Spatial resolution improvements in THz near-field techniques

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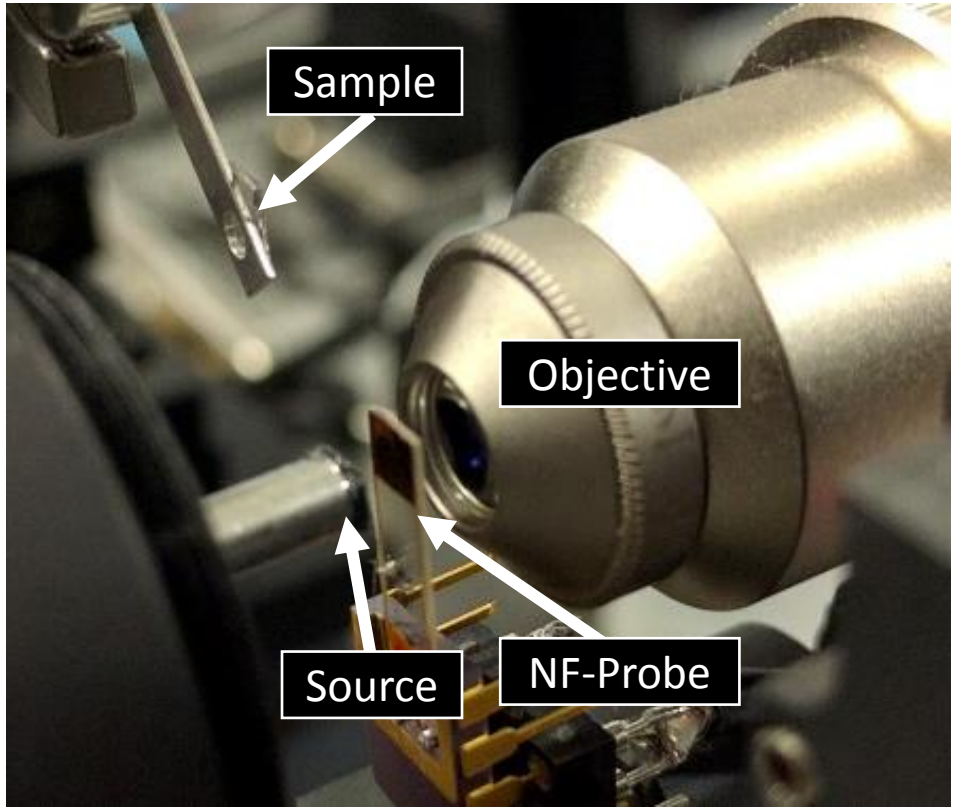
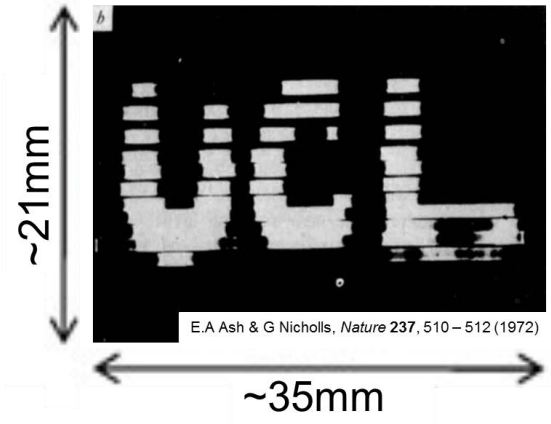
Engineering and Physical Sciences Research Council

