

High Resolution Laser Spectroscopy of Rhodium Monobromide

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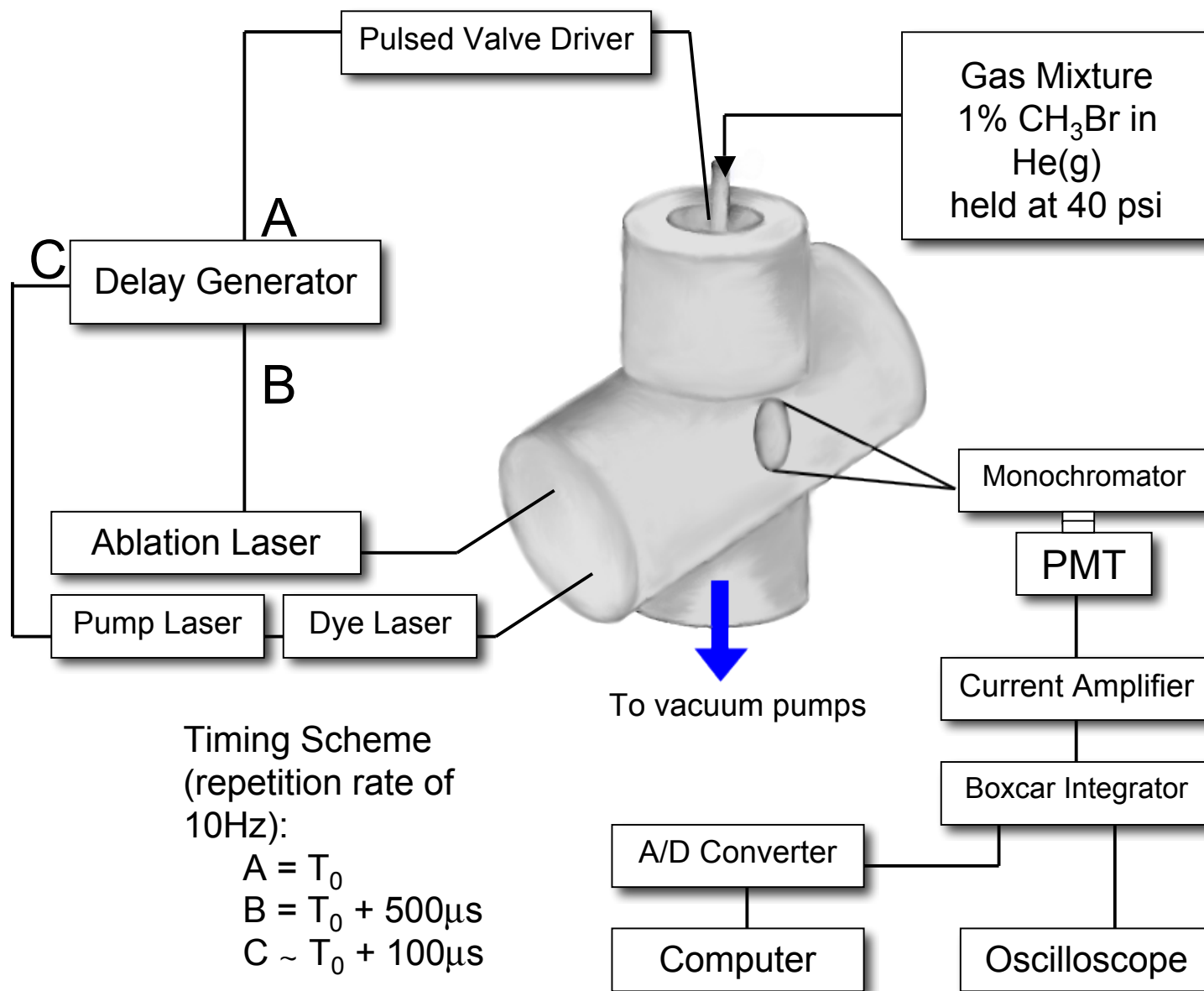
