Status of metrology measurements at DESY

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Outline

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What happend so far?

Results from last meeting

- CERN measurements could be reproduced at DESY
- Precision hole measurement should be improved
- Automation should be implemented to speed up measurement

Outline

Upper precision hole - pre-considerations

Pre-considerations

- Used as center of coordinate system for all 10 plates
  - $\Rightarrow$ High precision needed
- Magnification of microscope too large to see whole circle at once
  - $\Rightarrow$ Find circle edges in different regions $\rightarrow$ fit whole circle with RFit

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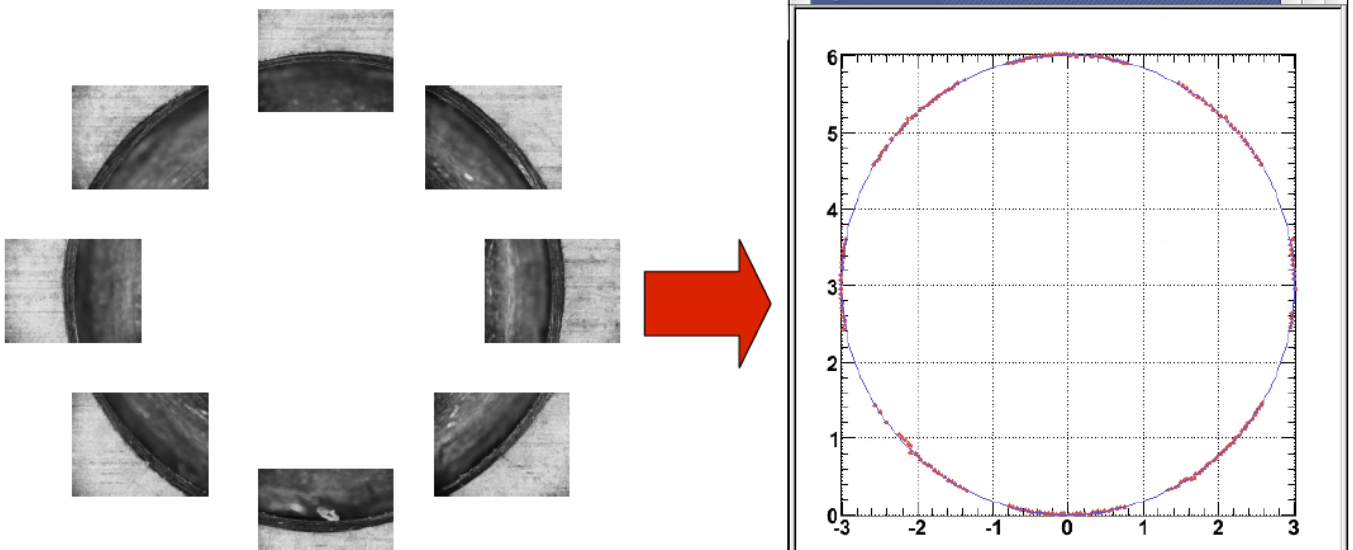
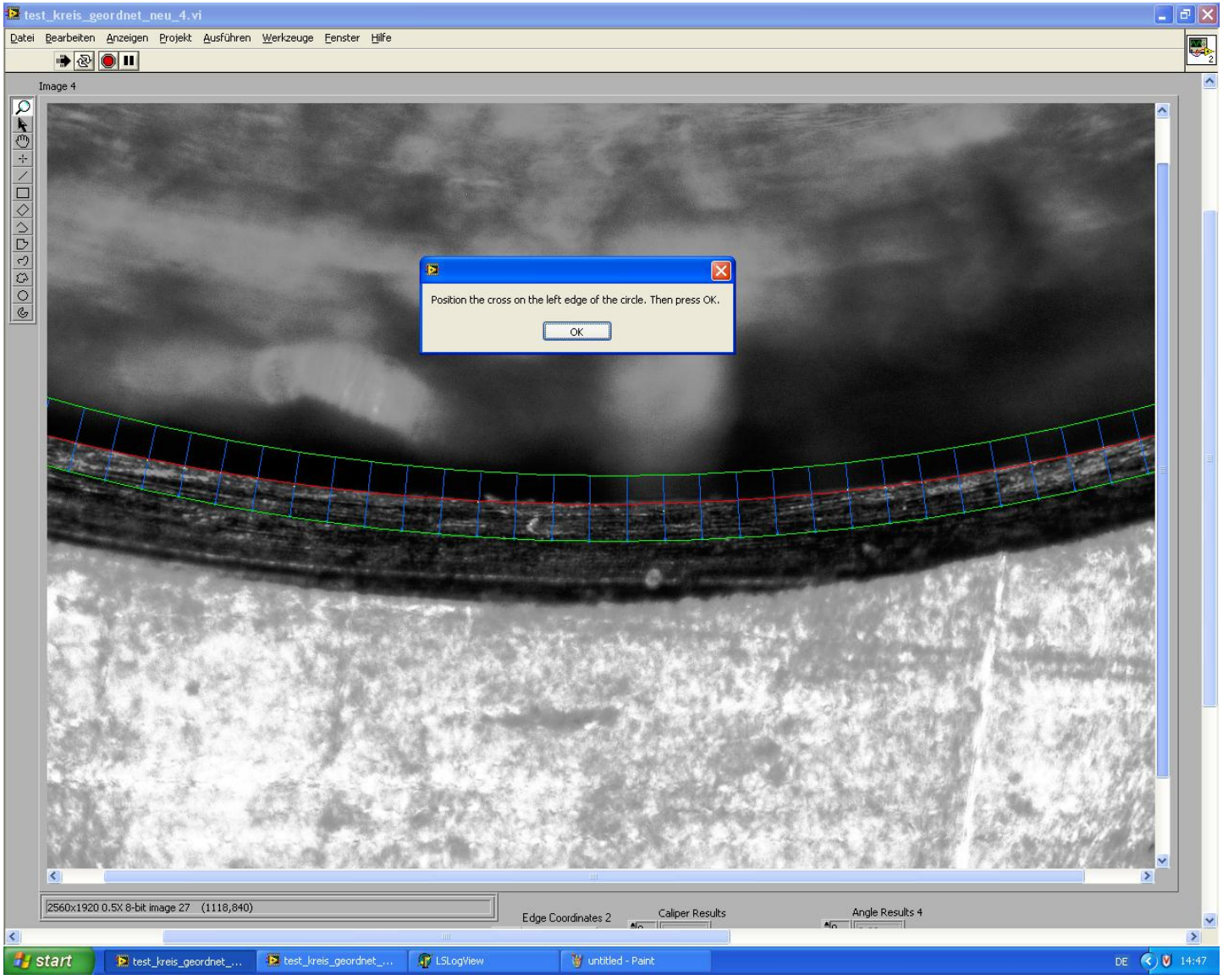


