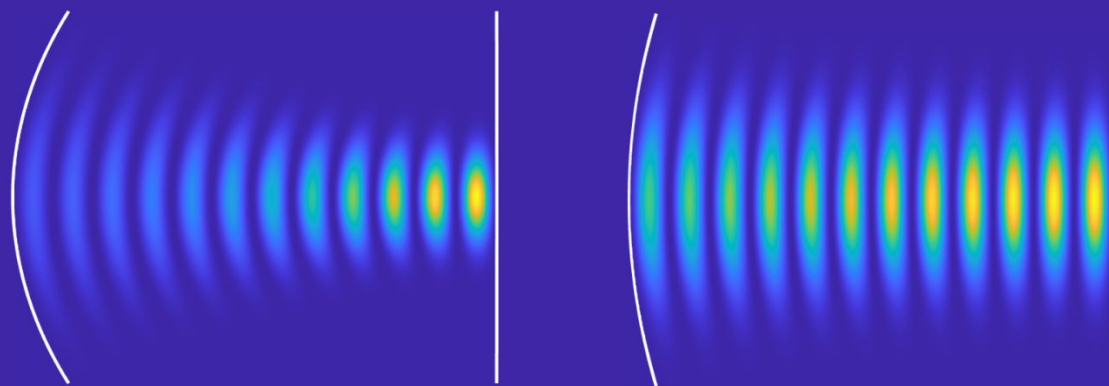
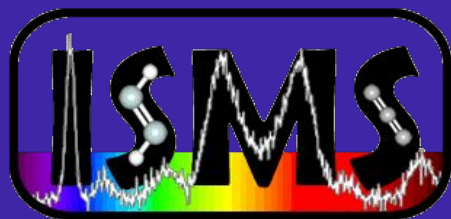


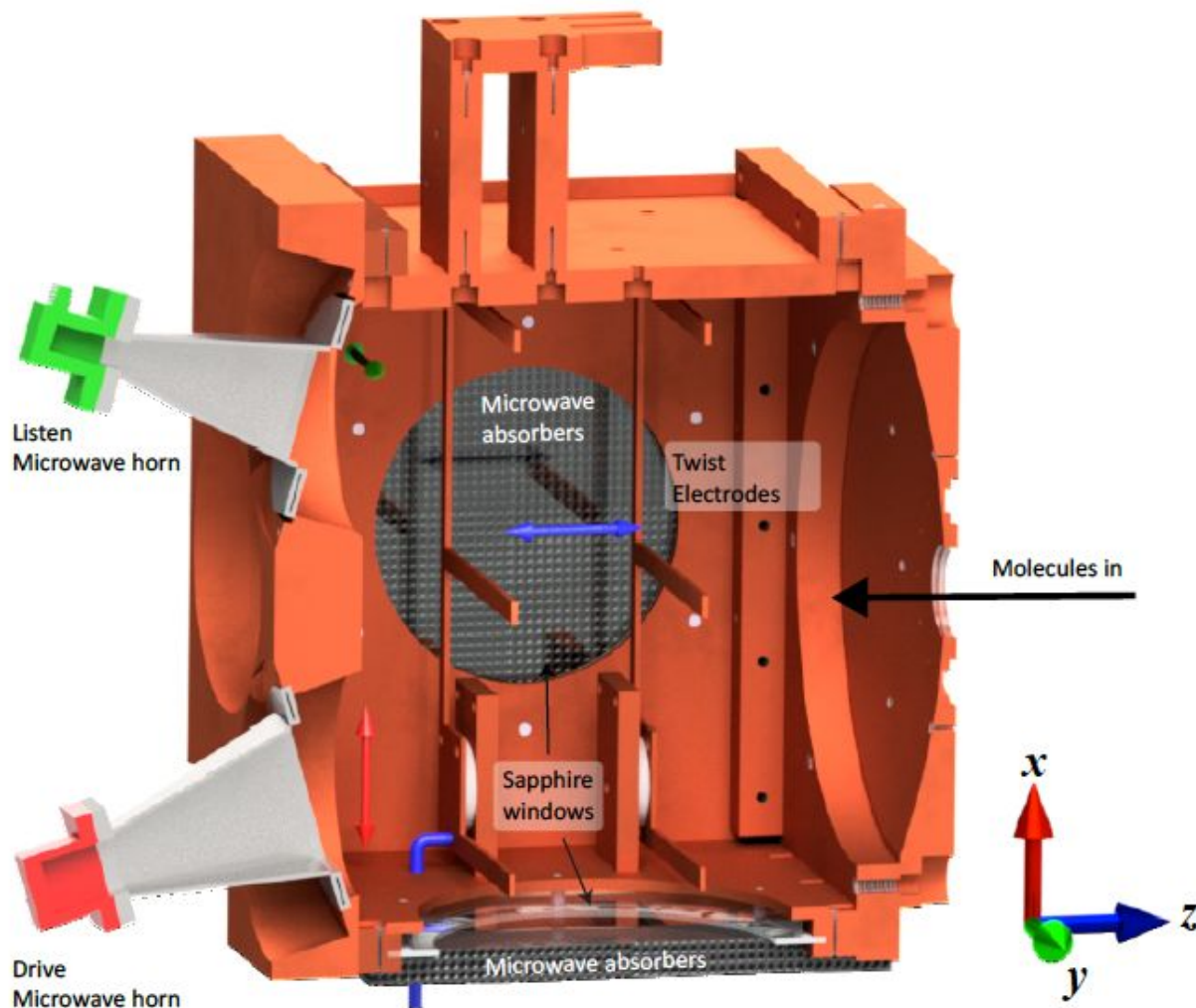
Fourth-generation buffer gas cell for microwave spectroscopy



Lincoln Satterthwaite, Daniel Sorensen, Greta Koumarianou, Dave Patterson



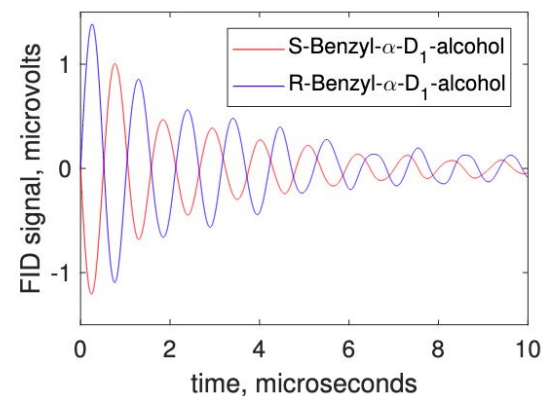
First generation (still effective, recently retired)



