# IoRL Measurement Campaign

by Brunel

# Introduction

- Measurement Campaigns Conducted
- Demonstrator layout
- VLC Setup and challenges
- VLC solution
- Methodolgy

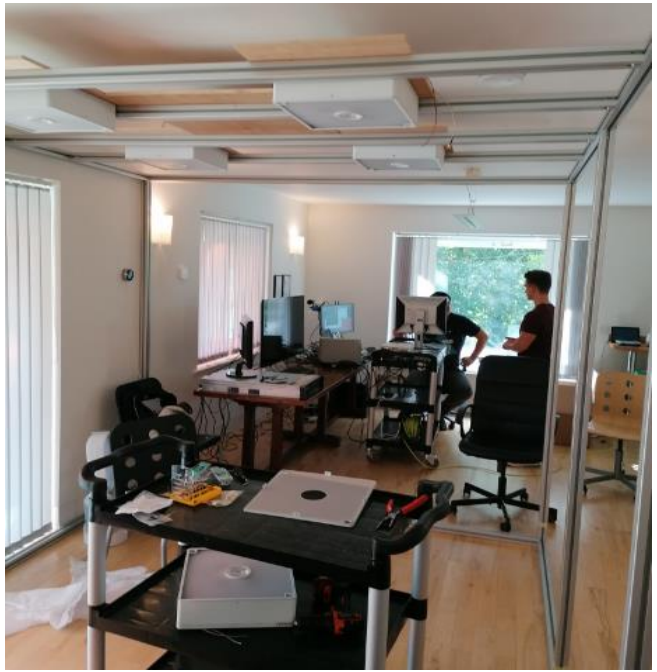
# Demonstrator Overview

## Aluminium Frame

- ❑ Avoid damage to Research Establishment
- ❑ Freedom to adjust system positions
- ❑ Mounts 4 Ceiling light design RRLH's

## Conducting

- ❑ VLC Positioning tests
- ❑ VLC EVM tests
- ❑ Mmwave EVM tests



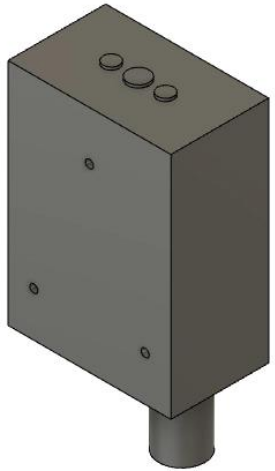
# VLC EVM Experiment setup

- Paper cm grid laid out on the floor
- Plumb line used to measure the centre points of RRLH's
- Measurements to be taken in along the floor 54cm in each 45 degree angle from the RRLH centre point

# VLC Receiver module

## Receiver housing

- ❑ Holds Receiver module upright
- ❑ Fixes lens at required distance from the photodiode
- ❑ Provides reference point for centre positioning

