Bonneagar Iompair Éireann
Transport Infrastructure Ireland

NTA
Údarás Náisiúnta Iompair
National Transport Authority

Luas Finglas

Environmental Impact Assessment Report 2024

Appendix A16.3: Electromagnetic Compatibility Baseline Measurement Survey

BARRY TRANSPORTATION
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Building Ireland's Future

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SECTION 1: Introduction and objectives

1.1 Context

Luas Finglas is the proposed new northern extension of the Luas Green Line from its current terminus in Broombridge to a new terminus in Charlestown, near the N2-M50 interchange, it is approximately 4km long, with 4 new stops, two new substations, two main bridges, and a new extension to Broombridge depot. The general environment of the new line runs through a combination of industrial areas, residential areas, street running, green field areas and an interface with an existing railway line.

This EMC Baseline Survey report follows on from the initial high-level desktop survey carried out within Technical Note [R1]. This helped identify the potential 'hot spots' and locations where EMI baseline measurements were to be carried out. These locations were detailed in the EMC Survey Plan [R2] that also outlined the particular tests that were to be carried out during the survey.

The EMC Baseline Survey was carried out between the dates 18th to the 24th October 2022.

1.2 Scope of the EMC Baseline Survey

The scope is limited to the proposed route of the new Luas Finglas extension and immediate surrounding area.

Measurements were carried out in accordance with EN50121-2 [R3] Class C emissions limit at five selected sights:

- Broombridge
- Finglas Garda
- Finglas Fire Station
- North Road/Finglas Bypass
- Charleston

It should be noted however that EN50121-2:2017 only mandates measurements between 150kHz and 1GHz, however for the purpose of this baseline survey the frequency range was extended down to 9kHz and up to 6GHz to enable a full view of the EMI environment across possible frequencies of interest.

1.3 Background to the EMC Survey

Electrical or magnetic interference can stop electrical or electronic equipment from working correctly. EMC is the ability of equipment or a system to function satisfactorily in its electromagnetic environment, without introducing intolerable electromagnetic disturbances to anything in that environment. The goal of EMC is the correct operation, in the same electromagnetic environment, of different equipment which use electromagnetic phenomena, and the avoidance of any interference effects.

In order to achieve EMC, two aspects need to be considered;

- Emission issues are related to the generation of electromagnetic energy (either intended or unintended) by a source, and to the countermeasures which should be taken in order to reduce such generation or avoid the escape of any remaining energies into the external environment, and;
- Susceptibility or immunity issues, in contrast, refer to the correct operation of electrical equipment; referred to as the victim, in the presence of electromagnetic disturbances.

Simply put, EMC is achieved by addressing both emission and immunity issues; by suppressing the sources of interference and hardening the potential victims where necessary.

The importance of the EMC measurement survey is establishing the baseline EMI environment that the new tramway needs to operate within. This will highlight any particularly high sources of EMI emission in the environment that the railway must be designed to be immune to. Further to this it identifies the baseline levels in the environment that are clearly attributable to outside sources. When the tramway is commissioned, it will be possible to identify those sources attributable to the tramway and those attributable to the outside sources. This is an important factor in demonstrating compliance of the new tramway to EN50121-2 [R3].

In addition to the standard radiated emission measurements to EN50121-2 [R3], electric and magnetic field measurements close to the 110kV HV lines which run parallel to the new tramway along Broombridge Road and over the route in Tolka Park were taken. This is important in identifying at an early stage, if induced voltages from the HV lines into the tramway could be an issue either from an equipment reliabililty perspective or for a staff or public touch potential safety issue.

SECTION 2: Abbreviations

Table 1 - List of Abbreviation

Abbreviation	Signification
dB	Decibel
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMF	Electromagnetic Fields
GHz	Giga Hertz
HV	High Voltage
ICNIRP	International Commission on Non-ionising Radiation Protection
OHL	Overhead Line
kHz	Kilo Hertz
MHz	Mega Hertz
µT	Micro Tesla

SECTION 3: Methodology

3.1 Location of the Measurements

The EMC measurement survey has been conducted to identify the electromagnetic environment in which the new tramway will be required to operate in. An outline of the route for the Luas Finglas extension is presented in Figure 1.

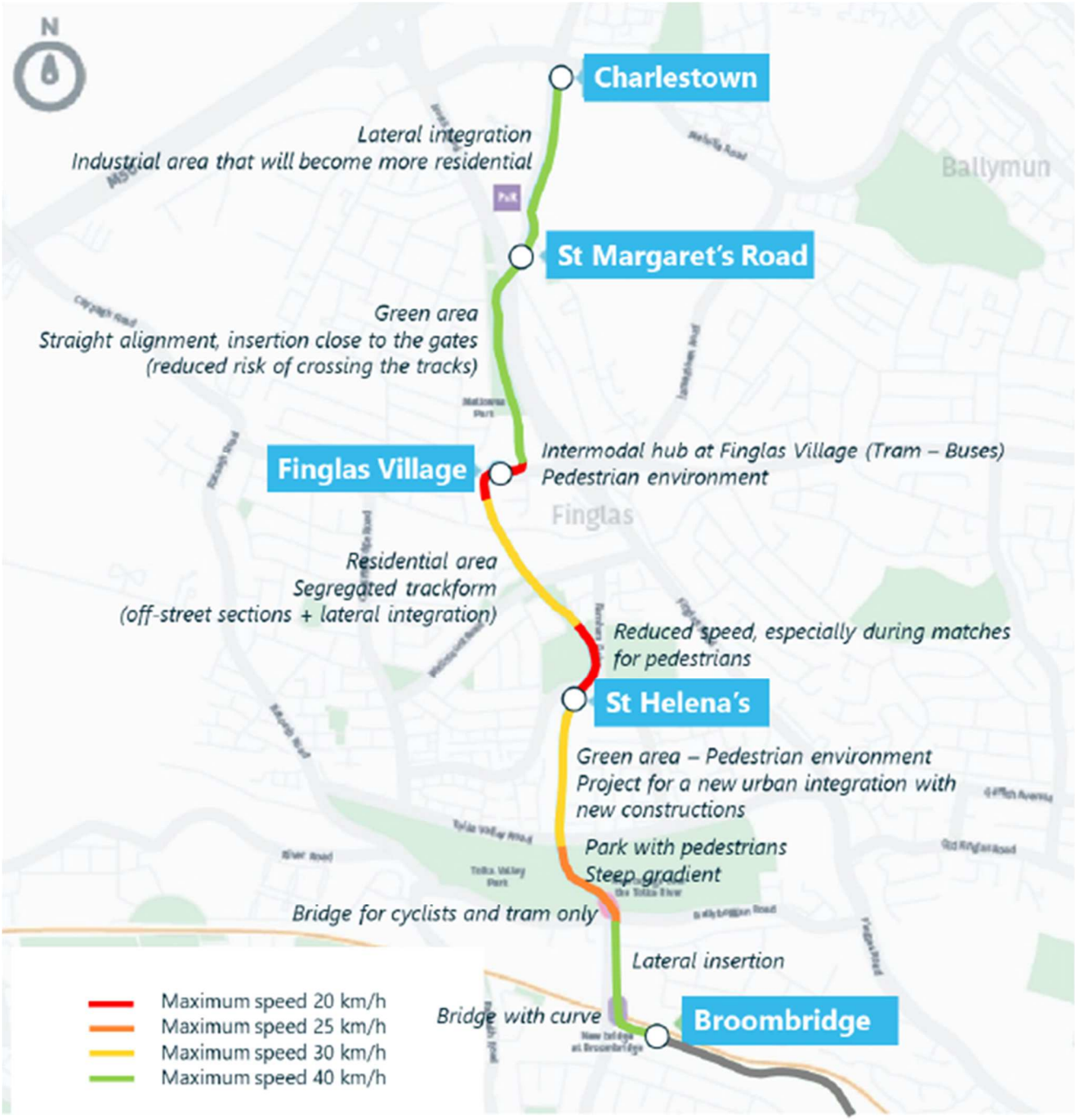


Figure 1 - Overview of Luas Finglas Route Extension

3.2 Scope of the Measurements

The test method for carrying out radiated emission measurements can be found in EN 50121-2:2017 [R3]. The test method requires an aerial to be set up on a tripod at a distance of 10m from the tramway. Given that these are baseline measurements prior to building the tramway, the locations chosen were close to the alignment at points of interest identified by an earlier EMC Desktop Survey [R1], followed by a route walk and finalised in the the EMC Survey Plan [R2]. The measurement locations were:

- Adjacent to Broombridge Station close to the current terminus of the tramway
- Finglas Garda Station
- Finglas Fire Station (one of the new substation locations)
- Finglas Bypass/North Road (second new substation location)
- Charlestown Terminus

The locations were chosen because they were identified as potentially 'EMI noisy' locations, for example at Broombridge with three possible EMI sources:

(i) the parallel running railway,
(ii) the nearby mobile communications antenna
(iii) the nearby HV pylon.

Similarly, Finglas Garda Station was chosen as it is close to a communications mast. The two new substation locations were also chosen as these represent significant sites for the new equipment and it is important to understand the EMI environment in which they are required to operate.

3.3 Measurement Methodology

Although the measurement methodology is driven by the requirements of EN50121-2:2017 [R3], the latest version of this standard only requires measurement between 150kHz and 1GHz. For the purpose of defining the EM environment in as much detail as possible, the measurement range has been extended down to 9kHz and up to 6GHz. Figure 2 below provides the limit lines that covered the range 9kHz to 1GHz from the 2006 version of EN50121-2 [R4]. The range from 1GHz to 6GHz is not shown as there are no limit lines set for this range and the measurements are taken in the higher frequency band for information only.

It should be noted that the limit lines in Figure 2 are peak values, which is appropriate for the purposes of a baseline survey. Although EN50121-2 [R2] also provides a set of quasi peak limits specific to substations, this only becomes relevant when measuring levels from an actual substation when it is in operation for compliance purposes. In defining the EM environment, the more pessimistic levels (higher levels) associated with peak measurements are considered more appropriate.

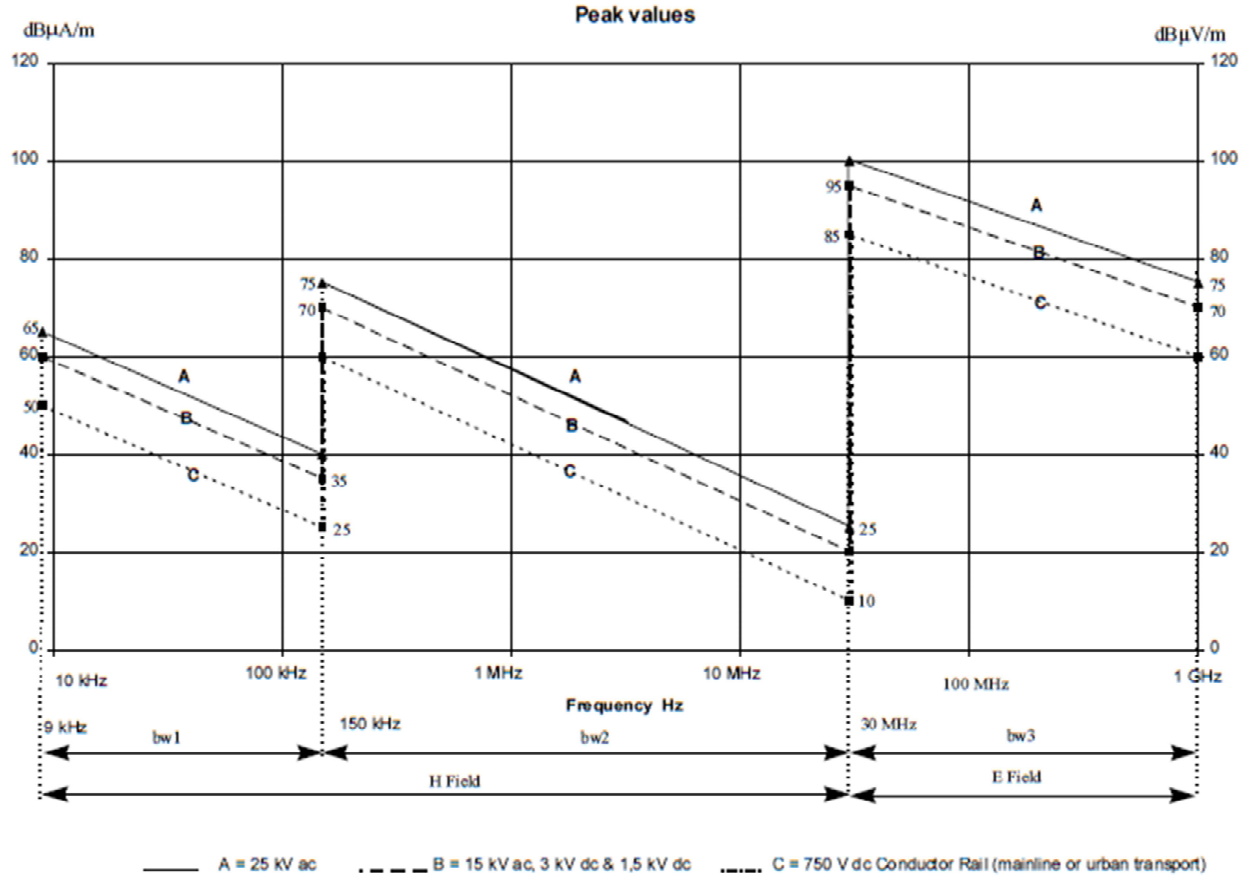


Figure 2 - Limit Lines for Measurements Between 9kHz and 1GHz - Limit Line C for Luas Finglas

Table 2 - Antenna Resolution Bandwidths for Measurements

Band Width	Frequency Range	Resolution Bandwidth
bw1	9kHz-150kHz	200Hz
bw2	150kHz-30MHz	9kHz
bw3	30MHz-1GHz	120kHz
bw4	1GHz-6GHz	1MHz

The measurement set up from EN50121-2 is shown in Figure 3 and Figure 4 below, however for the baseline measurements there are no tracks, so the measurement antenna were located at positions close to the proposed new route.

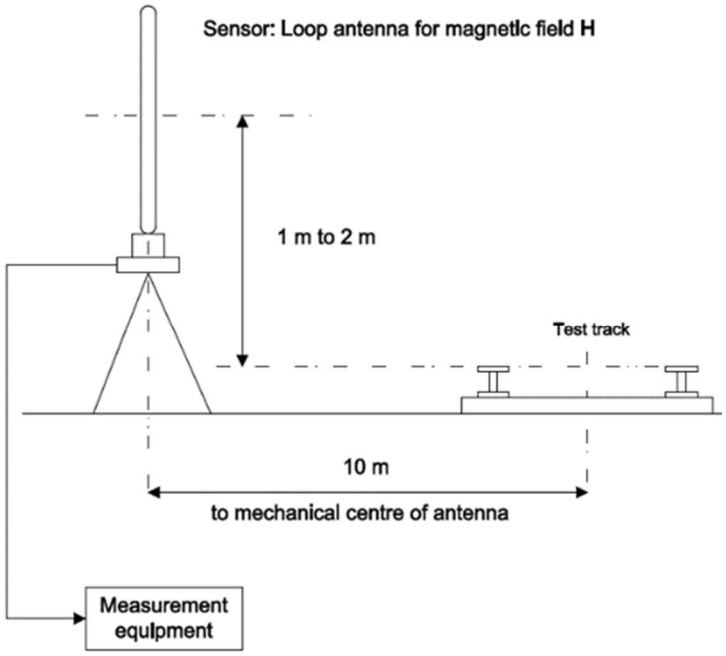


Figure 3 - Position of Antenna for Measurement of Magnetic Field in the 9kHz to 30MHz Frequency Band

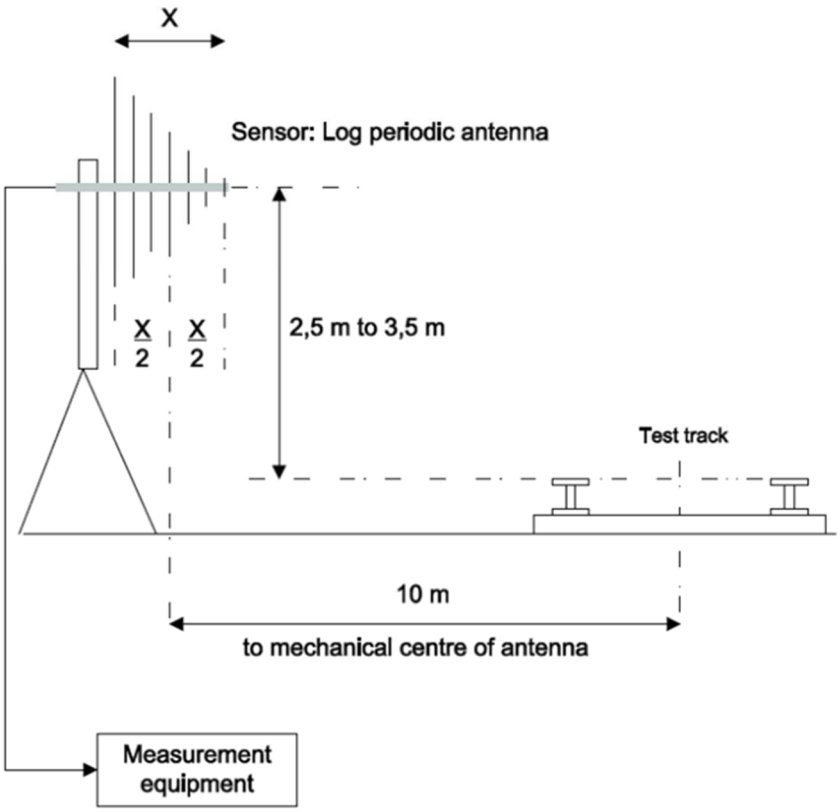


Figure 4 - Position (Vertical Polarisation) of Antenna for Measurement of Electric Field in the 30MHz to 6GHz Frequency Band

3.4 Test Equipment

Measurements were taken using a CISPR 16 [R6] compliant test receiver (Rohde & Schwarz ESPI – 7 Test Receiver) and the following antennas listed in Table 3 were used to capture the EMI. All equipment was controlled and test results captured using the Radimation EMI Measurement software (version 2019.1.9).

