

EMF SURVEY REPORT
VF_12806 O2_50751
MARDEN
RECREATION
GROUND



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CONTENTS

1	Document Control	3
1.1	Security Classification	3
1.2	Changes from previous Issue	3
1.3	History	3
1.4	Abbreviations	3
1.5	Associated Documents	4
1.6	Distribution	4
2	SCOPE	5
3	SITE DETAILS	5
4	EXPOSURE LIMITS AND BACKGROUND	8
5	MEASUREMENTS	8
6	CONCLUSIONS	9

1 Document Control

1.1 Security Classification

This document and the information within is not commercially sensitive.

1.2 Changes from previous Issue

This is the first issue of this document

1.3 History

Version	Date	Author	Changes
Version 0.1	17 June 2019	Paul Cowap	First draft for comment / review
Version 1.0	17 June 2019	Paul Cowap	First Issue

1.4 Abbreviations

CEMFAW	C ontrol of E lectromagnetic F ields at W ork R egulations 2016
EMF	E lectromagnetic F ields
PHE	P ublic H ealth E ngland
ICNIRP	I nternational C ommission on N on-Ionizing R adiation P rotection
RBS	R adio B ase S tation
RF	R adio F requency
TEF	T elefonica UK
VF	V odafone UK

1.5 Associated Documents

REFERENCE	TITLE
Miscellaneous Documents	
Statutory Instrument 2016 No.588 Health & Safety	The Control of Electromagnetic Fields at Work Regulations 2106
Directive 2013/35/EU	The minimum health and safety Requirements regarding the exposure of workers to physical agents (electromagnetic fields).
ICNIRP Guidelines	Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz), Health Physics April 1998, Volume 74, Number 4: 494-522 - International Commission on Non-Ionizing Radiation Protection
EU Recommendation 1999/519/EC	Council recommendation of 12th July 1999 on the limitation of exposure of the general public to electromagnetic fields 0Hz - 300GHz, EU Recommendation 1999/519/EC

1.6 Distribution

Name	Organisation	Date	Version
Ilana Clark	Cornerstone	17/6/19	1.0
James Harbut	Shared Access Ltd	17/6/19	1.0
Jane Miles	Shared Access Ltd	17/6/19	1.0

2 SCOPE

The document is a record of the radio frequency exposure levels measured at Vodafone site 12806 Marden Tennis Club. The purpose of the measurement survey was to establish the radio frequency exposure levels in the publicly accessible areas around the site.

The measurement survey was undertaken in the morning of 10th June 2019 in response to a request from the site provider. A local resident had expressed concerns about the radio frequency exposure level from the site. The survey was undertaken in response to those concerns.

3 SITE DETAILS

The Telefonica UK (O2) radio base station site reference is 50751 and the Vodafone site reference is 12806. The site name is Marden Tennis Club, and full address is Marden Recreation Ground, Marden Hereford, HR1 3EW. The grid reference is 352392E, 247451N. Under the Beacon shared radio access network (RAN) it is a Vodafone managed site.

It is a Greenfield monopole site with the Telefonica and Vodafone antennas mounted at a height of 14m. It is a standard three sector site with the antennas orientated at 30°, 150° and 270°. The site compound is located in the south west corner of the recreation ground adjacent to the tennis courts. The car park and changing rooms are in the north east corner of the recreation ground and are approximately 100m from the radio base station site. The cell 1 antenna orientated at 30° points across the recreation ground.

Only technologies in the 800 MHz and 900 MHz frequency bands have been deployed on this site. The site location is shown figure 1 below. Figures 2 shows the monopole and antennas.

A full set of site general arrangement drawings are available.



Figure 1 - VF_12806 O2_50751 Marden Location



Figure 2 – Marden Recreation Ground Radio Base Station Site

4 EXPOSURE LIMITS AND BACKGROUND

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) determines guideline limits for human exposure to Electromagnetic Fields (EMFs) including radio frequency EMFs. The ICNIRP guidelines have been adopted by many and non-European countries for EMF exposure protection. The ICNIRP limits are recommended to the telecommunications industry by Public Health England the UK public health regulatory body whose remit includes radio frequency EMFs.

