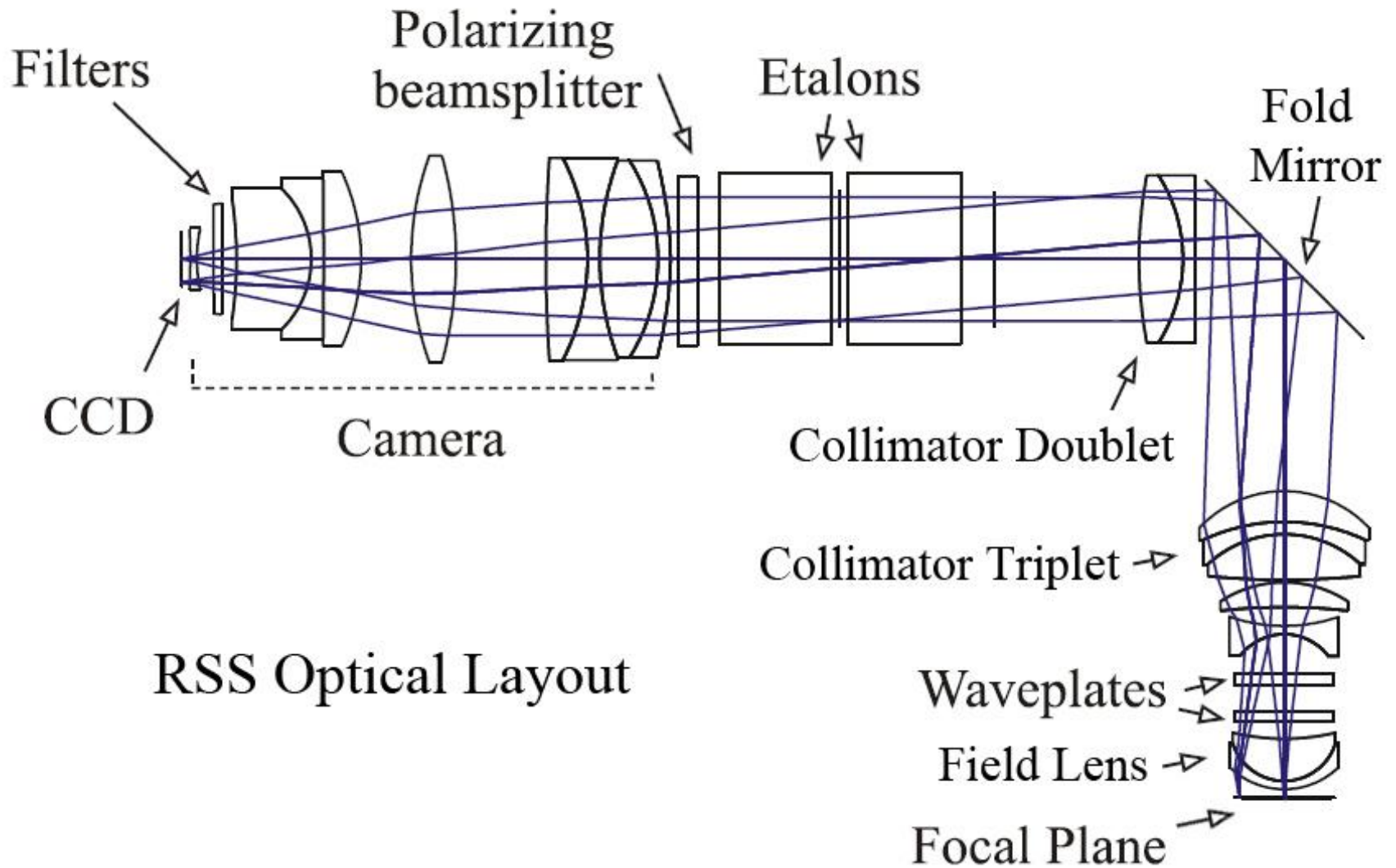


# RSS Optics Update

Lisa Crause & Éric Depagne

12 May 2014

# RSS Optical Layout



# April 2014 Throughput Tests

- As measured from the grating position:

Camera Red = 95% (2012 = 88%)

Collimator Red = 48% (2012 = 59%)

**RSS Red = 45% (2012 = 52%)**

Camera Blue = 80% (2012 = 78%)

Collimator Blue = 29% (2012 = 37%)

**RSS Blue = 23% (2012 = 29%)**

# Collimator Sub-Units

- Doublet + Fold Red = 100% (2012 = 100%)
- Main Group Red = 61% (2012 = 65%)
- Field Lens Red = 79% (2012 = 92%)
  
- Doublet + Fold Blue = 69% (2012 = 68%)
- Main Group Blue = 70% (2012 = 69%)
- Field Lens Blue = 60% (2012 = 79%)
  
- Expected the Triplet in the Main Group to have changed over time, but the Field Lens turns out to have degraded!

