Optical Diagnostics Update

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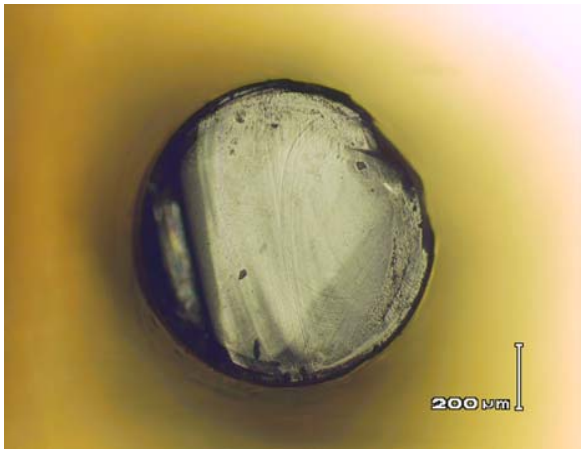
Imaging Fiber Polishing Process Investigation

Purpose : To get better image quality

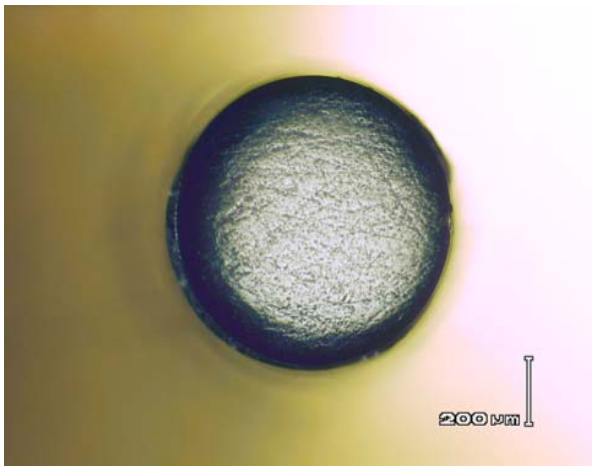
Polishing Process

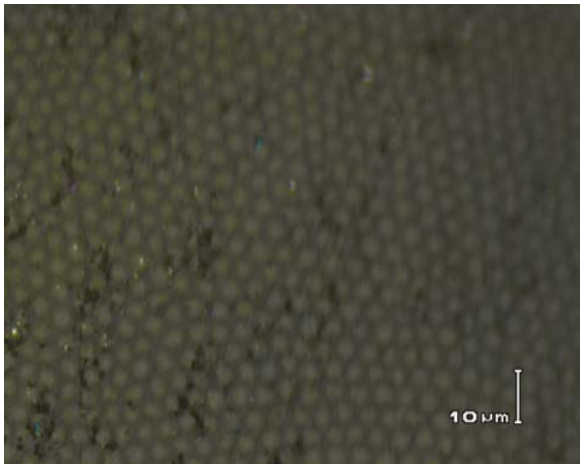
Fujikura Fiber Used
Rotating Pad Speed : 120 rpm
Rotating Spindle Time : 48 min