Table 3 - Antenna Details

Frequency Range	Antenna Used	Antenna Height
9 kHz to 30 MHz	EMCO 6512 Magnetic Loop Antenna	1m
30 MHz to 1 GHz	CBL6111B BiLog Antenna	2.5 – 3.5 m
1GHz to 6GHz	EMCO 3115 Double Ridged Guide Antenna	2.5m

The equipment listed in Table 4 was used to carry out the measurements

Table 4 - Measurement Equipment and Calibrations

Item	Description	Serial Number	Callibration Date	Callibration Due Date
EMCO 6512 [R13]	Passive Magnetic Field Loop Antenna	8911-1052	03/08/2022	03/08/2025
Chase CPA 9231 [R18]	RF Signal Pre-amplifier	3089	16/12/21	16-12-2023
Schaffner Chase CBL6111 [R9]	BiLog Antenna 30 MHz to 1 GHz	2003	28/10/2022	28/10/2024 Note **
Rohde & Schwarz ESPI-7 [R10]	EMC Test Receiver/Analyser	100024	27/10/2020	27/10/2023
30m RG214 Double Screened RF Coax Cable [R14]	30 metre 50 Ω RF Coax cable with 50 mm N type connectors	7171	08/02/2022	08/02/2023
25m N to N(m) Utiflex [R15]	Microwave coaxial Cable	43681A	13/10/22	13/10/25
EMCO 3115 [R17]	Double Ridged Guide Antenna	9605-4794	08/01/2020	08/01/2023
Agilent 87405C [R11]	Microwave Signal Pre-amplifier	MY47010567	09/02/2022	09/02/2024
Test software	Dare Radimation test software and dongle	N/A	N/A	N/A

Note **: the BiLog Antenna formal external calibration due date had expired, however EMC Hire carried out internal verification tests in their lab to confirm that the antenna was in fact still in calibration [R9] on the 31/05/22.

SECTION 4: Radiated Emission Measurements

4.1 Site 1 – Broombridge

4.1.1 Test Location and Set-up

Figure 5 - Google Earth View of Broombridge Measurement Location

Figure 6 - Test Set-up at Broombridge

4.1.2 Broombridge Test Measurements

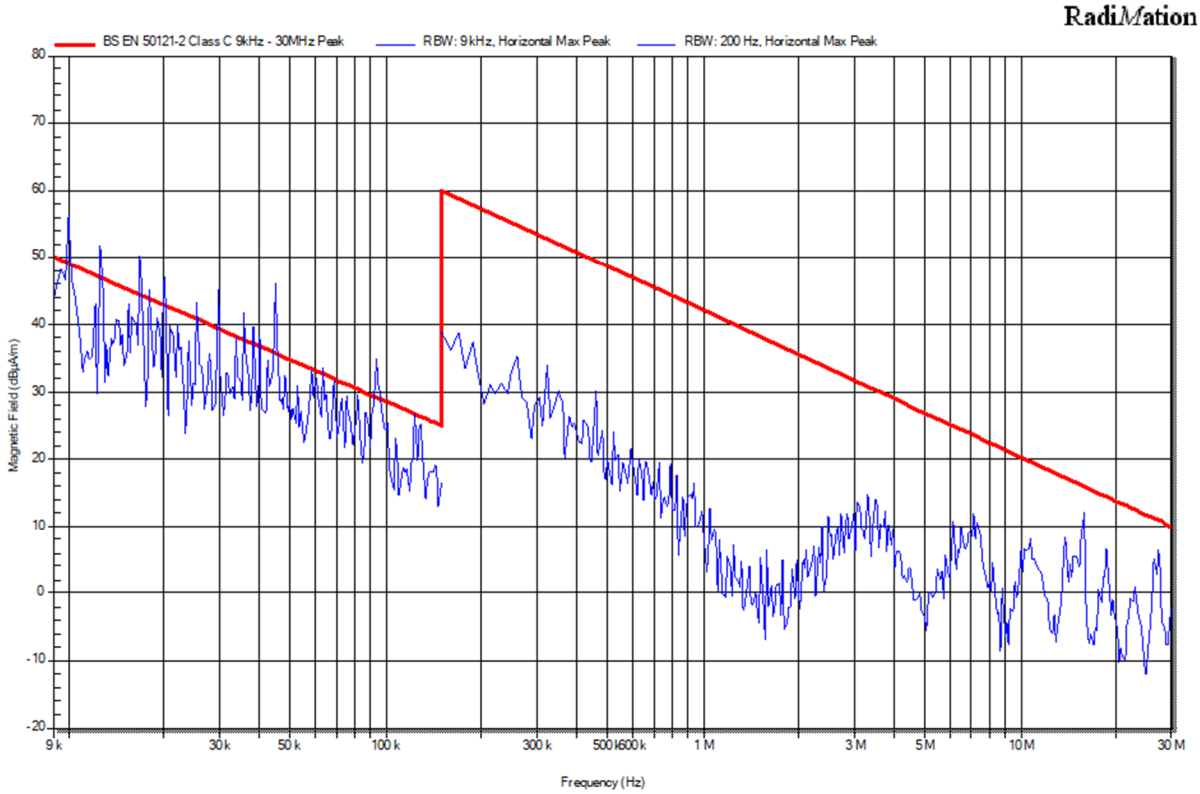


Figure 7 - Broombridge Measurements 9kHz-30MHz Loop Antenna Parallel

Table 5 - Broombridge Peak Measurements 9kHz-30MHz - Parallel

Frequency	Amplitude	Above limit line
9.94kHz	56 dBµA/m	Yes
12.3kHz	52 dBµA/m	Yes
15.76kHz	50 dBµA/m	Yes
20.2kHz	46 dBµA/m	Yes
29.8kHz	29.8 dBµA/m	Yes
43.6kHz	46 dBµA/m	Yes
92.8kHz	34.7 dBµA/m	Yes

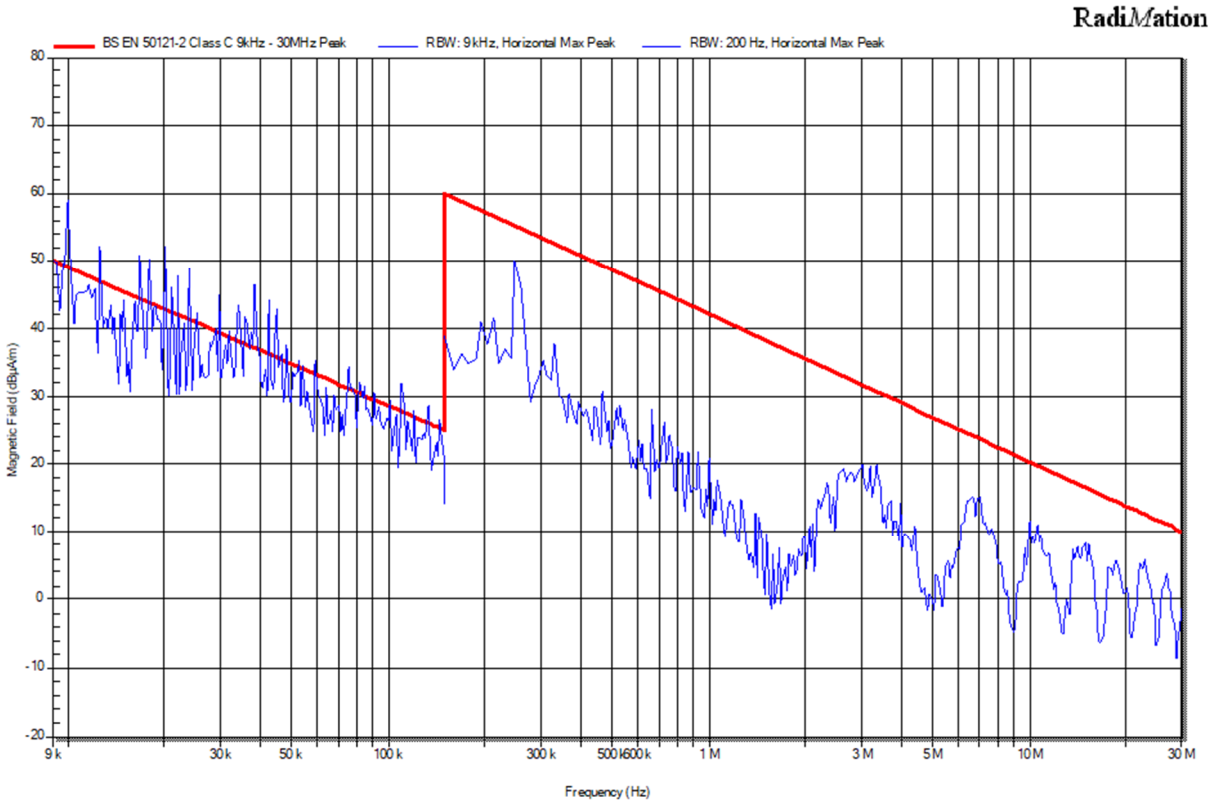


Figure 8 - Broombridge Measurements 9kHz-30MHz Loop Antenna Perpendicular

Table 6 - Broombridge Peak Measurements 9kHz-30MHz - Perpendicular

Frequency	Amplitude	Above limit line
9.98kHz	58.6 dBµA/m	Yes
12.2kHz	52.3 dBµA/m	Yes
20.2kHz	52.2 dBµA/m	Yes
22.8kHz	48.4 dBµA/m	Yes
37.4kHz	46.4 dBµA/m	Yes
118kHz	32 dBµA/m	Yes
235kHz	50 dBµA/m	No

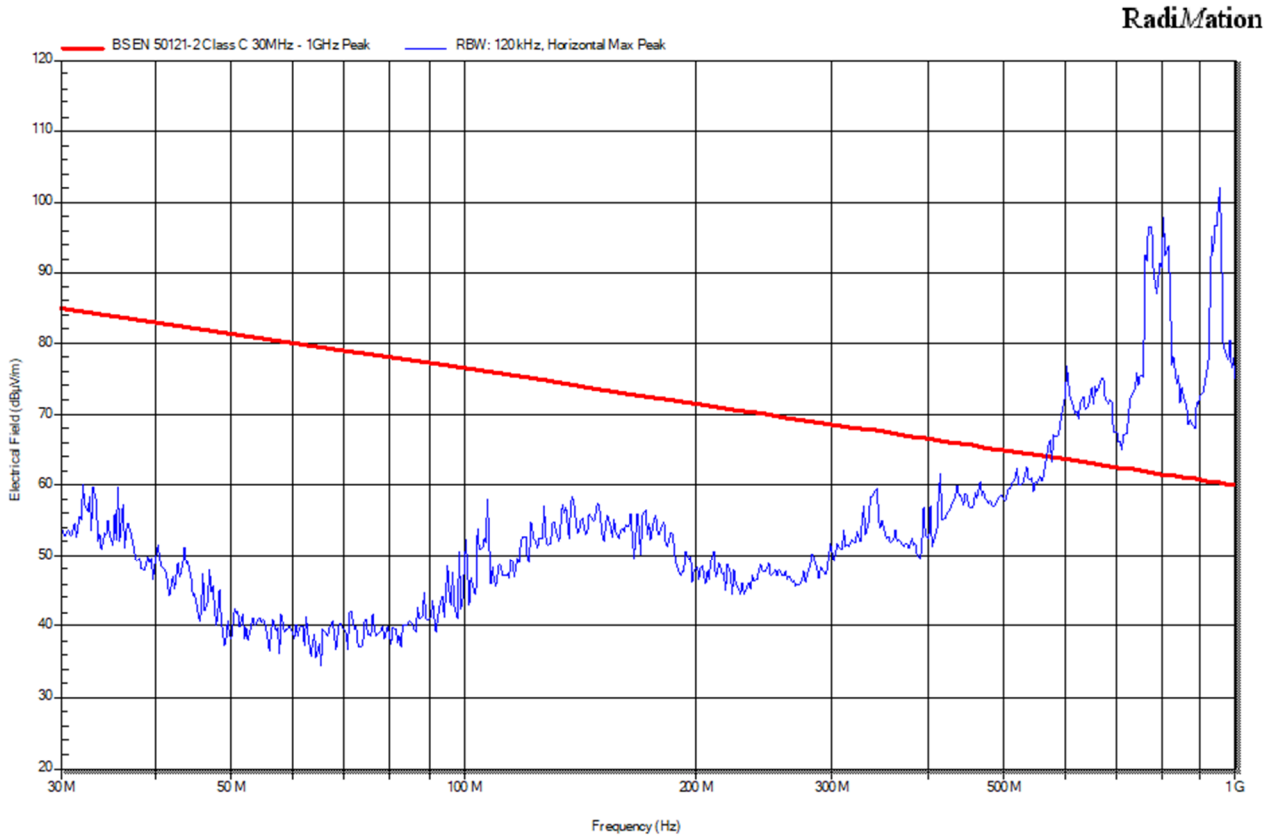


Figure 9 - Broombridge Measurements 30MHz-1GHz Bilog Horizontal

Table 7 - Broombridge Peak Measurements 30MHz–1GHz - Horizontal

Frequency	Amplitude	Above limit line
604.14MHz	76.2 dBµV/m	Yes
775.98MHz	96.1 dBµV/m	Yes
811.44MHz	97.1 dBµV/m	Yes
941.94MHz	102.2 dBµV/m	Yes

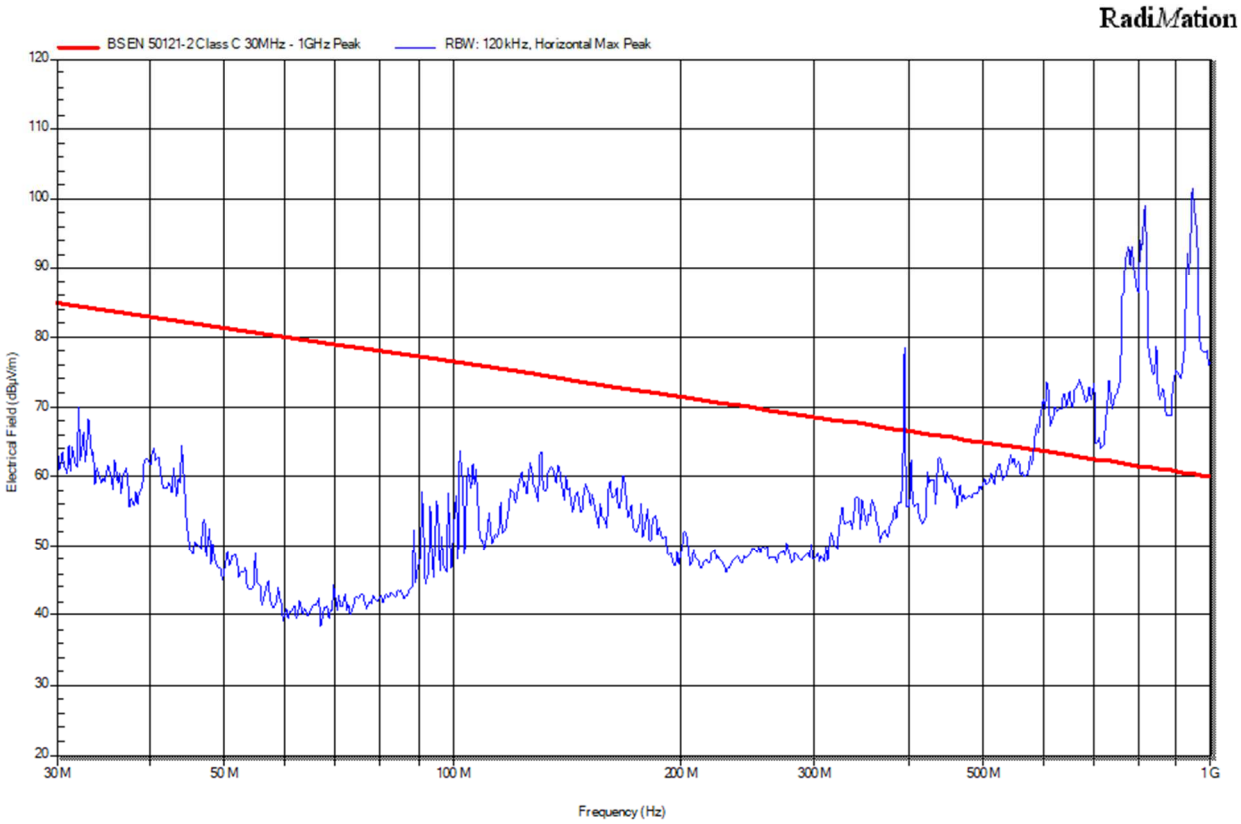


Figure 10 - Broombridge Measurements 30MH-1GHz Bilog Vertical

Table 8 - Broombridge Peak Measurements 30MHz-1GHz - Vertical

Frequency	Amplitude	Above limit line
392.34MHz	78.2dBµV/m	Yes
604.14MHz	73.8dBµV/m	Yes
775.98MHz	93.8dBµV/m	Yes
811.44MHz	98.3dBµV/m	Yes
941.94MHz	101.8dBµV/m	Yes

