Seibersdorf Laboratories

CORHA 2

Advancing Radiation Testing and AI-driven Reliability for COTS Components

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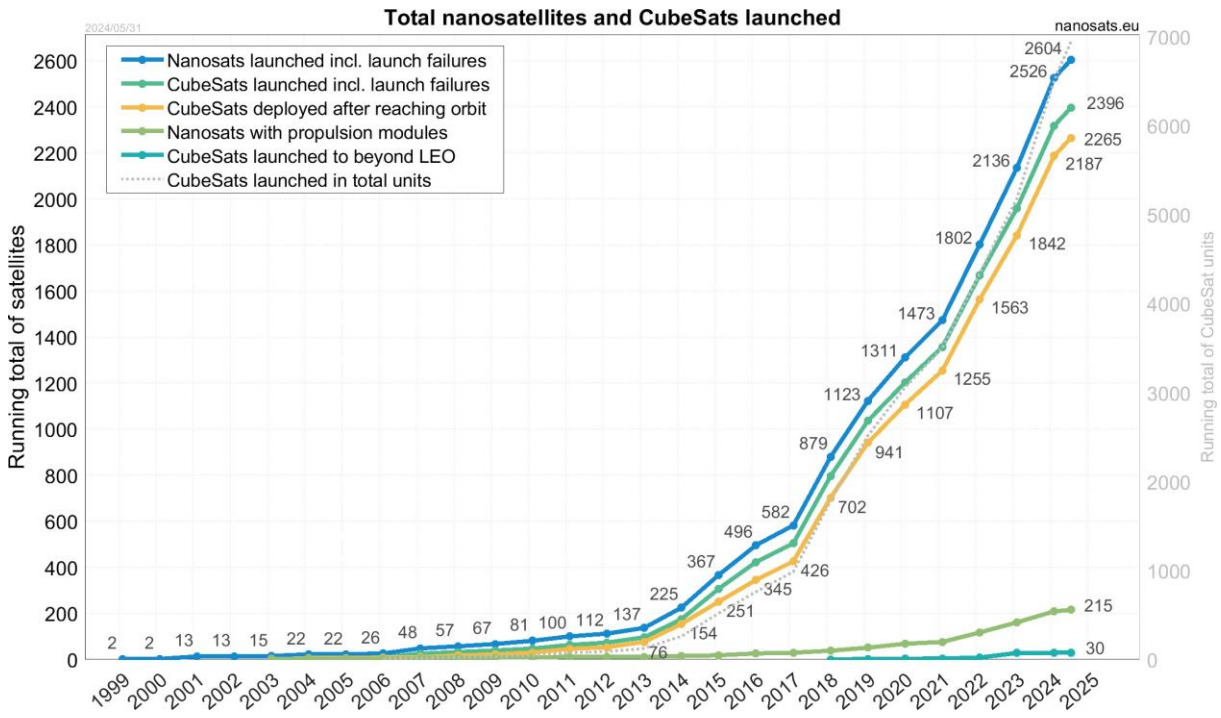
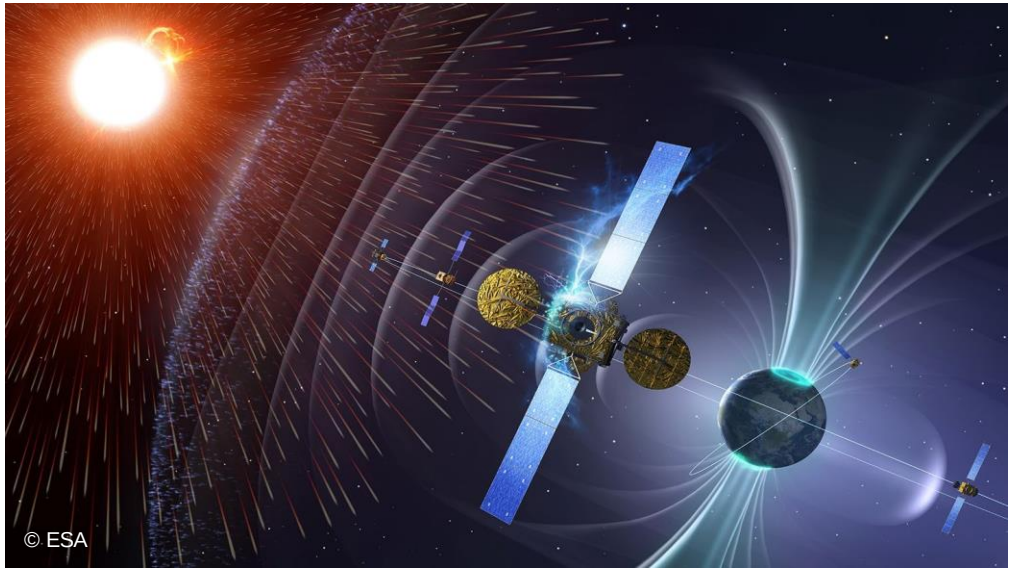
[3] European Space Agency, ESA

