

“2nd International Scanner Contest (ISC)”

Information for Participants (I)

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1. General Information

In table 1 you get an overview about the vendors which have been registered and categories in which they will take part.

Vendor	High-Troughput	Quality	Image Analysis	Fluorescence	Technical
3D-Hitech	X	X	X	X	X
Hammamatsu	X	X		X	
Huron				X	
Leica	X	X	X	X	X
Metasystems	X	X	X	X	X
Olympus		X		X	X
Philips	X	X			

Table 1 Overview participation in 2nd International Scanner Contest

2. Schedule for the contest

Shipping:

You can ship your devices to the congress center „BCC“ to the following address:

bcc Berliner Congress Center GmbH

-Woche der Pathologie / International Scanner Contest-

Alexanderstr. 11

10178 Berlin, Germany

Please consider the day before the contest is Whit Monday and as such holidays in Germany. That might influence delivery times. The scanner may arrive at BCC Thursday May 24th, Friday 25th and Saturday 26nd between 8 a.m. and 6 p.m. or Tuesday 29th between 8 a.m. and 10 a.m.

Tuesday, May 29th 2012

08:00 to 11:00 Assembling of the devices

11:00 to 18:00 Scanning in different domains

Glass slides will be rotating between participants in the round-robin test set, so several domains will take place at the same time.

There will be a detailed schedule indicating who will scan what at which time.

You will get a warm lunch in between.

18:00 to 19:00 Start of the domain „High Throughput“

These scans shall be done automatically over night. So they will be started last on Tuesday by all participants. Each company will get its own box with glass slides for this domain.

Wednesday, May 30th 2012

08:00 to 16:30 Scanning in different domains

Glass slides will be rotating between participants in the round-robin test set, so several domains will take place at the same time.

There will be a detailed schedule indicating who will scan what at which time.

You will get a warm lunch in between.

16:30 to 18:00 Disassembling of the devices

If your device is needed for the industry booth at the DGP conference, you may store it for the day in between at the BCC or assemble it right away in the conference area.

18:00 to 20:00 Excursion to the TU exhibition “Colour and Colour Vision”

(Address: Technical University, Einsteinufer 19, 10587 Berlin)

Those who want to attend the excursion start at 18:00 (first group) or 18:30 (second group) from the BCC.

20:30 Farewell Dinner

The location will be announced. Participation is optional and at own costs.

3. Room conditions

We will have one room with 200 m². The room will be separated by dividers of 1,90m height and 1,30m width into boxes for each participant. We need to know the size of the table area you need and the weight of the system.

It is possible to order exhibition stand construction boards of 2,30m height and 1,00m width alternatively. This would generate an additional fee of € 45,00 per running meter.



Fig. 1: Room for the 2nd International Scanner Contest 2012 without installation of boxes.

4. Domains

4.1 High throughput scanning at 20x and 40x

- **Task**
 - Scan under daily-use conditions in a clinical pathology laboratory.
 - Scan 35 glass slides in a routine procedure.
- **Aim**
 - Measurement of scanning time and image quality.
- **General conditions**
 - 20 biopsies and 15 specimen of surgical material of different origin, HE stains only. No interaction or reloading of the scanner will be allowed.
 - A technician is allowed to prepare the scanner settings. Preparation and scanning time will be measured separately.
 - Glass slides are randomly selected from the daily workload of different pathology institutions. Several comparable sets of mixed slides will be provided.
 - Regions on the slides are not marked. All relevant particles have to be found automatically.
- **Evaluation Criteria**
 - No reference focus assessment using automatic image analysis
 - Completeness of the digitized tissue area
 - Time needed, including preparation, loading of slides, scanning and data handling.
- **Prize Categories**

Because the resolution of the slide scanners varies, and some vendors may change the objective lens, the quality prize will be awarded in two different categories, 20x and 40x objective. The assignment to the category will be based on resulting pixel resolution.

 - Best High Throughput 20x 2nd International Scanner Contest 2012
 - Best High Throughput 40x 2nd International Scanner Contest 2012

If your device can scan in both resolutions, you are free to participate in both prize categories. With respect to evaluation efforts this implies a double participation fee for this domain.

