

RSS Optics Update

Lisa Crause & Éric Depagne

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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%)

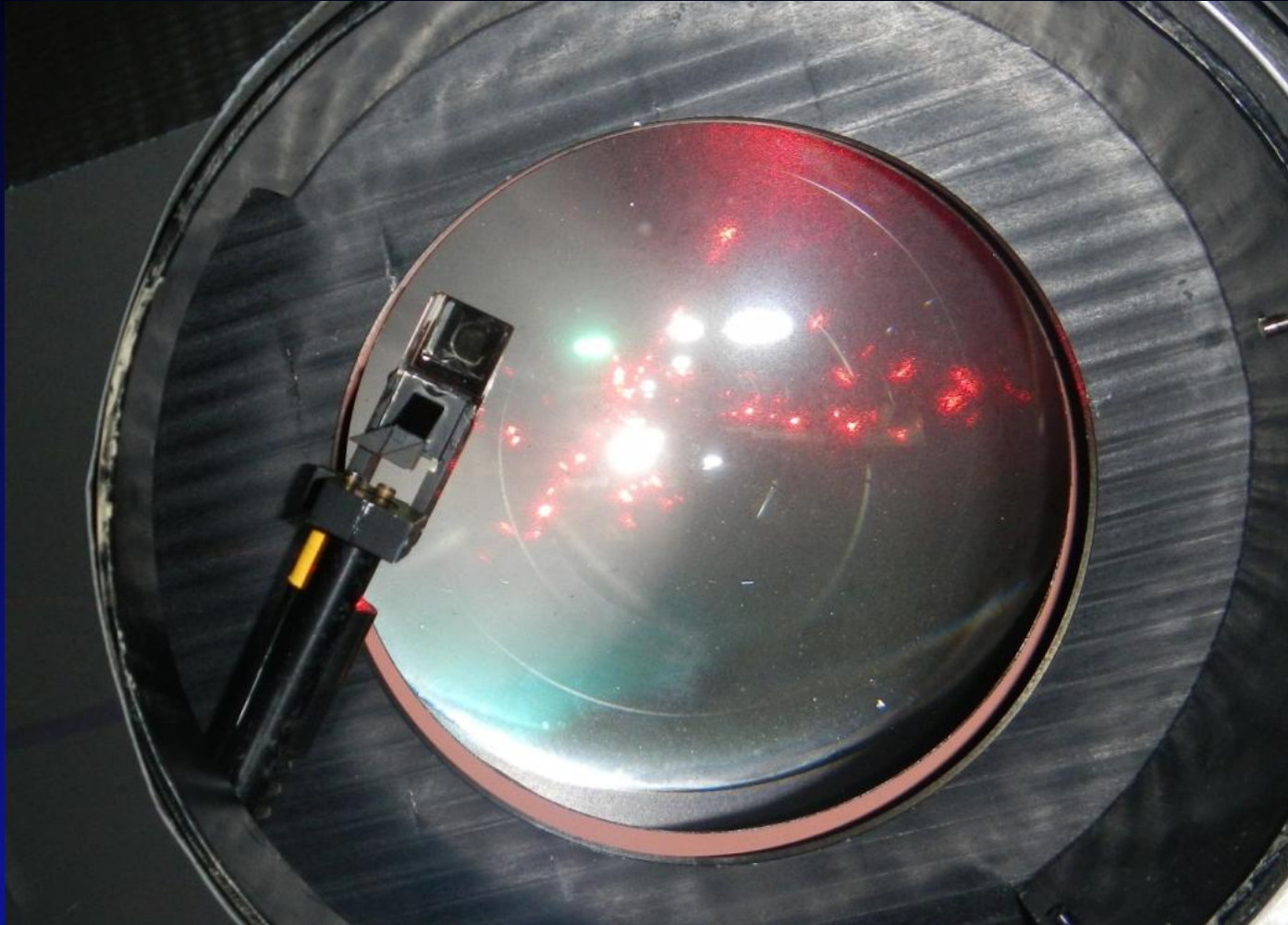
Collimator Sub-Units

- 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

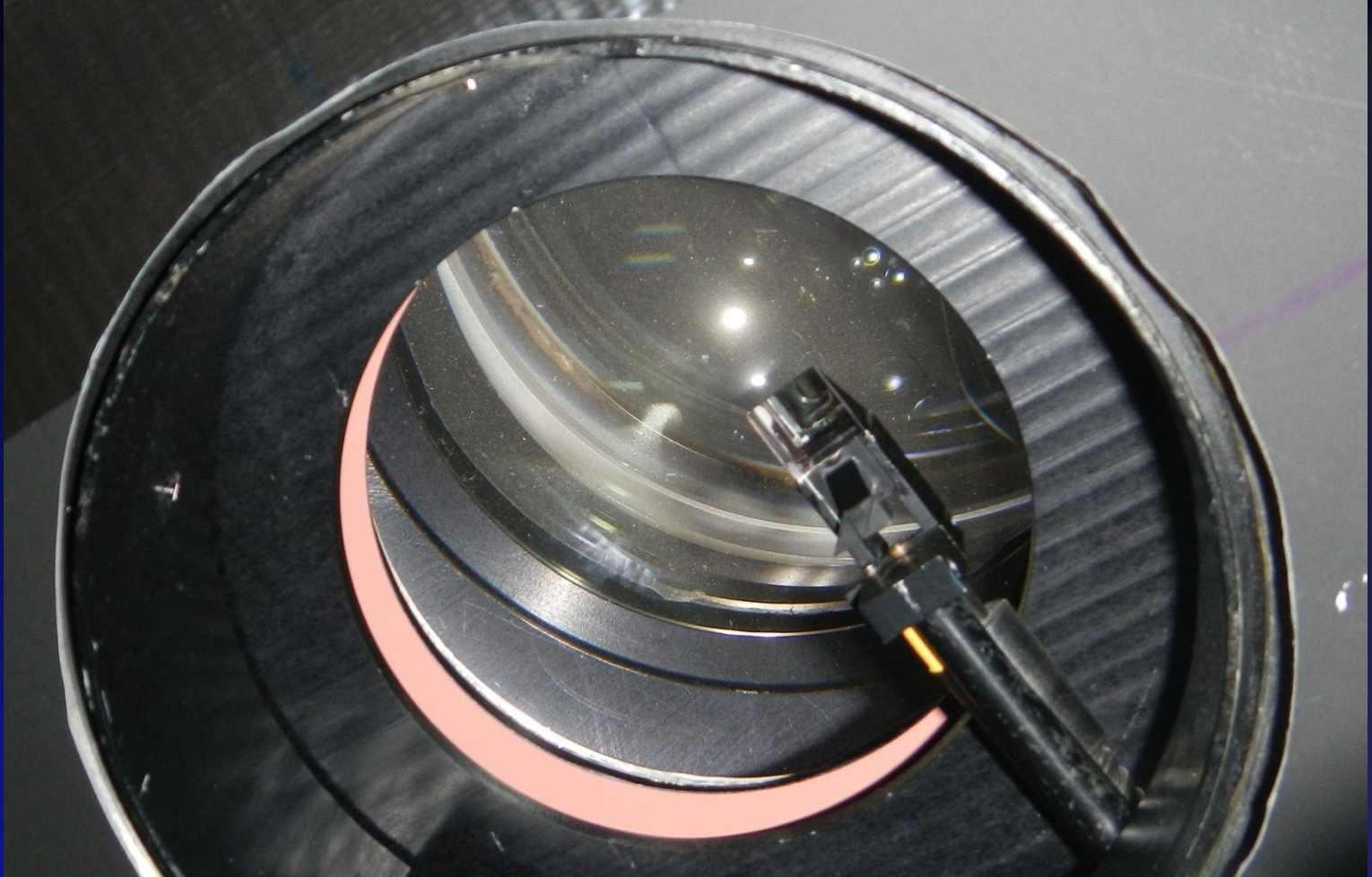
- Repeated the throughput measurements from the ADC position (aka *from below*):
 - Main Group + Field Lens Red = 55%
 - Main Group + Field Lens Blue = 41%
- Compared these results to the earlier 2014 measurements from the grating position (aka *from above*):
 - Main Group + Field Lens Red = 48%
 - Main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

