TinyGS
LoRA Yer Kontrol Istasyonu Kurulumu ve Ayarlari

Baris DINC
TA7W / OH2UDS
Eylul 2021

Icerik

- LoRA nedir ?
- Serbest Uzay Kaybi Hesabi
- dBm - watt cevrimleri
- Nedir bu TinyGS ?
- Malzemeleri nereden temin edebilirim ?
- Kurulum Adimlari
- Ayarlar
- Yonetim Paneli
- Nasil bir yere koymaliyim ? Nasil bir anten kullanmaliyim ?

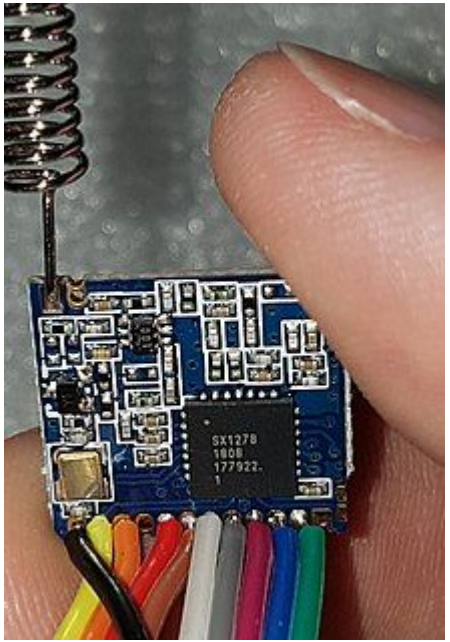
Büyük sözü dinlemek

TA2T : LoRA diye birşey varmış, çok başarılıymış, bunu uyduda kullansak ya...!
TA7W: Olmaz Tahir Bey, LoRA'nın bilgileri kapalıymış, amatör olarak kullanamayız kurallar gereği
TA2T : Gavur yapınca oluyor da biz yapınca mı olmuyor, pöhhhh, nerde yazıyormuş kullanılamaz diye, aç bakayım...

LoRA Nedir ?

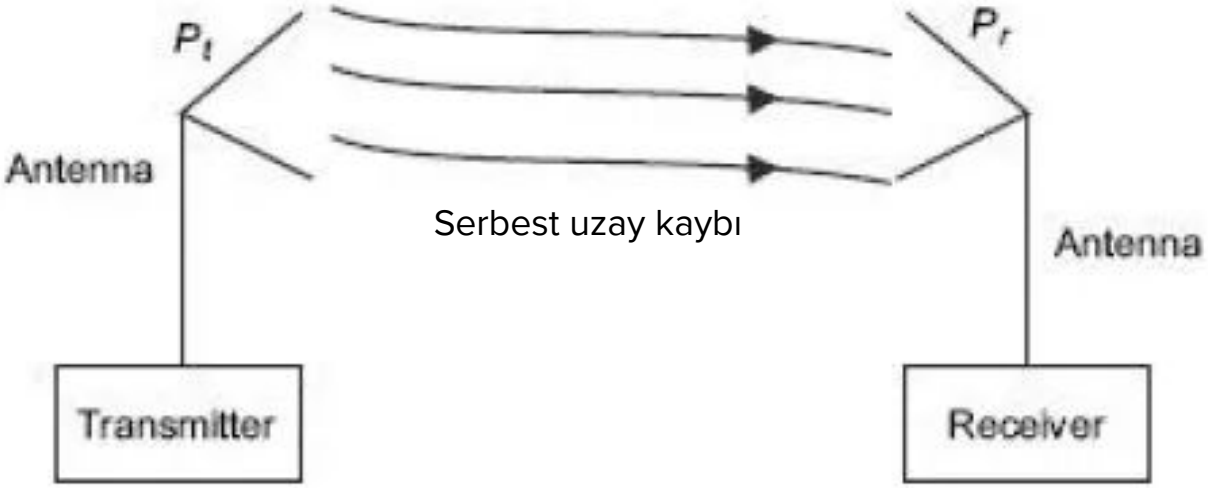
Long **Ra**nge : Uzun Mesafe

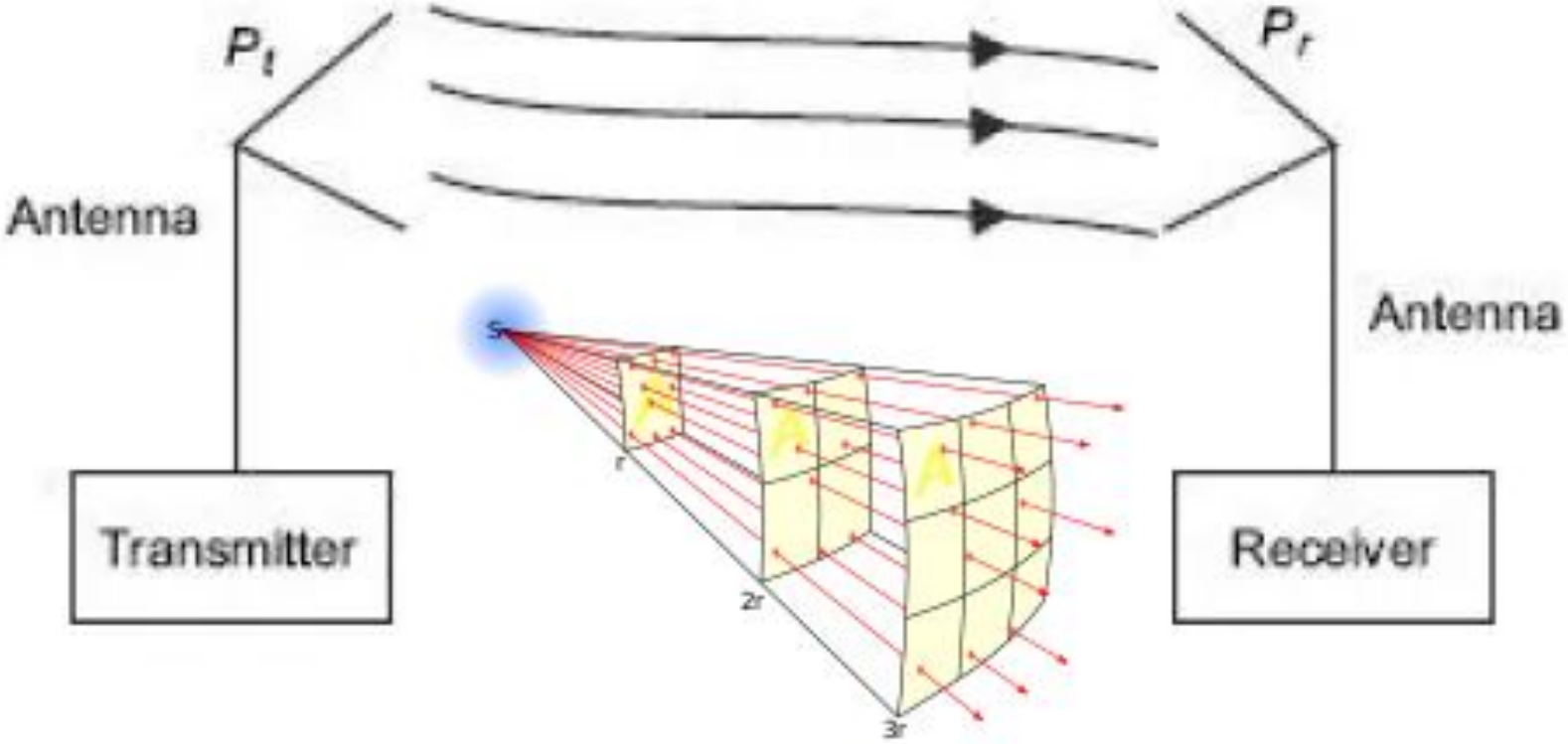
- Yeni bir modülasyon tekniğidir
- **Patentlidir**
- Fransız Grenoble firmasının ürünüdür, Semtech tarafından satın alınmıştr
- Spread Spectrum modülasyonuna benzeyen Chirp Spread Spectrum modülasyonu gibidir
- 433, 868, 915 MHz bandlarında kullanılmaktadır
- 0.3 Kbit/s - 27Kbit/s hızlarında çalışabilmektedir
- Özel bir FEC kullanır
- 5-15 Kilometre mesafeye kolaylıkla ulaşabilir
- 160-170 dB link bütçesi vardır

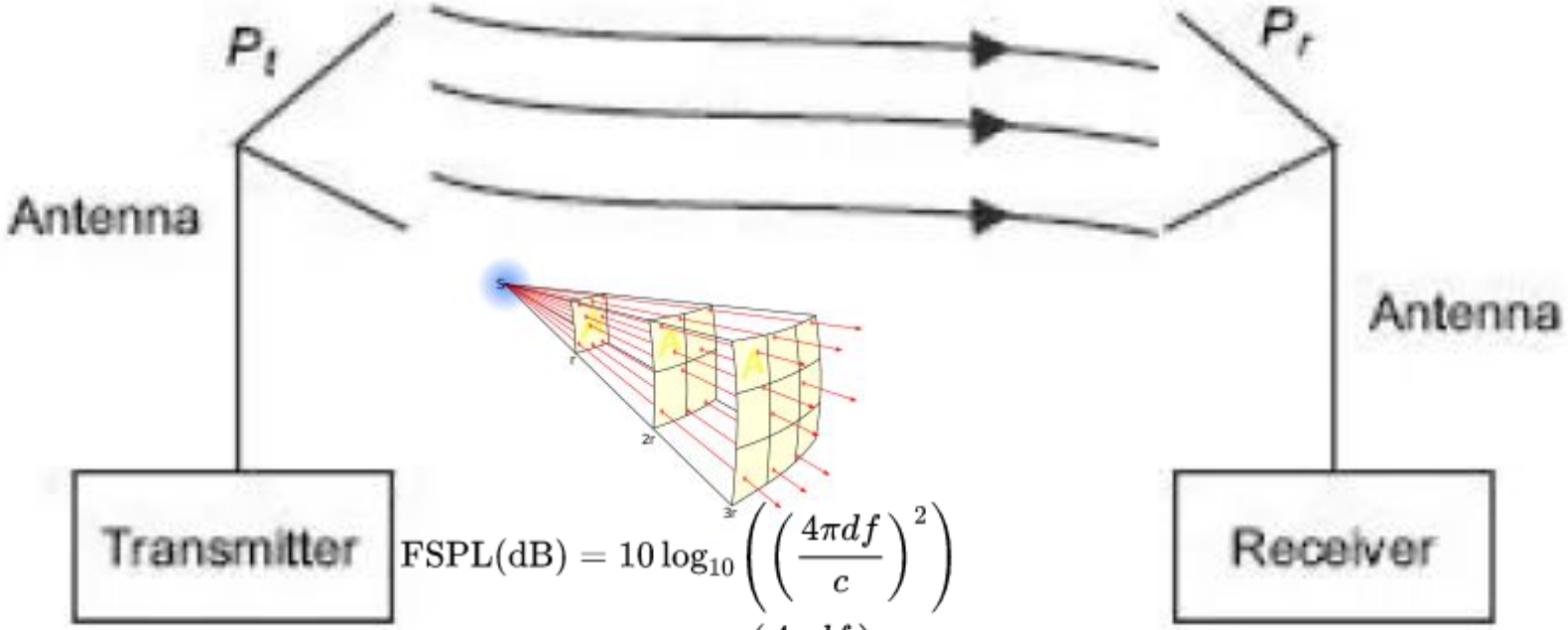


Link Bütçesi Nedir ?

