

# *HIGH TECH SMALL SAT MISSIONS*

## *CASD*

### **MINI AND MICRO SATELLITES**

#### **A COST EFFECTIVE INDUSTRIAL APPROACH**

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# FACTS ABOUT MICRO SATELLITES

- **SPACE TECHNOLOGIES ARE BECOMING MATURE**
- **COSTS AND RISKS REDUCTION COMPETITION PREVALENT ON PERFORMANCES COMPETITION**
- **SPACE INDUSTRIES BECAME MULTINATIONAL: OWNERSHIP IN ONE COUNTRY, OPERATIONS IN MANY COUNTRIES**
- **SUBSYSTEMS FOR MICROSATELLITES ARE NOT YET STANDARDIZED**

# ANSWERS TO FACTS ABOUT MICRO SATELLITES

- TEAMING TOGETHER WITH WELL IDENTIFIED RESPONSIBILITIES REDUCES COSTS AND RISKS
  
- NATIONAL FUNDS SHOULD FINANCE ACTIVITIES DEVELOPED IN THE NATIONAL TERRITORIES SO AS TO DEVELOP THE INDUSTRIES WITH PRODUCTION CAPACITY IN THE NATION (BEST USE OF THE LEARNING CURVE)
  
- ESSENTIAL TO MAKE USE OF ALL ALREADY IN PLACE
  - ◆ TECHNOLOGICAL RESEARCH INVESTMENTS (easy to be accepted)
  
  - and
  
  - ◆ INDUSTRIAL ASSETS (difficult to be accepted)

# ISSUES ABOUT ANSWERS IMPLEMENTATION

- PROPORTION BETWEEN MARKET AND ENTERPRISES SIZE
- LARGE, MEDIUM AND SMALL ENTERPRISES ROLES
- COMPLEX MAKE OR BUY DECISION PROCESS
- DIFFICULT TO RECOGNIZE TECHNOLOGICAL LEADS (LITTLE RE-USE OF TECHNOLOGICAL INVESTMENTS)
- DIFFICULT USE OF AVAILABLE STATE OF ARTS COMPETENCES IN A PROACTIVE WAY NOT IN A REACTIVE WAY

# CONSEQUENCES

- **COST INEFFICENCY**
- **EXTENDED TIME TO MARKET**
- **SMALL COMPETITION CAPACITY OF THE DOMESTIC INDUSTRY IN THE INTERNATIONAL ENVIRONMENT**

# HOW TO DO IT ? - 1

- LOOK FOR INDUSTRY MOTIVATION
- CAREFULLY VERIFY THE INVOLVED HUMAN FACTOR
- FLEXIBLE SOLUTIONS: RE-ADDRESSMENT CAPACITY IS A KEY FACTOR
- USER ORIENTED SOLUTIONS
- INCREASE INTERNATIONAL PARTECIPATION

## HOW TO DO IT ? - 2

- SEPARATE APPRECIATION OF BASE AND APPLIED TECHNOLOGIES
- PREFER INDUSTRIAL TEAMS WITH WELL IDENTIFIED RESPONSIBILITIES EACH ONE IN FIELDS OF ALREADY ACQUIRED AND PROVEN COMPETENCES:

**WHO IS DOING WHAT BY WHICH TECHNOLOGIES,  
TIMING, RISKS AND COSTS**

- REDUCE THE TIME NEEDED FOR CONTRACT NEGOTIATION AND ASSIGNMENT

# SPACE ENGINEERING OFFER

- APPROPRIATE COMPANY SIZE WITH RESPECT TO EXPECTED CONTRACT SIZES
- LARGE RE-USE OF TECHNOLOGICAL INVESTMENTS IN AIT CAPACITY AND BASE TECHNOLOGIES INDEPENDENTLY FINANCED OVER THE YEARS
- SINCE 1998 DEDICATED TO BUILD A FULLY EQUIPPED PLANT WITH SIZE APPROPRIATE TO MICRO AND NANO SATELLITES :

i.e.

