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LETTER OF RECOMENDATION

To Whom It May Concern

I am a lecturer at the School of Electrical Engineering and Informatics, Institut Teknologi Bandung (STEI ITB) and Head of Laboratory of Electronic Manufacturing, Microelectronic Center, a leading research institution at the same university. I have worked in this institution which is known as best engineererring university in Indonesia since 1991.

This letter is about Mr. Surya Ramadhan who is now applying position as researcher to earn Doctoral degree. I got acquinted with Mr. Ramadhan in June/July 2015 when he started working in my laboratory as research assistant. His main job a the time is in Embedded-System development which we used to control battery management and supercapacitor for a research project on electric vehicle. At the time, we already used STM-32 Microcontroller-board which already incorporates ARM based processor which need certain sophisticated programming capabilty. Starting in 2016, I asked Mr. Ramadan to work on a team to develop the embedded system for an e-Fishery System which involved complex interfacing between a microcontroller and LORA, a radio technology with long-range and low-power consumption.

Starting early 2016 when I was involved in a research project on Microgrid System, I proposed to my senior colleague to offer Mr. Ramadan to work on the development of an early-form of IED (Intelligent Electronic Device) for his Master Thesis at STEI-ITB. The system to be developed is an instrumentation module to measure the waveforms of the currents and voltages of real AC electrical loads. In addition, this system is expected to provide accurate time-stamp as well as coordinate-position based on an incorporated GPS sub-module. This is an early phase to develop the capability within our research group in designing micro-PMU for Microgrid applications. Apart from this, the system is also expected to have ability in detecting and classifying electrical faults in a three-phase Microgrid environment.

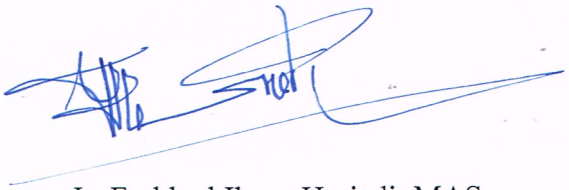
The basic method for fault classification was performed using discrete **Wavelets-transform**. To help speed-up the computation time for the discrete **Wavelets-transform**, a parallel processor with **Systolic-Array** architecture was implemented on FPGA board. Although the fault signals for the "three-phase power system" were emulated using an STM-32 microcontroller, these fault signals are really electrical signals in form of analog voltages which were converted by the ADC (Analog to Digital Converter) in the module before undergoing wavelet transform processes. The success of the design and implementation of such an instrument with high-degree of complexity shows the ability of Mr. Ramadhan as a fast learner to master new knowledge .

During his work in my laboratory, Mr. Ramadan has produced at least two (2) scientific papers that were already presented by him at the **International Symposium on Electronics and Smart Devices 2016** (ISESD-2016) in Bandung, and ISESD-2017 in Yogyakarta respectively, Indonesia, as the first author.

From more than 2 years working with Mr. Ramadhan, I have been impressed with his commitment and dedication in working and his endurance to overcome technical challenges encountered during the course of his Master's research program.

Considering the above candid evaluation, I therefore strongly recommend Mr. Surya Ramadhan to pursue doctoral degree in an overseas institution with more advanced research environment. Should there be any further question regarding the above candidate, I will be more than happy to be contacted at my address below, thankyou.

Best Regards,



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