PHOENIX LiDAR SYSTEMS

RANGER ULTRA SERIES

LEARN MORE

RANGER-U160

VTOL UAV HELICOPTER AIRPLANE

The **RANGER-U160** adds range and density capabilities to an already unrivaled mapping system. Featuring the Riegl VUX-160[23] with a unique forward and rear looking field of view was designed to minimize laser shadowing and provide a high level of detail on vertical surfaces. Pulse rates up to 2400 kHz and the ability to be carried by a variety of aircraft make this a highly versatile system that is suitable for mapping at various scales in order to meet your unique project objectives. The **RANGER-U160** is ideal for corridor mapping applications such as utility, rail and pipeline inspection.

FEATURES

- Exceptional data density with measurement rates up to 2,000,000/s
- 3 facet polygon mirror with -10° back, 0° nadir, and +10° forward for improved detail on vertical structures and surfaces
- Easily mountable to unmanned platforms (UAVs) and to helicopters, gyrocopters, and other small piloted aircrafts
- 100° lateral field of view for single pass corridor coverage

QUICK SPECS

ABSOLUTE ACCURACY (1)(2)(3)
1.5 - 3 cm RMSEz @ 120 m

INTRASWATH PRECISION (1)(2)(4)
2 cm RMSDz @ 120 m

EXAMPLE ACQUISITIONS:

UAV

» 120 m AGL , 8 m/s, 100° FOV, 2400 kHz
» Swath Width = 286 m
» Avg. Density = 875 points/m²

HELICOPTER

» 250 m AGL, 60 knots, 100° FOV, 1200 kHz
» Swath Width = 595 m
» Avg. Density = 54 points/m²

(1) Approximate values based on PLS test methods described at: https://docs.phoenixlidar.com/accuracy-standards-and-quantification.
(2) Using a 90° downward field of view.
(3) Expected RMSEz when following the PLS recommended acquisition & processing workflow and ASPRS check point guidelines.
(4) Flat surfaces with >20% reflectivity at the laser's wavelength.

APPLICATIONS

- UTILITIES MAPPING
- RAILWAY TRACK MAPPING
- CONSTRUCTION SURVEYING
- AGRICULTURE & FORESTRY MONITORING
- OPEN PIT MINING OPERATIONS
- OIL & GAS SURVEYING

PLATFORM

* Without Accessories

DIMENSIONS*	27.5 x 11.7 x 22.2 cm
OPERATING VOLTAGE	20 - 28 V DC
POWER CONSUMPTION*	75 W typical
OPERATING TEMPERATURE	0° - 40° C / 32° - 104° F
WEIGHT*	3.4 kg / 7.5 lbs