All Vodafone and Telefonica Radio Base Station (RBS) sites are designed, built and operated to comply with the International Commission on Non-Ionizing Radiation Protection (ICNIRP) limits for human exposure to radio frequency EMFs.

Since all locations are accessible by members of the public the ICNIRP general public limit is the appropriate measurement reference metric.

5 MEASUREMENTS

Broadband measurements of all radio frequency sources in the 75 MHz to 3 GHz band present were made using a Narda SRM 3000 Selective Radiation Meter. The measured levels of all the respective services are tabulated in the screenshots in Appendices 1 and 2 below.

The SRM 3000 measures the radio frequency energy directly as a percentage of the ICNIRP limit. In the measurement system 100% would be the guideline limit. A measurement of 50% would be half the guideline limit whilst a value of 25% a quarter of the guideline limit, 10% one tenth of the limit, 1% one hundredth of the limit, 0.1% one thousandth of the limit and so on.

Measurements were undertaken between 10.00 am and 10.45 am on Monday 10th June 2019. The measurements were made using the maximum hold function of the SRM 3000. This ensured that the maximum level at the locations of interest was recorded. All the measurements were made at ground level with the measurement probe at a height of approximately 2m. The exposure measurements were undertaken at four locations

- (i) The area within the compound itself. This would be expected to be the lowest level as very little RF energy is emitted directly downwards from the bottom of the antennas
- (ii) The playing field area. The playing area was walked with the maximum level anywhere on the field area recorded.

- (iii) The area around the car park. This would be expected to be the area of the highest exposure. It is approximately 100m the site and the area where the main antenna beam on sector 1 (30°) would be expected to intersect with the ground. There is also a significant slope upwards from the radio site to the car park area.
- (iv) The area around the changing rooms was found to be the highest exposure. The changing rooms are adjacent to the car park

The measured exposure levels at each location is tabulated below. In all locations the levels are a small fraction of the permissible public exposure limit.

Measurement Location Number	Location	Exposure Level (% of ICNIRP Limit)
1	RBS Compound	0.14
2	Playing Field	0.7
3	Car Park	1.39
4	Changing Rooms	1.49

Table 1 – Location and Measured Levels Summary

The maximum exposure level recorded anywhere was 1.49 % of the ICNIRP exposure limit expressed as a fraction this is less than one fiftieth (1/50) of the ICNIRP limit. The highest level were found to be in the area of the car park and changing rooms. The levels in the centre part of the playing field were considerably lower.

6 CONCLUSIONS

In all accessible locations the measured exposure levels are well below the permissible ICNIRP public exposure limit. The highest levels either were found to be less than one fiftieth (1/50) of the limit. In other locations the measured exposure level were considerable less.

The list of the all the sources in all of the measurement locations are shown in Appendices 1 and 2 below. The SRM screenshots are shown in Appendix 1 and the full list of tabulated values are shown in Appendix 2.


In Appendix 2 the Telefonica and Vodafone signals have been highlighted to distinguish them for the other ambient signals. As would be expected The



Telefonica and Vodafone signals are the principal contributors to the overall total exposure level. It is evident that only technologies in 800MHz and 900 MHz bands have been deployed by Vodafone and Telefonica on this site.


