**Synchronized Data-Based Back-Projection Algorithm for Stationary Receiver & Moving Transmitter SAR Imaging**

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***ABSTRACT***

A synchronized data-based back-projection algorithm(BPA) is presented in this study for reconstructing an image of the SAR system, which consists of a stationary receiver and a moving transmitter. In this BPA imaging process, the data synchronization performs time-, position- and frequency synchronization sequentially on the position information and two channels received data collected from the stationary receiver and moving transmitter, respectively. The BPA geometry for SAR imaging can be reconstructed using the time- and position-synchronized data. Then, the frequency synchronization corrects a linear phase error caused by using an individual receiver and transceiver. Residual phase errors that remain after correcting the linear phase error term can be mitigated by phase gradient autofocus(PGA), which is applied to the direct-path channel data of the stationary receiver, not the imaging-path channel data. Because two-channel data are simultaneously received under the same condition, any residual phase errors may equally come into both channel data. Thus, it can be analyzed with the direct-path data, which has a single trajectory in the range compressed domain. The residual phase errors analyzed using the PGA method on the direct-path data can be utilized to correct the input data for the proposed BPA process, resulting in a well-focused SAR image. The performance of the proposed BPA process has been validated using the raw data measured through the field campaign. In particular, a comparative result obtained by applying the PGA method on the direct-path data, rather than the imaging-path data is shown in the manuscript.

**Keywords:** back-projection algorithm, data synchronization, stationary Rx & moving Tx SAR, phase gradient autofocus, phase error correction