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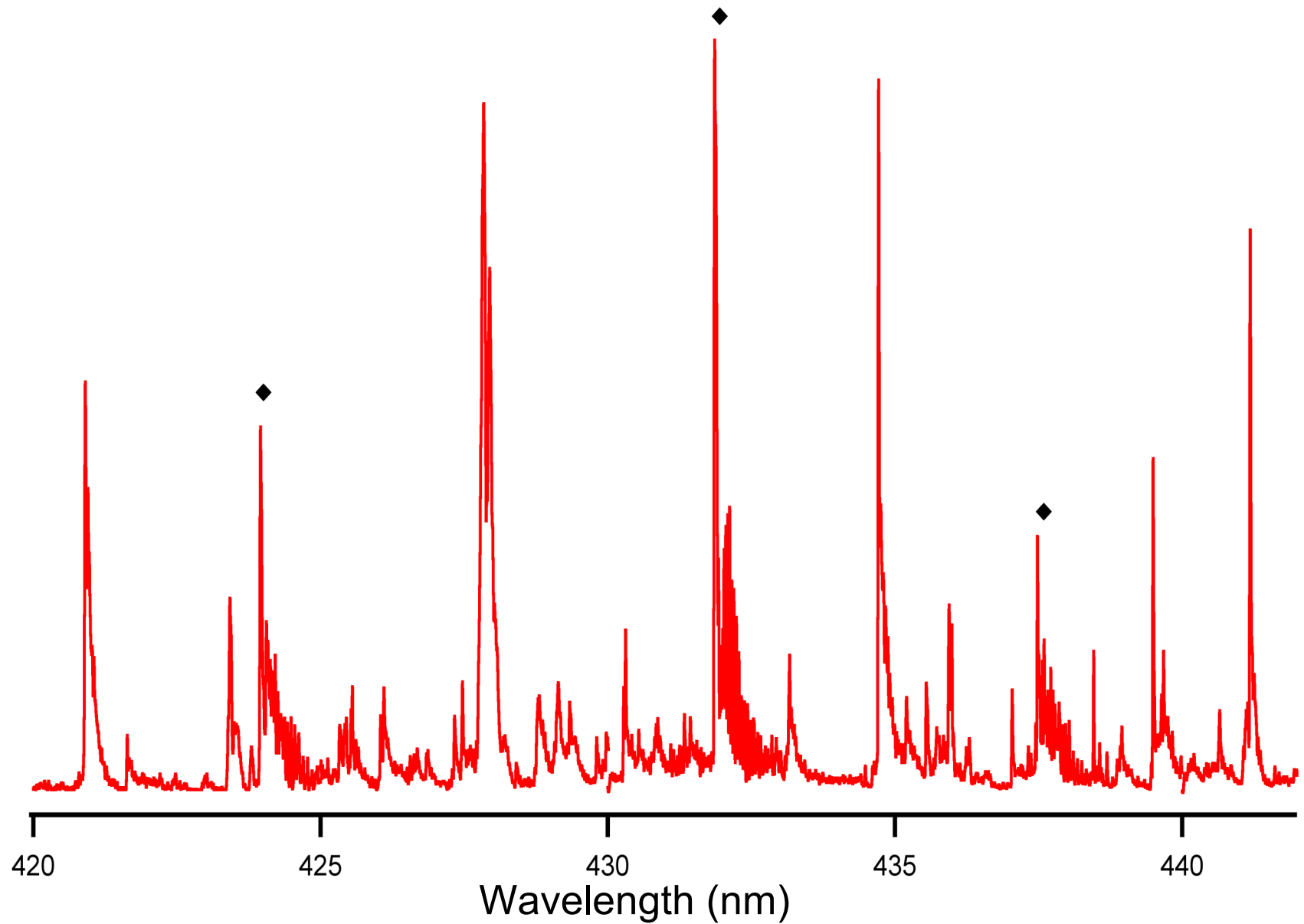
Previous Work on Pertinent Rhodium Diatomics