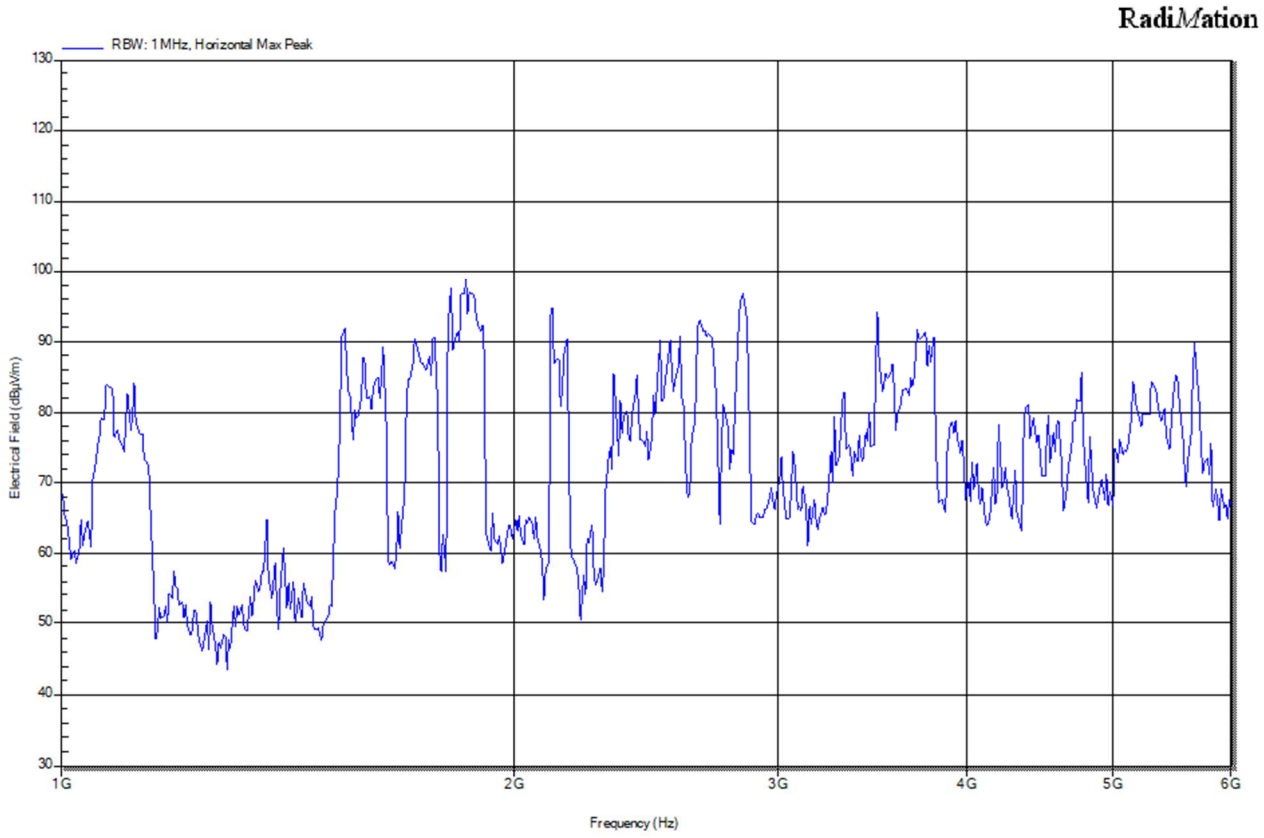


Figure 11 - Broombridge Measurements 1GHz-6GHz Wave-Guide Horizontal

Table 9 - Broombridge Peak Measurements 1GHz-6GHz Horizontal

Frequency	Amplitude	Above limit line
1.094GHz	84.1dBµV/m	N/A
1.56GHz	91.8dBµV/m	N/A
1.851GHz	98.2dBµV/m	N/A
2.538GHz	96.2dBµV/m	N/A
3.328GHz	94.1dBµV/m	N/A
5.448GHz	90dBµV/m	N/A

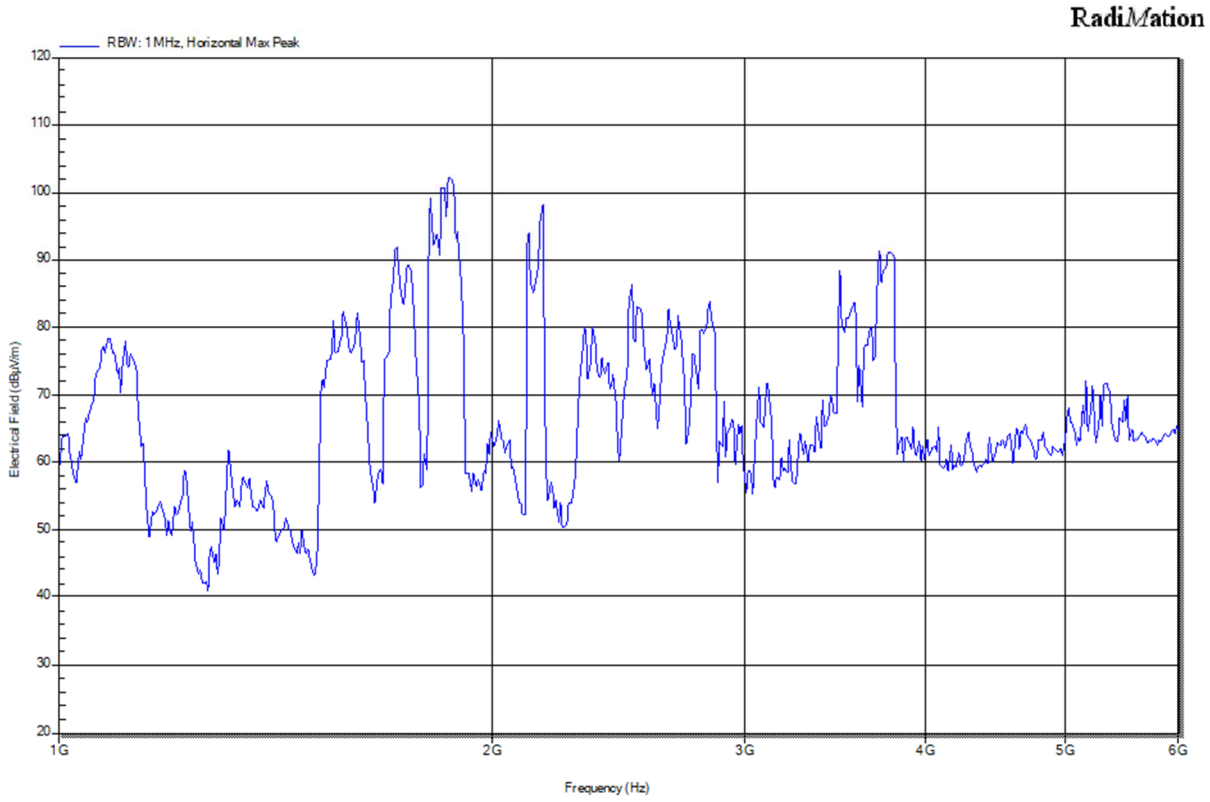


Figure 12 - Broombridge Measurements 1GHz-6GHz Wave-Guide Vertical

Table 10 - Broombridge Peak Measurements 1GHz-6GHz Vertical

Frequency	Amplitude	Above limit line
1.094GHz	78dBµV/m	N/A
1.58GHz	81.9dBµV/m	N/A
1.751GHz	91.9dBµV/m	N/A
1.851GHz	102.3dBµV/m	N/A
2.318GHz	98.1dBµV/m	N/A
3.787GHz	91.5dBµV/m	N/A

4.2 Site 2 - Finglas Garda

4.2.1 Test Location and Set-Up

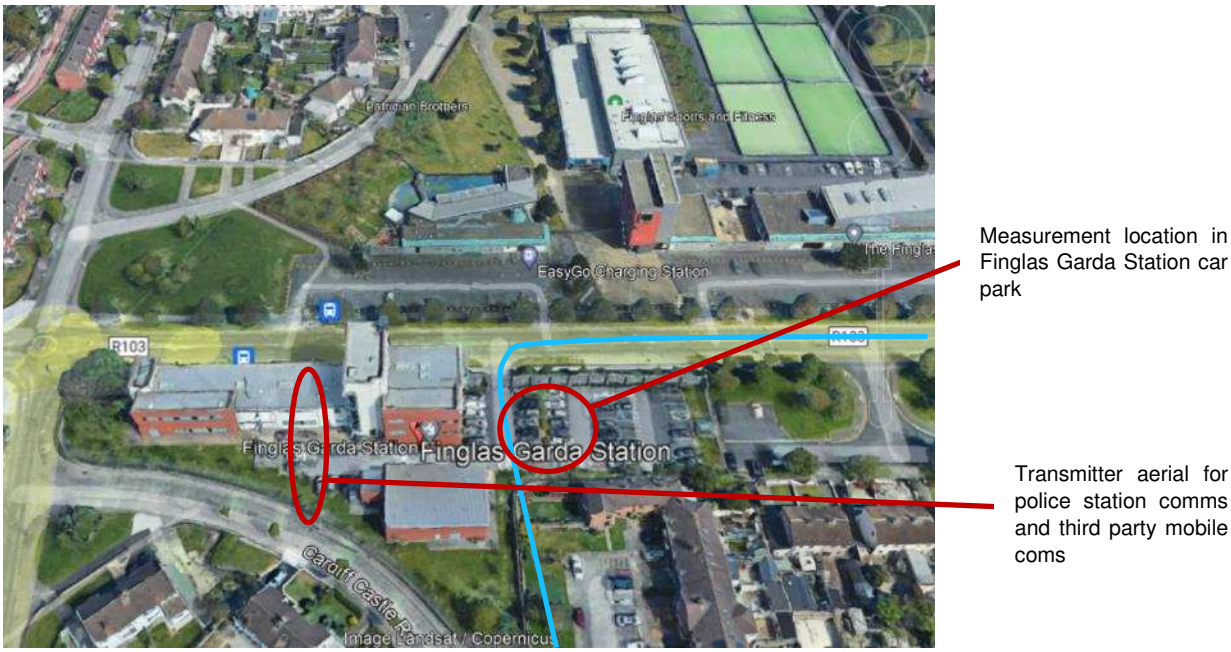


Figure 13 - Google Earth View of Finglas Garda Measurement Location

Figure 14 - Finglas Garda Measurement Location in Car Park

4.2.2 Finglas Garda Test Measurements

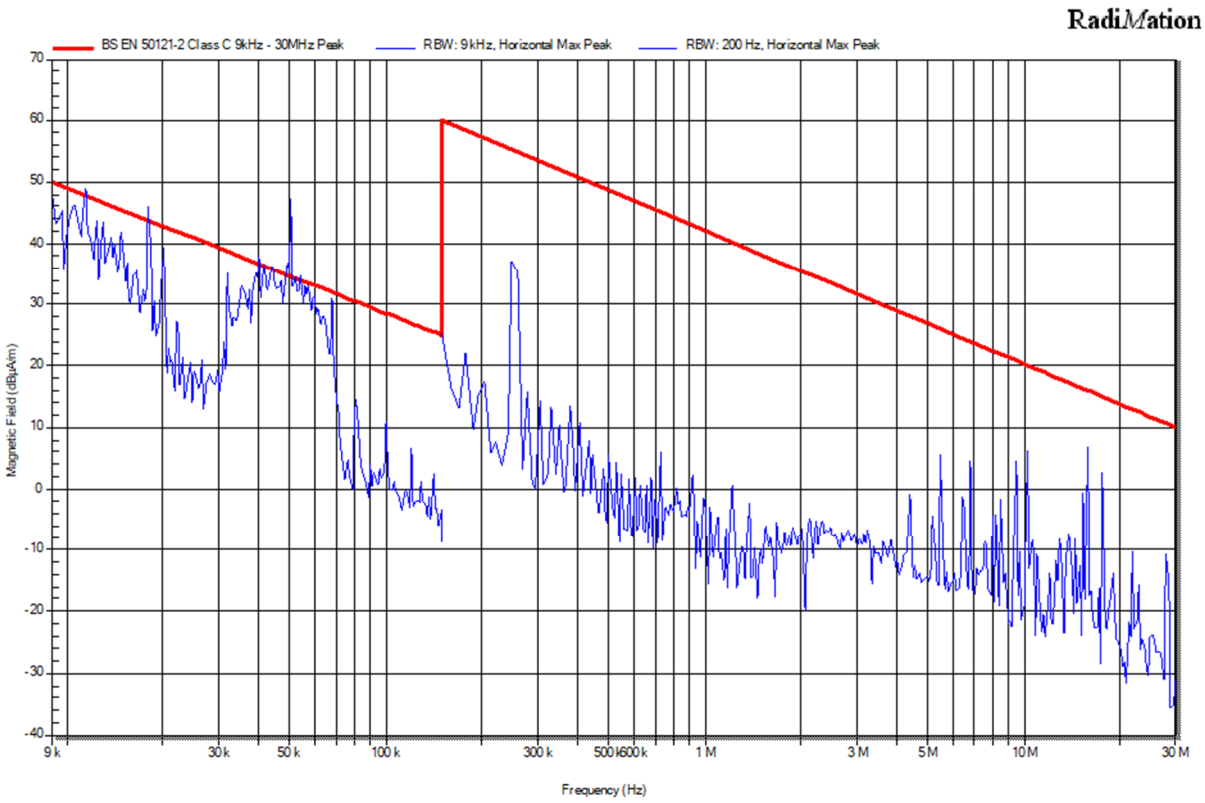


Figure 15 - Finglas Garda Measurements 9kHz-30MHz Loop Parallel

Table 11 - Finglas Garda Peak Measurements 9kHz-30MHz Parallel

Frequency	Amplitude	Above limit line
10.2kHz	48.7dBµA/m	Yes
18kHz	45.8dBµA/m	Yes
251.7kHz	36.8dBµA/m	Yes

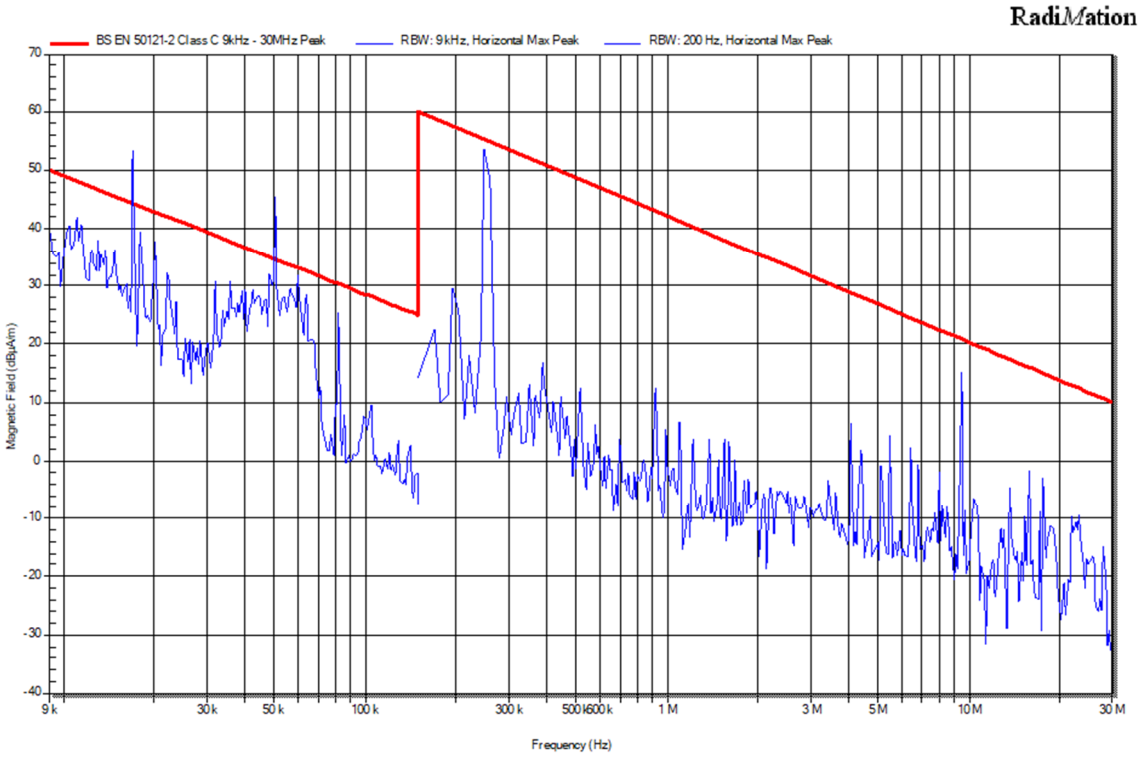


Figure 16 - Finglas Garda Measurements 9kHz-30MHz Loop Perpendicular

Table 12 - Finglas Garda Peak Measurements 9kHz-30MHz Perpendicular

Frequency	Amplitude	Above limit line
18kHz	53.8dBµA/m	Yes
50kHz	55.7dBµA/m	Yes
251.7kHz	53.9dBµA/m	No
9.3MHz	14.7dBµA/m	No

