

Sander_2023-09-26_P4RTK

Processing Report

01 July 2024



Survey Data

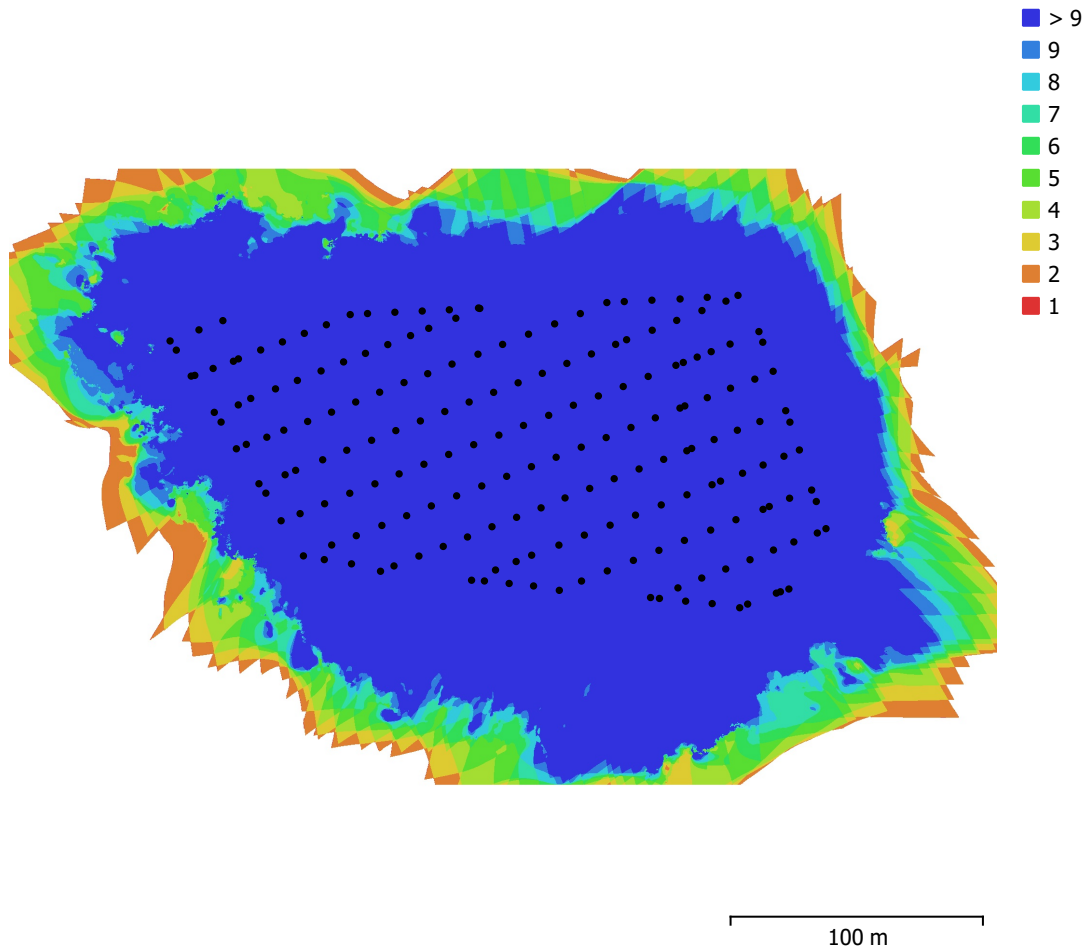


Fig. 1. Camera locations and image overlap.

| | | | |
|--------------------|------------------------|---------------------|-----------|
| Number of images: | 192 | Camera stations: | 192 |
| Flying altitude: | 60.2 m | Tie points: | 210,661 |
| Ground resolution: | 1.63 cm/pix | Projections: | 686,018 |
| Coverage area: | 0.0738 km ² | Reprojection error: | 0.673 pix |

| Camera Model | Resolution | Focal Length | Pixel Size | Precalibrated |
|-----------------|-------------|--------------|---------------------|---------------|
| FC6310R (8.8mm) | 5472 x 3648 | 8.8 mm | 2.41 x 2.41 μ m | Yes |

Table 1. Cameras.

