RIGA TECHNICAL UNIVERSITY

Necessity of Laser-scanner quality check

THE 60TH RTU STUDENT SCIENCE AND TECHNOLOGY CONFERENCE 2019

Vladislavs Jamkins, RTU Faculty of Civil Engineering/VGTU Faculty of Environmental Englineering. 1.study year.
Kristiāna Krūmiņa. RTU Faculty of Civil Engineering/VGTU Faculty of Environmental Englineering. 1.study year.
Supervisor: Assoc. Prof. Dr. Darius Popovas

Riga
2019-04-26

Introduction

- Nowadays laser-scanning is one of the most popular and fastest surveying techniques that results in a 3D point cloud. It is possible to acquire big amounts of data from laser-scanning and analyze it. Proper behavior of the instrument and data accuracy is important in order to avoid bad results that affects future works (designing, construction, etc.).

Aim

- To perform a quality check of Faro Focus 3D X330 laser scanner-several times within 2 weeks period: before and after intensive field works and compare obtained data. Performance of the instrument can decrease because of the intensive use, transportation, vibrations, shocks, etc.

General information

- Laser scanning is a non-contact measuring method which uses a laser beam to find the 3D position of a point on an objects surface. By repeating this process several million times the laser scanner is producing a point cloud. Point cloud is a precise capture of a physical object's size and shape and can be imported to a computer for further treatment and visualization.
- Faro Focus 3D Scan X330 laser-scanner uses phase shift technology, where constant waves of infrared light of varying length are projected outward from the scanner. Upon contact with an object, they are reflected back to the scanner. The distance from the scanner to the object is accurately determined by measuring the phase shifts in the waves of the infrared light. Faro Focus 3D Scan X330 is a long-range laser-scanner. [3.]

Materials and methods

- Used resources:
  - laser-scanner;
  - tripod;
  - spherical targets (r=0,0695m);
  - room with magnets;
  - computer with Faro Scene software.

Figure 1. Spherical target [1.]

Figure 2. Faro Focus X330 [2.]

