ALTER

TRISMAC
Trilateral Safety and Mission Assurance Conference 2024

Future Space, New Tools and PA services. ALTER perspective

Trilateral Safety and Mission Assurance Conference (TRISMAC 2024)

ESA –ESRIN. Frascati (Rome) 24-26 June 2024

Manuel Morales

TRISMAC
Trilateral Safety and Mission Assurance Conference 2024

Agenda

1. Presentation of ALTER Technology / TÜV NORD
2. New Projects, new Product Assurance
3. Same (old problems), new solutions
4. doEEEt
5. PRECEDER
6. VirtualLab™
7. RAD-E4SPACE

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Trilateral Safety and Mission Assurance Conference 2024

ALTER TECHNOLOGY

Inspired by Knowledge

TRISMAC (Frascati) 24-26 June 2024

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TÜV NORD GROUP

We create trust in technology –below ground, on ground, in space.

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Figures, data, facts

The TÜV NORD GROUP at a glance (2022's figures)

1,451.8

Million Euro sales

12.238

Employees worldwide

TÜVNORDGROUP

TÜVNORD · DMT · ALTER · TÜVIT

4

Core Brands
in the Industrial Services, Mobility, Training, Engineering and Natural Resources, Aerospace and IT business units

100

Active in 100 countries

82

Group Companies

The TÜV NORD GROUP

Taken together, this is our expertise for your success.

Below ground

On ground

In space

With our knowledge, we stand for safety, independence and quality – everywhere and at all times. We look to the future and dedicate ourselves to making our clients even more successful in the connected world.

We protect lives, goods and natural resources. We achieve this by offering services in testing, inspection, certification, engineering and training.

TÜVNORDCERT

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ALTER TECHNOLOGY

Inspired by Knowledge

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The Company

ALTER is a leading engineering company which provides reliable and agile solutions in engineering, procurement, assembly, and test to many of the world's most innovative technologies, such as semiconductors, electronic equipment and geospatial intelligence.

Our company is present in space, aeronautics, nuclear, automotive, medical and defence among many others.

Figures, data, facts

ALTER at a glance (2022's figures)

