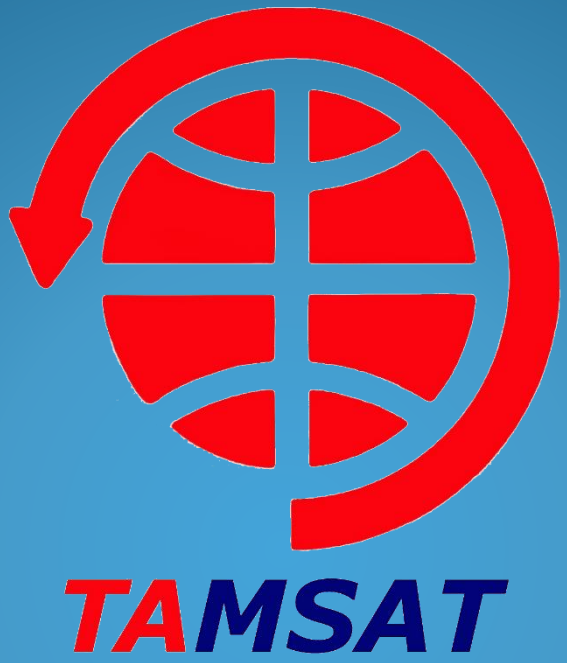


TAMSAT Amateur Satellite Technologies Organization (2010)

Burcu AYBAK
General Secretary

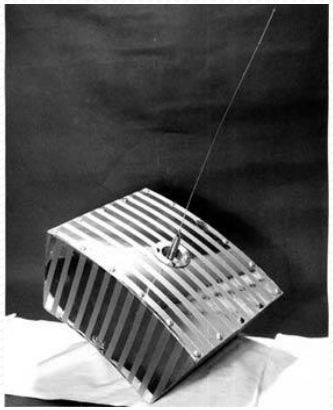
Barış DİNÇ
Vice President (Engineering)

Content

- TAMSAT Mission Vission
- Active Working Groups in TAMSAT
- Activities in TAMSAT
- TAMSAT in Press
- What is Cubesat?
- What is Satellite Communication?
- Satellite Subsystems
- Cubesat Project Lifecycle in TAMSAT
- Turksat 3USAT
- Anatomy of a Cubesat
- Cubesat Bus
- Cubesat Printout Standart
- The Structure (Skeleton)
- OBC&BEACON
- Antenna Opening Subsystem
- Payload-1(Transponder)
- Free Space Loss
- Payload-2 (Tamsat MicroSAT)
- The Mass Matters
- TAMSAT IHU
- TAMSAT Transponder
- TAMSAT OBC
- TAMSAT Beacon
- TAMSAT Satellite Tracking Network

AMSAT®

The **Radio Amateur Satellite Corporation** (as AMSAT is officially known) was first formed in the District of Columbia in 1969 as an educational organization. Its goal was to foster Amateur Radio's participation in space research and communication. AMSAT was founded to continue the efforts, begun in 1961, by Project **OSCAR** , a west coast USA-based group which built and launched the very first Amateur Radio satellite, OSCAR, on December 12, 1961, barely four years after the launch of Russia's first Sputnik.



AMATEUR RADIO IN SPACE
AMSAT®

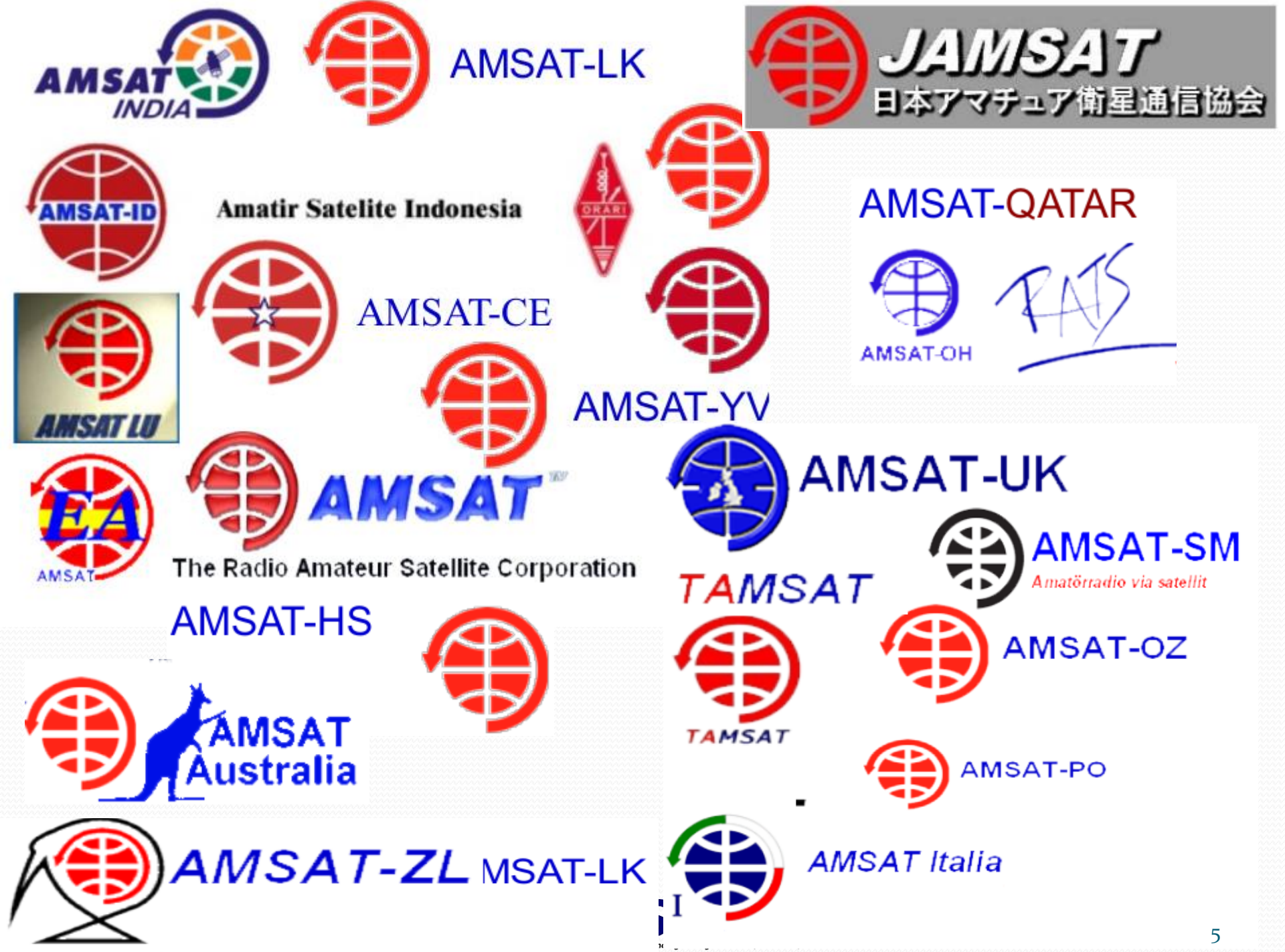
TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

AMSAT®

For over 48 years AMSAT groups in North America and elsewhere have played a key role in significantly advancing the state of the art in space science, space education, and space technology.

Undoubtedly, the work now being done by **AMSAT volunteers** throughout the world will continue to have far-reaching, positive effects on the very future of both Amateur Radio, as well as other governmental, scientific and commercial activities in the final frontier.

Rarely have a group of “amateur” volunteers managed to do so much…for so many…with so little.


AMSAT INDIA
AMSAT-LK
JAMSAT
日本アマチュア衛星通信協会
AMSAT-ID
Amatir Satelite Indonesia
AMSAT-QATAR
AMSAT-OH
AMSAT-CE
AMSAT LU
AMSAT-YV
AMSAT-UK
EA
AMSAT
AMSAT
The Radio Amateur Satellite Corporation
AMSAT-SM
Amatörradio via satellit
TAMSAT
AMSAT-HS
AMSAT-OZ
TAMSAT
AMSAT Australia
AMSAT-PO
AMSAT-ZL
MSAT-LK
AMSAT Italia

TAMSAT

OUR MISSION:

- Development, production and support of scientific amateur satellites,
- Research and Development (R&D) activities of national satellites,
- Education and Training support for satellites and space sciences,
- Sharing information to be used by ham radio operators,
- Organizing seminars and courses to increase the awareness of young people,
- Coordination with the international organizations and coordinators.

TAMSAT

OUR VISION:

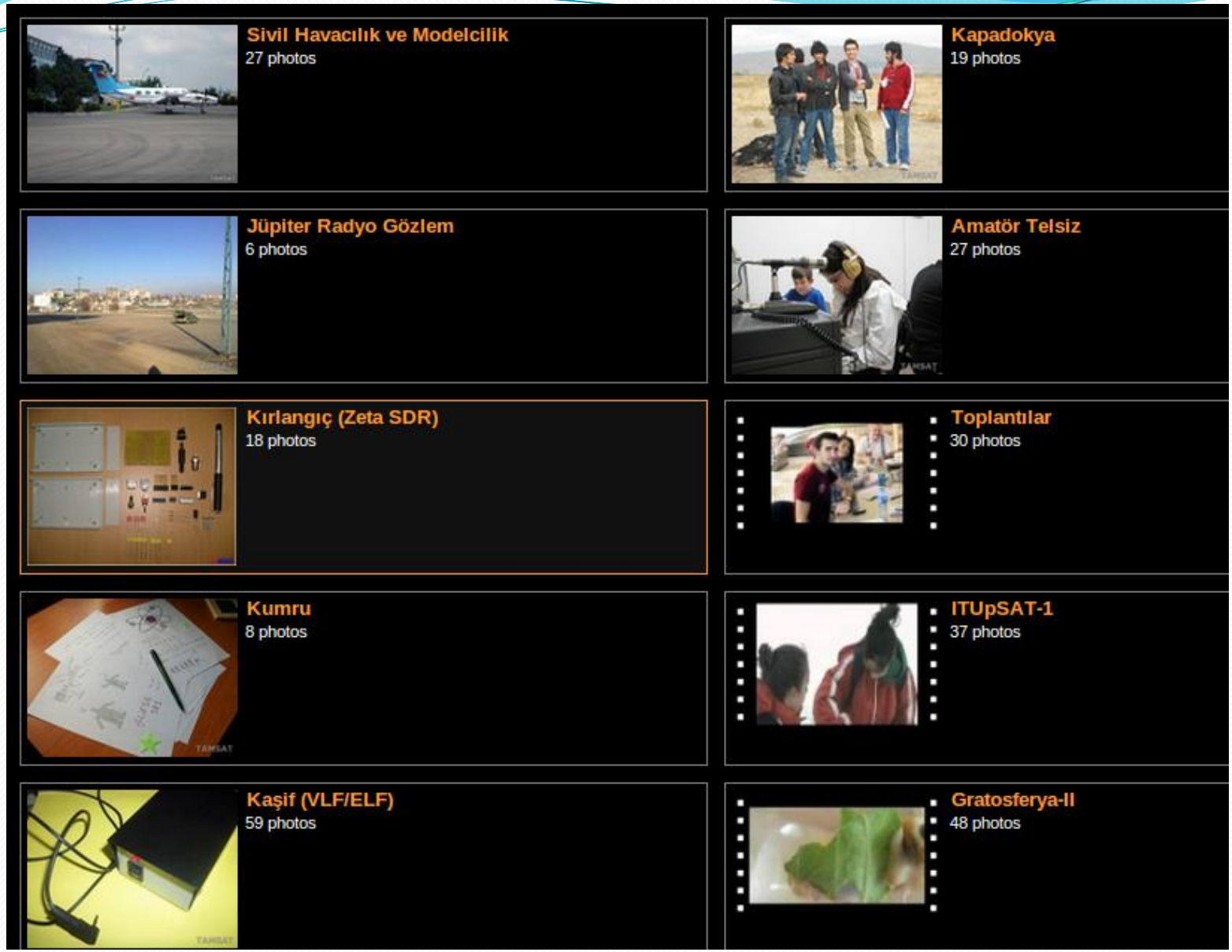
- Supporting Turkish Youth to build national satellites and subsystems,
- Importing required equipment and devices to support researches,
- Coordinating the usage of amateur satellites to support disaster communications and public safety,
- Equipment support for ham radio satellite ground stations operated by scout clubs, amateur radio clubs and search & rescue organizations.

Active Working Groups in TAMSAT

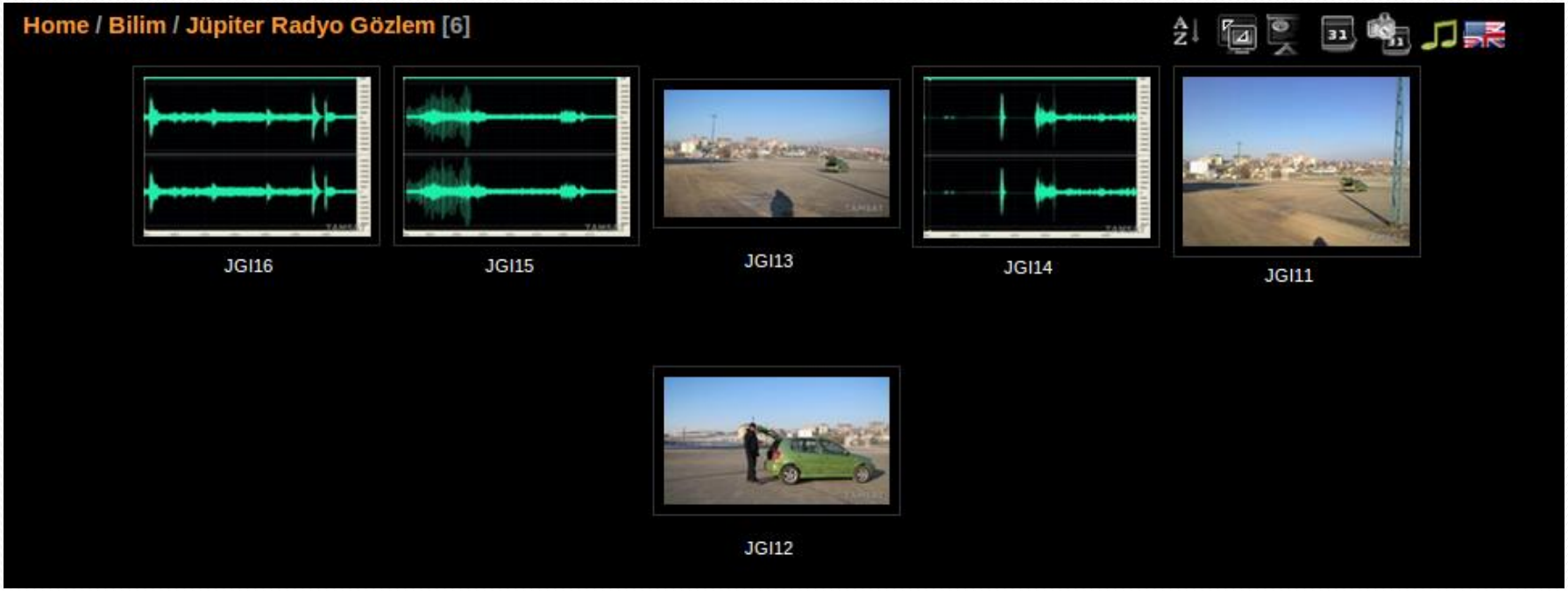
- Project Management
- CAD/CAM/Animation Team
- Digital Payload Module Group
- Amateur Satellite Integration and Test Team
- Budget & Finance Team
- Ground Stations and Monitoring Team
- Regulation & Frequency Coordination Team
- Structure Design Group
- Software Design & Development Team
- Antenna Design Group

