Real-Time Data Reduction Integrated Into Instrument Control Software

Paolo Mutti – Institut Laue-Langevin

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Outline

- Setting The Context
- Use-Case
- Solution
- Implementation's Examples
- Evolution

Setting The Context

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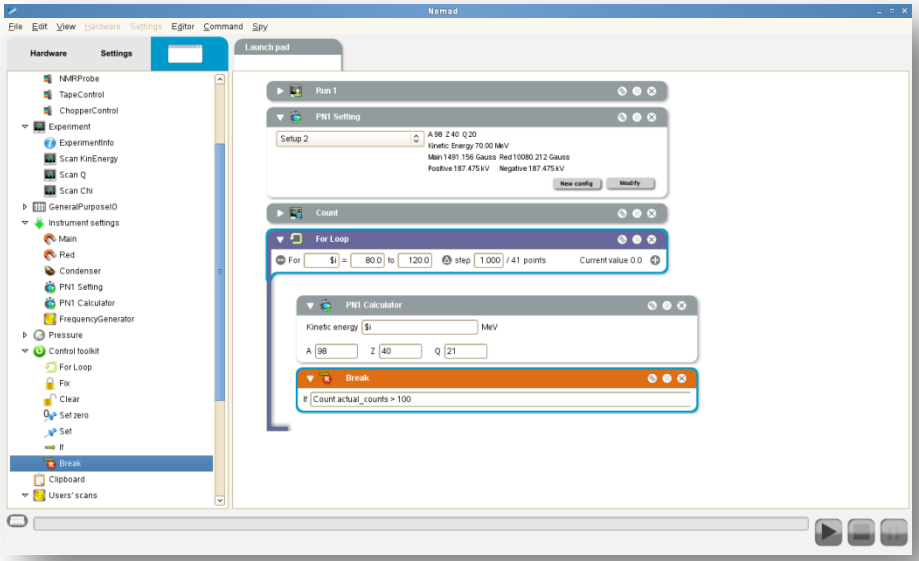
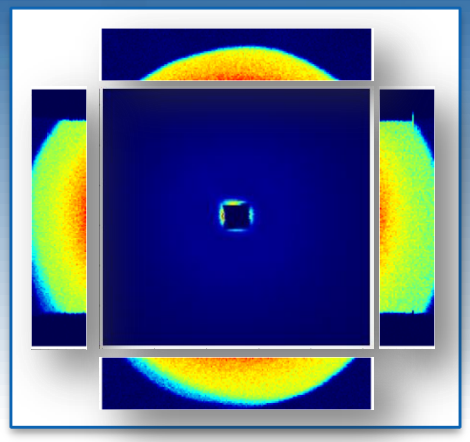
C++	Server
CORBA	Transport Layer
Java	GUI

NOMAD



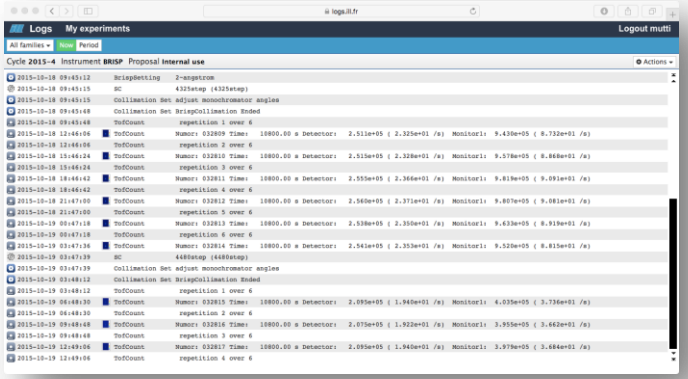
Use-Case

NOMAD



PlotScreen generator

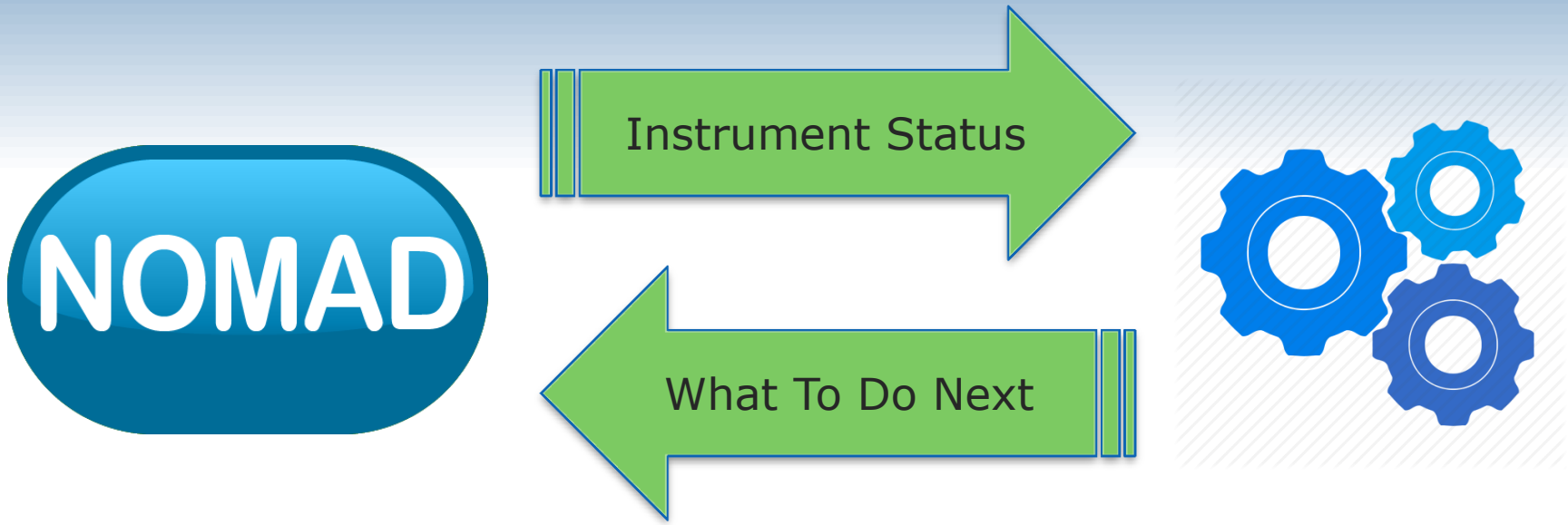
WEB Spy



Electronic log

Use-Case

Interaction with data reduction/analysis



- Multi-process
- Multi-environment
- Synchronization
- Crash management

Possible Solutions

- Monolithic

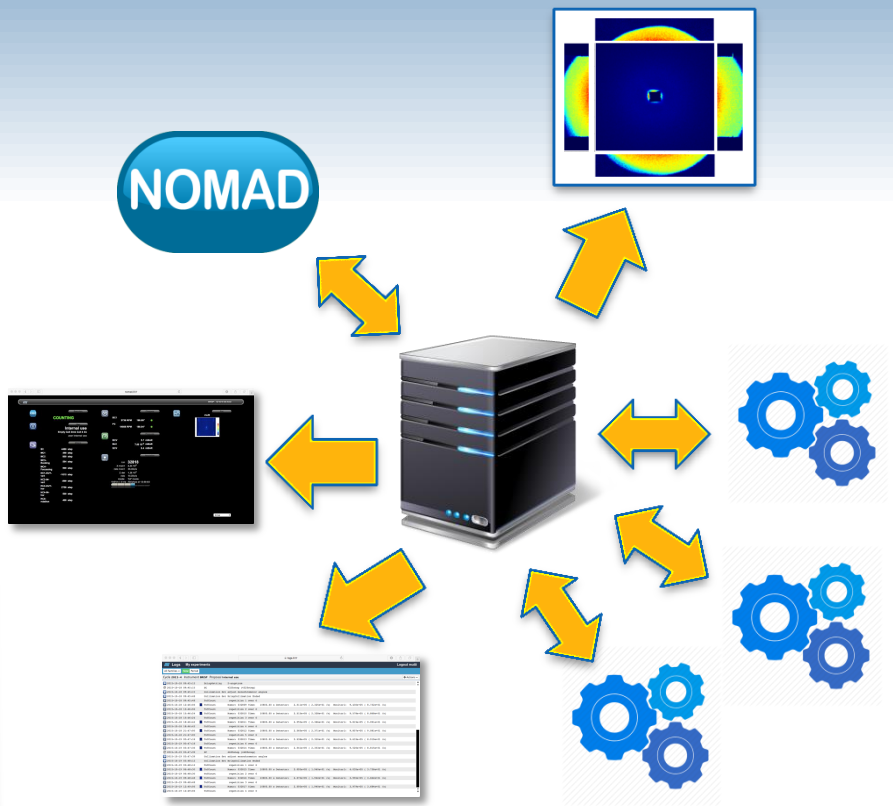
Every single Scientific method is included in NOMAD

