

DESIGN AND IMPLEMENTATION OF A CAMERA MODULE FOR CUBESATS



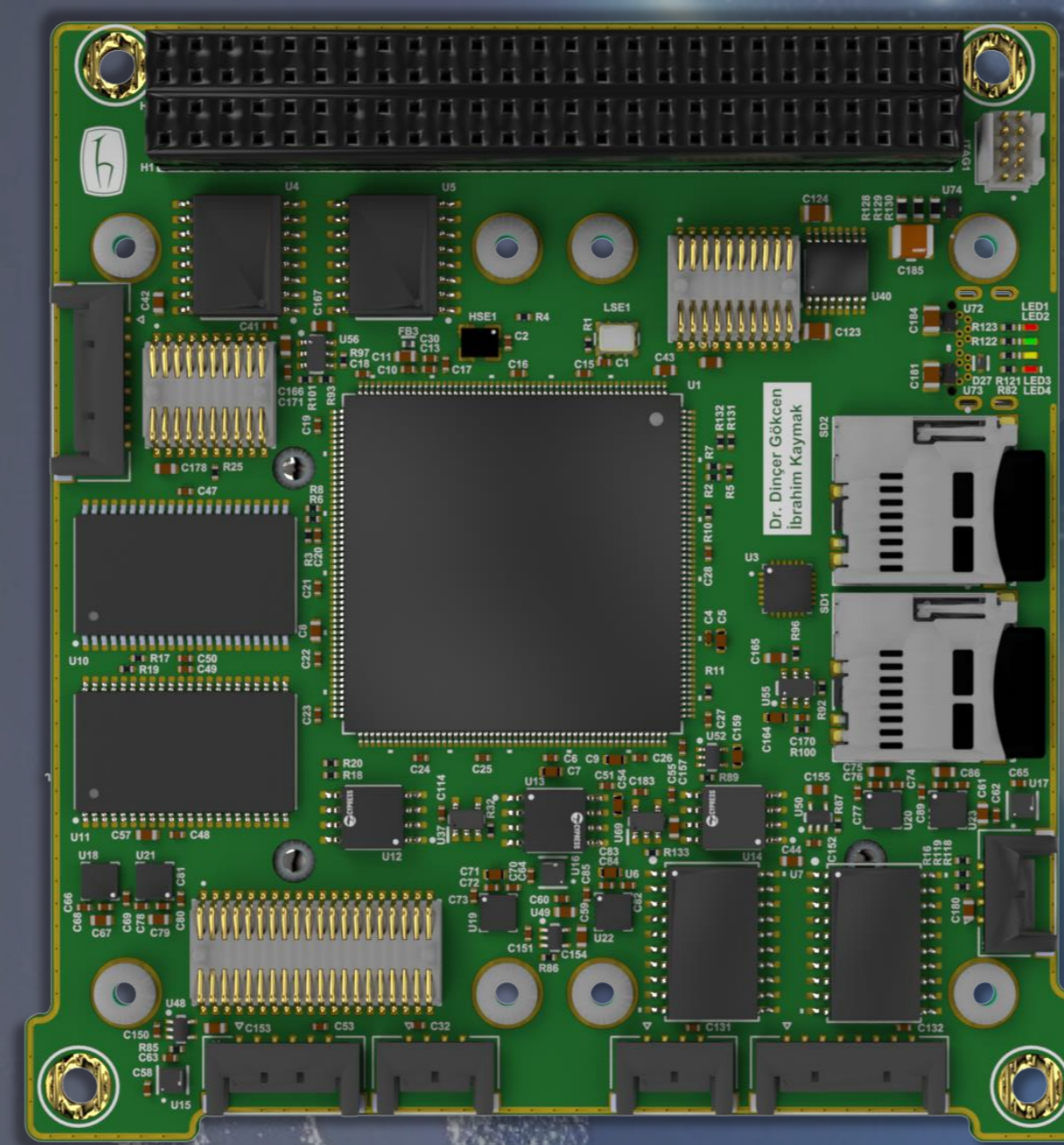
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INTRODUCTION

CubeSat is a nanosatellite, a type of spacecraft used by scientists and researchers for research. The standard dimensions of CubeSat are called Units (U). The dimensions of each unit are 10x10x10 cm. The size of the CubeSat can be 1U, 2U, 3U, or 6U, and typically the weight is less than 1.33 kg for each 1U. The CubeSat is deployed from a P-POD (Poly- Picosatellite Orbital Deployer). The CubeSat is designed at a miniature scale to reduce the cost of deployment. The missions of CubeSats are made for Low Earth Orbits (LEO), so that radiation can be ignored and commercial off-the-shelf electronics components can be used.