- **RhH**: Balfour et al., J. Mol. Spectroc. 201, 244(2000).
 - $^3\Delta_3$ from $\delta^3\pi^4\sigma^1$ configuration
- **RhF**: Li et al., J. Chem. Phys. 121, 2591(2004).
 - $^3\Pi_2$ from $\delta^4\pi^3\sigma^1$ configuration
- **RhCl**: Shepard et al., J. Mol. Spectrosc. 234, 99(2005).
 - $^3\Pi_2$ from $\delta^4\pi^3\sigma^1$ configuration
- **RhBr Theory**: Cheng et al., J. Comp. Chem. 28, 2190(2007).
 - $^3\Delta_3$ from $\delta^3\pi^4\sigma^1$ configuration for RhF, RhCl, RhI
 - $^3\Pi_2$ from $\delta^4\pi^3\sigma^1$ configuration for RhBr

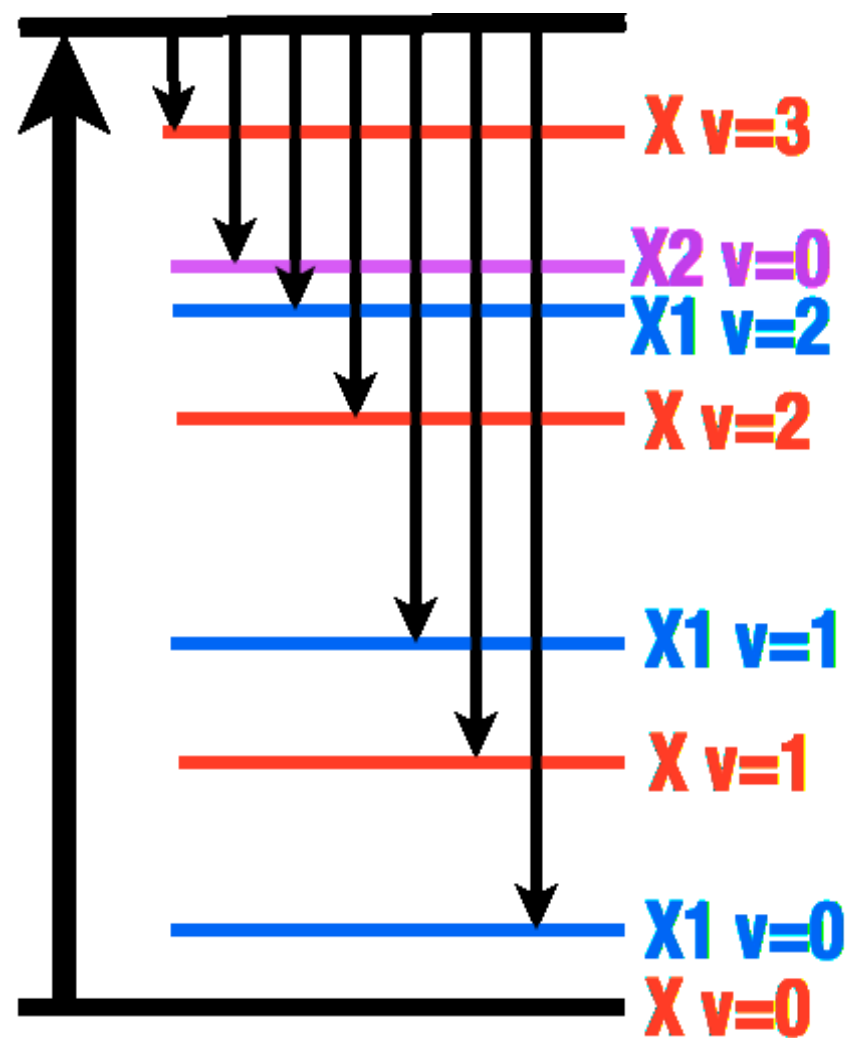
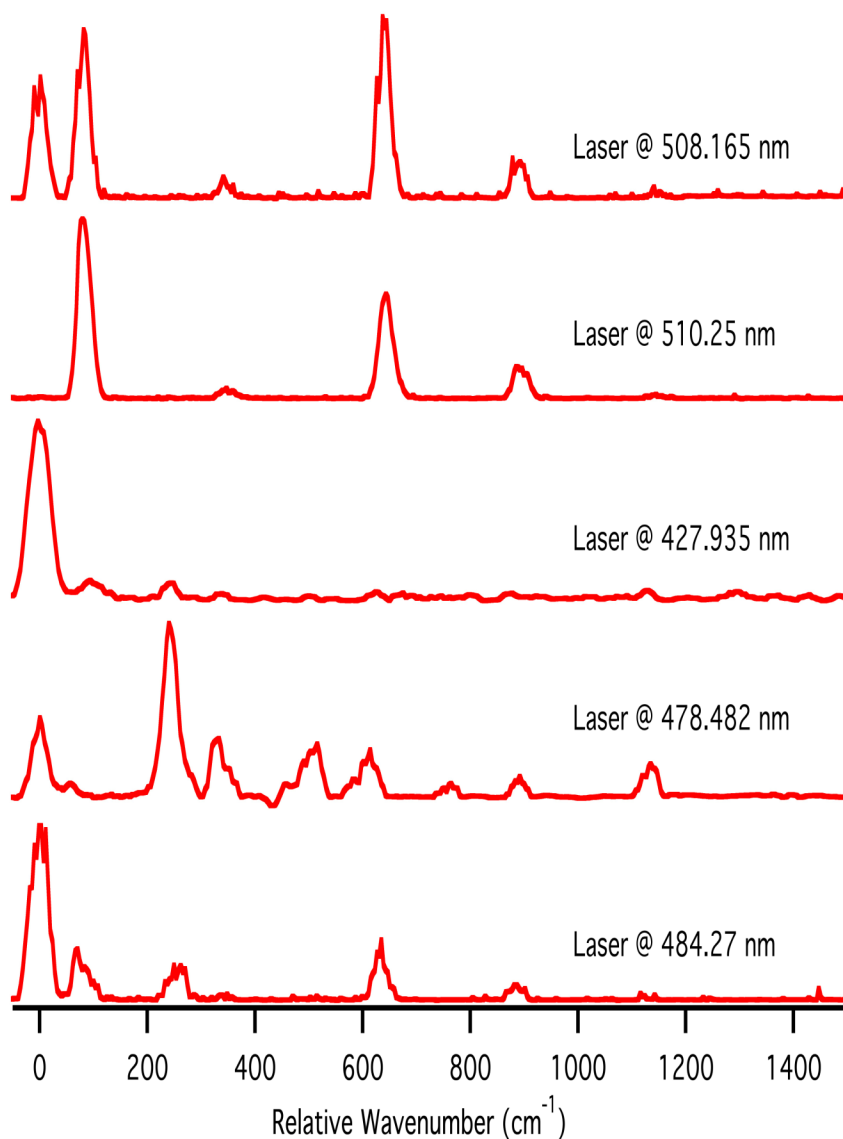
Apparatus



