



**EXHIBIT 9: TEST REPORT**

**Applicant:**

**Lucent Technologies**

**Equipment:**

**UMTS 9341 RRH 60W 1900MHz**

**FCC ID:**

**AS5ONEBTS-22**

**Rule Part:**

**Part 24, Subpart E – Broadband PCS**

**Frequency Range:**

**1930 - 1990 MHz**

**Power:**

**60 Watts Total Composite**

**Frequency Tolerance:**

**± 0.05 ppm**

**Emission Designator:**

**4M10F9W**

**Michael P. Farina  
Alcatel-Lucent  
67 Whippny Road  
Whippny, NJ 07981**

**October 2, 2008**



Subject: Application for Certification under FCC ID:  
AS5ONEBTS-22, Covering the *UMTS 9341*  
*RRH 60W 1900 MHz System, Operating in the*  
*Broadband Personal Communications*  
*Service, 1930-1990 MHz.*

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October 2, 2008

## TEST REPORT

### INTRODUCTION:

The exhibits presented in this test report demonstrate that the Alcatel-Lucent Broadband PCS Frequency *UMTS 9341 RRH 60W 1900 MHz System*, UMTS Distributed Base Station Transceiver System, is in full compliance with all requirements of the Rules of the Commission as specified in the Code of Federal Regulations (CFR), Title 47 – Telecommunication; Part 24, Subpart E – Broadband PCS; Section 24.2387 - Emission Limitations for Broadband PCS Equipment; effective October 1, 2007. All testing was performed in accordance with CFR 47, Part 2, Subpart J – Equipment Authorization Procedures; effective October 1, 2007. It also demonstrates compliance with the spurious emissions limitations specified in ETSI TS 125 141 V7.4.0 (2006-06): Universal Mobile Telecommunications System (UMTS); Base Station Conformance Testing (FDD), (3GPP TS 25.141, Version 7.4.0, Release 7). This standard was the guideline used in the design of the Distributed Base Station transceiver system. The objective of this application is to obtain initial FCC authorization, under FCC ID: AS5ONEBTS-22, for operation in the Universal Mobile Telecommunications System (UMTS) with both a single 5 MHz emission bandwidth carrier (4M10F9W) set to a maximum power level at the antenna terminal of 60 Watts (3-second average) and with two 5 MHz carriers set to 30 Watts per carrier, with the total composite power at 60 Watts (3-second average).

Alcatel-Lucent's wireless *UMTS 9341 RRH 60W 1900 MHz System* is the subject of this application for authorization by the Federal Communications Commission under the new FCC ID: AS5ONEBTS-22. Alcatel-Lucent's Universal Mobile Telecommunications System (UMTS) Distributed Base Station System, *UMTS 9341 RRH 60W 1900 MHz System*, is designed to operate in the North America Region (NAR) Broadband PCS Frequency Spectrum 1930-1990 MHz, with bandwidth of 60 MHz. The Distributed Base Station (DBS) can be configured both for single carrier (1S1C) operation at 60 Watts (+47.8 dBm) and for two carrier (1S2C) operation at 30 Watts (+44.8 dBm) per carrier with a total composite power of 60 Watts. The RF power rating is based the 3-second average, employing the Aggregate Overload Control (AOC) algorithm. Enhanced Digital Pre-Distortion (EDPD) and Closed Loop Gain Control (CLGC) are features that are enabled for each carrier. The carrier power level and frequency are remotely controlled by software. The single UMTS carrier has a 5 MHz bandwidth, with an emission designator at 4M10F9W, based on measurement of the Necessary Bandwidth. UMTS modulation capability demonstrated includes 1) up to 68 active channels, consisting of 64 voice + 4 control, 2) up to 44 active channels, which include 8 High Speed Downlink Packet Access (HSDPA) channels, and 3) a single active channel *Synchronization Channel* (SCH).

The *UMTS 9341 RRH 60W 1900 MHz System*, subject of this certification, is comprised of two separate modules interconnected by fiber optic cable: 1) the digital Base Band Unit (BBU), and 2) the RF Remote Radio Head (RRH). They have the flexibility of being installed either in close proximity to or remotely located from each other. The BBU has the capability of controlling up to 3 remotely located RRH units, via fiber optic cable, and incorporates the digital channel cards, reference oscillator module, T1/E1 and alarm interface, and the RF-to-Optical and Optical-to-RF conversion circuitry. The 1900 MHz RRH incorporates the Future Technology Radio (FTR1900), power amplifier (PA) and passive filter with single transmit (Tx) and diversity receive functionality (Rx0, Rx1). This system complies both with the Federal Communication Commission (FCC) Rules and Regulations (47 CFR Part 24), and with the European Telecommunications Standards Institute (ETSI) 3<sup>rd</sup> Generation Partnership Project (3GPP) Technical Specifications TS 25.104 and TS 25.141.

As a Transceiver System, all conducted RF characteristics and emissions measurements were performed at the transmit antenna terminal, using a production equipment frame. All testing was performed in the Alcatel-Lucent, Whippany, NJ, compliance laboratory by F. E. Chetwynd and M. P. Farina during the period September 10 – 24, 2008; in adherence to a test plan generated by M. P. Farina, in accordance with Alcatel-Lucent's ISO/TL9000 Registration. All measurement instrumentation utilized were also calibrated in compliance with Alcatel-Lucent's ISO/TL9000 Registration. The Whippany 3 & 10 Meter Open Area Test Site (OATS) is authorized by the Federal Communications Commission (FCC) under Registration Number: 90770, in compliance with the requirements of Section 2.948 of the Rules of the Commission.

Frequency stability measurements were performed by N.Hussain, Alcatel-Lucent, Swindon, United Kingdom, under the direction of M. P. Farina, and in adherence to the previously cited ISO/TL9000 test plan. A full report is attached to this exhibit.

This report fully documents all required tests and the test results, sufficient to show full compliance with the Rules of the Commission.

#### APPLICABLE FCC RULES AND INDUSTRY STANDARDS:

The exhibits presented in this test report demonstrate that Alcatel-Lucent's Broadband PCS Frequency *UMTS 9341 RRH 60W 1900 MHz System* is in full compliance with all requirements of the Rules of the Commission, as specified in the Code of Federal Regulations (CFR), Title 47 – Telecommunication; Part 24, Subpart E – Broadband PCS; Section 24.238 - Emission Limitations for Broadband PCS Equipment; effective October 1, 2007. All testing was performed in accordance with CFR 47, Part 2, Subpart J – Equipment Authorization Procedures; effective October 1, 2007. It also demonstrates compliance with the spurious emission limitations specified in TSI TS 125 141 V7.4.0 (2006-06): Universal Mobile Telecommunications System (UMTS); Base Station Conformance Testing (FDD), (3GPP TS 25.141, Version 7.4.0, Release 7). The specific test procedures that are both required for and are applicable to the UMTS Distributed Base Station Transceiver System are:

<b>Part 2.1046</b>	RF Power Output	<b>Pages 4 – 5</b>
<b>Part 2.1047</b>	Modulation Characteristics	<b>Pages 6-8</b>
<b>Part 2.1049</b>	Occupied Bandwidth - Single Carrier	<b>Pages 9-19</b>
<b>Part 2.1049</b>	Occupied Bandwidth - Two Carriers	<b>Pages 20-26</b>
<b>Part 2.1051</b>	Spurious Emissions at the Antenna Terminals.	<b>Pages 27-40</b>
<b>Part 2.1053</b>	Field Strength of Spurious Radiation	<b>Pages 41</b>
<b>Part 2.1055</b>	Frequency Stability	<b>Pages 42-43</b>
<b>Part 2.1057</b>	Frequency Spectrum to be Investigated	
<b>Part 24</b>	Personal Communications Services; Subpart E – Broadband PCS	
<b>Part 24.238</b>	Emission Limitations for Broadband PCS Equipment	
<b>ETSI</b>	TS 125 141 V7.4.0 (2006-06): Universal Mobile Telecommunications System (UMTS); Base Station (BS) Conformance Testing (FDD), (3GPP TS 25.141, Version 7.4.0, Release 7).	

**ETSI** TS 125 104 V7.4.0 (2006-06): Universal Mobile Telecommunications System (UMTS); Base Station (BS) Radio Transmission and Reception (FDD), (3GPP TS 25.104, Version 7.4.0, Release 7).

**ANSI C63.4-2003** American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic in the Range of 9 kHz to 40 GHz; January 30, 2004

#### PART 2.1046 MEASUREMENTS REQUIRED: RF POWER OUTPUT

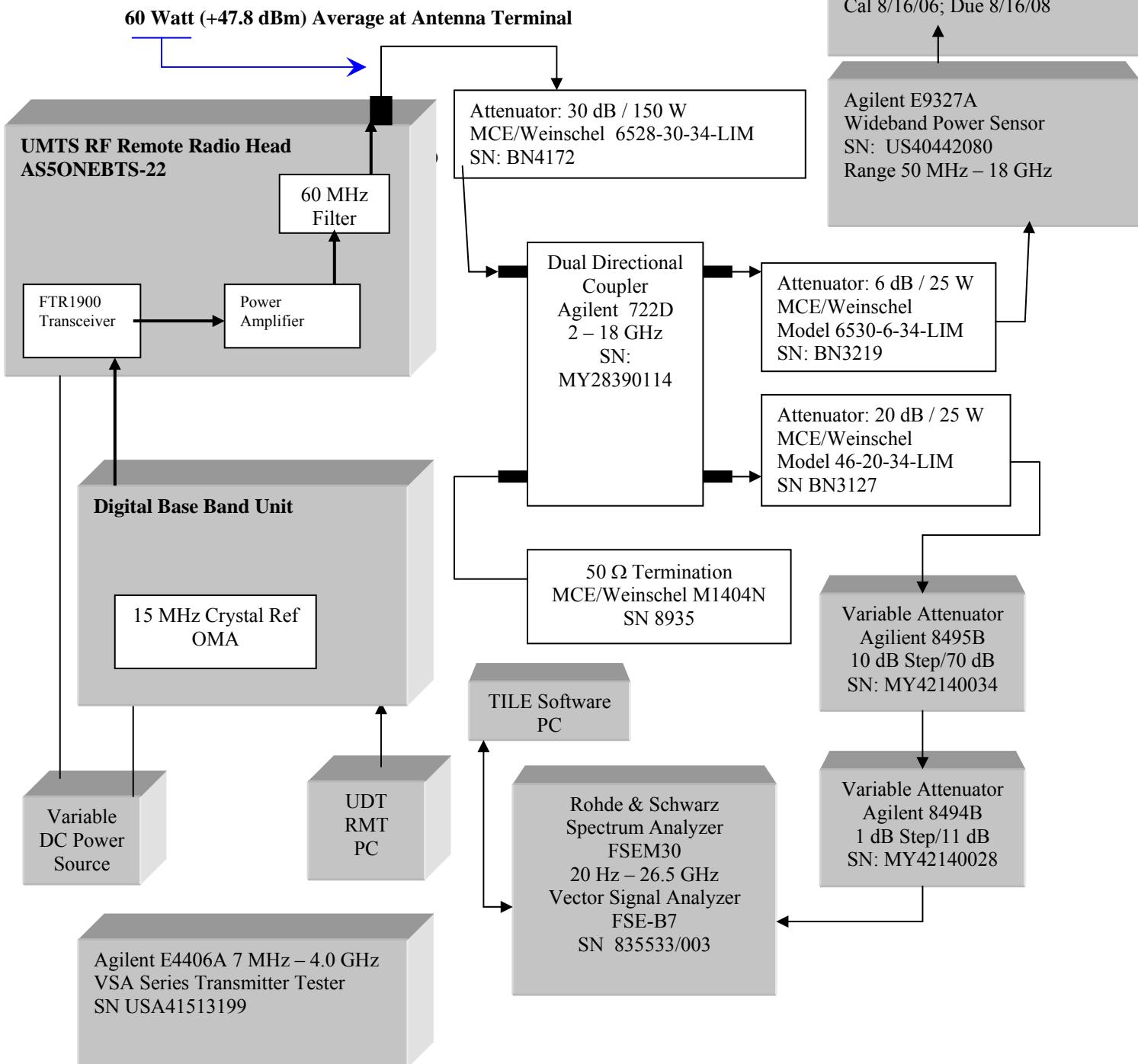
The *UMTS 9341 RRH 40W 1900 MHz System*, Distributed Base Station Transceiver System, subject of this application for certification, is designed to provide a maximum RF power level, per single 5 MHz carrier emission bandwidth, of 60 Watts (+47.8 dBm) at the Equipment Antenna Terminal (EAC). The RF power rating is based the 3-second average, employing the Aggregate Overload Control (AOC) algorithm. Enhanced Digital Pre-Distortion (EDPD) and Closed Loop Gain Control (CLGC) are features that are enabled for each carrier. This System is designed to operate in a 60 MHz bandwidth, over the Broadband PCS frequency spectrum: 1930-1990 MHz. This system is also designed to transmit 2 carriers at 30 Watts (+44.8 dBm) per carrier for a total composite power at 60 Watts.

All conducted emission measurements are performed at the EAC, with measurements being made at the lowest and the highest settable carrier frequencies in Broadband PCS Blocks A, B and C and at the center frequency of Blocks D, E and F. These 9 carrier channels were used throughout this test procedure, as tabulated below. Each time the carrier is set to each of the channels, and to each of 2 ETSI Test Modulation schemes, the power level is adjusted, by software control, to +47.8 dBm (60 Watts at 3-second average) before performing each emission measurement.

PCS Frequency	PCS Frequency Block	UARFCN Channel Number	Carrier Center Frequency	Measured Power Level
A1	Lowest Settable Channel	12	1932.5 MHz	+47.8 dBm
A3	Highest Settable Channel	62	1942.5 MHz	+47.8 dBm
D	Block Center	87	1947.5 MHz	+47.8 dBm
B1	Lowest Settable Channel	112	1952.5 MHz	+47.8 dBm
B3	Highest Settable Channel	162	1962.5 MHz	+47.8 dBm
E	Block Center	187	1967.5 MHz	+47.8 dBm
F	Block Center	212	1972.5 MHz	+47.8 dBm
C3	Lowest Settable Channel	237	1977.5 MHz	+47.8 dBm
C5	Highest Settable Channel	287	1987.5 MHz	+47.8 dBm

Note: UARFCN = UTRA Absolute Radio Frequency Channel Number

**Results:** The 5 MHz *UMTS 9341 RRH 60W 1900 MHz System*, Transceiver System, is compliant with the manufacturer's rated power level at the transmit antenna terminal for the above listed carrier frequencies.

**Block Diagram Of The Power Measurement Test Set-Up And Test Equipment Configuration for the Alcatel-Lucent UMTS Distributed Base Station**

**PART 2.1047 MEASUREMENTS REQUIRED: MODULATION CHARACTERISTICS**

The modulation accuracy was measured at the Equipment Antenna Terminal (EAC) for the lowest settable, the mid-band and the highest settable carriers over the spectrum 1930-1990 MHz, as previously cited. In accordance with ETSI TS 25.141, the Error Vector Magnitude (EVM) was measured for a single modulation scheme:

1. Test Model 5-44 modulation with 44 active channels that include 8 HSDPA channels. TM5-44 with 44 active channels (16QAM) and the power level set to Pmax (+47.8 dBm). The Error Vector Magnitude limit is EVM < 12.5% for 16QAM.

**TM5-44: with 44 Active Channels, Including 8 HSDPA (High Speed Downlink Packet Access)**  
**ETSI TS 25.141 Rel 7, Table 6.6A : Test Model 5 Active Channels**

Type	Number of Channels	Fraction of Power (%)
P-CCPCH+SCH	1	7.9
Primary CPICH	1	7.9
PICH	1	1.3
S-CCPCH containing PCH (SF=256)	1	1.3
DPCH (SF=128)	30	14
HS-SCCH	2	4
HS-PDSCH (16 QAM)	8	63.6

**Minimum Standard Requirement:** The minimum standard requirement is that the RMS Error Vector Magnitude (EVM) average shall be less than 12.5% for TM5-44.

**Test Set-up and Configuration:** Same as previously used for Part 2.1046 RF Power Measurement, with exception that the FSEM30 Spectrum Analyzer is replaced by:

- 1) Agilent E4406A VSA Series Transmitter Tester, 7 MHz – 4.0 GHz, SN US41513199
- 2) The VSA measurement set up was for Composite Modulation Accuracy with 10 sweeps for test.

**TEST RESULTS:****RMS Error Vector Magnitude (EVM) Measurement Summary at the Antenna Terminal:**

UMTS PCS Frequency Block	Broadband PCS Frequency Block	Power Level at Antenna Terminal	UMTS1900 Channel No.	UMTS 1900 Carrier Center Frequency MHz	RMS EVM TM5-44 <12.5 % Average	RMS EVM TM5-44 <12.5 % Peak Hold
A1	Lowest Settable	47.8 dBm	12	1932.5	6.67 %	7.64 %
B1	Mid Band	47.8 dBm	112	1952.5	6.48 %	8.49 %
C5	Highest Settable	47.8 dBm	287	1987.5	6.43 %	7.35 %

**RESULTS:** The *UMTS 9341 RRH 60W 1900 MHz System*, Transceiver System, demonstrated full compliance with the modulation accuracy requirements specified in ETSI TS 25.141. All EVM measurements were less than the 12.5% RMS limitation, respectively, as tabulated above.

