Can CR be used for CT “film” tests?

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CT tests using film

- Irradiated slice thickness
  - IPEM 77 CT07
- Light to scan plane alignment
  - IPEM 77 CT10
- Focal spot alignment
  - IPEM 77 (2) CT13 - draft

Background

- These tests usually performed with film
- Radiology Depts “going digital”
- Fewer film processing options
- Can we future proof the service by using CR for these tests?

Methodology

- Performed tests on two new Siemens Sensation 16 scanners and Fuji CR
- Showed deficiencies in technique, further investigation needed
- More in depth investigation performed on GE Hi-Speed CTi and Fuji/Philips CR

Methodology

- Followed methodology of IPEM 32, III
- Stationary tube used for irradiated slice tests
- Philips PCR AC3000 CR reader, FUJI ST-V_N CR plates (0.2/0.1mm pixel size for 35x43/18x24)
- Processed film as normal

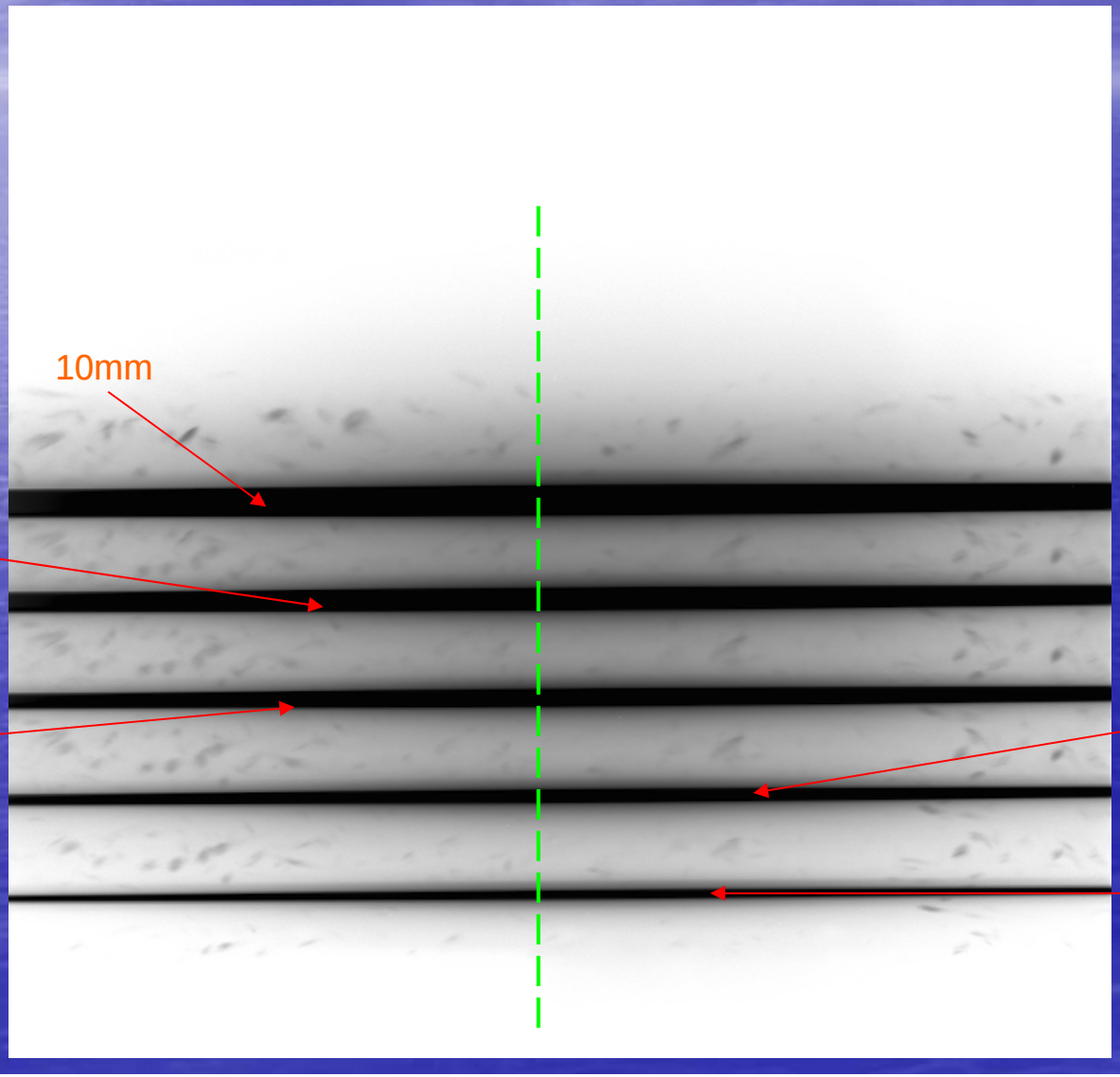
Methodology

- Process CR plates on “Auto”, “Semi-Auto”, “Fixed” & “Manual”
- “Semi” allows L to be user set, “Fixed” has fixed S & L, “Manual” allows S & L to be adjusted by user
- Used L = 1, 2, 3, 4, set S as appropriate
- Stored images on PACS
- Analysed on separate workstation

