

Supplemental Information

1. PET Supplemental Figures

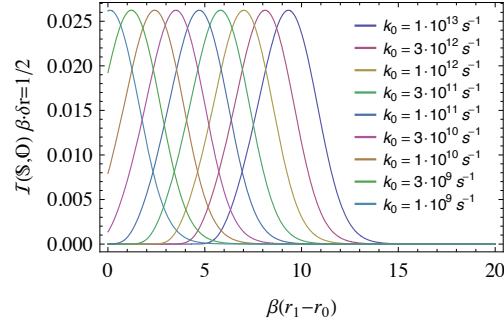


FIG. 18: Dependence of the Mutual information between two states that differ in their PET distance by $1/2\beta$ with the closer state at $\beta(r_1 - r_0)$ as indicated on the horizontal axis for several values of k_0 .

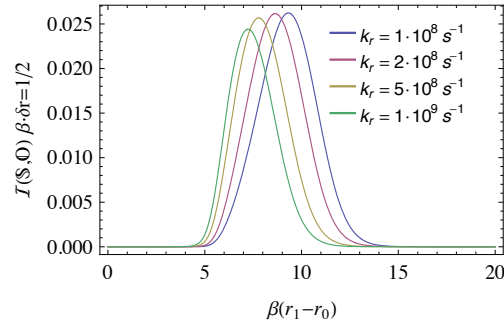


FIG. 19: Dependence of the Mutual information between two states that differ in their PET distance by $1/2\beta$ with the closer state at $\beta(r_1 - r_0)$ as indicated on the horizontal axis for several values of k_r .

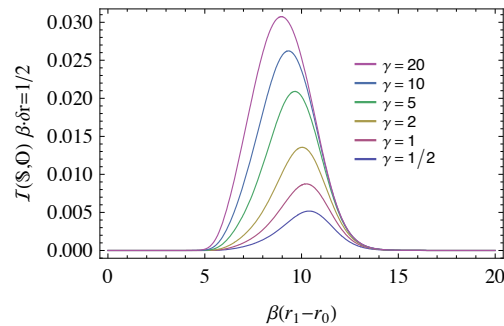


FIG. 20: Dependence of the Mutual information between two states that differ in their PET distance by $1/2\beta$ with the closer state at $\beta(r_1 - r_0)$ as indicated on the horizontal axis for several values of γ .

2. FRET Supplemental Figures

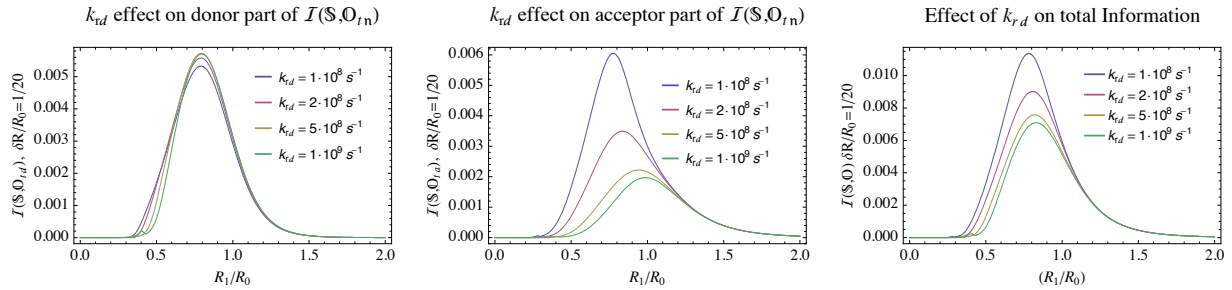


FIG. 21: **Donor Lifetime Dependence** Donor (left), Acceptor (middle), and Total (right) contributions to the Mutual information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of the donor radiative rate, k_{rd} as labeled in the figure.

