# EMC Test Report

**Project Number:** 4076029

**Report Number:** 4076029EMC01 **Revision Level:** 1

**Client:** Social Bicycles Inc.

**Equipment Under Test:** Smart Bike Share System

**Model:** SB3

**FCC ID:** 2ADEK22017SB3

**IC ID:** 12433A-22017SB3

**FCC Rule Parts:** Part 2, Part 22(H), Part 24(E)

**Industry Canada:** RSS-GEN, Issue 4: 2014

RSS-132, Issue 3: 2013

RSS-133, Issue 6: 2013

**Report issued on:** 07 March 2017

**Test Result:** Compliant

Tested by: Martin Taylor, Project Engineer

Reviewed by: Jeremy Pickens, Senior EMC Engineer

Remarks:
This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

# Table of Contents

# 1 Summary of Test Results

| Reference Sections | | Test Description | Test Limit | Test Condition | Test Result |
|---|---|---|---|---|---|
| FCC | IC | | | | |
| 2.1046 | RSS-GEN (6.12) | Conducted Output Power | N/A | Conducted | Reported |
| 24.232(d) | RSS-132 (5.4)<br>RSS-133 (6.4) | Peak-to-Average Ratio | <13 dB | | Pass |
| 2.1049<br>22.917(a)<br>24.238(a) | RSS-GEN(6.6)<br>RSS-133 (2.3) | Occupied Bandwidth | N/A | | Reported |
| 2.1051<br>22.917(a)<br>24.238(a) | RSS-132 (5.5)<br>RSS-133 (6.5.1) | Band Edge / Conducted Spurious Emissions | < 43 +10log$_{10}$ ($P_{[Watts]}$) at band edge and for all out of band emissions | | Pass |
| 22.913(a)(2) | -- | Effective Radiated Power | < 7 Watts max ERP | Radiated | Pass |
| -- | RSS-132 (5.4) | Equivalent Isotropically Radiated Power | < 11.5 Watts max ERP | | Pass |
| 24.232(c) | RSS-133 (6.4)<br>SRSP-510 (5.1.2) | | < 2 Watts max EIRP | | Pass |
| 2.1053<br>22.917(a)<br>24.238(a) | RSS-GEN (6.13)<br>RSS-132 (5.5)<br>RSS-133 (6.5.1) | Radiated Spurious Emissions | < 43 +10log$_{10}$ ($P_{[Watts]}$) at band edge and for all out of band emissions | | Pass |
| 2.1055<br>22.917(a)<br>24.238(a) | RSS-GEN (6.11)<br>RSS-132 (5.3)<br>RSS-133 (6.3) | Frequency Stability | <2.5 ppm | | Pass |

## *1.1 Modifications Required to Compliance*

None

# 2 General Information

## 2.1 Client Information

| | |
|---|---|
| Name: | Social Bicycles Inc. |
| Address: | 55 Prospect Street, Ste 304 |
| City, State, Zip, Country: | Brooklyn, NY 11201, USA |

## 2.2 Test Laboratory

| | |
|---|---|
| Name: | SGS North America, Inc. |
| Address: | 620 Old Peachtree Road NW, Suite 100 |
| City, State, Zip, Country: | Suwanee, GA 30024, USA |

## 2.3 General Information of EUT

| | |
|---|---|
| Type of Product: | Smart Bike Share System |
| Model Number: | SB3 |
| Serial Number: | SC2-02AD5-EBMW-0716-P09 (Conducted)<br>SC2-02B6E-EBMW-0716-P09 (Radiated) |
| IMEI Number: | 356118040855322 (Conducted)<br>356118040981078 (Radiated) |
| Rated Voltage: | 3.7 Vdc |
| Test Voltage: | 3.7 Vdc |
| Tx Frequency Range: | 824.2– 848.8 MHz (GSM850)<br>1850.2– 1909.8 MHz (GSM1900) |
| Antenna: | Antenova, P/N: A10340, Peak Gain: 1.7 / 3.0 dBi (850/1900 Bands) |
| FCC Classification: | PCS Licensed Transmitter PCB |
| Type: | Pre Production |
| Sample Received Date: | 05 December 2016 |
| Dates of testing: | 07 – 23 December 2016 |

## 2.4 Operating Modes and Conditions

The EUT was exercised by connecting a CMW communications tester to the device. The CMW was used to control signaling and channel during testing.

# 3 RF Output Power

## 3.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| RF Output Power | FCC Part 2.1046<br>RSS-GEN (6.12) | Reported |

## 3.2 Test Method

A radio link was established between EUT and Radio Communication Tester. The output power of the EUT was set to maximum value by using the maximum power setting on the Radio Communications Tester. A spectrum analyzer was used to measure the peak output power using the methods defined in ANSI/TIA-603-D.

The measurements were conducted at the low, middle, and high channel.

## 3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

| | |
|---|---|
| Temperature: | 22.9 °C |
| Relative Humidity: | 28.5% |
| Atmospheric Pressure: | 98.5 kPa |

## 3.4 Test Equipment

Test Date: 9-Dec-2016 Tester: MT

| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| EMI TEST RECEIVER | ESU40 | ROHDE & SCHWARZ | B079629 | 20-Jun-2017 |
| WIDEBAND RADIO COMMUNICATION TESTER | CMW500 | ROHDE & SCHWARZ | B094874 | 19-Jan-2018 |
| RF CABLE | 141 | HUBER & SUHNER | B095590 | 26-Jul-2017 |
| ATTENUATOR, 10DB | 10DB | ROHDE & SCHWARZ | B095594 | 27-Jul-2017 |

- Unless otherwise noted, equipment is on a 1 year calibration cycle.
- Based on manufacturer's specifications, the CMW-500 is on a 2 year calibration cycle.

## 3.5 Test Data

| Band | UpLink Channel | UL Frequency (MHz) | Mode | Slots | Measured Power (dBm) | Cable Loss (dB) | Conducted Power (dBm) |
|---|---|---|---|---|---|---|---|
| 850 | 128 | 824.2 | GPRS | 1 | 30.87 | 0.7 | 31.57 |
| 850 | 128 | 824.2 | GPRS | 2 | 30.87 | 0.7 | 31.57 |
| 850 | 128 | 824.2 | GPRS | 3 | 30.87 | 0.7 | 31.57 |
| 850 | 128 | 824.2 | GPRS | 4 | 30.87 | 0.7 | 31.57 |
| 850 | 190 | 836.6 | GPRS | 1 | 31.03 | 0.7 | 31.73 |
| 850 | 190 | 836.6 | GPRS | 2 | 31.03 | 0.7 | 31.73 |
| 850 | 190 | 836.6 | GPRS | 3 | 31.03 | 0.7 | 31.73 |
| 850 | 190 | 836.6 | GPRS | 4 | 31.02 | 0.7 | 31.72 |
| 850 | 251 | 848.8 | GPRS | 1 | 30.94 | 0.7 | 31.64 |
| 850 | 251 | 848.8 | GPRS | 2 | 30.93 | 0.7 | 31.63 |
| 850 | 251 | 848.8 | GPRS | 3 | 30.93 | 0.7 | 31.63 |
| 850 | 251 | 848.8 | GPRS | 4 | 30.92 | 0.7 | 31.62 |
| 850 | 128 | 824.2 | EGPRS | 1 | 31.02 | 0.7 | 31.72 |
| 850 | 128 | 824.2 | EGPRS | 2 | 30.97 | 0.7 | 31.67 |
| 850 | 128 | 824.2 | EGPRS | 3 | 30.96 | 0.7 | 31.66 |
| 850 | 128 | 824.2 | EGPRS | 4 | 30.96 | 0.7 | 31.66 |
| 850 | 190 | 836.6 | EGPRS | 1 | 31.05 | 0.7 | 31.75 |
| 850 | 190 | 836.6 | EGPRS | 2 | 31.05 | 0.7 | 31.75 |
| 850 | 190 | 836.6 | EGPRS | 3 | 31.05 | 0.7 | 31.75 |
| 850 | 190 | 836.6 | EGPRS | 4 | 31.05 | 0.7 | 31.75 |
| 850 | 251 | 848.8 | EGPRS | 1 | 30.92 | 0.7 | 31.62 |
| 850 | 251 | 848.8 | EGPRS | 2 | 30.92 | 0.7 | 31.62 |
| 850 | 251 | 848.8 | EGPRS | 3 | 30.92 | 0.7 | 31.62 |
| 850 | 251 | 848.8 | EGPRS | 4 | 30.92 | 0.7 | 31.62 |
| 1900 | 512 | 1850.2 | GPRS | 1 | 26.14 | 1.08 | 27.22 |
| 1900 | 512 | 1850.2 | GPRS | 2 | 26.14 | 1.08 | 27.22 |
| 1900 | 512 | 1850.2 | GPRS | 3 | 26.14 | 1.08 | 27.22 |
| 1900 | 512 | 1850.2 | GPRS | 4 | 26.13 | 1.08 | 27.21 |
| 1900 | 661 | 1880 | GPRS | 1 | 26.25 | 1.08 | 27.33 |
| 1900 | 661 | 1880 | GPRS | 2 | 26.25 | 1.08 | 27.33 |
| 1900 | 661 | 1880 | GPRS | 3 | 26.25 | 1.08 | 27.33 |
| 1900 | 661 | 1880 | GPRS | 4 | 26.25 | 1.08 | 27.33 |
| 1900 | 810 | 1909.8 | GPRS | 1 | 26.58 | 1.12 | 27.7 |
| 1900 | 810 | 1909.8 | GPRS | 2 | 26.58 | 1.12 | 27.7 |
| 1900 | 810 | 1909.8 | GPRS | 3 | 26.58 | 1.12 | 27.7 |
| 1900 | 810 | 1909.8 | GPRS | 4 | 26.58 | 1.12 | 27.7 |
| 1900 | 512 | 1850.2 | EGPRS | 1 | 26.12 | 1.08 | 27.2 |
| 1900 | 512 | 1850.2 | EGPRS | 2 | 26.12 | 1.08 | 27.2 |
| 1900 | 512 | 1850.2 | EGPRS | 3 | 26.11 | 1.08 | 27.19 |
| 1900 | 512 | 1850.2 | EGPRS | 4 | 26.11 | 1.08 | 27.19 |
| 1900 | 661 | 1880 | EGPRS | 1 | 26.23 | 1.08 | 27.31 |
| 1900 | 661 | 1880 | EGPRS | 2 | 26.23 | 1.08 | 27.31 |
| 1900 | 661 | 1880 | EGPRS | 3 | 26.23 | 1.08 | 27.31 |
| 1900 | 661 | 1880 | EGPRS | 4 | 26.24 | 1.08 | 27.32 |
| 1900 | 810 | 1909.8 | EGPRS | 1 | 26.56 | 1.12 | 27.68 |
| 1900 | 810 | 1909.8 | EGPRS | 2 | 26.56 | 1.12 | 27.68 |
| 1900 | 810 | 1909.8 | EGPRS | 3 | 26.56 | 1.12 | 27.68 |
| 1900 | 810 | 1909.8 | EGPRS | 4 | 26.56 | 1.12 | 27.68 |

GSM850 Max: 31.75dBm (1.496W)
GSM1900 Max: 27.7dBm (0.589W)

# 4 Peak to Average Ratio

## 4.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| Peak to Average Ratio | FCC 24.232(d)<br>RSS-132 (5.4)<br>RSS-133 (6.4) | Pass |

## 4.2 Test Method

KDB document 971168 D01 Power Meas License Digital Systems v02r02 was used to determine peak-to-average ratio. For the measurements, Clause 5.7.1 was used which defined the measurement method using the CCDF function of the spectrum analyzer. Measurements were recorded at the mid channels at the highest power.

## 4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

| | |
|---|---|
| Temperature: | 22.8 °C |
| Relative Humidity: | 26.7 % |
| Atmospheric Pressure: | 97.9 kPa |

## 4.4 Test Equipment

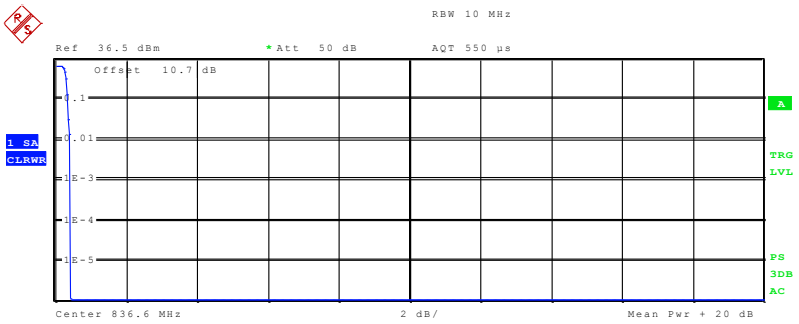
Test Date: 12-Dec-2016 Tester: MT

| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| WIDEBAND RADIO COMMUNICATION TESTER | CMW500 | ROHDE & SCHWARZ | B094874 | 19-Jan-2018 |
| RF CABLE | 141 | HUBER & SUHNER | B095590 | 26-Jul-2017 |
| ATTENUATOR, 10DB | 10DB | ROHDE & SCHWARZ | B095594 | 27-Jul-2017 |
| EMI TEST RECEIVER | ESU40 | ROHDE & SCHWARZ | B079629 | 20-Jun-2017 |

- Unless otherwise noted, equipment is on a 1 year calibration cycle.
- Based on manufacturer's specifications, the CMW500 is on a 2 year calibration cycle.

## 4.5 Test Data

### GSM850 CH 190

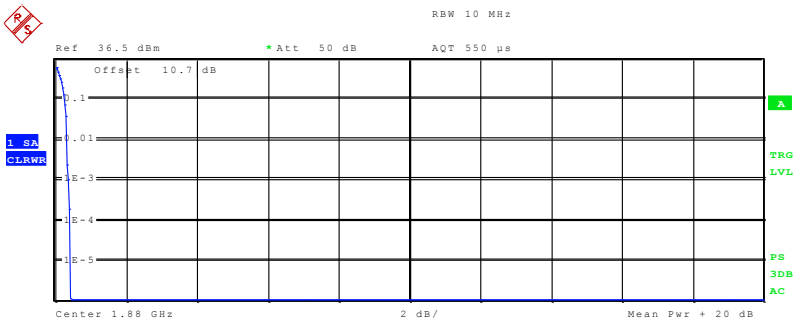



Complementary Cumulative Distribution Function
NOF samples: 8800, Usable BW: 11.2MHz

| | Trace 1 |
|---|---|
| Mean | 31.11 dBm |
| Peak | 31.52 dBm |
| Crest | 0.41 dB |
| 10 % | 0.32 dB |
| 1 % | 0.38 dB |
| .1 % | 0.42 dB |
| .01 % | 0.42 dB |

Date: 12.DEC.2016 17:35:49

### GSM1900 CH 661




Complementary Cumulative Distribution Function
NOF samples: 8800, Usable BW: 11.2MHz

| | Trace 1 |
|---|---|
| Mean | 26.70 dBm |
| Peak | 27.09 dBm |
| Crest | 0.39 dB |
| 10 % | 0.26 dB |
| 1 % | 0.32 dB |
| .1 % | 0.35 dB |
| .01 % | 0.38 dB |

Date: 12.DEC.2016 17:43:02

# 5 Occupied Bandwidth

## 5.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| Occupied Bandwidth | FCC Part 2.1049<br>FCC Part 22.917(a)<br>FCC Part 24.238(a)<br>RSS-GEN(6.6)<br>RSS-133 (2.3) | Reported |

## 5.2 Test Method

KDB document 971168 D01 Power Meas License Digital Systems v02r02, Clause 4 was used to determine the occupied measurement.

The 99% measurement function of the spectrum analyzer was used.

The measurement was conducted at the center channel of each band.

## 5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

| | |
|---|---|
| Temperature: | 22.8 °C |
| Relative Humidity: | 26.7 % |
| Atmospheric Pressure: | 97.9 kPa |

## 5.4 Test Equipment

Test Date: 12-Dec-2016 Tester: MT

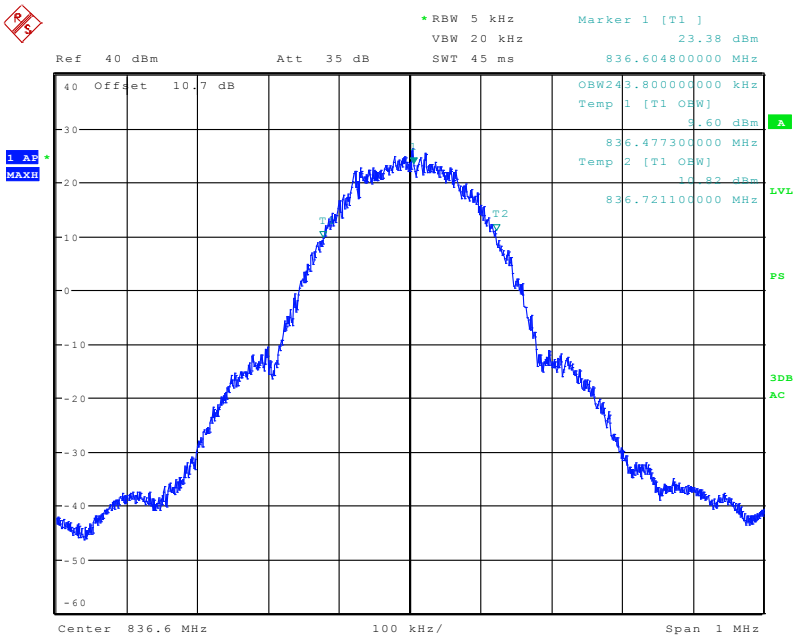
| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| WIDEBAND RADIO COMMUNICATION TESTER | CMW500 | ROHDE & SCHWARZ | B094874 | 19-Jan-2018 |
| RF CABLE | 141 | HUBER & SUHNER | B095590 | 26-Jul-2017 |
| ATTENUATOR, 10DB | 10DB | ROHDE & SCHWARZ | B095594 | 27-Jul-2017 |
| EMI TEST RECEIVER | ESU40 | ROHDE & SCHWARZ | B079629 | 20-Jun-2017 |

- Unless otherwise noted, equipment is on a 1 year calibration cycle.
- Based on manufacturer's specifications, the CMW500 is on a 2 year calibration cycle.

## 5.5 Test Data

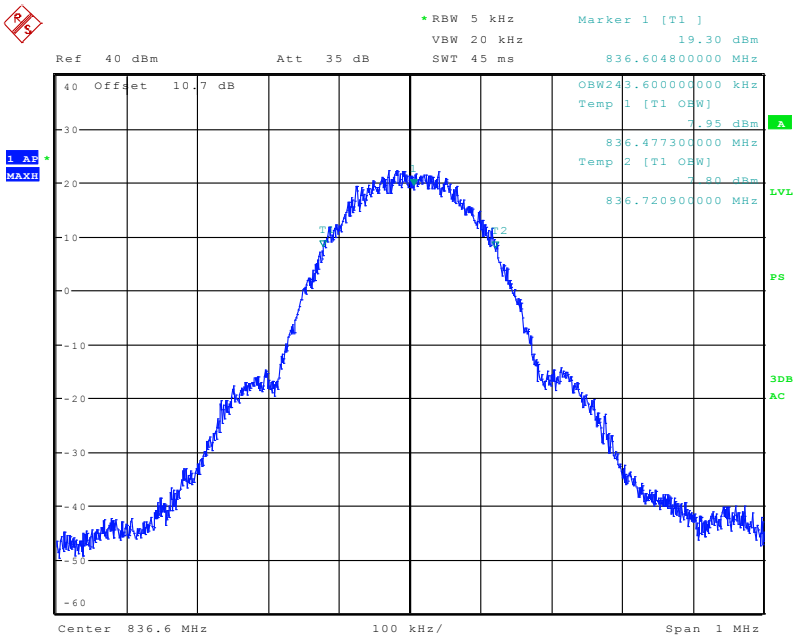
**GSM850 CH 190 - 99% Occupied Bandwidth**

GPRS




Date: 12.DEC.2016 10:42:42

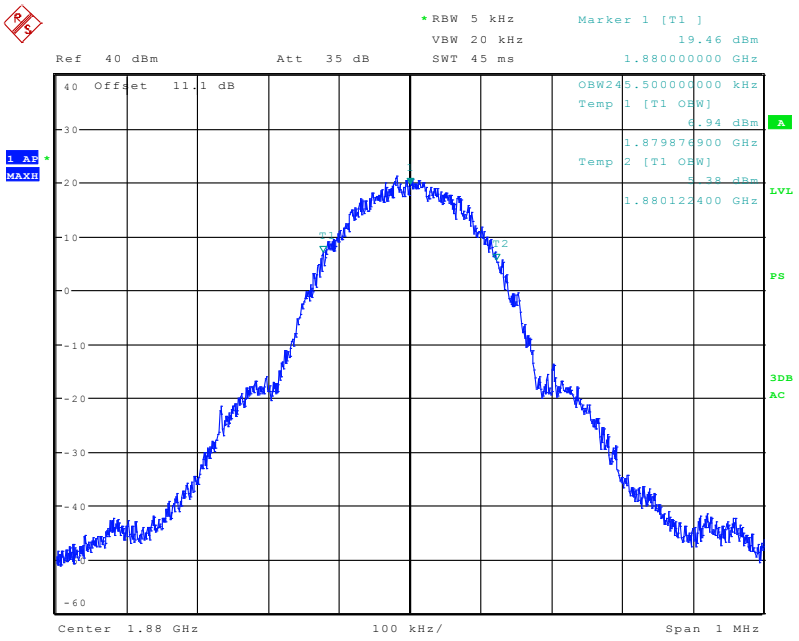
EGPRS




Date: 12.DEC.2016 10:21:31

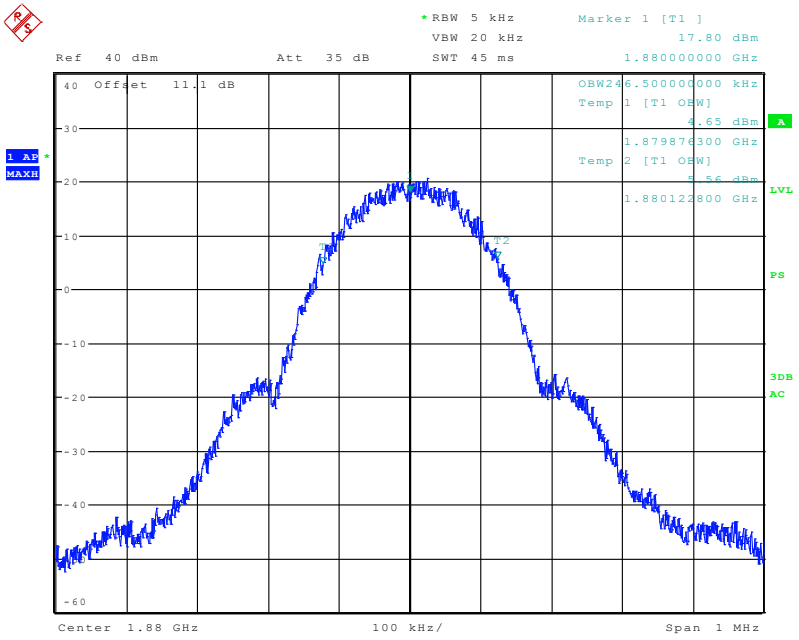
## GSM1900 CH 661 - 99% Occupied Bandwidth

GPRS




Date: 12.DEC.2016 10:53:04

EGPRS




Date: 12.DEC.2016 10:55:32

# 6 Band Edge and Conducted Spurious Emissions

## 6.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| Conducted spurious emissions and Band Edge | 2.1051<br>22.917(a)<br>24.238(a)<br>RSS-132 (5.5)<br>RSS-133 (6.5.1) | Pass |

## 6.2 Test Method

KDB document 971168 D01 Power Meas License Digital Systems v02r02, Clause 6 was used to measure spurious emissions at the antenna terminals.

