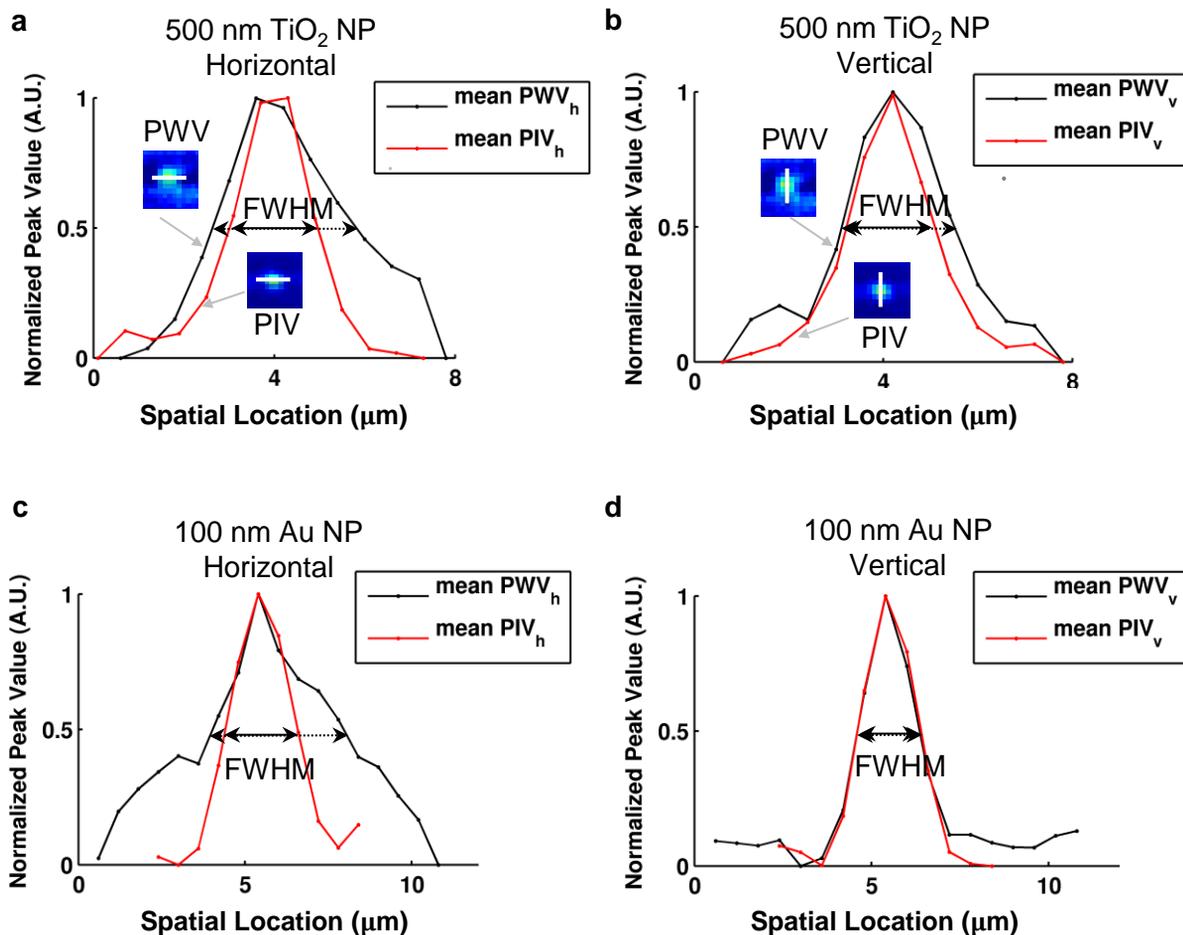
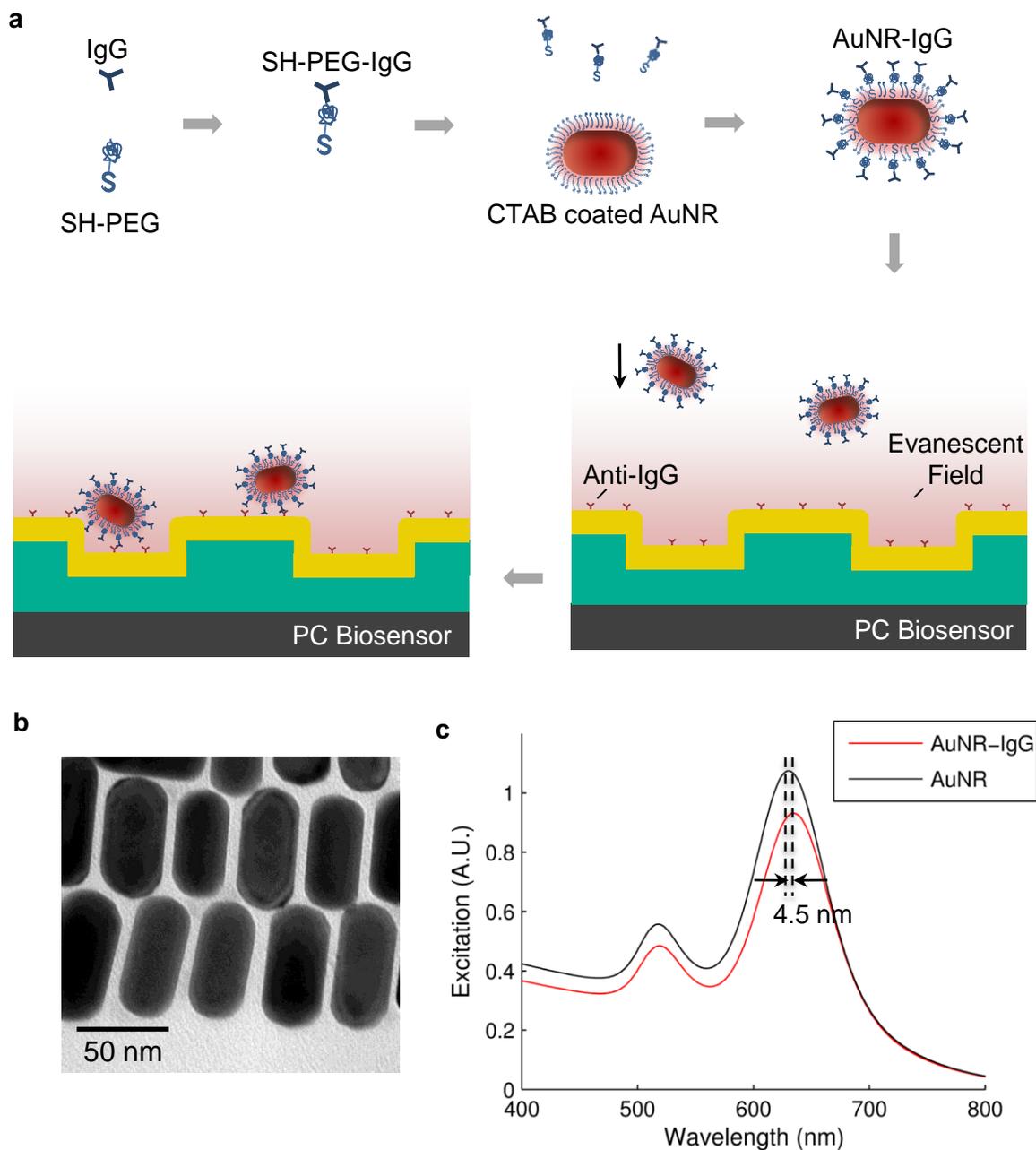


