

DLR Update on EEE Components development and qualification

ESCCON March 2019, Noordwijk

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German Aerospace Center (DLR)

Space Administration, General Technologies and Robotics

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Knowledge for Tomorrow



Overview

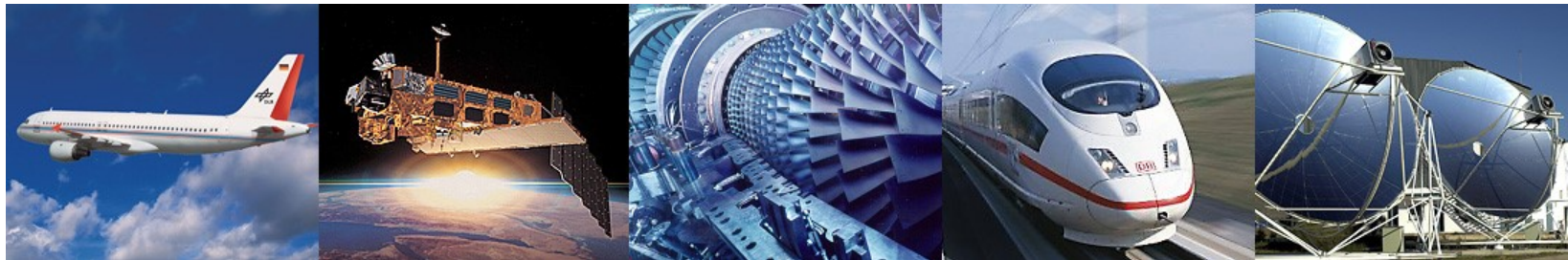
- The German Aerospace Center – DLR
- New Space Activities
- EEE-Components Development and Qualification



The German Aerospace Center – DLR

DLR has approximately 8000 employees at 20 locations in Germany

- Research and Technology
- Space Administration
- Project Management Agencies



Research Areas:

Aeronautics, Space Research and Technology, Transport, Energy, Defence and Security, Space Administration, Project Management Agency



The German Aerospace Center – DLR

Research and Technology

The German Aerospace Center (DLR) provides ground-breaking services through the combination of research in aeronautics, space, energy and transport, as well as the cross-sectoral fields of security and digitalization. With its scientific and technical expertise, DLR strengthens Germany's position as a scientific and economic location.

