PHOENIX LiDAR SYSTEMS

RANGER ULTRA SERIES

LEARN MORE

RANGER-U580

The **RANGER-U580** is a compact manned airborne laser scanning system designed for mid-range flight altitude applications such as medium/wide-area mapping as well as corridor mapping. Featuring the compact and lightweight Riegl VQ-580II-S laser scanner, PhaseOne iXM-GS120 and the PLS FOG IMU-60, the **RANGER-U580** is perfectly suited for integration into a wide range of manned aircrafts such as helicopters, small fixed wing aircraft and ultralight aircraft.

With a measurement rate of up to 1,250,000 meas./sec, laser wavelength of 1052nm and a wide field of view of 75°, the **RANGER-U580** perfectly meets the challenges of various special airborne surveying applications like corridor mapping, city modeling, snowfield mapping, glacier monitoring, agriculture and forestry.

HELICOPTER AIRPLANE NDAA COMPLIANT

FEATURES

- Increased measurement range of up to 2,450m (8,038ft)
- Linear and parallel scan lines and 1052nm laser enable accurate snow and ice surface mapping
- Narrow 0.28 mrad beam ensures long-range accuracy and precision

QUICK SPECS

EXAMPLE ACQUISITIONS:

HELICOPTER

» 550 m AGL, 60 knots, 75° FOV, 2000 kHz
» Swath Width = 840 m
» Avg. Point Density = 48 points/m²
» Image GSD = 5.5 cm/pixel

FIXED WING

» 980 m AGL, 120 knots, 75° FOV, 1200 kHz
» Swath Width = 1500 m
» Avg. Point Density = 8 points/m²
» Image GSD = 10 cm/pixel

APPLICATIONS

- MEDIUM TO WIDE AREA MAPPING
- CORRIDOR MAPPING
- CITY MODELING
- AGRICULTURE & FORESTRY
- GLACIER AND SNOWFIELD MONITORING

PLATFORM

OVERALL DIMENSIONS	65.8 x 26.0 x 36.5 cm (L x W x H)
POWER SUPPLY INPUT VOLTAGE	20 - 28 V DC
POWER CONSUMPTION	160 W typical 270 W max.
OPERATING TEMPERATURE	0° - 40° C / 32° - 104° F
WEIGHT (W/GPS BOOM)	20.8 kg / 45.8 lbs (22.2 kg / 49 lbs)

LiDAR SENSOR

LASER WAVELENGTH	1052 nm
RANGE MAXIMUM	2460 m @ 20% reflectivity, 300 kHz
SCAN SPEED	30 - 300 lines/second
HORIZONTAL FIELD OF VIEW	75°
ANGULAR STEP WIDTH	$0.008° \leq \Delta\vartheta \leq 0.12°$ (2) (3)
BEAM DIVERGENCE	typ. 0.28 mrad @ 1/e², typ. 0.20 mrad @ 1/e
MINIMUM RANGE	20 m
LASER ACCURACY & PRECISION	20 mm (1σ @ 150 m)

CAMERA

SENSOR TYPE	CMOS Global Shutter (Medium Format)
PIXEL SIZE (µm)	3.45
RESOLUTION	12,768 x 9,564 (120 MP)
FIELD OF VIEW	64.4° HFOV / 50.5° VFOV
LENS	35mm f/5.6
INTERFACE	Ethernet

NAVIGATION SYSTEM

CONSTELLATION SUPPORT	GPS + GLONASS + BEIDOU + GALILEO
SUPPORTED ALIGNMENT	Static, Kinematic, Dual-Antenna
IMU SAMPLING RATE	200 Hz
ACCURACY POSITION	1 cm + 1 ppm GNSS baseline RMS Horizontal
ACCURACY ATTITUDE (1)	
ROLL, PITCH	0.002° RMS
HEADING	0.004° RMS

(1) Estimated post-processed accuracy with IMU-60
(2) The angular step width depends on the selected laser PRR.
(3) The maximum angular step width is limited by the maximum scan rate.

The **RANGER-U580** has two primary integration options, the **HB1 - Hybrid Integration System**, designed for easy mounting and transferability between manned helicopter and fixed wing aircraft and the **UP2 - ULTRAPOD Integration System** designed for dedicated use on the wing strut of Cessna single-engine piston aircraft.

