Title: **Controlled plasma dynamics and non-equilibrium chemical kinetics for next generation plasma technologies**

Speaker: Prof Timo Gans, School of Physical Sciences, DCU.

Abstract:

The landscape of plasma science and technology is currently undergoing a radical transformation with nascent technologies and potential disruptive approaches been developed across many sectors. Weakly-ionised plasmas, consisting of reactive neutrals, charged particles, electric fields and photons, can generate and deliver a dry reactive chemistry at ambient temperature to diverse materials. Future and emerging applications include rapidly emerging bio-medical applications and new concepts in environmental application, including: plasma activated chemical energy storage, plasma agriculture and more generally a sustainable electrified chemical industry. These critically depend on precise control of complex molecular plasma properties. The non-equilibrium chemical kinetics is initiated and determined by the electron dynamics which can be tailored using multi-frequency power coupling techniques. Measurements and predictive simulations of key reactive species are equally challenging due to their multi-scale nature in space and time. The most promising approach is the exploitation of complementary advantages in direct measurements combined with specifically designed computational techniques. The presentation will discuss recent advances in plasma control strategies and advanced laser spectroscopy using topical examples at reduced pressure as well as ambient atmospheric pressure, in particular plasma induced splitting of CO2 for green electrically driven technologies.