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PImMS, a fast event-triggered pixel detector with storage of multiple timestamps

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PImMS, or Pixel Imaging Mass Spectrometry, is a novel high-speed CMOS imaging sensor tailored to mass spectrometry requirements, also suitable for other dark-field applications. In its application to mass spectrometry, the sensor permits Time of Flight information to be combined with 2D imaging, gaining additional information about the initial position or velocity of ions under study. PImMS1, the first generation sensor in this family, has an array of 72 by 72 pixels on a 70μm by 70μm pitch. Pixels independently record digital timestamps when events over an adjustable threshold occur. Each pixel contains 4 memories to record timestamps at a resolution of better than 50ns. The sensor was designed and manufactured in the INMAPS 0.18μm process. This allows the inclusion of significant amounts of circuitry (over 600 transistors) within each pixel while maintaining good detection efficiency. We will present an overview of the pixel and sensor architecture, explain its functioning and present test results, ranging from characterisation of the analogue front end of the pixel, to verification of its digital functions, to images captured on mass spectrometers.

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Author: Mr JOHN, Jaya John (Department of Physics, University of Oxford)

Co-authors: Dr JOHNSEN, Alex (Department of Chemistry, University of Oxford); Dr NOMEROTSKI, Andrei (Department of Physics, University of Oxford); Mr CLARK, Andy (Rutherford Appleton Laboratory); Dr VALLANCE, Claire (Department of Chemistry, University of Oxford); Mr SLATER, Craig (Department of Chemistry, University of Oxford); Mr WILMAN, Edward (Department of Chemistry, University of Oxford); Mr CAMPBELL, Ewen (Department of Chemistry, University of Oxford); Ms FRIEDLI, Iris (Department of Physics, University of Oxford); Mr CROOKS, Jamie (Rutherford Appleton Laboratory); Mr LEE, Jason (Department of Chemistry, University of Oxford); Ms HILL, Laura (Department of Physics, University of Oxford); Prof. BROUARD, Mark (Department of Chemistry, University of Oxford); Dr TURCHETTA, Renato (Rutherford Appleton Laboratory); Mr YUEN, Weihao (Department of Chemistry, University of Oxford)

Presenter: Mr JOHN, Jaya John (Department of Physics, University of Oxford)

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