

## EXHIBITS

- EXHIBIT 1: Letter Requesting Confidentiality under Sec. 0.457(d)
- EXHIBIT 2: Information for which Confidentiality is Requested
- Schematics  
Block Diagrams  
Theory of Operations
- EXHIBIT 3: Product Photographs
- EXHIBIT 4: Parts List of Active Devices
- EXHIBIT 5: User Manual and FCC ID Label
- EXHIBIT 6: Spectral Efficiency Per Section 90.203
- EXHIBIT 7: Report of Measurements
- EXHIBIT 8: Data Graphs - Occupied Bandwidth
- EXHIBIT 9: Data Graphs - Out of Band Emissions
- EXHIBIT 10: Data Graphs - Modulation Limiting and Transient Response
- EXHIBIT 11: Data Sheets - Frequency Stability

**EXHIBIT 1: Letter Requesting Confidentiality under Sec. 0.457(d)**

*- see separate attachment TM3conf.doc*

**EXHIBIT 2: Information for which Confidentiality is Requested**

**Schematics**

**Theory of Operation**

**Block Diagrams**

### **EXHIBIT 3: Product Photographs**

***- See separately submitted .jpg photograph files***

**EXHIBIT 4:      Parts List of Active Devices**

***- refer to schematics, block diagrams, and theory of operation***

**EXHIBIT 5: User Manual and FCC ID Label**

***- See separate attachments USERMAN.pdf and TRIM3FCCID.pdf***

## **EXHIBIT 6: Spectral Efficiency per Section 90.203**

### **CERTIFICATE:**

Trimble Navigation Ltd. certifies that, per the requirements of 90.203(j)3, that the reference radio, FCC ID: JUP-9414-450, meets the spectrum efficiency channel of one voice channel bandwidth per 12.5 kHz of channel bandwidth. Furthermore, the reference device is capable of transmitting data and is capable of supporting a data rate of 4800 bits per second per 6.25 kHz of bandwidth. Channel bandwidth is calculated as the bandwidth containing 99% of the energy of the emission, or the 20 dB bandwidth.

## **EXHIBIT 7:      Report of Measurements**

**FCC CERTIFICATION INFORMATION**

The following information is in accordance with FCC Rules, 47CFR Part 2, Subpart J, sections 2.1031 - 2.1057.

**2.1033(c)1**     Applicant:     Trimble Navigation Ltd.  
                                         645 N. Mary Avenue  
                                         Sunnyvale, CA 94086

**2.1033(c)2**     FCC ID: JUP-9414-450

**2.1033(c)3**     Installation and operating instructions are in separate documentation.

**2.1033(c)4**     Types of emission:

|                                          |                    |          |
|------------------------------------------|--------------------|----------|
| 1. 4800 baud GMSK(.5), 3.5 kHz deviation | 20 kHz auth BW:    | 20K0G1D  |
| 2. 9600 baud GMSK(.5), 3.5 kHz deviation | 20 kHz auth BW:    | 20K0G1D  |
| 3. 4800 baud GMSK(.5), 2.4 kHz deviation | 20 kHz auth BW:    | 20K0G1D  |
| 4. 4800 baud GMSK(.5) 1.2 kHz deviation  | 11.25 kHz auth BW: | 11K25G1D |
| 5. 9600 baud GMSK(.3) 1.5 kHz deviation  | 11.25 kHz auth BW: | 11K25G1D |
| 6. 9600 baud GMSK(.5) 4.8 kHz deviation  | 20 kHz auth BW:    | 20K0G1D  |
| 7. 19200baud GMSK(.3) 4.0 kHz deviation  | 20 kHz auth BW:    | 20K0G1D  |
| 8. 9600 baud 4FSK 4 kHz deviation        | 11.25 kHz auth BW: | 11K25G1D |
| 9. 19200 baud 4FSK 4.8 kHz deviation     | 20 kHz auth BW:    | 20K0G1D  |

**2.1033(c)5**     Frequency range: 410-470 MHz

**2.1033(c)6**     Range of operating power: 2 watts or 25 watts programmable

**2.1033(c)7**     Maximum output power: 25 watts design (26.6 watts measured, +0.3 dB)

**2.1033(c)8**     Applied DC voltages and currents to final amplifier:

Refer to schematic

**2.1033(c)9**     Tune-up procedure

Refer to user manual USERMAN.pdf

**2.1033(c)10**   Schematic, Block Diagram, and Theory of Operation

Refer to Exhibit 2. Confidentiality is requested for these items.

**2.1033(c)11** Drawing or photograph of FCC ID label

Refer to Exhibit 5.

**2.1033(c)12** Types of equipment: Refer to separate .jpg product photographs

**2.1033(c)13** Description of digital modulation: See 2.1033(c) above and Exhibit 2

## Standard Test Conditions

The transmitter was tested under the following conditions:

Room Temperature: 20 - 23 °C

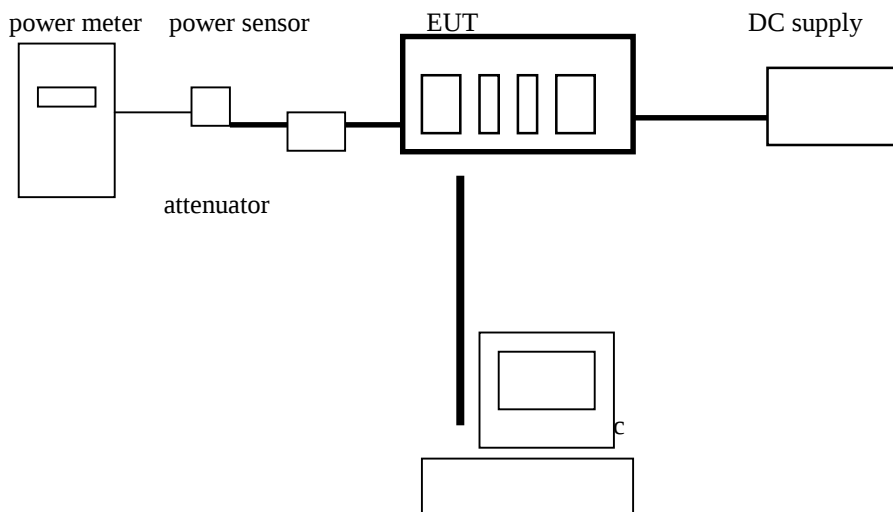
Relative Humidity: 35 - 50%

DC Supply Voltage: 12.6 VDC

The transmitter was aligned and tuned up according to manufacturer's alignment procedure, prior to testing. All data presented represents the worst case parameter being measured.

## Section 2.1046 RF Power Output

### Test Set-up



### Measurement Equipment Used:

HP 437B Power Meter

HP 8482A Power Sensor

Weinschel model 401034 attenuator, 50 watt

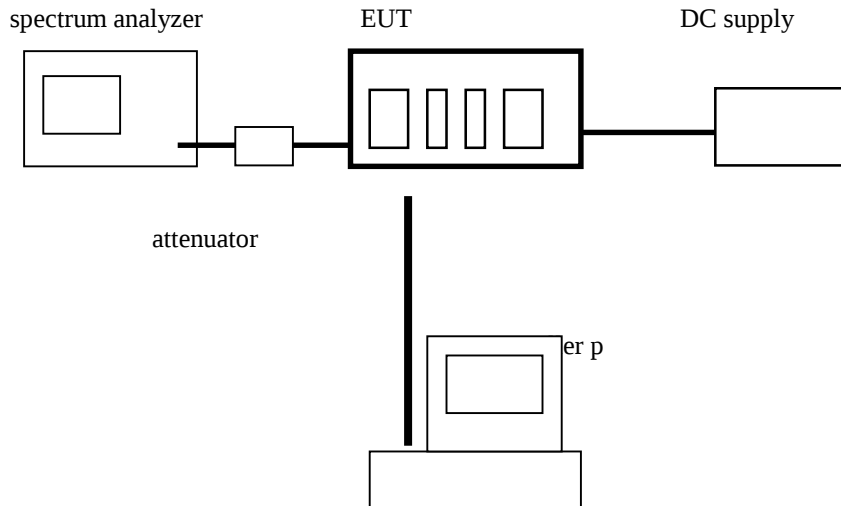
## 90.205 Power and Antenna Height Limits

### Test Results

Maximum Output Power: 26.6 Watts @ 450 MHz

## Section 2.1049 Occupied Bandwidth

### Test Set-up



### Measurement Equipment Used:

HP 8561 Spectrum Analyzer

Weinschel model 401034 attenuator, 50 watt

Data on the bandwidth occupied by this transmitter is presented in graphical form using spectrum analyzer plots.

