

練習実験報告

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Glavano Sepctrum

REMPI scan

- Selected peaks

- Radius and angular distributions

- Peak assignments

- Speed correction

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Glavano Sepctrum



Fig. 1: Wavelen. correction

Glavano Sepctrum

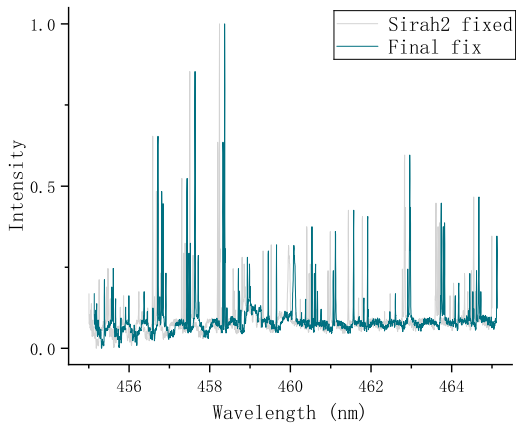


Fig. 1: Wavelen. correction

Glavano Sepctrum

Correction

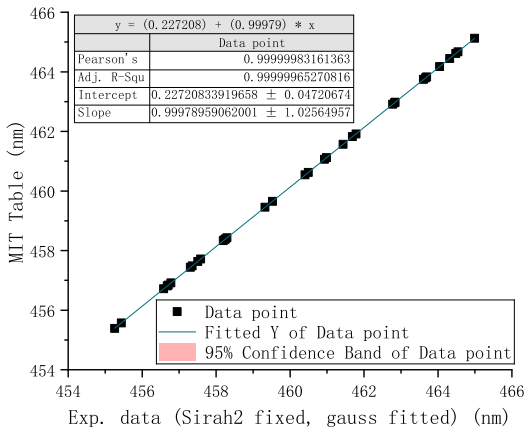


Fig. 2: Correction function

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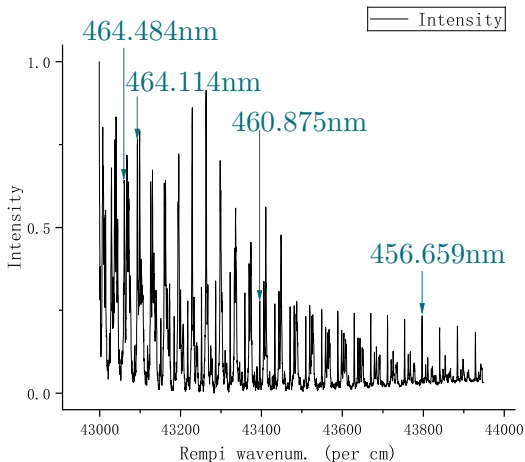
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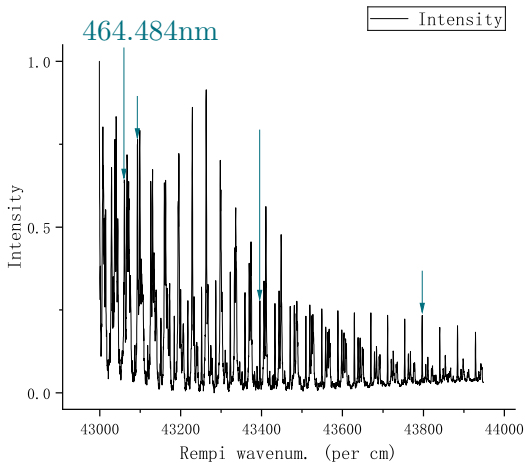
Selected peaks

