DESCRIPTIVE INFORMATION

FCC FILING FOR SC9600 MIXED MODE / MULTIPLE CARRIER

The Information in this exhibit is in accordance with the FCC Rules and Regulations, Vol. II, Part 2, Subpart J. Sections 2.983 through 2.999 are addressed.

Section 2.983 (a) **Name of Applicant and Manufacturer:**

Motorola, Inc.
5555 N. Beach St.
Ft. Worth, Texas 76137

Section 2.983 (b) **Identification of Equipment:** IHET5YE1

Section 2.983 (c) **Quantity Production:** Quantity Production is Planned.

Section 2.983 (d) **Technical Description**

This Transmitter is intended for use in the Public Cellular Radio Telecommunications Service and is designed in compliance with the FCC Rules and Regulations Title 47, Part 22(H) and with EIA/TIA/IS-97-A. This transmitter is capable of spread spectrum (CDMA) operation, and allows up to 64 Walsh Codes to support Pilot, Sync, Paging and Traffic channels. In Analog transmission mode, this device complies with compatibility specification Office of Science and Technology Bulletin Number 53.

(1) **Types of Emissions**

In Analog transmission mode, this equipment continues to be capable of the existing, specified emissions for previously existing equipment designed and accepted for operation in the Domestic Public Cellular Radio Telecommunication Service in the wide mode.

For the Analog transmitter in wide mode, the emission designator for voice transmission is 40K0F8W (per FCC Part 2.201, subpart C) and the emission designator for data (signaling) transmission is 40K0F1 D (per FCC Part 2.201, subpart C).

For the Analog transmitter in narrow mode, emission designator, 17K4F9W (per FCC Part 2.201, subpart C), is added. The same signaling transceiver used in wide mode is also used in narrow mode, thus there is no additional designator for a narrow mode signaling transceiver.

In CDMA transmission mode, this equipment will be capable of operation using wide band spread spectrum techniques employing Direct Sequence Code Division Multiple Access (DS-CDMA) digital communication techniques. For this transmitter, the emission designator is 1M25F9W (per FCC Part 2.201, subpart C).

(2) **Frequency Range**

In the Wide Analog system, this transmitter operates on any of 832 channels in the 869-894 MHz band. The lowest frequency channel is 991 and is centered at 869.04 MHz. The highest channel is 799 and is centered at 893.97 MHz. The channel spacing is 30 kHz.

In the Narrow Analog System, there will be a low, middle, and high channel for each channel in the wide mode, with the middle channel being coincident in center frequency with the wide analog channel. The low and high channel center frequencies are 10 kHz below and above the middle channel center frequency, respectively.

In CDMA transmission mode, this transmitter operates within the 869.70 to 893.31 MHz Band (per FCC Part 22). This base station will support CDMA operations on channel numbers 1013 through 1023 and 1 through 777 inclusive.

(3) **Range of Operating Power**

The rated maximum average power out of the SC9600 Mixed Mode/Multiple Carrier CDMA system is .16 mW (-8 dBm) and the rated minimum average power is.1 μW (-40 dBm). However, in the CDMA system the actual power output is based on the number of traffic channels in operation. The maximum power occurs when a pilot along with paging, synchronization, and traffic channels are present. The minimum power occurs when only a pilot signal is present. The output power is variable in 0.25 dB steps.

In addition, the dynamics of a CDMA system allow for what is called "cell breathing". This allows an operator to vary the range of a cell by controlling the power of the pilot signal.

The rated maximum average power out of the SC9600 Mixed Mode/Multiple Carrier Analog system is .01 mW (-17 dBm) and the rated minimum average power is 0.001 μW (-60 dBm).

(4) **Maximum Power Limits**

The peak output power of a base station transmitter may not exceed 500 Watts as defined in Part 22.905.

(5) **Applied voltages and currents into the final transistor elements of the transmitter output:**

In the CDMA system, the applied voltages and currents into the final stage element MRFIC0904 for +3 dBm (2 mW) output:

IC Voltage	4 V
IC Current	150 mA

(6) **Function of Each Active Device**

Refer to Exhibit #4.

(7) **Complete Circuit Diagrams**

Refer to Exhibits #6 through #18.

(8) **Instruction/Installation Manual**

Refer to Exhibit #19.

(9) **Tune-Up/Optimization Procedure**

Refer to Exhibit #20.

(10) **Means for Frequency Stabilization**

Refer to Exhibit #25

For both the Analog and the CDMA systems, the Clock Synchronization Module (CSM) provides clock and time signals for an SC9600 Mixed Mode/Multiple Carrier. The CSM relies on a GPS receiver as the primary time reference. Dual CSM cards provide redundancy in case of primary CSM failure as the primary time reference.

The CSM uses the received signals as a reference to provide the required clock for the site. The redundant CSM's will keep the required ±0.05 ppm for CDMA. The CSM distributes CDMA time, a 19.6608 MHz clock, and two second synchronization pulses every even second of universal time to the Baseband Distribution and Combiner (BDC) Cards of the (up to) four CDMA channel processor shelves in the RF modem frame.

The CSM is also responsible for configuration and management of the GPS systems. CSM software determines on a site basis what the GPS configuration should be. For future commercial CDMA systems, GPS configuration information could optionally be down loaded to the CSM from the GLI. The CSM is managed by the GLI.

For the analog system, two separate voltage controlled oscillators, which are phase locked to the reference frequency derived from this 3 MHz oscillator, are used to generate the transmit frequencies.

1. The VCO operates in the 750-775 MHz band and is programmable (by the site controller) in 10 kHz steps in order to accommodate both wide and narrow modes of operation. This oscillator supplies a signal to both the transmitter and receiver and is known as the main VCO.

2. The VCO, which is known as the offset or sidestep synthesizer, is maintained at a fixed frequency of 118.5 MHz and is modulated by voice, Supervisory Audio Tone (SAT), Digital Supervisory Audio Tone (DSAT), narrowband and wideband data. The signals from these two VCO's are mixed together to create the transmit frequencies.

The Low Frequency Time Reference (LFR) is used to provide a stable time reference in case of a GPS system failure or shutdown. The output of the LFR card is routed to the CSM cards, which derive the appropriate time references for the RF Modem Frame.

The current LFR is a Loran C receiver. In areas where Loran C is unavailable, another time reference may be used.

(11) Means for Attenuation of Spurious Emissions

Refer to Exhibit #23

In the Analog system, suppression of spurious radiation is obtained by proper shielding techniques and the use of transceiver circuitry.

In the CDMA section, Bandpass filters are employed in the RF circuit to attenuate far out spurious emisions. The filter used here is a ceramic filter.

The baseband employs a discrete L-C 7-pole elliptic filter. This filter is used to attenuate sideband noise and close in spurious emissions.

Means for Limiting Modulation

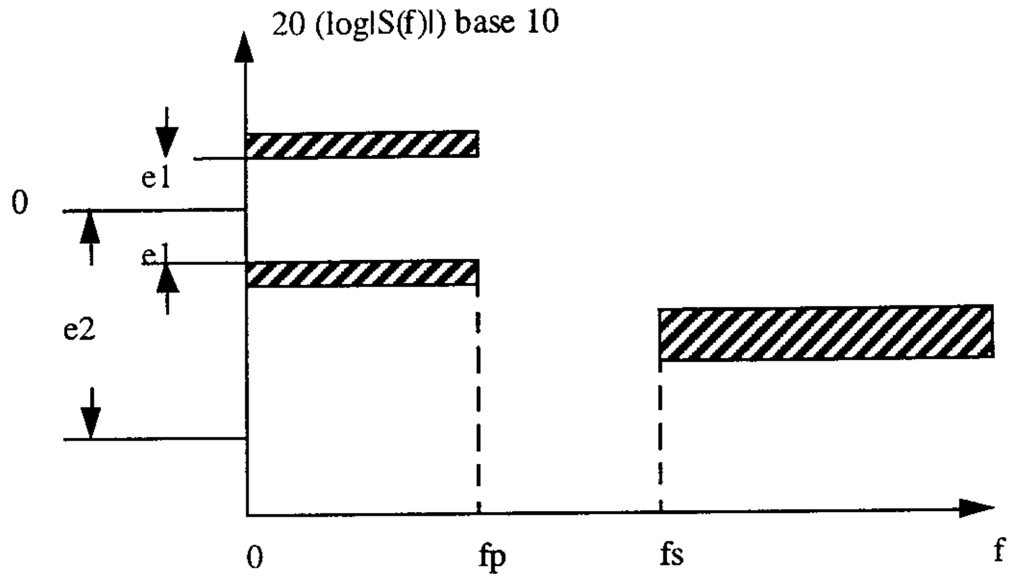
Refer to Exhibits #21 and #25

In the Analog system, the transmitter modulation is accomplished by a Motorola 56156 DSP. Limiting is set within the DSP via software control to the desired value. It instantaneously controls the signal introduced into the I and 0 frequency modulator. The deviation limit can be set to the channel width requirement for peak modulation of ±12kHz in wide mode or ±5kHz for narrow mode. The data can be set to maximum of ±8kHz in wide mode and 700Hz in narrow mode.

In a CDMA system, the input signal (voice for example) is sampled and coded in a vocoder. This signal is then spread to 1.23 MHz by a pseudo-random spreading code. This spreading code sets the bandwidth of the spread-spectrum signal. If more than one signal is in operation (i.e. more than one voice channel), then the two signals are simply layered one atop the other within the 1.23 MHz band. So, to some extent, the bandwidth of the transmitted signal is limited by the chip rate of the PN spreading code.

