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Co-organized

IEEE SSIT Society on Social Implications of Technology

The ISR Indonesian Society for Reliability

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Proceedings of FoITIC 2017 – International Conference

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PREFACE

WELCOME FROM THE RECTOR
INSTITUT TEKNOLOGI NASIONAL BANDUNG

Dear speakers and participants,

Welcome to Bandung and welcome to Itenas campus!

It is great pleasure for me to welcome you in campus of Itenas Bandung at the 1st Faculty of Industrial Technology International Congress (FoITIC) 2017.

The theme for the 1st FoITIC 2017 “Toward Reliability Renewable and Sustainable Energy Systems: Challenges and Opportunities”, is very relevant with the current hot issues about climate change, growing populations and limited fossil fuel resources.

We believe that scientists and researchers will hand in hand with industrial experts, to create and develop new renewable and sustainable technologies that enable human to make products and services more efficient, protect environment and keep people healthier.

I am deeply grateful appreciative to the Faculty of Industrial Technology Itenas, Indonesian Society Reliability, Institute of Electrical & Electronics Engineers Indonesia Society on Social Implication of Technology Chapter, IEEE CAS Hyderabad, delegates, organizing committee and many others who have contributed to the success of this conference.

I am confident that this event will serve to promote much valuable communication and information exchange among scientist – researcher and industrial expert.

May we have a successful, stimulating, fruitful and rewarding the conference.

Thank you.

Dr. Iman Aschuri

Rector
Institut Teknologi Nasional Bandung

PREFACE

WELCOME FROM THE DEAN OF FACULTY OF INDUSTRIAL TECHNOLOGY, INSTITUT TEKNOLOGI NASIONAL BANDUNG

Dear distinguished Guest, Ladies and Gentlemen,

Welcome to the 1st Faculty of Industrial Technology International Congress (FoITIC) 2017, which is organized by Faculty of Industrial Technology, Institut Teknologi Nasional (Itenas) Bandung, in conjunction with Indonesian Society for Reliability (ISR) and Institute of Electrical & Electronics Engineers Indonesia Society on Social Implication of Technology Chapter (IEEE Indonesia SSIT Chapter). In our Faculty, we have agreed that FoITIC event will be held every two years (biennial program).

The main theme for the 1st congress is "Towards Reliable Renewable and Sustainable Energy Systems: Challenges and Opportunities". The congress will divide into 2 (two) main programs i.e. International Conference and international workshop.

The aim of the International Conference is invites academics, researchers, engineers, government officers, company delegates and students from the field of energy and other discipline to gather, present and share the results of their research and/or work, and discuss strategies for the future utilization of renewable and sustainable energy system.

Taking this opportunity, I would like to convey my sincere thanks and appreciations to our keynote speakers and invited speakers from Szent Istvan University Hungary, IEEE Indonesia SSIT Chapter, Indonesian Society for Reliability, University Malaysia Pahang and Indonesian Wind Energy Society, workshop facilitators i.e. IEEE Circuits and Systems (IEEE CAS) Hyderabad – India) and national and international scientific committee for their support of this important event. I would also like to invite all participants in expressing our appreciation to all members of the FoITIC 2017 organizing committee for their hard work in making this conference success.

Finally, we wish you all fruitful networking during conference and workshop, and we do hope that you will reap the most benefit of it.

Do enjoy your stay in Bandung, and thank you very much!

Dr. Dani Rusirawan

Dean Faculty of Industrial Technology – Institut Teknologi Nasional Bandung
Chairman of FoITIC 2017

ACKNOWLEDGEMENT

The completion of this undertaking could not have been possible without the participation and assistance of so many people whose names may not all be enumerated. The contributions are sincerely appreciated and gratefully acknowledged. The 1st International Conference on FoITIC (Faculty of Industrial Technology Congress) Organizing Committee wishes to express its gratitude and deep appreciation to the following:

1. Dr. Imam Aschuri, Rector of Institut Teknologi Nasional Bandung;
2. All keynote and invited speakers, moderators, conference speakers, all participants and others who have in one way or another contributed for their valuable participation;
3. Institute of Electrical & Electronics Engineers Indonesia Society on Social Implication of Technology Chapter (IEEE Indonesia SSIT Chapter);
4. Institute of Electrical & Electronics Engineers Circuits and Systems (IEEE CAS), Hyderabad India;
5. Indonesian Society for Reliability (ISR);
6. Universiti Malaysia Pahang;
7. Indonesian Wind Energy Society (IWES).

KEYNOTE AND INVITED SPEAKERS INTERNATIONAL CONFERENCE

Prof. Dr. Istvan Farkas (Szent Istvan University)

Prof. Dr. Istvan Farkas is Director of Institute for Environmental Engineering System, Szent Istvan University (SZIU), Godollo – Hungary. He is also Head of Department Physics and Process Control and head of Engineering Doctoral School, at SZIU. He got Doctoral Degree from Technical University Budapest (1985). Presently, a lot of his activities devotes on International professional societies such as: International Solar Energy Societies (ISES), International Federation of Automatic Control (IFAC), European Federation of Chemical Engineering (EFChE), European Thematic Network on Education and Research in Biosystems Engineering, European Network on Photovoltaic Technologies, FAO Regional Working Group on Greenhouse Crops in the SEE Countries, Solar Energy Journal Associate Editor, Drying Technology Journal Editorial Board, etc. He was a visiting Professor in several universities: Solar Energy Applications Laboratory, Colorado University State University, Fort Collins - USA; Department of Energy, Helsinki University of Technology, Espoo - Finland; Institut for Meteorology and Physics, University of Agricultures Sciencies, Vienna - Austria; Laboratory of Bioprocess Engineering, The University of Tokyo - Japan.

