



RF EME SURVEY REPORT NR850 SURVEY 2021-05



**GOLD COAST
QUEENSLAND**

September 2021

RF EME SURVEY REPORT

For

**Telstra Corporation Limited
242 Exhibition Street
Melbourne VIC 3000**

At

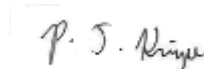
**VARIOUS LOCATIONS
SEE TABLE 2 FOR DETAILS**

Measurement Dates: 24 and 25 May 2021

Reference No: 5G202105

Measurement Officer: Phillip Knipe

Approved Signatory



Name: Dr Phillip Knipe
Title: Consultant Physicist
Date: 01/09/2021
Total Radiation Solutions



NATA Accredited Laboratory Number: 15096

This document is issued in accordance with requirements for compliance with ISO/IEC 17025-Testing.

The results of the measurements included in this document are traceable to Australian / National Standards.

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Contents

1. Introduction.....	4
2. Regulatory Exposure Limits	4
3. Measurement Methodology	5
4. Measurement Equipment	6
5. Measurement Results.....	7
5.1 Runaway Bay RT - 24 th and 25 th May 2021.....	7
5.2 Paradise Point Exchange - 24 th May 2021	9
5.3 Biggera Waters RT - 24 th May 2021.....	10
5.4 Coombabah Exchange - 24 th May 2021.....	11
APPENDIX A - Glossary and Abbreviations	14
APPENDIX B – Background Source Spectrum Scans.....	15

1. Introduction

Telstra Corporation Limited (Telstra) is operating a 850MHz 5G network in Australia.

Consequently, Telstra requested that Total Radiation Solutions (TRS) conduct a series of radiofrequency electromagnetic energy (RF EME) surveys to further characterize the RF EME levels around 5G base stations (BS).

The purpose of this survey is to characterise the 850MHz RF EME levels around the BS.

This report is based on measurements taken during the survey.

2. Regulatory Exposure Limits

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), an agency of the Commonwealth Department of Health has established a Radiation Protection Standard (RPS3) specifying limits for continuous exposure to RF EME transmissions (Table 1). Further information can be gained from the ARPANSA web site at <http://www.arpansa.gov.au>.

The Australian Communications and Media Authority (ACMA) mandates exposure limits for continuous exposure of the general public to RF EME. Further information can be found at the ACMA website at <http://www.acma.gov.au>.

Table 1 Reference Levels for Time Averaged Exposure to RMS Electric and Magnetic Fields (Unperturbed Fields) (ARPANSA)

Exposure Category	Frequency Range	E-Field Strength (V/m rms)	H-Field Strength (A/m rms)	Power Flux Density (W/m ²)
Occupational (RF Worker)	100 kHz – 1 MHz	614	1.63/f	N/A
	1 MHz – 10 MHz	614/f	1.63/f	1000 / f ²
	10MHz – 400 MHz	61.4	0.163	10
	400 MHz – 2 GHz	3.07 x f ^{0.5}	0.00814 x f ^{0.5}	f / 40
	2 GHz – 300 GHz	137	0.364	50
Non-Occupational (General Public)	100 kHz – 150 kHz	86.8	4.86	N/A
	150 kHz – 1 MHz	86.8	0.729/f	N/A
	1 MHz – 10 MHz	86.8 / f ^{0.5}	0.729/f	N/A
	10MHz – 400 MHz	27.4	0.0729	2
	400 MHz – 2 GHz	1.37 x f ^{0.5}	0.00364 x f ^{0.5}	f / 200
	2 GHz – 300 GHz	61.4	0.163	10

NOTES:

1. f is frequency in MHz.
2. For frequencies between 100 kHz and 10 GHz, S_{eq} , E^2 , and H^2 , must be averaged over any six minute period.
3. There are also applicable limits for exposure to instantaneous RMS electric and magnetic fields (unperturbed fields). These limits are less restrictive than the limits specified in Table 1 and as a result are not referenced in this measurement report.

3. Measurement Methodology

Using a NARDA SRM-3006 Selective Radiation Meter with an E-Field (420 MHz to 6 GHz) probe and 5m RF-Cable (9 kHz – 6 GHz), the average and maximum 850MHz WCDMA and 5G levels were measured. The average environmental (background – BG) RF EME levels due to existing RF EME sources were also measured.

Measurements were conducted on a number of dates at a number of selected locations. The measurement locations were selected in consultation with a Telstra representative.