Difficult to maintain

No freedom and flexibility for scientists

NOMAD

- Microservices

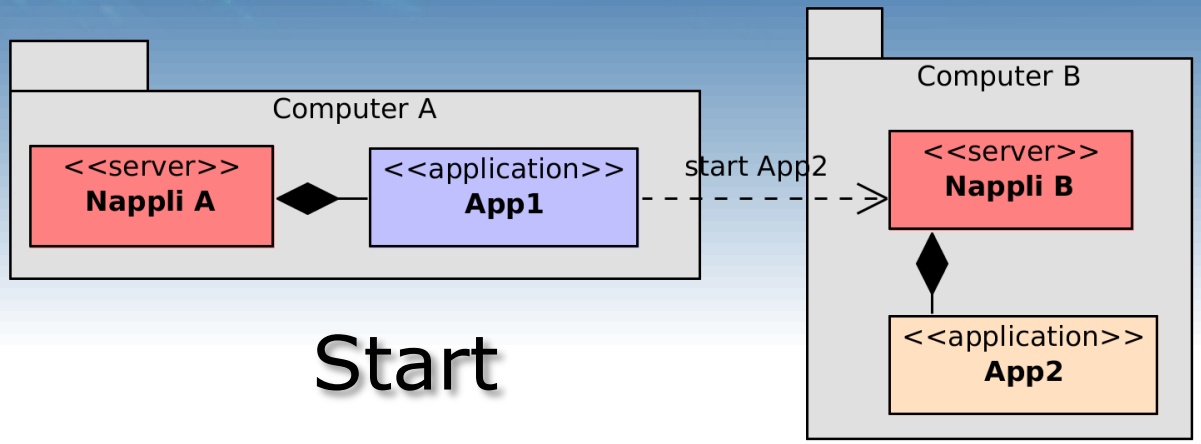


What Is NAPPLI

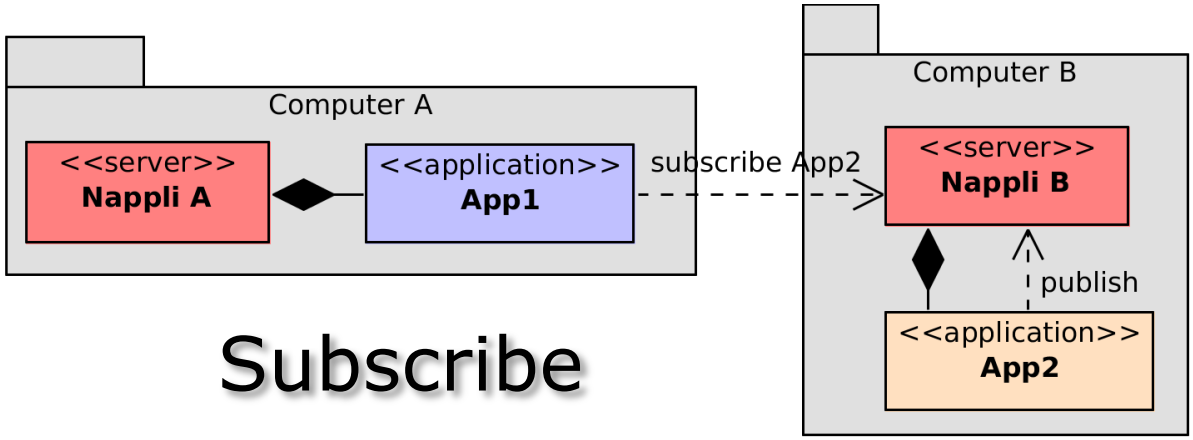
- Lightweight application server
- Multiplatform (Linux, Mac, Windows)
- Manages the entire application lifecycle
  - Start/Stop nicely
- Provides client API in C++ and Java
- Implements different communication patterns
  - Request/response
  - Publisher/Subscriber
  - Return value at the end

