

TRANSIENT FREQUENCY BEHAVIOR

The transmitter was tested for transient frequency behavior using the test method TIA/E1A-603. The test setup is shown in Fig. 1. The functions of the test receiver and storage oscilloscope were provided by the HP spectrum analyzer using the FM demodulator option with span set to zero. Resolution and video bandwidth were both set to 30 kHz. The spectrum analyzer was triggered using an enable signal from the transmitter which was delayed using a variable delay. The function of the RF power meter was provided by the spectrum analyzer. The 1 kHz test signal was provided by the Marconi Radio Communications test set.

Test Requirements per 90.214 are:

1. Frequency deviation during t_1 may be greater than ± 12.5 kHz because power output is less than 6 watts.
2. Frequency deviation during t_2 (10 ms to 25 ms) must be less than ± 6.25 kHz.
3. Frequency deviation after t_2 (25 ms) must be less than FCC limits which are $\pm 2.5 \text{ PPM} \times 460 \text{ MHz} = \pm 1.15 \text{ kHz}$.
4. Frequency deviation during t_3 may exceed ± 12.5 kHz because power output is less than 6 watts.

The upper plot of Fig. 2 shows the transmitter output spectrum with the attenuator = 0dB. The middle plot of Fig. 2 shows the unmodulated 1 kHz test signal set to 50 dB below the transmitter signal level. The lower plot of Fig. 2 shows the output spectrum of the modulated 1 kHz test signal.

The upper plot of Fig. 3 shows the test receiver output of the 1 kHz test signal with deviation = ± 12.5 kHz. The middle plot of Fig. 3 shows the device turn-on transient with the test signal unmodulated on a scale of ± 12 kHz. The lower plot of Fig. 3 shows the turn-on transient behavior of the transmitter on a ± 12 kHz scale. During the t_1 interval the deviation exceeds ± 12.5 kHz which is allowed because power output is less than 6 watts. During the t_2 interval the deviation is within the ± 6.25 kHz limit. The frequency resolution is not sufficient to accurately check the deviation after the t_2 interval. For better resolution the top and bottom plots of Fig. 4 were made with

the vertical scale reduced to ± 4 kHz (limit = $1.15 \text{ kHz} \times 1 \text{ div/kHz} = 1.15 \text{ div}$). From the bottom plot the deviation is clearly within the limits after the t_2 interval.

The upper plot of Fig. 5 shows the transmitter switch-off behavior. The lower plot of Fig. 5 shows the same signal but with increased vertical resolution of ± 4 kHz. The frequency deviation during the t_3 interval is less than ± 12.5 kHz.

CONCLUSION

The transmitter has been verified to comply with the FCC requirements of paragraph 90.214 for the transient behavior during switch-on and switch-off conditions.

MEASUREMENT EQUIPMENT:

Hewlett Packard Spectrum analyzer Model 8591A
S/N 3212AO2920
Options 004, 021, 102

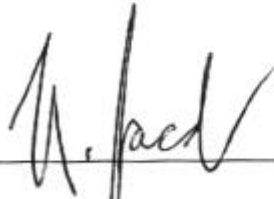
10 MHz Rubidium Frequency Standard
EFRATOM Model FRK-L S/N 25016879

Marconi Instruments
Radio Communications Test Set Type 52955-900A
S/N 132085/227

HP VJF Attenuator Model 355D
50 SL, 10dB steps
S/N 1204A23633

Measurements made and recorded by:

Sept. 17, 1999



Nathan R. Jacob, P. Eng.