Lots of spectroscopy has been done here

Enantiomeric Analysis of Chiral Isotopomers via Microwave Three-Wave Mixing

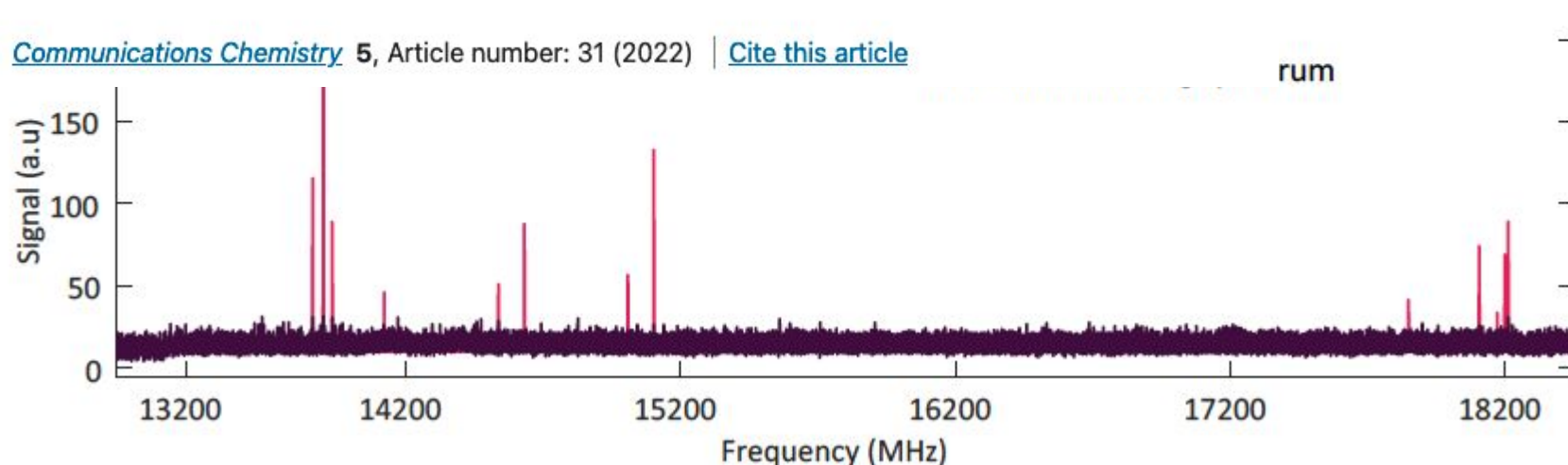
Lincoln Satterthwaite*, Cristóbal Pérez, Amanda L. Steber, Dylan Finestone, Robert L. Broadrup, and David Patterson *J. Phys. Chem. A*



Assignment-free chirality detection in unknown samples via microwave three-wave mixing

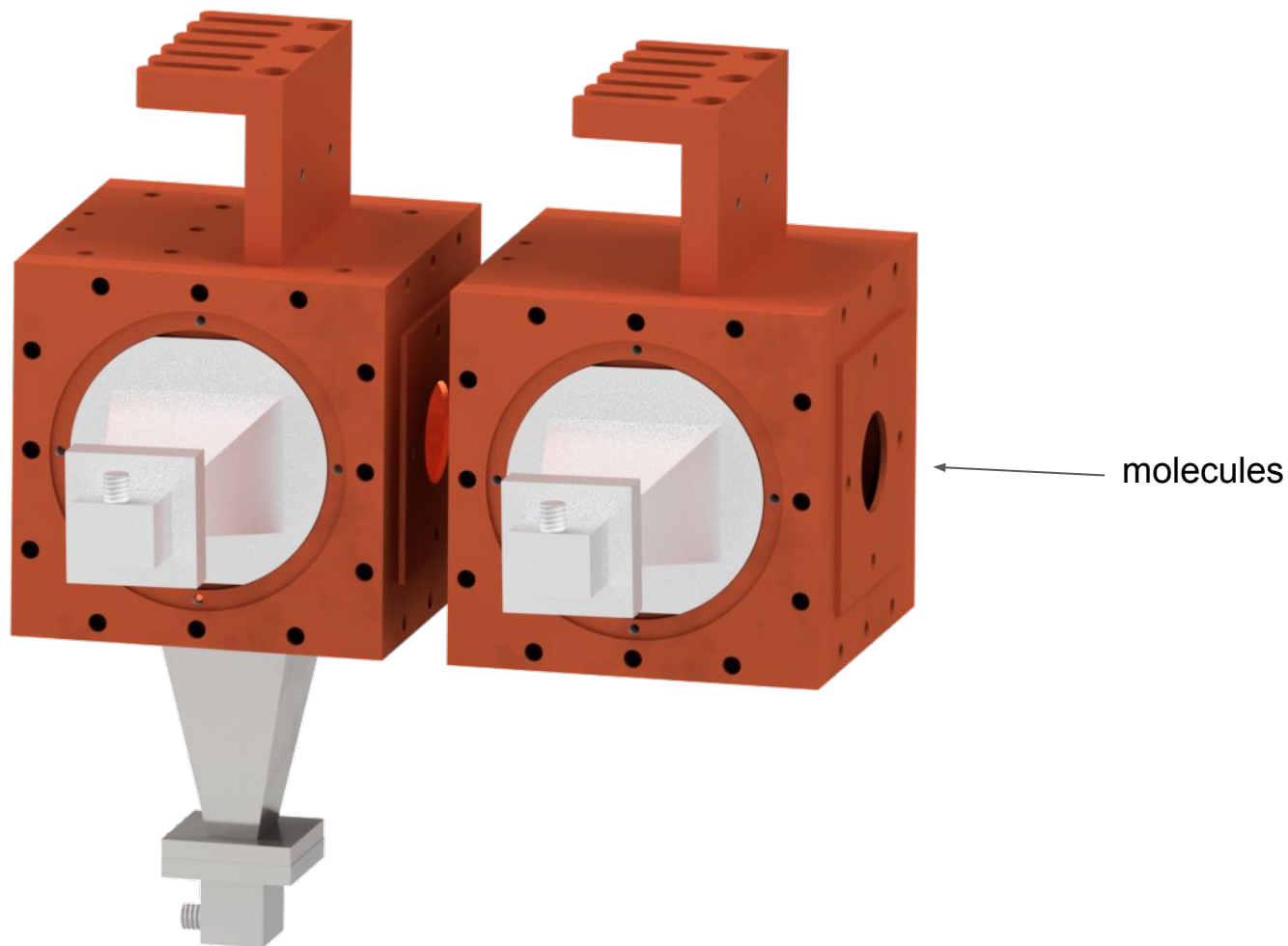
[Greta Koumarianou](#) ✉, [Irene Wang](#), [Lincoln Satterthwaite](#) & [David Patterson](#)

[Communications Chemistry](#) 5, Article number: 31 (2022) | [Cite this article](#)

