

# Uydu Takip Ve Yer Kontrol İstasyonu



Barış DİNÇ (OH2UDS/TA7W)  
Nisan 2021

# Sunum Akışı

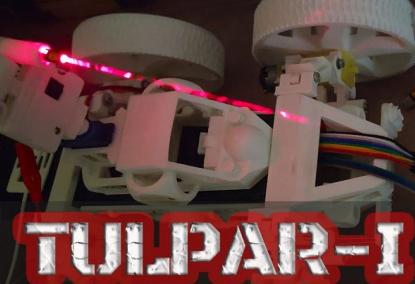
- Ben Kimim ?
- Mars On Earth Project
- TAMSAT
- Genel Bilgiler (Uydu, YKİ, Anten, vb)
- İyi Bir Yer Kontrol İstasyonu Nasıl Olmalı ?
- Uydu Takibi Nasıl Yapılır ?
- Satnogs Nedir ?
- LoRA TinyGS Nedir ?
- Canlı Gösterim

# Ben Kimim ?

- Elektronik Mühendisi
- Astronomi ve Uzay Bilimleri (YL)
- 1980'li yıllarda beri radyo amatörlüğü yapıyorum
- TAMSAT bünyesinde pek çok uydu üretimi ve takibi çalışmaları
- MarsOnEarthProject kurucularındanım
- RF, Anten, gömülü sistemler, yazılım geliştirme, linux



# Dünyadaki Mars Projesi



Mars on Earth Project 🔍 ⚙️

Dünyadaki Mars Projesi - Dağılım  
94 görüntüleme  
[PAYLAŞ](#)

Gönüllü

- Gönüllü
- Gönüllü
- Gönüllü
- MARS-10-1

... 44 üye daha

Çocuk Uzay Gücü

- Çocuk Uzay Gücü
- Çocuk Uzay Gücü
- Çocuk Uzay Gücü
- Çocuk Uzay Gücü

... 44 üye daha

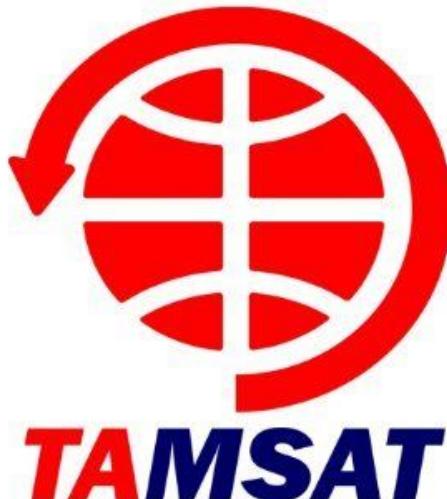
Manned Sahilinden Çocuklar



# TAMSAT (AMSAT-TR)



A.Tahir DENGİZ, TA2T (S.K.)



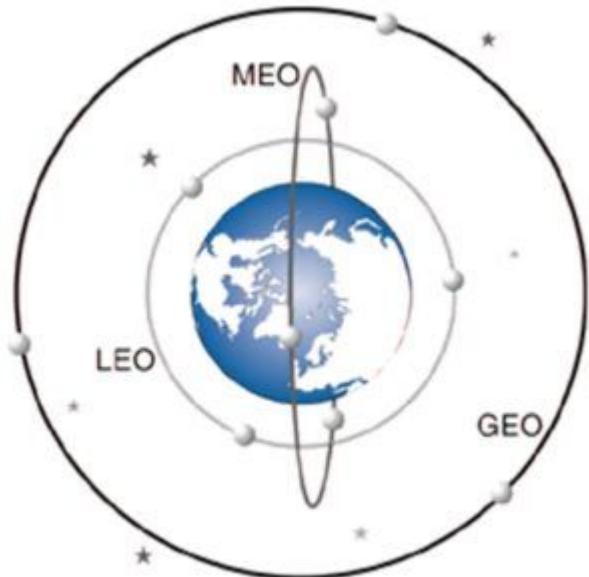
- Uydu ve Uzay Projeleri
- Modül Geliştirme
  - TURKSAT 3USAT
    - Transponder-1
    - Transponder-2
  - UBAKUSAT
    - Transponder-1
    - Single-Board-Mikrosat
  - HAVELSAT, BEAGLESAT
    - Ground Station
    - Monitoring
- ISS Haberleşmesi

# Genel Bilgiler



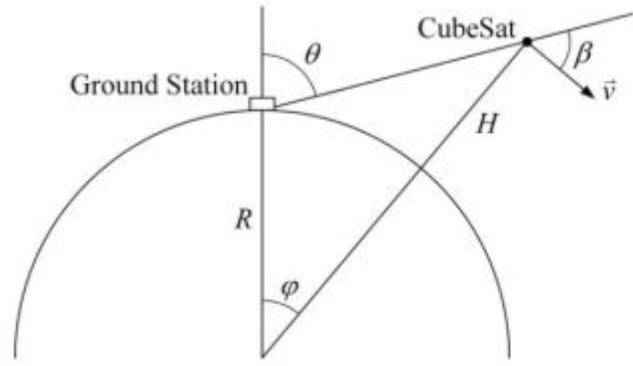
<https://marsonearthproject.org/amator-uydu-haberlesmesi-nedir/>

# Genel Bilgi - Yörünge



Kısaltma	İngilizce Tanımı	Türkçe Açıklaması
LEO	Low Earth Orbit	Alçak Dünya Yörünge. Kutuplar üzerinden geçen yakın dairesel yörünge tipi olup ortalama yüksekliği 650-2000 km.dir. Uydular bir tur dönüşlerini ortalama 1,5 saatte tamamlarlar. Yöringedeki uydunun ömrü de-orbit işlemine tabi tutulmadığı sürece 4-7 yıla arasında değişmektedir.
MEO	Medium Earth Orbit	Orta Dünya Yörünge. Yörunge yüksekliği 10 bin Km olup bir dönüşünü 6 saatte tamamlar. Yöringedeki uydunun ömrü de-orbit işlemine tabi tutulmadığı sürece 10-15 yıla arasında değişmektedir.
HEO	High Elliptical Orbit	Yüksek Eliptik Yörünge. Adından da anlaşıldığı gibi yüksekliği birkaç yüz metre ile 40 bin km arasında değişen elips benzeri yöründedir.
GEO	Geostationary Earth Orbit	Eşzamanlı Uydu Yörünge, diğer ismiyle "Clarke Yörünge". Dünya dönüşü ile senkronize olup genellikle 36 bin km yörünge uzaklığında ve sabit uydular ekvator eksenin enlemesinde konumlandırılır. TV, meteoroloji ve bazı askeri uydular bu yörüngeye bulunmaktadır.
HEO	High Elliptic Orbit	Yüksek Eliptik Yörünge. Dünya'ya olan uzaklığı geometrik şekeinden dolayı değişmektedir. Elipsin yakın geçiş 500, uzak geçiş noktası 50.000 Km.dir. Rusların Tundra ve Molnya sistemleri tarafından kullanılmaktadır.
PEO	Polar Earth Orbit	Kutupsal Dünya Yörünge. Kutup bölgelerinde kapsama alanının geniş olduğu bir yöründedir bu yöringedeki uydular kutup bölgelerinden geçerler. Her seferinde farklı bir meridyenden geçtiği için harita yapımında da kullanılırlar. Ekvator düzleminden 90 derece eğimlendirilmiş yörunge düzlemine haizdir. Arama kurtarma uyduları genelde bu yörunge üzerinde bulunmaktadır.

# Genel Bilgi - Doppler Nedir ?



$$\varphi = \frac{\sqrt{g/R}}{(1+H/R)^{3/2}} \cdot t$$

$$\delta F = \frac{F - F_0}{F_0} = \frac{1}{1 + \frac{v}{c} \cdot \cos(\beta)} - 1.$$

$$\delta F = \frac{1}{1 + \frac{1}{c} \cdot \sqrt{\frac{g \cdot R}{1+H/R}} \cdot \frac{\sin(\varphi)}{\sqrt{(1+H/R)^2 - 2 \cdot (1+H/R) \cdot \cos(\varphi) + 1}}} - 1$$

# Genel Bilgi - Aktif Amatör Uydular



Name	Jan 9	Jan 8	Jan 7	Jan 6	Jan 5	Jan 4
AISAT-1	1 1	1 1	1 1	1 1	1 1	1 1
CubeBel-1	1	1	1	1	1	1
CUTE-1	1 1	1	1	1	1	1
BY70-2				1		
LilacSat-2	1 1 1 1 1	11 1 11	2 1 1111 1	1 21	1 11 1 1 1	11
FS-3	1			1		
[B] AO-7	112 1	1432123111	451 121	1 221 1	12 1111 1	1 2311 1 1
AO-92_Lv	3 2 2 2 3 3	1111 21 2111 44	2212211222	2 142 32 4	2 33321141	
AO-92_Uv	21	1 21	1 13	1 1 1 12	11 12	11
[B] UO-11	11	1	1	1	1	1
AO-16	1					
LO-19	11	1	1	1	1	1
AO-27	3 1 1 1 21113	12 1122	1 1 2	13 1	2 1	1
FO-29	1 1 21					1
XW-2A	1 1 1121 1	1 1 111 1	1 11	11 1	1 1 111 1	
XW-2B	11 1	1	1	1		1
XW-2C	1 2	1	1	1		1
XW-2D	11211 1 2	1 11 1 11	1 131	2 2	1	11
XW-2E	1		1			1
XW-2F	1 3 2 1 1	12 12 11	1 1 1 1	1		2
CAS-2T		1				
SO-33		1				
NO-44		1				1
RS-44	32232 13 2 221 12	11 2211442 2	211 23 1 21 132112121	2 112 12		
CAS-4A	131 1	1	1	1	1	1
CAS-4B	131 1	1 11	14	1	1	11
SO-50	1 2 2 1	2211 1 12 432	11 221111 2 1 231	12 122 2		
HO-68	1	1	1	1		1
AO-73	1 1 1 32 1 111	1 22	1 1 1 1 1	1		1
EO-80		1				
AO-85		1 2	1			
IO-86	2 1	1111	1 1 1	1 1	1 12	
EO-88	11 1211 11	1 2	1	11	2	
AO-91	1 2 211	121 1 1	1 431 213 32 12	11 21 11	11 121	
JO-97	1 1 1	1	1	2	1 1	1
FO-99	1 1 2 1	1	1			1
Delfi-C3	1		1		1	1
ISS-FM	211 414111	123222113	232 6 42	1 42522 11	222193122	1 2221211
NO-84_Digi		1			1	1
NO-104[UHF]					1	
XI-IV	1 1	2	1			1
PO-101[FM]	23 1 12 2 11	1 1 1 3 22 11	1 111 221	1 1 2 11 11		
QO-100_NB	1 221	2 2	2211	1	1	15 132
ISS-DATA	1					1
ISS-SSTV	1	1				

<https://www.amsat.org/status/>

# Genel Bilgi - Yer Kontrol İstasyonu

## Rotor Kontrol Arabirimleri

Yaesu, K3NG, FoxDelta, vb.