A separate spectrum plot is supplied for each modulation type.

### 90.209 Bandwidth limitations

#### 90.210(b) Emission mask B: 25 kHz channel (20 kHz authorized BW)

Any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

1. On any frequency removed from the assigned frequency by more than 50 percent but less than 100 percent: at least 25 dB

2. On any frequency removed from the assigned frequency by more than 100 percent but less than 250 percent: at least 35 dB
3. On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 250 percent: At least  $43 + 10 \log(P)$  dB

90.210(d) Emission mask D: 12.5 kHz channel bandwidth (11.25 kHz authorized BW)

Any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

1. On any frequency from the center of the authorized bandwidth  $f_o$  to 5.625 kHz removed from  $f_o$ : Zero dB
2. On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least  $7.27(f_d - 2.88 \text{ kHz})$  dB
3. On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz: At least  $50 + 10 \log(P)$  dB or 70 dB, whichever is the lesser attenuation.

**Test Results:**

Refer to spectrum analyzer charts labeled in Exhibit 8.

**Section 2.1051 Spurious and Harmonic Emissions at Antenna Terminals**

**Measurement Equipment Used:**

HP 8561 Spectrum Analyzer  
Weinschel model 401034 attenuator, 50 watt  
HP Modulation analyzer/audio generator

**Test Set-up**

-see Occupied Bandwidth test above

**90.210**

Minimum standard: The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under conditions specified in the instruction manual and/or alignment procedure, shall not be less than:

Mask B:  $43 + 10\log(\text{mean output power in watts})$  dBc, equivalent to -13 dBm

Mask D:  $50 + 10\log(\text{mean output power in watts})$  dBc , equivalent to - 20 dBm.

### **Test Results**

Refer to spectrum analyzer charts in Exhibit 9. Output emissions data is presented from 1 MHz to the 10th harmonic of the carrier frequency, for worst-case emission (Mask D).

## Section 2.1053 Field Strength of Spurious and Harmonic Radiation

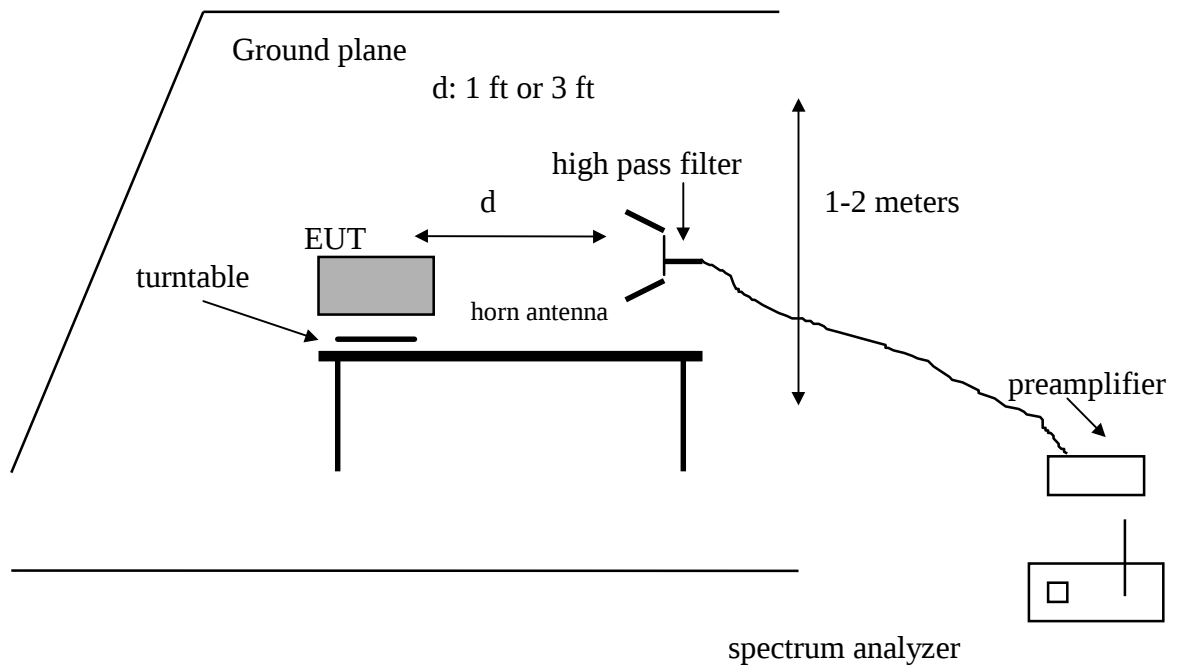
### Measurement Equipment Used:

HP 8563E Spectrum Analyzer

EMCO 3146 Log Periodic Antenna, 200 - 1000 MHz

ARA DRG-118/A Double Ridged Horn antenna, 1 - 18 GHz

### Test Set-Up



### Minimum Requirement

The magnitude of each spurious and harmonic emission detected as being radiated from the EUT must be at a level more than  $50 + 10 \log(\text{mean output power, watts})$  dB below the mean power output ( $= -20$  dBm).

Resultant radiated field at 3 m from -20 dBm source feeding isotropic antenna: 75.4 dBuV/m

### Test Method

The antenna output port of the EUT was terminated with a 50 ohm shielded termination. With the transmitter operating at full power, the EUT was rotated 360° and the search antenna was raised and lowered in both polarities, all in an attempt to maximize the levels of the received emission for each harmonic and spurious emission up to 10 fo.

## Test Results

Corrected field strength readings extrapolated to 3m: more 7 dB below limit. Refer to tabular data in Exhibit 9.

## Section 2.1055 Frequency Stability

### Test Set-up

- see Occupied Bandwidth above

### Measurement Equipment Used

HP 8561 Spectrum Analyzer  
Weinschel model 401034 attenuator, 50 watt

## Section 90.213 Minimum Frequency Stability

### Minimum Requirement

Fixed and base stations, 421 - 512 MHz: 2.5 ppm = 1150 Hz for 460 MHz  
Mobile stations, over 2 watts: 5.0 ppm = 2300 Hz for 460 MHz

### Test Method

Temperature: Vary the ambient temperature from -30 to +50°C, in 10 degree increments, allowing the EUT to stabilize at each temperature.

Primary Supply Voltage: Vary the supply voltage from 85% to 115% of the nominal operating voltage

Requirement is that frequency determining circuitry only needs testing.

## Test Results

Freq. v Temperature: Refer to manufacturer's data in Exhibit 10 for TCXO data.

Freq. v Supply Voltage: TX set to 460 MHz

Nominal: 12.6 VDC                       $f = 459.999861 \text{ MHz} (-149 \text{ Hz})$

115% Nominal: 14.5 VDC     $f = 459.999854 \text{ MHz}$  (-146 Hz)  
 85% Nominal: . 10.8 VDC     $f = 459.999853 \text{ MHz}$  (-157 Hz)  
 10.65 VDC: LO BATT warning

### 90.214 Transient frequency behavior

The Trimmark 3 radio is designed to operate on 12.5 kHz channels. Transient frequencies must be within the tolerances and within the time frames described below:

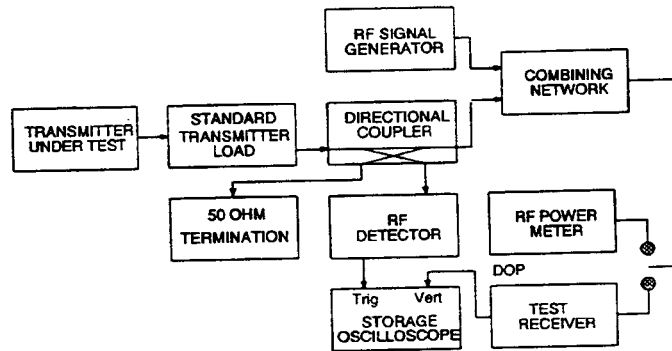
| Time Intervals | Maximum freq. diff, kHz | Duration for 450-500 MHz |
|----------------|-------------------------|--------------------------|
| t1             | 12.5                    | 10 msec                  |
| t2             | 6.25                    | 25 msec                  |
| t3             | 12.5                    | 10 msec                  |

Transient frequency behavior was tested according to the procedures in section 2.2.19 of TIA/EIA Standard TIA/EIA - 603. The turn on /turn off limits described in the table is shown in section 5.2.19.