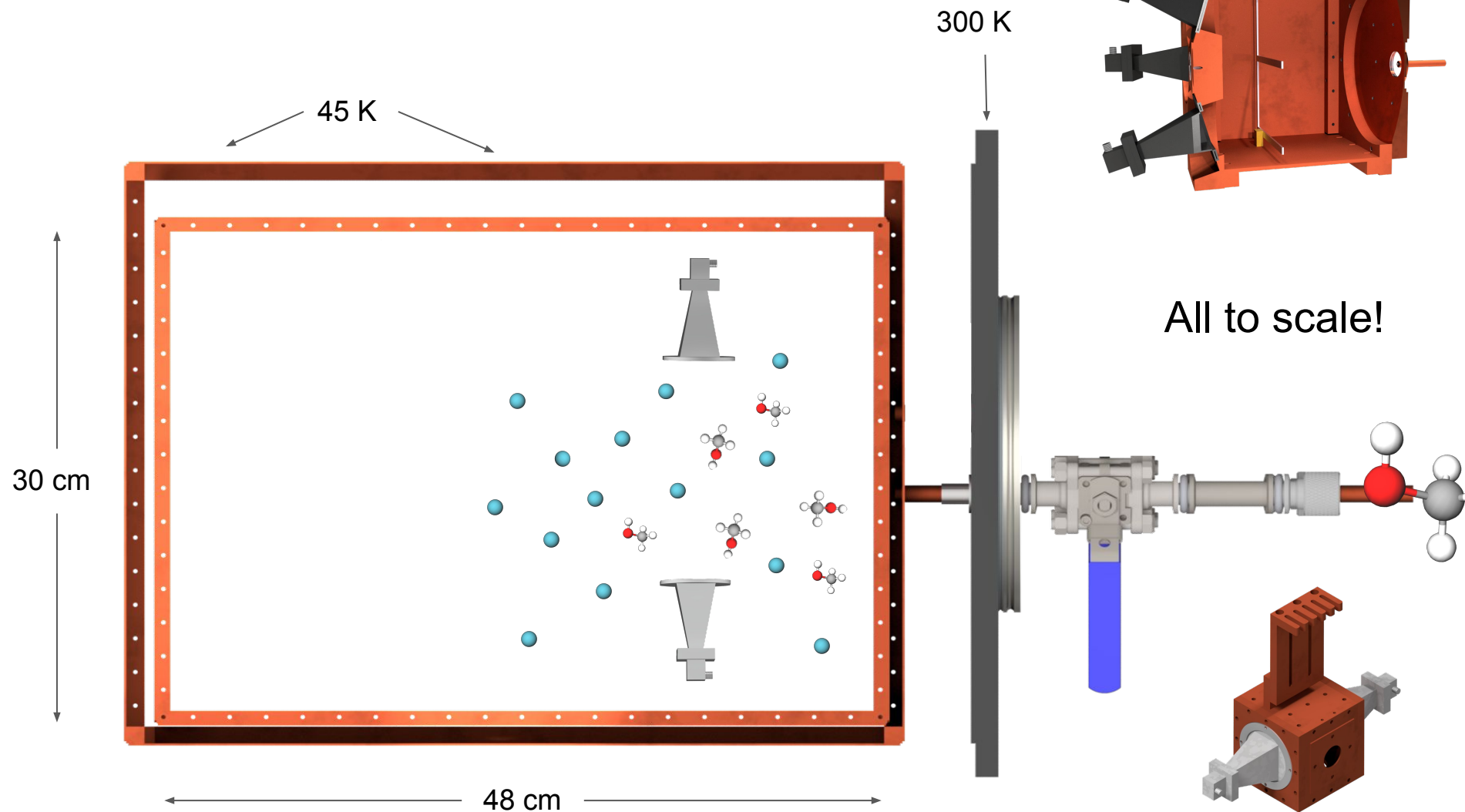


Koumarianou, Wang, **Satterthwaite**, et al. *Commun. Chem.* 5, 31 (2022)

2nd generation, feeble attempt at a beam



3rd generation: what if it were huge?



Supercell yields nice linewidths

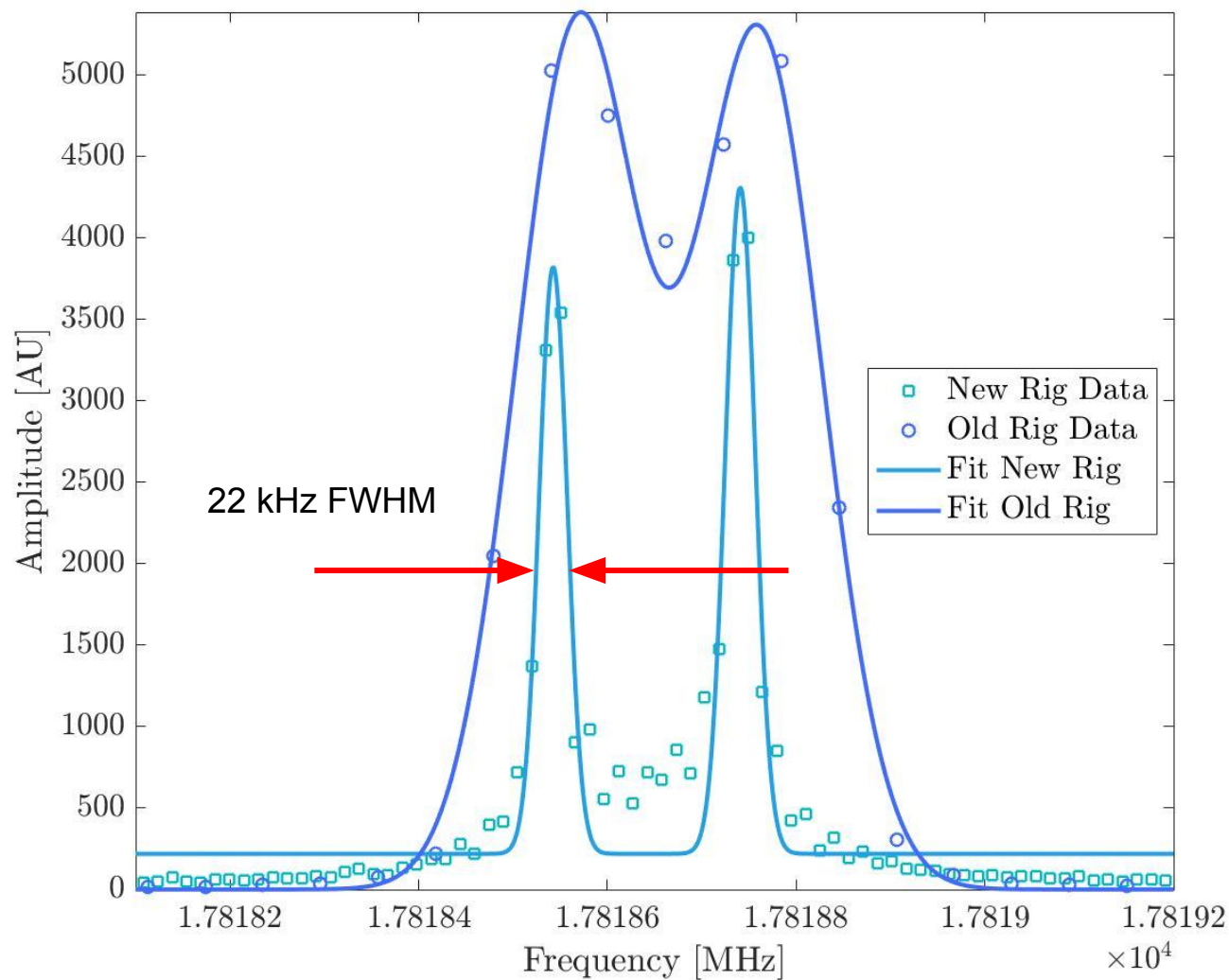
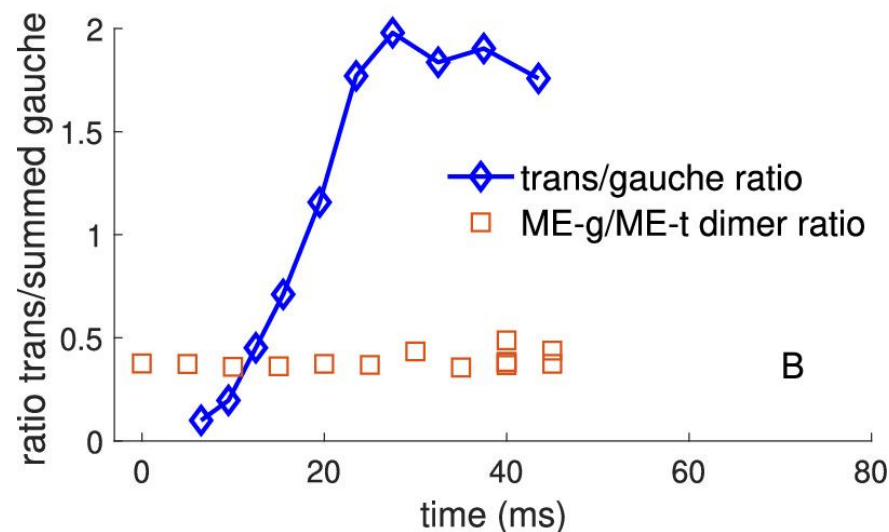
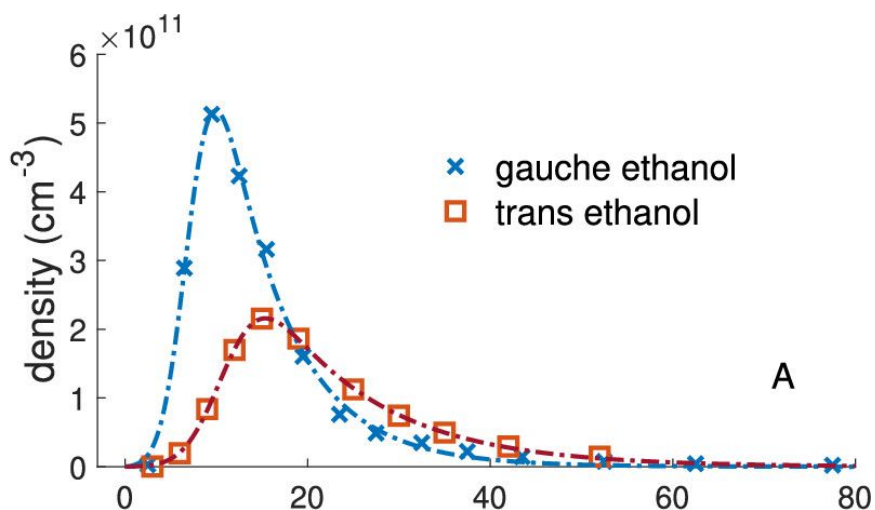