http://www.tamsat.org.tr

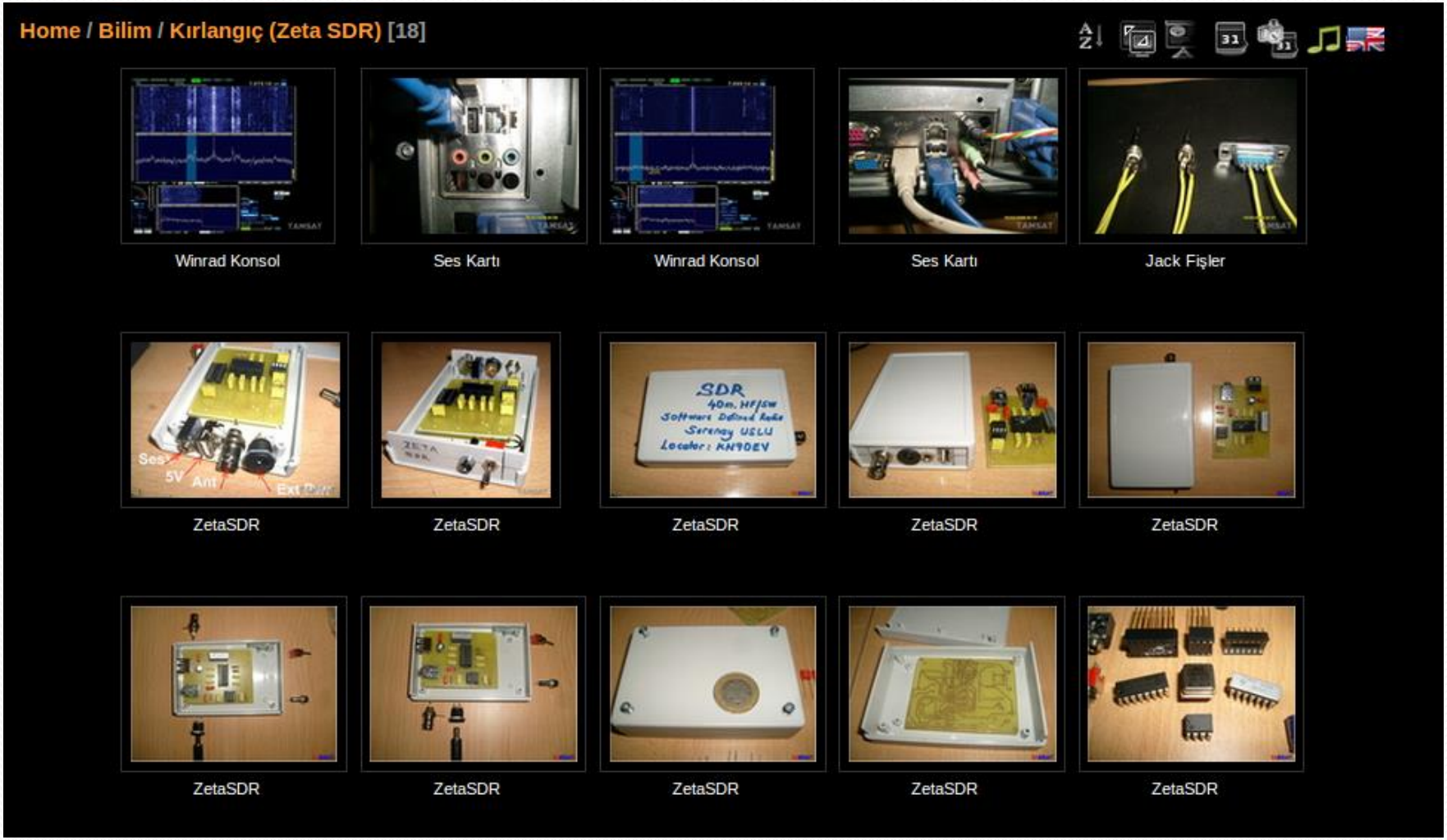
ACTIVITIES in TAMSAT



ACTIVITIES in TAMSAT

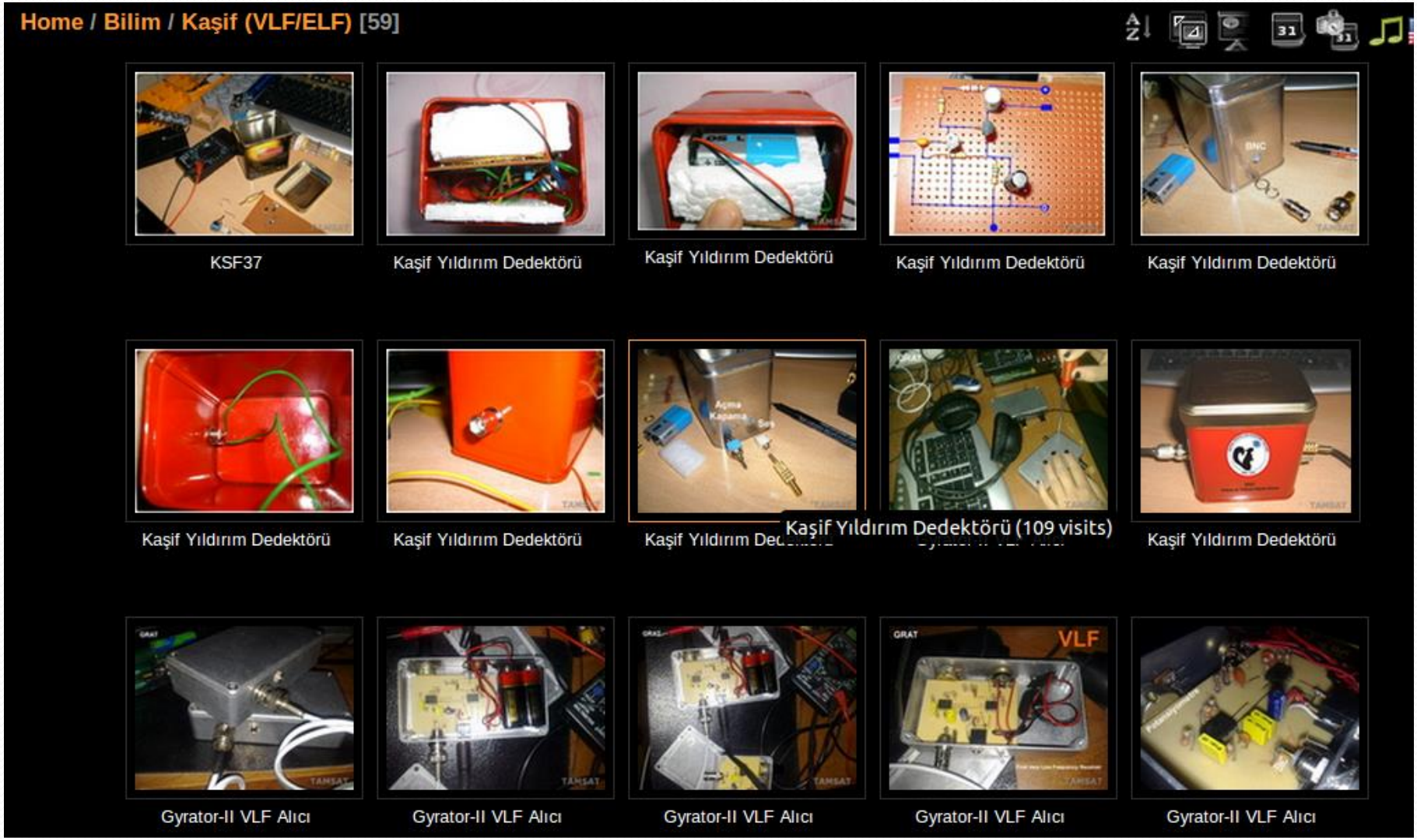


ACTIVITIES in TAMSAT



TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

ACTIVITIES in TAMSAT



ACTIVITIES in TAMSAT

Home / Bilim / Kaşif (VLF/ELF) [59]


Gyrator-II VLF Alıcı


Gyrator-II VLF Alıcı


Gyrator-II VLF Alıcı


KSF21


VLF Güneş Gözlem


VLF Güneş Gözlem


VLF Güneş Gözlem


VLF Güneş Gözlem


VLF Güneş Gözlem


VLF Güneş Gözlem


VLF Güneş Gözlem


VLF Güneş Gözlem


GGI11


GGI12

TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

ACTIVITIES in TAMSAT

Home / Bilim / Gratosferya-II [48]