Primary limiting of the CDMA signal bandwidth is accomplished by the use of a programmable digital limiter and Finite Impulse Response (FIR) filters in the Base Band Distribution and Combiner Card (BDC). The digital limiter prevents occasional large peaks and thus avoids wrap-around error that would occur. The FIR filters are 13 Tap and run with four sets of coefficients at a 4X rate, thus being equivalent to a 48-tap linear FIR filter. Output I and Q data streams from the filters are guaranteed to be 45 dBc below the carrier at 885 kHz offset. Further filtering of the analog wave is accomplished through the use of a 7-pole elliptic filter in the BBX. A more detailed description of the FIR filter response is given on the following graph.

The baseband filters have a linear phase. In addition, they have a frequency response S(f) that satisfies the limits shown in the figure below. The normalized frequency response of the filter shall be contained within plus or minus error (e1) in the passband and shall be less than or equal to error (e2) in the stop band (f>fs). The numerical values for the parameters are e1=1.5dB, e2=-40dB, fp=590kHz, and fs=740kHz.



BASEBAND FILTERS FREQUENCY RESPONSE LIMITS

Means for Limiting Power

In the Analog system, power limiting is obtained via the transceiver power control loop. The loop senses the transceiver output power and continuously adjusts a voltage variable attenuator to achieve proper power control error. If the controller is unable to achieve TX power control the transceiver is taken out of service via software and an error message is sent.

1. Level 0 Adjustment: The level 0 power for each channel will be adjustable via software by means of a A/D converter. The minimum adjustable range will be 25 dB. A voltage variable attenuator will be used to vary the power level. Closed-loop power control is used to prevent drift.

2. Power Stepping: 8 power levels (0-7 with 0 being maximum power) with increments of 4 dB.

3. Key Line: The transmitter can be toggled on and off via software control. This is accomplished by turning off the bias for the final, driver transistors and setting all the attenuators to a maximum insertion loss.

In the CDMA system, further power limiting is obtained in the Broad Band Transceiver Card (BBX) through the use of a digitally controlled attenuator (DCA).

In the CDMA system, the power output will be controlled by the Multi-Channel CDMA (MCC) card and the Base Band Distribution Card (BDC). The Base Band Transceiver card (BBX) has an automatic gain control around the transmitter lineup to maintain an output power that is within $\pm$1dB of the input power plus required gain on the BBX.

(11) Means for Attenuating Higher Audio

In the Analog system, higher audio frequencies are attenuated by a low pass filter in the DSP before the modulator. This provides a 40 dB/octave roll-off above 3 kHz and at least 52 dB of attenuation above 8 kHz.

(12) **Description of Digital Modulation Techniques**

Refer to Exhibit #21.

For the Analog system, no special digital modulation techniques are used with this transmitter. The same modulator used for audio, is also used for data. The wideband data signal passes through a low pass filter before entering the modulator. This filter provides a 24 dB/octave roll-off above 10 kHz.

The Code Division Multiple Access (CDMA) system uses only a digital transmission mode for both the voice and data transmission. The voice vocoder rate is variable and ranges from 0.8 to 8.6 KBPS in a Rate Set 1 system, and from 1.05 to 13.35 KBPS in a Rate Set 2 system. The exact data rate chosen is based on the voice activity factor. Regardless of vocoder rate and system type, Rate Set 1 or 2, the modulation symbol rate is always 19.2 KBPS into the block interleaver and walsh function modulator on all paging and traffic channels. Encoding at 9600 bps results in a set forward traffic channel power, and at a sub-rate of 4800 bps approximately half of the forward power is effectively reduced.

The CDMA waveform is a combination of frequency division, code division, and orthogonal signal multiple access techniques. Frequency division is employed by dividing the available spectrum into nominal 1.25 MHz bandwidth channels. Code division is employed by "mixing" the data with a pseudorandom noise binary code at a rate of 1.2288 MHz. This spreads the signal over a 1.23 MHz bandwidth.

The spread signal is then encoded into two parallel bit streams referred to as I(t) and Q(t). At any time t, the vector form of I(t) and Q(t) forms a vector which can be plotted as a constellation on a graph whose abscissa and ordinate axes are scaled in terms of the magnitude of I(t) and Q(t) respectively. For the US standard (EIA/TIA/IS-97-A), only four differential changes between any two sequential vectors are permitted. The digitally encoded I and Q waveforms from the pilot, paging, synchronizing, and traffic signals are then digitally combined and digitally filtered. These signals are then passed through a Digital to Analog converter and filtered using a 7-pole Elliptic filter with a 3 dB cutoff frequency of 630 KHz. This encoding scheme is referred to as Binary Phase Shift Keying (BPSK). These I(t) and Q(t) signals are then applied to the modulator.

Section 2.983 (e) **Standard Test Conditions**

The following conditions and procedures were followed during testing of this transmitter:

Room Temperature	+ 25 °C
Room Humidity	50%
DC Supply Voltage	+27 VDC (Nominal)

Prior to testing, the unit was tuned up according to the Manufacturer's Alignment Procedure. All data presented represents the worst case parameter being measured. All test data required by sections 2.985 through 2.997 can be found in Exhibits #21 through #25.

Section 2.983 (f) **Equipment Identification**

A drawing of the equipment identification nameplate appears in Exhibit #1.

Section 2.983 (g) **Photographs**

The photographs showing external and internal construction are in Exhibit #26.

Section 2.983 **Description of Various Frame Configurations**

The SC9600 Mixed Mode/Multiple Carrier Frame has four cages, or shelves in which either an Analog shelf or a CDMA shelf may be inserted. These Analog or CDMA shelves are configured to enable the frame to operate at different carrier frequencies simultaneously thus making it Multiple Carrier capable. The frame may then be configured in one of three modes:
1) All CDMA 2) All Analog or 3) Mixed Mode .

A description of each configuration follows:

1) All CDMA: When configured as all CDMA, the four (4) cages will be equipped with only CDMA shelves (CCP cages) in one or up to four of the shelves.

2) All Analog: When configured as all Analog, the four (4) cages will be equipped with only Analog Transceiver shelves in one or up to four of the shelves.

3) Mixed Mode: When configured as mixed mode, the four (4) cages will be equipped with at least one Analog shelf and at least one CDMA shelf, or combination of Analog and CDMA shelves to fill up the 4 cages.

Section 2.983 **Use with Various Power Supplies**

The Frame can accommodate a DC input voltage of +27VDC. Polarity changes are accommodated in the power distribution area by feeding straight through or crossing over the primary input voltage. Circuit breakers are provided for each card shelf in the Frame. Additionally, circuit breakers are provided for fans and other components requiring direct primary input voltage.

Two Power Supply Cards installed in the Power Distribution Shelf convert the input DC voltage to the necessary voltages required to power the Common Equipment Shelf Modules (Multicoupler/Preselectors, CSM's, AMR, etc.). The Power Supply card used in the Common Equipment Shelf is not the same card used in the Transceiver Shelves.

The power supply cards in the Power Distribution Shelf are in a redundant, load sharing configuration. This means both supplies are on line at all times. One supply has the capacity to power an entire shelf. With this scheme, one supply is not designated as primary or redundant, both are on line and circuitry between the two supplies assures load sharing equality to within approximately 15%. Each supply has an LED to alarm a detected failure.

Section 2.987(d) Measurements Required: **Modulation Characteristics**

Refer to Exhibit #21.

(a) Analog Audio Frequency Response

DEFINITION

The transmit audio frequency response is the relative signal level of any frequency relative to the level of 1 kHz, with the transmit audio compressor disabled and when measured using a C message filter.

METHOD OF MEASUREMENT

Operate the transmitter under standard test conditions and monitor the output with a frequency deviation meter or a calibrated test receiver with the compressor and expander disabled, without standard 750 microsecond de-emphasis, and with a C message weighted filter. Apply a standard 1000 Hz sinewave test tone at a standard test tone level input (i.e. -13 dBm) to the transmitter external audio input port, and set the deviation to 2.9 kHz. Without varying the input level, vary the modulating frequency from 300 to 30,000 Hz and measure the relative level with respect to 1000 Hz on the deviation monitor.

MINIMUM STANDARD

For 300 to 3000 Hz, the audio frequency response shall not vary more than +1 or -3 dB from a true 6 dB per octave pre-emphasis characteristic as referenced to the 1000 Hz level (with the exception of the permissible 6 dB per octave roll-off from 2500 to 3000 Hz). Between 3 and 30 kHz, the response shall not exceed by 1 dB the curve defined by the following table (per EIA/TIA-IS-89):

AUDIO FREQUENCY BAND ATTENUATION

Frequency Band	Attenuation Relative to 3000 Hz
3000-5900 Hz	40 log (f/3000) dB
5900-6100 Hz	35 dB
6100-15000 Hz	40 log (f/3000) dB
Above 15000 Hz	28 dB

For Narrow Analog operation the audio response shall be -15 dB maximum relative to the 1000 Hz level for any frequency below 200 Hz.

MEASURED DATA

This transmitter is equipped with an audio low pass filter which precedes the modulator. This transmitter is also equipped with a wideband data low pass filter in the data path preceding the modulator.

The frequency response of both of these filters was measured by applying a sine wave, over a frequency range of 300 Hz to 100,000 Hz, to the input terminal and measuring the output amplitude relative to the output level at 1000 Hz.

(b) Analog Modulation Limiting

DEFINITION

Modulation limiting refers to the ability of transmitter circuits to prevent the transmitter from producing deviation in excess of rated system deviation.

MINIMUM STANDARD

The transmitter modulation must not exceed rated system deviation at any audio input level from 60% rated input level to a value 20 dB greater (per EIA/TIA-IS-89).

METHOD OF MEASUREMENT

The transmitter shall be adjusted for full rated system deviation at 1000 Hz and reference that output as 0 dB. With modulation frequencies of 300,1000, and 3000 Hz respectively, vary the audio input to a level 20 dB above that required at 1000 Hz to produce 60% of rated system deviation. This is required for both up and down modulation. Record the percent of full system deviation obtained as a function of input level. Perform this measurement twice, with the compressor disabled and with the compressor enabled.