1. Environmental Sources (BG) - The time-averaged cumulative RF EME level due to existing sources.

- The meter was set to measure the representative time averaged cumulative RF EME level across the 420 MHz to 6 GHz bandwidth.
- The measured band includes all radio signals from 420 MHz to 6 GHz. Signals present in this band are Wi-Fi, some TV signals and base station signals. RF EME scans for the measurement locations are included in Appendix B.
- All measurements unless otherwise specified were conducted with the probe mounted on the tripod at a height of 1.5m above standing level (ASL).
- These measurements determined the representative RF EME levels present at the time of measurement for the selected locations.

2. 5G Levels - The time-averaged RF EME level due to the existing Telstra 5G signals.

Due to the efficiency of 5G, the network effectively only transmits when there are required services e.g. when there are active users. This measurement provides information about RF EME levels when a 5G device is activated.

- The meter was set to measure the maximum and time-averaged RF EME level due to the 5G signal when the 5G device is active.
- The active 5G device performed a file download and mobile network speed tests using the freely available application by Ookla (<https://www.speedtest.net/apps/mobile>).
- At each measurement location five file downloads and speed test measurements were undertaken.
- Only the highest measured level for the measurement locations is reported in Table 3.
- The averaging time for the active 5G device measurement was the duration of the downlink component of the file download or speed test.

The measurement scenarios were determined in consultation with a Telstra representative. All measurements unless otherwise specified were conducted with the probe mounted on the tripod at a height of 1.5m above standing level (ASL). These measurements determined the representative RF EME levels present at the time of measurement for the selected locations.

Table 2 Measurement Locations

Measurement Location	Measurement Location Description	Site Reference
1A	Runaway Bay RT – Location A	4976-7773
1B	Runaway Bay RT – Location B	4976-7773
2	Paradise Point Exchange	4514-7773
3	Biggera Waters RT	4978-7773
4	Coombabah Exchange	4977-7773

4. Measurement Equipment

- NARDA SRM-3006 Selective Radiation Meter
 Frequency Range 100 kHz – 6 GHz
 Model Number 3006/01
 Serial No. K-0092
- NARDA 3-Axis Antenna
 Frequency Range 420 MHz – 6 GHz
 Model Number 3502/01
 Serial No. G-0299
- NARDA RF-Cable SRM, Length 5m, 50 Ohms
 Frequency Range 9 kHz – 6 GHz
 Model Number 3602/02
 Serial No. AB-0018

5. Measurement Results

5.1 Runaway Bay RT – 24th and 25th May 2021

RUNAWAY BAY RT - NSA No. 4216007

Morala Avenue Runaway Bay QLD 4216

Location A – 25th May 2021



Table 3 RF EME Measurement Results – % RPS3 GP Limit

Measurement	Measured Level
NR850 DL Only - Avg	0.0069
WCDMA850 DL Only - Avg	0.00612
NR850 DL 1-min Avg	0.0034
WCDMA850 DL 1-min Avg	0.0078
BG 1-min Avg (700-6000 MHz)	0.276

