

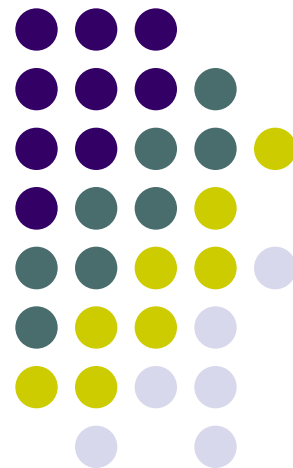
SciFi for the Target Tracker Status update & plans



Presented by Alexander Malinin,
NRC KI, Moscow

7 October , 2015

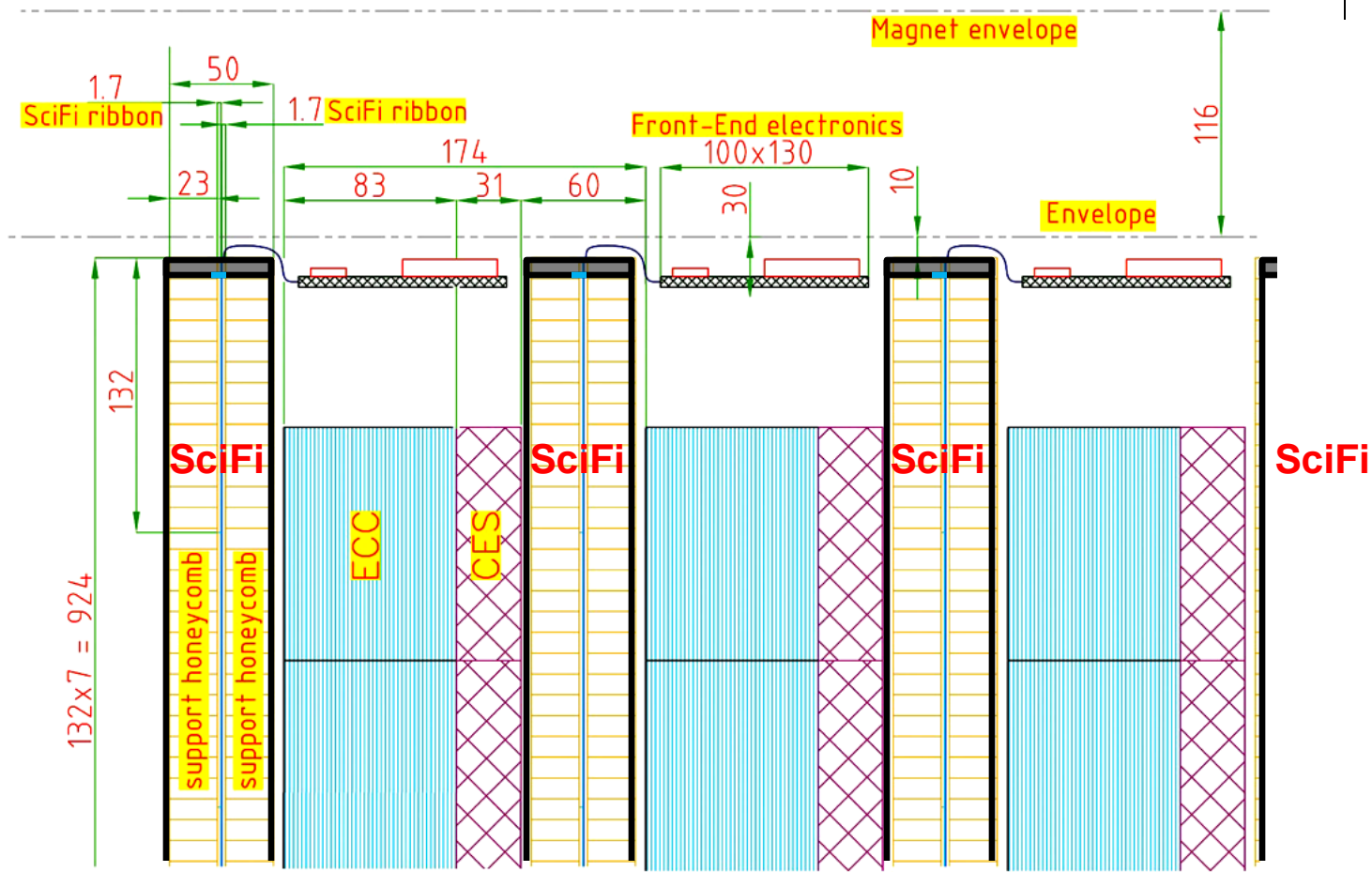
6th SHiP Collaboration meeting, CERN



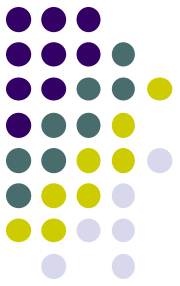


Tau-neutrino detector crosssection

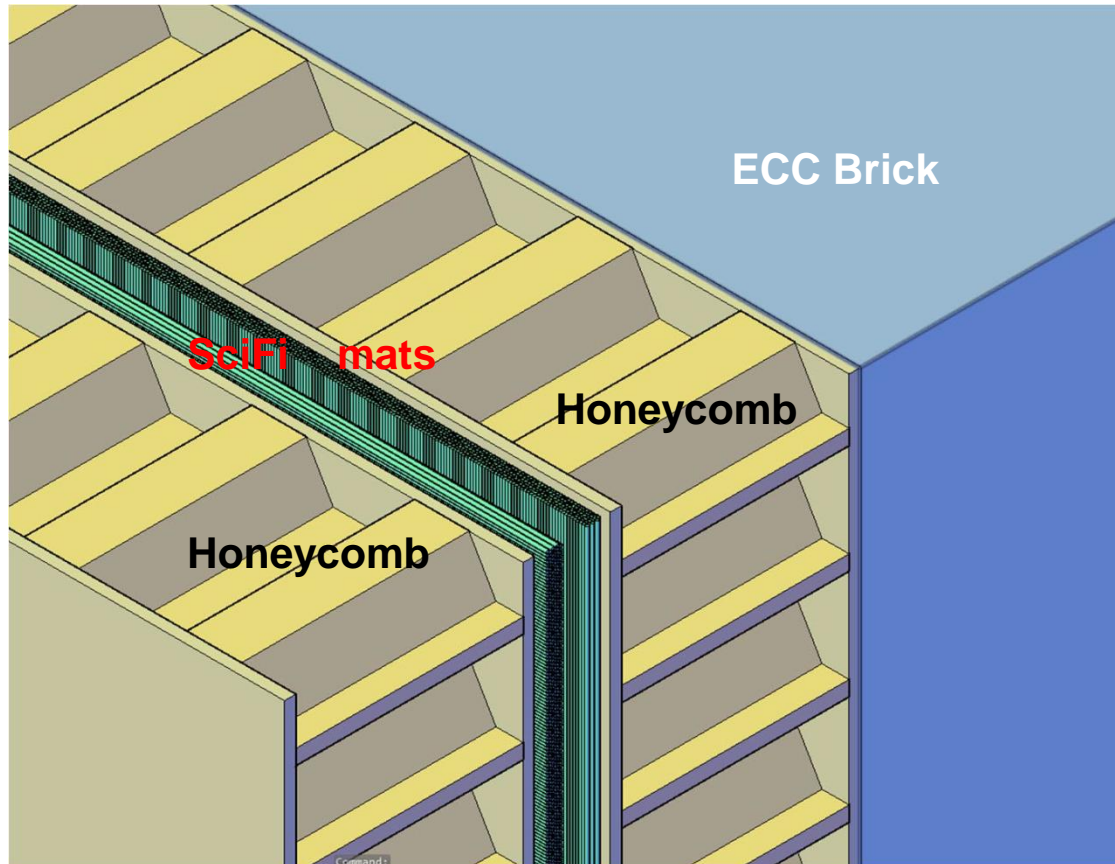
SciFi tracker envelope



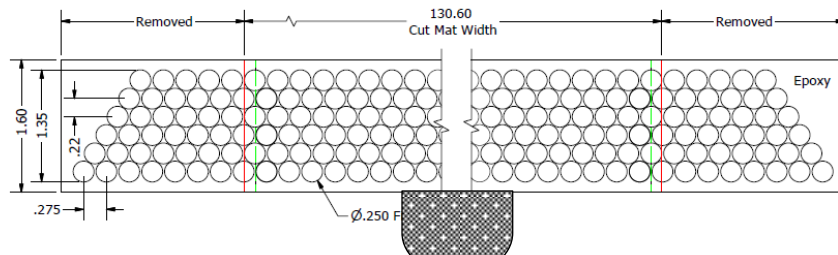
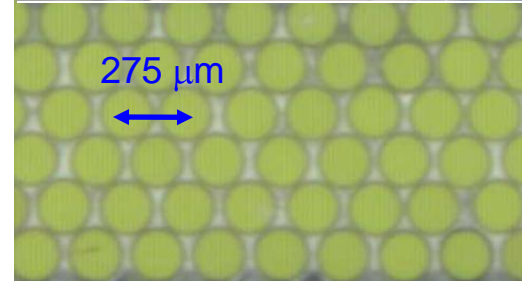
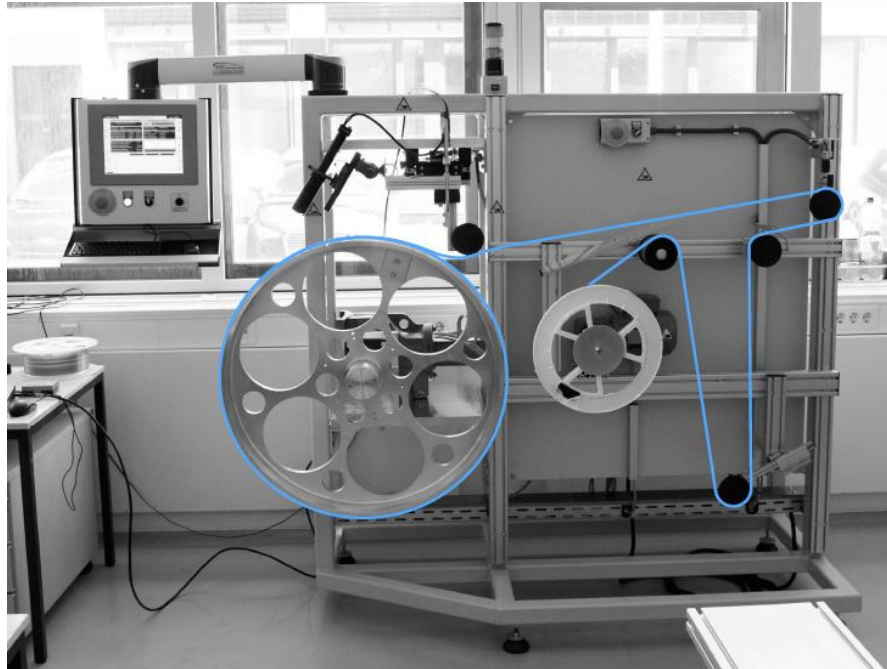
SciFi tracker structure



