GAS TEST ANODE

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INTRODUCTION: GAS TEST GRID HISTORY

1. Anode and gate tested with ***no surface treatments***.
2. Anode and gate sent to Advanced for ***passivation* alone**.
   - ➤ High rates of electron emission observed!
   - ➤ Caveat: Grids have not been sparked which is the usual early test.
   - ➤ Cursory observations of the wire surfaces after returning from Advanced & before testing show crusty regions and fibers.
   - ➤ Question: Are high rates due to different HV testing procedure or emission from debris on the wires?
3. Clean the anode to see if this helps the rate. Leave the gate dirty to (a) have a dirty grid to test, (b) depend on new gas test gate to be properly and realistically cleaned & passivated at Astropak.
   - ➤ Passivated grids had been tested with reverse bias (“anode” grid as cathodic surface), so we can use this mode with previous data with a clean anode and dirty gate.

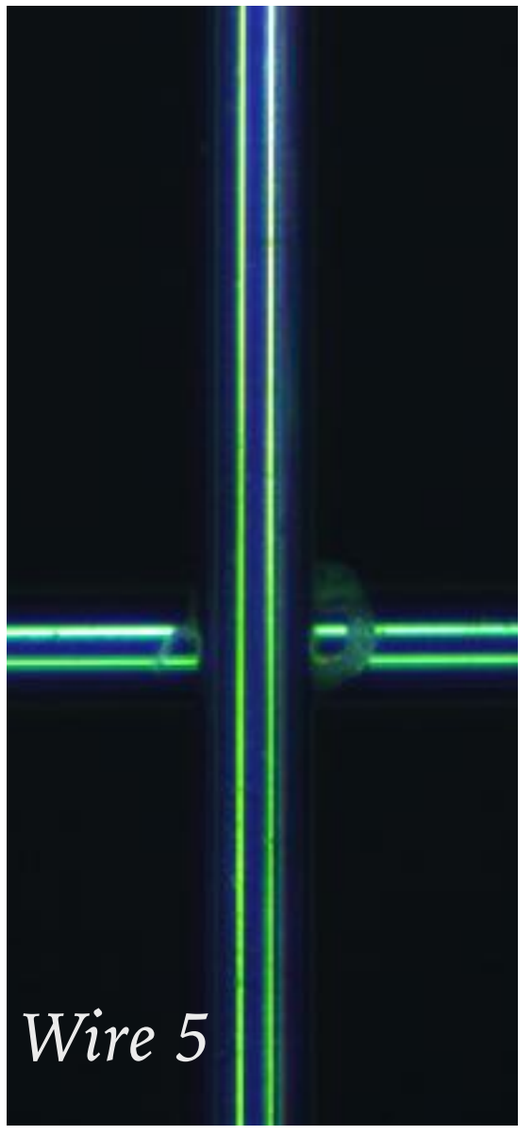
ANODE CLEANING

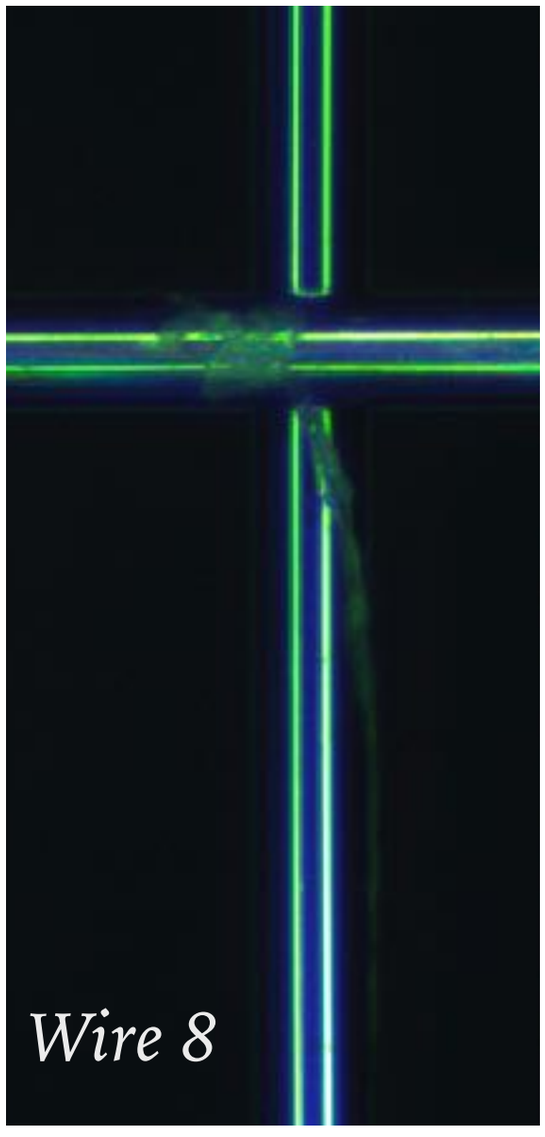
- Inspect subset of wires before & after cleaning to estimate effect.
- Ultrasonic set up in Phase II cleanroom.