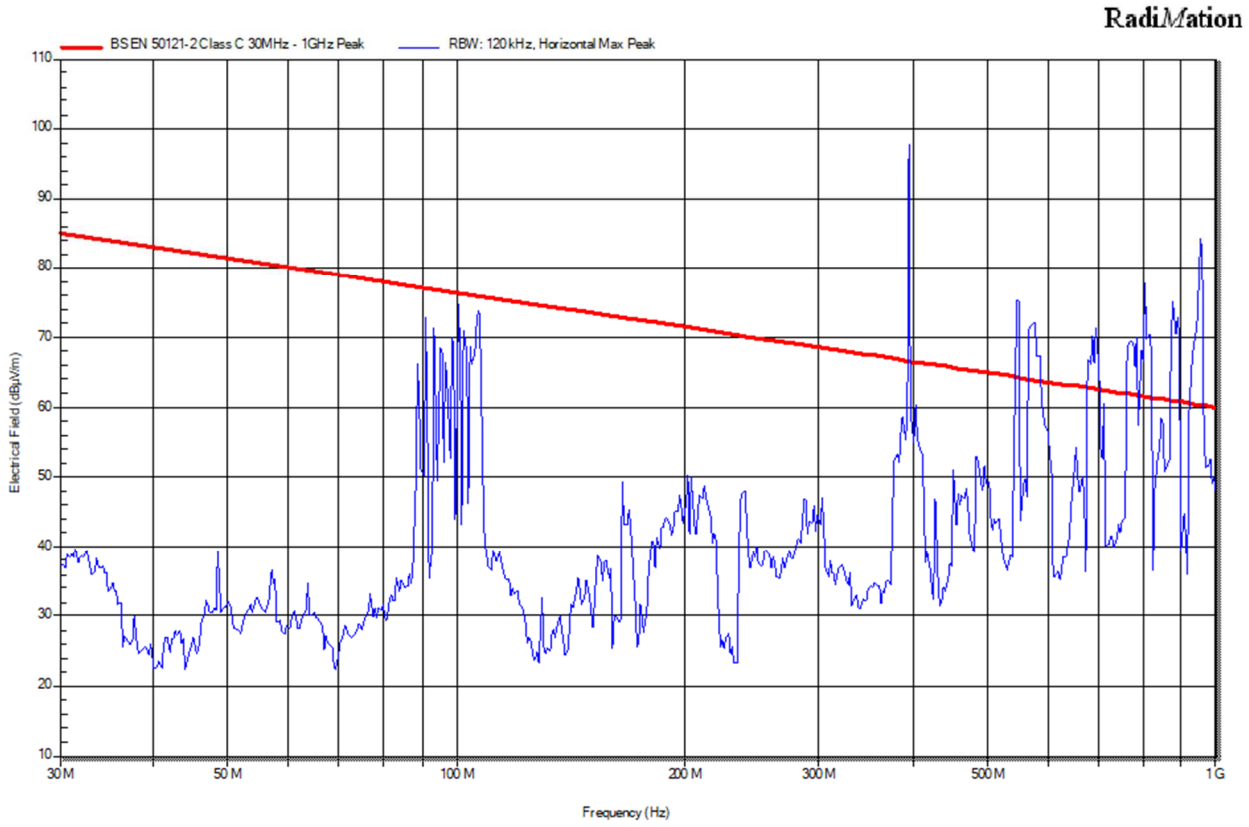


Figure 17 - Finglas Garda Measurements 30MHz-1GHz Bilog Horizontal

Table 13 - Finglas Garda Peak Measurements 30MHz-1GHz Horizontal

Frequency	Amplitude	Above limit line
100.31MHz	74.3dBµV/m	No
392.32MHz	97.8dBµV/m	Yes
548.88MHz	76.1dBµV/m	Yes
801.48MMHz	77.8dBµV/m	Yes
949.2MHz	84.6dBµV/m	Yes

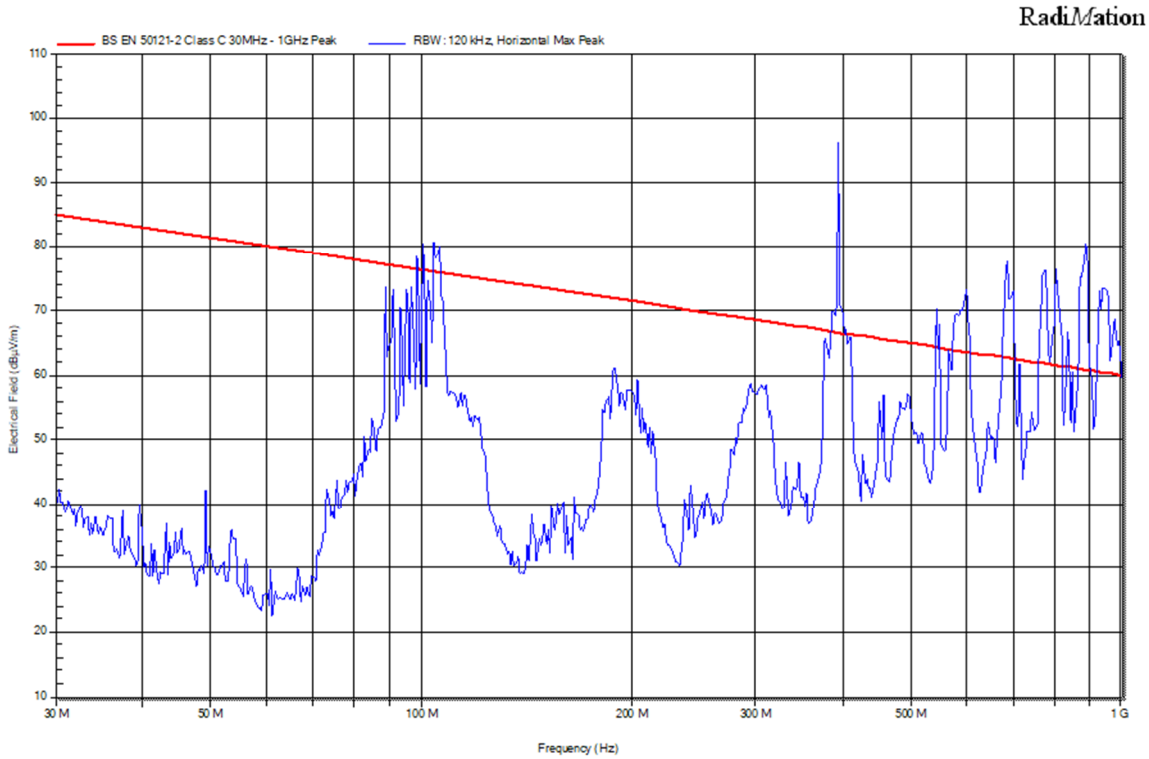


Figure 18 - Finglas Garda Measurements 30MHz-1GHz Bilog Vertical

Table 14 - Finglas Garda Peak Measurements 30MHz-1GHz Vertical

Frequency	Amplitude	Above limit line
110.2MHz	80.3dBµV/m	Yes
392.32MHz	96.7dBµV/m	Yes
684.354MHz	77.8dBµV/m	Yes
888.408MHz	80.3dBµV/m	Yes

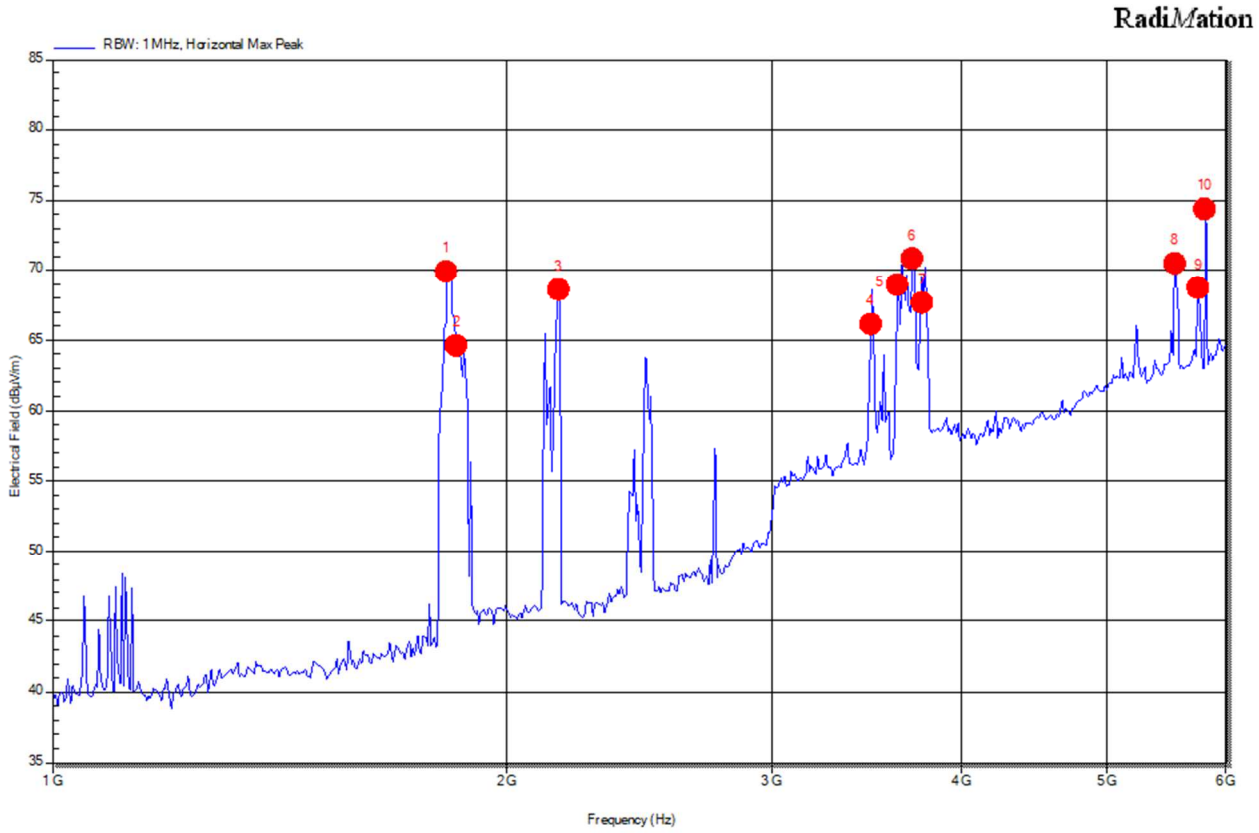


Figure 19 - Finglas Garda Measurements 1GHz-6GHz Wave-Guide Horizontal

Table 15 - Finglas Garda Peak Measurements 1GHz-6GHz Horizontal

Frequency	Amplitude	Above limit line
1.826GHz	69.9dBµV/m	N/A
1.852GHz	64.6dBµV/m	N/A
2.163GHz	68.6dBµV/m	N/A
3.485GHz	66.2dBµV/m	N/A
3.626GHz	69dBµV/m	N/A
3.711GHz	70.8dBµV/m	N/A
3.769GHz	67.7dBµV/m	N/A
5.539GHz	70dBµV/m	N/A
5.739GHz	68.82BµV/m	N/A
5.803GHz	74.4dBµV/m	N/A

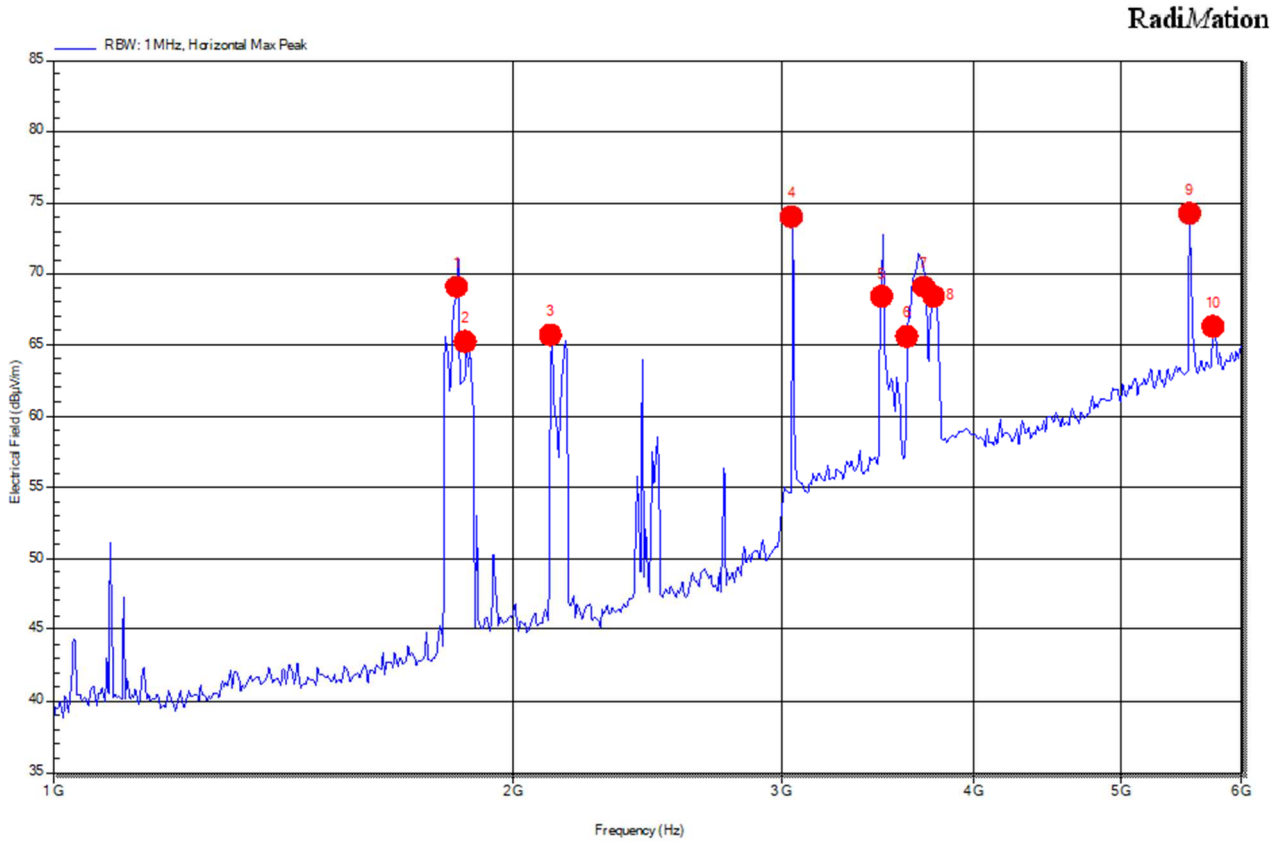


Figure 20 - Finglas Garda Measurements 1GHz-6GHz Wave-Guide Vertical

Table 16 - Finglas Garda Peak Measurements 1GHz-6GHz Vertical

Frequency	Amplitude	Above limit line
1.837GHz	69dBµV/m	N/A
1.861GHz	65.2dBµV/m	N/A
2.118GHz	65.7dBµV/m	N/A
3.041GHz	74.1dBµV/m	N/A
3.489GHz	68.4dBµV/m	N/A
3.623GHz	65.5dBµV/m	N/A
3.713GHz	69.1dBµV/m	N/A
3.769GHz	68.4dBµV/m	N/A
5.545GHz	74.2BµV/m	N/A
5.739GHz	66.3dBµV/m	N/A

4.3 Site 3 - Finglas Fire Station

4.3.1 Measurement Location and Set-Up

Figure 21 - Google Earth View of Measurement Location (Adjacent to Fire Station)