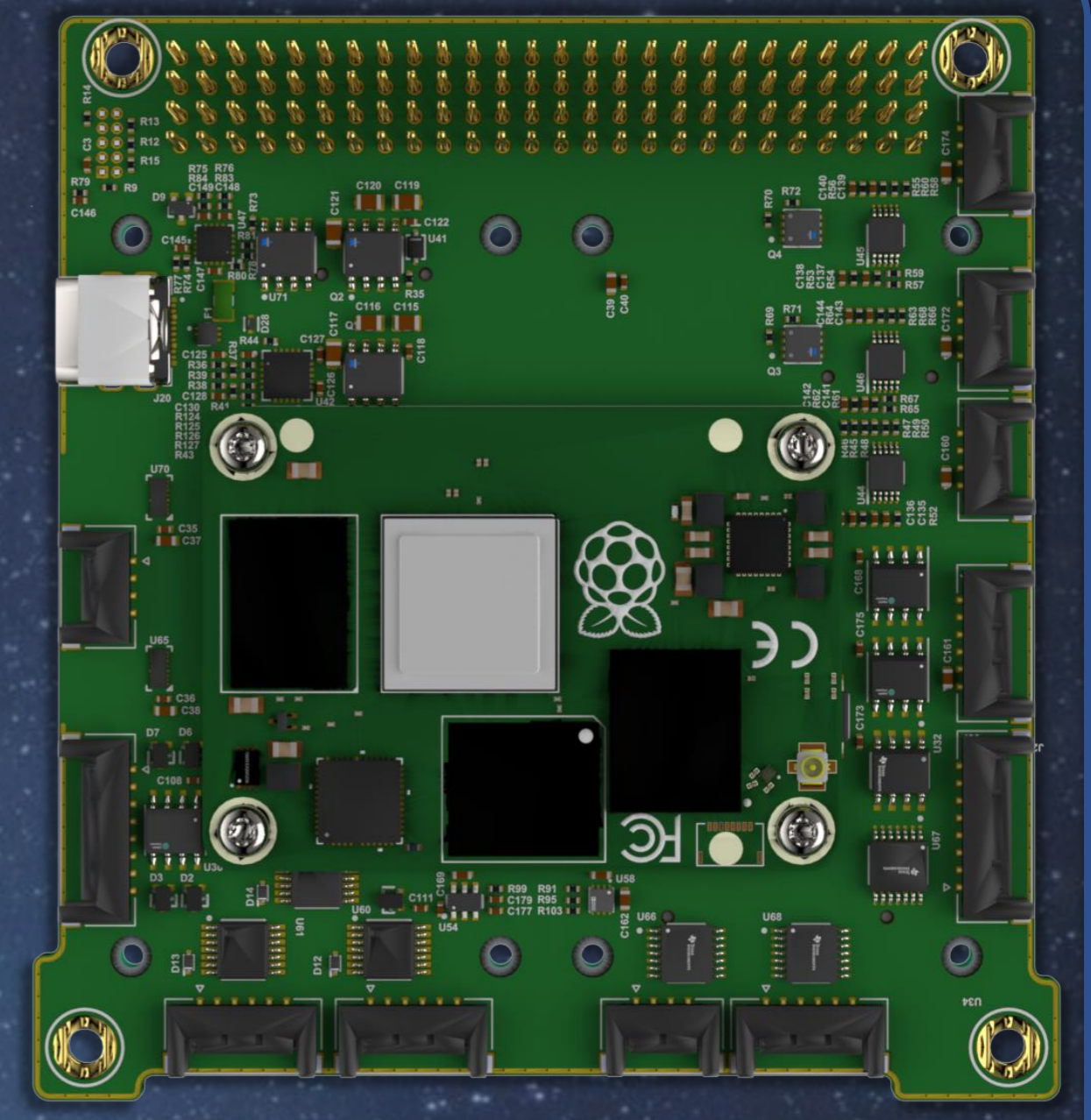
Captured Photo Frames



Top View

On-Board Computer

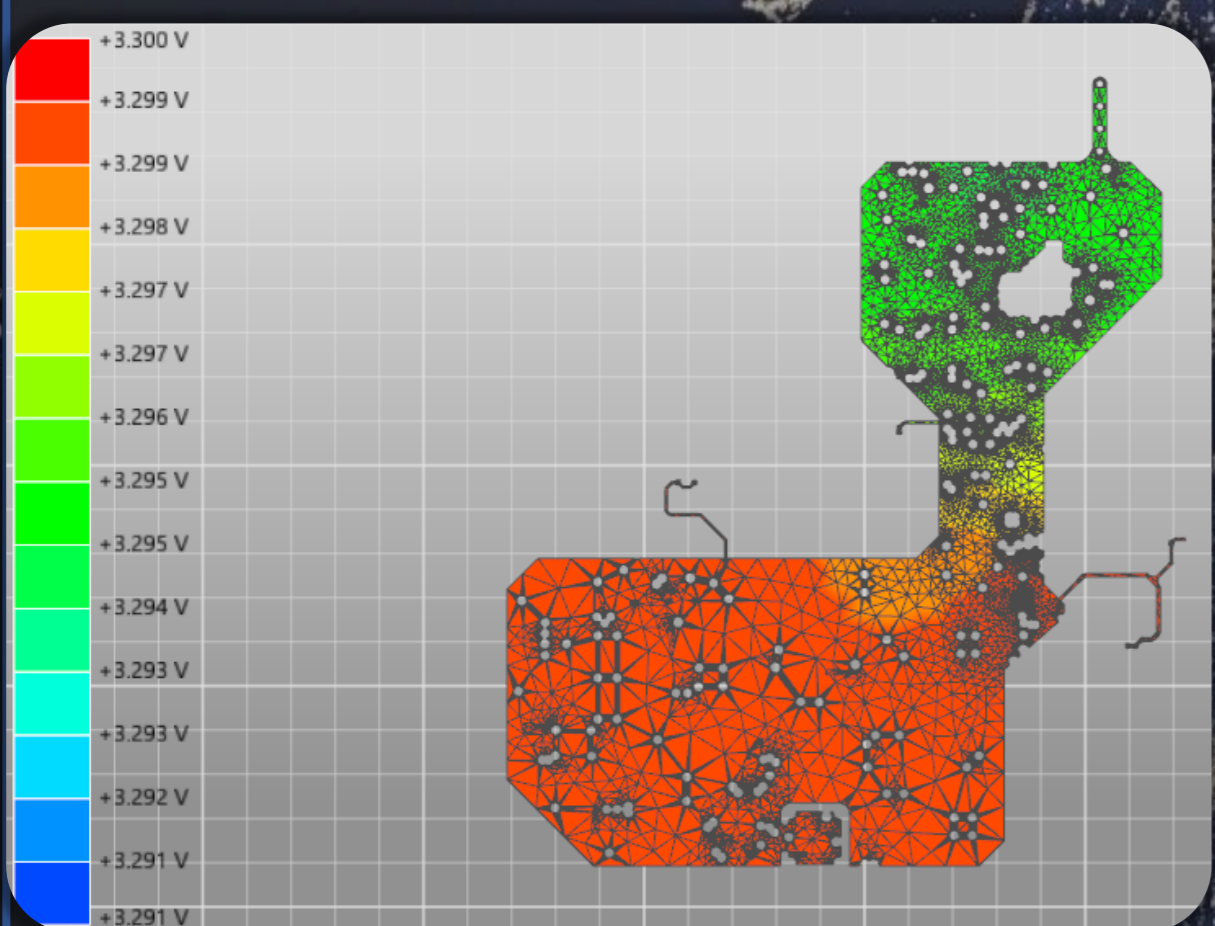
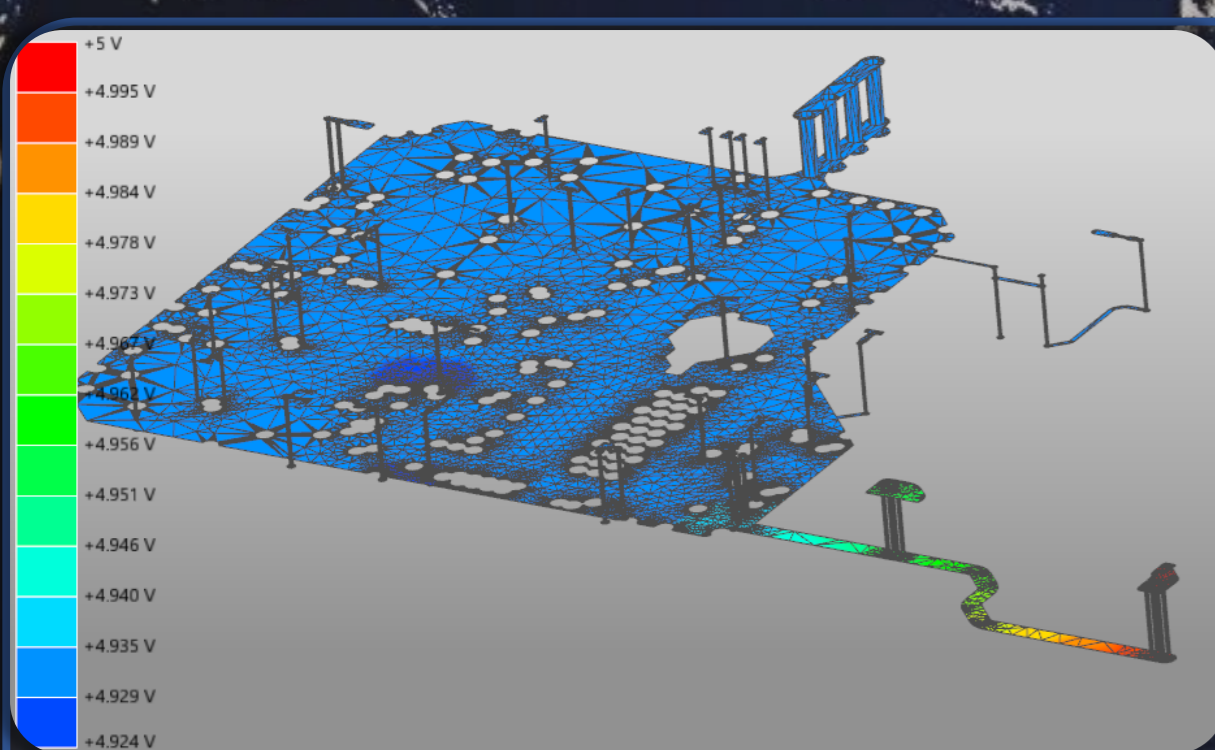
