

## Ultra-Low-Noise Magnetrons

Poster session VIII, poster RP -1.066, Thursday, October 30, 2:00 PM, Fran Hill Southeast Exhibit Hall, ACC

A unique magnetic field has been discovered, which completely eliminates the microwave noise in microwave oven magnetrons.

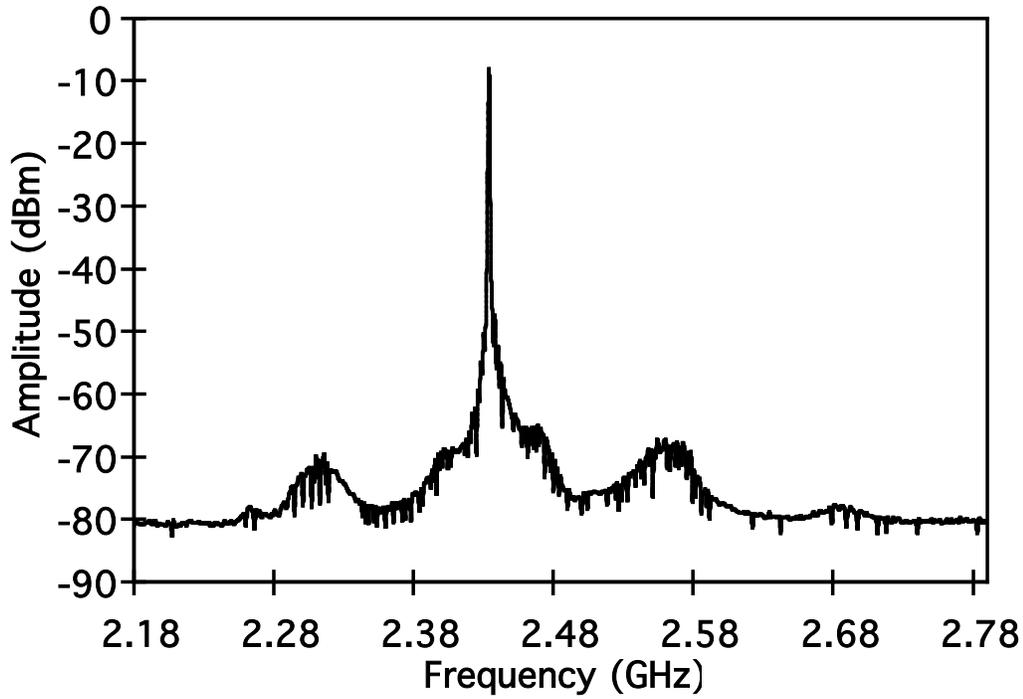
The recent best-selling book, "Tuxedo Park", describes the crucial role of the magnetron in the radar systems that contributed to the Allied victory in WWII. Magnetrons, and their derivatives, continue to be an important part of today's national defense, including the Navy's Aegis class cruiser and various missile systems. Other applications include maritime radars and industrial heating. There have also been experiments to upgrade the magnetron to produce billions of watts of microwave power. Perhaps the most ubiquitous use of magnetrons is as the microwave power source in some 60 million microwave ovens sold each year. However, in the 60 years since its invention, the problem of microwave noise emission from the magnetron has never been solved. This microwave noise, near 2.45 GHz, causes interference with cordless phones, and could potentially interfere with computers and computer communications systems such as Bluetooth and IEEE 802.11 b,g, which utilize the same part of the unlicensed microwave spectrum as microwave ovens.

A recent breakthrough in solving this crucial problem was achieved in the Nuclear Engineering and Radiological Sciences Department at the University of Michigan, Ann Arbor. With support from the Air Force Office of Scientific Research, UM graduate student Bogdan Neculaes, with Professors Ron Gilgenbach and Y.Y. Lau discovered a novel magnetic field configuration that completely eliminates the noise in microwave oven magnetrons. This invention is so inexpensive and simple to implement that it could easily be incorporated into the manufacture of tens of millions of microwave ovens, without alterations to existing assembly procedures. This invention has been demonstrated to be effective for magnetrons of different makes, different ages, and for virtually all operating current levels. This discovery also allows the magnetron to start oscillation much faster, for potentially higher average power in AC mode, in addition to generation of the cleaner microwave spectrum. The initial results have been published in the September 8, 2003 issue of Applied Physics Letters, and will be reported at the 45<sup>th</sup> Annual Meeting of the APS Division of Plasma Physics in Albuquerque, NM, October 27-31, 2003.

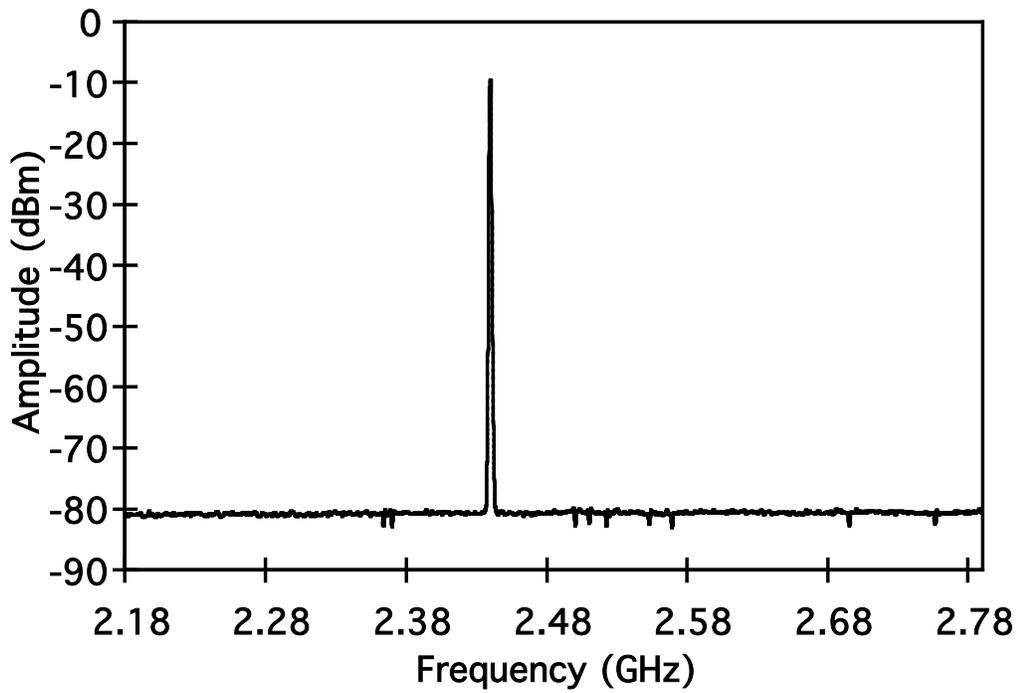
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Microwave spectrum of standard microwave oven magnetron.



Microwave spectrum of microwave oven magnetron with UM-invented magnetic field.