# IAPP Mid-Term Review

27 Sep 2012

Pauli Piirainen

# Background

- - Bachelor of Science 1994
- - Working experience: Ocotec (Finland), Nokia Networks (Finland), Viasystems (China)
- - Sweco/Lewel Group (Finland) 2003 ->
  - Various customer projects e.g. for NSN, Huawei, PKC
  - Mostly in Base Station mechanical design projects/maintenances teams
  - Current project is Radio Base Station design for Ericsson in R&D mechanical team
  - Strong sheet metal and assembling experience

# Project in Cern 10.2010 – 09.2011

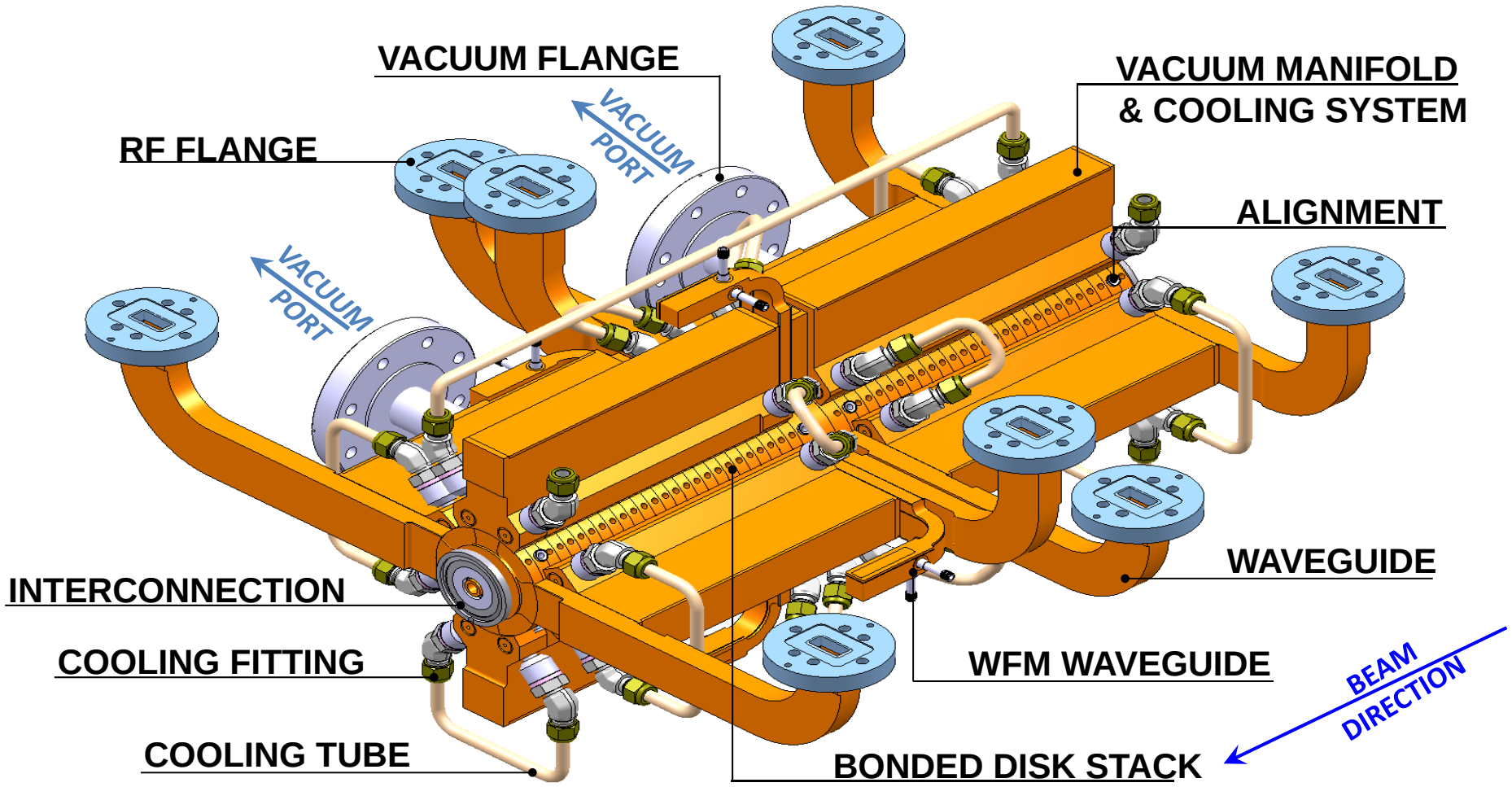
- The main task in this project was to be involved in CERN RF structure production and two-beam teams in charge of manufacturing the X-band RF structures for the CLIC study.
- This included taking part in the present development and design work being done for the CLIC RF structure development.
- The work consisted of CATIA 3D-design work in co-operation with other researchers and designers working on the CLIC project.
- Design work concentrates on the modelling of high accuracy RF parts, supporting components and components for related technical systems necessary for a proper functionality of the CLIC module.

