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VTOL



UAV



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RANGER-U120

The **RANGER-U120** is an airborne laser scanner with an impressive combination of weight, range, accuracy and pulse rate. Featuring the Riegl VUX-120²³ with a unique forward and rear looking FOV designed to minimize laser shadowing and provide geometry on complex vertical structures on a single pass. With its wide field of view of 100 degrees and an extremely fast pulse repetition rate of up to 2400kHz, the **RANGER-U120** is perfectly suited for high point density corridor mapping applications such as power line, railway track and pipeline inspection.

FEATURES

- RGB camera options ranging from 24 MP to 120 MP for maximum project flexibility are available
- Easily mountable to unmanned platforms (UAVs) and to helicopters, gyrocopters, and other small manned aircrafts
- Operating flight altitude up to 720 m / 2,350 ft
- Scan speed up to 400 lines/second
- 3 faceted mirror (-10, 0, +10°) creates a virtual multilaser for improved mapping of vertical surfaces

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

- » 120m AGL, 8 m/s, 100° FOV, 1800 kHz
- » Swath Width = 286
- » Avg. Density = 657 points/m²
- » Collection Rate = 8 km²/h

HELICOPTER

- » 230 AGL, 60 knots, 100° FOV, 600 kHz
- » Swath Width = 548 m
- » Avg. Density = 29 points/m²
- » Collection Rate = 61 km²/h

(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% refl. activity at the laser's wavelength.
 (5) Estimated post processed accurat with IMU-30.

APPLICATIONS

- UTILITIES MAPPING
- RAILWAY TRACK MAPPING
- AGRICULTURE & FORESTRY MONITORING
- OPEN PIT MINING OPERATIONS
- GENERAL MAPPING

PLATFORM

* Without Accessories

OVERALL DIMENSIONS*	24.2 x 11.7 x 21.4 cm
OPERATING VOLTAGE	14 - 28 V DC
POWER CONSUMPTION*	60 W typical
OPERATING TEMPERATURE	0° - 40° C / 32° - 104° F
WEIGHT*	3 kg / 6.5 lbs (approx)

LIDAR SENSOR

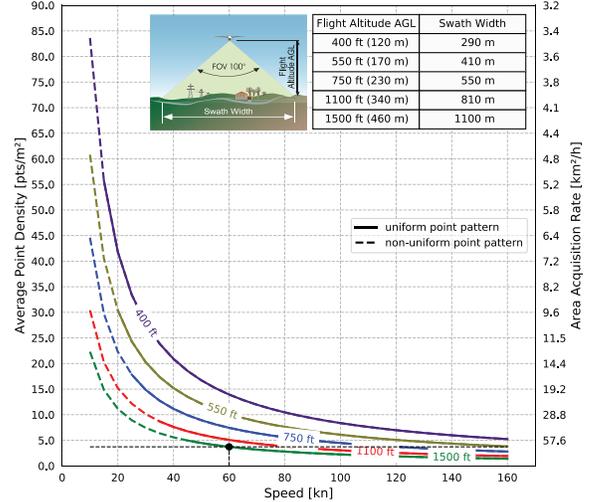
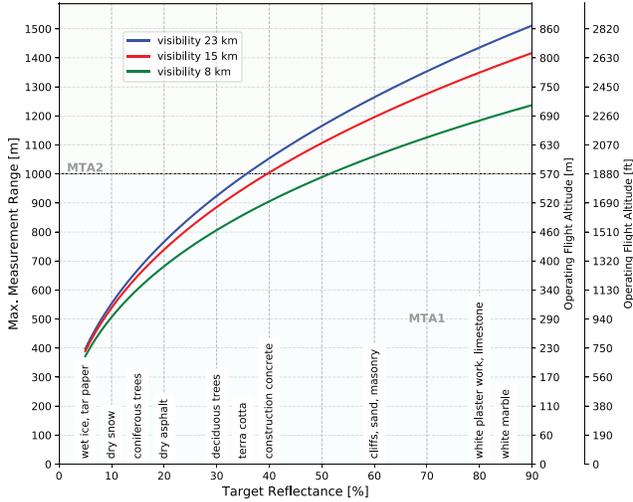
LASER WAVELENGTH	1550 nm
RANGE MINIMUM	5 m
RANGE MAXIMUM	760 m @ 20% reflectivity, 150 kHz
PULSE REPETITION RATE	150 - 2400 kHz
SCAN SPEED	50 - 400 lines/second
MAX RETURN COUNT	32
BEAM COUNT	3
BEAM DIVERGENCE	0.4 mrad
HORIZONTAL FIELD OF VIEW	100° (± 50°)
VERTICAL FIELD OF VIEW	20° @ nadir (-10°, 0°, +10° Scan Pattern)
LASER ACCURACY (PRECISION)	10 m (5 mm) 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