GFI30


GFI29


GFI27


GFI28

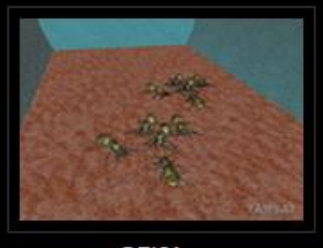

GFI25


GFI26


GFI22

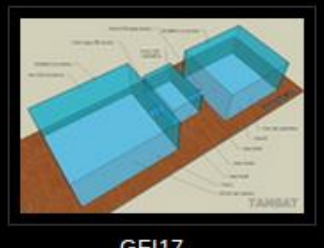

GFI23


GFI24


GFI21


GFI20

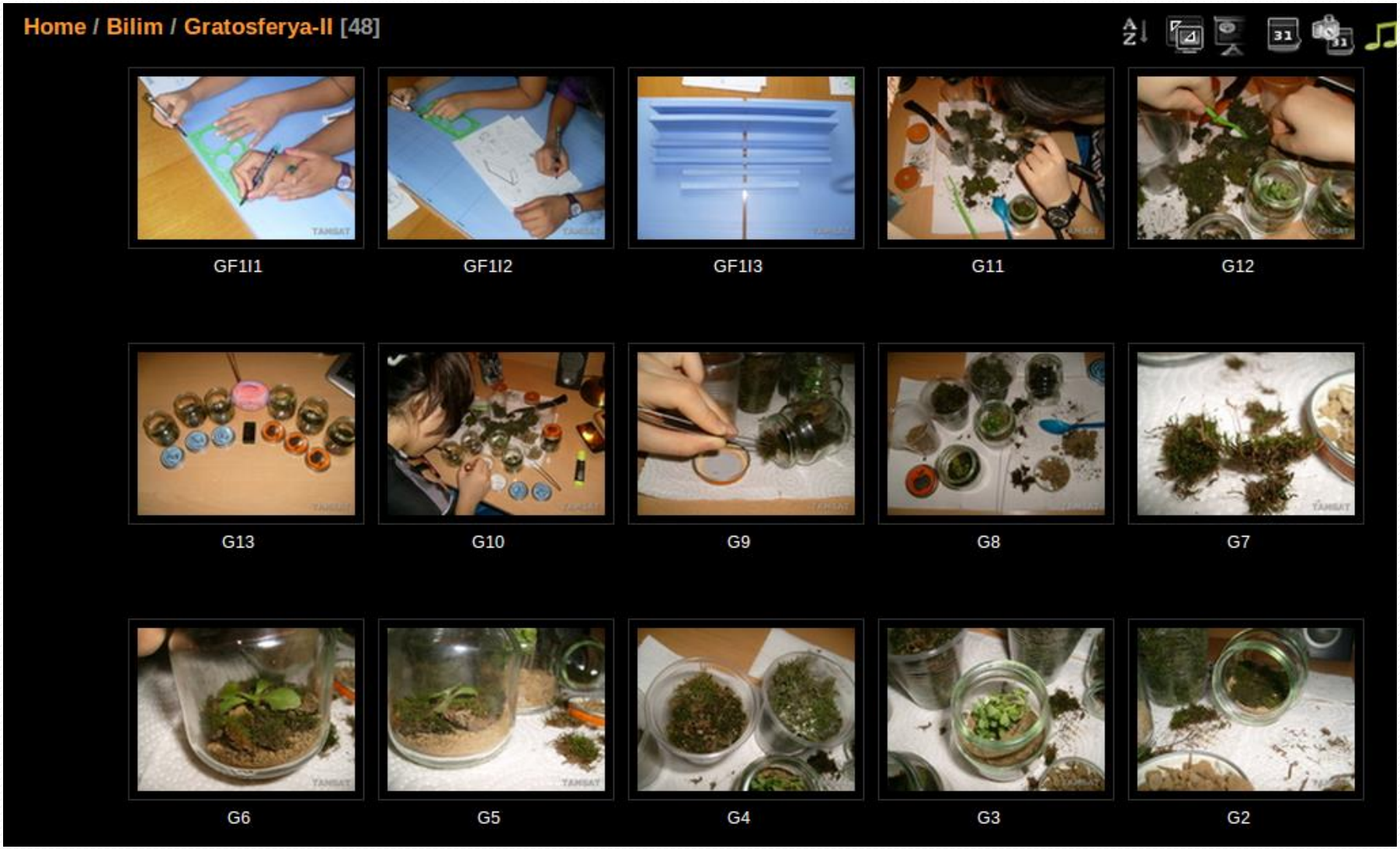

GFI19


GFI17


GFI18


GFI16

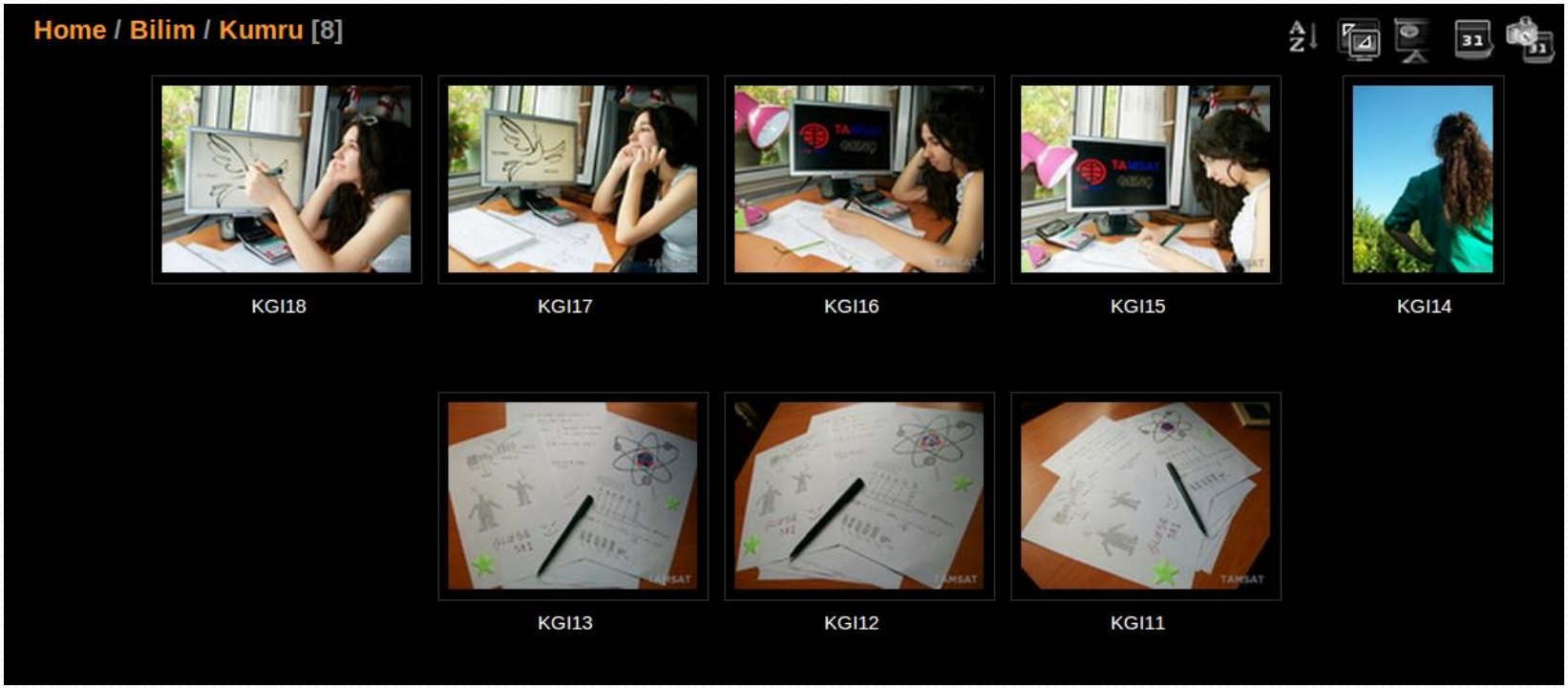
ACTIVITIES in TAMSAT



ACTIVITIES in TAMSAT

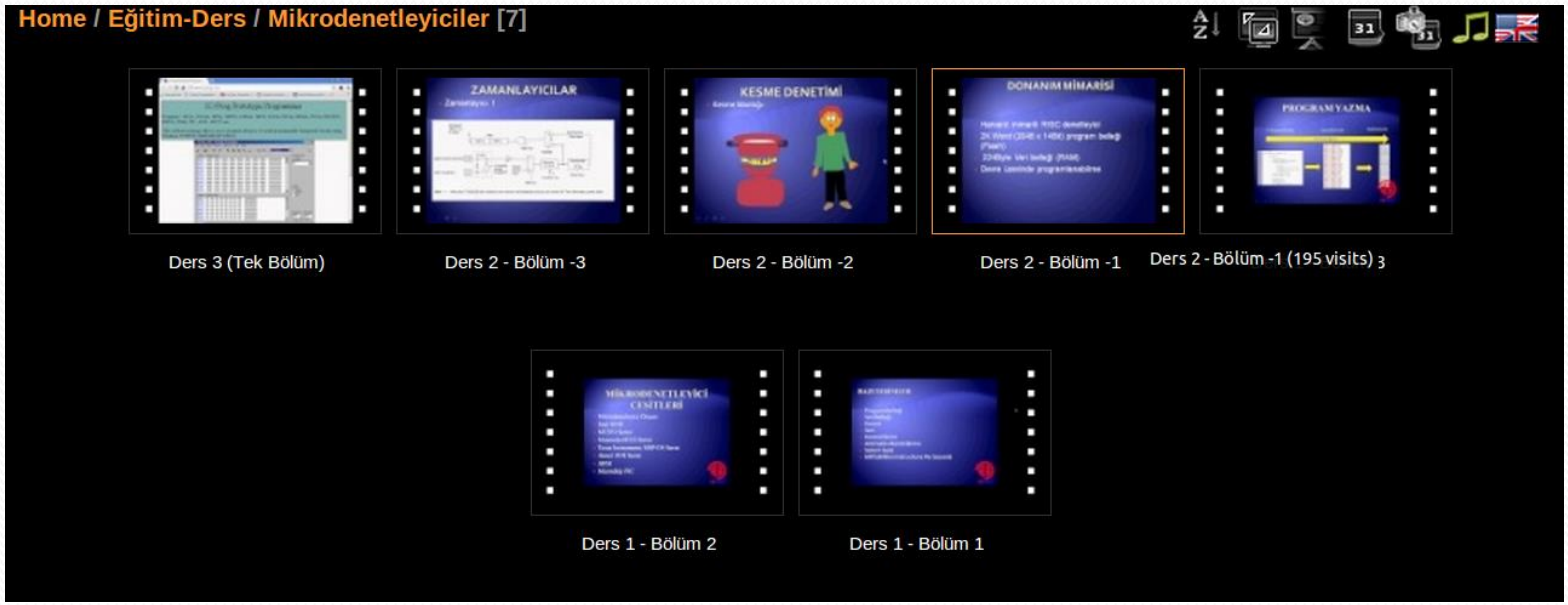
ACTIVITIES in TAMSAT

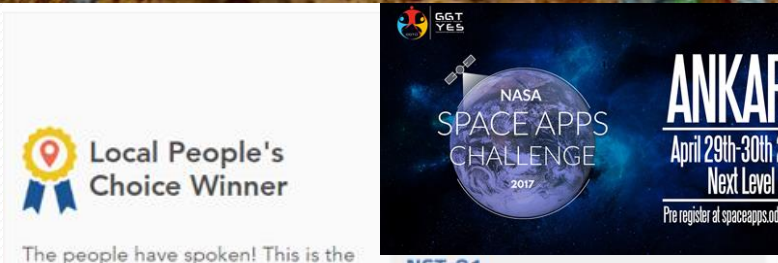
ACTIVITIES in TAMSAT



TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

ACTIVITIES in TAMSAT





Local People's Choice Winner

The people have spoken! This is the project that captured our hearts.

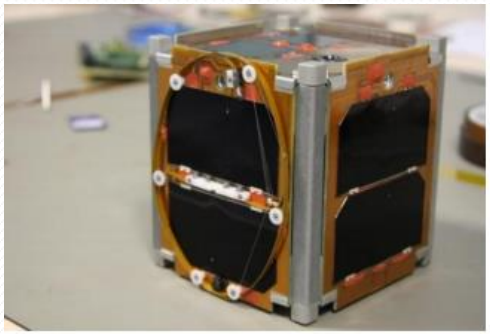
NST-01

Innovation

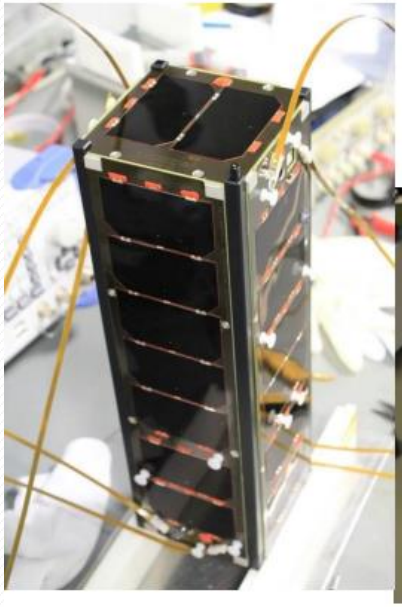
Ankara | 7 members

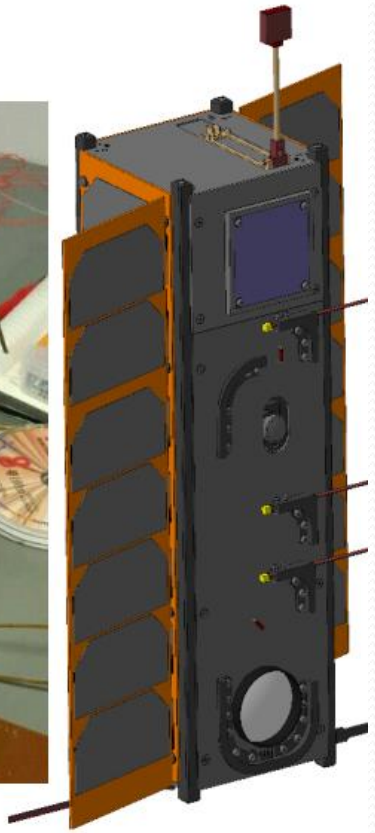
TAMSAT in Press

What is CUBESAT?



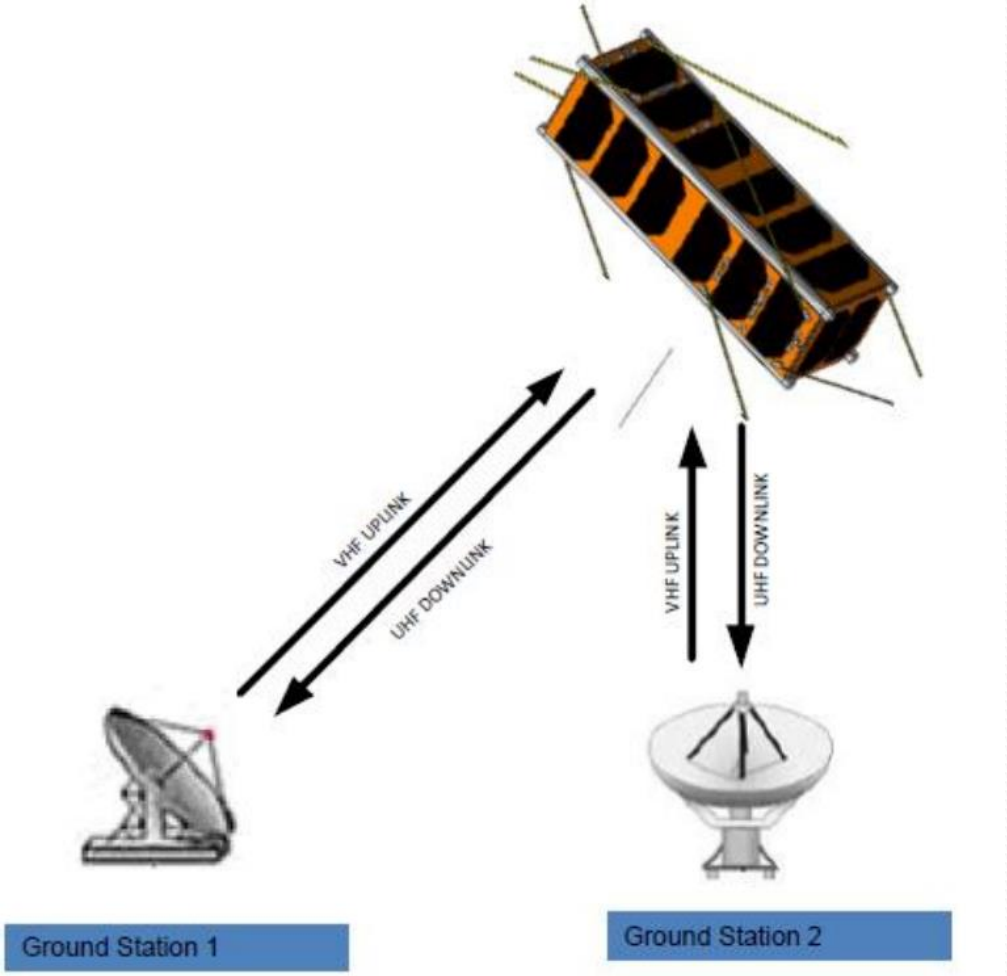
ITUPSAT1: 2009
TURKSAT 3USAT: 2013
BEEAGLESAT and HAVELSAT: 2017
UBAKUSAT: 2018



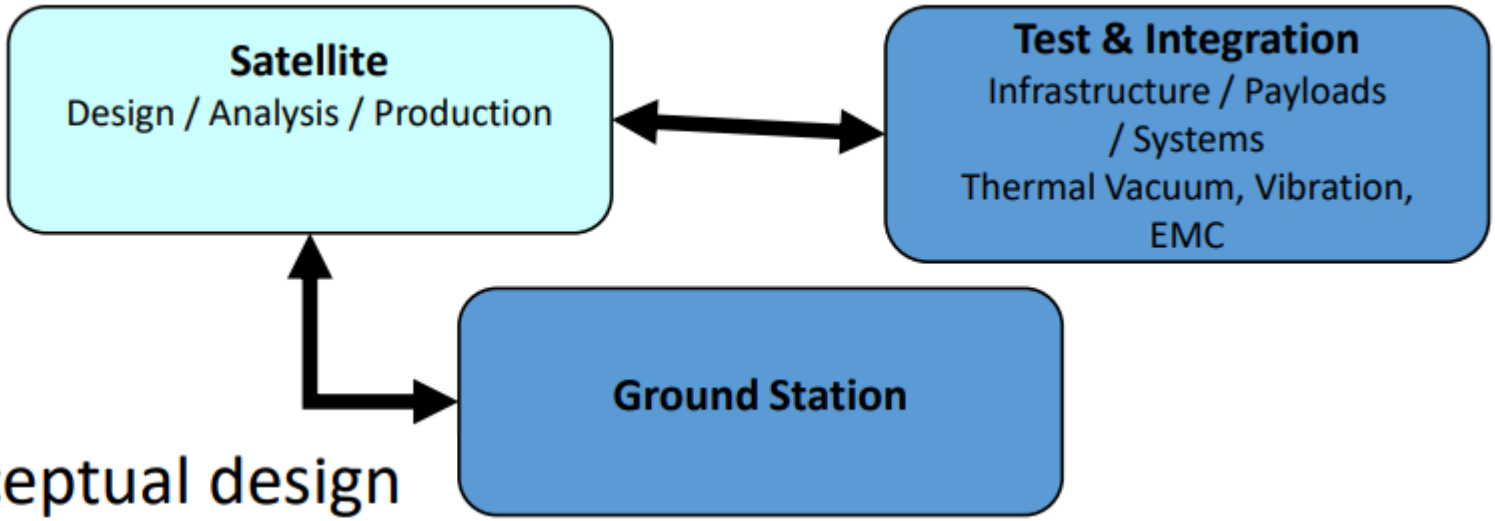


TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

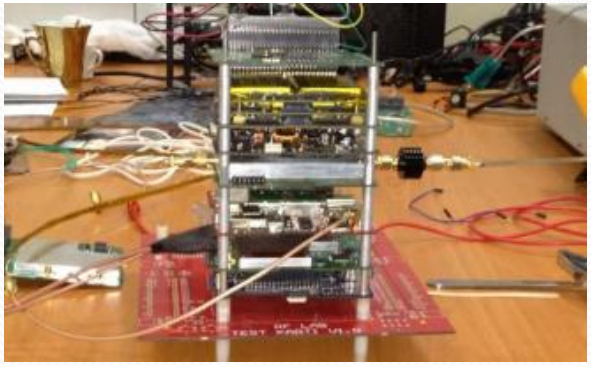
What is Satellite Communication?

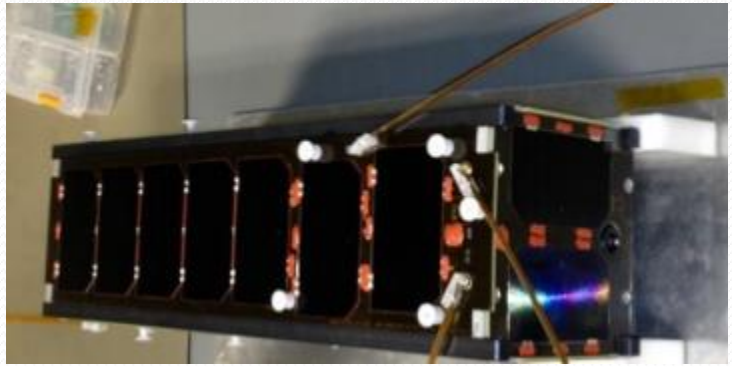


Satellite Subsystems



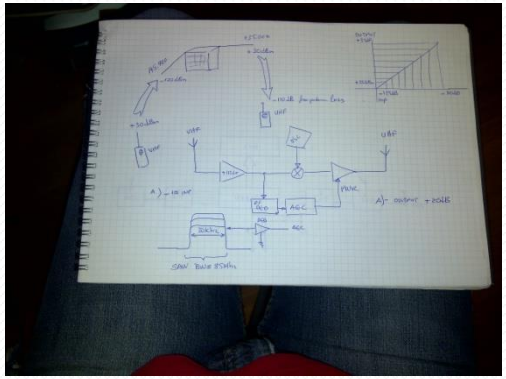
- Conceptual design
- Desktop model
- Engineering model
- Flight Model



