Interim Notes on Hamamatsu Pre-Series Detectors delivered to ATLAS
June 2000

1. The evaluation of the pre-series is not yet complete, and more comments and issues are expected to arise as the process continues.

2. **General Comment on the Detectors:**
   We are very pleased with the overall quality of the detectors, in particular their good strip quality and low leakage currents.

3. **Some Particular Comments:**

(a) The QA measurements of detectors at our Institutes in general correlate with those made at Hamamatsu. A full comparative report will be made at a future date. There was major disagreement for one W12 detector.
There is a systematic difference in our method for extracting the depletion voltage from a CV curve from that used by Hamamatsu (our values are systematically about 10V lower).

(b) A few individual detectors are being returned to Hamamatsu as being below standard, and each will be reported on separately. Some examples of the defects can be seen at:

http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200007p1.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200158pic1.gif
http://dpnc.unige.ch/atlas/atlaspage/module/detect/measure/W32-1-HAM/iv/w32-1-20220900700004-28042000-civ.iv.gif
http://www.shef.ac.uk/~phys/research/hep/atlas/dectest/results/index.html

(c) Light scratching has been observed on the backs of a substantial fraction of the barrel detectors, but this seems not to have affected their leakage currents. Some detectors (<10%) have visual defects (scratches, dicing or processing) on the strip side. Some images of defects seen can be found on:

http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200005p1.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200005p2.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200009p1.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200035p1.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200041p1.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200090p1.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200090p2.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200103p1.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200156pic1.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200164pic1.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200168pic1.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900200183p1.gif
http://www.hep.phy.cam.ac.uk/~silicon/images/prod/20220900300079p1.gif
http://scpc00.unige.ch/atlas/ferrere/ham/pictures/w31-40-ham001.jpg
http://scpc00.unige.ch/atlas/ferrere/ham/pictures/w32-4-ham005.jpg

(d) Two detectors have large current fluctuations of up to 0.5ÉA. Long term leakage current stability tests are being carried out on them.

(e) Occasional errors have been found on the detector envelopes (eg incorrect manufacturer serial number). There was a major mix-up of database files for some W12 and W31 baby detectors.

(f) W12 baby detectors are labelled on their metal as W21.

(g) We would welcome further discussion of the substrate identification numbers provided by Hamamatsu for the database. We were hoping to use these numbers as an indication of substrate changes that might need an irradiation check. However, the number changes very frequently in the pre-series detectors.

4. Passivation:

The passivation mask remains an issue for further discussion.

We would welcome the advice of Hamamatsu on a suitable coating we might try to apply over the cut edge of the detector during module construction to increase the safety against high voltage breakdown.

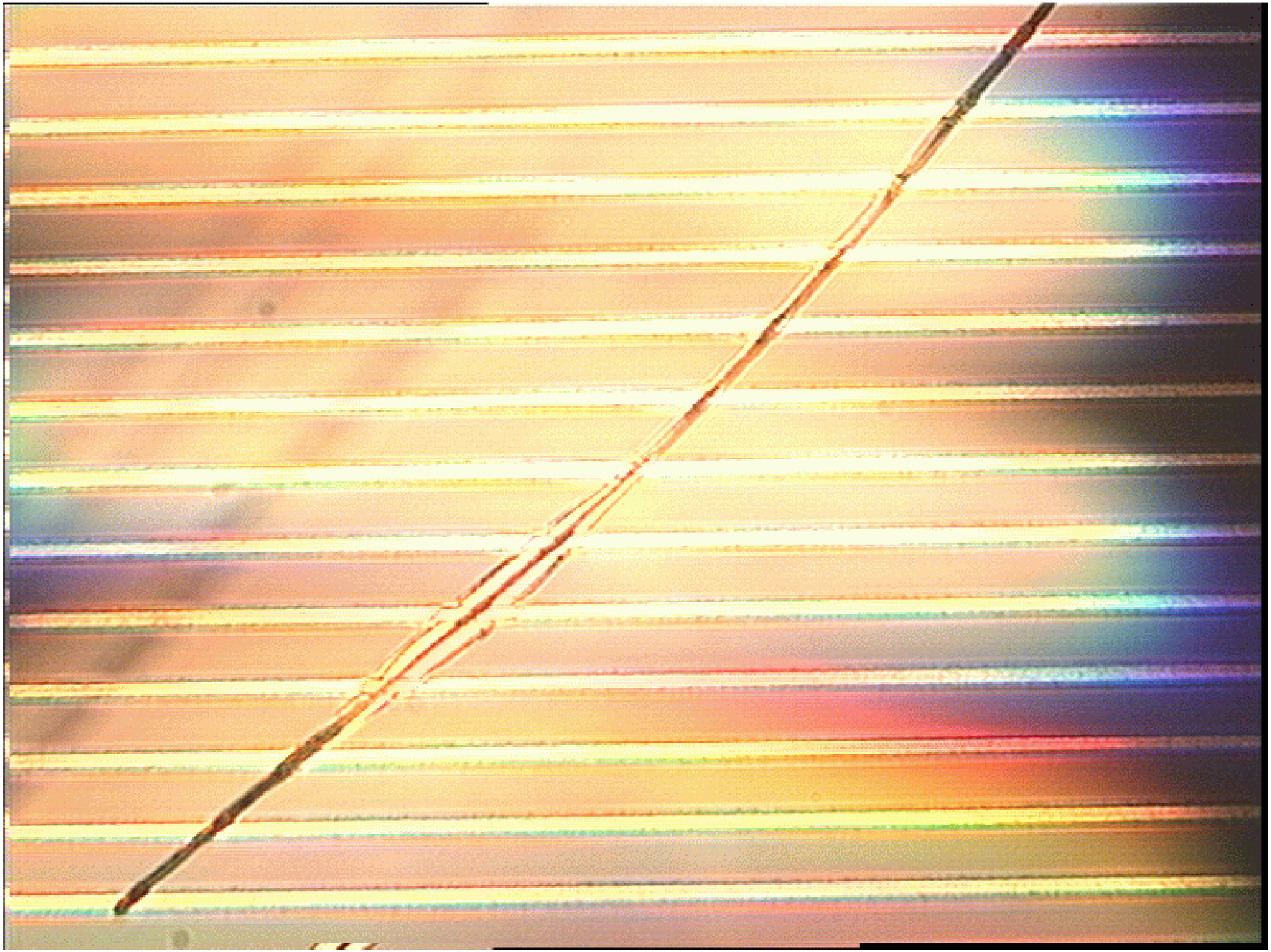
5. Post-irradiation Performance:

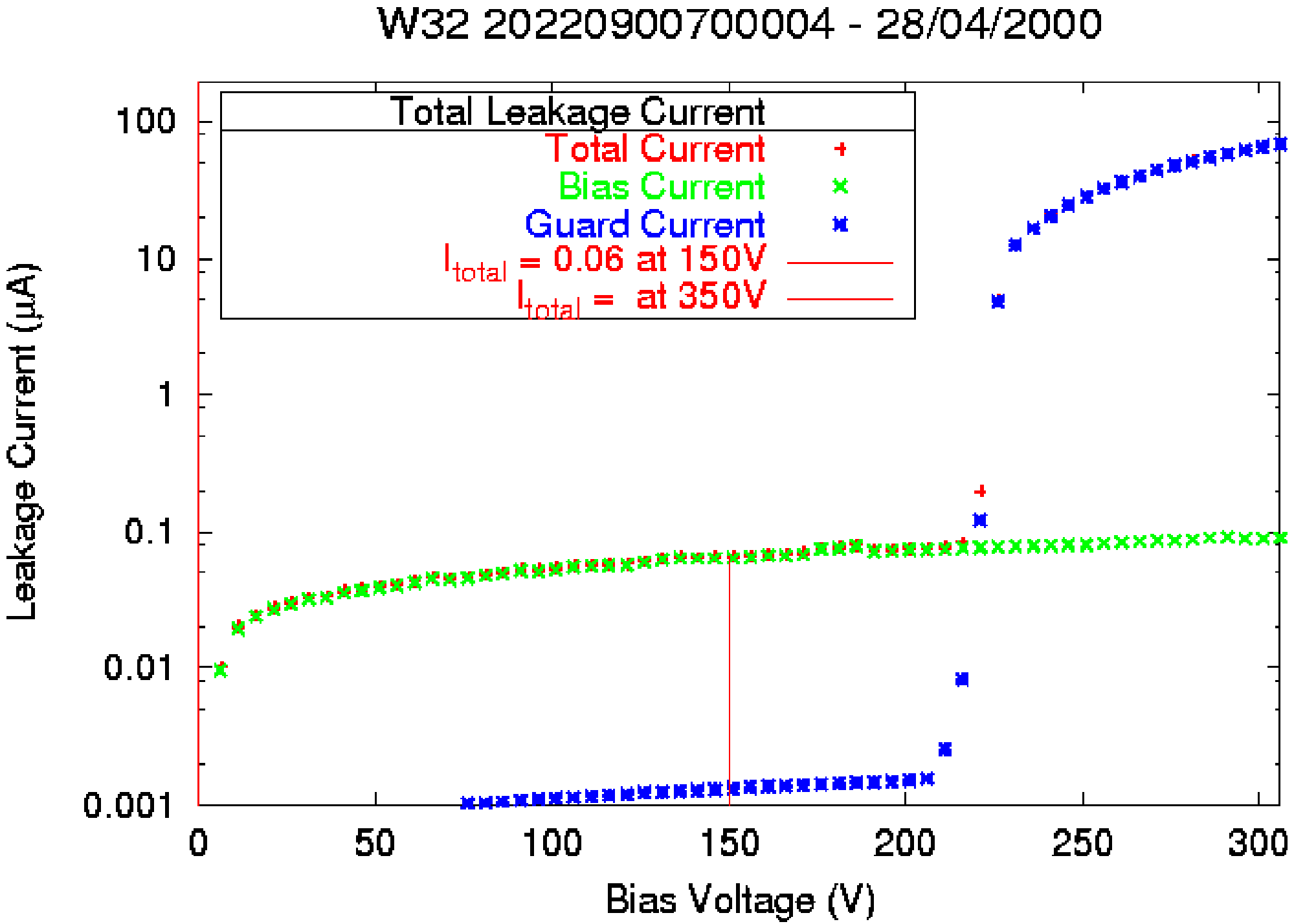
This is currently under evaluation. We are testing <111> and <100> detectors and the different types of W12.

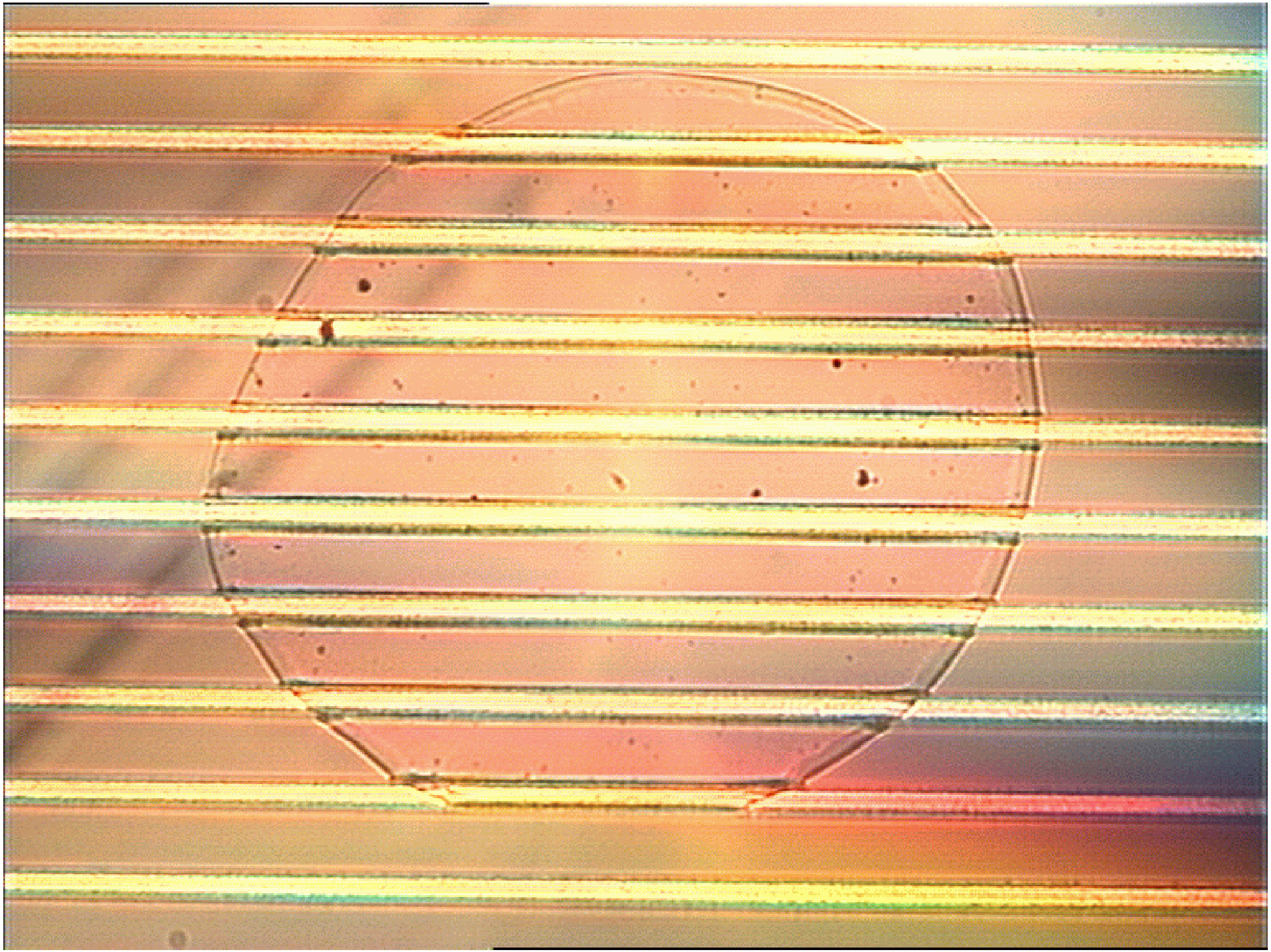
6. Deliveries:

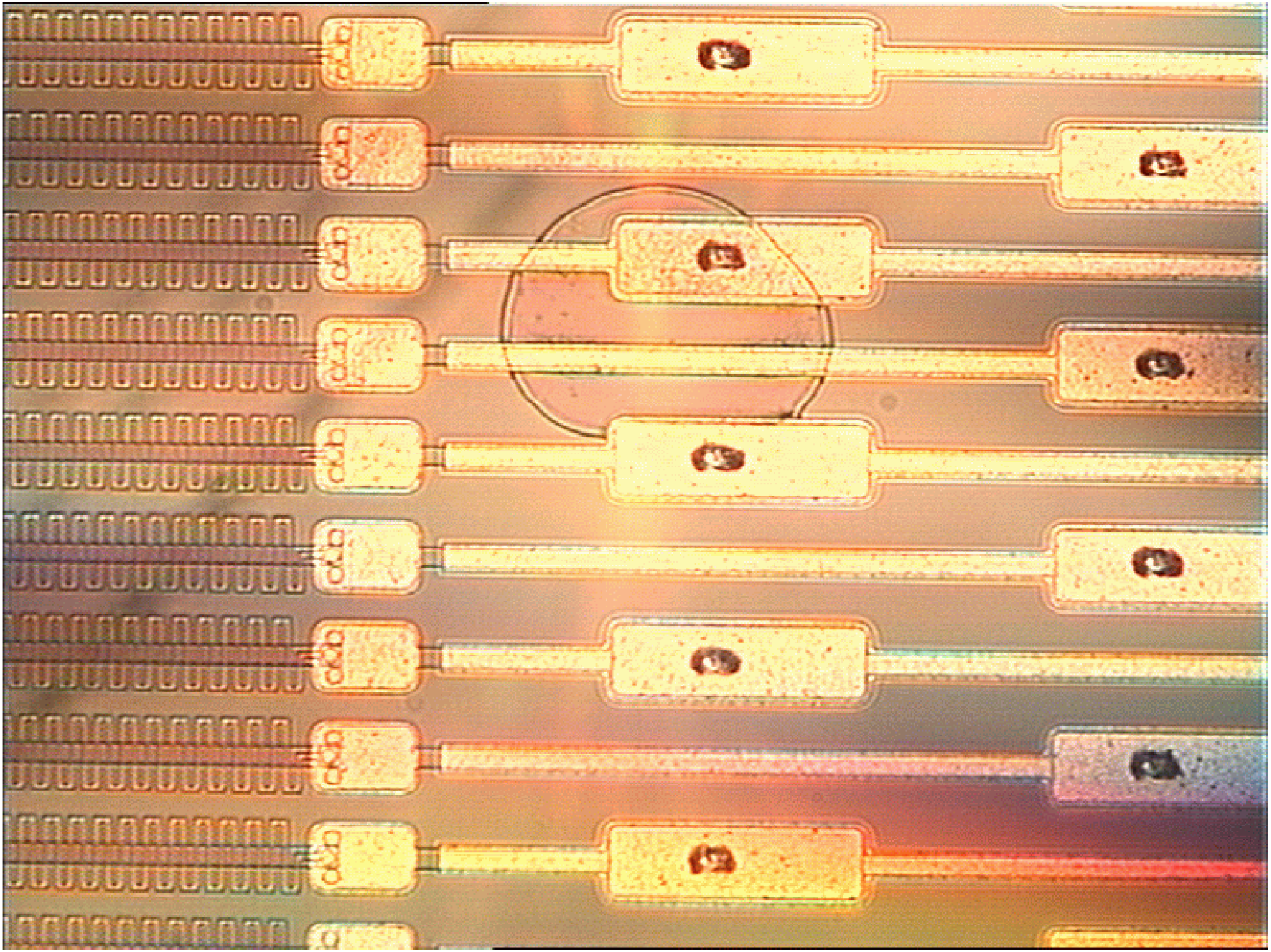
Hamamatsu will be aware of their very unfortunate error in not so far producing pre-series detectors to satisfy the order placed through CERN for the University of Valencia. We hope that this situation can be very rapidly rectified.

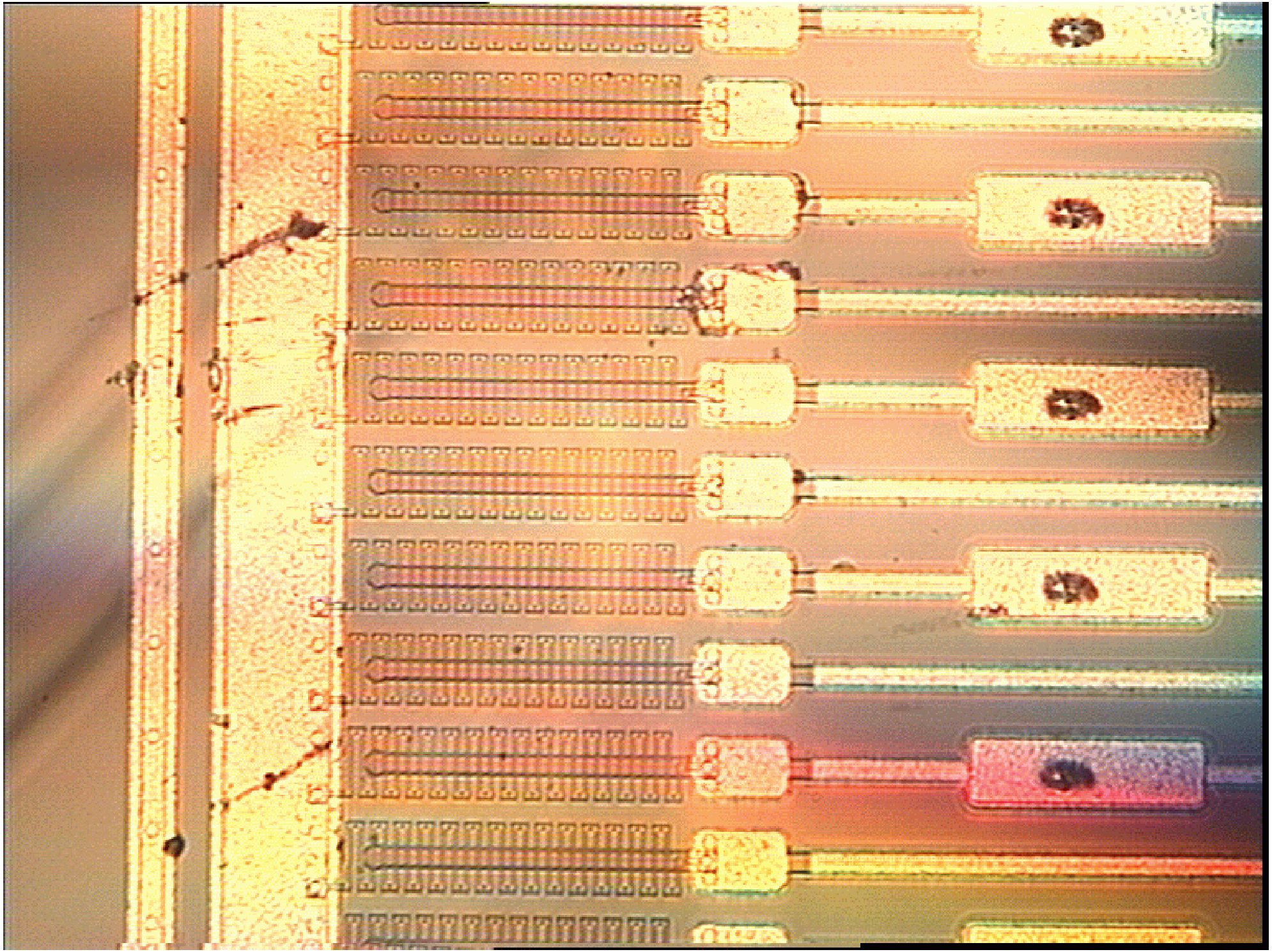
There were delivery delays of up to 1 month for the last batches for Geneva and the UK.

