Drill Core Scanning

The logging of drill core and cuttings is one of the most important aspects of mine development and mineral exploration. Corescan’s HCI-3 integrates reflectance spectroscopy, visual imagery and 3D laser profiling to map the mineralogy, geochemistry and textural morphology of drill core, rock chips and other geological samples.

Alteration minerals and assemblages, and the way in which they vary with respect to mineralisation, offer the explorer and mining professional important vectors towards mineralisation. In exploration, this influences the positioning of new drill holes or curtailing the progress of current holes to preserve precious exploration expenditure. In mining, ore and gangue are tracked while textural and mineralogical variables reveal key mechanical rock properties leading to consistent metallurgical and mine planning.

HCI-3 takes spectral core logging to a higher level providing the geologist, the metallurgist and exploration and development teams as a whole with a rapid and reliable digital record of a drill hole that can be sent electronically to any number of geological experts or consultants should the need arise.

HCI-3 complements the geologist’s own qualitative assessment of core with quantitative mineral assemblage, compositional and textural data.
**HCI-3 Overview**

HCI-3 operates across the VNIR and SWIR bands from 450nm to 2500nm at a spectral resolution of ~4nm. The wavelength range covers spectral regions in which a wide range of hydrothermal alteration minerals exhibit spectral absorption features.

High quality optics focus the spectral measurement to a 0.5mm point on the core, maximising signal and minimising spectral mixing. The revolutionary design of HCI-3 reduces the uncertainties associated with spectral mixing inherent in traditional measurement systems, thus providing a ‘near pure’ spectral signature at each point on the core. This results in ~100,000 spectra per metre of scanned core.

A spectrally calibrated RGB camera provides a high resolution visual record of the core at 60 micron pixel size. Measurement of core surface features, texture and shape is complemented using a 3D laser profiler. The system comprises a scan unit housing the optics, spectrometers, cameras and 3D profiling sensors; a translation table with conveyor driven core tray loading system; and a high speed data acquisition, processing and control computer.

**HCI-3 Operation**

As each tray is loaded, an automated tray recognition system identifies sections of core and masks out unwanted materials such as the core tray and depth markers. Depth coordinates, scan modes and image resolutions are then confirmed by the operator for individual core sections prior to scanning.

The logging of spatial coordinates along with the automated identification and extraction of core sections means visualisation of the core and mineral mapping products are immediately available in a spatially referenced context, overcoming the time consuming image reconstruction overhead associated with traditional core tray imaging approaches. Core is scaled and reconstructed in real time even where core recovery is less than 100%.

A range of scan modes from full core detailed imaging through to rapid reconnaissance profiling are available to optimise image resolution with core throughput and data storage.

In reconnaissance mode, a spectral scan along a narrow swath down the centre of the core is performed, increasing core throughput while still providing substantial detail. In regions of mineralogical significance, detailed mode can be selected and the full core width is analysed at the highest resolution.

Sample densities may also be varied with each scan mode, typically between 0.5mm and 5.0mm. Scan rates of up to 50m per hour are achieved depending upon the scan mode required.

The simultaneous measurement of surface features using the 3D laser profiler offers an enormous advantage to both the structural geologist and metallurgist. In uncut core, structural features such as bedding, cleavages, fracture and vein orientations are not only visualised in the imagery, but orientation can also be computed.

HCI-3’s real time processing and visualisation software allows the geologist to review core as each section is scanned. Automated real-time interpretation analyses of core is then compared against pre-defined mineralogical models. In addition, sections of core scanned in high speed reconnaissance mode may be re-scanned immediately at detailed resolution should mineralogy of significance be detected.

**HCI-3 System Specification**

<table>
<thead>
<tr>
<th>Spec</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Spectrometers</td>
<td>3 (VNIR, SWIR-A, SWIR-B)</td>
</tr>
<tr>
<td>Spectral range</td>
<td>450nm to 2500nm</td>
</tr>
<tr>
<td>Spectral resolution</td>
<td>~4nm</td>
</tr>
<tr>
<td>Spatial resolution</td>
<td>0.5mm pixels</td>
</tr>
<tr>
<td>Scan modes</td>
<td>Detailed full width scan, Reconnaissance profile scan</td>
</tr>
<tr>
<td>Spectral calibration</td>
<td>NIST traceable rare earth reflectance standard</td>
</tr>
<tr>
<td>Radiometric calibration</td>
<td>Spectron reflectance standard, dark current</td>
</tr>
<tr>
<td>RGB image resolution</td>
<td>60um</td>
</tr>
<tr>
<td>Height profile resolution</td>
<td>1.5m</td>
</tr>
<tr>
<td>Core tray sizes</td>
<td>Up to 0.6m x 1.5m (W x L)</td>
</tr>
<tr>
<td>Scan rates</td>
<td>Up to 1000m per day Depending on operational constraints</td>
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