82

Million Euros Revenues

470

Employees

36

Years in the market

7

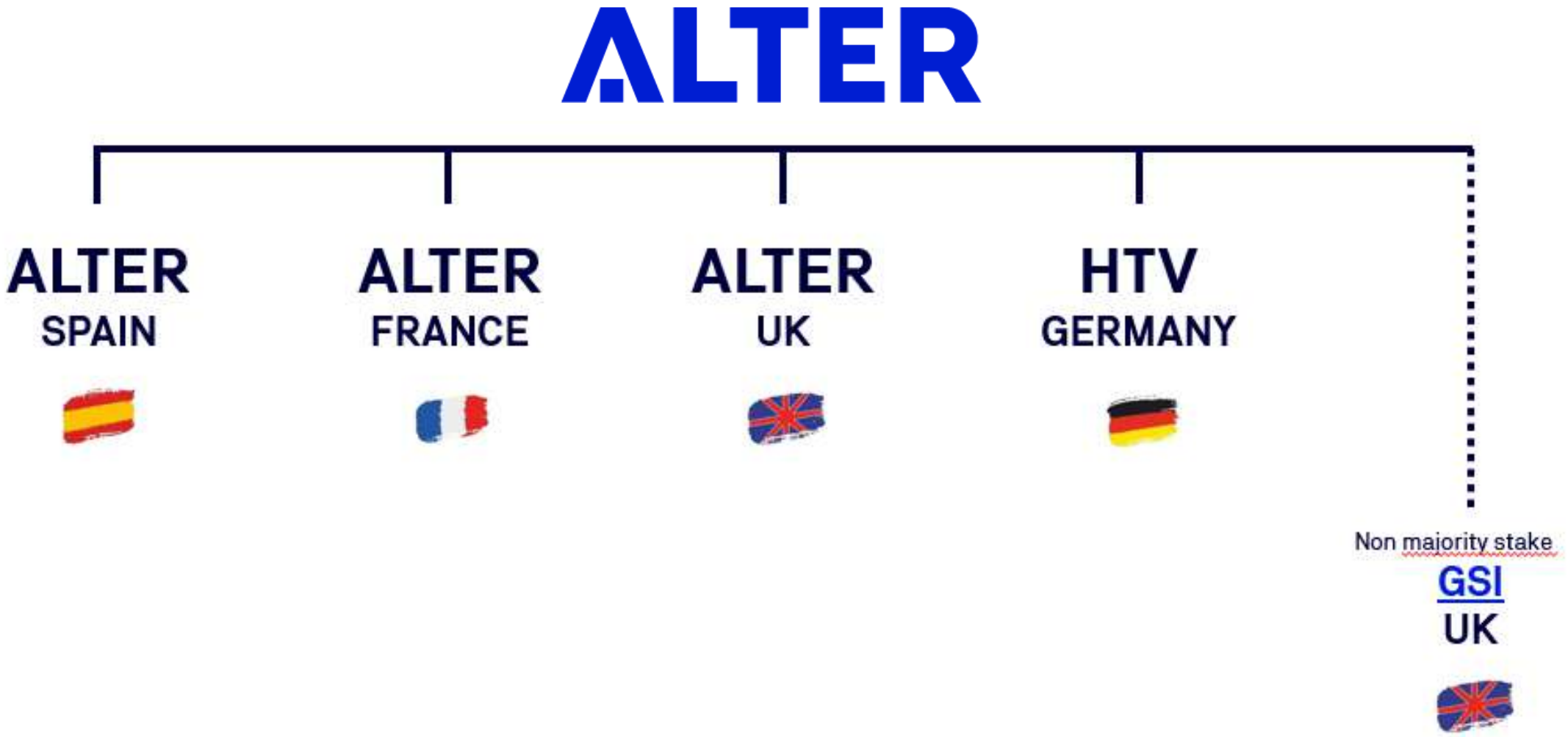
sites

>8500

M2 laboratories

ALTER

Business Unit Aerospace



Objective of Product Assurance

Basic definition from ECSS-Q-ST-10C Rev1 (March 2016):

> *"The prime objective of Product Assurance is to ensure that space products **accomplish** their defined mission objectives in a **safe**, **available** and **reliable** way"*

Although this definition is independent on the type of mission or mission classification (from IOD cubesat to top-class), the Product Assurance (PA) activities need to be tailored accordingly and following specific standards.

However, the rapid growth of NewSpace and the emergence of new players in the space industry necessitate innovative thinking, advanced tools, and associated PA services.

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New projects, new Product Assurance

- Develop and stabilizing of **Testing capabilities for small sat up to 500kg**, getting compliance against ECSS-Q-ST-20-07 tailored by ESA-TECQQ-TN-024614.
- Leading the ESA project 4000134569/21/NL/KMLHALT: "**Highly Accelerated Life Test Pilot Supporting Agile Space Engineering**", assessing a methodology to validate commercial electronic boards for space.
- Participation in **ATCOS project: "Alternative Test Methods for COTS"**, with the main objective to gather information on the performance and reliability of commercial parts, including automotive components, investigating, and comparing the effectiveness and suitability of a typical board/unit test in comparison with the classic test at component level.
- Development of **PRECEDER** (Prediction of the Electrical Behaviour of Electronic Devices under Radiation, Spanish acronym) methodology, as a new concept to get confidence on device radiation hardness based on previous data.
- Design of a **radiation test process at unit / system even satellite level**, considering classic and mixed-field radiation environments.
- Adapted PA services for **NewSpace companies and universities**, adjusting requirements related to EEE components, materials, processes, and testing.
- Development of a low cost tool for analysis of the radiation environment for COTS (**RAD-E4SPACE**).

