



RICH Prototype Mirror Testing

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February 5, 2020

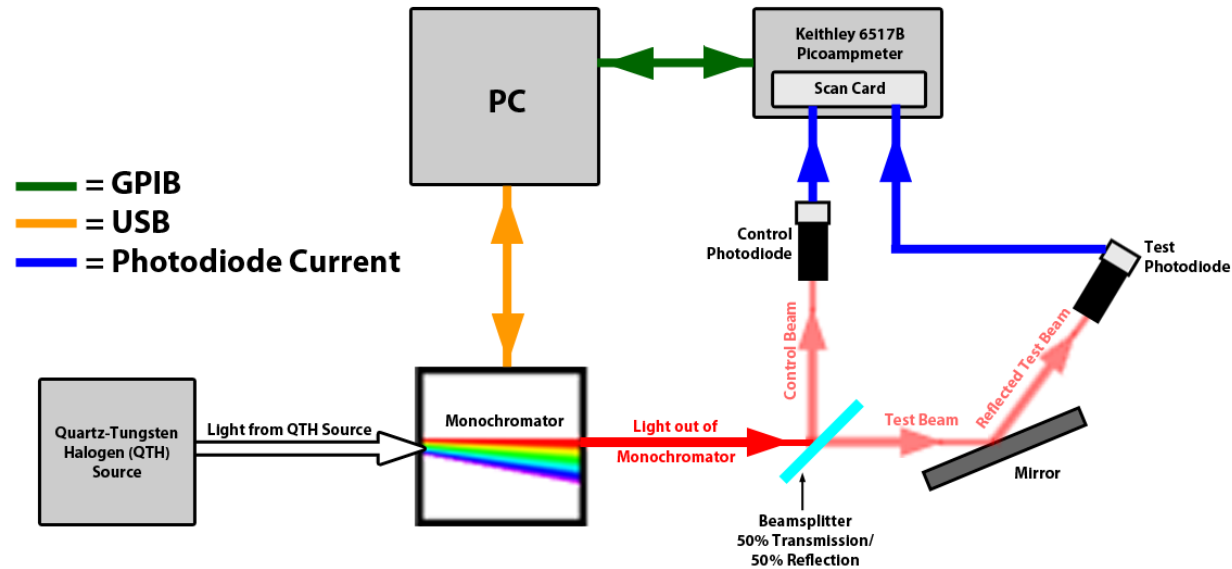
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Overview

- Collaborators from Núcleo Milenio de Formación Planetaria (NPF) in Chile fabricated mirror
 - Attempting to make mirrors for RICH and also astronomical applications
- Collaborators requested we measure its reflectivity in our test station

