

# Text Report

## Modulation Characteristics

### Rule Parts:

2.1047(d), 21.905(b), 21.908(d)(e), 74.936(a)(f)

Modulation Characteristics = OFDM

21.905(b) Quadrature amplitude modulation (QAM), digital vestigial sideband modulation (VSB), quadrature phase shift key modulation (QPSK), code division multiple access (CDMA), and orthogonal frequency division multiplex (OFDM) emissions may be employed, subject to compliance with the policies set forth in the Declaratory Ruling and Order, 11 FCC Rcd 18839 (1996). Use of OFDM also is subject to the subsequent Declaratory Ruling and Order, DA 99-554 (Mass Med. Bur. rel. Mar. 19, 1999).

21.908(d) The maximum out-of-band power of an MDS response station using all or part of a 6 MHz channel, employing digital modulation and transmitting with an EIRP greater than -6 dBW per 6 MHz channel shall be attenuated (as measured in accordance with paragraph (e) of this section) at the 6 MHz channel edges at least 25 dB relative to the average 6 MHz channel power level, then attenuated along a linear slope to at least 40 dB at 250 kHz beyond the nearest channel edge, then attenuated along a linear slope from that level to at least 60 dB at 3 MHz above the upper and below the lower licensed channel edges, and attenuated at least 60 dB at all other frequencies.

21.908(e) In measuring compliance with the out-of-band emissions limitations, the licensee shall employ one of two methods in each instance: (1) absolute power measurement of the average signal power with one instrument, with measurement of the spectral attenuation on a separate instrument; or (2) relative measurement of both the average power and the spectral attenuation on a single instrument. The formula for absolute power measurements is to be used when the average signal power is found using a separate instrument, such as a power meter; the formula gives the amount by which the measured power value is to be attenuated to find the absolute power value to be used on the spectrum analyzer or equivalent instrument at the spectral point of concern. The formula for relative power measurements is to be used when the average signal power is found using the same instrument as used to measure the attenuation at the specified spectral points, and allows different resolution bandwidths to be applied to the two parts of the measurement; the formula gives the required amplitude separation (in dB) between the flat top of the (digital) signal and the point of concern.

## Modulation Characteristics

For absolute power measurements:

Attenuation in dB (below channel power) =  $A + 10\log(\text{CBW} / \text{RBW})$

For relative power measurements:

Attenuation in dB (below flat top) =  $A + 10\log(\text{RBW1} / \text{RBW2})$

Where:

$A$  = Attenuation specified for spectral point (e.g., 25, 35, 40, 60 dB)

$\text{CBW}$  = Channel bandwidth (for absolute power measurements)

$\text{RBW}$  = Resolution bandwidth (for absolute power measurements)

$\text{RBW1}$  = Resolution bandwidth for flat top measurement (relative)

$\text{RBW2}$  = Resolution bandwidth for spectral point measurement (relative)

74.936(a) An ITFS station may employ amplitude modulation (C3F) for the transmission of the visual signal and frequency modulation (F3E) or (G3E) for the transmission of the aural signal when transmitting a standard analog television signal. Quadrature amplitude modulation (QAM), digital vestigial sideband modulation (VSB), quadrature phase shift key modulation (QPSK), code division multiple access (CDMA) and orthogonal frequency division multiplex (OFDM) emissions may be employed, subject to compliance with the policies set forth in the *Declaratory Ruling and Order*, 11 FCC Rcd 18839 (1996). Use of OFDM also is subject to the subsequently *Digital Declaratory Ruling and Order*, DA 99-554 (Mass Med. Bur. rel. Mar. 19, 1999).

74.936(f) The maximum out-of-band power of an ITFS response station using all or part of a 6 MHz channel, employing digital modulation and transmitting with an EIRP greater than 6 dBW per 6 MHz channel shall be attenuated (as measured in accordance with §21.908(e)) at the 6 MHz channel edges at least 25 dB relative to the average 6 MHz channel power level, then attenuated along a linear slope to at least 40 dB at 250 kHz beyond the nearest channel edge, then attenuated along a linear slope from that level to at least 60 dB at 3 MHz above the upper and below the lower licensed channel edges, and attenuated at least 60 dB at all other frequencies. The maximum out-of-band power of an ITFS response station using all or part of a 6 MHz channel, employing digital modulation and transmitting with an EIRP no greater than 6 dBW per 6 MHz channel shall be attenuated (as measured in accordance with §21.908(e)) at the channel edges at least 25 dB relative to the average 6 MHz channel transmitter output power level (P), then attenuated along a linear slope to at least 40 dB or  $33+10\log(P)$  dB, whichever is the lesser attenuation, at 250 kHz beyond the nearest channel edge, then attenuated along a linear slope from that level to at least 60 dB or  $43+10\log(P)$  dB, whichever is the lesser attenuation, at 3 MHz above the upper and below the lower licensed channel edges, and attenuated at least 60 dB or  $43+10\log(P)$  dB, whichever is the lesser attenuation, at all other frequencies.

## Modulation Characteristics

### Test Procedure:

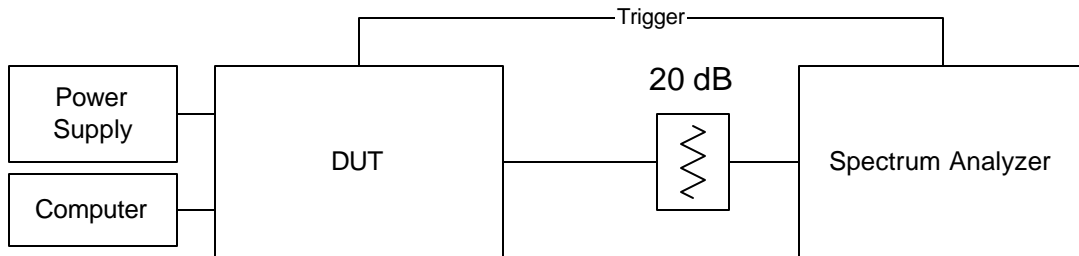
The Orthogonal Frequency Division Multiplexing (OFDM) modulated Time Division Duplex (TDD) RF signal from the test unit is applied to a spectrum analyzer. The Spectrum Analyzer is time gated, with zero delay, to capture the transmission during the burst. An RMS detector is used to measure the average power of the transmission. The resolution bandwidth of the flat top measurement is equal to the resolution bandwidth of the spectral point measurement thereby setting the  $10\log(RBW1 / RBW2) = 0$  for the relative power measurement method. The spectral emissions of the test unit are recorded for minimum and maximum RF power levels at the appropriate power levels for the two mask conditions. The transmitter is enabled in test mode with the attached computer.

