

Pre-Baseline Pixel R&D

Simon Kwan

BTeV Electronics & Software Mtg., May 24, 2001

And

BTeV Coll. Mtg., May 25, 2001

WBS Level 3 Activities

- Sensor and Pixel Detector Hybridization
- Readout Electronics
- Mechanical support, cooling and vacuum systems
- System integration
- Project Management

Sensor and Hybridization

- Sensor
 - FNAL and Syracuse
 - Good progress on measurements at FNAL
 - I-V, C-V, voltage distribution on wafers and single dies of various structures (diodes and pixels) using different p-stop designs and 3 different guard-ring designs from different sources
 - Normal and oxygenated wafers
 - Will also measure interpixel capacitance and interpixel resistance
 - Effect of temperature(cold-chuck), humidity, dicing, cleaning
 - Will extend to different resistivity, p-spray technologies from different vendors
 - Irradiation studies
 - Laser test stand setup to study effect of magnetic field
 - Will have most of the results we want for the baseline review

Sensor (cont'd)

- Syracuse University
 - 3D Simulation program
 - Probe station and accessories
 - Lack of NSF money hampers the effort
 - Need support to get a laser test stand
 - Start assembly of FPIX0 detectors (extended finger to bias the p-stop)

Detector Hybridization

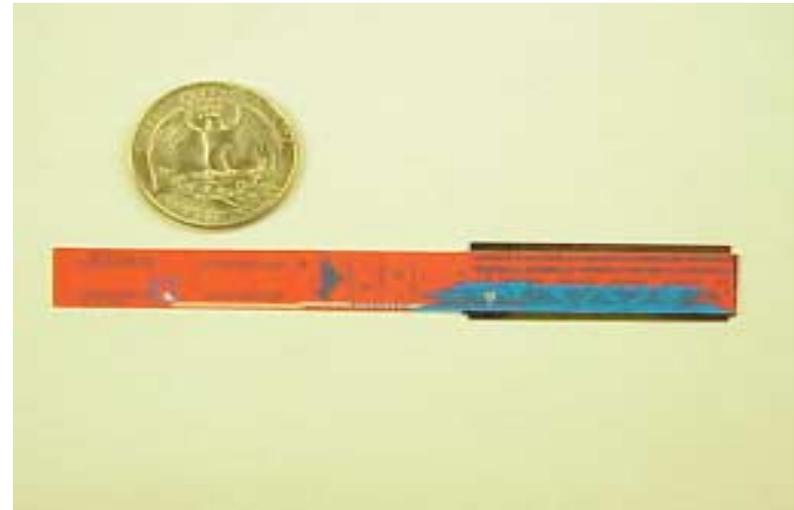
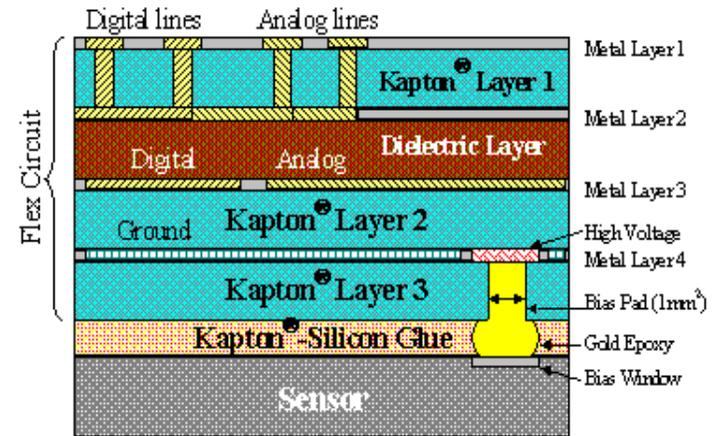
- Rec'd 11 detectors and 2 modules made using both Indium(4+1) and Pb/Sn bumps (7+1)
- Long term test, thermal cycle + irradiation tests on dummies now under way
- Remaining issue : 8" wafer and thinning
- Existing contract with MCNC to do assembly from 8" dummies provided by CERN. AIT claimed that they have 8" capability
- Thinning – program of studies; working together with MCNC (issues: flatness, stress, probing, dicing after thinning, bump protection)
- Yield and quality assurance – work in progress with vendor

