ALTIMETER/RADAR TARGET SIMULATOR

(SRT – 2944)

Technical Specifications

T&R

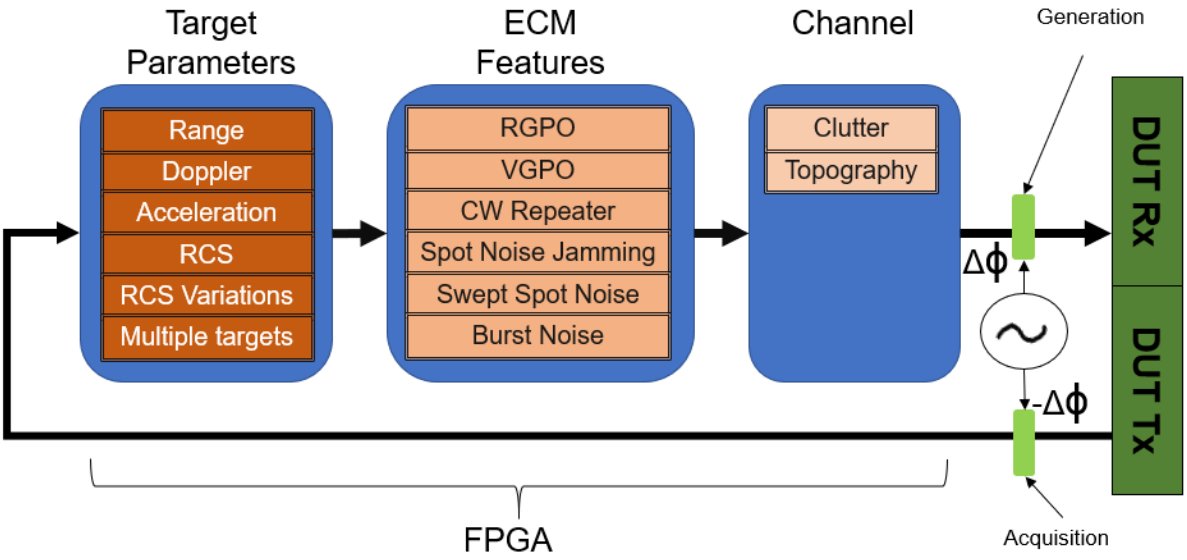
Content

DEFINITION

This document aims to explain details of SRT-2944 which conducts the tests for altimeters and radars. Document describes general architecture and software interface.

FREQUENCY- System works between 0.2GHz-6GHz with an instantaneous bandwidth of 160MHz. If there is a need for higher frequencies, users can select two options for frequency extensions up to 18 or 40 GHz .

FUNCTION- System replaces the actual target and the environment, SRT-2944 could be used in cabled mode or over the air. System is independent to radar parameters like PRI, signal type or transmit power. SRT-2944 receives the signal which is transmitted from the radar and generates the target signals according to user input. Users can generate still targets manually or create a trajectory scenario. Architecture of the system is as below:



Şekil 1 Target Generation Block Diagram

SYSTEM SPECIFICATIONS- SRT 2944 accommodates Hardware and Software specifications below:

- SRT 2944 can generate 2 targets independently.
- Each target could be used manually or an automatic trajectory scenario.
- Each target range can set independent from 150 mt to 300km.
- Each target is capable of generating +- 10 kHz doppler.
- Optionally, user can connect the system to a simulation computer enable HIL(Hardware in the Loop) mode for Real-Time scenario execution.
- Small size and lightweight system is suitable for working in lab or field conditions.
- Standard 6GHz frequency could be extended up to 18 GHz or 40 GHz.
- Instantaneous bandwidth is 160MHz, there are two more options for 1 GHz and 1.2GHz.

HARDWARE ARCHITECTURE

System utilizes an NI USPR RIO 2944 Software Defined Radio and a Lenovo Workstation. System computer has a PCMCIA interface to transmit/receive IQ data from/to USRP.

NI PCI Express Cable and NI8360b Express card is used for MXI connection.

The USRP RIO has a mainboard which houses the FPGA, ADC and DAC components. Signal conversion daughter boards are selected upon frequency needs, which UBX-160 in this system. UBX-160 is 1x1 transceiver daughterboard with 10MHz to 6GHz frequency range with 160 MHz IBW. This daughterboard is connected directly to the FPGA model Kintex7-410T which is placed on mainboard.

CALIBRATION- SRT 2944 has 2 daughterboards which makes the system 2x2 system. 1 transmit and receive channel is used for target generation. The other channel is used to calibrate frequency and amplitude by connecting to a rigid frequency source. Calibration scheme is as follows:

Amplitude and frequency will be read from channel 2 and calibration parameters for amplitude and frequency will be calculated online. This method ensures frequency stability and amplitude control.

