Optical Diagnostics Update

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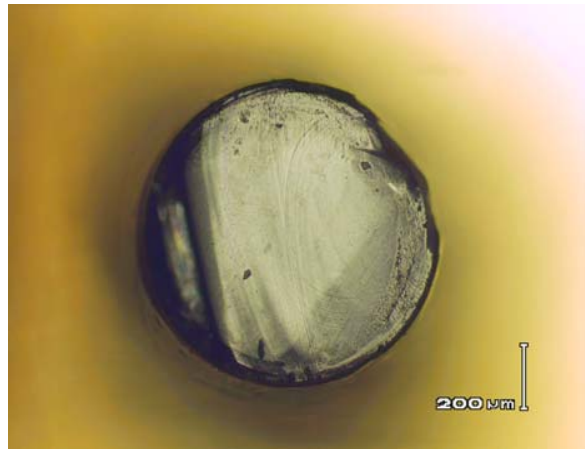
Imaging Fiber Polishing Process Investigation

Purpose : To get better image quality

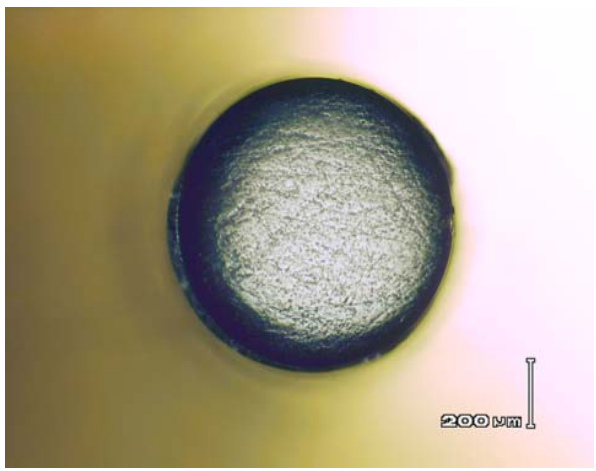
Polishing Process

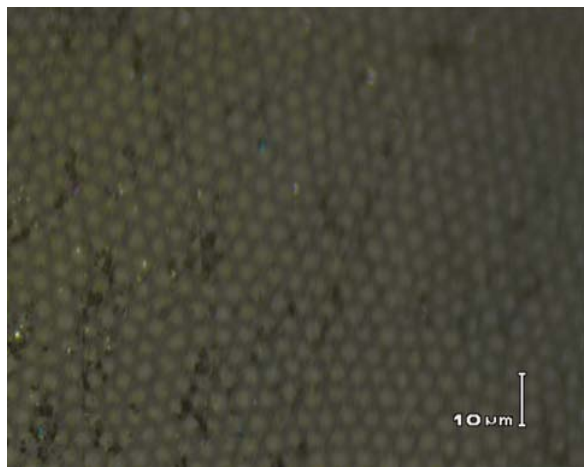
Fujikura Fiber Used
Rotating Pad Speed : 120 rpm
Rotating Spindle Time : 48 min