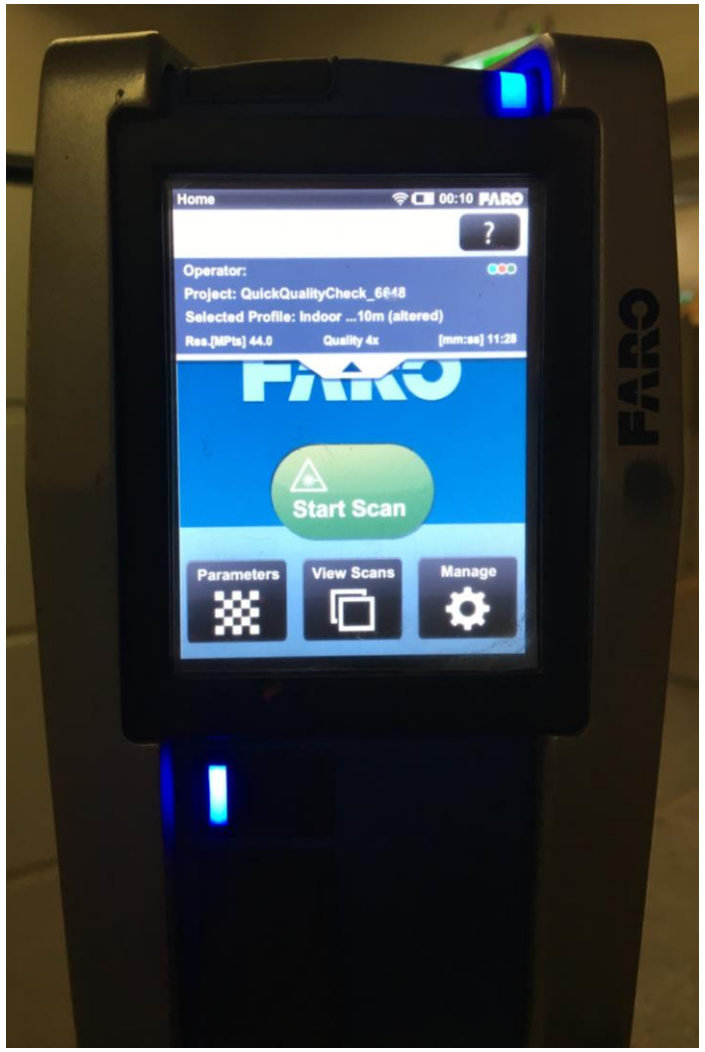
Materials and methods

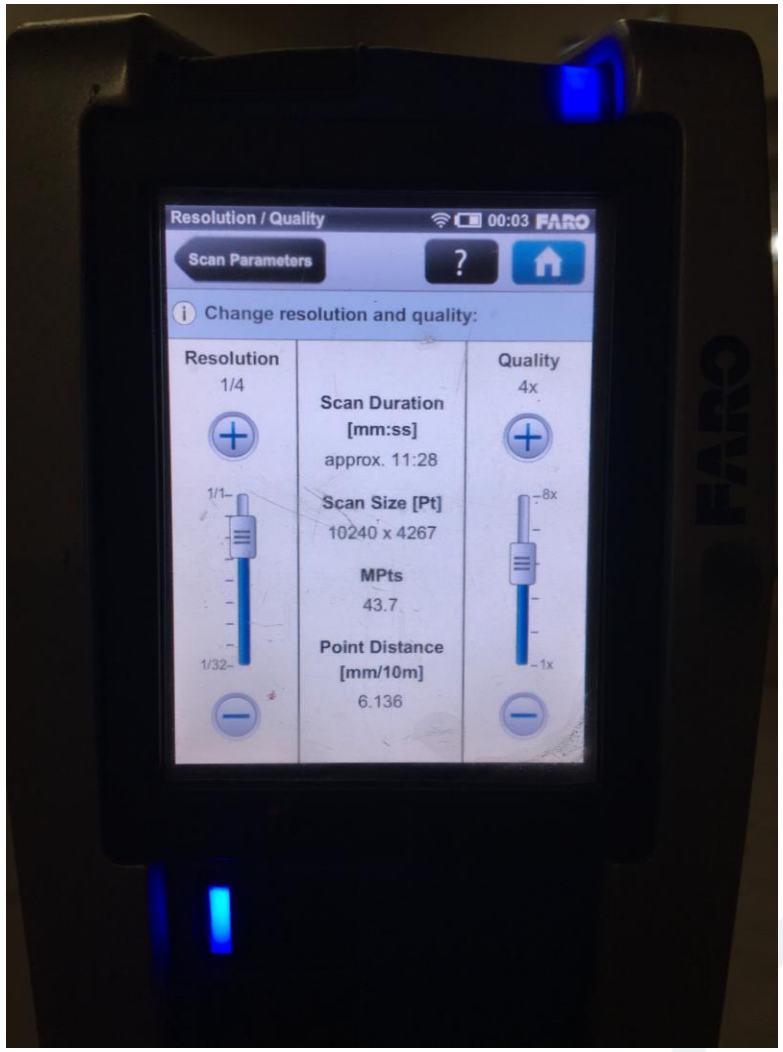
- In order to perform quality check of the laser-scanner the test room (8x3m) was used.
- On each wall, floor and ceiling a magnets, for attaching spherical targets, were installed.
- Important thing was to keep targets **undisturbed** and stationary in between tests. Any changes to their location would prevent the comparison between data sets.
- Before scanning process, scanner has to **warm up at least for 30 minutes**.

Materials and methods

- Afterwards laser scanner is mounted on tripod and with selected parameters reference scan was done.
- For data comparing another scan has to be done from different location in the room. When both scans are done, data can be imported in Faro Scene software and scans can be compared with each other.

Settings in laser-scanner





Settings	
Selected profile	Indoor...10m
Resolution	1/4
Quality	4x
Scan with color	Yes
Scanning time [mm:ss]	11:28

Table 1. Settings in laser-scanner.

Figure 3 and 4. Settings in laser-scanner [authors].