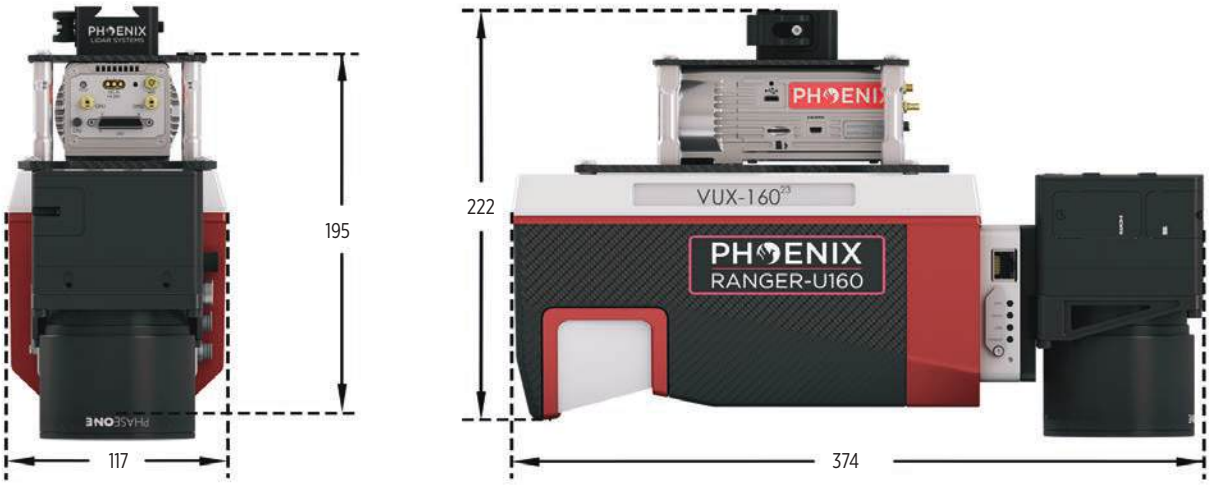
LiDAR SENSOR

LASER WAVELENGTH	1550 nm
RANGE MINIMUM	5 m
RANGE MAXIMUM	980 m @ 20% reflectivity, 300 kHz
PULSE REPETITION RATE	300 - 2400 kHz
SCAN SPEED	50 - 400 lines/second
MAX RETURN COUNT	32
BEAM COUNT	3
BEAM DIVERGENCE	0.4 mrad
HORIZONTAL FIELD OF VIEW	100°
VERTICAL FIELD OF VIEW	20° @ nadir
LASER ACCURACY	0.01 m (1σ @ 150 m)
LASER SAFETY	CLASS 1

NAVIGATION SYSTEM

CONSTELLATION SUPPORT	GPS + GLONASS + BEIDOU + GALILEO
SUPPORTED ALIGNMENT	Kinematic, Dual-Antenna
OPERATION MODES	Real-time, Post-Processed
ACCURACY POSITION	1 cm + 1 ppm GNSS baseline RMS Horizontal
ACCURACY ATTITUDE(5)	
ROLL, PITCH	0.002° RMS
HEADING	0.007° RMS

RANGER-U160 DIMENSIONS (mm)

