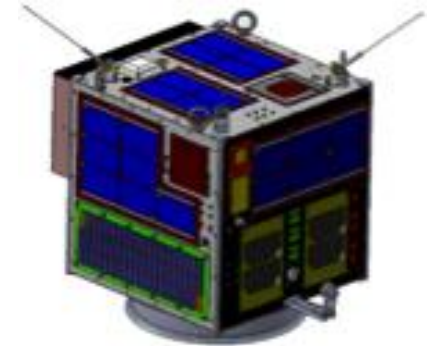


# GLOBAL ANTENNA SHARING PROJECT for achieving Sustainable Development Goals



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# A UNISEC-GLOBAL PROJECT

The Global Antenna Sharing Project initiated by

- Kyushu Institute of Technology,  
UNISEC-Japan

in collaboration with

- Istanbul Technical University,  
UNISEC-Turkey

with support of InfoStellar, Japan



# Main Goal of Project

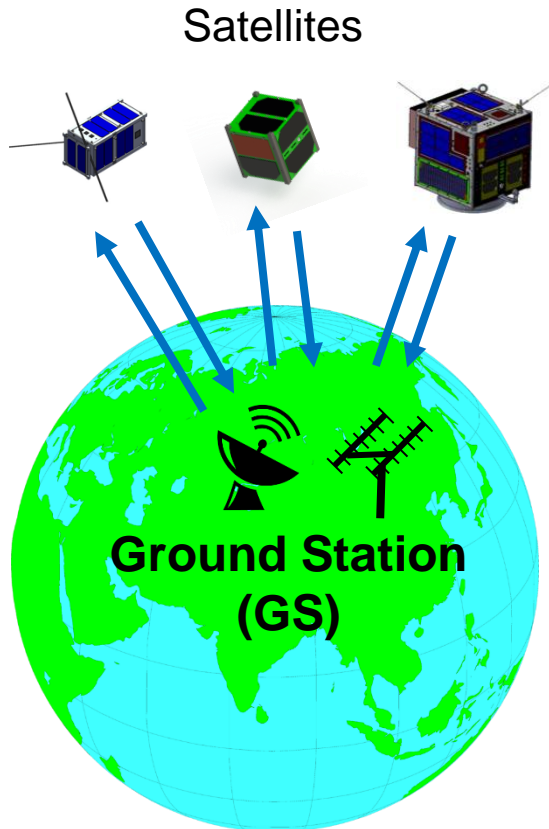
- **Efficient use of *Micro/Nano Satellite systems (constellations)* (300 placed in orbit in 2017)**
  - *Sharing resources*
  - *Helping less developed institutions to reach higher levels*
  - *Increased usage time of expensive systems (ground stations)*
  - *Reduced downtime*
  - *Better use of systems*
  - *Get ready for your satellite before you launch it!*
- *help yourself help other*

# how we can help SDGs...?



<https://sustainabledevelopment.un.org/sdgs>

# Satellites Communication

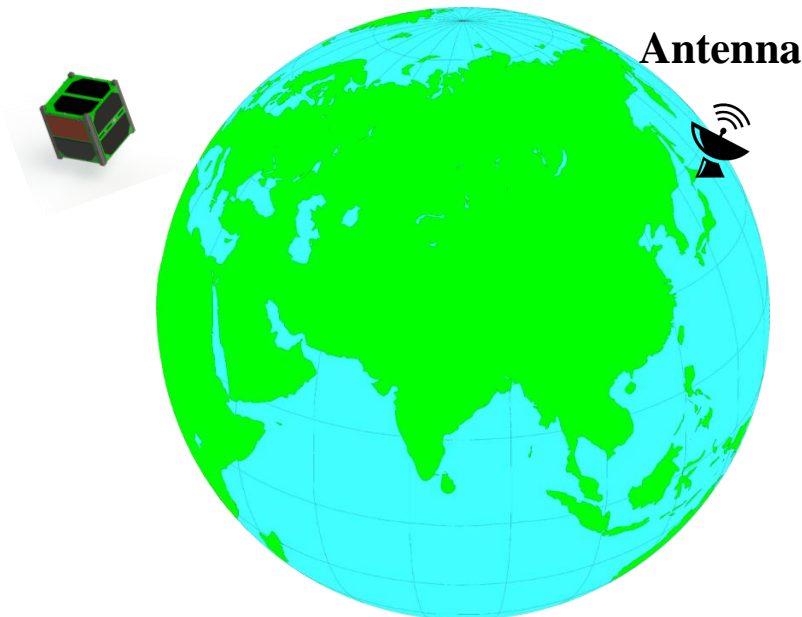


## Function of Ground Station

- Pointing to a satellite (Satellite tracking)
- Send telecommand to satellite
- Receive telemetry/mission data from satellite
- Process RF signal (Mod/Demodulation, Coding/Decoding)

