GS-Kit

Alén Space Ground Station kit

Datasheet

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1. Changelog

Table 1 - Changelog

Date	Revision	Author	Description
24/11/2020	1.0	BFA/JML	Initial release

2. Overview

The GS-Kit from Alén Space S.L. is a ground station complete solution used to communicate and track LEO satellites. It is composed of different subsystems: external structure and antennas with azimuth and elevation rotators, SDR rack, power rack and server.

With the external structure and both rotators (azimuth and elevation rotator), the antennas can point in any direction, and follow the spacecraft in each and every contact.

The SDR rack is able to transmit and receive data from the satellite with different antennas and different bands, providing this data to the server through USB 3.0.
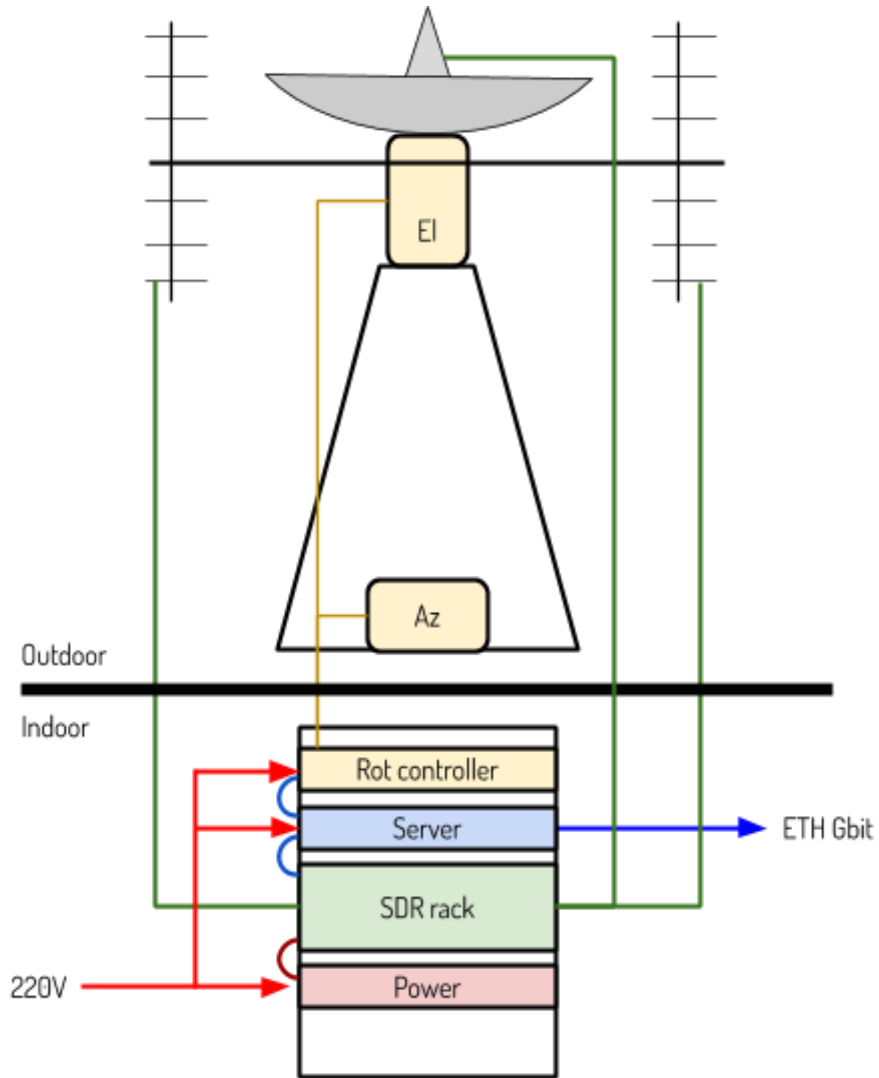
3. Architecture

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Figure 1 - GS-Kit diagram

3.1 Outdoor equipment

The output equipment is composed of a structure with four base bars to provide stability. Over the four bars, is the main pyramid tower with the azimuth rotator. Over the pyramid is the elevation rotation with the cross boom with the antennas.

The antennas are connected to a LNA, polarization switch or LNC, depending on the option selected.

The structure can support 3 antennas: 2 yagi (UHF and VHF, or same antenna in both sides), and a S-Band antenna (Dish antenna or helix antenna).