Readout Electronics

- preFPIX2 Pixel Readout Chip
 - preFPIX2Tb – SEU tests last month; more test early June, also total dosage
 - Detectors using preFPIX2Tb – expected delivery in the summer; irradiation tests planned for September
 - preFPIX2Ti ; may get 1 or more detectors from UCD; still negotiating with CERN to get 1 complete wafer
- Development path to FPIX2 and production chip
 - Needs a consensus (dynamic range, threshold dispersion, number of serial lines, pads, iterations)
 - Features (eg. Pattern to check bump bonding)
 - Specification document (summer?)
 - Schedule
 - Complete engineering run Dec 01?
 - Small chip with complete readout via MOSIS (MPW)
 - Split submission with SVX4: submission in Oct 01 with another submission in 2002

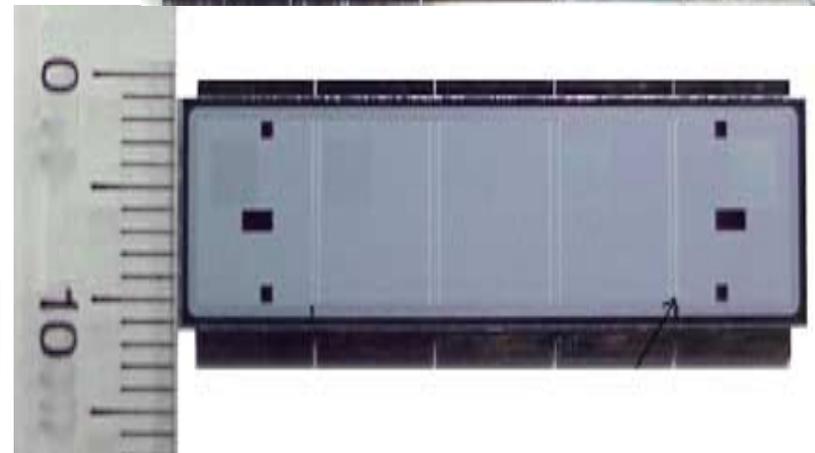
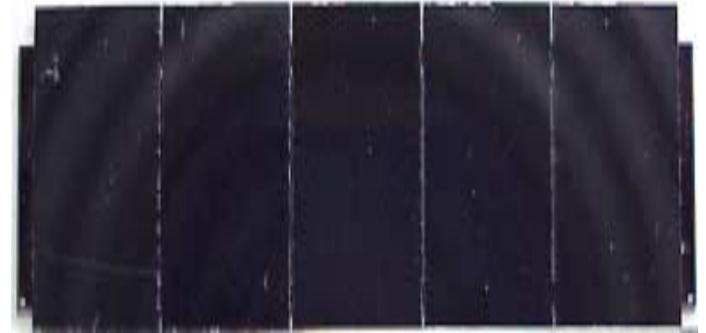
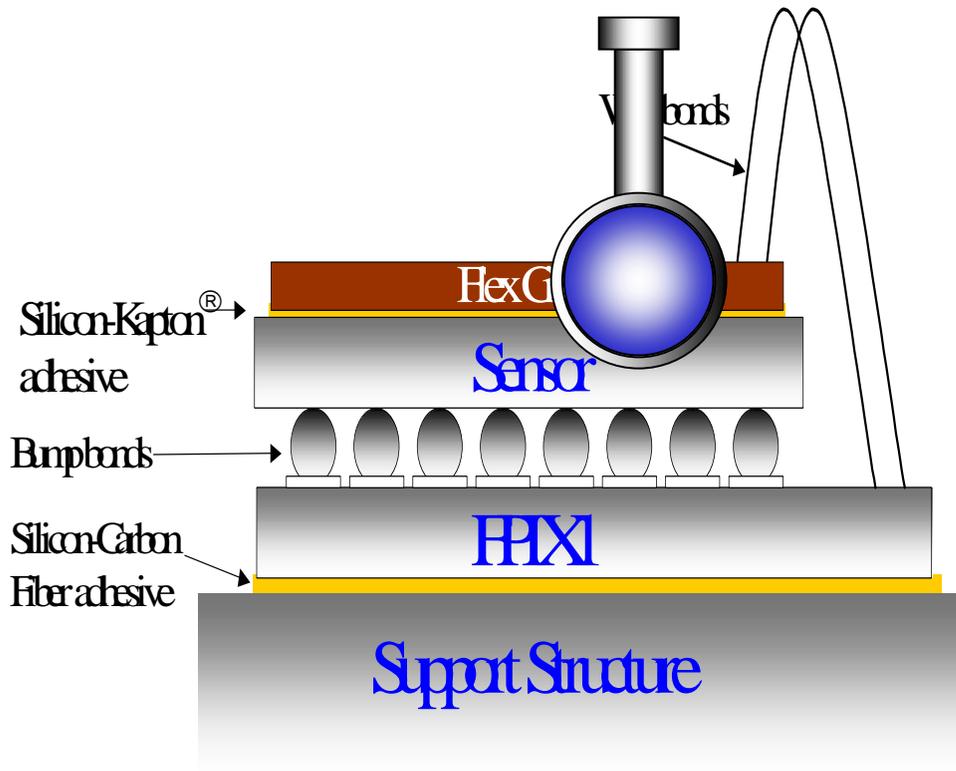
High Density Flex Cable