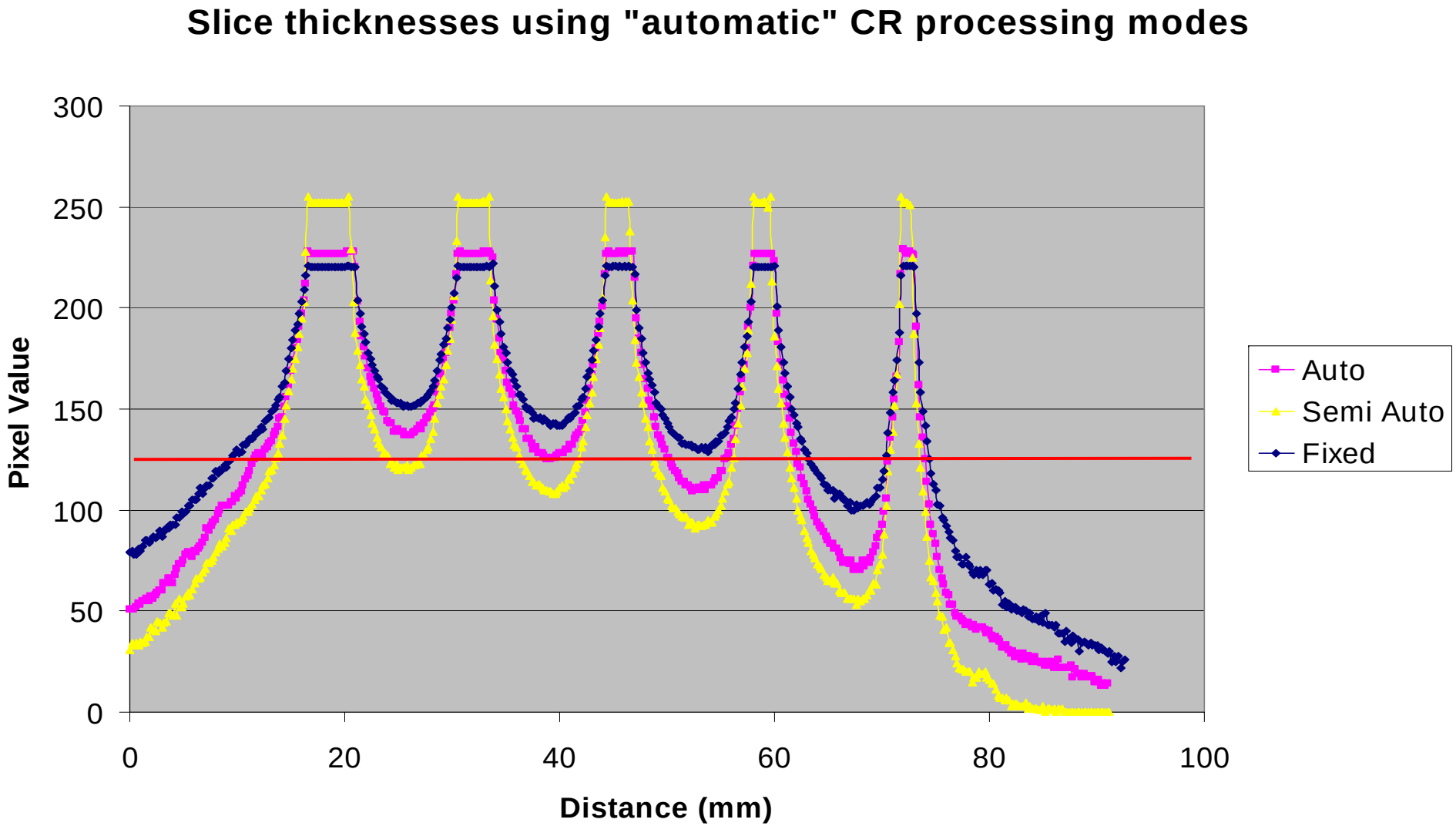
Methodology

- Analysed digital images using software tools (Image Tool© & Excel©)
- Digitised some films using Radiotherapy film scanner (pixel pitch 0.4/0.2mm)
- Compared results from manually measured film, CR & scanned films