Diamond Cut

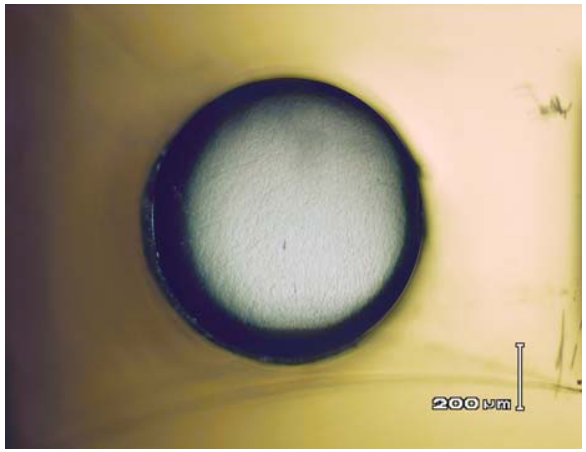


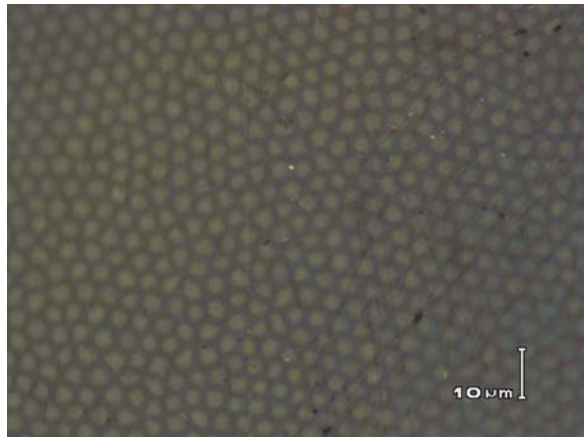
9 µm diamond suspension
10 lbf applied



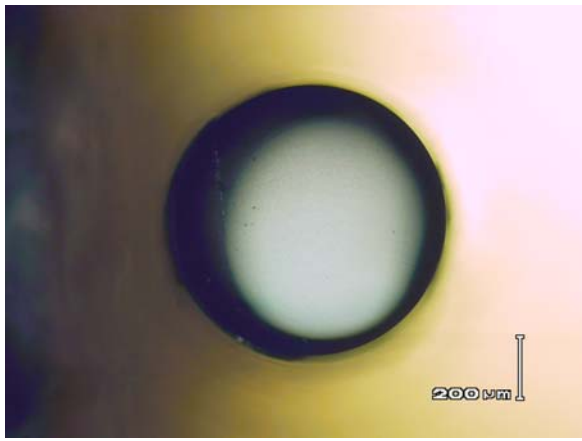


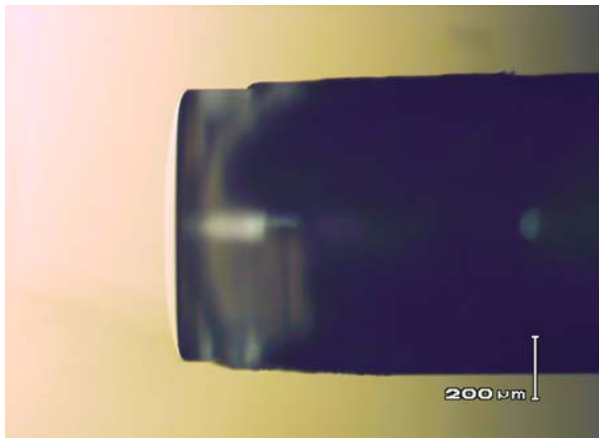
6 µm diamond suspension
10 lbf applied

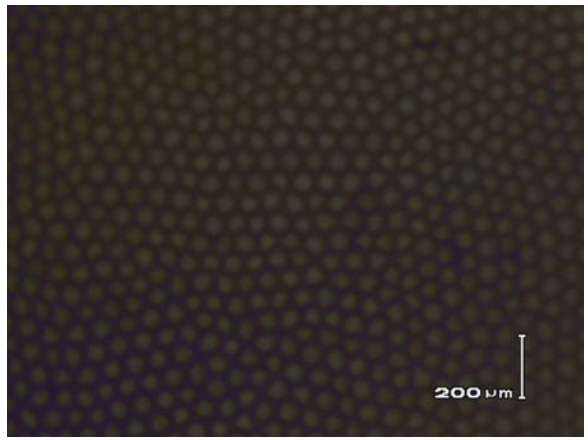




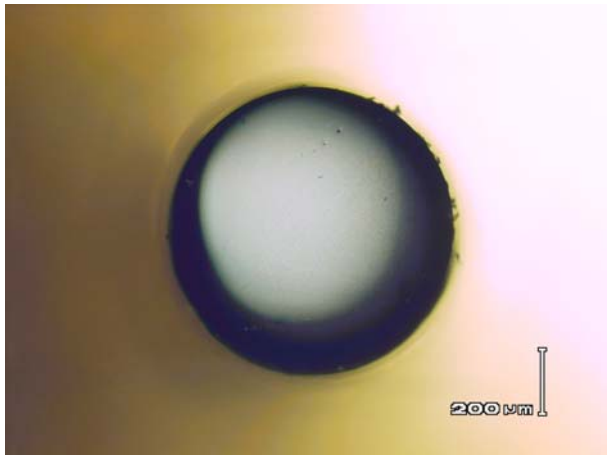
1 µm diamond suspension