Scan process

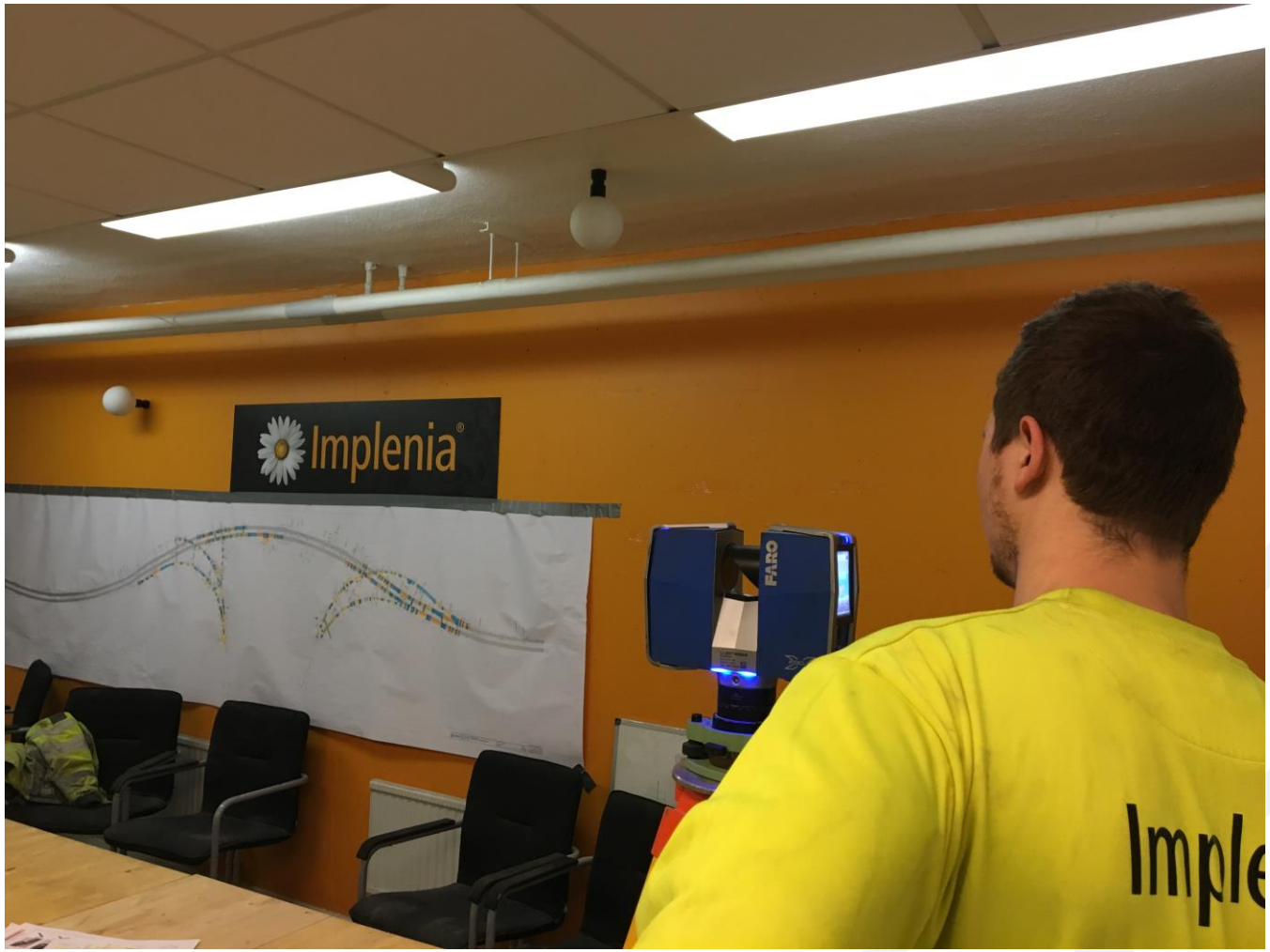


Figure 5. Work process [authors].

