## Supplemental Information

This section contains (i) a graphical description of the multiple-LED set-up in Amsterdam, (ii) the SVD results of all experiments presented in the main text and (iii) the results obtained after analysis based upon our method for WT *Synechocystis* and the ΔPSI and ΔPSII mutants thereof both non-treated and in the presence of DCMU.

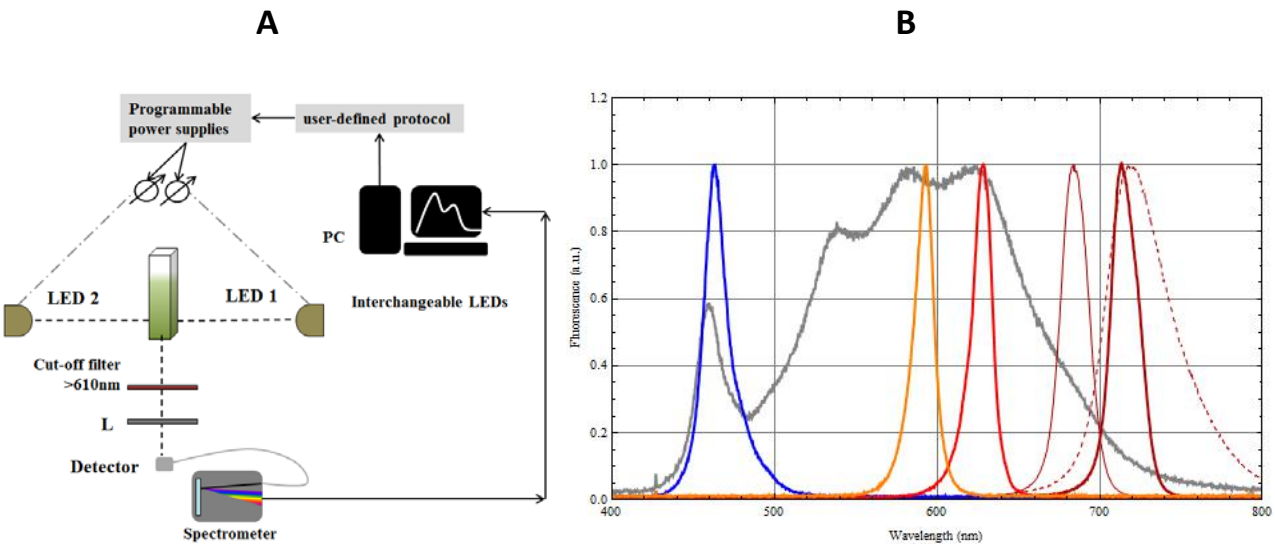


Figure S 1 A) Schematic representation of the multiple-LED set-up in the LaserLab, in Amsterdam, The Netherlands. B) Spectra of the LEDs available. Key: *Gray:* White LED; *Blue:* 460 nm; *Orange:* 590 nm; *Red:* 640 nm; *Dark red solid:* White LED with a 695 nm filter; *Dark red thick:* White LED with a 715 nm filter; *Dark red dashed:* White LED with a 725 nm filter

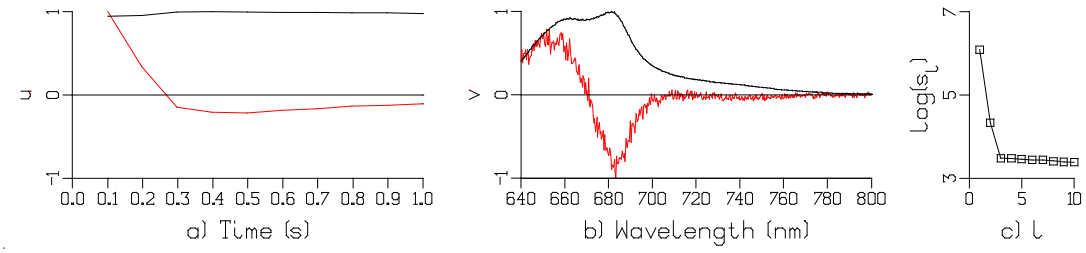


Figure S 2 SVD of the time resolved spectrum of the WT *Synechocystis* cells during a saturation flash. a) first two left singular vectors $u_1$(black) and $u_2$ (red). b) first two right singular vectors $v_1$(black) and $v_2$ (red). c) scree plot