Appendix 1 - Screenshots

Location 1 – RBS Compound

Values		Configuration	
		Standard: ICNIRP GP	
Service	Value	Lower Frequency	Upper Frequency
O2 U900	0.0622350 %	930.100 MHz	935.100 MHz
VF GSM 900	0.0004921 %	935.200 MHz	939.600 MHz
O2 GSM 900	0.0131920 %	939.800 MHz	947.200 MHz
VF GSM 900	0.0005983 %	947.400 MHz	955.000 MHz
O2 GSM 900	0.0077133 %	955.200 MHz	960.000 MHz
SHF1 Comms	0.0012078 %	960.000 MHz	1710.000 MHz
O2 GSM 1800	0.0000119 %	1805.000 MHz	1810.800 MHz
VF GSM 1800	0.0000116 %	1811.000 MHz	1816.600 MHz
Three LTE 1800	0.0000300 %	1816.700 MHz	1831.700 MHz
EE(TM) GSM 1800	0.0000186 %	1831.800 MHz	1841.000 MHz
EE LTE 1800	0.0000372 %	1841.600 MHz	1861.800 MHz
EE(OR) GSM 1800	0.0000308 %	1862.000 MHz	1876.600 MHz
DECT Phone	0.0000394 %	1880.000 MHz	1900.000 MHz
Three 3G	0.0000371 %	2110.300 MHz	2124.900 MHz
O2 3G	0.0000312 %	2124.900 MHz	2134.900 MHz
VF 3G	0.0000387 %	2134.900 MHz	2149.700 MHz
EE 3G	0.0000586 %	2149.700 MHz	2169.700 MHz
WIFI802.11BGN	0.0003428 %	2400.000 MHz	2486.500 MHz
BT LTE 2600	0.0000952 %	2517.500 MHz	2537.500 MHz
VF LTE 2600	0.0001137 %	2620.000 MHz	2640.000 MHz
EE LTE 2600	0.0001213 %	2670.000 MHz	2690.000 MHz
SHF3 Comms	0.0019398 %	2700.000 MHz	3000.000 MHz
Others	0.0023024 %		
Total	0.1438500 %	88.000 MHz	3000.000 MHz
Isotropic Result			

Location 2 – Playing Field

Values \ Configuration




Standard: ICNIRP GP


Service	Value	Lower Frequency	Upper Frequency
O2 U900	0.1240200 %	930.100 MHz	935.100 MHz
VF GSM 900	0.0020619 %	935.200 MHz	939.600 MHz
O2 GSM 900	0.0672470 %	939.800 MHz	947.200 MHz
VF GSM 900	0.0094030 %	947.400 MHz	955.000 MHz
O2 GSM 900	0.0654090 %	955.200 MHz	960.000 MHz
SHF1 Comms	0.0012280 %	960.000 MHz	1710.000 MHz
O2 GSM 1800	0.0000136 %	1805.000 MHz	1810.800 MHz
VF GSM 1800	0.0000130 %	1811.000 MHz	1816.600 MHz
Three LTE 1800	0.0000326 %	1816.700 MHz	1831.700 MHz
EE(TM) GSM 1800	0.0000229 %	1831.800 MHz	1841.000 MHz
EE LTE 1800	0.0000403 %	1841.600 MHz	1861.800 MHz
EE(OR) GSM 1800	0.0000331 %	1862.000 MHz	1876.600 MHz
DECT Phone	0.0000410 %	1880.000 MHz	1900.000 MHz
Three 3G	0.0000423 %	2110.300 MHz	2124.900 MHz
O2 3G	0.0000309 %	2124.900 MHz	2134.900 MHz
VF 3G	0.0000432 %	2134.900 MHz	2149.700 MHz
EE 3G	0.0000643 %	2149.700 MHz	2169.700 MHz
WiFi802.11BGN	0.0003564 %	2400.000 MHz	2486.500 MHz
BT LTE 2600	0.0001043 %	2517.500 MHz	2537.500 MHz
VF LTE 2600	0.0001330 %	2620.000 MHz	2640.000 MHz
EE LTE 2600	0.0001435 %	2670.000 MHz	2690.000 MHz
SHF3 Comms	0.0019892 %	2700.000 MHz	3000.000 MHz
Others	0.0025493 %		
Total	0.7023100 %	88.000 MHz	3000.000 MHz