NAPPLI Basics

Protocol Buffers

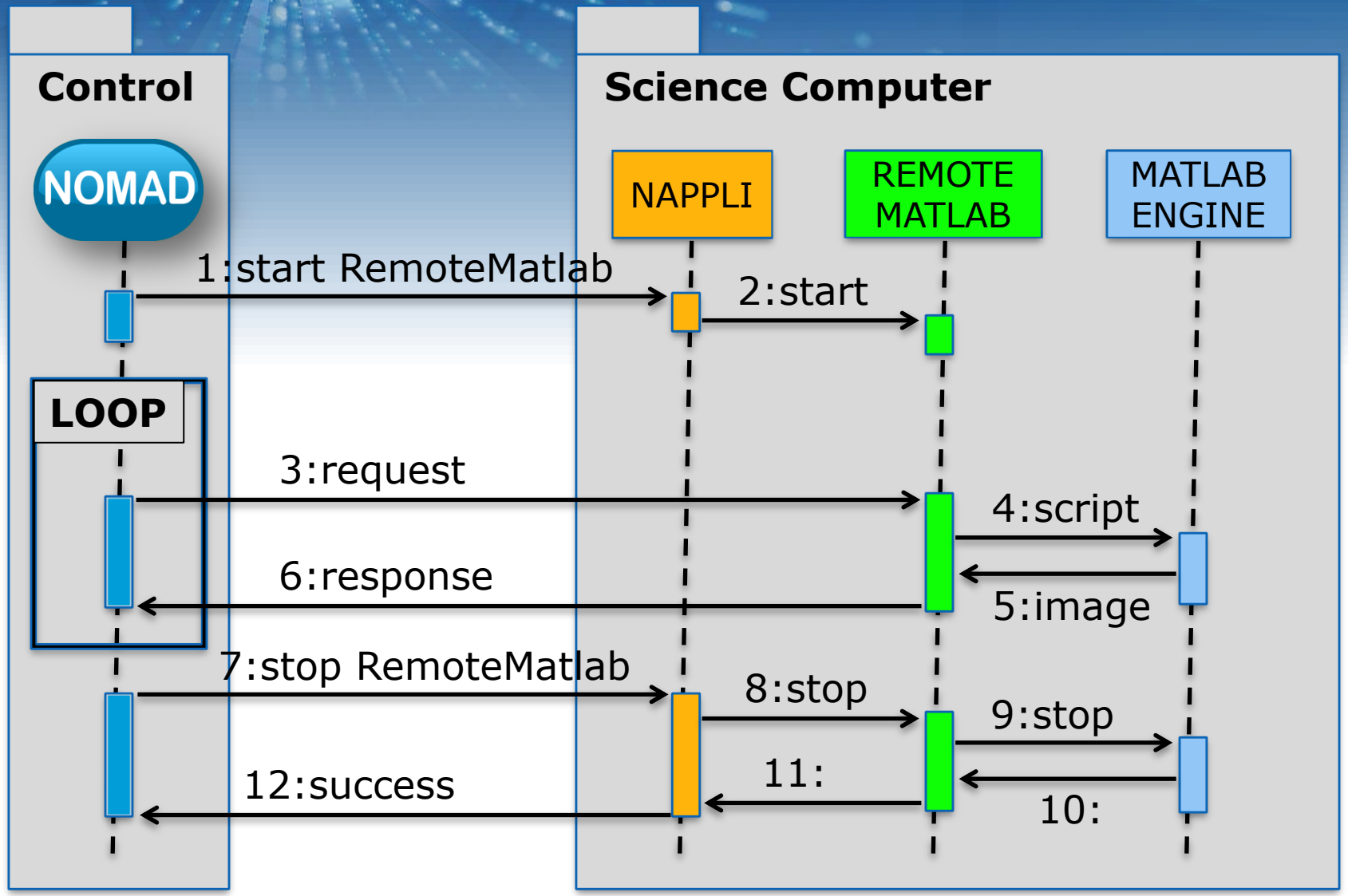


Start



Subscribe

MATLAB Synchronous Server



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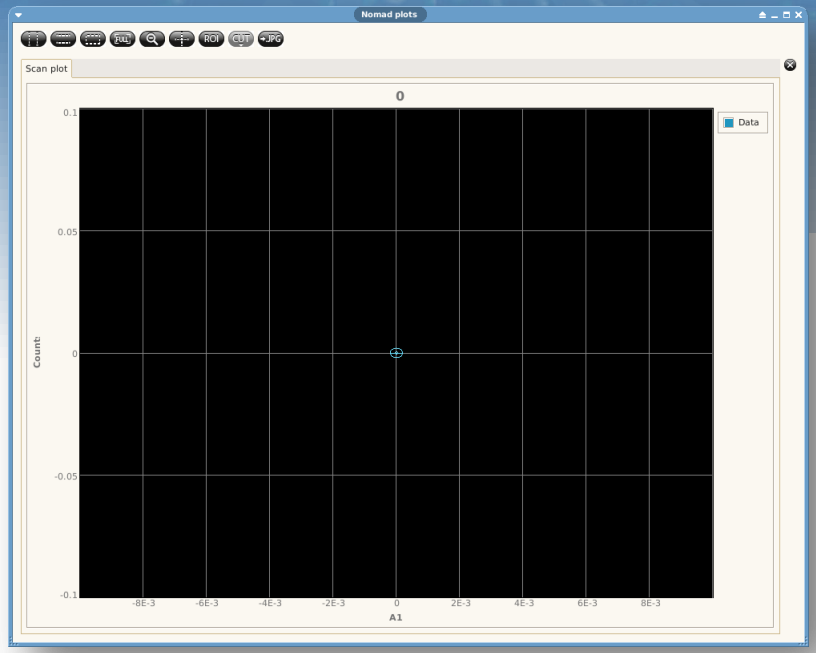
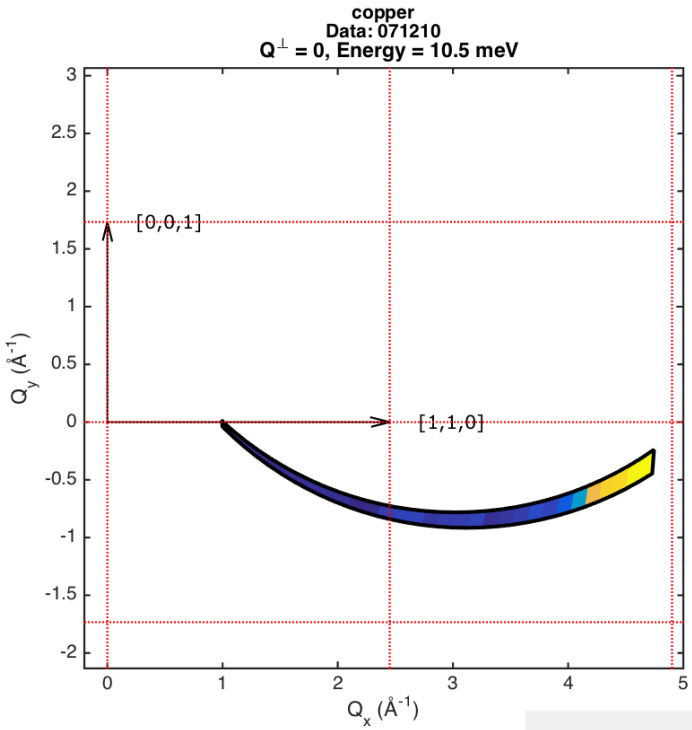


SCAN Raw Data

Q Space



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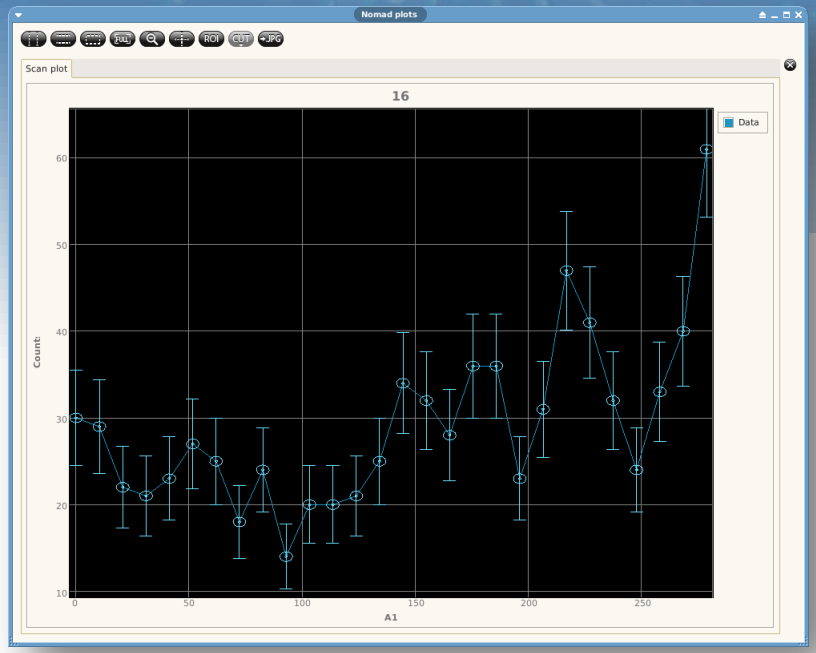

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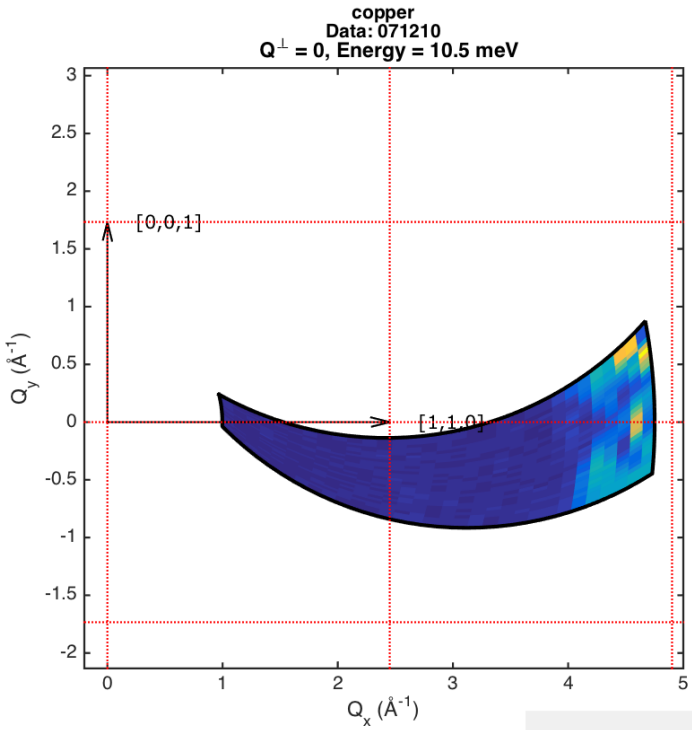

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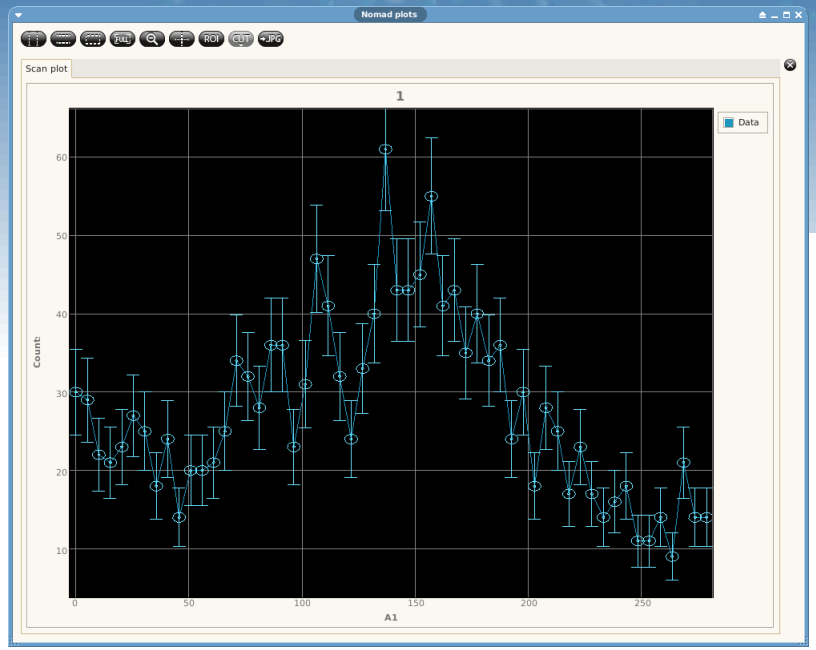

