

# Some observations on scratch analysis for IEC SC86B WG4 round robin

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# General observations on the images

- The sampling resolution varies from 0.4  $\mu\text{m}/\text{pixel}$  to 1.4 $\mu\text{m}/\text{pixel}$
- Some participants saturate the ferrule and/or core area to enhance the scratches contrast.
- Hence, the signal to noise ratio varies a lot between the equipments

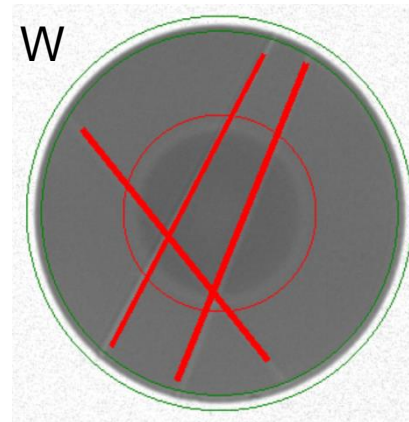
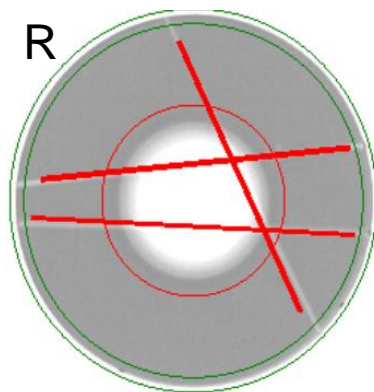
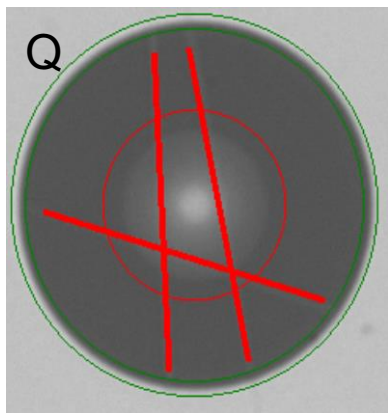
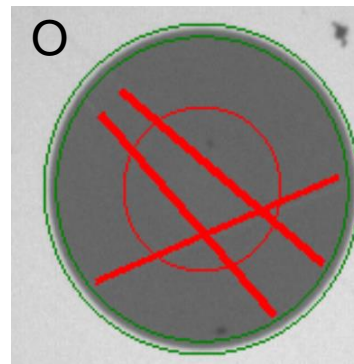
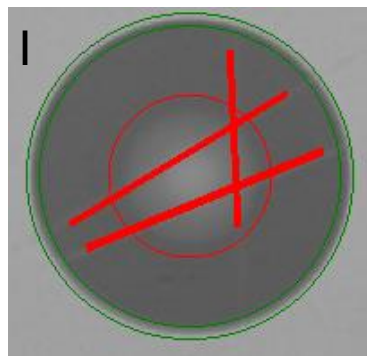
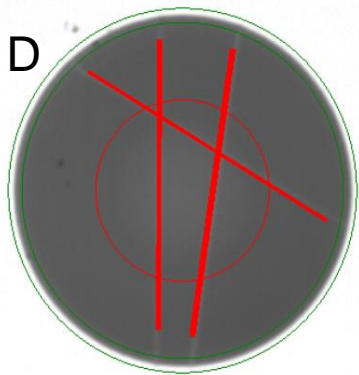
SNR variations range from 7.89 (9dB) to 27.09 (14.3dB)

