Impinging-jets spray is a type of spray were two or more streams collide at the impingement point to enhance the spray formation.

Due to intense collision, even intact streams can break up into droplets and effectively form a spray cloud. Moreover, if the liquids are different, then during this collision process they mix and the two (or more) liquid substances are distributed over the whole spray cloud.

This feature is used in rocket engines where fuel and oxidizer imping, mix, ignite and combust. The feature of efficient mixing of impinging jets is also used in the process equipment and reactors to mix two different comments needed for a process or reaction.

The efficient mixing is possible when the streams of injected liquids travel along the nozzles' axes and collide at the intersection point. When the liquid streams start to be wavy or break up into droplets, the collision of the liquids traveling from different nozzles starts to be less probable and the mixing process becomes less effective. This may happen when a liquid is injected into environment of pressure lower than its vapour pressure. In that case the rapid vaporization (flash boiling) occurs, which significantly changes the jet structure at the nozzle's exit. In such conditions the vapour bubbles which are generated inside the liquid stream expand rapidly and lead to micro explosions, in which the streams bursts into droplets.

Moreover, these micro explosions accelerate droplets in different directions and only part of them travels along the original path and mix with the other stream. This negative effect may become even stronger if the sprays are formed in cross-flow conditions. Then the small droplets will travel along different paths than the bigger ones or the unbroken liquid stream.

Although the flash boiling has been highly interesting to many researchers and its influence on sprays is fairly well known, the vast majority of the studies was limited to round nozzles and hollow-cone sprays, while the influence on impinging jets is completely omitted.

This study is aimed at filling these knowledge gaps and provide comprehensive data on impinging jets using non-intrusive laser-based visualization methods, such as: high-speed imaging, microscopic shadowgraphy imaging, and finally microscopic LIF (Laser-Induced Fluorescence).

The project will provide answers about the overall flash-boiling effect on the impinging-jets. It will also examine the transition from non-flashing to flashing sprays. Moreover, the project will link three considered aspects: near-nozzle stream behaviour, mixing process in a collision area and further spray formation. This will lead to understanding of the mixing process of impinging jets operating in flash-boiling and cross-flow conditions.