Ahmad Taufik, M.Eng., Ph.D (Indonesian Society for Reliability)

Ahmad Taufik, M.Eng, Ph.D (Graduated from Georgia Institute of Technology, USA – 1996) is a lecturer and a professional trainer and consultant. He is member of American Society for Metals (ASM) and American Society for Mechanical Engineer (ASME). He performs research in fatigue and fracture mechanics of oil and gas pipeline. Dr. Ahmad Taufik highly experienced in providing industrial training and consulting work more than 20 projects related to Pipelines Failure Analysis, Risk and Reliability Assessment, Repair Design, Pipeline Corrosion Protection in Oil and Gas Industries. Dr. Ahmad Taufik has been chairman and speakers for many Oil and Gas International Conferences in Indonesia, (INDOPIPE, MAPREC), Malaysia (ASCOPE), Singapore and China (IPTEC) for the last five years. He is founder of Indonesian Society Reliability (ISR) and presently he is a chairman of the ISR. Since 2006, he was work as part time lecturer at Dept. of Mechanical Engineering, Itenas.

Prof. Dr. Soegijardjo Soegijoko (Institut Teknologi Nasional Bandung)

Soegijardjo Soegijoko (born in Yogyakarta, 1942) earned his Engineer Degree in Telecommunication Engineering from the Department of Electrical Engineering, Institut Teknologi Bandung (ITB), Indonesia, in 1964. His Doctor Degree (*Docteur Ingenieur*) was obtained from USTL (*Universite des Sciences et Techniques du Languedoc, Montpellier, France*) in 1980. Additionally, he has also completed a number of non-degree or post-doctoral programs, such as: tertiary education (UNSW, Australia, 1970), VLSI Design (Stanford University – 1986; UNSW- 1991; Tokyo Institute of Technology-1984, 1985, 1990).

Since 1966, he joined ITB as a teaching staff at the Department of Electrical Engineering, (currently School of Electrical Engineering & Informatics) ITB, and appointed as a Professor on Biomedical Engineering in 1998. During his academic services at ITB (from 1966 – 2007), he has actively involved in the developments and operations of various units, e.g.: Electronics Laboratory, Master Program on Microelectronics, Inter University Center on Microelectronics, Biomedical Engineering Program (Undergraduate, Master & Doctorate programs), and Biomedical Engineering Laboratory. Although he has been officially retired in 2007, he has appointed as an adjunct Professor at ITB for some years. At present (August 2017), he is an adjunct Professor at the Department of Electrical Engineering, Institut Teknologi Nasional (ITENAS) Bandung (Indonesia). His current research interests include: Biomedical Engineering Instrumentation, e-Health &Telemedicine Systems, and Biomedical Engineering Education.

He has published more than 100 international papers in the above-mentioned research interests. Moreover, he (and his colleagues) have also authored five different book chapter titles (on biomedical engineering, ehealth & telemedicine) published by Jimoondang (Korea, 2008), Springer (Singapore, 2014), CRC Press – Taylor Francis (2016), and Springer (2017).

Currently, he actively involves in various societies within the IEEE that include: EMBS, SSIT, CASS, Computer, and Education, as well as SIGHT (Special Interest Group on Humanitarian Activities). He is currently the IEEE Indonesia SSIT Chapter Chair, EMBS Chapter Chair and actively involves in the Indonesian eHealth & Telemedicine Society (IeHTS) as well as the Indonesian Biomedical Engineering Society (IBES).

Prof. Dr. Ir. Soegijardjo Soegijoko is a *Life Senior Member* of the IEEE, and can be reached through: soegi@ieee.org

Prof. Dr. Rizalman Mamat (Universiti Malaysia Pahang)

Prof. Dr. Rizalman Mamat presently is Dean of Faculty Mechanical Engineering, Universiti Malaysia Pahang, Malaysia. He got Doctoral degree from University of Birmingham, United Kingdom in fuel and energy. Previously, he obtained his BSc and MSc from University Teknologi Malaysia (UTM). His field research interest is Heat transfer, Combustion, Internal Combustion Engine, Alternative Energy, Computational Fluid Dynamics, Propulsion System. Prof. Dr. Rizalman Mamat was visiting Professor at Karlsruhe University of Applied Science Germany (2017), Faculty of Engineering Universitas Abulyatama Aceh, Indonesia (2017), Faculty of Engineering Universitas Gajah Putih Aceh, Indonesia (2017), Department of Mechanical Manufacture & Automation Ningxia University, Yinchuan, China (2016), Department of Mechanical Manufacture & Automation Ningxia University, Yinchuan, China (2015).

