# Egyptian Space Agency (EgSA)
# Technological Capabilities and Facilities
## *Space Technology Services Lists*

EgSA
وكالة الفضاء المصرية
Egyptian Space Agency

info@egsa.gov.eg
egsa.gov.eg
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# EgSA Space Technology Portal

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2. Introduction to Space Environment & Its effect on Satellite Systems
3. Introduction to Satellite System Engineering
4. Introduction to Orbital Mechanics
5. Introduction to Satellite Subsystems
6. Introduction to Satellite Systems' Assembly, Integration, and Testing
7. Space Project Management and Planning

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8. Satellite Structure Design and Mechanical Components
9. Thermal control Subsystem in Satellites
10. Satellite Electrical Power Subsystem
11. Satellite Payload Subsystem
12. Satellite Attitude Determination and Control Subsystem
13. Satellite Communication, Telemetry Tracking and Command Subsystems
14. Satellite On-Board Computer Subsystem

### 03 Certified Space Operation, Control & Management Specialist.. Certified SOCMS™

15. Ground Reception Management
16. Satellite Flight Control Center
17. Introduction to Satellite Ground Control Station (GCS) design

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Egyptian Space Agency (EgSA)

# Technological Capabilities and Facilities

## *Space Technology Services Lists*


## Table of Content

# Satellite Assembly, Integration and Test Center (AITC)

## Services Provided:

- Assembling two satellites up to mass 600kg at the same time
- Measuring the alignment with high precision during and after satellite assembly
- Measuring mass property [Center of Gravity (COG) and Moment of Inertia (MOI)] of the satellite
- Thermal Vacuum Test (TVT)
- Vibration test
- Solar array deployment test
- Optical payload test
- And many others…

## Facilities Available:

- Assembly hall
- Alignment system
- COG measurement system
- MOI measurement system
- Thermal vacuum test system
- Vibration test system
- Solar array deployment test stand
- EMC test Laboratory with working frequency range from 30Hz to 18GHz and supports the test items
- Optical test system aims at optical payload whose focal length is less than 6m and diameter is less than 600mm
- Integration test Laboratory

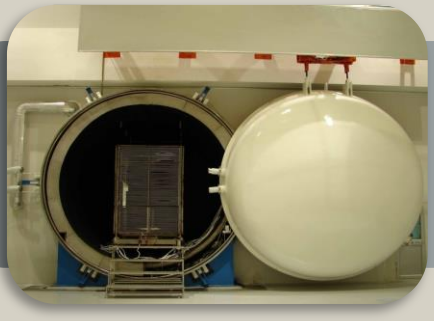
# Part of our Facilities / Services:

**Assembly hall classified (ISO-8)**
Area around 540m$^2$ with full Mechanical Ground Support Equipment (MGSE)



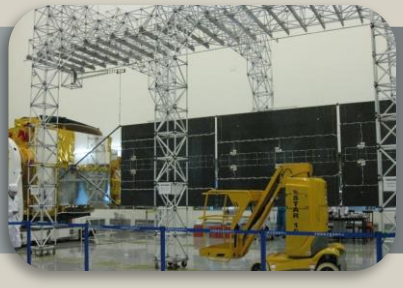
**Alignment system**
Three electronic theodolites with angular measurement precision of (0.5"), type Leica TM6100A
Multiplexer for theodolites Interface Type: 8pin LEMO-1

**Vibration test system**
Max sine force: 120-kN, Max random force: 90-kN
Max displacement: 51-mm (P-P) and frequency range: 5～2000Hz
Slip table: 1200mm × 1200mm with static load up to: 1000kg
Vertical expansion table: 1200mm × 1200mm, static load up to: 1000kg



**Thermal vacuum test system**
Vacuum chamber with internal effective dimensions
Φ4.5m × 6m (D×L)
Temperature : 100K or less
Non-load ultimate pressure below 6.5× $10^{-5}$Pa

**Solar array deployment test stand**
Simulates the folding and deployment process of the solar array under conditions of zero gravity.
Outline dimension :7000mm × 4000mm × 5500mm
Maximum load of single-point hanging: 10kg



**And many others... Contact us to know more about our Services.**

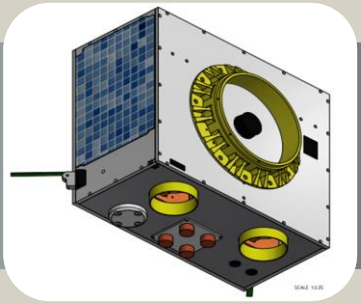
# Satellite Projects


## Samples from our satellites

| No | Name | Satellite Mission |
|---|---|---|
| 1 | **National Experimental Satellite( NExSat) Series** | Remote Sensing Microsatellite and Satellite's Technology Localization |
| 2 | **Egyptian Space Agency CubeSat (EgSACube) Series** | Remote Sensing Nanosatellite, Technology Demonstration and Constellation Operation. |
| 3 | **NARSSCube Series** | CubeSats for Technology Demonstration |
| 4 | **EgyptSat-1** | 160 kg Satellite for Remote Sensing applications with GSD of 7m |
| 5 | **Space Keys Educational Satellite Platform** | Nano-satellite size for educational and training propose. It consists of the same onboard satellite subsystems fabricated from commercialized components, ground receiving and control station, solar and space simulators. |
| 6 | **Egyptian Universities Satellite (EUS-1)** | 1U Cube Satellites are built by the Egyptian Space Agency and 17 different Egyptian universities. |
| 7 | **Pre-University Students Educational Satellite - CanSat** | Soda can size educational satellite that will be used for spreading the space engineering and technology of a satellite |
| 8 | **MisrSat Series** | Operational satellite series over 100 kgs for Earth Observation (EO) with GSD of 5m or less. It is a Chinese satellite granted to Egypt |

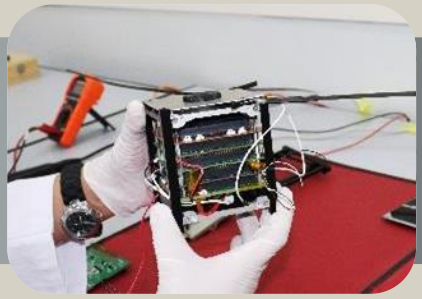
# Part of our Satellite Projects:

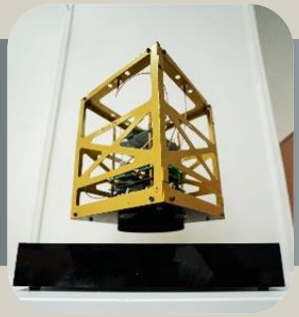
**National Experimental Satellite (NExSat) Series**
Remote sensing microsatellite series aims to localize satellites technology in Egypt. NExSat-1 has local contribution of about 45% which includes the OBC software, AIT and launch coordination.



