Measurements of the dominant mode insertion loss of the filter reveal that the filter suppresses this mode by more than 45 db throughout the 5.3–12.4-Gc stop band. The spurious mode insertion loss was measured to be greater than 50 db throughout the stop band. Of course, greater attenuation can be achieved by increasing the number of waffle-iron sections.

The measurements of the power capacity of the waffle-iron filter with rounded edges were conducted at the General Electric Microwave Laboratory, Palo Alto, Calif., under the direction of V. Price. The measurements were conducted at a frequency of 2.78 Gc, using a pulsed transmitter. The pulses were 2 μsec long and occurred at a rate of 300 pps. All the experiments were conducted a cobalt-60 radioisotope to irradiate the filter.

Table I gives the experimental results of the tests as a function of pressure.[1] The filter is said to be arcing or suffering voltage breakdown when a pulse incident on the filter is not transmitted—*i.e.*, the pulse is totally reflected. The "sputtering power" is defined as the power level for which there is at least one arc within a 5-minute interval. The "all-clear power" is that power for which there is no arc within a 5-minute interval. It is seen from Table I that the filter will transmit 2-Mw peak power without the incidence of voltage breakdown if the filter is operated at an air pressure of 30 psi (gage). A further increase in the power-handling capability is to be expected if the filter is pressurized with sulfur hexafluoride.

TABLE I

MEASURED POWER CAPACITY OF THE HIGH-POWER WAFFLE-IRON FILTER

Pressure (psi gage)	Sputter Power (kw peak)	All-Clear Power (kw peak)
0	293 250	272 231
15	1260 952	1050 935
30	2200	2090

[1] Windows having a relatively large mismatch were employed at either end of the filter during the tests of the pressurized filter. The combination of the windows and the stepped transformers was found to produce an input VSWR s of 3.0. Thus only $4s/(s+1)^2 = 0.75$ of the incident power was transmitted. Within the waffle-iron filter proper, the VSWR s' was 2.5. The standing waves within the filter allowed it to transmit to the load only $1/s'$ of the power that it could transmit when it had no standing waves within it. The values of power capacity of the filter listed in Table I are $4s'/(1+s)^2 = 1.88$ times the experimentally measured values, and represent the power handling capacity of a matched filter.

The authors extend their thanks to V. Price, now with the Electromagnetic Technology Corporation, Palo Alto, Calif., for making the facilities and staff of the General Electric Microwave Laboratory available for the power tests, and to Dr. W. Wilson of Stanford Research Institute in making the cobalt-60 radioisotope available for the high-power measurements.

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Contributors

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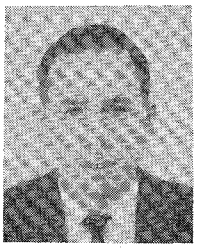

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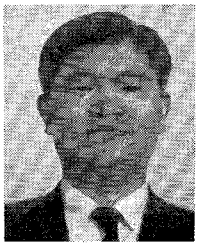

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