Fanout status

Como/Trieste group

The BaBar manufacturer: the CERN PCB workshop

- Responsible of the whole BaBar production → at the time, 6 months for the production with a cost of 400CHF for the small pieces and 600CHF for the long ones
- The control was performed by INFN-Ts with a dedicated tree at the end of the fanout on the ASIC side (the tree was cut after the test) → shorts were cured with a probe for silicon detectors while open lines were just indicated (a maximum nr of open lines was set to accept the fanout)
- The material was UPILEX (produced by UBE) with the following features:
 - ✤ 50um of upilex
 - ✤ 150nm of Cr
 - ✤ 4.5um of copper
 - ✤ 150nm of Cr
 - ✤ 1.5um of amorphous gold

- New production chain: the photoresist is impressed with a laser (instead of using a mask) → save time and much larger dimensions
- The technique is the same used for the microstrip gas chambers

- ◆ Test of a new material (the BaBar one has to be ordered) → 50um polyammide + 5um of copper directly deposited on the substrate (no Cr)
- ◆ Automatic optical check of the fanout → ok with lines of 25um; in the region where they are 16um it has to be manual

Money and time schedule

MONEY

- Long pieces → 150CHF/piece
- Small pieces → 50CHF/piece
- All pieces → gold plated (1.5um amorphous gold) and optically checked

TIME SCHEDULE

• 50 pieces per month

With this cost and schedule, we can think of replacing the ones with open lines

Shorts can be cured, already done in BaBar

 We can check the possibility of curing them with a laser at TVR

Today the check is manual but they are working to make it automatical

They have already tested the whole production chain on two different designs and are going to produce our new designs as soon as we send them (\rightarrow we can use them for bonding tests)

What we have designed up to now

- Layer 1 phi
- Layer 3 z with 2 possibilities: ganging and pairing
- Under design \rightarrow Layer 5b z

GOALS

- Test of the production/control chain → produce more than one piece per design
- Capacitance and noise measurements
- Bonding tests

Layer 1 - phi

Requirement from CERN \rightarrow grid of **2.5µm** minimum

- 799 readout strips
- Readout pitch = 50 µm
- Bonding pad pitch = 45 μ m \rightarrow in BaBar it was 42.5 μ m \rightarrow this implies an umbrella bonding with a maximum angle of 9°
- Smallest distance pad-line in the bonding region ۲ $= 15 \mu m$
- Smallest distance line-line elsewhere = 18-20µm
- Pad-line distance in the silicon region = 20µm
- Bias lines positioned as in BaBar \rightarrow 150µm from ۲ the last pad and then another one at 150µm more
- Cut line at 450µm from the second bias line ۲
- Silicon HDI distance = 79.82mm
- Fanout glued on the HDI = 5.5 mm
- Overall length = 97.5mm ۲



For the gold deposit

Como-Trieste, 27/01/12

Layer 3 – $z \rightarrow pairing x^2-x^3$

- Nr of strips per detector = 865 → 1730 to become 1280 channels
- Readout strip pitch = 110µm (physical pitch 55µm)
- Nr of readout channels = 1280: 957 readout strips + 196 pairing x2 + 127 pairing x3
- Distance detector HDI = 44.63mm
- Clearance between silicon tiles = 100µm
- Overall length = 247mm
- In the pairing region → bonding pads also on the inner floating strips

E.VALLAZZA-INFN TS 2012-01-03 SUPERB FANOUT LAYER 3 Z PAIRING	

Floating strips bonding pads

Como-Trieste, 27/01/12

Layer 3 – $z \rightarrow$ ganging x2

- Nr of strips per detector = 865 → 1730 to become 1280 channels
- Readout strip pitch = 110µm (physical pitch 55µm)
- Nr of readout channels = 1280: 830 readout strips+450 ganging x2
- Distance detector HDI = 44.63mm
- Clearance between silicon tiles = 100µm
- Overall length = 247 mm

Numbering: every $10 \rightarrow 1$ dot

Numbering: every $100 \rightarrow 2 \text{ dots}$



To understand

From the design point of view

- Pad pitch at 45 μ m in front of the ASIC \rightarrow is it OK?
- Horizontal displacement detector-HDI → for the moment we use the BaBar one

From the production point of view

- Production yield
- Automatic control
- Bondability of the substrate
- Possibility of eliminating shorts

Como-Trieste, 27/01/12