

TSV Processing of Medipix3 wafers by CEA-LETI: a progress report

Authors

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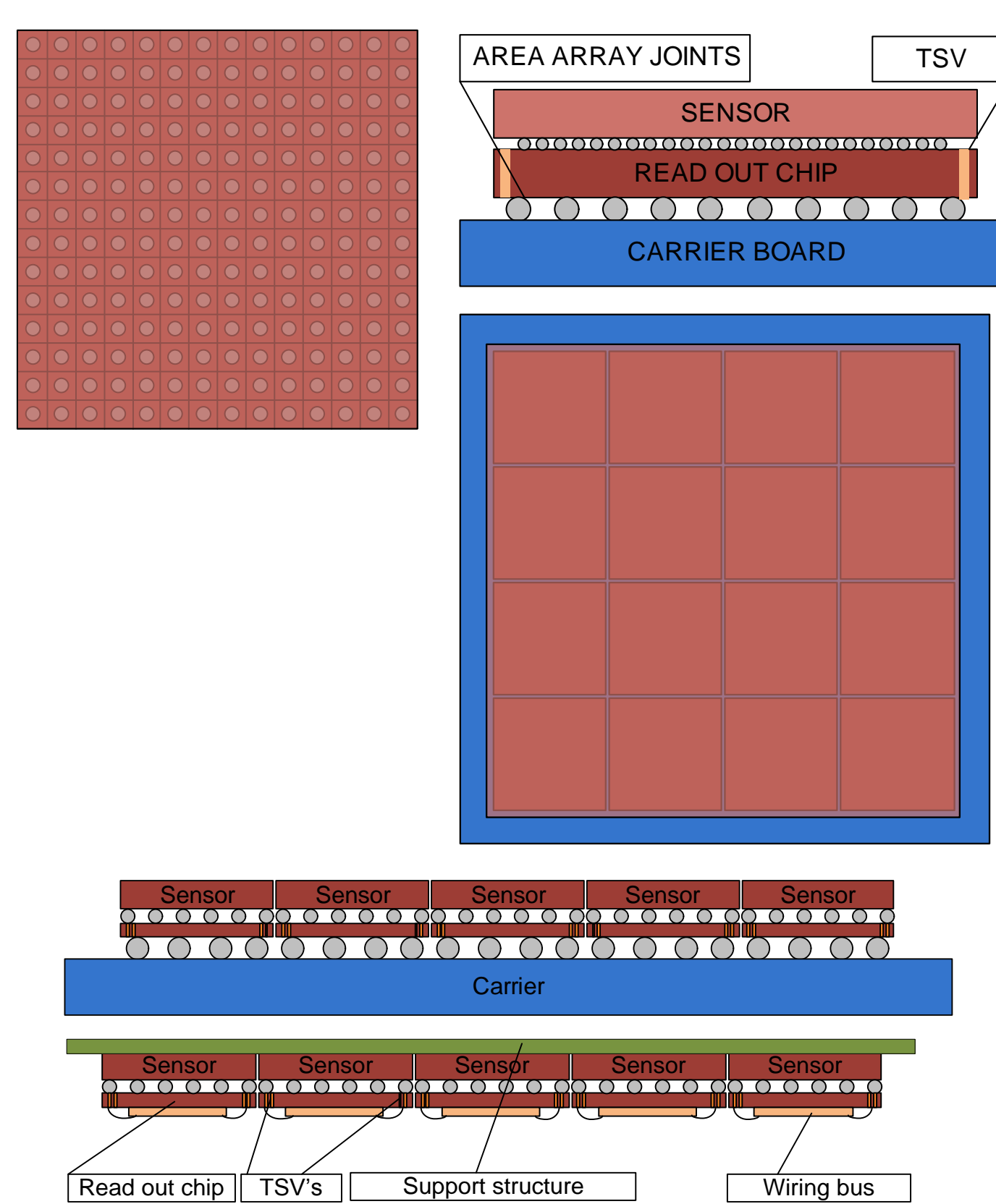
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Background