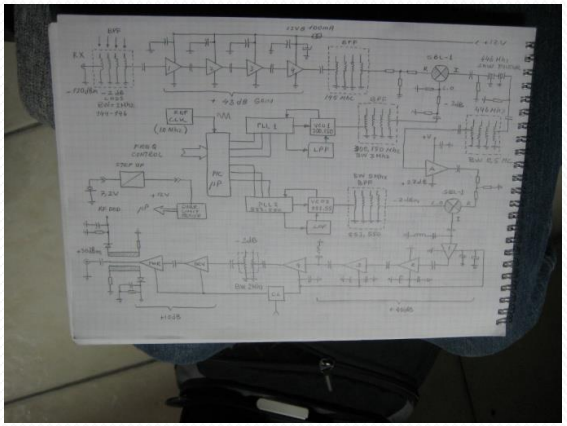


TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

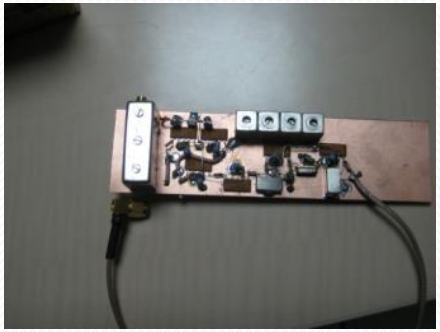
CUBESAT Project Lifecycle in TAMSAT



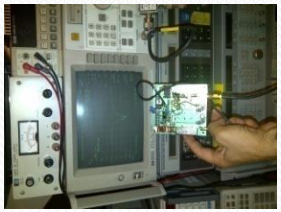
- Concept Of Operation
- Requirements



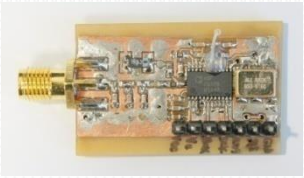
Preliminary Design



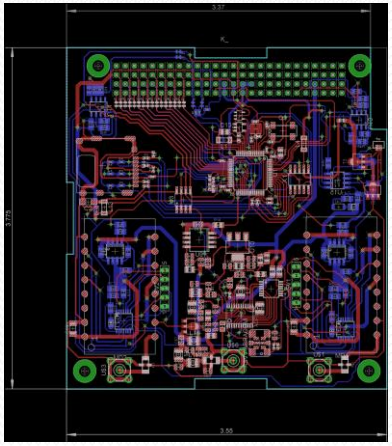
Preliminary Prototypes



Lab Tests



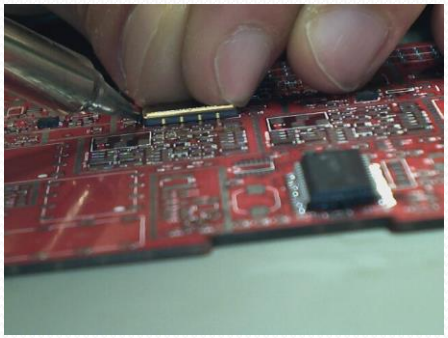
More Prototypes



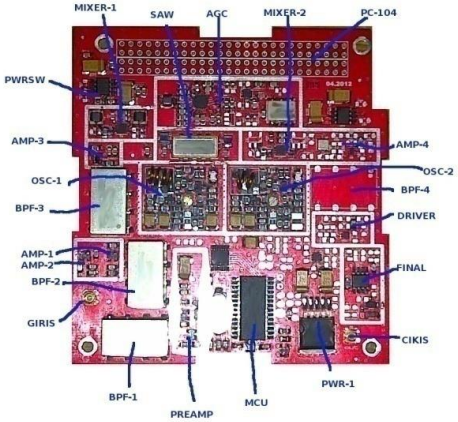
Final Design

TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

CUBESAT Project Lifecycle in TAMSAT

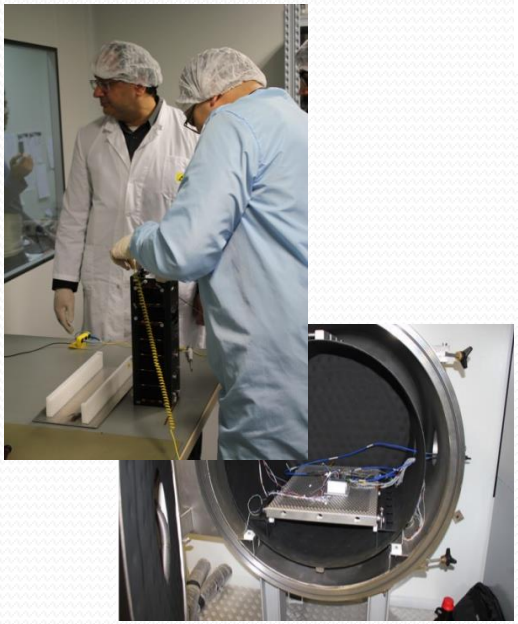


Production

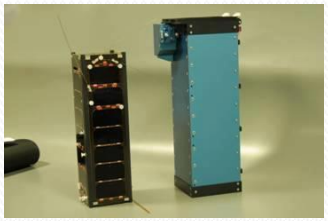


First Prduct

Integration



Final Space Tests

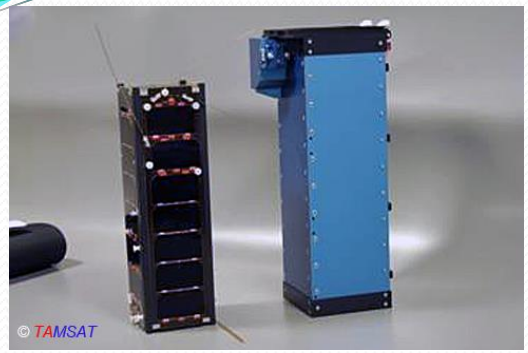


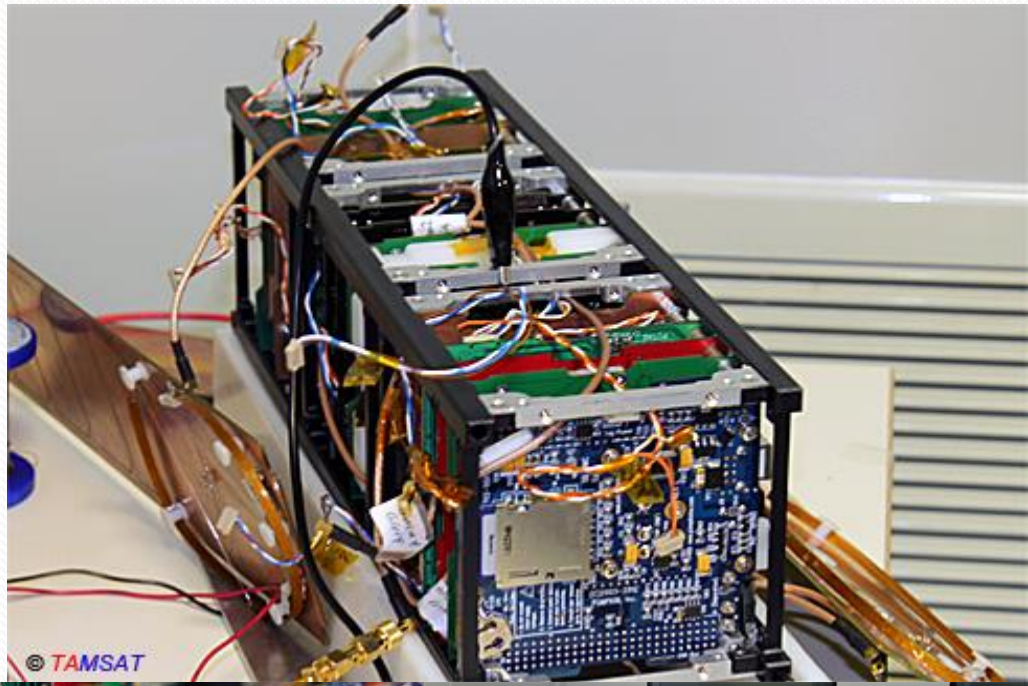
Ready for Launch

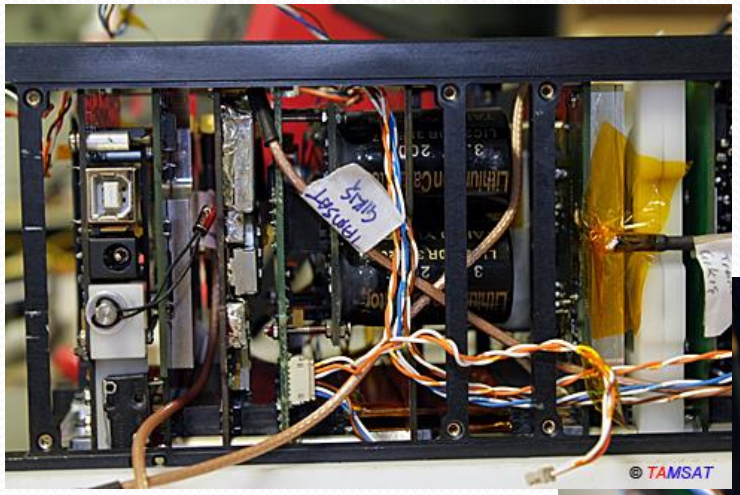
Journey to Space

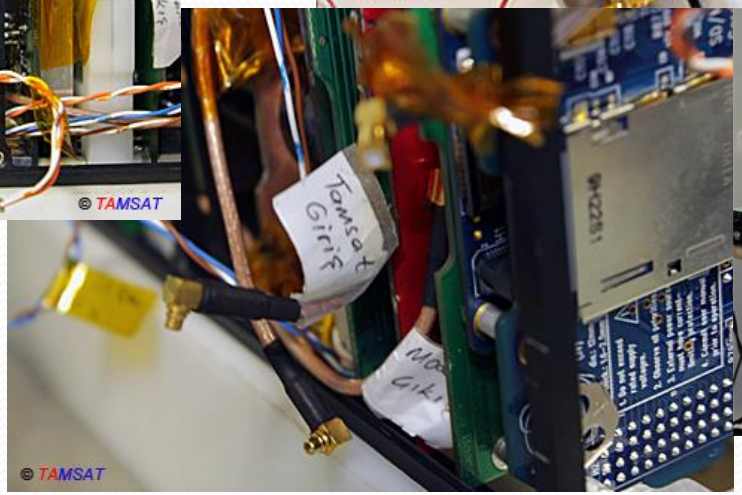
TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

TURKSAT 3USAT



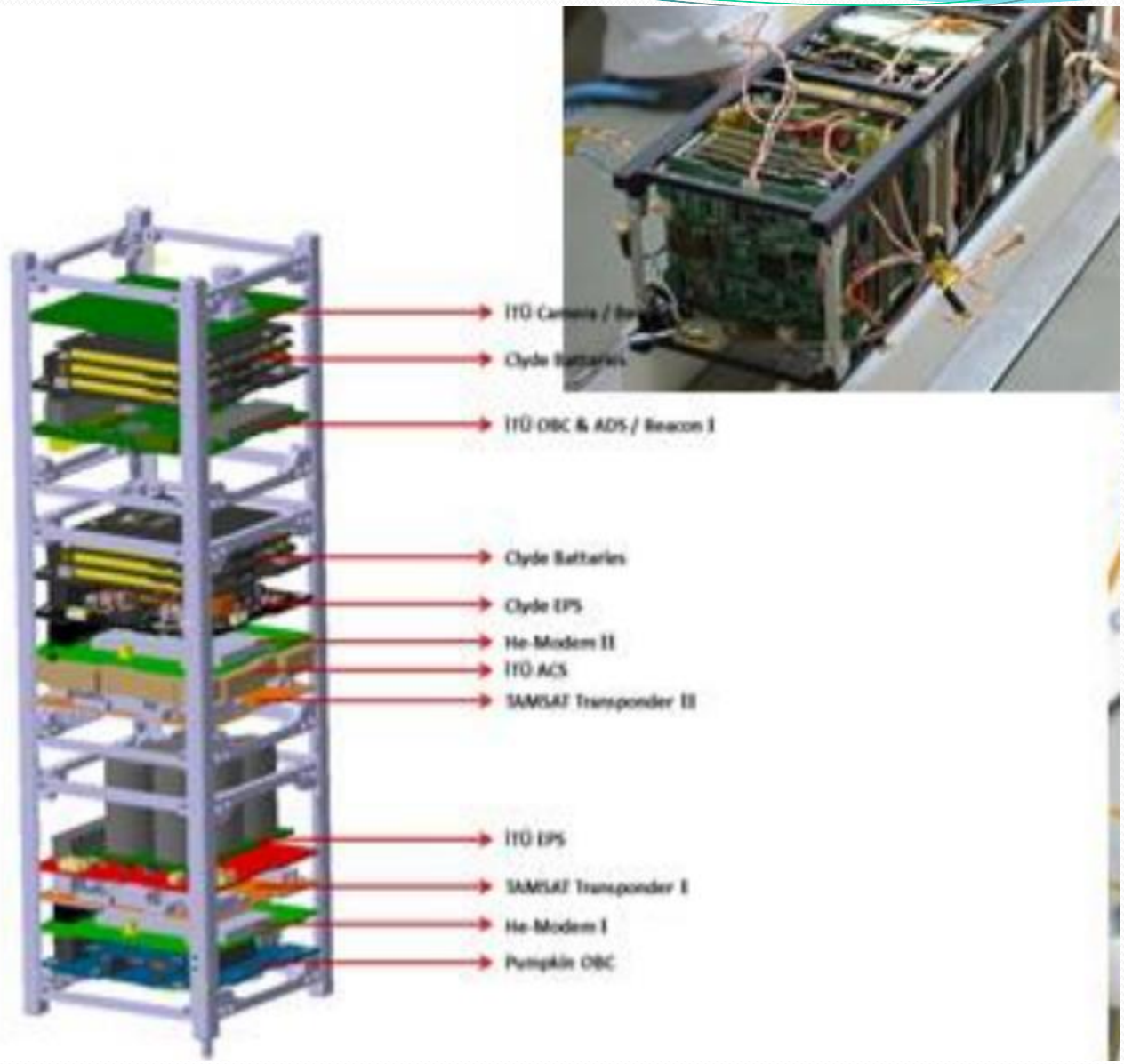






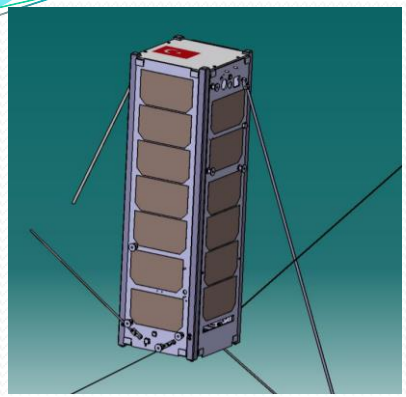
TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