Conceptual view

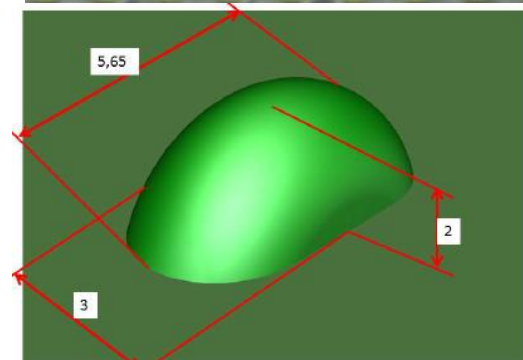


SciFi mats production



Not to scale

The alignment pins
define center and
fibre direction



Alignment pins on the mat
produced through glue
filled holes on the wheel



SciFi resolution, 2015 beam test data



Measured charge weighted

Double Gaussian fit

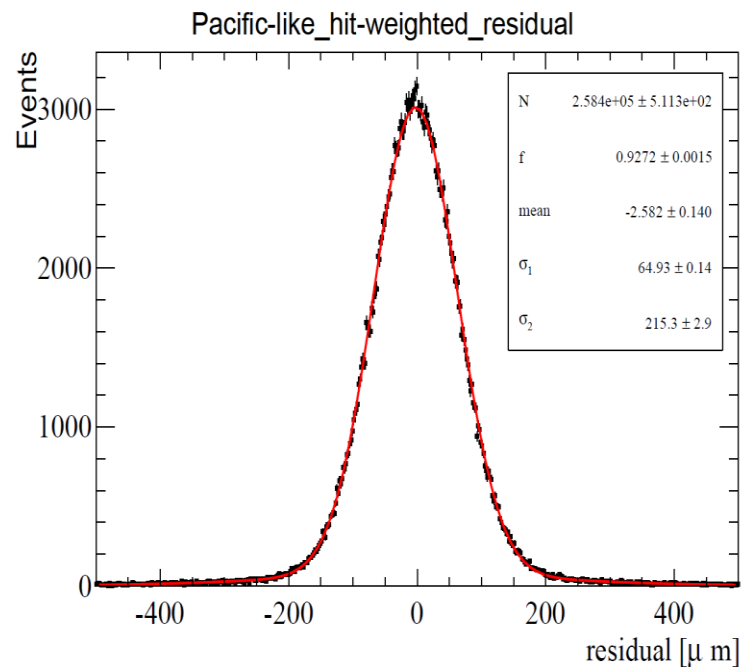
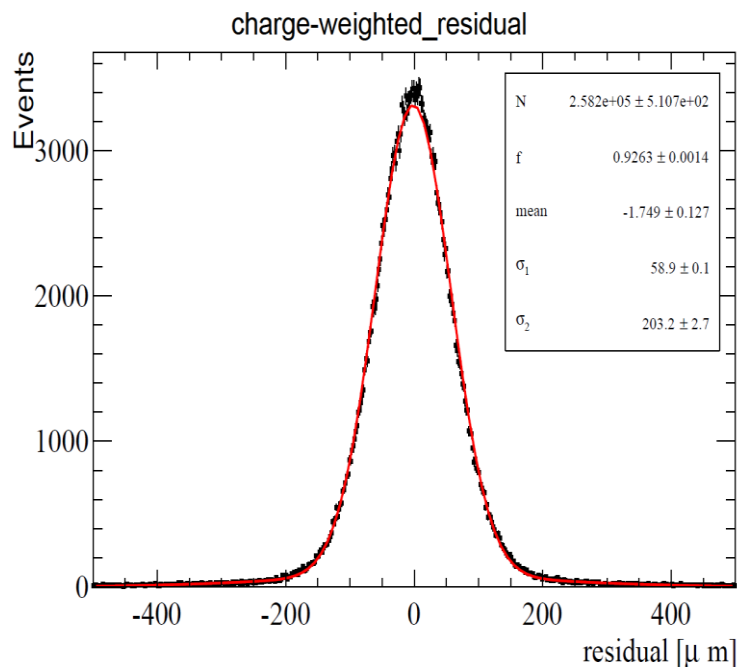
- $\sigma_1 = 59 \mu\text{m}$
- $\sigma_2 = 203 \mu\text{m}$
- $\sigma_{\text{eff}} = 79 \mu\text{m}$ (weighted average)

$$x_c = \frac{\sum_i q_i x_i}{\sum_i q_i}$$

Simulated with FE (PACIFIC) readout

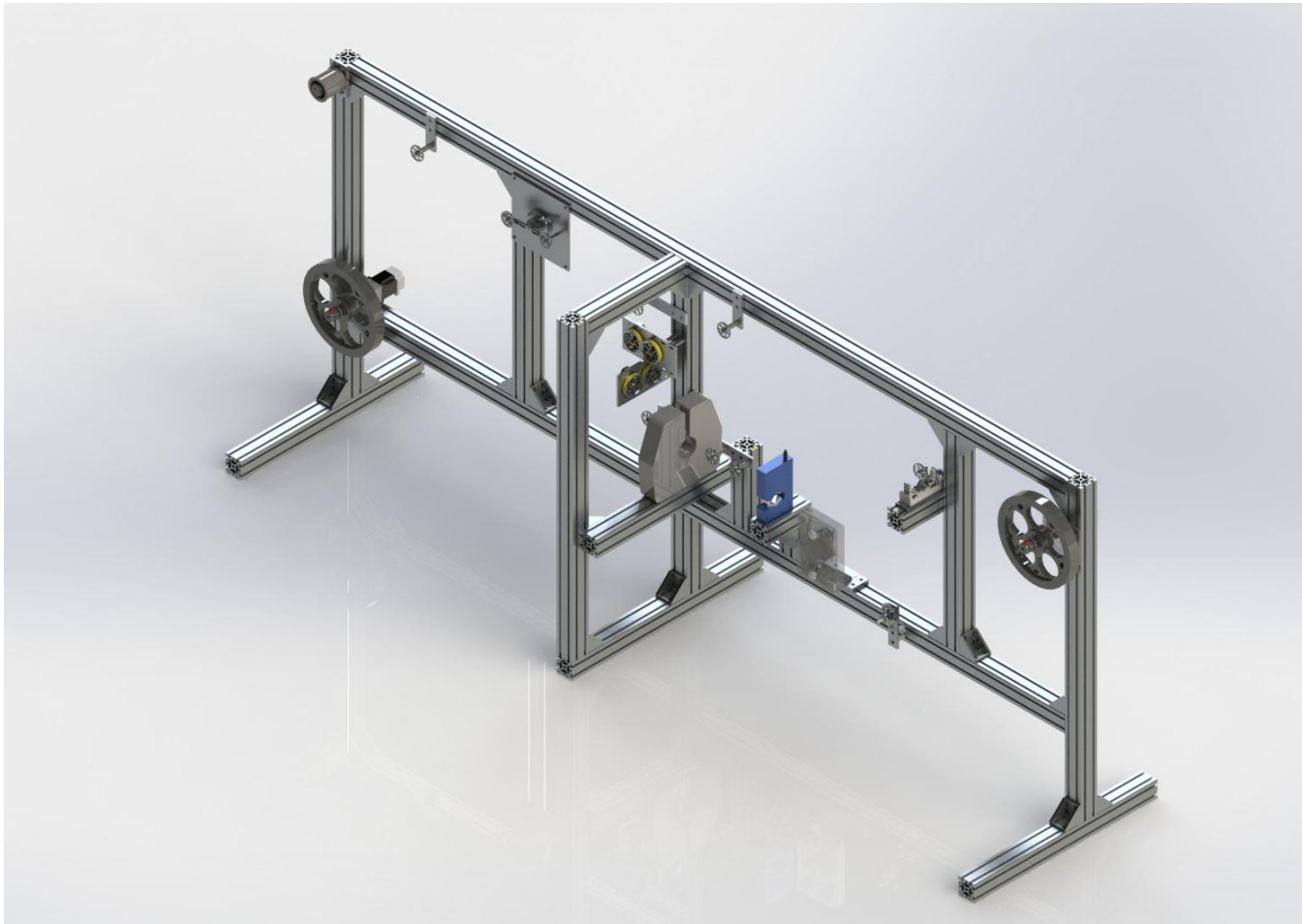
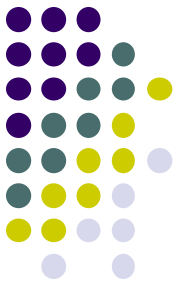
Double Gaussian fit

