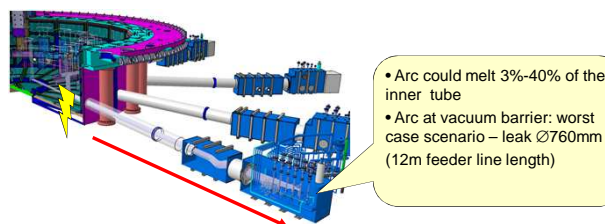
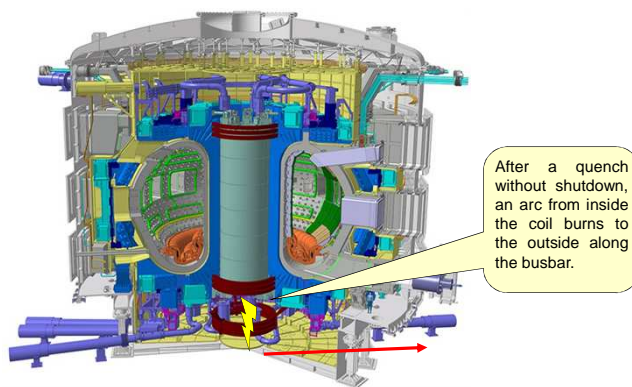


## Busbar arcs at large Fusion Magnets: Model Experiments on Busbar arcing in a Double Walled Feeder Tube with the LONGARC device

Dmitry Klimenko, Volker Pasler

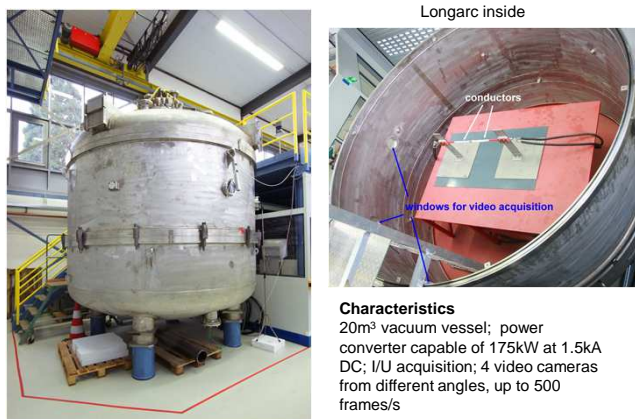
■ **Objective:** Model arc experiments were set up to study the propagation and damage potential of possible high current arcs at busbars of tokamak devices such as ITER and DEMO.



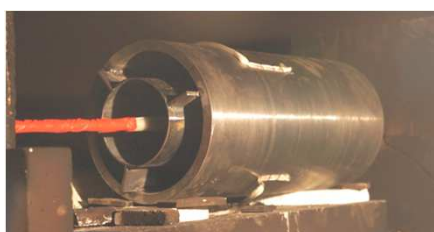
### Purposes of the Experiments:

- Accident scenario with inductively driven high current arcs at Toroidal Field (TF) magnet coil busbars that propagate to the cryostat wall and penetrate it
- Support of numerical model development
- Model validation

### Experimental Setup



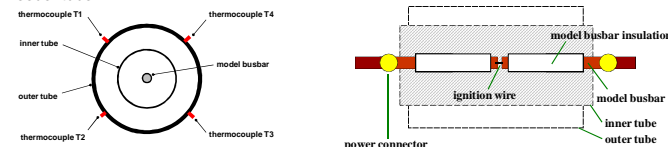
**Characteristics**  
 20m<sup>3</sup> vacuum vessel; power converter capable of 175kW at 1.5kA DC; I/U acquisition; 4 video cameras from different angles, up to 500 frames/s



Setup of a double walled feeder line carrying a single model busbar.

### LONGARC setup for experiments with double walled feeder tube: Inline mode

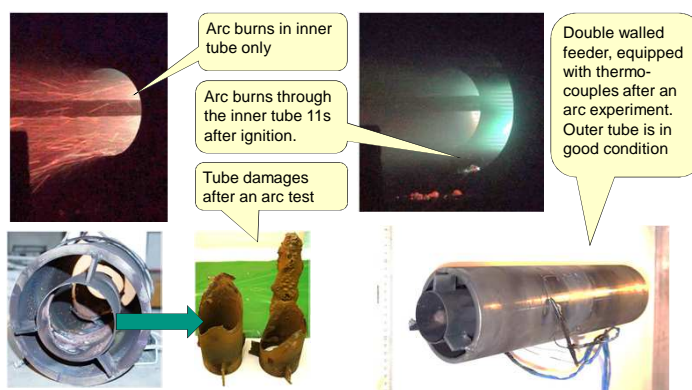
The present work is to simulate the structure side arc spot in geometry similar an busbar feeder tube.



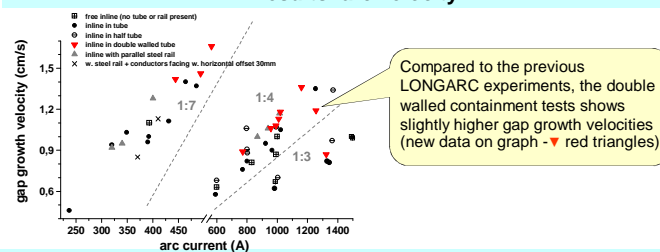
Cut view of setup with model busbar with double tube feeder equipped with 4 thermocouples

Setup for inline arcing with double tube

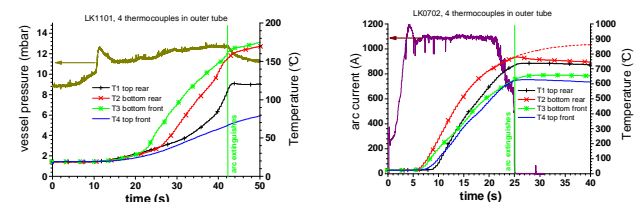
### Results: tube damage



### Results: arc velocity



### Results: temperature



The pressure in vessel and temperature of outer tube vs. time during LONGARC test (770 amperes, 84.4kW)

Temperature data during an experiment with a 1:4 conductor in a 1:7 double tube (1100A, 106kW)



Tempering colours on the outer tube after an experiment (1100A, 106kW) with a 1:4 conductor in a 1:7 double tube

### Conclusions

- The LONGARC device was successfully implemented for busbar to double walled feeder tubes arcing model experiments.
- The double tube experiments in LONGARC device did show slightly more severe damage to the inner tube than comparable single inner tube experiments.
- The outer tube of busbars is expected to withstand high current arcing in any case.
- For DEMO, the double walled TF feeder tube concept of ITER seems a very promising approach to avoid holes in the cryostat vacuum caused by a moving busbar arc along the feeder region.