GEO SMART INDIA 2021

THEME

ADVANCING THE ROLE OF GEOSPATIAL KNOWLEDGE IN INDIAN ECONOMY

24-26 August 2021

HICC Hyderabad, India

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PRASHANT SURVEYS

(Advanced Land Survey & Geospatial Solutions)

LiDAR Survey for Infrastructure projects.

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GEO SMART India 2019

05th December, 2019.

ISO 9001 : 2015

GEO SMART India, 2019.

GeoSmart Construction & Engineering,

"Integrated Geospatial BIM solution for Construction lifecycle"

05th December, 2019.

LiDAR Survey for Infrastructure & Engineering projects.

Prashant Alatgi, Head : Technical & Business Development

Prashant Surveys, Pune, India.

05th December, 2019.

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Contents :

1. About “Prashant Surveys”.
2. Our advancement in Mobile LiDAR technology.
3. Advantages of Mobile LiDAR over conventional Total Stations
4. About Mobile LiDAR System & its major Components
5. Data Capture on highways by Mobile LiDAR system.
6. Data processing, feature extraction & 3D output.
7. Terrestrial / hand held LiDAR for shadow areas & BIM.
8. LiDAR based PPK UAV / Drones.
9. GNSS / DGPS Base Stations / Ground Control Points (GCP’s)
10. Seamless Integration of the above captured data.
11. Wide range of applications.

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About “Prashant Surveys” :

- One of the leading and most experienced (28 years) Land Surveying and Mapping Company in India.
- Started in 1991 by the Founder Mr. Shivanand Alatgi, Retd. From Survey of India after serving for 24 years.
- Completed about 25,000 Km of Roads and highway surveys by using Leica Total Stations & DGPS since 1998. (about 21 years).
- Adopting the most advanced Land surveying and mapping Techniques (Mobile LiDAR) available in the market.
- Strive to achieve the maximum accuracy in minimum time and optimum cost.

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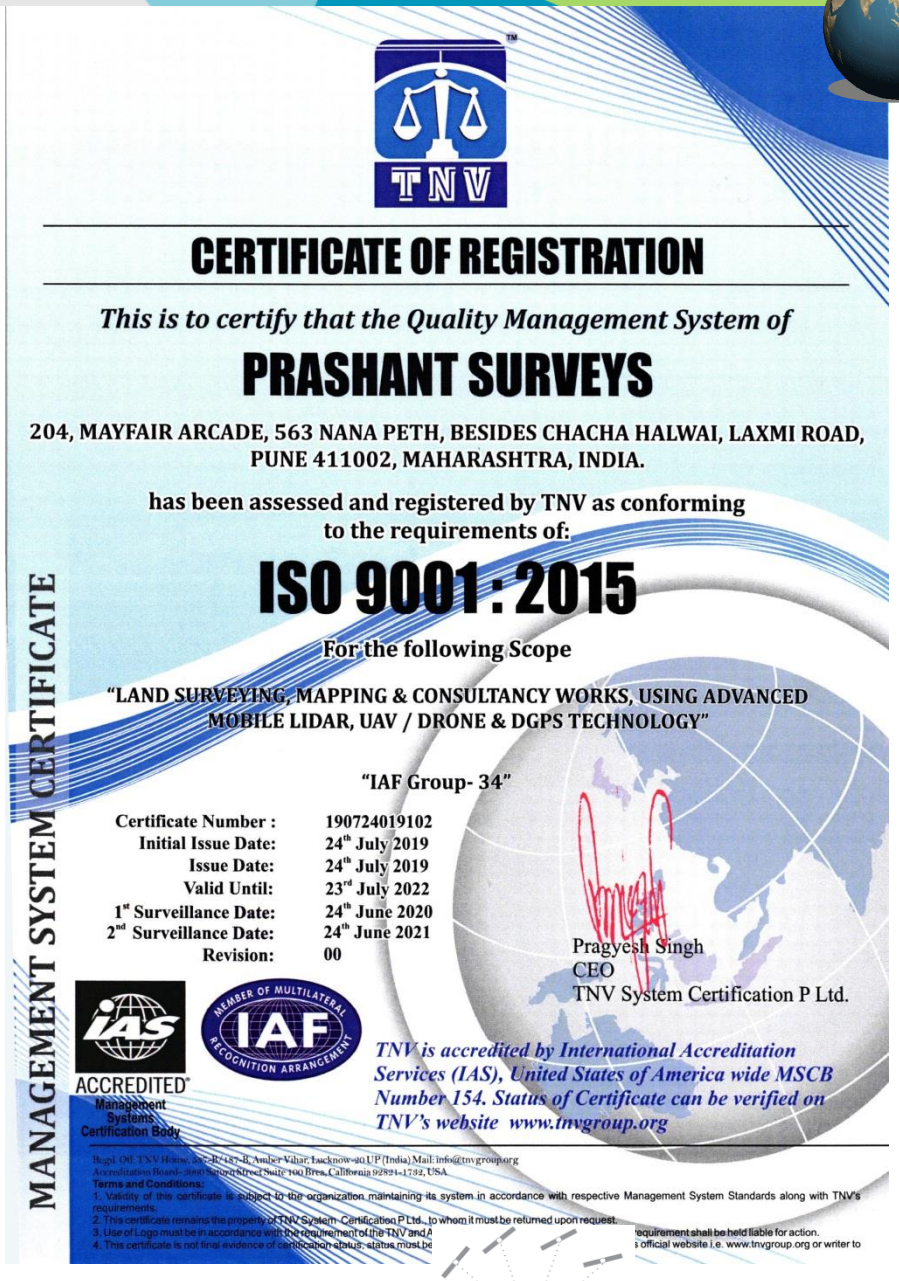
Assets of our Company :

- Leica ‘Pegasus Two’ Mobile LiDAR systems. : 02 Nos.
- DGPS / GNSS Receivers (Dual frequency). : 15 Nos.
- UAV / Drone, Lookout VTOL™- X-Mapper Series. : 01 No.
- Leica Electronic Total Stations. : 12 Nos.
- Leica Digital Levels ‘Sprinter 150M’. : 02 Nos.
- Leica ‘Infinity’ / TBC for GNSS data processing. : 08 Nos.
- Leica ‘Mapfactory’ licenses for Arc GIS. : 08 Nos.
- Leica ‘Auto P’ & ‘Waypoint Inertial Explorer’ licenses. : 02 Nos.
- Pix4d Professional & ‘3D Reshaper’ license. : 03 Nos.



