

# Chirped-Pulse in Uniform Flow: Probing the Dynamics of Multichannel Reactions with Pure Rotational Spectroscopy

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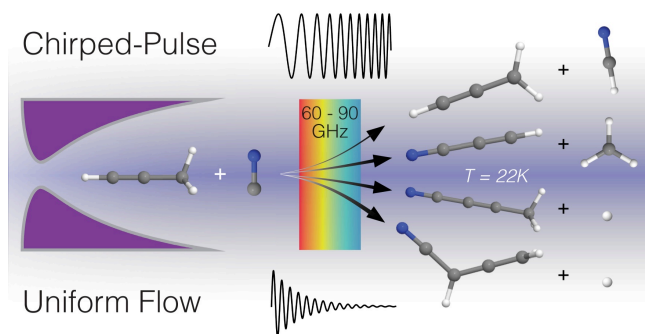
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The interplay between fundamental laboratory investigations, theoretical advances, and chemical modeling has led to tremendous progress in our understanding of the reactivity of polyatomic systems. Measured and/or calculated reaction rates are incorporated into models to identify the key pathways that control reaction outcomes. However, experimental studies often report the rate of reactant disappearance, leaving product identity and branching largely unknown. This limitation arises from considerable experimental challenges inherent to the quantitative detection of the full range of products of a given reaction, in particular for large molecules. To address these issues, we have developed a new approach incorporating chirped-pulse microwave spectroscopy (1) in low-temperature uniform supersonic flows (Chirped-Pulse in Uniform Flow, CPUF (2,3)). This technique provides clear quantifiable spectroscopic signatures for polyatomic products in bimolecular or unimolecular reactions for virtually any species with a modest dipole moment. In this talk, I will first illustrate the principle of this new experimental strategy and discuss a number of challenges related to the collisional environment of the flow. Results on the  $\text{CN} + \text{C}_3\text{H}_4$  reaction at nearly 20 K (4) and on the photodissociation of isoxazole  $\text{C}_3\text{H}_3\text{NO}$  at 193 nm, for which line intensities in the [60-90] GHz range have been measured, will then be presented. Overall, this work opens the door for new applications in kinetics/reaction dynamics with an unprecedented overlap with radioastronomy.



CPUF can probe quantitatively all the products of some multichannel reactions, providing that these products exhibit permanent dipolar moments as illustrated here for the  $\text{CN} + \text{C}_3\text{H}_4$  reaction at 22K.

## References

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