### Measurement Equipment Used

HP 54602A Oscilloscope  
 HP 8561 Spectrum Analyzer  
 HP 8648C Signal Generator  
 HP 8920A Communications Transceiver Test Set  
 Mini-Circuits RF combiners, 2-2500 Mhz  
 Weinshel 30 dB in-line RF attenuator, 50 watts  
 Directional coupler. 20 dB  
 HP 423A RF detector

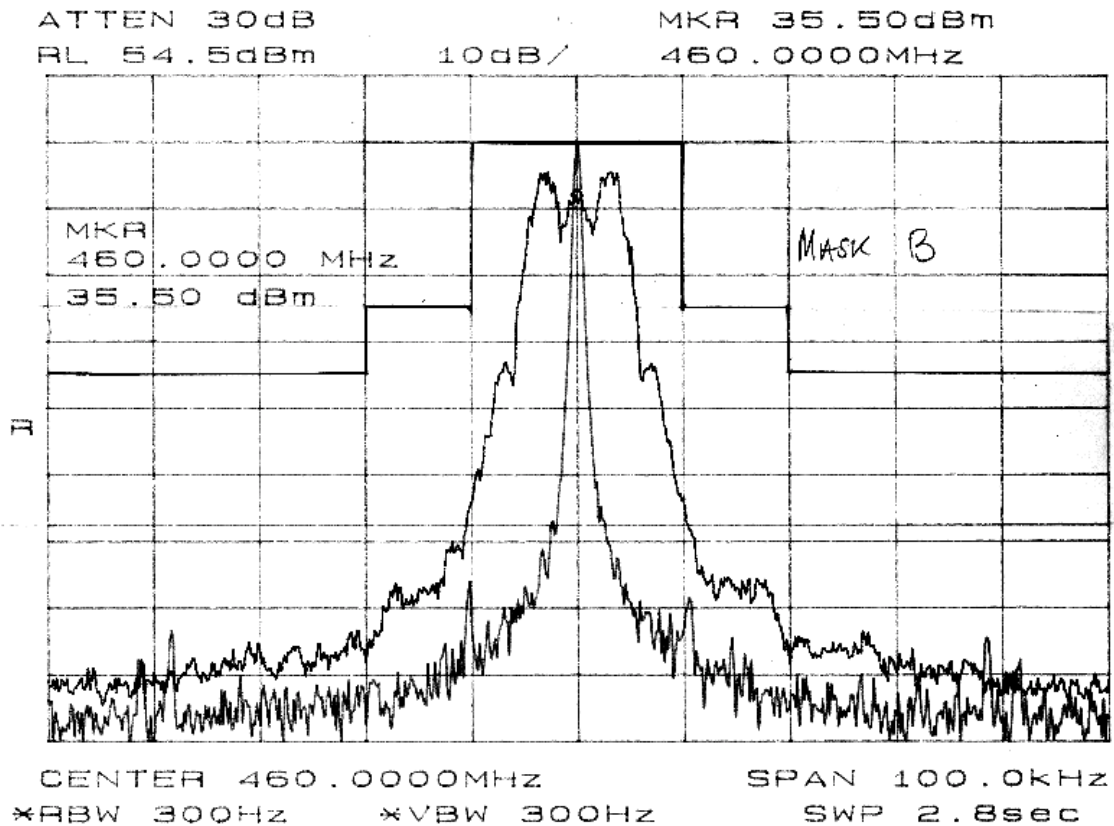
### Test Set-up



## Test Results

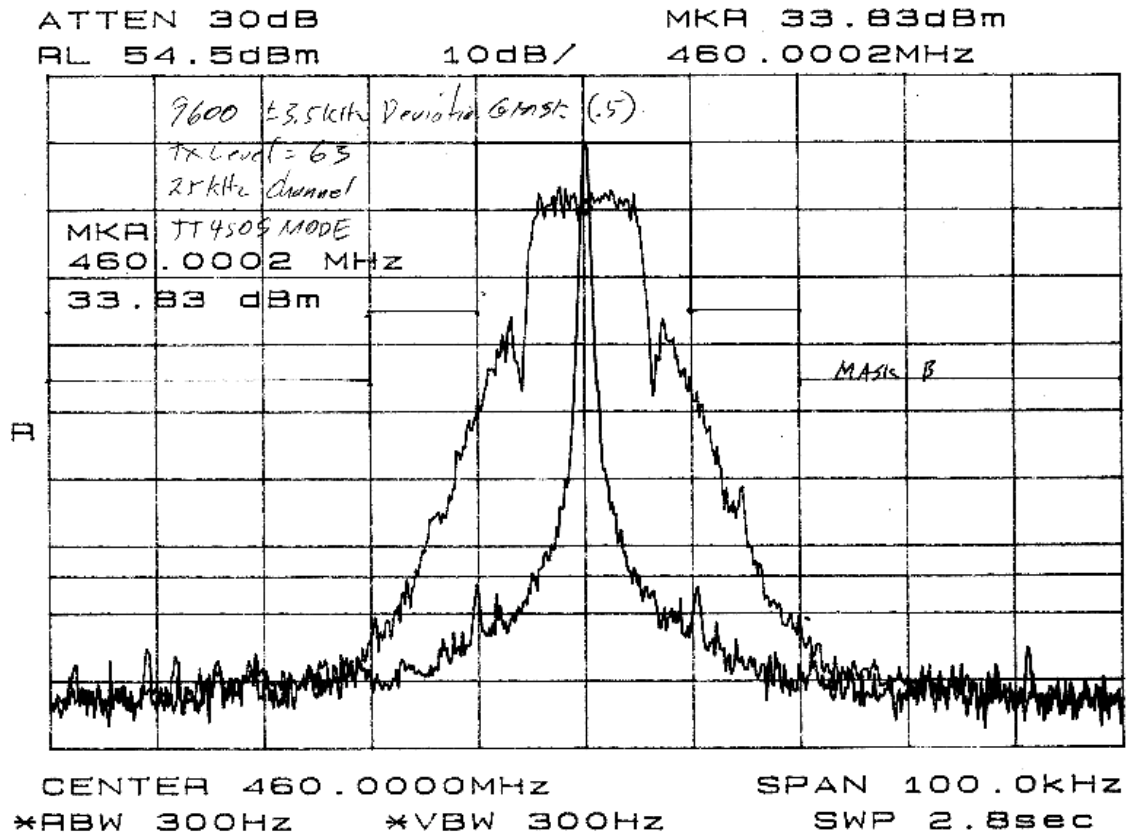
Refer to oscilloscope printouts labeled **“Key ON”** and **“Key OFF”**.