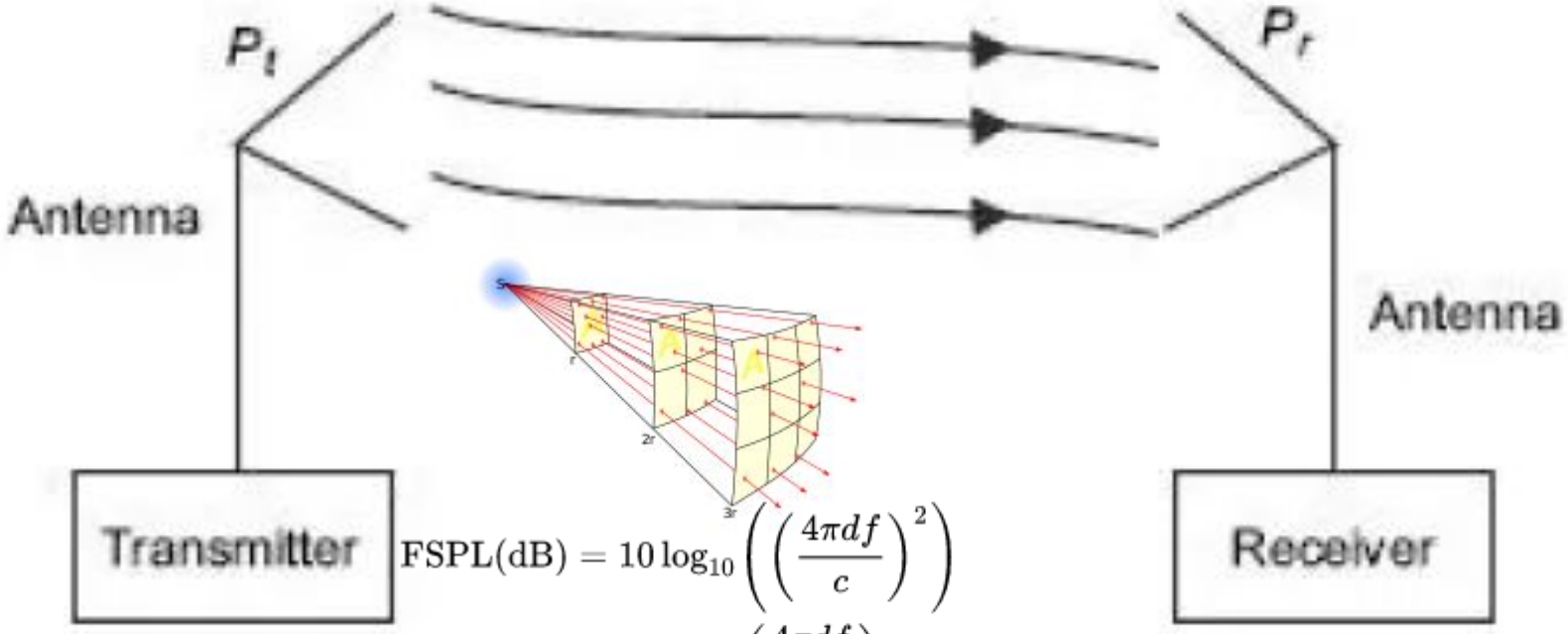
Vericinin alıcı tarafından duyulabildiği etkin mesafe, ya da belirli bir mesafede duyulabilirlik durumu olarak özetleyebiliriz.




P_t
P_r
Antenna
Antenna
Transmitter
Receiver
S
r
2r
3r



$$
\begin{aligned}
\mathrm{FSPL(dB)} &= 10 \log_{10} \left(\left(\frac{4\pi d f}{c} \right)^2 \right) \\
&= 20 \log_{10} \left(\frac{4\pi d f}{c} \right) \\
&= 20 \log_{10}(d) + 20 \log_{10}(f) + 20 \log_{10} \left(\frac{4\pi}{c} \right) \\
&= 20 \log_{10}(d) + 20 \log_{10}(f) - 147.55,
\end{aligned}
$$

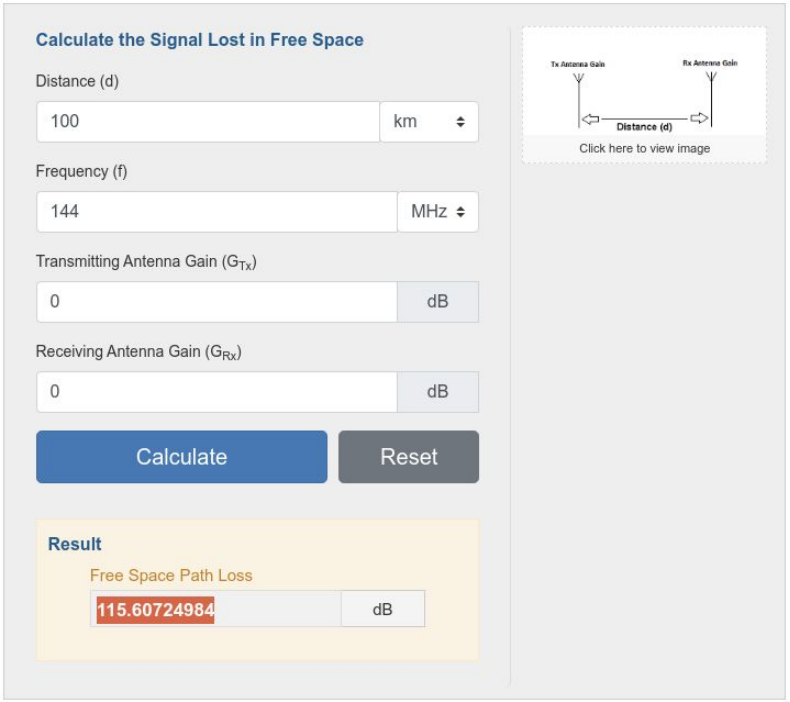


$$\begin{aligned}
\mathrm{FSPL(dB)} &= 10\log_{10}\left(\left(\frac{4\pi df}{c}\right)^2\right) \\
&= 20\log_{10}\left(\frac{4\pi df}{c}\right) \\
&= 20\log_{10}(d) + 20\log_{10}(f) + 20\log_{10}\left(\frac{4\pi}{c}\right) \\
&= 20\log_{10}(d) + 20\log_{10}(f) - 147.55,
\end{aligned}$$

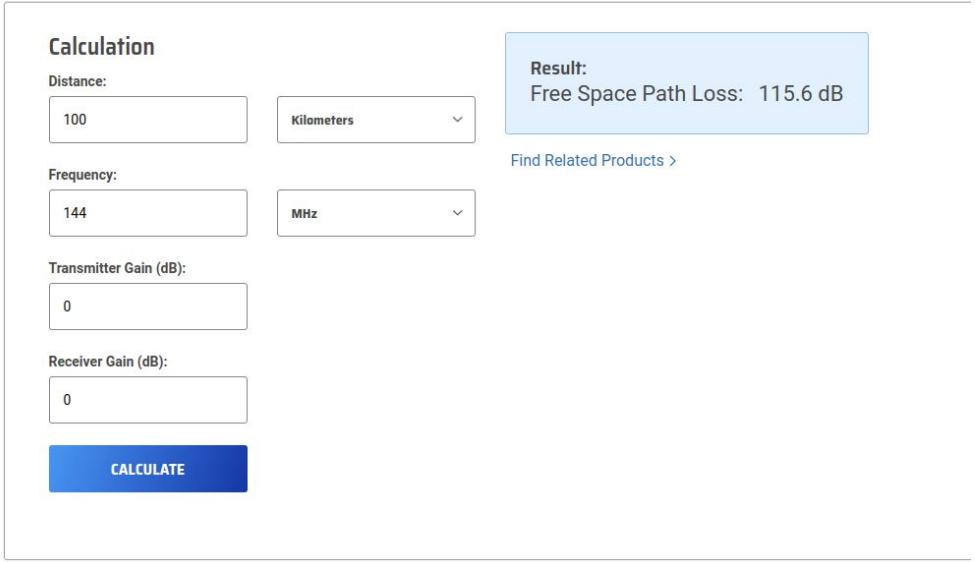
Mesafe

Frekans

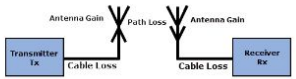
1) https://www.everythingrf.com/rf-calculators/free-space-path-loss-calculator
2) https://www.pasternack.com/t-calculator-fspl.aspx



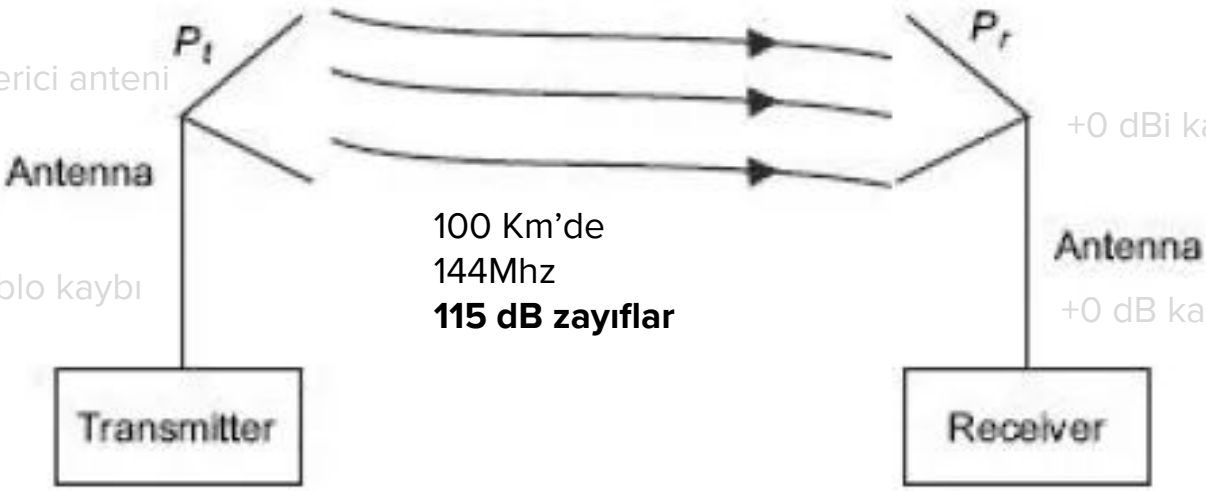
$$FSPL = 20\,log_{10}(d) + 20\,log_{10}(f) + 20log_{10}\left(\frac{4\pi}{c}\right) - G_{Tx} - G_{Rx}$$



$$FSPL = 20\log_{10}(d) + 20\log_{10}(f) + 20\log_{10}\left(\frac{4\pi}{c}\right) - G_t - G_r$$



Link Bütçesi Nedir ?



+0 dBi kazançlı verici anteni

+0 dBi kazançlı alıcı anteni

100 Km'de
144Mhz
115 dB zayıflar

+0 dB kablo kaybı

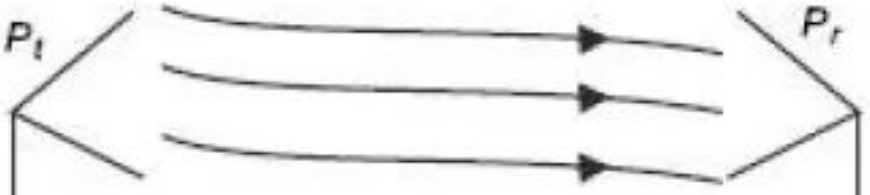
+0 dB kablo kaybı

Verici gücü 0dBm (1 miliwatt)

-120dBm

0 - 0 + 0 - 115 + 0 - 0 > -120 sinyal duyulur

Link Bütçesi Nedir ?