TNV

CERTIFICATE OF REGISTRATION

This is to certify that the Quality Management System of

PRASHANT SURVEYS

204, MAYFAIR ARCADE, 563 NANA PETH, BESIDES CHACHA HALWAI, LAXMI ROAD, PUNE 411002, MAHARASHTRA, INDIA.

has been assessed and registered by TNV as conforming to the requirements of:

ISO 9001 : 2015

For the following Scope

“LAND SURVEYING, MAPPING & CONSULTANCY WORKS, USING ADVANCED MOBILE LIDAR, UAV / DRONE & DGPS TECHNOLOGY”

“IAF Group- 34”

Certificate Number :	190724019102
Initial Issue Date:	24th July 2019
Issue Date:	24th July 2019
Valid Until:	23rd July 2022
1st Surveillance Date:	24th June 2020
2nd Surveillance Date:	24th June 2021
Revision:	00

Pragyesh Singh
CEO
TNV System Certification P Ltd.

MANAGEMENT SYSTEM CERTIFICATE

ACCREDITED Management Systems Certification Body

TNV is accredited by International Accreditation Services (IAS), United States of America wide MSCB Number 154. Status of Certificate can be verified on TNV’s website www.tnvgroup.org

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Our advancement in Mobile LiDAR technology :

- First Company in India to Procure ‘Leica Pegasus’ Mobile Mapping System in March 2015.
- Only Land Surveying and Mapping Company in India to own Two numbers of ‘Leica Pegasus Two’ Mobile LiDAR systems, with about 4 years of LiDAR Survey experience.
- Completed about 12,000 Km of Mobile LiDAR Surveys of Highways in India.
- Site data collection team of about 15 members, assisted with 3D point cloud data processing team of 18 members.
- Capable of data capturing about 4,000 Km of 2 lane Highway network in a month using our Two numbers of ‘Pegasus Two’ Mobile LiDAR systems.

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Advantages of LiDAR over conventional Total Stations :

Mobile LiDAR System :

- Field data capture can be done with great speed, very effective in urban & sensitive areas.
- Manpower required is considerably less, which adds to the savings in the overall project costs.
- The captured data gives complete information about the site, which can be used for different applications.
- Lesser chances of human error, process is more automated.
- Collected Pictures and images can be used to generate videos which can assist in decision making.
- The accuracy obtained is absolute, depending on the DGPS and is not compounding in nature.

Electronic Total Stations (ETS) :

- Field data capture take lots of time, very slow in urban areas. Difficult to carry out physical survey in sensitive areas.
- Manpower required is comparatively higher, which also leads to other indirect costs to the project.
- There are limitations in the data capture and depends more on the expertise of the Total Station operator.
- More chances of human error, process not fully automated.
- No pictures or videos are collected by using ETS. Site visits are often required before decision making in the office.
- The accuracy obtained is depending on the orientation of the previous station points & is compounding in natur

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About Mobile LiDAR System :

- Mobile LiDAR is an advanced mapping solution used to collect survey grade 3D point cloud data quickly & accurately.
- Incorporates the most advanced LiDAR sensors, Cameras & position / GNSS / GPS receivers.
- Mobile mapping : is the process of collecting geospatial data from a mobile vehicle, typically fitted with a Mobile LiDAR system.
- Output after processing include; Geo-referenced 3D point cloud data, digital 3D maps in Autocad *.dwg or Arc GIS *.shp files, images / Panaromic views & Videos.

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Data Captured by Leica ‘Pegasus Two’ Mobile LiDAR system :

- The Leica ‘Pegasus Two’ mobile LiDAR System can capture :

(i) ‘3D Scan point cloud data’ in 360 degrees

(ii) ‘High Resolution photographs’ in all directions.

(iii) ‘Trajectory file’ / position information, (GNSS Receivers).

- Above data can be captured for about 80 to 100 Km per day depending upon the road & site conditions for single pass.
- DGPS base stations observations are required.
- Requires proper logistics planning for DGPS & LiDAR teams.
- LiDAR scan point cloud Resolution is about 6 mm.
- Overall accuracy of the LiDAR data is upto + / - 2 cm.

