

SUPPORTING INFORMATION

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Direct Quantification of the Plasmon Dephasing Time in Ensembles of
Gold Nanorods Through Two-Dimensional Electronic Spectroscopy

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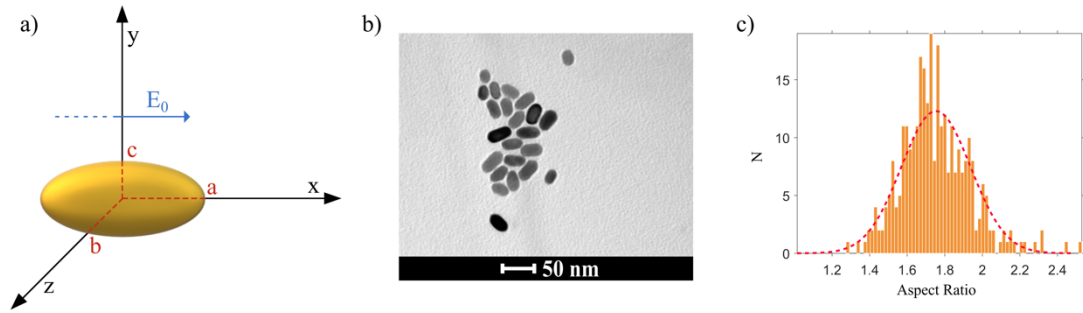


Figure S1. (a) Schematization of a single NR with relevant dimensions. **a**, **b** and **c** represent the three semiaxes of the rod. E_0 is the (uniform) external static field. (b) Example of a TEM image of a NRs sample. (c) Size distributions of AR for the same sample of panel (b) obtained from the analysis of up to 300 NRs.

Table S1. Parameters used in Eqs 1-4.

$m = 9.109 \cdot 10^{-31} \text{ kg}$	$\epsilon_{\infty} = 9.84$
$\epsilon_m = 80$	$\epsilon_0 = 8.854 \cdot 10^{-12} \text{ C}^2\text{N}^{-1}\text{m}^{-2}$
$n^{(x)} = 0.1941$	$(a, b, c) = (1.8, 1, 1)$
$\rho = 5.9 \cdot 10^{28} \text{ m}^{-3}$	$e = 1.602 \cdot 10^{-19} \text{ C}$
$\omega_0 = 2.00 \text{ eV}$ (Fig 2a-c) 2.08 eV (Fig 2d)	$E_0(\omega) = 1 \text{ N/C}$ (constant for each frequency)

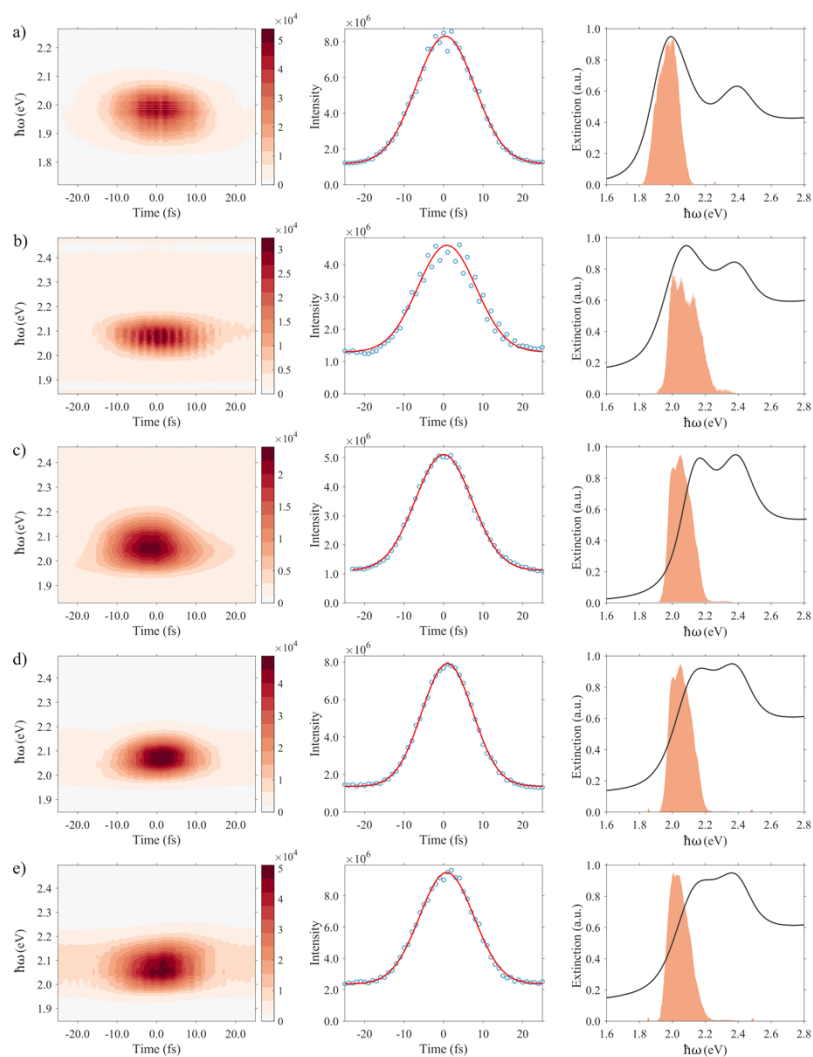


Figure S2. Characterization of the exciting pulses used to perform 2DES measurements on the different NRs' samples with the LSPR located at (a) 1.99 eV; (b) 2.07 eV; (c) 2.124 eV; (d) 2.125 eV; and (e) 2.128 eV. First column: FROG (frequency-resolved optical gating) measurement obtained in the 2DES setup at the sample position by replacing the sample with dimethyl sulfoxide. Second column: Estimation of the pulse duration by a Gaussian fit of the wavelength-integrated FROG profile. In all cases, the pulse duration has been estimated 11 ± 2 fs. Third column: Exciting laser profile (orange area) compared with the extinction spectrum of the NRs samples.