Location B - 24th May 2021

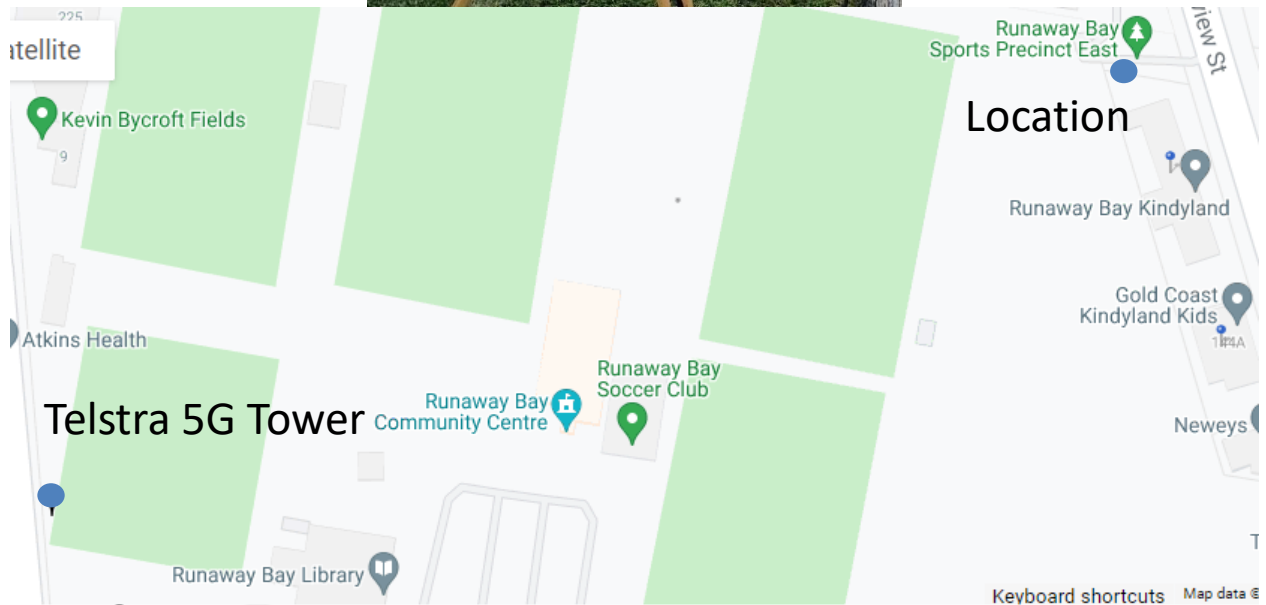


Table 4 RF EME Measurement Results – % RPS3 GP Limit

Measurement	Measured Level
NR850 DL Only - Avg	0.00122
WCDMA850 DL Only - Avg	0.00639
NR850 DL 1-min Avg	0.00068
WCDMA850 DL 1-min Avg	0.00515
BG 1-min Avg (700-6000 MHz)	0.043

5.2 Paradise Point Exchange – 24th May 2021



PARADISE POINT EXCHANGE – NSA No. 4216002

18 Robin Avenue Paradise Point QLD 4216

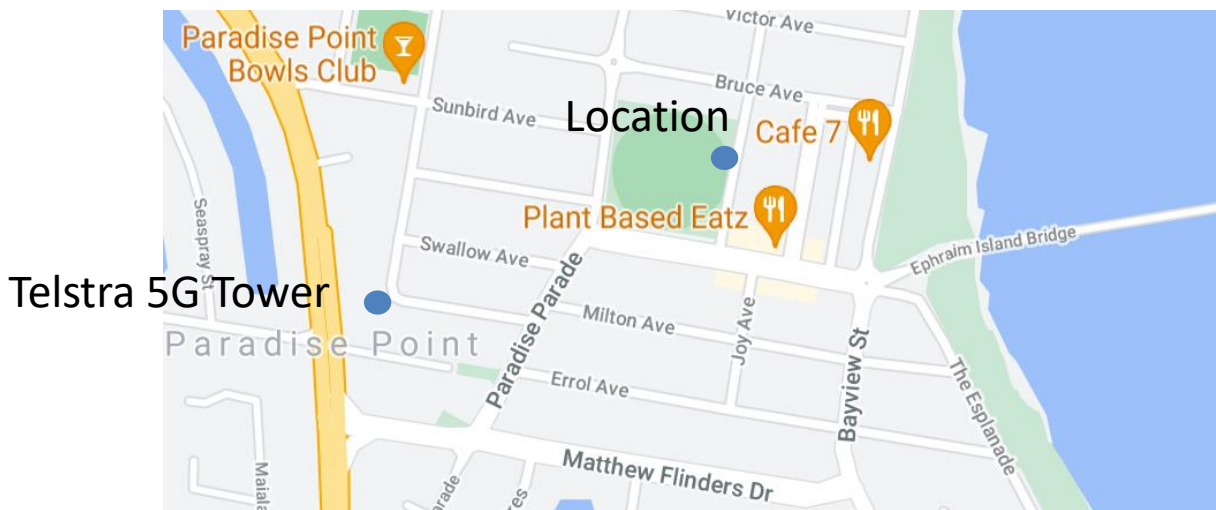


Table 5 RF EME Measurement Results – % RPS3 GP Limit

Measurement	Measured Level
NR850 DL Only - Avg	0.00094
WCDMA850 DL Only - Avg	0.00339
NR850 DL 1-min Avg	0.00036
WCDMA850 DL 1-min Avg	0.00366
BG 1-min Avg (700-6000 MHz)	0.062

