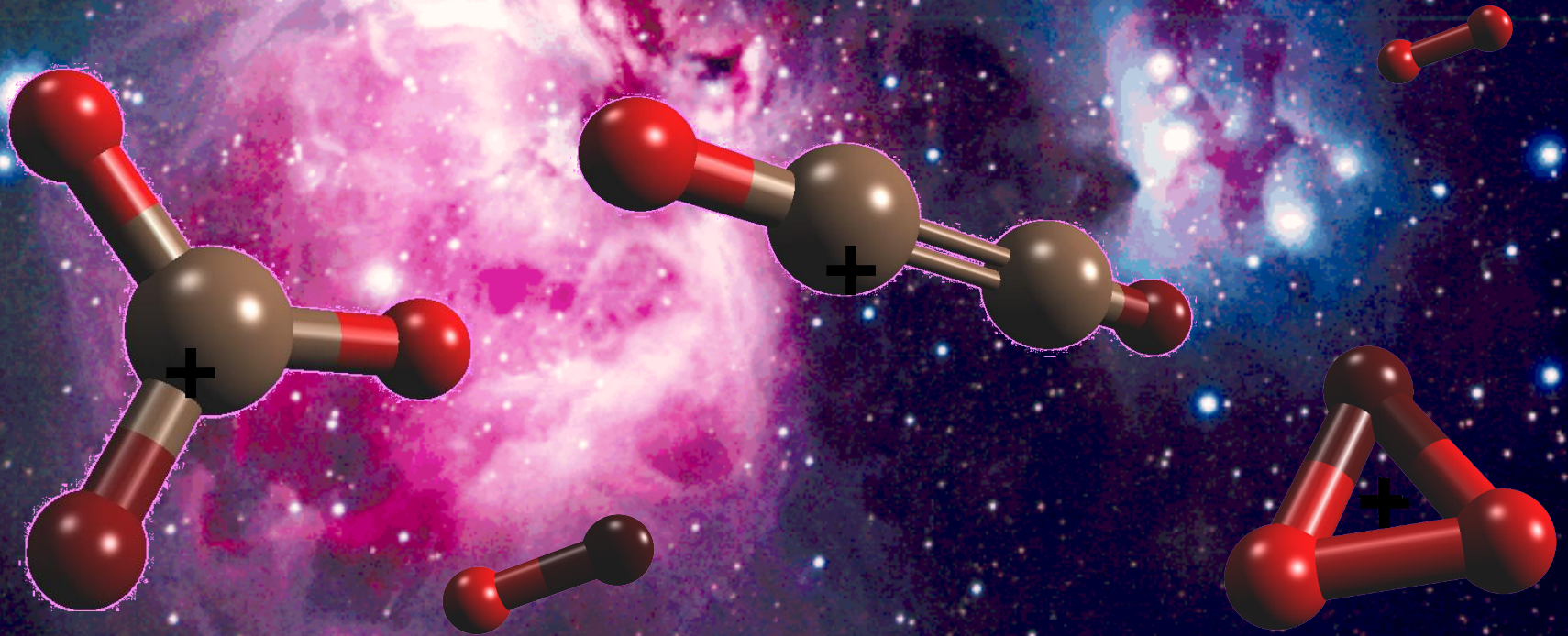


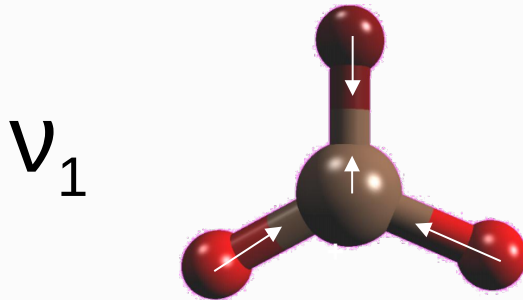
Vibrational and rotational spectroscopy of CD_2H^+



Oskar Asvany, Pavol Jusko, Sandra Brünken,
Stephan Schlemmer
Urbana-Champaign, June 2016

spectroscopy of CD_2H^+

- first IR spectra by Oka



Jagod et al., J. Mol. Spectr., 153, 666 (1992)