Spherical targets location in the room

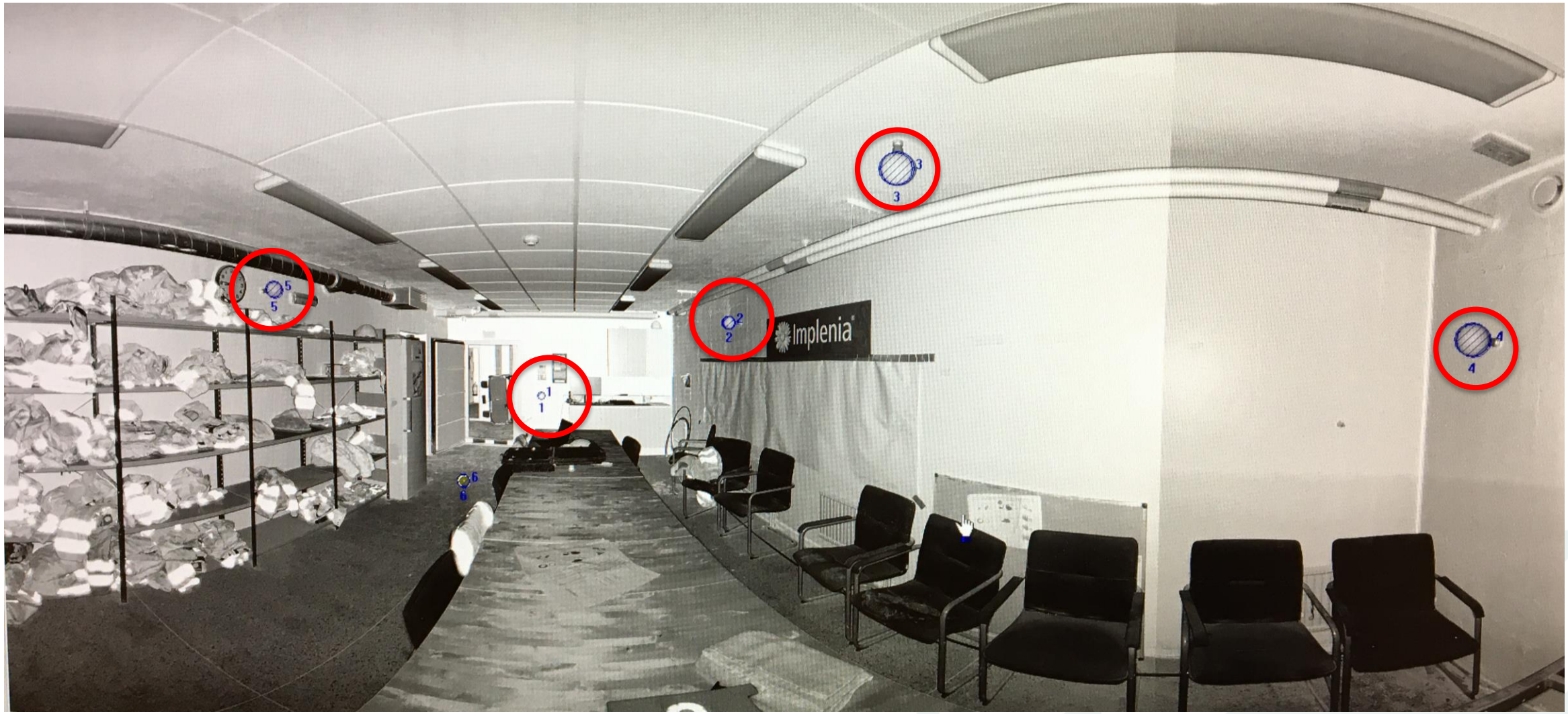


Figure 6. Location of spherical targets [authors].

Location of stations (top view)