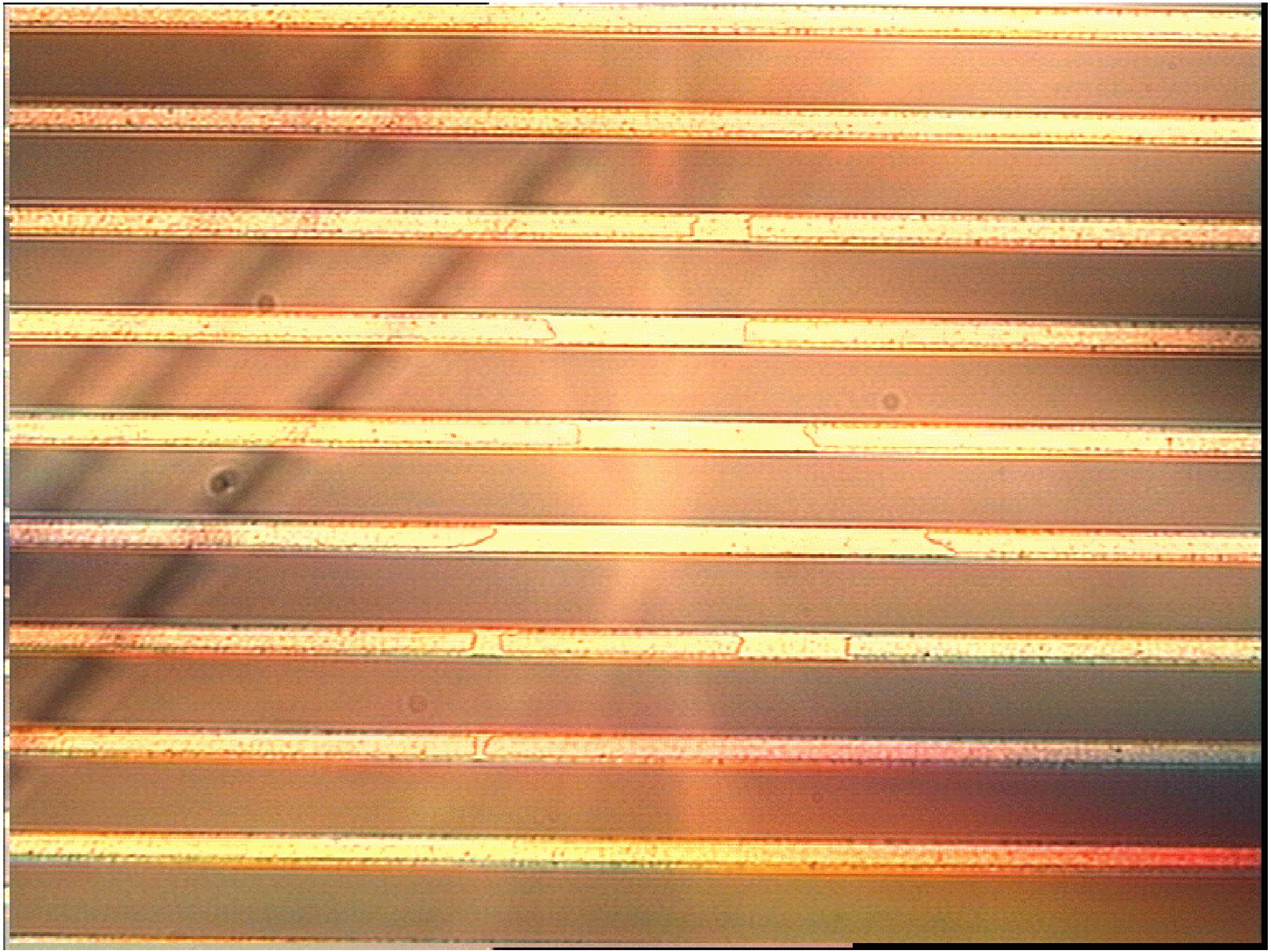


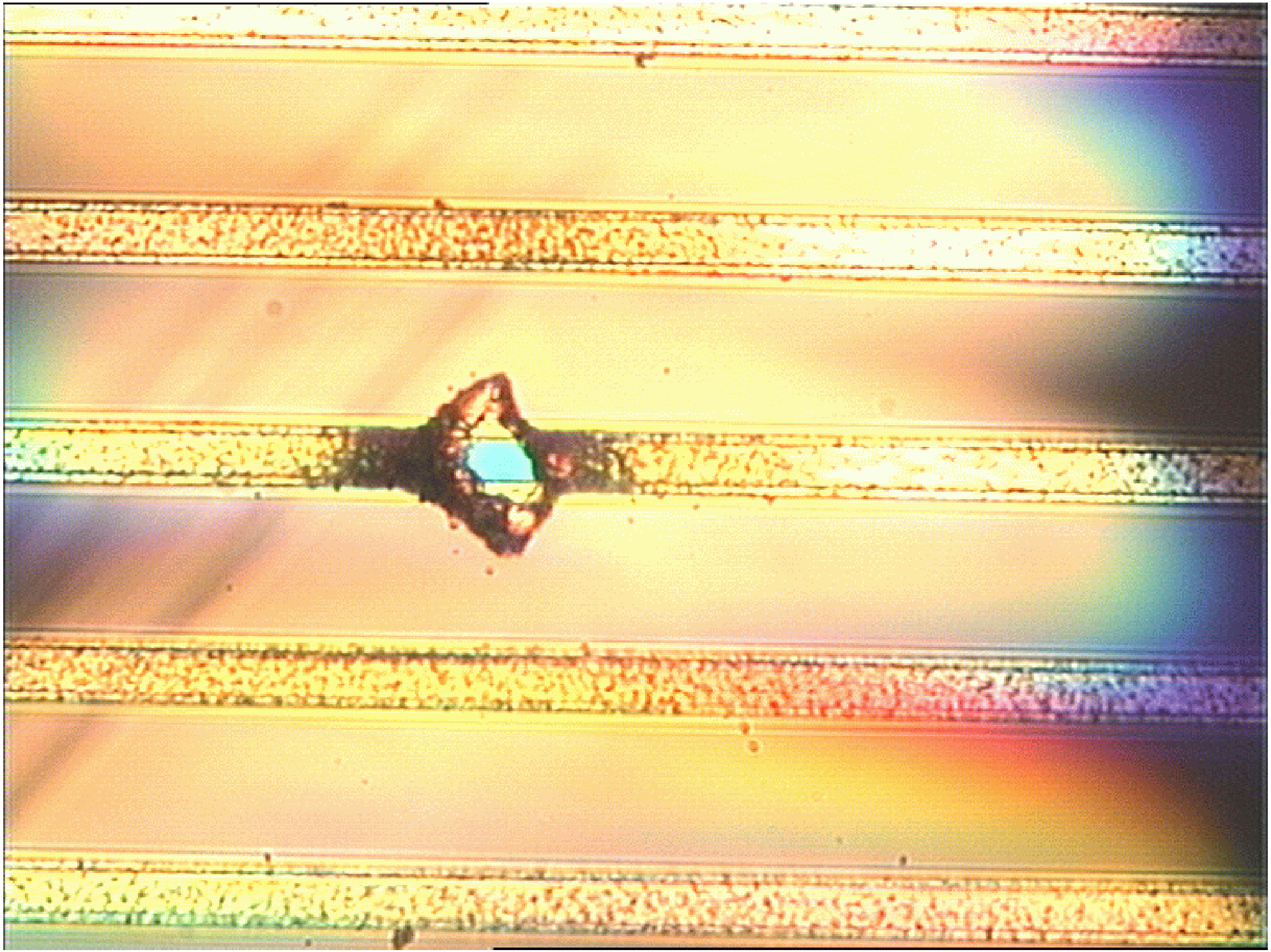

W32 20220900700004 - 28/04/2000
Total Leakage Current
Total Current
Bias Current
Guard Current
I_total = 0.06 at 150V
I_total = at 350V
Leakage Current (µA)
100
10
1
0.1
0.01
0.001
0
50
100
150
200
250
300
Bias Voltage (V)