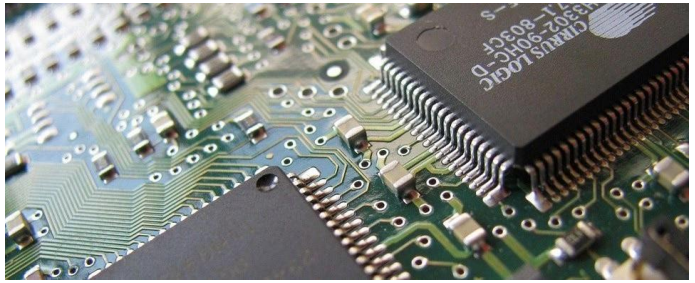
25th March 2025, Seville

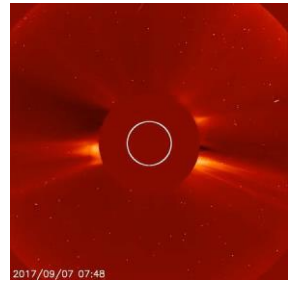
New Space & COTS



Erik Kulu, Nanosats Database, www.nanosats.eu







***CME** detection by SOHO*

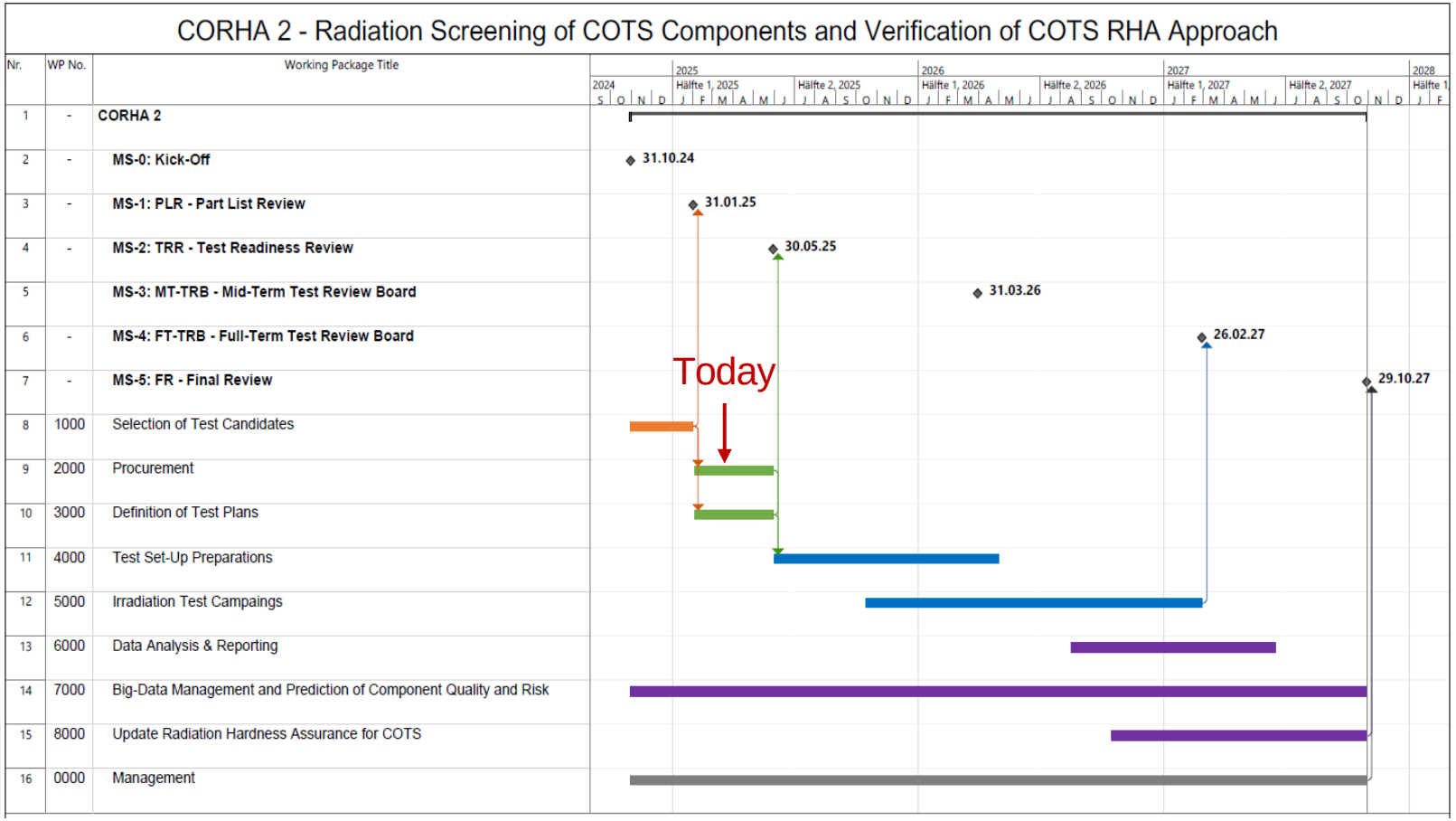
The CORHA 2 Project

- **ESA initiative** led by Seibersdorf Laboratories, Partner: University of Padova
- **Building on CORHA 1** on radiation testing and COTS guidelines
- **Creating an open-access COTS database** to support the space industry
- **Investigating AI-supported RHA** for performance prediction and risk mitigation

