NAKUJA *N*-2 PROJECT

WEEK 8 REPORT - AVIONICS:

Martin Munialo

George Bange

Caleb Mucheru

Ian Muchiri

TASKS FOR THE PAST WEEK

<< Internship 2020 Repo >>

#113 Integration of Redundant pressure and IMU sensors

#129 Review Matching Circuit

#141 Review Wi-Fi amplifier

#131 Review SD Card Circuit

#133 Review voltage regulator circuit

#134 review I2C lines for flight control and avionics

<< On the Onboard Telemetry Computer >>

#6 Review I2C lines for Flight control and Avionics

#7 Review SDA lines for LoRa module and SD card

#8 Review reverse voltage protection circuit

#10 Review LoRa module circuit

<< Miscellaneous >>

- Testing the Range of ESP Wireless Modules without external Antennas
- Testing the ESP camera module
- Asserting I2C connections between BMP/IMU and MCU

<<Antenna >>

ONBOARD ANTENNA ARRAY

#113 Integration of Redundant pressure and IMU sensors

- Completed schematics for BMP 380 and I3G4250D (IMU), pushed to Avionics Playground Repo. Awaiting review. NB – Through-hole designs were strongly advised by Mike, but both are SMD. However, they have considerable small form factor

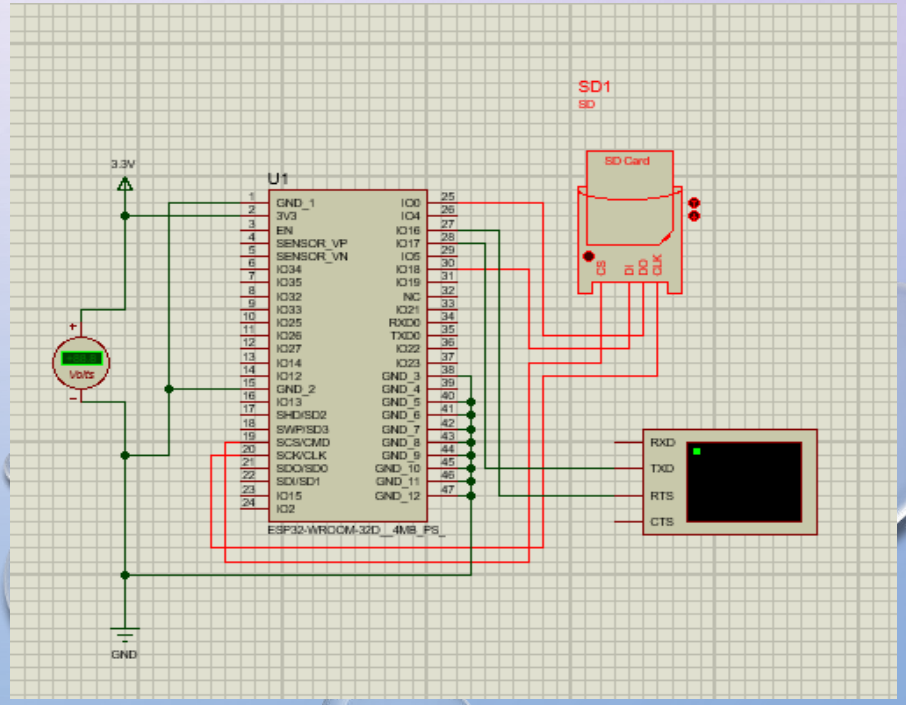
#133 Review of LoRa module:

- - Reviewed the module circuit against the datasheet
- Recommendation:
- - Single-point grounding recommended
- - 0 ohm resistor or 10 mH inductance recommend in grounding.

#7 Review SDA lines for LoRa module and SD card

- The connection schemes (SDA and SCL) are well done. Recommended best-practices were followed and should work as expected. A simulation in Proteus could not yield conclusive results on the integrity of SCL and SDA connections.
- The SD image did not load properly;

We will retry



#141 Review Wi-Fi amplifier

>>Reviewing Matching circuits and WiFi amplifier

From the ESP32 datasheets we realized modules supporting external antennas are already matched at 50 Ohms.