Results – Slice thicknesses



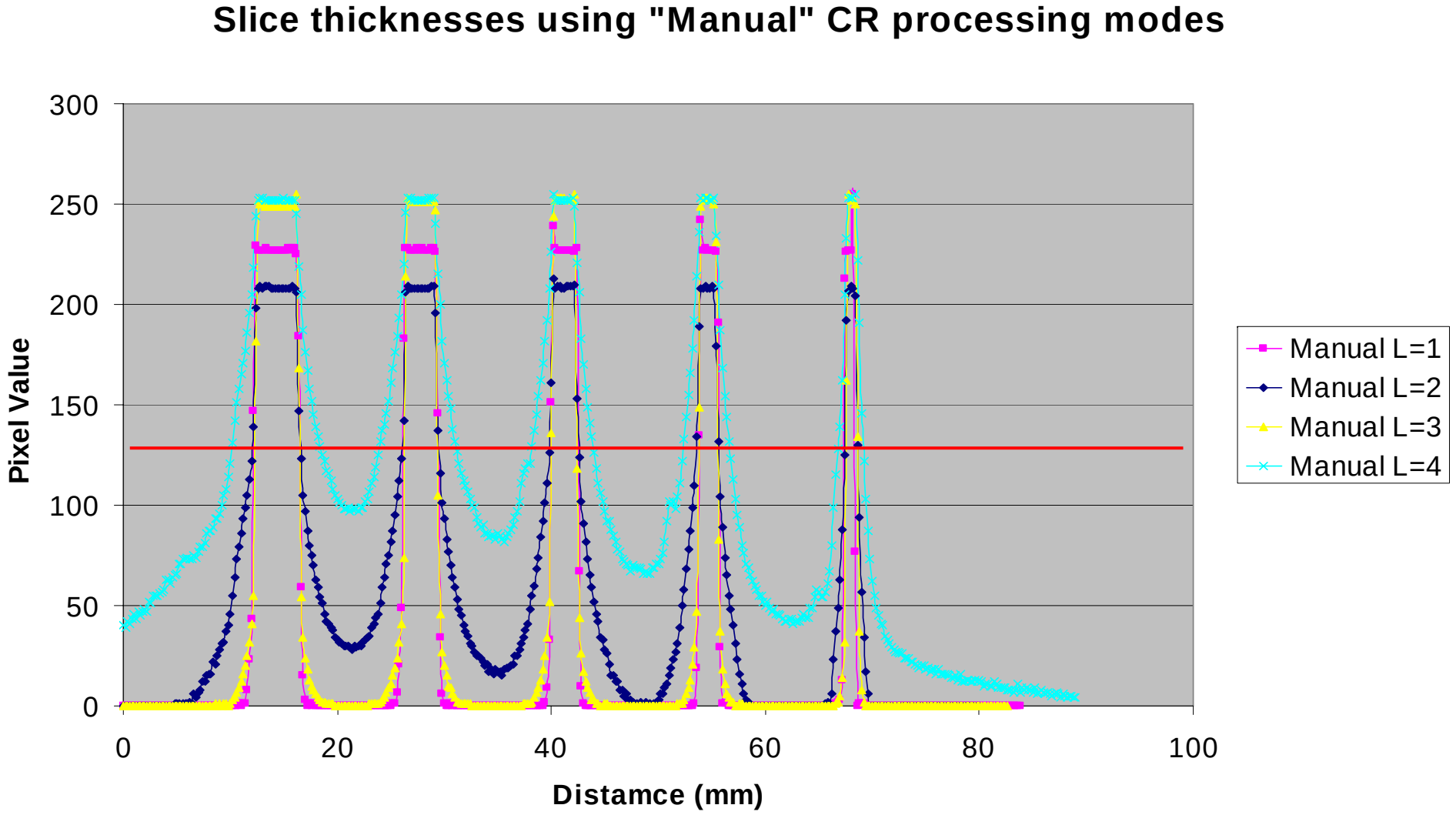
Slice thicknesses



Slice thicknesses

- Problem with inter-slice incrementation – most slices don’t reach half-max value
- All slices “clipped” at maximum pixel value
- All slices significantly broadened
- Conclude that “Auto” modes are not useful