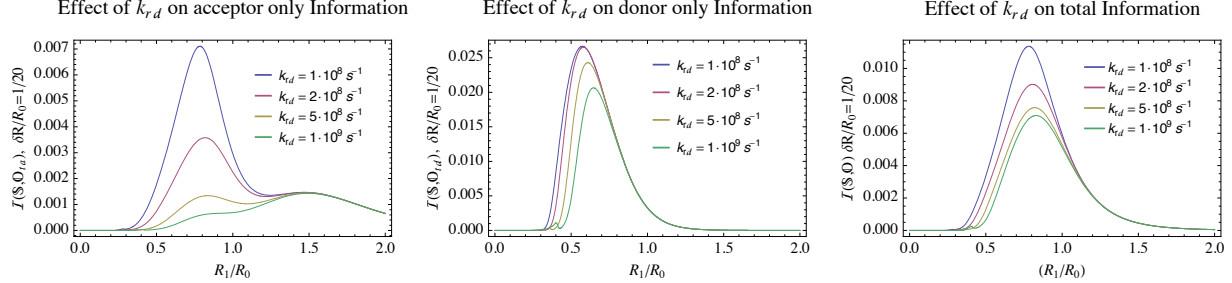


FIG. 22: **Donor Lifetime Dependence** Donor (left), Acceptor (middle), contributions to the Marginal information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of the donor radiative rate, k_{rd} as labeled in the figure compared to the Total (right) Mutual information.

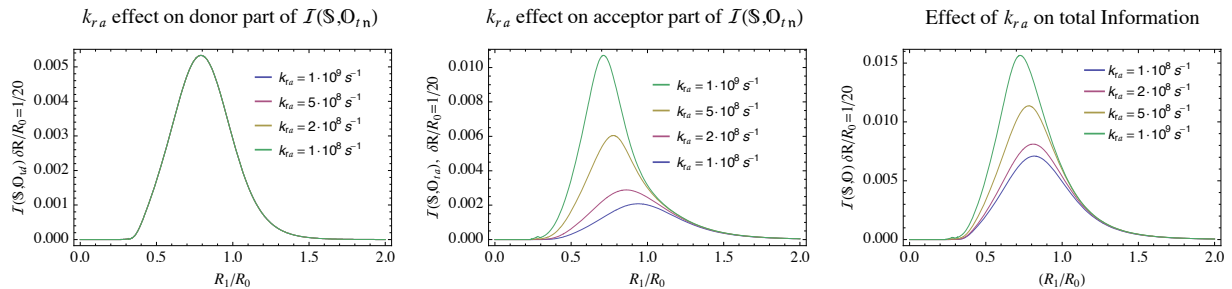


FIG. 23: **Acceptor Lifetime Dependence** Donor (left), Acceptor (middle), and Total (right) contributions to the Mutual information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of the acceptor radiative rate, k_{ra} as labeled in the figure.

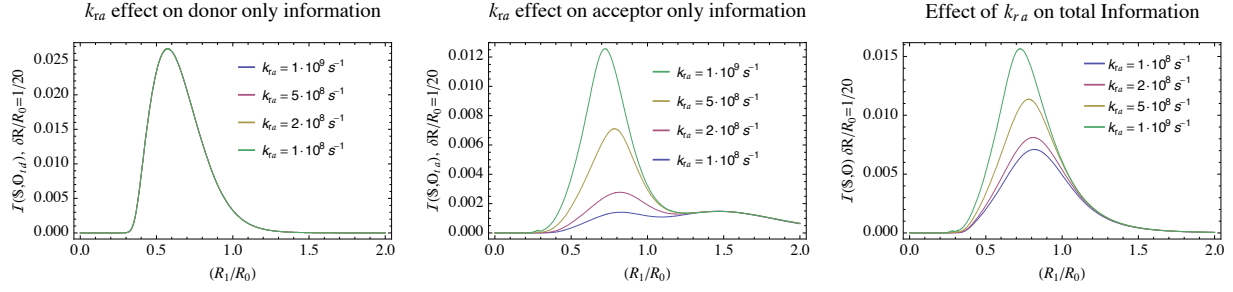


FIG. 24: **Acceptor Lifetime Dependence** Donor (left), Acceptor (middle), contributions to the Marginal information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of the acceptor radiative rate, k_{ra} as labeled in the figure compared to the Total (right) Mutual information.

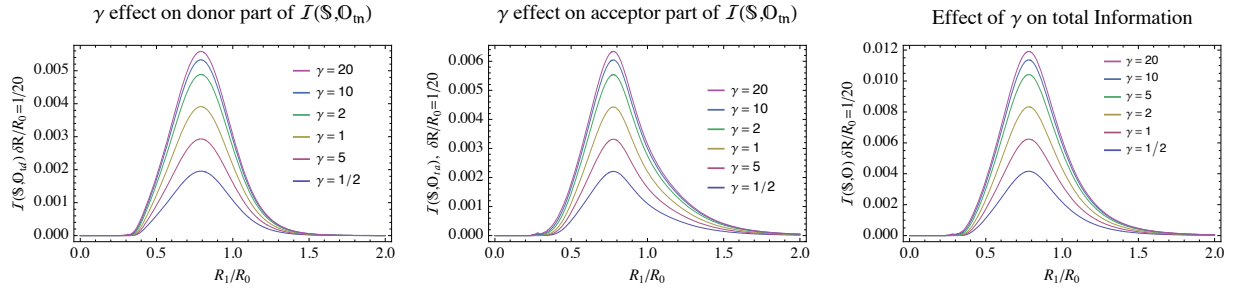


FIG. 25: **Signal:Background Dependence** Donor (left), Acceptor (middle), and Total (right) contributions to the Mutual information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of signal-to-background, γ as labeled in the figure.

