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Getting to know the Trimble SX10 Scanning Total Station - Inside and Out

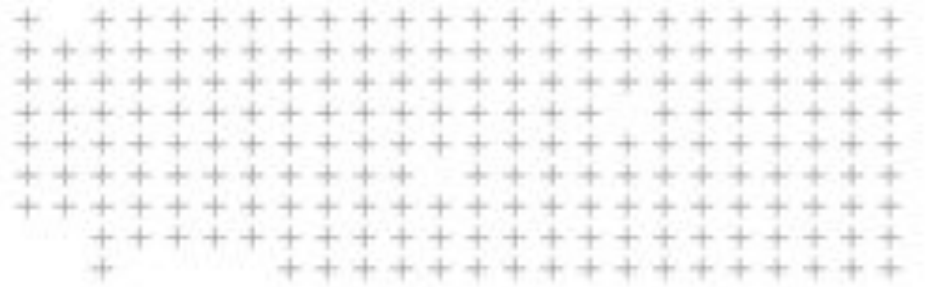
ISV Regional Conference 2017: Moama, NSW





Contents

- Difference between scanner and a Total station
- Band scanning and deflection inside telescope
- Lightning 3DM
- New tracker system
- Enhances Trimble Vision Imageing

The Trimble logo, featuring a blue circular icon with a white stylized 'T' and the word 'Trimble' in blue text.The UPG logo, featuring a stylized orange and blue circular icon and the letters 'UPG' in bold black text.

 **What is the difference between a Total station and a Scanner?**

Total station

- **ACCURACY!!!**
 - Arc second angle accuracy
 - mm distance accuracy
 - Stability and repeatability
- **Multiple uses**
 - Prism measurements
 - Automatic tracking
 - DR-measurements
 - Camera guided aiming
 - Robotic operation



3D Laser Scanner

- SPEED!!!
 - Fast EDM
 - Fast beam movement
- One job!
 - Scan...



How do you make a Total Station Scan?

- MagDrives are fast... But not that fast.
 - Hard to maintain stability with large mass rotating at full speed
 - Dangerous!!!
- Highest practical speed 1 rotation/s
 - 1 mRad grid would give EDM speed of 6,300 pts/s
 - 1h 45min to complete full dome scan
 - **Not practical! Too slow!**