- $\sigma_1 = 65 \mu\text{m}$
- $\sigma_2 = 215 \mu\text{m}$
- $\sigma_{\text{eff}} = 85 \mu\text{m}$ (weighted average)

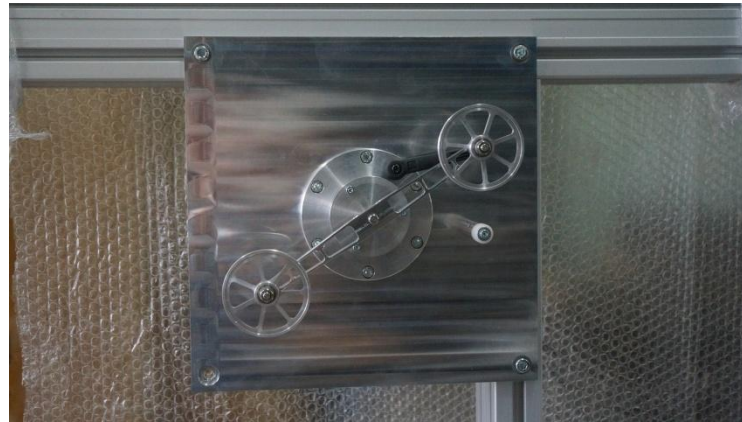
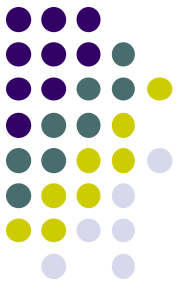


<https://indico.cern.ch/event/406444/contribution/10/attachments/1127656/1610549/EDRTest-beamresults.pdf>

