DESY Ultimate Camera Check Script (DUCCS)

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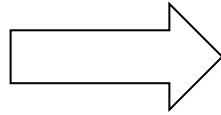**DESY Summer Student Program**

Zeuthen

Motivation

- In order to capture the beam properties, most of the measurement techniques use screen stations with CCD cameras
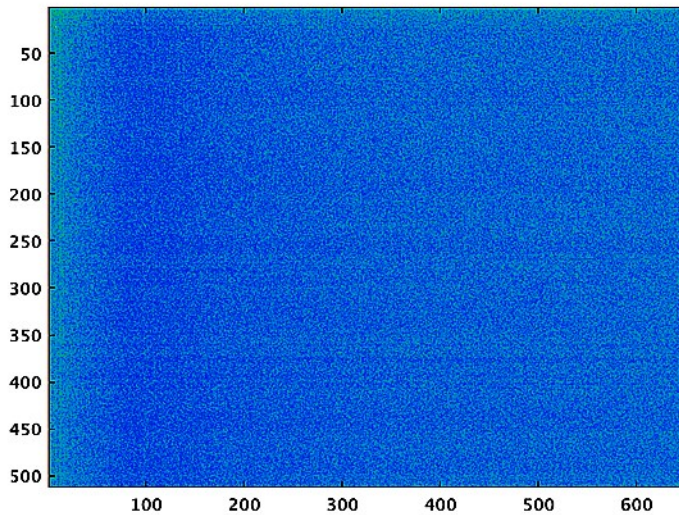- The cameras used for electron beam diagnostics are AVT Prosilica GC 1350
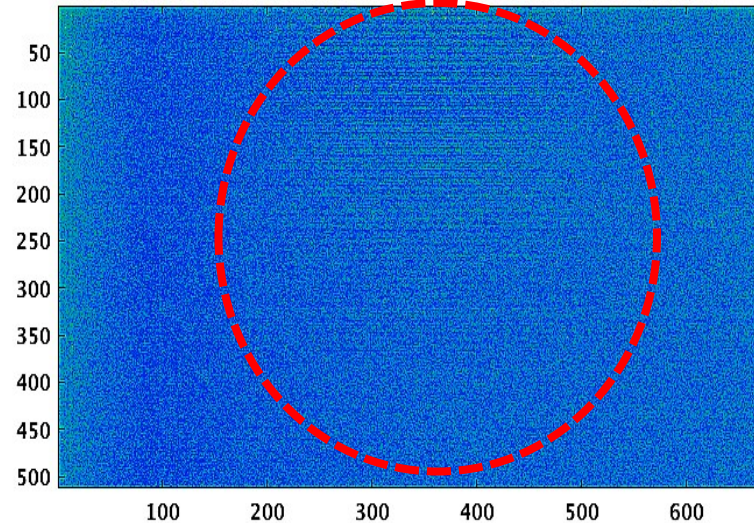
AVT Prosilica GC1350
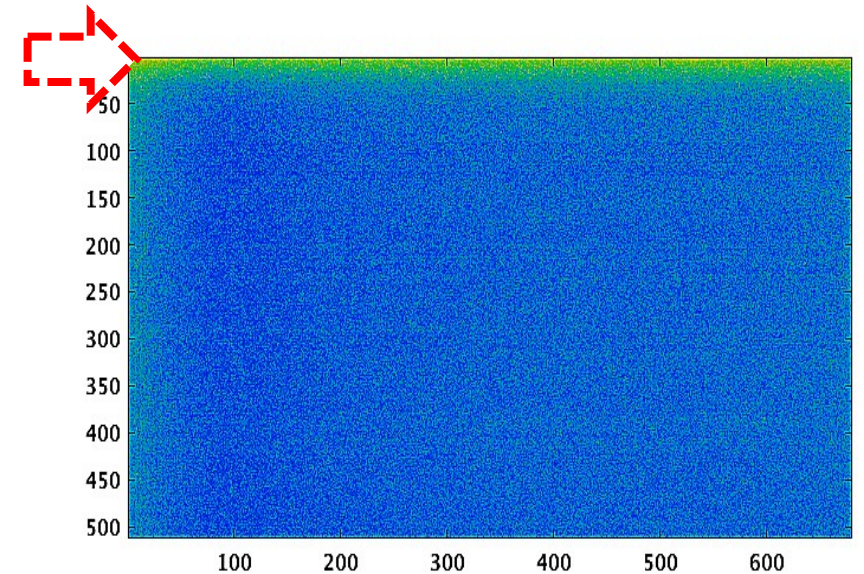
Radiation leads to damage in the PITZ cameras ⟹ Develop a script to help assess camera replacement
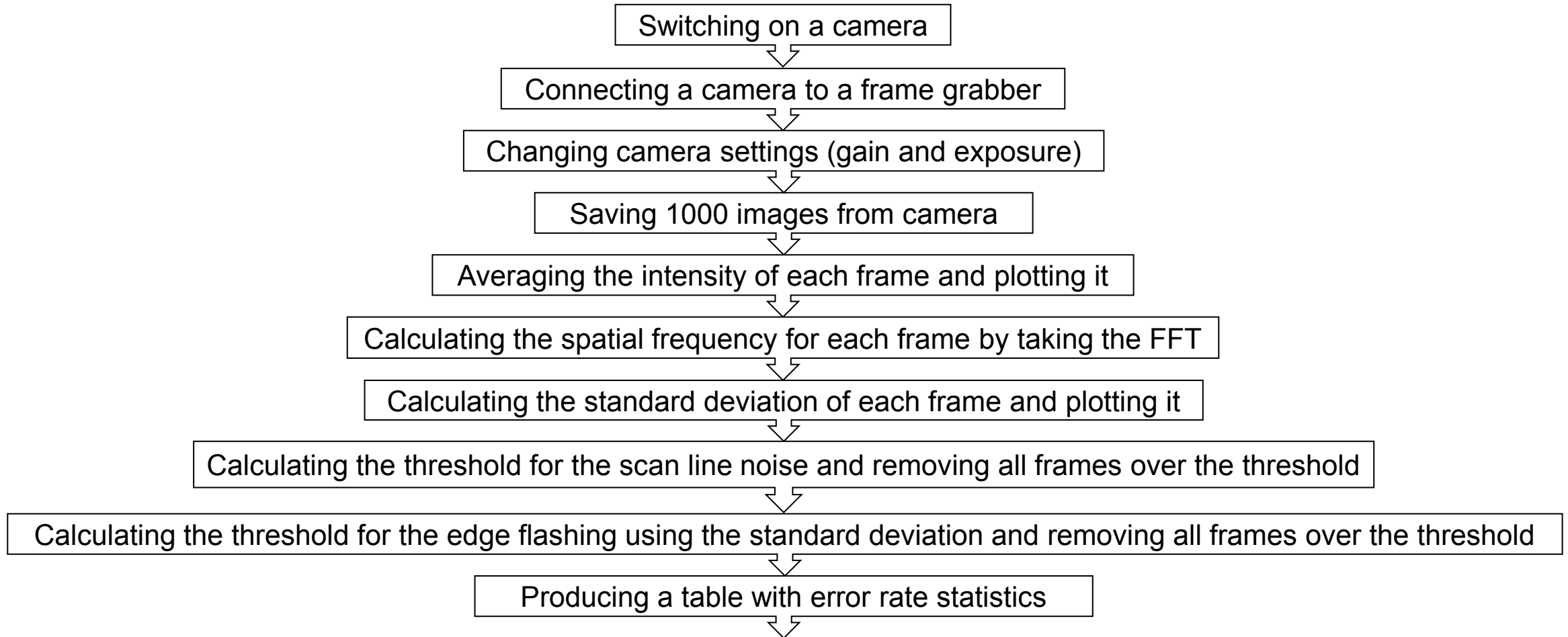

