

Towards a Terrestrial Laserscanner Testing Facility

Towards a Terrestrial Laserscanner Testing Facility

Wolffried Wehmann, Chris van Zyl, Holger Kramer

Department of Surveying and Cartography
Hochschule für Technik und Wirtschaft Dresden (FH)
University of Applied Sciences

Towards a Terrestrial Laserscanner Testing Facility

- Who
- Why
- How
- What
- Where

Towards a Terrestrial Laserscanner Testing Facility

Who?

Wolffried Wehmann Prof. Dr.-Ing	Chris van Zyl Prof.	Holger Kramer Graduate engineer
Teaching Surveying techniques Surveying instruments	Teaching CAD, Virtual Reality Technical English	Teaching CAD, Virtual Reality GIS
Interests Instrument testing Instrument calibration	Interests 3D modelling Survey profession	Interests 3D modelling Surveying Applied programming

Towards a Terrestrial Laserscanner Testing Facility

Why?

- Measurement (and enthusiasm) alone insufficient
- Lack of standard nomenclature and methodology
- Tradition within the department

Towards a Terrestrial Laserscanner Testing Facility

How?

Undergraduate theses, completed:

Widiger, D & Zimmermann, R: *Einrichtung eines Prüffeldes zur Untersuchung der Genauigkeit und Zuverlässigkeit von Laserscannern sowie Untersuchungen des Laserscanners LMS-Z360i der Firma Riegl in diesem Testfeld* HTW Dresden 2006

Current:

Heyne, C & Koschemann, D: *Erweiterung eines Prüffeldes zur Untersuchung der Genauigkeit und Zuverlässigkeit von terrestrischen Laserscannern sowie Untersuchungen der Laserscanner GX von Trimble und LMS-Z360i von Riegl in diesem Testfeld* publication expected August 2007.

Towards a Terrestrial Laserscanner Testing Facility

What?

Set up a facility to test

- Short – medium range indoor measurements to targets
- Medium – long range outdoor measurements to targets
- Determination of points, lines and planes (reflectivity)
- Resolution
- Camera registration
- Camera calibration

Towards a Terrestrial Laserscanner Testing Facility

Determination of points, lines and planes

Problem: reflectivity

- Points (small discrete objects, not marked)
- Lines
 - Linear elements within the object
 - Intersection of planes (edges)
 - Sections
- Planes