Diamond Cut

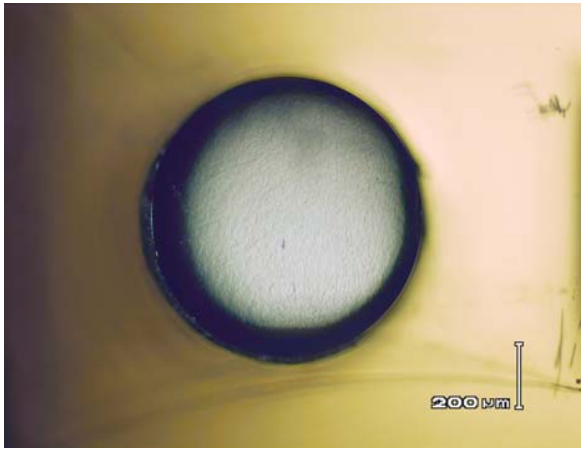


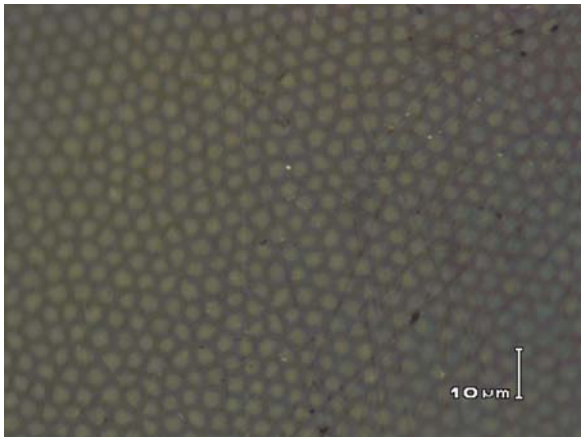
9 µm diamond suspension
10 lbf applied



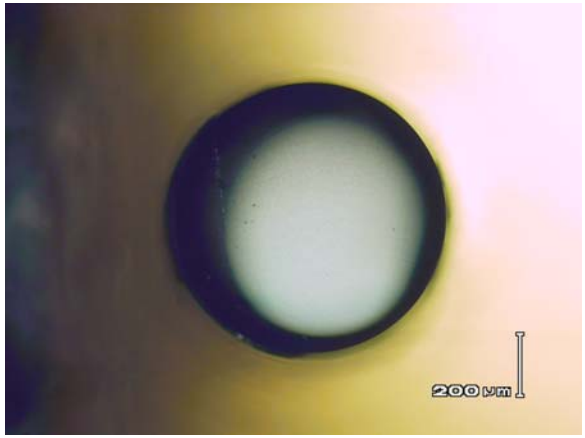


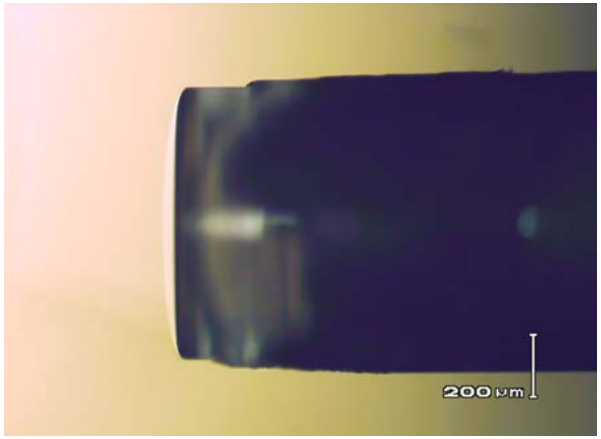
6 µm diamond suspension
10 lbf applied

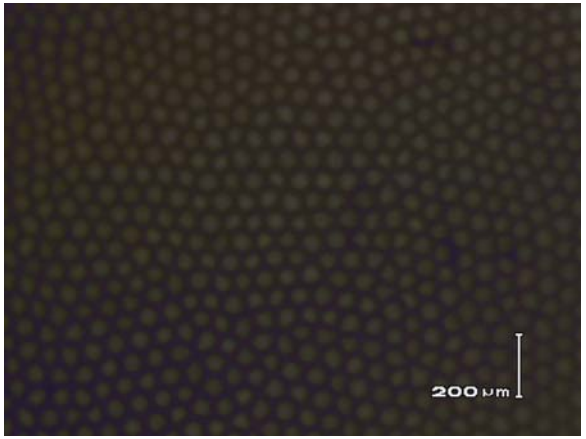




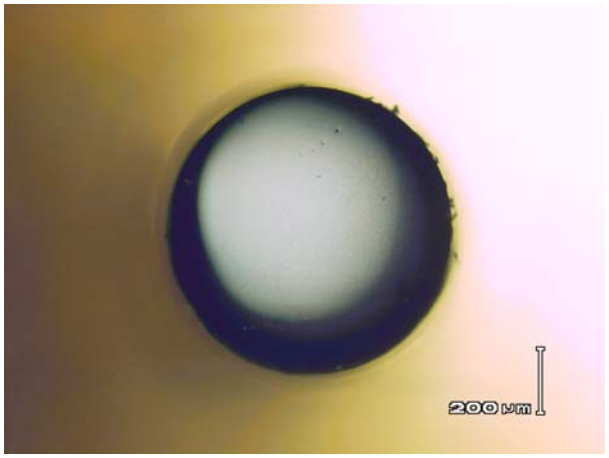
1 µm diamond suspension
