

# The Foucault Test – pushing the limits

Johann Swanepoel

ScopeX 2010

## The Foucault Test – No Masks Required

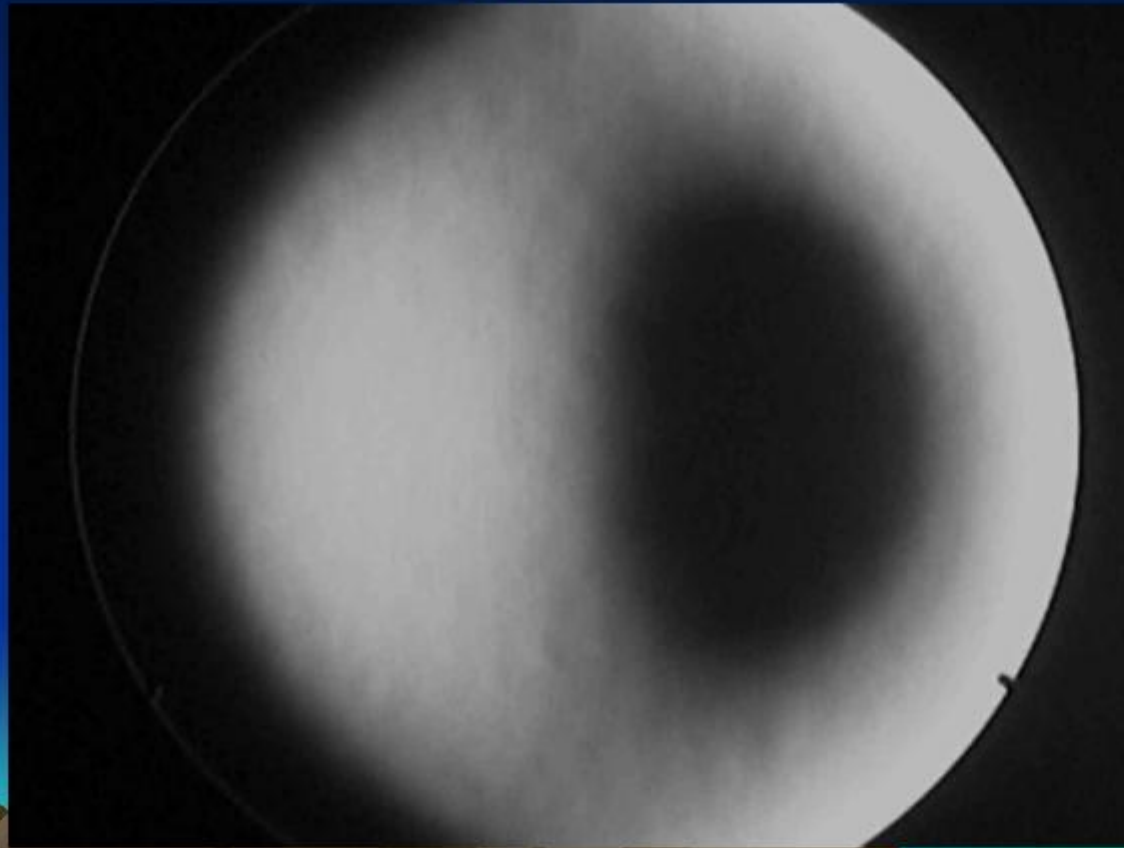
- Modern approach to old knife-edge test
- Overcomes limitations of using masks
- Almost unlimited number of test points across mirror possible – also close to edge
- More objective, convenient, reliable and repeatable measurements obtained
- Well-suited to testing large fast mirrors
- Improvement on Harold Suiter's method (ATMJ 2 chap 13)
- Digital analysis of Foucaultgrams provides other hidden information not visible to the human eye

## Foucaultgram set for 20" F4.3 mirror



Images taken at 0.010" (10 thou) intervals along longitudinal axis –  
takes less than 10 minutes for set of images