# TD26 CLEX Structure

## Design report

*P. Piirainen*

# TD26 CLEX Structure



# TD26 CLEX Structure

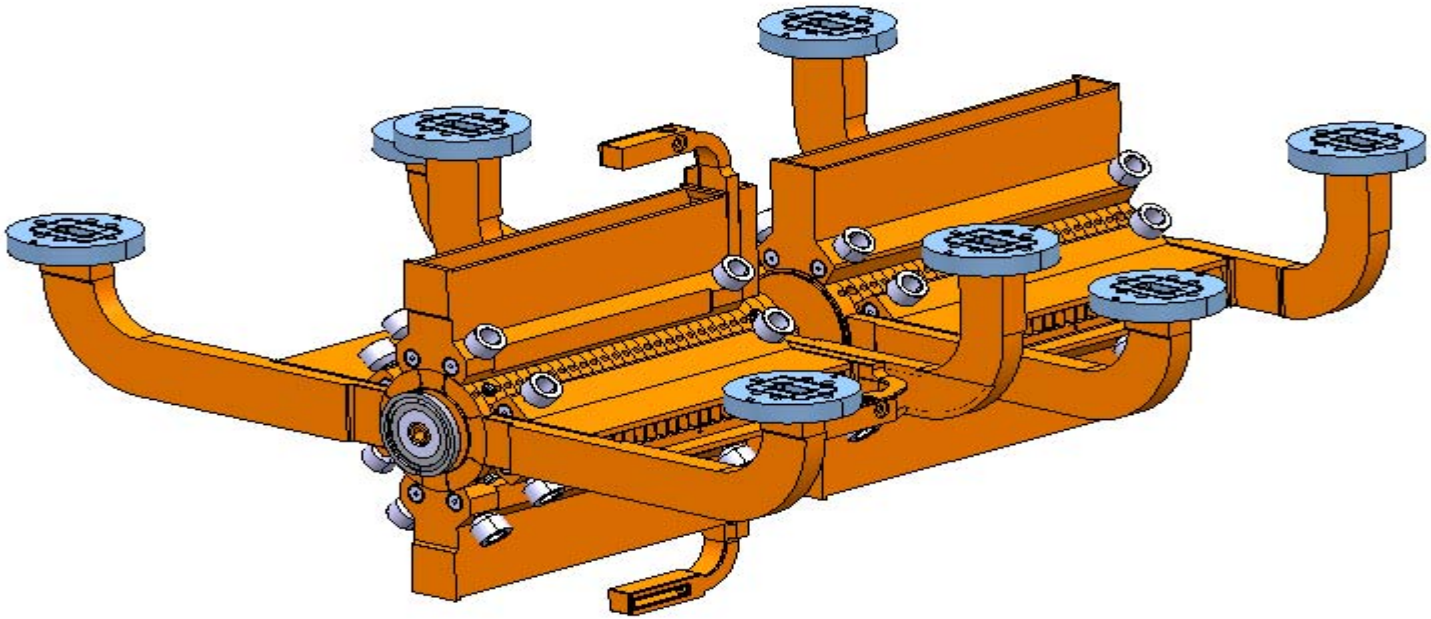
TD26 CLEX Super Accelerating Structure is an accelerating module with compact couplers and silicon carbide (SiC)damping material integrated. It consists of two accelerating structures bonded together and several features are integrated to meet RF and physical requirements for the structure.

The main task was to continue the engineering design for the TD26 CLEX structure and the following issues needed to be considered:

- Mechanical design of the wakefield monitors
- Mechanical design of the cooling system
- Mechanical design of the vacuum manifolds
- Mechanical design of the interconnections
- Implementation of the alignment features

# TD26 CLEX Structure

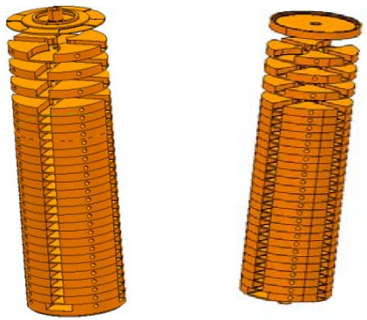
- Super Accelerating Structure (SAS) has been formed by brazing two Accelerating Structure (AS) together