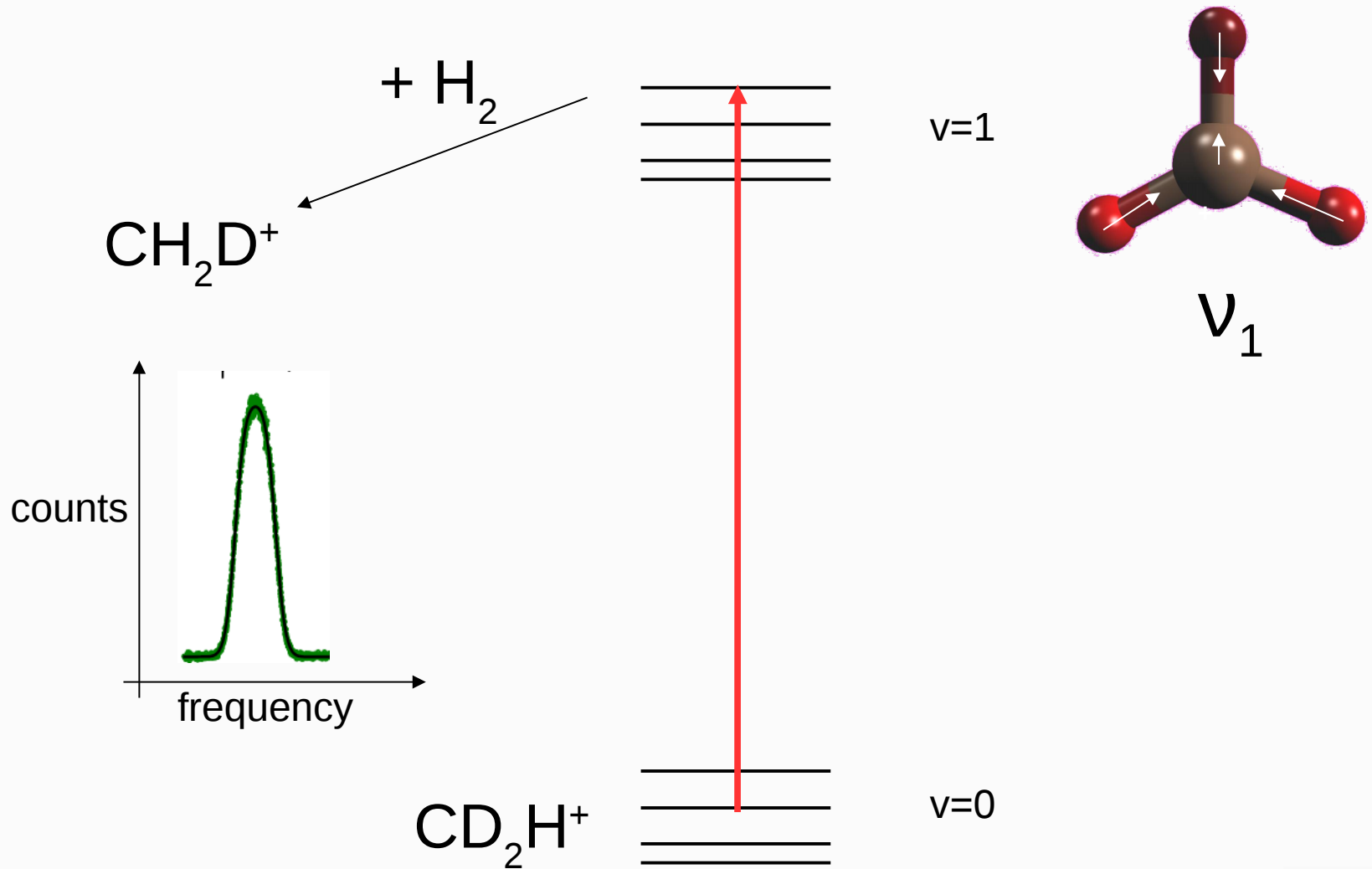
measured ~300 lines
with ~90 MHz accuracy