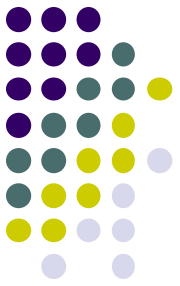
Fibre rewinding and QA machine model



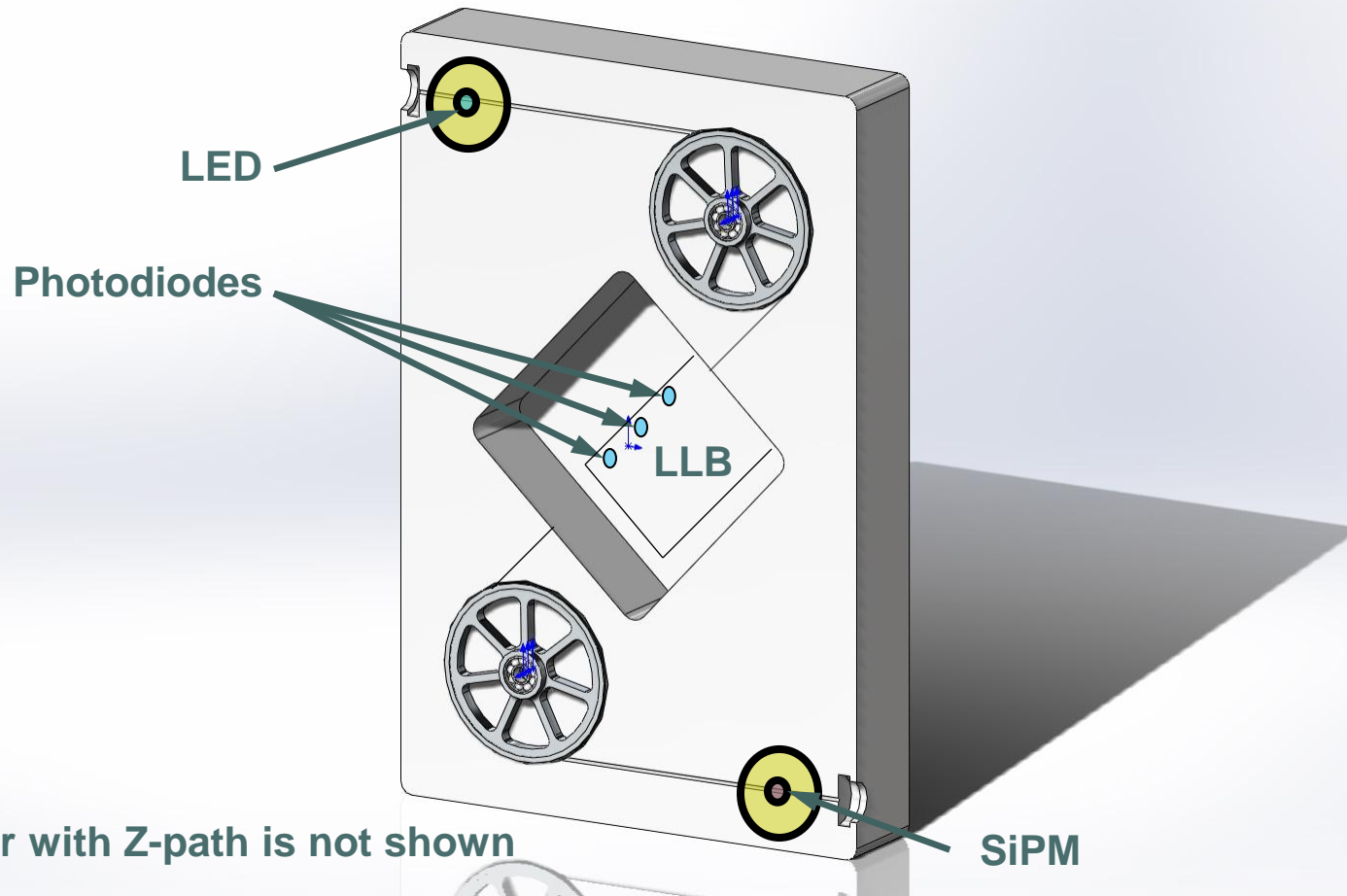
Fibre QA scanner



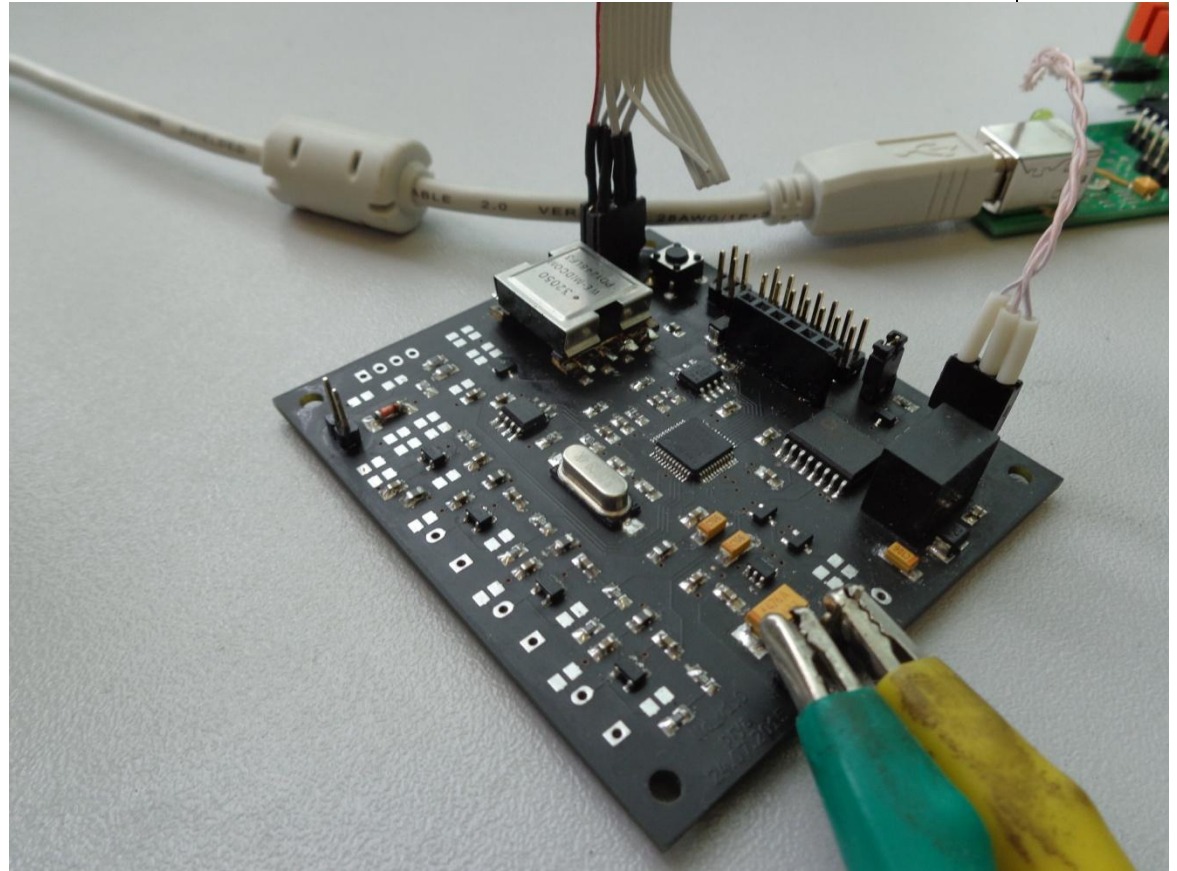
Fibre Rewinding & QA machine parts