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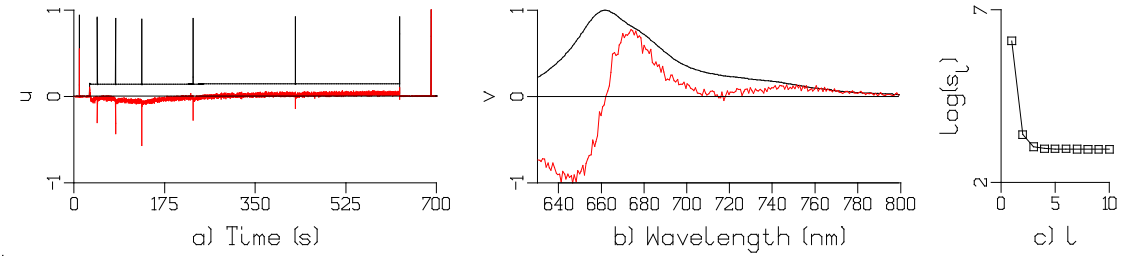



Figure S 3 SVD of the time resolved spectrum of the ΔPSII mutant cells. a) first two left singular vectors $u_1$(black) and $u_2$ (red). b) first two right singular vectors $v_1$(black) and $v_2$ (red). c) scree plot.

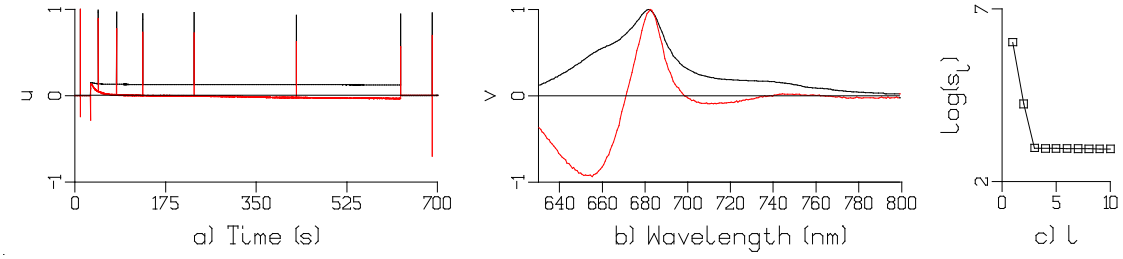



Figure S 4 SVD of the time resolved spectrum of the ΔPSI mutant cells. a) first two left singular vectors $u_1$(black) and $u_2$ (red). b) first two right singular vectors $v_1$(black) and $v_2$ (red). c) scree plot.

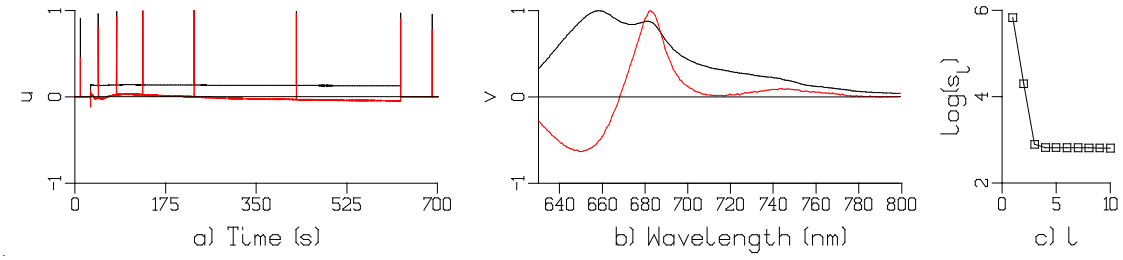
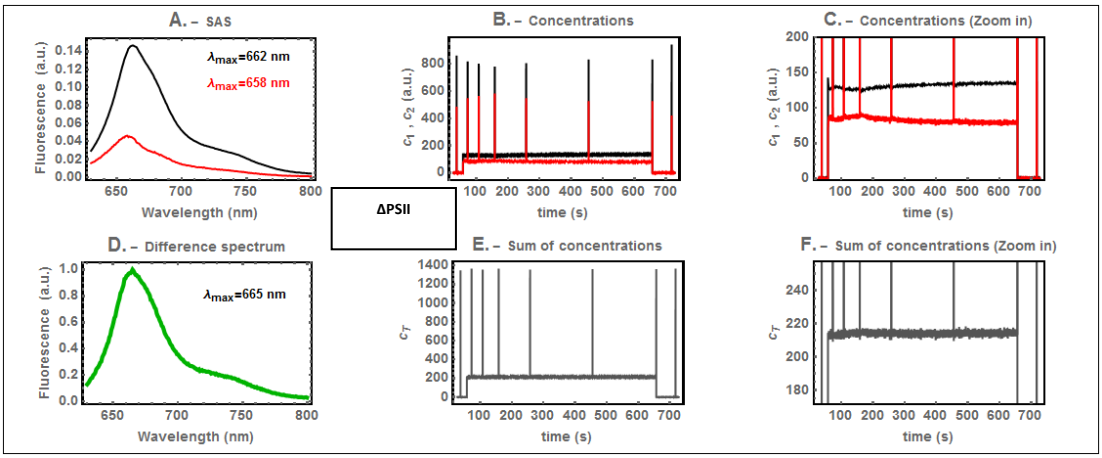