6 lbf applied

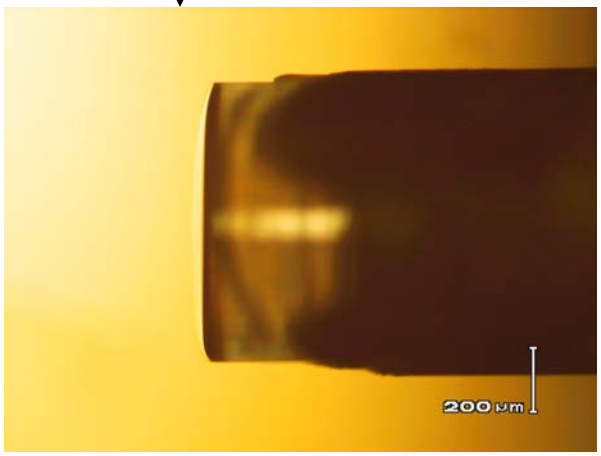


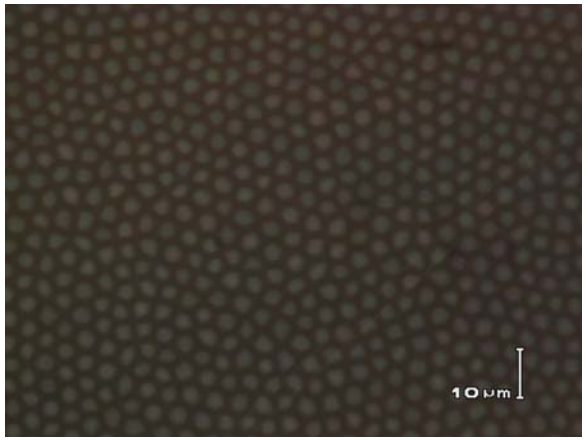




1/4 μm diamond suspension
6 lbf applied

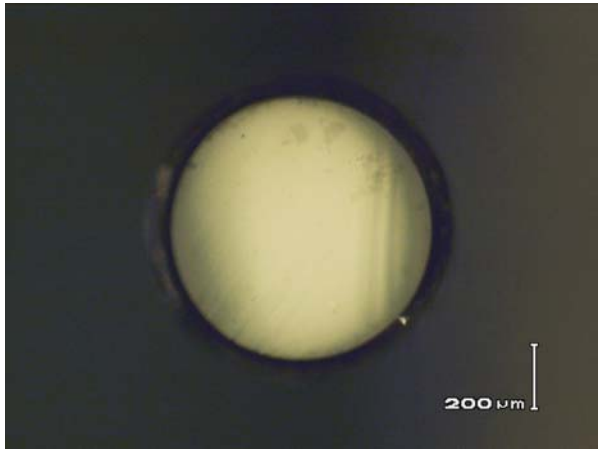


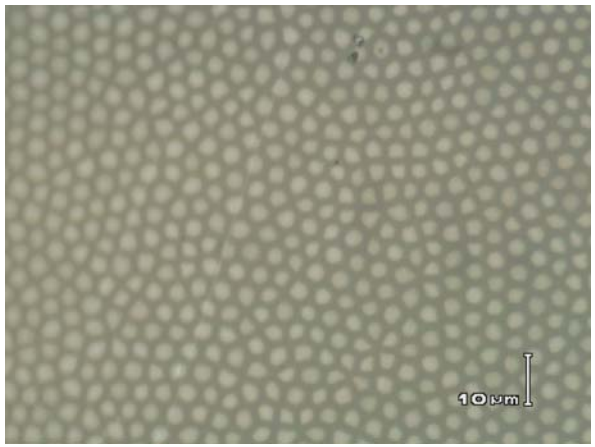




Surface roughness is good, but it is hard to make the surface flat. Therefore, the edge of fiber was not well polished.