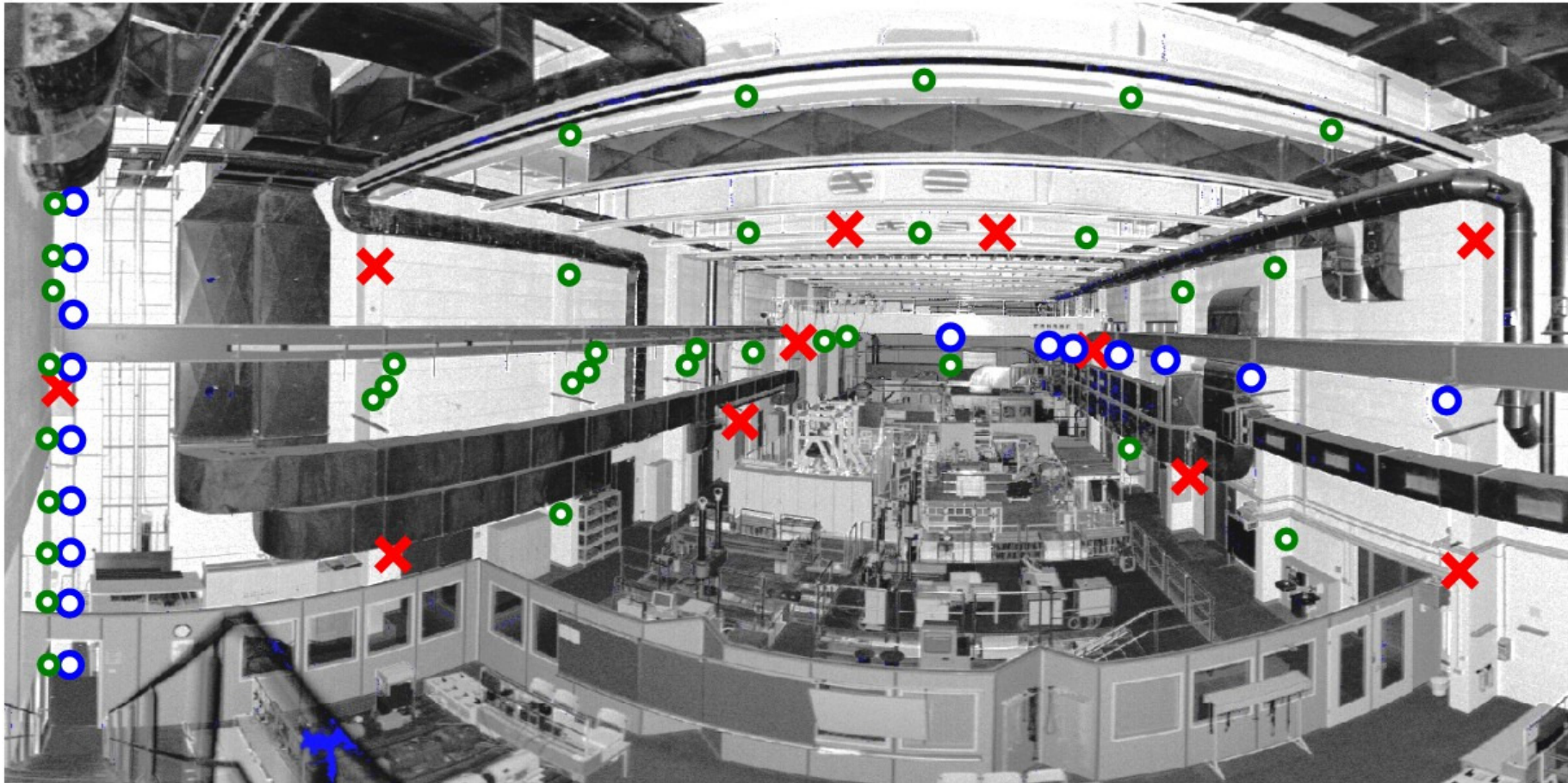
Towards a Terrestrial Laserscanner Testing Facility

Where: Indoor testing, machine hall

- Primary network (ground points)
- Secondary network (reflectors)
- Tertiary network (reflectors)