band is perturbed

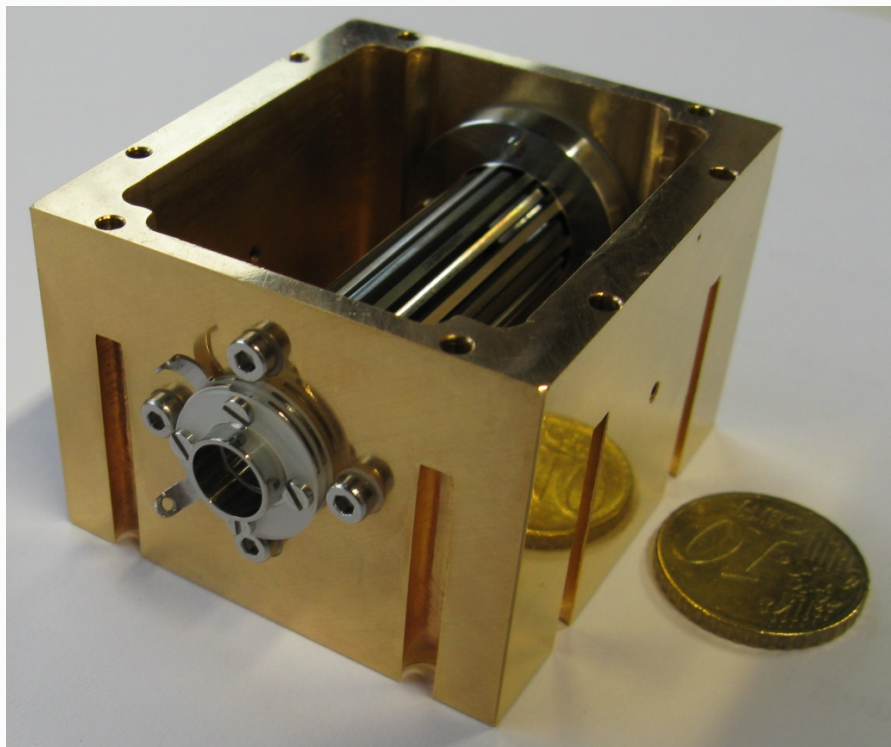
- no pure rotational lines up to date

- potential interest for ISM

Laser induced reactions LIR



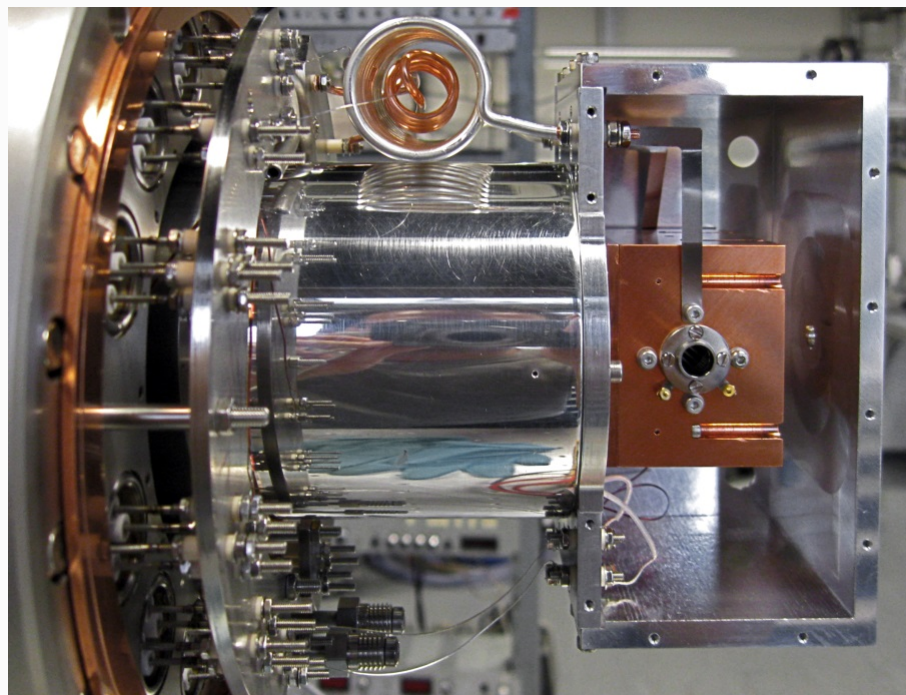
reaching cryogenic temperatures ...