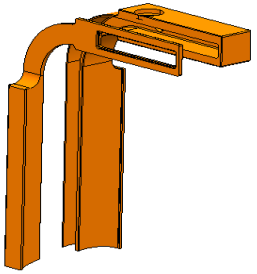
# TD26 CLEX Structure

Main components and subassemblies for SAS, which will be assembled together

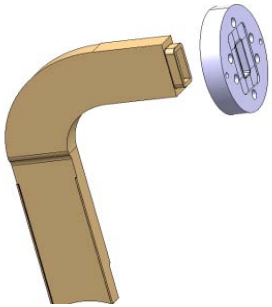
Bonded disk stacks



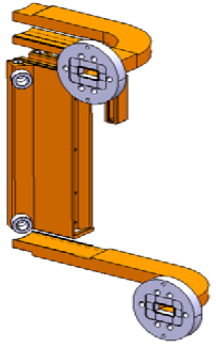
Wakefield monitor



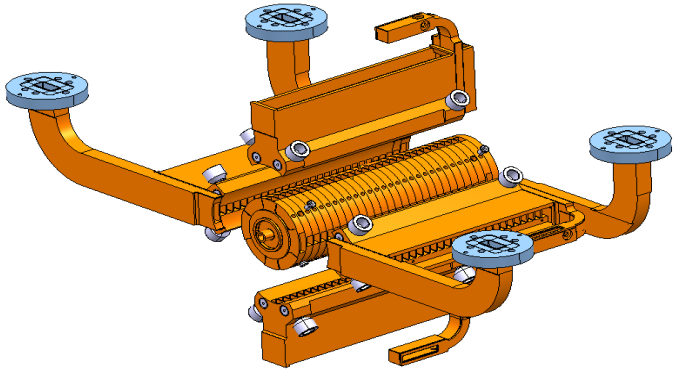
Waveguide



Manifold assembly

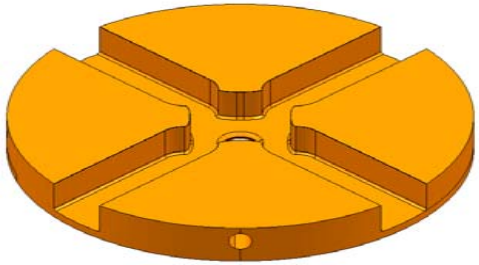


Disk stack and manifold assem

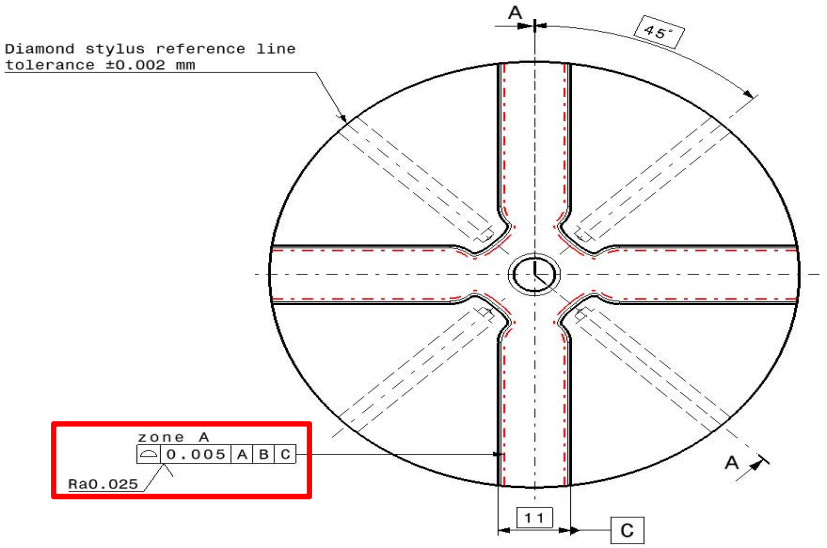


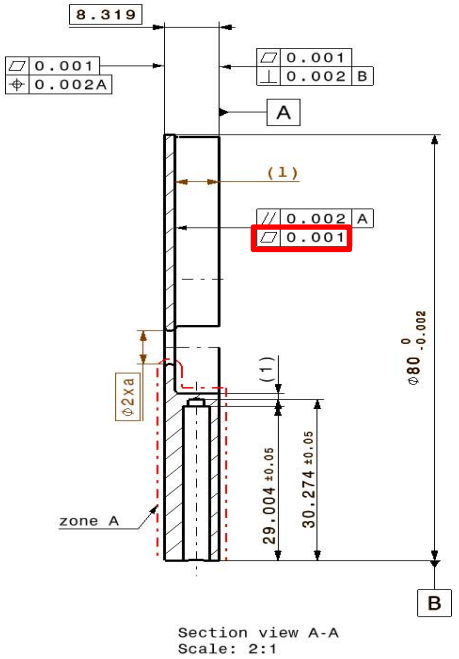
# TD26 CLEX Structure

**REGULAR CELL**



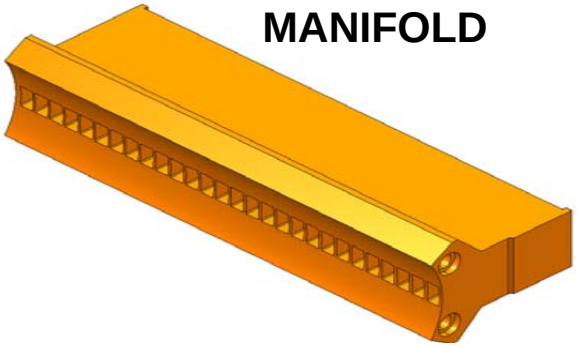
- Cell shape accuracy 0.005 mm
- Flatness accuracy 0.001 mm
- Cell shape roughness Ra 0.025 µm



