Supplementary Information for Simple and Robust Panchromatic Light Harvesting Antenna Composites via FRET Engineering in Solid State Host Matrices

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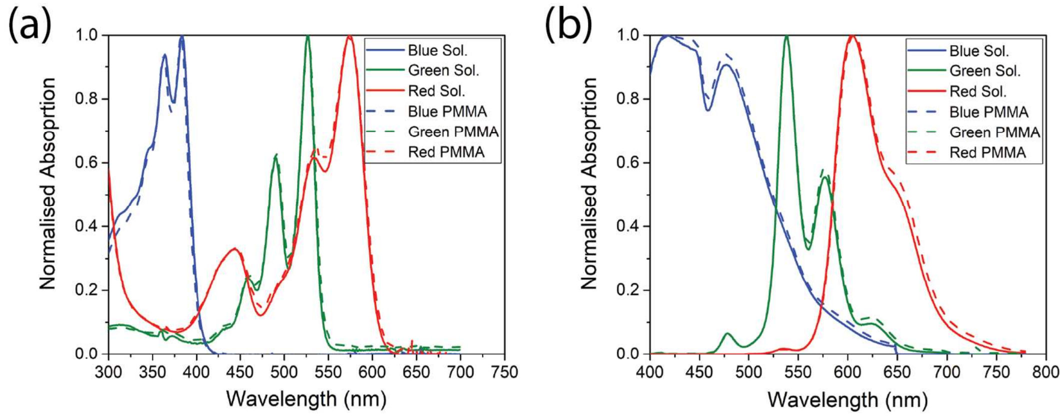

Figure S1: Comparison of absorption and emission spectra shifts upon incorporation into a PMMA matrix (0.1 w/w %).

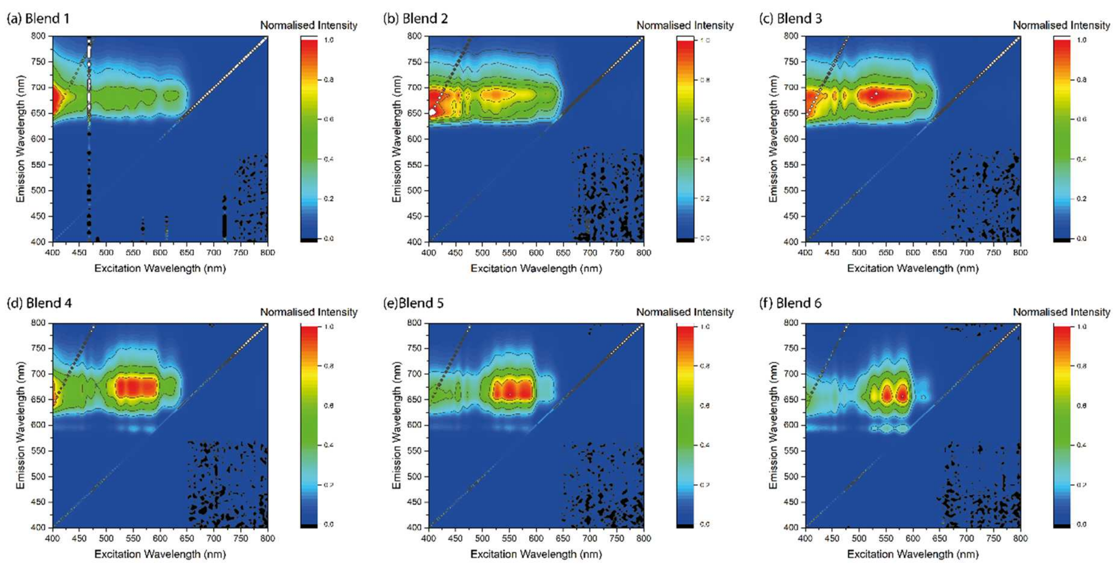

Figure S2: Two-dimensional emission/excitation spectra clearly showing that for concentrated complexes, under any excitation, emission occurs from the red dye at 650 nm but at lower concentrations emission from the green dye at 600 occurs.