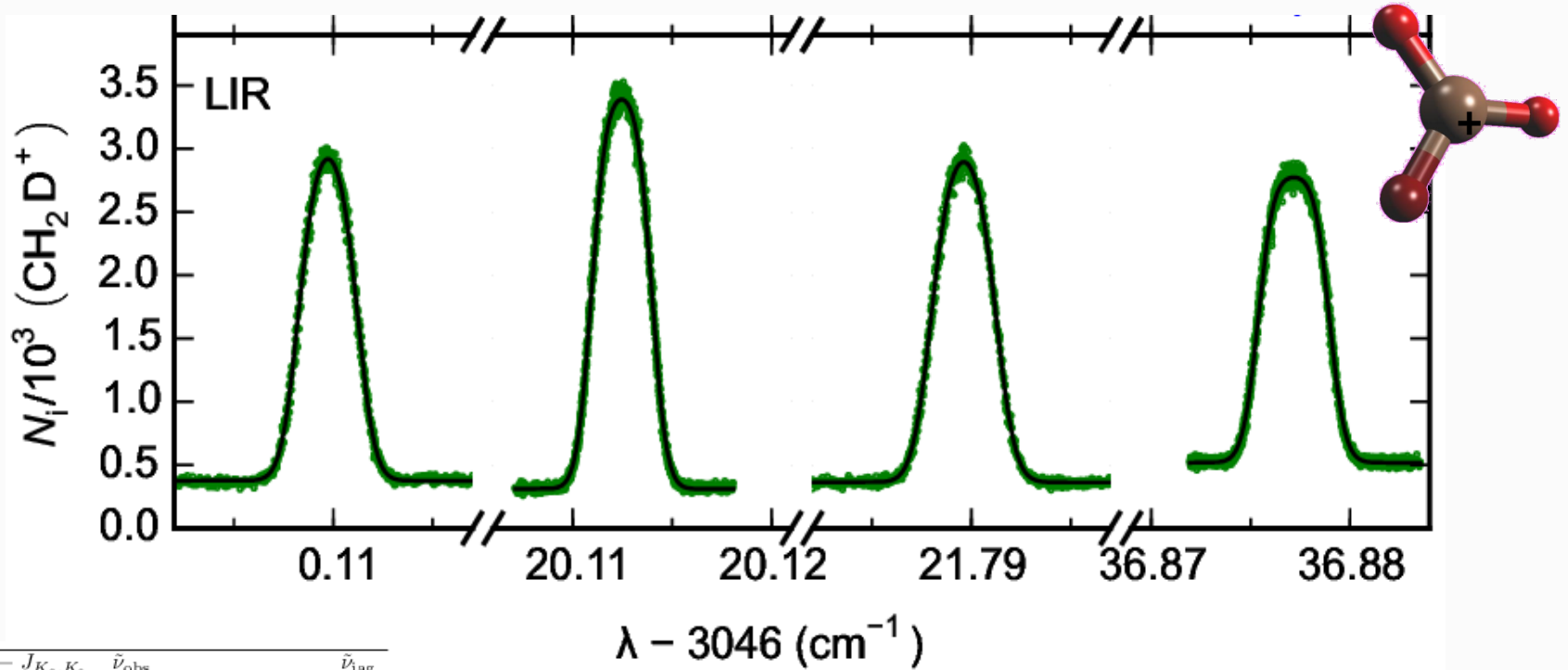
22-pole ion trap

Phys Scr. T59, 256 (1995)

Rev. Sci. Instr. 81, 076102 (2010)