Radius and angular distributions

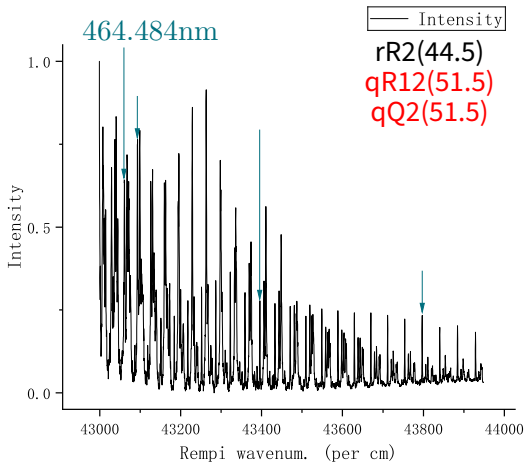
Peak assignments

Speed correction

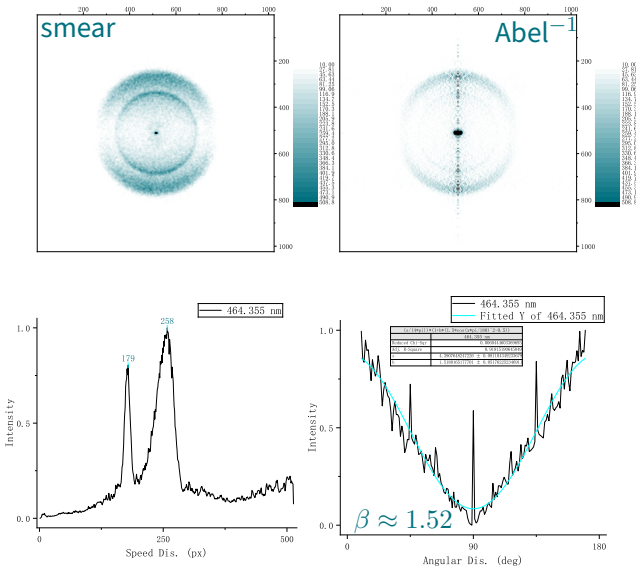
Peak 1



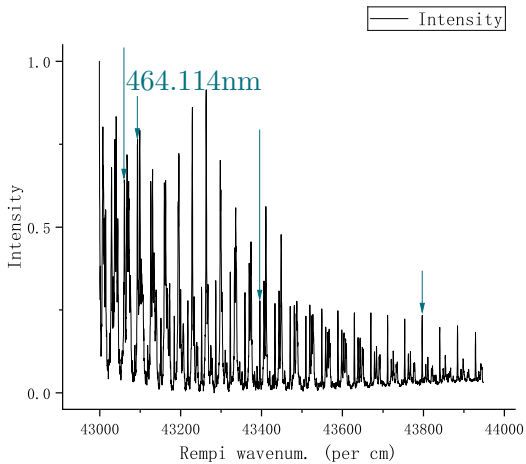
Peak 1



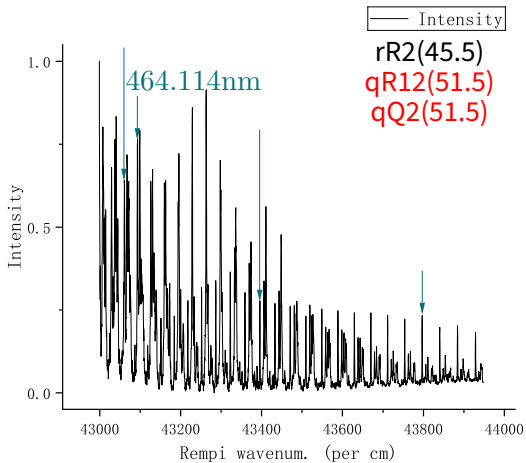
Peak 1



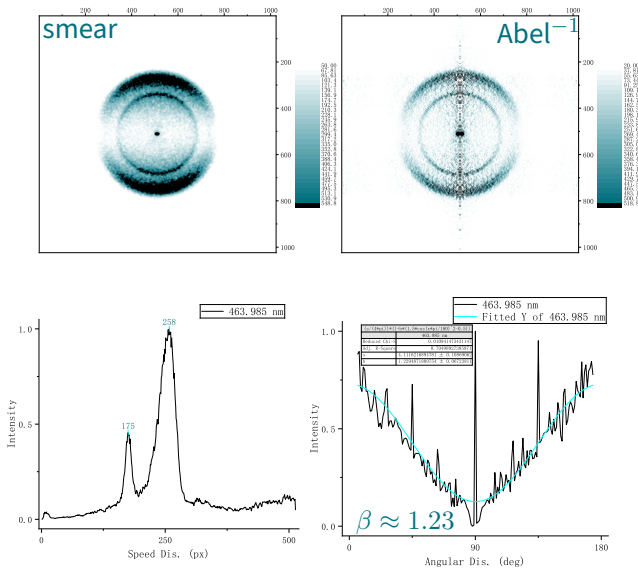
Peak 2



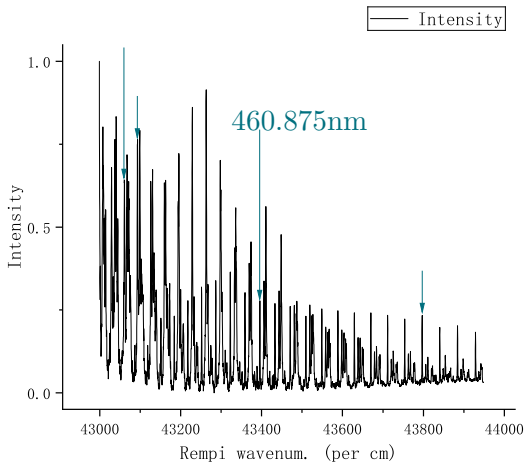
Peak 2



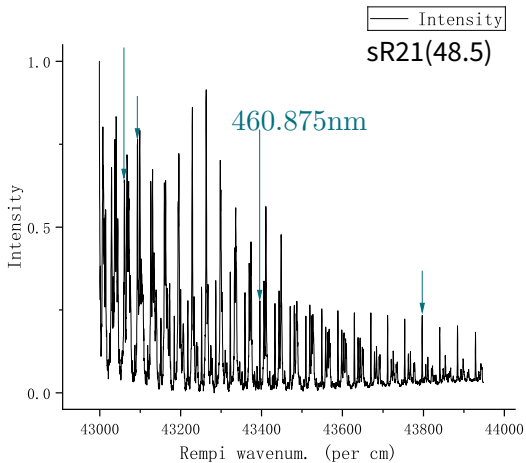
Peak 2



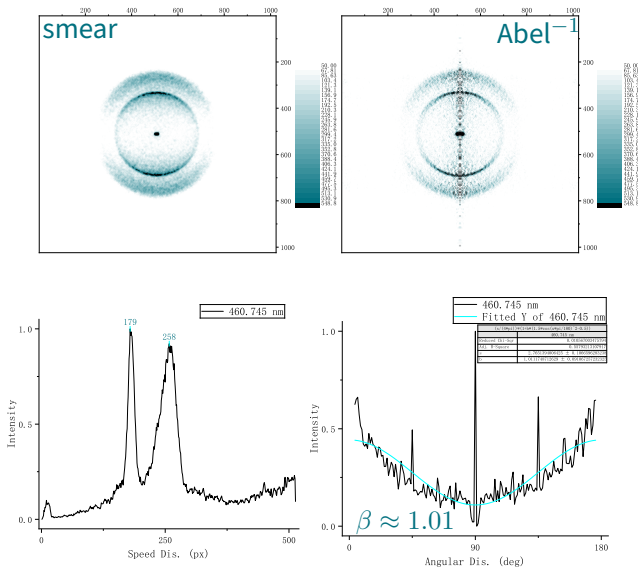
Peak 3



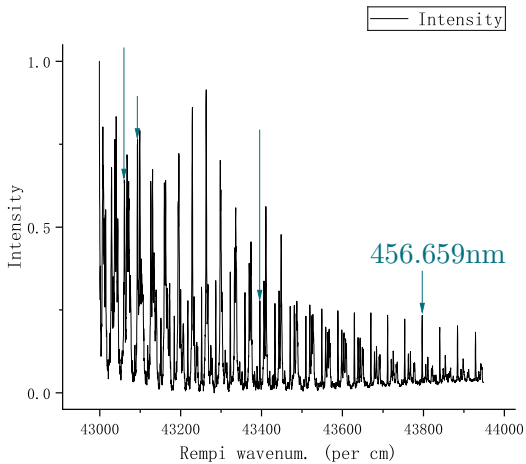
Peak 3



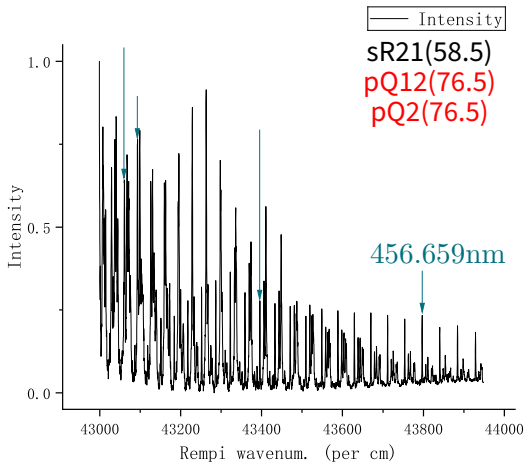