Figure 22 - Finglas Fire Station Measurement Set-Up

4.3.2 Finglas Fire Station Test Measurements

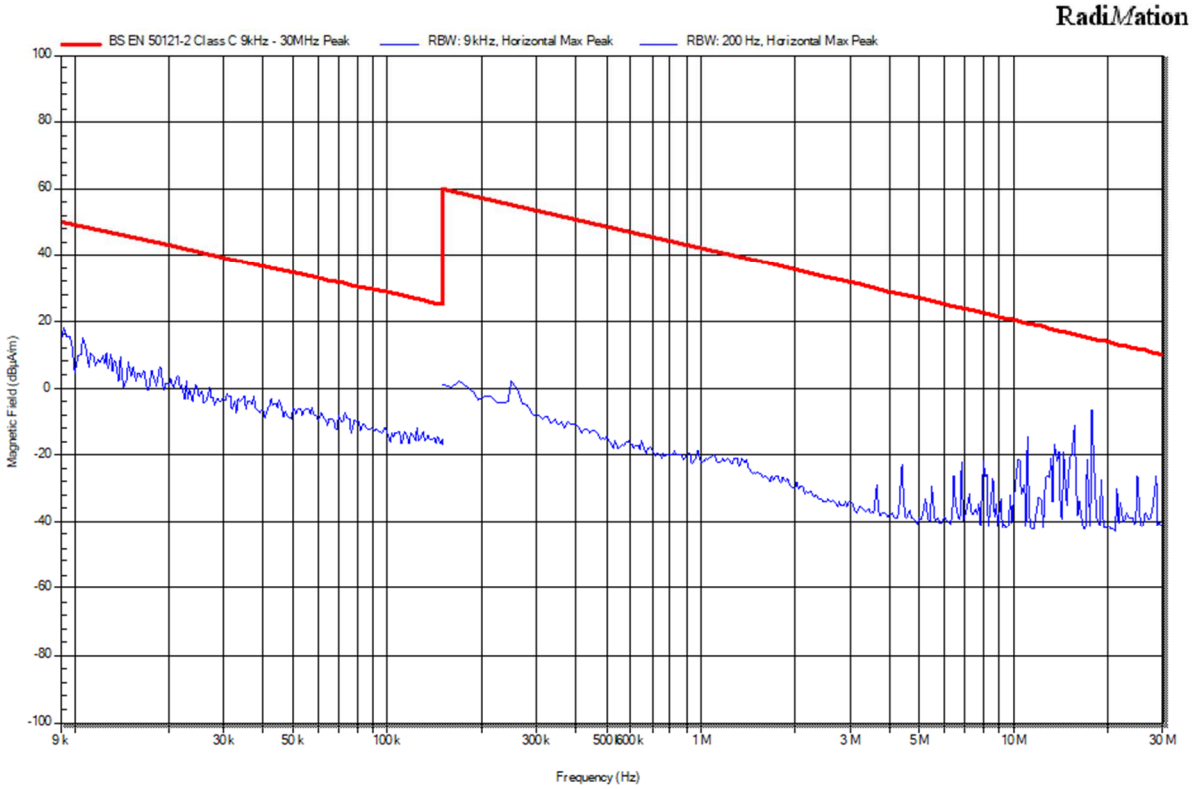


Figure 23 - Finglas Fire Station Measurements 9kHz-30MHz Loop Parallel

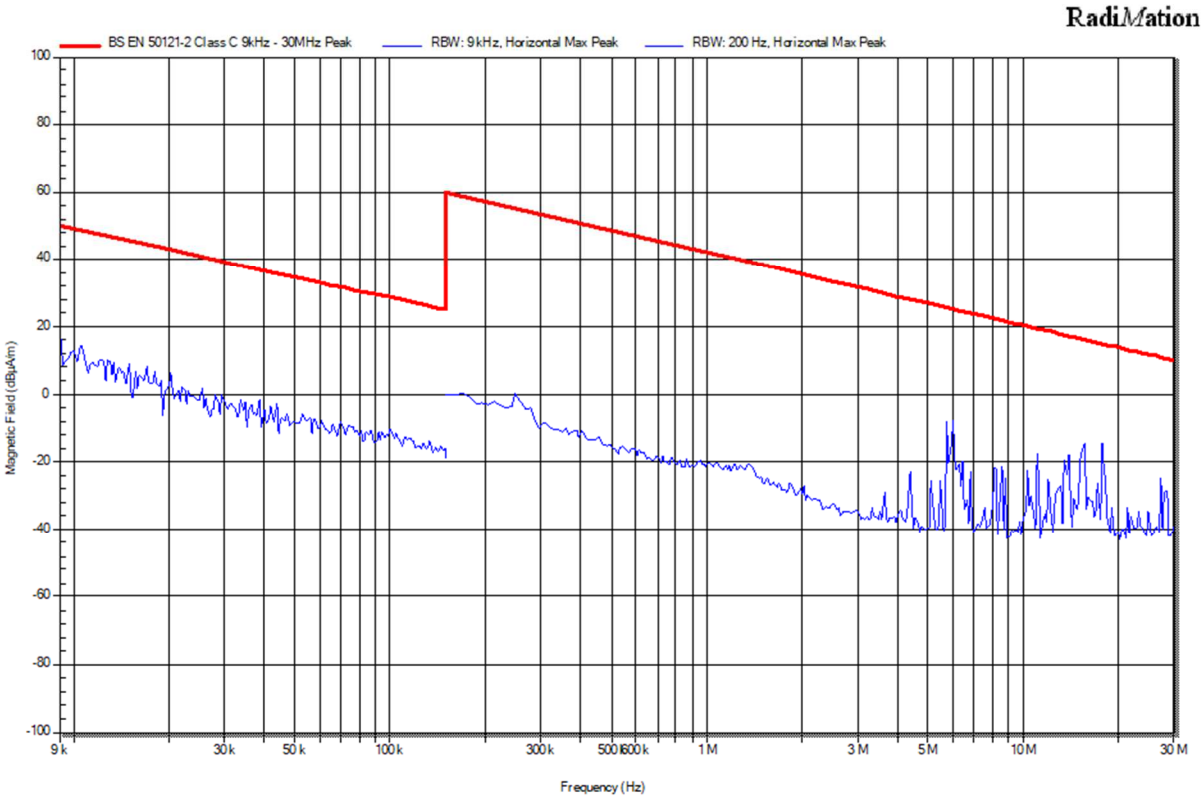


Figure 24 - Finglas Garda Measurements 9kHz-30MHz Loop Perpendicular

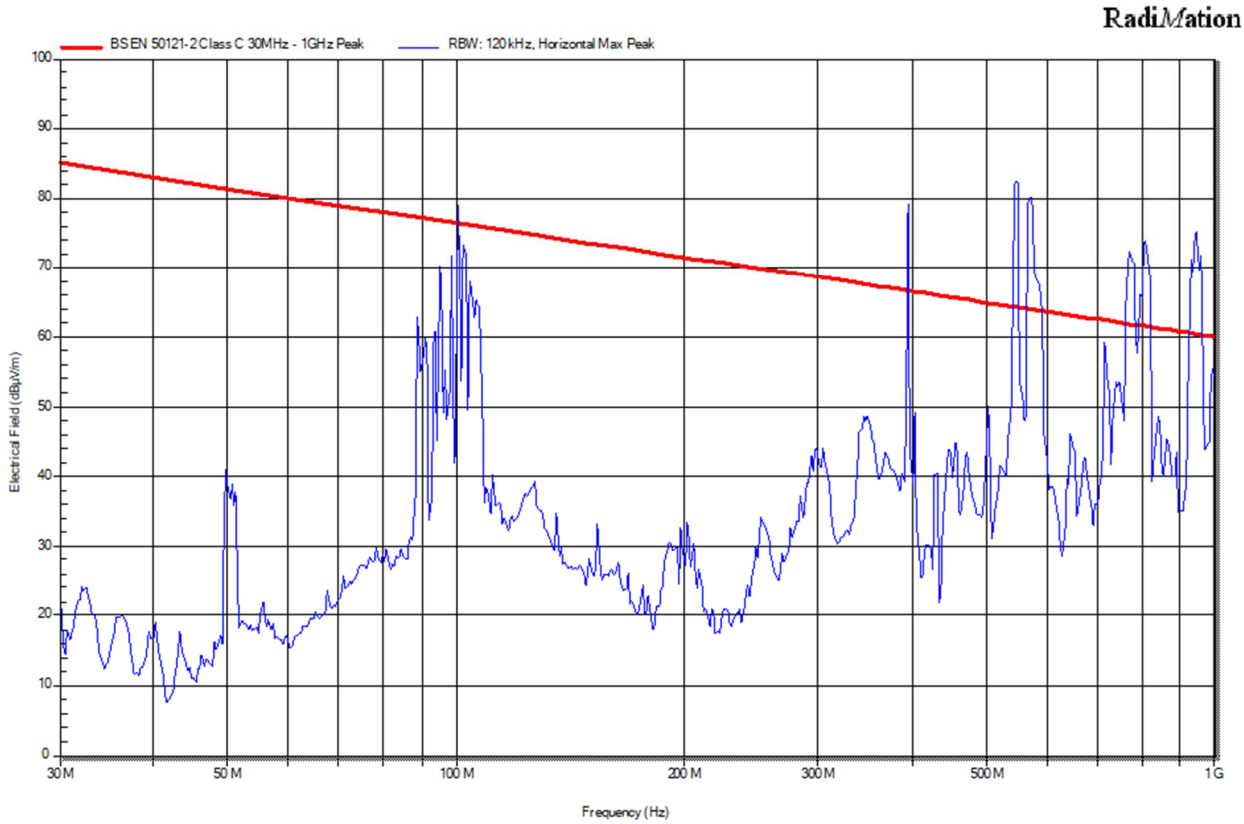


Figure 25 - Finglas Fire Station Measurements 30MHz-1GHz Bilog Horizontal

Table 17 - Finglas Fire Station Peak Measurements Horizontal

Frequency	Amplitude	Above limit line
100.2MHz	78.6dBµV/m	Yes
392.316MHz	79.2dBµV/m	Yes
544.74MHz	81.3dBµV/m	Yes
806.712MHz	73.7dBµV/m	Yes
928.032MHz	71.9dBµV/m	Yes
940.2MHz	73.6dBµV/m	Yes

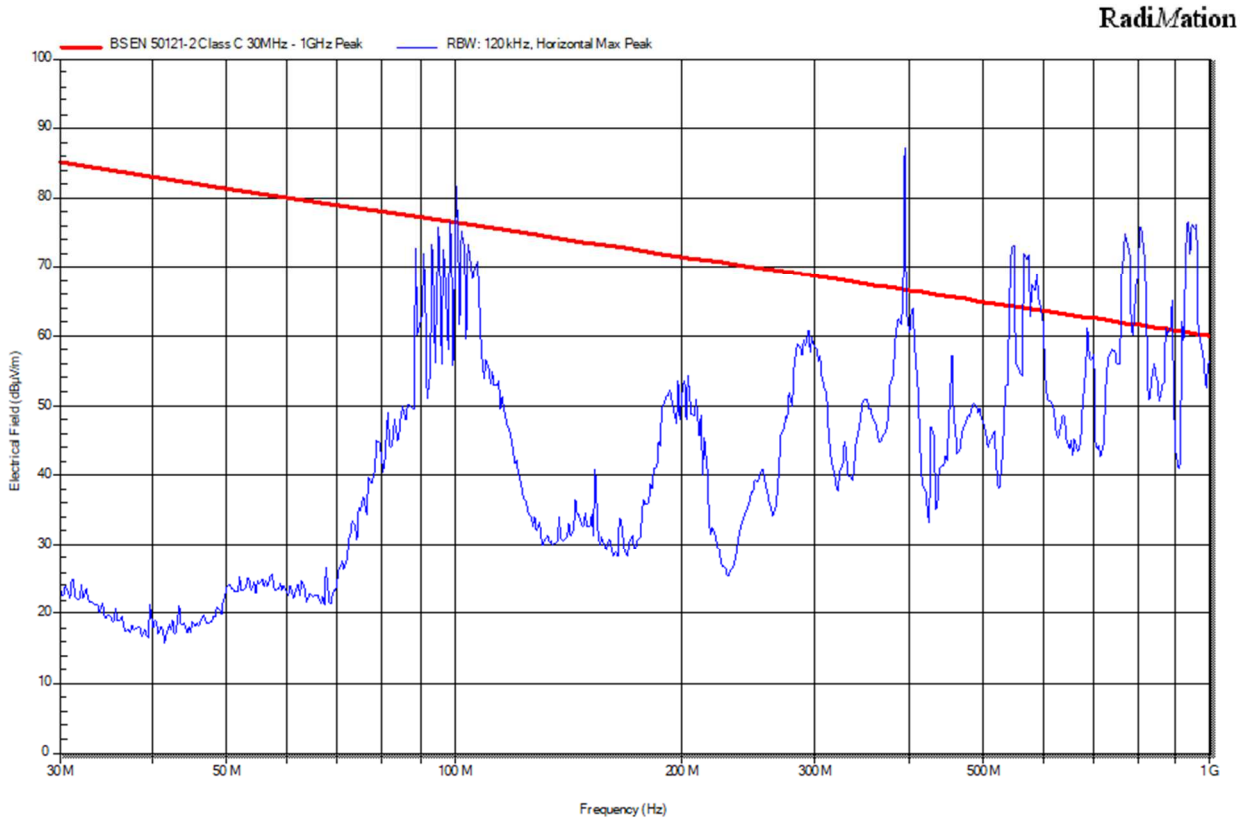


Figure 26 - Finglas Fire Station Measurements 30MHz-1GHz Bilog Vertical

Table 18 - Finglas Fire Station Peak Measurements 30MHz-1GHz Vertical

Frequency	Amplitude	Above limit line
100.2MHz	82.1dBµV/m	Yes
392.316MHz	87.8dBµV/m	Yes
543.78MHz	73.8dBµV/m	Yes
800.4MHz	76.1dBµV/m	Yes
928.00MHz	76.2dBµV/m	Yes

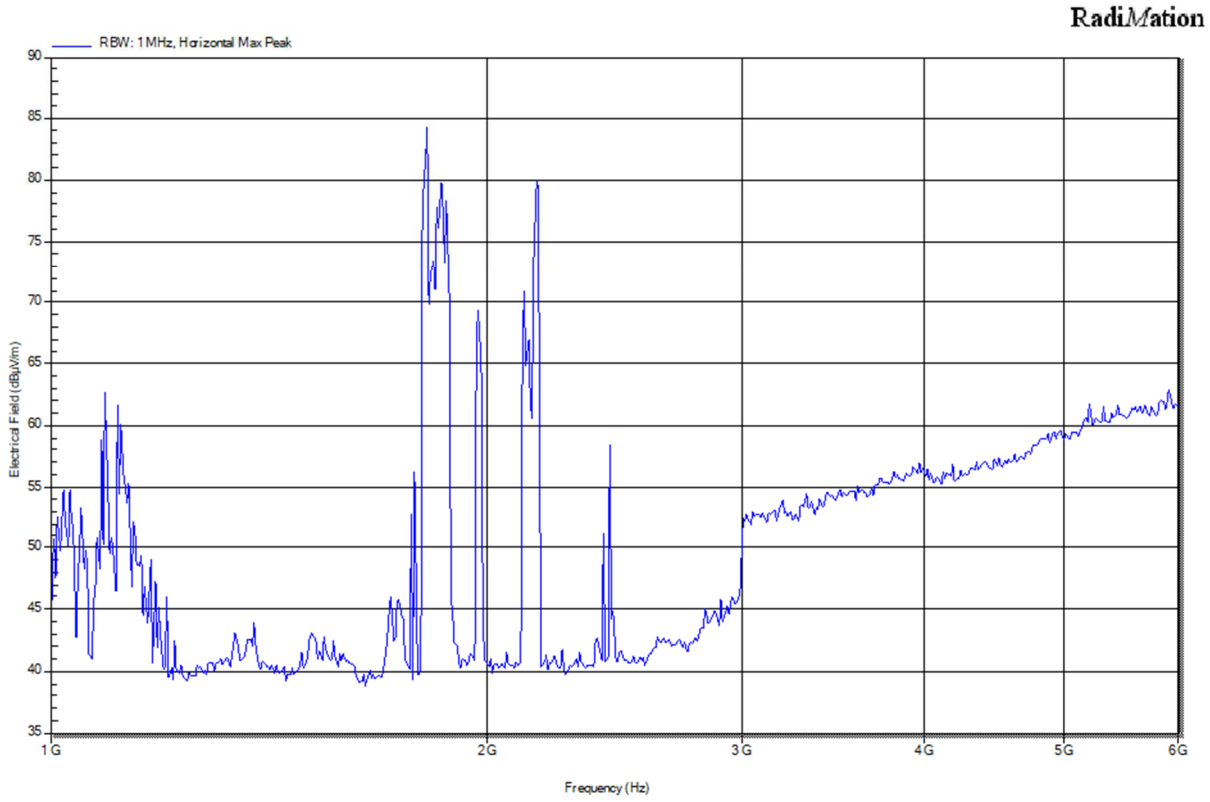


Figure 27 - Finglas Fire Station Measurements 1GHz-6GHz Wave-Guide Horizontal

Table 19 - Finglas Garda Fire Station Peak Measurements 1GHz-6GHz Horizontal

Frequency	Amplitude	Above limit line
1.816GHz	84.1dBµV/m	N/A
1.848GHz	79.9dBµV/m	N/A
2.16GHz	72.1dBµV/m	N/A
2.402GHz	57.1dBµV/m	N/A

