

# Update on PMMA cathode developments

## Status

- Mechanical - electrical - optical - operation in TPC mode — successfully tested
- Basic double sided ITO coated units of up to 1x1m<sup>2</sup> feasible
- Large evaporator for TPB built and commissioned @ CERN
- A prototype ITO/PMMA cathode (ton scale LAr TPC) long term test ongoing

## News

- Cool-down for spring loaded contact test to the ITO surface successful
- ITO coating quality issue (under investigation with Visiontek)
- Progress on the conceptual design

# Cathode for ton scale LAr TPC (ArDM) — tests at CERN

## Aims

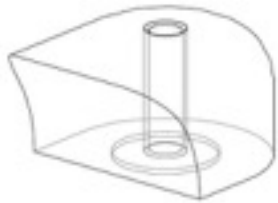
- Mechanical robustness during T variation
- Contact and electrical resistances
- Contact failures



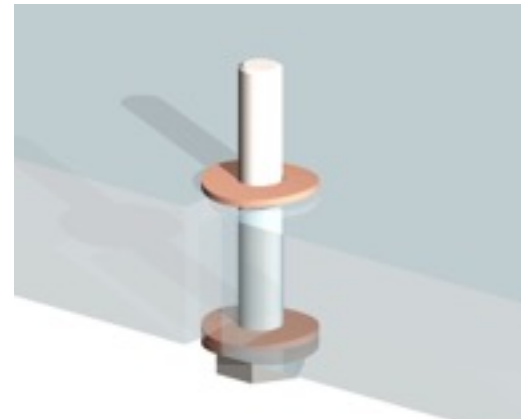
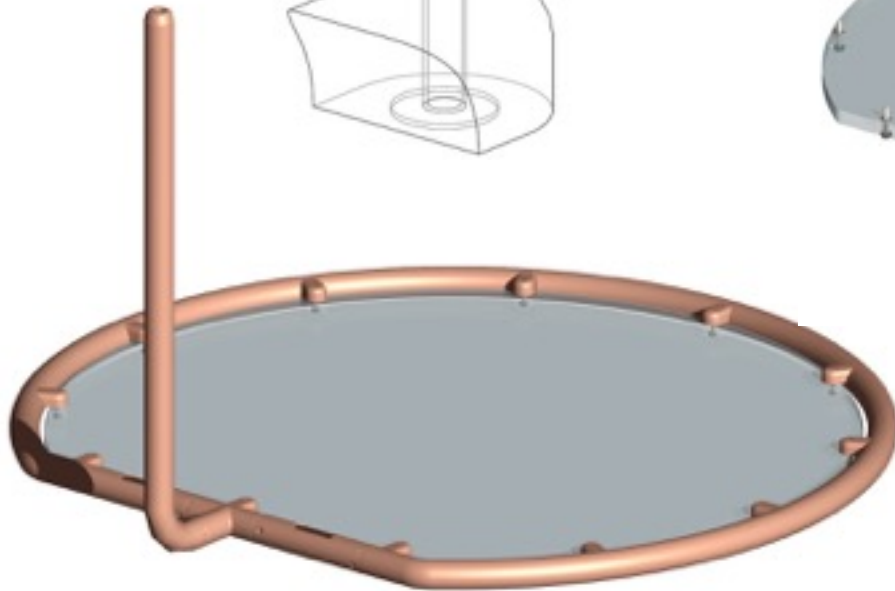
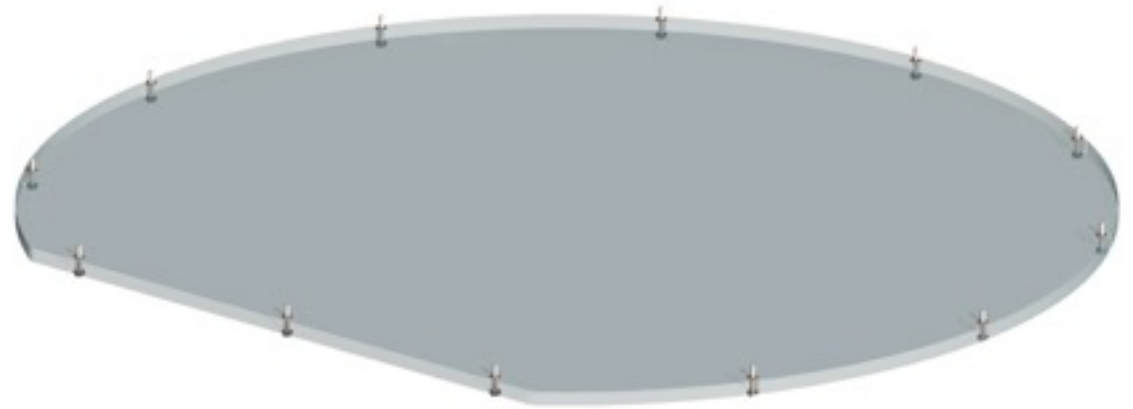
# Getting experience with the mechanics - the components