# Limitation of Communication Time

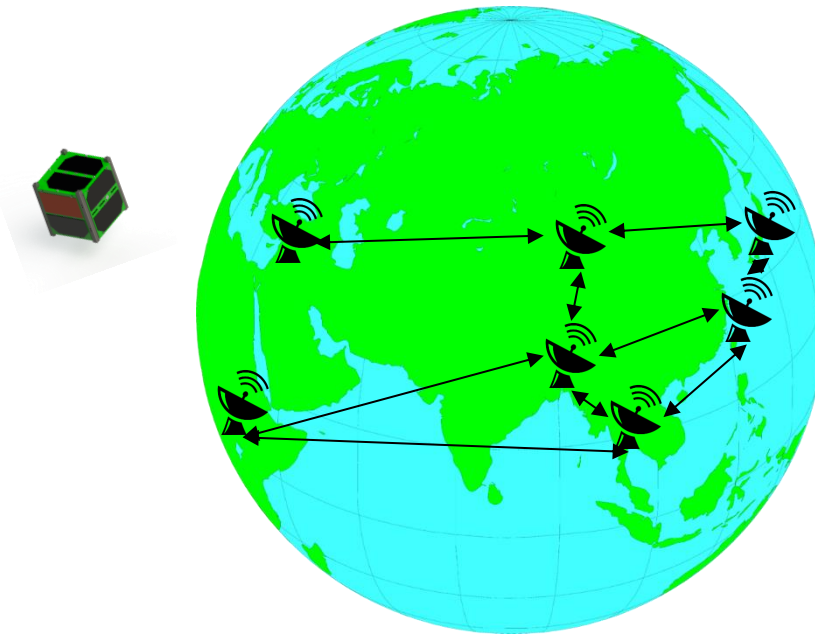
- Limited communication time window in LEO
- Average communication time = 40 minutes/day
- Require long time to download payload data



**40 min/ 1day**  
**[10min x 1 pass x 4 times]**

# Antenna Sharing

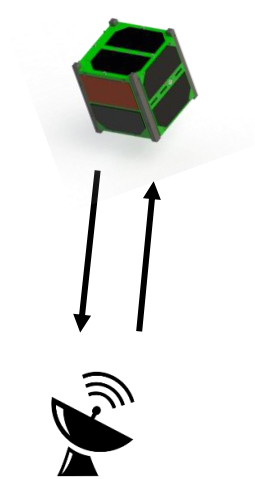
- Increase the number of tracking antennas