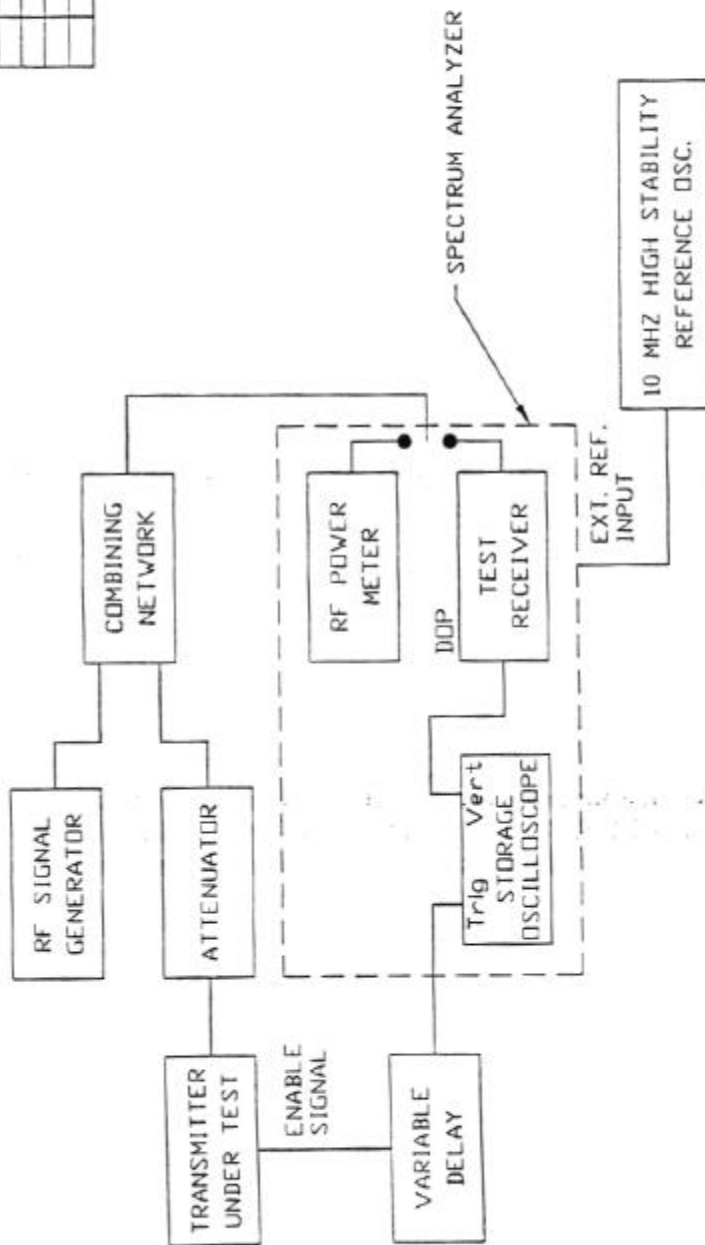


FIG. 1
TRANSIENT FREQUENCY BEHAVIOR
TEST SET-UP

REVISIONS			
LTR	DESCRIPTION	BY	DATE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS DECIMALS ANGLES 31/64 .001 1/2 11/2 .001 .001 .001		APPROVAL J.E.G. 12-11-97	DATE 12-11-97
		DRAWN J.E.G. 12-11-97	
MATERIAL FINISH SCALE		APPROVED J.E.G. 12-11-97	TITLE LLB6717
USED (IN)		DO NOT SCALE DRAWING	REV.

HEXAGRAM, INC.
CLEVELAND, OHIO

LLB6717

DRIVING NO.