**EgSACube Series**
Remote sensing nanosatellite for technology demonstration and constellation operation.

**Egyptian Universities Satellite EUS-1**
1U Cube Satellites are being built by the Egyptian Space Agency (EgSA) and 17 different Egyptian universities.





**Space Keys Educational Satellite Platform**
Nano-satellite size for educational and training proposes. It consists of the same onboard satellite subsystems fabricated from commercialized components, ground receiving and control station, solar and space simulators.

**MisrSat-2**
Operational satellite series over 100 kgs for Earth Observation (EO) with GSD of 5m or less. This satellite is a Chinese satellite granted to Egypt.

**And many others... Contact us and Enjoy our Services.**

# Satellite Electromagnetic Compatibility Test lab (EMC)

## Services Provided:

Performing the electromagnetic compatibility tests for equipment, subsystem and whole satellite system according to standard as follows:

- Radiation Emission test (RE)
- Radiation Susceptibility test (RS)
- Conduction Emission test (CE)
- Conduction Susceptibility test (CS)
- Electrostatic discharge Test (ESD)

## Facilities Available:

- Semi-anechoic chamber Nanjing Lopu Co Ltd & BISEE
- EMI Test Receiver 9kHz to 26.5GHz (Rohde & Schwarz ESR 26)
- Oscilloscope: Sample rate: 5Gsample/s bandwidth 200MHz to 2GHz (R&S RTE1202)
- Different Antenna types from (10kHz-18GHz) (SCHWARZBECK / Rohde & Schwarz)
- Rohde & Schwarz, Power amplifiers (10kHz-18GHz)
- Different types of signal generators (Solar / Rohde & Schwarz / Keysight)
- (Solar) Injection probe, current probes and (WeinSchel) attenuators
- ESD gun (3Ctest ESD 30T)
- EMC test management software (Rohde & Schwarz EMC 32)
- Laboratory test accessories

## Samples from our Projects / Products:

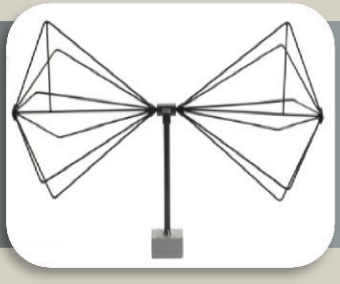
- Testing of MisrSat-2 Satellite

# Part of our Facilities / Services:

**Oscilloscope (R&S RTE1202).**
2 channel oscilloscope with 2GHz Bandwidth, 5GSa/s sample rate, up to 16Bit A/D converter, 200Mpts memory depth and a 26.4cm touch display (1024x768 pixel). Upgradable to MSO with a 16 channel logic analyzer and power analyzer.

**EMI test receiver (Rohde & Schwarz ESR 26).**
The R&S®ESR is an EMI test receiver for the frequency range from 10Hz to 26.5GHz which complies with the CISPR 16-1-1 standard. It measures electromagnetic disturbances with the conventional stepped frequency scan or – at an extremely high speed – with an FFT-based time domain scan.

**R&S®SMC100A signal generator**
The R&S®SMC100A offers outstanding signal quality. It covers the frequency range from 9kHz to 1.1GHz or 3.2GHz. Output power type is > +17dBm. All important functions (AM, FM, ϕM, PM) are already integrated in the instrument. This makes the R&S®SMC100A signal generator a flexible and versatile instrument.



**R&S®HK116E biconical antenna**
The R&S®HK116E is a biconical dipole antenna for linearly polarized waves. The antenna features a wide frequency range, a radiation pattern virtually independent of frequency and low weight. Each R&S®HK116E is individually calibrated in line with ANSI C63.5 and SAE ARP 958 and is particularly suitable for radiated emission measurements in EMC test rooms.

**Electrostatic discharge simulator**
The ESD30T is a state of the art electrostatic discharge simulator available in 30kV. It is the most ergonomic ESD gun without an additional base control unit as per IEC/EN 61000-4-2.

**And many others... Contact us to know more about our Services.**

# Satellite Attitude Determination & Control Laboratory

## Services Provided:

- Design and implementation of attitude determination and control subsystem for various sizes of satellite missions
- Software testing for ADCS Subsystem using mathematical benches, HIL and SIL benches
- Incoming inspection of ADCS sensors and actuators
- Real time simulation of satellite dynamics
- Development of sensors and actuators mathematical models
- Modeling of external environmental disturbances

## Samples from our Projects / Products:

- Attitude determination and control subsystem for NARSSCube-1 and NARSSCube-2
- Attitude determination and control subsystem for NExSat-1

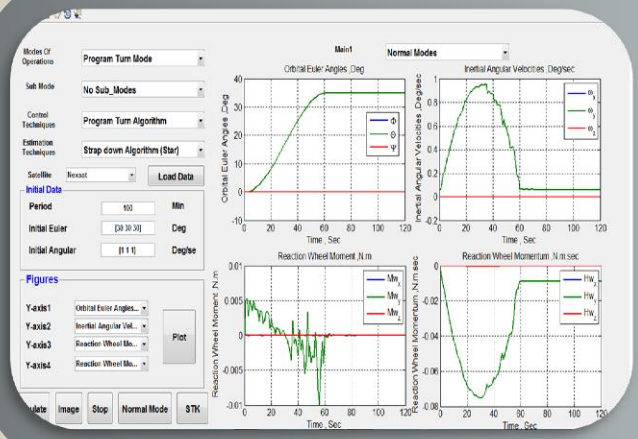
## Facilities Available:

- Attitude determination and control mathematical bench
- Attitude determination and control hardware in the loop test bench
- Attitude determination and control software in the loop test Bench
- Attitude determination and control sensors and actuators interface model
- ADCS Air Bearing Test Bed

# Part of our Facilities / Services:

**ADCS Air bearing test bed**

The ADCS Air Bearing Test Bed consists of a free-floating platform on an air bearing, allowing almost frictionless motion of the satellite's ADCS model and environmental simulations for the magnetic field and the sun, making it a perfect tool to perform end to end tests of the ADCS software with the hardware in the loop. Also it includes sensor inputs for a GNSS receiver and a star tracker, as well as an external reference system.