### Test Conditions:

Frequencies = 2503, 2593, 2683 MHz  
Temperature = 25°C  
Supply Voltage = 120 Vac / 60 Hz

## Modulation Characteristics

Test Set-Up:

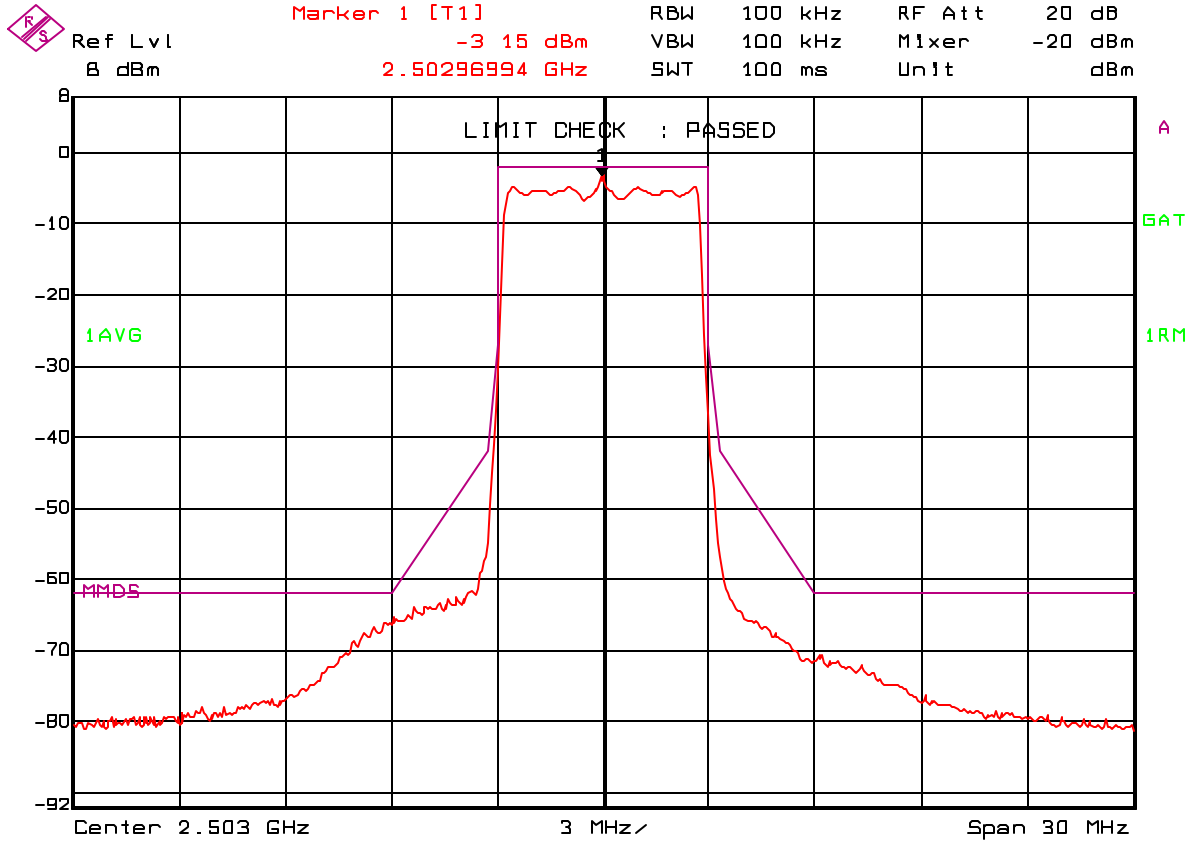


Test Equipment:

DVM	Fluke 87 III Calibration not required
Spectrum Analyzer	Rohde&Schwarz Model: FSEB20 S/N: DE22490 Cal Date: 09-17-2001 Cal Due: 09-17-2002
Computer	Dell Latitude LM Model: TS30GI FCC ID: IIRTS30GH S/N: 6497346BYK7274A
Attenuator	Pasternack Model: PE7005-20 Calibration not required
Power Supply	GlobTek, Inc. Model: GT-21089-1815-T3 S/N: 0109029311

### Modulation Characteristics

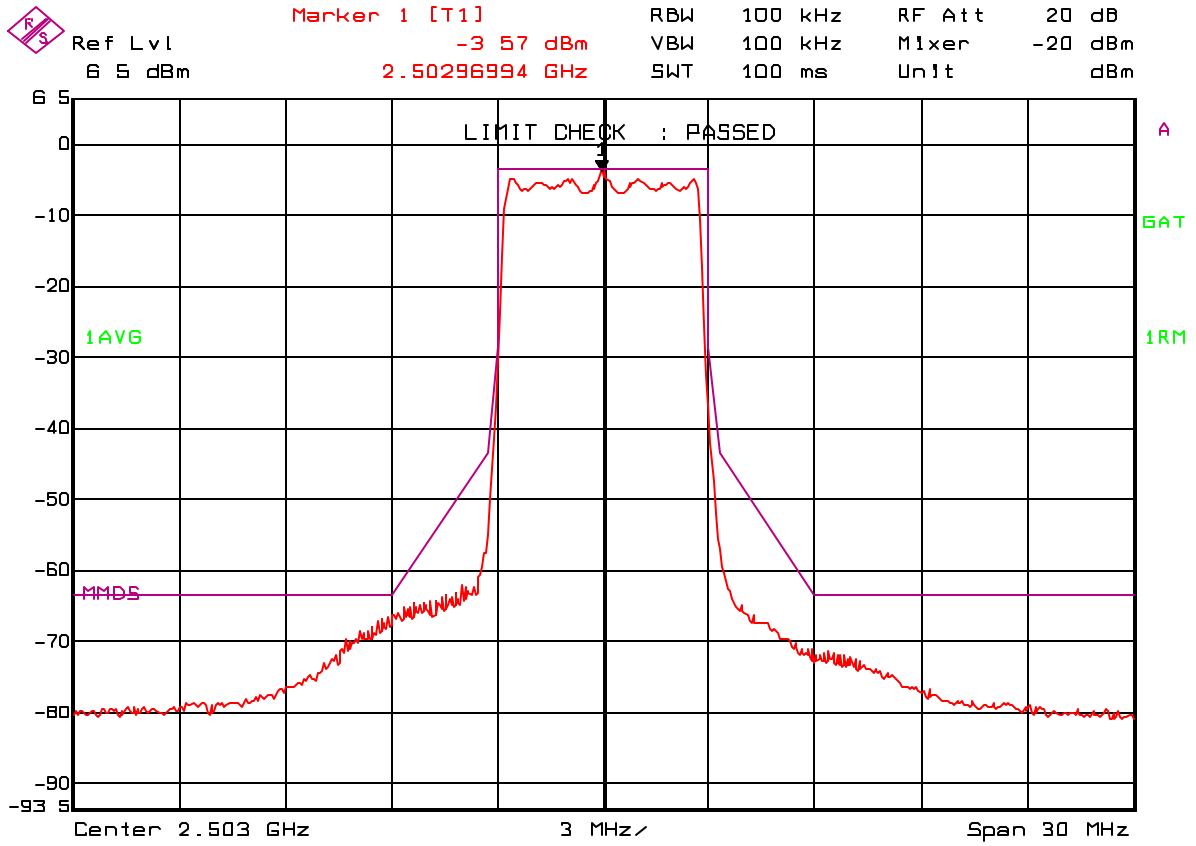
Test Results: Channel 1, 2503 MHz (33dBm / 2W)  
Time slot: 1 of 14



