

Supplementary information for: Gate-tunable FZP based on single-walled carbon nanotubes for terahertz applications

*Arina V. Radivon Nikita I. Raginov Elizaveta G. Tsiplakova Aram A. Mkrtchyan Gleb M. Katyba
Aleksey V. Chernykh Ignat I. Rakov Maksim I. Paukov Mikhail S. Mironov Mikhail V. Shashkov An-
drey A. Vyshnevyy Demyan D. Rybnikov Darya R. Ilyenkova Gennadiy A. Komandin Kirill I. Zayt-
sev Yuriy G. Gladush Nikolay V. Petrov Albert G. Nasibulin Aleksey V. Arsenin Valentyn Volkov
Dmitry V. Krasnikov Maria G. Burdanova*

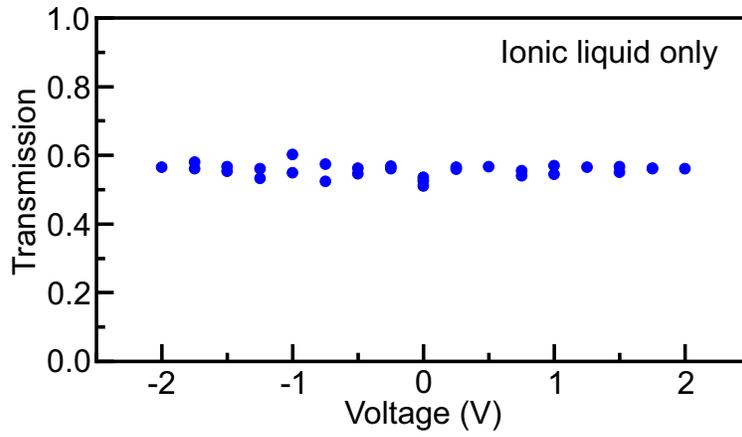


Figure S1: The transmission at 320 GHz as a function of voltage for ionic liquid squeezed between two quartz substrates.

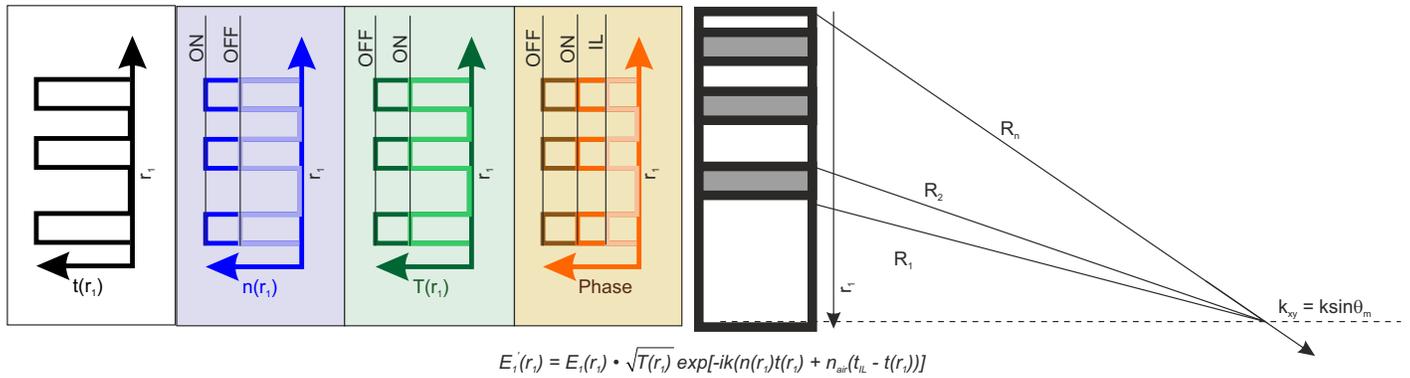


Figure S2: The general explanation of the change of the intensity using analytical Rayleigh–Sommerfeld diffraction theory. From the left to right: thickness, refractive index, transmission and phase profiles along with radial direction.