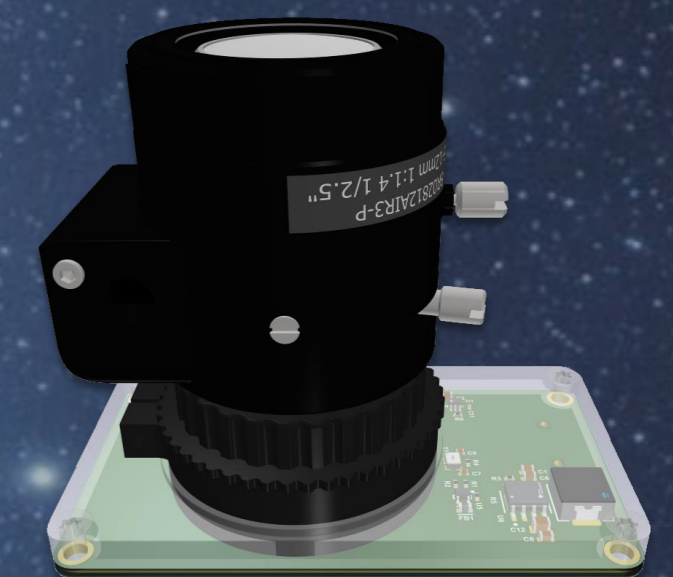
- An on-board ADCS unit
- An on-board CM4 SoM
- Two daughter board slot
- Multi-support slot design
- Cortex-M7 core (up to 400MHz)
- 2 x 512 kB FRAM (with FMC)
- 256 MB NOR Flash Memory
- 2 x mSD NAND Memory
- On-board RTC, compass, gyro
- Redundant memories and sensors
- CAN, SPI, I2C, UART interfaces
- PWM, GPIO Outputs