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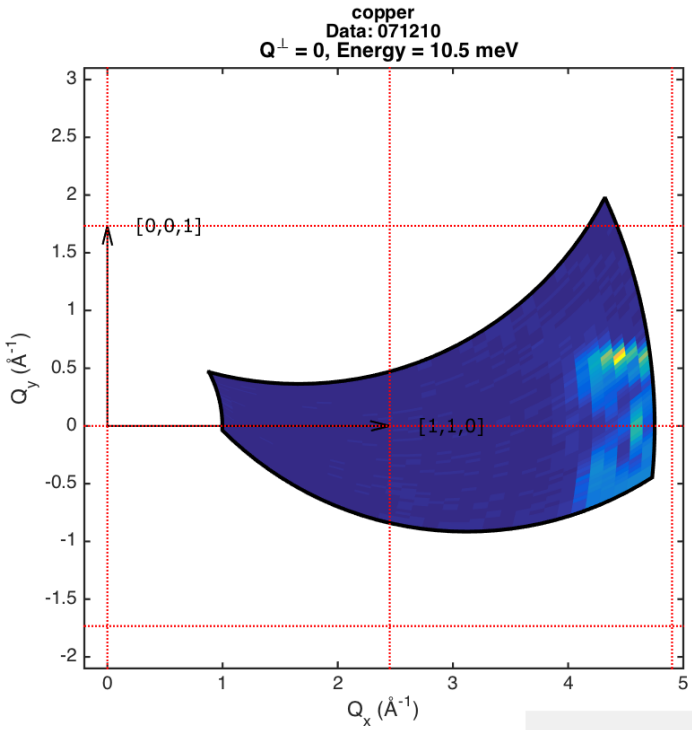

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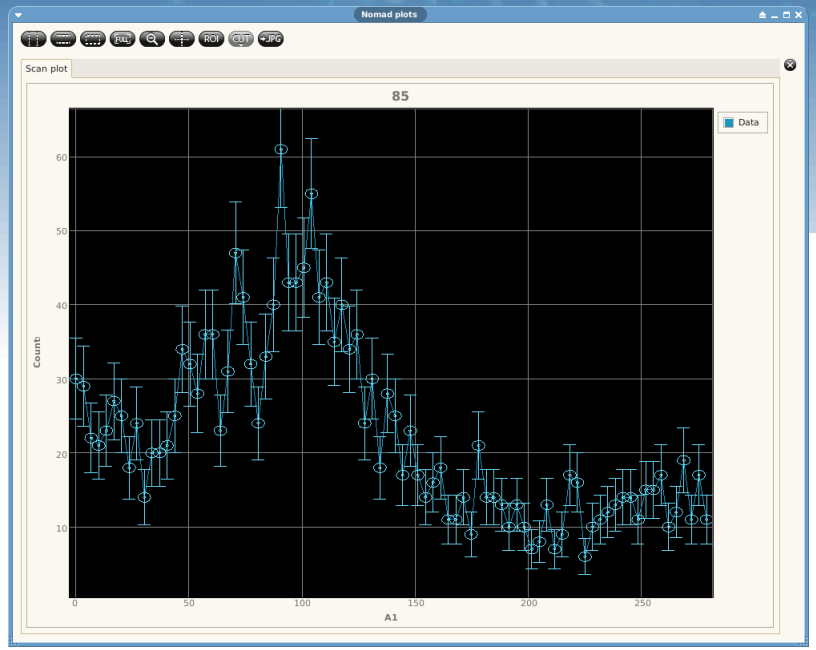

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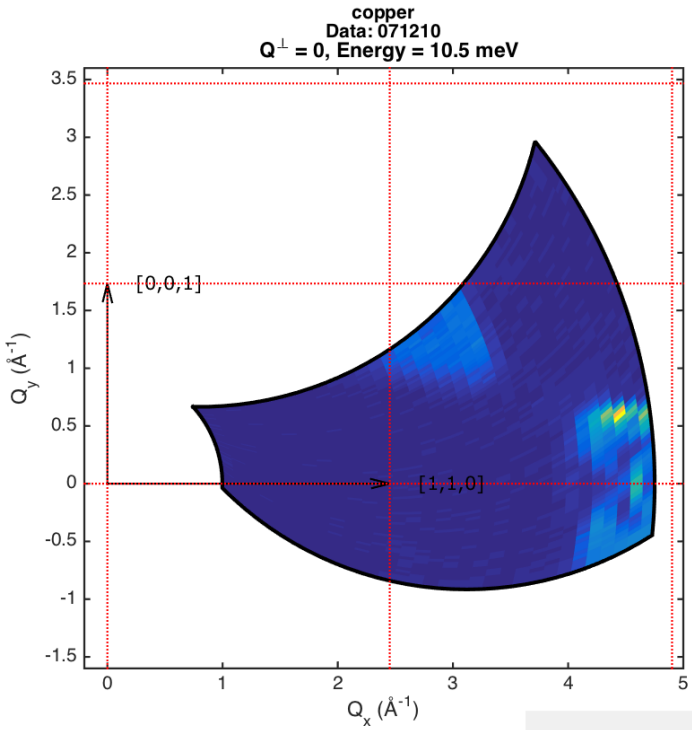

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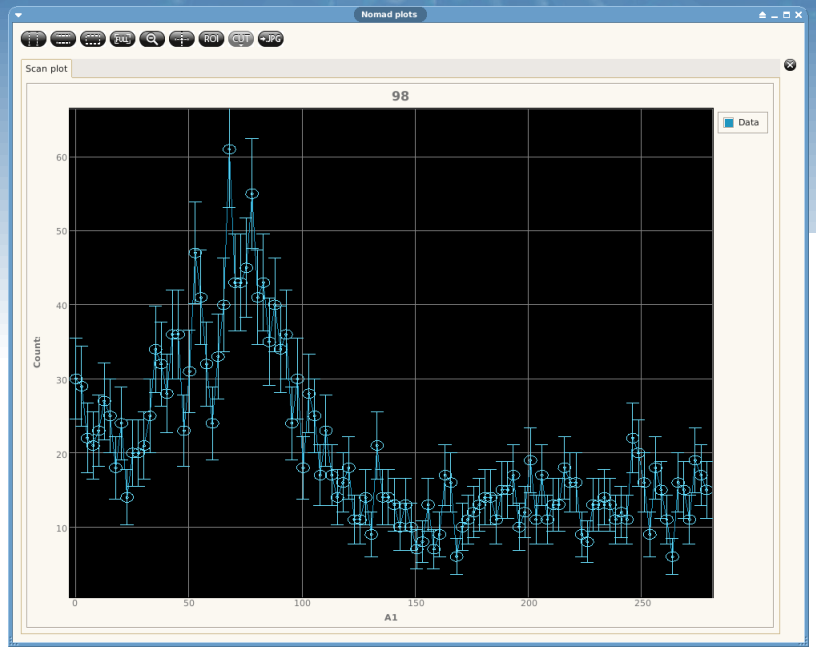

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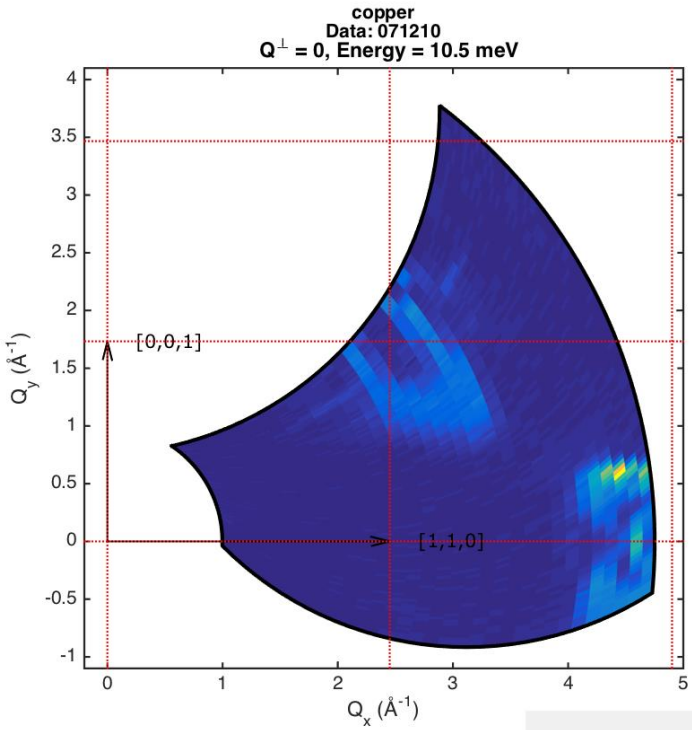