(c) CDMA Waveform Quality (ρ)

DEFINITION

Transmit waveform quality is the normalized correlated power between the actual waveform and the ideal waveform. The range of values for the transmit waveform quality is from 1.0, a perfect CDMA waveform, to 0.0, a non-CDMA signal. As an example, a base station with a -0.4 dB degradation in its transmit waveform would have a quality (ρ) of 10^(-0.4/10) = 0.912.

MINIMUM STANDARD

The minimum waveform quality figure for a spread-spectrum CDMA signal is -0.4 dB or 0.912 as measured with a Rho meter (per EIA/TIA/IS-97-A).

METHOD OF MEASUREMENT

Set the pilot level to 20% of the CDMA Avg. power, and transmit the pilot signal only. Connect the Rho meter directly to the transmit port. On the CDMA Rho Meter, disable the RF generator and set the tuning mode to manual. Enter the base station's RF transmit frequency and set the input attenuation to hold. Set the input attenuation to 20 dB. Now, set the DSP Analyzer test mode to continuous and chose the Rho measurement as the measurement type. Set the channel to forward and choose amplitude middle as the trigger qualifier. Set the gain to 0 dB. Set the reference frequency to 19.6608 MHz. Select internal to lock-on to the CDMA time base reference. Read the measured value for Rho on the Rho meter.

Section 2.989(c) Measurement Required: **Occupied Bandwidth**

Refer to Exhibit #24.

(a) Analog Waveform

DEFINITION

For the Analog system the occupied bandwidth is the frequency bandwidth of a modulation carrier within which a total of 99% of the rated power appears. Data on the bandwidth occupied by this transmitter is presented in the form of plots taken to illustrate the spectrum analysis of the transmitter sideband spectrum. The plots depict the carrier signal modulated with a 2500 Hz test signal. A separate spectrum plot is supplied for each maximum deviation limit which applies to this transmitter.

MINIMUM STANDARD

The mean power of emissions shall be attenuated below the mean power of the transmitter in accordance with the following schedule (per FCC Part 22.907).

Wide Mode:
For voice modulation (40K0F8W mode ±12 kHz max):

1. On any frequency removed from the carrier frequency by greater than 20 kHz up to and including 45 kHz: At least 26 dBc; and

2. On any frequency removed from the carrier frequency by greater than 45 kHz up to the first multiple of the carrier frequency: At least 60 dBc or 43 + 10 log (mean output power in watts) dBc, whichever is the lesser attenuation.

For 10 kHz data modulation (4OKOF1D mode ± 8 kHz max.):

1. On any frequency removed from the carrier frequency by greater than 20 kHz up to and including 45 kHz: At least 26 dBc; and

2. On any frequency removed from the carrier frequency by greater than 45 kHz up to and including 90 kHz: At least 45 dBc; and

3. On any frequency removed from the carrier frequency by greater than 90 kHz up to the first multiple of the carrier frequency: At least 60 dBc or 43 + 10 log (mean output power in watts) dBc, whichever is the lesser attenuation.

Narrow Mode:
For voice and data modulation combined (17K4F9W (±5 kHz max voice; ±700 Hz data)):

1. On any frequency removed from the carrier frequency by greater than 9 kHz up to and including 20 kHz: At least 24 dBc; and

2. On any frequency removed from the carrier frequency by greater than 24 kHz up to the first multiple of the carrier frequency: At least 60 dBc or 43 + 10 log (mean output power in watts) dBc, whichever is the lesser attenuation.

METHOD OF MEASUREMENT

The spectrum of the modulated carrier shall be monitored by a panoramic method capable of 60 dB amplitude range.

(b) CDMA Waveform

DEFINITION

The measured spectral width of an emission. The measurement determines occupied bandwidth as the difference between upper and lower frequencies where 0.5% of the emission power is above the upper frequency and 0.5% of the emission power is below the lower frequency.

Data to show the bandwidth occupied by this transmitter and output power is presented in the form of Channel Power Measurement plots from a spectrum analyzer. The Channel Power Measurement divides the Channel Power Bandwidth into increments (defined by the Resolution Bandwidth Setting selected), then sums the energy contained in each of those increments to provide an integrated measurement of the power in the Channel Power Bandwidth.

METHOD OF MEASUREMENT

Connect a spectrum analyzer to the Frame RF Transmit Port. Set the CDMA signal power to maximum. Setup the spectrum analyzer to make the following integrated Channel Power Measurements:

1. Channel Power Measurement of the CDMA Carrier Centered at 869.7 (Ch. 1013).

Channel Power Bandwidth:	1.25 MHz
Resolution Bandwidth:	30 KHz

2. Channel Power Measurement of the CDMA Carrier Centered at 893.310 (Ch. 777).

Channel Power Bandwidth:	1.25 MHz
Resolution Bandwidth:	30 KHz

Record the Channel Power Measurements.

Section 2.991 Measurement Required: **Spurious & Harmonic Emissions at the Antenna Terminals**

Refer to Exhibit #22.

DEFINITION

Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside the authorized bandwidth of the transmitter. Reduction in the level of these spurious emissions will not affect the quality of the information being transmitted.

(a) Analog System

MINIMUM STANDARD

The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the alignment procedure, shall not be less than 43 + 10 log (mean output power in watts) dBc below the mean power output.

METHOD OF MEASUREMENT

Measurements shall be made from the lowest audio frequency generated in the equipment to the tenth harmonic of the carrier (or as high as the state of the art permits) except for that region within 75 kHz of the carrier frequency. The level of the carrier frequency and the various conducted spurious frequencies shall be measured with calibrated equipment.

(b) CDMA System

MINIMUM STANDARD

Per Parts 22.901(d) (2) and 22.917(e), the minimum standards for Transmit Port Conducted Spurious Emissions are as follows:

Section 22.917(e) Out of Band Emissions:

METHOD OF MEASUREMENT

Connect a spectrum analyzer to the Frame RF Transmit Port. Measure the power level at the carrier frequency. Now, sweep the spectrum analyzer over a frequency range from 1MHz to tenth harmonic of the carrier frequency, recording all spurious emissions.

Section 2.993 Measurement Required: **Field Strength of Spurious & Harmonic Radiation**

Refer to Exhibit #22

DEFINITION

Radiated spurious and harmonic emissions are emissions from the equipment when loaded into a non-radiating load on a frequency or frequencies that are outside an occupied band sufficient to assure transmission of information with required quality for the class of communications desired. The reduction in the level of these spurious emissions will not affect the quality of the information being transmitted.

MINIMUM STANDARD

Section 22.917(e) Out of Band Emissions.

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more that twice the fundamental frequency by: at least 43+10 log P dB.

Necessary measurements were made at Motorola Inc., located at 5555 N. Beach Street, Fort Worth, Texas 76137, the radiation test facility 1605 Liberty School Rd., Azle, Texas, 76020 or at Motorola, Inc., located at 1501 West Shure Dr., Arlington Heights, Illinois, 60004.

INSTALLATION OF EQUIPMENT

The equipment under test is placed on a turntable, connected to a dummy RF load, and placed in normal operation. A receiving antenna located 3 meters from the turntable picks up any signal radiated from the transmitter and its operating accessories. The antenna is adjustable in height from 1 to 4 meters and can be horizontally or vertically polarized.

METHOD OF MEASUREMENT

The equipment is adjusted to obtain peak readings of received signals wherever they occur in the spectrum by:

1. Rotating the transmitter under test.

2. Adjusting the antenna height.

The testing procedure is repeated for both horizontal and vertical polarization of the receiving antenna. Relative signal strength is indicated on meters built into the receiver. To obtain an actual radiated signal strength, the meter reading is adjusted to correct for all affecting factors, such as antenna gain, RF gain, and cable loss. A table of correction factors vs. frequency is then used to convert a signal level measured at the receiver to the value that would be measured at the device (assuming an isotropic radiator).

Section 2.995 Measurement Required: **Frequency Stability**

Refer to Exhibit #25.

DEFINITION

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

(a) Analog System

MINIMUM STANDARD

The land station carrier frequency during wide analog operation shall be maintained within ± .5 parts per million (ppm) of any assigned channel frequency. During Narrow Analog operation, the land station carrier frequency shall be maintained within ±O.25 ppm of any assigned channel frequency. The required stability shall be maintained over the specified temperature range when additionally the supply voltage is varied ±15% from normal (per EIA/TIA-IS89).

METHOD OF MEASUREMENT

Frequency measurements shall be made at the extremes of the temperature range 0 to +50 degrees Celsius and at intervals of not more than 10 degrees throughout the range. A period of time sufficient to stabilize all of the components in the equipment shall be allowed prior to each frequency measurement. The frequency of the transmitter shall be measured by extracting a sample of the carrier and measuring its center frequency by equipment having a degree of accuracy of at least 10 times that of the minimum specification to be measured.

The frequency stability of transmitting equipment shall be checked with variations in:

1. Temperature: Vary the ambient temperature from 0 to +50^{0}C.

2. Primary Supply Voltage: Vary the primary supply voltage from 85% to 115% of the voltage normally measured at the input to the power cable supplied or at the power supply terminals if cables are not normally supplied.

(b) CDMA System

MINIMUM STANDARD

For the operating temperatures of -30 to 50 degrees Celsius and supply voltages of 85 to 115% of the normal value, the average frequency difference between the actual CDMA transmit carrier frequency and specified CDMA transmit frequency assignment shall be less than +5*10^-8 of the frequency assignment (+0.05 ppm).

METHOD OF MEASUREMENT

Frequency measurements shall be made at the extremes of the temperature range -30 to 50 degrees Celsius and at intervals of not more than 10 degrees throughout the range. A period of time sufficient to stabilize all of the components in the equipment shall be allowed prior to each frequency measurement. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need to be subjected to the temperature variation test. In this filing, the device under test derives its carrier frequency from the clock signal in the CSM. Frequency stability over temperature data is provided in Exhibit #25.

