# Description of the systems:



S-Band

X-Band

Ground Station

MCC

**S-band System:**

**Model:** <http://www.iq-wireless.com/images/pdf/SLINK-PHY-Datasheet.pdf> <https://www.isispace.nl/product/full-ground-station-kit-s-band/>

**Main Features:**

* S-band downlink and uplink capability (half-duplex).

**Purpose:** Housekeeping data/ TT&C and clients data upload.

S-Band Transciever

Computer

HPA

LNA

RF Limiter

RF Fuse



Rotors

RF Switch

LNA: *Low noise amplifier.* HPA: *High Power Amplifier.*

Sband Ant.

**X-band System:**

**Model:** <http://www.dartcom.co.uk/files/DartcomXBandEOSSystemBrochure.pdf>

**Main Features:**

* X-band downlink capacity

**Purpose:** Clients data download

X-Band Receiver

Computer

LNA

RF Limiter

RF Fuse



Rotors

LNA: *Low noise amplifier.*

Xband Ant.

# Description of the main tasks of the Ground Station:

**Satellite Control:** The GS is capable of talking to the satellite in half-duplex and in S-band only. So, in order to avoid taking uplink time to the clients, the housekeeping data acquiring of the satellite and the TT&C is going to be done on GS demand. The Mission Control Center has several departments. The TT&C Processing Department is going to be in charge of these tasks. Their operational procedure could be simplified in the following cased scenarios (all of them using the s-band system):

Node Failure:

1. If there is a failure in a node, the neighbouring nodes are going to be aware of that and are going to send an alert to Ground. While this happens, the system is reconfiguring its map so as to be aware of the recently generated gap.
2. When TT&C Processing Department receives the alert, they will reserve a Ground Station only for them and will send debugging commands to the broken node, aiming to repair it. Client data would be redirected to another GS.

Periodic Checks:

1. Every hour, the TT&C department is going to collect housekeeping data of the constellation in order to analyse its health. The least used GS at that time is going to be used since delay times are not critical in this case.
2. In case that a potential problem is encountered, such as node saturation, solving and logistics measures are going to be taken in order to try to solve the issue and to prepare the network for the probable failure.

Scheduling commands

1. When a command is nor urgent, the typical procedure would be to wait until the satellite is above a GS and only then, send the command to it. If there is any client data to be uploaded, since they share the channel, client data is put to the queue until commands are completely sent.

**Payload Control:** The client data is a separate process. Similarly, several cases appear:

1. If the client sends through *Astrea Software* a command to his/her satellite, then this command is going to be put on a queue on the closest GS to the clients satellite. If that GS is working at more than 80% of its capacity, then the Satellite command is going to be sent to the next closer GS and will be put to its queue. All this is managed by *Astrea Software.* It is important to mention that the uplink is going to be done through the S-band system.
2. When client data is downloaded from the satellites, X-band is going to be used due to the higher achievable data rate. This channel is going to be specifically reserved for clients’ data so it will be really fast.

**Costs of the Ground Station:**

The following items are needed:

* S-band system: Cost extracted from the web.
* X-band system: Cost obtained from enterprises.
* Computers + office material:

13000€

* Building: 50000€

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| --- | --- |
| **Item** | **Cost (€)** |
| S-band system | 46500 |
| X-band system | 100000 |
| Computers and office | 13000 |
| Building | 50000 |

**The total initial investment for one ground station is of 209500 €**

**For the three GS: 628500 €**

