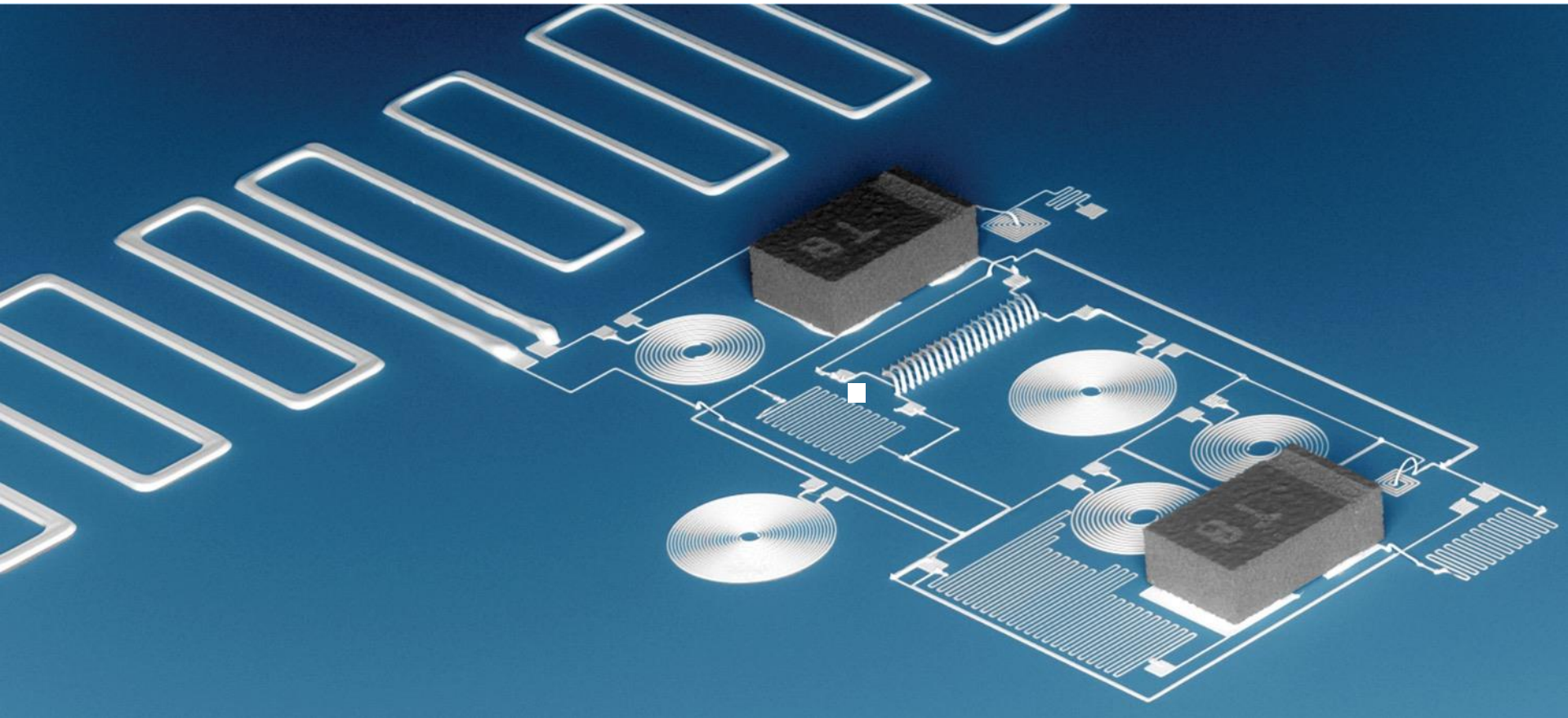


Gigahertz Electromagnetic Structures via Direct Ink Writing Radio-Frequency Oscillator and Transmitter Applications

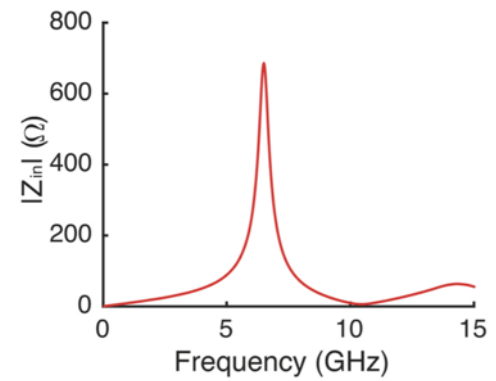
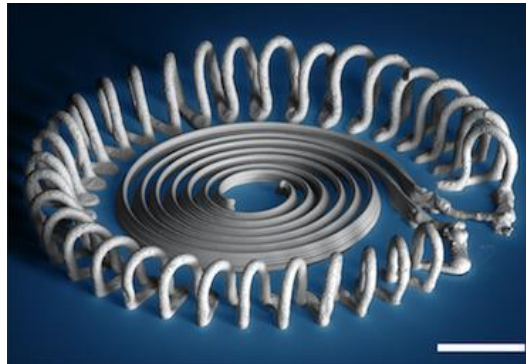
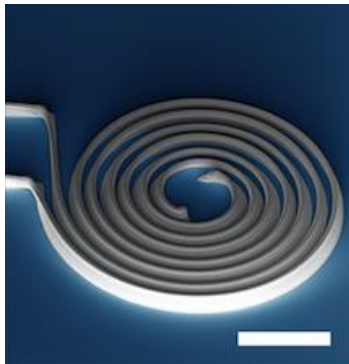
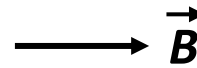
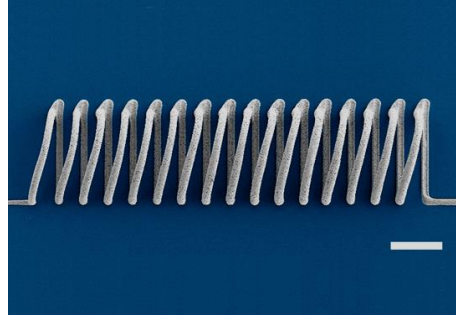
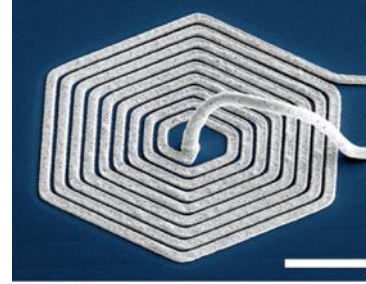
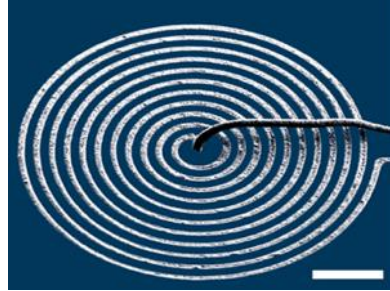
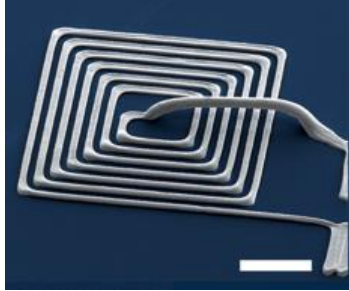