Isotropic Result

Location 3 – Car Park

Values \ Configuration \			
		Standard: ICNIRP GP	
Service	Value	Lower Frequency	Upper Frequency
O2 U900	0.2869700 %	930.100 MHz	935.100 MHz
VF GSM 900	0.0048469 %	935.200 MHz	939.600 MHz
O2 GSM 900	0.1109400 %	939.800 MHz	947.200 MHz
VF GSM 900	0.0293860 %	947.400 MHz	955.000 MHz
O2 GSM 900	0.1080000 %	955.200 MHz	960.000 MHz
SHF1 Comms	0.0012393 %	960.000 MHz	1710.000 MHz
O2 GSM 1800	0.0000159 %	1805.000 MHz	1810.800 MHz
VF GSM 1800	0.0000139 %	1811.000 MHz	1816.600 MHz
Three LTE 1800	0.0000358 %	1816.700 MHz	1831.700 MHz
EE(TM) GSM 1800	0.0000409 %	1831.800 MHz	1841.000 MHz
EE LTE 1800	0.0000509 %	1841.600 MHz	1861.800 MHz
EE(OR) GSM 1800	0.0000371 %	1862.000 MHz	1876.600 MHz
DECT Phone	0.0000448 %	1880.000 MHz	1900.000 MHz
Three 3G	0.0000457 %	2110.300 MHz	2124.900 MHz
O2 3G	0.0000332 %	2124.900 MHz	2134.900 MHz
VF 3G	0.0000465 %	2134.900 MHz	2149.700 MHz
EE 3G	0.0000657 %	2149.700 MHz	2169.700 MHz
WIFI802.11BGN	0.0003634 %	2400.000 MHz	2486.500 MHz
BT LTE 2600	0.0001074 %	2517.500 MHz	2537.500 MHz
VF LTE 2600	0.0001430 %	2620.000 MHz	2640.000 MHz
EE LTE 2600	0.0001471 %	2670.000 MHz	2690.000 MHz
SHF3 Comms	0.0019991 %	2700.000 MHz	3000.000 MHz
Others	0.0029924 %		
Total	1.3868001 %	88.000 MHz	3000.000 MHz
Isotropic Result			

Location 4 – Changing Room

Values		Configuration	
		Standard: ICNIRP GP	
Service	Value	Lower Frequency	Upper Frequency
O2 U900	0.3799900 %	930.100 MHz	935.100 MHz
VF GSM 900	0.0036119 %	935.200 MHz	939.600 MHz
O2 GSM 900	0.0880780 %	939.800 MHz	947.200 MHz
VF GSM 900	0.0153940 %	947.400 MHz	955.000 MHz
O2 GSM 900	0.1104400 %	955.200 MHz	960.000 MHz
SHF1 Comms	0.0012428 %	960.000 MHz	1710.000 MHz
O2 GSM 1800	0.0000147 %	1805.000 MHz	1810.800 MHz
VF GSM 1800	0.0000148 %	1811.000 MHz	1816.600 MHz
Three LTE 1800	0.0000318 %	1816.700 MHz	1831.700 MHz
EE(TM) GSM 1800	0.0000271 %	1831.800 MHz	1841.000 MHz
EE LTE 1800	0.0000427 %	1841.600 MHz	1861.800 MHz
EE(OR) GSM 1800	0.0000360 %	1862.000 MHz	1876.600 MHz
DECT Phone	0.0000451 %	1880.000 MHz	1900.000 MHz
Three 3G	0.0000406 %	2110.300 MHz	2124.900 MHz
O2 3G	0.0000344 %	2124.900 MHz	2134.900 MHz
VF 3G	0.0000502 %	2134.900 MHz	2149.700 MHz
EE 3G	0.0000642 %	2149.700 MHz	2169.700 MHz
WIFI802.11BGN	0.0003584 %	2400.000 MHz	2486.500 MHz
BT LTE 2600	0.0001069 %	2517.500 MHz	2537.500 MHz
VF LTE 2600	0.0001364 %	2620.000 MHz	2640.000 MHz
EE LTE 2600	0.0001422 %	2670.000 MHz	2690.000 MHz
SHF3 Comms	0.0020180 %	2700.000 MHz	3000.000 MHz
Others	0.0026003 %		
Total	1.4856000 %	88.000 MHz	3000.000 MHz
Isotropic Result			