Good frame

Scanline noise

Edge flashing

DUCCS Structure

Switching on a camera
↓
Connecting a camera to a frame grabber
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Changing camera settings (gain and exposure)
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Saving 1000 images from camera
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Averaging the intensity of each frame and plotting it
↓
Calculating the spatial frequency for each frame by taking the FFT
↓
Calculating the standard deviation of each frame and plotting it
↓
Calculating the threshold for the scan line noise and removing all frames over the threshold
↓
Calculating the threshold for the edge flashing using the standard deviation and removing all frames over the threshold
↓
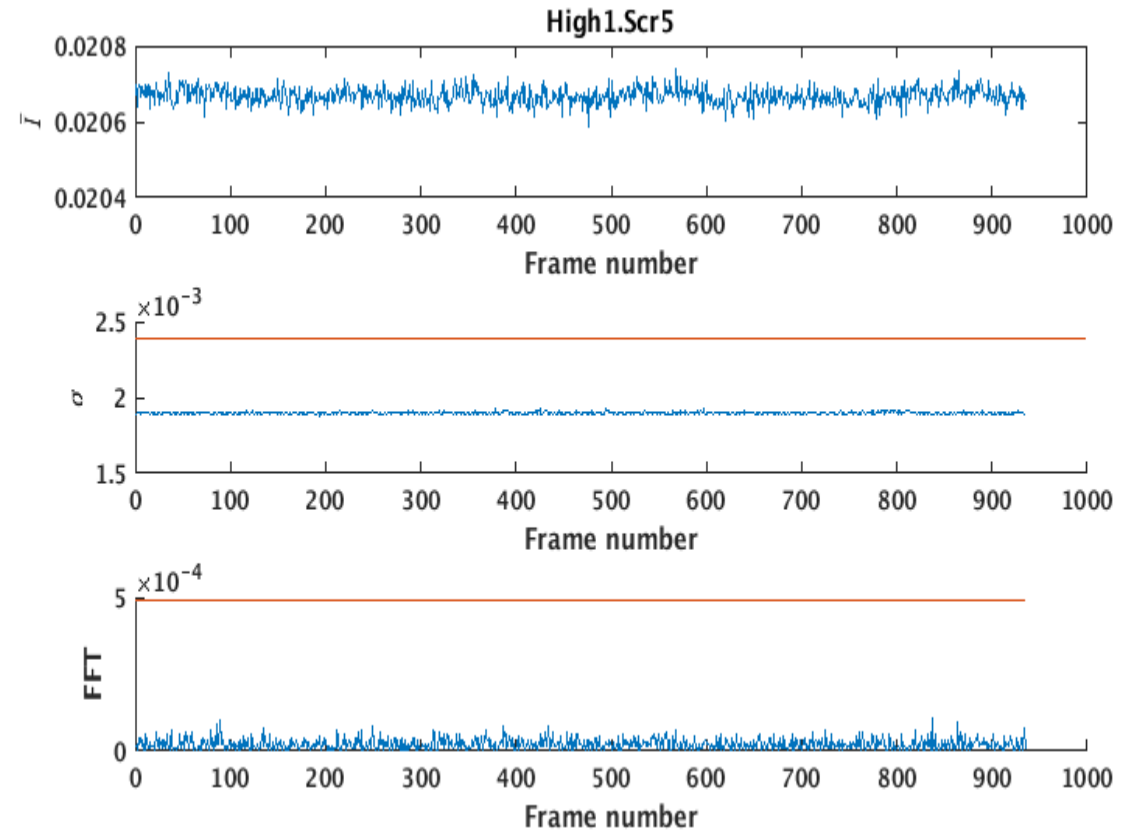Producing a table with error rate statistics
↓

