# 1. Folder explanation

**1. APRS GST Codes**

This folder contains all of the code used in the APRS Ground Station Terminal (GST). It is divided into two main categories:

* Codes for the sensor interface board Arduino UNO R3: Folder name Arduino codes
* Codes for the Raspberry Pi 3B Microcomputer Unit (MCU): Folder name APRS\_Python\_codes

The first category includes:

* Arduino codes to read data from one sensor only (gas, wind, and thermal)
* Arduino codes to read data from two sensors
* Arduino codes to read data from all 3 sensors: The newest version is ***test\_ALL\_8***

The second category includes:

* The python code to automatically run Direwolf and KISS Protocol when beginning a transmission session (v5 is the newest version): *ORBTEST\_autoDirewolf\_merged\_v5*
* The python codes to read the sensor data and organized them to APRS format (8 is the newest version): *output\_format\_overwrite\_APRS8*
* In the folder **autorelay codes**, there are Python codes to control the electrical relay to automatically Turn ON/ OFF the YAESU Transceiver by commands from Raspberry Pi:
  + Python codes to automatically turn ON only: *autorelay\_turnON\_only*
  + Python codes to automatically turn ON only: *autorelay\_turnOFF\_only*
  + Python codes to automatically turn ON and OFF: *autorelay*
* The Python code which combines all the functions of the above codes: ***Sensor\_Data\_APRS***

**2. APRS Protocol**

In this folder, there is a PDF file named ***APRS101***. Our standard APRS format is referenced from this file. Our currently used APRS format is ***MESSAGES***, with the maximum message text length of 67 characters (the format structure can be seen in section **14 MESSAGES, BULLETINS AND ANNOUNCEMENTS** of this document)

**3. APRS Sensor Data**

This folder contains the APRS old data before the FRR on April 18th, 2024. It will be updated in the future when the GST is in real operation.

**4. Data Budget Analysis**

This folder included a folder named **Simulation (STK)**, in which there are 2 text files demonstrating the Satellite Tool Kit (STK) simulated results of the accesses and azimuth-elevation-range between our GST and the DragonFly satellite. The input altitudes and inclination angle of the satellite are referenced from the parameters of the ISS. The simulation time is around 2 weeks.

The excel file, Data Budget Calcuation, is created based on the STK simulation results. Our purpose is to determine the maximum allowable number of APRS packets that can be transmitted without error in the simulation scenario.

**5. Datasheet**

This folder contains the datasheet of the VHF Eggbeater antenna, as well as the sensors (Thermal, Windmeter and Gas) that we are using in our GST.

**6. Diagrams**

This folder contains the overall diagram of the APRS Student Mission GST and the connection diagram between sensors, Arduino sensor interface, and the Raspberry Pi 3B MCU.

**7. Link Budget**

This folder contains the Link Budget analysis for the VHF Data Uplink (transmit signal from GST to satellite), the calculation is done for several output power transmission scenarios, with different Elevation angles.