



RM-267V Occupied Bandwidth & Band Edge Emissions

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1. PURPOSE

1.1 Document Purpose

This test is used to determine RM-267V's compliance to a variety of government emissions regulations for the United States. This test is necessary to support applications for approval of RM-267V in the United States. This test also takes account of recent FCC guidelines dividing the PCS1900 band into 6 blocks, compliance with band edge emissions regulations is now required to be shown at the band edges of all 6 blocks.

1.2 Test Overview

A conducted connection is made between the phone and the test equipment. The phone is placed in a call. Its occupied bandwidth is measured, then its band edge emissions are measured to determine if it is within guidelines

1.3 Test Rationale

This test is essential to determining a handset's compliance with federal regulations.

2. LIST OF ABBREVIATIONS, ACRONYMS AND TERMS

2.1 Abbreviations

dBm	dB (milliwatts)
MHz	Megahertz
Tx	Transmit

2.2 Acronyms

ARFCN	Absolute Radio Frequency Channel Number
BSE	Base Station Emulator
BW	Bandwidth
CFR	Code of Federal Regulations
DC	Direct Current
EUT	Equipment Under Test
FCC	Federal Communications Commission
GPS	Global Positioning System
GSM	Global System for Mobile communications
PCS	Personal Communications Systems
P	Power (Watts)
RBW	Resolution Bandwidth

2.3 Terms

This section intentionally left blank.



3. STANDARDS BASIS

Note – The CFR is updated annually. The latest version should always apply.

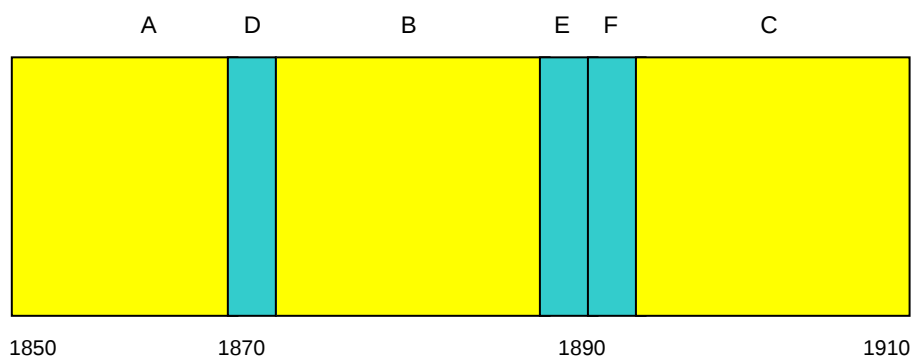
FCC. 47 CFR, Part 2.1049 (c): Occupied Bandwidth.

FCC. 47 CFR, Part 24.238 (b): Occupied Bandwidth.

FCC. 47 CFR, Part 24: Emissions at Band Edges

3.1 PCS Band Subdivision

Recent FCC correspondence indicated a requirement to show compliance at all band edges within the relevant Tx band. For PCS1900 this requires compliance to be shown at 12 band edges. The frequency blocks for PCS1900 Mobile Transmitters are shown below:



Block	Freq	Band	Channel range
BLOCK 1:	1850 – 1865 MHz	(A)	ARFCN 512 - 585
BLOCK 2:	1865 – 1870 MHz	(D)	ARFCN 587 - 610
BLOCK 3:	1870 – 1885 MHz	(B)	ARFCN 612 - 685
BLOCK 4:	1885 – 1890 MHz	(E)	ARFCN 687 - 710
BLOCK 5:	1890 – 1895 MHz	(F)	ARFCN 712 - 735
BLOCK 6:	1895 – 1910 MHz	(C)	ARFCN 737 - 810



4. TEST EQUIPMENT, MATERIALS LIST AND SAMPLE REQUIREMENTS

4.1 Test Equipment and Materials

The relevant equipment used during the test is listed below.

DC Power Supply Agilent E3631A	Serial no. KR94625346 Calibrated 20 May, 2005	Due 20 May, 2007
Base Station Emulator Rohde & Schwarz CMU200	Serial no. 24589 Calibrated 25 Jan, 2006	Due 25 Jan, 2007
Spectrum Analyser Rohde & Schwarz FSIQ	Serial no. 24570 Calibrated 01 Feb, 2006	Due 01 Feb, 2007

4.2 Phone Sample

RM-267V Serial no. 001302 Proto B3 IMEI 12345610654321

Conducted RF connection to test system, powered via dummy battery connected to power supply. FBUS via system connector for automated phone control. Test conducted in shielded room.

5. LOCATION INFORMATION

All equipment needed to perform this test is available in the RM-267V project area laboratory at the Vertu Ltd. Church Crookham site in the UK.

6. PASS/FAIL CRITERIA

FCC Part 24.238 specifies a maximum allowable emission of $P - 43 + 10 \log (P)$ outside of the licensee's frequency block

For a GSM1900 transmitter operating at top power level and transmitting 30 dBm (1W) as per the GSM recommendations this equates to $30 - 43 + 10 \log (1) = -13$ dBm.

For a GSM850 transmitter operating at top power level and transmitting 33 dBm (2W) as per the GSM recommendations this equates to $33 - 43 + 10 \log (2) = -7$ dBm.

For the band edge channels this is measured using a bandwidth equal to 1% of the emission bandwidth.