Appendix 2 - Tabulated Values

Location 1 – Compound

Service Name	Value %	Lower Frequency [MHz]	Upper Frequency [MHz]
Local Radio	0.0015	88	108
VHF Comms	0.0037	108	217.5
DAB	0.0003	217.5	230
UHF1 Comms	0.0020	230	380
Airwave	0.0002	380	400
UHF2 Comms	0.0006	400	470
TV	0.0015	470	790
Three LTE 800	0.0000	791	796
EE LTE 800	0.0003	796	801
VF LTE 800	0.0106	801	811
O2 LTE 800	0.0063	811	821
Zigbee 868MHz	0.0000	865.5	870.5
GSM-R	0.0001	915	925
VF U900	0.0260	925.1	930.1
O2 U900	0.0622	930.1	935.1
VF GSM 900	0.0005	935.2	939.6
O2 GSM 900	0.0132	939.8	947.2
VF GSM 900	0.0006	947.4	955
O2 GSM 900	0.0077	955.2	960
SHF1 Comms	0.0012	960	1710
O2 GSM 1800	0.0000	1805	1810.8
VF GSM 1800	0.0000	1811	1816.6
Three LTE 1800	0.0000	1816.7	1831.7
EE(TM) GSM 1800	0.0000	1831.8	1841
EE LTE 1800	0.0000	1841.6	1861.8
EE(OR) GSM 1800	0.0000	1862	1876.6
DECT Phone	0.0000	1880	1900
Three 3G	0.0000	2110.3	2124.9
O2 3G	0.0000	2124.9	2134.9
VF 3G	0.0000	2134.9	2149.7
EE 3G	0.0001	2149.7	2169.7
WiFi802.11BGN	0.0003	2400	2486.5
BT LTE 2600	0.0001	2517.5	2537.5
VF LTE 2600	0.0001	2620	2640
EE LTE 2600	0.0001	2670	2690
SHF3 Comms	0.0019	2700	3000
Others	0.0023		
Total	0.1438		

Location 2 – Playing Field

Service Name	Value %	Lower Frequency [MHz]	Upper Frequency [MHz]
Local Radio	0.00154	88	108
VHF Comms	0.00392	108	217.5
DAB	0.00032	217.5	230
UHF1 Comms	0.00206	230	380
Airwave	0.00024	380	400
UHF2 Comms	0.00062	400	470
TV	0.00164	470	790
Three LTE 800	0.00003	791	796
EE LTE 800	0.00248	796	801
VF LTE 800	0.13847	801	811
O2 LTE 800	0.13083	811	821
Zigbee 868MHz	0.00002	865.5	870.5
GSM-R	0.00027	915	925
VF U900	0.14485	925.1	930.1
O2 U900	0.12402	930.1	935.1
VF GSM 900	0.00206	935.2	939.6
O2 GSM 900	0.06725	939.8	947.2
VF GSM 900	0.00940	947.4	955
O2 GSM 900	0.06541	955.2	960
SHF1 Comms	0.00123	960	1710
O2 GSM 1800	0.00001	1805	1810.8
VF GSM 1800	0.00001	1811	1816.6
Three LTE 1800	0.00003	1816.7	1831.7
EE(TM) GSM 1800	0.00002	1831.8	1841
EE LTE 1800	0.00004	1841.6	1861.8
EE(OR) GSM 1800	0.00003	1862	1876.6
DECT Phone	0.00004	1880	1900
Three 3G	0.00004	2110.3	2124.9
O2 3G	0.00003	2124.9	2134.9
VF 3G	0.00004	2134.9	2149.7
EE 3G	0.00006	2149.7	2169.7
WiFi802.11BGN	0.00036	2400	2486.5
BT LTE 2600	0.00010	2517.5	2537.5
VF LTE 2600	0.00013	2620	2640
EE LTE 2600	0.00014	2670	2690
SHF3 Comms	0.00199	2700	3000
Others	0.00255		
Total	0.70231		