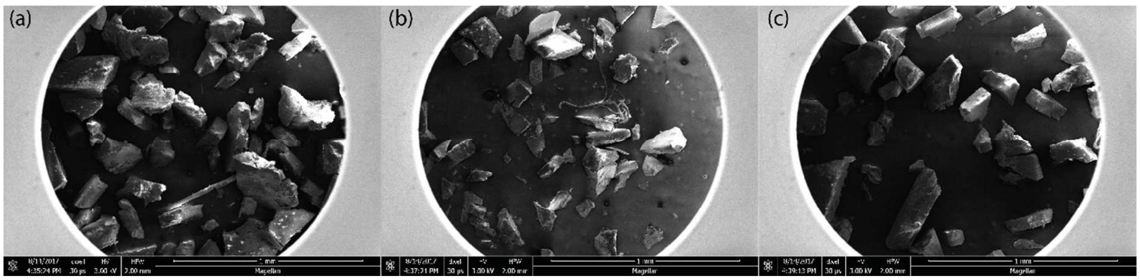

Figure S3: Scanning electrode microscopes of fabricated LHCs.

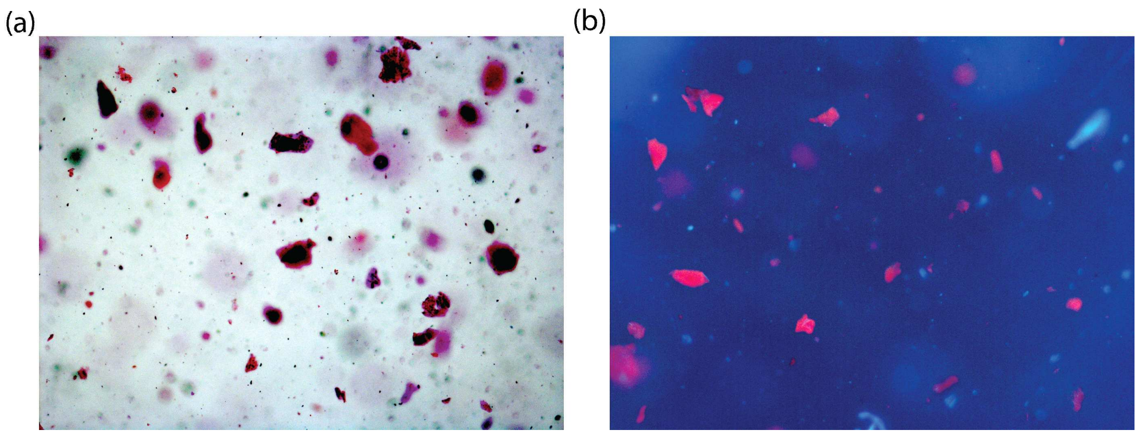

Figure S4: PMMA/dye LHCs dispersed within an 80:20 lauryl methacrylate and ethylene glycol dimethacrylate matrix (a) under white light and (b) under 365 nm UV lamp illumination.