7. SYSTEM VALIDATION INSTRUCTIONS

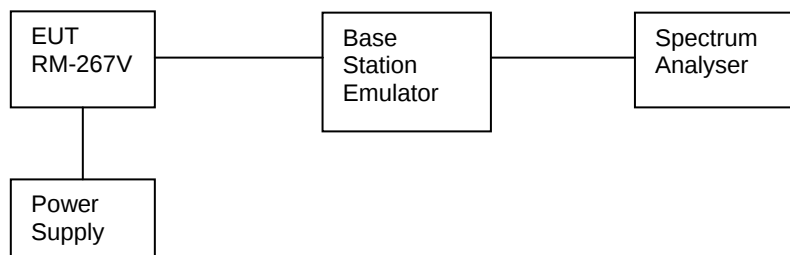
The following was verified before proceeding:

- All calibrated equipment is marked with a calibration sticker and is still within its calibration interval.
- The ambient temperature and humidity of the lab is within the normal operating limits of all test equipment.
- The BSE should power on and pass any internal self checks.

8. TEST PROCEDURE

The testing described below is designed to cover all the requirements listed in Section 3.

The measurement equipment is set up as shown below.

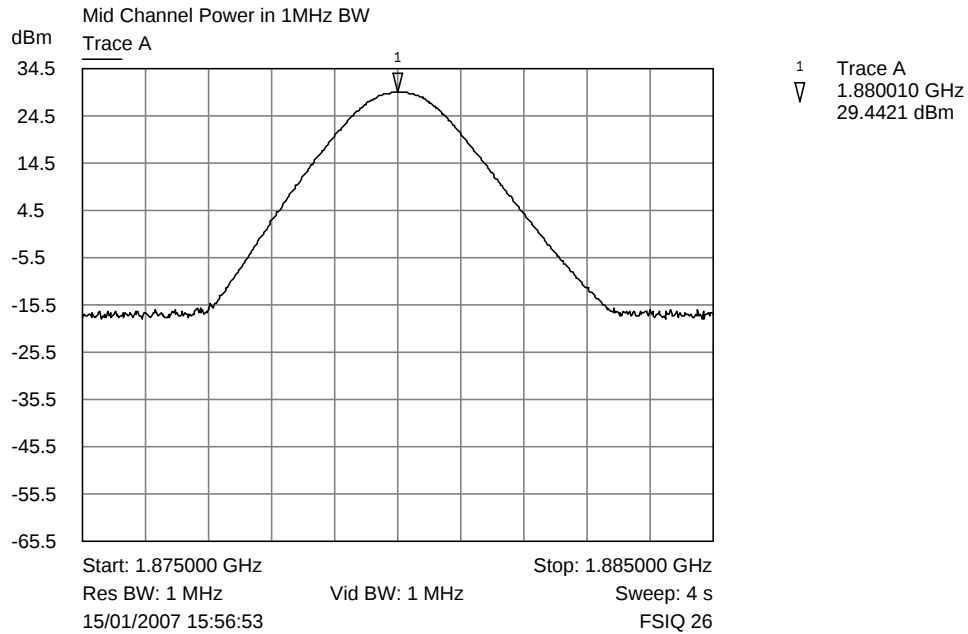


- 1) The EUT is connected via a conducted connection and placed in a call with random (worst case) modulation against the base station emulator, mid channel, Tx Power Control level set to max power.
- 2) The spectrum analyser is connected via the coupled RF port on the base station emulator.
- 3) The maximum power in 1 MHz RBW is measured.
- 4) The Occupied Bandwidth is measured via the 99% Power BW function on the spectrum analyser.
- 5) The channel is changed to low channel.
- 6) The band edge emissions limit is checked in 1% RBW for compliance.
- 7) The channel is changed to the next band edge channel.
- 8) The band edge emissions limit is checked in 1% RBW for compliance.
- 9) Repeat 7) & 8) up to the last band edge channel.
- 10) Repeat 1) to 9) for all other bands of operation.
- 11) The results are attached in the following pages.

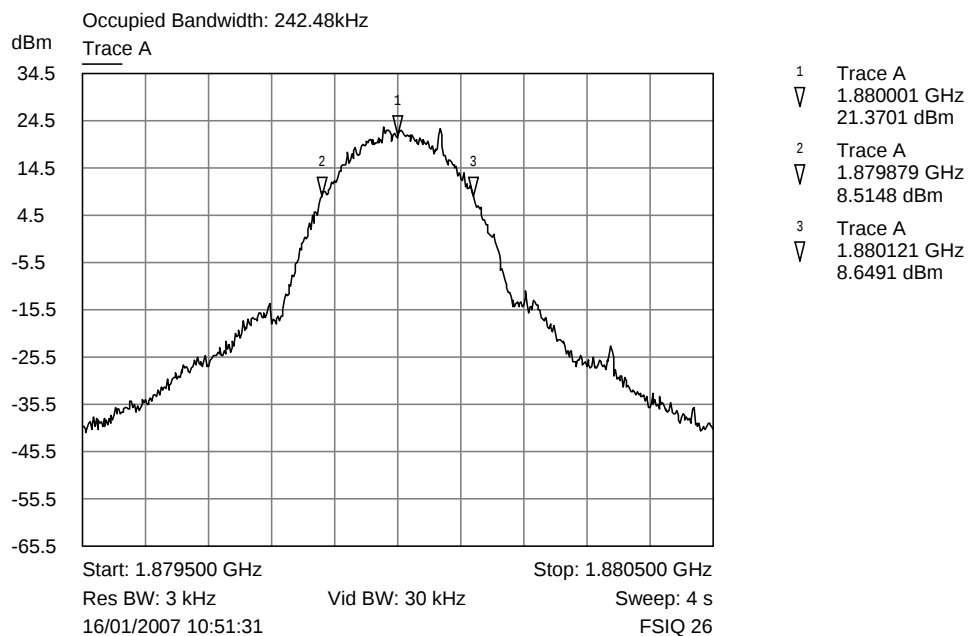


9. GSM 1900 RESULTS

9.1 Mid Channel, Power in 1MHz



9.2 Mid Channel, Occupied Bandwidth



Power: Tx level 0 (highest)