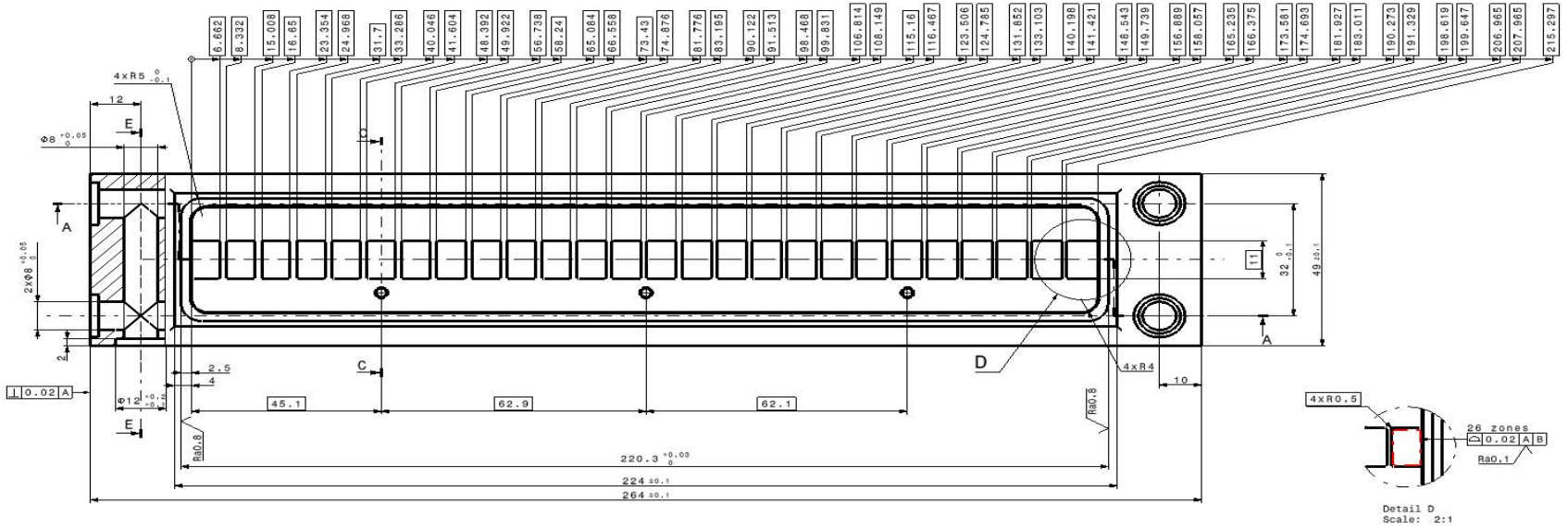



# TD26 CLEX Structure

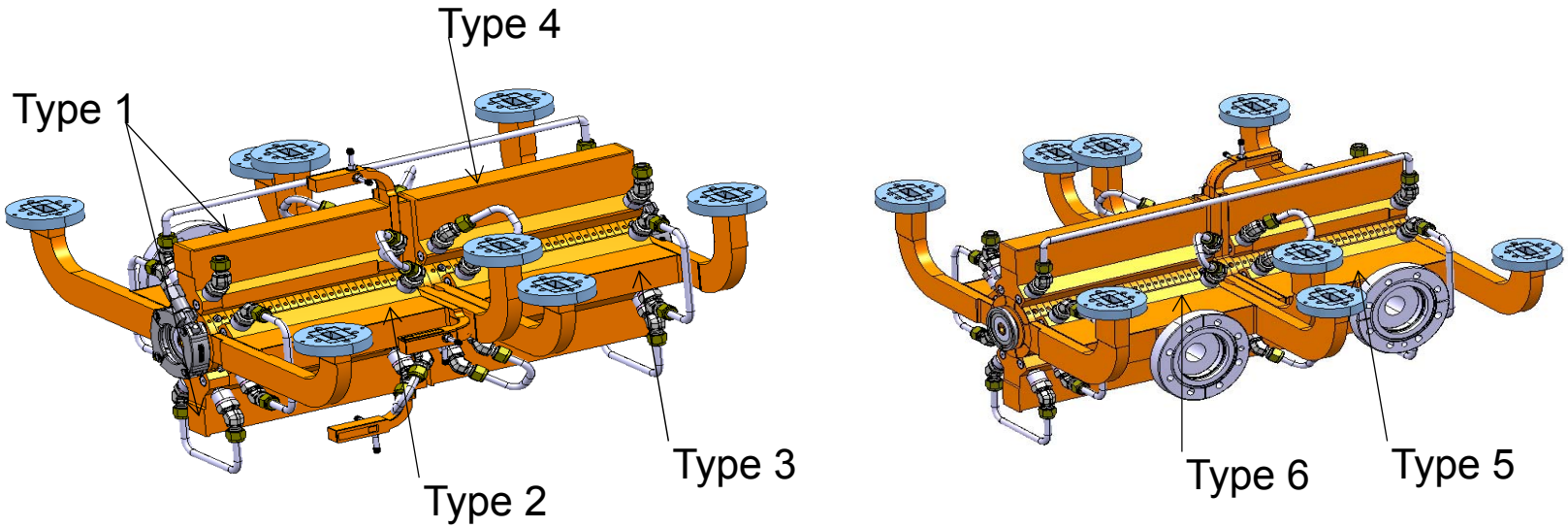
**MANIFOLD**



- Shape accuracy 0.02 mm
- Shape roughness Ra 0.1 µm



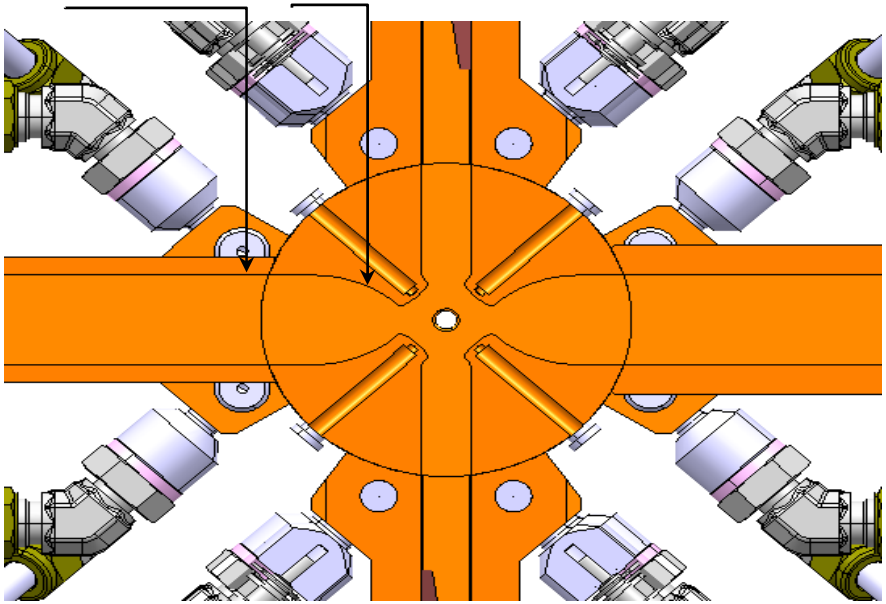
## Vacuum Manifold design, 6 different types