Hand-Polished Fiber Surface
Sumitomo Fiber Used



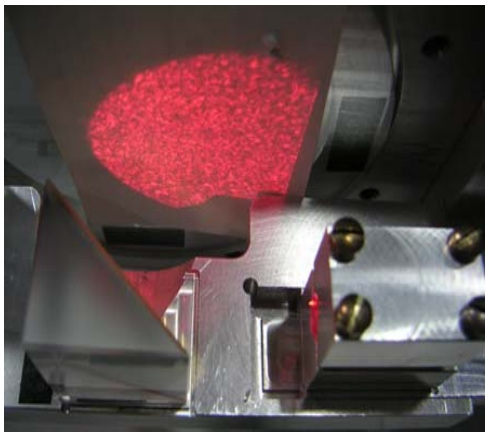


This method will be tested and applied for polishing of 10m length of Imaging fiber.

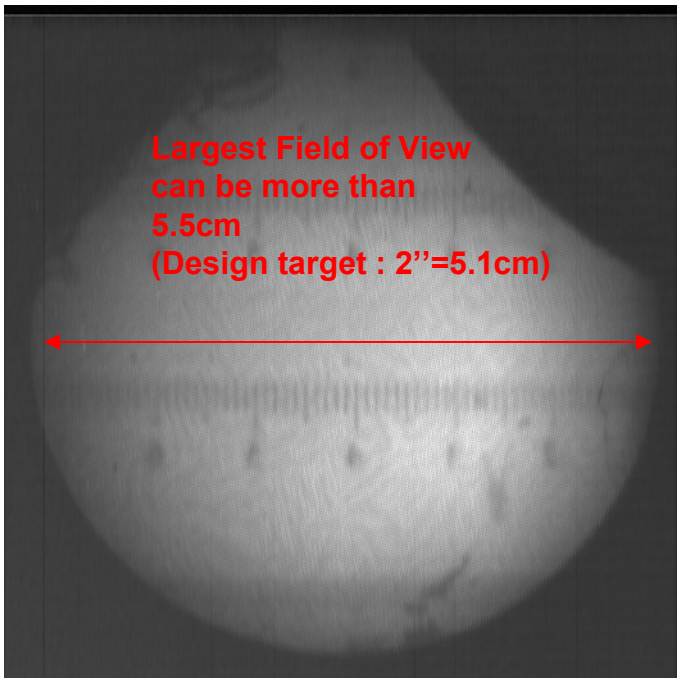
Ball Lens Test : Illuminated Field

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

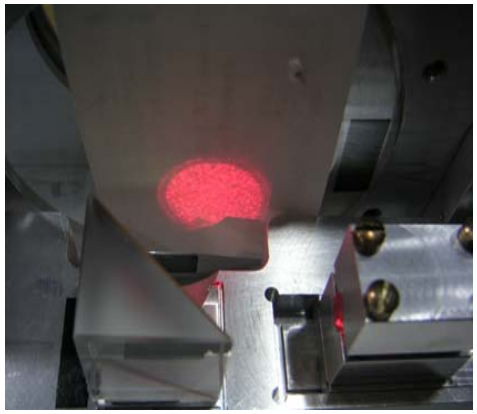
Ø0.5 mm ball lens



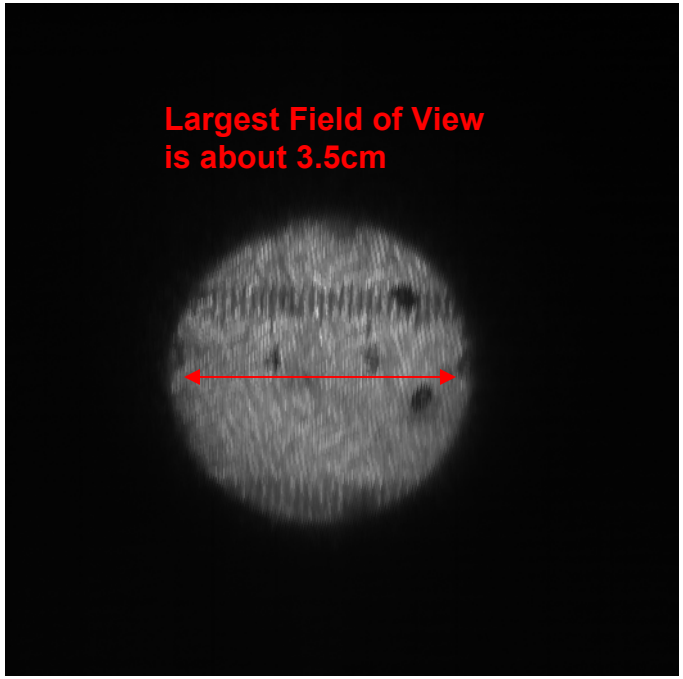
White Light, Sumitomo (30cm) Used 20 ms/frame