Mr. Soeripno Martosaputro (Indonesia Wind Energy Society)

Soeripno Martosaputro, graduated from Universitas Sebelas Maret (Bachelor) and University of Pancasila (MSc.). Presently, he is worked at PT UPC Renewables. Moreover, he is Chairman of Indonesia Wind Energy Society (IWES) and Chairman of Expert Board of Indonesia Wind Energy Association (IWEA). Previously he worked as a researcher at the National Institute of Aeronautics and Space (LAPAN), Aerospace Technology Center, particularly in the field of technology development and engineering of the Wind Energy Conversion Systems. He is active in the field of science and technology utilization in particular wind energy technology as speakers and resource persons in seminars nationally and internationally. He is member of the Asia Pacific Wind Energy Forum (APWEF), Indonesia National Committee World Energy Congress (KNI-WEC), Indonesia Renewable Energy Society (METI), and National Research Council (DRN). In 2012 – 2016, he was act as National Project Manager of WHYPGEN (Wind Hybrid Power Generation market initiatives Project) – UNDP Project.

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Implementation of Digital Communication System on DSK TMS320C6713

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Abstract

Communication system using digital modulation has been used widely on telecommunication system nowadays, including voice communication, video or data. In this research author make a system implementation digital communication using modulation techniques ASK, FSK, BPSK, dan QPSK that passed into AWGN channel (Additive White Gaussian Noise) then added Rayleigh on DSK device (Digital Signal Processing Starter Kit) TMS320C6713 type. Furthermore, the designed system was evaluated. The evaluation of modulator signal output was in accordance with characteristic each modulation, but the received information signal was different from the sent information signal. BER performance that resulted from each system was fluktuatif. Both of these were caused by the AWGN channel and Rayleigh and the system did not use the signal quality improvement techniques of received information. The most efficient system in terms of memory usage on TMS320C6713 DSK is a system with FSK modulation, with a value of 1.15719697%. While most large systems use a memory is ASK communication systems with a value of 1.191666667% efficiency.

Keywords: Digital Modulation, AWGN, Rayleigh, BER, DSK TMS320C6713

Introduction

Telecommunications technology is currently growing very rapidly as a result of the increasing needs of the community in activities or work. Communications technology effectively and efficiently continue to be developed by human to obtain a telecommunication system better than the existing telecommunications system. Therefore, many telecommunications researchers in the world continue to compete until now in order to improve the performance of a telecommunications system.

M-file of the simulation conducted found that the bit error rate (BER) at the BPSK and QPSK are equal in value. This is due to the process of sending data between BPSK (Binary Phase Shift Keying) and QPSK (Quadrature Phase Shift Keying) to within one bit. From these results indicate that the simulator results are in accordance with the theory of BER in digital modulation techniques when passed in AWGN channel (Sa'iyanti, N.P.. Pratiarso, A.,2011; Darlis, A.R, 2015).

Implementation modulation and demodulation on DSK TMS320C6416T to the type of modulation QAM (Quadrature Amplitude Modulation), 16 QAM and 64 QAM is concluded that there worst performance in 64 QAM modulation. This result is due to the BER values obtained worse. When compared with the value of BER of 10-5 BER value, the value of 64 QAM modulation BER is greater than 10-5. As for QAM and 16 QAM modulation BER values that are less than 10-5 (Aryanta, D. et al, (2015); Lidyawati, L. et al, (2015)).

There are several advantages when using TMS320C6713 DSK, which has a very quick process because TMS320C6713 DSK has a larger clock is 225 MHz. TMS320C6713 DSK is a specific application processor is a processor made specifically for certain applications (Nugraha, 2011).

From these studies, the author had the idea to create a digital communications system implementation on the device DSK (Digital Signal Processing Starter Kit) type TMS320C6713. This research will be conducted digital communication system simulation using Matlab software version r2007a and implementation of digital communication systems on the TMS320C6713 DSK. In the simulation and implementation will use a modulation technique ASK, FSK, BPSK and QPSK(Wahyudi, R.A., (2008)). A telecommunications system is always passed on certain tracks or channels that cause noise (interference signal channel). In this study, all modulation will be passed on channel AWGN (Additive White Gaussian Noise) and Rayleigh (Harada dan Prasad, (2002)).

The purpose of this study include the simulated digital communication system that is passed in AWGN channel and Rayleigh using Matlab software version r2007a format m-file, create a simulation of digital communication system that is passed in AWGN channel and Rayleigh using software matlab version r207a using Simulink, implementing on system design software with simulink Matlab version r2007a on TMS320C6713 DSK (Yeh, H.G. et al, (2007); Ghariani, N. et al, (2011)).

2. Methodology

In order for this research is more focused and clear the authors limit the study to be discussed, while the boundary problem is the modulation used modulation techniques ASK, FSK, BPSK and QPSK, the channels used in the system using the AWGN channel and Rayleigh, and do not use the technique improvement of signal quality information received.

Digital communication system is the process of delivering information from the sender to the receiver where the signal information sent or received is digitized, the signals are expressed in the form of bits of data (eg with the numbers 0 and 1). The main part of the digital communication system is the sender, the medium through which the transmitted signal, and a receiver (Emir, H. et al, (2007). With the hope of the received signal is equal to the signal sent by the sender information. Block diagram of a digital transmission system can be seen in Figure 1.