MAX MEASUREMENT RANGE & POINT DENSITY RANGER-U120

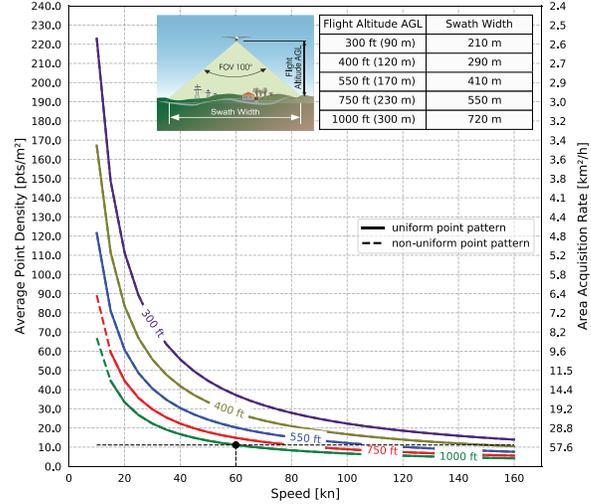
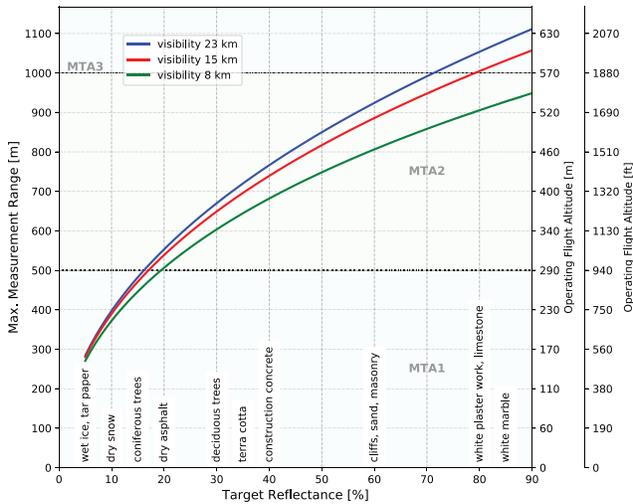
**LASER PULSE REPETITION RATE = 150 KHZ
LASER POWER LEVEL = 100%**



Example: RANGER-U120 at 150,000 pulses/sec, laser power level 100%
altitude 1,500 ft AGL, speed 60 kn