**Mechanical structure**

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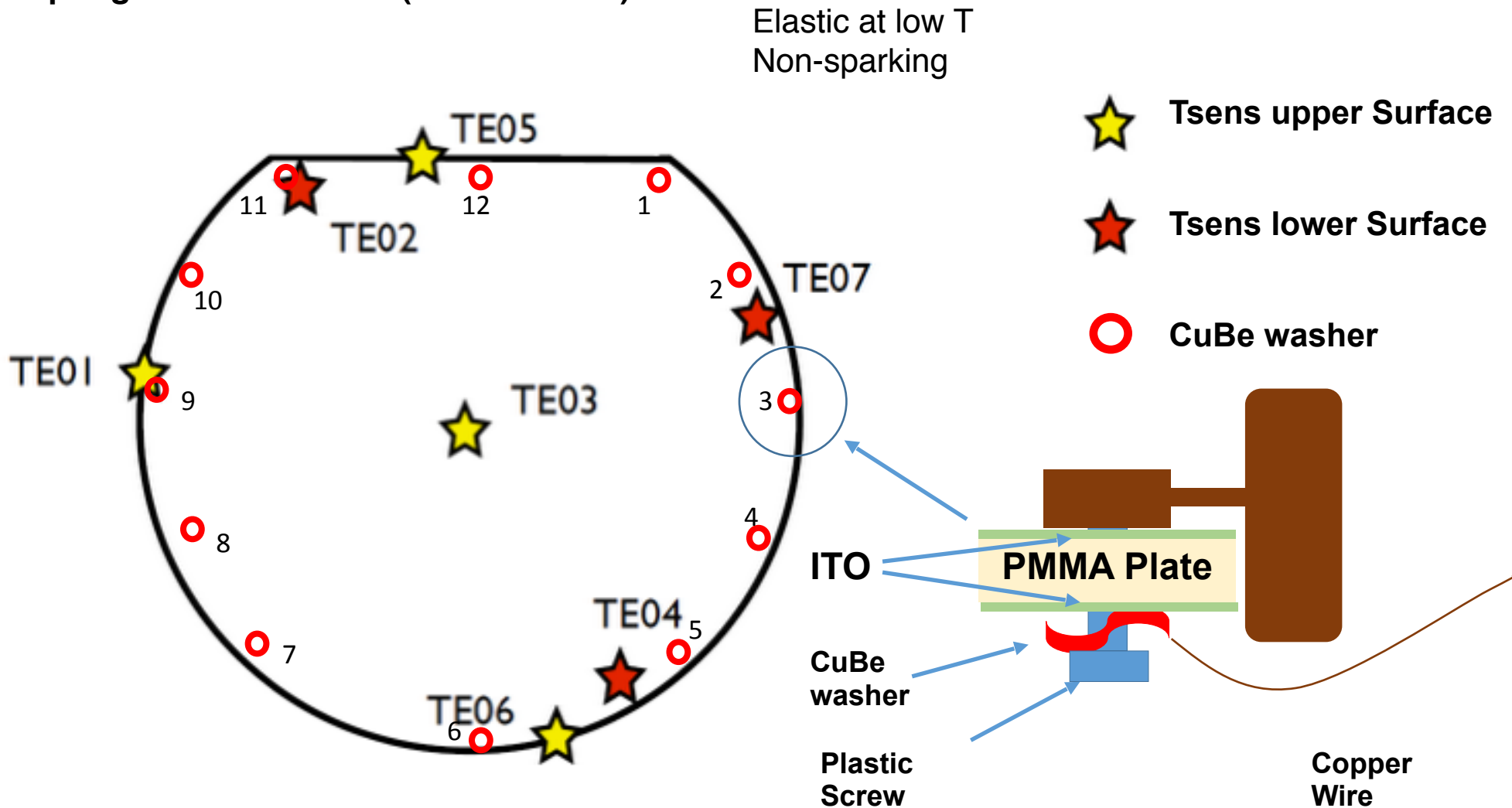
**Cathode plate**