Slice thicknesses



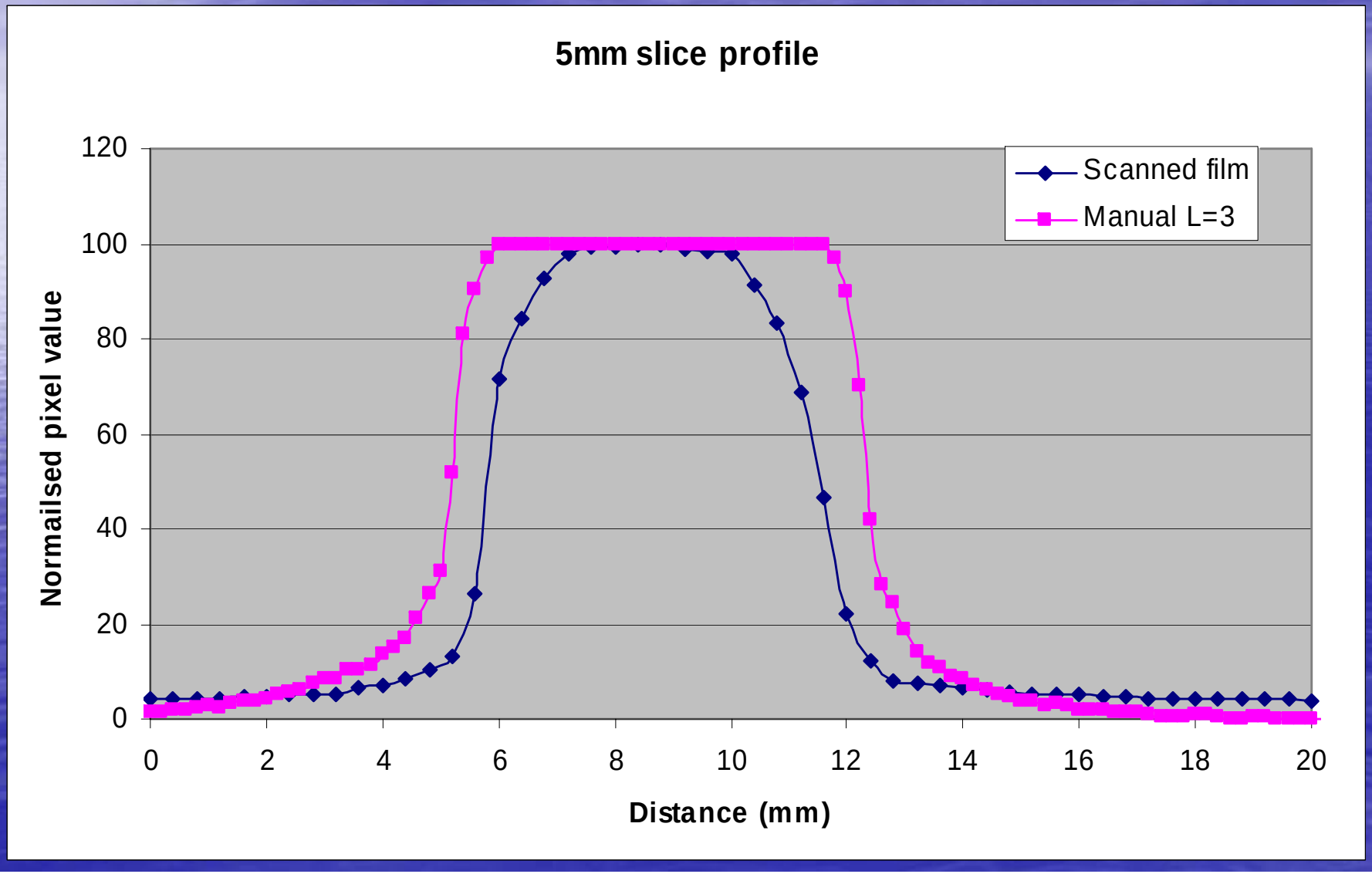
Slice thicknesses

- Profile shape depends on S & L selected by user
- All profiles reach half-max value
- Results appear closer to film profiles
- Less problem with incrementation
- Some profiles clipped, peak widths appear stable
- Potentially useful results...