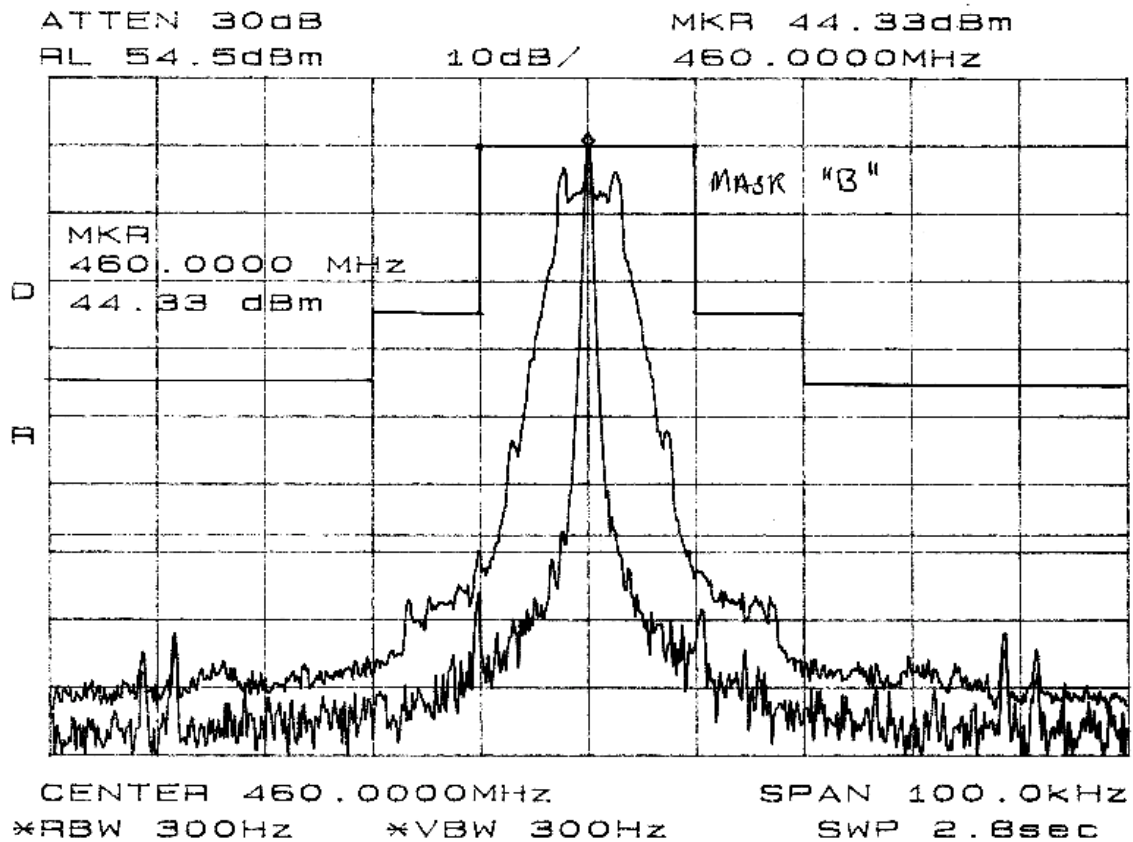
The EUT meets the minimum transient frequency response limits for this type of device.

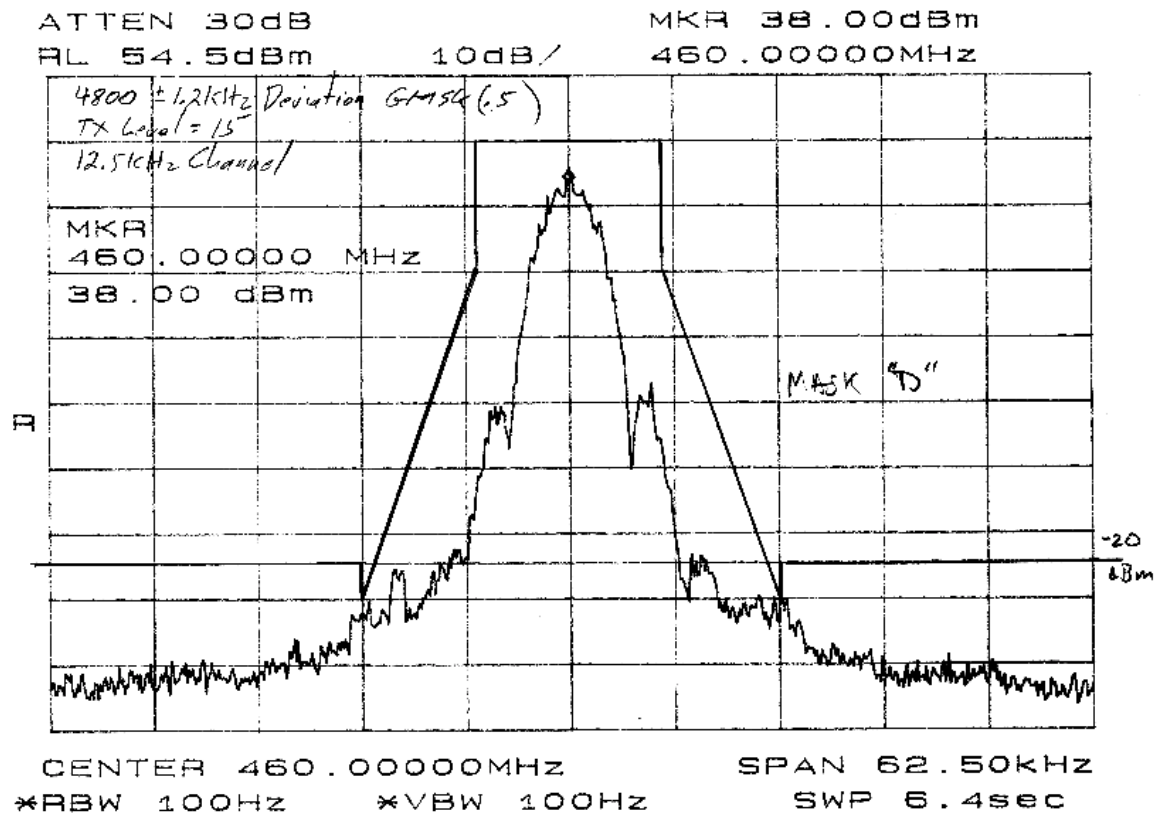
**EXHIBIT 8: Data Graphs: Occupied Bandwidth****1. 4800 baud, GMSK(.5),  $\pm 3.5\text{kHz}$  Deviation, BW= 20 kHz**

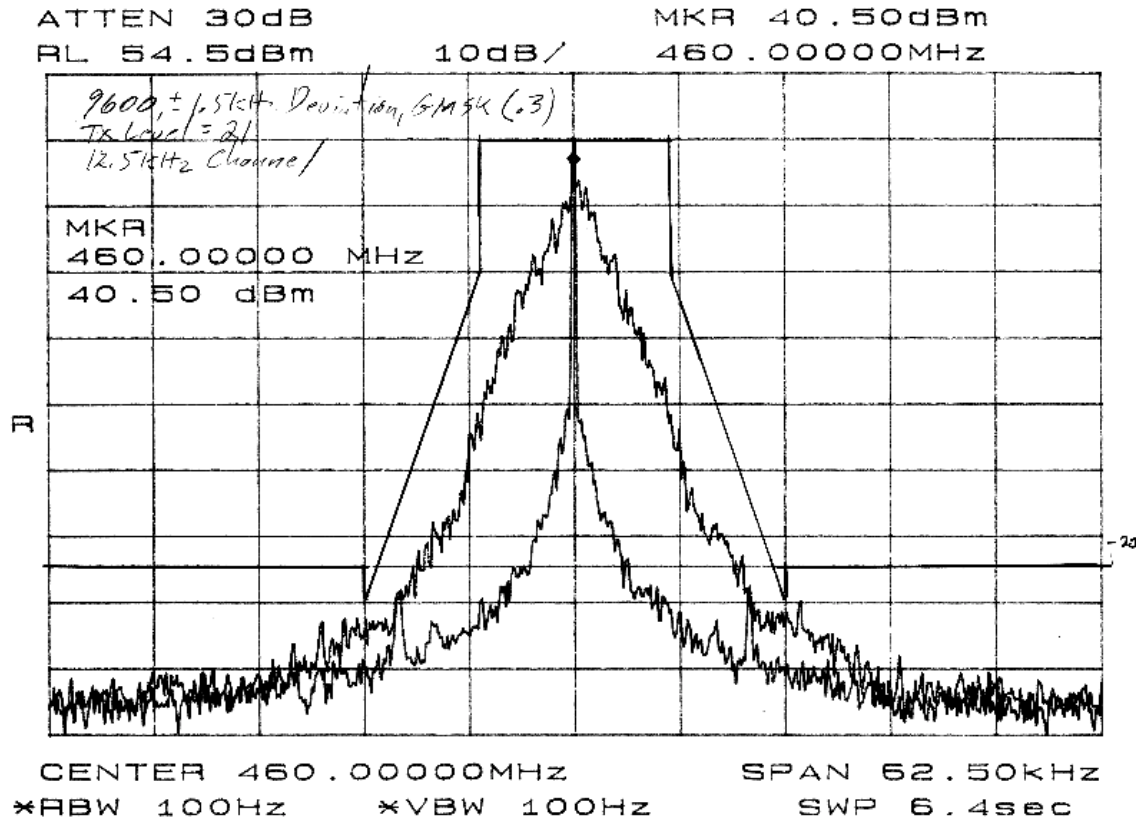
## EXHIBIT 8: Data Graphs: Occupied Bandwidth

