

## EUROPEAN SPALLATION SOURCE

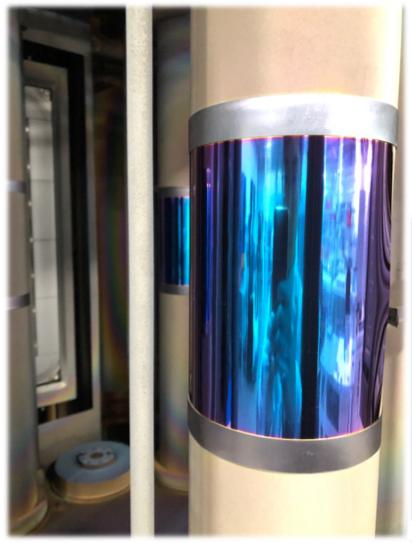


## **Detector Coatings Workshop of European Spallation Source ERIC (ESS)**

CHUNG-CHUAN LAI
THE DETECTOR GROUP, ESS
2023-02-09 EURIZON Annual Meeting

## **ESS Detector Coatings Workshop**







## **ESS Detector Coatings Workshop**



#### **Our Mission**

A go-to place to support development of neutron detector technologies with high quality *boron carbide coatings*.

### Some numbers about our B₄C coatings...



Coating R&D Since 2010

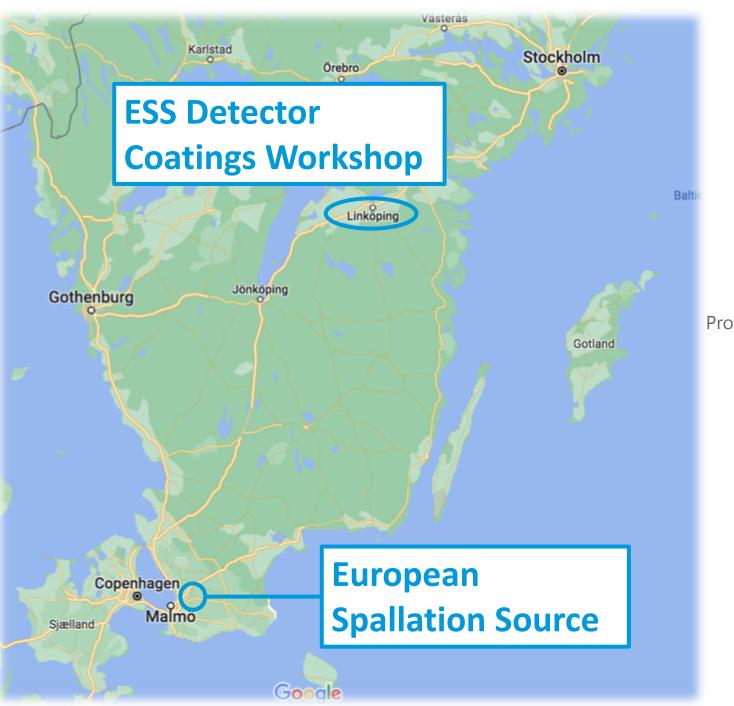
ESS Workshop Since 2014

Internal Projects
60

External Projects
139

Institutes/Companies 36

Countries 16











Prof. Jens Birch

Dr. Carina Höglund

Prof. Richard Hall-Wilton

#### Move to ESS Site in 2023:

Downtime expected? Yes

Stop providing coatings? NO

## **Coatings Production**



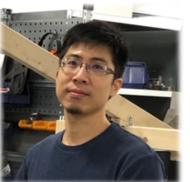


Chewbacca (CemeCon CC800/9 system)

- DC magnetron sputtering, 4 cathodes.
- Batch-loading sample table.



**Per-Olof Svensson**, Production Technician

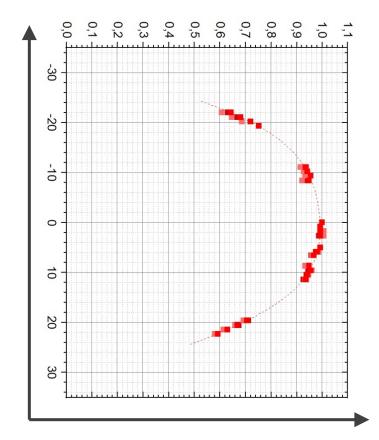


Chung-Chuan Lai, Coatings Scientist (chung-chuan.lai@ess.eu)