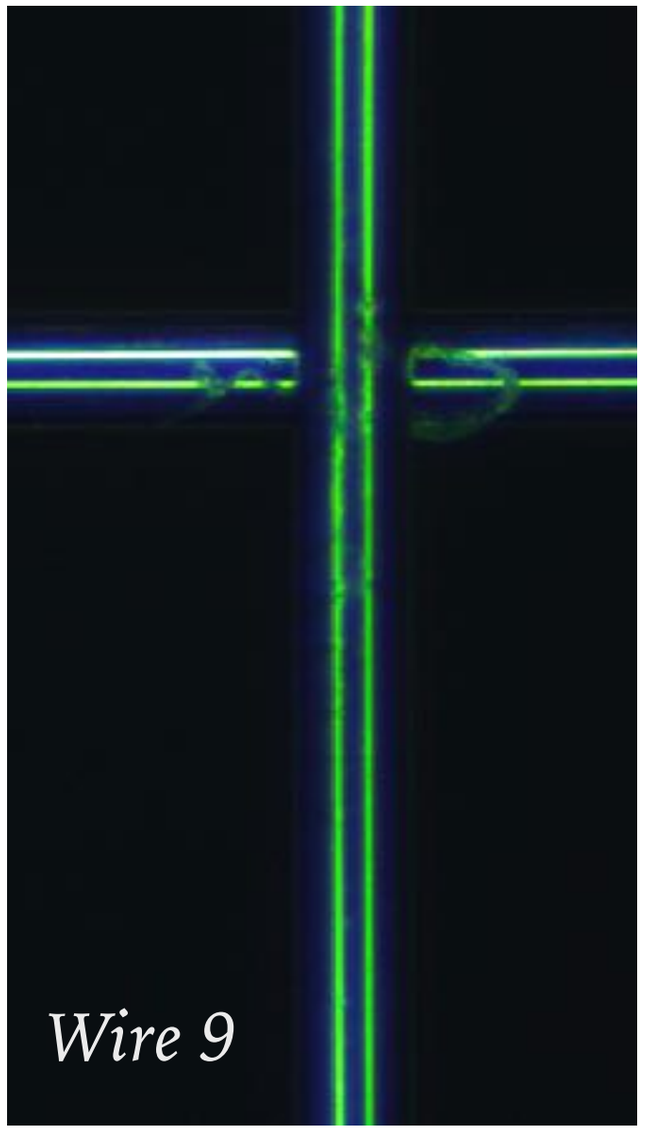
1. 30 minutes in heated bath (medium setting) with Alconox + DI water.
2. 30 minutes in heated bath (medium setting) with DI water.
3. Add DI water to tray to let loose fibers flow off the water surface. This treats the bath as a weir.
4. Lift anode out when surface looks clear.
5. Bag anode for transport to Building 33 cleanroom.
6. Low flow deionized N2 used to dry grid.

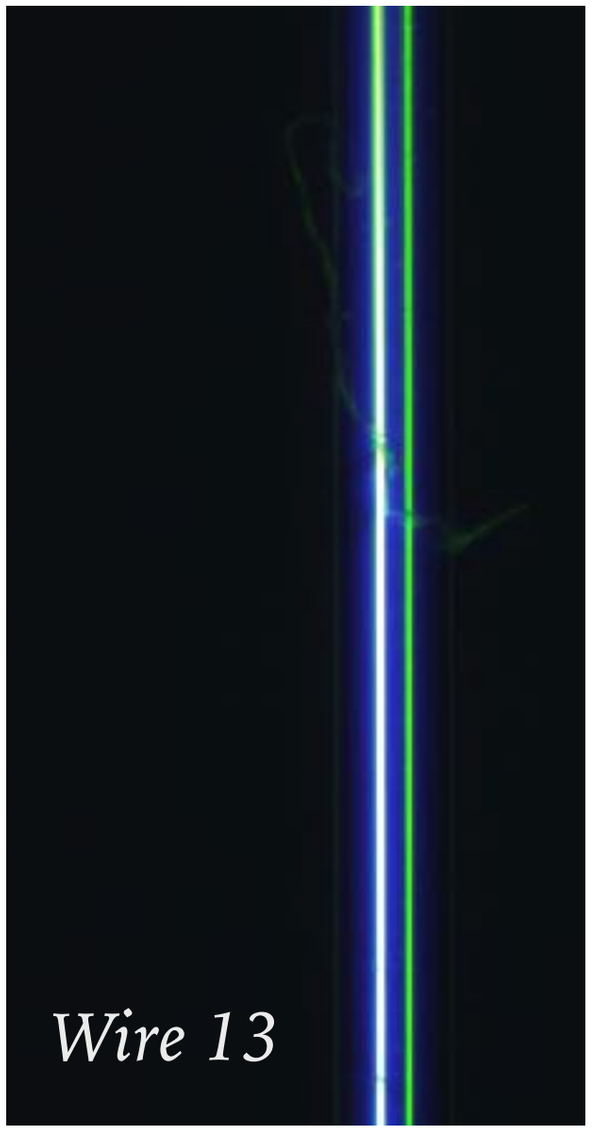
***Figure**: Anode grid is placed in a tray within the ultrasonic cleaner in the cleanroom. DI water added to the tray spills over into the main bath visibly removing some debris from the water surface. Grid is removed from the tray once the surface is visibly clear.*