**PLANT COSTS OF OUR TITO (Potenza) PLANT MATCHED TO SATELLITES EXPECTED COSTS**

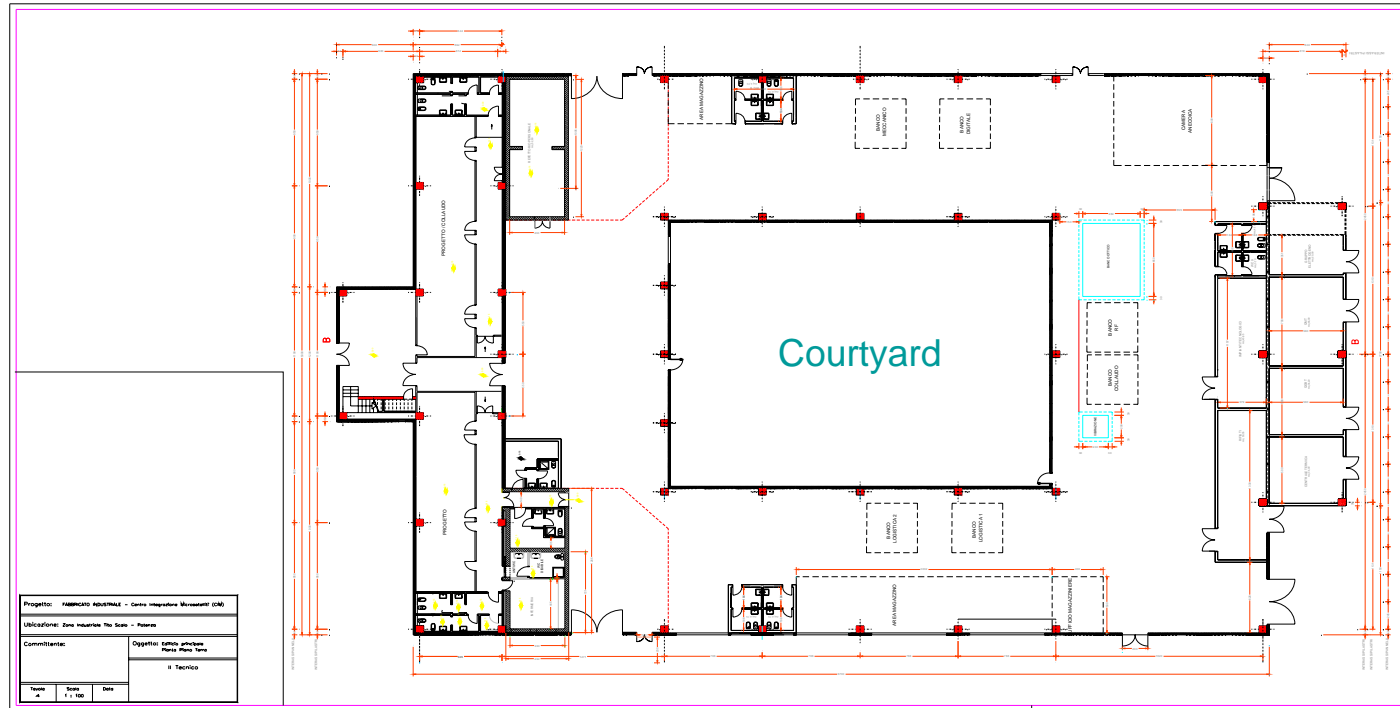


# TeS Facility (Tito PZ plant)



# Building layout (Tito PZ plant)

PIANO TERRA

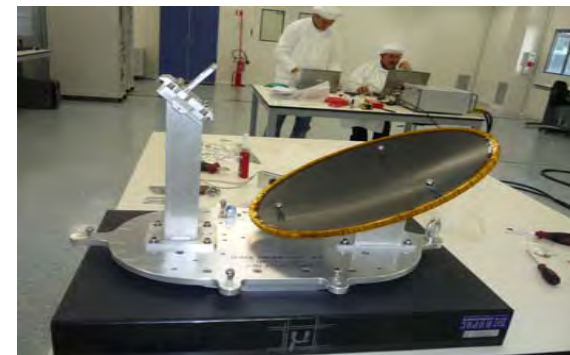


*4.500 m<sup>2</sup> organized on two levels*

# Clean room (Tito PZ plant)

## Clean Room main characteristics:

- ✓ Class 100.000 (ISO8)
- ✓ Dimensions: 15 (l) x 8 (w) x 3.5 (h) m
- ✓ Temperature:  $20 \div 22^{\circ} \text{C} \pm 2^{\circ} \text{C}$
- ✓ Temperature Stability:  $1^{\circ} \text{C/h}$
- ✓ Humidity:  $45\% \pm 5\%$ ; max: 65%; min: 40%



