NCC 2024

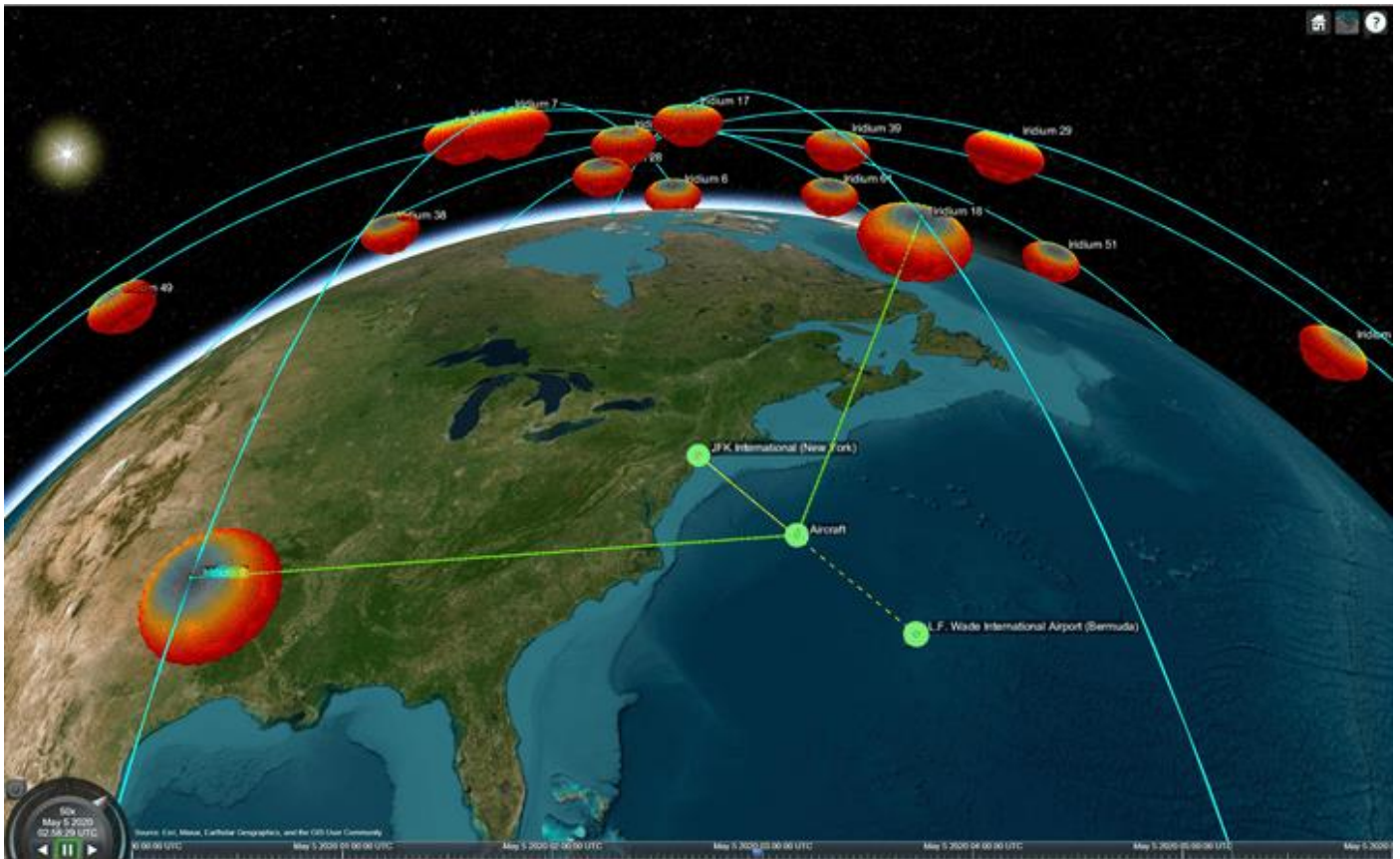**Workshop on Satellite Communications with MATLAB**

28 February 2024 | 9:00 AM to 12:30 PM

Abstract/Overview:

The MathWorks Workshop on Satellite Communications will focus on modeling multi-platform satellite communication scenarios that include satellites, aircraft, ground stations, and moving ground vehicles. Participants will model and visualize platform trajectories, perform visual access calculations, and link budget analyses. The workshop will also cover end-to-end satellite communication link simulations with standards-based signals like 5G NTN, DVB-S2/S2X/RCS2, and GPS, as well as the design of physical layer algorithms together with RF components and ground station receivers.

The topics covered include the following:

- Visualize 3D satellite orbits, fields of view, and ground tracks.
- Analyze line-of-sight access and compute link closures in integrated scenarios that include satellites, ground stations, aircraft, and moving ground vehicles.
- Demodulate and decode 5G NTN signals impaired by 3GPP-specified NTN channel models.
- Demodulate DVB-S2 signals subject to severe Doppler shifts, sample clock offset, and phase noise.
- Demodulate a composite waveform from multiple GPS satellites. Perform acquisition, tracking, and bit processing on a signal impaired with Doppler and thermal noise. Decode the bits to determine the location of a GPS receiver.

Planned Outcomes:

At the end of the workshop, participants are expected to be able to modify and customize MATLAB code, functions, and reference examples for modeling and simulation of satellite communications systems and devices. The workshop will utilize hands-on exercises using MATLAB that will enable participants to:

- Set up and launch a satellite scenario viewer for different scenarios.
- Compute and visualize the visibility access between a satellite and a ground station.
- Compute and visualize communications link closure between a satellite and a ground station.

Prerequisites and Requirements:

Attendees should have previous experience working with MATLAB and calling MATLAB functions. Learn MATLAB with self-paced courses at https://matlabacademy.mathworks.com/

IMPORTANT NOTE: This workshop uses MATLAB Online, a browser-based version of MATLAB.

- **Attendees will need access to a laptop and internet access to participate.**
- **Participants will get complimentary access to MATLAB Online as part of the workshop.**

Speakers:

Jayamohan Govindaraj | Principal Application Engineer, MathWorks

Jayamohan Govindaraj is a Principal Application Engineer at MathWorks India, with a specialized focus on Wireless Communication. Jayamohan has over two decades of experience in the wireless sector, and before joining MathWorks, he contributed to the evolution of multiple wireless standards including GSM, GPRS, EDGE, WCDMA, LTE, and Wi-Fi. His professional journey encompasses significant roles in the development and execution of baseband algorithms for 5G, and he currently supports the development of various wireless standards including 6G technology. Jayamohan holds a Bachelor's Degree from the University of Madras and a Master's Degree in Communication Systems from the Indian Institute of Technology, Kanpur.

Praful Pai, PhD | Manager – EECS - Signal Processing and Communications, MathWorks

Praful is a Manager, EECS, Signal Processing and Communications at MathWorks, where he works closely with researchers and educators at universities worldwide to accelerate research and development in signal processing and wireless communication with model-based design, as well as help make engineering education engaging using computational thinking. He has worked extensively in multi-disciplinary teams on domains including instrumentation, statistics and data analysis, mathematical modelling, signal and image processing, and machine learning. Prior to MathWorks, he worked as a Research Scientist with the National Brain Research Centre, Gurgaon on MR imaging and neuroimage analysis. Praful completed his undergraduate studies in Biomedical Engineering from Manipal Institute of Technology, and thereafter, his MS and PhD from the Department of Electronics & Electrical Communication Engineering at the Indian Institute of Technology, Kharagpur.