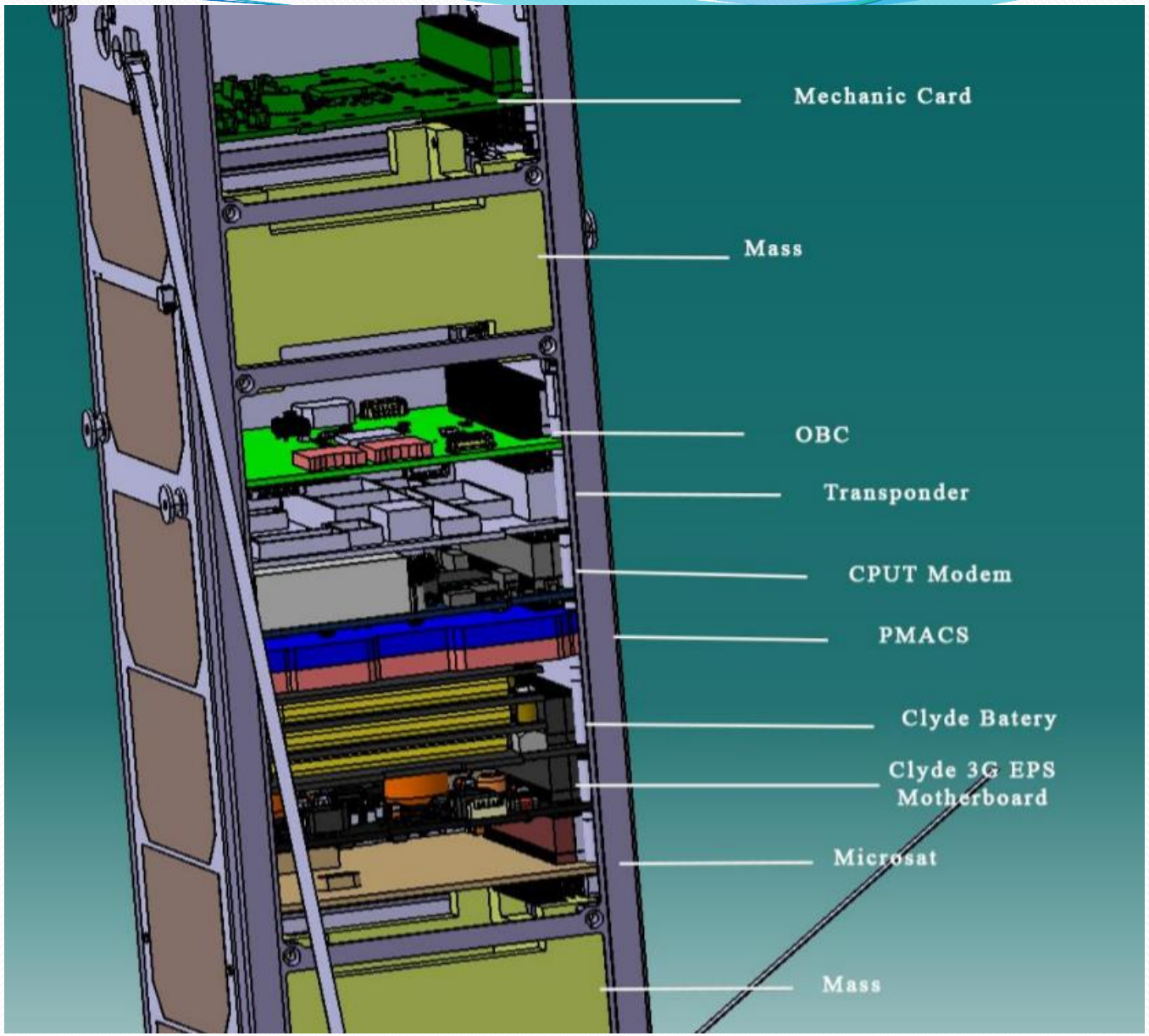
ANATOMY of a CUBESAT



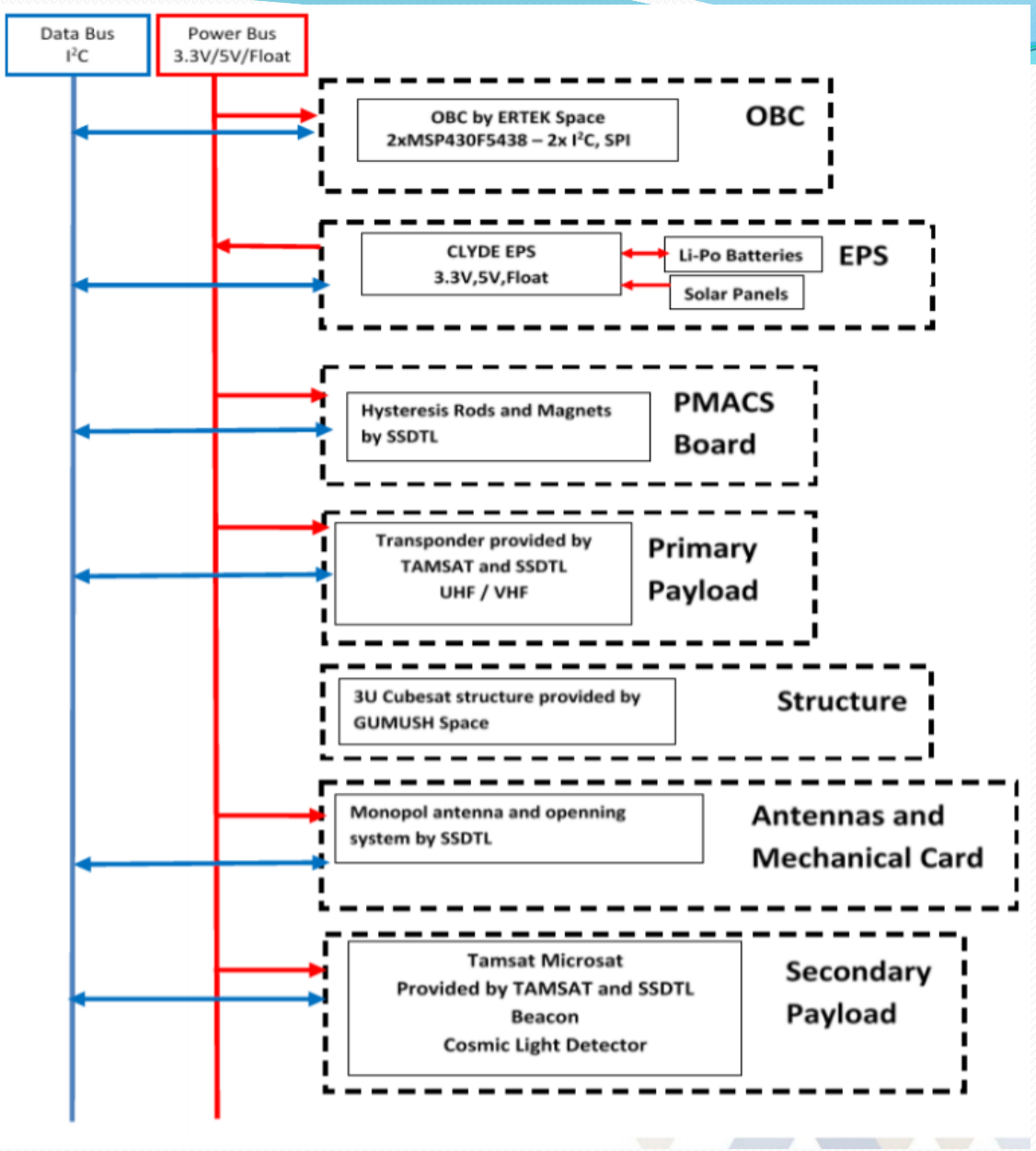
TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

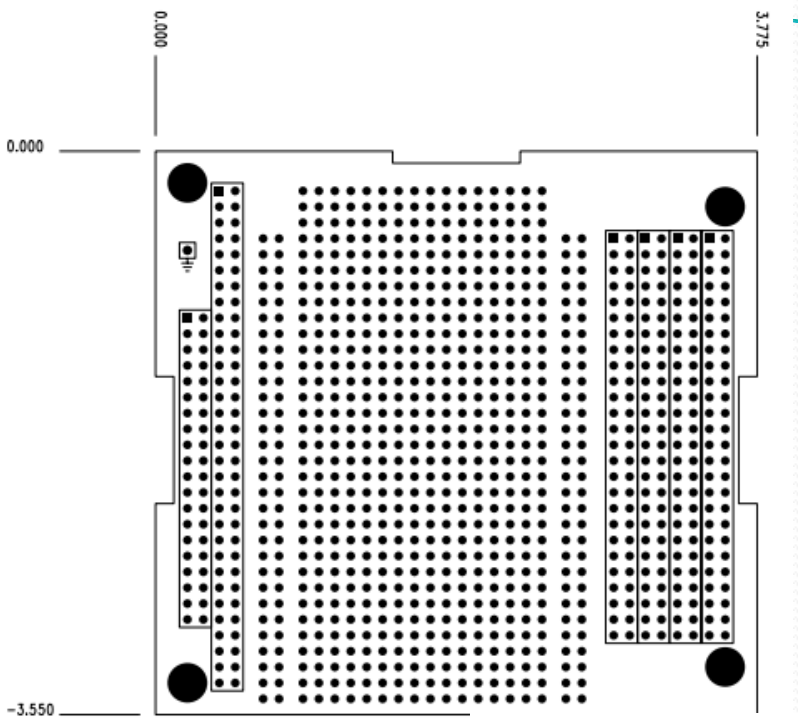
ANATOMY of a CUBESAT

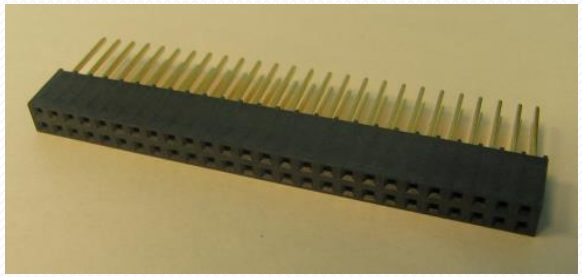


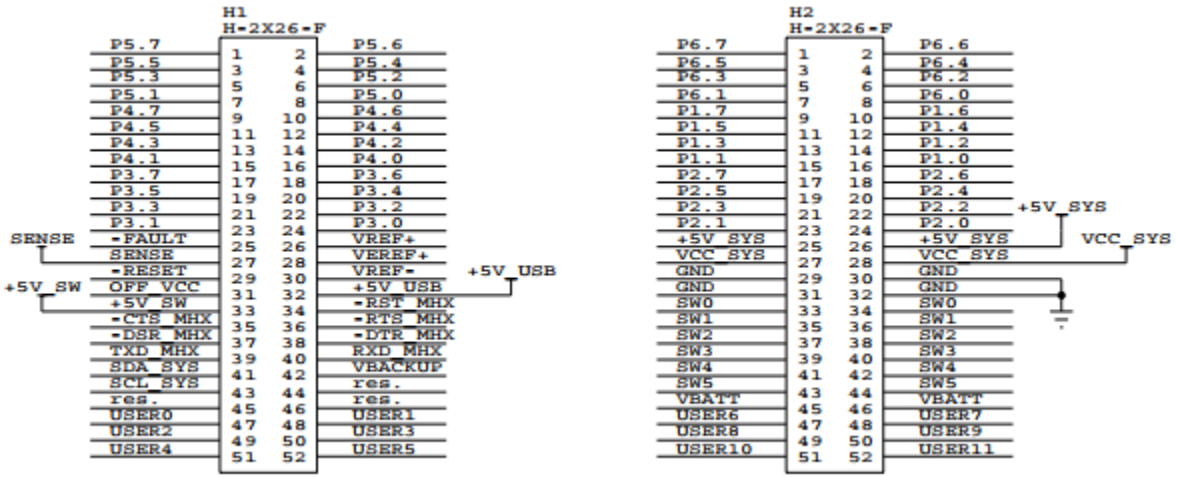


CUBESAT BUS


Data Bus
I²C
Power Bus
3.3V/5V/Float
OBC by ERTEK Space
2xMSP430F5438 – 2x I²C, SPI
OBC
CLYDE EPS
3.3V,5V,Float
Li-Po Batteries
Solar Panels
EPS
Hysteresis Rods and Magnets
by SSDTL
PMACS
Board
Transponder provided by
TAMSAT and SSDTL
UHF / VHF
Primary
Payload
3U Cubesat structure provided by
GUMUSH Space
Structure
Monopol antenna and openning
system by SSDTL
Antennas and
Mechanical Card
Tamsat Microsat
Provided by TAMSAT and SSDTL
Beacon
Cosmic Light Detector
Secondary
Payload



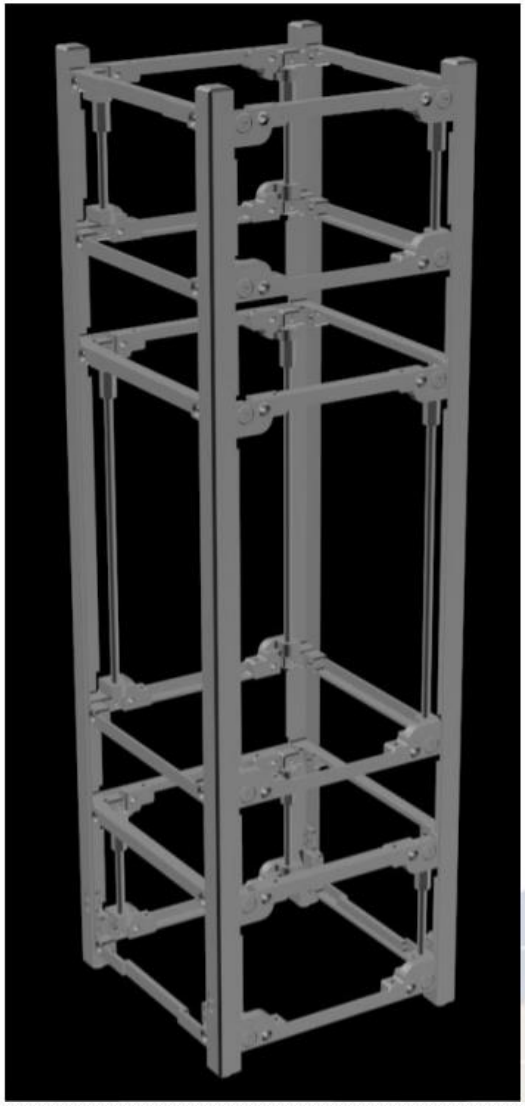




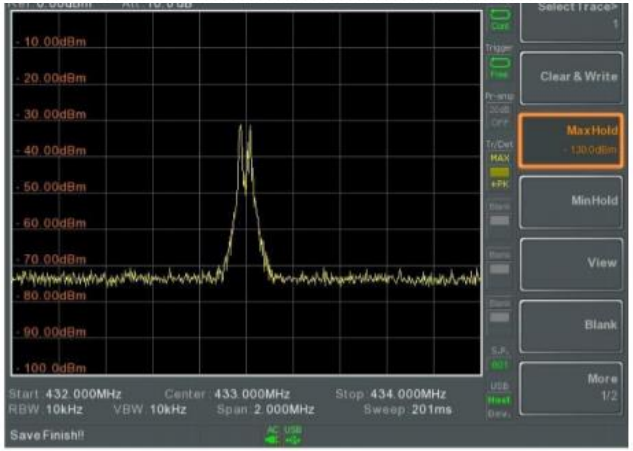
CUBESAT PINOUT STANDARD

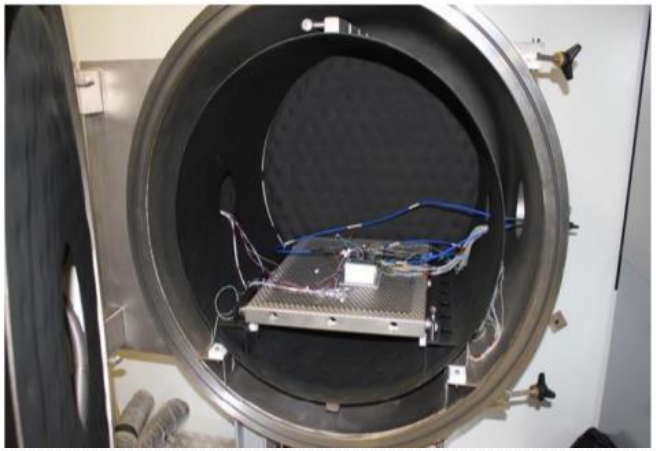
TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

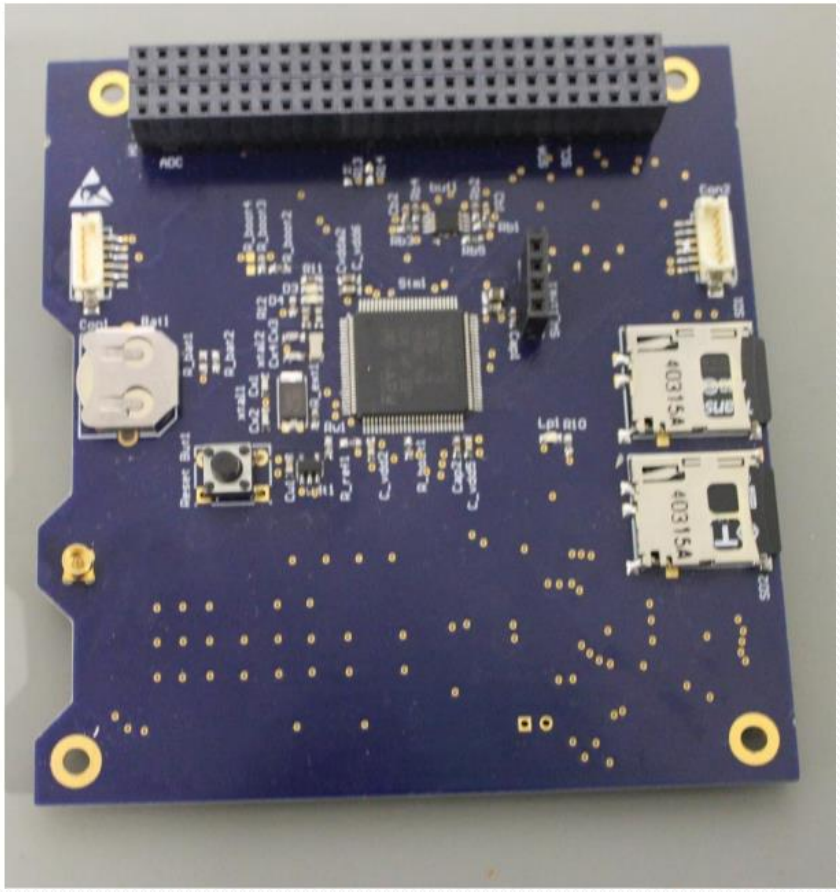
THE STRUCTURE (SKELETON)