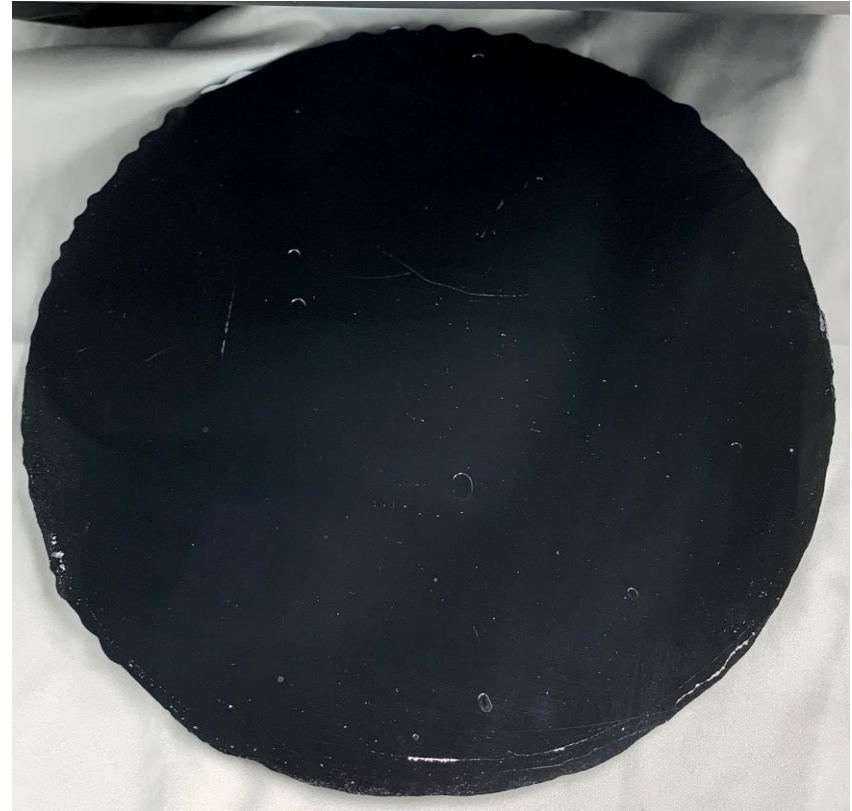
Reflectivity Test Station



- Monochromator provides light of specified wavelength
- Light is split into control beam and test beam using beamsplitter
- Test beam is reflected off mirror
 - For calibrations, test beam directly hits test photodiode
- Control beam and reflected test beam's power are measured by separate photodiodes
- Photodiode current response measured by Keithley picoampmeter

Prototype Mirror

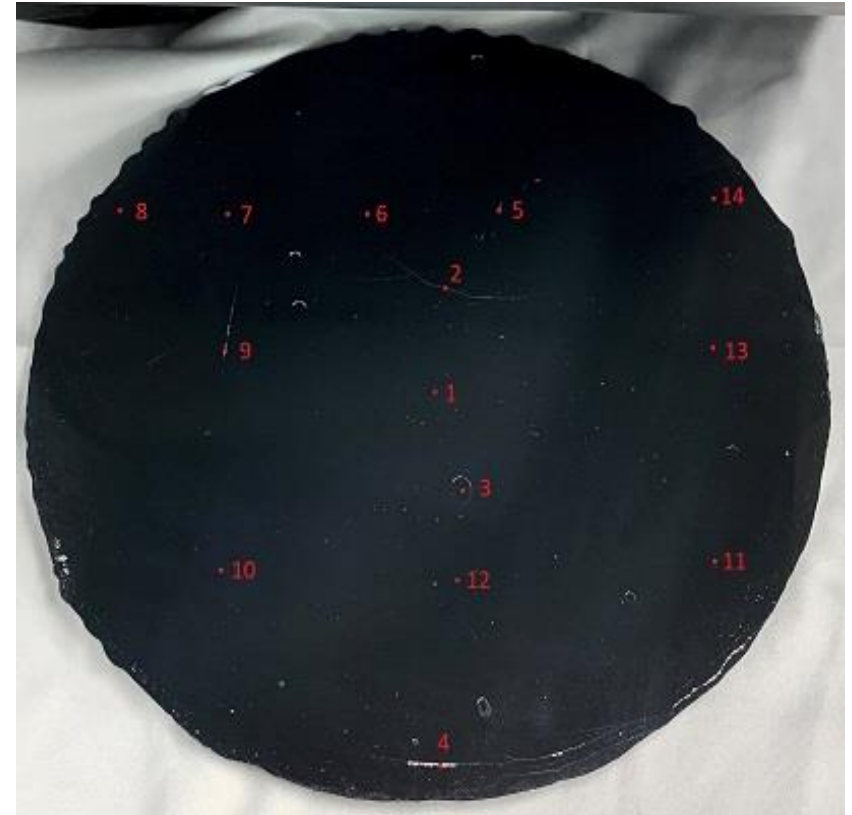
- Carbon-fiber reinforced polymer (CFRP) backing with aluminum reflective coating and silica protective coating
- Planar mirror
- 15 cm in diameter