5.3 Biggera Waters RT – 24th May 2021



BIGGERA WATERS RT – NSA No. 4215016
 2 Sinclair Street Biggera Waters QLD 4215



Telstra 5G Tower

Table 6 RF EME Measurement Results – % RPS3 GP Limit

Measurement	Measured Level
NR850 DL Only - Avg	0.00583
WCDMA850 DL Only - Avg	0.01
NR850 DL 1-min Avg	0.00262
WCDMA850 DL 1-min Avg	0.01
BG 1-min Avg (700-6000 MHz)	0.136

5.4 Coombabah Exchange – 24th May 2021



COOMBABAH EXCHANGE – NSA No. 4216010
21 Morala Avenue Biggera Waters QLD 4216



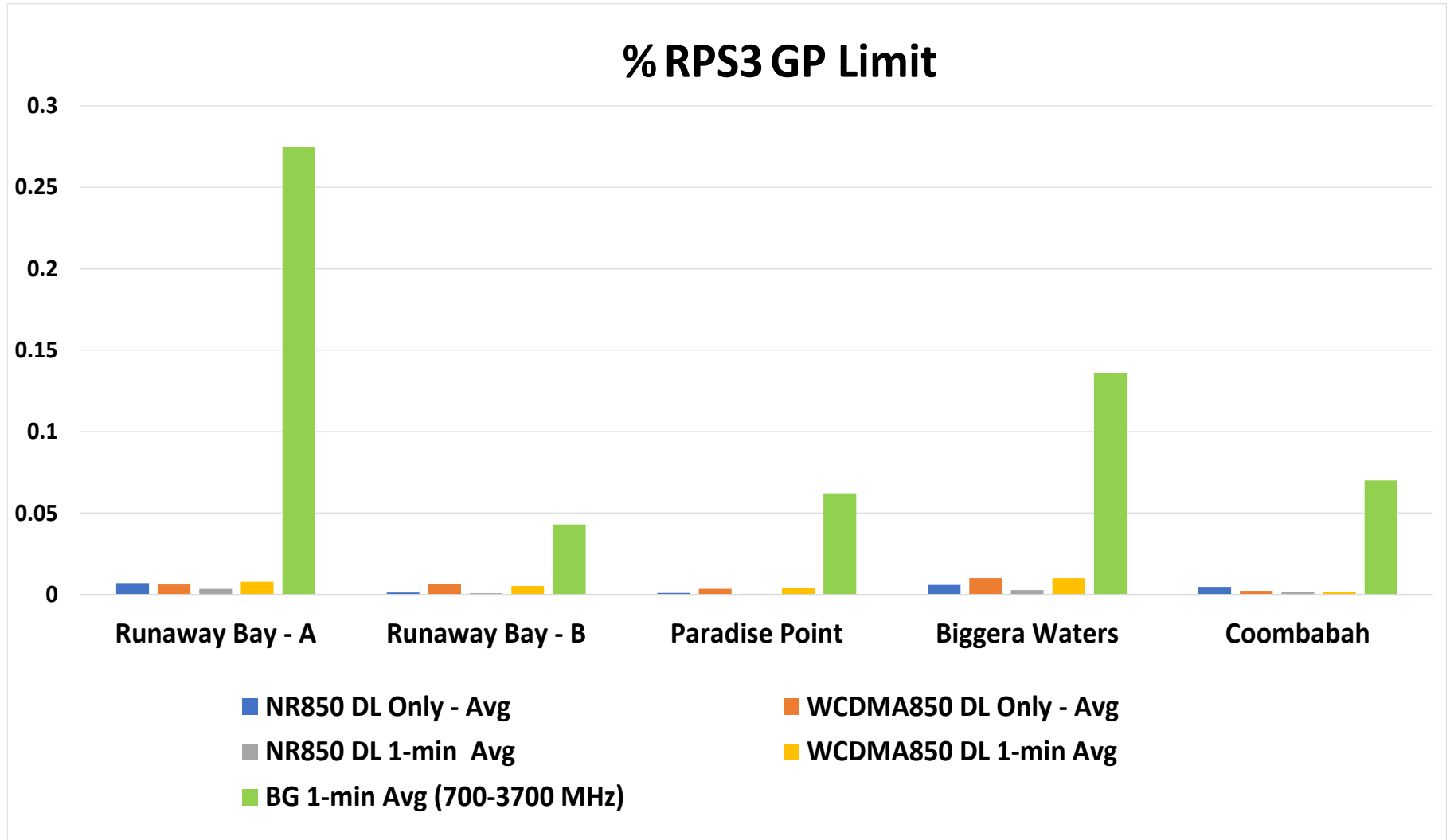
Table 7 RF EME Measurement Results – % RPS3 GP Limit