Date: 26.OCT.2001 13:38:39

### Modulation Characteristics

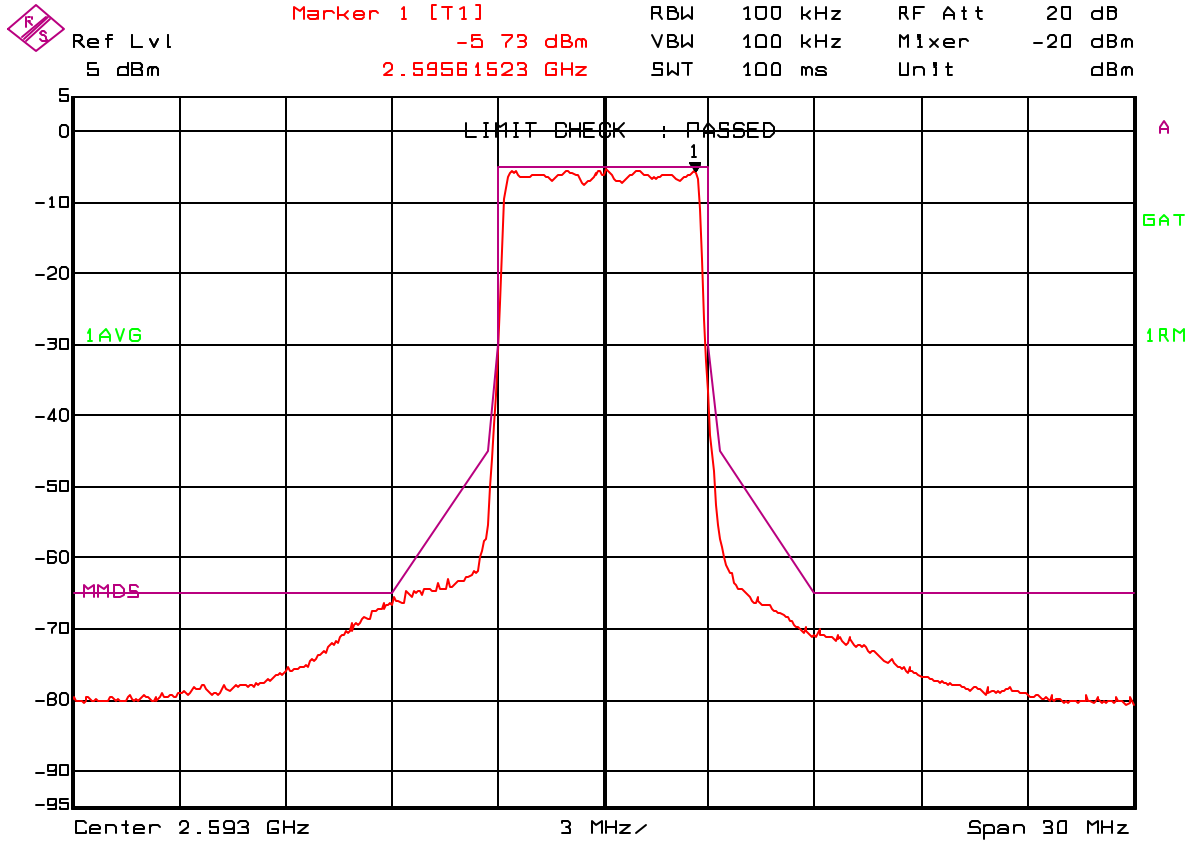
Test Results: Channel 1, 2503 MHz (33dBm / 2W)  
Time slots: 2 of 22