3.2 Indoor equipment

The indoor equipment is composed by:
- A rotator controller, that controls both rotators; a server rack.
- SDR rack provides the signal transmission and reception. Connected directly to the outdoor LNAs/LNC.
- Power rack provides power supply to the SDR rack.
- Server rack is connected to the rotator controller rack and SDR rack. The server controls the rotator controller, and sends and receives data from the SDR rack.

4. Electrical characteristics

8.1 Outdoor equipment

Table 1 - Outdoor electrical characteristics

Description	Typ	Unit
UHF-400 LNA RX frequency range	400-402	MHz
UHF-400 LNA gain	22	dB
UHF-400 LNA current consumption	320	mA
UHF-400 LNA noise figure	0.9	dB
UHF-400 LNA insertion Loss	0.15	dB
UHF-435 LNA RX frequency range	430-440	MHz
UHF-435 LNA gain	22	dB
UHF-435 LNA current consumption	320	mA
UHF-435 LNA noise figure	0.7	dB
UHF-435 LNA insertion Loss	0.15	dB
VHF LNA RX frequency range	144-146	MHz
VHF LNA gain	20	dB
VHF LNA current consumption	320	mA
VHF LNA noise figure	1	dB
VHF LNA insertion Loss	0.3	dB
LNC frequency range	2.1 - 2.6	GHz
LNC frequency mixer	916.5	MHz
LNC gain	40	dB
LNC noise figure	1	dB
LNC current consumption	130	mA

8.2 Power rack

Table 2 - Power rack electrical characteristics

Description	Typ	Unit
Input voltage	90 - 264	VAC
Input frequency range	47 - 63	Hz
Efficiency	81	%
Maximum power consumption	1000	W
Output voltage	12	V
Output max current	60	A

8.3 SDR Rack

Table 3 - SDR rack electrical characteristics

Description	Typ	Unit
Input power supply (VCC)	12 - 13.8	V
Current supply typical	4	A
Current supply maximum (fused)	16	A
ANT1, ANT2 and ANT3 output voltage (DC)	VCC	V
ANT1, ANT2 and ANT3 output max current (DC)	500	mA

Table 4 - SDR rack RF characteristics

Description	Typ	Unit	Comments
ANT1/2 (VHF) transmission frequency range	144 - 146	MHz	
ANT1/2 (VHF) transmission maximum bandwidth	61.44	MHz	
ANT1/2 (VHF) maximum output power	+47	dBm	
ANT1/2 (VHF) reception range	100 - 1500	MHz	
ANT1/2 (VHF) reception maximum bandwidth (per channel)	61.44	MHz	
ANT1/2 (VHF) maximum input power	+7	dBm	
ANT1/2 (UHF) transmission frequency range	400 - 480	MHz	
ANT1/2 (UHF) transmission maximum bandwidth	61.44	MHz	
ANT1/2 (UHF) maximum output power	+47	dBm	
ANT1/2 (UHF) reception range	100 - 1500	MHz	
ANT1/2 (UHF) reception maximum bandwidth (per channel)	61.44	MHz	
ANT1/2 (UHF) maximum input power	+7	dBm	
ANT3 reception range	100 - 3000	MHz	
ANT3 reception maximum bandwidth	61.44	MHz	
ANT3 maximum input power	+7	dBm	
SDR2 RF Output transmission frequency range	0.1 - 3.8	GHz	
SDR2 RF Output transmission maximum bandwidth	61.44	MHz	
SDR2 RF Output transmission maximum output power (CW)	+10 +0 -12 -22	dBm	At 1.7 GHz At 2.5 GHz At 3.0 GHz At 3.5 GHz

5. Antennae characteristics

Table 5 - Antennae characteristics

Description	Typ	Unit

UHF-400 antenna
    Type
    Nº elements
	
	Yagi
	30
		N/A

UHF-400 antenna frequency band	395-405	MHz
UHF-400 antenna gain	16.2	dBi

UHF-435 antenna
    Type
    Nº elements
	
	Yagi
	18
		N/A

UHF-435 antenna frequency band	435	MHz
UHF-435 antenna gain	14.94	dBi

VHF antenna
    Type
    Nº elements
	
	Yagi
	12
		N/A

VHF antenna frequency band	145	MHz
VHF antenna gain	12.64	dBi

S-Band Dish antenna
    Type
    Diameter
	
	Dish
	1.9
		
		m

S-Band Dish antenna frequency band	2.1 - 2.6*	GHz
S-Band Dish antenna gain	31.34	dBi

