Projects for 2010 and beyond

PLUME

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Geometry for ILC

- ✗ ILD layers: 125mm

Material budget request

- ✗ 0.16% X0 for double layer
- ✗ 0.11% X0 for single layer

Operation mode

- ✗ Power pulsing (200ms period)
- ✗ Air cooling (100mW/cm^2)

Fabrication

- ✗ Knowledge of full process
- ✗ Identify critical steps
- ✗ Develop expertise in lab
  - ➔ Testing
  - ➔ Validating
  - ➔ Mounting

Expected Performances

- ✗ For a single layer:
  Single point resolution ⩽3µm
  with efficiency ~ 100%
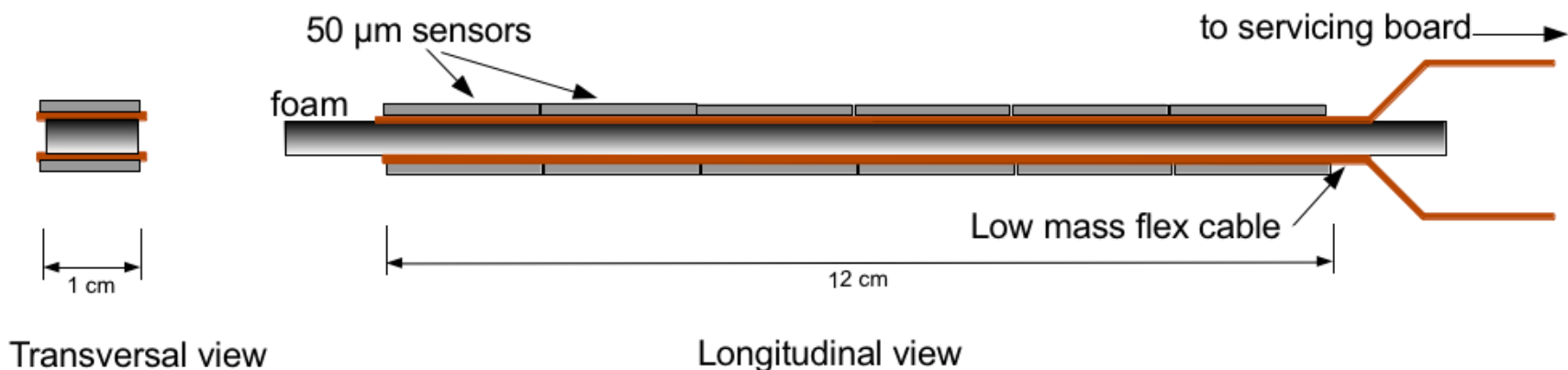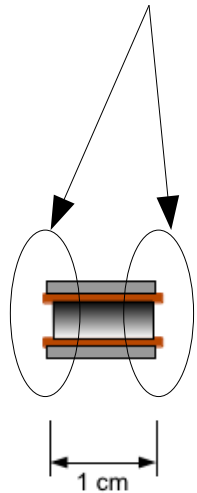- ✗ For both layers:
  evaluate pointing resolution
  of mini-vectors
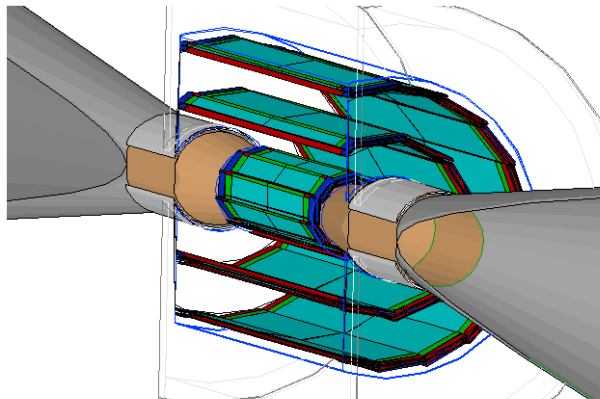
Assumptions, at least for 2010

- ✗ MIMOSA 26 sensors, thinned down to 50 µm
- ✗ Silicon carbide foam stiffener, 2mm width
- ✗ Kapton-metal flex cable
- ✗ Discrete components (R,C) on flex for decoupling/termination
- ✗ wire bonding for flex – outer world connection

