Australian Government

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Advanced Workflow for Experimental Control

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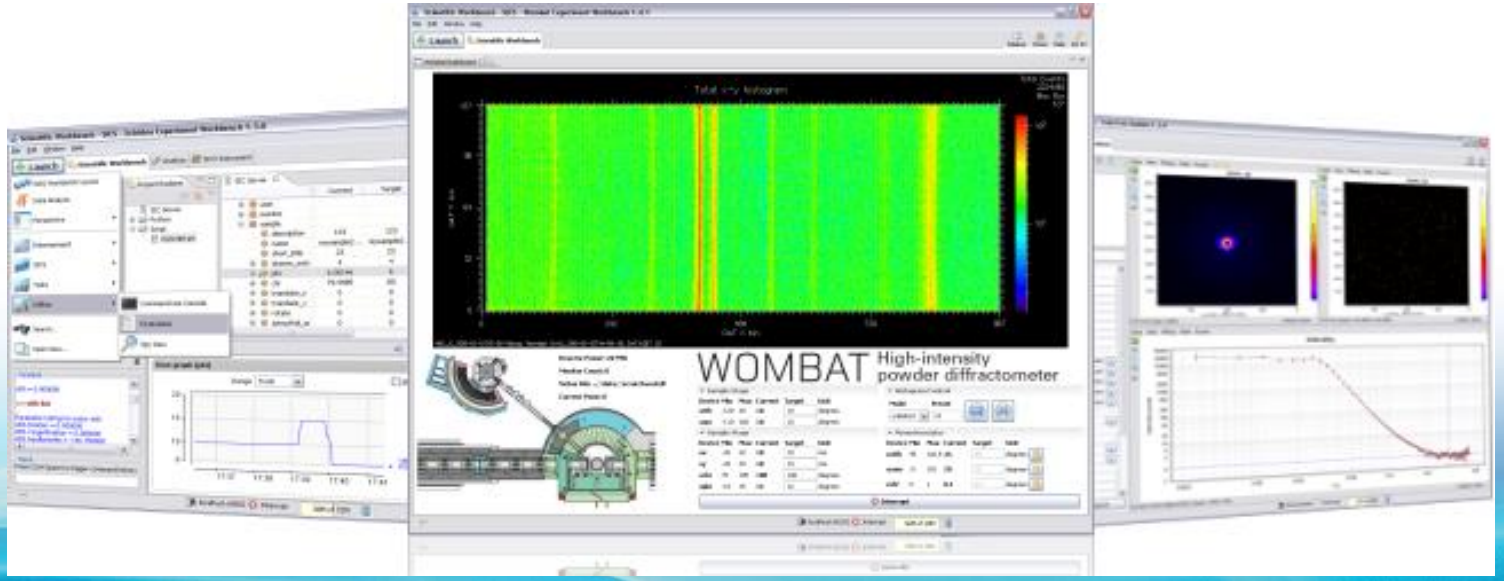
Overview

- GumTree
- Expectations
- Implementation
- Future Opportunities

GumTree

- Open Source Project (on GitHub)
- Instrument Control and Data Acquisition
- Data Correction and Reduction

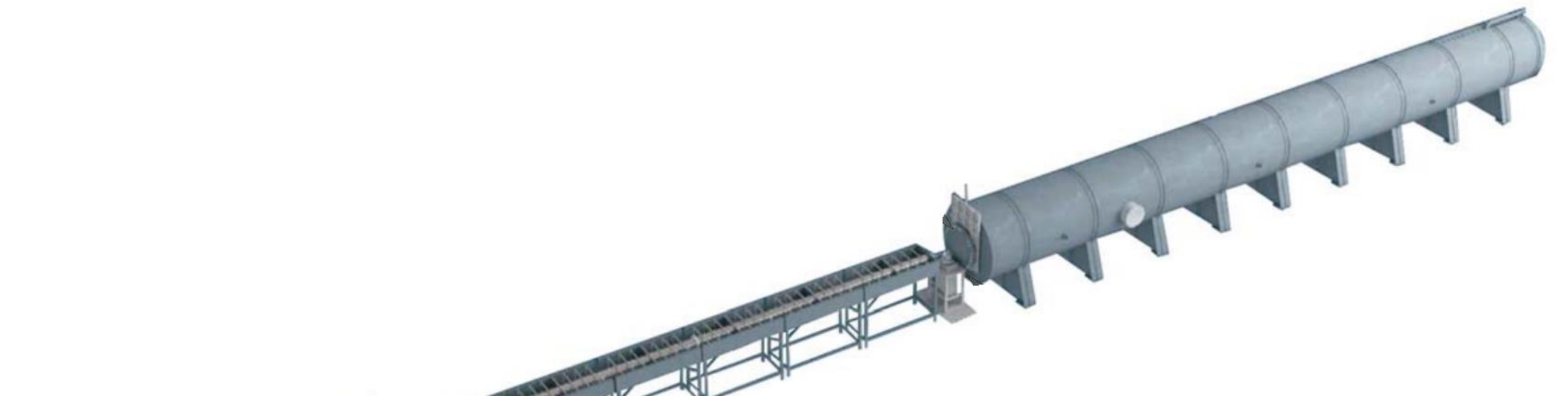


Workflow

- **User Friendly Interface for Data Acquisition**
- **Multiple Samples, Configurations and Sample Environments**

Workflow

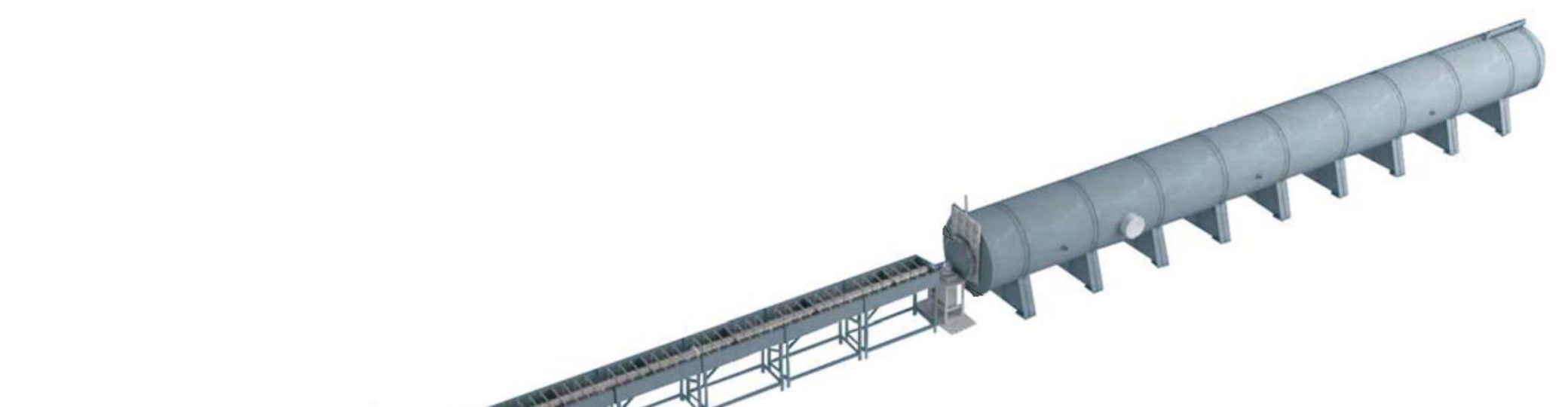
Example for Quokka:



Workflow

Example for Quokka:

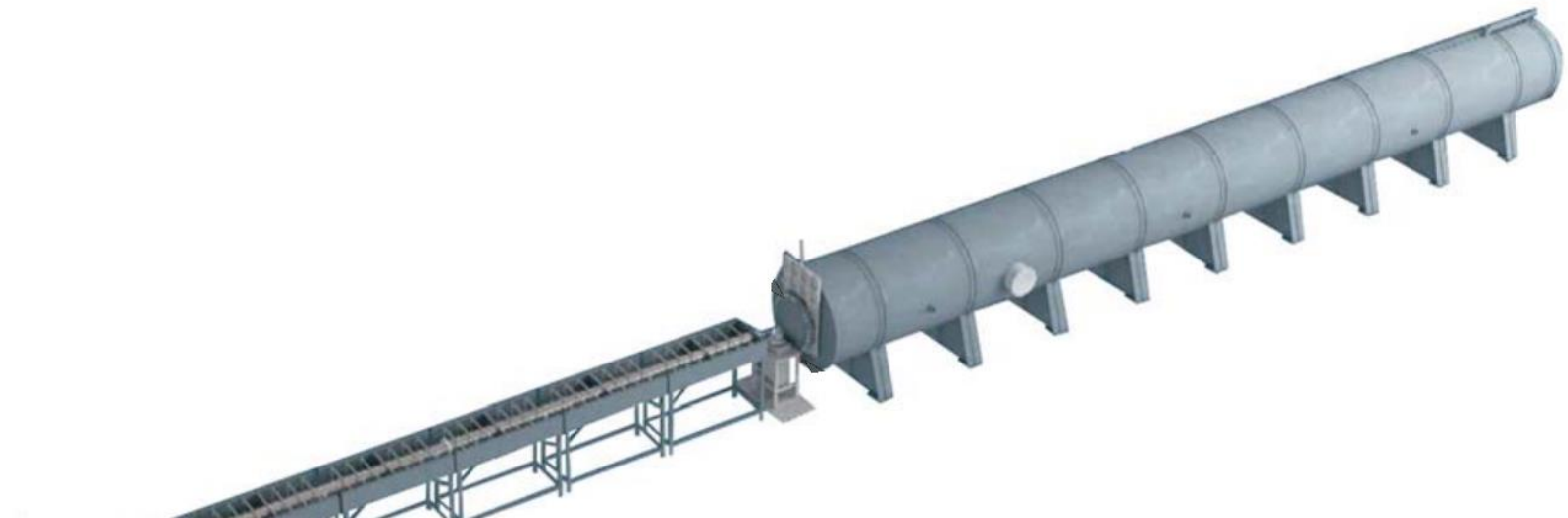
+3 Configurations



Workflow

Example for Quokka:

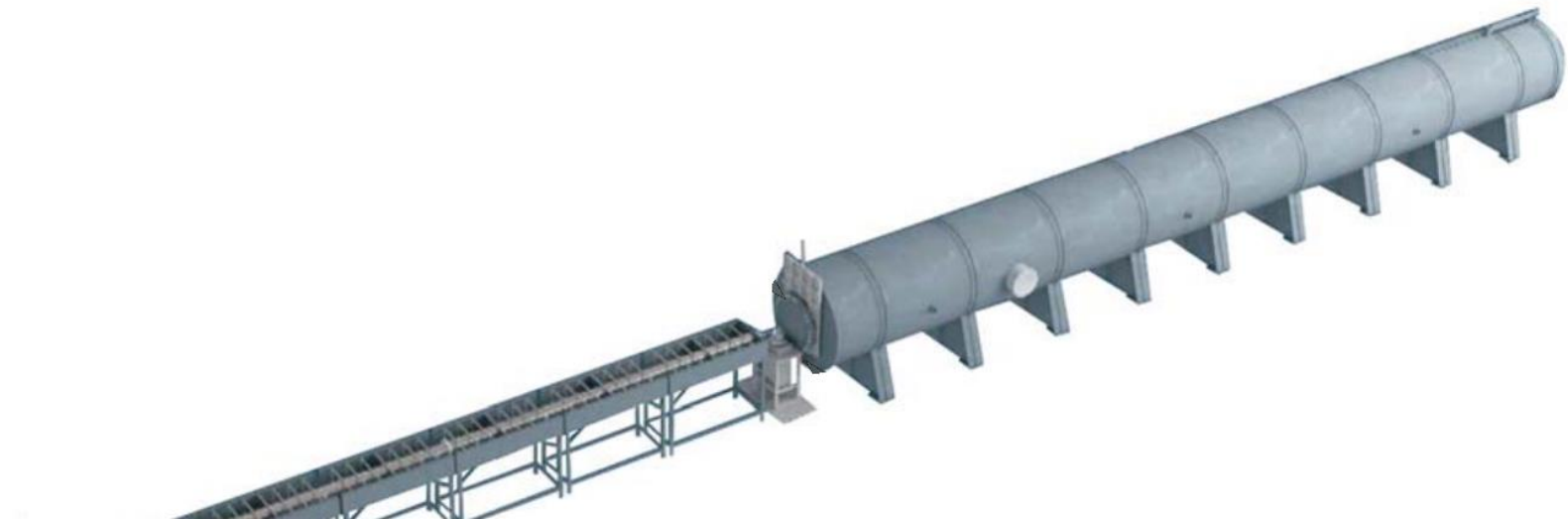
- **+3 Configurations**
- **+7 Samples**



Workflow

Example for Quokka:

- **+3 Configurations**
- **+7 Samples**
- **+5 Temperatures**



Workflow

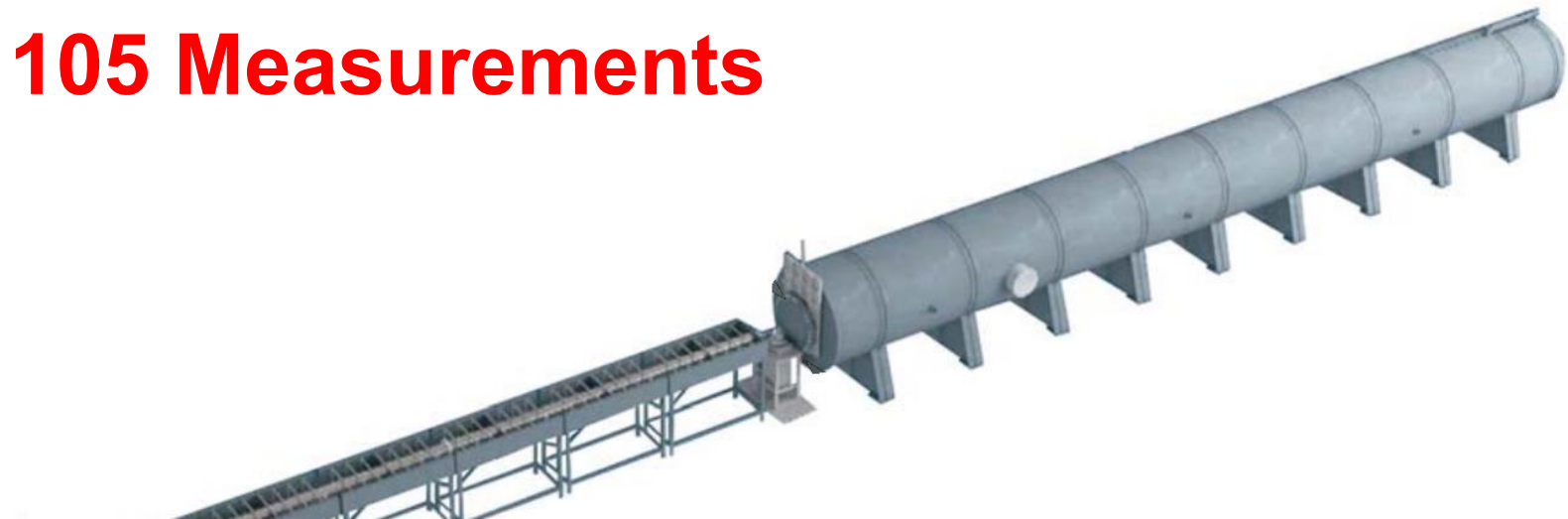
Example for Quokka:

+3 Configurations

+7 Samples

+5 Temperatures

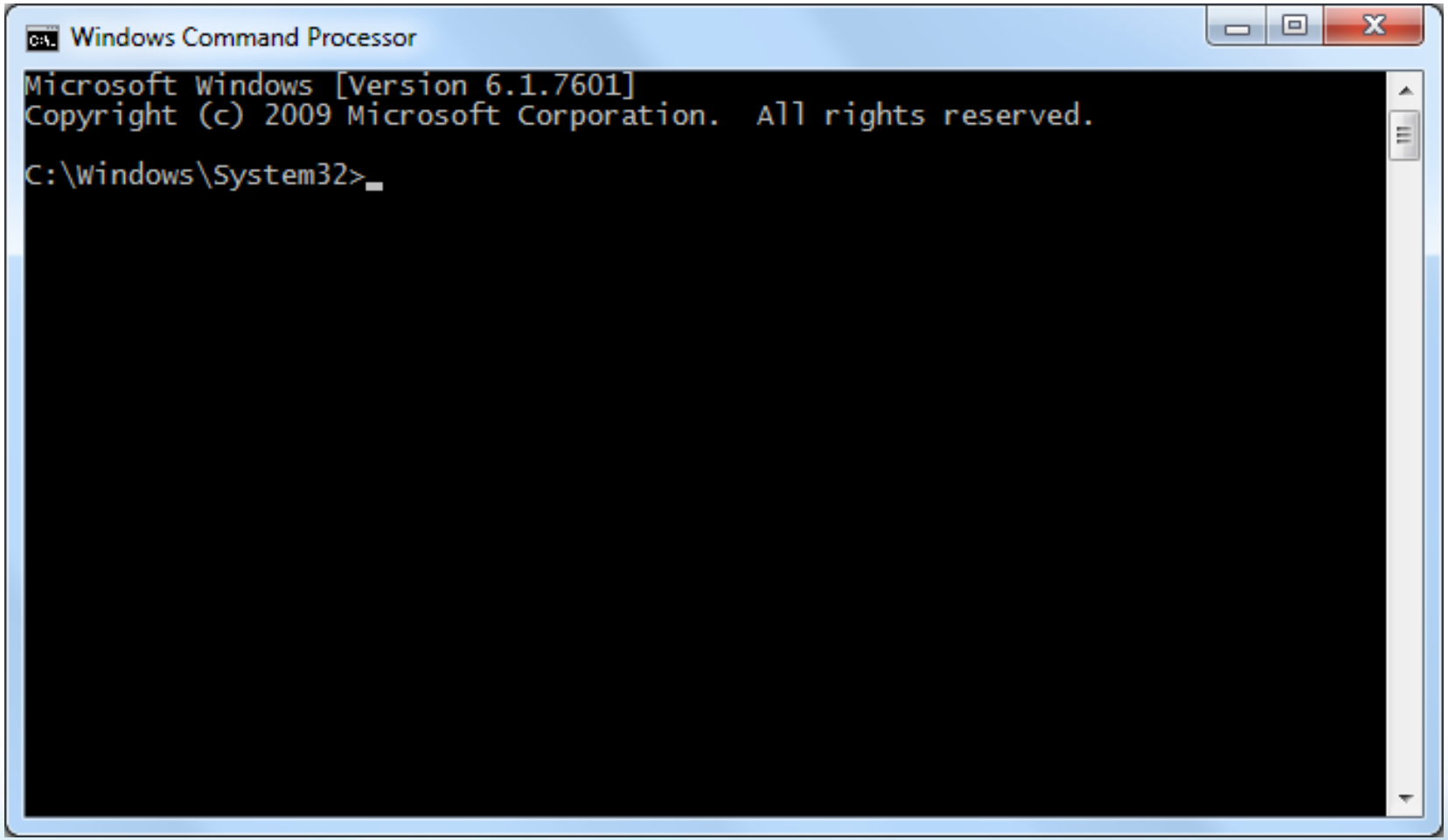
=105 Measurements



Input from Scientists

- Has to be simple
- Maximum Flexibility
- Everything on one page

Input from Scientists



Input from Scientists

- Different Experiences
- Contradicting Expectations
- Many corner cases

Conclusion

Samples

- Sample Holders
- Properties

Configurations

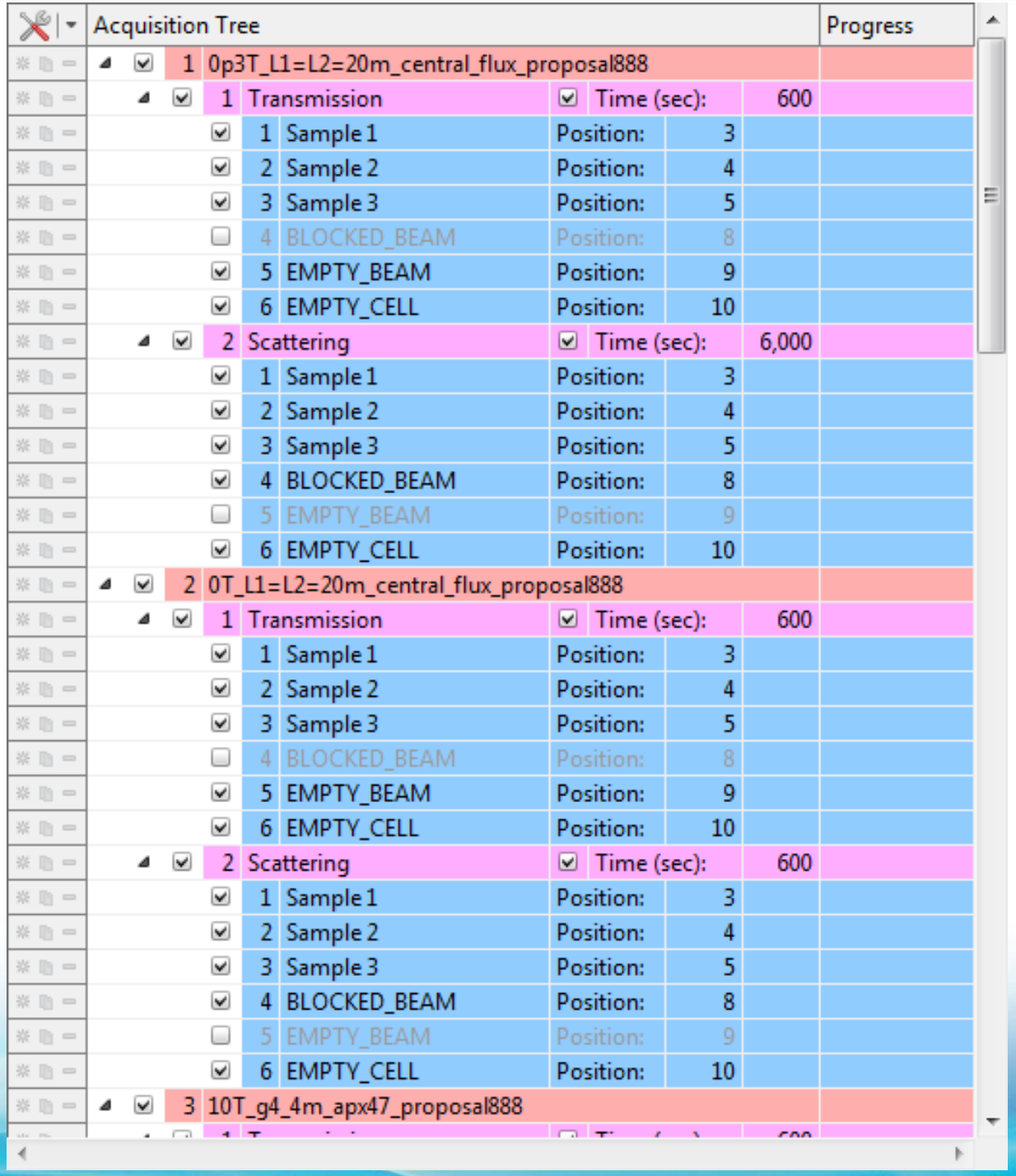
- Config. Scripts
- Transmission
- Scattering

Environments

- Temperatures, Magnets etc.
- Multi Level

Acquisition

- Start and Stop
- Time Estimation
- Fine Tuning


Acquisition Tree
Progress
1 0p3T_L1=L2=20m_central_flux_proposal888
1 Transmission Time (sec): 600
1 Sample 1 Position: 3
2 Sample 2 Position: 4
3 Sample 3 Position: 5
4 BLOCKED_BEAM Position: 8
5 EMPTY_BEAM Position: 9
6 EMPTY_CELL Position: 10
2 Scattering Time (sec): 6,000
1 Sample 1 Position: 3
2 Sample 2 Position: 4
3 Sample 3 Position: 5
4 BLOCKED_BEAM Position: 8
5 EMPTY_BEAM Position: 9
6 EMPTY_CELL Position: 10
2 0T_L1=L2=20m_central_flux_proposal888
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1 Sample 1 Position: 3
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2 Sample 2 Position: 4
3 Sample 3 Position: 5
4 BLOCKED_BEAM Position: 8
5 EMPTY_BEAM Position: 9
6 EMPTY_CELL Position: 10
3 10T_g4_4m_apx47_proposal888

Model is very import

Implementation

- Integration in existing infrastructure
- Realistic Time Estimations
- Headless Server / Thin Client
- Easy to maintain for multiple instruments

Instrument Specific

Server	Client
• Model Definition (XSD) • Instrument Interaction (Python)	• GUI Layout • Binding to Model • Send Commands

Instrument Independent

Server	Client
• Model Database • Communication Protocols • Time Estimation • …	• GumTree • Model Framework