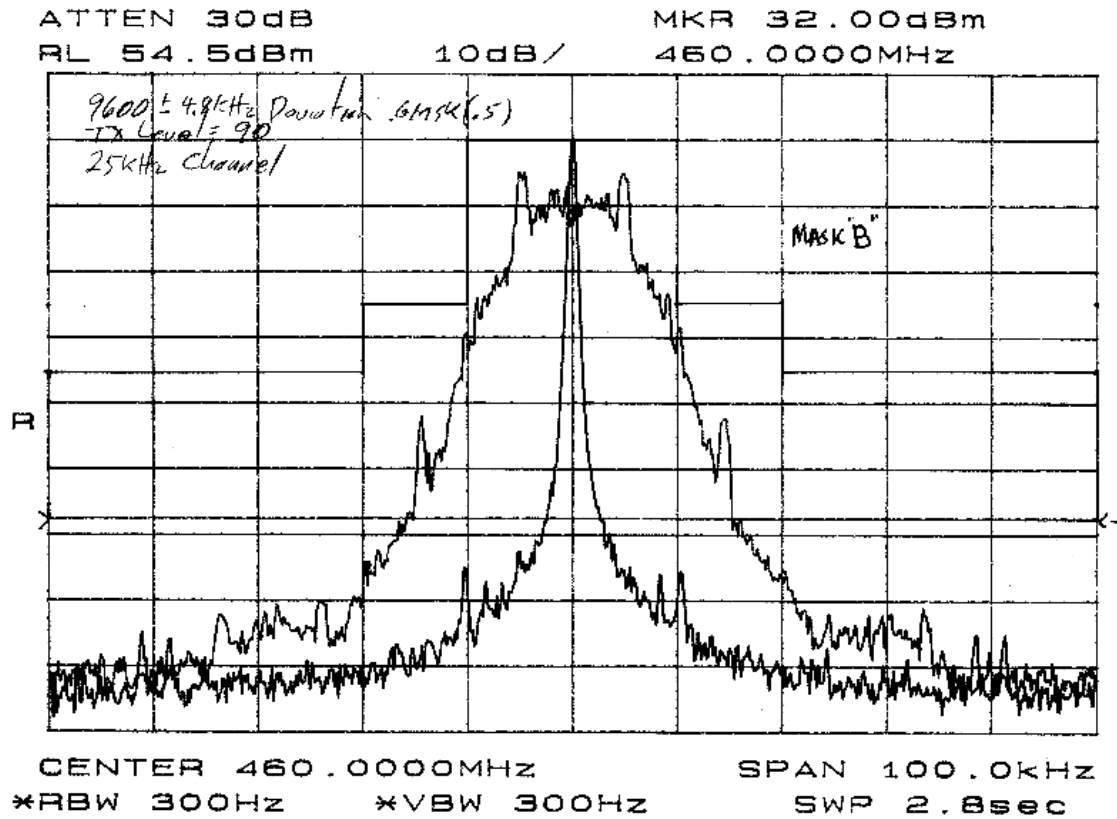
### 2. 9600 baud, GMSK(0.5), $\pm 3.5\text{kHz}$ Deviation, BW= 20 kHz

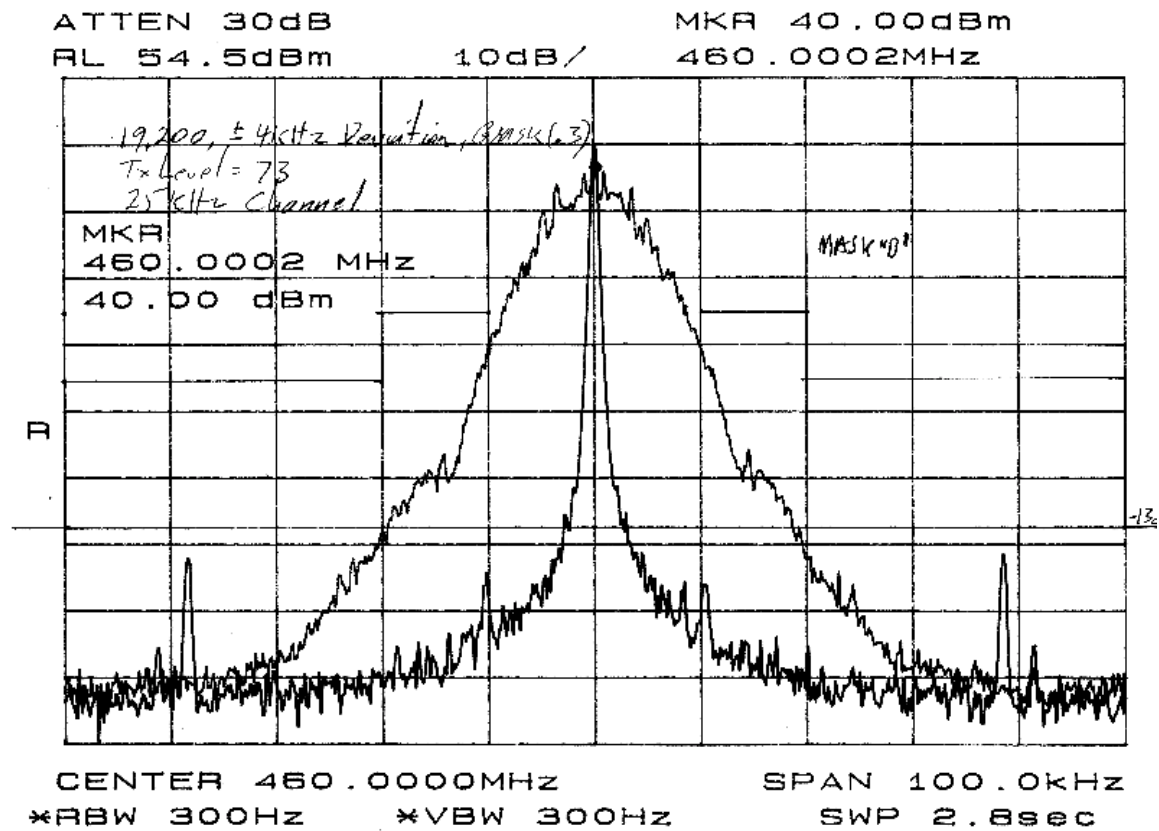


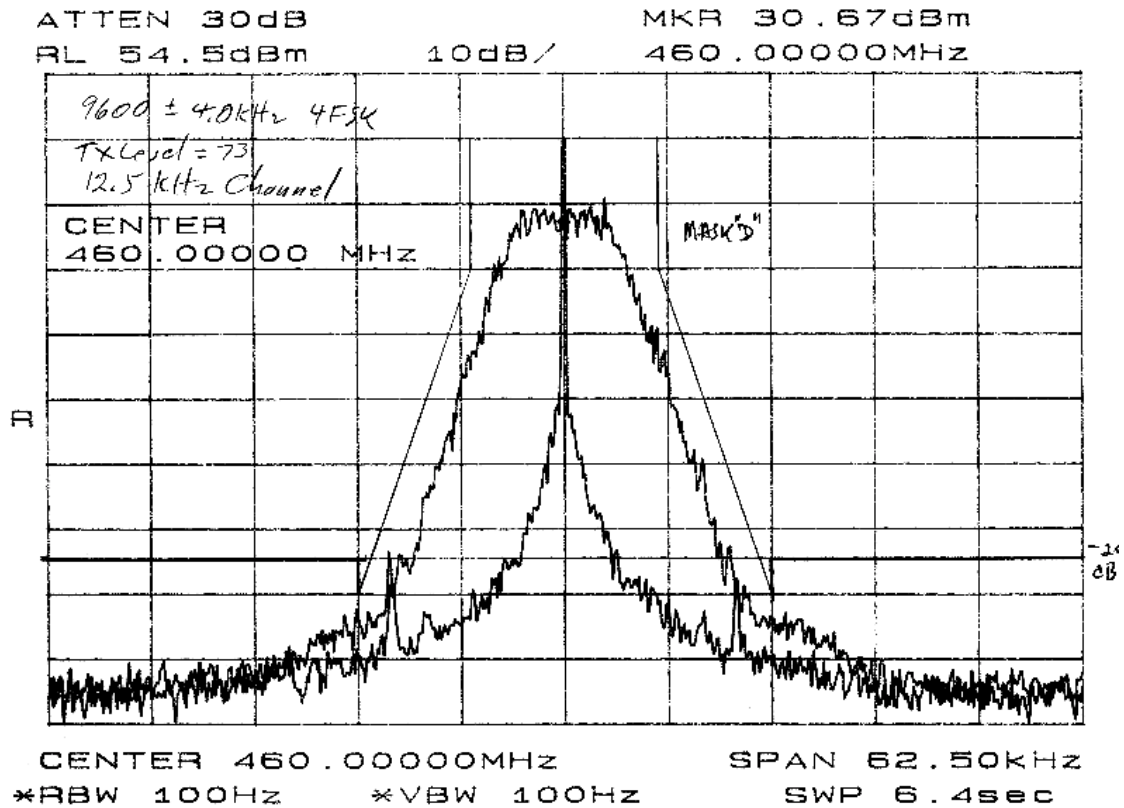
**EXHIBIT 8: Data Graphs: Occupied Bandwidth****3. 4800 baud, GMSK(.5)  $\pm 2.4$  kHz deviation, BW=20 kHz**