By connecting more antenna  
**Time Resolution Increases!**

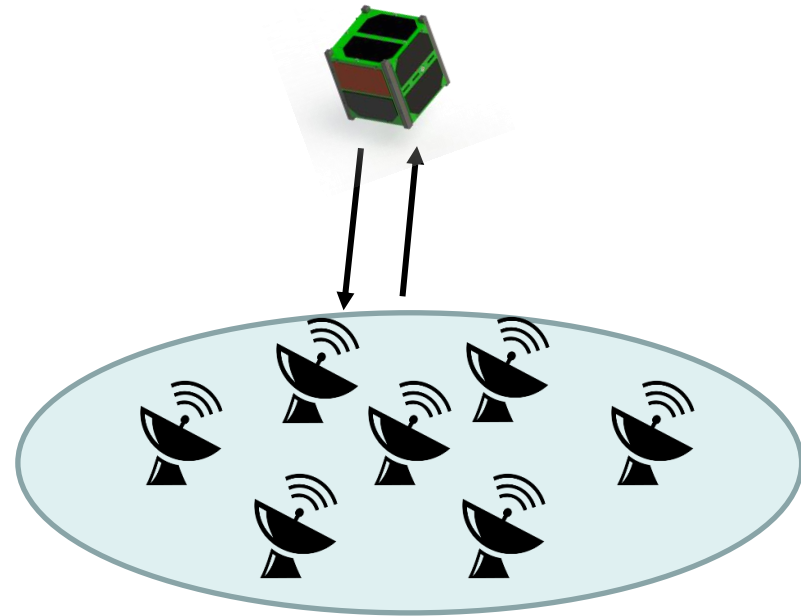


# Advantage of Many Antennas



## 1 Antenna

1 Satellite with 1 Antenna  
**35-65 Min / day**



## Many Antenna

1 Satellite with 7 Antenna  
**145 Min / day**

**Time resolution increase up to 3 time!!**



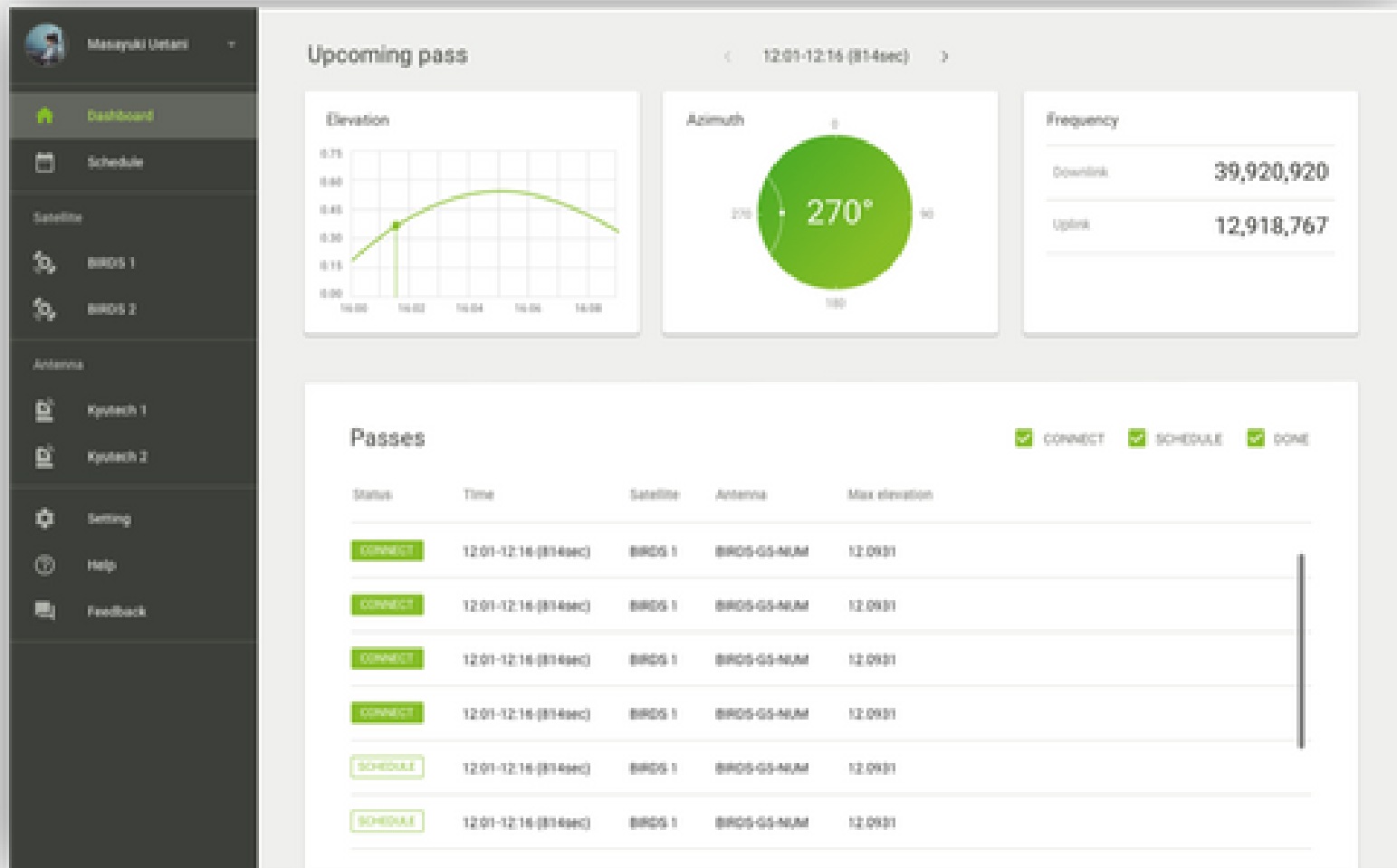
# A solution: StellarStation

A cloud-based software platform that connects satellite operators with antenna owners, solving both the problem of **insufficient satellite access time** and **unused antenna idle time**.

The process is simple:

- Share your antenna's idling time and get credits.
- Use your credits to access other antennas around the globe.
- Exchange your credits for cash, or buy additional credits for even more antenna access time.

# Graphical User Interface



# A new standard for satellite ground stations

- Flagship product, StellarStation. Reshape the satellite operation scene in three major ways:
  1. Shifting the paradigm to antenna sharing, opening up large numbers of antennas for use and dramatically increasing access
  2. Solidifying satellite communications into a standardized system so that this increased access can be seamlessly utilized
  3. Creating a real-time transmission environment for satellites, thus lowering the barrier to entry on satellite operations

# space development for everyone

- Building this new ecosystem for ground station networks, we hope to open the door for previously unachievable space development.
- Space for everyone !

# StellarStation Amateur

- Built on the StellarStation platform, StellarStation Amateur provides free LEOP support for amateur UHF band satellites.
- Use StellarStation Amateur to access invaluable telemetry data and schedule passes using member worldwide antenna network during a critical phase of launch and satellite operations.