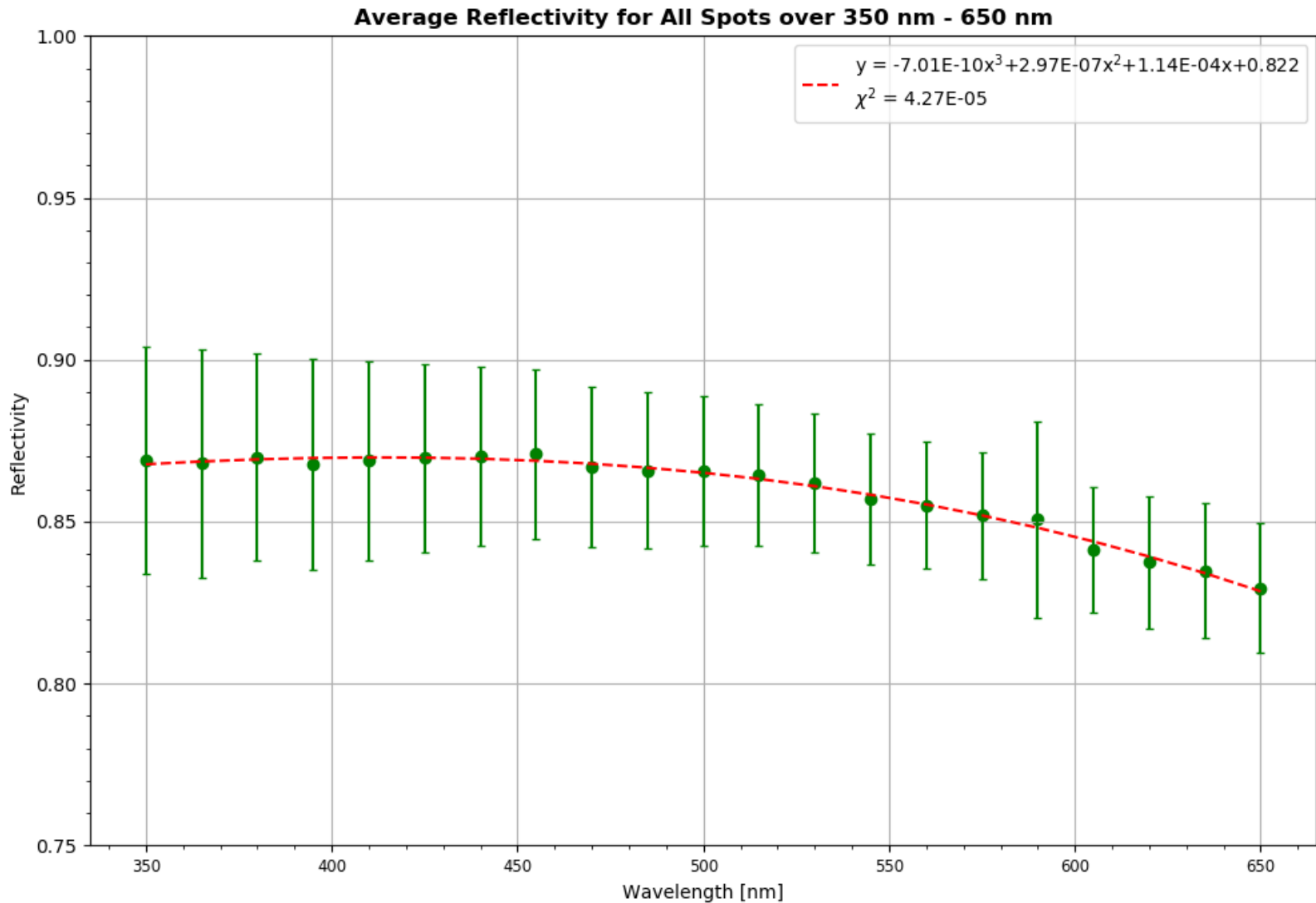
Results – Typical Test Station Range

- 350 nm – 650 nm wavelength light tested in 15 nm steps
- 25 measurements taken at each step

