Bump Bonding and Thinning of Hybrid Pixel Detectors

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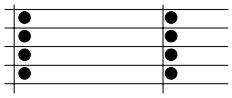
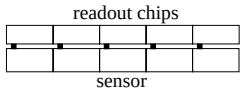
Contents

Bump bonding of hybrid Si pixel detectors

- Hybrid -- sensor/readout chip separately produced
  ➔ bonding
- High density -- wire bonding impossible
  ➔ Bump bonding





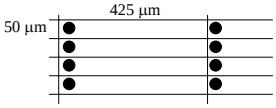
Bump bonding of hybrid Si pixel detectors (2)

- Advanced technology -- a small number of specialized vendors available worldwide.
- Material: Solder or Indium
- Maximum wafer size
- Minimum wafer thickness

Significant R&D required

R&D study @CERN

- ALICE, LHCb, NA60 in collaboration with VTT company, Finland.
- 1 cell: 50 μm x 425 μm
  Bump size: 20 μmϕ
- single chip (32x256 cells)
  multi chip ladder (10 chips)
  -- successful
- R&D for whole 8" wafer ongoing



Thinning

- Necessary for shorter radiation length
- Not yet done -- R&D ongoing at CERN
- goal
  sensor: 300 μm → 200 μm
  readout chip: 750 μm → 150 μm
- Performed before dicing
  → **dicing/bump bonding difficult**
- low mass readout bus also required

Status of PHENIX activities

- Just started.
- Will learn from CERN experience
- **RIKEN** is now contacting CERN to access thinning and bump bonding technologies.

Summary

- Bump bonding
  -- significant R&D required for thinned whole wafer
- CERN is leading R&D studies
- Thinning is also an important R&D issue
- PHENIX has started to access these technologies via RIKEN effort. We will learn from CERN experience.