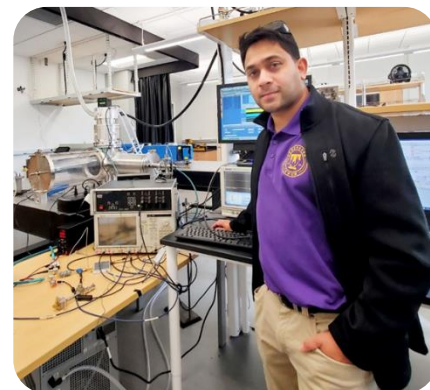


# Unlocking Molecular Mysteries with a Novel L-Shaped FTMW Spectrometer

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Chemistry  
Seminar on  
*Microwave  
spectroscopy of  
Molecules*

**Monday  
November 4  
at 4 pm in  
303 Schrenk**

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**Abstract:** Fourier Transform Microwave (FTMW) spectroscopy opens an exciting window into gas-phase chemistry through accurate measurements of molecular rotational transitions. Due to the direct relationship between a molecule's moment of inertia and its rotational spectrum, FTMW provides an unambiguous pathway for uncovering precise molecular geometry and intrinsic molecular properties. This technique has become a versatile tool, now at the forefront of various research areas, from molecular structure determination and internal motions to chiral discrimination, nonbonding interactions, reaction dynamics, and even chemical kinetics.

In our lab, we've built a new L-shaped FTMW spectrometer that operates across two frequency ranges: 8–18 GHz and 26–40 GHz. What distinguishes our design is its unique blend of high-resolution and broadband spectroscopy capabilities in a simple, cost-effective, and versatile setup. On one side of the spectrometer, a tunable Fabry-Pérot resonator with 7.5-inch mirrors provides high-resolution measurements (2.5 kHz). On the other, a microwave-transparent polycarbonate chamber allows for broad 3 GHz frequency sweeps. The latest enhancement to the spectrometer is a Python-based user interface that streamlines the cavity tuning and automates the spectral data collection process.

In this talk, I will share the latest upgrades to our custom-built FTMW spectrometer and delve into recent findings on the quantum tunneling properties of methylstyrene derivatives in the near-free rotor limit.

**About the speaker:** Dr. Ranil M. Gurusinghe is an Assistant Professor of Chemistry at Tennessee Tech University, where he leads a research lab focused on molecular spectroscopy, reaction dynamics, and kinetics. His work utilizes Fourier transform microwave (FTMW) and millimeterwave (FTmmW) spectroscopy techniques, along with resonance-enhanced ionization techniques, to explore the intricate details of gas phase chemistry.

Dr. Gurusinghe joined the faculty at TTU in 2022, bringing valuable experience from his previous roles as a Postdoctoral Research Scientist at the University of Missouri–Columbia and as a Research and Development Scientist in the pharmaceutical industry. He received his Ph.D. in Physical Chemistry from Kent State University, where he conducted research under Dr. Michael Tubergen, focusing on methyl torsions and weakly bonded complexes in various molecular systems using high-resolution FTMW spectroscopy. Additionally, he holds a B.Sc. in Chemistry from the University of Peradeniya, Sri Lanka.