

# Large mirror test stand

Jan Vanek

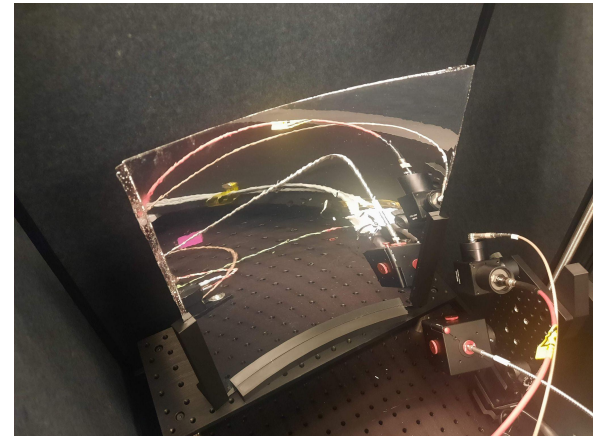
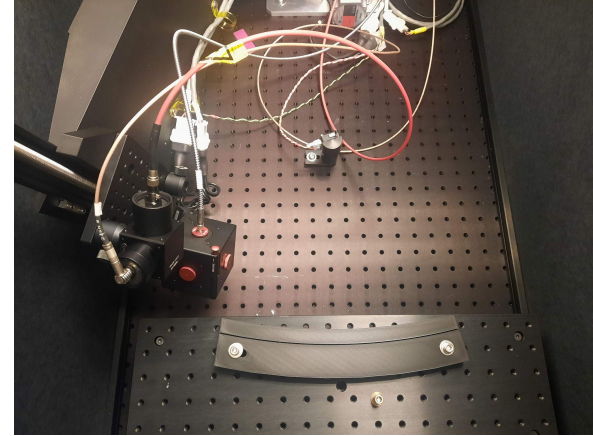
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# Overview

- New large mirror holders
- Reference mirror holder
- First test scan
  - Full scale mirror
- Small flat mirror holder
  - For surface scan test to evaluate “dark spot” and other coating challenges

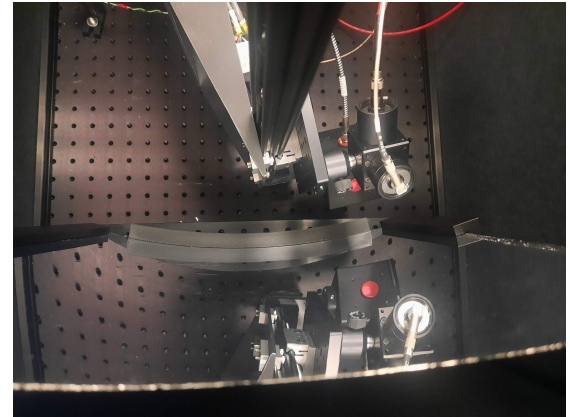
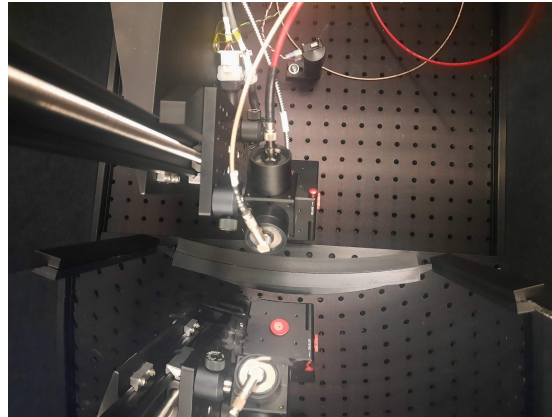
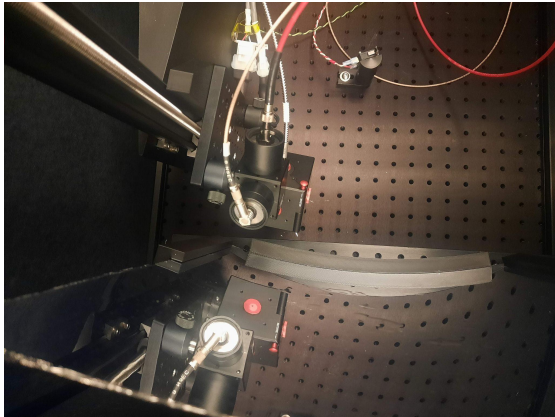
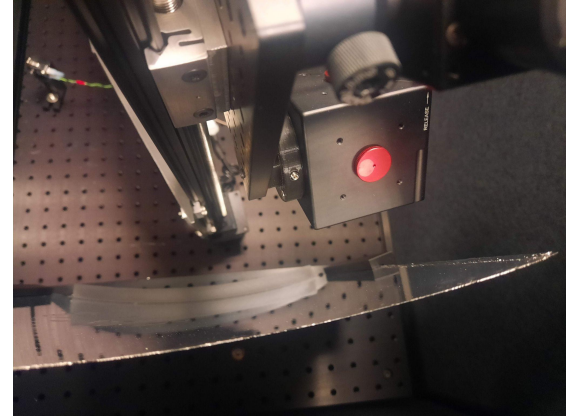
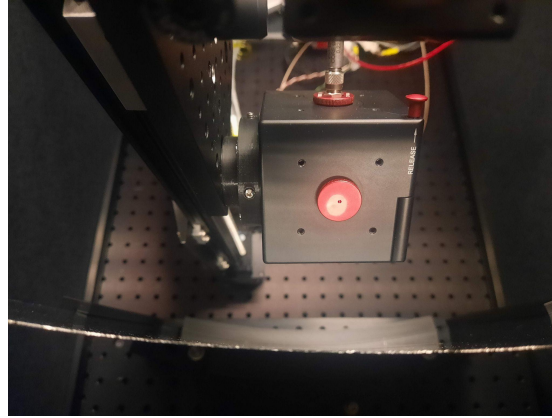
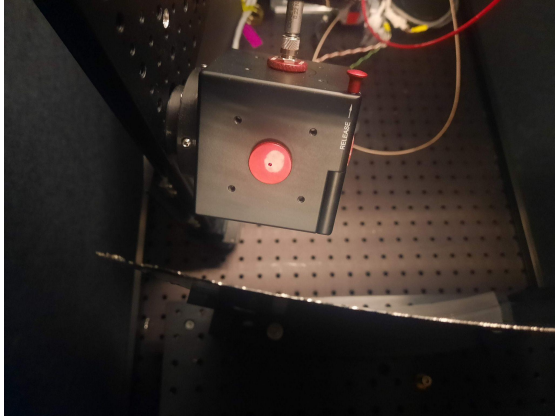
# Large mirror holder