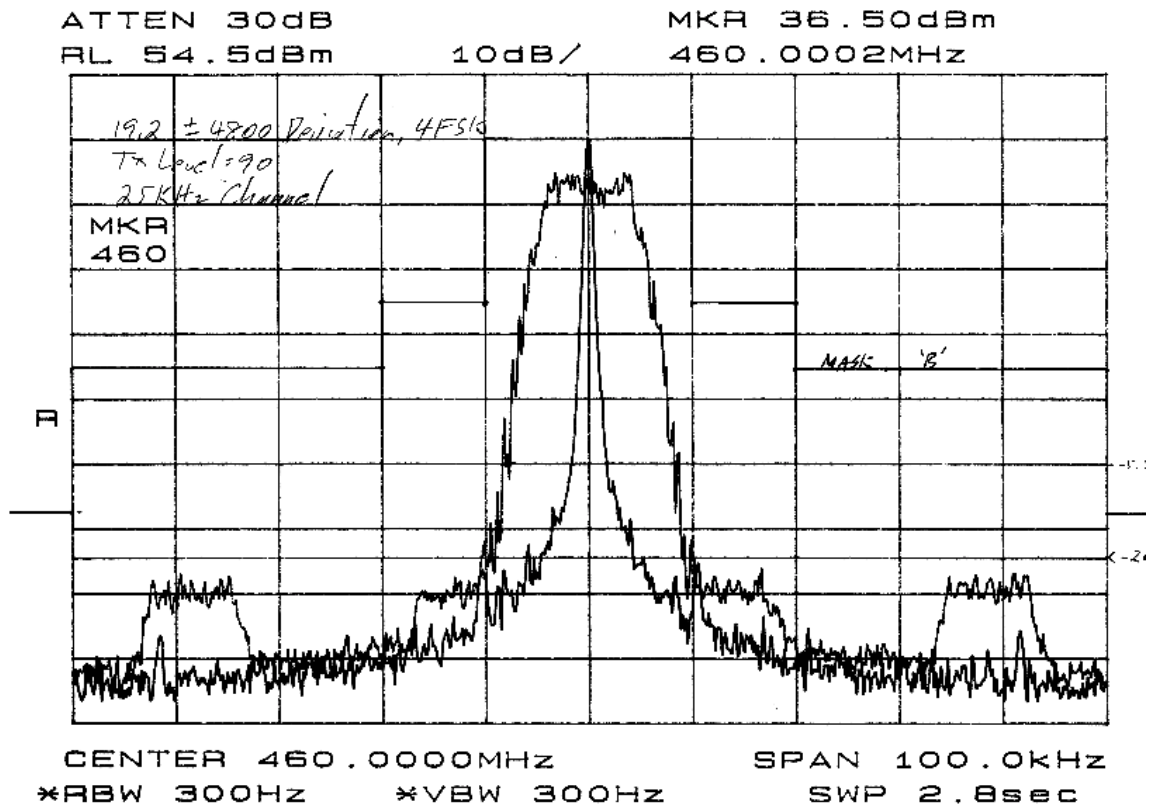
**EXHIBIT 8: Data Graphs: Occupied Bandwidth****4. 4800 baud, GMSK(.5)  $\pm 1.2$  kHz deviation, BW=11.25 kHz**

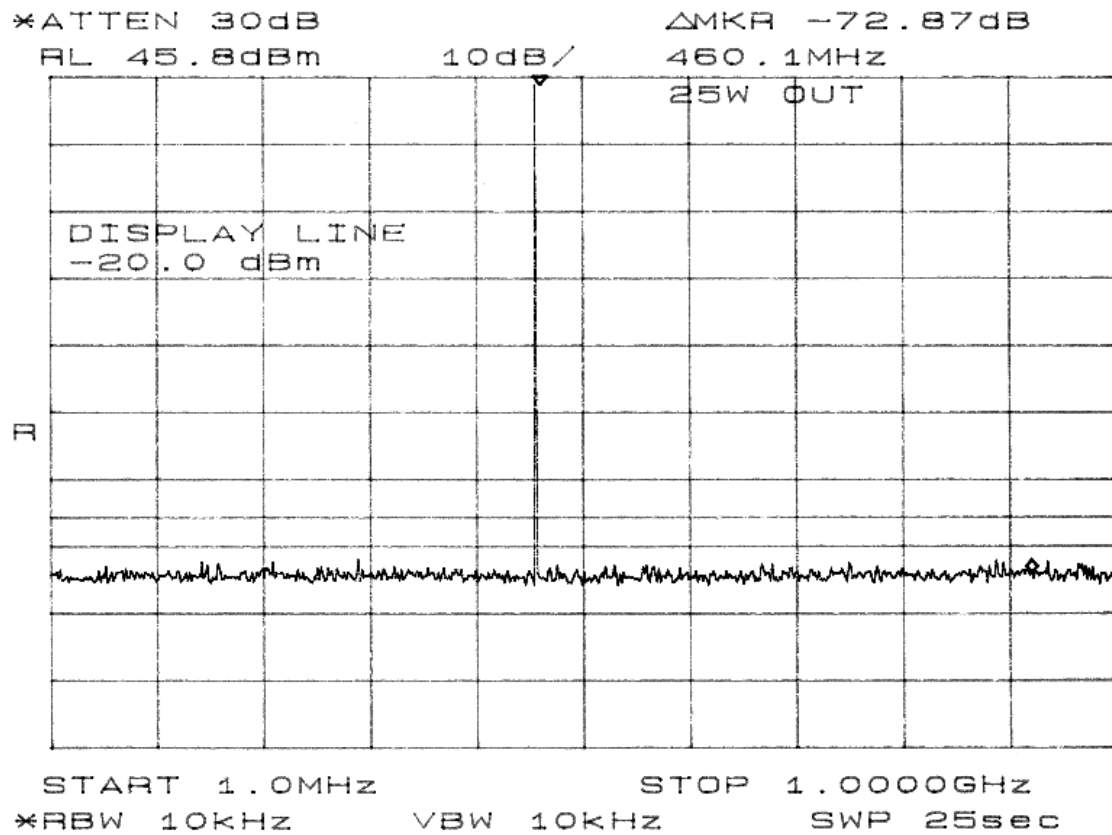
**EXHIBIT 8: Data Graphs: Occupied Bandwidth****5. 9600 baud, GMSK(.3)  $\pm 1.5$  kHz deviation, BW=11.25 kHz**