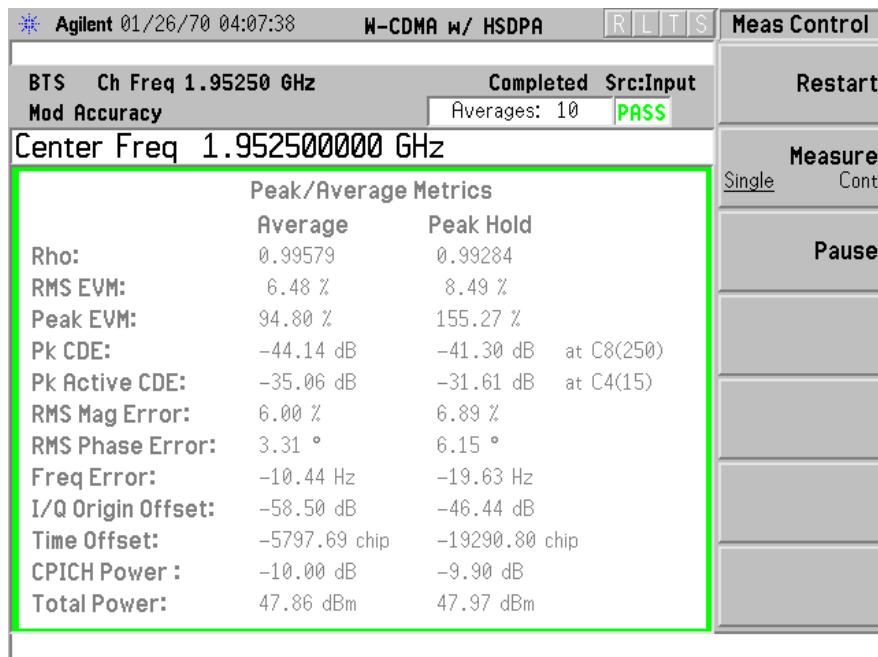
## Lowest Settable Carrier - TM5-44 Modulation

**TM5-44 Modulation Characteristics: UARFCN Channel Number 12 @ 1932.5 MHz**  
**Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier**

Agilent 01/26/70 04:04:55		W-CDMA w/ HSDPA		R	L	T	S	Measure
BTS Ch Freq 1.93250 GHz		Completed		Src:Input				Channel Power
Mod Accuracy		Averages: 10		PASS				ACPR (ACLR)
Peak/Average Metrics								Intermod
		Average		Peak Hold				Multi Carrier Power
Rho:		0.99554		0.99420				Spectrum Emission Mask
RMS EVM:		6.67 %		7.64 %				Occupied BW
Peak EVM:		95.94 %		141.80 %				More (1 of 3)
Pk CDE:		-44.03 dB		-42.21 dB at C8(0)				
Pk Active CDE:		-34.81 dB		-32.45 dB at C4(6)				
RMS Mag Error:		6.12 %		7.02 %				
RMS Phase Error:		3.72 °		6.10 °				
Freq Error:		-11.47 Hz		-23.59 Hz				
I/Q Origin Offset:		-58.17 dB		-46.55 dB				
Time Offset:		-3861.53 chip		-19155.15 chip				
CPICH Power :		-10.00 dB		-9.91 dB				
Total Power:		47.68 dBm		47.77 dBm				

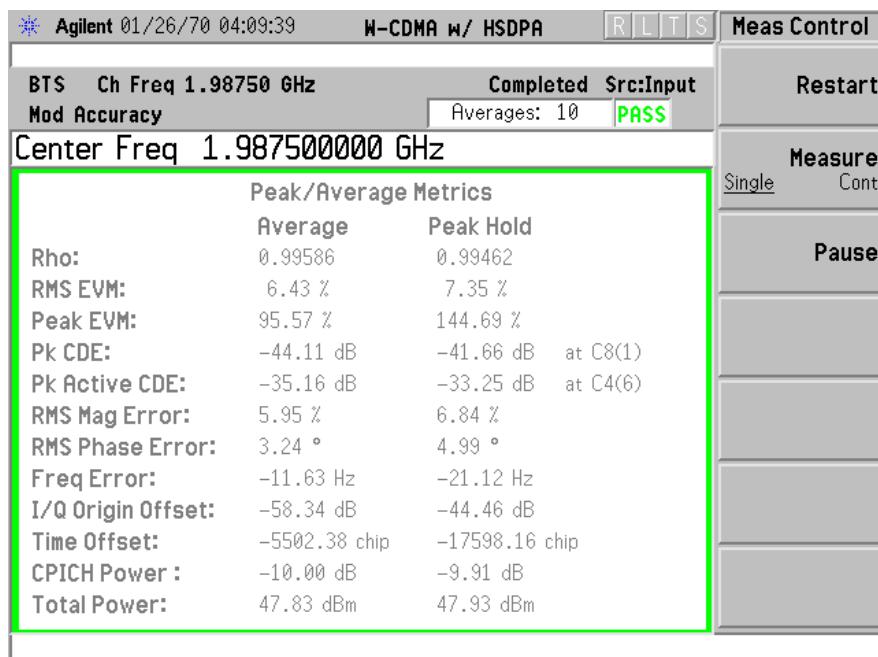
## Mid-Band Carrier - TM5-44 Modulation

**TM5-44 Modulation Characteristics: UARFCN Channel Number 112 @ 1952.5 MHz**  
**Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier**



## Highest Settable Carrier - TM5-44 Modulation

**TM5-44 Modulation Characteristics: UARFCN Channel Number 287 @ 1987.5 MHz**  
**Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier**



**PART 2.1049 MEASUREMENTS REQUIRED: OCCUPIED BANDWIDTH - SINGLE CARRIER**

The occupied bandwidth was measured at the Equipment Antenna Terminal (EAC) for each of the nine, UMTS 1900 MHz, 5 MHz carriers. The power level was set to 60 Watts (+47.8 dBm). Two ETSI Test Modulation schemes were utilized:

- 1) TM1-64 with up to 68 active channels, consisting of 64 Voice + 4 Control active channels, for 9 carriers measured as previously cited, and
- 2) TM5-44 with up to 44 active channels, consisting of 30 Voice + 8 HSDPA + 6 Control active channels, where HSDPA = High Speed Downlink Packet Access. Since the test results were consistent from carrier to carrier between the two test modulations (TM), three carriers were sufficient for this modulation: the lowest settable, the mid-band and the highest settable.

The occupied bandwidth was measured by two methods:

1. The carrier 99% power bandwidth, which is also the necessary bandwidth, using an Agilent E4406A VSA Series Transmitter Tester (SN US41513199).
2. Emission mask limitation using a Rohde & Schwarz: Spectrum Analyzer FSEM30 (SN 835533/003), to demonstrate compliance with the ETSI TS 25.141 emission mask requirements and with Part 24.238.

**Method 1:** The carrier 99% power bandwidth was measured at the Equipment Antenna Terminal (EAC) with the 5 MHz carrier set to +47.8 dBm and modulated first with TM1-64 (9 carriers) and then with TM5-44 (3 carriers). The necessary bandwidth measurement results show that the carrier is within the manufacturer's rated 5 MHz bandwidth for all carriers measured, and for both modulation schemes, as tabulated below. For brevity, the data plots that are attached show the lowest settable, the mid-band and the highest settable carriers/channels for both TM1-64 and TM5-44 modulations. All measurement results are tabulated below.

UMTS PCS Carrier	Broadband PCS Frequency Block	Power Level at Antenna Terminal	UMTS1900 Channel No.	UMTS 1900 Carrier Center Frequency MHz	99% Bandwidth TM1-64	99% Bandwidth TM5-44
A1	Lowest Settable	+47.8 dBm	12	1932.5	4.1024 MHz	4.1013 MHz
A3	Highest Settable	+47.8 dBm	62	1942.5	4.1023 MHz	
D	Center	+47.8 dBm	87	1947.5	4.1042 MHz	
B1	Lowest Settable	+47.8 dBm	112	1952.5	4.1031 MHz	4.1090 MHz
B3	Highest Settable	+47.8 dBm	162	1962.5	4.1063 MHz	
E	Center	+47.8 dBm	187	1967.5	4.1045 MHz	
F	Center	+47.8 dBm	212	1972.5	4.1034 MHz	
C3	Lowest Settable	+47.8 dBm	237	1977.5	4.1048 MHz	
C5	Highest Settable	+47.8 dBm	287	1987.5	4.1040 MHz	4.1087 MHz

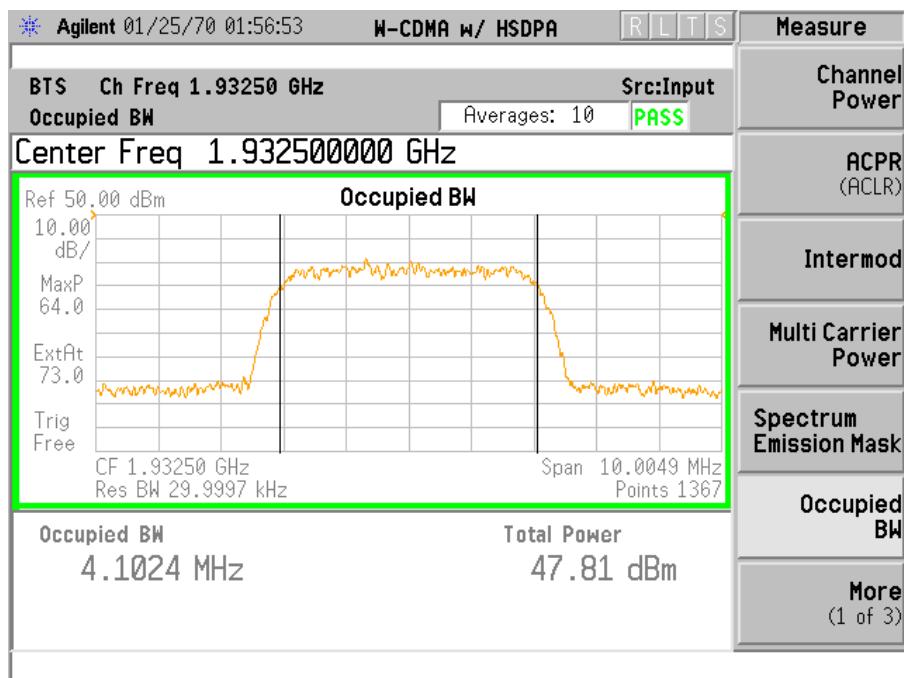
**Results:** For each UMTS 1900 MHz channel, and for each test modulation scheme, the carrier does not exceed 5.0 MHz. The necessary bandwidth and emission designator is consistently **4M10F9W**. The data plots for the above tabulated carriers A1, B1 and C5 are attached for each of the two modulation schemes. The data for the remaining carriers and modulation schemes are retained as permanent records.

The average and range of the 99% power bandwidth/necessary bandwidth measurements are:

Average	4.1047
Max	4.1090
Min	4.1013

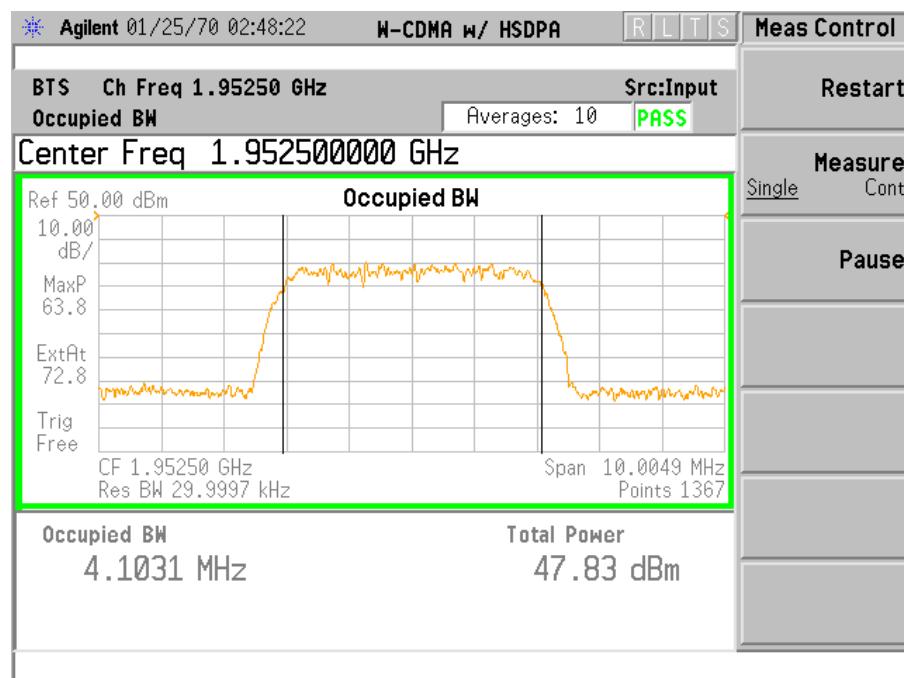
## Lowest Settable Carrier - TM1-64

**TM1-64 99% Bandwidth Characteristics: UARFCN Channel Number 12 @ 1932.5 MHz**  
**Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier**



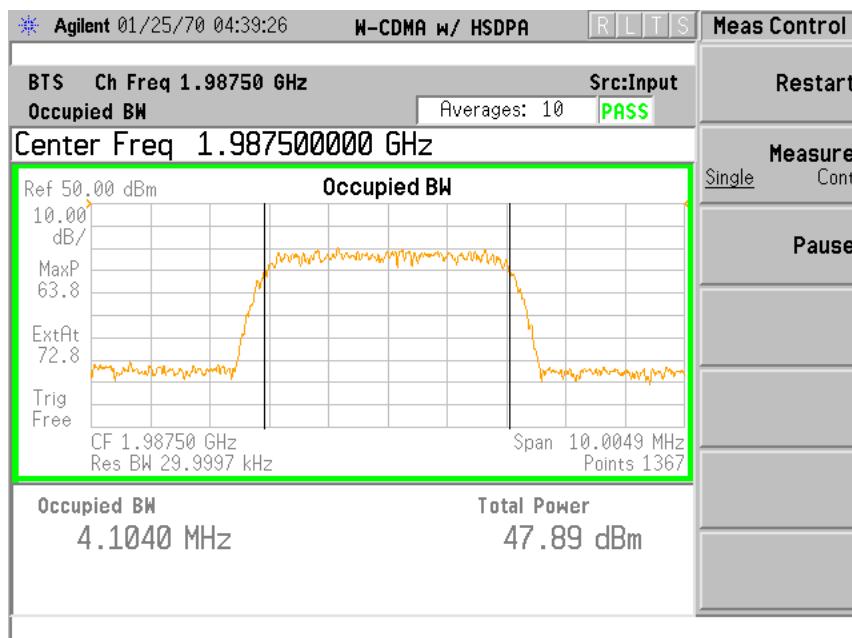
## Mid-Band Carrier - TM1-64

**TM1-64 99% Bandwidth Characteristics: UARFCN Channel Number 112 @ 1952.5 MHz**  
**Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier**



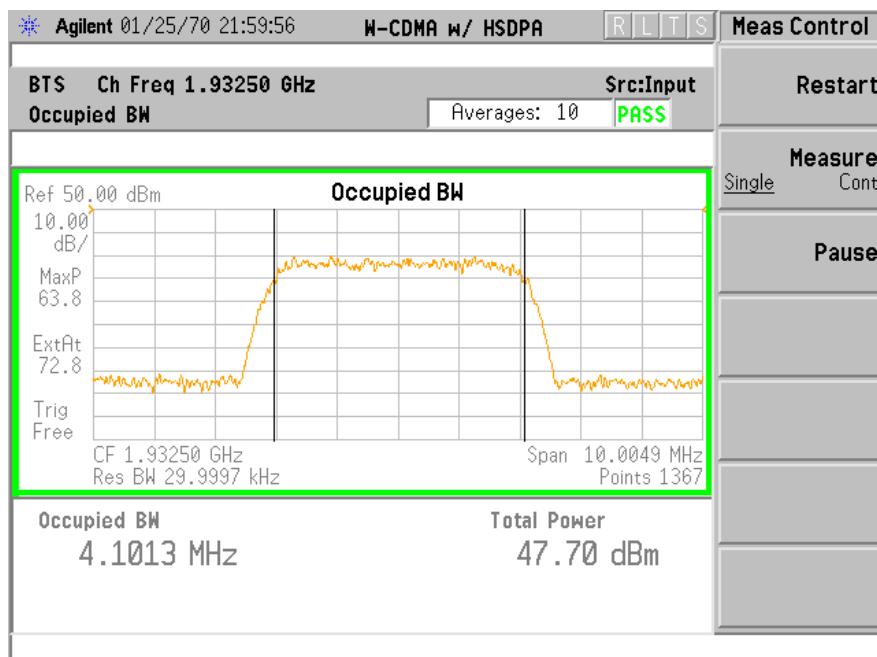
## Highest Settable Carrier - TM1-64

**TM1-64 99% Bandwidth Characteristics: UARFCN Channel Number 287 @ 1987.5 MHz**  
**Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier**



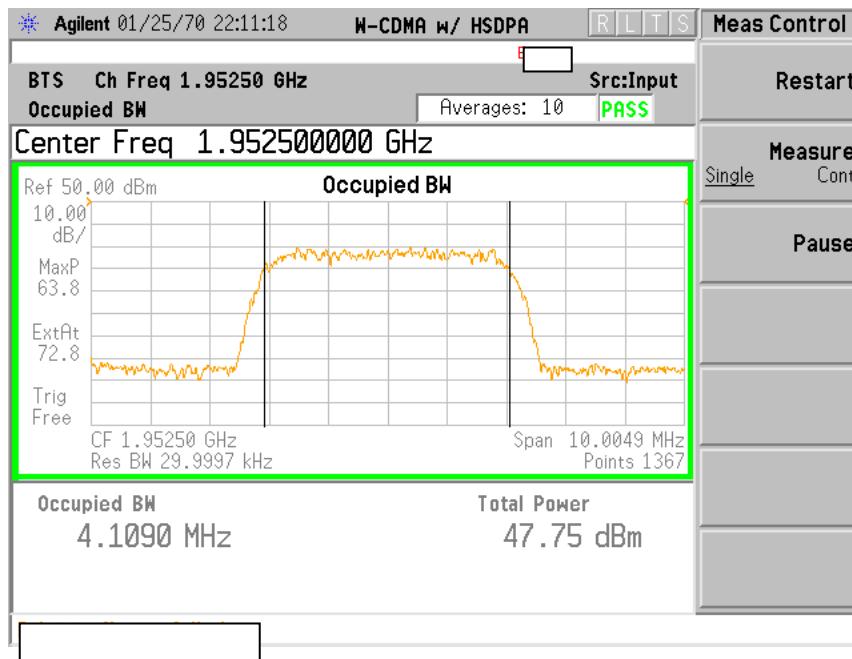
## Lowest Settable Carrier - TM5-44

**TM5-44 99% Bandwidth Characteristics: UARFCN Channel Number 12 @ 1932.5 MHz**  
**Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier**



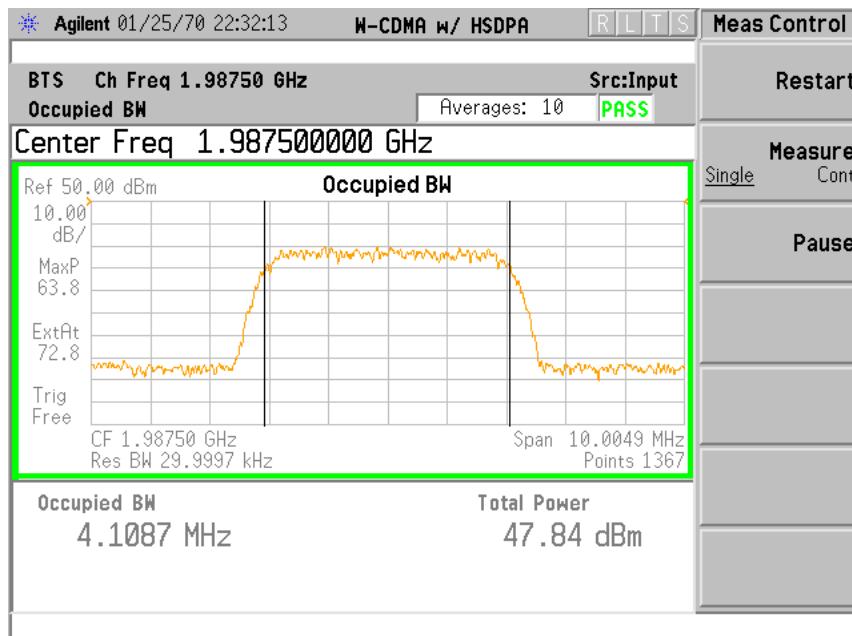
## Mid-BandCarrier - TM5-44

**TM5-44 99% Bandwidth Characteristics: UARFCN Channel Number 112 @ 1952.5 MHz**  
**Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier**



## Highest Settable Carrier - TM5-44

**TM5-44 99% Bandwidth Characteristics: UARFCN Channel Number 287 @ 1987.5 MHz**  
**Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier**



## PART 2.1049 MEASUREMENTS REQUIRED: OCCUPIED BANDWIDTH - SINGLE CARRIER

## - CONTINUED -

**Method 2.** Emission mask limitation using a Rohde & Schwarz: Spectrum Analyzer FSEM30 (SN 835533/003) with Total Integrated Laboratory Environment (TILE) test software.