Space Administration

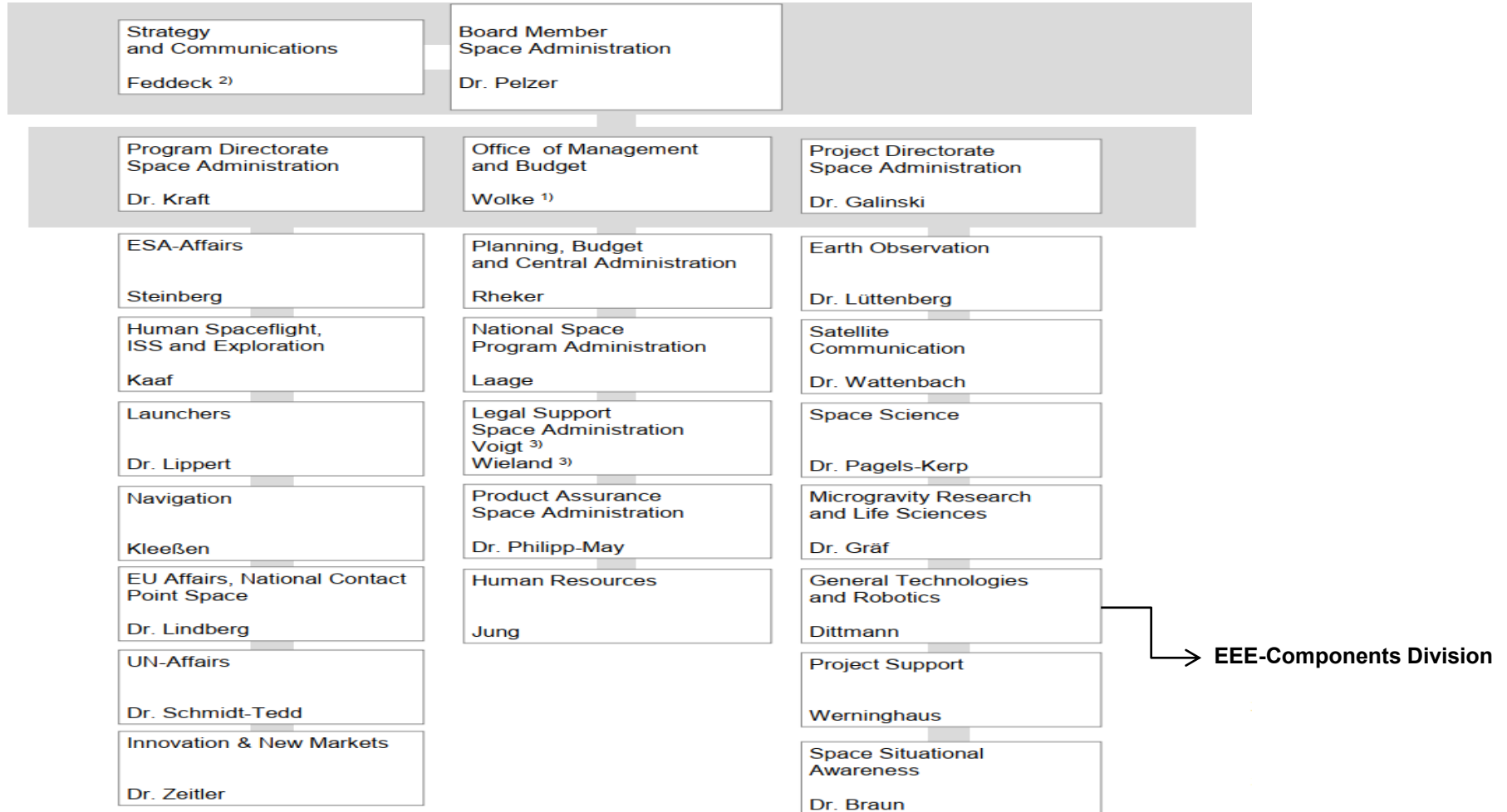
DLR has been assigned the task of the German national space agency. Acting on behalf of the German Federal Government, the DLR Space Administration designs the German space programme and implements it in cooperation with national and international partners.

Project Management Agencies

The DLR portfolio is complemented by the DLR Project Management Agency and the Project Management Agency for Aeronautics Research and Technology. These agencies support their clients in planning, implementing and communicating funding programmes and other measures in research, education and innovation.



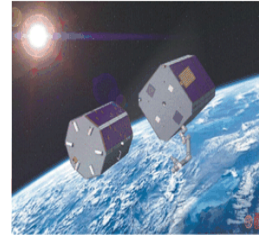
The German Aerospace Center - DLR Space Administration



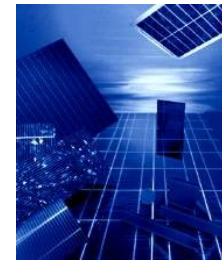
The German Aerospace Center – DLR

General Space Technologies and Robotics:

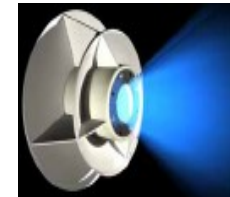
➤ **Automation and Robotics**



➤ **Solar Cells**



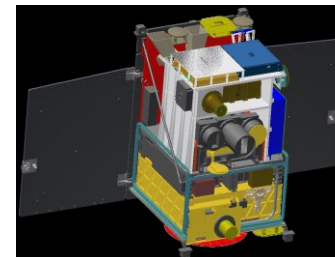
➤ **Electric Propulsion**



➤ **On-Board Computer**



➤ **On-Orbit Verification**



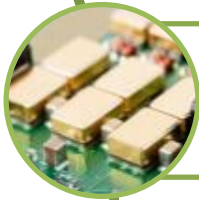
➤ **EEE-Components**



Objectives of EEE-Components Division



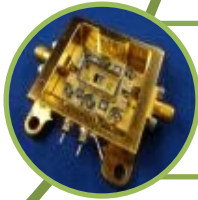
Ensuring German contributions on development and qualification