HB1 - HYBRID INTEGRATION SYSTEM

KEY FEATURES

- Easily transferable between Heli and Fixed Wing aircraft
- Quick installation and removal
- Optional GPS antenna boom
- Optional integrated control box (NavBox)

HB1 attached to Cessna 172

HB1 attached to R44 Helicopter

UP2 - ULTRAPOD INTEGRATION SYSTEM

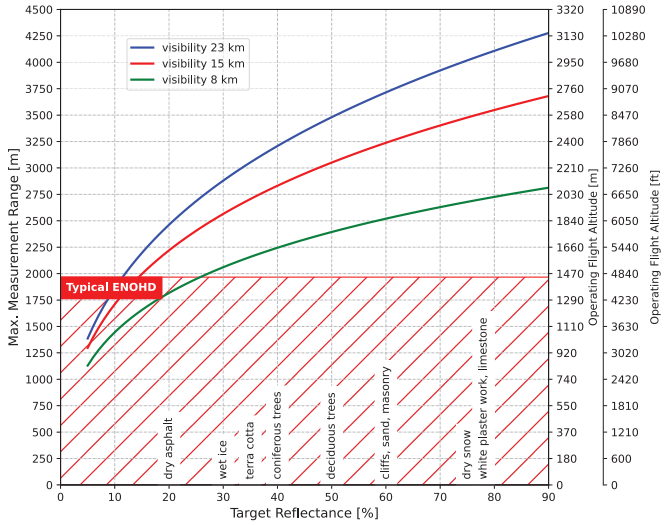
KEY FEATURES

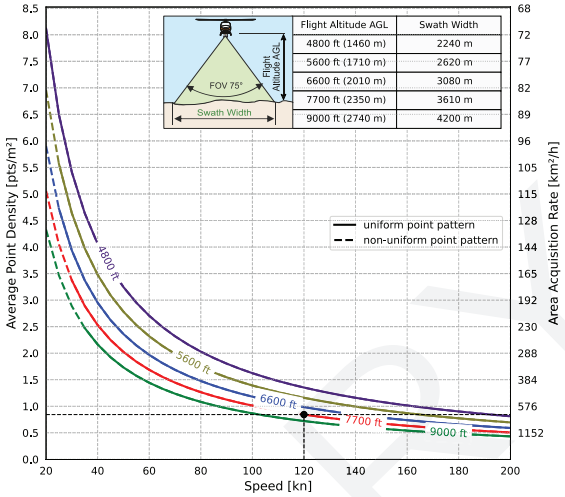
- Designed for Cessna 172-, 182-, and 206- series aircraft
- Quick installation and removal
- Easily transferred between Cessna aircraft
- Optional integrated control box (NavBox)

UP2 attached to Cessna 172

MAX MEASUREMENT RANGE & POINT DENSITY RANGER-U580

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

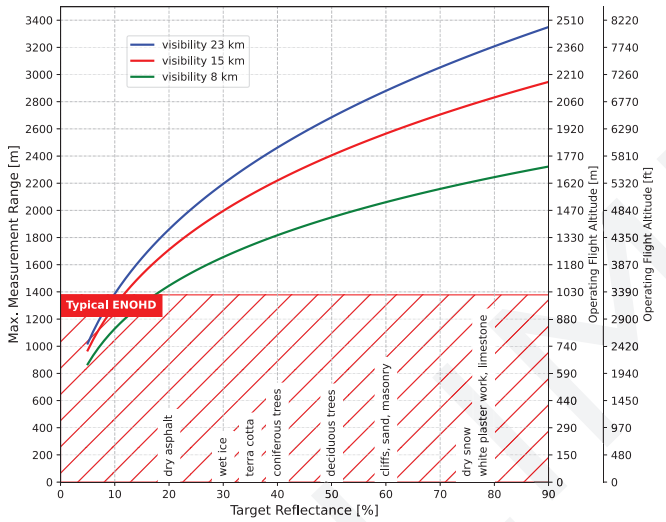


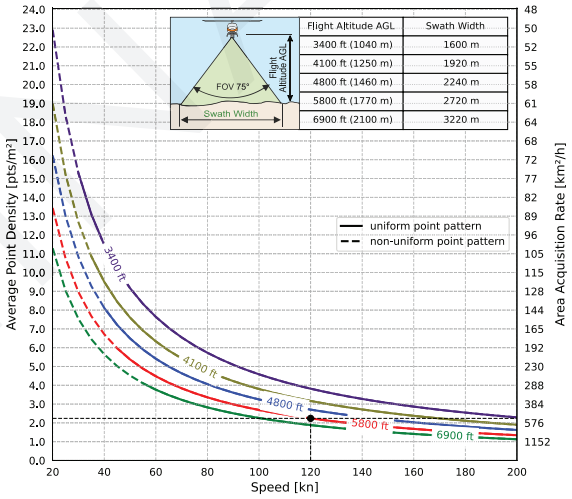


Example: RANGER-U580 at 300,000 pulses/sec, laser power level 100%
altitude 7,700 ft AGL, speed 120 kn