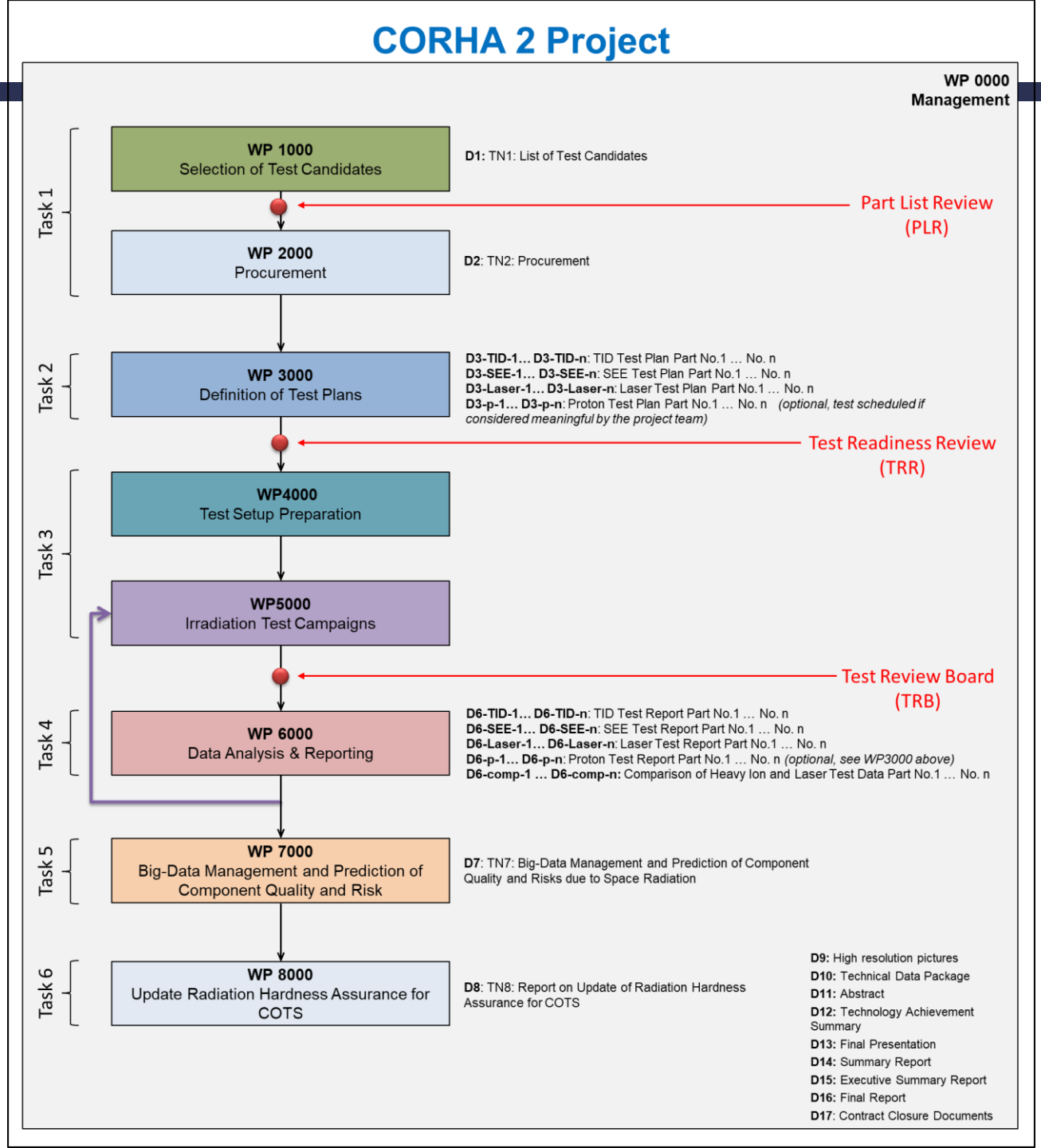
Our Goal:
Support successful COTS integration in space through radiation analysis and selection guidance

Project Overview and Schedule

Customer	ESA
Coordinator	Seibersdorf Labor GmbH
Partner	University Padova
Duration	2024 – 2027
Components	22
Part Types	Voltage Converters, Data Converters, Oscillators, GaN FETs, Memories
Testing	TID, SEE (HI, Laser)
Innovation	Database & AI



Study Logic


CORHA 2 Project
WP 0000
Management
Task 1
WP 1000
Selection of Test Candidates
D1: TN1: List of Test Candidates
Part List Review
(PLR)
WP 2000
Procurement
D2: TN2: Procurement
Task 2
WP 3000
Definition of Test Plans
D3-TID-1… D3-TID-n: TID Test Plan Part No.1 … No. n
D3-SEE-1… D3-SEE-n: SEE Test Plan Part No.1 … No. n
D3-Laser-1… D3-Laser-n: Laser Test Plan Part No.1 … No. n
D3-p-1… D3-p-n: Proton Test Plan Part No.1 … No. n (optional, test scheduled if considered meaningful by the project team)
Test Readiness Review
(TRR)
Task 3
WP4000
Test Setup Preparation
WP5000
Irradiation Test Campaigns
Test Review Board
(TRB)
Task 4
WP 6000
Data Analysis & Reporting
D6-TID-1… D6-TID-n: TID Test Report Part No.1 … No. n
D6-SEE-1… D6-SEE-n: SEE Test Report Part No.1 … No. n
D6-Laser-1… D6-Laser-n: Laser Test Report Part No.1 … No. n
D6-p-1… D6-p-n: Proton Test Report Part No.1 … No. n (optional, see WP3000 above)
D6-comp-1 … D6-comp-n: Comparison of Heavy Ion and Laser Test Data Part No.1 … No. n
Task 5
WP 7000
Big-Data Management and Prediction of Component Quality and Risk
D7: TN7: Big-Data Management and Prediction of Component Quality and Risks due to Space Radiation
Task 6
WP 8000
Update Radiation Hardness Assurance for COTS
D8: TN8: Report on Update of Radiation Hardness Assurance for COTS
D9: High resolution pictures
D10: Technical Data Package
D11: Abstract
D12: Technology Achievement Summary
D13: Final Presentation
D14: Summary Report
D15: Executive Summary Report
D16: Final Report
D17: Contract Closure Documents