# Climatic chamber (Tito PZ plant)

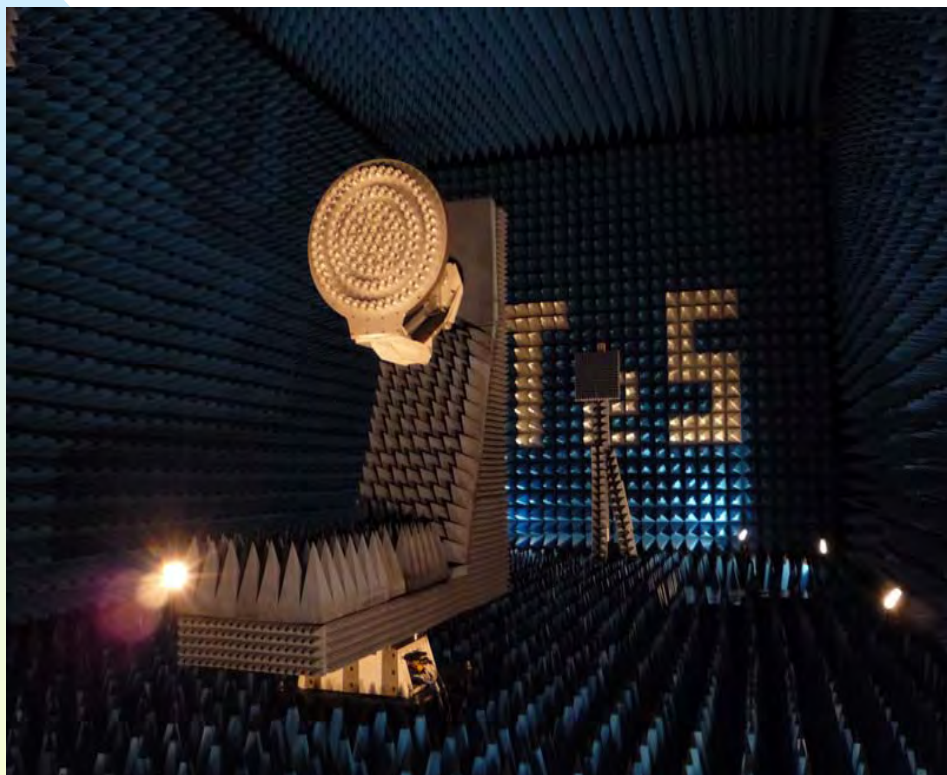
Climatic Chamber main characteristics:

- ✓ Dimensions: 1.0 (l) x 1.5 (w) x 1.0 (h) m
- ✓ Temperature:  $-40 \div 180^{\circ} \text{C}$
- ✓ Heating speed:  $2^{\circ}\text{C}/\text{min}$
- ✓ Cool speed:  $1.5^{\circ}\text{C}/\text{min}$





