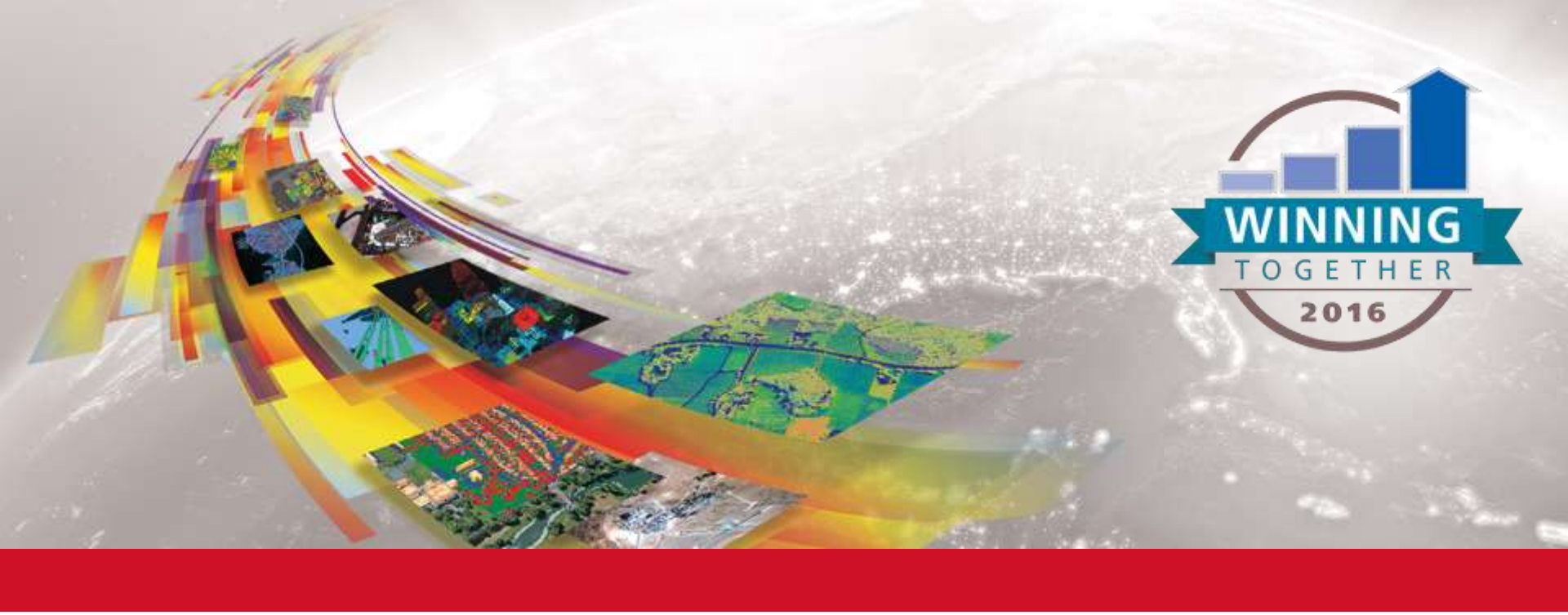

GEIGER MODE LIDAR, EGY ÚJ HARRIS GEOSPATIAL TECHNOLÓGIA

KÁKONYI GÁBOR, GEOIQ KFT.

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HARRIS® TECHNOLOGY TO CONNECT, INFORM AND PROTECT™

Advantage vs Competition

Existing technology – “linear-mode LiDAR”

- Inefficient and costly at high resolutions
- Has inherent data occlusions
- Foliage penetration is limited by single sample approach
- Limited range resolutions (target separation)

Harris Geiger-mode LiDAR

- Flies at higher altitudes for faster collection: altitudes up to 27,000
- Samples per second rate is 200,000 Khz, compared to 500 Khz for linear-mode
- Resolution is superior: from 2 points/m^2 to >150 points/m^2

FAQ's

Is Geiger Mode LiDAR a new technology

No - it been utilized successfully in the defense industry for over 15 years. It is only new to the commercial industry.

Why hasn't it been available before now?

Key components could not be sourced for commercial application until recently

Are Geiger Mode LiDAR data noisy?

Yes "But" - in its raw (unprocessed) state it is noisier than linear systems however, this just means a different approach to processing is utilized to produce elevation data and derivative products.

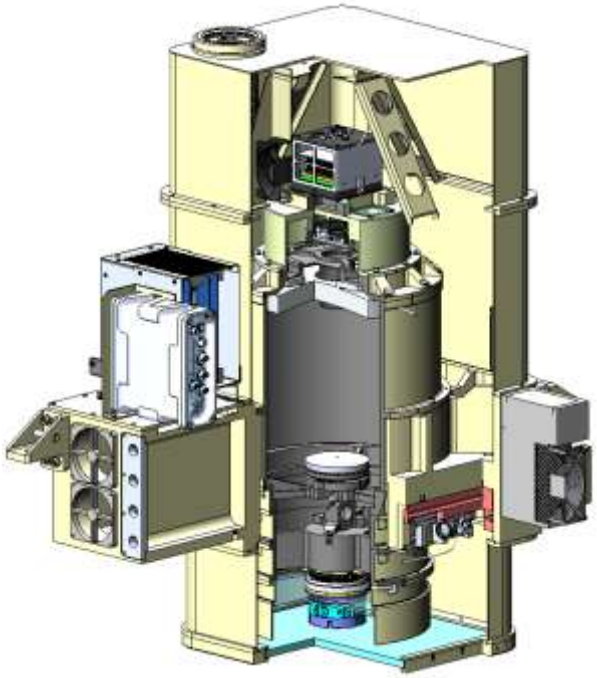
Does Geiger Mode LiDAR work in daylight conditions

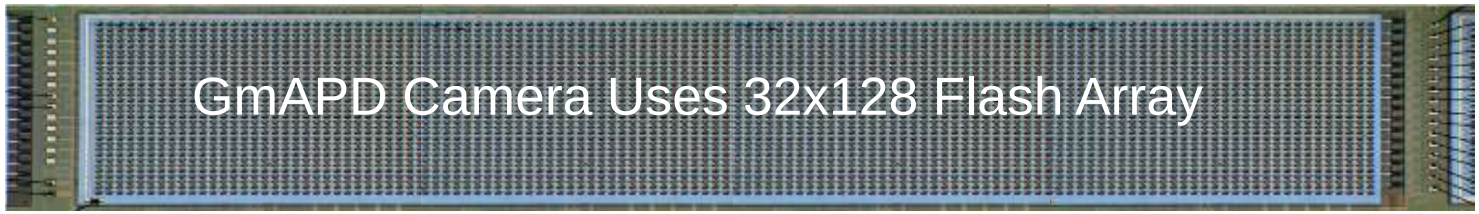
Yes – Commercial Geiger mode technology is designed to work in daylight (solar) conditions with a minimal decrease in performance.

Years of proven performance in real world operations and applications

How Does it Work?

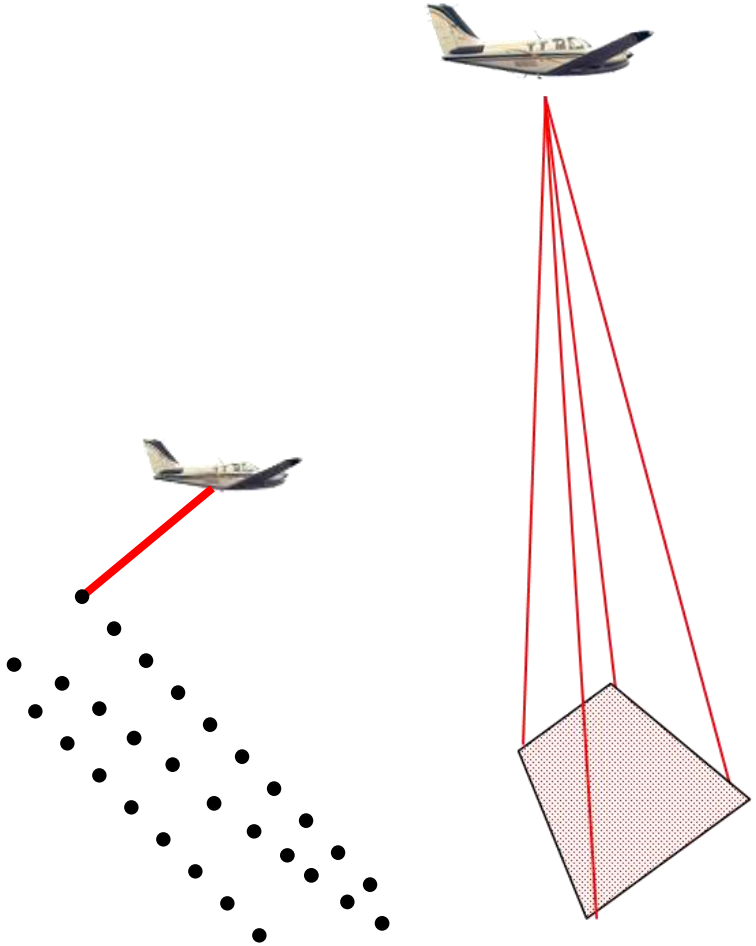
- Avalanche Photo Diode Array (4096 detectors)
- Photon counting device (Low light sensitivity enables use of low power laser)
- Capable of sub-ns operation (enables higher vertical measurement precision and vertical resolution)
- Supports high laser Pulse Repetition Frequencies (PRF)