Component Selection Strategy

- Call for Component Submissions
  - **133** submissions received
  - **46** fully compliant with the Statement of Work
  - **22** components selected together with ESA

Thank you!

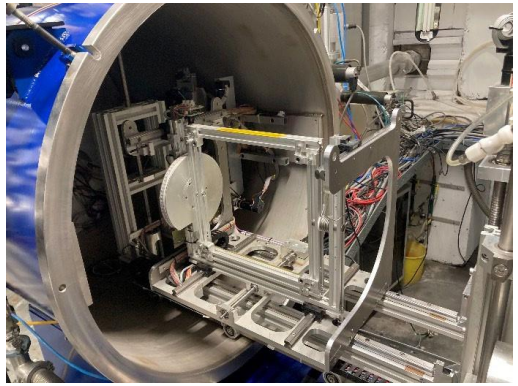
- Part List Selection Criteria:
  - Frequency & occurrence
  - Comparability within component types
  - Component availability

CORHA 2: Final Part List

- **DC/DC Converters:**
  LM2671M-3.3/NOPB | LT8646SIV#WPBF | LMR14030SQDPRRQ1 | LMR16006YQ3DDCTQ1 | LM22676QMRE-ADJ/NOPB | LT8643SIV#WPBF
- **Analog-to-Digital Converters:**
  AD7490WBCSZ | ADS7028IRTER
- **Oscillators:**
  ASAAIG5-16.000MHZ-Y-T3 | DSC1101DM2-016.0000T | ASVMB-16.000MHZ-XY-T
- **GaN FETs:**
  GAN7R0-150LBEZ | EPC2234 | EPC2067
- **Memories:**
  MT25QL128 | MT25QU128 | MT25QL256 | MT25QU256 | MX25L128 | MX25U128 | IS25LP128 | IS25WP128

Radiation Testing

Testing	Source	Facility
TID	Co-60	TEC-Laboratory, Seibersdorf, AT (ISO/IEC 17025)
SEE	Heavy Ions	HIF (UCL), Louvain, BE
	Pulsed Laser	SEE Laser Test Facility Seibersdorf, Seibersdorf, AT



Heavy Ion Facility, UCL, Belgium

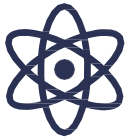
SEE Laser Test Facility Seibersdorf, Austria

TEC Laboratory Seibersdorf, Austria

CORHA 2 Test Strategy

TID – Co-60

- Sample Size: 5+5+1
- Target Dose: 50 krad
- Standard: ESCC 22900



SEE – Heavy Ions

- Destructive SEE: 2 samples & 2 LETs
- Non-destructive SEE on selected components: 2 samples & 5 LETs
- Standard: ESCC 25100

SEE – Laser

- Destructive and non-destructive SEE on selected components
- Localize errors, study error mechanisms, and cross-validate results
- Standard: ESCC 25100

Database & AI

Key Features

- **Centralized Hub**: A structured repository for COTS RHA test results
- **User-Friendly Search**: Enables efficient search and data retrieval for engineers & researchers
- **AI-Powered Insights**: Supports machine learning applications for predictive analysis