Results: point density ~ 0.8 pts/m²
area acquisition rate ~ 683 km²/h

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

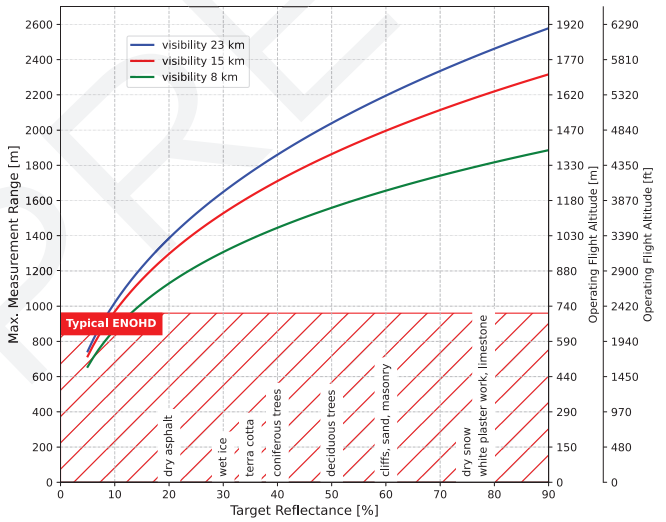


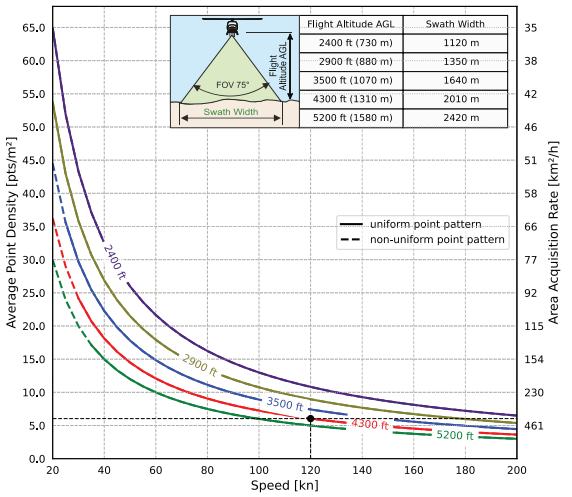


Example: RANGER-U580 at 600,000 pulses/sec, laser power level 100%
altitude 5,800 ft AGL, speed 120 kn

Results: point density ~ 2.2 pts/m²
area acquisition rate ~ 515 km²/h

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





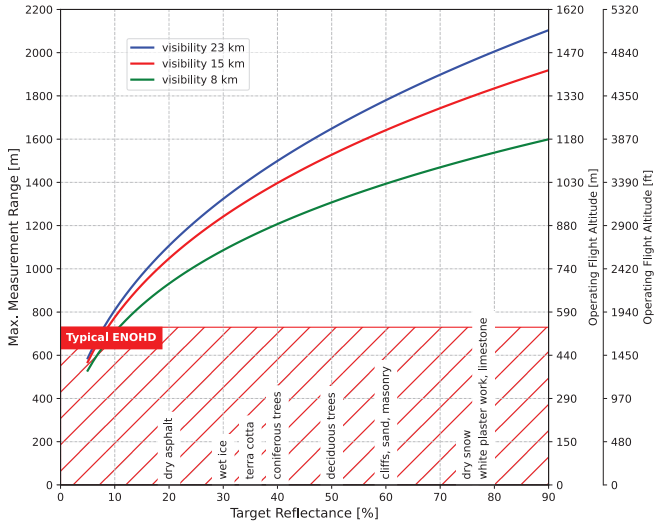
Example: RANGER-U580 at 1,200,000 pulses/sec, laser power level 100%
altitude 4,300 ft AGL, speed 120 kn