BEFORE CLEANING: FIBERS



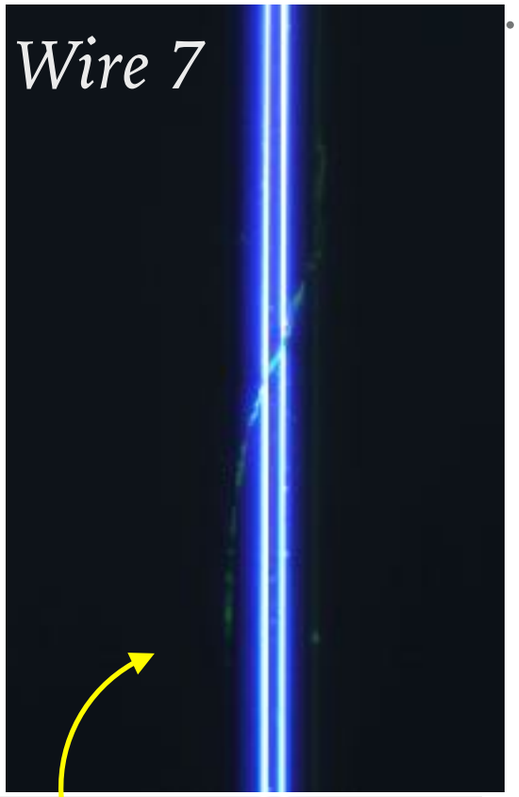


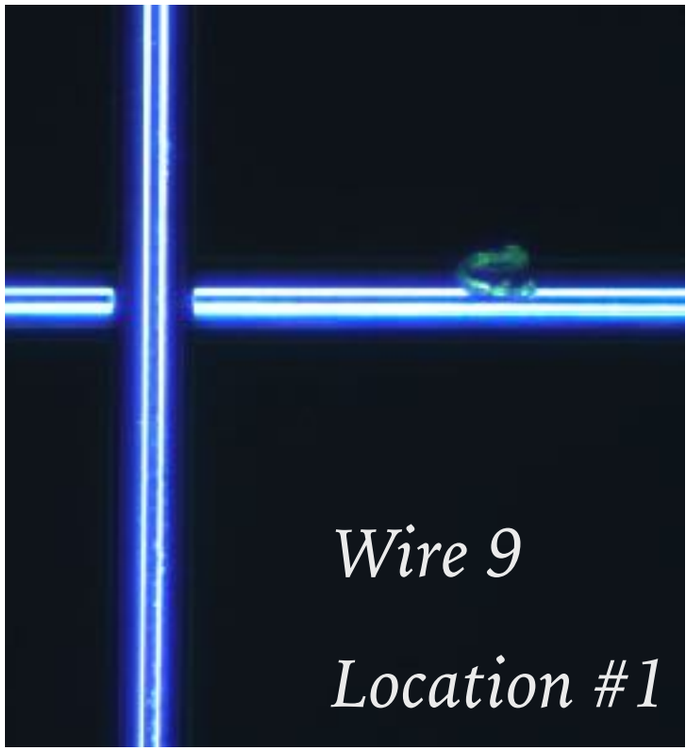


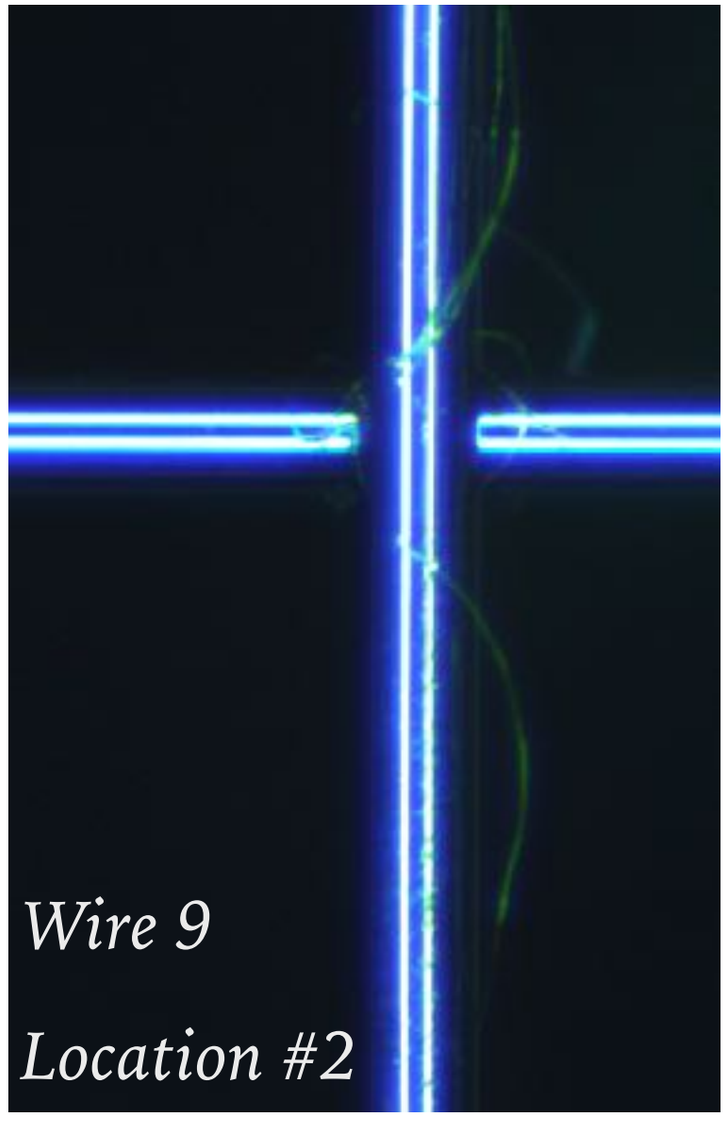


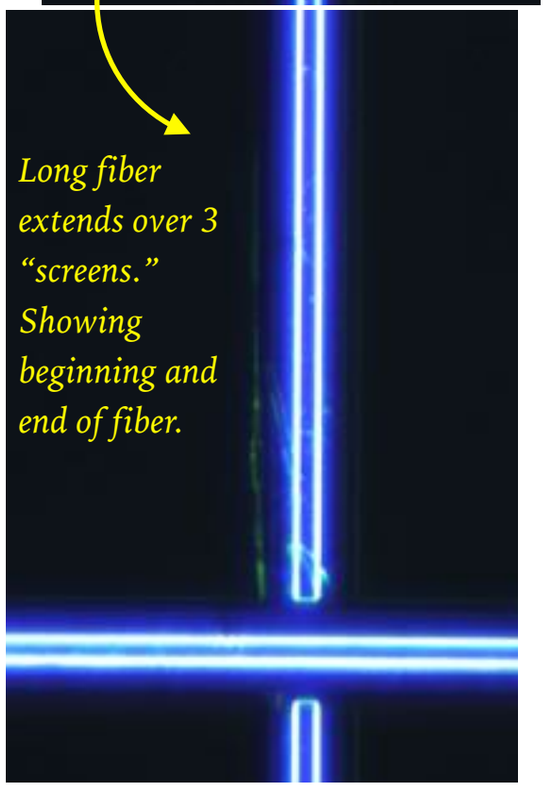
- 14 fibers observed on 20 wires (9 observed on wires 1-14).

