November 11, 2002
FCC ID: LLB7330

TRANSIENT FREQUENCY BEHAVIOR

Test Setup

The LLB7330 transmitter was tested for transient frequency behavior using the test method TIA/EIA-603. The test setup is shown in Fig. 1.

The 5373-LZ test receiver with audio bandwidth set to16kHz (low pass) was used. The receiver is furnished with 14.4 MHz high-stability reference generator. The storage oscilloscope was triggered in a presence of an RF radiation from the transmitter which was delayed using a variable digital delay build into the oscilloscope. The 1 kHz test signal was provided by the Marconi Signal Generator. The 1 kHz signal was attenuated by a build into Marconi attenuator to insure 50 dB down from the received signal of LLB7330.

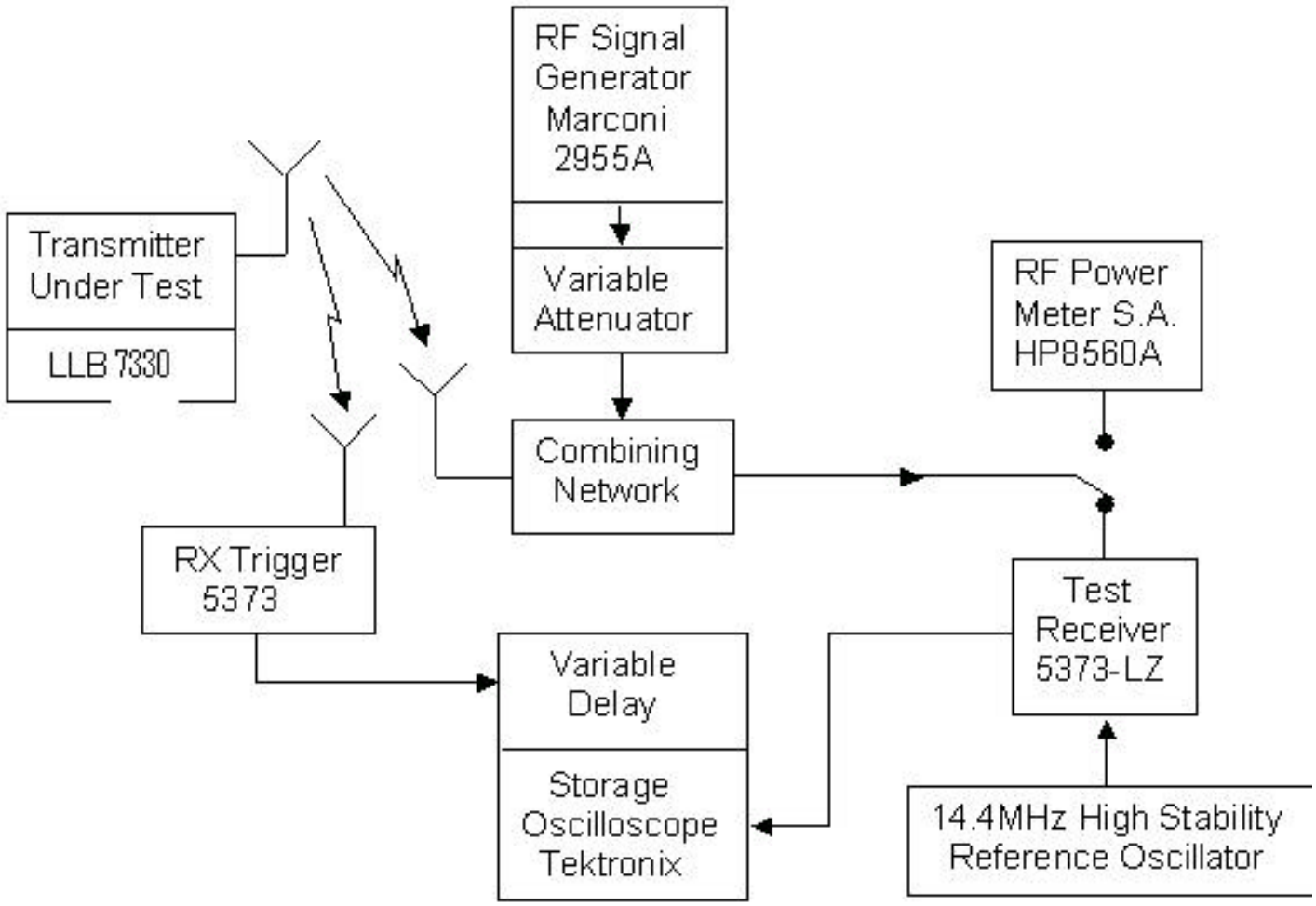


Figure 1 Test Setup

Test Requirements
The test requirements per 90.214 are:

1. Frequency deviation during t_1 (10ms duration after t_{on}) may be greater than +/-12.5 kHz because output power is less than 6 watts.