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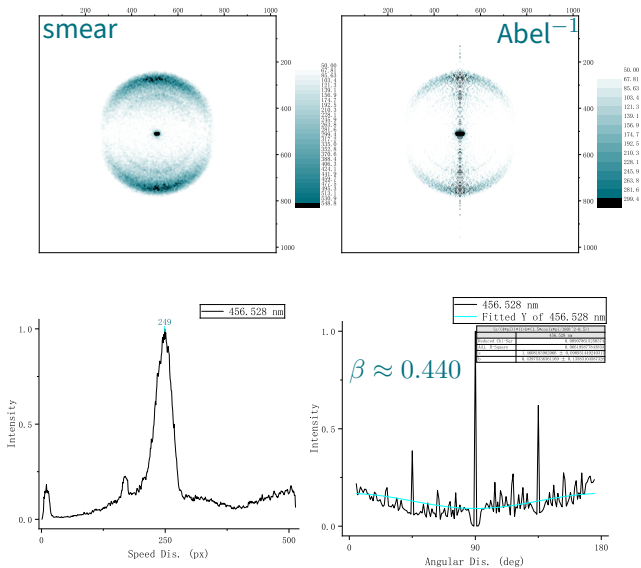
Peak 4



Peak 4



Peak 4



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464.484nm $\approx 43058.49\text{cm}^{-1}$	464.114nm $\approx 43092.81\text{cm}^{-1}$	460.875nm $\approx 43395.69\text{cm}^{-1}$	456.659nm $\approx 43796.34\text{cm}^{-1}$
px = 258	px = 258	px = 258	px = 249
<i>rR2</i> 44.5 <i>qR12</i> 51.5 <i>qQ2</i> 51.5	<i>rR2</i> 45.5 <i>qR12</i> 51.5 <i>qQ2</i> 51.5	<i>sR21</i> 48.5	<i>sR21</i> 58.5 <i>pQ12</i> 76.5 <i>pP2</i> 76.5

Notice

Colored assignments are mismatched, and will not be used to calculate.

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Speed correction

	E_{total}	$E_{\text{bond}}(\text{O}-\text{NO})^1$	$E_{\text{int.}}(\text{NO})$
Peak 1 464.484nm	43 058.49cm ⁻¹	25 128.57cm ⁻¹	$E(v = 1) + E(J = 44)$
Peak 2 464.114nm	43 092.81cm ⁻¹		$E(v = 1) + E(J = 45)$
Peak 3 460.875nm	43 395.69cm ⁻¹		$E(v = 1) + E(J = 48)$
Peak 4 456.659nm	43 796.34cm ⁻¹		$E(v = 1) + E(J = 58)$

¹Rémy Jost et al. *The Journal of Chemical Physics* **105.3** (July 1996).