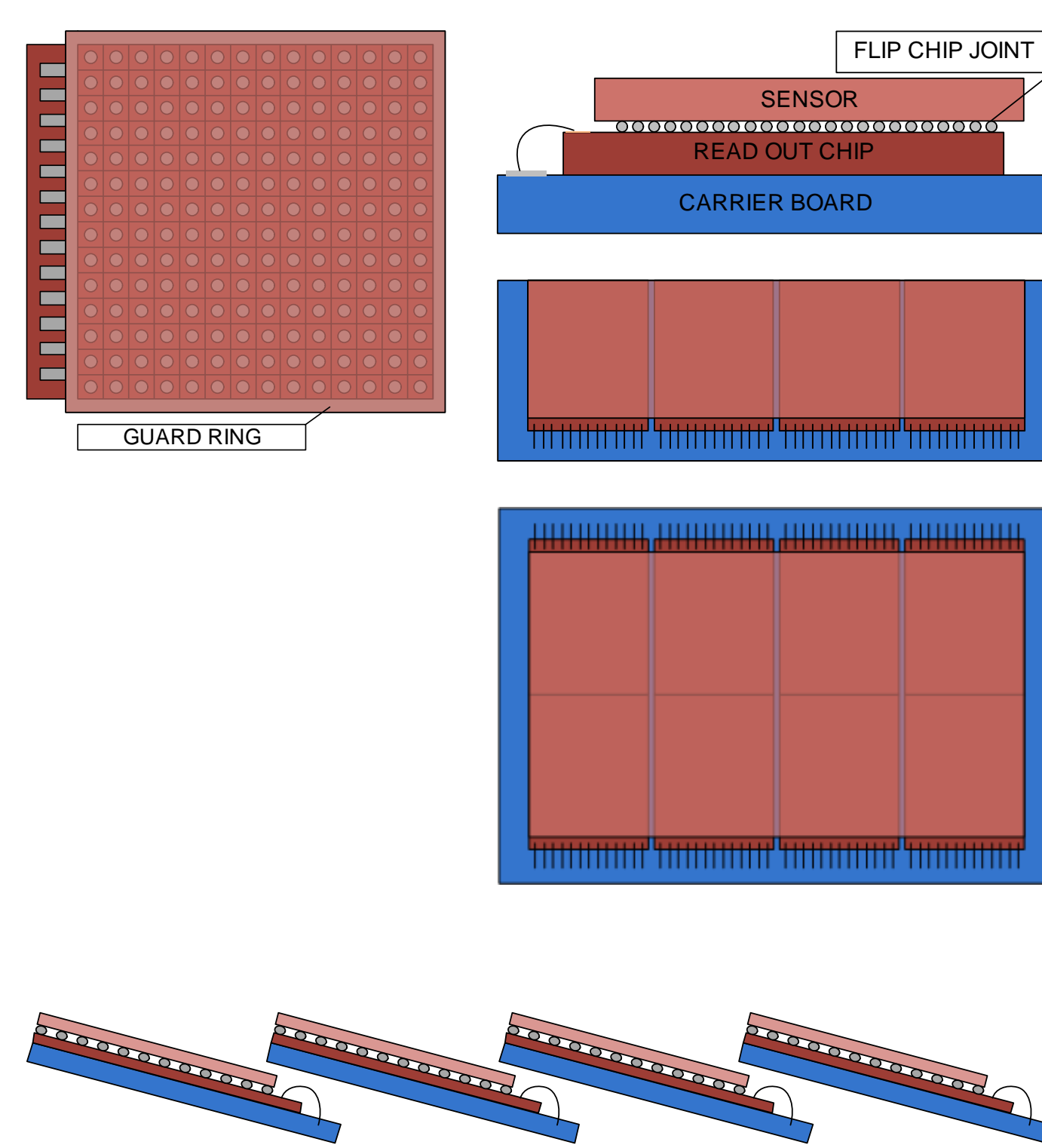
The next generation hybrid pixel detectors in particle physics experiments require reduced mass budget, increased interconnection density and they need to be tileable to seamlessly cover large areas. These criteria cannot be fulfilled with present day interconnection techniques. As a result the particle physics community has recently put in a lot of effort to investigate and evaluate variety of novel interconnection technologies.

This poster focuses on describing a recently launched Through Silicon Via process development project with CEA-LETI. The project aims to use Medipix3 wafers and an existing "via last" TSV process made available by CEA-LETI to demonstrate the feasibility of TSVs on a functional detector chips. The status of the project, TSV design and future plans are presented.