## 6.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

| | |
|---|---|
| Temperature: | 22.8 °C |
| Relative Humidity: | 26.7 % |
| Atmospheric Pressure: | 97.9 kPa |

## 6.4 Test Equipment

Test Date: 12-Dec-2016 Tester: MT

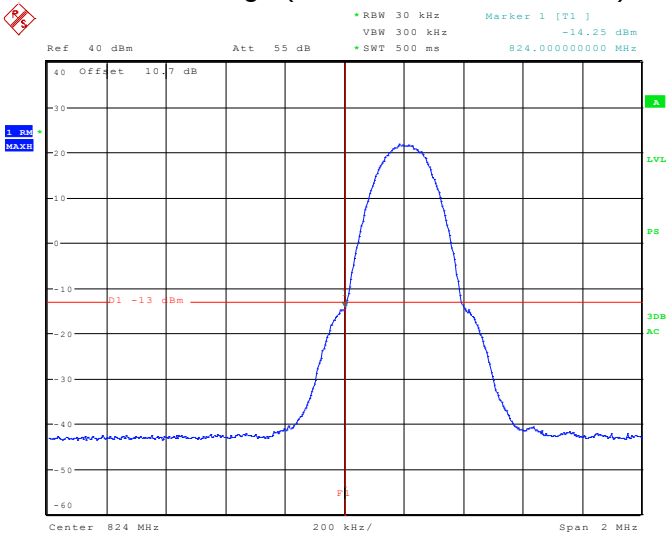
| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| WIDEBAND RADIO COMMUNICATION TESTER | CMW500 | ROHDE & SCHWARZ | B094874 | 19-Jan-2018 |
| RF CABLE | 141 | HUBER & SUHNER | B095590 | 26-Jul-2017 |
| ATTENUATOR, 10DB | 10DB | ROHDE & SCHWARZ | B095594 | 27-Jul-2017 |
| EMI TEST RECEIVER | ESU40 | ROHDE & SCHWARZ | B079629 | 20-Jun-2017 |

- Unless otherwise noted, equipment is on a 1 year calibration cycle.
- Based on manufacturer's specifications, the CMW500 is on a 2 year calibration cycle.

## 6.5 *Test Data – Band Edge Plots*

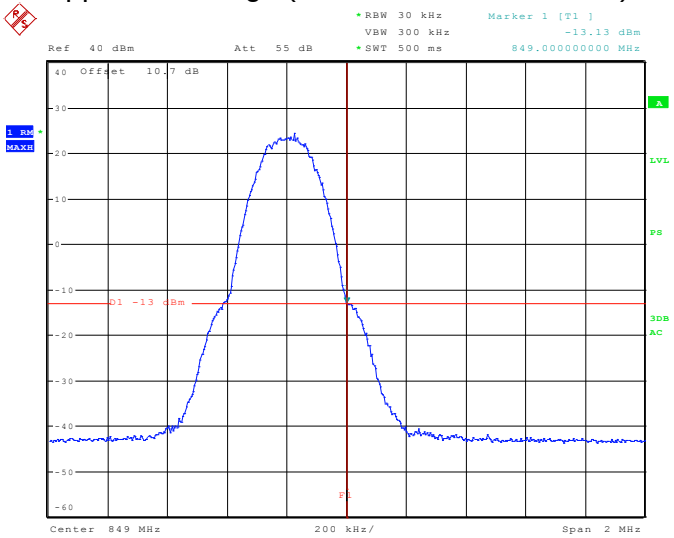
### GSM850

Lower Band Edge (Channel 128, 824.2 MHz)




Date: 12.DEC.2016 15:53:09

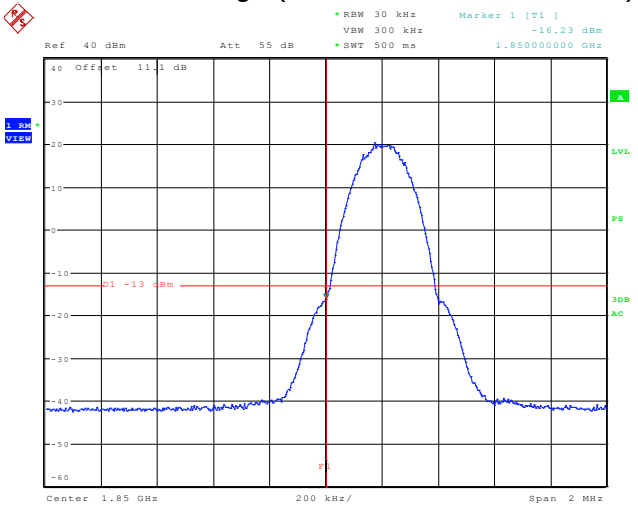
Upper Band Edge (Channel 251, 848.8 MHz)




Date: 12.DEC.2016 16:12:44

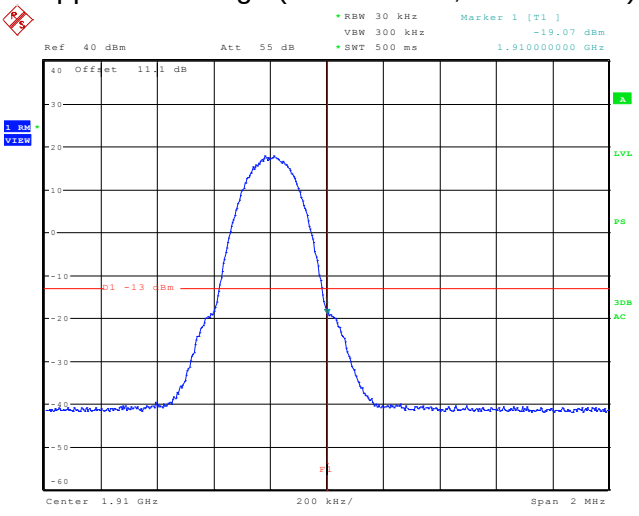
### GSM1900

Lower Band Edge (Channel 512, 1850.2 MHz)




Date: 12.DEC.2016 11:52:28

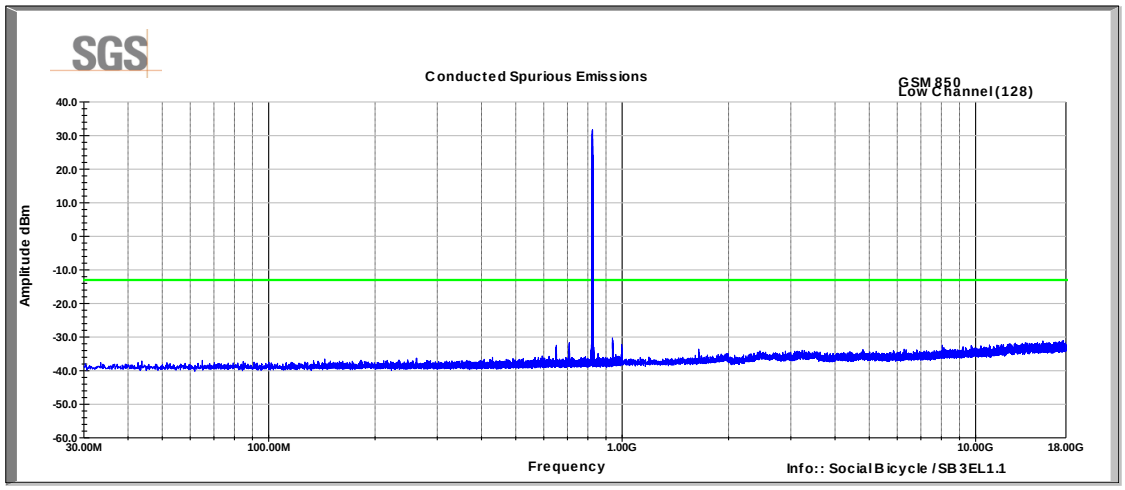
Upper Band Edge (Channel 810, 1909.8 MHz)



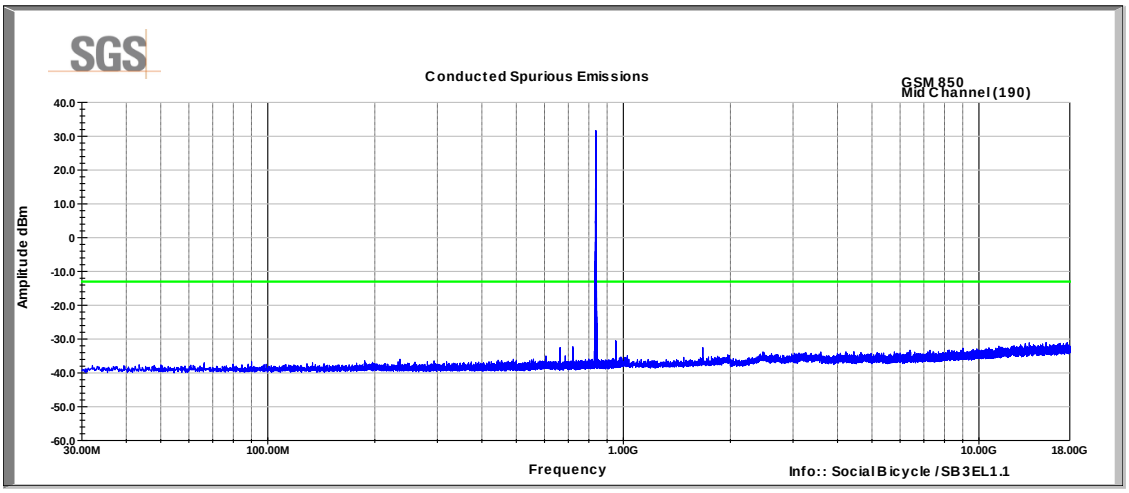

Date: 12.DEC.2016 11:56:57

## 6.6 *Test Data – Conducted Spurious Emissions Plots*

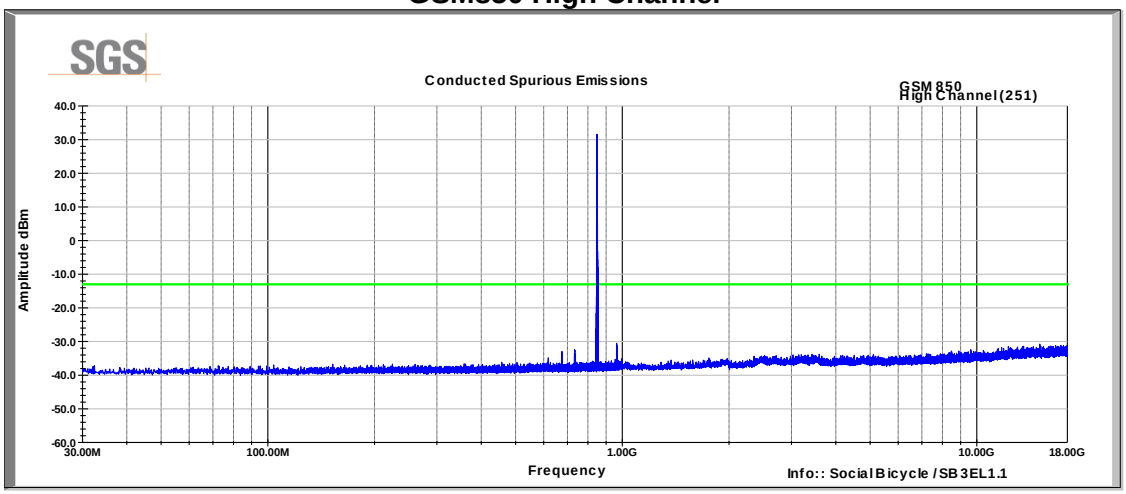
**GSM850 Low Channel**



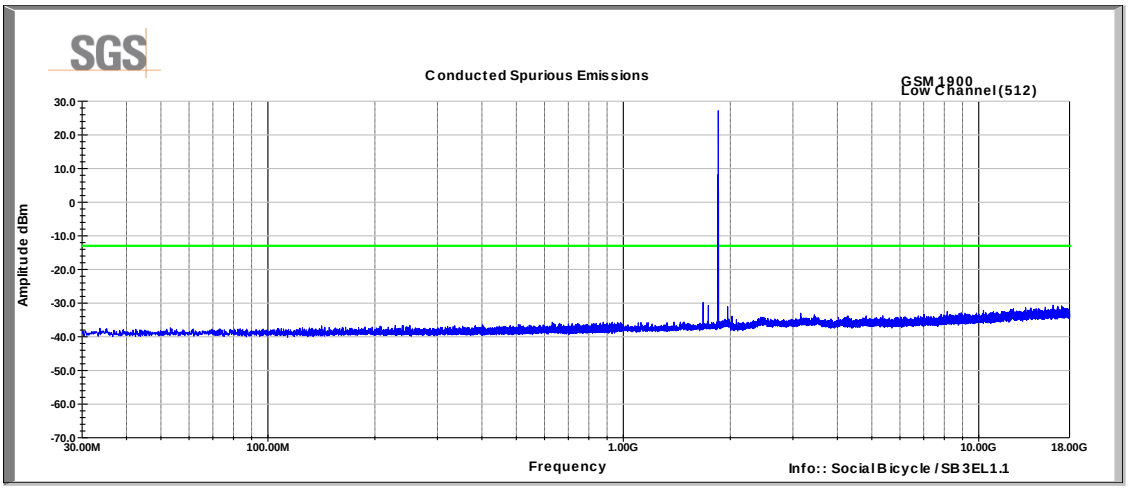

**GSM850 Mid Channel**



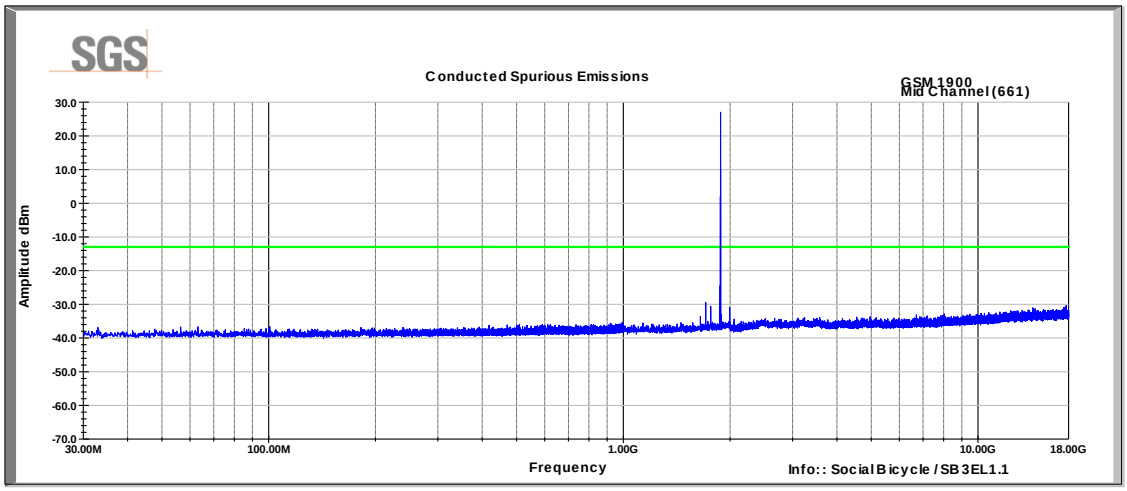

**GSM850 High Channel**



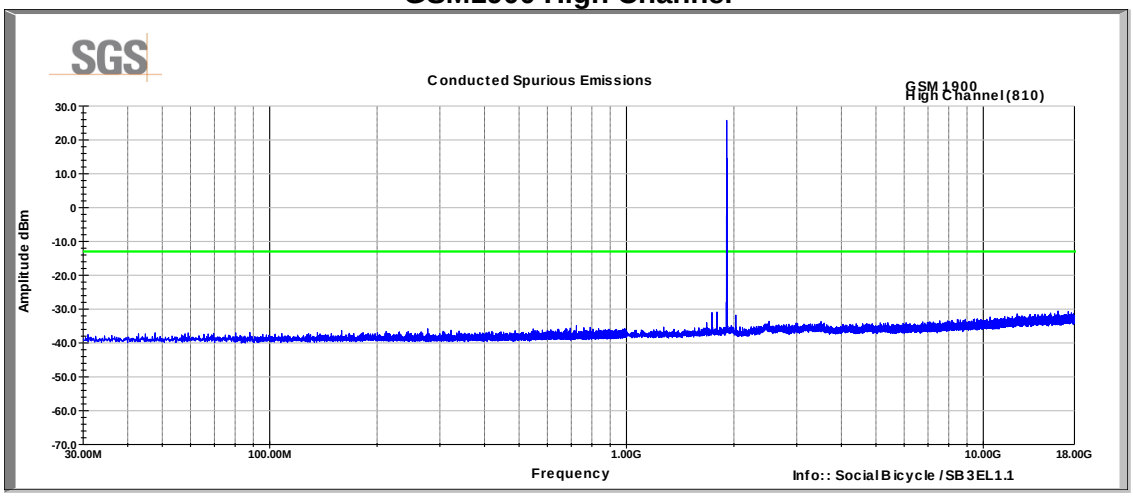
## GSM1900 Low Channel




## GSM1900 Mid Channel




## GSM1900 High Channel



# 7 Effective Radiated Power

### 7.1.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| Effective Radiated Power | FCC Part 22.913(a)(2)<br>RSS-132 5.4 | Pass |
| Effective Isotropic Radiated Power | 24.232(c)<br>RSS-133 6.4 | Pass |

### 7.1.2 Test Method

For ERP/EIRP calculations, the peak antenna gains obtained from the antenna datasheet were used for each band.

## *7.2 Test Site*

SGS EMC Laboratory, Suwanee, GA

## *7.3 Test Equipment*

None

## *7.4 Test Data*

| Band | Max Power dBm | Antenna Gain dBd/dBi | Cable Loss, dB | ERP/EIRP (dBm) | ERP/EIRP Limit, dBm | | Result | |
|---|---|---|---|---|---|---|---|---|
| | | | | | FCC | IC | FCC | IC |
| GSM850 / 824.2 | 31.72 | 1.7 | 0 | 33.42 | 38.5 | 40.6 | PASS | PASS |
| GSM850 / 836.6 | 31.75 | 1.7 | 0 | 33.45 | 38.5 | 40.6 | PASS | PASS |
| GSM850 / 848.8 | 31.64 | 1.7 | 0 | 33.34 | 38.5 | 40.6 | PASS | PASS |
| GSM1900 / 1850.2 | 27.22 | 3 | 0 | 30.22 | 33 | 33 | PASS | PASS |
| GSM1900 / 1880 | 27.33 | 3 | 0 | 30.33 | 33 | 33 | PASS | PASS |
| GSM1900 / 1909.8 | 27.7 | 3 | 0 | 30.7 | 33 | 33 | PASS | PASS |

# 8 Radiated Spurious Emissions

## 8.1 Test Result

| Test Description | Basic Standards | | Test Result |
|---|---|---|---|
| Radiated Spurious Emissions | FCC Part 2.1053<br>FCC Part 22.917(a)<br>FCC Part 24.238(a)<br>ANSI/TIA-603-D-2009 | RSS-GEN (6.13)<br>RSS-132 5.5<br>RSS-133 6.5 | Pass |

## 8.2 Test Method

The levels of the carrier and the various conducted spurious and harmonics frequencies are measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10$^{th}$ harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB. Compliance is based on the use of a spectrum analyzer employing a resolution bandwidth of 1 MHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of a least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emissions bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

The EUT was manipulated in 30° increments from 0 to 330°.

A radio link was established between EUT and Radio Communications Tester. The output power of the EUT was set to maximum value by using the maximum power setting on the Radio Communications Tester. The measurements were conducted at the low, middle, and high channels in RC3/SO55 which was determined to be the worst case operating mode.