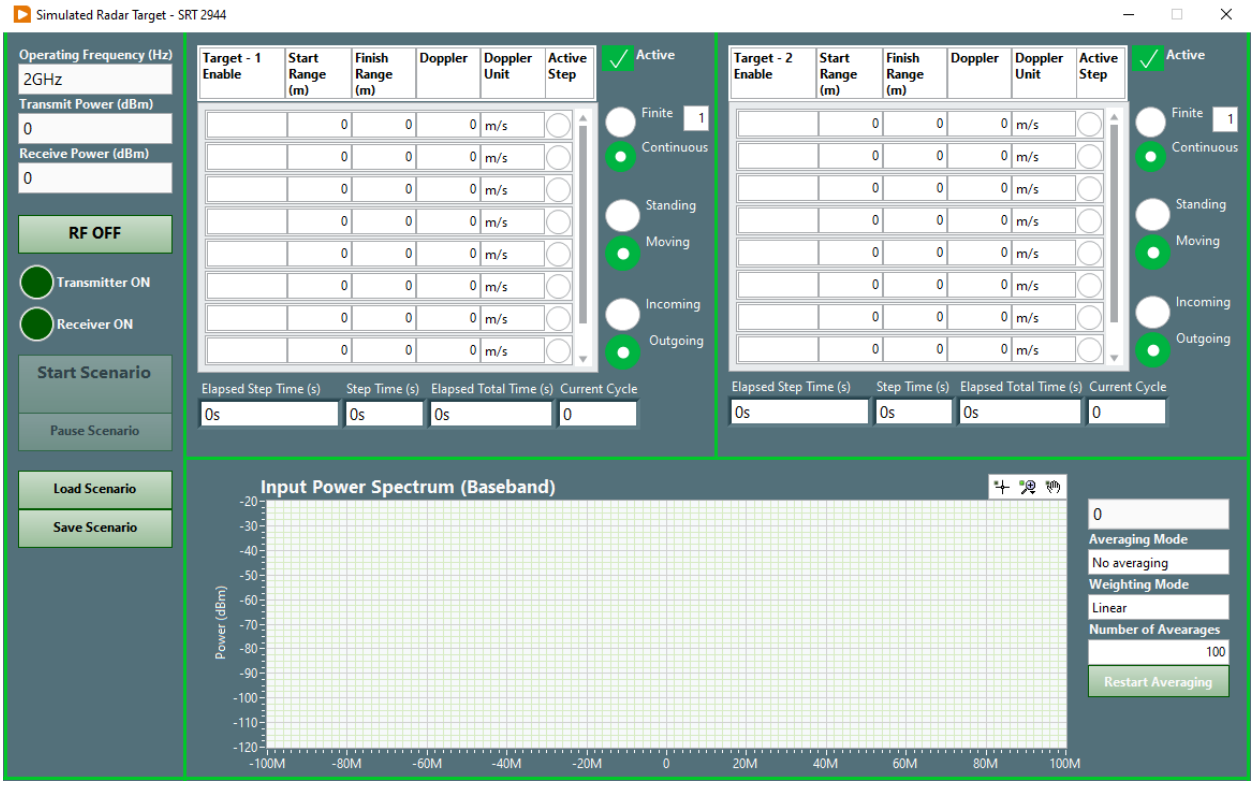
SOFTWARE

The software consists of two applications for Windows Host and embedded FPGA. All software developed using NI Labview.

User can reach all functions without interfering to FPGA or Windows coding. The GUI explained below is targeted for all types of users.