6 lbf applied

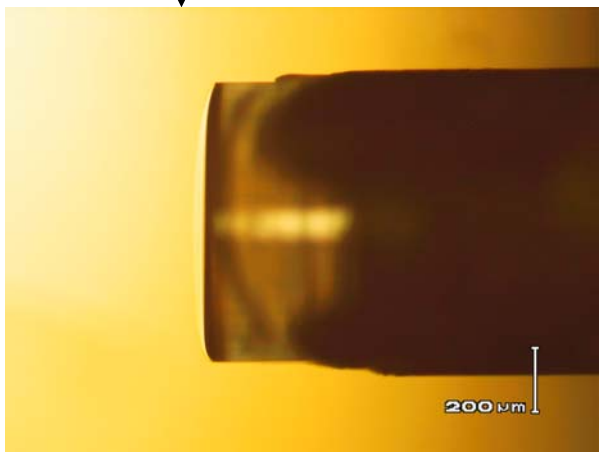


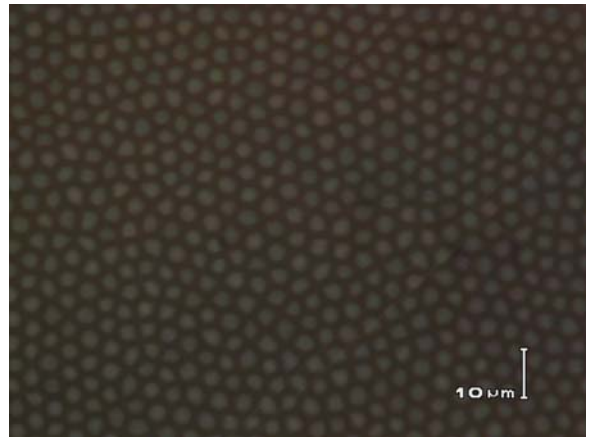




1/4 μm diamond suspension
6 lbf applied

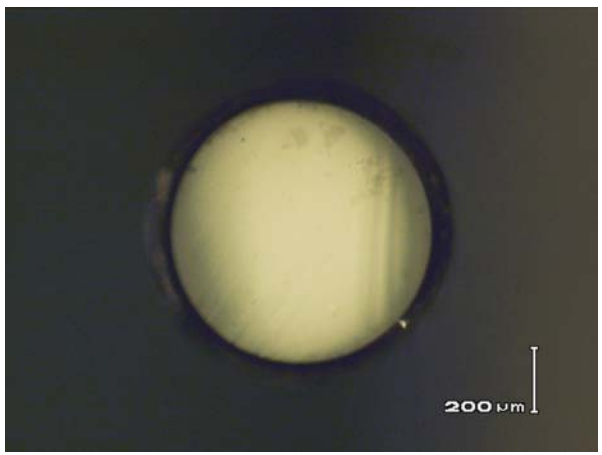


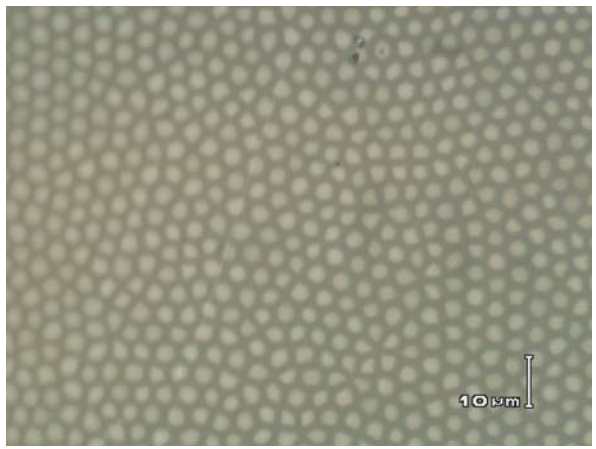




Surface roughness is good, but it is hard to make the surface flat. Therefore, the edge of fiber was not well polished.

