA	redacted	redacted	redacted	27.7	redacted
TETRA	redacted	redacted	redacted	27.7	redacted
TETRA	redacted	redacted	redacted	27.7	redacted
TETRA	redacted	redacted	redacted	27.7	redacted
PMR	redacted	0.00377	0.00377	29.4	7787.754
PMR	redacted	0.00297	0.00297	29.4	9900.248
PMR	redacted	0.00035	0.00035	29.4	84612.488
DVB-T	474.480	0.00223	0.00263	30.0	11402.616
LTE	773.000	0.09950	0.28457	38.2	134.339
LTE	783.000	0.05670	0.16216	38.5	237.265
5G NR	763.000	0.05675	1.46500	38.0	25.926
LTE	796.000	0.25390	0.72615	38.8	53.423
LTE	806.000	0.11010	0.31489	39.0	123.970
LTE	816.000	0.07850	0.22451	39.3	174.949
GSM	957.203	0.55100	1.10200	42.5	38.603
GSM	925.637	0.52840	1.05680	41.8	39.585
GSM	928.400	0.28760	0.57520	41.9	72.837
GSM	955.200	0.21680	0.43360	42.5	98.008
GSM	927.200	0.16960	0.33920	41.9	123.434
GSM	926.200	0.16540	0.33080	41.8	126.500
GSM	959.800	0.13380	0.26760	42.6	159.187
GSM	957.800	0.13300	0.26600	42.6	159.977
GSM	958.100	0.12970	0.25940	42.6	164.073
GSM	947.199	0.12790	0.25580	42.3	165.433
GSM	959.000	0.11930	0.23860	42.6	178.460
GSM	946.600	0.02873	0.05746	42.3	736.242
GSM	947.700	0.02117	0.04234	42.3	999.740
GSM	948.400	0.01818	0.03636	42.3	1164.594
GSM	949.000	0.01615	0.03230	42.4	1311.394
UMTS FDD	932.500	0.46950	1.75326	42.0	23.949
UMTS FDD	937.000	0.25240	0.94254	42.1	44.655

LTE	942.500	0.08490	0.18084	42.2	233.430
LTE	952.500	0.02550	0.05432	42.4	781.296
LTE	1815.000	0.14560	0.51007	58.6	114.844
LTE	1830.000	0.03460	0.13996	58.8	420.254
LTE	1855.000	0.26810	1.08452	59.2	54.606
LTE	1875.000	0.15480	0.54230	59.5	109.790
LTE	2140.000	0.03430	0.14612	61.0	417.471
LTE	2160.000	0.43000	1.83180	61.0	33.301
5G NR	2120.000	0.05361	1.95800	61.0	31.154
LTE	2310.000	0.09120	0.38851	61.0	157.009
LTE	2330.000	0.15500	0.66030	61.0	92.382
LTE	2350.000	0.16630	0.70844	61.0	86.105
WiFi	2402.000	0.05739	0.09337	61.0	653.330
WiFi	2482.000	0.05226	0.08502	61.0	717.463
WiFi	2427.000	0.03320	0.05401	61.0	1129.356
WiFi	2422.000	0.03046	0.04956	61.0	1230.946
WiFi	2412.000	0.02944	0.04790	61.0	1273.594
WiFi	2462.000	0.02888	0.04698	61.0	1298.290
WiFi	2452.000	0.02169	0.03529	61.0	1728.659
WiFi	2442.000	0.02004	0.03260	61.0	1870.989
LTE	2630.000	0.34380	1.46459	61.0	41.650
LTE	2645.000	0.21100	0.77859	61.0	78.347
LTE	2665.000	0.03380	0.14399	61.0	423.646
LTE	2685.000	0.03390	0.12509	61.0	487.645
5G NR	3525.000	0.00116	0.06709	61.0	909.199
5G NR	3660.000	0.06276	3.24100	61.0	18.821
5G NR	3750.000	0.03587	2.07100	61.0	29.454

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**	0.014072	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

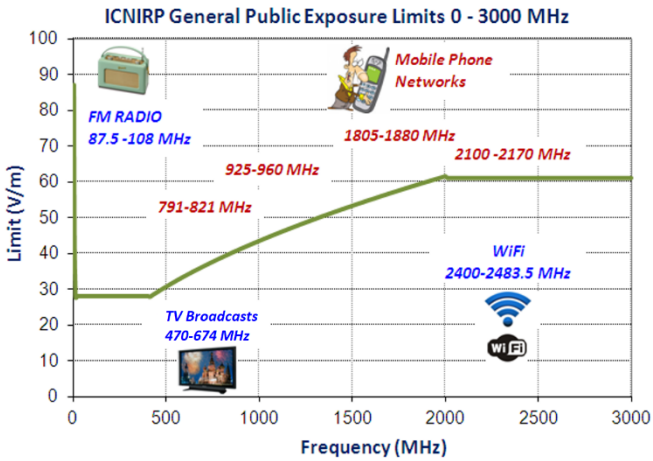
For some emissions, an adjusted level may be required to be derived from the measured level:

(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

Broadband Measurements

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

Spectrum Analyser

Manufacturer:	Narda
Model:	Signalshark 3310
Serial Number:	AA-0268
Calibration Date:	20/03/2025

Spectrum Analyser

Manufacturer:	Rohde & Schwarz
Model:	FSH20
Serial Number:	102532
Calibration Date:	05/06/2026

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

2. Site Photographs



Photo 1. Broadband Measurement location looking towards antennas



Photo 2. Frequency selective measurement location looking towards antennas