Camera Calibration

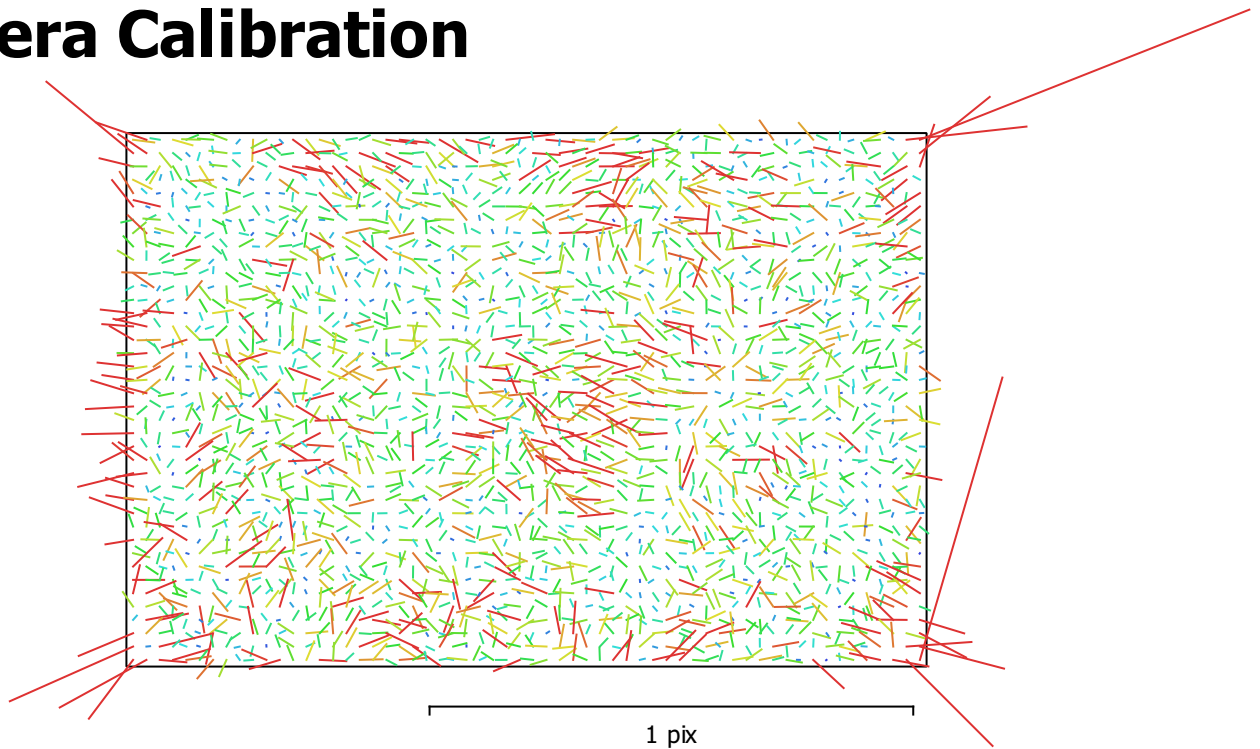


Fig. 2. Image residuals for FC6310R (8.8mm).

FC6310R (8.8mm)

192 images, precalibrated

| Type | Resolution | Focal Length | Pixel Size |
|--------------|--------------------|---------------|--------------------------------------|
| Frame | 5472 x 3648 | 8.8 mm | 2.41 x 2.41 μm |

| | Value | Error | F | Cx | Cy | B1 | B2 | K1 | K2 | K3 | K4 | P1 | P2 |
|-----------|---------------------|---------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| F | 3702.88 | 0.13 | 1.00 | 0.06 | -0.93 | 0.47 | 0.07 | -0.51 | 0.20 | -0.13 | 0.10 | -0.06 | 0.83 |
| Cx | -17.9844 | 0.032 | | 1.00 | -0.06 | 0.08 | 0.12 | -0.03 | 0.01 | -0.00 | 0.00 | -0.22 | 0.03 |
| Cy | -16.1333 | 0.072 | | | 1.00 | -0.50 | -0.03 | 0.42 | -0.12 | 0.06 | -0.04 | 0.06 | -0.84 |
| B1 | 0.110372 | 0.014 | | | | 1.00 | 0.01 | -0.27 | 0.04 | 0.00 | -0.01 | -0.11 | 0.58 |
| B2 | 0.384297 | 0.012 | | | | | 1.00 | -0.02 | -0.00 | 0.01 | -0.01 | -0.13 | 0.01 |
| K1 | -0.288162 | 3.9e-05 | | | | | | 1.00 | -0.90 | 0.83 | -0.78 | 0.04 | -0.46 |
| K2 | 0.144723 | 0.00012 | | | | | | | 1.00 | -0.98 | 0.95 | -0.02 | 0.11 |
| K3 | -0.0649434 | 0.00015 | | | | | | | | 1.00 | -0.99 | 0.01 | -0.04 |
| K4 | 0.0147655 | 6.7e-05 | | | | | | | | | 1.00 | -0.00 | 0.02 |
| P1 | -5.14992e-05 | 8.9e-07 | | | | | | | | | | 1.00 | -0.05 |
| P2 | -6.60557e-05 | 3.7e-06 | | | | | | | | | | | 1.00 |