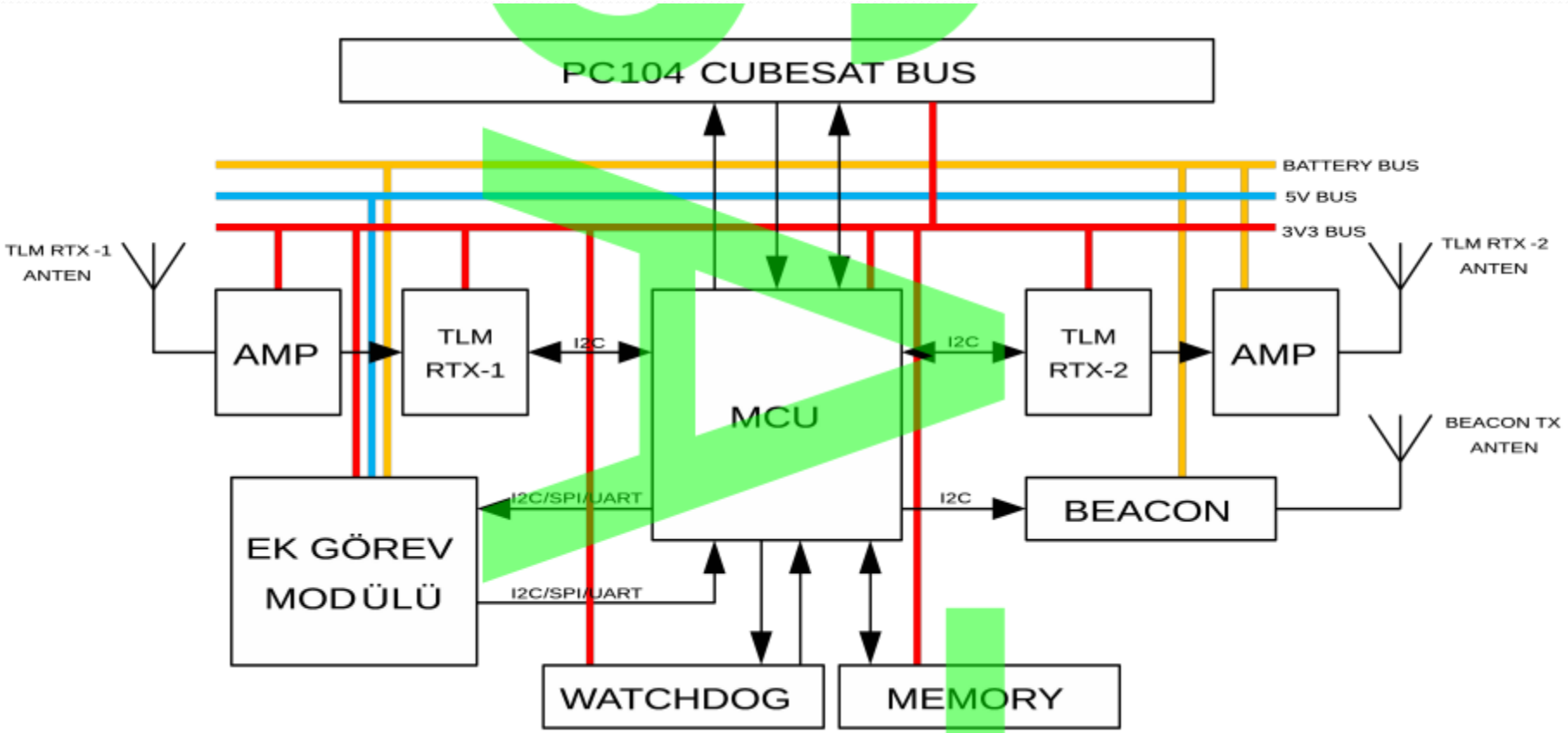
OBC & BEACON

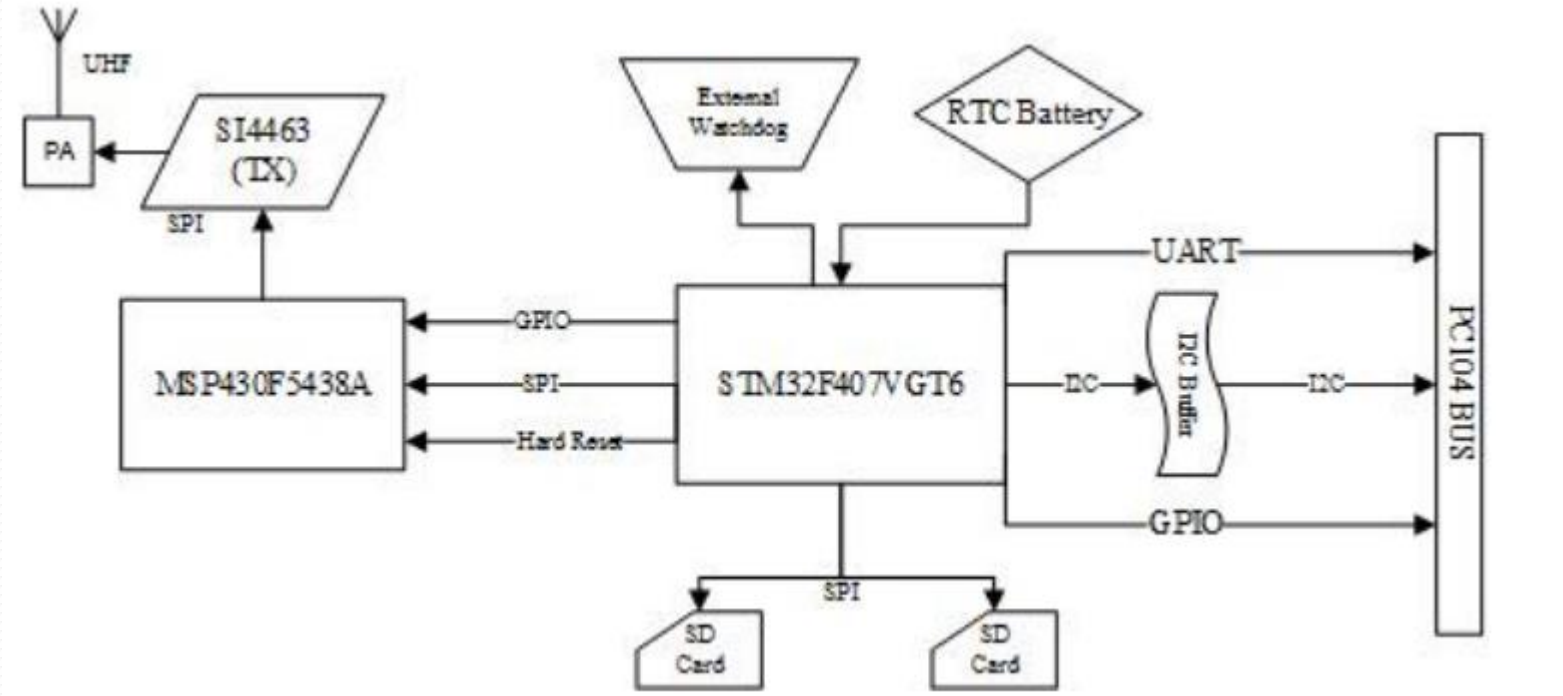

-10.00dBm
-20.00dBm
-30.00dBm
-40.00dBm
-50.00dBm
-60.00dBm
-70.00dBm
-80.00dBm
-90.00dBm
-100.0dBm
Start :432.000MHz
RBW :10kHz
Center :433.000MHz
VBW :10kHz
Stop :434.000MHz
Span :2.000MHz
Sweep :201ms
Save Finish!!
Select Trace
Clear & Write
Max Hold
Min Hold
View
Blank
More
1/2



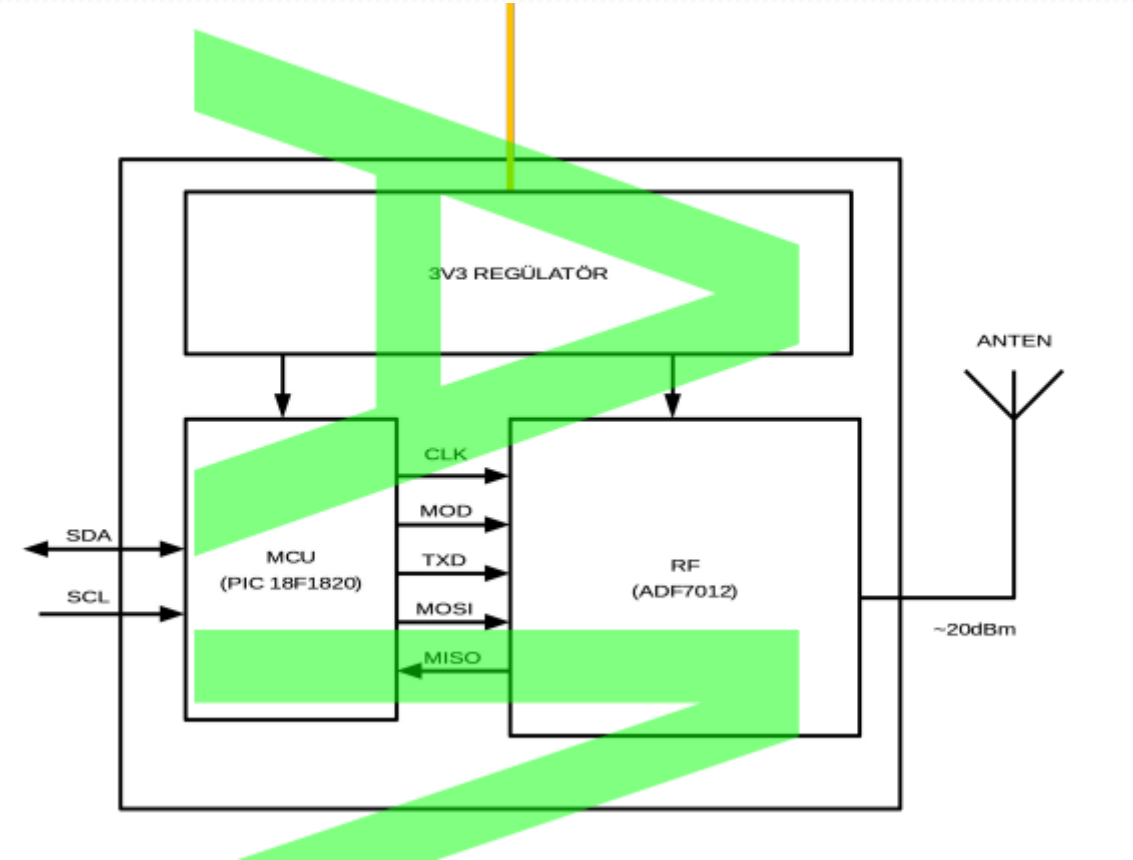


OBC & BEACON

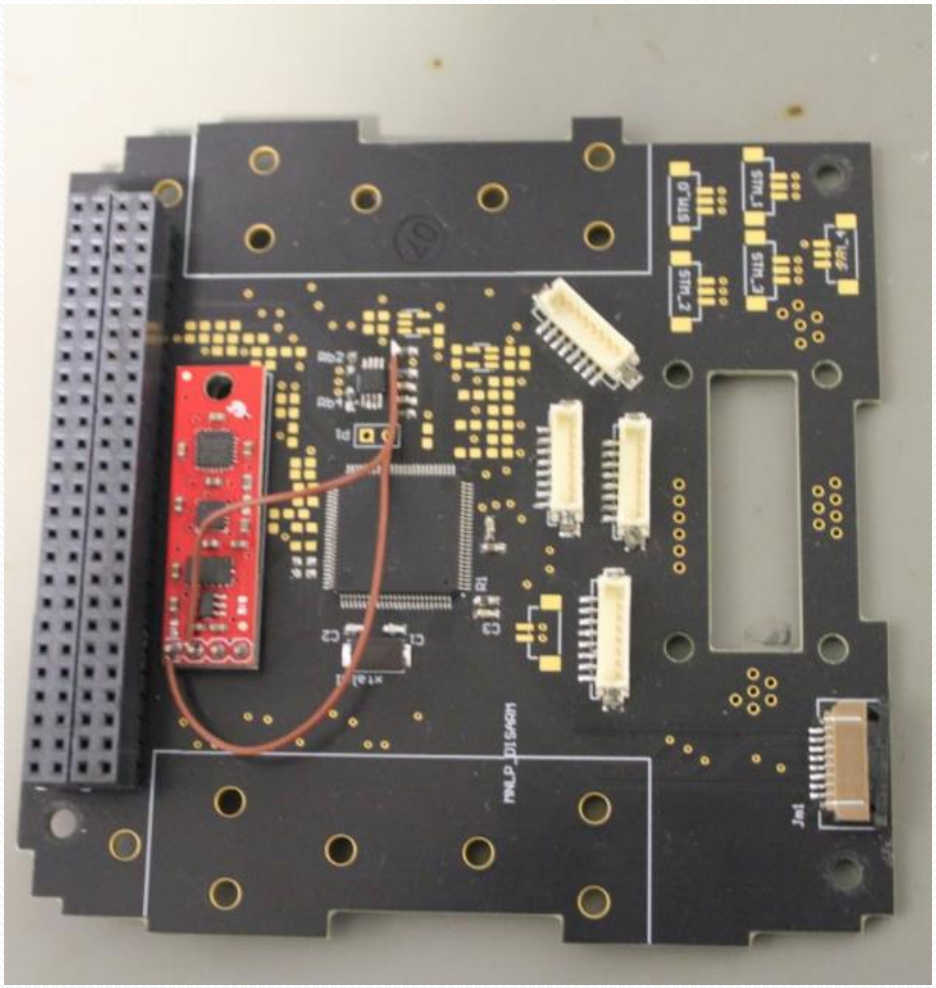

PC104 CUBESAT BUS
BATTERY BUS
5V BUS
3V3 BUS
TLM RTX -1
ANTEN
TLM RTX -2
ANTEN
AMP
TLM
RTX-1
I2C
MCU
I2C
TLM
RTX-2
AMP
BEACON TX
ANTEN
I2C/SPI/UART
I2C
BEACON
EK GÖREV
MODÜLÜ
I2C/SPI/UART
WATCHDOG
MEMORY


UHF
PA
SI4463
(TX)
SPI
External
Watchdog
RTC Battery
UART
GPIO
MSP430F5438A
SPI
Hard Reset
STM32F407VGT6
I2C
I2C Buffer
I2C
PC104 BUS
GPIO
SPI
SD
Card
SD
Card