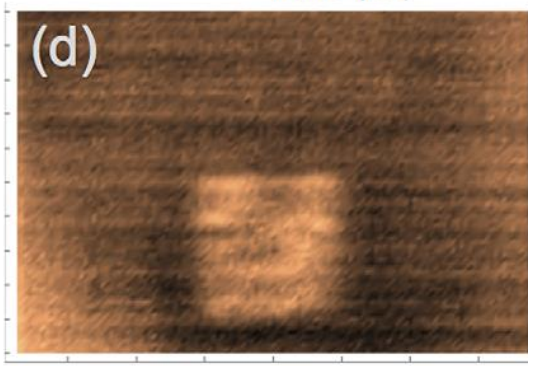
Imaging the near field





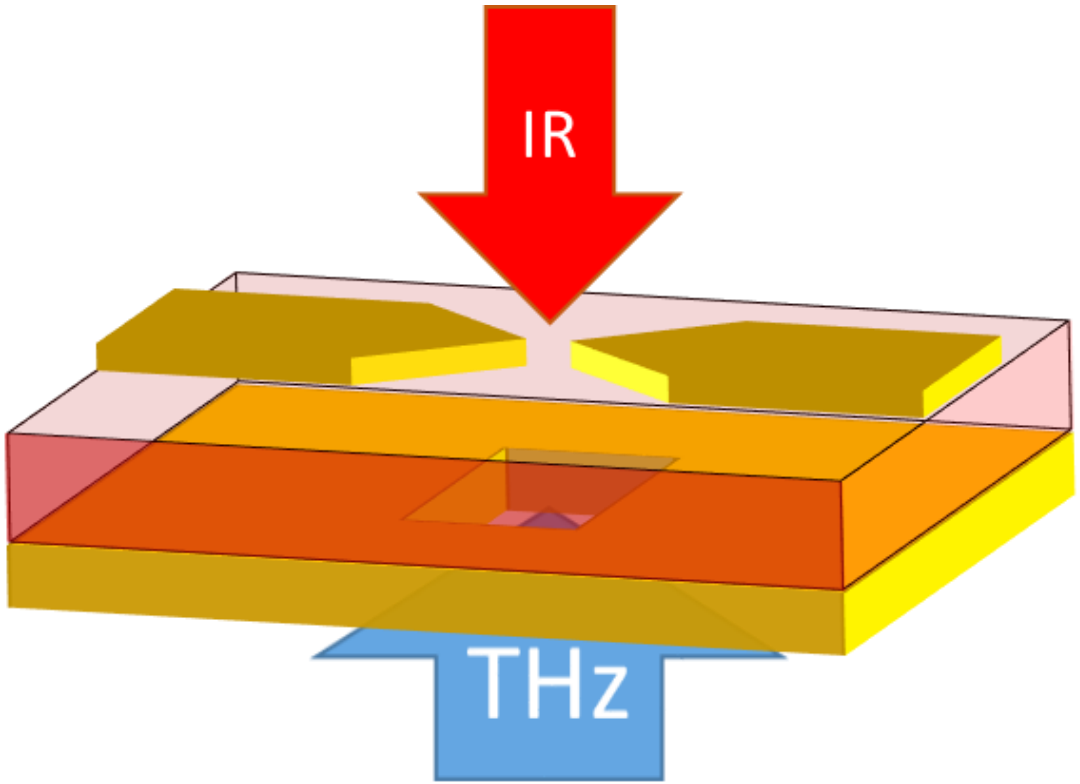
GHz

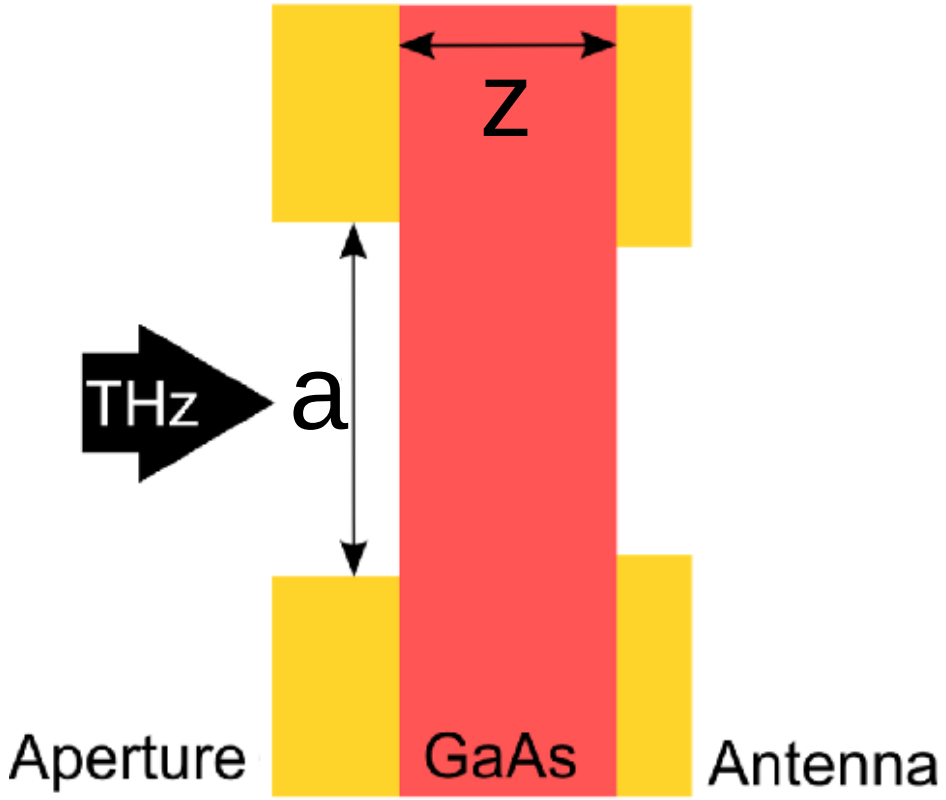
THz



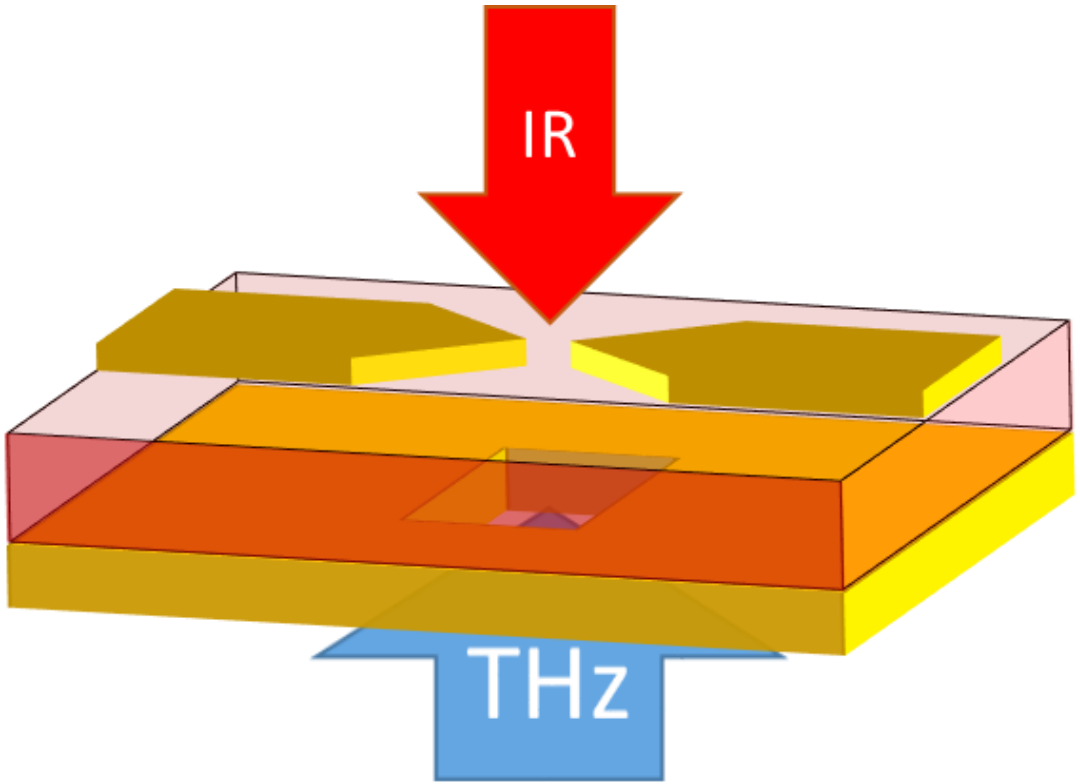
O. Mitrofanov et al. Applied Physics Letters 103, 111105 (2013)