- Expected delivery of flex-circuits from CERN next week
- PCB being procured to test the circuit and bare FPIX1 chips before moving to detector module
- Plan to address assembly issue



Module

Module Prototype X-section

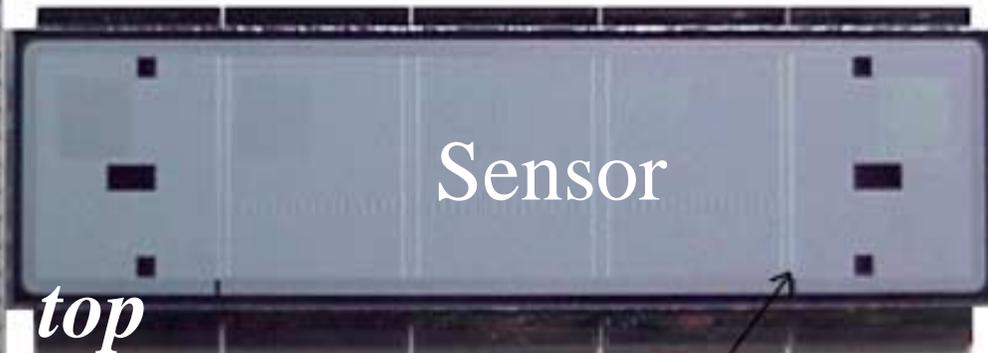




Second Pixel Multichip Module Prototype

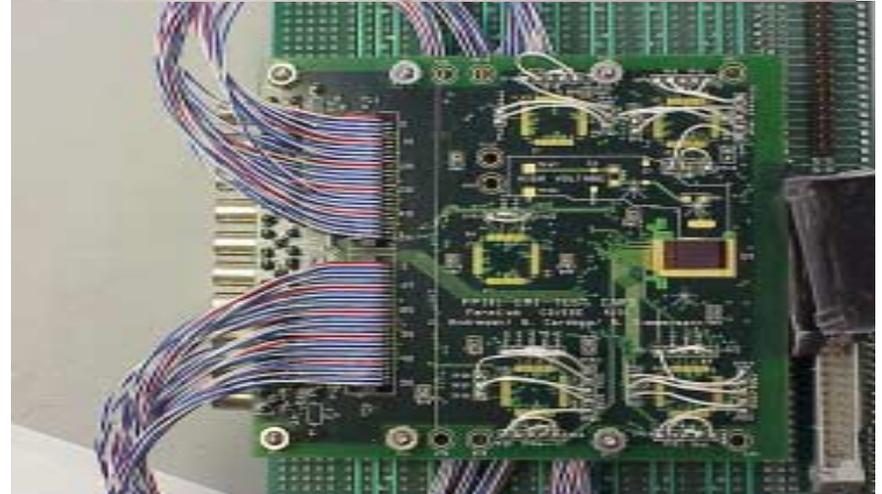


-5 FPIX1's bump bonded
to 5*1 SINTEF sensor



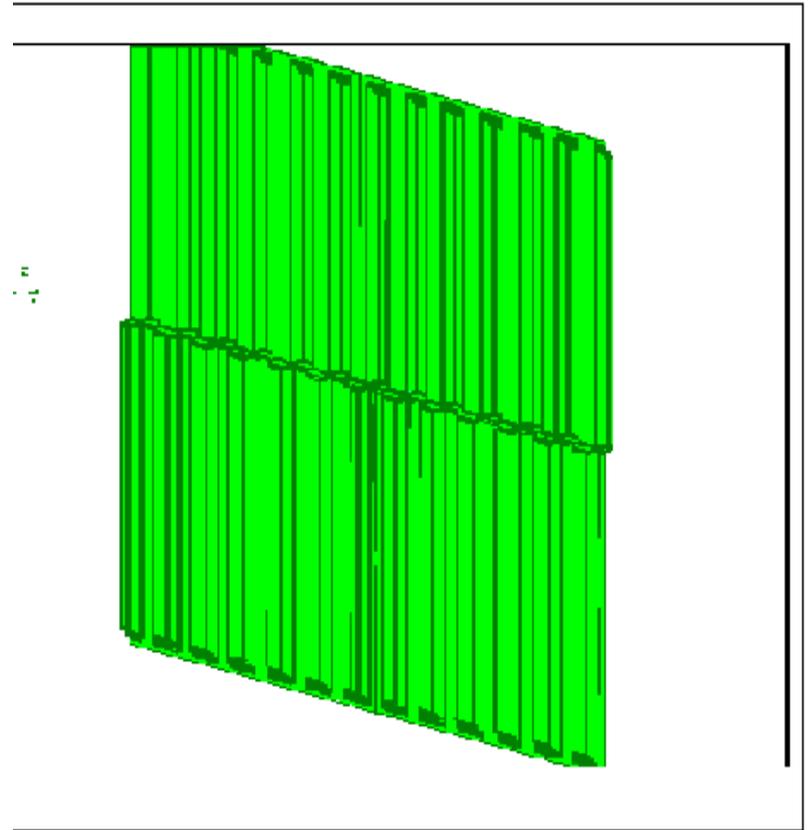
EMI studies

- Test FPIX1 chips and then detectors in beam simulator
- PCB now being tested
- EMI test will start in July to evaluate necessary RF shielding for pixel planes



Rf shielding

- Same membrane hopefully serve three purposes:
 - RF shielding of the pixel detector
 - Vacuum barrier
 - Image current
- Plan is to proceed with the mechanical design and then expert from BD will calculate impact on the beam and whether it's enough to carry the image current



Data Combiner board

- Study number of serial lines, maximum clock frequency as function of chip size and number of interactions per BCO
- Working on input protocol from the pixel module to the board

Misc.

- PCI test stand (working)
- Test beam preparation (needs help from university groups and maybe software professional)
- HV and LV power supply, connectors (HV workshop)

Summary

- Good progress has been made in all areas
- This will be a very busy summer; expect a lot of tests and results
- We are on track to produce all the material we want for the design and TDR
- Manpower – would prefer more people working on EMI tests and/or module. Some outside help? Also needs university group to help in preparing for test beam next year

WBS and WBS dictionary

- WBS
 - Reasonably good shape except the Mechanical and System Integration section
 - Plan to address these two parts
 - Will prepare a document summarizing the assumptions that will go into the WBS
- WBS Dictionary
 - Just started on this
 - Cut and paste from what we did last year