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

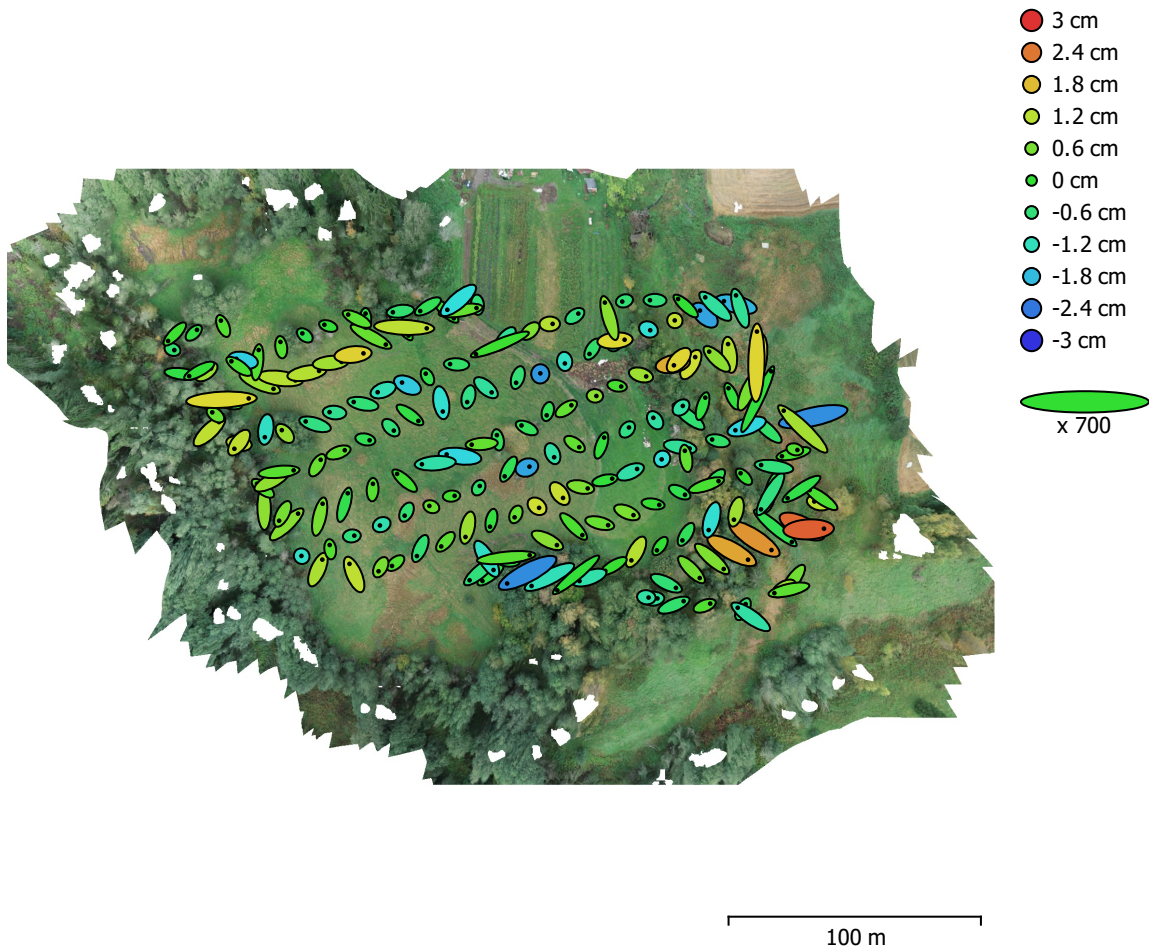


Fig. 3. Camera locations and error estimates.

Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.

Estimated camera locations are marked with a black dot.

| X error (cm) | Y error (cm) | Z error (cm) | XY error (cm) | Total error (cm) |
|---------------------|---------------------|---------------------|----------------------|-------------------------|
| 0.971086 | 0.787864 | 0.927584 | 1.2505 | 1.55697 |

Table 3. Average camera location error.

X - Easting, Y - Northing, Z - Altitude.

Ground Control Points

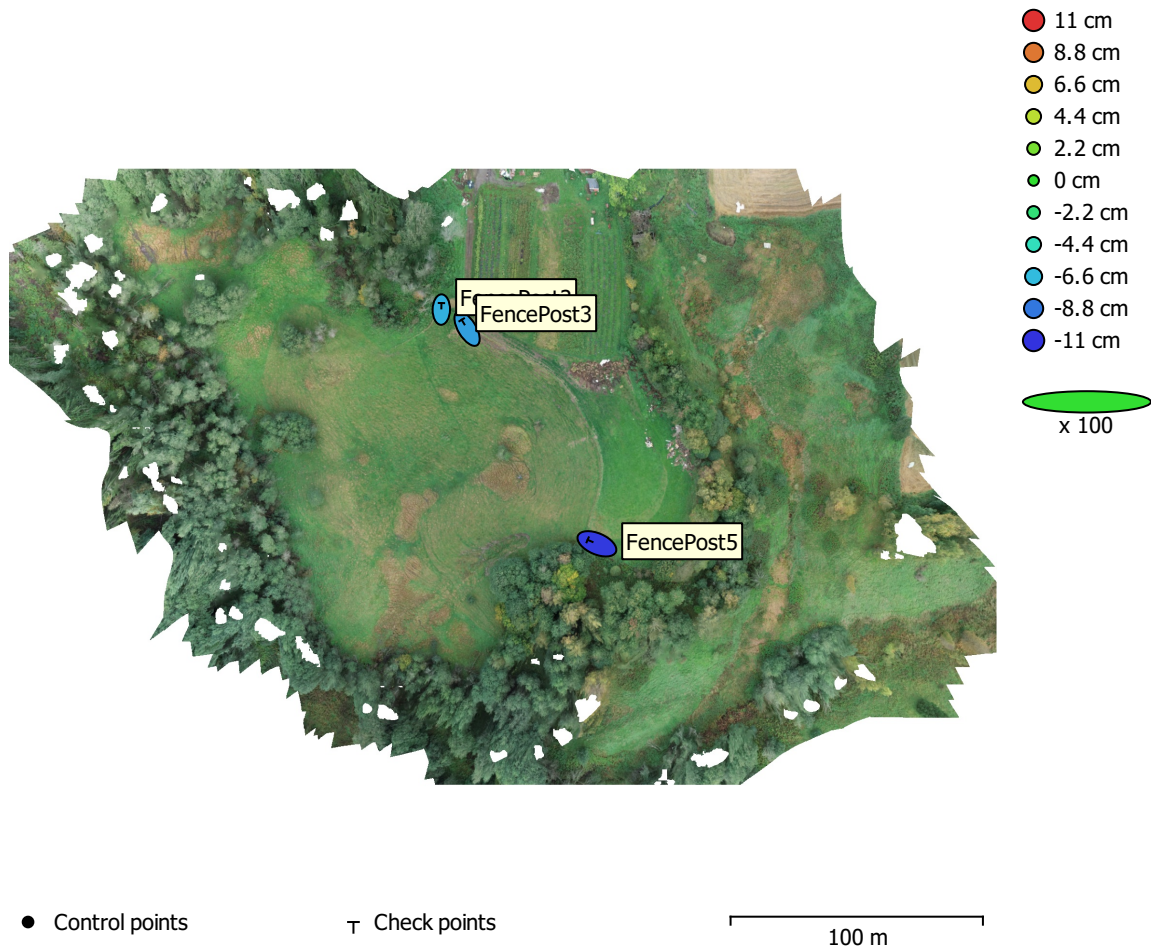


Fig. 4. GCP locations and error estimates.

Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.

Estimated GCP locations are marked with a dot or crossing.

| Count | X error (cm) | Y error (cm) | Z error (cm) | XY error (cm) | Total (cm) |
|-------|--------------|--------------|--------------|---------------|------------|
| 3 | 4.90225 | 5.36036 | 8.57717 | 7.26398 | 11.2398 |

Table 4. Check points RMSE.

X - Easting, Y - Northing, Z - Altitude.

| Label | X error (cm) | Y error (cm) | Z error (cm) | Total (cm) | Image (pix) |
|--------------|---------------------|---------------------|---------------------|-------------------|--------------------|
| FencePost2 | 0.10462 | 5.17386 | -6.96069 | 8.67358 | 0.478 (5) |
| FencePost3 | -4.24964 | 7.03363 | -7.50938 | 11.132 | 0.393 (9) |
| FencePost5 | -7.35022 | 3.15587 | -10.7639 | 13.4107 | 0.524 (12) |
| Total | 4.90225 | 5.36036 | 8.57717 | 11.2398 | 0.473 |

Table 5. Check points.
X - Easting, Y - Northing, Z - Altitude.

Digital Elevation Model

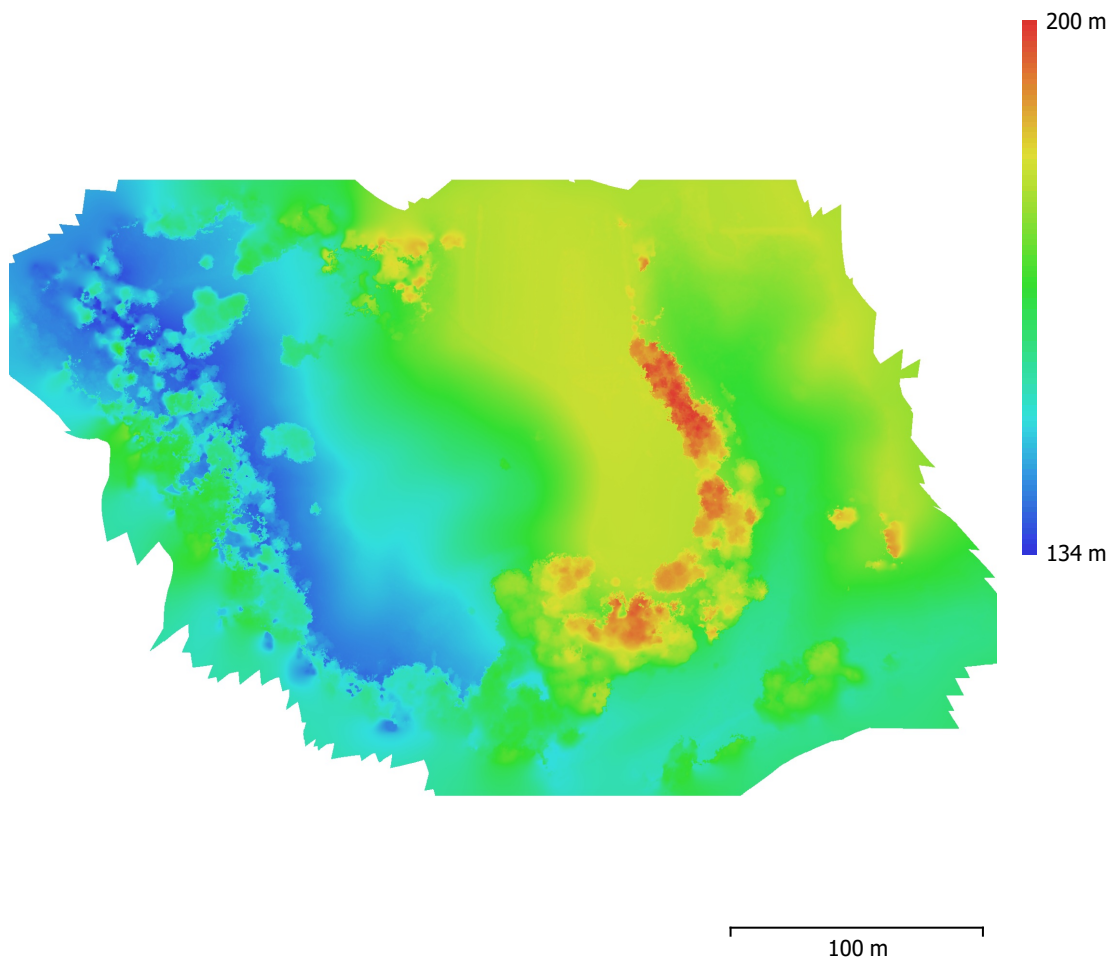


Fig. 5. Reconstructed digital elevation model.