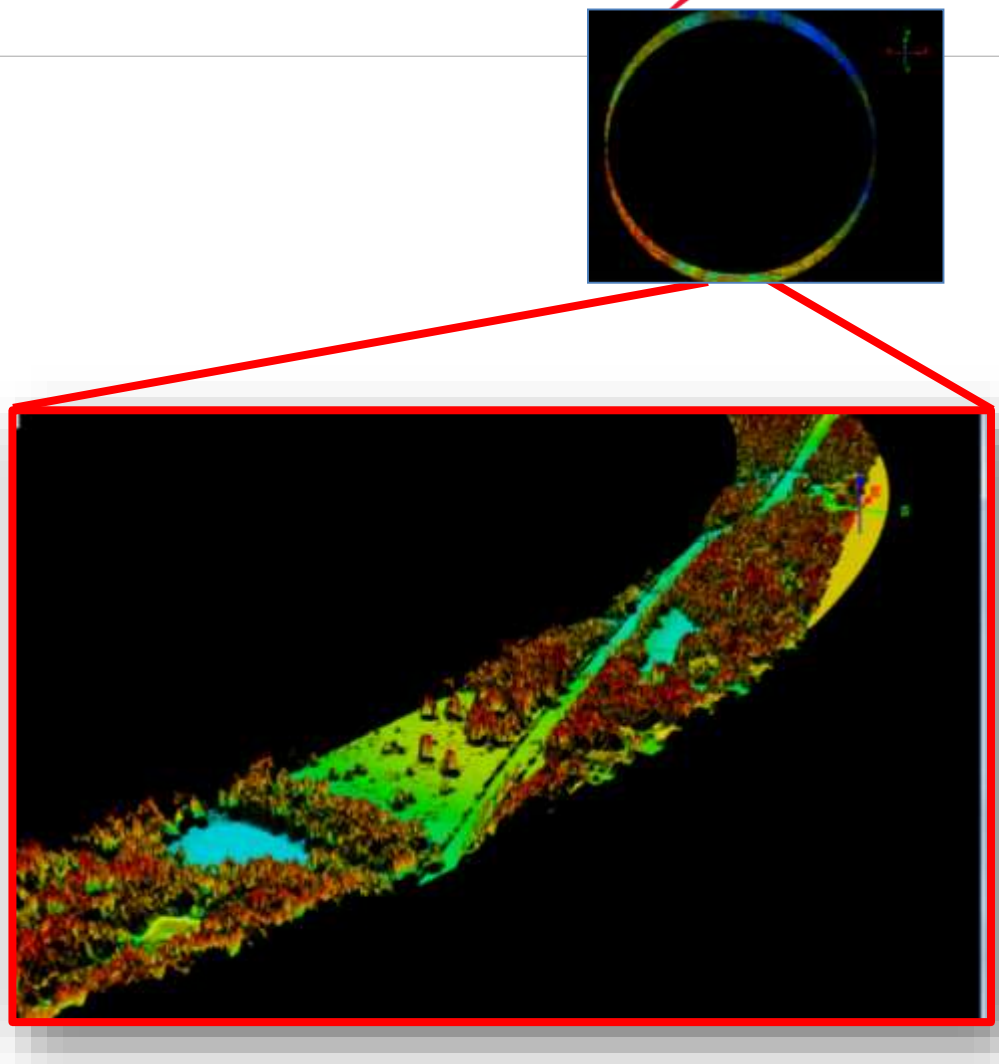




Think of it as a 3D camera

What makes Geiger Mode so Different





Geiger-mode sensors sample the same spot on the ground multiple times

Existing Technology

High power, low sensitivity

Technology Comparison

Linear LiDAR

- Single Pulse
- Single measurement
- Low sample rate

Collects at required resolution

Geiger-mode LiDAR

Low Power, High Sensitivity

Technology Comparison

Geiger LiDAR

- Large array collection
- Collection from multiple angles
- High sample rate
  (204 million samples per second)

Collects (oversamples) at high resolution

Collection Simulation Comparison (8ppm)

Direct Comparison

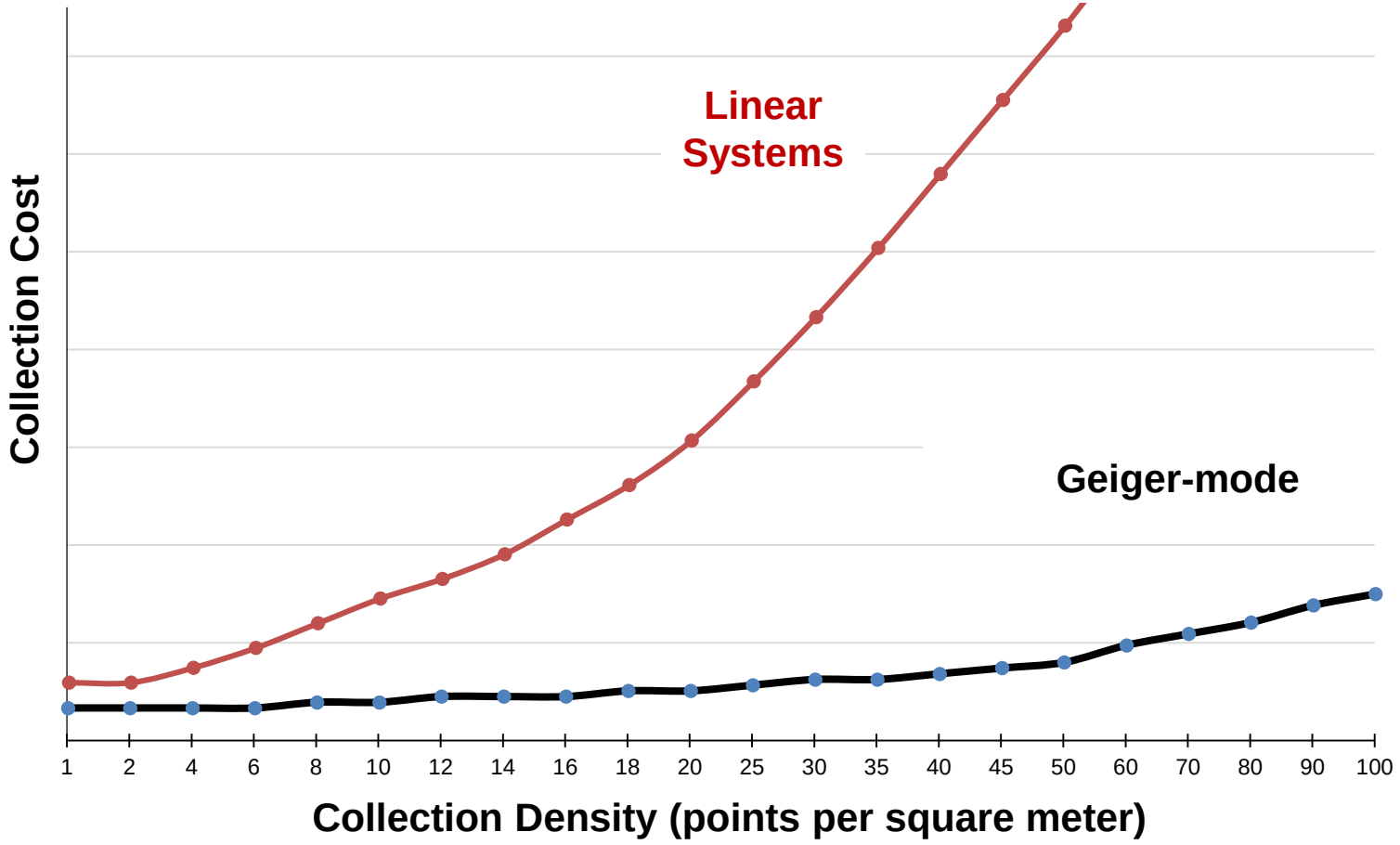
Superior Performance

	Linear LiDAR	Geiger LiDAR
Density (points per meter)	8	8
Instantaneous Coverage Rate (mi2/hr)	50	850
RMSEz (cm)	9.25	9.25
Altitude (AGL ft)	3,200	27,000
Swath Width (ft)	3,300	16,000
Ground Speed (kts)	90	290