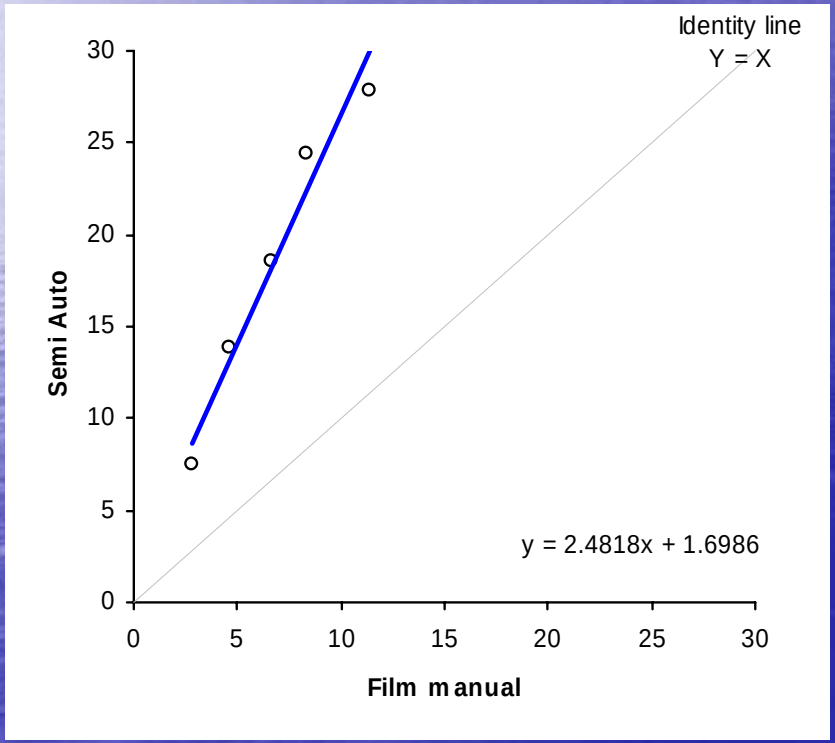
Slice thicknesses

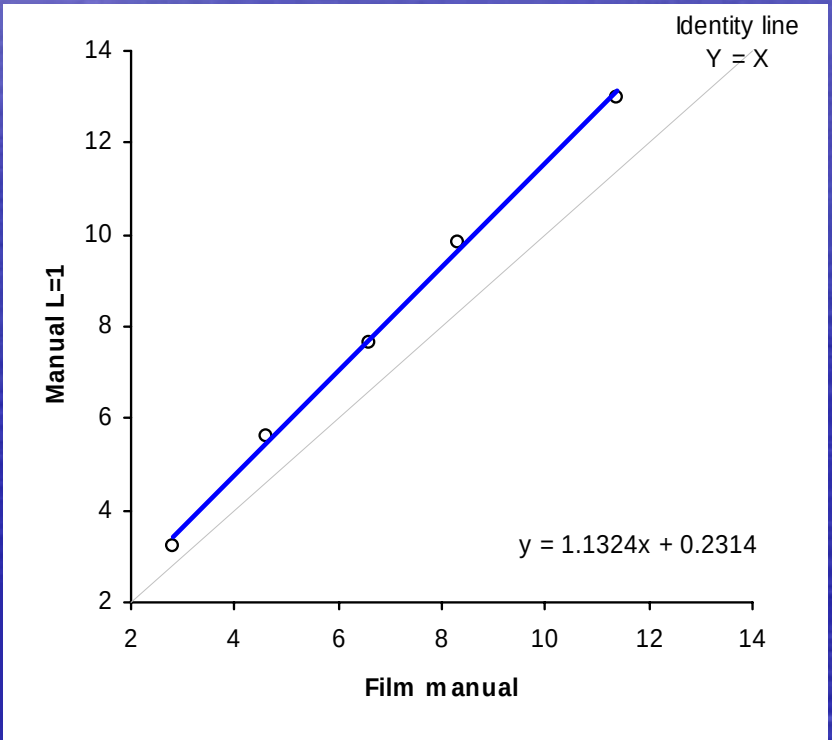
	10mm	7mm	5mm	3mm	1mm
L=1	12.98	9.85	7.66	5.60	3.23
L=2	14.73	11.60	9.08	6.79	4.11
L=3	12.24	9.20	7.16	5.21	3.08
L=4	23.17	19.40	15.73	11.72	6.17
Film manual	11.40	8.30	6.60	4.60	2.80
Film scanned	10.49	7.40	5.75	3.75	2.25