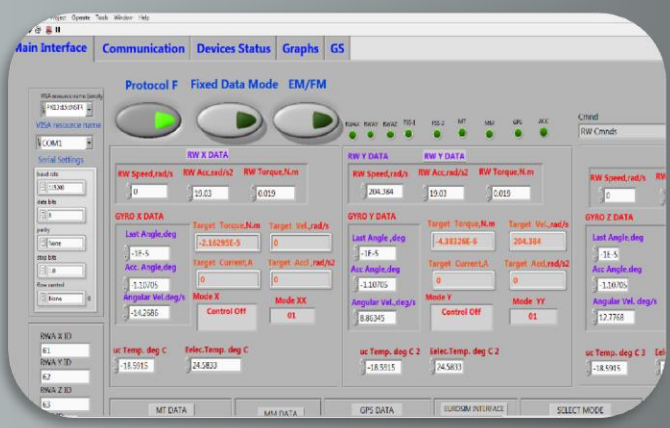

**ADCS simulation bench**

This bench simulates the satellite's dynamics and position in orbit. It also simulates all environmental disturbances. It includes a mathematical model of ADCS sensors (star tracker, magnetometer, Gyro, Sun sensor), and ADCS actuators (reaction wheel, Magnetorquer, thrusters), attitude determination algorithms (Kalman, extended Kalman filter, Triad,..) It also contains all common control algorithms used for Satellite detumbling, satellite imaging, inertial object tracking and ground station tracking.

**Full ADCS sensors and actuators simulation bench**

This Bench provides a real time simulation of all commonly used sensors and actuators

- It includes the mathematical interface models of ADCS sensors such as:
  - Star tracker & Gyro
  - Magnetometer & GPS
  - Sun Sensor
- It includes the mathematical and interface models of ADCS Actuators such as
  - Reaction wheel
  - Magnetorquers




**And many others... Contact us to know more about our Services.**

# Space Telecommunication & Navigation Laboratory

## Services Provided:

- Communication systems simulation and modeling
- Link budget and radio frequency coverage analysis
- Transceivers & HW systems design and testing
- Radio frequency development
- Communication protocols simulation and development
- Communication link security protocols
- GPS and navigation systems simulation and development
- Design and development of antenna

## Facilities Available:

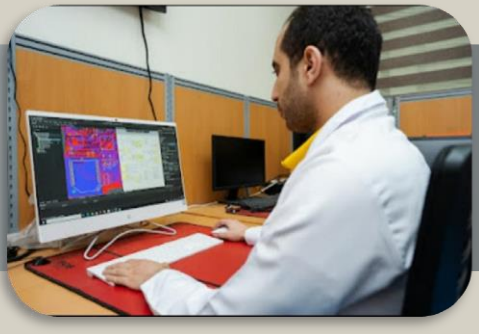
- Keysight Vector network analyzer upto 44GHz
- Keysight Spectrum analyzer upto 44GHz
- NI Dual channel FPGA based USRP upto 6GHz
- Keysight PSG Vector Signal generator upto 44GHz
- Keysight arbitrary waveform generator
- NI Logic analyzer for system-level debugging of digital designs
- LPKF RF prototyping system
- DELL 32 TFLOPS CUDA workstation
- FPGA development tools
- Keysight ADS RF design software
- CST design software

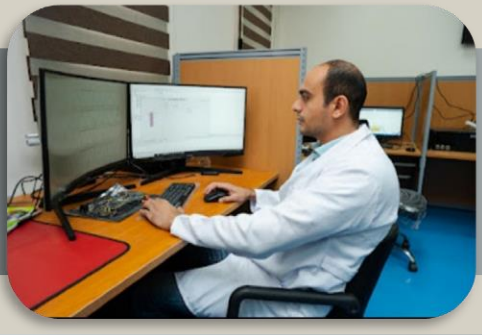
## Samples from our Projects / Products:

- Satellite data handling software for EgSACube Series and Micro-satellites (NARSSCube-1&2, NExSat-1, etc…)
- On-Board computer & data handling subsystem (CDHS) for EgSACube and Micro-satellites (NARSSCube-1&2, NExSat-2)
- TT&C communication subsystems for EgSACube Series and Micro-satellites (NARSSCube-1&2, NExSat-2)
- LEO GPS receiver subsystem for Cubesat (EgSACube-5) and Micro-satellites (NExSat-2)
- Configurable telemetry module (TLM) subsystem for Micro-satellites (NExSat-2)
- Synthetic Aperture Radar (SAR) satellite payload
- Inter-satellite RF link subsystem

# Part of our Facilities / Services:

Keysight ADS and Altium designer for transceivers hardware design and simulation of RF circuit, antenna, and PCB .