Low Resolution Survey



Dispersed Fluorescence



Equilibrium Molecular Constants and Bond Strengths

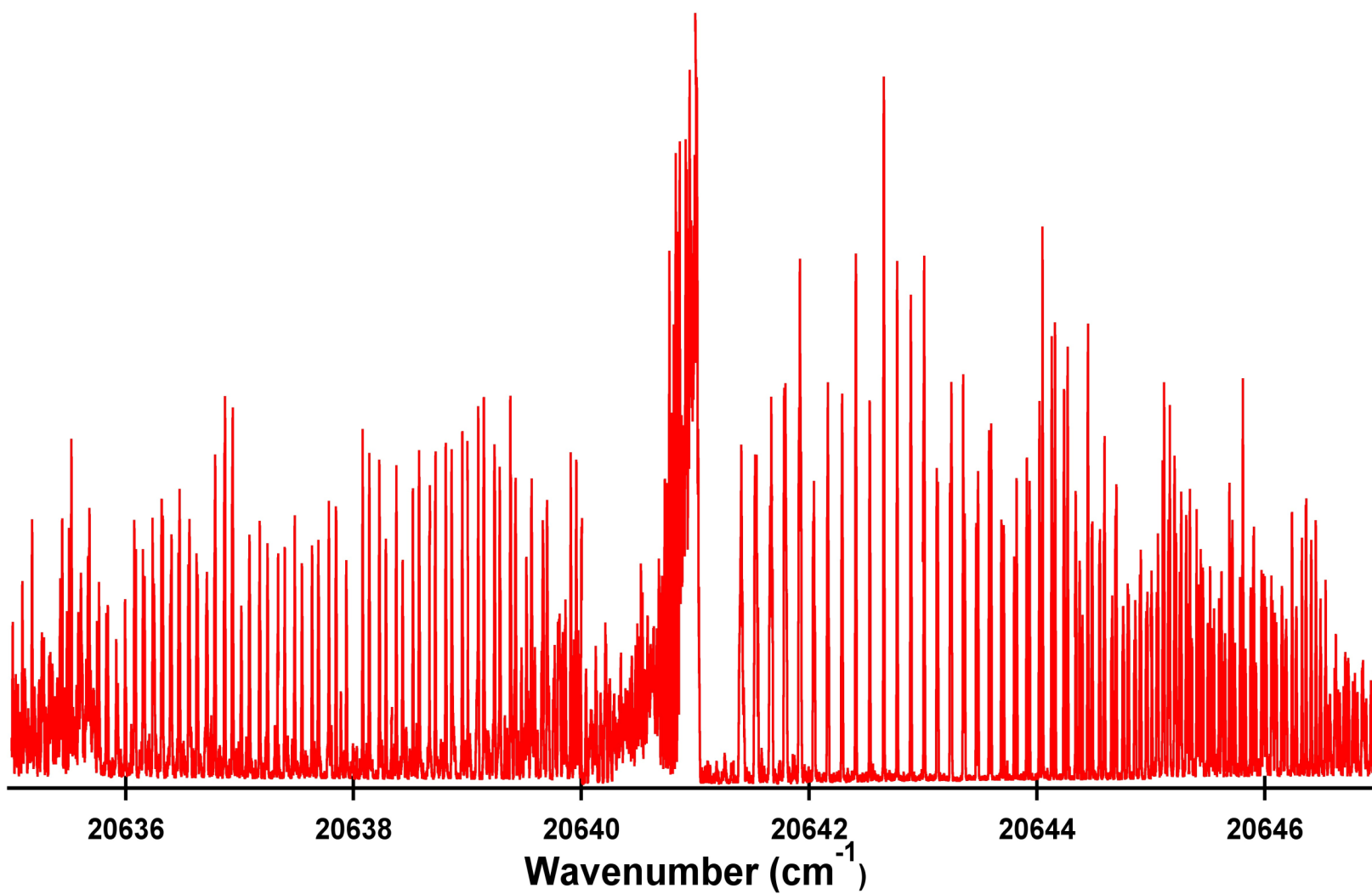
	<i>Ground State X</i>	<i>Lower State X1</i>
ω_e (cm ⁻¹)	260(8)	268(8)
$\omega_e x_e$ (cm ⁻¹)	2.0(1)	6.0(2)
k (N/m)	180	190