Speed correction

	E_{total}	$E_{\text{bond}}(\text{O}-\text{NO})^2$	$E_{\text{int.}}(\text{NO})$
Peak 1 464.484nm	43 058.49cm ⁻¹		3525.074 362 5cm ⁻¹ + $E(J = 44)$
Peak 2 464.114nm	43 092.81cm ⁻¹		3525.074 362 5cm ⁻¹ + $E(J = 45)$
Peak 3 460.875nm	43 395.69cm ⁻¹	25 128.57cm ⁻¹	3525.074 362 5cm ⁻¹ + $E(J = 48)$
Peak 4 456.659nm	43 796.34cm ⁻¹		3525.074 362 5cm ⁻¹ + $E(J = 58)$

²Rémy Jost et al. *The Journal of Chemical Physics* **105**.3 (July 1996).

³J. Danielak et al. *Journal of Molecular Spectroscopy* **181**.2 (1997), pp. 394–402.

Speed correction

	E_{total}	$E_{\text{bond}}(\text{O}-\text{NO})^2$	$E_{\text{int.}}(\text{NO})$
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Peak 2 464.114nm	43 092.81cm ⁻¹		3525.074 362 5cm ⁻¹ + $E(J = 45)$
Peak 3 460.875nm	43 395.69cm ⁻¹	25 128.57cm ⁻¹	3525.074 362 5cm ⁻¹ + $E(J = 48)$
Peak 4 456.659nm	43 796.34cm ⁻¹		3525.074 362 5cm ⁻¹ + $E(J = 58)$

Vib. energy level³

$$E(v) = \omega_e \left(v + \frac{1}{2}\right) - \omega_e x_e \left(v + \frac{1}{2}\right)^2 + \omega_e y_e \left(v + \frac{1}{2}\right)^3.$$

²Rémy Jost et al. *The Journal of Chemical Physics* **105.3** (July 1996).

³J. Danielak et al. *Journal of Molecular Spectroscopy* **181.2** (1997), pp. 394–402.

Speed correction

	E_{total}	$E_{\text{bond}}(\text{O}-\text{NO})^4$	$E_{\text{int.}}(\text{NO})$
Peak 1 464.484nm	43 058.49cm ⁻¹	25 128.57cm ⁻¹	6848.563 763cm ⁻¹
Peak 2 464.114nm	43 092.81cm ⁻¹		6999.631 462cm ⁻¹
Peak 3 460.875nm	43 395.69cm ⁻¹		7472.976 923cm ⁻¹
Peak 4 456.659nm	43 796.34cm ⁻¹		9269.004 023cm ⁻¹

⁴Rémy Jost et al. *The Journal of Chemical Physics* **105.3** (July 1996).

⁵J. Danielak et al. *Journal of Molecular Spectroscopy* **181.2** (1997), pp. 394–402.

Speed correction

	E_{total}	$E_{\text{bond}}(\text{O}-\text{NO})^4$	$E_{\text{int.}}(\text{NO})$
Peak 1 464.484nm	43 058.49cm ⁻¹	25 128.57cm ⁻¹	6848.563 763cm ⁻¹
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Peak 3 460.875nm	43 395.69cm ⁻¹		7472.976 923cm ⁻¹
Peak 4 456.659nm	43 796.34cm ⁻¹		9269.004 023cm ⁻¹

Rot. energy level⁵

$$E(J) = B_v (J^2 + J)$$

⁴Rémy Jost et al. *The Journal of Chemical Physics* **105.3** (July 1996).

⁵J. Danielak et al. *Journal of Molecular Spectroscopy* **181.2** (1997), pp. 394–402.