National coordination and information exchange



Provision of the necessary components for the German industry



European harmonization



Status of re-organization

Re-organization is completed end of 2018

- ✓ ESA recognition as ESCC lead Auditor
- ✓ All certificates are extended
- ✓ Most of manufacturers are visited/audited.
- Development of technical knowledge is ongoing
 - Radiation
 - Hybrid and Packaging

We are THANKFUL to Support of
➤ **DLR QP-NPQ colleagues**
➤ **ESA ESCC colleagues**

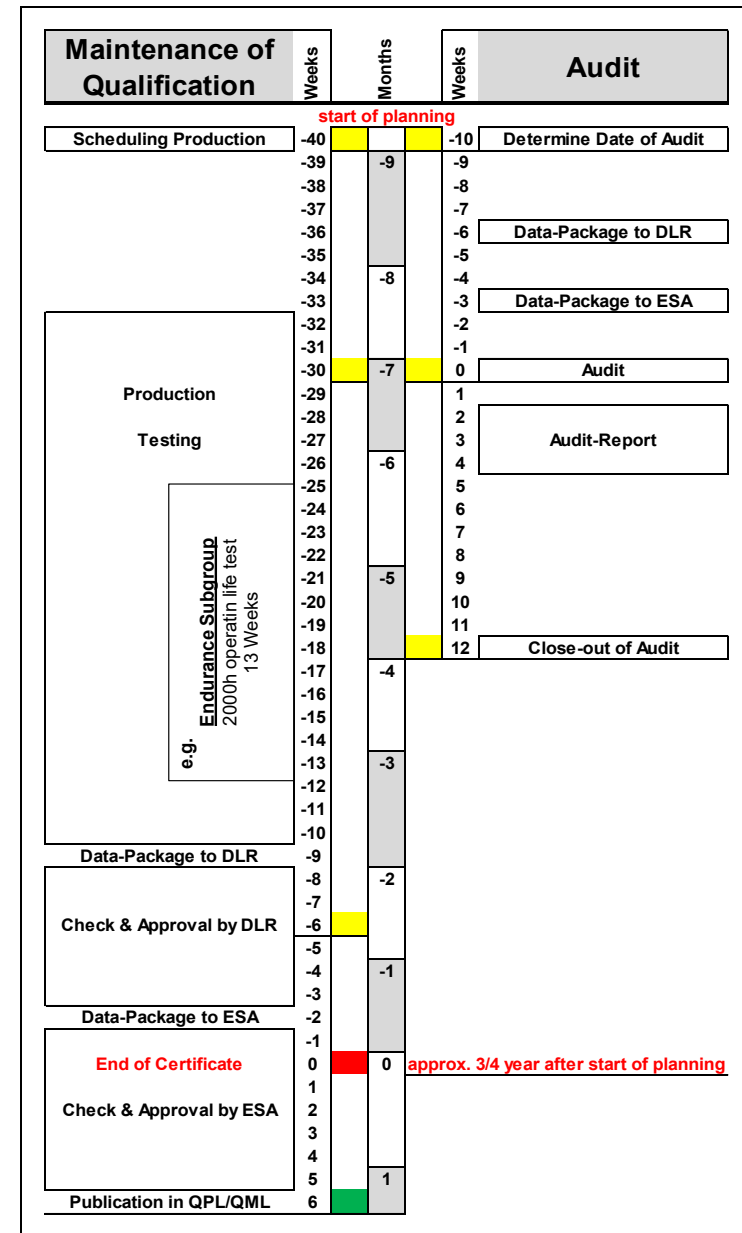


Lessons Learned

Maintenance of Qualification & Audit

(!) Planning

- Availability
- Scheduling of production



Coordination and Information Exchange e.g. Component Technology Board Working Groups

Stronger involvement of German industry on CTB activities

- Inform German companies and institutes about CTB WG discussions.
- Prepare an introduction for each CTB WG
- Identify partners with key technologies, research and development programs
- Share the Agenda & the MoM (only with dedicated ones) to collect the feedbacks before and after the meetings



DLR EEE-Components Conference

Annual conference which serves as exchange platform for:

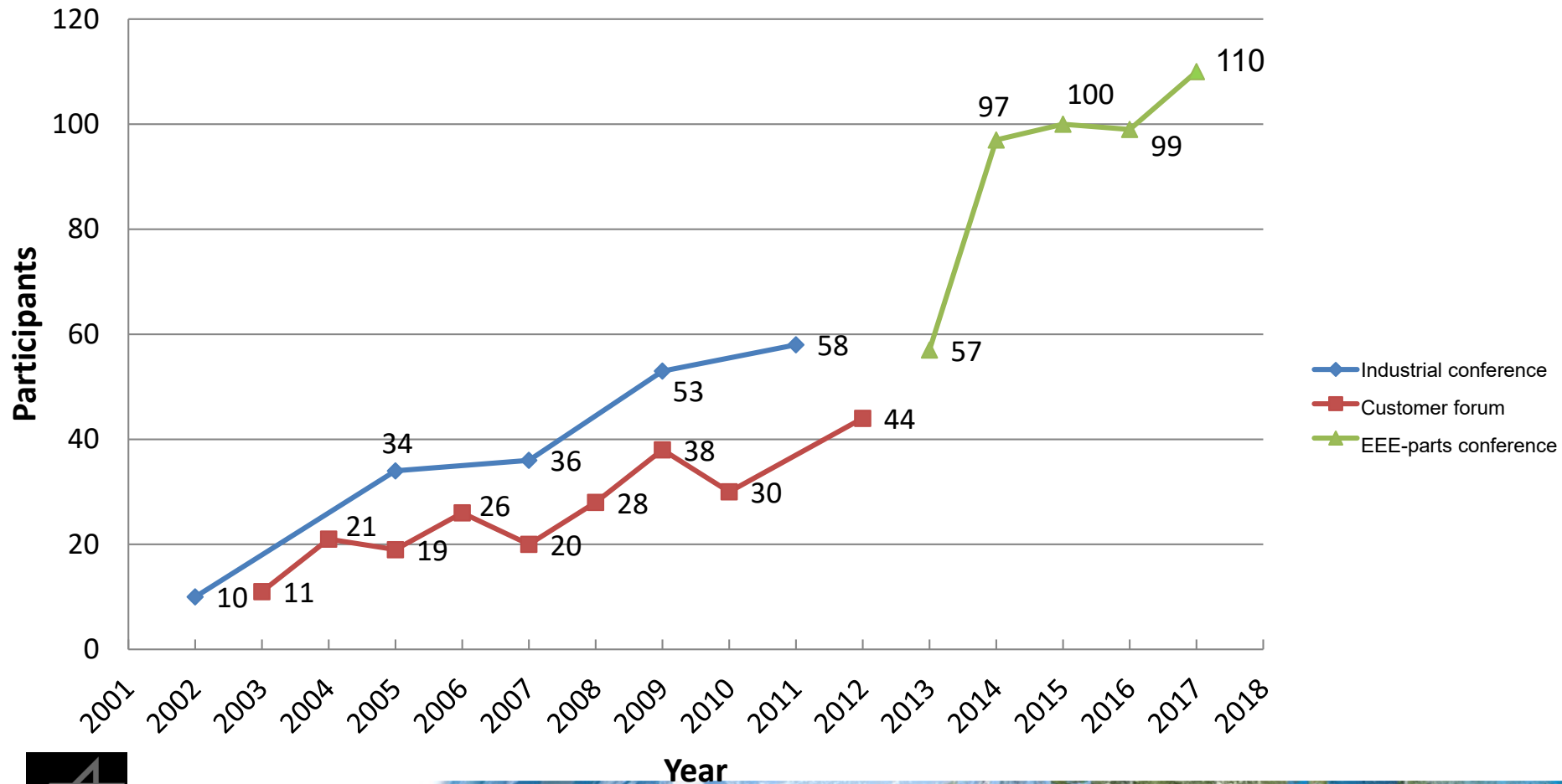
- Demand and availability of space EEE-components
- New technologies for future applications
- Status of ongoing national technology and qualification programs
- Information of planned activities
- Information of national funding opportunities
- Updates on ESCC and ECSS with support of ESA

23rd and 24th of May 2019 in Bonn/Königswinter
„New Space“ is part of the agenda



DLR EEE-Components Conference

DLR EEE-Components conference: number of participants



New Space Motivation

As space industry is facing a **process of renewal**, the possible usage of non-space qualified parts in space missions to reduce overall costs, improve availability, reduce lead time and increase flexibility (functionality, new technologies) getting more **important**.

