LS–6
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350 MHz KEK–Style Cavity Design Parameters

The 350–MHz KEK–style cavity is shown on the attached Figure. The cavity dimensions are approximately scaled from the 500–MHz dimensions. As a result, the bore tube radius is 0.07 meters, requiring a transition section to the main–ring vacuum tube.

The attached table gives a summary of the cavity modes measured on the 500–MHz KEK cavity[1,2] and the calculations of the modes at 500 MHz using URMEL. Frequencies of the modes scaled by the ratio of 350 to 500 MHz dimensions are presented in the third column. The fourth column lists the calculated frequencies for the 350–MHz–size cavity using URMEL. The HEM modes are not calculated in URMEL. For those modes calculated by URMEL, the results agree very well. There are a few modes, however, measured or calculated, which don't appear; the reasons for which are not known.

KEK operates the 500–MHz cavity at 425 kV with 22.25 kW of cavity power. The URMEL calculation gives 461.7 kV for the same power level. This is only 8% higher than actually achieved. The calculated peak electric field at the cavity surface is 4.76 MV/m.

Using the 350–MHz URMEL calculation and increasing the cavity power by 1.08, the relevant parameters for the cavity when operating at a peak surface electric of 5 MV/m are:

$$\int E_z \cos kz \, dz = 658.9 \text{ kV},$$
$$(1.08) \text{ Power (copper loss)} = 41.8 \text{ kW},$$
$$\text{Power (beam)} = 197.7 \text{ kW},$$
$$\text{Power (total)} = 239.5 \text{ kW}.$$

References

1. Photon Factory Activity Report, National Laboratory for High Energy Physics, KEK, 1982/83.

2. IEEE Transactions on Nuclear Science, Vol. NS–28, No. 3, June, 1981.

Table
500–MHz and 350–MHz KEK–style Cavity Modes

TM (m = 0)

500–MHz		350–MHz	
(measured)	(URMEL)	(Scaled)	(URMEL)
499.5	499.6	352.6	350.2
758.4	–	535.3	–
1052.2	1047.4	742.7	737.0
1299.9	1298.2	917.6	917.4

TM (m = 1)

–	828.0	–	586.9

HEM

689.0	–	486.4	–
829.3	–	585.4	–
1070.8	–	755.9	–
1137.9	–	803.2	–
1245.0	–	878.8	–

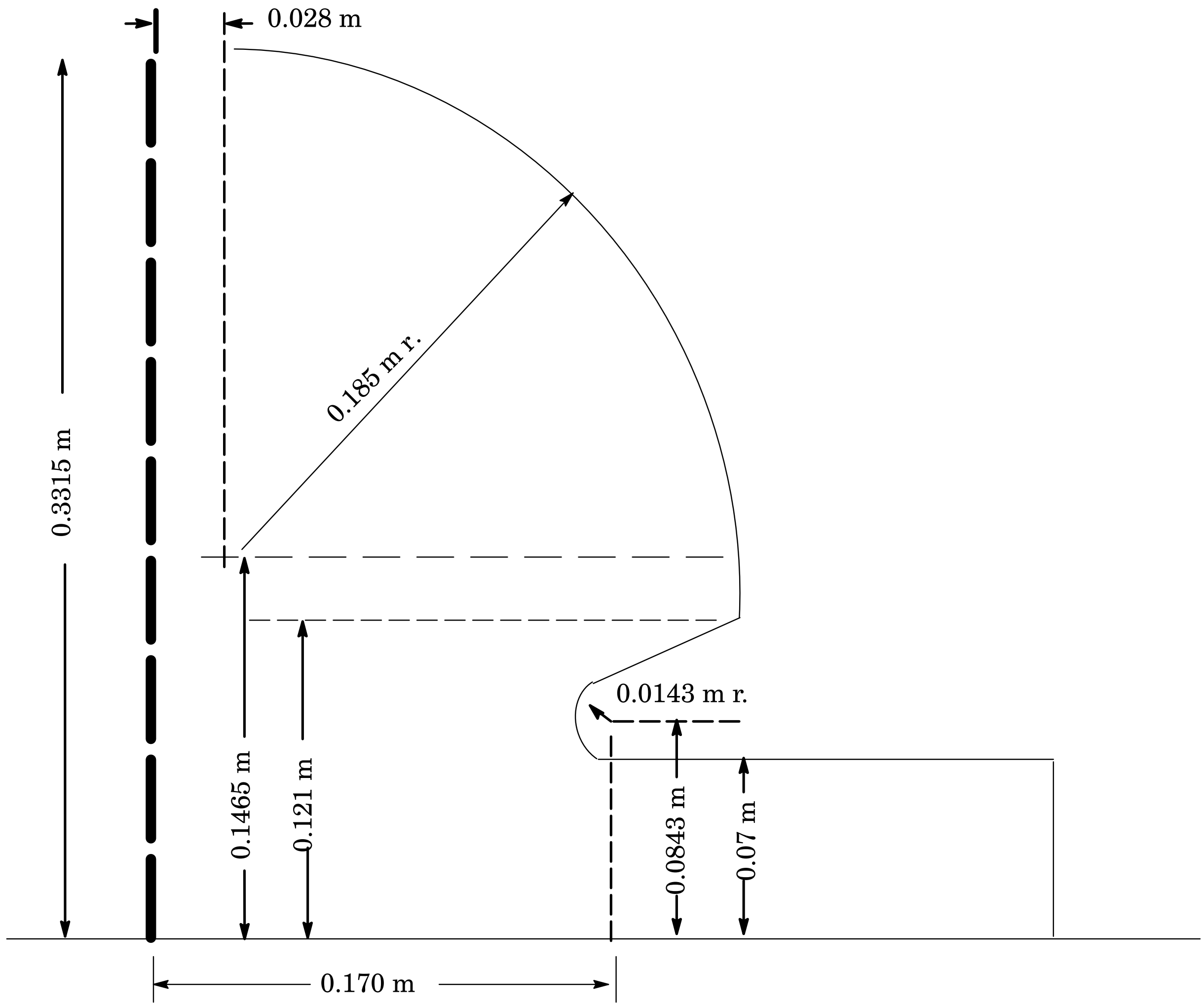

Figure
350–MHz KEK–Style Cavity