# General analysis considerations

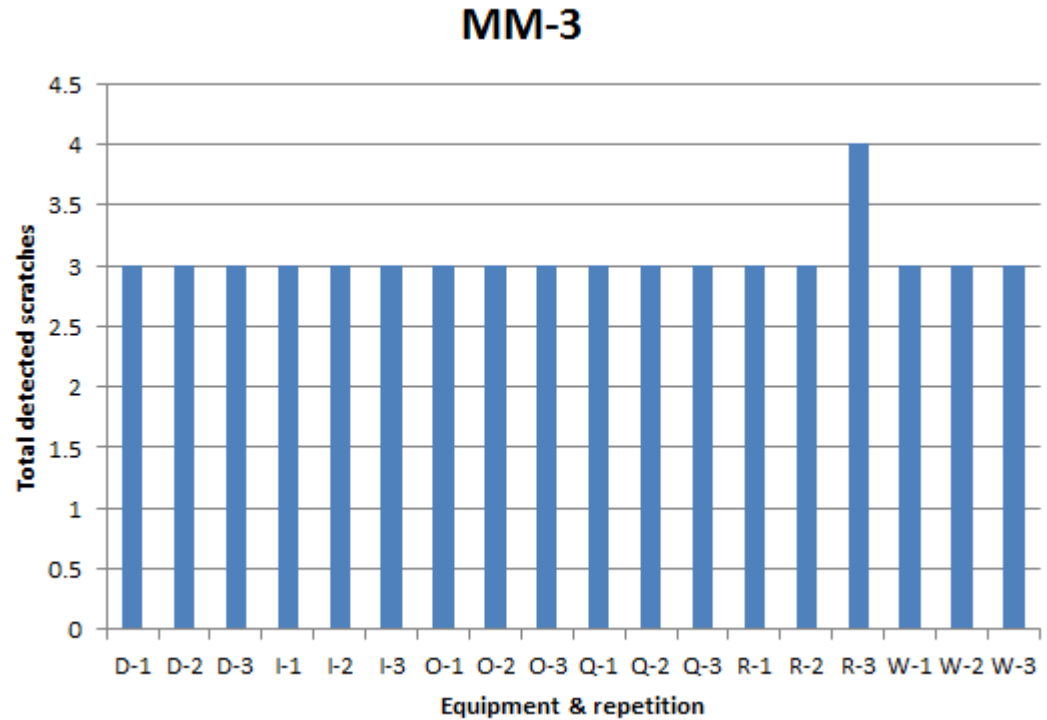
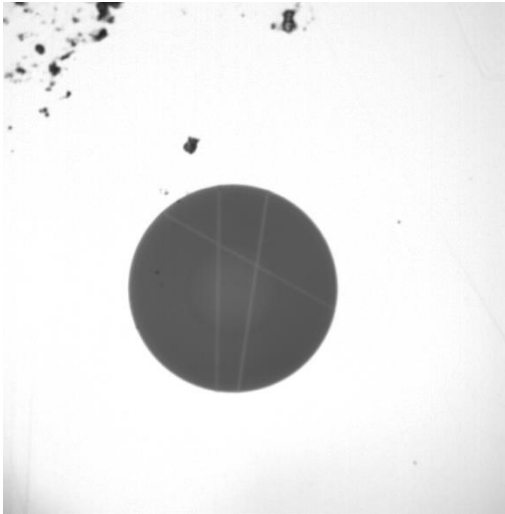
- All equipment apply normalization of dimension by cladding diameter
- 3 typical MMF type samples analyzed
- MM-3: (a few) “high contrast” large and well separated scratches in the range of  $3\mu\text{m} - 4\mu\text{m}$
- MM-1: (a few) “low contrast” medium and well separated scratches in the range of  $2\mu\text{m} - 3\mu\text{m}$
- MM-4, MM-6, MM-12: (a lot of) “fine” scratches; so called “texture” structure ( $\approx 1.5 - 2.5\mu\text{m}$ , and ?)