## Bilgisayar

Anten Kontrol Yazılımları,  
İletişim Terminali Yazılımları,  
Telsiz Kontrol Yazılımı, vb.



## S.D.R.

USRP, BladeRF, HackRF,  
Adalm Pluto, RTLSDR, vb.



## Modem / Ses Arayüzü

Kamtramics, Rigexpert, CatIV, vb.



## Telsiz

Kenwood, ICOM, Yaesu, vb.



Rotor Kontrol

PreAmp. / Anten

# Genel Bilgi - Yer Kontrol İstasyonu - Antenler

## İstasyon Odası Bağlantıları

Alici/Verisi,  
Rotor Kontrolörü, Amplifikatör, vb.

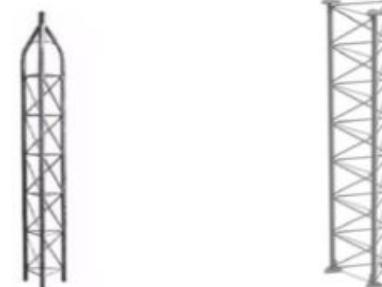
### Anten Rotoru

Yaesu, Emotator, SPIDvb.



### Anten Kulesi / Kaidesi

ASELSAN, ŞARA, MİTAŞ, vb.



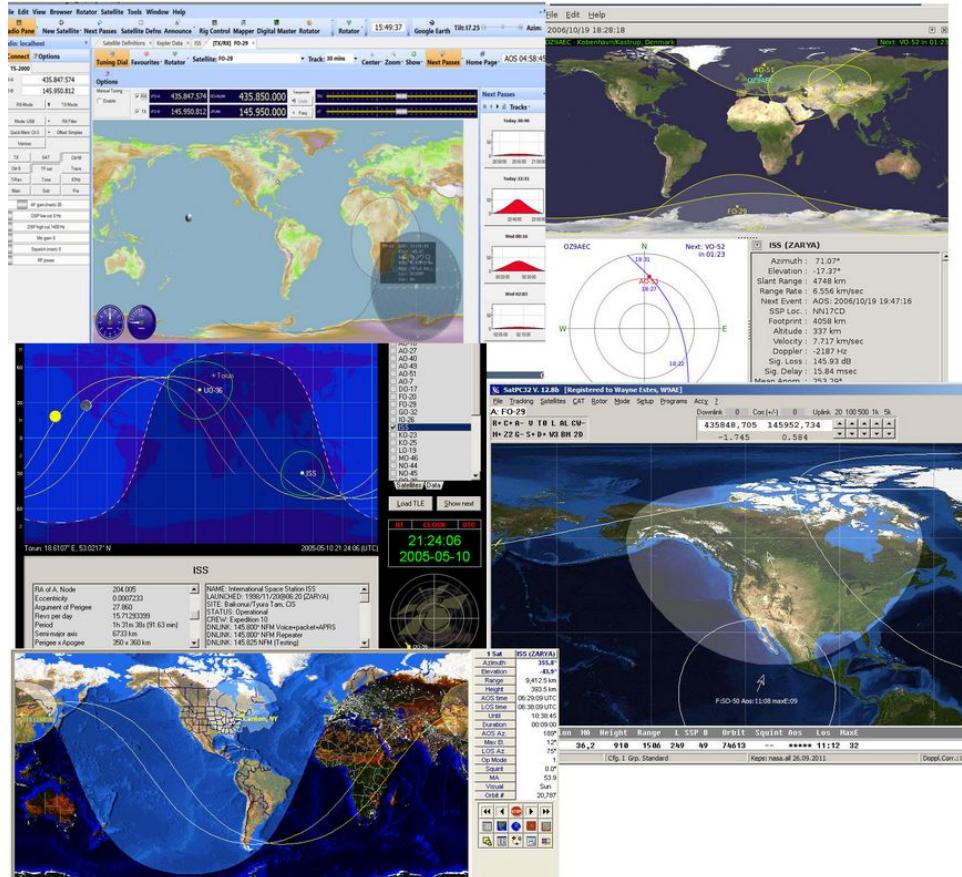
### VHF/UHF/SHF Anten

Diamond, Cushcraft, M2, Innovantennas

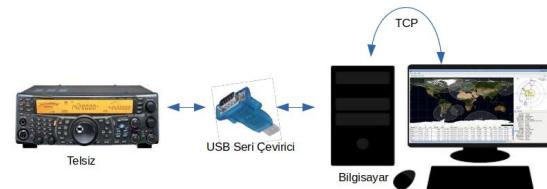
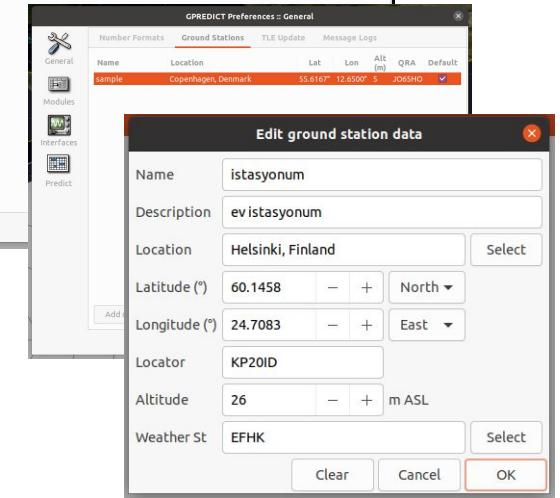
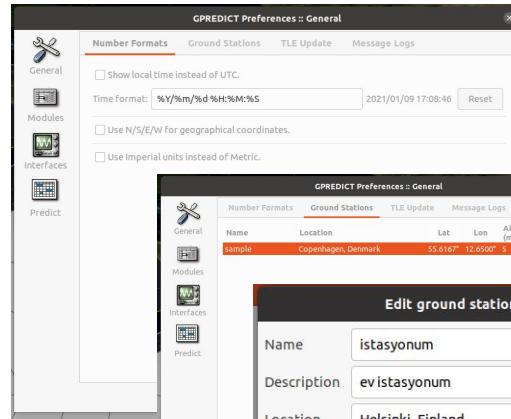
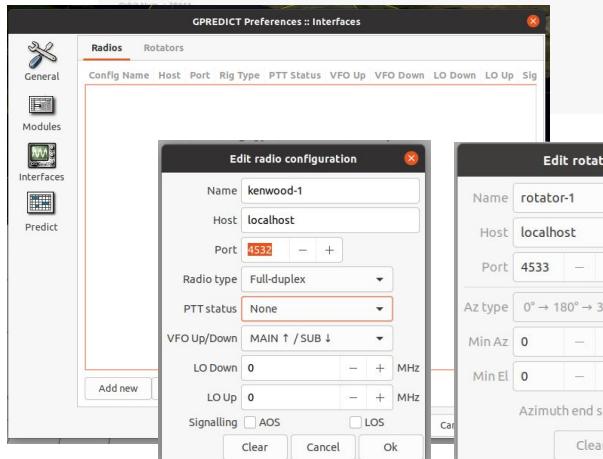