Speed correction

$E_{\text{int.}}(\text{O})$	$E_{\text{trans}}(\text{total}) \approx 2.88 E_{\text{trans}}(\text{NO})$ $= E_{\text{total}} - E_{\text{bond}}(\text{O}-\text{NO}) - E_{\text{int.}}(\text{O}) - E_{\text{int.}}(\text{O})$	$E_{\text{trans}}(\text{NO})$ $= \frac{1}{2} m(\text{NO}) v^2(\text{NO})$
3P_2 (0cm^{-1})	11081.356237 cm^{-1}	1923.84656892361 cm^{-1}
	10964.608538 cm^{-1}	1903.57787118055 cm^{-1}
	10794.143077 cm^{-1}	1873.98317309028 cm^{-1}
	9398.765977 cm^{-1}	1631.73020434028 cm^{-1}
3P_1 (158.625cm^{-1})	10922.731237 cm^{-1}	1896.30750642361 cm^{-1}
	10805.983538 cm^{-1}	1876.03880868055 cm^{-1}
	10635.518077 cm^{-1}	1846.44411059028 cm^{-1}
	9240.140977 cm^{-1}	1604.19114184028 cm^{-1}
3P_0 (226.977cm^{-1})	10854.379237 cm^{-1}	1884.44083975695 cm^{-1}
	10737.631538 cm^{-1}	1864.17214201389 cm^{-1}
	10567.166077 cm^{-1}	1834.57744392361 cm^{-1}
	9171.788977 cm^{-1}	1592.32447517361 cm^{-1}

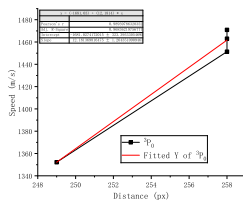
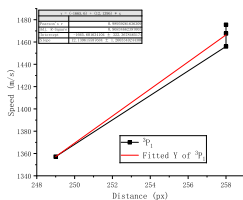
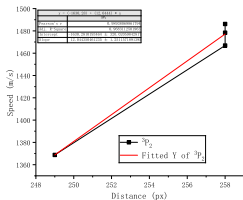
Speed correction

y Trans. energy of NO

$E_{\text{int.}}(\text{O})$	$v(\text{NO})$ $= \sqrt{\frac{2E_{\text{trans}}(\text{NO})}{m(\text{NO})}}$	Δy
3P_2 (0 cm ⁻¹)	1486.240384 m s ⁻¹	258 px
	1478.3905065 m s ⁻¹	258 px
	1466.8533085 m s ⁻¹	258 px
	1368.7622455 m s ⁻¹	249 px
3P_1 (158.625 cm ⁻¹)	1475.5645855 m s ⁻¹	258 px
	1467.6576085 m s ⁻¹	258 px
	1456.0353685 m s ⁻¹	258 px
	1357.162647 m s ⁻¹	249 px
3P_0 (226.977 cm ⁻¹)	1470.940464 m s ⁻¹	258 px
	1463.0084955 m s ⁻¹	258 px
	1451.3490265 m s ⁻¹	258 px
	1352.133667 m s ⁻¹	249 px

Speed correction

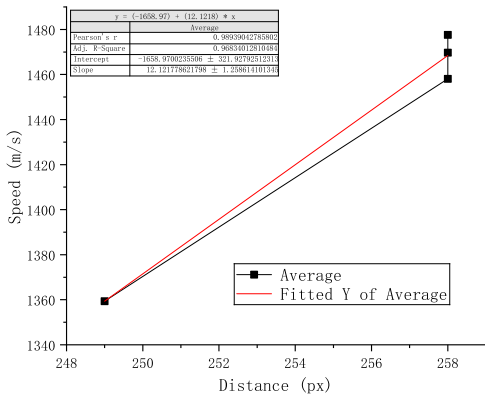
y Trans. energy of NO



$$\frac{dv}{dpx} = 12.04 \text{ m s}^{-1} / \text{px} @ {}^3P_2 \quad \frac{dv}{dpx} = 12.14 \text{ m s}^{-1} / \text{px} @ {}^3P_1 \quad \frac{dv}{dpx} = 12.18 \text{ m s}^{-1} / \text{px} @ {}^3P_0$$

Speed correction

y Trans. energy of NO



$$\frac{dv}{dpx} = 12.12 \text{ m s}^{-1} / \text{px @ Average}$$

Reference

- [1] J. Danielak et al. *Journal of Molecular Spectroscopy* **181.2** (1997), pp. 394–402.
- [2] Rémy Jost et al. *The Journal of Chemical Physics* **105.3** (July 1996).

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