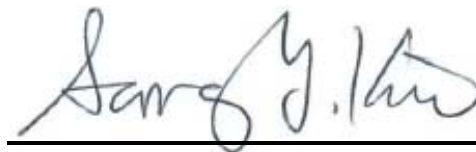


Guided Wave Analysis

Validation Certificate for MsSR3030R Instrument Operation

MsSR3030R Instrument, Serial No. 2703 was successfully tested in accordance with the MsS Equipment Operational Test Procedure developed by Guided Wave Analysis LLC and meets the requirements of the MsSR3030R Instrument Operational Specification.

Certified by:



Sang Kim, Ph.D.

Guided Wave Analysis LLC

Date: Oct. 1st, 2021

Expiry Date: Oct. 1st, 2022





MsSR3030R Instrument Operation Test

This document proves that the MsSR3030R Instrument, Serial No. 2703 was successfully tested in accordance with the MsS Equipment Operational Test Procedure developed by Guided Wave Analysis LLC and meets the requirements of the MsSR3030R Instrument Operational Specification.

Equipment: MsSR3030R

Serial Number: 2703

Specification: MsSR3030R Instrument Operation Test Procedure

Date of test: 10-1-2021

Expiry Date: 10-1-2022

Data Analyzer: Sang Kim in Guided Wave Analysis LLC

Scope of Tests:

- External visual examination of the unit
- Connection of MsSR3030R equipment, main cable, Y-connector, and MsS adapter
- Calibration Data acquired at 250, 180, 128, 90, 64, 45, and 32 kHz center frequency
- Data acquisition parameter settings for above frequencies
- Initial pulse and dead zone length
- Direction control level
- Signal-to-Noise ratio of end-reflected signals
- Spatial resolution

Tested Sample: Sample: 5.5-ft-long, 2.38-inch-OD, 0.15-inch-wall carbon steel pipe

Guided Wave Analysis LLC

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32 kHz MsS Data

Operating center frequency: 32 kHz

Number of cycles: 1

% Amplitude: 25 %

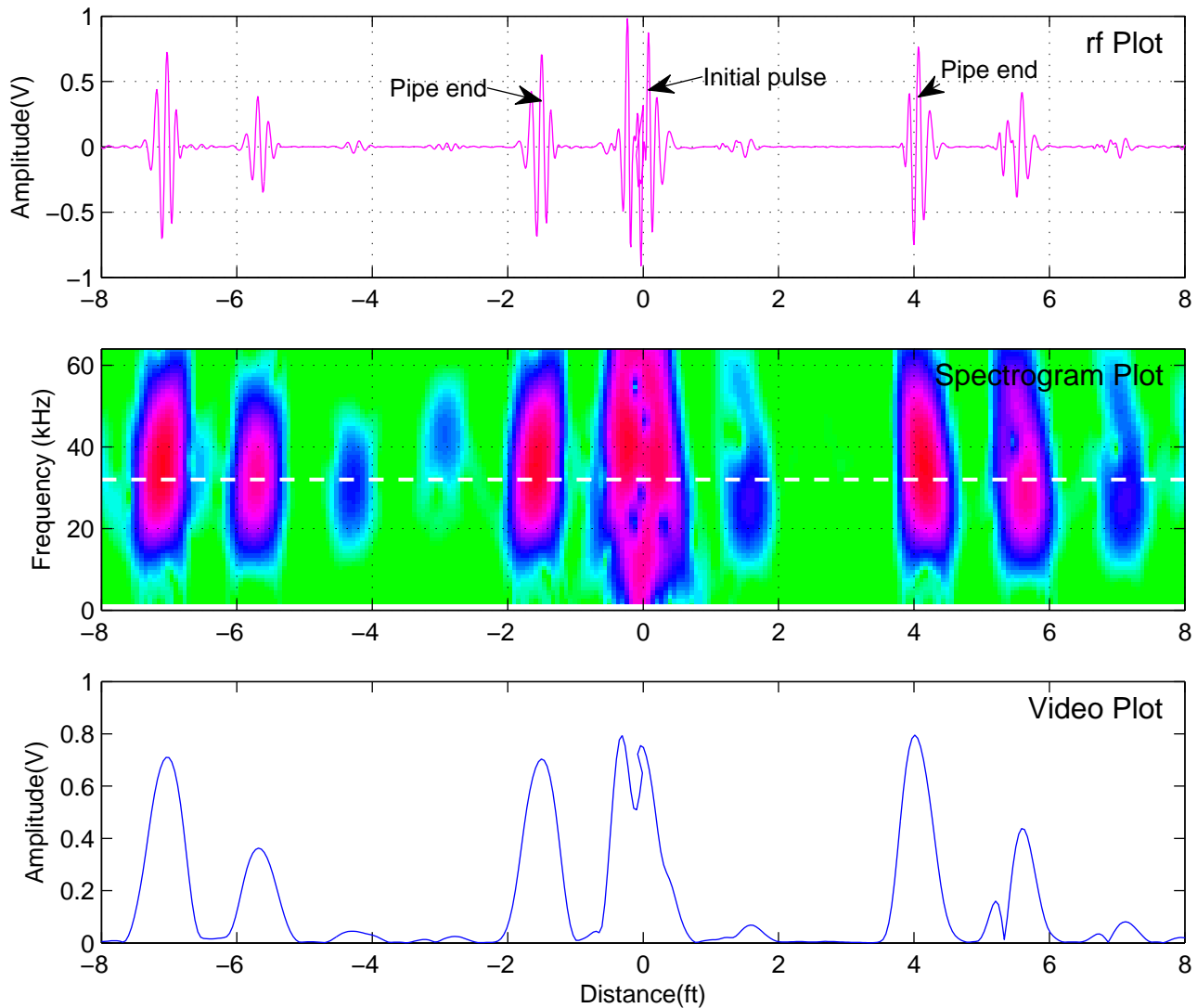
Gain: 4.0 dB

Time corrected gain: 0.1 dB/ft

Test date: 30-Sep-2021

Equipment serial number: 2704

Software version: MsSPipe-V3.00



Test Result

Peak amplitude of pipe end signal: 0.72 V and 0.76 V

Dead zone length of initial pulse: 0.58 ft along (+) direction and -1.10 ft along (-) direction

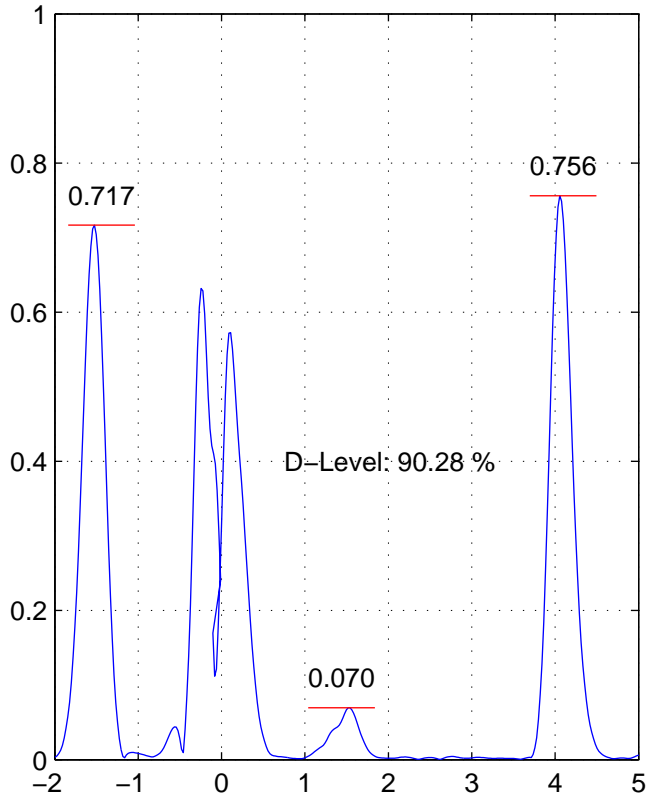
Direction control level: 90.28 %

Spatial resolution: 0.30 ft

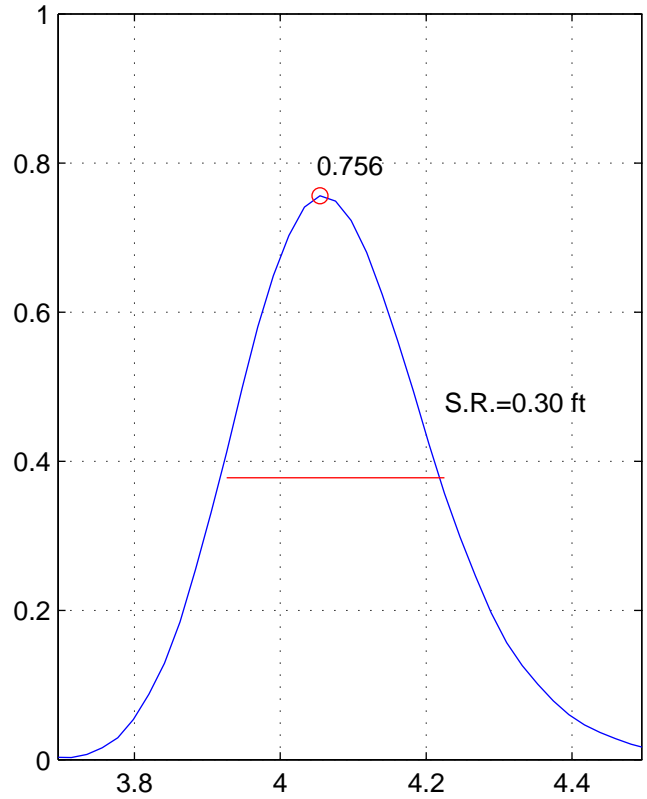
Signal-to-Noise ratio of pipe end signal: 414 (52.3 dB)