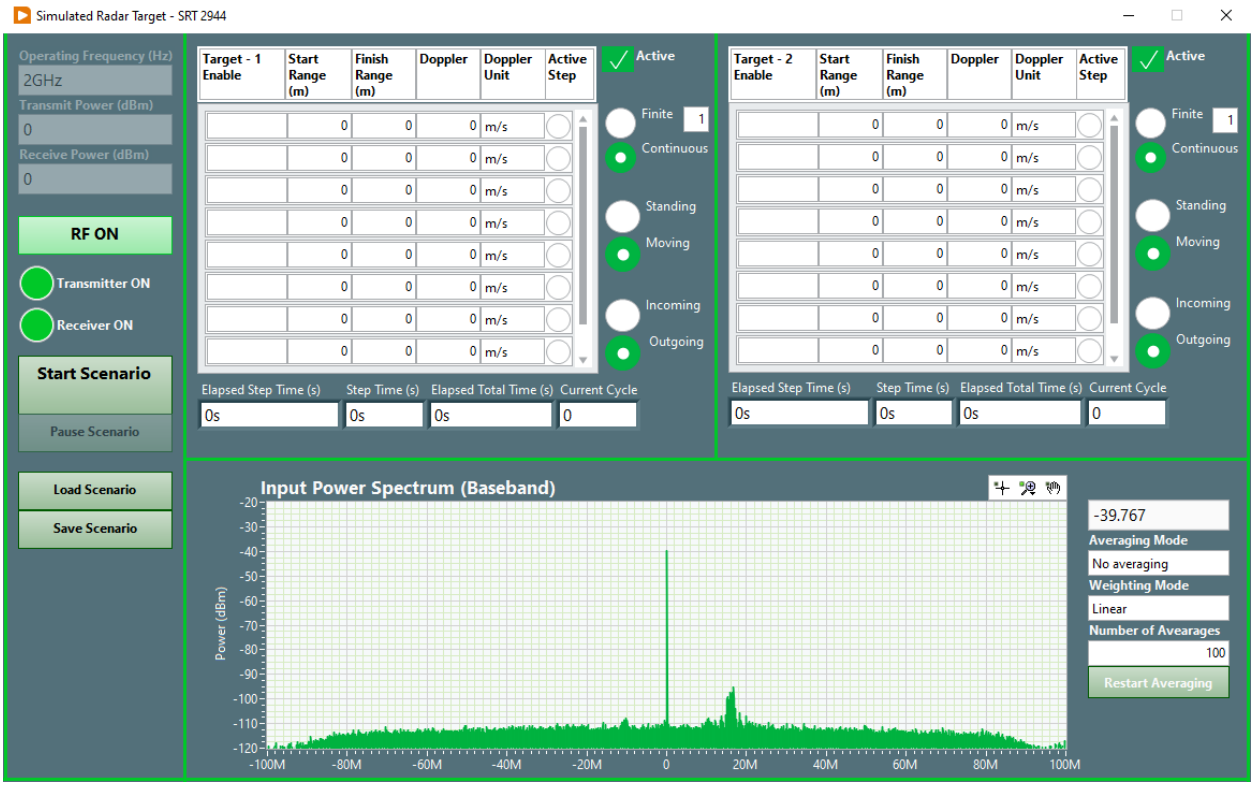
- **Main Windows User Screen**

  The screen below is the main user interface of the system. To avoid complication and mistakes, GUI objects will enable/disable themselves according to test states. This welcome screen will allow user to select Scenario creation, Scenario loading, scenario modes and RF ON/OFF.



