Illuminating Molecules with Lightning Speed

Rachel Sampson
Dr. Thomas Weinacht

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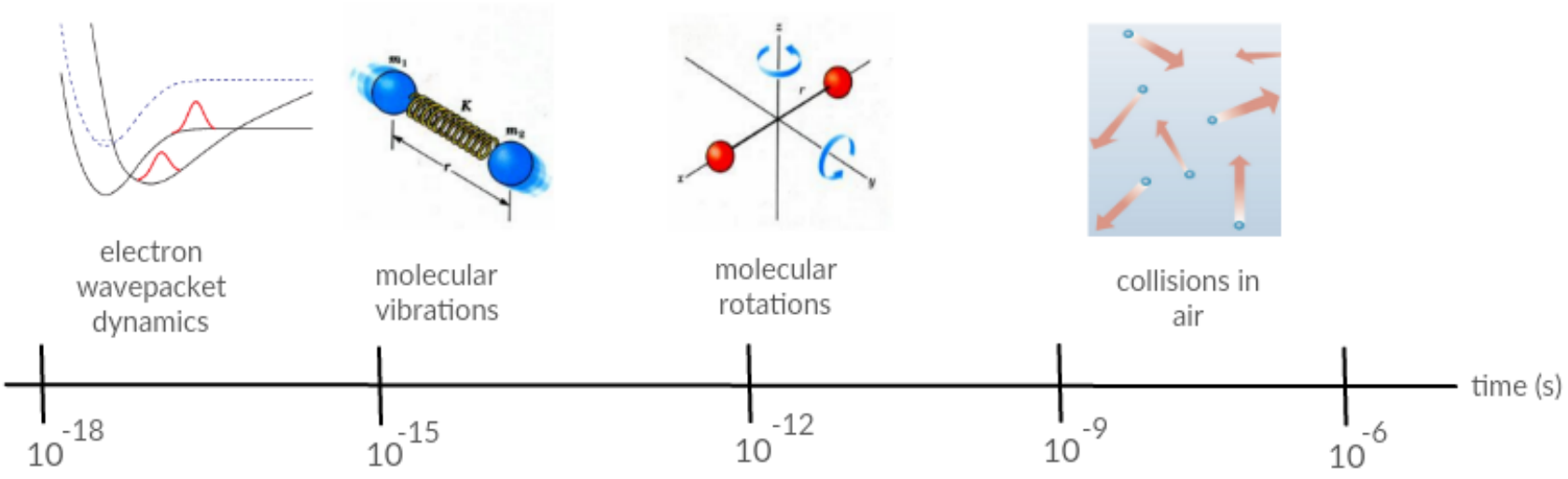
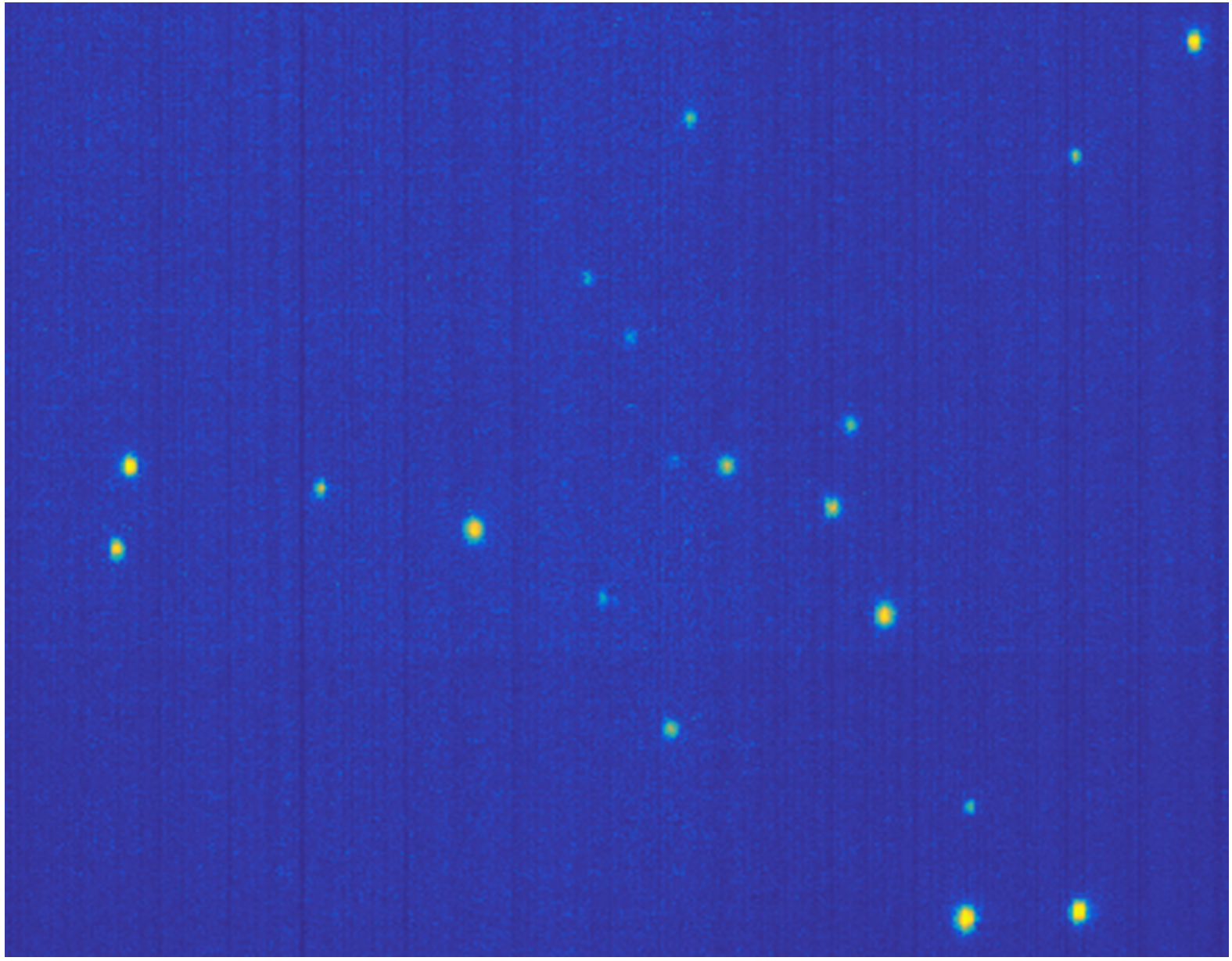
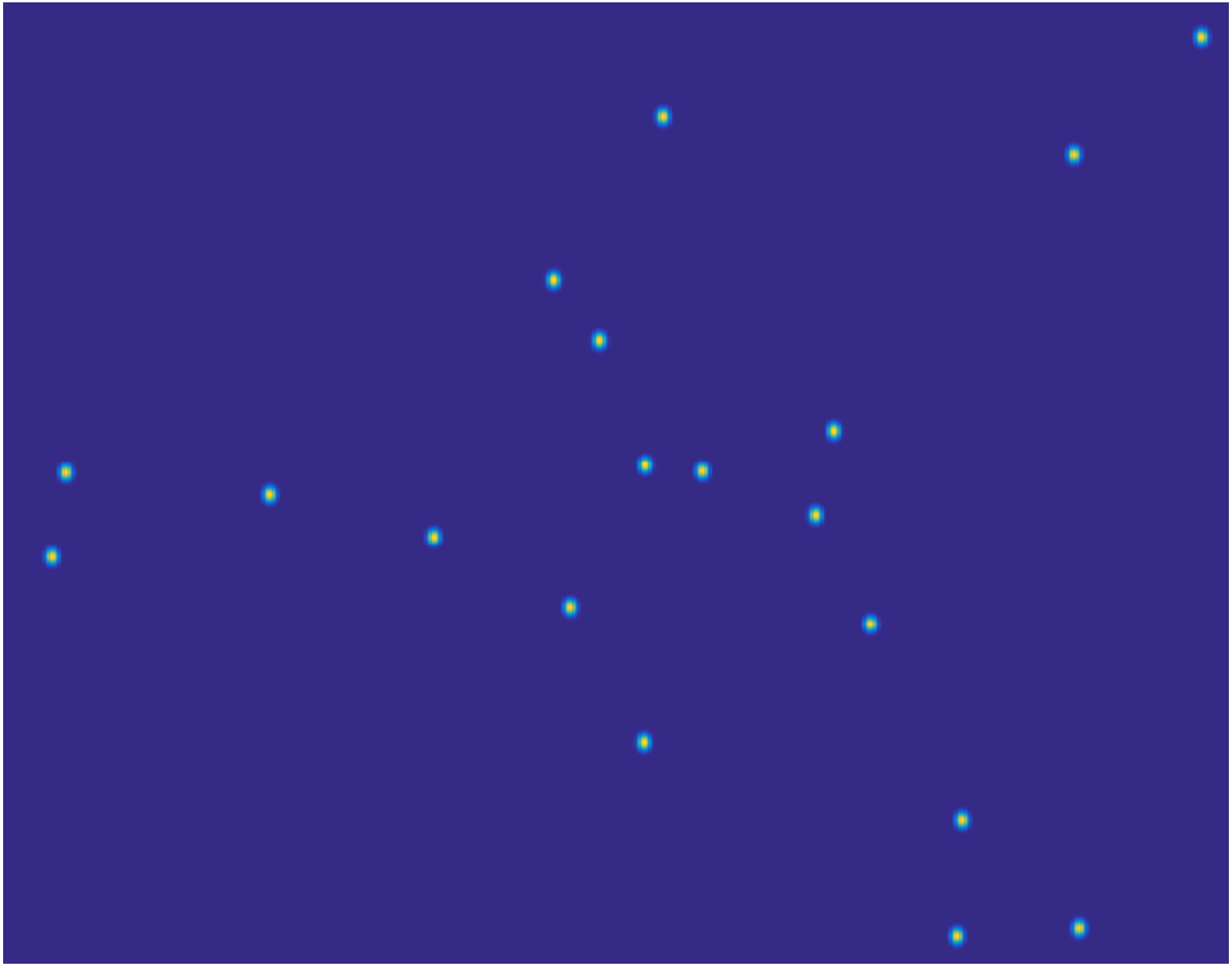
Ultrafast Physics