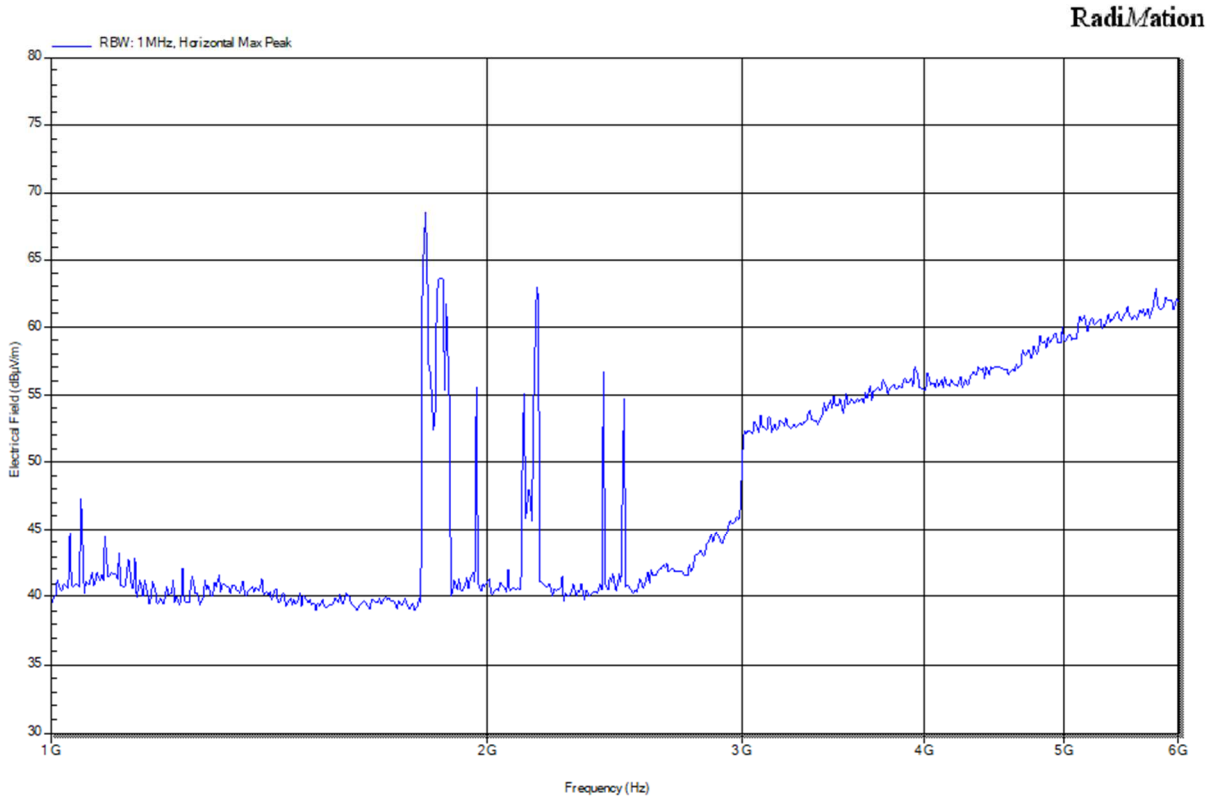


Figure 28 - Finglas Fire Station Measurements 1GHz-6GHz Wave-Guide Vertical

Table 20 - Finglas Fire Station Peak Measurements 1GHz-6GHz Vertical

Frequency	Amplitude	Above limit line
1.816GHz	68.1dBµV/m	N/A
1.848GHz	63.8dBµV/m	N/A
2.16GHz	63.2dBµV/m	N/A
2.402GHz	56.7dBµV/m	N/A

4.4 Site 4 - North Road

4.4.1 Measurement Location and Set-Up

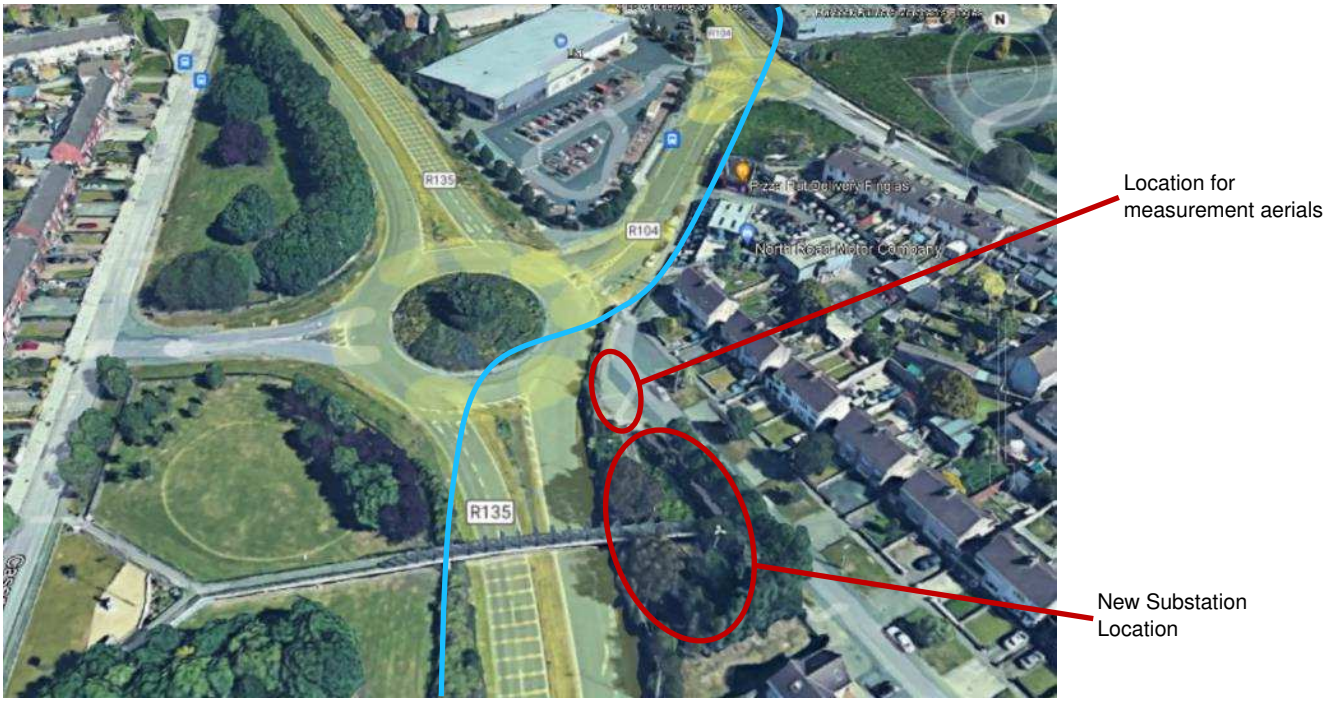


Figure 29 - Google Earth View of Measurement Location

Figure 30 - Location for Test Measurements Outside the Proposed Substation Compound

4.4.2 North Road Test Measurements

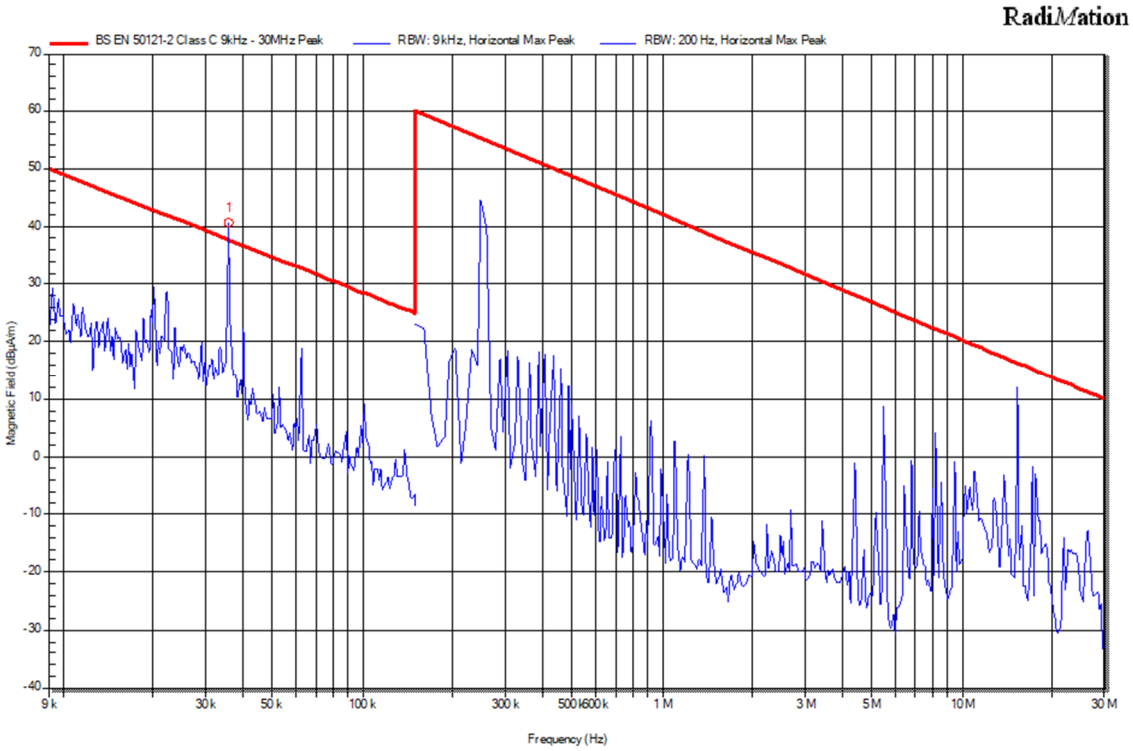


Figure 31 - North Road Measurements 9kHz-30MHz Loop Parallel

Note: Just one peak above the limit 36.5kHz at 41dBµA/m

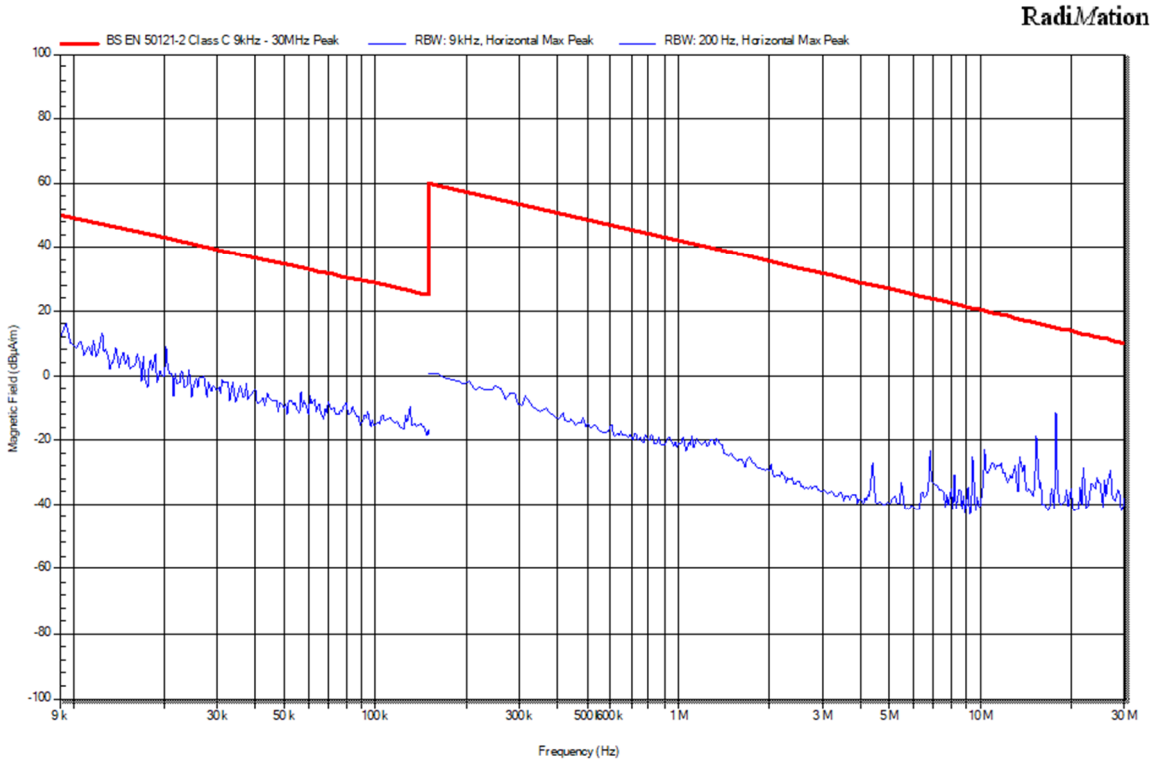


Figure 32 - North Road Measurements 9kHz-30MHz Loop Perpendicular

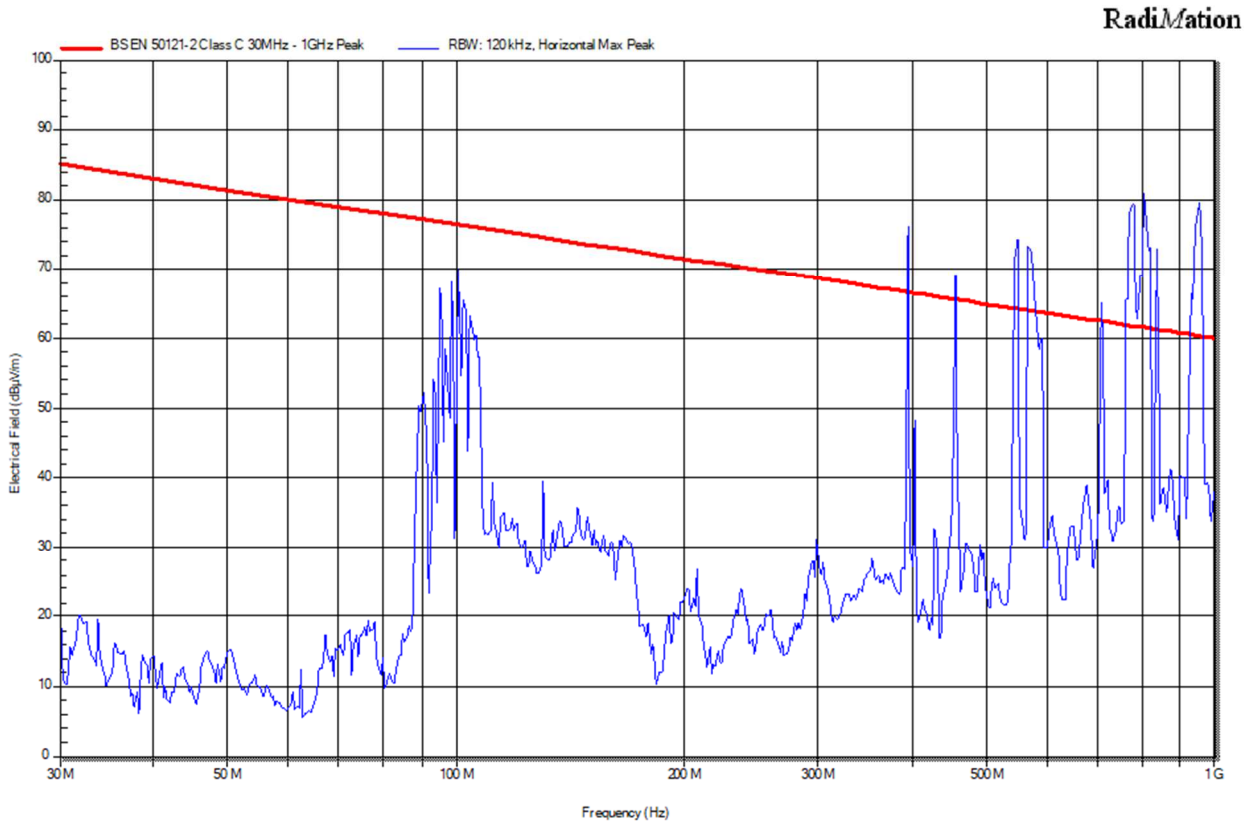


Figure 33 - North Road Measurements 30MHz-1GHz Bilog Horizontal

Table 21 - North Road Peak Measurements 30MHz-1GHz Horizontal

Frequency	Amplitude	Above limit line
392.31MHz	76.9dBµV/m	Yes
548.7MHz	74.4dBµV/m	Yes
776.85MHz	78.5dBµV/m	Yes
806.676MHz	81.8dBµV/m	Yes
947.73MHz	79.3dBµV/m	Yes