Modulation: Random GMSK

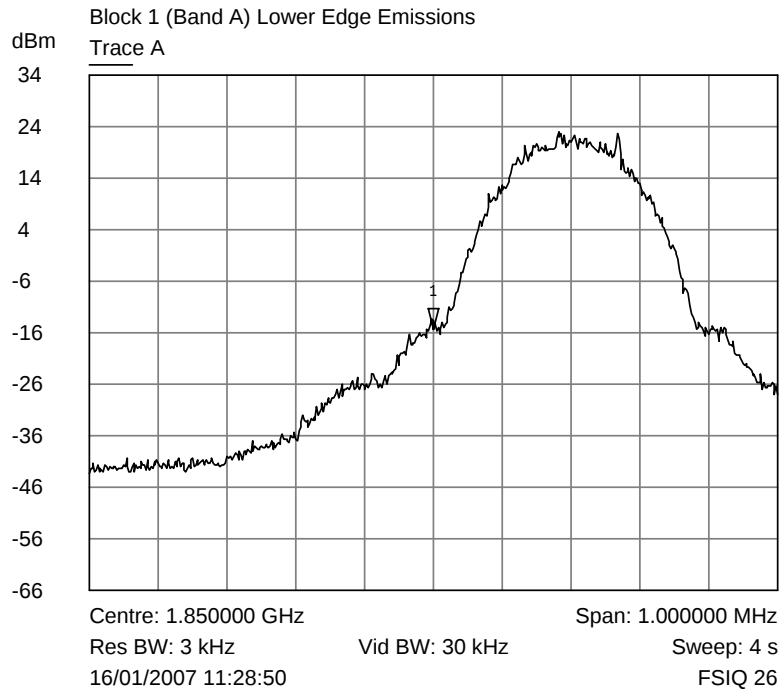
Channel: Mid ARFCN 661

Occupied Bandwidth = 242.5 kHz 1% Bandwidth = 2.425 kHz

3kHz = next largest bandwidth on spectrum analyser

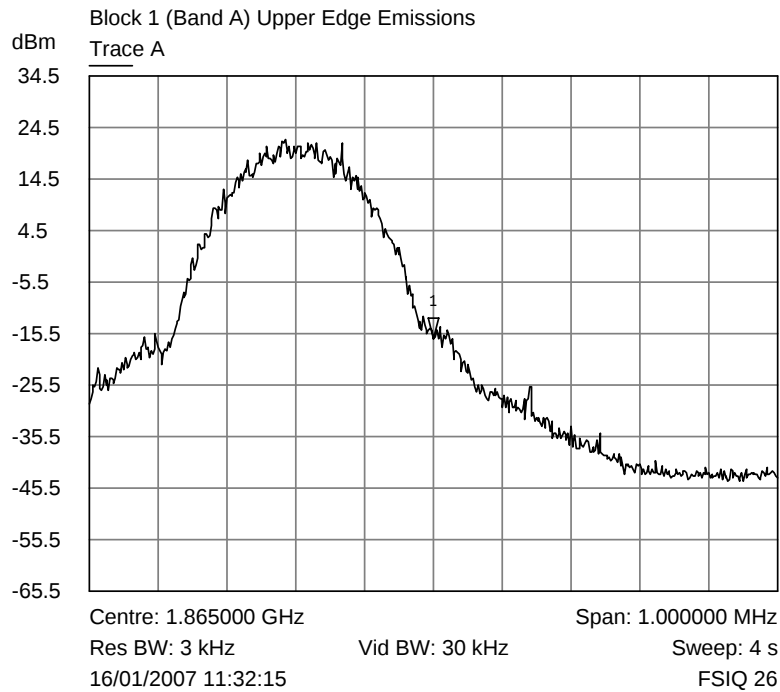


9.3 Block 1 (Band A) Lower Edge Emissions



¹ Trace A
▽ 1.850001 GHz
-15.2739 dBm

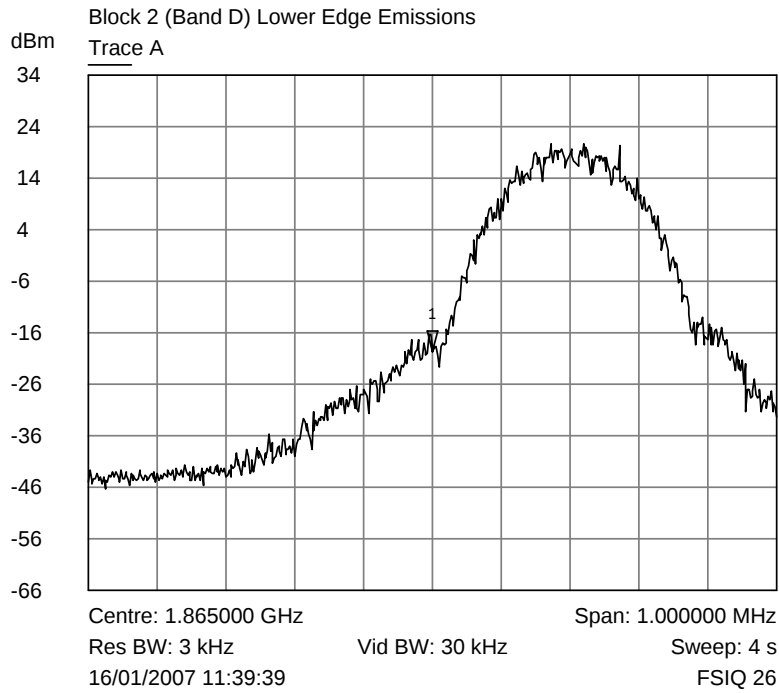
9.4 Block 1 (Band A) Upper Edge Emissions