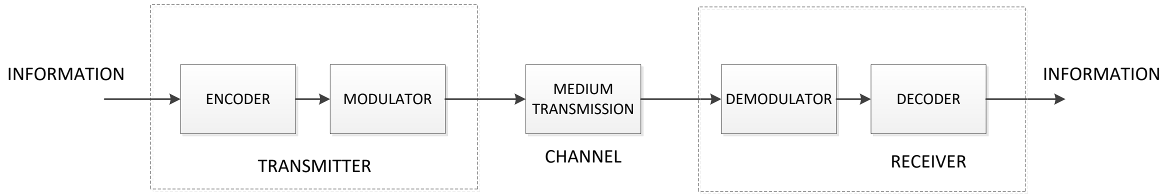


Fig. 1 : Diagram block system Digital Transmission System

If we construct a mathematical model for the received signal at the receiver, the channel through which the signal is assumed to undermine, by white Gaussian noise. When a signal is sent, white Gaussian noise, and received signal is modeled as (t), n (t0, and r (t), then the received signal:

$$r(t) = s(t) + n(t) \quad (1)$$

Where n (t) is a function of the AWGN process with the probability density function (pdf) and the power spectral density, the following equation:

$$\varphi_{nn}(f) = \frac{1}{2} N_0 [\frac{W}{Hz}] \quad (2)$$

Where N_0 is constant and often referred to as the power density noise (noise power density).

In multipath propagation, signal reception sometimes strengthen or weaken. This phenomenon is called multipath fading, and the received signal level change from time to time. Multipath fading increase data errors at the receiver, when the digital radio signal transmitted from the sender through terrestrial channels.

Rayleigh fading is often used as a realistic approach that is good enough for the wireless channel conditions non-LOS (Line Of Sight) and multipath. In the fading Rayleigh happen multiplication distortion h (t) with the transmission signal s (t), with n (t) is the noise, so that the received signal can be approximated by y (t) = [(h (t) • s (t)] + n (t) (Baddour, K. E. et al., (2005); Komninakis, C., (2008); Mathumisaranon, T. et al, (2013)).

Digital Signal Processing (DSP) processor, such as processor family TMS320C6x is a high-speed microprocessor with the type of architecture and instruction set specifically for signal processing. C6x notation indicates that the processor is a member of the Texas Instruments (TI) TMS320C6000 processor family (Texas Instrument. (2001); Kharel, R. et al, (2010); Maji, P. et al, (2012)). Architecture of digital signal processor C6x devoted to numerical calculations are very complex. Based on the architecture very longinstruction - word (VLIW) processor TI C6x considered as the best compared to others. DSP processor is closely related to signal processing in real-time (Ghariani, N. et al, (2011)).

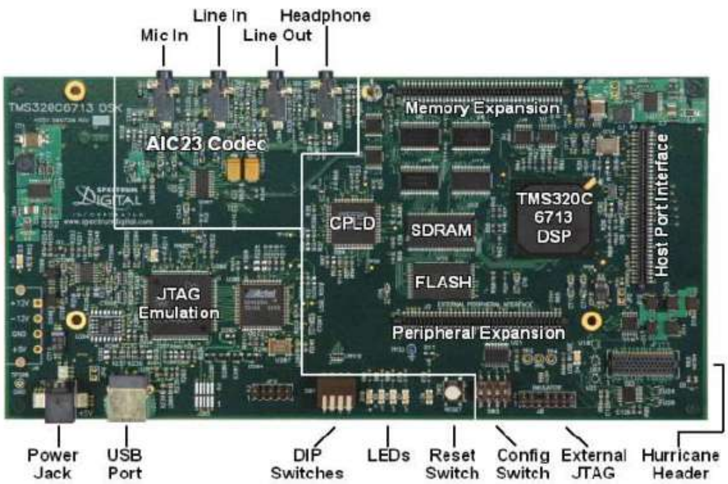


Fig. 3 : DSK TMS320C6713 Board

In this study conducted several stages of the simulation with m-file format, the simulation in Simulink and Simulink implementation of the TMS320C6713 DSK. Figure 4 shows the process flow of the making of this study. In this study will be made of digital communication system with five different types of modulation is ASK, FSK, BPSK and QPSK.

For a channel that is used is the AWGN channel and Rayleigh channel. Specifications of the canal Rayleighyang made are reflected signal to produce a third doppler frequency of 0.01 Hz. The first reflected signal gain of 10 dB and strengthening delay of 1 ms, the second reflected signal gain reinforcement 0:05 dB and 0.05 ms delay, and the third reflected signal gain of 20 dB attenuation and delay of 0.2 ms.