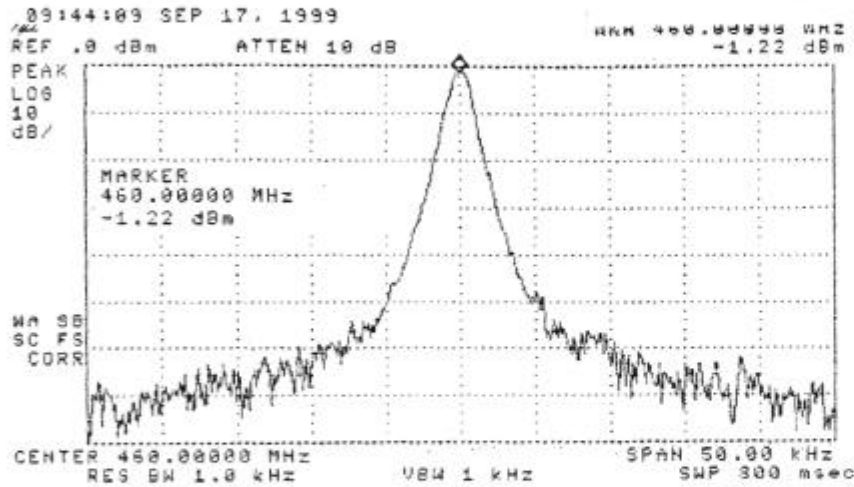
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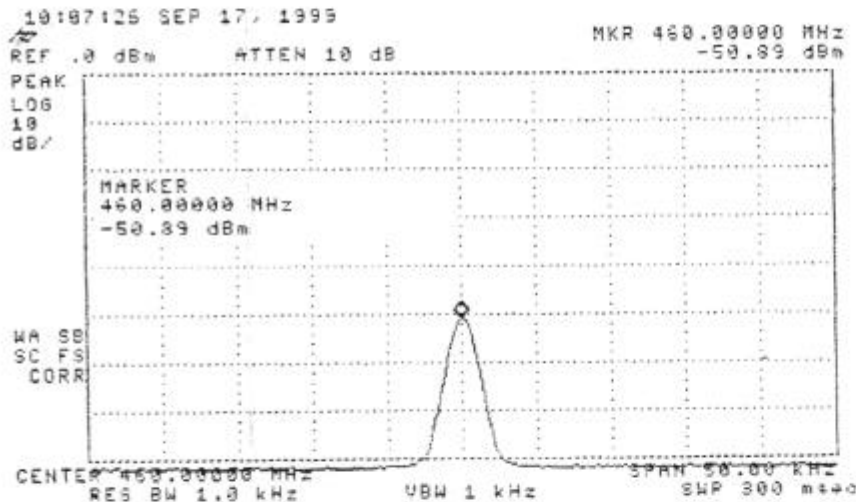
Sept. 17

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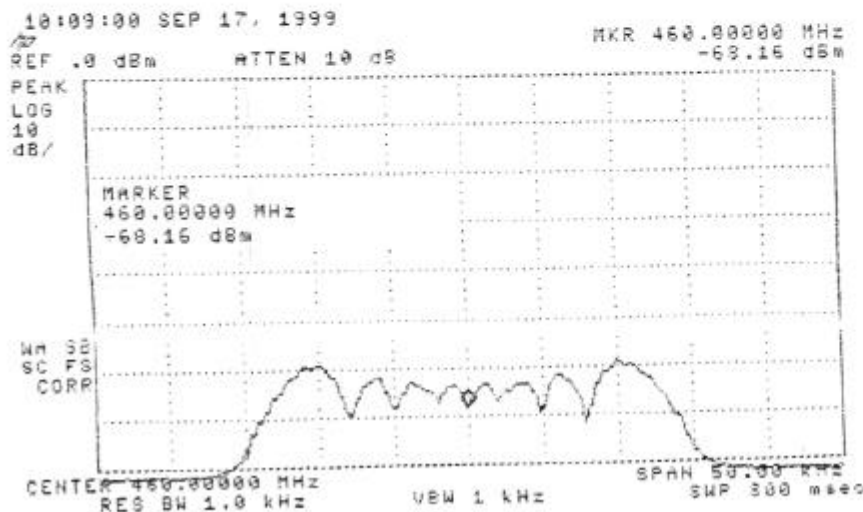
Figure 2



Star Pitset
Spectrum
Power Level = -1.22 dBm



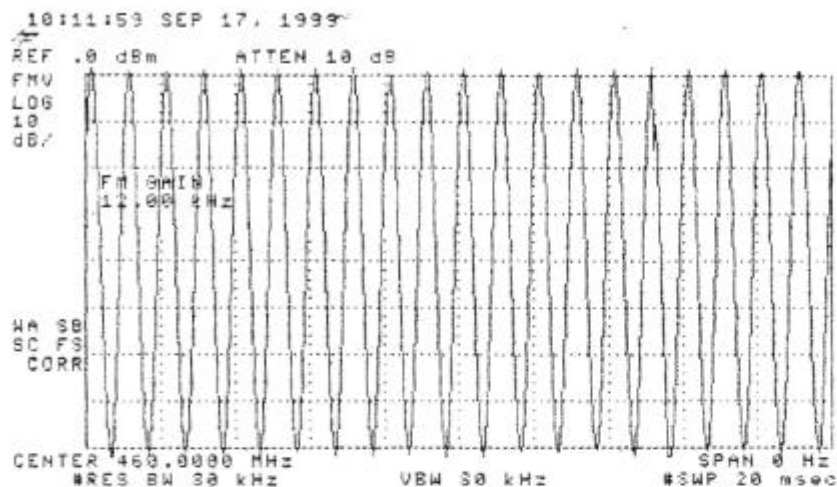
1 kHz Test Signal (unmodulated)
Spectrum
Power Level = -50.21 dBm