## 8.3 Test Site

10m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions

| | |
|---|---|
| Temperature: | 26.5 °C |
| Relative Humidity: | 21.3 % |
| Atmospheric Pressure: | 99.1 kPa |

## 8.4 Test Equipment

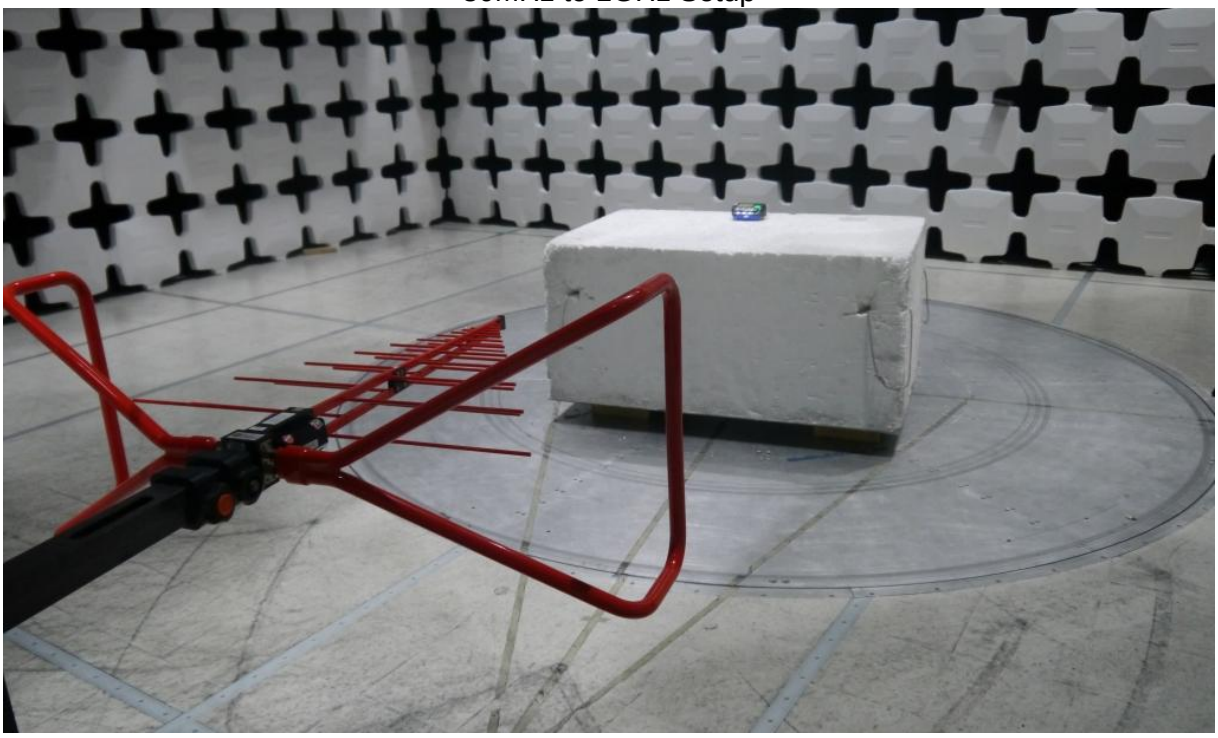
Test Date: 20-Dec-2016 Tester: MT

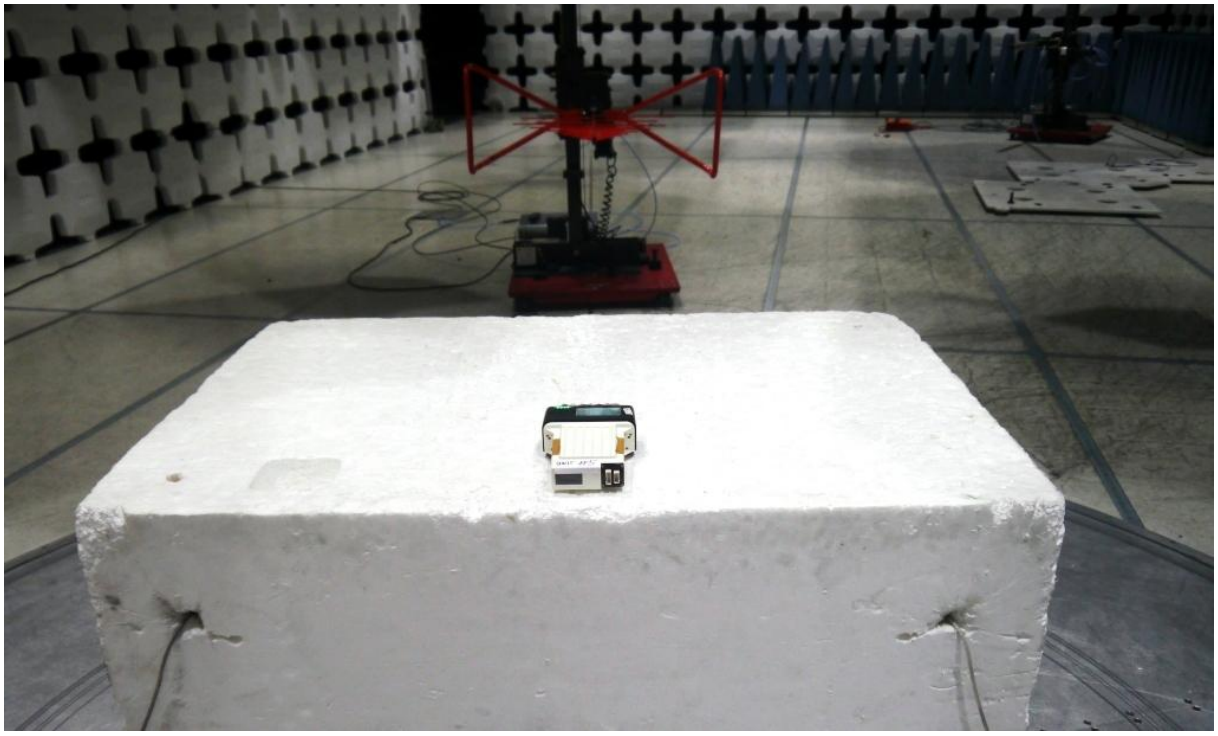
| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| ANTENNA, BILOG | JB6 | SUNOL | B079690 | 10-Nov-2017 |
| DRG HORN (MEDIUM) | 3117 | ETS LINDGREN | B079691 | 27-Jul-2017 |
| HORN(SMALL) | LB-180400-20-C-KF | A-INFO | 15007 | 29-Mar-2017 |
| WIDEBAND RADIO COMMUNICATION TESTER | CMW500 | ROHDE & SCHWARZ | B085757 | 27-Oct-2018 |
| RF CABLE | SF106 | HUBER & SUHNER | B079712 | 27-Jul-2017 |
| RF CABLE | SF106 | HUBER & SUHNER | B079716 | 27-Jul-2017 |
| RF CABLE | SF106 | HUBER & SUHNER | B079713 | 27-Jul-2017 |
| RF CABLE | SF106 | HUBER & SUHNER | B085892 | 27-Jul-2017 |
| RF CABLE | SUCOFLEX 100 | HUBER & SUHNER | B108523 | 4-Aug-2017 |
| RF CABLE | SF102 | HUBER & SUHNER | B079822 | 27-Jul-2017 |
| RF CABLE | SF102 | HUBER & SUHNER | B079824 | 27-Jul-2017 |
| LOW NOISE AMPLIFIER | TS-PR18 | ROHDE & SCHWARZ | B094463 | 16-Feb-2017 |
| LOW NOISE AMPLIFIER | NSP1840-HG | MITEQ | B087572 | 29-Jul-2017 |
| EMI TEST RECEIVER | ESU40 | ROHDE & SCHWARZ | B079629 | 20-Jun-2017 |
| FILTER, BAND REJECT (835MHZ) | 4N45 836/E26.4 | K&L MICROWAVE | B101738 | 28-Jul-2017 |
| FILTER, BAND REJECT | BRC50720 | MICRO-TRONICS | B079784 | 28-Jul-2017 |
| FILTER, HIGH PASS | HPM50108 | MICRO-TRONICS | B079802 | 28-Jul-2017 |
| FILTER, HIGH PASS | HPM50110 | MICRO-TRONICS | B079792 | 28-Jul-2017 |

- Unless otherwise noted, equipment is on a 1 year calibration cycle.
- Based on manufacturer's specifications, the CMW-500 is on a 2 year calibration cycle.

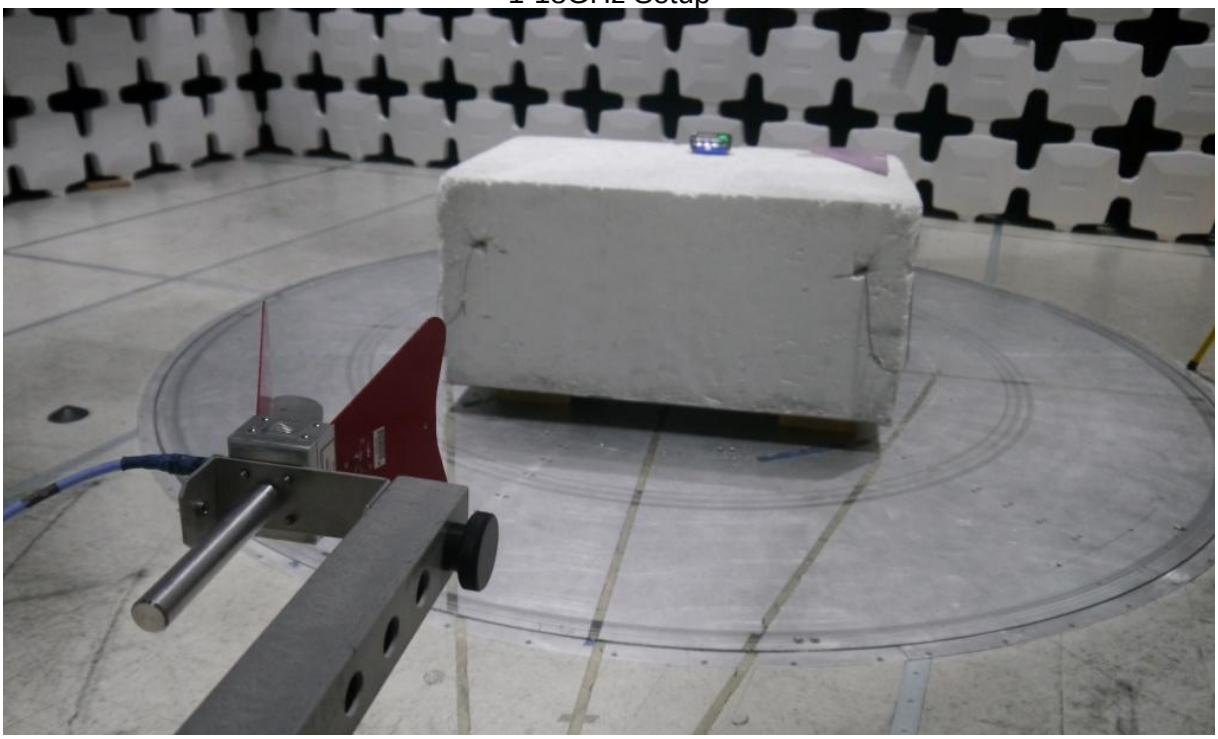
## 8.5 *Test Setup Photographs*

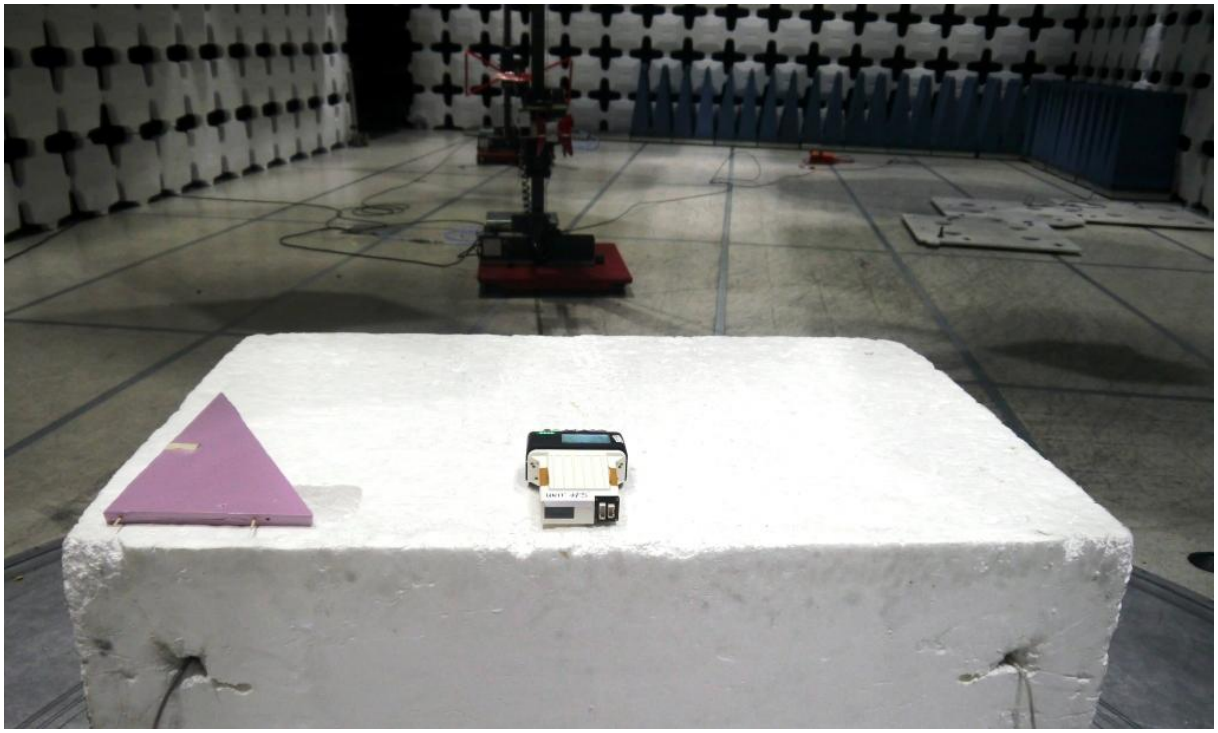
30MHz to 1GHz Setup





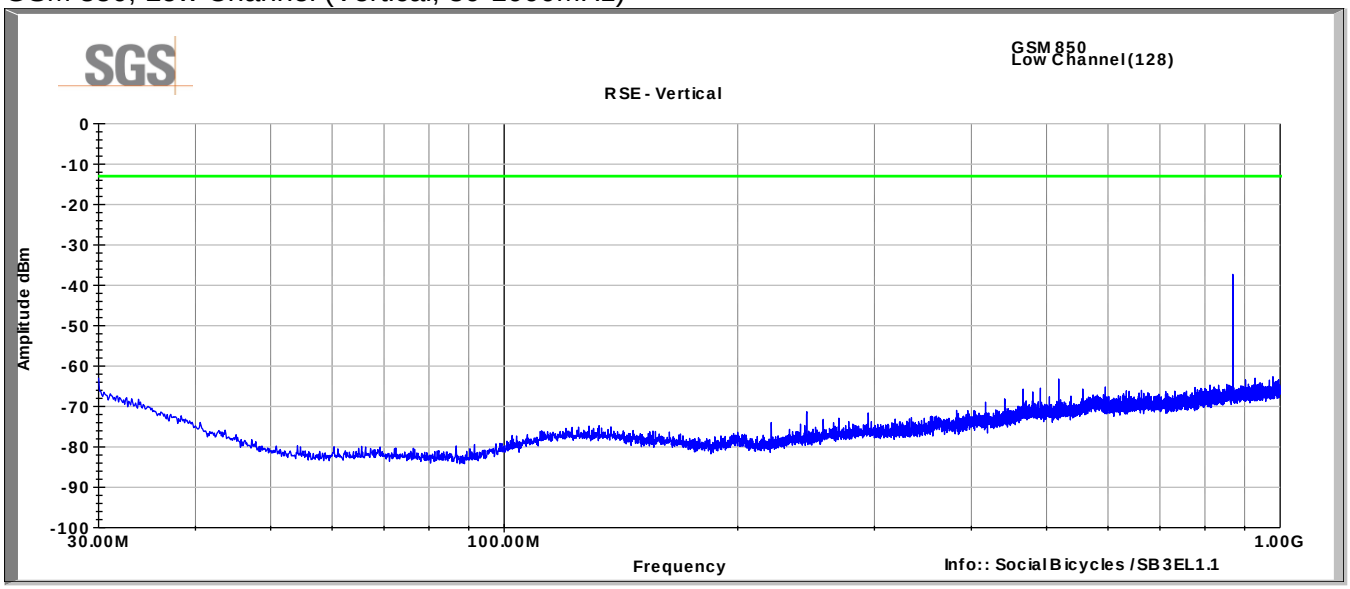
1-18GHz Setup



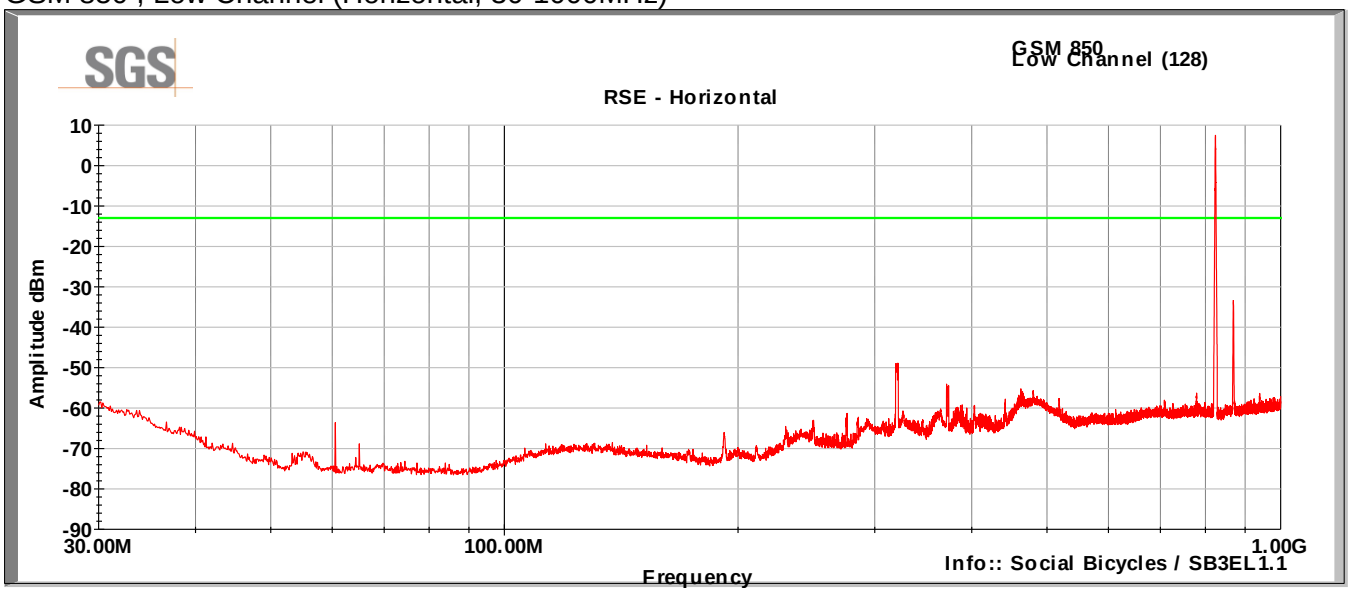


## *8.6 Test Data – GSM 850*

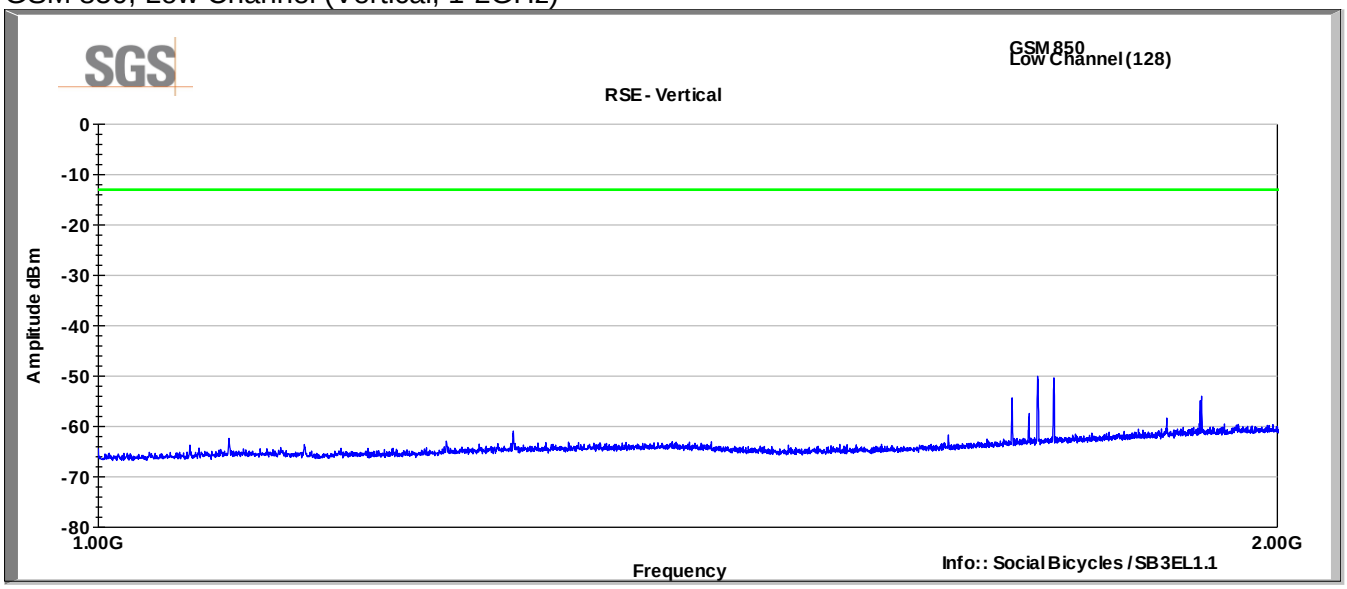
GSM 850, Low Channel (Vertical, 30-1000MHz)