Optical quality control (light leak detector)



Fibre QA scanner, light leak box



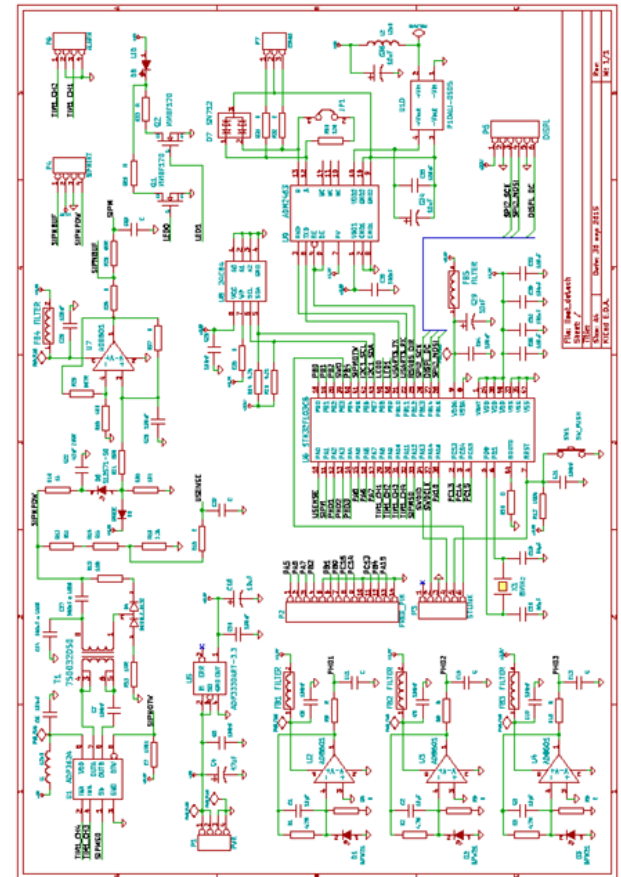
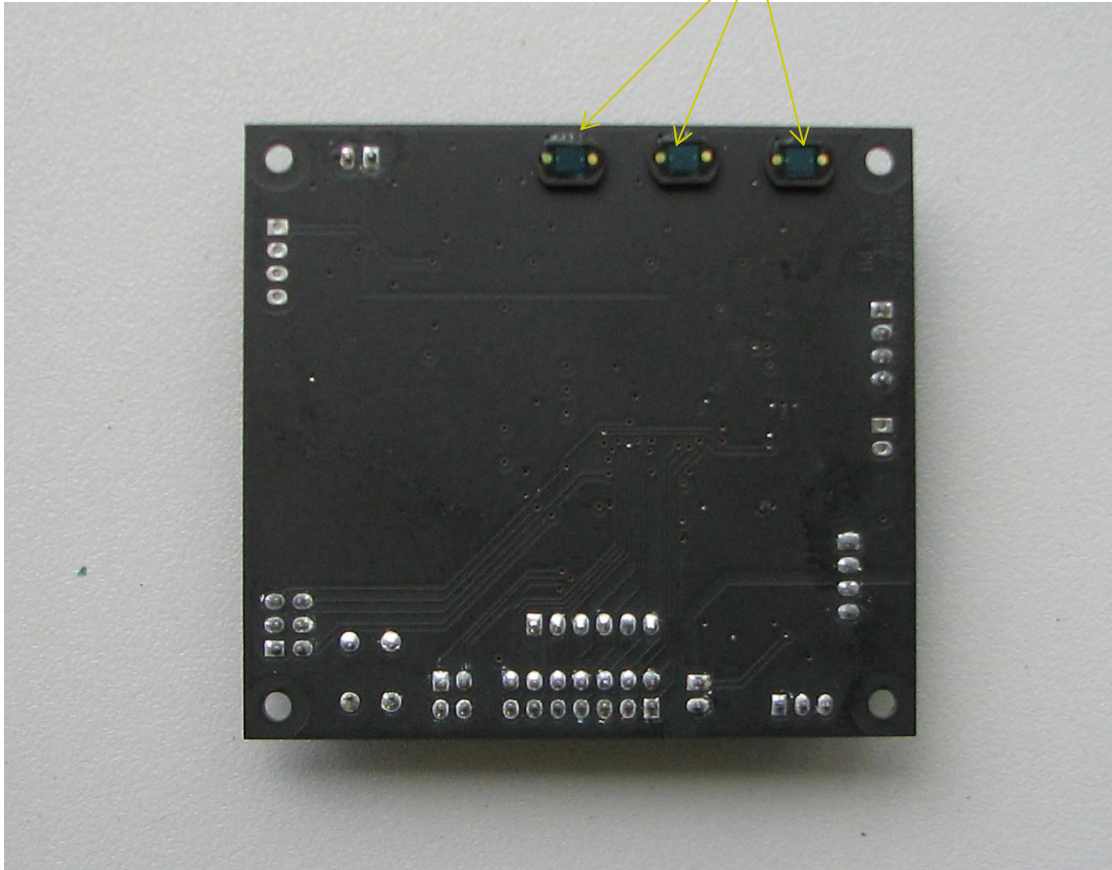
The box (not blackened).