Resolution: 5 cm/pix
Point density: 400 points/m²

Processing Parameters

General

| | |
|-------------------|--|
| Cameras | 192 |
| Aligned cameras | 192 |
| Markers | 3 |
| Coordinate system | ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972) |
| Rotation angles | Yaw, Pitch, Roll |

Tie Points

| | |
|--------------------------------|-------------------------|
| Points | 210,661 of 227,335 |
| RMS reprojection error | 0.166042 (0.673123 pix) |
| Max reprojection error | 0.758698 (37.0432 pix) |
| Mean key point size | 3.53217 pix |
| Point colors | 3 bands, uint8 |
| Key points | No |
| Average tie point multiplicity | 3.46435 |

Alignment parameters

| | |
|-------------------------------|---------------------|
| Accuracy | High |
| Generic preselection | Yes |
| Reference preselection | Source |
| Key point limit | 40,000 |
| Key point limit per Mpx | 1,000 |
| Tie point limit | 4,000 |
| Exclude stationary tie points | Yes |
| Guided image matching | No |
| Adaptive camera model fitting | Yes |
| Matching time | 1 minutes 4 seconds |
| Matching memory usage | 545.20 MB |
| Alignment time | 29 seconds |
| Alignment memory usage | 204.64 MB |

Optimization parameters

| | |
|-------------------------------|----------------------------------|
| Parameters | f, b1, b2, cx, cy, k1-k4, p1, p2 |
| Adaptive camera model fitting | No |
| Optimization time | 2 seconds |
| Date created | 2024:07:01 11:11:19 |
| Software version | 2.1.0.17532 |
| File size | 41.52 MB |

Depth Maps

| | |
|-------|-----|
| Count | 192 |
|-------|-----|

Depth maps generation parameters

| | |
|------------------|----------------------|
| Quality | High |
| Filtering mode | Mild |
| Max neighbors | 16 |
| Processing time | 8 minutes 56 seconds |
| Memory usage | 4.55 GB |
| Date created | 2024:07:01 11:28:22 |
| Software version | 2.1.0.17532 |
| File size | 1.36 GB |

DEM

| | |
|-------------------|--|
| Size | 7,831 x 4,879 |
| Coordinate system | ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972) |

Depth maps generation parameters

| | |
|----------------------------------|--|
| Quality | High |
| Filtering mode | Mild |
| Max neighbors | 16 |
| Processing time | 8 minutes 56 seconds |
| Memory usage | 4.55 GB |
| Reconstruction parameters | |
| Source data | Depth maps |
| Interpolation | Enabled |
| Processing time | 3 minutes 36 seconds |
| Memory usage | 10.09 GB |
| Date created | 2024:07:01 11:31:59 |
| Software version | 2.1.0.17532 |
| File size | 130.56 MB |
| Orthomosaic | |
| Size | 15,640 x 9,760 |
| Coordinate system | ETRS89 / UTM zone 32N + NN2000 height (EPSG::5972) |
| Colors | 3 bands, uint8 |
| Reconstruction parameters | |
| Blending mode | Mosaic |
| Surface | DEM |
| Enable hole filling | Yes |
| Enable ghosting filter | No |
| Processing time | 3 minutes 24 seconds |
| Memory usage | 2.14 GB |
| Date created | 2024:07:01 12:31:24 |
| Software version | 2.1.0.17532 |
| File size | 2.64 GB |
| System | |
| Software name | Agisoft Metashape Professional |
| Software version | 2.1.0 build 17532 |
| OS | Windows 64 bit |
| RAM | 127.15 GB |
| CPU | AMD Ryzen 9 7950X 16-Core Processor |
| GPU(s) | NVIDIA GeForce RTX 4080 SUPER |