

ECE 561 Project 1 Report

Date 2/1/17

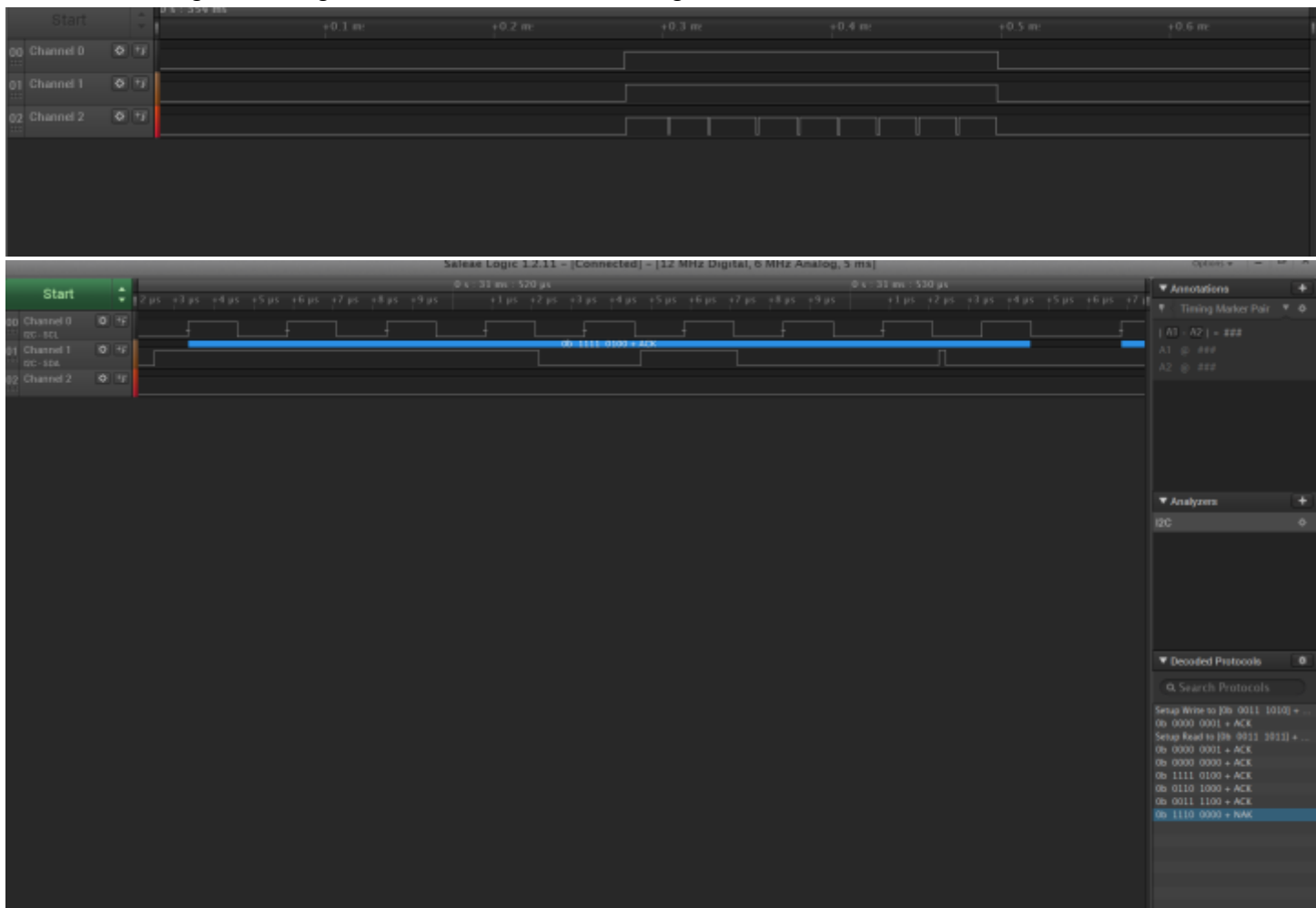
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For extra credit, include the I2C bus signals in the screenshots.

Blocking Code Implementation

1. Screenshot showing three debug bits over duration of a read message.



2. How much processor time is used to execute the `i2c_read_bytes_fsm` function to read the accelerations? What is the duration of the message on the bus?