Hand-Polished Fiber Surface
Sumitomo Fiber Used



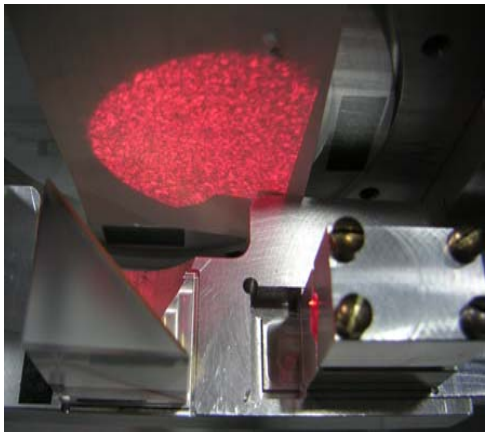


This method will be tested and applied for polishing of 10m length of Imaging fiber.

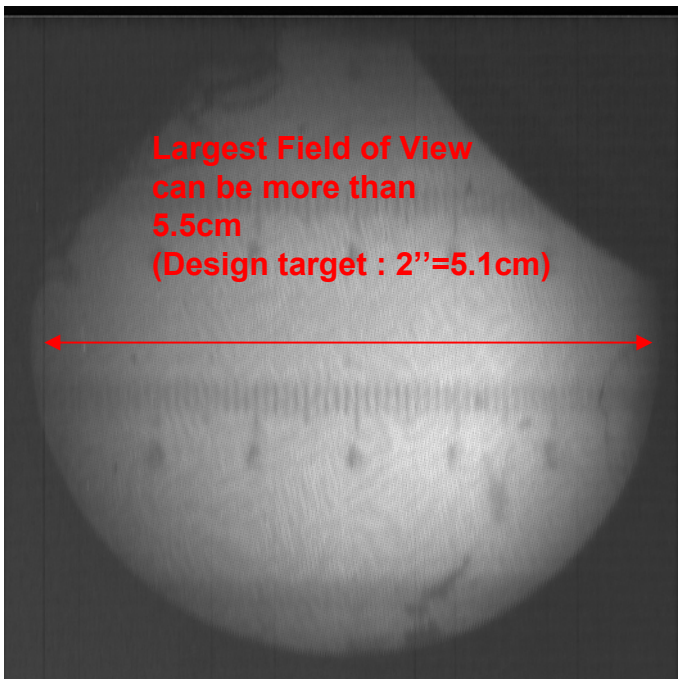
Ball Lens Test : Illuminated Field

Purpose : To see the difference of field of view by illuminated laser and captured image

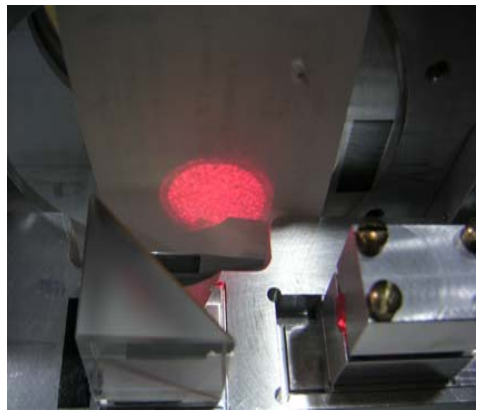
Ø0.5 mm ball lens



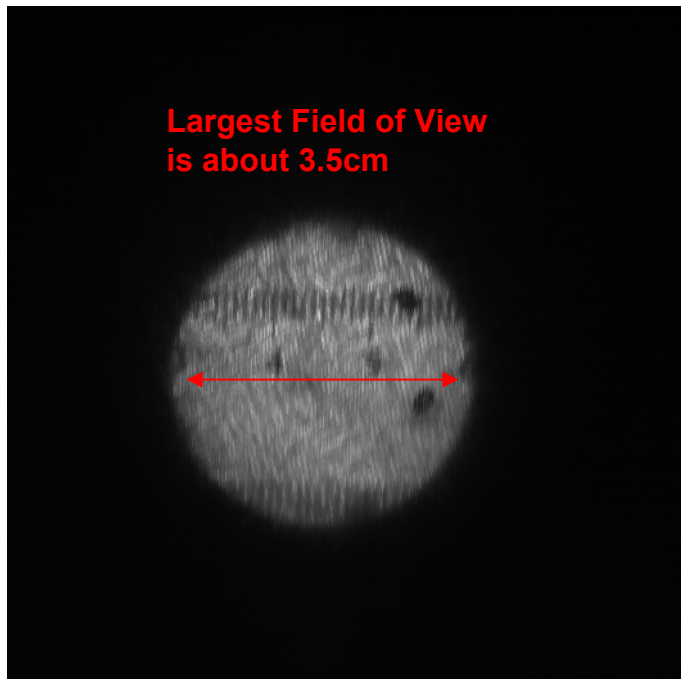
White Light,
Sumitomo (30cm) Used
20 ms/frame