Patterns Used

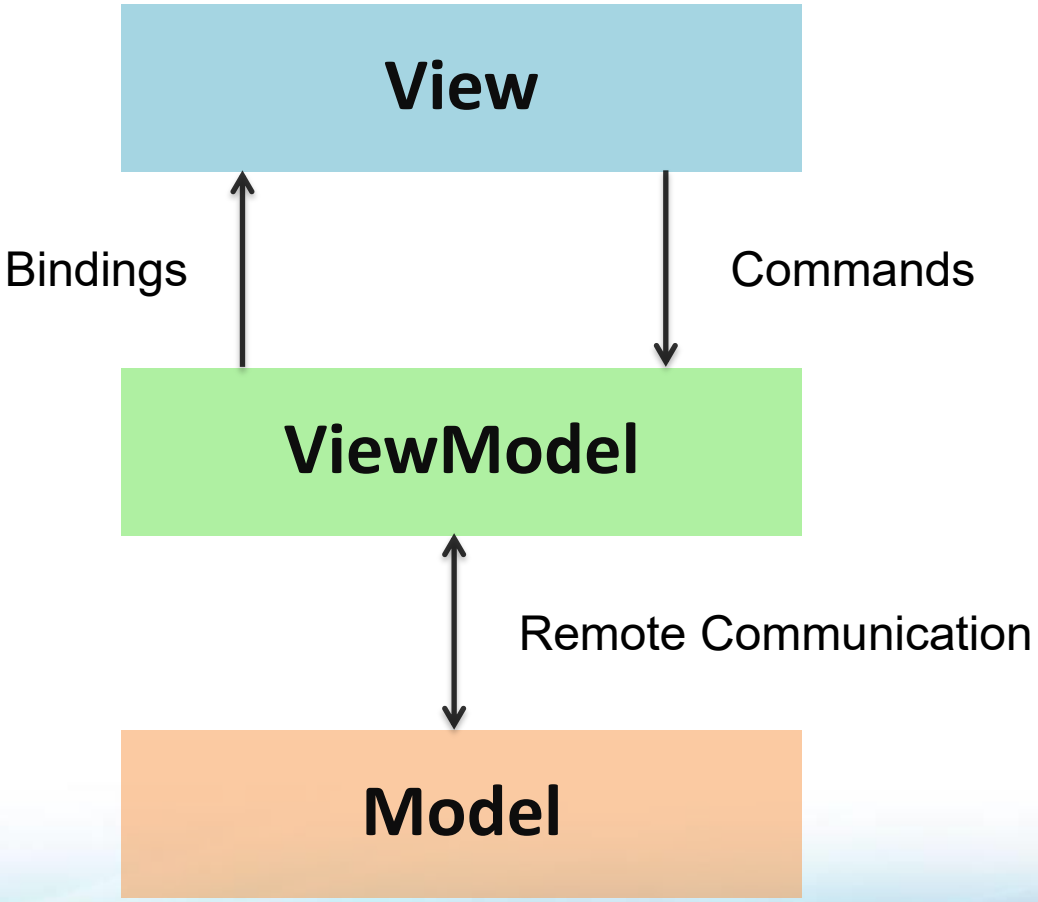
Command Pattern

- Only commands can influence model
- Easy to serialise and sent

Model View ViewModel (MVVM)

- Developed by Microsoft
- Separation between Model, ViewModel and View

MVVM Pattern



Time Estimation

- **Statistical Approach**

Time Estimation

- Statistical Approach
- Commands which are

Time Estimation

- Statistical Approach
- Commands which are
  - State Independent Time

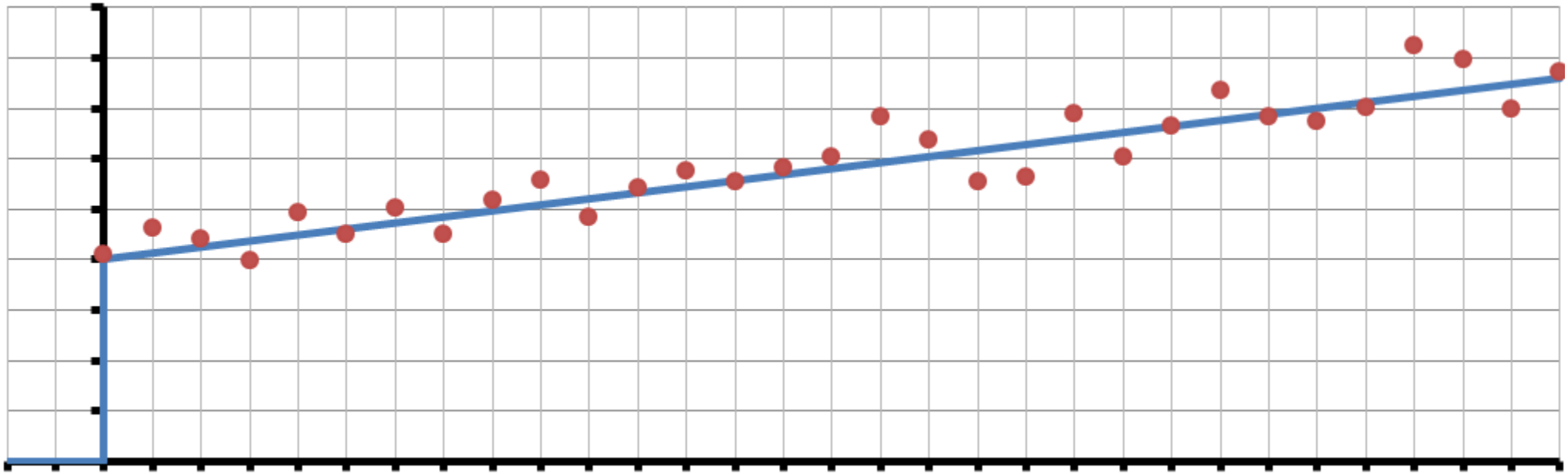
Time Estimation

- Statistical Approach
- Commands which are
  - State Independent Time
  - State Dependent

Time Estimation

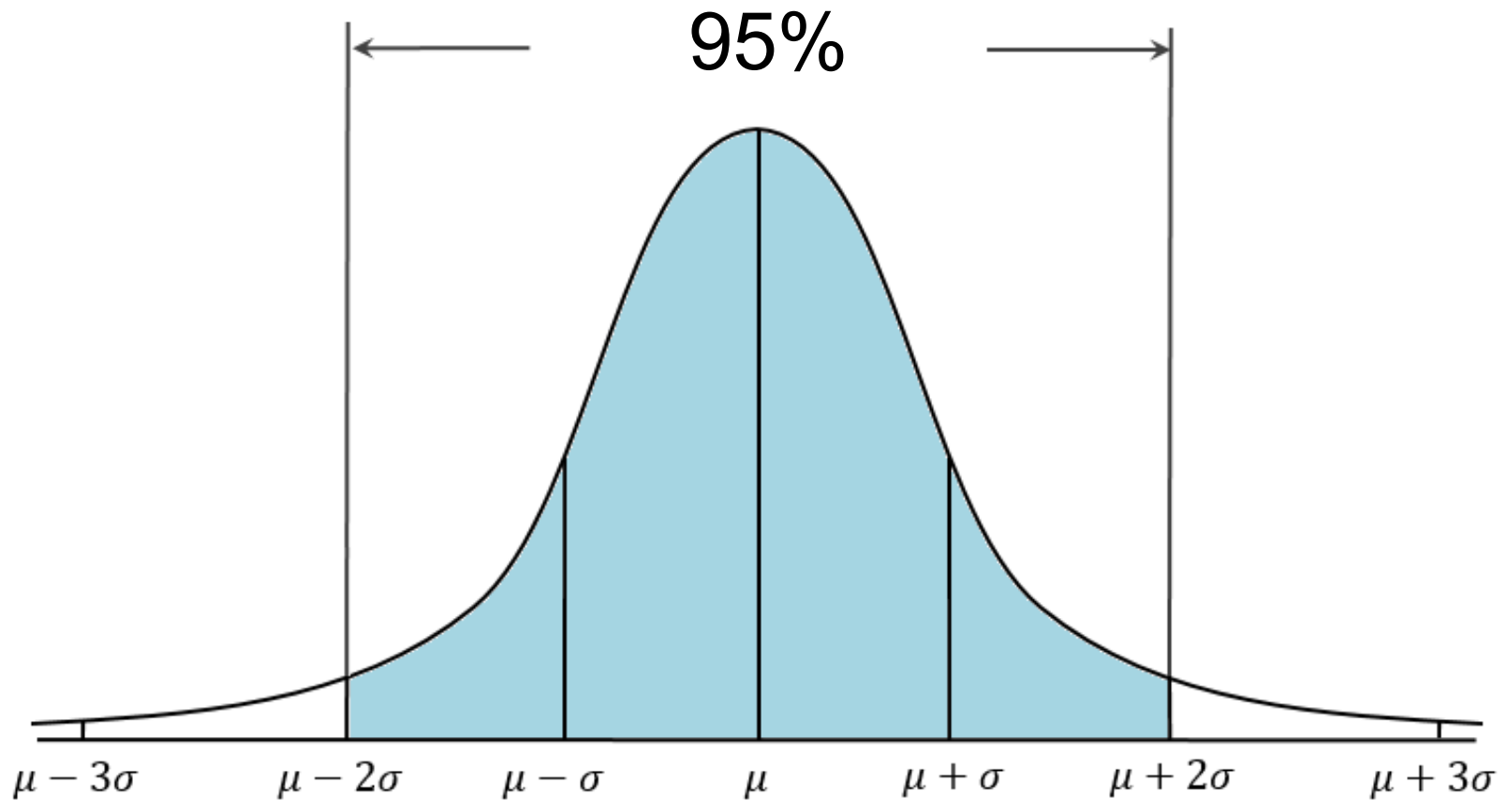
- Statistical Approach
- Commands which are
  - State Independent Time
  - State Dependent
  - Linear State Dependent

