

Optech Titan Multispectral Lidar System

High Precision Environmental Mapping

Applications

- Topographic mapping
- Land cover classification
- Seamless shallow water bathymetry
- Environmental modeling
- Forest inventory and vegetative classification
- Natural resource management
- Disaster response



A new era in fused sensor performance and feature identification!

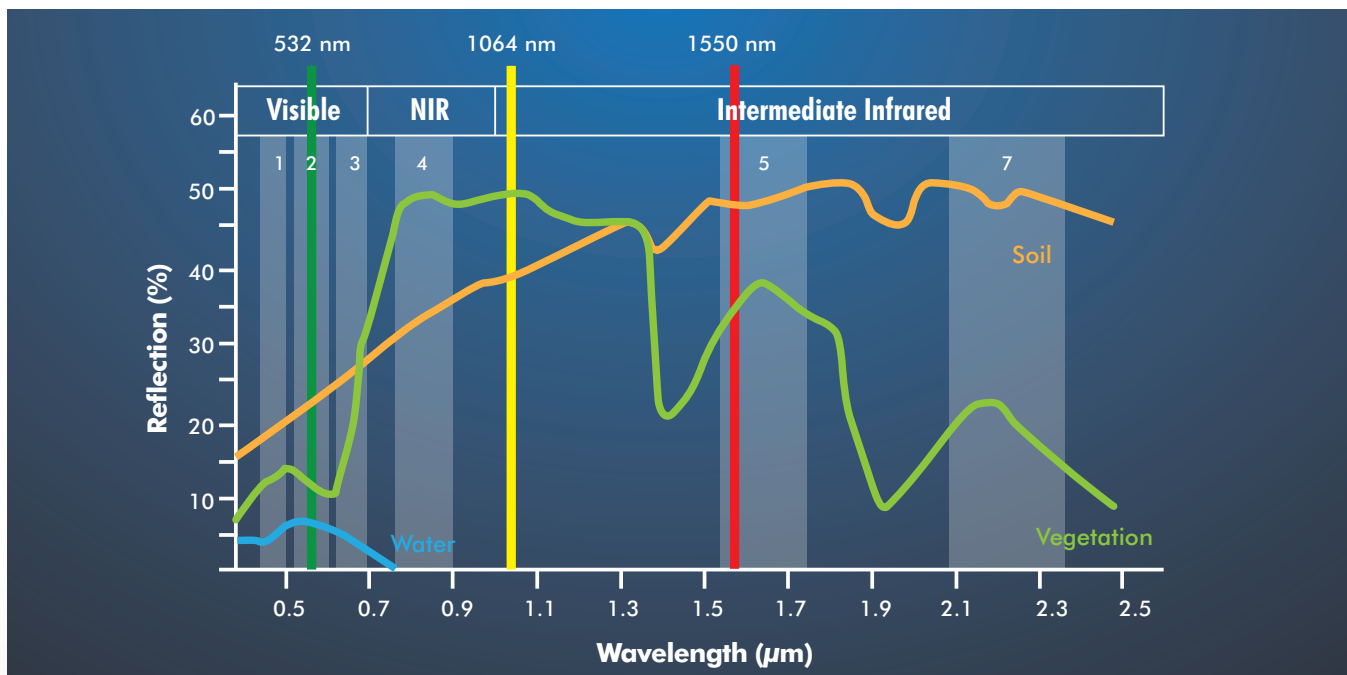
The Optech Titan is the world's first multispectral airborne lidar sensor, a revolutionary sensor that includes three active imaging channels of different wavelengths for day or night mapping of complex environments. Capable of capturing discrete and full-waveform data from all three channels, Titan has a combined ground sampling rate approaching 1 MHz that results in ultra-dense coverage. The sensor includes full gyro-stabilization compatibility and a fully-programmable scanner for significantly boosting point density with narrower FOVs. Passive imagery support is available via fully-embedded high-resolution metric mapping cameras, including multispectral, thermal, NIR and RGB options.