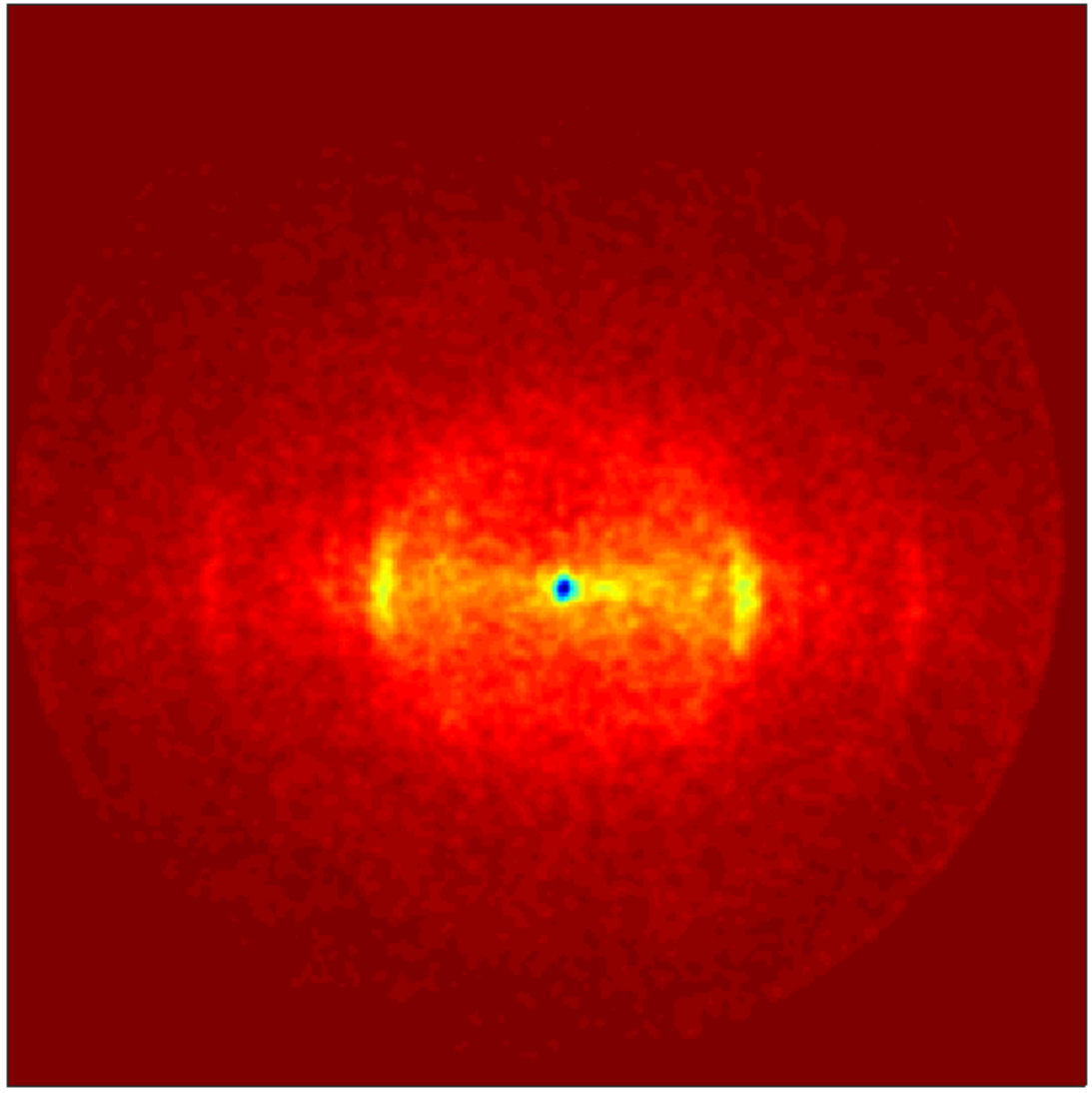
Pico, 10^{-12} • Femto, 10^{-15} • Atto, 10^{-18}