# İTÜ-SSDTL VHF/UHF GS



ANTENNA



# Additional Equipment for Antenna Sharing



SP1200 Main Unit



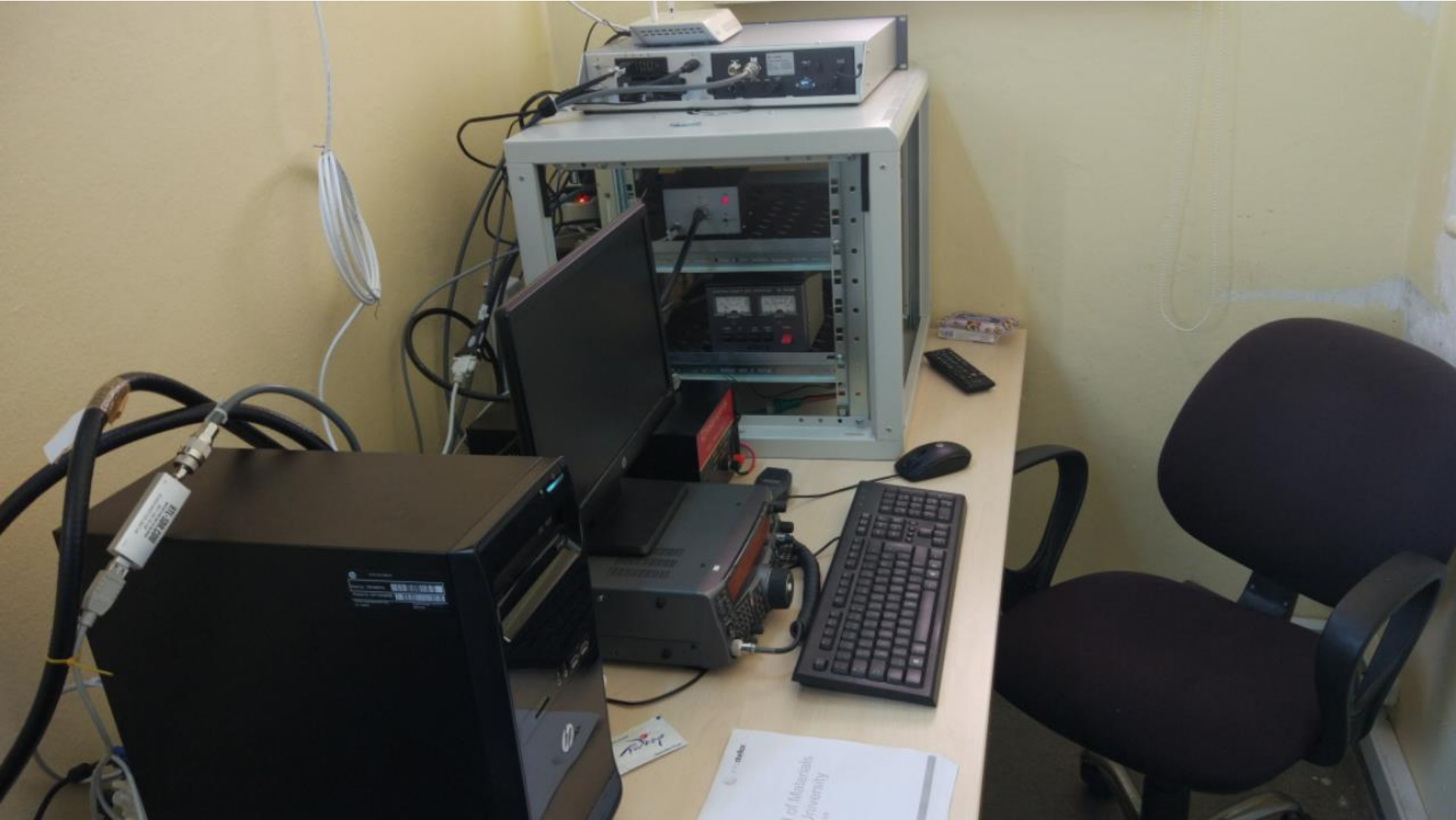
CRU Type-C1



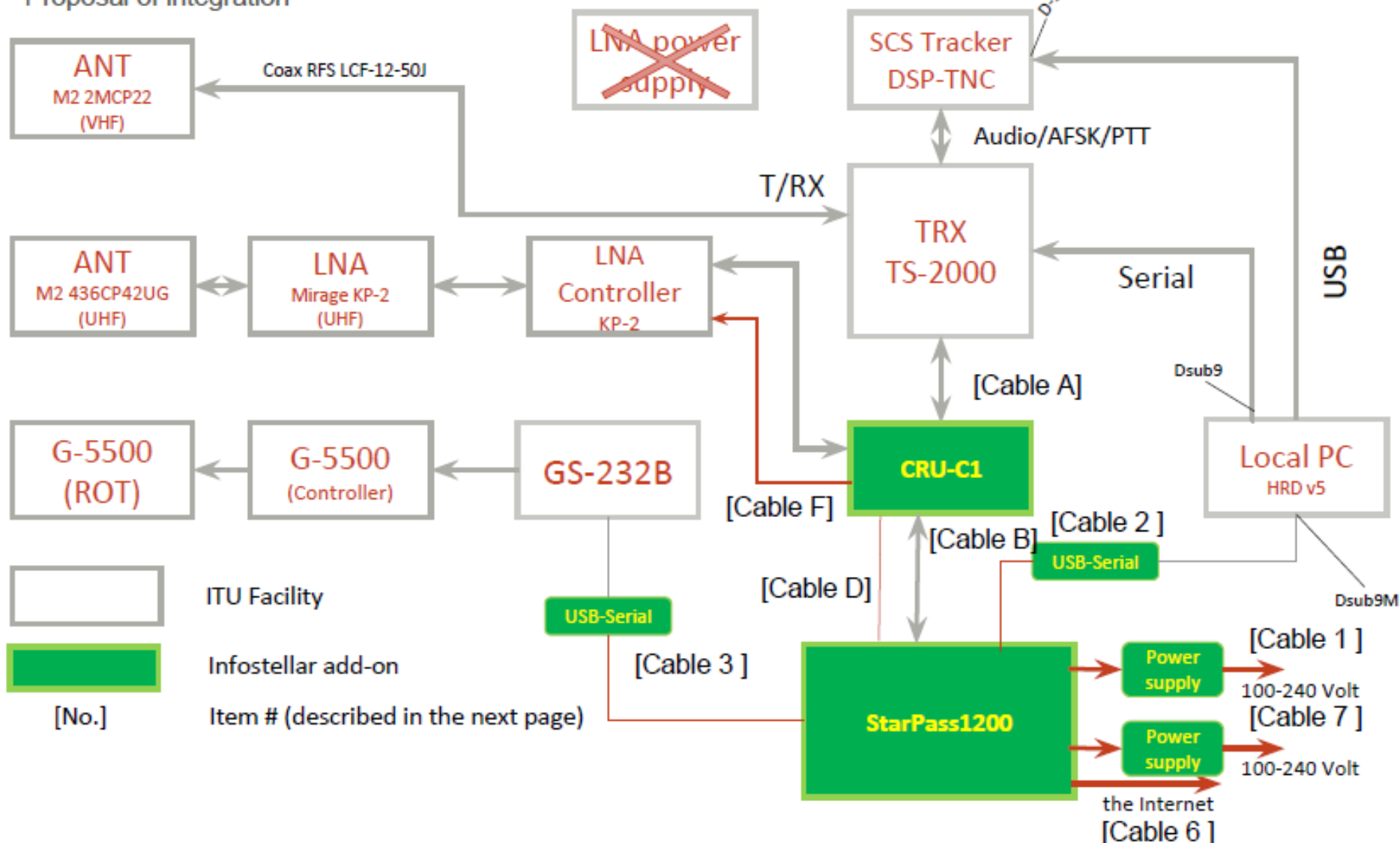
Cable 1