17x

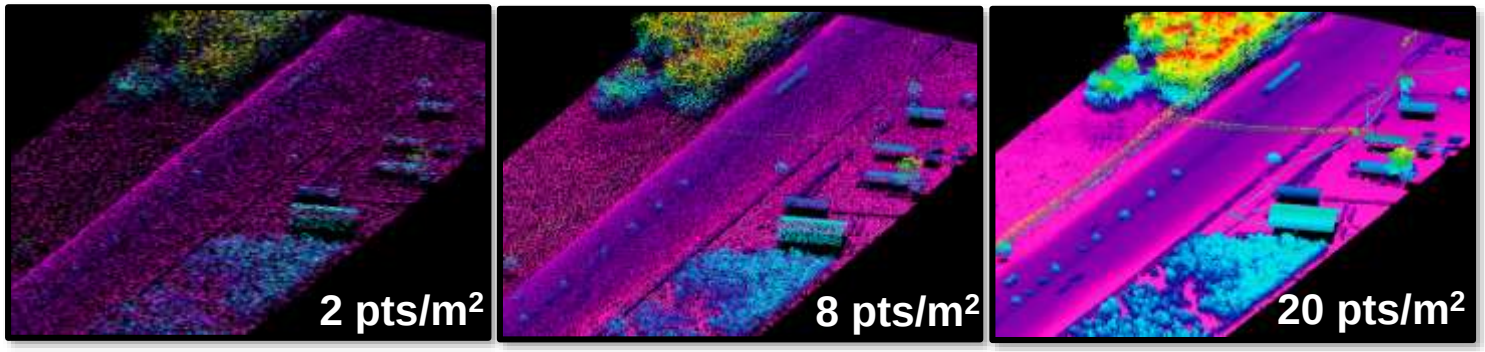
Efficiency gains keep costs down at higher collection densities

Reduced Cost at Higher Resolutions



Higher the resolution greater the payback

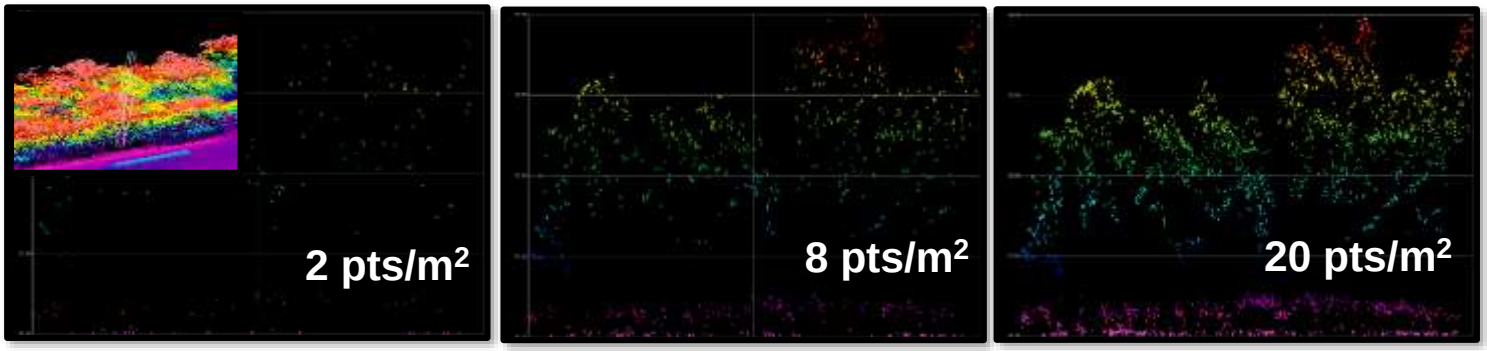
So, Why do higher densities matter?



Infrastructure details better defined

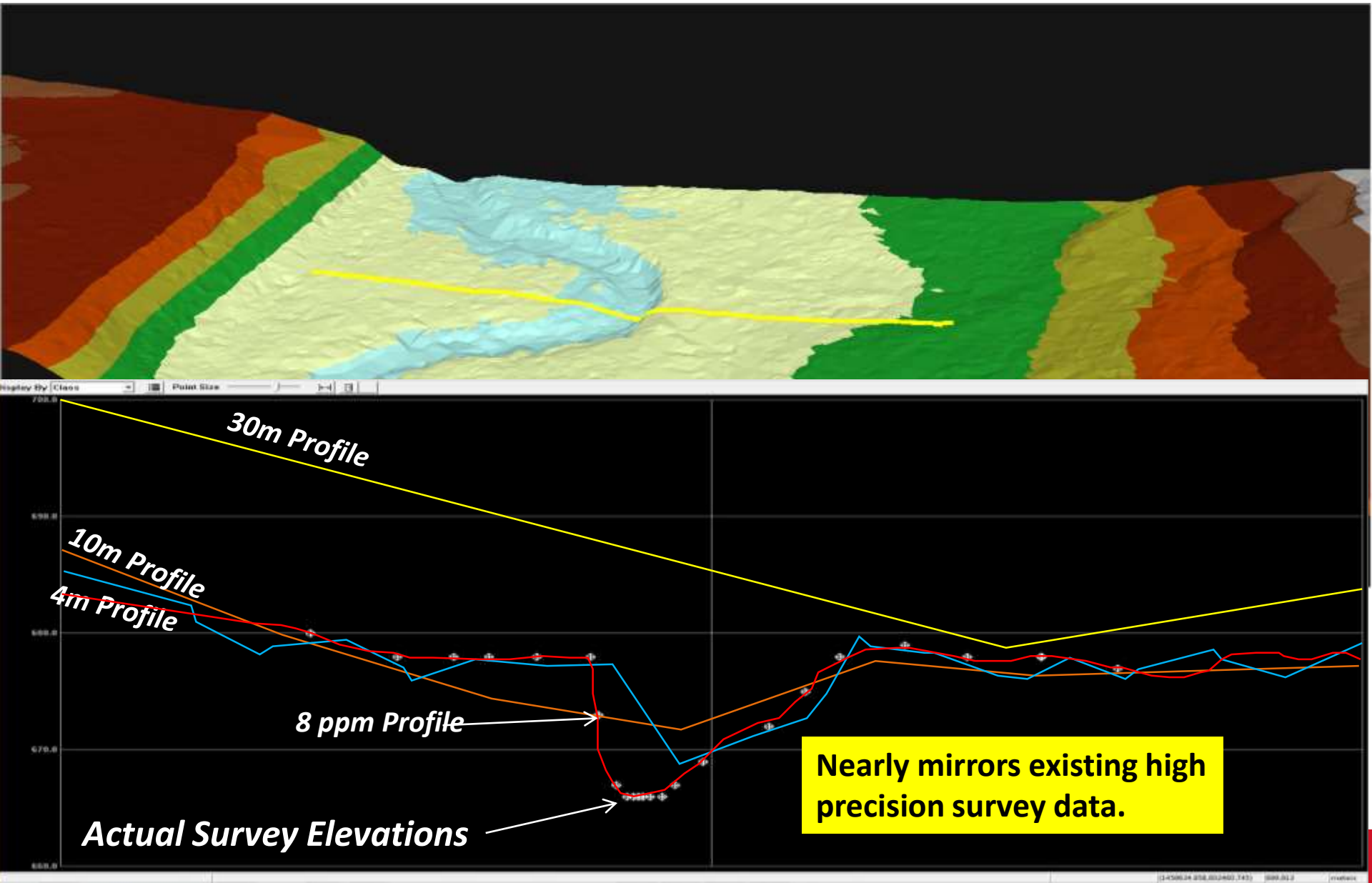
Improves:

- **Terrain accuracy**
- **Obscure object detection**



Higher definition and improved foliage penetration

Higher density improves terrain definition/accuracy

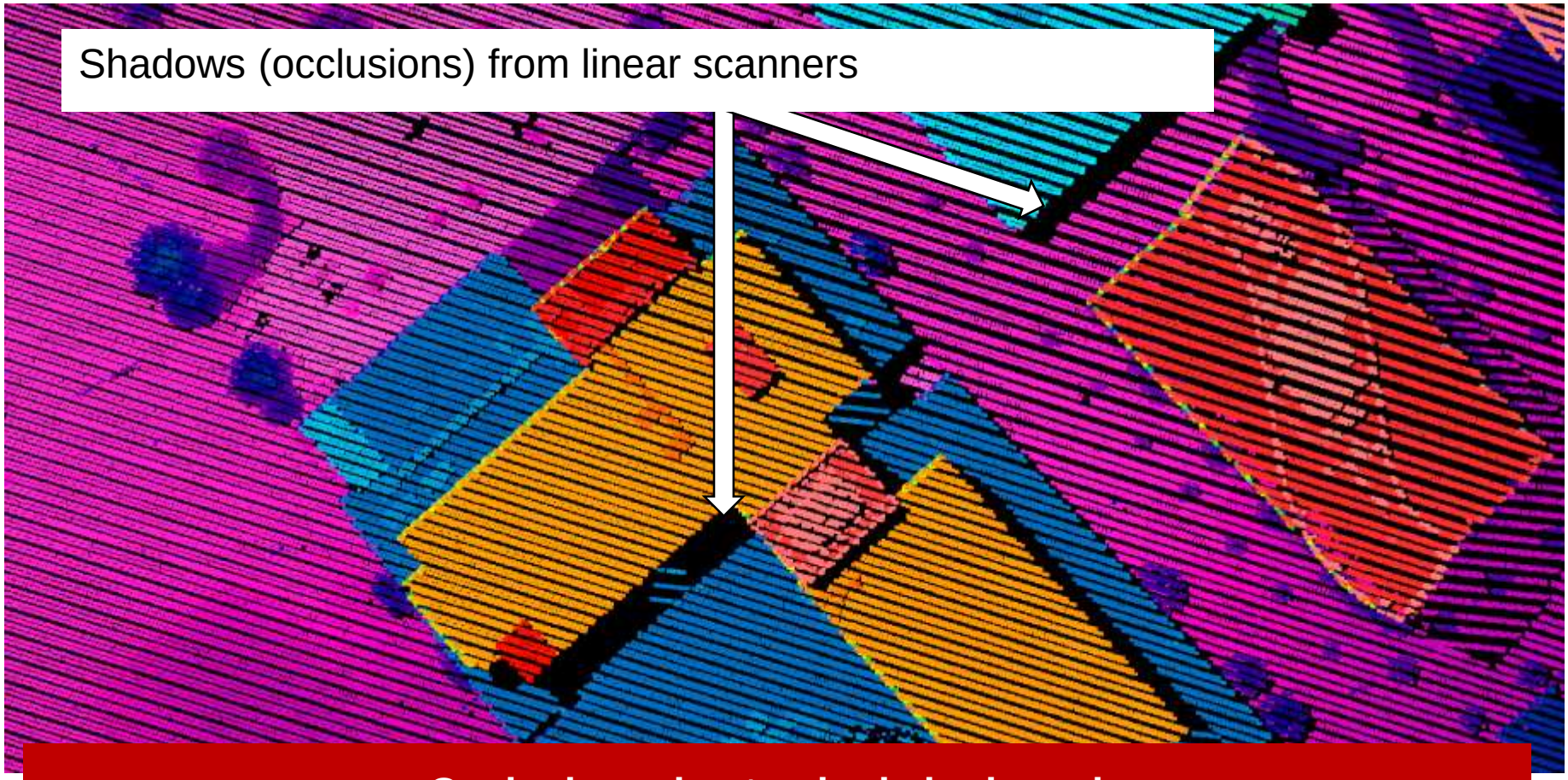


Linear Technology Limitations

- Inefficient and costly at high resolutions
- Has inherent data occlusions
- Foliage penetration is limited by single sample approach
- Limited-range resolution (target separation)

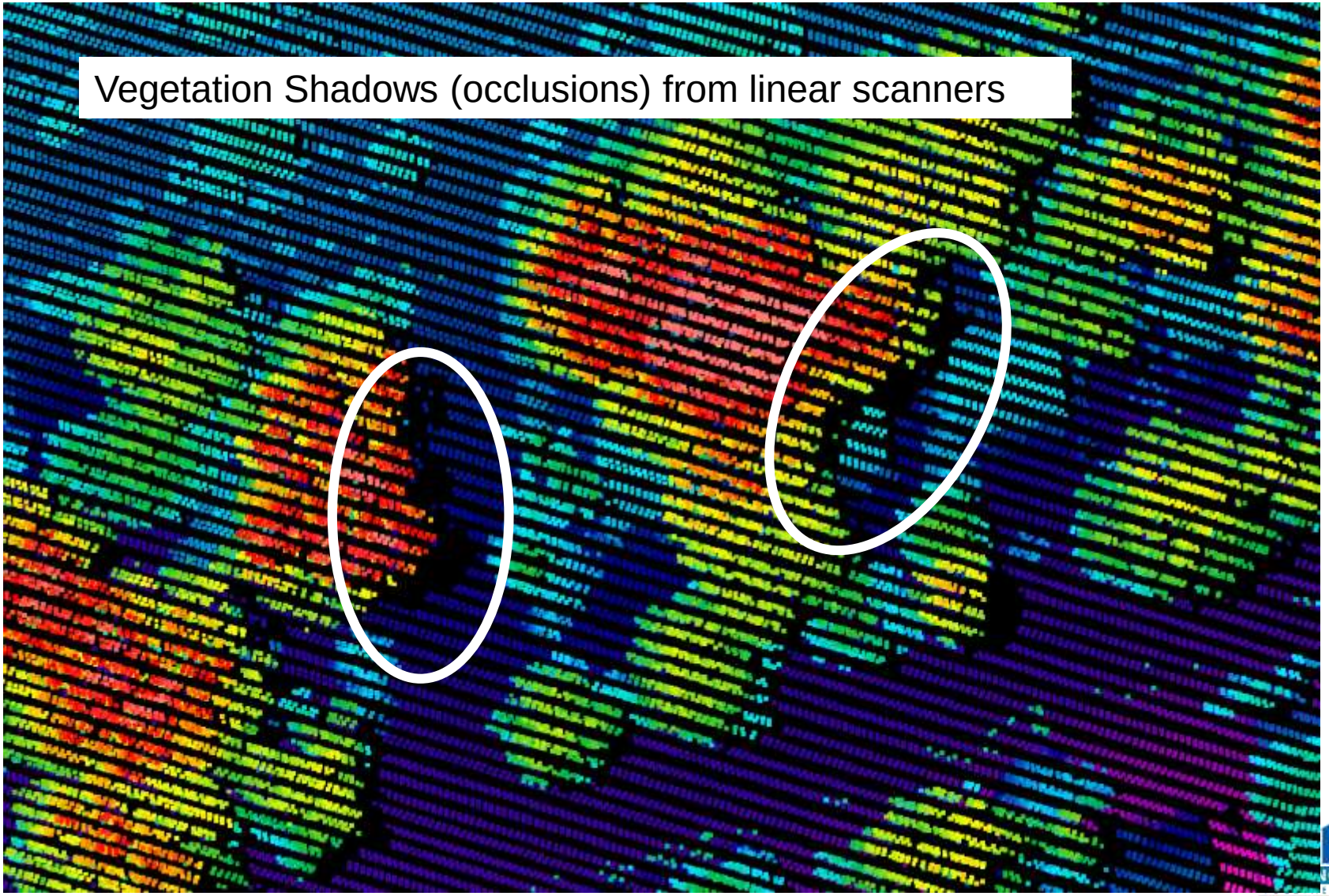
Limitations with single sample/look systems

