For later comparison with OP, we note that incomplete optical measurements relying on the Malus' law such as those described in Section 3 lead to the determination of the two Stokes parameters (s_1, s_2), equivalent to the ellipse orientation (ψ) and the amplitude of the linear component of the polarization $\sqrt{s_1^2 + s_2^2}$, but do not provide information on the circular and unpolarized components. One obtains only an "upper bound ellipticity" (ε_{ub}) defined as:

$$\varepsilon_{ub} = \tan \chi_{ub} \text{ with } \sin 2\chi_{ub} = s_{3-ub}, \quad s_{3-ub} = \sqrt{1 - {s_1}^2 - {s_2}^2} \text{ and } \varepsilon_{ub} \geq 0$$

ε_{ub} coincides with the absolute value of the ellipticity only for fully polarized light $P = 1$, $\varepsilon_{ub} = |\varepsilon|$.

As for the HHG emission, due to the absence of practical XUV dephasing elements, only incomplete optical polarimetry measurements have been performed up to now, assuming a totally polarized light ($P = 1$), thus leading to a possible over estimate of the ellipticity. We point out that the Stokes parameters, as well as the parameters of the polarization ellipse and degree of polarization, are quantities averaged in time and space: they provide an effective description of a temporally and spatially variable field – such as the harmonic field – as the sum of steadily polarized and unpolarized parts.

3. Combining 3D-momentum spectrometry with APT generation: experimental methodology

We now turn to the combination of the 3D-momentum spectrometry with APT generation. The experiments have been conducted on the PLFA beamline at the SLIC facility of CEA Saclay.[52] A schematic of the set-up is shown in Fig. 3. The IR laser delivers pulses at 800 nm with up to 8 mJ energy, 50 fs pulse duration at a 1 kHz repetition rate. For the SF_6 experiment, linearly polarized pulses of about 1 mJ are made elliptically polarized through a quarter wave plate whose rotation α determines the signed fundamental ellipticity $\varepsilon_{fun} = \tan(\alpha)$ as well as the direction of the main axis of the ellipse. The IR beam is focused with a 85 cm lens into an effusive gas jet of SF_6 molecules under vacuum. It is then filtered out of the generated harmonics with a 200 nm aluminum foil (not shown). The harmonics

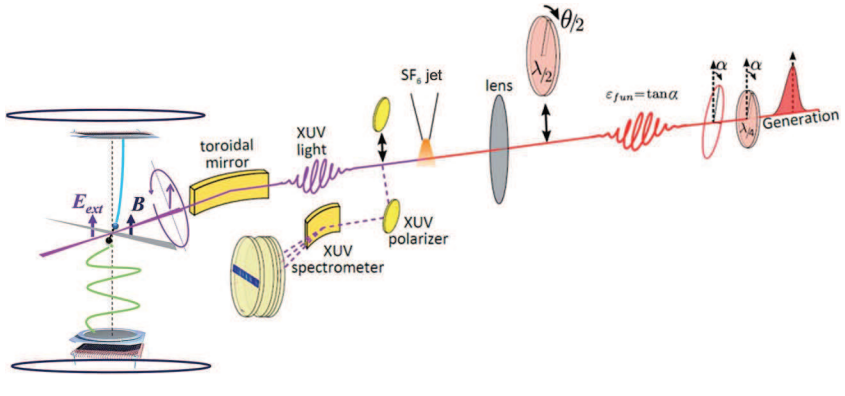

Fig. 3 Schematic of the experimental set-up combining the HHG PLFA beamline and the electron-ion 3D-momentum spectrometer.