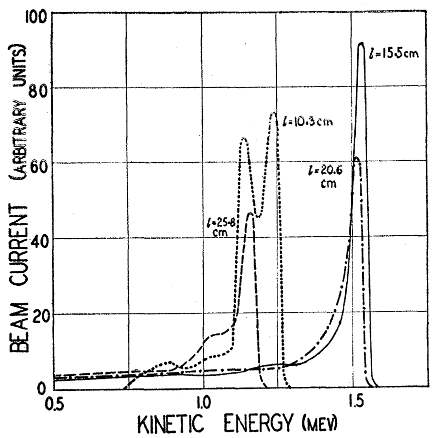

FIG. 1. Theoretical energy spectra for electrons from a TM_{010} mode cavity operating at 580 Mc/sec. idealized for a constant peak power of 400 kw dissipated in the cavity; continuous injection at 10 kev; cavity lengths l as noted.

begun. Grounded-grid triodes, type X126P, are being used as oscillators and amplifiers and are capable of peak powers of as much as 600 kw. These tubes and much useful design information have been generously supplied by the Federal Telephone and Radio Corporation.

The cavities are circular cylinders operating in the TM_{010} mode which provides an axial accelerating field. They are mounted coaxially and form a self-supporting vacuum chamber. The electron beam will traverse the axis, passing into each cavity through a small hole in the end plate. In preliminary tests full-scale cavities have been excited with an amplifier operating at low power levels, and it is found that the frequency and phase of the exciting fields can be varied smoothly in the region of cavity resonance. Rather long pulses are contemplated in the final design to allow the cavity fields to approach their steady-state values. The initial electron injection is to be over the entire r-f cycle, using a d.c. gun of relatively low voltage (10 kv). The injection at succeeding cavities is, of course, dependent on the phase and velocity homogeneity provided by the preceding cavities.

Calculations begun about a year ago indicate that the energy increment per cavity in electron volts is at least sixty percent of the peak voltage across the cavity. With low-voltage d.c. injection a large class of electron phases result in complete traversal of the first cavity. The transition between classical and relativistic velocities under the action of sinusoidal fields leads to longitudinal or phase focusing in the first cavity which is maintained in succeeding cavities. These fields also provide fair energy homogeneity even from the first cavity. Figure 1 shows the calculated energy spectrum from the first cavity for a given set of conditions. The magnetic fields in the cavity provide transverse focusing for nearly all of the accepted electrons for short cavities, and it appears that even with longer cavities magnetic defocusing will not be serious.

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The Isotopic Composition of Meteoritic Copper

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CONSTITUENTS of iron meteorites that have been previously studied for possible alterations in isotopic composition, using modern techniques, are iron[1] and carbon.[2] In neither case was a significant difference in composition between meteoritic elements and terrestrial elements observed. We have extended the work to a minor constituent of iron meteorites, copper, and have likewise observed no significant difference.

Copper is present in iron meteorites to an extent of approximately 300 parts per million.[3] One hundred grams of Canyon Diablo meteorite[4] were dissolved in HCl. The residual matter was treated with concentrated HF, following which a single treatment with HNO_3 served to take the residue into solution. The acid concentration was adjusted to $0.1M$, and the copper was co-precipitated with bismuth sulfide, previously purified from copper. The bismuth sulfide was dissolved and reprecipitated several times in order to eliminate traces of nickel, following which the bismuth and copper were separated by precipitating the bismuth several times in ammonia solution. The copper was finally precipitated alone as the sulfide, dissolved in HNO_3, and evaporated to dryness several times with HCl.

Three samples of copper were studied with the mass spectrometer:[5] a sample of terrestrial copper as CuCl, a sample of terrestrial copper as $CuCl_2$, and the Canyon Diablo sample as $CuCl_2$. The spectrometer was equipped with an automatic recorder, thus enabling one to measure quickly and conveniently about thirty ratios on each sample. The averages are shown in Table I.

TABLE I. Abundance ratios of Cu^{63} to Cu^{65} for terrestrial and meteoritic copper.

Source of copper	Form of copper	Ratio Cu^{63}/Cu^{65}
Terrestrial	CuCl	2.236
Terrestrial	$CuCl_2$	2.234
Canyon diablo	$CuCl_2$	2.244

It can be seen that the isotopic ratio for meteoritic copper does not differ from that of terrestrial copper by more than 0.5 percent, which we believe is within the experimental error.

The possible astrophysical implications of this isotope ratio identity in copper are discussed elsewhere in this issue.[6]

We are indebted to Col. C. C. Gregg, the Director of the Chicago Natural History Museum, and to Dr. S. K. Roy, the Curator of Geology, for their kindness in making available suitable meteorite samples.

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