S-Band Helix antenna
    Type
    Nº of turns
	
	Helix
	40
		N/A

S-Band Dish antenna frequency band	2.35	GHz
S-Band Dish antenna gain	16	dBi

* Customer must select a bandwidth of 100MHz in the range of 2100 to 2600 MHz

6. Physical characteristics

Table 6 - Physical characteristics

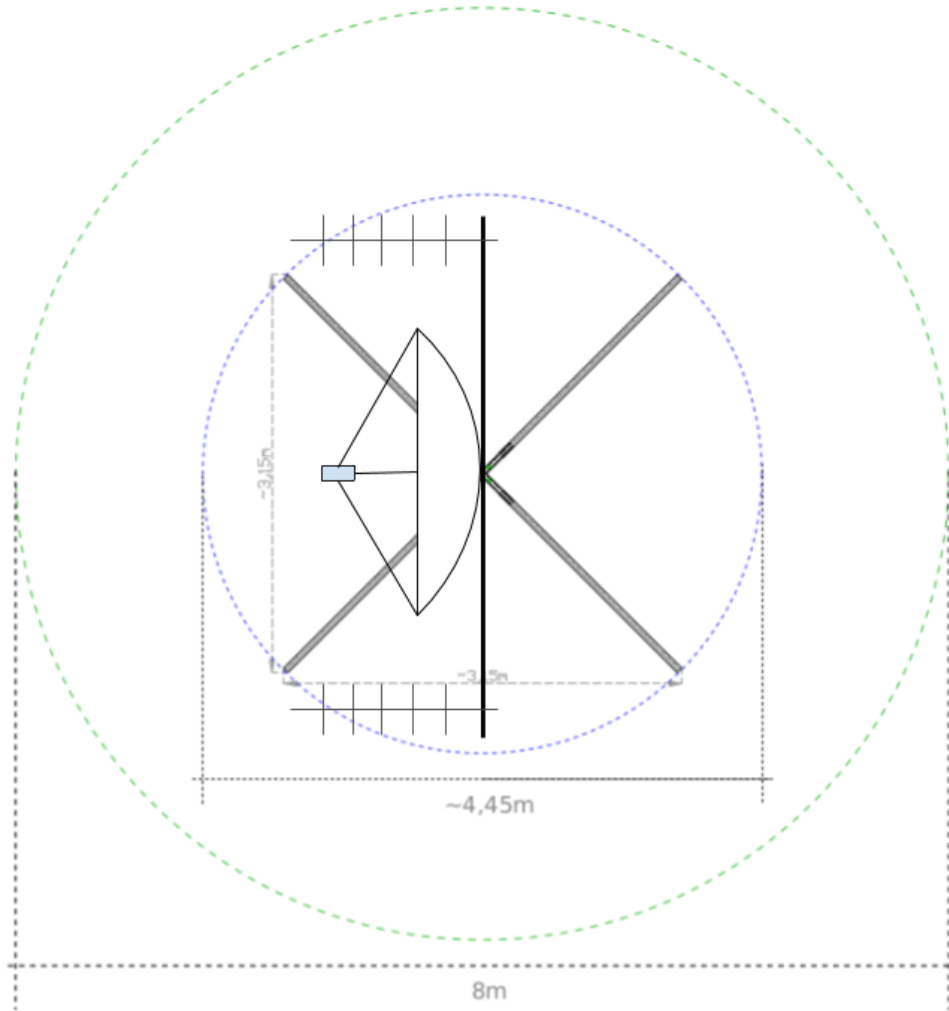| Description	Typ	Unit	Comments
Mass	300	kg	

Size structure:
    Base
    Height (from ground to cross boom)
	
	4.5 x 4.5
	2.3
		
		m²
		m	

Size antenna:
    VHF
    UHF-400
    UHF-435
    S-Band dish
    S-Band Helix
	
	1.46
	3.58
	1.27
	1.9
	1.25
		
		m
		m
		m
		m
		m
			
			Dish radius

Azimuth angles	0 - 360	º	
Elevation angles	0 - 180	º	

6.1 Installation area

Figure X - Alen GS-Kit structure installation area

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