- Curved base with correct curvature
- Side supports to ensure correct tilt and curvature
  - Grooves are 1 mm wide and 1 cm deep to provide sufficient support
- Performed beam alignment test (next slide)
  - Good alignment in tilt (linear stage)
  - Need to optimize alignment in curvature (rotating stage)
    - Will check curvature and position (left/right) of mirror relative to rotating stage
  - Should not be a problem for full mirrors with all supports
  - Need to optimize input fiber size
    - Beam spot too large now – easily falls out of integrating sphere input port



# Beam alignment test

- Six positions on mirror surface close to top and bottom edge of the mirror



# Reference mirror holder

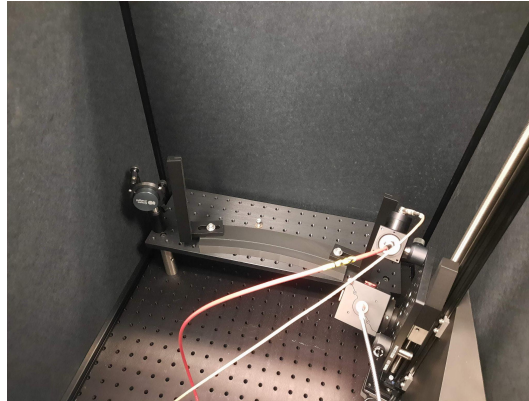
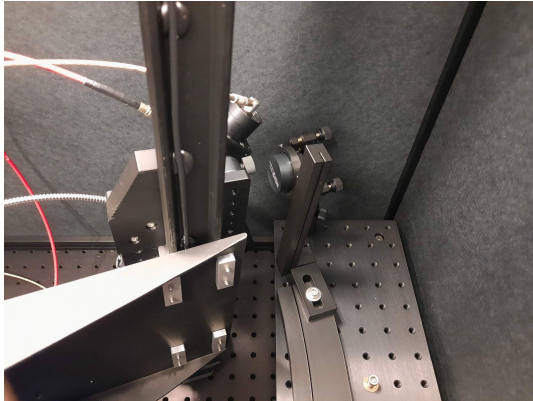
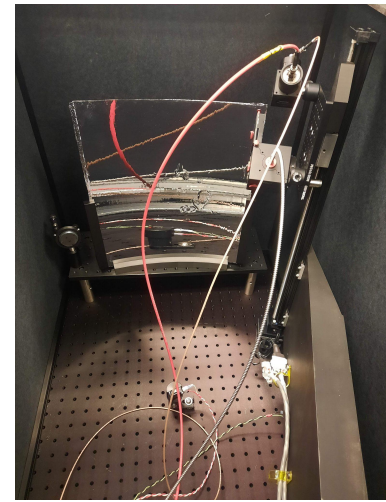
- Designed and 3D printed holder for reference mirror
  - Integrated 7.5 deg tilt, matching full scale mirror
  - Allows to remove/put on protective cover when installed in the test stand
  - Mounting done using standard 1" holder
    - Allows fine position adjustment





# Reference mirror holder

- Designed and 3D printed holder for reference mirror
  - Integrated 7.5 deg tilt, matching full scale mirror
  - Allows to remove/put on protective cover when installed in the test stand
  - Mounting done using standard 1" holder
    - Allows fine position adjustment