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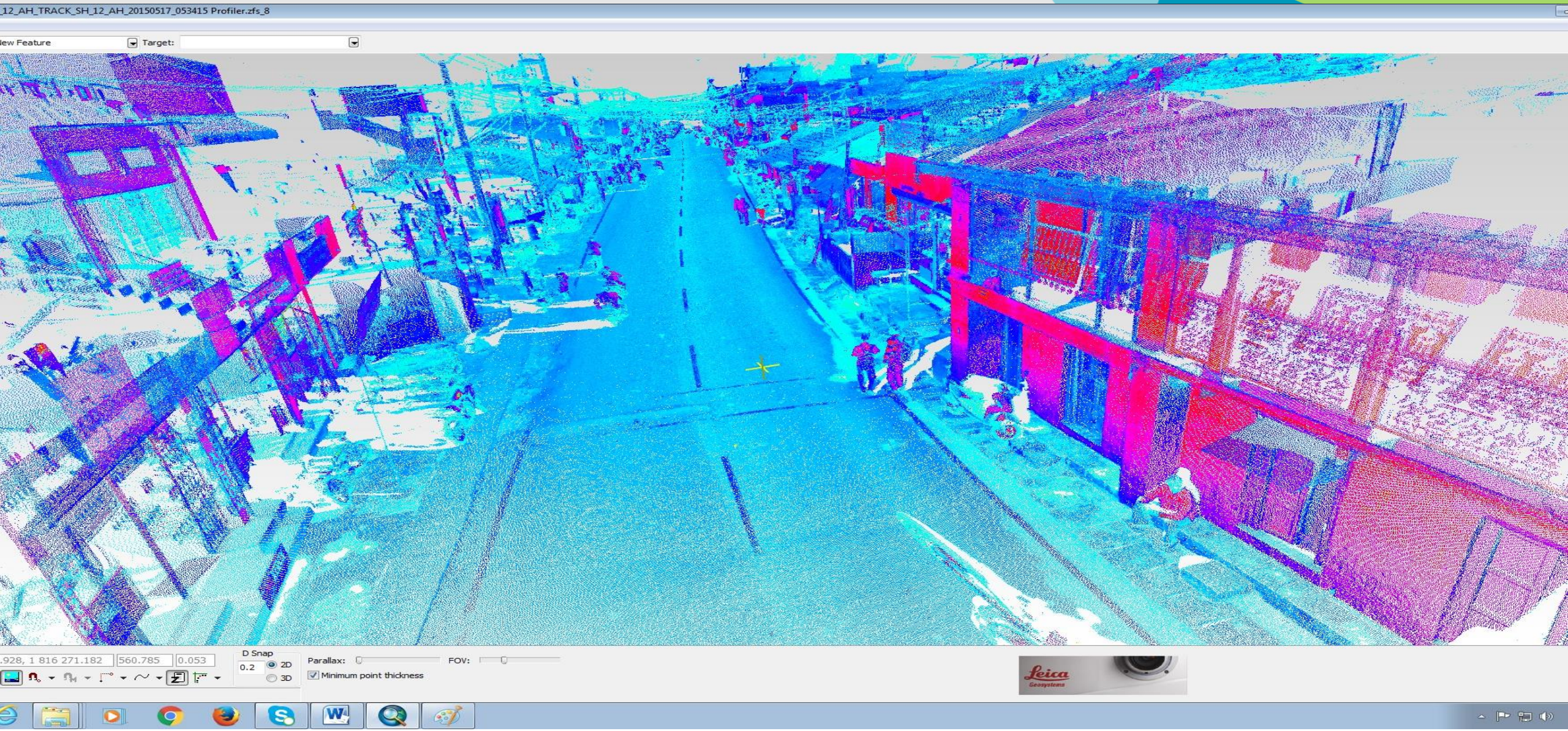

‘3D Scan point cloud data’ captured by using Mobile LiDAR ‘Leica Pegasus Two’:

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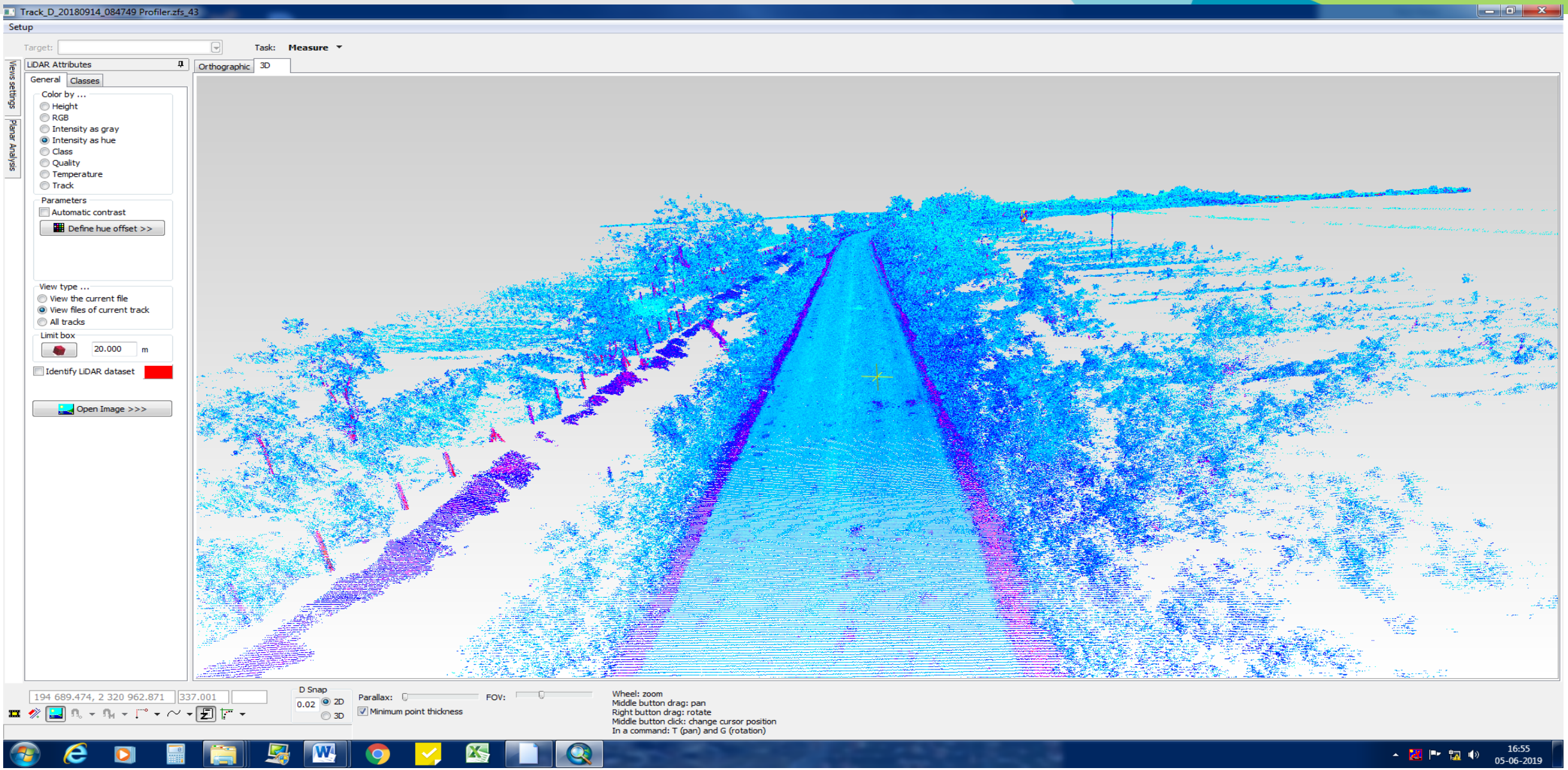