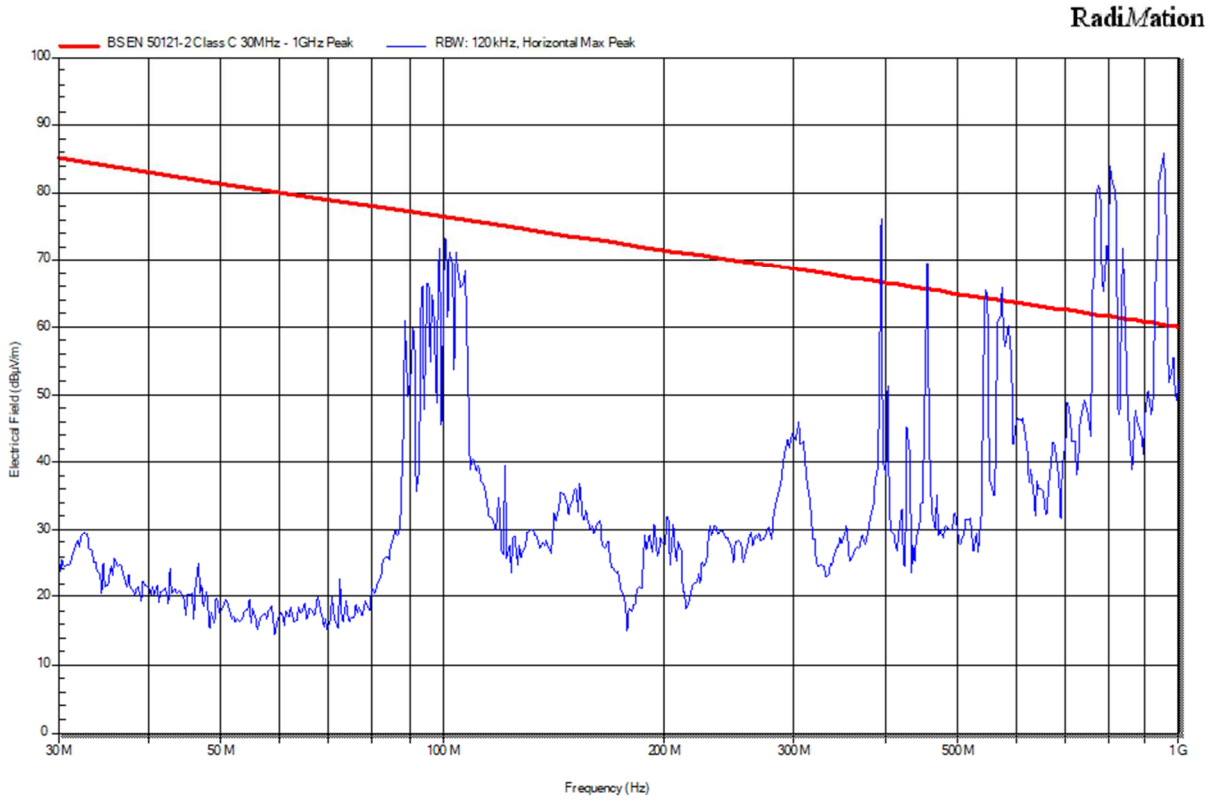


Figure 34 - North Road Measurements 30MHz-1GHz Bilog Vertical

Table 22 - North Road Peak Measurements 30MHz-1GHz Vertical

Frequency	Amplitude	Above limit line
100.938MHz	73.4dBµV/m	No
392.322MHz	76.8dBµV/m	Yes
772.572MHz	81.2dBµV/m	Yes
803.61MHz	84.1dBµV/m	Yes
947.868MHz	85.2dBµV/m	Yes

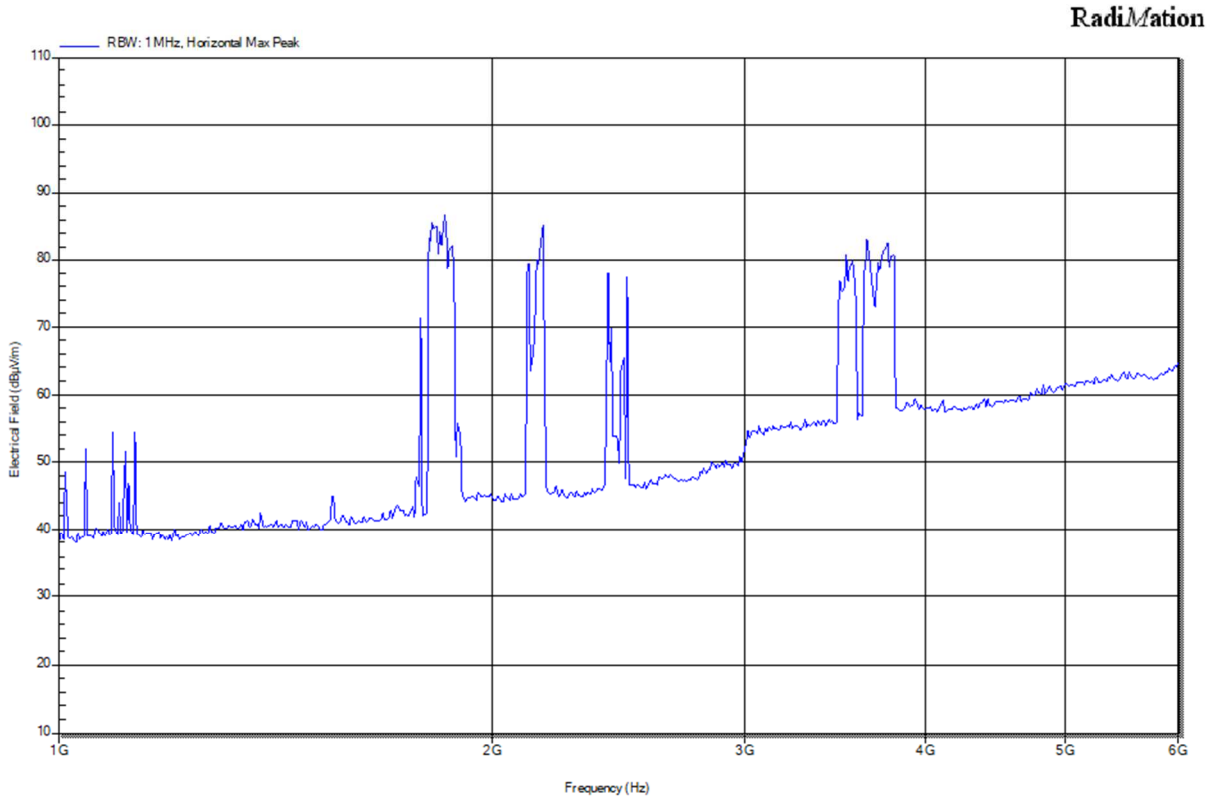


Figure 35 - North Road Measurements 1GHz-6GHz Wave-Guide Horizontal

Table 23 - North Road Peak Measurements 1GH-6GHz Horzontal

Frequency	Amplitude	Above limit line
1.182GHz	87.1dBµV/m	N/A
2.162GHz	84.2dBµV/m	N/A
2.4GHz	78.2dBµV/m	N/A
3.637GHz	83.1dBµV/m	N/A

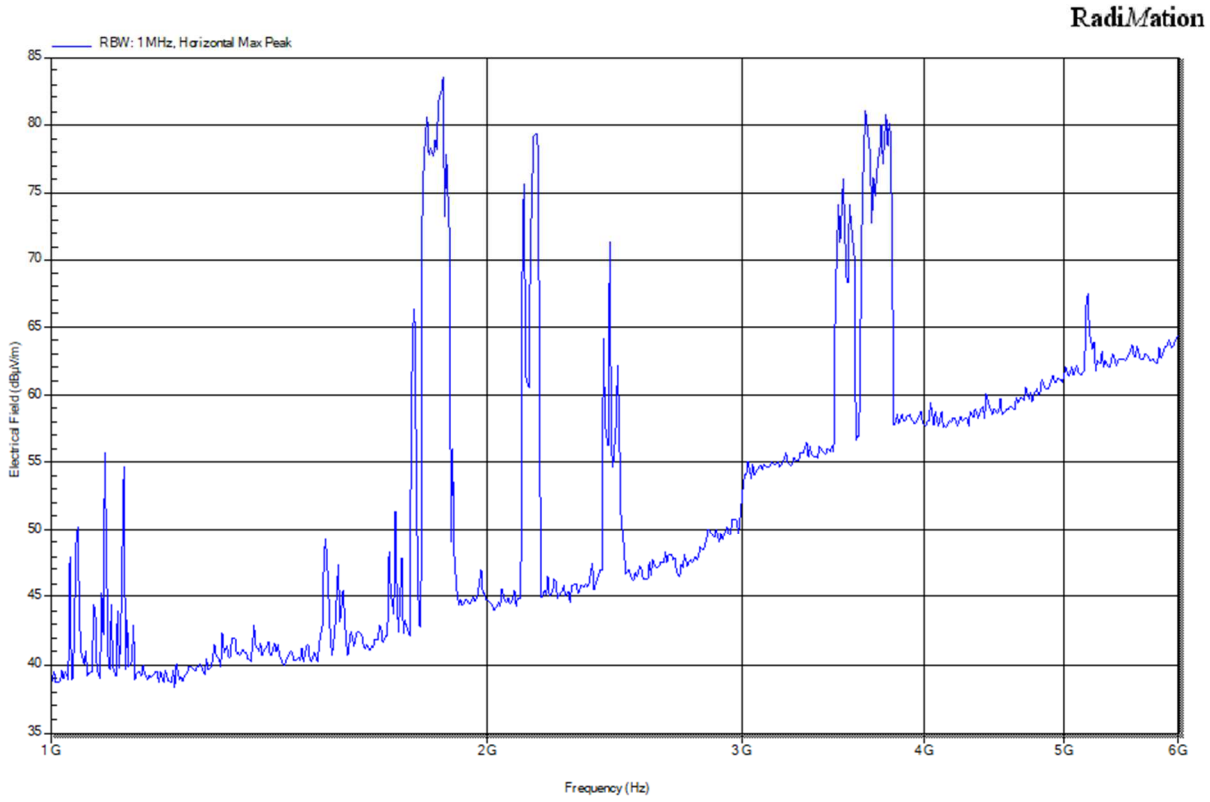


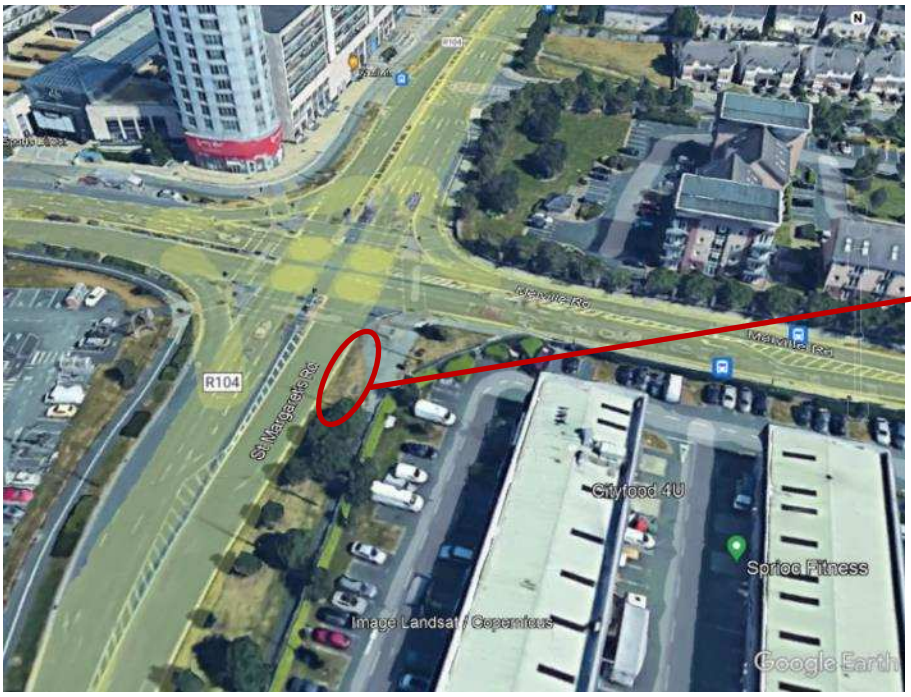
Figure 36 - North Road Measurements 1GHz-6GHz Wave-Guide Vertical

Table 24 - North Road Peak Measurements 1GHz-6GHz Vertical

Frequency	Amplitude	Above limit line
1.184GHz	83.2dBµV/m	N/A
2.153GHz	79.3dBµV/m	N/A
3.485GHz	76.1dBµV/m	N/A
3.795GHz	81.2dBµV/m	N/A

4.5 Site 5 – Charleston Terminus

4.5.1 Measurement Location and Set-Up



Proposed location for measurement aerials – Site 4. Also vehicle access from St Margaret's Road

Figure 37 - Google Earth View of Measurement Location - Charleston Terminus

Figure 38 - Measurement Set-Up at Charleston

4.5.2 Test Measurements

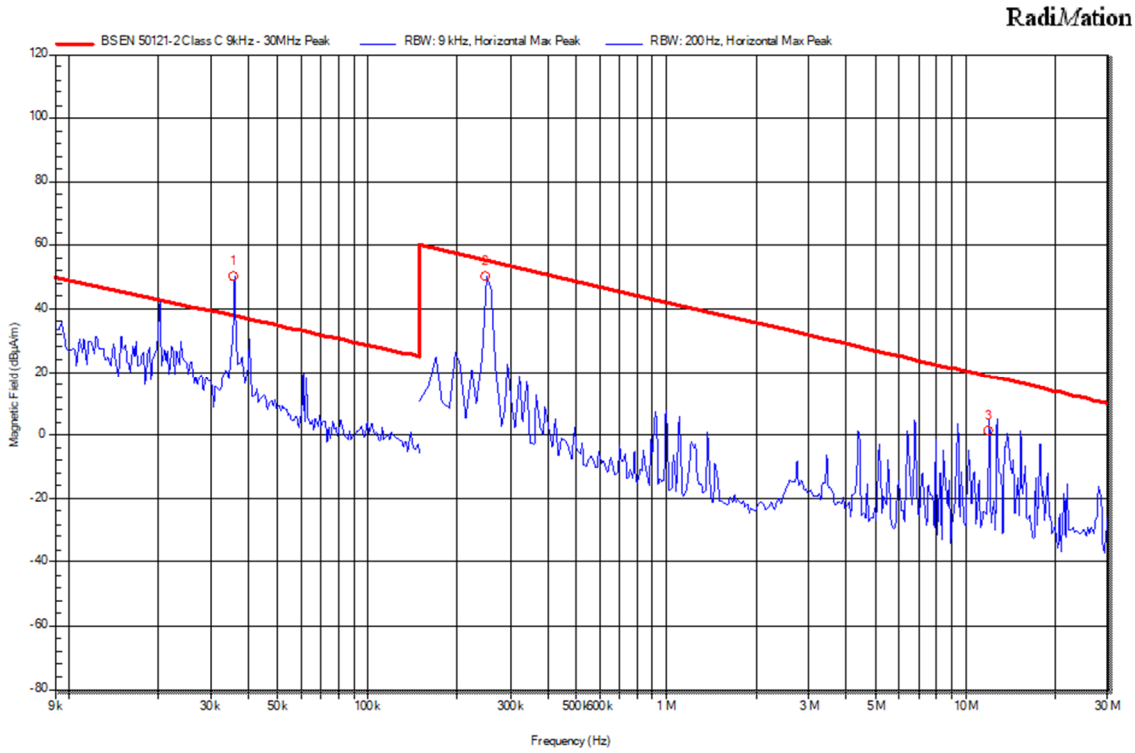


Figure 39 - Charleston Measurements 9kHz-30MHz Loop Parallel

Note:One peak above limit 20kHz 44.1dBµA/m, also 35.6kHz 50.2dBµA/m, 249kHz 50.4dBµA/m below limit

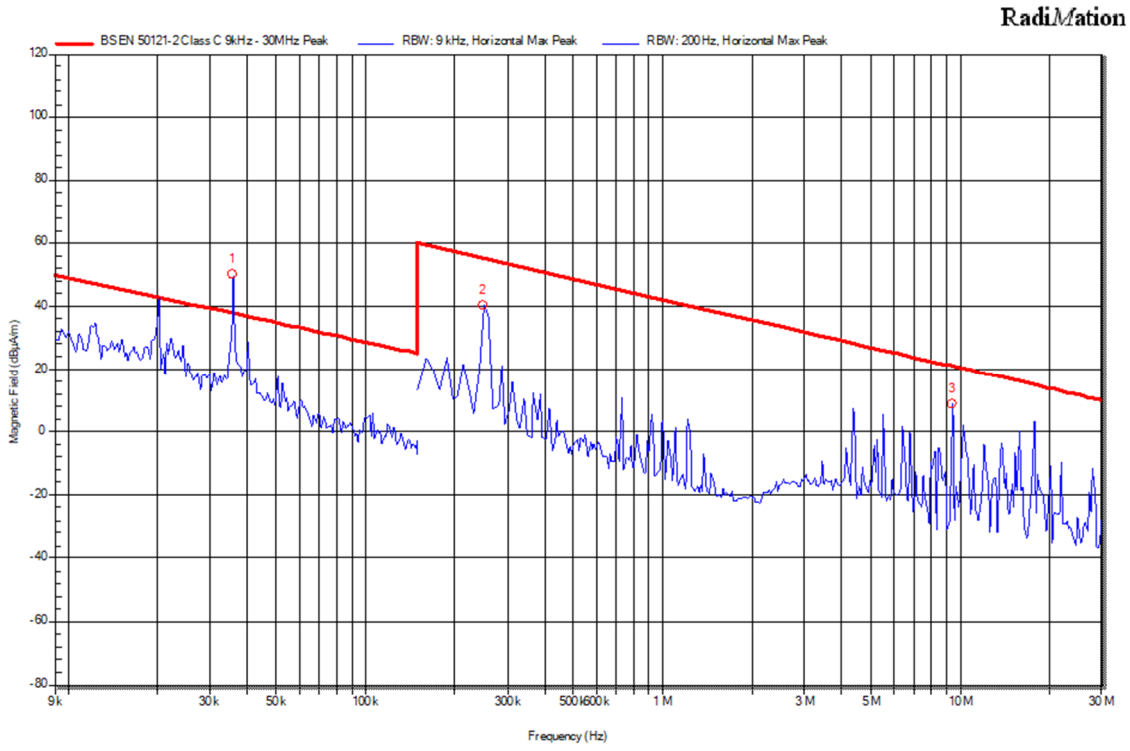


Figure 40 - Charleston Measurements 9kHz-30MHz Loop Perpendicular

Note one peak above limit 20kHz 43.8dBµA/m, other 35.6kHz 50.1dBµA/m, 249kHz 40.5dBµA/m below limit