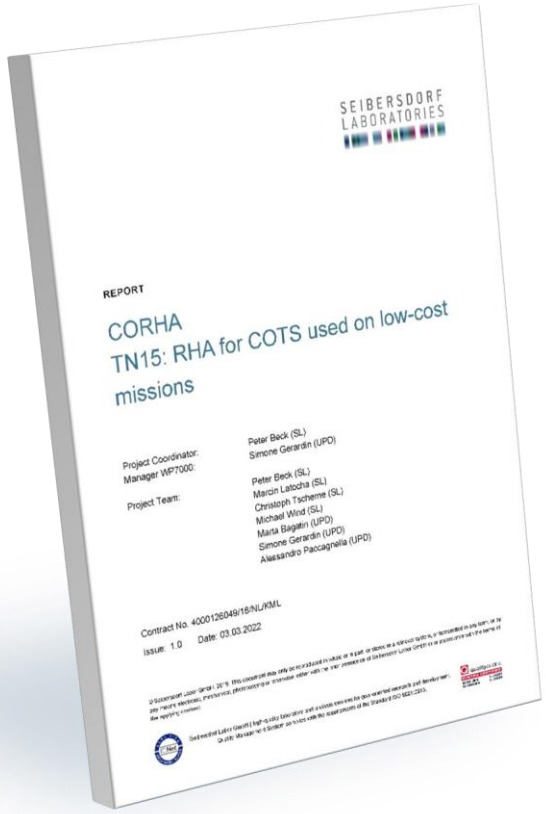
Key Benefits

- **Smarter Component Selection:** Helping engineers find radiation-tolerant COTS
- **Transparency & Collaboration:** Quick and easy data access
- **Improved Decision-Making:** AI-driven failure prediction and trend analysis
- **Data Archiving:** Valuable test data stored for future missions and applications

RHA on COTS Guidelines

Recap on CORHA-1

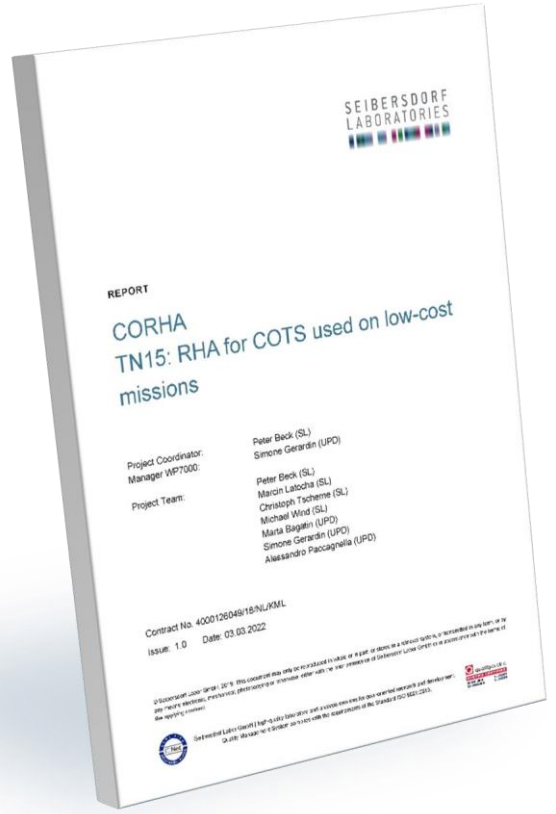
- ✓ **Part criticality analysis**
- ✓ **Evaluation of radiation performance of selected parts**
  - Use of existing data
  - Use of information on manufacturing technology
- ✓ **Radiation testing**
  - Reduction of tested parts and radiation sources
  - Radiation testing at board and system level
  - TID and SEE testing recommendations
- ✓ **Part suitability assessment**
  - Recommended radiation design margins



CORHA 2 Update on COTS Guidelines

Key Updates included in CORHA 2:

- **Broader Component Coverage:** Expands to new semiconductor technologies and a wider range of components
- **Application of SEE Laser Testing:** Methodologies for localized error detection, fault injection, RHA circuit design validation, model verification, and cross-validation with heavy ion testing
- **AI-Assisted Analysis:** Investigation of machine learning-driven failure prediction, anomaly detection, and optimized RHA strategies for more efficient and cost-effective COTS RHA approach

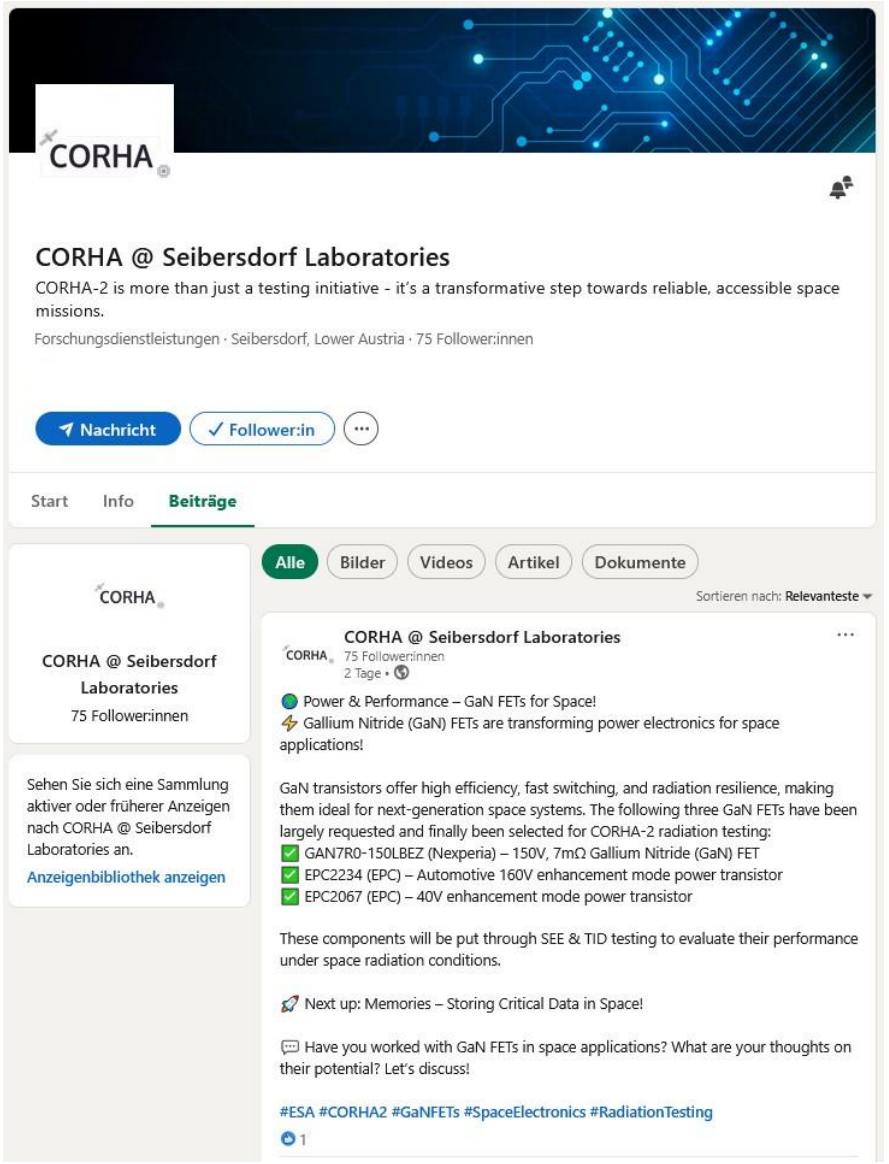


CORHA Website

https://www.seibersdorf-laboratories.at/corha2

CORHA LinkedIn

http://linkedin.com/showcase/corha-seibersdorf-laboratories



Let‘s Stay Connected

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Get in touch for collaboration, test inquiries, or more information on CORHA-2!

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