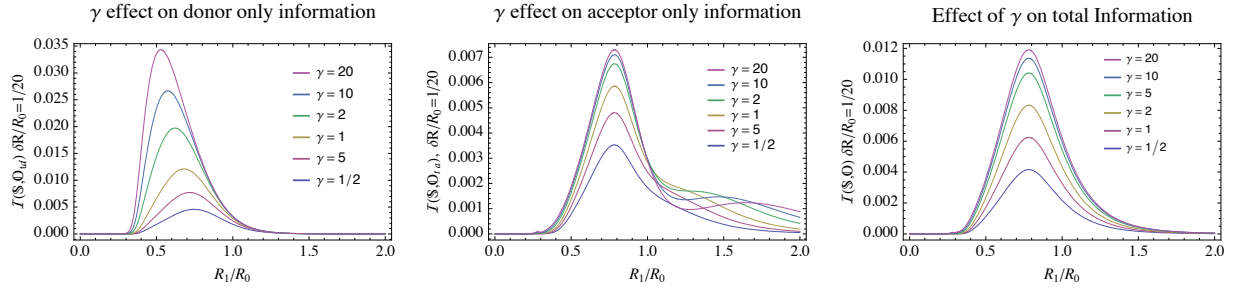


FIG. 26: **Signal:Background Dependence** Donor (left), Acceptor (middle), contributions to the Marginal information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of signal-to-background, γ as labeled in the figure compared to the Total (right) Mutual information.

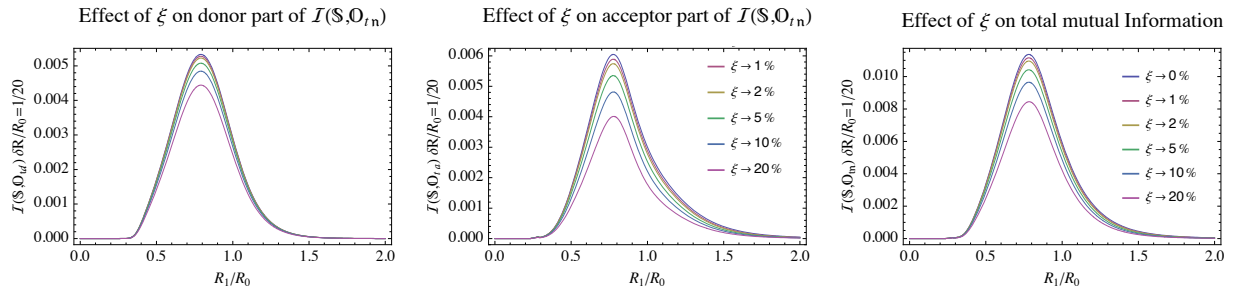


FIG. 27: **Direct Acceptor Excitation Dependence** Donor (left), Acceptor (middle), and Total (right) contributions to the Mutual information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of direct acceptor excitation, ξ as labeled in the figure.

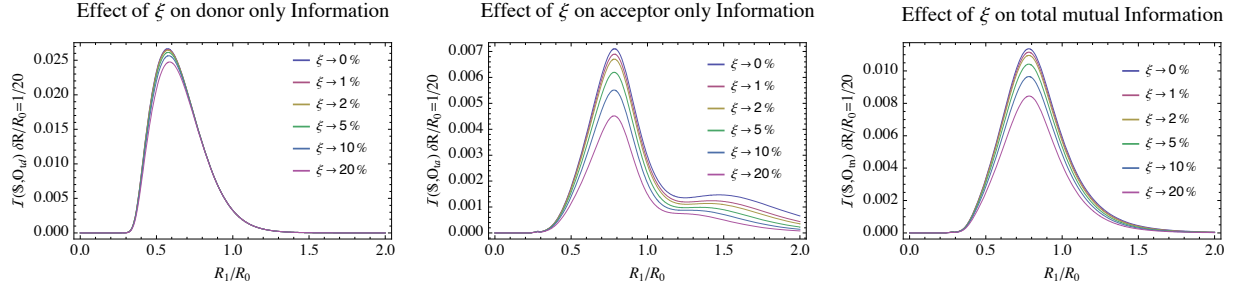


FIG. 28: **Direct Acceptor Excitation Dependence** Donor (left), Acceptor (middle), contributions to the Marginal information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of direct acceptor excitation, ξ as labeled in the figure compared to the Total (right) Mutual information.