Ø1 mm ball lens

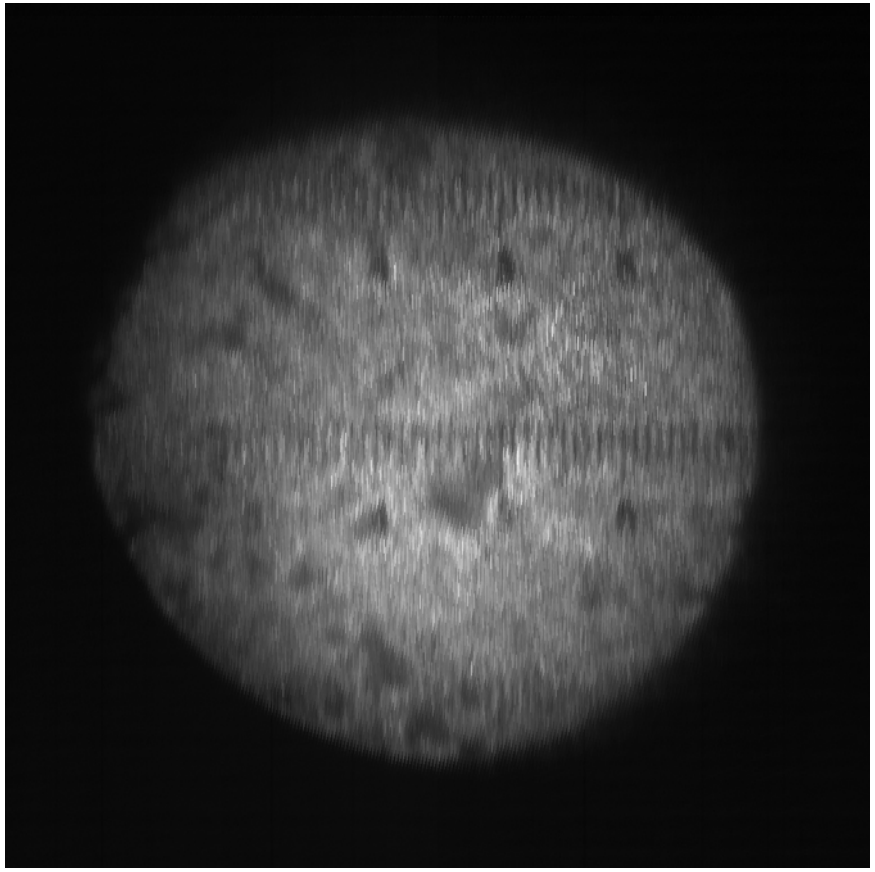


NIR Pulse Laser, Sumitomo (30cm) Used 10 µs/frame

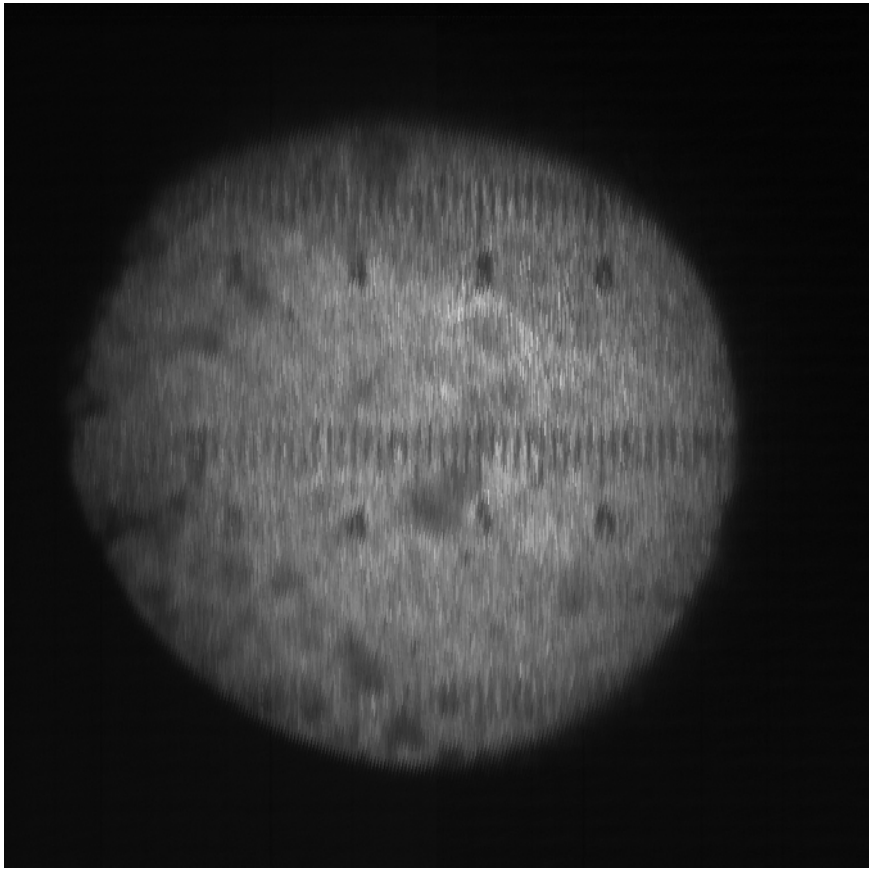


Laser Power Change

