3DHISTECH

Calibration based on IT8.7/1

Viktor Sebestyén Varga Ph.D.

November 18 2013, Vancouver

3DHISTECH

Current position of whole slide imaging in pathology

- Many studies show that digital pathology is useful for making diagnosis.

- Technology is ready. There are several vendors making scanners with sufficient quality, speed etc.

3DHISTECH

Current position of whole slide imaging in pathology

- The pathology community would like to use whole slide imaging, but they are uncomfortable without FDA approval.

- FDA understandably requires standardization for the systems.

3DHISTECH

Current position of whole slide imaging in pathology

- Current monitor and camera technology can produce satisfactory results.

- That’s why we have those successful studies and pathologist waiting to use the systems routinely.

Current position of whole slide imaging in pathology

- By any delay we are holding back the availability of the technology to patients!

- The development of the industry has slowed down!

3DHISTECH

What to do?

- As the currently available technologies showed sufficient results we should use them in the first place.

- Later we can develop a 2nd generation standard if it becomes necessary.

3DHISTECH

Monitors

- We recommend to use the sRGB color space as this is the most widespread color standard for monitors.

- If we would create a special color space which is larger than sRGB then we radiacally limit the number of available display devices.

Monitors

- If we would create a special color space when and for what price would be monitors available?

- Many institutions can’t afford 10K+ USD display devices in quantities.

Monitors

3DHISTECH

- **Some mobile devices and applications are already FDA approved**

FDA NEWS RELEASE

For Immediate Release: Feb. 4, 2011
Media Inquiries: Erica Jefferson, 301-796-4988, erica.jefferson@fda.hhs.gov
Consumer Inquiries: 888-INFO-FDA

FDA clears first diagnostic radiology application for mobile devices
Provides wireless access to medical images for iPhone, iPad users

- **http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm242295.htm**

Monitors

- We should not limit the possibility of remote diagnosis on mobile devices due to a requirement on a special color space.

Available calibration targets

- We bought from Charité in Berlin, Germany a calibrated microscope glass slide.
- This type of slide was used on the 2nd International Scanner Contest to assess scanner color quality.
- The slide is openly available to anybody for a reasonable price.

3DHISTECH

Available calibration targets

- The slide has a photographic film on it and it is calibrated to the IT8.7/1 standard.

- IT8.7/1 - 1993 (R2003) - Graphic technology - Color transmission target for input scanner calibration