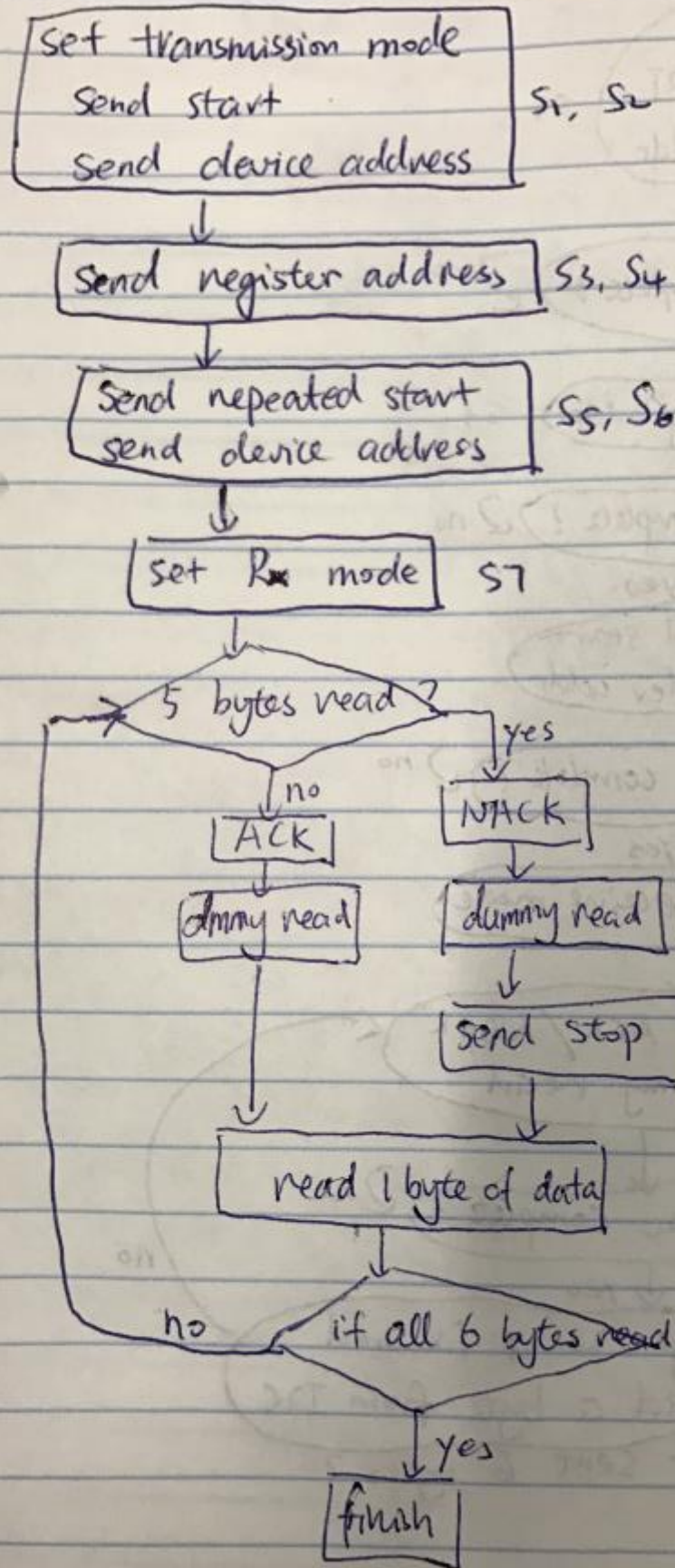
The processor takes 0.2207ms to execute the mode 1 code and the duration of the message on the bus is 0.2199ms