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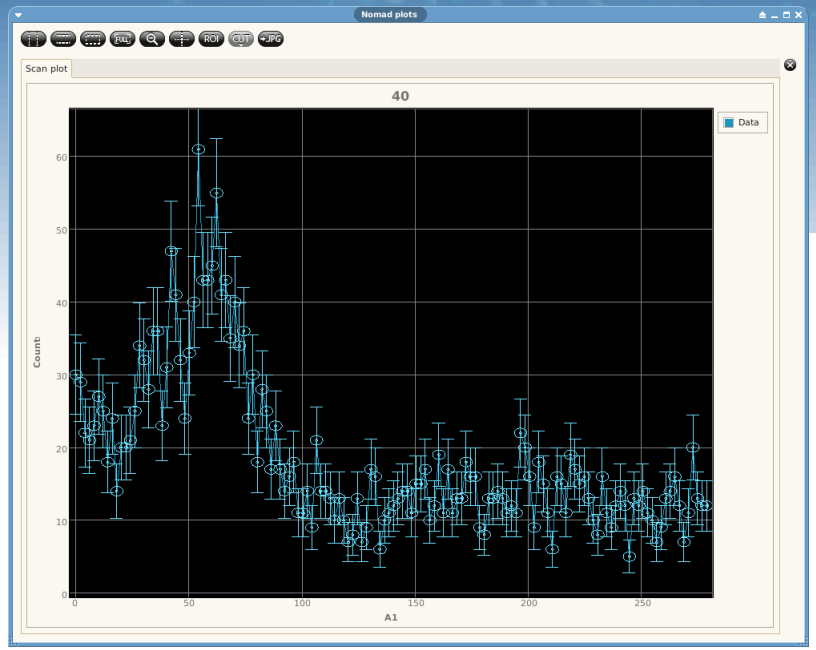

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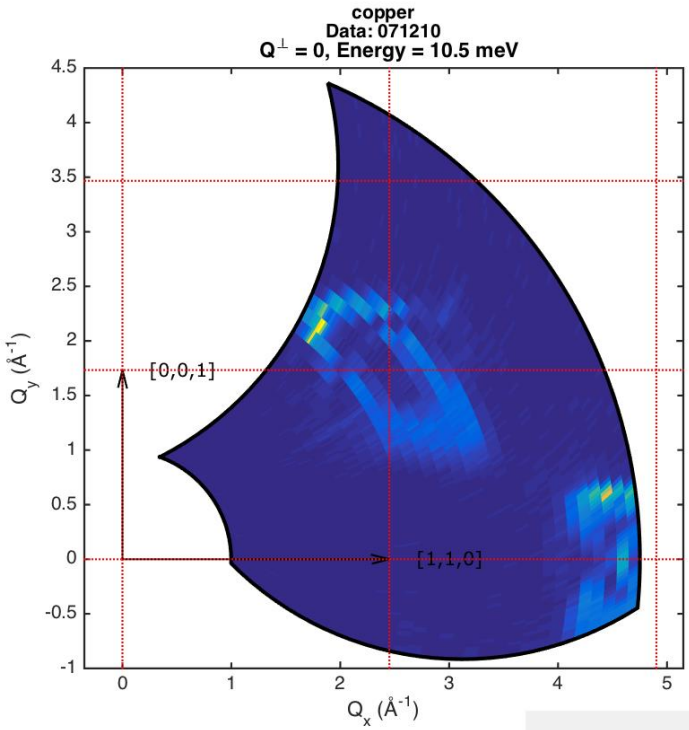

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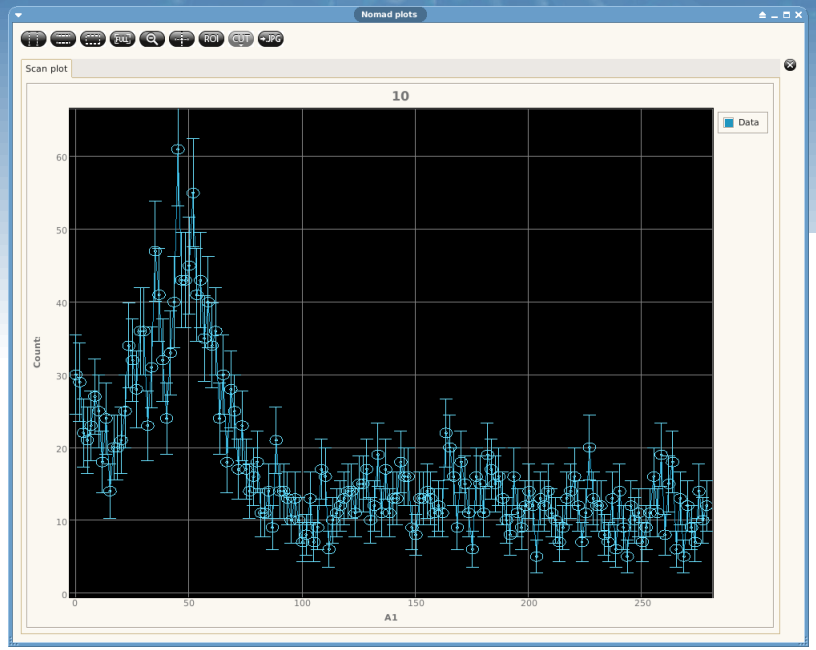

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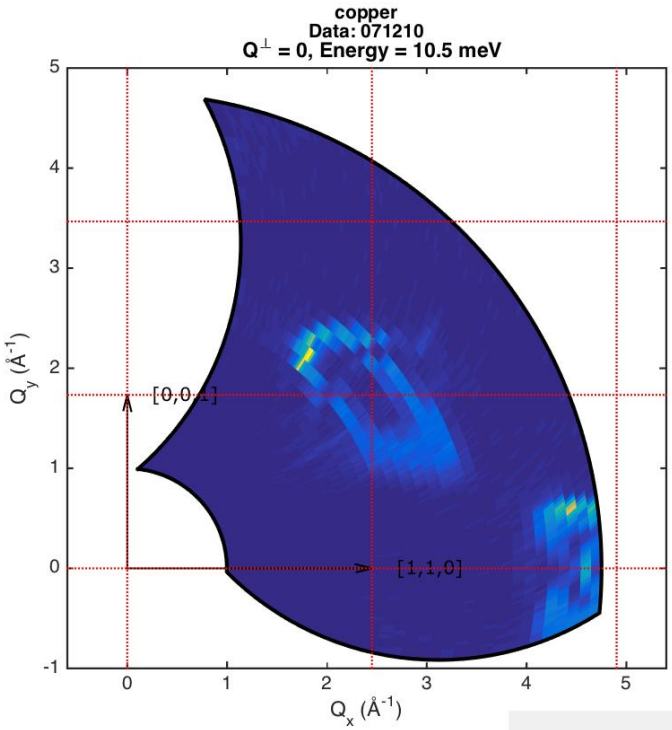