Upper precision hole - how it's done

Measurement steps

1. Let user position microscope on upper edge of hole
2. Let LabView find edge coordinates of circle
   → write coordinates to textfile
3. Move to next region automatically
4. Give user chance to correct microscope position
5. . . . continue with step 2
6. Let RFit use final textfile with all edge coordinates to fit center coordinates and radius
7. Move microscope to fitted center coordinates and set to (0,0)

How it actualy looks



Precision longhole - pre-considerations

Pre-considerations

- Used to define direction of coordinate system for all 10 plates
  - $\Rightarrow$ High precision needed
- Magnification of microscope too large to see whole longhole at once
  - $\Rightarrow$ Find straight edges on both sides of hole and calculate the center between edges

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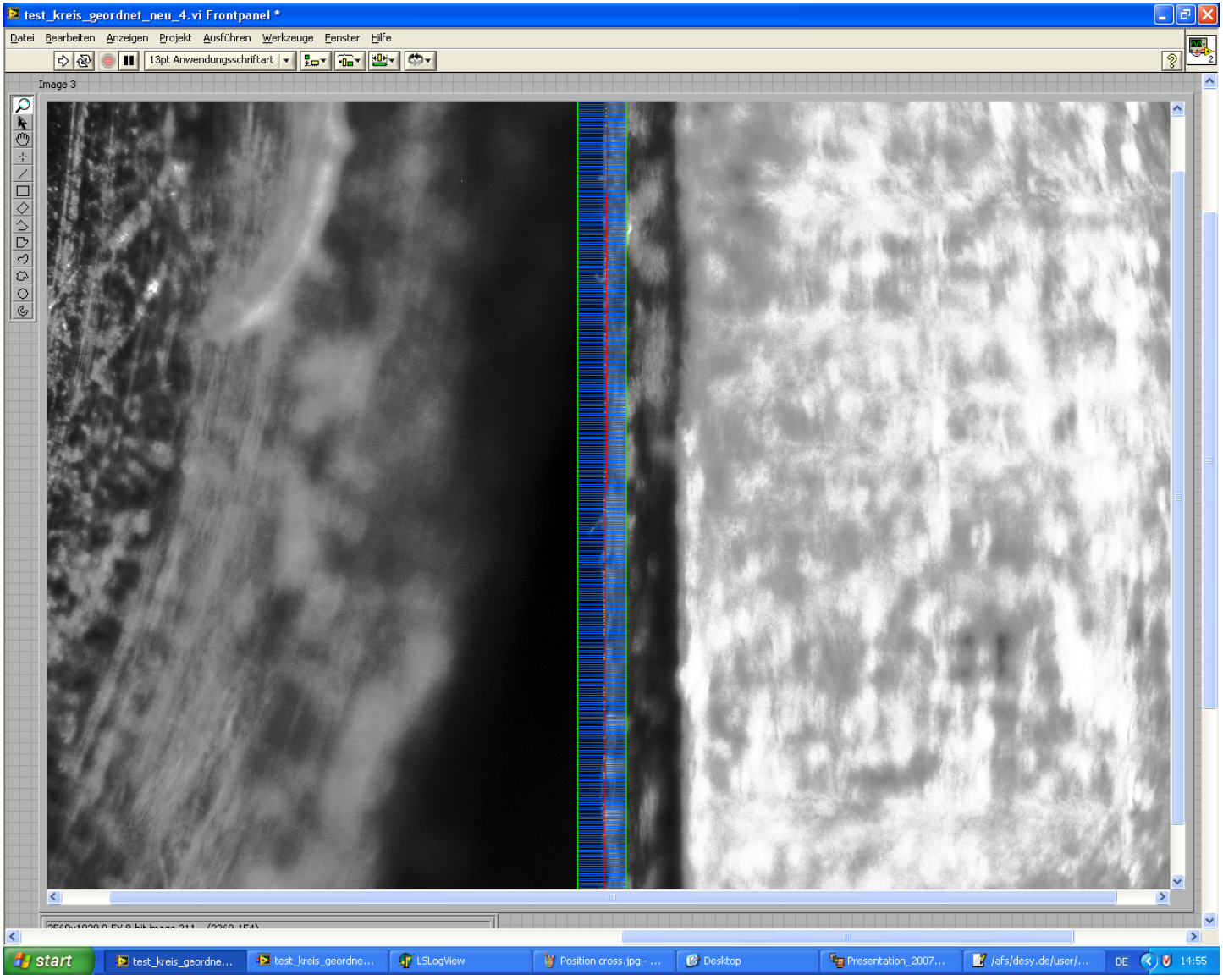
Precision longhole - how it's done

Measurement steps

1. Move to straight edges automatically
2. Let LabView find edge coordinates on both sides
3. Fit two parallel lines with found coordinates
4. Calculate mid-point between both sides
5. Take (0,0) and calculate angle from vertical

How it actualy looks



Fibre gaps - pre-considerations

Pre-considerations

- Different lightsources effect image quality
  - ⇒ Try to make measurement+results independent from used lightsource
- Change to higher magnification not possible due to error in lense-mechanics of microscope
  - ⇒ Use same magnification (lowest) as for precision hole measurements
- Use ”template picture” of gap for LabView’s pattern matching

