Name of the organization
Karlsruher Institut für Technologie (KIT)

Name of the infrastructure / laboratory
HYKA-A2 Facility (a Large Scale Explosion Chamber)

Address and country of the infrastructure / laboratory
Karlsruher Institut für Technologie (KIT), Campus Nord, Hermann-von-Helmholtz-Platz 1 - 76344 Eggenstein-Leopoldshafen, Germany

Person responsible of the access / Contact person
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Main field of activity of the infrastructure / laboratory
- *Hydrogen safety, refueling, hydrogen storages*

Short description of the infrastructure / laboratory
The largest safety vessel A2 with main dimensions of 6 m id and 9 m height provides an empty test volume of about 220 m3. It is designed for fire and explosion tests with an operating over-pressure from -1 to 10 bar. Depending on the purpose, large samples can be tested inside them, or the whole vessel can be used as a test volume. The vessel may be evacuated or filled with inert atmosphere of nitrogen or steam and may be heated up to 150 oC. The vessel is equipped with many vents and ports for experiment and measurement set-ups as well as with windows for visual observations. It has 3 vents of 2000 mm id, 4 vents of 700 mm id, 5 vents of 400 mm id and about 40 vents of smaller inner diameters (50-250 mm). The measuring system consists of thermocouples array (gas temperature, flame arrival time); piezoelectric and piezoresistive gauges (initial pressure, explosion pressure); gas analyzer and mass spectrometer (to control mixture composition); sonic hydrogen sensors, photodiodes and ion probes (flame arrival time, flame speed), strain gauges (deformations). The data acquisition system is based on multi-channel (64) ADC with a sampling rate of 1 MHz. The vessel was successfully tested using 2 large scale combustion experiments of hydrogen-steam-air mixture (10:25:75 = H2:H2O:air) at 1.5 bar of initial pressure and 90 oC temperature.

Main research area(s) of the infrastructure / laboratory
Turbulent hydrogen combustion in uniform and nonuniform gas mixtures at different initial pressures and temperatures; effect of venting on flame propagation regimes; high pressure hydrogen releases, experiments on hydrogen distribution in closed volume, structural response of piping structures to internal pressure loads, bon fire testing of high pressure tanks, integrity of high pressure tanks under external and internal pressure loads, to use as a safety vessel for small hydrogen inventory facilities (as explosion tubes and chambers, hydrogen fuel cells and forklifts).

Instruments and tools available for the above mentioned research
Vacuum pump, steam generator, high speed imaging system combined with BOS technique.