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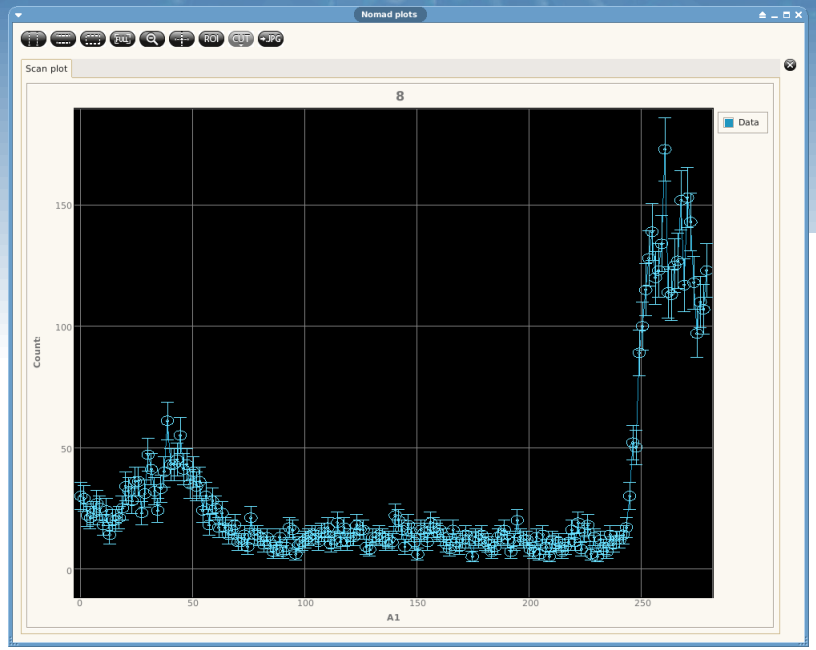

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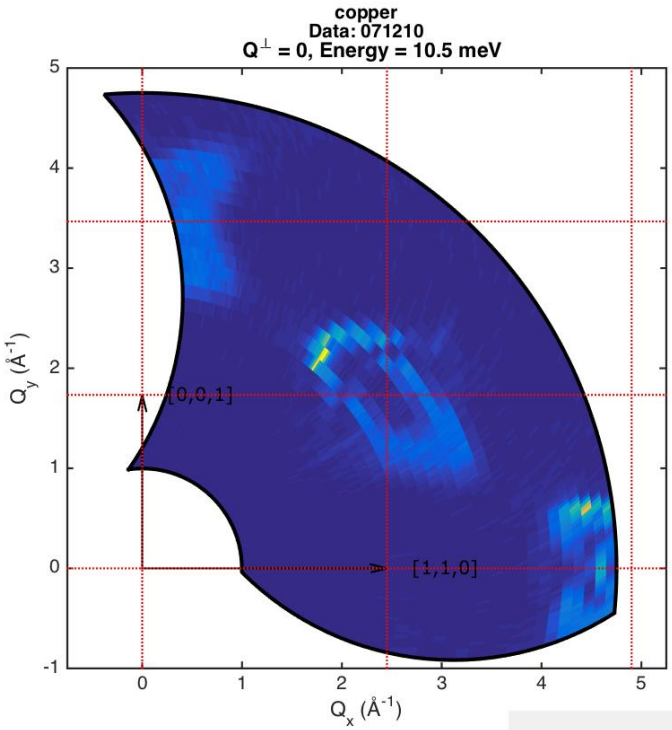

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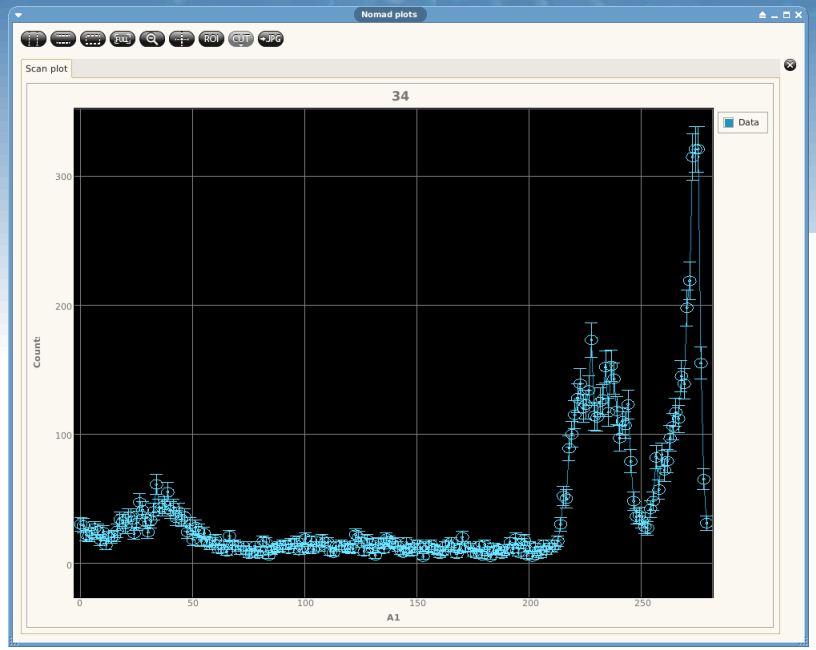

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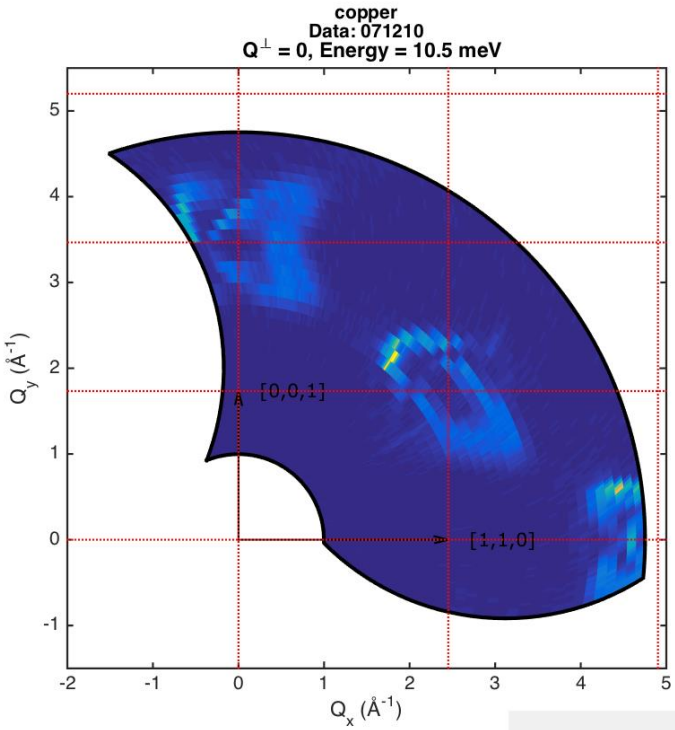

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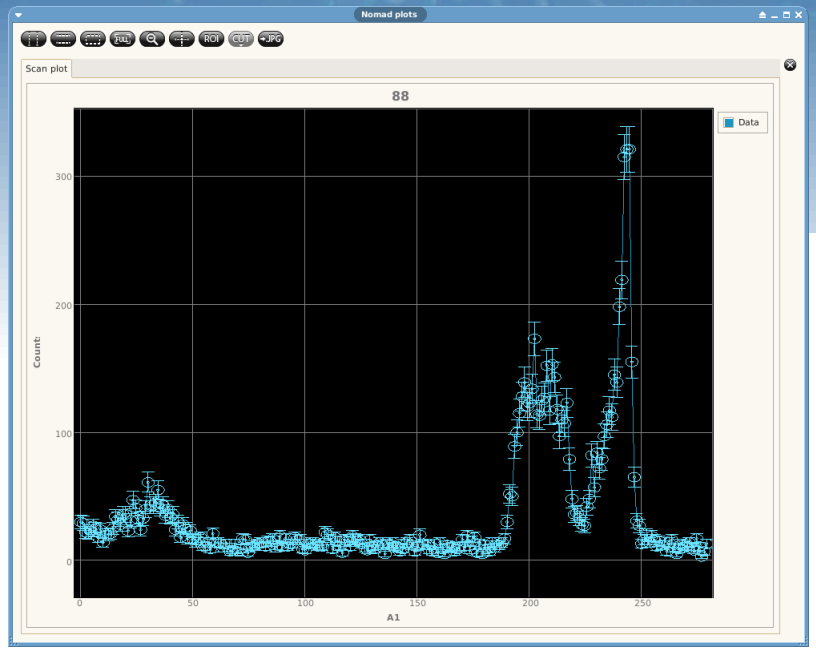