# Checking Our 2014 Measurements

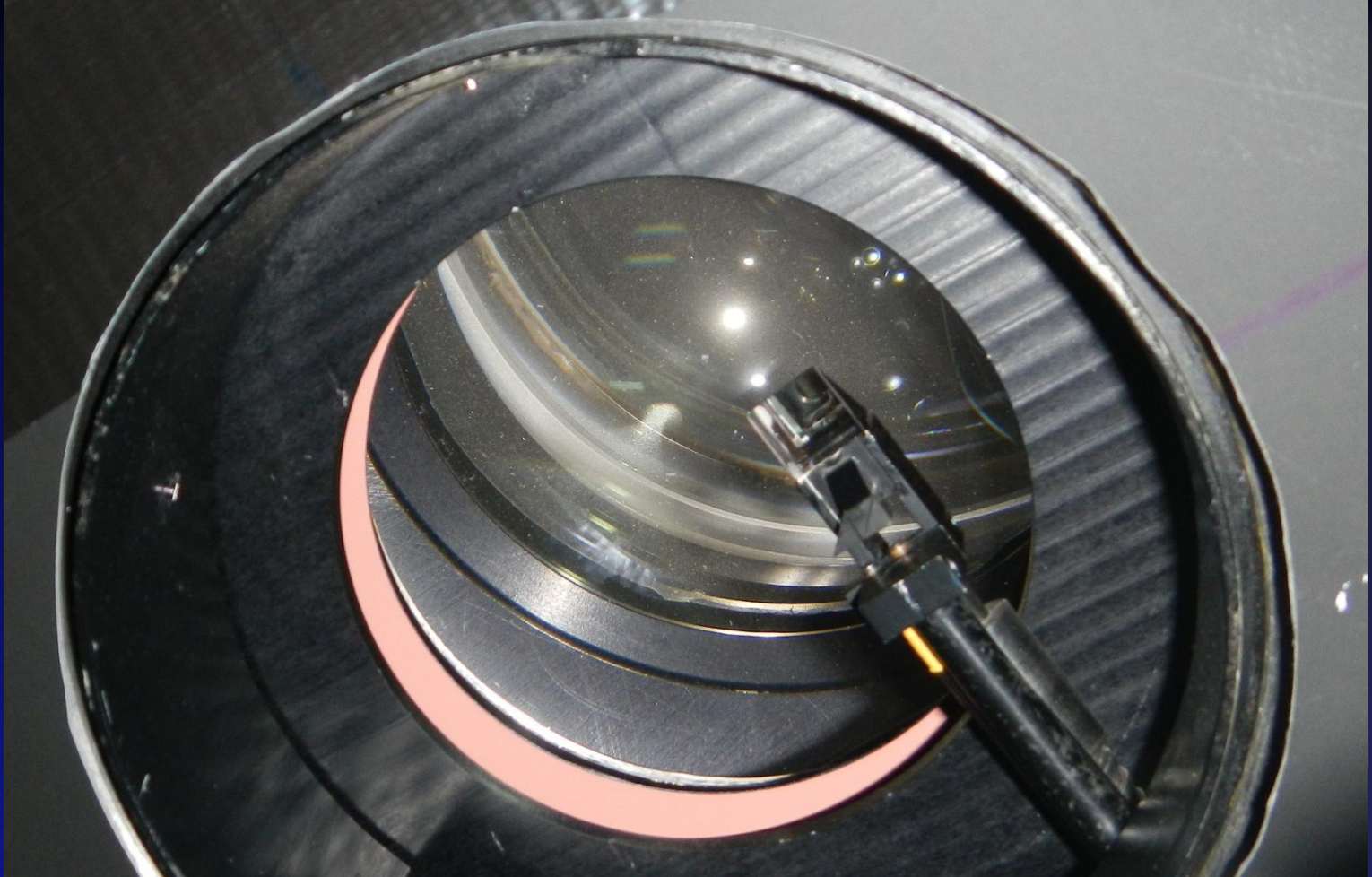
- Repeated the throughput measurements from the ADC position (aka *from below*):
  - Main Group + Field Lens Red = 55%
  - Main Group + Field Lens Blue = 41%
- Compared these results to the earlier 2014 measurements from the grating position (aka *from above*):
  - Main Group + Field Lens Red = 48%
  - Main Group + Field Lens Blue = 42%
- Alas: Field Lens problem confirmed...

