

# ARCS

## Automatic Radar Characterization and Calibration System

### Features

- Automatic measurement of VCO non-linearity in radars,
- Digital pre-distortion design per radar unit for non-linearity compensation,
- Calibration of radar distance and speed measurement,
- Measurement of VCO's temperature sensitivity,
- Determining FMCW radar bandwidth,
- Short measurement cycle,
- Easy-to-use GUI,
- Simple and cost effective setup.

### Description

Automatic Radar Characterization and Calibration System (ARCS) is comprised of an RF-front end, a signal control unit, a temperature unit and a GUI which enables the user to set measurement parameters for radar module, Fig. 1. This product is designed for linearising FMCW radar sensor VCOs as well as calibrating radar sensors for precise distance and/or speed measurement in a Hardware-In-the-Loop (HIL) setup.

#### RADAR CHARACTERIZATION SETUP

Voltage Controlled Oscillators of most FMCW radars do not demonstrate fully linear voltage-frequency characteristics, degrading functionality of these sensors to a great extent. This feature differs from one radar module to another and also varies with temperature.

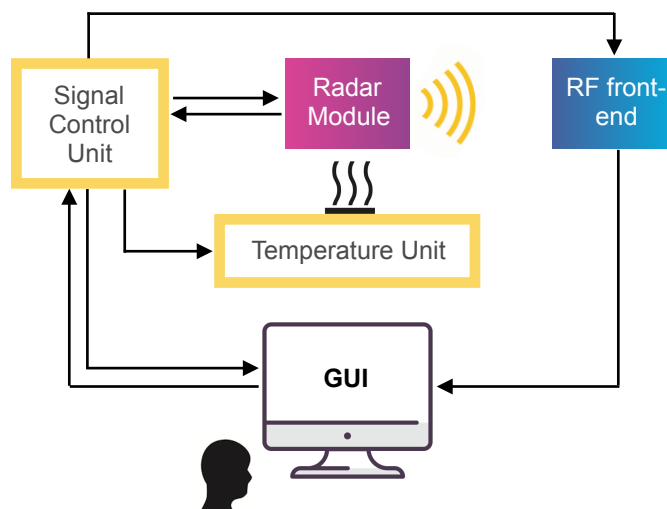


FIGURE 1. ARCS block diagram

The ARCS can, in characterization setup, automatically obtain VCO characteristics of each individual radar unit and design a digital pre-distortion solution for VCO non-linearity compensation.

In this setup, signal control unit regulates the input for radar VCO; RF front-end receives radar signal and sends measurements to the PC. The results of measurement as well as compensation parameters are available on GUI.

#### RADAR CALIBRATION SETUP

This setup is designed for simulation of radar targets at particular speed and/or distance in order to provide ground truth for calibration of radar modules towards better measurements.

SIGNAL PROCESSING

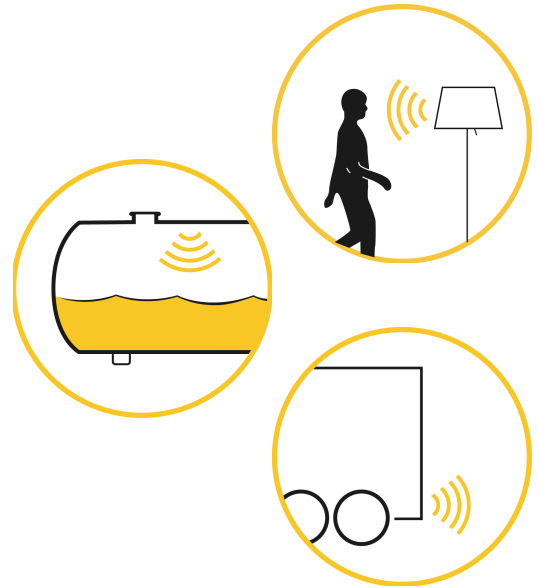
RADAR VERIFICATION

RADAR CALIBRATION

TARGET CLASSIFICATION

# Applications of ARCS

In the **ARCS calibration setup**, the user can set a desired speed and/or distance for simulation of a virtual target through GUI. The corresponding signature will be played by the RF front-end for radar module under test. Radar module's response to this signature is analysed and a corresponding feedback will be applied to radar system for calibration.



## Radar design

Design of radar products depends heavily on VCO's non-linearity measurement and its compensation. This is enabled through an automatic process by the ARCS characterization setup.

## Radar manufacturing

Radar manufacturers can use the ARCS for measuring VCO characteristic of radar modules and to provide non-linearity features of their products in different temperatures per radar unit.

## End-of-Line radar calibration

Calibration of FMCW radar products for precise speed and/or distance measurement by adjusting the algorithm is one of the applications of ARCS in calibration setup.

## End-of-Line quality control

The ARCS system is ideal for EoL quality control of radar products, by evaluation of radar products at multiple distances and speeds and demonstrating the result in form of a rating. The procedure is automatic and fast, allowing testing of large quantities.