FPGA development kits and CUDA workstation
Communication systems simulation and modeling
SDR system design

Keysight PSG vector signal generator and GNSS simulator
GPS and navigation systems simulation and development

NI FPGA based USRP up to 6GHz and Keysight arbitrary waveform generator
Communication and link security protocols simulation and development

Keysight Vector network analyzer and Spectrum analyzer up to 44GHz
RF units design, testing and development

**And many others... Contact us to know more about our Services.**

# Satellite Payload System Laboratory

**Services Provided:**

- Developing payload remote sensing systems
- Design and testing opto-mechanical support systems and space optics systems
- Developing of signal and image processing techniques
- Implementation of the software for visual testing of the space payload of satellites
- Implementation of electronic testing software of satellite space payload
- Testing and optical assembly of satellite payload
- Developing artificial intelligence techniques for space imaging system

**Facilities Available:**

- Optical bench
- Optical collimator
- Optical telescopes
- Guide scopes
- Auto-guiders
- Set of miniaturized and rugged space cameras
- USAF glass resolution target
- High speed data processing workstations
- Dry cabinet
- Optical, hardware, mechanical development software packages

**Samples from our Projects / Products:**

- EgSACubeSat-1 & 2 (former NARSSCube series)
- EgSACubeSat-3
- Space Plasma Nanosatellite experiment- COSPAR Project
- Hyperspectral camera system
- Payload camera for NExSat series
- Space monitoring telescope
- Remote sensing applications using AI techniques

# Part of our Facilities / Services:

### Optical bench

An optical bench is the base of building an optical experiment. It is designed to fit high performance, and space requirements. The setup has an optical equipment to enable developing, integrating and testing high reliability camera systems.

### Optical space monitoring telescope

An optical telescope is used for monitoring very far objects in space orbits, it is equipped with a very high speed artificial intelligence system for space object detection and identification in real time.

### Cubesat development facility

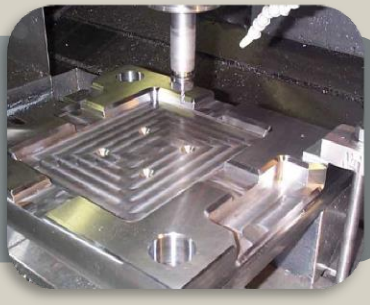
The CuDF is dedicated to the development of CubeSat platform and its associated payload. The platform has space heritage since 2019 and can accommodate different variety of payload missions; including - but not limited to- high resolution camera, RGB camera, Hyperspectral camera, and space environment payload sensors.

### High resolution satellite camera

A HR satellite camera is developed for the purpose of earth observation space missions at EgSA. It is small size and has relatively high resolution (5m @ 550Km Panchromatic)

### High Speed Workstations with CNC

High speed processing / large capacity workstations are used for data and image processing using AI techniques, and heavy duty tasks.
The CNC is attached to the workstation to allow high speed and precise manufacturing of cubesat and camera systems.



**And many others... Contact us and Enjoy our Services.**

# Space Environmental Test Laboratory


## Services Provided:

- Thermal tests in components, subsystems, and systems levels
- Thermal space environment simulation and modeling
- Satellite thermal design verification
- Thermal vacuum qualification test
- Thermal vacuum acceptance test
- Thermal vacuum proto-qualification test
- Vacuum bake-out test
- Thermal balance test (TBT)
- **And many others…**

## Samples from our Projects / Products:

- Payload Camera for EgSACube which will be launched to ISS
- Structure Thermal Model (STM) for Micro-satellite (NExSat-1)
- Battery and communication boards for EgSACube Series

## Facilities Available:

- ❑ Vacuum chamber from (CAST) China Academy of Space Technology with the following specifications:
  - Effective size (4.5m x 6m) (Length x Diameter)
  - Vacuum pumping system reaches up to (10-5)Pa (unloading pressure)
  - Cooling system reaches to (– 173)Celsius degree using LN2 Circulation, while heating system reaches to (+ 200)Celsius degree using Heat Cage method
- ❑ Vacuum chamber from LACO Technologies Company with the following specifications:
  - Size (1m x 1m x 1m) (Length x Width x Height)
  - Vacuum pumping system reaches up to (10-5)Pa
  - Cooling system reaches to (–150)Celsius degree & heating system reaches to (+150)Celsius degree
- ❑ Vacuum chamber from ABBESS Company with the following specifications:
  - Size (0.6m x 0.6m x 0.6m) (Length x Width x Height)
  - Vacuum pumping system reaches up to (10-7)bar
  - Cooling system reaches to (– 80)Celsius degree using thermal fluid circulation, while heating system reaches to (+ 150)Celsius degree using heaters

# Part of our Facilities / Services:

**Dynavac gaseous nitrogen Thermal Conditioning Units (TCU)**
They provide high efficiency temperature control of shrouds, platens, or cold plates over an operating range of -180°C to 150°C. TCU is controlled through PLC, while the user interface is controlled via a local touch screen.

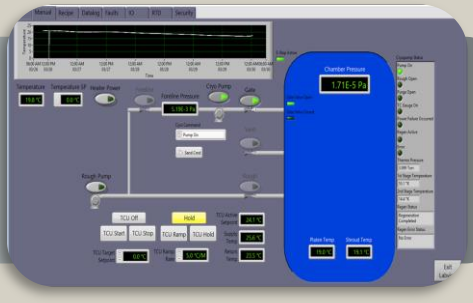


**Rough pump unit**
It reaches the pressure inside the chamber from atmospheric to 1pa.

**Cryo pump unit**
Does not contribute any contamination to the vacuum chamber because it functions by capturing gases, and no moving parts or lubricants are exposed to the vacuum. Produce clean, fast vacuum for high-vacuum applications .


**Thermal vacuum chamber**
Simulate the space environment by achieving lower space vacuum level and space thermal environment.

**Manual and automatic control Unit**
Enables the operator to control the system manually and automatically.



**And many others... Contact us to know more about our Services.**

# Satellite Engineering Model Laboratory

## Services Provided:

- Verifying and validating the integrity of satellite systems
- Perform testing programs (cyclograms) according to testing matrix
- Checking the satellite subsystems functionality and software capabilities using special check out equipment

## Facilities Available:

- EgyptSat-1 engineering model
- Central Control Console (CCC)
- Power Sub-System Check Out Equipment (PSS COE)
- PCDHS and ADCS Check Out Equipment (COE-IT)
- Communication subsystem (S-Band & X-Band) Check Out Equipment (CSS COE)
- Payload Command and Data Handling Subsystem Check Out Equipment (PLCDHS COE)
- GPS Check Out Equipment (GPS COE)
- Store and Forward Payload Check Out Equipment (SFCPL COE)
- Telemetry (TLM) module check out equipment