Figure S 5 SVD of the time resolved spectrum of the WT cells. a) first two left singular vectors $u_1$(black) and $u_2$ (red). b) first two right singular vectors $v_1$(black) and $v_2$ (red). c) scree plot.



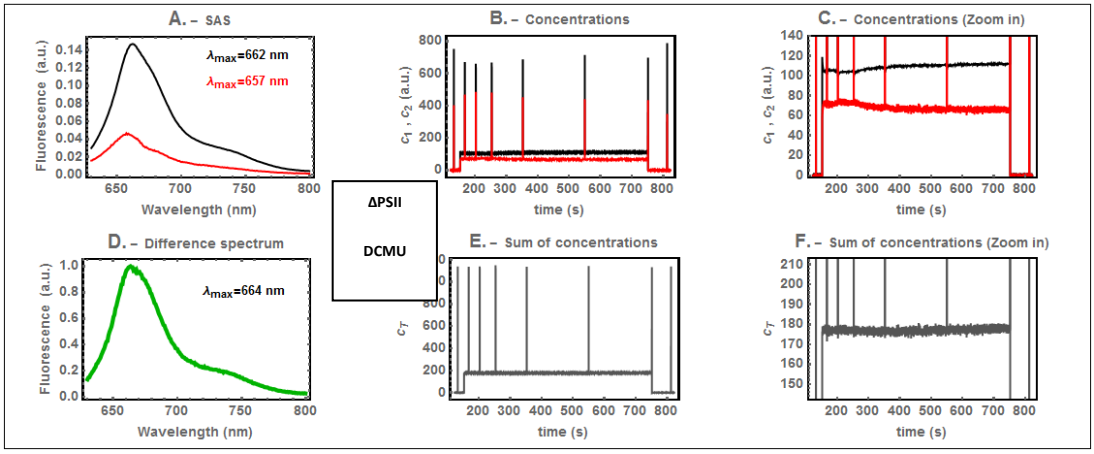
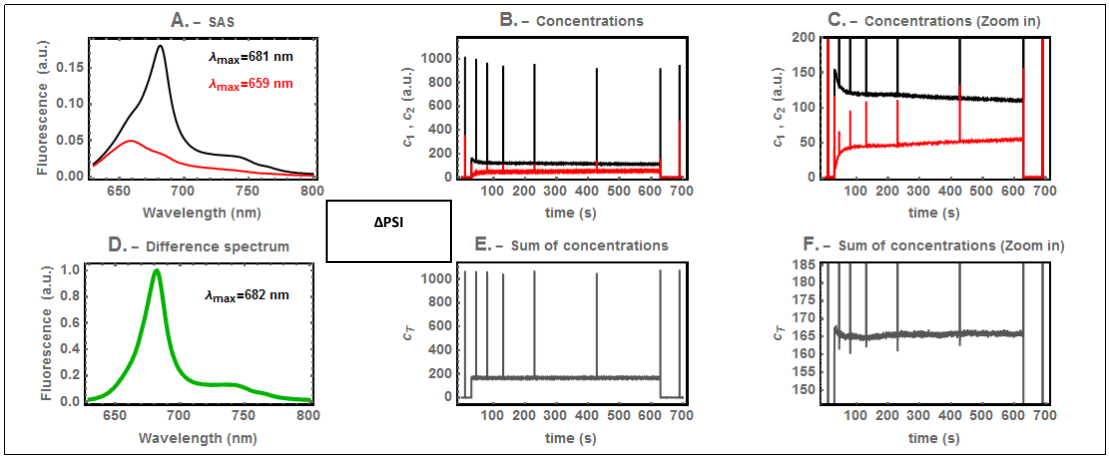