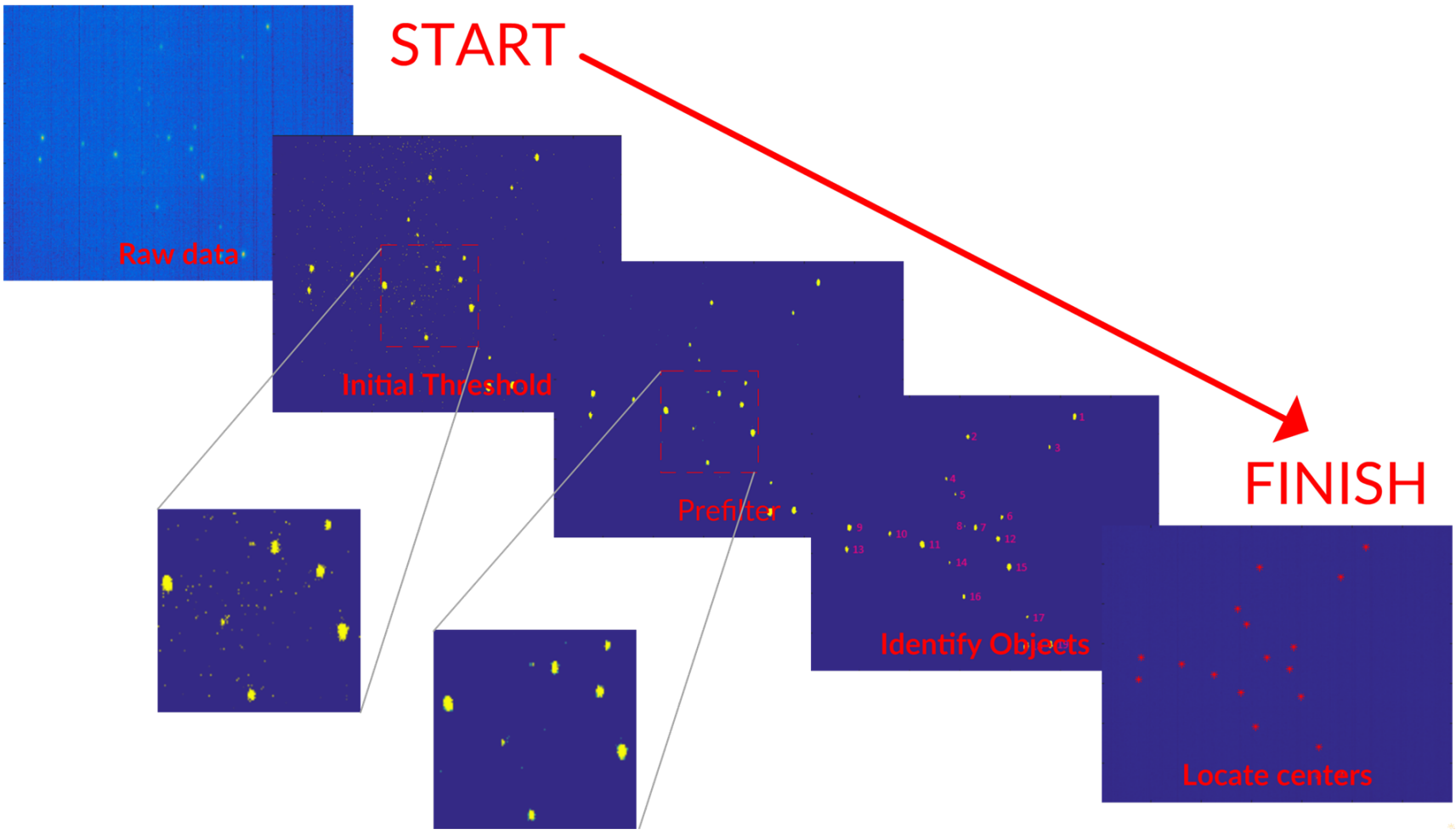

K



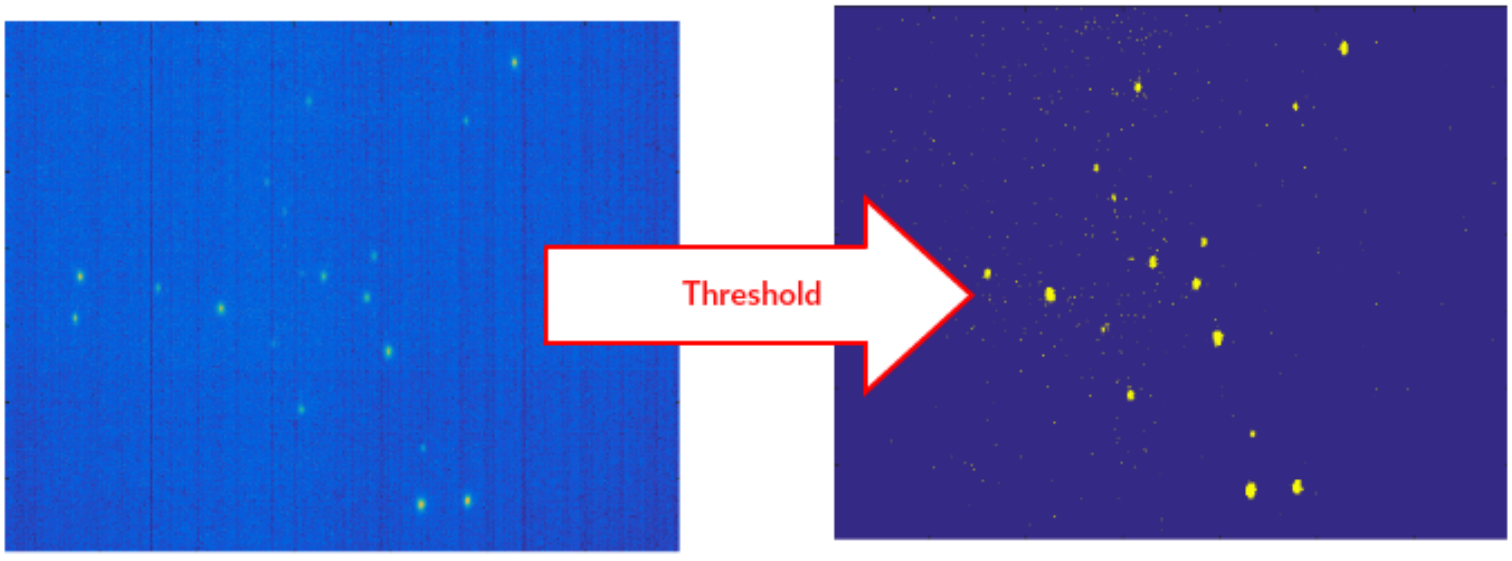




The Code

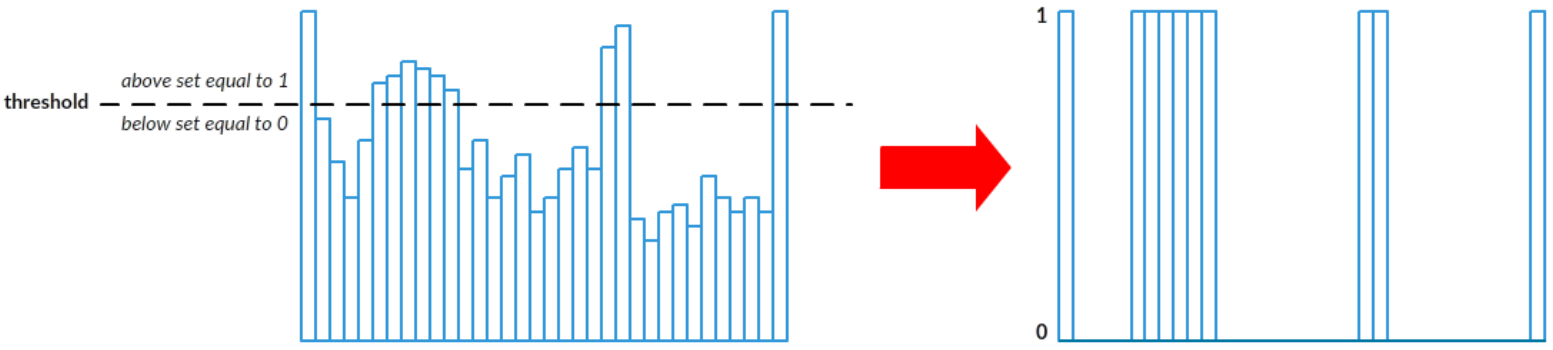

START
Raw data
Initial Threshold
Prefilter
Identify Objects
Locate centers
