# Imperial College SDR Array Testbed Dataset

**Setup Number: 1**

# Introduction

The purpose of this dataset is to allow an analysis of the operation of the Imperial College SDR Array Testbed. A small aperture uniform linear array of N=8 sensors is used to analyse a laboratory environment in the 2.4GHz band in the presence of up to two single sensor sources transmitting single frequency tones. A USRP2 board is connected via a splitter to the RF2 port of each of the boards in the array receiver. This transmits only a carrier and can be used to synchronise the array. Anechoic material is placed around the laboratory test environment to attempt to suppress some of the multipath.

# Experimental Setup

Host Computer: Dell XPS

Array Receiver

USRP2 Board Numbers: 1, 2, 3, 4, 9, 10, 7 and 8 connected via a switch to Eth 1

Rx Frequency: 2.42GHz

Gain: 28

Sample Rate: 1960784 samples/sec

Nominal Sensor Locations in meters:

| Sensor | x | y | z |
|--------|--------|---|---|
| 0 | 0 | 0 | 0 |
| 1 | 0.0641 | 0 | 0 |
| 2 | 0.1323 | 0 | 0 |
| 3 | 0.1992 | 0 | 0 |
| 4 | 0.2643 | 0 | 0 |
| 5 | 0.3298 | 0 | 0 |
| 6 | 0.3899 | 0 | 0 |
| 7 | 0.4636 | 0 | 0 |

Synchronisation Source

USRP2 Board Number: 5 connected directly to Eth2 with IP 192.168.20.50

Tx Frequency: 2.42GHz

Tx Power: 7.4dBm (5.495mW)

Message: Constant (carrier only) of digital amplitude 0.04

Transmitter 1

USRP2 Board Number: 6 connected directly to Eth4 with IP 192.168.40.60

Tx Frequency: 2.42GHz

Tx Power: 22.49dBm (177.419mW)

Message: 200KHz sine wave of digital amplitude 1

Location in Meters: (x,y,z) = (3.4627,3.9188,0)

Direction in Degrees: (Azimuth, Elevation) ˚ = (48.53604,0)˚


Transmitter 2

USRP2 Board Number: 12 connected directly to Lenovo Laptop with IP 192.168.10.120

Tx Frequency: 2.42GHz

Tx Power: 20.64dBm (115.878mW)

Message: 250KHz sine wave of digital amplitude 1

Location in Meters: (x,y,z) = (1.6439,4.8506,0)

Direction in Degrees: (Azimuth, Elevation) ˚ = (71.27838,0)˚


Location 3

Transmitter 1 and 2 are placed in a third location for some tests as detailed in the experiments section below.

Location in Meters: (x,y,z) = (-0.057,5.0213,0)

Direction in Degrees: (Azimuth, Elevation) ˚ = (90.64935,0)˚

Location 3: (-0.057,5.0213)
(90.64935,0)°

Tx2: (1.6439,4.8506)
(67.42177,0)°

Tx1: (3.4627,3.9188)
(48.53604,0)°

5.021611m

5.121626m

5.229491m

y (m)

71.27838°

48.53604°

90.64935°

x (m)