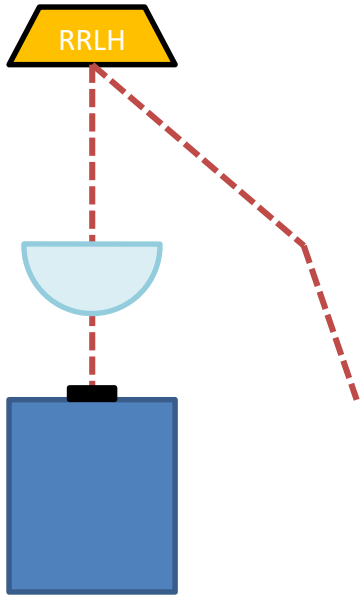


# VLC Challenge

- Lens required to focus the signal

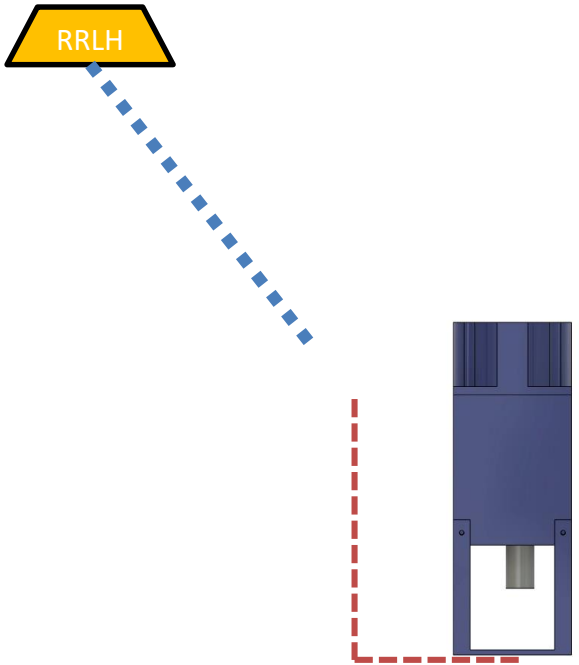
Lab testing had all been conducted with the Tx at 0 degrees in reference to the Rx

- Focal length of lens used so large that small horizontal translation caused the light to shift away from the photodiode and cut the signal.
- Drastic loss of signal and no positioning possible



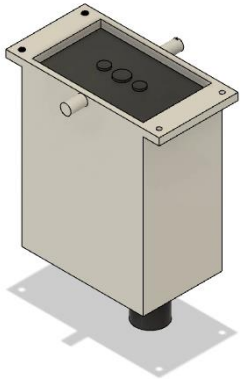
# VLC solutions

- Fish eye lenses with shorter focal lengths
  - Light Intensity not strong enough
- Angling the receiver to re-introduce Line of Sight transmission
  - Caused the centre point to deviate from its true position



# VLC Gimbal

- Maintain use of existing large lens
- Maintains the centre point of receiver
- Standard benefits of previous receiver housing
- Protractors included to measure angles



# VLC EVM Measurements

All measurements now to taken with the receiver both in a horizontal and angled position

All recorded at floor level

Storing EVM measurement data from the User Terminal at each point

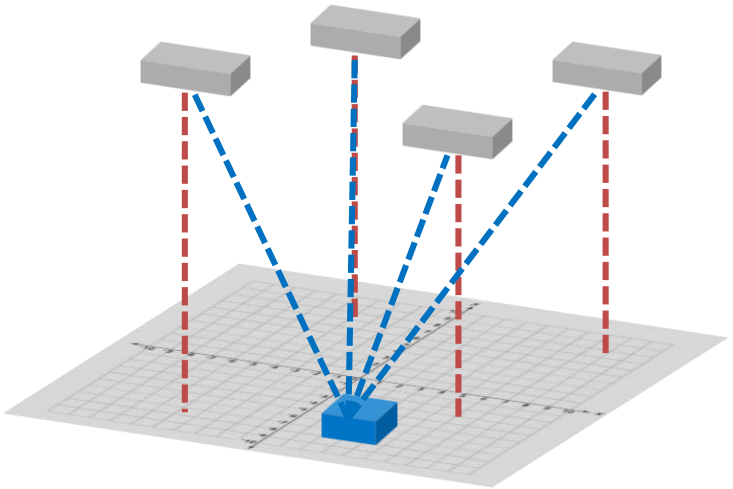
# VLC Positioning Experiments

Given the need to angle the receiver to maintain signal, all position data was recorded with the receiver angled towards the transmitting RRLH.