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

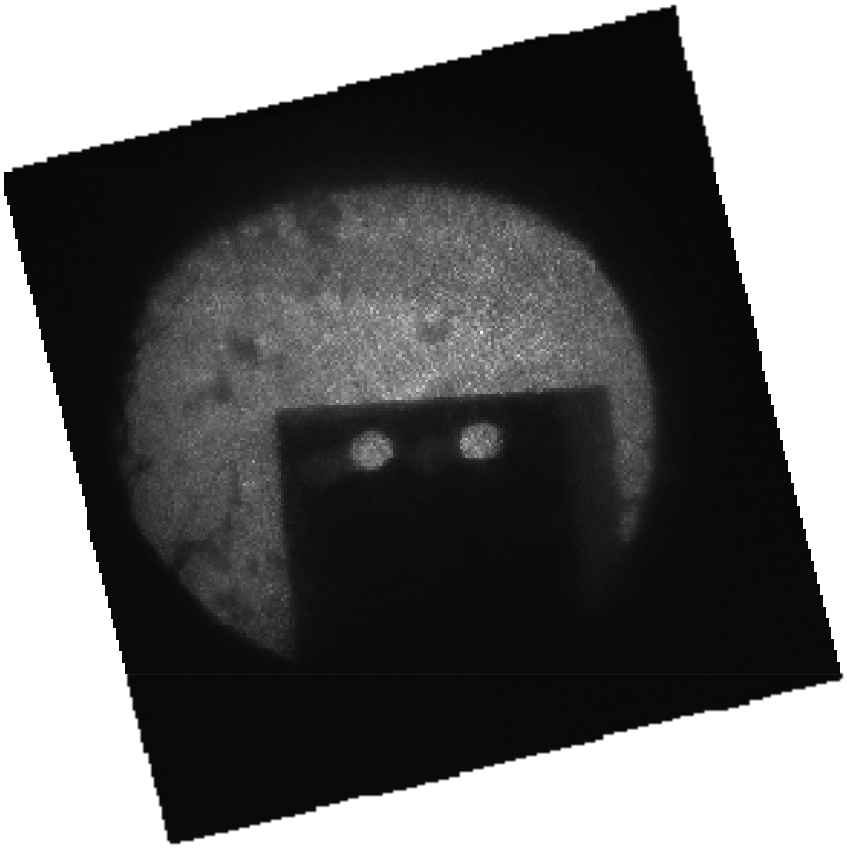


20W Power of NIR Pulsed Laser ,
Sumitomo (30cm) Used
100 μs/frame