FINISH

Threshold



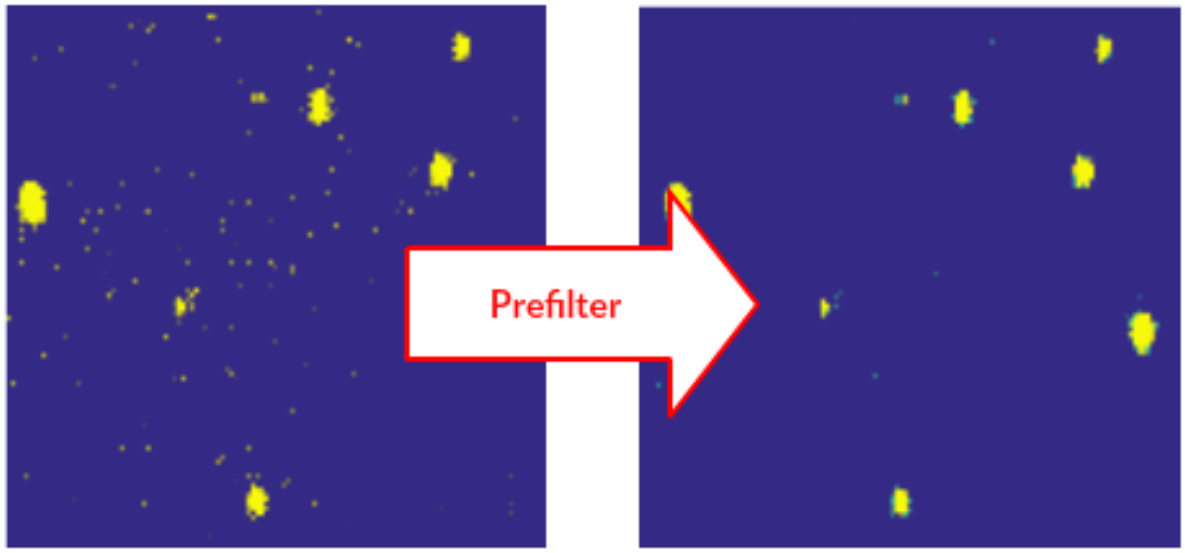
- Purpose: Removes low intensity background

Threshold



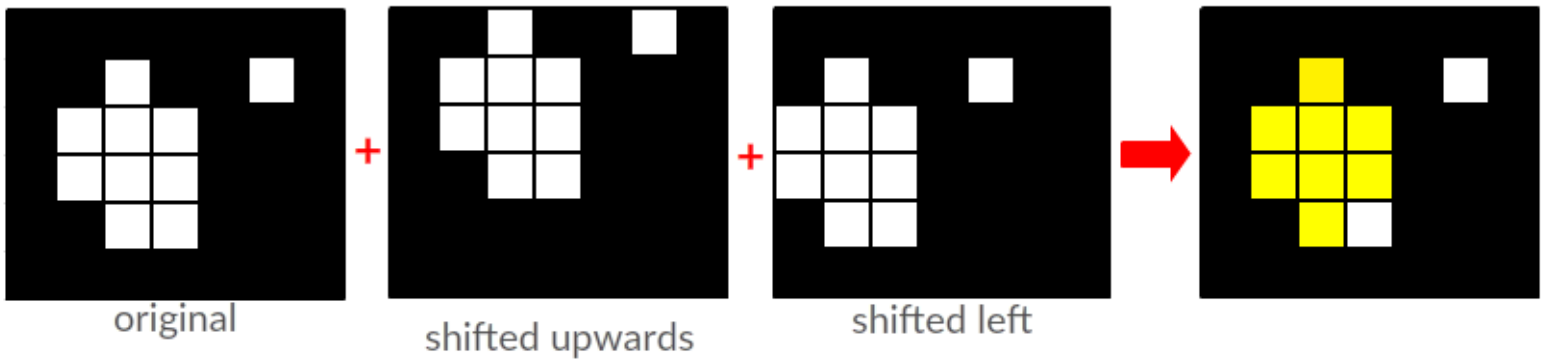
- Purpose: Removes low intensity background