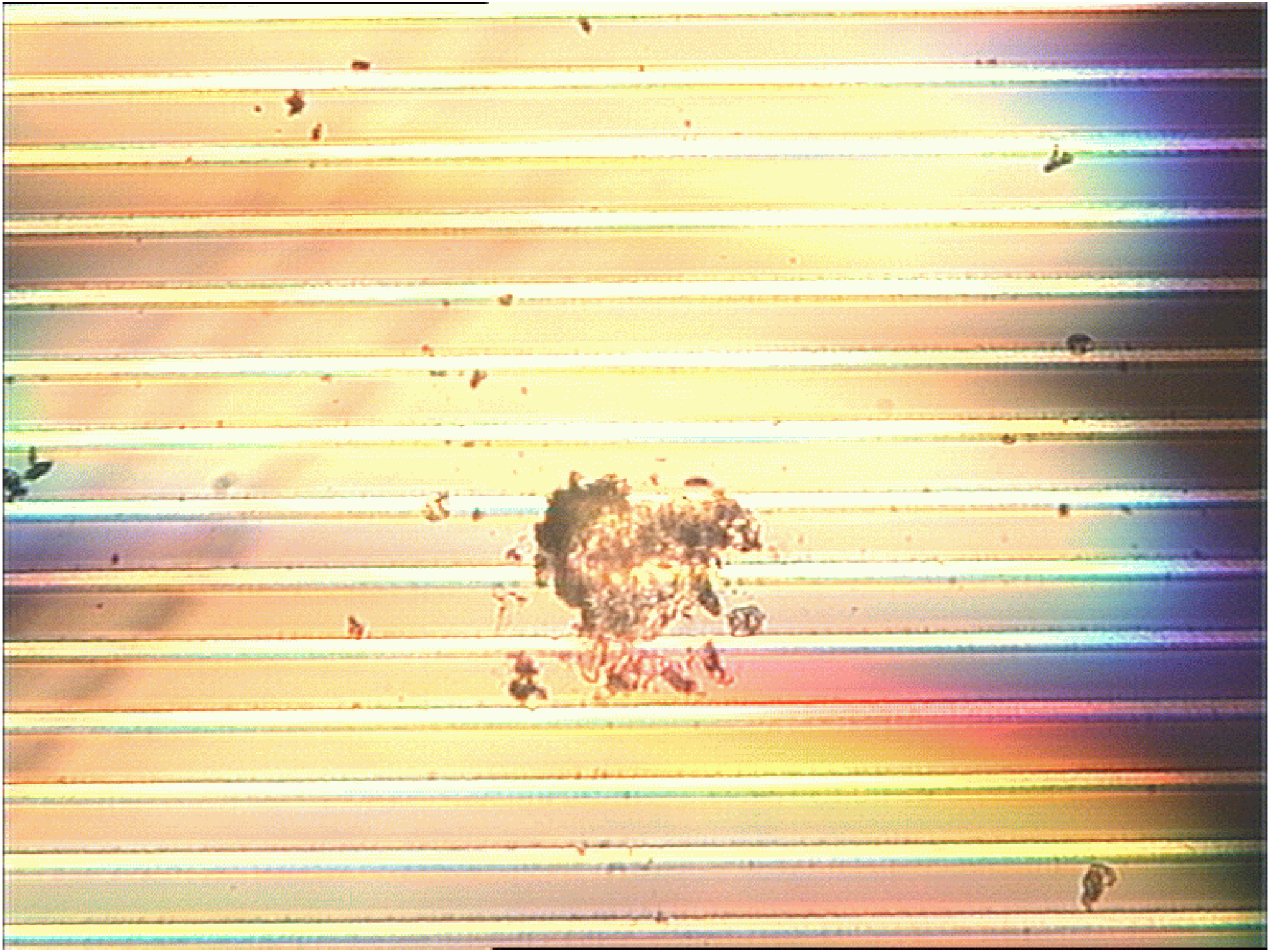


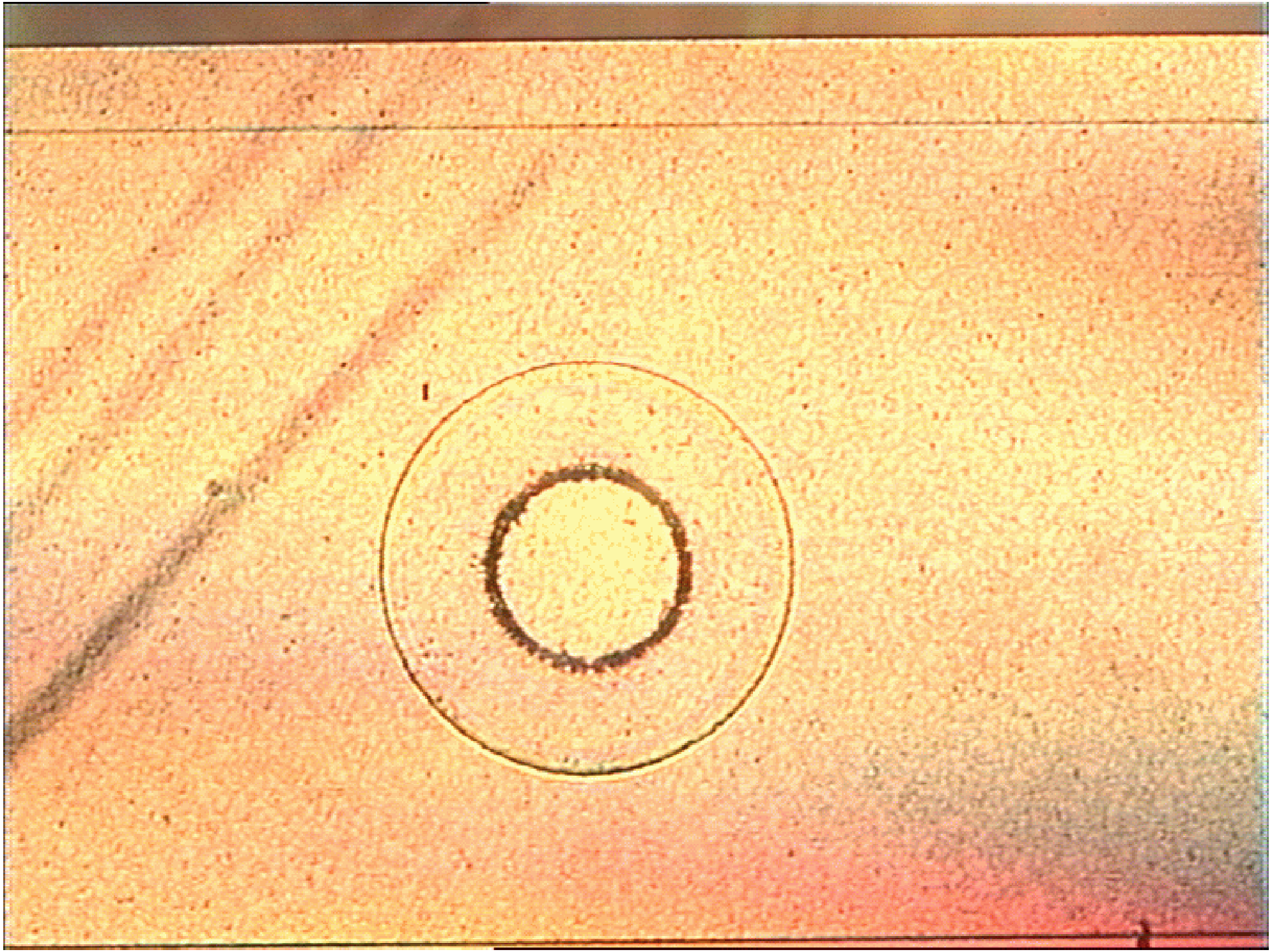