The frequency shall be measured by equipment having a degree of accuracy of at least 10 times that of the minimum specification to be measured (such as a rubidium stabilized source).

MOTOROLA
Cellular Infrastructure Group
Personal Communications Division

FCC ID: IHET5YE1

EXHIBIT #4

SUMMARY OF ACTIVE DEVICES

MOTOROLA

Cellular Infrastructure Group
Personal Communications Division

FCC ID: IHET5YE1

SUMMARY OF ACTIVE DEVICES

Analog

Summary of Active Devices

APPLICANT: MOTOROLA **TRANSMITTER TYPE: IHET5YE1**

TX SYNTHESIZER

Device Type	Component Description	Operating Frequencies
MQE-002-887	VCO	869-894 MHz
MC14520F	PLL Synthesizer IC	869-894 MHz
PMB2200	Modulator IC	869-894 MHz

TX EXCITER

Device Type	Component Description	Operating Frequencies
AT-109	Voltage Variable Attenuator	869-894 MHz
AT-230	Step Attenuator	869-894 MHz
UPC-2709	Gain Block	869-894 MHz
MSA-2111	Gain Block	869-894 MHz
MRF-57111L	RF Amp	869-894 MHz
CLY-5	OPAMP	D.C.
LP2951	Voltage Reference	D.C.
MC7812	Voltage Reference	D.C.
MC7905	Voltage Reference	D.C.

TRANSMIT MATRIX

Device Type	Component Description	Operating Frequencies
AC-282	GaAs	824-894 MHz
AC-305	Digital Attenuator	824-894 MHz
Max-665	Pos-to-Neg Volt. Converter	D.C.
MC74HC595	Shift/Store Register	D.C.
MC74HC32	Quad OR Gate	D.C.
MC74HC08	Quad AND Gate	D.C.
LM2901	Comparator	D.C.
LM385	Adj. Voltage Regulator	D.C.

POWER SUPPLY

Device Type	Component Description	Operating Frequencies
FC150A	Power Module +5V	D.C.
FC150C	Power Module +15V	D.C.
FC150S6R5	Power Module +6.5V	D.C.
82CNQ030L	Schottky diode	D.C.
MC33161D	Protection circuit	D.C.
LM2903D	Dual comparitor	D.C

MOTOROLA

Cellular Infrastructure Group
Personal Communications Division

FCC ID: IHET5YE1

SUMMARY OF ACTIVE DEVICES

CDMA

Summary of Active Devices

APPLICANT: MOTOROLA **TRANSMITTER TYPE: IHET5YE1**

MULTICOUPLER/PRESELECTOR CARD (MPC)

Device Type	Component Description	Operating Frequencies
ATF10136	TRANSISTOR GAAS FET ATF10136	824 - 849 MHz
4813824A10	TSTR NPN 40V .2A GEN PURP	D.C.
4813824A17	XSTR PNP40V .2A GENP B=100-3	D.C.
BFG541	TSTR RF BIPOLAR BFG541	824 - 849 MHz
5109905P01	IC LINEAR SWITCHED CAP REG	D.C.
74HC08AD	IC QUAD 2INP AND 74HC08AD	D.C.
74HC10D	IC TRIPLE 3INP NAND 74HC10D	D.C.
74HC32AD	IC QUAD 2INP OR 74HC32AD	D.C.
5113815A11	IC UNIVERSAL VOLTAGE MONITOR	D.C.
MC78L08ABD	REG 8V POS 100MA MC78L08ABD	D.C.
79L05	IC -5V REG 79L05	D.C.
5113816G14	IC ADJ. POSITIVE REG,500MA	D.C.
MC3303	IC QD OP AMP GEN PURP MC3303	D.C.
5184058R37	IC QUAD EEPOT POT 2KOHM X 92	D.C.
5199510A01	IC EEPROM SERIAL 256X8 X2502	D.C.

BASEBAND TRANSCEIVER CARD (BBX)

Device Type	Component Description	Operating Frequencies
MMBT3906	PNP TRANSISTOR	DC
MMBT3904	NPN TRANSISTOR	DC
AD706	OP-AMP	DC
MC33182	OP-AMP	1 - 630 KHz
MC33269DR2	VOLTAGE REGULATOR	DC
MC79M05BBDT	VOLTAGE REGULATOR	DC
AD603	VARIABLE GAIN AMP	1 - 630 KHz
MRFIC1806	RF AMPLIFIER	869.7 - 893.31 MHz
SW-419	SWITCH	869.7 - 893.31 MHz
MRF9411LT1	NPN TRANSISTOR	869.7 - 893.31 MHz
RF2422	MODULATOR	INPUT: 1-630 KHz LO: 869.70-893.31 MHz RF OUT: 869.70-893.31 MHz
0164000A30	TX VCO MODULE	869.7 - 893.31 MHz
0164000A66	RX VCO MODULE	754.7 - 778.31 MHz
SG615	REFERENCE OSCILLATOR	20 MHz
SI9400	MOSFET, P-CHANNEL	DC
MA4CS102	SCHOTTKY DIODE	869.7 - 893.31 MHz
MMDF2P02	POWER MOSFET	43 kHz
MMBFU310	SMALL SIGNAL FET	70 MHz
MMBD301	VARACTOR	70 MHz
MMBR901	NPN TRANSISTOR	754.7 - 778.31 MHz
MRF5812	NPN TRANSISTOR	754.7 - 778.31 MHz
MRFIC0904	NPN TRANSISTOR	869.7 - 893.3 MHz
MMBZ5232	ZENER DIODE	DC
MMBZ5240	ZENER DIODE	DC
MMSZ5243	ZENER DIODE	DC
MBRS340	RECTIFIER	43 kHz
MMBD7000	RECTIFIER	DC
MMBV409	DIODE	70 MHz
HSMP3800	RF DIODE	869.7 - 893.31 MHz
2SC3606	NPN TRANSISTOR	754.7 - 778.31 MHz
AT230	DIGITAL ATTENUATOR	869.7 - 893.31 MHz

Device Type	Component Description	Operating Frequencies
74F776A	XCVR	2 MHz
74F777A	XCVR	2 MHz
AD680	VOLTAGE REFERENCE	DC
X9C102SI	DIGITAL POT	DC
SC02PH003PD02	ASIC	16 MHz
MC68302FC16C	PROCESSOR	16 MHz
MCM518160AT60	DRAM	16 MHz
MC74HC4066	MUX	3 MHz
MC74ACT157	MUX	4 MHz
MC10EL16	RCVR	20 MHz
MC10EL58	MUX	20 MHz
MC100ELT23	PECL TO TTL	20 MHz
MC145041	SERIES ADC	800 Hz
MC145170	PLL	70 MHz
MC145191	PLL	869.7 - 893.31 MHz
MC33063	DC TO DC CONVERTER	43 kHz
MC33161	VOLTAGE MONITOR	DC
MC78M12	8V REGULATOR	DC
MC33269DTRK	ADJ. REGULATOR	DC
MC33269DR2	5V REGULATOR	DC
MC78MO5CDTRK	12V REGULATOR	DC
MC33077	DUAL OP AMP	1 - 630 kHz
MC33274	QUAD OP AMP	DC
LM2903	DUAL COMPARATOR	DC
LM2901	QUAD COMPARATOR	DC
AD9059	ADC	10 MHz
AD9762	DAC	5 MHz
EPF81188AQC	FPGA	20 MHz
74ABT823	BUFFER	20 MHz
AD637JR	RMS TO DC CONVERTER	1 - 630 kHz
AD603	VGA	1 - 630 kHz
AD706	VGA	1 - 630 kHz

Device Type	Component Description	Operating Frequencies
AD602	VGA	1 - 630 kHz
TLC5620	DAC	800 Hz
74ABT125	QUAD BUFFER	DC
LT1081	RS232 XMIT/RCVR	192 kHz
TE28F400CV	FLASH ROM	10 MHz

MULTI CHANNEL CDMA CARD (MCC-8)

Device Type	Component Description	Operating Frequencies
XC5210	CHI_Bus	2.0480 Mhz
74F777	CHI_Bus	2.0480 Mhz
74F777	CHI_Bus	2.0480 Mhz
MAXX_ASIC	Fwd Link	19.6608 MHz
MAXX_ASIC	Fwd Link	19.6608 MHz
MAXX_ASIC	Fwd Link	19.6608 MHz
MAXX_ASIC	Fwd Link	19.6608 MHz
MAXX_ASIC	Fwd Link	19.6608 MHz
MAXX_ASIC	Fwd Link	19.6608 MHz
MAXX_ASIC	Fwd Link	19.6608 MHz
MAXX_ASIC	Fwd Link	19.6608 MHz
XC5202	Fwd Link	19.6608 MHz
74ABT125	Fwd Link	19.6608 MHz
74ABT125	Fwd Link	19.6608 MHz
DSP56167	DSP	44.000 Mhz
DSP56167	DSP	44.000 Mhz
MC68EN360	CPU	25.000 MHz
LXT907	E-NET	20.000 MHz
74ACT541	Buffer	19.6608 MHz

BASEBAND DISTRIBUTION CARD (BDC)

Device Type	Component Description	Operating Frequencies
MC74ACT244DWR2	Oct. Line Driver	19.6608 MHz (unclocked)
SX02RH029DH01	DTCASIC	19.6608 MHz
N74ABT125D	Quad 3 State Buffer	19.6608 MHz (unclocked)

CLOCK SYNCRONIZATION MODULE (CSM)