¹ Trace A
▽ 1.865001 GHz
-16.5918 dBm

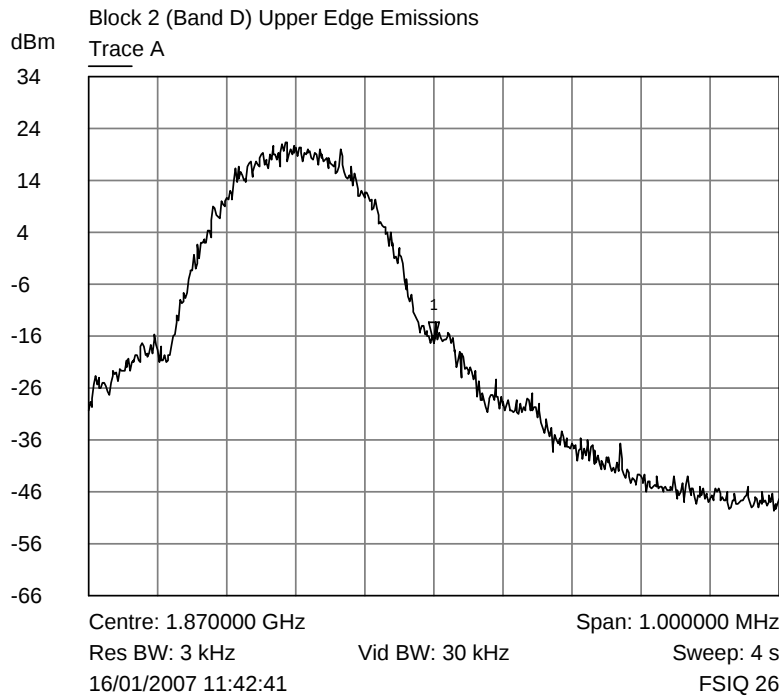


9.5 Block 2 (Band D) Lower Edge Emissions



1 Trace A
▽ 1.865001 GHz
-19.5346 dBm

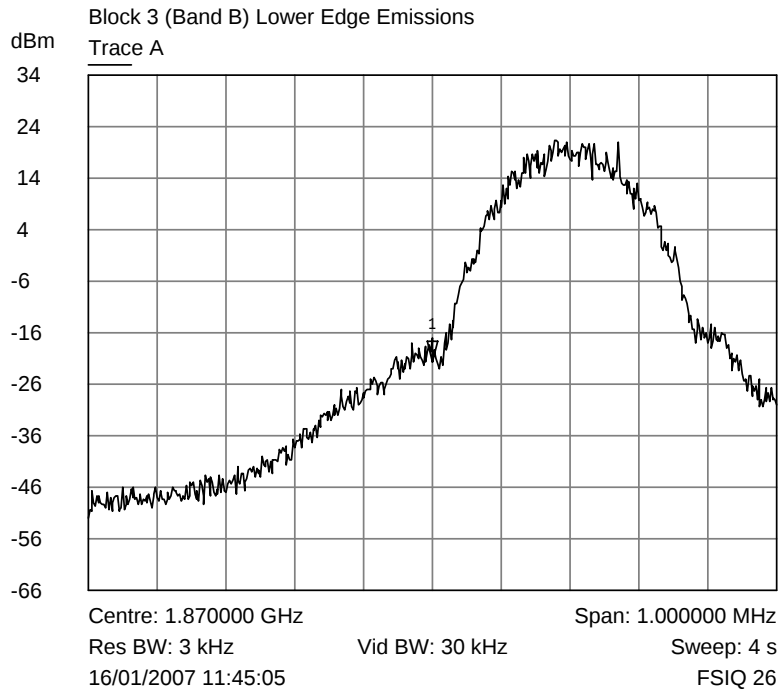
9.6 Block 2 (Band D) Upper Edge Emissions