RSS Field Lens



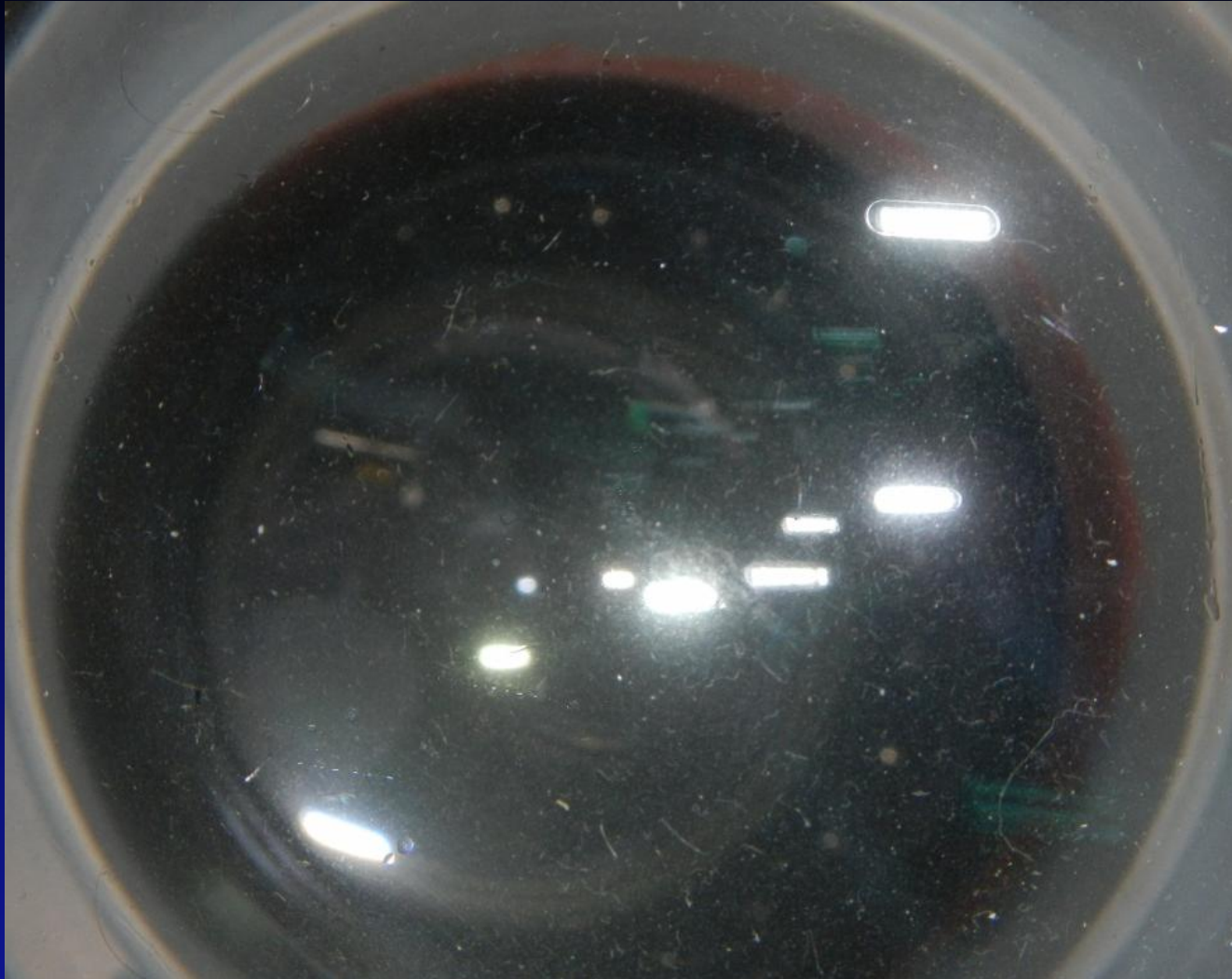
Harshly illuminated, the Field Lens appears slightly milky