# İTÜ-SSDTL COMM LAB with StellarStation



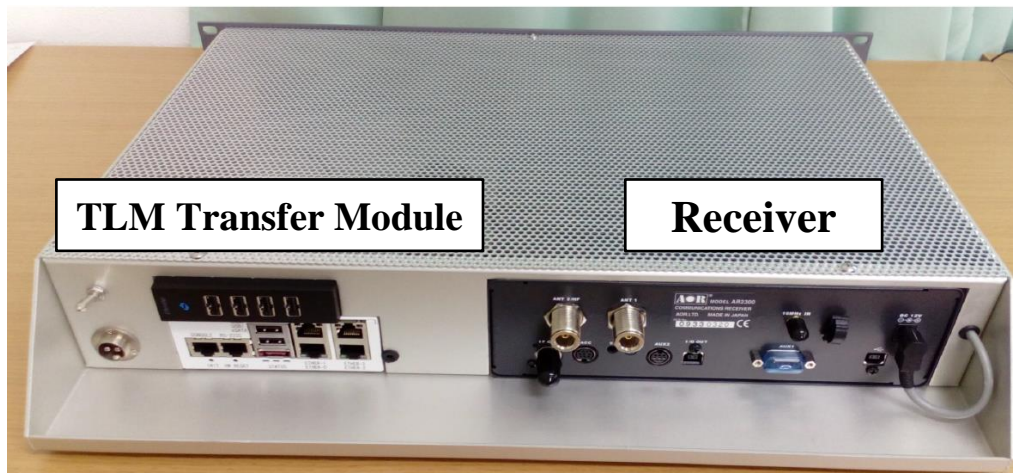
Istanbul Technical University (ITU) Space Systems Design and Test Lab.  
 Stellar Station Installation Proposal  
 Proposal of integration