Measurement of the occupied bandwidth emission characteristics was performed at the Equipment Antenna Terminal (EAC) with the 5 MHz carrier set to +47.8 dBm for each of the 9 carriers previously cited, and for the TM1-64 modulation scheme and to the lowest settable, mid-band and the highest settable for TM5-44. The emission mask used to demonstrate compliance was as specified in ETSI TS 25.141 for  $P \geq +43$  dBm. The mask attenuation values were based on a 30 kHz resolution bandwidth, which made the modulated 5 MHz carrier to be offset from +47.8 dBm by -22.218 dB, in accordance with the equation:

$$\text{Carrier Offset} = 10 \log (30 \text{ kHz}/5 \text{ MHz}) = -22.218 \text{ dB}$$

This series of measurements were performed using the EMC software:

Total Integrated Laboratory Environment (TILE),  
by ETS-Lindgren

For TM1-64, measurements were made at the lowest settable and highest settable carriers for Blocks A, B and C. For TM5-44, measurements were made at the total band lowest settable, mid-band and highest settable carriers. There was no detectable results difference between the two test modulations. For brevity, attached are the data plots for the lowest settable, mid-band and highest settable carriers for both TM1-64 and TM5-44 modulations.

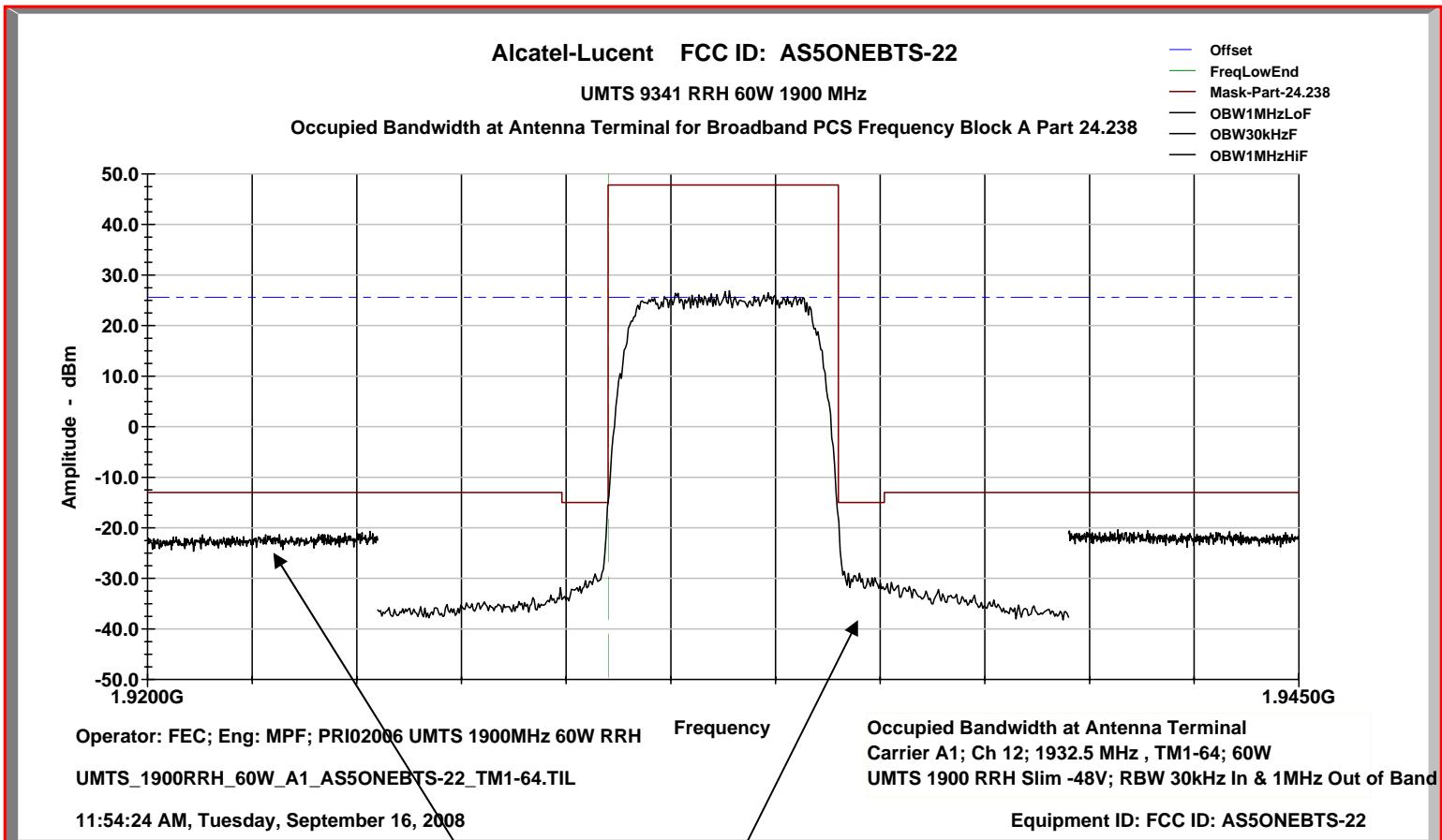
**Test Set-up and Configuration:** Same as previously used for Part 2.1046 RF Power Measurement.

**RESULTS:** The UARFCN 12 (lowest settable), 112 (mid-band), and 287 (highest settable) channels all demonstrate compliance with the emission mask specified by ETSI TS 25.141 for both TM1-64 and TM5-44 test modulations. In each test, the carriers do not exceed the mask limitation.

The data plots are attached below for both the TM1-64 test modulation scheme and the TM5-44 modulation. All nine carriers were evaluated, however, for brevity the lowest settable, mid-band and the highest settable are attached, for each of the two modulation schemes. The remaining tests are retained as a permanent record.

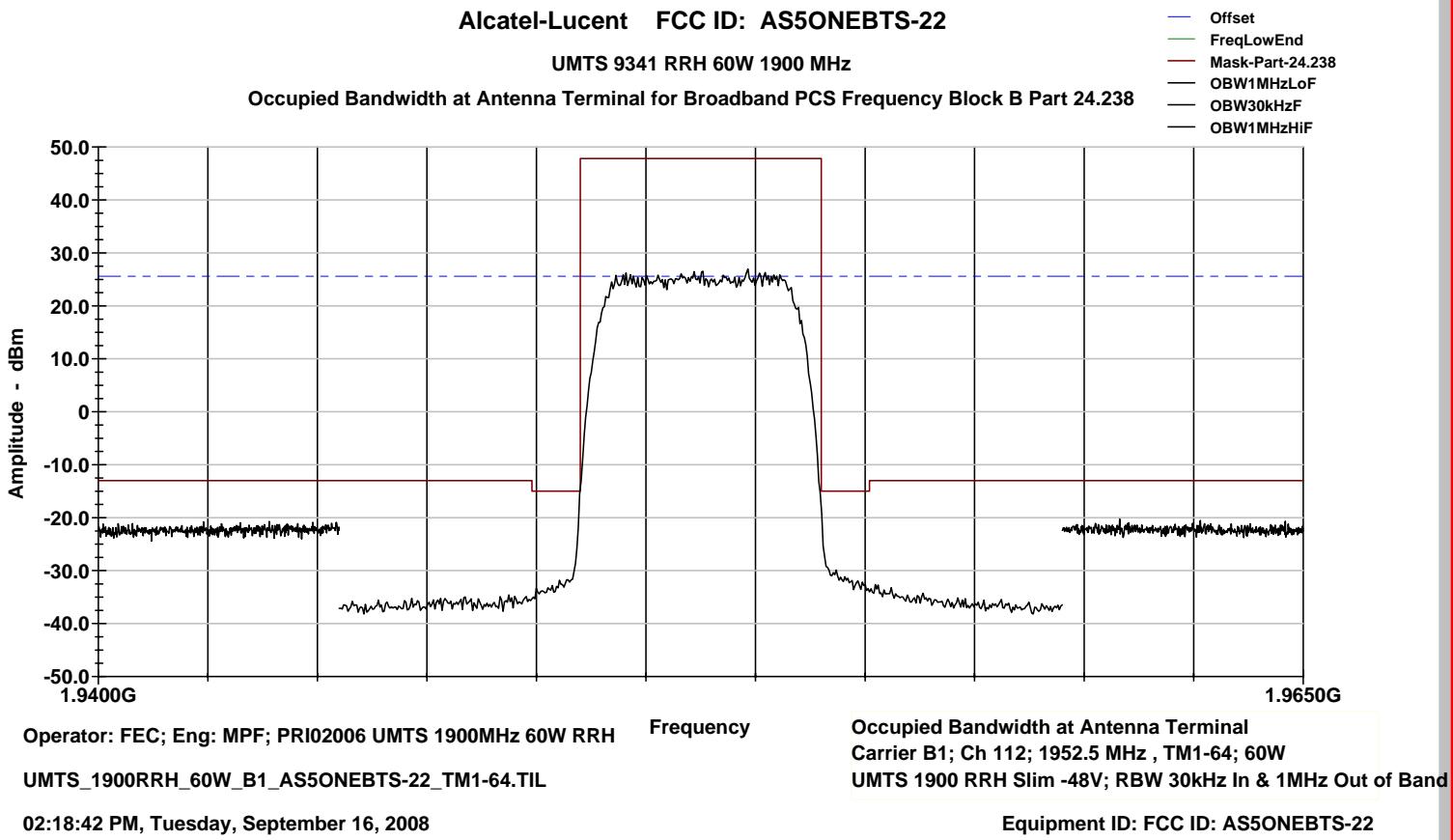
## Lowest Settable Carrier - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN Channel Number 12 @ 1932.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



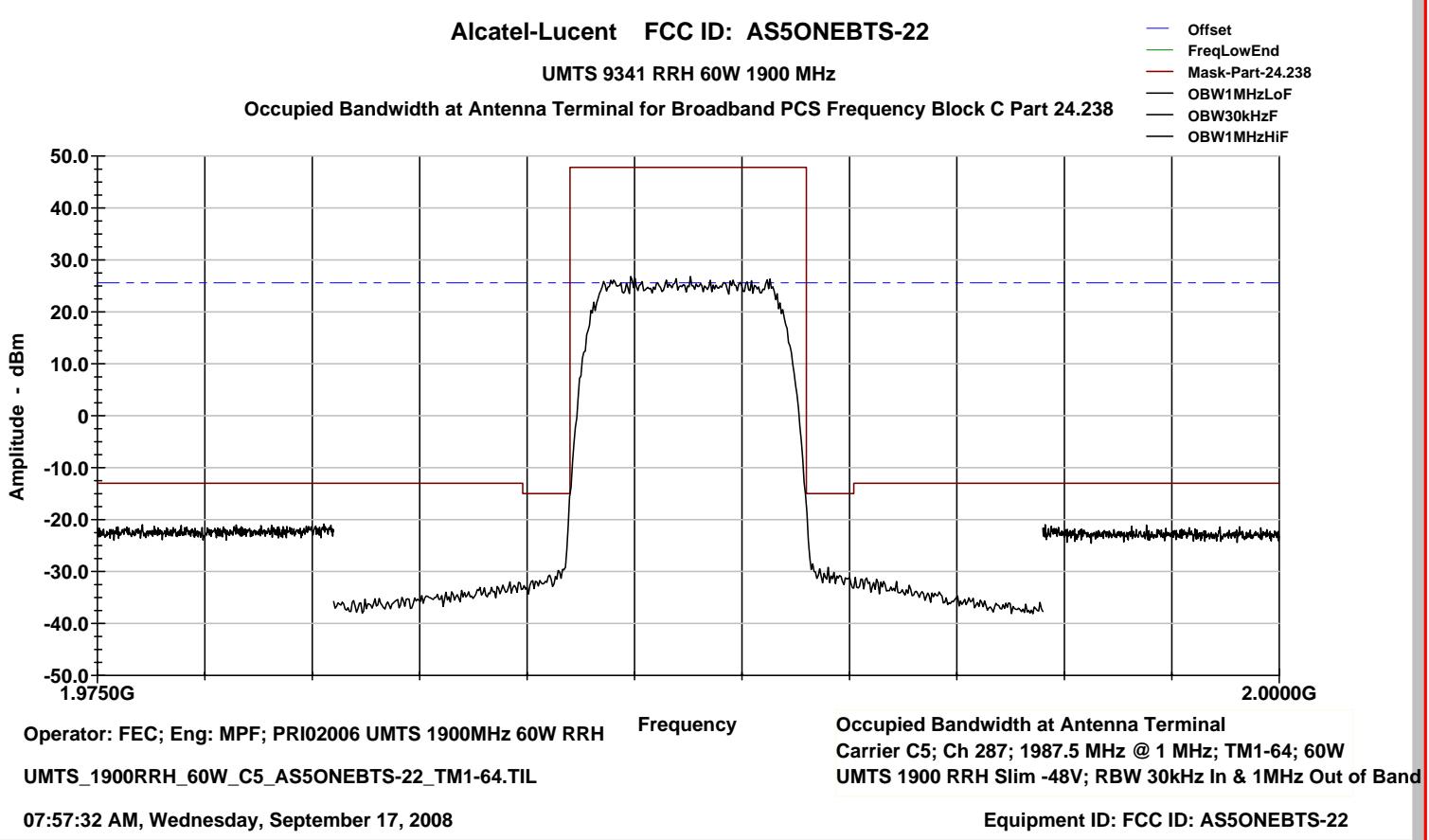
## Mid-Band Carrier - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN Channel Number 112 @ 1952.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



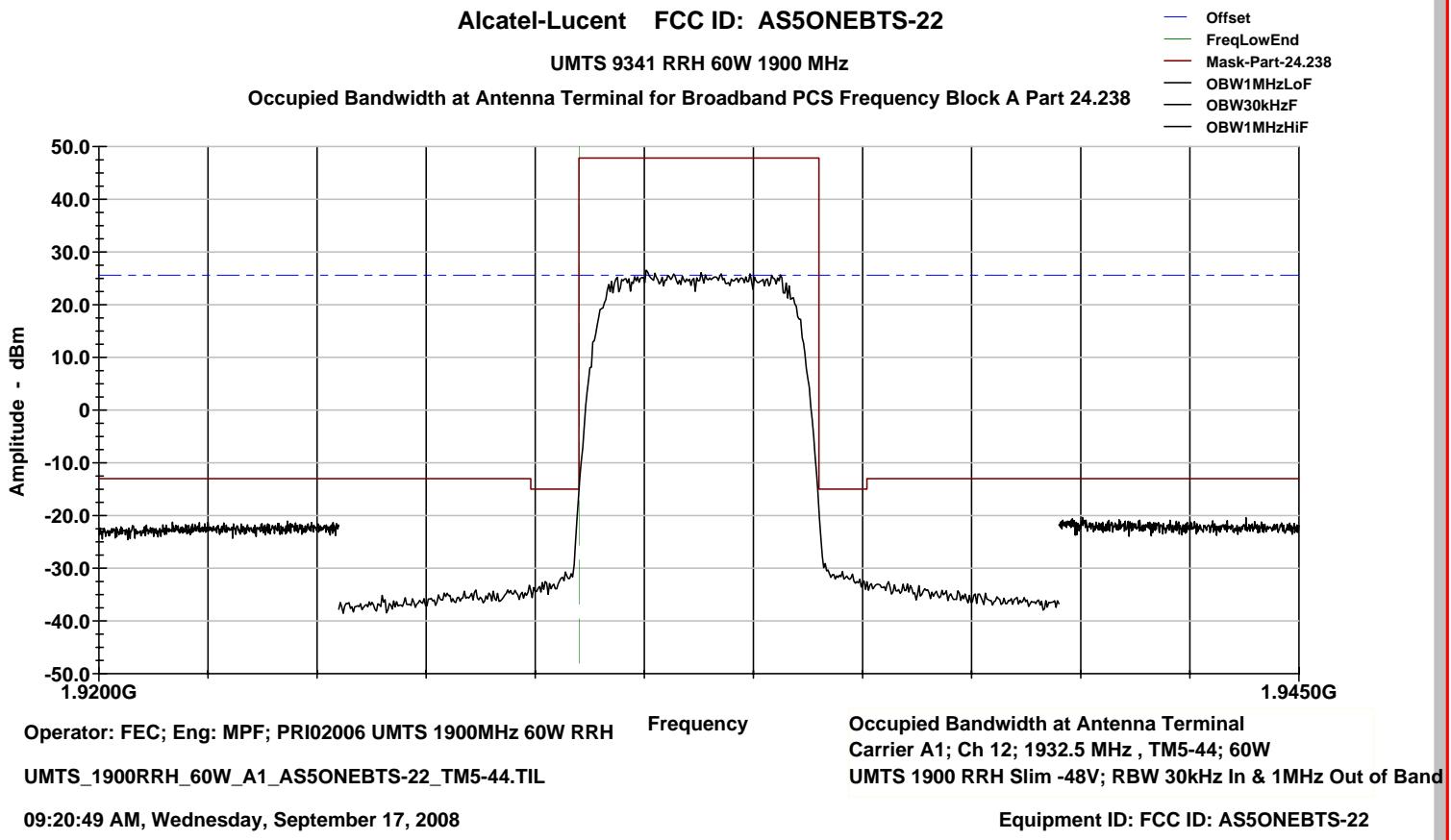
## Highest Settable Carrier - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN Channel Number 287 @ 1987.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



