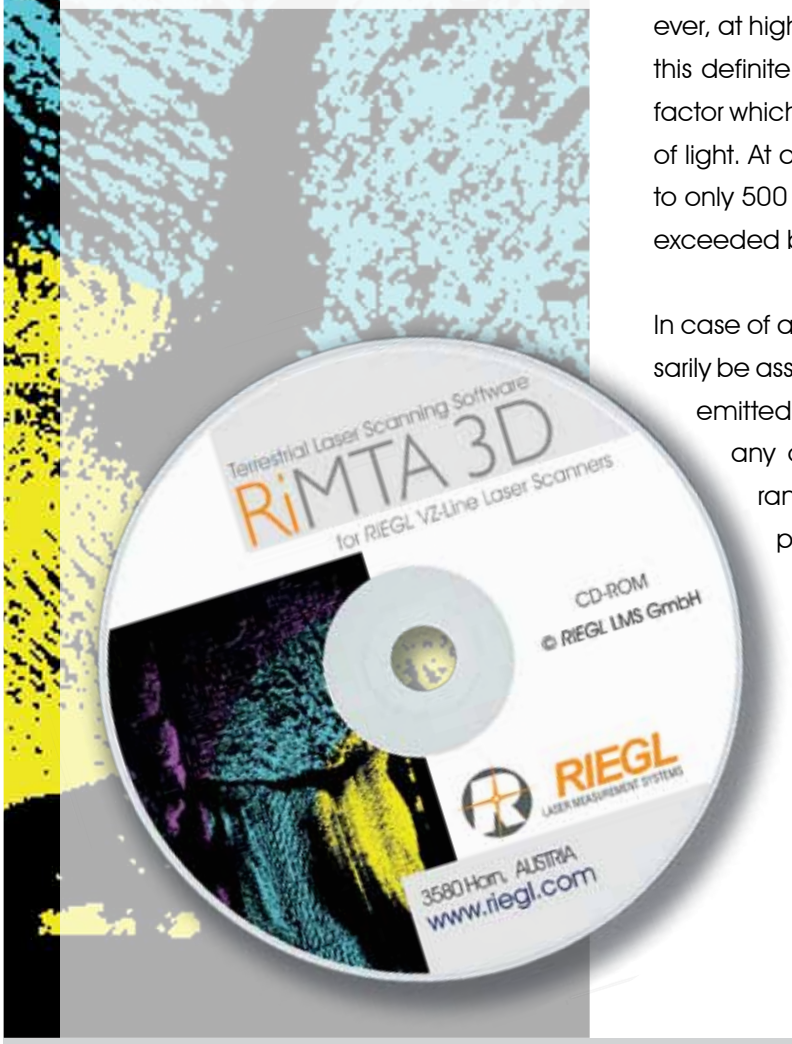
Terrestrial Laser Scanning Software

RiMTA 3D

for Automated Resolution of Range Ambiguities

- *automatic resolution of range ambiguity in time-of-flight ranging*
- *unlimited number of MTA zones*
- *processes data acquired with RIEGL VZ-4000 and VZ-6000 laser scanners*
- *smoothly integrated in the RIEGL data processing workflow*



Acquiring data in terrestrial laser scanning with high measurement rates over long ranges frequently results in range ambiguities. Instruments with multiple-time-around capability (MTA), like the *RIEGL* VZ-4000, include information in the provided data which the post-processing software can utilize in to resolve these ambiguities. Instead of asking the user to manually specify the correct MTA zone for each data set or even subset, RiMTA 3D calculates the most probable MTA zone for each measurement automatically.

In order to correctly determine the range to the target with LIDAR instruments using time-of-flight measurements with short laser pulses requires to correctly determine the correlation of each received echo pulse to its causative emitted laser pulse. However, at high pulse repetition rates (PRR) and large target ranges this definite allocation becomes ambiguous due to a limiting factor which may not be tweaked by engineer's skills: the speed of light. At a PRR of 300 kHz the range of unambiguity is limited to only 500 meters, a measurement distance which is routinely exceeded by *RIEGL* terrestrial laser scanners (TLS).

In case of ambiguities, received target echoes may not necessarily be associated with the immediately preceding laser pulse emitted (MTA-zone 1). Instead, they may be associated with any of the laser pulses emitted previously. For correct ranging it is therefore mandatory to correlate each pulse echo with its correct originating laser pulse.

