



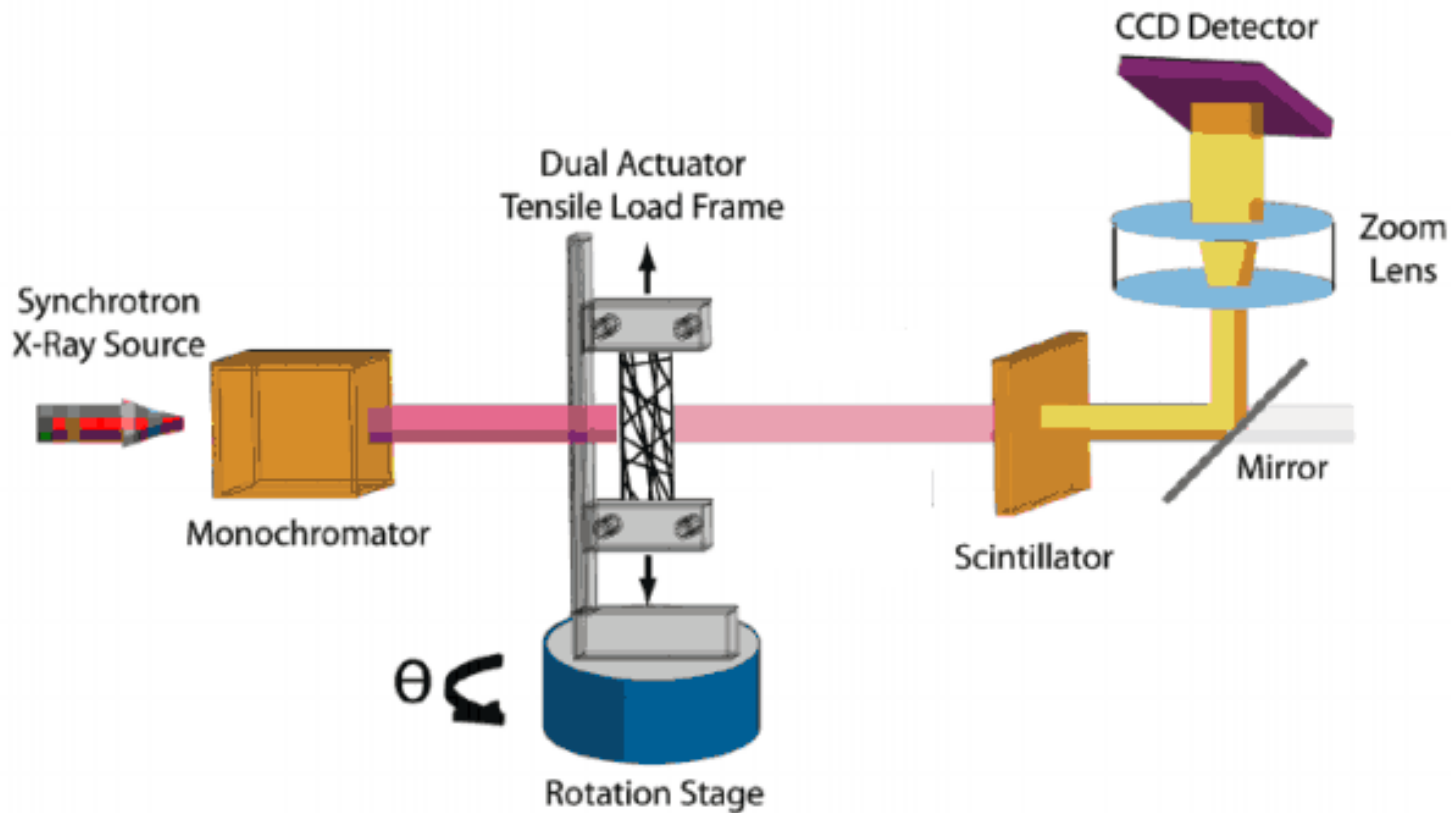
Development of a prototype x- ray computed tomography instrument

