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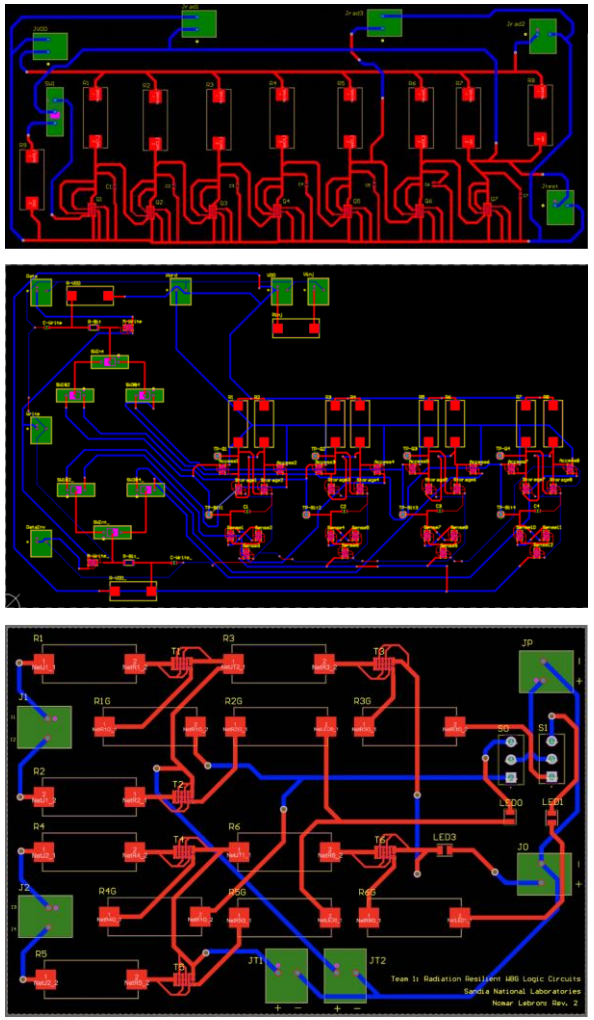
TEXAS A&M UNIVERSITY

Team 1: Radiation Resilient Logic Circuit Study with WBG Devices
Bi-Weekly Update 1

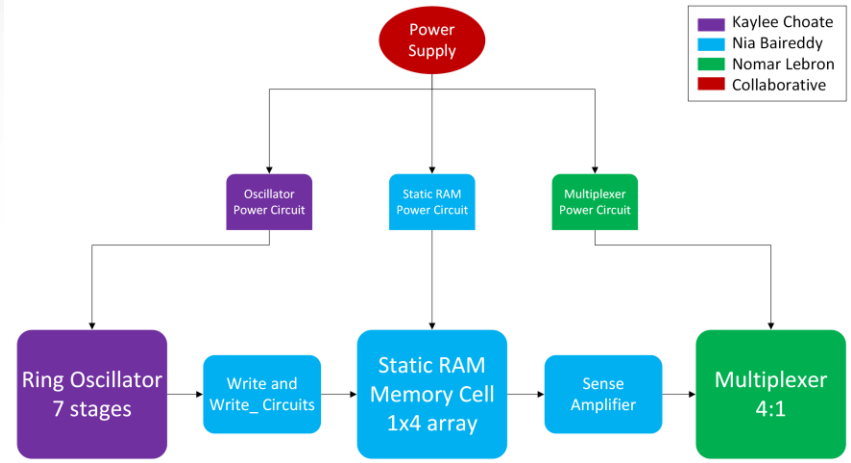
Nia Baireddy, Kaylee Choate, Nomar Lebron
Sponsor: Sandia National Laboratories
TA: Eric Robles

Project Summary and Solution

- Radiation effects on circuits are detrimental and must be mitigated for robust applications in space, military, and nuclear industries.
- Use radiation hardening by design techniques to modify various logic circuits for reliable operation in radiation environments