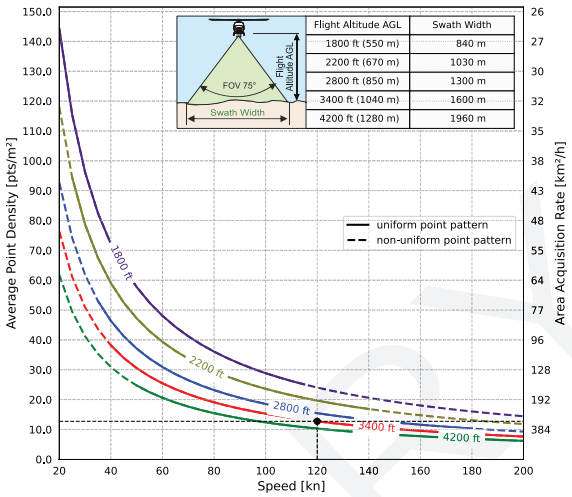
Results: point density ~ 6.4 pts/m²
area acquisition rate ~ 381 km²/h

The following conditions are assumed for the Operating Flight Altitude AGL:

- Ambiguity resolved by multiple-time-around (MTA) processing
- Roll angle up to ±5°
- Target size ≥ laser footprint
- Average ambient brightness
- Operating flight altitude given at a FOV of ±37.5°

LASER PULSE REPETITION RATE = 2000 KHZ
LASER POWER LEVEL 100%

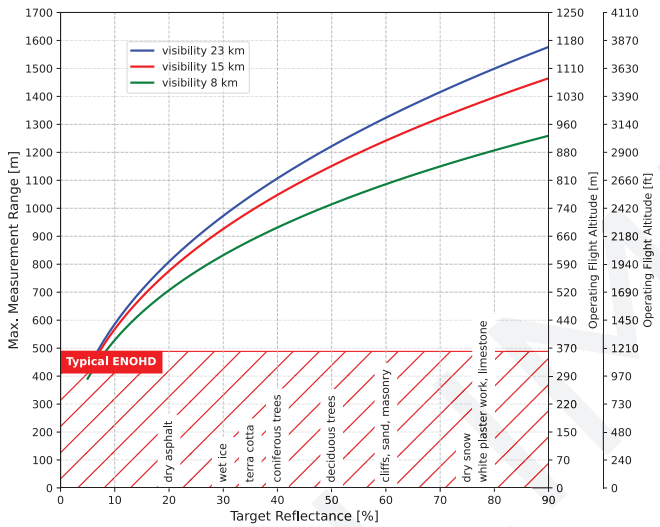


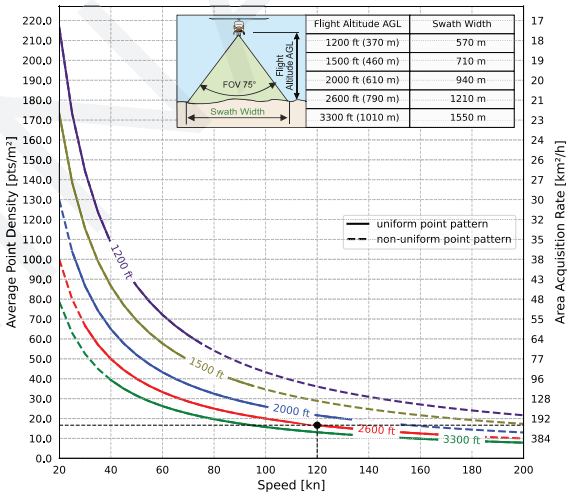


Example: RANGER-U580 at 2,000,000 pulses/sec, laser power level 100%
altitude 3,400 ft AGL, speed 120 kn