# RSS Field Lens



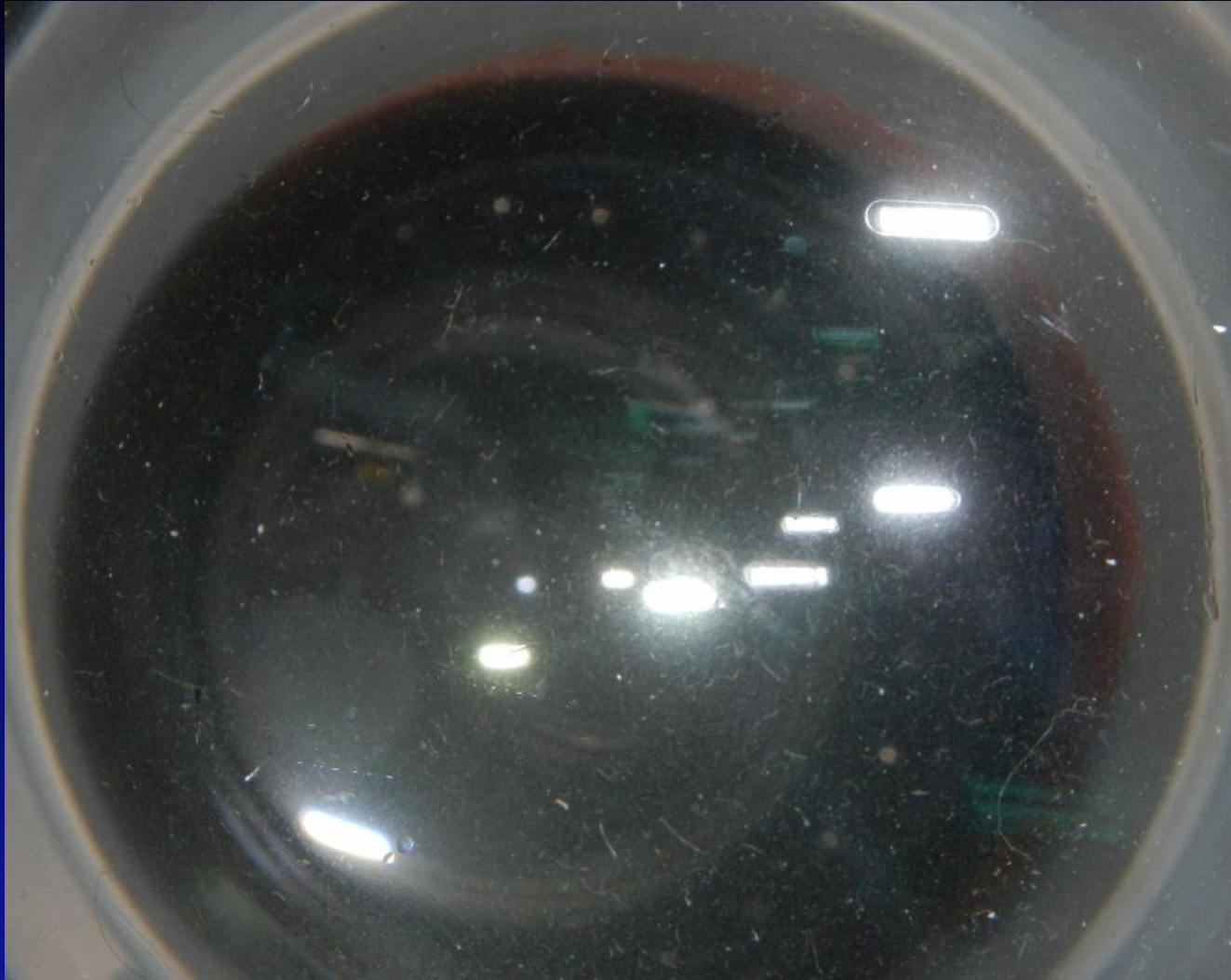
Harshly illuminated, the Field Lens appears slightly milky