Aperture probes, evanescent field





Aperture probes, evanescent field

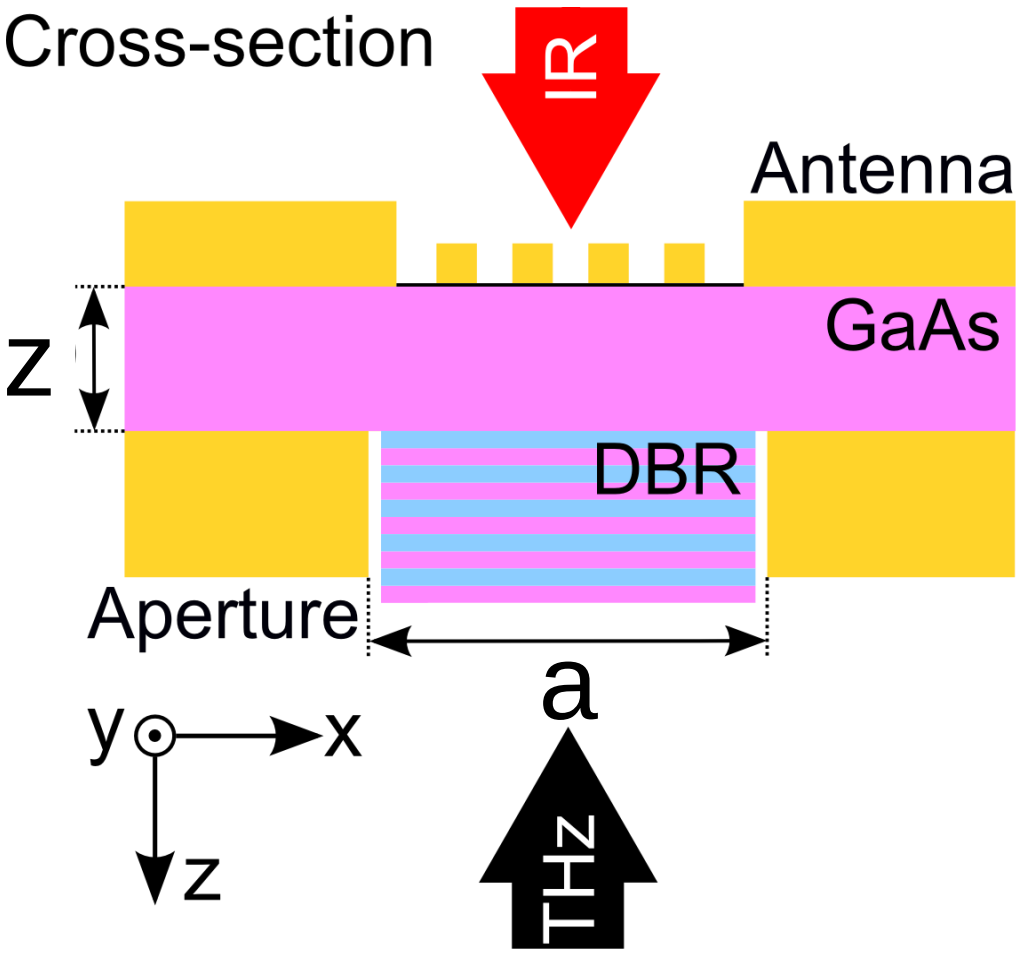


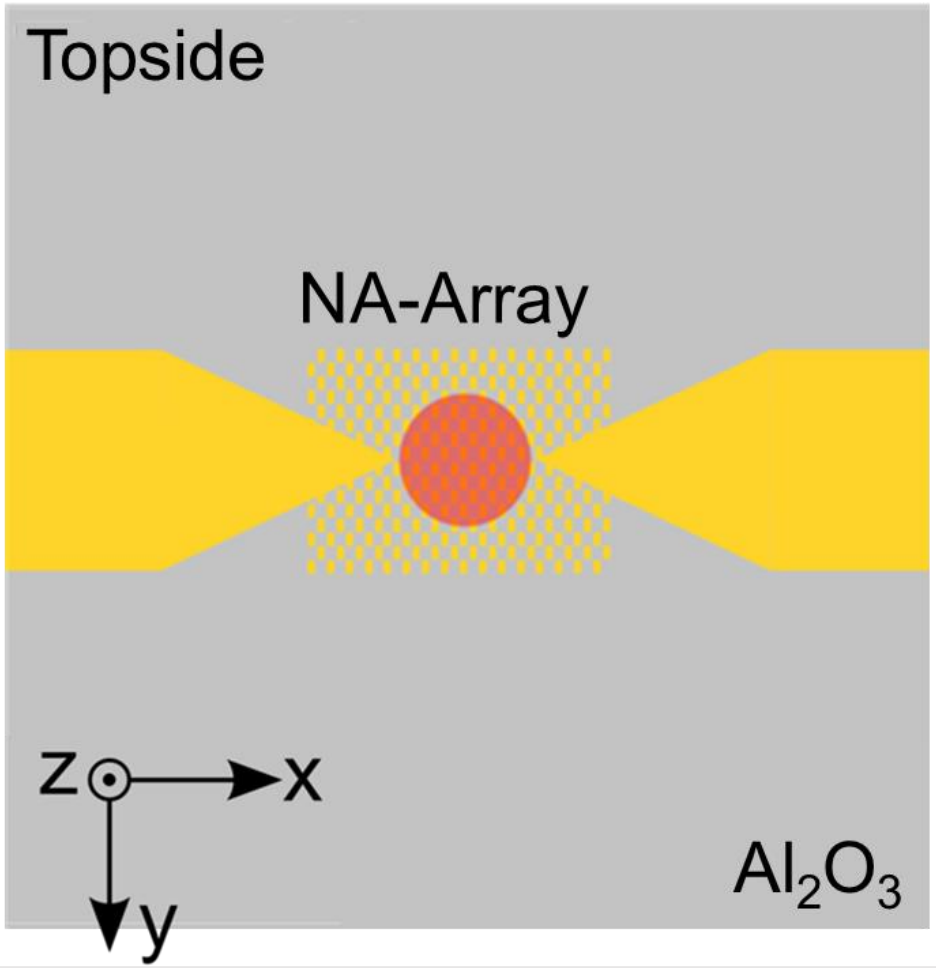
$$E \propto a^3$$

Z

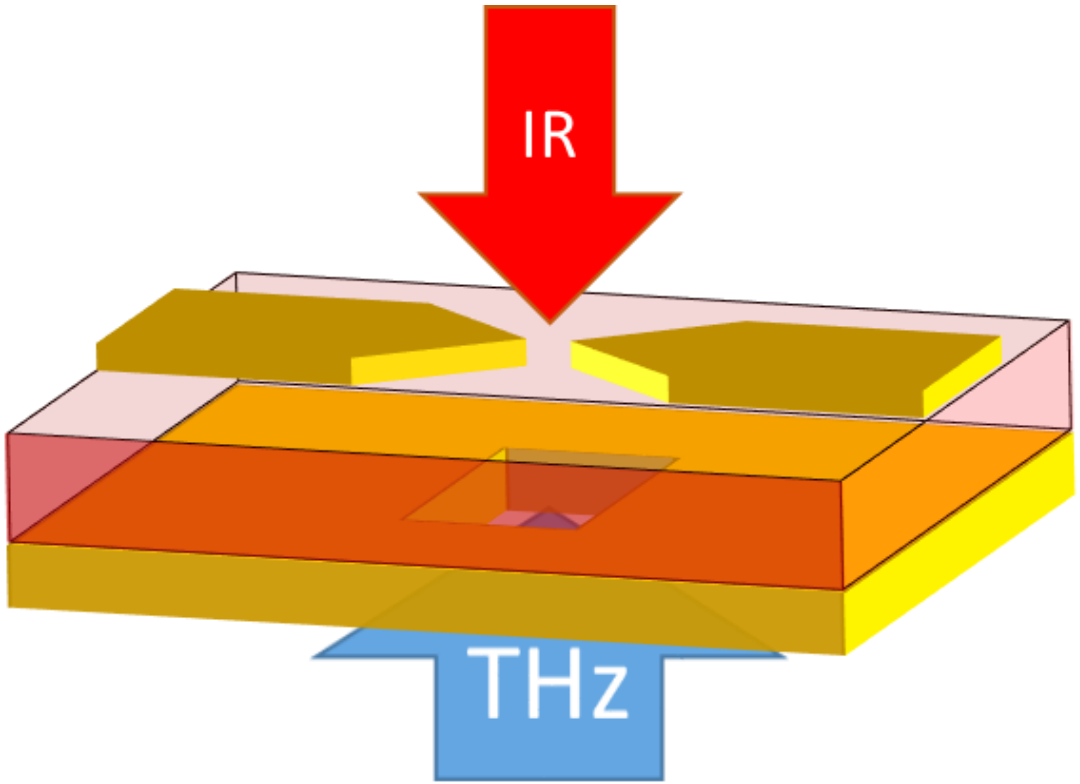
$$E \propto a$$

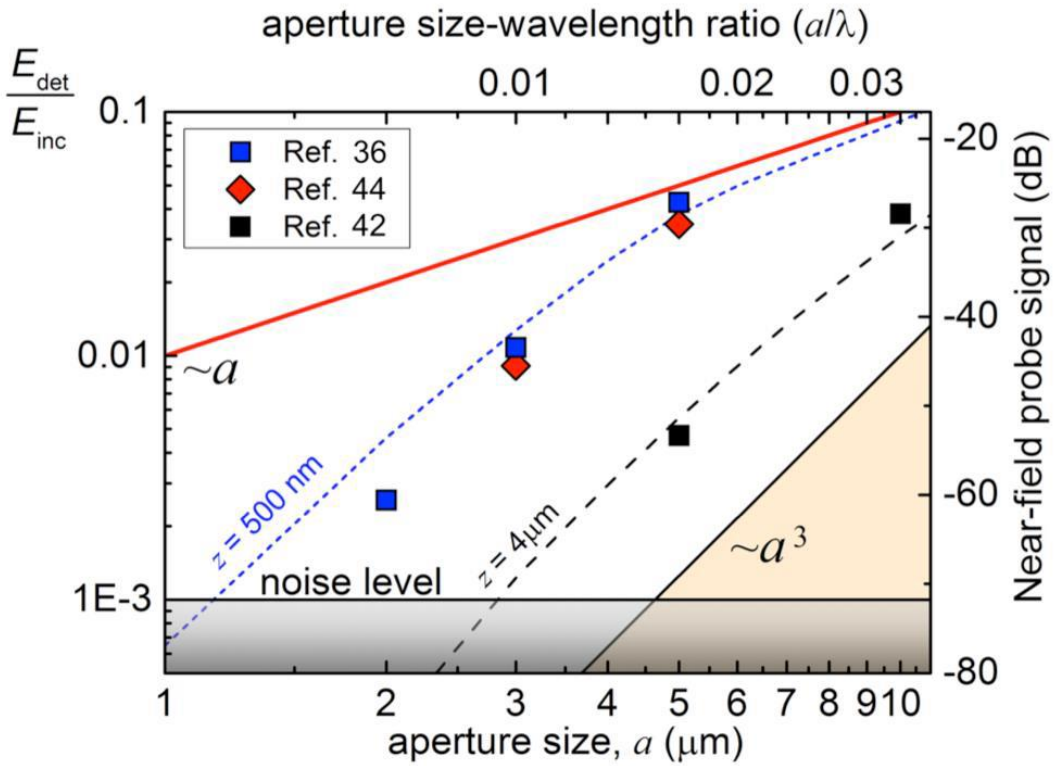
Near-field probe