50 µm sensors
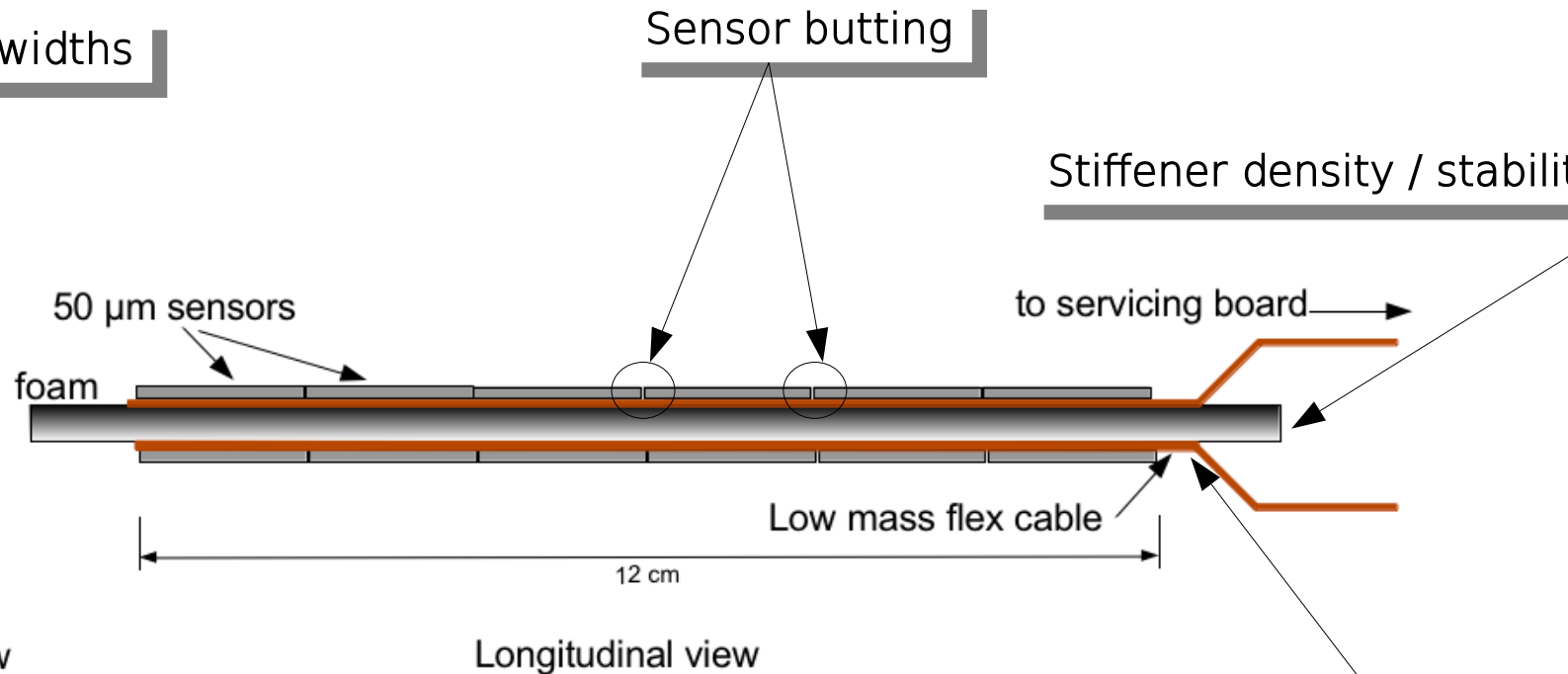
to servicing board

foam

1 cm

12 cm

Low mass flex cable

Transversal view

Longitudinal view

Flex & stiffener widths

Sensor butting

Stiffener density / stability

50 µm sensors

to servicing board

foam

Low mass flex cable

1 cm

12 cm

Transversal view

Longitudinal view

Flex design to minimize noise pick-up

Flex thickness

Quantity of discrete components

Sensors

- ✗ Individual tests when mounting on dedicated PCB

- ✗ Thinned down to 120 µm (other types to 50 µm)