New projects, new Product Assurance

Traditional space and new missions need more agile methodology, taking advantage of four pilars:

- **Digitization,** which involves converting physical or analog objects (such as documents, images, or records) into digital formats
- **Digitalization**, using digital technologies to transform business processes including automating manual tasks and embracing digital strategies.
- **Machine Learning and IA**, applied to prospective results for testing and processes.
- Direct **contact** with PA engineers, system engineers and technicians performing test, speaking the same ‘space’ language
- **PA mission tailoring**. No two missions are the same!

Same (old problems), new solutions

Some examples of processes addressed

- Search for EEE parts
- Approval process PAD approval process
- Prediction of radiation performance for EEE
- Radiation modelling
- PCB Soldering
- Online Audit/review

DOEFEET 2.0

Virtual Lab™

PRECEDER

RAD-E4SPACE

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You need something (1)

I need to
find a EEE component
for my application

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doEEEt

EEE parts database for Space

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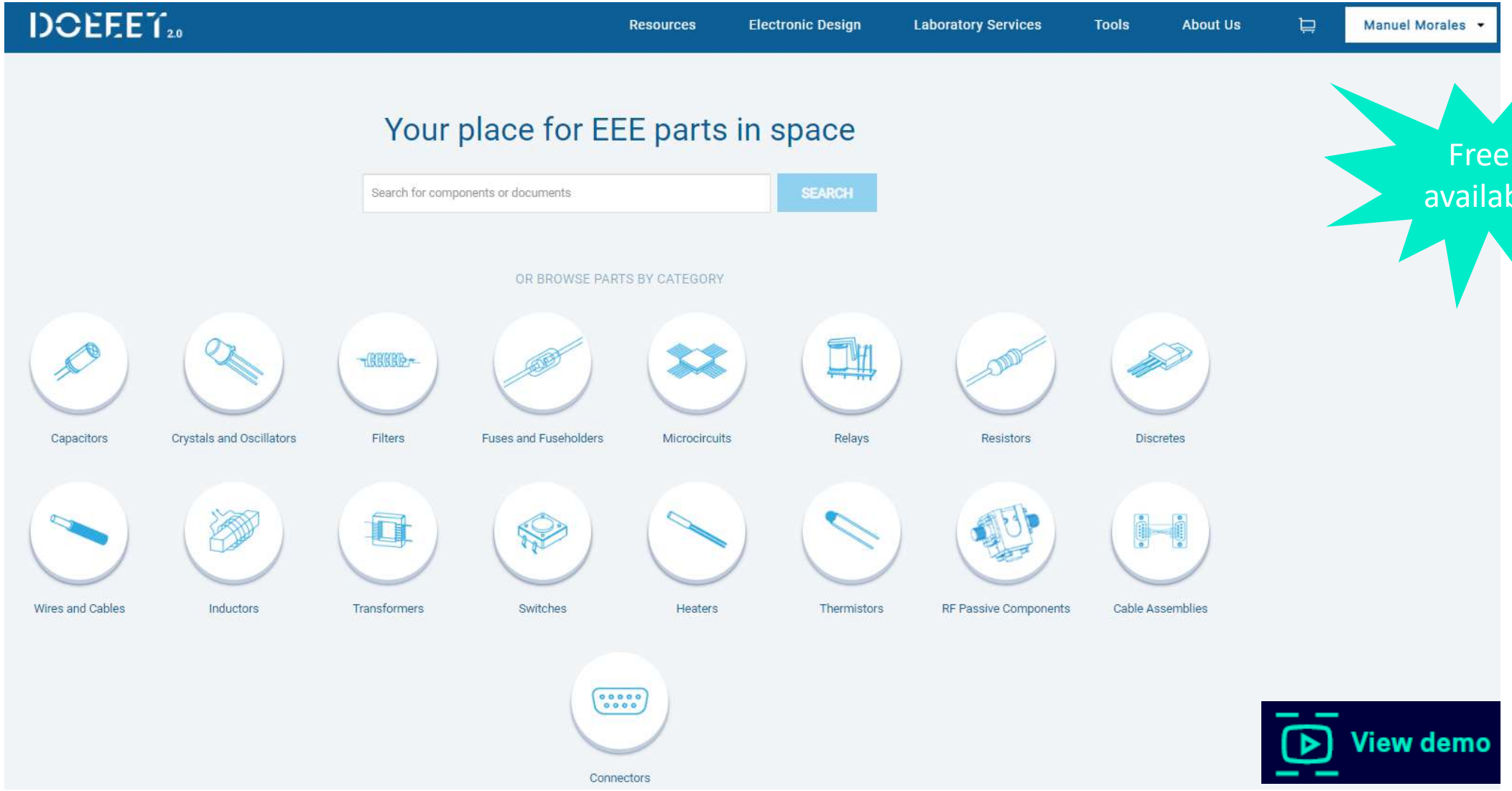
doEEEt.com EEE parts database for Space