Chengye Liu

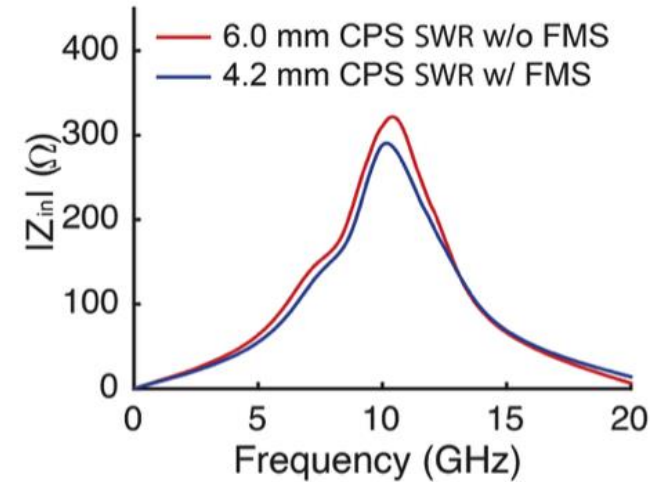
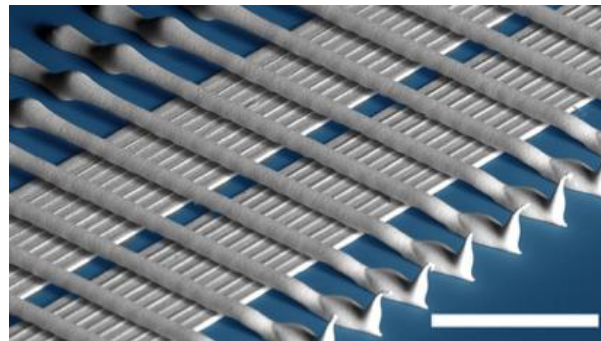
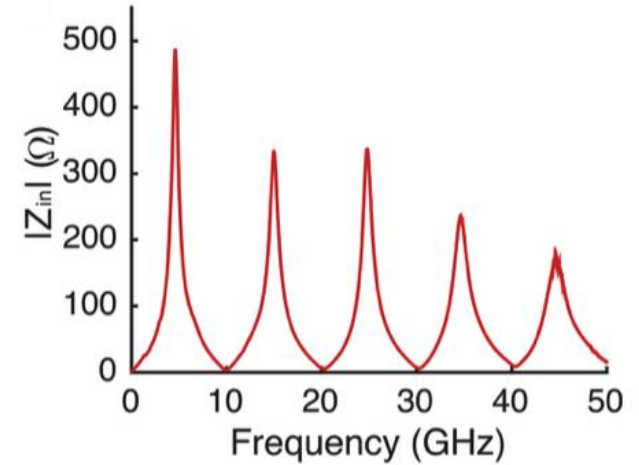
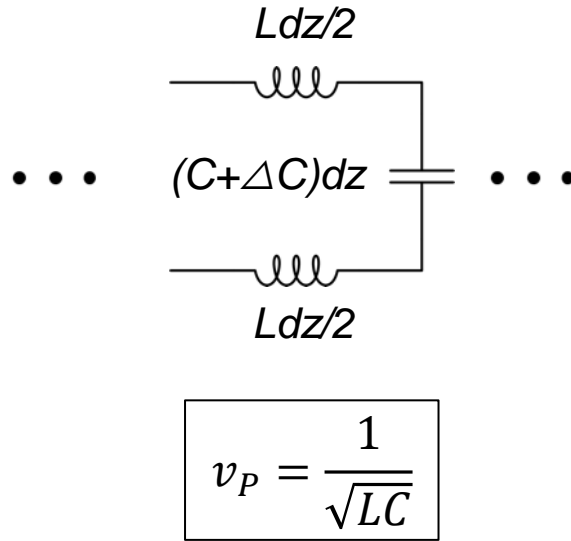
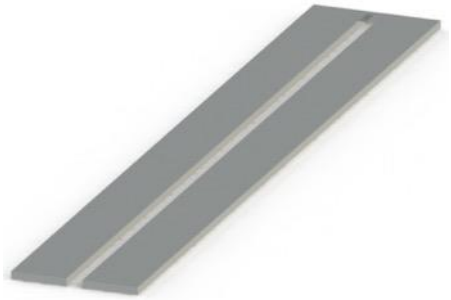