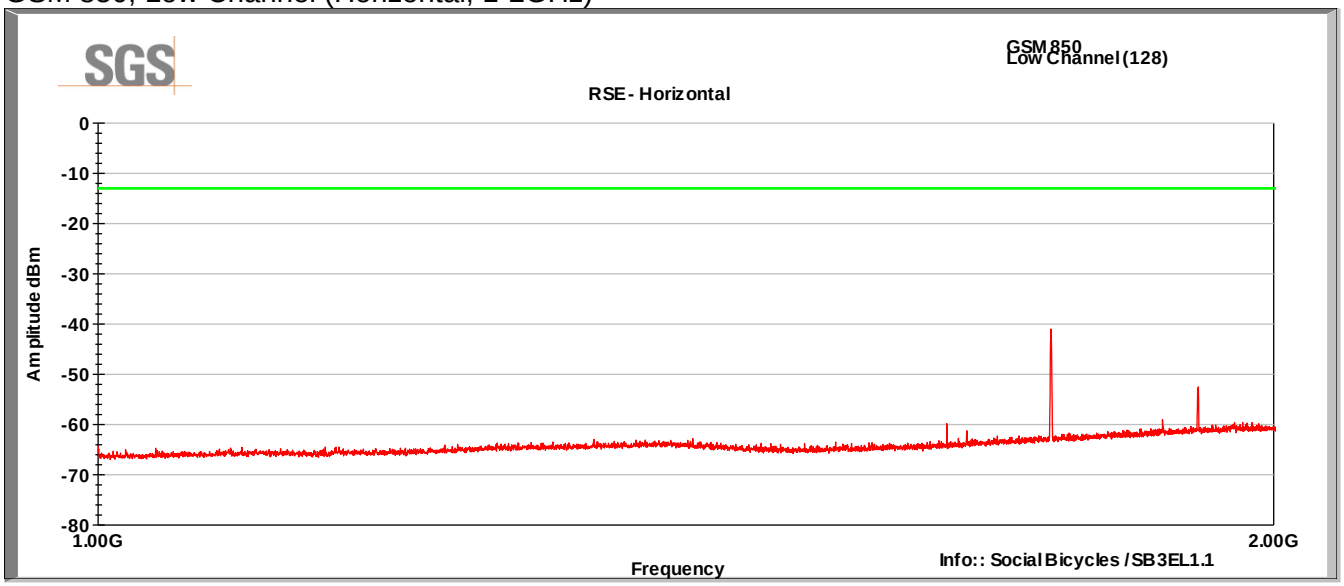

GSM 850 , Low Channel (Horizontal, 30-1000MHz)



GSM 850, Low Channel (Vertical, 1-2GHz)

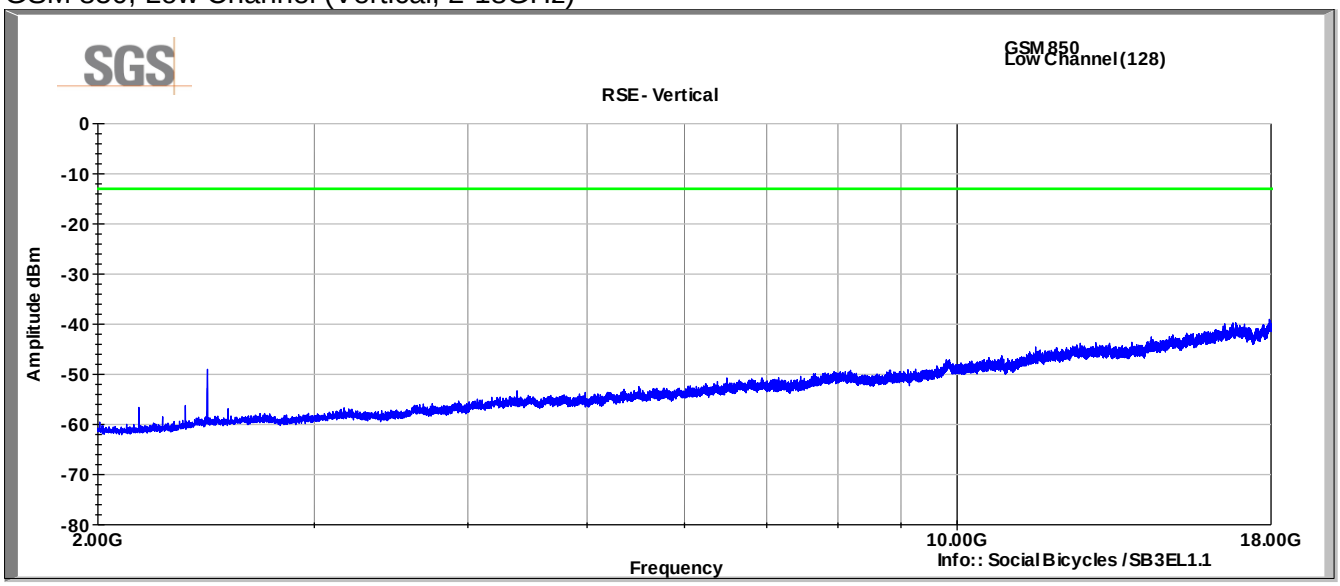



GSM 850, Low Channel (Horizontal, 1-2GHz)

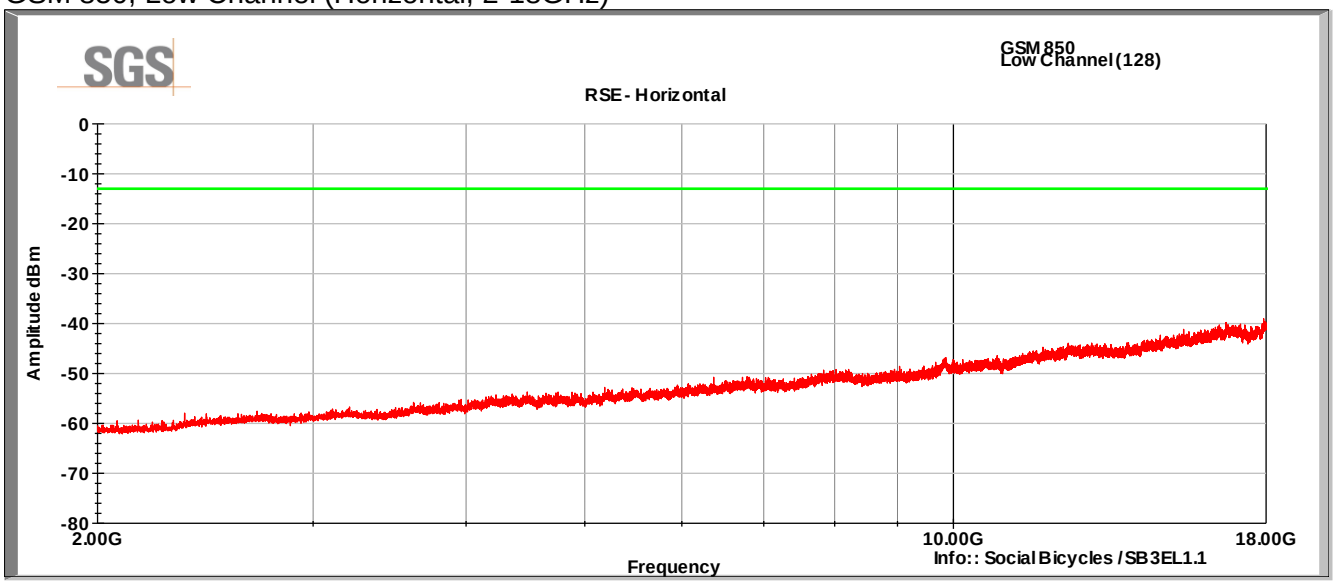



Worst case spur: -41dBm @ 1753.8MHz

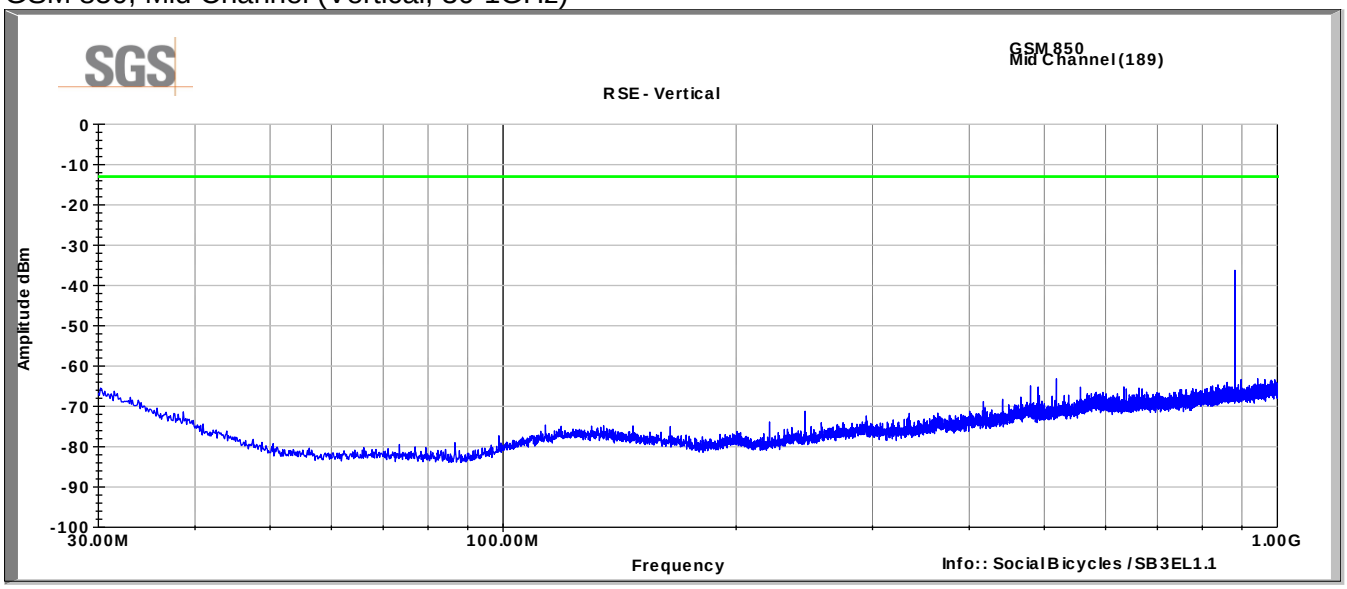
GSM 850, Low Channel (Vertical, 2-18GHz)



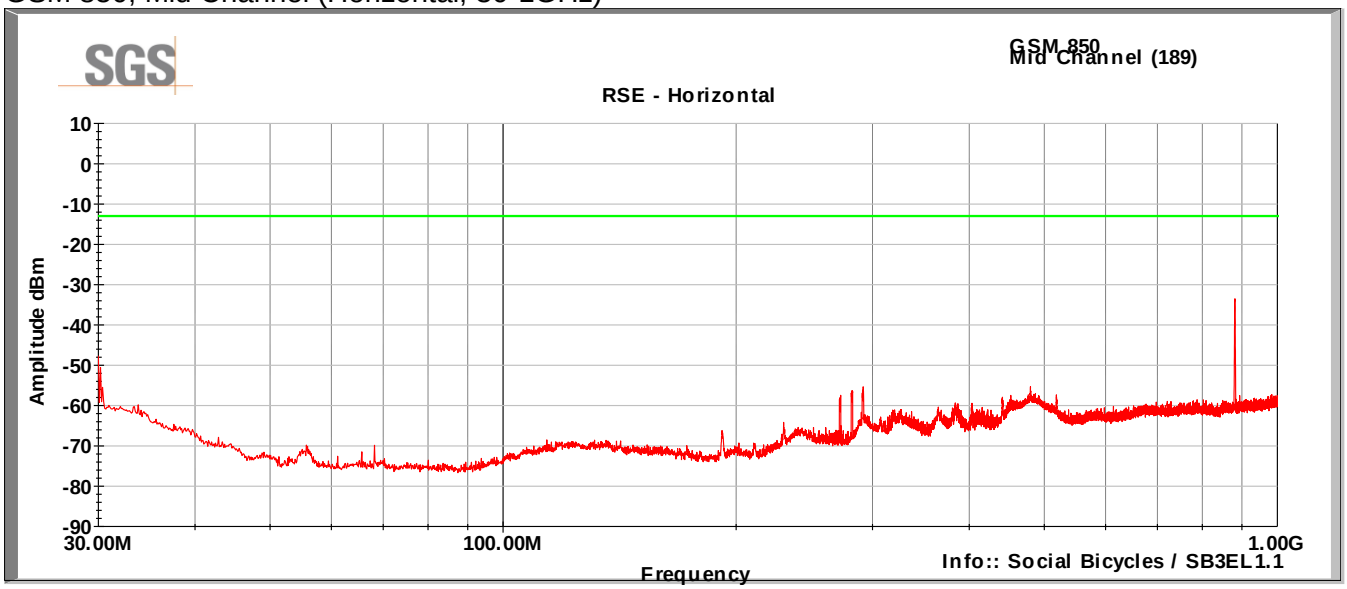

GSM 850, Low Channel (Horizontal, 2-18GHz)



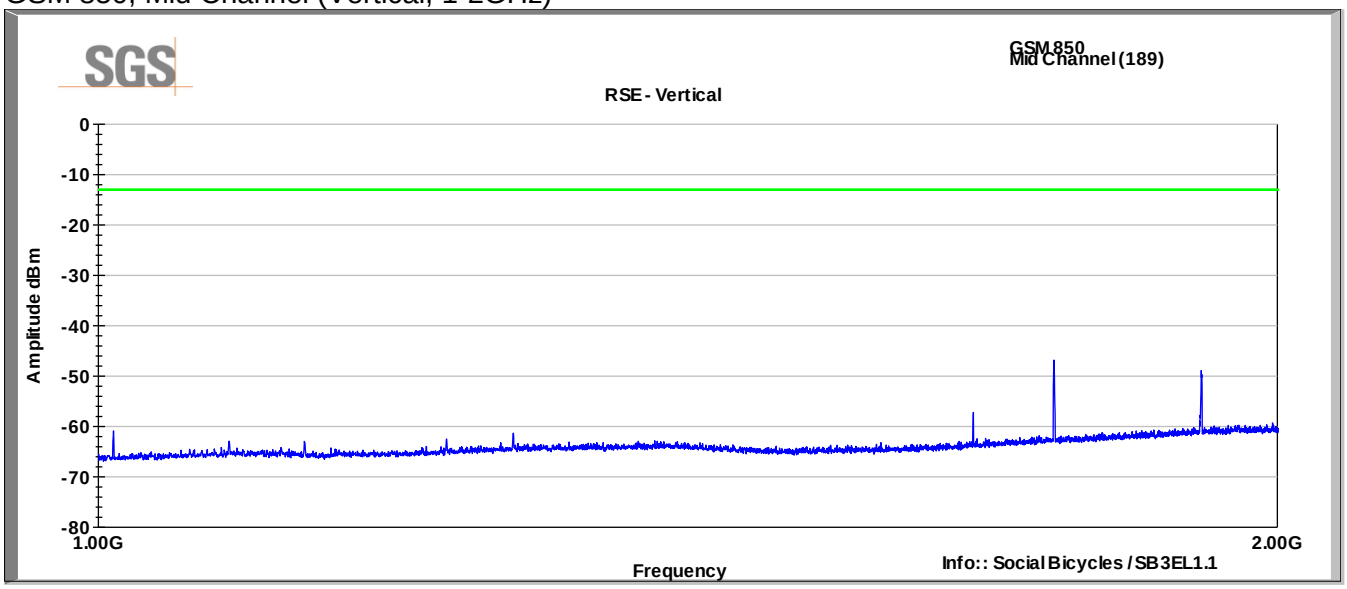
GSM 850, Mid Channel (Vertical, 30-1GHz)



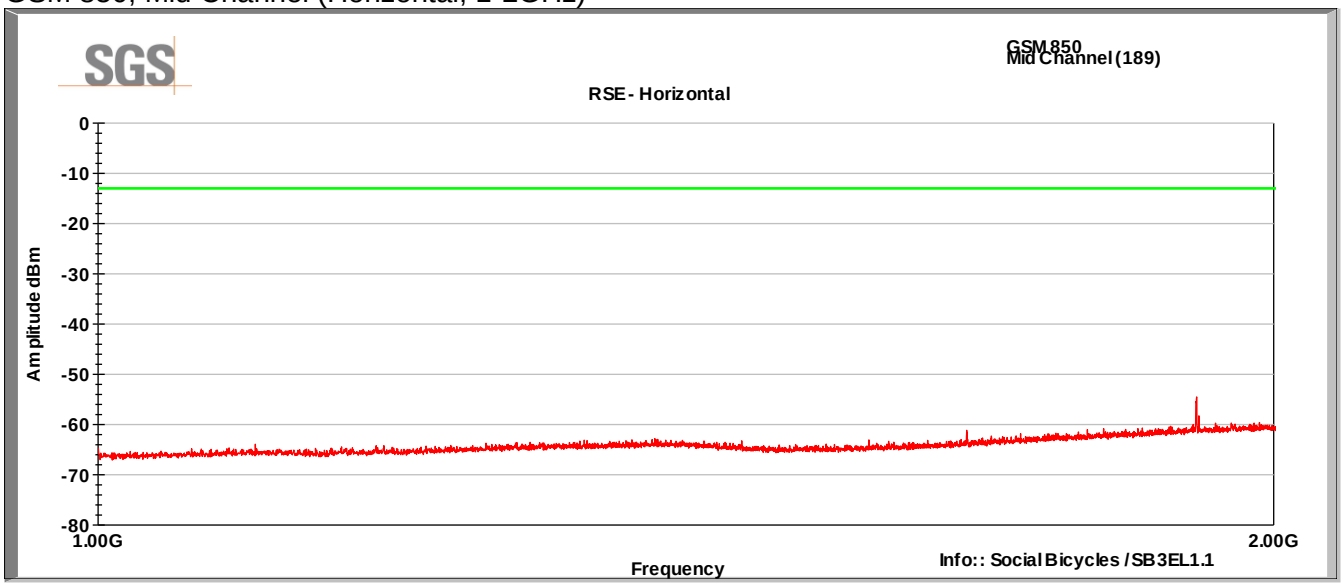

GSM 850, Mid Channel (Horizontal, 30-1GHz)



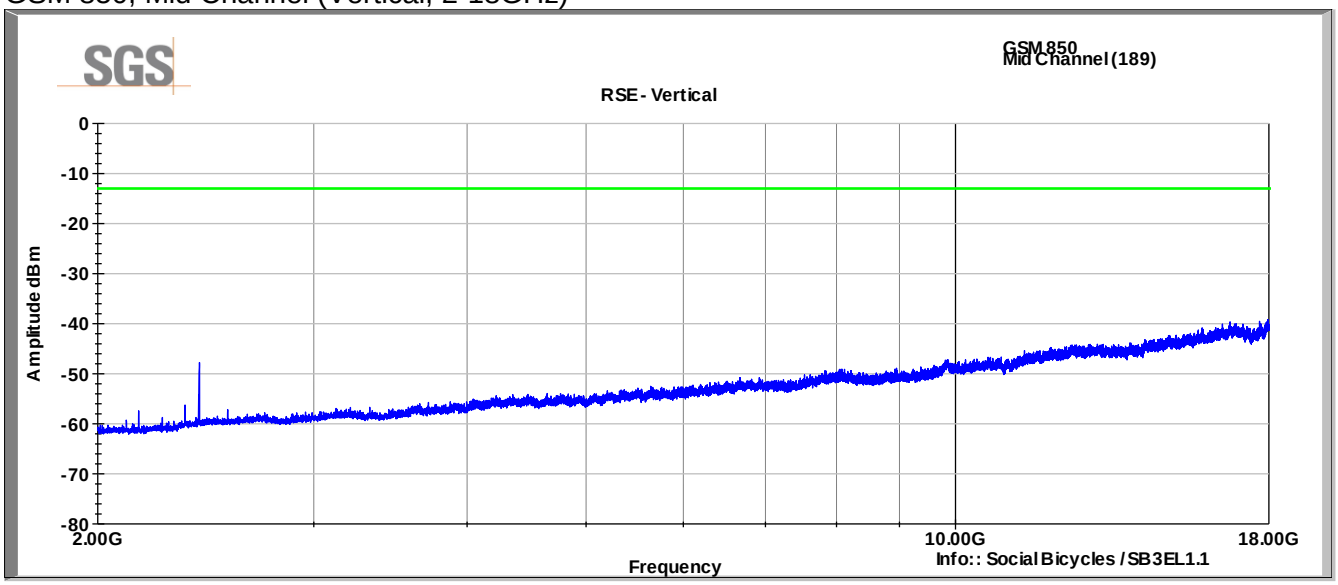
GSM 850, Mid Channel (Vertical, 1-2GHz)



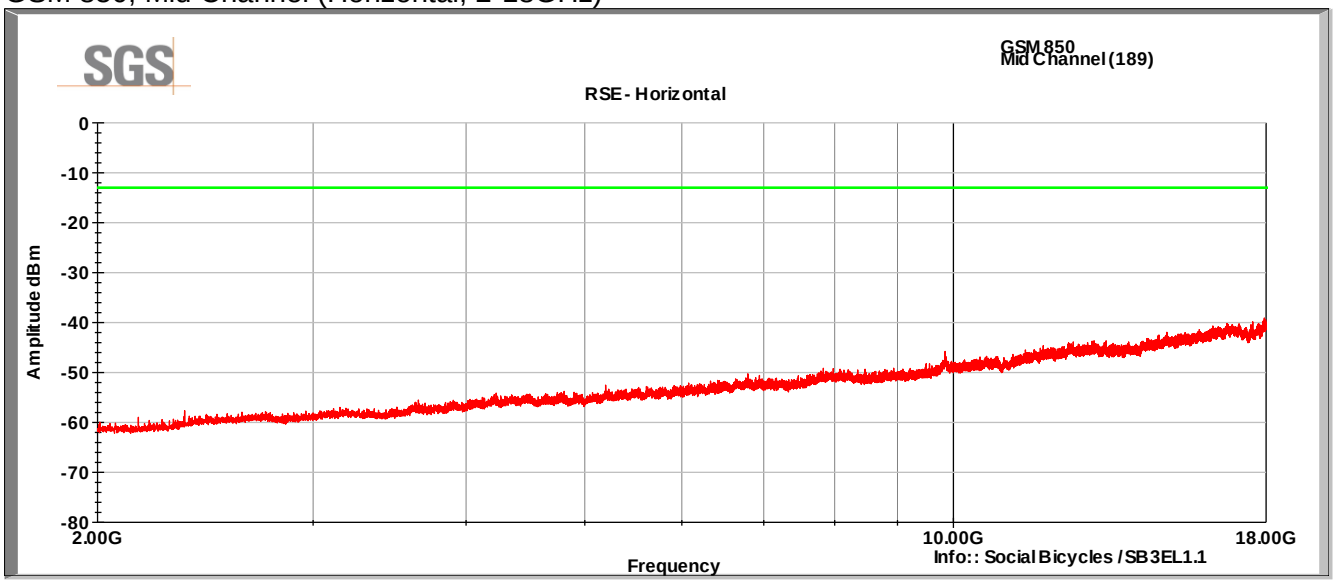

GSM 850, Mid Channel (Horizontal, 1-2GHz)