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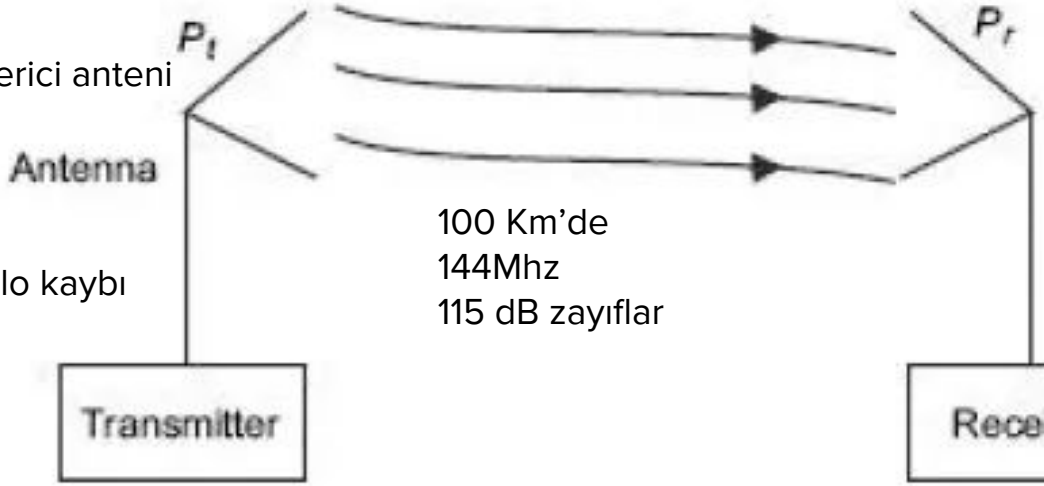


+8 dBi kazançlı verici anteni

2 dB kablo kaybı

100 Km'de
144Mhz
115 dB zayıflar

+8 dBi kazançlı alıcı anteni

2 dB kablo kaybı

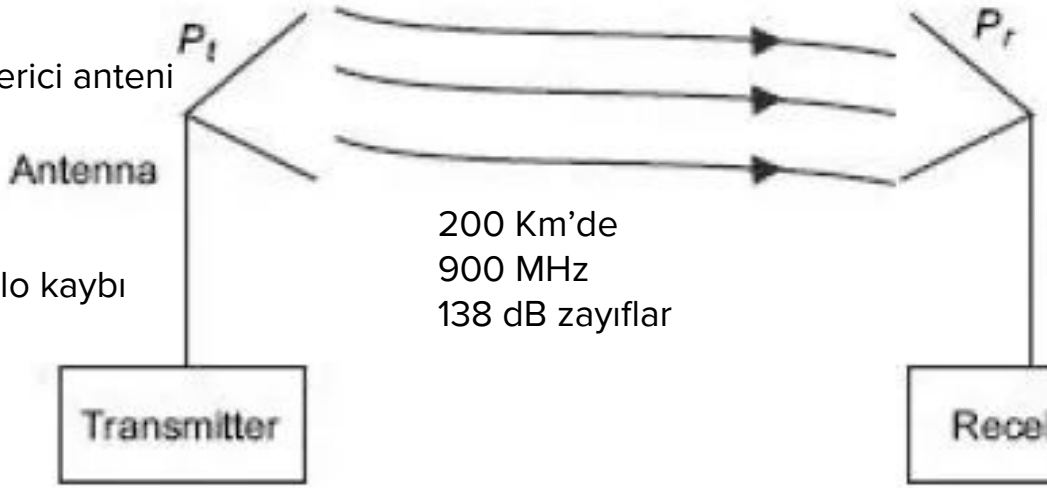
Verici gücü 20dBm (100 miliwatt)

-120dBm

20 - 2 + 8 - 115 + 8 - 2 (-83dBm) > -120 sinyal duyulur

-140 dBm alici ile LoRA nerelere gider ?

+0 dBi kazançlı verici anteni



+0 dBi kazançlı alıcı anteni

8 dB kablo kaybı

200 Km'de
900 MHz
138 dB zayıflar

8 dB kablo kaybı

Verici gücü 20dBm (100 miliwatt)

-120dBm

20 - 8 + 0 - 138 + 0 - 8 (-124dBm) > -140 sinyal duyulur

Nedir bu dB, dBm, dBi.... ?

dB	Power ratio
0	1

Nedir bu dB, dBm, dBi.... ?

dB	Power ratio
3	2
0	1

Nedir bu dB, dBm, dBi.... ?

dB	Power ratio
3	1.995 ≈ 2
0	1

Nedir bu dB, dBm, dBi.... ?

dB	Power ratio
6	3.981 ≈ 4
3	1.995 ≈ 2
0	1

Nedir bu dB, dBm, dBi.... ?

dB	Power ratio
10	10
6	3.981 ≈ 4
3	1.995 ≈ 2
0	1

Nedir bu dB, dBm, dBi.... ?

dB	Power ratio
20	100
10	10
6	3.981 ≈ 4
3	1.995 ≈ 2
0	1

Nedir bu dB, dBm, dBi.... ?

dB	Power ratio
100	10 000 000 000
90	1 000 000 000
80	100 000 000
70	10 000 000
60	1 000 000
50	100 000
40	10 000
30	1 000
20	100
10	10
6	3.981 ≈ 4
3	1.995 ≈ 2
0	1

Nedir bu dB, dBm, dBi.... ?

dB	Power ratio
100	10 000 000 000
90	1 000 000 000
80	100 000 000
70	10 000 000
60	1 000 000
50	100 000
40	10 000
30	1 000
20	100
10	10
6	3.981 ≈ 4
3	1.995 ≈ 2
0	1
−1	0.794
−3	0.501 ≈ $\frac{1}{2}$
−6	0.251 ≈ $\frac{1}{4}$
−10	0.1
−20	0.01
−30	0.001
−40	0.000 1
−50	0.000 01
−60	0.000 001
−70	0.000 000 1
−80	0.000 000 01
−90	0.000 000 001
−100	0.000 000 000 1

Nedir bu dB, **dBm**, dBi.... ?

Miliwatt	dBm
1	0
10	10
100	20
1000 (1 watt)	30
10000 (10 watt)	40
100000 (100 watt)	50
1000000 (1 kilowatt)	60

Nedir bu dB, **dBm**, dBi.... ?

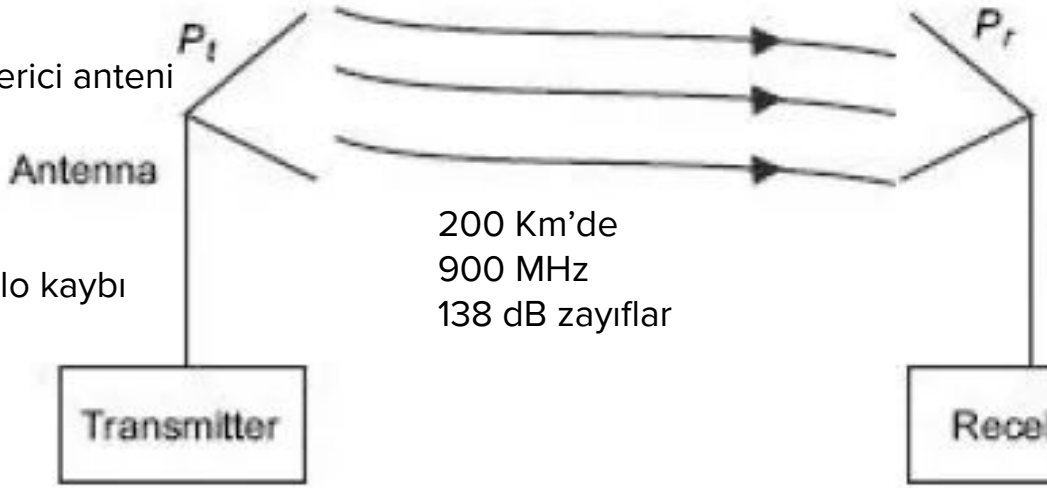
Miliwatt	dBm
1	0
10	10
100	20
1000 (1 watt)	30
10000 (10 watt)	40
100000 (100 watt)	50
1000000 (1 kilowatt)	60

Basit bir kural 2 kat guc artisi 3 dBm artis demektir

1	0
2	3
4	6
20	13
40	16
2000 (2 watt)	33
80000 (80 watt)	49

-140 dBm alici ile LoRA nerelere gider ?

+0 dBi kazançlı verici anteni



+0 dBi kazançlı alıcı anteni

8 dB kablo kaybı

200 Km'de
900 MHz
138 dB zayıflar

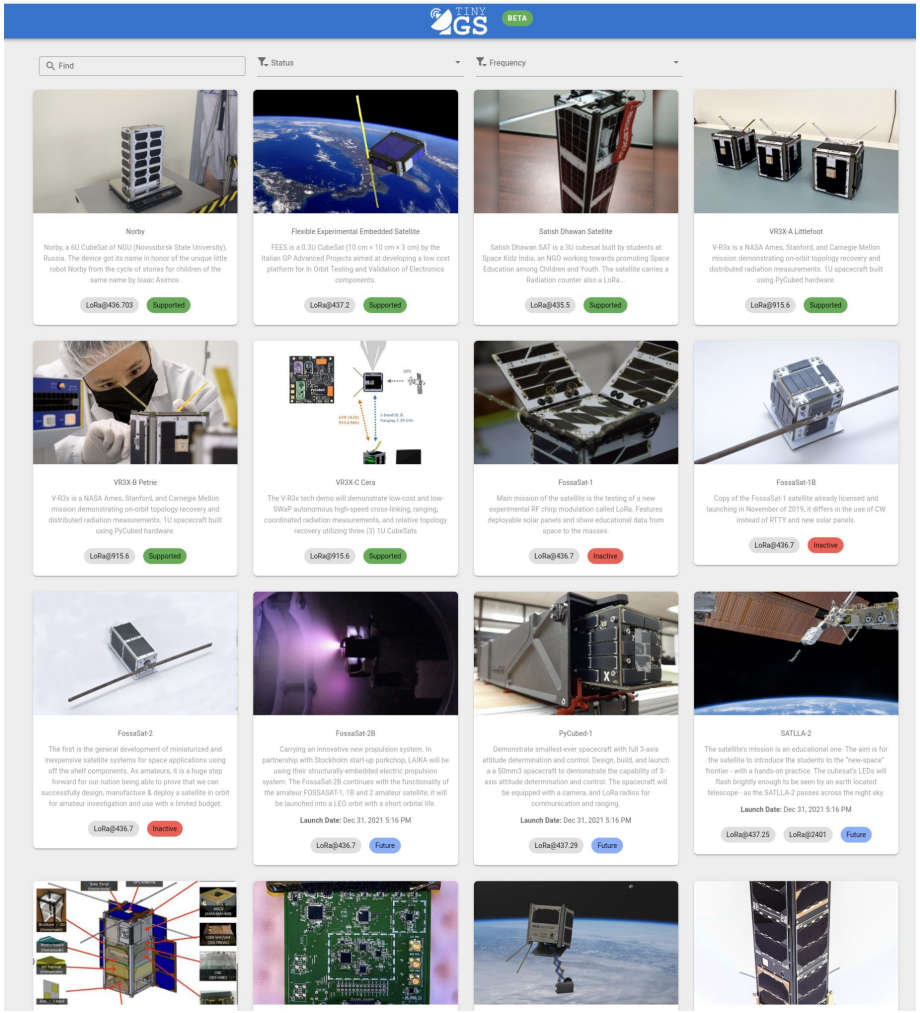
8 dB kablo kaybı

Verici gücü 20dBm (100 miliwatt)