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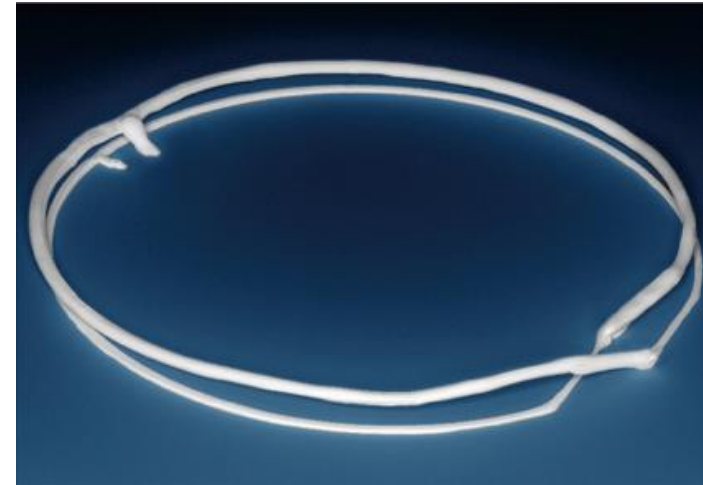
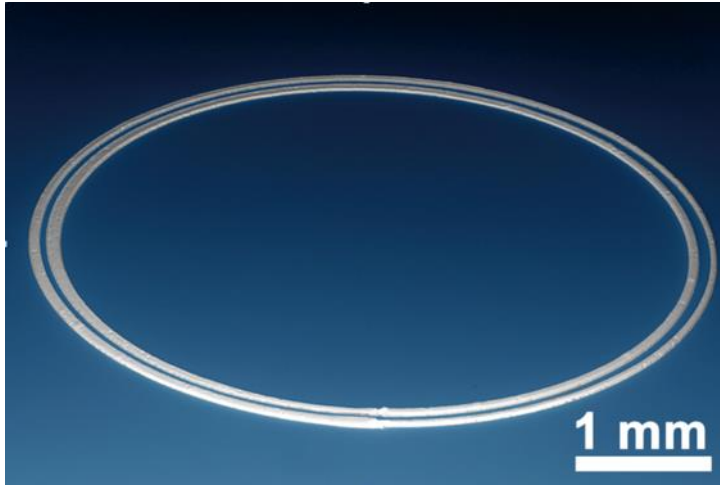
Inductors and Capacitors



Coplanar Strip (CPS) Standing Wave Resonator (SWR)



CPS Ring Resonators



Simple CPS ring:

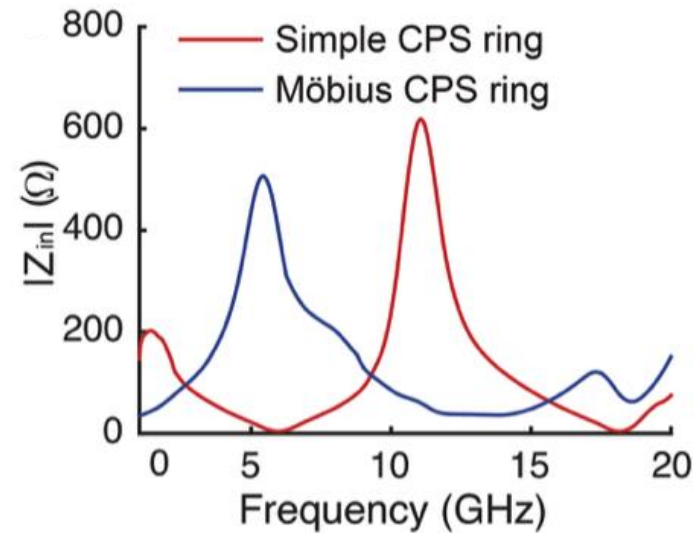
$$V(\phi + 2\pi) = V(\phi)$$

So $l = n\lambda$ where $n = 1, 2, 3, \dots$

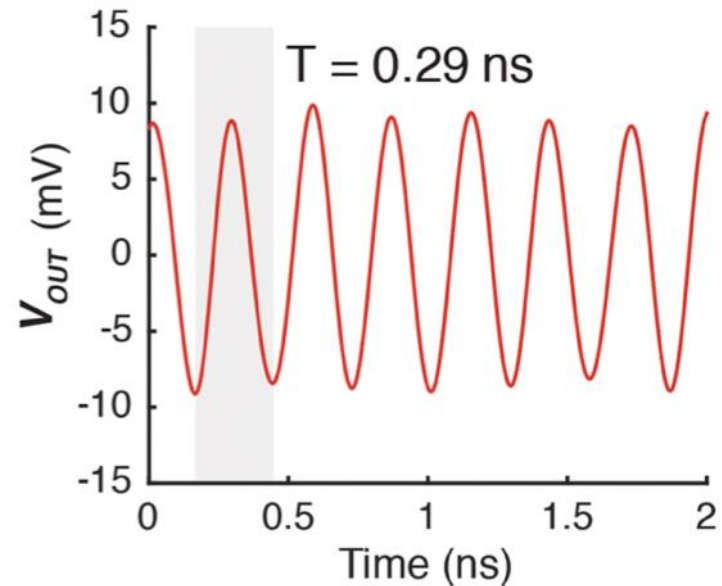
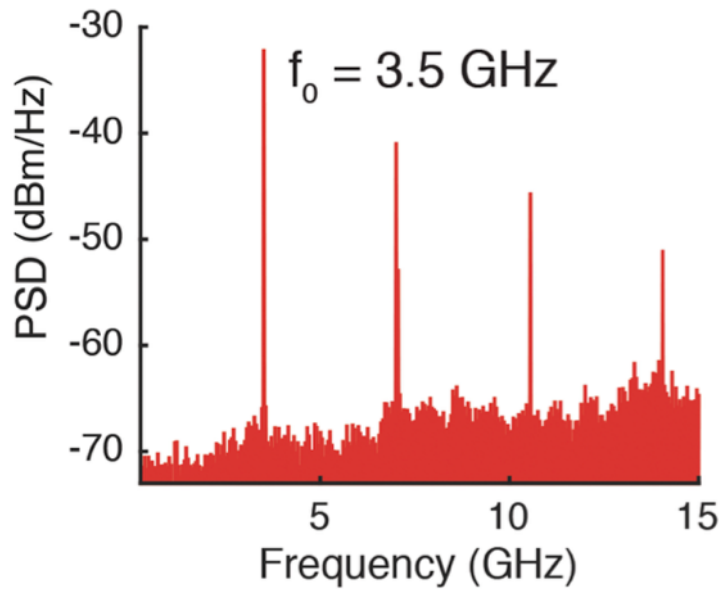
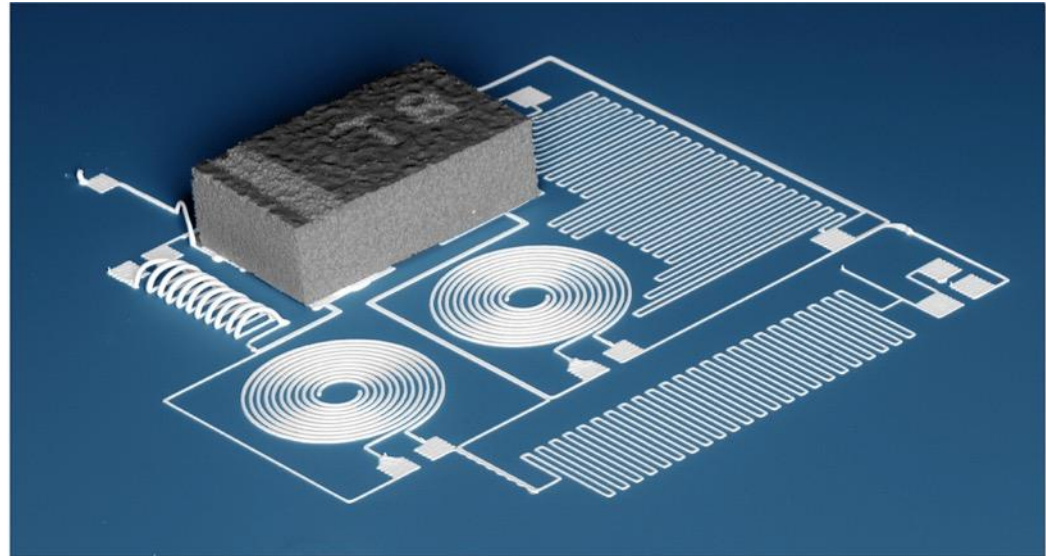
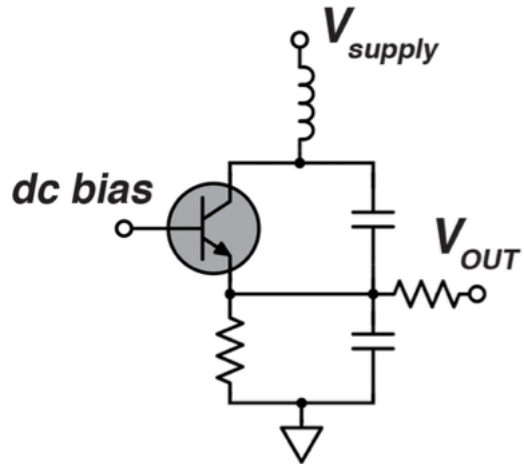
Möbius CPS ring:

$$V(\phi + \pi) = V(\phi)$$

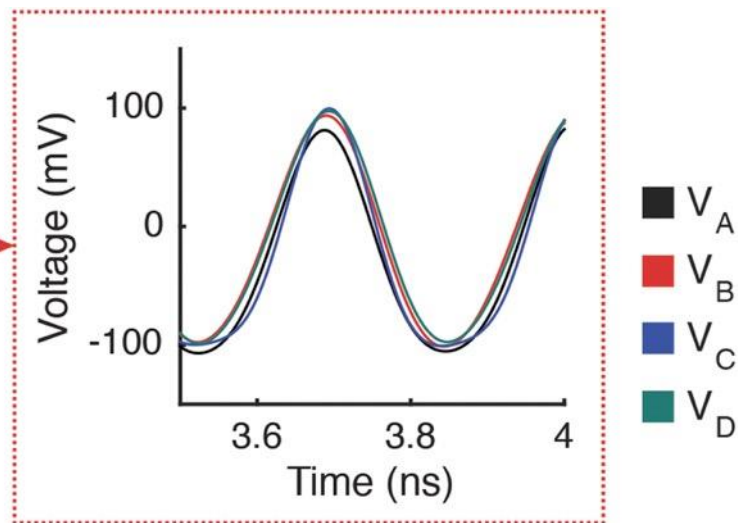
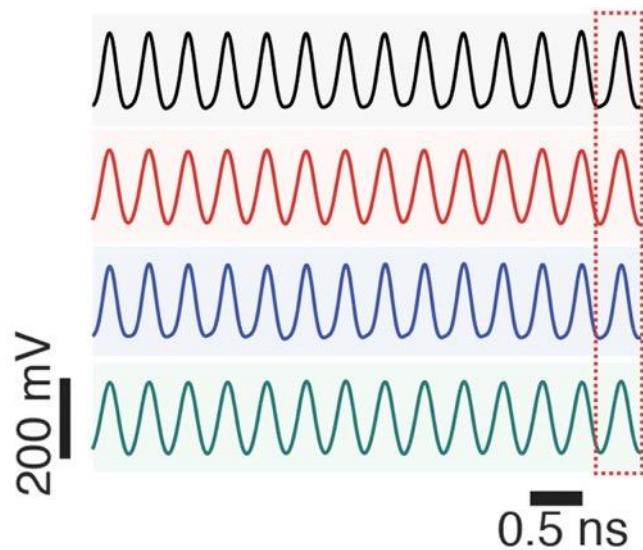
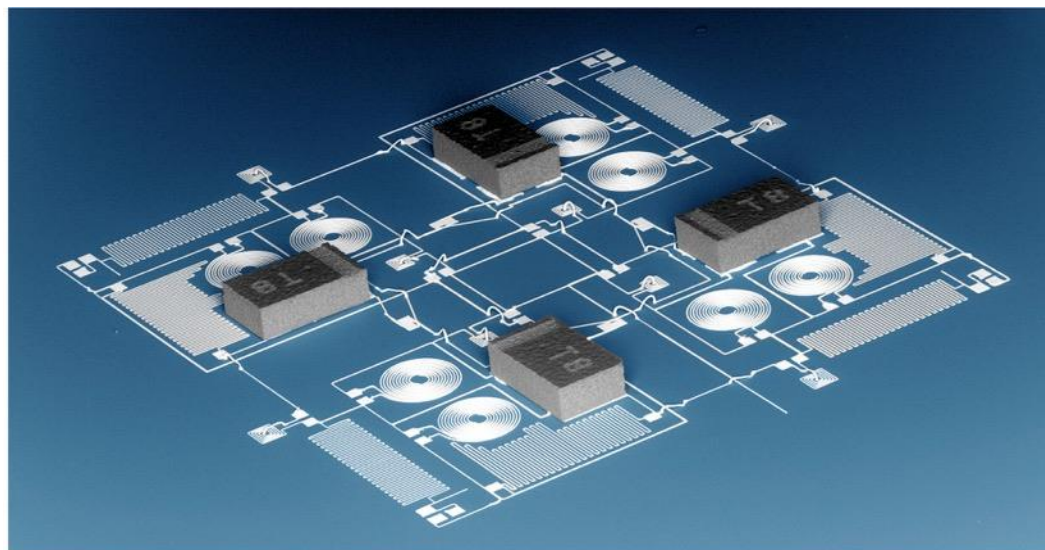
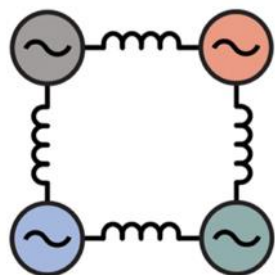
So $l = \frac{2n-1}{2}\lambda$ where $n = 1, 2, 3, \dots$