Spot #	Average Reflectivity [%]	Standard Deviation [%]	Comment
1	83.32	0.83	Center of mirror
2	84.61	1.10	On large scratch
3	87.22	1.47	On void in surface
4	80.05	1.52	On large scratch
5	86.18	1.15	On small scratch
6	84.87	0.83	-
7	86.94	1.00	-
8	86.15	1.43	-
9	87.41	1.74	-
10	86.05	1.29	-
11	91.13	3.40	-
12	83.89	0.86	-
13	86.75	1.18	-
14	87.82	1.76	-



Results – Typical Test Station Range



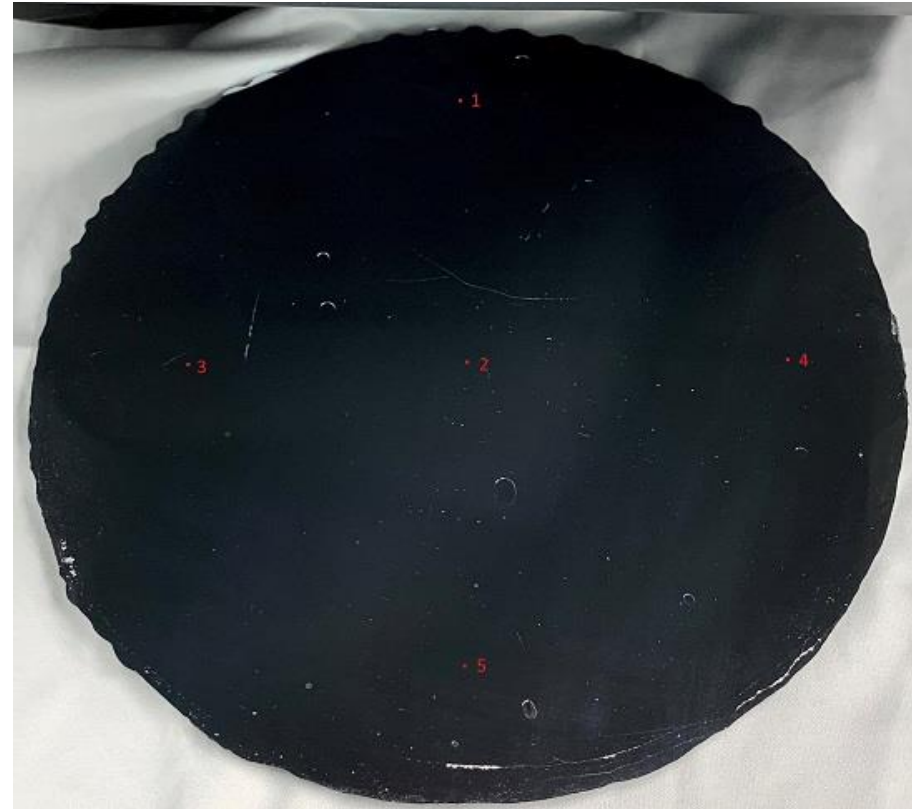
Results – Infrared Range

- Collaborators requested measuring mirror in more infrared spectrum
- Additional spots measured from 635 nm – to 800 nm
 - Range determined by eye based on monochromator output and configuration
- Because test wavelengths exceed rated range of monochromator, results most likely include large systematic error

