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Duty Cycle Calculation



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Report : RF Duty Cycle of CEL MDD Sensor
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1 Scope

This document details the RF duty cycle of CEL's pulsed Doppler microwave sensor.

2 Duty Cycle Determination

In order to determine the RF duty cycle, the PRF frequency and the oscillator on-time of the MDD sensor are measured and using these the duty cycle is calculated.

2.1 PRF Oscillator Period

The pulsed microwave oscillator is turned on/off by the PRF (Pulse Repetition Frequency) oscillator. The pulse repetition frequency is 1.5MHz. (see fig.1 below).

PRF = 1.46MHz
Oscillator period = 682ns

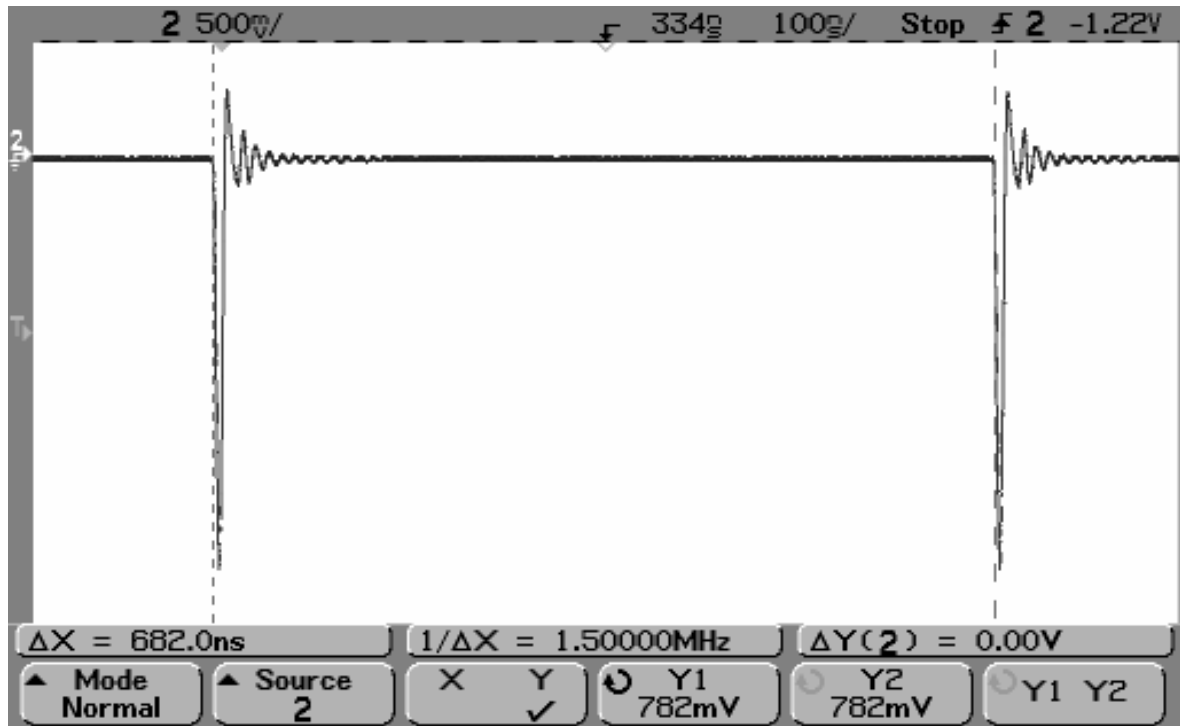


fig.1

2.2 RF pulse width determination:

The range of the MDD is 85cm. Thus using the mathematical formula for RF waves the pulse width can be determined:

$$\text{Pulse width} = (\text{Range} * 2) / (3 \times 10^8)$$

In the case of CEL's MDD sensor:

$$\begin{aligned} \text{Pulse width} &= 1.7 / (3 \times 10^8) \\ &= 5.66 \text{ ns} \end{aligned}$$

2.3 Duty Cycle Calculation

$$\begin{aligned} \text{Duty Cycle (\%)} &= \text{RF Pulse Duration} / \text{PRF Oscillation Period} \\ &= (5.66 \text{ ns} / 682 \text{ ns}) * 100 \\ &= 0.83 \% \end{aligned}$$