Prefilter



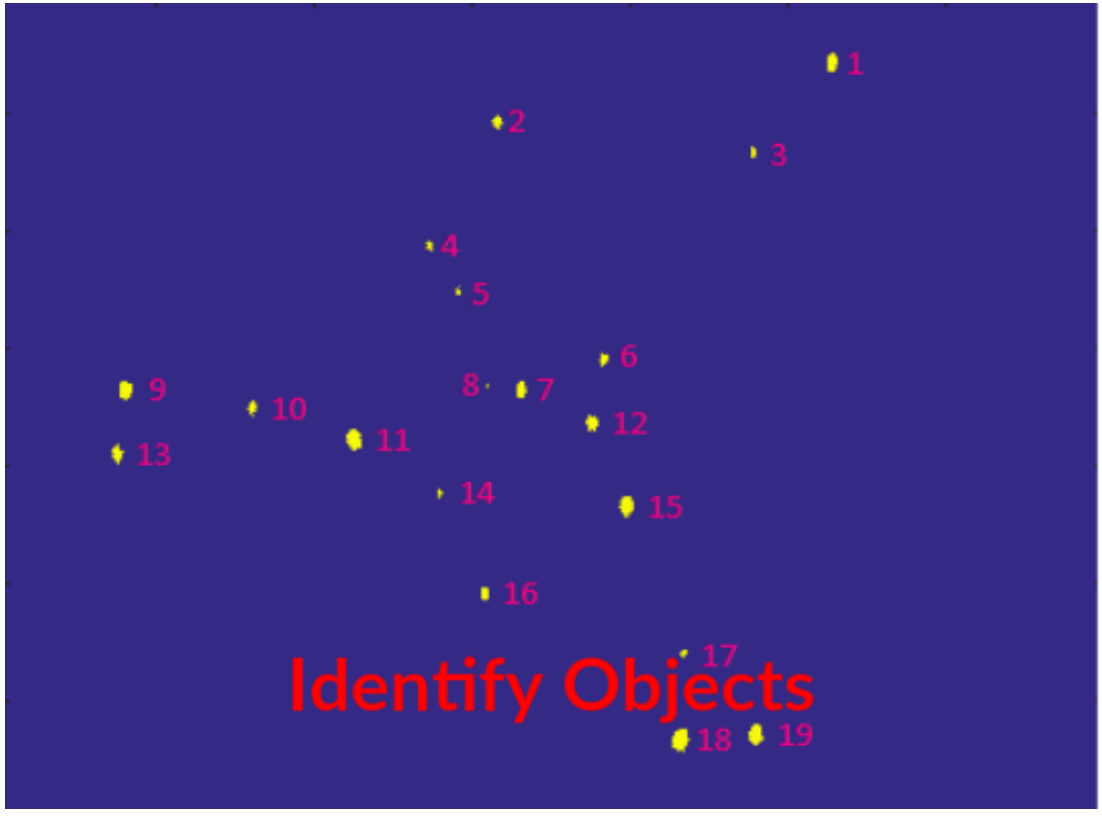
- Purpose: Removes single pixel high intensity noise

