



Specifications sheet: TM_{110} deflection cavity

Introduction

The deflection cavity is a compact, single-cell, power-efficient resonant microwave cavity, supporting a TM_{110} mode at a resonance frequency of 2.9985 GHz with an unloaded quality factor that can be as high as $Q \approx 5000$. The deflection cavity is a pillbox cavity partially filled with a dielectric material with a large permittivity ϵ and a small $\tan \delta$, which allows a substantial reduction in size and power consumption. The TM_{110} mode has an oscillating magnetic field oriented perpendicular to the symmetry axis, allowing periodic deflection of the electron beam passing through. Presently the ceramic $ZrTiO_4$ is used, with $\epsilon \approx 36$ and $\tan \delta \approx 0.0002$ at 3 GHz, enabling an on-axis magnetic field amplitude of 3 mT at an RF input power of 15 W. Additionally the dielectric can be coated to prevent charging due to the electron beam passing through.

Applications

- Beam chopper
- Pulse length diagnostics
- ToF electron energy loss spectroscopy
- Streak camera with bandwidth of 13 ns and 100 fs temporal resolution

Features

- Power efficient
- High vacuum compatible ($< 10^{-6}$ mbar)
- Tiny footprint

General

Cavity length	: 17.2 mm (optimized for 30 keV electrons)
On-axis magnetic field	: ~ 3 mT for 15 W input
Pole length	: 300 mm standard - variable pole length (special)

Cooling

Water Connection	: Legris (6×1 mm) push in fitting
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Temperature Sensor

Type	: NTC
Connector	: mini-XLR (RT3MC-B)
Time constant	: 15 s
R_{25}	: 5 k Ω
B-value $B_{0/100}$: 3450

RF

Mode of operation	: TM_{110}
Frequency	: 2.9985 GHz
Loaded Q	: > 6000
Power connector	: SMA-Type female
P_{\max}	: 15 W - Continuous

Vacuum

Flange	: CF63
Steel	: 316L
Leak rate	: $< 10^{-8}$ mbar/l/s

Dimensions

Size	: $112.5 \times 112.5 \times (41 + \text{pole length})$ mm
Weight	: Unknown