Project/Subsystem Overview

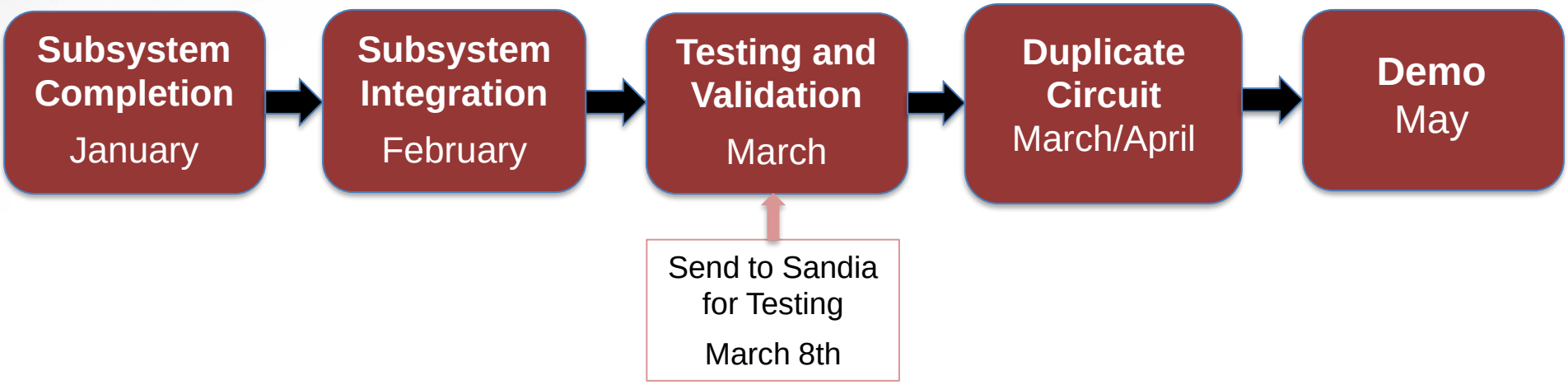


- Resilient wide bandgap material (GaN)
- Hardened components
  - Low resistance wirewound resistors
  - Multi-layer ceramic capacitors
- Alternative circuit layout
  - NMOS only
  - Trace width
  - Trace spacing

Major Project Changes for 404

- Condense PCB Designs
  - Implement 3 designs into 1 integrated PCB design
- Single power supply
  - Subsystem power circuits to distribute from single supply
- Additional subcircuits and circuit elements
  - Gate drivers
  - RC snubber

Project Timeline



Seven-Stage Ring Oscillator

Kaylee Choate

Accomplishments since 403 ~5 hrs of effort	Ongoing progress/problems and plans until the next presentation
• Circuit oscillates as expected • Researched implementation of RC snubber	• Addition of RC snubber onto PCB schematic

