

1.00E-5 error rate, thus 1 in 100,000 bits will be wrong. E.g. for a 1Mb file, 80 bits will be wrong and will need retransmission of their respective packets.

Regular telemetry files should be collected and deleted several times a day, but may accumulate in size up to around 1Mb in a day if left unchecked (can be vastly reduced with a more efficient formatting implementation). Image files are 20 Mb (?? Guessing, don't remember), and as such will have around 1600 incorrect bits. However due to the format, retransmission will not be needed for these.

New method for packet transmission and retransmission

Previously, decided to use a bitmask to specify which groups of packets to retransmit, however this is somewhat complex.

As the bit errors are rare, it would be easier to send a command after the main transmission specifying which specific packets to resend.

Command format

A possible recommended format would be as follows (256 byte payload):

- 1 byte command identifier
- 3 byte start packet identifier
- 3 byte max transmission time (will end transmission early if this time is reached)
- 249 byte list
 - If all zeros, continuous transmission beginning with the start packet
 - Else, every 3 bytes specifies a unique packet number (can specify $249/3 = 83$ unique packets in a single command)

Packet response from CubeSat

Each packet can be given a unique identifier. With the 256 byte payload in the AX.25 packet format, a packet response containing file data with a given size for the unique packet identifier field is shown:

1 byte identifier (256 unique packets, 255 byte payload)

256 packets x 255 bytes = 65.280 Kb

2 byte identifier (65536 unique packets, 254 byte payload)

65536 packets x 254 = 16.646 Mb

3 byte identifier (16,777,216 unique packets, 253 byte payload)

16777216 packets x 253 = 4.245 Gb

4 byte identifier (4,294,967,296 unique packets, 252 byte payload)

4294967296 packets x 252 = 1.082 Tb

Realistically, a field greater than 3 bytes is not needed.

With this, the CubeSat can be told where in the file to begin transmission from (if not all of the data was received in the first transmission/pass), how long to transmit (seconds), and whether we want it to transmit as much as it can or specific packets. With the ability to specify up to 83 unique packets in a single command, this should generally only require one additional command to retransmit corrupted packets of a 1Mb file (~80 wrong bits or packets).