# Genel Bilgi - Yer Kontrol İstasyonu - Yazılımlar

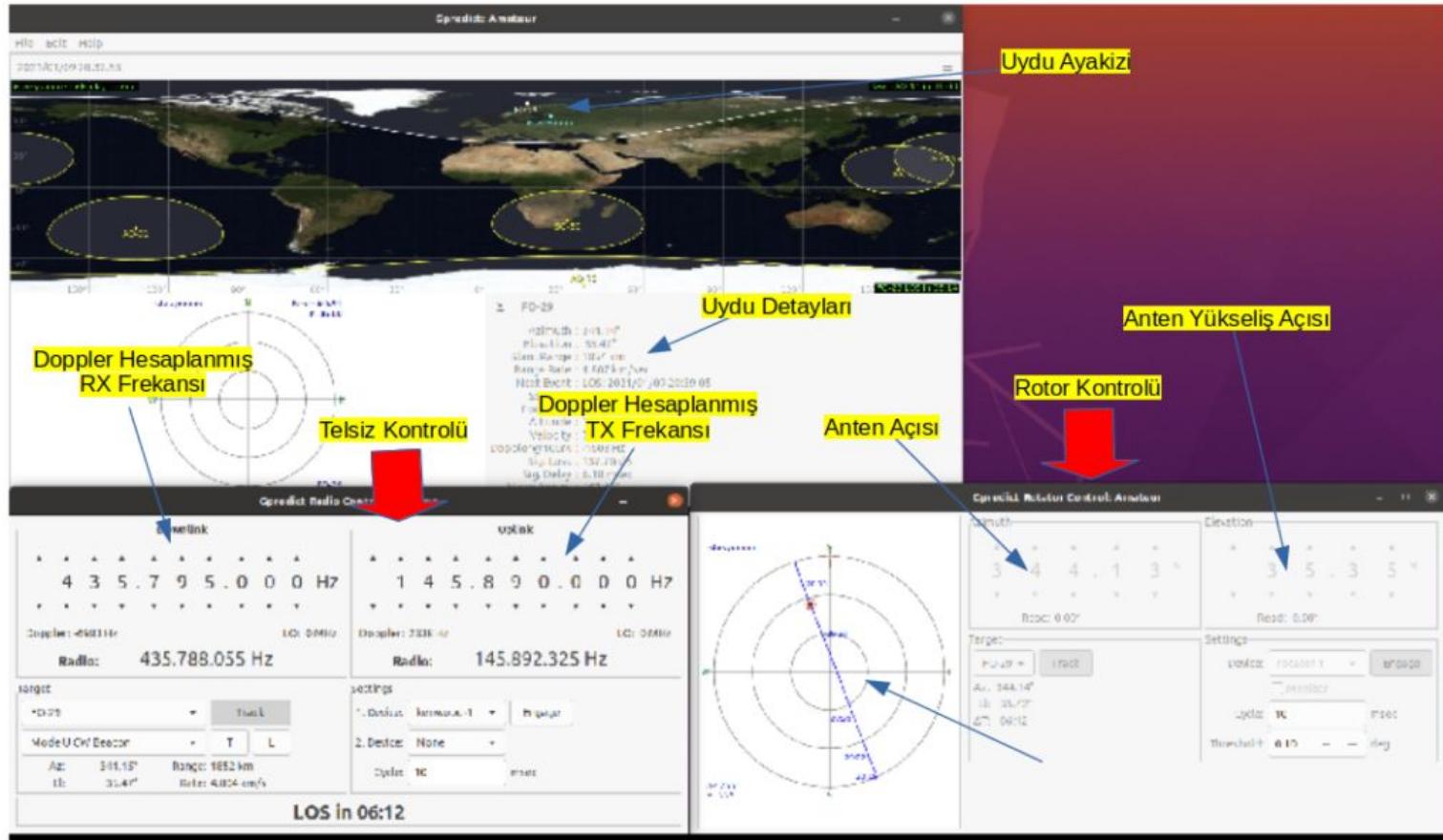
- Ham Radio Deluxe (HRD) (Windows)
- Gpredict (Windows, Mac, Linux)
- Nova (Windows)
- SatPC32 (Windows)
- Orbitron (Windows)



# Genel Bilgi - Yer Kontrol İstasyonu - GPredict



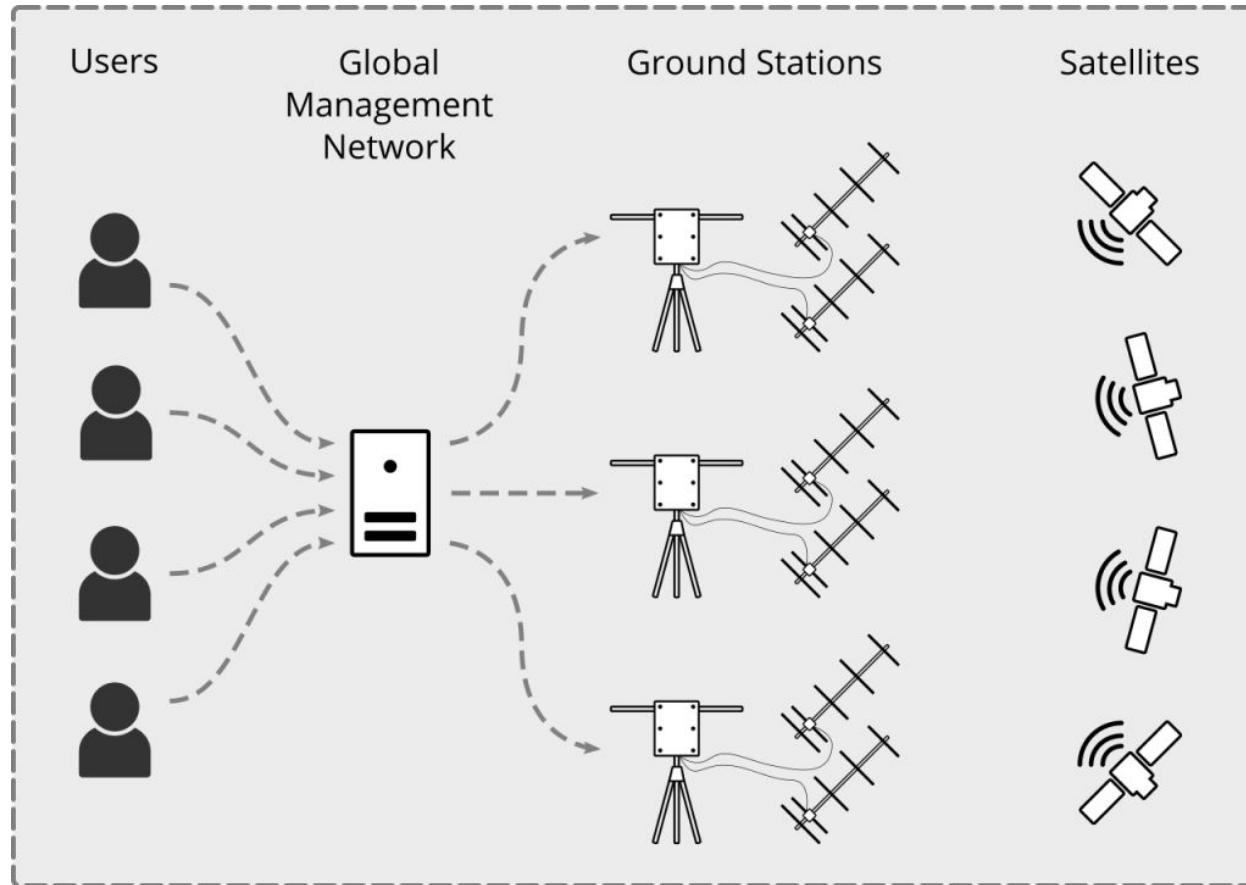
# Genel Bilgi - Yer Kontrol İstasyonu - GPredict



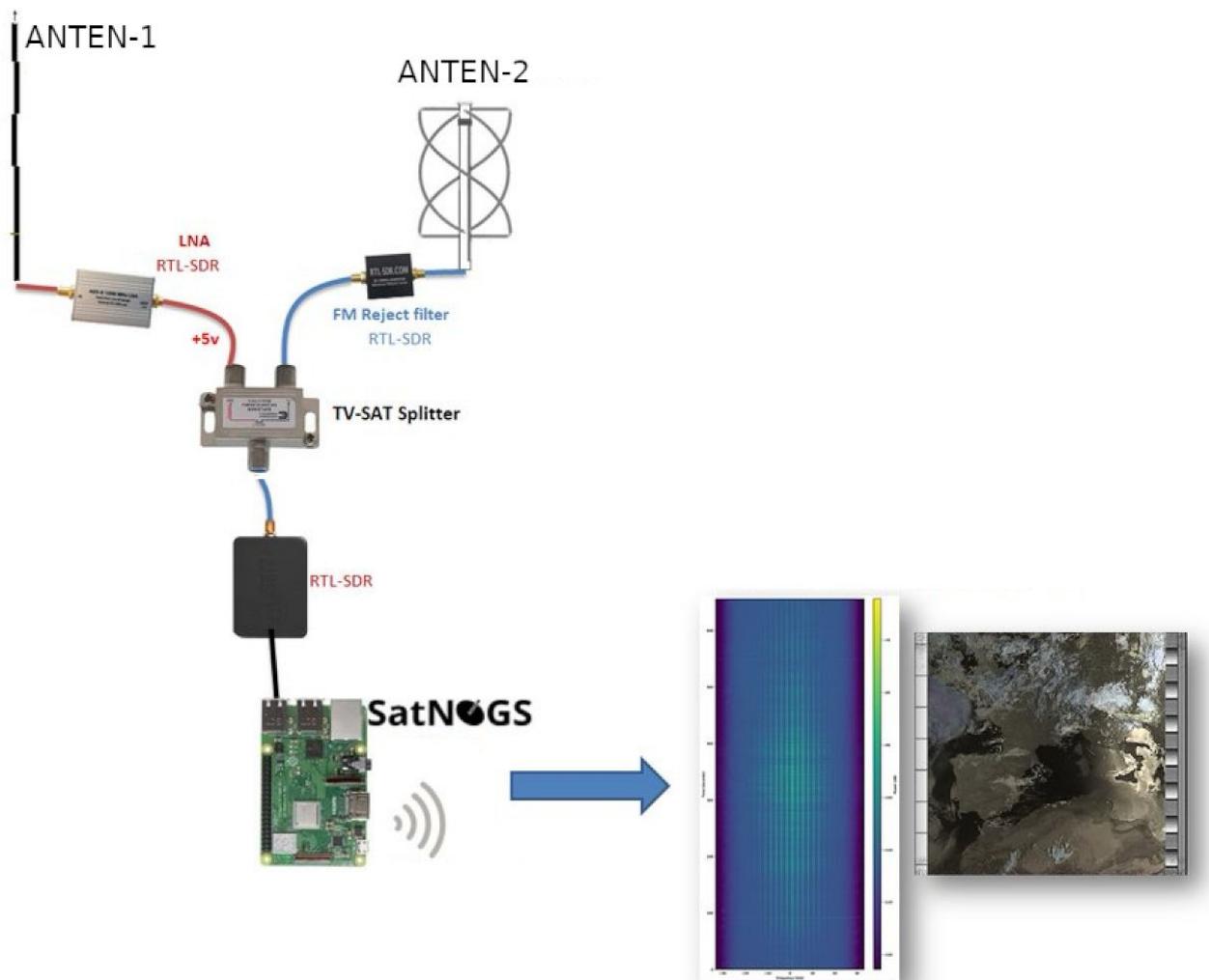
# Genel Bilgi - Yer Kontrol İstasyonu - Antenler