Linear Artifact Example1

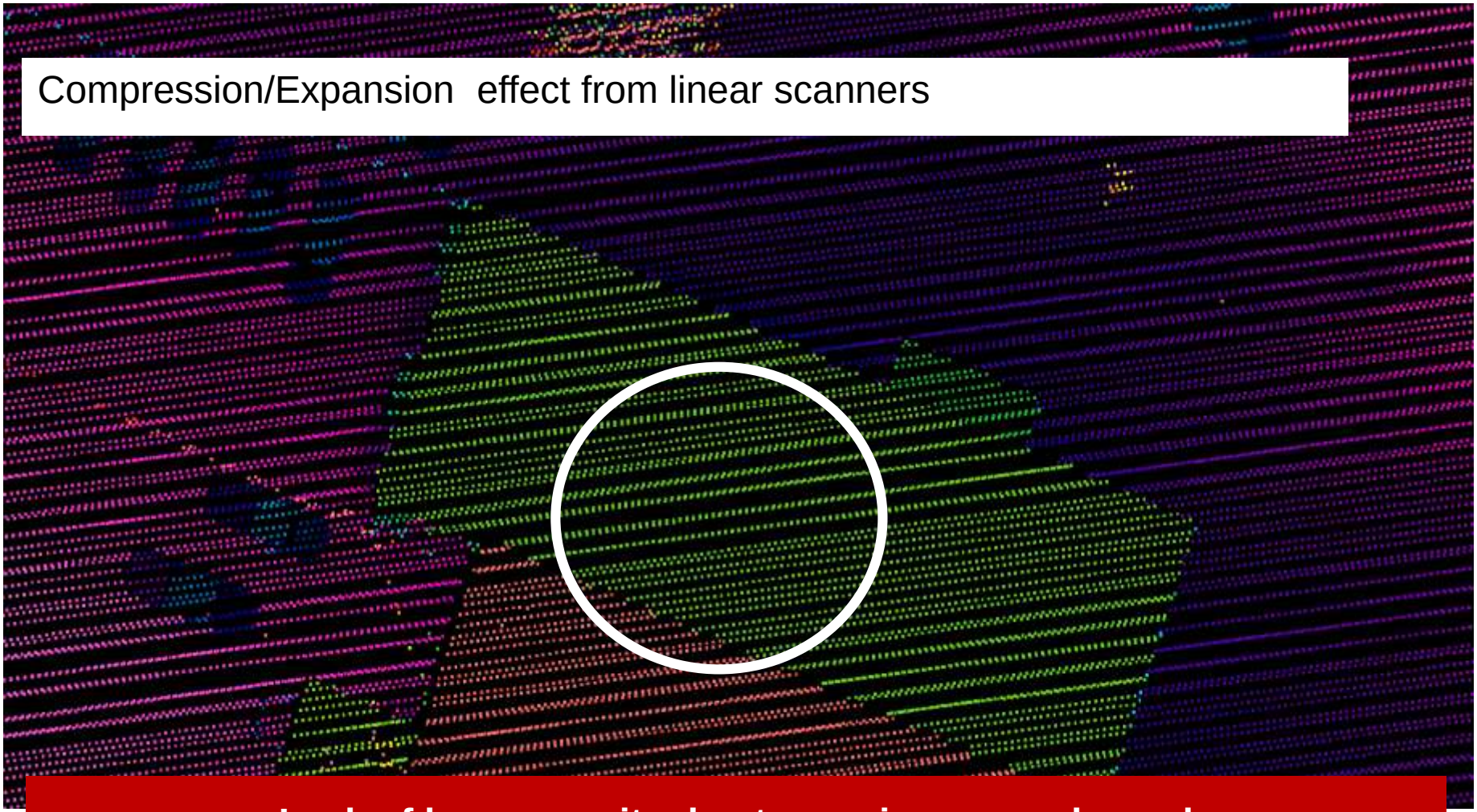


Occlusions due to single look angle

Linear Artifact Example 2

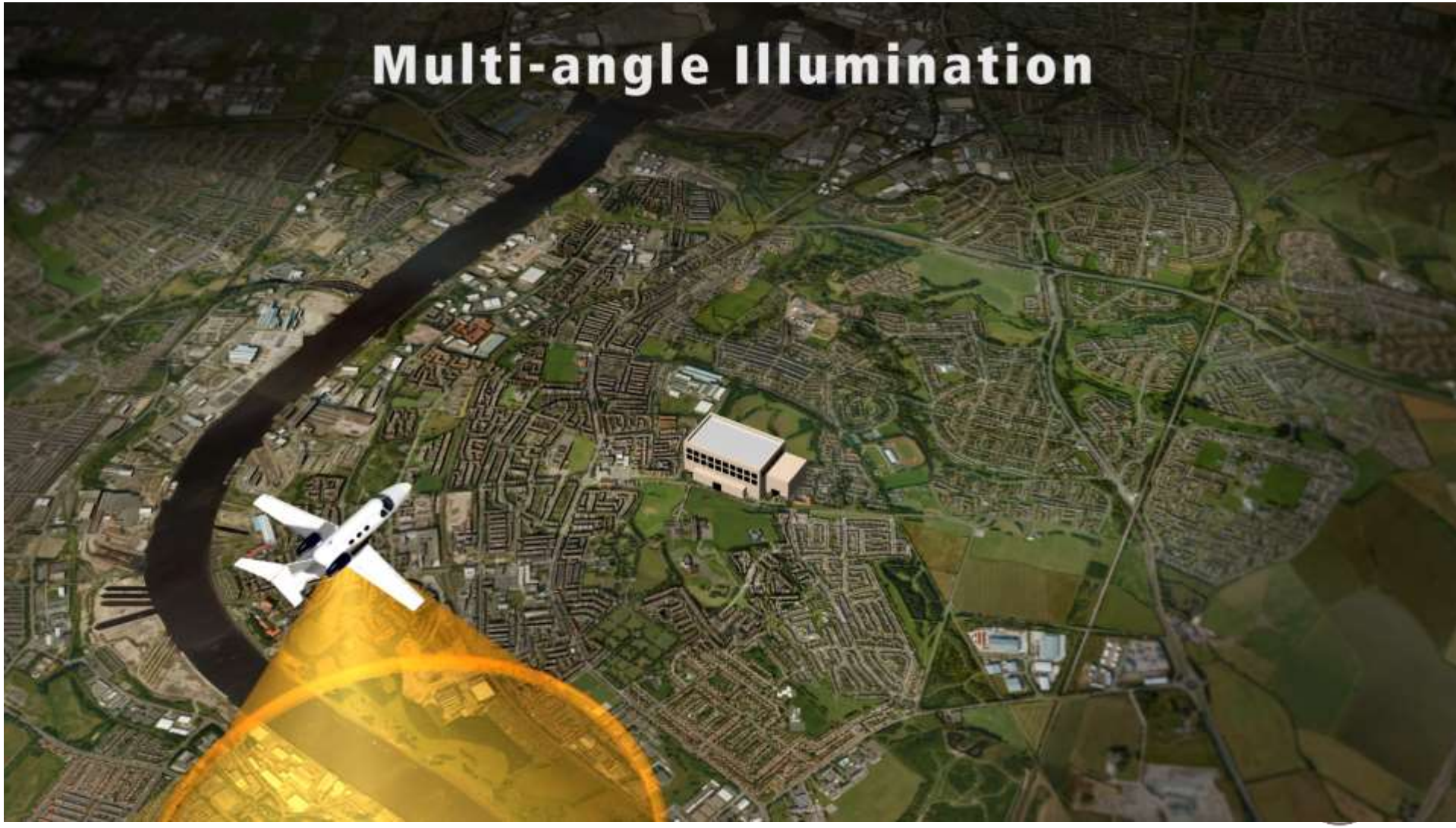


Linear Artifact Example 3



Lack of homogeneity due to varying groundspeed

Simulation: Multi-Look and Oversampling



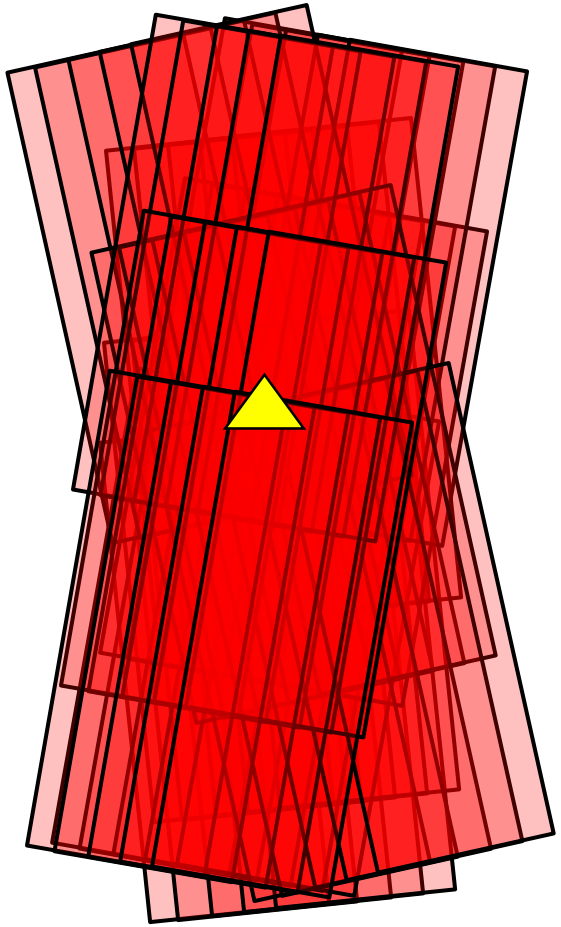
Multi-look approach

- 4096 measurements per laser flash
- 50,000 flashes per second
- Approx= 205 million elevation measurement per second