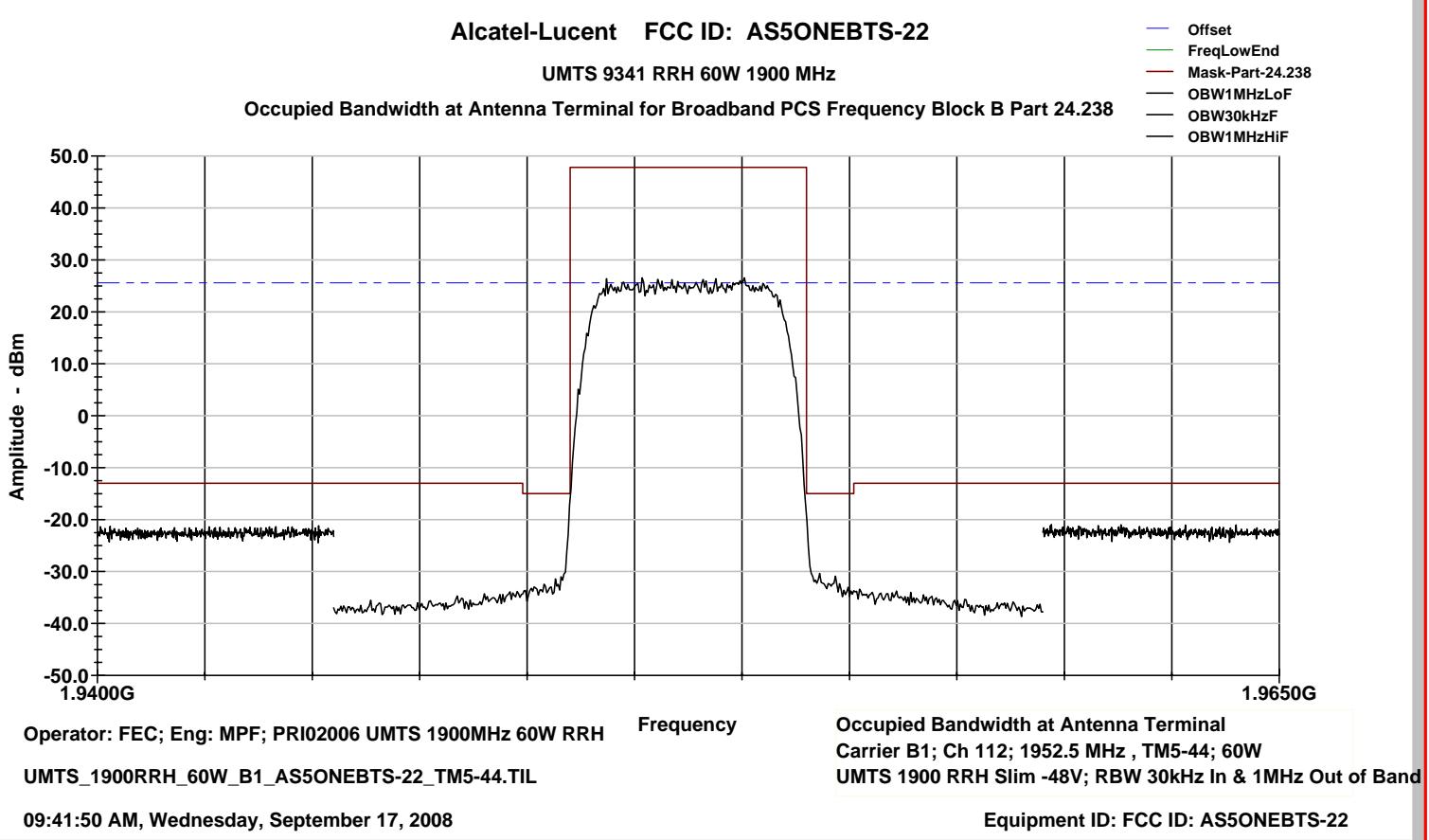
## Lowest Settable Carrier - TM5-44 Test Modulation

Occupied Bandwidth Characteristics: UARFCN Channel Number 12 @ 1932.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



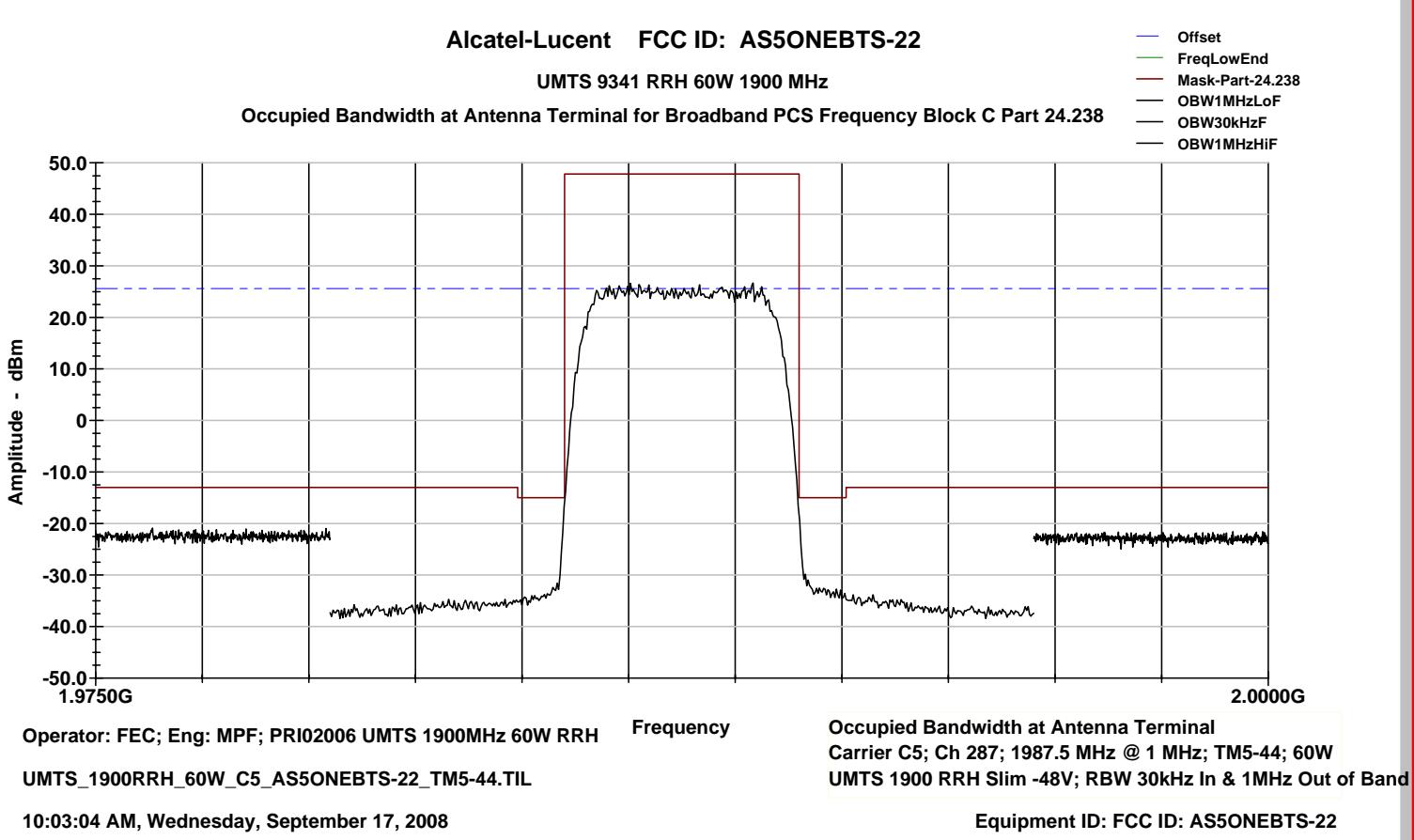
## Mid-Band Carrier - TM5-44 Test Modulation

Occupied Bandwidth Characteristics: UARFCN Channel Number 112 @ 1952.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



## Highest Settable Carrier - TM5-44 Test Modulation

Occupied Bandwidth Characteristics: UARFCN Channel Number 287 @ 1987.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



**PART 2.1049 MEASUREMENTS REQUIRED: OCCUPIED BANDWIDTH - TWO CARRIERS****- CONTINUED -**

**Method 2.** Emission mask limitation using a Rohde & Schwarz: Spectrum Analyzer FSEM30 (SN 835533/003) with Total Integrated Laboratory Environment (TILE) test software.

In addition to single carrier operation at 60W, the *UMTS 9341 RRH 60W 1900 MHz System* can also operate with two adjacent carriers at 30W per carrier with a total composite power of 60W. As with the single carrier measurements, the 2-carrier occupied bandwidth emission characteristics was performed at the Equipment Antenna Terminal (EAC) with each carrier set to 30W/C (+44.8 dBm/Carrier) and to the TM1-64 modulation scheme. The two adjacent carriers were measured and recorded at the lowest settable and the highest settable carrier pairs for the A, B and C Blocks. The emission mask used to demonstrate compliance was as specified in ETSI TS 25.141 for  $P \geq +43$  dBm. The mask attenuation values were based on a 30 kHz resolution bandwidth, which made the modulated 5 MHz carrier to be offset from +44.8 dBm by -22.218 dB, in accordance with the equation:

$$\text{Carrier Offset} = 10 \log (30 \text{ kHz}/5 \text{ MHz}) = -22.218 \text{ dB}$$

This series of measurements were performed using the EMC software:

Total Integrated Laboratory Environment (TILE),  
by ETS-Lindgren

Attached are six data plots showing the lowest settable and the highest settable carrier pairs for the Broadband PCS frequency blocks A, B and C.

**Test Set-up and Configuration:** Same as previously used for Part 2.1046 RF Power Measurement.

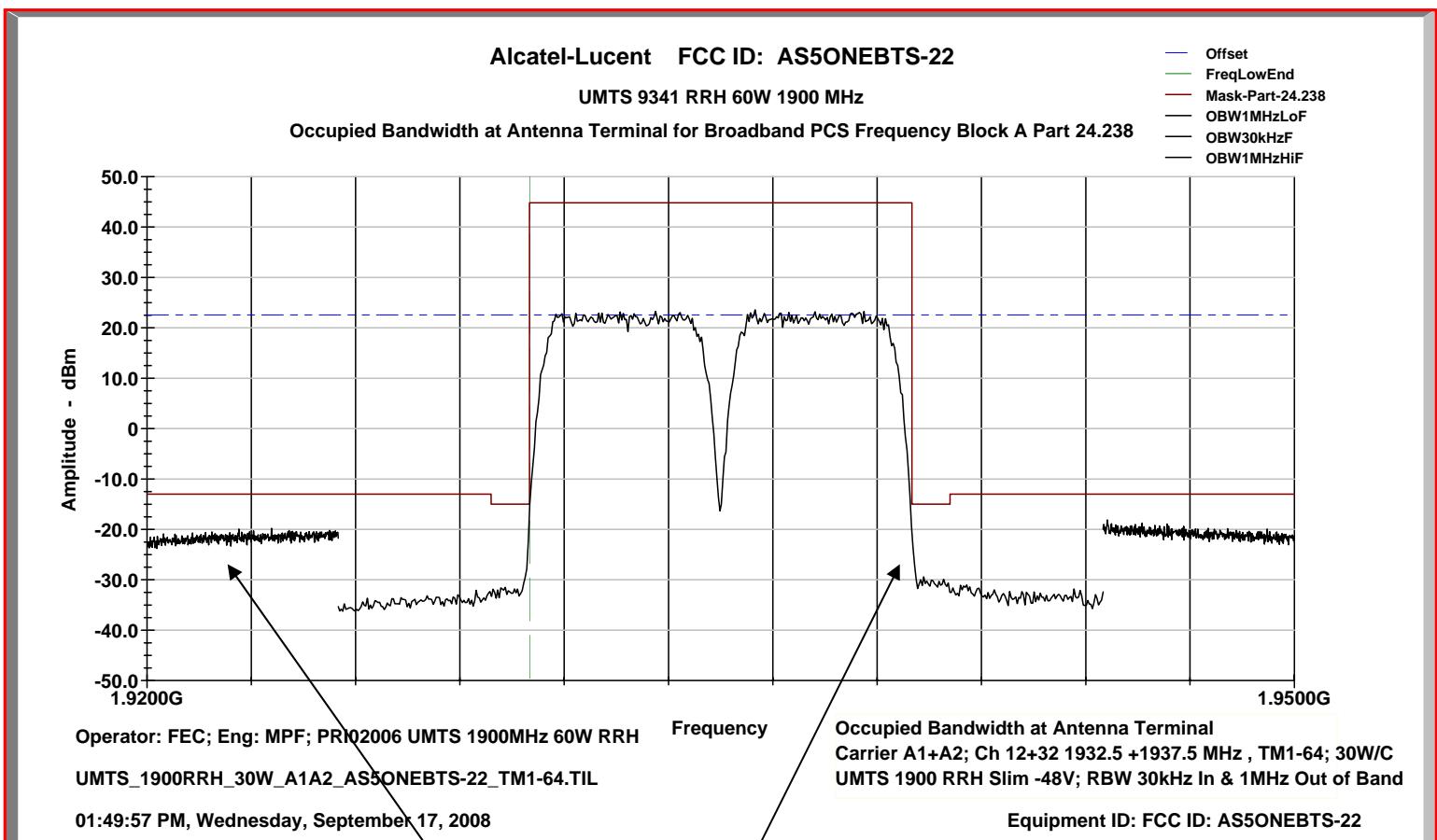
**RESULTS:** In all 2-carrier tests, compliance was demonstrated with the emission mask specified by ETSI TS 25.141. In each test, the carrier pairs do not exceed the mask limitation.

The data plots are attached below showing the lowest settable and the highest settable carrier pairs for the Broadband PCS frequency blocks A, B and C.

## Lowest Settable Carrier Pair - A Block - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN 12 @ 1932.50 MHz + CN 32 @ 1937.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

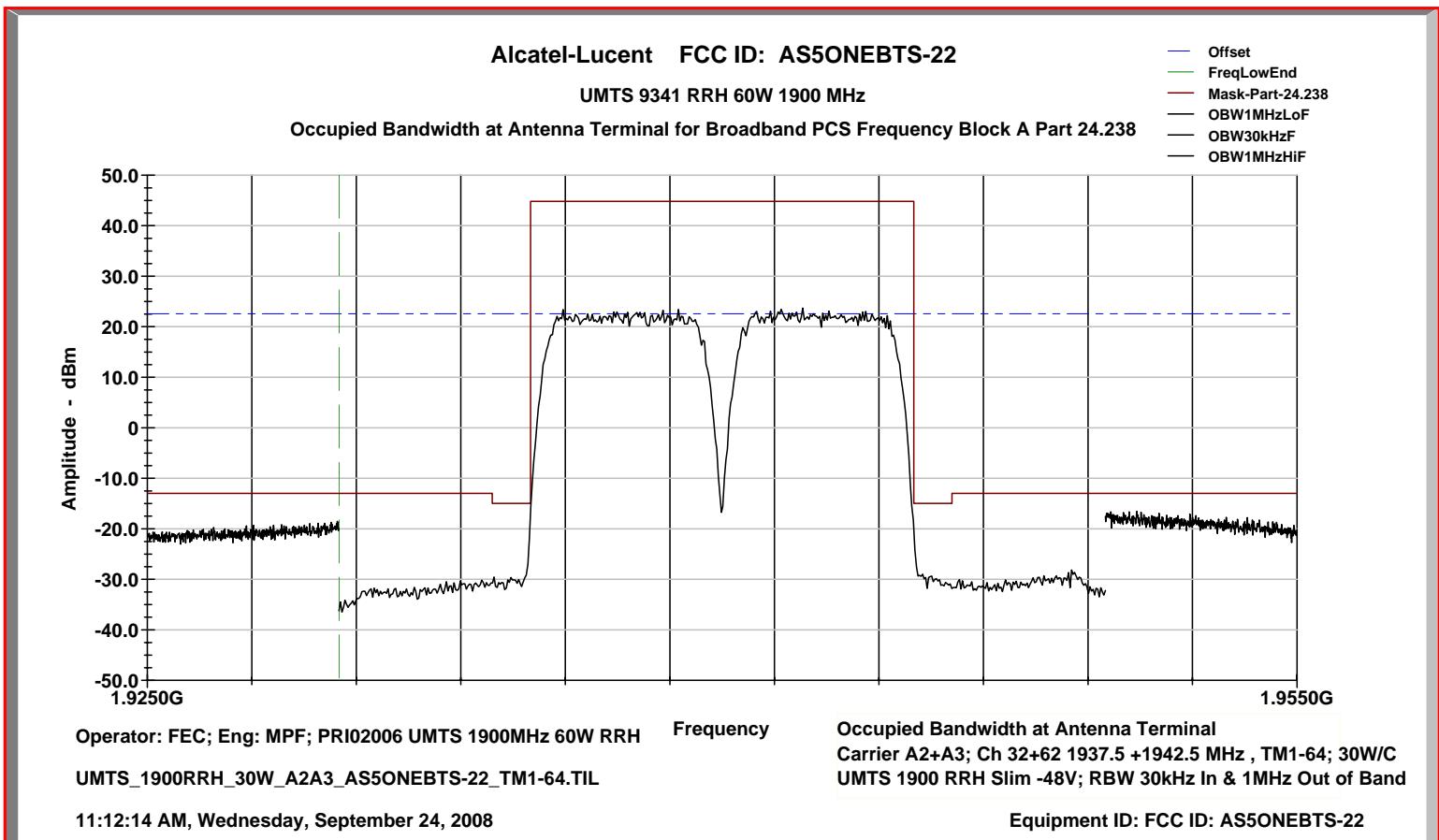
## Two Carrier A1 + A2



## Highest Settable Carrier Pair - A Block - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN 32 @ 1937.5 MHz + CN 62 @ 1942.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