RSS Field Lens



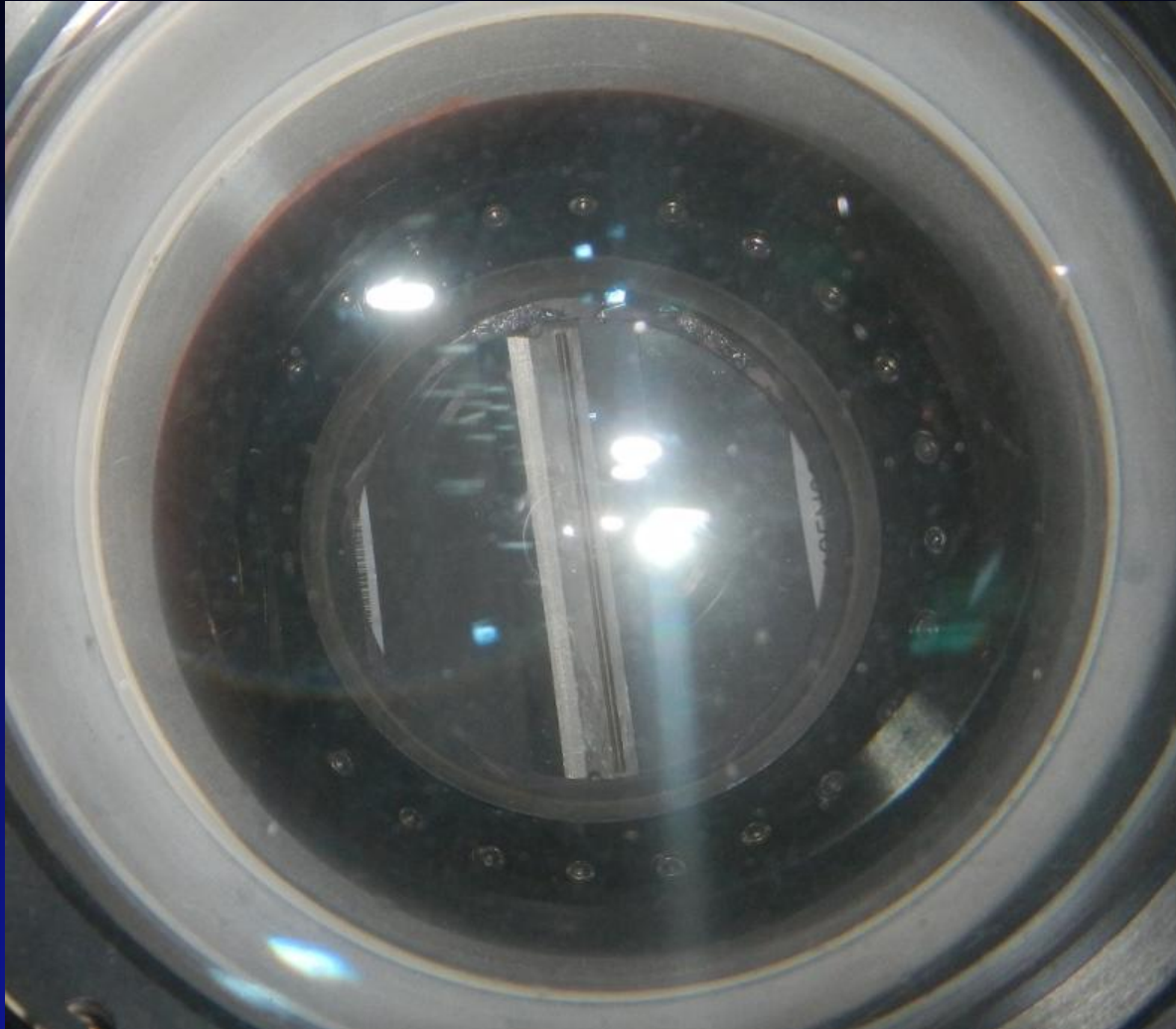
The lenses appear hazy under gentler illumination