1 Trace A
▽ 1.870001 GHz
-17.3399 dBm

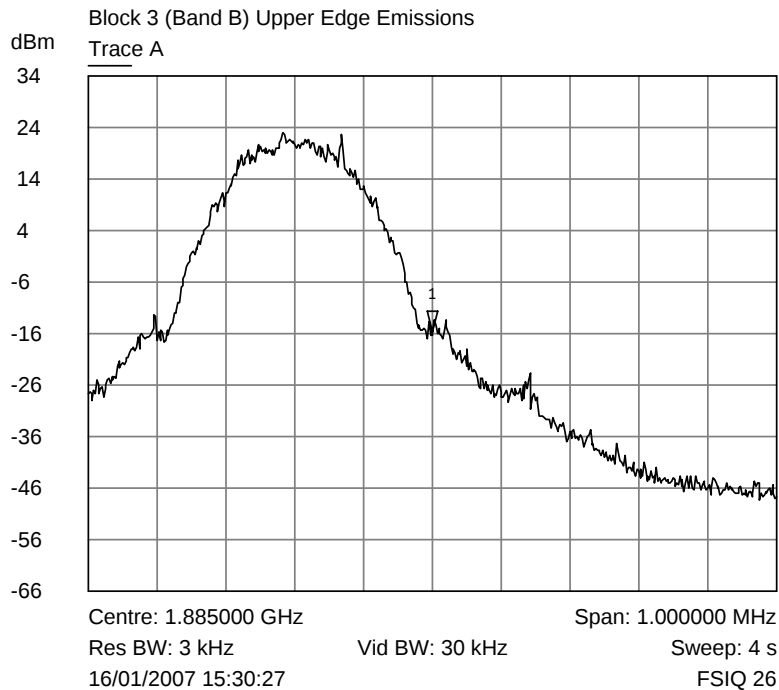


9.7 Block 3 (Band B) Lower Edge Emissions



¹ Trace A
▽ 1.870001 GHz
-21.7714 dBm

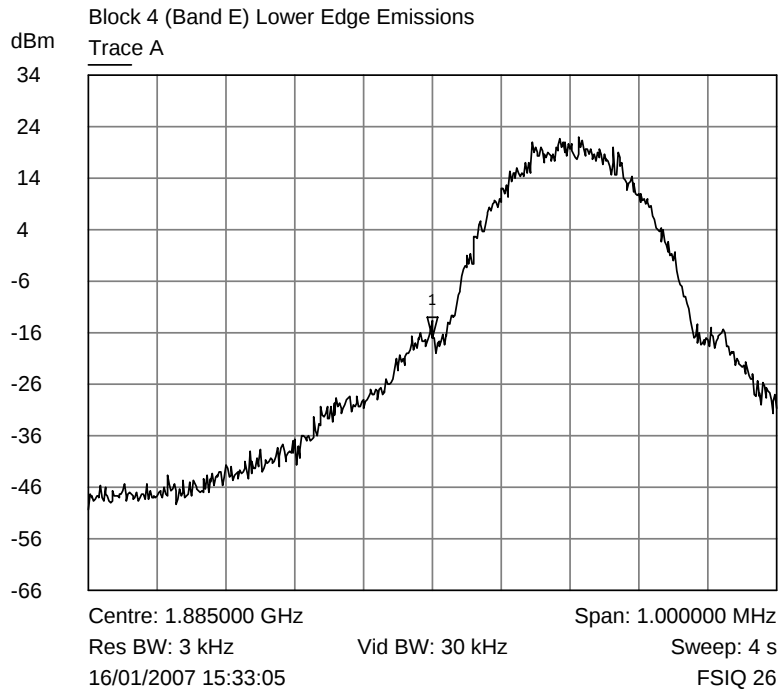
9.8 Block 3 (Band B) Upper Edge Emissions



¹ Trace A
▽ 1.885001 GHz
-15.5929 dBm

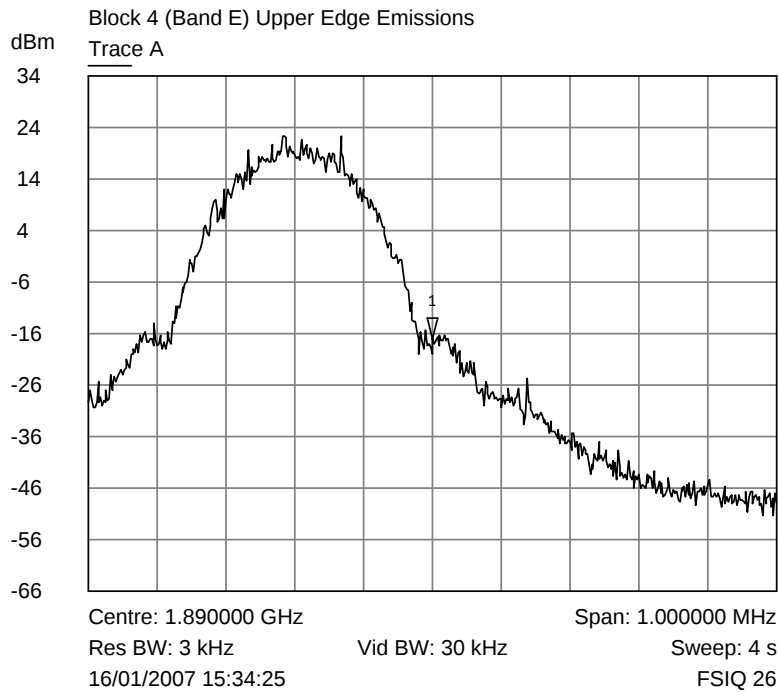


9.9 Block 4 (Band E) Lower Edge Emissions



¹ Trace A
▽ 1.885001 GHz
-17.1507 dBm

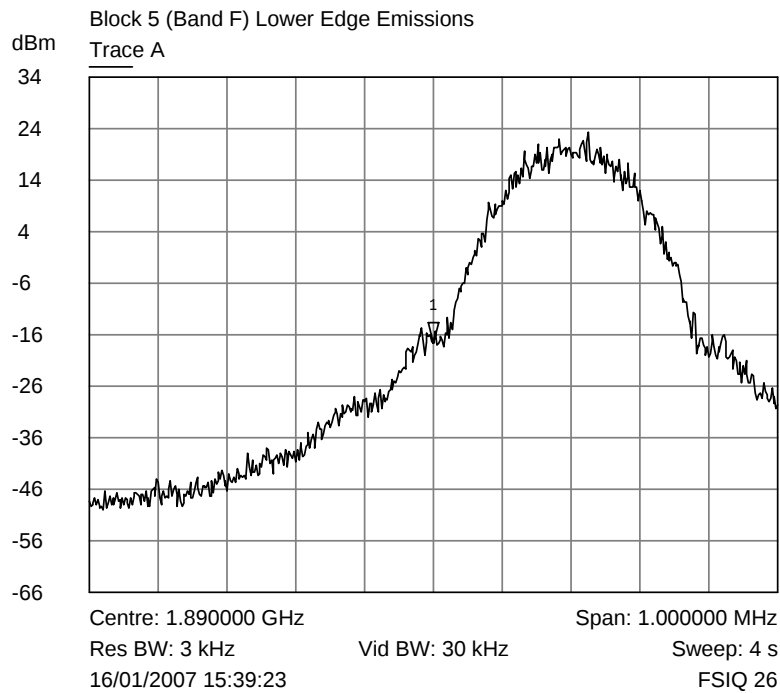
9.10 Block 4 (Band E) Upper Edge Emissions