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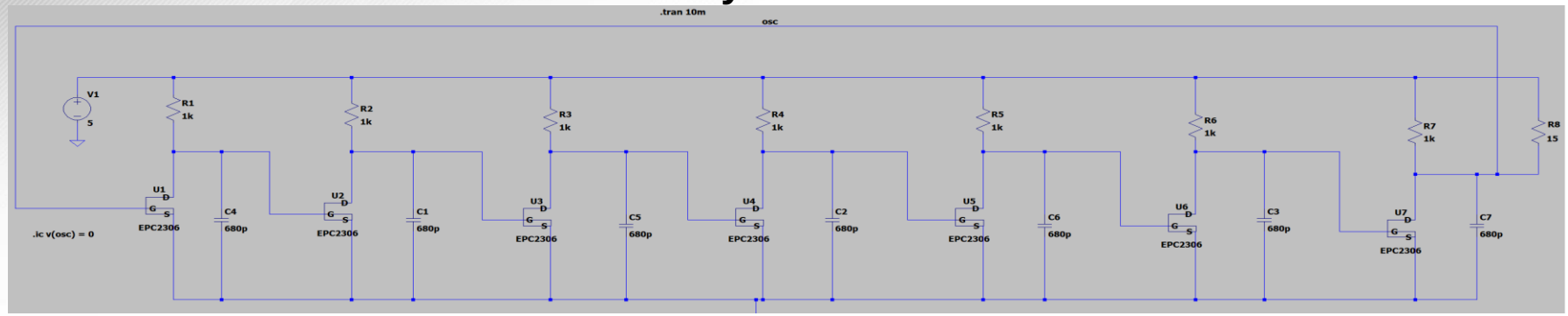
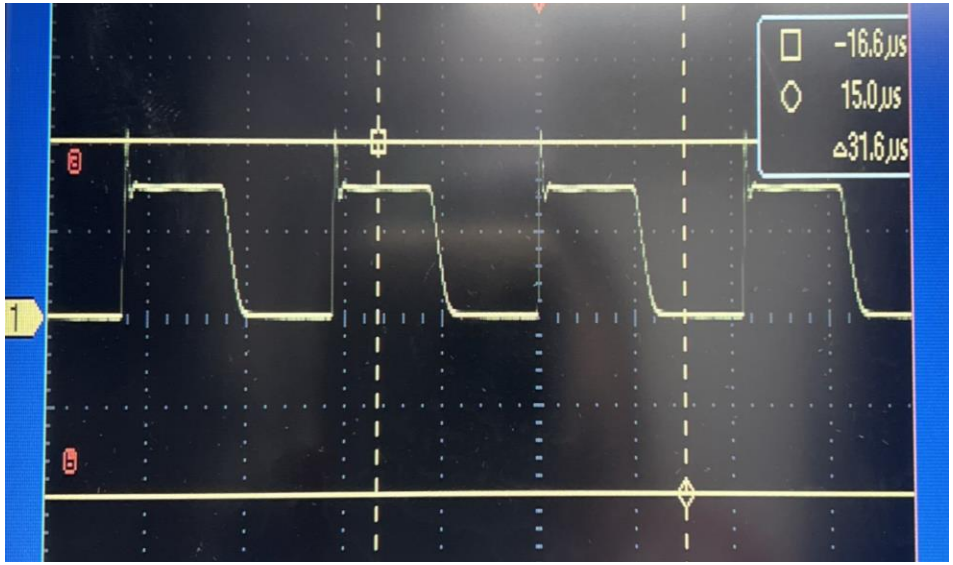
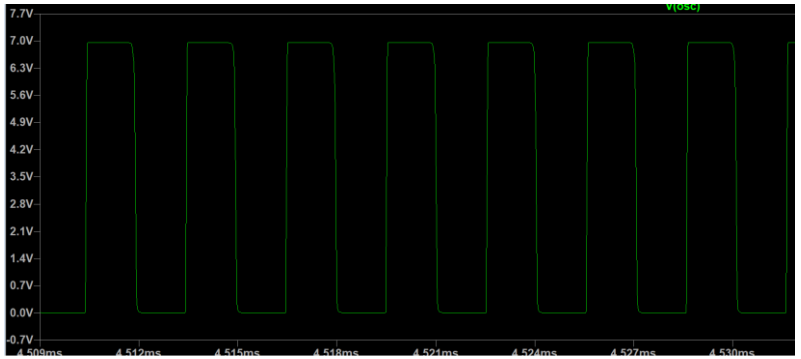
Seven-Stage Ring Oscillator