Towards a Terrestrial Laserscanner Testing Facility

Indoor testing: machine hall

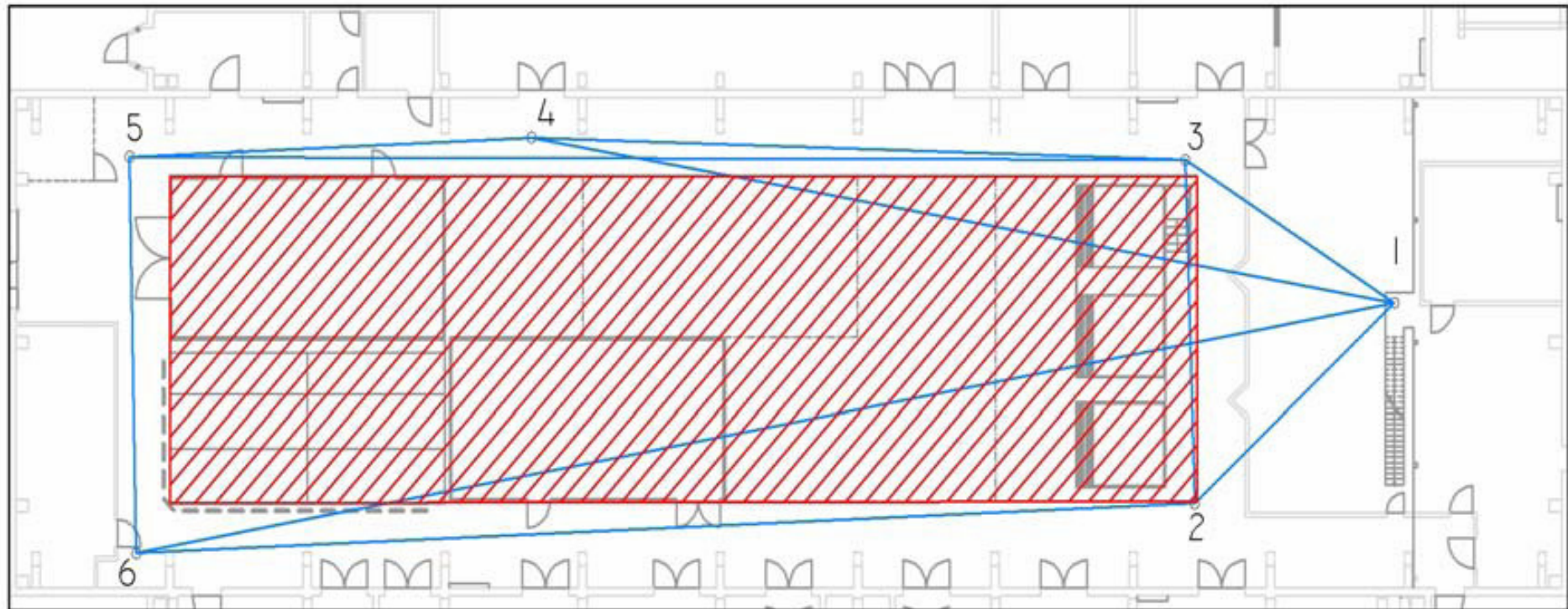


Passmarken: Riegl Flat **X**

Prüfmarken: Riegl Flat **○** HTW Flat **●**

Towards a Terrestrial Laserscanner Testing Facility

Primary network (Extent ca. 55m by 15m, 3D $\sigma < 1,6\text{mm}$)