‘3D Scan point cloud data’ captured by using Mobile LiDAR ‘Leica Pegasus Two’:

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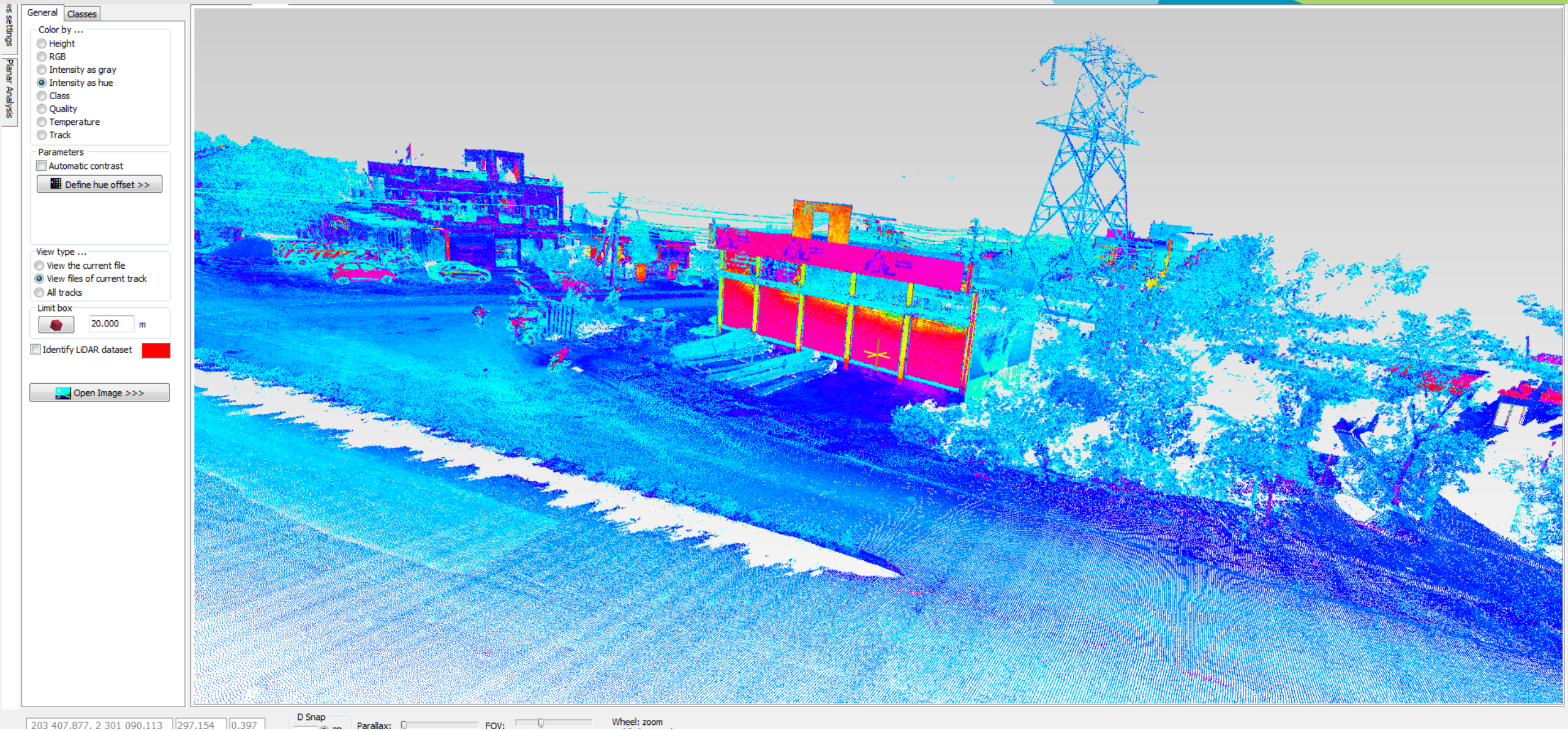
‘High Resolution Photographs’ captured using Mobile LiDAR ‘Leica Pegasus Two’:

ISO 9001 : 2015



‘3D Scan point cloud data’ captured by using Mobile LiDAR ‘Leica Pegasus Two’:

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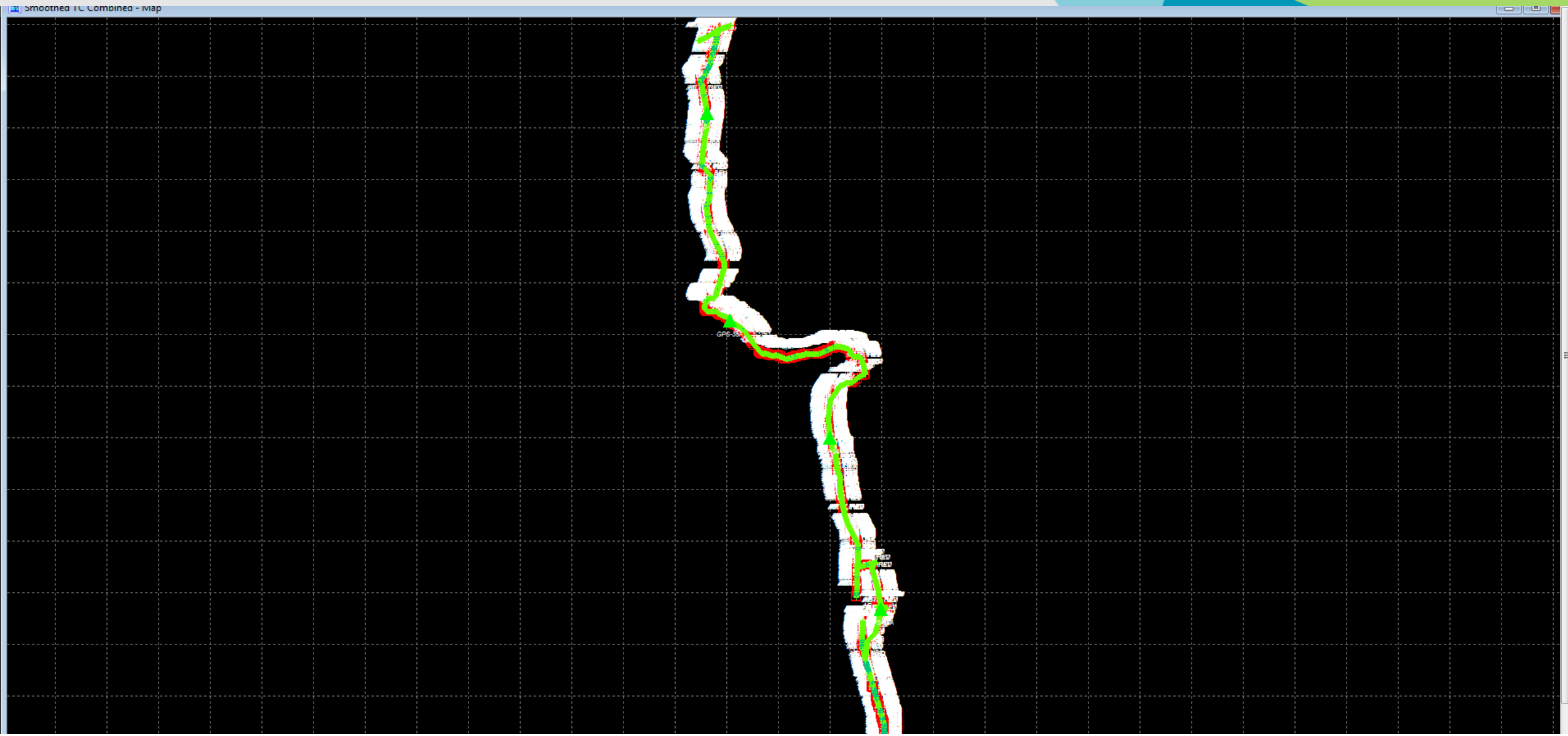
‘High Resolution Photographs’ captured using Mobile LiDAR ‘Leica Pegasus Two’:

ISO 9001 : 2015



‘Trajectory file’ generated using Mobile LiDAR ‘Leica Pegasus Two’:

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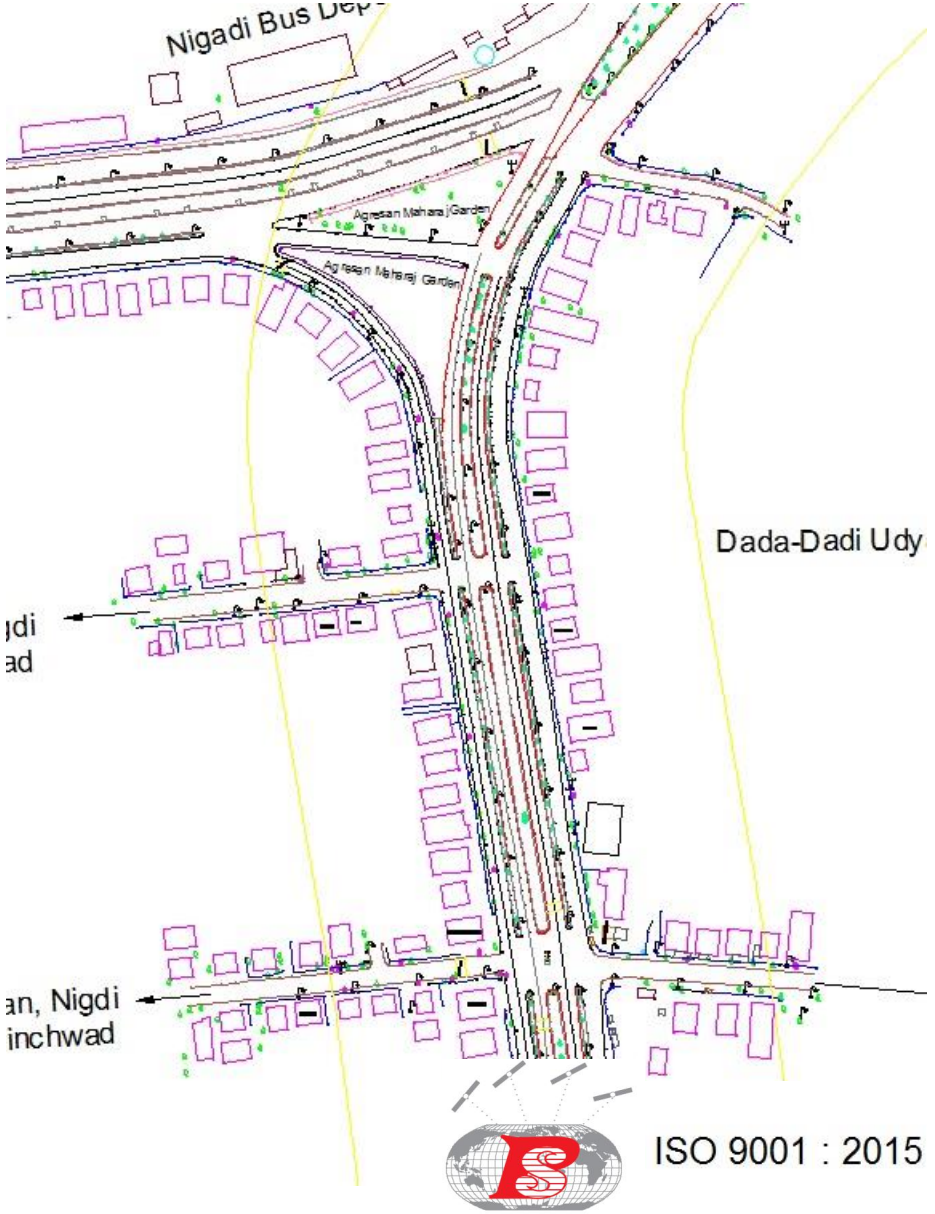
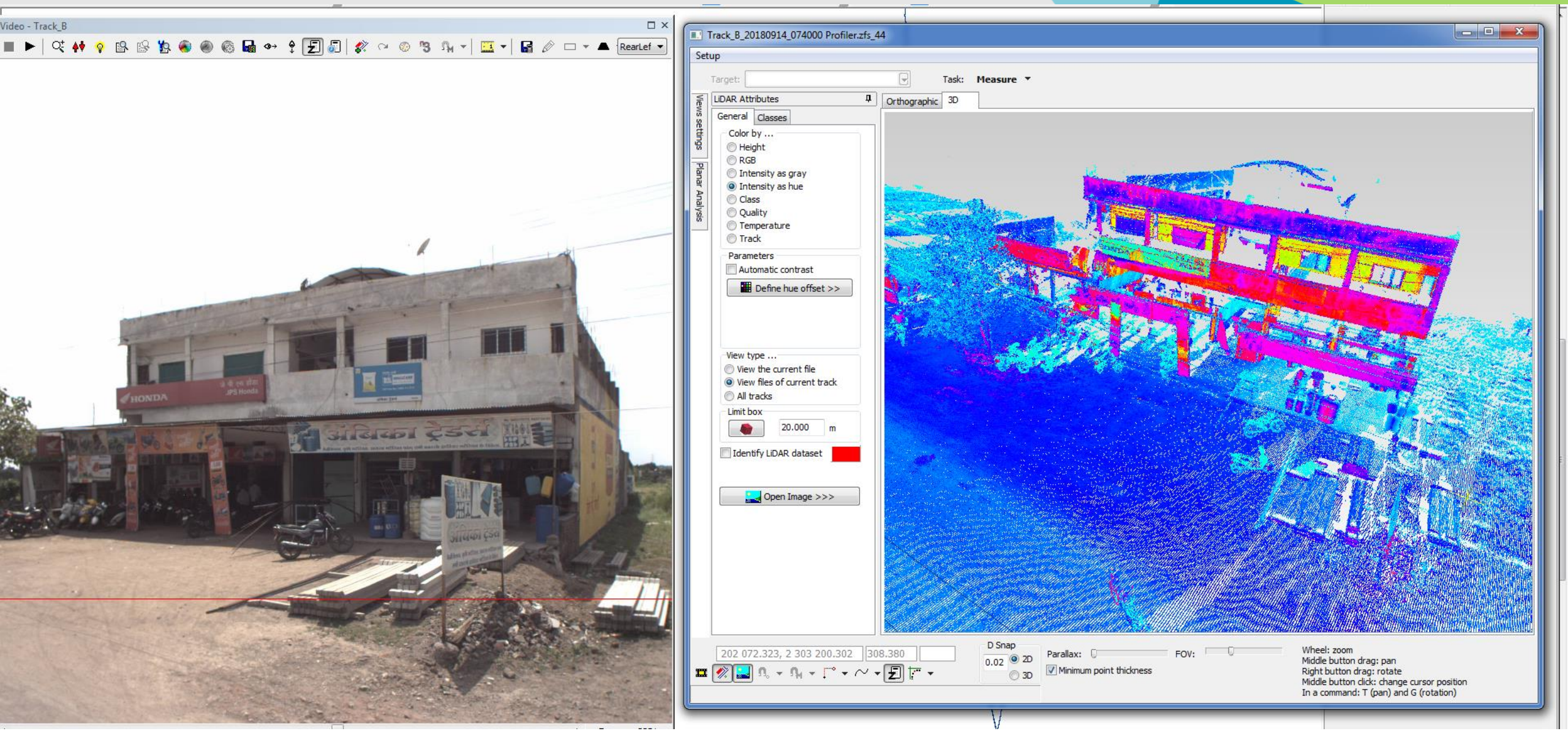
Data processing, feature extraction & 3D Output :

- **Data processing is done for generating ‘3D point cloud data’ & ‘feature extraction’ for plotting all existing features along the highways, using workstations as follows :**
- Using the GPS and IMU data, the precise trajectory is computed by ‘Way point inertial explorer’ software.
- The 3D point cloud data is prepared using ‘Leica Auto PP’, from the captured scan files, the images files & the trajectory files.
- The required features along the highway are extracted in the Arc GIS environment using ‘Leica Map Factory Advanced’ software.
- The extracted features are then exported to Autocad *.dwg format for further drafting works. L-Sections and Cross-Sections are generated by using ‘3D Reshaper’ software.
- The 360 degrees panoramic view of the camera & the point cloud data can be viewed in ‘Pegasus Manager’ software.





Screen Shot of ‘Photographs’ & ‘3D Scan point cloud data’ in ‘Leica Map Factory’ :