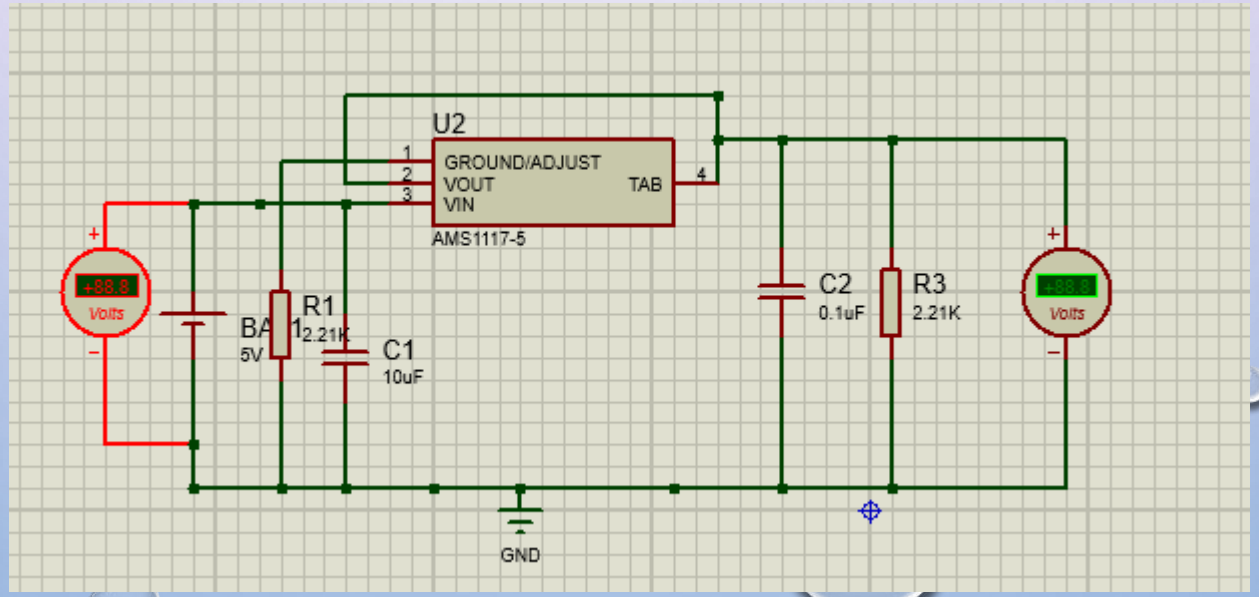
A WiFi amplifier is also not required at the onboard ESP in order to remain within CAK defined bounds for 2.4 GHz

>>Legal Concerns

CAK defines a maximum transmit power of 20dBm(100mW) for 2.4GHz with both devices at ground level. A special permit is needed for such devices on flight

#133 Review voltage regulator circuit

- The circuit is properly done. Some designs recommend the two capacitors to have equal vale, but not entirely necessary.
- A simulation in Proteus fell short of a conclusive proof; the devices could not work as expected.

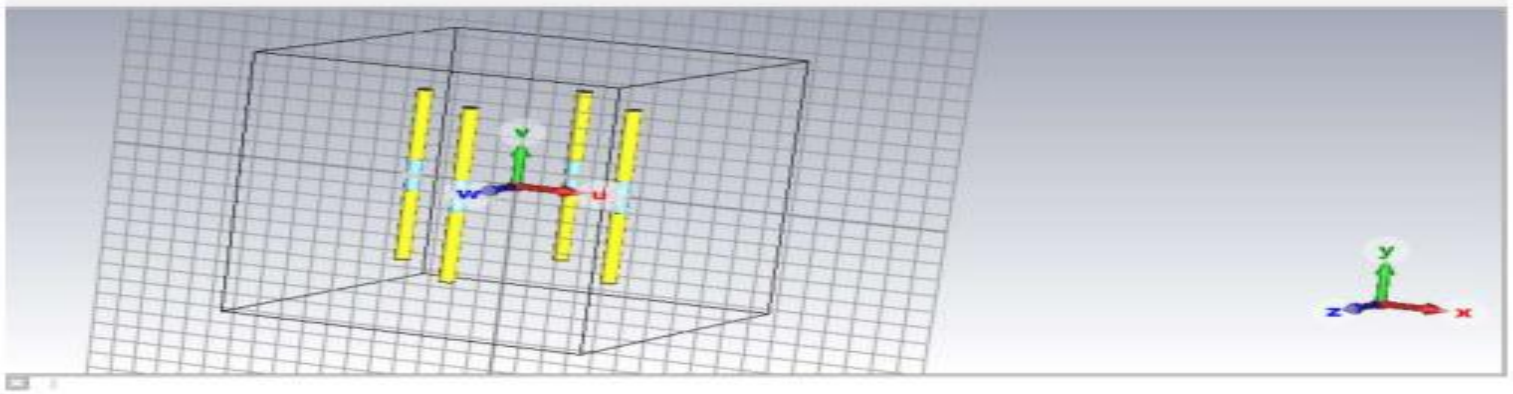


#133 onboard antenna

- We have proposed to have an omnidirectional dipole antenna array that will be surface mounted on the surface of the rocket radiating equally in all directions.

