

# Leica RTC360 Image Resolution White Paper



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- when it has to be **right**



# Leica RTC360 3D Reality Capture Solution

## Image Resolution

### Summary

The Leica RTC360 3D laser scanner collects 432 Megapixels (MP) of HDR images. These source images are designed with considerable overlap to ensure good blending performance. The source images have a native resolution designed to match the highest scan setting at 3 mm @ 10 metres. When considered as a panorama, this is equivalent to a 200 MP panorama, that is, 20480 x 10240 pixels, or equivalently a 5120 (5k) cube map. Leica Cyclone REGISTER 360 and Cyclone REGISTER both can be configured to deliver this resolution.



**Figure 1:** RTC360 panorama of the Leica Geosystems showroom, in Heerbrugg, Switzerland.

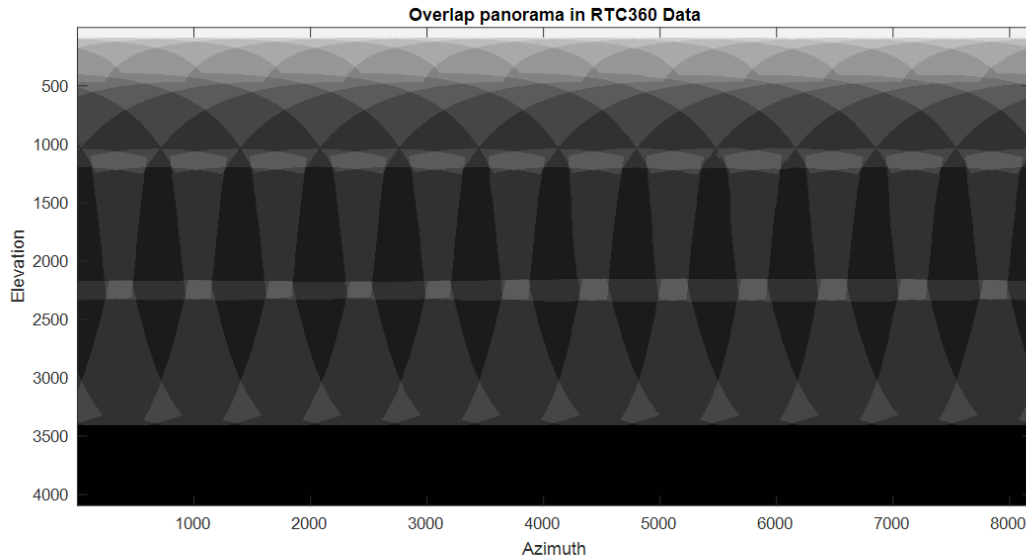
### Source Data

The RTC360 collects images of the full field of view using three 12 MP cameras placed on the frame, recording 5 HDR brackets in 12 horizontal positions.

The three HDR imaging cameras are organised in a radial array, fixed to the scanner frame. Each camera is composed of a 12 MP colour sensor vertically oriented, and a 62° vertical field of view lens. The three cameras cover the full vertical field of view, considering the bottom nadir hole and the required overlap. The horizontal field of view is 48°, such that the vertical overlap given by the 12 positions (30° shift) is guaranteed over the full horizon. The resulting high level of overlap between multi-images improves the results of the blending algorithms in the processing downstream.

Each HDR bracket differs from the previous by one stop, and the combination of exposure values and ISOs are predefined, no matter what the illumination conditions of the scene are. No light measurement procedures are needed before the actual image collection, because the dynamic range from brightest to darkest is covered by the five stops without a priori measurement. Timewise, this can be translated into a fixed 1-minute HDR images collection time.

With 12 shooting positions. 3 cameras with 12 MP sensor and 5 HDR brackets, the resulting amount of 180 images are collected for each setup. Considering the merged HDR images, the total RAW images resolution is 432 MP (12 MP x 3 cameras x 12 positions).



**Figure 2:** RTC360 overlap panorama. Images near the zenith overlap with as much as 11 other images (white). Images near the equator usually overlap with either none or two images. The brighter areas have more overlap in this figure.

The cameras have been designed such that the optical resolution matches the point cloud resolution at the highest setting of 3 mm @10 m point spacing. Source images are approximately 48 x 62 degrees, with a

resulting pixel size on the order of 300 uR. Panoramic images at 200 MP have a matched inherent pixel size, at  $2\pi / (20480) = 306.8$  uR.



**Figure 3:** Comparison of 200 MP panorama resolution, on the left, versus source image resolution, on the right. Source image is in D65, panorama is default illuminant compensated.

## Conclusion

The option to create 5k (5120) cube maps in Cyclone REGISTER 360 and Cyclone REGISTER matches closely the native resolution of the source images, which is matched to the highest resolution scan setting on the scanner. The decision to create these high resolution cube maps must be made before importing the data, and can be accessed in the preferences of both programs.

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