Project Title: MAC protocols for Wireless Data Centre Networks using Terahertz band

Supervisors: Dr. Saim Ghafoor (Letterkenny Institute of Technology, Ireland), Dr. Mubashir Husain Rehmani (Munster Technology University, Ireland)

Keywords: Terahertz band communication, Datacentre networks, Protocols for Terahertz based Datacentre networks

Project Summary:

The Data Centers are the pillar of Ireland's Data economy. Currently, more than 50 Data Centers are operating within Ireland because it is the preferred choice for different cloud service providers due to the robust and reliable infrastructure, skilled workforce, climate, renewable energy resources, and government incentives. The research is progressing in enhancing the data centers' efficiency and performance using new communication technologies and reducing the cost of operations by proposing new infrastructures. The fiber optic is one of the candidates which can provide Gigabits of the speed. However, its deployment and maintenance are very high and cannot support the Terabits per second (Tbps) link. Whereas, Terahertz (THz) band is evolving as a potential candidate which can support high traffic demands and can provide 1 Tbps wireless links, due to the huge bandwidth availability of up to 1 THz. However, suffers from issues like high path and absorption loss, scattering, and reflecting, which limits the communication distance and requires directional antennas with narrow beams. The current research on realizing the Tbps link mostly focused on the transceiver and antenna design, and Physical layer protocols. Less focus has been given to Medium Access Control (MAC) protocols which provide channel access control mechanisms for nodes to communicate. To provide efficient and reliable communication, MAC protocols need to be developed while considering the unique features of the THz band, and directional antenna usage. This project will focus on designing and implementing distributed MAC protocols for Terahertz-based Data Centre Networks.

Candidate Qualifications/Requirements:

Master's degree in computer engineering or science or equivalent.

Bachelor's degree holder can also apply provided they show strong motivation and proficiency in the following requirements.

- Strong mathematical background and understanding. Prior experience in modelling will be preferred.
- Prior experience in Machine Learning and mathematical models/tools will be preferred.
- Strong programming skills, especially in C++ and Python.
- English proficiency with good communication skills.
- Previous publications in the related field will be given preference.