Results: point density - 4 pts/m²

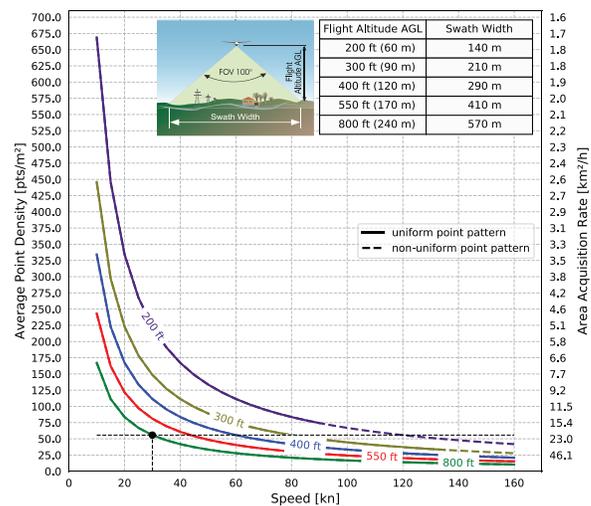
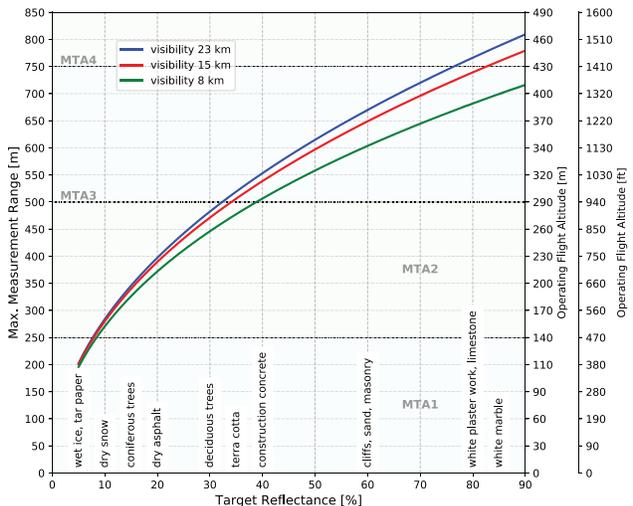
**LASER PULSE REPETITION RATE = 300 KHZ
LASER POWER LEVEL = 100%**



Example: RANGER-U120 at 300,000 pulses/sec, laser power level 100%
altitude 1,000 ft AGL, speed 60 kn

Results: point density - 11 pts/m²

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



Example: RANGER-U120 at 600,000 pulses/sec, laser power level 100%
altitude 800 ft AGL, speed 30 kn

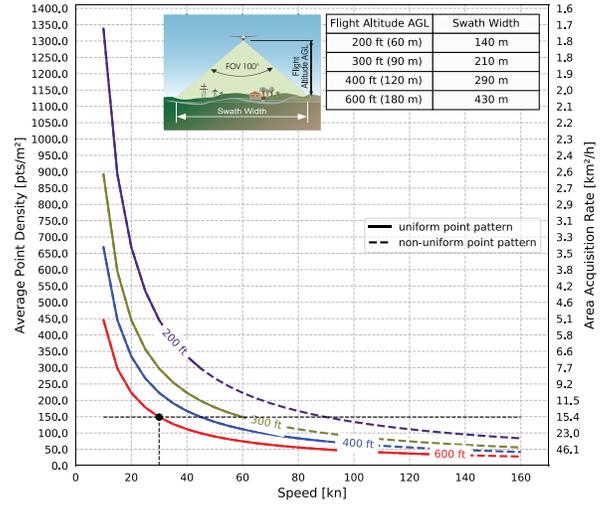
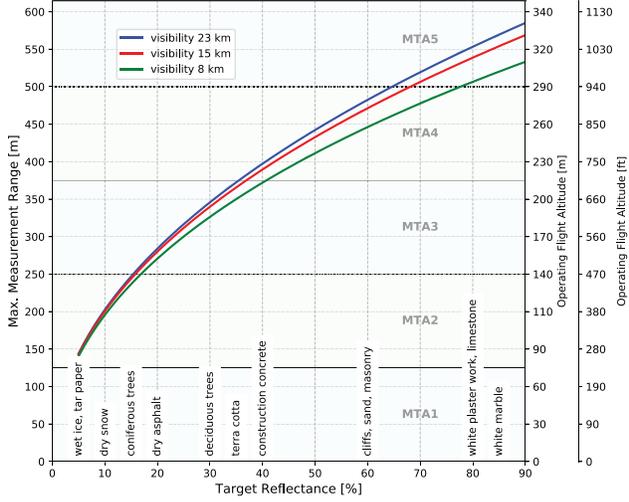
Results: point density - 55 pts/m²

