## **Supplementary Information**

## Nanoscale direct mapping of localized and induced noise sources on conducting polymer films

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**Figure S1.** Topography and current images of a ITO/PEDOT:PSS substrate. a) Topography image shows a smooth surface of the PEDOT:PSS coated ITO substrate. The surface roughness was within 6 nm. b) Current map measured with a bias voltage of 0.2 V. A nearly homogeneous current distribution was observed in the ITO/PEDOT:PSS substrate. Scale bars are 200 nm.



**Figure S2.** Images of currents (a) and lateral forces (b) on an ITO/PEDOT:PSS substrate. Note that the disordered polymer regions with rather small currents in the current image matches to those with rather large lateral forces in the lateral force image. Scale bars are 200 nm.



**Figure S3.** Maps of conductivity at different sample bias voltages. a) Conductivity map measured at 0.1 V. b) Conductivity map measured at 1 V. It can be seen that disordered-phase regions with a rather low conductivity exhibited a larger conductivity change than ordered-phase regions with a high conductivity. Scale bars are 200 nm.



**Figure S4.** Map showing the change of noise PSD after light illumination. The changes of noise PSD were larger in the ordered-phase regions than those in the disordered-phase regions on the light-illumination. Scale bar is 200 nm.