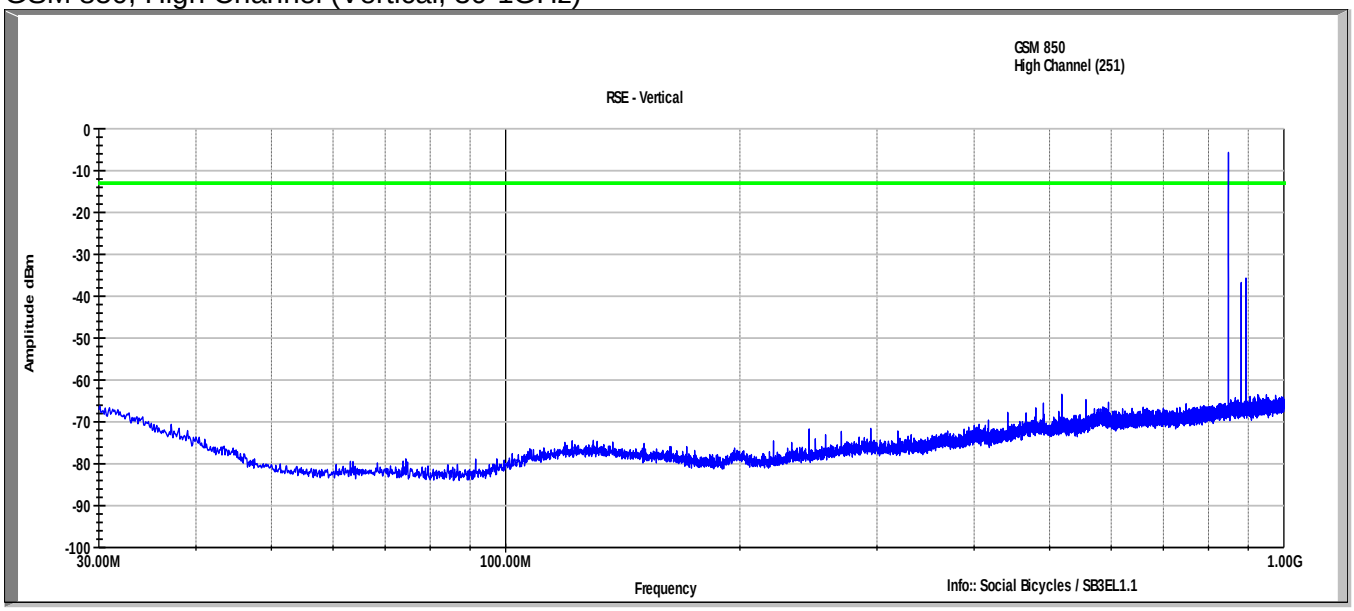
GSM 850, Mid Channel (Vertical, 2-18GHz)



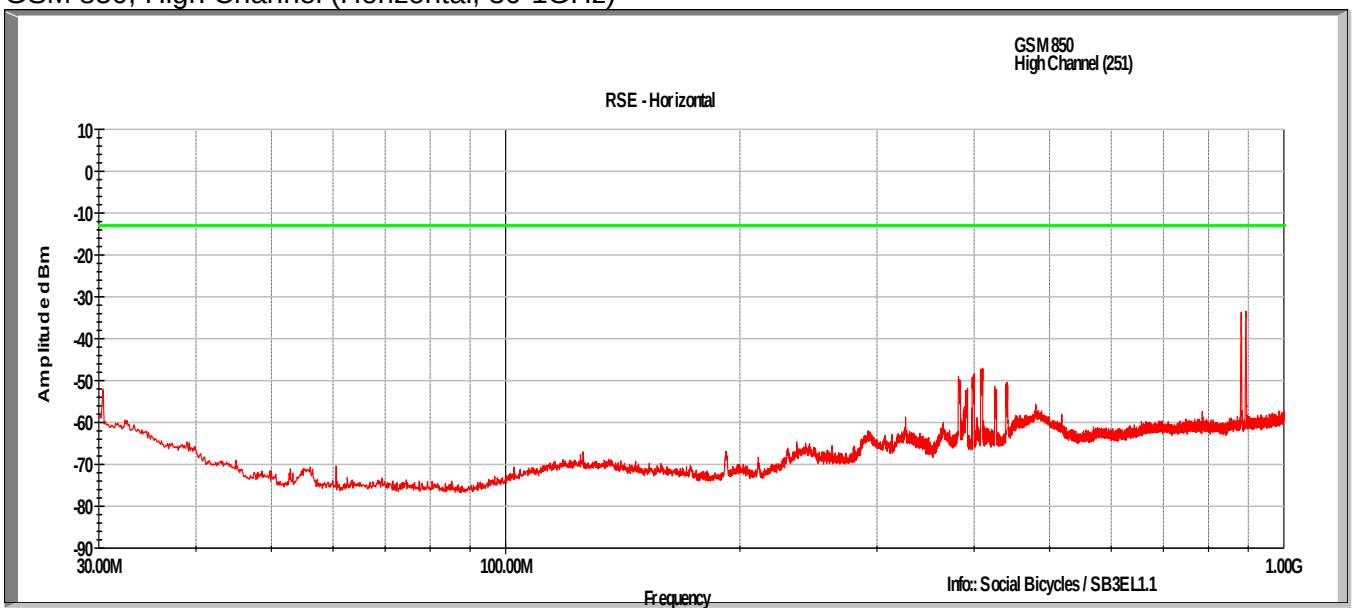

GSM 850, Mid Channel (Horizontal, 2-18GHz)



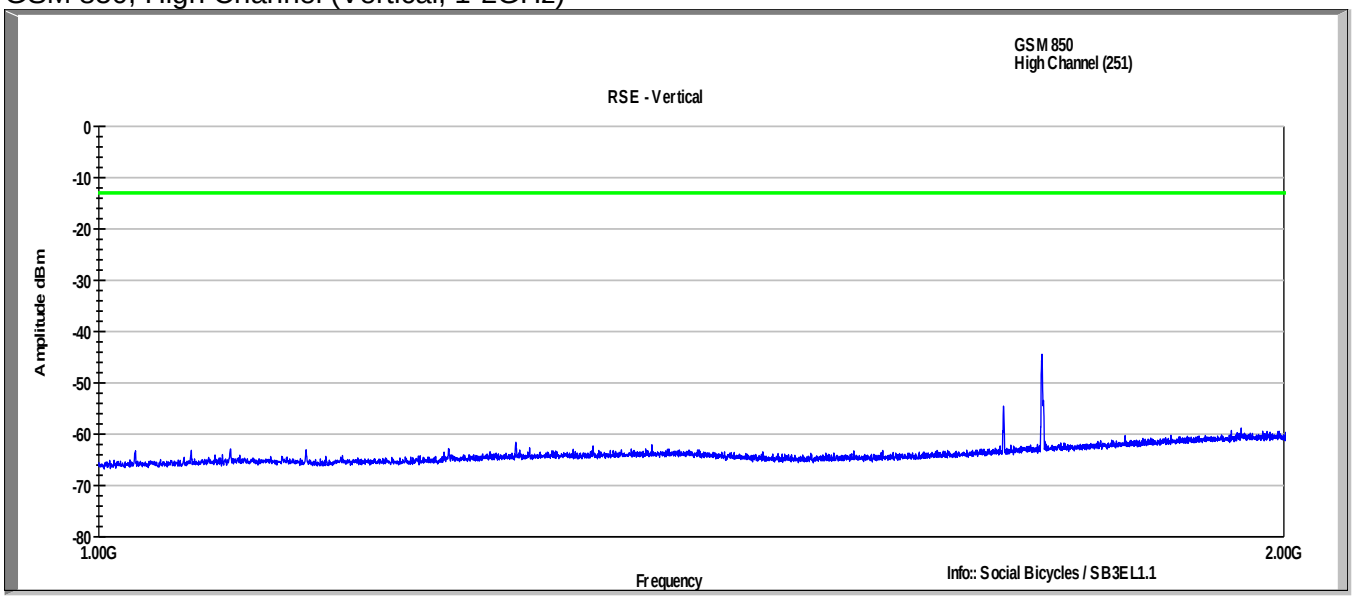
GSM 850, High Channel (Vertical, 30-1GHz)



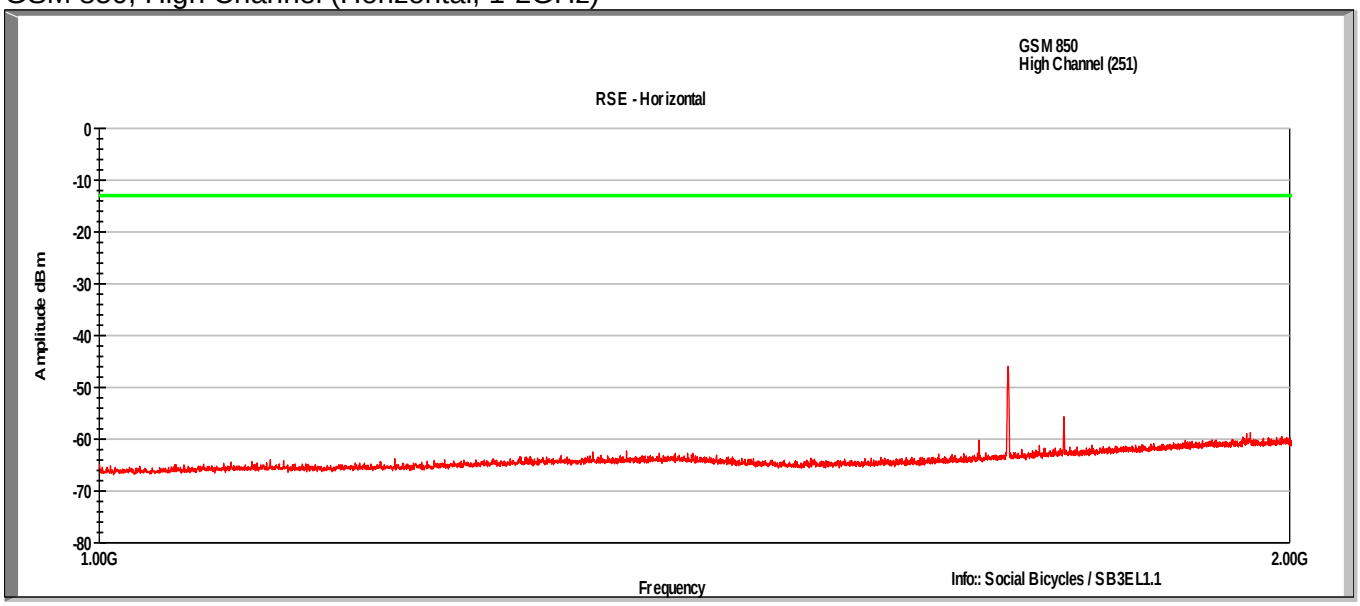

GSM 850, High Channel (Horizontal, 30-1GHz)



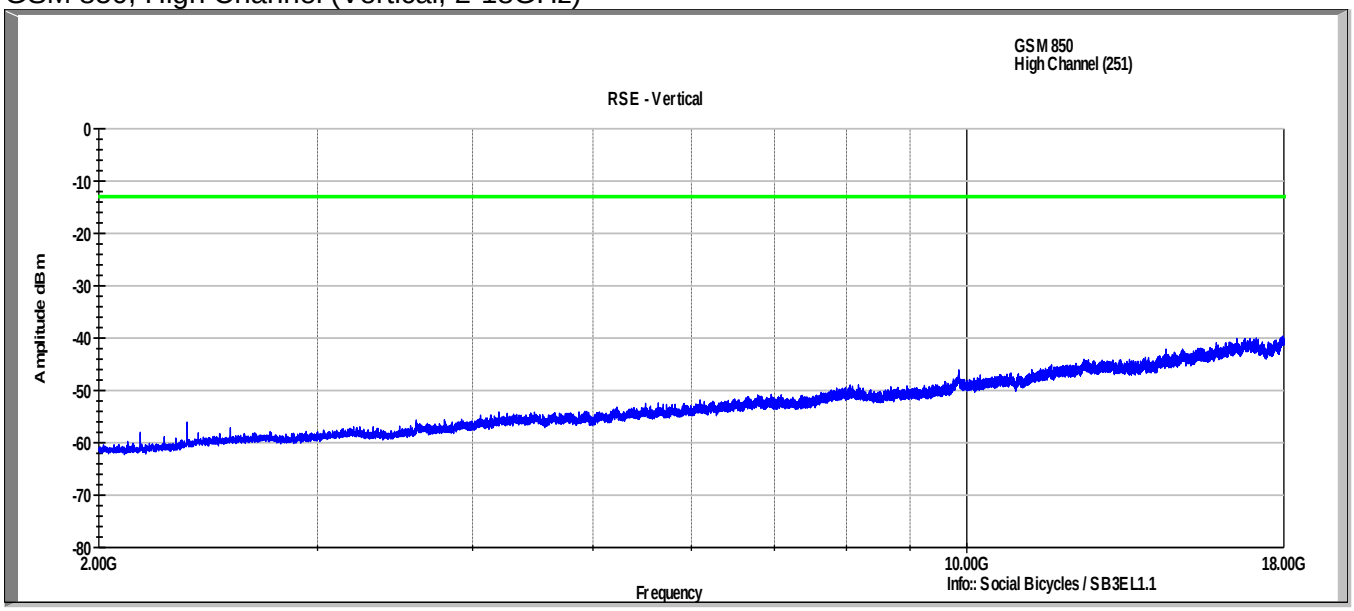
GSM 850, High Channel (Vertical, 1-2GHz)



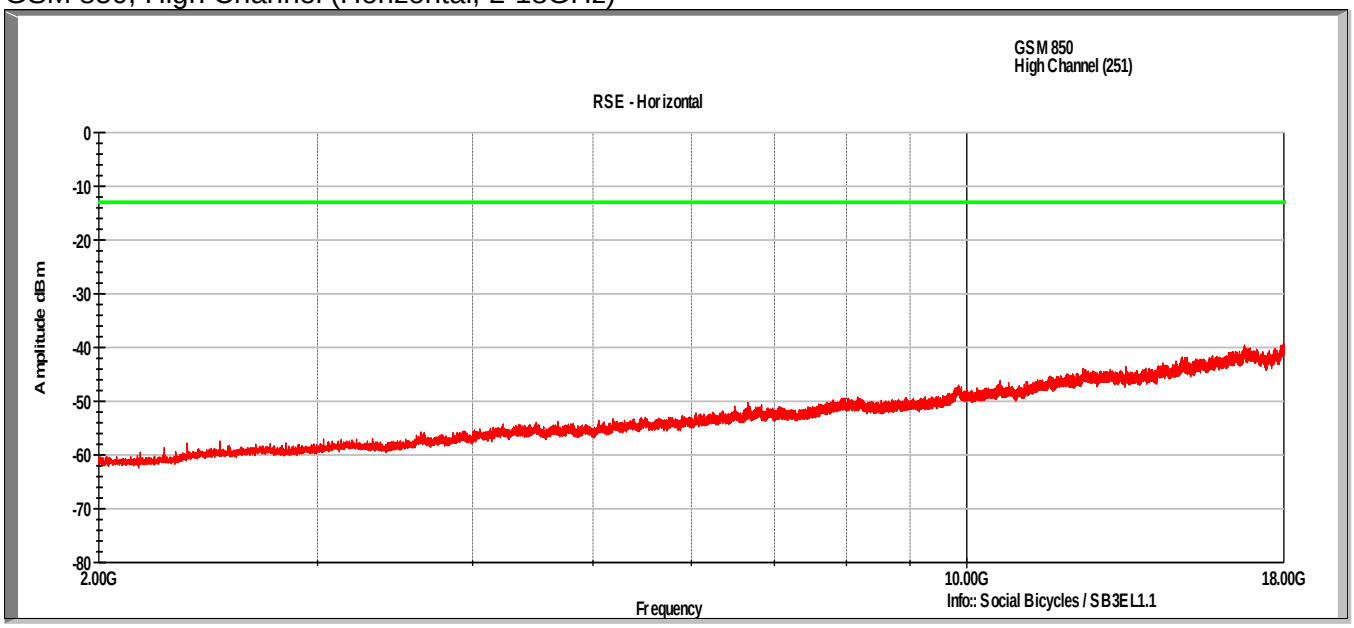

GSM 850, High Channel (Horizontal, 1-2GHz)



GSM 850, High Channel (Vertical, 2-18GHz)

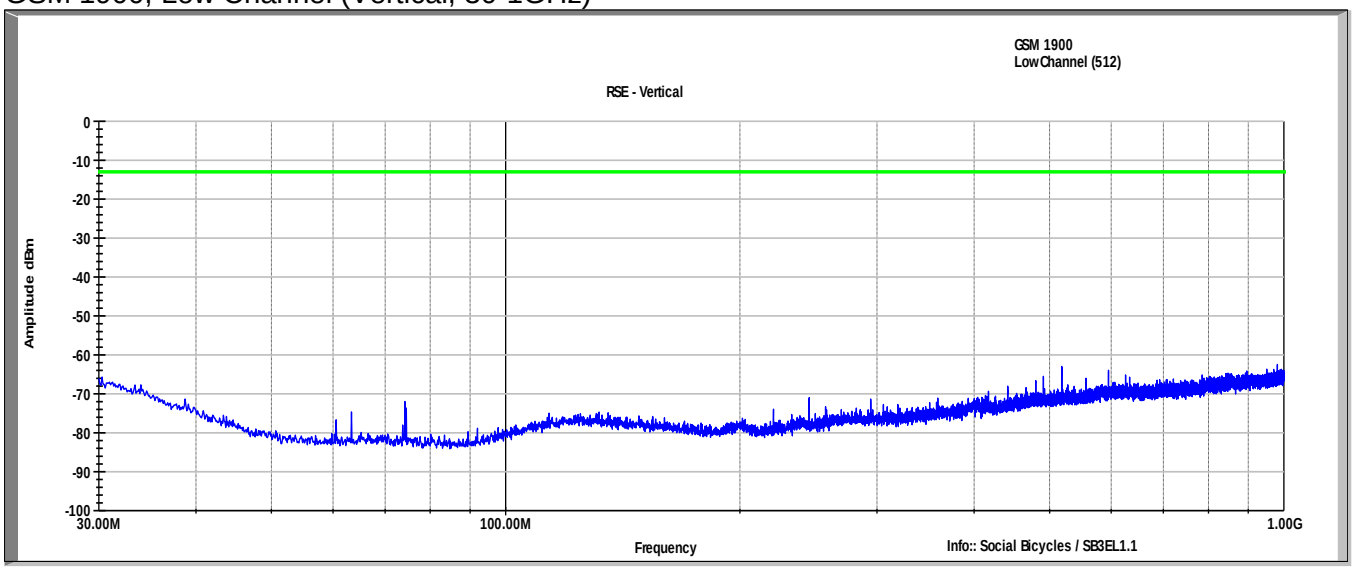



GSM 850, High Channel (Horizontal, 2-18GHz)

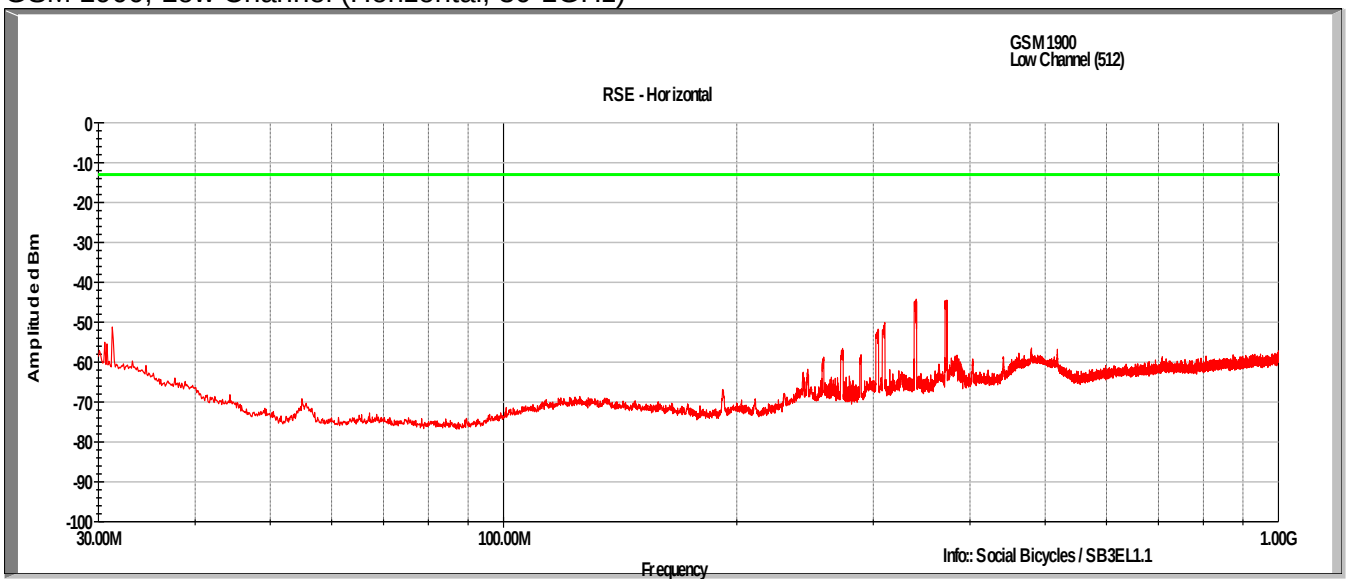


## *8.7 Test Data – GSM 1900*

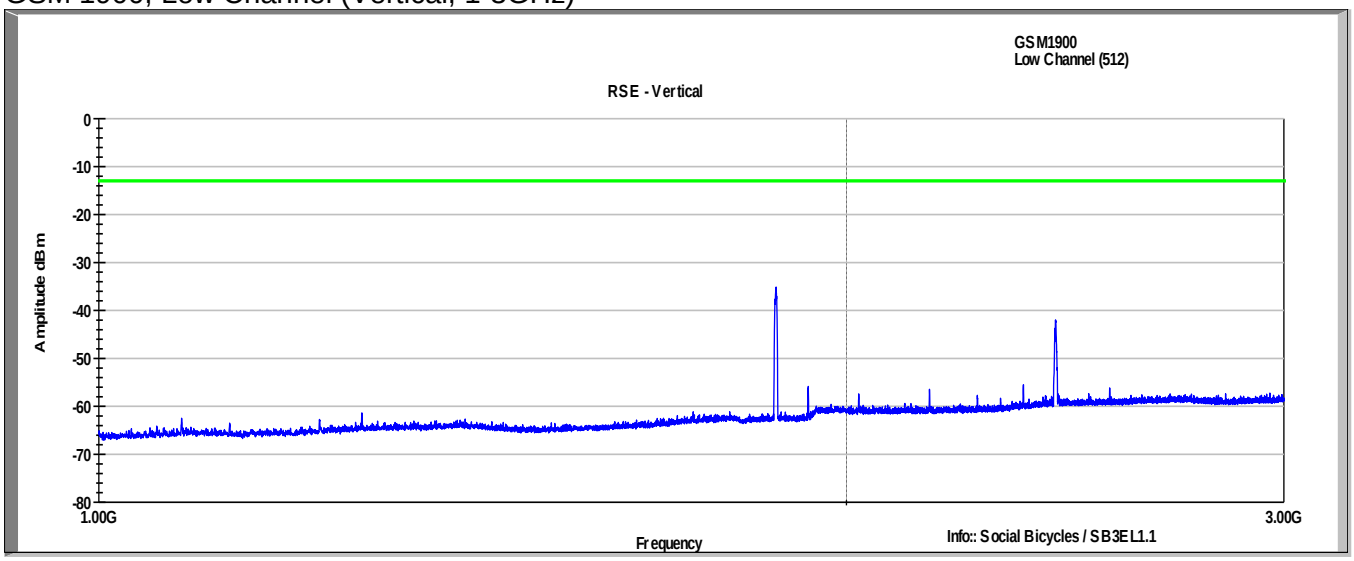
GSM 1900, Low Channel (Vertical, 30-1GHz)