L=3 vs scanned film

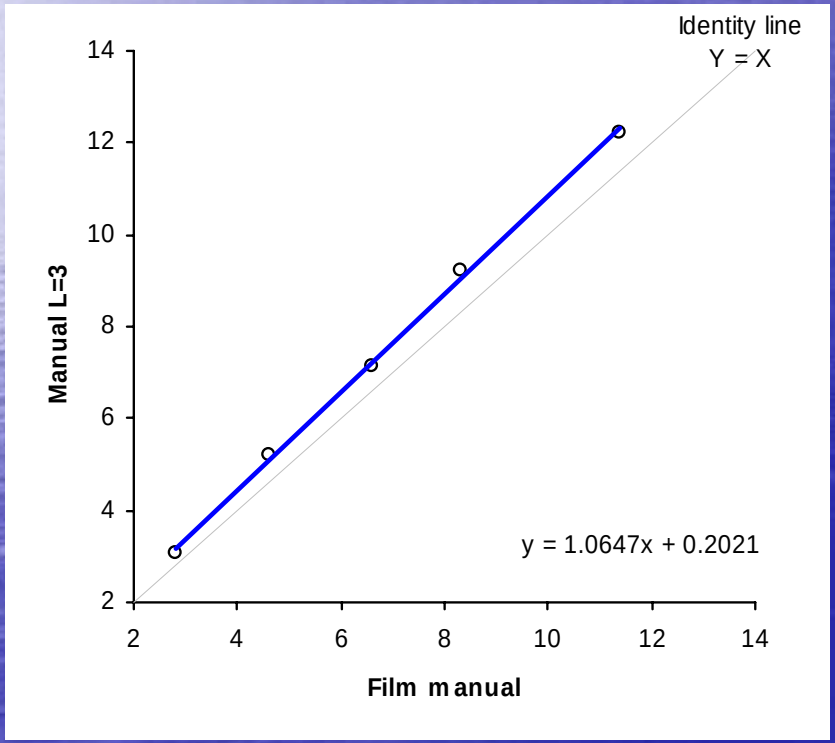


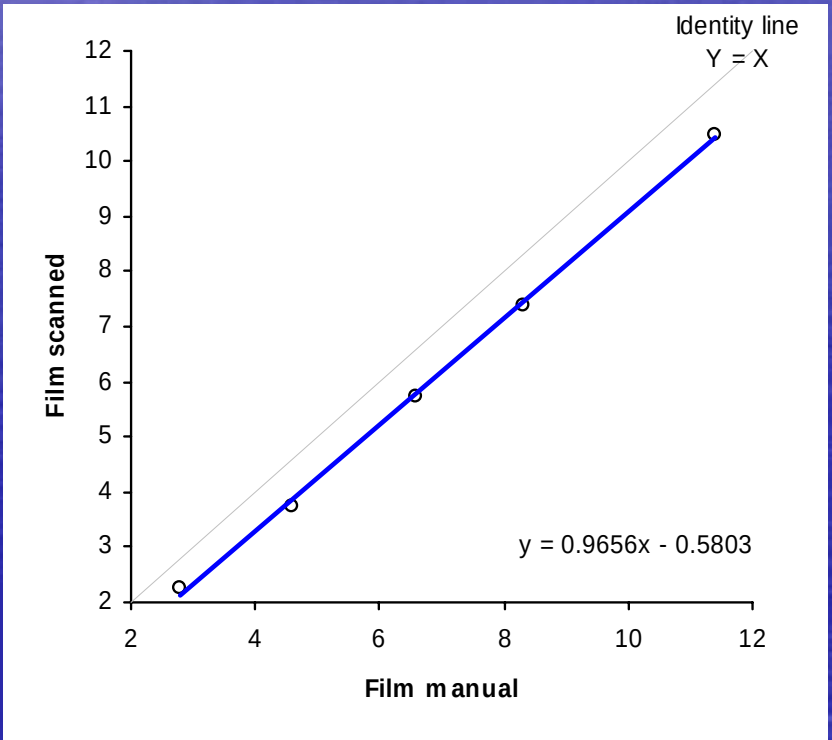
Correction factors?