Kaylee Choate







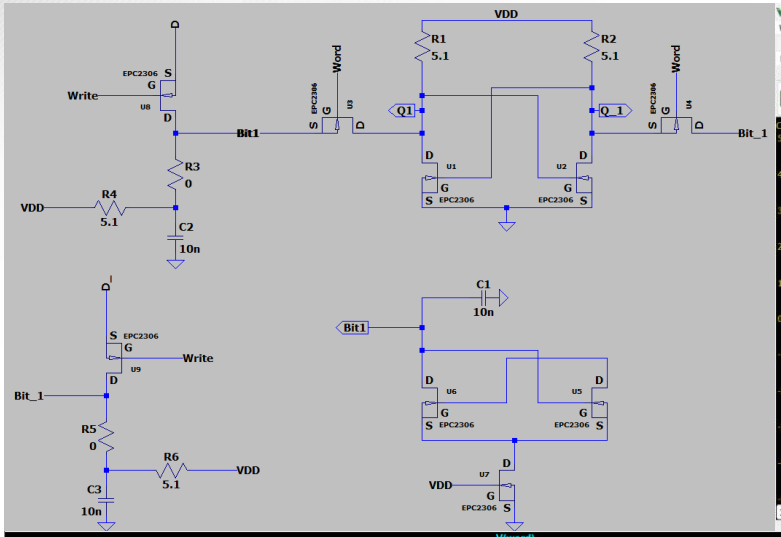
1x4 SRAM Cell Array

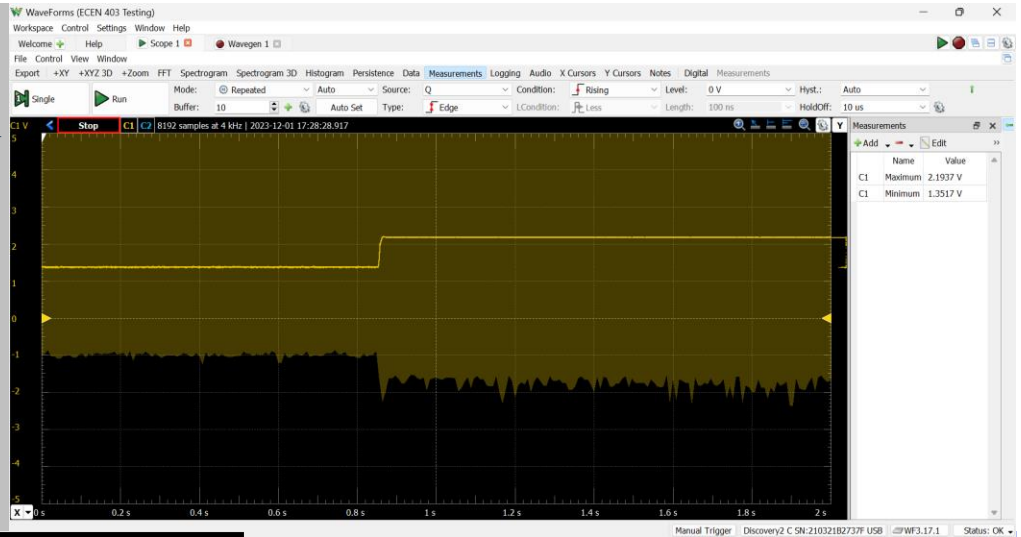
Nia Baireddy

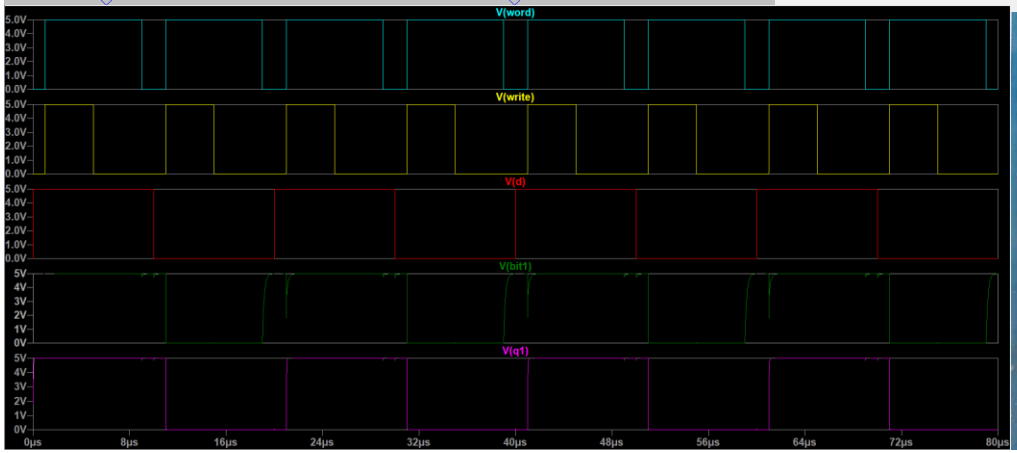
Accomplishments since 403 ~5 hours of effort	Ongoing progress/problems and plans until the next presentation
• Verified circuit behavior • Researched GaN FET source to ground design • Researched gate driver implementations	• Implement gate driver subcircuits (simulations then board modifications)