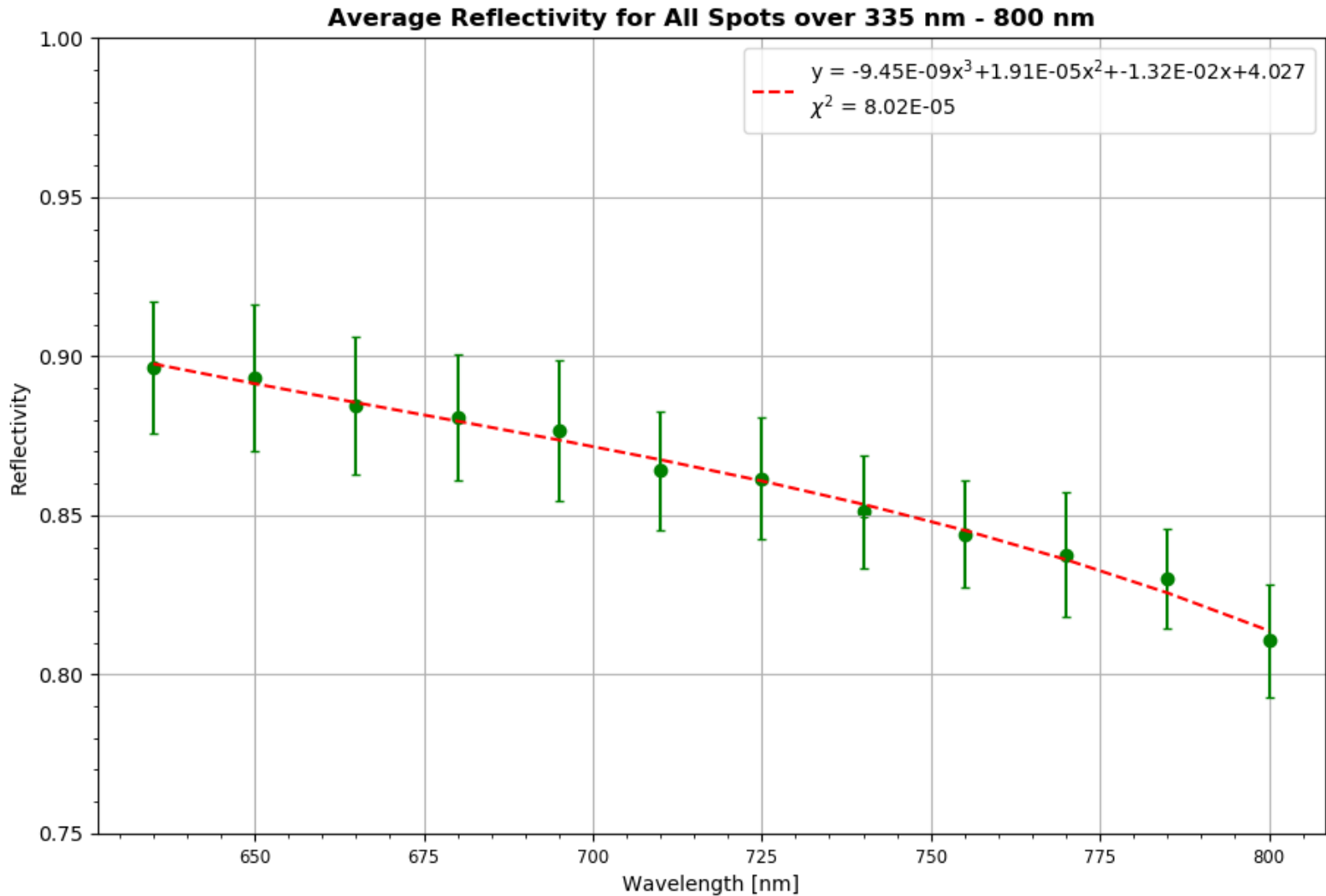
Results – Infrared Range

- 635 nm – 800 nm wavelength light tested in 15 nm steps
- 25 measurements taken at each step