Measurement	Measured Level
NR850 DL Only - Avg	0.0046
WCDMA850 DL Only - Avg	0.00222
NR850 DL 1-min Avg	0.00174
WCDMA850 DL 1-min Avg	0.00139
BG 1-min Avg (700-3700 MHz)	0.07

Notes:

1. The recorded measurements were taken from the SRM-3006 for the 420 MHz – 6 GHz band.
2. The measurements were taken as per Australian Standard AS 2772.2:2016 Radiofrequency fields Part 2: Principles and methods of measurement and computation– 3 kHz to 300 GHz.
3. The measurements conducted with the SRM-3006 instrument with and without a tripod mounted probe and 5m cable have an expanded uncertainty of + 3 dB. See uncertainty excel spreadsheets in the specific job folder for the calculations.
4. The coverage factor (k) value used to give an upper one sided expanded uncertainty with a 95% confidence interval was 1.64.
5. The recorded measurements taken from the SRM-3006 were percentage of RPS3 general public limit and frequency.
6. % RPS3 GP Limit – Percentage of the Australian Regulatory General Public Exposure Limit.
7. The speedtest measurement scenario created conditions to measure the actual maximum power.
8. TRS permanently stores all measurement equipment calibration details, site maps and recorded measurement scans.
9. The assessment methodologies in AS/NZS 2772.2:2016 are consistent with international best practices such as IEC 62232.

Figure 1 Summary of Measurement Results



APPENDIX A - Glossary and Abbreviations

**ARPANSA RPS3 General
Public Limit**

Current Australian Radiation Protection Standard limits (reference levels) for continuous exposure of the general public to radio frequency transmissions.

Broadcast

Public transmission services such as radio and TV.

Power Density

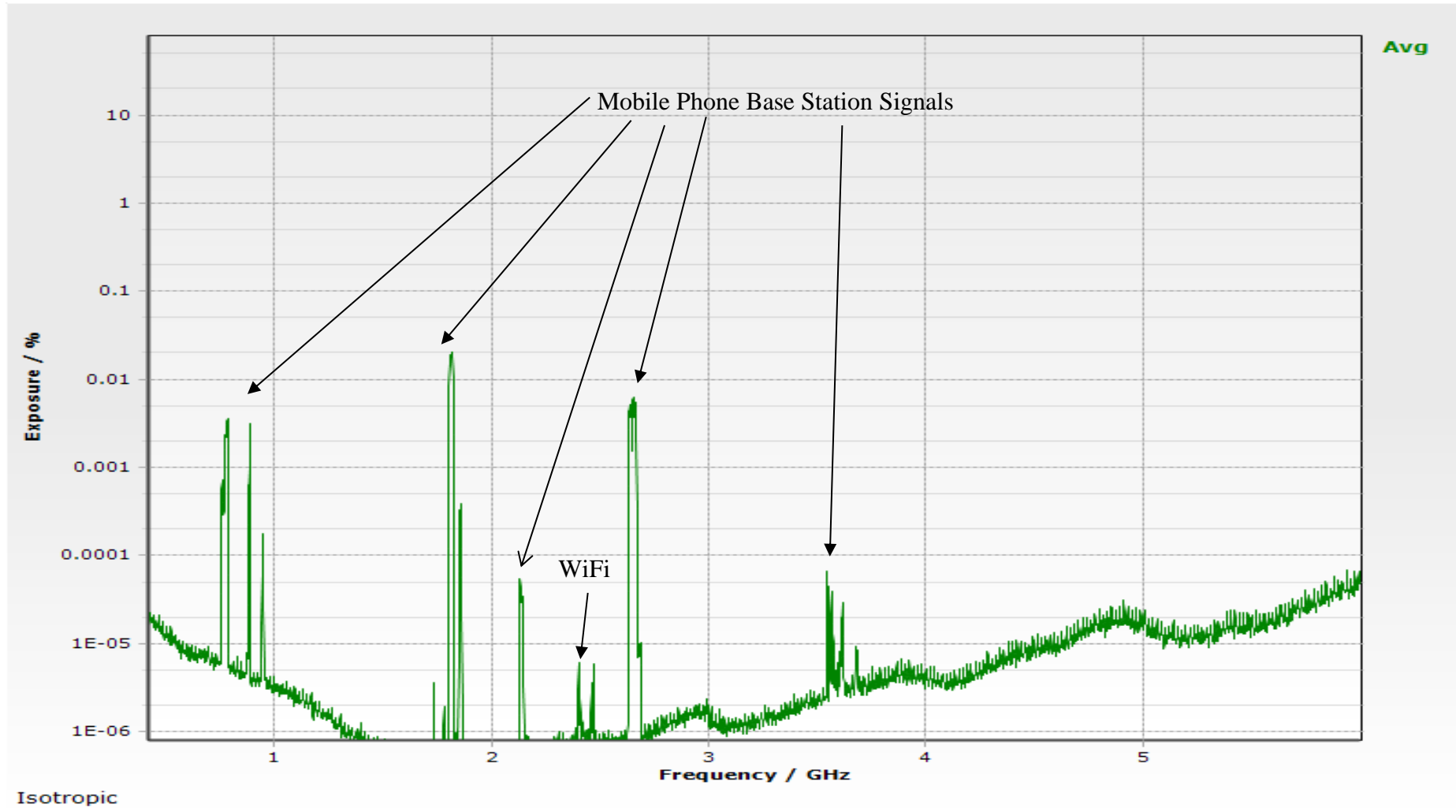
The amount of electromagnetic energy flowing through a given area.