Meet the Trimble SX10 Scanning Total Station

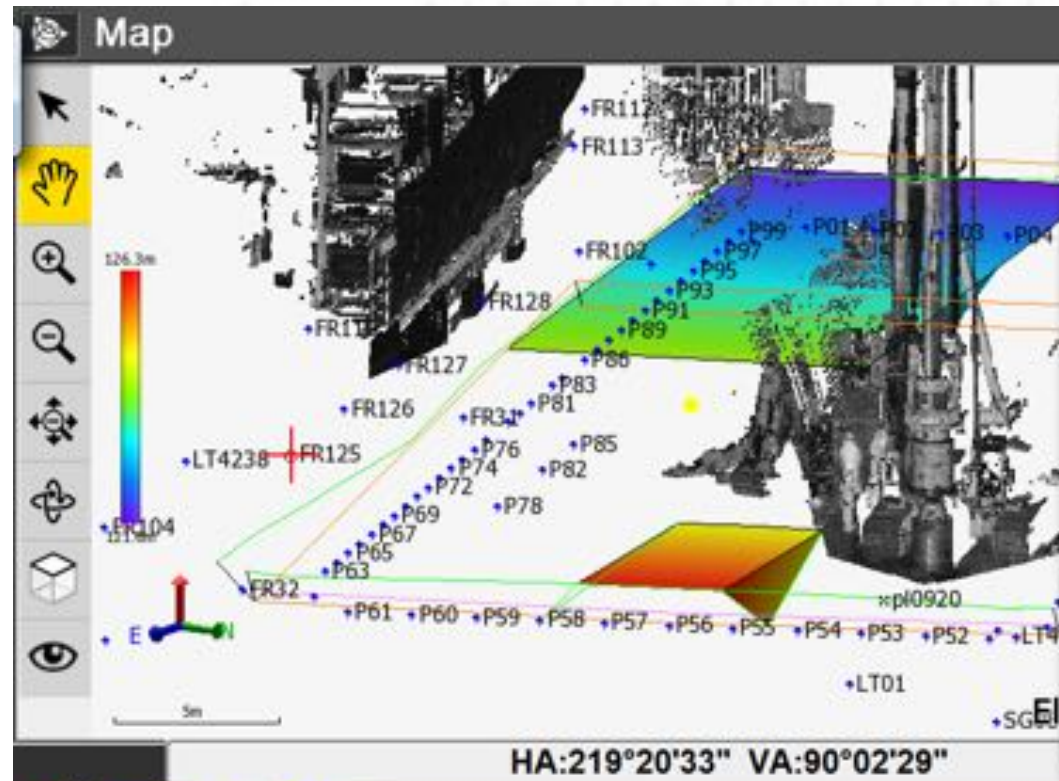


TRANSFORMING THE WAY THE WORLD WORKS



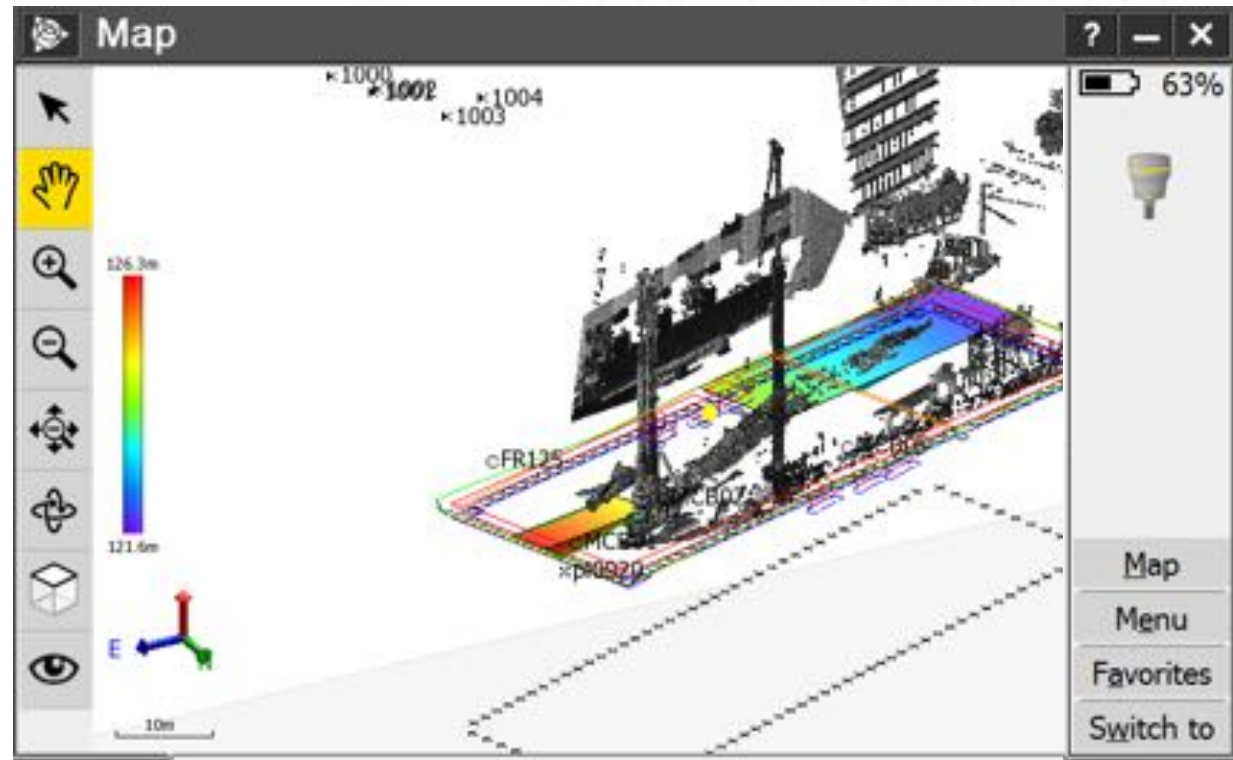
Advanced Total Station Functionality

- Features
 - Interactive data view
 - Design Points
 - Line Work
 - Topo points
 - Scan data
 - Surfaces



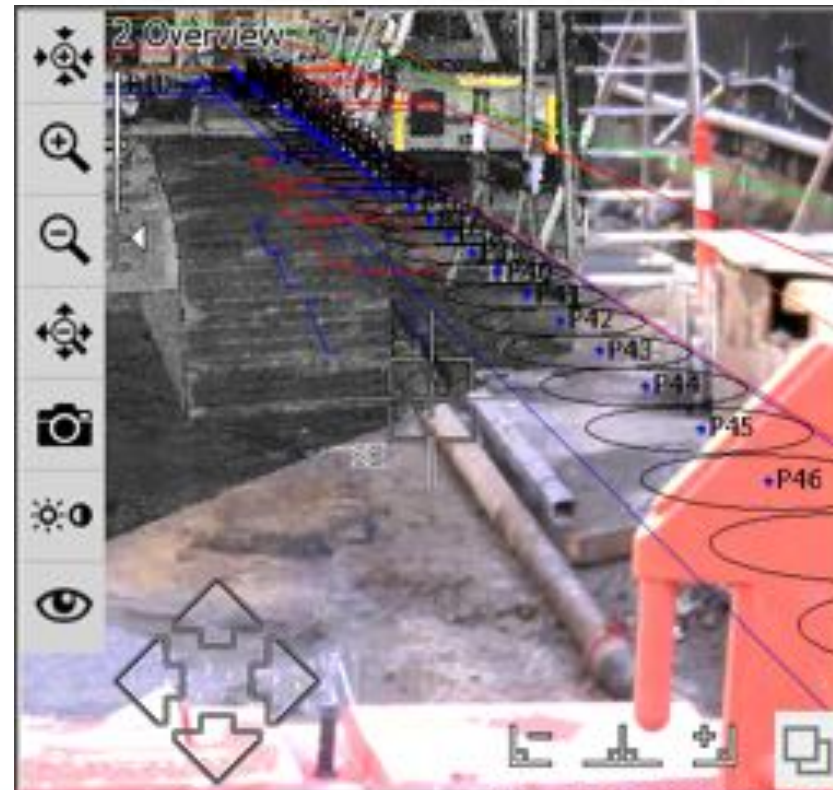
Advanced Total Station Functionality

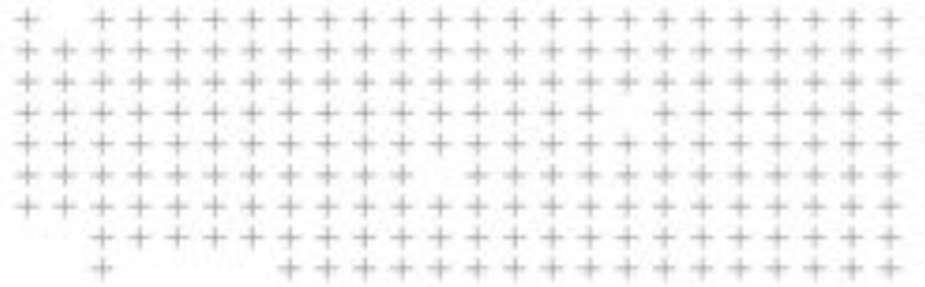
- Benefit –
 - Total station everyday
 - no new workflow
 - All info on screen
 - Ease of use
 - Validate Design
 - ROI



Advanced Total Station Functionality

- Benefit –
 - QA for setout through images and reporting
 - QA for pick up via visual Inspection





