



2nd Collaboration Meeting on X-band Accelerator Structure Design and Test-Program

General engineering and integration issues concerning the design of accelerating structure

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KEK - 13.05.2008



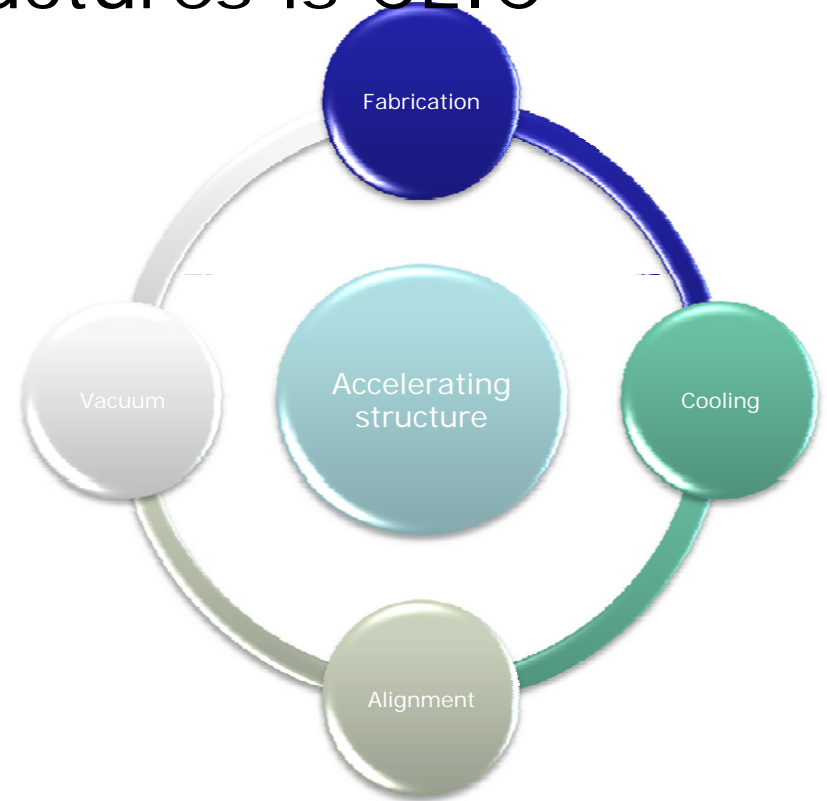
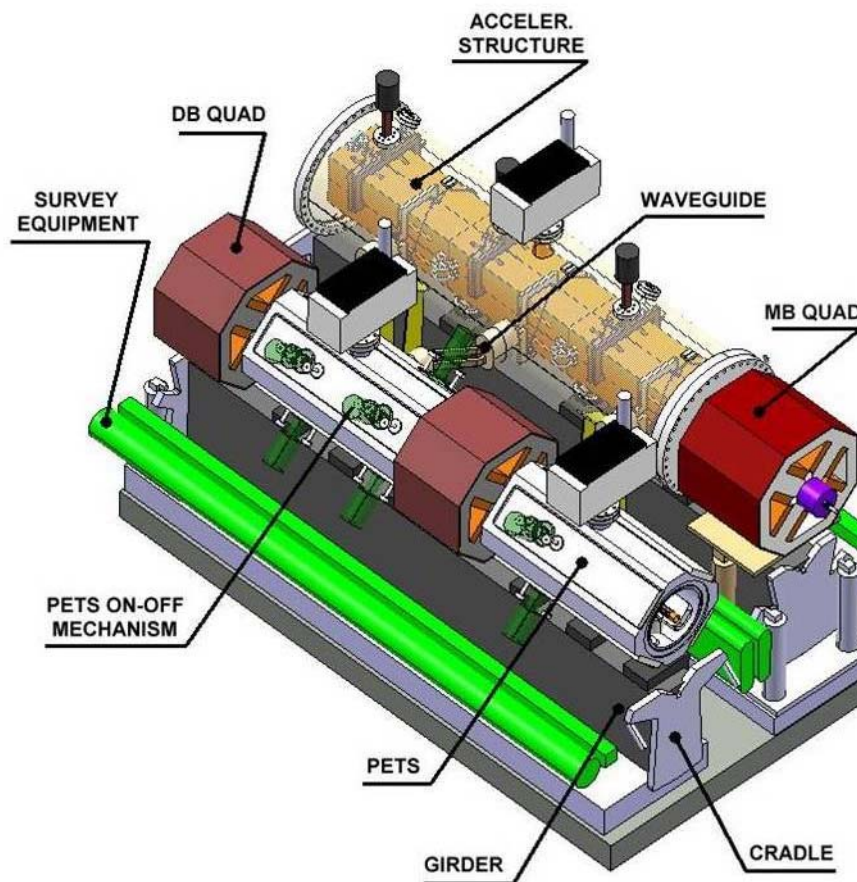
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Introduction