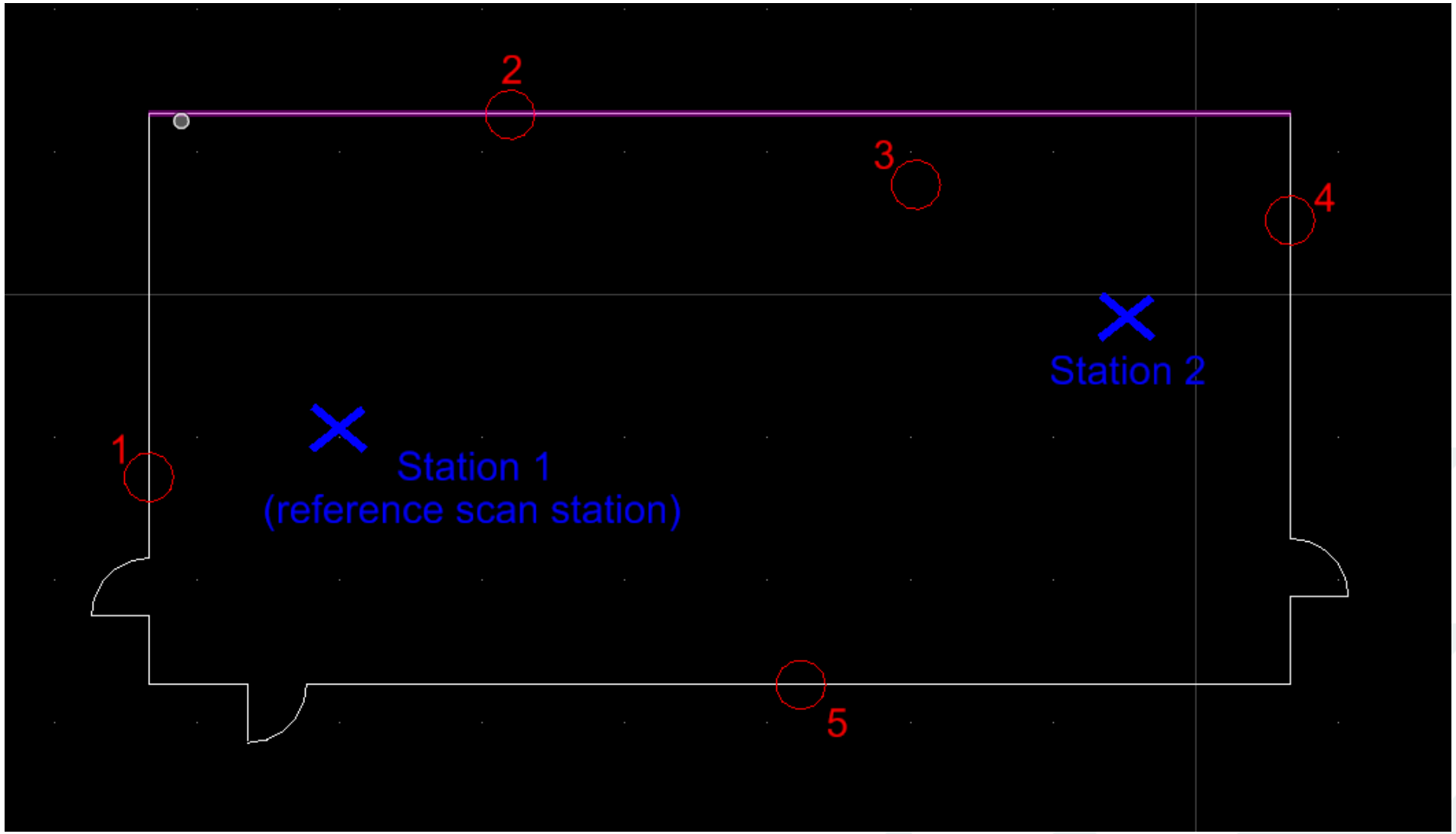


Figure 7. Schematic top view of the room with targets and station location [authors].