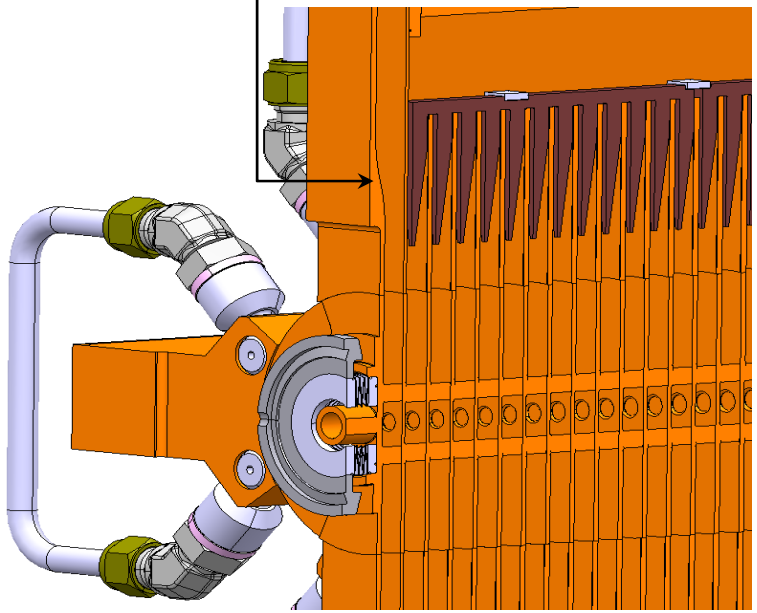
## Compact Coupler Design

Compact couplers and new design waveguides have been integrated to the disk structure