# RSS Field Lens



The lenses appear hazy under gentler illumination

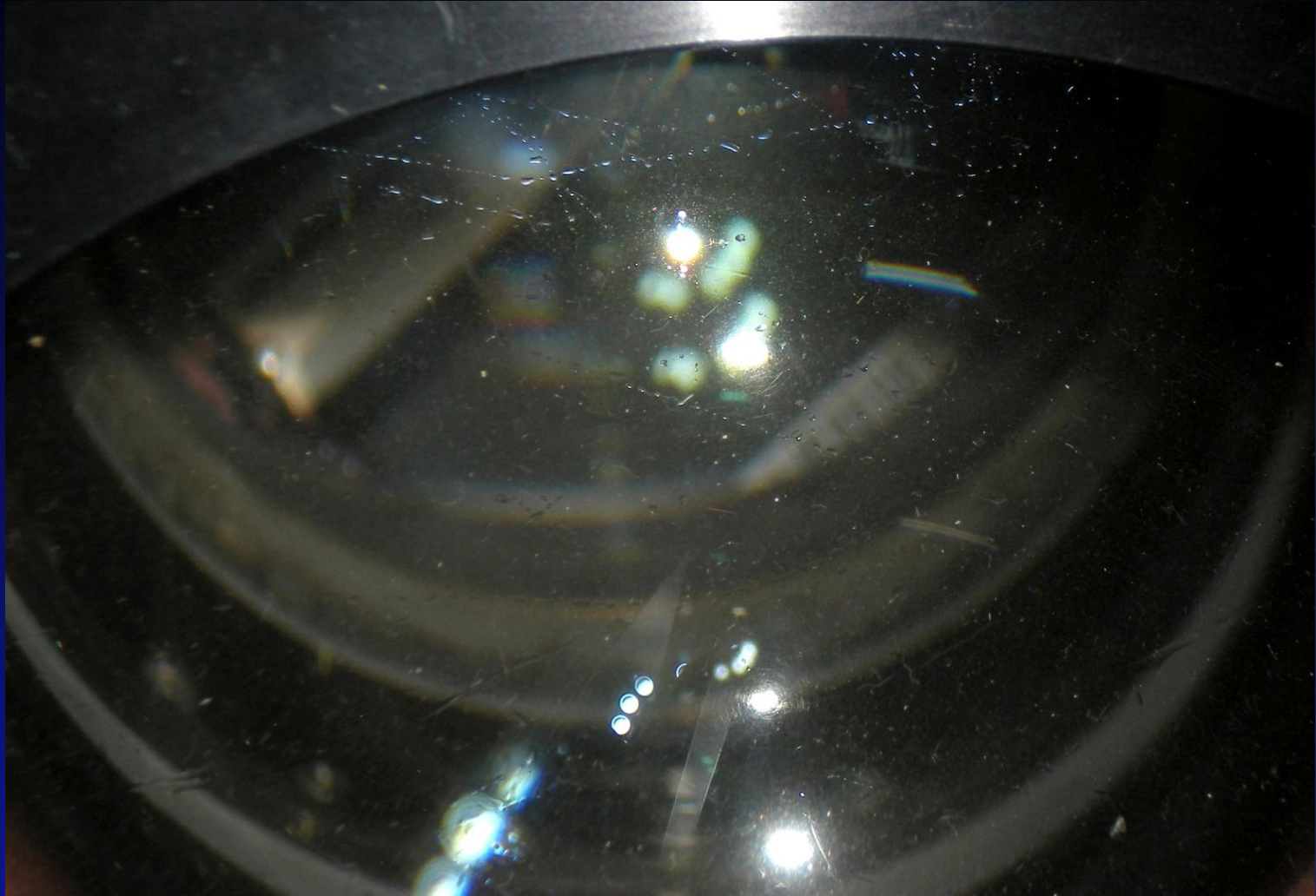
# Collimator Triplet



Camera focused on the top of the Triplet