Figure courtesy of Dr. (!!) Greta Koumarianou

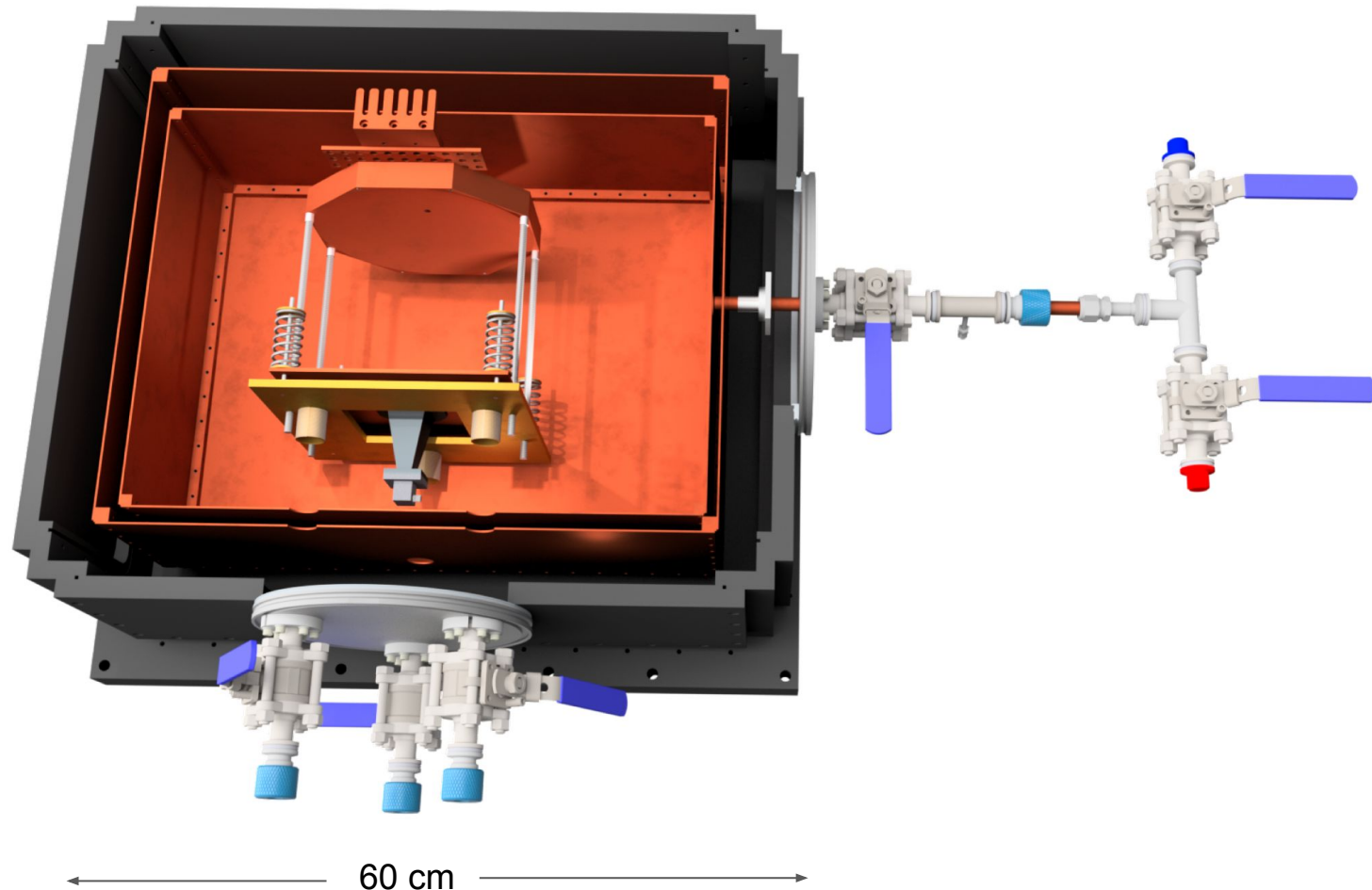
And it can do kinetics (kinda)

Low-Temperature Gas-Phase Kinetics of Ethanol–Methanol Heterodimer Formation

Lincoln Satterthwaite*, Greta Koumarianou, P. Brandon Carroll,
Robert J. Sedlik Jr., Irene Wang, Michael C. McCarthy, and David Patterson
J. Phys. Chem. A

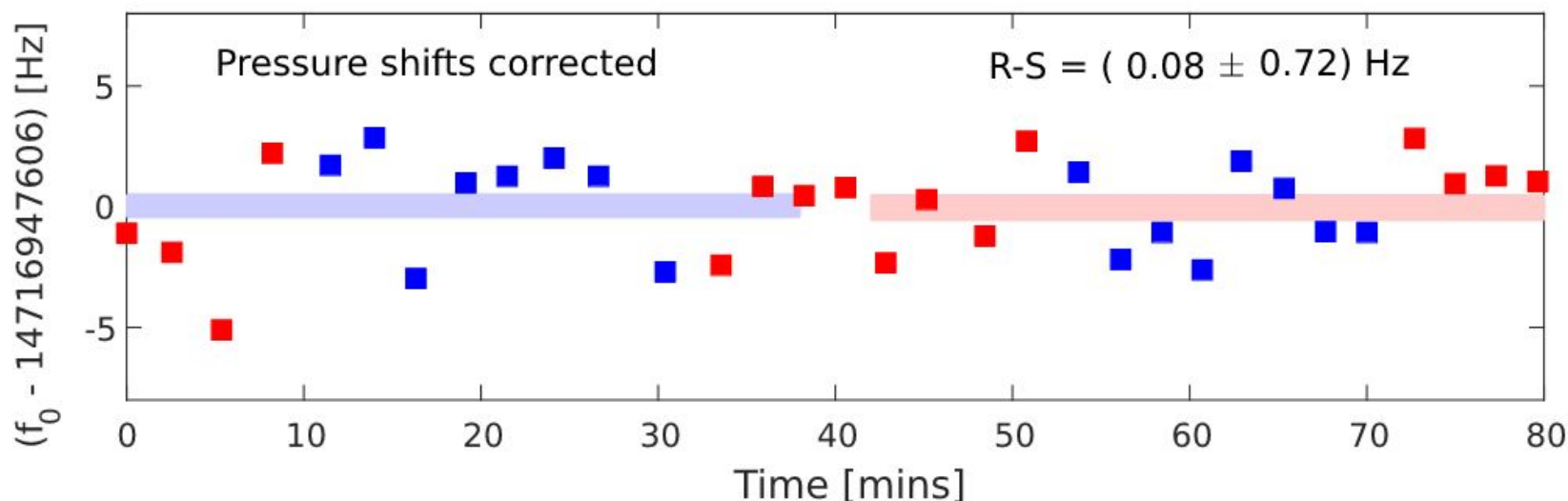


What if we put a cavity in it



Satterthwaite, L et al. *Symmetry* **2022**, 14(1), 28

Precision differential rotational spectroscopy using the cavity



Sub-Hz Differential Rotational Spectroscopy of Enantiomers

by Lincoln Satterthwaite ^{1,†} , Greta Koumarianou ¹ , Daniel Sorensen ² and David Patterson ^{2,*}