**Electrical contact  
by spring washers  
and bolts**

# Arrangement of T-sensors and test contacts to the ITO surface

## Spring loaded contacts (CuBe washer)



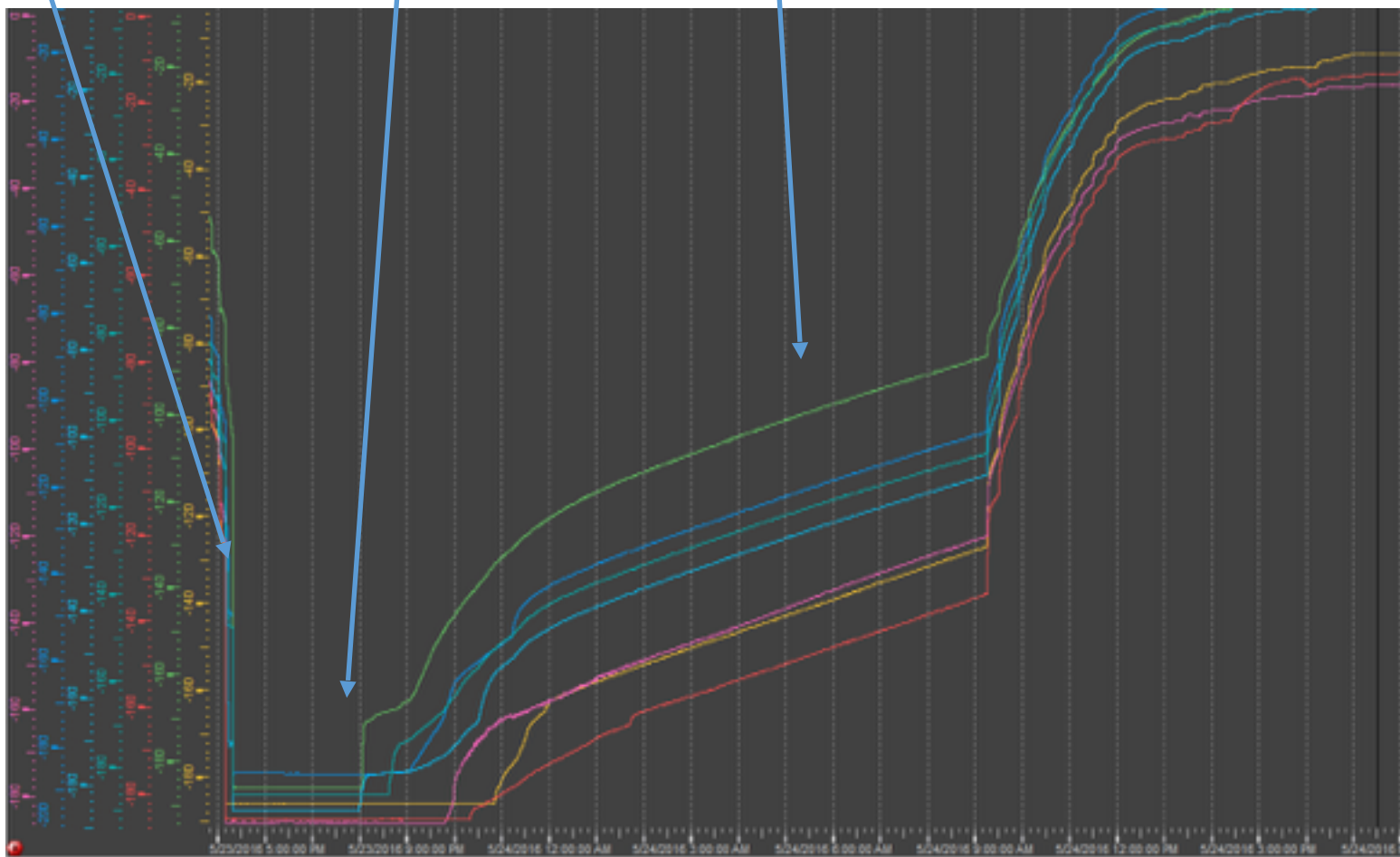
# Test cycle

Cool down,  
immersing in Lar