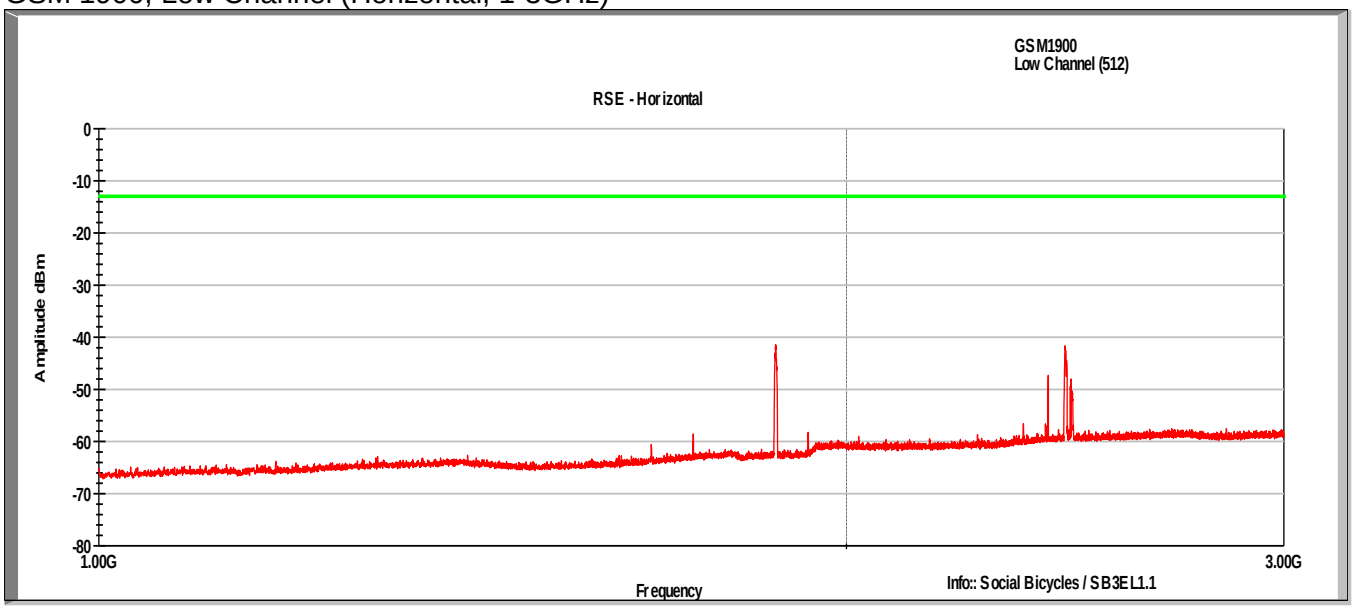

GSM 1900, Low Channel (Horizontal, 30-1GHz)



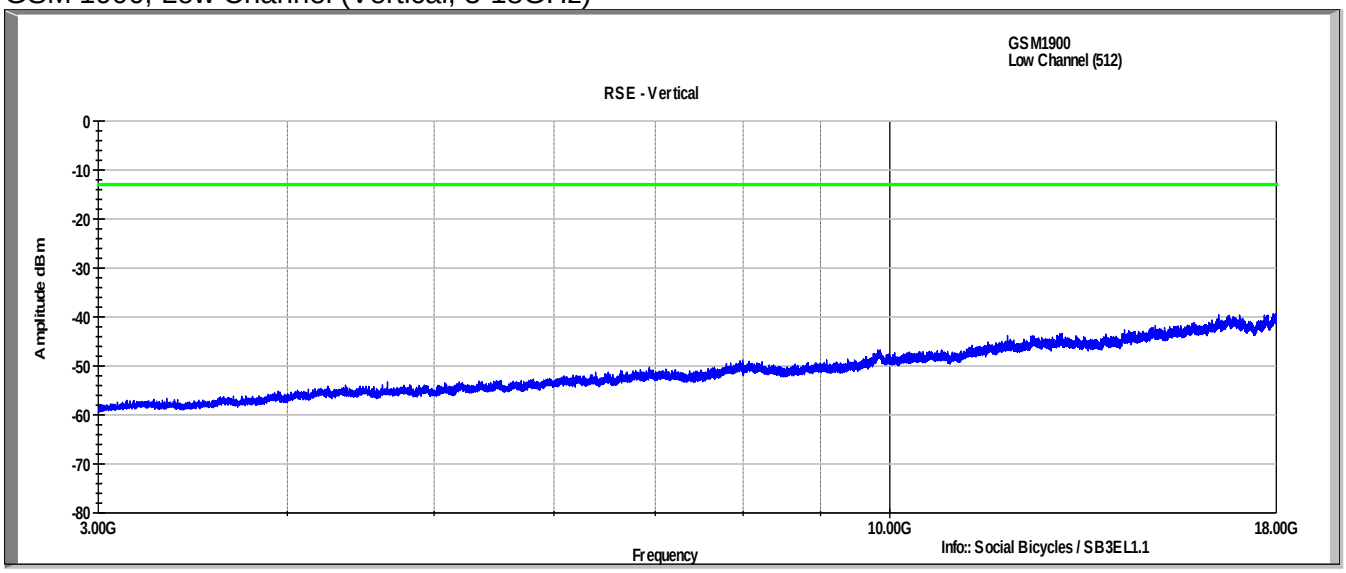
GSM 1900, Low Channel (Vertical, 1-3GHz)



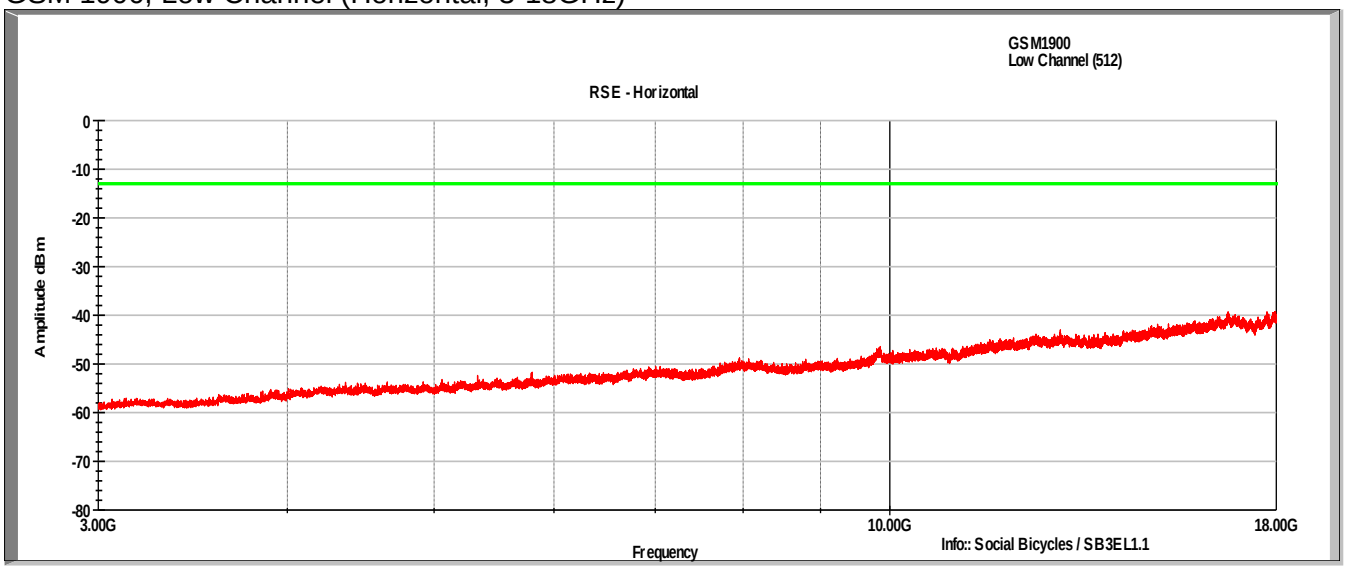

GSM 1900, Low Channel (Horizontal, 1-3GHz)



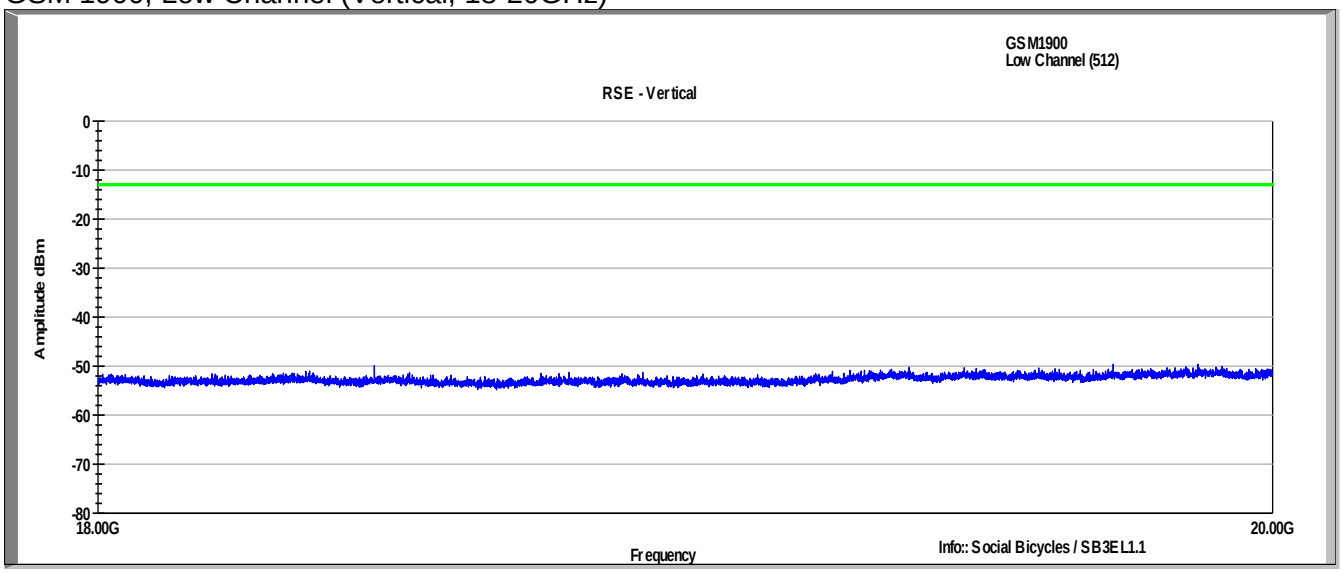
GSM 1900, Low Channel (Vertical, 3-18GHz)



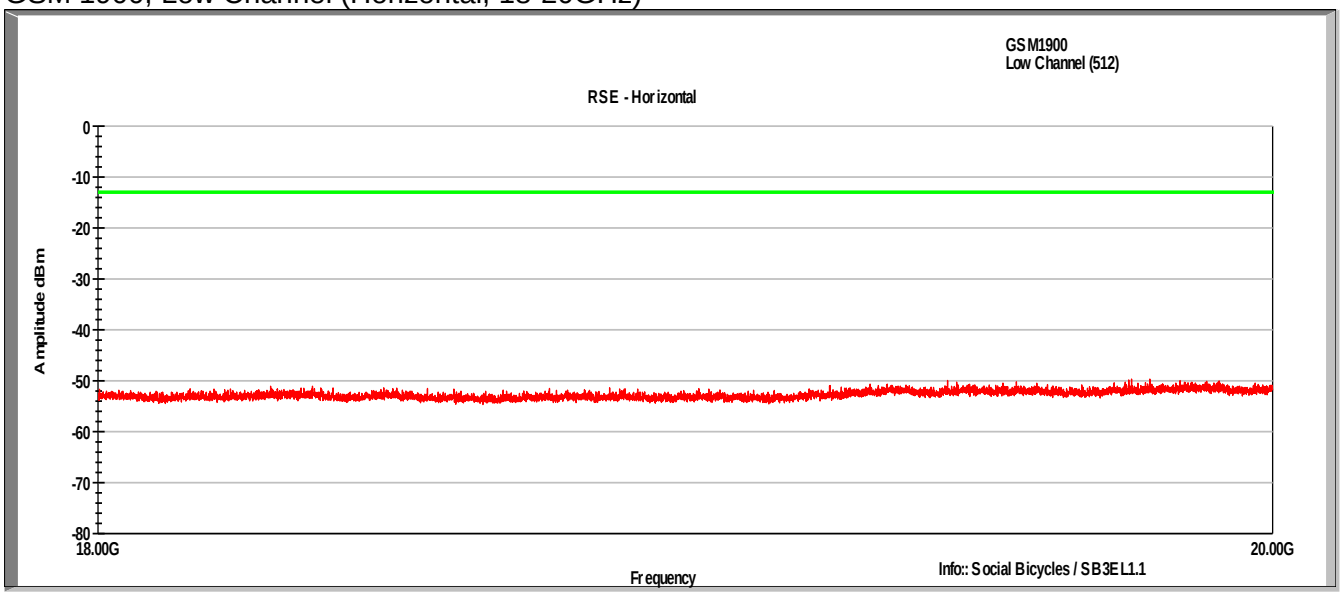

GSM 1900, Low Channel (Horizontal, 3-18GHz)



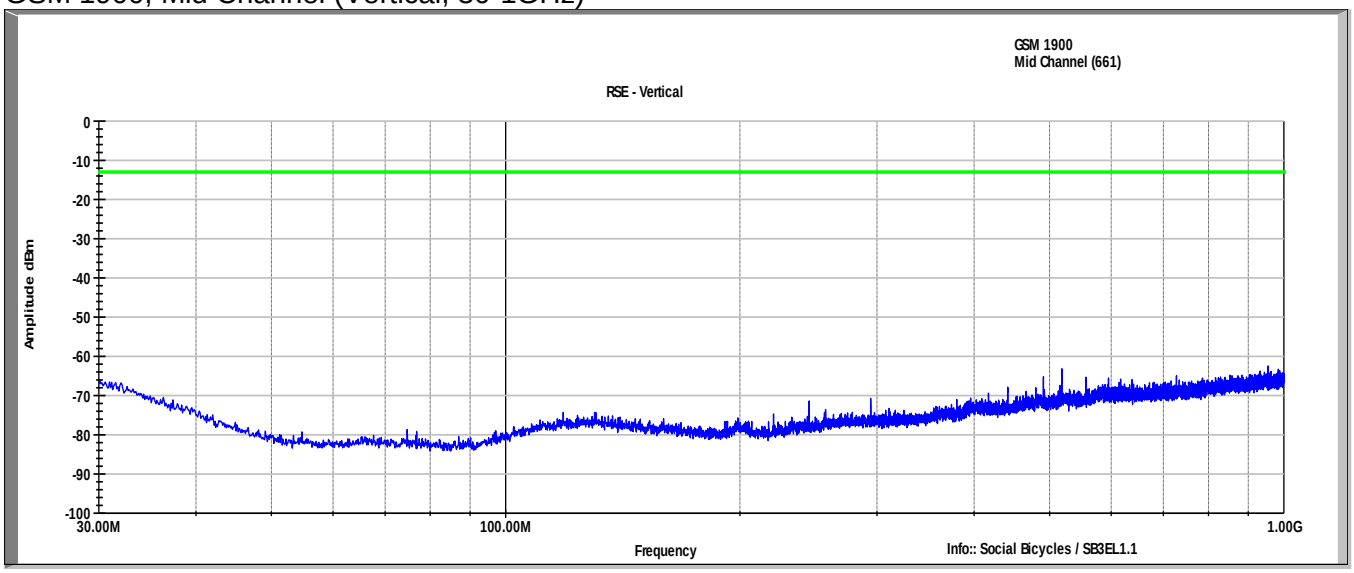
GSM 1900, Low Channel (Vertical, 18-20GHz)



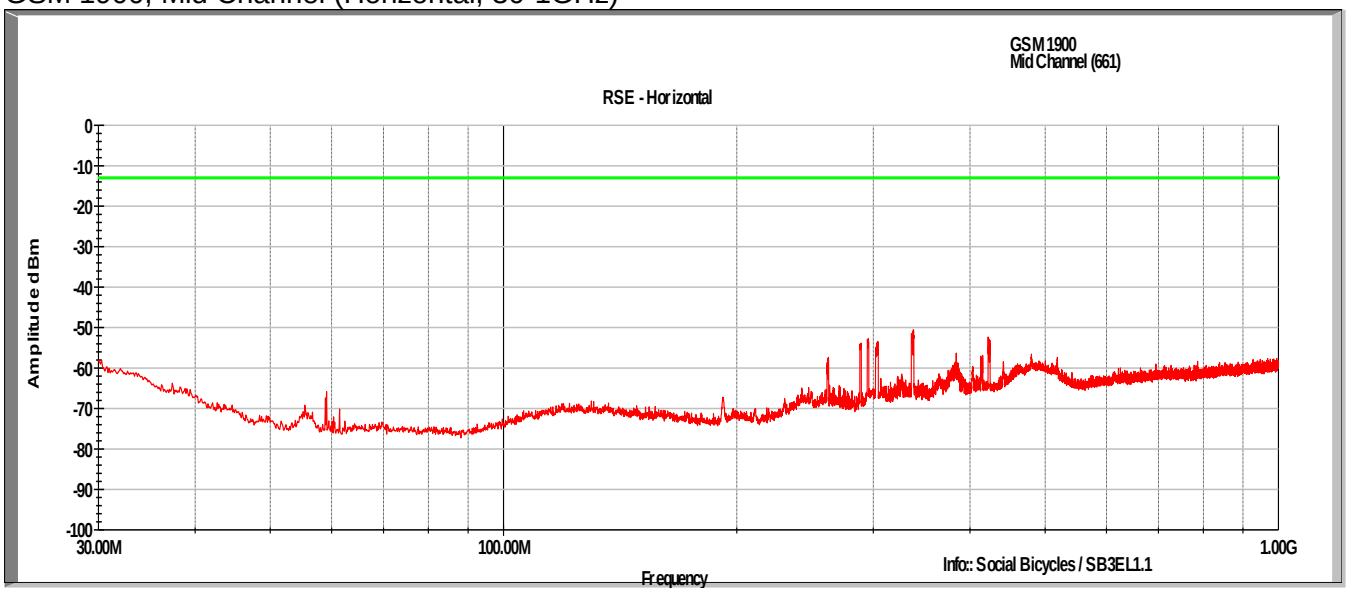

GSM 1900, Low Channel (Horizontal, 18-20GHz)



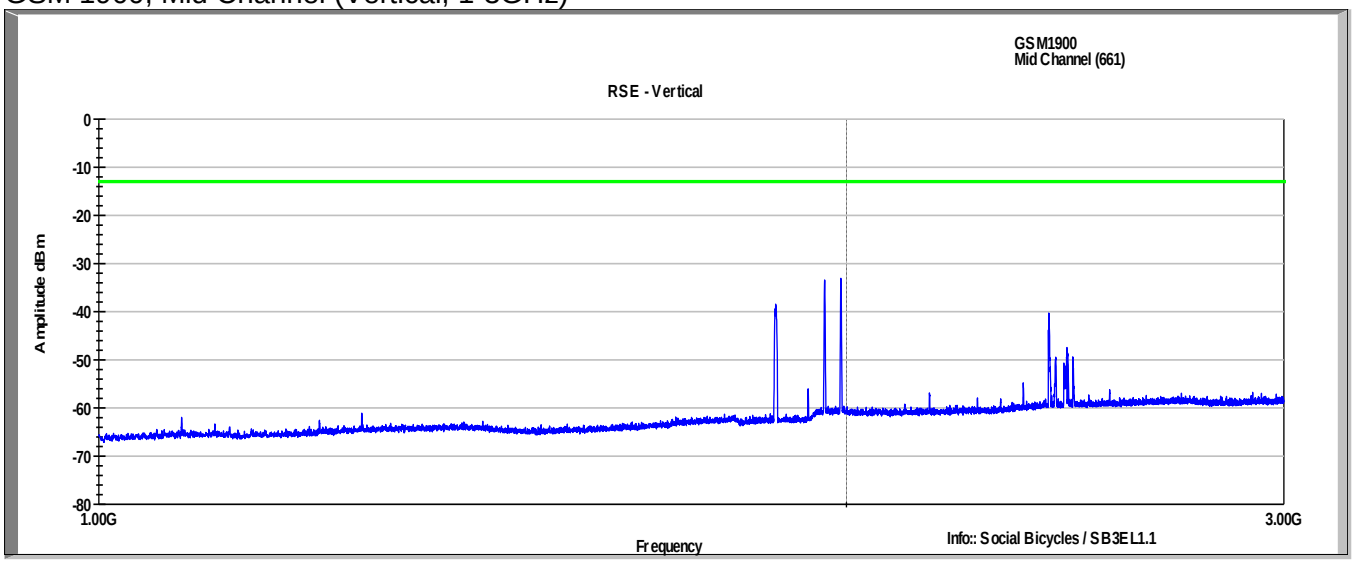
GSM 1900, Mid Channel (Vertical, 30-1GHz)