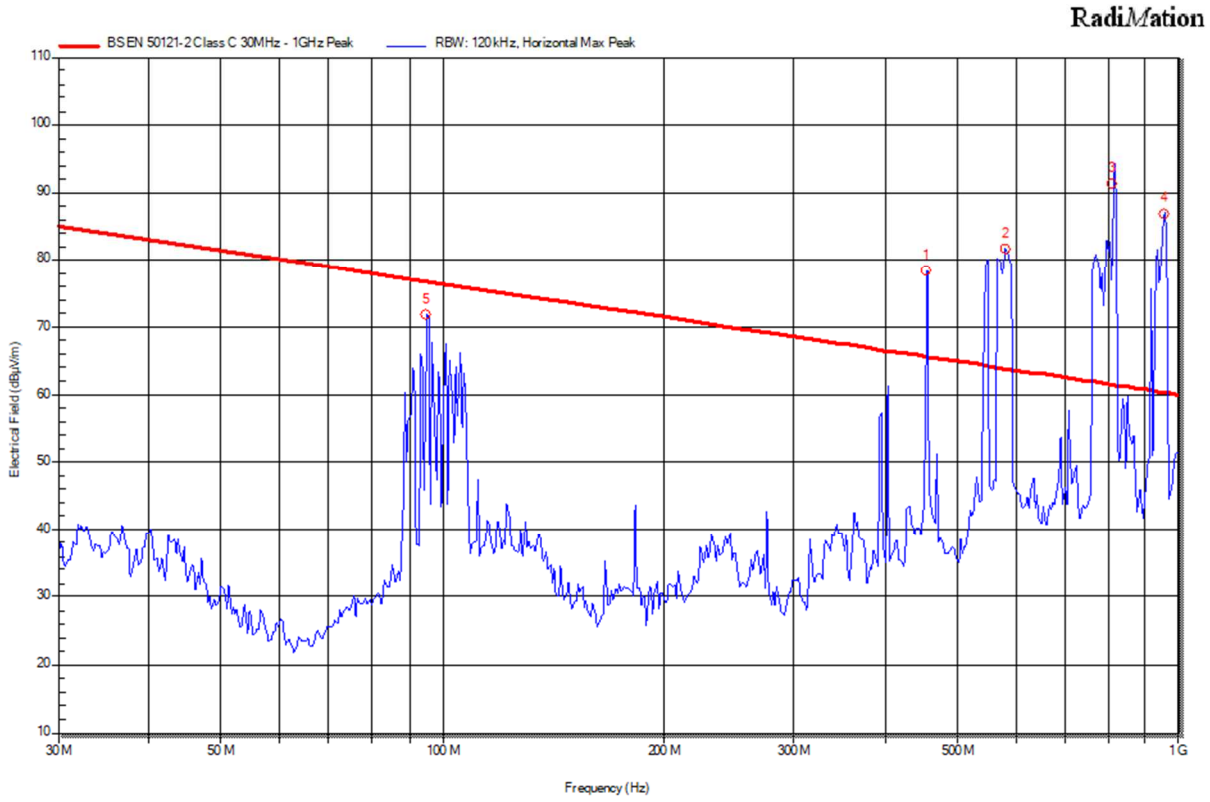


Figure 41 - Charleston Measurements 30MHz-1GHz Bilog Horizontal

Table 25 - Charleston Peak Measurements 30MHz-1GHz Horizontal

Frequency	Amplitude	Above limit line
94.9MHz	71.8dBµV/m	No
580.2MHz	81.8dBµV/m	Yes
811.44MHz	91.3dBµV/m	Yes
954.32MHz	86.9dBµV/m	Yes

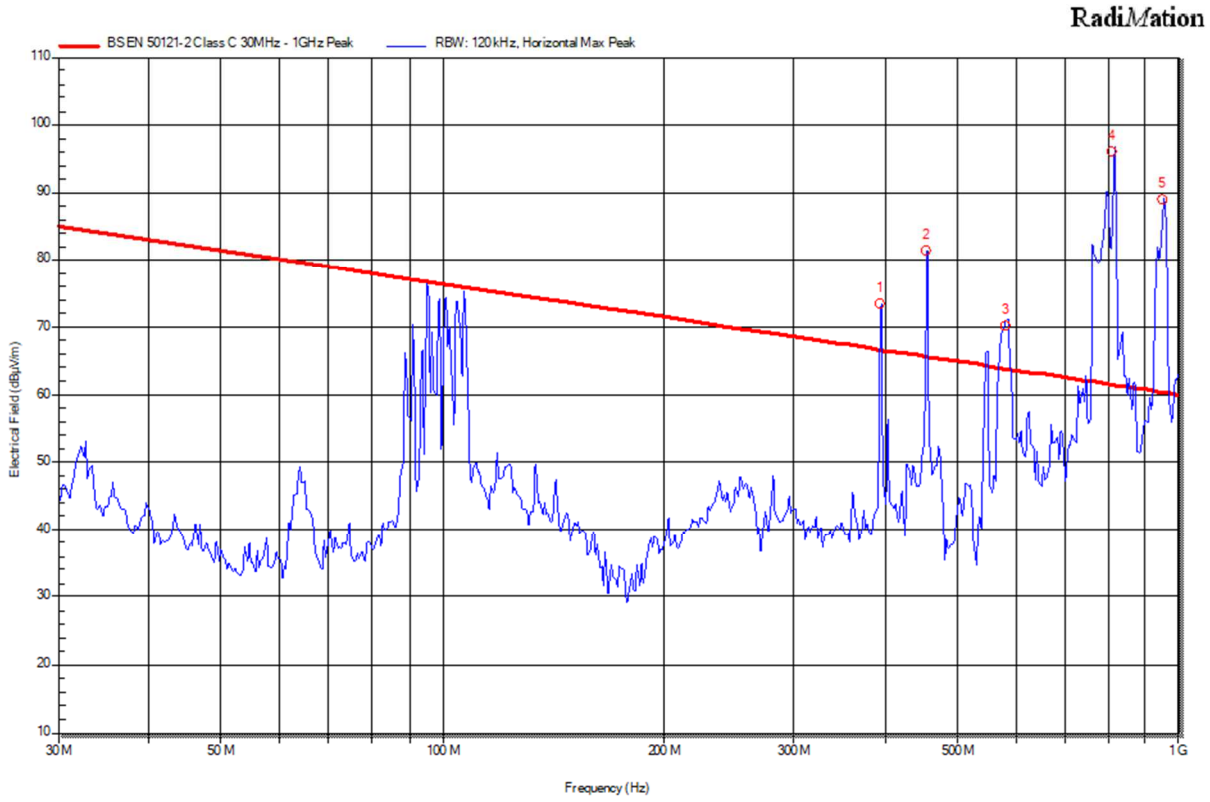


Figure 42 - Charleston Measurements 30MHz-1GHz Bilog Vertical

Table 26 - Charleston Peak Measurements 30MHz-1GHz Vertical

Frequency	Amplitude	Above limit line
94.9MHz	76dBµV/m	No
392.34MHz	73.5dBµV/m	Yes
453.12MHz	81.4dBµV/m	Yes
581.58MHz	70.2dBµV/m	Yes
811.44MHz	96.1dBµV/m	Yes
948.78MHz	89dBµV/m	Yes

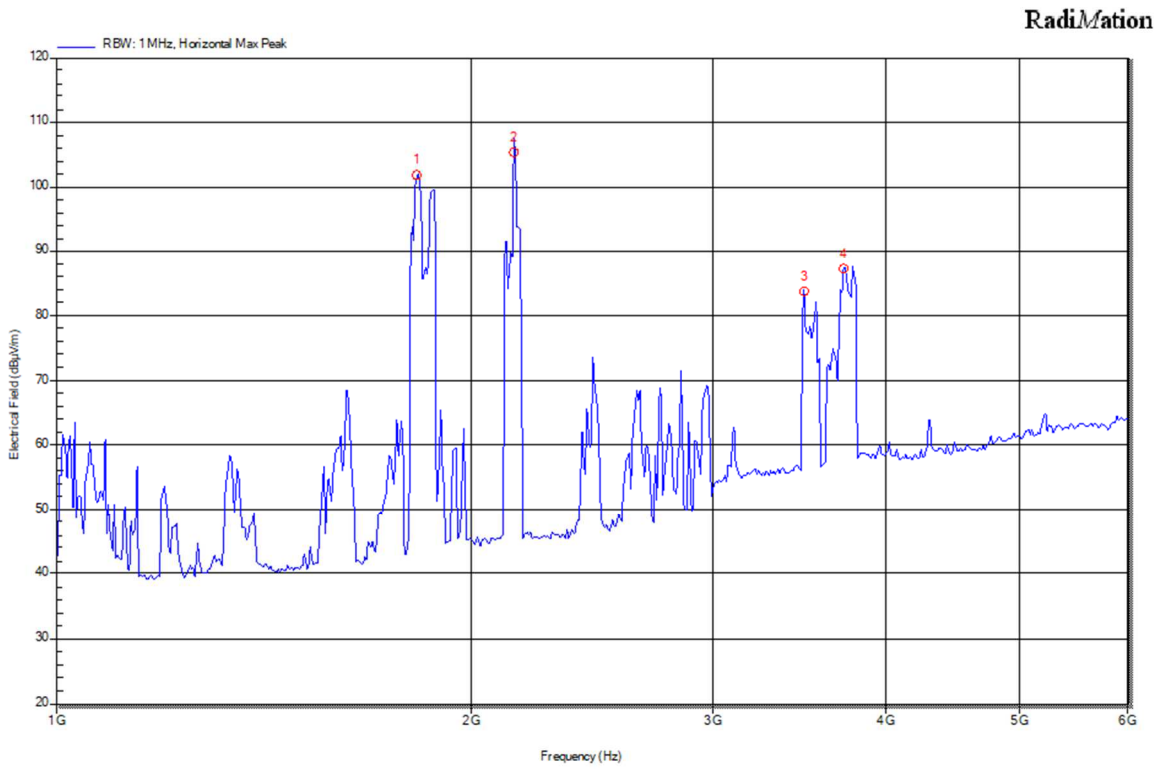


Figure 43 - Charleston Measurements 1GHz-6GHz Wave-Guide Horizontal

Table 27 - Charleston Peak Measurements 1GHz-6GHz

Frequency	Amplitude	Above limit line
1.183GHz	101.9dBµV/m	N/A
2.148GHz	105.4dBµV/m	N/A
3.486GHz	83.8dBµV/m	N/A
3.726GHz	87.2dBµV/m	N/A

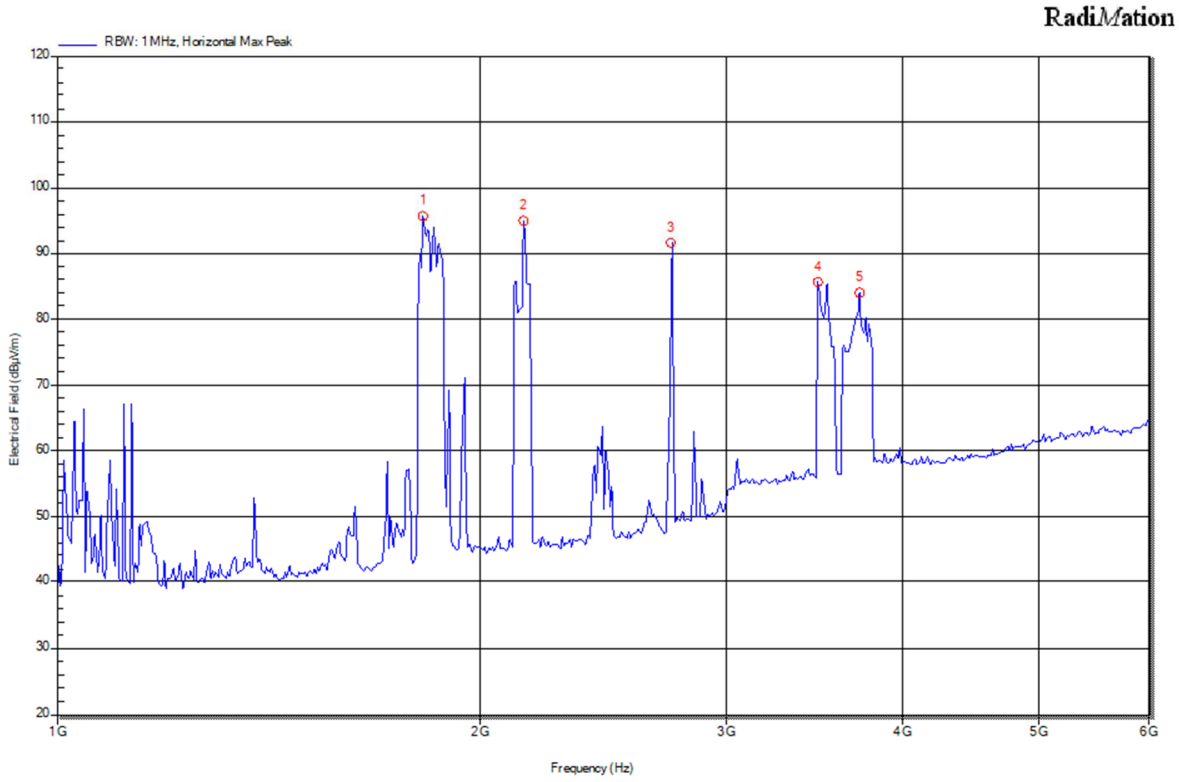


Figure 44 - Charleston Measurements 1GHz-6GHz Wave-Guide Vertical

Table 28 - Charleston Peak Measurements 1GHz-6GHz Vertical

Frequency	Amplitude	Above limit line
1.826GHz	101.9dBµV/m	N/A
2.148GHz	105.4dBµV/m	N/A
3.486GHz	83.8dBµV/m	N/A
3.726GHz	87.2dBµV/m	N/A

SECTION 5: Electric and Magnetic Field Measurements

5.1 Background

The proposed tramway route runs parallel a 110kV HV line along Broombridge Road and then crosses twice under it in Tolka Valley Park. A potential hazard was identified where 50Hz fields could induce hazardous 50Hz voltages onto tramway rails or other lineside services. Although this requires a simulation study to determine worst case induction under normal, imbalanced and fault conditions, the opportunity was taken to carry out electric and magnetic field measurements as part of the EMC measurement survey.

5.2 Test Equipment

5.2.1 Electric and Magnetic Field Meters

Simple hand-held measurement meters were used for the measurement of fields under the HV power lines to provide and initial indication of the normal field levels experienced under and parallel to the lines.

The Narda ELT-400 provides a single broadband reading of the magnetic field level (30Hz to 400kHz). It is therefore only really accurate for measuring predominantly single frequency fields, which is the case under the HV lines which are predominantly 50Hz. Similarly, the electric field meter EMM-4 provides a single broadband reading (5Hz-2000Hz).

The measurements taken are able to provide an early indication of the 50Hz field levels under the lines and these meters are suitable for the purpose.

Table 29 below provides details of the equipment used and their calibration status.

Table 29 - Measurement Equipment for Electric and Magnetic Field Measurements

Item	Description	Serial Number	Callibration Date	Callibration Due Date
NARDA ELT-400 [R18]	Meter and Magnetic Field Probe	168001001	19/07/2021	19/07/2023
B Field Probe [R19]	B Field Probe 100cm^2	M-1143	08/09/2021	08/09/2023
Environmentor EMM-4 [R16]	Electric Field Meter	4293	26/10/22	Note*

The Electric Field Meter does not have a formal calibration certificate from a certified test house, rather EMC Hire provide a ‘Verification Report’ proving that they have calibrated the device ‘in house’.

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