# Anechoic chamber (Tito PZ plant)



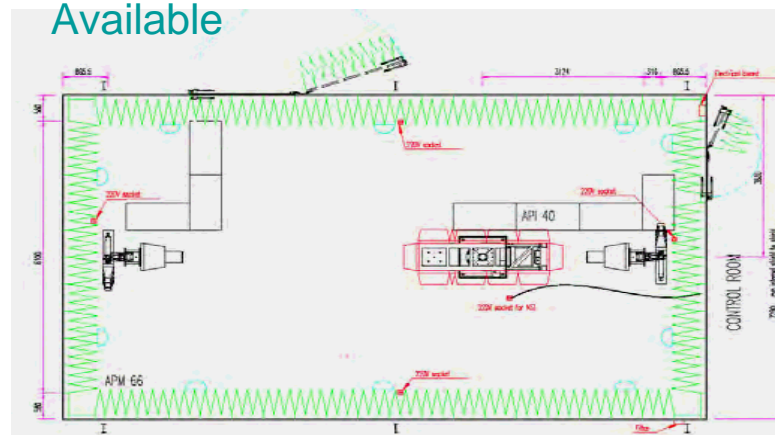
Length **12610 mm**

Width

**8100 mm**

Height **7000 mm**

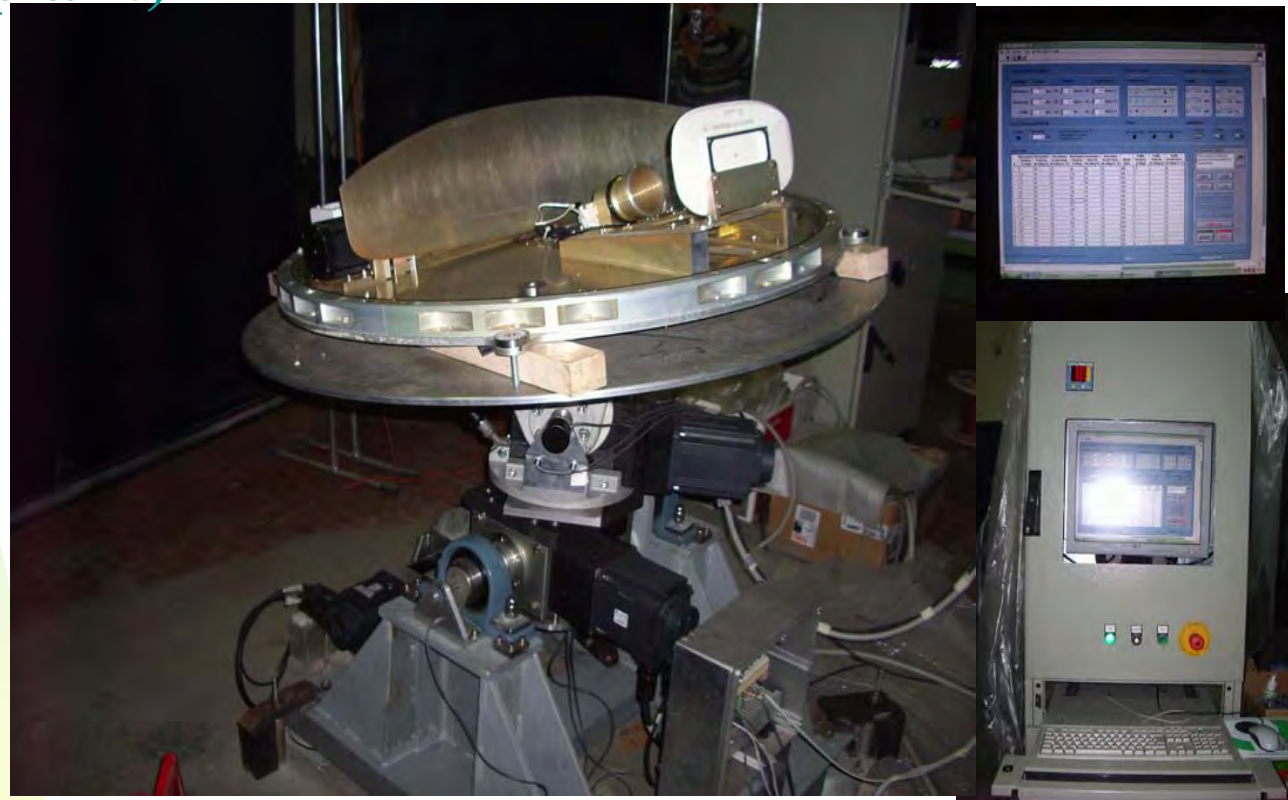
- NSI-700S-60 Spherical Near-Field scanning
- From L-band to mm Wave Band Measurements
- Far-field, Holographic and Near-field Patterns
- Far-field Measurement Options Available





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# Attitude simulator (illuminated by a near-field beacon source) (Tito PZ plant)



Teleinformatica e Sistemi s.r.l.

# Laboratories

(Tito PZ plant)

- RF LABORATORY
  - Fully Equipped
  - From L-band to mm Wave Band
- DIGITAL LABORATORY

# CONCLUSIONS

- **SPACE ENGINEERING OFFERS A MIX OF**
  - ◆ **A READY TO USE PLANT MATCHING SIZES AND COSTS REQUIRED FOR MICRO AND NANO SATELLITES INTEGRATION AND TESTING**
  - ◆ **LARGE RE-USE OF TECHNOLOGICAL INVESTMENTS IN AIT CAPACITY AND BASE TECHNOLOGIES INDEPENDENTLY FINANCED OVER THE YEARS**
  - ◆ **LONG PROVEN EXPERIENCE IN TEAMING WITH OTHER COMPANIES WITH WELL IDENTIFIED RESPONSIBILITIES**
  - ◆ **COST EFFECTIVE INDUSTRIAL INVESTMENTS AND ASSETS**