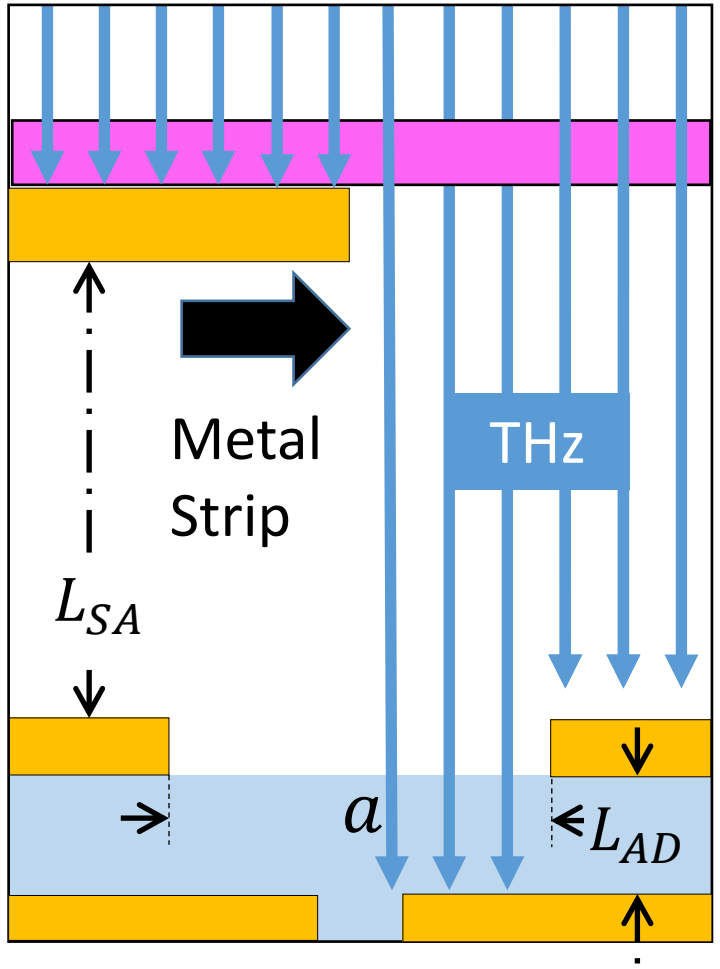
Aperture probes, evanescent field

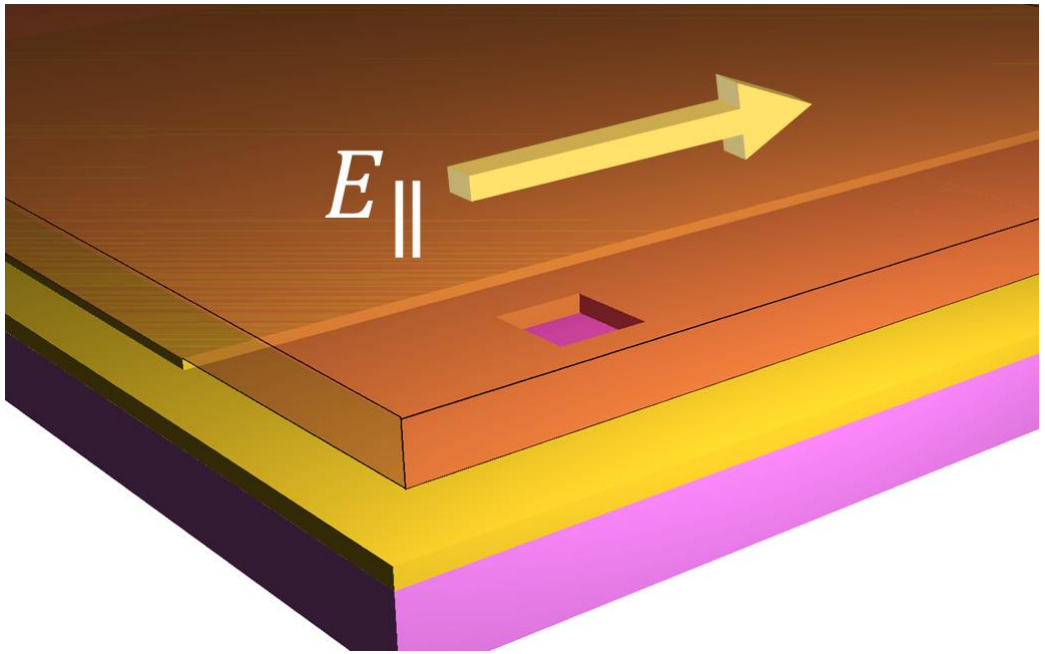




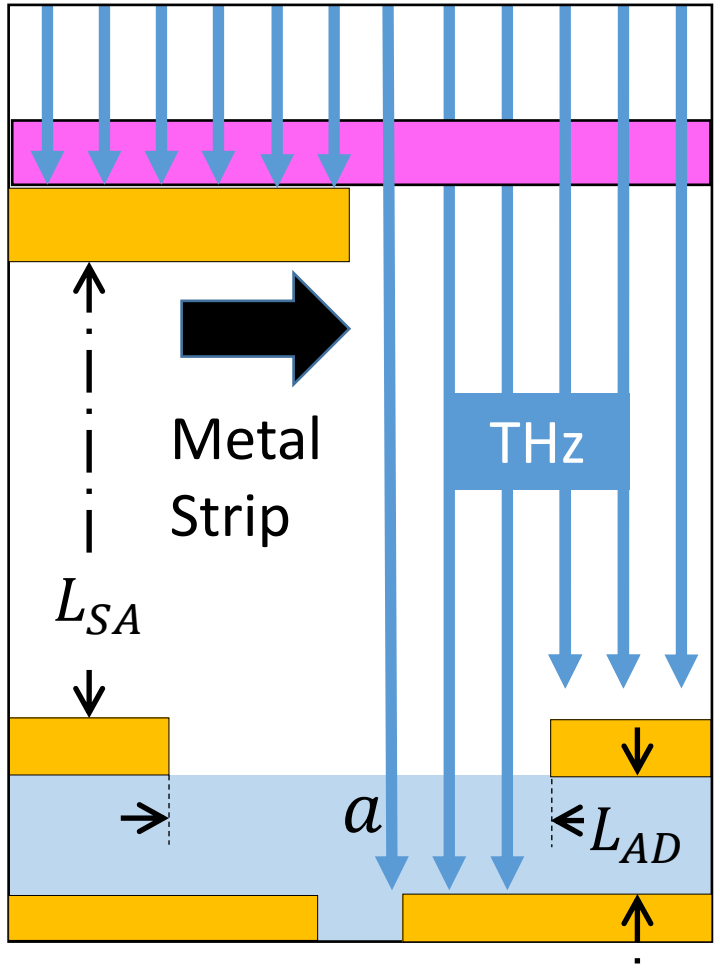
Near-field spectroscopy and imaging of subwavelength plasmonic terahertz resonators, O Mitrofanov et al. IEEE Trans. on THz Science and Technology (under review)