## Samples from our Projects / Products:

- EgyptSat-1
- EgSACube Series

# Part of our Facilities / Services:

**EgyptSat-1 engineering model**
The real engineering model of Satellite EgyptSat-1.

**Power distribution and control unit of satellites**

**NExSat**
Engineering model of NExSat satellite

**EgSACube**
Assemble and test unit of EgSACube

**Communication check test equipment**
Testing device of satellite communication system.

**And many others... Contact us to know more about our Services.**

# Satellite Concurrent Design Center (CDC) Laboratory

## Services Provided:

- Space mission analysis
- Space mission simulation
- Feasibility study of different space missions
- Space systems engineering consultations
- Training with hands on for space mission design and analysis

## Facilities Available:

- Mathacad Program
- Matlab Program
- Satellite Tool Kit STK Program
- Ansys Program
- Eurosim Simulator
- High Speed Tesla Machines

## Samples from our Projects / Products:

Mission analysis of several satellites, such as:

- EgSACube Series
- MisrSat-2
- MisrSat-3
- NExSat-1

- Training for African space agencies
- Training for Egyptian students

# Part of our Facilities / Services:

### Concurrent Design Center

Concurrent design center is a multi-discipline network that helps system engineers to integrate all required analysis, design, verification and integration phases in one network.

All system engineers can use the database of a system in order to make current and future satellite mission analysis reports and calculate their budgets.

### Design facility interface

The image shows the master Graphical User Interface (GUI) that initiates the needed software moudules to start an integration session of all subsystems together.


**And many others... Contact us and Enjoy our Services.**

# Satellite Orbit Design and Analysis Laboratory


## Services Provided:

- Spacecraft orbit design and mission analysis
- Spacecraft orbit estimation
- Spacecraft orbit access and operation
- Spacecraft orbit determination
- Spacecraft orbit control
- Spacecraft orbit propagation

## Facilities Available:

- Systems Tool Kit (STK)
- FreeFlyer
- EgSA customized software for orbit design and operation
- Matrix Laboratory (MATLAB)

## Samples from our Projects / Products:

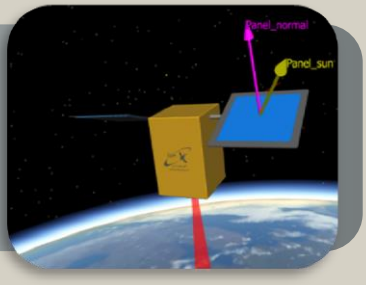
Spacecraft orbit design and mission analysis of:

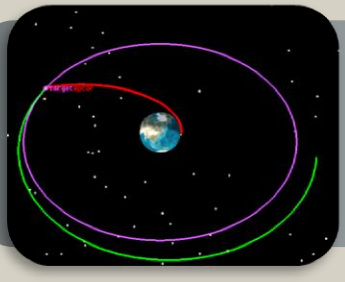
- Mini satellite MisrSat-2
- Micro satellite NExSat-2

# Part of our Facilities / Services:

**Satellite 3D model importing to FreeFlyer**

Satellite 3d model has been previously generated using CAD programs (Ex: Solidworks, Inventor, 3DS Max). Satellite 3ds file is imported to FreeFlyer to simulate satellite motion around the earth, and calculate the Sun angle with respect to Satellite solar panels.

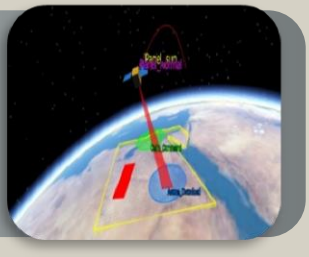


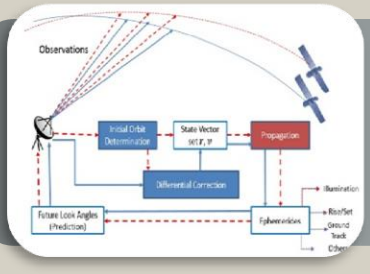



**Orbit Maneuver**

We have our own package of orbit maneuvers program which include: circulation maneuvers, escape maneuver, maintenance orbit. Also, determination of the point of closest approach of two orbits, and uses STK or FreeFlyer to perform such missions.

**Orbit design:** design of different orbits, such as (Sun Synchronous - Repeating Ground Trace - Critically Inclined), based on the following factors: altitude, sun elevation angle, and roll angle, without or with the propulsion system. The results are: determination of local mean solar time, coverage area, change of the local solar time of the ascending node, orbit decay, and DeOrbit Satellite.



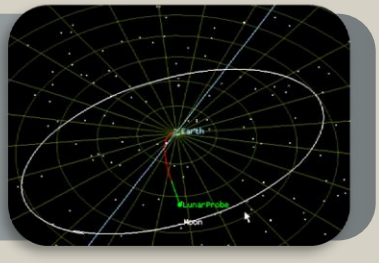



**Determination, propagation and estimation of orbits**

We have our own SW package of determination, propagation, and estimation of orbits. Satellite Orbit Determination (OD) can be described as the method of determining the position and velocity (i.e., the state vector, state or ephemeris) of an orbiting object, such as an interplanetary spacecraft or an Earth-orbiting satellite.

**Lunar Mission**

We have designed a complete lunar mission to the moon, starting with the orbit design, then rotating around the earth, then reaching the moon, revolving around the moon, calculating the lunar track for satellite and coverage area.



