



## **Tutorial Session**

### **Migration methods for GPR signal enhancement**

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The tutorial session will present and discuss the methods and algorithms for focusing B-Scan images obtained using Ground Penetrating Radar (GPR).

The session will start with a general description of the workflow in GPR operations. Following this, the refocusing or migration problem will be introduced. Different migration methods will be presented and compared, among them, hyperbolic summation, back-projection, Kirchhoff migration, phase-shift migration, and time-reversal.

A discussion on the practical limitations of the methods will be addressed during the tutorial. Especially those regarding the field of interest of the URSI Commission E. For example, the influence of different type the electromagnetic noise, electromagnetic interference, and ground losses on the effectiveness of the methods will be discussed. Finally, the results of different methods on examples, both real and synthetic, will be provided.

The tutorial is addressed to researchers working on detection of underground targets, nondestructive testing, geological assessment, and other applications using GPR. The attendees will have the opportunity of gaining first-hand experience of signal processing for addressing one of the most challenging problems in GPR.

It's recommended to review the list of references prior to the tutorial, in order to gain familiarity with the topic.

## **References**

- [1] Shen, Ruiqing, Yonghui Zhao, Shufan Hu, Bo Li, and Wenda Bi. 2021. "Reverse-Time Migration Imaging of Ground-Penetrating Radar in NDT of Reinforced Concrete Structures" Remote Sensing 13, no. 10: 2020. <https://doi.org/10.3390/rs13102020>
- [2] Z. Yang, X. Yang, B. Wang, Q. Liu and T. Zeng, "Improved F-K Migration Based on Interpolation Method for GPR Imaging," 2019 6th Asia-Pacific Conference on Synthetic Aperture Radar (APSAR), Xiamen, China, 2019, pp. 1-6, doi: 10.1109/APSAR46974.2019.9048259
- [3] Smitha, N., Ullas Bharadwaj, D.R., Abilash, S. et al. Kirchhoff and F-K migration to focus ground penetrating radar images. Geo-Engineering 7, 4 (2016). <https://doi.org/10.1186/s40703-016-0019-6>
- [4] X. Feng, M. Sato and C. Liu, "Hand-Held GPR Imaging Using Migration for Irregular Data," in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 4, no. 4, pp. 799-803, Dec. 2011, doi: 10.1109/JSTARS.2011.2164573.