measured 108 transitions of ν_1 band of CD_2H^+

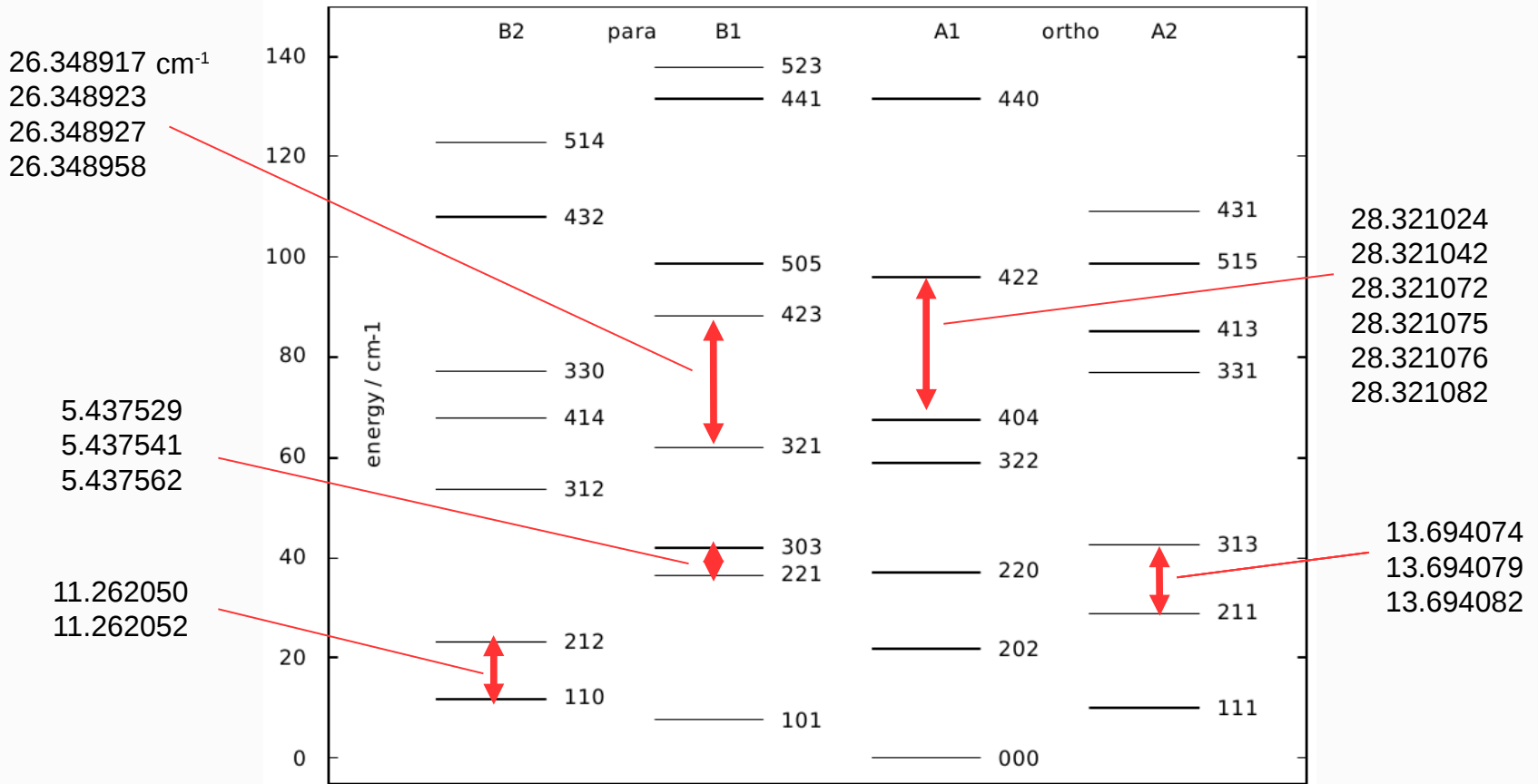


$J_{K_a, K_c}^{\leftarrow} \leftarrow J_{K_a, K_c}$	$\tilde{\nu}_{\text{obs}}$	$\tilde{\nu}_{\text{ag}}$
3 ₀₃ ← 4 ₃₂	2989.936816(8)	-
2 ₀₂ ← 3 ₃₁	3000.993880(6)	-
3 ₁₃ ← 4 ₂₂	3002.492024(6)	3002.493
3 ₂₂ ← 4 ₃₁	3005.545962(6)	3005.546
3 ₂₁ ← 4 ₃₂	3009.989612(7)	3009.989
4 ₀₄ ← 4 ₃₁	3014.160467(10)	-
2 ₂₁ ← 3 ₃₀	3015.154432(5)	3015.153
2 ₂₀ ← 3 ₃₁	3016.081427(3)	3016.082
2 ₁₂ ← 3 ₂₁	3017.080900(5)	-
3 ₀₃ ← 3 ₃₀	3020.791029(8)	-
3 ₁₂ ← 4 ₂₃	3021.035368(2)	3021.034
2 ₁₁ ← 3 ₂₂	3025.820550(3)	3025.818
1 ₁₁ ← 2 ₂₀	3028.891541(3)	3028.889
3 ₂₂ ← 4 ₁₃	3029.342476(8)	3029.340
.....		