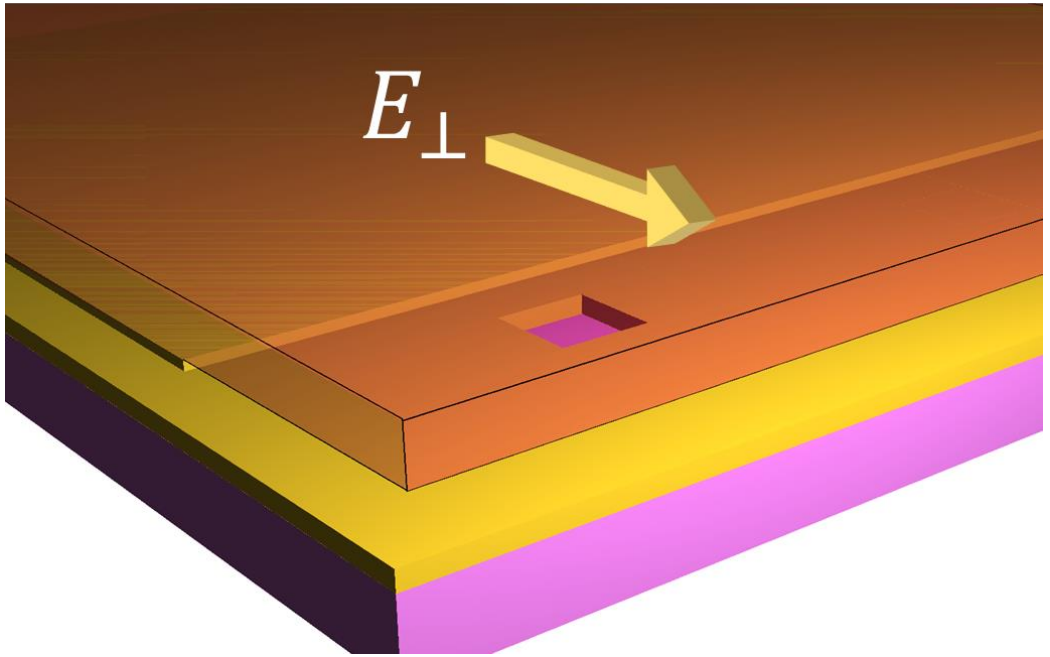
Testing Resolution



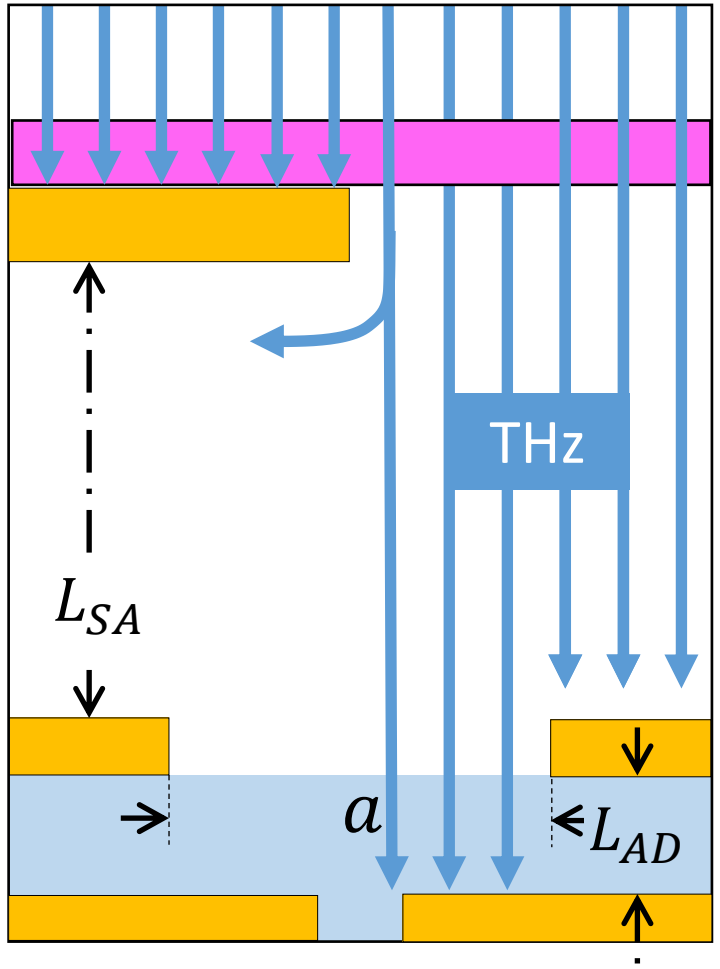


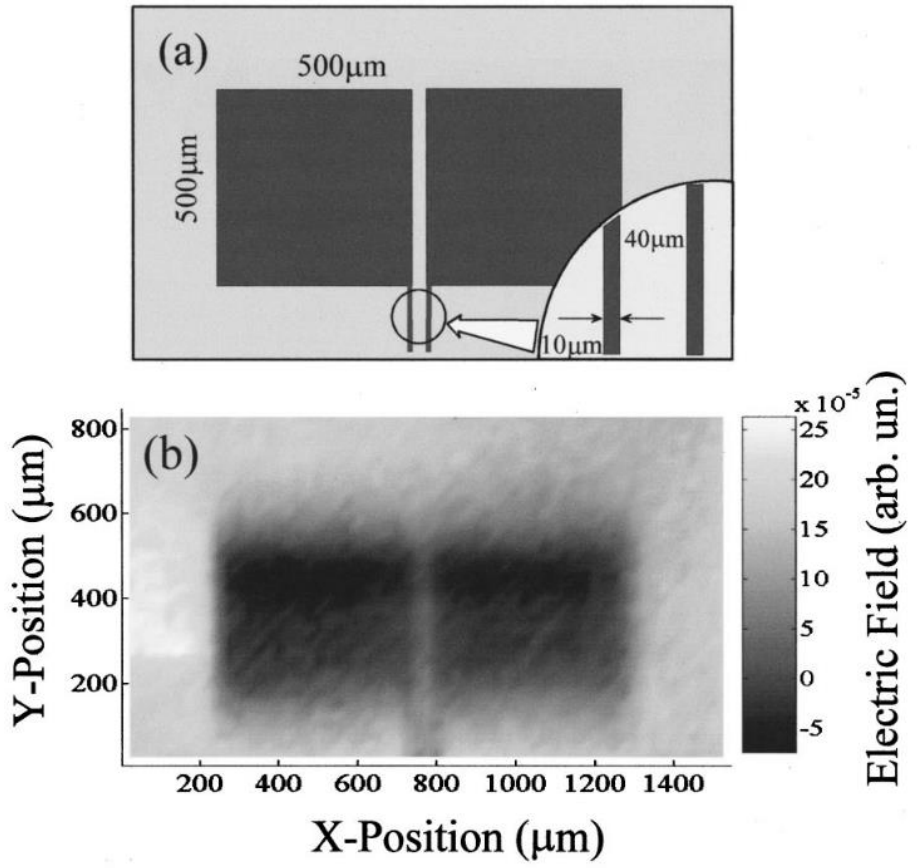
Testing Resolution





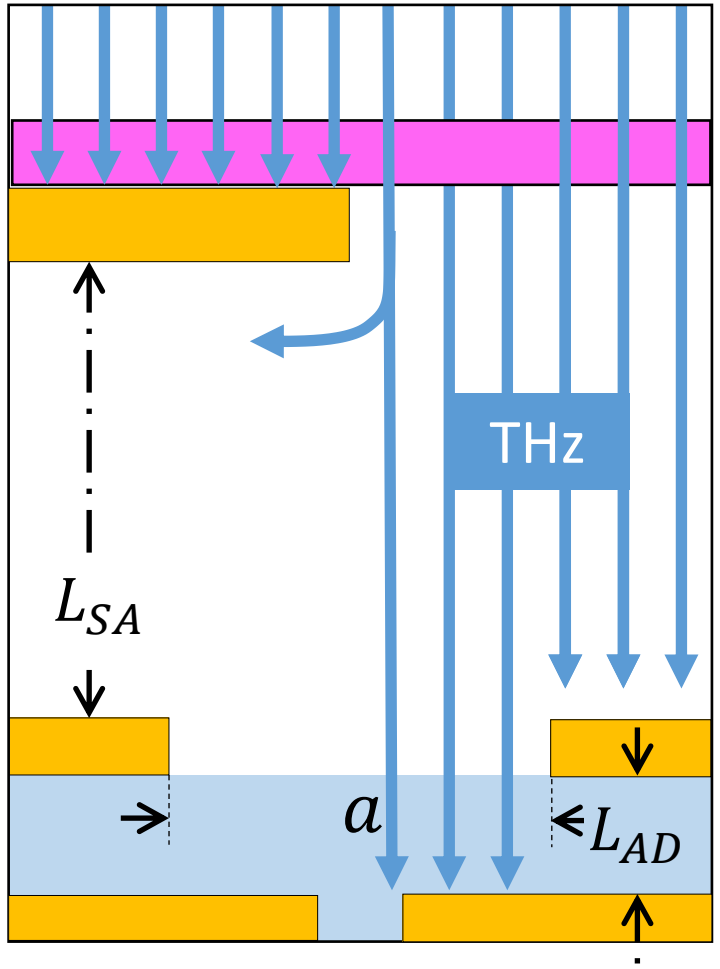
Polarisation



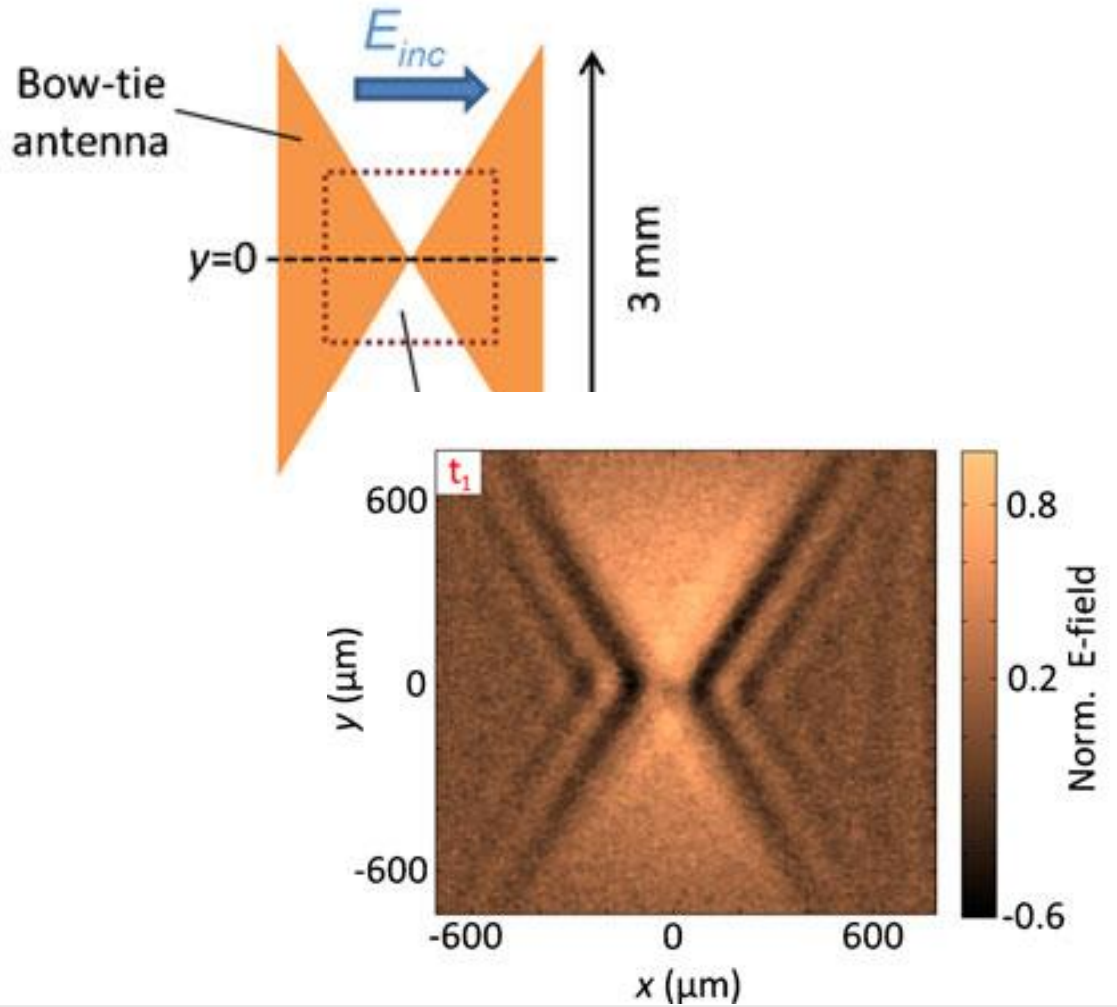


O. Mitrofanov et al. Appl. Phys. Lett., Vol. 77, No. 22, 27 November 2000

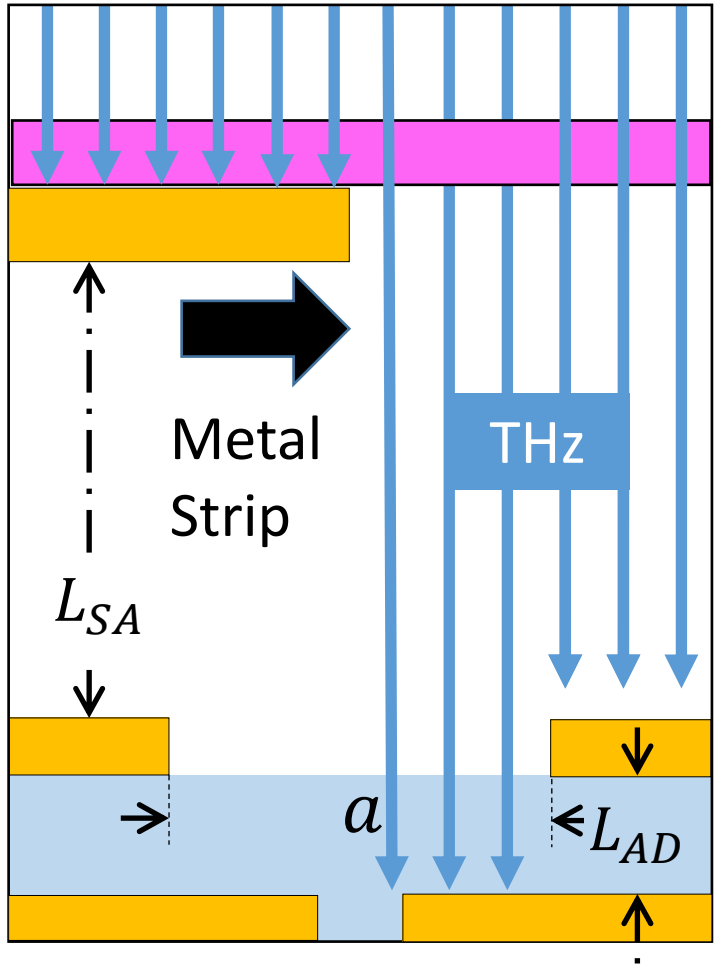
Polarisation

