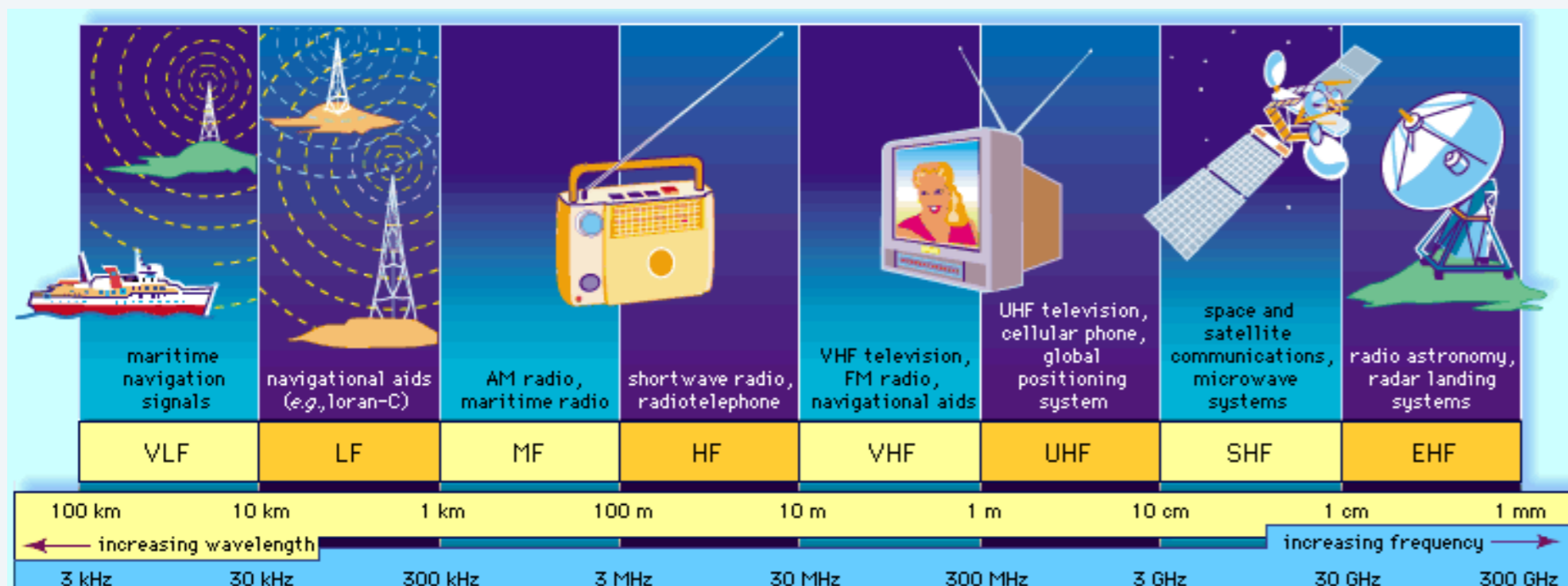


Abstract

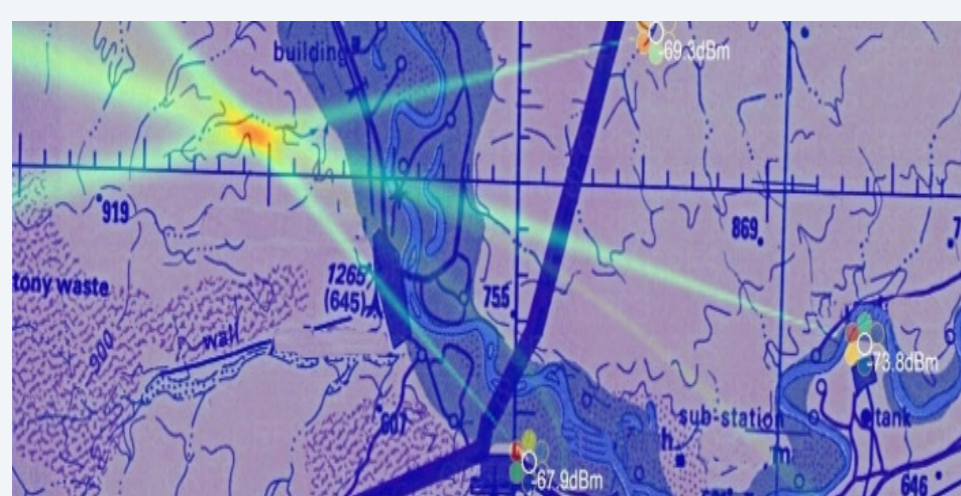
Reconfigurable antennas are becoming more widely used due to the increasing number of wireless communications and new functionalities of these systems. Moreover, multiple antennas supporting different wireless bands are not a suitable solution, because of the higher demand of compact size, efficiency, low power consumption and low cost. The aim of this project is to explore new and different reconfigurable techniques for multiple wireless applications at different frequency bands and having stable radiation patterns in all working frequencies. The novel reconfigurable antenna has to be able to operate from hundreds of MHz to a few GHz, offering stable radiation