# Typical Foucaultgram of 20" F4.3 mirror



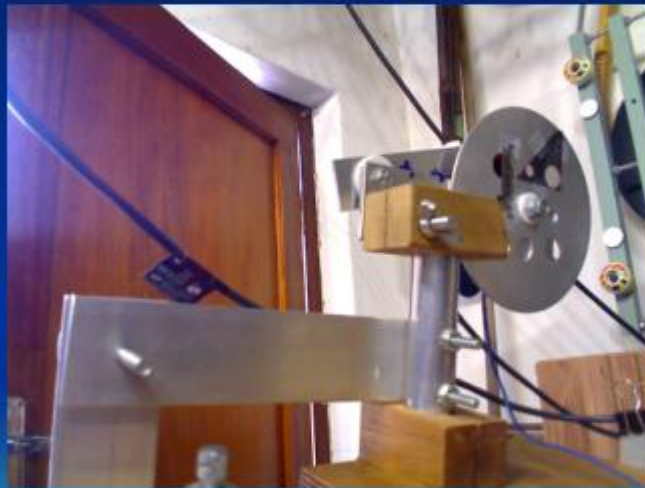


## Setup for successful testing

- Stable and well-aligned slitless test set with dial plate and various height and panning adjustments
- Modified webcam and lens system behind knife-edge or Ronchi screen (webcam connected to computer)
- Ensure camera is properly focussed and image vertically aligned
- Use Ronchi screen to aid precise longitudinal alignment (more sensitive than knife-edge for this)
- Centre camera behind knife-edge and properly adjust knife-edge for balanced “dual kidney shaped” image
- Fine pan camera to precisely centre image (edge diffraction ring helps alignment – using MirrorProfile)
- Take series of images (Foucaultgrams) at chosen knife-edge positions (outside to inside) without making any other adjustments