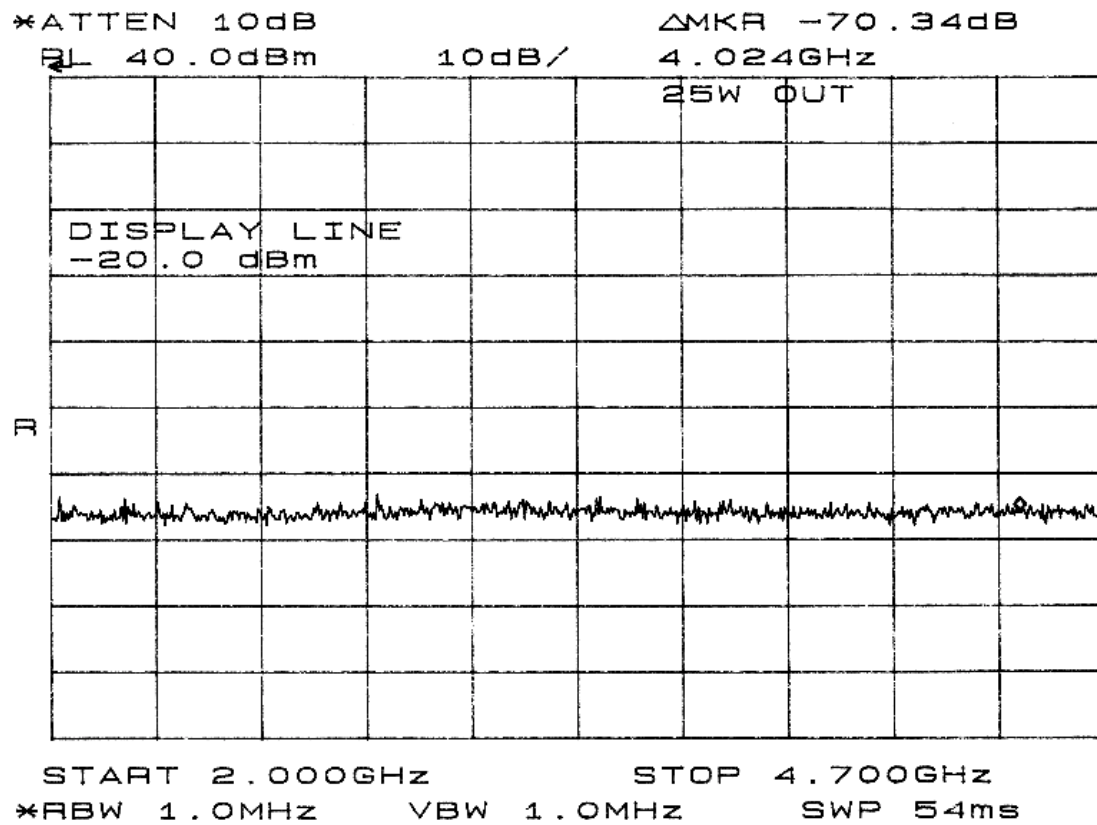
**EXHIBIT 8: Data Graphs: Occupied Bandwidth****6. 9600 baud, GMSK(.3)  $\pm$  4.8 kHz deviation, BW= 20 kHz**

**EXHIBIT 8: Data Graphs: Occupied Bandwidth****7. 19200 baud, GMSK(.3)  $\pm$  4.0 kHz deviation, BW= 20 kHz**

**EXHIBIT 8: Data Graphs: Occupied Bandwidth****8. 9600 baud, 4FSK  $\pm 4.0$  kHz deviation, BW= 11.25 kHz**

**EXHIBIT 8: Data Graphs: Occupied Bandwidth****9. 19200 baud, 4FSK  $\pm 4.8$  kHz deviation, BW= 20 kHz**

**EXHIBIT 9: Data Graphs: Out of Band Emissions****Conducted: Antenna port spurious and harmonics**

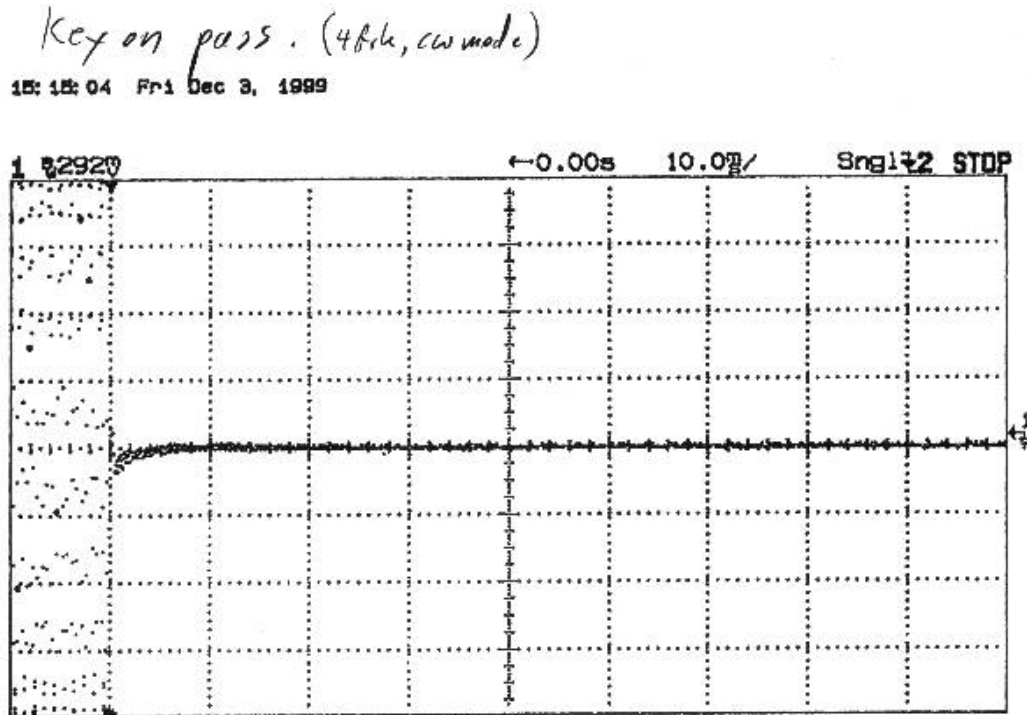
**EXHIBIT 9: Data Graphs: Out of Band Emissions****Conducted: Antenna port spurious and harmonics**

**EXHIBIT 9: Data Graphs: Out of Band Emissions****Case Radiated****COMPLIANCE ENGINEERING SERVICES, INC.**  
CASE RADIATED EMISSIONS23-Dec-99  
Morgan Hill, Test Site A  
R. CastilloTrimble  
FCC ID: JUP-9414-450 $f_0 = 460$  MHz

| F(MHz) | READING<br>(dBuV) | AF<br>(dB) | CL<br>(dB) | AMP<br>(dB) | HPF<br>(dB) | TOTAL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) |
|--------|-------------------|------------|------------|-------------|-------------|-------------------|-------------------|----------------|
|        | <u>Pk</u>         |            |            |             |             | <u>Pk</u>         | <u>Pk</u>         | <u>Pk</u>      |
| 1380   | 69.1              | 31         | 1.1        | -35         | 1           | 67.2              | 75.4              | -8.2           |
| 1840   | 67                | 33         | 1.7        | -35         | 1           | 67.9              | 75.4              | -7.5           |
| 2300   | 53                | 33         | 2.2        | -35         | 1           | 53.7              | 75.4              | -21.7          |
| 2760   | 52                | 34         | 2.7        | -35         | 1           | 54.7              | 75.4              | -20.7          |
| 3220   | 47.6              | 36         | 3.1        | -35         | 1           | 52.6              | 75.4              | -22.8          |
| 3680   | 49.7              | 37         | 3.2        | -35         | 1           | 55.9              | 75.4              | -19.5          |
| 4140   | 47.8              | 38         | 4.8        | -35         | 1           | 56.1              | 75.4              | -19.3          |
| 4600   | 32.7              | 39         | 5.2        | -35         | 1           | 43.0              | 75.4              | -32.4          |

**NOTE: ALL READINGS ARE HORIZONTAL****AF:** Antenna Factor**AMP:** Pre-amp gain**CL:** Cable loss**HPF:** High pass filter insertion loss (4.6GHz)

## EXHIBIT 10: Data Graphs: Modulation Limiting Transient Response



| Chan   | State | Volts/Div | Position | Couplg | BW Lim | Invert | Probe |
|--------|-------|-----------|----------|--------|--------|--------|-------|
| Chan 1 | On    | 292.0mV   | 50.00mV  | DC     | On     | Off    | 1:1   |
| Chan 2 | Off   | 20.00mV   | 48.75mV  | DC     | Off    | Off    | 1:1   |
| Chan 3 | Off   | 100.0mV   | 0.000 V  | DC     | -----  | -----  | 1:1   |
| Chan 4 | Off   | 100.0mV   | 0.000 V  | DC     | -----  | -----  | 1:1   |