**And many others... Contact us to know more about our Services.**

# Satellite Functional Testing Laboratory

## Services Provided:

- Developing of Complex Integration Test System
- Developing of Electrical Ground Support Equipment EGSE
- Functional test of Satellite systems
- Automated test and validation systems
- Embedded Control and Monitoring Systems
- Developing Testing Management Software by LabVIEW

## Facilities Available:

- Industrial PXI chassis provide high-performance modular instruments for test and measurement.
- Data Acquisition and control as a multifunction DAQ functionality with reconfigurable I/O options.
- NI's electronic test and instrumentation products oscilloscopes, digital instruments, frequency counters, power supplies and loads, switches, GPIB, serial, and Ethernet, Digital Multimeters, waveform generators, instruments, source of measuring units, FlexRIO
- Wireless communications, Vector Signal Transceivers, RF Signal Generators, Network Analyzers, Spectrum and Signal Analyzers, RF and Microwave Switches, Power Sensors, RF Signal Conditioning

## Samples from our Projects / Products:

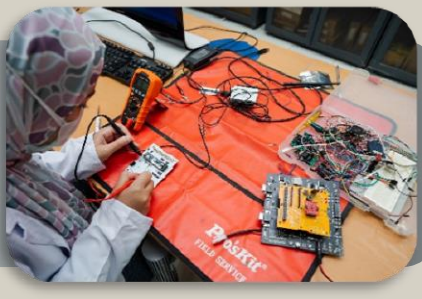
- Satellite Integration Test equipment for CubeSat and Micro-satellites (NARSSCube-1&2, NExSat-1, etc…).
- Check Test equipment for different satellite subsystems (FMS, EPS, TT&C, X-band, Space Env, etc…).

# Part of our Facilities / Services:

Developing Complex Integration Test System for Space Keys Educational Satellite Platform.

Developing of the Complex Integration Test System for NExSat-1 Satellite

Developing Electrical Ground Support Equipment EGSE for Space Keys Educational Satellite Platform payload subsystem



Developing Electrical Ground Support Equipment EGSE for satellite failure management system

Training equipment for satellite functional testing

**And many others... Contact us to know more about our Services.**

# Satellite Ground Telemetry, Tracking & Control Station (TT&C)

## Services Provided:

- UHF Satellite communication and tracking
- Telemetry download and analysis
- Image download, capture, and storing
- Create satellite plan using satellite control server
- Doppler shift measurement and automatically tracking of downlink frequency
- Communication link security protocols implementations
- GPS data receiving and system synchronization
- Ground control station communication system

## Facilities Available:

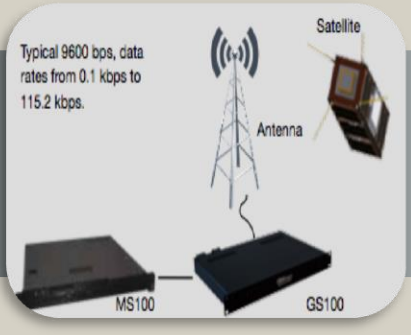
- Vector network analyzer (up to 18GHz, 4 ports)
- Spectrum analyzer (9GHz, Pre-amplifier, Noise figure measurements)
- Space inventor GND2 UHF transceiver based on CSP protocol with 50Watts output power
- MS100 Gomspace Telemetry server (connected through network to client and GS100 or GS2000)
- GS100 Gomspace UHF based on CSP protocol 25Watts output power, supports (FSK, GFSK,MSK)
- GS2000 Gomspace S-band based on CSP protocol 25Watts output power supports (FSK, GFSK,MSK)
- Noise Source (10MHz to 18GHz)
- Other measurement tools (Oscilloscope - ...etc)

## Samples from our Projects / Products:

- GCS software for CubeSat and Micro-satellites (NARSSCube-1&2, NExSat-1, EgSACube-3, etc.…)
- Satellite control software CubeSat and Micro-satellites (NARSSCube-1&2, NExSat-1)
- Telemetry software for CubeSat and Micro-satellites (NARSSCube-1&2, NExSat-1, EgSACube-3)
- Time synchronization module based on NTP server
- Antenna control software for antenna subsystem program tracking

# Part of our Facilities / Services:

**GND-2** is a ground station for the TTC-P3 satellite radio. It is a more powerful version of the TTC-P3 with 200-Watt output power, designed to accommodate difficult uplink situations in noisy environments. With the built-in Linux computer, all that is needed is power and Ethernet.




**Complete UHF/VHF ground station**
Two independent receivers reduce polarization loss independent of satellite orientation. The ground station can be completely controlled/operated over Ethernet/Internet.

**S-band ground station radio**
This solution was used for high speed space-to-ground link for the GOMX4-satellites.



**USRP X310 high-performance user-programmable FPGA**
high-performance, scalable software defined radio (SDR) platform for designing and deploying next generation wireless communications systems.

**PCI-Express connectivity kit (PCIe – Desktop)**
The PCI-Express connectivity kit provides high-speed connectivity between a desktop PC (with an available PCI-Express x4 slot) to the USRP ™ X300/X310.

**And many others... Contact us to know more about our Services.**

# Satellite Mission Control Center (MCC)

## Services Provided:

- Managing satellite operation missions
- Determining how to process telemetry data received from the spacecraft and what data is transmitted to a spacecraft
- Determining how to process telecommands data received from the spacecraft and what telecommands is transmitted to the spacecraft
- Establishing and managing satellite communication sessions
- Receiving alert data from satellite s in anomalies faults
- Filtering redundant alert data
- Most functions are handled automatically, to increase efficiency

## Facilities Available:

- Ground control network interface design software
- Satellite Mission Control Center (MCC) design and implementation software
- Satellite operation and real time control system
- Satellite validation and qualification test software

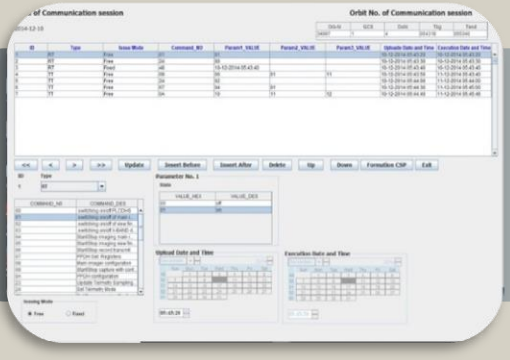
## Samples from our Projects / Products:

MCC design and implementation of experimental satellite (NExSat-1)

- Satellite Planning Software
- Satellite Control Software
- Satellite Telemetry
- Satellite Data Base Software
- Satellite Orbit propagator software
- Satellite In flight control fault Identification and recovery software

# Part of our Facilities / Services:

Satellite control system software is a core and essential subsystem that provides operation control to satellite capabilities.