# Slitless Foucault tester with modified webcam

Front showing knife-edge dial plate  
and fine panning arm



Rear showing webcam  
behind knife-edge

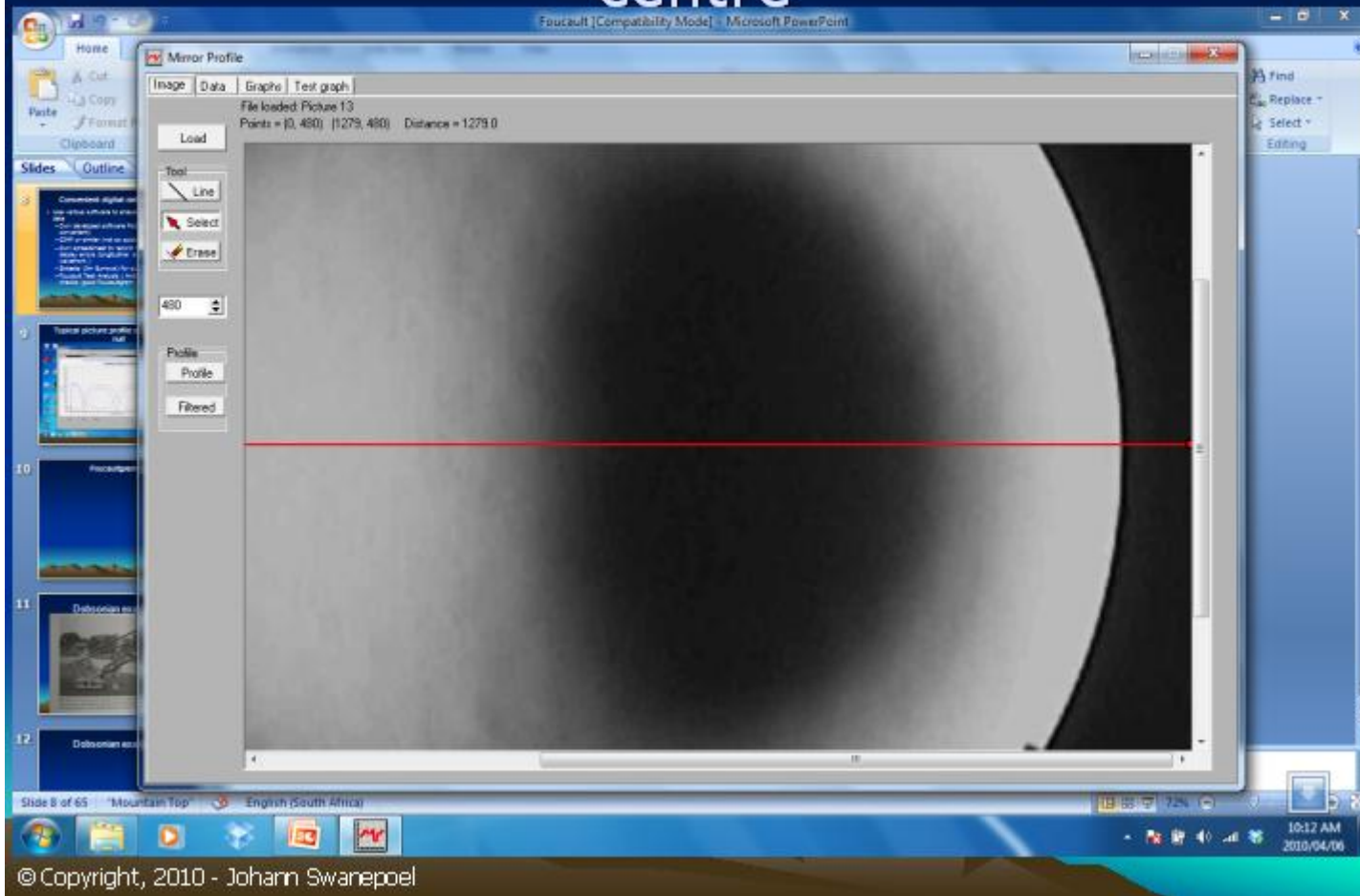


## Convenient digital data reduction

- Various pieces of software available to analyse images and reduce data to establish mirror figure
  - Own developed software (MirrorProfile) to take image pixel intensity profiles (quick and convenient)
  - GIMP or similar (not so quick or convenient)
  - Own spreadsheet to record results, compute and display errors (longitudinal aberration and wavefront )
  - Sixtests (Jim Burrows) for surface profile, etc
  - Foucault Test Analysis (Andreas Reifke) for cross-checks (good Foucaultgram simulations)
  - FigureXP