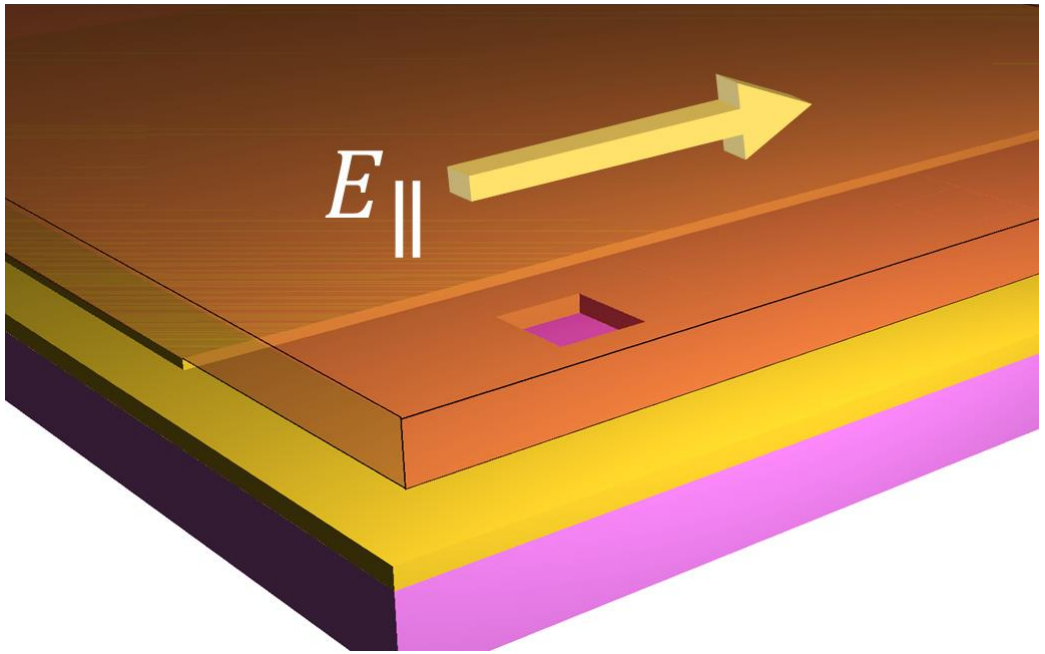


R. Mueckstein, Journal of Infrared, Millimeter, and Terahertz Waves, September 2011

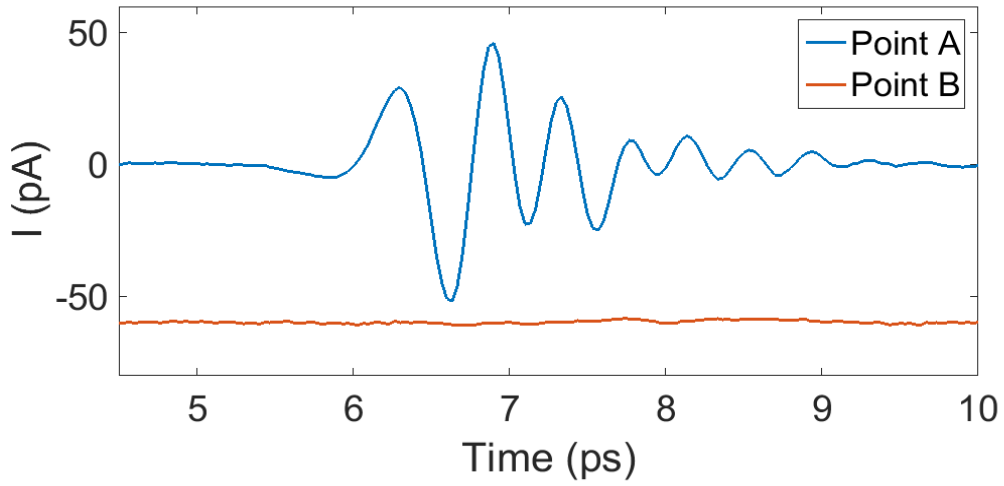


Testing Resolution

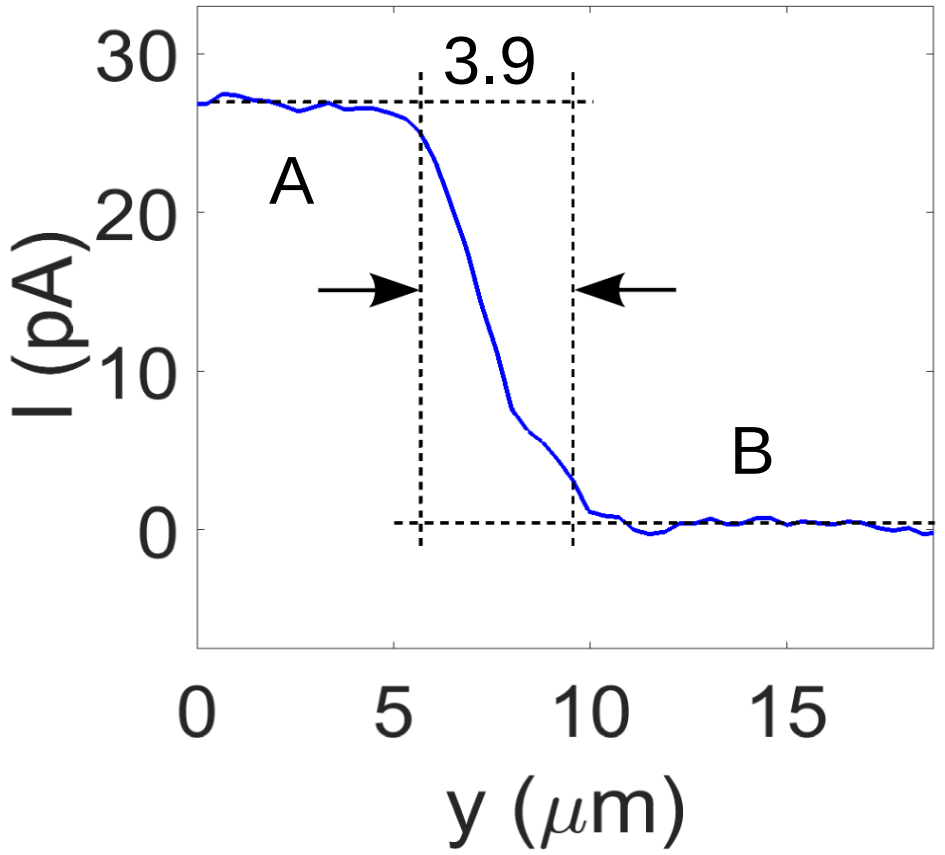




5μm aperture probe

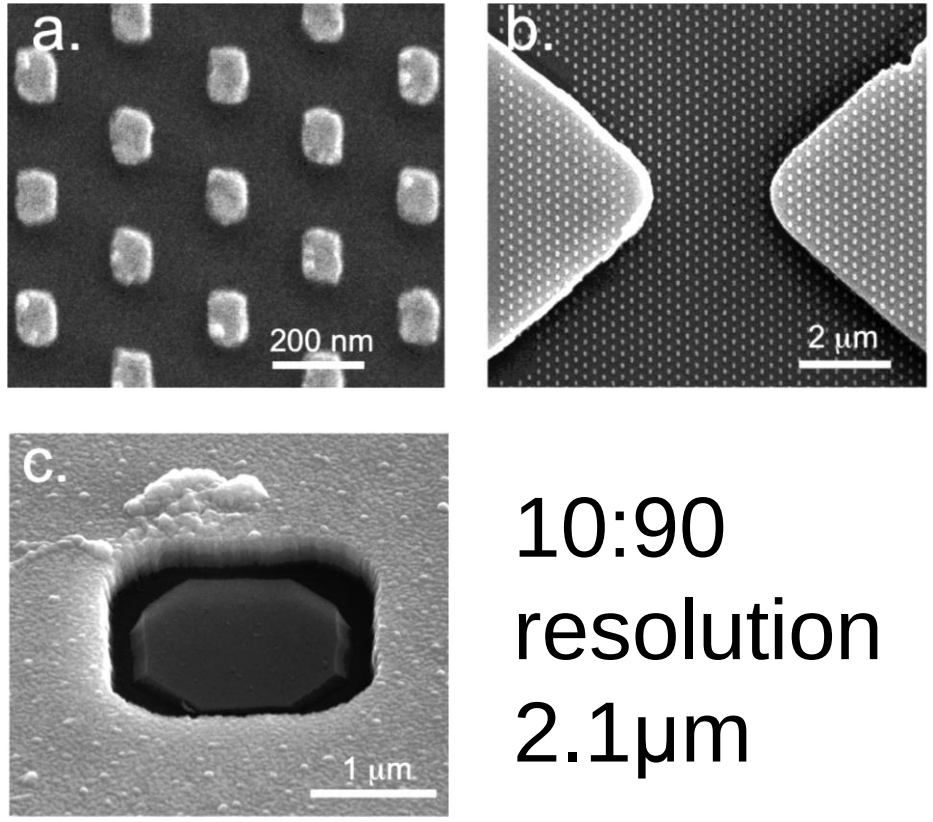


10:90 criteria gives a resolution of 3.9μm

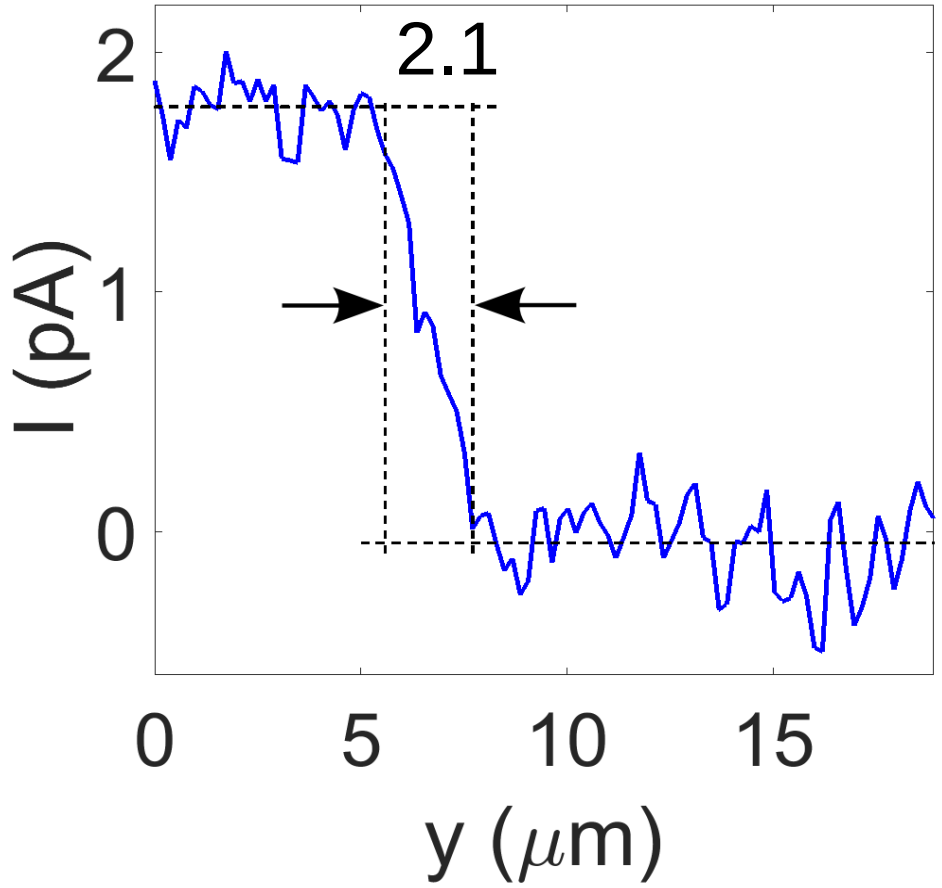