Results 2019-03-18

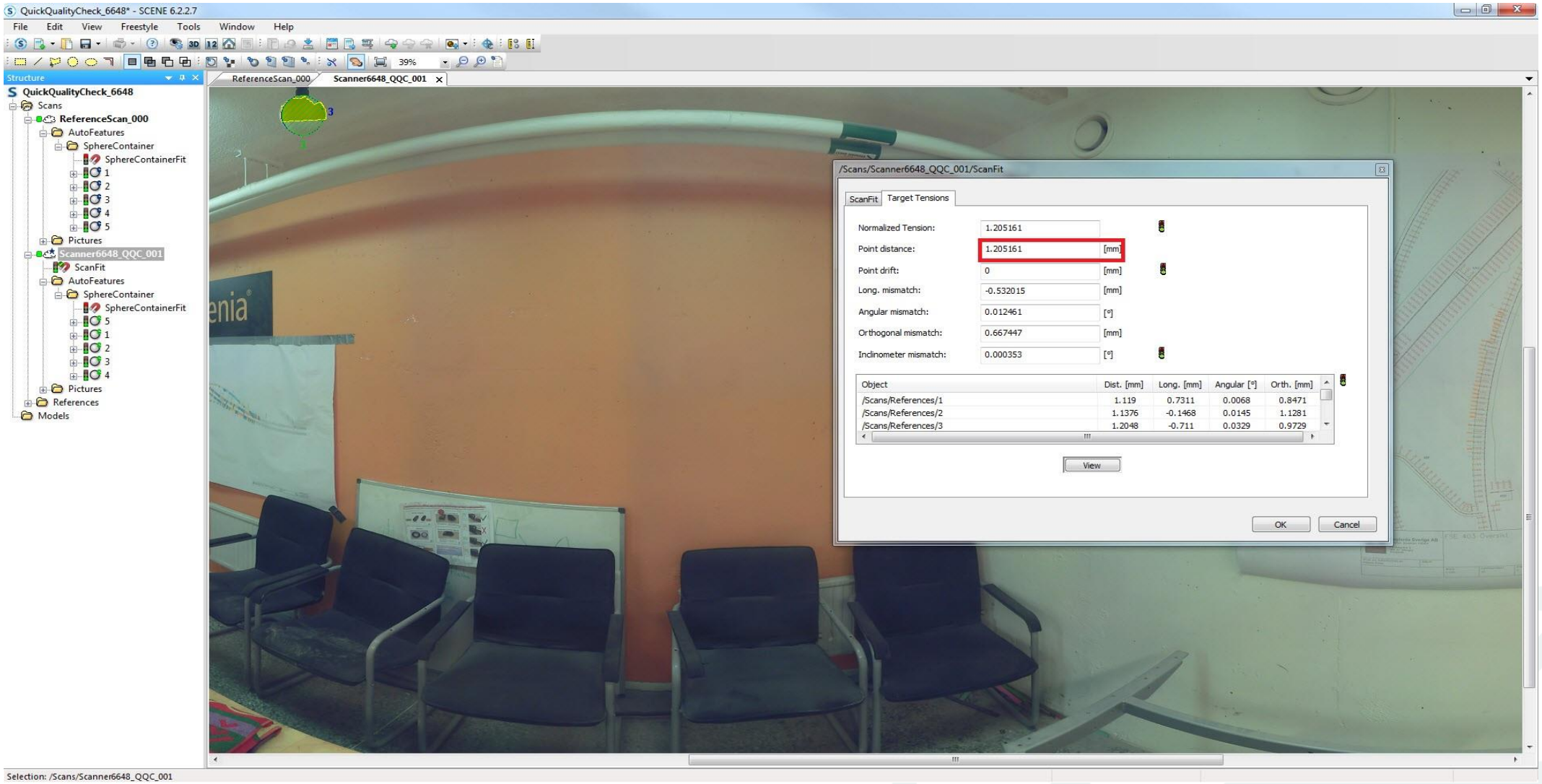


Figure 8. Results after first scanning [authors].