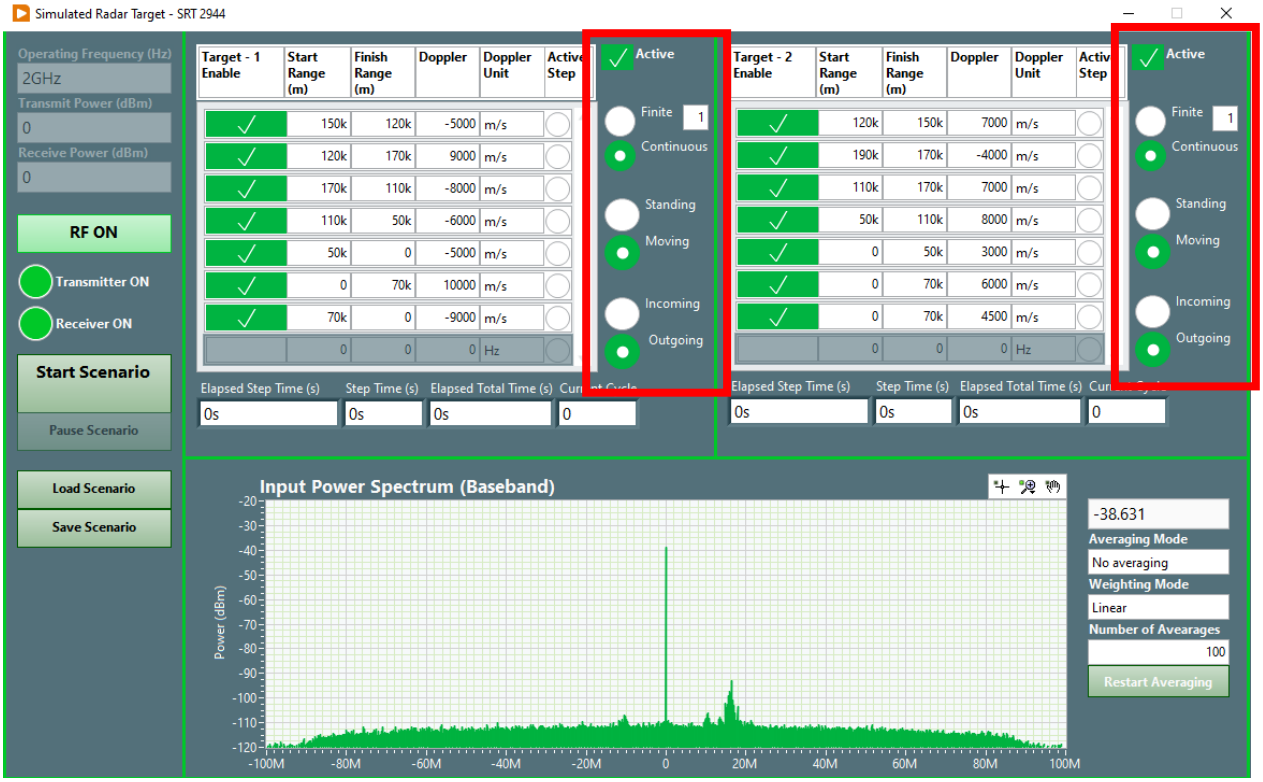
- **RF On State**

Once the user selects RF ON, the software will allow user to enter scenarios and starts indicating whole 160 MHz IBW spectrum signal on the graph and starts calculating peak power.

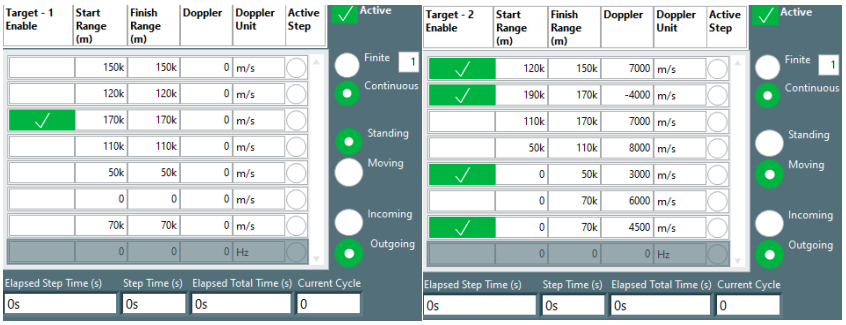


- **Scenario Creation and Execution**

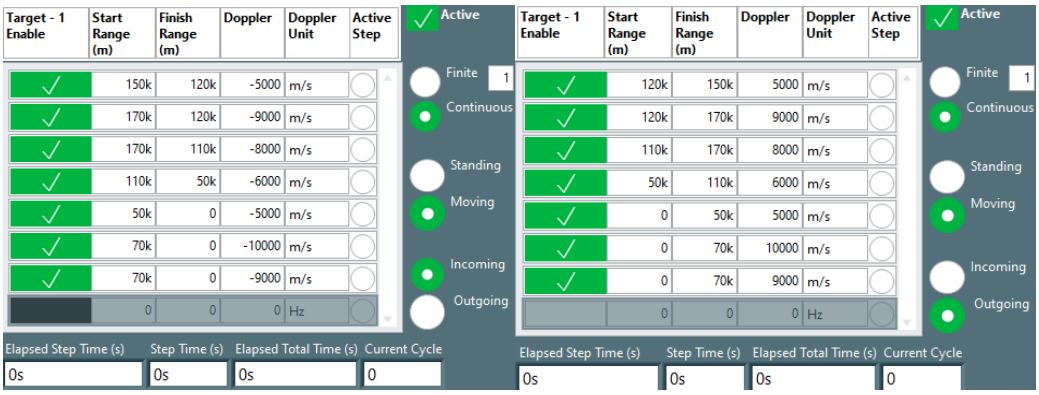
User can input scenario steps and can select either mode from 4 different scenario execution schemes.



Active Checkbox : Disable/Enable Scenario.
Finite-Continuous : Indicates if the scenario should start over once it is done. User can select a number of start overs or continuous.
Standing-Moving : In moving mode, users will enter the scenario steps and automatically interpolate the values if entered with missing ranges. Any step could be disabled online.
In standing mode, only 1 step is active and system only generates a standing target. If needed user can input a speed to simulate discrete targets for debugging.



Incoming-Outgoing : This selection will arrange the doppler according to approaching or receding objects.



Speed Input Conversions

User can select speed input as meters per second or Doppler as Hz. Doppler will be converter automatically after entering the speed value.