¹ Department of Chemistry and Biochemistry, University of California Santa Barbara, Santa Barbara, CA 93106, USA

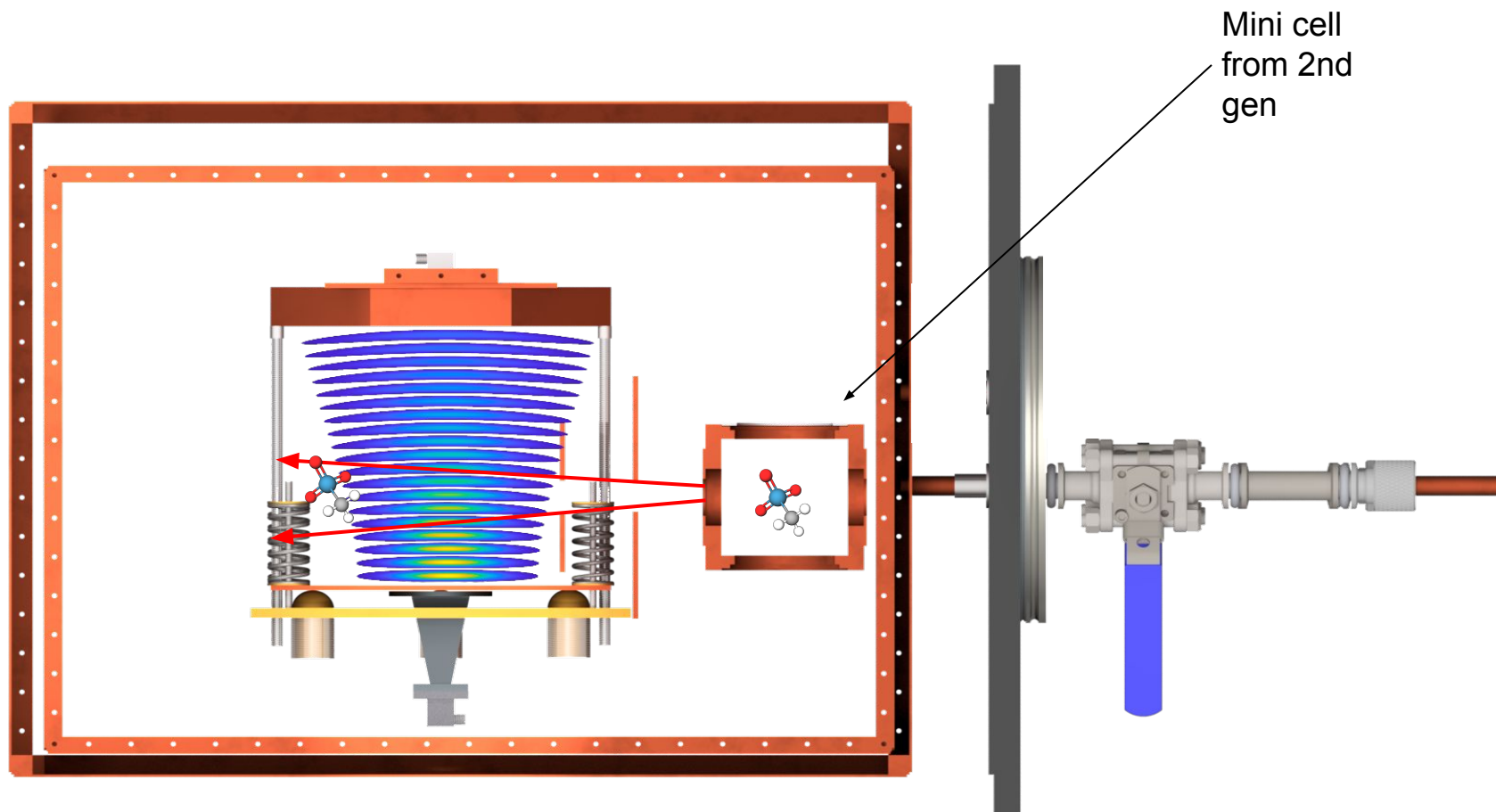
² Physics Department, University of California Santa Barbara, Santa Barbara, CA 93106, USA

* Author to whom correspondence should be addressed.

† Current Address: 1311 Broida Hall, Santa Barbara, CA 93106, USA.

Symmetry **2022**, *14*(1), 28; <https://doi.org/10.3390/sym14010028>

Cryogenic buffer gas beams are widely used

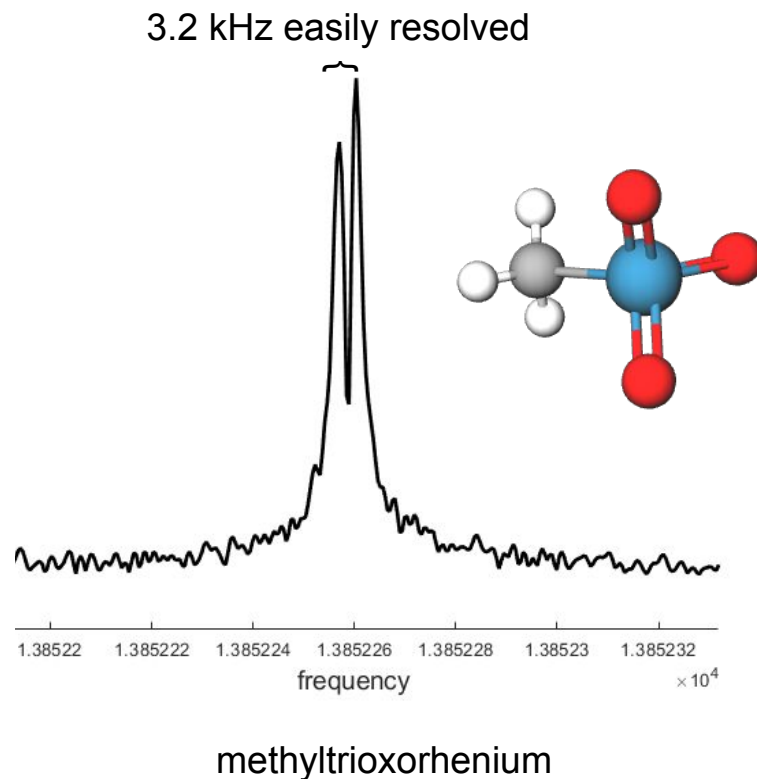
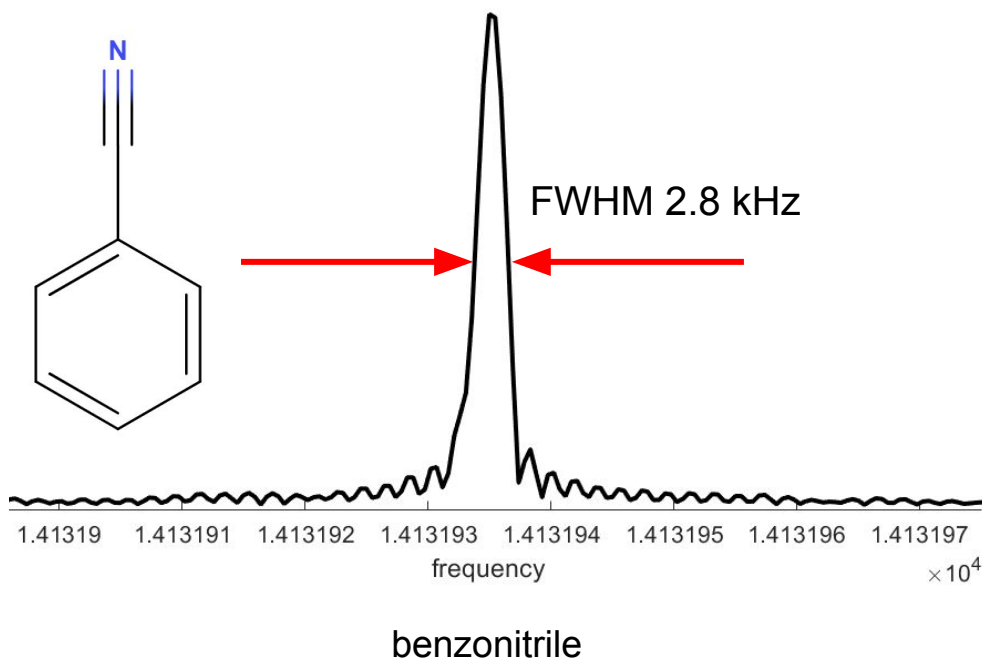