Date: 26.OCT.2001 13:53:00

### Modulation Characteristics

Test Results: Channel 16, 2593 MHz (33dBm / 2W)  
Time slots: 1 of 14

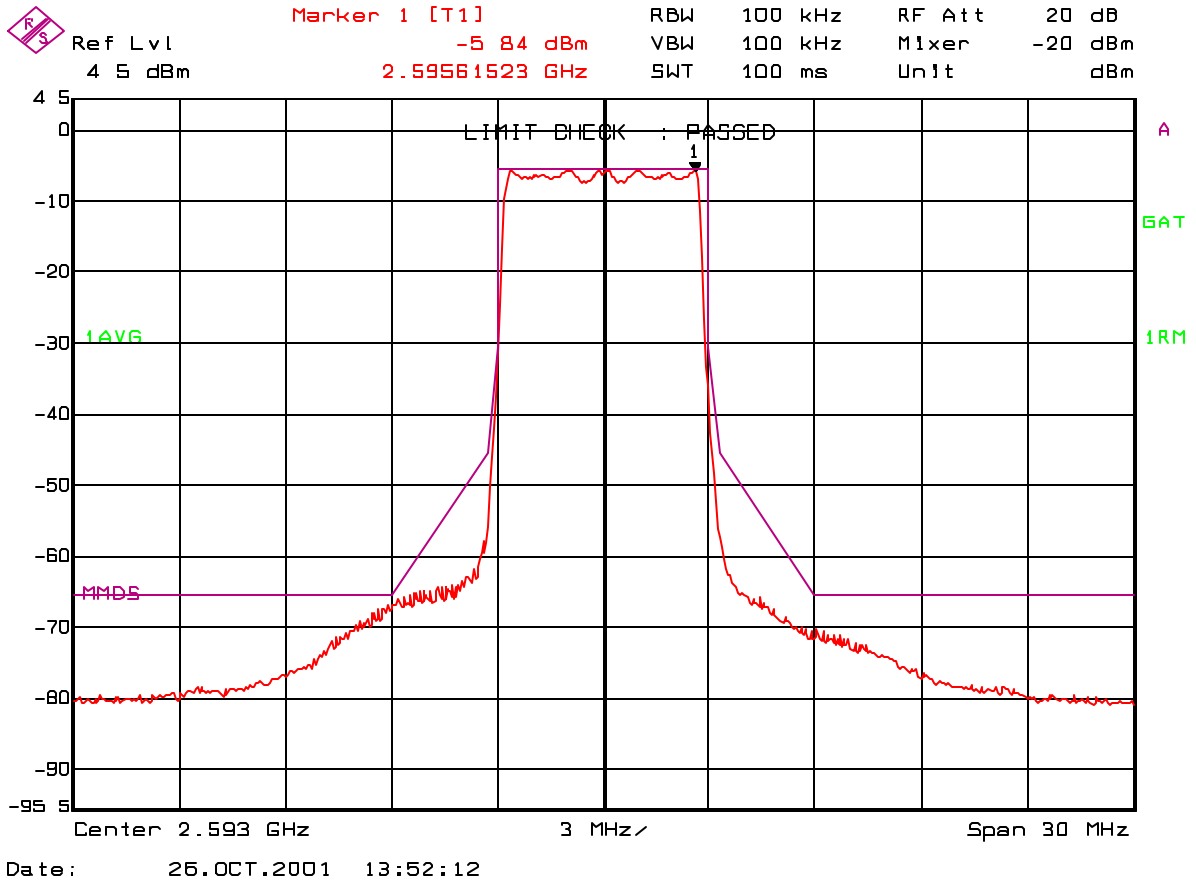


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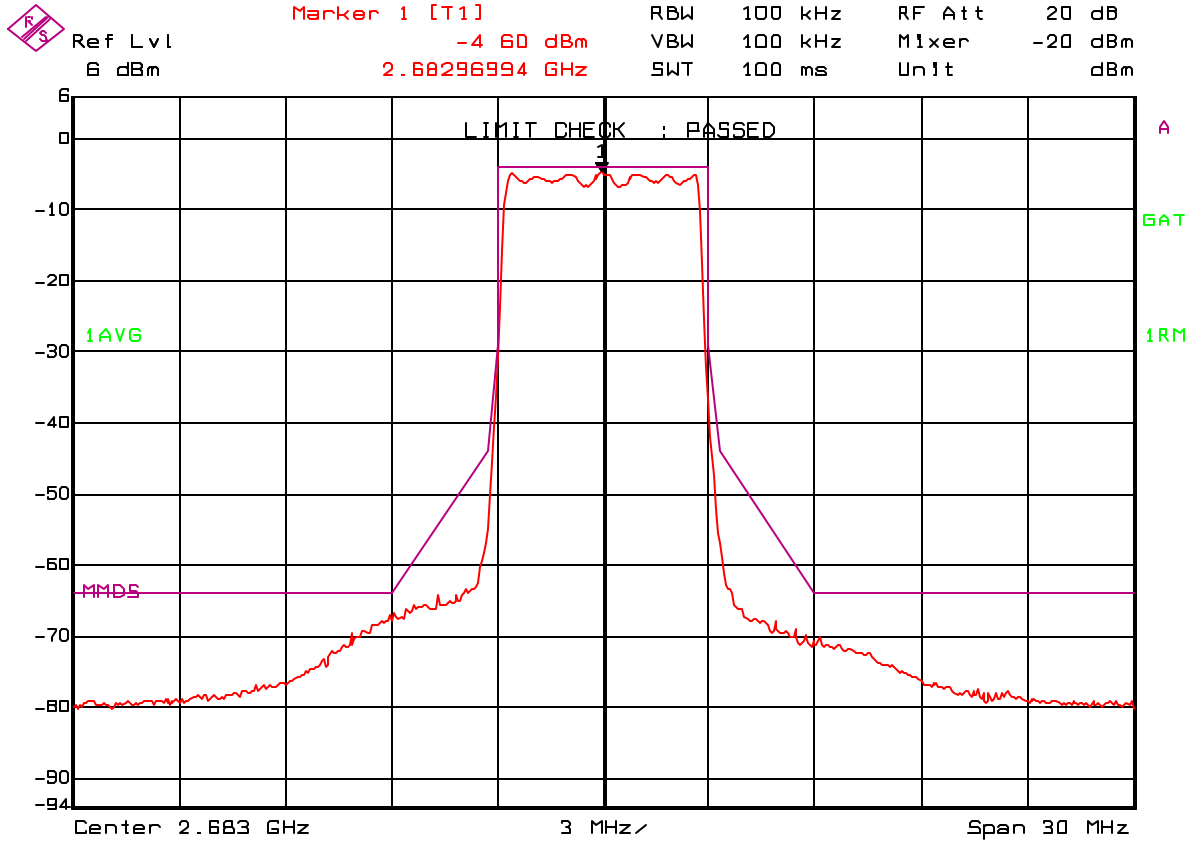
### Modulation Characteristics

Test Results: Channel 16, 2593 MHz (33dBm / 2W)  
Time slots: 2 of 22



### Modulation Characteristics

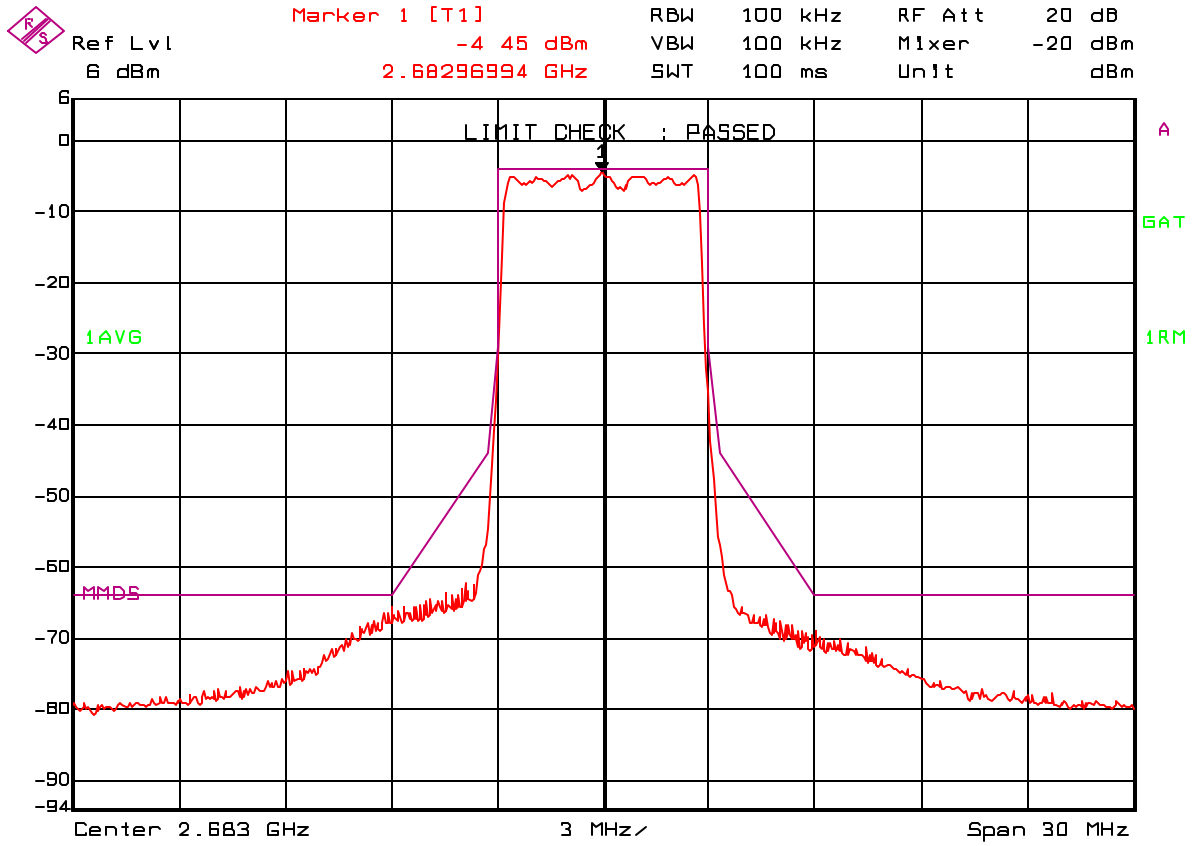
Test Results: Channel 31, 2683 MHz (33dBm / 2W)  
Time slots: 1 of 14