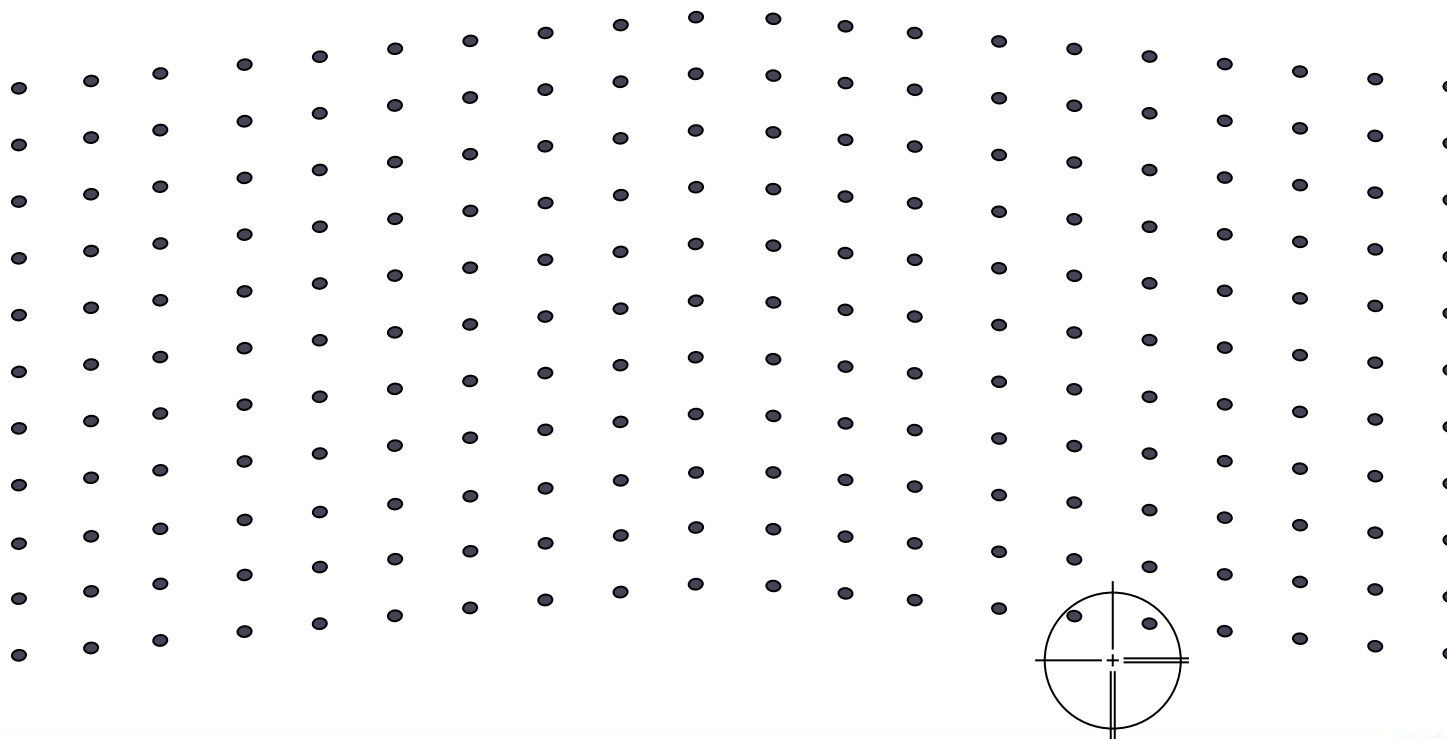
Deflection inside telescope & Band Scanning

