

Kinetics and Dynamics on the Formation of $S_2(X^3\Sigma_g^-, a^1\Delta_g)$ in the $S(^1D) + OCS$ Reaction

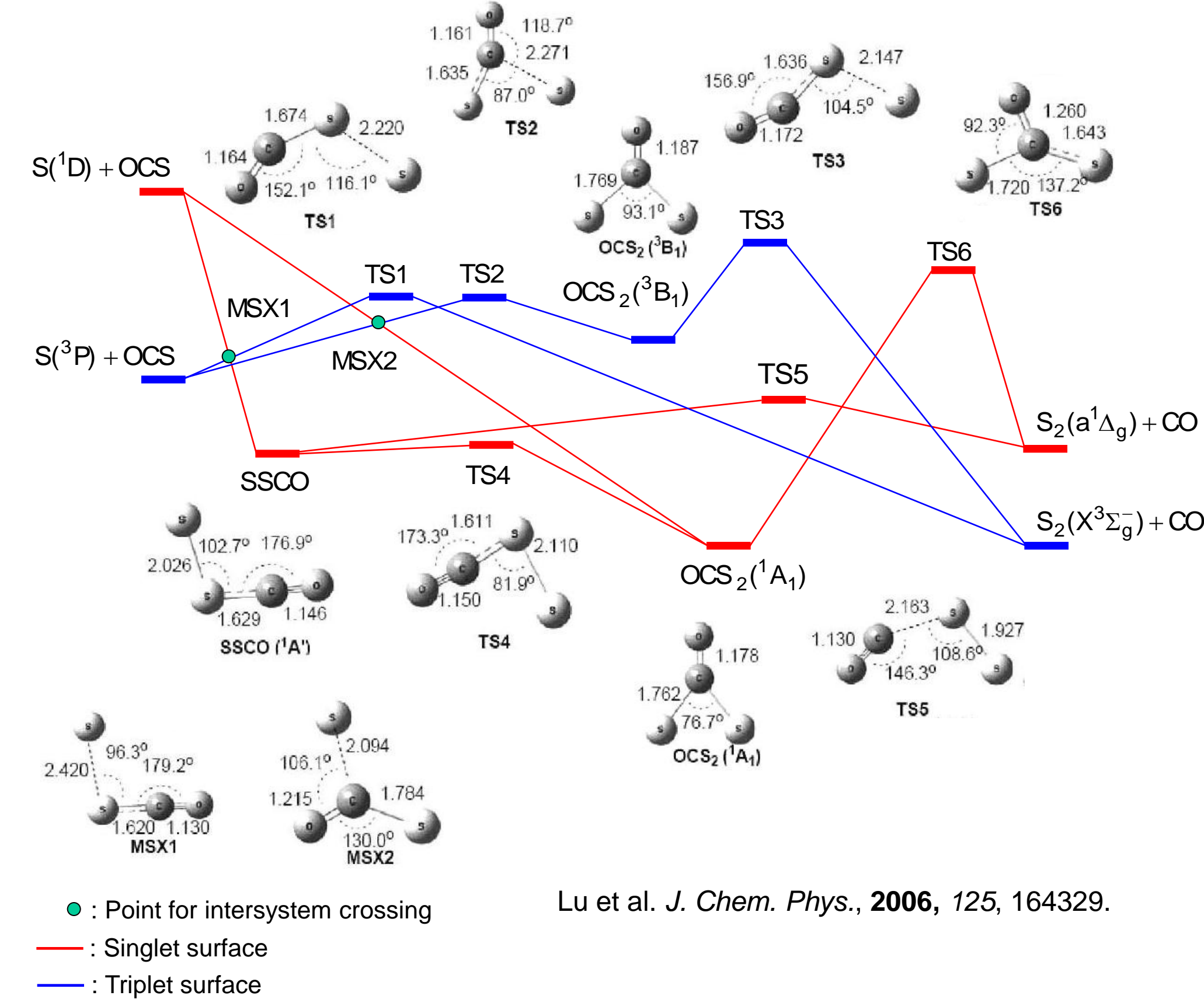
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Introduction

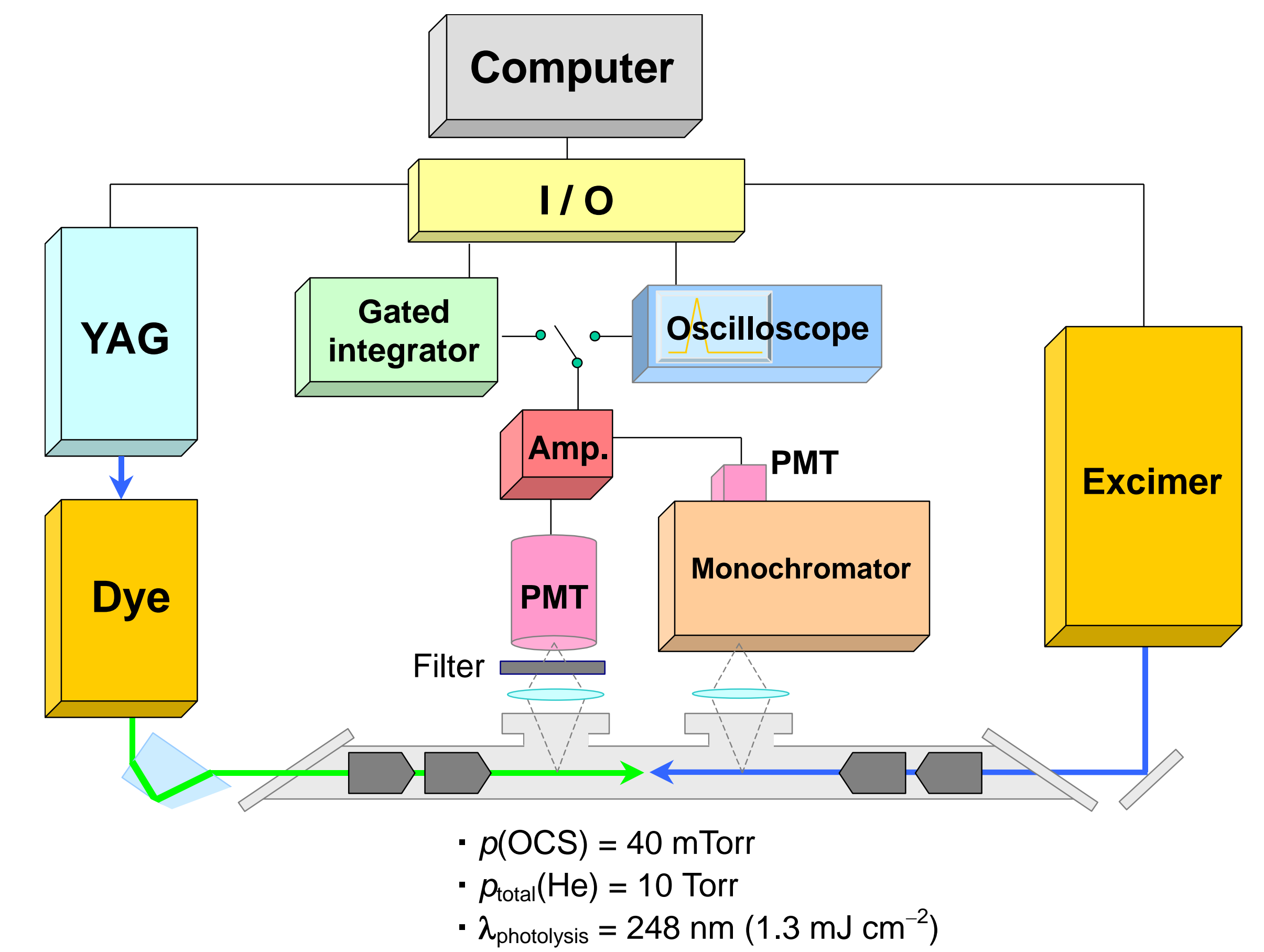