AFTER CLEANING: FIBERS



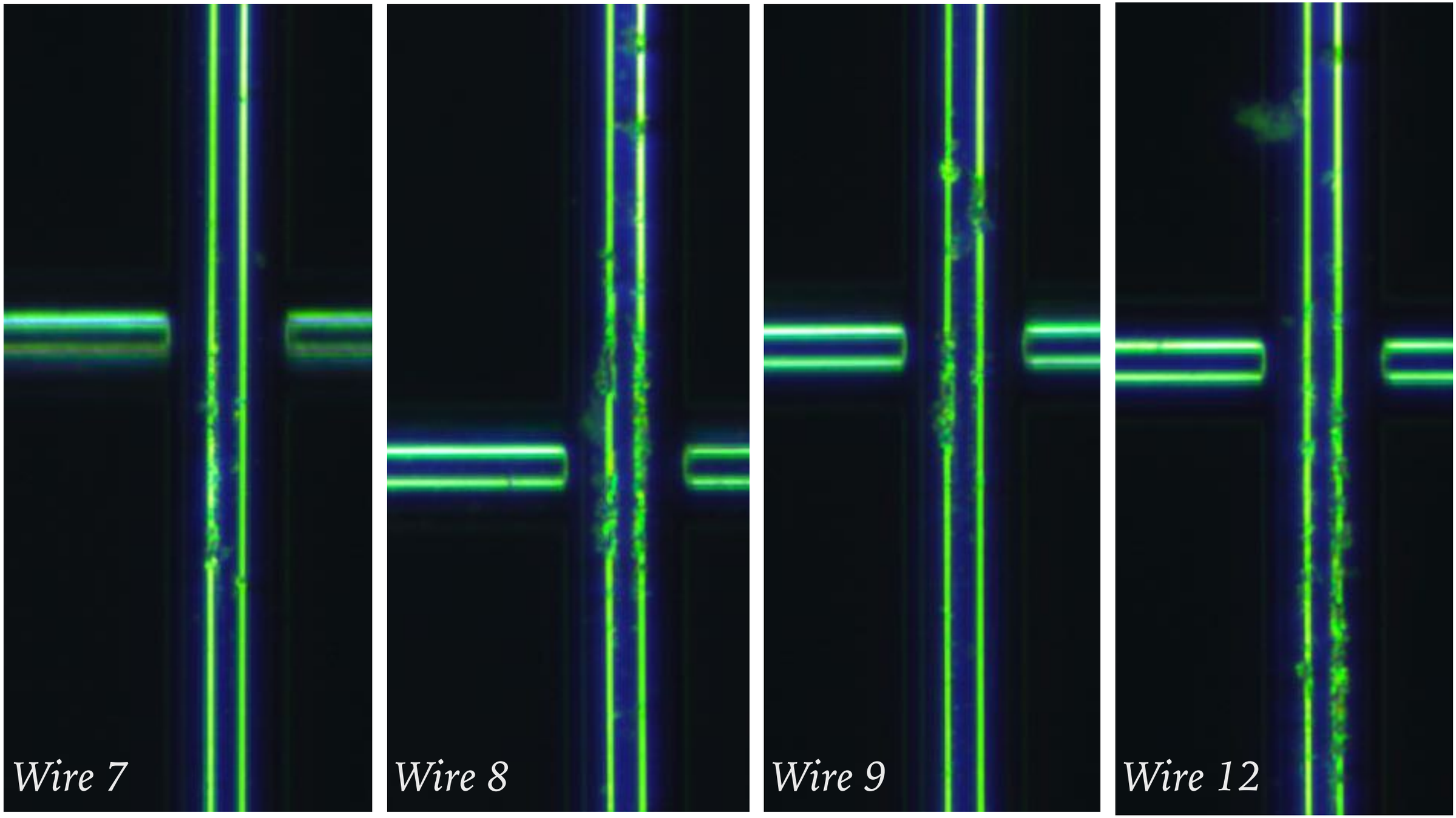






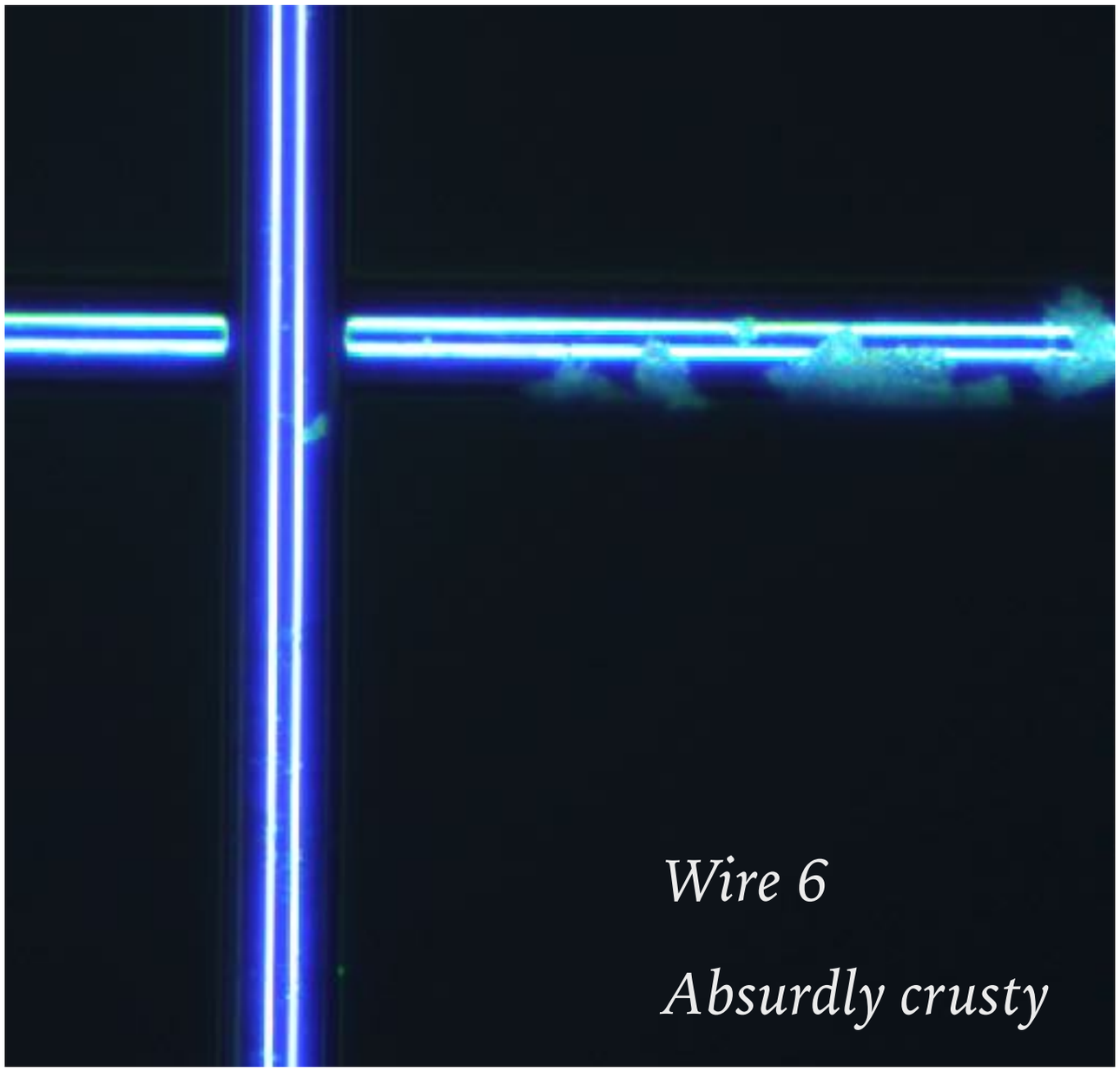
- 3 fibers seen in wires 1-14.