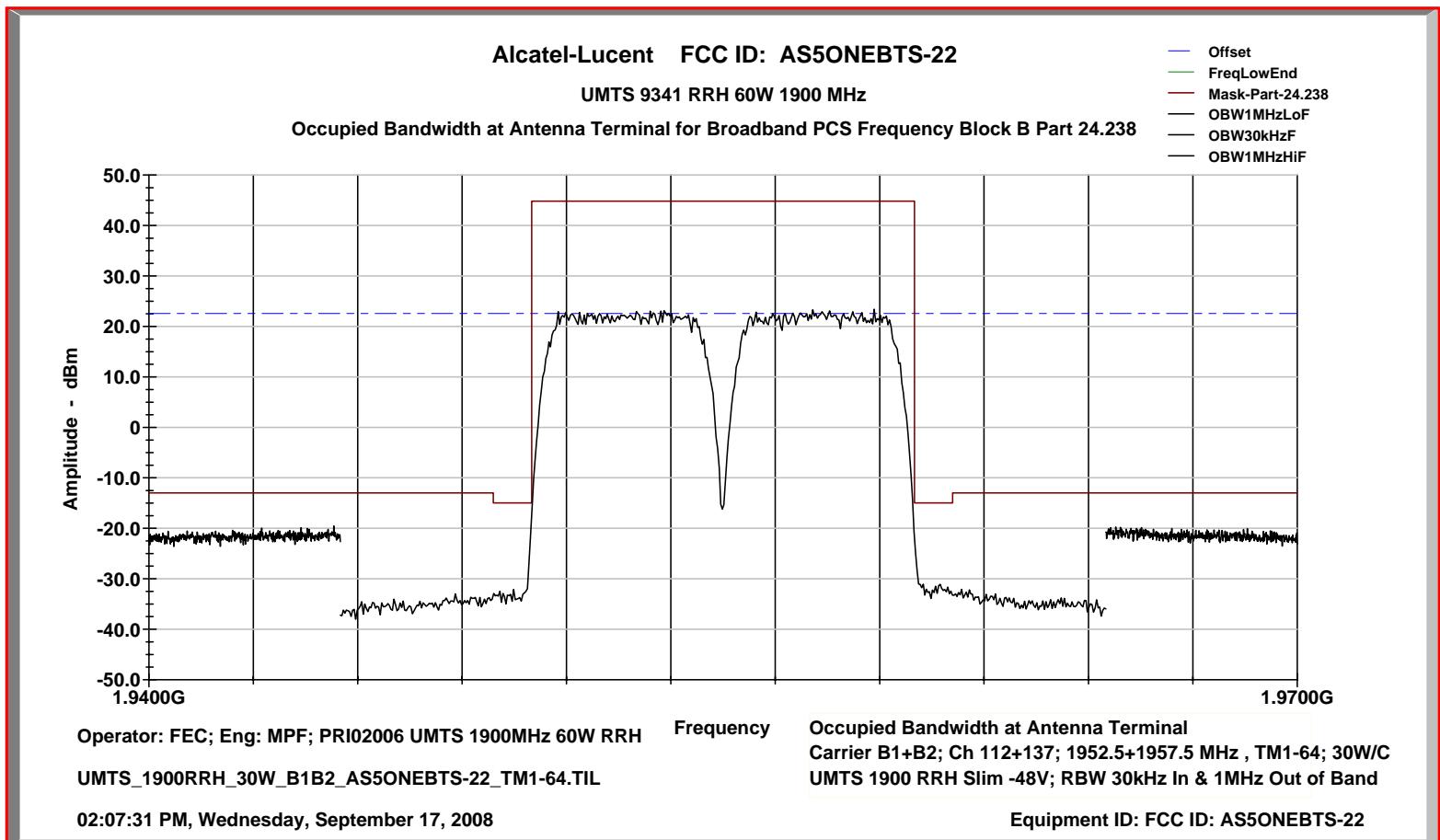
Two Carrier A2 + A3



## Lowest Settable Carrier Pair - B Block - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN 112 @ 1952.5 MHz + CN 137 @ 1957.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

Two Carrier B1 + B2



## Highest Settable Carrier Pair - B Block - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN 137 @ 1957.5 MHz + CN 162 @ 1962.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

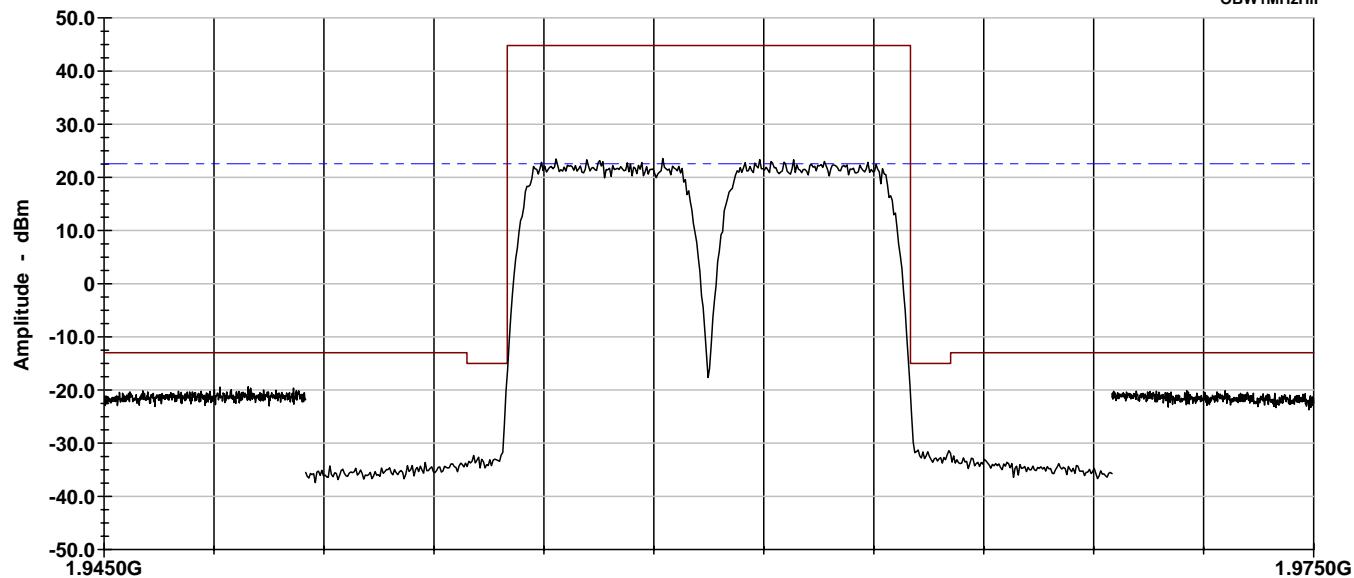
Two Carrier B2 + B3

## Alcatel-Lucent FCC ID: AS5ONEBTS-22

UMTS 9341 RRH 60W 1900 MHz

Occupied Bandwidth at Antenna Terminal for Broadband PCS Frequency Block B Part 24.238

- Offset
- FreqLowEnd
- Mask-Part-24.238
- OBW1MHzLoF
- OBW30kHzF
- OBW1MHzHiF



Operator: FEC; Eng: MPF; PRI02006 UMTS 1900MHz 60W RRH

Frequency

Occupied Bandwidth at Antenna Terminal  
Carrier B2+B3; Ch 137+162; 1957.5 +1962.5 MHz, TM1-64; 30W/C  
UMTS 1900 RRH Slim -48V; RBW 30kHz In & 1MHz Out of Band

UMTS\_1900RRH\_30W\_B2B3\_AS5ONEBTS-22\_TM1-64.TIL

11:11:05 AM, Wednesday, September 24, 2008

Equipment ID: FCC ID: AS5ONEBTS-22

## Lowest Settable Carrier Pair - C Block - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN 237 @ 1977.5 MHz + CN 262 @ 1982.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

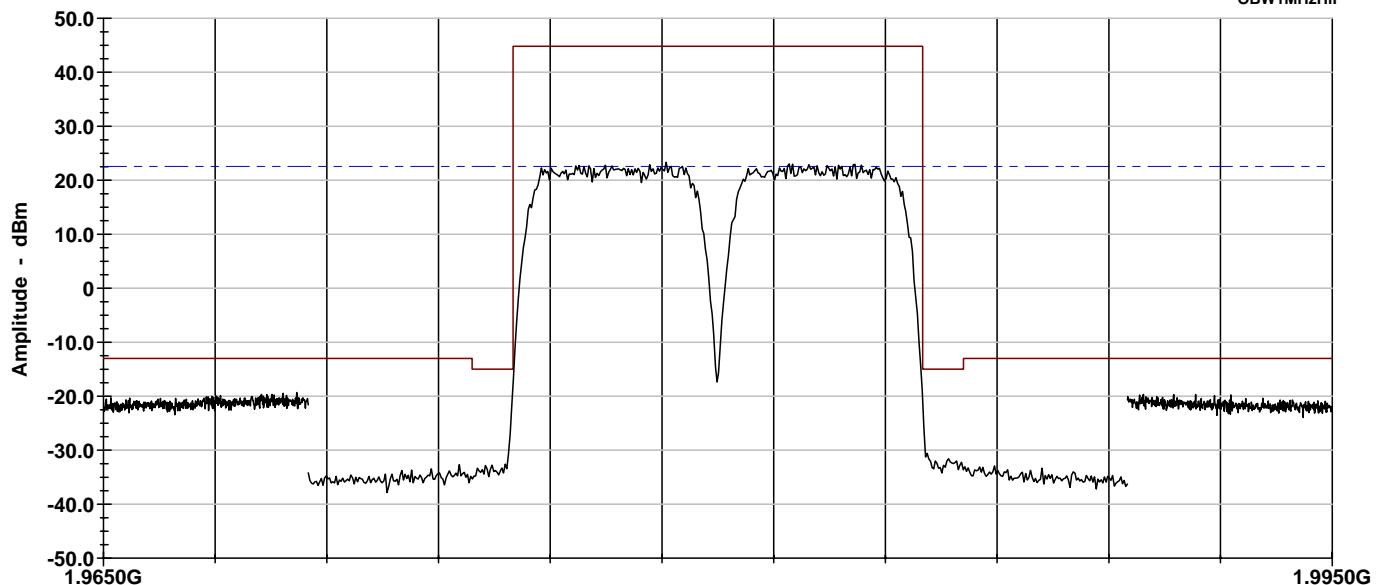
## Two Carrier C3 + C4

Alcatel-Lucent FCC ID: AS5ONEBTS-22

UMTS 9341 RRH 60W 1900 MHz

Occupied Bandwidth at Antenna Terminal for Broadband PCS Frequency Block C Part 24.238

- Offset
- FreqLowEnd
- Mask-Part-24.238
- OBW1MHzLoF
- OBW30kHzF
- OBW1MHzHiF



Operator: FEC; Eng: MPF; PRI02006 UMTS 1900MHz 60W RRH

Frequency

Occupied Bandwidth at Antenna Terminal  
Carrier C3+C4; Ch 237+262; 1977.5+1982.5 MHz @ 1 MHz; TM1-64  
UMTS 1900 RRH; RBW 30kHz In & 1MHz Out of Band at 30W/C

UMTS\_1900RRH\_30W\_C3C4\_AS5ONEBTS-22\_TM1-64.TIL

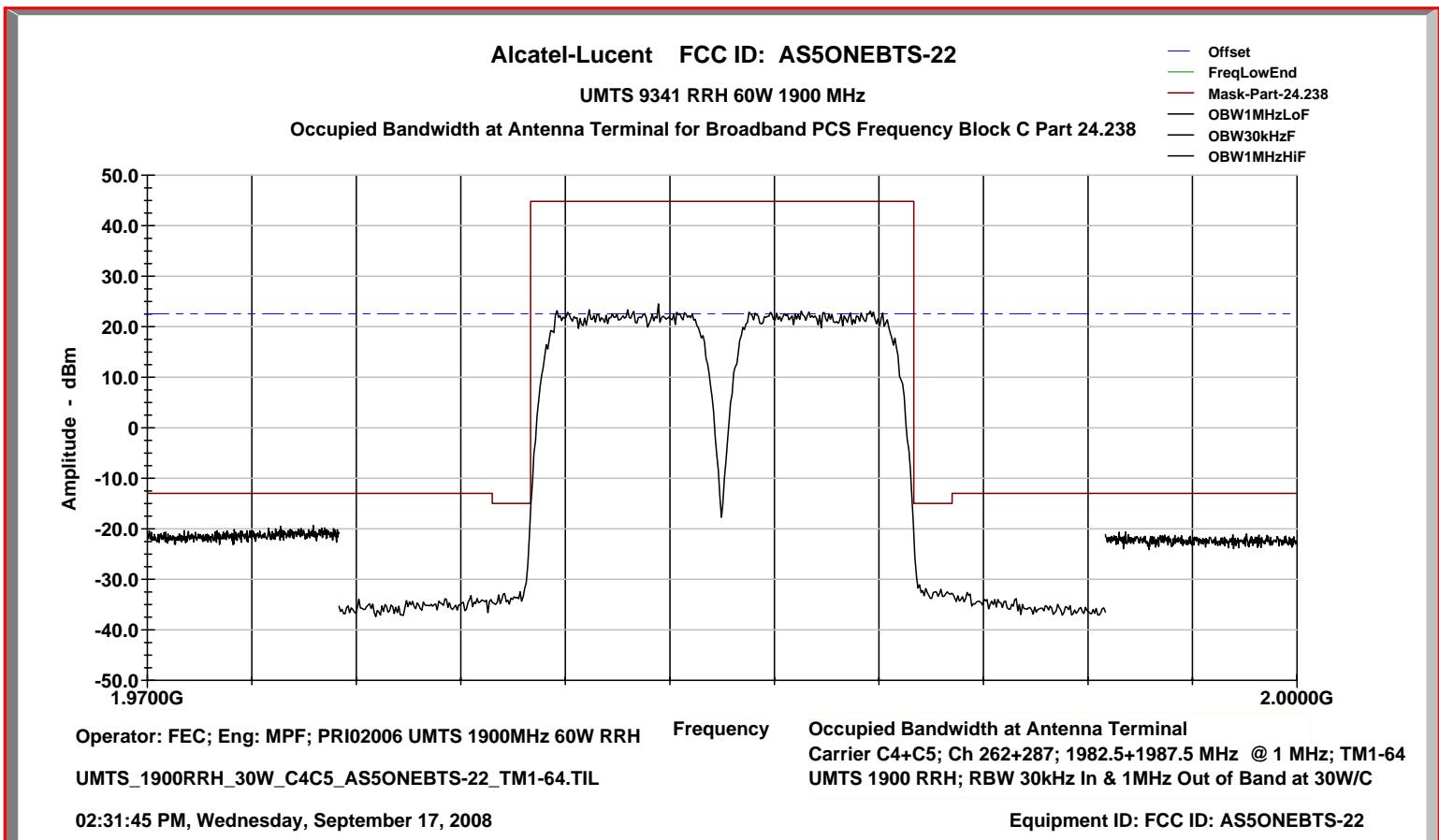
11:10:04 AM, Wednesday, September 24, 2008

Equipment ID: FCC ID: AS5ONEBTS-22

## Highest Settable Carrier Pair - C Block - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN 262 @ 1982.5 MHz + CN 287 @ 1987.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

## Two Carrier C4 + C5



**PART 2.1051 MEASUREMENTS REQUIRED: SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS.**

This test procedure is an extension of the occupied bandwidth measurement at the Equipment Antenna Connector (EAC) terminal, using the same carrier frequencies, power level setting procedure and modulated carrier offset procedure. In accordance with Part 2.1057(a), the required frequency spectrum to be investigated extends from the lowest RF signal generated to the 10<sup>th</sup> harmonic of the carrier at the EAC terminal. The emission limits at the antenna terminal are specified in Part 24.238 (a) ... the power of any emission shall be attenuated below the transmitter power ( $P$ ) by at least  $43 + 10 \log (P)$  dBc. The power  $P$  is the average carrier power measured at the EAC (antenna) terminal in Watts. Setting the power level at EAC to 60 Watts average, produces an emission attenuation below the carrier of 60.78 dBc. Part 24.238 (b) specifies the required Resolution Bandwidth (RBW) to be 1 MHz or greater. In accordance with Part 2.1051, "the magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified"; i.e., these are not reportable. Hence, the measurement equipment must be adjusted and configured to provide an instrumentation noise floor that is at least 20 dB or more below the  $43 + 10 \log (P)$  dBc limit, which equates to 80.78 dBc. The pertinent test parameters are:

1. Frequency Spectrum:	10 MHz to 20 GHz
2. Resolution Bandwidth:	1 MHz or greater (Part 24.238)
3. Emission Limitation:	$43 + 10 \log (P)$ dBc = $43 + 10 \log (60 \text{ Watts})$ = 60.78 dBc
4. Instrumentation Noise Floor:	at least 20 dB greater than " $43 + 10 \log (P)$ dBc" = 80.78 dBc

**Minimum Standard Requirement:**

The emission limits at the antenna terminal are specified in Part 24.238 (a) ... the power of any emission shall be attenuated below the transmitter power ( $P$ ) by at least  $43 + 10 \log (P)$  dBc (i.e., attenuation below the unmodulated carrier). The power  $P$  is the average carrier power measured at the J4 antenna terminal in Watts. The measurement equipment must be adjusted and configured to provide an instrumentation noise floor that is 20 dB or more below the  $43 + 10 \log (P)$  dBc limit. In summary:

1. Carrier Power Level = 47.78 dBm
2. Emission Limitation =  $47.78 \text{ dBm} - 60.78 \text{ dBc} = -13.0 \text{ dBm}$
3. Reportable Emission Limit =  $-13.0 \text{ dBm} - 20 \text{ dBc} = -33.0 \text{ dBm}$
4. Emission power levels less than  $-33.0 \text{ dBm}$  are not reportable; i.e., at  $\geq 80.78 \text{ dBc}$

**Test Set-up and Configuration:** Same as previously used for Part 2.1046 RF Power Measurement.

**Method of Measurement:**

In order to suppress the instrumentation noise floor sufficient to detect and measure spurious signals that have power levels as low as 20 dB below the required limit, or as low as  $-33.0 \text{ dBm}$  (i.e., 80.8 dBc), an EMC software package was employed to drive the spectrum analyzer, collect and compile the acquired data, perform mathematical corrections to the data by incorporating (i.e., programming) pre-measured path losses into the software, and then generate a graphical display as shown in this exhibit. The software package is: *TILE/IC (Total Integrated Laboratory Environment/Instrument Control System)*; purchased and licensed from ETS-Lindgren. The instrumentation noise floor is suppressed by the software's ability to split the spectrum being measured into many small segments, perform the mathematical corrections to each segment, and then sequentially compile all the segments into a continuous graphical display.

Part 24.238 requires that emissions over the required spectrum 10 MHz to 20 GHz be measured using an instrumentation resolution bandwidth of 1 MHz or greater. The TILE/IC software was able to sufficiently suppress the normally high noise floor by measuring the spectrum in a sequential series of short segments using a peak detector, in combination with an appropriate low-pass filter and then with an appropriate high-pass filter, installed at the input terminal of the spectrum analyzer, to prevent the carrier from over driving the spectrum analyzer. The spectrum portion 1930 MHz – 1990 MHz, in close proximity to the carrier, was measured without filters.