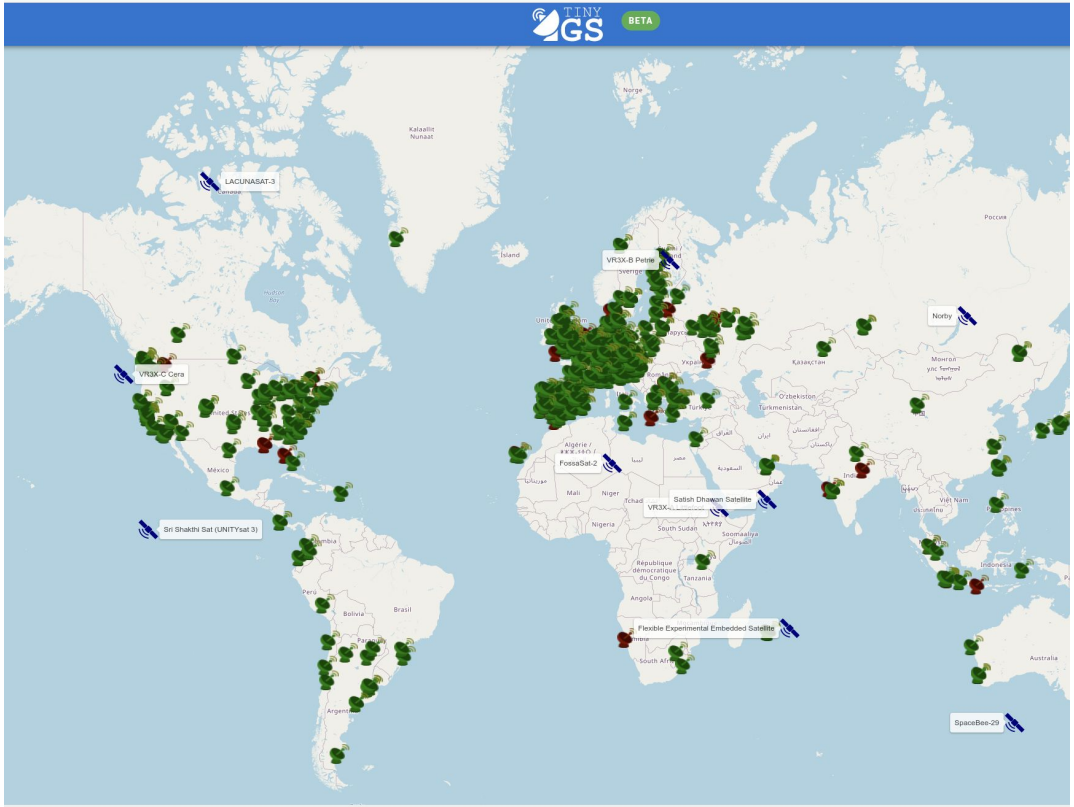
-120dBm

20 - 8 + 0 - 138 + 0 - 8 (-124dBm) > -140 sinyal duyulur

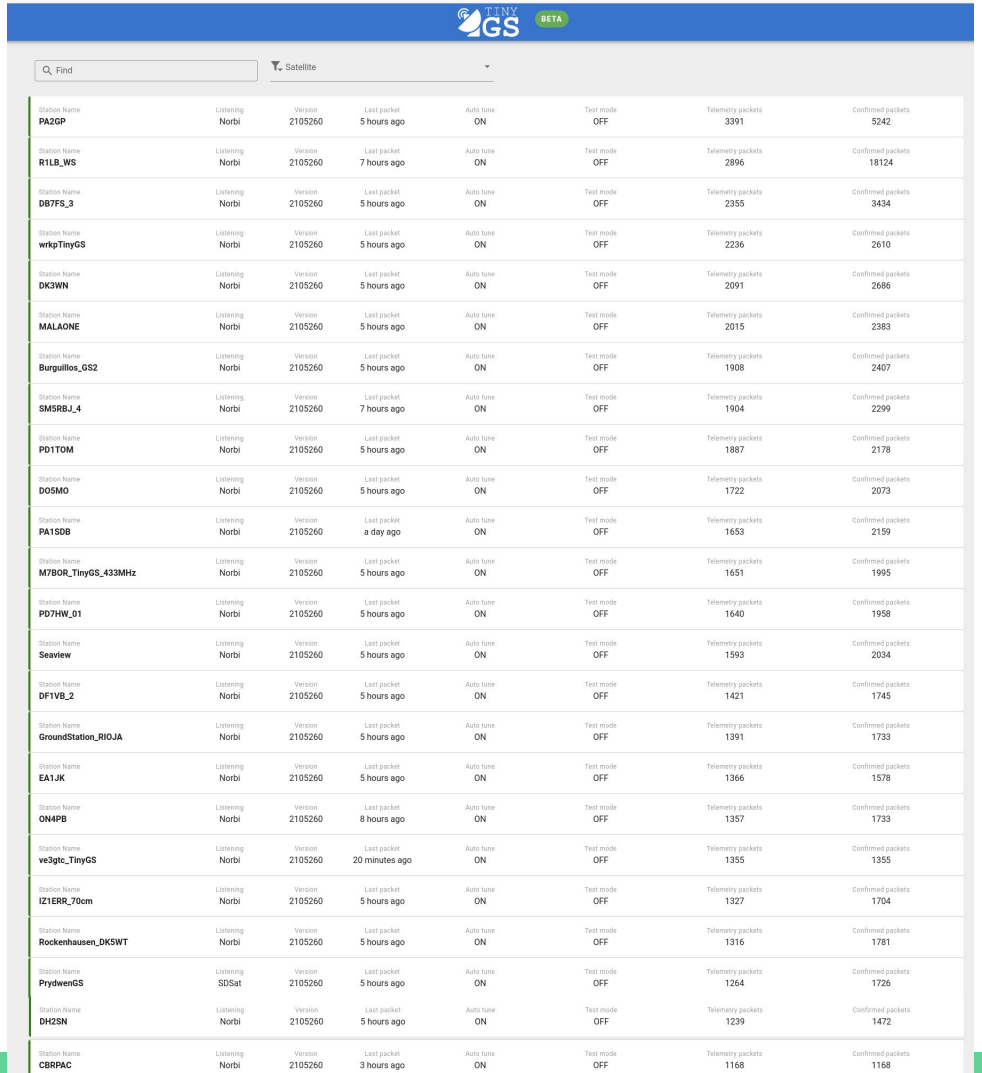
TinyGS nedir ?



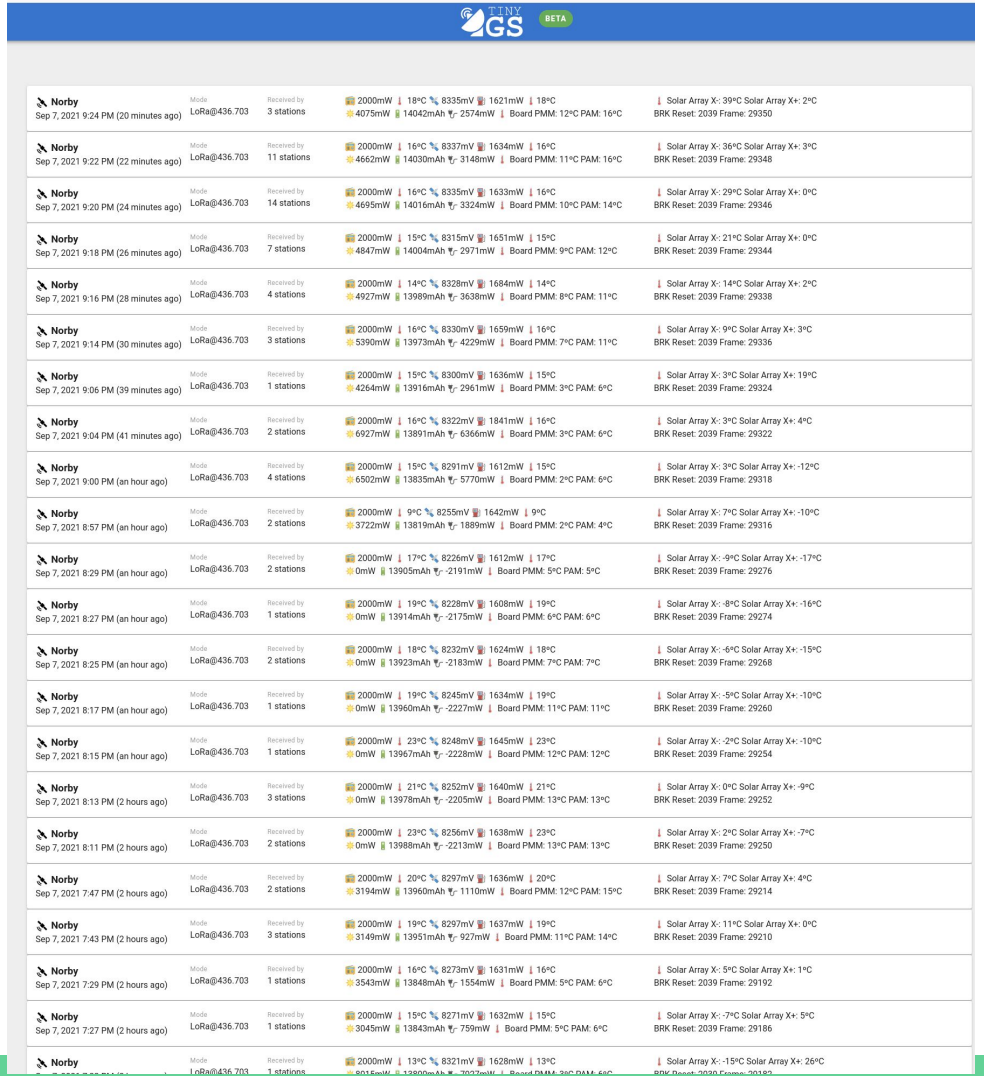
TinyGS nedir ?