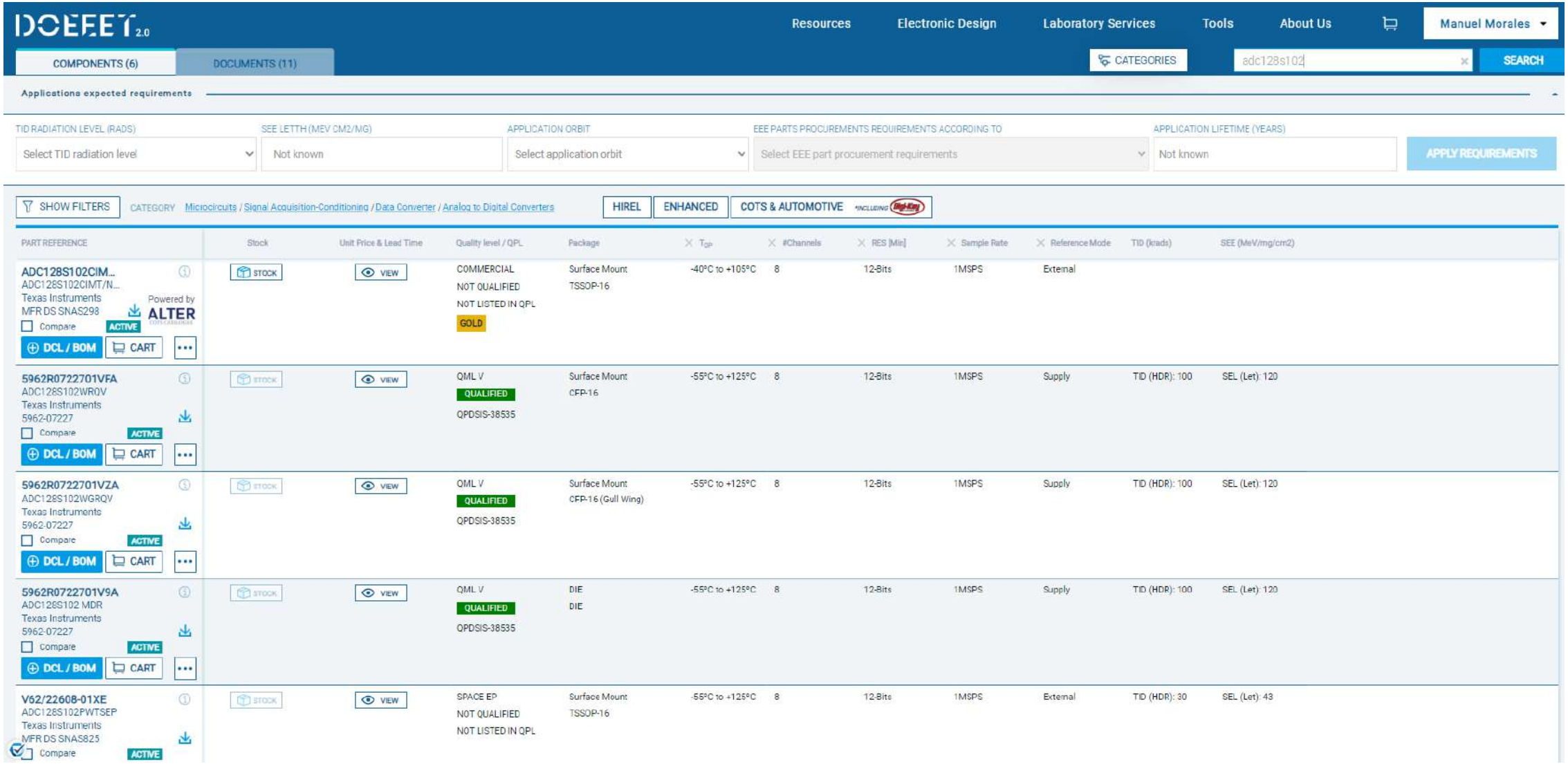


Freely available!