TSV interconnections:



Wire bond interconnections:

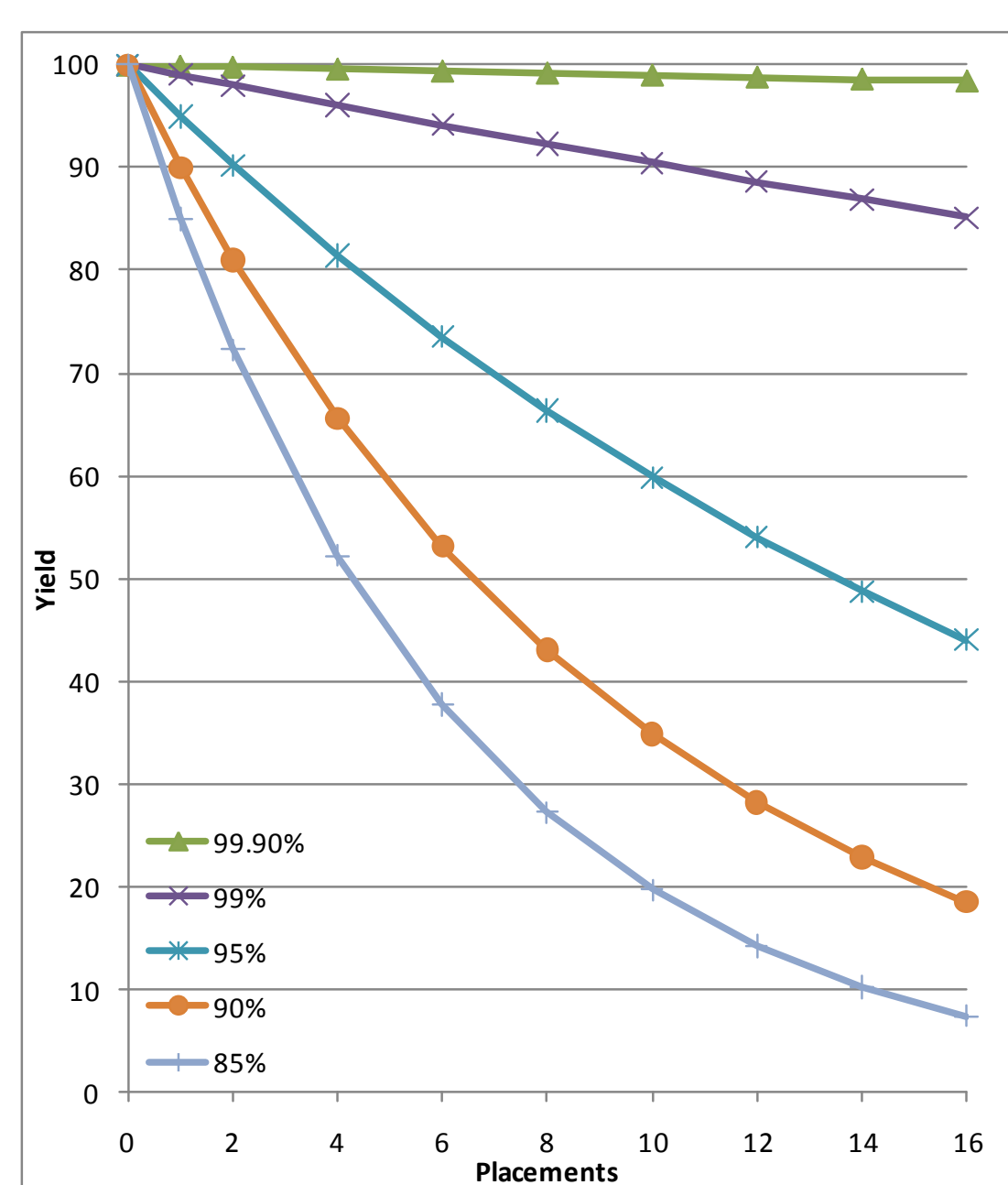