Ø1 mm ball lens

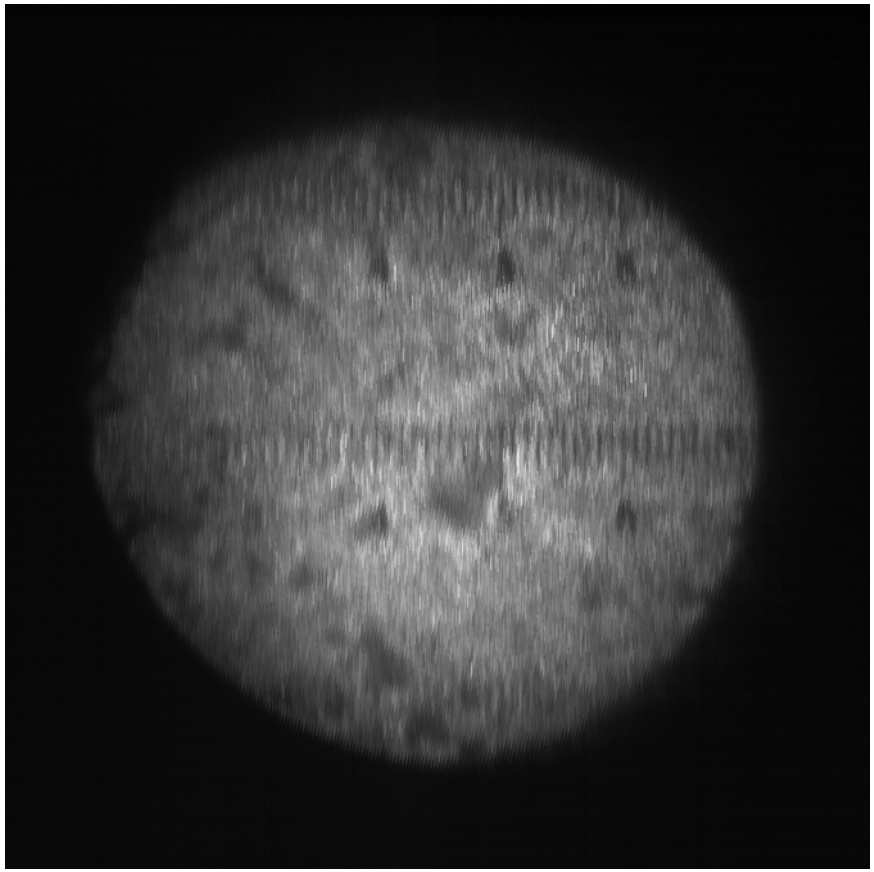


NIR Pulse Laser,
Sumitomo (30cm) Used
10 µs/frame

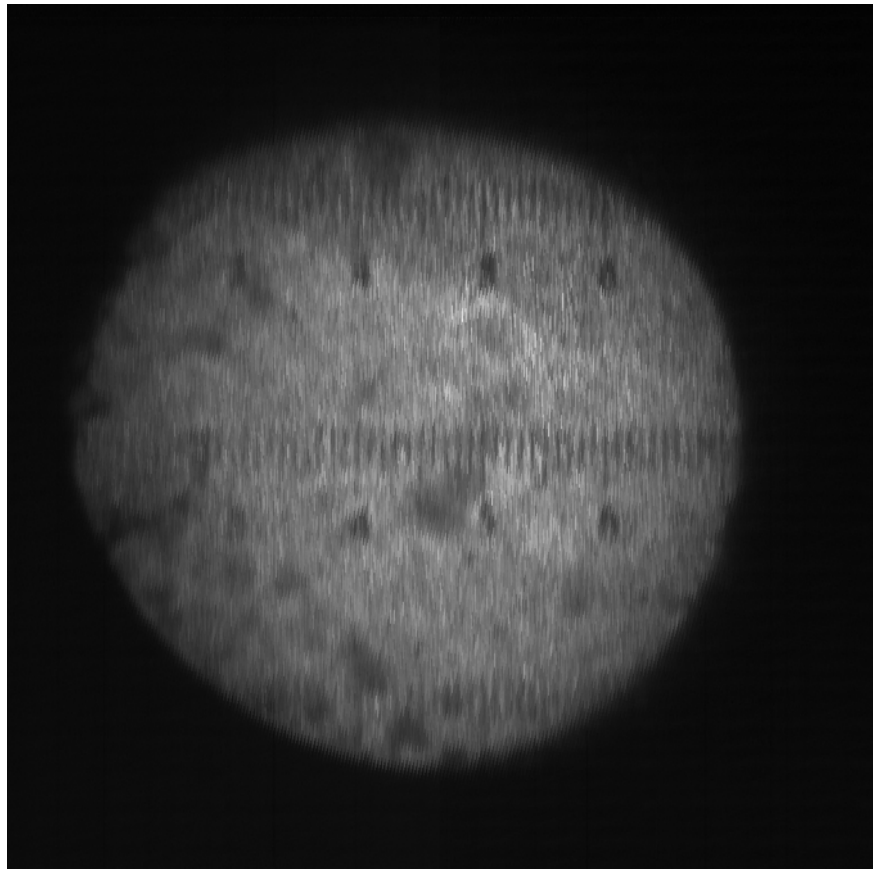


Laser Power Change

1W Power of NIR Pulsed Laser ,
Sumitomo (30cm) Used
100 μs/frame

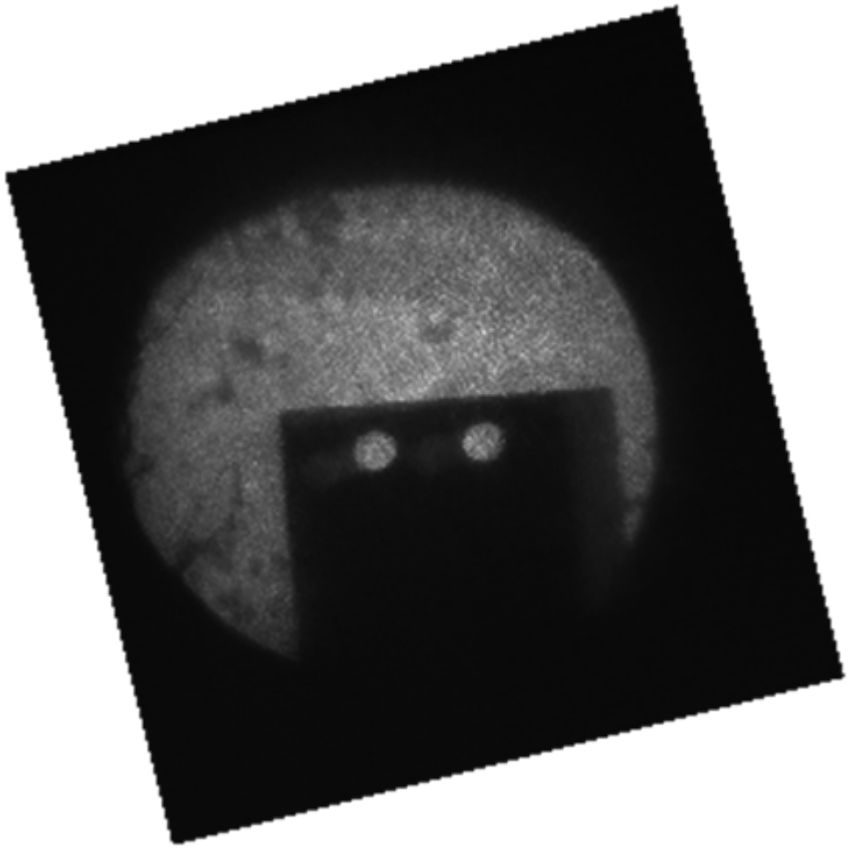


20W Power of NIR Pulsed Laser ,
Sumitomo (30cm) Used
100 μs/frame

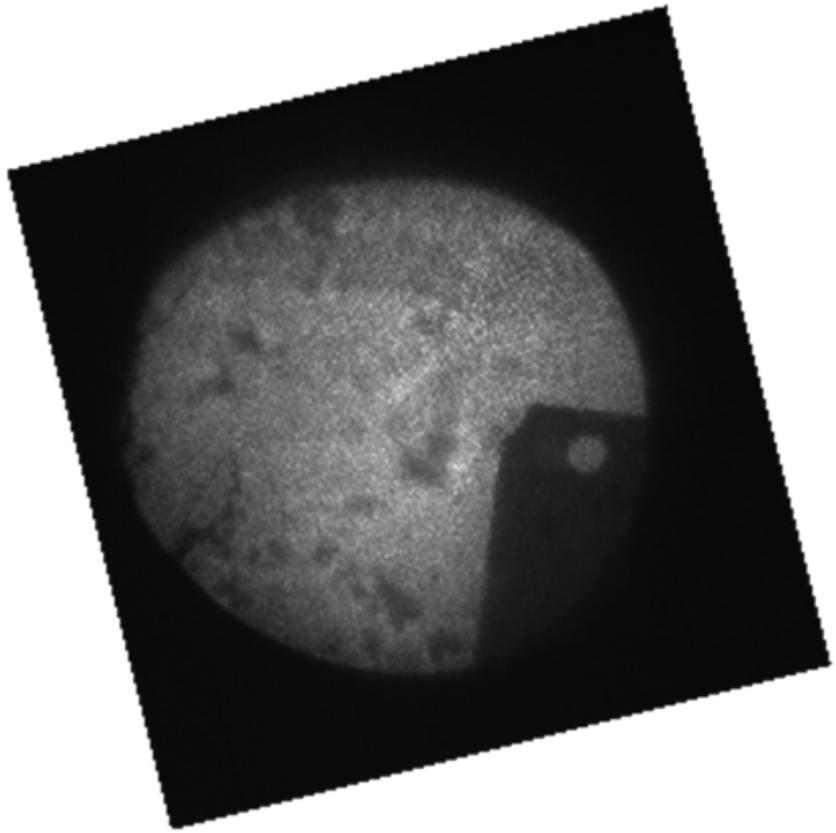


Moving Image Capture with 1W Power of Laser(Ø0.5mm ball lens used)

NIR Pulsed Laser ,
Sumitomo (30cm) Used
10 μs/frame



NIR Pulsed Laser ,
Sumitomo (30cm) Used
100 μs/frame



Current Status and Things To Do (Based on April 12th Version)

1. The modified 4 different types of fiber holder are now under fabrication.

→ Done : Updated fiber holders were check up and It was good
feed back will be given with modified whole plate drawing for 4 viewport

2. Ø=1.8mm imaging lens will be tested to see the effect of the field of view as well as illumination intensity with combination of ø=0.5mm & ø=1mm spherical ball lens.

→ Done : ø=0.5mm ball lens satisfied the targeted large field of view

3. The hole for the fiber bunch following fiber holder will be modified to let the fiber bunch bend within the allowable bending radius (40mm)

→ The concept which should be modified was made. Drawing will be updated and One plate for 4 viewport will be fabricated

4. Polishing process of Imaging fiber will be investigated before we polish the actual 10m long imaging fiber.

→ Done : Polishing machining process was investigated and Surface was good, but Surface was not flat. So Hand-polishing will be tested later.

5. The retro-reflecting mirror assembly for 4 viewport is already now under fabrication.
One whole plate for 4 viewport will be designed after modification based on the mock-up test result.

→ Same with #3

6. Finally, the performance of 4 individual viewport must be tested simultaneously with the actual length of imaging fiber and illumination fiber.

→ Scheduled : 20m imaging fiber was delivered and it will be applied