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RIEGL®
LASER MEASUREMENT SYSTEMS

RiMTA 3D - For Automated Range Ambiguity Resolution

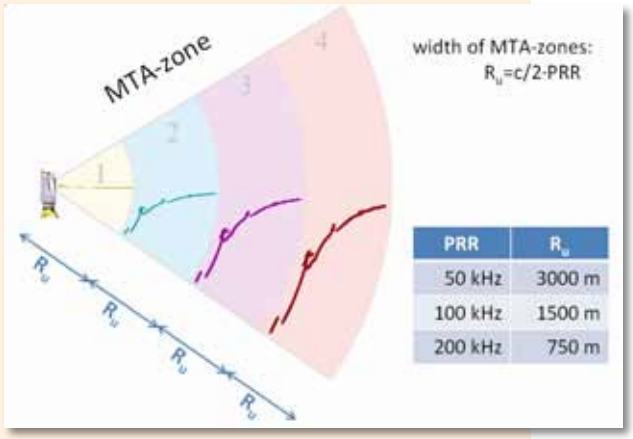

Fig. 1 Profile of scan data physically present in MTA zone 1 shown as processed in MTA zones 1-4

Terrestrial scanning, compared to airborne laser scanning, introduces an additional level of complexity in the resolution of ranging ambiguity. It is possible that a single laser pulse hitting multiple targets, e.g., a nearby target only partly obscuring the propagating laser beam and a remote target, thus causing echoes in multiple MTA zones. Therefore, the resolution of the ambiguity has to be carried out strictly on an echo to echo basis and not simple on a laser shot basis. Each target echo is subject to a congruence test measuring also the confidence for the association with the selected MTA zone. This confidence value, an additional point attribute to each point of the resulting point cloud, allows the user to filter the data and thus to clean up the point cloud by rejecting statistical outliers.

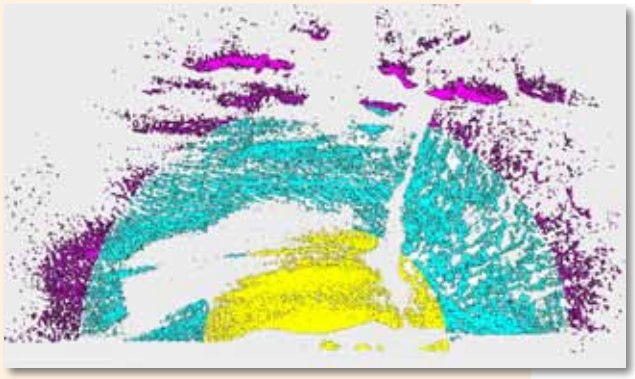

Fig. 2 Top view of data acquired by RIEGL VZ-6000 at 50 kHz with data from 3 different MTA zones

RIEGL utilizes a novel modulation scheme to the train of emitted laser pulses and unique techniques in high-speed signal processing thus enabling range measurements without any notable gaps between the MTA zones within the instrument's maximum measurement range.

For an optimized workflow, RiMTA 3D is seamlessly integrated into RiSCAN PRO, thus maintaining fast processing speeds for mass data production.

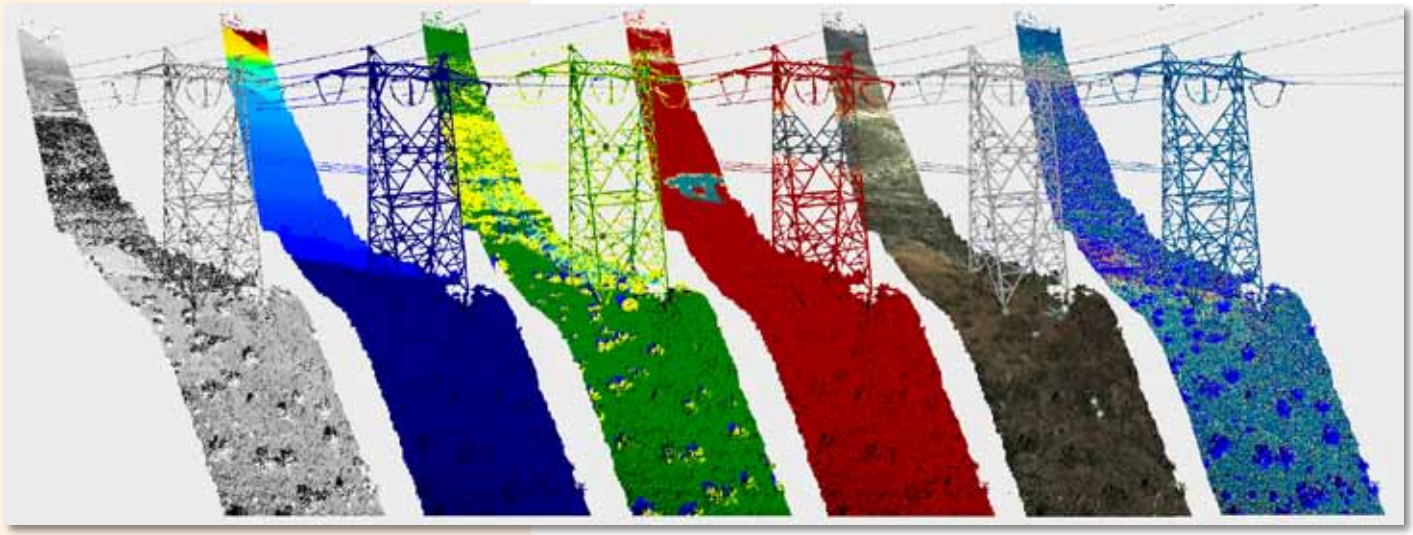

Fig. 3 Data visualized by (from left to right) reflectance, target range, multiple echoes ID, MTA confidence, true color, and pulse shape deviation

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