32 kHz MsS Data

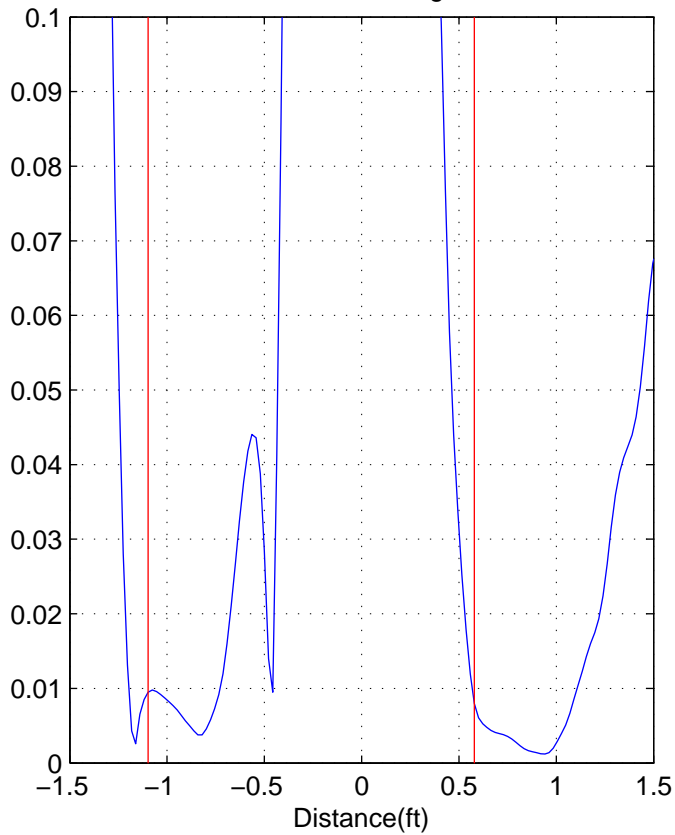
Pipe end amplitude and Direction



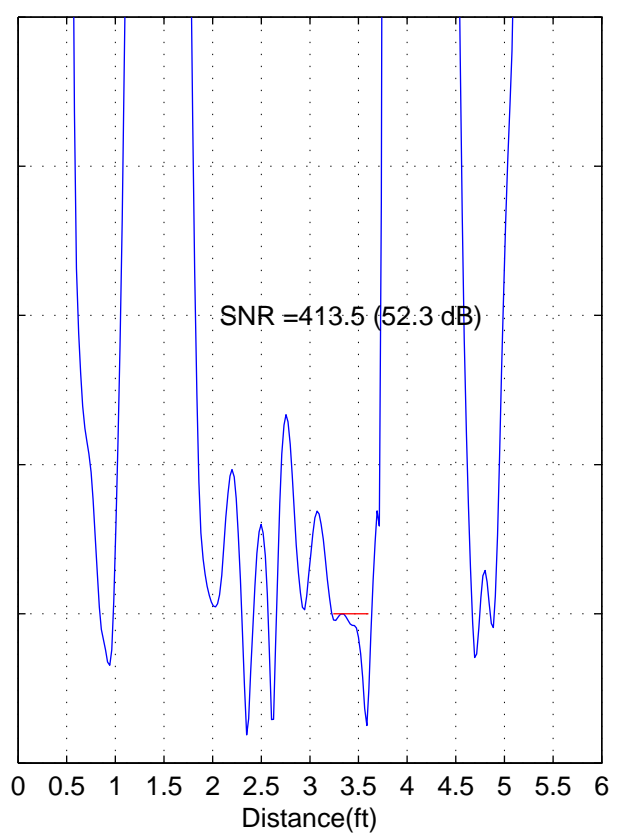
Spatial Resolution



Dead zone length



Noise Level



45 kHz MsS Data

Operating center frequency: 45 kHz

Number of cycles: 1

% Amplitude: 25 %

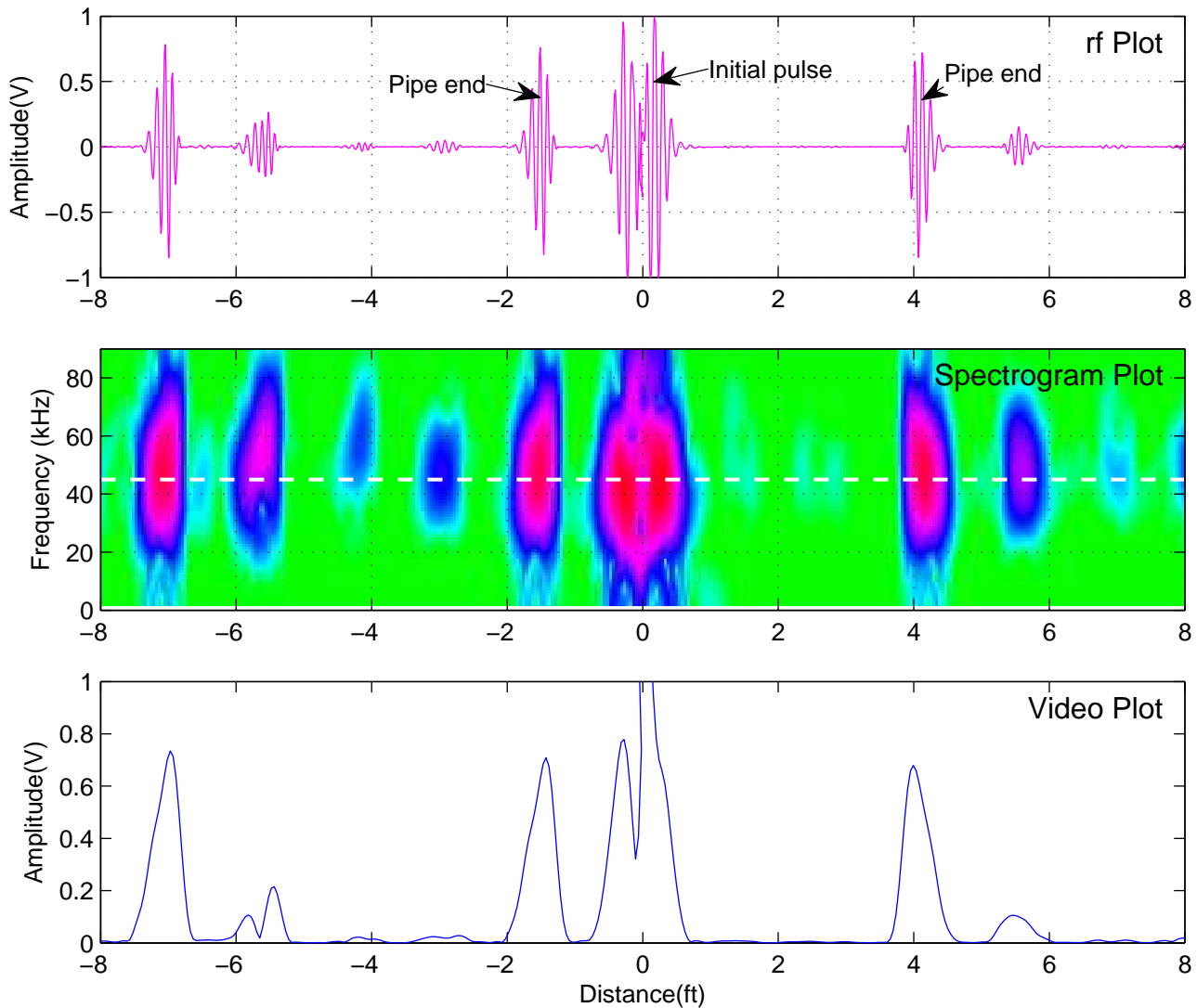
Gain: 6.0 dB

Time corrected gain: 0.1 dB/ft

Test date: 30-Sep-2021

Equipment serial number: 2704

Software version: MsSPipe-V3.00



Test Result

Peak amplitude of pipe end signal: 0.82 V and 0.83 V

Dead zone length of initial pulse: 0.78 ft along (+) direction and -0.81 ft along (-) direction

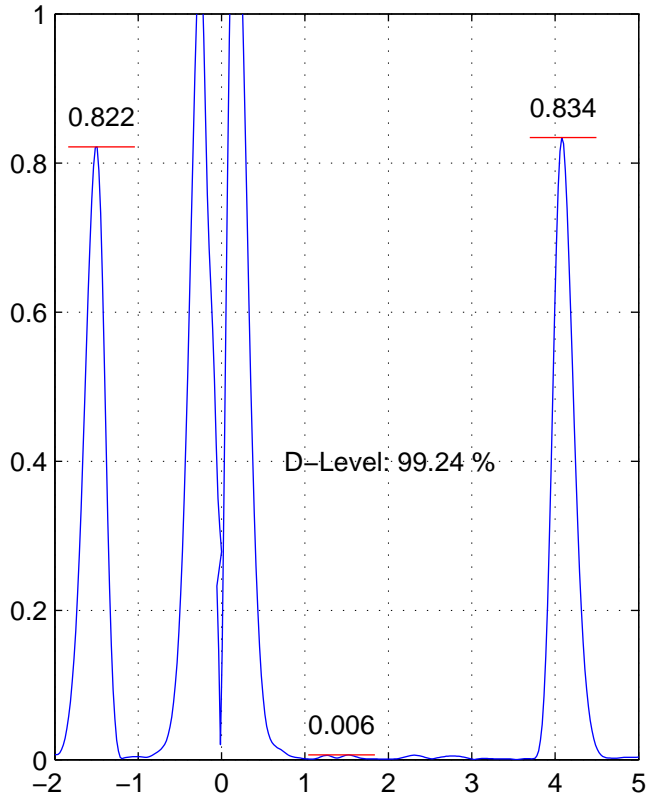
Direction control level: 99.24 %

Spatial resolution: 0.28 ft

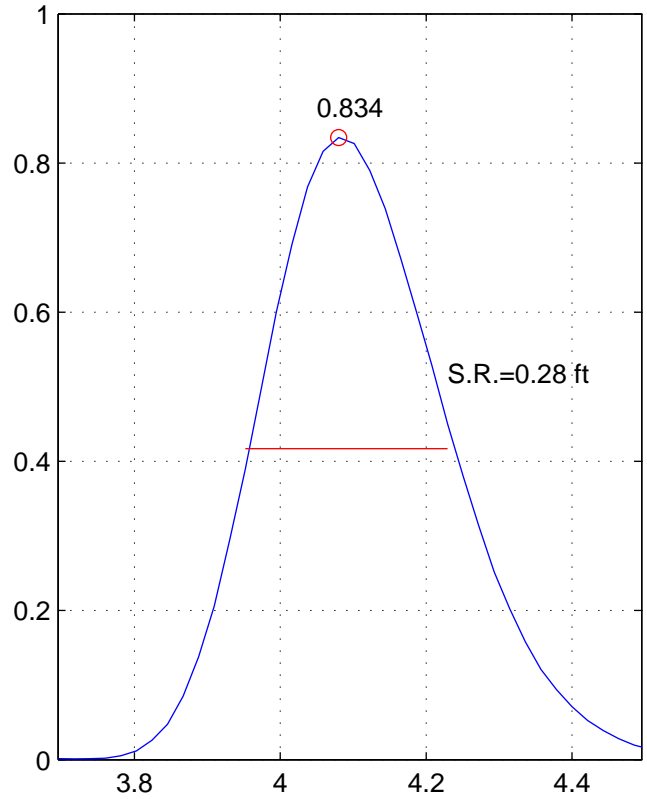
Signal-to-Noise ratio of pipe end signal: 498 (54.0 dB)