#133 simulations for the onboard antenna

Visual outlook:



S11-Parameter simulation:

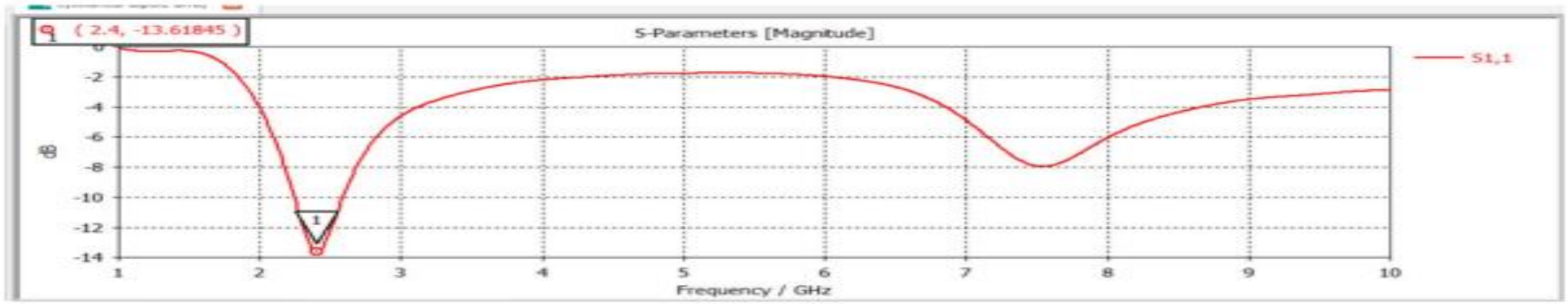
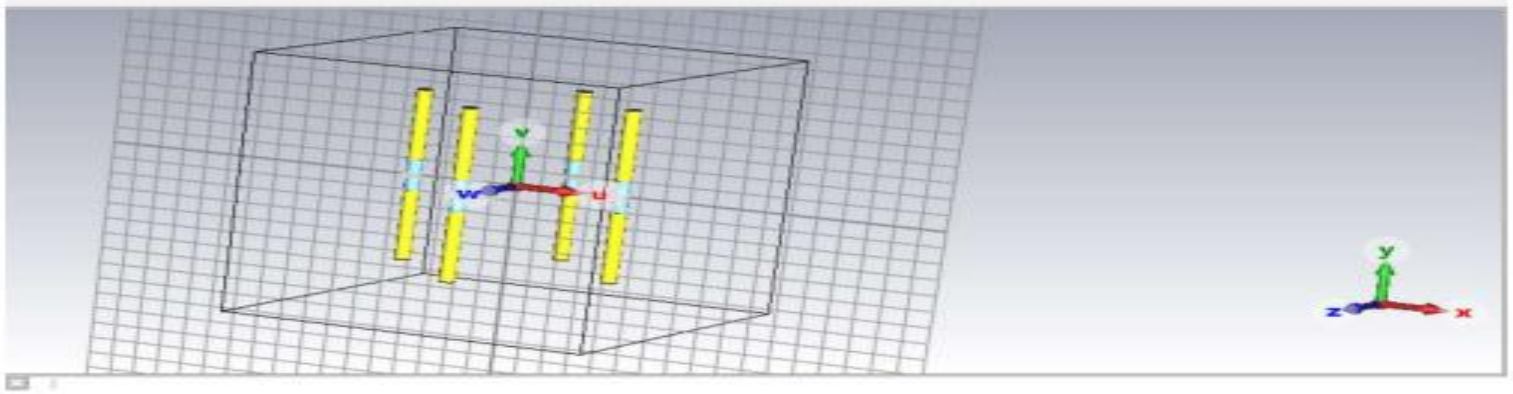


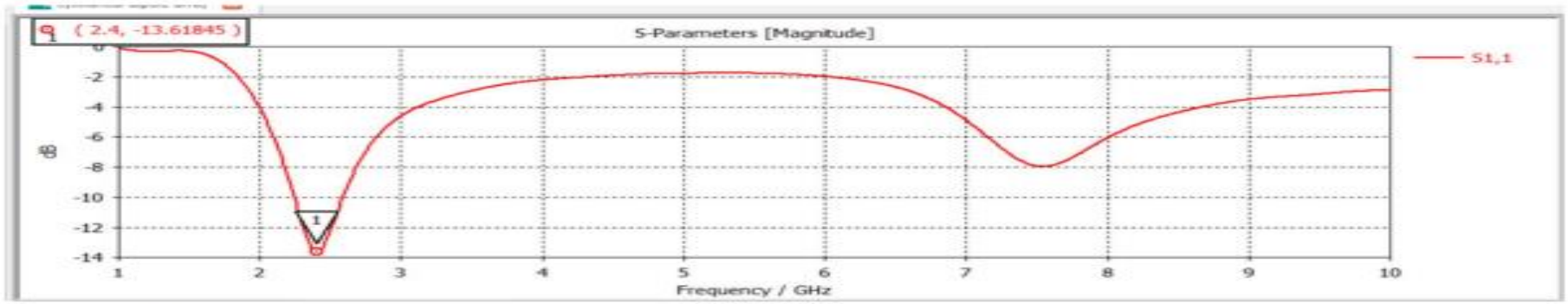
Figure 1:parameter sweep for the initial one dipole antenna