¹ Trace A
▽ 1.890001 GHz
-17.0958 dBm

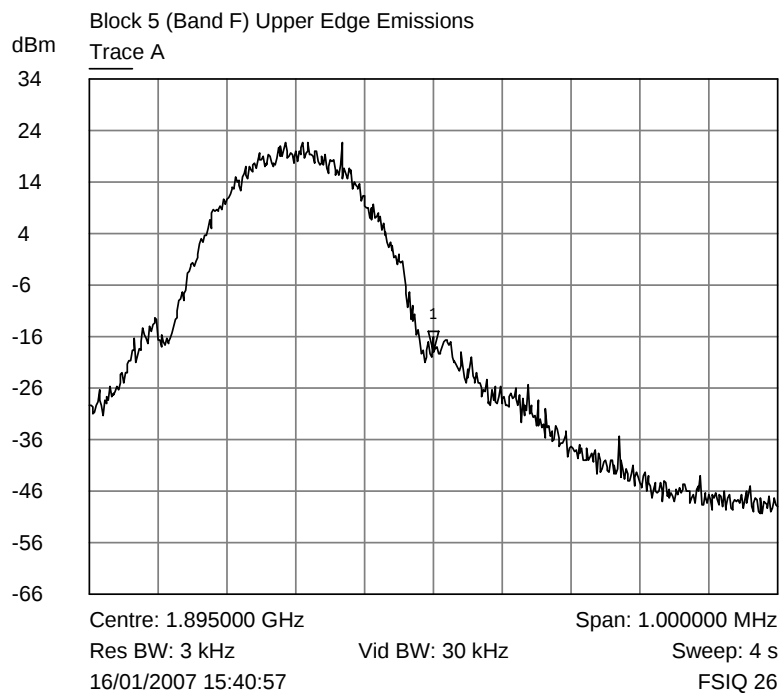


9.11 Block 5 (Band F) Lower Edge Emissions



1 Trace A
1.890001 GHz
-17.5982 dBm

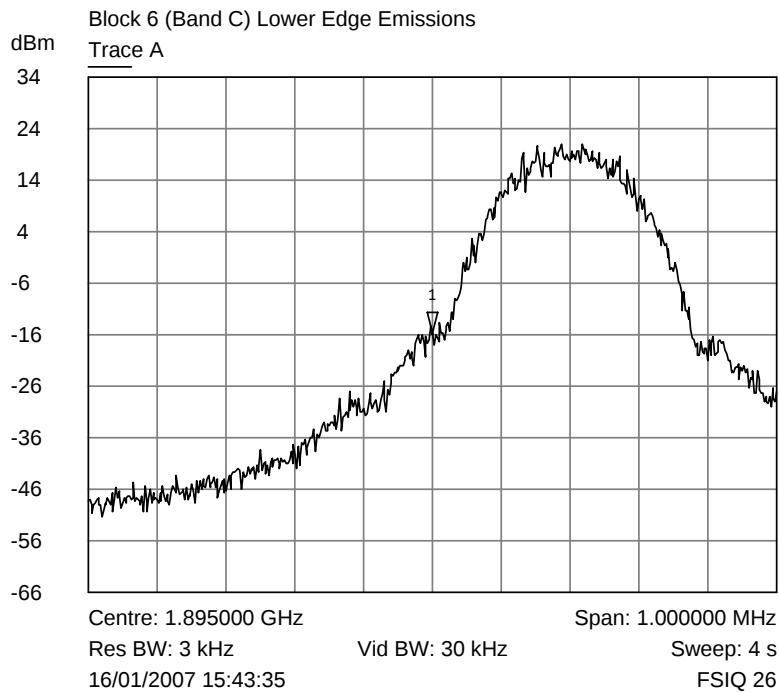
9.12 Block 5 (Band F) Upper Edge Emissions