Bottom View

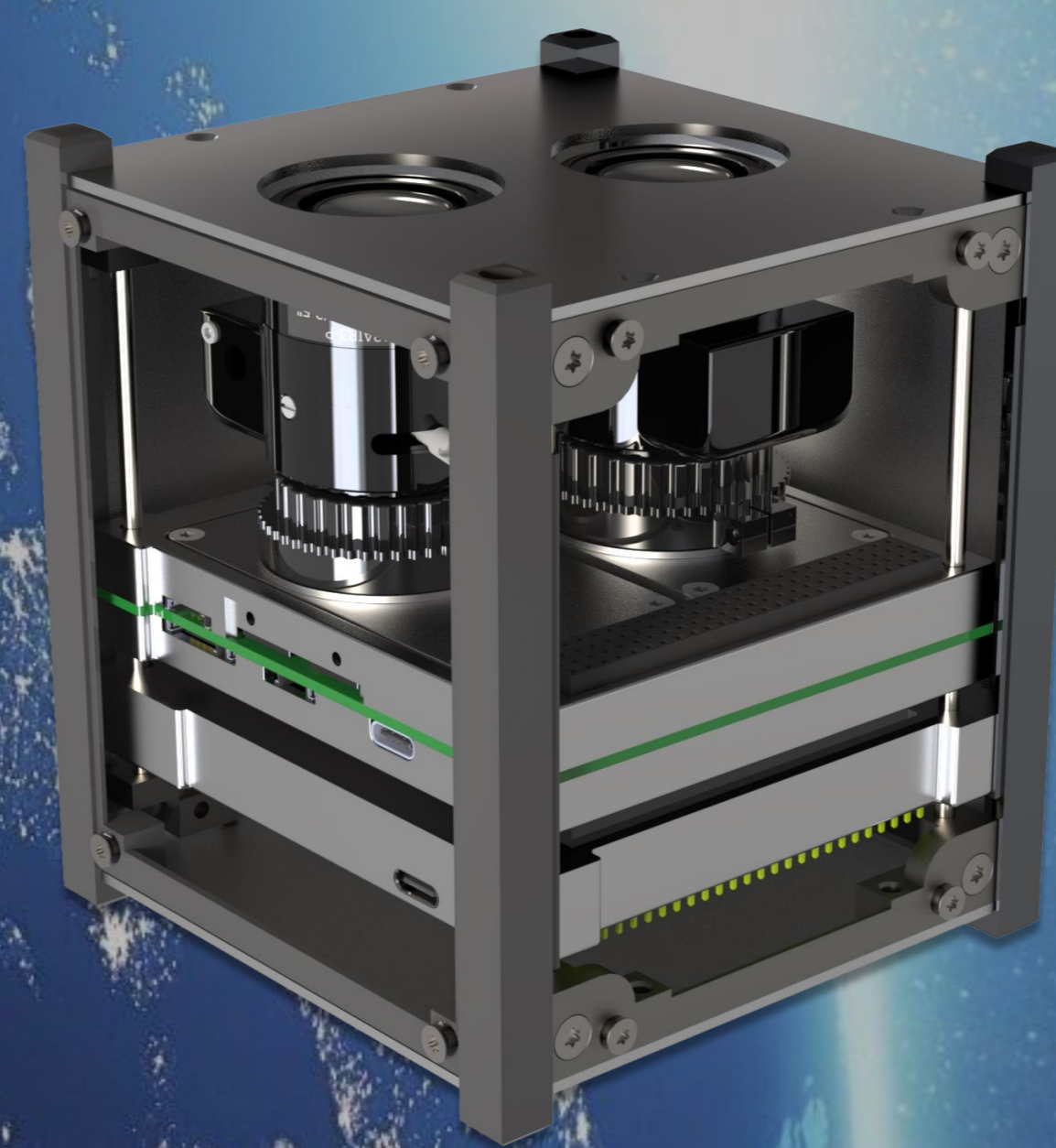
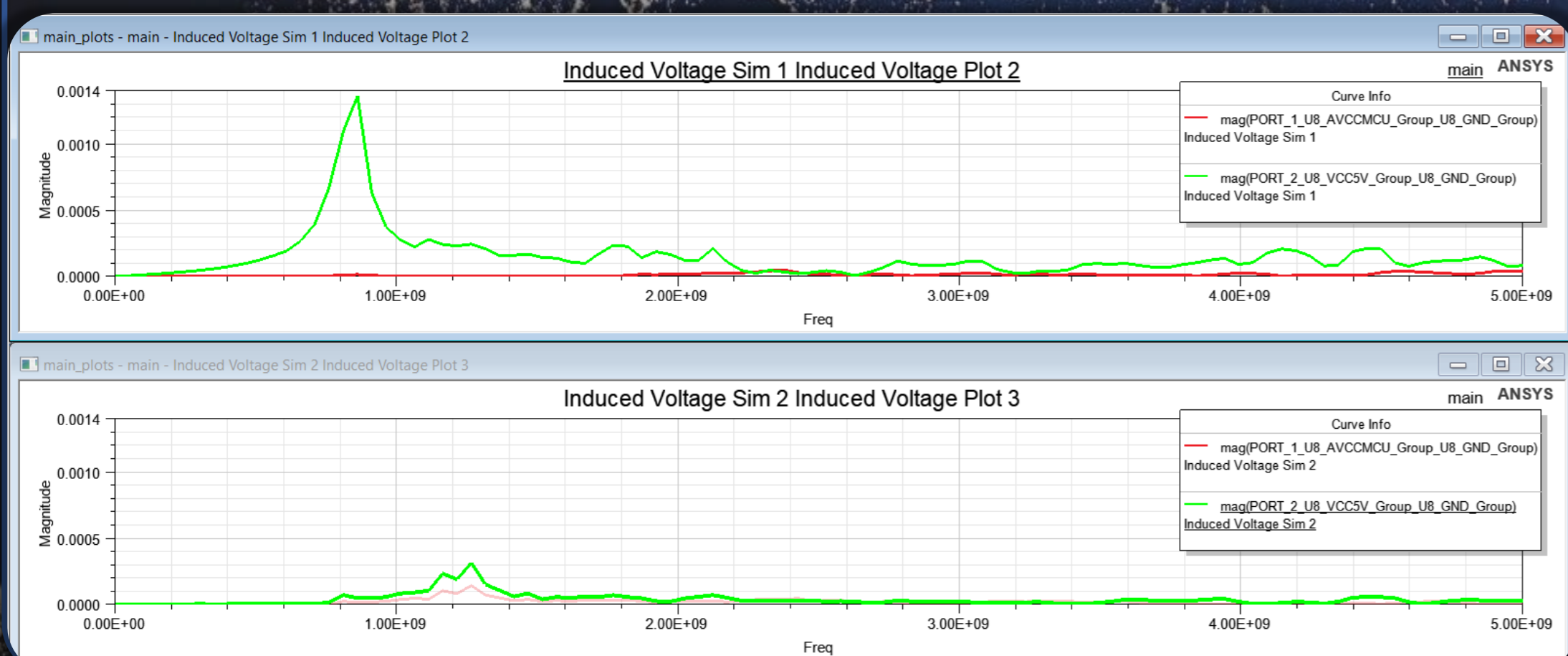
Camera Module

- Image Sensor: 1.3 MP CMOS, (5/4)
- Spatial Resolution @ 550 km
- Wavelength Range: 400-650 nm(RGB)
- Pixels: 5.3µm (1280 x 1024)