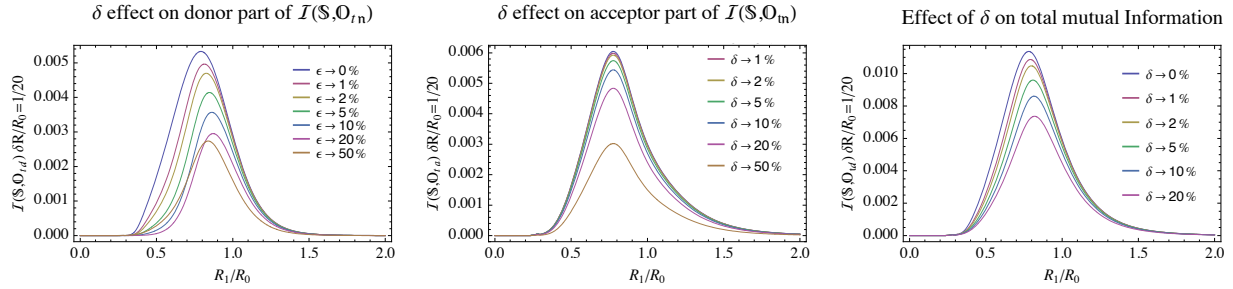


FIG. 29: **Acceptor-Donor Leakage Dependence** Donor (left), Acceptor (middle), and Total (right) contributions to the Mutual information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of Donor-Acceptor leakage, δ as labeled in the figure.

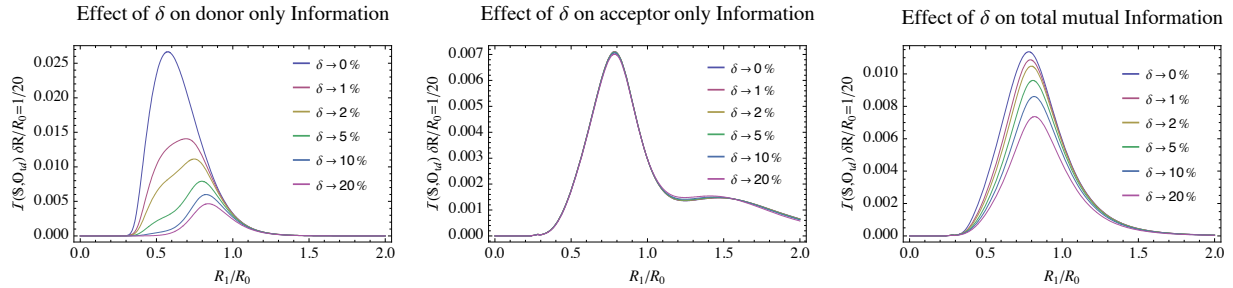


FIG. 30: **Acceptor-Donor Leakage Dependence** Donor (left), Acceptor (middle), contributions to the Marginal information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of Donor-Acceptor leakage, δ as labeled in the figure compared to the Total (right) Mutual information.

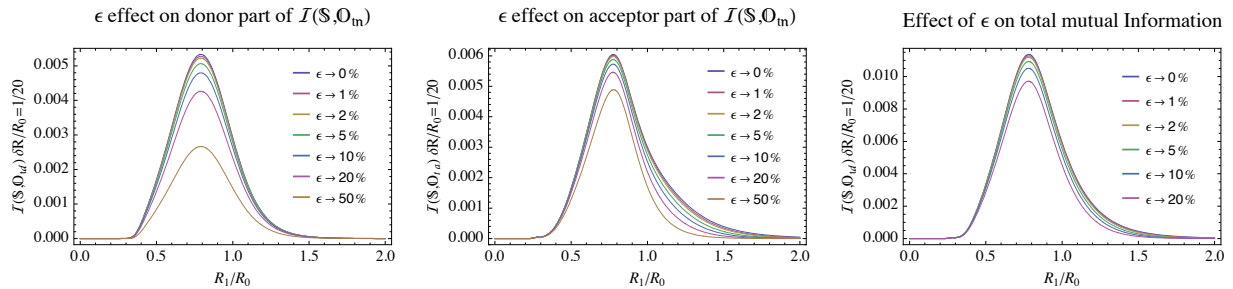


FIG. 31: **Donor-Acceptor Leakage Dependence** Donor (left), Acceptor (middle), and Total (right) contributions to the Mutual information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of Acceptor-Donor leakage, ϵ as labeled in the figure.