BEFORE CLEANING: CRUSTY REGION



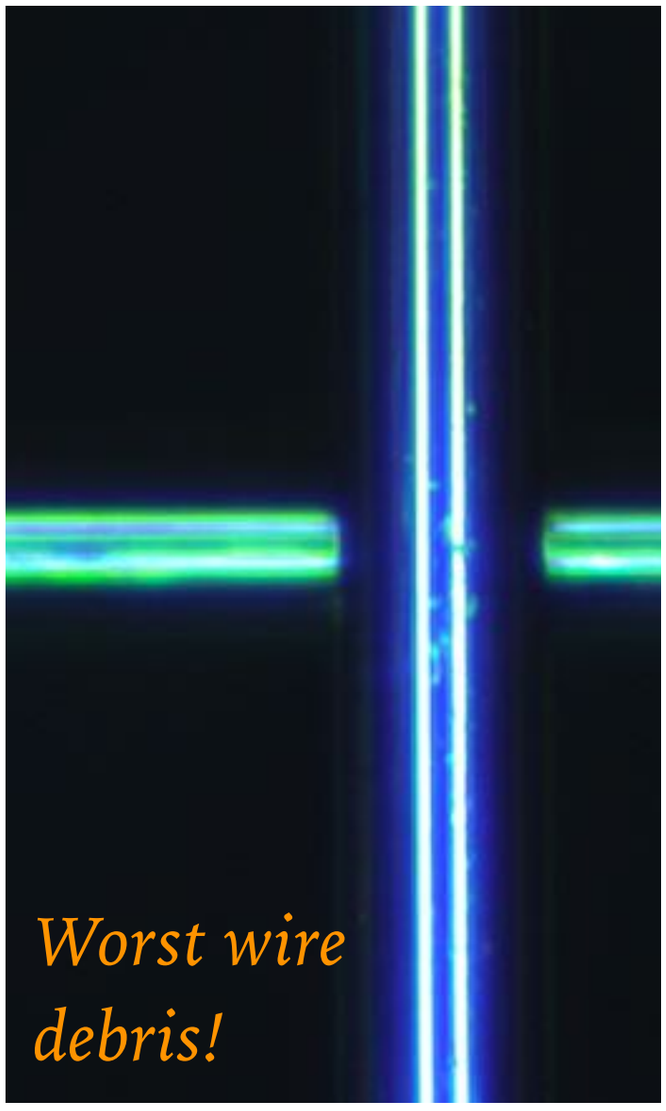
- 92 crusty regions in wires 6-14

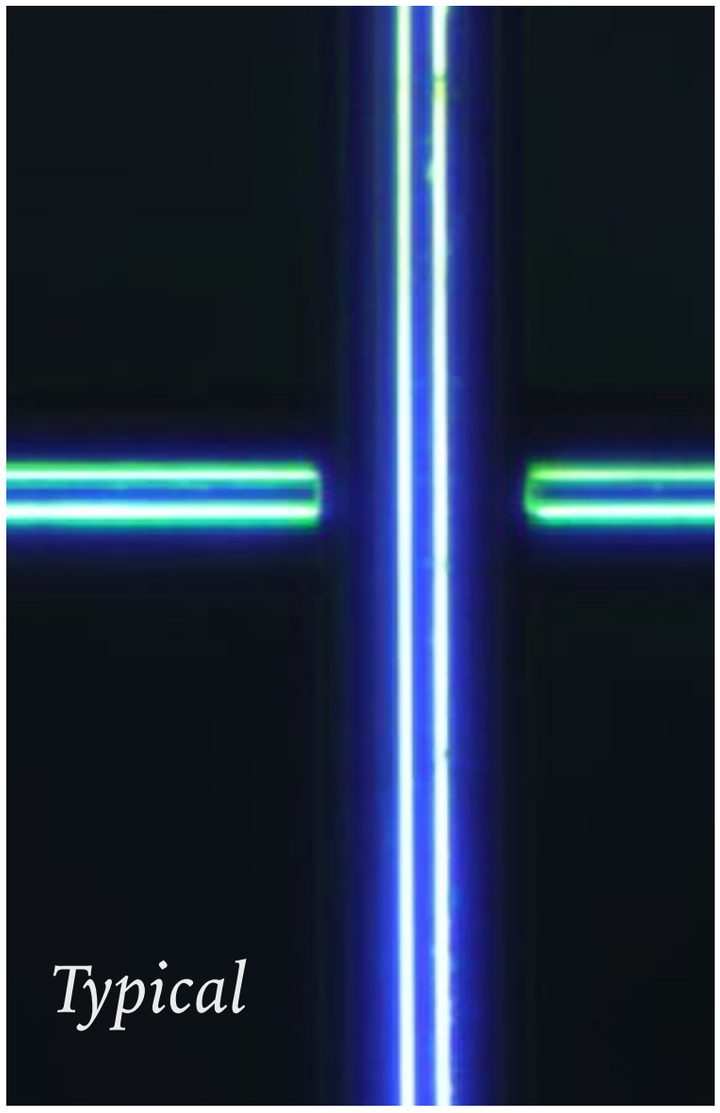