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Meredith Silberstein



The Experiment



-Theory

-Software

-Analysis

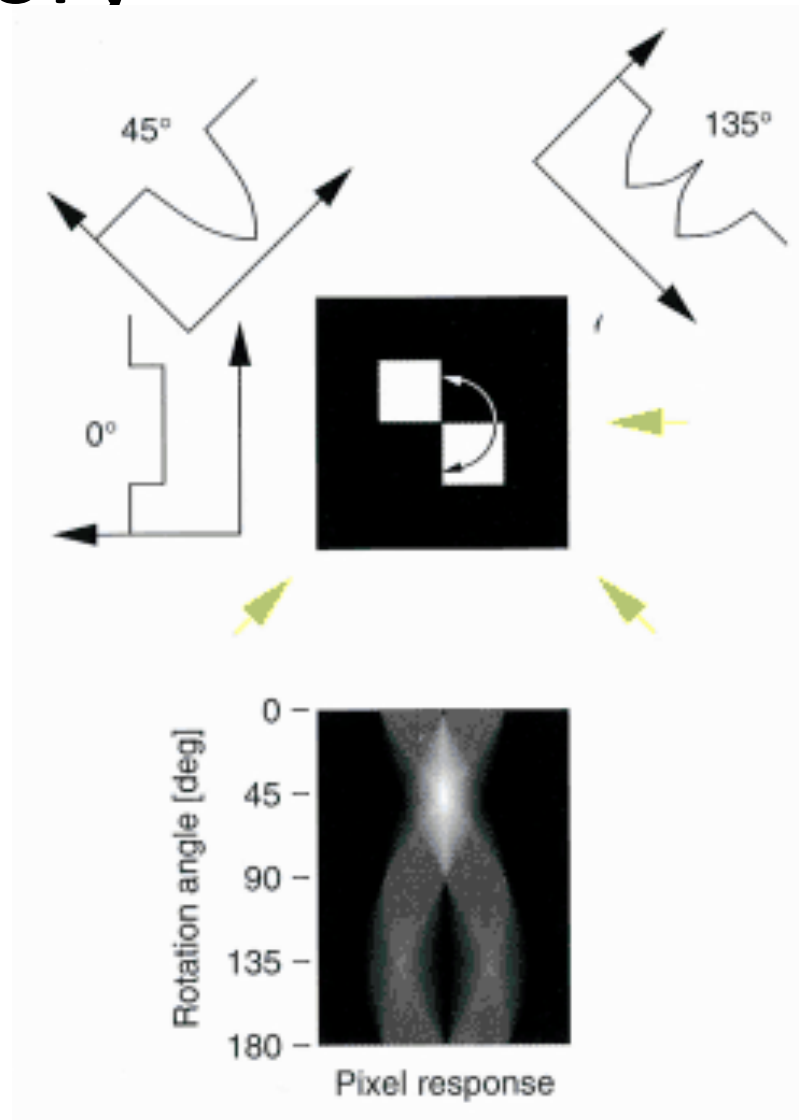
-Hardware

-Detectors/Imaging



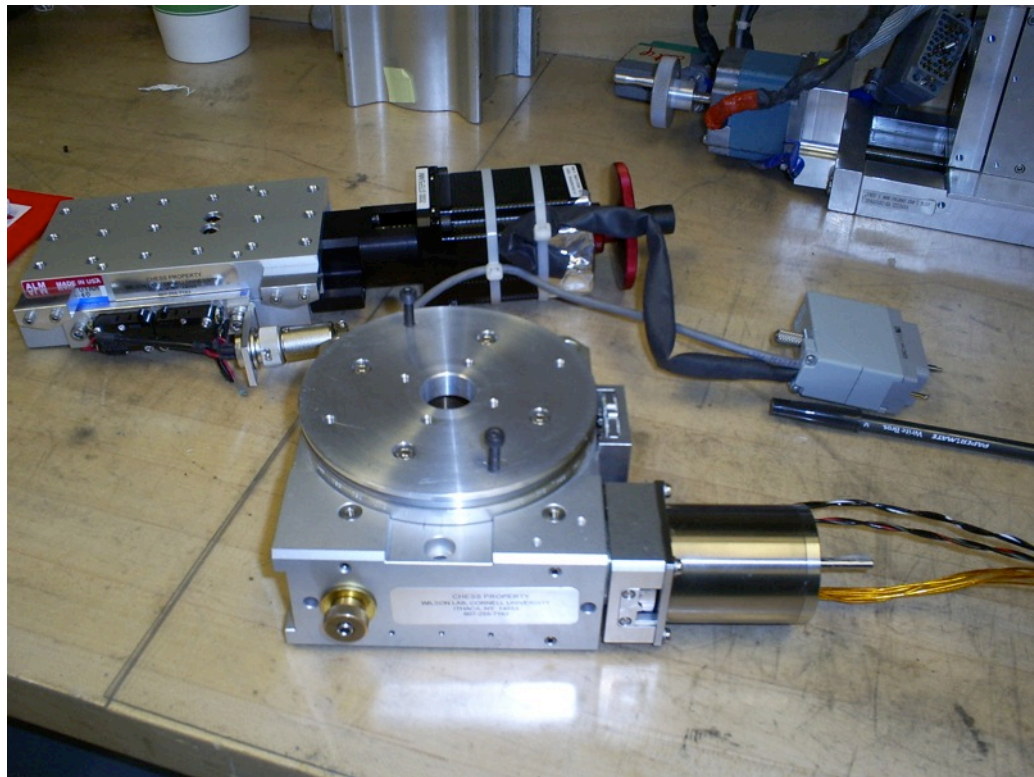
Theory

- X-ray Absorption
- CAT Scan
- Small scale Fibers
- Fourier Slice Theorem
- Imaging
- Uses