use frequency comb (FC) to calibrate frequency

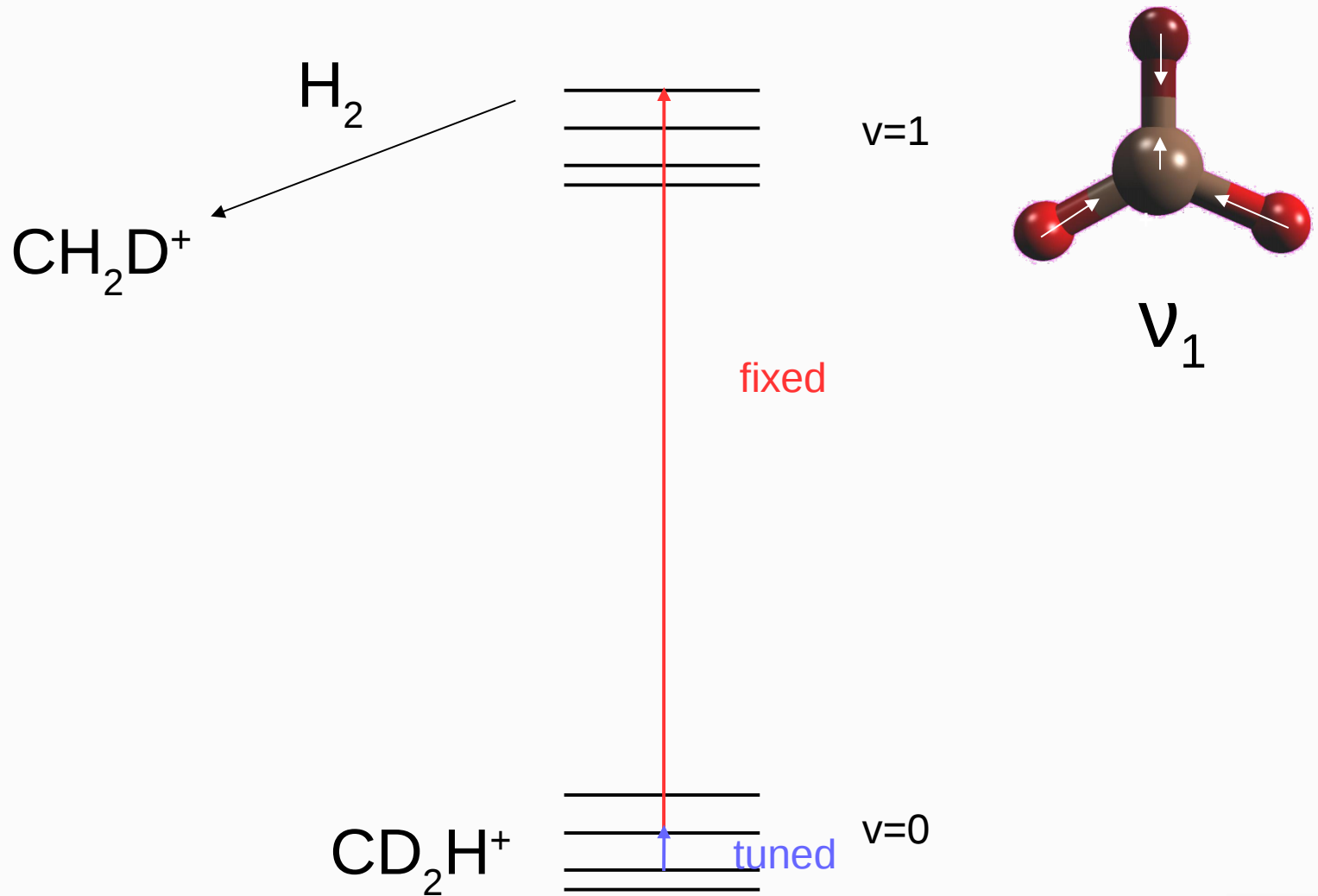


plenty of combination differences ...

