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| FPGA-Based Spectrum Sensing for OpenBTS |
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FPGA-Based Spectrum Sensing for OpenBTS

Professor Dr. Magdi Fikri&Dr. Mohamed Bakr

**Abstract:**

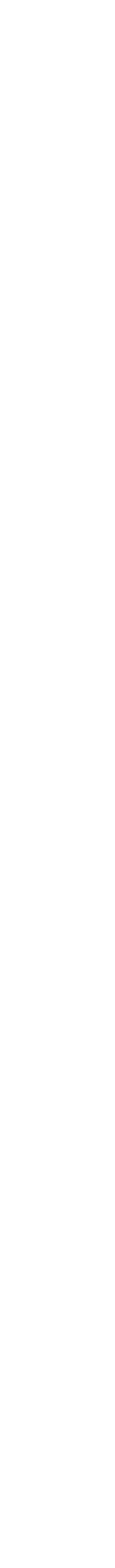
Not only is the price of building a new mobile BTS is very high, but also acquiring the permits needed to build a new mobile BTS takes a lot of time, effort and money. In addition to the previous problems, finding a suitable place to build the BTS has proved to be a dilemma.

The OpenBTS project helps in overcoming the mentioned problems as it consumes a very small area and its cost is very economic. This project will be of great importance to the mobile communication market as it will decrease the costs and ease the process of building a new BTS.

Actually, we are building a new type of cellular network that could be deployed and operated at substantially lower cost than existing technologies and generating an air interface that to a cell phone looks just like any other GSM cellular network.

So far, we were able to develop the standard OpenBTS by performing FPGA-Based





Spectrum sensing using FFT algorithm.

Standard OpenBTS can now use these scanning results to perform sophisticated channel allocation in both Up-link and Down-link frequency of both GSM900 and GSM1800 bands instead of the old dummy method of channel allocation, this is a very important feature for any BTS.

Doing so would help OpenBTS to choose the channel with the least power, hence least interference and noise and best quality.

**CONCLUSION:**

Our task was to scan the GSM 900 and GSM 1800 bands using FFT algorithm.

We chose the hardware approach (FPGA), we were able to modify the area of the USRP standard FPGA implementation by removing unnecessary modules to have free logic elements to add the FFT module keeping one receiving path and one transmitting path without affecting OpenBTS function.

We used FFT IP MegaCore which has small area compared to other FFT algorithms due to the limitation of FPGA area, we verified the core functionality in both software and hardware scopes:

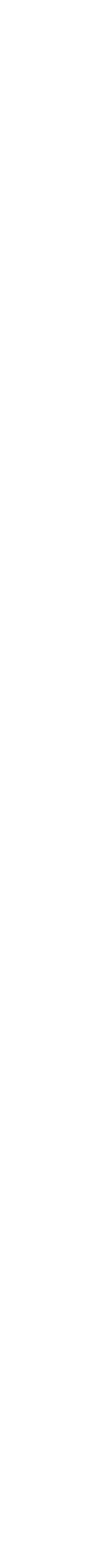
 Software simulation verification by using Modelsim.

 Hardware verification by using:

 NIOS II development kit and obtaining the FFT output using JTAG.

 USRP and obtaining the FFT output using function “usrp\_rx\_cfile” in GNURadio.





We fixed the VCO frequency value in the uplink direction to 890 MHz by modifying driver source code in both UHD and Libusrp.

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