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## Science, Technology, Research and Innovation for Development (STRIDE)

**PHASE I**

**Optimized Chip Implementation of Indoor Light Energy Harvesting for Sensor Network and Battery Recharging**

**PHASE II**

**INLIGHT2-Chip Fabrication and Testing of Indoor Light Energy Harvesting for Sensor Network and Battery Recharging**

**GRANTEE:** Mindanao State University–Iligan Institute of Technology (MSU- IIT)

**PRINCIPAL INVESTIGATOR:** Engr. Jefferson Hora

**INDUSTRY PARTNER:** Xinyx Design Consultancy and Services, Inc. and Analog Devices, General Trias, Inc. (ADI)

**GRANT PERIOD:** Phase I: May 1, 2015 to April 30, 2016
Phase II: July 16, 2016 to July 15, 2017

**GRANT AMOUNT:** Php 7,062,848.30 (approximately USD150,300)

### Indoor light energy

Wireless sensor networks (WSNs) are known to produce more reliable data than any other sensors, even with fewer units, in applications like monitoring and security systems used in hospitals, factories, and other industrial establishments. They are also more cost-effective in numerous applications because sensor nodes are inexpensive and easy to maintain while producing efficient power supply through an energy harvesting system.

*The research team works on the IC design in a laboratory at MSU-IIT*

To continue the promotion of microelectronics integrated circuit (IC) design awareness in the Philippines and eventually push for the overall development of R&D IC design in the country, MSU-IIT, initiated the INLIGHT project, with support from USAID STRIDE.

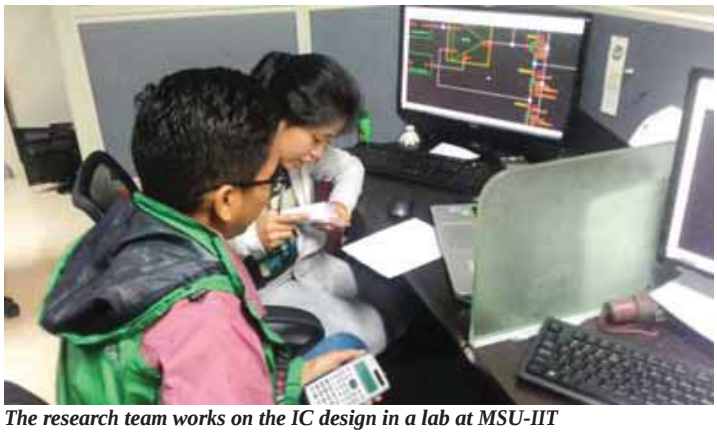
### Milestones

Phase I of the project successfully utilized INLIGHT as a power system that generates energy from indoor light stored in a rechargeable solar cell and converted into electricity instead of the light from the sun. INLIGHT allowed wireless sensor networks to operate where there is no conventional power source, thereby eliminating use of wires, frequent monitoring of NiMH

batteries for replacement, and regular power regulation to ensure protection. The stored energy in INLIGHT can be used to power small, wireless autonomous devices such as those in wireless sensor networks used in buildings.

## Findings

The results of project implementation were commendable particularly with the development of the IC of the core block. To further enhance what has been achieved, an extension of the grant was approved. The continuing initiative aims to sustain the gains and further enhance power harvesting. The most challenging part of the research is the electrostatic discharge (ESD) protection circuit of the system. ESD is the sudden flow of electricity between two electrically charged objects caused by contact, an electrical short, or dielectric breakdown. Reliable system design requires some form of ESD protection. Fabrication and testing of the chip to ensure that the design becomes a tangible product or yields a marketable electronic subcomponent/device and generates intellectual property salable to semiconductor IC design companies is one of the major objectives of Phase II.



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Although several types of transient circuit protection devices are available, extra care must be taken when deciding which circuit protection device to use. An ill-chosen device will not only be ineffective, but can interfere with the normal operation of the circuit. To ensure a foolproof and successful ESD circuit design and fabrication, collaboration with an industry partner is crucial.

The success and realization of the project will strengthen the capabilities of MSU-IIT's Microelectronics Laboratory to design and implement integrated circuits. Consequently, this initiative will produce graduates with solid background and strong skills in IC design and will benefit Xinyx Design, ADI, and other emerging IC design companies with manpower skills development. Another expected long-term result is the promotion of microelectronics IC design in the country that may propel MSU-IIT as an IC design and microelectronics training center in the Southern Philippines.