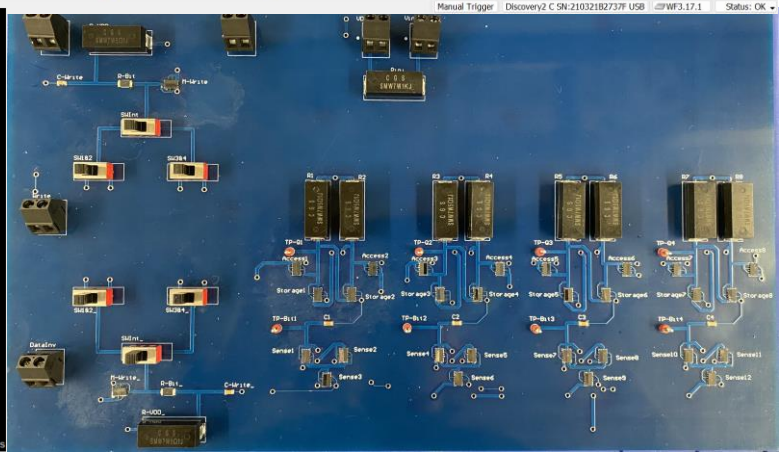
1x4 SRAM Cell Array

Nia Baireddy









4:1 Multiplexer

Nomar Lebron

Accomplishments since 403 ~5 hrs of effort	Ongoing progress/problems and plans until the next presentation
• Circuit Switches Between Inputs As Expected • Research Gate Drivers • Research Source to Ground Design	• Implement gate driver to fix data stability • Begin researching LEDs for user interface