Hardware; Motors



- Stepper Motors
- -x/y/z/ θ / ϕ / ψ
- -Microstepping
- -Worm Gear

- Optical Tables

- Computer Controlled



Software

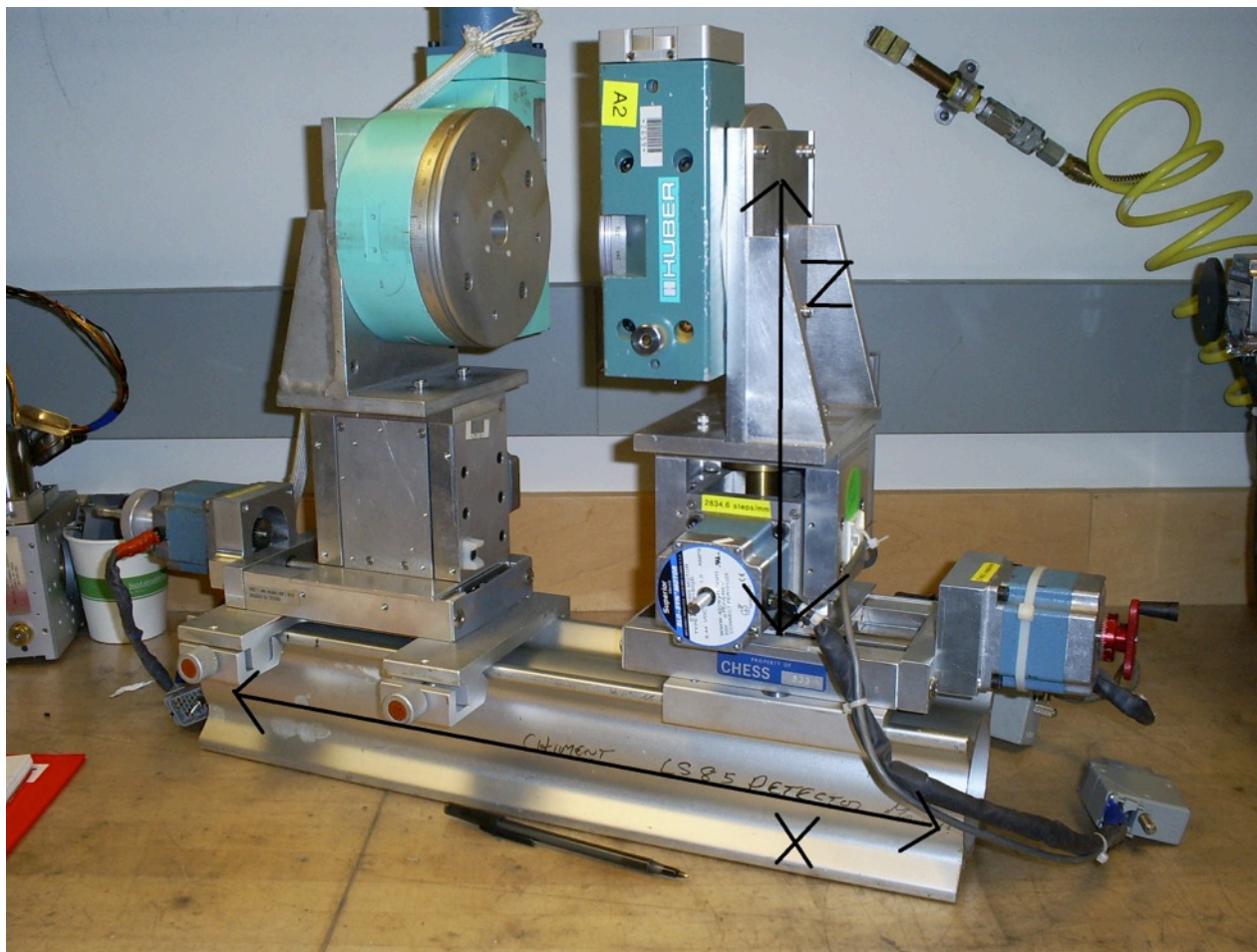
- Spec
- Configuration
- Macros

```
specuser: spec
File Edit View Scrollback Bookmarks Settings Help
Can't use "xu" as a motor mnemonic. It's already a motor mnemonic.
Can't use "xd" as a motor mnemonic. It's already a motor mnemonic.
Can't use "unused" as a motor mnemonic. It's already a motor mnemonic.
Galil motor "m22" (unit 1, ch 6) unusable: duplicate channel.
NEWPORT XPS motor "rgv" (unit 0, ch 0) unusable: unit not configured.
Can't use "h409" as a motor mnemonic. It's already a motor mnemonic.
Galil motor "mmxr" (unit 3, ch 0) unusable: unit not configured.
Galil motor "mmyr" (unit 3, ch 1) unusable: unit not configured.
Galil motor "mmzr" (unit 3, ch 2) unusable: unit not configured.
Galil motor "mmzl" (unit 3, ch 3) unusable: unit not configured.
Galil motor "mmyl" (unit 3, ch 4) unusable: unit not configured.
Galil motor "mmld" (unit 3, ch 5) unusable: unit not configured.
Can't use "ome" as a motor mnemonic. It's already a motor mnemonic.
Can't use "m42" as a motor mnemonic. It's already a motor mnemonic.
Can't use "m43" as a motor mnemonic. It's already a motor mnemonic.
Galil motor "mbad44" (unit 0, ch 0) unusable: duplicate channel.
Can't use "m44" as a motor mnemonic. It's already a motor mnemonic.
Galil motor "mbad45" (unit 0, ch 1) unusable: duplicate channel.
ESP300 motor "samx" (unit 0, ch 0) unusable: controller unresponsive.
ESP300 motor "samy" (unit 0, ch 1) unusable: controller unresponsive.
PSEUDO controller doesn't allow reassignment of monitor channel.
