

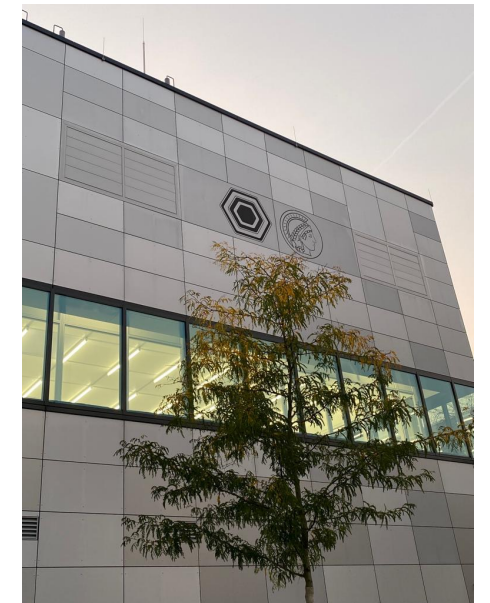
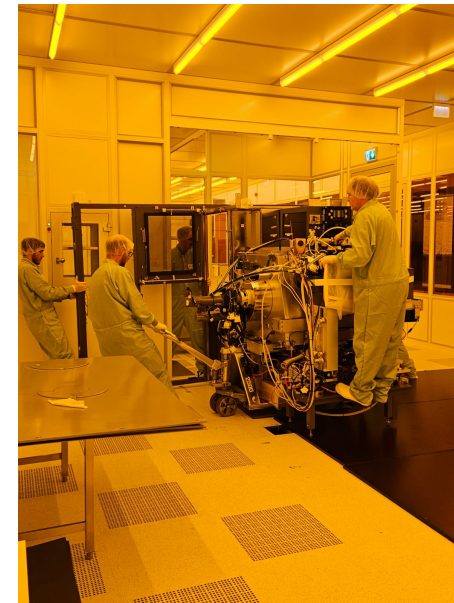


MPG HLL Status



- ▷ MPG HLL is working on the installation of a process line for
 - ↳ Post processing of up to 200 mm CMOS wafers
 - ↳ Fabrication of actively cooled interposers with micro-channels and TSVs
 - ↳ Low temperature direct bonding
 - ↳ Hybrid bonding of post-processed CMOS wafers or single CMOS chips to sensors wafers

- ▷ Current status
 - ↳ The clean room of MPG HLL was relocated to a new and larger building
 - ↳ Tests with equipment manufacturer finished, tool configuration done, purchasing in progress
 - ↳ Relocated equipment currently in the hook-up phase, qualification to follow





Planned technology extension



Towards post-processing, micro-machining, vertical integration, and advanced heat management

- ▷ Deep reactive Ion etching for TSVs, micro-channels
 - ↳ **Ordered**, to be installed summer 2024

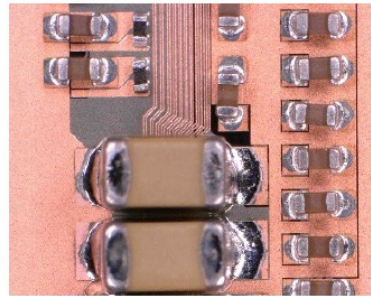
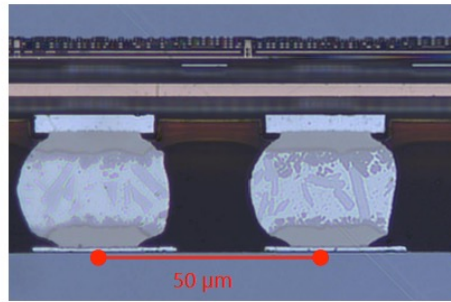
- ▷ Chemical mechanical polishing (prep for planarization and wafer bonding)
 - ↳ **Ordered**, to be installed autumn 2024

- ▷ Low temperature direct wafer bonding line
 - ↳ Plasma activation, cleaning, bonding, metrology
 - ↳ Process defined, pre-tests accomplished, tendering in progress
 - ↳ Lead time about 12 months