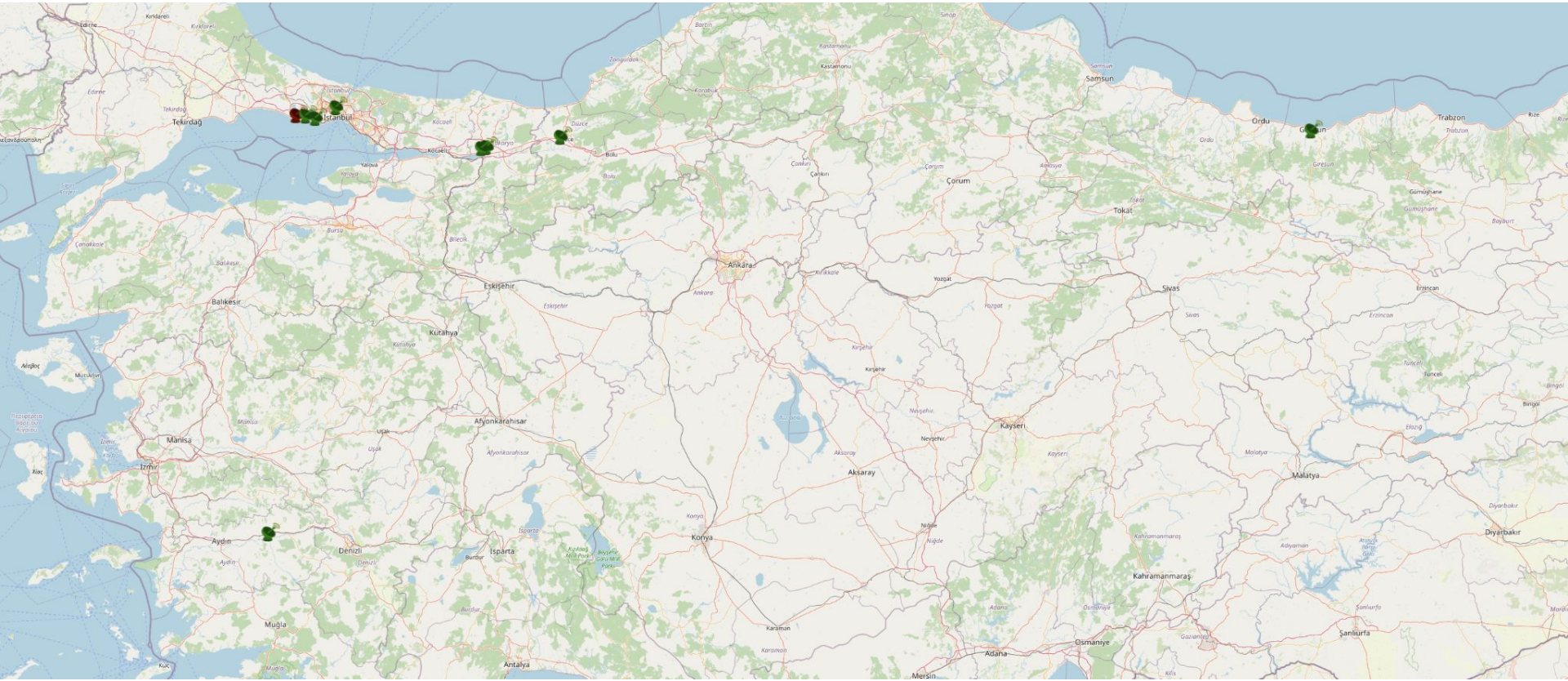
TinyGS istasyonları



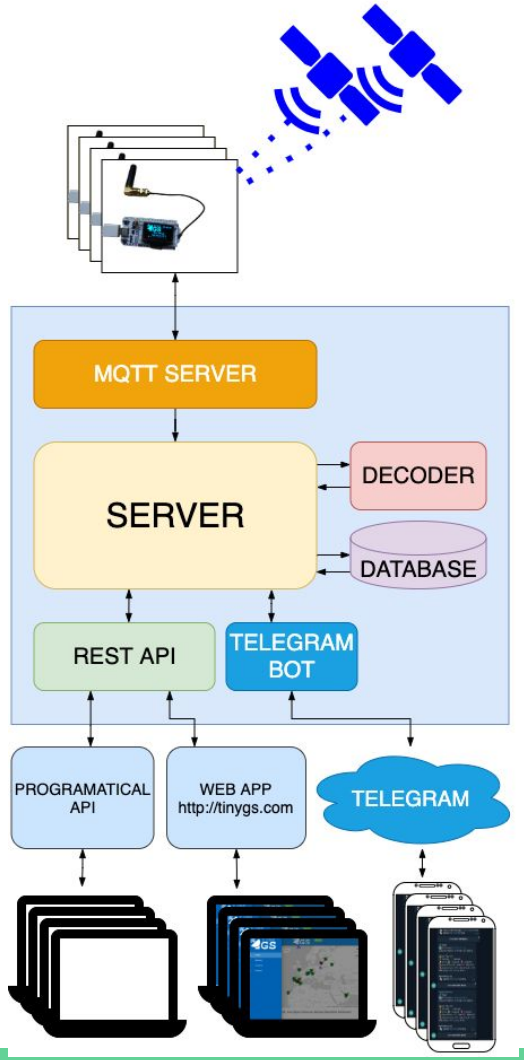
TinyGS verileri



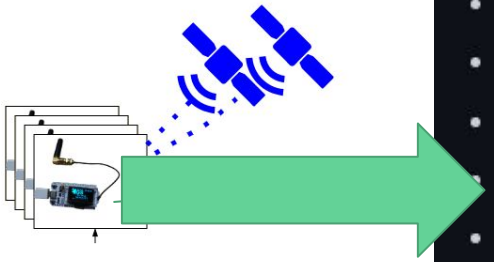
Türkiye’de TinyGS



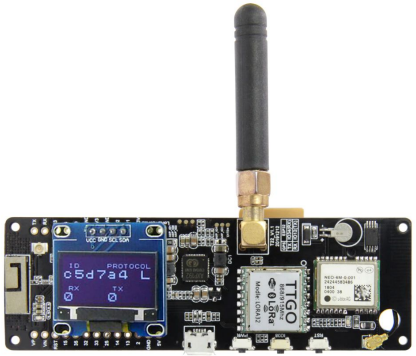
Nasıl çalışıyor ?



Donanımlar

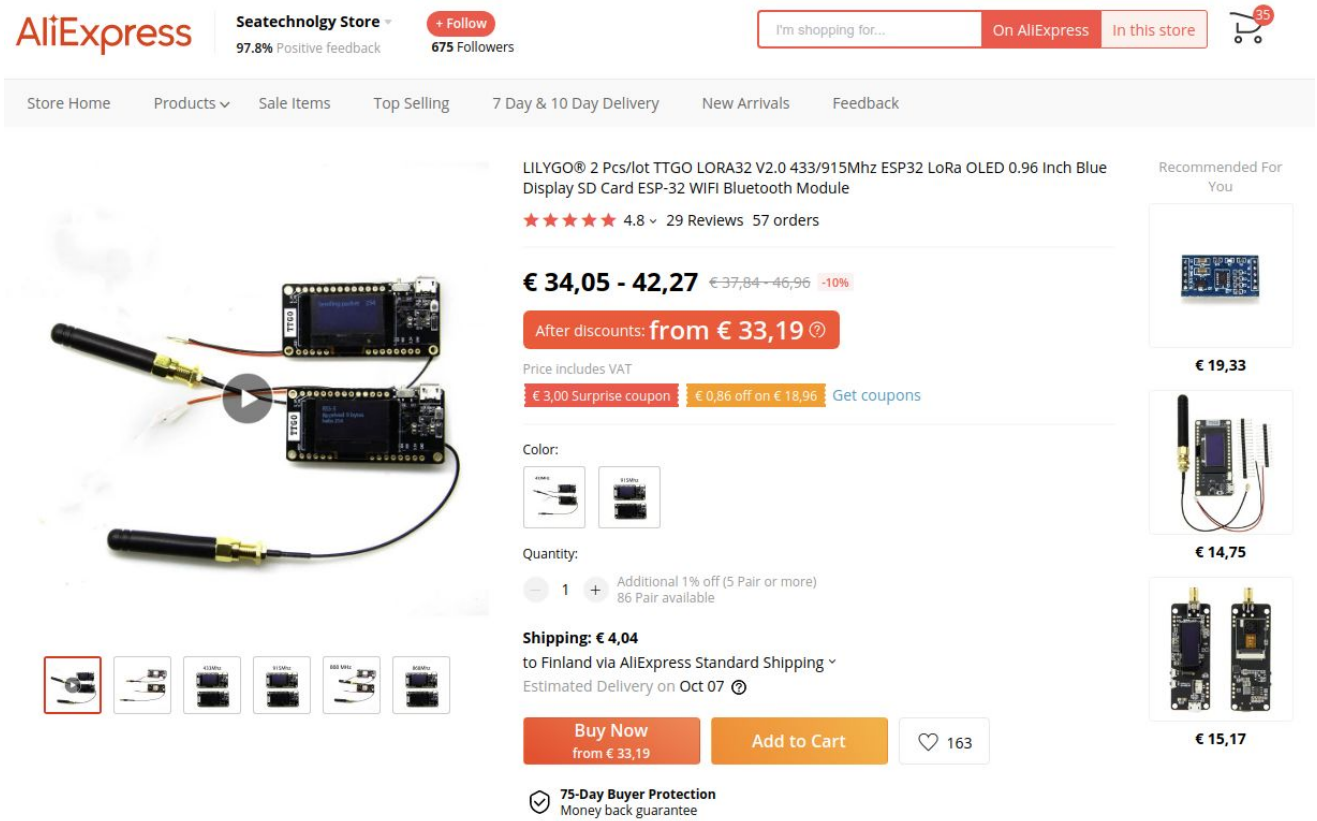


- Heltec WiFi LoRa 32 V1 (433MHz & 863-928MHz versions)
- Heltec WiFi LoRa 32 V2 (433MHz & 863-928MHz versions)
- TTGO LoRa32 V1 (433MHz & 868-915MHz versions)
- TTGO LoRa32 V2 (433MHz & 868-915MHz versions)
- TTGO LoRa32 V2 (Manually swapped SX1267 to SX1278)
- T-BEAM + OLED (433MHz & 868-915MHz versions)
- 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)



Biz ne satın aldık ?

https://www.aliexpress.com/item/32845688586.html?spm=2114.13010708.0.0.6dd04c4dyaUU3P



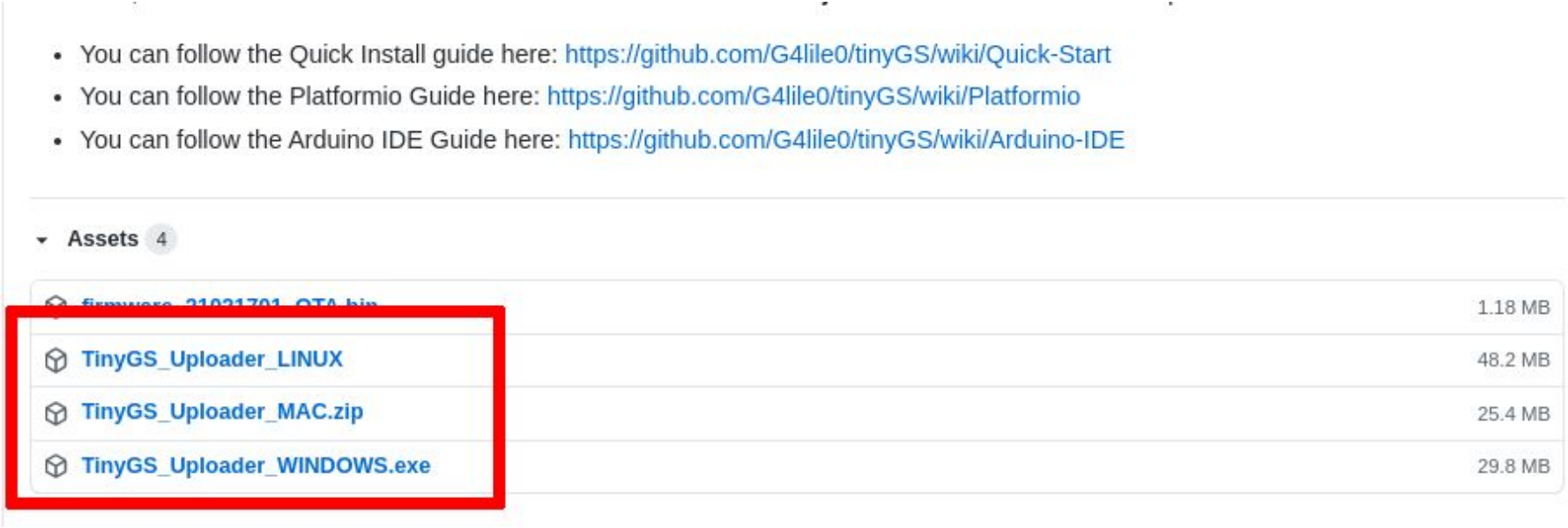
DİKKAT !!!