# GSN Device



Front Panel

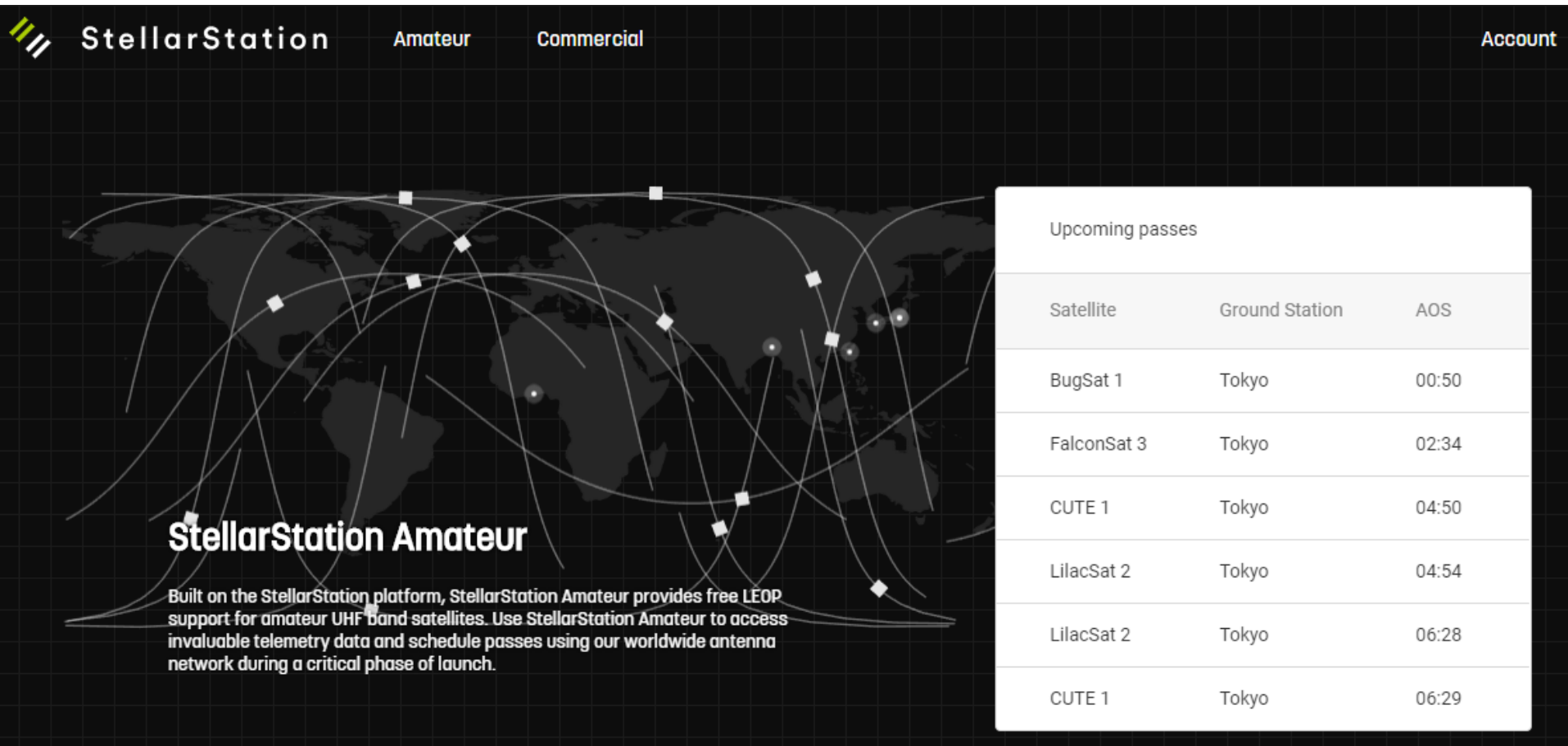


Rear Panel

- Receiver
  - Satellite downlink signal reception
  - Output in IQ data (raw data)
  - Centralized demodulation and decoding are done by software defined radio (SDR) at Central Server.
- TLM transfer
  - Transfer IQ data or processed data to Central Server
- Transmitter (optional)
  - Satellite uplink signal transmission
  - Encoded and modulated IQ data from Centralized SDR at Central server and transmits uplink signal to satellite.

# How use our GS network?

Go to: <https://www.stellarstation.com/amateur>  
and Sign up for an account



**StellarStation Amateur**

Built on the StellarStation platform, StellarStation Amateur provides free LEOP support for amateur UHF band satellites. Use StellarStation Amateur to access invaluable telemetry data and schedule passes using our worldwide antenna network during a critical phase of launch.

| Satellite   | Ground Station | AOS   |
|-------------|----------------|-------|
| BugSat 1    | Tokyo          | 00:50 |
| FalconSat 3 | Tokyo          | 02:34 |
| CUTE 1      | Tokyo          | 04:50 |
| LilacSat 2  | Tokyo          | 04:54 |
| LilacSat 2  | Tokyo          | 06:28 |
| CUTE 1      | Tokyo          | 06:29 |

# Select satellite and download data

Latest Telemetry [2 days of tracking left](#)

[How to decode the IQ data](#)

| Status     | AOS (Local Time) | LOS (Local Time) | Duration | Max Elevation | Ground Station |           |
|------------|------------------|------------------|----------|---------------|----------------|-----------|
| Upcoming   | 2018/06/19 13:09 | 2018/06/19 13:19 | 09:30    | 73°           | Tokyo          | Scheduled |
| Upcoming   | 2018/06/18 14:26 | 2018/06/18 14:35 | 08:49    | 21°           | Tokyo          | Scheduled |
| Upcoming   | 2018/06/18 12:51 | 2018/06/18 13:00 | 09:02    | 22°           | Tokyo          |           |
| Downlinked | 2018/06/17 14:07 | 2018/06/17 14:16 | 09:30    | 82°           | Tokyo          | Download  |
| Downlinked | 2018/06/17 06:09 | 2018/06/17 06:18 | 09:09    | 28°           | Tokyo          | Download  |
| Downlinked | 2018/06/16 15:23 | 2018/06/16 15:32 | 08:30    | 16°           | Tokyo          | Download  |
| Downlinked | 2018/06/16 13:48 | 2018/06/16 13:58 | 09:11    | 27°           | Tokyo          | Download  |