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°

MAX MEASUREMENT RANGE & POINT DENSITY RANGER-U120

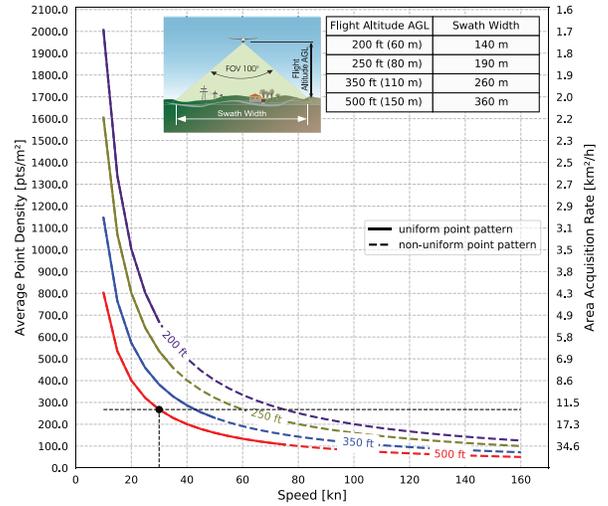
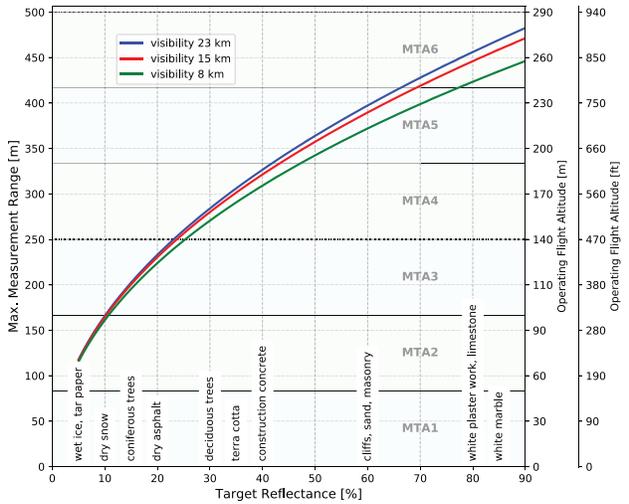
**LASER PULSE REPETITION RATE = 1200 KHZ
LASER POWER LEVEL = 100%**



Example: RANGER-U120 at 1,200,000 pulses/sec, laser power level 100% altitude 600 ft AGL, speed 30 kn

Results: point density - 150 pts/m²

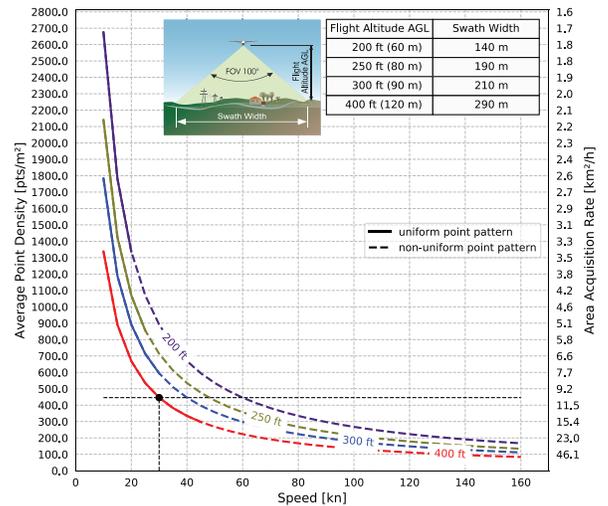
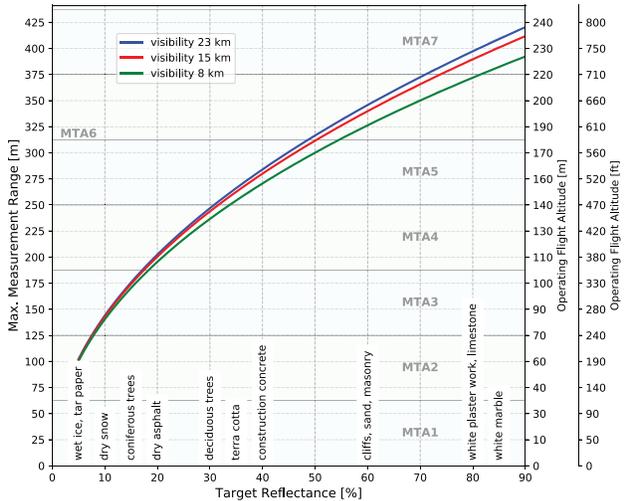
**LASER PULSE REPETITION RATE = 1800 KHZ
LASER POWER LEVEL = 100%**