RhF: 575 cm⁻¹, 312 N/m
RhCl: 348 cm⁻¹, 186 N/m

HF: 914 N/m
HCl: 516 N/m
HBr: 411 N/m

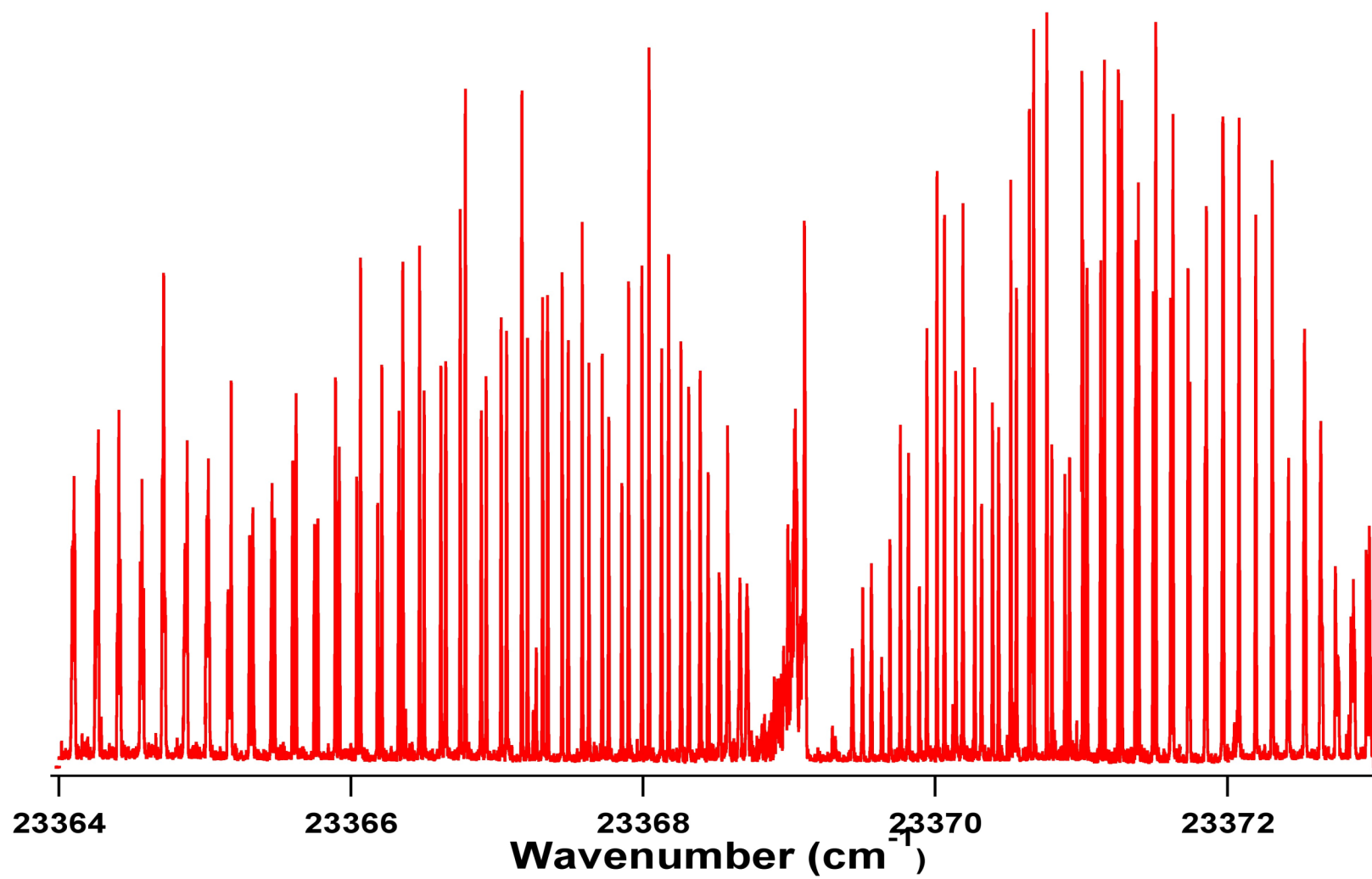
High Resolution

Strong Q-branch



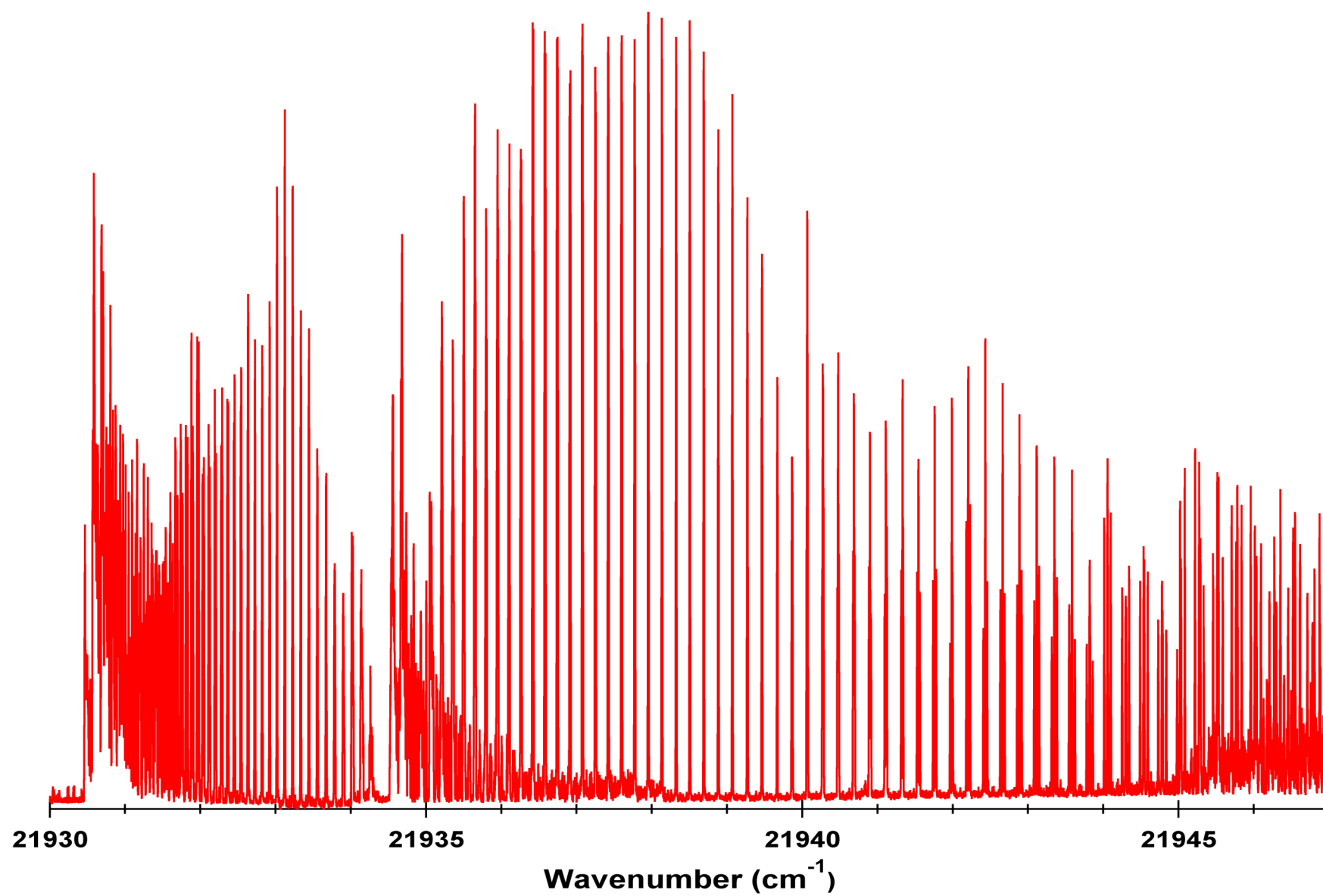
High Resolution

Weak Q-branch



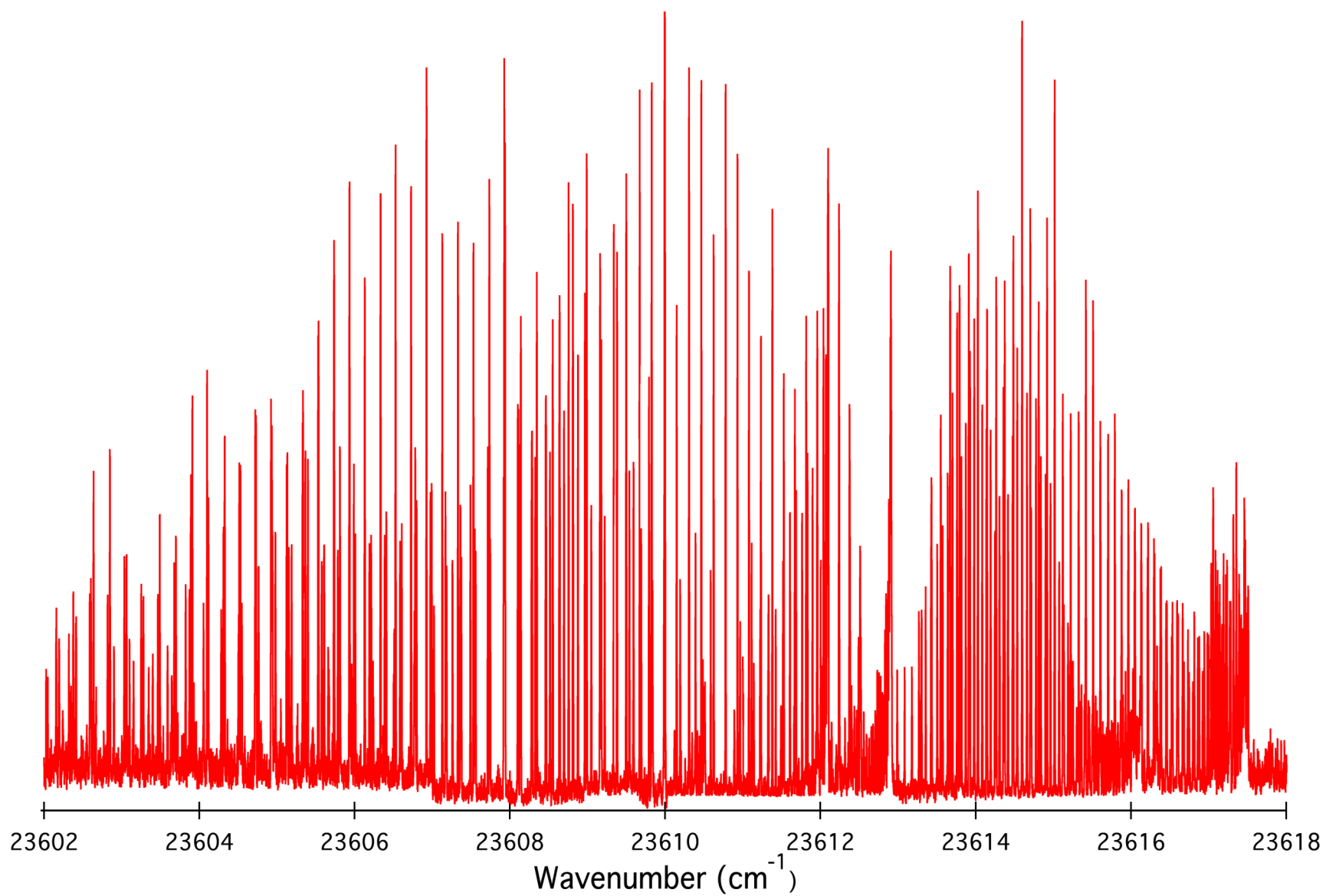
High Resolution

P-head

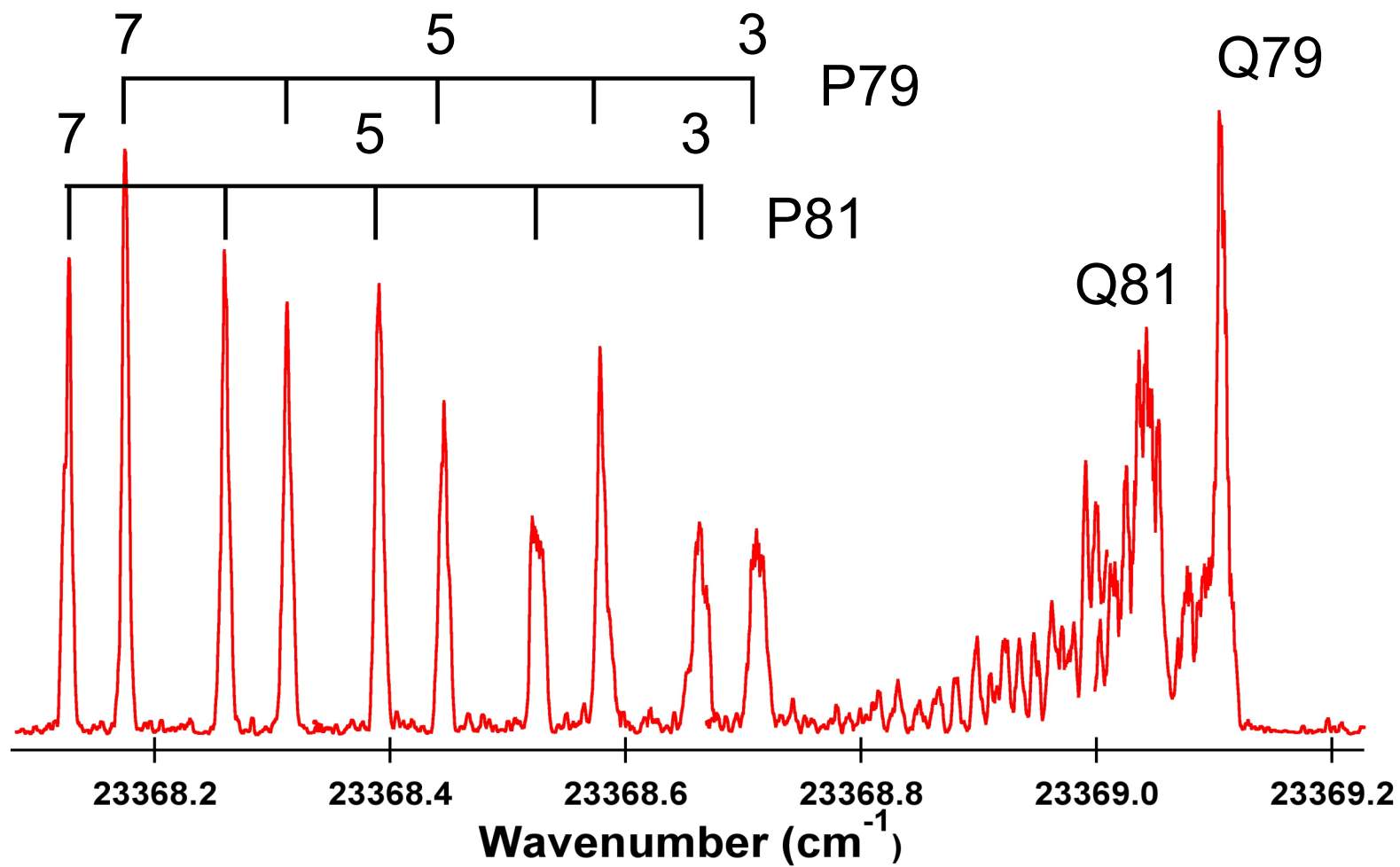


High Resolution

R-head