**Radio Frequency Electromagnetic
Energy (RF EME)**

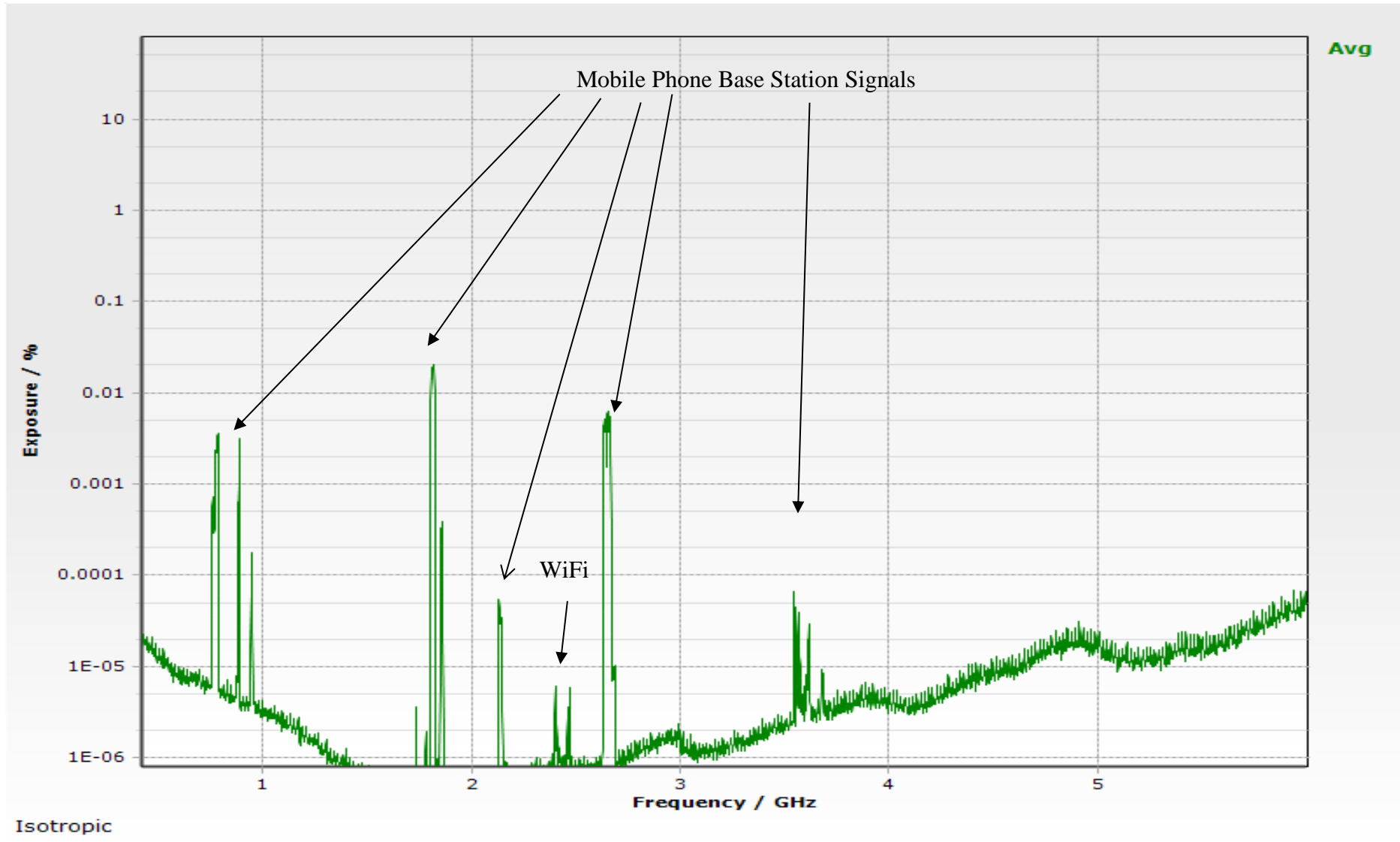
RF EME is the radio waves generated by transmitting devices such as antennas.