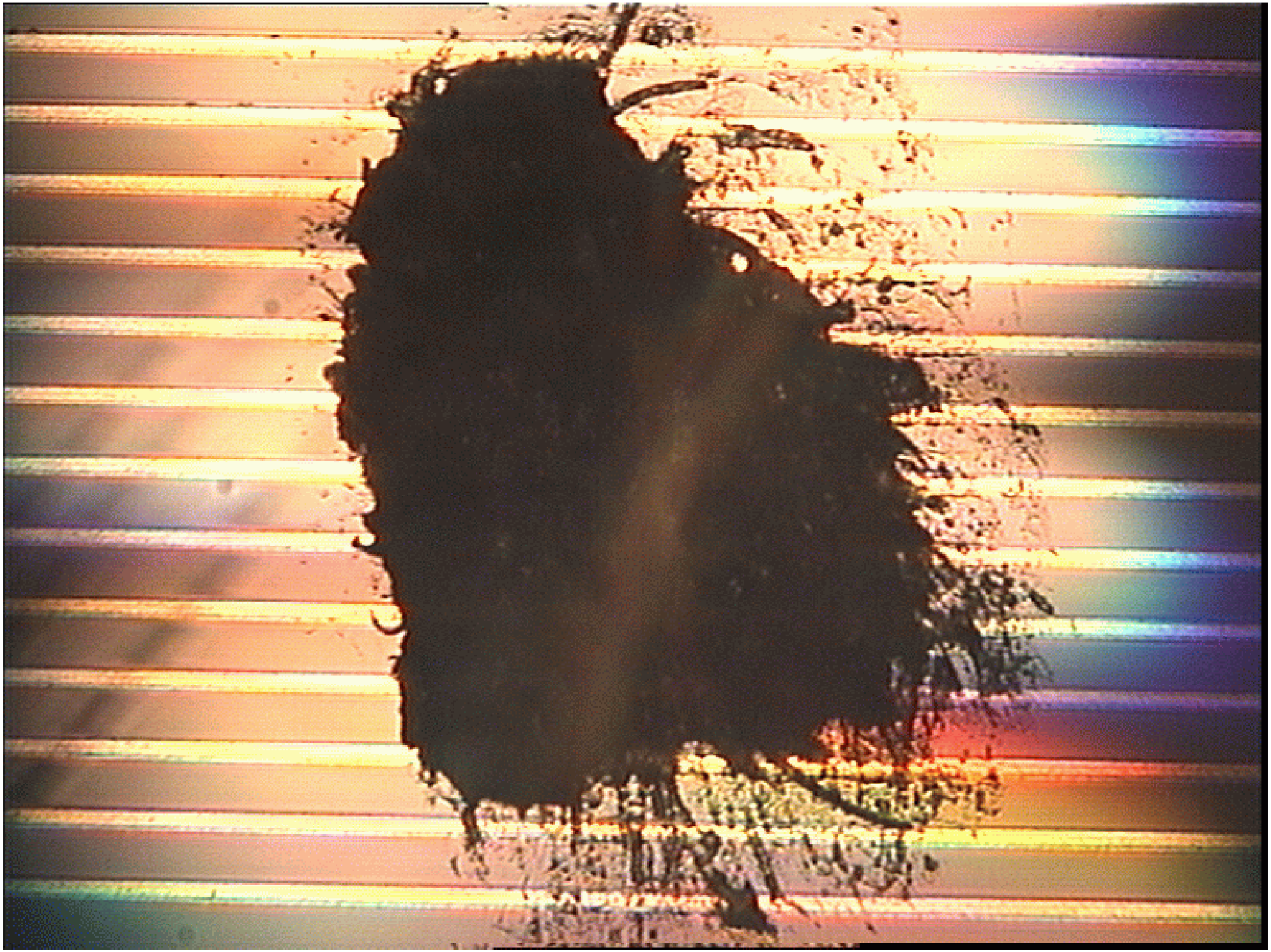


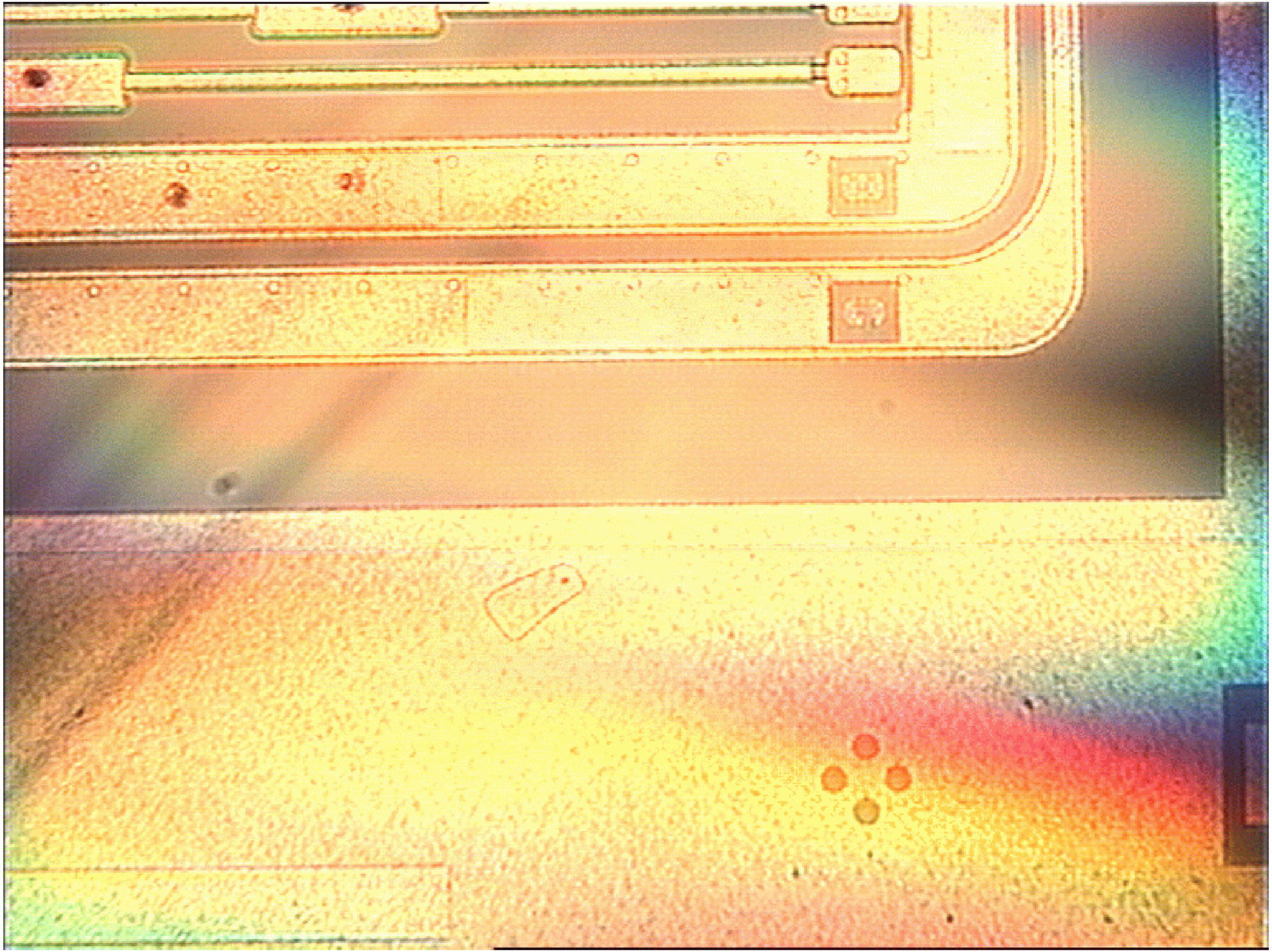


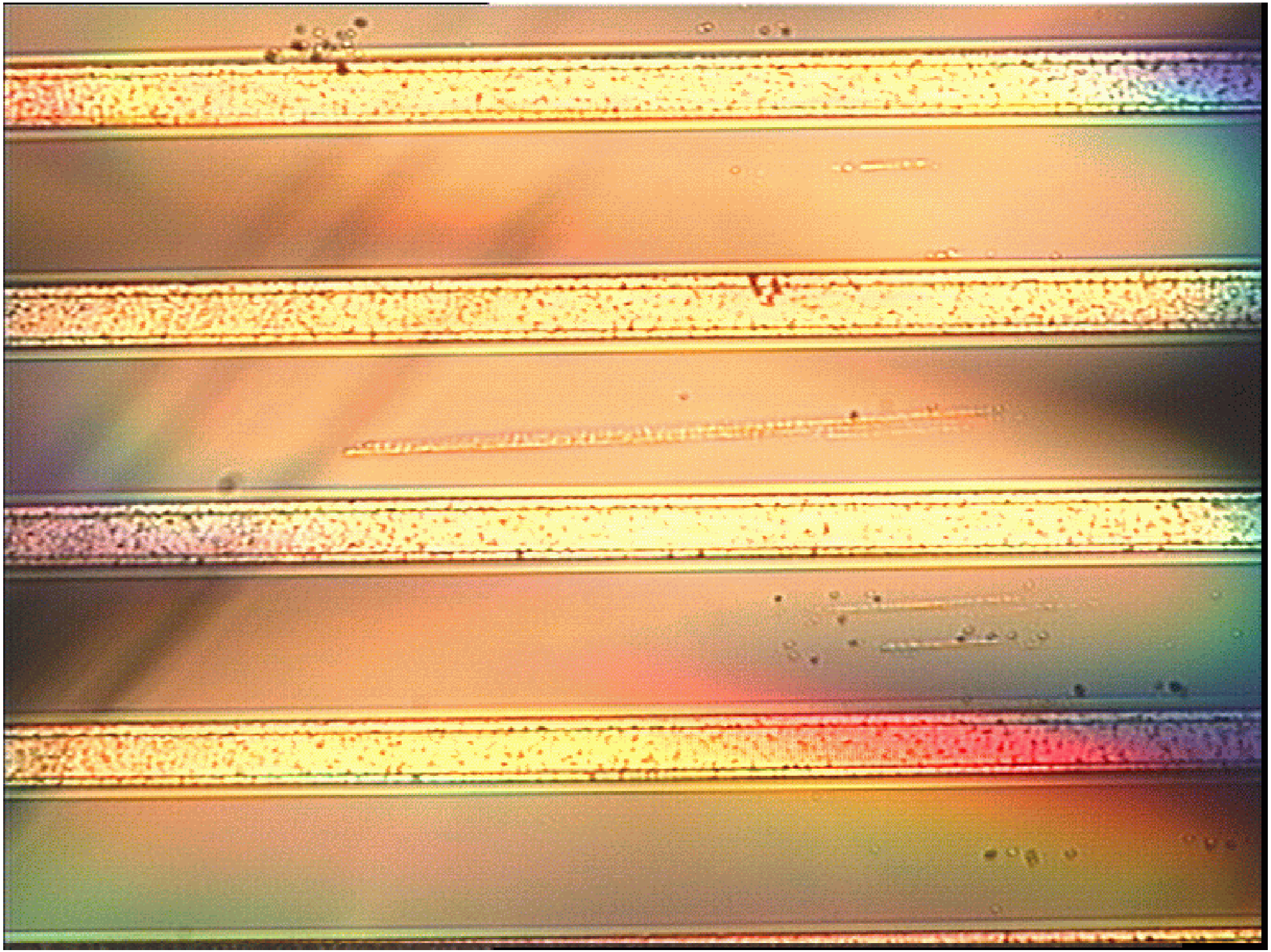