# Satnogs Nedir ?



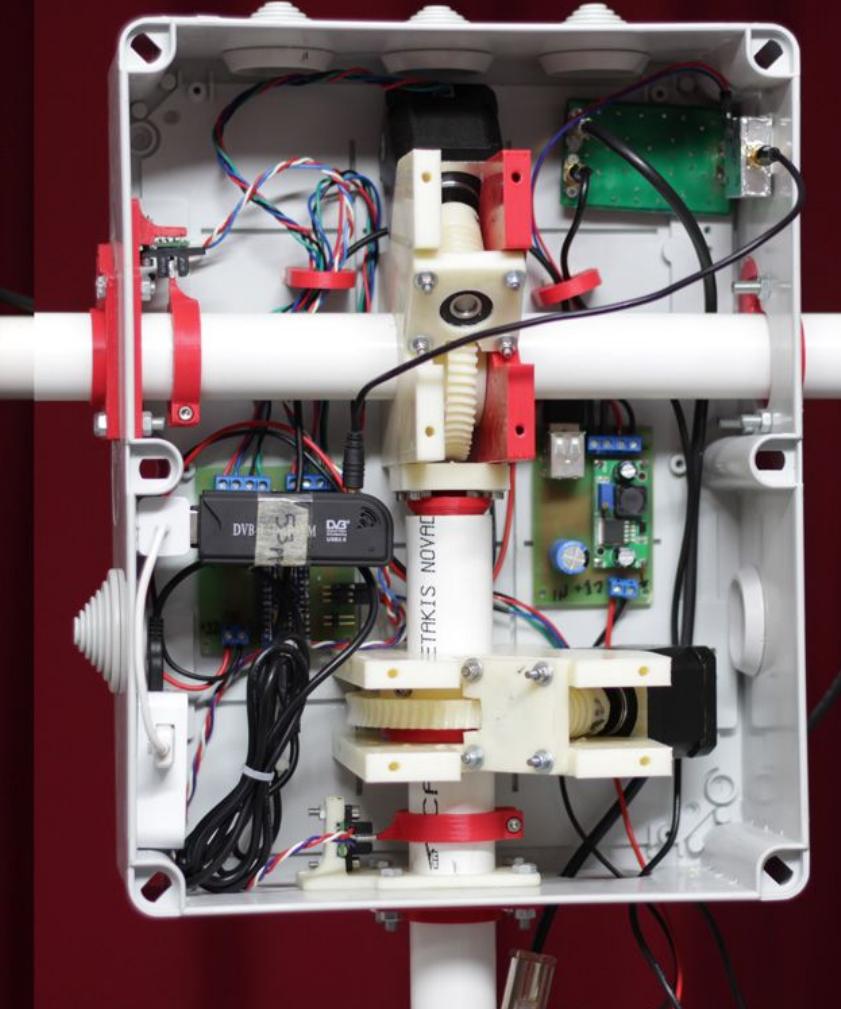
# SATNOGS-İSTASYON



# SATNOGS-OMNI ANTEN



SATNOGS-ROTOR



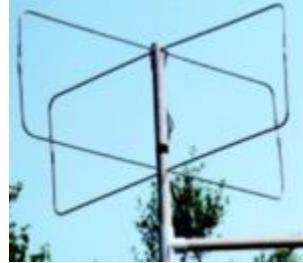
# SATNOGS-YÖNLÜ ANTEN



## SATNOGS-ALICI ve BİLGİSAYAR (rPi)



# SATNOGS-ÖRNEK KURULUMLAR



# SATNOGS-KURULUM

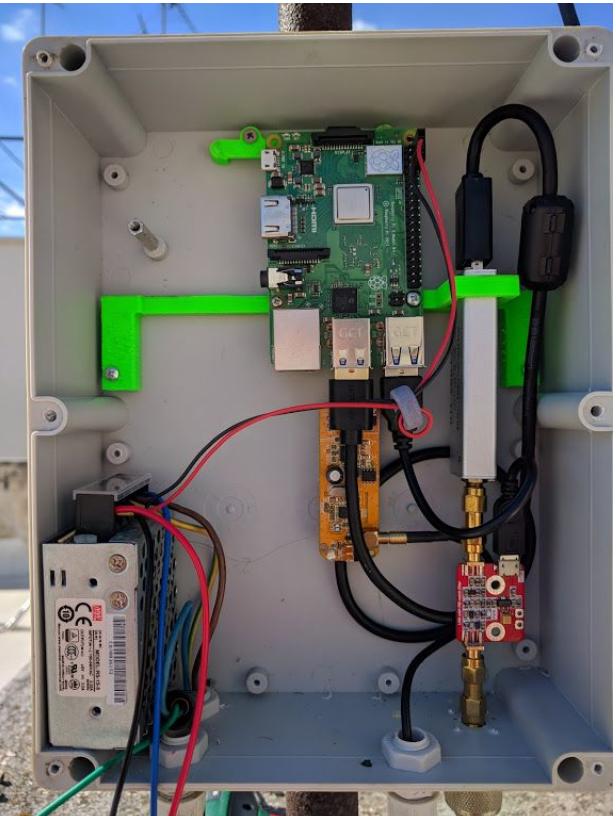
Baris Dinc

Settings Email Avatar API Key

## Ground Stations

ID	Name	Location	Total	Future	Antennas
2066	OH2UDS-MarsOnEarthProject	KP20Id @25m	618	6	Yagi (UHF)

+ Add Ground Station



## Edit: 2066 - OH2UDS-MarsOnEarthProject

General Info

Name: OH2UDS-MarsOnEarthProject  
Description: Mars On Earth Project (<http://www.marsonearthproject.org>) observation station in Espoo/Finland.  
Receiver:

Location

Latitude: 60.1626978 Longitude: 24.6879769 Altitude (ASL): 25  
QTH Locator: KP20Id

Image

Back to Station Save Changes

## satnogs-setup

<a href="#">Basic</a>	<b>Basic configuration options</b>
<a href="#">Advanced</a>	Advanced configuration options
<a href="#">Show</a>	Show configuration file
<a href="#">Update</a>	Update configuration tool
<a href="#">Reset</a>	Reset configuration
<a href="#">Reboot</a>	Reboot system
<a href="#">About</a>	Information about satnogs-config

<b>SATNOGS_API_TOKEN</b>	*Define API token [a25db1eab297da392f2aff5431e4]
<b>SATNOGS_SOAPY_RX_DEVIC</b>	*Define Soapy RX device [driver=rtlsdr]
<b>SATNOGS_ANTENNA</b>	*Define SatNOGS Radio Antenna [RX]
<b>SATNOGS_RX_SAMP_RATE</b>	*Define RX sampling rate [2.048e6]
<b>SATNOGS_STATION_ELEV</b>	*Define station elevation [25]
<b>SATNOGS_STATION_ID</b>	*Define station ID [2066]
<b>SATNOGS_STATION_LAT</b>	*Define station latitude [60.1626978]
<b>SATNOGS_STATION_LON</b>	*Define station longitude [24.6879769]

## Network

[Radio](#)  
[Rotator](#)  
[Waterfall](#)  
[Artifacts](#)  
[Scripts](#)  
[Paths](#)  
[Hamlib](#)  
[SNMP](#)  
[GPS](#)  
[Software](#)  
[Debug](#)  
[v\(+\)](#)

## Network settings

Radio settings  
Rotator settings  
Waterfall settings  
Artifacts settings  
Pre/post-observation scripts  
Path settings  
Hamlib settings  
SNMP settings  
GPS settings  
Software package settings  
Debug settings

92%

<https://community.libre.space/t/raspbian-satnogs-client-images-available/1291>



Baris Dinc

[Settings](#)[Email](#)[Avatar](#)[API Key](#)

## Ground Stations

ID	Name	Location	Total	Future	Antennas
2066	OH2UDS-MarsOnEarthProject	KP20Id @25m	618	6	Yagi (UHF)

[+ Add Ground Station](#)

## Observations

ID	Satellite	Frequency	Mode	Timeframe	Station
3988674	ASELSAT	436.950 MHz	CW	2021-04-23 20:02:54 2021-04-23 20:12:35	539 - OZ3RF
3988681	ASELSAT	436.950 MHz	CW	2021-04-23 19:59:46 2021-04-23 20:11:53	1698 - DD1US/2 VHF/UHF/L-Omni
3988666	ASELSAT	436.950 MHz	CW	2021-04-23 15:38:08 2021-04-23 15:50:06	28 - NB3T - UHF
3988665	ASELSAT	436.950 MHz	CW	2021-04-23 14:04:40 2021-04-23 14:14:37	28 - NB3T - UHF
3988669	ASELSAT	436.950 MHz	CW	2021-04-23 14:03:19 2021-04-23 14:14:29	223 - W2MMD GCARC Clubhouse
3988680	ASELSAT	436.950 MHz	CW	2021-04-23 10:49:00 2021-04-23 10:59:22	1698 - DD1US/2 VHF/UHF/L-Omni
3988679	ASELSAT	436.950 MHz	CW	2021-04-23 09:14:13 2021-04-23 09:26:29	1698 - DD1US/2 VHF/UHF/L-Omni
3988673	ASELSAT	436.950 MHz	CW	2021-04-23 09:13:31 2021-04-23 09:23:08	539 - OZ3RF
3988668	ASELSAT	436.950 MHz	CW	2021-04-23 02:29:13 2021-04-23 02:41:13	223 - W2MMD GCARC Clubhouse
3988664	ASELSAT	436.950 MHz	CW	2021-04-23 02:28:41 2021-04-23 02:40:51	28 - NB3T - UHF