1 Trace A
1.895001 GHz
-19.0991 dBm

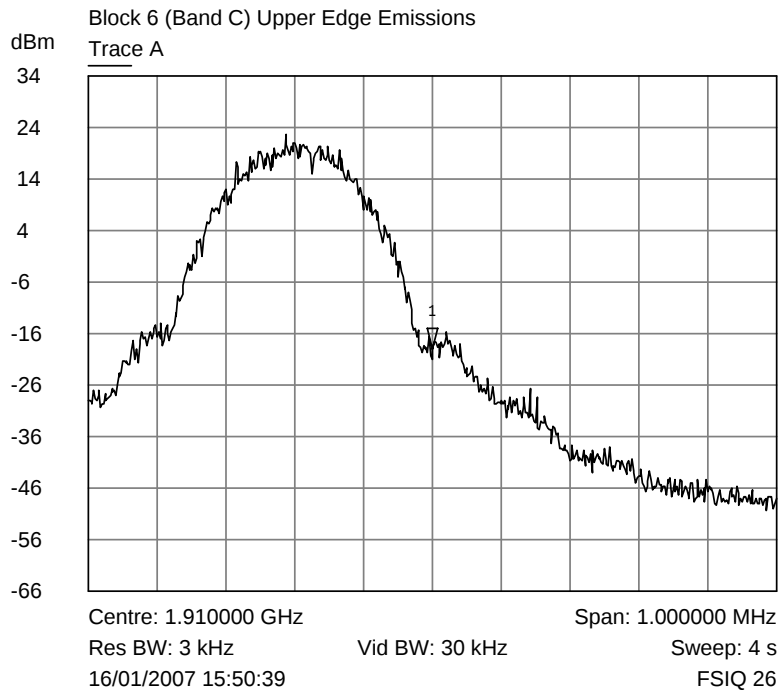


9.13 Block 6 (Band C) Lower Edge Emissions



¹ Trace A
▽ 1.895001 GHz
-15.5787 dBm

9.14 Block 6 (Band C) Upper Edge Emissions

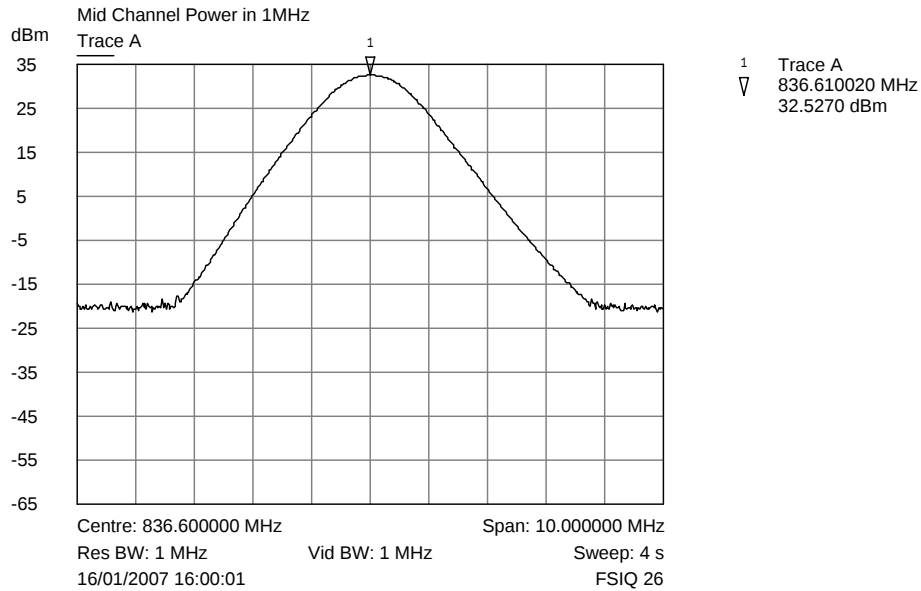


¹ Trace A
▽ 1.910001 GHz
-19.0482 dBm

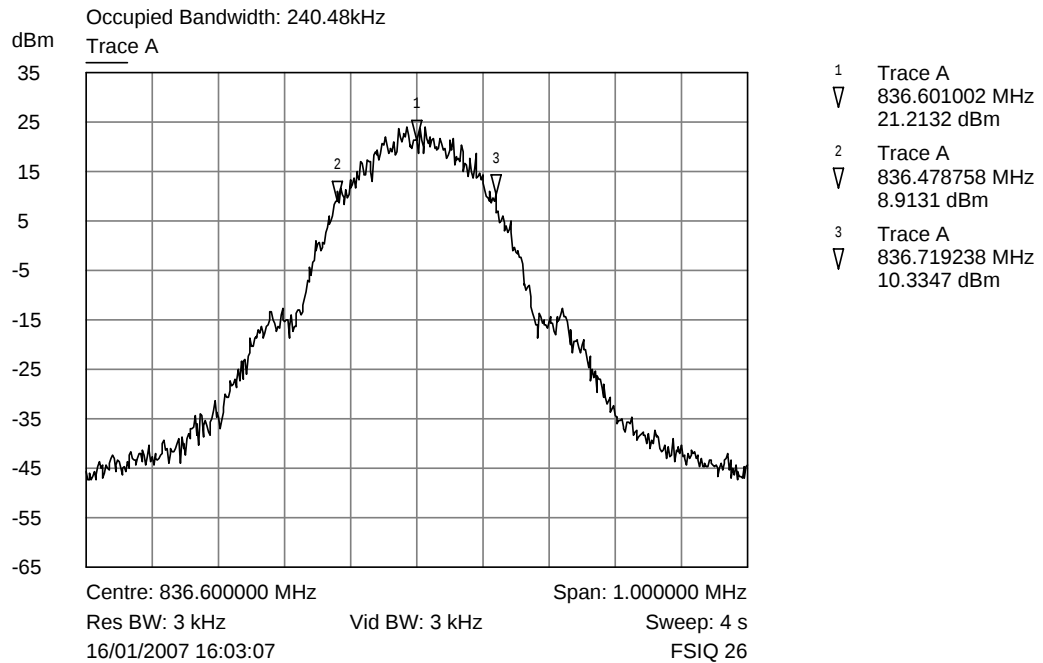


10. GSM 850 RESULTS

10.1 Mid Channel Power in 1MHz



10.2 Mid Channel Occupied Bandwidth



Power: Tx level 5 (highest)