- Every spot illuminated 1000's of times

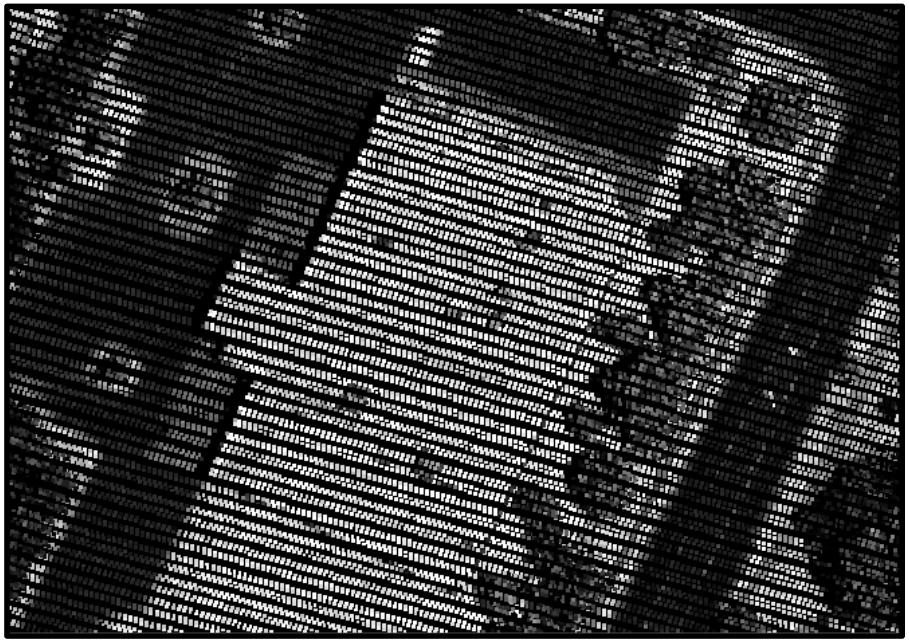
- The dozens of photon detections are processed to determine the real objects

- Programmable Forward/Sidelap

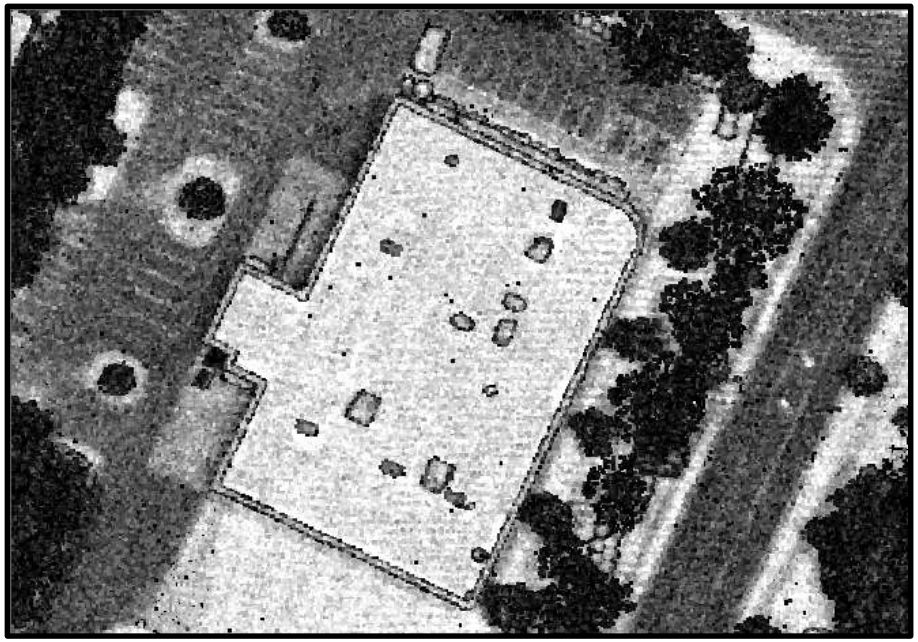


Results in higher quality/detail

Linear-mode



Geiger-mode



Geiger data provides increased detail

Highly homogenous, high-density, accurate data

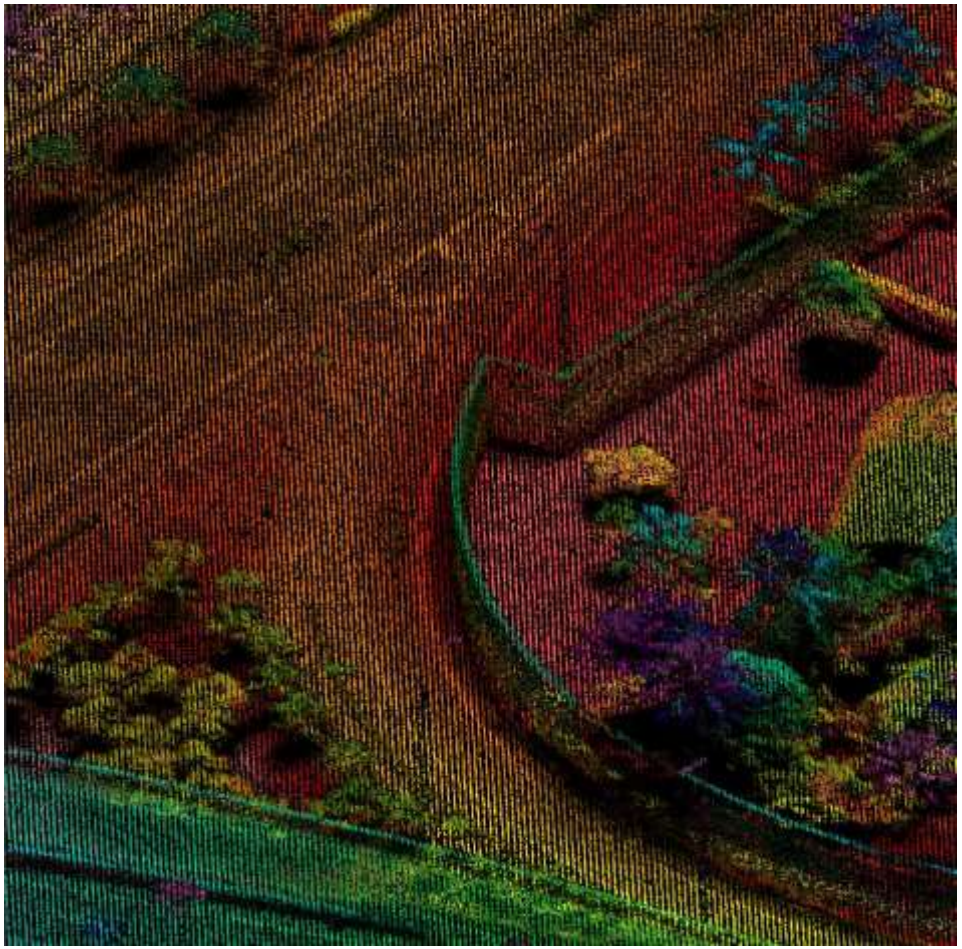
Benefits of Geiger-mode LiDAR Resolution Comparison

