Title
Q and Zs for 1/10 Scale Gravity

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Publication Date
1950-10-23
UNIVERSITY OF CALIFORNIA
Radiation Laboratory

UCRL - 965

INDEX NO. 203-11 11/20
This document contains 33 pages
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1. Conditions for measurements

a. Drift Tube Position

The D.T.'s were aligned to their prescribed positions as given on Layout #26475B. Longitudinal alignment was made with a Cenco cathetometer with a one meter base length. Analysis shows repeatability of ±0.01" and D.T.'s were set to ±0.01". Total accuracy is then ±0.02" from theoretical value listed below.

<table>
<thead>
<tr>
<th>DT#</th>
<th>Theoretical Q Position from entrance wall (In)</th>
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<tbody>
<tr>
<td>0 (wall)</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1.688</td>
</tr>
<tr>
<td>2</td>
<td>5.168</td>
</tr>
<tr>
<td>3</td>
<td>10.388</td>
</tr>
<tr>
<td>4</td>
<td>17.348</td>
</tr>
<tr>
<td>5</td>
<td>26.099</td>
</tr>
<tr>
<td>6</td>
<td>36.740</td>
</tr>
<tr>
<td>7</td>
<td>49.374</td>
</tr>
<tr>
<td>8</td>
<td>64.098</td>
</tr>
</tbody>
</table>

b. The entrance and exit ends were flat ± 1/16 except as noted.

c. The cavity is 72.25 in. long. (This is .25" longer than design figures for the 8 1/2 D.T. model because it was made for the 7 1/2 D.T. model originally.

d. The transverse alignment was made with a dumpy level sighting along the cavity axis. In each D.T. there is a set of crosshairs in each end to define the Q. Total accuracy of crosshair alignment and positioning is ± 1/16".
There were two 1/2 in. wide slots - one 90° from the drift tube stems and one 180° from the stems - in this cavity. They extended from the center of the entrance around the side to the center of the exit end. They were shorted across approximately every 1/8 wave length.

2. **Frequency**

Frequency was measured with Signal Corps frequency meter TS-175/U Serial #833.

a. Drift tubes were aligned at values in table of (1). The accuracy is ±0.02 as mentioned above.

End walls flat to ± 1/16 in.

Frequency = 122.6 m.c. ± .1

b. End wall perturbation measurements. Given in terms of megacycles shift per inch of movement of end diaphragm measured at center. (Outer extremity does not change its position).

Entrance End .93 mc/inch

Exit End .80 mc/inch

c. Drift tube perturbation measurement. Data taken on #1 D.T. because this is the most sensitive and therefore represents the worst case.

#1 D.T. .16 mc/inch (longitudinal)

3. **Shunt Impedance, Z₀**

Average of three independent integrations for ∫B.δa

a. Plane 90° from stems using areas between successive Q between D.T.'s.

b. Plane 180° from stems using same areas as above

c. Plane 180° from stems using cell divisions between successive D.T. transverse Q

Average $Z₀ = 36.4$

$Z₀ = 23.3 \sqrt{N} \pm 3\%$

λ in meters
4. \( Q \)

a. Calculated \( Q \) from field plots \( \rightarrow 83,900 \pm 2500 \)

\[ Q = 53,600 \sqrt{\lambda} \]

(\( \lambda \) in meters)

b. Experimental \( Q \). Made by bandwidth measurements.

(1) Original value \( \rightarrow 71,000 \pm 2000 \)

(2) After opening tank and cleaning shell and D.T.'s with Brilliantshine \( \rightarrow 69,000 \pm 2000 \)

The difference between measured and calculated values is 15 - 20%. A program is now underway to account for this difference. It is planned to replace the D.T.'s in accordance with L. Cook's experience in obtaining high conductivity plating.

Measurements by:
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