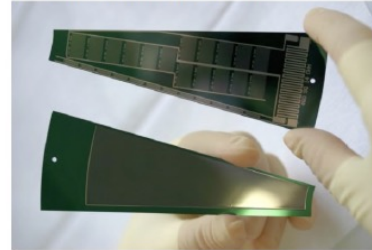
- ▷ Hybrid bonding tool
 - ↳ W2W, C2W aligned bonding (bumpless fine pitch interconnect)
 - ↳ Process defined, **tendering in progress**
 - ↳ Lead time about 12 months



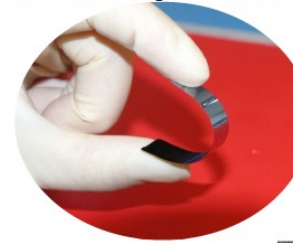
A few few pictures from past projects – more to come!



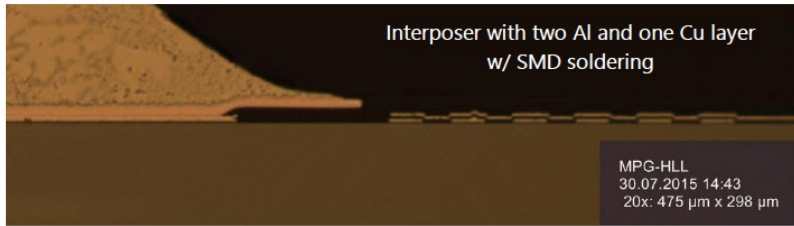
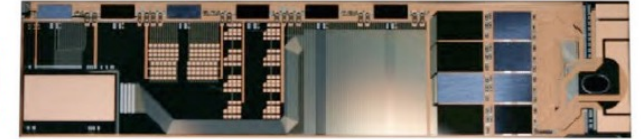
Thermo-mechanical modules



Thin Si with integrated heaters

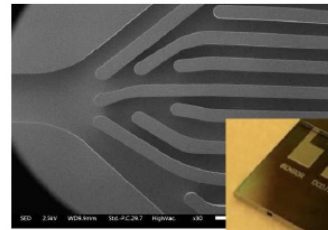


Si interposer /w flip-chipped ASICs and SMD passives

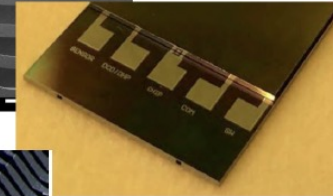


Interposer with two Al and one Cu layer w/ SMD soldering

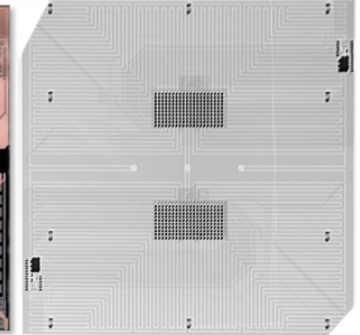
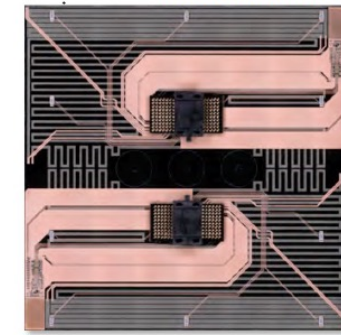
MPG-HLL
30.07.2015 14:43
20x: 475 µm x 298 µm



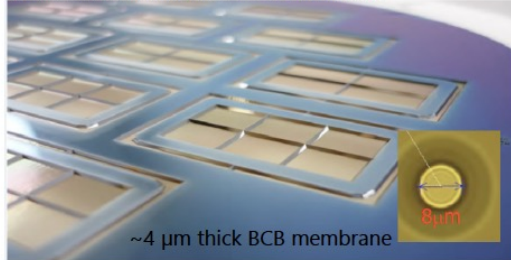
Micro-channel-cooling



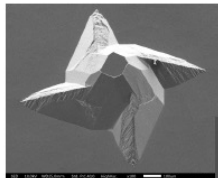
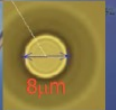
Interposer with integrated cooling channels