AFTER CLEANING: CRUSTY REGION

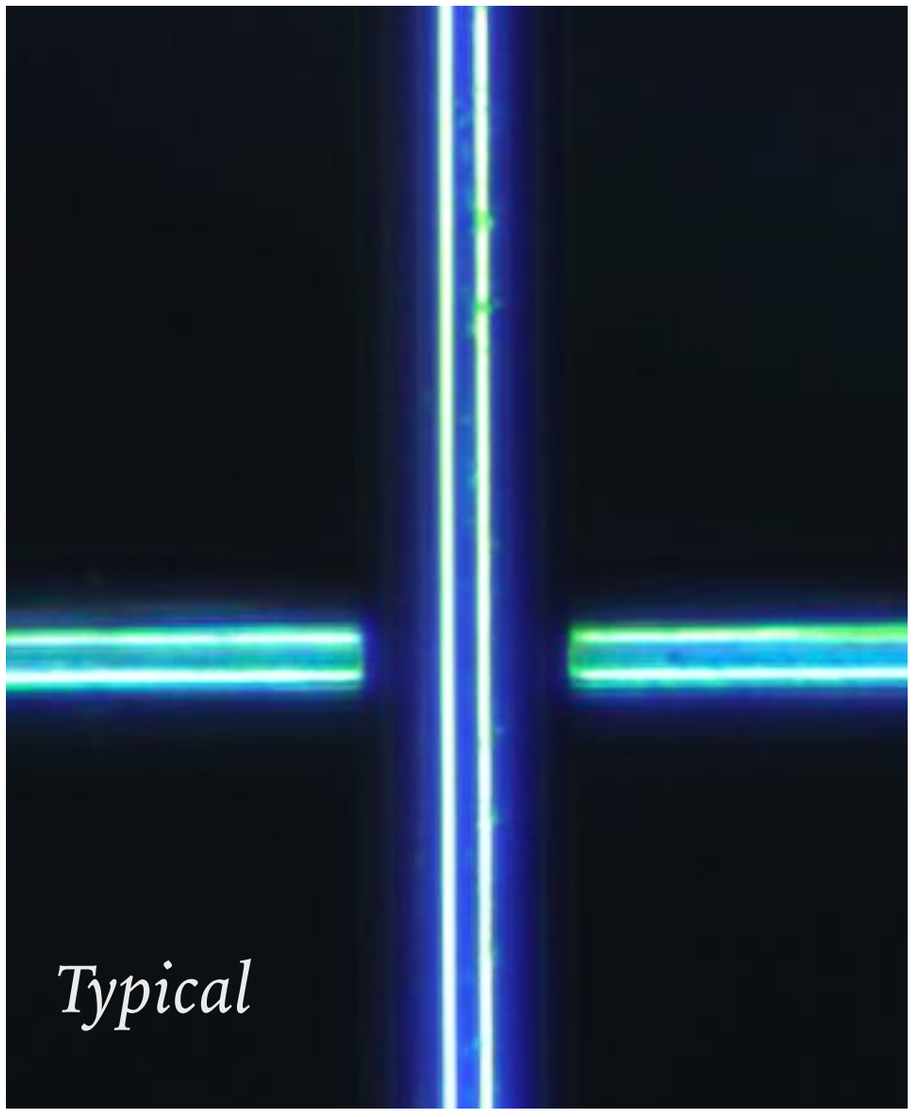


- 83 crusty regions counted in wires 6-14.