# MM-3: Very good agreement

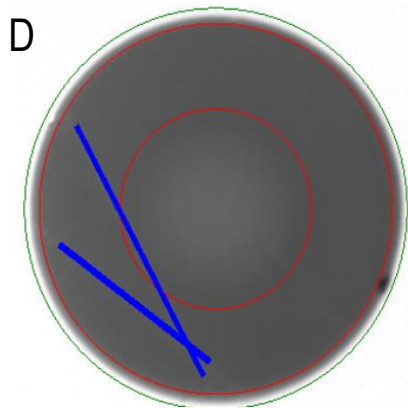
high contrast, well separated scratches



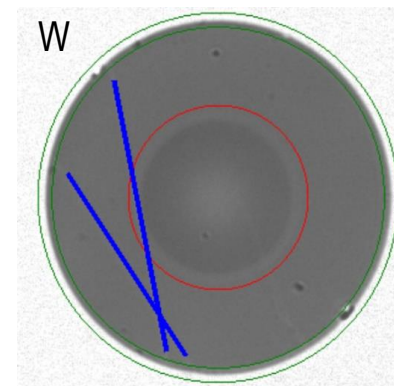
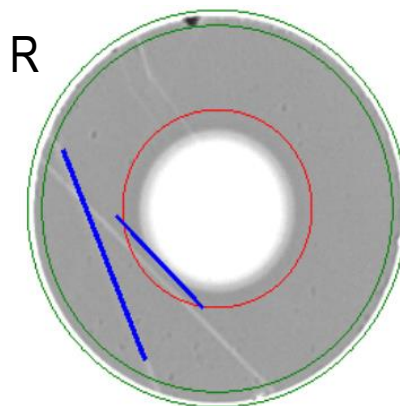
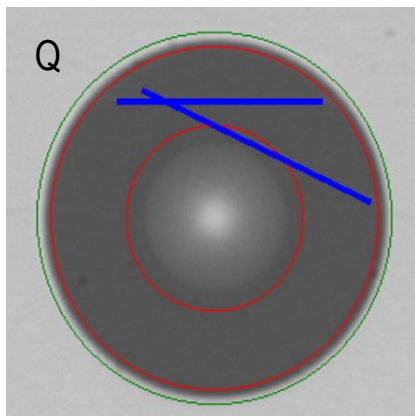
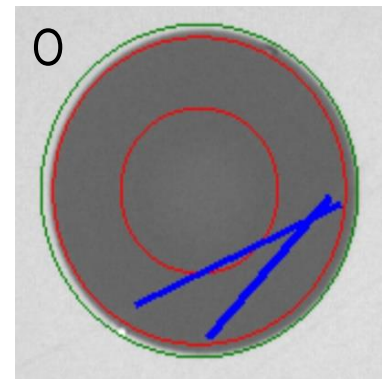
# MMF3: Very good repeatability and reproducibility