The image shows our Telemetry Server Software. It collects information of the health and status of the entire satellite and its subsystems.

The purpose of telemetry software is to design and implement an extensible and adaptable Graphical User Interface (GUI) for viewing satellite telemetry subsystem.


The payload is a part of a satellite that allows it to fulfill a mission for which it has been designed. It represents the reason of the satellite existence.

Our system manages satellite imagery information and provides a simple and easy software for its manipulation.

**And many others... Contact us to know more about our Services.**

# Satellite Electric Power Systems Laboratory

## Services Provided:

- Design and implementation of spacecrafts electric power subsystem
- Software testing of electrical power subsystem using NI tools
- Assembly and soldering process for PCBs
- Hardware testing using various lab facilities
- Simulation and modeling of power conditioning and distribution unit of satellites
- Design of EPS firmware for various sizes of satellites

## Facilities Available:

- Keysight modular solar array simulator, model E4360A
- Rigol programmable DC power supply, model DP831A
- Rigol DC electronic load 150V/60A 350W, model Rigol DL3031
- Electrical microscope, model Kaisi 45A-BD
- Agilent technologies digital storage oscilloscope, model Rigol MSO5354
- Triple output DC power supply 0-30V, 3A, model IT6322B
- Electronic load 0-80V / 0-40A 400W, model SPL K853A
- Hakko soldiering station, model FX-951
- ETNEO soldiering station, model 201D ESD
- ONEZILI Ultrasonic cleaner 2L, model OZL 10A

## Samples from our Projects / Products:

- Power conditioning and distribution unit of NExSat-3
- Power conditioning and distribution unit of the Egyptian Universities Satellite EUS-1
- Power subsystem module of NARSSCube-1 & NARSSCube-2
- Power subsystem module of EgSACube-3 and EgSACube-4
- Energy storage module of EgSACube-3

# Part of our Facilities / Services:

### E4360A modular solar array simulator mainframe

Testing satellite power systems under various conditions.
A specialized power supply, such as the solar array simulator (SAS), generates accurate outputs to verify the satellite power system.


### SPL GM-K853A programmable DC electonic load

Series SPL electronic loads are high precision direct current sinks for use in research and product development, the devices are distinguished by a diverse range of functions and excellent regulating accuracy.

### Rigol MSO5354, mixed signal oscilloscope

The Rigol MSO5354 is a four-channel, 350MHz digital/mixed-signal oscilloscope with a real-time sample rate of up to 8GSa/s real-time sample rate.


### Rigol DP831A, programmable DC power supply

The Rigol DP831A is a very high quality programmable laboratory power supply with three switchable outputs (+8V/5A, +30V/2A and -30V/2A) and a maximum power output of 160W.

### Kaisi 45A-BD (LED) digital microscope

Digital microscope with VGA camera and 8-inch screen ideal for PCB repairs and testing. With 45A BD Maximum focal length: 9.5cm Package content and Lens 05 × 1, 1.5, 2, 2.5, 3, 3.5, 4,4.5

**And many others... Contact us to know more about our Services.**

# Satellite On-Board Computers & Space Software Lab

## Services Provided:

- Design and implementation of Command and Data Handling (CDH)/OBC hardware circuits
- Development of On-Board Computer (OBC) real-time embedded software
- Design & implement of OBC Real-Time Operating Systems
- Validation and testing of OBC hardware design
- Development of Command & Data Handling CDH software
- Validation and testing of OBC real-time space mission SW
- Fault detection, identification, isolation, and recovery FDIIR
- Autonomous check and test equipment for OBC with state-of-the-art artificial intelligence algorithms

## Facilities Available:

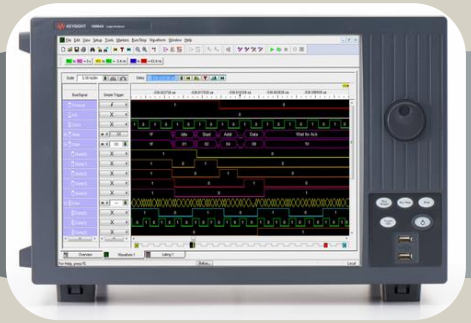
- OBC development tools and Kits (ST, NXP, Microchip, etc.…)
- Xilinx FPGA development tools and Kits
- Keysight Logic analyzer for system-level debugging of digital designs
- Keysight oscilloscope up to 200MHz
- NI test rack with PXI slots, Hybrid slots, PXI Express System Timing slot, and different IO cards
- Triple output DC power supply 0-30V, 3A

## Samples from our Projects / Products:

- Satellite data handling software for CubeSat and Micro-satellites (EgSACube-4, NExSAT-1, etc.…)
- OBC mission software, autonomous check & test equipment SW for CubeSat (Egyptian Universities Satellite EUS-1)
- On-Board Computer Command and Data Handling Subsystem (CDHS) for CubeSat (EUS-1, EgSACube-4)
- Electrical Power Subsystem (EPS) mission software (EgyPWR-1) for Micro-Satellites (NExSat-2)
- Testing software for command and data handling systems

# Part of our Facilities / Services:

**InfiniiVision 3000T X-Series oscilloscopes**
Four channel oscilloscope with 100MHz Bandwidth, 5GSa/s sample rate, 4Mpts memory depth and a 21.6cm Touch display. Includes MSO with a 16-channel logic analyzer, upgradable to a 20MHz wave form generator



**Keysight logic analyzer**
68 channels, 350MHz state, 12.5GHz timing zoom, 2.5GHz timing, fast data transfer and storage of large amounts of data, 1.4GHz trigger sequencer to ensure high-speed events are captured

**Itech triple output DC power supply**
30V/3A/90Wx2CH, 5V/3A/15Wx1CH, Triple output voltage, all are adjustable, Support/parallel/tracking mode, Built-in RS232/USB communication interface