Device Type	Component Description	Operating Frequencies
GAL16V8-7LJ	U39	50 MHz, 3 MHz
GAL16V8-7LJ	U42	50 MHz, 3 MHz
19.6608 MHz VCXO	Y2	19.6608 MHz
CY10E301L-6JC	U41	D.C.
AD817AR	U16	19.6608 MHz, 3 MHz
MC100ELT23D	U73, U72	D.C.
	U31	19.6608 MHz
MC10ELT21D	U25	10 MHz
ADV7128KR30	U22	19.6608 MHz
MC10E1651FN	U27	19.6608 MHz
XC4006PQ160-5	U20	19.6608 MHz, 10 MHz
LM385D-1.2	VR1	D.C.
MC79M15CDT	U30	D.C.
78ST305HC	U40	1 MHz
GAL22V10B-7LJ	U34	50 MHz
SG615H-50MHz	Y3	50 MHz
MA505-16MHz	Y1	16.0 MHz
MJD243RL	Q13, Q11, Q10, Q9, Q8, Q1	3 MHz
MMBT3904	Q14, Q12, Q7, Q5, Q4, Q2	D.C.
MMBT3906	Q6, Q3	D.C.
MT5C1008-35DJI	U12, U11	16 MHz
MC68302FC	U2	16 MHz
MC14538B	U10	D.C.
74ACT00D	U60	D.C.
	U13	19.6608 MHz

Device Type	Component Description	Operating Frequencies
74ACT04D	U9	16 MHz
74ACT14D	U75, U66, U65, U37	1 Hz
	U1	0.5 Hz
74ACT32D	U8	16 MHz
74ACT74D	U38	9.8304 Mhz
74ACT245DW	U19, U17	1 Hz
74ACT05D	U5	D.C.
MC10H350FN	U77	3 MHz
	U36	19.6608 MHz
MC10EL51D	U55	0.5 Hz
	U52, U50, U45, U44	D.C.
MC10EL16D	U64	D.C.
	U63	19.6608 MHz
	U62, U61, U58	D.C.
	U33	19.6608 MHz
MC10EL04D	U57, U48	D.C.
MC10EL07D	U49, U43	19.6608 MHz
MC10EL111FN	U70	19.6608 MHz
	U69	D.C.
	U68	0.5 Hz
MC10EL31D	U56, U51, U46	D.C.
MC68681FN	U7	4 MHz, 9600 Hz
75172BDW	U71	0.5 Hz
	U67, U54	4800 Hz
75175D	U76, U47	4800 Hz
	U74, U59	8000 Hz
LT1054IS	U32	25 kHz
AD7846JP	U24	1 Hz
74ABT273	U21	19.6608 MHz
LT1081IS	U3	D.C.
DS1232S	U6	D.C.
IDT7134J	U18	19.6608 MHz
X25020	U4	D.C.
AMF29F010-120JC	U14	16 MHz

High Stability Oscillator (HSO)

Device Type	Component Description	Operating Frequencies
SN74AC240DW	LINE DRIVER	1 HZ
X2502OS	EEPROM	9.6 KHZ
DS3695AM	RS485 DRIVER	1 HZ
FE5680A	Rb MODULE	500 HZ
		8.388608 MHZ
		38 MHZ
		50.255 MHZ
		100.51 MHZ
		6.8 GHZ

MOTOROLA

Cellular Infrastructure Group
Personal Communications Division

FCC ID: IHET5YE1

EXHIBIT #21

MODULATION CHARACTERISTICS

FCC ID: IHET5YE1

MODULATION CHARACTERISTICS

ANALOG

```
******************************************************************
******************************************************************

                RESULTS FOR RFDS REGRESSION TEST

                Created: Fri Jul 19 17:07:29 CDT 1996

                Verified Passed by Joshua Broadwater 6:10pm 7/19/96

                Version 1.0.0.0.7

******************************************************************
******************************************************************

General:

I) Comparison of Voice channel to RFDS Performance.
    A) Receive Audio (Rx in 1k @ 2.9kHz dev (AMPS)
         or 1.5kHz Dev (NAMPS)
         Power out = -50 dBm
         Input RSSI measure at receiver by unit under test.
         Channel output measured at CHI by audio analyzer.
         1) RFDS AMPS
             a) RSSI = DAEF
             b) Output = 44.319 mV
         2) AMPS Voice
             a) RSSI = DAF9
             b) Output = 0.913094 mV     43.913094
         3) RFDS NAMPS
             a) RSSI = DAE1
             b) Output = 43.2584 mV
         4) NAMPS Voice
             a) RSSI = DAE6
             b) Output = 44.0519 mV

    B) Transmit Audio (CHI in = 1k @ 70 mV (rms) nominal.)
         Output measured by HP modulation analyzer.
         1) RFDS AMPS
             a) RSSI = 1.57413 mW
             b) Deviation = 2.68565 kHz
         2) AMPS Voice
             a) RSSI = 1.64777 mW
             b) Deviation = 3.01492 kHz
         3) RFDS NAMPS
             a) RSSI = 1.58678 mW
             b) Deviation = 1.51898 kHz
         4) NAMPS Voice
             a) RSSI = 1.58678 mW
             b) Deviation = 1.55041 kHz

******************************************************************
******************************************************************

                RFDS TESTS

******************************************************************
******************************************************************

0) RSSI
        A) AMPS

Signal Generator vs. unit under test

        -50                 DAE2
        -60                 D0DD
        -70                 C6DD
        -80                 BCD4
        -90                 B2D2
Branch B at -70             C6C1

        B) NAMPS

Signal Generator vs. unit under test

        -50                 DAD4
        -60                 D0D4
        -70                 C6D1
        -80                 BCC8
        -90                 B2C6
Branch B at -70             C6BF

------------------------------------------------------------------

1) C/I

Single Channel in with no interference.
        A) AMPS = 1900
```

B) NAMPS = 2380

---

2) Control Diversity

With both channels receiving (A = -50 dBm, B = -70 dBm) and with A modulated by a 1 kHz tone and B modulated by a 400 Hz tone.

A) AMPS
- 0) Use Strongest: 999.924 Hz
- 1) Use A: 999.97 Hz
- 2) Use B: 401.442 Hz

B) NAMPS
- 0) Use Strongest: 999.961 Hz
- 1) Use A: 999.972 Hz
- 2) Use B: 401.508 Hz

---

3) Control De-emphasis

A) AMPS

freq	Chi Output In	Chi Output Out
400 Hz	234.156 mV	37.8947 mV
1000 Hz	41.1374 mV	43.9985 mV

B) NAMPS

freq	Chi Output In	Chi Output Out
400 Hz	242.61 mV	40.7788 mV
1000 Hz	44.2732 mV	41.7935 mV

---

4) Measure Frequency Deviation

A) AMPS
- a) Branch A
  - 0) 1 kHz @ 2.9 kHz Deviation --> 2931.0 Hz
  - 1) 10 kHz @ 8 kHz Deviation --> 8141.0 Hz
  - 0) 6 kHz @ 2.0 kHz Deviation --> 2083.0 Hz
- b) Branch B
  - 0) 1 kHz @ 2.9 kHz Deviation --> 2918.0 Hz
  - 1) 10 kHz @ 8 kHz Deviation --> 8206.0 Hz
  - 2) 6 kHz @ 2.0 kHz Deviation --> 1954.0 Hz

A) NAMPS
- a) Branch A
  - 0) 1 kHz @ 1.5 kHz Deviation --> 1436.0 Hz
- b) Branch B
  - 0) 1 kHz @ 1.5 kHz Deviation --> 1468.0 Hz

---

5) DSAT BER

In NAMPS mode only: Color 3 DSAT
BER = 0.0 bits in error out of 4000.0 bits

---

6) SAT/DSAT Detect

A) AMPS
- 0) Color 0 --> Pass
- 1) Color 1 --> Pass
- 2) Color 2 --> Pass

B) NAMPS
- 0) Color 0 --> Pass
- 1) Color 1 --> Pass
- 2) Color 2 --> Pass
- 3) Color 3 --> Pass
- 4) Color 4 --> Pass
- 5) Color 5 --> Pass
- 6) Color 6 --> Pass

---

7) ST Detect

a) 1999.0 detected
b) 0.0 detected

---

8) Control Compressor

A) AMPS

TDM Signal Strength	Deviation with Compressor In	Out
70 mV	2.69435 kHz	2.85597 kHz
300 mV	6.37338 kHz	11.746 kHz

B) NAMPS

TDM Signal Strength	Deviation with Compressor In	Out
70 mV	1.53336 kHz	1.56711 kHz
300 mV	3.03162 kHz	4.80746 kHz

---

9) Control Pre-emphasis

A) AMPS

freq	Deviation with de-emp In	Out
400 Hz	1.13518 kHz	3.01386 kHz
1000 Hz	2.98952 kHz	2.80766 kHz

B) NAMPS

freq	Deviation with de-emp In	Out
400 Hz	0.600771 kHz	1.32805 kHz
1000 Hz	1.51862 kHz	1.50175 kHz

---

10) Control Receive Audio Mute

A) AMPS
- 0) On SAT --> Pass
- 1) Off SAT --> Pass
- 2) Muted --> Pass
- 3) Unmuted --> Pass

B) NAMPS
- 0) On SAT --> Pass
- 1) Off SAT --> Pass
- 2) Muted --> Pass
- 3) Unmuted --> Pass

---

11) Control Transmit Audio Mute

A) AMPS
- 0) Off --> Pass
- 1) On --> Pass

B) NAMPS
- 0) Off --> Pass
- 1) On --> Pass

---

12) Generate Transmit Audio Tone

1 kHz @ nominal (2.9 kHz AMPS, 1.5 kHz NAMPS)
A) AMPS = 3130.54 Hz
B) NAMPS = 1449.18 Hz

---

13) Generate SAT/DSAT

A) AMPS generate 6 kHz @ 2 kHz dev
- 1) Deviation --> 2195.64 Hz
- 2) Frequency --> 6000.23 Hz

B) NAMPS generate Color 0 @ 700 Hz dev
- 1) Code 2556CB

---

15) Measure Audio Level

1 kHz @ nominal (2.9 kHz AMPS, 1.5 kHz NAMPS)
A) AMPS --> 78CB FFFD --> -18.5652 dBm
B) NAMPS --> 7C8A FFFD --> -18.2999 dBm