BUGBITES (Buffer Gas Beam In a caviTy Enhanced Spectrometer)

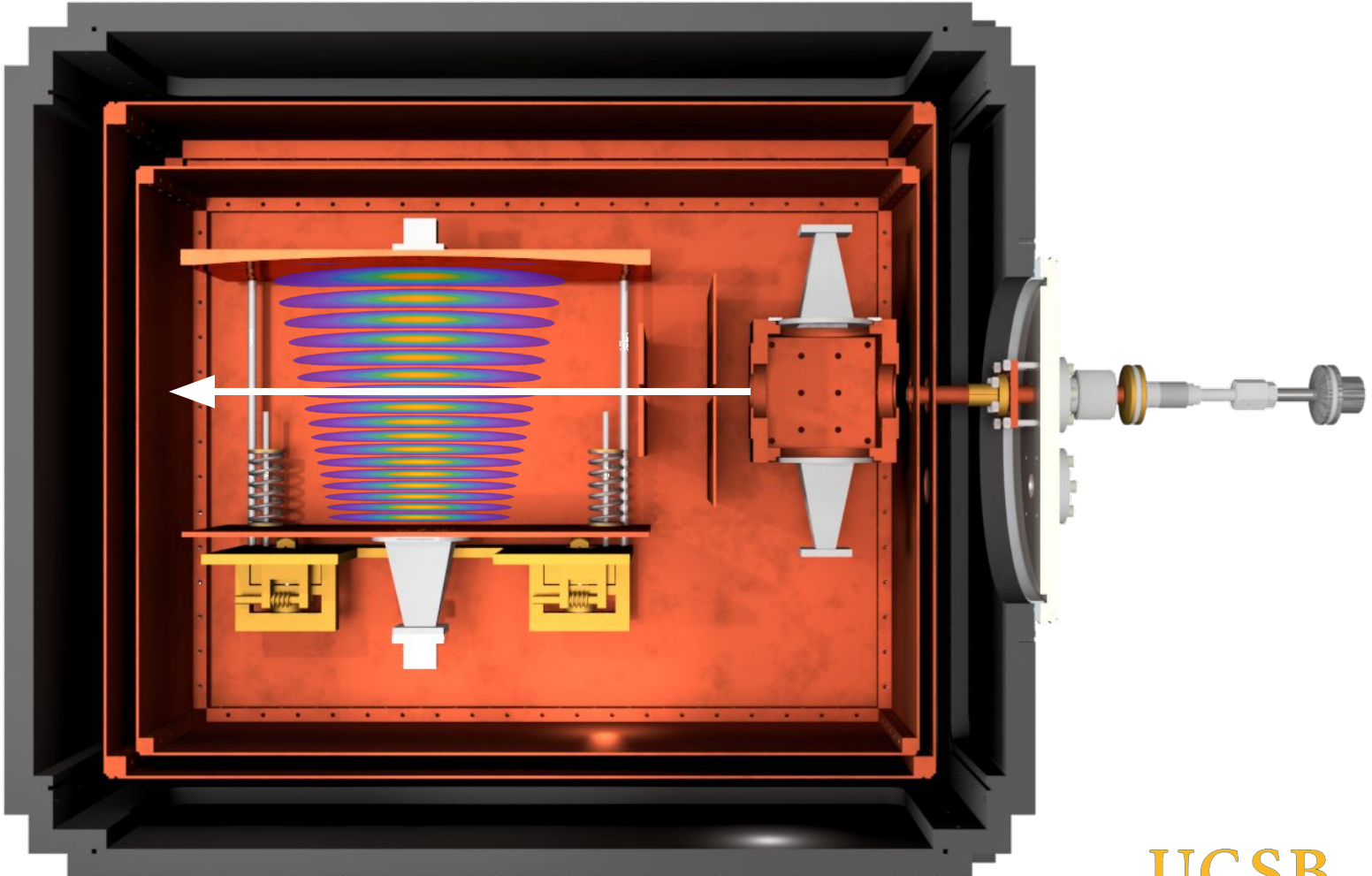
But not for microwave spectroscopy, **until now!**

Ultra-high resolution microwave spectroscopy

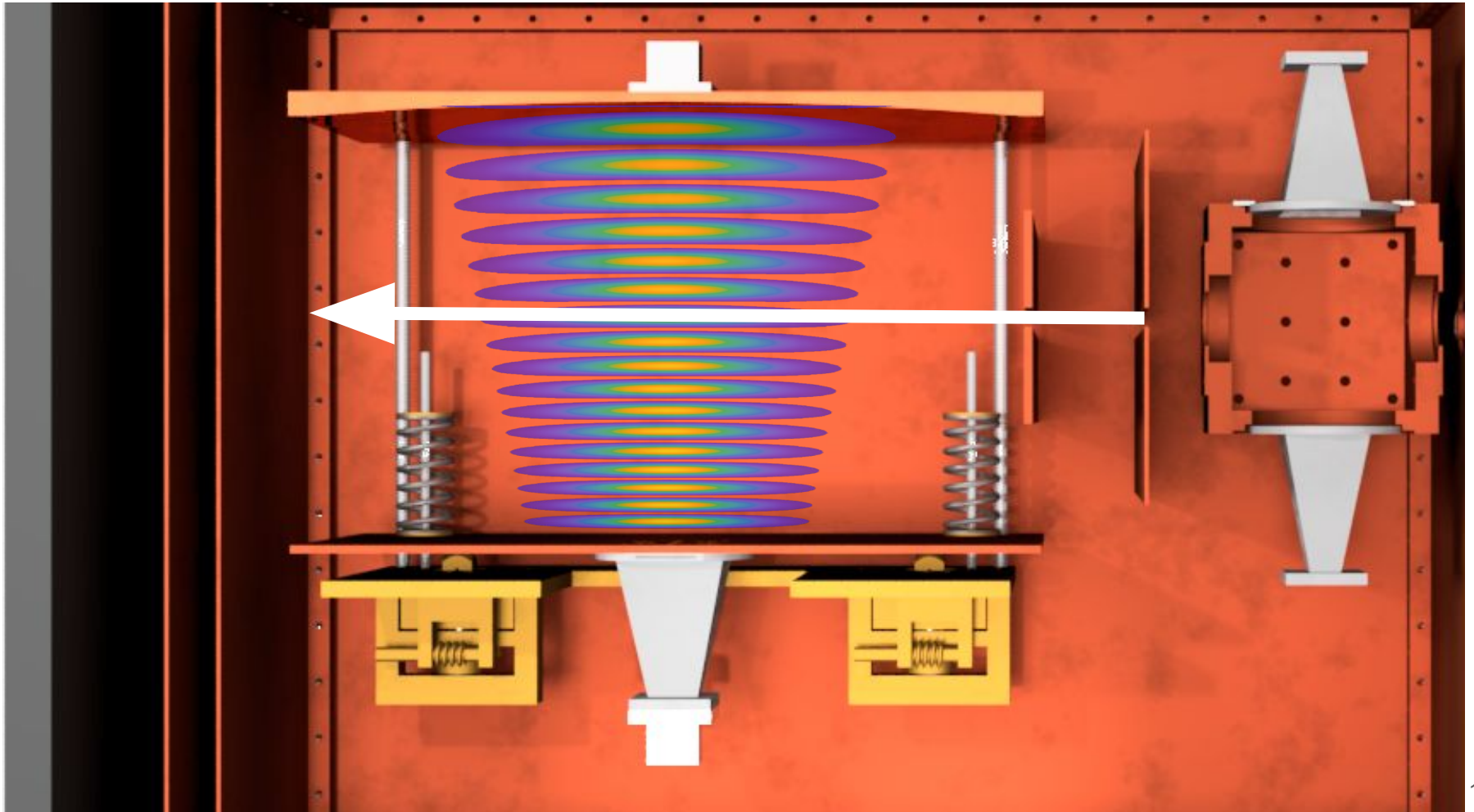
$$\Delta\delta = \frac{\Delta f}{\text{SNR}}$$