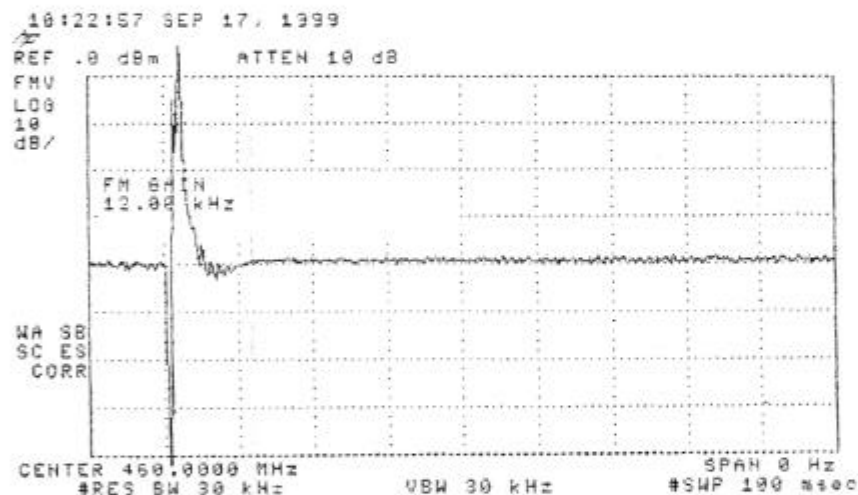
1 kHz Test Signal
Spectrum
±25 kHz deviation

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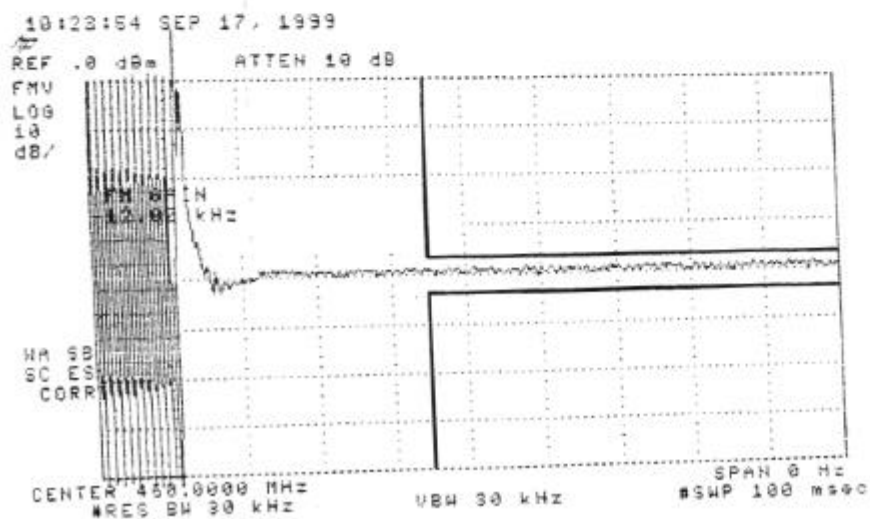
Figure 3