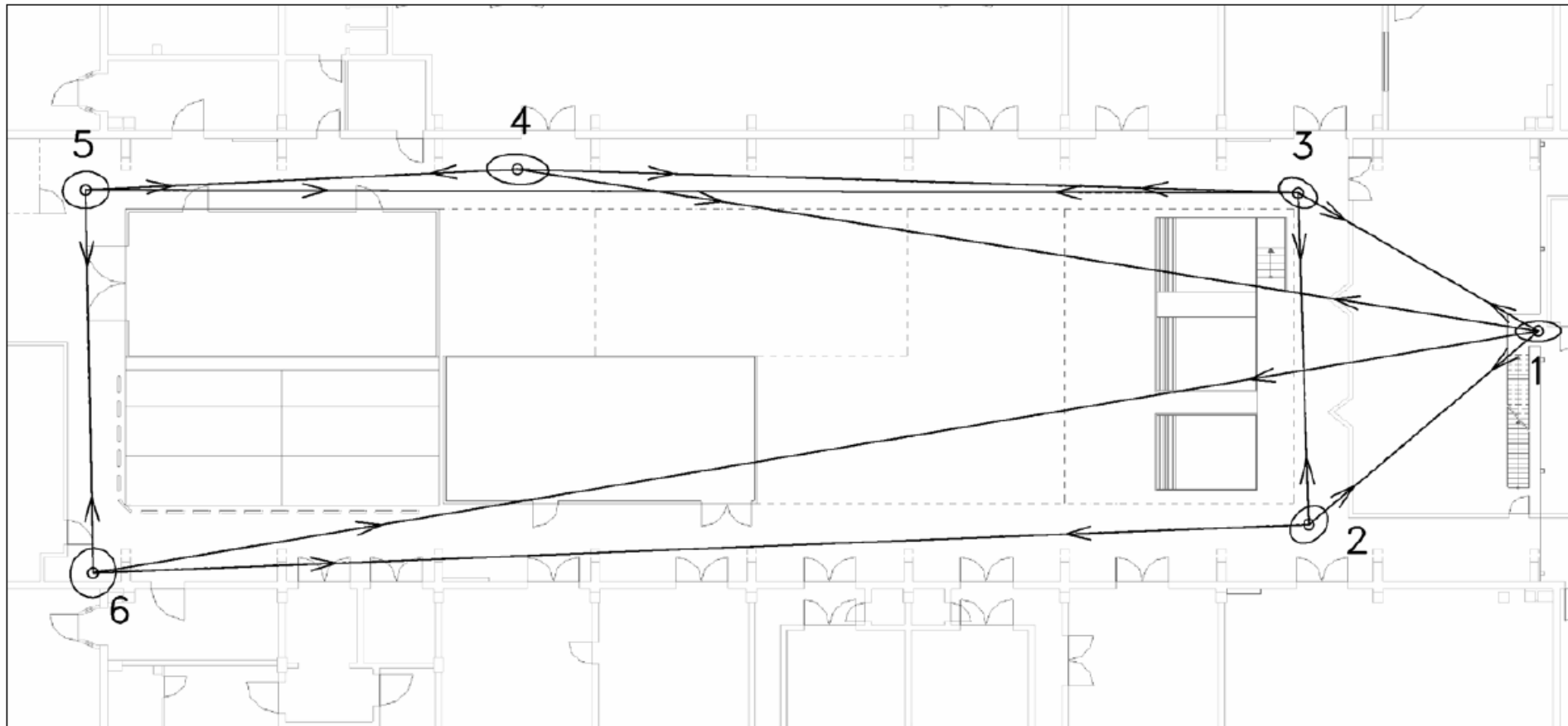
10 metres



Restricted visibility

Towards a Terrestrial Laserscanner Testing Facility

Primary network (Extent ca. 55m by 15m, 3D $\sigma < 1,6\text{mm}$)