Finite State Machine Implementation

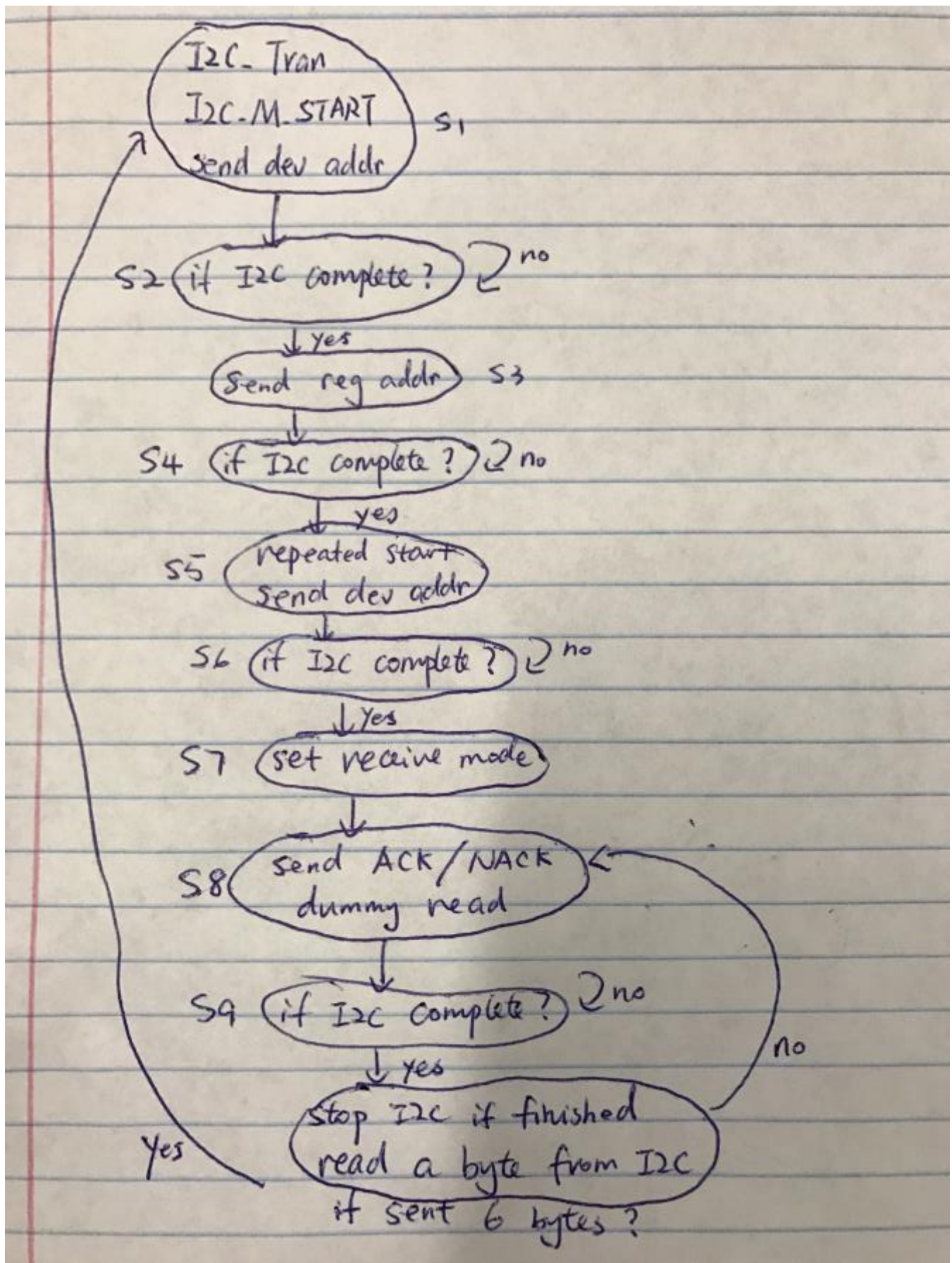
3. Explanation of how you pass input data to the FSM, and handshaking used (if any)
We are passing the device address, register address, data array, and data count to the FSM as function arguments
4. Explanation of how you get result data from the FSM, and handshaking used (if any)

In our FSM, only in state 10 does the FSM read a byte from the I2C bus. The FSM is executing in a while() loop, and it is supposed to go through state 10 six times in order to fetch the entire 6 bytes of data. The data is copied into a data array pointer which is then used in the calculations