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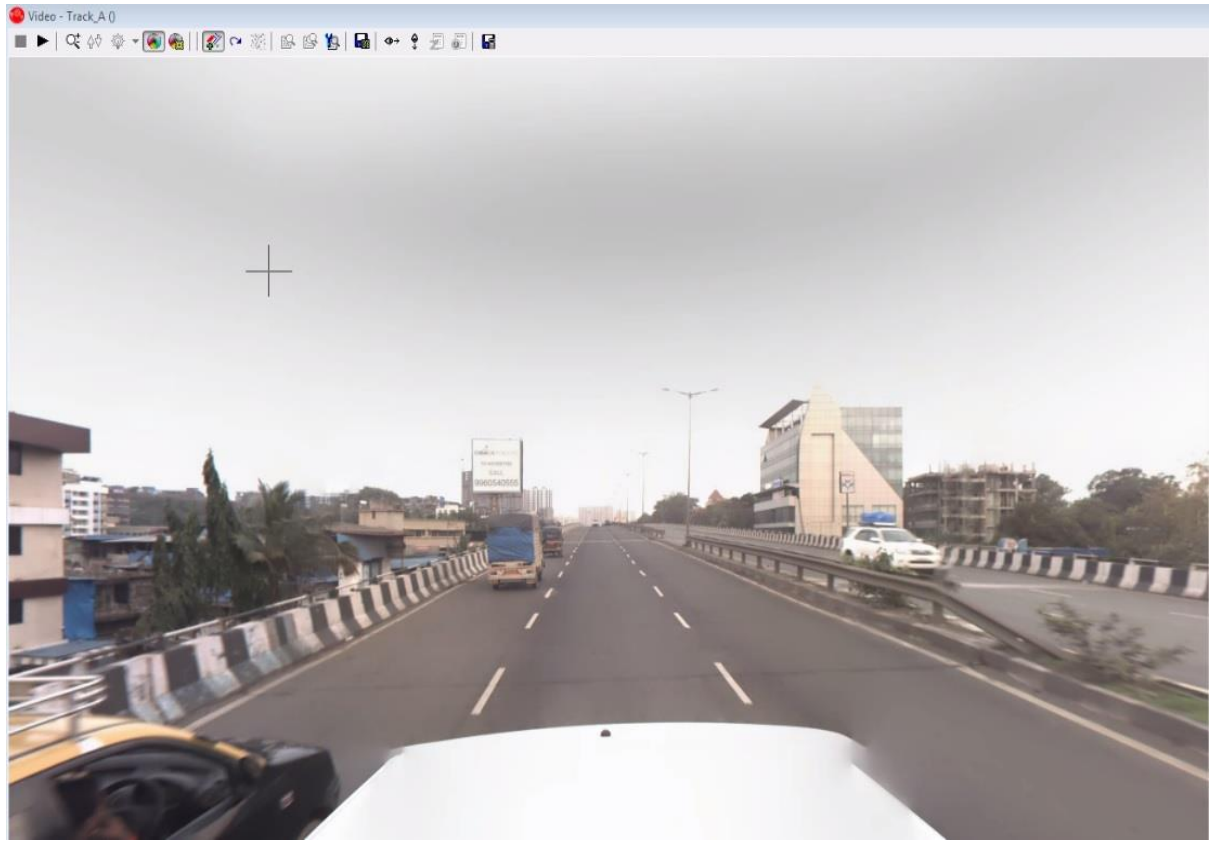
Contd… 3D Deliverables from ‘Pegasus’ Mobile LiDAR Survey :

- 3D Plan showing point, line and polygon features;
  in Arc GIS *.shp file or Autocad *.dwg files.
- Registered 3D point cloud data in *.hpc or LAS format.
- L-Sections and Cross-Sections of the road / Highway.
- Contours / DEM / TIN of the surface surveyed.
- The 360 degrees panoramic view of the camera data with the point cloud data superimposed on it.



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Terrestrial LiDAR for shadow areas / archeological / Plant & Machinery :

- For some shadow areas neither covered by Mobile LiDAR nor by UAV / Drones, Terrestrial LiDAR should be used.
- These can scan upto two million points per second and create dense point cloud which can be merged with the Mobile LiDAR database.
- The range of the Terrestrial scanner varies from few meters (short range) to few Kilometers (long range), which can be selected depending upon the site conditions and the applications.
- The same set of Ground control points are to be used for Terrestrial Scanner as well, for accurate registration of the point cloud data with that of the mobile LiDAR or UAV / Drone data.

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Hand Held LiDAR “Leica BLK2GO” for shadow areas / BIM :

- For some shadow areas & BIM neither covered by Mobile LiDAR nor by UAV / Drones, light weight Hand Held LiDAR can be used.
- It captures images and dimensionally accurate 3D point clouds in real-time and uses SLAM (Simultaneous Localization And Mapping) technology to record the trajectory through space.
- BLK2GO is the smallest dual axis LiDAR available with best-in-class accuracy, that scans up to 7,00,000 points per second.
- It has a 12 megapixel camera & three panoramic cameras for point cloud colorization & capture of panoramic imagery.
- Wireless & weighs less than 1 Kg including battery.

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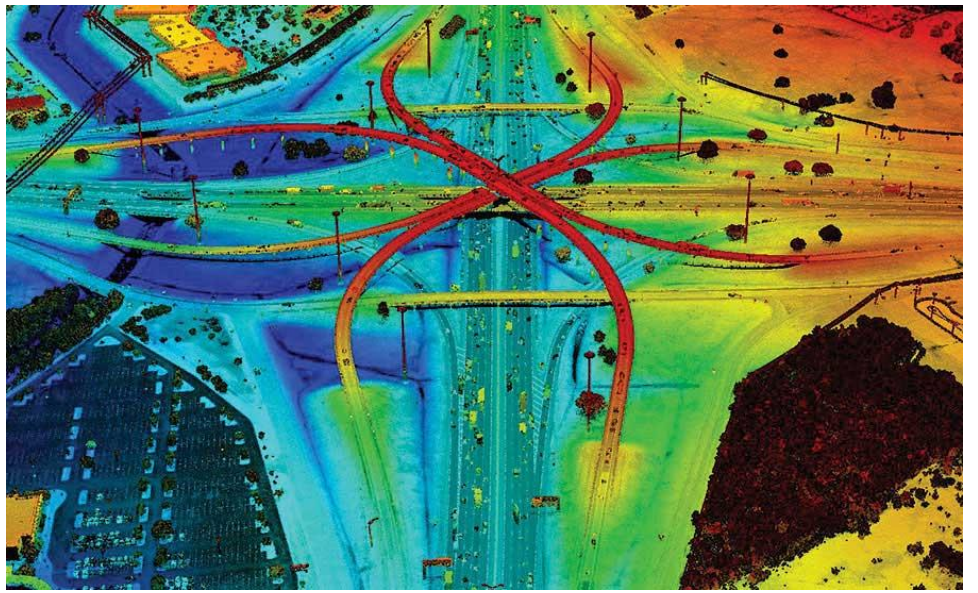
LiDAR based PPK UAV / Drones :

- PPK or RTK UAV / Drones can to be used either with Camera or with LiDAR Sensors, or using both; for the areas where Mobile LiDAR cannot capture the data.