Beam deflection inside telescope

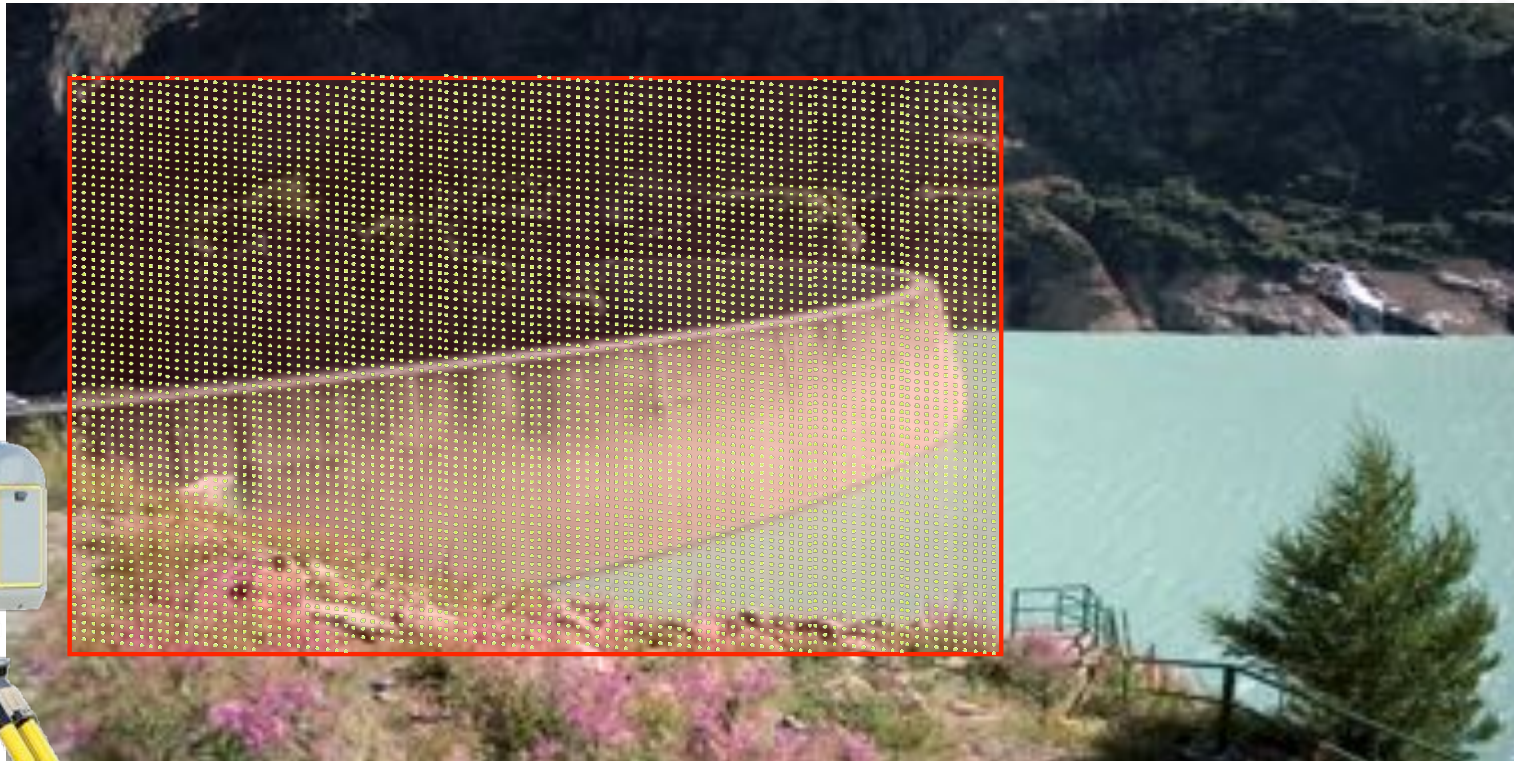




Creating a grid



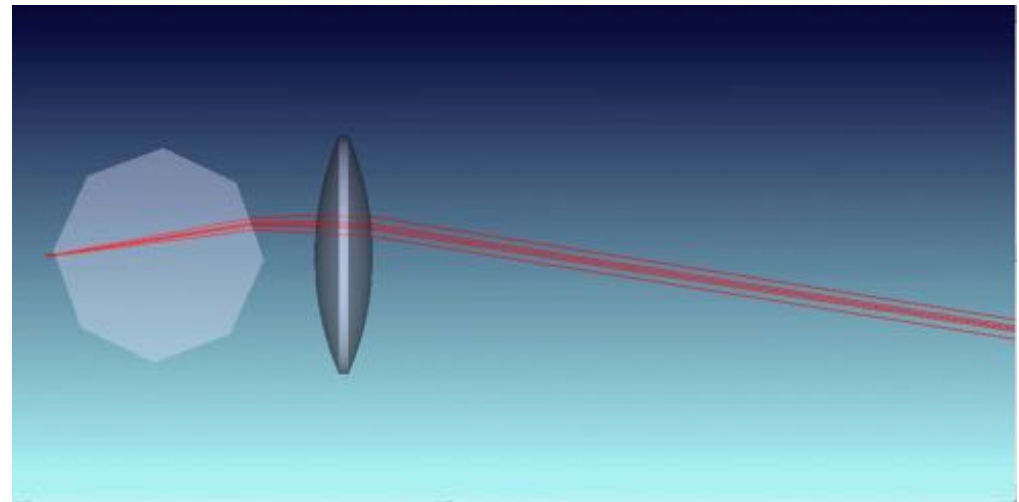
Band Scanning



TRANSFORMING THE WAY THE WORLD WORKS

How to deflect the beam inside the telescope?

- **Rotating polygon prism!**
 - The prism will translate the beam sideways
 - The positive lens converts the translation into an angular deflection
- Converts continuous movement of prism to saw-tooth deflection pattern



