Mobile Monitoring System
Likewise LHC, the FCC tunnel should be carefully supervised to protect personnel working inside and prevent equipment damage. Nevertheless, the experience of CERN fire brigade in LHC tunnels underline the need for a reconnaissance system, which could be rapidly used for situation assessment in the place of accident. Due to expected circumference and high complexity of the FCC tunnel, use of conventional surveillance systems for instantaneous situation assessment is practically impossible. The aim of this study is to develop an autonomous mobile reconnaissance system for harsh environments (partial darkness, presence of smoke and fire, high amount of metallic parts, etc.), based on sensor fusion and machine learning algorithms. Described set-up could be mounted on a specialized robot, which is stationed inside the tunnel. In case of emergency it could be the first-response unit sent to the hot-spot for reconnaissance mission while firefighters are on the way. The main objective of the system is to detect accident victims and monitor their health status wirelessly. Their location and status could be send to augmented reality headsets of the fire brigade to help in search task.

The Proposed Approach
The proposed system consists of Ultra Wide Band radars (UWB) and a thermal camera. The UWB transmitter sends an impulse across room while receivers sample signal and classify distance to object using swept threshold principle. Range-Doppler processing and frequency filtering enables micro-Doppler signature acquisition, which gives information about lung and heart activity, whereas thermal camera provides heat signature of the human body. Sensor fusion with a unique noise cancelling algorithm could increase robustness of system and make it less vulnerable against surrounding noise in the harsh environment.

System Workflow