Active multispectral sensing: A revolution for lidar

An extremely versatile sensor, Titan is the first commercial multispectral active imaging sensor that enables a broad spectrum of application capability in a single sensor design. By incorporating multiple wavelengths, Titan is just as capable performing high-density topographic mapping as it is doing shallow water bathymetry, vegetation mapping or even 3D land classification.

Materials such as foliage, asphalt and soil reflect or absorb different wavelengths of light in different

ways – foliage strongly reflects near-infrared light but absorbs visible green light, whereas soil responds significantly differently to the same wavelengths. With three independent channels, one for each wavelength, operators can now compare the intensity variations of various surface targets to assist in materials differentiation. No longer is lidar restricted to simple coordinate measurements. Titan opens the door for multispectral active imaging of the environment, day or night.



Independent normalized lidar intensity images can be generated for each Titan wavelength



New and improved applications served by Titan include:



3D land cover classification:

Significantly improve land cover classification accuracies with 3D multispectral intensity analysis



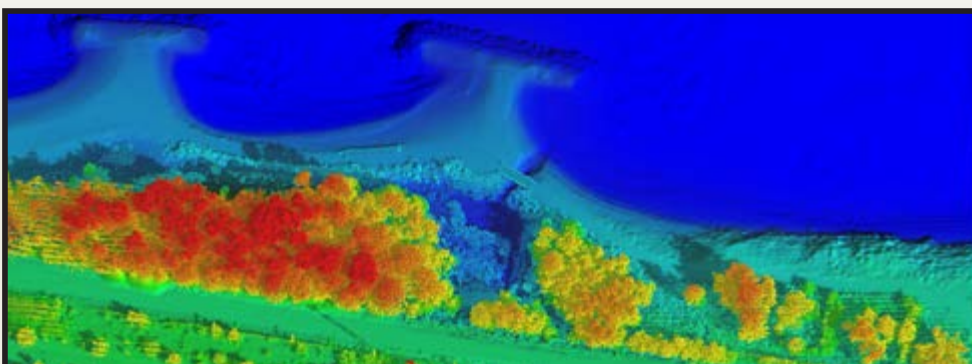
Vegetation mapping:

Map vegetative differences for environmental, forestry and agricultural applications day or night, with high precision and accuracy



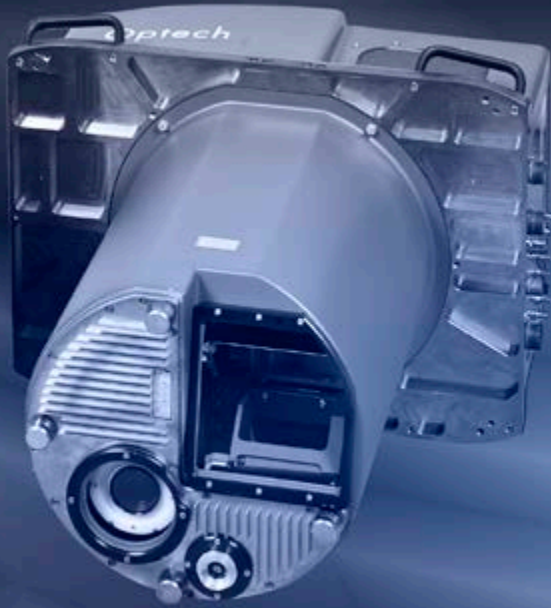
Shallow-water bathymetry:

Collect seamless data sets across the land-water interface with Titan's water-penetrating green channel and surface-detecting NIR channels for shallow water bathymetry



Dense topography:

Achieve extreme point density with Titan's 900 kHz pulse repetition frequency, 210 Hz effective scanner rate, and gyro-stabilized sensor configuration



A New Era has Begun!