Compact coupler waveguide/disk

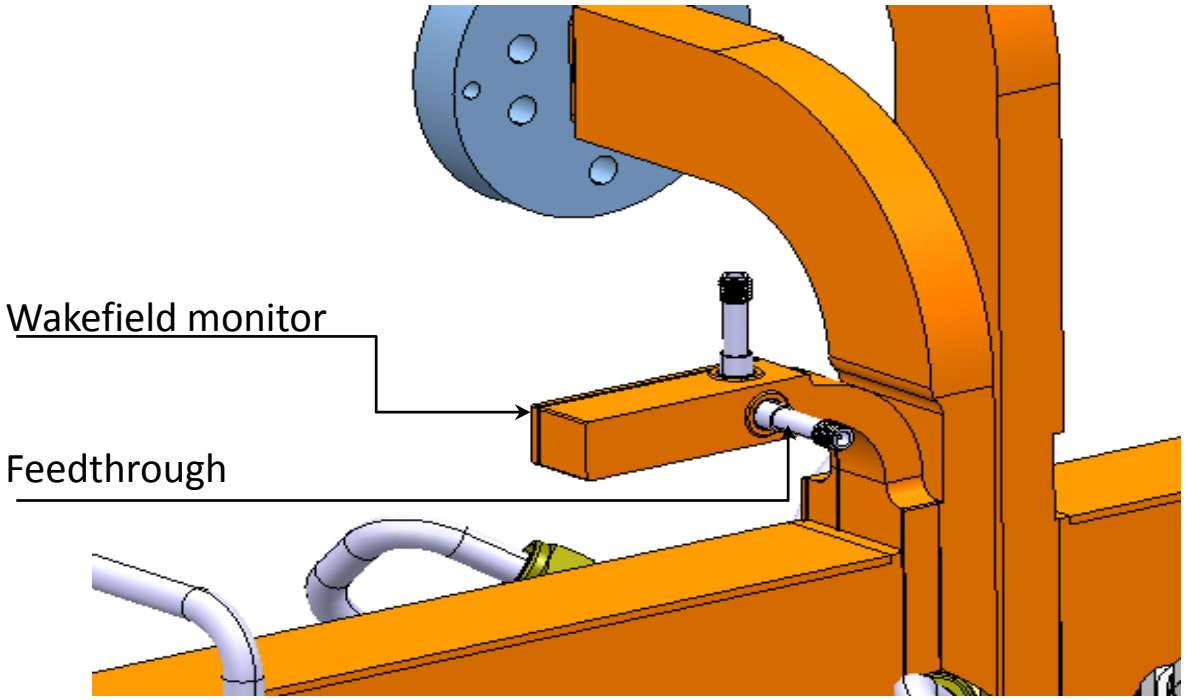


Waveguide with special shape



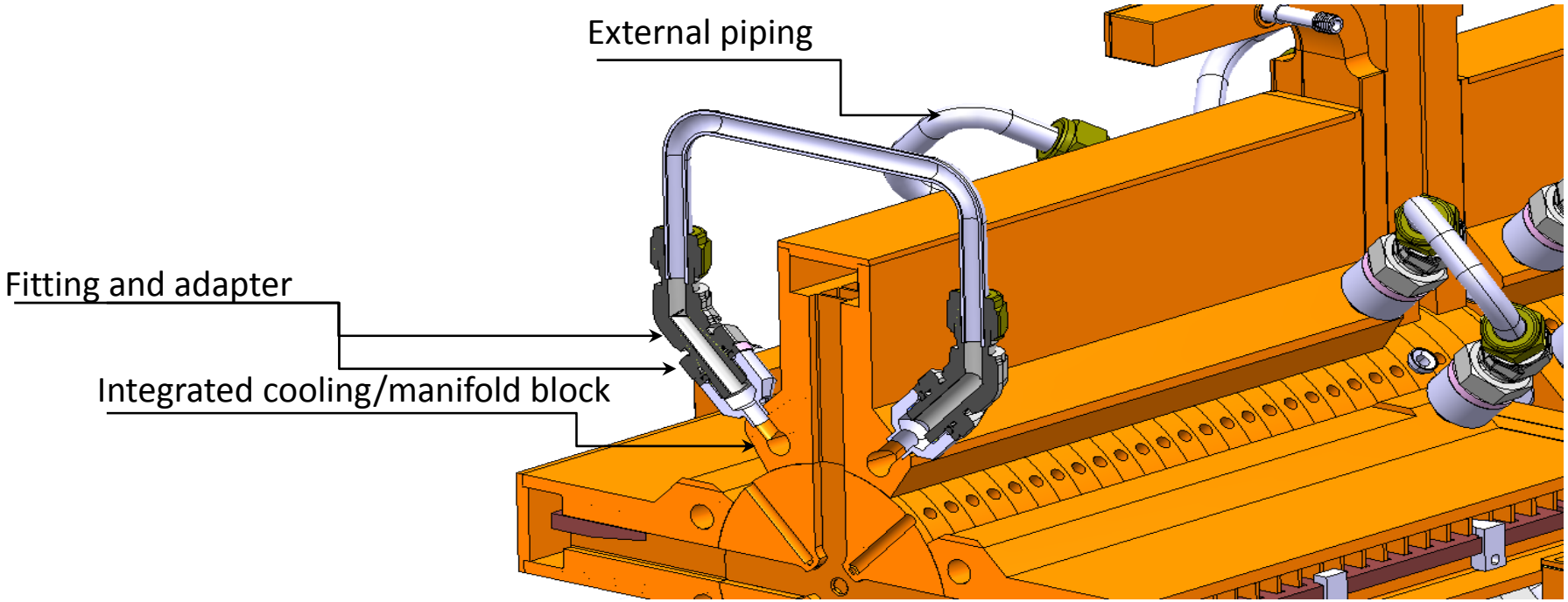
## Wakefield Monitor Design

Wakefield monitors with feedthroughs have been integrated to the structure



## Cooling System Design

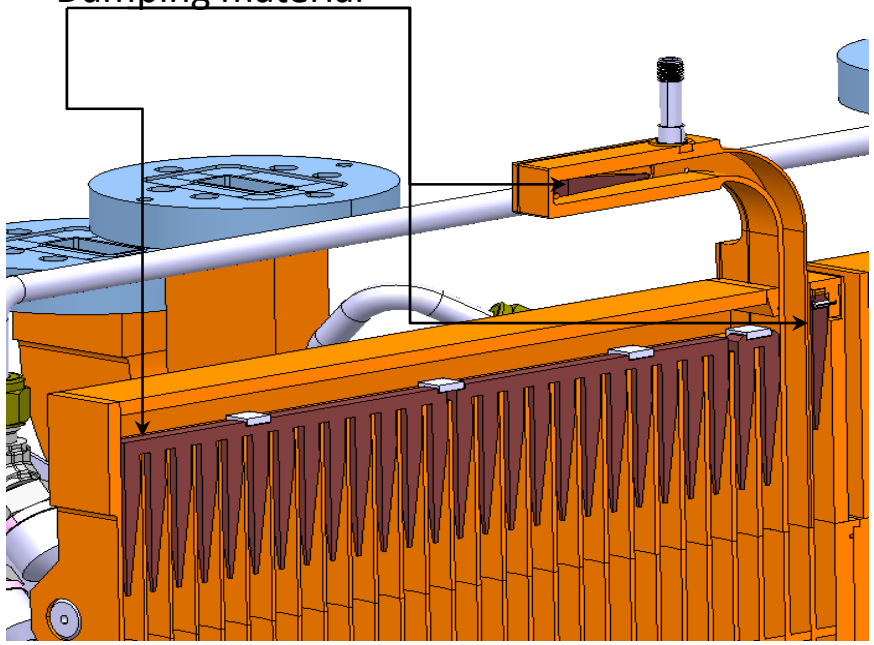
- Cooling system has been integrated to vacuum manifolds
- External piping has been implemented with standard fittings and pipes