Why Automotive parts?

- ✓ Strategy in automotive industry (e.g. Standardization, Product Roadmaps ...)
- ✓ More recent technologies and features
- ✓ Significantly lower costs, shorter lead times, better availability
- ✓ Guaranteed reliability and temperature ranges
- ✓ **Many German automotive parts manufacturers have also Space Productions**



New Space

Preliminary Plan: Identification Phase

Target: To understand the past and to define the critical parts (needs)

- Lessons Learned:
 - Experiences from previous programs using non-space grade parts (e.g. TET-1)
 - DLR studies related to use/evaluation and qualification of non-space grade parts
- Which parts are needed (Critical space parts: e.g. long lead times, high costs, ...)
- Market analysis and data collection on automotive parts



New Space

Preliminary Plan: Development Phase

Target: To understand the Delta and analyze the challenges

- Perform a GAP-Analysis:
Differences between ESCC qualified parts and AEC-Q parts
- Work on solutions covering the **challenges** resulting from use of **automotive parts** (some examples)
 - Pure tin – mitigate whisker growth
 - Risk assessment - Assess reliability, failure mechanisms, drift calculations
 - High minimum order quantities, high non-recurring costs – smart, lean procurement process, storage and sales strategy
- Define mission profiles
- **Create a Parts Data Base**



New Space

Preliminary Plan: Verification Phase

Target: Develop a concept and verification methods for automotive parts to evidence for suitability of the automotive parts

○ **Option 1 -> On Orbit:**

- Use of small satellites & Cube-Sats, maybe Sample return mission (?)
- Assembled boards with selected EEE-parts.
- Data transfer during mission time, „real-time“ analysis
- Extrapolation of data, assessment of perimeter and risk

What kind of data could be gained?

- ✓ Detect early failures
- ✓ Launch conditions provide information about resistance to shock and vibration
- ✓ Radiation related data
- ✓ Statistical data for the pre-selection of parts

○ **Option 2 -> Systematic on ground testing for validation**





New Space

DLR Space2Motion Working Groups

DLR initiative: “Space sector meets with automotive”

Exchange platform for automotive and space sector **not only** for EEE-Components

Sub-WG Title: Usage of Automotive Parts in Space Applications

KOM with limited participation is held in Jan. 2019

Scope (finalisation ongoing)

- Identify demand for EEE parts
- Define mission profiles
- Create a platform for exchange (Knowledge Database)
- Verification – Testing of components

Participants (finalisation ongoing) for each Phase

- EEE-Components manufacturers
- EEE-Components users
- Automotive OEMs



New Space Preliminary Schedule

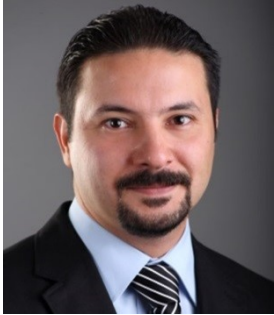


We are aware of challenges

2019				2020				2021			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Sapce 2 motion Working Group											
Identification											
				Development							
								Verification			

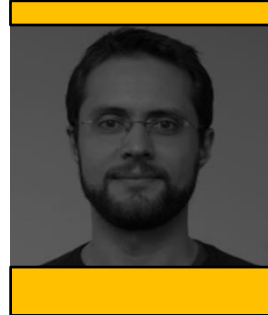


EEE-Components Division



Burak Gökgöz

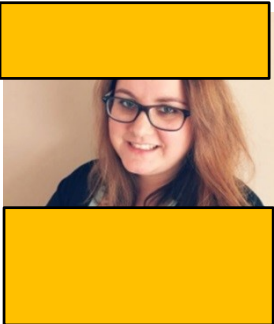
- Programmatic and strategic targets
- Management of flow of funds
- ESCC Lead Auditor
- DLR Representation ESCC
- CTB Working Groups



Thilo Kaupisch

- DLR EEE-Components Conference
- ESCC Lead Auditor
- PM on Eval. & Qual. Projects
- Radiation CTB Working Group