4.2 Quality at 20x and 40x

- **Task**
 - Scan 10 slides in best possible quality.
- **Aim**
 - Evaluation of image quality.
- **General conditions**
 - Slides of different origin and staining.
 - You will get 5 bundles of 2 slides each.
 - Human interaction is allowed (however, no post processing with separate programs).
 - The time limit is one hour per two slides bundle.
- **Evaluation Criteria**
 - "No reference" focus assessment using automatic image analysis
 - Completeness of the digitized tissue area
 - Visual image evaluation by experts: Experienced pathologists attending the congress will evaluate several corresponding image tiles of each scanned slide by its image quality and tissue details.
- **Award Categories**

Because the resolution of the slide scanners varies, and some vendors may change the objective lens, the quality prize will be awarded in two different categories, 20x and 40x objective. The assignment to the category will be based on resulting pixel resolution.

 - Best Quality 20x 2nd International Scanner Contest 2012
 - Best Quality 40x 2nd International Scanner Contest 2012

If your device can scan in both resolutions, you are free to participate in both prize categories. With respect to evaluation efforts this implies a double participation fee for this domain.

2nd International Scanner Contest (ISC)

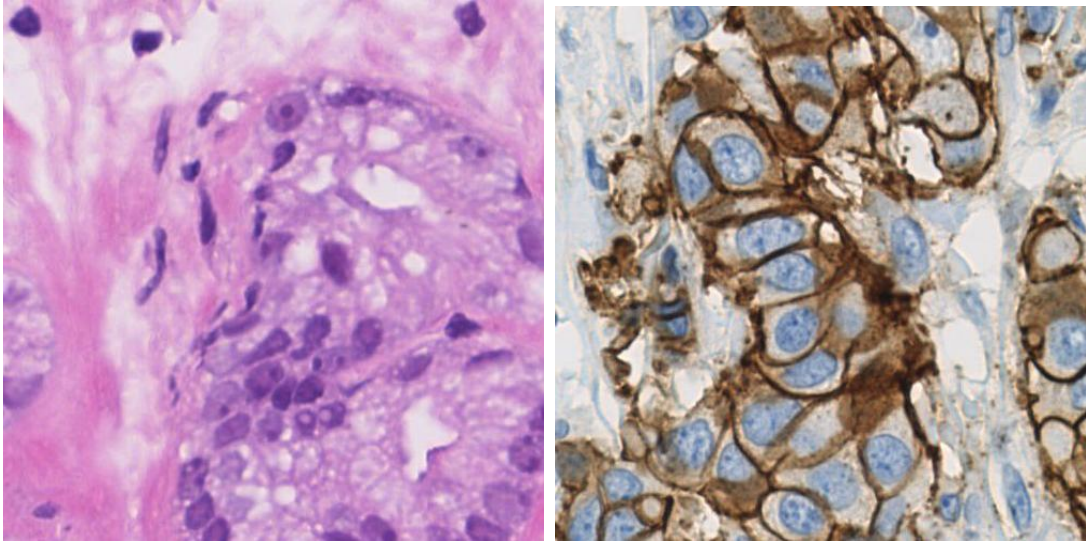


Fig. 2: Examples for image tiles which pathologists evaluate

4.3 Image Analysis

- **Task**

- Scan 1 breast cancer tissue micro array (TMA) with 20 spots, stained for nuclear proliferation marker Ki67 (DAPI=brown)
- Quantification of Ki67-positive tumor cells

- **Aim**

- Evaluation of the Ki67 quantification.

- **General conditions**

- All participants get the identical slide and deliver the corresponding WSI
- TMA spots may be selected manual or automatically
- Results have to be reported as an Excel-sheet
- For training purposes we will provide a breast cancer TMA slide for all participating companies within March 2012.

- **Evaluation Criteria**

The Ki67 positivity will be analyzed on the level of spots. As ground truth for each spot the ratio X_i between positive tumor cells and all tumor cells (Ki67-index) will be used. The calculation of the Ki67-index is based on the consensus of the evaluation of all cells within the spots by 5 pathologists from different institutions.