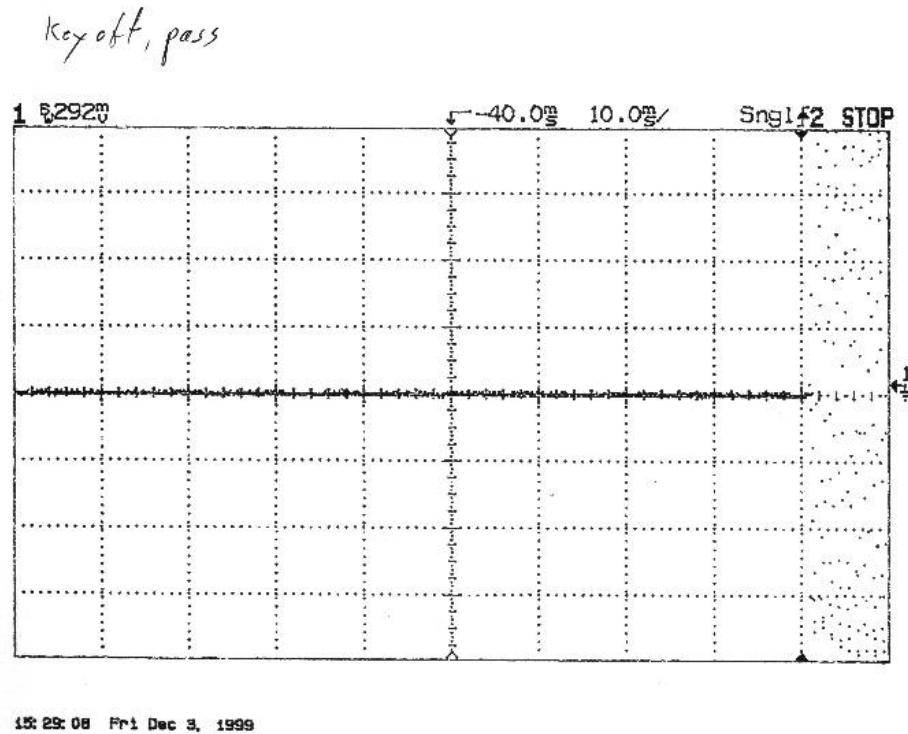
|            | Mode   | Main Time/Div | Main Delay | Time Ref | Delayed Time/Div | Delayed Delay |
|------------|--------|---------------|------------|----------|------------------|---------------|
| Horizontal | Normal | 10.00ms/      | 0.000 s    | Left     | -----            | -----         |

| Trigger Mode | Source | Level    | Holdoff | Slope | Couplg | Reject | NoiseRej |
|--------------|--------|----------|---------|-------|--------|--------|----------|
| Single       | Ch 2   | -68.75mV | 200.0ns | Neg   | DC     | Off    | Off      |

Display Mode: Normal

# EXHIBIT 10: Data Graphs: Modulation Limiting Transient Response



**EXHIBIT 11: Data Sheets - Frequency Stability**

37514

NO. 20-0831A  
DATE 26. DEC. '97SPECIFICATION

CUSTOMER : NDK-A

ITEM : CRYSTAL OSCILLATOR

MODEL : ENA3244A

CUSTOMER SPEC. NO. : \_\_\_\_\_

NDK SPEC. NO. : ENA3244A

CONTENTS : SPECIFICATION (T35-4408A-A)

OUT VIEW OF CRYSTAL OSCILLATOR (T23-1008Y-B)

PACKING SPECIFICATION (T42-0021F-D)

ORDER NO.(NDK ON NO.) : TRIMBLE/SRQ11189 (T7120550)

RECEIPT

DRAWN : Yen Hendong

CHECKED : \_\_\_\_\_

APPROVED : K. Naitou

NIHON DEMPA KOGYO CO., LTD.

- [ TOKYO SALES OFFICE ]  
21-2, NISHIHARA 1-CHOME, SHIBUYA-KU, TOKYO, 151, JAPAN
- [ HEAD OFFICE / OVERSEAS DEPT. ]  
SHINWA BLDG, 3-2-4, NISHISHINJUKU, SHINJUKU-KU, TOKYO, 160, JAPAN
- [ NDK AMERICA Inc. ]  
47871 WESTINGHOUSE Dr, FREMONT, CA 94539, U.S.A
- [ NDK ELECTRONICS SINGAPORE Pte. Ltd. ]  
150 BEACH ROAD, #20-01/04, GATEWAY WEST, SINGAPORE 0718
- [ NDK EUROPE LIMITED ]  
TOLWORTH TOWER, EWELL ROAD, SURBITON, SURREY KT6 7EL, ENGLAND, U.K.

## EXHIBIT 11: Data Sheets - Frequency Stability

## TEST DATA

Ref: ..... Date: 18 FEB 1998 Page: 1

No. 09011189 Spec. No. Type of Crystal Oscillator

| frequency<br>Hz | Serial<br>No. | Current<br>mA | Temperature test                   |                   | Supply voltage at $\pm 3$ V Load at 10K $\Omega$ 10PF |                                 | Room temp $\pm 1.5$ °C | Humidity<br>%    | Judge-<br>ment                           |
|-----------------|---------------|---------------|------------------------------------|-------------------|-------------------------------------------------------|---------------------------------|------------------------|------------------|------------------------------------------|
|                 |               |               | Freq. adjustment<br>Hz $\times 10$ | Freq. stability   | $\mu V \times 10^{-6}$                                | Out put Voltage<br>dBm P-P<br>V |                        |                  |                                          |
| 2.8             | 1             | 1.1           | max.                               | at -40°C at -30°C | at -20°C at -10°C                                     | at -10°C at -1°C                | at -10°C at -1°C       | at -10°C at -1°C | Visu. & Dime. Good                       |
|                 | 2             | 1.1           | min.                               | +0.1 -1.1         | -0.6                                                  | $\pm 0$                         | $\pm 0$                | $\pm 0$          | Out put Wave form<br>Clipped Sine square |
|                 | 3             | 1.1           | max.                               | +1.0 -0.4         | -0.4                                                  | $\pm 0$                         | $\pm 0$                | $\pm 0$          | Supply voltage<br>test                   |
|                 | 4             | 1.1           | min.                               | -0.6 -1.0         | -0.8                                                  | $\pm 0$                         | $\pm 0$                | $\pm 0$          | Load test                                |
|                 | 5             | 1.2           | max.                               | +1.1 -0.1         | -0.1                                                  | $\pm 0$                         | $\pm 0$                | $\pm 0$          | Shock test                               |
|                 | 6             | 1.1           | min.                               | -0.6 -0.3         | -0.3                                                  | $\pm 0$                         | $\pm 0$                | $\pm 0$          | Vibration<br>test                        |
|                 | 7             | 1.1           | max.                               | +0.6 -0.1         | -0.1                                                  | $\pm 0$                         | $\pm 0$                | $\pm 0$          | Harmonics                                |
|                 | 8             | 1.1           | min.                               | -0.8 +0.1         | +0.1                                                  | $\pm 0$                         | $\pm 0$                | $\pm 0$          | Spurious                                 |
|                 | 9             | 1.1           | max.                               | +0.8 -0.8         | -0.8                                                  | $\pm 0$                         | $\pm 0$                | $\pm 0$          | Duty cycle                               |
|                 | 10            | 1.1           | min.                               | -0.3 -0.3         | -0.3                                                  | $\pm 0$                         | $\pm 0$                | $\pm 0$          | Building up                              |
|                 |               |               | max.                               |                   |                                                       |                                 |                        |                  |                                          |
|                 |               |               | min.                               |                   |                                                       |                                 |                        |                  |                                          |
|                 |               |               | max.                               |                   |                                                       |                                 |                        |                  |                                          |
|                 |               |               | min.                               |                   |                                                       |                                 |                        |                  |                                          |
|                 |               |               | max.                               |                   |                                                       |                                 |                        |                  |                                          |
|                 |               |               | min.                               |                   |                                                       |                                 |                        |                  |                                          |
| Remarks         |               |               |                                    |                   |                                                       |                                 |                        |                  |                                          |



Inspector Y. Tamura

INSPECTION LOT: 18  
SAMPLE: 10

NIHON DEMPA KOGYO CO., LTD.

QNTD 120550CZ  
N D K Spec. No. ENA7244A-8