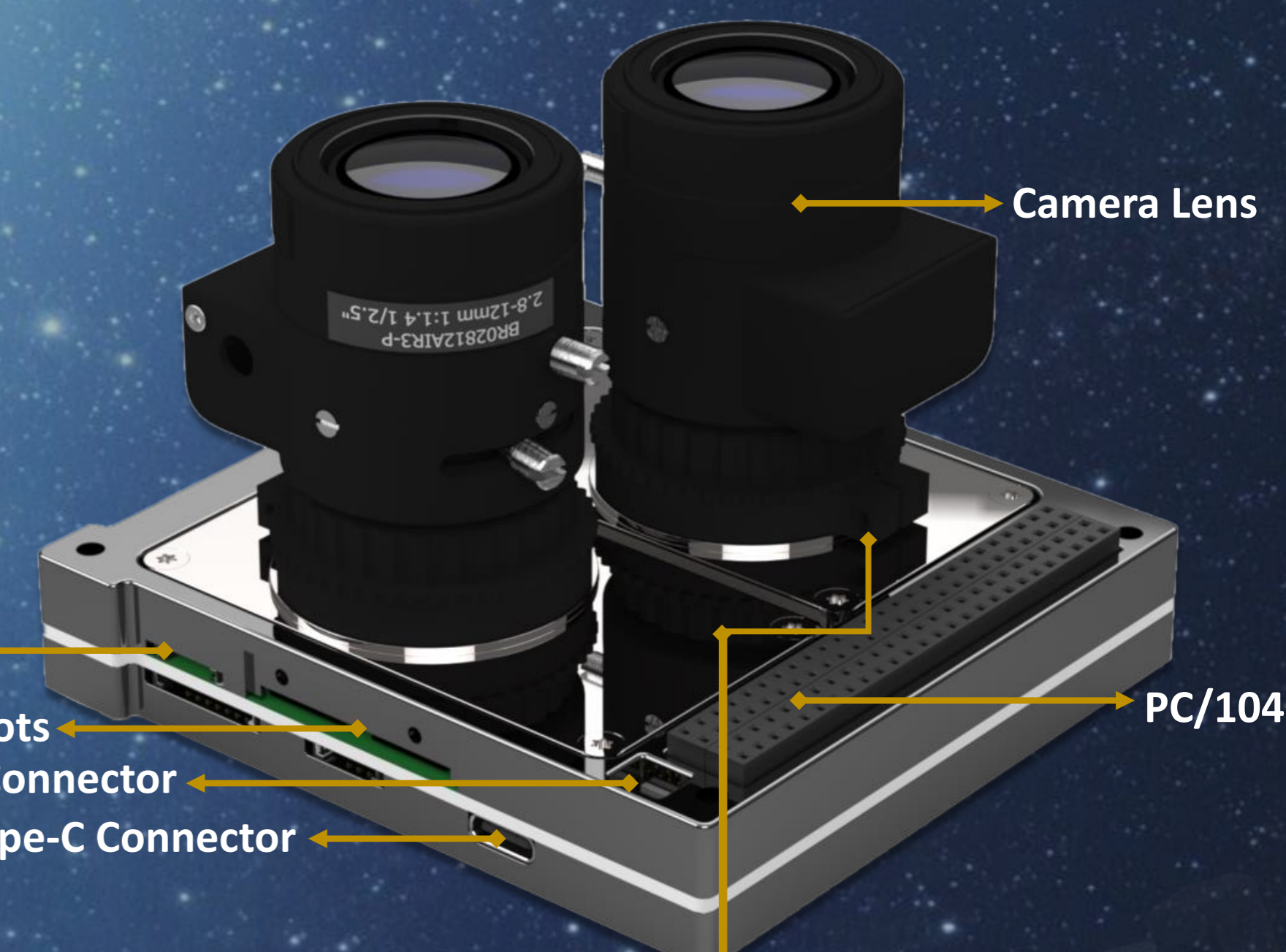


Power & Signal Integrity Analysis

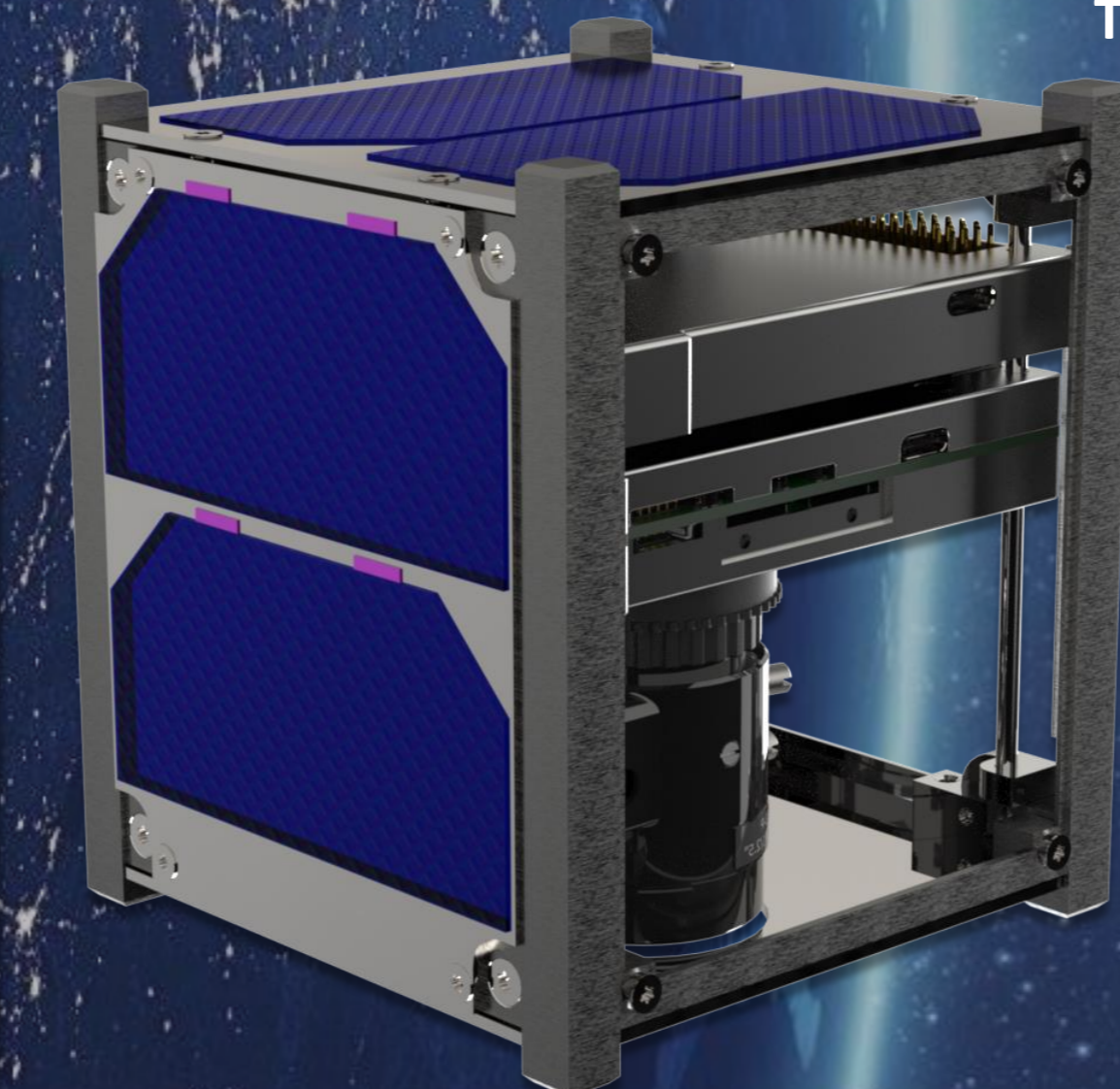
Signal and integrity analyzes of the designs were made with the ANSYS SIwave tool. The voltage distribution in the power lines is shown on the left. In the graphics at the bottom, it is seen that the noise is suppressed with decoupling capacitors.



External Interfaces



Daughter Board Slots



Special Thanks to Ayşe İrem Yalçın & Mustafa Koca