

# ACOUPLASMA<sup>OPTICAL</sup>

## APPLICATION NOTE

## HEMATOCRIT AND HEMOLYSIS DETERMINATION

AcouPlasmaOptical is an OEM device designed for rapid automated optical access to plasma from whole blood. Blood cells are acoustically focused, enabling measurements of blood analytes through the generated plasma window. AcouPlasmaOptical allows for easy integration into third-party diagnostic instruments reducing sample processing variations.

Hematocrit is part of a complete blood count and is defined as the proportion of red blood cells in whole blood, where an abnormal hematocrit value can indicate e.g. anemia, leukemia and lymphoma, dehydration, and lung and heart disease. For hemolysis, abnormal values can indicate bacterial infection, toxins, autoimmune disorders, but can also occur from incorrect sample handling which can interfere in laboratory tests.

### Hematocrit determination

The width of the plasma window generated when whole blood cells are acoustically focused shows a linear correlation to hematocrit (15–70 % hct). AcouPlasmaOptical can thus be used for rapid automated hematocrit determination minimizing the handling steps and time of measurement.

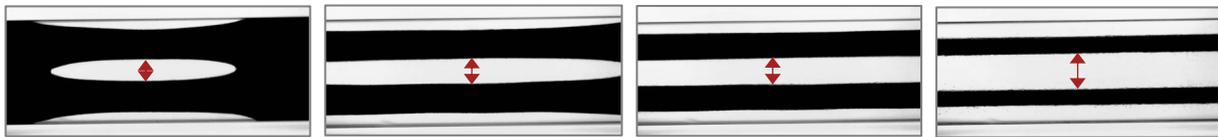
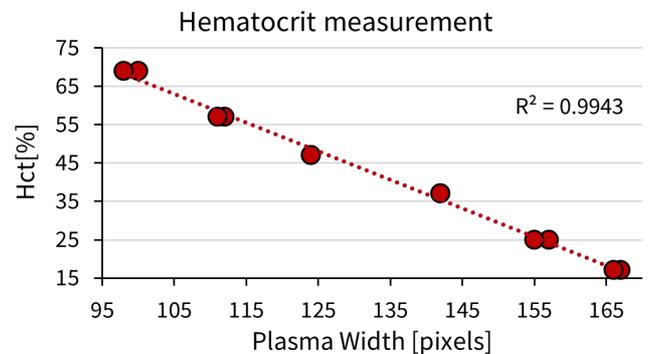


Figure 1. Graph showing measurement of plasma window size and the correlation to the measured hematocrit values. Images show plasma window size for hematocrit values of 69%, 57%, 47% and 17% (left to right).

### Hemolysis determination

Blood plasma containing different concentrations of free hemoglobin is linear to the transmission measured through the plasma window generated by the acoustic forces. AcouPlasmaOptical is gentle to the cells thereby not interfering with downstream measurements.

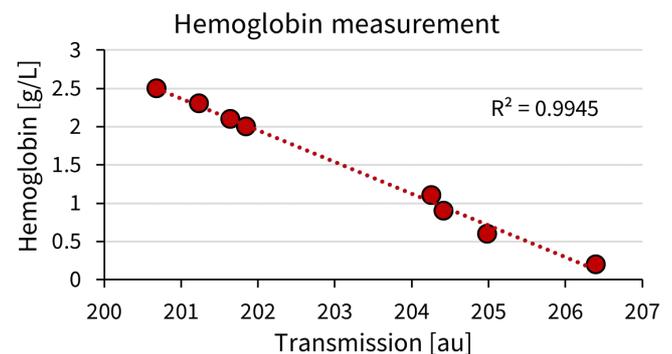


Figure 2. Measurement of transmission in the plasma window and the correlation to the hemoglobin concentration.

#### Methods

Human whole blood was adjusted to different hematocrit values by adding or removing blood plasma. The hematocrit value was confirmed using a Hettich Haematokrit 210 centrifuge. Samples were injected into the AcouPlasmaOptical module and blood cells were acoustically focused using a frequency sweep from 1900–2100 kHz with 5 ms sweep time, 10 V<sub>pp</sub> and 20 sec actuation time. The resulting plasma width in pixels was correlated to the hematocrit value.

For hemoglobin measurements, whole blood was centrifuged for 10 min, 2000x g and the plasma fraction was collected. Free hemoglobin from ultrasonically lysed blood was added to the plasma and the hemoglobin content was measured using HemoCue Plasma/Low Hb. The sample was loaded into the AcouPlasmaOptical module, pictures were taken and the grey value of the image was correlated to the measured hemoglobin value.