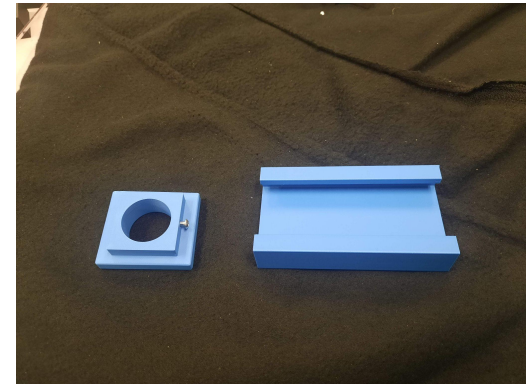
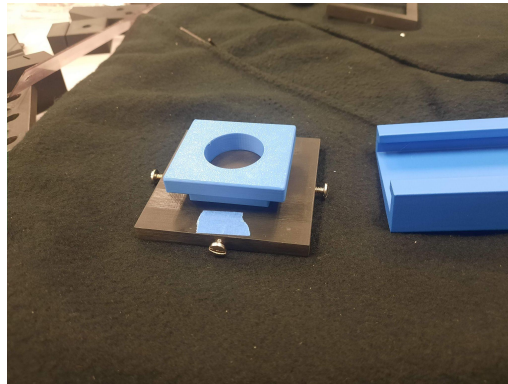
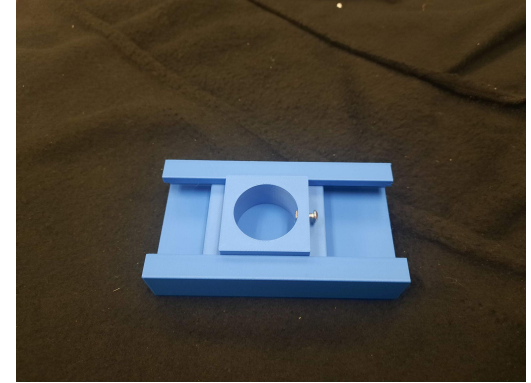


# Fist test scan

- Finished first version of output data format
  - Fully installed and tested
- Scanning procedure:
  - Measure dark current
    - Now done for each measure point on the mirror to test “uniformity of darkness” in the box
  - Perform measurement with light source
    - First measure reference mirror
    - Then measure NxN points on mirror surface
      - Done for 3x3 for testing
  - Now have only spectra (not reflectivity)
- To-do:
  - Prepare plots
  - Develop reflectivity measurement analysis macro

# Flat mirror holder

- New holder for flat mirrors to perform surface scan in the large test stand with built-in 7.5 deg tilt
  - Allows manually shifting mirror in horizontal direction
  - Vertical direction will be covered by linear stage movement
  - Uses original mirror holder from small stand
    - We have a new holder for small stand which allows similar measurement with the small test stand
    - We will be able to do cross-check measurements
  - Mounting done using standard 1" holder





# Summary

- Large mirror test stand close to be fully ready for full reflectivity measurements
  - Working scanning procedure, including reference mirror
  - Working first version of output format
- New holder for surface scan with small flat mirrors
- To-do:
  - Improve alignment of full scale mirror with respect to rotating stage
  - Optimize input fiber
    - Currently using 600  $\mu\text{m}$  fiber which gives too large beam spot
    - Solutions:
      - Use smaller (400  $\mu\text{m}$ ) fiber?
      - Use different collimator?
  - Prepare macro for reflectivity calculation

# Estimated work timeline – previous status

## 1. May

- a. Readout – finished
  - i. Result: Readout software successfully installed and successfully tested
- b. Steering of stages
  - i. Both rotational and linear stage operational
  - ii. Cross-check homing precision for rotating stage – should be good enough for now

## 2. June

- a. Development and optimization of steering and readout software
- b. Prepare for scans of small and large mirrors
  - i. Installation of the optical table to the dark box
  - ii. Optimization of output data format – ongoing, will be finished with coated mirror
  - iii. Curved mirror holders – minor updates needed

## 3. July

- a. First test scans – with coated mirror (first full scale mirror coating this week)
- b. Deploy full reflectivity scanning framework, including documentation (finish by ca. July 11)
  - i. Present progress at Collaboration meeting
- c. Start full mirror scans (have ready by end of July)

## 4. August

- a. Make sure everything is working and properly documented for anyone to take over (by August 15)
- b. Help with any leftover items (by end of my contract at BNL, August 21)

# Estimated work timeline – **current** status

## 1. May

- a. Readout – finished
  - i. Result: Readout software successfully installed and successfully tested
- b. Steering of stages
  - i. Both rotational and linear stage operational
  - ii. Cross-check homing precision for rotating stage – should be good enough for now

## 2. June

- a. Development and optimization of steering and readout software
- b. Prepare for scans of small and large mirrors
  - i. Installation of the optical table to the dark box
  - ii. Optimization of output data format
  - iii. Holders: Curved full scale mirror, reference mirror, small flat sample mirrors

## 3. July

- a. First test scans – with coated mirror
- b. Ready for first full scans – **minor updates may be needed**
- c. **Deploy full reflectivity scanning framework, including documentation**

## 4. August

- a. Make sure everything is working and properly documented for anyone to take over (by August 15)
- b. Help with any leftover items (by end of my contract at BNL, August 21)