- ✗ Experience of mounting & connection on flex @ Strasbourg
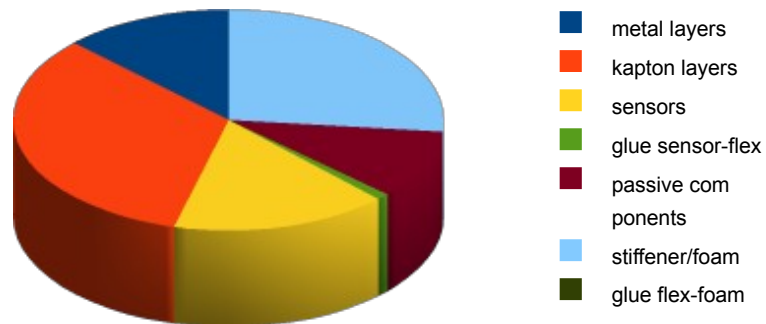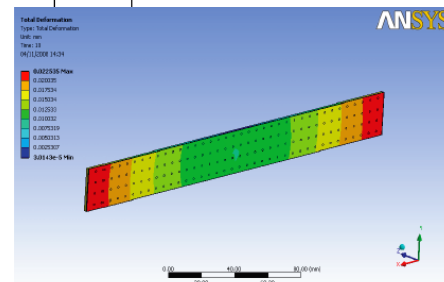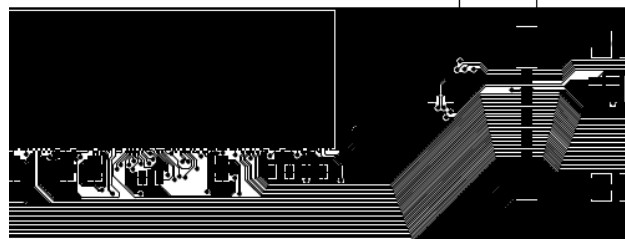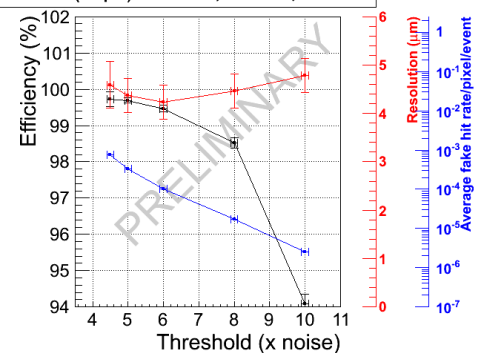
Flex

- ✗ Design @ Oxford finalized

Stiffener

- ✗ Material well understood @ Bristol

- ✗ Experience of mounting flex

Expected material budget for 2010

- ✗ Computed relatively / sensitive area

- ✗ 2 modules = 0.48% X0

- ✗ 1 double-sided ladder = 0.65% X0

MIMOSA 26 (chip 1) unthinned, vref2=98, 80 MHz

Pie chart legend:
- metal layers
- kapton layers
- sensors
- glue sensor-flex
- passive components
- stiffener/foam
- glue flex-foam

- **Thermal behavior**
  - ✗ dissipated heat drained by air flow (~°C precision)
  - ✗ -> design air system & supporting mechanics

- **Mechanical behavior**
  - ✗ X,Y,Z displacement (μm level) when in operation
  - ✗ Effect of power pulsing, air flow, B-field…
  - ✗ -> design ladder stiffener & flex

- **Electronic & Electromagnetic behavior**
  - ✗ Noise/signal level when power is pulsed
  - ✗ Noise level (or fake hit rate) of sensors on flex and nearby other sensors and PCB
  - ✗ -> design flex

- **Detection performances**
  - ✗ Once in full operation (power pulsing, air cooling) asses the single point resolution and efficiency IN BEAM
  - ✗ Final testing will occur in the AIDA setup in 201?

Tentative schedule & milestones

This is a starting point for discussion today!

- **2010**
  - ✗ Produce electrically working ladder
  - ✗ Test electromagnetic sensitivity
  - ✗

- **2011**
  - ✗ Produce first optimized ladder
  - ✗ Perform all tests and provide inputs / design

- **2012**
  - ✗ Produce best ladder possible
  - ✗ Final test in beam with full servicing

Tentative task planning

2010

- ✗ Produce first flex for 6 MIMOSA26
- ✗ Build sensor-flex automatic mounting setup
- ✗ Design & fabricate mechanical ladder-support: handling/traveling/testing
- ✗ Characterize MIMOSA26 for electro-sensitivity, "thermal map"
- ✗ Set-up power pulsing bench
- ✗ Set-up thermo-mecanical measurement bench
- ✗ Second flex design

2011

- ✗ Data Acquisition System ready for 12 sensors readout
- ✗ Produce optimized flex
- ✗ Mount – assemble - test
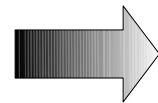
2012

- ✗ Produce best flex
- ✗ Mount – assemble - test

- How many ladders?

  ✗ In 2010, 2011, 2012

- Need to mirror the flex or not in 2010?

- How many DAQ system do we need?

- Which alternative sensors do we consider?

- Alternative global design?

  ✗ Without stiffener?

  ✗ Embedded sensors in polyimide?
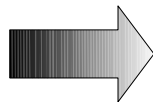
- Performances aimed for the 2012 ladder ?

- …

DISCUSSION BEGINS...

what, when and who ?

... and for what costs

➡ Are all difficulties adressed ?

➡ Memorandum Of Understanding