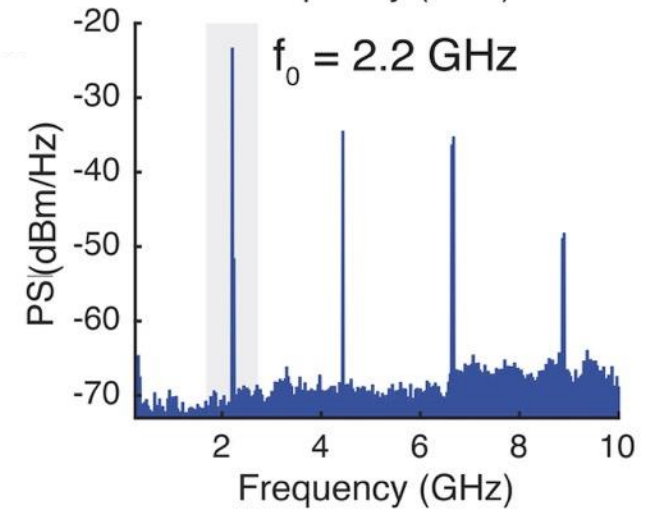
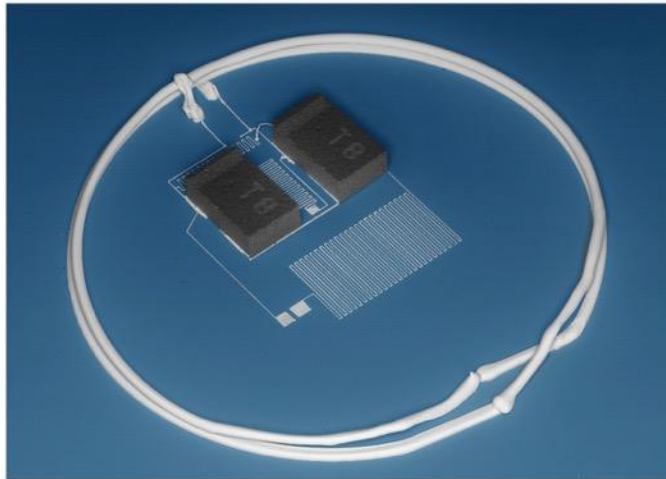
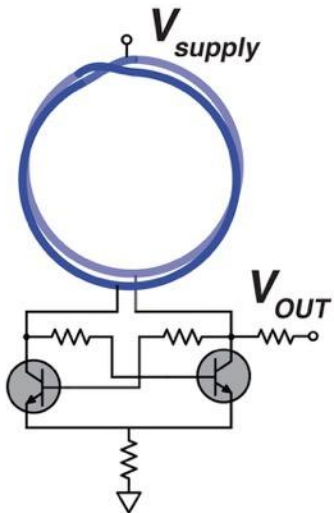
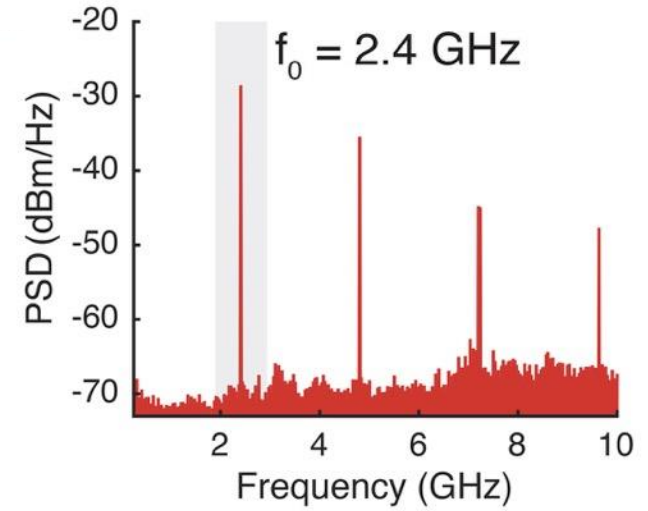
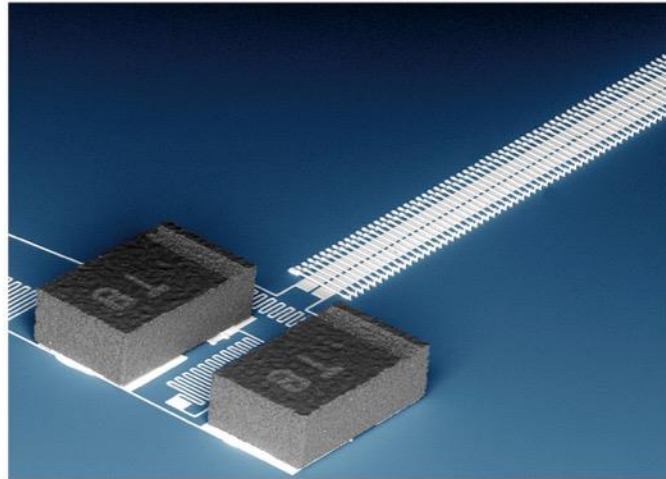
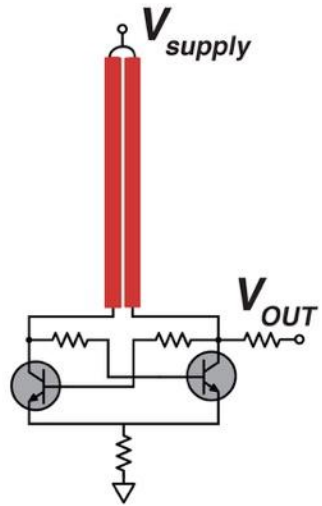
Colpitts Oscillator



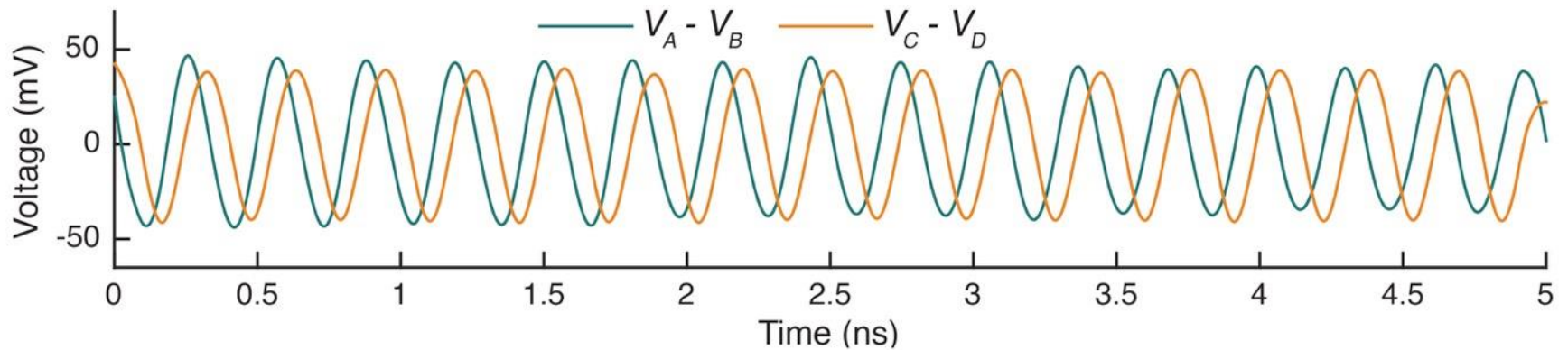
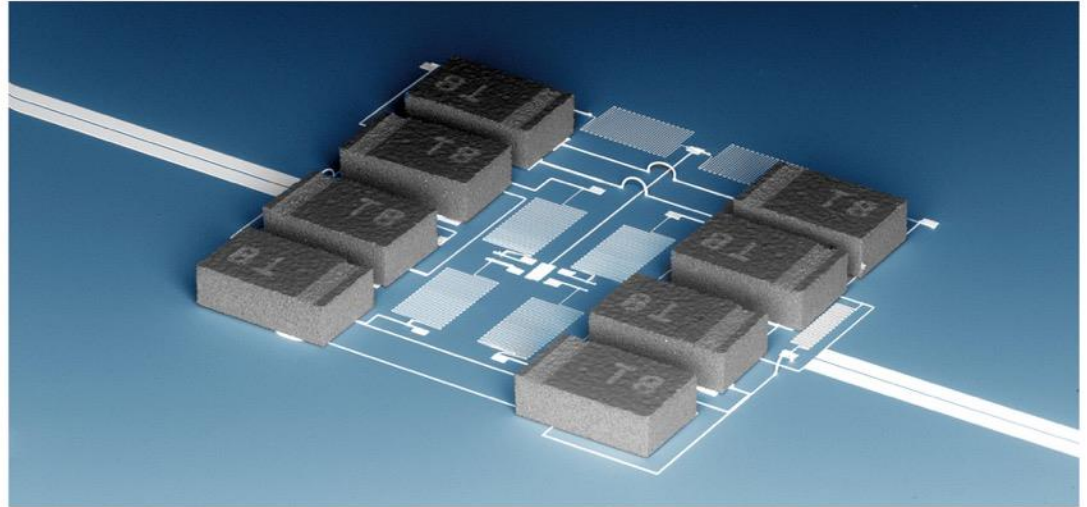
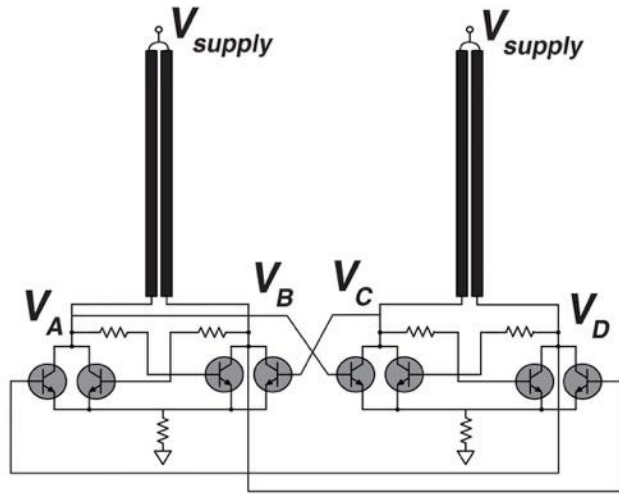
Injection-Locked Colpitts Oscillators