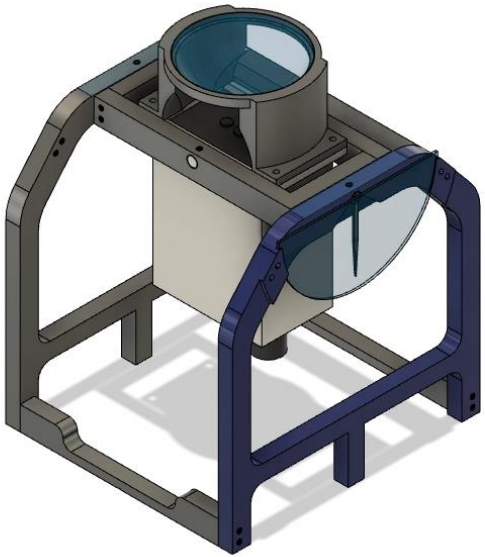
**One position measurement**

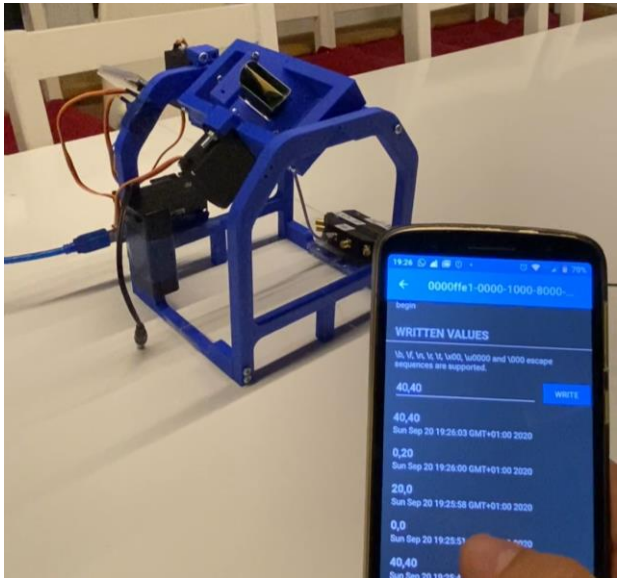
- ❑ *Angle towards RRLH 1*
- ❑ *Record UE received subcarrier strengths*
- ❑ *Repeat for all four RRLH's*

*Test Conducted at both floor level and Tabletop height (0.9m from floor level)*

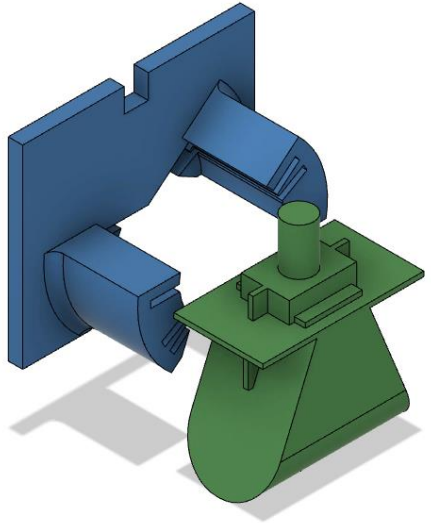


# MmWave Gimbal





# Tx mount



# MMW EVM Experiments

Using a single mmWave Transmitter fixed to the side of a RRLH using the adjustable antenna mount

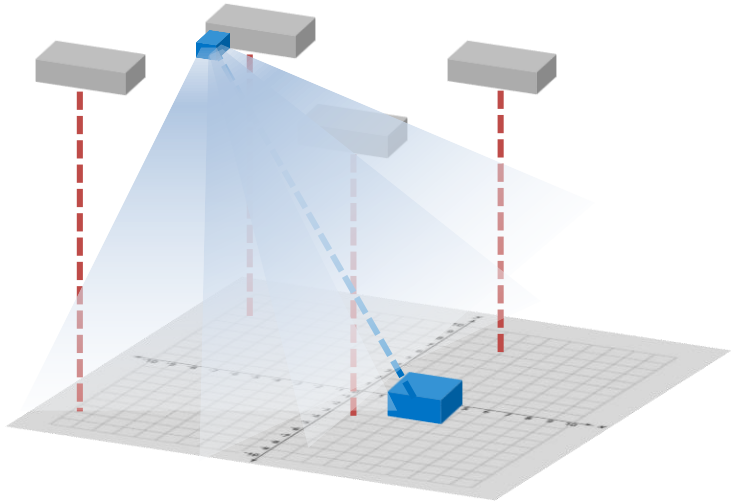
All tests conducted with the Rx **angled** towards the Tx and facing **vertically** upwards

***Tests conducted***

- ❑ Tx @ 0 degrees – Rx @ 2 heights
- ❑ Tx @ 30 degrees – Rx @ 1 heights
- ❑ Tx @ 40 degrees – Rx @ 2 heights

*The two heights were floor level and a tabletop 0.7m from floor level*

Due to the polarisation of the antennas Rx was always kept in parallel with Tx



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