#133 simulations for the onboard antenna

Visual outlook:



S11-Parameter simulation:



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Antenna Efficiency:

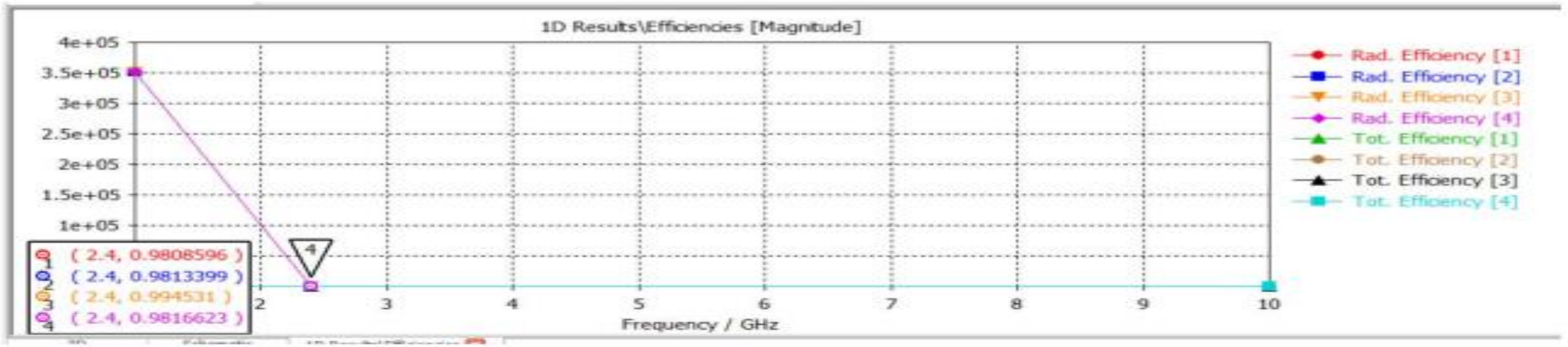

Figure 3:radiation efficiencies

VSWR:

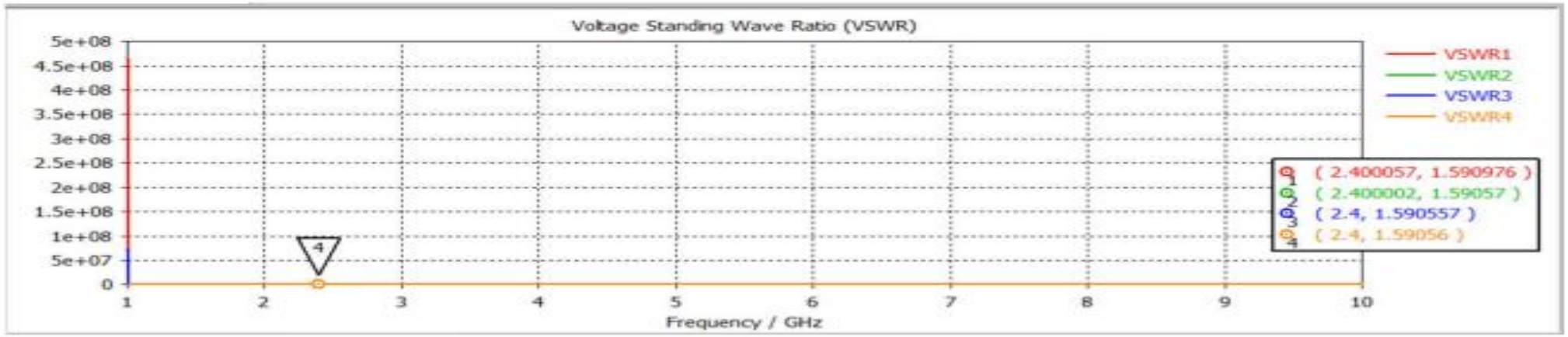

Figure 4:VSWR

To Do This Week

This week we are researching ways to optimizing antenna polarization for better reception.

Complete #134 to review I2C lines for flight control and avionics.

#126 FC PCB Review

#127 PDB Review

#122 move SoC to IC

#SD Card review