	$\Delta_r H_{298}^\circ / \text{kJ mol}^{-1}$
$S(^1D) + OCS \rightarrow SO + CS$	+39
$\rightarrow S(^3P) + OCS$	-111
$\rightarrow S_2(a^1\Delta_g) + CO$	-175
$\rightarrow S_2(X^3\Sigma_g^-) + CO$	-228

Overall rate coefficients	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$
$S(^3P) + OCS$	
Lu et al. (2006)	$(6.1 \pm 0.3) \times 10^{-18} T^{1.97 \pm 0.24} e^{-(1560 \pm 170)/T}$
@298 K:	$(2.7 \pm 0.5) \times 10^{-15}$
$S(^1D) + OCS$ (@298 K)	
Donovan et al. (1968)	6.6×10^{-11}
Addison et al. (1979)	$(1.2 \pm 0.3) \times 10^{-10}$
Veen et al. (1983)	$(3.0 \pm 0.3) \times 10^{-10}$

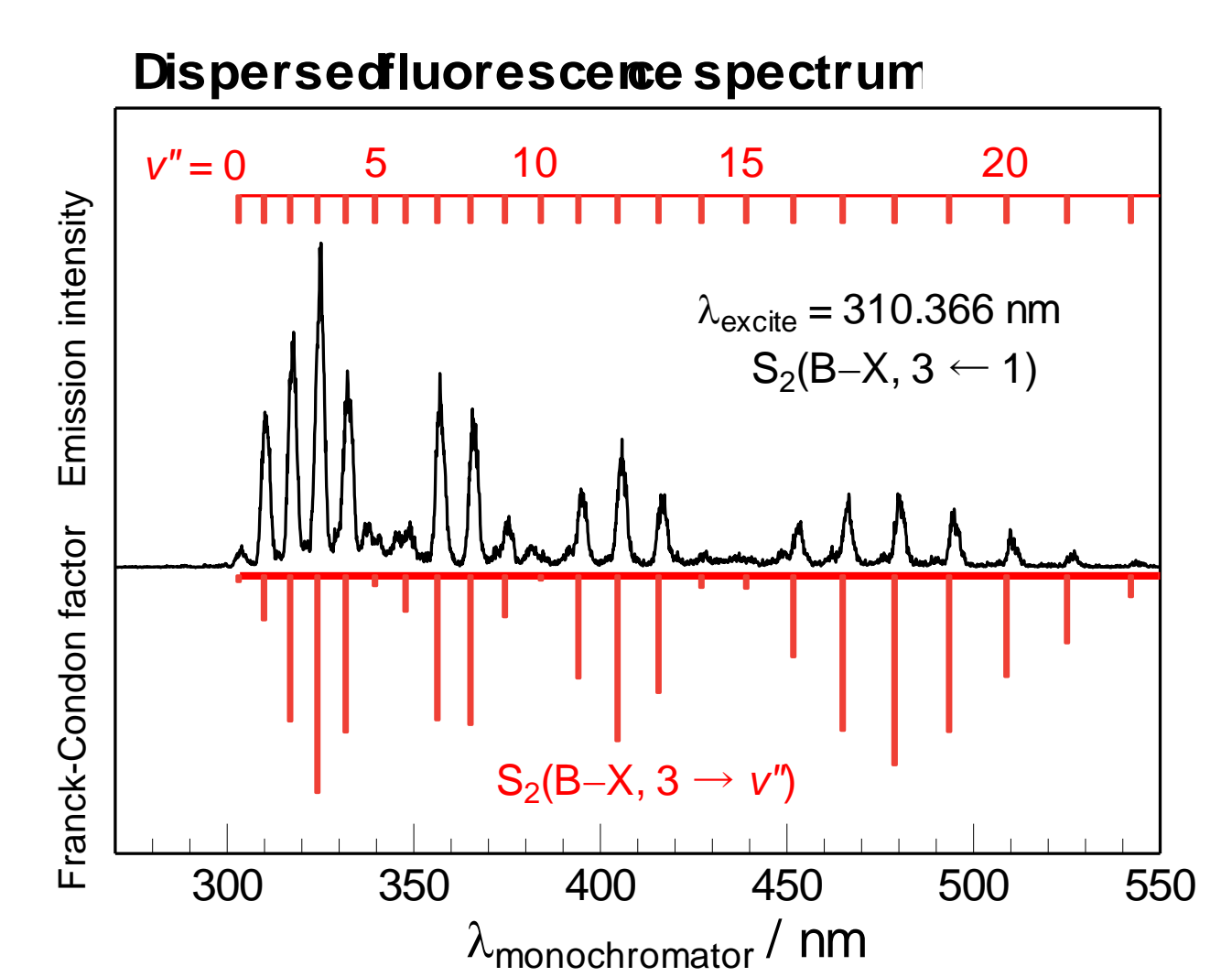
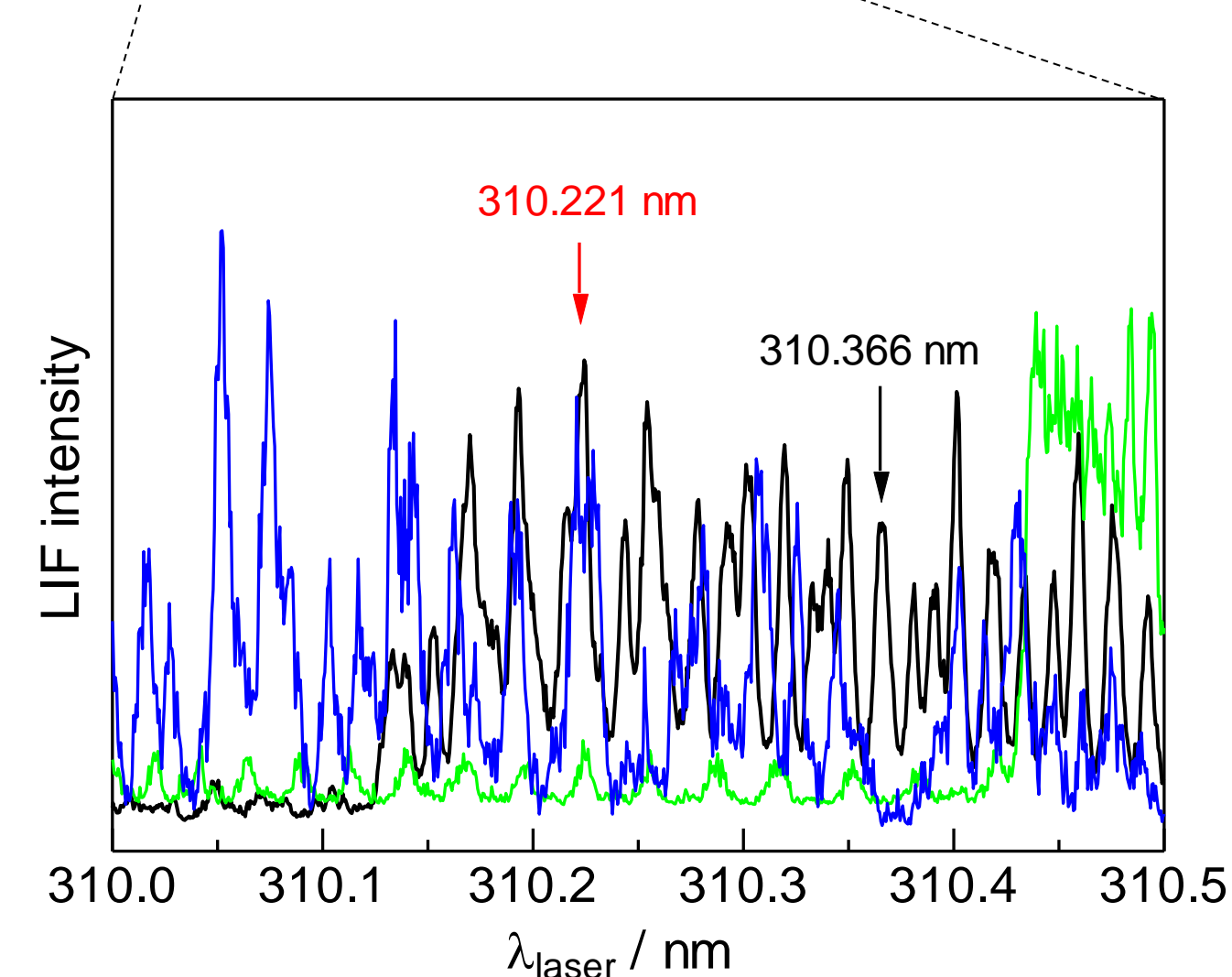
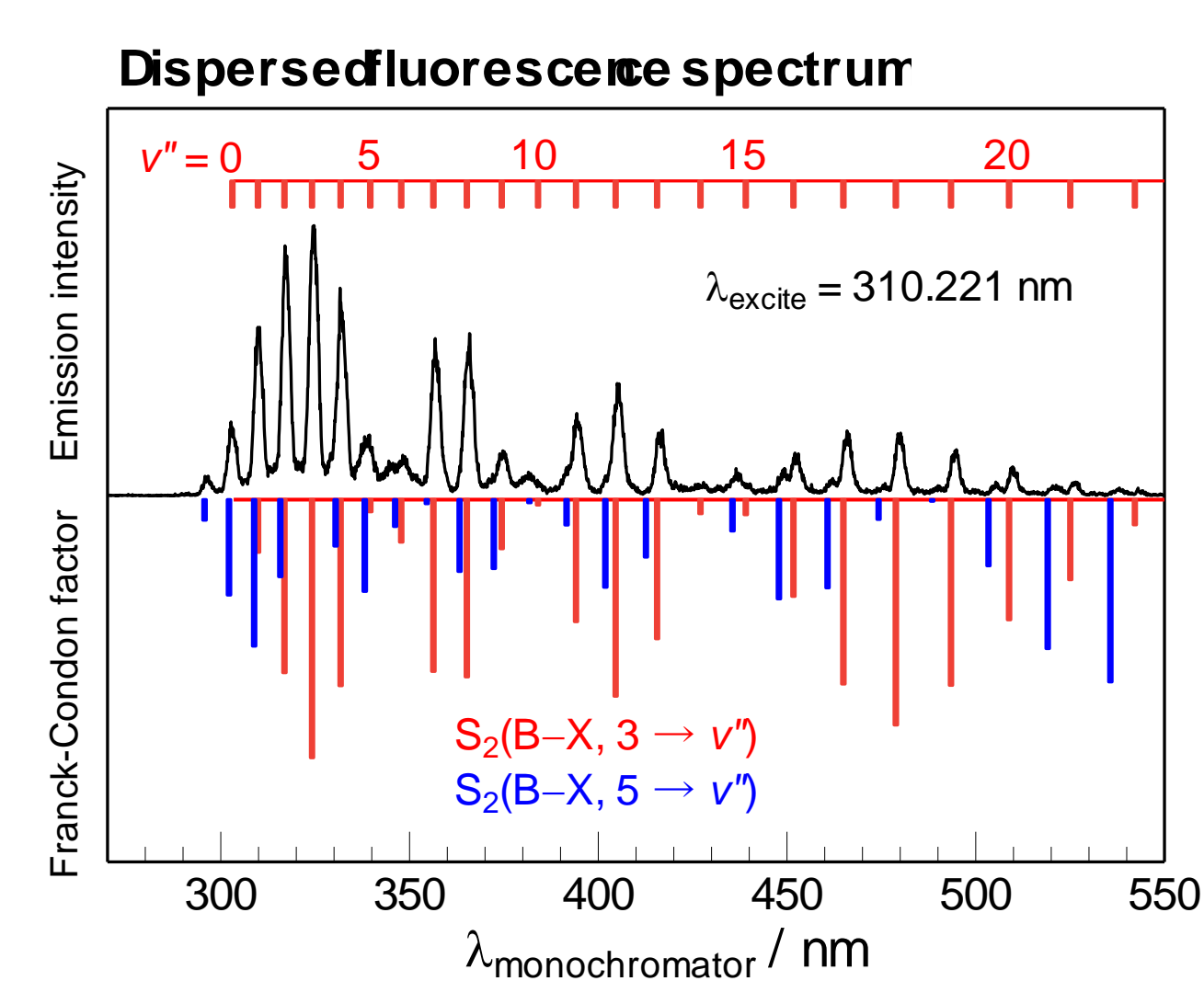
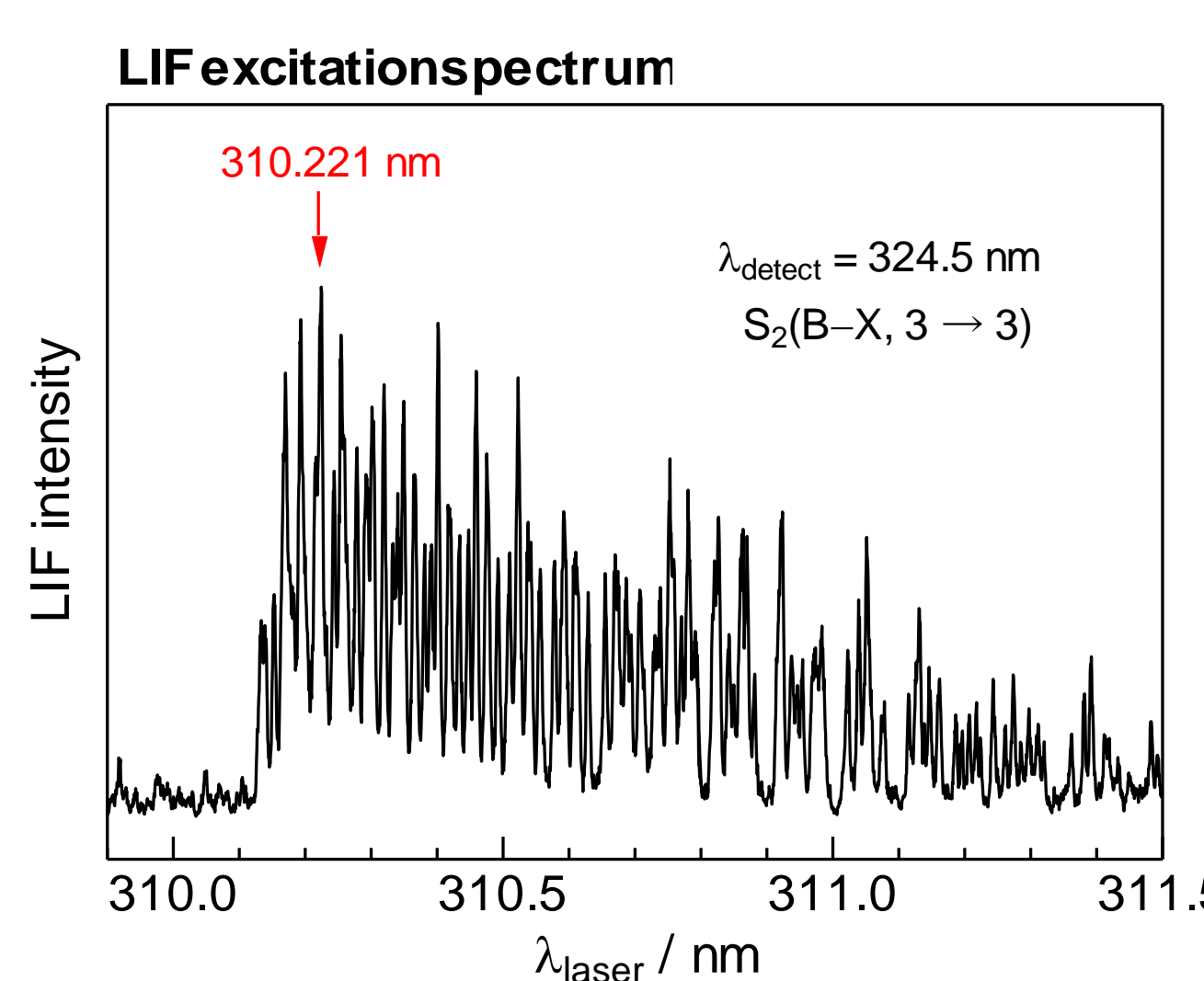
