



## A relationship between slide quality and image quality in whole slide imaging (WSI)

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### Abstract

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**Introduction:** This study examined the effect of tissue section thickness and consistency – parameters outside the direct control of the imaging devices themselves – on WSI capture speed and image quality. Preliminary data indicates that thinner, more consistent tissue sectioning (such as those produced by automated tissue sectioning robots) result in significantly faster WSI capture times and better image quality.

**Methods:** A variety of tissue types (including human breast, mouse embryo, mouse brain, etc.) were sectioned using an (AS-200) Automated Tissue Sectioning System (Kurabo Industries, Osaka Japan) at thicknesses from 2 - 9  $\mu\text{m}$  (at one  $\mu\text{m}$  intervals) and stained with H&E by a standard method. The resulting slides were imaged with 5 different WSI devices ( ScanScope CS, Aperio, CA, iScan, BioImagene, CA, DX40, DMetrix, AZ, NanoZoomer, Hamamatsu Photonics K.K., Japan, Mirax Scan, Carl Zeiss Inc., Germany) with sampling periods of 0.43 – 0.69  $\mu\text{m}/\text{pixel}$ . Slides with different tissue thicknesses were compared for image quality, appropriate number of focus points, and overall scanning speed.

**Results:** Thinner sections (ie 3  $\mu\text{m}$  sections versus 7  $\mu\text{m}$ ), required significantly fewer focus points and had significantly lower (10-15%) capture times. Improvement was seen with all devices and tissues tested. Furthermore, a panel of experienced pathologist judged image quality to be significantly better (for example, with better apparent resolution of nucleoli) with the thinner sections.

**Conclusion:** Automated tissue sectioning is a very new technology; however, the AS-200 seems to be able to produce thinner, more consistent, flatter sections than manual methods at reasonably high throughput. The resulting tissue sections seem to be easier for a WSI system's focusing systems to deal with (compared to manually cut slides). Teaming an automated tissue sectioning device with a WSI device shows promise in producing faster WSI throughput with better image quality.

**Keywords:** Slide quality, Image quality, Whole Slide Imaging.