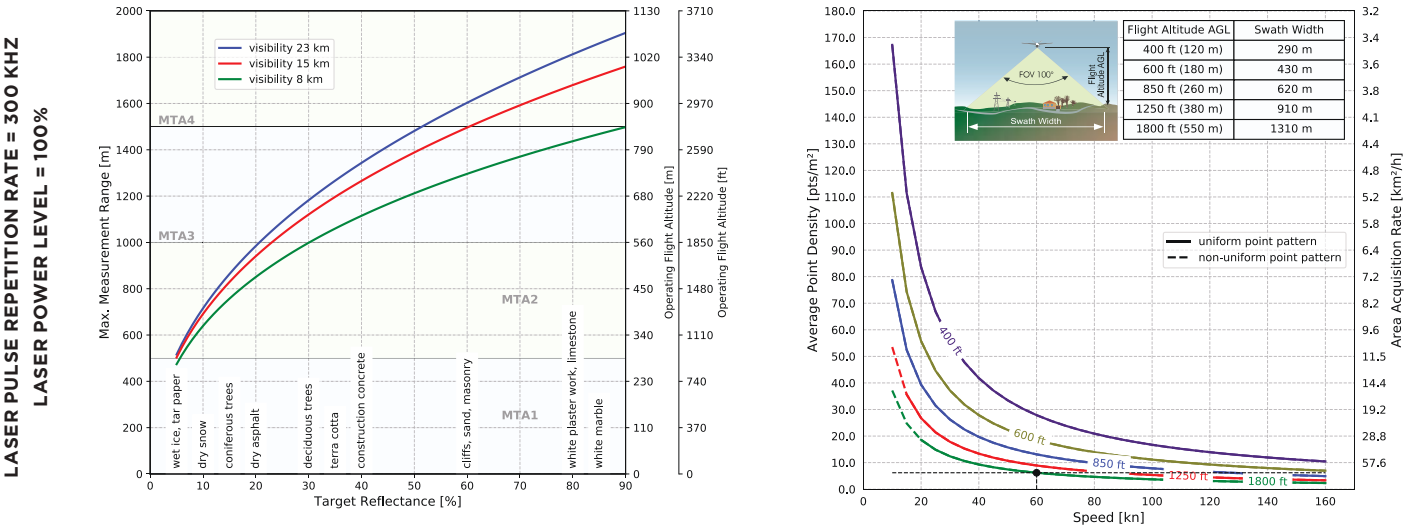


RANGE MEASUREMENT PERFORMANCE

Laser Pulse Repetition Rate PRR [1]	300 kHz	600 kHz	1200 kHz	1800 kHz	2400 kHz
Max. Measuring Range [2] [3] natural targets ρ ≥ 20% natural targets ρ ≥ 60% natural targets ρ ≥ 80%	980 m 1600 m 1800 m	720 m 1180 m 1340 m	520 m 860 m 980 m	420 m 720 m 820 m	370 m 620 m 720 m
Max. Operating Flight Altitude AGL [2] [4] @ ρ ≥ 20% @ ρ ≥ 60%	560 m (1800 ft) 900 m (2950 ft)	400 m (1350 ft) 670 m (2200 ft)	290 m (950 ft) 490 m (1600 ft)	240 m (800 ft) 400 m (1350 ft)	210 m (700 ft) 350 m (1150 ft)
Max. Number of Targets per Pulse [5]	**32**	**24**	**11**	**7**	**5**

1) Rounded average PRR.
2) Typical values for average conditions and average ambient brightness. In bright sunlight, the max. range is shorter than under an overcast sky.
3) The maximum range is specified for flat targets with size in excess of the laser beam diameter, perpendicular angle of incidence, and for atmospheric visibility of 23 km. Range ambiguities have to be resolved by multiple-time-around processing.
4) Considering max. effective FOV 100°, additional roll angle <± 5 deg.
5) If the laser beam hits, in part, more than one target, the laser's pulse power is split accordingly. Thus the achievable range is reduced.
Source: RIEGL Laser Measurement Systems

MAX MEASUREMENT RANGE & POINT DENSITY RANGER-U160



Example: RANGER-U160 at 300,000 pulses/sec, laser power level 100% altitude 1,800 ft AGL, speed 60 kn

Results: point density ~ 6.2 pts/m²

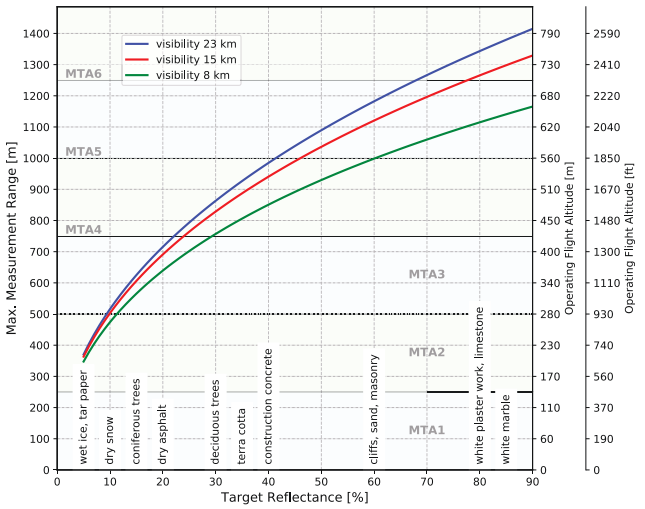
Operating Flight Altitude AGL given for the following conditions:

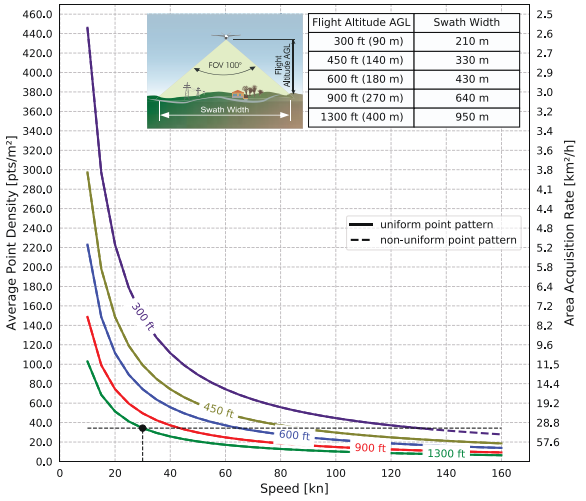
- Ambiguity resolved by multiple-time-around (MTA) processing
- FOV 100°
- Average ambient brightness
- Target size ≥ laser footprint
- Roll angle < ± 5°

(continued next page)

