

**Lab #5: MSP430– Low Power Modes**

Finish the lab by 3/23/2017 by 5:00 pm, report due: 3/30/2017 by 2:00 pm

**Introduction**

The main goal of this lab is to learn more about the MSP430 power modes.

**Equipment:**

CrossStudio for MSP430, TI MSP-EXP430F5438 Experimenter Board, Multimeter

**Procedure:**

1. Write a program that changes the current power mode every time the user presses one of the buttons on the experimenter board. The sequence should be as follows:  
AM⇒LPM0⇒LPM1⇒LPM2⇒LPM3⇒LPM4⇒AM⇒...

Do everything you can (pins, clock sources, clocks on demand, etc.) to lower the power consumption. If necessary, re-read the appropriate sections from the MSP430 documentation (see the slides of Set 6 beginning with “Here’s what TI says about low power”). How low can you go?

- Measure the current draw of the MSP430 by connecting the multimeter to JP1.
- In “Target properties” set “Release JTAG” to yes and start without debugging (Ctrl + F5) or alternatively, run on batteries.
- Send the clocks out so that you can monitor their operation.
- Run the program at ~1 MHz and measure the current draw by the MSP430 only, in each of the power modes.
- Explain the results. Are they what you expected to see after reading about low power modes? Are the clocks acting the way they are supposed to act?
- Would results be any different if you had something in your program that uses SMCLK (for example, if Timer A is used to toggle a pin periodically)?

*SUGGESTION: Use S2 to toggle between using and not using Timer A. Repeat your measurements under these conditions. Are there any changes?*

2. Repeat the previous experiment for MCLK=SMCLK=8 MHz.
  - Answer the same questions as before.

**NOTES:**

- One of the goals of this lab is to learn through experimentation. Carefully write down every result and all the conditions when the results were taken so that you can draw conclusions.
- Measure the current draw with the oscilloscope probe(s) disconnected.
- When using an external crystal, make sure it stabilizes at the beginning of your program

**General Requirements:**

1. The report should include all the programming files you wrote, all the measurements performed, answers to questions, detailed description of the program and the procedures used in completing this task.
2. Write a detailed report explaining what you have learned while working on this lab assignment and what steps you took to ensure the lowest current draw. Follow the template provided on Blackboard.
3. The code should be reasonably commented.

*Be extra careful when handling the board, connecting probes, and setting the jumpers.*