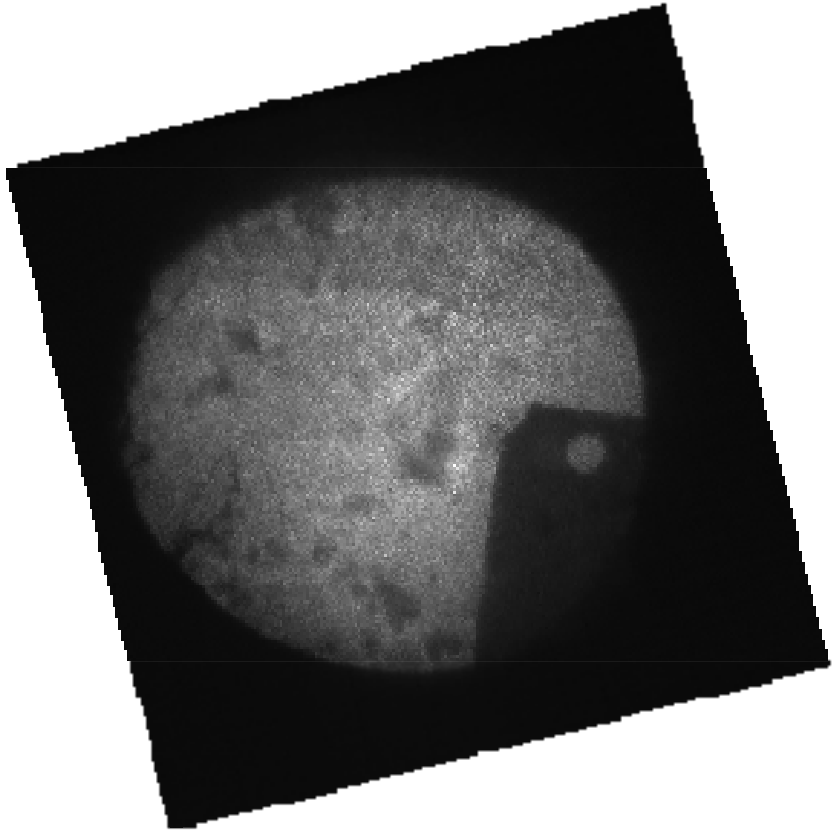


Moving Image Capture with 1W Power of Laser(Ø0.5mm ball lens used)

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***