45 kHz MsS Data

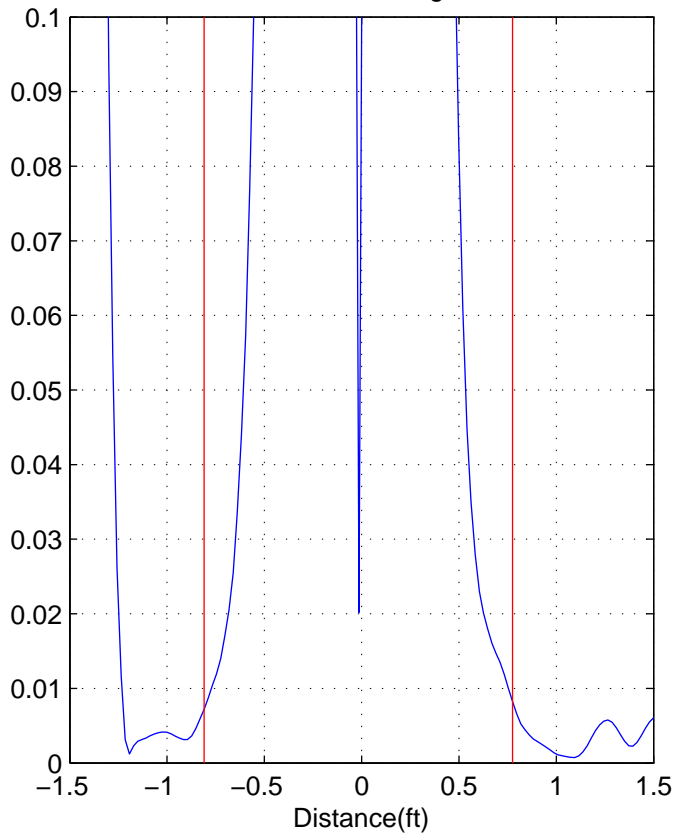
Pipe end amplitude and Direction



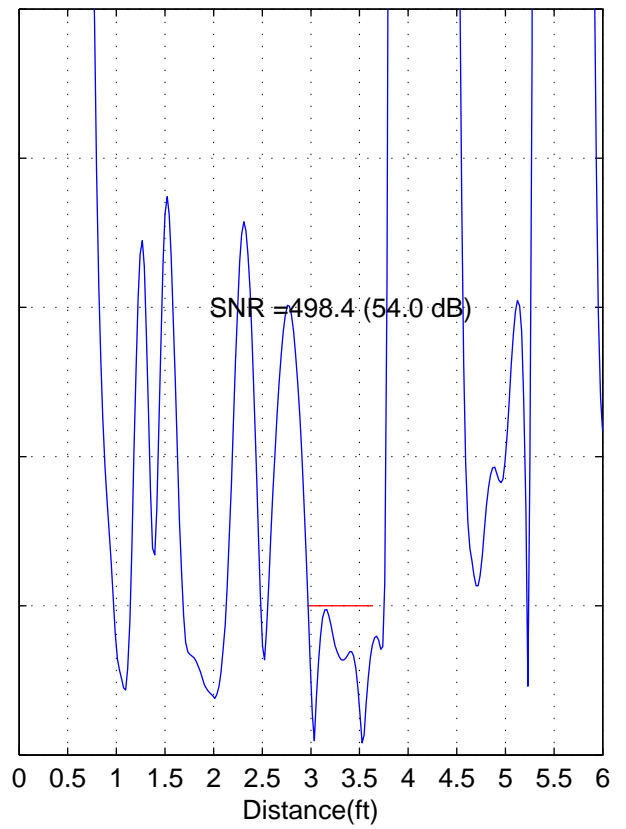
Spatial Resolution



Dead zone length



Noise Level



64 kHz MsS Data

Operating center frequency: 64 kHz

Number of cycles: 1

% Amplitude: 25 %

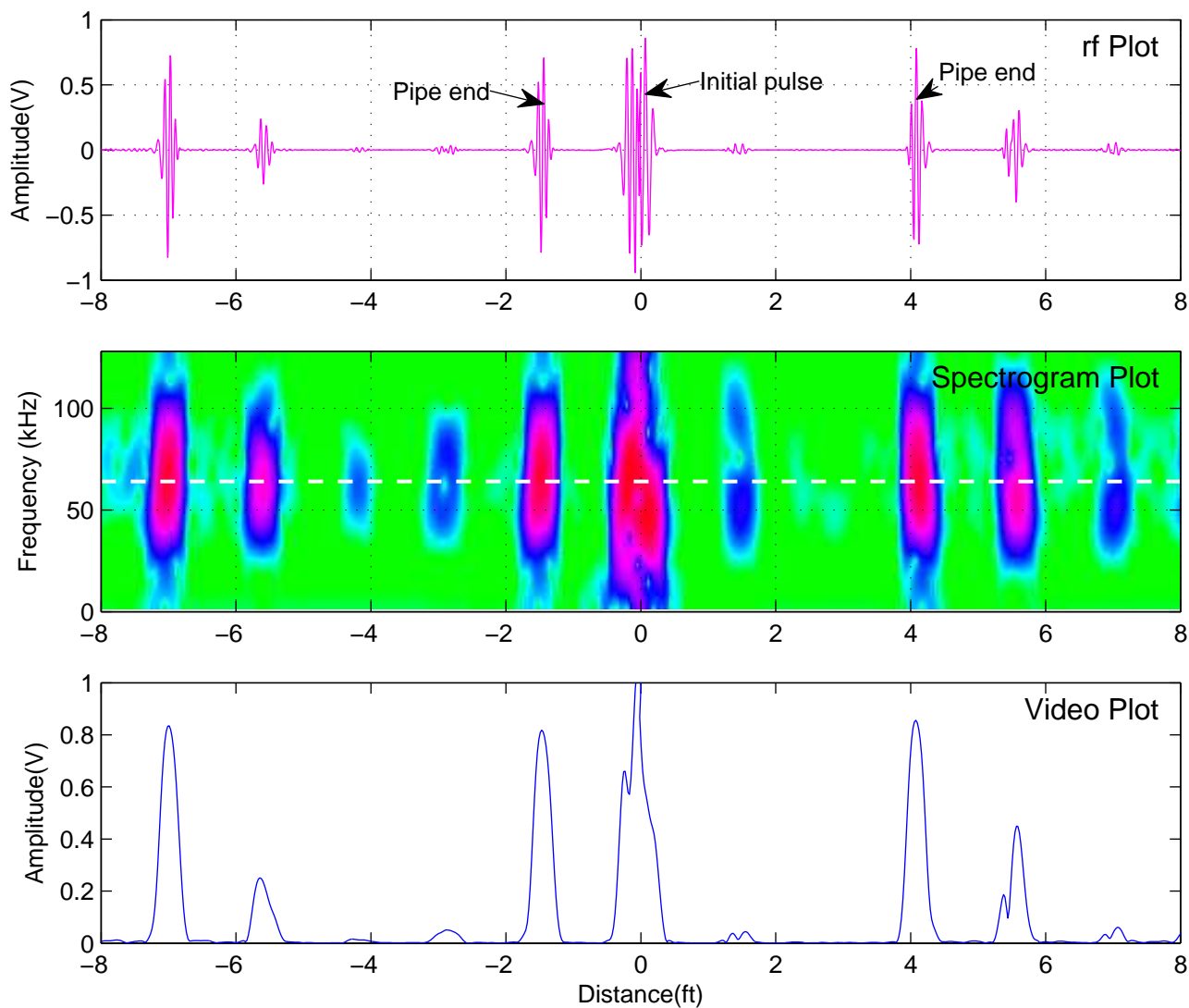
Gain: 2.0 dB

Time corrected gain: 0.1 dB/ft

Test date: 30-Sep-2021

Equipment serial number: 2704

Software version: MsSPipe-V3.00



Test Result

Peak amplitude of pipe end signal: 0.77 V and 0.80 V

Dead zone length of initial pulse: 0.37 ft along (+) direction and -0.42 ft along (-) direction