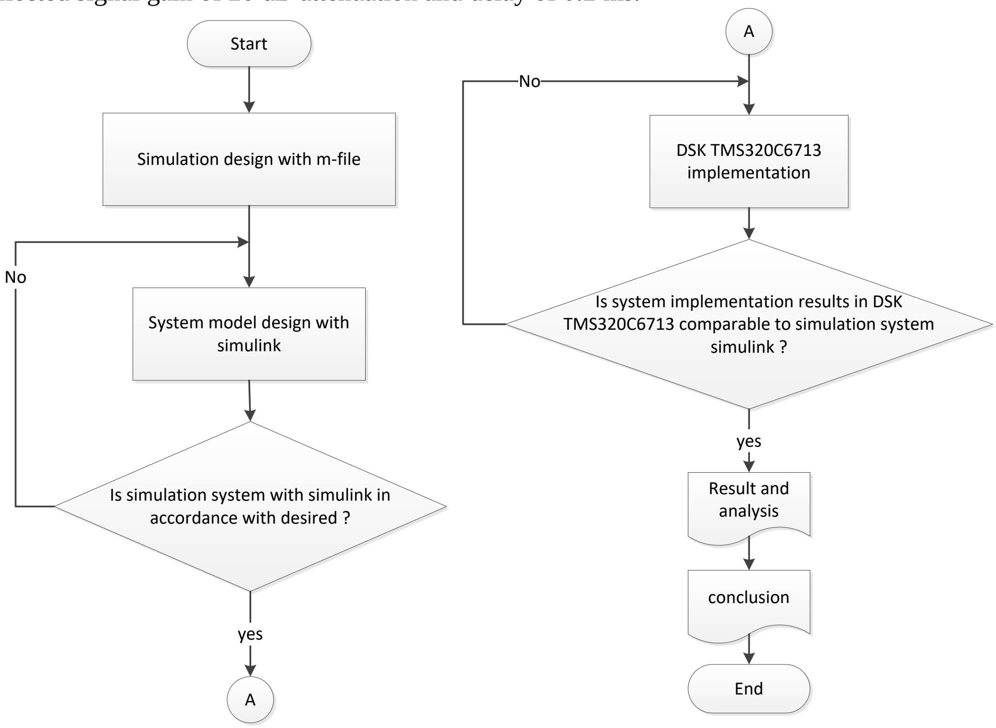


Fig. 4 : System Flowchart Diagram

The digital communication system created is a digital communication system using modulation ASK, FSK, BPSK and QPSK.

Digital communications system modeling with Simulink format created for implementation on TMS320C6713 DSK. But in Simulink modeling simulation can be performed before modeling is implemented on the device. Modelling made a total of five models, namely for systems with modulation ASK, FSK, BPSK and QPSK Of the five systems made, simply modeling made like Figure 5.

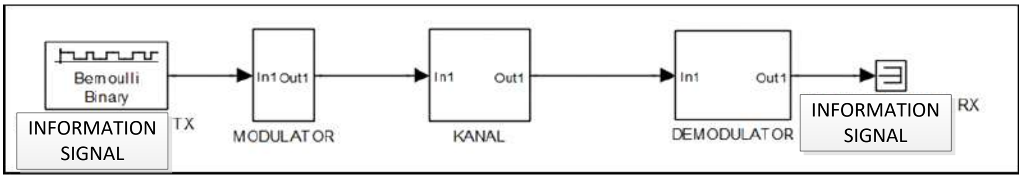


Fig. 5 : Simulink Modeling

3. RESULTS AND DISCUSSION

On systems that have been carefully tested to observe the shape of the signal generated by the system and testing the performance of BER (Bit Error Rate).

The output signal is taken on the simulation ¬m-file and Simulink are signaling information is transmitted, the signal modulator output signal after passing through the canal, and the information signal is received. While the implementation stages, the signal is taken from information transmitted signal, the modulator output signal, and the signal demodulation results. In the test signal generation information used in the form of a digital signal with an infinite amount of data, the value of Eb / N0 (Comparison of Bit Energy to Noise Energy) by 40 dB.

The test signal at the implementation stage done twice integration of the device, the first integration output signal modulator for testing and integration of the two to take the information received after the signal demodulator block. The tools used for image capture signal is 1 oscilloscope, 1 audio generator, one device is a PC (Personal Computer), and the TMS320C6713 DSK. In a system that will be implemented written blocks DSK board, pulse generator, and Block DAC (line out DSK).

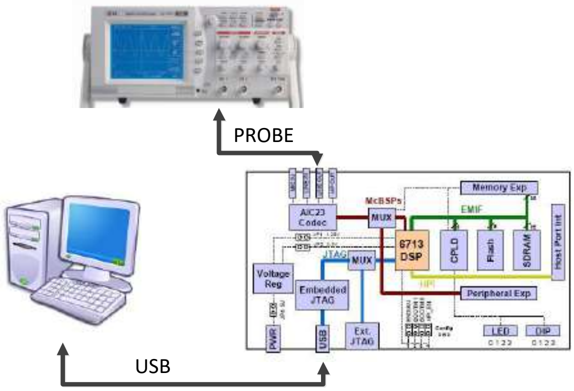
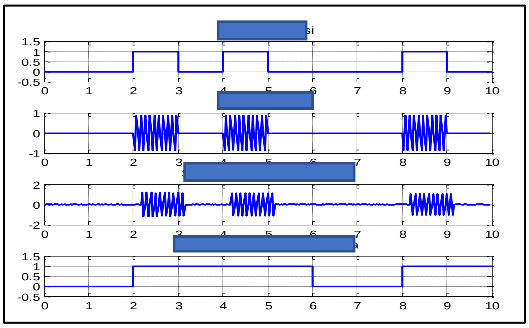