- The surrounding for structures is CLIC module





Vacuum system

- Main beam and drive beam connected via waveguides → Same vacuum (low conductance in the connecting waveguides)
- Vacuum requirement governed by beam dynamics
 - Fast ion instability, trapping...
 - No explicit criteria at the moment – somewhere between 10^{-8} - 10^{-10} mbar
- Consideration:
 - If vacuum requirement $> \sim 5 \times 10^{-9}$ mbar: Vacuum pumps can be enough
 - If vacuum requirement $< \sim 5 \times 10^{-9}$ mbar: bakeout + NEG would be required → cannot be applied to ac. structures
- If $\sim 10^{-10}$ mbar is needed, this might be a feasibility issue for CLIC



Vacuum system

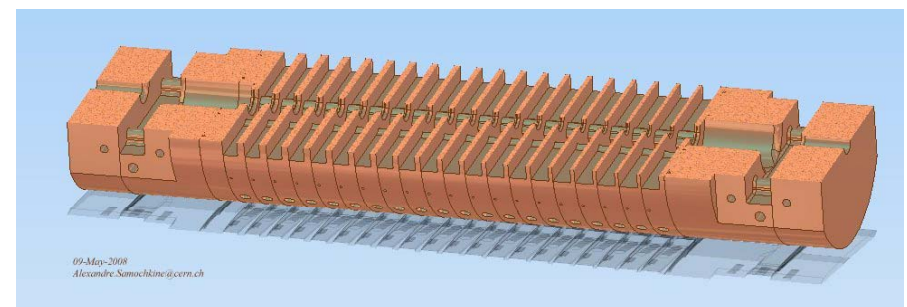
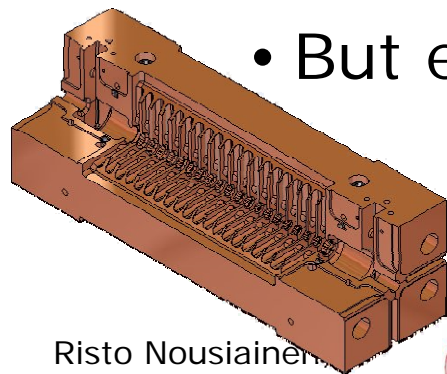
- Actions in parallel to beam dynamics simulations (to confirm the vacuum requirement)
- Study dynamics of the H₂O pumping in limited conductance systems
 - Best possible dynamic vacuum will have to be simulated