---

16) Measure Audio SINAD

1 kHz @ -110 dBm (2.9 kHz AMPS, 1.5 kHz NAMPS)
A) AMPS --> 52A2 FFF9 4080 FFFE --> 27.9511 dB
B) NAMPS --> 7C63 FFF9 7A45 FFFD --> 23.9333 dB

---

17) Generate Audio Loopback

1 kHz @ nominal (2.9 kHz AMPS, 1.5 kHz NAMPS)
A) AMPS --> Pass
B) NAMPS --> Pass

---

18) Control Expandor

A) AMPS

Deviation	Chi output with expandor In	Out
2.9 kHz	44.8912 mV	43.9299 mV
4.5 kHz	106.265 mV	66.659 mV

B) NAMPS

Deviation	Chi output with expandor In	Out
1.5 kHz	42.1521 mV	43.617 mV
3.0 kHz	171.294 mV	87.8469 mV

---

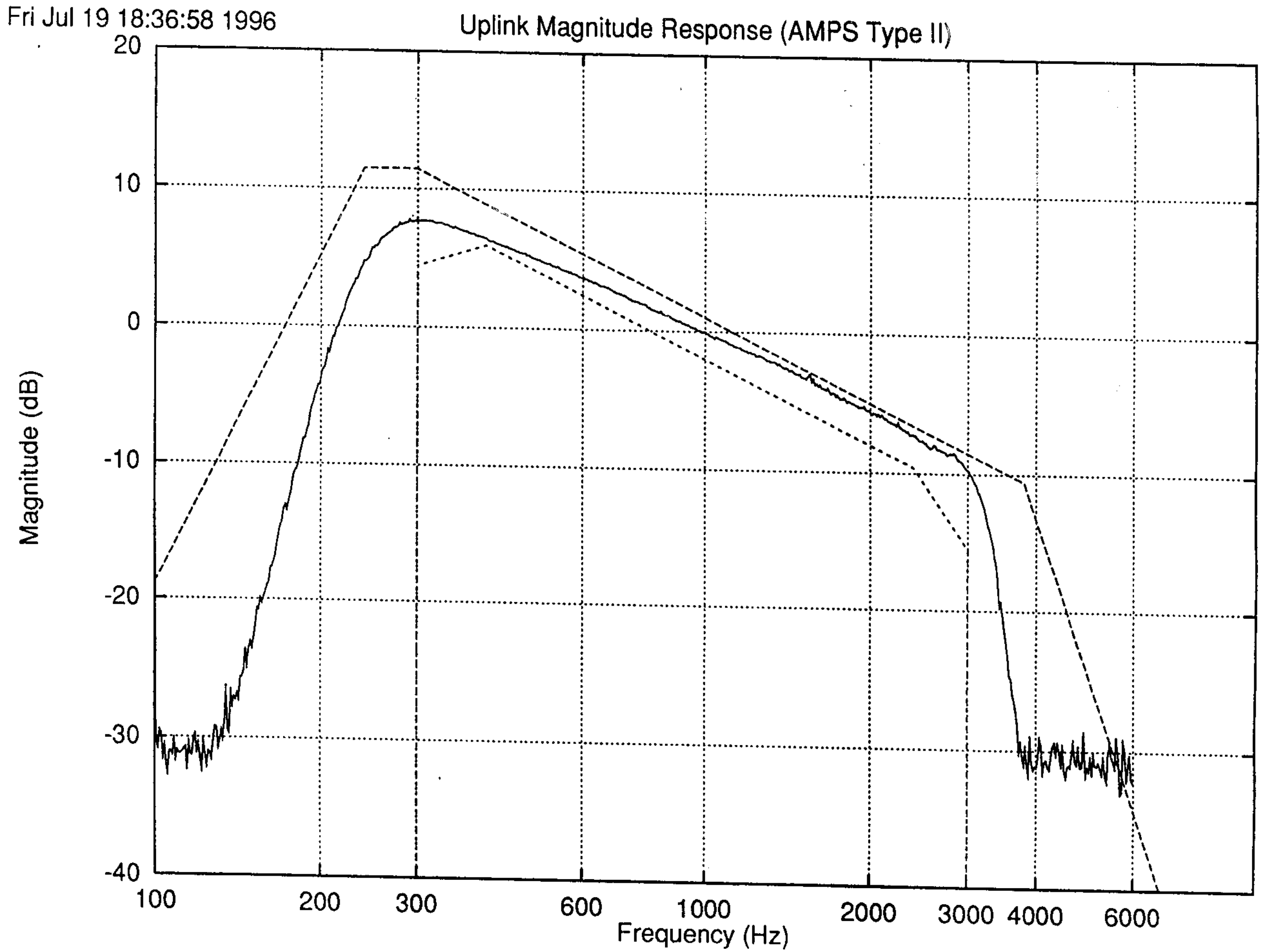
19) Generate Receive Audio Tone

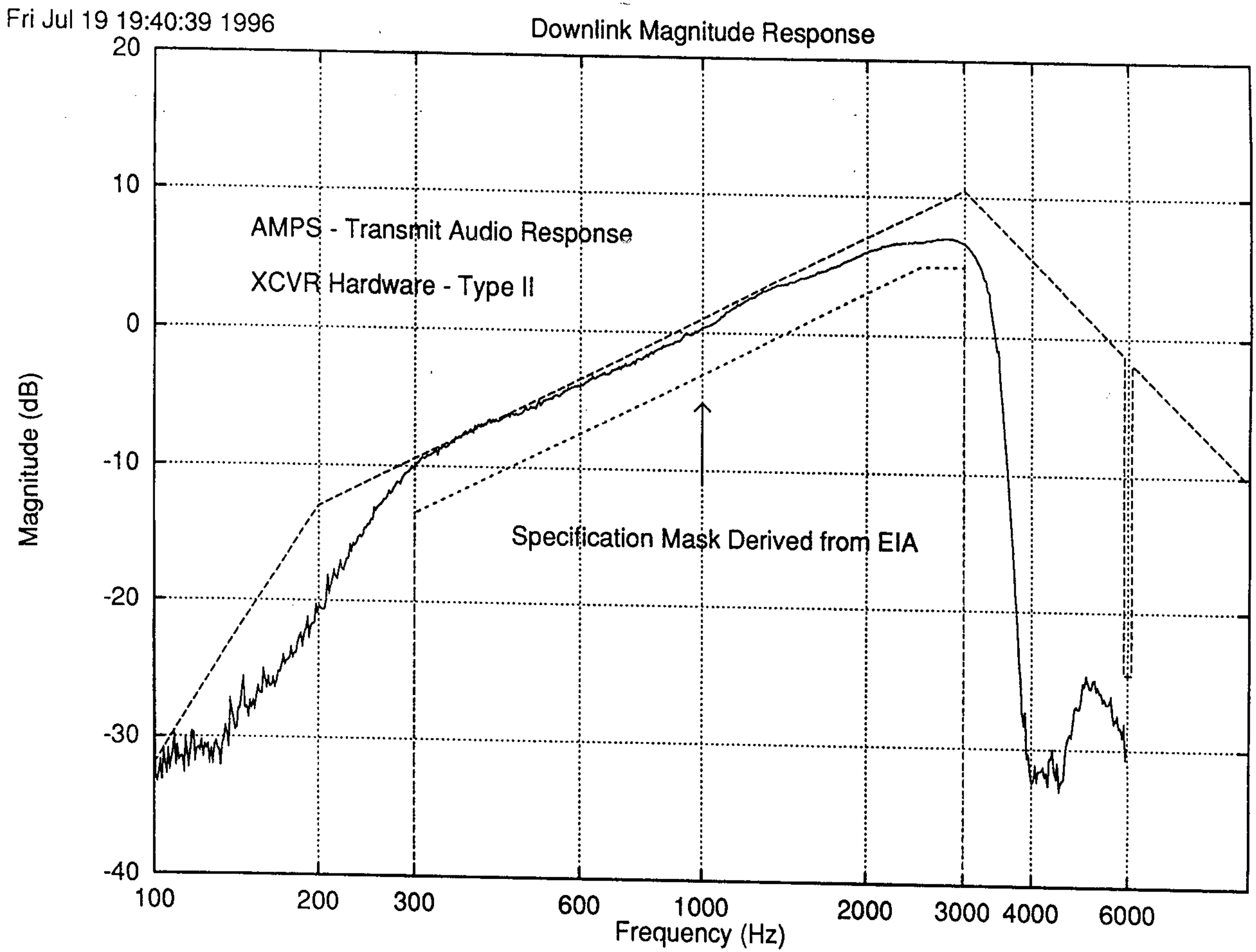
1 kHz @ nominal (2.9 kHz AMPS, 1.5 kHz NAMPS)
A) AMPS = 999.997 Hz @ 43.0982 mV
A) NAMPS = 999.999 Hz @ 21.9942 mV