[+ New Observation](#)

# SATNOGS - İZLEMELERİ İNCELEME



## Observations

« 1 2 3 4 ... 196526 »



+ New Observation

ID	Satellite	Frequency	Mode	Timeframe	Results	Observer	Station
4001782	NO-84	145.825 MHz	AFSK 1200	2021-04-26 08:41:23 2021-04-26 08:45:07		Steven McGuire	1145 - VK4SMC
4001981	ISS	145.825 MHz	AFSK 1200	2021-04-26 08:38:10 2021-04-26 08:45:32		SMOIKR George	2099 - Aarsta
4001642	ACRUX-1	437.425 MHz	GFSK 9600	2021-04-26 07:58:53 2021-04-26 08:10:17		cmorgan	1175 - UHF Chelsea
4001784	ASELSAT	436.950 MHz	CW	2021-04-26 07:27:01 2021-04-26 07:34:44		Mehmet Fatih Ertürk	1089 - ZR6AIC Ground Station
4001781	NO-84	145.825 MHz	AFSK 1200	2021-04-26 07:06:21 2021-04-26 07:09:47		Steven McGuire	1145 - VK4SMC
4001980	ISS	145.825 MHz	AFSK 1200	2021-04-26 07:01:33 2021-04-26 07:10:11		SMOIKR George	2099 - Aarsta
4001559	ACRUX-1	437.425 MHz	GFSK 9600	2021-04-26 06:21:19 2021-04-26 06:32:26		cmorgan	1175 - UHF Chelsea
4001773	Nanoconnect-2	450.000 MHz	FSK 9600	2021-04-26 05:47:40 2021-04-26 05:55:02		israfel	1711 - VA7DLT-aSat1
4001778	Nanoconnect-2	450.000 MHz	FSK 9600	2021-04-26 05:37:25 2021-04-26 05:47:35		israfel	2056 - LINX-ICN-UNAM
4001979	ISS	145.825 MHz	AFSK 1200	2021-04-26 05:25:28 2021-04-26 05:34:00		SMOIKR George	2099 - Aarsta
4001368	LILACSAT 2	437.200 MHz	FM	2021-04-26 05:18:53 2021-04-26 05:31:03		Pino Pannielo	446 - ik1jns
4001785	ASELSAT	436.950 MHz	CW	2021-04-26 05:07:15 2021-04-26 05:15:17		Mehmet Fatih Ertürk	1129 - W6MSU
4001344	SAUDISAT 1C	436.795 MHz	FM 0	2021-04-26 05:00:21 2021-04-26 05:14:09		Pino Pannielo	446 - ik1jns

SatNOGS							
Status	Satellite	Observer	Station	Start Time	End Time	Rated Artifacts	Update Filter
Observations							
Nothing selected	All	All	All	2021-04-24 10:32:11	2021-04-24 10:37:00	Auto Scheduler	1031 - Romeo-Golf-VHF
4001782	FOX-1B	145.960 MHz	DUV 200	2021-04-24 10:34:07	2021-04-24 10:37:54	cmorgan	1400 - F4GPM
4001781	FOX-1B	145.960 MHz	DUV 200	2021-04-24 10:33:29	2021-04-24 10:37:18	SMOIKR George	1927 - DragonLab-SatNOGS
4001642	AISTECHSAT-3	436.730 MHz	FSK AX.100 Mode 5 9600	2021-04-24 10:31:28	2021-04-24 10:37:08	cmorgan	1558 - PEI MET QFH VHF
4001559	JY1Sat	145.840 MHz	BPSK 1200	2021-04-24 10:31:14	2021-04-24 10:38:05	cmorgan	282 - Doini Vlkyst1
4001773	InnoSat-2	435.500 MHz	MSK AX.100 Mode 5 4800	2021-04-24 10:30:59	2021-04-24 10:35:38	israfel	EU1AEM
4001778	LVSQ-SAT	437.020 MHz	BPSK 9600	2021-04-24 10:30:51	2021-04-24 10:38:07	israfel	1183 - gd0gv
4001778	AISTECHSAT-3	436.730 MHz	FSK AX.100 Mode 5 9600	2021-04-24 10:30:31	2021-04-24 10:37:35	israfel	2012 - SP7THR-UHF
4001778	InnoSat-2	435.500 MHz	MSK AX.100 Mode 5 4800	2021-04-24 10:30:22	2021-04-24 10:38:03	israfel	365 - DS-1 (VHF)
4001778	JY1Sat	145.840 MHz	BPSK 1200	2021-04-24 10:28:06	2021-04-24 10:34:59	israfel	EU1AEM
4001778	GRUFEK	437.485 MHz	FSK 9600	2021-04-24 10:26:26	2021-04-24 10:36:42	israfel	1793 - SV1QZZ VHF #1
4001778	FOX-1B	145.960 MHz	DUV 200	2021-04-24 10:26:07	2021-04-24 10:31:03	israfel	21 - Avia
4001778	Taurus-1	435.840 MHz	BPSK 9600	2021-04-24 10:26:07	2021-04-24 10:31:03	israfel	

## Observation #4001486

⌚ Timeframes are in UTC

Satellite

44103 - AISTECHSAT-3

Station

1927 - DragonLab-SatNOGS

Observer

Auto Scheduler

Status

Good

Transmitter

GFSK9k6

Frequency

436.730 MHz

Mode

FSK AX.100 Mode 5 9600

Timeframe

2021-04-24 10:32:11

2021-04-24 10:37:00

Rise

9.0°

Max

75.0°

Set

203.0°

Client Version

1.4

Metadata

{ 5 items }

Polar Plot

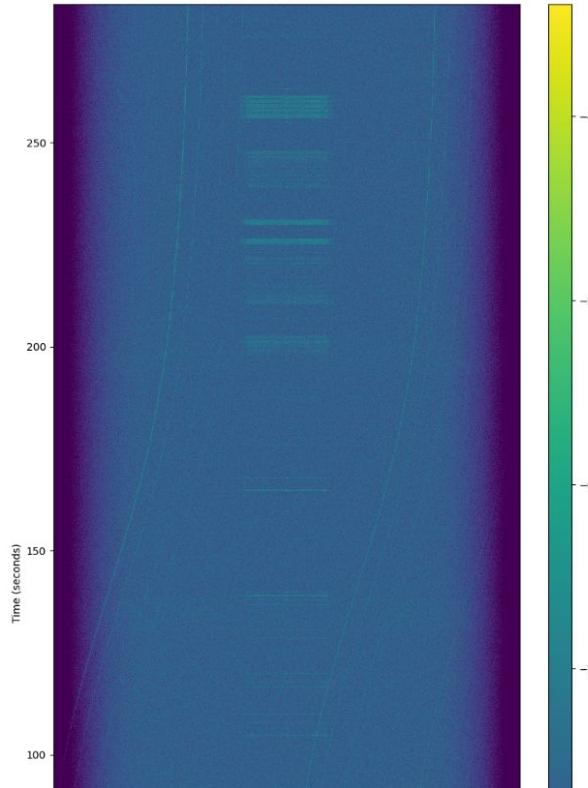


Downloads

Audio Waterfall

Waterfall Audio Data 4

signal in wr Unknown ⓘ ✓ ✘



## Observation #4001486

⌚ Timeframes are in UTC

[Satellite](#)

44103 - AISTECHSAT-3

[Station](#)

1927 - DragonLab-SatNOGS

[Observer](#)

Auto Scheduler

[Status](#)

Good

[Transmitter](#)

GFSK9k6

[Frequency](#)

436.730 MHz

[Mode](#)

FSK AX.100 Mode 5 9600

[Timeframe](#)

2021-04-24 10:32:11

2021-04-24 10:37:00

[Rise](#)

9.0°

[Max](#)

75.0°

[Set](#)

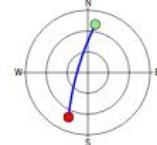
203.0°

[Client Version](#)

1.4

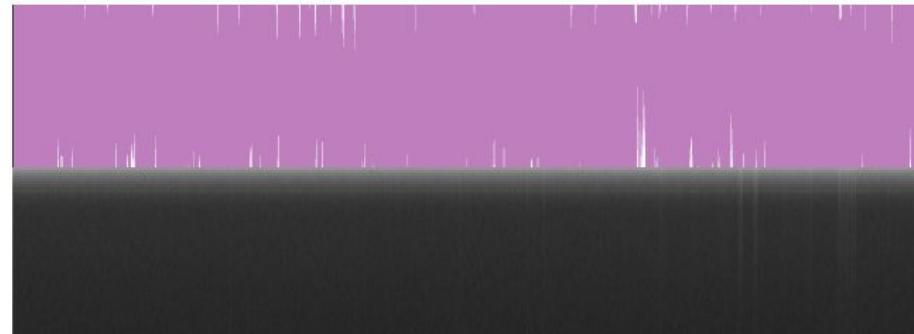
[Metadata](#)

▶ { 5 items }

[Polar Plot](#)[downloads](#)

① Audio

② Waterfall

[Waterfall](#)[Audio](#)[Data](#) 4

▶ || 0:00 / 0 s



## Observation #4001486

⌚ Timeframes are in UTC

Satellite

44103 - AISTECHSAT-3

Station

1927 - DragonLab-SatNOGS

Observer

Auto Scheduler

Status

Good

Transmitter

GFSK9k6

Frequency

436.730 MHz

Mode

FSK AX.100 Mode 5 9600

Timeframe

2021-04-24 10:32:11

2021-04-24 10:37:00

Rise

9.0°

Max

75.0°

Set

203.0°

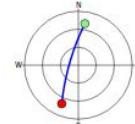
Client Version

1.4

Metadata

{ 5 items }

Polar Plot



Downloads

① Audio

② Waterfall

Waterfall

Audio

Data 4



Discuss

ASCII HEX

data\_obs/4001486/data\_4001486\_2021-04-24T10-36-02

```
83 D7 80 01 01 33 01 00 01 2E 1E 60 83 F4 91 00 04 40 50 00 00 07 06 07 06 00 00 00  
06 07 06 07 06 40 B2 EF BD BE B0 00 00 41 38 00 00 41 00 00 00 41 C0 40 00 40 A6 00  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

data\_obs/4001486/data\_4001486\_2021-04-24T10-36-03