Results 2019-03-29

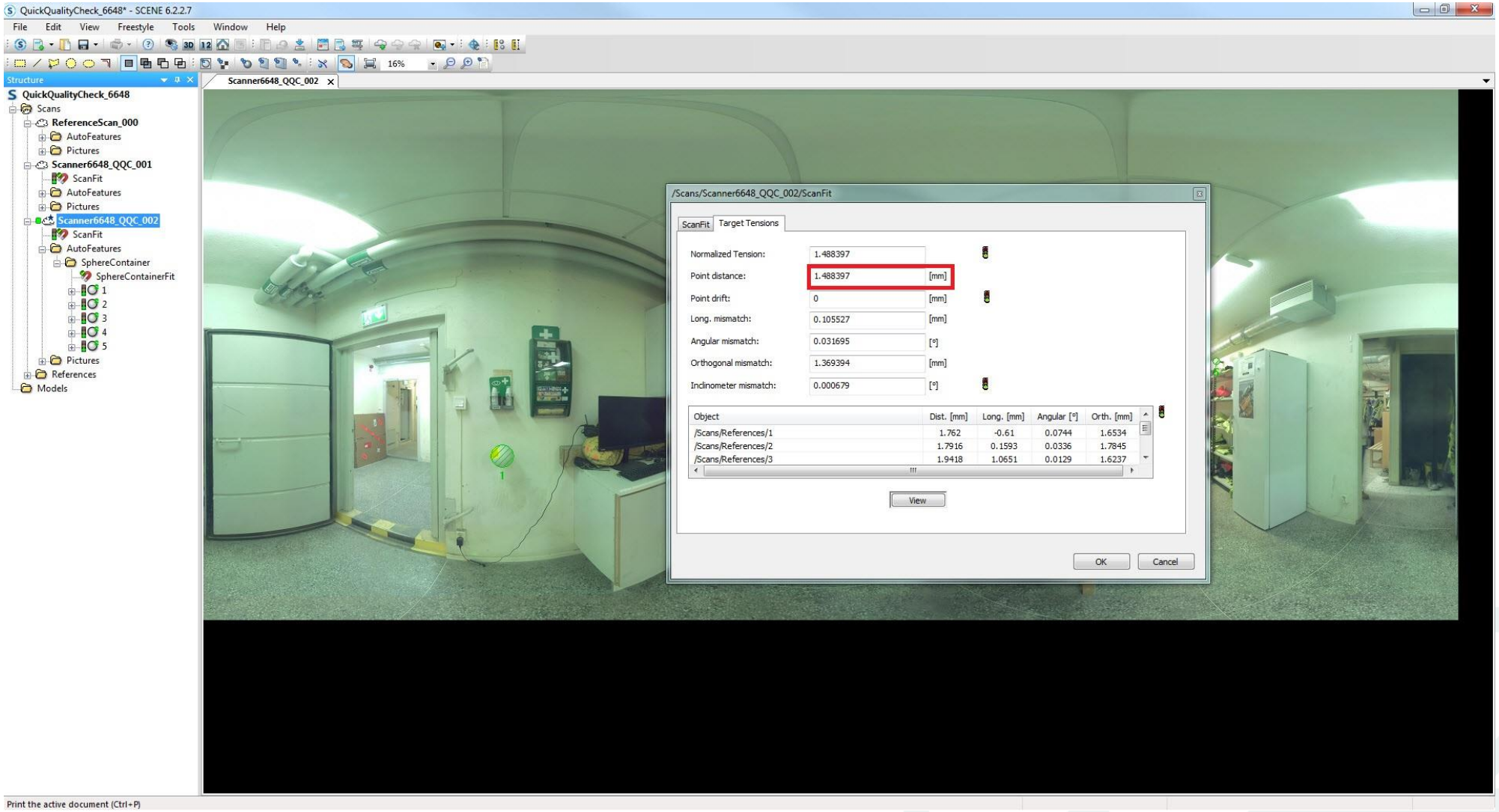


Figure 9. Results after second scanning [authors].

Conclusions

- Comparing two scans from different time periods with reference scan, no problems with the performance of laser-scanner quality was detected.
- Both scans are within developers specified accuracy – it did not exceeded 4 millimeters and urgent service and calibration for the laser-scanner is not needed. Comparing results in two weeks period we got 0,28mm difference between reference scan and scans done for observing.
  - Results for scanners check 2019-03-18=1,205161mm
  - Results for scanners check 2019-03-29=1,488397mm

References

1. LASER SCANNER ACCESSORIES: https://www.surveying.com/en/products/scanner-accessories.html. Viewed 14 April, 2019.
2. THE NEW FARO LASER SCANNER FOCUS3D X 330: https://www.faro.com/en-gb/news/the-new-faro-laser-scanner-focus3d-x-330-the-perfect-instrument-for-3d-documentation-and-land-surveying-2/. Viewed 14 April, 2019.
3. FARO FOCUS USER MANUAL: https://faro.app.box.com/s/4f908b59hcjjj8mezdr58z6n4qy5neli. Viewed 30 March, 2019.
4. Focus 3D Quick Quality Check. Faro, 2013.

Thank you for your attention!