**Supplementary Figure 1. Comparison of FWHM of tDPN nano-dots on the PC surface measured by AFM and PCEM.** (a) tDPN nano-dots measured by AFM, indicating a FWHM (mean) of 540 nm. (b) tDPN nano-dots measured by PCEM, indicating a FWHM (mean) of 1.20 μm in horizontal direction and 1.13 μm in vertical direction (measured from PWV image).



**Supplementary Figure 2. Comparison of FWHM (in horizontal and vertical directions) in PWV and PIV images detected by PCEM with randomly distributed nanoparticles on the PC surface.** FWHM (mean) in PWV and PIV images of 500 nm  $\text{TiO}_2$  NP measured by PCEM in (a) horizontal and (b) vertical directions. FWHM (mean) in PWV and PIV images of 100 nm Au NP measured by PCEM in (c) horizontal and (d) vertical directions.



**Supplementary Figure 3. PCEM Detection of AuNR conjugation with SH-PEG-IgG.** (a) Schematic Illustration of AuNR conjugation with SH-PEG-IgG. (b) TEM image of AuNRs. (c) UV-vis extinction spectra confirming AuNR and SH-PEG-IgG conjugation.

	PWV FWHM ( $\mu\text{m}$ )		PIV FWHM ( $\mu\text{m}$ )	
	Horizontal	Vertical	Horizontal	Vertical
TiO <sub>2</sub> NP (500 nm)	1.56 $\pm$ 0.26	1.20 $\pm$ 0.28	0.95 $\pm$ 0.09	0.96 $\pm$ 0.39
Au NP (100 nm)	1.85 $\pm$ 0.81	1.34 $\pm$ 0.34	1.15 $\pm$ 0.05	0.97 $\pm$ 0.07

**Supplementary Table 1. Measured FWHM** (mean  $\pm$  std, in units of  $\mu\text{m}$ ) in horizontal and vertical directions (in both PWV and PIV images) for 500 nm TiO<sub>2</sub> NP and 100 nm Au NP.

**Video 1. Dynamic detection of 100 nm Au nanoparticle using PCEM.** The Au nanoparticle was incubated in DI water on a PC surface. PIV images were acquired at a rate of 10 sec/frame. Video shows random adsorption, desorption, and re-adsorption of an Au nanoparticle.

**Video 2. Dynamic detection of 100 nm TiO<sub>2</sub> nanoparticle using PCEM.** The TiO<sub>2</sub> nanoparticle was incubated in DI water on a PC surface. PIV images were acquired at a rate of 10 sec/frame. Video shows random adsorption, desorption, and re-adsorption of a TiO<sub>2</sub> nanoparticle.