Results: point density ~ 12.73 pts/m²
area acquisition rate ~ 302 km²/h

LASER PULSE REPETITION RATE = 2000 KHZ
LASER POWER LEVEL 50%

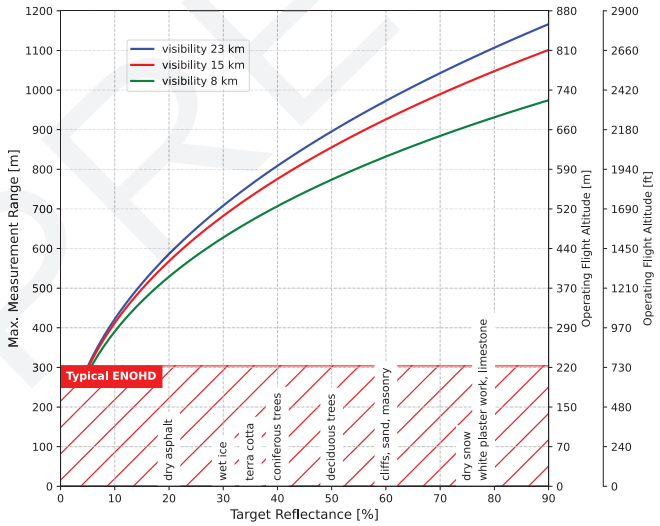


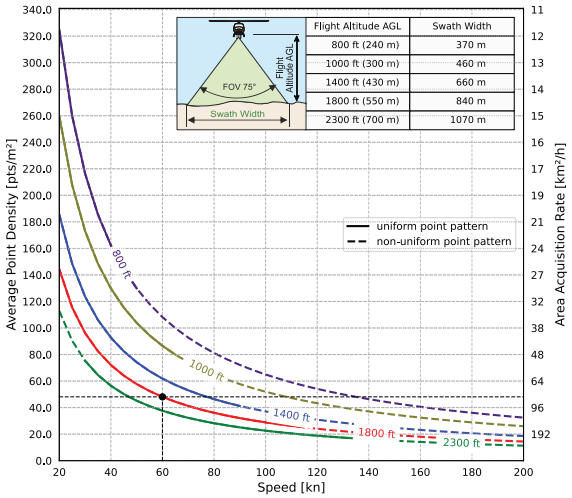


Example: RANGER-U580 at 2,000,000 pulses/sec, laser power level 50%
altitude 2,600 ft AGL, speed 120 kn

Results: point density ~ 16.7 pts/m²
area acquisition rate ~ 231 km²/h

LASER PULSE REPETITION RATE = 2000 KHZ
LASER POWER LEVEL 25%





Example: RANGER-U580 at 2,000,000 pulses/sec, laser power level 25%
altitude 1,800 ft AGL, speed 60 kn

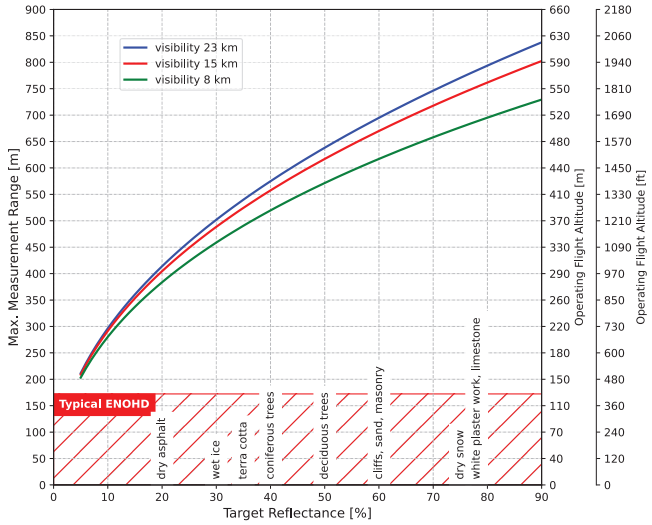
Results: point density ~ 48.1 pts/m²
area acquisition rate ~ 80 km²/h

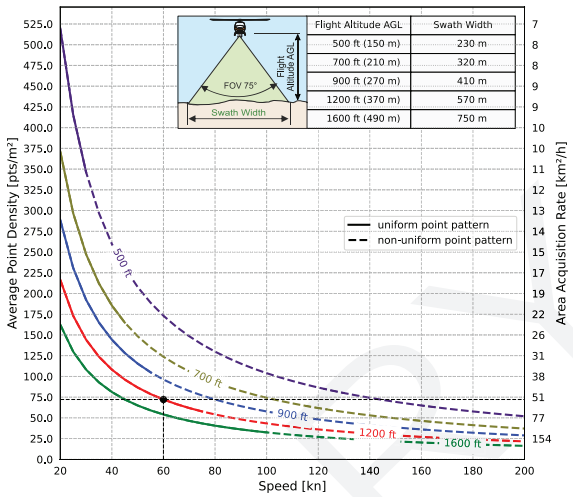
The following conditions are assumed for the Operating Flight Altitude AGL:

- Ambiguity resolved by multiple-time-around (MTA) processing
- Roll angle up to ±5°
- Target size ≥ laser footprint
- Average ambient brightness
- Operating flight altitude given at a FOV of ±37.5°