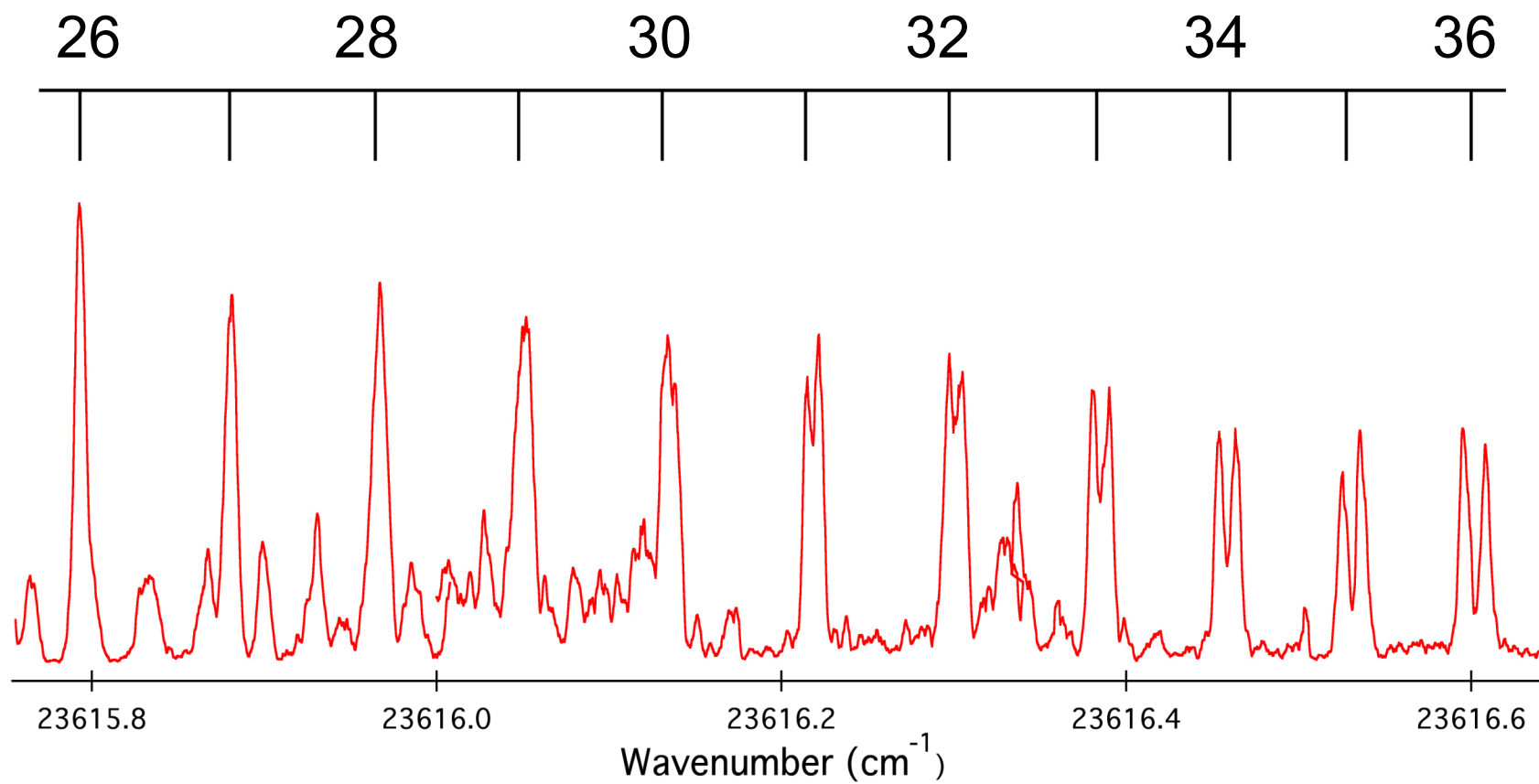


Two Isotopologues



Λ -Doubling

Rh⁷⁹Br



Preliminary Polynomial Fits

Rh⁸¹Br

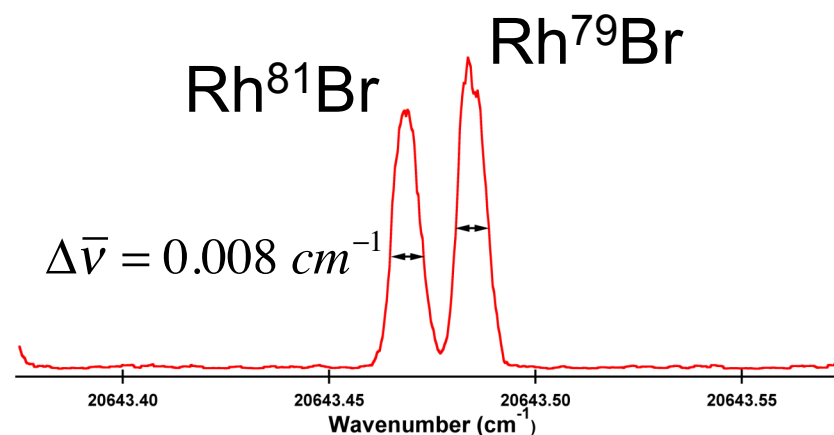
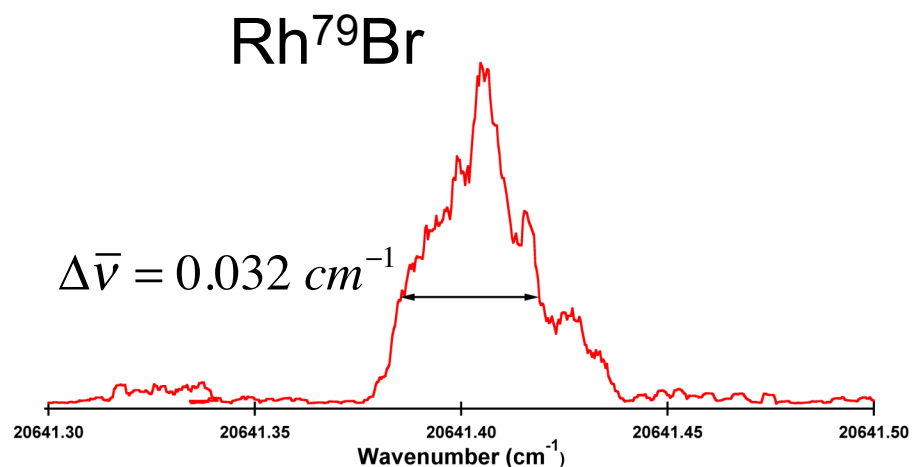
$\Omega' - \Omega''$	$T'_0 \text{ (cm}^{-1}\text{)}$	$B' \text{ (cm}^{-1}\text{)}$	$D' \text{ (cm}^{-1}\text{)}$	$B'' \text{ (cm}^{-1}\text{)}$	$D'' \text{ (cm}^{-1}\text{)}$	$q'' \text{ (cm}^{-1}\text{)}$	$q''_d \text{ (cm}^{-1}\text{)}$
2 - 2	23612.37(1)	Perturbed					
2 - 2	23610.4944(8)	0.063003(5)	$-1.09(2) \times 10^{-6}$	0.064849(5)	$3.79(11) \times 10^{-9}$		
2 - 2	23369.0473(5)	0.064610(12)	$4(5) \times 10^{-9}$	0.064926(13)	$2.13(56) \times 10^{-8}$	$4.54(47) \times 10^{-9}$	
2 - 2	21934.5344(5)	0.065964(15)	$5.77(82) \times 10^{-8}$	0.064833(15)	$6.89(85) \times 10^{-8}$	$4.72(81) \times 10^{-9}$	
2 - 2	20641.0323(5)	0.064568(11)	$-1.64(54) \times 10^{-8}$	0.064953(11)	$1(5) \times 10^{-9}$		$7.17(49) \times 10^{-9}$

Future Work

- Assign the remaining bands
- Perform a global fit
- Try to resolve the apparent hyperfine structure

R(2)

R(19)



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Questions?