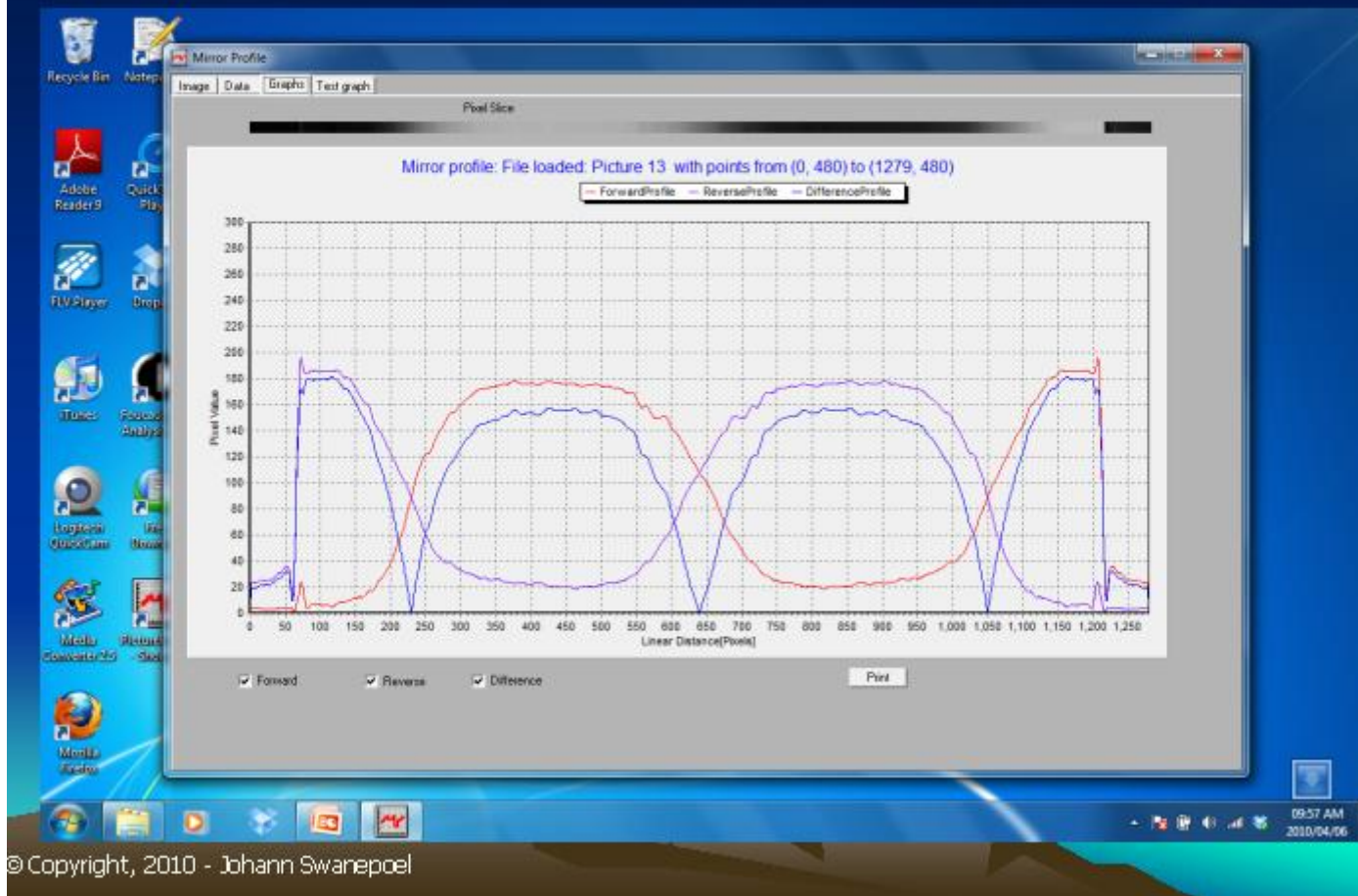


# Taking pixel profile through image centre



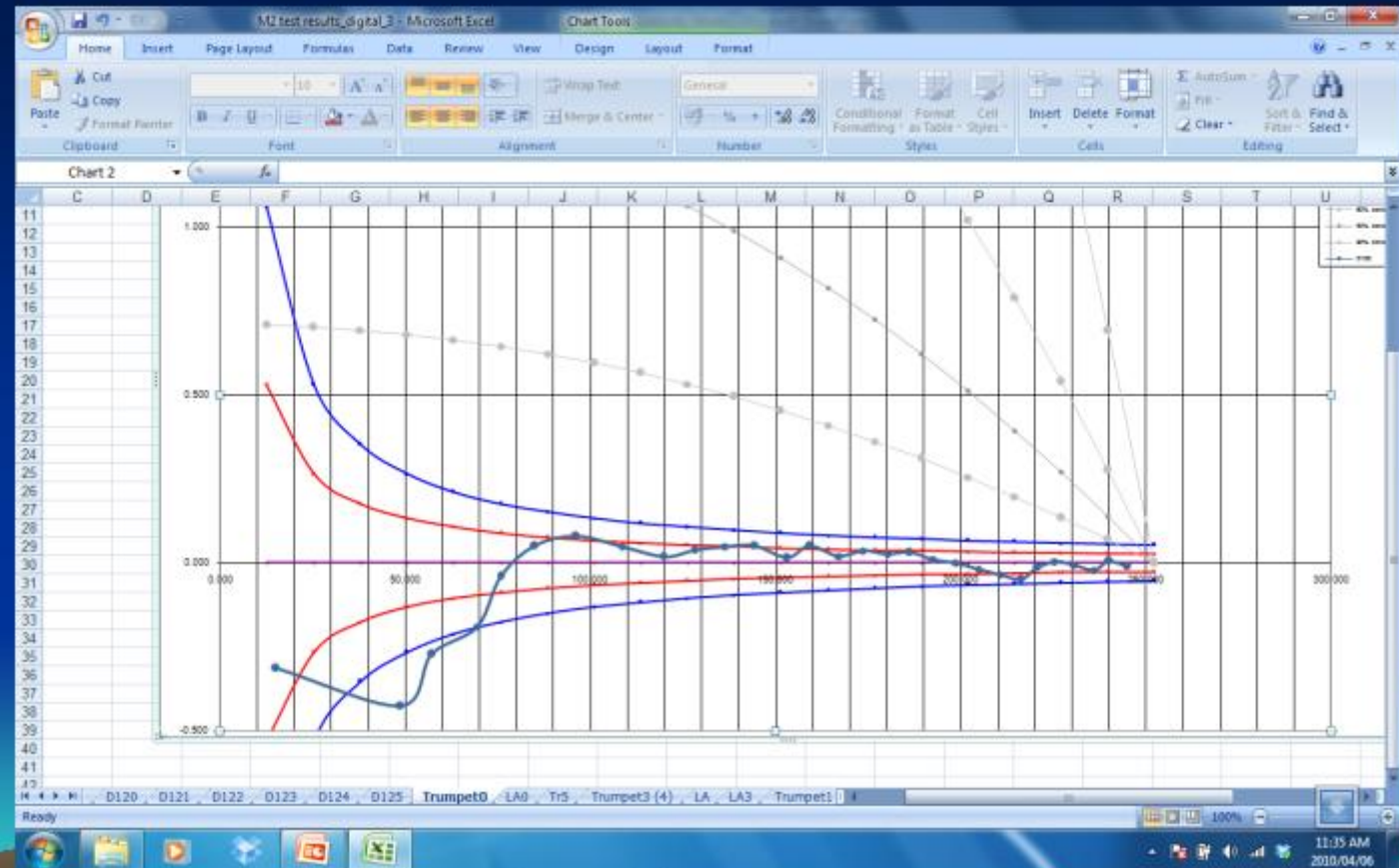


# Typical image profile showing zone null





# Spreadsheet calculations



# Surface profile calculations with Sixtests