Collimator Triplet



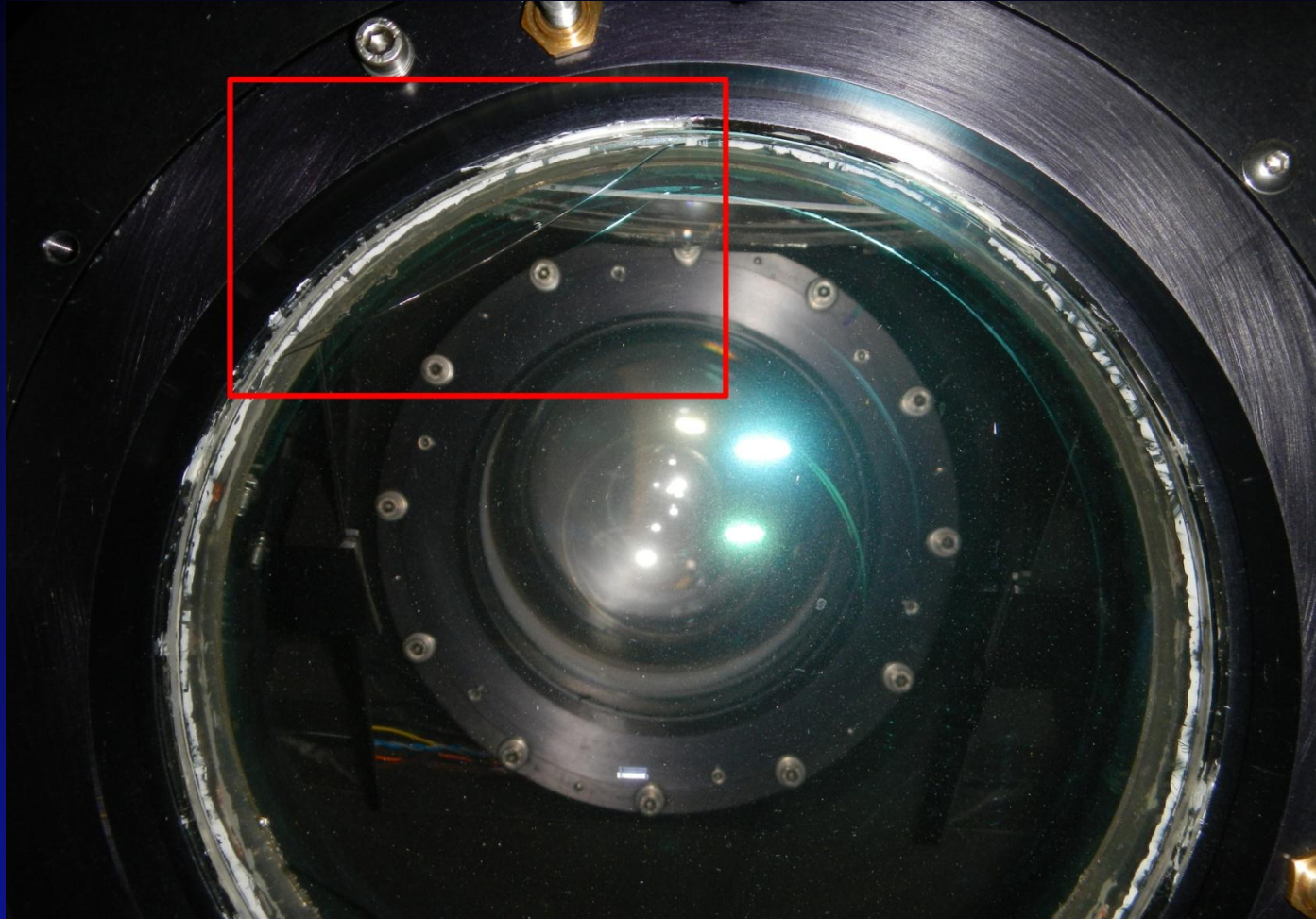
Camera focused on the top of the Triplet