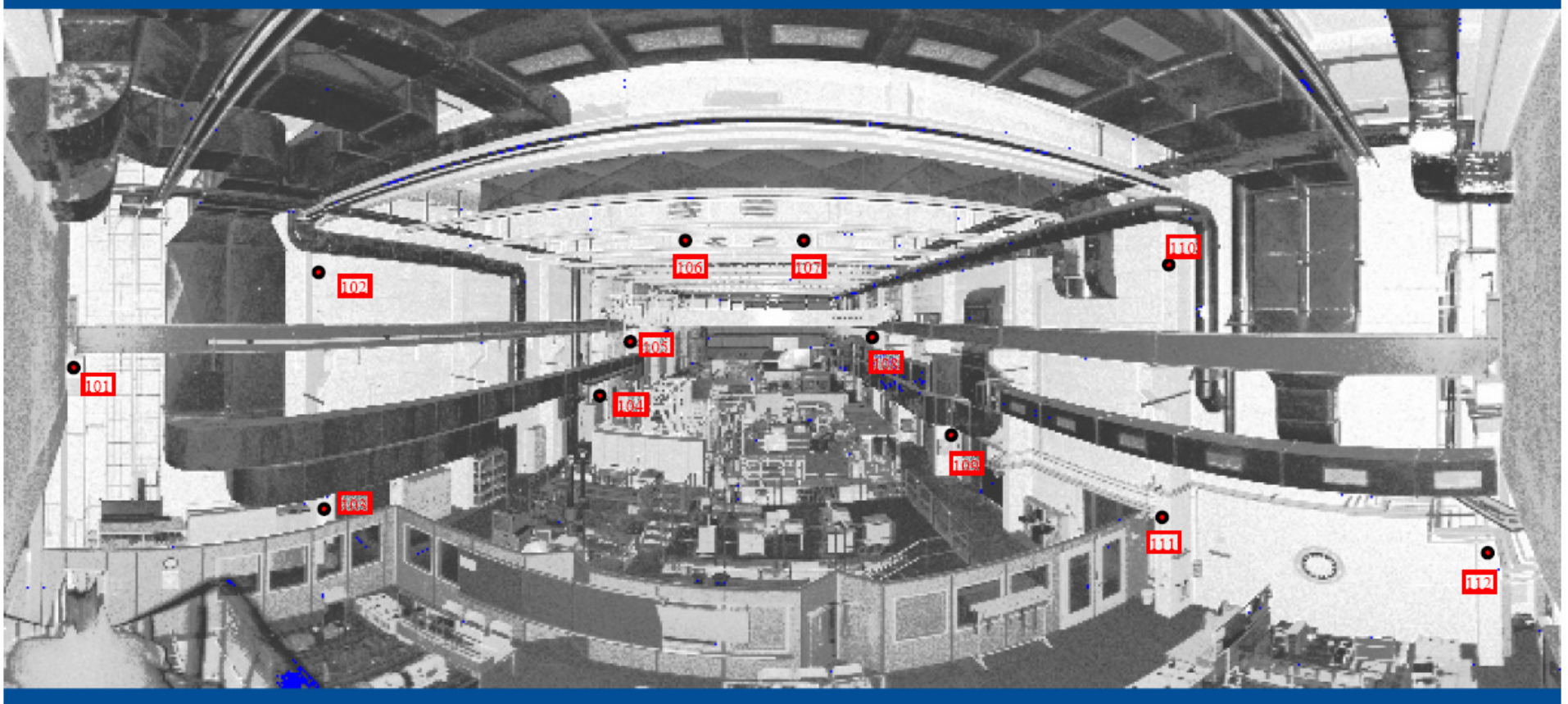


Netzmaßstab 1:250

Maßstab der Fehlerellipsen 1:0,07

Towards a Terrestrial Laserscanner Testing Facility

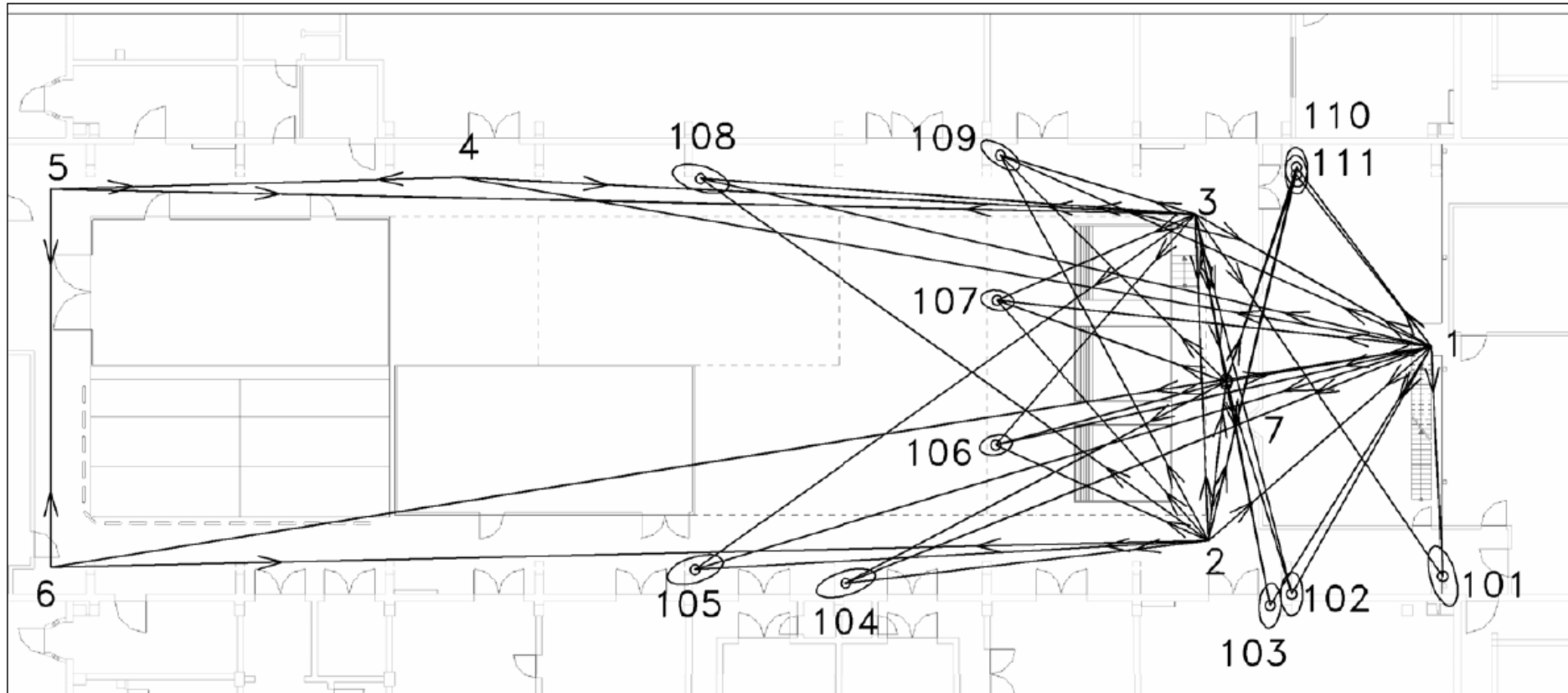
Secondary network



Scan from point 1

Towards a Terrestrial Laserscanner Testing Facility

Secondary network (3D $\sigma < 1,8\text{mm}$)