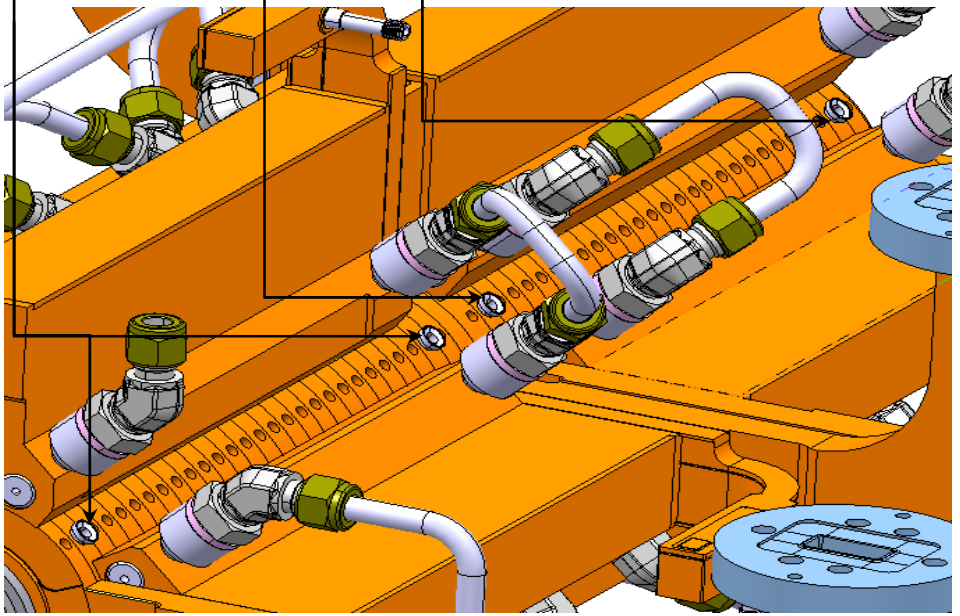
## Damping and Alignment Design

Damping material has been integrated to the vacuum manifolds and WFM waveguides
Alignment inserts have been included to design

