ALCOR - dRICH Readout

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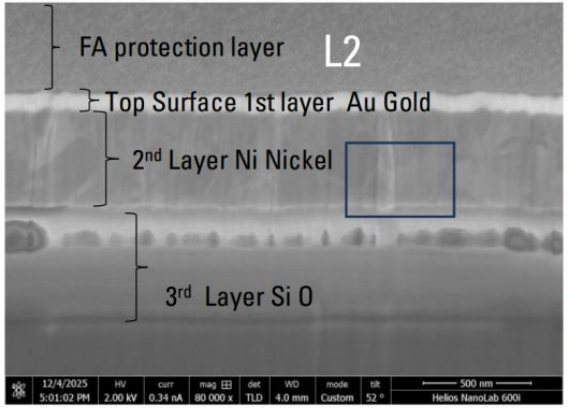
ePIC Electronics & DAQ WG meeting
ASICs & Electronics Monthly Progress Reports

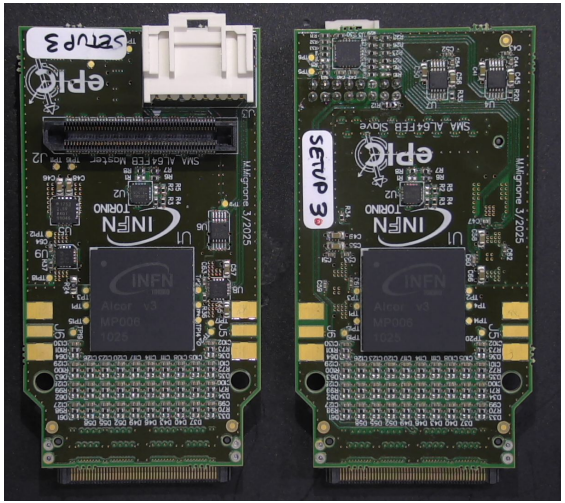
April 09, 2026

ALCOR-64 packaging status



Packaging company (I-Tronics) confirmed issue on **UBM process** (managed by them via different subcontractor) for **ALCOR packaging**:

- **UBM layers extend beyond the bump pads**, covering additional areas of the chip surface above the passivation layer
- This metalization **creates a wetting surface** that facilitates solder migration from the substrate-side bumps to the die → the **solder overflows across the UBM**, leading to **short circuits between adjacent pads**



Completed packaging on 4 ALCOR dies using company proposed **recovery solution** (*gold stud bump)* which reduces/avoids solder overflow

BGA devices received in February, then assembled on ALCOR FEB → 4 FEBs with ALCOR-64 received on Mar 3rd

Critical issues on all 4 tested devices: many short-circuits and some open-circuit on ALCOR pins

Short-circuit pins correspond to adjacent bump pads on the chip, this spatial correlation strongly support the hypothesis that the UBM metallization between pads facilitates solder overflow, creating bridges during the reflow process

ALCOR-64 packaging status

- We have requested the packaging vendor to perform **impedance measurements** and continuity tests, probing directly on the bump pads of the remaining **bare dies** to check if open/short circuits are already present before the assembly process → results received yesterday:
  - Shorts already present, likely due to the NiAu UBM layer
  - Tested dies already underwent the UBM process (we do not have any untouched dies w/o UBM)
  - Technical discussions are underway with the vendor to confirm UBM as the sole root cause and to define the necessary corrective actions and next steps
- Started discussions for a **new MPW run** and **alternatives for UBM process**
  - New Flip-Chip TLR introduced by the foundry this year → possibility to implement an RDL on ALCOR and thus simplify BGA substrate and flip-chip assembly
- This issue introduces an important **delay** in our **schedule** → next slide

ALCOR Tentative Timeline

ALCOR-64 new MPW run

- Fabrication: Q3-Q4 2026
- Packaging: Q1 2027
- Testing: Q2-Q4 2027

ALCOR-64 production

- Fabrication: Q1-Q2 2028
- Packaging: Q3-Q4 2028
- Testing and FEB assembly: Q4 2028 - 2029

➔ After that, FEBs need to be integrated in the PDU modules and dRICH detector boxes
➔ All these steps managed by INFN
➔ Oct 2032: dRICH installation