The specific EMC test filters used were manufactured by TRILITHIC, Inc., Indianapolis, IN:

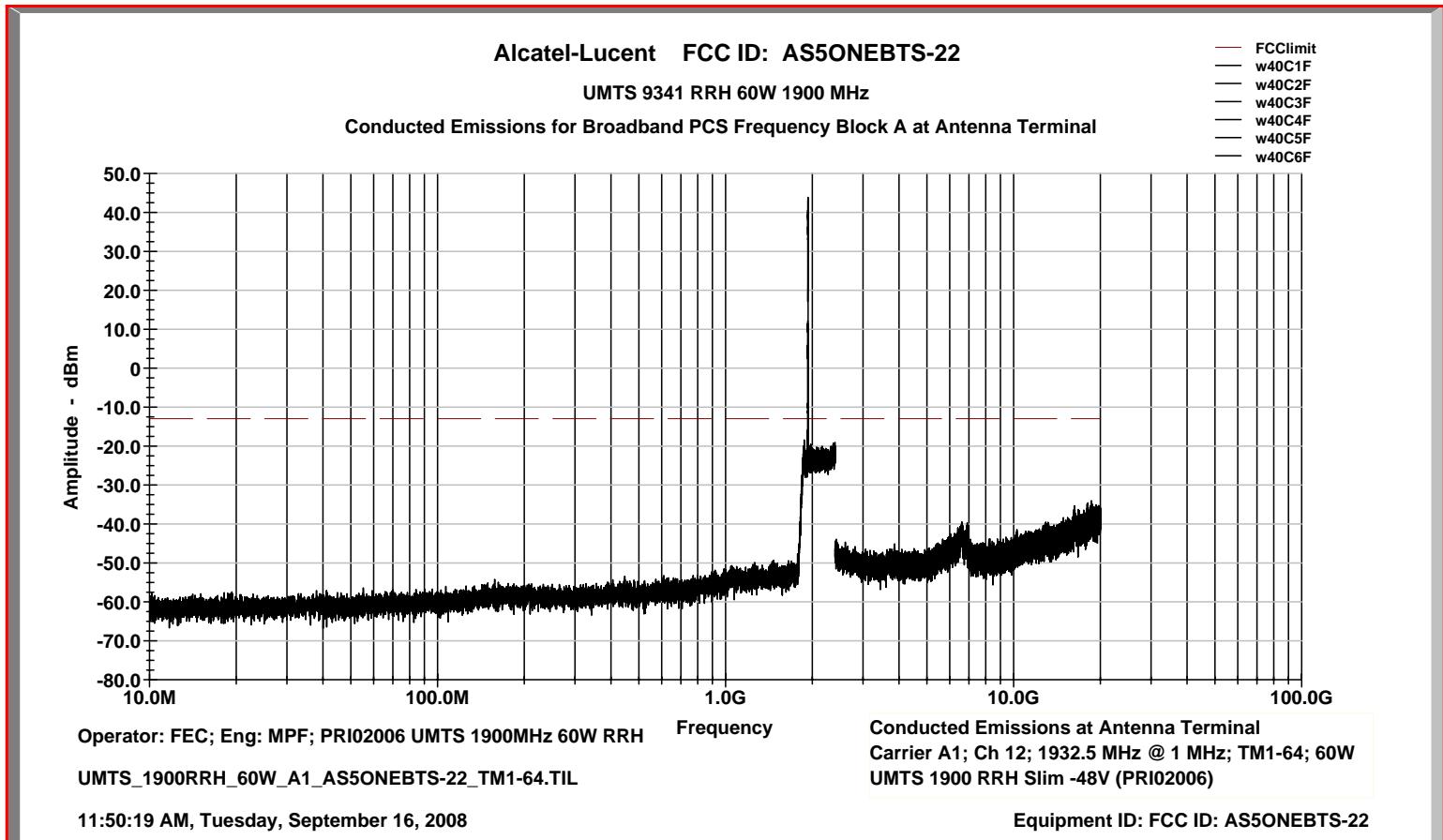
1. Low Pass Filter: Model 10LC800-3-AA; Product No. 23042
2. High Pass Filter: Model 4HC1400/8000-1-KK; Product No. 23042

This test procedure was conducted in conjunction with the previously cited occupied bandwidth tests for single carrier at 60W and for 2 adjacent carriers at 30W per carrier, as previously cited, plus the same two test modulations: TM1-64 and TM5-44, as used for the occupied bandwidth tests.

**Results:** For each UMTS carrier, there were no reportable emissions for either a single carrier at 60W or for 2 adjacent carriers at 30W per carrier. Data plots for the lowest settable, mid-band and the highest settable single carriers with each of the two test modulations: TM1-64 and TM5-44, are attached to this exhibit. The remaining carrier tests and data plots are retained as a permanent record.

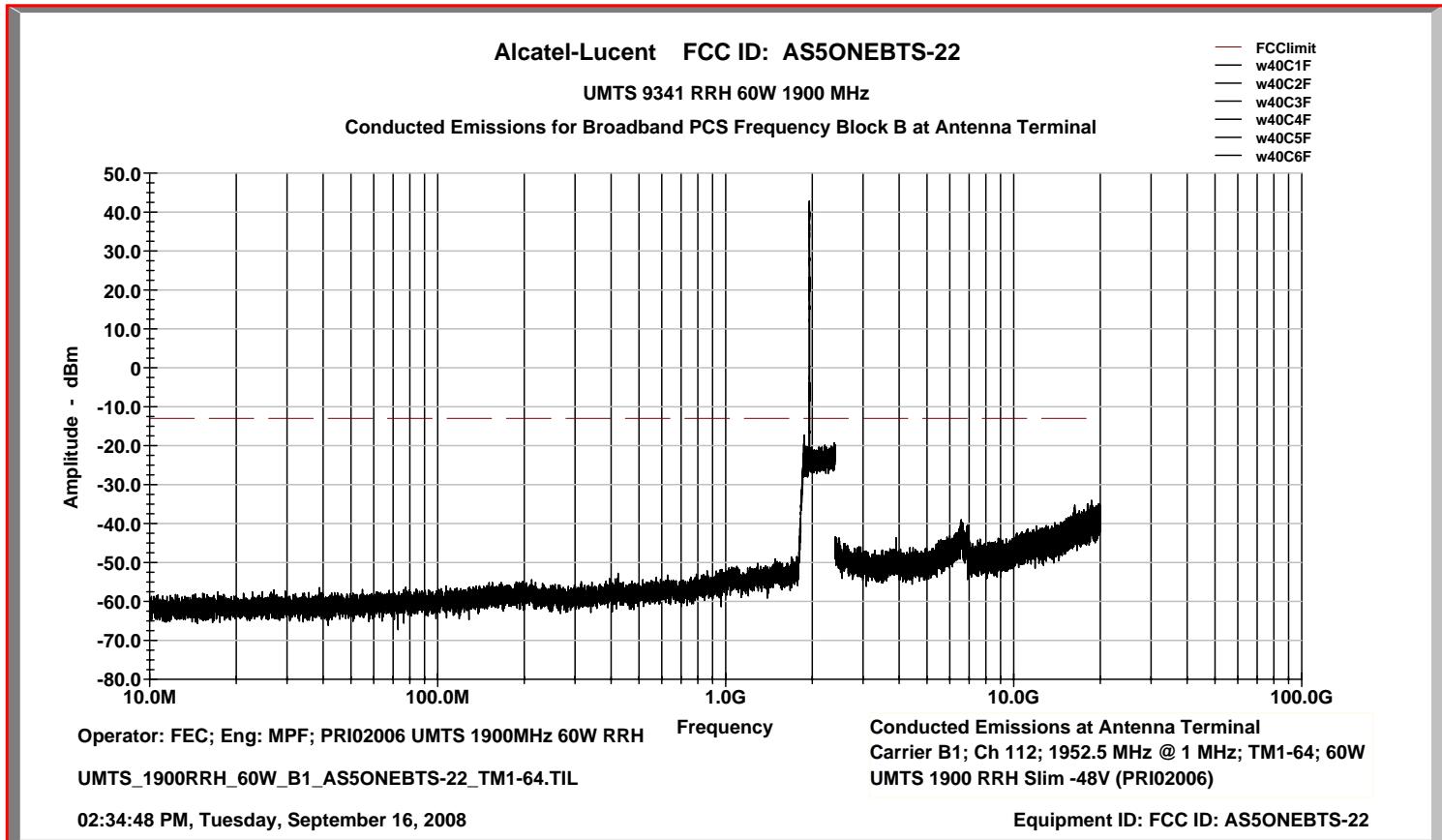
## Lowest Settable Carrier - TM1-64 Test Modulation

Conducted Emissions Characteristics: UARFCN Channel Number 12 @ 1932.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



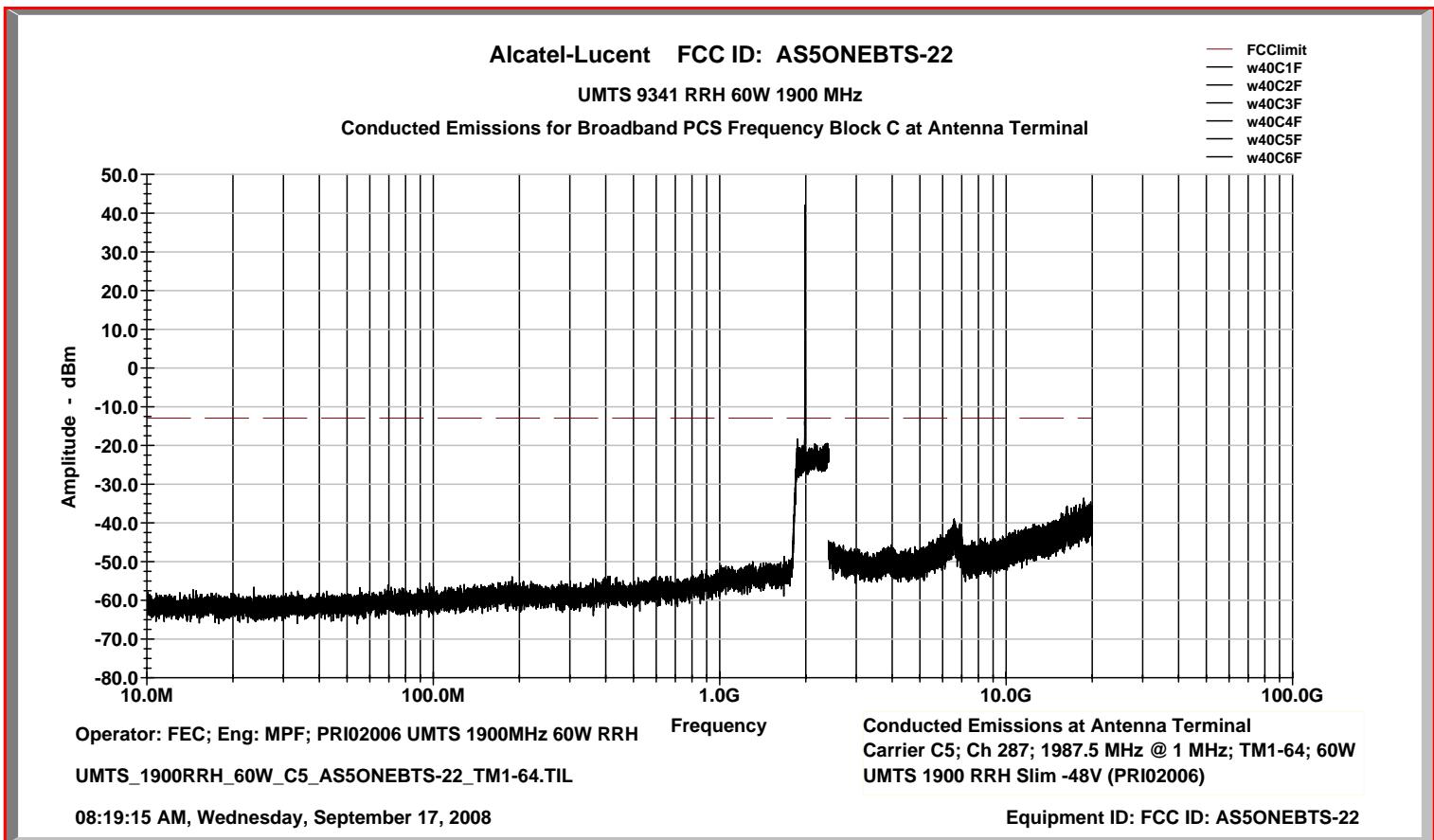
## Mid-Band Carrier - TM1-64 Test Modulation

Conducted Emissions Characteristics: UARFCN Channel Number 112 @ 1952.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



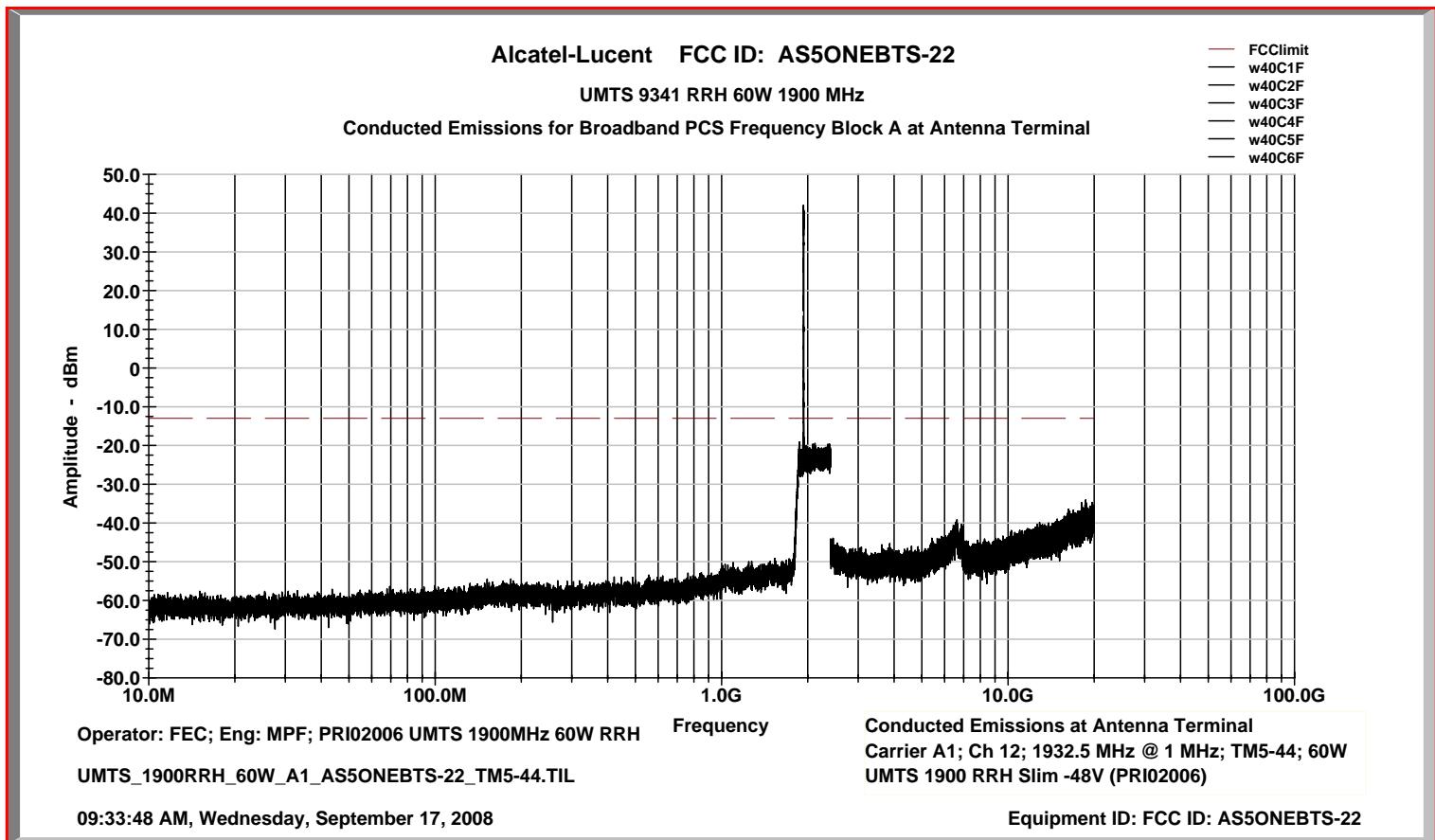
## Highest Settable Carrier - TM1-64 Test Modulation

Conducted Emissions Characteristics: UARFCN Channel Number 287 @ 1987.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



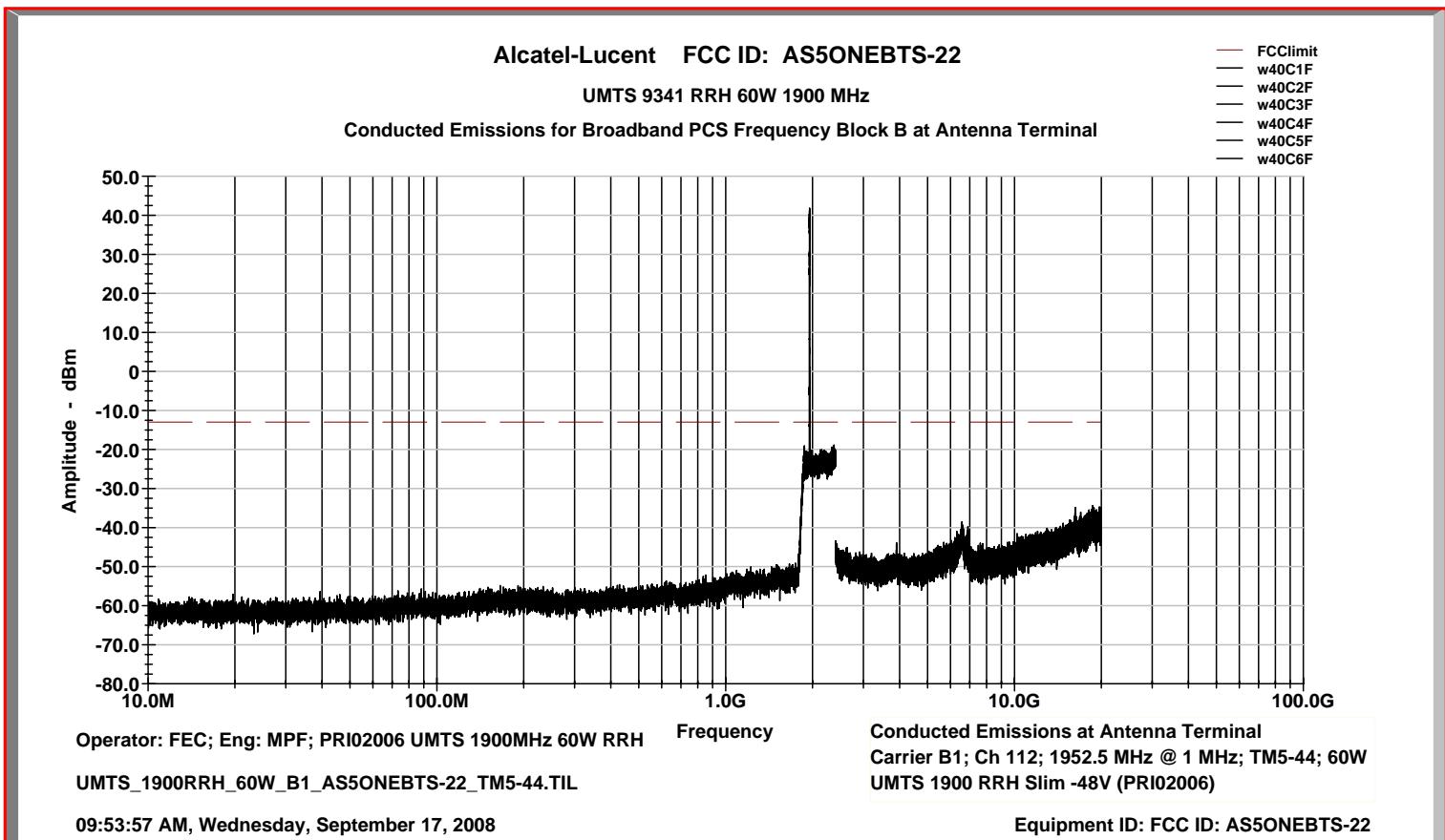
## Lowest Settable Carrier - TM5-44 Test Modulation

