



**HEXAGRAM INC.**

*An ESCO Technologies Company*

**30400 Solon Road**

**Solon OH 44139**

**(440) 528-7200**

**ENGINEERING TEST REPORT**

**RADIO-FREQUENCY EMISSIONS TEST REPORT**

**TRANSIENT BEHAVIOR**

**FOR**

**HIGH READ-RATE  
GAS METER TRANSMITTING UNIT**

Model 2011-005X, Rev. C

FCC ID: LLB11005X

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Report Prepared by

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James R. Pollock

Agency Certification Control Technician

# **TEST REPORT**

## **INTRODUCTION**

The Hexagram Model 2011-005X transceiver is a “Meter Transmitting Unit” (MTU) designed to provide remote meter reading capability for a gas meter. The transceiver is self-powered and mounts directly on a gas meter. On board batteries provide power. The transmitter provides a very short, intermittent radio frequency transmission to send a remote reading of the meter to a data collector unit. A microprocessor provides timing, control and data processing functions. The internal antenna is inaccessible to the user and no external antenna is provided. Two identical units were used as test subjects for this report. The unit used for each test is identified under the test procedure. This report presents the data obtained in support of an application for Certification under Part 90 of the FCC rules.

## **MEASUREMENTS PERFORMED**

Occupied Bandwidth

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## TRANSIENT STABILITY

The transient stability measurements indicate the variation in tuned frequency during the brief interval of time during the start of the transmission and at the end of the transmission.

The Model 2011-005X transmitter was tested for transient frequency behavior using the test method of TIA/EIA-603-C. A block diagram of the test setup is seen in Fig. 2. A Hexagram model 9975G-WB receiver was used. The storage oscilloscope was triggered by the output of the RSSI output of the receiver. Appropriate delay was provided by the digital delay circuitry of the oscilloscope. The 1 kHz test signal was provided by the Marconi signal generator. The generator's output control was used to insure that the test signal was at least 50 dB below the received signal level from the 2011-005X.