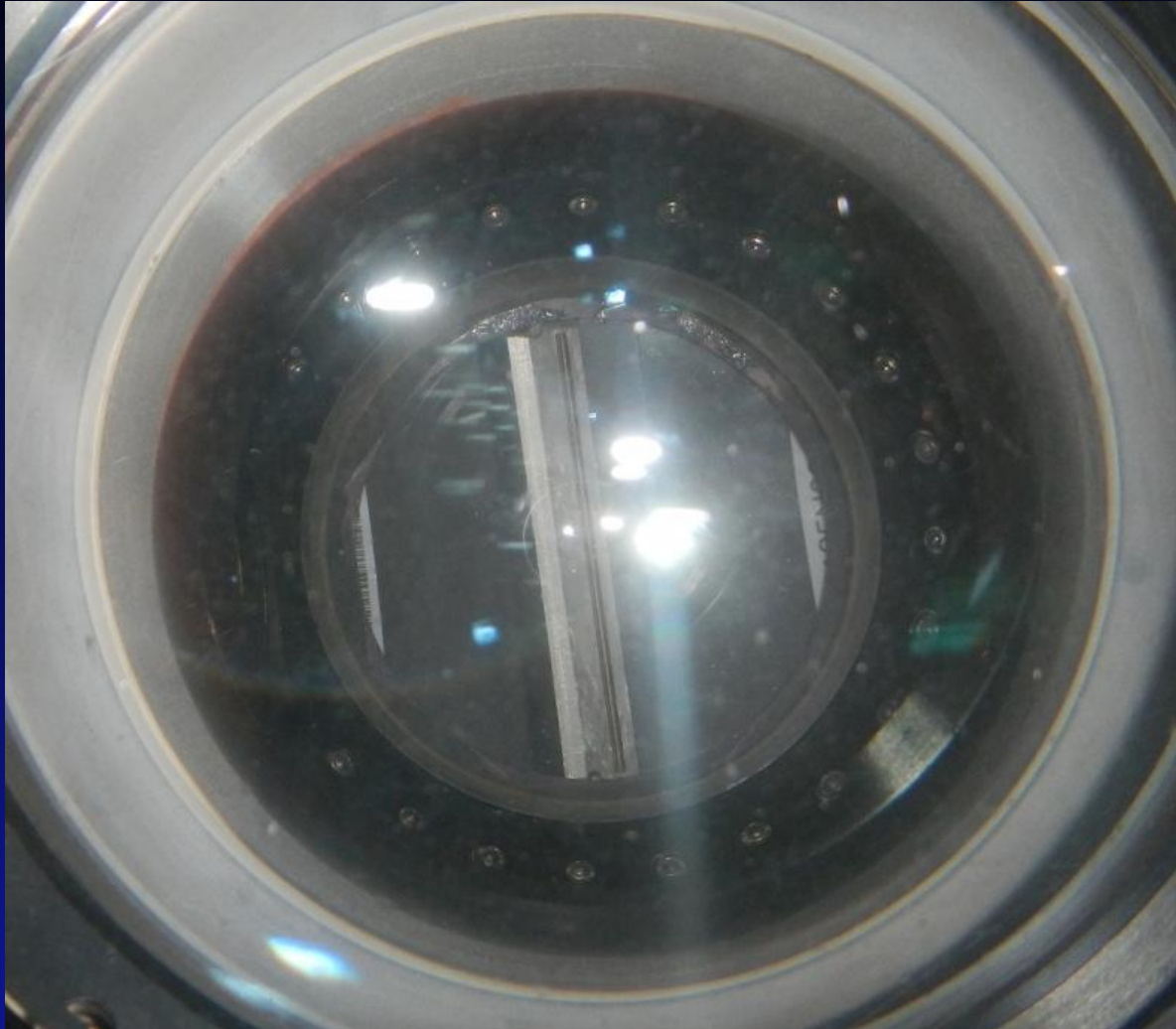


# Collimator Triplet



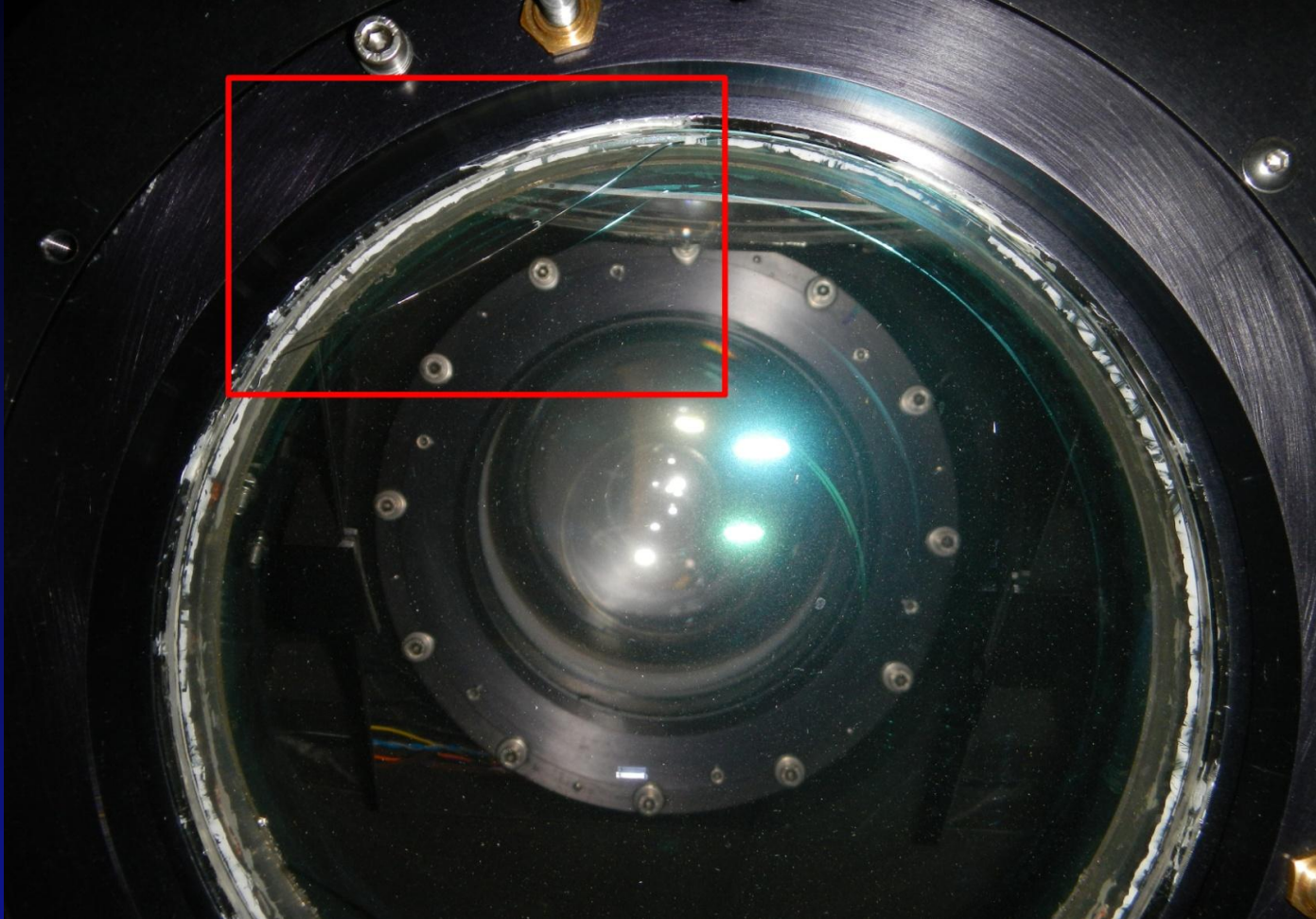
Droplets & streaks in the collimator triplet