Figure S 6 Full analysis of the time resolved fluorescence spectrum of **ΔPSII mutant** cells: non-treated (above), DCMU-treated (below); **A:** Estimated $SAS_{1,\Delta PSII}$ (black) and $SAS_{2,\Delta PSII}$ (red). **B:** the concentration profiles $c_1$ (black) and $c_2$ (red), the spikes are due to the saturation flashes; **C:** zoom into a region of **B**; **D:** the normalized difference spectrum between black and red SAS; **E:** sum of the concentrations $\mathbf{c}_{total}$; **F:** zoom into a region of **E**. See the main text for a detailed explanation of the non-treated panels. Transformation coefficients: non-treated: $a_{12}= 0.026$, $a_{21}= 0.3$ and $a_{22}= -0.16$ ; DCMU: $a_{12}= 0.026$, $a_{21}= 0.3$ and $a_{22}= -0.16$



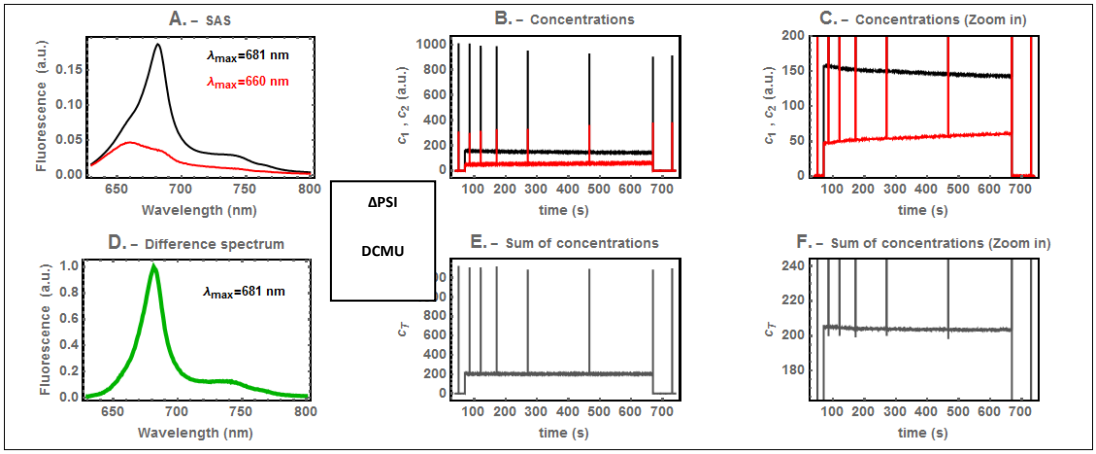
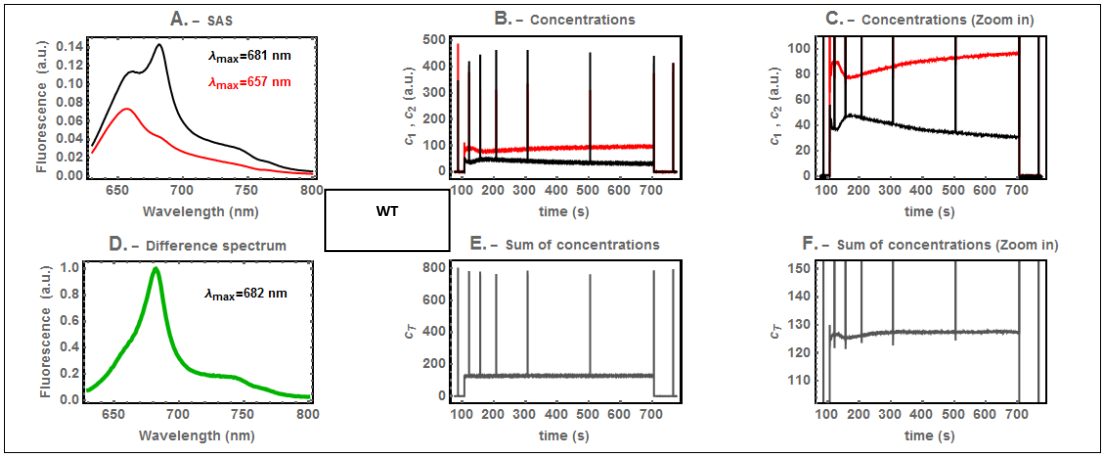