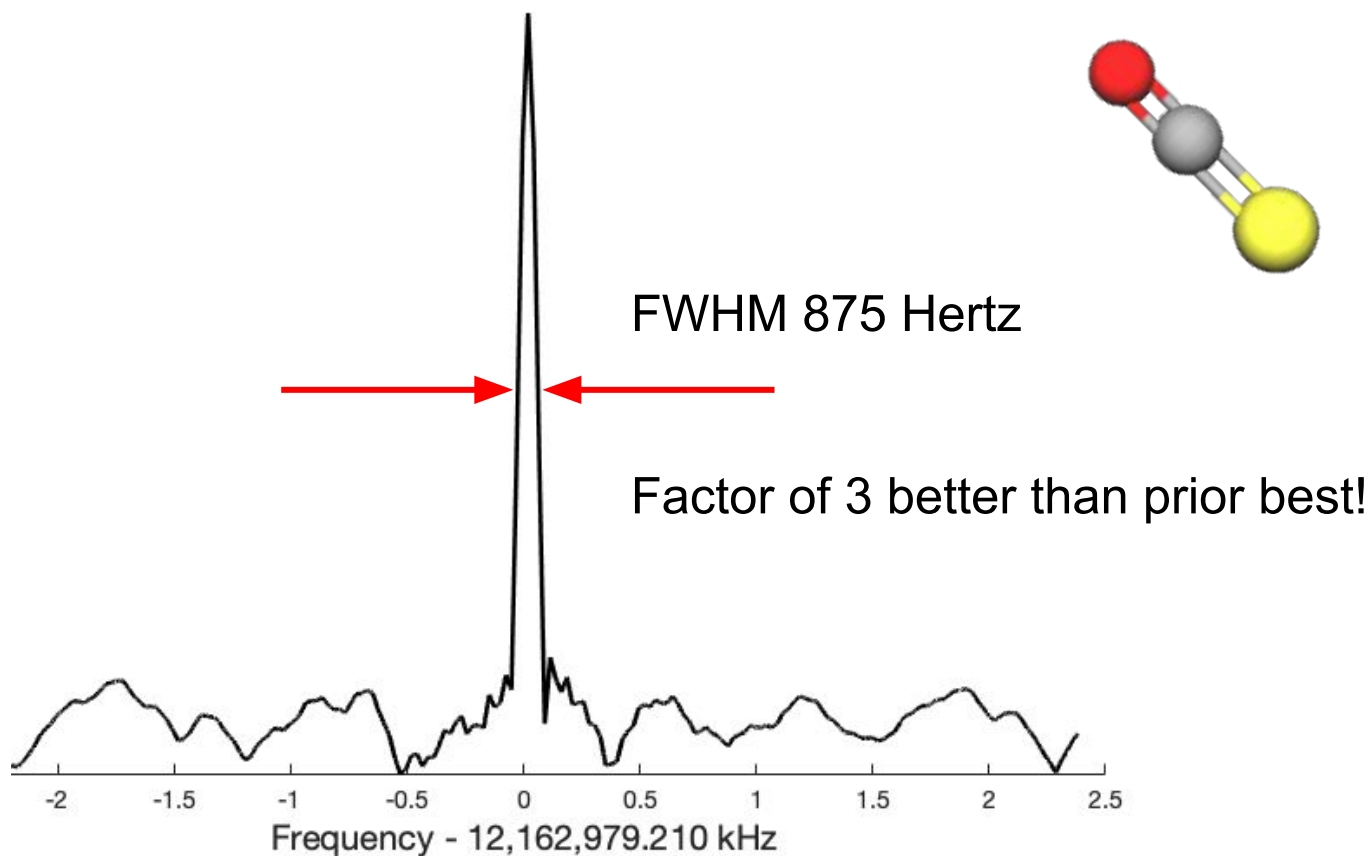
What if we stretched the cavity in one dimension?



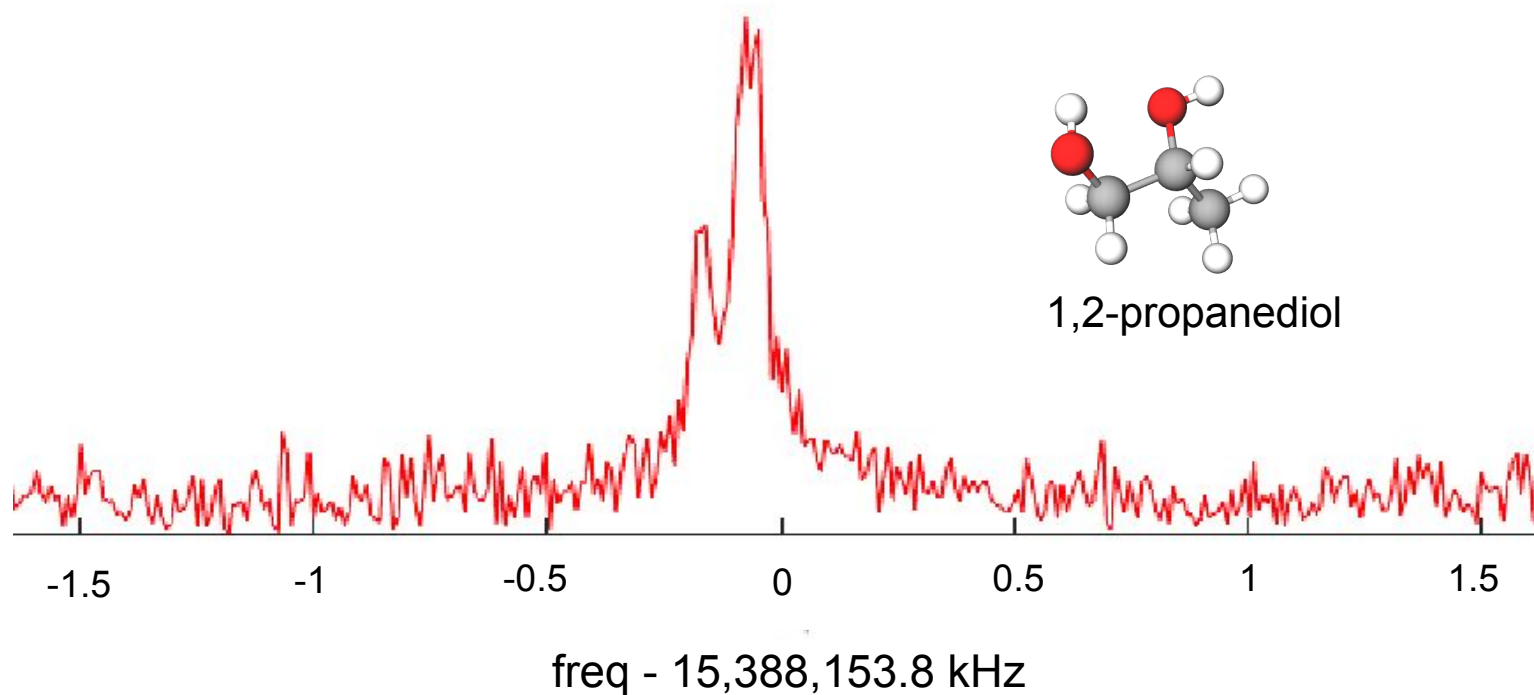
Collimate well enough to stay between nodes in mode