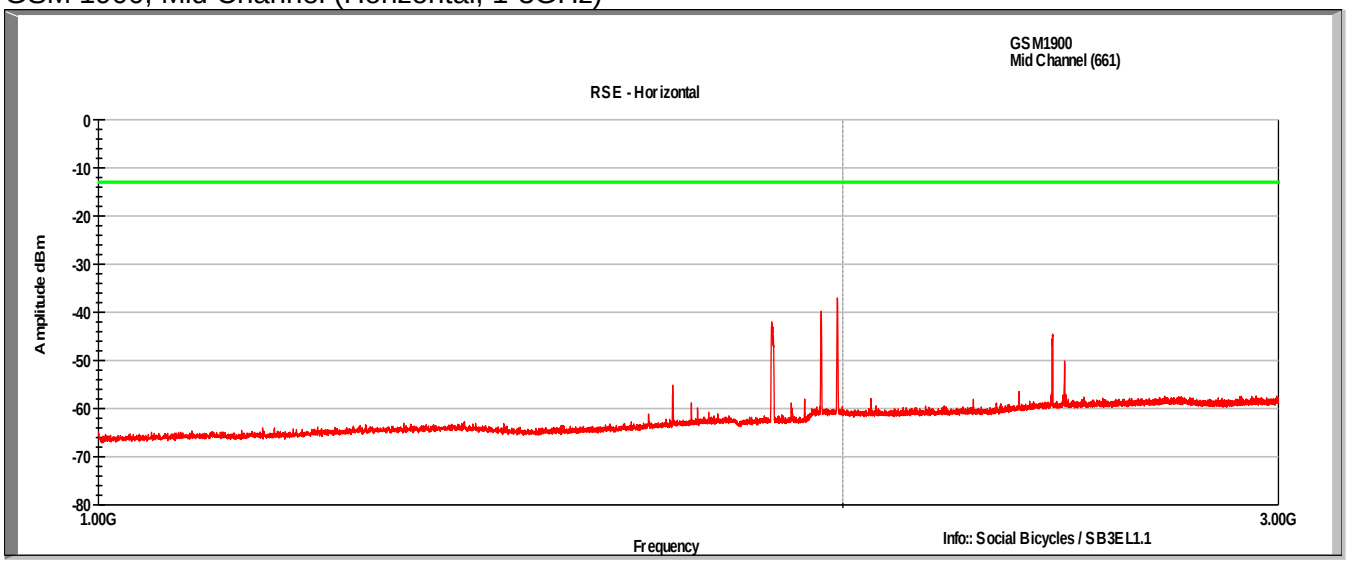

GSM 1900, Mid Channel (Horizontal, 30-1GHz)



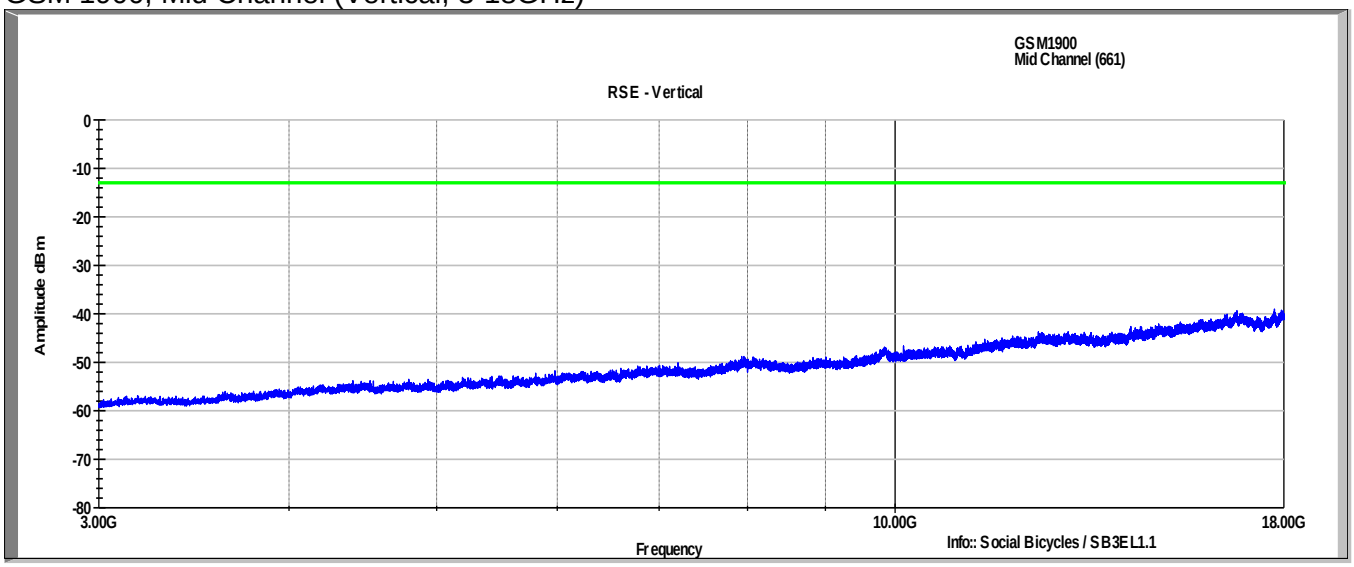
GSM 1900, Mid Channel (Vertical, 1-3GHz)



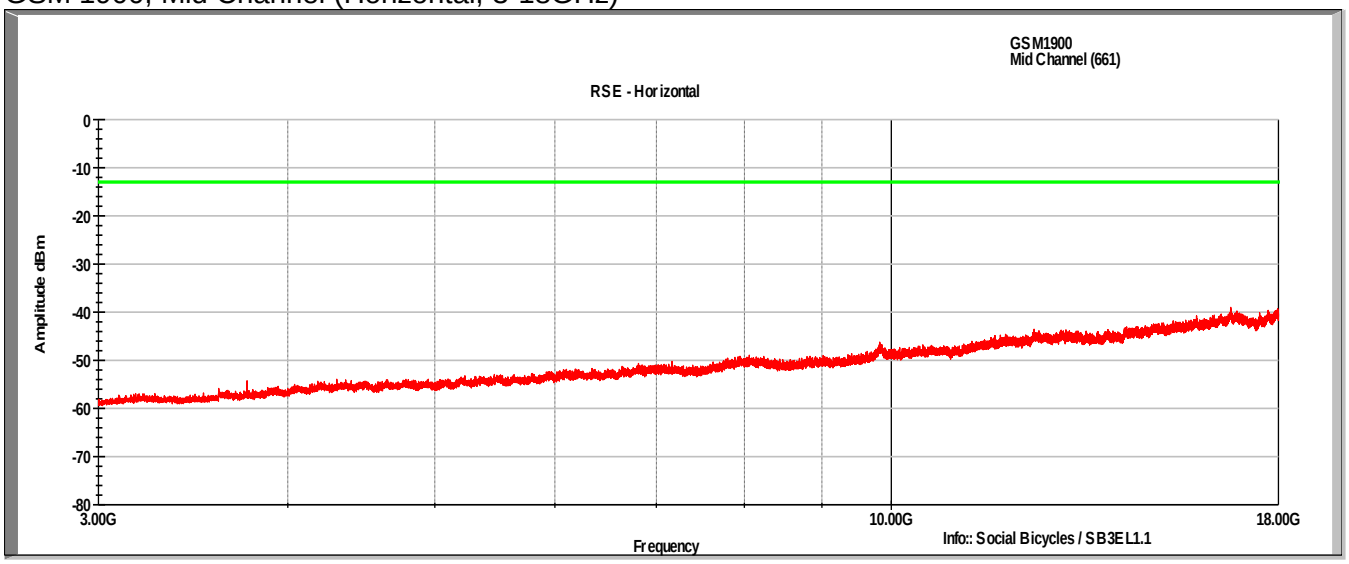

GSM 1900, Mid Channel (Horizontal, 1-3GHz)



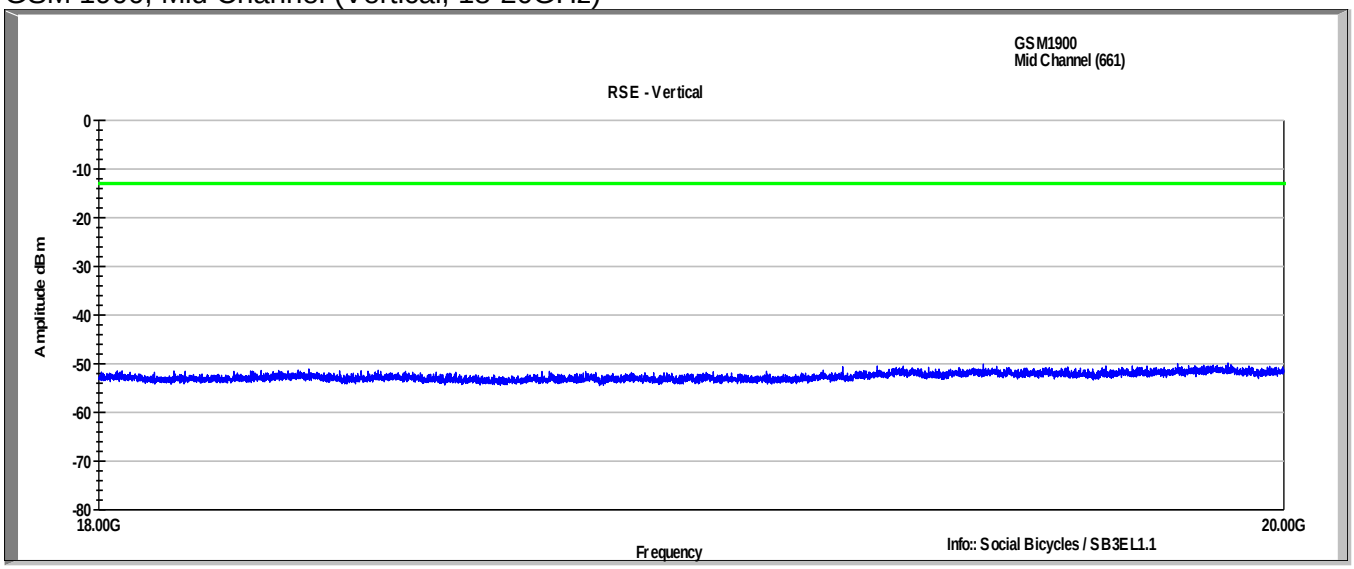
GSM 1900, Mid Channel (Vertical, 3-18GHz)



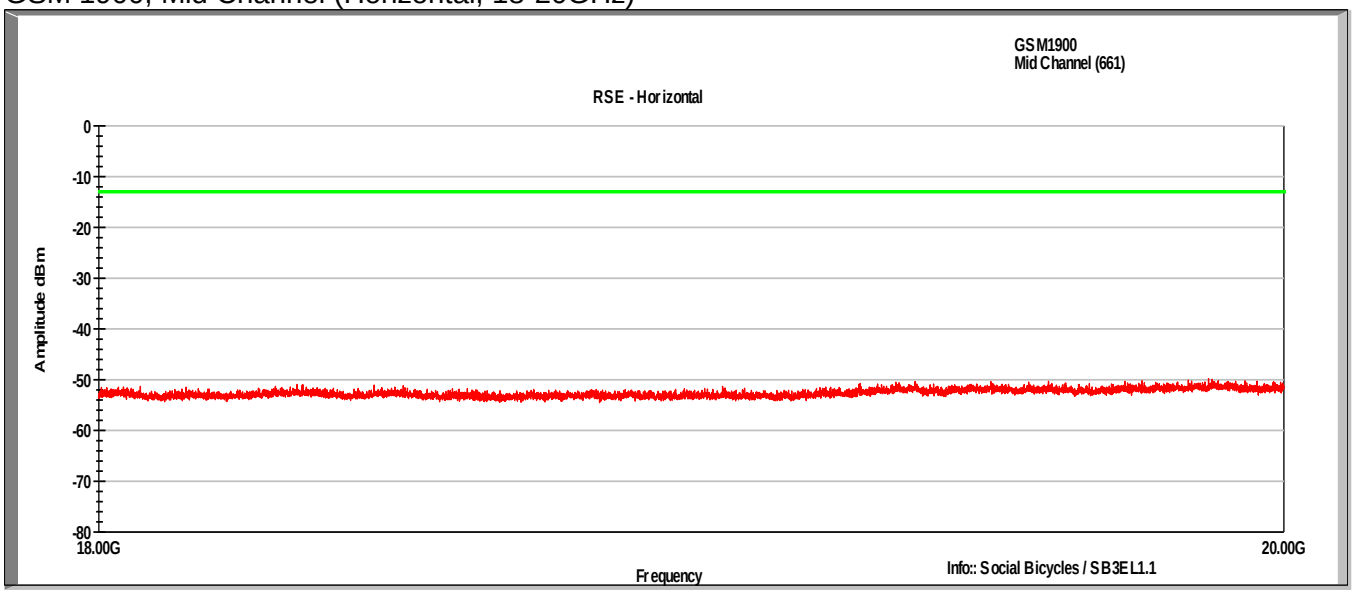

GSM 1900, Mid Channel (Horizontal, 3-18GHz)



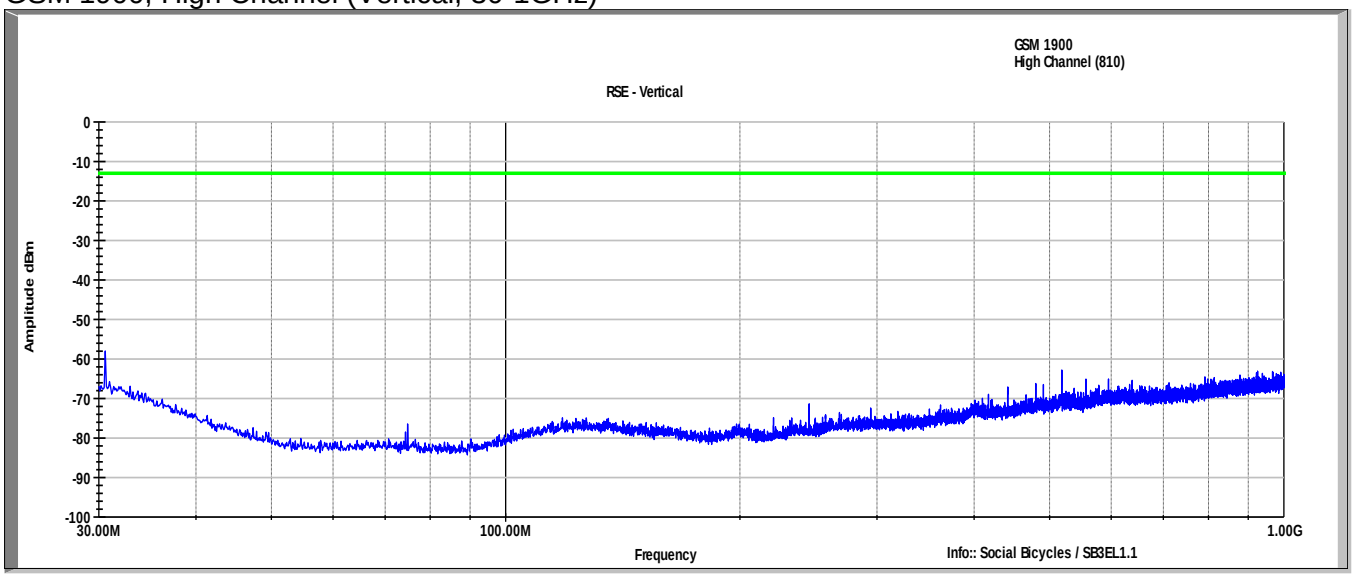
GSM 1900, Mid Channel (Vertical, 18-20GHz)



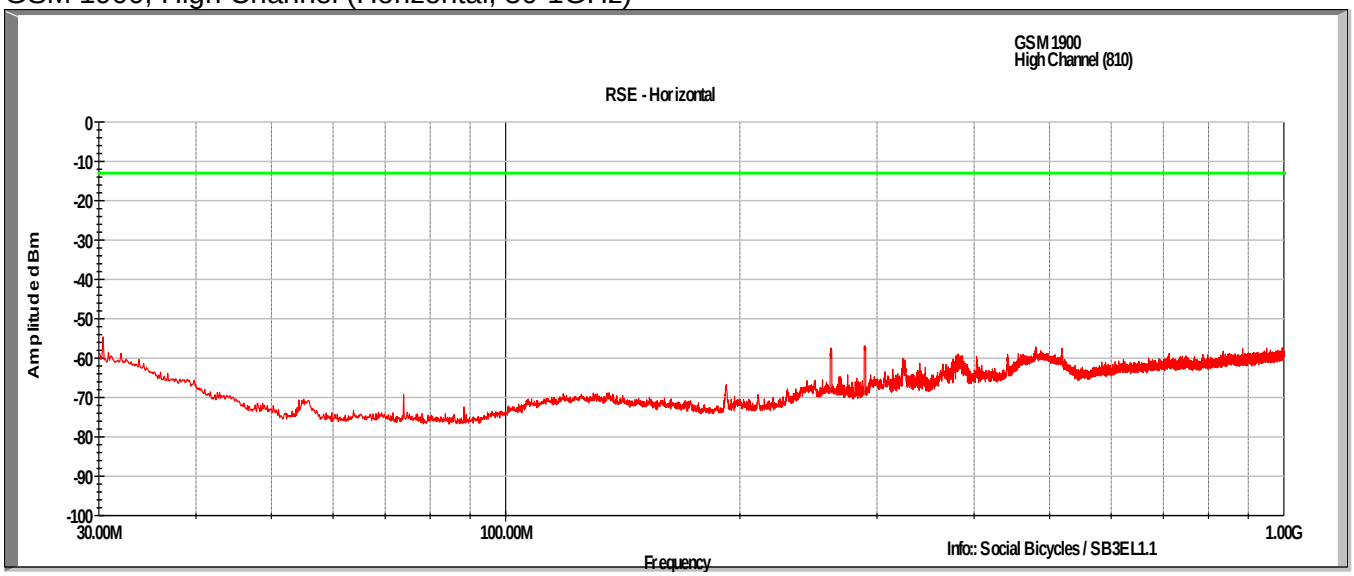

GSM 1900, Mid Channel (Horizontal, 18-20GHz)



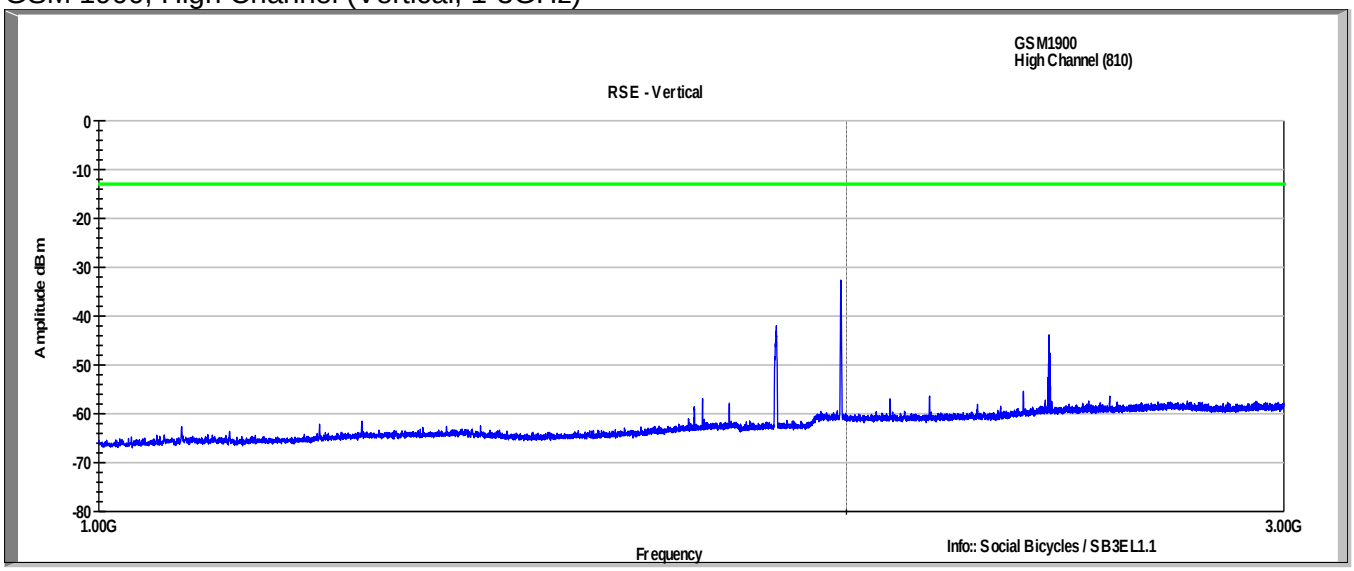
GSM 1900, High Channel (Vertical, 30-1GHz)



