

International Workshop on Linear Colliders 2010



Design and fabrication update on PSI/Trieste X-band phasespace rotator structure

Dmitry Gudkov 21-OCT-2010

WG 4 «Main Linac and NC RF»





- Aim of Engineering Design
- Engineering Design Overview
- Mechanical Design of Copper Disks and Couplers
- Accelerating Structure Assembly Sequence
- Cooling System
- Wake field monitor Feedthrough
- **Tuning System**
- Fabrication strategy

Aim of Engineering Design



The European FEL projects FERMI@ELETTRA and PSI-XFEL plan to employ an X-band structure to compensate nonlinearities in the longitudinal phase space in order to improve bunch compression.



The aim of engineering design of the structure is to transfer the RF geometry into real hardware device which can be produced with existing technological methods of metal working and assembly.

* RF-design done by R. Zennaro, M. Dehler and colleagues from PSI

Engineering Design Overview



- The accelerating structure consists of two coupler subassemblies, 73 disks and includes a wakefield monitor and diagnostic waveguides;

- The engineering study includes the external cooling system, consisting of two parallel cooling circuits;

- RF tuning system, which allows phase advance tuning of the cell by deforming the outer wall;

- The engineering solution for the installation and sealing of the wake field monitor feedthrough devices that are integrated in the accelerating structure are presented.





- The accelerating structure body consists of a stack of thick cylindrical copper disks, which are machined following the RF design of the cavity geometry.
- For the final RF frequency tuning, the disks are equipped with four radial holes.
- Each special wakefield monitor disk incorporates four coupling holes and is also equipped with tuning holes.



Mechanical Design of Copper Disks and Couplers





Cell shape accuracy 0.004 mm Flatness accuracy 0.002 mm Cell shape roughness Ra 0.025

Mechanical Design of Copper Disks and Couplers





WFM Disk Type 2





WFM Disk Type 4



WFM Disk Type 5









1. Bonding of 3 stacks containing 24..25 disks each

-Each stack includes one disks with slots for the next operation of brazing. -Slots are used for insertion of brazing alloy







Bonding of 5 test disks



Load pressure 0.28 MPa





Metallographical observation.. ..shows that grains are crossing the joining plane



Accelerating Structure Assembly Sequence





Accelerating Structure Assembly Sequence





Accelerating Structure Assembly Sequence, Cooling System





- Two parallel cooling circuits;
- 8 cooling blocks each of 394 mm long;
- Brazed directly onto the accelerating structure body;
- Standard water connectors.

Flexible hoses WITZENMANN







11.Installation and sealing of Wake field monitor Feedthrough

- Based on standard feed-through
- Special end of connector
- Specially designed adapter from the standard feed-through to the accelerating structure body
- The adapter is laser welded to the feed-through
- Final, vacuum tight connection of the feed-through assembly is made by electron beam welding













Prototype phase: Successfully finished

Series production phase:

Time/phase	July	August	September	October	November	December	January
Structure 1+2							
machining							
measurement							
cleaning+packaging							
ready for transport							
Structure 3+4							
machining							
measurement							
cleaning+packaging							
ready for transport							



The End



REFERENCES

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