433MHz modelini almalısınız

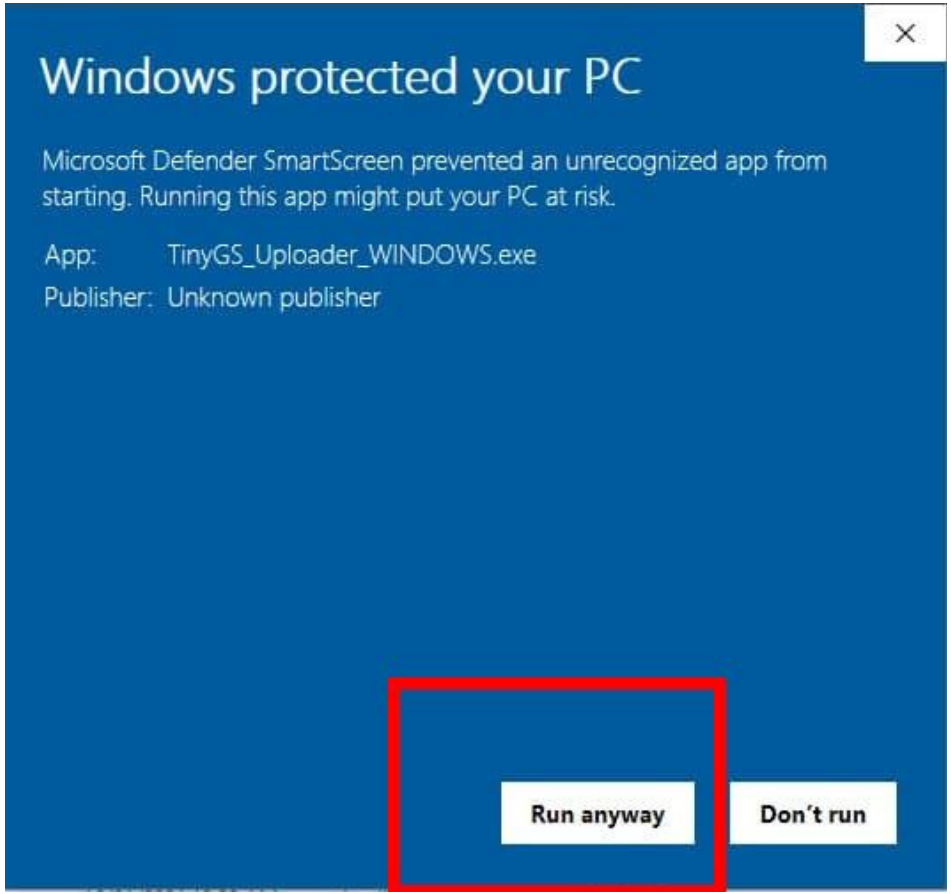
Kurulum Adımları

https://github.com/G4lile0/tinyGS/releases

Adresinden kurulum programını indirin ve çalıştırın



M$ Windows uyarı mesajı

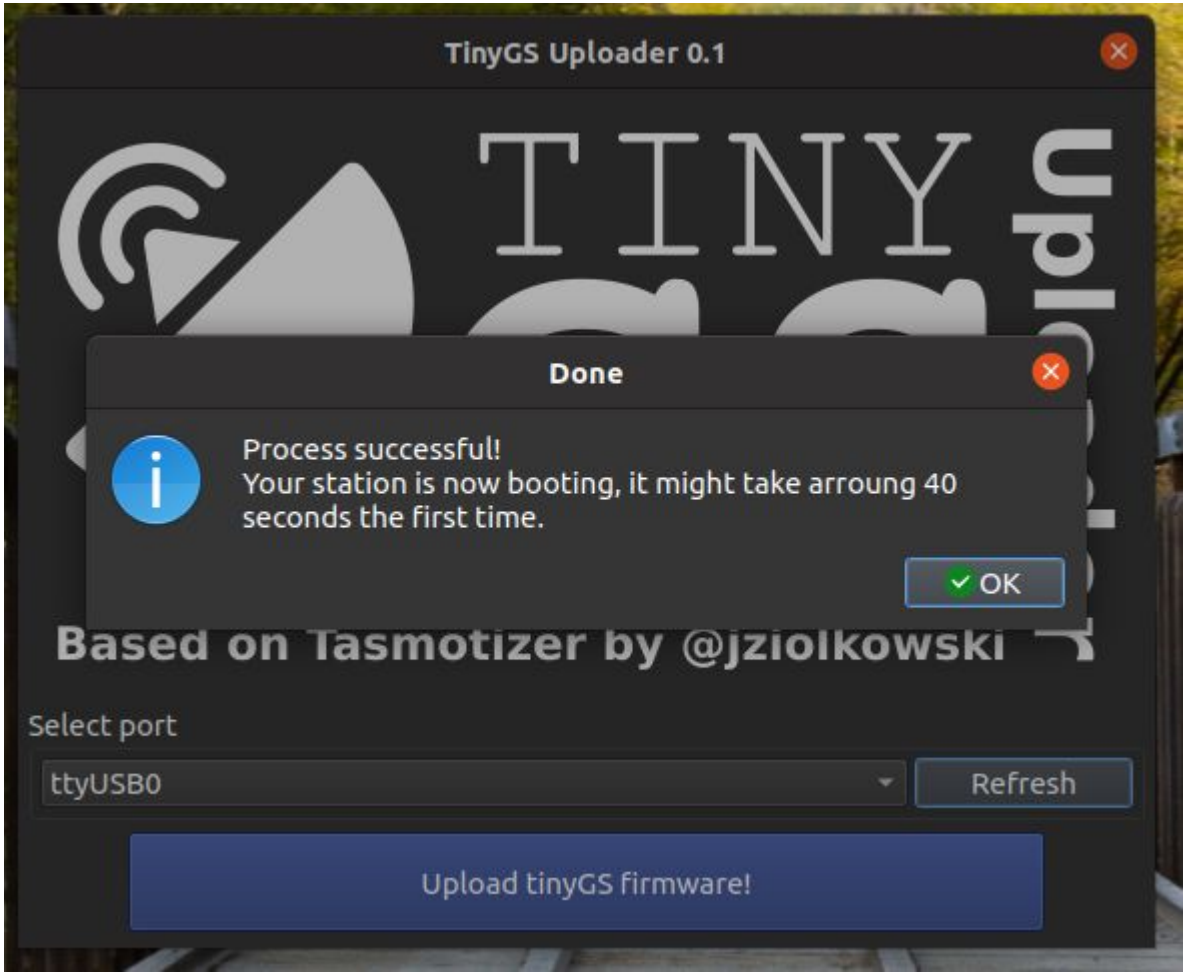


Seri portu tespit edin ve seçin

Denetim masasında hangi seri portun aktif olduğunu bulun

COM1... COM12 vb....


TinyGS Uploader 0.1
TINY
Uploader
Cooking your TinyGS station...
Download
100%
Erase
100%
Write
2%
Abort
Connected to ESP32-PICO-D4 (revision 1) [MAC: 50:02:
Select port
ttyUSB0
Refresh
Upload tinyGS firmware!


TinyGS Uploader 0.1
Done
Process successful!
Your station is now booting, it might take arroung 40 seconds the first time.
OK
Based on Tasmotizer by @jziolkowski
Select port
ttyUSB0
Refresh
Upload tinyGS firmware!

