Supplementary Information (SI) to accompany

Two-stage capture employing active transport enables sensitive and fast biosensors

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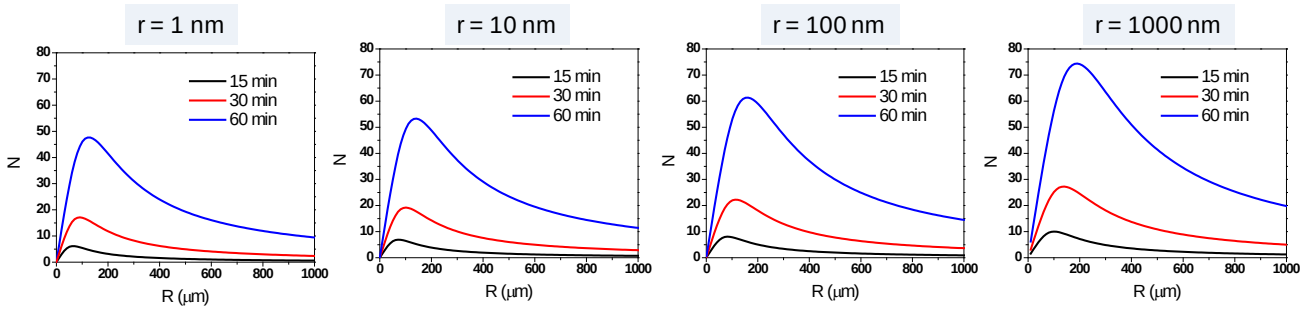
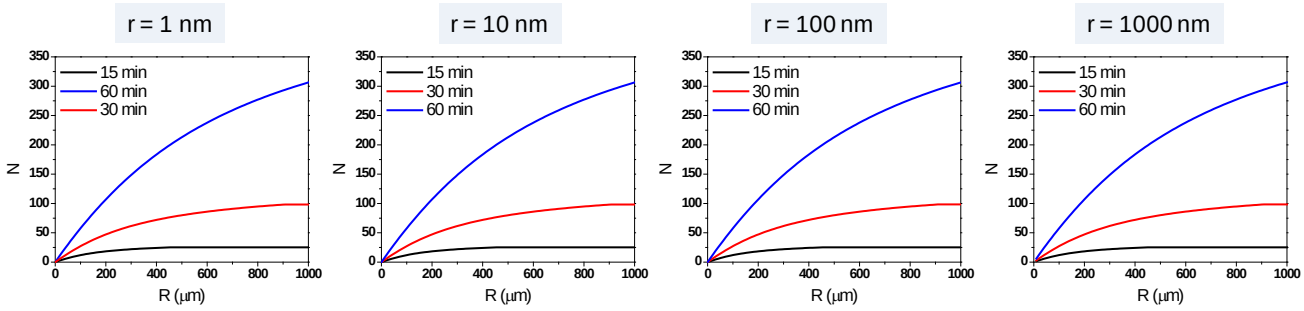
Supplementary figures:

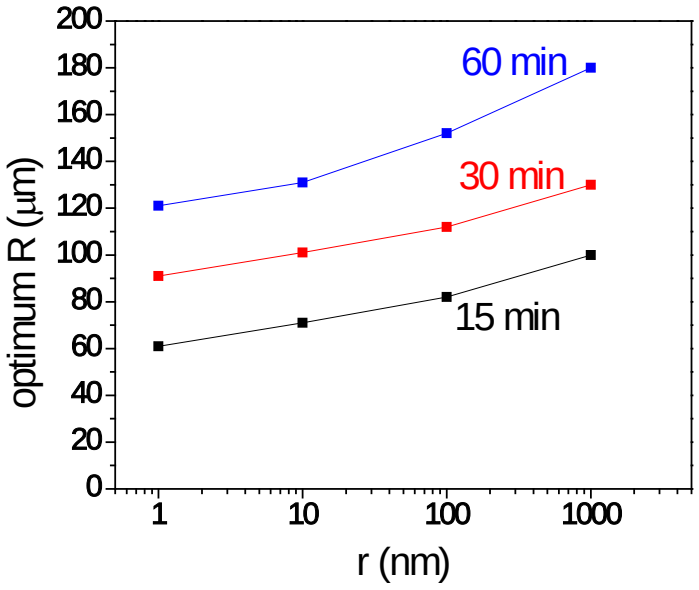


Supplementary Figure 1. Number of analytes collected for 3D analyte diffusion onto molecular shuttles followed by undirected (diffusive) shuttle movement as a function of compartment radius R. The available time for collection (15, 30, 60 min shown) and the radius r of the sensor patch determine the optimal size of the sensor compartment. A diffusion constant for 3D-diffusion of 80 $\mu m^2/s$, active transport velocity v of 0.5 µm/s, capture fraction f of 0.9 and analyte concentration C of 1 fM is assumed.



Supplementary Figure 2. Number of analytes collected for 3D analyte diffusion onto molecular shuttles followed by directed transport as a function of compartment radius R. Increasing the

compartment radius R increases the number of collected analytes N but once τ_{avg} = t (time for detection), the number of analytes captured in time t would remain constant. The size of the sensor patch does not visibly affect the number of collected analytes. A diffusion constant for 3D-diffusion of 80 $\mu m^2/s$, an active transport velocity v of 0.5 µm/s, a capture fraction f of 0.9 and an analyte concentration C of 1 fM is assumed.



Supplementary Figure 3. Optimum compartment size for a two stage capture process involving 3D diffusion to molecular shuttles followed by random 2D motion of the shuttles along the surface to the sensor patch. A diffusion constant of 80 $\mu m^2/s$ for 3D-diffusion and an active transport velocity of 0.5 µm/s is assumed.