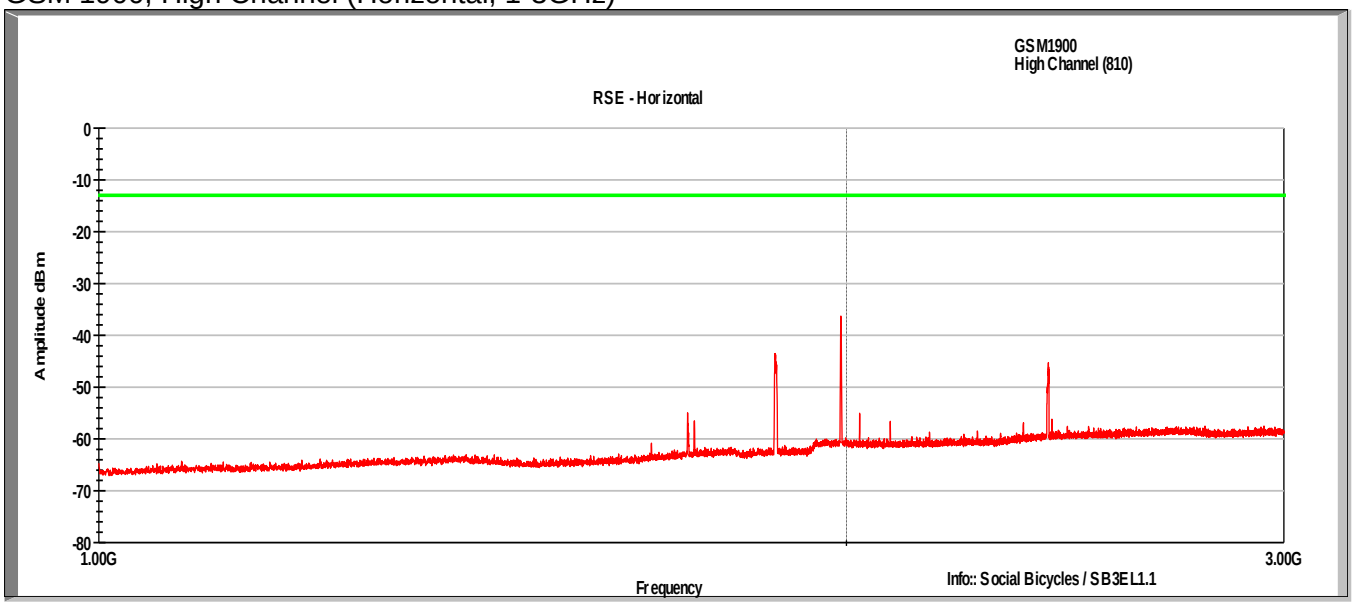

GSM 1900, High Channel (Horizontal, 30-1GHz)



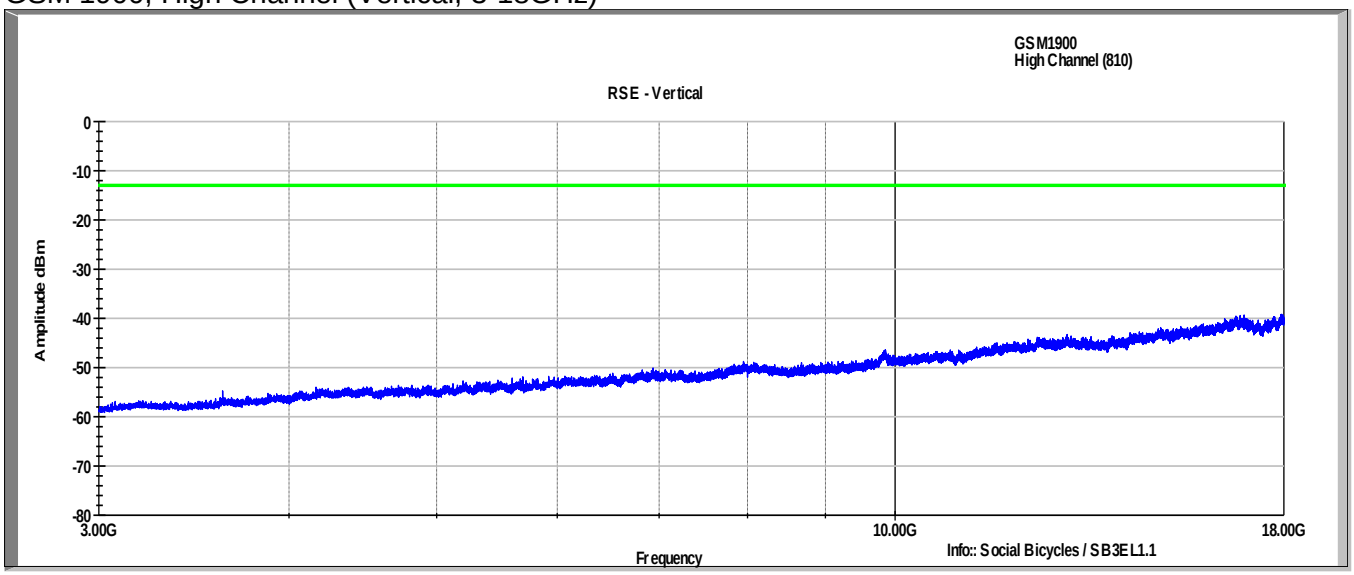
GSM 1900, High Channel (Vertical, 1-3GHz)



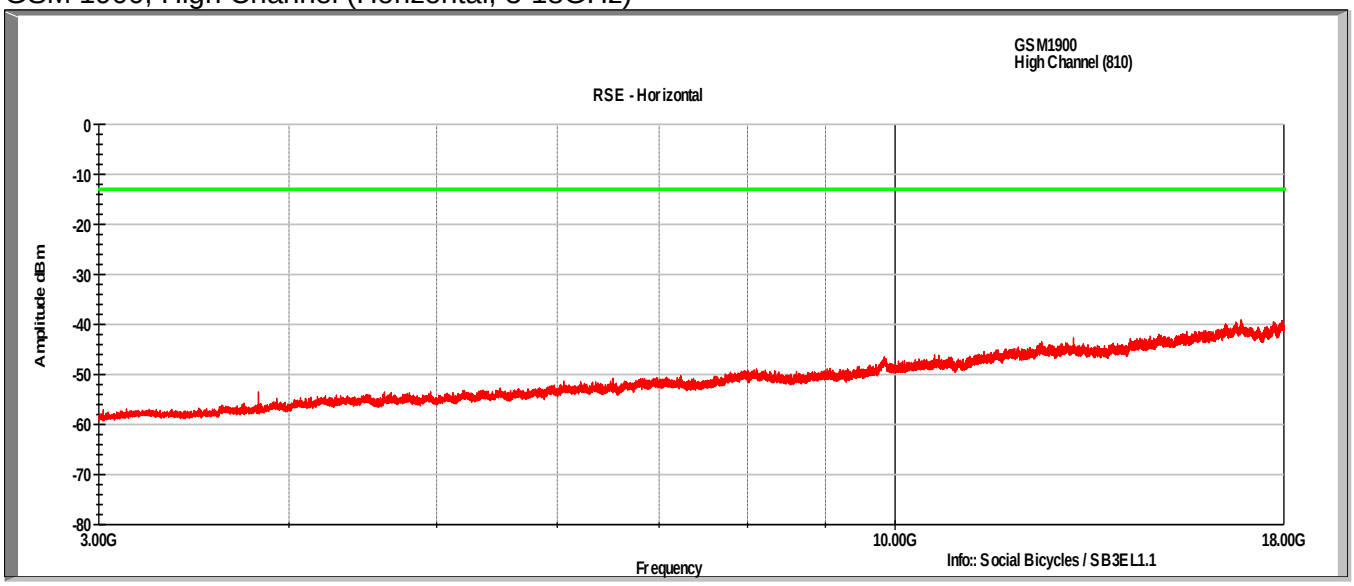

GSM 1900, High Channel (Horizontal, 1-3GHz)



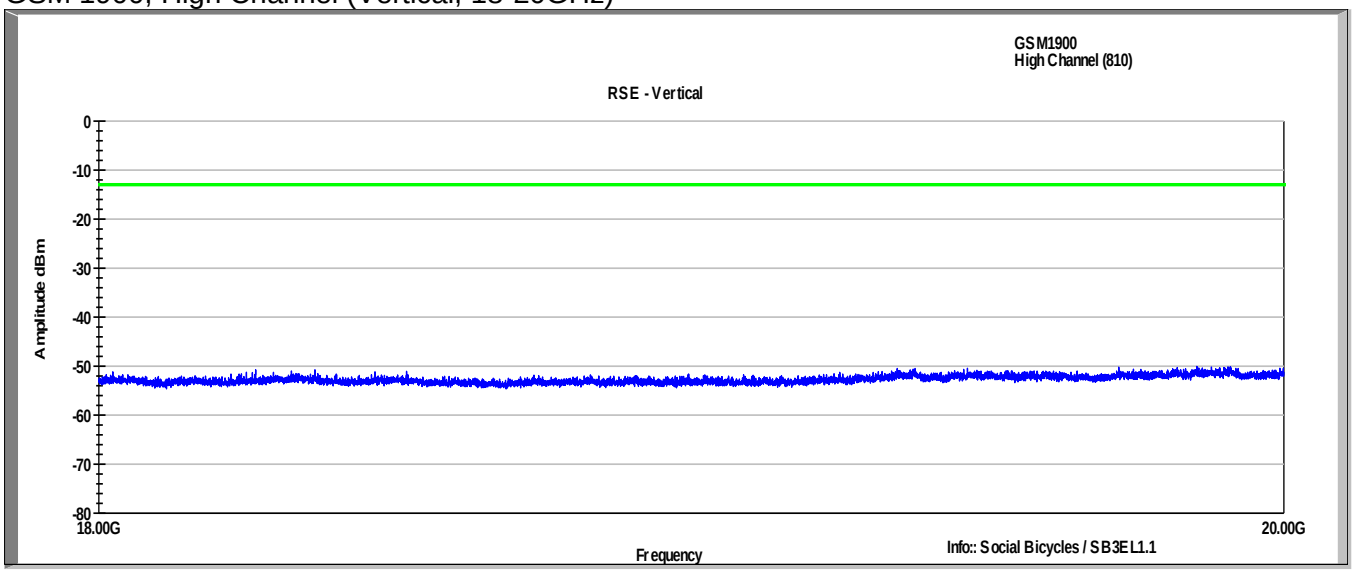
GSM 1900, High Channel (Vertical, 3-18GHz)



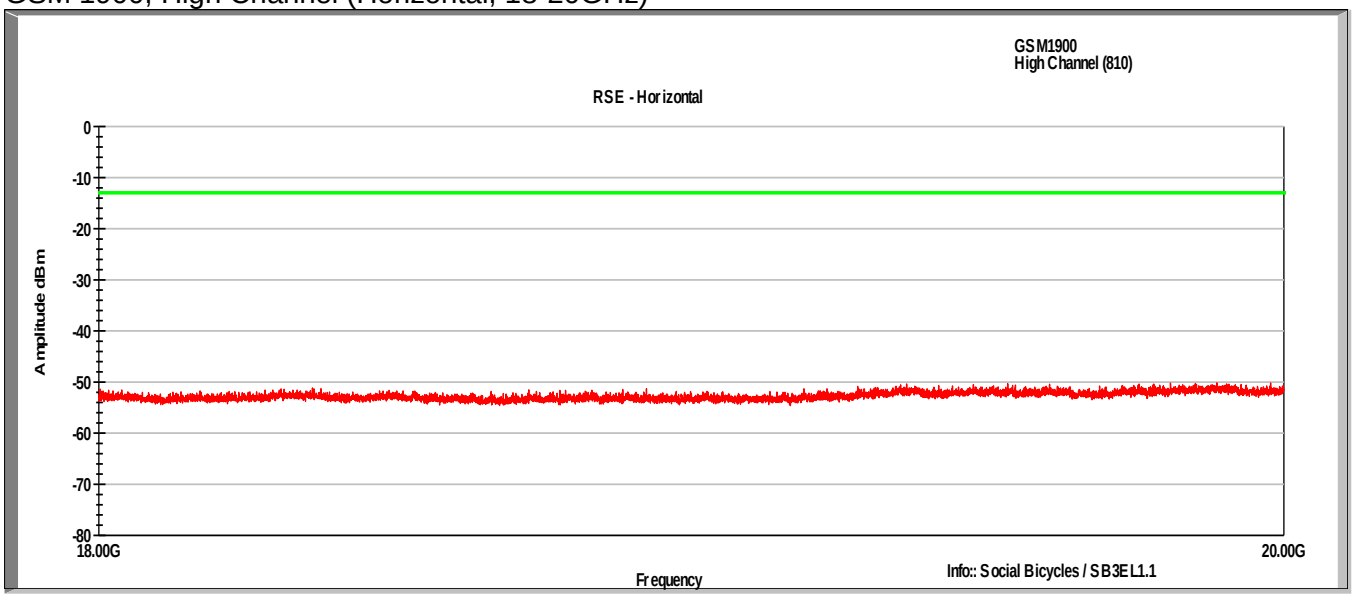

GSM 1900, High Channel (Horizontal, 3-18GHz)



GSM 1900, High Channel (Vertical, 18-20GHz)




GSM 1900, High Channel (Horizontal, 18-20GHz)



# 9 Frequency Stability

## 9.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| Frequency Stability | FCC Part 2.1055<br>FCC Part 22.917(a)<br>FCC Part 24.238(a)<br>RSS-GEN (6.11)<br>RSS-132 5.3<br>RSS-132 6.3 | Pass |

## 9.2 Test Method

The EUT was placed inside the Environmental Chamber and was left inside chamber to stabilize to set temperature for minimum of thirty minutes before any measurements were made. The EUT was tested at GSM 850 Channel 190 and GSM 1900 Channel 661.

## 9.3 Test Site

SGS EMC Laboratory, Suwanee, GA

## 9.4 Test Equipment

Test Date: 23-Dec-2016 Tester: MT

| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| ENVIRONMENTAL TEST CHAMBER | T2RC | TENNEY ENVIRONMENTAL | B094877 | CNR |
| HANDHELD MULTIMETER | 87V | FLUKE | B079677 | 29-Jul-2017 |
| WIDEBAND RADIO COMMUNICATION TESTER | CMW500 | ROHDE & SCHWARZ | B094874 | 19-Jan-2018 |
| ATTENUATOR, 10DB | 10DB | ROHDE & SCHWARZ | B095594 | 27-Jul-2017 |
| RF CABLE | 141 | HUBER & SUHNER | B095590 | 26-Jul-2017 |

- Unless otherwise noted, equipment is on a 1 year calibration cycle.
- Based on manufacturer's specifications, the CMW-500 is on a 2 year calibration cycle.

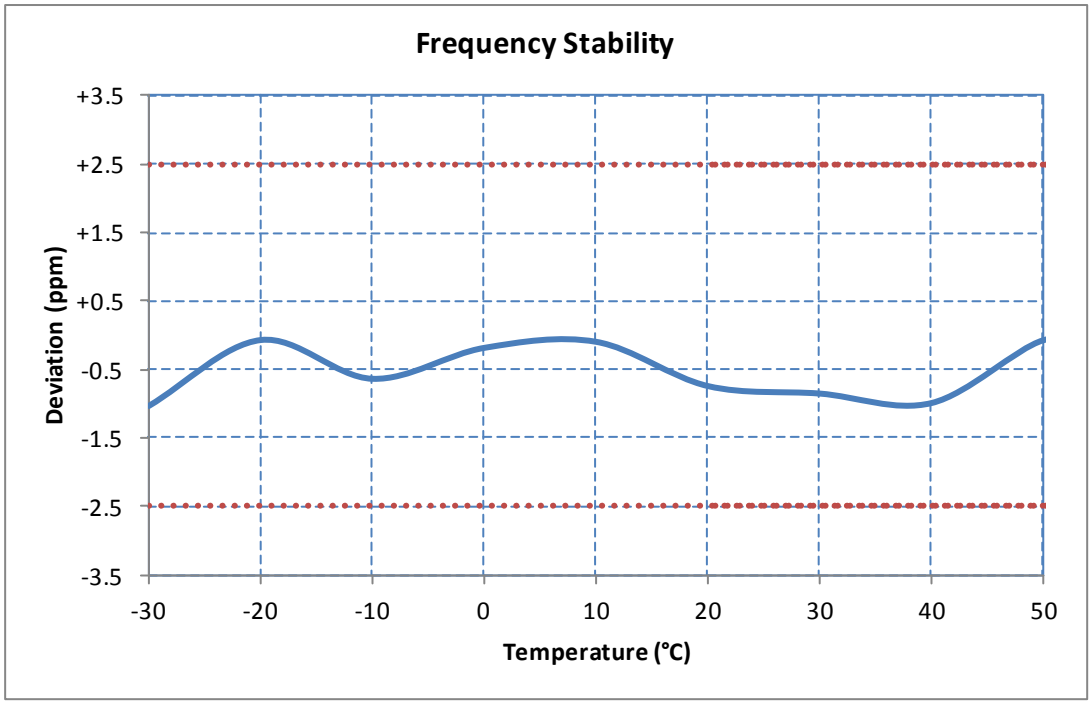
## 9.5 *Test Data*

Test Date: 23 December 2016

GSM 850, Channel 190 (836.6MHz)

| Voltage % | Power $V_{DC}$ | Temp °C | Frequency Hz | Freq Dev Hz | Freq Dev ppm | Deviation % |
|---|---|---|---|---|---|---|
| 100% | 3.70 | +20 (Ref) | 836,599,378 | -622 | -0.74 | -0.000074 |
| 100% | 3.70 | -30 | 836,599,137 | -863 | -1.03 | -0.000103 |
| 100% | 3.70 | -20 | 836,599,937 | -63 | -0.07 | -0.000007 |
| 100% | 3.70 | -10 | 836,599,466 | -534 | -0.64 | -0.000064 |
| 100% | 3.70 | 0 | 836,599,842 | -158 | -0.19 | -0.000019 |
| 100% | 3.70 | +10 | 836,599,916 | -84 | -0.10 | -0.000010 |
| 100% | 3.70 | +20 | 836,599,378 | -622 | -0.74 | -0.000074 |
| 100% | 3.70 | +30 | 836,599,287 | -713 | -0.85 | -0.000085 |
| 100% | 3.70 | +40 | 836,599,171 | -829 | -0.99 | -0.000099 |
| 100% | 3.70 | +50 | 836,599,935 | -65 | -0.08 | -0.000008 |
| 100% | 3.70 | +55 | 836,599,770 | -230 | -0.27 | -0.000027 |
| 114% | 4.20 | +20 | 836,599,938 | -62 | -0.07 | -0.000007 |
| 95% | 3.52 | +20 | 836,599,295 | -705 | -0.84 | -0.000084 |

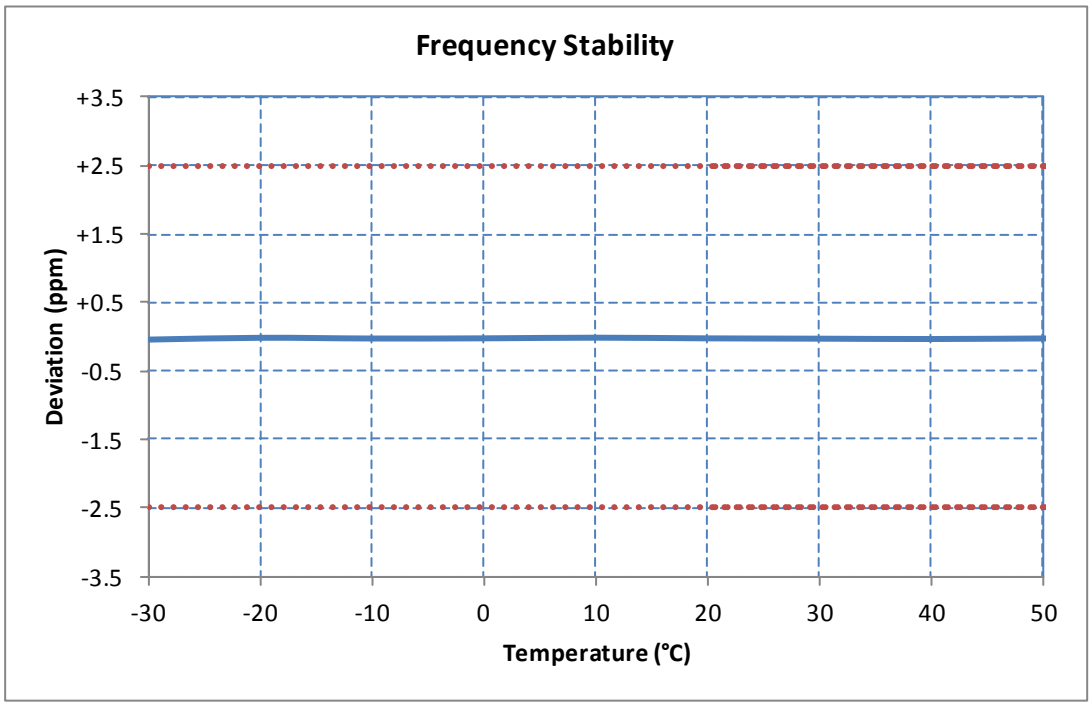
Note: Call would not remain connected when voltage was set to 85% value of 3.145V



GSM 1900, Channel 661 (1880MHz)

| Voltage % | Power $V_{DC}$ | Temp °C | Frequency Hz | Freq Dev Hz | Freq Dev ppm | Deviation % |
|---|---|---|---|---|---|---|
| 100% | 3.70 | +20 (Ref) | 1,879,999,957 | -43 | -0.02 | -0.000002 |
| 100% | 3.70 | -30 | 1,879,999,909 | -91 | -0.05 | -0.000005 |
| 100% | 3.70 | -20 | 1,879,999,979 | -21 | -0.01 | -0.000001 |
| 100% | 3.70 | -10 | 1,879,999,951 | -49 | -0.03 | -0.000003 |
| 100% | 3.70 | 0 | 1,879,999,958 | -42 | -0.02 | -0.000002 |
| 100% | 3.70 | +10 | 1,879,999,983 | -17 | -0.01 | -0.000001 |
| 100% | 3.70 | +20 | 1,879,999,957 | -43 | -0.02 | -0.000002 |
| 100% | 3.70 | +30 | 1,879,999,945 | -56 | -0.03 | -0.000003 |
| 100% | 3.70 | +40 | 1,879,999,931 | -69 | -0.04 | -0.000004 |
| 100% | 3.70 | +50 | 1,879,999,953 | -47 | -0.02 | -0.000002 |
| 100% | 3.70 | +55 | 1,879,999,952 | -48 | -0.03 | -0.000003 |
| 114% | 4.20 | +20 | 1,879,999,942 | -59 | -0.03 | -0.000003 |
| 90% | 3.33 | +20 | 1,879,999,891 | -109 | -0.06 | -0.000006 |

Note: Call would not remain connected when voltage was set to 85% value of 3.145V



# 10 Revision History

| Revision Level | Description of changes | Revision Date |
|---|---|---|
| 0 | Initial release | 30 January 2017 |
| 1 | Changed references from “SB1” to “SB3”<br>Corrected FCC and IC IDs | 07 March 2017 |
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