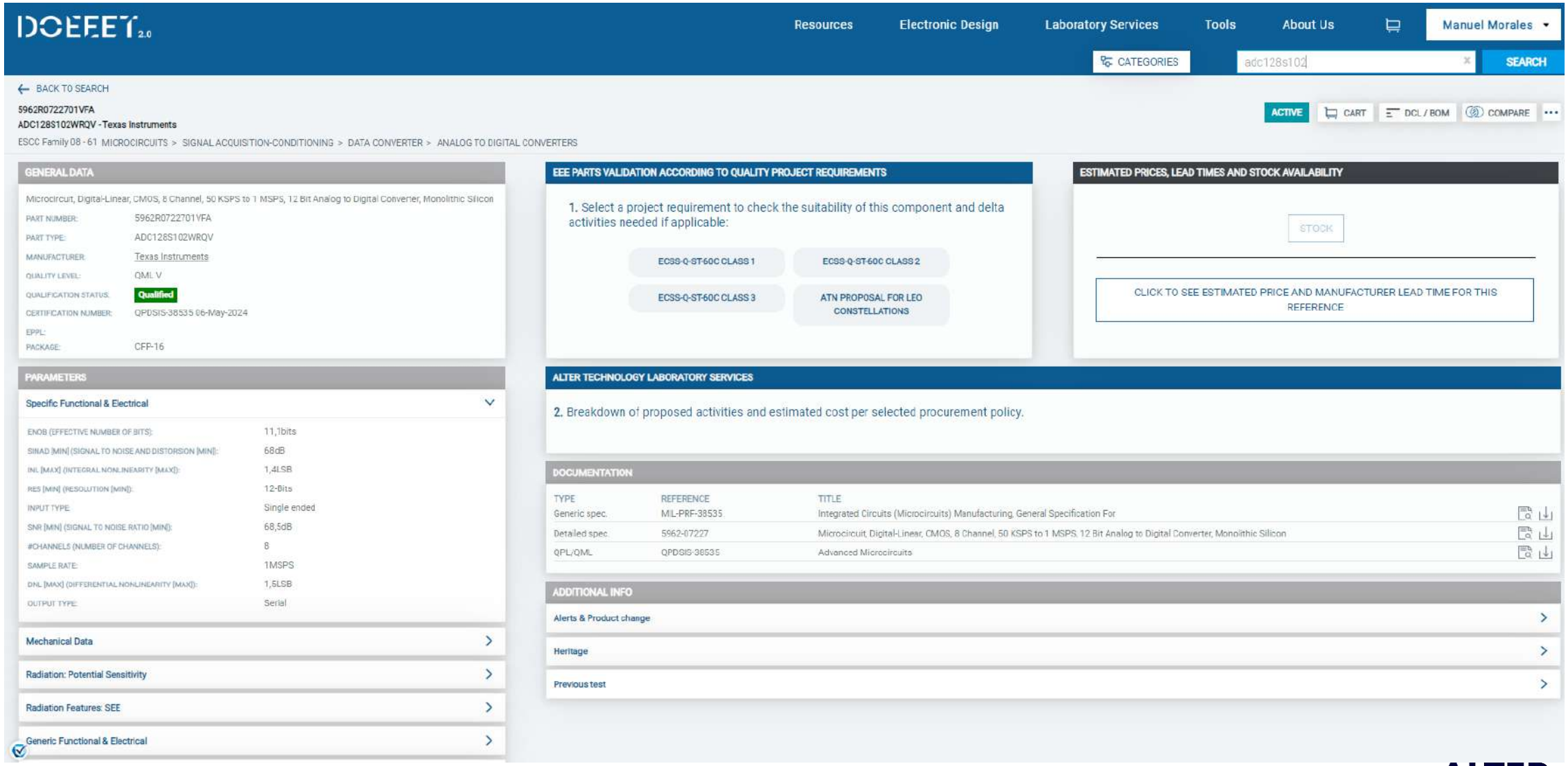
View demo

ALTER

doEEEt.com EEE parts database for Space



doEEEt.com EEE parts database for Space



doEEEt.com platform

Our capabilities

Only **database** for the **space market** with more than 22 million of Hi-Rel EEE parts and COTS.

Designed to **support** any kind of user (designers, engineers, manufacturers, commercial) through the **component selection process**.

Gain **efficiency** in the component selection and information searching, improve **competitiveness** and **time** to market.

Technical information

- Different ways to search components and documents
- All technical information in one place
- Laboratory services consultant

doEEEt Tools

- Comparator
- DCL/BOM
- Stockplace

User area

- My doEEEt
- Proposal next

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EEE parts database for Space

Help users to succeed

Supporting the user throughout the component selection process

Differents ways to search components and documents
- Global and family search
- Search suggestions
- Adaptive parametric filter
