Spatial Resolution Studies for the PERCIVAL Sensor.

1. PERCIVAL Sensor and the Experimental Setup

1.1 The Sensor
- The Pixelated Energy Resolving CMOS Image (PERCIVAL) is a project under development to build a.
- The sensor is designed to operate at a high level of sensitivity for low-energy photons.
- The sensor has a high quantum efficiency, allowing for efficient photon collection.

1.2 The Knife Edge
- The knife edge method is used to study the spatial resolution of the sensor.
- A knife edge is placed in front of the detector to block part of the incoming beam.
- The sensor's response to the knife edge is measured and analyzed to determine its spatial resolution.

2. The Modulation Transfer Function and Slant Edge Method

2.1 The Modulation Transfer Function
- The MTF is a measure of the system's ability to resolve details.
- In this study, the MTF is measured for different pixel types:
  - Pixel Type A
  - Pixel Type B
  - Pixel Type C
  - Pixel Type D
  - Pixel Type E
  - Pixel Type F
- The MTF curves are compared to the ideal MTF curve.

2.2 The Slant Edge Method
- The slant edge method is used to measure the MTF of the sensor.
- A slant edge is placed in front of the detector.
- The sensor's response to the slant edge is measured and analyzed to determine its spatial resolution.

3. The Data

3.1 Data Taking
- For each pixel type, 5000 images are recorded.
- For Pixel Type A, 1000 images are recorded.
- Correlated Double Sampling was applied to reduce the noise.

3.2 Data Processing
- The data is analyzed to extract the modulation transfer function.
- The data is corrected for the effect of pixel size.

3.3 Knife Angle Determination
- The knife angle is determined to obtain the ESF.
- The pixel size is measured to obtain the ESF.

4. The Algorithms

4.1 Standard Algorithm
- The pixel data is projected onto a line, and the pixel data is analyzed.
- The ESF is estimated using an algorithm.

5. The Ideal MTF
- The ideal MTF is compared to the measured MTF.
- The ideal MTF has its first node at 0.04 lp/µm, which corresponds to a line pair of 25 µm.

6. Results for the MFT Analysis
- For each Pixel Type, images with and without beam are taken.
- The pixel height at 0.04 lp/µm is shown.

7. Charge Blooming Studies

7.1 Pixel Beam
- For Pixel Type E and F, knife images were taken.
- The images were analyzed to determine the charge blooming.

8. References