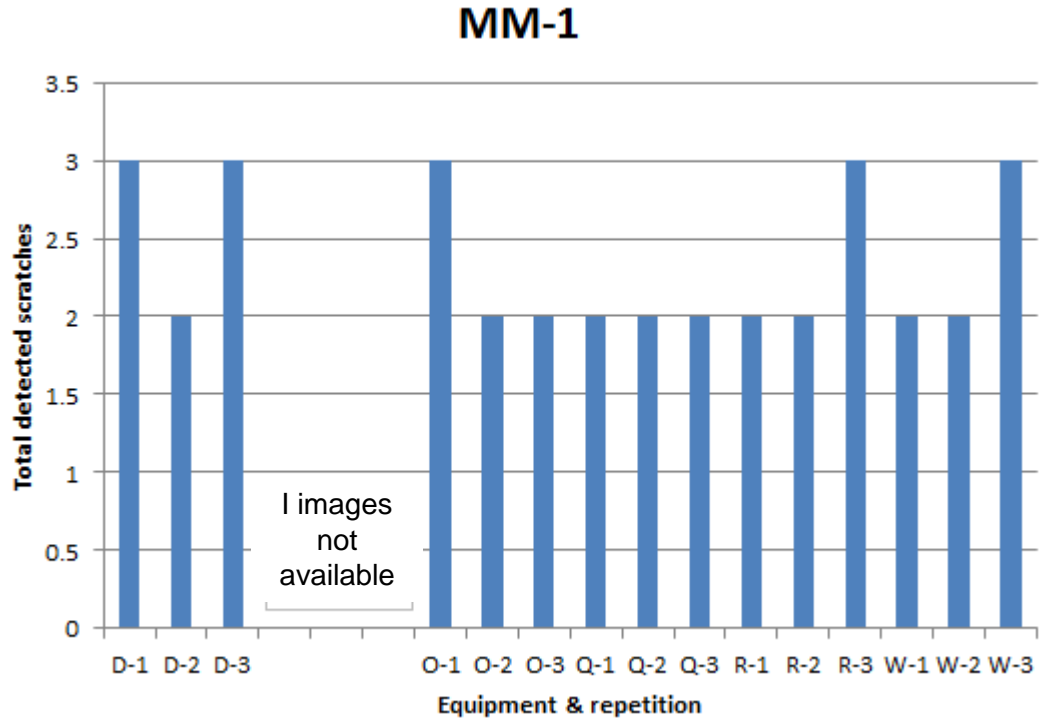
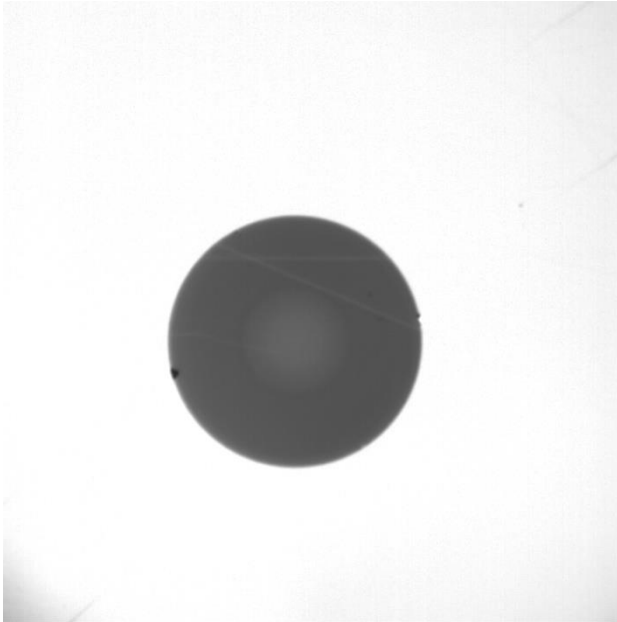
# MM-1: Good agreement



I: No data

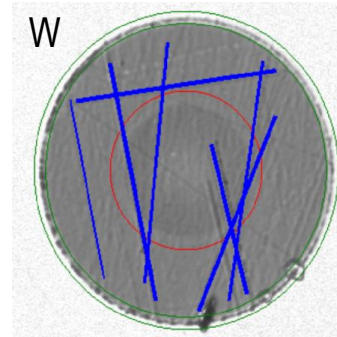
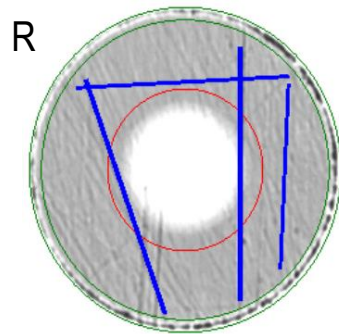
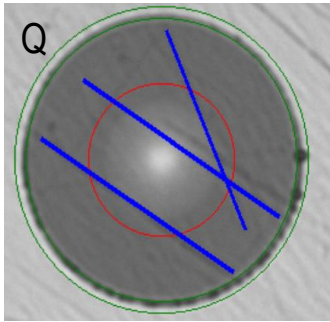
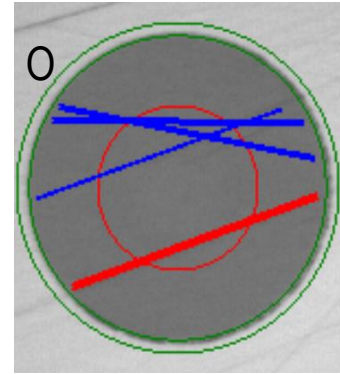
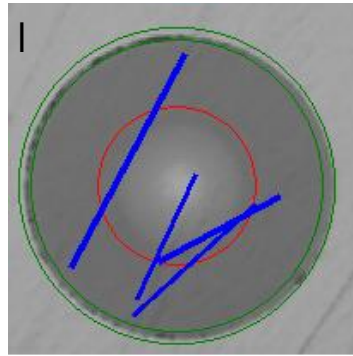
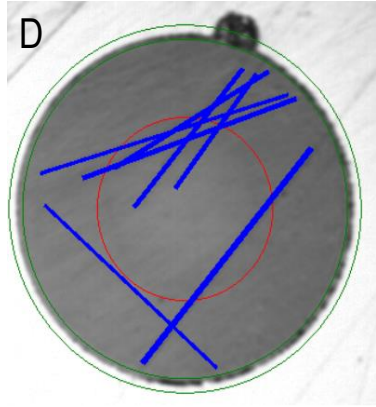