- Load DCL/BOM

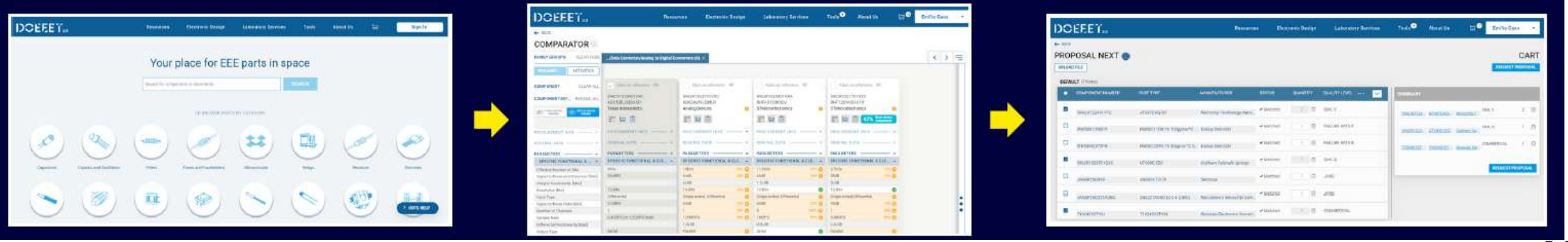
All technical information in one place
- Technical parameters and documentation
- Radiation information
- Alerts notificacions
- CAD models

Check alternatives
- New Space and COTS
- Comparator tool
- Fine tunning

Laboratory services consultant
- Recommended test activities according to your project requirements

Stock and price
- Real time stock availability
- Instant price

PROPOSAL NEXT



doEEEt.com database

Three grades of products for the Space and New Space markets

Space products

Devices designed for Space applications and with quality and/or reliability confident enough for use in Space projects

Enhanced devices

USA and European Manufacturers

Plastic devices with enhanced properties designed for NewSpace applications

COTS & Automotive

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COTS CATALOGUE

Digi-Key ELECTRONICS

Devices designed for Commercial or Automotive applications. Can be used in space applications provided specific controls are implemented depending on mission profile