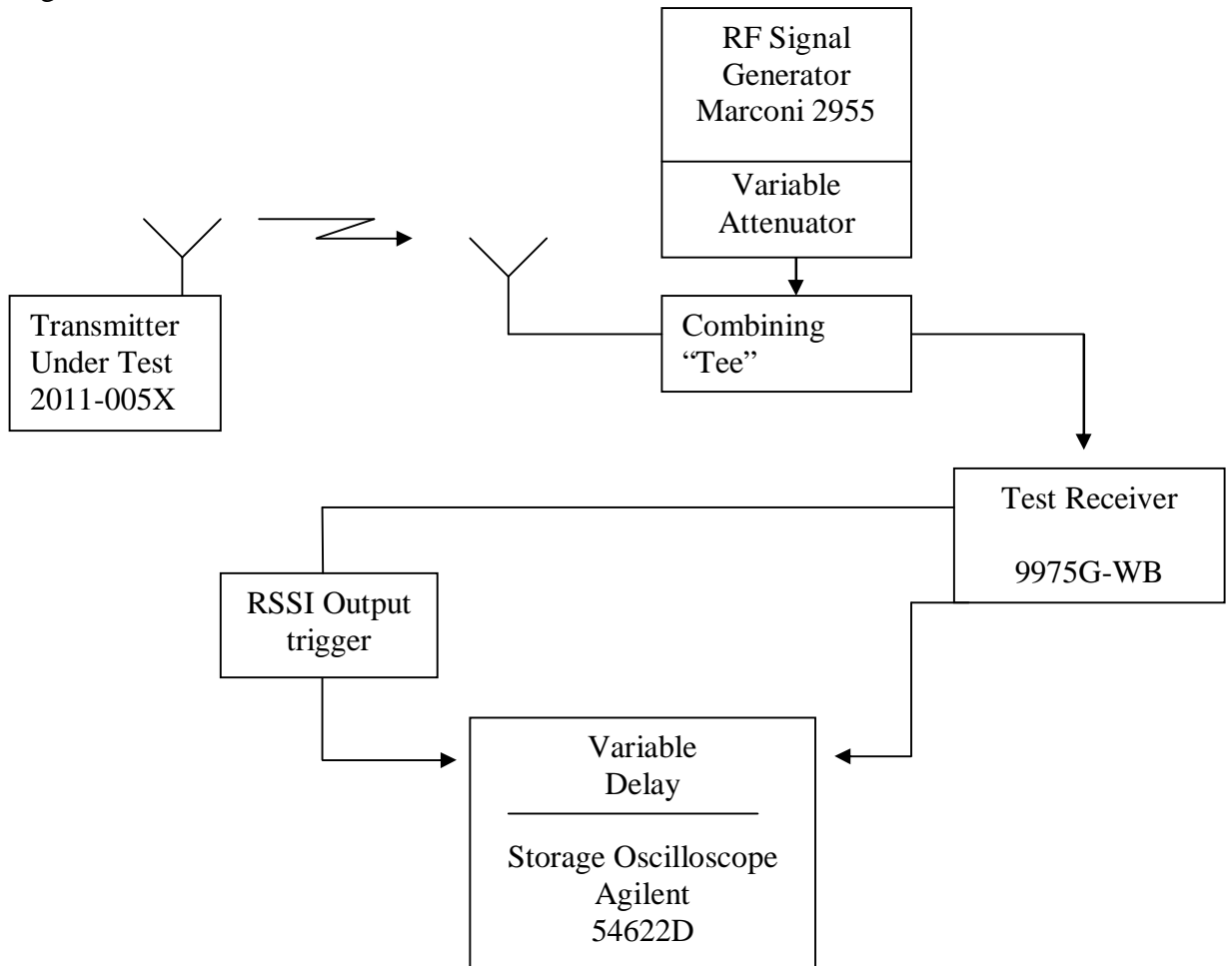


Fig. 2  
Transient Frequency Behavior  
Test Setup

## Test Requirements

The test requirements per 90.214 are:

1. Frequency deviation during  $t_1$  (10 ms duration after  $t_{on}$ ) may be greater than  $\pm 12.5$  kHz because the output power is less than 6 Watts.
2. Frequency deviation during  $t_2$  (25 ms duration after  $t_1$ ) must be less than  $\pm 6.25$  kHz.
3. Frequency deviation after  $t_2$  must be less than  $\pm 2.5$  ppm, or  $\pm 1150$  Hz at 460 MHz.
4. Frequency deviation during  $t_3$  (10 ms duration after transmitter is turned off) may exceed  $\pm 12.5$  kHz because output power is less than 6 Watts.

## Test Data

Figures 3 through 7 show the Model 2011-006X transient frequency characteristics. The limit masks are indicated on each of the figures.

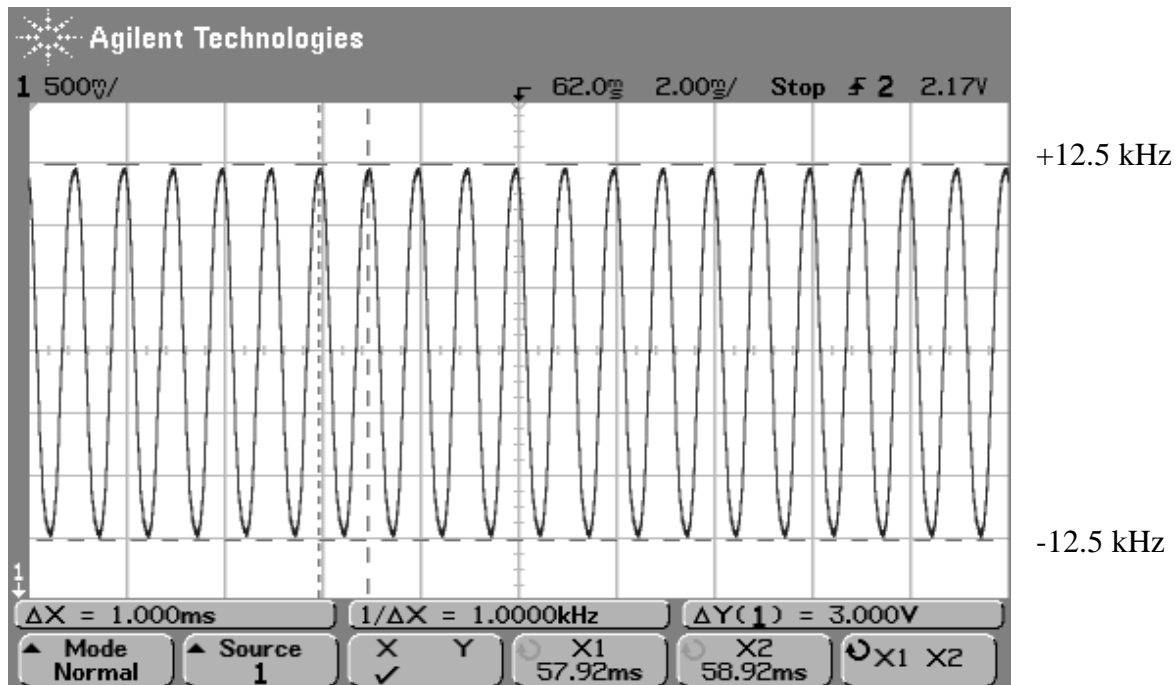


Fig. 3  $\pm 12.5$  kHz modulated test signal .