# MM-1: Good repeatability and reproducibility



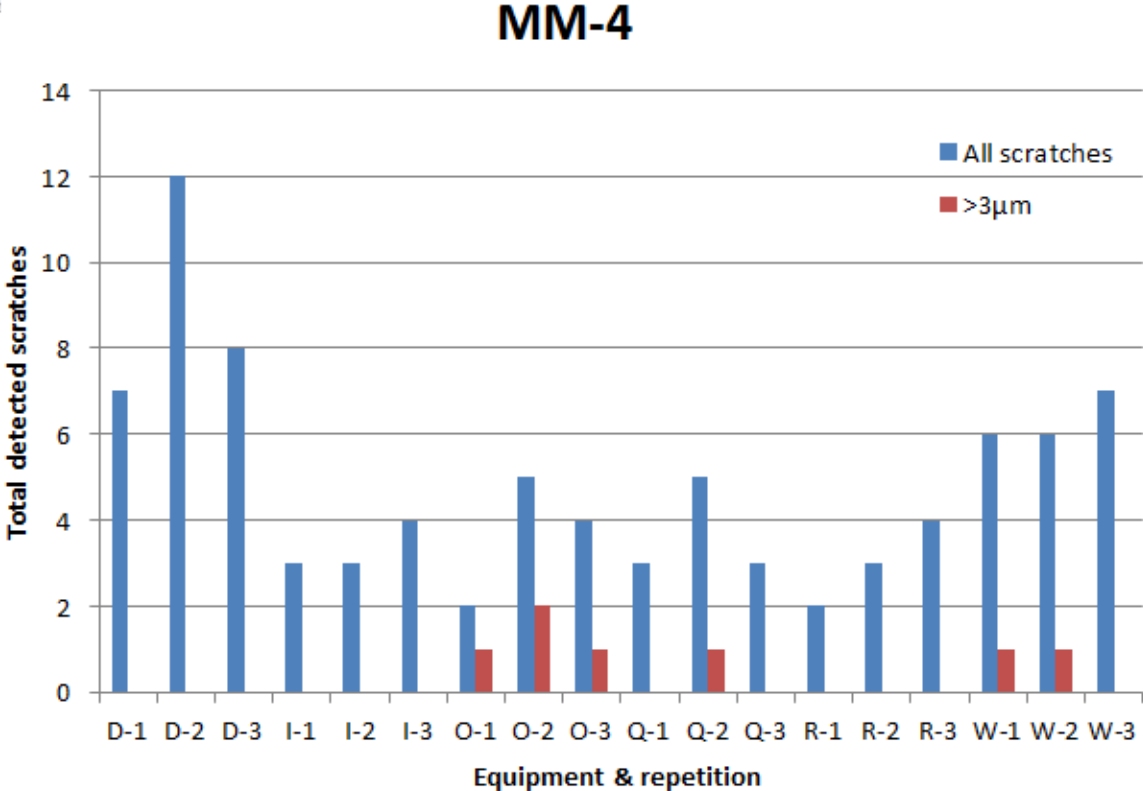
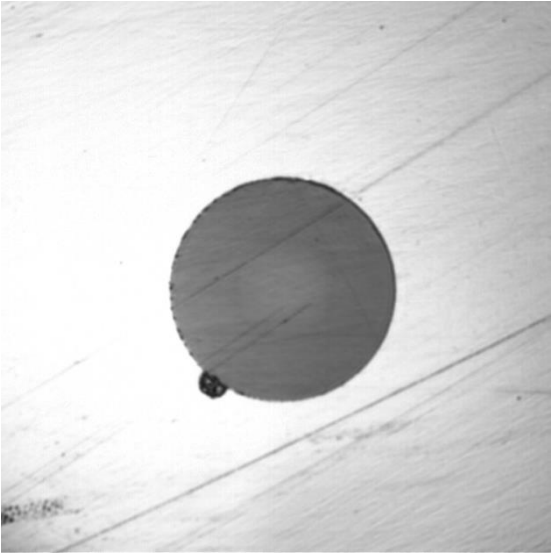