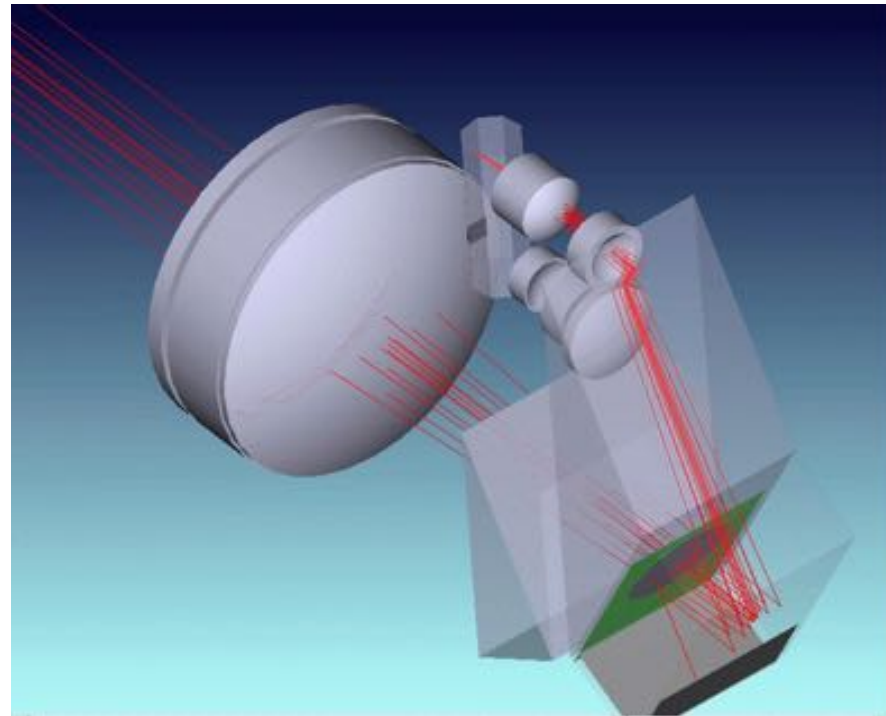
Optical implementation in telescope



TRANSFORMING THE WAY THE WORLD WORKS

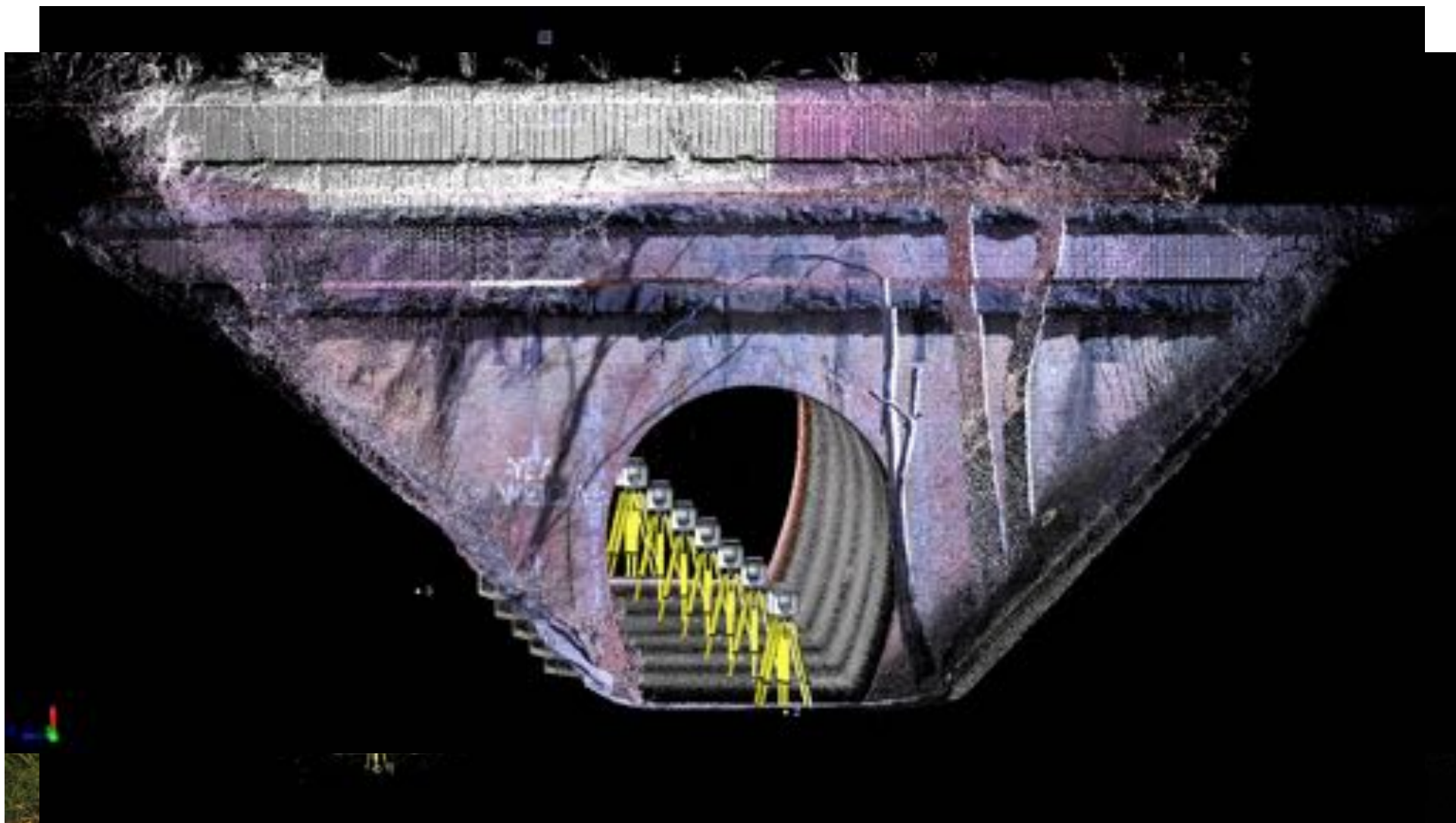
Polygon prism Deflection – in action

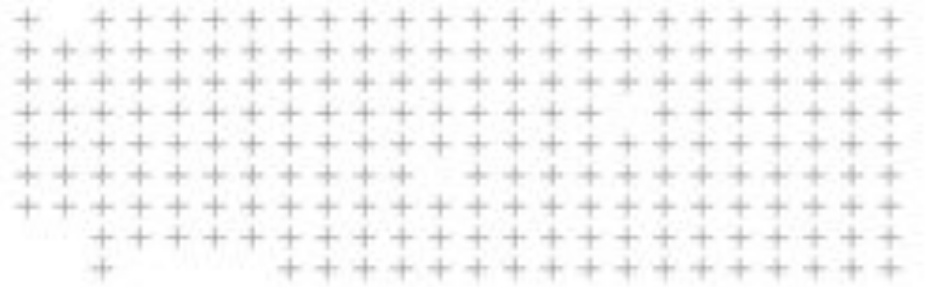
- One scan band is about 1 degree wide.
 - 1.7 m wide at 100 m range



Swan Street Bridge Duplication







Lightning 3DM –
The worlds fastest Total station EDM

Lightning 3DM

- Same **Time of Flight** principle as used in our proven **DRplus**



- Single shot measurement** – Every laser pulse must give a distance
- Merging DRplus technologies from S-series with Lightning technology from Trimble TX8.



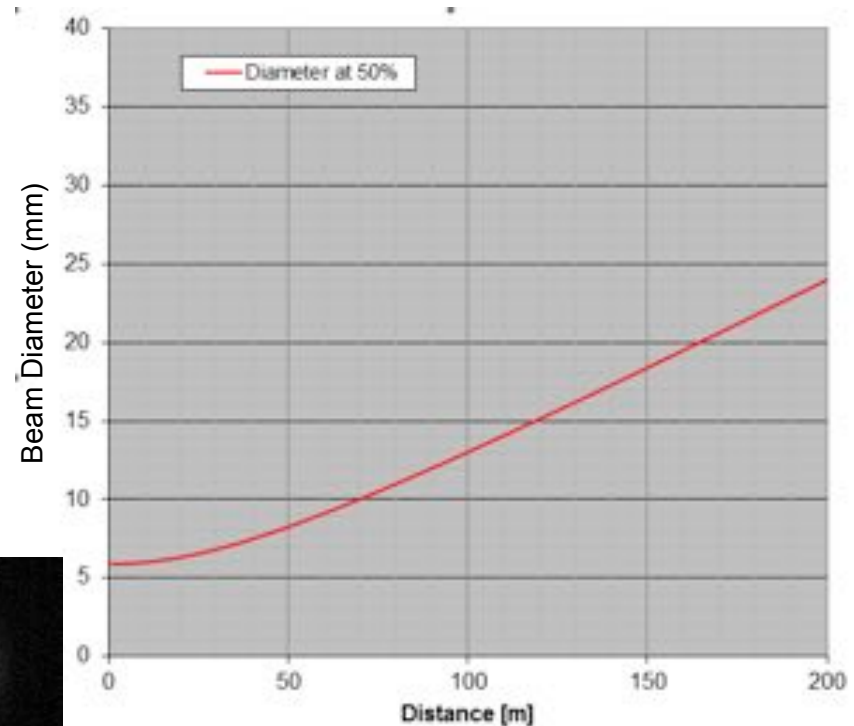
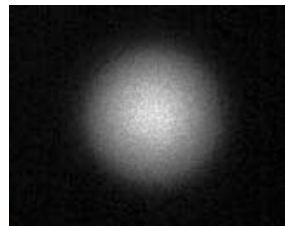
Single shot measurement

