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Analysis of 2-D DNA Origami with Nanopipettes

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Supplementary information:

Laser pulling parameters and pore size calculation:

Nanopipettes with pore diameters of 80-100nm was fabricated from quartz capillaries of 0.5mm inner diameter and 1.0mm as per the parameters given below.

Table S1 Laser pulling parameters for ~80-100nm pore size

HEAT	FIL	VEL	DEL	PULL
575	3	35	145	75
900	2	15	128	150

Successful fabrication of nanopipettes with the appropriate pore size was determined via SEM and IV measurements. Apart from extensive SEM imaging to check the nanopipette pore size consistency and fabrication reproducibility, a quick calculation for nanopipette pore size was done via the equation adapted from [34] using the IV measurements.

$$Rp \cong \cot\left[\frac{\alpha_{inner}}{2}\right] \Big/ \kappa\pi r_i$$

Where Rp is the pipette resistance, r_i the inner pipette radius, κ is the solution conductivity, and α_{inner} is the inner nanopipette cone angle. SEM imaging of a batch of 15 random nanopipettes confirmed the pore size calculation to a very close approximation

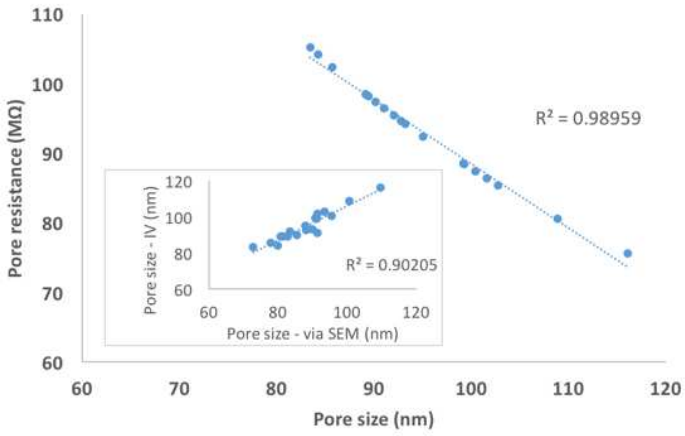

Figure S 1 Graph showing the correlation between nanopipette pore size and pore resistance obtained from IV measurements for quartz nanopipettes fabricated using the parameters given in Table S1. The inset shows the pore size measured via SEM plotted against the pore size calculated through IV measurements. The data is fitted with least square fits of first order polynomial with a high correlation of 0.9 R^2 and 0.9 R^2 for the main graph and inset correspondingly.

DNA origami design:

Schematic diagrams of DNA origami frames (F1 and F2) and solid tiles (T1 and T2) showing the path of the long scaffold fold along with the complementary short staple nucleotide strands are disclosed. All the DNA origami design other than T2 have the same length of scaffold, T2 comprises of 44 additional protruding loops as shown in figure S5. In all the representations, the scaffold M13mp18 ssDNA is shown running through the entire structure in blue colour and the short staple strands complementary to the scaffold are shown in different colours.