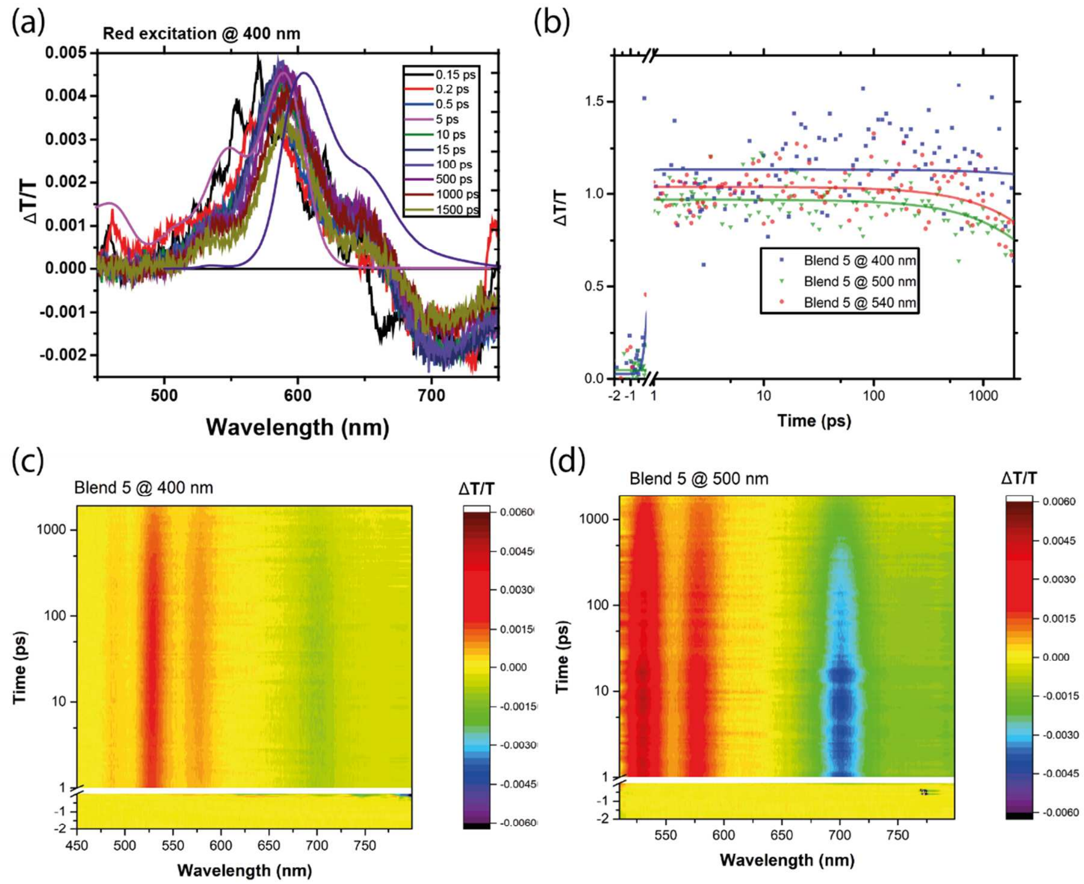

Figure S5: (a) Spectral slices associated with excitation of the red dye alone at 400 nm. The purple and blue curves indicate the steady state absorption and emission spectra, respectively. The band at 595 nm is hence an ideal wavelength to monitor for transfer as there is a minimum contribution from blend stimulated emission and maximum red acceptor bleach. (b) Kinetic at 595 nm corresponding to ground state bleach band of red acceptor dye. Kinetics are normalised to 0.5 ps before which the kinetics of the red dye are approximately independent of pump wavelength. Three different pump excitation wavelengths are shown: 400, 500, and 540 nm (c) Transient absorption map for blend 5 with excitation at 400 nm. (d) Transient absorption map for excitation of blend 5 at 500 nm.

