Vita

Candidate’s name: Zhenduo Huang

Universities Attended:
University of New Brunswick (2010)
Bachelors of Civil Engineering

University of New Brunswick (2017)
Masters of Science

Performance Analysis of Optical Orthogonal Code

UNIVERSITY OF NEW BRUNSWICK
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by

Zhenduo Huang

in the Department of Mathematics & Statistics

U.N.B., Saint John, N.B.

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Examining Committee

Dr. Tim Alderson  Supervisor
Dr. Rebecca McKay  Internal Examiner
Dr. Owen Kaser  External Examiner
Dr. Bruce MacDonald  Chair of Oral Examination
Abstract

Optical orthogonal codes (OOCs) are families of binary (0,1) spreading codes used in optical code-division multiple access (OCDMA) systems. There exist 1D-OOC (sequences in time spreading), 2D-OOC (sequences in both time spreading and wavelength hopping), and 3D-OOC (sequences in time spreading, wavelength hopping, and polarization). 1D-OOC and 2D-OOC can be constructed by both algebraic and combinatorial methods. In this report, we introduce several OOCs, we develop a technique to construct TC (Truncated Costas) codes, and also we provide some corrections to previously published results by Salehi in 1989. We employ three different methods to measure the error rate of cross-correlation. We compare these methods and investigate which is most suitable under various scenarios. At last we compare several families of OOC's introduced in this report and determine which types are best suited to specific environments.