Prefilter



- Purpose: Removes single pixel high intensity noise

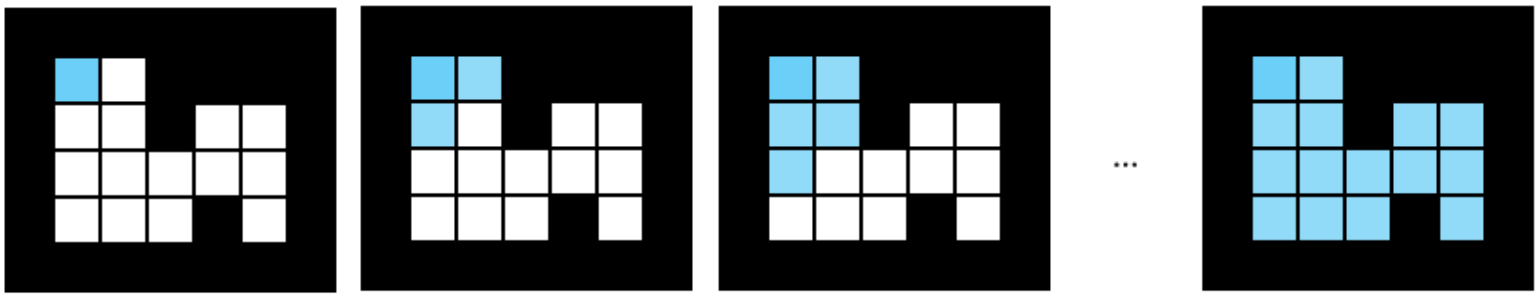
Identify Objects



- Purpose: Find hits within the image, remove small hits

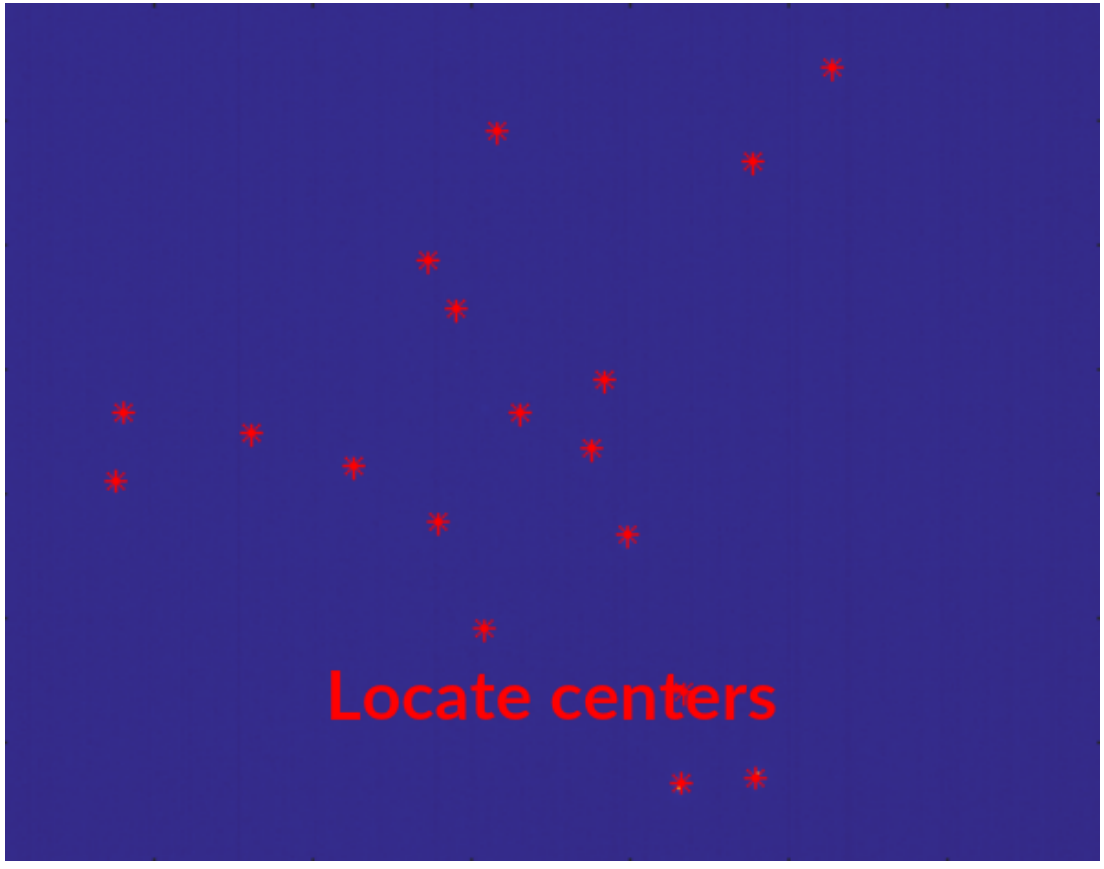
Identify Objects

Flood-fill Algorithm



- Purpose: Find hits within the image, remove small hits

Locate Centroid



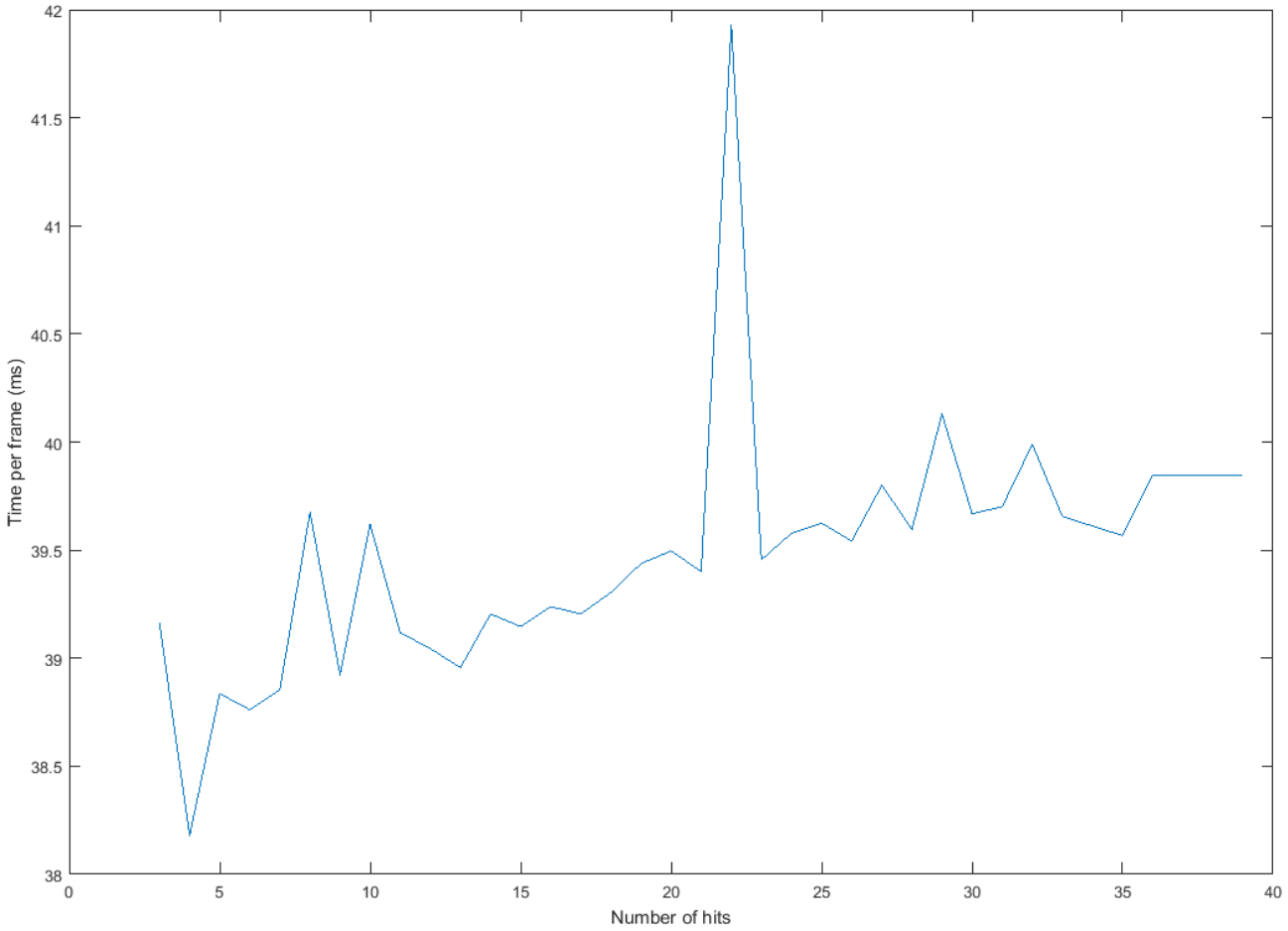
- Purpose: Gives noise-free, memory-efficient location data for each hit