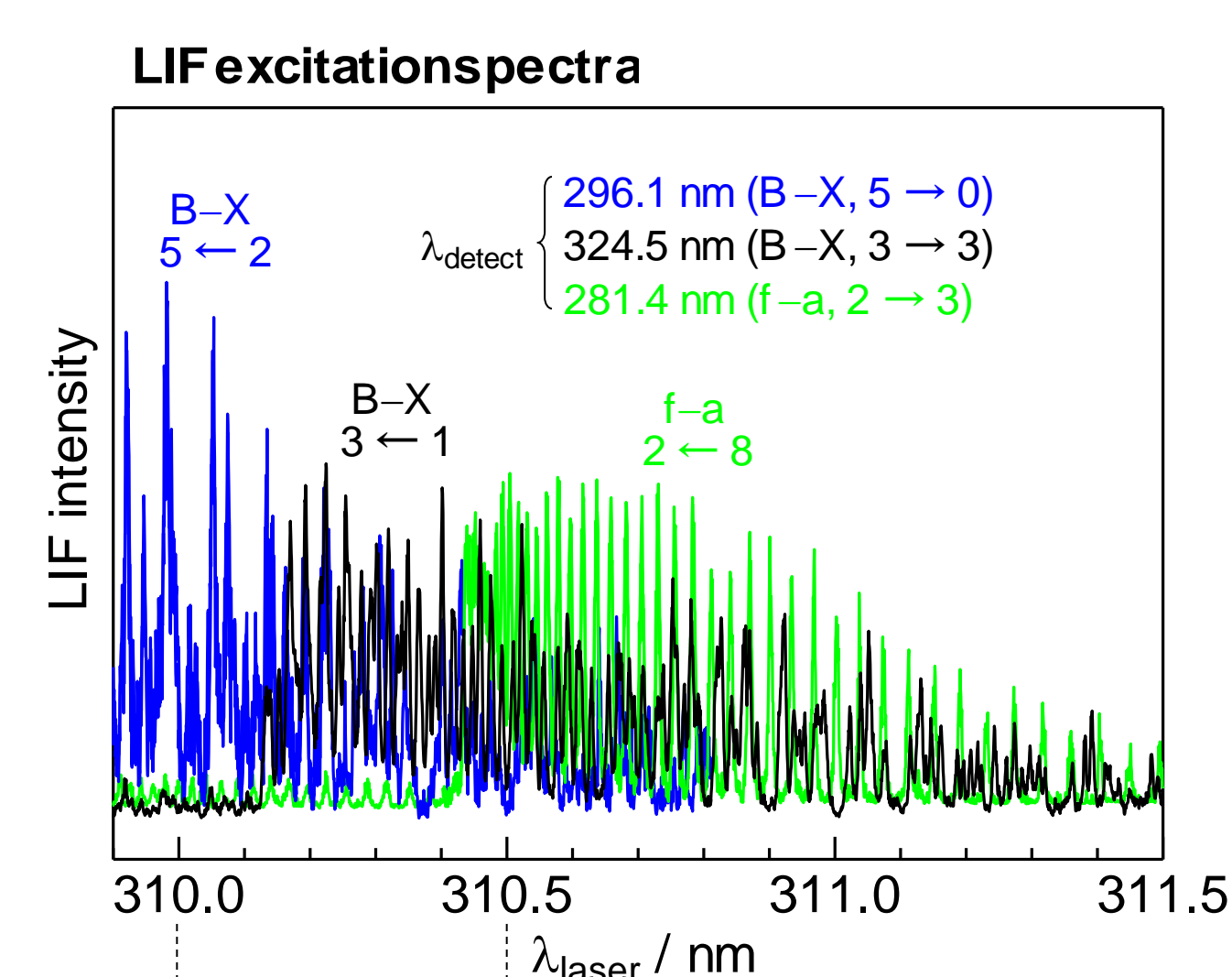
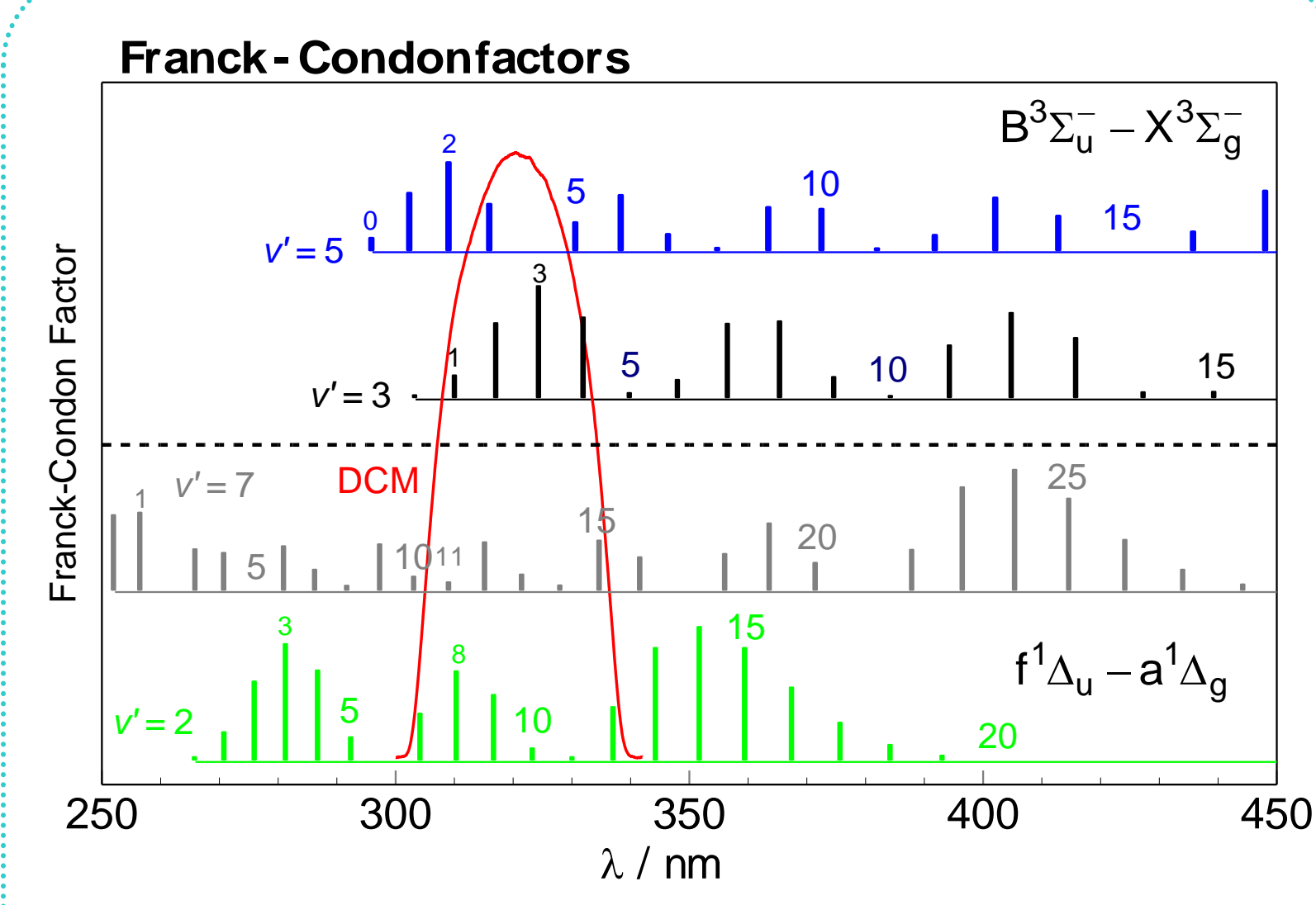
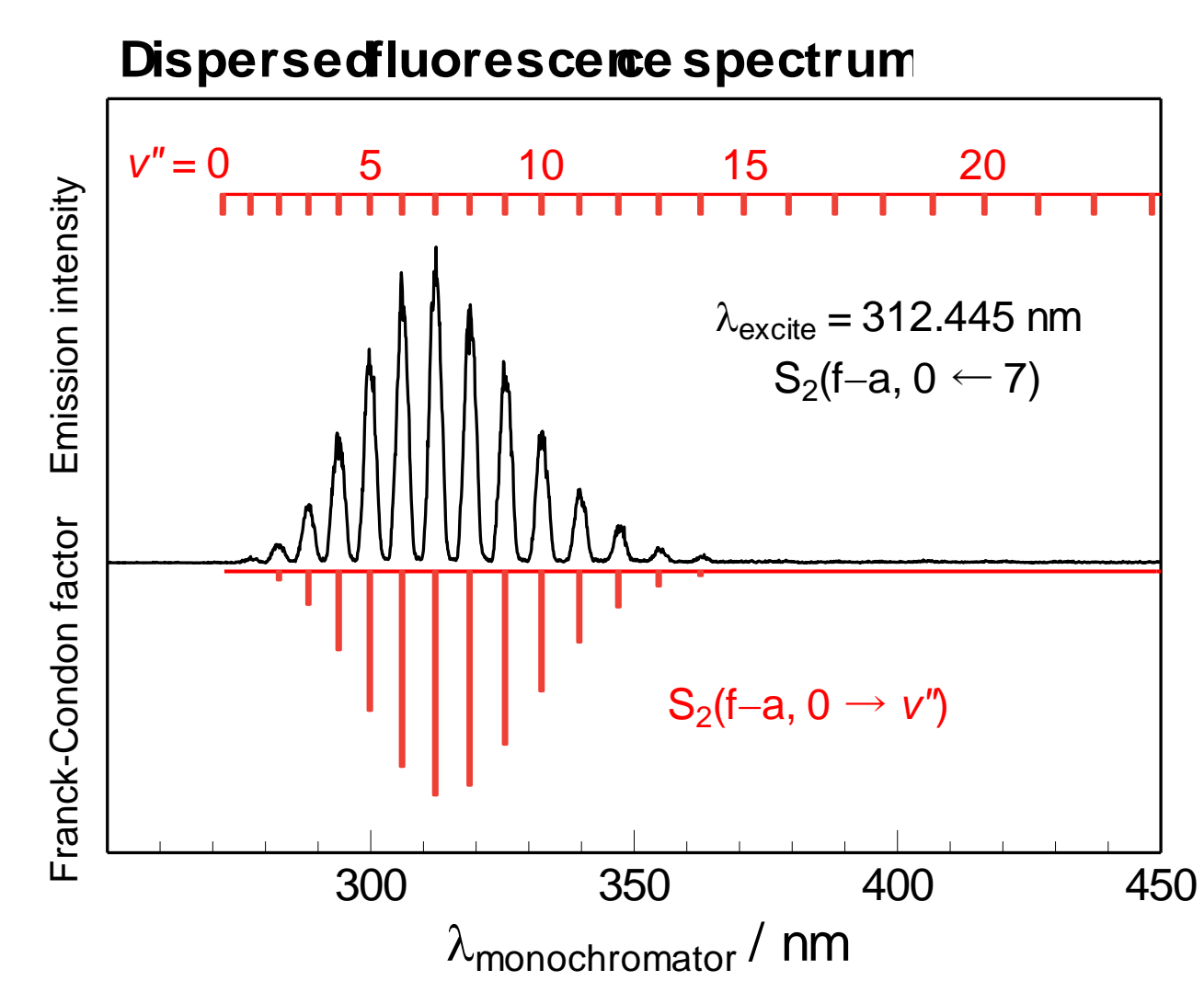
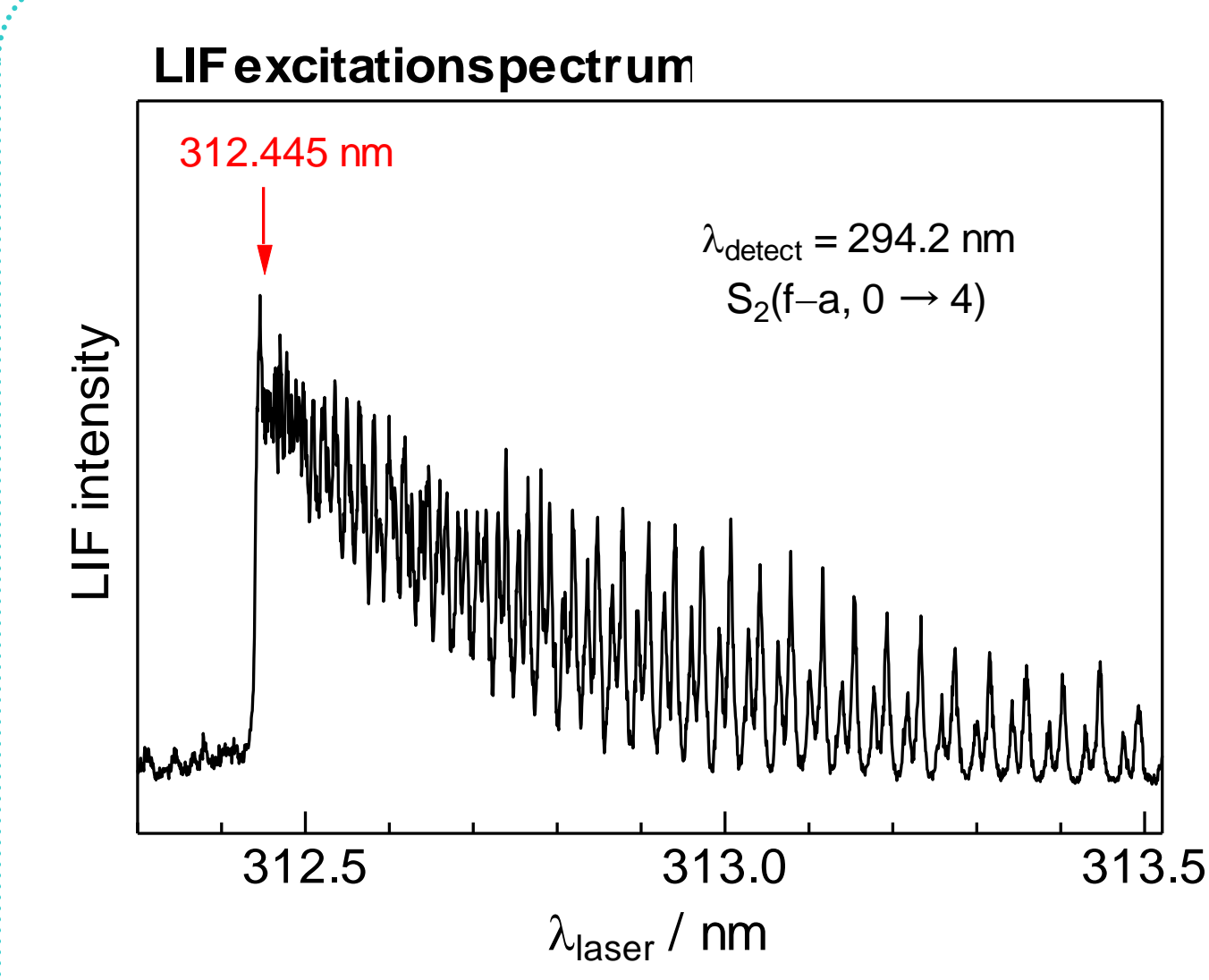
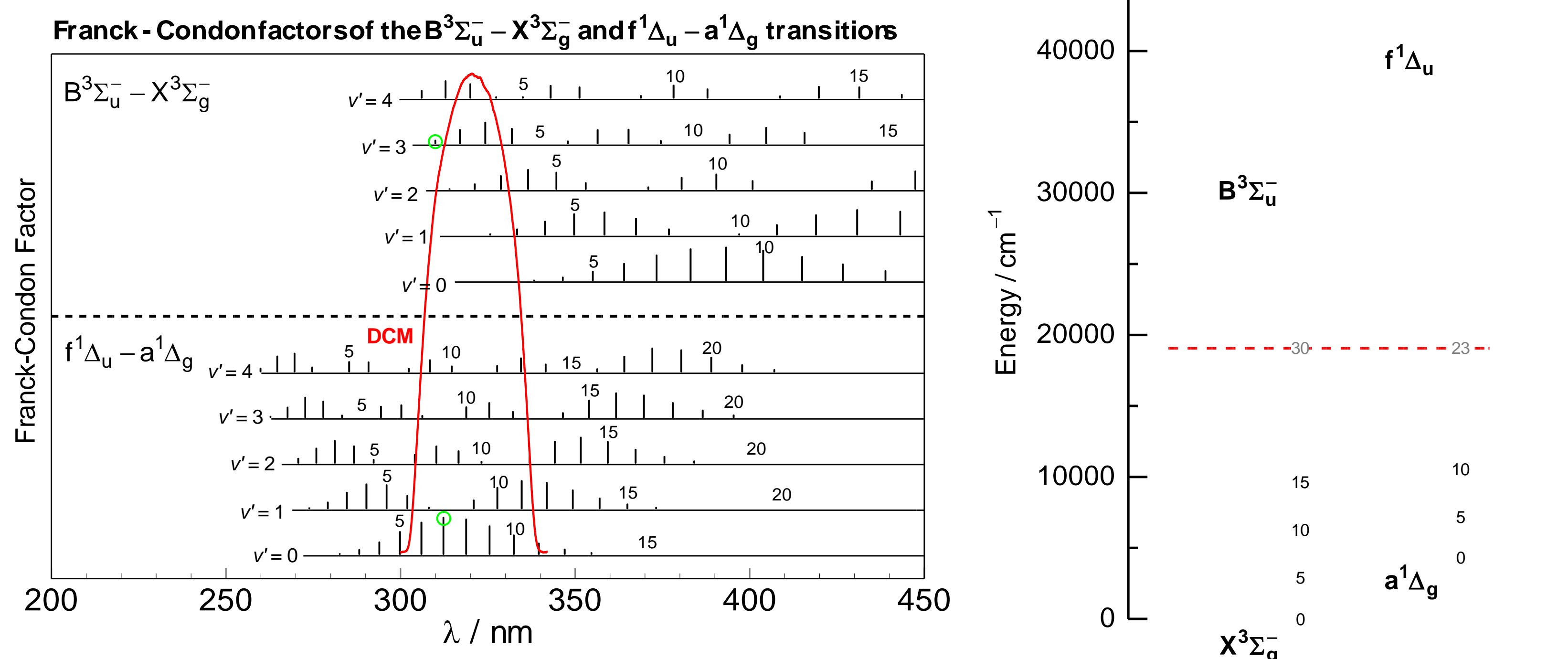
Highest vibrational levels of S_2	$X^3\Sigma_g^-$	$a^1\Delta_g$