- Though the Mobile LiDAR is much precise (upto + / - 2 CM) the UAV / Drones when used with PPK or RTK GNSS systems, can yield us accuracy upto + / - 5 to 10 CM, which is quite sufficient for city mapping applications.

- Usually most of the utilities are laid besides the existing roads, which are captured by Mobile LiDAR with high precision, where as the other features like the property boundaries, trees etc. which are not captured in mobile LiDAR, can be captured by the UAV / Drones.

- The GNSS network of base stations are to be kept same in both the above methods for uniform integration of datasets.



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GNSS / DGPS Base Stations / Ground Control Points (GCP's) :

- The precise GNSS / DGPS Base Station network sometimes called Ground Control Points (GCP's) is the backbone of all the data capture methods (Mobile LiDAR, UAV / Drone, GPR).
- These have to be established by Dual Frequency Survey Grade GNSS receivers with triangulation method and proper adjustments.
- Usually they are established in 3 levels of accuracy and density, Primary, Secondary and Tertiary based on the requirements of the project.
- The Primary, Secondary and in some cases even the Tertiary control points are established on permanent structures or monumental pillars and database maintained for future references.

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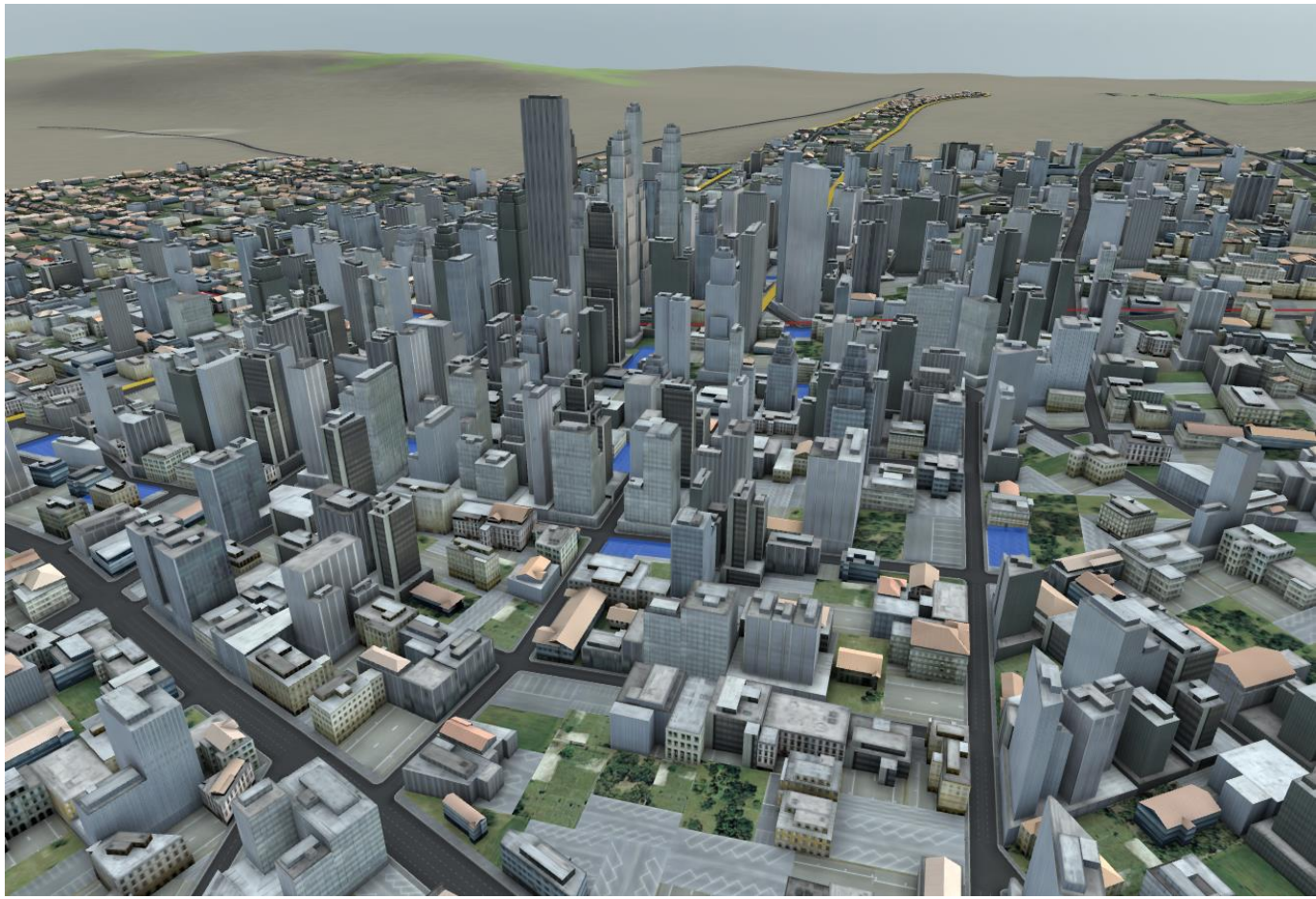
Seamless Integration of the above captured data :

- The data captured using various technologies, above and below the ground, needs to be seamlessly integrated, to result into a single uniform dataset.
- The accuracy for merging these data sets depends upon the usage of precision GNSS and DGPS network, which is common in all the technologies.
- Creating a 3D model and walk through using the above integrated data.
- Developing customized GIS applications & tools for urban Governments & local bodies.
- Useful for the highway infrastructure & 105, 3D Smart City projects, which have been recently launched in India.



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Applications :

- 3D City modeling, Smart City surveys
- As built surveys for the highways and roads.
- Airport runways, taxiways and adjoining areas Survey

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Thank You !!

Any Questions ?

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