2. Frequency deviation during t_2 (25 ms duration after t_1) must be less than +/-6.25 kHz.

3. Frequency deviation after t_2 must be less than +/-2.5ppm x 460MHz = +/-1.15 kHz.

4. Frequency deviation during t_3 (10ms duration after transmitter is turned off) may exceed +/-12.5 kHz because output power is less than 6watts.

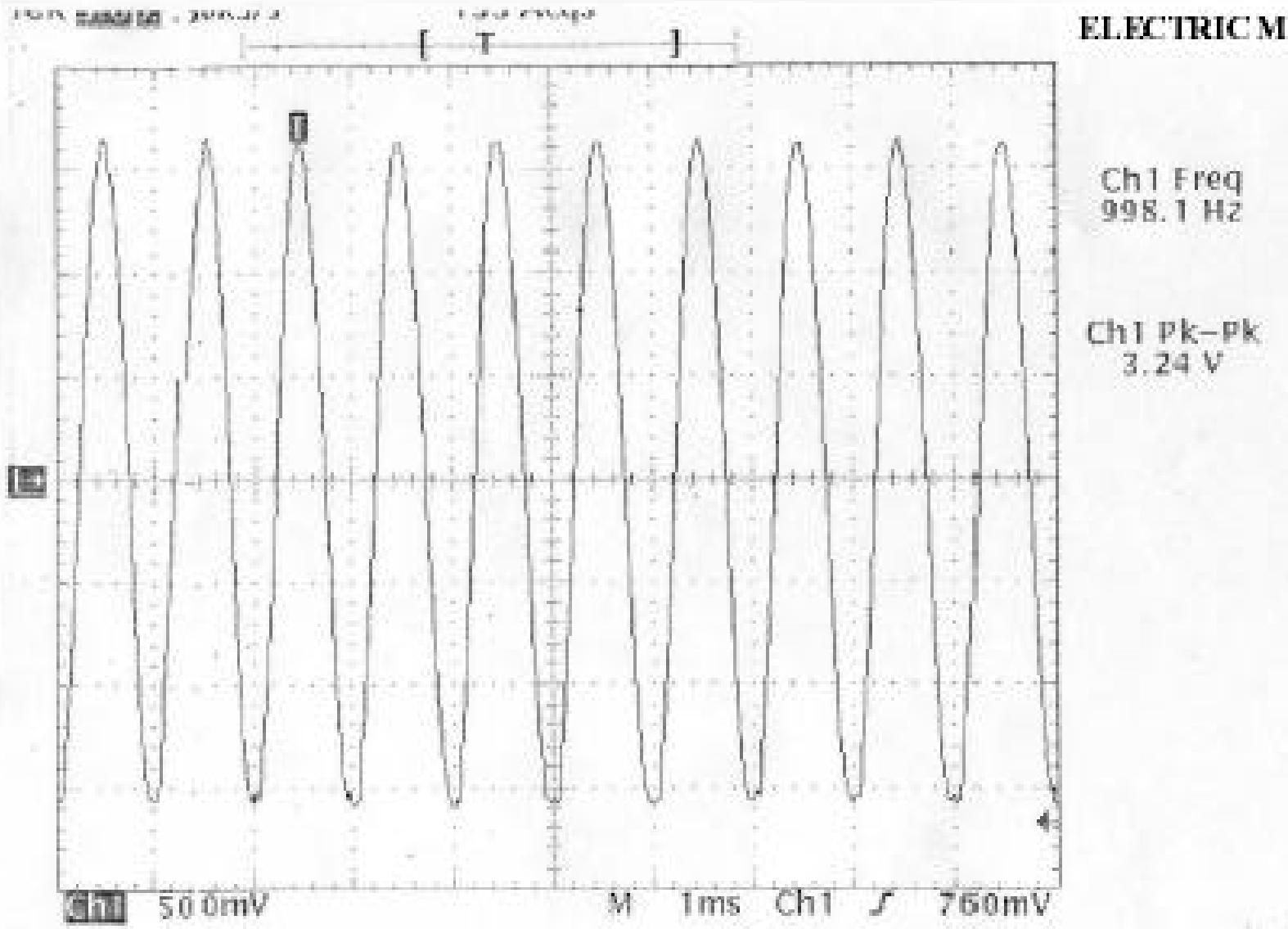
Test Data
Figures 2 through 8 show the measured LLB6717 Transient Frequency characteristics. The limit masks are shown overlaid on figures 3 through 6. Time scale used on Fig.2 is 1 ms, Figures 4, 5, and Fig.8 is 5ms per division, Fig.6 is 10 ms per division, Fig.3 and 7 is 2.5 ms/div. Deviation scales of 4 kHz per division and 0.8 kHz per division were used in order to better resolve details of the waveforms.