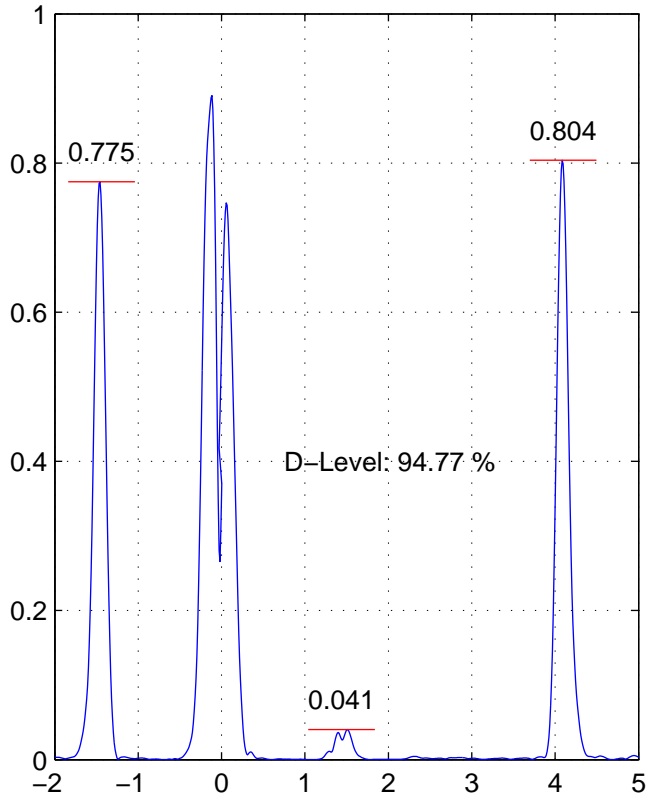
Direction control level: 94.77 %

Spatial resolution: 0.16 ft

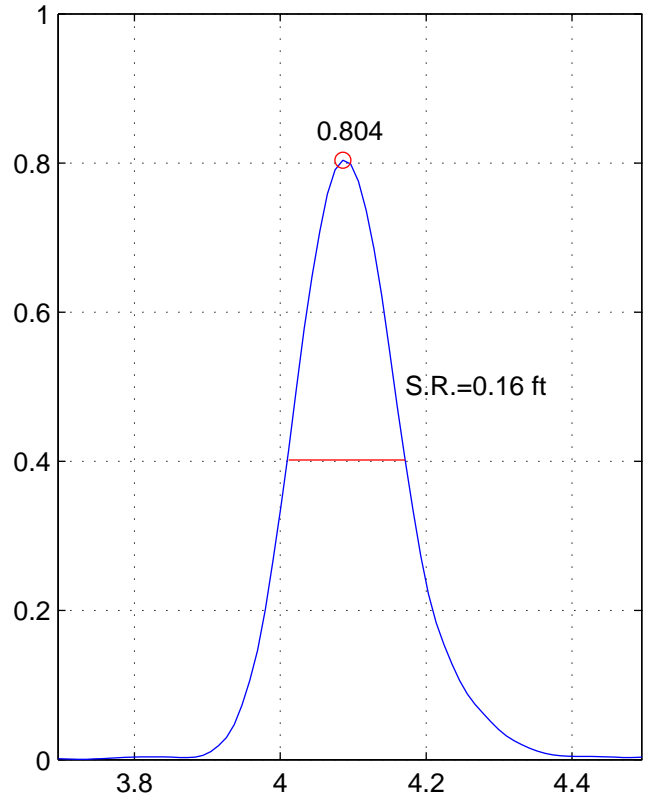
Signal-to-Noise ratio of pipe end signal: 380 (51.6 dB)

64 kHz MsS Data

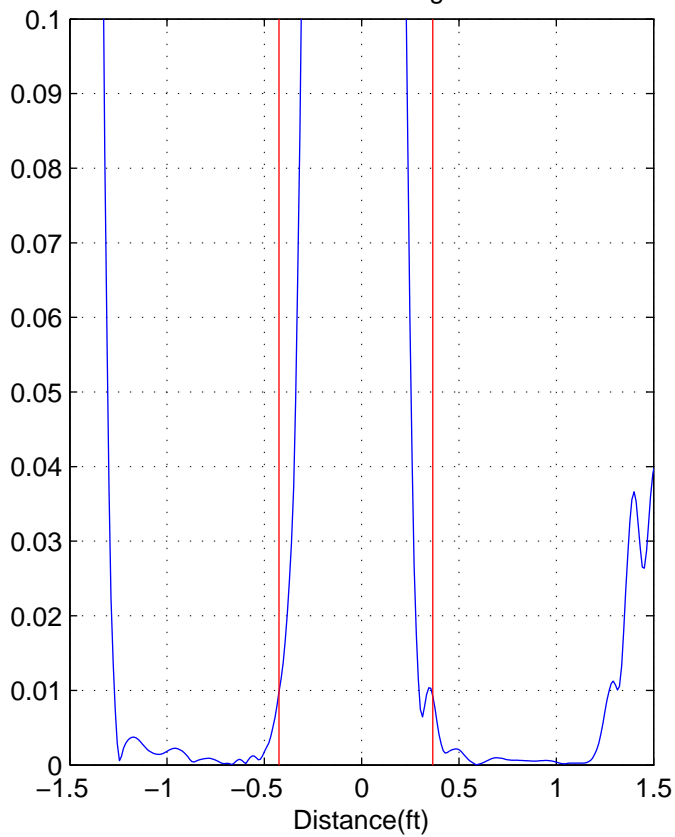
Pipe end amplitude and Direction



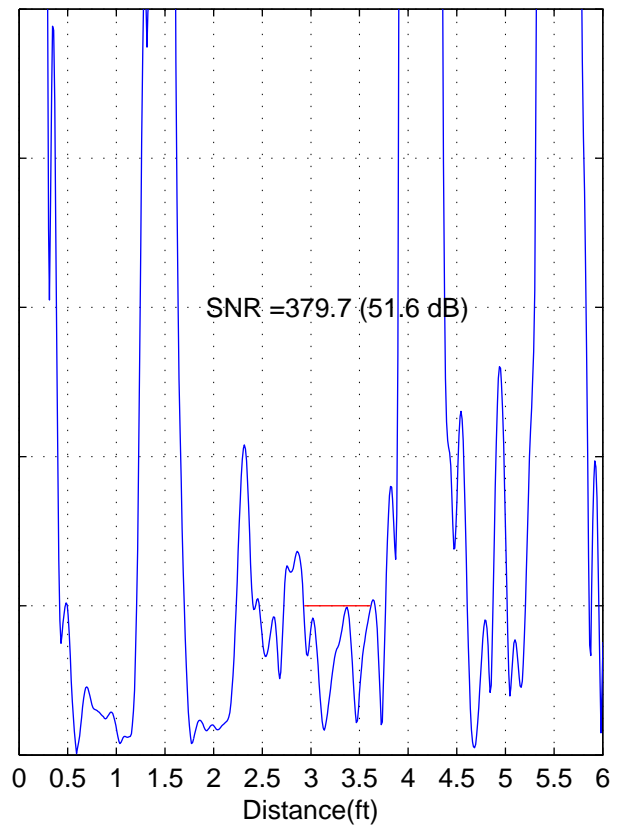
Spatial Resolution



Dead zone length



Noise Level



90 kHz MsS Data

Operating center frequency: 90 kHz

Number of cycles: 1

% Amplitude: 25 %

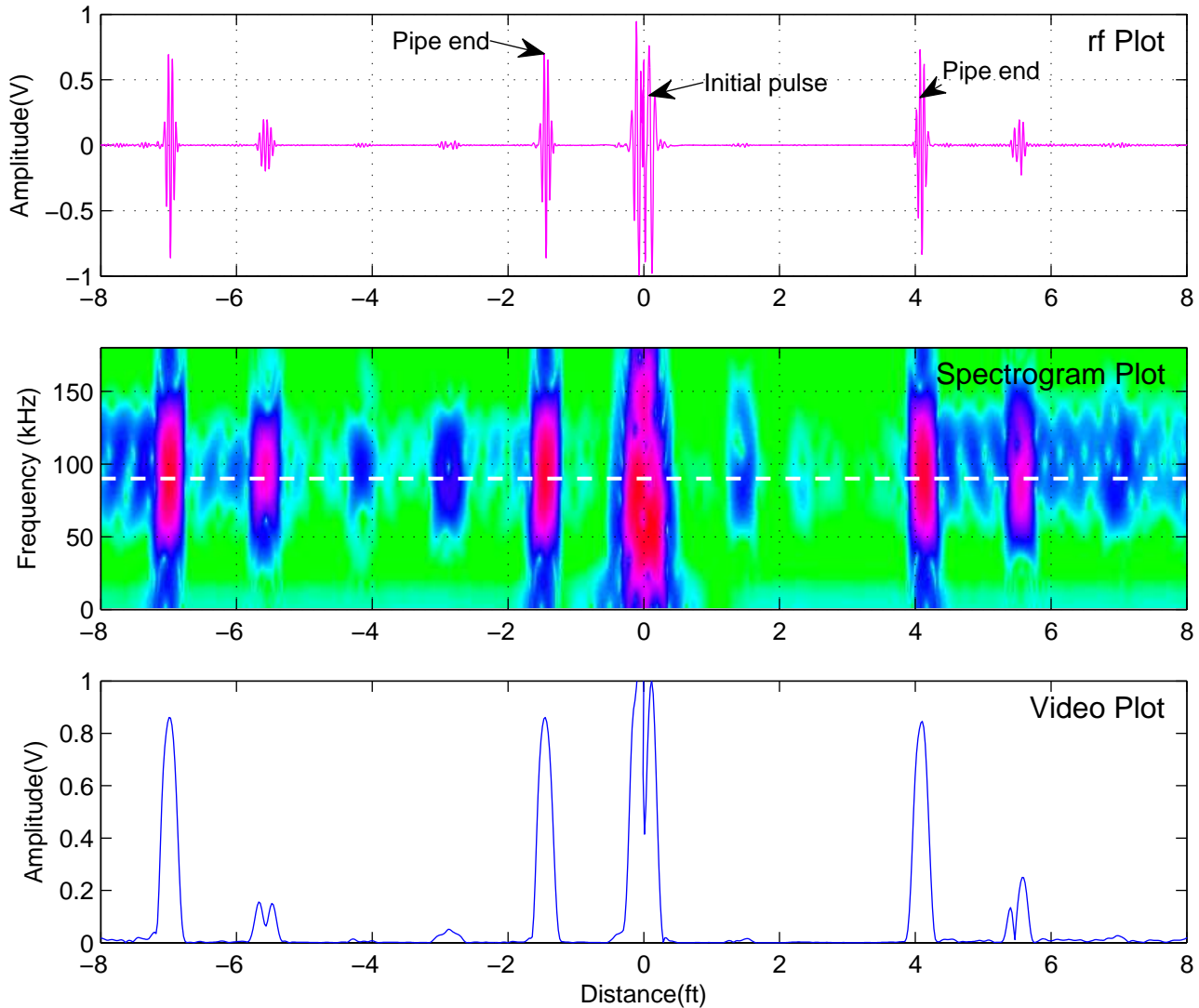
Gain: 3.0 dB

Time corrected gain: 0.1 dB/ft

Test date: 30-Sep-2021

Equipment serial number: 2704

Software version: MsSPipe-V3.00



Test Result

Peak amplitude of pipe end signal: 0.85 V and 0.85 V

Dead zone length of initial pulse: 0.38 ft along (+) direction and -0.43 ft along (-) direction