```
83 D7 80 01 01 40 01 00 01 2E 1E 60 83 F4 91 00 04 00 00 00 00 00 00 00 00 00 00 00 00  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

data\_obs/4001486/data\_4001486\_2021-04-24T10-36-07

```
43 4B 89 03 04 FE 4C A4 BE
```

data\_obs/4001486/data\_4001486\_2021-04-24T10-36-47

```
43 4B 89 03 04 FE 84 A4 BE
```

TLE used fetched from Space-Track.org 4 hours ago

```
1 44103U 19018AB 21114.15967797 .00002020 00000-0 86331-4 0 9990  
2 44103 97.3643 176.6126 0013505 167.6412 217.3159 15.23926439114745
```



## Observation #4001486

🕒 Timeframes are in UTC

6

[Discuss](#)

Satellite	44103 - AISTECHSAT-3
Station	1927 - DragonLab-SatNO
Observer	Auto Scheduler
Status	<span style="background-color: #80E6AA; border: 1px solid black; padding: 2px;">Good</span>
Transmitter	GFSK9k6
Frequency	436.730 MHz
Mode	FSK AX.100 Mode 5 9600
Timeframe	2021-04-24 10:32:11 2021-04-24 10:37:00
Rise	<span style="color: green;">●</span> 9.0°
Max	75.0°
Set	<span style="color: red;">●</span> 203.0°
Client Version	1.4
Metadata	<span style="border: 1px solid black; padding: 2px;">▶ { 5 items }</span>
Polar Plot	
Downloads	<span style="border: 1px solid black; padding: 2px;">① Audio</span> <span style="border: 1px solid black; padding: 2px;">② Waterfall</span>

Waterfall      Audio      Data 4

## Waterfall

Data 4

ASCII HEX

data\_obs/4001486/data\_4001486\_2021-04-24T10-36-02

)x(<<3<<.4`)>@P@Q@Q@Q@Q@Q@?i<sup>1</sup><sub>2</sub><sup>3</sup>°A8AAÀ@@;

data\_obs/4001486/data\_4001486\_2021-04-24T10-36-03

30/06/2014

data\_obs/4001486/data\_4001486\_2021-04-24T10-36-07

CK ▶▶ bL

data\_obs/4001486/data\_4001486\_2021-04-24T10-36-47

CK-12

**TLE used** fetched from Space-Track.org 4 hours ago

```

1 44103U 19018AB 21114.15967797 .00002020 00000-0 86331-4 0 9990
2 44103 97.3643 176.6126 0013505 167.6412 217.3159 15.23926439114745

```

## New Observation

⌚ Timeframes are in UTC

**Satellite****Start Time**

2021-04-24 10:47

**Transmitter****End Time**

2021-04-24 10:57

**Stations**

965 - TRANSIT 5B-5

1002 - LES-1

1291 - SOLRAD-7B

1315 - SECOR 4

1804 - ALOUETTE-2

2389 - OV3-3

2412 - ERS-15

2768 - ERS 20 (OV5-3)

3669 - ISIS-1

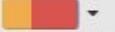
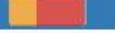
4237 - OPS 7613 (P/L 4)

4256 - OPS 7613 (P/L 1)

**Calculate**

# New Observation

⌚ Timeframes are in [UTC](#)

<b>Satellite</b>	<input type="text" value="47441 - ASELSAT"/>	<b>Start Time</b>	<input type="text" value="2021-04-24 10:47"/> 
<b>Transmitter</b>	<input type="text" value="Mode U - CW - 436.950 MHz - CW"/> 	<b>End Time</b>	<input type="text" value="2021-04-24 10:57"/> 
<b>Stations</b>	<input type="text" value="Mode U - CW - 436.950 MHz - CW"/>  <input type="text" value="Data Telemetry - 436.950 MHz - GMSK"/> 		

 [Show Advanced Options](#)

**Calculate**

# New Observation



⌚ Timeframes are in UTC

Satellite

47441 - ASELSAT



Start Time

2021-04-24 10:47



Transmitter

Mode U - CW - 436.950 MHz - CW



End Time

2021-04-24 10:57



Stations

Selected 169 of 169 stations



▼ Show Advanced Options

		Select All
		Deselect All
1536	KF5IDY RTL-SDR Egg 70cm	✓
1025	Canberra, Australia VK1MIC	✓
2	KB9JHU	✓
1282	DJOMDO	✓
1539	N9CQQ-EN52-Muskego, WI	✓
1795	DL8LAQ	✓
2051	WesternMA USA QFH	✓

Calculate

⌚ 2014-2021 Libre Space Foundation  
Observation data are provided by volunteers

[SatNOGS](#) | [Back to top](#)  
Version: 1.74+0.g20c61d2.dirty

## New Observation

(○ Timeframes are in UTC

Satellite

Transmitter

Stations

Start Time

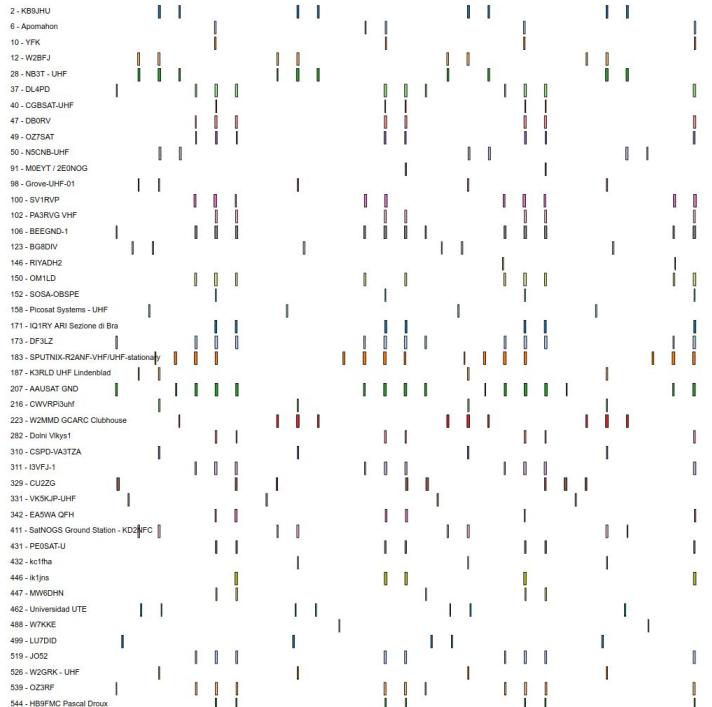
End Time

▼ Show Advanced Options

Calculate

## Calculated Timeline

All None



## Observations



+ New Observation

Status	Satellite	Observer	Station
	All	Baris Dinc	All
Results	Start Time	End Time	Rated Artifacts
Nothing selected	<input type="text"/>	<input type="text"/>	Non Rated
<button>Update filters</button>			

ID	Satellite	Frequency	Mode	Timeframe		Results	Observer	Station
3988681	ASELSAT	436.950 MHz	CW	2021-04-23	19:59:46		Baris Dinc	1698 - DD1US/2 VHF/UHF/L-Omni
				2021-04-23	20:11:53			
3988666	ASELSAT	436.950 MHz	CW	2021-04-23	15:38:08		Baris Dinc	28 - NB3T - UHF
				2021-04-23	15:50:06			
3966061	ASELSAT	436.950 MHz	CW	2021-04-18	14:21:44		Baris Dinc	1271 - YC1SCC
				2021-04-18	14:32:07			

Query returned 3 observations. Open all in tabs

## Observation #3988681

⌚ Timeframes are in UTC

[Satellite](#)

47441 - ASELSAT

[Station](#)1698 - DD1US/2 VHF/UHF/L-Omni  
Baris Dinc[Observer](#)[Unknown](#)[Status](#)

Mode U - CW

[Transmitter](#)

436.950 MHz

[Frequency](#)

CW

[Mode](#)2021-04-23 19:59:46  
2021-04-23 20:11:53[Timeframe](#)

155.0°

[Rise](#)

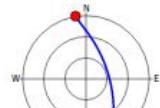
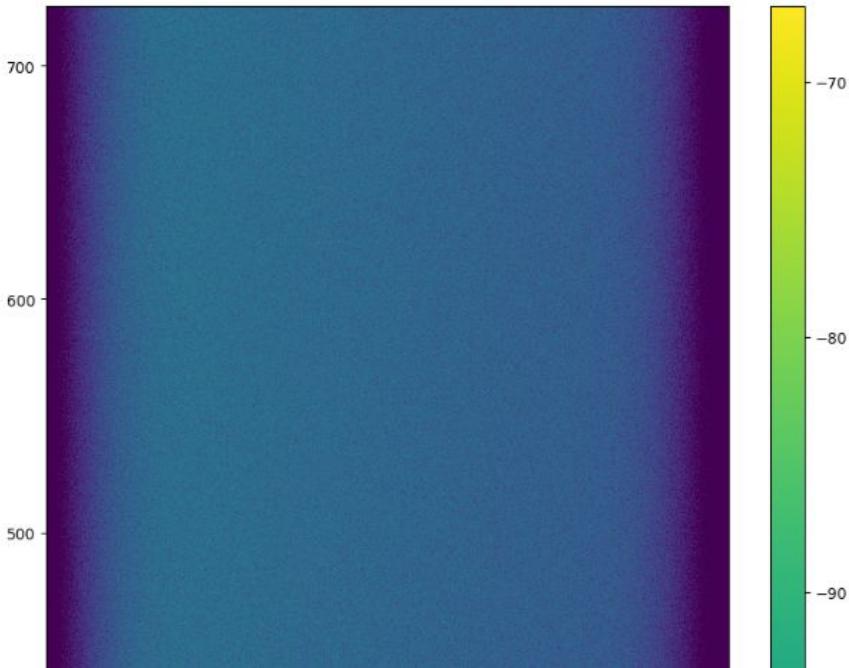
58.0°