Conducted Emissions Characteristics: UARFCN Channel Number 12 @ 1932.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



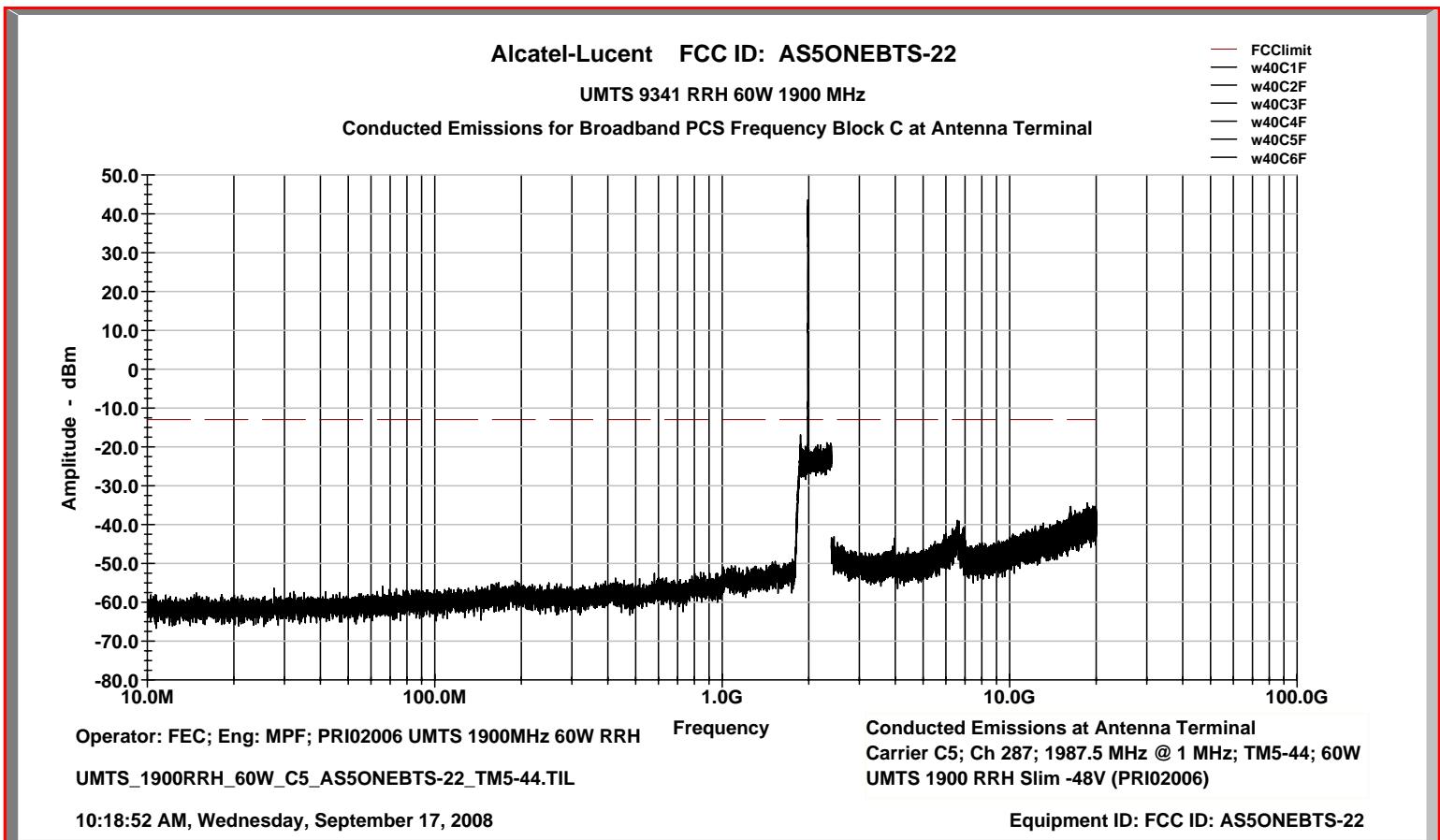
## Mid-Band Carrier - TM5-44 Test Modulation

Conducted Emissions Characteristics: UARFCN Channel Number 112 @ 1952.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



## Highest Settable Carrier - TM5-44 Test Modulation

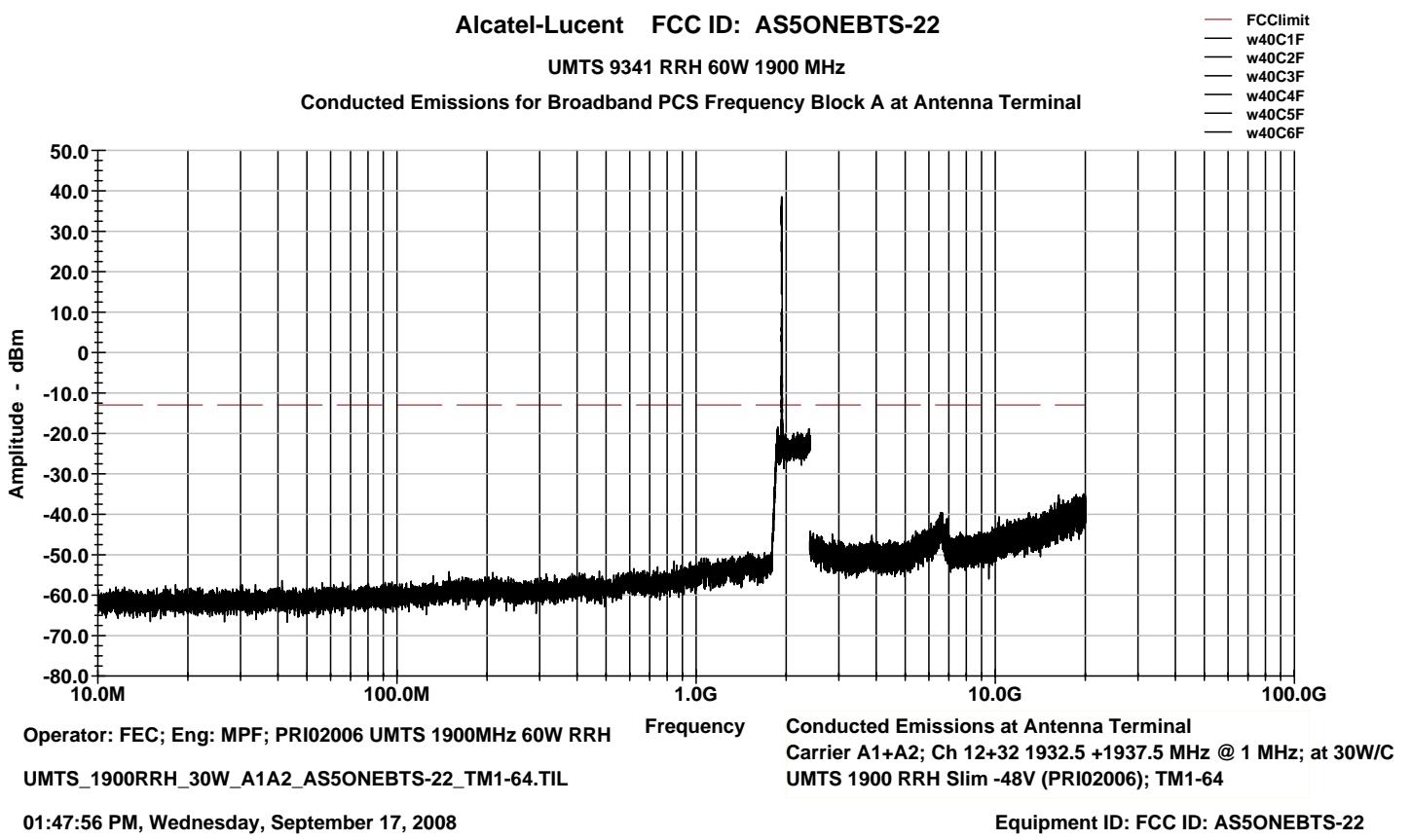
Conducted Emissions Characteristics: UARFCN Channel Number 287 @ 1987.50 MHz  
Tx Antenna Terminal at +47.8 dBm per single 5 MHz carrier



## Lowest Settable Carrier Pair - A Block - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN 12 @ 1932.5 MHz + CN 32 @ 1937.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

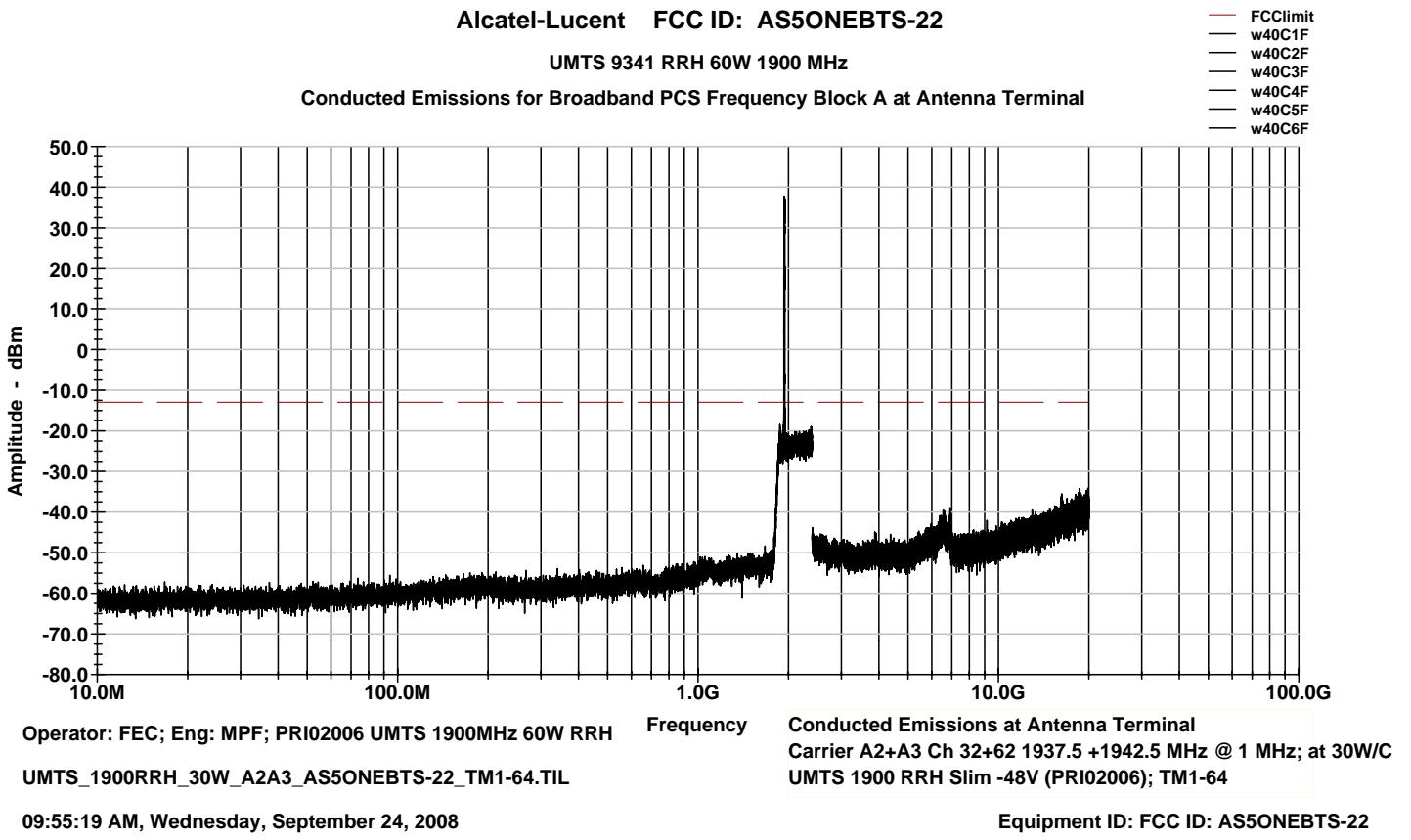
Two Carrier A1 + A2



## Highest Settable Carrier Pair - A Block - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN 32 @ 1937.5 MHz + CN 62 @ 1942.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

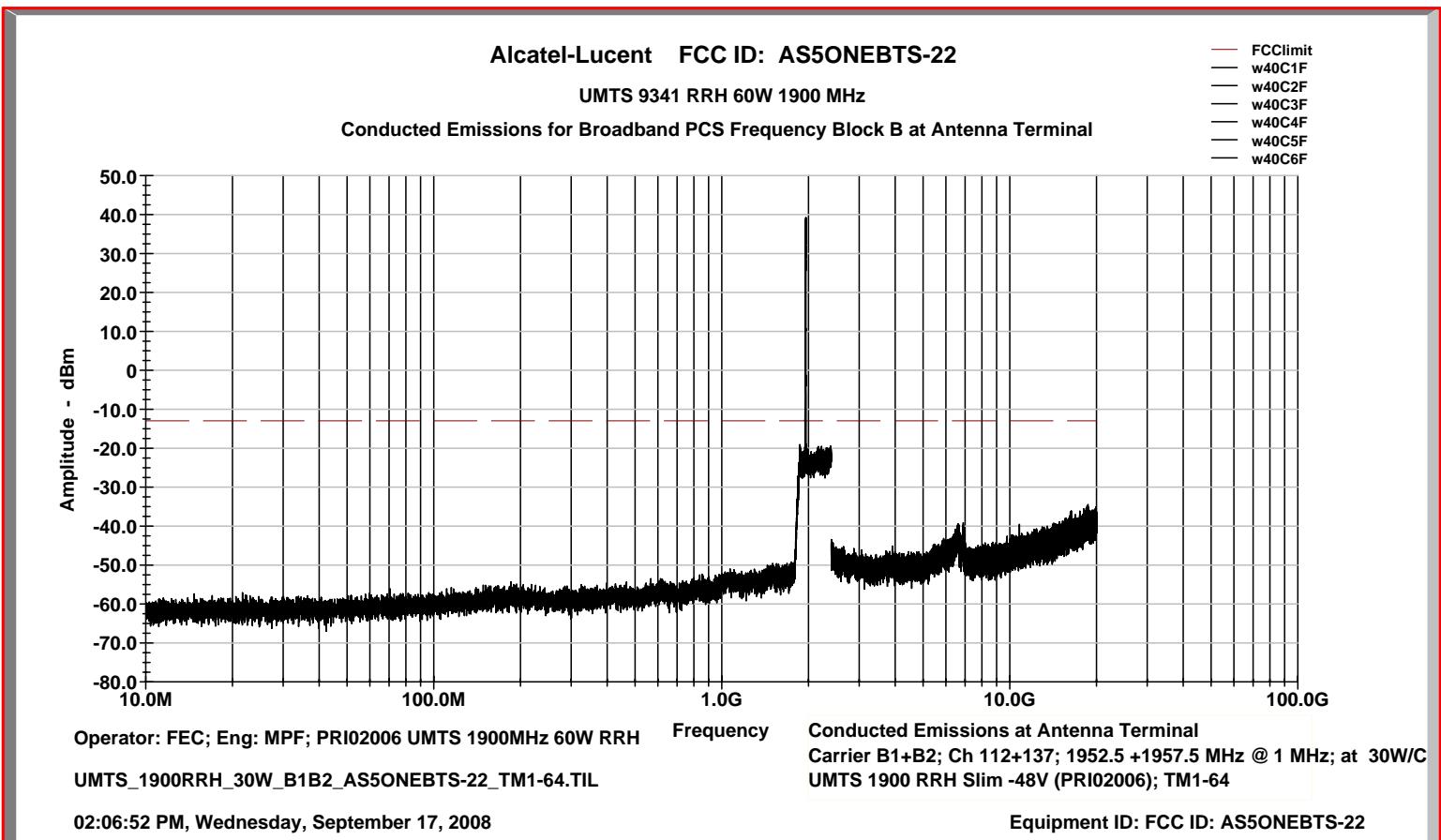
Two Carrier A2 + A3



## Lowest Settable Carrier Pair - B Block - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN 112 @ 1952.5 MHz + CN 137 @ 1957.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

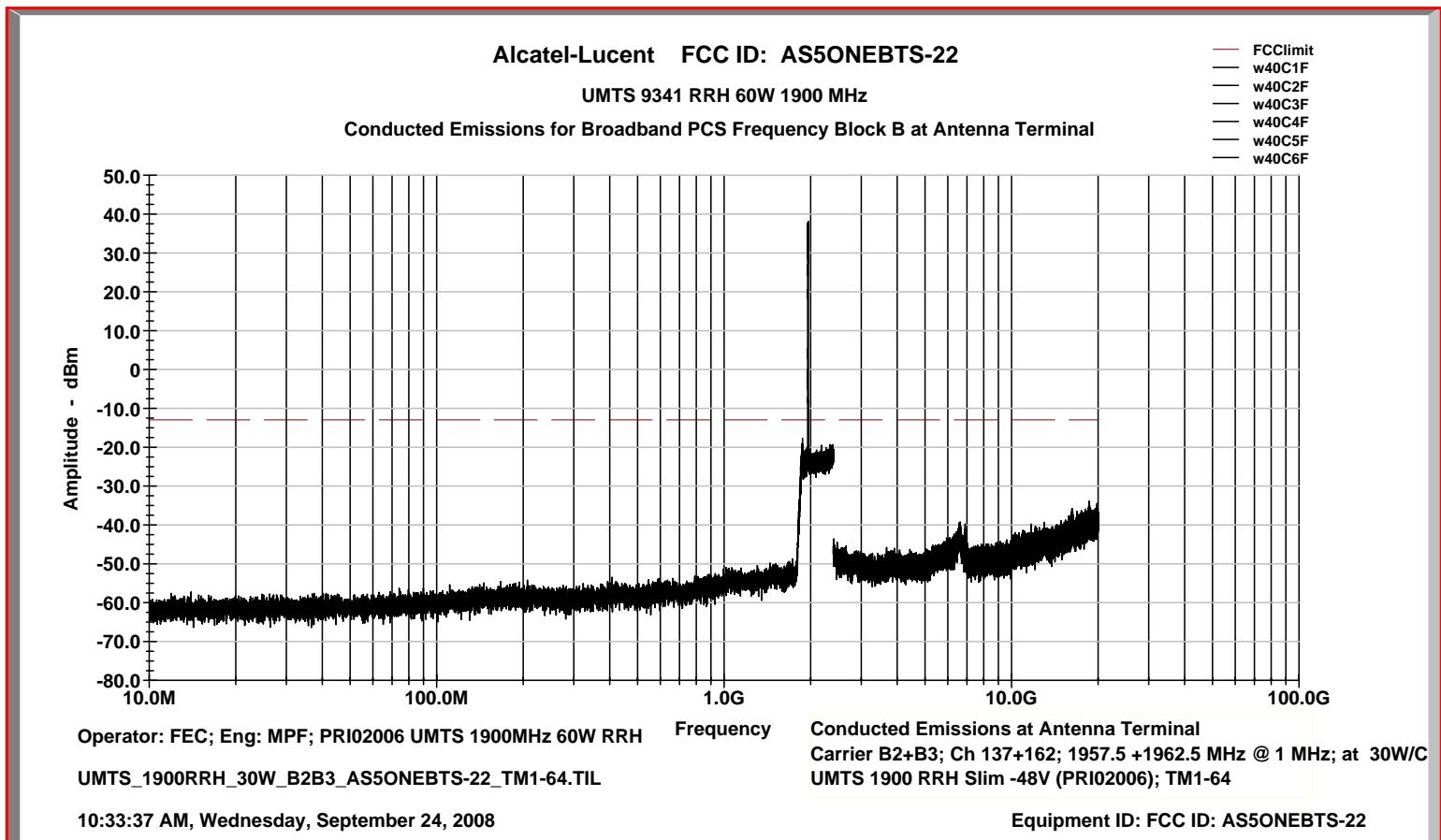
## Two Carrier B1 + B2



## Highest Settable Carrier Pair - B Block - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN 137 @ 1957.5 MHz + CN 162 @ 1962.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