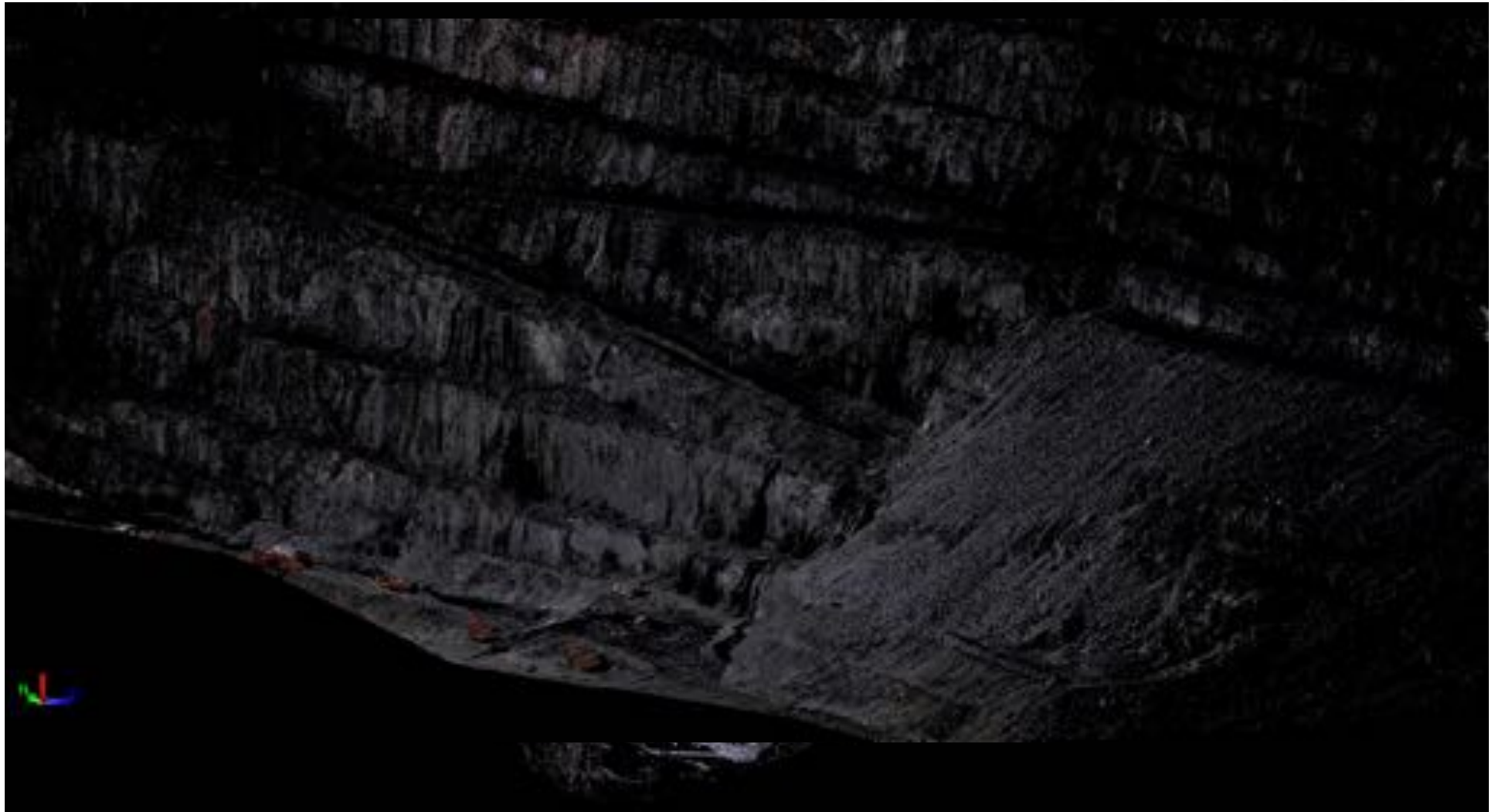
- **Powerful laser source** with very good beam quality and pulse shape repeatability
- **Direct sampling receiver** to allow for single shot measurements
- **Advanced signal processing** to achieve total station accuracy

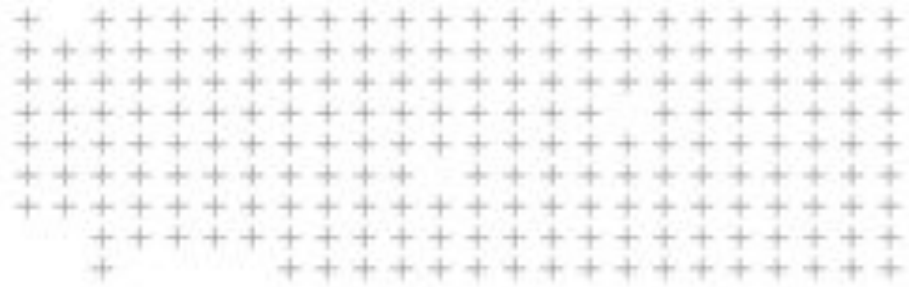


Fibre Laser Source

- Fantastic beam properties:
 - Smallest measurement spot in the industry
 - Round symmetric spot
 - 8 mm @ 50 m
 - 14 mm @ 100 m
- Great for both scanning and DR measurements