patterns in all operating frequencies, good gain and the ability to maintain higher signal to noise. In the beginning, the aim of the Master of Research project is to design a dual-band reconfigurable antenna, to afterwards achieve one-band moving in a big range of frequencies. This project is partly funded by L-3 TRL Technology.

The Problem

Nowadays, there is an increasing number of wireless communications and new functionalities of these systems. Different bands are defined to be used by different applications. Some examples are detailed in the figure shown below:



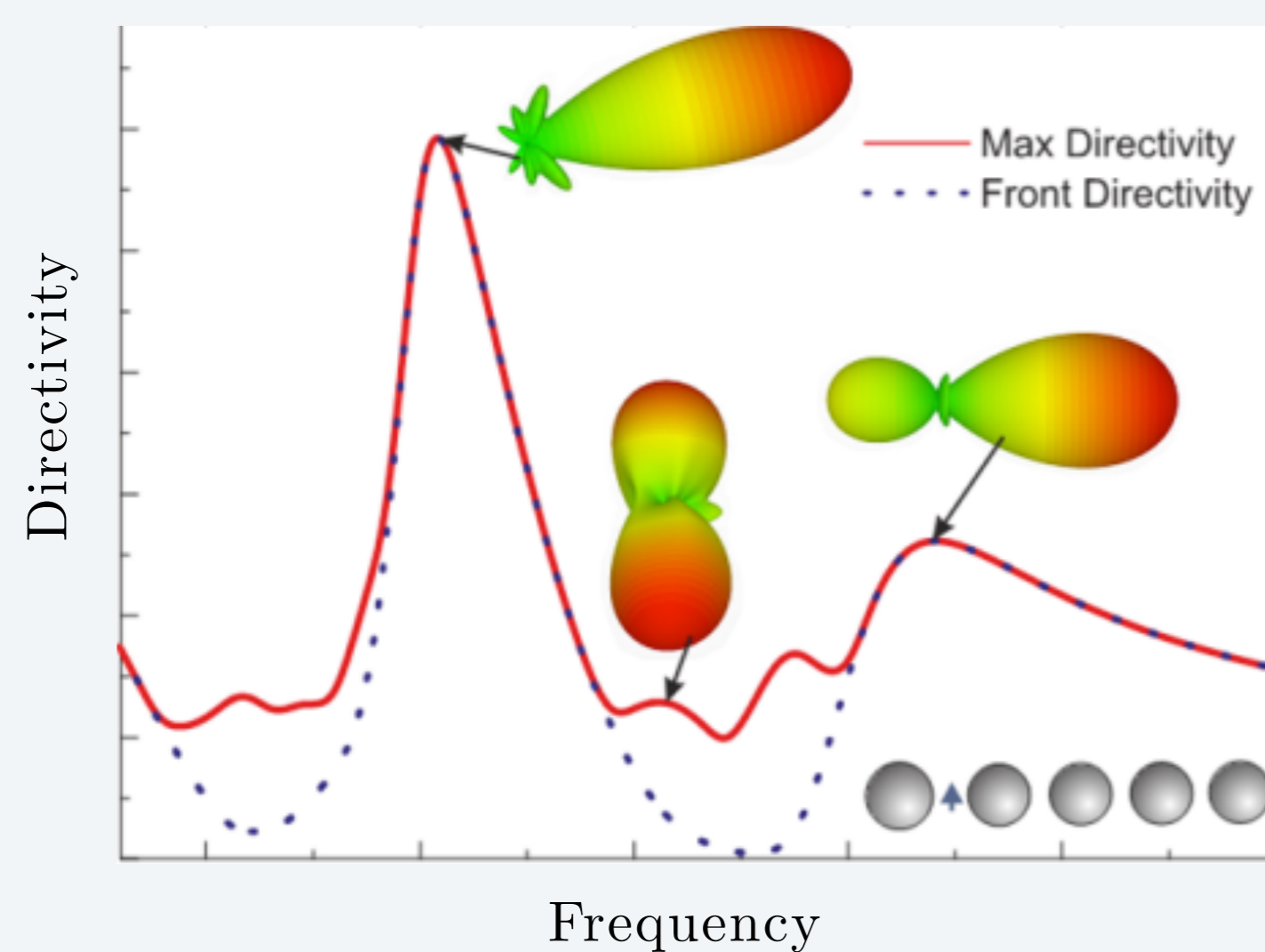
Multiple antennas supporting different bands are not a suitable solution, because of a higher demand on new requirements, including:



- Compact size
- Efficiency
- Low power consumption
- Low cost

Reconfigurable antennas are a feasible solution, but the current solutions do not meet the wideband requirements and the stability in the radiation pattern.

The figure below is an example of low stability in the radiation pattern when working on different frequencies, having different directivity and changing the maximum radiated direction of the antenna under test.



Aims and objectives

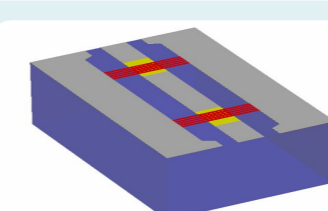
The aim of the MRes project is to design, build and evaluate a dual-band reconfigurable antenna and, assess if it can be adapted to a smoother frequency adjustment, to achieve one-band moving in the most commonly frequencies used nowadays.

The novel reconfigurable antenna has to meet some requirements:

- Frequency range: from hundreds of MHz to a few GHz
- Smooth frequency adjustment
- Stability in the radiation pattern
- Narrow multiple bandwidth
- High gain

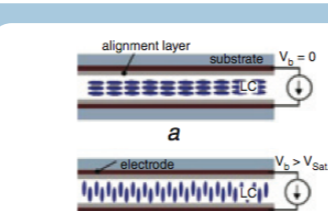
Current Reconfigurable Antennas

Based on previous research, there are several ways of designing a reconfigurable antenna:



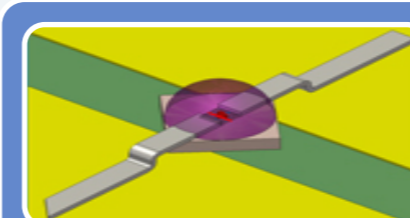
MEMS

- Micro-Electro-Mechanical Systems to switch between frequencies.
- It is slower than other techniques.



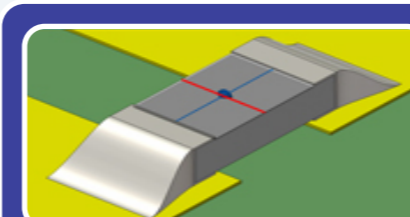
Liquid Crystal

- Uses a dielectric material which can change the dielectric constant.
- It needs a thin antenna to be effective.



Reconfigurable feedings

- It allows to have different working states with different operating frequencies using PIN diodes.



Varactors

- Variable capacitors can be used to shift down the resonant frequencies of the antenna.

Methodology