Time Estimation



Linear State Dependent

Time Estimation



Confidence Interval

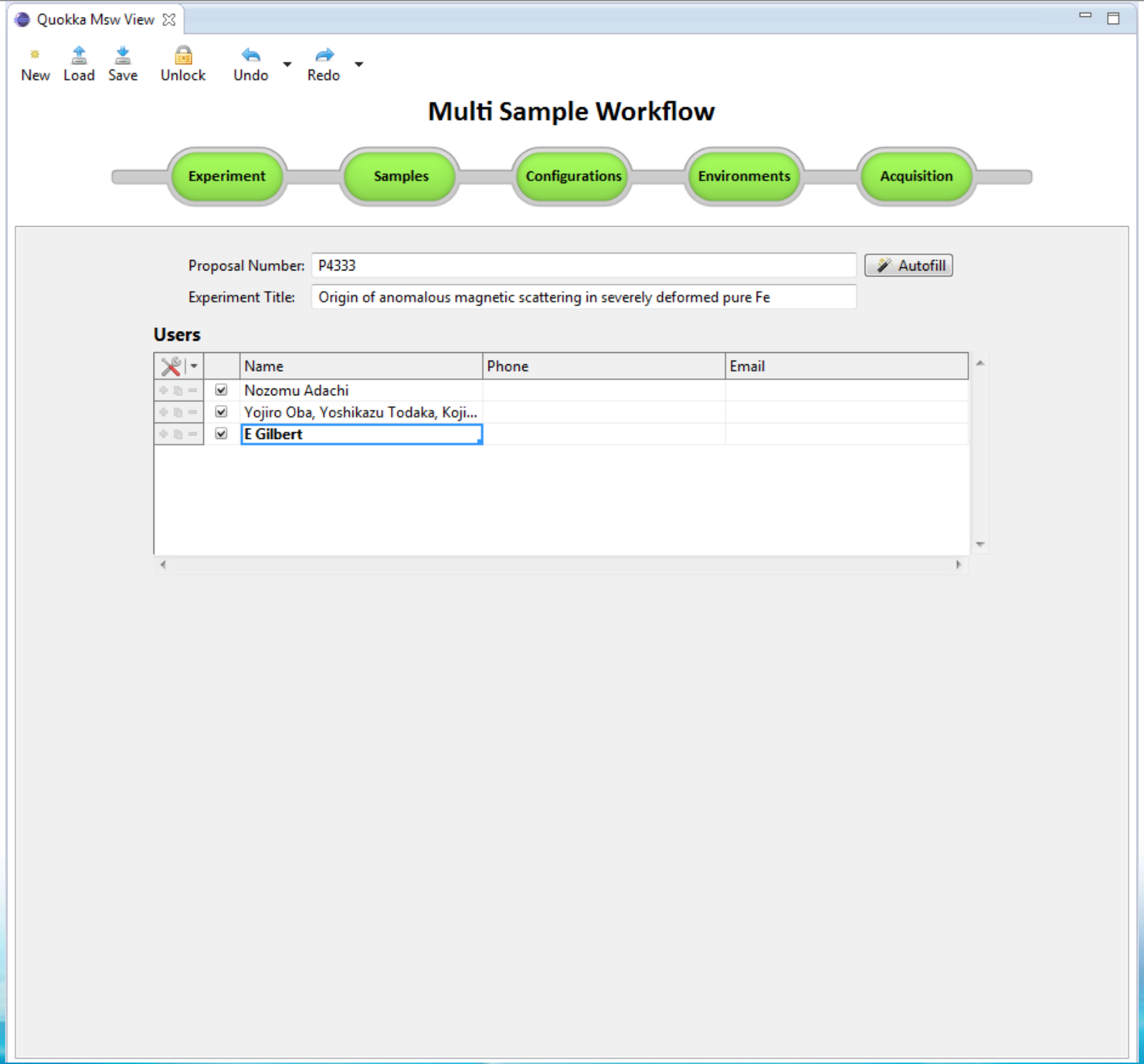
Future

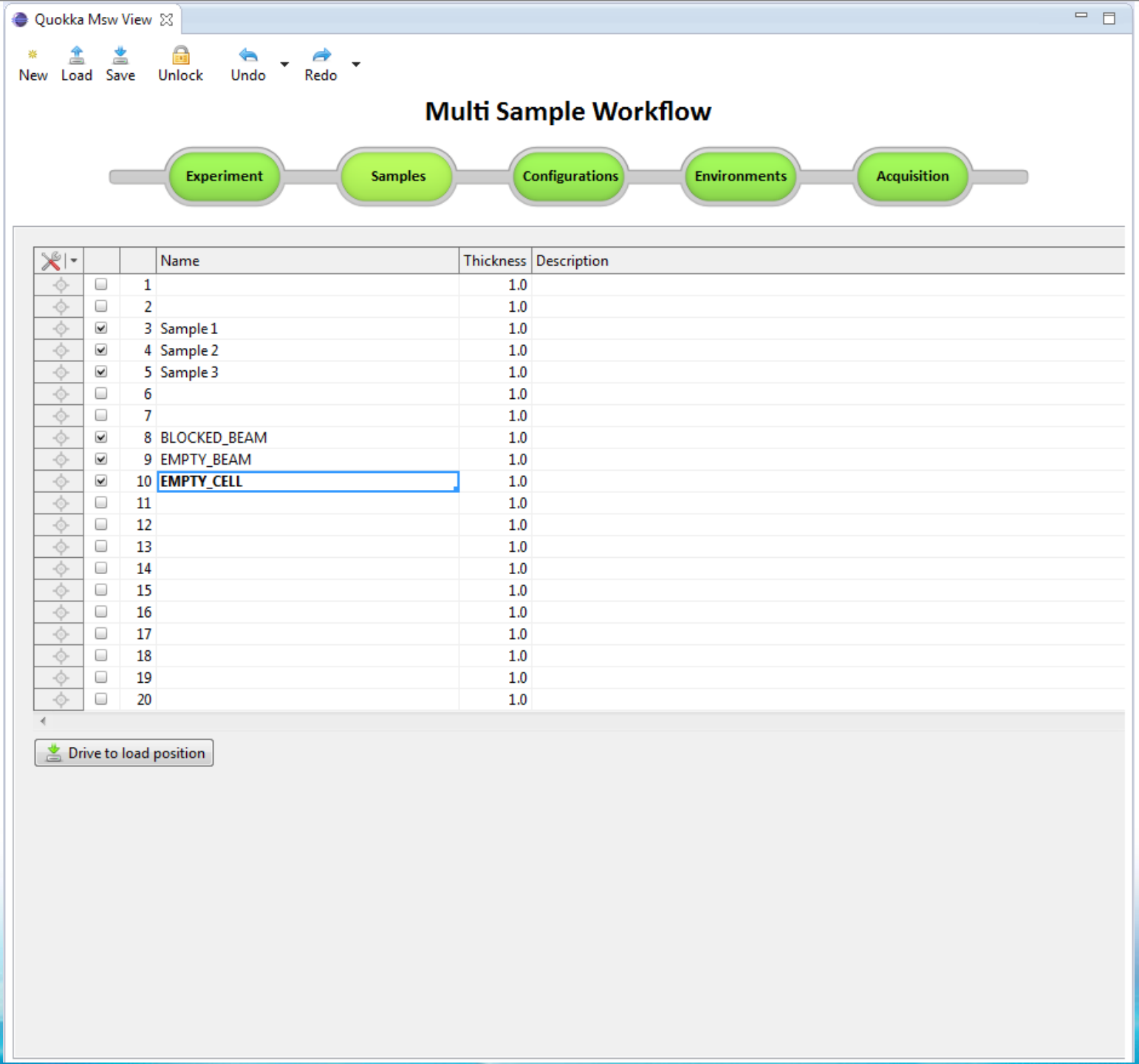
- Fault detection
- Web Viewer
- Feedback Loop

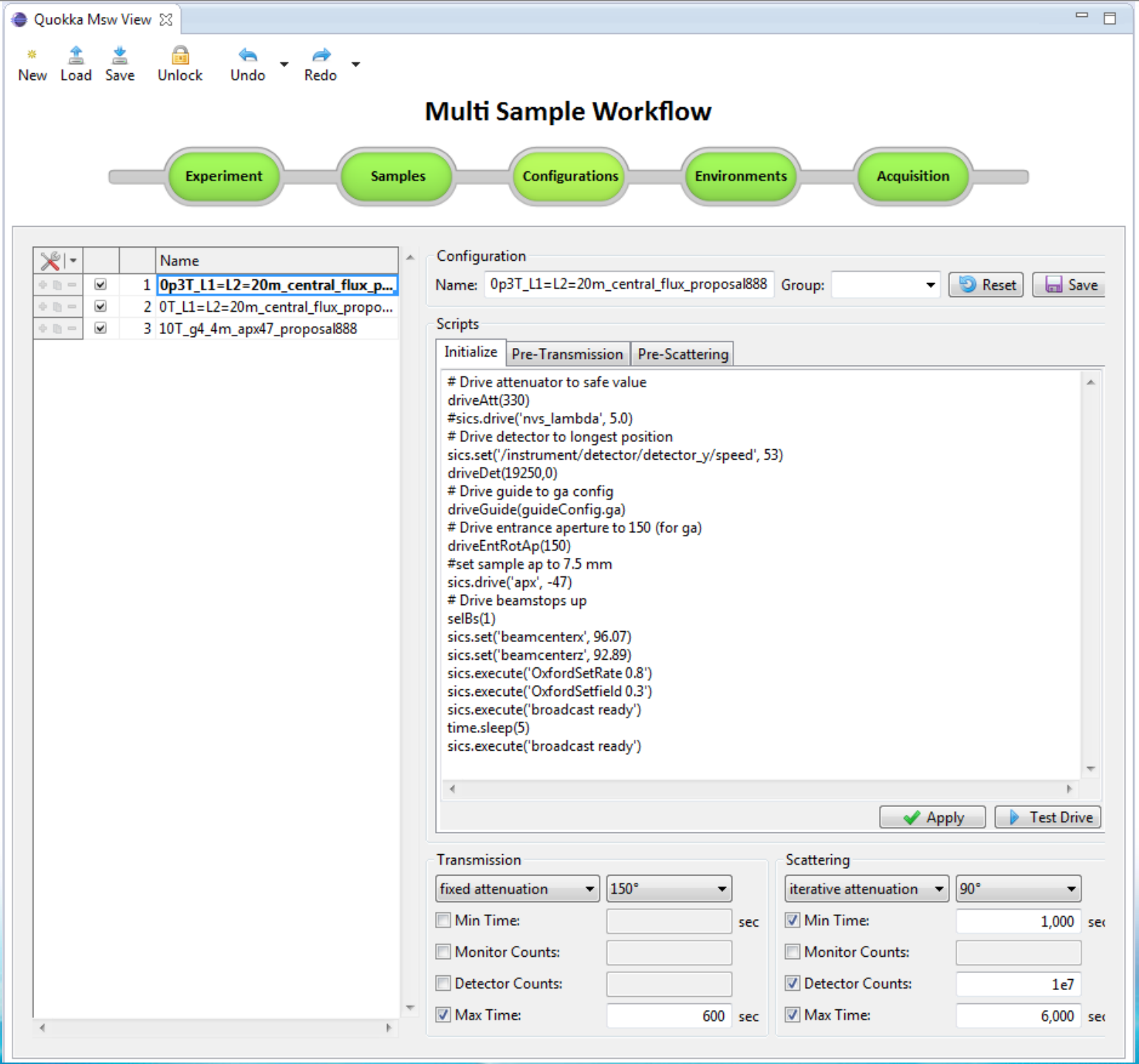
Future

- Fault detection
- Web Viewer
- Feedback Loop

Thank You


Quokka Msw View
New
Load
Save
Unlock
Undo
Redo
Multi Sample Workflow
Experiment
Samples
Configurations
Environments
Acquisition
Proposal Number:
P4333
Autofill
Experiment Title:
Origin of anomalous magnetic scattering in severely deformed pure Fe
Users
Name
Phone
Email
Nozomu Adachi
Yojiro Oba, Yoshikazu Todaka, Koji...
E Gilbert