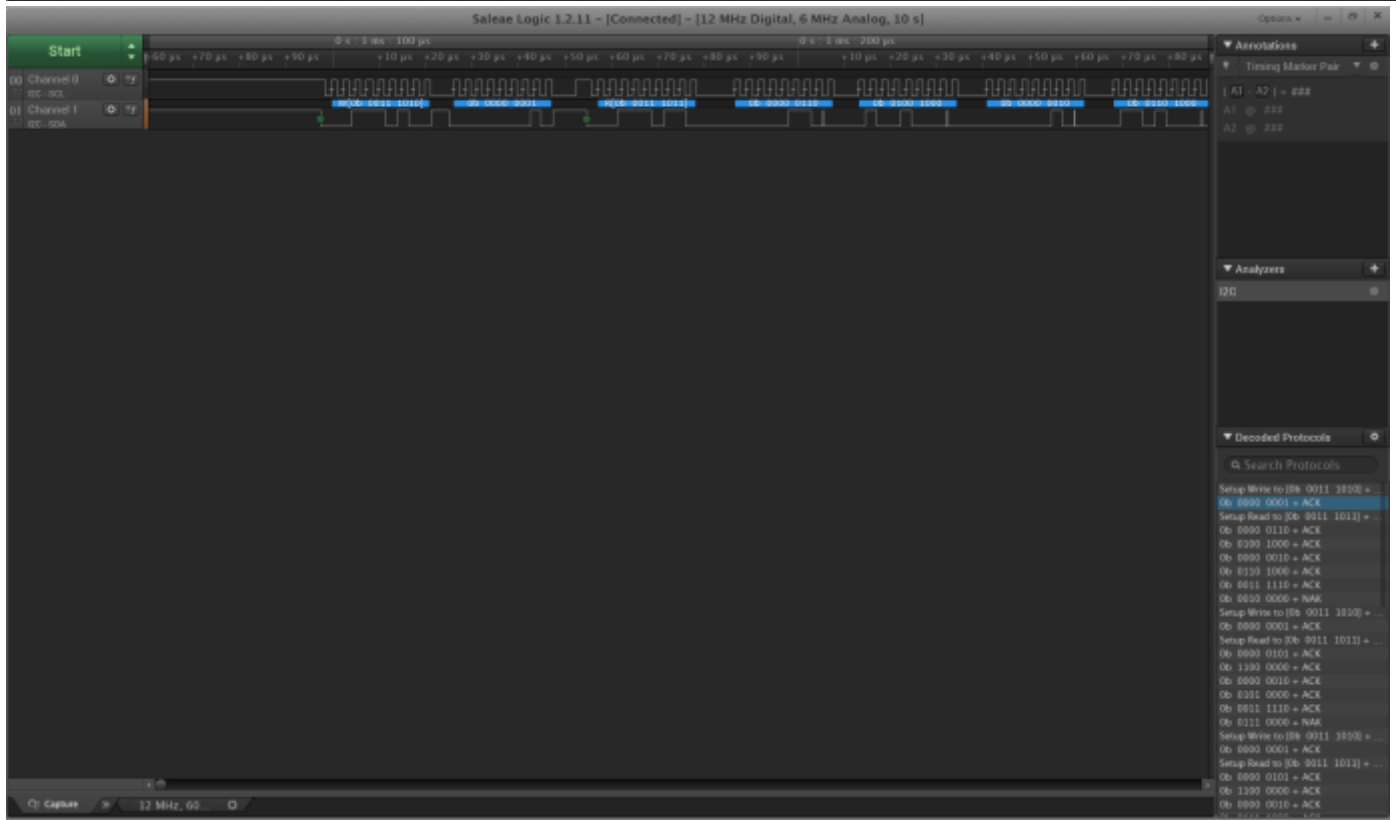
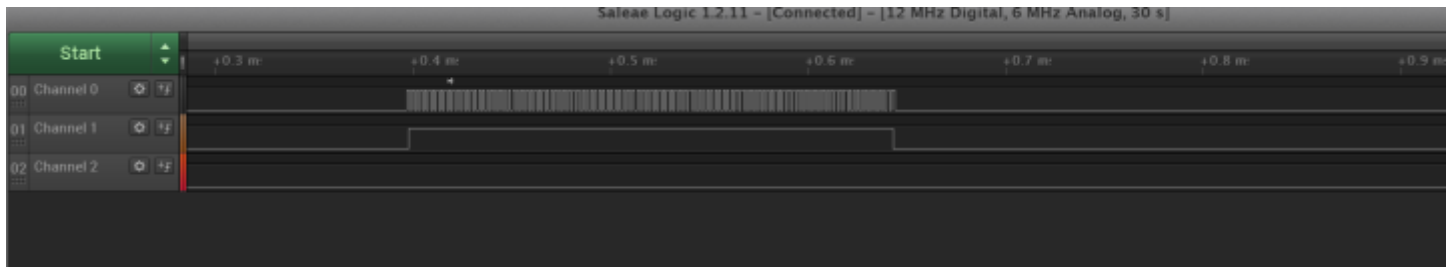
5. Drawing of control flow graph (flow chart) with states identified



