National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Performance Analysis of FSO Communication under Foggy Conditions.
Speaker	: Suchitra Rana.
Supervisor	: Dr. Santos Kumar Das
Venue	: EC303, Seminar Room
Date and Time	: 13 Mar 2025 (04.00PM)
Abstract	: This study examines the impact of weather factors on free space optics (FSO) transmission performance using OptiSystem21 models. The study investigated lasers working at wavelengths of 650 nm, 910 nm, and 1550 nm in various settings, viewing levels, data speeds, and link distances. This work assessed the data transit quality using key parameters such as the Q-factor and the bit error rate (BER). Our findings underlined the importance of fog, a frequent meteorological condition that disrupts free-space optical communication. Notably, the 1550 nm laser significantly reduced fog-induced signal loss. Furthermore, we investigated the effects of emitter power, transmitter aperture diameter, beam deviation, and receiver aperture diameter on signal quality and BER. To maintain constant communication, we used hybrid FSO/radio frequency (RF) systems that dynamically switched between FSO and RF channels depending on real-time weather conditions, even during severe weather. A free-space data transmission experiment was done inside a controlled fog chamber, mimicking the circumstances described in OptiSystem21, focused on the performance of the 650 nm laser. The experimental results demonstrated the limitations of the models in adequately representing the intricacies of atmospheric processes, particularly attenuation.