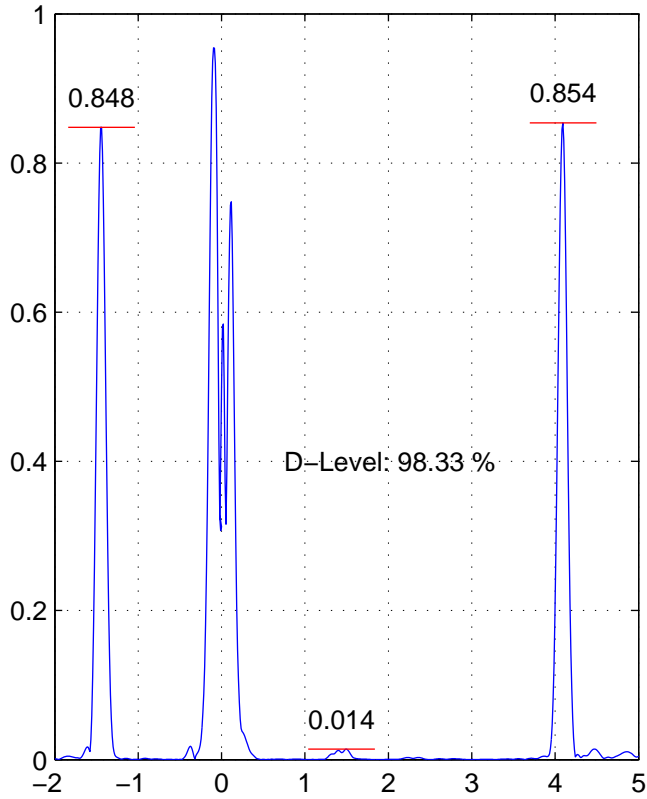
Direction control level: 98.33 %

Spatial resolution: 0.13 ft

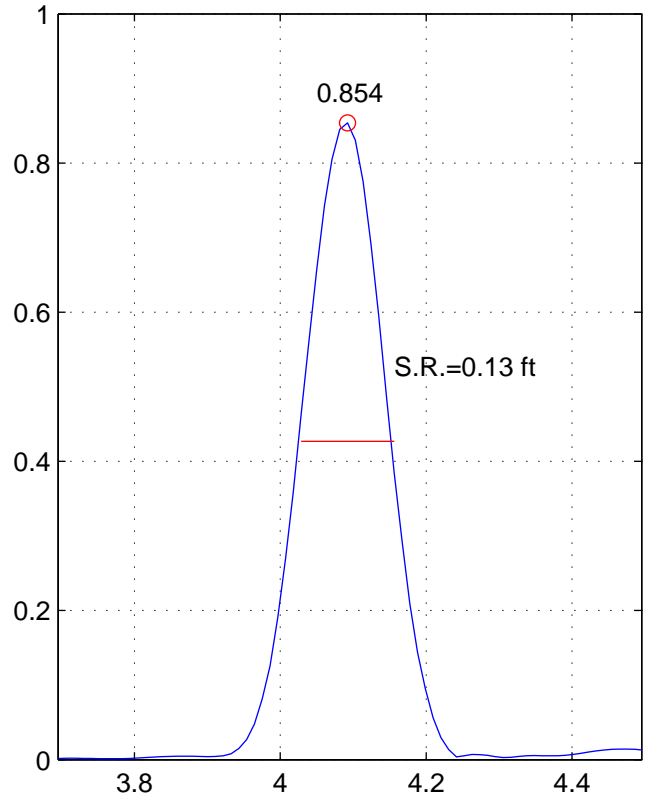
Signal-to-Noise ratio of pipe end signal: 665 (56.5 dB)