Measured waveforms include the following.

Figure 2: 1kHz Test Signal +/-12.5kHz Deviation – 4kHz per Division
Figure 3: LLB7330 Turn On – Test Signal Modulated – 4kHz per Division
Figure 4: LLB7330 Turn On – Test Signal Unmodulated – 0.8kHz per Division
Figure 5: LLB7330 Turn On – Test Signal Modulated – 0.8kHz per division
Figure 6: LLB7330 Turn On – Test Signal Unmodulated – 0.8kHz per Division
Figure 7: LLB7330 Turn Off – Test Signal Modulated – 4kHz per division
Figure 8: LLB7330 Turn Off – Test Signal Modulated – 0.8kHz per division

Test Results

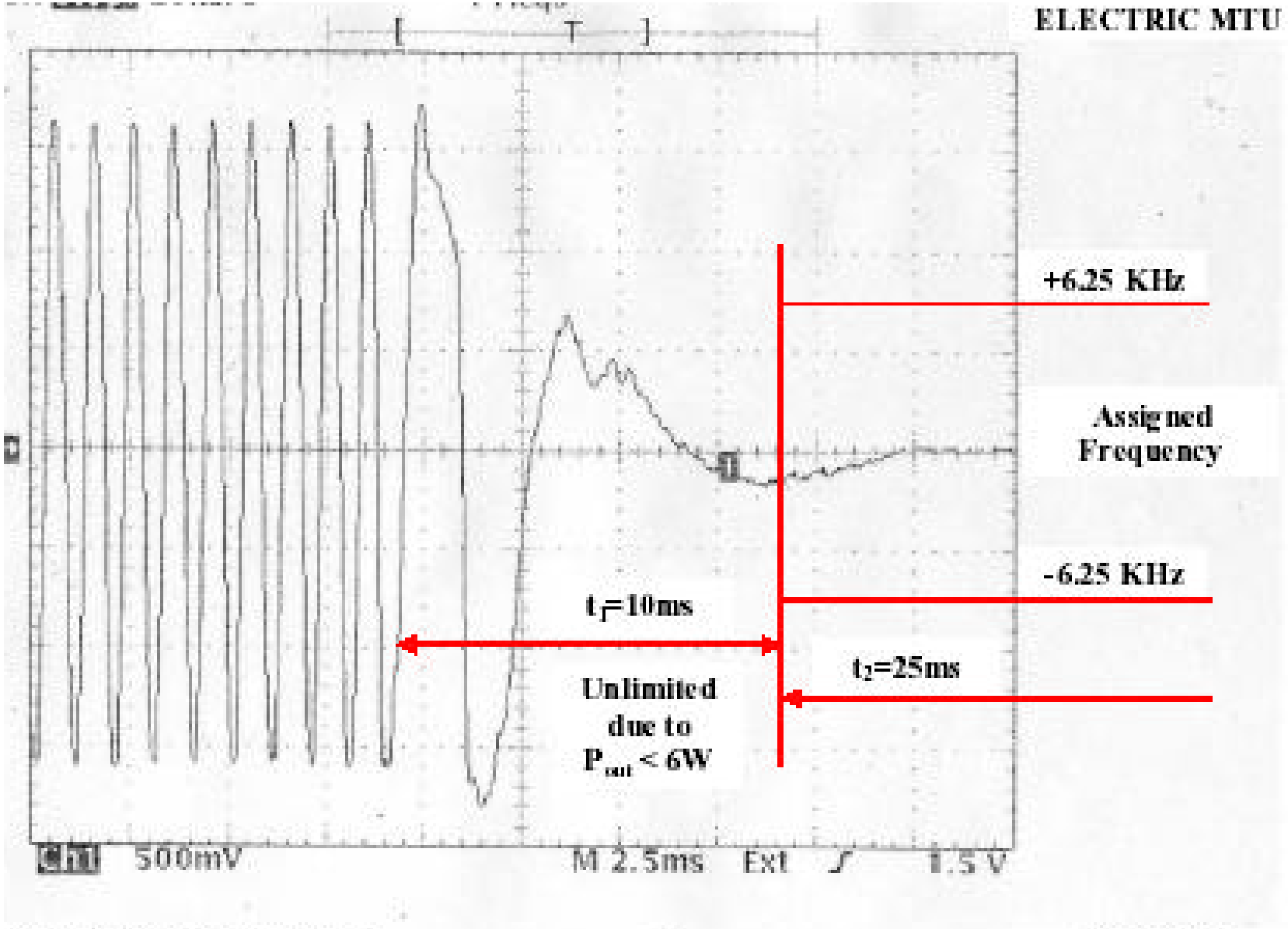
ELECTRIC MTU



1 KHz Reference Signal
Deviation = 12.5 KHz

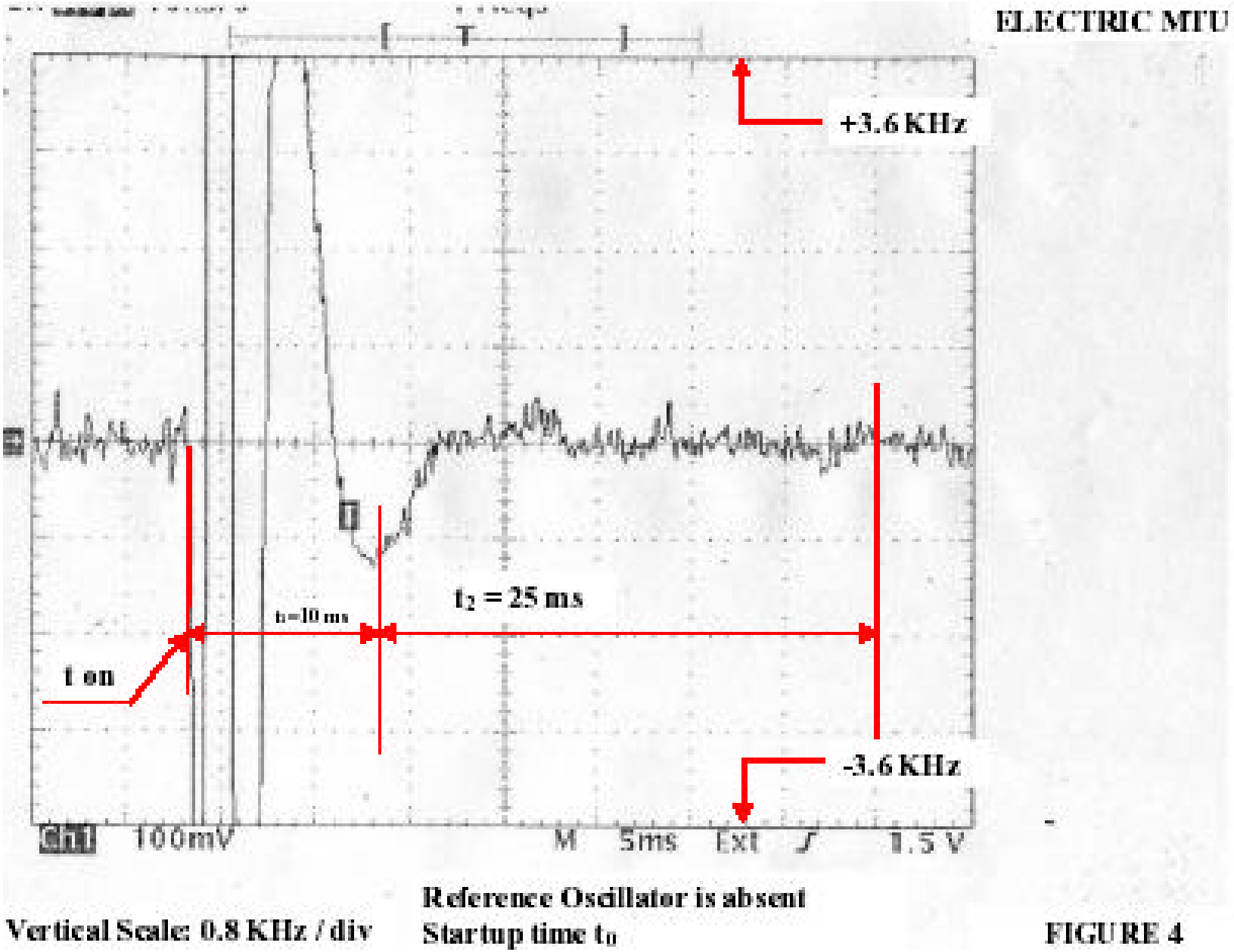