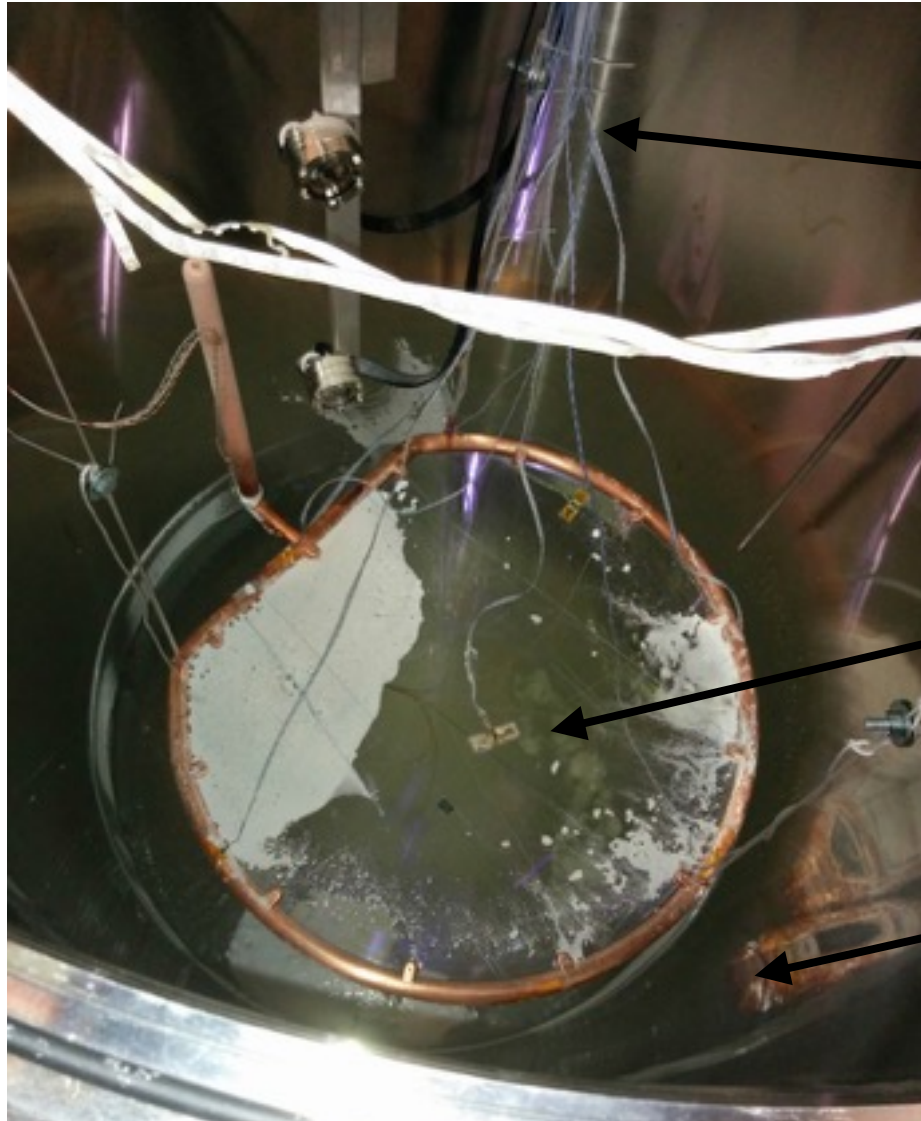
At  $T_{\text{LAr}}$

LAr evaporating  
overnight

Lifting the plate,  
warm up



# Open cryostat tests at CERN – ETHZ laboratory



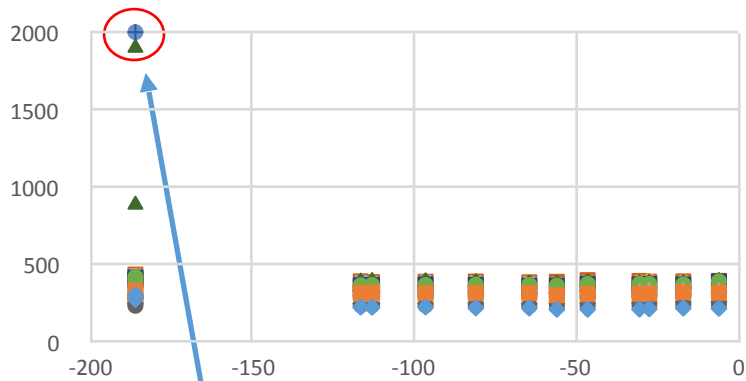
Electrical connections to  
12 points on lower ITO  
surface

Temperature sensors

LAr bath

# Preliminary results

## Resistance V.S. Temperature

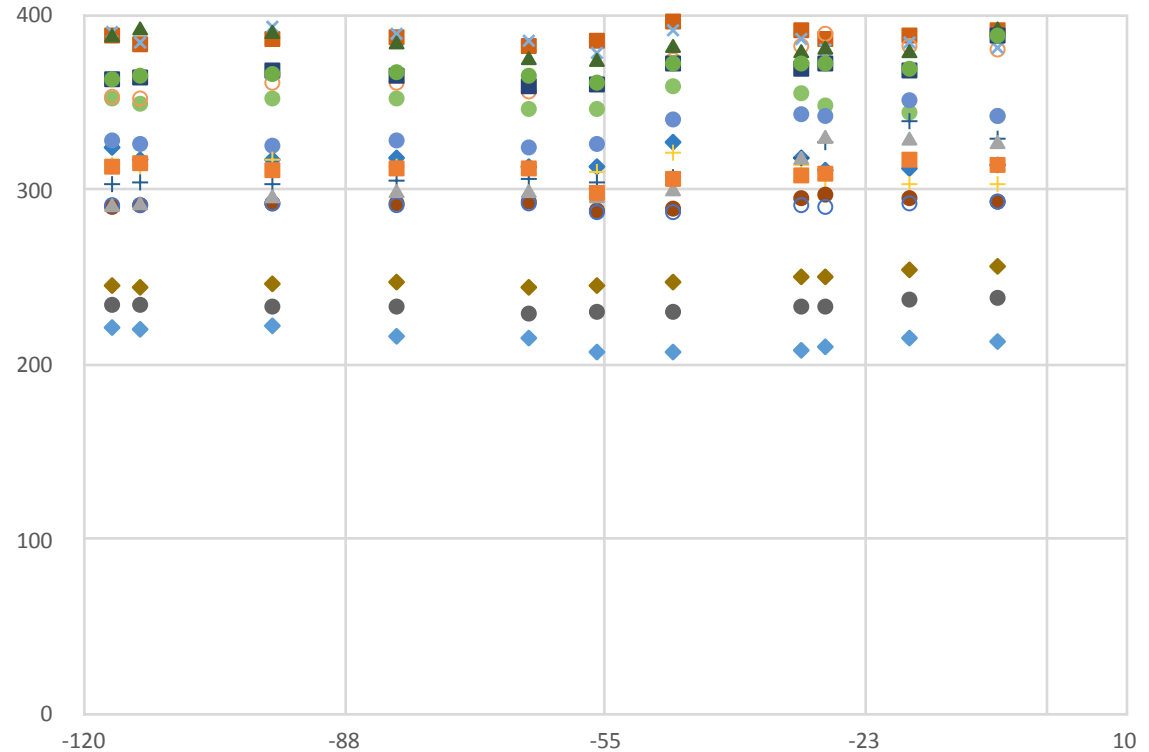


**At low temperature (87 K),  
two rings (point 2 and 9) lost contact,  
(resistances are out of the range)**

**Other resistances look reasonable  
(not measures with 4-wire method)**

