Contribution ID : **18** Type : **Contributed talk**

A Synchronisation Gate for Adapting MKID Photon-Counting Data to Fourier-Transform Spectral Reduction

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Imaging Fourier-transform spectrographs (IFTS) such as SITELLE record spectral information by scanning a Michelson interferometer mirror and are reduced with the ORBS pipeline, which assumes conventional camera-style, frame-based exposures. We are developing a laboratory prototype IFTS built around Microwave Kinetic Inductance Detectors (MKIDs): energy-resolving, photon-counting sensors that read out continuously rather than in discrete frames. This mismatch between MKID's continuous photon stream and ORBS's frame-based input format is the central obstacle to reusing existing SITELLE-heritage reduction software for the new instrument.

We present the Synchronisation Gate, a software module that reconciles the two data formats by binning the continuous MKID photon stream along two axes simultaneously: mirror position, using timestamps from the interferometer's actuator log to isolate stable-alignment windows, and photon energy, using each photon's intrinsic energy resolution. An efficient binary-search-based algorithm converts the raw photon table into a (step, energy bin, y, x) frame array that ORBS can ingest directly. Because MKIDs resolve photon energy natively, this also enables an "N-cube" strategy: splitting one photon stream into N independent energy-sliced datacubes, each reduced in parallel through a modified ORBS roadmap that bypasses SITELLE's two-camera-specific calibration steps.

The gate has been implemented and integrated into the lab's MKID data pipeline and validated against synthetic photon-stream data. Remaining work includes full end-to-end validation on real detector data and flux calibration without on-sky standards. This work demonstrates a practical path for extending mature astronomical spectral-reduction software to a fundamentally different detector technology.

Did you give a contributed talk at CASCA 2026?

No

If you are selected for a poster, would you be interested in giving a short flash talk on your work?

Yes

What is your career level?

Undergraduate

Which keyword describes the area of focus of this talk?

Instrumentation

Primary author(s) : AYTEKIN, Irmak (University of Toronto)

Co-author(s) : Prof. ROUSSEAU-NEPTON, Laurie (University of Toronto)

Presenter(s) : AYTEKIN, Irmak (University of Toronto)

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