The Technology and Innovation

- FPGA technologies are used to develop the modem chip of the In-vehicle System (IVS) for the EU emergency call (eCall) system. The different modules of the IVS modem are designed, synthesized, simulated, and implemented on a FPGA device.
- The Cyclic Redundancy Check (CRC) module is developed and verified.
- The modulator and demodulator modules are also developed and implemented on an FPGA device.
- The decoder and demodulator modules of the IVS are designed and implemented on a single chip.
- Different clock frequencies are used for verification and testing the developed modules.
- The IVS modem is designed to be interfaced with the other embedded system modules in a vehicle through CAN, SPI, and I2S buses.

Community/Industry Impact and Value

- Demonstrated saving more lives in car accidents by activating data and voice channel between the vehicle that is involved in an accident and the most appropriate Public Safety Answering Point (PSAP) station.
- The IVS modem collects all constructional data for the Minimum Set of Data (MSD) and send it to the PSAP through a cellular system. The emergency service will be sent to the location of the accident to aid people who involved in the car incident.
- The IVS modem is designed for the eCall system that is to be operable in EU countries by October 2017.

Community/Industry Engagement

- Wayne State university, Electrical and Computer Engineering Department.

Team Composition

- Majeed Nader, ECE
- John Liu, (Faculty Advisor)

Learning Experiences

- Verilog HDL and FPGA technologies are used to develop the modulator, demodulator, and decoder modules of the IVS modem.
- The interfaces of the developed modules are studied.
- Parallel computing is used to develop the CRC hardware encoder.
- The Register Transfer Level (RTL) of the designed modules are developed and simulated.
- The chip verifications of the developed modules are done.

Further Research and Development

- We are developing the Turbo encoder module for the IVS on an FPGA device.
- We design and implement the LDPC encoder module for the IVS and study the performances of the two encoding techniques.
- We design the modules of the IVS on a single chip as a System-On-Chip (SoC).