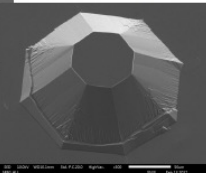
Perforated thin membranes as sample holders



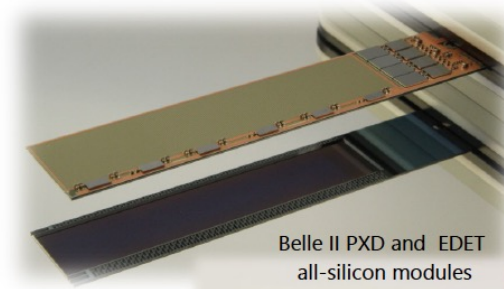
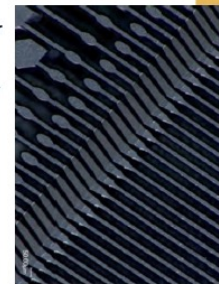
~4 µm thick BCB membrane



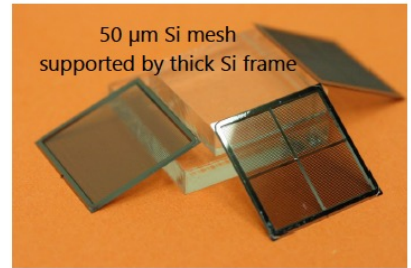
High purity Si pins as crystal holders



Metallization over extreme topography "Molecular traps"

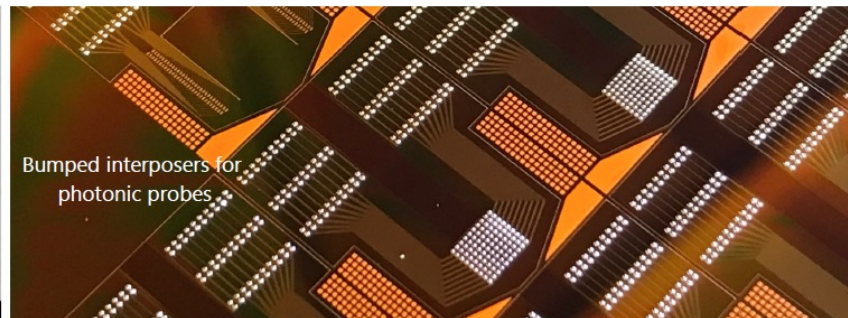
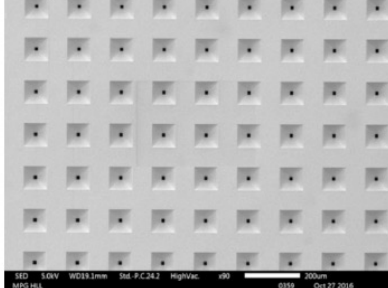


Belle II PXD and EDET all-silicon modules

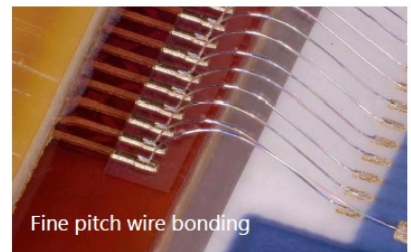
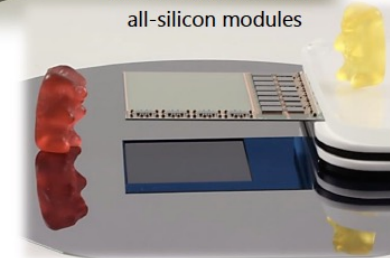


50 µm Si mesh supported by thick Si frame

Sample holders for FEL studies



Bumped interposers for photonic probes



Fine pitch wire bonding