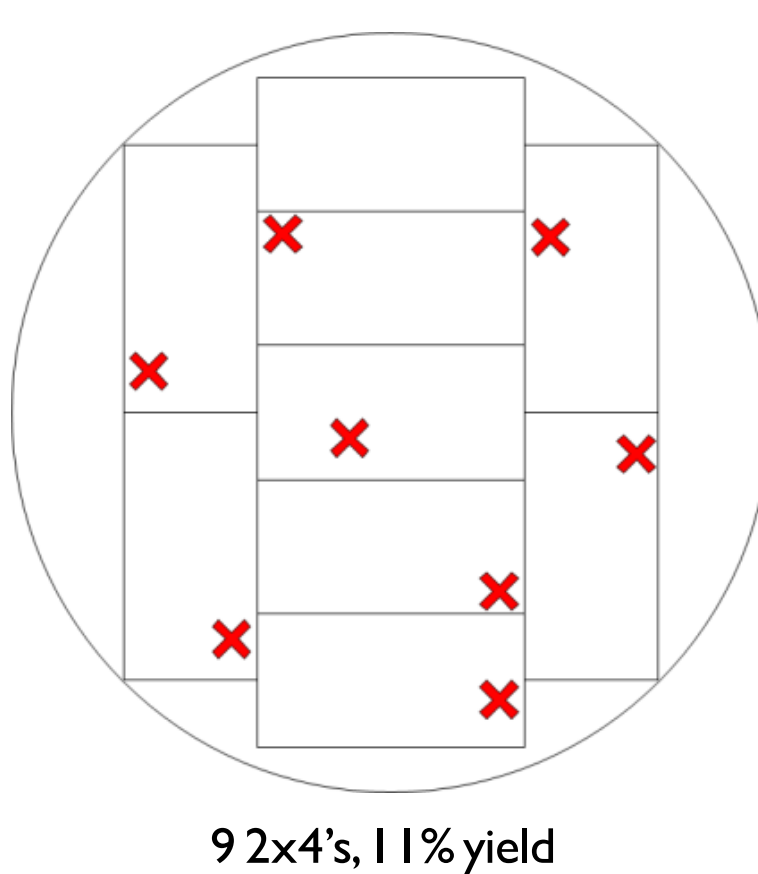
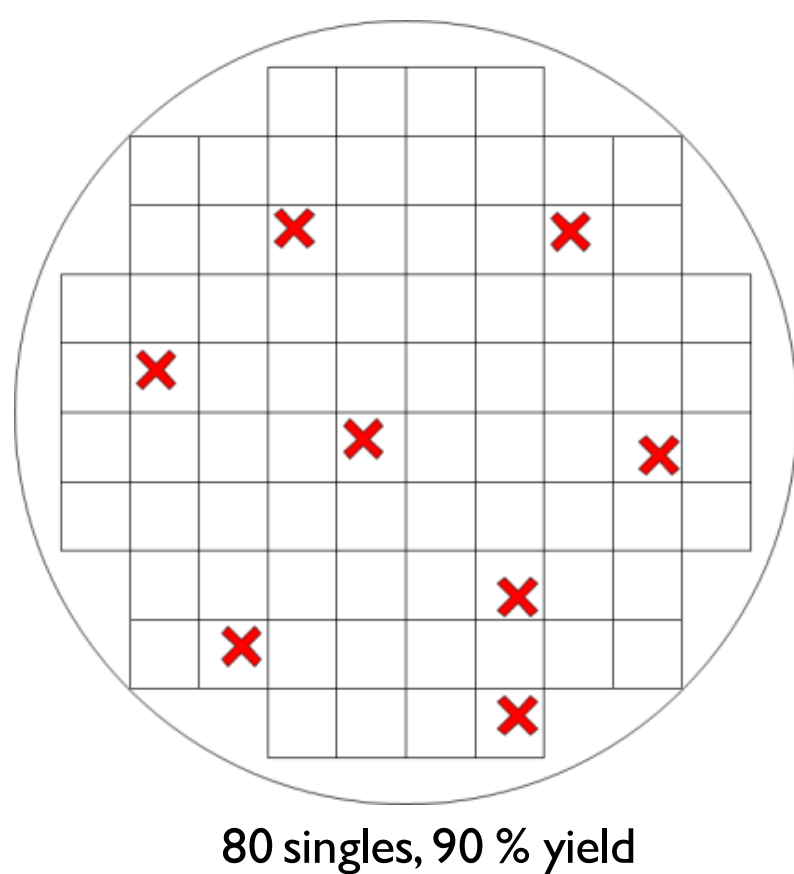