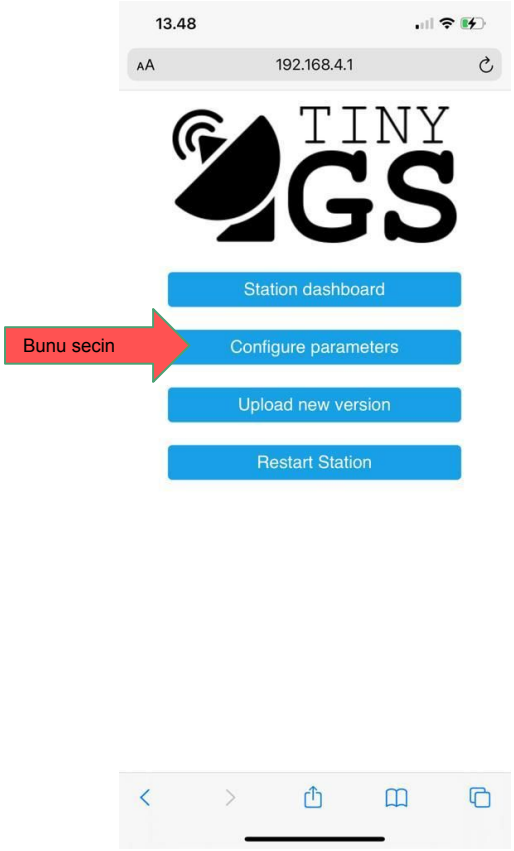
İlk ayarlar

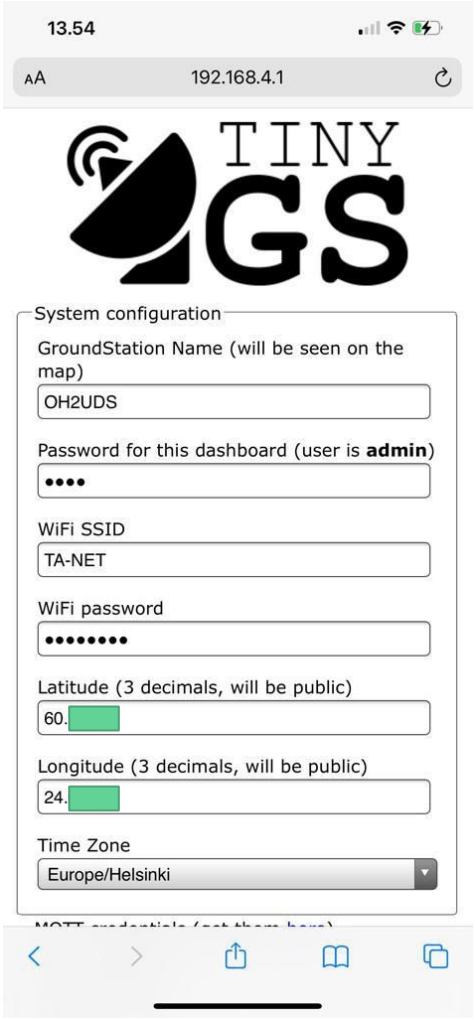

Connect to AP:
->My TinyGS
to configure your Station
IP: 192.168.4.1

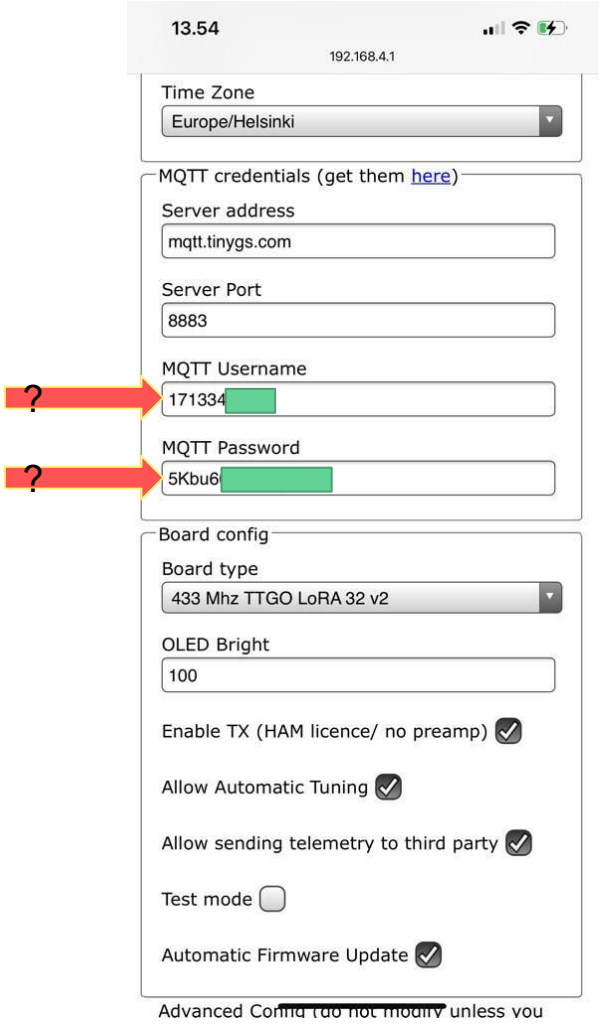

Connect to AP:
->My TinyGS
to configure your Station
IP: 192.168.4.1
TTGO

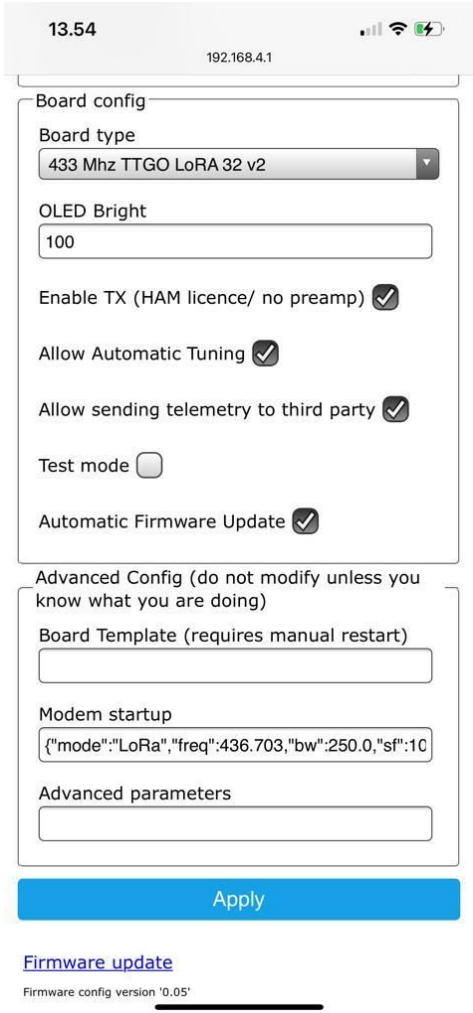
İlk ayarlar

- My TinyGS isimli WİFİ ağına bağlanın
- Bilgisayarınızın adres çubuğuna 192.168.4.1 yazın




13.54
AA
192.168.4.1
TINY GS
System configuration
GroundStation Name (will be seen on the map)
OH2UDS
Password for this dashboard (user is admin)
WiFi SSID
TA-NET
WiFi password
Latitude (3 decimals, will be public)
60.
Longitude (3 decimals, will be public)
24.
Time Zone
Europe/Helsinki


13.54
192.168.4.1
Time Zone
Europe/Helsinki
MQTT credentials (get them here)
Server address
mqtt.tinygs.com
Server Port
8883
MQTT Username
171334
MQTT Password
5Kbu6
Board config
Board type
433 Mhz TTGO LoRA 32 v2
OLED Bright
100
Enable TX (HAM licence/ no preamp)
Allow Automatic Tuning
Allow sending telemetry to third party
Test mode
Automatic Firmware Update
Advanced Config (do not modify unless you

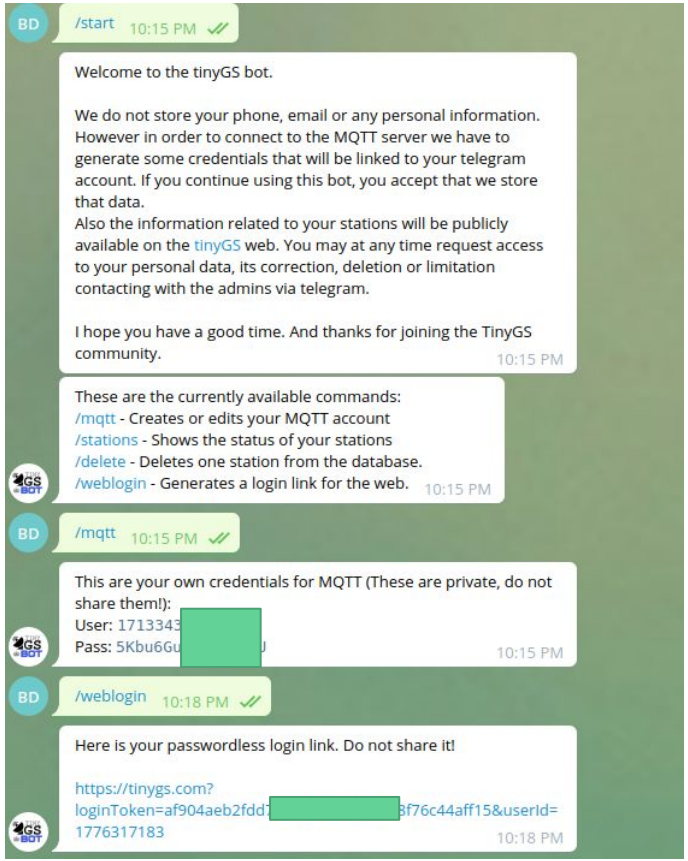

13.54
192.168.4.1
Board config
Board type
433 Mhz TTGO LoRA 32 v2
OLED Bright
100
Enable TX (HAM licence/ no preamp)
Allow Automatic Tuning
Allow sending telemetry to third party
Test mode
Automatic Firmware Update
Advanced Config (do not modify unless you know what you are doing)
Board Template (requires manual restart)
Modem startup
{"mode":"LoRa","freq":436.703,"bw":250.0,"sf":10
Advanced parameters
Apply
Firmware update
Firmware config version '0.05'

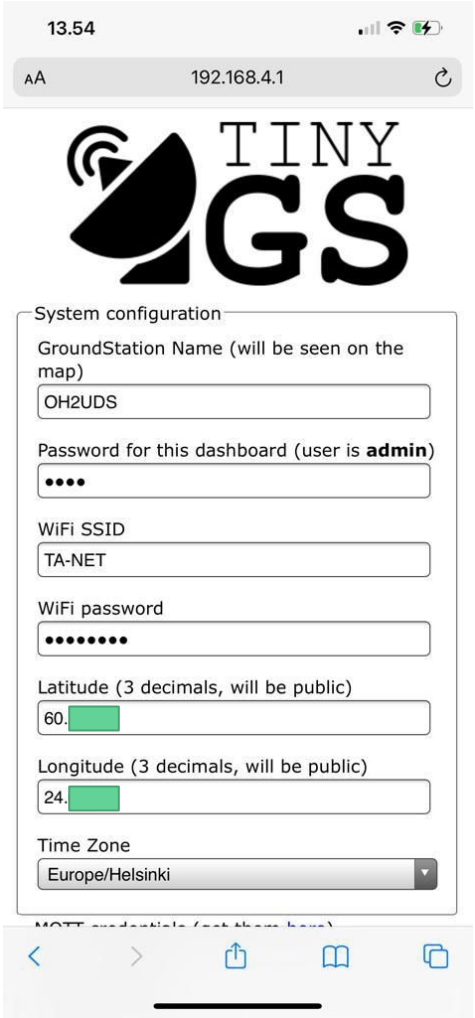
TELEGRAM botundan kullanıcı adı ve şifre almak

https://t.me/joinchat/DmYSElZahiJGwHX6jCzB3Q

TinyGS Personal Bot

bot




13.54
AA
192.168.4.1
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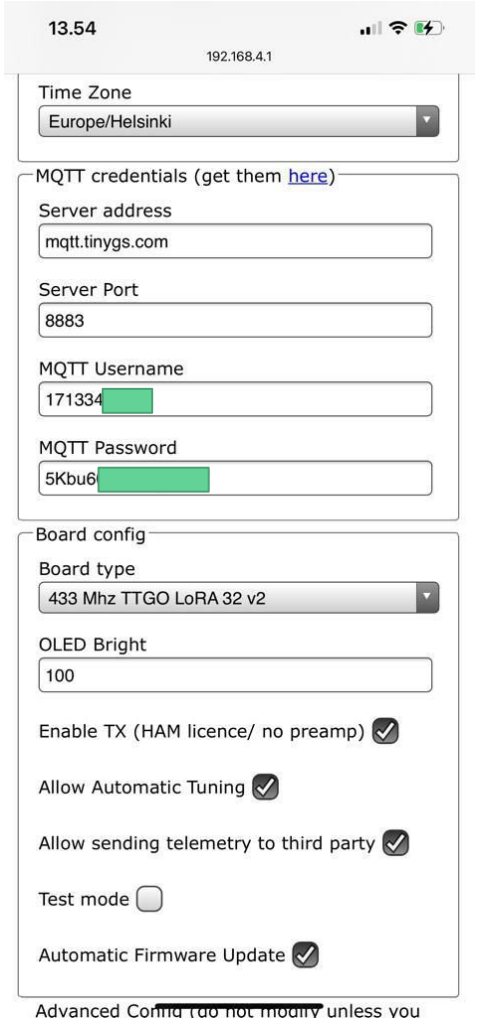
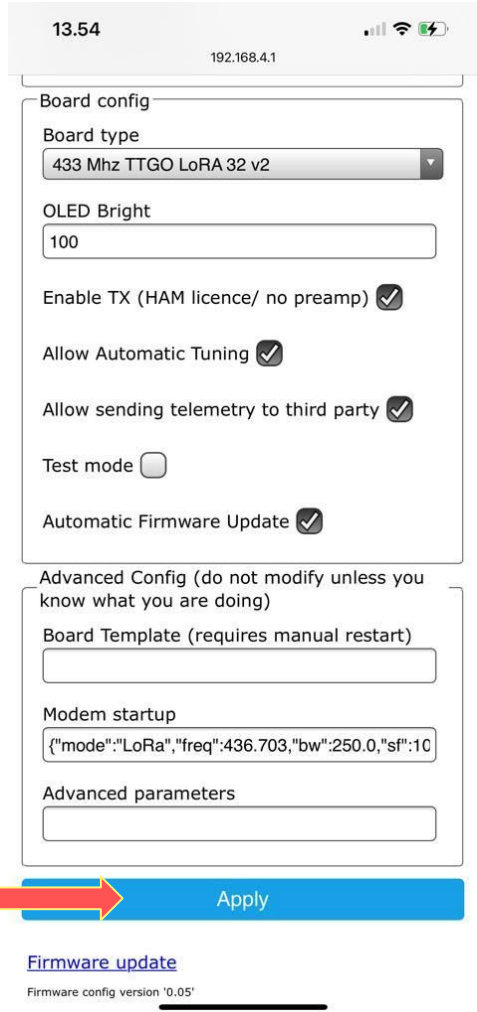
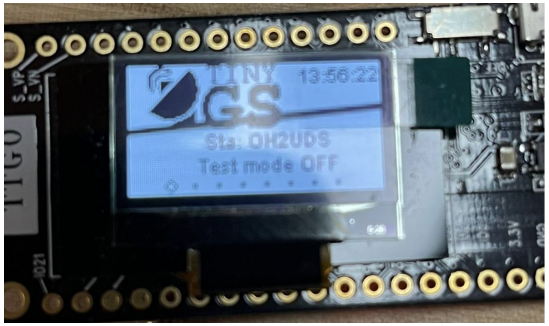
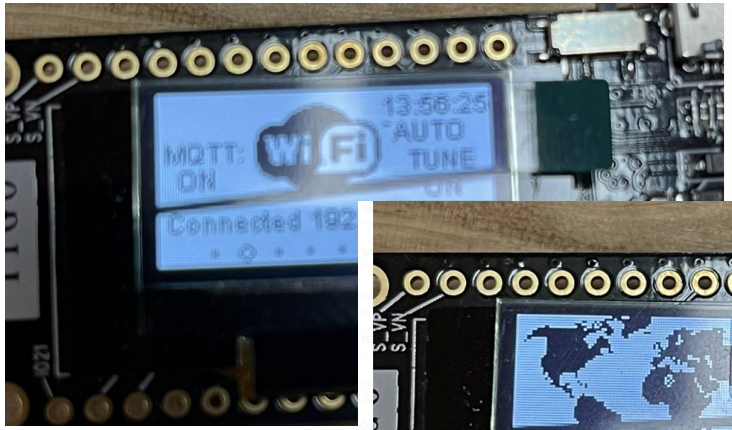
GroundStation Name (will be seen on the map)
OH2UDS
Password for this dashboard (user is admin)
WiFi SSID
TA-NET
WiFi password
Latitude (3 decimals, will be public)
60.
Longitude (3 decimals, will be public)
24.
Time Zone
Europe/Helsinki