Sensor 0: 0
Sensor 1: 0.0641
Sensor 2: 0.1323
Sensor 3: 0.1992
Sensor 4: 0.2643
Sensor 5: 0.3298
Sensor 6: 0.3899
Sensor 7: 0.4636
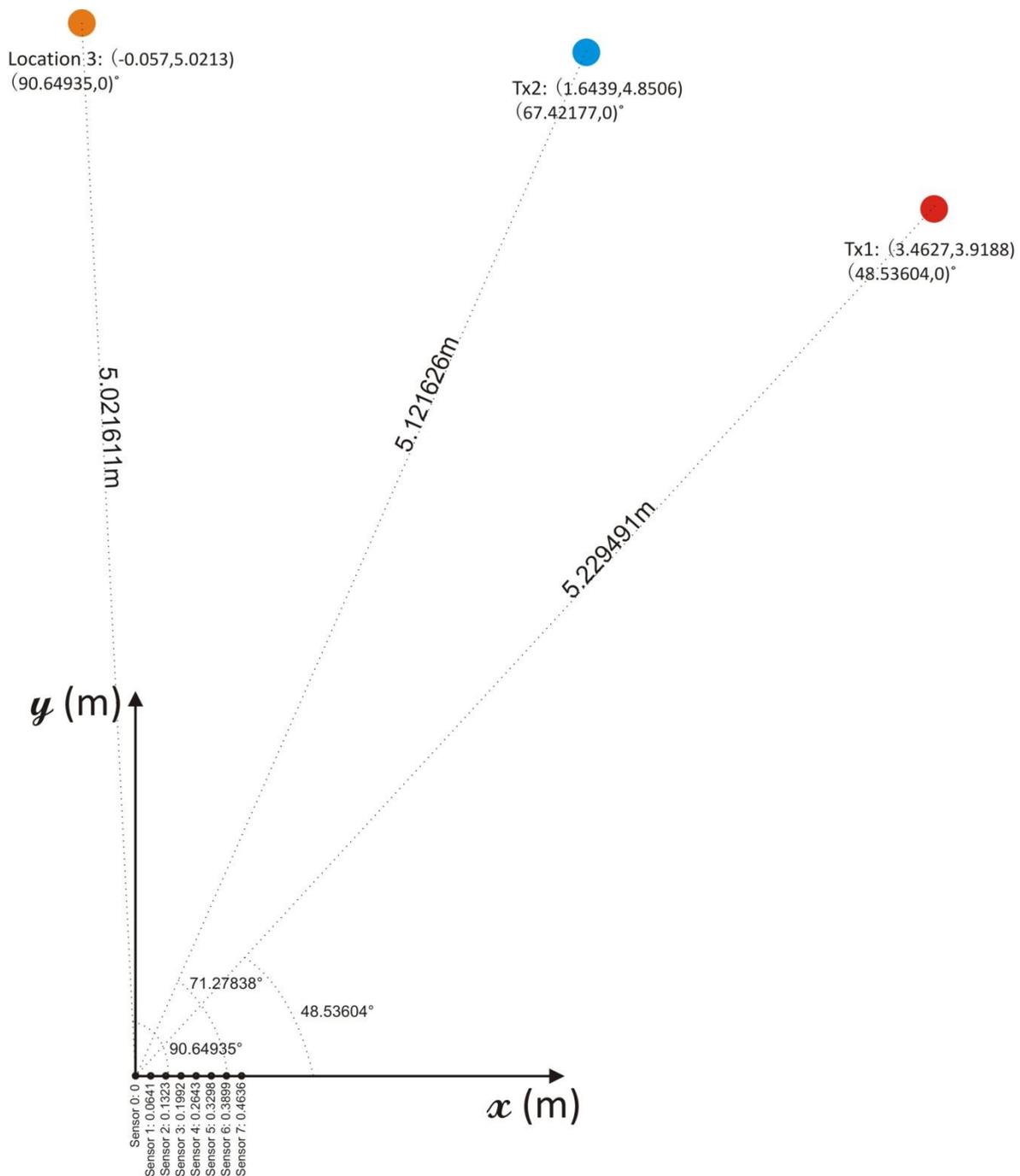
# Experiments

For each of the tests detailed below there are 3 associated matlab data files. Each contains 2,000,000 snapshots of I and Q data collected from the 8 sensors at different observation intervals (for sample rate and other specifics refer to the figure and sections above). These can be found in the variables "*X_I*" and "*X_Q*" respectively as 8x2000000 matrices of floating point numbers. The 3 observation intervals follow one another in the time when they were collected. The data recorded is labelled with the format:

**<DD.MM.YYYY>-<HH.MM.SS>-<Setup Number>-<Test Number>-<Observation Number>**

Note that this document details **Setup Number 1**. In each data file, the variables "*array*" and "*source*" (where applicable) define the array and source locations in meters respectively. The tests performed are detailed below:

**Test 1 and Test 2**: No transmitters active (Synchronisation Source and Noise only)

**Test 3**: Synchronisation Source and Transmitter 1 active

**Test 4**: Synchronisation Source and Transmitter 2 active

**Test 5**: Synchronisation Source and Transmitters 1 and 2 active

**Test 6**: As Test 4 but Transmitter 2 is placed at Location 3

**Test 7**: As Test 5 but Transmitter 2 is placed at Location 3

**Test 8**: As Test 5 but Transmitter 1 is placed at Location 3