Loading /usr/local/lib/Macros/dist/site.mac...
Reading file "/usr/local/lib/Macros/dist/site.mac".
Loading /usr/local/lib/Macros/dist/chess.mac...
Reading file "/usr/local/lib/Macros/dist/chess.mac" (level 2).
Loading /usr/local/lib/Macros/nondist/energy_local.mac...
Reading file "/usr/local/lib/Macros/nondist/energy_local.mac" (level 3).
Loading /usr/local/lib/Macros/dist/local.mac...
Reading file "/usr/local/lib/Macros/dist/local.mac" (level 3).
Using "/home/specuser/roll_2012Jul03.dat". Next scan is number 1.
Loading /usr/local/lib/Macros/dist/chess_scans.mac...
Reading file "/usr/local/lib/Macros/dist/chess_scans.mac" (level 3).
Loading /usr/local/lib/Macros/dist/chess_macros.mac...
Reading file "/usr/local/lib/Macros/dist/chess_macros.mac" (level 3).
Loading /usr/local/lib/Macros/nondist/chess_admin.mac...
Reading file "/usr/local/lib/Macros/nondist/chess_admin.mac" (level 2).
Loading /usr/local/lib/Macros/nondist/station.mac...
Reading file "/usr/local/lib/Macros/nondist/station.mac" (level 2).
Loading /usr/local/lib/Macros/nondist/chess_admin.mac...
Reading file "/usr/local/lib/Macros/nondist/chess_admin.mac" (level 3).
Loading /usr/local/lib/Macros/nondist/plot_util.mac...
Reading file "/usr/local/lib/Macros/nondist/plot_util.mac" (level 3).
Loading /usr/local/lib/Macros/nondist/plotlast.mac...
Reading file "/usr/local/lib/Macros/nondist/plotlast.mac" (level 4).
Loading /usr/local/lib/Macros/nondist/plotlast.mac...
Loading /usr/local/lib/Macros/nondist/multiple_motor.mac...
Reading file "/usr/local/lib/Macros/nondist/multiple_motor.mac" (level 3).
Loading /home/specuser/Macros/userlist.mac...
Reading file "/home/specuser/Macros/userlist.mac".
632.SPEC> mv picol 50
specuser: spec
```





