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LIST OF ABBREVIATIONS

FSO	-	Free Space Optics
FCC	-	Federal Communication Comission
MAI	-	Multiple Access Interference
OCDMA	-	Optical Code Division Multiple Access
SAC OCDMA	-	Spectral Amplitude Codewords for the Optical Code Division Multiple Access
OOC	-	Optical Orthogonal Code
KS	-	Khazani-Syed
EDW	-	Enhanced Double Weight
MDF	-	Modified Frequency Hopping
MQC	-	Modified Quadratic Congruence
RD	-	Random Diagonal
MDW	-	Modified Double Weight
MD	-	Multi Diagonal
NRZ	-	Non Return to Zero
RZ	-	Return to Zero
bps	-	bit per second
NRZ-L	-	Non Return to Zero-Level
NRZ-I	-	Non Return to Zero-Inver
MD-SAC OCDMA	-	Multi Diagonal Spectral Amplitude Codewords for the Optical Code Division Multiple Access
ITU-R	-	International Telecommunication Union-Radiocommunication
BER	-	Bit Error Rate
UDBS	-	User Defined Bit Sequence
CW	-	Continous Wave
MZM	-	Mach-Zehnder Modulator
FBG	-	Fiber Bragg Grating
SPM-GVD	-	Single Phase-Modulation Group Velocity Dispersion

RINGKASAN

Mahdin Rohmatillah, Jurusan Teknik Elektro, Fakultas Teknik Universitas Brawijaya, Januari 2016, *Design and Performance Analysis of Multi Diagonal Spectral Amplitude Codewords for Optical Code Division Multiple Access with Variation of Line Codings in Free Space Optics Communication System*, Dosen Pembimbing : Dr. Ir. Sholeh Hadi Pramono, M.T. and Dr. Nor Shahida Binti Mohd Shah

Saat ini teknologi serat optik telah memenuhi semua ekspektasi dan diprediksi teknologi ini tidak akan digantikan oleh teknologi yang lain sampi beberapa tahun kedepan. Namun demikian saluran serat optik tidak dapat dibangun dengan cepat karena dibutuhkan biaya yang mahal dan waktu yang lama. *Free Space Optics* (FSO) adalah salah satu teknologi yang dapat mengatasi masalah tersebut. Sebagaimana komunikasi melalui FSO telah semakin berkembang dan mampu mendukung sistem komunikasi *multi-user*, maka teknik *multiple-acces* menjadi sangat penting didalam sistem tersebut.Diantara semua teknik *multiple-access* dalam lingkup optik, OCDMA menjadi teknik yang paling menarik perhatian karena bersifat fleksibel, mudah dalam pengimplementasiannya, sinkronisasi antar user tidak dibutuhkan, serta mampu menangani trafik dalam sistem.

Terdapat banyak jenis kode yang ditawarkan dalam sistem OCDMA, salah satu kode yang mampu menangani *Multiple Access Interference* adalah kode *Multi Diagonal* (MD). Isu lain yang perlu dibahas adalah cahaya laser menjalar pada lapisan troposfer yang dikenal tidak stabil seperti halnya dielektrik kabel serat optik. Penelitian ini menganalisa *Multi Diagonal Spectral Amplitude Codewords* untuk sistem komunikasi FSO didalam lima jenis cuaca, yaitu cerah, berkabut, hujan ringan, hujan sedang, dan hujan lebat dengan simulasi pada software OptiSystem 13. Jenis *line coding* yang digunakan adalah *non chirped* NRZ, c*hirped* NRZ, RZ, dan Manchester. Dari hasil didapatkan jenis *line coding* terbaik adalah *chirped* NRZ dan yang terburuk adalah Manchester

Kata Kunci **:** *Multi Diagonal Spectral Amplitude Codewords*, OCDMA, FSO, *non chirped* NRZ, *chirped* NRZ, RZ, Manchester

SUMMARY

Mahdin Rohmatillah, Department of Electrical Engineering, Faculty of Engineering, University of Brawijaya, Januari 2016, *Design and Performance Analysis of Multi Diagonal Spectral Amplitude Codewords for Optical Code Division Multiple Access with Variation of Line Codings in Free Space Optics Communication System*, Academic Supervisor : Dr. Ir. Sholeh Hadi Pramono, M.T. and Dr. Nor Shahida Binti Mohd Shah

Currently, the fiber optic technology has successfully met all expectations and the prediction is that it will not be replaced by another technology for many years to come. However, fiber optic link can not be deployed rapidly because it takes high cost and time. Free Space Optics (FSO) is one of the available technology which can overcome that issue. As FSO Communication get more mature and become viable for multi-user communication systems, advanced multiple-access technique become more important and attractive in such systems. Among all multiple-access techniques in optical domain, OCDMA is of outmust interest because of its flexibility, ease of implementation, no need for synchronization among many users, and soft traffic handling capability.

There are many kinds of code, but one of code that can overcome Multiple Access Interference is Multi Diagonal (MD) Code. Another issue that has to be addressed is the laser beam propagates through the atmosphere, and in most cases through its lower layer known as troposphere, which is not a well - defined stable medium like the dielectric fiber, so that selecting line coding format is very important. This research analyzes the Multi Diagonal Spectral Amplitude Codewords for Optical Code Division Multiple Access with variation of line coding in FSO communication system in five different weather which are clear, haze, light rain, medium rain, and heavy rain by simulate it in OptiSystem 13. The line codings which are implemented to the system are NRZ, chirped NRZ, RZ, and Manchester. From the result obtained, the best line coding for the system is chirped NRZ and the worst is Manchester.

Keywords **:** Multi Diagonal Spectral Amplitude Codewords, OCDMA, FSO, non chirped NRZ, chirped NRZ, RZ, Manchester