**Contact problem related to mechanical  
imperfection of holes (not related to  
ice formation)**

## Resistance V.S. Temperature





# ITO coating problems



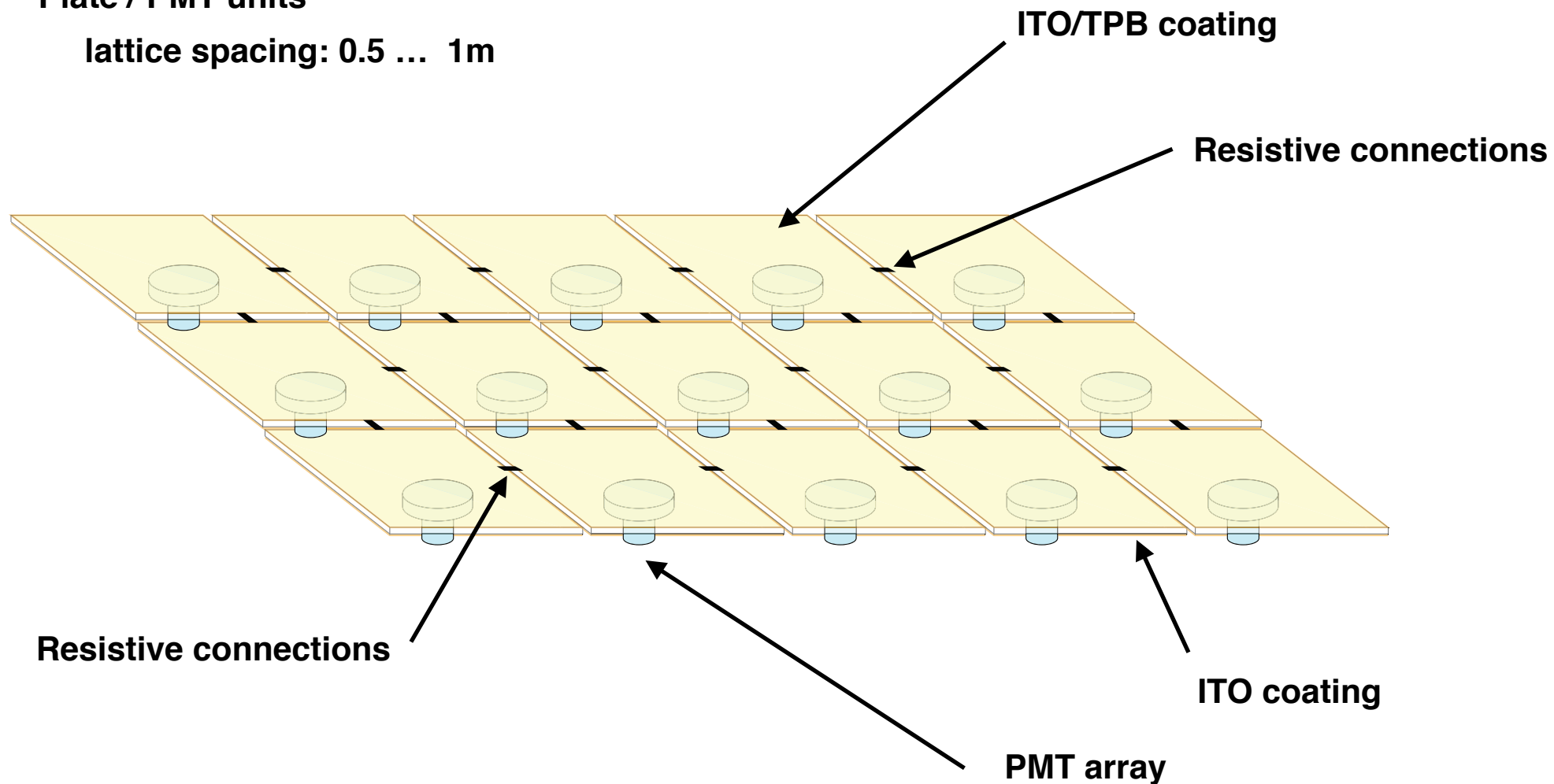
**Appeared only on 2 surfaces out of 6  
Presently under investigation with Visiontek**