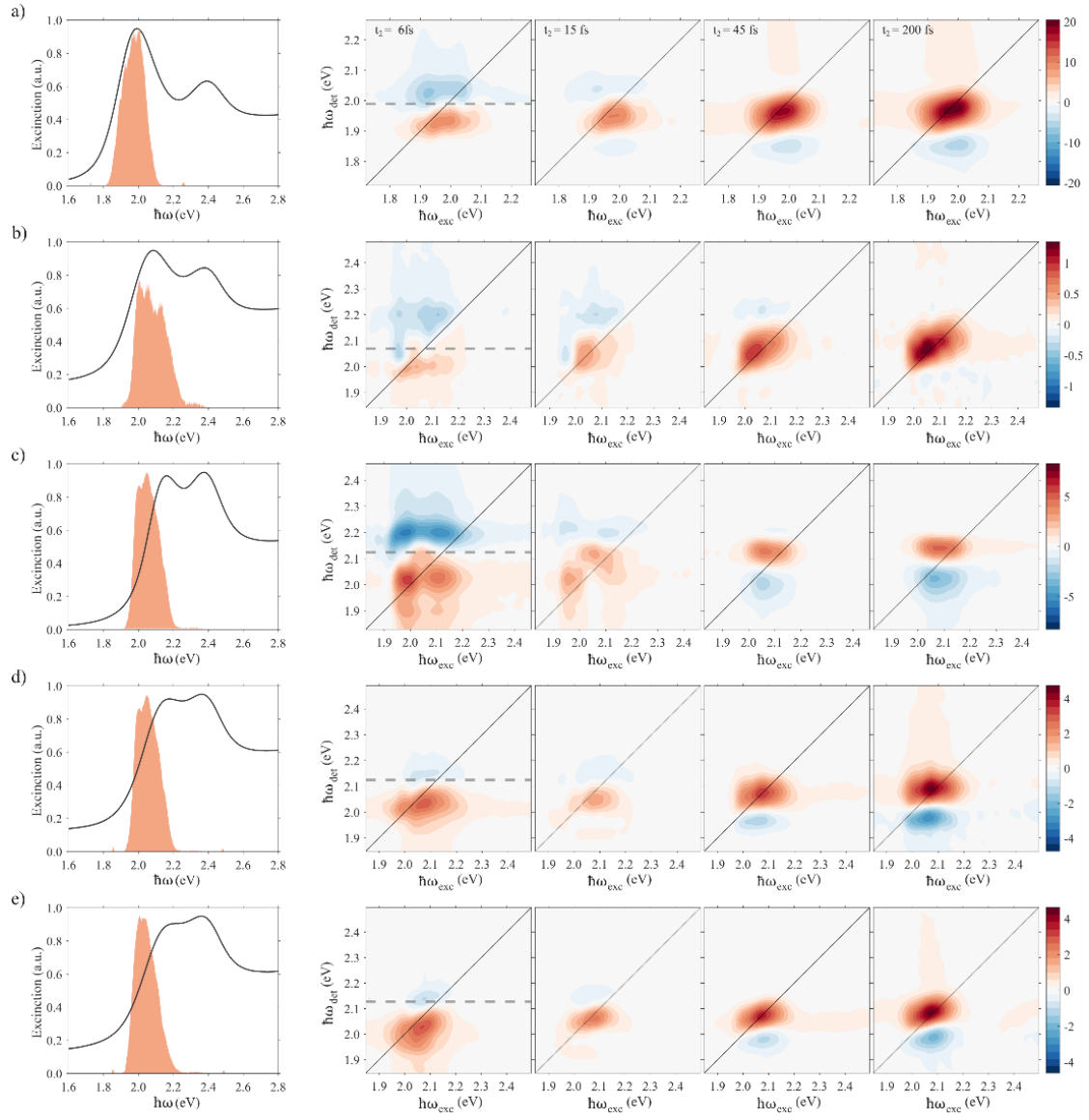


Figure S3. (Left column) Extinction spectra of the NRs suspensions (black line) and spectral profiles of the laser spectrum used for 2DES measurements (orange area) for five additional NRs samples with the LSPR located at (a) 1.99 eV; (b) 2.07 eV; (c) 2.124 eV; (d) 2.125 eV; and (e) 2.128 eV. (Right column) Corresponding purely absorptive 2DES maps (real signal) at selected values of population time t_2 . The dashed lines serve as a visual guide to emphasize the nodal lines in the dispersive-like signals observed at early times.