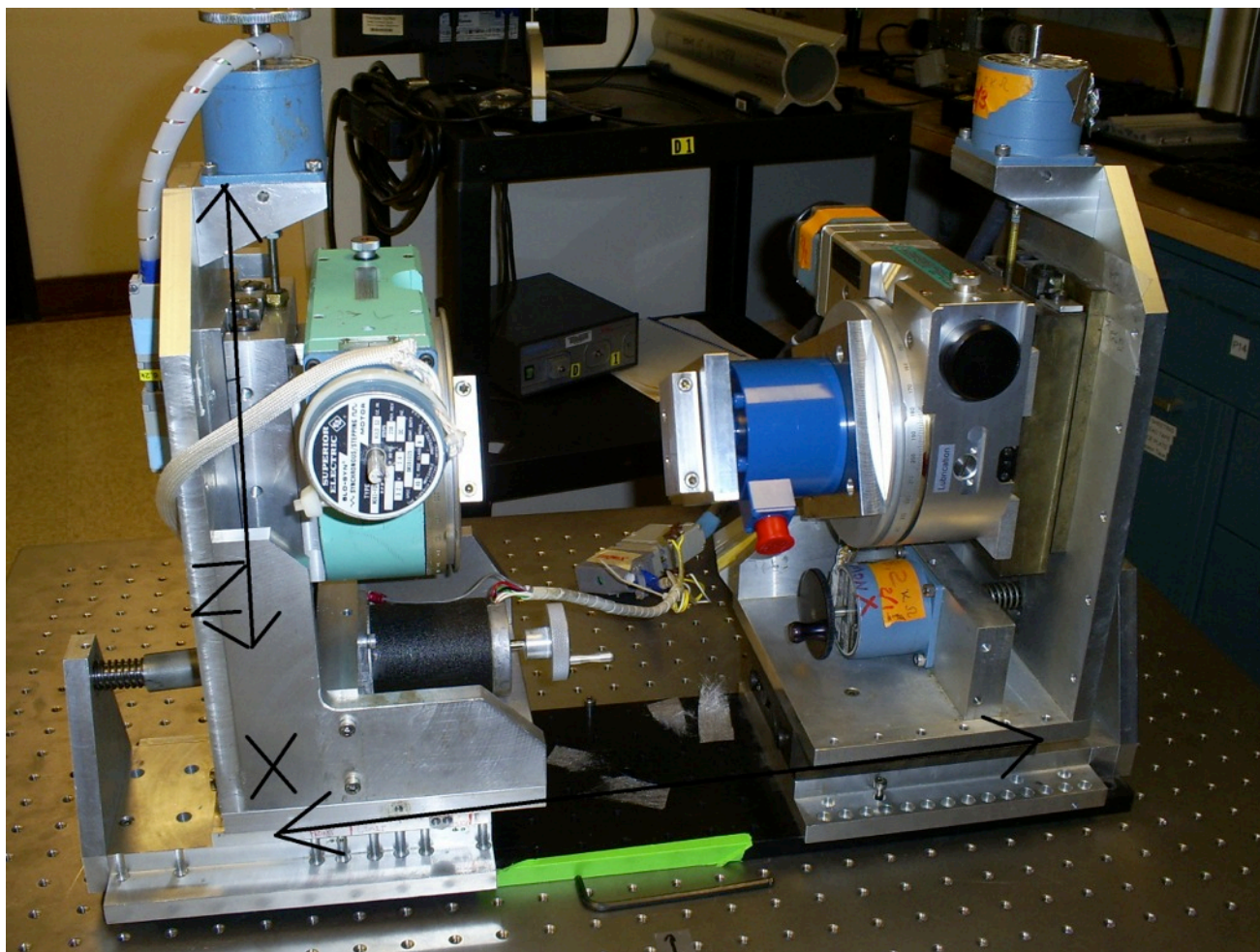
Prototype; Dummy 2.0



- Team Meeting
 - Horizontal
 - Concept
- Brand new 3-D images
- Design and Refinement