Example: RANGER-U120 at 1,800,000 pulses/sec, laser power level 100% altitude 500 ft AGL, speed 30 kn

Results: point density - 270 pts/m²

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



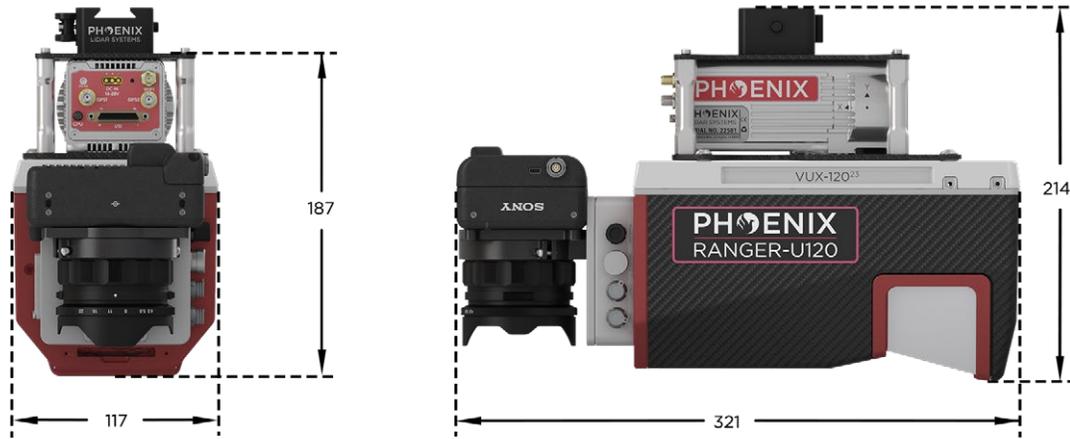
Example: RANGER-U120 at 2,400,000 pulses/sec, laser power level 100% altitude 400 ft AGL, speed 30 kn

Results: point density - 450 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-U120 DIMENSIONS (mm)



RANGE MEASUREMENT PERFORMANCE

Laser Pulse Repetition Rate PRR ⁽¹⁾ Effective Measurement Rate (meas./sec)	150 kHz 125K	300 kHz 250K	600 kHz 500K	1200 kHz 1000K	1800 kHz 1500K	2400 kHz 2000K
Max. Measuring Range ^{(2) (3)}						
natural targets $\rho \geq 20\%$	760 m	550 m	400 m	280 m	230 m	200 m
natural targets $\rho \geq 60\%$	1260 m	920 m	670 m	480 m	400 m	350 m
natural targets $\rho \geq 80\%$	1430 m	1050 m	760 m	550 m	450 m	400 m
Max. Operating Flight Altitude AGL ^{(2) (4)}						
@ $\rho \geq 20\%$	440 m (1450 ft)	320 m (1050 ft)	230 m (750 ft)	160 m (550 ft)	130 m (450 ft)	110 m (360 ft)
@ $\rho \geq 60\%$	720 m (2350 ft)	530 m (1750 ft)	380 m (1250 ft)	280 m (900 ft)	230 m (750 ft)	200 m (650 ft)
Max. Number of Targets per Pulse ⁽⁵⁾	32	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) Effective FOV 100°, additional roll angle $\pm 5^\circ$.

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.

RANGER-U120 CAMERA OPTIONS



A6k-A Lite (24 MP)



SONY LRI (61 MP)



PhaseOne iXM-GS120 (120 MP)



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