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**PIV measurement of
the flow in the vaneless
space of a Francis
turbine**

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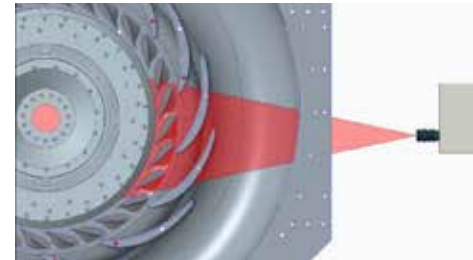
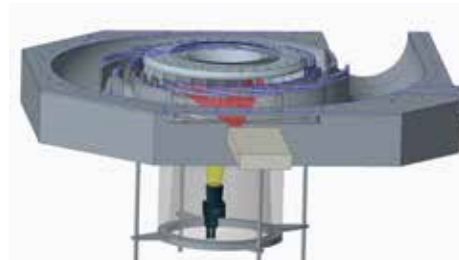
Kristian Sagmo



Background and objective

The vaneless space in a Francis turbine is a narrow region between the guide vanes and turbine blades. Experimental analysis using pressure gauges has previously been conducted. However, the data provided by gauges is not sufficient to analyse pressure distribution in an area. It is hypothesized that the pressure pulsations in this region is root cause of several undesired dynamic phenomena in Francis runners.

The goal for this thesis is to provide a deeper understanding of the velocity field, and thus also the pressure, in the vaneless space of a Francis turbine. This is to be done with the help of Particle Induced Velocimetry (PIV). PIV is a non-intrusive measuring technique, utilizing camera, laser and tracer particles to give an overview of a velocity field. The Francis test rig has to be modified to allow for PIV measurements and a measurement campaign is to be developed.



Side and top view of the suggested PIV setup for the Francis test rig.