Vertical Scale: 4 KHz / div

FIGURE 2



Vertical Scale: 4 KHz / div

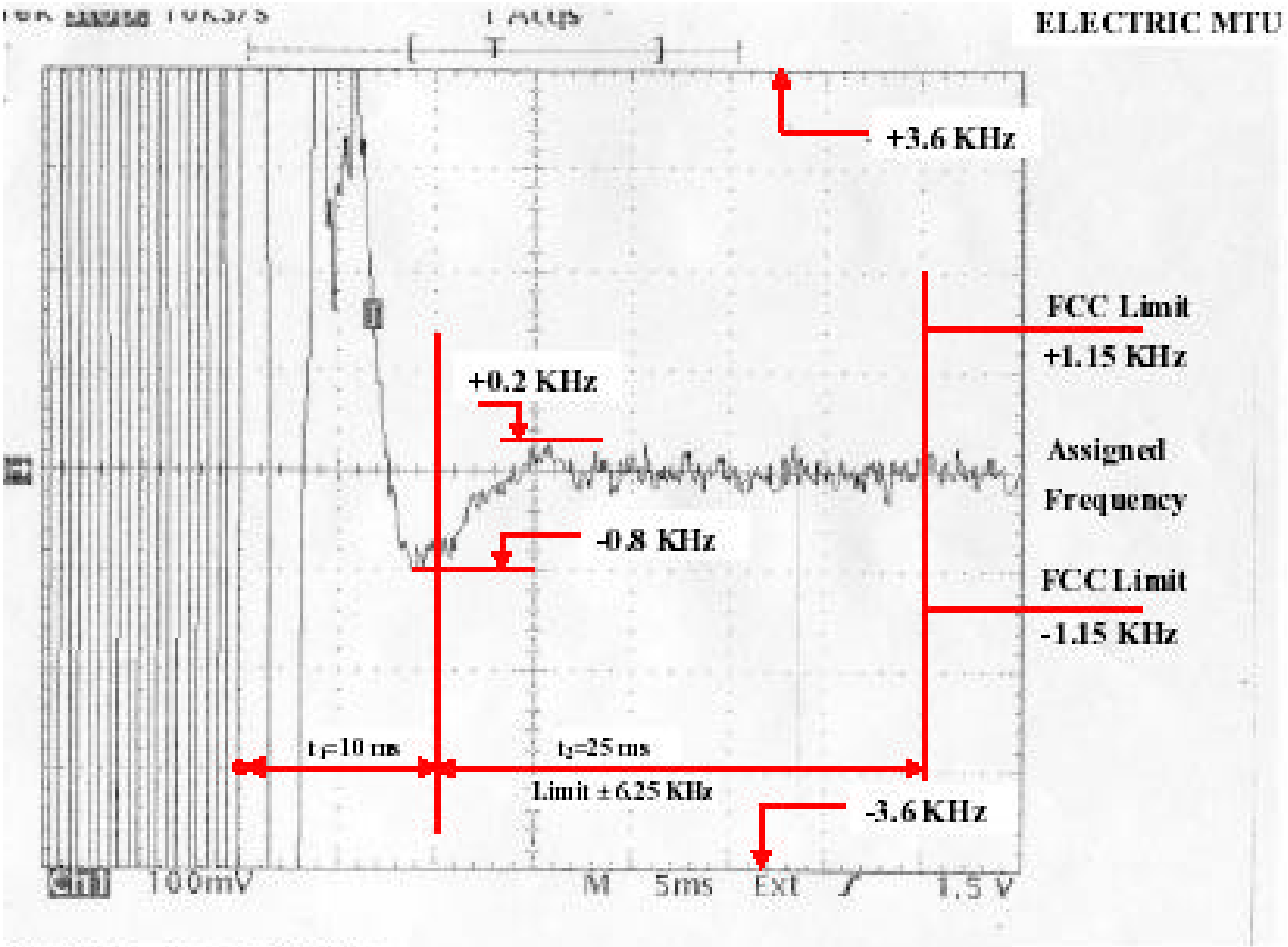
FIGURE 3



Vertical Scale: 0.8 KHz / div

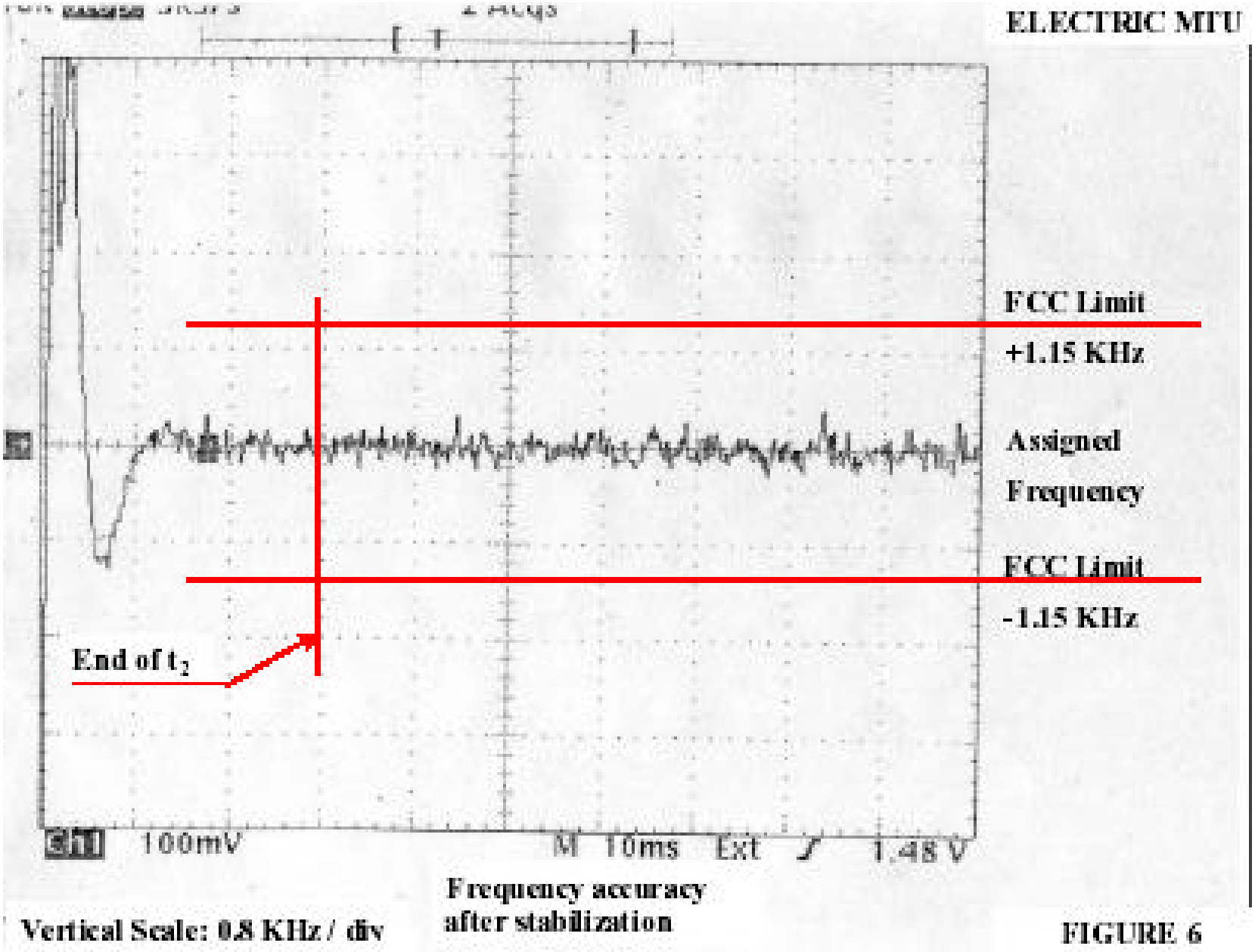
Reference Oscillator is absent
Startup time t_0