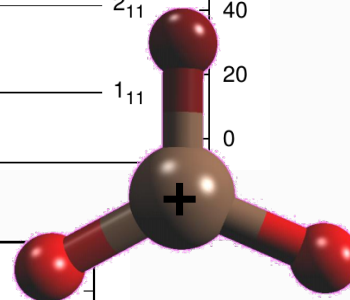
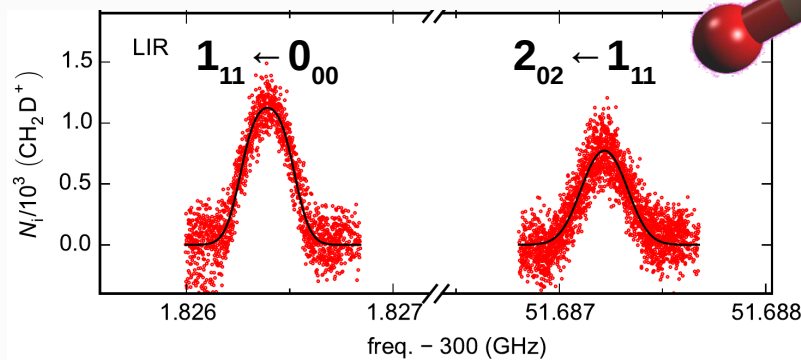
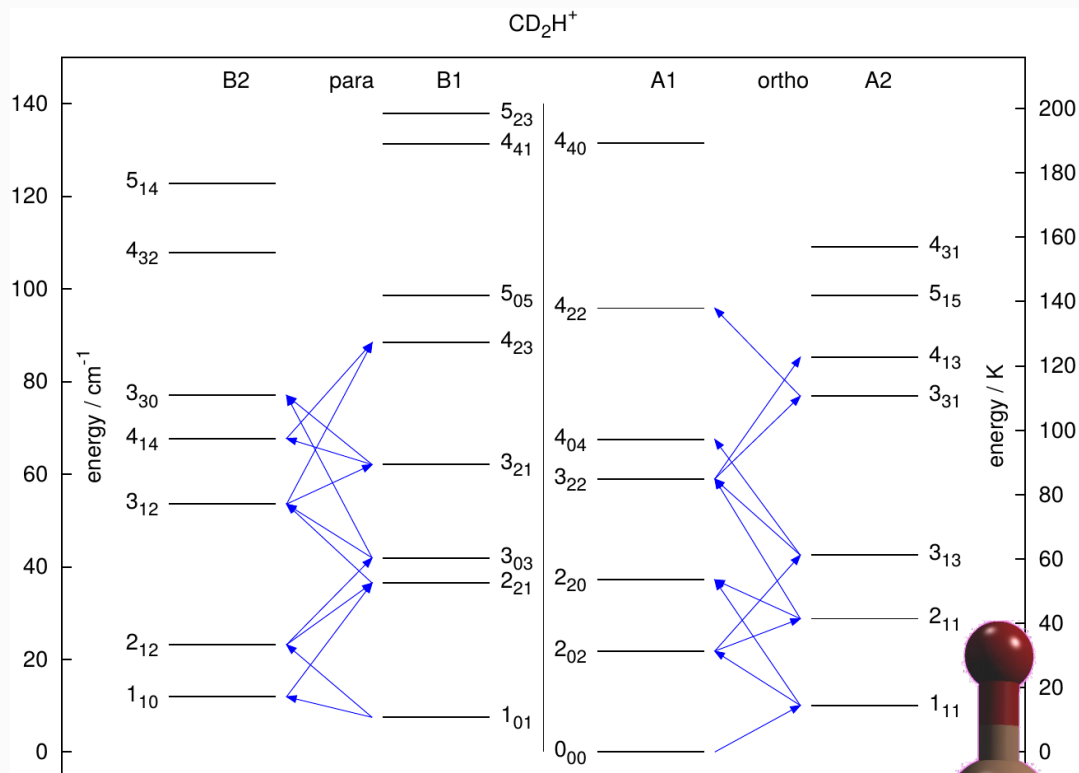