MAX MEASUREMENT RANGE & POINT DENSITY RANGER-U160

LASER PULSE REPETITION RATE = 600 KHZ
LASER POWER LEVEL = 100%

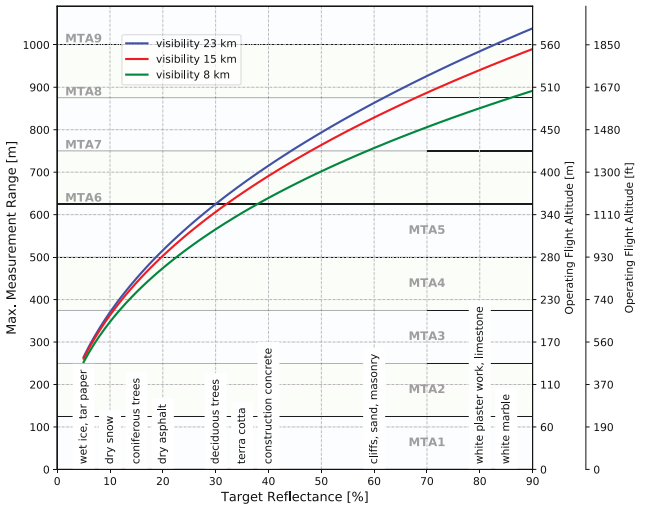


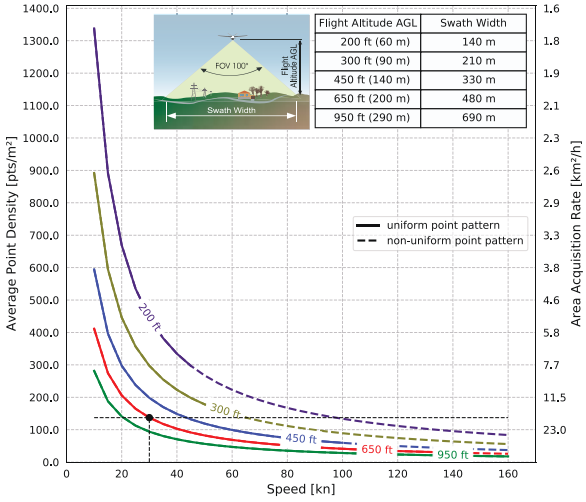


Example: RANGER-U160 at 600,000 pulses/sec, laser power level 100% altitude 1,300 ft AGL, speed 30 kn

Results: point density ~ 34 pts/m²

LASER PULSE REPETITION RATE = 1200 KHZ
LASER POWER LEVEL = 100%

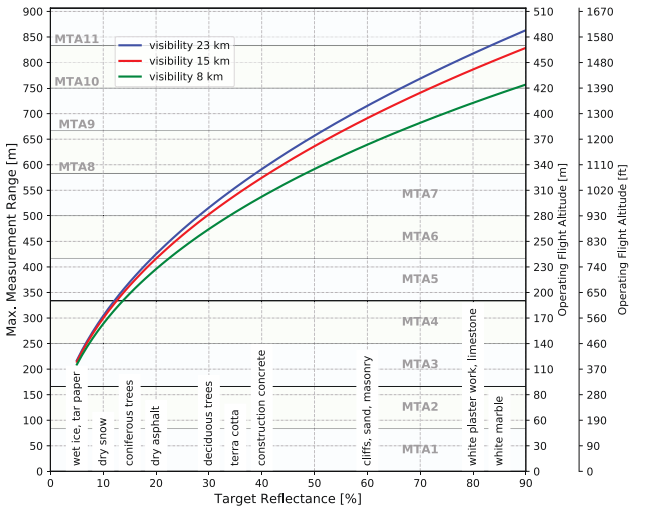


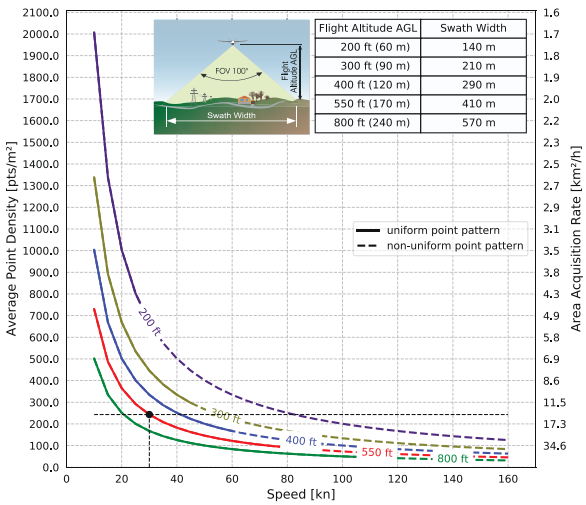


Example: RANGER-U160 at 1,200,000 pulses/sec, laser power level 100% altitude 650 ft AGL, speed 30 kn