90 kHz MsS Data

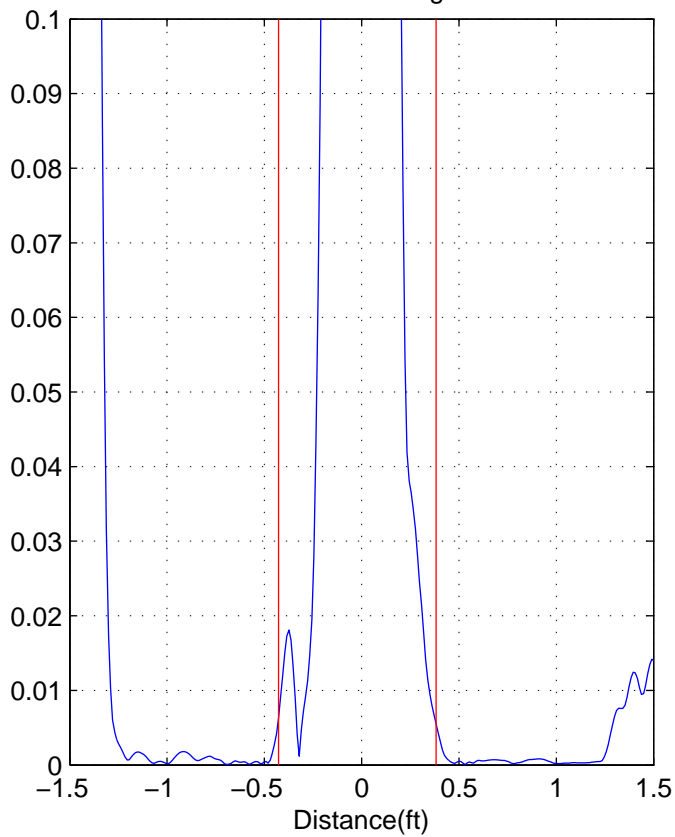
Pipe end amplitude and Direction



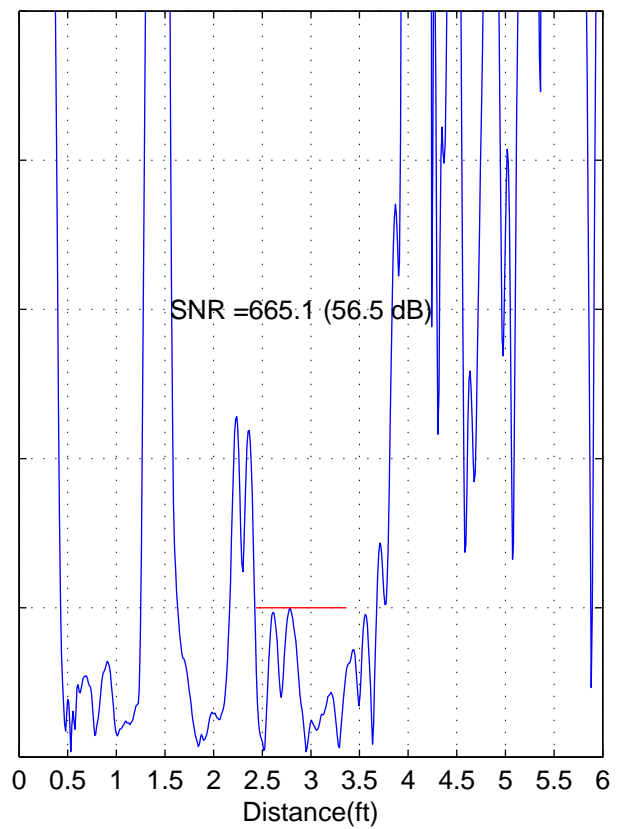
Spatial Resolution



Dead zone length



Noise Level



128 kHz MsS Data

Operating center frequency: 128 kHz

Test date: 30-Sep-2021

Number of cycles: 1

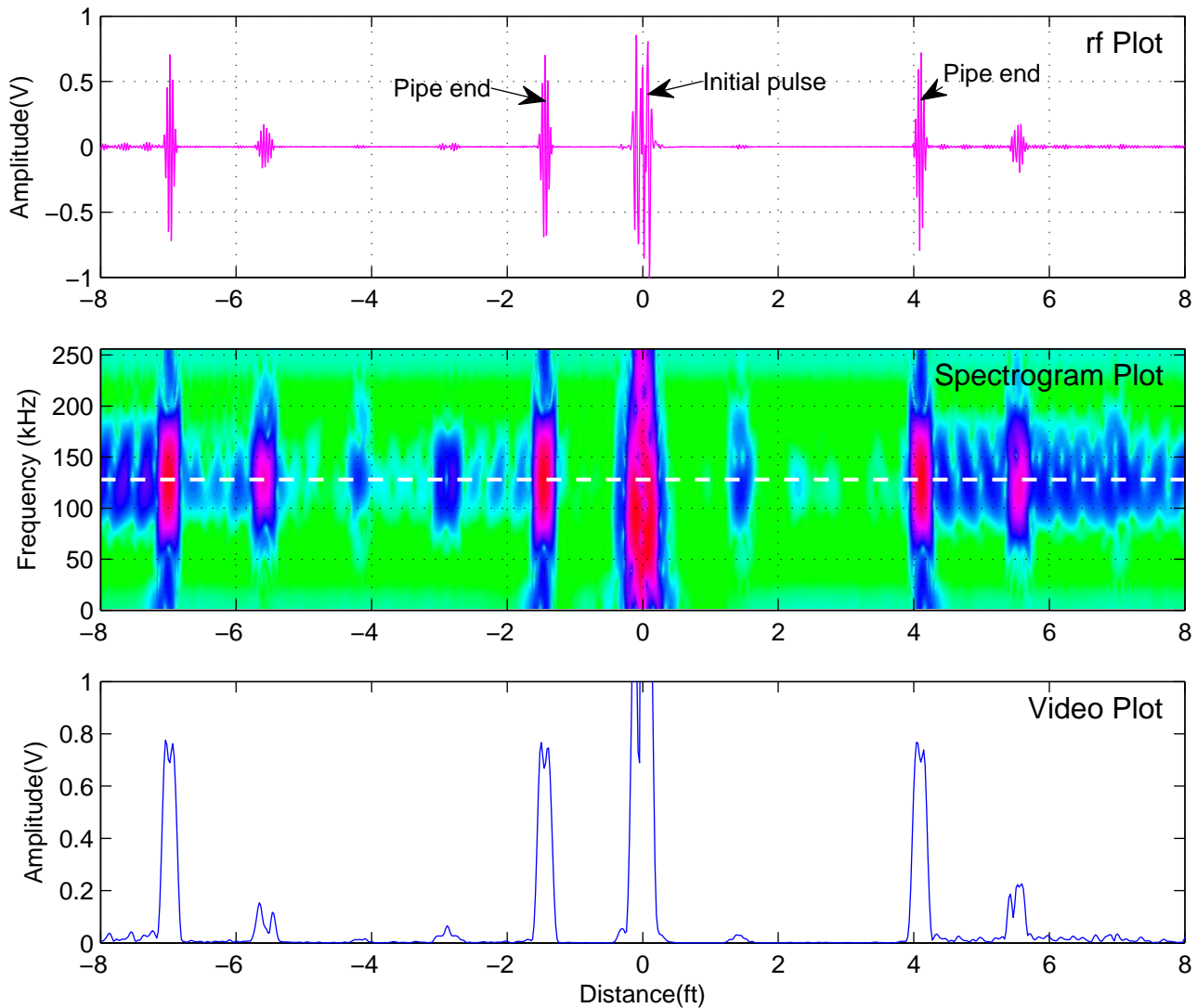
Equipment serial number: 2704

% Amplitude: 25 %

Software version: MsSPipe-V3.00

Gain: 4.0 dB

Time corrected gain: 0.2 dB/ft



Test Result

Peak amplitude of pipe end signal: 0.77 V and 0.79 V

Dead zone length of initial pulse: 0.30 ft along (+) direction and -0.36 ft along (-) direction

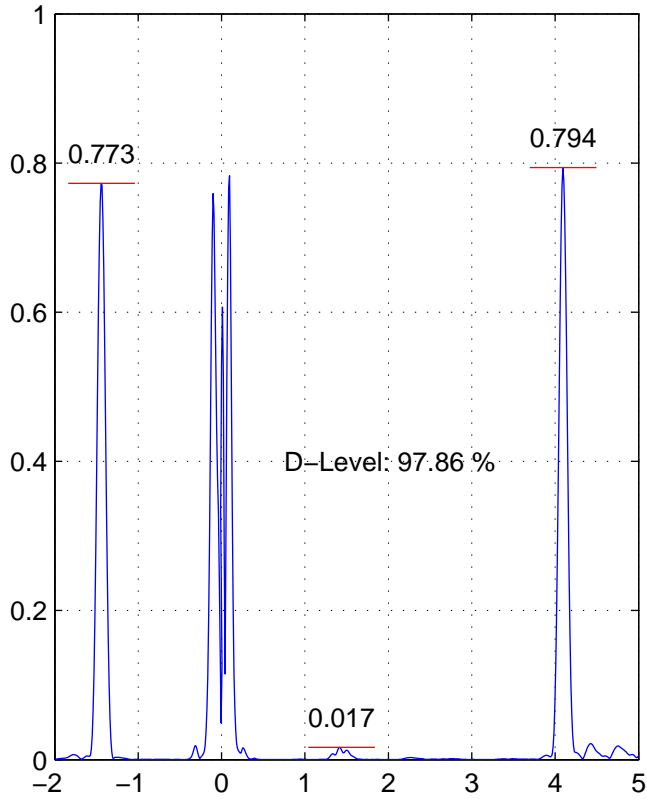
Direction control level: 97.86 %

Spatial resolution: 0.12 ft

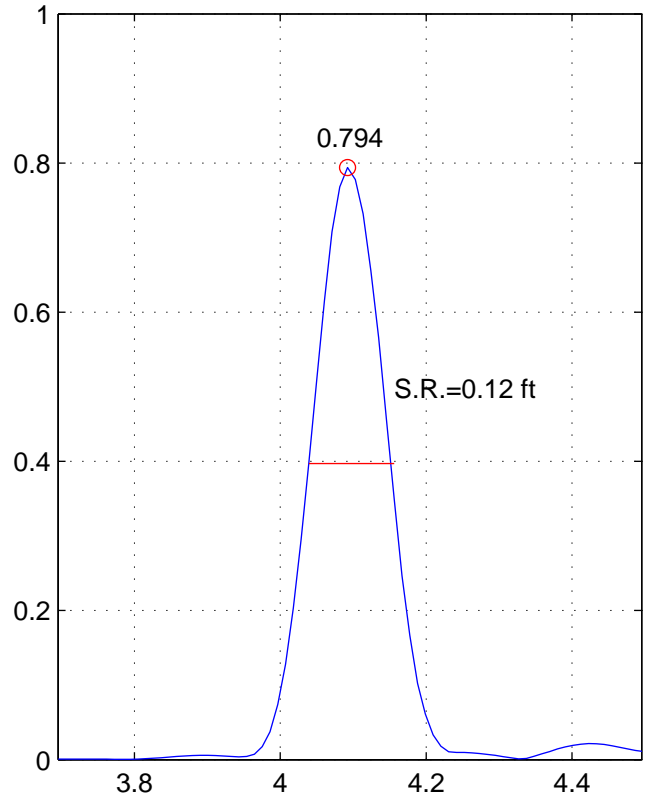
Signal-to-Noise ratio of pipe end signal: 707 (57.0 dB)