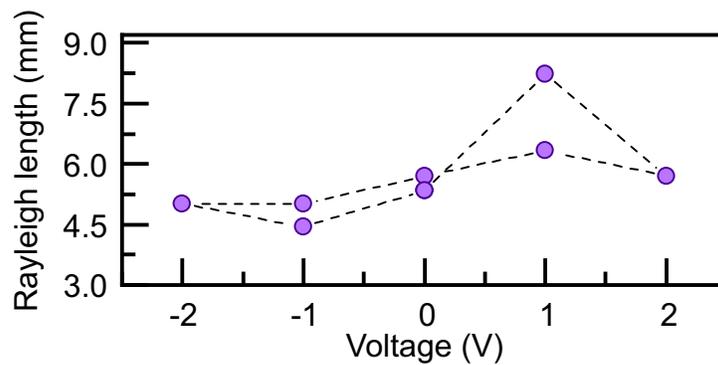
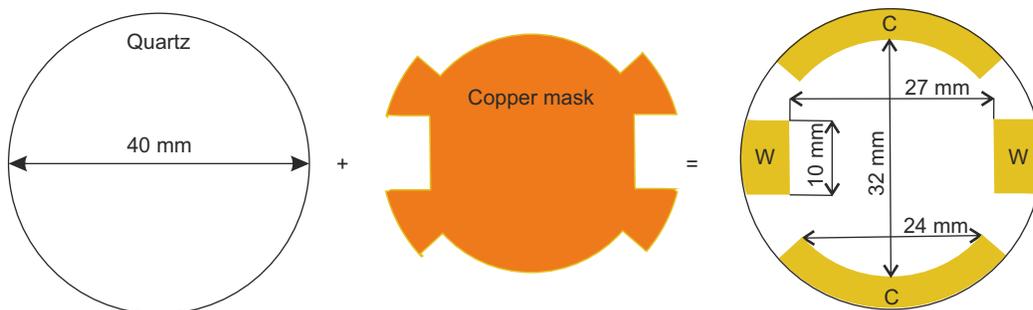


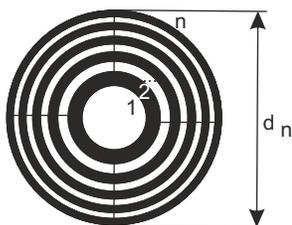
Figure S3: Rayleigh length parameter as a function of voltage.

1. Shadow mask for gold contact deposition

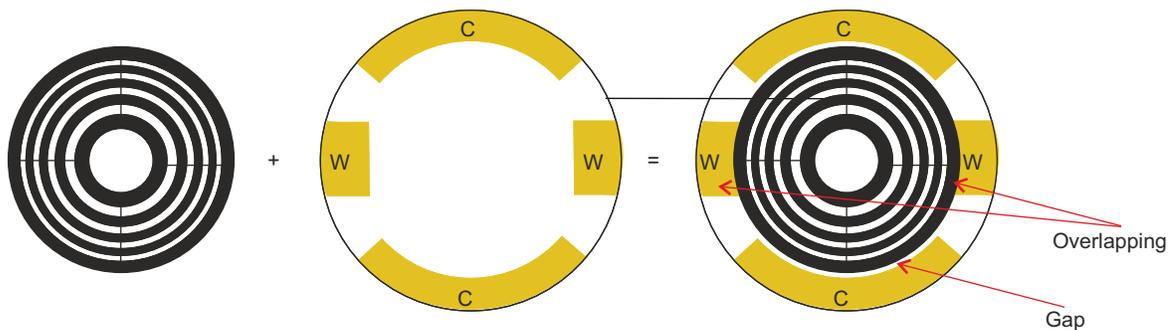


2. CNT pattern following the diameters in table

n	d_n (mm)
1	8.609242
2	12.24403
3	15.07951
4	17.50842
5	19.68188
6	21.67685
7	23.53877
8	25.29703
9	26.9719
10	28.57806



3. Dry-transfer CNT on Quartz with gold contacts



4. Coverage with ionic liquid and encapsulation

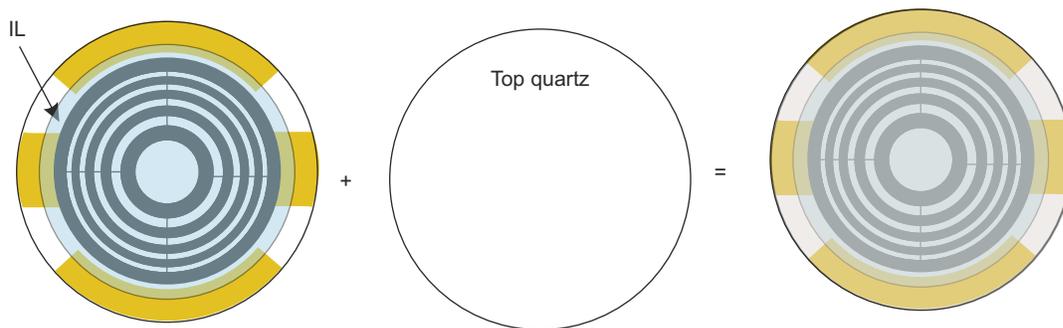


Figure S4: The main fabrication steps of electrochemically gated FZP. “C” denotes the counter electrode, while “W” denotes the working electrode.