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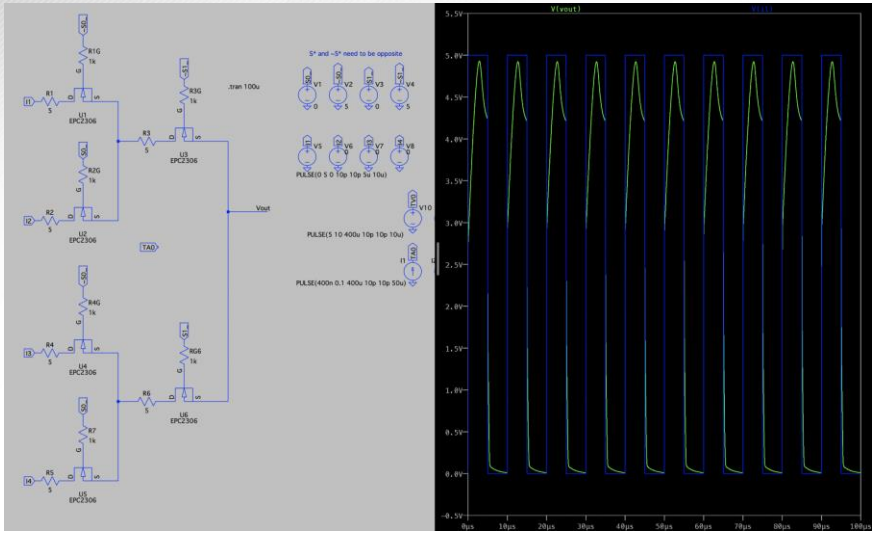
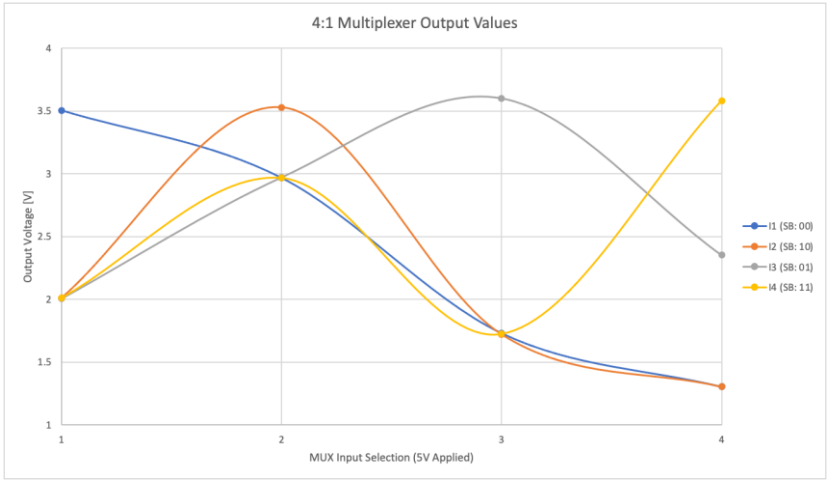
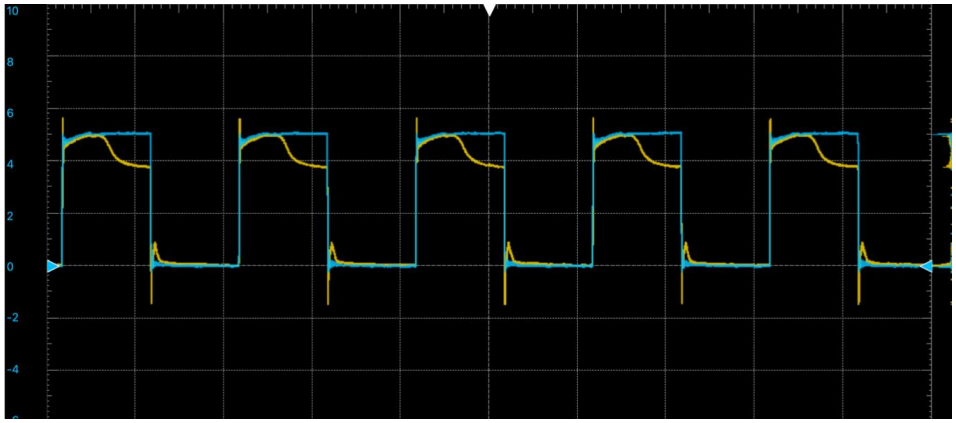
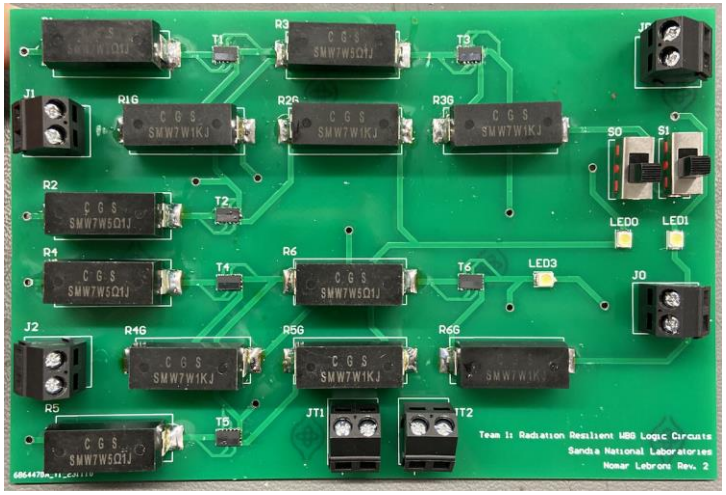
4:1 Multiplexer