Click for download



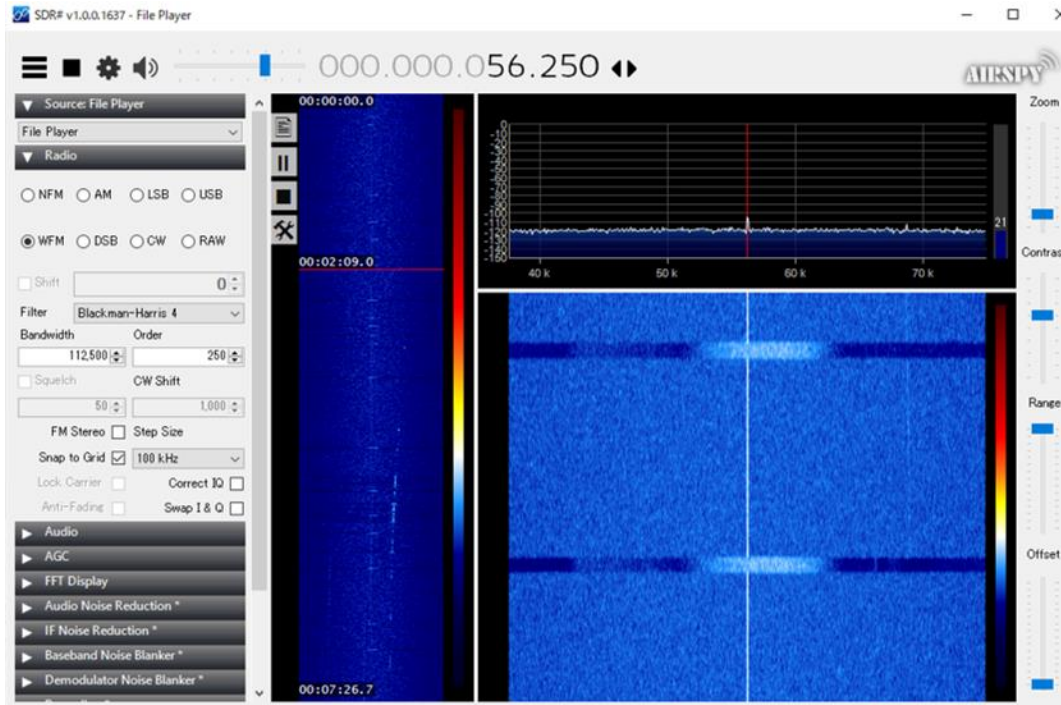
## Use web based GUI to:

- Download telemetry (Raw Data) from satellites
  - See available passes across the world
- Demodulate / Decode in the cloud and view the Telemetry in browser.\*

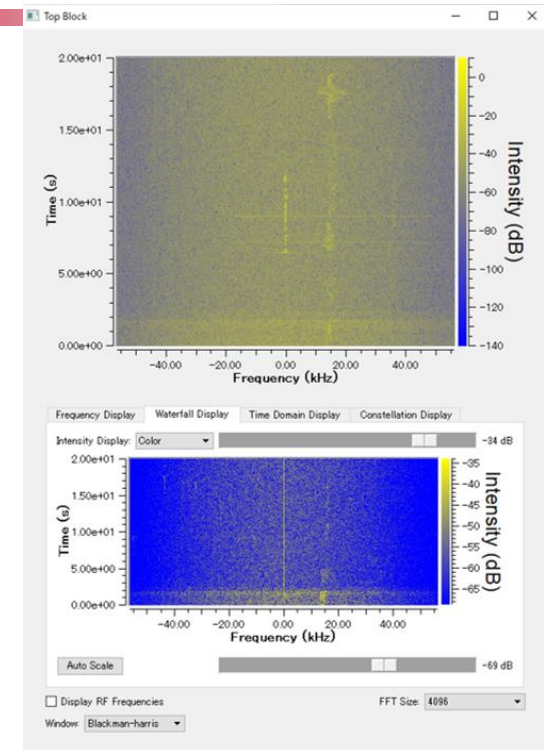
\* To be available



# Re-processing satellite downlink data



**SDR#**



**GNU Radio**

The satellite downlink data can be re-play and processing by using **SDR#** and **GNU radio**