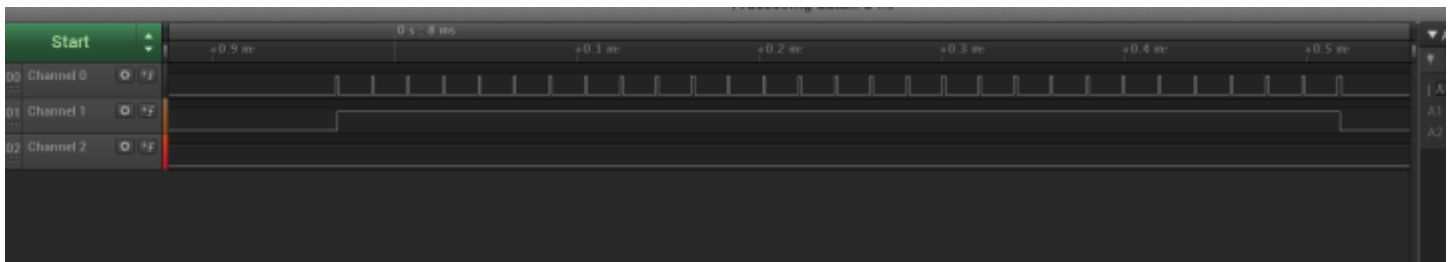
6. Drawing of finite state machine showing states and labeled transitions



7. Screenshot showing three debug bits over duration of a read message with no delay between calls to FSM



8. Screenshot showing three debug bits over duration of a read message with maximum delay between calls to FSM



9. What are the durations of the shortest and longest calls to the FSM function?

The shortest calls to the FSM is 2.083 micro secs and the longest call is 1.7 micro seconds long

10. What is the maximum delay between FSM calls which works?

ShortDelay(8)

