Contribution ID: **105** Type: **Talk**

Multimodal X-ray Imaging with Darkfield Contrast: Improved COVID-19 Detection with Chest X-rays

Thursday, 20 May 2021 18:00 (20 minutes)

Diseases of the respiratory system are leading global causes of chronic morbidity and mortality. While advanced medical imaging technologies of today deliver detailed diagnostic information, a low-dose, fast, and inexpensive option for early detection and/or follow-ups is still lacking.
Here, we report on the first human application of a novel modality, namely X-ray dark-field chest imaging, which might fill this gap. Enabling the assessment of microstructural changes in lung parenchyma, this technique presents a more sensitive alternative to conventional chest X-rays, and yet requires only a fraction of the dose applied in computed tomography (CT).
For this first clinical evaluation, we have built a novel dark-field chest X-ray system, which is also capable of simultaneously acquiring a conventional thorax radiograph. With this first system worldwide, we are presently conducting two patient studies. The first is devoted to chronic obstructive pulmonary disease (COPD), the second to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).
First results look very promising and show that X-ray dark-field chest imaging allows the diagnosis of COPD and COVID-19 more effectively than conventional chest X-ray does.

References

1. Pfeiffer, F., Weitkamp, T., Bunk, O. & David, C. Phase retrieval and differential phase-contrast imaging with low-brilliance X-ray sources. Nature Physics 2(4), 258-261 (2006).
2. Pfeiffer, F., Bech, M., Bunk, O., Kraft, P., Eikenberry, E.F., Brönnimann, C., Grünzweig, C. & David, C. Hard-X-ray dark-field imaging using a grating interferometer. Nature Materials 7(2), 134-137 (2008).
3. Dierolf, M., Menzel, A., Thibault, P., Schneider, P., Kewish, C.M., Wepf, R., Bunk, O. & Pfeiffer, F. Ptychographic X-ray computed tomography at the nanoscale. Nature 467(7314), 436-439 (2010).
4. Schaff, F., Bech, M., Zaslansky, P., Jud, C., Liebi, M., Guizar-Sicairos, M. & Pfeiffer, F. Six-dimensional real and reciprocal space small-angle X-ray scattering tomography. Nature 527(7578), 353-356 (2015).
5. Willer, K., Fingerle, A., Noichl, W., De Marco, F., Frank, M., Urban, T., Schick, R., Gustschin, A., Gleich, B., Herzen, J., Koehler, T., Yaroshenko, A., Pralow, T., Zimmermann, G., Renger, B., Sauter, A., Pfeiffer, D., Makowski, M., Rummeny, E., Grenier, P. & Pfeiffer, F., X-ray Dark-Field Chest Imaging can Detect and Quantify Emphysema in COPD Patients, (2021), preprint: [https://doi.org/10.1101/2021.01.15.21249798]

Primary author: Prof. PFEIFFER, Franz (Technical University Munich)

Presenter: Prof. PFEIFFER, Franz (Technical University Munich)

Session Classification: Diagnostics by Imaging