Test of FCC-hh Beam Screen at the ANKA Beamline.

L.A. Gonzalez,1, 2 M. Gil Costa,3, 2 P. Chiggiato,2 V. Baglin,2 C. Garion,2 R. Kersevan,2 S. Casalbuoni,4 E. Huttel,4 A. Gutierrez2, J. Cortes2, A. Grau4, D. Saez de Juaregui4, I. Bellafont2,5 and F. Perez5

Task4.6: Measurements on cryogenic beam vacuum system prototype
Test of FCC-hh Beam Screen at the ANKA Beamline:

Outline

• Remedies SR Induced Effects

• Test at ANKA
  • Scientific Objectives
  • The Samples
  • The Setup

• Conditioning Results

• Installation procedure
SR induced Effects Remedies

<table>
<thead>
<tr>
<th></th>
<th>LHC - 0.58A 7TeV</th>
<th>FCC-hh - 0.5A 50TeV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SR power [W/m]</strong></td>
<td>0.2</td>
<td>35.2</td>
</tr>
<tr>
<td><em><em>Flux</em> ph/m/s</em>*</td>
<td>4.2·10^{16}</td>
<td>1.5·10^{17}</td>
</tr>
<tr>
<td><strong>Critical Energy</strong></td>
<td>44.2eV</td>
<td>4.3 KeV</td>
</tr>
</tbody>
</table>

* Photon energy above 4eV

R. Kersevan; Beam Dynamics meets Vacuum, Collimations, and Surfaces Workshop. KIT, Karlsruhe. March 2017
Test of FCC-hh Beam Screen at the ANKA Beamline:

Test at ANKA

Ec FCC-hh = 4.2 KeV

Ec ANKA = 6.2KeV


ANKA reasonably resembles FCC-hh’s spectrum and linear power, and even at nominal beam energy (2.5 GeV) ANKA’s spectrum is a close match of that of FCC-hh.

Scientific Objectives

- Define PSD
- Define Heat load distribution
- Define photoelectron generation
- Define reflectivity
Test of FCC-hh Beam Screen at the ANKA Beamline:

Test at ANKA.

May `17-October `17

#1 for validation of temperature profile and validity of photon reflector

October `17-March `18

#2: #1 + electrodes for photoelectron current measurements

March `18-June `18

#3: Surface treatments as for baseline, updated internal screen and pumping slots, desorption yield measurement and pressure profile

The Samples
Test of FCC-hh Beam Screen at the ANKA Beamline:

Test at ANKA.

The Setup

Test of FCC-hh Beam Screen at the ANKA Beamline.

FCC week 2017 June 1st

Luis Gonzalez
LNF-INFN/CERN TE-VSC
Test at ANKA.

Slits Apperture 1.2x20.7mm
- 83% of flux cropped → 8.83E16 Ph/sec
- 69% of power cropped → 57 w

Average Angle 18 mrad

Irradiated Length 1800 mm → 32 W/m - Power per meter at FCC-hh Dipole
Test of FCC-hh Beam Screen at the ANKA Beamline:

Test at ANKA.

- **Manufacturing**
  - Reflector Position $< 0.500\text{mm}$

- **Sample Position**
  - Repeatability $< 0.050\text{mm}$

- **Laser Tracker alignment BS**
  - Accuracy $< 0.200\text{mm}$

- **Laser Tracker alignment Slits**
  - Accuracy $< 0.200\text{mm}$

$\Delta < 0.700\text{mm}$
Test of FCC-hh Beam Screen at the ANKA Beamline:

Test at ANKA.

Chimney Connexion

Model By Miguel Gil Costa
Test of FCC-hh Beam Screen at the ANKA Beamline:

**Test at ANKA.**

Photon Collector

- L=2000mm
- \(d\approx 20.7\)mm
- L=1800mm
- \(\beta=18\) mrad

Model By Miguel Gil Costa
Test of FCC-hh Beam Screen at the ANKA Beamline:

Test at ANKA.

Diagnostics Equipment

Heat Load

Model By Miguel Gil Costa

Test of FCC-hh Beam Screen at the ANKA Beamline.

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Test at ANKA.

Diagnostics Equipment  
Photoelectron Generation

Luis Gonzalez  
LNF-INFN/CERN TE-VSC
Test of FCC-hh Beam Screen at the ANKA Beamline: Conditioning Slits

\[ \eta \propto \Gamma^{0.7} \]

Test of FCC-hh Beam Screen at the ANKA Beamline.

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Test of FCC-hh Beam Screen at the ANKA Beamline:

Setup Installation
Conclusions

- Installation was performed
- Test with beam will start in the next weeks with the first prototype
Test of FCC-hh Beam Screen at the ANKA Beamline:

Thank You