Vacuum system

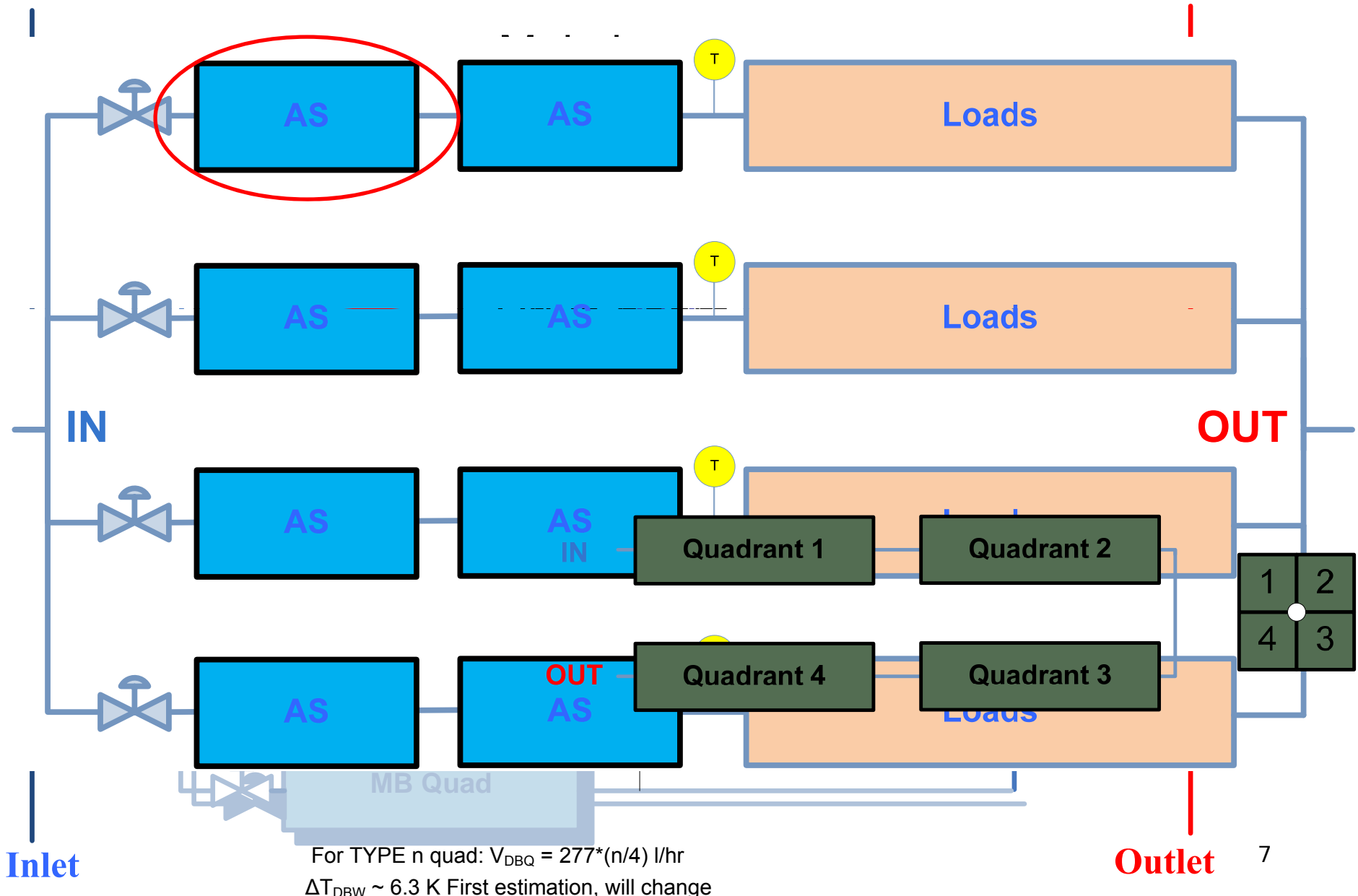
- Two approaches for the vacuum integration
 - Sealed structure
 - Integrated vacuum manifold
 - Possible less space for pumps, flanges...
 - Vacuum tank
 - More connections
 - But easier access to structures

In the framework of the module working group, these two configurations are being studied and compared