The sensors board (3 Hamamatsu photodiodes and 1 SiPM).

Fibre QA scanner, light leak box



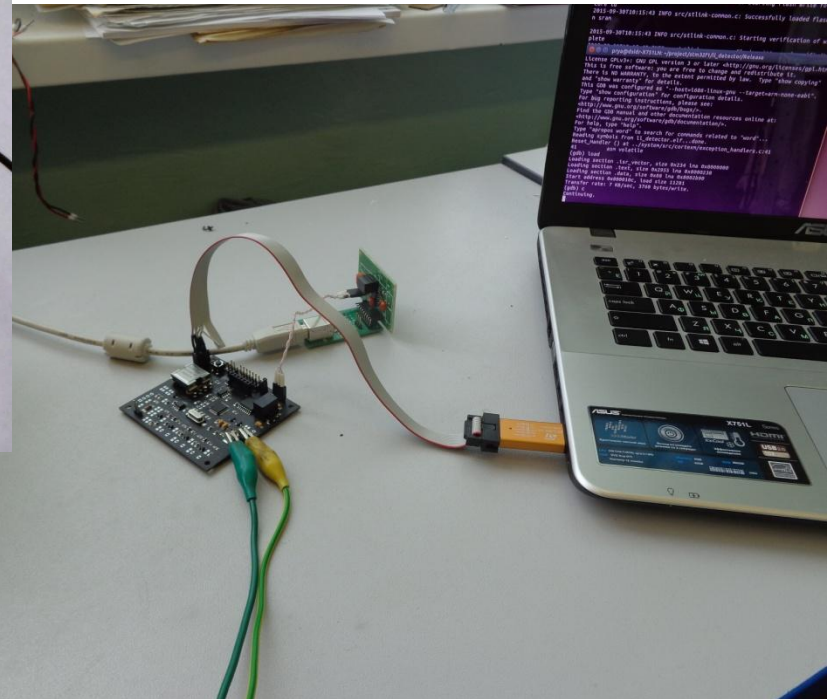
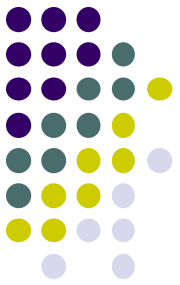
Photodiodes



The sensor side of the board which will face the fibre.

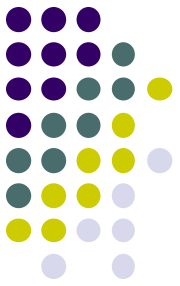
The LLB board's schematics.

QA light leak box mockup test



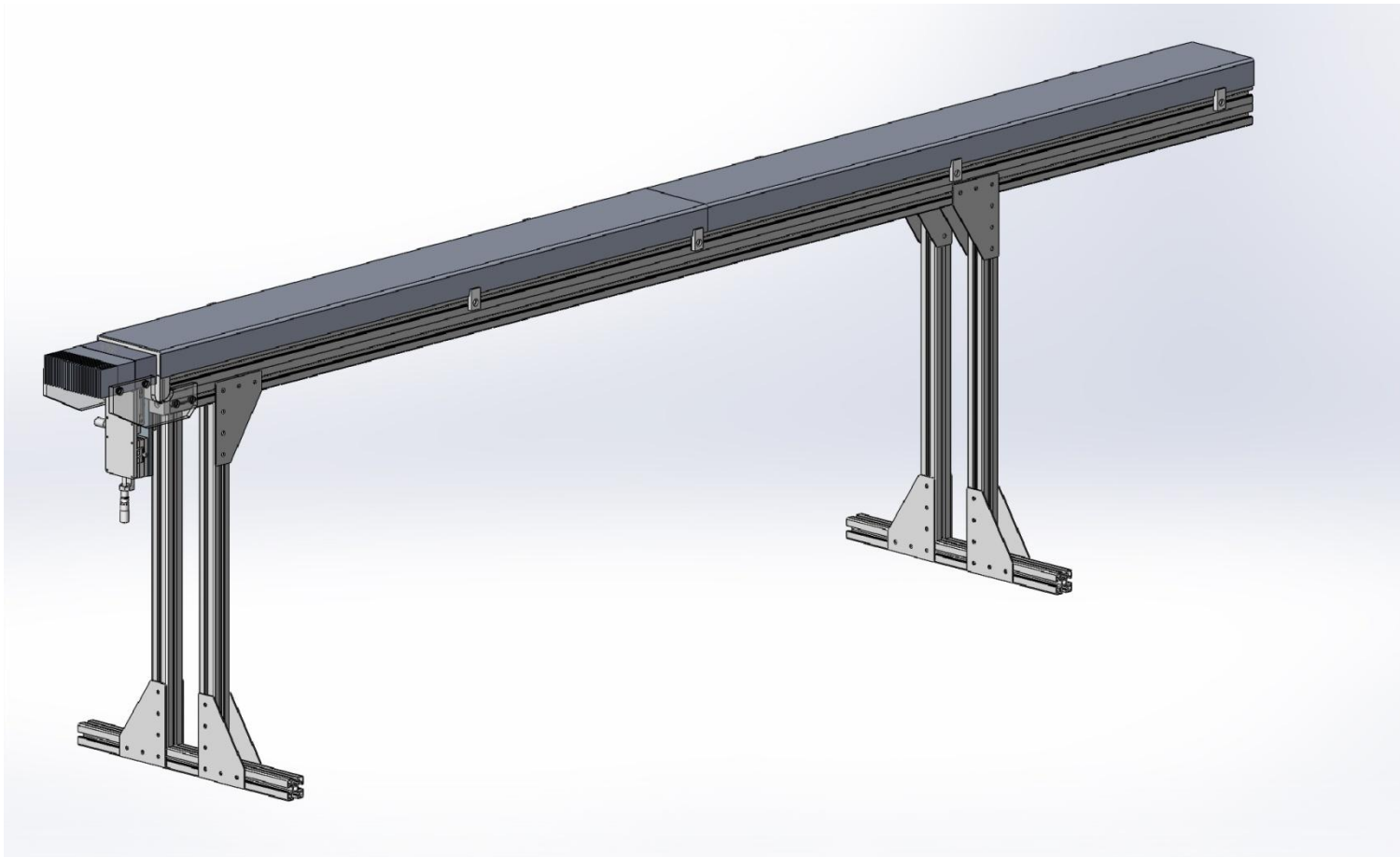
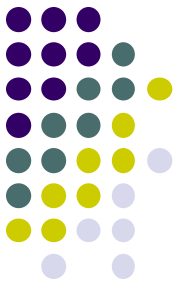
The prototype LLB board test with fibre.

