In this article, we investigate the mathematical model of a digital optoelectronic processor for the purpose of determining the signal at the processor's output. The study of the model allows us to determine the distortions of the input signal of the processor, which are caused by the matrix spatio-temporal modulator. The developed physical and mathematical model of the processor made it possible to obtain an analytical expression for the signal at the processor's output. Its analysis shows that the formula for determining the spatial frequency differs significantly from the traditional formula. The spatial frequency depends on positions of the central and side maxima in the first-order diffraction maximum. In this case, the signal spectrum can be determined by measuring the lateral maximum, which is located closer to the optical axis of the processor. This allows to use of smaller matrix detectors, as well as to investigate the signal spectrum beyond the Nyquist frequency of the modulator.

https://doi.org/10.1117/12.2501595

Full article