# Minutes kick-off meeting PWIE SP X1 08-07-2021

Present: Michael Reinhard (FZJ), Gennady Sergeinko (FZJ), Ivo Classen (DIFFER), Huw Leggate (DCU), Timo Gans (DCU). Pavel Veis (CU) will be contacted later

Remark: For 2021 and partly 2022 a lot of tasks described in the work package concerns only design and installation of diagnostics.

**Hennie**

Hennie motivated and summarized the goals of the SP X1 project

**Ivo Classen – DIFFER deliverables**

* TALIF is being setup for measuring atomic density in Magnum-PSI , the dye laser that will be implemented for this diagnostic will be the work horse for future CARS/SARS. First TALIF measurements are expected in Q1 of 2022.
* In collaboration with Erasmus student, under super vision of Pavel and Hennie/Ivo, VUV passive spectroscopy will be performed to measure ro-vib. ground state distribution of H2 and isotopes
* Conceptual design CARS and SARS is ongoing
* CTS/TS measurements are being performed in Magnum-PSI to explore the very near surface plasma including the presheath

Good remark from Gennady: the narrow plasma beam and the forthcoming density gradients can influence the ro-vibrational distribution measurements. It is expected that the DIFFER SARS LIF system can measure with a spatial resolution of max 2 mm, while the plasma diameter is 17-18 mm FWHM at a B~1.2 T. Indeed for low densities, it seems the mean free path will be longer than the beam dimensions, thus this needs to be taken into account. The beam can be broadened by lowering the magnetic field. Moreover, in a divertor the beam width in one direction is also in the range of ~10 mm, thus at a first approximation in terms of dimensions the situation could be comparable with that in Magnum. The temperature range determines also the free mean path, thus one has to be careful with these assumptions.

**Michael Reinhard – FZJ deliverables**

* PSI-2 is back in operation since June 2021
* LIF system for H/H2 ro-vib. measurements is available (system used at TEXTOR by Sebastijan). The system based on a 3-photon excitation scheme, is large in dimensions, and a suitable location has to be found near PSI-2. Design is ongoing.
* VUV passive spectroscopy: spectrometer is available (else contact Ivo, Hennie) and will be installed together with vacuum tubing at PSI-2. Measurements expected in Q4 2021 (PSI-2 is fully booked up to and including September)

**Pavel Veis – CU deliverables**

* VUV passive spectroscopy (see Ivo Classen) will be performed in Magnum this year (depending on COVID pandemic restrictions)
* Before starting passive VUV spectroscopy at DIFFER in autumn 2021, we would like to carry out measurements of the spectral response of the whole VUV spectrometer, including a new hollow fibre, in our laboratory in Bratislava. Measurements will be done using the method of the molecular branching ratio of the singlet nitrogen LBH transition N2(a)-N2(X), using a standard nitrogen glow discharge. The goal of this intermediate study is to determine the application range of this fibre in terms of spectral transmission. In case the fiber is suitable, this will allow us to locate the camera at a location where the magnetic field of MAGNUM-PSI at a sufficient low value
* CU will send a VUV spectrometer to DIFFER, and a PhD student will come for installation and measurements. student is Spectrometer system

**Timo Gans – DCU deliverables**

This year DCU will not directly contribute to the work package deliverables, but some investigations will be carried out to see if a 3-photon or 4-photon excitation scheme can be deployed for LIF on H2 using tuneable high-intensity picosecond or femtosecond laser systems. The selection rules change in comparison to 1-photon and 2-photon schemes and suitable excitation schemes need to be developed and tested. 3-photon schemes have higher excitation cross-sections than 4-photon schemes. However, the use of even number of photons, i.e. 4, allows spectrally symmetric excitation. This is beneficial as it can compensate for spectrally broader pulses, in particular for femtosecond laser systems. Shorter pulses also provide the benefit of improved discrimination between signal and background in high background environments.

**In general: risk for the project**

Covid remains a risk for the different projects, so far DIFFER and FZJ could continue their work in a reasonable pace. COVID has had an impact on activities at DCU where it is anticipated that activities should resume in Q4 2021.