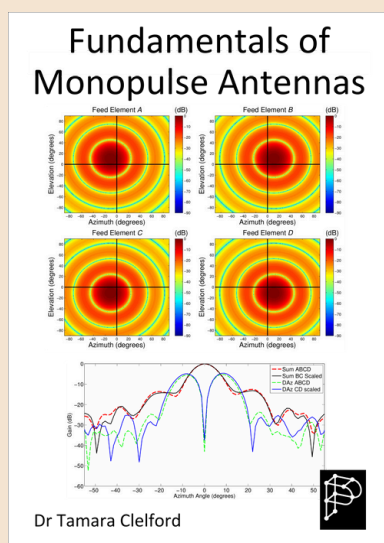


# SC05- Fundamentals of Monopulse Antennas



## Abstract

A monopulse antenna uses multiple overlapping beams sent out in a single pulse to locate and track a target. During this course we will look at why monopulse antennas are used, how they work by live coding a MATLAB simulation, understand how the multiple signals are combined both in hardware and software, look at the mathematics behind the antenna patterns and understand how to go about testing a monopulse antenna. The course is designed and taught by an industry professional, Dr Tamara Cleford, and draws on over 15 years of experience in the field.

## Recommended prerequisites

This course requires a basic knowledge of how an antenna radiates. Knowledge of MATLAB is not required as the coding will be shown live and explained as written.

## Learning objectives

After the course, the participant will be able to:

- Define what a monopulse antenna is
- Understand why and where they are advantageous to use
- Know how to create the sum and difference signal in hardware and software
- Understand how the sum and difference signals are used to track targets
- Have an appreciation of how to write an antenna numerical simulation in MATLAB
- Understand how to test a monopulse antenna system
- Have an appreciation of the future of monopulse antennas

## Course outline

This tutorial will be an interactive dive into the world of monopulse antennas. Using images, videos, computer simulations, expert explanations, problem solving and application of knowledge we will learn about monopulse antennas.

In the tutorial we will:

- Define what a monopulse antenna is and understand the different types available.
- Understand why and how monopulse antennas are used. Here we will take a brief history tour of monopulse antennas and look at current examples in different applications.
- Understand how the multiple signals are combined, both in hardware and software. We will discuss the specific hardware needed in the system, and how in some cases this can be eliminated with the correct approach in software.
- Define the mathematical treatment of the antenna patterns in a monopulse antenna system. We will look in detail at how the antenna patterns are created and interpreted and show this as a numerical simulation in MATLAB.
- Understand the difficulties of testing monopulse antennas and how to overcome these in both bench and anechoic and free space testing.
- Discuss the future of monopulse antennas and how they can be used within an AESA system.

You have the opportunity to code along live with the MATLAB simulation if you wish, there is no necessity to do this but it will aid your learning. Please bring a laptop with MATLAB installed on it if you wish to code along in the session.

# SC05- Fundamentals of Monopulse Antennas



**Dr Tamara Cleford** has over 15 years of industrial experience working with monopulse antennas and holds a PhD from Queen Mary University London in the topic. She has extensive experience with the design, simulation and test of many monopulse systems. Tamara is now a physics consultant working in the simulation and modelling in antennas and RF and works with a range of companies. Alongside her technical work she is a qualified teacher and an experienced educator having taught at educational companies, universities and for the Institute of Physics.