1 kHz Test Signal
Test Receiver Output
 ± 25 kHz deviation

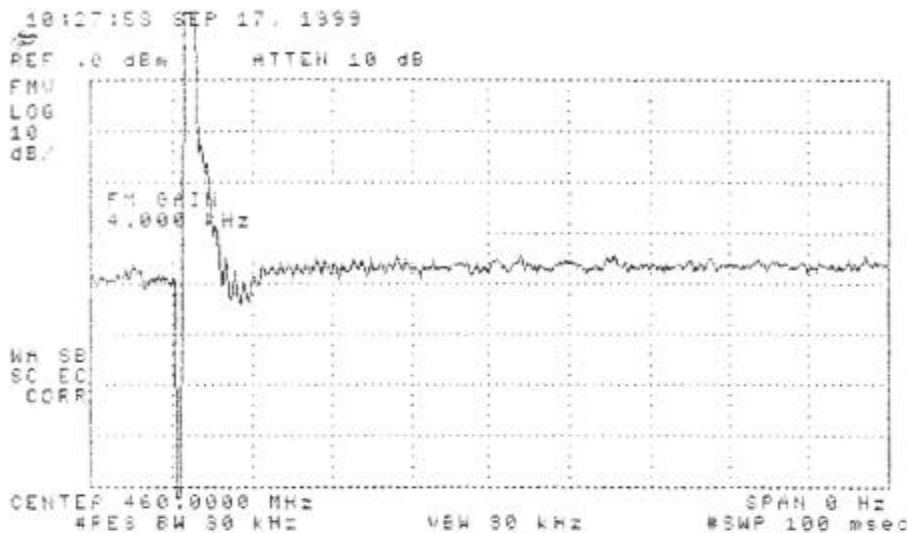


Star Pitset Turn-on
Test Receiver Output
3.0 kHz / div
Test Signal unmodulated



STAR Pitset Turn-on
Test Receiver Output
3.0 kHz / div
Test Signal modulated

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Star Pitset Turn-on
Test Receiver Output
1.0 kHz / div
Test Signal unmodulated

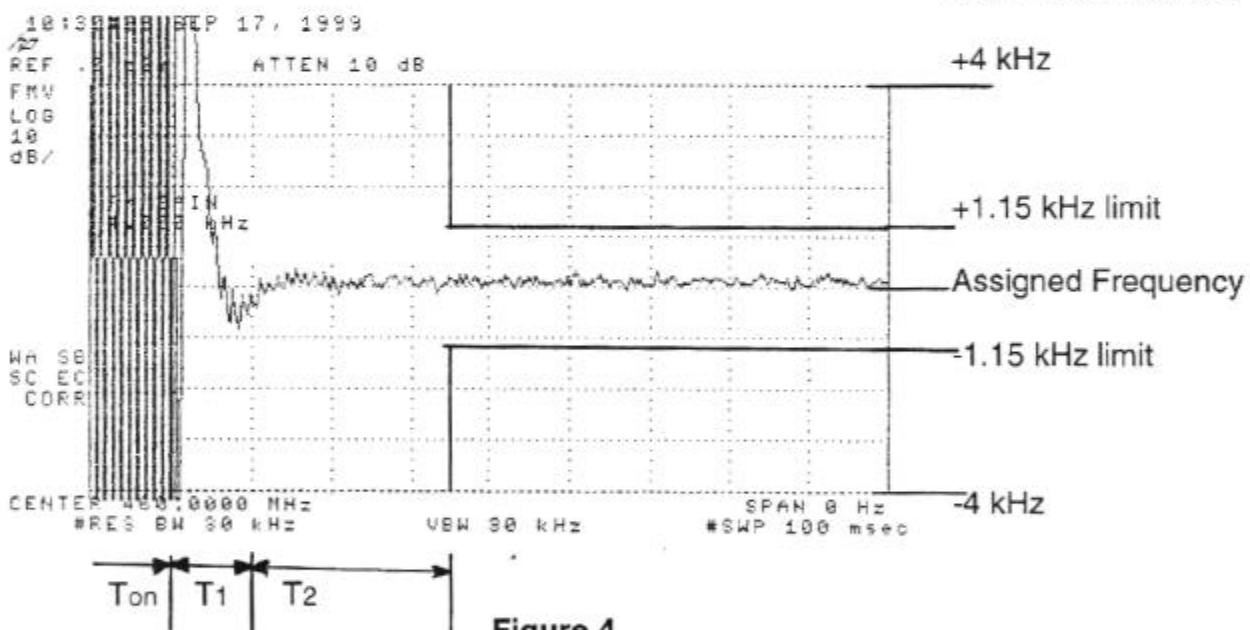
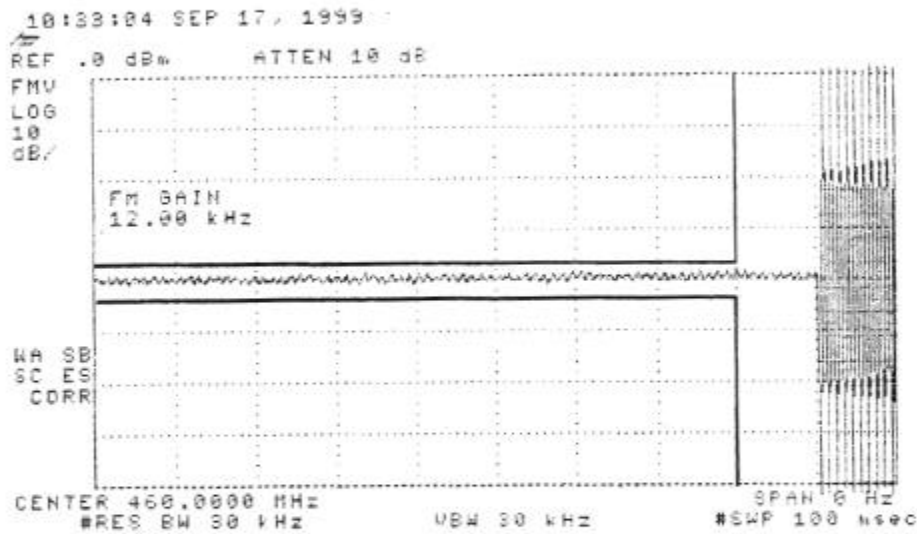


