INVESTIGATION OF A SPATIAL OPTICAL PULSE COLLECTION SYSTEM IN THE ALL-OPTICAL ANALOG-TO-DIGITAL CONVERTER

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ABSTRACT

In this research, I conducted a systematic integration of specific calculations for the analysis of the spatial filter that is a critical component of an all-optical analog-to-digital converter. The designed all-optical analog-to-digital converter has special relevance for high-resolution$\times$bandwidth applications such as radar image processing. The design of the spatial filter array is based on the silicon-on-insulator process, a design that fulfills requirements of both lower power consumption and smaller integrated circuit chip size.

For the developed calculation model, Babinet's principle is used in order to decompose a complicated structure into different simple components. The decomposed structure is analyzed by modifying the existing diffraction calculation methods.

The method of calculating the transmission ratio of the propagating electric field compared to the finite-different-time-domain method is a new approach. The systematic integration is also adaptive to changes in the spatial filter's components. Structural changes do not require changes to the entire calculation model.