70%



Carina Götschenberg

- DLR Component Portal
- DLR EEE-Components Conference
- Project Assistance

50%



Thomas Schulze

- PM on Eval. & Qual. Projects
- ESCC Lead Auditor
- Hybrid und Packaging CTB Working Group



Anita Weinschrott-Schaaf
(Coordination)

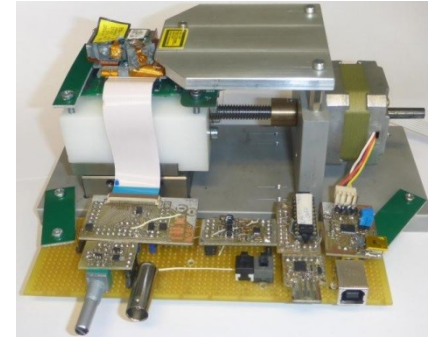
- Many experts acting as “technical advisor”
- CTB Working groups
- Eval. & Qual. Projects
- Many other topics



EEE Components Development and Qualification

LUNTE - Ongoing

Activity	Remarks
Latchup Investigations of Electronic Components	University of Jena Completed: Hardware of automatable pulse laser set-up Latchup investigations performed Running: Extend hardware by developing new features Next steps: Latchup investigations with additional components Project duration: July 2020



EEE Components Development and Qualification

NOVELO - Ongoing

Activity	Remarks
Wideband Synthesizer for Space Applications	IMST Completed: Test Chip available Running: Package re-design Next steps: Evaluation Project duration: December 2020



EEE Components Development and Qualification

SPAC - Ongoing

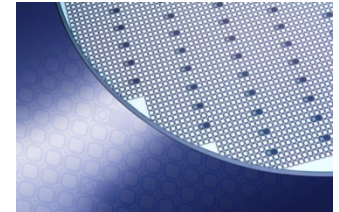
Activity	Remarks
Approval Process of an ESCC qualified ASIC Supply Chain	IMST Completed: Evaluation Phase Running: Preparation of Qualification Next steps: Qualification Project duration: December 2019



EEE Components Development and Qualification

High Voltage Diode - Ongoing

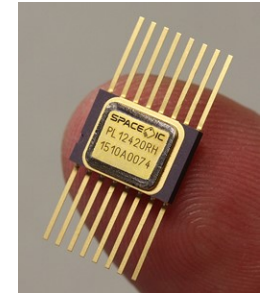
Activity	Remarks
ESCC Evaluation and Qualification of a High voltage „ultrafast reverse recovery time“ diode in a MELF compatible ceramic package	Tesat Spacecom Completed: Evaluation Running: Rework of the Wafer Next Step: Qualification Project duration: December 2019



EEE Components Development and Qualification

Point-of-Load Converter - Ongoing

Activity	Remarks
ESCC Evaluation and Qualification of the SPPL12420RH Point-of-Load Converter	Space-IC Completed: Mostly Evaluation Running: Closeout of Evaluation Next steps: Qualification Project duration: December 2019



EEE Components Development and Qualification

Microcoil - Ongoing

Activity	Remarks
Feasibility Study of Next Generation of Microcoil Springs-CCGA Assembly Phase I	OHB System AG Completed: -/- Running: Literature search Next steps: Examination of Soldering Process Mechanical and Thermal Analysis Test and verification Project duration: January 2020



Photo provided by NASA



Photo provided by NASA



EEE Components Development and Qualification

NDT - Planned

Activity	Remarks
NDT Investigation on CCGA Soldering	SGS Completed: -/- Running: -/- Next steps: -/- Project duration: 2 years



Questions & Answers

Thank you for your attention!

Vielen Dank für Ihre Aufmerksamkeit!

Merci de votre attention!

Kiitos huomiostasi!

ご清聴ありがとうございました

谢谢各位的注意！

ध्यान देने के लिए आपका धन्यवाद !

Tak for din opmærksomhed!

Grazie per l'attenzione!

Bedankt voor uw aandacht!

¡Gracias por su atención!

Takk for din oppmerksomhet!

Спасибо за внимание!

Tack för din uppmärksamhet!

உங்கள் கவனத்திற்கு நன்றி!

Dziękuję za uwagę!

ilgiyle dinlediğiniz için teşekkürler!

I'll be thankful for the corrections