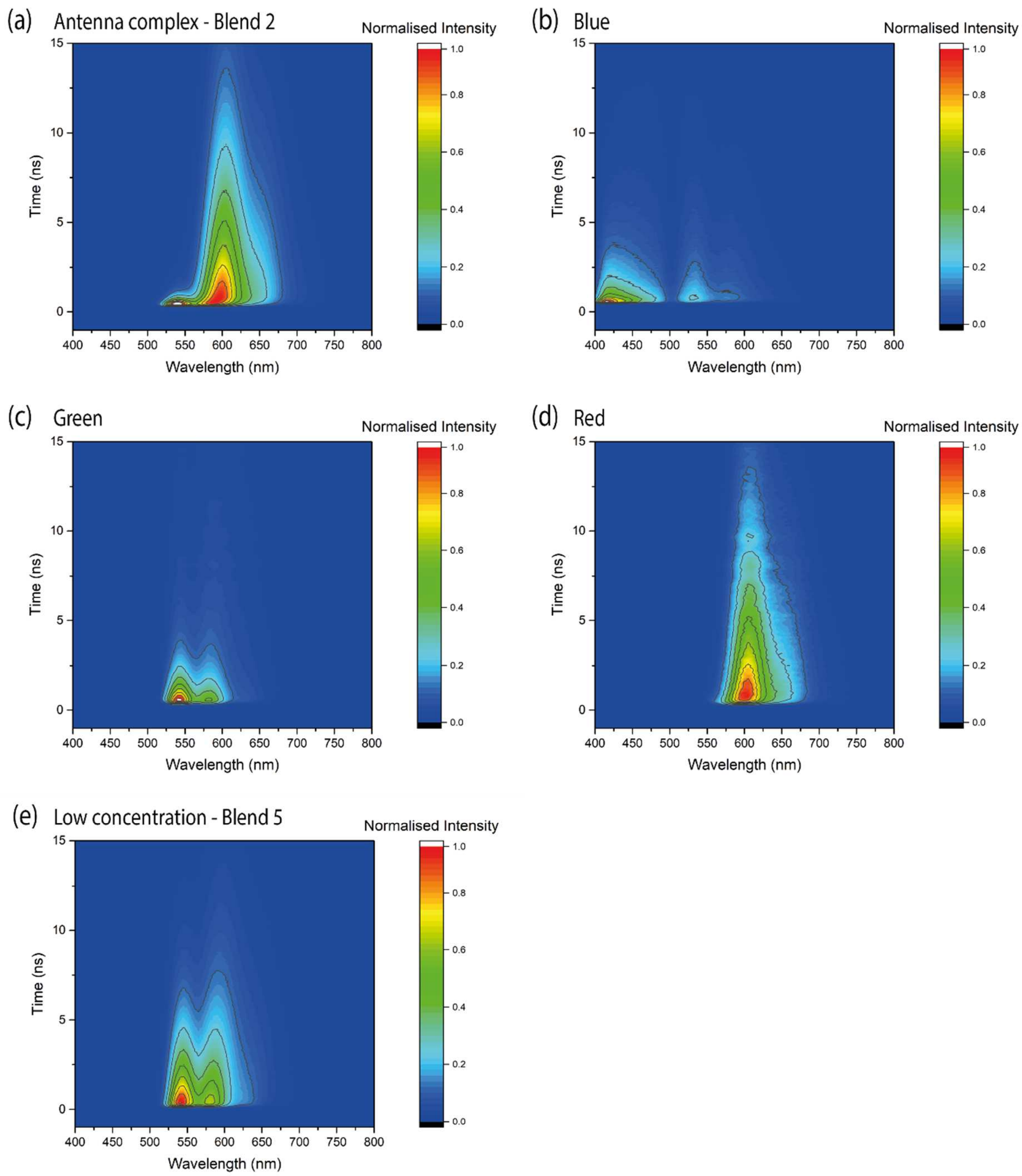

Figure S6: Transient photoluminescence of different PMMA composites. Lowering the concentration of dyes within the blend leads to dual emission (e) and reduces the overall efficiency.

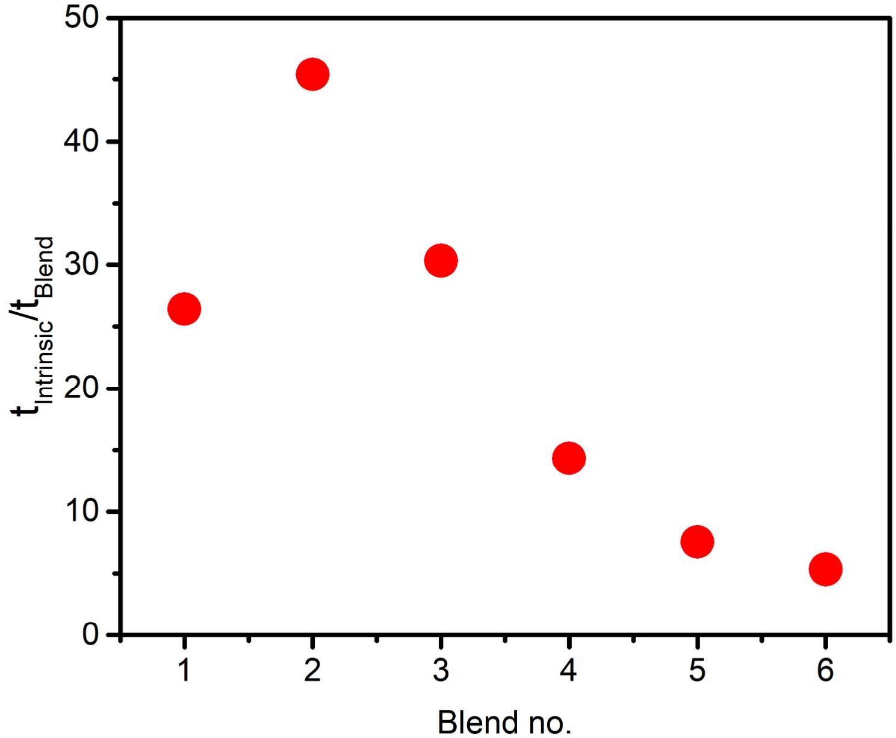

Figure S7: Relative transfer efficiency of the different fabricated PMMA composites, taken by measuring the lifetime of red dye in the blend compared to its intrinsic lifetime when isolated. An almost 50-fold increase in its lifetime is seen when incorporating into the dye into the blend structure, emphasising efficient FRET.

Table S1: Calculated $\tau_{Intrinsc}/\tau_{Blend}$ values and errors for the different fabricated PMMA composites

	Value	error
1	26.4	0.6
2	45.4	0.4
3	30.3	0.2
4	14.3	0.4
5	7.5	0.5
6	5.3	0.5

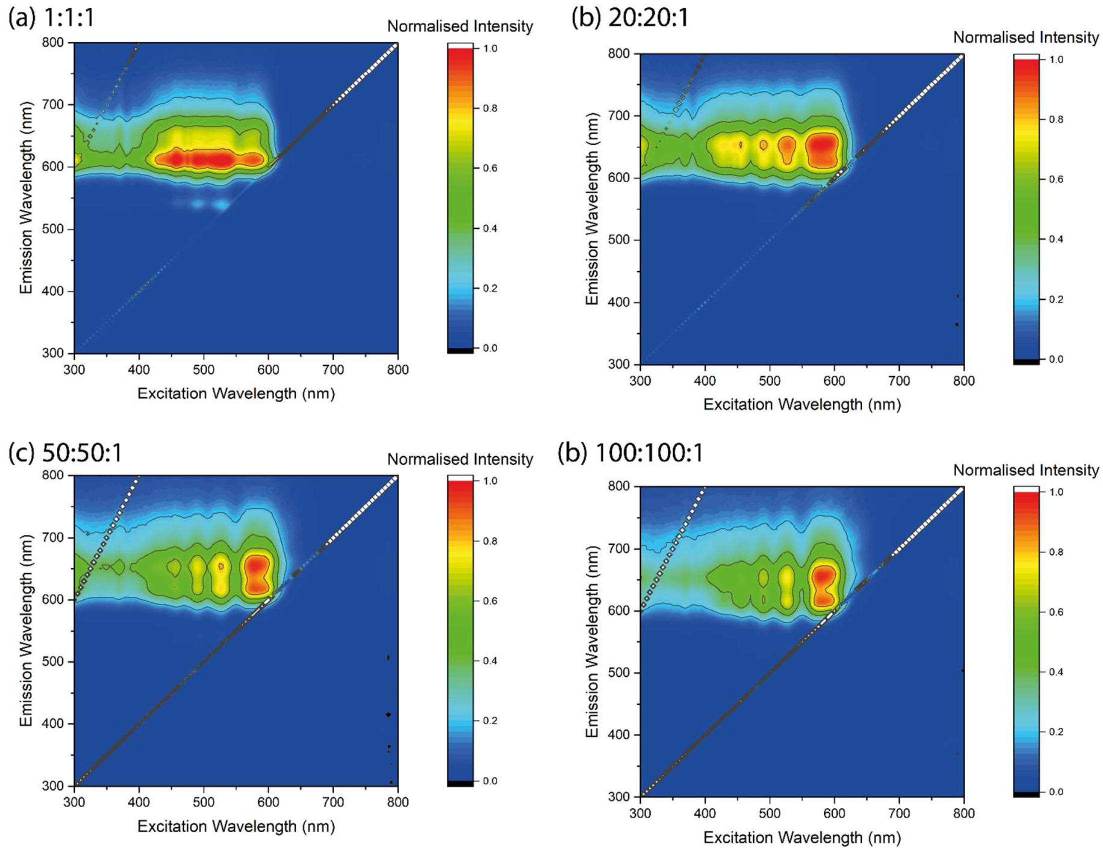

Figure S8: Two-dimensional emission/excitation spectra clearly showing that, under any excitation, emission occurs from the red dye at 650 nm.

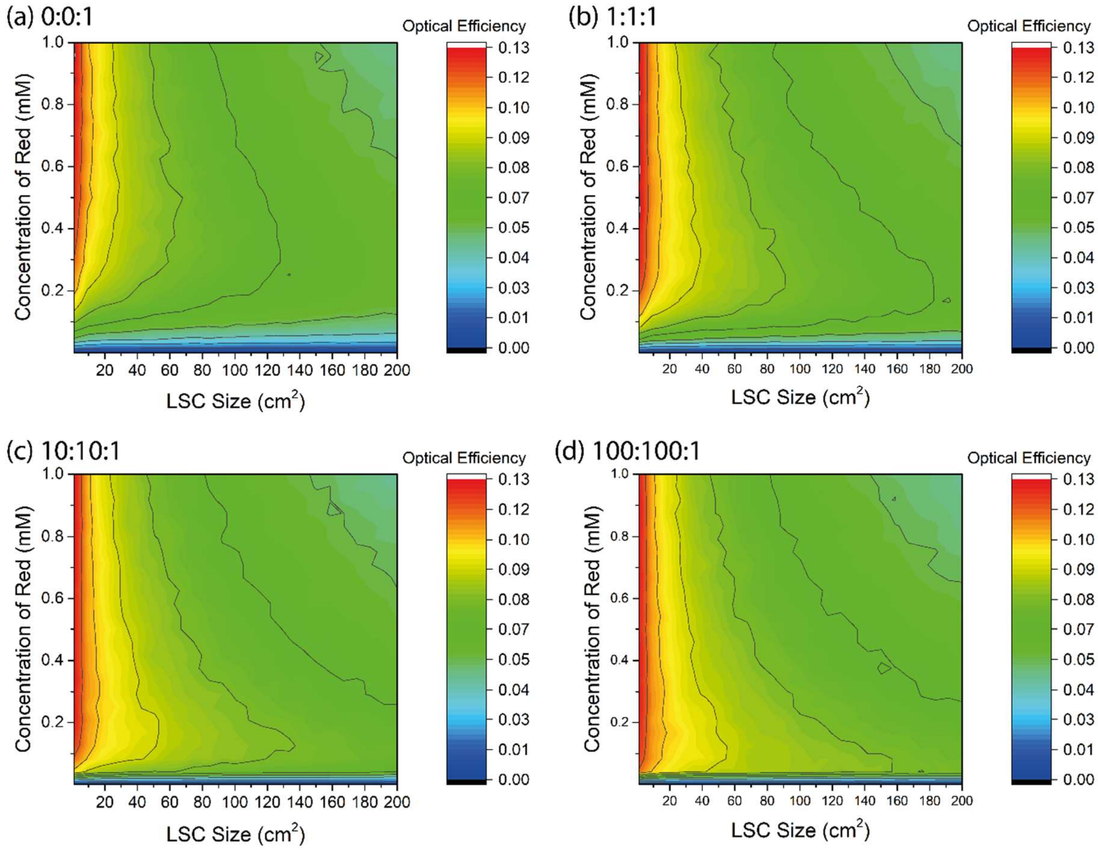

Figure S9: Results of Monte-Carlo ray trancing simulations on different ratio LHCs. Full details on the simulations can be found in the methods section.