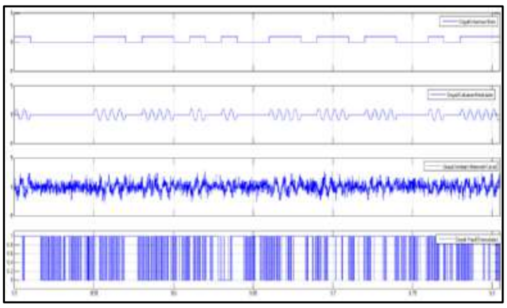
Fig. 6 : The Composition of Signal Testing Tool Implementation at TMS 320C6713 DSK

Block pulse generator is used as an information signal generator. The resulting information signal has an amplitude value of 1 volt, the bit period of 0.02 seconds, and a pulse width of 50% of the width of the signal of the period. The signals generated in the form of data bits 1 and 0 are repeated periodically over 0.01 seconds.

While signaling information used for decision QPSK modulation signal is converted into an information signal predetermined information data bits QPSK signal so that the phase change due to changes in the data bits of information can be observed. Block information signal pulse generator is converted into a block of repeating sequences of stair to generate the desired information signal.



(a)



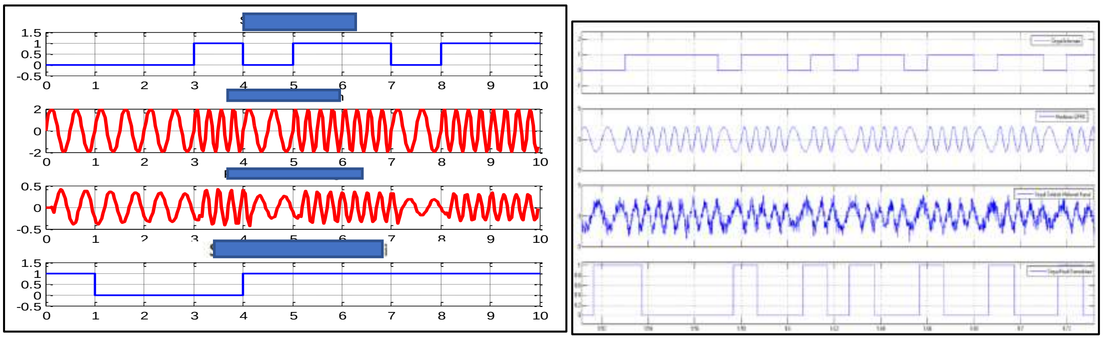
(b)

(c) **(d)**

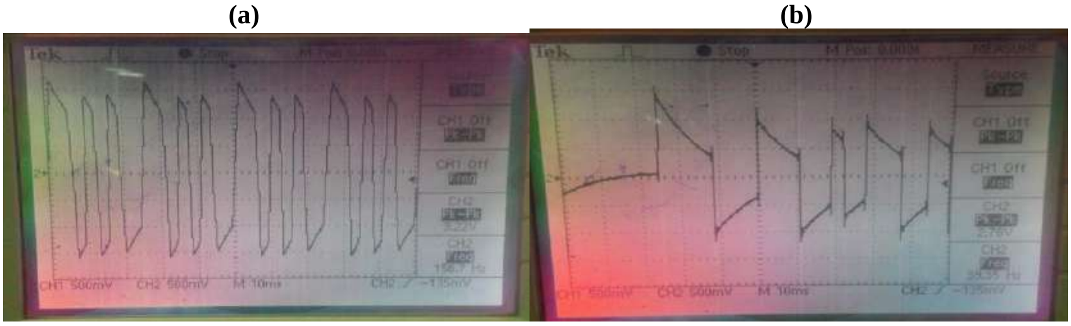
Fig.7 : Output Signal System ASK (a) *m-file* (b) Simulink (c) Implementation of Modulator output Signal (d) Implementation Signal after Demodulation

Results of testing the output signal m-file shown in Figure 7 (a), Simulink output signal in Figure 7 (b), a modulator output signal implementation results in Figure 7 (c), and implementation of signal demodulation results in Figure 7 (d) . From Figure 7, the signal after passing through the channel on the simulation of m-file get a delay between 0 to 0.3 seconds. The signal after passing through the channel Simulink simulation results have strengthened the amplitude at every second.

Results of testing the output signal m-file shown in Figure 8 (a), Simulink output signal in Figure 8 (b), a modulator output signal implementation results in Figure 8 (c), and implementation of signal demodulation results in Figure 8 (d). From Figure 8 Value amplitude of the signal after passing through the canal on the simulation of m-file damped to 1.6 volts. Signal demodulation results with Simulink simulation opposite to the information signal is sent, the information signal is supposed to be one received data bits are data bits 0 and vice versa continuously. As in 9.54 to 9.56 seconds.