Date: 26.OCT.2001 13:47:43

### Modulation Characteristics

Test Results: Channel 31, 2683 MHz (33dBm / 2W)  
Time slots: 2 of 22



Date: 26.OCT.2001 13:50:56

## Occupied Bandwidth

Rule Part Number: 2.1049(h), 21.105

Each authorization issued pursuant to these rules will show, as the emission designator, a symbol representing the class of emission which shall be prefixed by a number specifying the necessary bandwidth. This figure does not necessarily indicate the bandwidth actually occupied by the emission at any instant. In those cases where part 2 of this chapter does not provide a formula for the computation of the necessary bandwidth, the occupied bandwidth may be used in the emission designator.

**Test Procedure:** The Orthogonal Frequency Division Multiplexing (OFDM) modulated Time Division Duplex (TDD) RF signal from the test unit is applied to a spectrum analyzer thru a 20 dB attenuator. The occupied bandwidth of the test unit is recorded by measuring the modulation bandwidth at the 25 dB points. Transmit power is 2 watts. The transmitter is enabled in test mode with the attached computer.

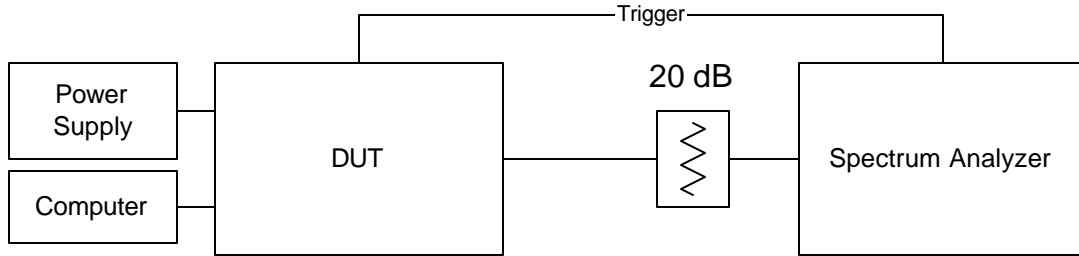
**Test Conditions:** Frequency = 2503, 2593, 2683 MHz  
Temperature = 25°C  
Supply Voltage = 120 Vac / 60 Hz

**Test Equipment:**

DVM	Fluke 87 III Calibration not required
Spectrum Analyzer	Rohde&Schwarz Model: FSEB20 S/N: DE22490 Cal Date: 09-17-2001 Cal Due: 09-17-2002
Computer	Dell Latitude LM Model: TS30GI FCC ID: IIRTS30GH S/N: 6497346BYK7274A
Attenuator	Pasternack Model: PE7005-20 Calibration not required
Power Supply	GlobTek, Inc. Model: GT-21089-1815-T3 S/N: 0109029311

## Occupied Bandwidth

Test Set-Up:



Test Results Summary:

Time Slots: 1 of 14

### **Channel 1**

Occupied Bandwidth = 2.50595341 GHz – 2.50010671 GHz

Occupied Bandwidth = 5.846700 MHz

### **Channel 16**

Occupied Bandwidth = 2.59583317 GHz – 2.59016683 GHz

Occupied Bandwidth = 5.666340 MHz

### **Channel 31**

Occupied Bandwidth = 2.68592335 GHz – 2.68009168 GHz

Occupied Bandwidth = 5.831670 MHz

Time Slots: 2 of 22

### **Channel 1**

Occupied Bandwidth = 2.50586323 GHz – 2.50016683 GHz

Occupied Bandwidth = 5.696400 MHz

### **Channel 16**

Occupied Bandwidth = 2.59584820 GHz – 2.59016683 GHz

Occupied Bandwidth = 5.681370 MHz

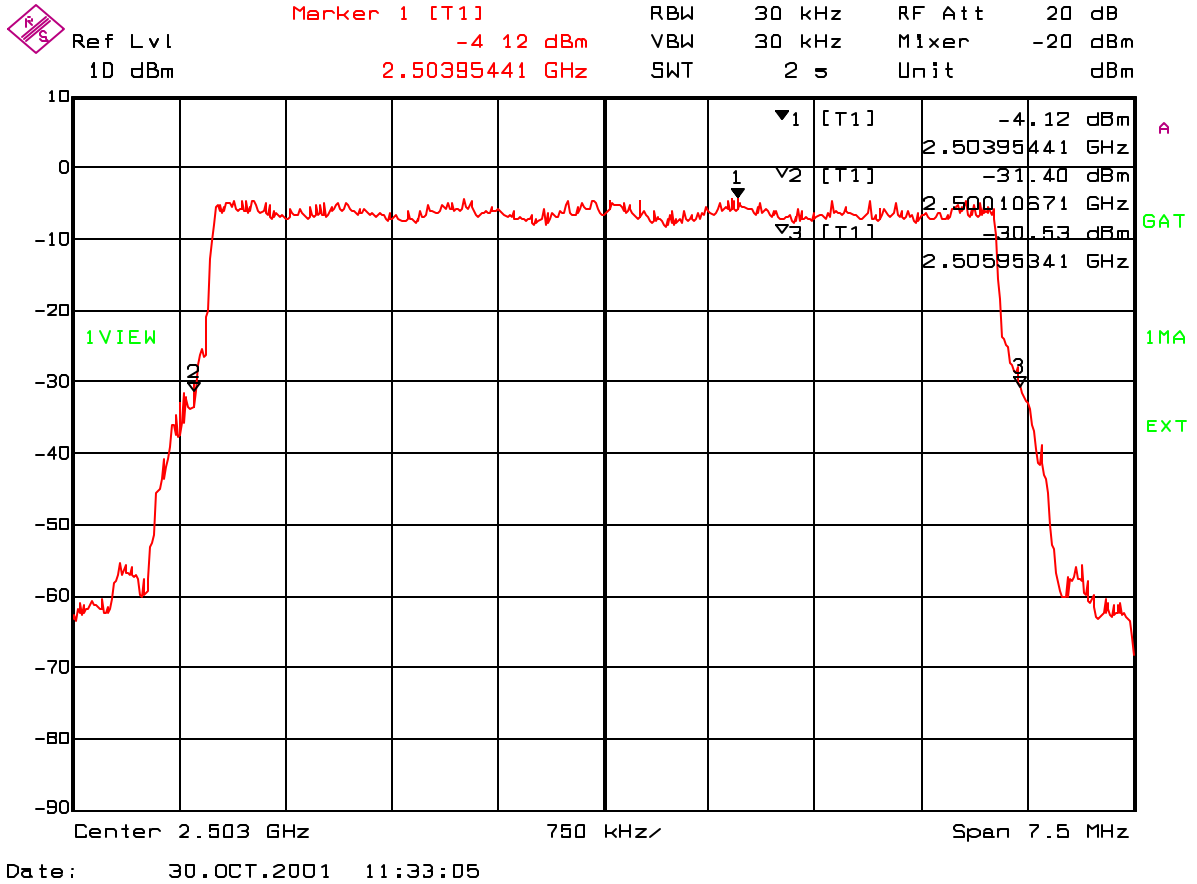
### **Channel 31**

Occupied Bandwidth = 2.68583317 GHz – 2.68012174 GHz

Occupied Bandwidth = 5.711430 MHz

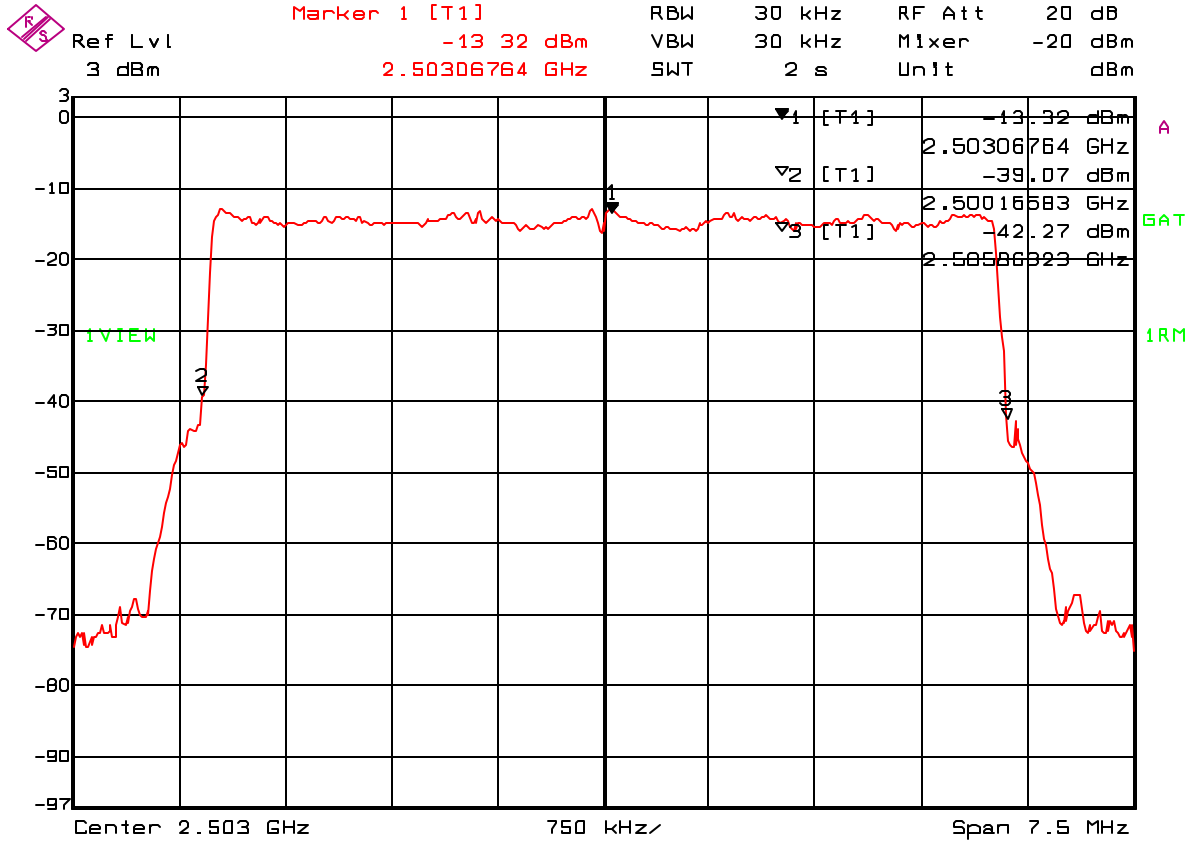
## Occupied Bandwidth

Test Results: Channel 1  
Time Slots: 1 of 14



# Occupied Bandwidth

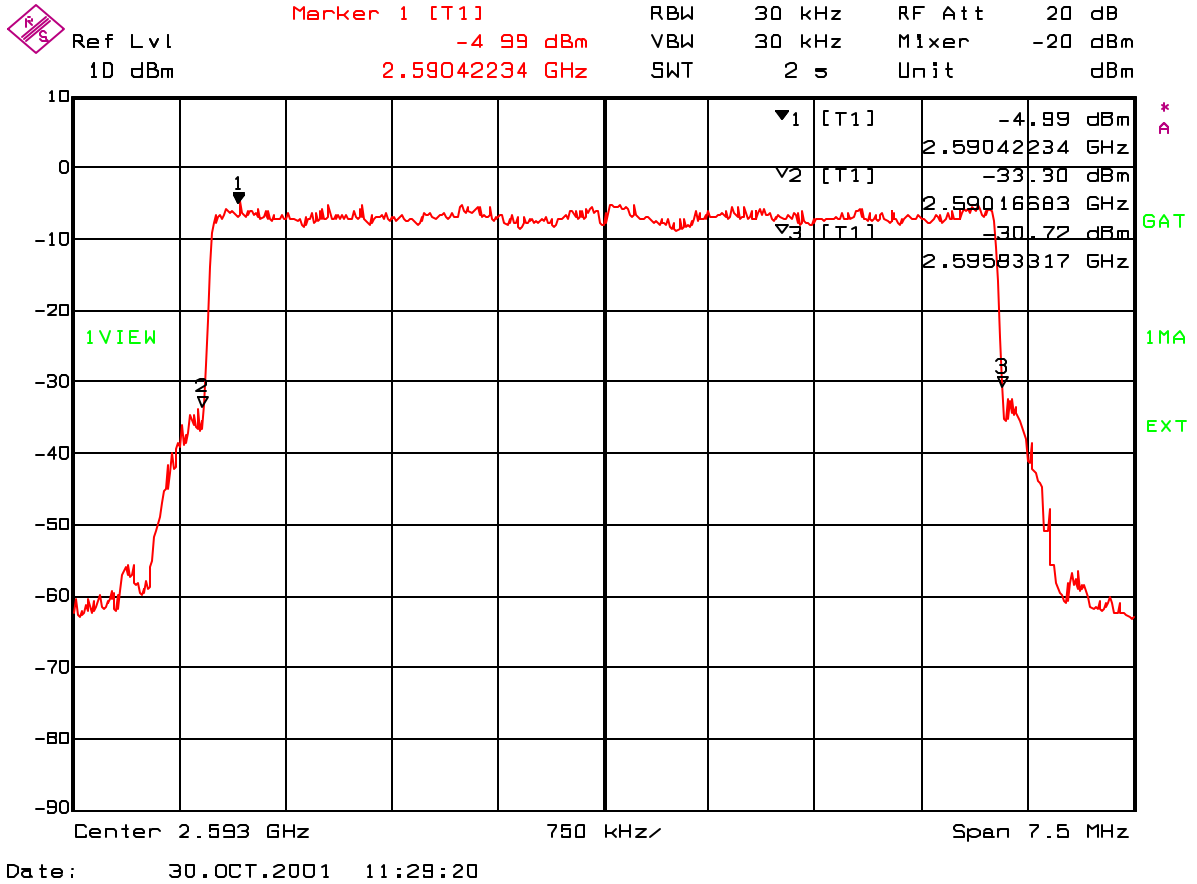
Test Results: Channel 1  
Time Slots: 2 of 22



Date: 21.JAN.2002 10:16:25

## Occupied Bandwidth

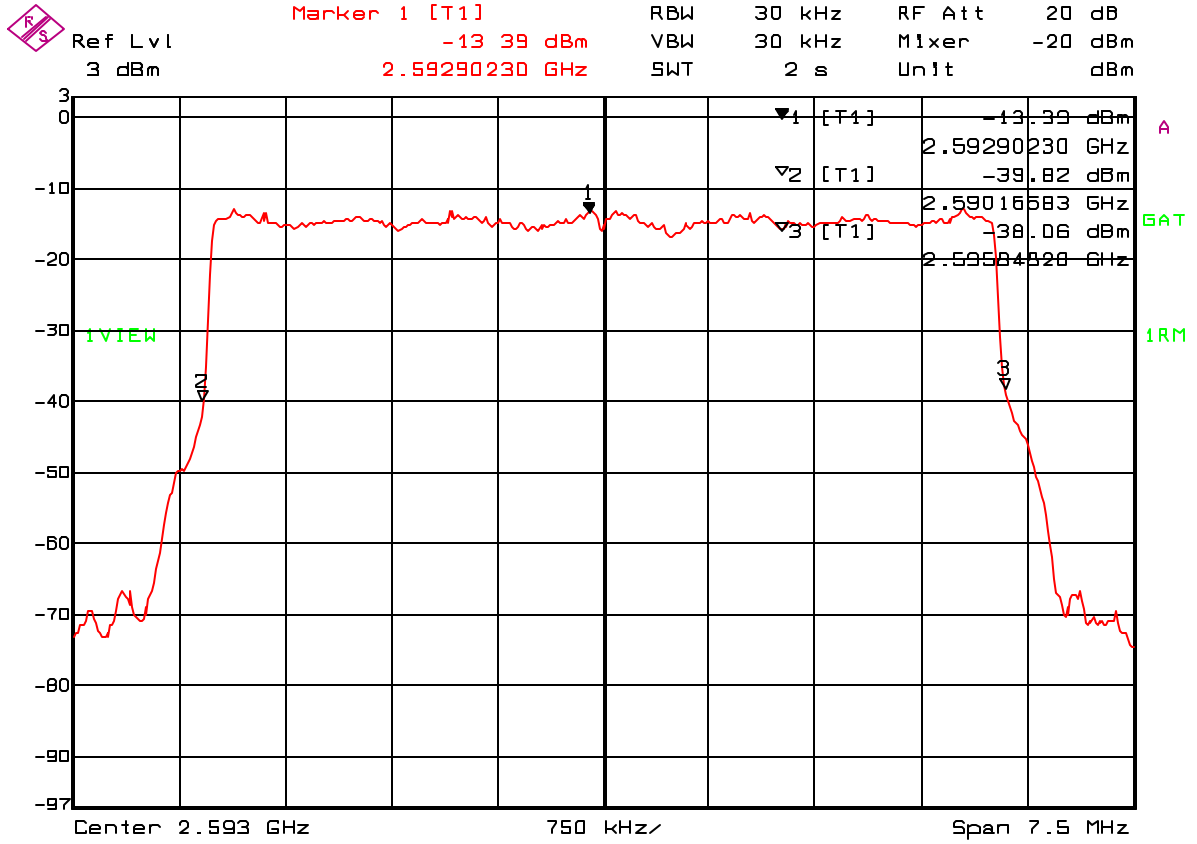
Test Results: Channel 16  
Time Slots: 1 of 14