- Criterion: Mean deviation \bar{D} of all deviations $D_i = |x_i - X_i|$ between estimated scores x_i and true score X_i for all spots

Based on an individual cell report by the vendor, which is an Excel list of all cell nuclei with spot number, center coordinates (x, y) class label (0 stands for Ki67-, 1 stands for Ki67+) and if possible the class of the cell nuclei (0 non tumor, 1 tumor cell) we will determine the correct classification rates (CCR_i) of Ki67-positive and Ki67-negative tumor cells for all spots.

- **Award Categories**

- Best Image Analysis – Marker Evaluation 2nd International Scanner Contest 2012

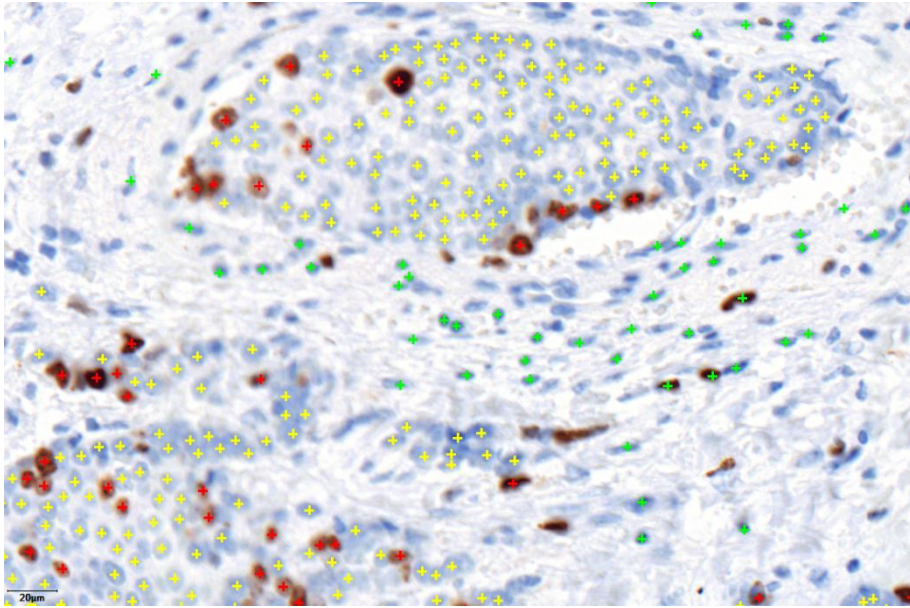


Fig. 3: Example showing annotated data used for benchmarking. Red: Ki67-positive tumor cells; Yellow: Ki67-negative tumor cells; Green: Non-tumor cells.

4.4 Fluorescence Scanning at 20x and 40x

- **Task**

- Scan two artificial slides stained with quantum dots immunofluorescence in monochrome (Texas Red: emission: 620nm, excitation: 596nm) in round-robin-test set

- **Aim**

- Comparison and measurement of the quality of a fluorescence signal

- **General Conditions**

- A technician is allowed to prepare the scanner settings. Preparation and scanning time will be measured separately (are no evaluation criteria).
- Regions on the slides are not marked. All spots on the slide have to be scanned.

- **Evaluation Criteria**

- Shading error assessment using automatic image analysis
- Peak signal-to-noise ratio assessment using automatic image analysis
- "No reference" focus assessment using automatic image analysis
- Luminance assessment using automatic image analysis

- **Prize Categories**

Because the resolution of the slide scanners varies, and some vendors may change the objective lens, the quality prize will be awarded in two different categories, 20x and 40x objective. The assignment to the category will be based on resulting pixel resolution.

- Best Fluorescence Quality 20x 2nd International Scanner Contest 2012
- Best Fluorescence Quality 40x 2nd International Scanner Contest 2012

If your device can scan in both resolutions, you are free to participate in both prize categories. With respect to evaluation efforts this implies a double participation fee for this domain.