AFTER CLEANING: CRUSTY REGION ON UNDERSIDE OF WIRES







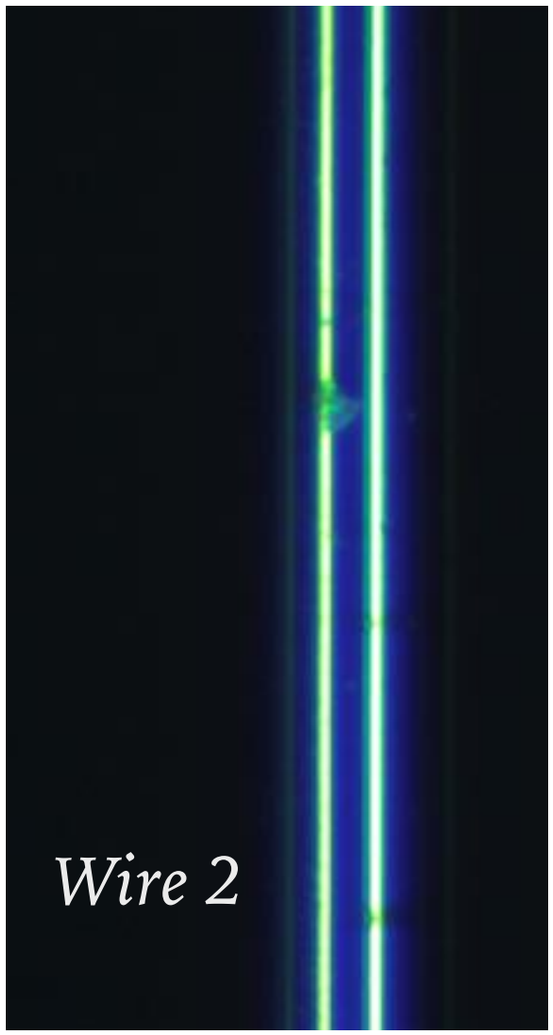
- 104 intersections on 2 long wires —> no crust
- Grid was submerged in the passivation bath at Advanced ***right-side up***.
  - Presumably lifting it out of the bath deposited debris on the top surface. The underside has remained mostly clean.

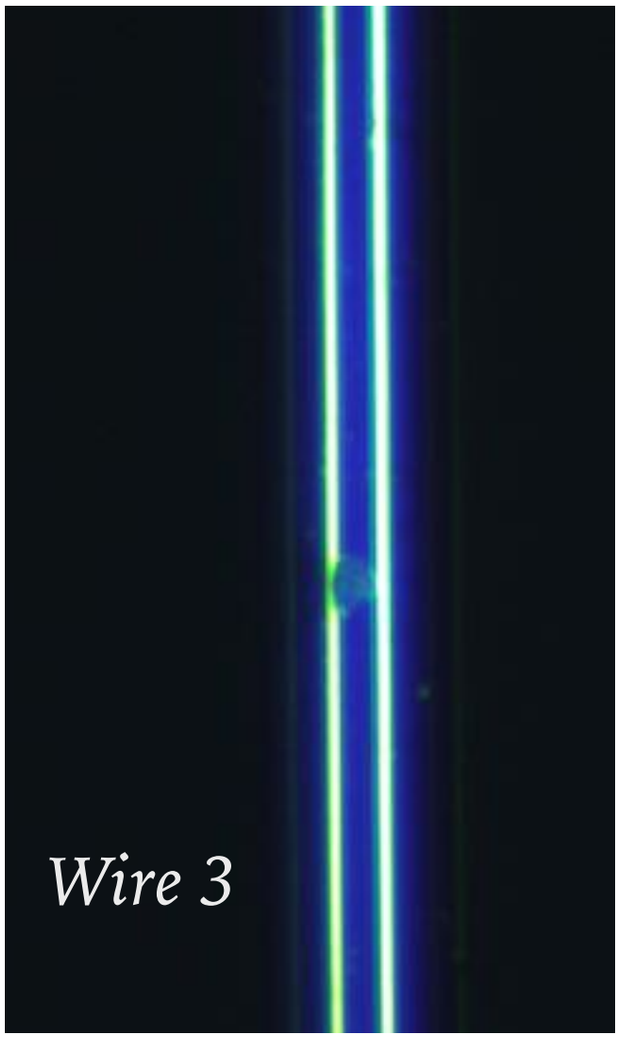
SUMMARY

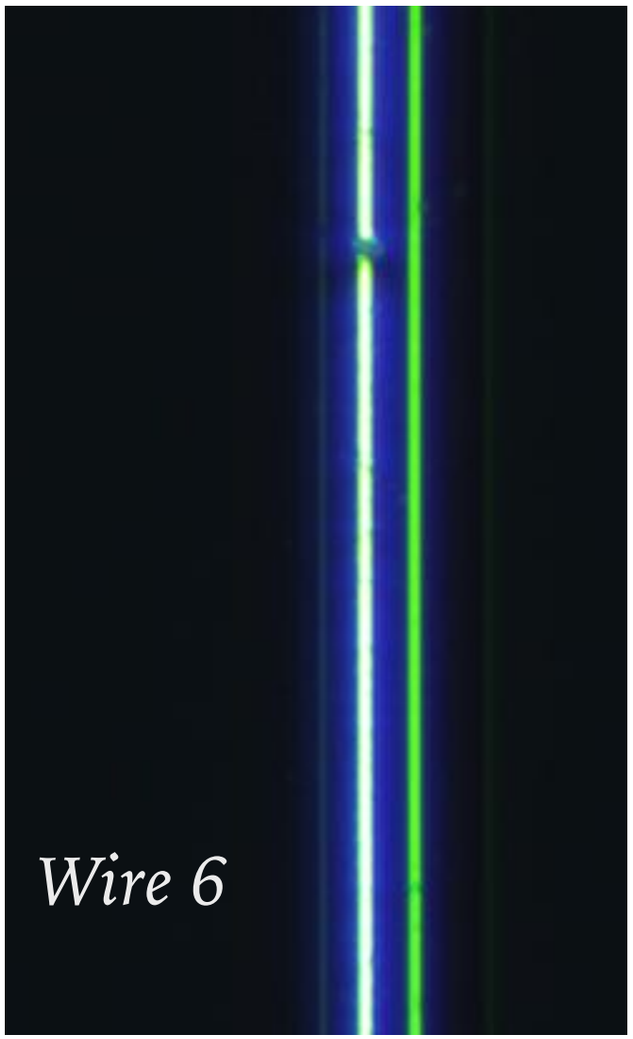
- Advanced's passivation bath left debris, crust, fibers on the wires.
  - **Solution**: Passivate in a cleanroom environment at Astropak.
- Cleaning in an ultrasonic bath reduced the number of fibers on the wires, but had very little effect (~10% reduction) on the number of crusty regions.
- The location of crusty regions on only the intersections of the top surface of the wires indicates debris may have been deposited during the cleaning/handling process.
  - Not seen on the Phase I grids sent to Advanced. Maybe a different bath was used or someone previously using the bath left debris.
- **Plan**: Weave a new gas test gate grid and send to Astropak for passivation.
  - Expect less debris as grid will only see cleanroom environments.