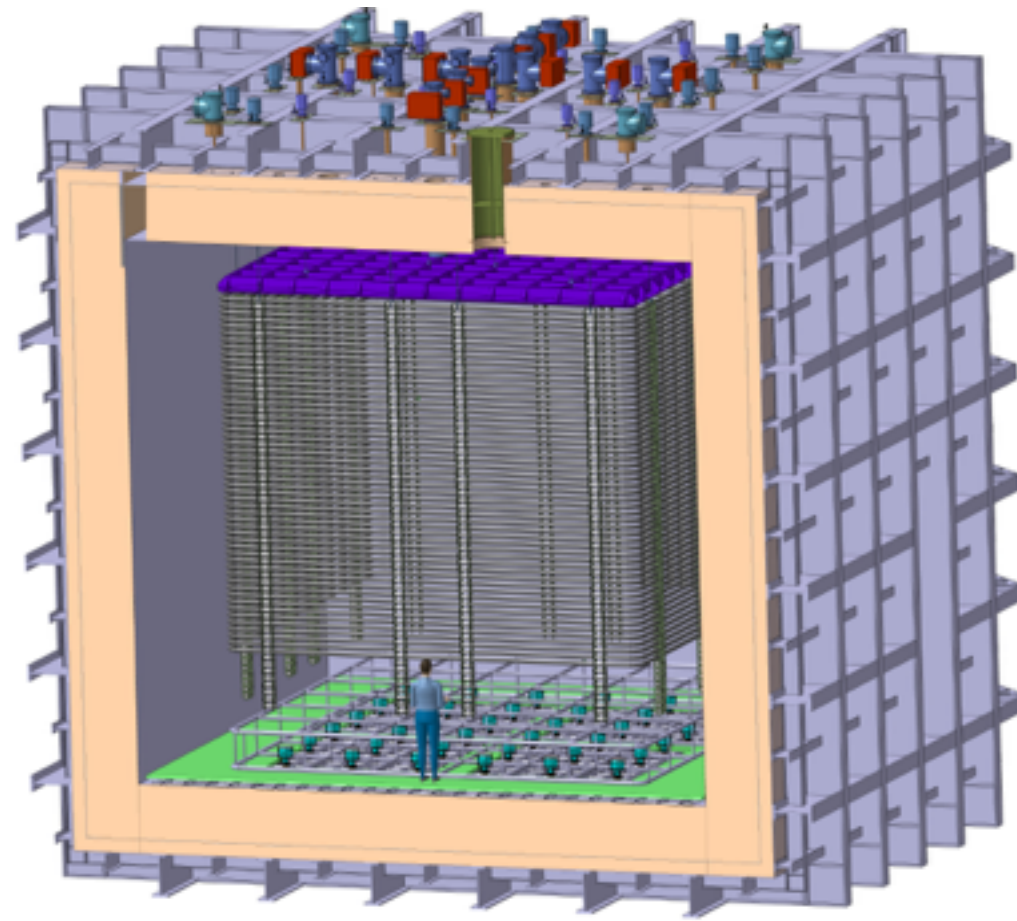
# Conceptual design

Plate / PMT units

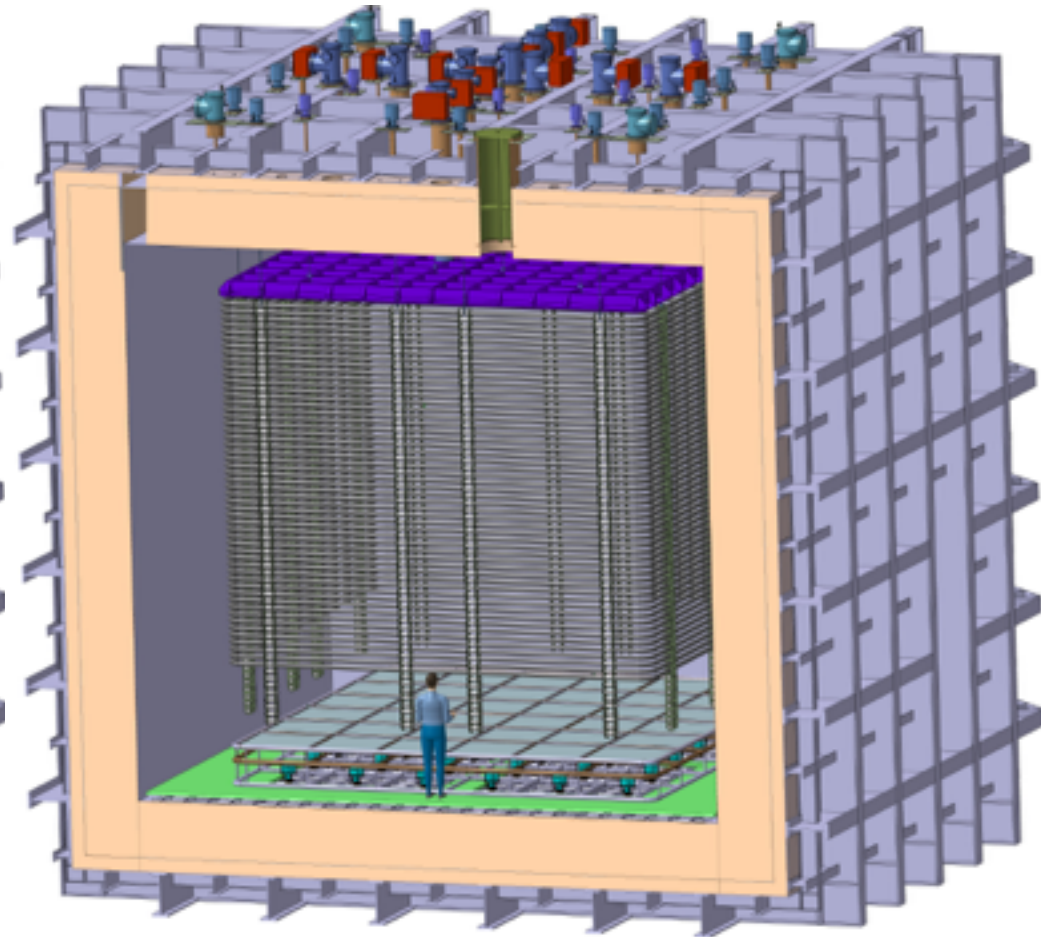
lattice spacing: 0.5 ... 1m



# Possible arrangement in WA105



**PMT and Cathode structures**



**ITO coated PMMA Plates  
installed at the Cathode**

# Summary / next steps

## Summary

- **Basic R&D finished**
- **Company identified capable to provide ITO coatings up to 1 x 1 m<sup>2</sup>**
- **Quality issues to be understood (process) – need to develop QA procedure**
- **Conceptual design more or less existing**

## Plans

- **Continue tests in the 3L cell**
- **Long term tests ongoing**
- **Developing the mechanical design (ongoing with Adamo)**