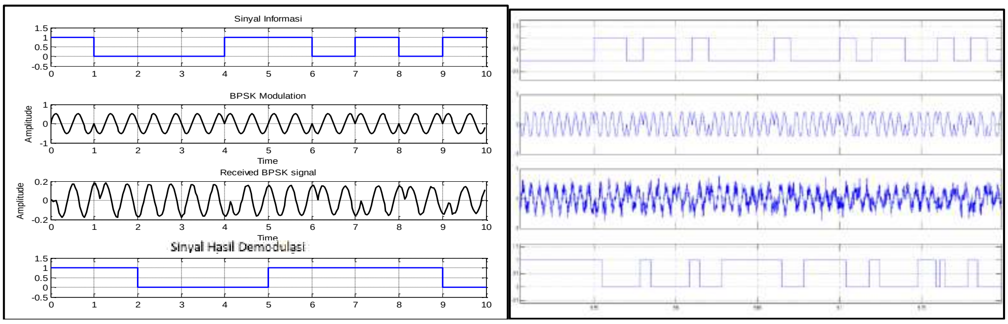
(a) **(b)**



(c) **(d)**

Fig. 8 : Output Signal FSK System (a) *m-file* (b) Simulink (c) Implementation of Modulator Output Signal (d) Implementation signal after Demodulation

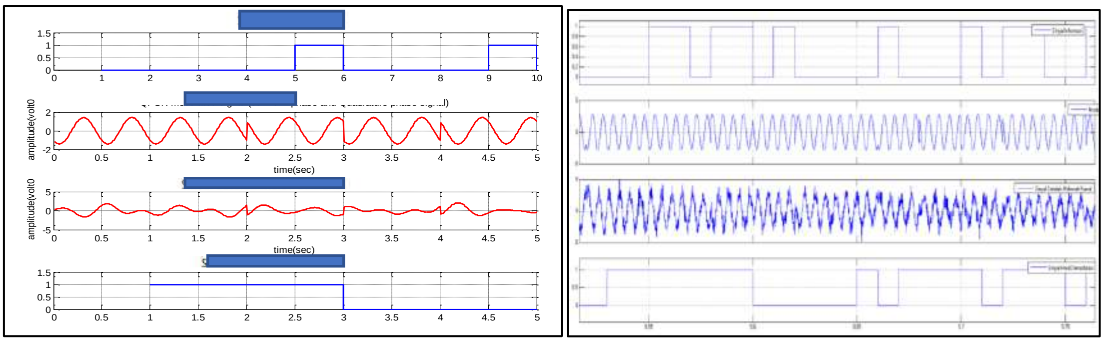
Results of testing the output signal m-file shown in Figure 9 (a), Simulink output signal in Figure 9 (b), the results of the implementation of a modulator output signal in Figure 9 (c), and implementation of signal demodulation results in Figure 9 (d). From Figure 18, the signal after passing through the canal on the simulation of m-file delayed by 0 to 0.2 seconds and experienced a phase change at 180 °. The signal after passing through the canal Simulink simulation results undergo a phase shift of 180 °.



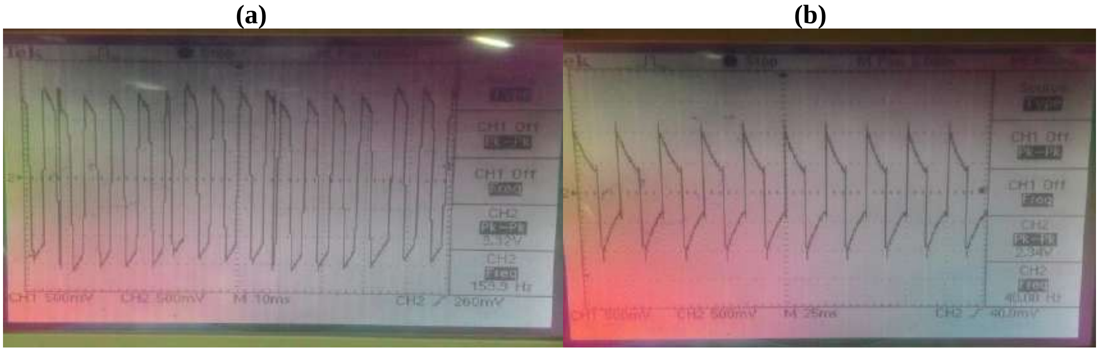
(a) **(b)**

(c) **(d)**

Fig. 9 : Output Signal BPSK Sytem m-file (b) Simulink (c) Implementation of Modulator Output Signal (d) Implementation Signal after Demodulation



(a) **(b)**



(c) **(d)**

Fig.10 : Output Signal QPSK System(a) *m-file* (b) Simulink (c) Implementation of Modulator Output Signal (d) Implementation Signal after Demodulation

Results of testing the output signal m-file shown in Figure 10 (a), Simulink output signal in Figure 10 (b), a modulator output signal implementation results in Figure 10 (c), and implementation of signal demodulation results in Figure 10 (d). The signal after passing through the canal on the simulation of m-file get every second damping constant and the signal is not worth the experience the phase shift between 150 ° to 180 °. The signal after passing through the canal Simulink simulation results undergo a phase shift between -150 ° to -180 ° and the amplitude value also rose that is not constant, shown in Figure 19.