# Collimator Triplet



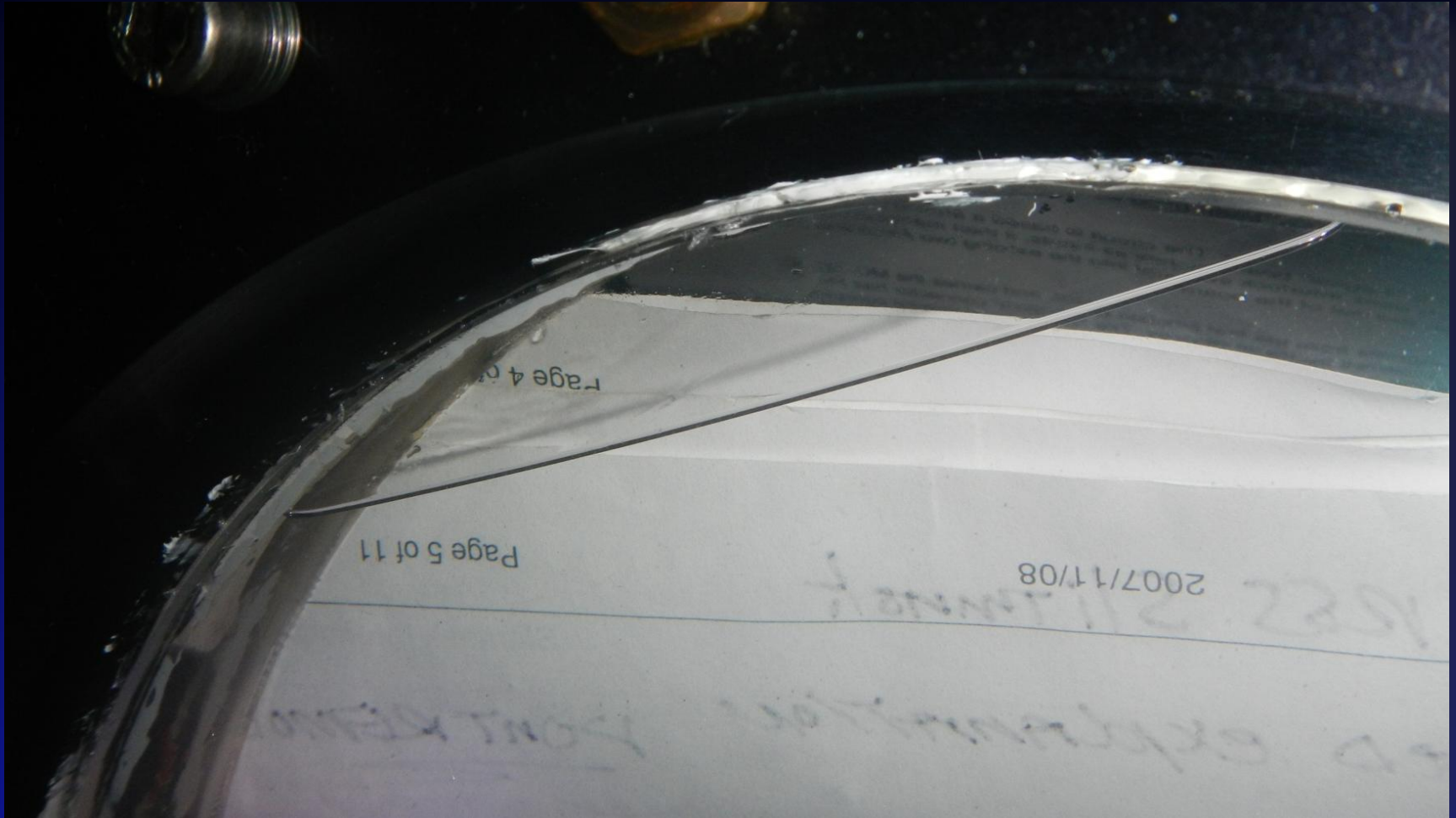
Camera focused on the Slitmask