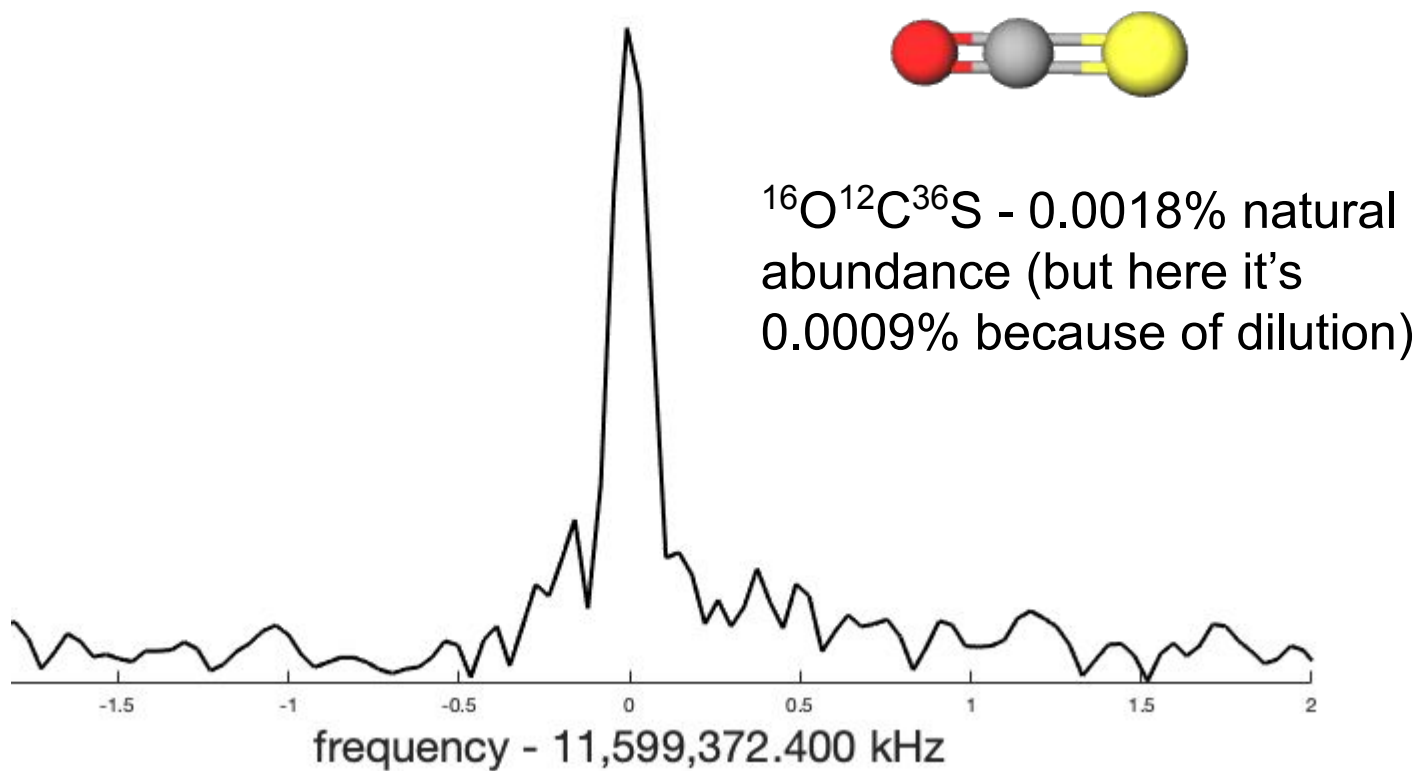
Well that worked spectacularly well



Regular molecules turn out to be a messy soup



How sensitive is it?



Anyone have any ideas?

Thanks for your time and attention!



the David &
Lucile Packard
FOUNDATION

The Whited Family



Daniel Sorensen
Dr. Greta Koumarianou
Ben Riley
Irene Wang
Dylan Finestone
Dave Patterson



The issue of tuning the cavity

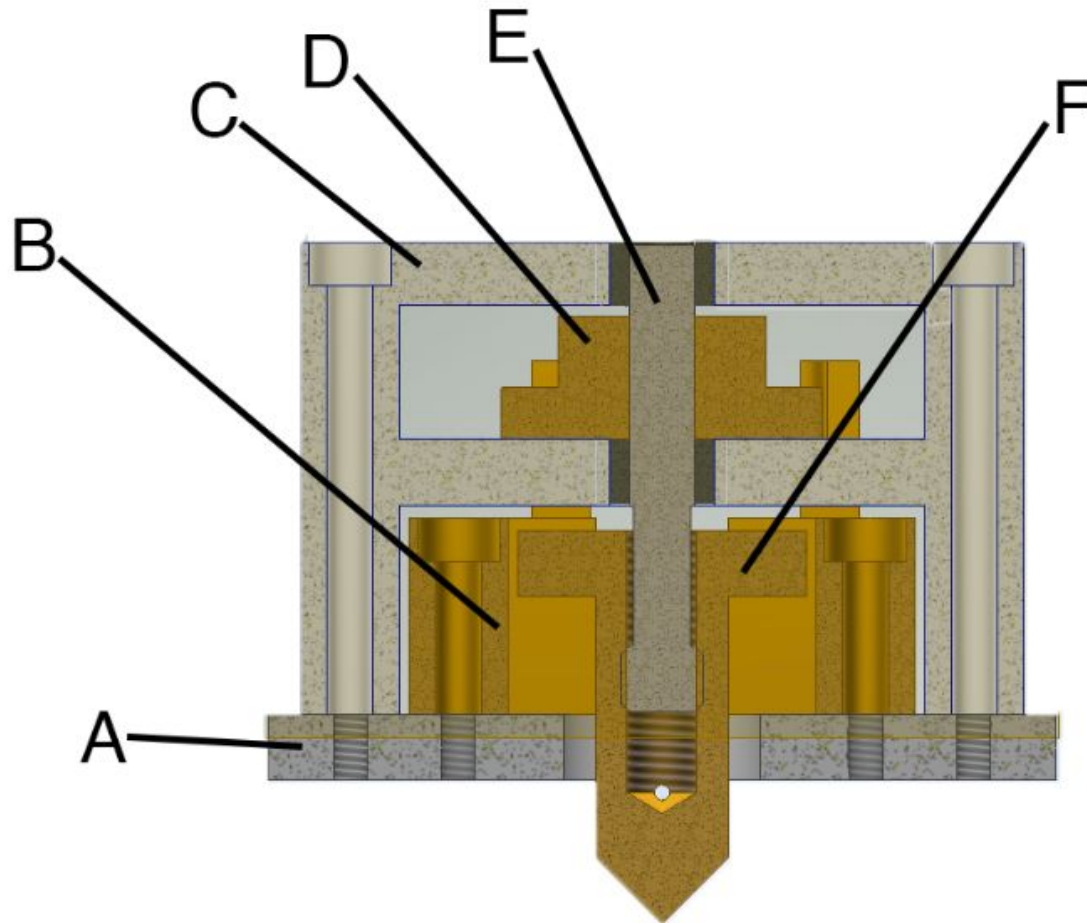


Figure courtesy Daniel Sorensen