DUCCS Structure

Before removing noisy frames

After removing noisy frames

Tool output

	Gain	Exposure	Number of frames	SL frames	Edge frames	Error rate
Low.Scr2	0	20	1000	9	0	0.009
Low.Scr3	0	20	1000	21	86	0.107
High1.Scr1	0	20	1000	17	84	0.101
High1.Scr3	0	20	1000	5	30	0.035
High1.Scr4	0	20	1000	10	63	0.073
High1.Scr5	0	20	1000	7	58	0.065

	Gain	Exposure	Number of frames	SL frames	Edge frames	Error rate
Low.Scr2	5	20	1000	71	0	0.071
Low.Scr3	5	20	1000	334	0	0.334
High1.Scr1	5	20	1000	61	39	0.1
High1.Scr3	5	20	1000	33	29	0.062
High1.Scr4	5	20	1000	39	93	0.132
High1.Scr5	5	20	1000	42	70	0.112

	Gain	Exposure	Number of frames	SL frames	Edge frames	Error rate
Low.Scr2	15	20	1000	0	25	0.025
Low.Scr3	15	20	1000	23	0	0.023
High1.Scr1	15	20	1000	7	50	0.057
High1.Scr3	15	20	1000	18	73	0.091
High1.Scr4	15	20	1000	22	89	0.111
High1.Scr5	15	20	1000	11	36	0.047
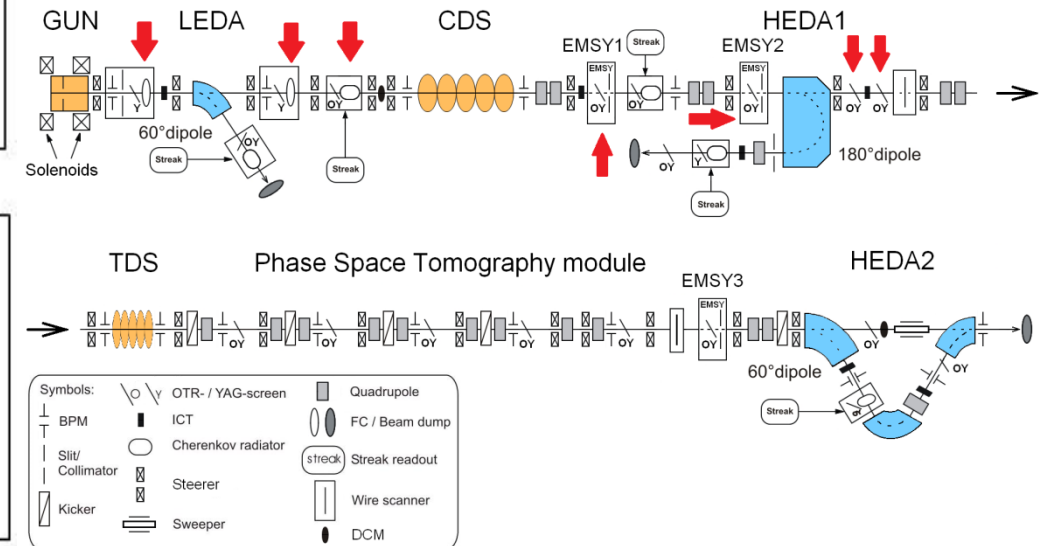
Summary and outlook

- The **DUCCS** tool is a useful way to keep track of the health of the cameras at PITZ and can be improved and generalized for other types of cameras in order to be used at other facilities as well

- **The tool is ready** for data gathering and analysis and can already be used

- Testing data is collected and **first results are obtained**: it seems that Low.Scr3 and High1.Scr1 are damaged a bit more than others due to high radiation from CDS booster

- More data must be collected and analysed

- Only after detailed data analysis the threshold levels on the camera parameters can be set properly

- The next steps of the tool development are:

  - Analysis of the background slope should be added

  - The tool should be integrated to control system

Thank you!