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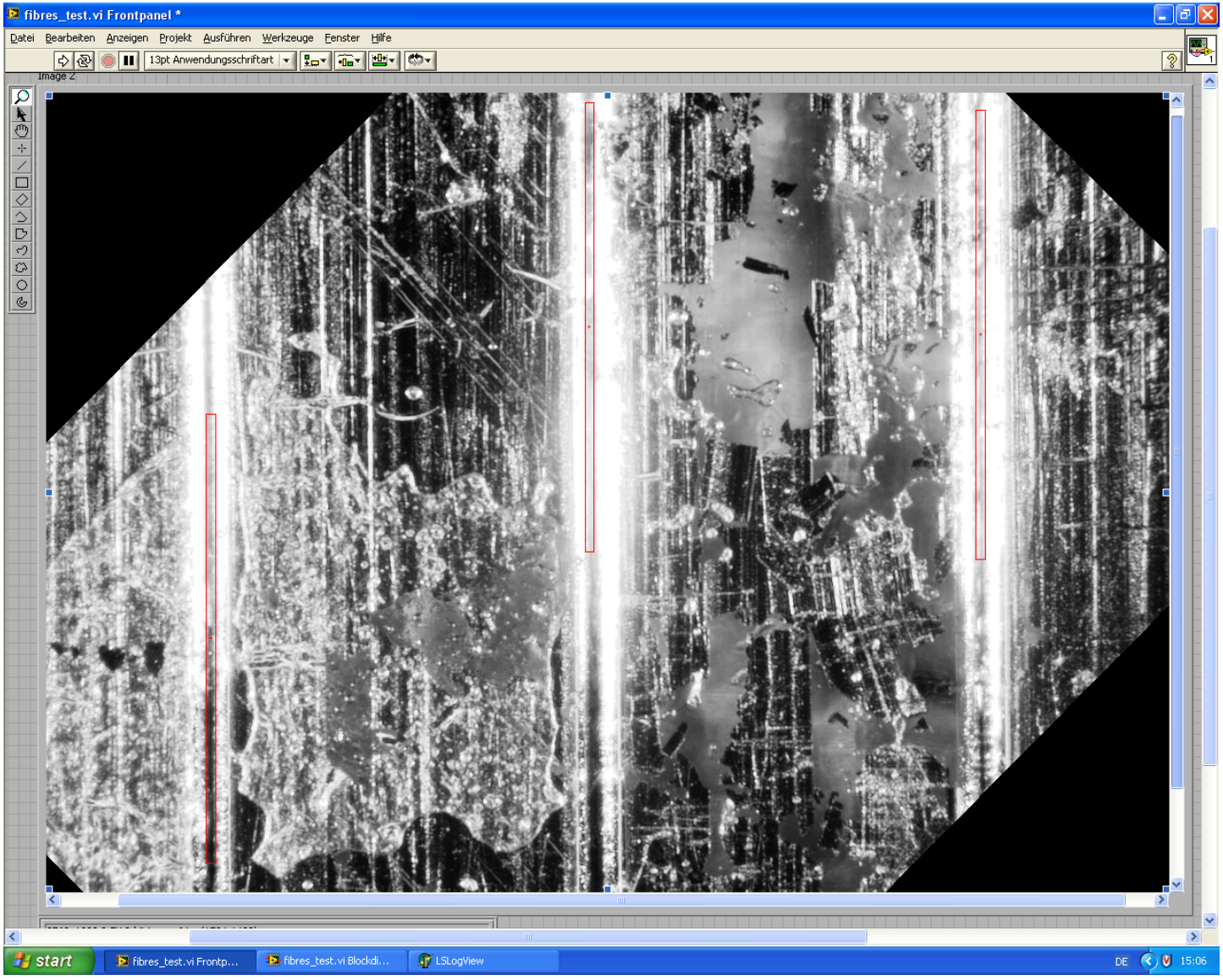
Fibre gaps - how it's done

Measurement steps

1. Move automatically to first gap between two fibres
2. Rotate picture 45°
3. Let LabView look for "template gap" in right, middle and left area of picture
4. Take centers of found gaps as result
5. Move to next three gaps automatically

How it actualy looks



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Results for upper precision hole

Results:

- $\sim$ 70-200 points found, depending on lightsource

  But: Precision-results from different lightsources vary only insignificantly!