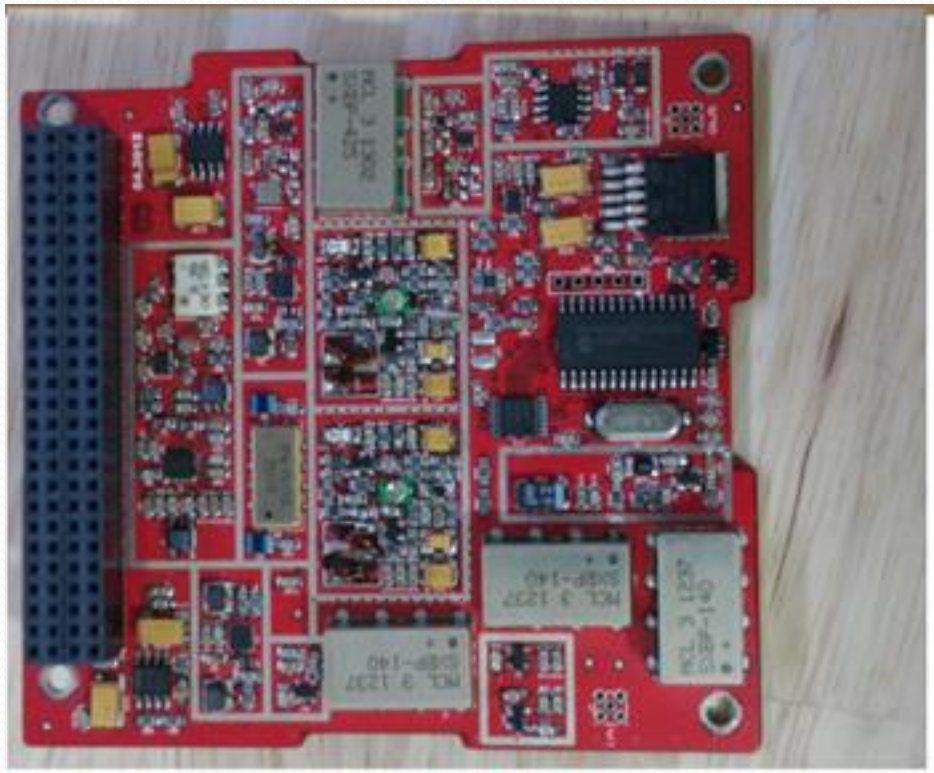
BEACON

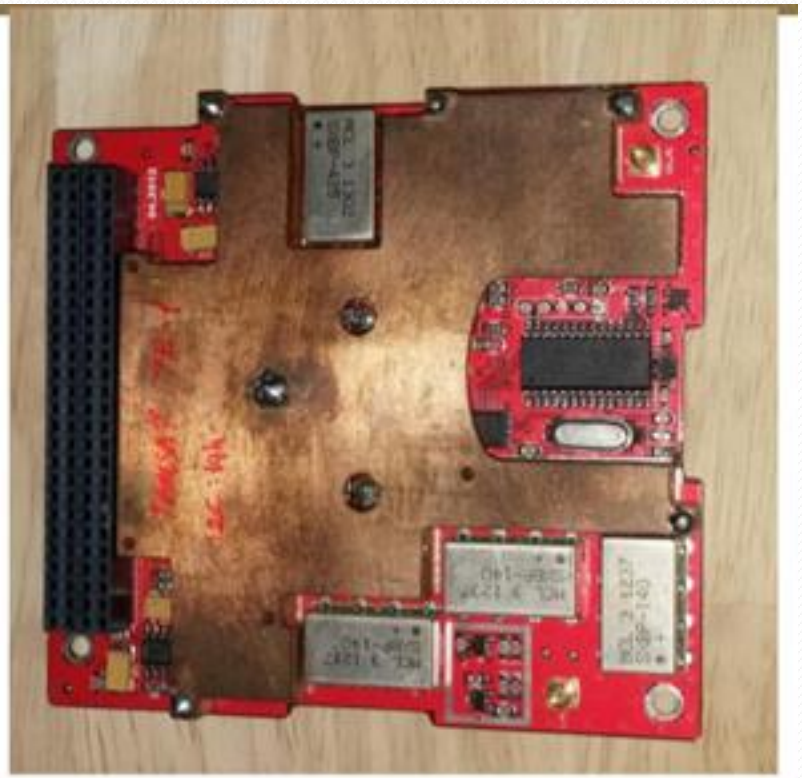

3V3 REGÜLATÖR
ANTEN
CLK
MOD
TXD
MOSI
MISO
SDA
SCL
MCU
(PIC 18F1820)
RF
(ADF7012)
~20dBm

ANTENNA OPENING SUBSYSTEM

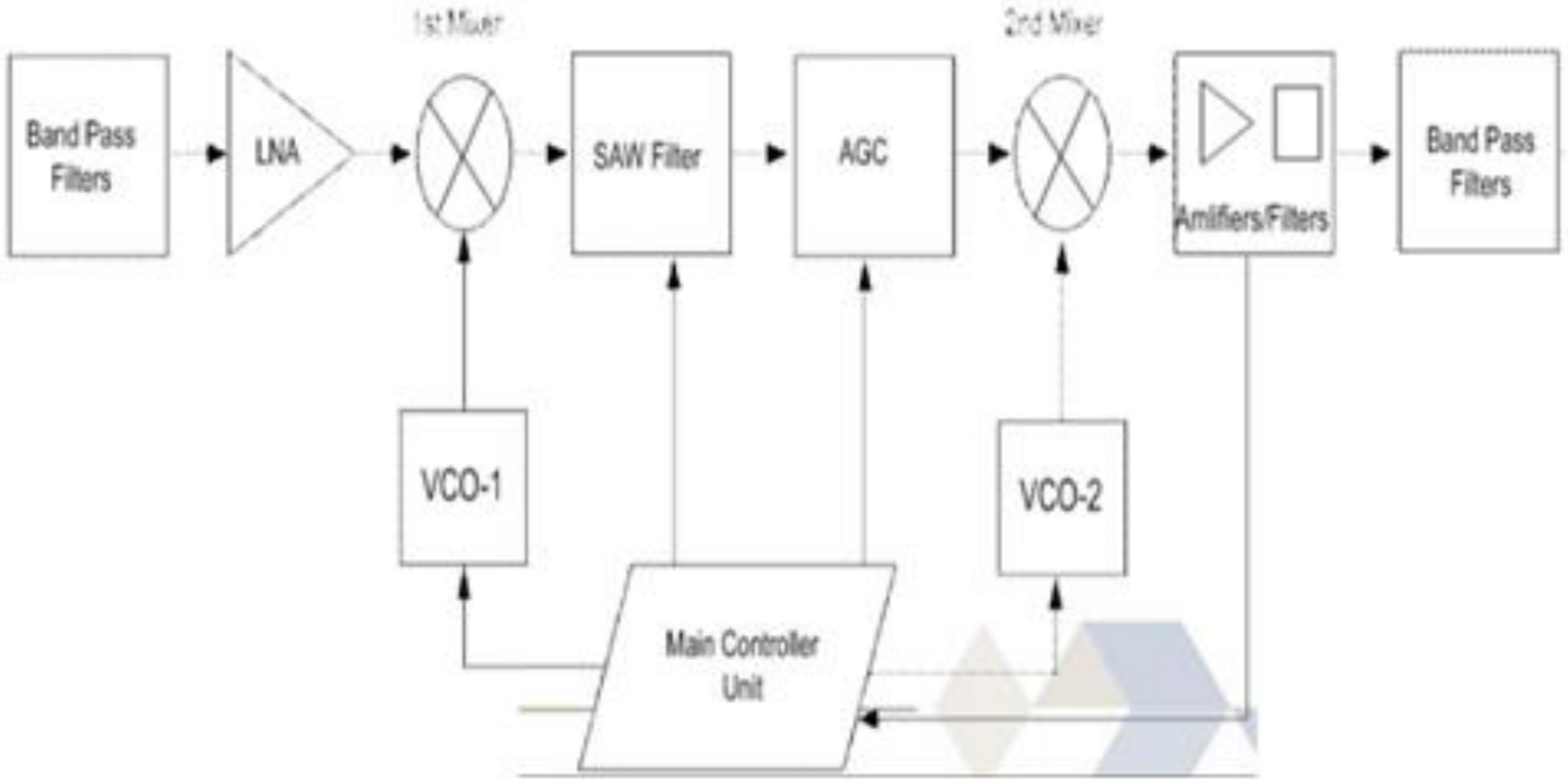


PAYLOAD-1 (TRANSPONDER)

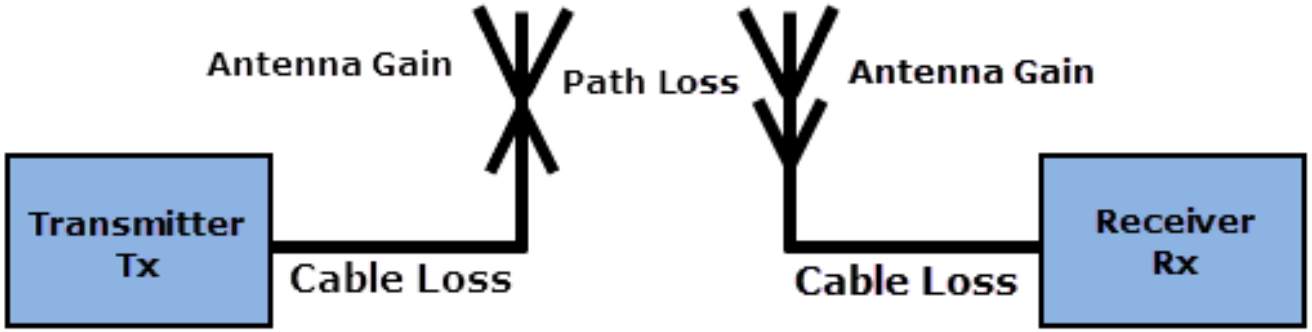




PAYLOAD-1 (TRANSPONDER)



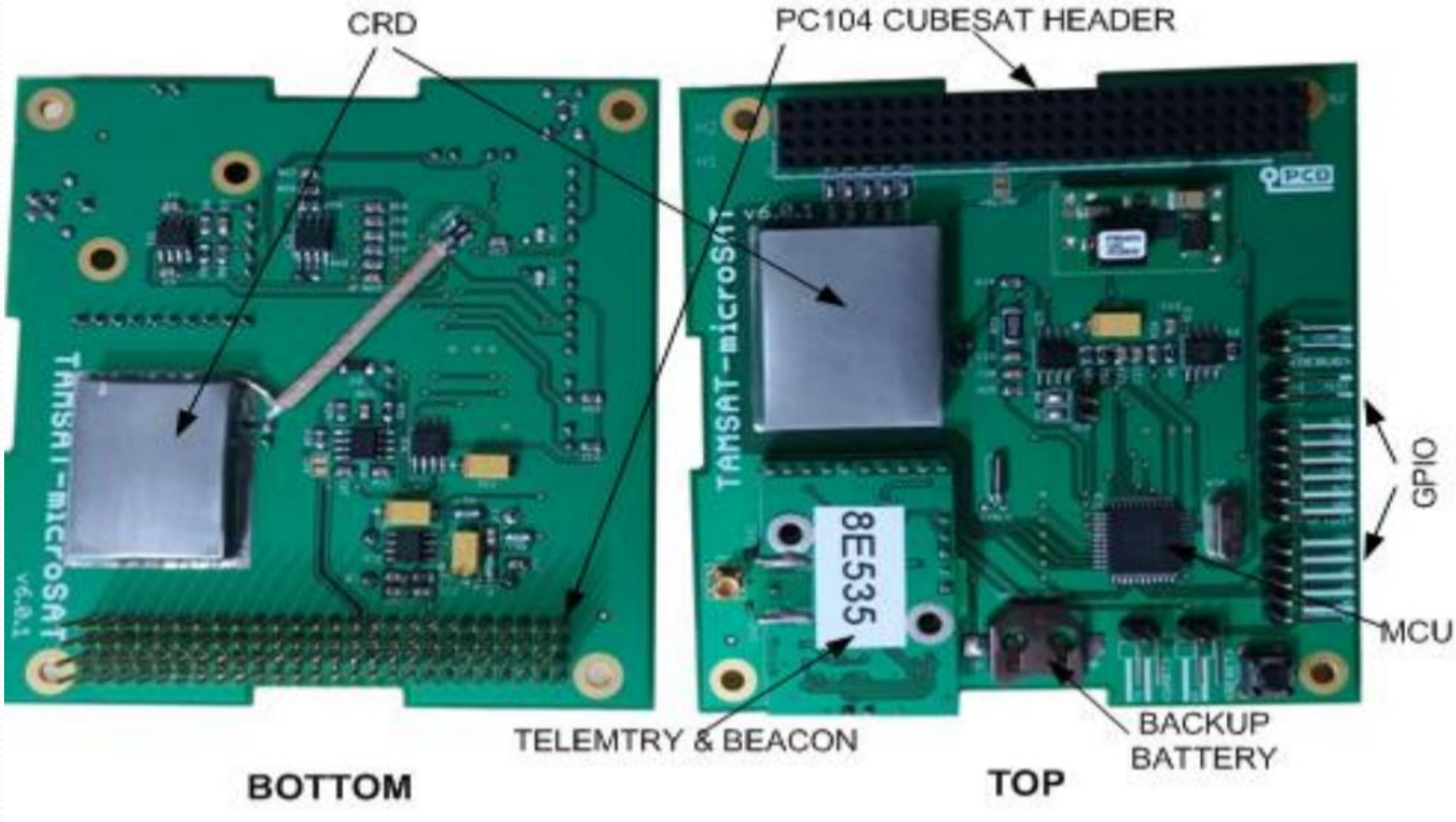
FREE SPACE LOSS



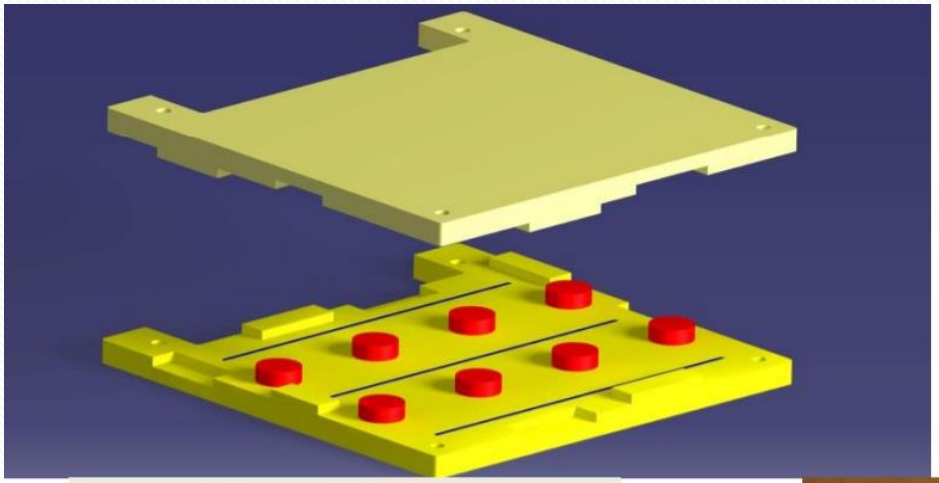
$$FSPL = 20\log_{10}(d) + 20\log_{10}(f) + 20\log_{10}\left(\frac{4\pi}{c}\right) - G_t - G_r$$

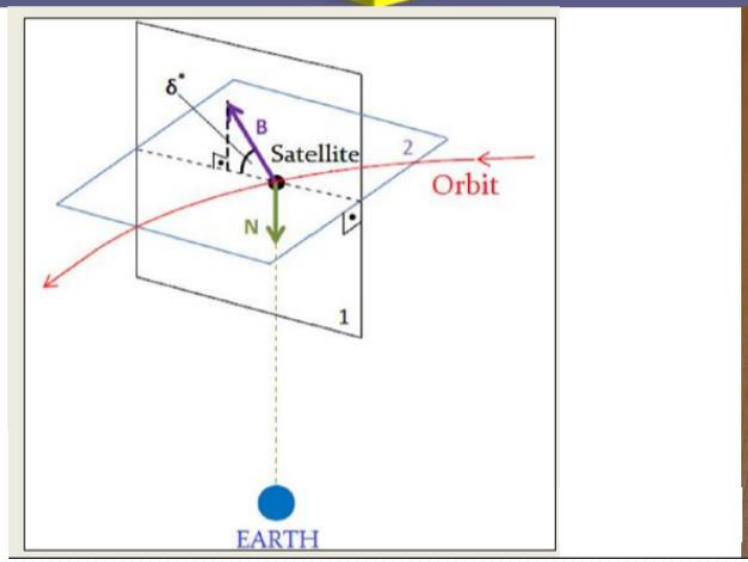
300 Mhz FSL	
50km	116dB
100km	122dB
150km	125.5dB
200km	128dB
250km	129.9dB
300km	131.5dB
350km	132.9
400km	134dB
450km	135dB

PAYLOAD-2 (TAMSAT MicroSAT)



STABILIZER





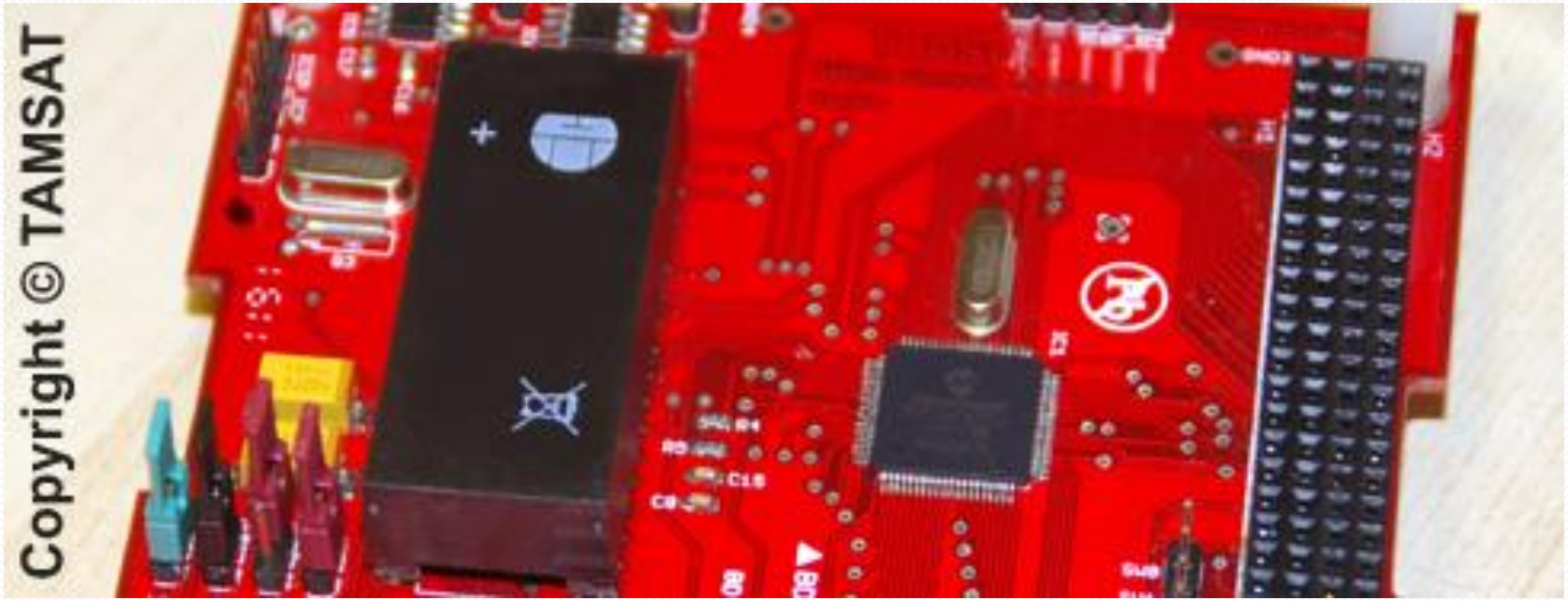
THE MASS MATTERS

Component Name	Number of Units	Unit	Unit Weight	Total Weight
2 mm Spacer	20	Number	0.11	2,20
3 mm Spacer	18	Number	0.15	2,70
5 mm Spacer	6	Number	0.24	1,44
10 mm Spacer	4	Number	0.46	1,84
15 mm Spacer	20	Number	0.67	13,40
OBC Card+2 memory cards+battery	1	Number	58.0	58,00
Transponder	1	Number	127.5	127,5
Microsat	1	Number	68	68,00
EPS	1	Number	82.5	82,50
Mechanic Card	1	Number	40.5	40,5
PMACS	1	Number	98.5	98,50
Batteries	1	Number	257	257,00
Structur Holders With Short Rods	3	Number	18.5	55,5
Structur Holders With Ambilical Conne	1	Number	34	34,00
Structure	2	Number	80	160,00
Cables	16	Number	3	48,00
Washer	20	Number	0.12	2,40
Large Structure Holders	2	Number	21,5	43,00
Upper-Lower Covers	2	Number	38.5	77,00
Antenna (51 cm)(with Connector)	2	Number	4	8,00
Antenna (19 cm) (with Connektor)	4	Number	2	8,00
Antenna Cables (with Connektor)	6	Number	6,75	40,50
Solar Panel 1	1	Number	145.5	145,55
Solar Panel 2	1	Number	148.5	148,50
Solar Panel 3	1	Number	147	147,00
Solar Panel 4	1	Number	147.5	147,50
1U Solar Panel	1	Number	48	48,00
RBF Pins	2	Number	3	6,00
Additional Mass	2	Number	615	1230,00
CPUT	1	Number	97	97,00
PCB Card (Flag)	1	Number	28.5	28,5
			TOTAL	3228,03