Results: Timing

	Old (ms)	New (ms)	Additional Analysis (ms)
Basler Matlab	5.8	1.3	———
Basler LabVIEW	5.0	0.5	———
TimePix Matlab	———	3.0	0.3 ms

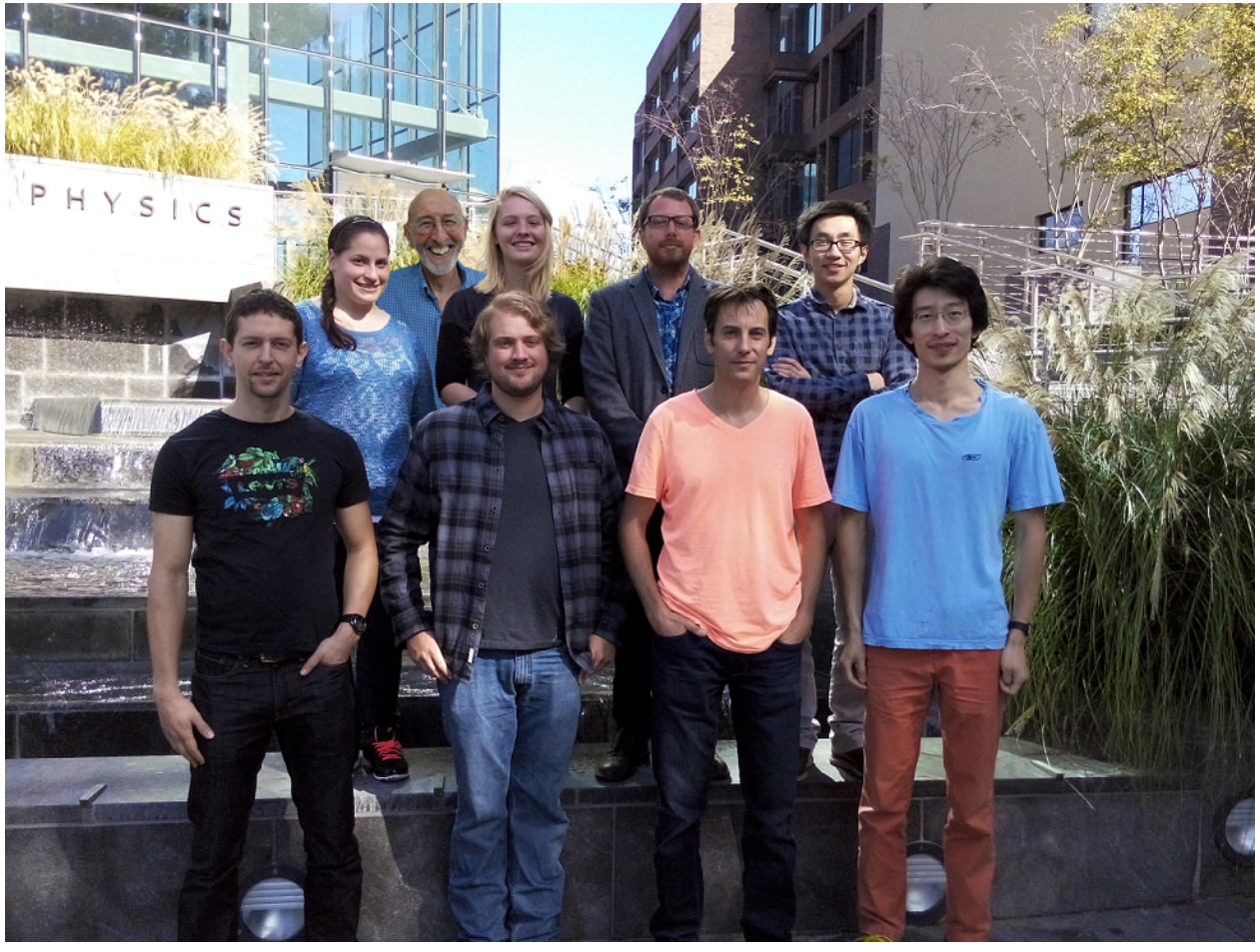
- New algorithm is $\sim$ an order of magnitude faster than the old algorithm

Results: Timing



- Timing scales slightly with number of hits

Acknowledgements



- TimePix Collaboration: Merlin Fisher-Levine & Andrei Nomerotski

Questions

Questions?

The Experiment