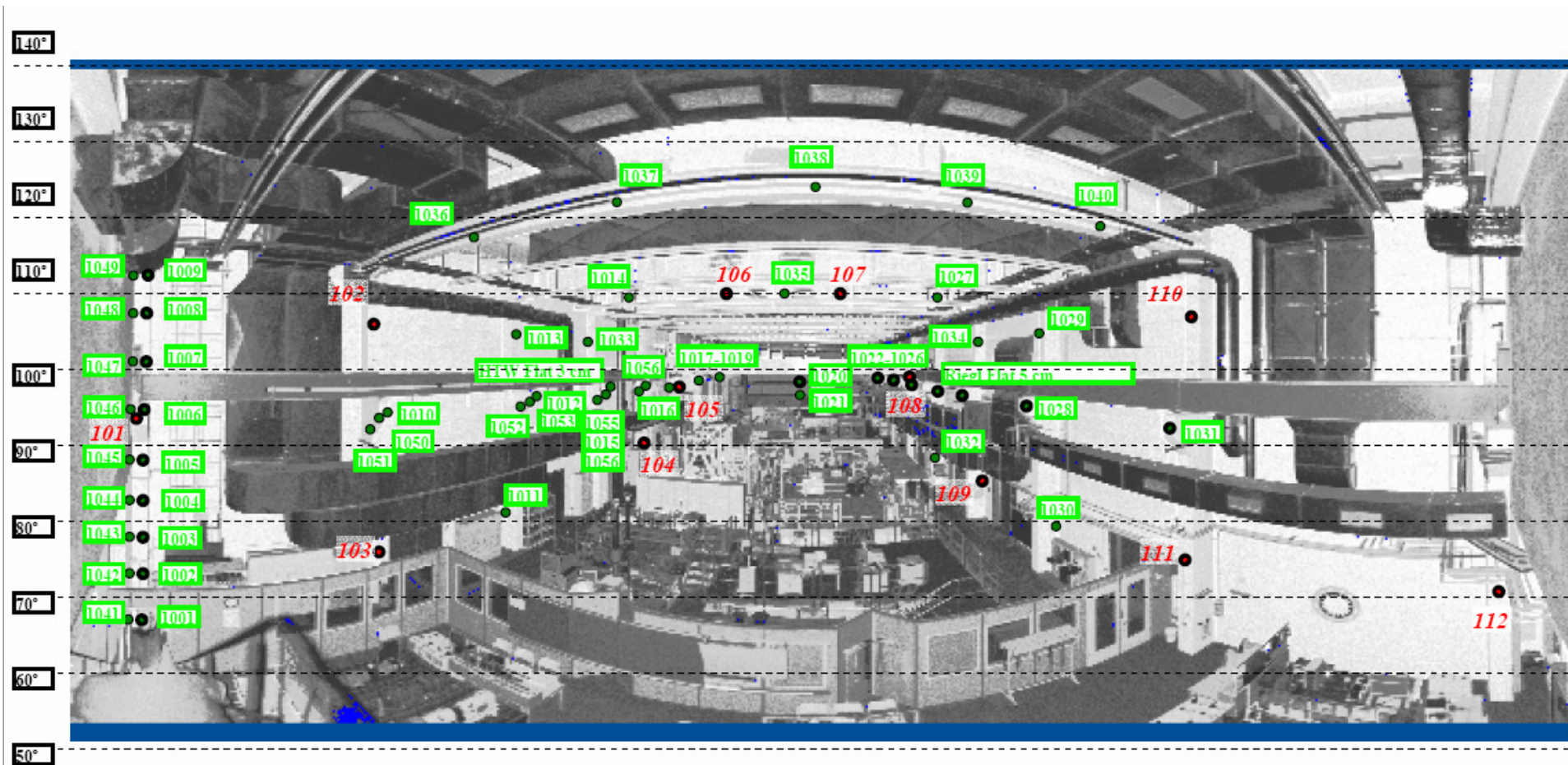


Netzmaßstab 1:250

Maßstab der Fehlerellipsen 1:0,07

Towards a Terrestrial Laserscanner Testing Facility

Tertiary network ($3D \sigma < 2,2m$)