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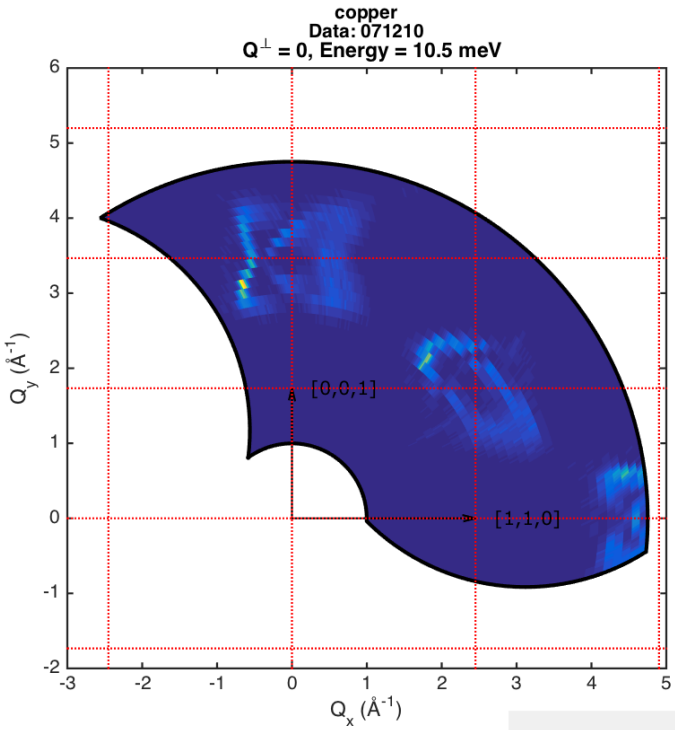

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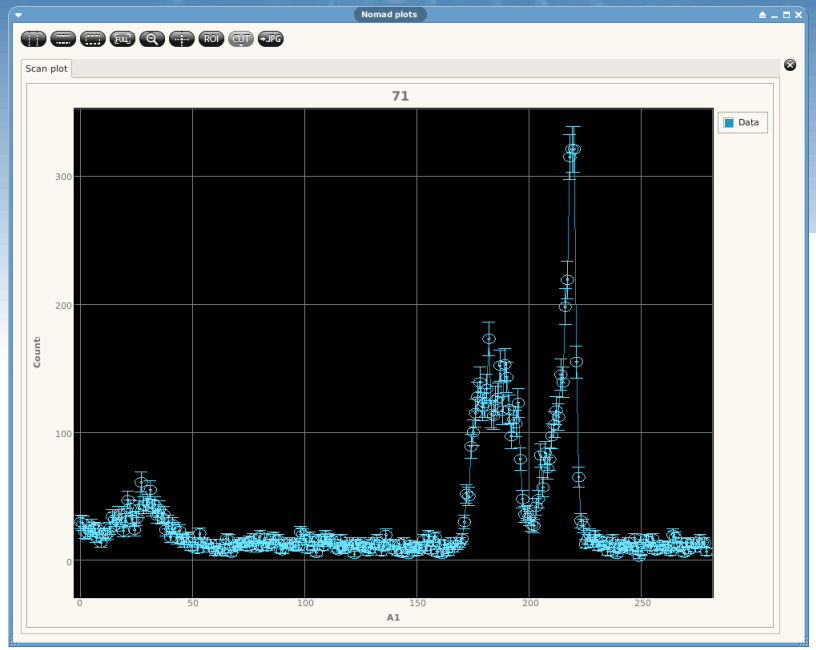

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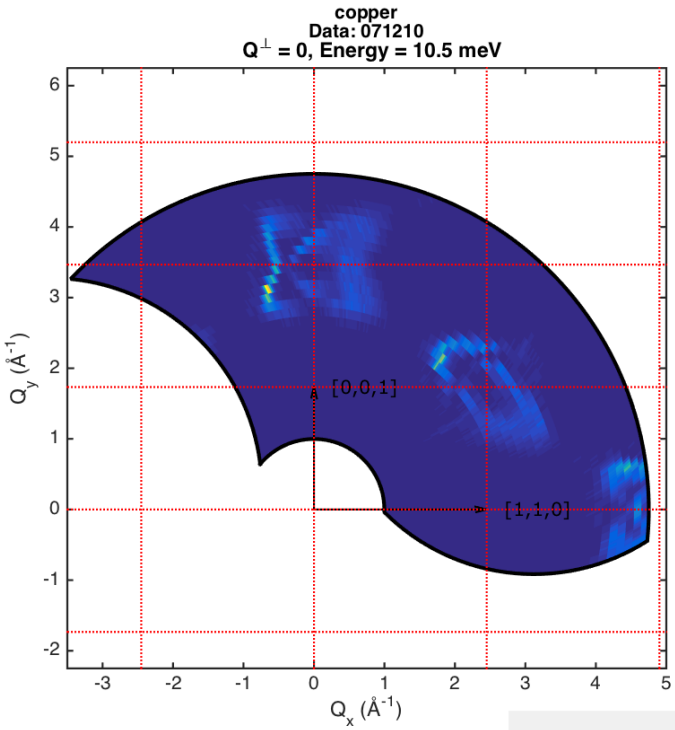

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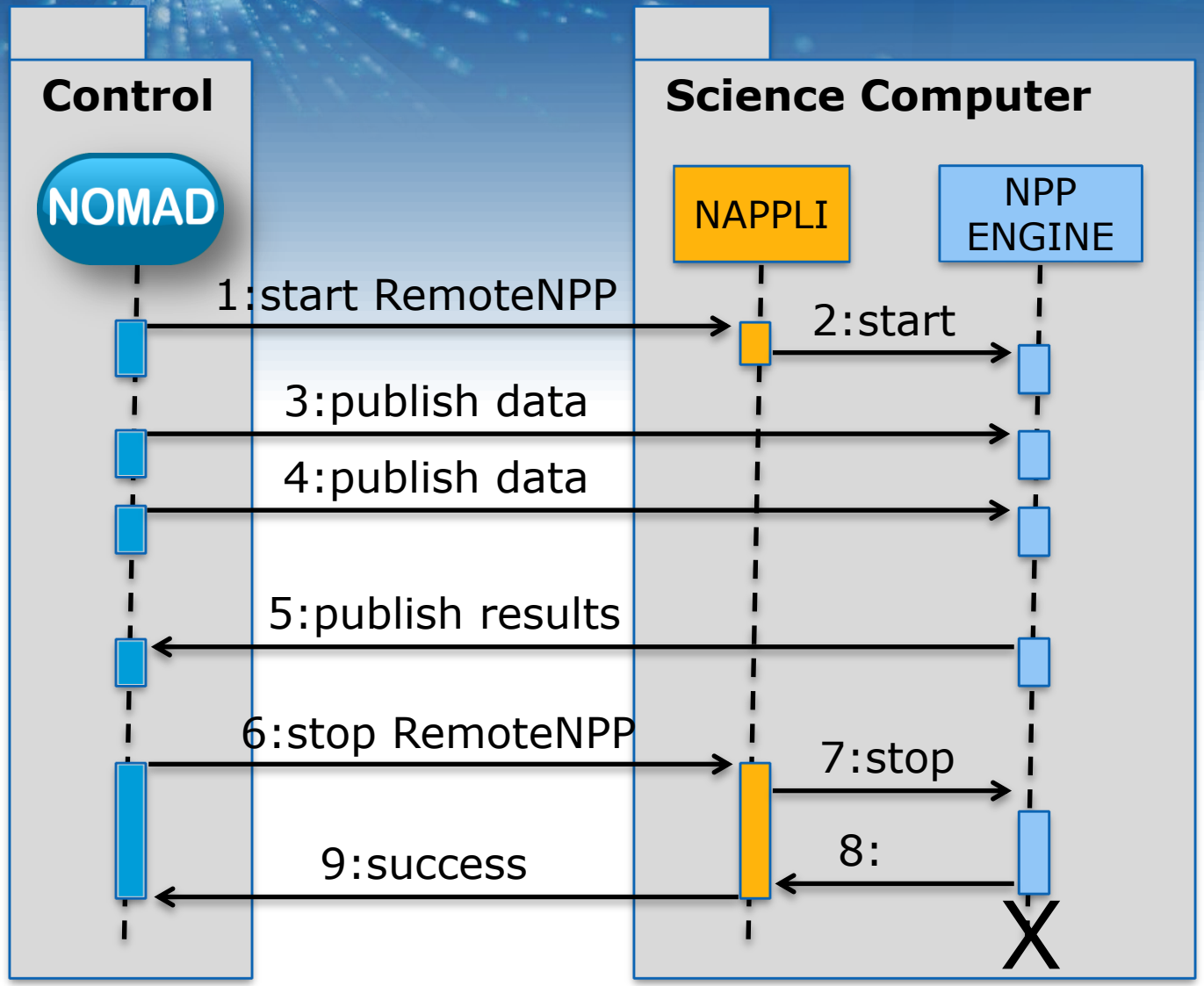
Coincidence Asynchronous Server