Cooling system

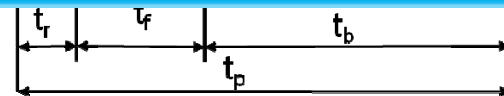
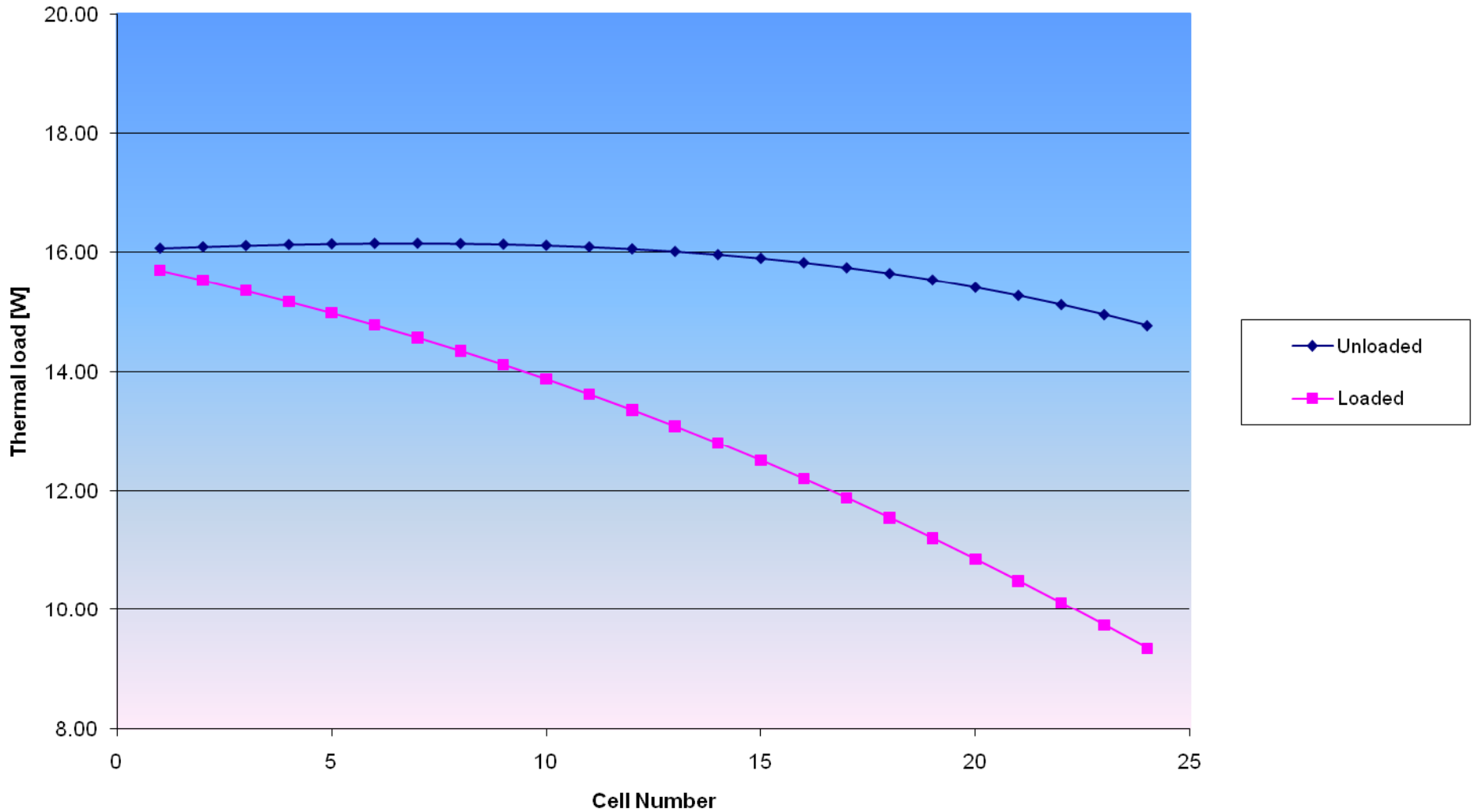


For TYPE n quad: $V_{DBQ} = 277 \cdot (n/4) \text{ l/hr}$
 $\Delta T_{DBW} \sim 6.3 \text{ K}$ First estimation, will change



Thermo-mechanical model of AS

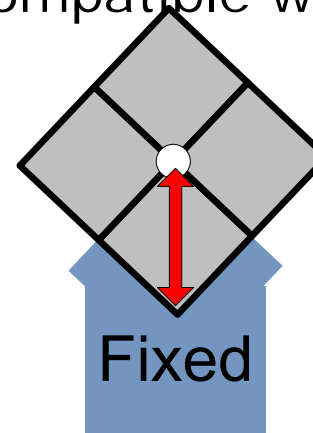
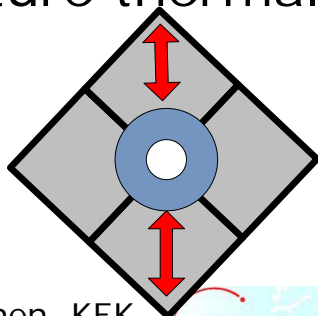
Cell to Cell thermal dissipations for CLIC G structure





Thermo-mechanical model of AS

- Supporting concept affects the achieved alignment performance. Two cases of supports have been considered:
 - V-support
 - Center support
- Thermal effect
 - Alignment errors due to thermal expansion: static (predictable) and dynamic (unpredictable)
 - Temperature dependent RF behavior: phase error (mainly for AS)
- Possible operational sequence:
 - Ramp up to nominal unloaded power
 - Unloaded to loaded operation mode
- **Alignment should be sustained**
- Can we optimize the RF load to be compatible with the structure thermal behavior?





Conclusions / Future work

- In parallel to the gradient optimization accelerating structure design involves, several other systems, such as:
 - Vacuum system
 - Possible feasibility issue if requirement 10^{-9} - 10^{-10}
 - Cooling system
 - Close relation to assembly and alignment
 - Detailed thermo-mechanical model for the whole module is needed and being prepared (coupling between accelerating structure, PETS and quadrupoles)