Fig. 4: Overview image of Quantum dots

4.5 Technical Assessment

4.5.1 Precision

- **Task**
 - Scan artificial slides (grid pattern, color matrix) in best possible quality.
- **Aim**
 - Evaluation of color fastness and geometric accuracy.
- **General conditions**
 - Human interaction is allowed.
 - No post processing with separate programs.
 - The time limit is 2 hours for the three slide bundle.
- **Evaluation Criteria**
 - Color fastness of digitized color matrices (IT8/7 Target) using automatic image analysis
 - RGB values in scanned images will be converted to Lab colour space. The source RGB colour space has to be provided by the manufacturer. Otherwise the sRGB colour space will be assumed.
 - Quality of the colour reproduction (colour difference dE) will be evaluated using CIEDE2000 color difference formula (see for example the following paper for further details:
<http://www.ece.rochester.edu/~gsharma/ciede2000/ciede2000noteCRNA.pdf>).
 - Average dE will be calculated over all test tiles. Ranking of the results will be based on the average dE (from lowest (best) to higher differences).
 - Geometric precision using automatic image analysis
- **Award Categories**
 - Best Accuracy 2nd International Scanner Contest 2012

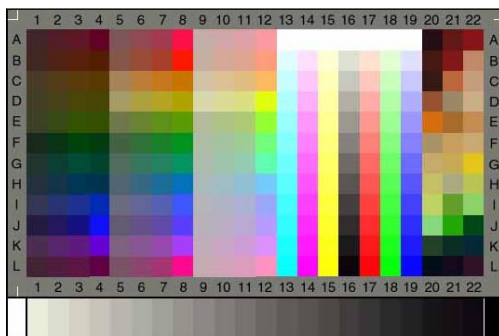


Fig. 5: "IT8/7" Color Target

4.5.2 Green IT

- **Task**
 - No separate scan
- **Aim**
 - Evaluation of electric power consumption and acoustic analysis of machine sound.
- **General conditions**
 - Measurements are performed with an electricity meter and an acoustic camera
 - Measurements are performed during Quality scans
- **Evaluation Criteria**
 - Noise level in idle mode and during scan
 - Power consumption in idle mode and during scan
- **Award Categories**
 - Green IT Award 2nd International Scanner Contest 2012



Fig. 6: Acoustic camera

5. Hints

- Available power supply is German socket, 220 Volt. Please bring adapters if necessary.
- With respect to accounting problems via the University administration we switched to a company (Digital Pathology UG) for invoicing, which was explicitly founded to organize the financial transactions for the Scanner Contest. This was the reason for the postponement of invoicing.
- Image files (WSI) are transferred via USB hard drive. Please prepare minimal one USB 2.0 hard drive.
- If you have any questions please don't hesitate to contact us via scanner-contest@charite.de.

6. Open questions

- Because the resolution of the slide scanners varies, and some vendors may change the objective lens, the prizes for high-throughput, quality and fluorescence will be awarded in two different categories, 20x and 40x objective. The assignment to the category will be based on resulting pixel resolution. If your device can scan in both resolutions, you are free to participate in both prize categories. With respect to evaluation efforts this implies a double participation fee for this domain.
- We need a SDK from each vendor for accessing their images. This is a basic component for the automatic evaluation – which will take place after the scanner contest. We have access to SDKs provided by vendors who participated in the 1st European Scanner Contest. If there are any changes to image formats or if you have not made your SDK available to ISC Committee please make this up. Same also applies for sample images of supported formats.
- To prepare the relevant screenshots and for manual inspection of images vendors are required to provide their viewer software. ISC committee will make one PC (Windows XP 64 bit) available inside contest room. Please provide installer packages for your viewer at your earliest convenience.
- Please indicate if you like to attend to our excursion to the TU exhibition "Color and Color Vision" (installed by Prof. Dr. em. Klaus Richter <http://web.me.com/klaus.richter/>), and/or a farewell dinner in the evening of Wednesday, May 30th. If you are interested please inform us about the number of persons from your company that like to attend to these events.

2nd International Scanner Contest (ISC)

Questionnaire: (please return via scanner-contest@charite.de)

Vendor: _____

- We participate in the High-throughput domain and like to take part in following subdomains. 20x 40x
- We participate in the Quality domain and like to take part in following subdomains. 20x 40x
- We participate in the Fluorescence domain and like to take part in following subdomains. 20x 40x
- We already made a recent SDK for accessing image data available to ISC committee.
- We already made test-images of all supported formats available to ISC committee.
- We already made a recent installer of our viewer available to ISC committee.
- We like to attend to the TU excursion "Color and Color Vision". Please register _____ persons from our company.
- We like to attend to the Farewell Dinner. Please register _____ persons from our company.