# MM-4: Two fine scratches could be mistaken as a large one

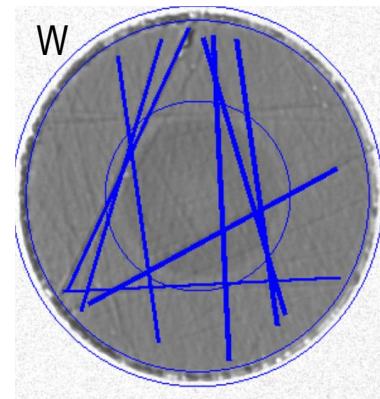
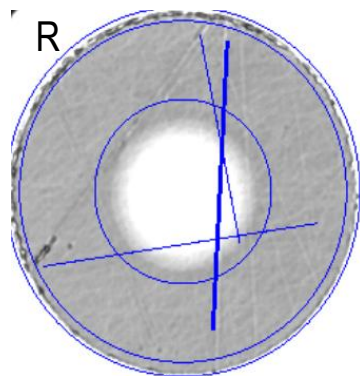
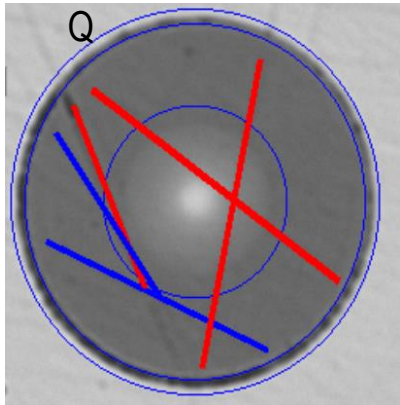
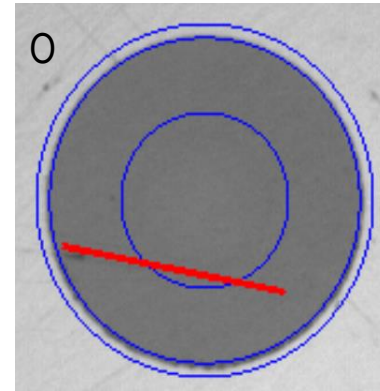
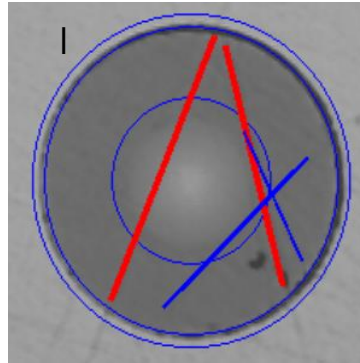
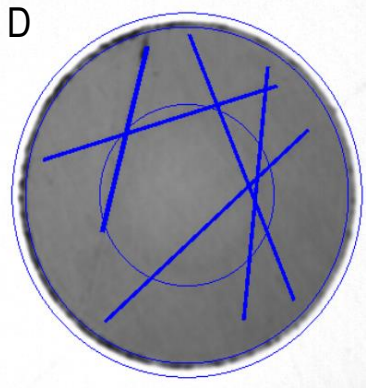