APPENDIX B – Background Source Spectrum Scans

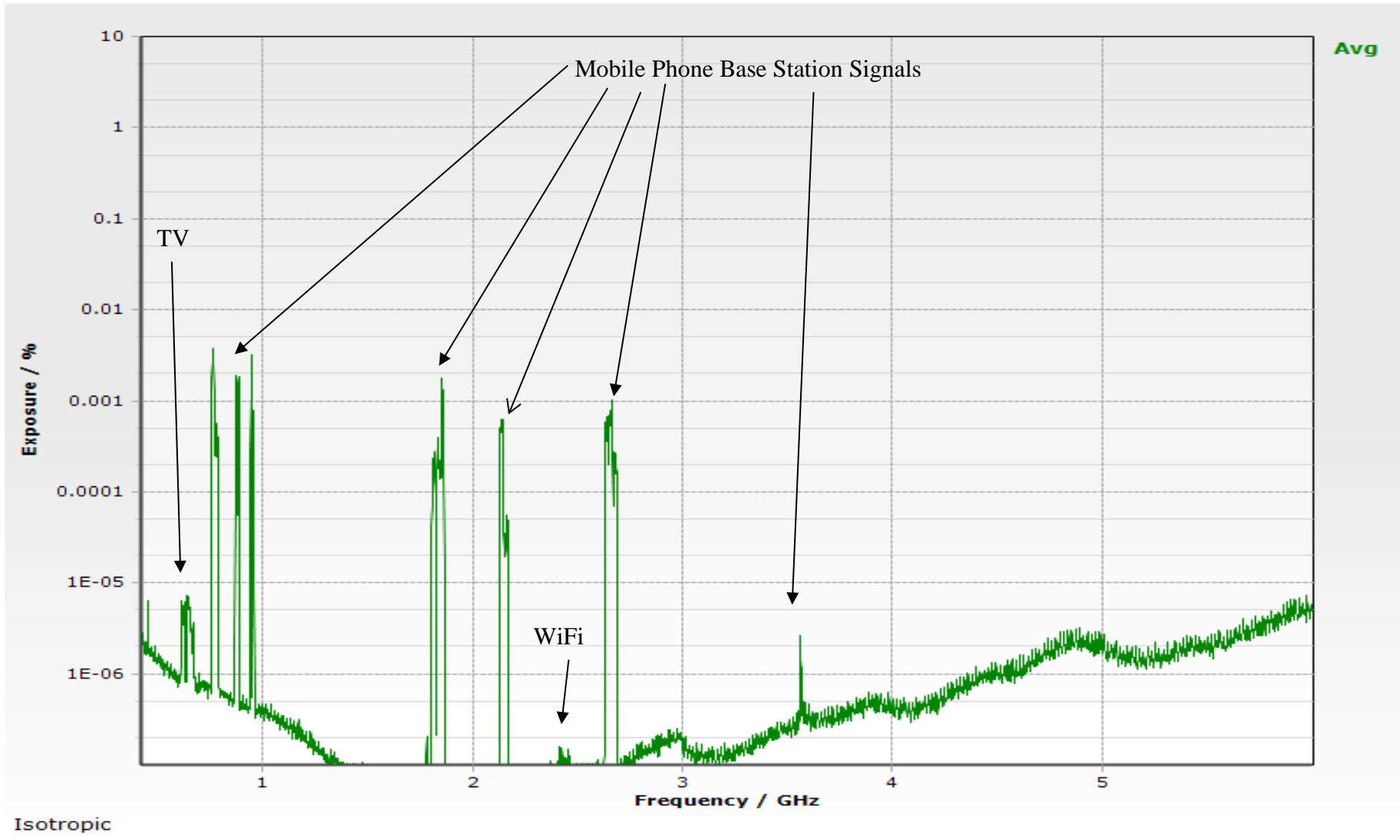
Location 1 A – Environmental RF EME Average (420MHz – 6GHz)