# Collimator Doublet



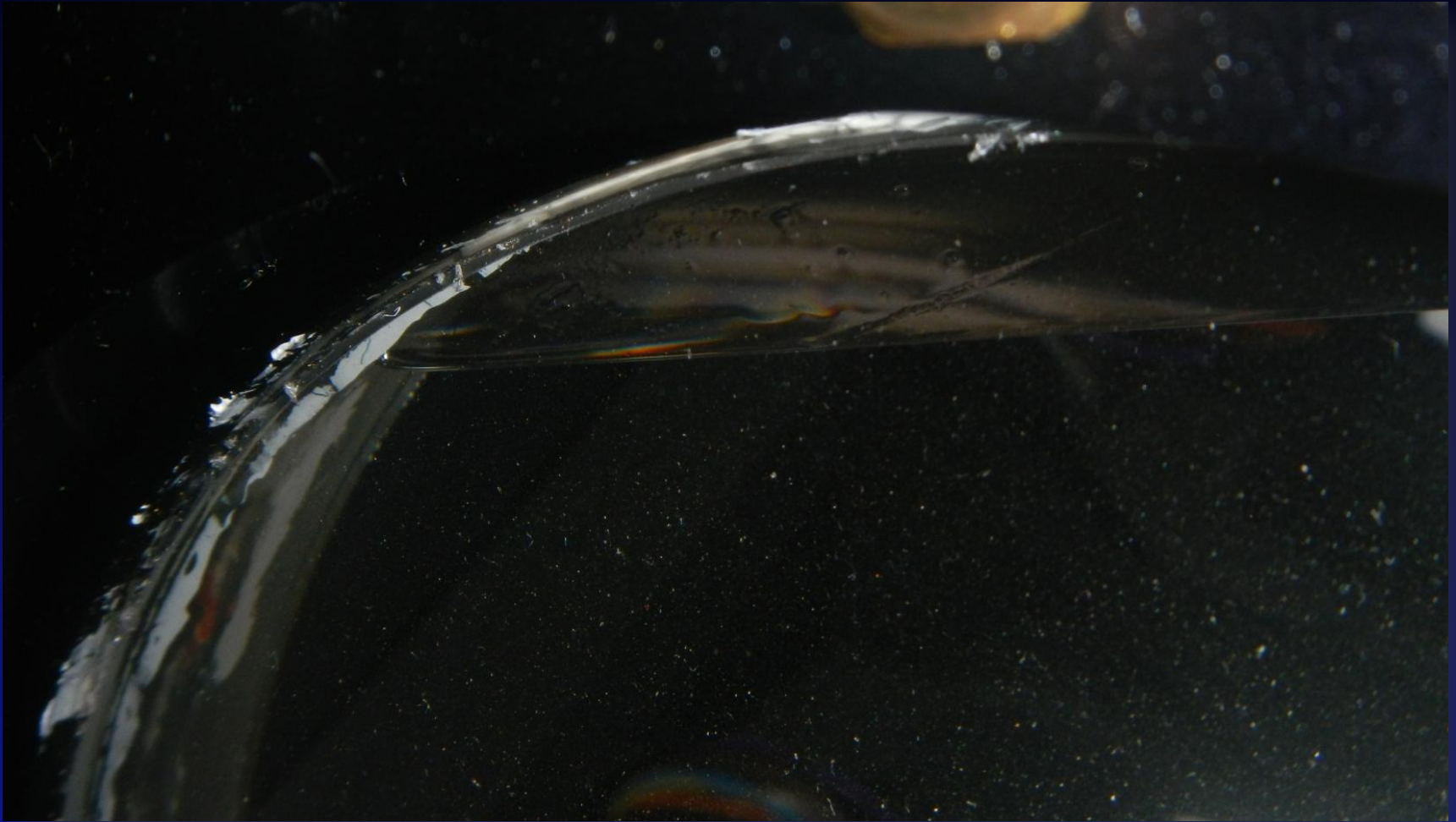
A suspicious line was noticed near the top of the Doublet