Scan from point 1

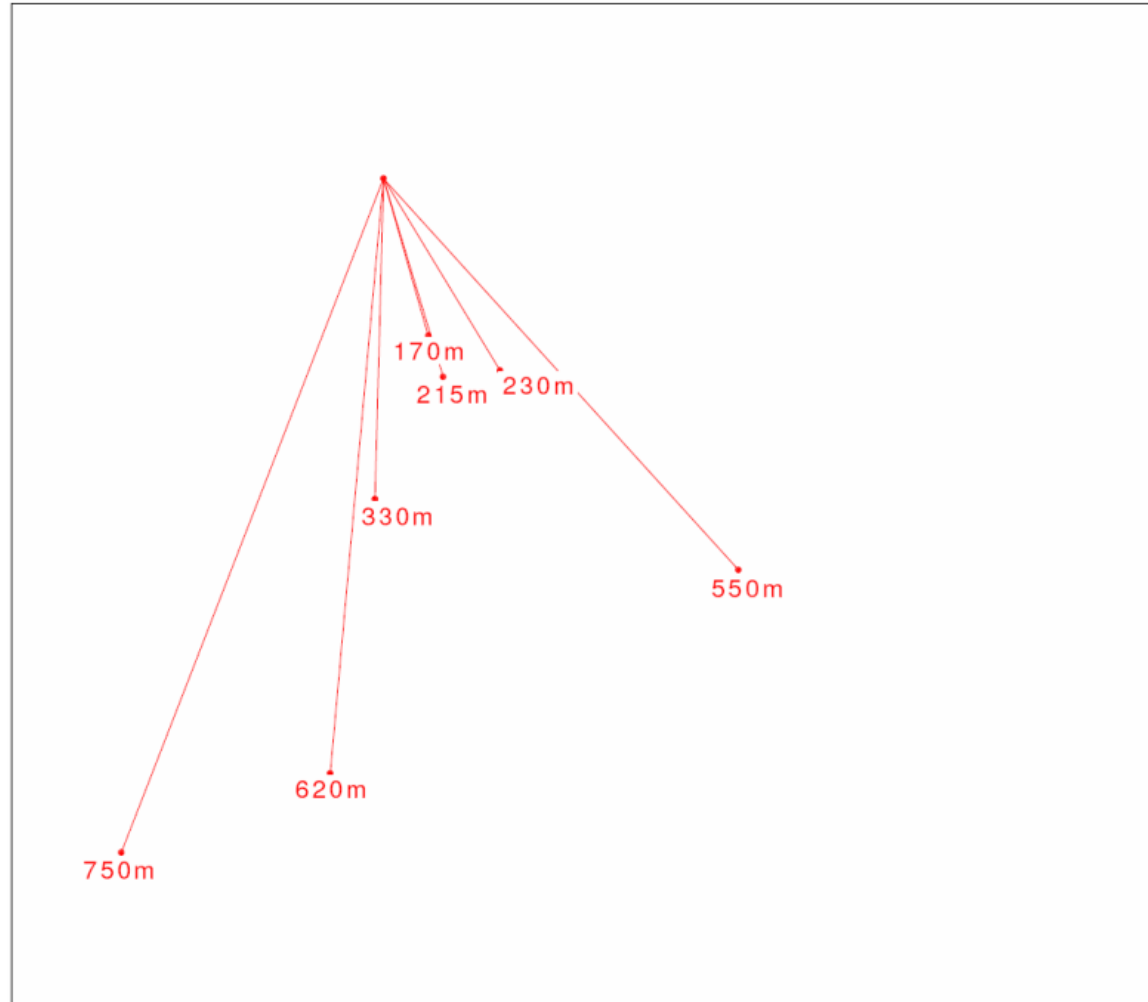
Towards a Terrestrial Laserscanner Testing Facility

