Many of the open questions in particle physics are related to neutrinos. One of the enigmas related to neutrinos is the observed deficit in the number of anti-neutrinos produced by nuclear reactors w.r.t. the prediction. To explain this anomaly theorists hypothesized a new fundamental particle, the so-called 'sterile' neutrino. This sterile neutrino does not interact with matter like ordinary neutrinos. If it exists, its presence could be inferred from the variation of the detected number of anti-neutrinos as a function of their energy and travelled distance from the reactor. Distances below 10 m are particularly interesting.

In order to solve the reactor anti-neutrino anomaly, the SoLid collaboration constructed an anti-neutrino detector capable of accurately measuring both the position and energy of each interacting anti-neutrino. This detector was placed next to SCK°CEN's BR2 reactor in Mol, Belgium, at a distance of only 6.2 m between the reactor core and the detector.

Anti-neutrinos interact with the detector material via inverse beta decay interactions, producing a neutron and a positron. It is the coincidence between these two particles that indicates the presence of neutrinos. The SoLid detector is a voxelised hybrid solid scintillator detector. The voxelisation into cubes allows for the determination of the interaction position of the anti-neutrino. The use of solid scintillators is new in the field and led to an extensive commissioning period for the detector.

The research presented in this thesis is performed on the prototype SM1 detector and the full scale Phase 1 detector. The studies performed with the SM1 detector led to several design changes for the Phase 1 detector to increase the efficiency to detect anti-neutrinos. The analysis performed on the first data collected by the Phase 1 detector demonstrates the capability of the SoLid experiment to detect anti-neutrinos despite the large background, which is essential for the success of the experiment as it is the first step towards solving the reactor anti-neutrino anomaly.