

# Synchrotron Radiation Detectors for BEAST II

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- 2 PXD half ladders (L1+L2)
- 4 SVD single modules (L3-L6)
- Thermal envelope and cooling (dry air+CO<sub>2</sub>)
- PXD cooling blocks and 'some' SVD support structure
- BEAST II specific monitoring
   → Synchrotron radiation
- General monitoring (T and RH) and abort systems
   → Fibers and commercial devices (TB-like)
   → Diamonds

### **The VXD Volume**







Phase II under discussion Still, some conflict remains

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#### **VXD Geometry**





- PXD not depicted

#### **VXD Geometry**





• PXD not depicted



• Rotation by 78.5 degrees



→ Still under discussion (Nakamura-san)

#### **BEAST Workshop**



# BEAST Commissioning Detector Workshop, June 2-5, 2014



### **Synchrotron Radiation Study**







Silicon Drift



### **SDD Performance**





### **SDD Energy Calibration**

- Measured Gaussian mean value of several  $K_{\alpha}$  and  $K_{\beta}$  transitions
- Linear response



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# **Pile-up**



- Pile-up effects for lowest settings of tungsten X-ray source (5 μA, 20 kV)
- A collimator reduces max. height/pile-up ratio by 20
- Other possible solutions:
  - Filters and finer collimator

Reducing shaping time (currently ~  $2.5 \ \mu s$ )





## **Bias Scan**





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#### **Temperature Dependence**





At > 0°C, the two Fe peaks are indistinguishable (non-irradiated)

Energy resolution degradation with T visible

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# **Irradiation Campaign**





## **Irradiation Results**





- Resolution is worsened after each irradiation step and at 3 Mrad, the Fe55 peaks are hardly distinguishable
- Temperature control is vital
- Gain is slightly reduced (?)

# **Irradiation Results**





After irradiation the temperature constraint is stronger < -15°C

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# Annealing







- BEAST community focused on Phase I
- Phase II still under discussion
- SDD shows good energy resolution and is radiation hard (3 Mrad)
   → Operation temperature < -15°C</li>

Still, issues remain:

- Operation in magnetic field
- Limited count rate
- System related aspects (kapton and electronics)





# Thank you



# **Silicon Drift Detectors**