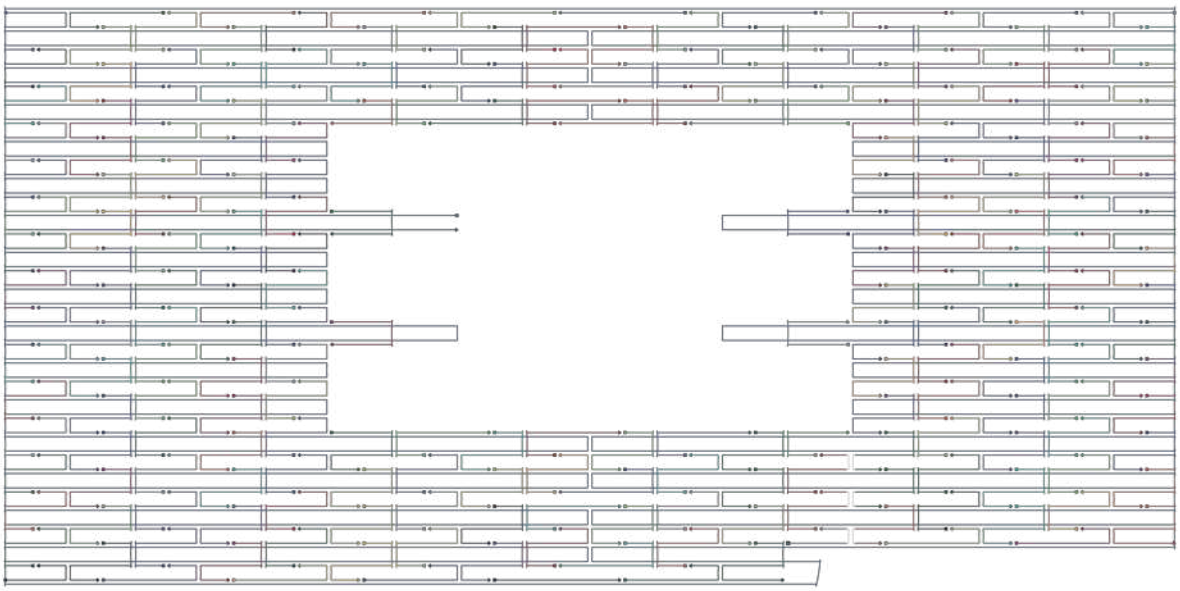

Figure S 2 Schematic diagram of DNA origami frame 1 (F1) with an inner frame width of 40*40nm.

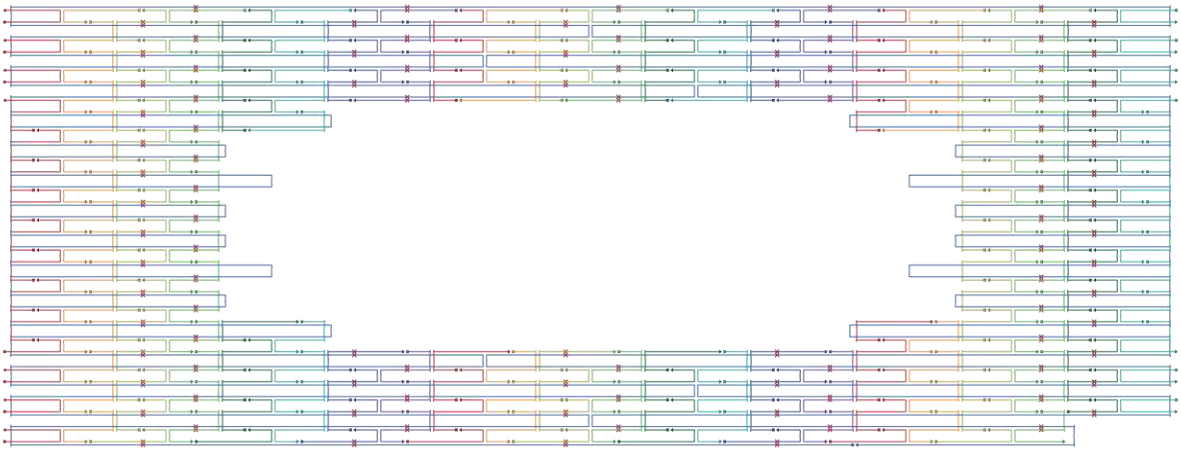

Figure S 3 Schematic diagram of DNA origami frame 2 (F2) with 60*40nm internal frame.

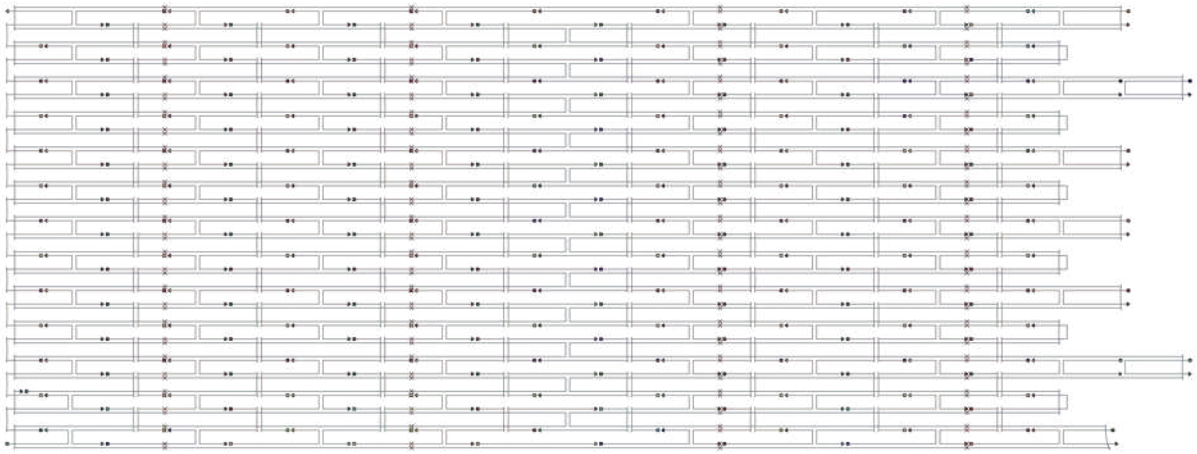

Figure S 4 Schematic diagram of DNA origami tile (T1).