MAX MEASUREMENT RANGE & POINT DENSITY RANGER-U580

LASER PULSE REPETITION RATE = 2000 KHZ
LASER POWER LEVEL 12%





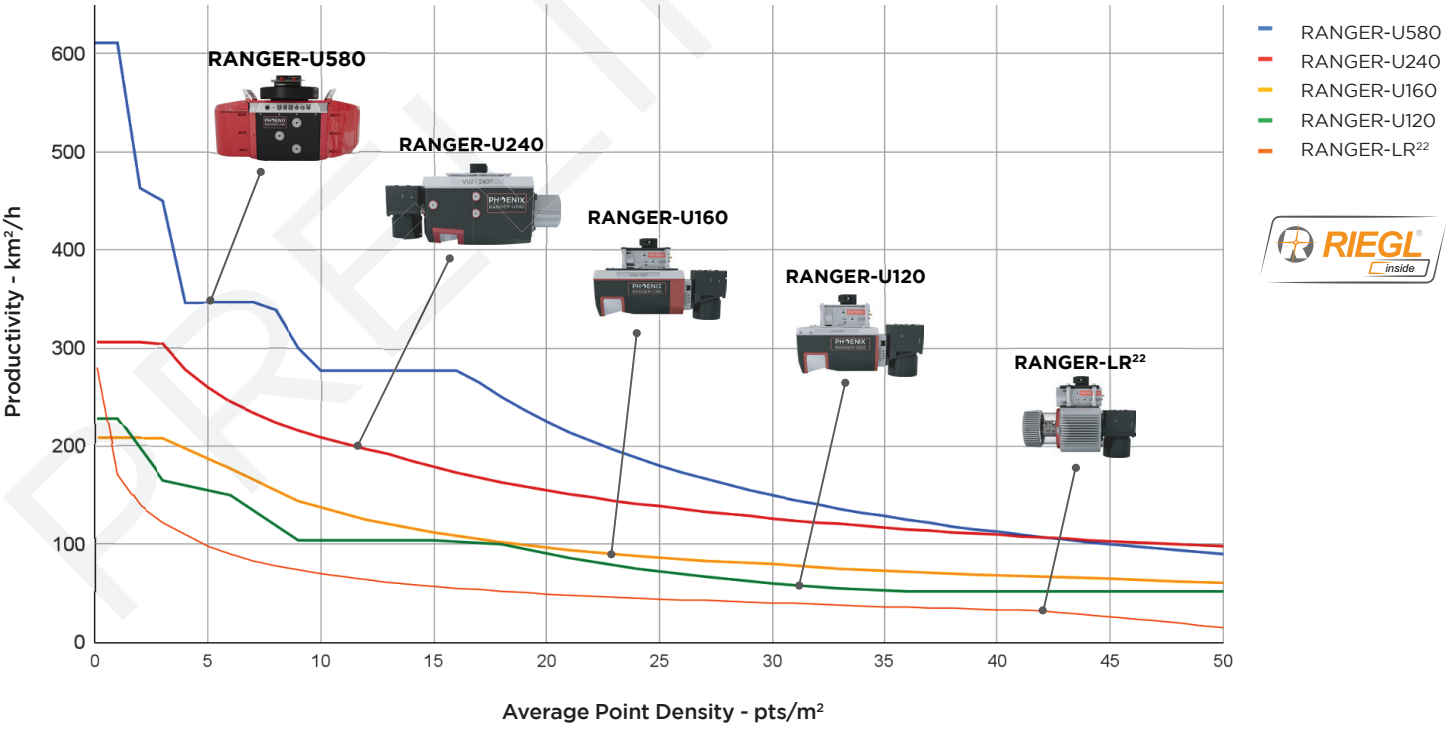
Example: RANGER-U580 at 2,000,000 pulses/sec, laser power level 12% altitude 1,200 ft AGL, speed 60 kn

Results: point density ~ 72.2 pts/m²
area acquisition rate ~ 53 km²/h

The following conditions are assumed for the Operating Flight Altitude AGL:

- Ambiguity resolved by multiple-time-around (MTA) processing
- Roll angle up to ±5°
- Target size ≥ laser footprint
- Average ambient brightness
- Operating flight altitude given at a FOV of ±37.5°

AIRBORNE ACQUISITION PERFORMANCE



The following conditions are assumed for calculating Airborne Acquisition Performance:

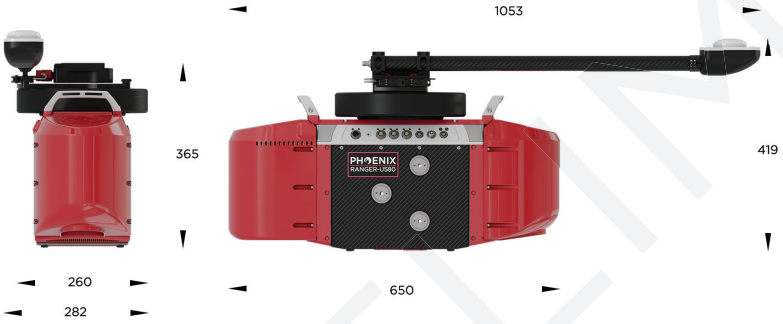
- Min/max flying speed: 60 kn/120 kn
  min. flying height: 120m AGL
- RANGER-U120 and U160. FNB facets combined density. Optimization scope: "Best Practices"
- 20% reflectivity targets
- Riegl estimates generated by RiParameter 2.5.5
- RANGER-LR²² max 90 degree FOV

RANGE MEASUREMENT PERFORMANCE

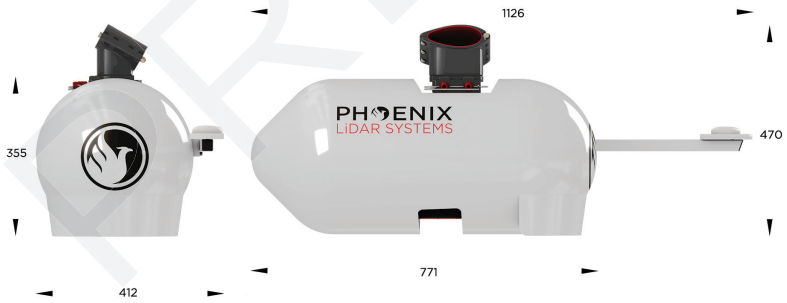
Laser Pulse Repetition Rate PRR [1] Effective Measurement Rate (meas./sec) Laser Power Level	300 kHz 187.5K 100%	600 kHz 375K 100%	1200 kHz 750K 100%	2000 kHz 1250K 100%	2000 kHz 1250K 50%	2000 kHz 1250K 25%	2000 kHz 1250K 12%
Max. Measuring Range [2] [3]							
natural targets ρ ≥ 20%	2460 m	1860 m	1390 m	1100 m	810 m	590 m	410 m
natural targets ρ ≥ 60%	3720 m	2880 m	2200 m	1780 m	1320 m	970 m	700 m
Max. Operating Flight Altitude AGL [2] [4]							
natural targets @ ρ ≥ 20%	1820 m (5950 ft)	1370 m (4500 ft)	1020 m (3350 ft)	820 m (2700 ft)	600 m (1950 ft)	430 m (1400 ft)	300 m (1000 ft)
natural targets @ ρ ≥ 60%	2740 m (9000 ft)	2120 m (6950 ft)	1620 m (5300 ft)	1310 m (4300 ft)	980 m (3200 ft)	720 m (2350 ft)	510 m (1700 ft)
NOHD [5] [7]	201 m	139 m	95 m	70 m	44 m	27 m	14 m
ENOHD [6] [7]	1450 m	1016 m	708 m	538 m	360 m	224 m	127 m
Max. Number of Targets per Pulse [8]	**15**	**15**	**9**	**5**	**5**	**5**	**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 75°, additional roll angle ± 5°.
(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.
(6) Extended Nominal Ocular Hazard Distance, based upon MPE according to ICE 60825-1:2014, for single line condition
(7) NOHD and ENOHD have been calculated for a typical angular step width with non-overlapping laser footprints and an aircraft speed higher than 10kn. NOHD and ENOHD increase when using overlapping laser footprints which may be intended e.g. for power line mapping.
(8) If more than one target is hit, the total laser transmitter power is split and, accordingly, the achievable range is reduced.

RANGER-U580 HB1 DIMENSIONS (mm)



RANGER-U580 UP2 DIMENSIONS (mm)



LASER PRODUCT CLASSIFICATION

Class 3B Laser Product according to IEC 60825-1:2014

The following clause applies for instruments delivered into the United States: Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed.3., as described in Laser Notice No. 56, dated May 8, 2019.

The instrument must be used only in combination with the appropriate laser safety box.

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

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