Fine Grooving of Conductor Surfaces of RF Input Coupler To Suppress Multipacting
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Accelerator Resonantly-coupled with Energy Storage

3-cavity system stabilized with the $\pi/2$-mode operation

consists of

- HOM-damped accelerating cavity (A-cav)
- Energy-storage cavity with $\text{TE}_{013}$ (S-cav)
- Coupling cavity (C-cav) with a parasitic-mode damper

For the KEK B-factory:
Two of the 32 ARES cavities had \textit{multipacting} problems in the \textit{coaxial line}.

(WX77D)
Multipacting Zone Map
for the ARES Input Coupler with a regular coaxial line
from the model in
Good Reproduction Power for the Data

- Measurements

(a) Multipactoring

(b) Vacuum [10^-6Pa]

(c) P_{in} [kW]
Fine Grooving of the Surface

The *Quasi*-TEM is simulated by $\text{Gdf idL}$. 

Body of Revolution
Electric Field (peak) at the Groove

The max. 0.565 [MV/m] is lower than that on the inner conductor of the coaxial line with no groove (=0.717 [MV/m]).
Suppression against Multipacting

Increasing Groove Depth

(a) (b) (c) (d)

Increasing Groove Depth

Integration in the Map

Our choice

Fixed
- Groove width: 1mm
- Groove pitch: 2mm
1\textsuperscript{st} Prototype

The inner surface has been electropolished.

Replica

Silicone

(copper)
Summary

- We have performed a multipacting simulation study for a grooved coaxial line based on the method in T. Abe et al., Phys. Rev. ST Accel. Beams 9, 062002 (2006)
  
  \(\rightarrow\) Very effective against multipacting.

- We have constructed a first prototype of input coupler with a grooved coaxial line.

  \(\rightarrow\) High power test to be performed soon