ENGINEERING CHALLENGES OF THE VMXI BEAMLINETIME

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Dr Jon Kelly

diamond
Talk Outline

• Introduction to the VMX$i$ Beamline
• DMM & Beamline
• Sample Loading
• On-axis Viewing
• Beam Conditioning
• Sample Goniometer
• Air Con CFD
• Conclusion
In-situ Versatile Macromolecular Crystallography

- Crystals measured from within the SBS plate
- Fully automated
- Remote access
- High throughput
- High data capture rate
- High flux
DMM & Beamline

- DMM Operates over 10-25 keV
- Designed to operate with ~ 500 W
- Beam Stability at sample 34 nrad RMS 1-350 Hz
- Diamond Power Filters
- CuCrZr Alloy Masks
Sample Loading

- Formulatrix units present plate thru rear hatch
- External 6 axis robot
- Pneumatic revolving fail safe load-lock
- Internal temperature controlled storage
- Internal gantry robot
- Numerous in-position switches & bar code readers
Beam Conditioning

- He water cooled environment
- 3D printed flexure attenuator foil mounts
- Single crystal diamond XBPM
- DC Servo Shutter/Chopper, open time < 3 ms, transition time < 20 µs
- Boron doped diamond window I1 detector
On-axis Viewing

Fast & Repeatable lens insertion mechanism
• Mounted upon a granite arch
• Optimum lens for pattern recognition
• Drilled lens for commissioning
• Lenses driven onto axis by servo stages
• Kinematic location features
• He pipe for scatter reduction
• Aperture stick on fast retract servo stage
Aim: Large range, high speed, high accuracy

• Base X/Z stage < 50 nm bi-dir repeatability
• Air bearing Omega rotation
• Sample Z Stage
• Parallel kinematic X/Y stage
• Pneumatic sample tilt 0°-20°

Prototype X/Z test < 200 nm bi-dir repeatability
Air Conditioning CFD

Aim: Good thermal stability ± 0.1°C
• Prevent 4°C air passing sample position
• Minimise heat loads by ducting away detector heat
Conclusion

The Endstation is currently being assembled & commissioned with first user planned for December

Thank you