# 2. Requirements, Constraints, And Standards

## 2.1 Requirements & Constraints

The success of the Heimdall project relies on a thorough understanding and definition of its requirements, constraints, and adherence to engineering standards. This section outlines those constraints that guide the development of Heimdall, focusing on the functional requirements and resource constraints. By defining these parameters, the project team can ensure Heimdall meets its objectives of improving the video quality of transmissions from high-altitude weather balloon payloads while complying with expected performance standards. From functional requirements that specify the system's essential capabilities to resource constraints that define its limitations, each aspect plays a crucial role in shaping the design and development of Heimdall

### 2.1.1 Functional Requirements

Heimdall's functional requirements define the essential tasks and operations it must perform to achieve high-quality video transmission. This section outlines these requirements, guiding the development of Heimdall to meet the project's objectives effectively.

- Video Transmission Reliability: The Heimdall system shall be capable of streaming and recording video at a minimum quality of 720p.
- Software-Defined Radio (SDR) Integration: The system shall integrate SDR technology to control phase and frequency modulation for video transmission to allow for cheap customizable configuration of the system in the long term.

- Remote Control Capability: Heimdall shall allow for remote control and adjustment of modulation parameters during flight from a ground station.

- Frequency of transmission: The range of frequency transmission must be within 900 MHz to 1200 MHz

- Distance: The signal must be capable of traveling between 35km and 40km, hence we are lowering the operating frequency from the 5 GHz range to the range stated above

## 2.1.2 Constraints

Similar to functional requirements, constraints define the limitations and boundaries within which Heimdall must operate. This section details the specific constraints that influence the system's development, guiding the design process to meet these limitations effectively.

- Weight: The overall spacecraft shall weigh less than 12 lbs. to comply with FAA regulations for high-altitude balloon payloads, therefore requiring Heimdall's addition to be as light as possible (constraint).

- Power: The system shall operate with as minimal of a power budget as possible and must be constantly monitored and controlled by either pre-programmed or remote access intervention. (constraint).

## 2.2. Engineering Standards

This section outlines the industry standards and guidelines that Heimdall will adhere to during its development and operation. These standards ensure that the system meets established criteria for safety, performance, and interoperability with other systems.

### 2.2.1 IEEE 802.11 Standards:

Heimdall will utilize Wi-Fi technology for remote control and data transmission. IEEE 802.11 ac standard provides high-speed wireless communication, aligning with the project's requirement for reliable and efficient data transfer.

### 2.2.2 FCC Regulations for Radio Transmissions:

The project must comply with FCC regulations to ensure legal and safe operation of the radio frequency transmission equipment. This standard is essential for the project's video communication component.

### 2.2.3 FAA Regulations for High-Altitude Balloon Payloads:

Heimdall's weight, power consumption, and dimensions must adhere to FAA regulations for high-altitude balloon payloads. Compliance with these regulations is critical for successful and legal balloon launches.