[Max](#)

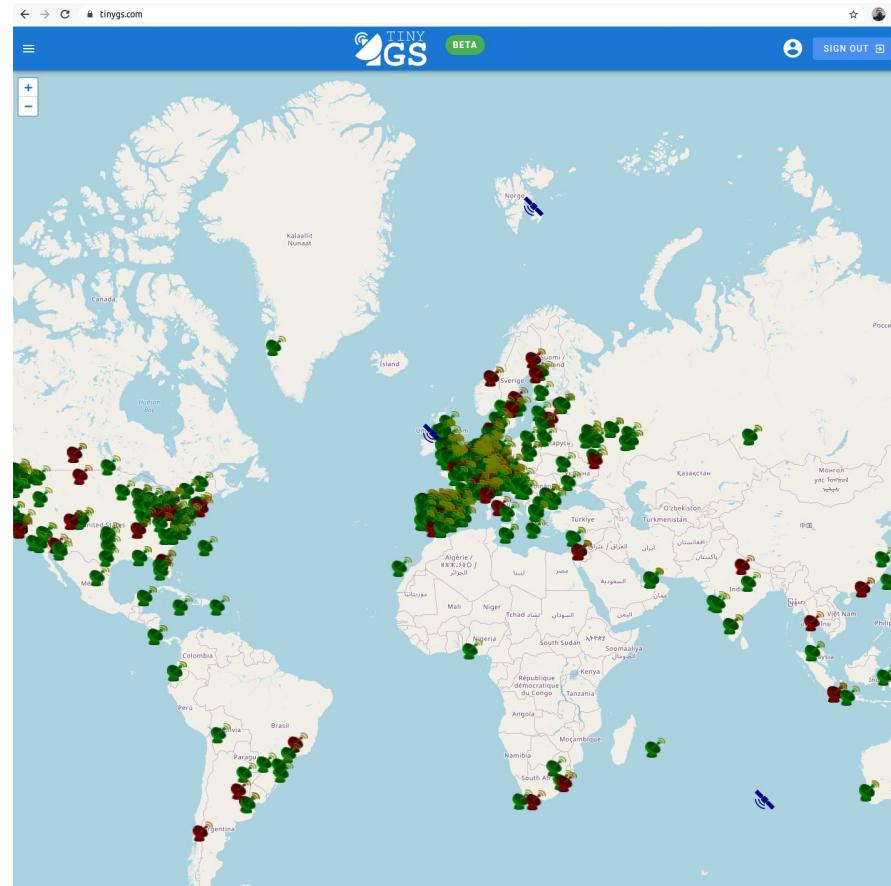
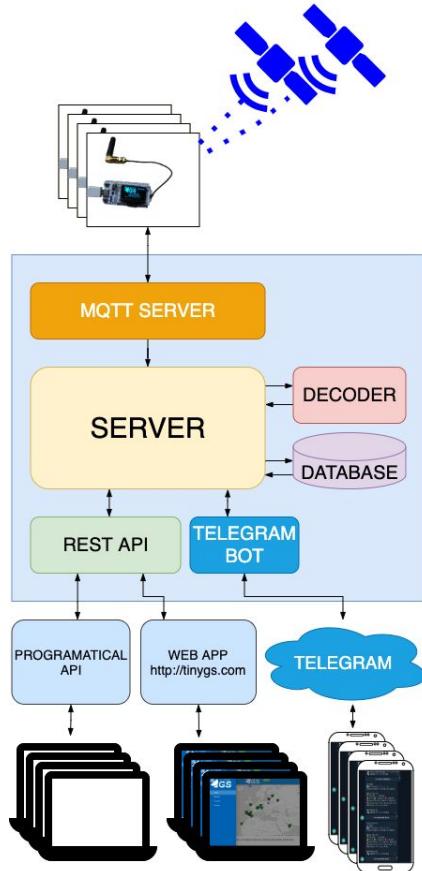
351.0°

[Set](#)

1.3.4

[Client Version](#)[Metadata](#) { 5 items }[Polar Plot](#)[Downloads](#)[Audio](#) [Waterfall](#)[Waterfall](#) [Audio](#) [Data](#)  
[signal in WF](#) [Unknown](#)   [Discuss](#)

# TinyGS Nedir ?





BETA



SIGN OUT

Home  
Stations  
Satellites  
Packets

Station Name	Listening	Version	Last seen	Auto tuning	Test mode	Telemetry packets	Confirmed packets
PA3ARK	Norbi	2103210	a minute ago	✓	OFF	1158	1513
OK5TVR	Norbi	2103201	a minute ago	✓	ON	844	898
YL3CT_Imantas	Norbi	21021701	a minute ago	✓	OFF	742	3321
PA1SDB	Norbi	2103201	a minute ago	✓	OFF	634	772
F4EWI	Norbi	2103201	a minute ago	✓	OFF	633	633
DB7FS_3	Norbi	2104211	a few seconds ago	✓	OFF	557	672
DG2GG	Norbi	2104211	a few seconds ago	✓	OFF	554	554
F4FAA	FEES	2103201	a minute ago	✓	OFF	536	536
R1LB_WS	Norbi	21021701	3 hours ago	✓	OFF	516	1687
F1IZL	Norbi	2104210	a few seconds ago	⌚	OFF	482	482
OE3KSS	Norbi	2103201	a minute ago	✓	OFF	447	481
G8HAM_1	Norbi	2104210	a few seconds ago	✓	OFF	440	440
Station Name	Listening	Version	Last seen	Auto tuning	Test mode	Telemetry	Confirmed

## ← BACK F4EWI Console

Listening	Version	Last seen	Auto tuning
Norbi	2103201	a few seconds ago	✓
Test mode	Confirmed packets	Status	
OFF	633	Online	

**Norby**  
Apr 23, 2021 4:00 PM (a day ago)

Mode LoRa@436.703

Received by 34 stations

2W 19°C 5614mW 14410mAh 2399mW

8337mV 3555mW Board PMM: 15°C PAM: 20°C

**Norby**  
Apr 23, 2021 5:19 AM (a day ago)

Mode LoRa@436.703

Received by 31 stations

2W 26°C 0mW 14302mAH -2667mW

8276mV 2048mW Board PMM: 18°C PAM: 18°C

**Norby**  
Apr 22, 2021 4:09 PM (2 days ago)

Mode LoRa@436.703

Received by 80 stations

2W 13°C 12750mW 13725mAH 13190mW

8103mV 2034mW Board PMM: 3°C PAM: 6°C

**Norby**  
Apr 22, 2021 5:16 AM (2 days ago)

Mode LoRa@436.703

Received by 76 stations

2W 12°C 3919mW 13503mAH 1101mW

7992mV 1642mW Board PMM: 2°C PAM: 4°C

**Norby**  
Apr 21, 2021 2:37 PM (3 days ago)

Mode LoRa@436.703

Received by 50 stations

2W 12°C 4865mW 13496mAH 2371mW

8211mV 2282mW Board PMM: 5°C PAM: 8°C

**Norby**  
Apr 21, 2021 2:35 PM (3 days ago)

Mode LoRa@436.703

Received by 38 stations

2W 16°C 4161mW 13480mAH 581mW

8200mV 2364mW Board PMM: 4°C PAM: 7°C

**Norby**  
Apr 21, 2021 2:33 PM (3 days ago)

Mode LoRa@436.703

Received by 54 stations

2W 12°C 5906mW 13461mAH 1163mW

8212mV 2380mW Board PMM: 4°C PAM: 6°C

**Norby**  
Apr 21, 2021 2:31 PM (3 days ago)

Mode LoRa@436.703

Received by 15 stations

2W 14°C 6497mW 13445mAH 779mW

8216mV 2341mW Board PMM: 3°C PAM: 6°C

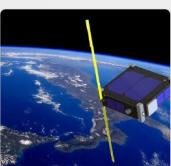
[ALL](#) [LoRa](#) [FSK](#) [GFSK9K6](#)


Norby

Norby, a 6U CubeSat of NGU (Novosibirsk State University), Russia. The device got its name in honor of the unique little robot Norby from the cycle of stories for children of the same name by Isaac Asimov.

[LoRa@436.703](#)

Supported



Flexible Experimental Embedded Satellite

FEES is a 10 cm (10 cm x 10 cm x 3 cm) by the Italian GP Advanced Projects aimed at developing a low cost platform for In Orbit Testing and Validation of Electronics components.

[LoRa@437.2](#)

Supported



Satish Dhawan Satellite

Satish Dhawan SAT is a 3U cubesat built by students at Space Kidz India, an NGO working towards promoting Space Education among Children and Youth. The satellite carries a Radiation counter also a LoRa...

[LoRa@435.5](#)

Supported



VR3X-A Littlefoot

V-R3x is a NASA Ames, Stanford, and Carnegie Mellon mission demonstrating on-orbit topology recovery and distributed radiation measurements. 1U spacecraft built using PyCubed hardware.

[LoRa@915.6](#)

Supported

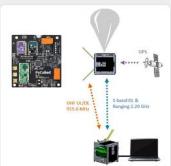


VR3X-B Petrie

V-R3x is a NASA Ames, Stanford, and Carnegie Mellon mission demonstrating low-cost and low-SWaP autonomous high-speed cross-linking, ranging, coordinated radiation measurements, and relative topology recovery utilizing three (3) 1U CubeSats built using PyCubed hardware.

