Field measurement in TESLA cavities

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Measurement principle

Nylon thread

Roller

To the TX port of network analyzer

Obstacle

To the RX port of network analyzer
Mechanical arrangement
Instrumentation

- Stepper motors
- Motor control unit - Phytron IXE alpha-A-RS
- TX antenna
- RX antenna
- Measured cavity
- Broad band amplifier
  - HP 8347 A
  - 100 kHz - 3 GHz
- RX-port
- TX-port
- Network analyzer
  - Agilent N 3383 A
  - 300 kHz - 9 GHz
- Personal computer
- GPIB
- Broad band amplifier
  - HP 8347 A
  - 100 kHz - 3 GHz
- Motor control unit - Phytron IXE alpha-A-RS
- RS 232
Cu cavity, TM$_{010}$ $\pi/9$, $2\pi/9$, $4\pi/9$, beadpull measurement

These modes were used for measurements on irises. Suitable irises for given modes are red marked - electric field intensity in the adjacent cells is not very different.
Cu cavity, TM$_{010}$ - equators
Cu cavity, TM$_{010}$ - irises

- Eccentricity - radius [mm]
- Eccentricity - angle [°]
- Standard deviation of radial eccentricity [mm]
Cu cavity, $\text{TM}_{010}$ – comparison between equators and irises
Cu cavity, $\text{TM}_{110}$ - equators

![Graphs showing eccentricity measurements](image-url)
Cu cavity, TM\textsubscript{011} - irises

![Graph showing eccentricity-radius in mm for different irises and eccentricity-angle in ° for different irises.](image-url)
Z93 cavity, TM\textsubscript{010}, equators

Coarse tuned

Final tuned
Z93 cavity, electrical and geometrical axis

<table>
<thead>
<tr>
<th>Cavity state</th>
<th>Equator plane 1 crossing [mm]</th>
<th>Equator plane 9 crossing [mm]</th>
<th>Tilt [μrad]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-tuned</td>
<td>(-0.265, 0.238)</td>
<td>(0.181, 0.155)</td>
<td>487</td>
</tr>
<tr>
<td>Final tuned</td>
<td>(-0.139, 0.125)</td>
<td>(0.392, 0.028)</td>
<td>576</td>
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<tbody>
<tr>
<td>Pre-tuned</td>
<td>(-0.325, 0.208)</td>
<td>(-0.02, 0.12)</td>
<td>349</td>
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<tr>
<td>Final tuned</td>
<td>(-0.156, 0.116)</td>
<td>(0.177, 0.033)</td>
<td>367</td>
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<tr>
<td>Pre-tuned</td>
<td>(0.06, 0.03)</td>
<td>(0.201, 0.036)</td>
<td>154</td>
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<tr>
<td>Final tuned</td>
<td>(0.017, 0.008)</td>
<td>(0.215, -0.046)</td>
<td>209</td>
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