Project description:

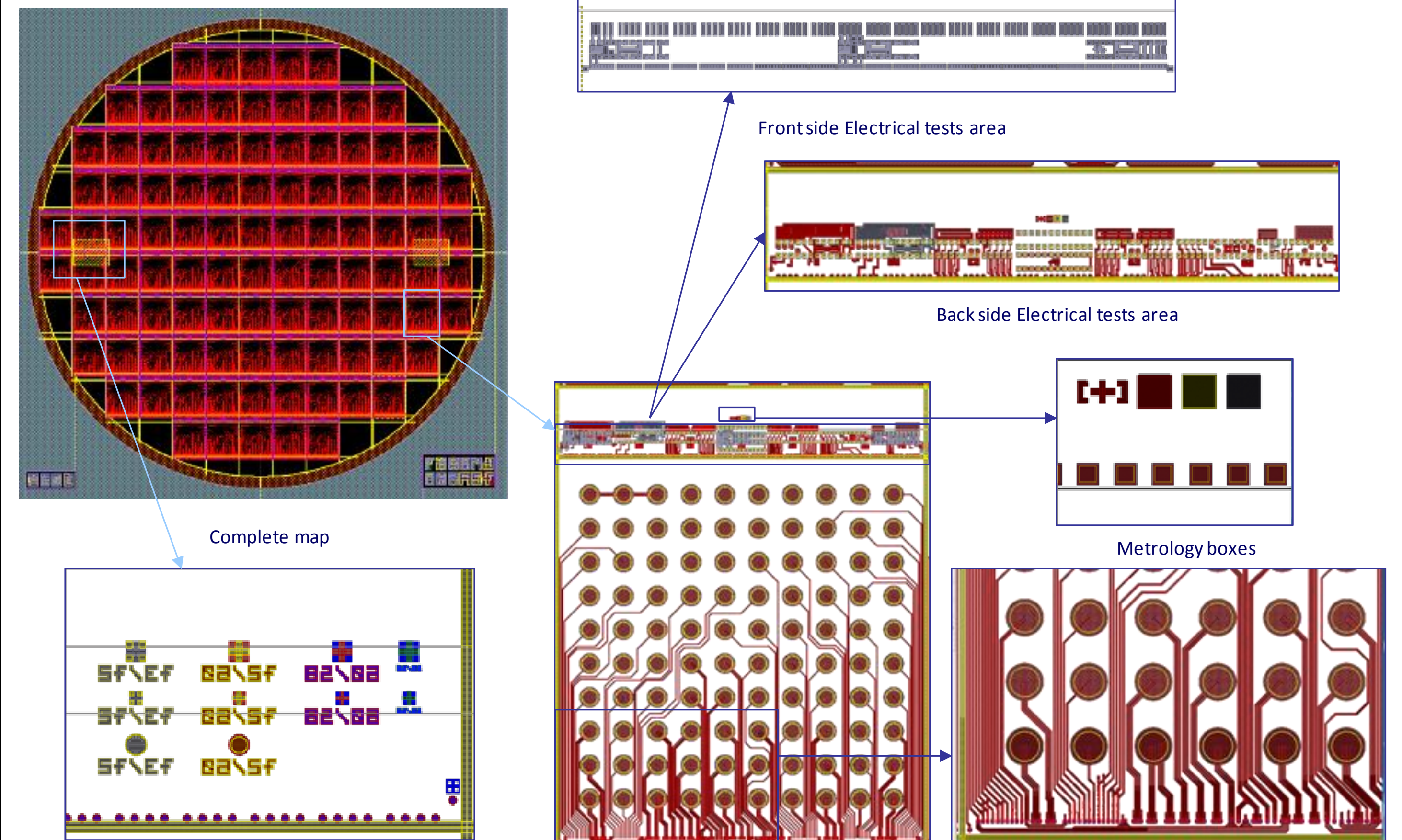
- Participants: Medipix 3, ALICE, CLIC, AIDA, ACEOLE
- Application of CEA-LETI's TSV process to Medipix 3 wafers
 - The process has been developed by CEA-LETI and is currently applied commercially in mobile phone camera chips
 - Via size 60 μm , wafers are thinned to 120 μm
- Expected results:
 - Receive 3-6 Medipix3 wafers processed with TSVs and solderable pads on top and bottom side
 - Receive measured data of:
 - TSV yield
 - Electrical characteristics of the vias, redistribution layer and UBM
 - Develop TSV design guidelines for future chips

Potential benefits in yield:

- Collapsing yields with consecutive Flip Chip bonds
- Sensor yield dependent on the sensor size



Layout design:



Images courtesy of David Henry, CEA-LETI

Project Status:

- 10 Medipix 3 wafers have been sent to CEA-LETI
 - Process will be done in 2 lots of 3 wafers + 4 spares
- First technical meeting at Grenoble on 3rd of August:
 - The layout design was verified by CERN and approved with minor changes for mask making
 - Project schedule was agreed with a delivery of the first 3 wafers on 31.12
- Second technical meeting at Grenoble on 16th of September:
 - The processing of the first lot of 3 wafers had been started
 - Problems in UBM deposition due to particle contamination – will affect yield similarly as in normal bump bonding process
 - Wafer bonding process, and facilities need to be reviewed
 - Minor problems in UBM deposition due to the wafer topography – this was foreseen and taken into account in the layout design of the UBM mask
 - One mask needs to be changed to protect wire bond/probing pads
 - Due to problems and new mask the delivery delayed by to 30.1.2012
- Processing will continue at CEA-LETI and the progress will be followed by CERN
 - Monthly technical meetings are scheduled

Module construction ideas:

