

# Selection of Atto Dye FRET Pairs

## DNA Labeling and Modification

### Background

FRET (Fluorescence Resonance Energy Transfer) describes the non-radiative energy transfer from an excited state of a donor fluorophore to an acceptor fluorophore in close proximity (typically <10nm). The mechanism is based on a long-range dipole-dipole coupling mechanism.

The energy transfer rate  $k_T$  from the donor to the acceptor molecule is given as following:

$$k_T = 8.785 \cdot 10^{-25} \kappa^2 J(\lambda) k_f / r^6 \eta^4$$

$\kappa$ : mutual orientation of donor and acceptor dipole moments ( $\kappa^2 = 2/3$  for free rotating fluorophores)

$J(\lambda)$ : spectral overlap between donor emission and acceptor excitation wavelengths

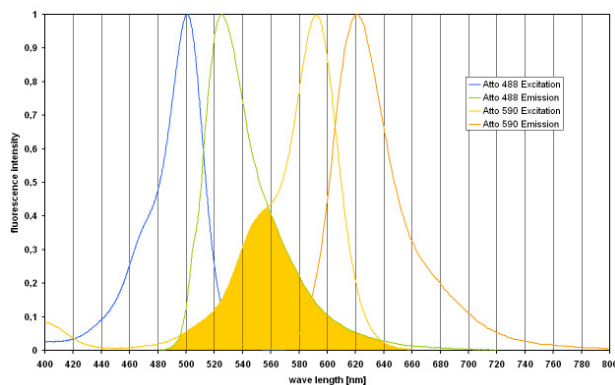
$k_f$ : equilibrium constant of the fluorescent transition

$r$ : distance between donor and acceptor

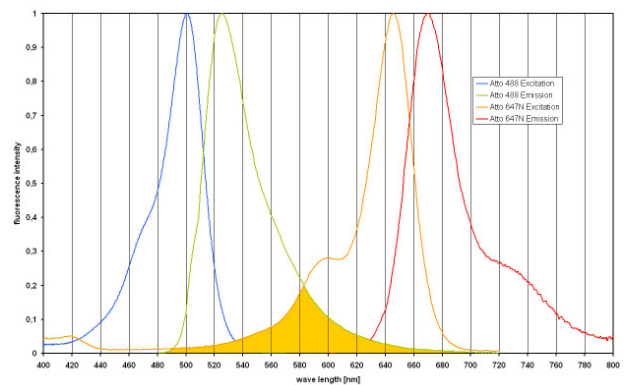
$\eta$ : refractive index of the medium (1.33 for water and 1.75 for fluorophores intercalated into DNA)

### Spectral overlap $J(\lambda)$ of Atto FRET Pairs

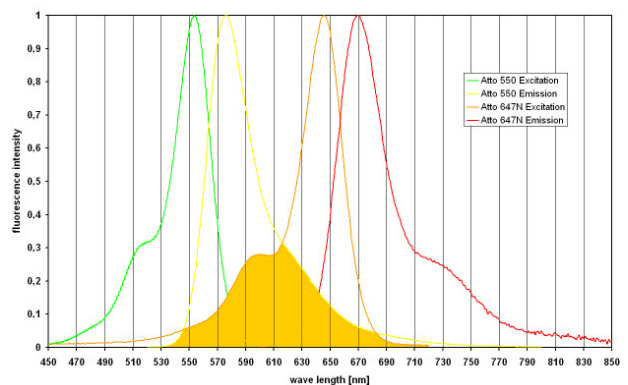
Atto 488 → Atto 590



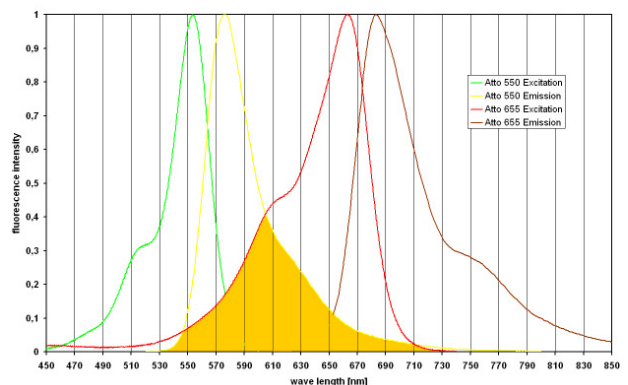
Atto 488 → Atto 647N



Atto 550 → Atto 647N



Atto 550 → Atto 655



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Atto 590 → Atto 655