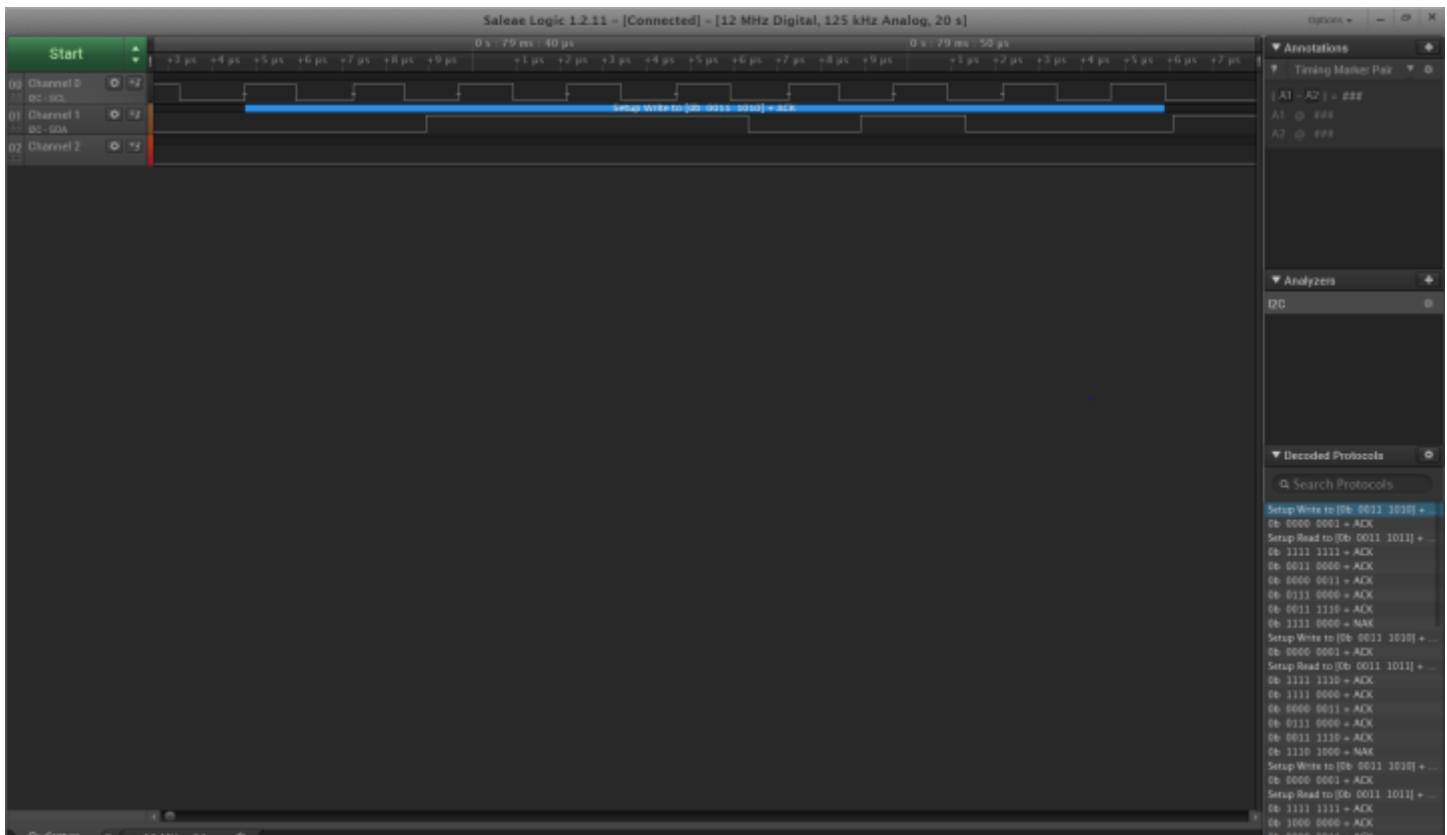
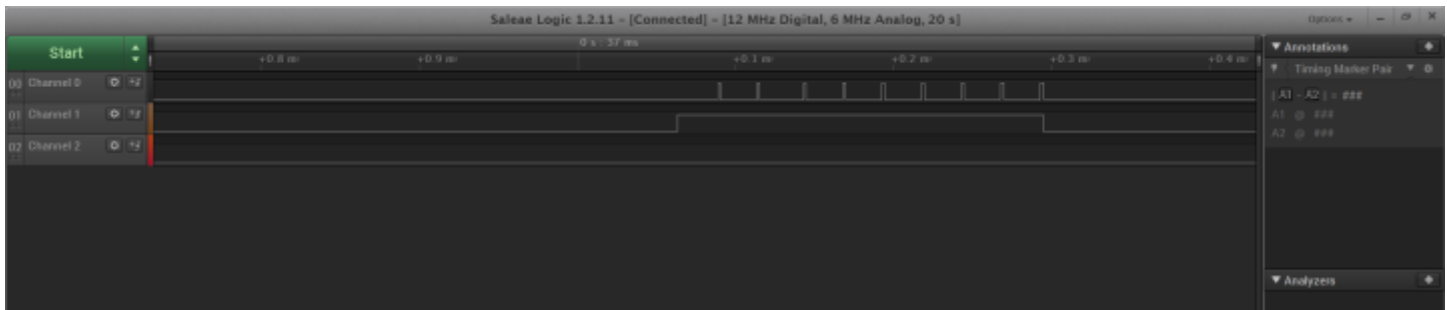
11. With that maximum delay, how much processor time is used to execute the i2c_read_bytes_fsm function to read the accelerations? What is the duration of the message on the bus?

- The processor takes 41.327 micro secs to execute the fsm and the duration of the message on the bus is 0.5493 ms

12. Extra Credit: Reduce the number of states which need to be executed to read the acceleration. Explain your approach and quantify the time benefits.
Any states that does the same “wait for I2C transmission complete” can be combined into 1 state, and we can use flags to differentiate the exit path from the state to proceed.

Interrupt Service Routine Implementation

13. Explanation of how you pass input data to the ISR, and handshaking used (if any)
 We are using several global variables to pass the data to the ISR. We used several flags to wait at a particular point until the ISR finished executing.
14. Explanation of how you get result data from the ISR, and handshaking used (if any)
 The ISR sets different global flags, whose information is used to determine how the read_bytes_isr function is executed. We used a globally declared array to pass the information copied in the ISR into the read_full_xyz() function
15. Screenshot showing three debug bits over duration of a read message



16. How much processor time is used to execute the I2C ISR to read the accelerations? What is the duration of the message on the bus?

The duration of the message is 0.2313 ms and the ISR takes 16.417 microseconds to read the acceleration.