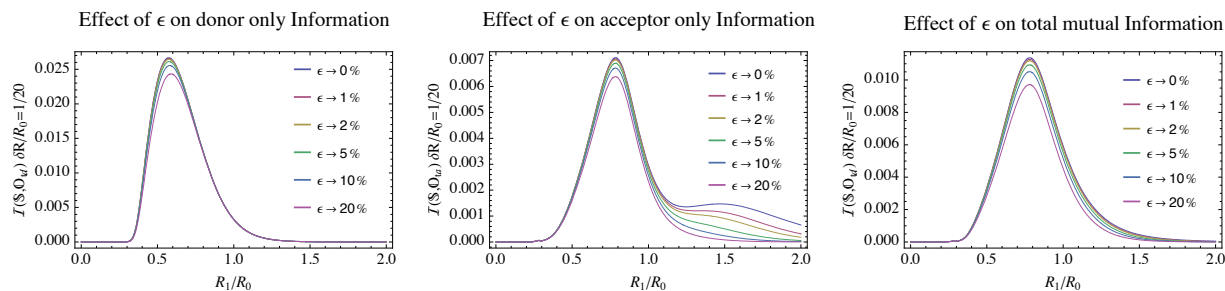


FIG. 32: **Donor-Acceptor Leakage Dependence** Donor (left), Acceptor (middle), contributions to the Marginal information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance at varying levels of Acceptor-Donor leakage, ϵ as labeled in the figure compared to the Total (right) Mutual information.

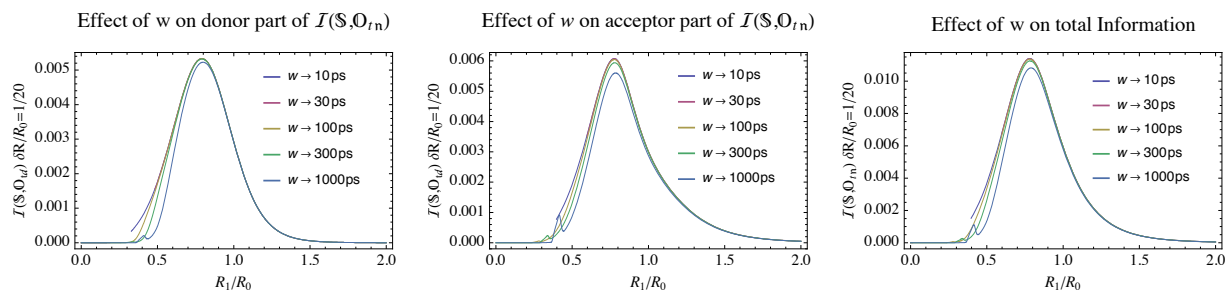


FIG. 33: **IRF width Dependence** Donor (left), Acceptor (middle), and Total (right) contributions to the Mutual information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance for several different IRF widths, w as labeled in the figure.

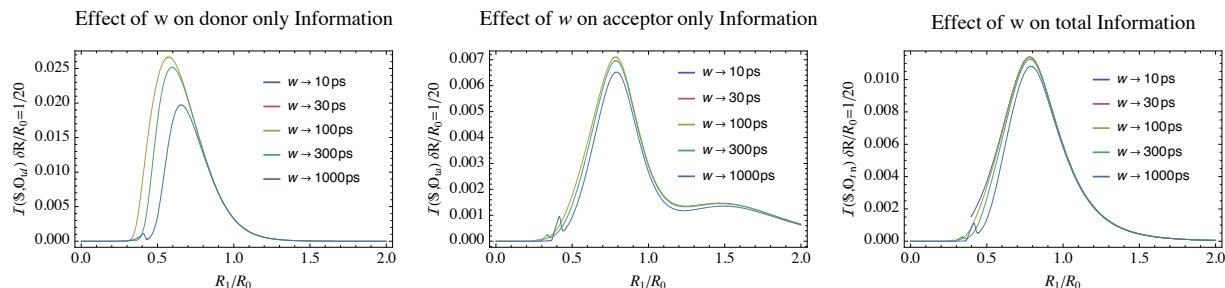


FIG. 34: **IRF width Dependence** Donor (left), Acceptor (middle), contributions to the Marginal information of two states separated by $\delta R=R_0/20$ as a function of the closer state distance for several different IRF widths, w as labeled in the figure compared to the Total (right) Mutual information.