FIGURE 4



Vertical Scale: 0.8 KHz / div

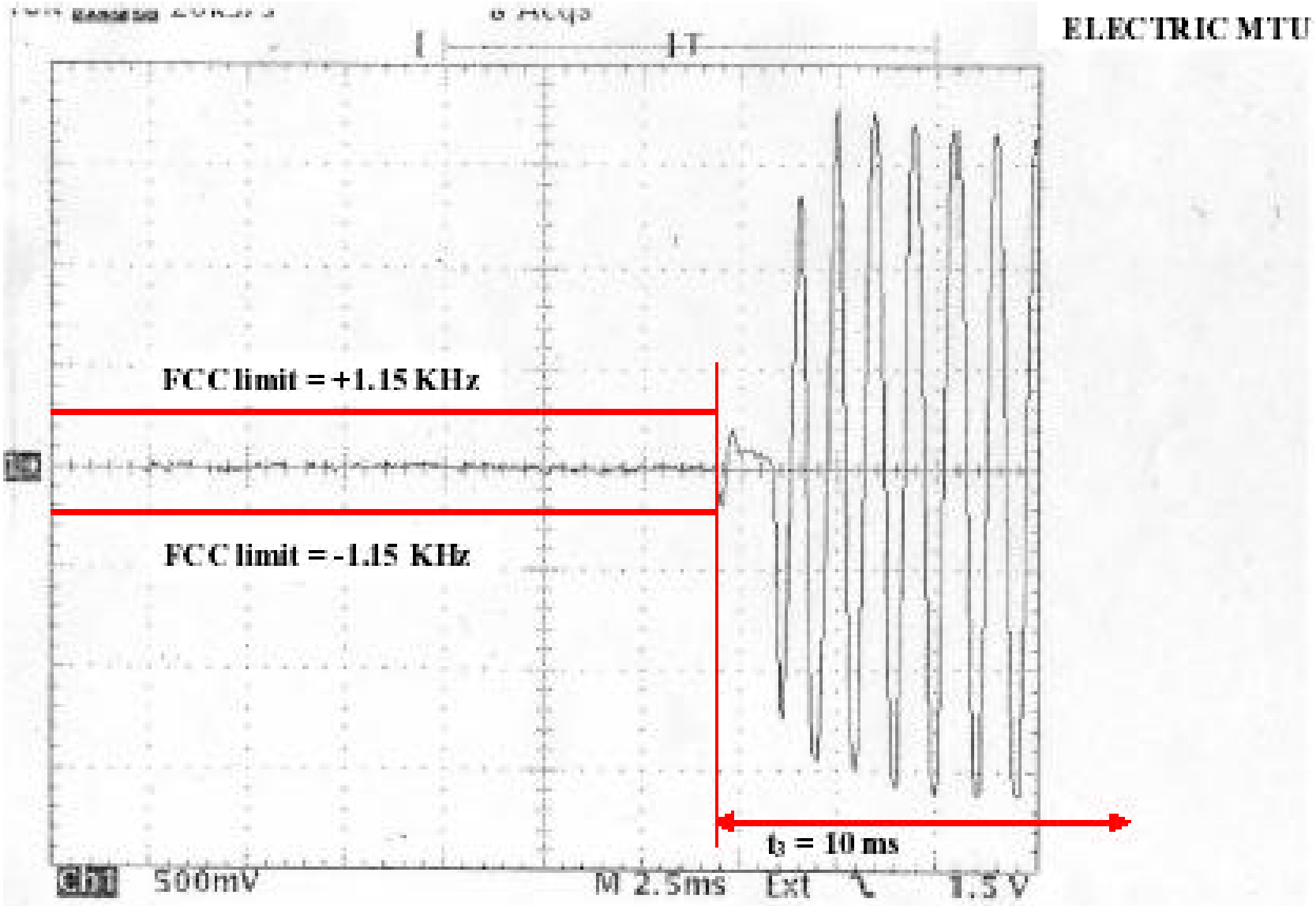
FIGURE 5



Vertical Scale: 0.8 KHz / div

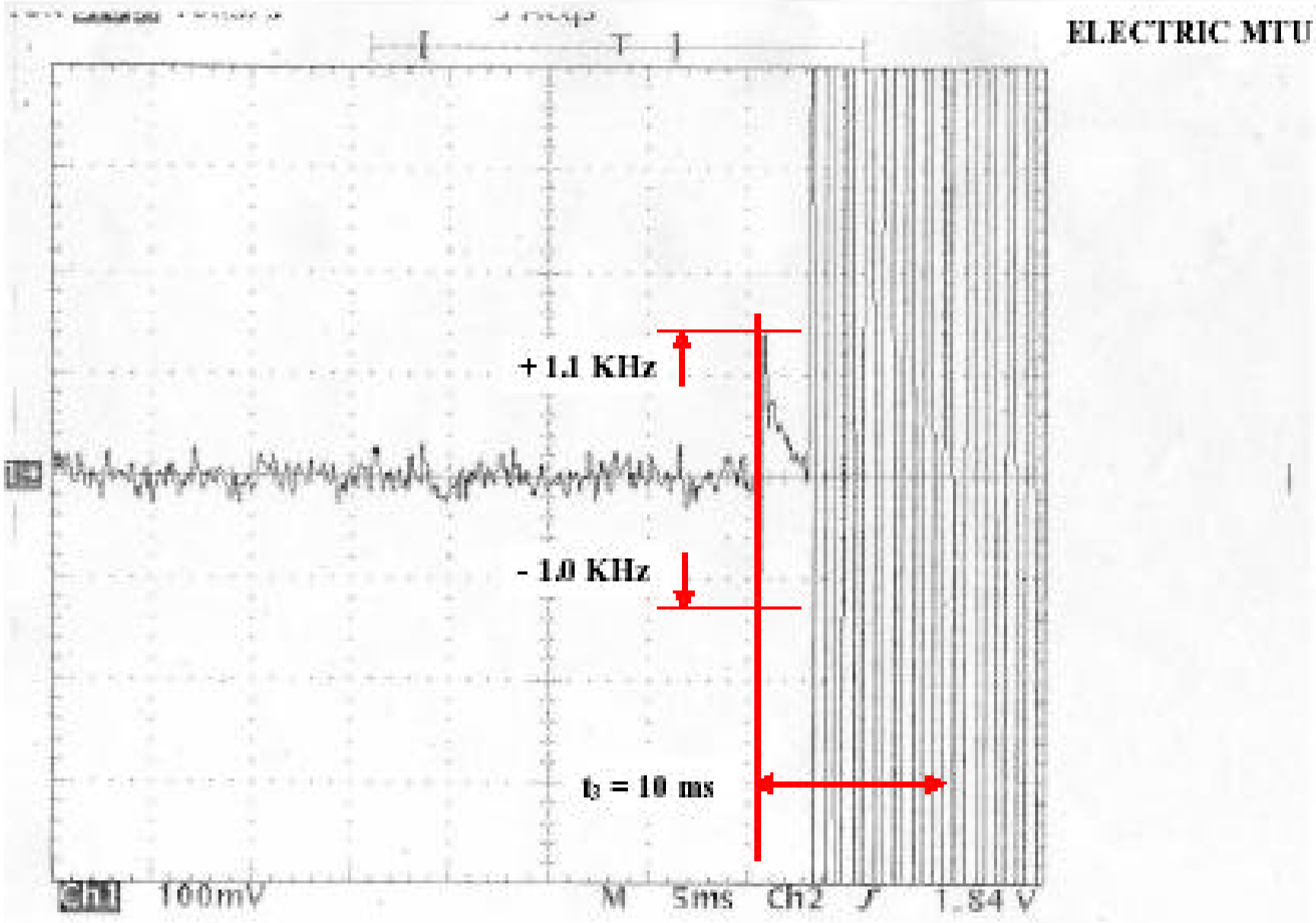
Frequency accuracy
after stabilization

FIGURE 6



Vertical Scale: 4 KHz / div Time t_3

FIGURE 7



Vertical Scale: 0.8 KHz / div **Time t_3**

FIGURE 8

Figure 2 shows the receiver response to the 1kHz test signal. Figure 4 shows the turn on response with the test signal unmodulated in order to identify the T_{on} point.

Figure 3 shows the LLB7330 turn on response is well within the required +/-6.25kHz during interval T_2. Interval T_2 starts 10ms after T_{on} and continues for duration of 25ms. There is no transient frequency limit specified during interval t1 since the output power does not exceed 6watt.

Figure 6 show that the LLB7330 frequency accuracy is well within the requirement of +/- 1.15 kHz from the end of $T_{2.}$

Figure 7 and 8 show the LLB7330 turn off response. There is no transient frequency limit during interval T3 since the output power does not exceed 6watt.

Conclusion

The Hexagram LLB7330 transmitter has been shown to be capable of complying with the requirements of the FCC Part 90 transmitter that is covered by this report.

Measurements made and recorded on November 11, 2002 by:
Lazar Feldman
David Allen,

Measurement Equipment
Hewlett Packard
Spectrum Analyzer model 8560A
Option 003 high stability reference

Marconi Instruments
Radio Communications Test Set model 2955A

Tektronix
Digital Storage Oscilloscope model TDS350

Hexagram
Test receiver 5373-LZ with high stability
reference oscillator.