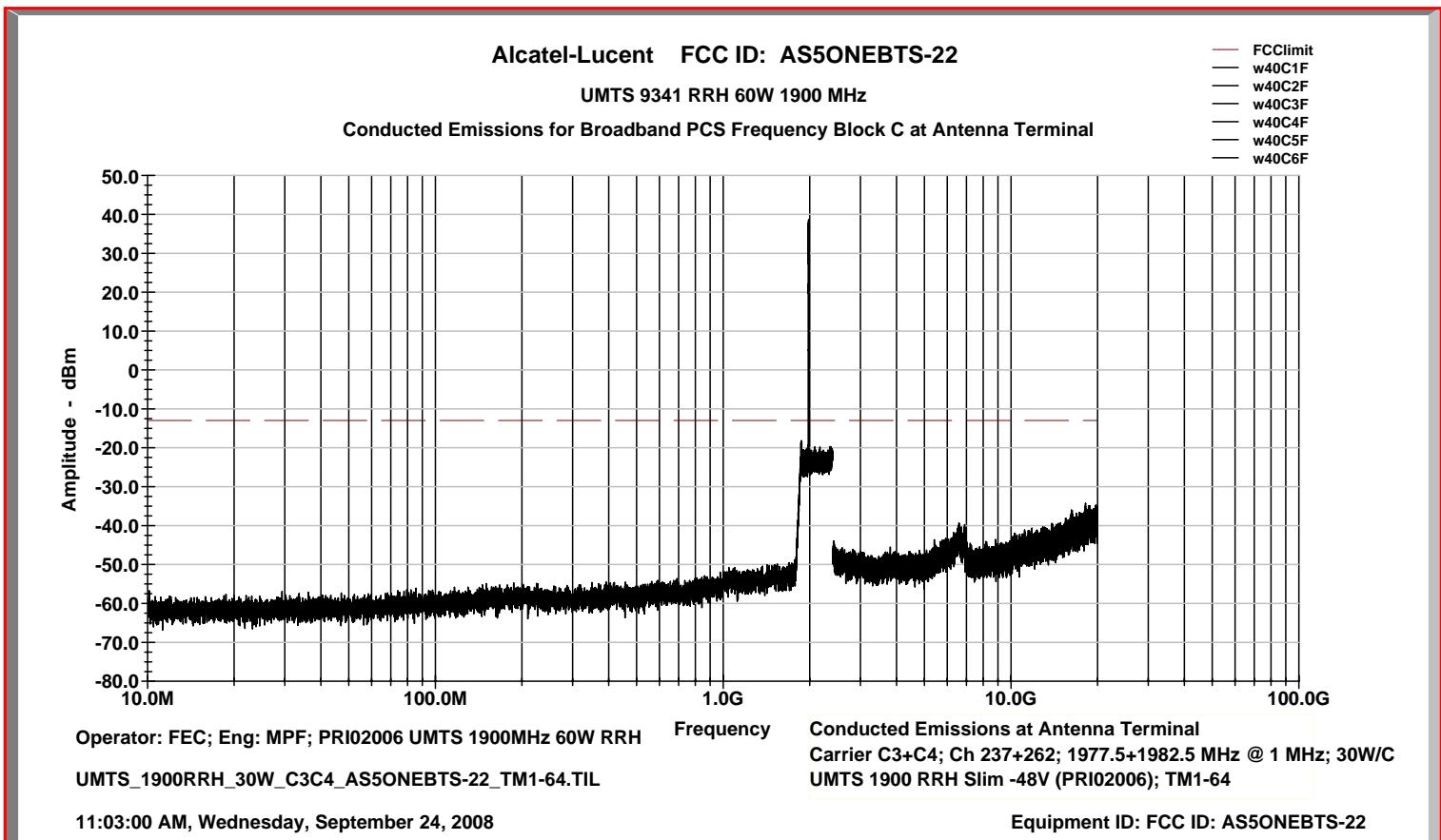
## Two Carrier B2 + B3



## Lowest Settable Carrier Pair - C Block - TM1-64 Test Modulation

Occupied Bandwidth Characteristics: UARFCN 237 @ 1977.5 MHz + CN 262 @ 1982.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

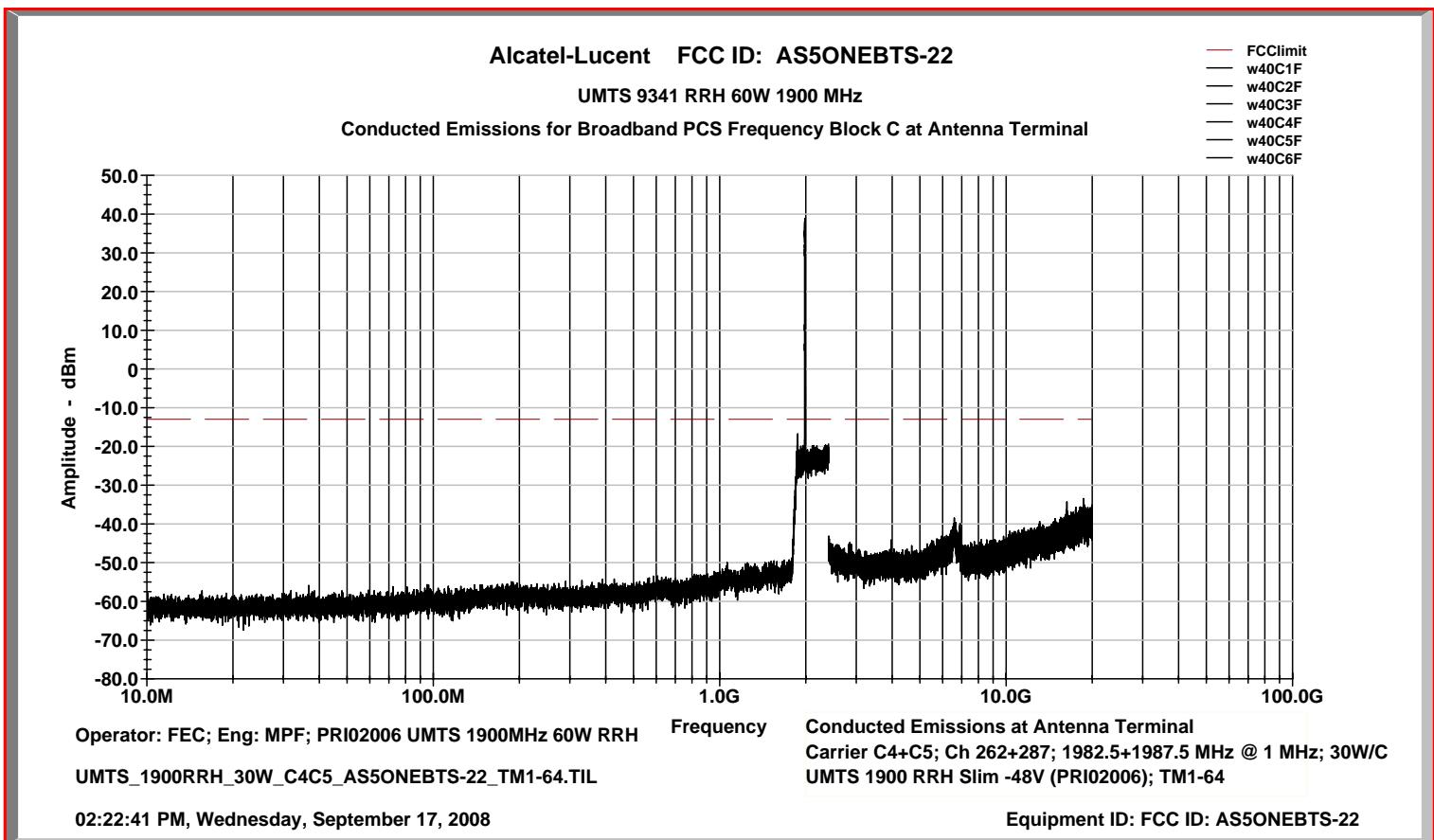
Two Carrier C3 + C4



**Highest Settable Carrier Pair - C Block - TM1-64 Test Modulation**

**Occupied Bandwidth Characteristics:** UARFCN 262 @ 1982.5 MHz + CN 287 @ 1987.5 MHz  
Tx Antenna Terminal at +44.8 dBm per 5 MHz carrier

**Two Carrier C4 + C5**



**PART 2.1053 MEASUREMENTS REQUIRED: FIELD STRENGTH OF SPURIOUS RADIATION**

This test was performed first with a single carrier at maximum rated power 60 Watts, and then followed with 2 adjacent carriers at 30W per carrier, transmitting into a non-radiating dummy load. The equipment under test (EUT) is configured for 1 sector - 1 carrier (1S1C) and for 1 sector - 2 carriers (1S2C). As required, the frequency range investigated was from 10 MHz to 20 GHz (10<sup>th</sup> harmonic of the carrier) as in the previous conducted spurious emissions test procedure. The single carrier tests were performed with the 60W carrier set to the lowest settable and to the highest settable carriers of Blocks A, B and C, and to mid-band of Blocks D, E and F. The 2-carrier tests were performed with the paired carriers set to 30W/C and to the lowest settable and to the highest settable carriers of Blocks A, B and C. The test modulation was TM1-64 for all.

In compliance with the guidelines of ANSI C63.4-2003, the equipment under test (EUT) was configured as recommended for *floor standing equipment*. The EUT was installed and operated as in the *normal mode of operation* with external alarm and T1 cables connected to the EUT and routed as prescribed in ANSI C63.4-2003. Field strength measurements of radiated spurious emissions were evaluated in a 3m semi-anechoic pre-compliance chamber and verified as required at the ten meter Open Area Test Site (OATS) maintained by Alcatel-Lucent FCC Compliance Laboratory in Whippany, New Jersey. A complete description and full measurement data for the site have been placed on file with the Commission.

The spectrum from 10 MHz to the tenth harmonic of the carrier was searched for spurious radiation. Measurements were made using both horizontally and vertically polarized broadband antennas. Per FCC regulations, the comparison of out-of-band spurious emissions directly to the limit is appropriately made using the substitution method. However, when the emissions are more than 20 dB below the specification limit, the use of field strength measurements for compliance determination is acceptable and those emissions are considered not reportable (Section 2.1053 and the FCC Interpretive database for 2.1053). For this case the evaluation of acceptable radiated field strength is as follows.

The calculated emission levels were found by:

$$\text{Pmeas (dBm)} + \text{Cable Loss(dB)} + \text{Antenna Factor(dB)} + 107 \text{ (dB}\mu\text{V/dBm)} - \text{Amplifier Gain (dB)} \\ = \text{Field Strength (dB}\mu\text{V/m)}$$

Section 24.238 and 2.1053 contains the requirements for the levels of spurious radiation as a function of the EIRP of the unmodulated carrier. The reference level for the unmodulated carrier is calculated as the field produced by an isotropic radiator excited by the transmitter output power according to the following relation taken from Reference Data for Radio Engineers, page 27-7, 6th edition, IT&T Corp.

$$E = (120\pi P)^{1/2} = [(30*P)^{1/2}] / R$$

$$20 \log (E*10^6) - (43 + 10 \log P) = 71.77 \text{ dB }\mu\text{V/meter}$$

Where: E = Field Intensity in Volts/ meter  
P = Transmitted Power in watts = 40 W/ Carrier

R = Distance in meters = 10 m

**Results:**

For this particular test, the field strength of any spurious radiation is required to be less than 71.8 dB $\mu$ V/meter. Emissions equal to or less than 51.8 dB $\mu$ V/meter are not reportable and may be verified using field strength measurements. Over the out-of-band spectrum investigated from 30 MHz to tenth harmonic of the carrier, no reportable spurious emissions were detected. This demonstrates that the *UMTS 9341 RRH 60W 1900 MHz System*, the subject of this application, complies with Sections 2.1053, 24.238 and 2.1057 of the Rules.

**PART 2.1055 MEASUREMENTS REQUIRED: FREQUENCY STABILITY**

The frequency stability was measured both at the Equipment Antenna Terminal (EAC) of the RF Remote Radio Head (RRH) and at the reference frequency output terminal of the digital Base Band Unit (BBU) for a single carrier set to 1960.0 MHz, which corresponds to mid Broadband PCS frequency band. Frequency stability measurements were performed by N. Hussain, Alcatel-Lucent, Swindon, United Kingdom, under the direction of M. P. Farina, and in adherence to the previously cited ISO/TL9000 test plan. The complete test report is attached, which shows the test results, test equipment configuration and photographs of the test set-up.

The procedure required by the FCC is specified in CFR 47, Part 2, Subpart J – Equipment Authorization Procedures, Section 2.1055 – Measurements Required: Frequency Stability, Effective: October 01, 2007. The requirements for base station/land station equipment, are summarized as:

**Section 2.1055(a)(1):** The frequency stability shall be measured with variation of ambient temperature from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$

**Section 2.1055(b):** Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than  $10^{\circ}\text{C}$  through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. (*Note: The term “keying” does not apply to base station/land station equipment. “Heating element” applies to “heat cartridges” if used.*) Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

**Section 2.1055(d)(1):** The frequency stability shall be measured with variation of primary supply voltage from 85% to 115% of the nominal value.

**Frequency Stability Limitation:**

The frequency stability is the measurement of the carrier center frequency deviation from its assigned value as a function of (1) temperature variation from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ , in  $+10^{\circ}\text{C}$  increments, and (2) variation of supply voltage, at the equipment frame power input terminals, from 85% to 115% of the nominal value. This is a lengthy procedure and is performed one time with a single UMTS 1900 carrier set to 1960.0 MHz. The required tolerance limit for UMTS 1900 base station/land station equipment is specified in ETSI TS 25.141 as  $\pm 0.05$  ppm.

**Exception:**

The FCC requires testing over the temperature range  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ , in  $10^{\circ}\text{C}$  increments. This would apply to equipment installed and operated in an outdoor, non-controlled environment. Equipment installed in an indoor, controlled environment should be compliant with Telcordia, GR-63-CORE, Issue 3, March 2006 - NEBSTM Requirements: Physical Protection. Equipment installed and operated in an indoor, controlled environment are required to demonstrate frequency stability compliance over the temperature range  $-5^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ . This would apply to the Indoor BBU, which is the subject of this certification.

**Results:**

The UMTS Distributed Base Station Transceiver System (1900 MHz), subject of this application for certification under FCC ID: AS5ONEBTS-22, demonstrated full compliance with the requirements of FCC Rule Part 2.1055. The frequency stability for all measurements were well within the required  $\pm 0.05$  ppm, as shown in detail in the attached Test Report. The measurement results are summarized below.

**Frequency stability testing for 1900 RRH with BBU.**

TEST FREQUENCY: 1960.0 MHz (Middle channel)  
P<sub>out</sub> max: 40W(46dBm)

Note:

Test Model 4 used to check RF Output frequency, Trace on Max hold and part per million calculated.  
On 15 MHz reading deviation from 15MHz noted and PPM calculated.

**RF Remote Radio Head (RRH)**

Stabilized temperature (°C)		TEST: TRANSMIT FREQUENCY ERROR					
		Spec: F <sub>tx</sub> ± 50ppb = 1960.0MHz ± 98.0MHz		Supply voltage: @85% of nominal (-48V-15%=-40.8V)		Supply voltage: @100% of nominal (i.e. -48.0V)	
Outdoor BBU	Outdoor RRH	Measured Tx Freq Error (Hz)	Deviation [Note 1] (ppb)	Measured Tx Freq Error (Hz)	Deviation [Note 1] (ppb)	Measured Tx Freq Error (Hz)	Deviation [Note 1] (ppb)
-30 C	-30 C	7.77	4.0	7.69	3.9	9.60	4.9
-20 C	-20 C	9.21	4.7	9.44	4.8	9.70	4.9
-10 C	-10 C	7.32	3.7	6.26	3.2	7.18	3.7
0 C	0 C	7.77	4.0	4.86	2.5	8.61	4.4
+10 C	+10 C	7.48	3.8	7.07	3.6	6.66	3.4
+20C	+20 C	13.4	6.8	4.70	2.4	6.75	3.4
+30 C	+30 C	7.22	3.7	6.95	3.5	8.25	4.2
+40 C	+40 C	4.27	2.2	5.07	2.6	5.42	2.8
+50 C	+50 C	3.23	1.6	5.9	3.0	3.81	1.9

**Digital Base Band Unit (BBU)**

Stabilized temperature (°C)		TEST: STABILITY OF 15MHz REFERENCE FREQUENCY					
		Spec: 15MHz ± 0.05ppm = 15MHz ± 0.75Hz		Supply voltage: @85% of nominal (-48V-15%=-40.8V)		Supply voltage: @100% of nominal (i.e. -48.0V)	
Outdoor BBU	Outdoor RRH	Measured Ref freq stability (Hz)	Deviation [Note 2] (ppm)	Measured Ref freq stability (Hz)	Deviation [Note 2] (ppm)	Measured Ref freq stability (Hz)	Deviation [Note 2] (ppm)
-30 C	-30 C	0.04	0.00267	0.04	0.00267	0.04	0.00267
-20 C	-20 C	0.04	0.00267	0.04	0.00267	0.04	0.00267
-10 C	-10 C	0.03	0.00200	0.03	0.00200	0.03	0.00200
0 C	0 C	0.04	0.00267	0.04	0.00267	0.04	0.00267
+10 C	+10 C	0.03	0.00200	0.03	0.00200	0.03	0.00200
+20C	+20 C	0.03	0.00200	0.03	0.00200	0.03	0.00200
+30 C	+30 C	0.03	0.00200	0.03	0.00200	0.03	0.00200
+40 C	+40 C	0.02	0.00133	0.02	0.00133	0.02	0.00133
+50 C	+50 C	0.02	0.00133	0.02	0.00133	0.02	0.00133