- Precision received after 20 measurements in a row: 2-3 μm

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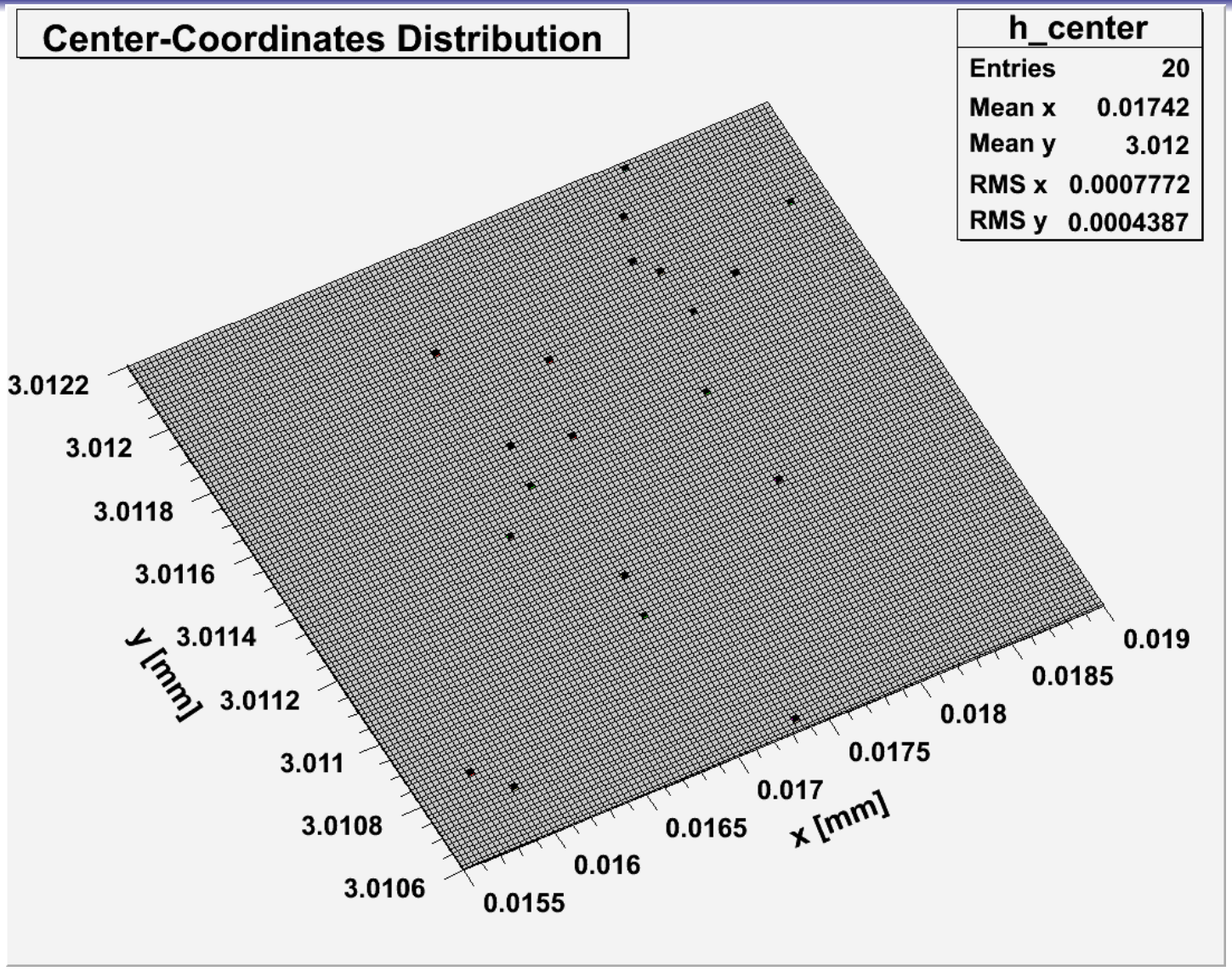
Precision longhole



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Preliminary Results:

- LabView finds (almost) all gaps on its own
  - $\Rightarrow$ Only little user intervention needed!
- Finds three gaps in one picture
  - $\Rightarrow$ Reduces picture-downloadtime bottleneck
- Even with low magnification: Needed precision seems to be achieved
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Summary

Q: What has been achieved so far?

A: Programming for cirularhole and longhole done. Fibre gaps programming almost done.

Q: What about the precision?

A: A precision of $\sim$ 2-3 μm is possible for the coordinate system.

Q: What about the overall automation?

A: User intervention (measurement-time) already reduced drastically.

Q: Whats up next?

A: Finish programming of fibre gaps + put everything together.