8PPM

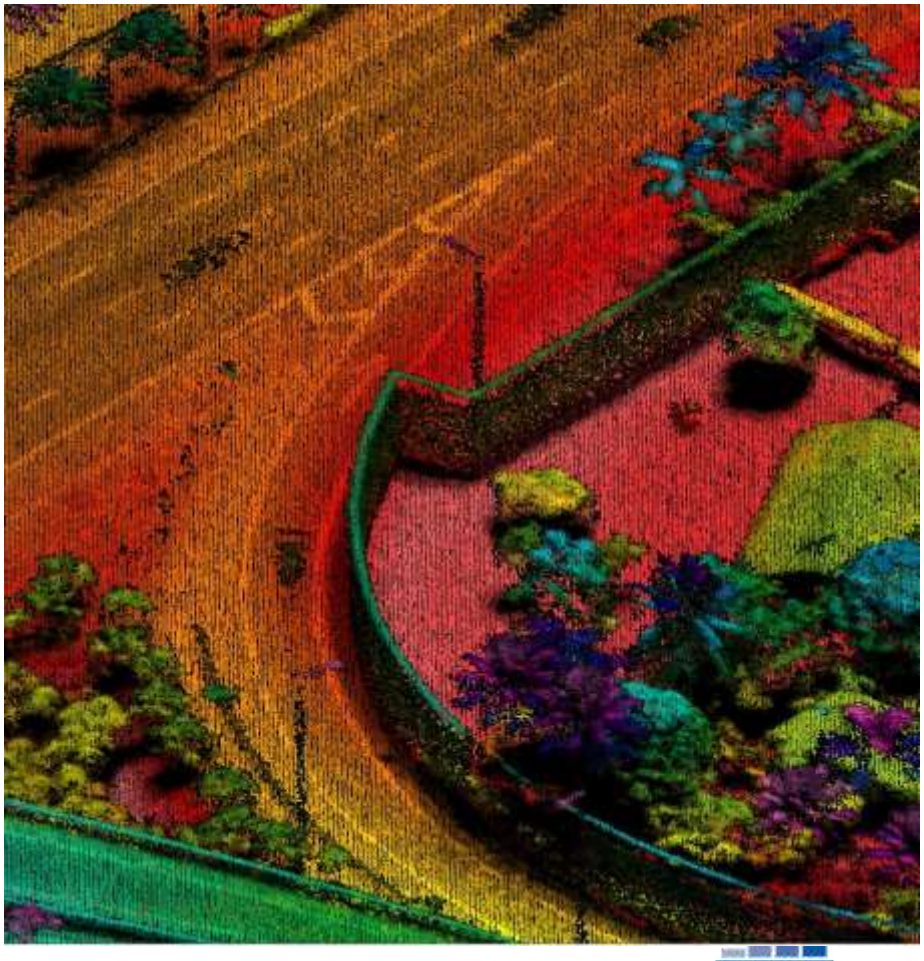
20PPM

Benefits of Geiger-mode LiDAR Resolution Comparison

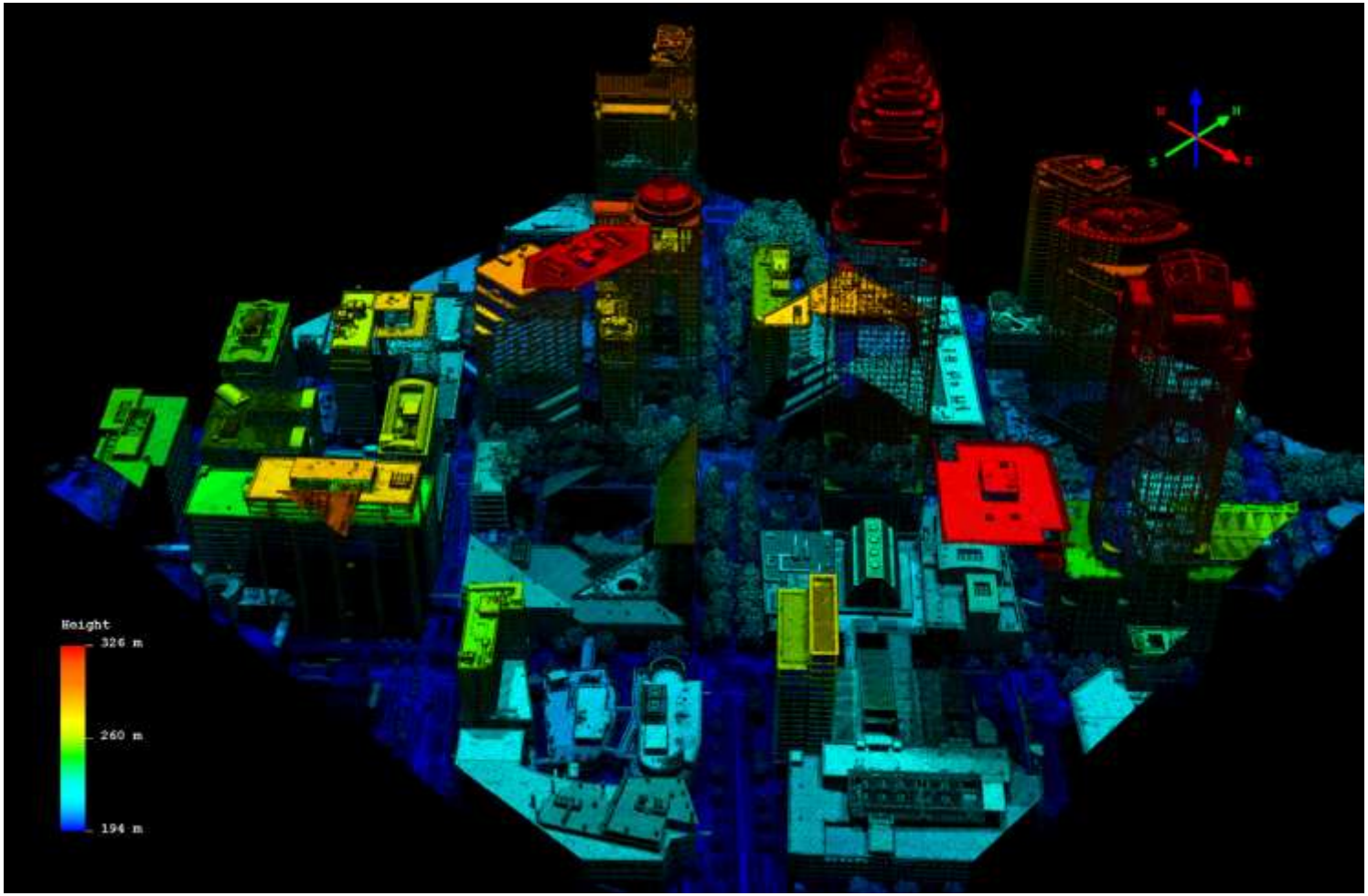
8PPM



20PPM

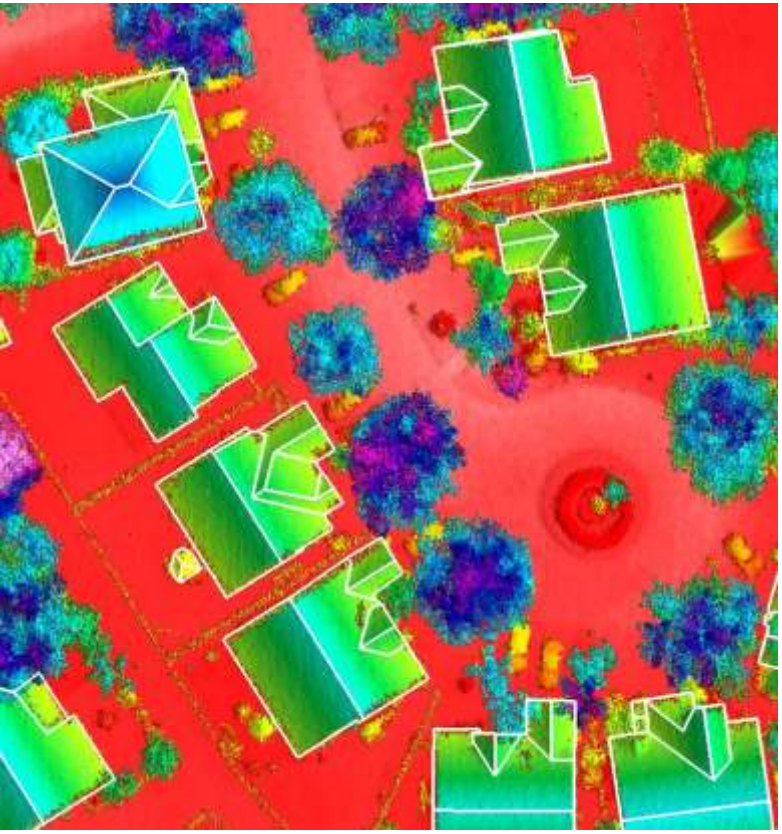


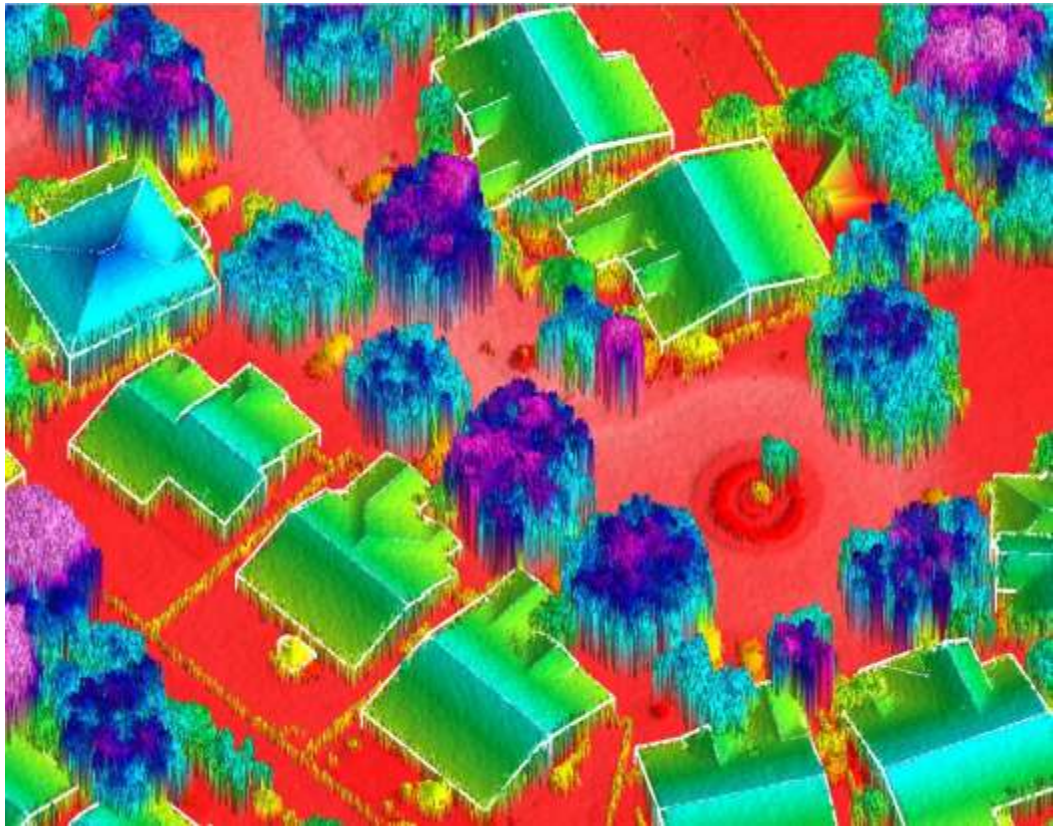
Urban Planning Charlotte NC CBD (20PPM)