Titan enables the previously impossible with innovative hardware, software and productivity enhancements

- Three independent active imaging channels that support 532, 1064, and 1550 nm wavelengths for multispectral mapping of the earth's surface, day or night
- A high-resolution "green" channel that ensures high point density for shallow water mapping applications
- Narrow pulse widths, state-of-the-art receiver and timing electronics guarantee the highest range precision possible for maximum data quality
- A fully programmable scanner enables huge increases in point density at narrower FOVs for maximum target resolution and detail over competing sensors
- A 29 MP high-resolution, fully electronic QA camera provides passive imagery support.
- Optional embedded 80 MP RGB orthometric camera with forward motion compensation enhances image quality and improves classification. Also available with imbedded multispectral, thermal or NIR sensor options

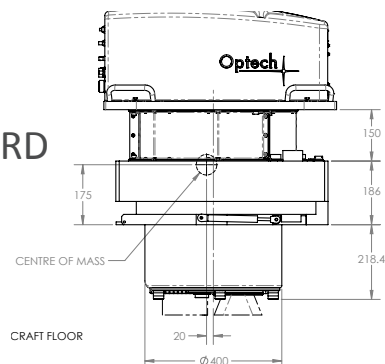


- Realtime XYZI point display, available exclusively with Optech FMS, enables independent channel visualization during flight for true-coverage verification and collection monitoring
- Optional sensor gyro-stabilization, fully automated with Teledyne Optech's comprehensive Flight Management System (FMS) for effortless operation and consistent point distribution
- The latest in tightly-coupled inertial and Virtual Reference System processing technology enables steep turns, extended GPS baselines, and the elimination of remote base stations
- Optional CenterPoint RTX provides global coverage of centimeter-level real time position accuracy, a critical consideration for bathymetric mapping in remote locations (<0.1 m XY)
- Powerful Optech LMS lidar processing software automates sensor calibration, maximizes laser point accuracies and quantifies project accuracy deliverables
- An Optech LMS software extension supports water attenuation corrections for bathymetric applications

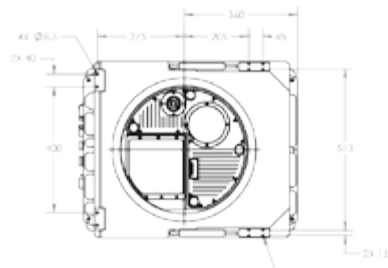
Optech Titan Specifications

Parameter	Specification
Laser Configuration	
Channel 1	1550 nm IR
Channel 2	1064 nm NIR
Channel 3	532 nm visible
Beam divergence	Channel 1 & 2: ≈ 0.35 mrad (1/e) Channel 3: ≈ 0.7 mrad (1/e)
Laser classification	Class IV (US FDA 21 CFR 1040.10 and 1040.11; IEC/EN 60825-1)
Operating altitudes ^{1,2}	Topographic: 300 - 2000 m AGL, all channels Bathymetric: 300 - 600 m AGL, 532 nm
Depth performance ^{1,4}	D_{max} (m) $\approx 1.5/K_d$, where K_d is the diffuse attenuation coefficient of the water
Effective PRF	Programmable; 50 - 300 kHz (per channel); 900 kHz total
Point density ⁴	Bathymetric: >15 pts/m ² Topographic: >45 pts/m ²
Scan angle (FOV)	Programmable; 0 - 60° maximum
Effective scan frequency	Programmable; 0 - 210 Hz
Swath width	0 - 115% of AGL
Horizontal accuracy ^{2,3}	$1/7,500 \times$ altitude; 1σ
Elevation accuracy ^{2,3}	$< 5 - 10$ cm; 1σ
Laser range precision ⁵	< 0.008 m; 1σ
Camera Configuration	
Q/A camera	29 MP RGB/CIR; 5.5 μ m pixel; 6,600 x 4,400 pixels; 0.5 sec/frame
Medium format camera (optional)	80 MP RGB/CIR; 5.2 μ m pixel; 10,320 x 7,760 pixels ; 2.5 sec/frame