# Collimator Doublet Fluid Loss



The line indicates the fluid level within the Doublet

# Collimator Doublet Fluid Loss



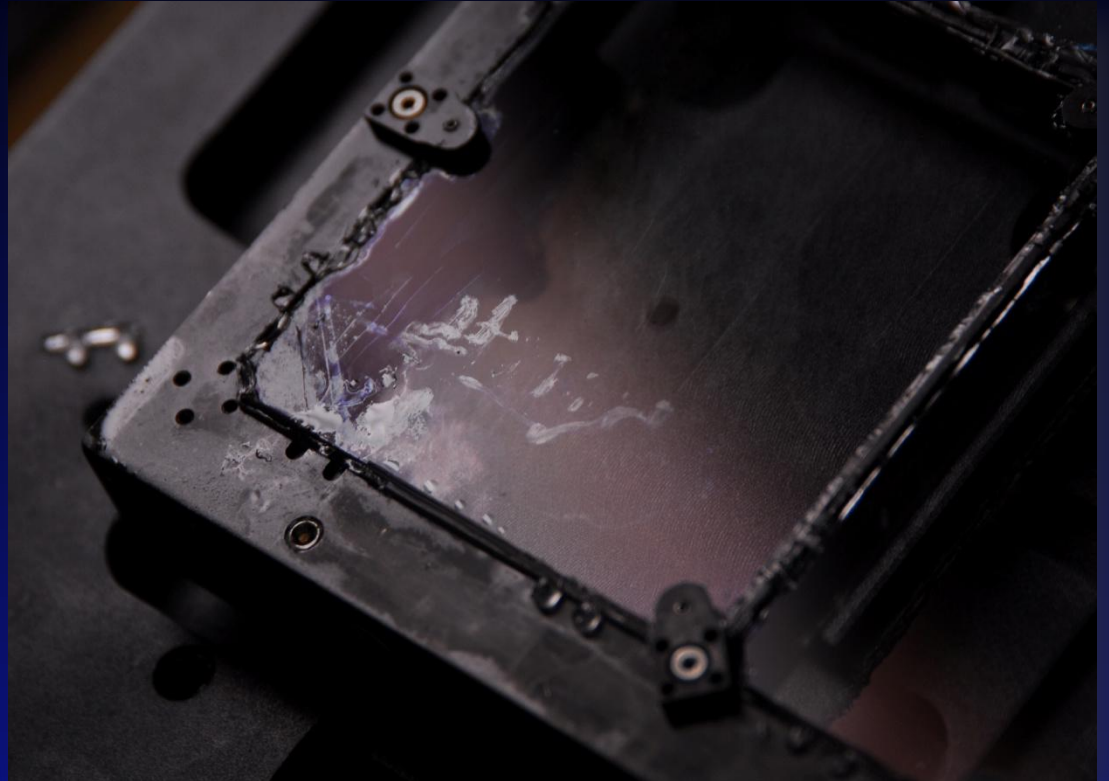
The missing fluid doesn't appear to have left the assembly?

# Doublet Sylgard Degradation



However, the Sylgard seal has clearly denatured...

# Beam Splitter Sylgard Failure



The seals on the Beam Splitter failed spectacularly in 2011 & the Doublet seals look very similar!

# Recommendations

- Remove RSS from the telescope to conduct a thorough inspection of all the lens groups (collimator & camera)
- Measure the throughput of the various lens groups individually
- Extract lens fluid samples for analysis
- Replace the lens fluid in all of the collimator groups (the Field Lens, Triplet & Doublet)
- Clean the upper surface of the Triplet
- Measure the throughput of all the collimator groups again afterwards
- Assemble, align & install on the telescope