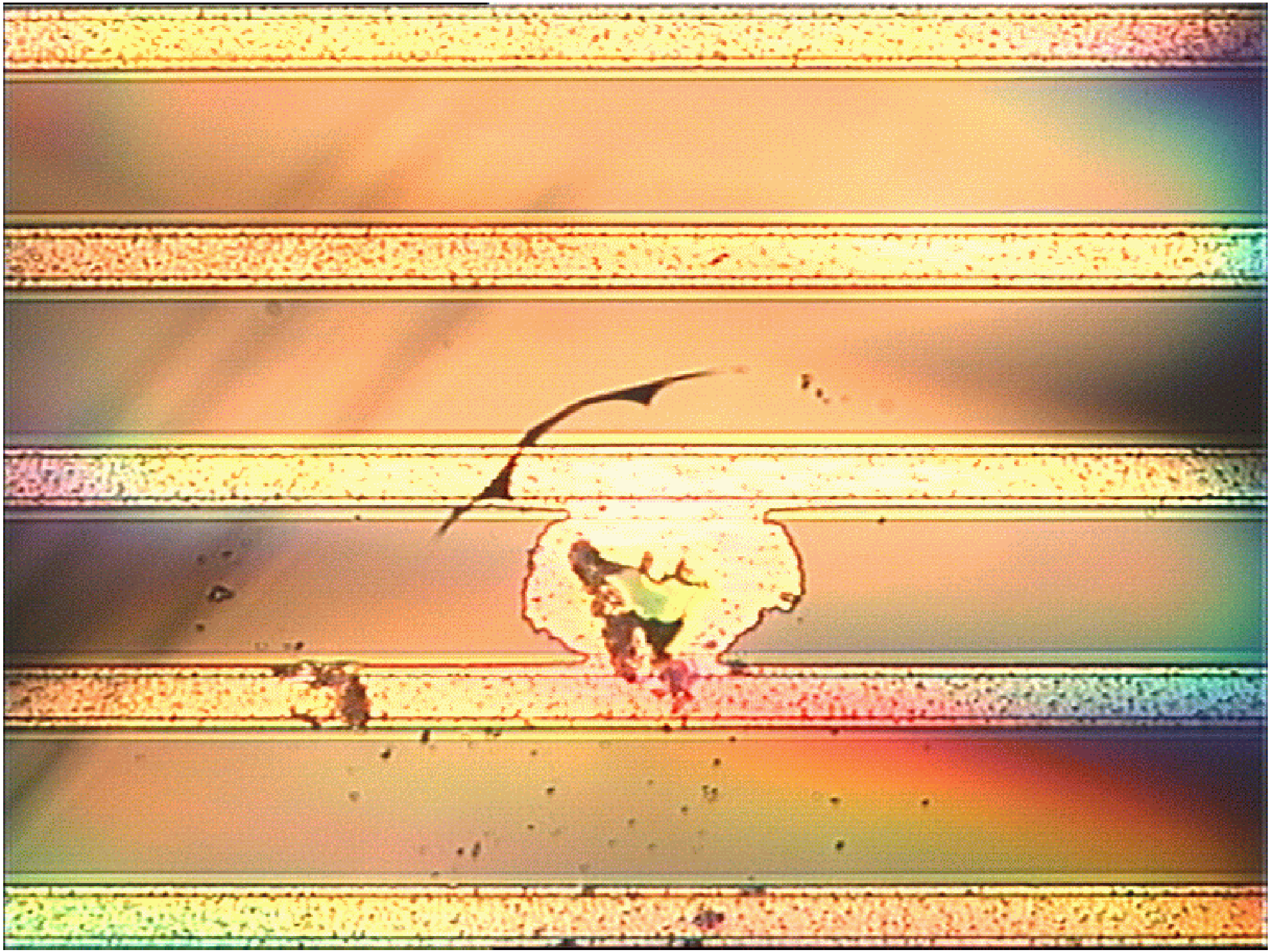


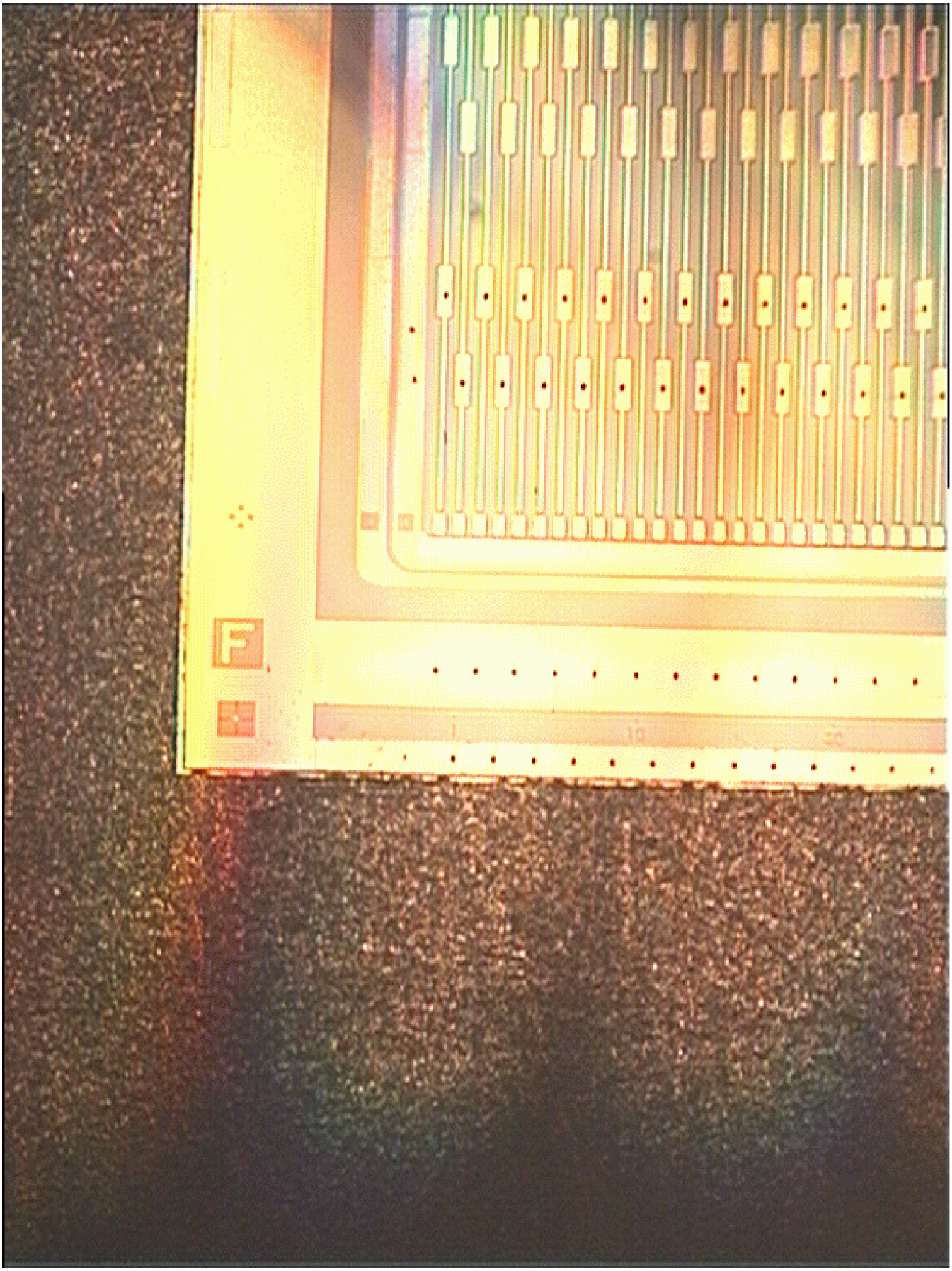