Collimator Triplet



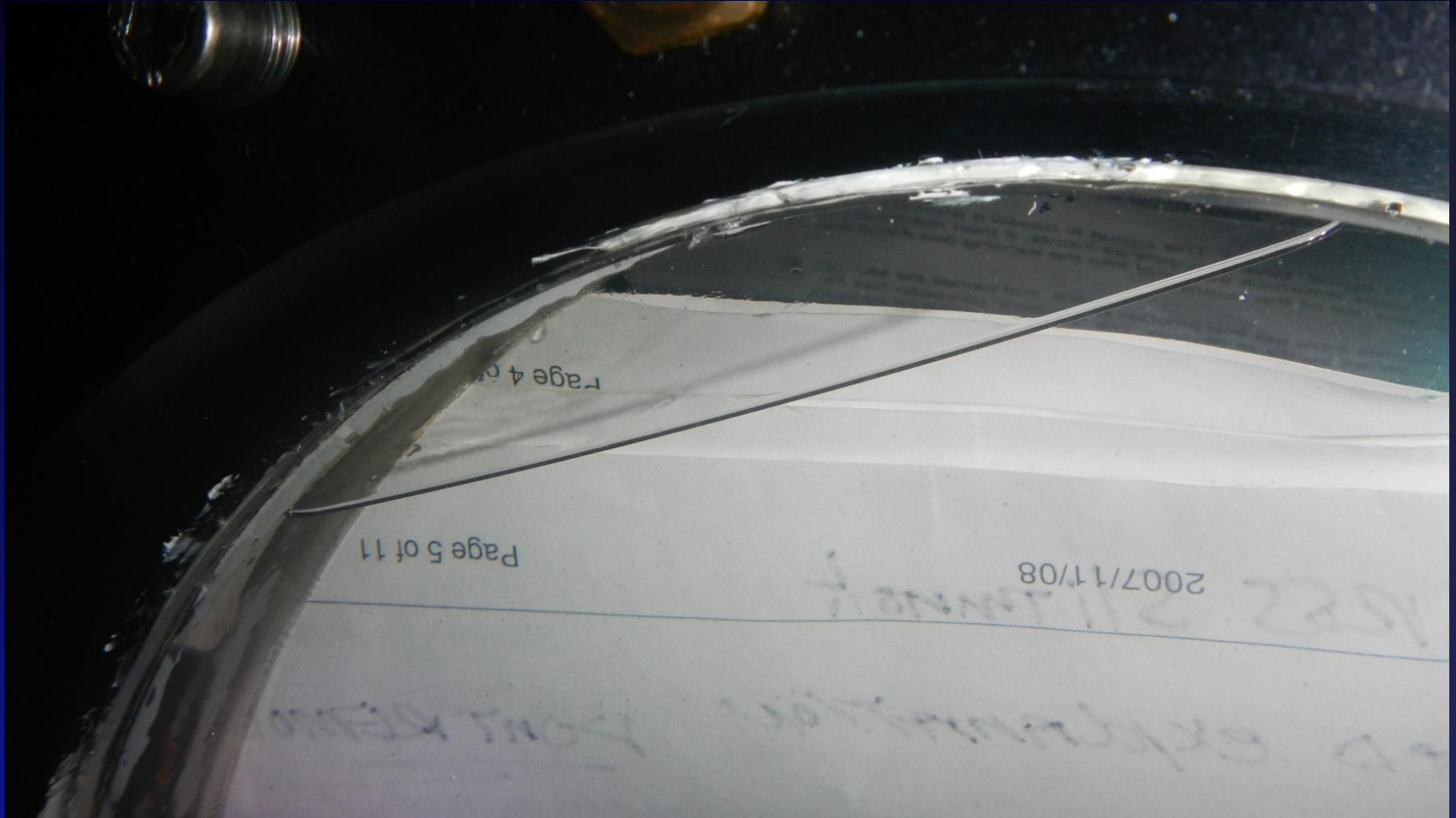
Camera focused on the Slitmask

Collimator Doublet



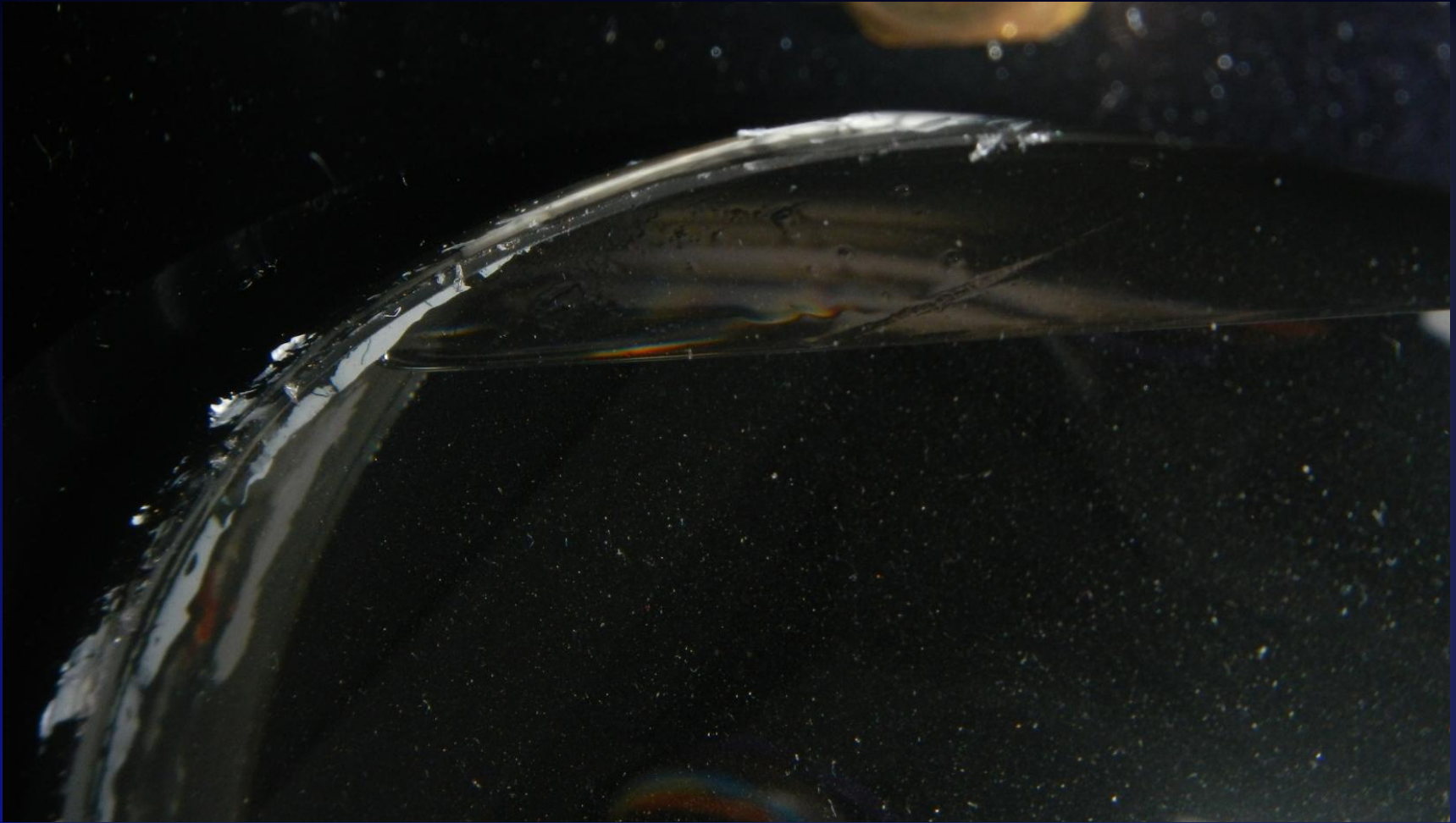