Coincidence Experiment Setup

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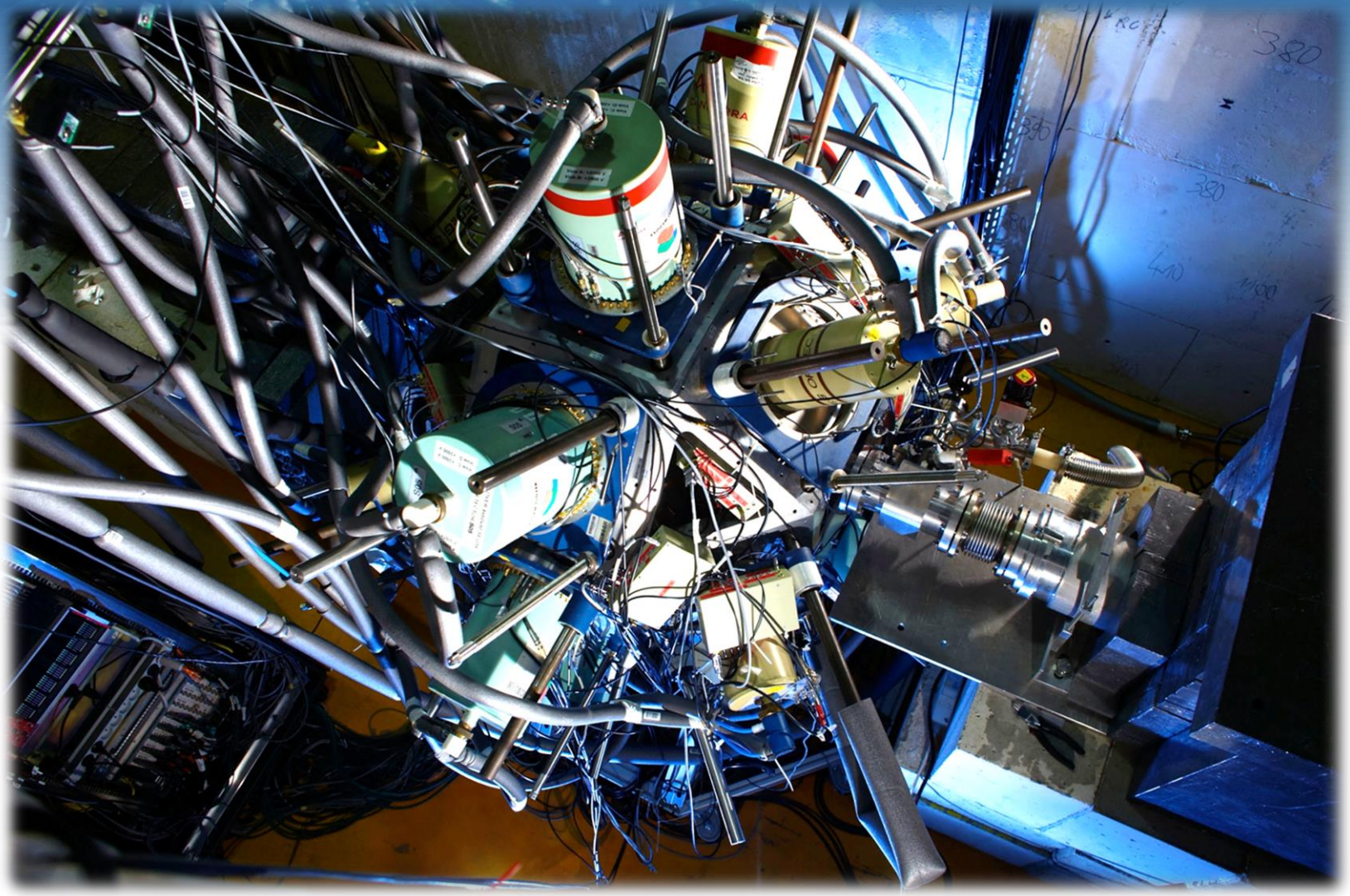
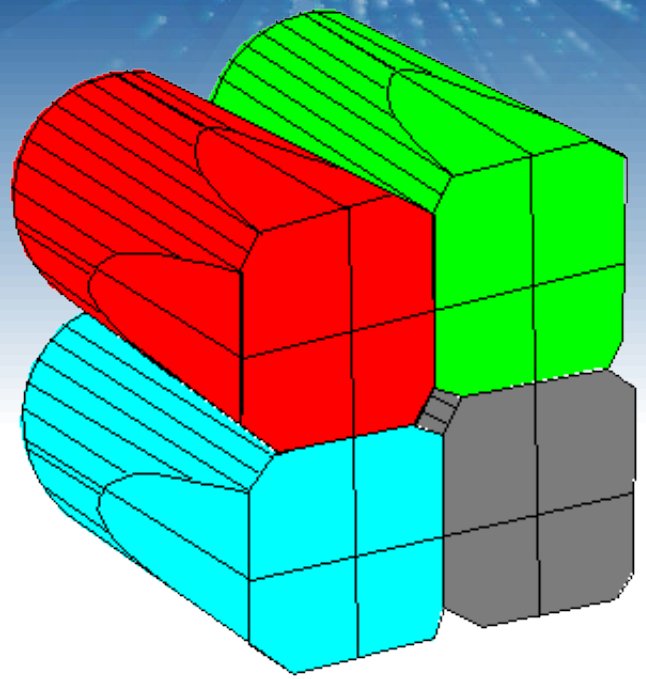
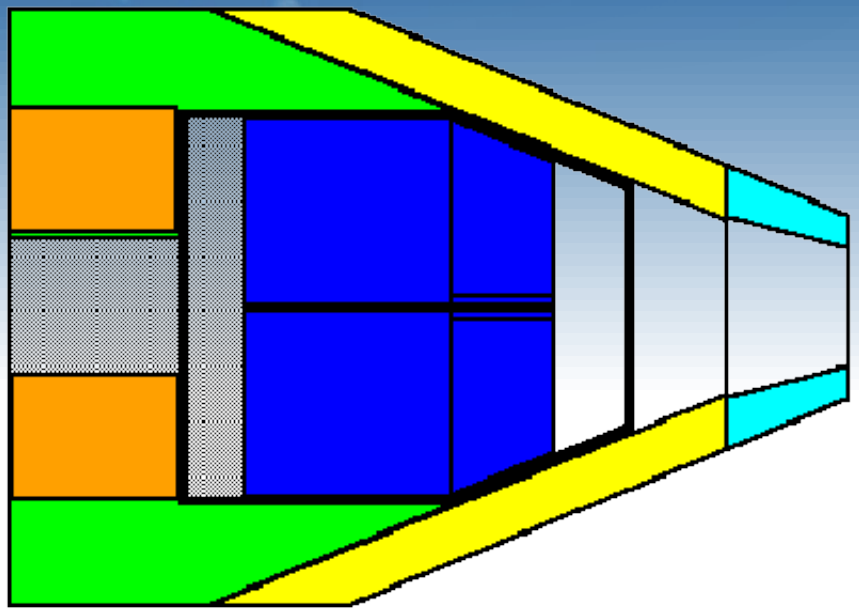


Detector Layout





- 4 x Ge crystals
- 4 x NaI back-catcher
- 8 x BGO rear side shield
- 8 x BGO side shield

24 correlated detectors

Coincidence Asynchronous Server

- Average event rate ~ 1 MHz
- Event-mode file ~ 2 GB in less than 5 min.

Detector - Crystal	Raw Rate (kHz)	Clean Rate (kHz)
1	XXX	xxx
1	1-XXX	1-xxx
2	2-XXX	2-xxx
3	3-XXX	3-xxx
4	4-XXX	4-xxx

Coincidence	Raw Rate (kHz)	Clean Rate (kHz)
Single	XXX	xxx
Fold 2	YYY	yyy
.	…	…
Fold n	ZZZ	zzz

Conclusion

NAPPLI

- Manage and organize the execution of different applications of the instrument control software
- Easily distribute and run new/existing scientific computations over different computers
- Flexible in term of platform and application's interaction
- Coming soon: decision taking within NOMAD workflow based on data analysis

http://forge.ill.fr/projects/nappli