2μm aperture probe

O. Mitrofanov, ACS Photonics 2015, 2, 1763−1768



10:90 resolution 2.1μm



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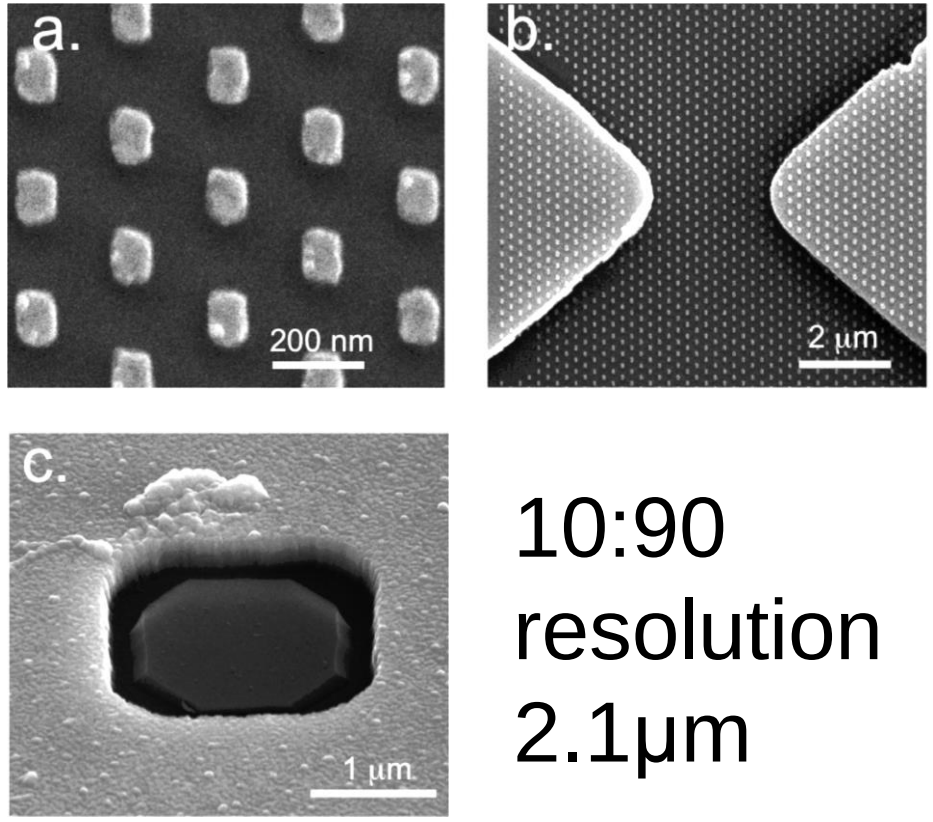
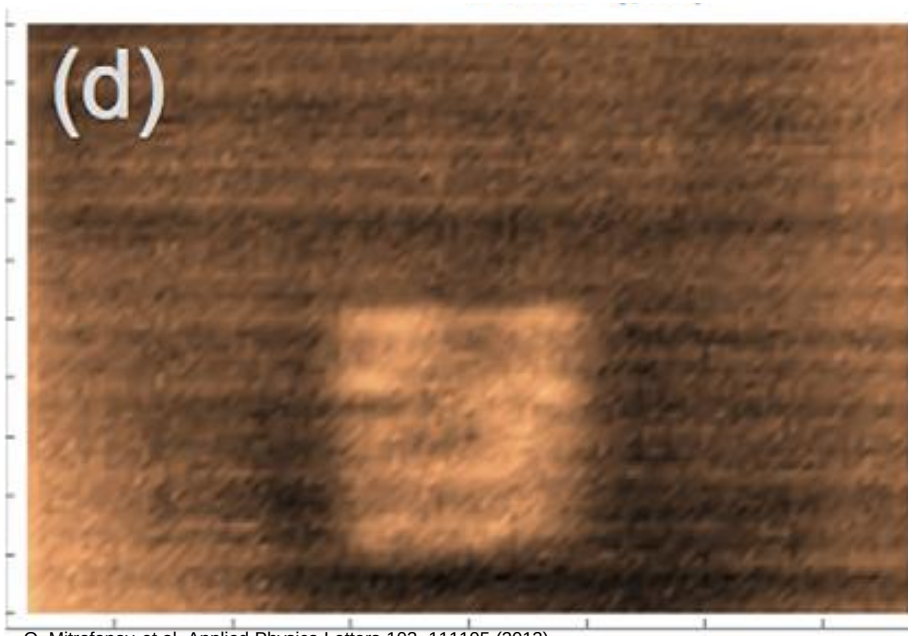


10:90 resolution 2.1μm



O. Mitrofanov et al. Applied Physics Letters 103, 111105 (2013)

Conclusion

- Discussed the advantages of near field detectors capable of detecting evanescent fields through small apertures
- Shown the configuration used in order to realise such a device
- Discussed a resolution test for aperture probes, and the influence of polarisation on structures with metallic edges
- Demonstrated aperture probes using both 5, and 2 micron apertures which exhibit resolution within the expected range. (3.9 and 2.1 µm respectively using 10:90 criteria)