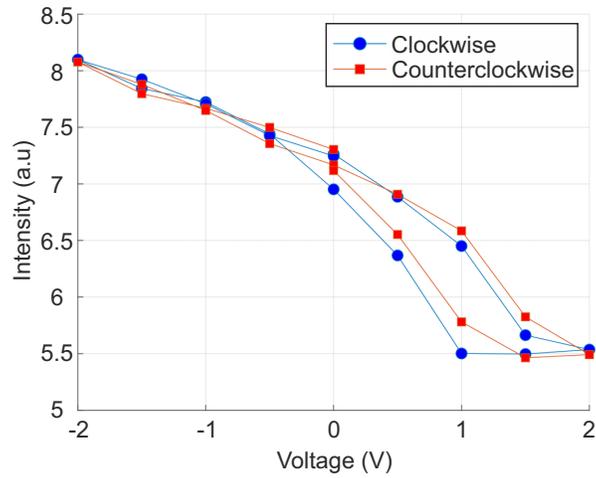


Figure S5: Change in the focal spot intensity of the lens for the voltage bias in the range of -2 to 2 V with the step of 0.5 V for voltage applied clockwise and counterclockwise.

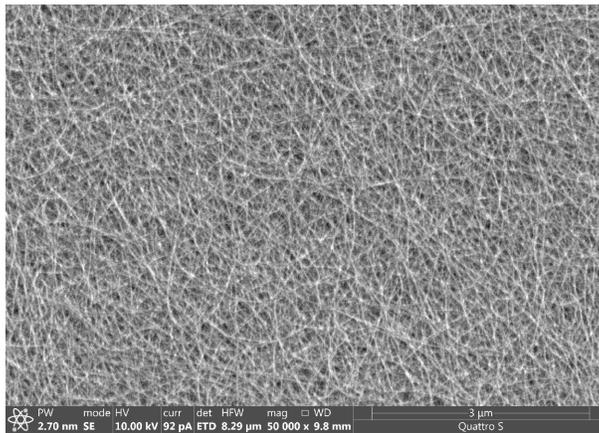


Figure S6: The SEM image of a pristine SWCNT film shows the morphology of randomly oriented SWCNTs composed of FZP.

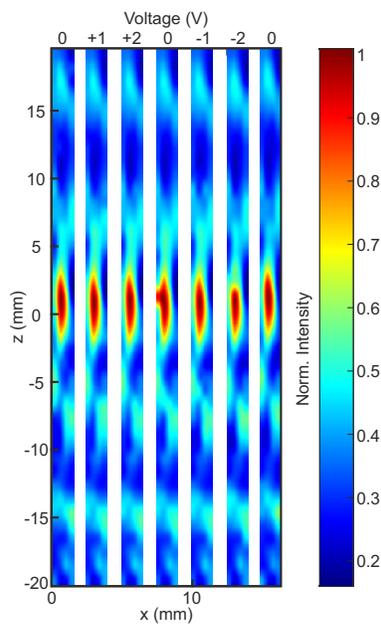


Figure S7: The intensity images along beam propagation direction.

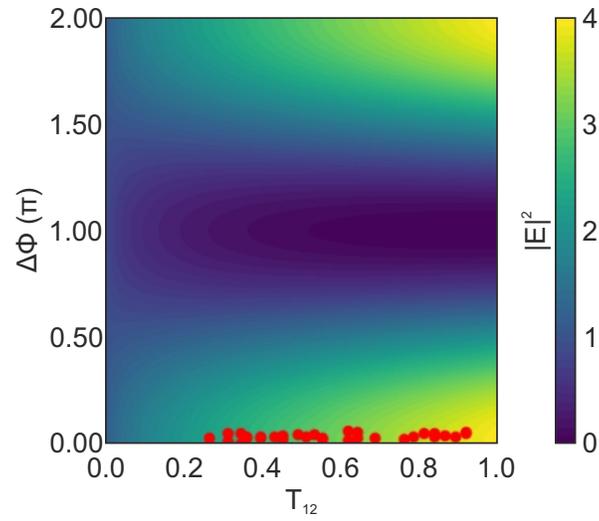


Figure S8: The interference of two coherent beams as a function of the phase change ($\Delta\phi_{12} = \phi_1 - \phi_2$) and the squared amplitude ratio $T_{12} = |A_1 A_2^{-1}|$. The points correspond to the values obtained in the experiments, illustrating the relationship between phase variations and amplitude effects on the resulting interference pattern.



Figure S9: Amplitude and phase of transmission function modulated by the applied voltage.