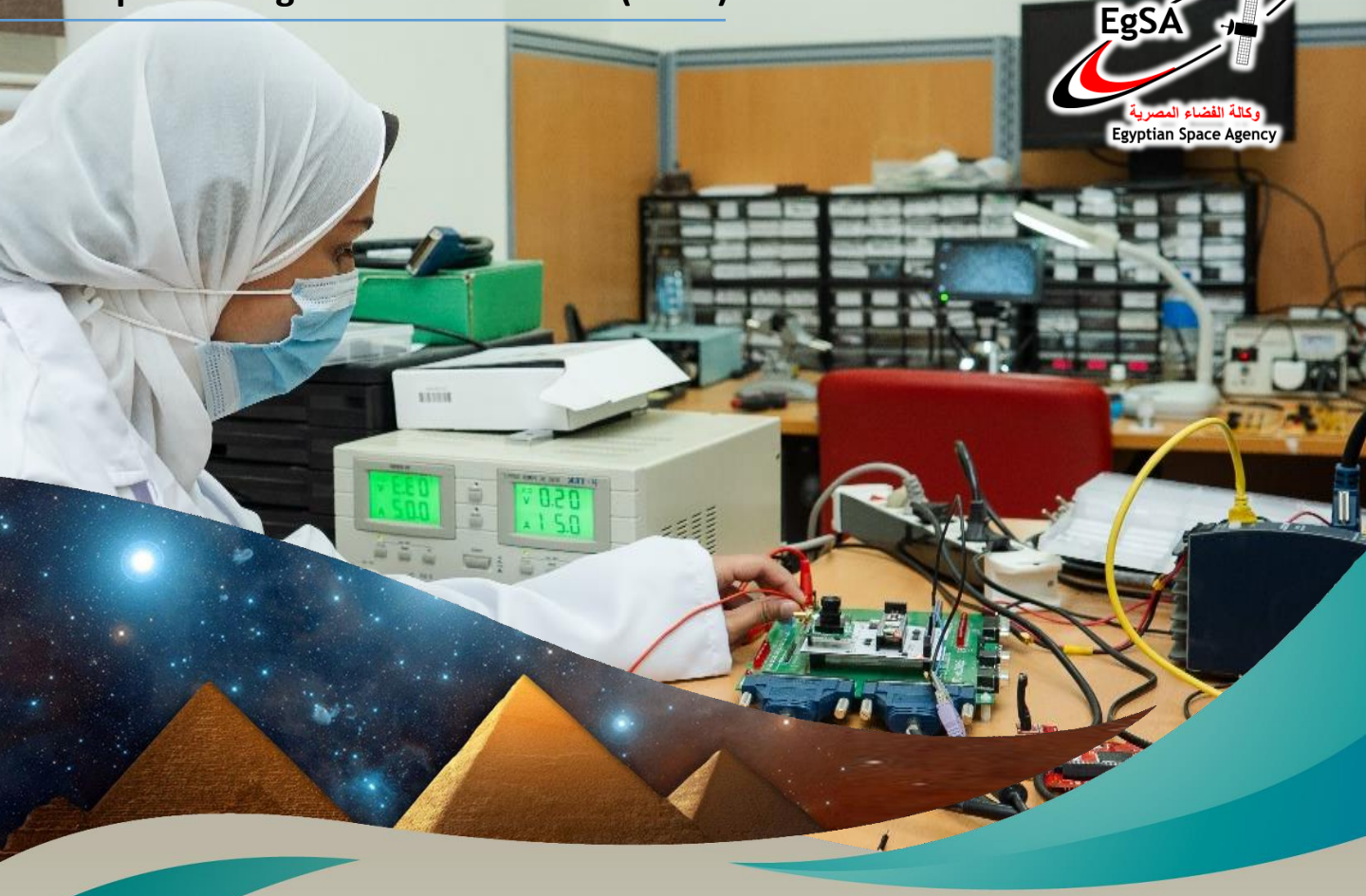
**NI PXIE-1062Q test equipment with I/O outputs**
Test and measurement equipment works with both PXI and PXI Express modules and can operate in a temperature range up to 55°C, Up to 1GB/s per-slot dedicated bandwidth [x4 PCI Express], 354W available power, 30W per-slot.

**Digital control SMD ESD soldering station**

YaoGong is a compact high performance soldering station, The station features a programmable sleep mode of 0-29 minutes or auto-power shut off at 30minutes.

**And many others... Contact us to know more about our Services.**

# Space Design Execution Center (SDEC)



## Services Provided:

- PCB and high-speed PCB design
- Troubleshooting and testing assembled PCB
- Providing PCB repair using our high-quality repair stations
- Executing prototype PCB for verifying new design before final PCB version
- Providing full PCB assembly with high quantity and high precision
- Soldering and desoldring different kinds of components

## Facilities Available:

- High power rating power supply
- Digital oscilloscope
- Microcontroller precision programmer
- Weller full set repair station
- BGA rework station
- High performance computers for Altium PCB design software

## Samples from our Projects / Products:

- SAR OBC FPGA high speed board
- CanSat
- EgSACube-3
- Space Keys Educational Satellite Platform

# Part of our Facilities / Services:

**Digital circuit design**
SDEC executes various circuit designs such as:
- FPGA and microcontroller circuit design
- High speed ADC and DAC circuit design

**PCB design**
The PCB design process creates footprints and 3D model for electronic components, placement and routing to define electrical connectivity and generation of required manufacturing documents for the designed circuit board.

**Soldering and Assembly**
Assembly of Through-Hole and SMT components with all types of footprints like BGA, LGA, QFP, TSSOP, SOIC ..etc.

**Initial Testing**
Performs an initial test (electrical connectivity and basic function of the board) on the designed circuit board using NI equipment.

**Electronic Board inspection**
Defines rigorous inspection and test procedures. It is capable of ensuring the quality of the final designed electronic board using power microscopes and NI equipment.

**And many others... Contact us to know more about our Services.**

# Egyptian Space Agency (EgSA)
# EgSA Space Technology Portal

## Samples from our Space Technology Students' Certificates



## Our Global Education Coverage on Google Maps


**EgSA Space Technology Portal**

**egsa-space-technology-portal.com**

**Address:** KM 6 Middle Ring Road, 5th settlement, New Cairo, Cairo, Egypt.
**P. O. Box:** Egyptian Space Agency 130
**Tel:** +20-2-21297950, 994 **Fax:** +20-2-21297993