Modulation: Random GMSK

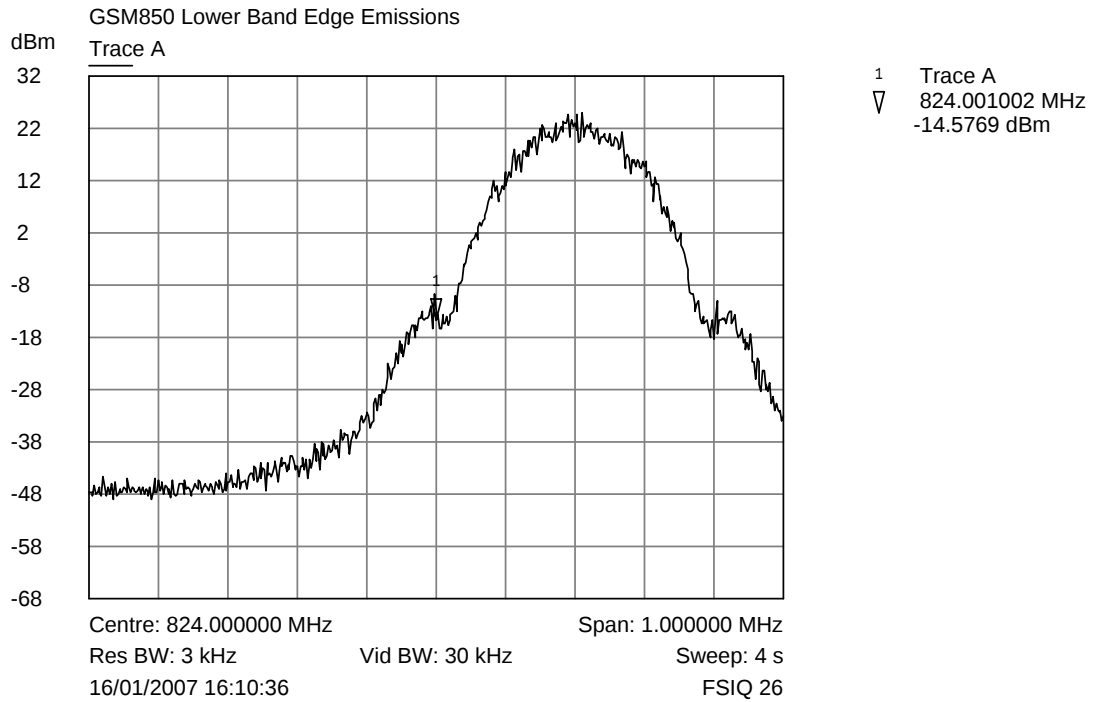
Channel: Mid ARFCN 190

Occupied Bandwidth = 240.48 kHz 1% Bandwidth = 2.405 kHz

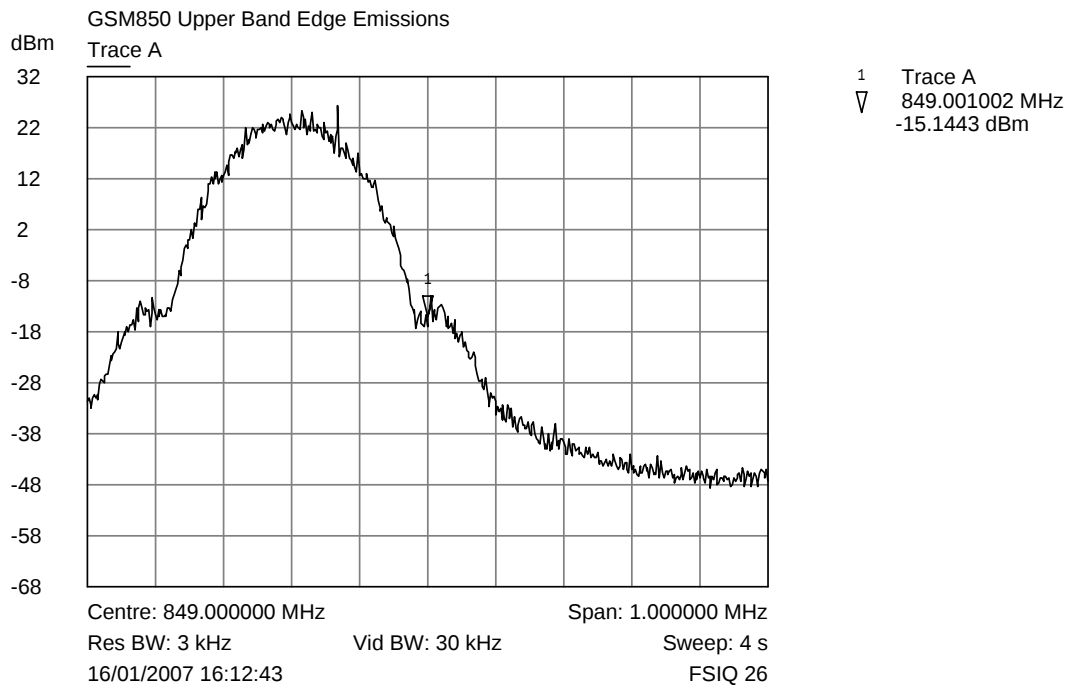
3kHz = next largest bandwidth on spectrum analyser



10.3 Lower Band Edge Emissions



10.4 Upper Band Edge Emissions



11. CONCLUSIONS

Worst case in PCS1900 is -15.27dBm, >2dB in specification.

Worst case in GSM850 is -14.58dBm, >7dB in specification.



Overall, PCS1900 comes closest to the specification limit but is a pass by more than 2dB.