[LoRa@915.6](#)

Supported

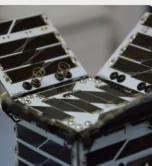


VR3X-C Cera

The V-R3x tech demo will demonstrate low-cost and low-SWaP autonomous high-speed cross-linking, ranging, coordinated radiation measurements, and relative topology recovery utilizing three (3) 1U CubeSats

[LoRa@915.6](#)

Supported

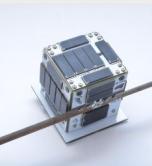


FossaSat-1

Main mission of the satellite is the testing of a new experimental RF chirp modulation called LoRa. Features deployable solar panels and share educational data from space to the masses.

[LoRa@436.7](#)

Inactive



FossaSat-1B

Copy of the FossaSat-1 satellite already licensed and launching in November of 2019, it differs in the use of CW instead of RTTY and new solar panels.

Launch Date: May 18, 2021 11:10 AM

[LoRa@436.7](#)

Future



FossaSat-2

The first is the general development of miniaturized and inexpensive satellite systems for space...



FossaSat-2B

Carrying an innovative new propulsion system. In partnership with Stockholm start-up norktron...



PyCubed-1

Demonstrate smallest-ever spacecraft with full 3-axis attitude determination and control. Design...



SATLLA-2

The satellite's mission is an educational one. The aim is for the students to introduce the students to...

## Norby

The NSU apparatus carries the payload of the Skobeltsyn Research Institute of Nuclear Physics of Moscow State University for monitoring heliogeophysical parameters of near-earth space in the interests of Roshydromet and additional target equipment of the information Satellite Systems Joint-Stock Company a set of promising communication boards of the SpaceWire format.

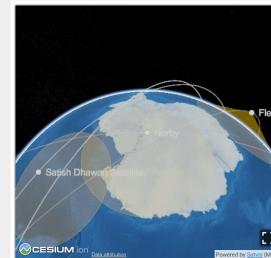
ISS JSC is testing the boards to confirm the possibility of their flight qualification as part of the CubeSat satellites and further integration of the equipment into the federal spacecraft.

MCA "NORBY" was launched within the framework of the program of the state corporation "Roscosmos" "UniverSat". The program allows launching small spacecraft developed by Russian universities and research centers, taking into account the required payloads of the Roscosmos state corporation.

SMKA "NORBY" is assembled on the basis of a [universal modular satellite platform](#) developed at the OAI NSU within the framework of the project of the Federal Target Program of the Ministry of Education and Science of the Russian Federation for 2017–2019. The platform was developed jointly with the university's industrial partner KB "Fifth Generation".

The device got its name in honor of the unique little robot Norby from the cycle of stories for children of the same name by the famous science fiction writer Isaac Asimov. The name of the robot is an anagram of the name of the writer's daughter, Robin.

- Status: Supported
- Launch Date: Sep 28, 2020 3:00 AM



### TLEs

NORBY

1	46494U	20068.3	21113.93521449	.09090441	090000-0	3675E
2	46494A	97.6900	51.8082	0016189	265.3172	94.6200 15.035E

[View TLEs](#) [View EPH](#) [View TLE JSON](#)



### Last telemetry

Norby

Mode	Received by
LoRa@436.703	1 stations
	<a href="#">View Telemetry</a>

Norby

Mode	Received by
LoRa@436.703	2 stations
	<a href="#">View Telemetry</a>

Norby

Mode	Received by
LoRa@436.703	2 stations
	<a href="#">View Telemetry</a>

Norby

Mode	Received by
LoRa@436.703	3 stations
	<a href="#">View Telemetry</a>

Norby

Mode	Received by
LoRa@436.703	23 stations
	<a href="#">View Telemetry</a>

Norby

Mode	Received by
LoRa@436.703	7 stations
	<a href="#">View Telemetry</a>

Norby

Mode	Received by
LoRa@436.703	4 stations
	<a href="#">View Telemetry</a>

Norby

Mode	Received by
LoRa@436.703	5 stations
	<a href="#">View Telemetry</a>

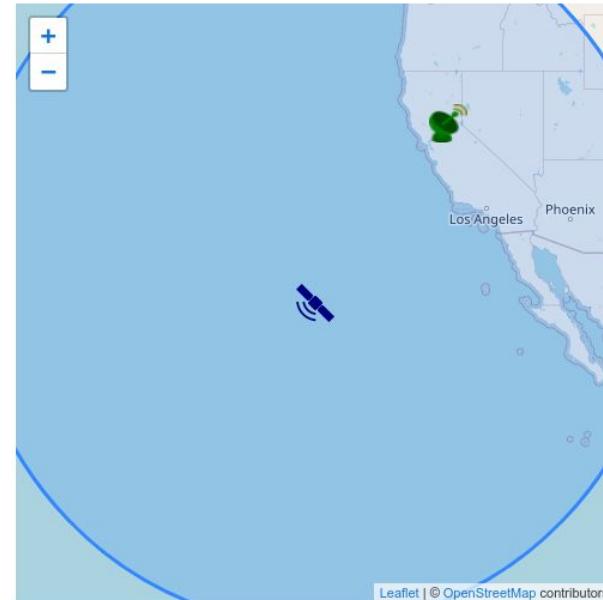
# Norby

Received on: April 24, 2021 1:17 PM  
LoRa 436.703 Mhz SF: 10 CR: 5 BW: 250 kHz

2W 25°C  
8100mV 3685mW  
0mW 12692mAh -4257mW  
Board PMM: 15°C PAM: 15°C PDM: 13°C  
Solar Array X-: 11°C Solar Array X+: -10°C  
BRK Reset: 2028 Frame: 28824

## Hexadecimal view

```
0 1 2 3 4 5 6 7 8 9 A B C D E F 0123
0000 8E FF FF FF FF 0A 06 01 C9 70 91 00 00 00 00 F1 ....
0010 0F 00 00 98 70 CF AC 16 28 42 52 4B 20 4D 57 20 ....
0020 56 45 52 3A 30 32 5F 31 32 00 00 00 00 00 00 0E VER:
0030 00 00 EC 07 00 00 00 02 19 00 08 D3 0A 80 00 91 ....
0040 04 00 00 00 00 00 A2 00 56 00 1B BB 02 01 ....
0050 79 47 53 FB D4 AC 16 28 19 00 04 00 F4 FF FE FF yGS.
0060 00 00 00 00 00 00 13 04 04 8F 8F 8F 8F 8F 00 ....
0070 F6 0B 3F FC 30 20 00 94 31 0E 0C 00 0C 00 00 5F ..?.
0080 EF 00 00 65 0E 0F 0D 00 60 10 A4 1F 60 AE ...e
< >
```



Station Name	Distance	Elevation	Time	RSSI	SNR	Predicted Doppler	Frequency Error	CRC Error
K9JM_tinyGS	1673 Km	12.71°	13:17:58.365	-130.25 dBm	-11.25 dB	8955.53 Hz	8566.866 Hz	

# TinyGS - Donanim

- Heltec WiFi LoRa 32 V1 (433MHz & 863-928MHz versions)
- Heltec WiFi LoRa 32 V2 (433MHz & 863-928MHz versions)
- TTGO LoRa32 V1 (433MHz & 868-915MHz versions)
- TTGO LoRa32 V2 (433MHz & 868-915MHz versions)
- TTGO LoRa32 V2 (Manually swapped SX1267 to SX1278)
- T-BEAM + OLED (433MHz & 868-915MHz versions)
- T-BEAM V1.0 + OLED
- FOSSA 1W Ground Station (433MHz & 868-915MHz versions)
- ESP32 dev board + SX126X with crystal (Custom build, OLED optional)
- ESP32 dev board + SX126X with TCXO (Custom build, OLED optional)
- ESP32 dev board + SX127X (Custom build, OLED optional)



- You can follow the Quick Install guide here: <https://github.com/G4lile0/tinyGS/wiki/Quick-Start>
- You can follow the Platformio Guide here: <https://github.com/G4lile0/tinyGS/wiki/Platformio>
- You can follow the Arduino IDE Guide here: <https://github.com/G4lile0/tinyGS/wiki/Arduino-IDE>

File	Size
tinygs_21021701_GTA.bin	48.2 MB
TinyGS_Uploader_MAC.zip	25.4 MB
TinyGS_Uploader_WINDOWS.exe	29.8 MB

22:48 4G 0,0KB/s ⚡ ⌂ 192.168.4.1/config

TINY GS

System configuration

GroundStation Name (will be seen on the map)  
4m1g0

Password for this dashboard (user is admin)

WiFi SSID

WiFi password

Latitude (will be public)

Longitude (will be public)

TINY GS

BETA

SIGN OUT

## User Console

We are still working on this component :)

We are still working on this component :)

Station Name	Listening	Version	Last seen	Auto tuning	Test mode	Telemetry packets	Confirmed packets
MarsOnEarthProject_OH2UDS	SDSat	2103210	8 days ago	✓	OFF	0	1

TINY GS

BETA

SIGN OUT

## MarsOnEarthProject\_OH2UDS Console

BACK

Listening	Version	Last seen	Auto tuning
SDSat	2103210	8 days ago	✓

Test mode  
OFF

Confirmed packets  
1

Status  
**Offline**

**EDIT**

Message to trans...

**SEND TX!**   **TRANSMIT TEST FRAME**

Make sure you are allowed to transmit by local regulations!

Cesium ion Data attribution

Powered by Satvis (MIT)

Örnek bir SATNOGS istasyonu gezelim (OH2UDS-MOEP)

TEŞEKKÜRLER

TA7W / OH2UDS  
BARIŞ DİNÇ