Damping material



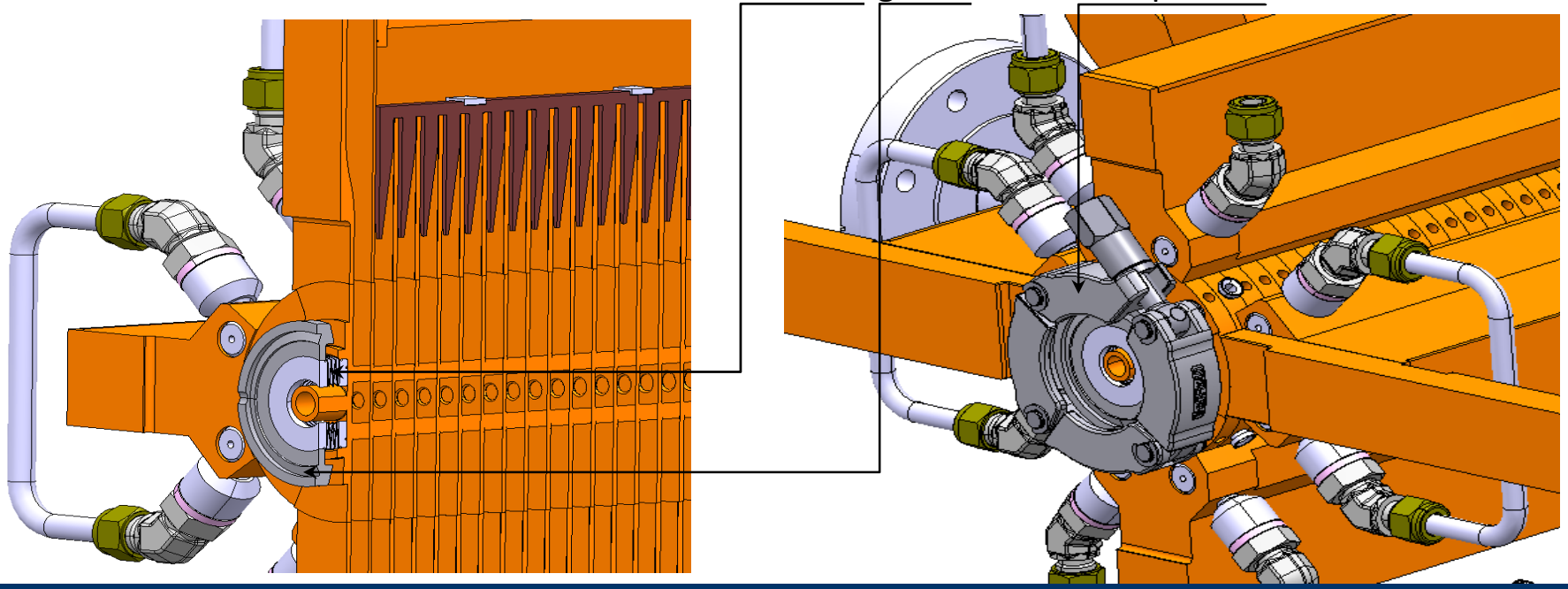
Alignment inserts



## Interconnection Design

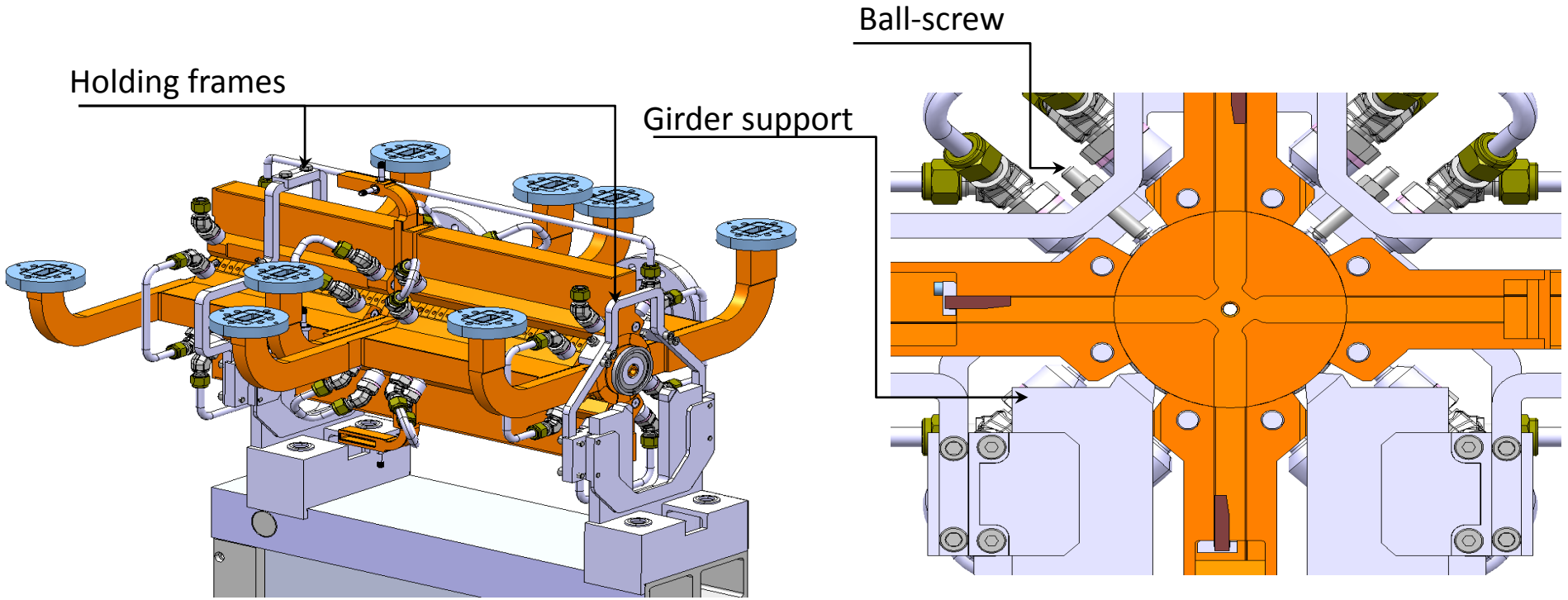
Super Accelerating Structure has been designed so that it is able to assemble to adjacent structures with flexible interconnections

Interconnection with bellow, flange and chain clamp



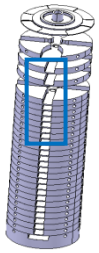
## Supporting System

Super Accelerating Structure has been fitted on the girder

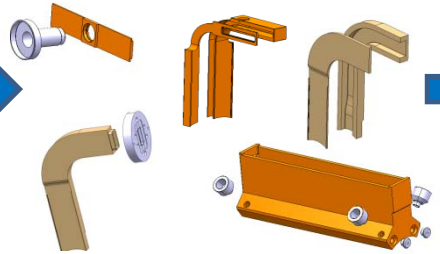


# ASSEMBLY PROCEDURE

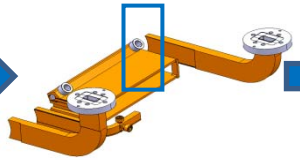
1. Diffusion bonding disks



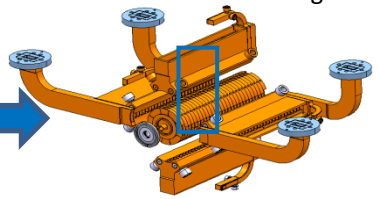
2. Pre-assembling and brazing of manifold cover wakefield monitor, waveguide and cooling parts



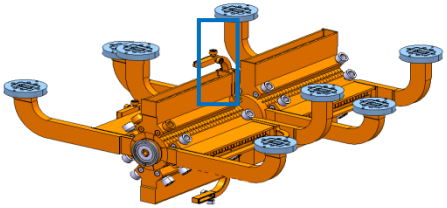
3. Brazing pre-assemblies to vacuum manifold



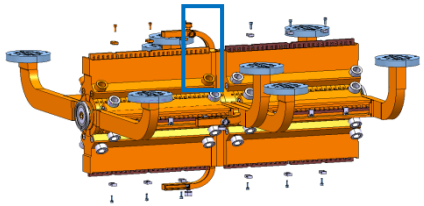
4. Brazing of manifolds, disk stack and interconnection flange



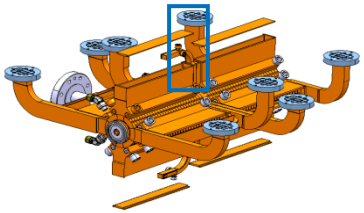
5. Brazing two AS assemblies to form a super accelerating structure



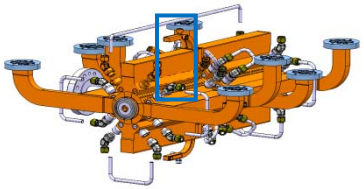
6. Installation of damping loads



7. EBW welding of manifold covers and vacuum flanges



8. Installation of tube connectors and tubes



KIITOS!

MERCI!

THANK YOU!