Figure 4

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Star Pitset Turn-off
Test Receiver Output
3.0 kHz / div
Test Signal unmodulated

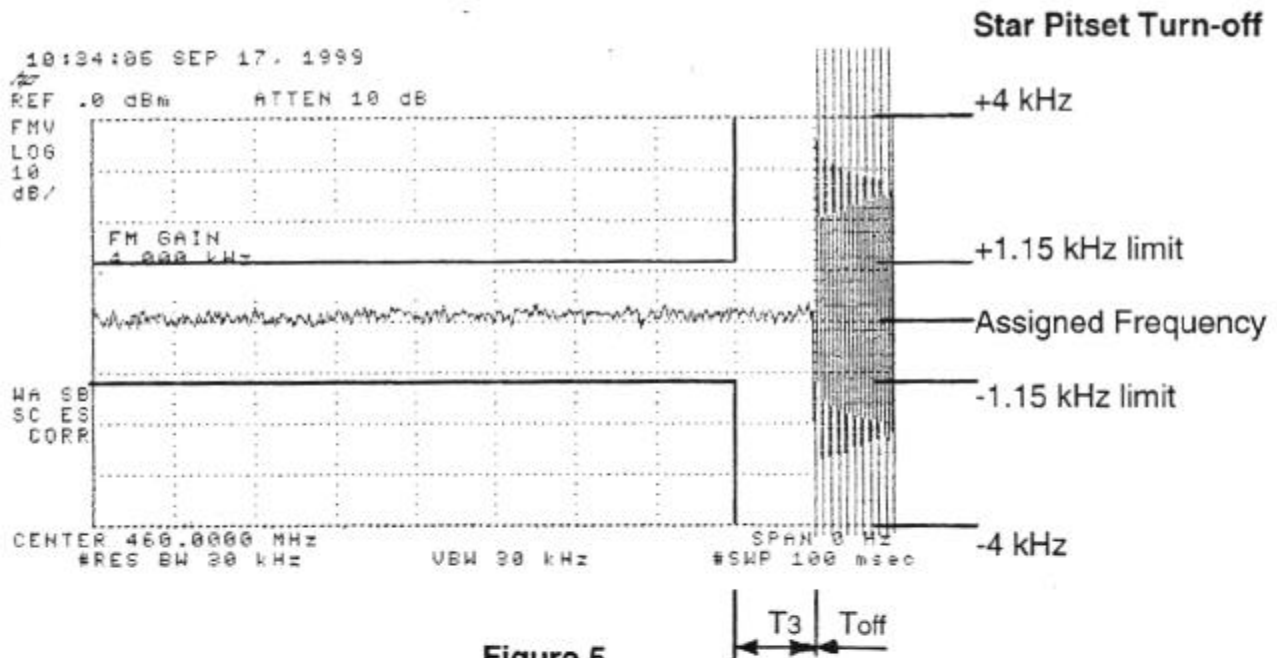


Figure 5