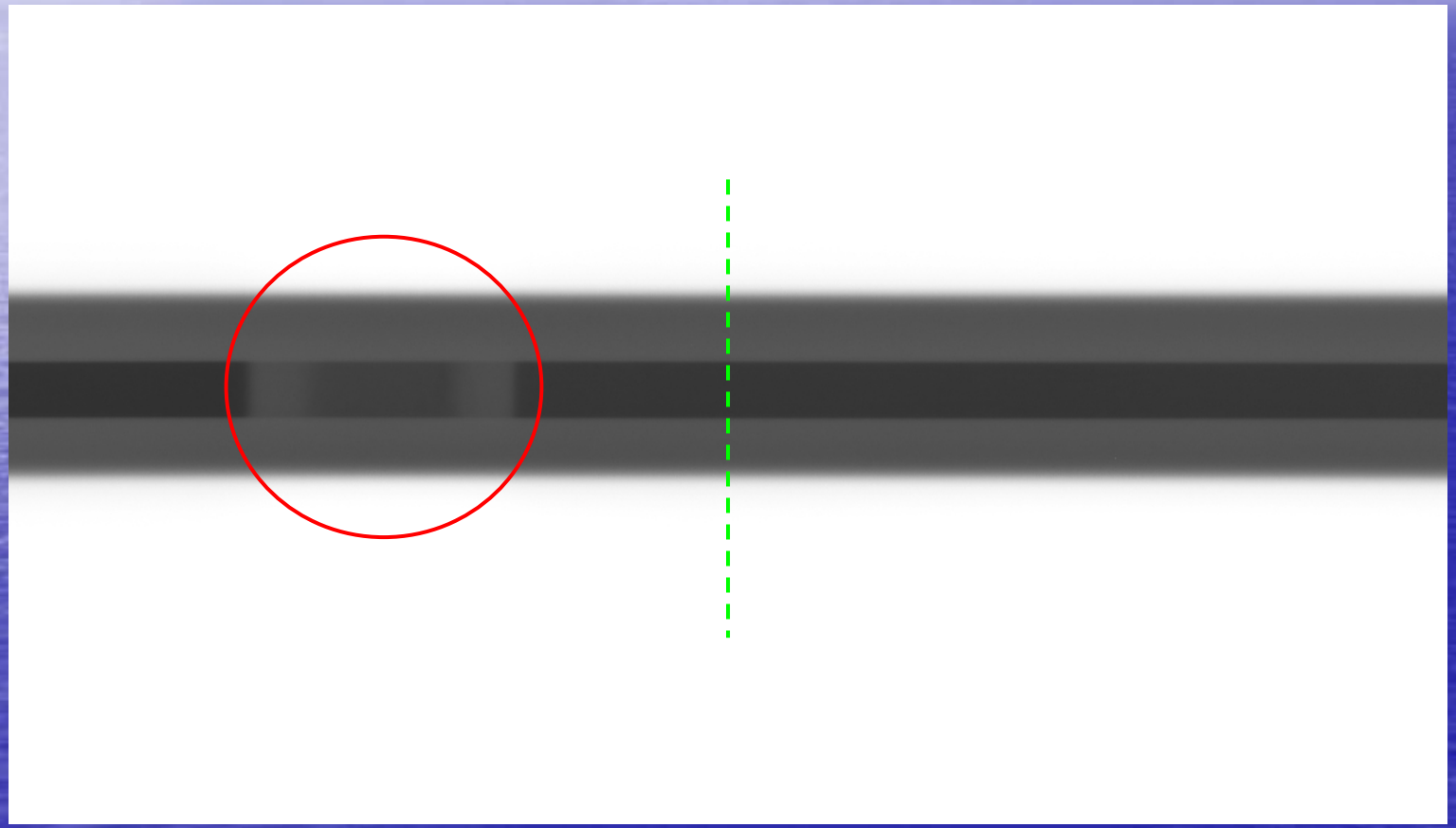


Correction factors?