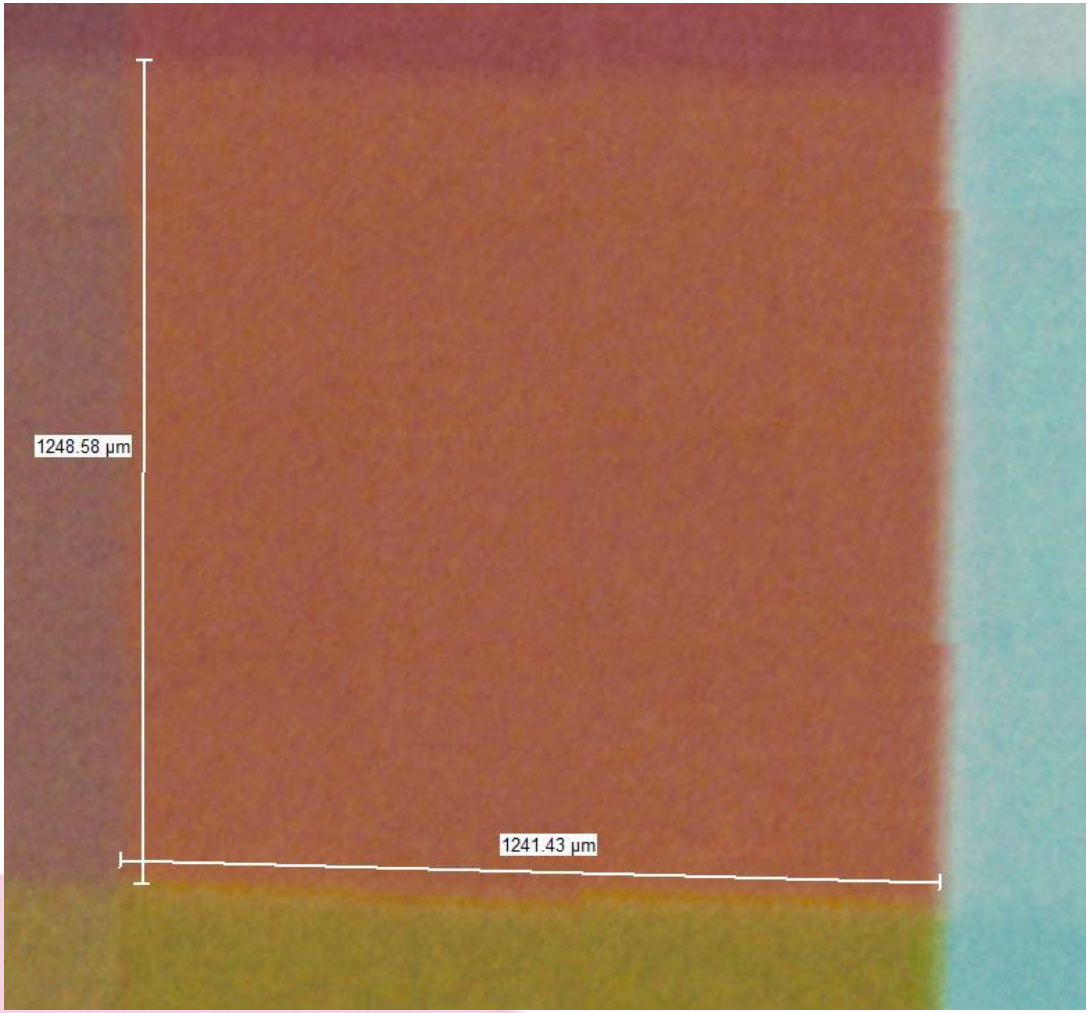
Available calibration targets

3DHISTECH

- One color patch is 1.2 x 1.2 mm
- With a typical 0.25 um / pixel scanner resolution 1 path is 4800 x 4800 pixels
- 23 megapixel, this is more than enough to average out any errors.

Available calibration targets

- **One color patch**



3DHISTECH

Available calibration targets

- **The slide came with detailed individual measurment data**
- **Spotes are measured in standard color spaces**

```
IT8.7/1
DESCRIPTOR "Velvia 100, 100F, Astia 100F, Provia 400X and Sensia 100 (Emul. 687 or
higher), Type 3, L* a* b* (light D50, viewing angle 2)"
CREATED "December 07, 2011"
PROD_DATE "2011:12"
SERIAL "N111203 Batch Average Data"
MATERIAL "Fujichrome Velvia 100 (RVP 100)"
NUMBER_OF_FIELDS 9
BEGIN_DATA_FORMAT
SAMPLE_ID  XYZ_X   XYZ_Y   XYZ_Z          LAB_L   LAB_A   LAB_B          LAB_C   LAB_H
END_DATA_FORMAT
NUMBER_OF_SETS 288
BEGIN_DATA
A1          1.69    1.48    1.08          12.50    6.98    2.00           7.26   15.97
A2          2.06    1.39    0.86          11.92   18.44    4.45          18.97   13.55
A3          2.62    1.46    0.71          12.34   28.15    7.97          29.26   15.79
A4          3.51    1.59    0.58          13.14   40.08   11.70          41.75   16.27
A5          8.22    7.20    5.32          32.26   11.99    2.99          12.36   14.03
```

Available calibration targets

- **Spectroscopic data for each spot with 10 nm precision is also included**

380nm	390nm	400nm	410nm	420nm	430nm	440nm
0.00091824	0.00176521	0.00949385	0.01578880	0.01268378	0.00882265	0.00700251
0.00078407	0.00165351	0.00892271	0.01453170	0.01139506	0.00773698	0.00596058
0.00058924	0.00129804	0.00852275	0.01381671	0.01065996	0.00709638	0.00535962
0.00037871	0.00131613	0.00925115	0.01550941	0.01233086	0.00824112	0.00605750
0.00203092	0.00537091	0.03245061	0.06256583	0.06103052	0.05091783	0.04485548
0.00156014	0.00483033	0.02956906	0.05602203	0.05310111	0.04299920	0.03705385
0.00100718	0.00427990	0.02818066	0.05292655	0.04943358	0.03933310	0.03330519
0.00044349	0.00370273	0.02734909	0.05173849	0.04812323	0.03772201	0.03121903
0.00729106	0.01429436	0.08350096	0.18283713	0.21157364	0.20706955	0.20119433
0.00638787	0.01377743	0.08166103	0.17770098	0.20339274	0.19694950	0.18993581

Available calibration targets

- The IT 8.7/1 standard is based on 5000k or D50 white point.
- We shifted this to 6500K / D65 to provide a white background on the sRGB monitor.

Calibration process

- For an initial standard we would recommend that color fidelity of the scanner should be checked by the pixel values in a scanned digital slide of a calibration target.

- The monitors should be calibrated with off the shelf monitor calibration products.

Calibration process

- The IT 8.7/1 standard has no particular advantage over other standards.

- If there are other available standardized and calibrated slides those could be used as well.

3DHISTECH

Thank you for your attention!