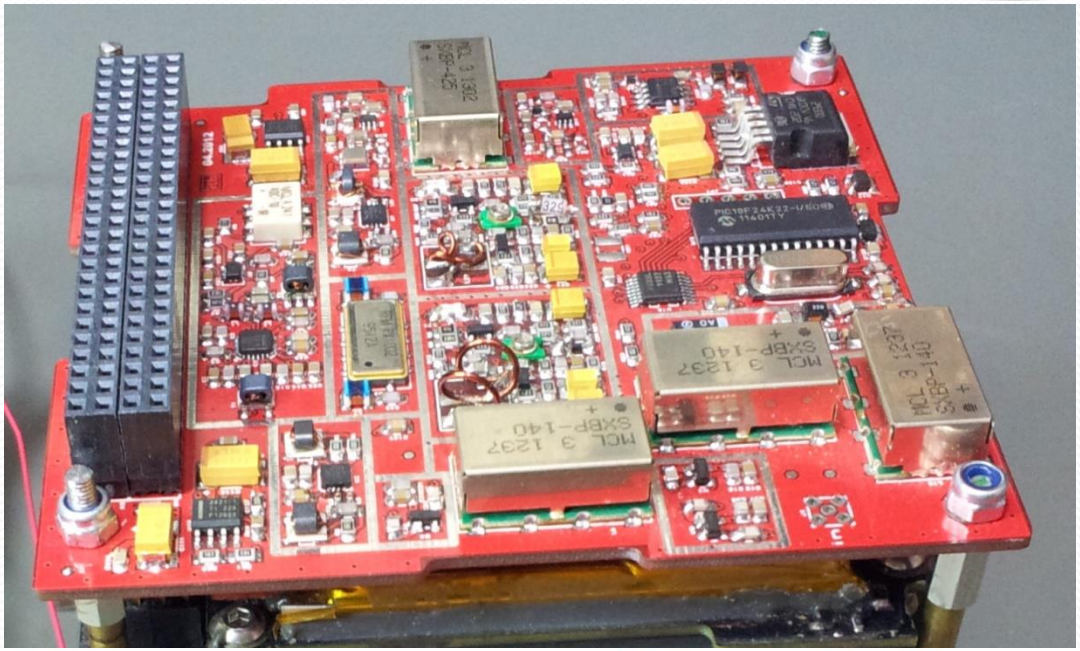
TAMSAT PROJECTS FOR CUBESATS

TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

TAMSAT IHU
Internal Housekeeping Unit

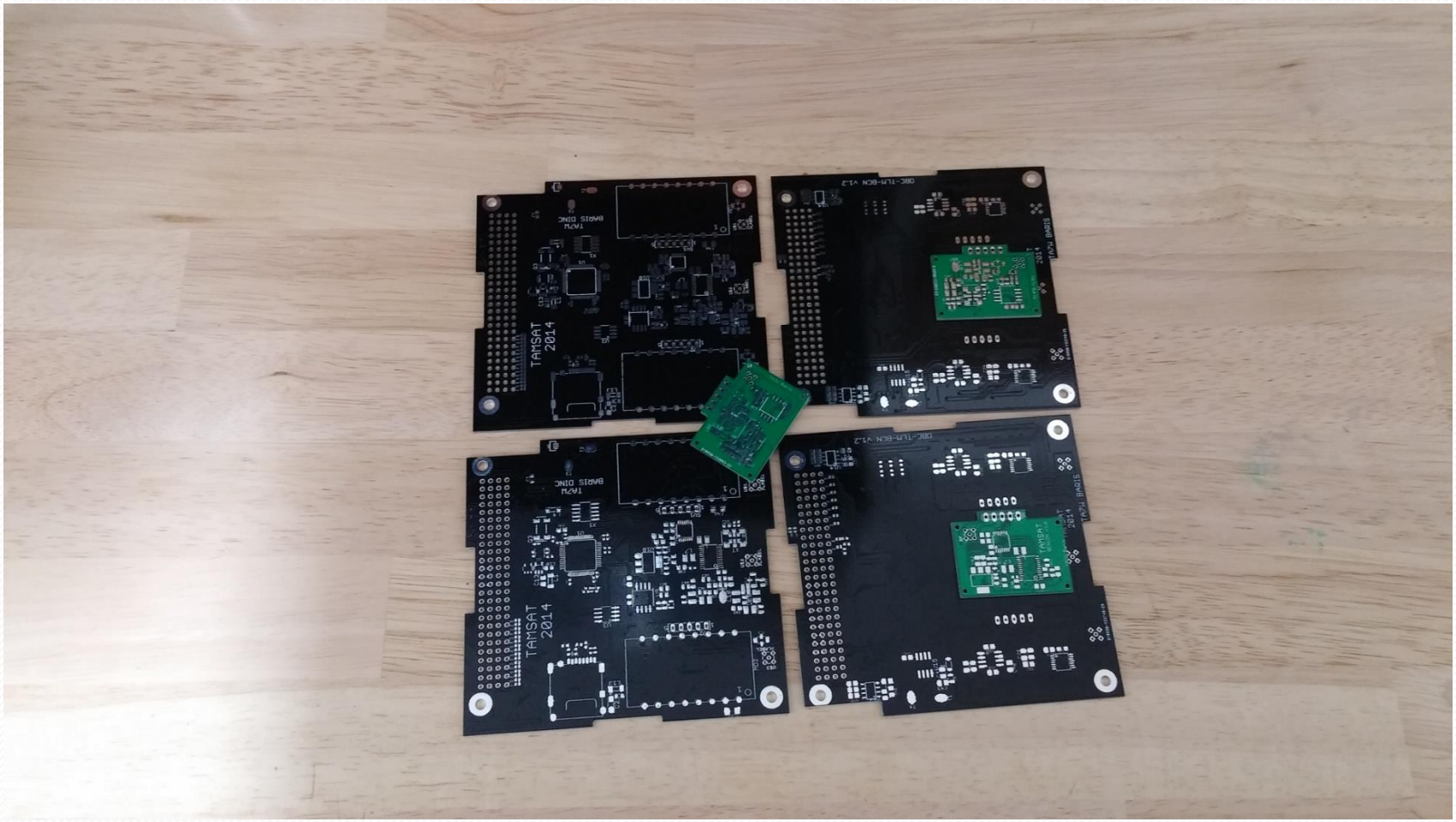


TAMSAT Transponder

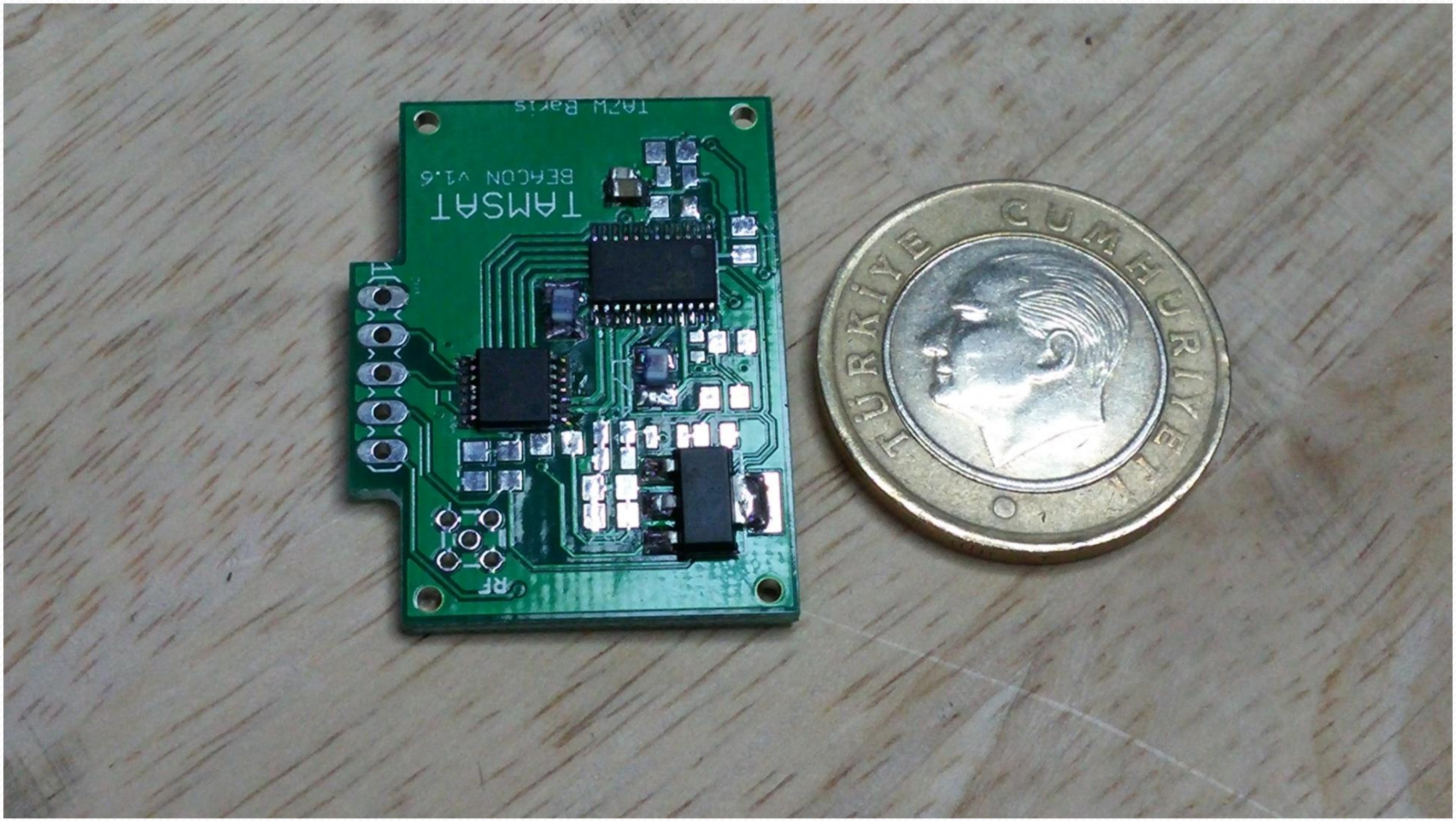


Supply Voltage	5V, 3.3V, Vbatt
RF interfaces	VHF antenna, UHF antenna
Receiving	-122dBm
Transmit Power	600mW
Power Consumption	3 W
Receiver	145.940 -145.990 Mhz
Transmitter	435.200-435.250 MHz

TAMSAT OBC



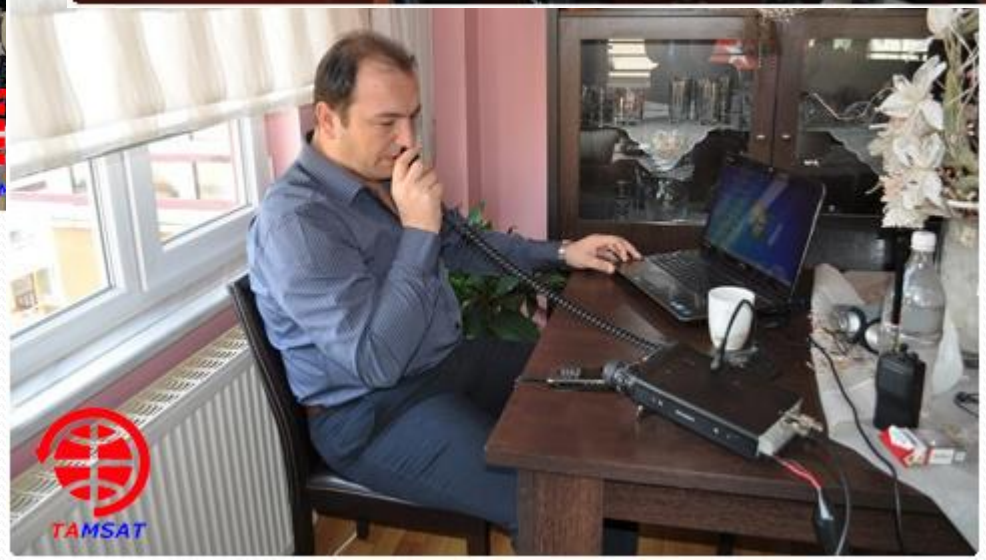
TAMSAT BEACON

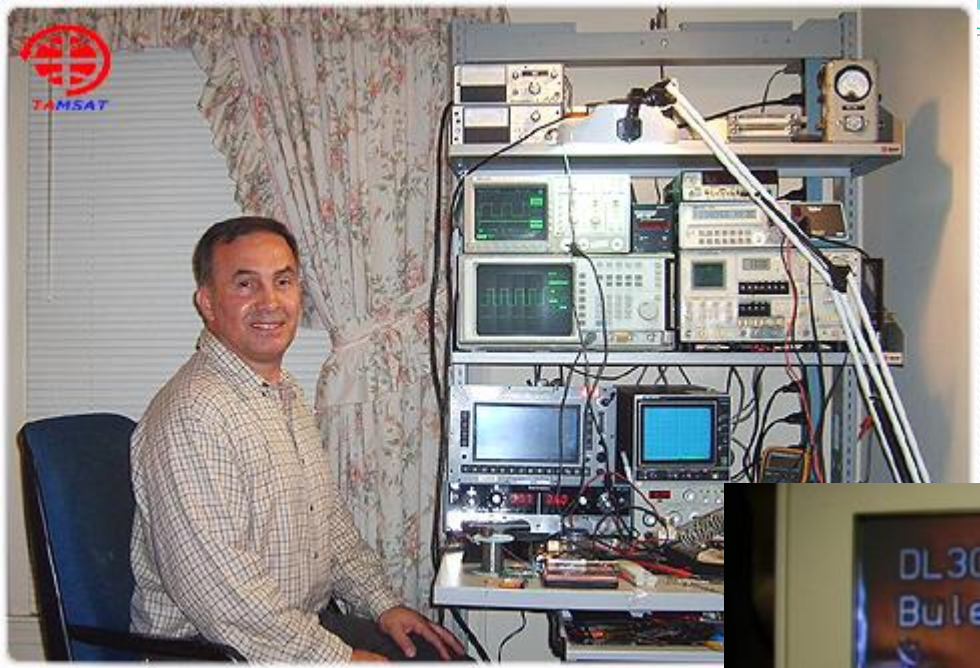


TAMSAT
SATELLITE TRACKING NETWORK

- Based on volunteers and TAMSAT members all around the world
- Supports Hamradio and Educational satellite missions
- Collects data for further analysis by satellite operators
- Experimenting and documenting satellite communication systems
- Enhancing digital modes


AMATEUR's WORLD MAP


TAMSAT


TAMSAT


TAMSAT


DL3CQ
Bulent


TIMER
POWER
TRANSMIT
PHONES
ELEC-KEY
MIC
TAMSAT


TAMSAT

TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)


TA6P (T6-55-1B)


TB3JJ (T3-35-1B)


POWER GPS TRAFIC TX
CONFIG
Uydu : 03
Rakım: 00825 m
Hız : 000.0 kmh
Yön : xxx.x° - K
DUAL BAND FM TRANSCEIVER IC-2725


TAMSAT
TA2VG (T2-06-1B)


TAMSAT
TA2VG (T2-06-1B)


10 GHz-13 cm
ATV


TAMSAT
TA2VG (T2-06-1B)

WHO WE ARE?

A group of "DAYDREAMERS" who like living within TECHNOLOGY And develop solutions for every issue.

Our goal is to make our DREAMS REAL

«WE ARE MUCH MORE POWERFULL TOGETHER»

TAMSAT
Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)

THANKS

TAMSAT

TAMSAT

Turkish Ameteur Satellite Technologies Organization (AMSAT-TR)