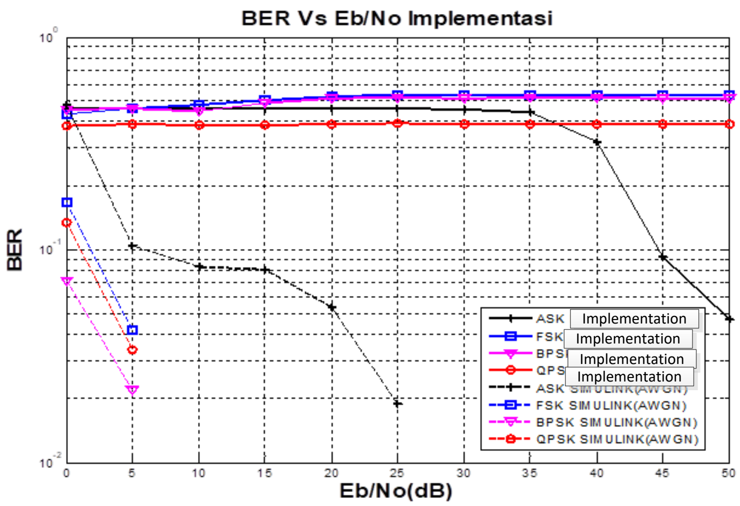


Fig. 11 : BER Curve against Eb/N0 System Implementation Stage ASK, FSK, BPSK, and QPSK

Simulink simulation of BER performance shown in Figure 11 are depicted with dashed lines, while the BER performance results of the implementation depicted without the dotted line. Black curve shows the communication system ASK, FSK communication system in blue, BPSK communication system with the color pink, and communication systems QPSK with red color. Comparison of each system in the implementation phase of the BER performance is shown in Figure 11. Up and down performance occurs when indigo Eb / N0 is increased. At Eb / N0 of 0 dB, in the implementation of the system performance QPSK modulation is better than the other three by a margin of 0.076 against the BER of ASK, BPSK 0.05 on, and 0.073 to BPSK. But when Eb/N0 is increased to 50 dB ASK BER performance is better than the three other modulation by the difference in value of the QPSK BER of 0.342, 0.491 against FSK, BPSK and 0.47 against.

TMS320C6713 DSK device has a data storage capacity of 264 kbytes (TexasInstrument, 2001). Storage capacity constraints become one of the important stages of implementation on the device, so that the efficiency of the system can be observed in terms of data storage capacity.

Observations made by taking the storage capacity of the data memory value of any system that has been implemented (Darlis, 2011). Then calculate the equation 3 for making the comparison value memory used to the total memory capacity of DSK (y) in units of percent

$$y = \frac{used\ memory}{DSK\ total\ memory} \cdot 100\% \qquad (3)$$

Table 5 : Memory used on DSK for each system

Modulation	*Memory (bytes)*	y(%)
ASK	3146	1,191666667
FSK	3055	1,15719697
BPSK	3078	1,165909091
QPSK	3096	1,172727273

Observations memory on implementation, to a communication system with ASK modulation using a memory of 3146 bytes with the y value of 1.191666667%, for communication with FSK modulation system using a memory of 3055 bytes and the y value of 1.15719697%, for communication systems with BPSK modulation using a memory of 3078 bytes and the y value of 1.165909091%, and communications systems with the QPSK modulation using a memory of 3096 bytes and the y value of 1.172727273%.

The result of the four systems were implemented, the most efficient system is a communication system using FSK modulation with a value of 1.15719697%. While most systems use a memory is a communication system using ASK modulation with a value of 1.191666667% efficiency.

From the observation memory used by each system to the implementation stages, if a comparison of each system with the characteristics of the modulation results of observations memory as opposed to BER test results. On the results of the BER performance, systems with ASK modulation best when Eb / N0 of 40 dB to 50 dB. While the memory used by DSK for system implementation with ASK modulation, using the ASK system memory compared to most other systems, with the unused memory of 3146 bytes.

5. CONCLUSION

From the results of the testing and performance analysis of communication system that has been done, then we got some conclusions, namely:

1. In the communication system with ASK modulation, required Eb / N0 of 50 dB so that BER performance difference between implementations with Simulink simulations that were previously worth 0.21 into 0,014.
2. In communication with FSK modulation system, required EB / N0 35 dB and 50 dB difference in value BER of implementations with Simulink relatively constant at 0.1004.
3. BER performance of a communication system with BPSK modulation at the time of implementation of the BER difference is greater than the average differences Simulink simulation - BER average of 0.08.
4. In communication systems using QPSK modulation BER performance in the implementation of relatively constant with average BER value - average of .387.
5. In the implementation phase on the condition of Eb / N0 0 to 37 dB the best system in terms of BER performance is a communication system with QPSK modulation compared to the three other modulation.
6. In the implementation phase on the condition of Eb / N0 of 50 dB-generating system BER performance is greatest communication system with ASK modulation compared with the three other modulation BER value of 0.047.
7. The most efficient systems in terms of memory usage on TMS320C6713 DSK is a communication system using FSK modulation with a value of 1.15719697%. While most systems use a memory is a communication system using ASK modulation with a value of 1.191666667% efficiency.

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