Brand new Tracker system

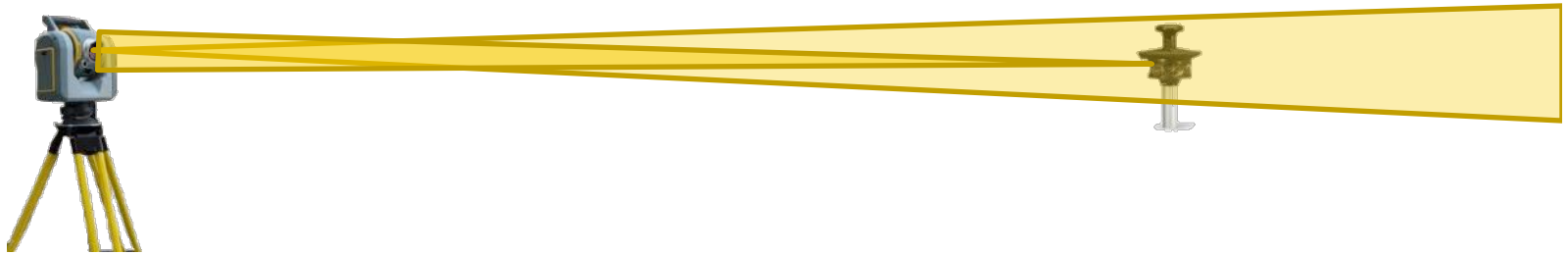
Why a new tracker system?

- Why not inherit the S-series tracker?
 - Impossible to combine with the optical setup needed for the beam deflection
- Camera based tracker systems:
 - Camera sensors have improved greatly in recent years
 - Computation power needed for good performance is now available.
- Time of a switch of technology!



Camera based tracker system

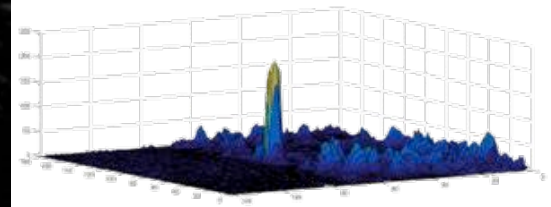
- The SX10 tracker is camera based



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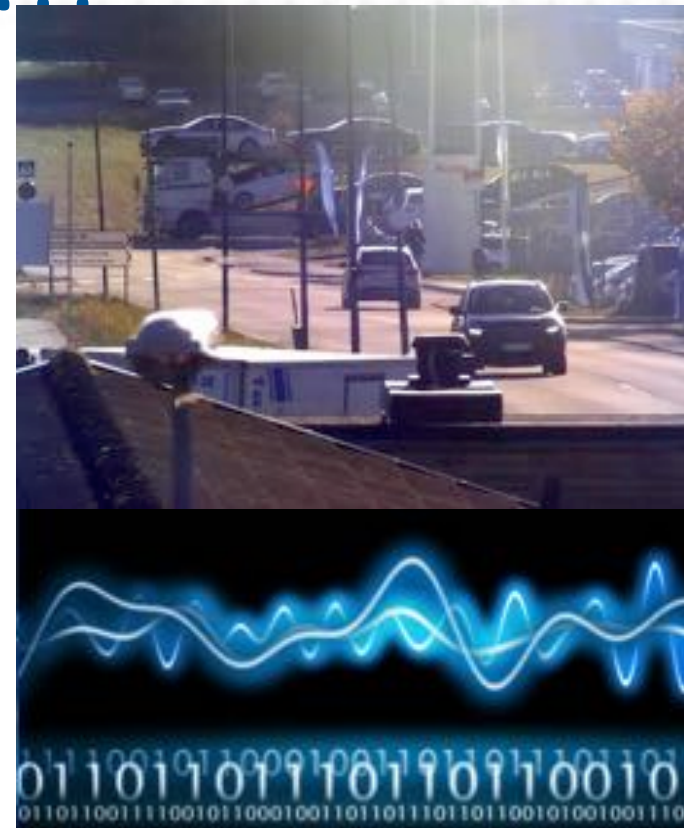


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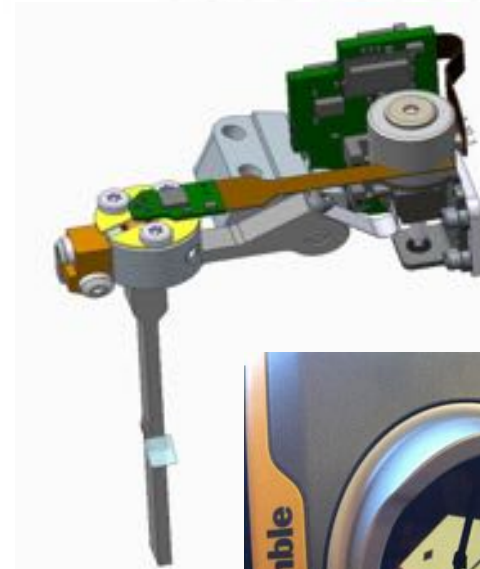
Which target is your target???

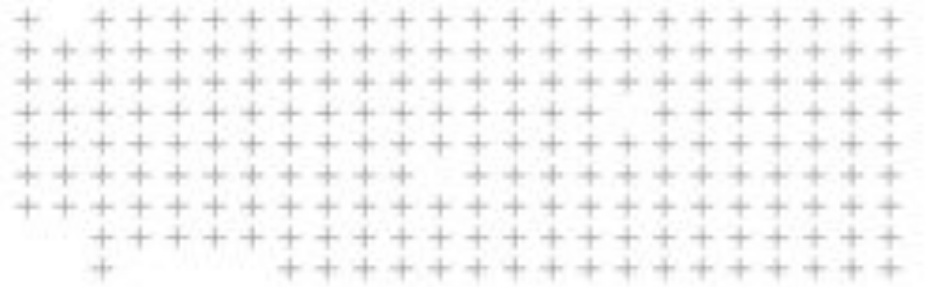
- Difficult part is distinguishing your target from everything else.
 - Other targets
 - Other reflective objects
 - Sun reflexes
 - Bright moving objects (car headlights etc.)