Where: Outdoor testing, stationing cluster



Towards a Terrestrial Laserscanner Testing Facility

Outdoor testing: Distant points



Towards a Terrestrial Laserscanner Testing Facility

Outdoor testing: Distant points, planes



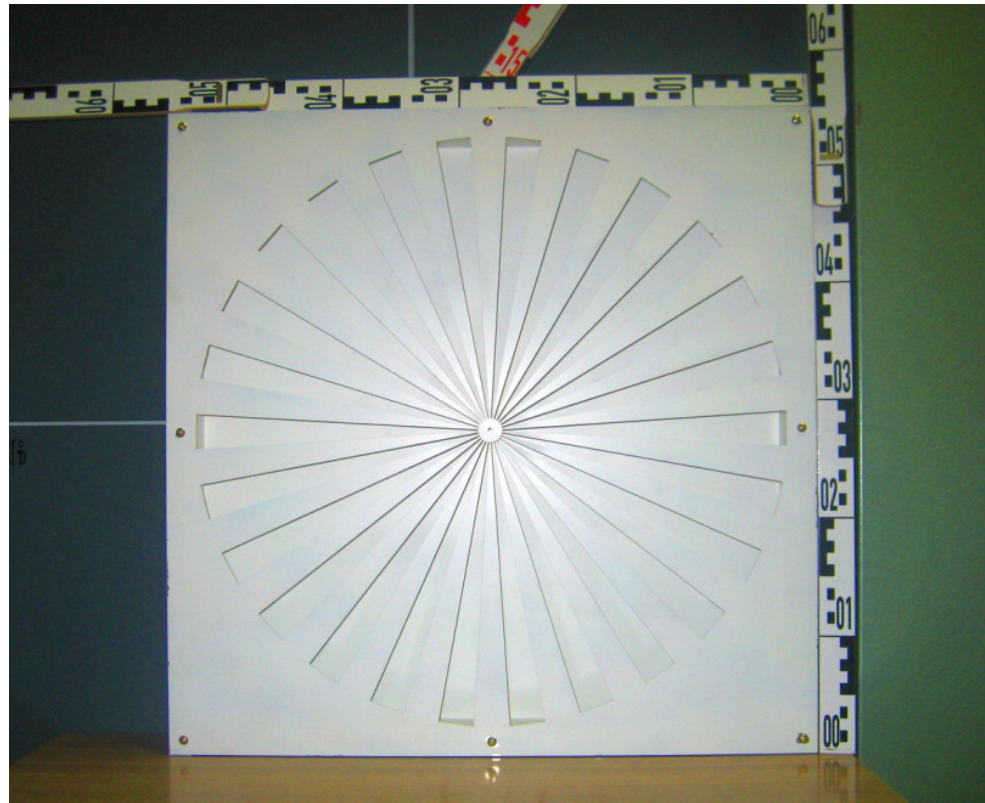
Towards a Terrestrial Laserscanner Testing Facility

Outdoor testing: Distant points



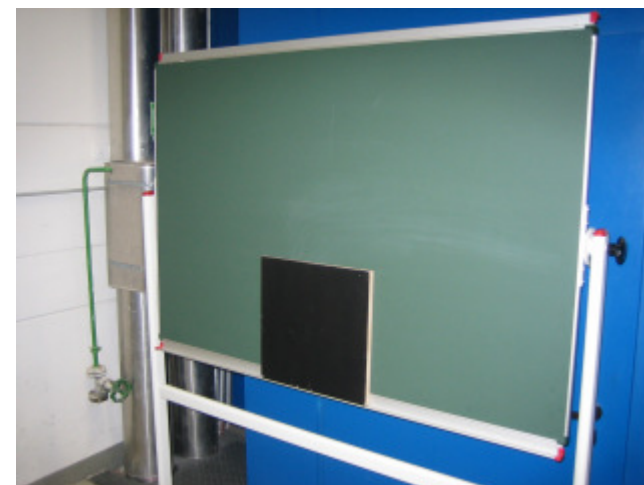
Towards a Terrestrial Laserscanner Testing Facility

Resolution: "Boehler star"



Towards a Terrestrial Laserscanner Testing Facility

Reflectivity



Towards a Terrestrial Laserscanner Testing Facility

Camera registration (mounting)

Reflector columns as recommended by Riegl:

Three columns of six reflectors

Vertical separation ca. 60 cm.

Horizontal separation ca. 4 m



Towards a Terrestrial Laserscanner Testing Facility

Camera calibration



Towards a Terrestrial Laserscanner Testing Facility

References

Böehler, W, Marbs,A: *Investigating Laser Scanner Accuracy*
<http://scanning.fh-mainz.de/scannertest/results300305.pdf>, accessed
12.06.2007

Widiger, D & Zimmermann, R: *Einrichtung eines Prüffeldes zur
Untersuchung der Genauigkeit und Zuverlässigkeit von
Laserscannern sowie Untersuchungen des Laserscanners LMS-
Z360i der Firma Riegl in diesem Testfeld HTW Dresden 2006*

Towards a Terrestrial Laserscanner Testing Facility

Thank you for your attention

<http://www.htw-dresden.de/vk/>