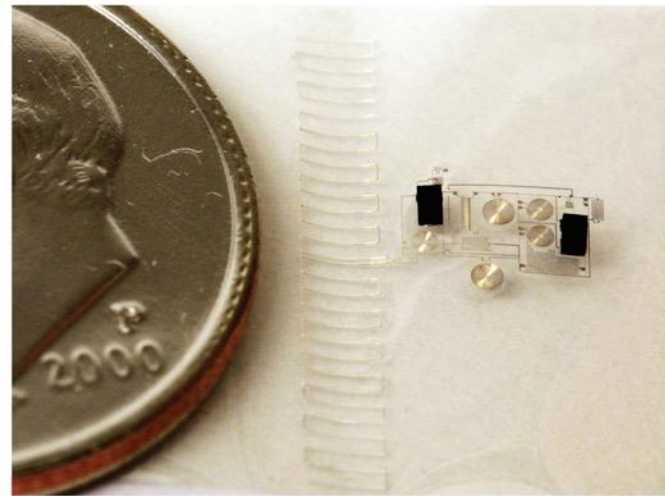
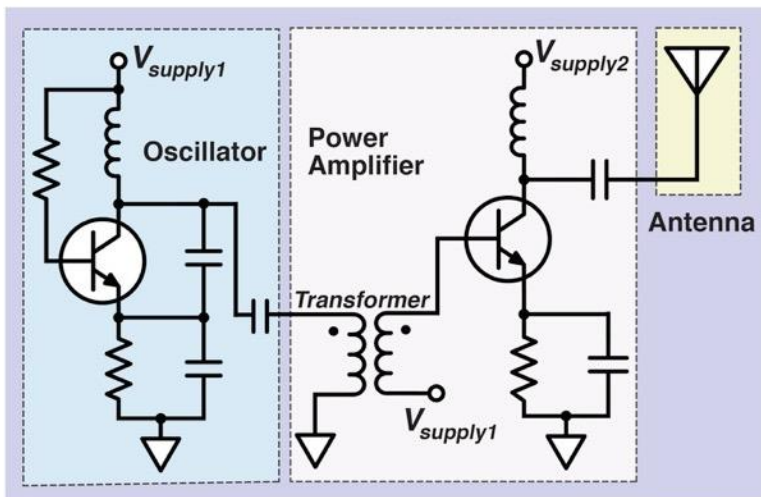
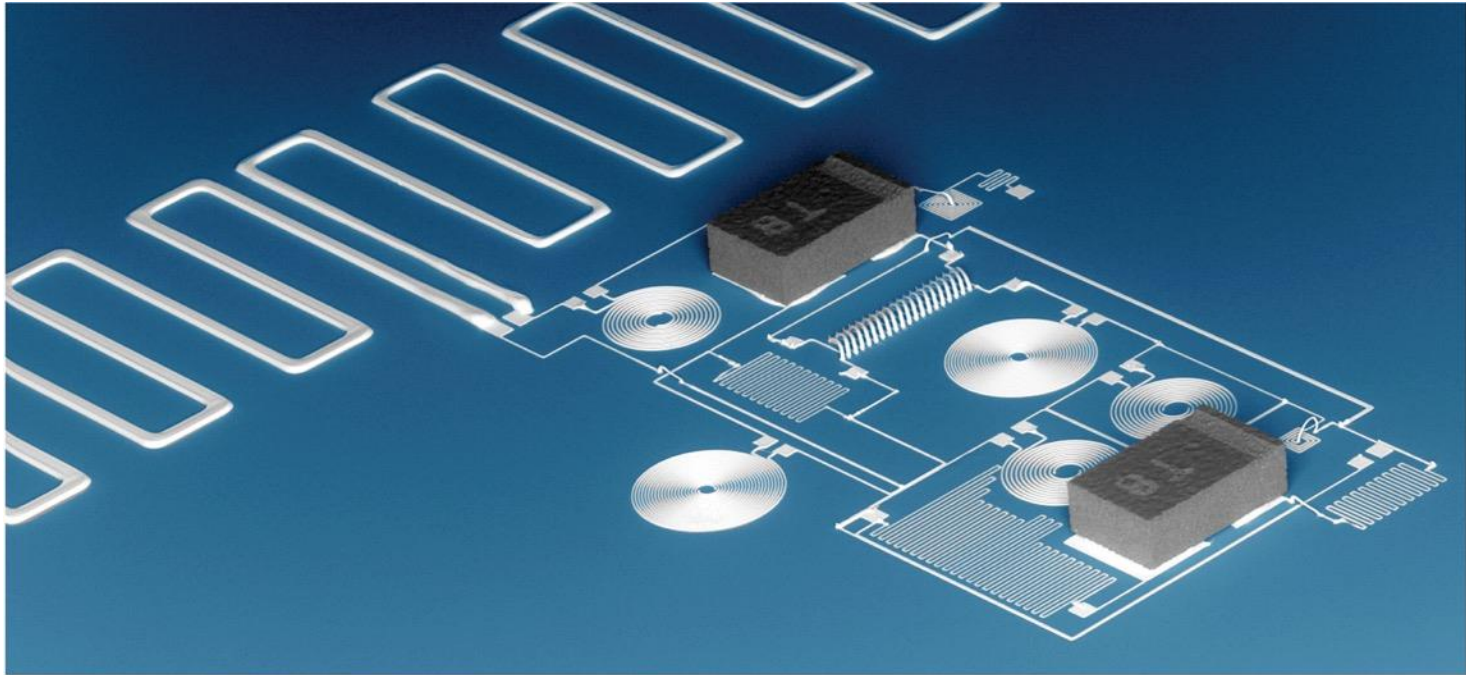
Oscillators with Wave-Based Resonators



