Supporting Information



Figure S 1

Selected traces after 500 nm excitation at wavelengths (indicated as ordinate labels, vertical unit is mOD) between 420 and 720 nm. Dashed lines indicate fit. The time axis is linear till 1 ps, and logarithmic thereafter.



Figure S 2

Top row: DADS and EADS estimated from magic-angle pump-probe data after 475 nm excitation measured in a 20 ps time range. Bottom row shows normalized DADS and EADS. Key: 0.04 ps (black), 0.6 ps (red), 2.4 ps (blue), 20 ps (green), 2 ns fixed (magenta).



Figure S 3

Concentration profiles (left) and SADS estimated from magic-angle pump-probe data after 475 nm excitation using the kinetic schemes from Figure 4. Key: S_2 (cyan), hot S_1 (red), S_1 (blue), slow S_1 (green), Chl (black), terminal Chl (magenta).



Figure S 4

Selected traces at wavelengths (indicated as ordinate labels, vertical unit is mOD) between 478 and 1800 nm. Dashed lines indicate fit. The five red traces are separate measurements in the near infrared. The time axis is linear till 1 ps, and logarithmic thereafter.



Figure S 5

Top row: DADS and EADS estimated from magic-angle pump-probe data after 535 nm excitation measured in a 72 ps time range. Bottom row shows normalized DADS and EADS. Key: 0.09 ps (black), 0.5 ps (red), 2.4 ps (blue), 20 ps (green), 2 ns fixed (magenta).



Figure S 6

Top row: DADS and EADS estimated from magic-angle pump-probe data after 490 nm excitation measured in a 72 ps time range. Bottom row shows normalized DADS and EADS. Key: 0.07 ps (black), 0.5 ps (red), 2.5 ps (blue), 21 ps (green), 2 ns fixed (magenta).



Figure S 7

Top row: DADS and EADS estimated from magic-angle pump-probe data at 77K after 500 nm excitation. Bottom row shows normalized DADS and EADS. Key: 0.06 ps (black), 0.5 ps (red), 2.3 ps (blue), 21 ps (green), 1.2 ns (magenta).



Figure S 8

Selected traces at wavelengths (indicated as ordinate labels, vertical unit is mOD) between 420 and 720 nm. Dashed lines indicate fit. The time axis is linear till 1 ps, and logarithmic thereafter. Black are the ordinary pump-probe traces already depicted in Figure S 1, blue is the prepump signal, which corresponds to Chl*. The red traces are from the 400-nm prepump followed after 300 ps by the 500-nm pump pulse.



Figure S 9

Concentration profiles (left) and SADS estimated from magic-angle data after 475 nm excitation using the kinetic schemes from Figure 4. The dotted concentrations are from the prepump experiment, the solid lines are from the normal pump-probe experiment, and the dashed lines correspond to the combined prepump-pump-probe experiment. Key: S_2 (cyan), hot S_1 (red), S_1 (blue), slow S_1 (green), Chl (black), terminal Chl (magenta).



Figure S 10

Top row: DADS and EADS estimated from magic-angle pump-probe data after 670 nm excitation measured in a 1000 ps time range. Bottom row shows normalized DADS and EADS. Key: 13 ps (black), 2.4 ns (red).

530 nm 0.8 -0.4 0.0	How was and	571 m		611 nm po o,s 1,o 1,s		651 nm 40 0,2 0,4 0,6		691 nm 0.2 0.0 0.2 0.4	
527 nm 1 0,0 0,4 5		569 nm 2 6		609 nm 1 2 ±1		649 m o,s 1,0 1,5 d	oa a o yayoodhayoodhay	689 nm 1. 0.0 0.4 .r	
524 nm 0.0 0.4 6 ⁻⁰ 0	ba a ba	566 nm 0.5 tu 1.5 tu 0		306 nm 1 2 ⊟1		346 nm 0,5 1,0 1,5 4,00	i xi xi	386 nm -0.5 0.00.	
11 mm	o no no	3 nm 10 15 500	o 10 100	3 nm 1 2 1-0		3 mm 2 mm	i a a http://www.com	3 nm 5	
		10 400 40	bar br	nm 60 2 ±1		nm 64 10 15 50 05	ia a i	nm 68 ⊥-268	
10 210 10 210	i a a a a a a a a a a a a a a a a a a a	197 200 197 200	o in in internet	3 ± 1 600	d d no no d	1.5 500 0.5	i n no	a 680 	
10 516 m	aa a o	08 400 04		3 8 1 1 2		537 m 2 500 05 10		677 m 677 m	
513 nm		554 nm 504 a.0 0.4		594 nm 51 1 2		634 nm		674 nm .1-10 -5	
510 nm		551 nm	Marine and a state	591 nm 1 2 3		631 nm 100 045 140 15		671 nm -16 -8 0	
507 nm 0 d,s i,0 t		548 m		589 nm		629 m 0 0,5 1,0 1,5 1		669 nm 1 1 10	
504 nm 0,5 1,0 40	i x xi	545 nm -9.5 0.0 ±-	o 10 100	586 nm 1 2 ±1		626 nm 0,5 1,0 1,5 6,	o n no Maria	666 nm -10 0 1-4	
01 m 04 0.8 400	o a ao	42 m 0 -0.5 00 5-1.0		33 nm 1 2 1 0		23 nm 5 10 15 100	aa a o	53 nm 0 .1-20	
3 m 3 m 2 m 2 m 2 m 2 m 2 m 2 m 2 m 2 m	ia a i	3 m 5 05 0.0 ±15 -	iau ia iai] m 2 4 9 1 2 4 9		1 m 6 m 6	ia a i	0 mm 6 0 T-13	
100 - 100 -				1 580		m 62	o o oo	יד 1 1560 1-1 1 1-1	
495 r		- 536 r	Markan Markan	577 r 2 8 9 1		617 r 15 goo ofs 1		657 r 0.0 3 - 2	
492 nm 800 0.5 1.0	Date (ps)	533 nm 5-10 - 9.5	d 10 100 Time (ps)	574 nm 8.9 1	o o b b bo Time (ps)	614 nm 840 0,5 1,0	o po po Time (ps)	654 nm 1-15 -10 -05	a d zd zd Time (ps)

Figure S 11

Selected traces at wavelengths (indicated as ordinate labels, vertical unit is mOD) from polarized pump-probe data after 670 nm excitation. Dashed lines indicate fit. The time axis is linear till 10 ps, and logarithmic thereafter. The black, red, and blue color correspond to, respectively, magic angle, parallel and perpendicular orientation.