

## List of potential training modules

- EEE components hands-on laboratory testing. Customer Source Inspections (CSI)
  - ✓ Precap
  - ✓ Buy-off
  - ✓ Incoming Inspections
- Acceptance and Physical Inspections
  - ✓ DPA
  - ✓ PIND
  - ✓ Failure Analysis
  - ✓ Counterfeit: How to detect them
- Advanced Techniques in Electrical, Electronic and Electro-mechanical (EEE) components Testing.
  - ✓ Material Analysis
  - ✓ 3D X-Ray Inspection
  - ✓ XPS - X-ray Photoelectron Spectroscopy
  - ✓ TEM - Transmission Electron Microscopy
  - ✓ SEM/FIB - Scanning Electron Microscopy / Focused Ion Beam
- Radiation on EEE components
  - ✓ Radiation types.
  - ✓ Radiation Interaction. Microscopic effects.
  - ✓ Radiation Environments, Space: LEO, MEO, GEO, other orbits, and others
  - ✓ Radiation effect on electronic devices:
    - Total Ionization Dose (TID).
    - ELDRS Effect
    - SEE (Single Event Effects).
    - TNID / DD (Displacement Damages).
  - ✓ Radiation hardening assurance. Introduction.
  - ✓ Radiation test:
    - Assessment of radiation test need.
    - Radiation test plan design.
    - Radiation test performance.
    - Data assessment.
    - Examples of Radiation Test Plan and Test reports: TID, SEE, DD and Laser testing.
    - Radiation test at equipment level
    - Simulation and other radiation assessments: Software and hardware simulations, TCAD,
    - Radiation test set-up activities: board bias design, manufacturing, ..., etc.
    - RadLab facilities Visit.
  - ✓ ESCC 21900 vs MIL-STD-883 TM1019
- Laser Radiation Testing: How and why using it
  
- EEE procurement strategy

- ✓ Selection among preferred sources
- ✓ Standardization
- ✓ Long lead items
- ✓ Obsolescence
- ✓ Alerts
- ✓ Counterfeit: how to avoid them
- ✓ Using ECSS-Q-ST-60-13
- Introduction to Hybrids and Hybrid DPA
  - ✓ Hybrid technologies. Examples: Thick film, Thin film, Hermetic and non-hermetic hybrids,...., etc.
  - ✓ Some hybrid quality concepts:
    - Evaluation
    - QPL/QML
    - Space quality levels and others
    - Passive, active,...., elements procurement and evaluation
    - Hybrid Screening
    - QCI/LAT
    - Manufacturing monitoring and control
  - ✓ Hybrid specification system requirements:
    - MIL-PRF-38534.
    - ESCC 2566000. PCA.
    - ECSS-Q-ST-60-05.
    - Others: NASA EEE-INST-002 M2 SECTION, MIL-PRF-55310, JAXA,...
  - ✓ Inspections to increase Lot confidence:
    - KIP and Precap inspection,
    - Buy-off:
      - DPA (Destructive Physical Analysis): ESCC 21001, MIL-STD-1580, ECSS-Q-ST-60-5, MIL-STD-883. TM 5009
      - Examples of DPA activities and test reports
      - Other considerations: Radiation,..
  - ✓ Hybrid procurement design and execution: pre-procurement, procurement y post-procurement.
- Internal visual inspection in bare dice
- Hermeticity test: methods and different approaches
- Packaging parts for space applications
- New technologies : reliability testing on Sic and GaN
- Dual use management: US and European regulations
- Failure analysis.
  - ✓ When, how, who,..
  - ✓ Failure test sequence
  - ✓ Description of main failure mechanism
  - ✓ Case studies
- Validation flow for flip-chip packages
- ....