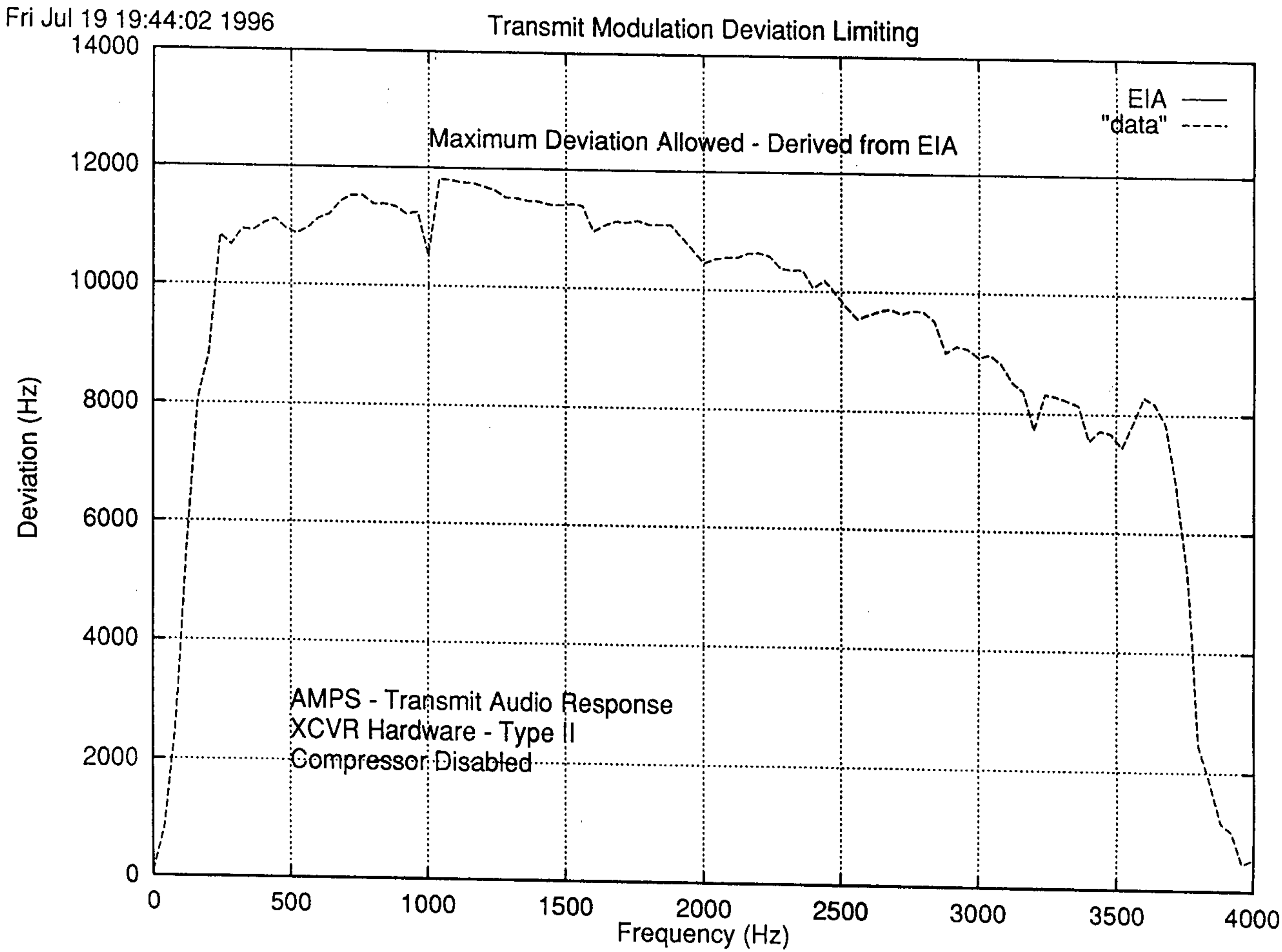
---

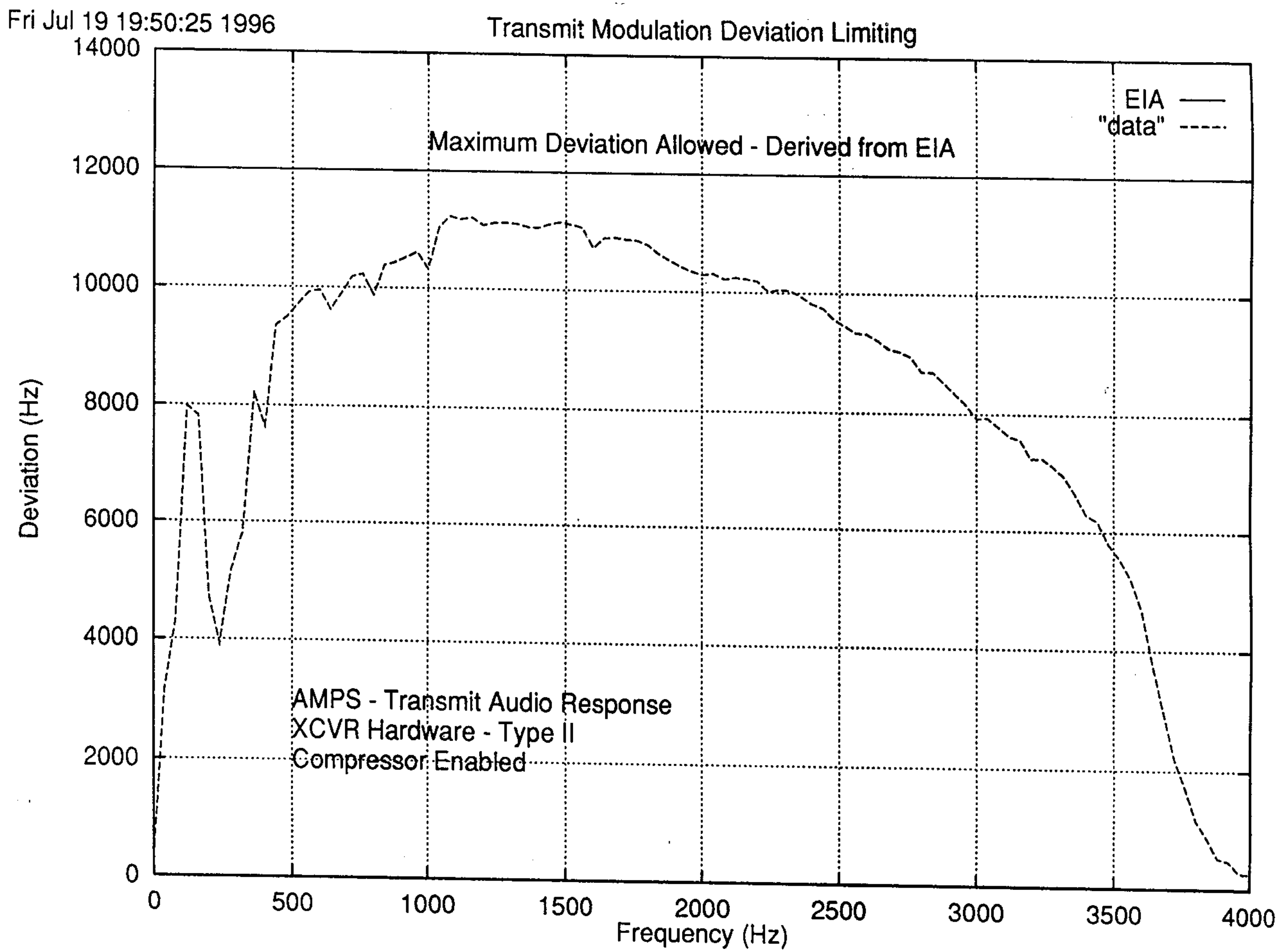
20) Send Discriminator/Abacus Data to Auxiliary SSI

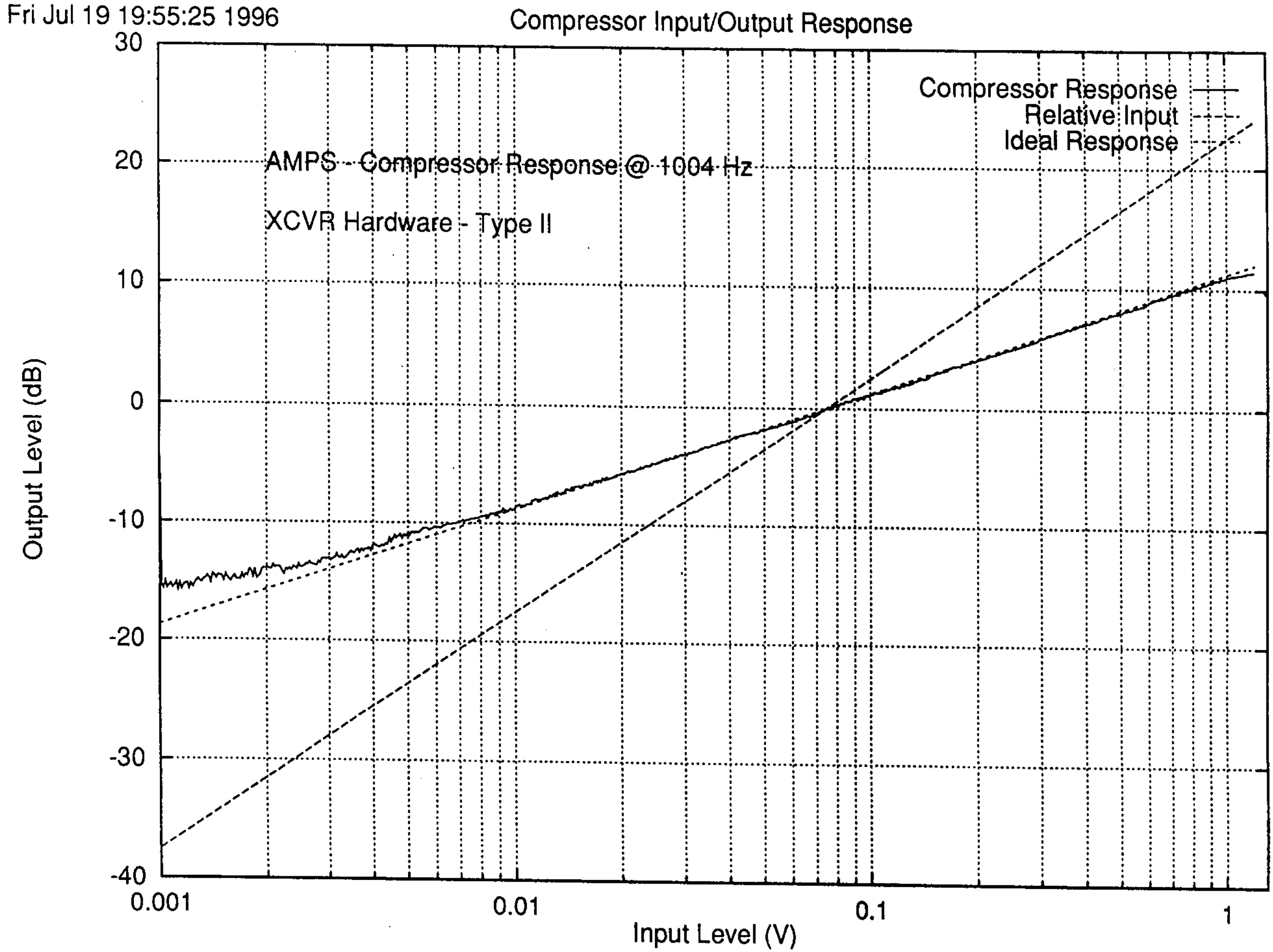
	AMPS	NAMPS
Receive	Ok	Ok
Discriminator	Ok	Ok
High Pass	Ok	Ok
Expandor	Ok	Ok
I/Q	Ok	Ok

