New X-ray imaging techniques based on the analysis of speckle patterns have been successfully developed on synchrotron beamlines. The relatively simple experimental setup can be adapted to conventional X-ray sources, and gives access to several image modalities in a single experiment: absorption contrast, phase contrast and dark field. Applications involve polymers, composite materials, additive manufacturing or biomedical imaging, to name a few. The technique is non destructive, and the short measurement time is suitable for time-resolved studies (thermal evolution, mechanical constraints,…).

The methodologies developed for synchrotrons need to be adapted to conventional laboratory equipment. Indeed, laboratory X-ray sources differ widely from synchrotron beams in terms of brilliance, energy composition, coherence, divergence and beam size. The PhD candidate will adapt and extend conventional SBI data analysis models to incorporate the characterictics of conventional laboratory sources. The reconstruction of volumetric information (tomography) from the different image modalities will also be considered.

During the thesis, experimental data will be collected on a laboratory beamline at the company and during measurement campaigns on synchrotron. The candidate will develop a deep understanding of speckle-based imaging algorithms, building on the expertise of the academic laboratory. Ultimately, this work will help spread the use of this new imaging technique outside synchrotrons.

• **Description of job *:** The research activities will be carried out at the company (50%) and at the academic laboratory (50%). Both sites are located in Grenoble, France. Measurement campaigns on synchrotron beamlines (e.g. ESRF in Grenoble) will be organized during the thesis. The following topics will be addressed:

- Acquisition of speckle images on a laboratory beamline and at synchrotrons
- Numerical simulation and modelling of the laboratory optical components
- Development and validation of data analysis algorithms for the reconstruction of multimodal images (absorption, phase, dark field)
- Optimization of the experimental conditions and analysis workflow

• **Main Research Field *:**

☐ Agricultural sciences
☐ Anthropology
☐ Architecture
☐ Arts
☐ Astronomy
☐ Biological sciences
☐ Chemistry
☐ Communication sciences
☐ Computer science
☐ Criminology
☐ Cultural studies
☐ Demography
☐ Economics
☐ Educational sciences
x Engineering
☐ Environmental science
☐ Ethics in health sciences
☐ Ethics in natural sciences
☐ Ethics in physical sciences
☐ Ethics in social sciences
☐ Geography
☐ History
☐ Information science
☐ Juridical sciences
☐ Language sciences
☐ Literature
x Mathematics
☐ Medical Sciences
☐ Neurosciences
☐ Pharmacological sciences
☐ Philosophy
x Physics
☐ Political sciences
☐ Psychological sciences
☐ Religious sciences
☐ Sociology
☐ Technology
☐ Other

• **Function *: PhD candidate (CIFRE thesis)**

• **Research Profile*:** The applicant must hold a master's or engineering degree in physics, medical imaging or applied mathematics. Skills in numerical data analysis (e.g. images) and computer programming are necessary. Knowledge or previous experience with X-ray techniques (imaging, scattering, diffraction, fluorescence) will be appreciated but is not required.

The candidate should be able to communicate in English and French.

- **Date of recruitment** : September 2021……

- **E-mail address to which the candidate has to send his candidacy: bertrand.faure@xenocs.com, emmanuel.brun@esrf.fr**

CV, motivation letter and University transcripts are required.