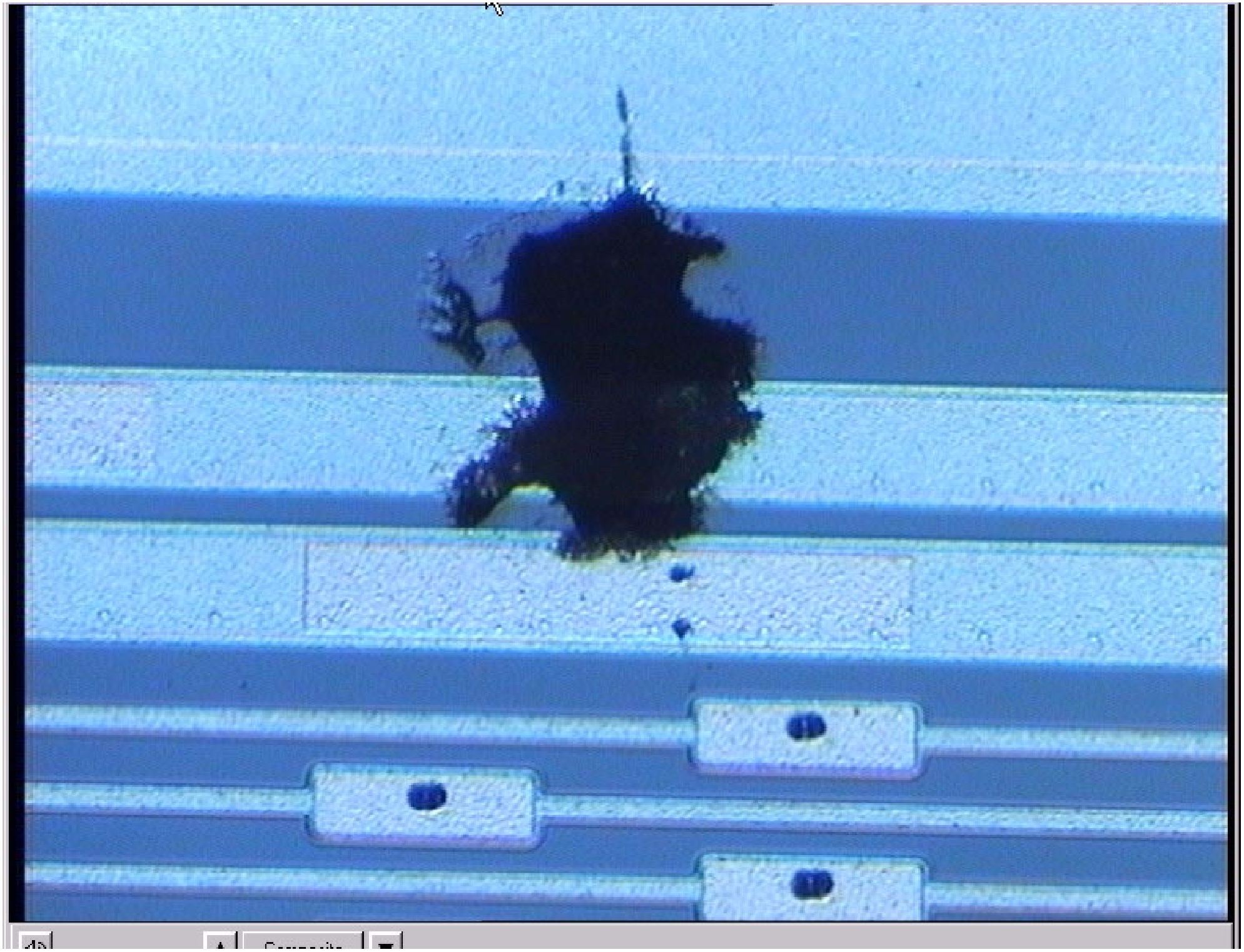


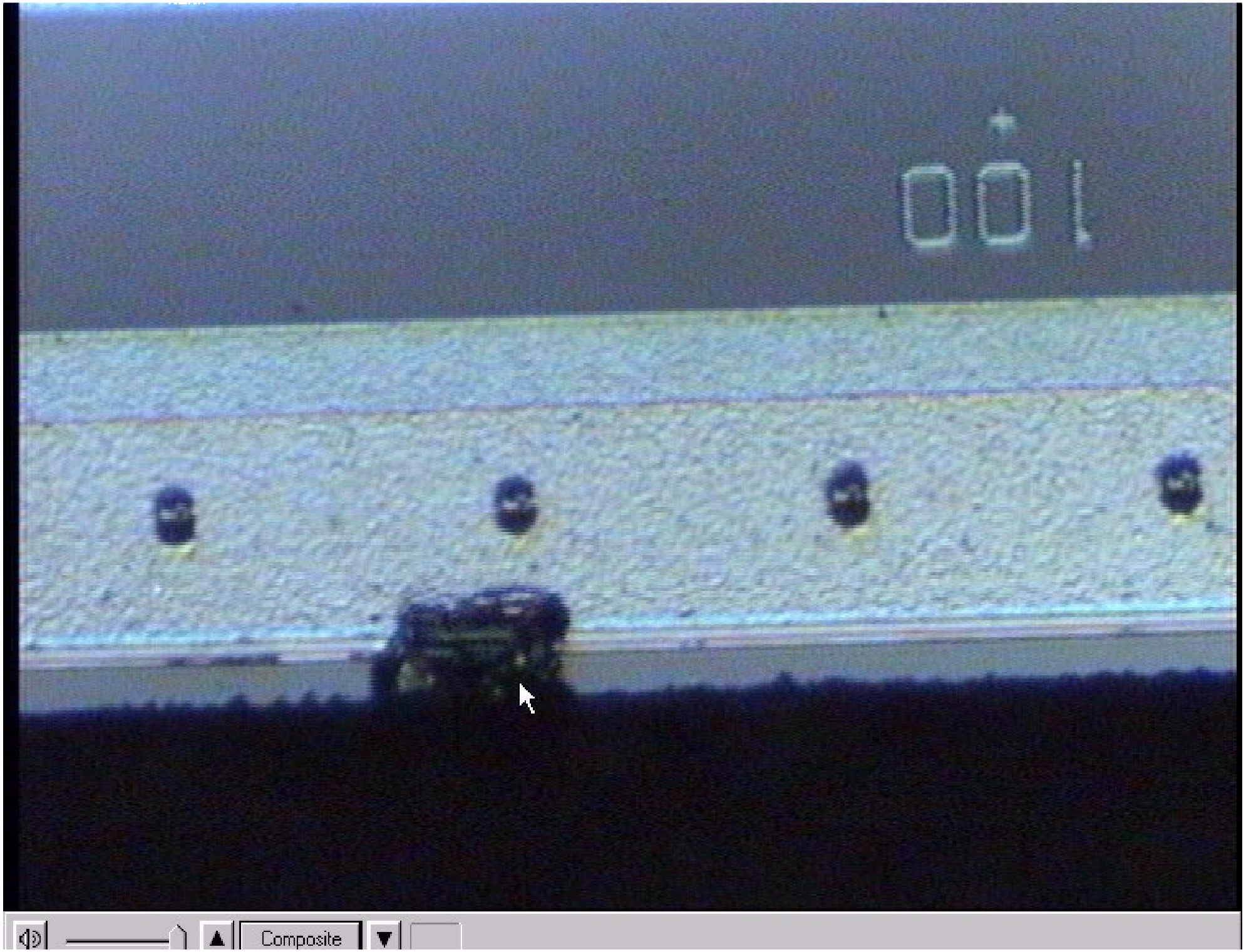







500




Composite