# Occupied Bandwidth

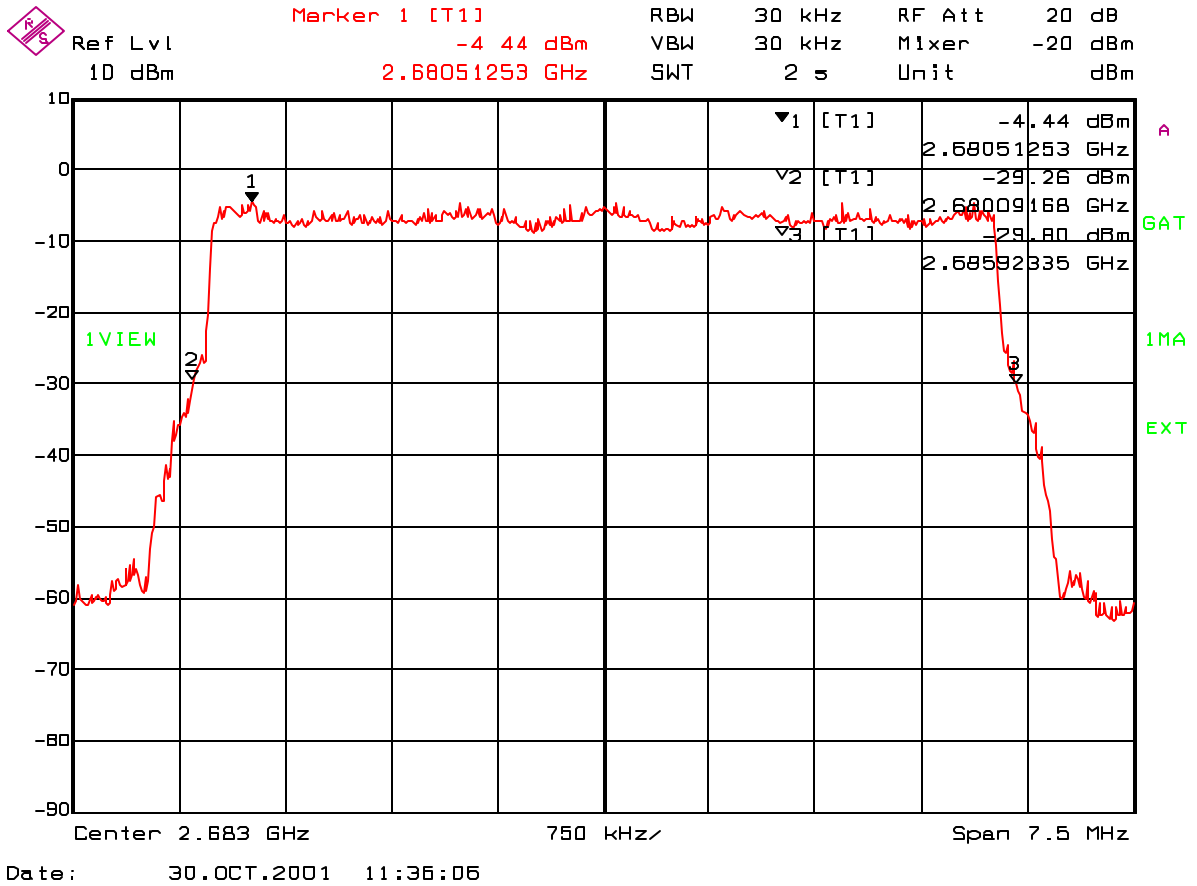
Test Results: Channel 16  
Time Slots: 2 of 22



Date: 21.JAN.2002 10:13:03

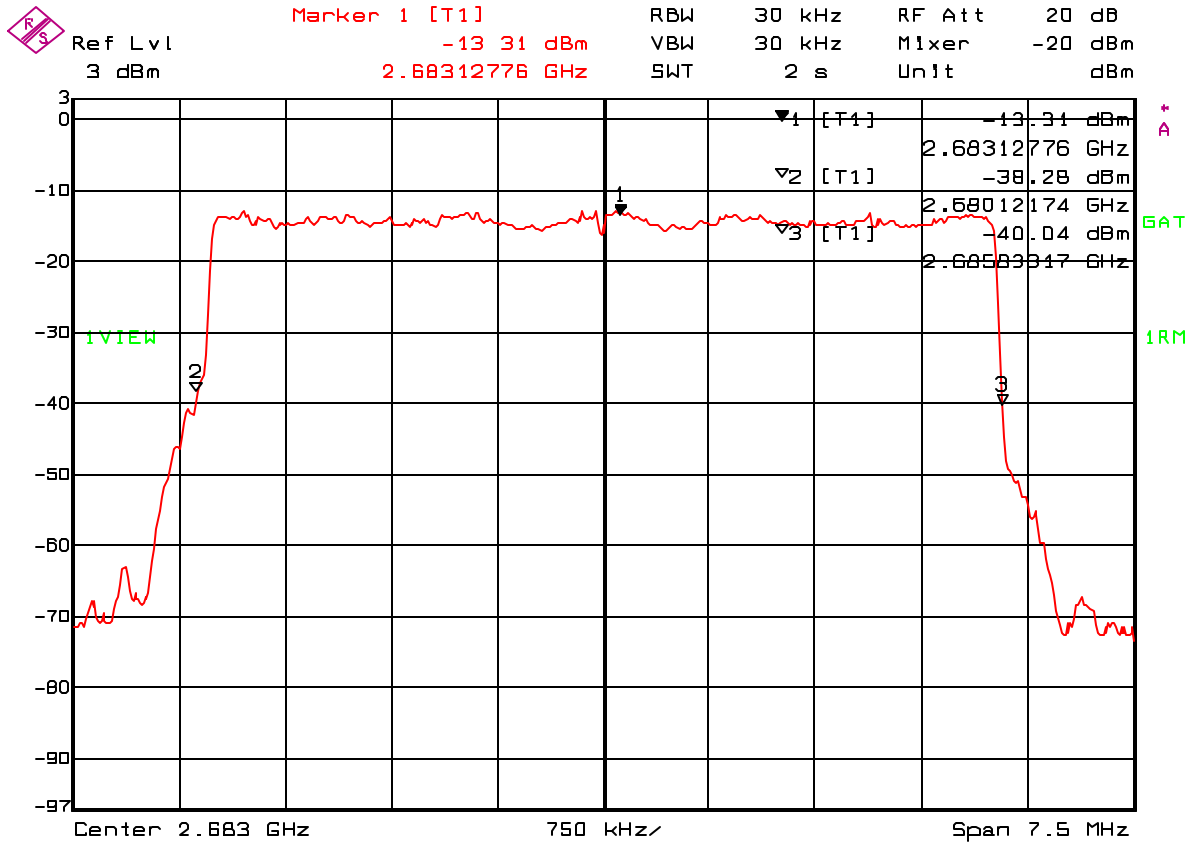
# Occupied Bandwidth

Test Results: Channel 31  
Time Slots: 1 of 14



## Occupied Bandwidth

Test Results: Channel 31  
Time Slots: 2 of 22



Date: 21.JAN.2002 10:18:51