A suspicious line was noticed near the top of the Doublet

Collimator Doublet Fluid Loss



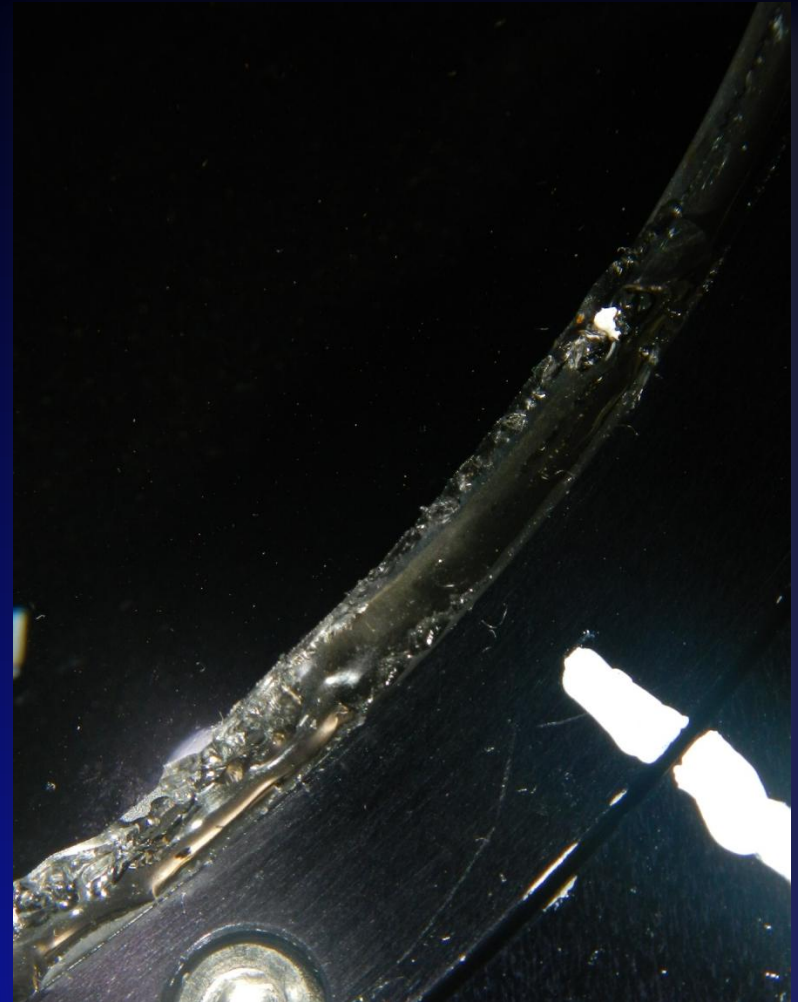
The line indicates the fluid level within the Doublet