Results: point density ~ 137 pts/m²

LASER PULSE REPETITION RATE = 1800 KHZ
LASER POWER LEVEL = 100%





Example: RANGER-U160 at 1,800,000 pulses/sec, laser power level 100% altitude 550 ft AGL, speed 30 kn

Results: point density ~ 243 pts/m²

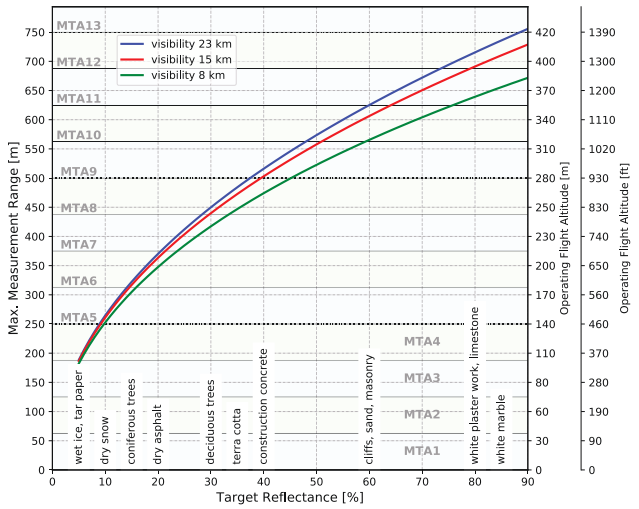
Operating Flight Altitude AGL given for the following conditions:

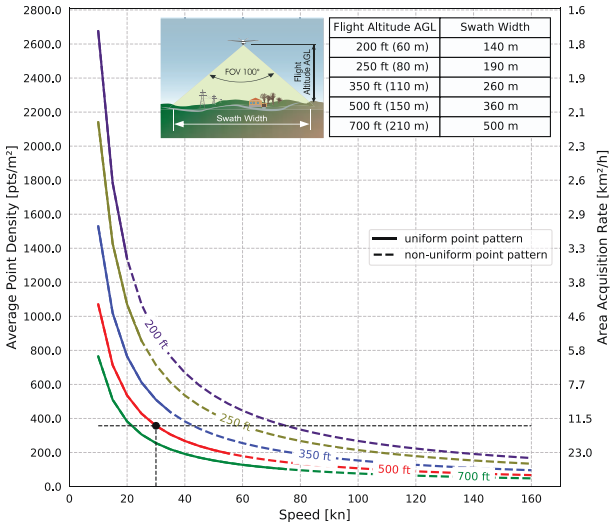
- Ambiguity resolved by multiple-time-around (MTA) processing
- FOV 100°
- Average ambient brightness
- Target size ≥ laser footprint
- Roll angle < ± 5°

(continued next page)

MAX MEASUREMENT RANGE & POINT DENSITY RANGER-U160

LASER PULSE REPETITION RATE = 2400 KHZ
LASER POWER LEVEL = 100%





Flight Altitude AGL	Swath Width
200 ft (60 m)	140 m
250 ft (80 m)	190 m
350 ft (110 m)	260 m
500 ft (150 m)	360 m
700 ft (210 m)	500 m

Example: RANGER-U160 at 2,400,000 pulses/sec, laser power level 100% altitude 500 ft AGL, speed 30 kn

Results: point density ~ 356 pts/m²

Operating Flight Altitude AGL given for the following conditions:

- Ambiguity resolved by multiple-time-around (MTA) processing
- FOV 100°
- Average ambient brightness
- Target size ≥ laser footprint
- Roll angle < ± 5°

RANGER-U160 ACCESSORIES

R6

SONY LR1

Helicopter Mount

UltraPod

EXPLORE A PHOENIX LiDAR SYSTEM FOR YOUR TEAM, CONTACT US!

PhoenixLiDAR.com • sales@phoenixlidar.com • USA +1.323.577.3366

 2025-9-2