Moveble tracker transmitter

- Full front lens must be used for scanning.
- Tracker transmitter must be moved out of the way while scanning!





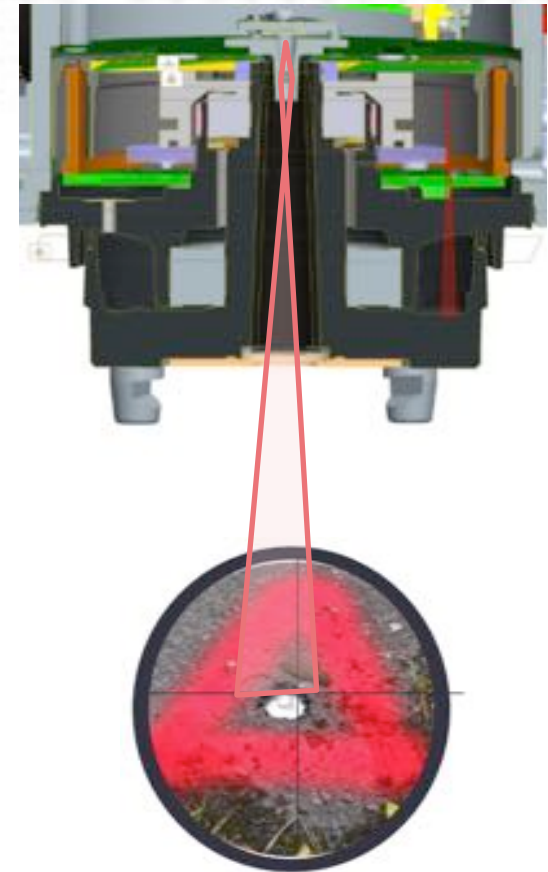
Enhanced Trimble VISION Imaging

Trimble VISION in SX10

- Fully integrated and calibrated camera system
- Instrument operation
- Documentation
- Measurement



Calibrated plummet camera



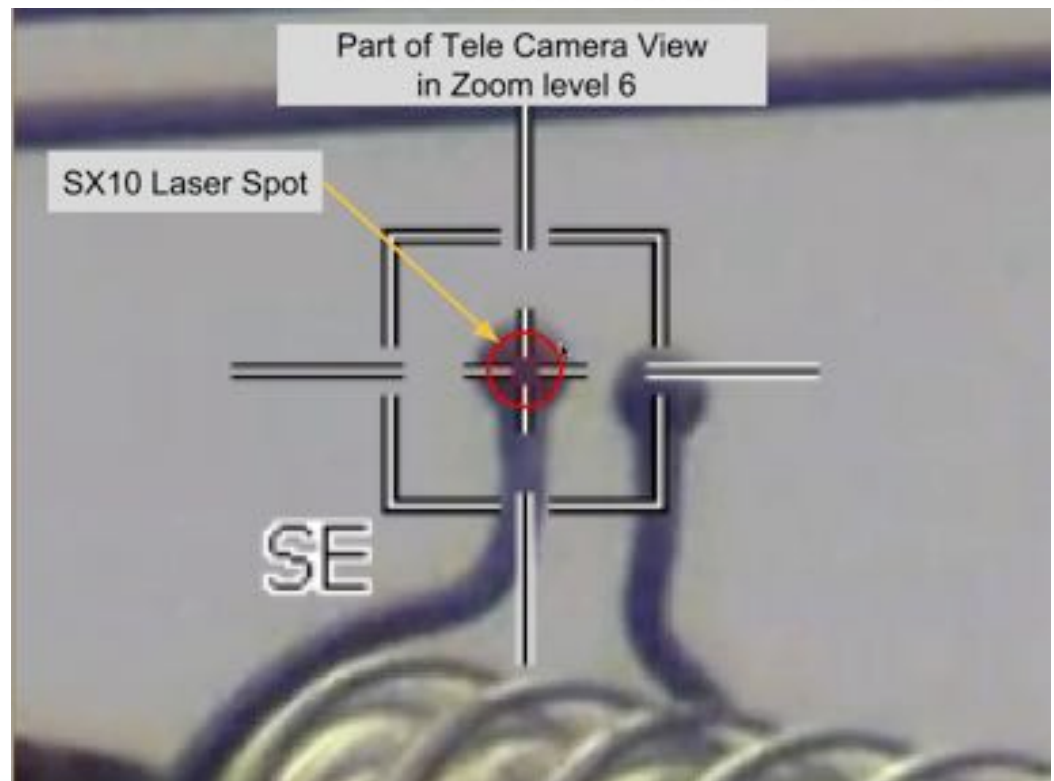
Bundled Camera System

- Experiences as one camera with 8 levels
- 57° to 0.65° Field of view
- 84 x Zoom at level 6
- Level 7 and 8: digital zoom



Zoom levels

- The finest physical zoom is level 6
- 1 pixel of camera = 1 pixel of screen.
- Laser spot of distance meter is smaller than the inner cross
- 1 pixel is 0.88 mm @ 50m



Panorama

- Images match by calibration not by warping of the content



Panorama with overview camera

Fixed Exposure
at start of
Panorama



Measure Now – Extract Later

- Benefits –
 - Changing client requirements
 - After-thought requests
 - Missed measurements
 - Access the inaccessible
 - REDUCED TRAFFIC MANAGEMENT





Seeing is believing

Visit the UPG trade display

www.upgsolutions.com

For a full inside the SX10 Factory tour:
xyht.com/lidarimaging/behind-big-eye



TRANSFORMING THE WAY THE WORLD WORKS





Special Thanks



- Outright Surveying: outrightsurveying.com.au
- Rogerson & Birch Surveyors: rbsurveyors.com.au
- Think Spatial: thinkspatial.com.au
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