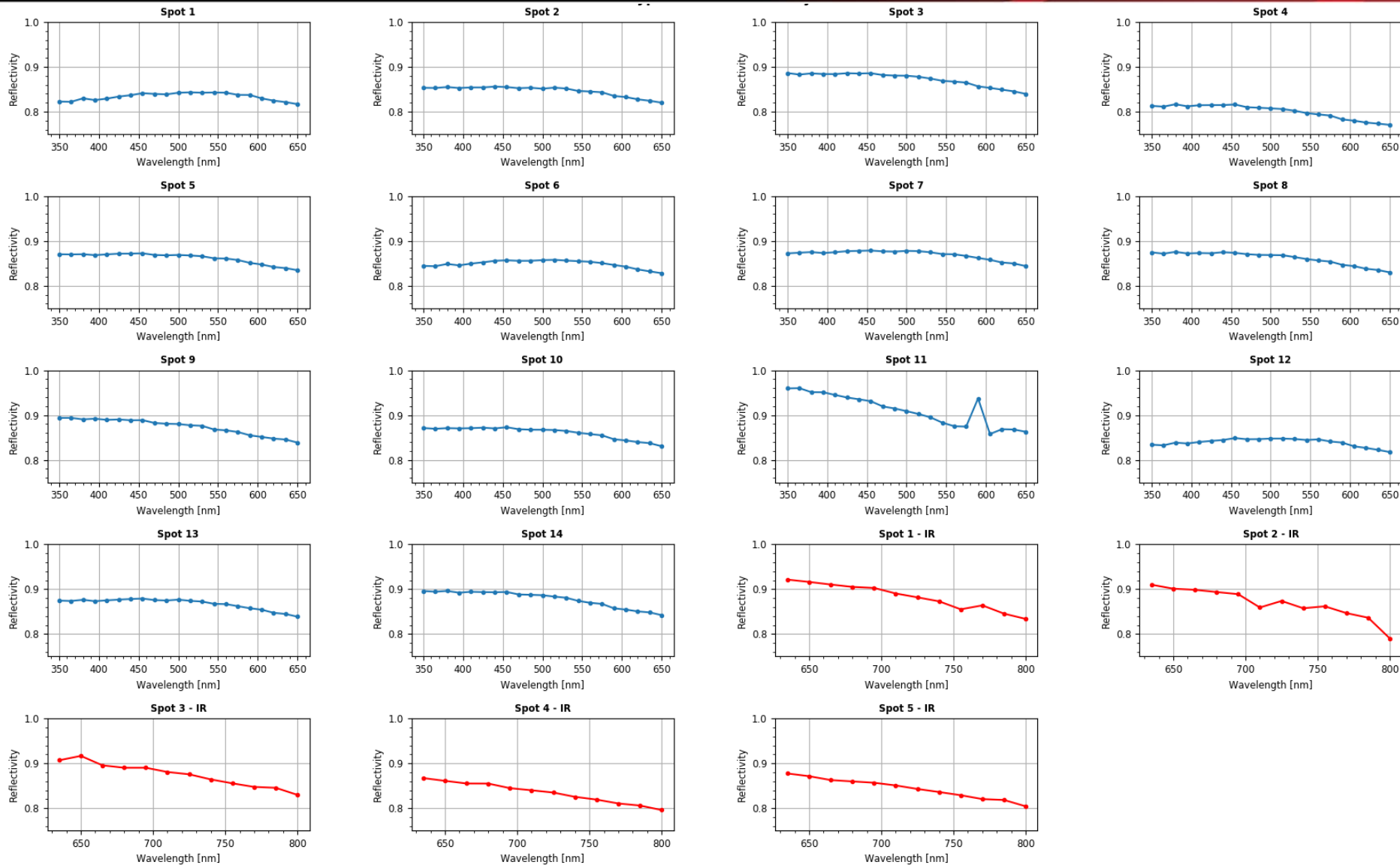
Spot #	Average Reflectivity [%]	Standard Deviation [%]
1	88.32	2.92
2	86.81	3.39
3	87.47	2.67
4	83.44	2.32
5	84.40	2.29



Results – Infrared Range



Plotted Results for Each Spot



Conclusion

- NPF collaborators fabricated a prototype CRFP mirror
- Mirror tested in reflectivity test station with light from 350 nm to 800 nm
 - Tests in infrared range most likely include large systematic error because test station is not specified for these wavelengths
 - Looking into test station improvements that would lessen errors
- Across all wavelengths tested, average mirror reflectivity was ~85%

Thank You