Uses: Urban Planning / Flood / Infrastructure / security

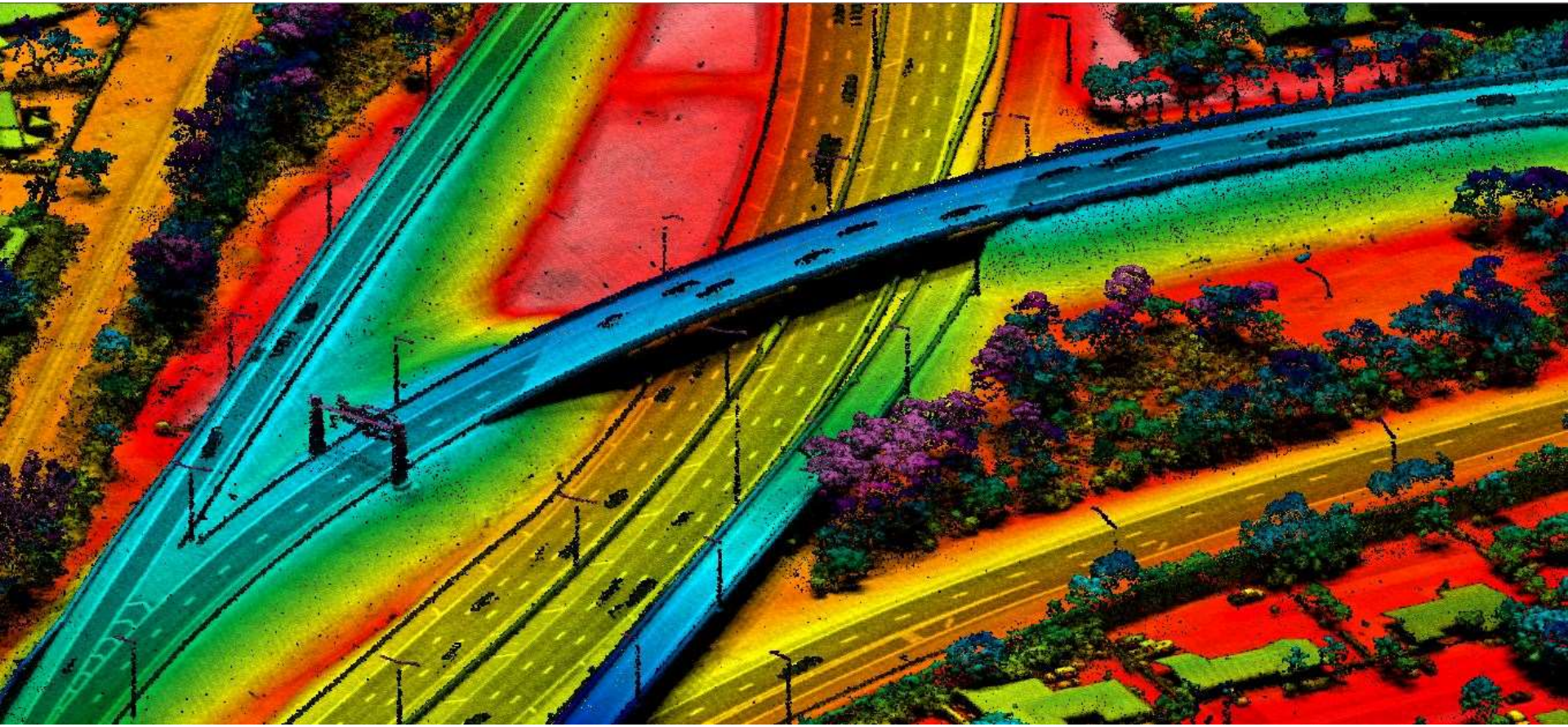
Automated 2D/3D Urban Model Extraction (8 PPM)





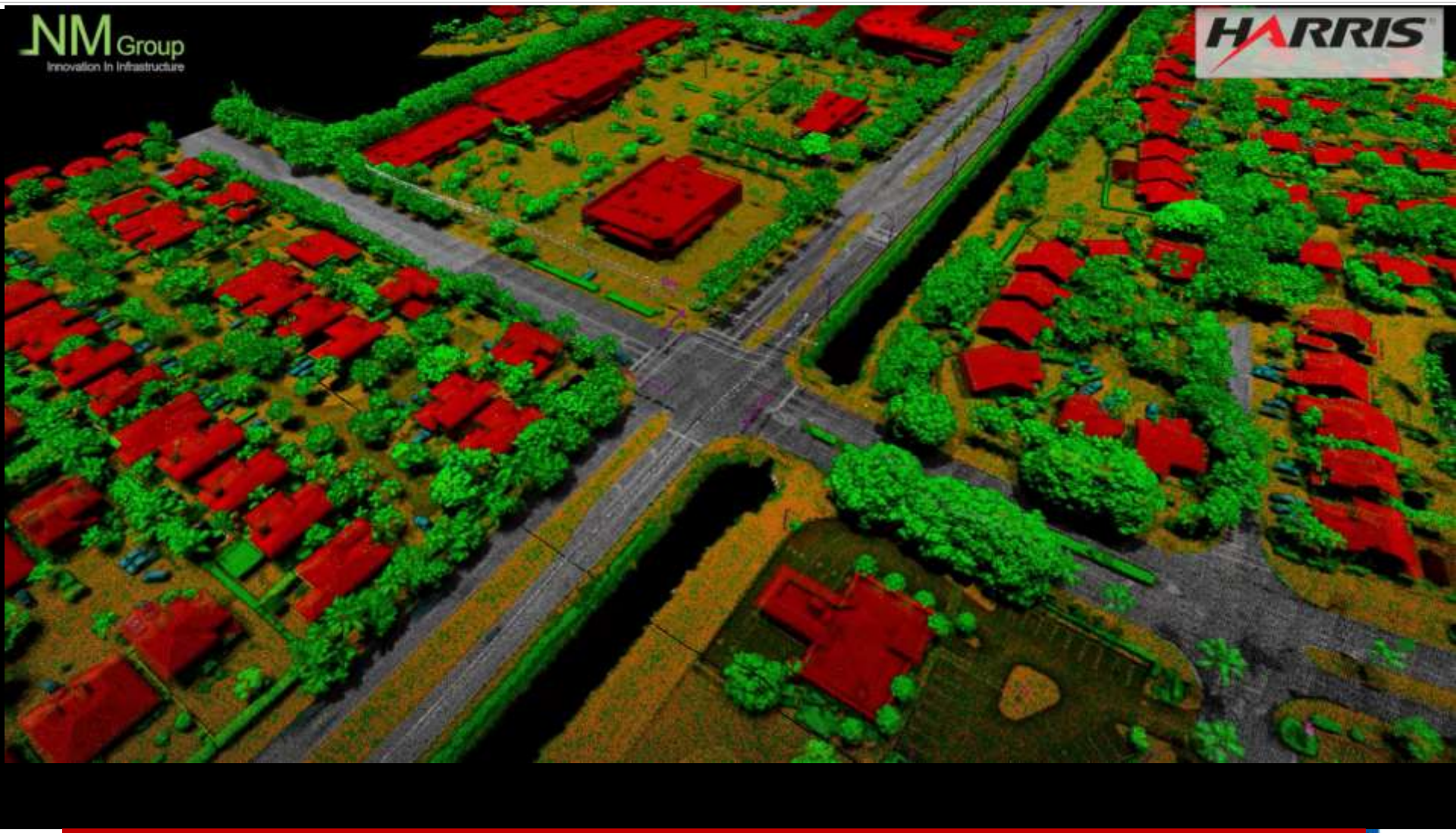
Higher density and homogenous data improve automation

Transportation



Uses: DOT mapping / asset management / autonomous vehicles

Utilities



High resolution from high altitude wide area coverage

Néhány hasznos olvasnivaló

http://support.geocue.com/geiger-mode-lidar-workflow-review/

http://support.geocue.com/wp-content/uploads/2016/08/Geiger-Mode-LIDAR-Workflow.pdf

http://www.lidarmap.org/wp-content/uploads/2017/01/Free-Report-Future-of-LiDAR-2017.pdf

https://calval.cr.usgs.gov/wordpress/wp-content/uploads/GM-SPL-evaluation_JACIE2016_v3.pdf

http://www.mdpi.com/2072-4292/8/9/767

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