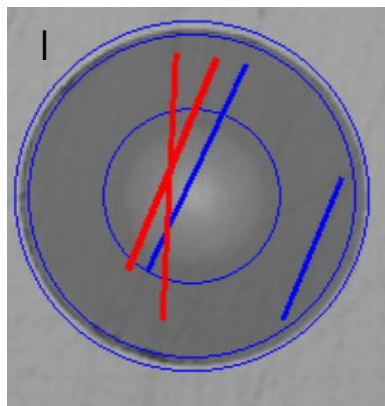
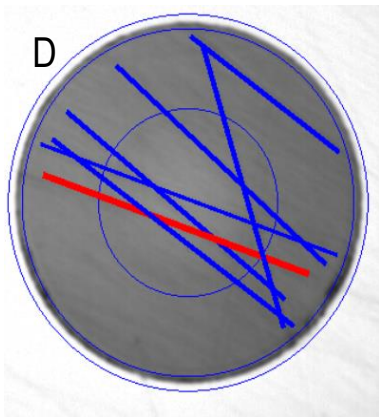
# MM4: Dependence on sampling resolution and optical response



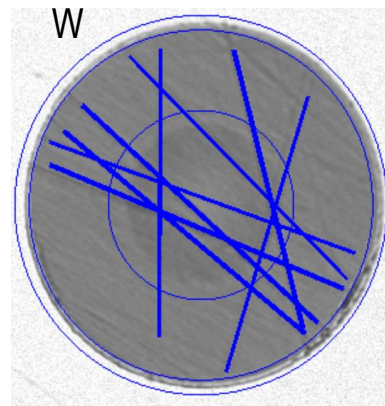
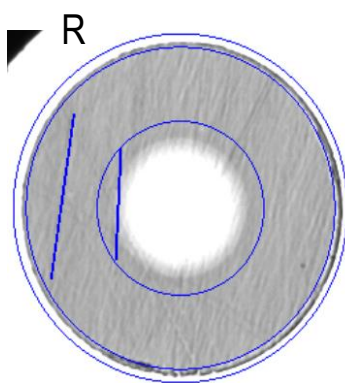
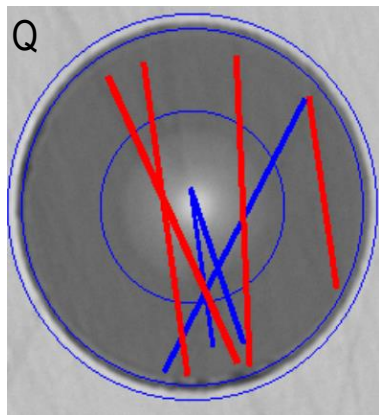
# MM-6: Many fine scratches



# MM-12: Many fine scratches



O: no data



# Summary

- Wide variations of equipment optical properties
  - sampling resolution
  - optical response (Airy radius of the optical system)
  - SNR (contrast)
- Same analysis software (with same relative calibration)
- Well separated scratches in the range of  $2\mu\text{m}$  -  $4\mu\text{m}$ , with high (MM3) and low (MM1) contrasts
  - Good repeatability and reproducibility
- Many thin/fine scratches (MM4, MM6 and MM12) mostly less than  $2\mu\text{m}$ 
  - More dependence on equipment optical properties
  - Two (or multiple) parallel thin scratches separated by the Airy radius (or less) of the optical system could be “mistaken” as a large scratch.
    - Question: is it ok if two (close) fine scratches  $\approx$  one large scratch?
  - Same difficulty applies to “human operators” making judgement

Thanks!