Veen et al. (1983)	0	2
Richter et al. (1998)	-	6



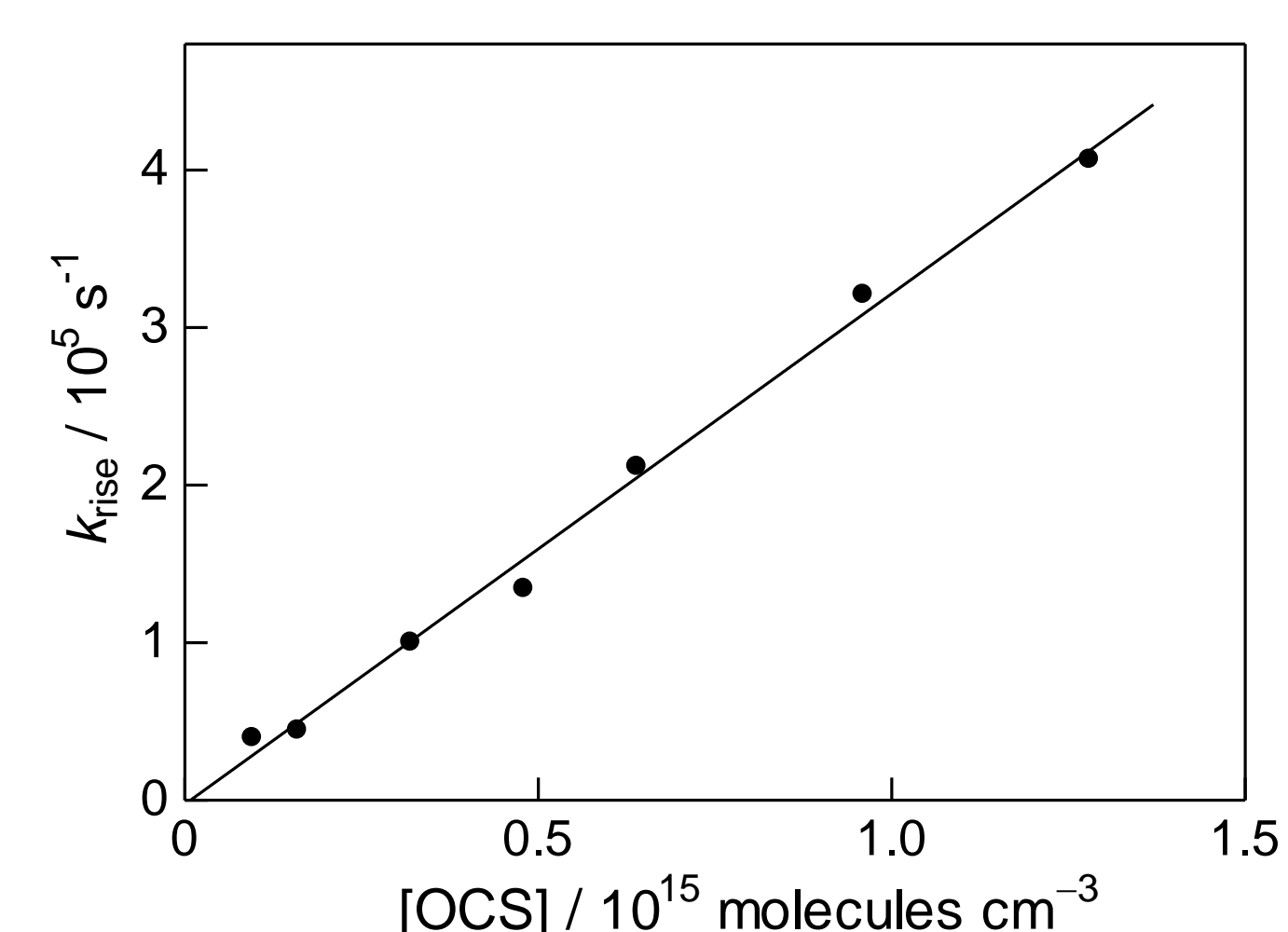
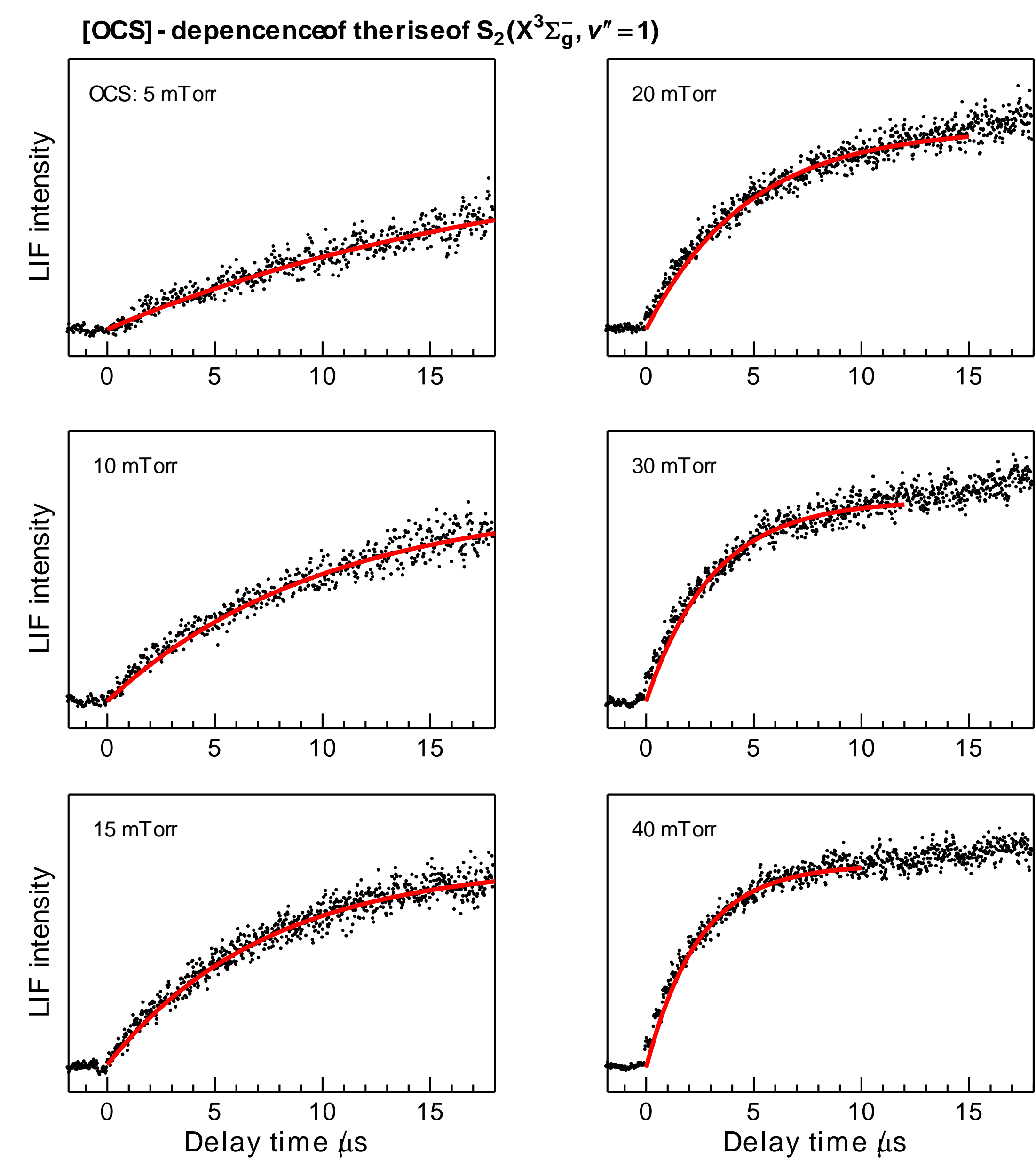
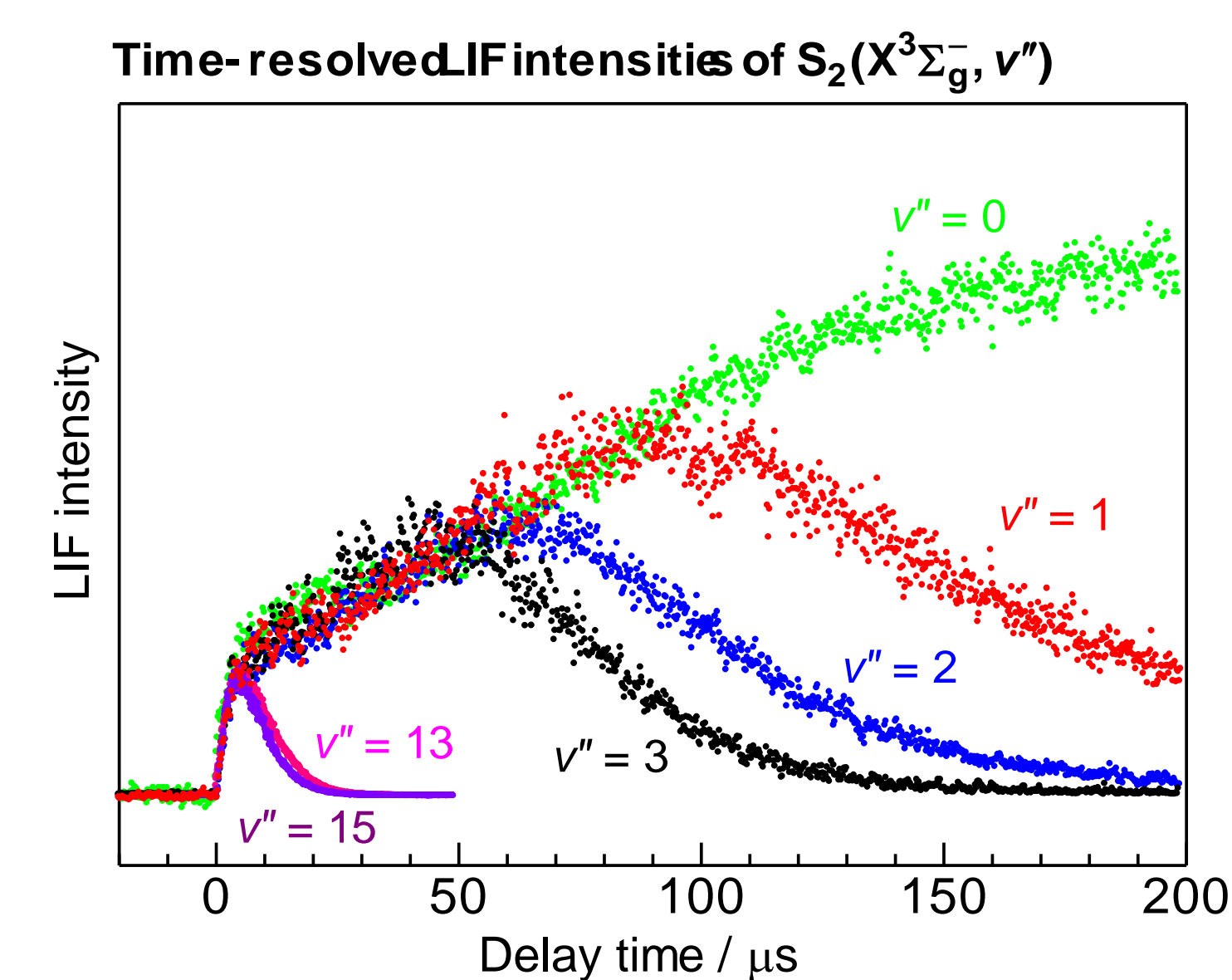
Experimental setup



Detection of single vibrational level of S_2



Overall rate coefficient



$$k[S(^1D) + OCS] = [3.2 \pm 0.2(2\sigma)] \times 10^{-10} \text{ cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$$

Summary

- Selective detection of single vibrational level of the X and a states of S_2 .
- Detection of highly vibrationally excited $S_2(X, a)$ generated in the $S(^1D) + OCS$ reaction. About half of the available energy is deposited into the vibrational motion of $S_2(X, a)$.
- Determination of the overall rate coefficient for the $S(^1D) + OCS$ reaction.