

SUBMILLIMETER WAVE OSCILLATOR

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We have developed an electrostatic analog [1,2], to the Gyrotron maser that has operated at one THz [3]. Our device, the Orbitron, operates by placing electrons in orbit around a positively - charged wire. The basic advantage of this device over the Gyrotron maser is that the electric fields can produce much higher orbital frequencies than the maser using conventional magnetic fields can produce. In addition, the electrostatic orbits are intrinsically unstable to the negative - mass instability, while the gyrotron must rely on relativistic effects (very - high voltage electrons) to operate. The device has been patented [4]. The basic advantages of this device over the Gyrotron Maser are :

1. No high magnetic field with superconducting magnet required. No magnet!
2. No high voltages and relativistic electrons required to achieve oscillation.
3. Higher frequencies intrinsically available due to the electric field configuration.

Operates at 1 THz.

The device apparently is quite efficient. A q - spoiled model had the central wire become incandescent when the RF emission was stopped. When the microwaves were being emitted, the wire became cold. Recent experiments overseas have confirmed the high efficiency [5].

References : [1] Victor Ganatstein and Igor Alexeff, "High - Power Microwave Sources", Artech House, 685 Canton Street, Norwood, MA 02062, 1987, Chapters 7, 8.[2] Igor Alexeff and Fred Dyer, "Millimeter Microwave Emission from a maser by use of plasma - produced electrons orbiting a positively - charged wire", Phys. Rev. Letters vol. 45, pp. 351 - 354, 1980.[3] Igor Alexeff et. al., "Orbitron operation at 1 THz", International Journal of Infrared and Millimeter Waves, Vol. 6, No. 7, pp. 481-482, 1985.[4] USA Patent 4 459 511.[5] Private communication, J. Felsteiner, Technion, Israel.

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2. D - Electronics and Photonics
3. (a)
4. I - Invited Paper
5. No special instructions