128 kHz MsS Data

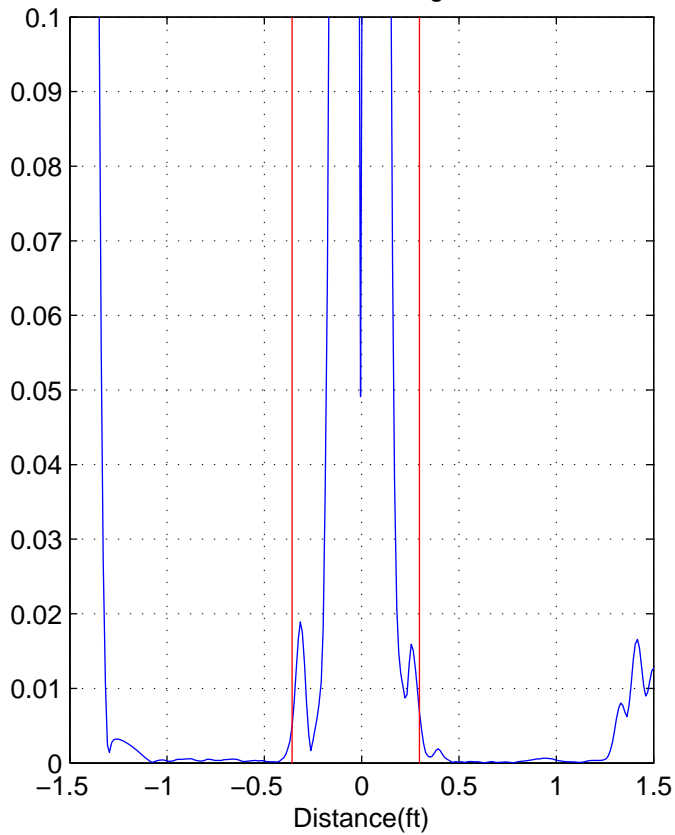
Pipe end amplitude and Direction



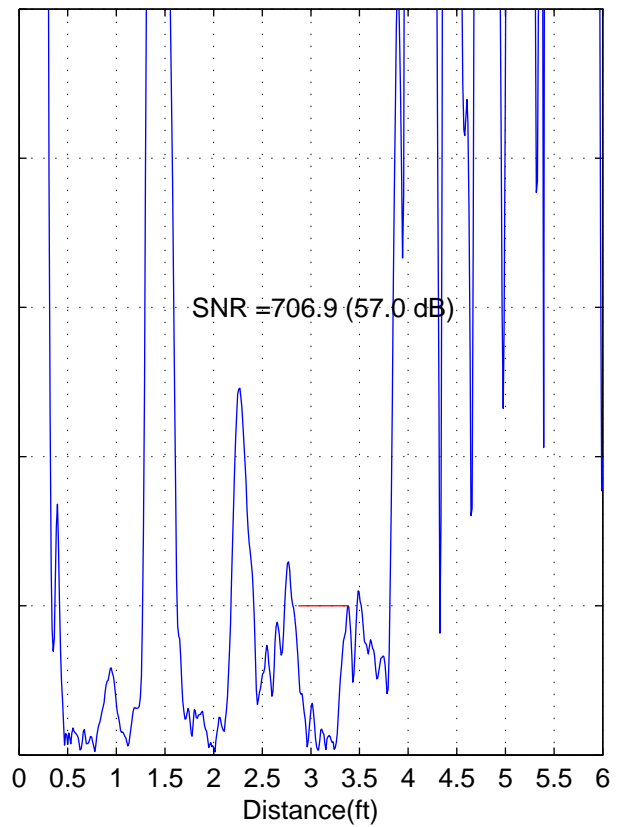
Spatial Resolution



Dead zone length



Noise Level



180 kHz MsS Data

Operating center frequency: 180 kHz

Test date: 30-Sep-2021

Number of cycles: 1

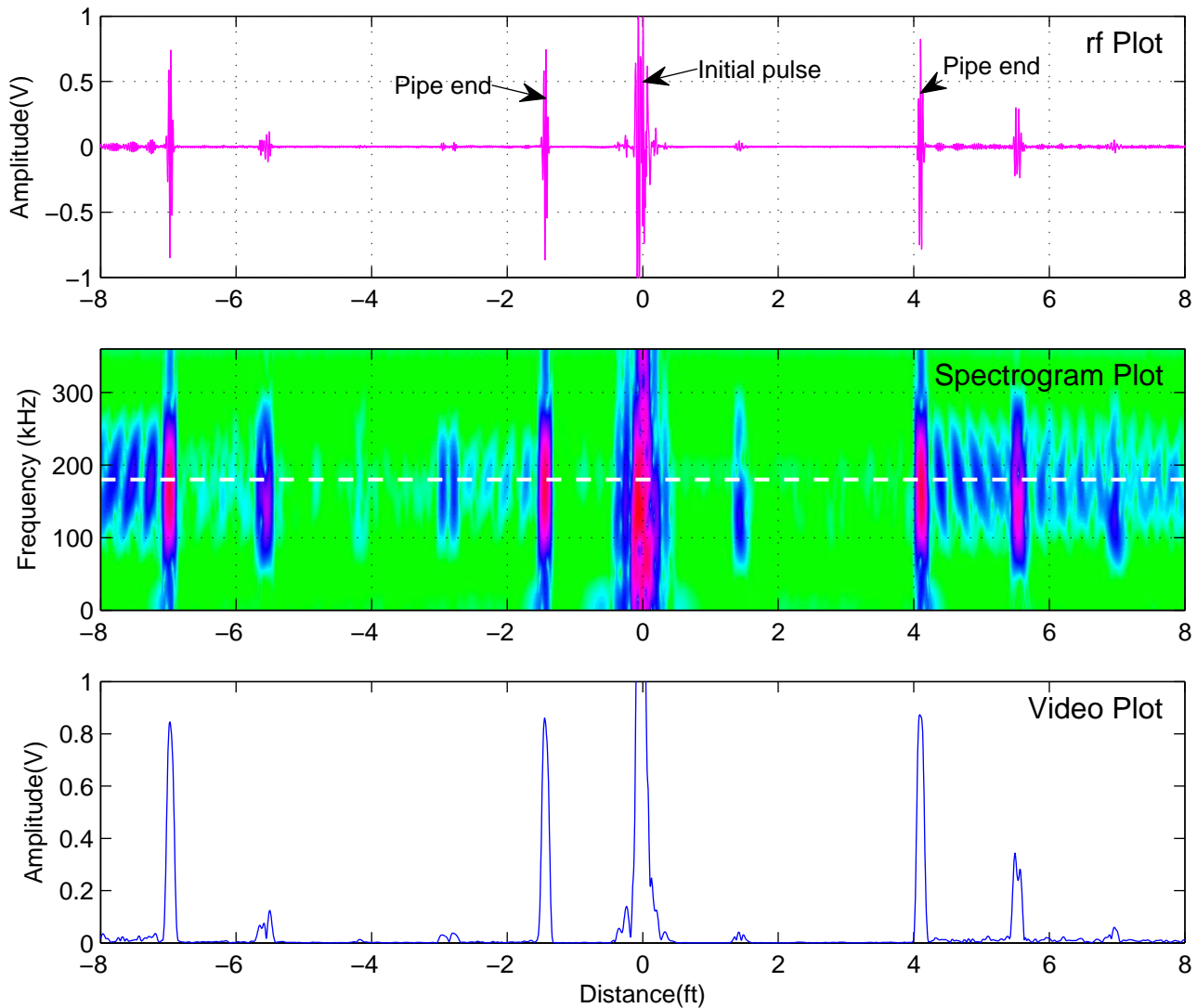
Equipment serial number: 2704

% Amplitude: 25 %

Software version: MsSPipe-V3.00

Gain: 6.0 dB

Time corrected gain: 0.2 dB/ft



Test Result

Peak amplitude of pipe end signal: 0.85 V and 0.87 V

Dead zone length of initial pulse: 0.36 ft along (+) direction and -0.42 ft along (-) direction

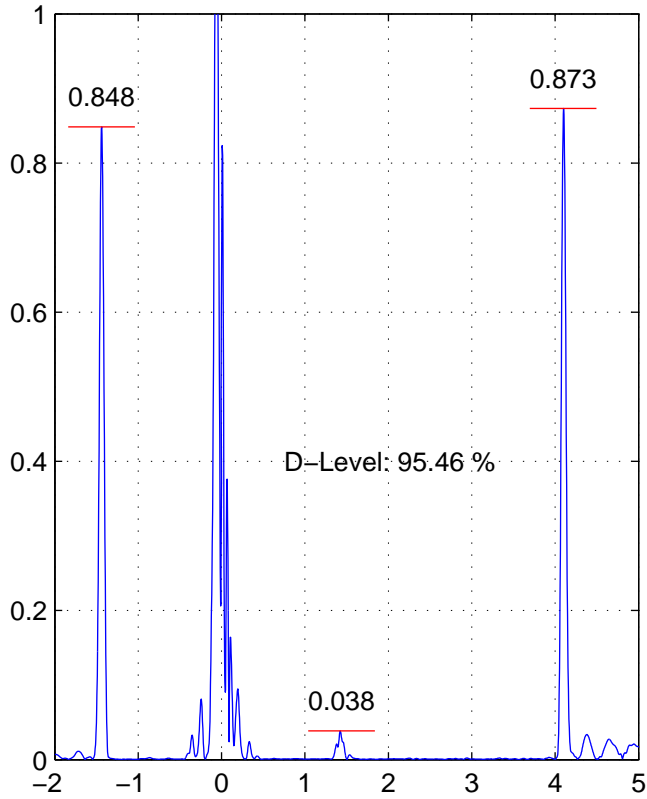
Direction control level: 95.46 %

Spatial resolution: 0.06 ft

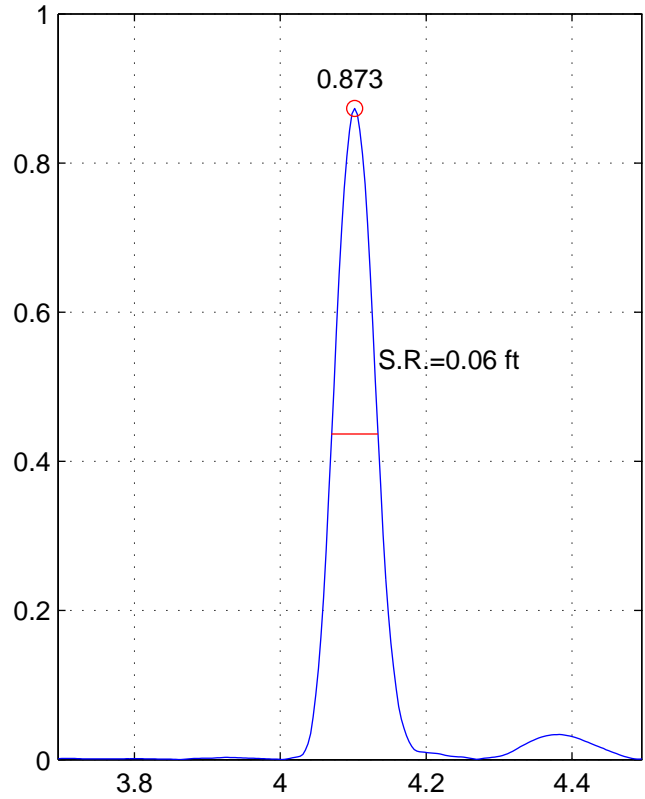
Signal-to-Noise ratio of pipe end signal: 675 (56.6 dB)