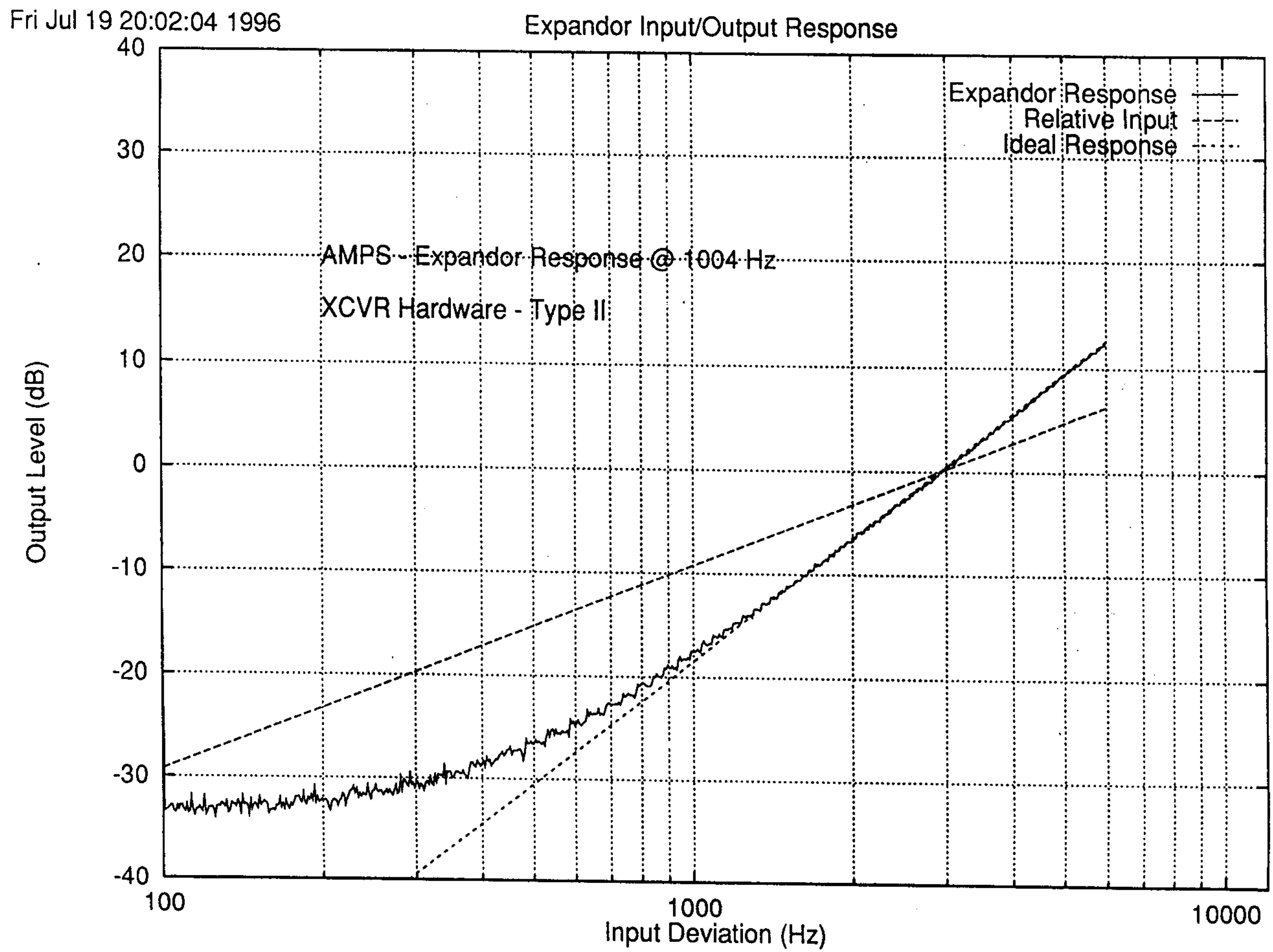

Fri Jul 19 18:36:58 1996
Uplink Magnitude Response (AMPS Type II)
Magnitude (dB)
20
10
0
-10
-20
-30
-40
100
200
300
600
1000
2000
3000
4000
6000
Frequency (Hz)


Fri Jul 19 19:40:39 1996
Downlink Magnitude Response
AMPS - Transmit Audio Response
XCVR Hardware - Type II
Specification Mask Derived from EIA
Magnitude (dB)
20
10
0
-10
-20
-30
-40
100
200
300
600
1000
2000
3000
4000
6000
Frequency (Hz)


Fri Jul 19 19:44:02 1996
Transmit Modulation Deviation Limiting
EIA
"data"
Maximum Deviation Allowed - Derived from EIA
AMPS - Transmit Audio Response
XCVR Hardware - Type II
Compressor Disabled
Deviation (Hz)
Frequency (Hz)
14000
12000
10000
8000
6000
4000
2000
0
0
500
1000
1500
2000
2500
3000
3500
4000


Fri Jul 19 19:50:25 1996
Transmit Modulation Deviation Limiting
EIA
"data"
Maximum Deviation Allowed - Derived from EIA
AMPS - Transmit Audio Response
XCVR Hardware - Type II
Compressor Enabled
Deviation (Hz)
Frequency (Hz)
0
2000
4000
6000
8000
10000
12000
14000
0
500
1000
1500
2000
2500
3000
3500
4000


Fri Jul 19 19:55:25 1996
Compressor Input/Output Response
Compressor Response
Relative Input
Ideal Response
AMPS - Compressor Response @ 1004 Hz
XCVR Hardware - Type II
Output Level (dB)
30
20
10
0
-10
-20
-30
-40
0.001
0.01
0.1
1
Input Level (V)


Fri Jul 19 20:02:04 1996
Expandor Input/Output Response
Expandor Response
Relative Input
Ideal Response
AMPS - Expandor Response @ 1004 Hz
XCVR Hardware - Type II
Output Level (dB)
40
30
20
10
0
-10
-20
-30
-40
100
1000
10000
Input Deviation (Hz)

MOTOROLA

Cellular Infrastructure Group
Personal Communications Division

FCC ID: IHET5YE1

MODULATION CHARACTERISTICS

CDMA

H 8921A Cell Site Test Set: 03/26/98 11:11:00 am

C

CDMA ANALYZER

Rho 0.9676	Frequency Error Hz -50 -1.2 50 Avg
Time Offset us 1.04	Carrier Feedthru dB -31.4

Tune Freq 869.700000 MHz	Synth Ref 10	Meas Intvl 0.50 ms	Analyzer Arm Meas Single/Cont Disarm	To Screen RF GEN RF ANL AF ANL SCOPE SPEC ANL ENCODER DECODER RADIO INT
Input Atten 0 dB	CDMA TB 19.6608	Gain Auto/Hold 36 dB	Qual Event 80 ms	
Input Port RF In/Ant	PN Offset 10.00	Anl Dir Fwd/Rev	Trig Event Immed	
Anl Special 0	Even Sec In Enable/Not			More

H 3921A Cell Site Test Set: 03/26/98 11:14:00 am

C

CDMA ANALYZER

Rho
0.9681

Time Offset us
1.05

Frequency Error Hz
-50 -2.1 50
Avg

Carrier Feedthru dB
-31.6

Tune Freq 881.520000 MHz	Synth Ref 10	Meas Intvl 0.50 ms	Analyzer Arm Meas Single/Cont Disarm	To Screen RF GEN RF ANL AF ANL SCOPE SPEC ANL ENCODER DECODER RADIO INT
Input Atten 0 dB	CDMA TB 19.6608	Gain Auto/Hold 36 dB	Qual Event 80 ms	
Input Port RF In/Ant	PN Offset 10.00	Anl Dir Fwd/Rev	Trig Event Immed	
Anl Special 0	Even Sec In Enable/Not			More

H' :921A Cell Site Test Set: 03/26/98 11:21:00 am

C

CDMA ANALYZER

Rho

0.9691

Time Offset (us)

1.05

Frequency Error (Hz)

-50 2.5 50

Avg

Carrier Feedthru (dB)

-33.6

Tune Freq	Synth Ref	Meas Intvl	Analyzer	To Screen
893.310000 MHz	10	0.50 ms	Arm Meas	RF GEN
Input Atten	CDMA TB	Gain	Single/Cont	RF ANL
0 dB	19.6608	Auto/Hold	Disarm	AF ANL
Input Port	PN Offset	36 dB	Qual Event	SCOPE
RF In/Ant	10.00	Anl Dir	80 ms	SPEC ANL
Anl Special	Even Sec In	Fwd/Rev	Trig Event	ENCODER
0	Enable/Not		Immed	DECODER
				RADIO INT
				More