A MECHANICALLY MODULATED RADIO FREQUENCY CAVITY MODEL

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With the greater flexibility of R.F. programming possible in FFAG synchrotrons, acceleration by means of a mechanically modulated cavity of high Q and high R.F. voltage is being seriously considered.

In order to study the properties of such a system, a model cavity has been constructed at Iowa State College under the direction of Professor D.J. Zaffarano and Professor L. W. Von Tersh. This cavity is 8 feet wide and 2.5 feet high (in a plane perpendicular to the gap electric field) and 2 feet deep. An aperture 2 feet wide and 3 inches high is cut in the center, corresponding to the scaled down donut cross section of a multibillion volt FFAG synchrotron. Modulation is accomplished by moving a plunger 6.7 feet wide and 14 inches high parallel to the gap field (or to the particle direction). In this way the cavity may be tuned from 25 to 200 megacycles. Spurious parasitic modes are detected but appear not to be serious over this range. The cavity Q has not yet been measured, but measurements on smaller, similar models gave Q values within a factor of four of the theoretical values. The behavior of the cavity under heavy R.F. driving will be studied in the near future, and later it will be operated as a self-excited oscillator.

Present plans are to frequency modulate this model with an arrangement of motors and magnetic clutches actuating the plunger, although pneumatic systems have also been considered. Using a one horsepower motor with this model, a one second period for the complete modulation cycle appears straight-forward and will be tried.