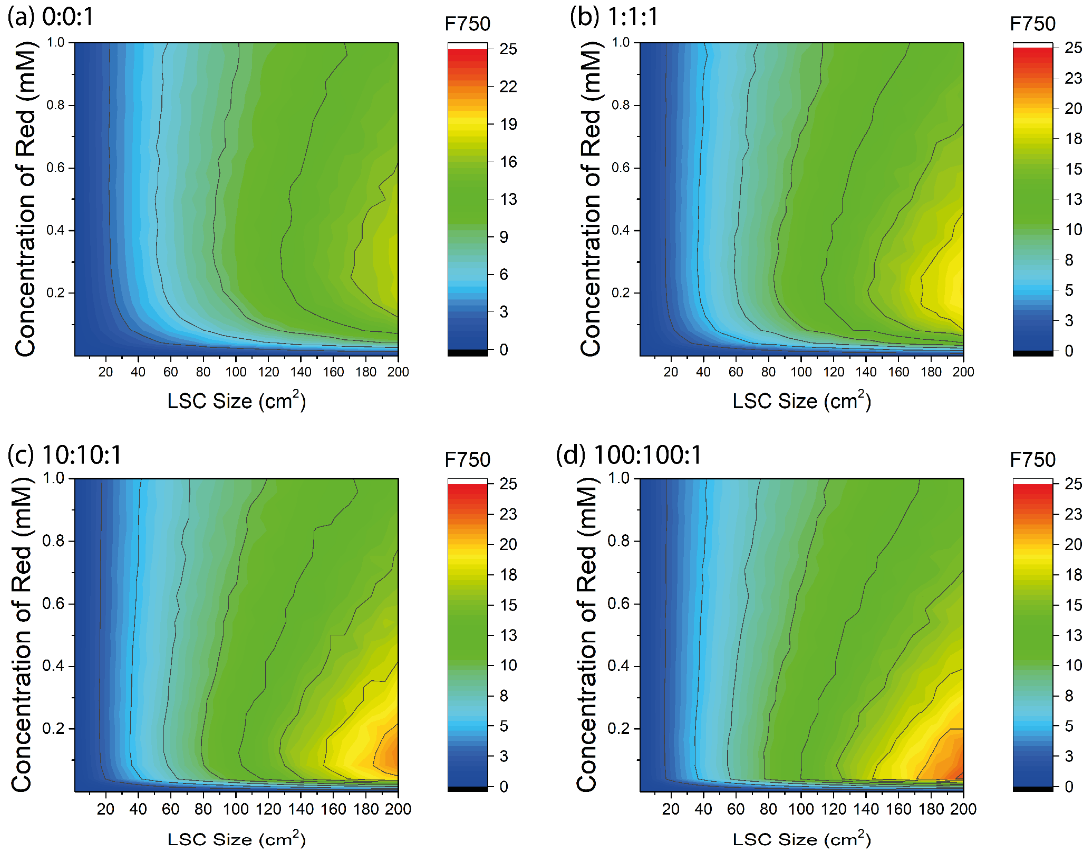

Figure S10: Results of Monte-Carlo ray trancing simulations on different ratio LHCs with a flux threshold of 750 nm. Full details on the simulations can be found in the methods section of the main text.

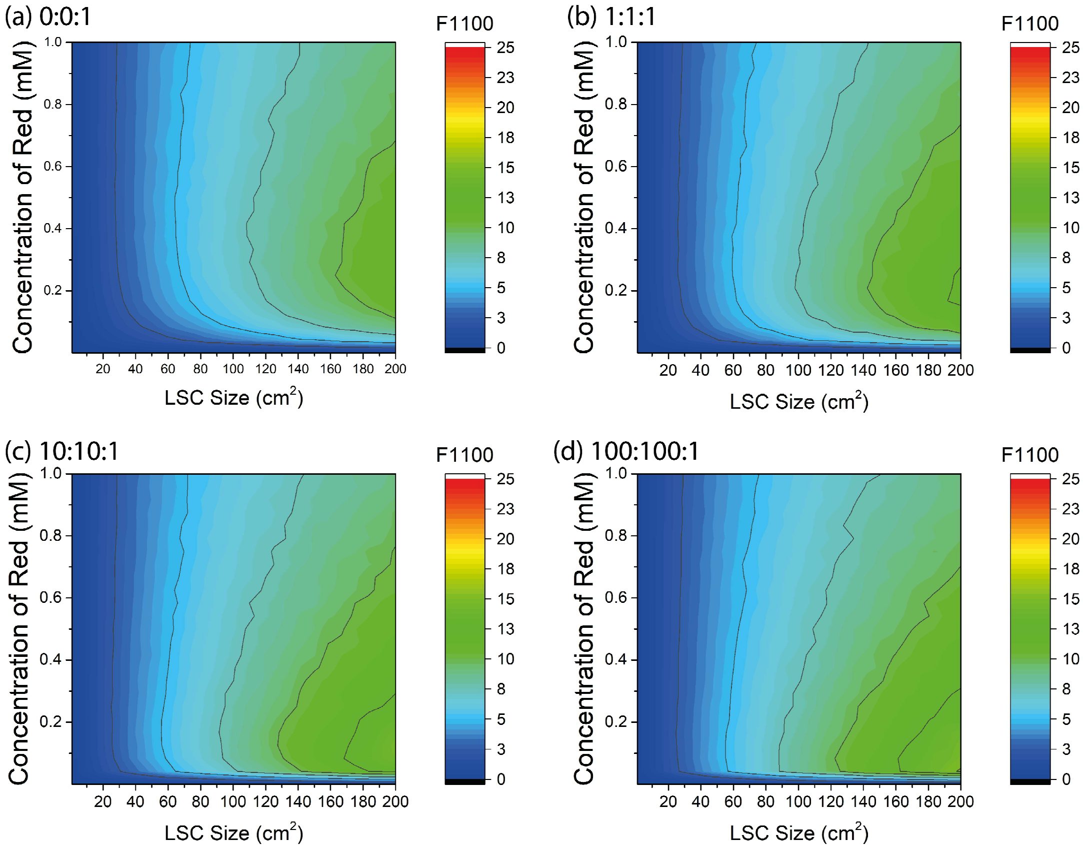

Figure S11: Results of Monte-Carlo ray trancing simulations on different ratio LHCs with a flux threshold of 1100 nm. Full details on the simulations can be found in the methods section of the main text.