Quokka Msw View
New
Load
Save
Unlock
Undo
Redo
Multi Sample Workflow
Experiment
Samples
Configurations
Environments
Acquisition
Name
Thickness
Description
1 1.0
2 1.0
3 Sample 1 1.0
4 Sample 2 1.0
5 Sample 3 1.0
6 1.0
7 1.0
8 BLOCKED_BEAM 1.0
9 EMPTY_BEAM 1.0
10 EMPTY_CELL 1.0
11 1.0
12 1.0
13 1.0
14 1.0
15 1.0
16 1.0
17 1.0
18 1.0
19 1.0
20 1.0
Drive to load position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New
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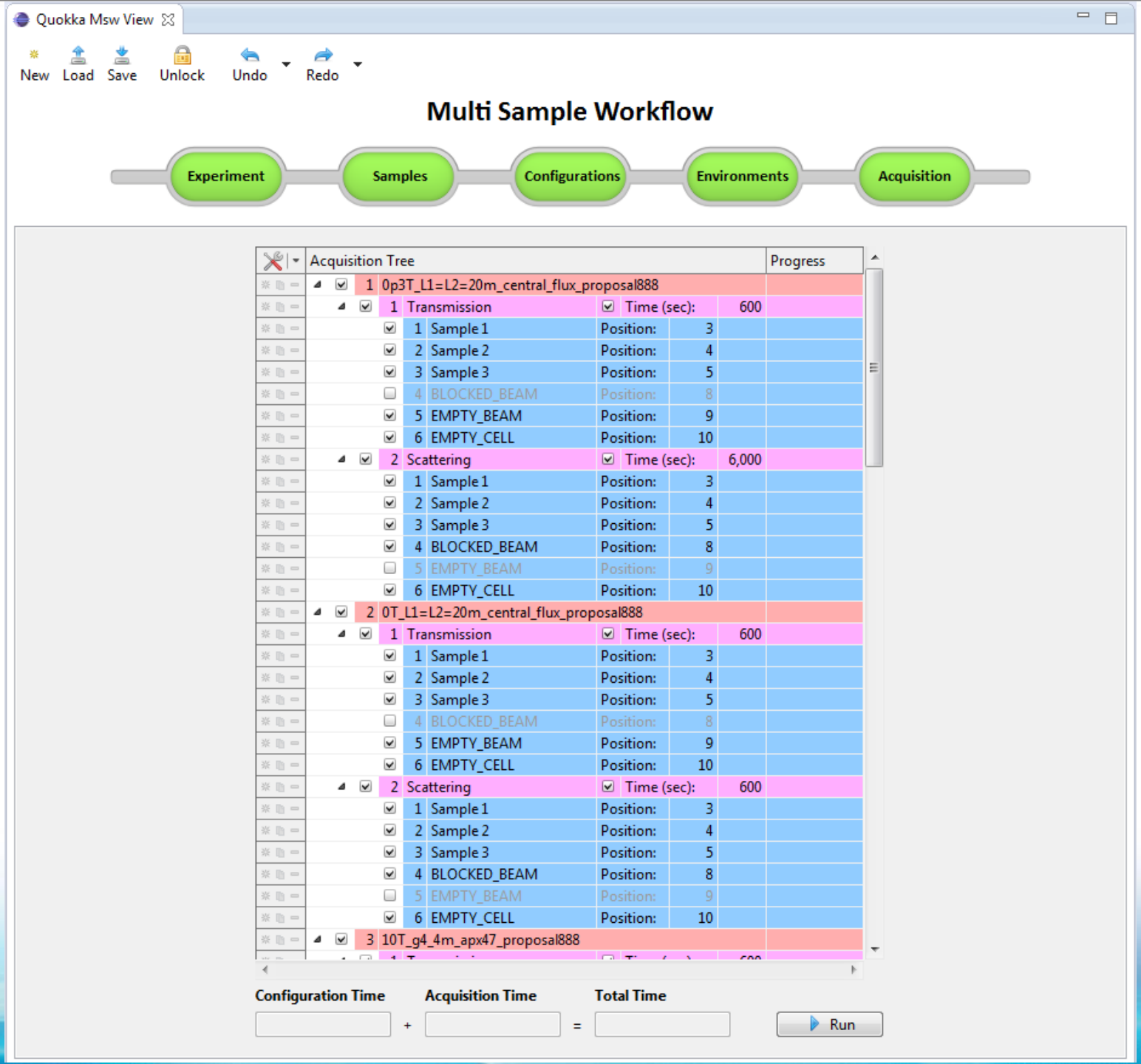
Unlock
Undo
Redo
Multi Sample Workflow
Experiment
Samples
Configurations
Environments
Acquisition
Name
1 0p3T_L1=L2=20m_central_flux_p...
2 0T_L1=L2=20m_central_flux_propo...
3 10T_g4_4m_apx47_proposal888
Configuration
Name: 0p3T_L1=L2=20m_central_flux_proposal888
Group:
Reset
Save
Scripts
Initialize
Pre-Transmission
Pre-Scattering
# Drive attenuator to safe value
driveAtt(330)
#sics.drive('nvs_lambda', 5.0)
# Drive detector to longest position
sics.set('/instrument/detector/detector_y/speed', 53)
driveDet(19250,0)
# Drive guide to ga config
driveGuide(guideConfig.ga)
# Drive entrance aperture to 150 (for ga)
driveEntRotAp(150)
#set sample ap to 7.5 mm
sics.drive('apx', -47)
# Drive beamstops up
selBs(1)
sics.set('beamcenterx', 96.07)
sics.set('beamcenterz', 92.89)
sics.execute('OxfordSetRate 0.8')
sics.execute('OxfordSetfield 0.3')
sics.execute('broadcast ready')
time.sleep(5)
sics.execute('broadcast ready')
Apply
Test Drive
Transmission
fixed attenuation
150°
Min Time:
sec
Monitor Counts:
Detector Counts:
Max Time:
600
sec
Scattering
iterative attenuation
90°
Min Time:
1,000
Monitor Counts:
Detector Counts:
1e7
Max Time:
6,000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3 10T_g4_4m_apx47_proposal888
Configuration Time
Acquisition Time
Total Time
+
=
Run