180 kHz MsS Data

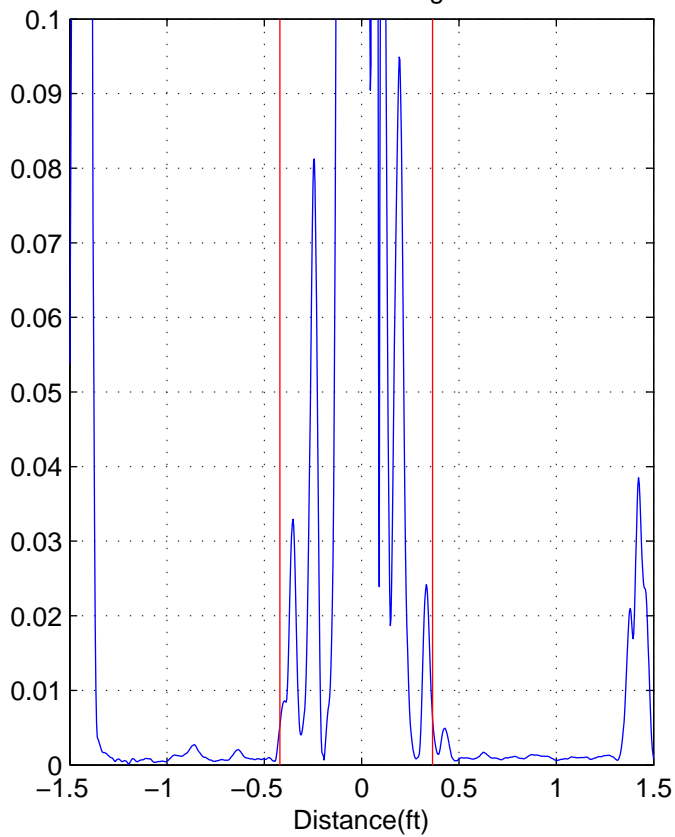
Pipe end amplitude and Direction



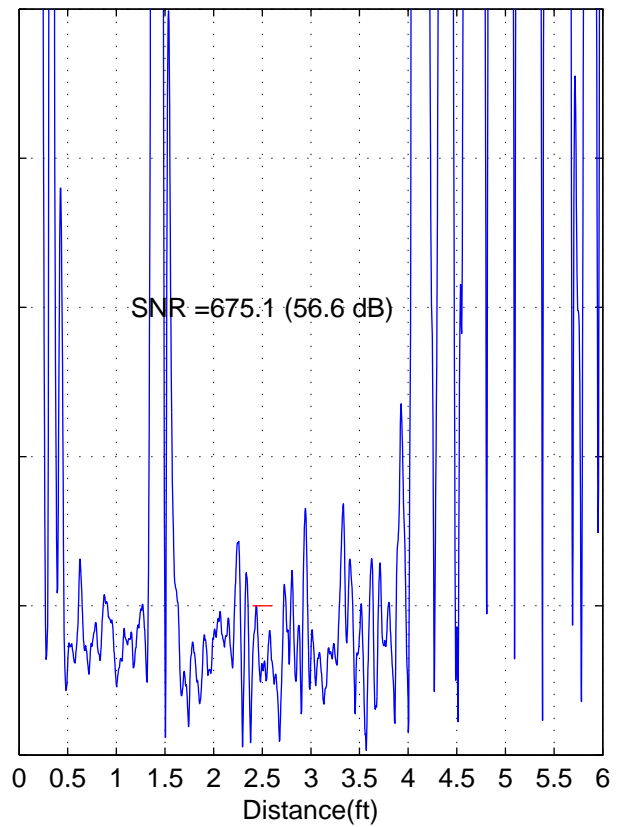
Spatial Resolution



Dead zone length



Noise Level



250 kHz MsS Data

Operating center frequency: 250 kHz

Test date: 30-Sep-2021

Number of cycles: 1

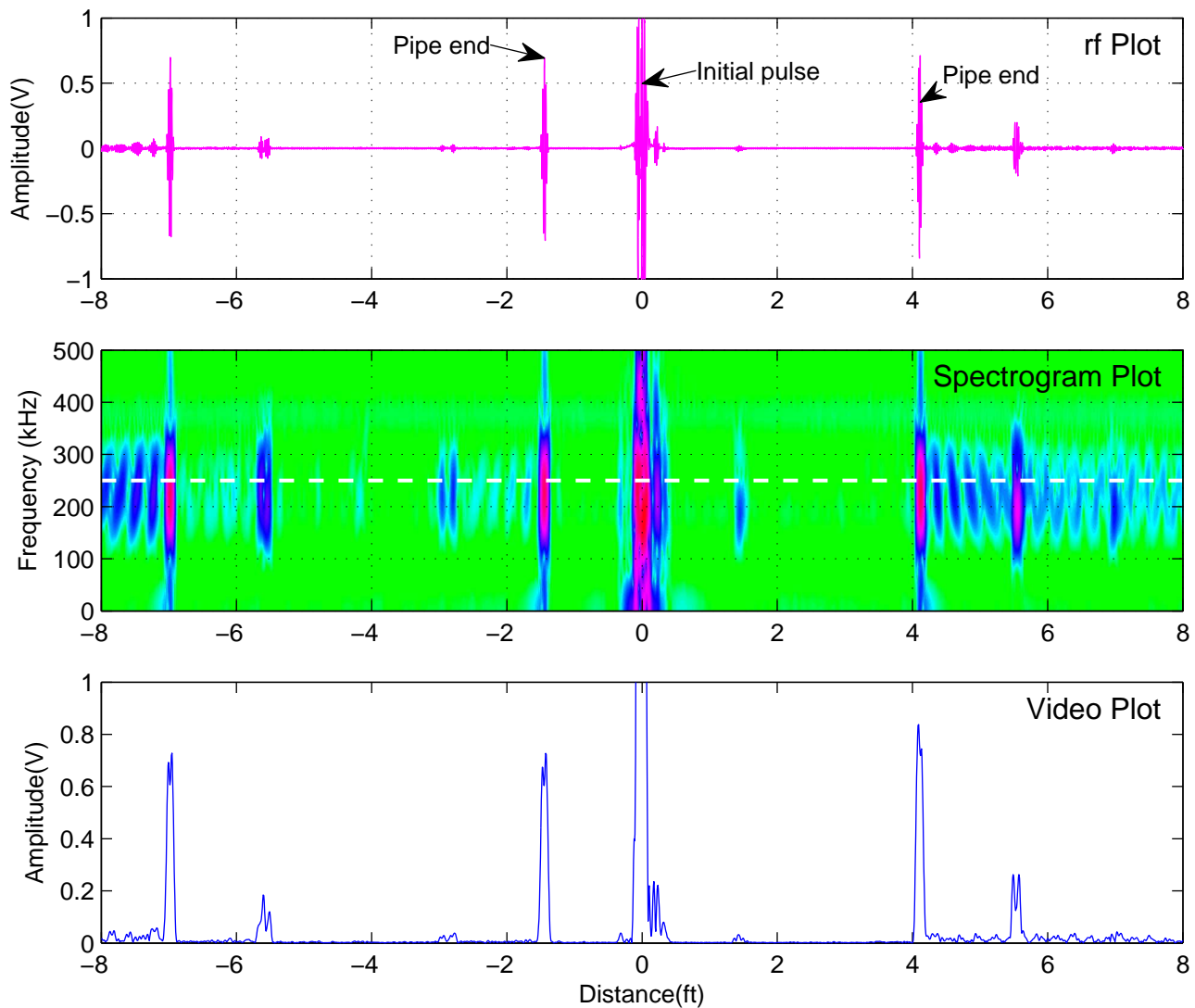
Equipment serial number: 2704

% Amplitude: 25 %

Software version: MsSPipe-V3.00

Gain: 8.0 dB

Time corrected gain: 0.3 dB/ft



Test Result

Peak amplitude of pipe end signal: 0.76 V and 0.84 V

Dead zone length of initial pulse: 0.38 ft along (+) direction and -0.33 ft along (-) direction

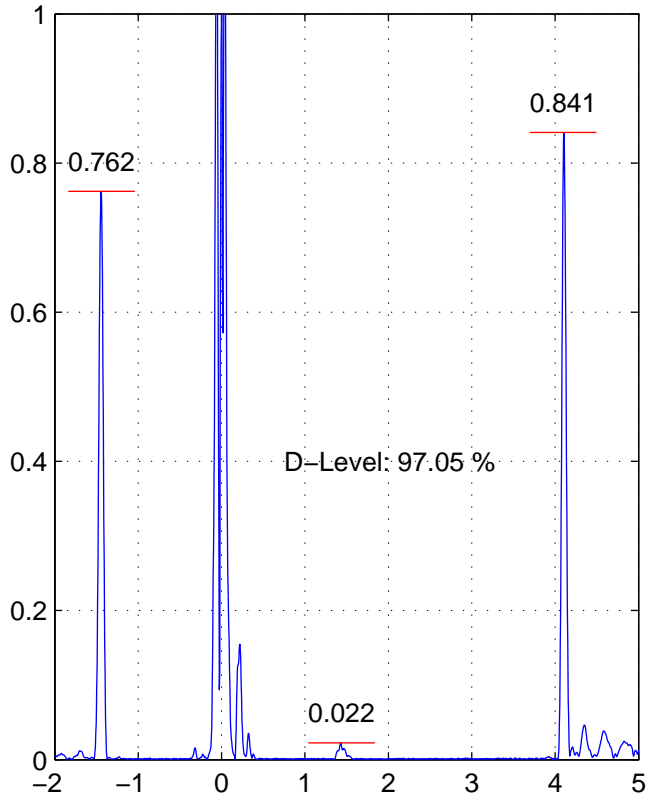
Direction control level: 97.05 %

Spatial resolution: 0.06 ft

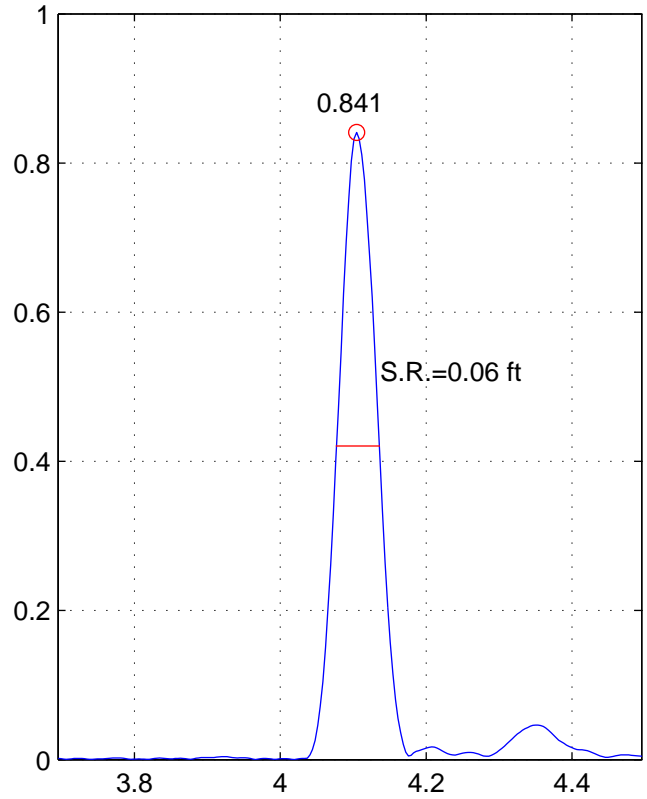
Signal-to-Noise ratio of pipe end signal: 516 (54.3 dB)

250 kHz MsS Data

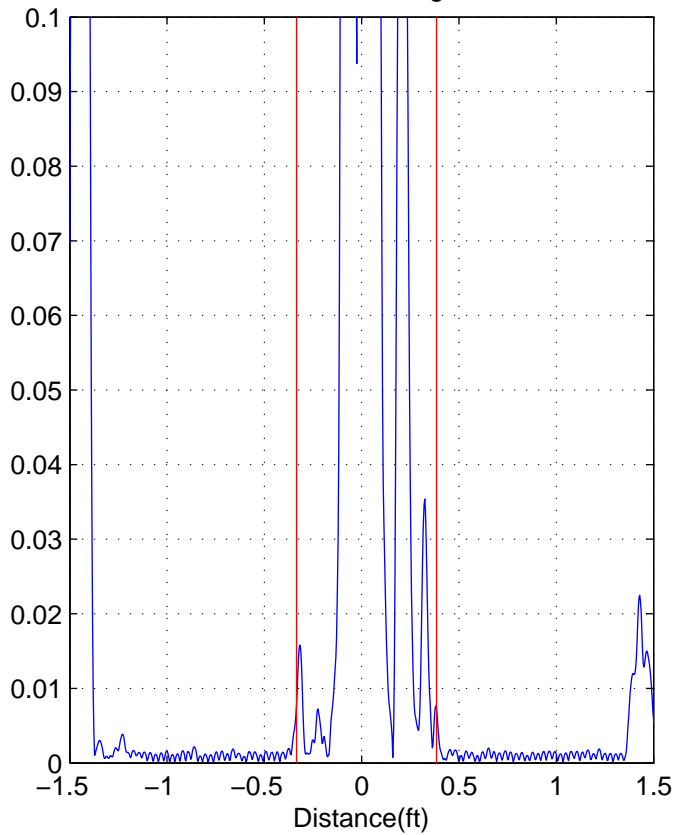
Pipe end amplitude and Direction



Spatial Resolution



Dead zone length



Noise Level