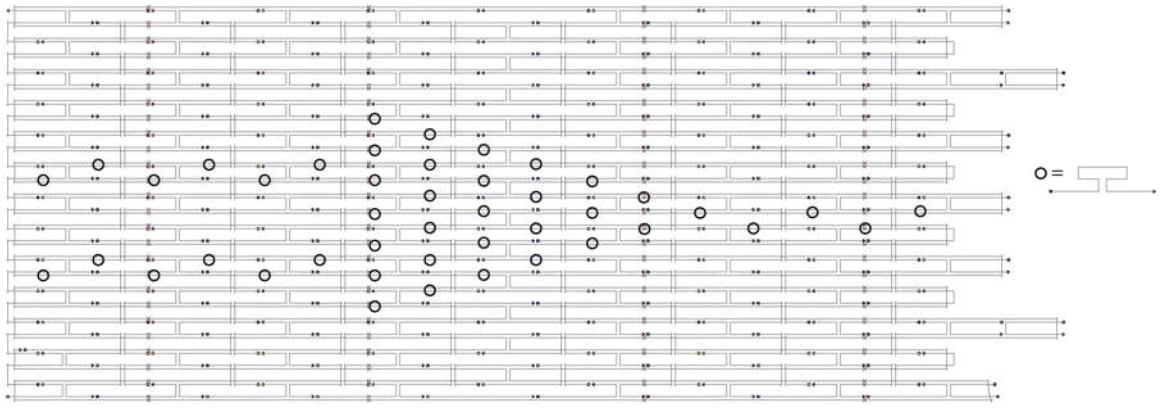

Figure S 5 Schematic for DNA origami tile T2, the protruding DNA loops on the surface are indicated by the black circles.

Ion current peak structure:

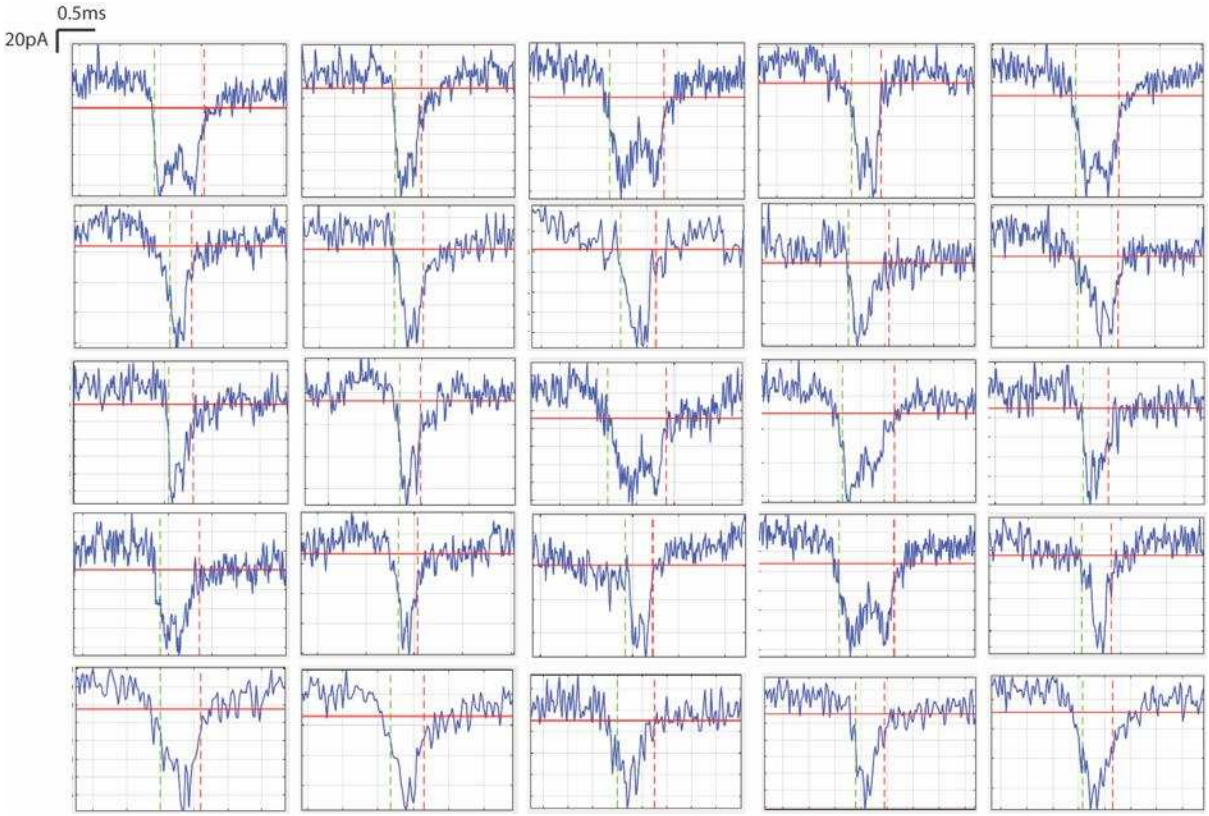

Figure S 6 An array of ion current amplitude peak structures for frame origami sample, the red line shows the baseline for the ion-current measurement along with the peak start and stop points.

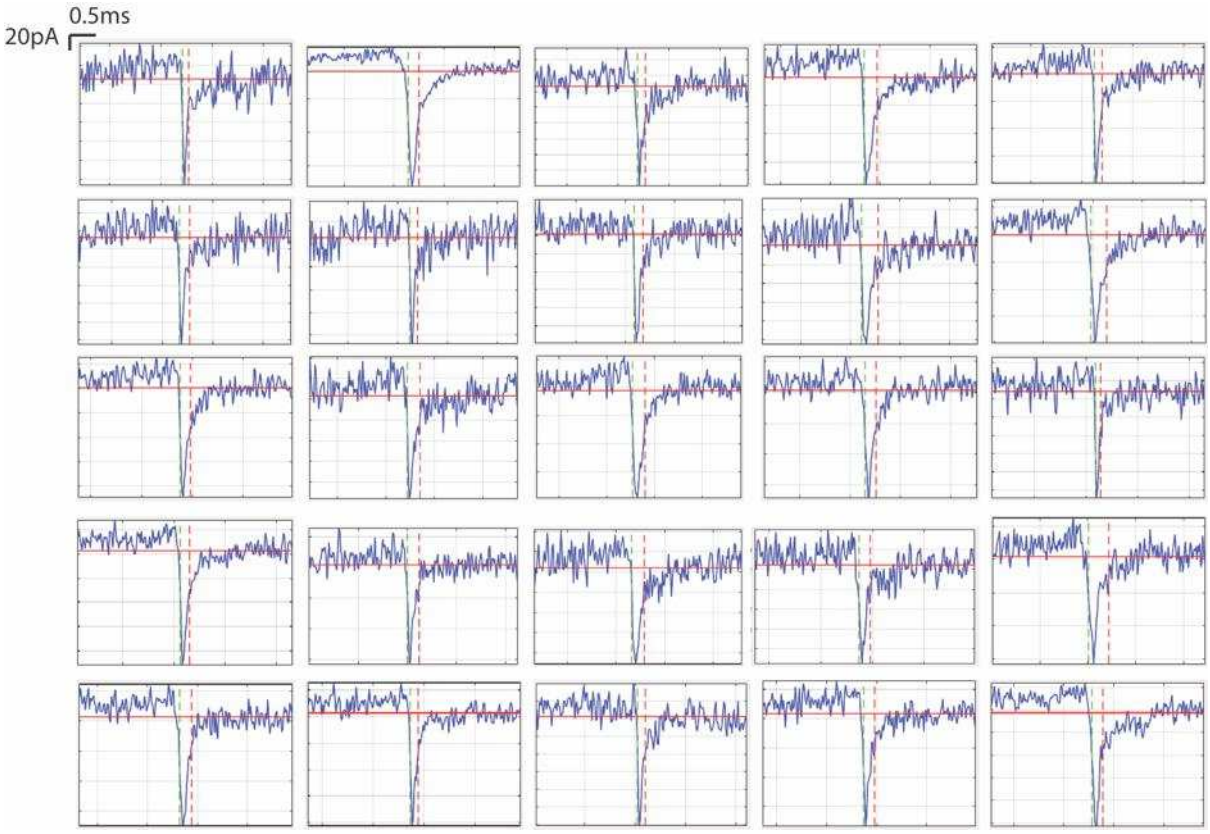

Figure S 7 An array of ion current amplitude peak structures for tile origami sample, the red line shows the baseline for the ion-current measurement along with the peak start and stop points.