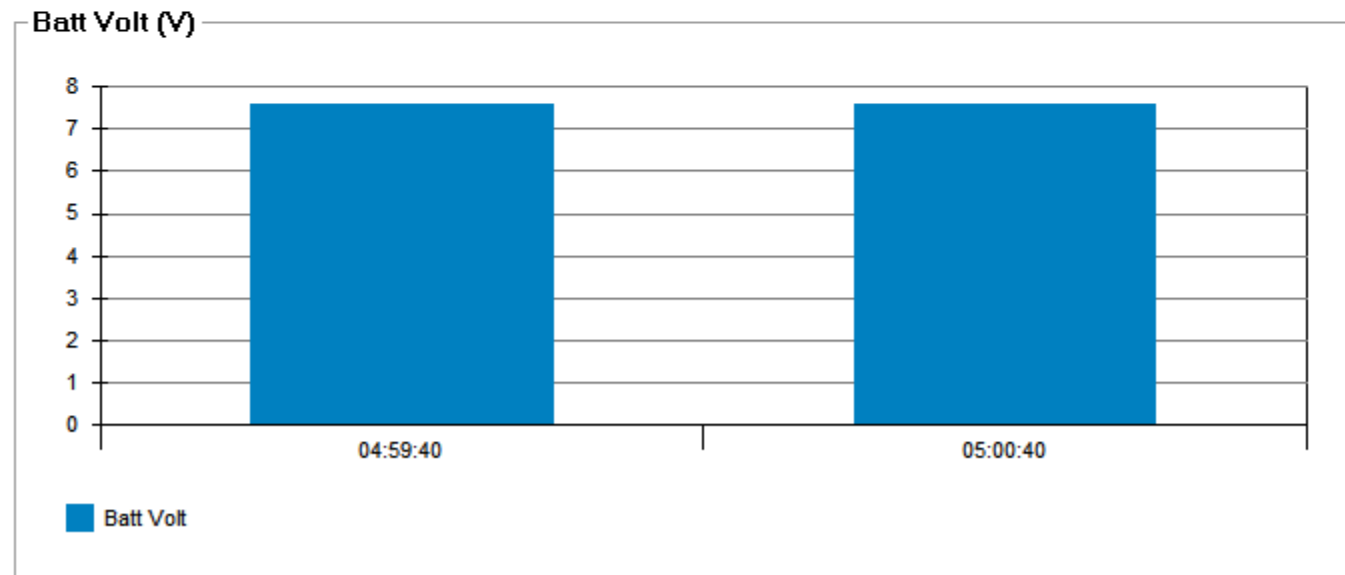
\* To be available

# Downloaded Data

|  |       |  |                                      |  |            |   |
|--|-------|--|--------------------------------------|--|------------|---|
| <input type="radio"/> Packet ID            | 2827  | <input type="radio"/> Mode               | SAFE                                 | <input type="radio"/> Exec Number        | 1291845    |   |
| <input type="radio"/> MCU Status           | ON    | <input type="radio"/> Beacon Status      | ON                                   | <input type="radio"/> Modem Status       | ON         |   |
| <input type="radio"/> SD Card 1 Status     | ON    | <input type="radio"/> SD Card 2 Status   | ON                                   | <input type="radio"/> EPS Status         | ON         |   |
| <input type="radio"/> Battery Status       | ON    | <input type="radio"/> Transponder Status | OFF                                  | <input type="radio"/> Control Card Speed | OFF        |   |
| <input type="radio"/> Accel Status         | OFF   | <input type="radio"/> Magn Status        | OFF                                  | <input type="radio"/> Gyro Status        | OFF        |   |
| <input type="radio"/> Accel X              | 0.00  | g  | <input type="radio"/> Accel Y        | 0.00                                     | g          |   |
| <input type="radio"/> Magn X               | 0.00  | μT                                       | <input type="radio"/> Magn Y         | 0.00                                     | μT         |   |
| <input type="radio"/> Gyro X               | 0.00  | deg/s                                    | <input type="radio"/> Gyro Y         | 0.00                                     | deg/s      |   |
| <input type="radio"/> BCR1 Volt            | 0.05  | V  | <input type="radio"/> BCR1A Curr     | 1.96                                     | mA         |   |
| <input type="radio"/> BCR2 Volt            | 0.05  | V  | <input type="radio"/> BCR2A Curr     | 1.96                                     | mA         |   |
| <input type="radio"/> BCR3B Curr           | 1.96  | mA                                       | <input type="radio"/> BCR3A Curr     | 1.96                                     | mA         |   |
| <input type="radio"/> 3V3 Curr Usage       | 21.24 |  | <input type="radio"/> Diode Out Volt | 7.65                                     | V          |   |
| <input type="radio"/> EPS Batt Volt        | 7.53  | V  | <input type="radio"/> EPS Batt Curr  | 36.66                                    | mA         |   |
| <input type="radio"/> 3V3 Curr             | 0.00  |  | <input type="radio"/> 5V Volt        | 5.04                                     | V          |   |
| <input checked="" type="radio"/> Batt Volt | 7.61  | V  | <input type="radio"/> EPS Temp       | -273.15                                  | C          |   |
| <input type="radio"/> Batt Temp            | 21.82 | C  | <input type="radio"/> Batt Curr Dir  | CHAR                                     | mA         |   |
| <input type="radio"/> Batt 3V3 Curr        | 6.64  | mA                                       | <input type="radio"/> Batt 5V Volt   | 5.04                                     | V          |   |
| <input type="radio"/> Batt 1 Heater        | OFF   |  | <input type="radio"/> Batt 1 Temp    | 23.05                                    | C          |   |
| <input type="radio"/> Batt2 Temp           | 23.85 | C  | <input type="radio"/> Batt 2 Heater  | OFF                                      |            |   |
| <input type="radio"/> Batt 3 Heater        | OFF   |  | <input type="radio"/> OBC Uptime     |  |            |   |
|  |       |  |                                      | <input type="radio"/> Batt 3 Temp        | 23.45      | C |
|  |       |  |                                      | <input type="radio"/> Transp Act Time    | 01/01/1970 |   |

YM1RAS -> TA2MKA

18/08/1976 03:54:02



D:\Amateurfunk\UBAKUSAT\ubakusat\_12052018\_0458.kss

#1 / 2



# How to join the Global Antenna Sharing Project with your Antenna

- Contact us to get a template of MoU.
- Review the MoU and make revisions that you deem necessary.
- Fill out Antenna Configuration Questionnaire: <https://goo.gl/forms/FNYypPrzHNR1V5vu2>
- A Block Diagram of your ground station is required to be sent.

# Further Benefits

UNISEC-Global provides Information and help on:

- How to operate a satellite
- Regulations and frequency coordination
- Ground Station Network Access
- Frequency Sharing

# WHAT ?

- How can ease and increase participation in the GS network
- Interaction with others (Satnogs!)
- Other points to consider?

Questions?  
Thank you

# Contact

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