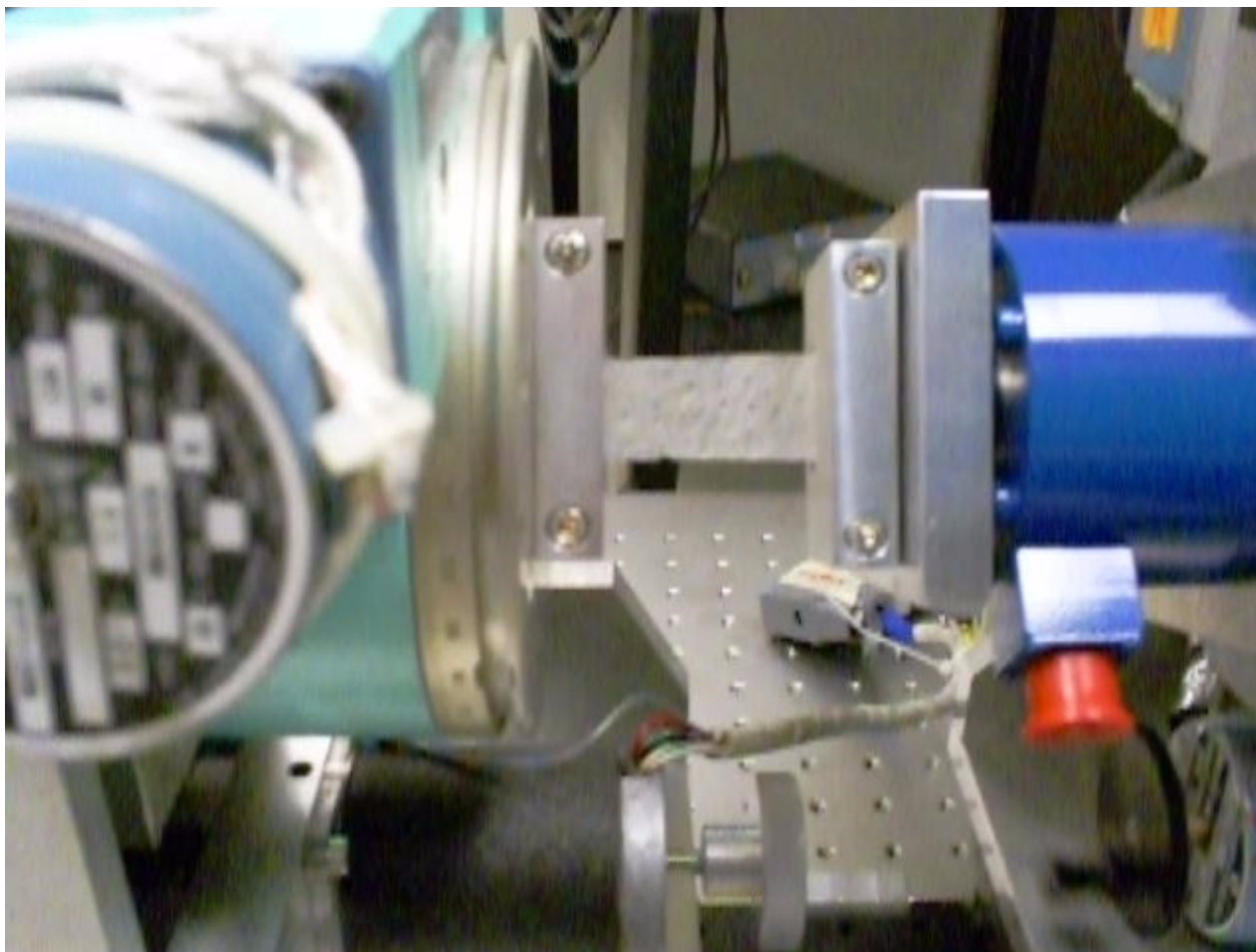
Prototype; Dummy 3.4



- Refinement
- Improvement
- Problems



Results





Looking Forward

- Refinement of current design
- Detectors
- Imaging software
- Calibration
- Full x-ray computed tomography trial
 - X-ray back room



References

- Theory Image: An Introduction to Synchrotron Radiation by P. Willmott (2011)
- Experiment Image by Meredith Silberstein
- Acknowledgments: Chris Conolly, Eric Edwards, Mike Cook, Jerry Houghton
- NSF DMR-0936384