TRIUMF

Programming the MAX10

Introduction

This document is intended to act as a guide for flashing the MAX10 firmware for revision 0 of the NuPRISM mPMT mainboard electronics. The firmware is located in the following Gitlab repository:

https://edev-group.triumf.ca/fw/exp/nuprism/max10/rev0

This code implements a simple UART mux between the XU1 SoM and the PMT bases. Additionally, this code implements a digital logic analyzer to view the clock cleaner SMA input, clock cleaner output, and clock cleaner status bits. The master for this mux is the XU1. The code to run the XU1 is located in the following Gitlab repository:

https://edev-group.triumf.ca/fw/exp/nuprism/xu1/rev0

A similar guide can be found in this repository.

To better understand the code, one might view the hardware schematic locating in the following Gitlab repository:

https://edev-group.triumf.ca/hw/exp/nuprism/nuprism-multi-channel-pmt-acquisition/rev0

Note: the board shipped to Poland on Friday, May 15th 2020 will have this firmware programmed into the MAX10 flash memory.

Prerequisites

Hardware:

- 30V Power Supply
- NuPRISM Multi-Channel PMT Rev. 0
- Enclustra Mercury-XU1+
- Xilinx Platform Cable USB II
- Altera USB Blaster
- PMT Base Controller

Software

- Vivado 2018.3
- Xilinx SDK 2018.3
- Quartus Prime Lite Edition 18.1 (Free)

Hardware Setup

1. Insert the Enclustra Mercury XU1+ Module into the NuPRISM Multi-Channel PMT Rev. 0
2. Connect the Xilinx Platform Cable USB II to the Xilinx JTAG connector
3. Connect the Altera USB Blaster to the MAX10 JTAG Connector
4. Connect the PMT Base Controller to one of the corresponding connectors
5. Power the board with a 30V power supply through the Auxiliary Input

Figure 1 depicts the set correct set-up. Please note that the white stripe on the Altera blaster indicates pin 1.

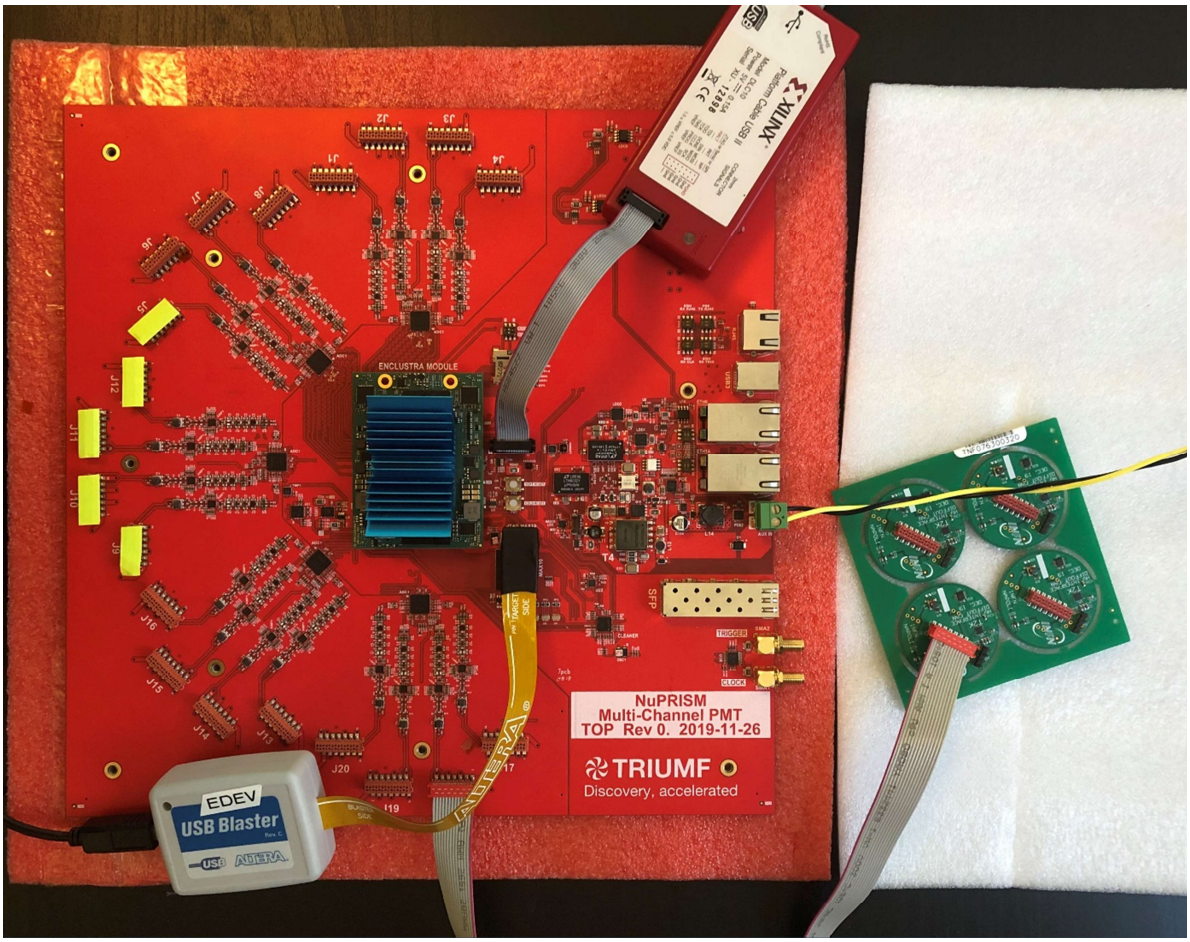

Figure 1: Hardware setup

Programming the MAX10

1. Open Quartus Lite 18.1
2. Open Tools -> Programmer
3. Hardware Setup -> Dropdown Menu -> USB Blaster
4. Close
5. Autodetect -> Select 10M08DAES
6. Right clock -> Add file -> <dir>\mercury_xu1_pmt\MAX10\tsb\ip\rtl\output_files ->
    a. Select NIOS_HyperRAM.sof to program into volatile memory
    b. Select NIOS_HyperRAM.sof to program into flash memory
7. Select start