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Supplementary Information

Bifunctional Tm^{3+},Yb^{3+}:$GdVO_4$@SiO_2 Core-Shell Nanoparticles in HeLa Cells: Upconversion Luminescence Nanothermometry in the First Biological Window and Biolabelling in the Visible

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Tm,Yb:$GdVO_4$@SiO_2 core-shell nanoparticles inside and outside HeLa cells.

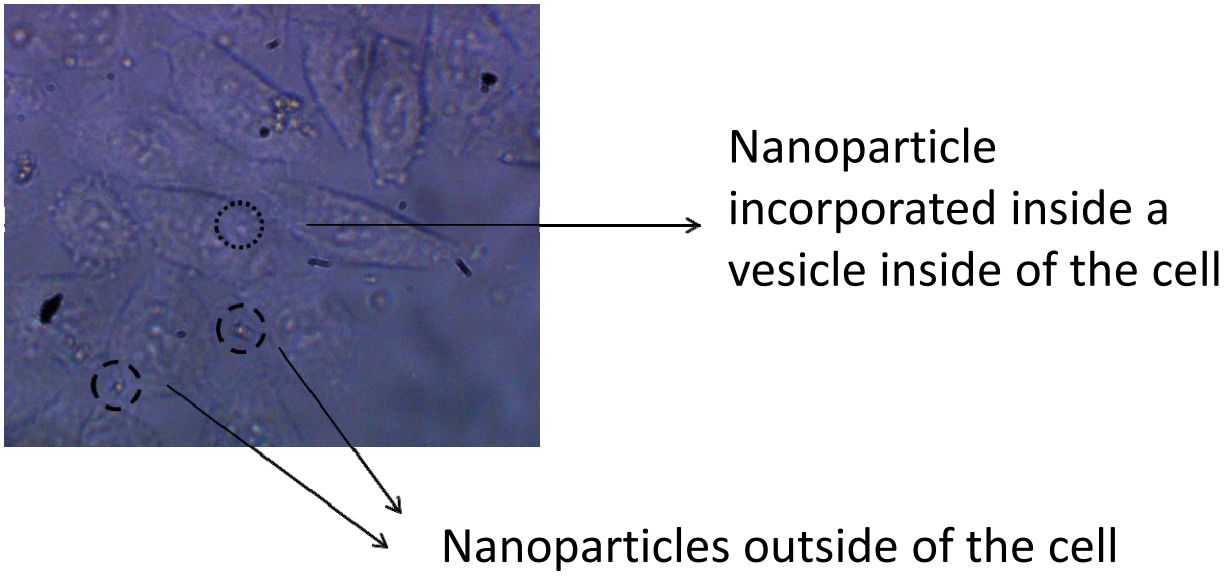

Figure S1. Microscope optical transmission image of the HeLa cells incubated with Tm,Yb:$GdVO_4$@SiO_2 core-shell nanoparticles when the excitation laser is on. The different arrows indicate the position were the core-shell nanoparticles are located. The nanoparticles located outside of the cell show a higher emission intensity, and they can be clearly seen in the images. The nanoparticles incorporated inside vesicles in the cells show a smaller emission intensity and a more attenuated image.

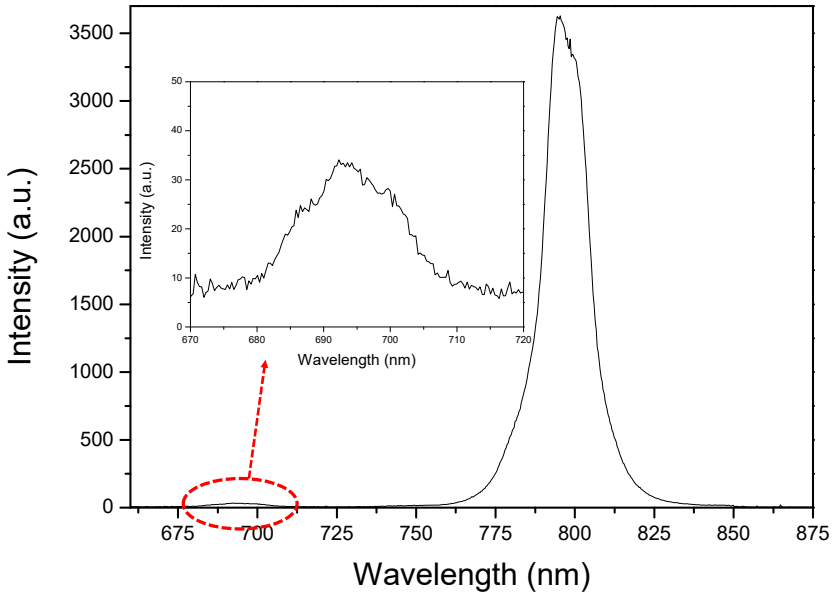

Figure S2. Typical luminescence spectrum recorded for the Tm,Yb:$GdVO_4$@SiO_2 core-shell nanoparticles in the I-BW after excitation at 980 nm with a power of 50 mW, and a spot size of 3 mm in the sample, to avoid photo damages in the living cells. From this spectrum the temperature could be determined by applying Equation (1) in the paper and the fitting function extracted from Figure 3a, resulting in a value of 308 ± 2 K after five measurements.