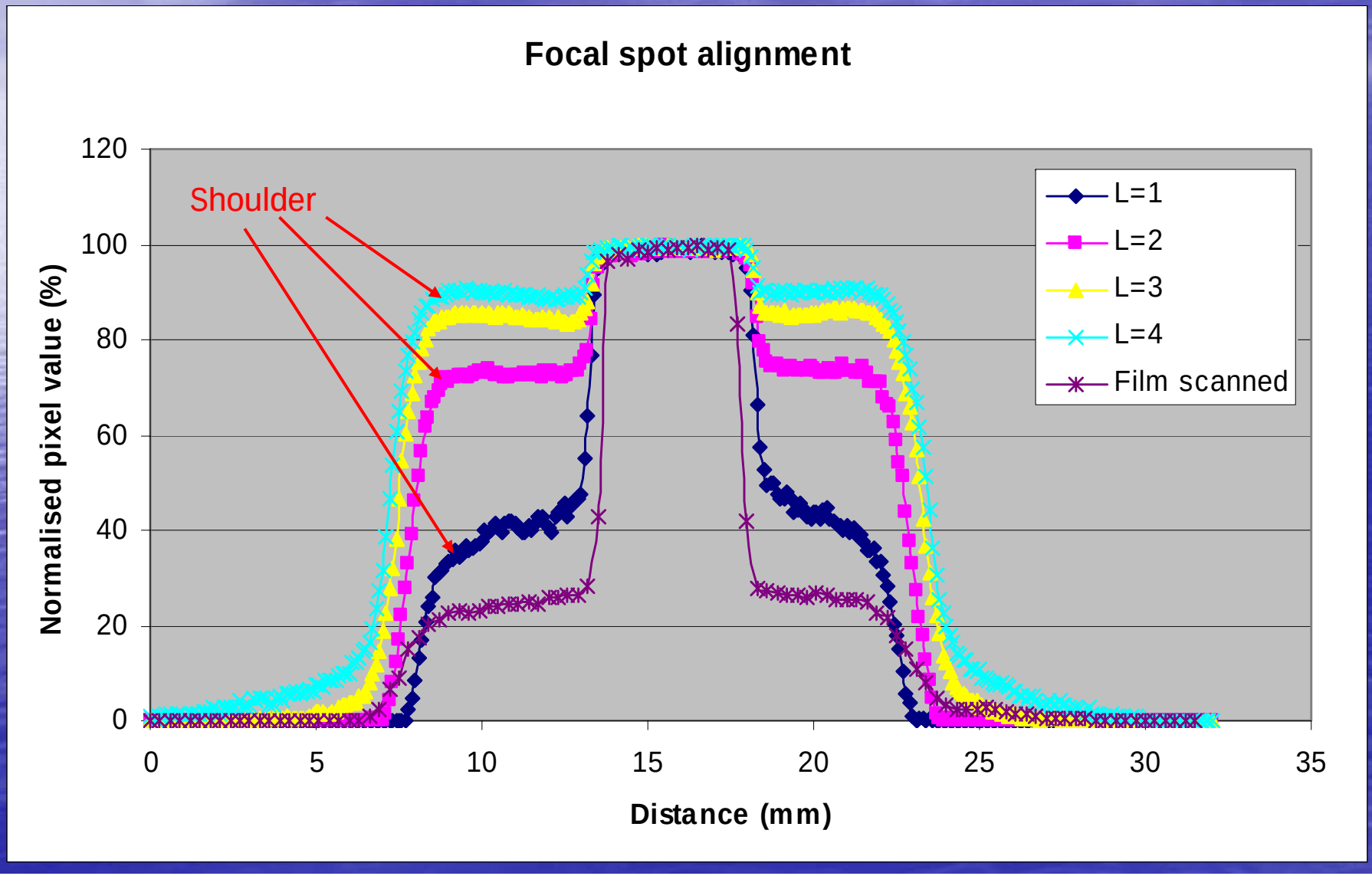




Results – Focal spot alignment



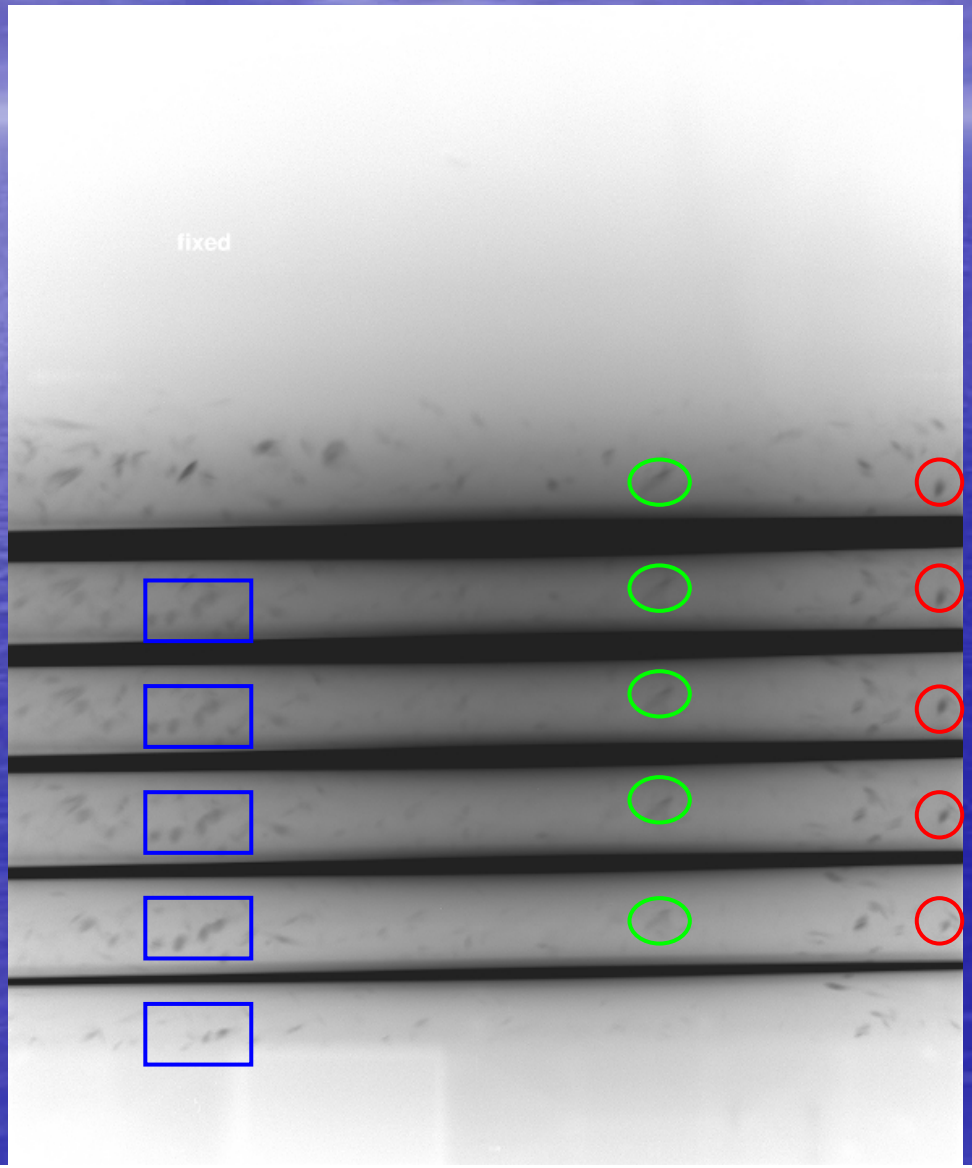
Focal spot alignment



Focal spot alignment

Processing Conditions	Mis-alignment (mm)
L = 1	0.39
L = 2	0.41
L = 3	0.39
L = 4	0.39
Film – manual measurement	0.40
Film - scanned	0.32

A useful aside?



Conclusions... so far

- Exposure factors...
- Slice thicknesses on different EDR settings
  - Auto processing probably not useful
  - Potential for using manual processing
- DC offset for CR similar to scanned film
- Focal spot alignment
  - Use any manual setting but low L value is best

Further Work

- Investigate effect of changing S for L=1 on slice thicknesses
- Effect of changing exposure for L=1
- Extend to different CR systems within our locality
  - Fuji, Kodak, AGFA etc

Has anyone done this already?

Acknowledgements

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