Fibre QA scanner status update



- Fibre QA scanner is delivered to NRC KI,
- Few parts (laser micrometer and lump detector) are still missing,
- Control system PCB-s are made and being tested,
- Light leak / attenuation length box is being instrumented with the sensors and electronics,
- Pars mounting and debugging is ongoing.

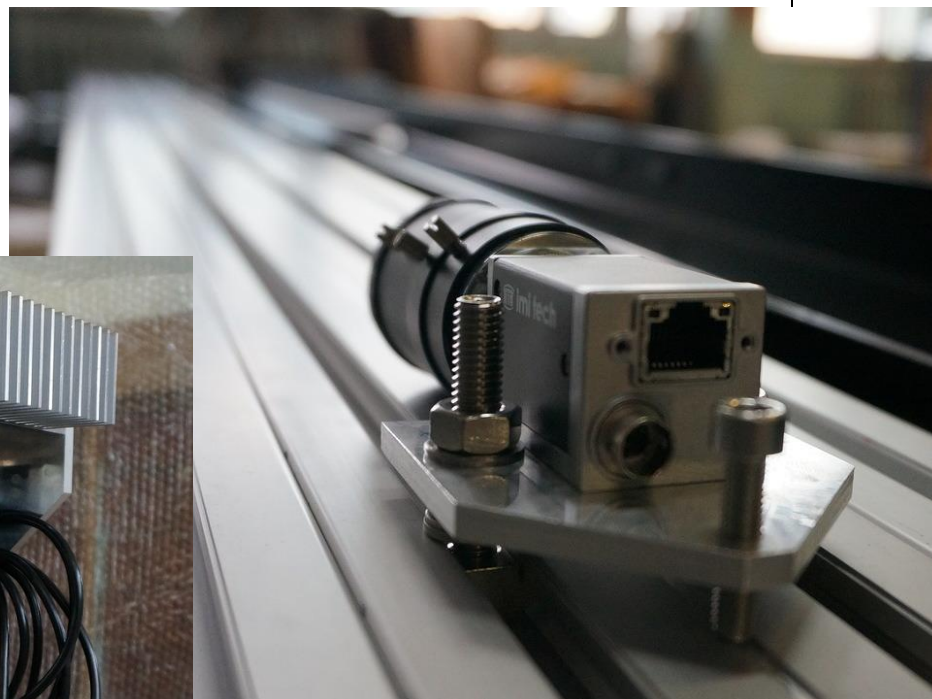
Mat QA optical stand (with coded mask)



Mat QA coded mask scanner

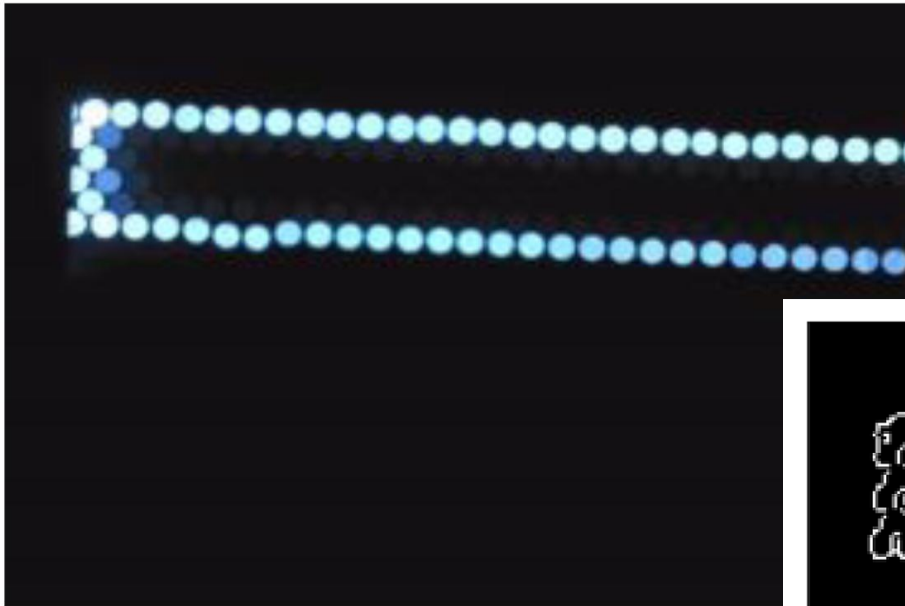
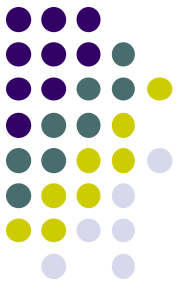