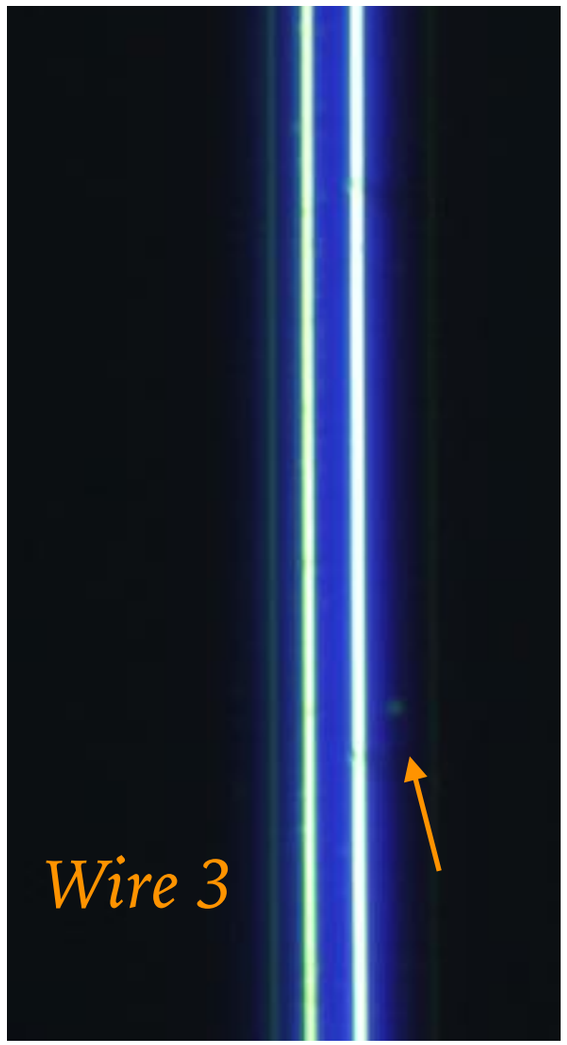
EXTRA SLIDES

BEFORE CLEANING: BLOBS









- Matter which looks separate from possible surface defects.
- Counting sizable objects.
  - Rightmost photo shows a “speck” which are not typically counted.

BEFORE CLEANING: NOTES

---------- January 28, 2018 ----------
* First time characterizing the anode grid's dust. Try to spot check and focus on fibers and big obvious dust (~radius of wire or bigger).
* May inspect 1 or 2 wires very carefully to get an idea of small dust. Probably it's the same as the gate's amount of tiny speckle dust.
* Wire 1 = 1st wire running east-west (weft) in bottom right corner (south end). Scanning west for odd-numbered wires, east for even-numbered.

Wire	Specks	Blobs	Crusty?	Fibers	Notes
1	5	2			Blobs obvious, specks protrude a lot
2	16	6			
3	15	12			
4	16	6			
5	21	3		3	Also saw some fiber-like surfaces along wire; not counted because prolly side of wire
6	24	19	1		Call rough extended surface crusty...
7	30	16	1		
8	15	16	4	1	
9	30	13	10	2	
10	-	32	14		Faster, not counting specks
11	-	53	11	1	
12	-	45	15	1	"Fiber" is too tiny to be real fiber
13	-	41	16	1	
14	-	41	20		Surface dusty or pocked on lot of wire
15	-	32	17		Illumination poorer here; cannot see small specks/dust
16	-	43	20	2	
17	-	54	20	1	
18	-	60	17	1	
19	-	45	21	1	Illumination poorer
20	-	60	21		

AFTER CLEANING: NOTES

---------- January 31, 2018 ----------
* Gas test anode put in ultrasonic cleaner in Phase II cleanroom near HEPA unit in the back corner. Ran for 1 cycle (30 min) of Alconox + DI water, heated to ~medium heat.
  Then, it was removed from its tray, the tray rinsed with DI water. Grid put back in tray, tray filled with DI water. Ran for 1 rinse cycle (30 min) of DI water, heated to ~med.
  heat. Finally, DI water added to the tray to overfill and carry debris into main bath. This way, lifting the grid out does not deposit debris back on the wires.
* Did not see too much debris on wires. There were a few fibers (~dozen would be the high upper limit ... >half dozen). Surface looked clear when grid lifted out.
* Grid placed in plastic bag and transported from Phase II cleanroom to B33 cleanroom.
* Attempted to replicate the Jan. 28 grid placement on the loom, but it seems that the small mark I used to orient myself was removed ... Apparently, there's an HV connection on
  the grid which I hadn't noticed. From Jan 28 photos, it looks like the adjacent pin holes had surface abnormalities in the ring nearby that caught the light in a noticeable way.
  Prolly ~80% sure I'm in the same orientation. Now, the HV connection is north (toward heddle).
* Scanning west for odd-numbered wires; east for even-numbered wires.

Wire	Specks	Blobs	Crusty?	Fibers	Notes
1	3-	1			Not counting specks, but these look important enough
2	4-	2			
3	8-	5			
4	9-	4	3		3 cross with speckly area: crust?
5	5-	2	3	1	
6	16-	7	6		Massive flake at start of wire (W end). Tried using ethanol spray and v. low N2 spray for removal, but both failed. Don't see by eye.
7	-	20	8	1	Counted few specks as blobs,...
8		16	8		
9		21	9	2	
10		20	12		
11		27	11		
12		44	9		
13		47	10		
14		57	10		