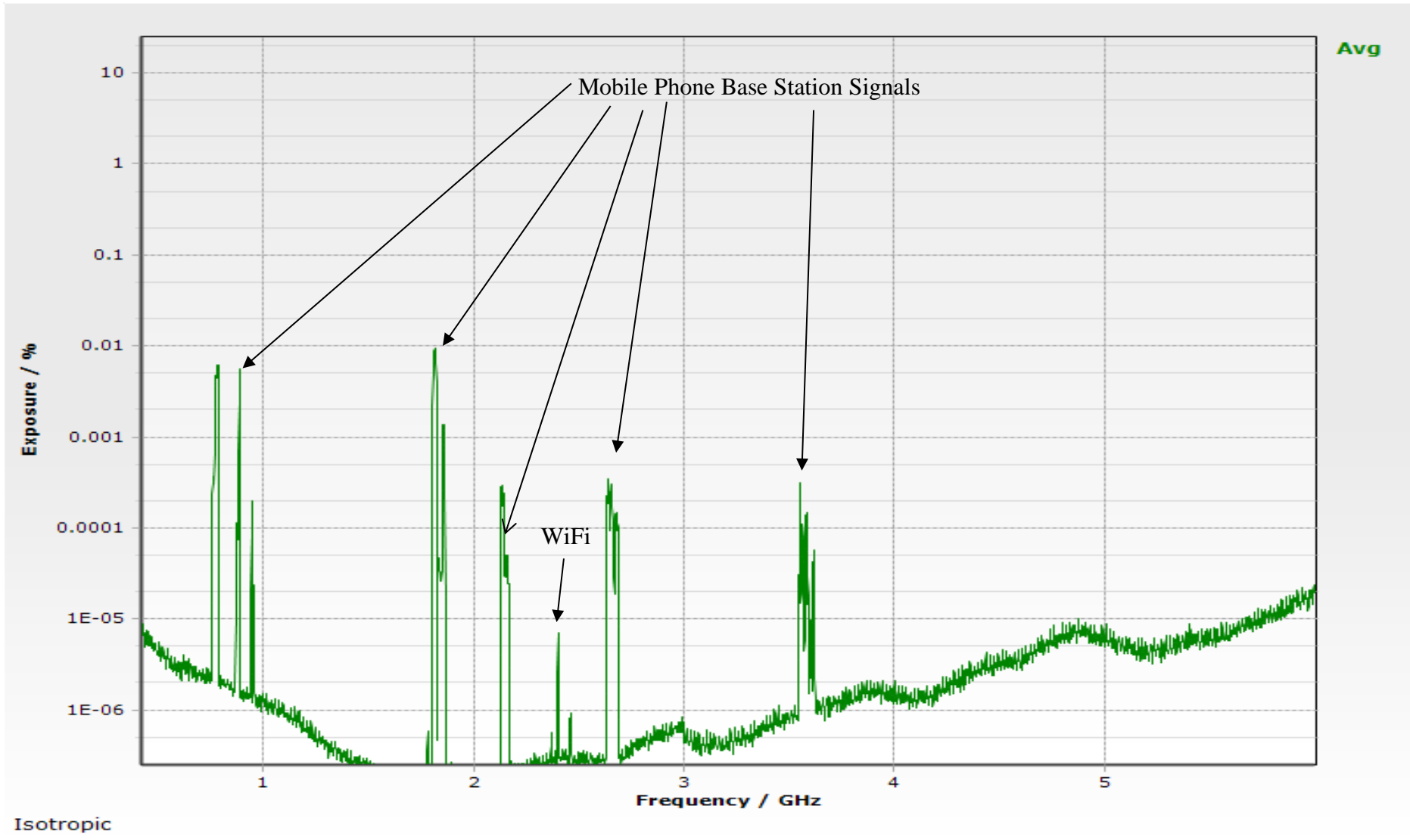
Location 1 B – Environmental RF EME Average (420MHz – 6GHz)



Location 2 – Environmental RF EME Average (420MHz – 6GHz)



Location 3 – Environmental RF EME Average (420MHz – 6GHz)



Location 4 – Environmental RF EME Average (420MHz – 6GHz)