Mat optical QA scanning stand

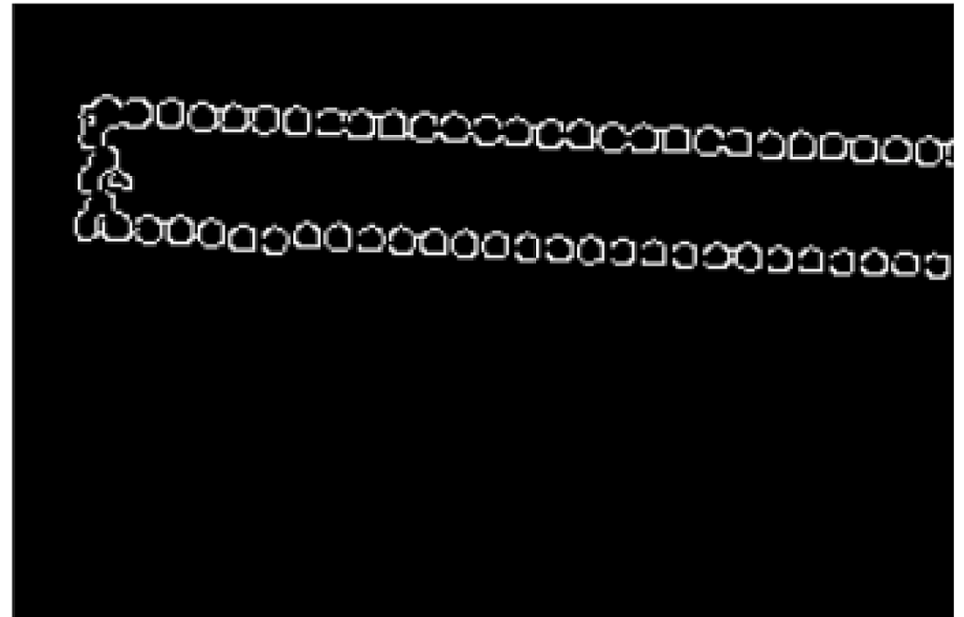


20 Mpx camera with lens

Mat QA coded mask scanner

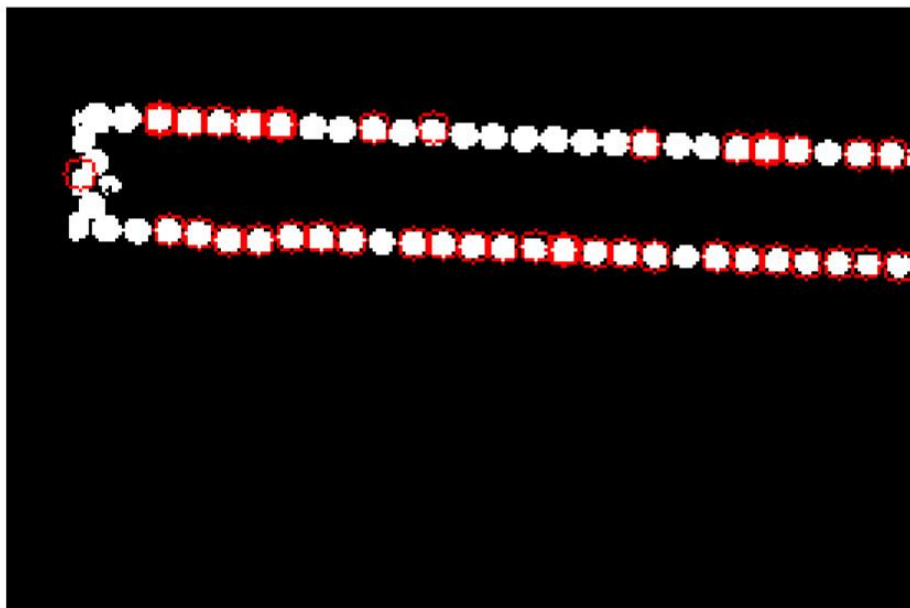


Neural Net based code to look for the fibres position and size



The fibre ends are detected by brightness (contrast) and color.

Mat QA coded mask scanner



1	270	77.5833
2	260.5	77
3	251.5	77
4	242.081	76.5968
5	233	76.1429
6	223.583	76
7	214.667	75.0833
8	196	74.5833
9	187	74.1429
10	178	73.5833
11	168.342	73.1053
12	168.833	73.1667
13	159.5	72.5
14	140.75	71.75
15	150	72.25
16	141	72
17	131.658	71.1053
18	122.75	70.75
19	132	71.25
20	66.75	69.75
21	104	70
22	94.9091	69.2727
23	85.7222	68.8333

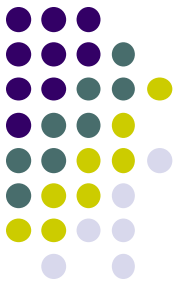
The NN code will calculate the coordinates of the fibres center and the fibre radius.

Mat QA (optical) status update

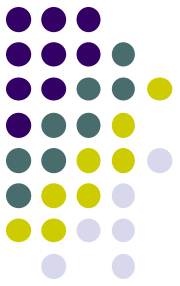


- Mat QA custom made optical scanner is delivered to NRC KI,
- The coded mask is being produced (the last part to be produced),
- The neural net based code to detect the fibres positions and diameters, as well as the optical output variations (brightness, color) is being tested.

Stainless steel winding wheel (new trial unit)



Stainless steel winding wheel (new trial unit)



The new 275 μm pitch thread is excellent. Made at Bryansk

NRC KI site status



1. Clean room construction is in progress at KI.
2. Tooling technical documentation and drawings for the QA rewinding machine, mat QA stand (optical coded mask QA), the mechanical QA stand, winding wheels, and curing centrifuge are made. Material, and components procurement is in progress.
3. Work on the QA stands mechanics and electronics fabrication is in progress. First two QA stands are ready. The third fibre QA stand (rewinding machine) is delivered to KI for assembly.
4. The winding machine (from Stiebert STC) procurement process is finalized. Delivery is expected by the end of November.
5. The new version trial winding wheel and hub are fabricated in Russia. The wheel was sent to RWTH for the winding tests.

Next steps towards TDR



- **Mechanical design of the 1980 x 924 mm² active area single cross-layers SciFi module and associated parts (end-pieces, end-plugs, mirrors etc.).**
- **Mockup demonstrator of the TT SciFi module with the CFC skins and honeycomb panels bonded together to achieve ~50 microns flatness in the 1980 x 925 mm² area.**
- **A modified LHCb SciFi Front-End board electronics design to adopt the SHiP style Ethernet readout.**
- **MC model of the SciFi TT and the event reconstruction code development. Simulation of the single muon track efficiency.**