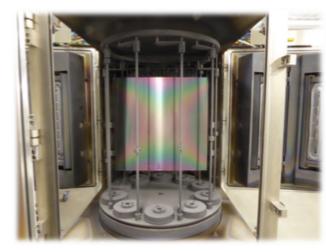
## Batch-Loading / Large-Area

**Strip Samples** (~25\*500 mm)



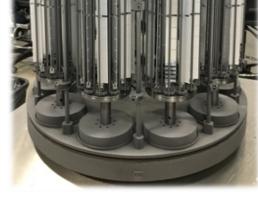


**Large Area Samples** (~500\*500 mm2)





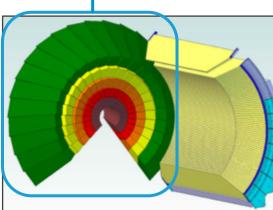




#### **ESS Instruments**

POWTEX technology: MAGIC & DREAM

End-cap section: ESS Workshop



2017: Prototype Jalousie

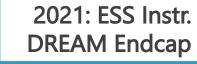




2020: ESS Instr. MAGIC











2022: ESS Instr. DREAM-SANS



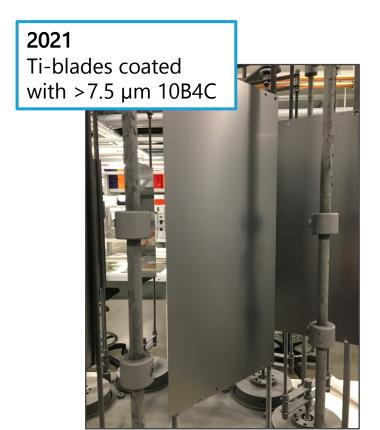
#### **ESS** Instruments

Assembly of MB300L Prototype detector



#### Multi-Blade (MB) technology: ESTIA, FREIA, & TBL

- MB-300L prototype (2020)
- MB-AMOR for PSI (Just finished in 2021)

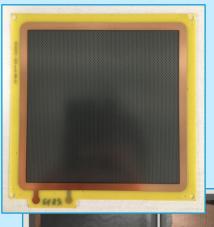




### **External Projects**

#### Temperature sensitive (<150 °C) substrates:

#### <sup>10</sup>B₄C Coated Multilayer Thick-GEM



Pre-bored Cu-plated FR4 plate



Flaking due to high stress at low temperature

In manuscript



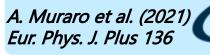
#### <sup>10</sup>B<sub>4</sub>C GEMPix Detector



Cu-plated **polyimide foil** 



Damaged at too high temperature



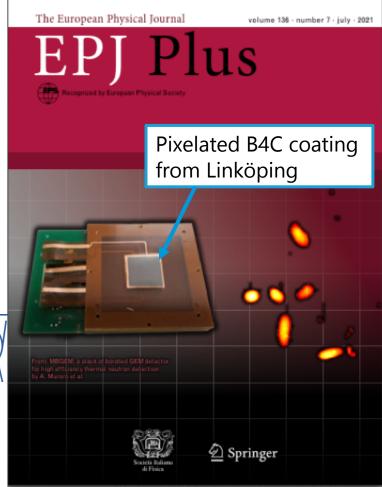


MBGEM : a stack of Borated GEM detector for high efficiency thermal neutron detection

A.Muraro<sup>5,6</sup>, G.Claps<sup>1,4</sup>, G.Croci<sup>6</sup>, L.Chung-Chuan<sup>6,3</sup>, R.De Oliveira<sup>2</sup>, S.Altieri<sup>7</sup>, S.Cancelli<sup>5,6</sup>, G.Gorini<sup>6</sup>, R.Hali-Wilton<sup>5,6</sup>, C.Höghund<sup>6,5</sup>, E.Perelli Cippe<sup>5</sup>, L.Robinson<sup>5</sup>, P.Svenson<sup>5</sup>, and F.Murtas<sup>1,2</sup>

Laboratori Nac

#### EPJ Plus cover



## ...and more projects



#### Si PIN Diodes

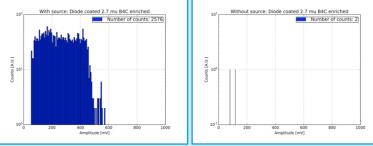


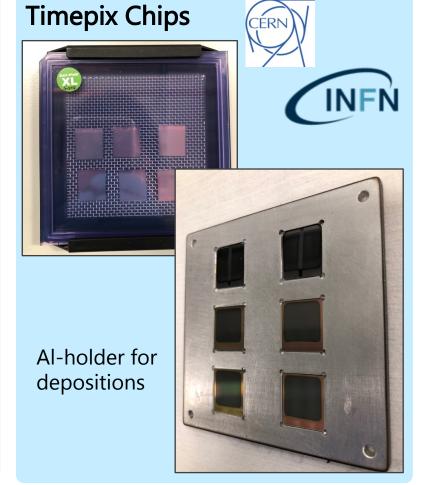
Within *n*-source

Direct deposition on **photo diodes** 

Without *n*-source









## Short summary



Mainly B4C, but also metals and carbon.

Visit us in Lund after 2023.



We will keep open for collaborations.

# Questions? Ideas? Contact *chung-chuan.lai@ess.eu*