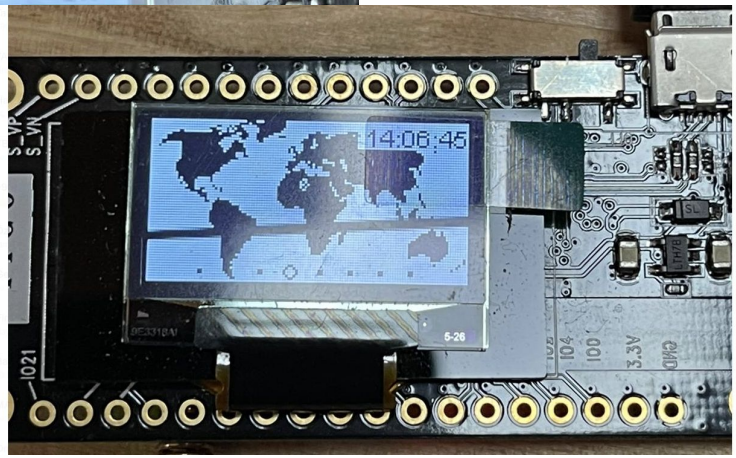

13.54
192.168.4.1
Time Zone
Europe/Helsinki
MQTT credentials (get them here)
Server address
mqtt.tinygs.com
Server Port
8883
MQTT Username
171334
MQTT Password
5Kbu6
Board config
Board type
433 Mhz TTGO LoRA 32 v2
OLED Bright
100
Enable TX (HAM licence/ no preamp)
Allow Automatic Tuning
Allow sending telemetry to third party
Test mode
Automatic Firmware Update
Advanced Config (do not modify unless you

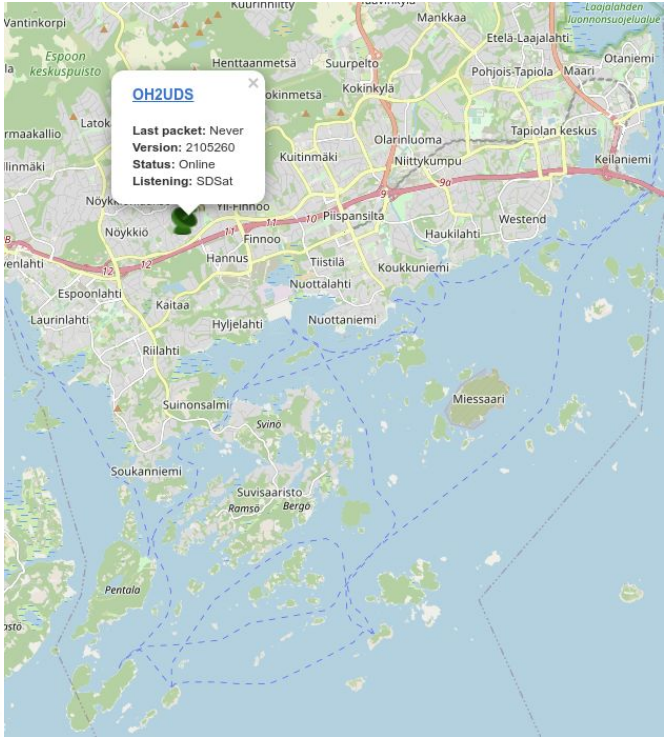

13.54
192.168.4.1
Board config
Board type
433 Mhz TTGO LoRA 32 v2
OLED Bright
100
Enable TX (HAM licence/ no preamp)
Allow Automatic Tuning
Allow sending telemetry to third party
Test mode
Automatic Firmware Update
Advanced Config (do not modify unless you know what you are doing)
Board Template (requires manual restart)
Modem startup
{"mode":"LoRa","freq":436.703,"bw":250.0,"sf":10
Advanced parameters
Apply
Firmware update
Firmware config version '0.05'


13:56:22
Sta: OH2UDS
Test mode OFF

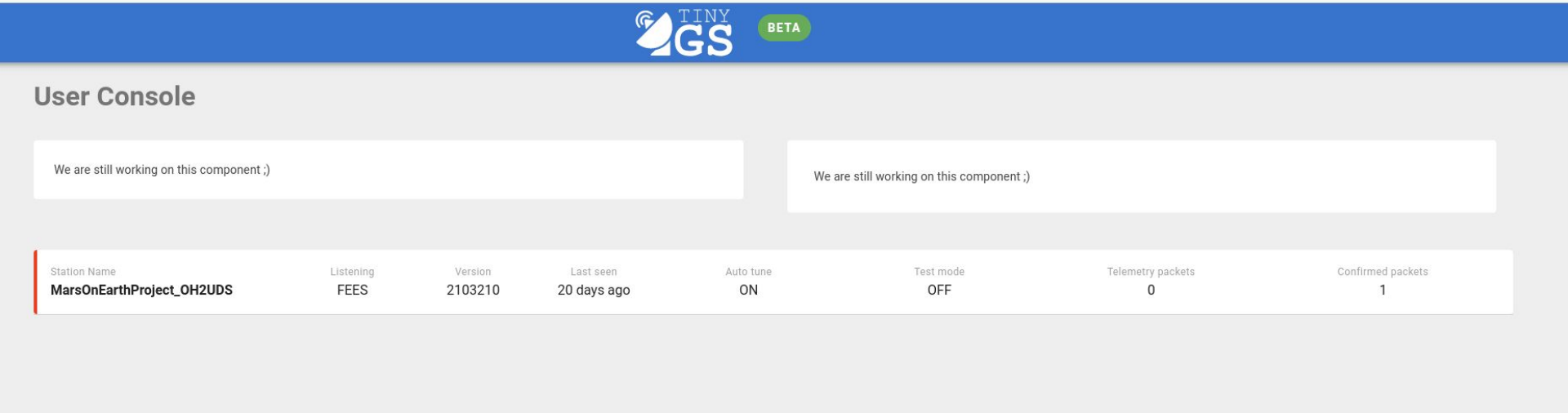

13:56:29

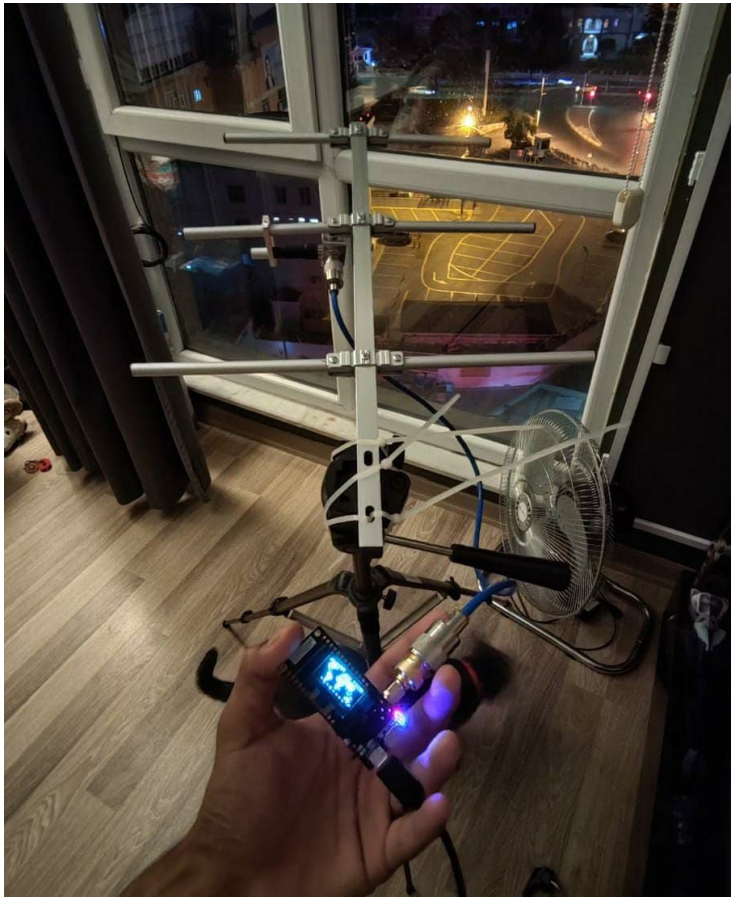

13:56:25
MQTT:
ON
AUTO
TUNE


14:06:45


OH2UDS
Last packet: Never
Version: 2105260
Status: Online
Listening: SDSat
Mankkaa
Etelä-Laajalahti
Henttaanmetsä
Suurpelto
Pohjois-Tapiola
Otaniemi
Kokinkylä
Olarinluoma
Tapiolan keskus
Kuitinmäki
Niittykumpu
Keilaniemi
Piispansilta
Westend
Haukilahti
Finnoo
Hannus
Tiistilä
Koukkuniemi
Nuottalahti
Espoonlahti
Kaitaa
Laurinlahti
Hyljelahti
Nuottaniemi
Riilahti
Suinonsalmi
Miessaari
Soukanniemi
Suvisaaristo
Pentala

Web Yönetim Arayüzünüz





TA1KEB Erdogan Bilgici

TESEKKURLER

73's DE TA7W / OH2UDS
Baris