**X-Ray Monitor for SuperKEKB HER/LER to Monitor Vertical Beam Size Bunch-by-Bunch**

**Motivation: Nanobeams & High Luminosity**

Goal: achieve 40X the luminosity of KEKB

\[ L = \frac{\gamma}{2\pi} \left( \frac{1}{\Gamma(1/2)} \right) \left( \frac{e}{1 - e} \right) \left( \frac{c}{\beta_{v} \gamma} \right)^{2} \geq d \]

Parameter

- KEKB: SuperKEKB
- LER/HER: LER/HER
- Beam current: 1.64/1.9 3.6/2.6 A
- Half crossing angle: 11.5 41.5 mrad
- Vertical emittance: 360 8.64/11.5 pm
- Vertical beta* function: 59/59 0.270/0.41 mm
- Vertical beam size: 2.11 80 x10^-3/cm^-2/s

**Uniform Redundant Array Mask**

Location of XRM beamline for the LER in Pj4 straight-section.

Location of XRM beamline for the HER in Ok4-straight-section.

**Single-Sided Silicon Strip Sensor**

128 cathode strips
50 μm pitch
Guard ring (4 sides)
Backside bias -70V
75 μm depletion depth
Presents 2 mm to beam
Made at Stanford Nanofab

**Bench Measurements of Laser Pulses**

Sensor
Laser diode
Stimulus
Response

**Mechanical Design**

2-axis translation+rotation
Collimate/absorb X-Ray beam

**Data Acquisition**

[Flowchart diagram of data acquisition system]

**Challenges**

- Thermal/cooling: absorbing 200 W X-Ray beam
- RF environment: near accelerator ring components
- RF EMI is synchronous to the signal we are trying to measure

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