Nomar Lebron





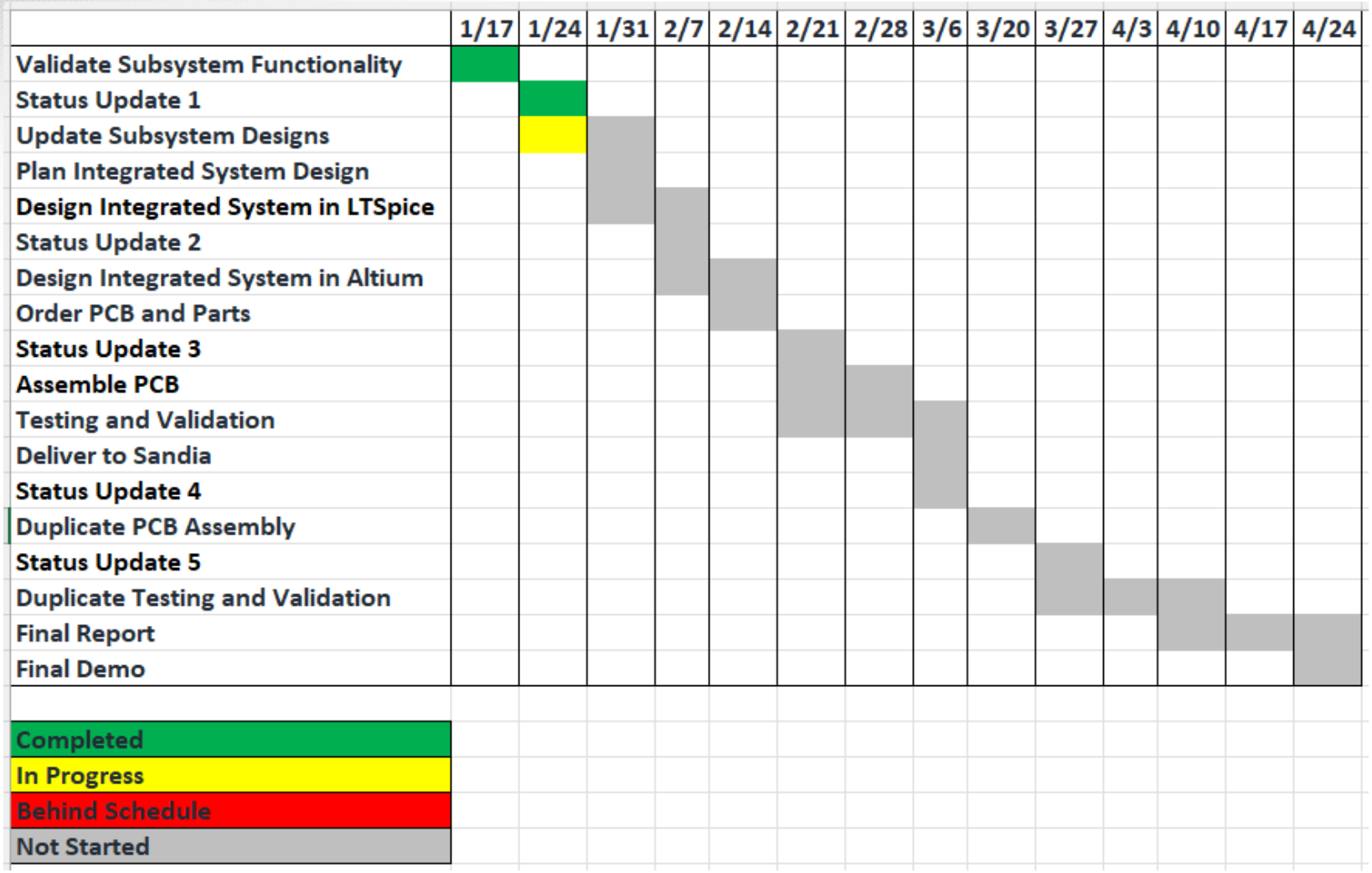




Parts Ordering Status

- Order EPC 2306 Transistors
- Order Wire-Wound Resistors & Multi-Layer Ceramic Capacitors
- Order 2 Fully Implemented Printed Circuit Boards
- Expected to receive them by mid-February

Execution Plan



Thanks and Gig ‘Em!

Questions?