STARBOARD



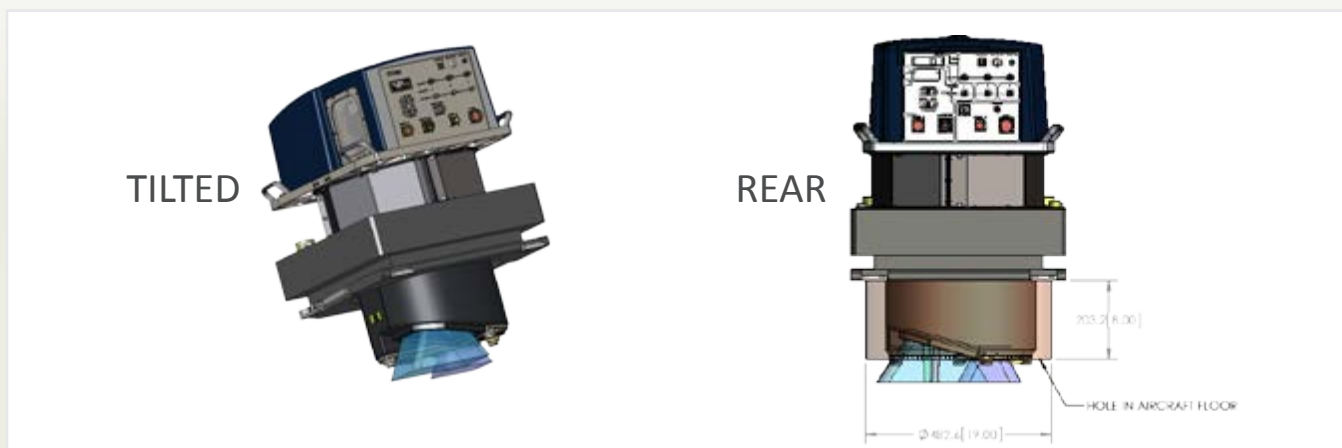
BOTTOM



Optech Titan Specifications *continued*

Parameter	Specification
Sensor Configuration	
Gyro-stabilization	SOMAG GSM3000/4000 compatible (optional)
Roll compensation	Programmable; $\pm 5^\circ$ at 50° FOV; increasing with decreasing FOV from 50°
Position and orientation system	POSAV AP50 (OEM); 220-channel dual frequency GNSS receiver
Inertial measurement unit	ITAR-free FMU-301 (IMU-46)
Flight management system	Optech FMS with real-time point display
Minimum target separation distance	<1.0 m (discrete)
Range capture	Up to 4 range measurements for each pulse, including last
Intensity capture	Up to 4 range measurements for each pulse, including last 12 bit dynamic measurement and data range
Data storage drives	Removable solid state drive SSD (SATA II)
Waveform capture	12 bit, 1 Gs/sec (optional)
Power requirements	28 V (continuous); 800W (nominal); 30A
Operation temperature	0° to $+35^\circ\text{C}$
Dimensions and weight	Sensor head: 850 x 500 x 680 mm, ≥ 71 kg Control rack: 485 x 535 x 545 mm, ≥ 45 kg

- ¹ 20% reflective surface or bottom. **Note:** Vegetation and other targets may result in a lower response in the green channel, as compared to the IR channels. Lower operating altitudes may be required to ensure measurable returns from low reflectance targets at 532 nm.
- ² Dependent on selected operational parameters using nominal 50° FOV in standard atmospheric conditions (i.e. 23 km visibility)
- ³ Valid for 1064 nm and 1550 nm channels on above-water targets only
- ⁴ Assumes 400 m AGL, 60 m/s aircraft speed, 40° FOV
- ⁵ Under Teledyne Optech test conditions





Multi-wavelength lidar color composite

Image courtesy of Laserdata GmbH

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