Collimator Doublet Fluid Loss



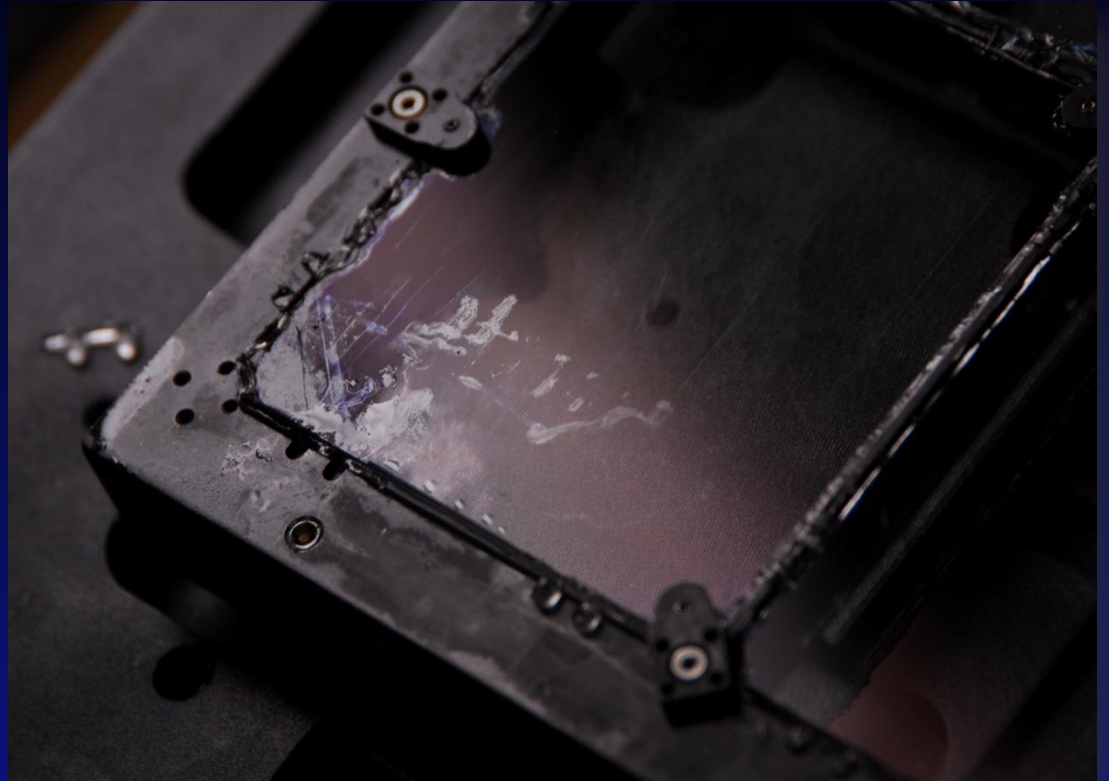
The missing fluid doesn't appear to have left the assembly?

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