... give good definition of ground state

Double resonance spectroscopy

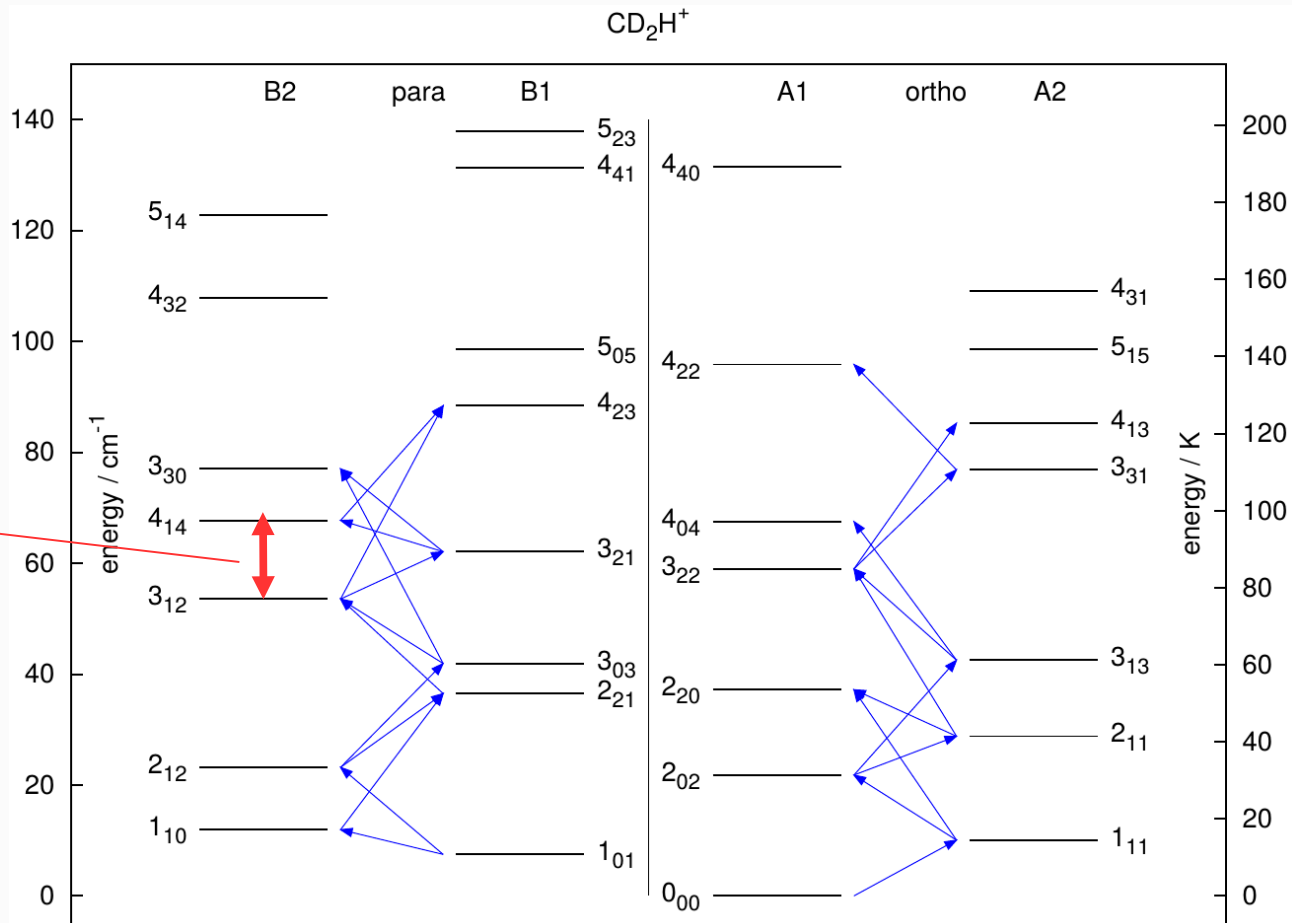


measured 25 rotational transitions



again combination differences

14.178647 cm⁻¹
 14.178660
 14.1786686
 14.1786687
 14.178683
 14.178727



Summary + outlook + thanks:

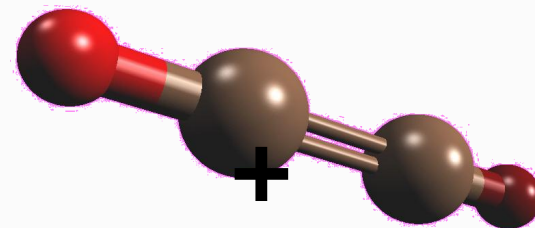
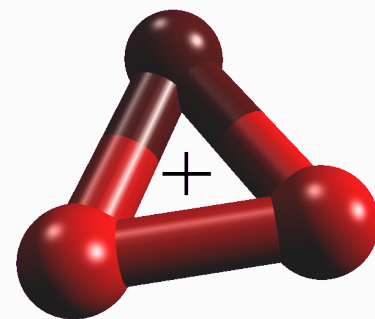
- double resonance rotational spectroscopy quite powerful

- further targets:

H_2D^+ , D_2H^+ talk WI05 P. Jusko

CH_2D^+ completed

C_2HD^+ soon



thanks to:
electrical & mechanical workshops
Funding: SFB 956

4 K trap machine COLTRAP