Figure S 7 Full analysis of the time resolved fluorescence spectrum of **ΔPSI mutant** cells: non-treated (above), DCMU-treated (below); **A:** Estimated $SAS_{1,\Delta PSI}$ (black) and $SAS_{2,\Delta PSI}$ (red); **B:** the concentration profiles $c_1$ (black) and $c_2$ (red); **C:** zoom into a region of **B**; **D:** the normalized difference spectrum between black and red; **E:** sum of the concentrations $\mathbf{c}_{total}$; **F:** zoom into a region of **E**. See the main text for a detailed explanation of the non-treated panels. Transformation coefficients: non-treated: $a_{12}= 0.055$, $a_{21}= 0.32$ and $a_{22}= -0.45$; DCMU: $a_{12}= 0.05$, $a_{21}= 0.32$ and $a_{22}= -0.42$



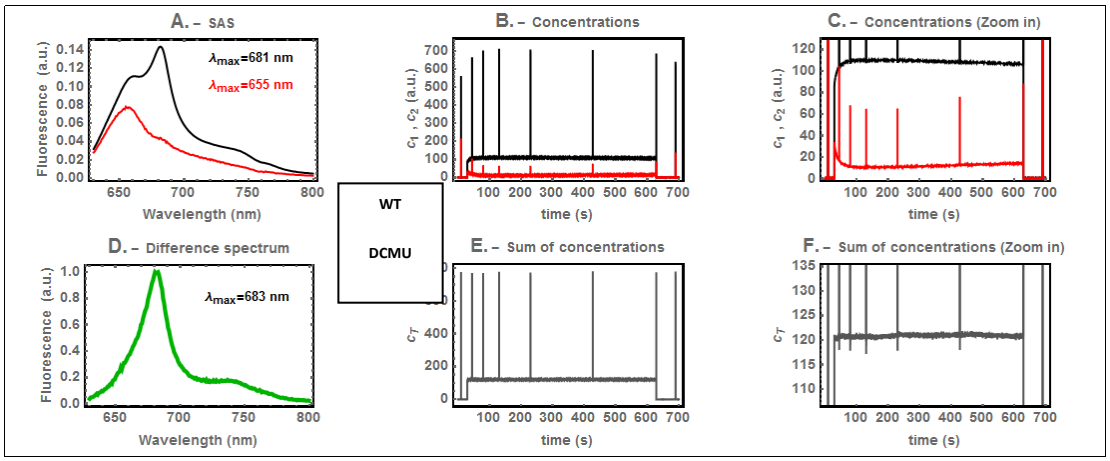




Figure S 8 Full analysis of the time resolved fluorescence spectrum of **WT cells**: non-treated (above), DCMU-treated (below); **A:** Estimated $SAS_{1,WT}$ (black) and $SAS_{2,WT}$ (red); **B:** the concentration profiles $c_1$ (black) and $c_2$ (red), where, $c_1$ has been pulled to the front for better visibility of the first/last pulses; **C:** zoom into a region of **B**; **D:** the normalized difference spectrum between black and red; **E:** sum of the concentrations $\mathbf{c}_{total}$; **F:** zoom into a region of **E**. See the main text for a detailed explanation of the non-treated panels. Transformation coefficients: non-treated: $a_{12}= 0.16$, $a_{21}= 0.51$ and $a_{22}= -0.15$; DCMU: $a_{12}= -0.02$, $a_{21}= 0.51$ and $a_{22}= 0.33$