- $\pm 12.5$  kHz = 3.00 V
- $\pm 6.25$  kHz = 1.50 V
- $\pm 1.15$  kHz = 276 mV

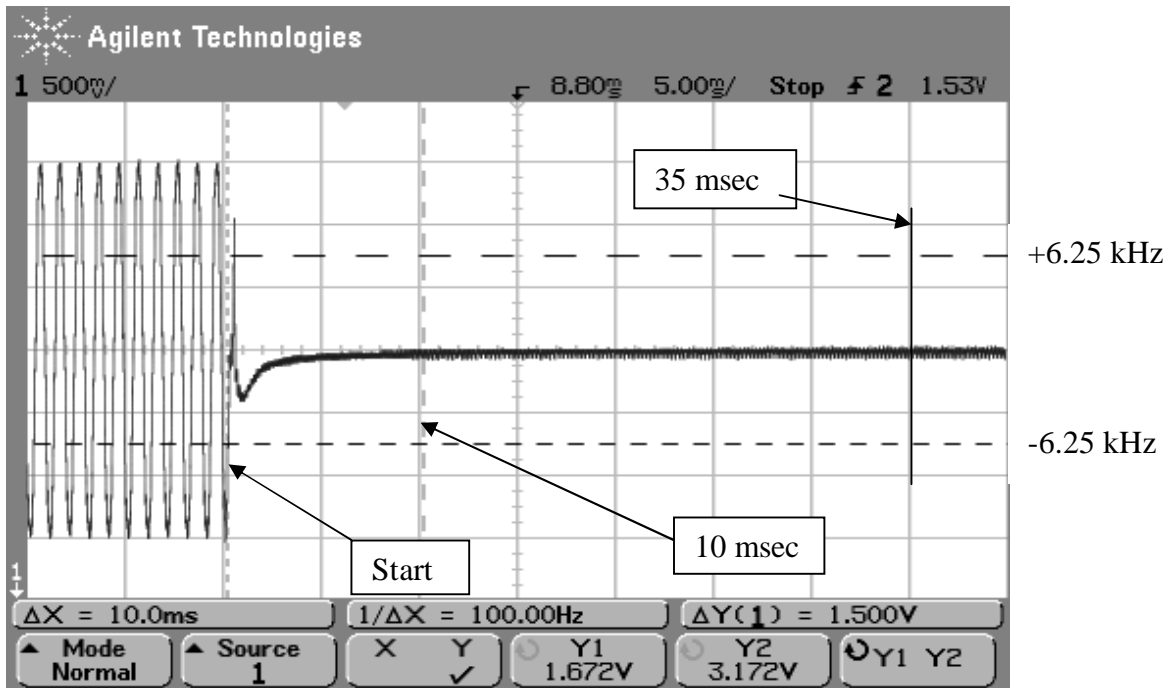


Fig. 4 Start of Transmission

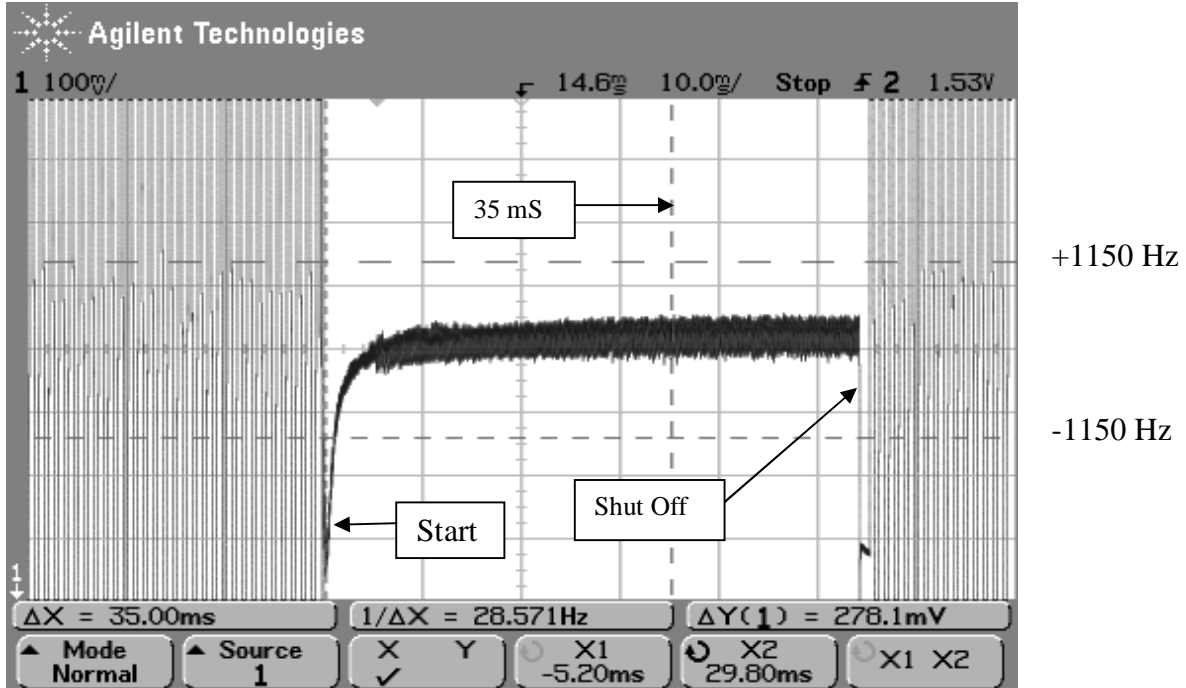
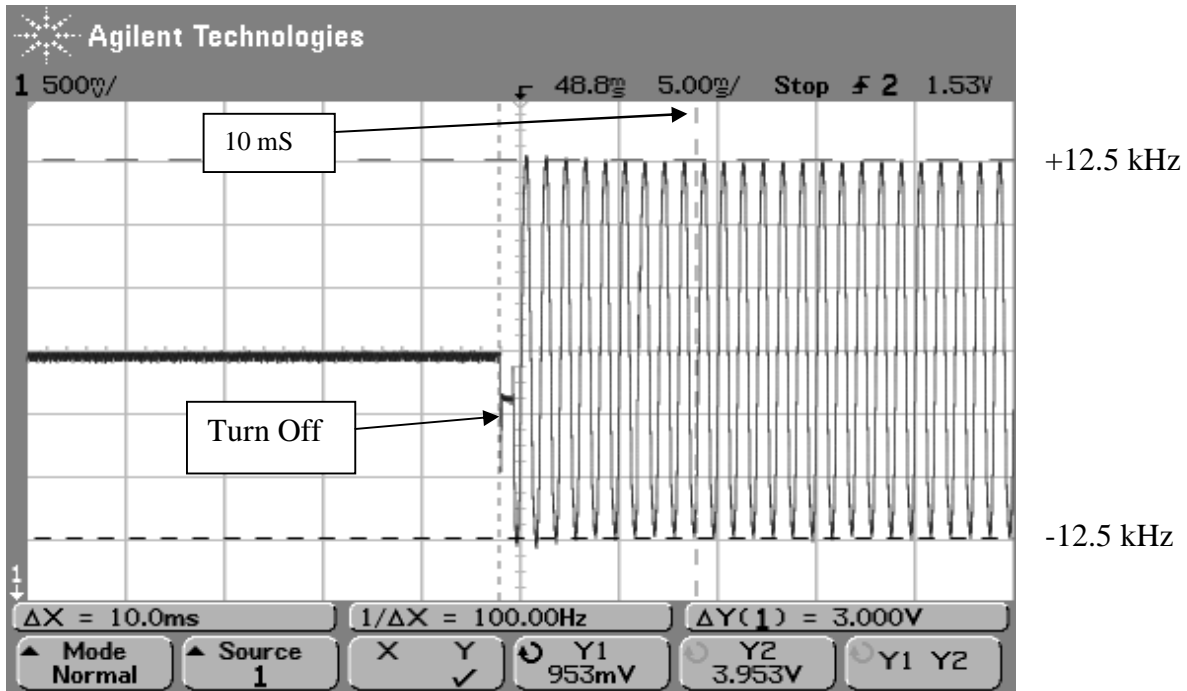


Fig. 5 Full Transmission



**Fig. 6 Turn Off Transient**

The modulated signal appears well within the allowed 10 ms and does not exceed  $\pm 12.5$  kHz beyond 10 ms.

## TEST EQUIPMENT USED

### Signal Generator

Marconi Model 2955 RF Test Set  
S/N 132061  
Cal Due: 2/25/2012

### Test Receiver

Hexagram 9975G-WB w/  
RSSI trigger output

### Oscilloscope

Agilent Model 54622D  
SN: MY40003551 Cal Due: 2/28/12

### Test Performed

November 30, 2011