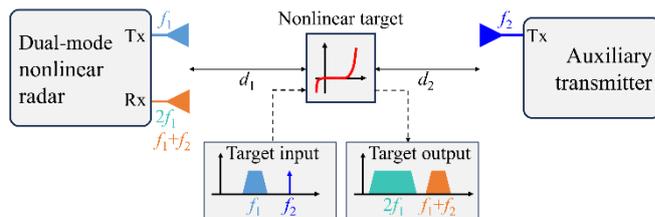


## Project title: “Make nonlinear radar chirp”

### Introduction

Nonlinear radar systems have been successfully used to detect and track small passive tags in a variety of applications. One of the common use case is tracking of tags carried by insects. The main operating principle in nonlinear radar is that the target of interest is nonlinear so that it produces a return signal at a frequency different of that of the illuminating signal, as is schematically shown in the figure below. This allows efficient clutter reflection but introduces a number of unique challenges to the system design.



**Dual-mode (harmonic and intermodulation) nonlinear radar system: schematic (left-hand side) and hardware implementation (right-hand side)**

### Project description

In this project, we employ a chirp waveform, aka Frequency Modulated Continuous Wave (FMCW), in a nonlinear radar system. A number of different topics are available for investigation, such as

- design and evaluation of a multi-chirping system with distributed transmitters;
- optimal signal processing for dual-mode system employing intermodulation and harmonic products;
- testing and validation of system performance;
- field testing of system capabilities in a practical scenario, etc.

Multiple Bachelor and Master projects are available on this topic. Depending on the type of project, the work can involve one or more of the following: Matlab/Simulink simulations, proof-of-concept implementation, lab measurements and/or field testing, etc.

**Requirements:** You are a motivated student looking for a project topic in the field of microwave sensing. You have interest in practically-oriented work, have basic knowledge and interest in microwaves and signal processing, and you enjoy working in the lab environment.

If you are interested in this topic, please contact **Dr. A. Lavrenko** at [a.lavrenko@utwente.nl](mailto:a.lavrenko@utwente.nl).