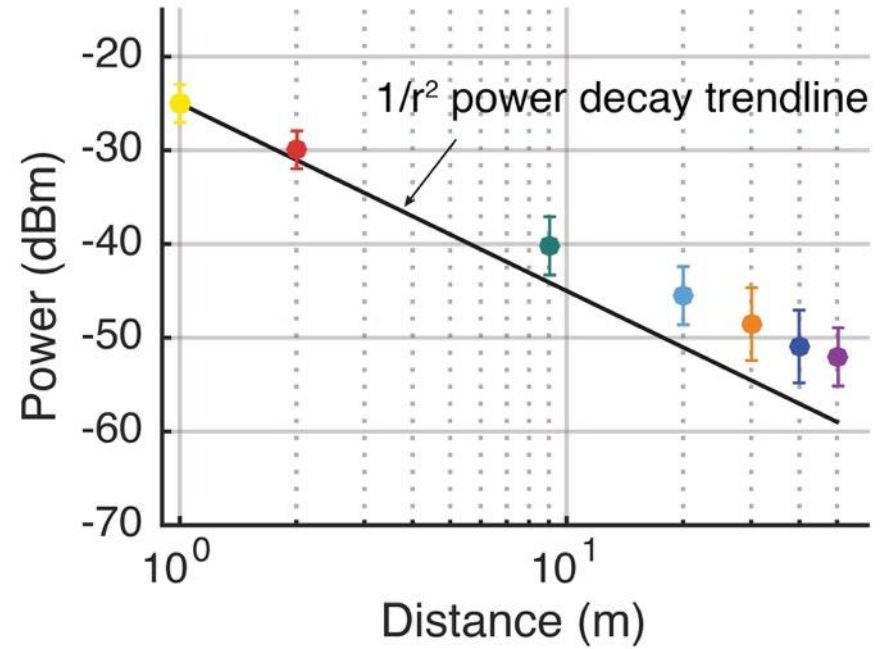
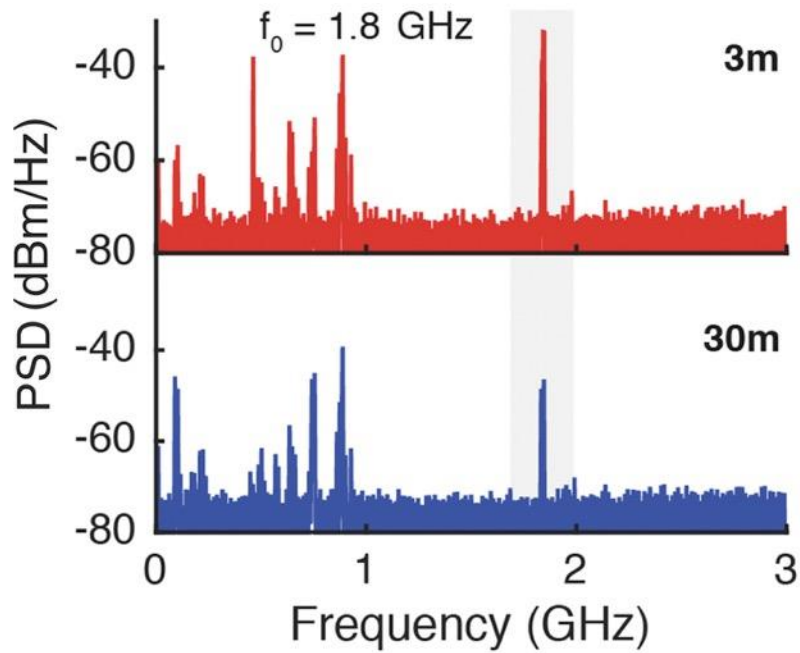
Injection-Locked Quadrature Oscillators



Wireless Transmitter



Wireless Transmitter



Thank you!