Location 3 – Car Park

Service Name	Value %	Lower Frequency [MHz]	Upper Frequency [MHz]
Local Radio	0.00159	88	108
VHF Comms	0.00399	108	217.5
DAB	0.00032	217.5	230
UHF1 Comms	0.00208	230	380
Airwave	0.00026	380	400
UHF2 Comms	0.00065	400	470
TV	0.00235	470	790
Three LTE 800	0.00007	791	796
EE LTE 800	0.00629	796	801
VF LTE 800	0.21522	801	811
O2 LTE 800	0.33244	811	821
Zigbee 868MHz	0.00002	865.5	870.5
GSM-R	0.00091	915	925
VF U900	0.27301	925.1	930.1
O2 U900	0.28697	930.1	935.1
VF GSM 900	0.00485	935.2	939.6
O2 GSM 900	0.11094	939.8	947.2
VF GSM 900	0.02939	947.4	955
O2 GSM 900	0.10800	955.2	960
SHF1 Comms	0.00124	960	1710
O2 GSM 1800	0.00002	1805	1810.8
VF GSM 1800	0.00001	1811	1816.6
Three LTE 1800	0.00004	1816.7	1831.7
EE(TM) GSM 1800	0.00004	1831.8	1841
EE LTE 1800	0.00005	1841.6	1861.8
EE(OR) GSM 1800	0.00004	1862	1876.6
DECT Phone	0.00004	1880	1900
Three 3G	0.00005	2110.3	2124.9
O2 3G	0.00003	2124.9	2134.9
VF 3G	0.00005	2134.9	2149.7
EE 3G	0.00007	2149.7	2169.7
WiFi802.11BGN	0.00036	2400	2486.5
BT LTE 2600	0.00011	2517.5	2537.5
VF LTE 2600	0.00014	2620	2640
EE LTE 2600	0.00015	2670	2690
SHF3 Comms	0.00200	2700	3000
Others	0.00299		
Total	1.38680		

Location 4 – Changing Rooms

Service Name	Value %	Lower Frequency [MHz]	Upper Frequency [MHz]
Local Radio	0.00147	88	108
VHF Comms	0.00387	108	217.5
DAB	0.00031	217.5	230
UHF1 Comms	0.00212	230	380
Airwave	0.00024	380	400
UHF2 Comms	0.00065	400	470
TV	0.00152	470	790
Three LTE 800	0.00003	791	796
EE LTE 800	0.00348	796	801
VF LTE 800	0.38193	801	811
O2 LTE 800	0.12360	811	821
Zigbee 868MHz	0.00002	865.5	870.5
GSM-R	0.00034	915	925
VF U900	0.36147	925.1	930.1
O2 U900	0.37999	930.1	935.1
VF GSM 900	0.00361	935.2	939.6
O2 GSM 900	0.08808	939.8	947.2
VF GSM 900	0.01539	947.4	955
O2 GSM 900	0.11044	955.2	960
SHF1 Comms	0.00124	960	1710
O2 GSM 1800	0.00001	1805	1810.8
VF GSM 1800	0.00001	1811	1816.6
Three LTE 1800	0.00003	1816.7	1831.7
EE(TM) GSM 1800	0.00003	1831.8	1841
EE LTE 1800	0.00004	1841.6	1861.8
EE(OR) GSM 1800	0.00004	1862	1876.6
DECT Phone	0.00005	1880	1900
Three 3G	0.00004	2110.3	2124.9
O2 3G	0.00003	2124.9	2134.9
VF 3G	0.00005	2134.9	2149.7
EE 3G	0.00006	2149.7	2169.7
WiFi802.11BGN	0.00036	2400	2486.5
BT LTE 2600	0.00011	2517.5	2537.5
VF LTE 2600	0.00014	2620	2640
EE LTE 2600	0.00014	2670	2690
SHF3 Comms	0.00202	2700	3000
Others	0.00260		
Total	1.48560		



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