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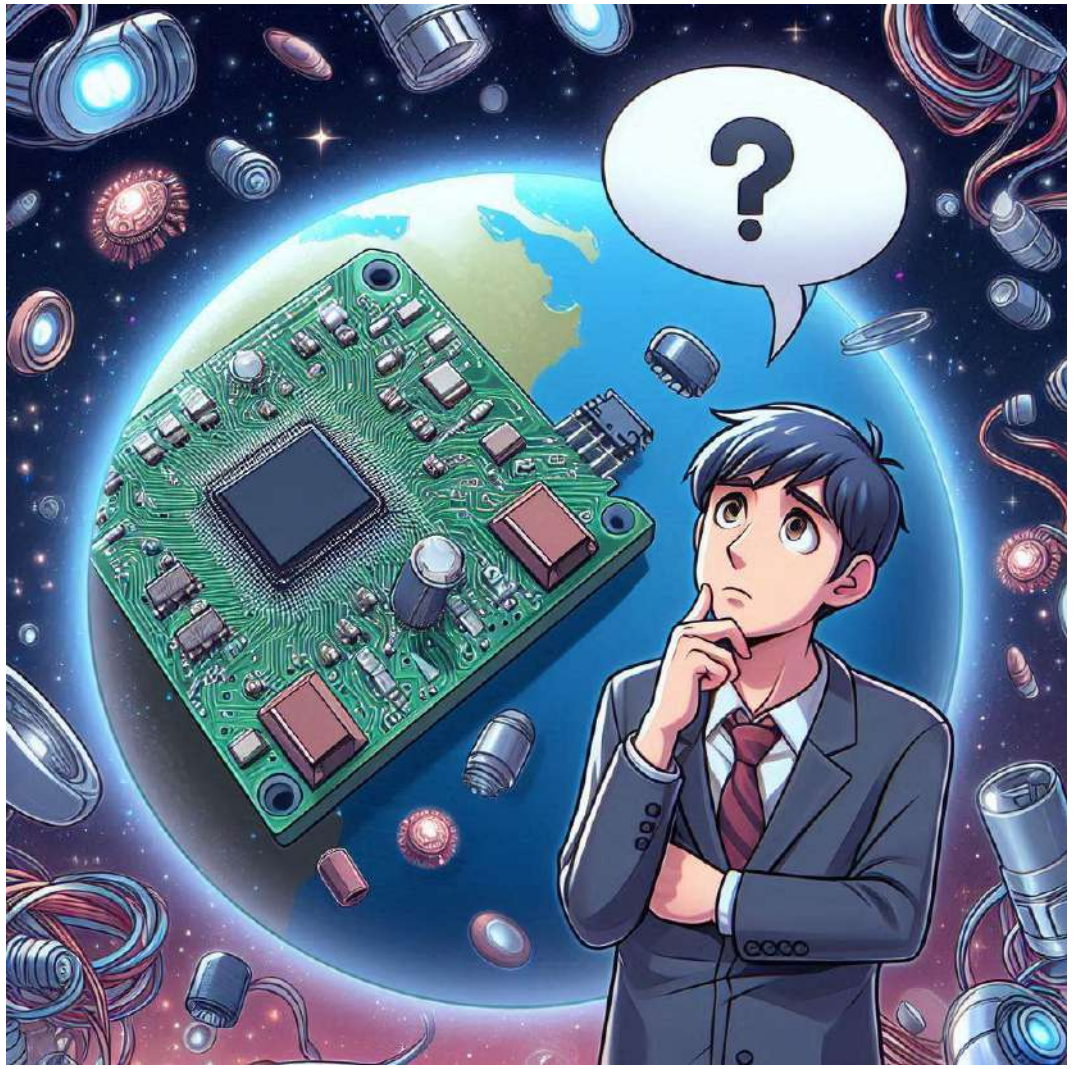
You need something (2)



I need to
know whether I should test my device for radiation

(but have limited budget….as usual)

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PRECEDER

Prediction of radiation performance for EEE components

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Prediction of radiation performance for EEE

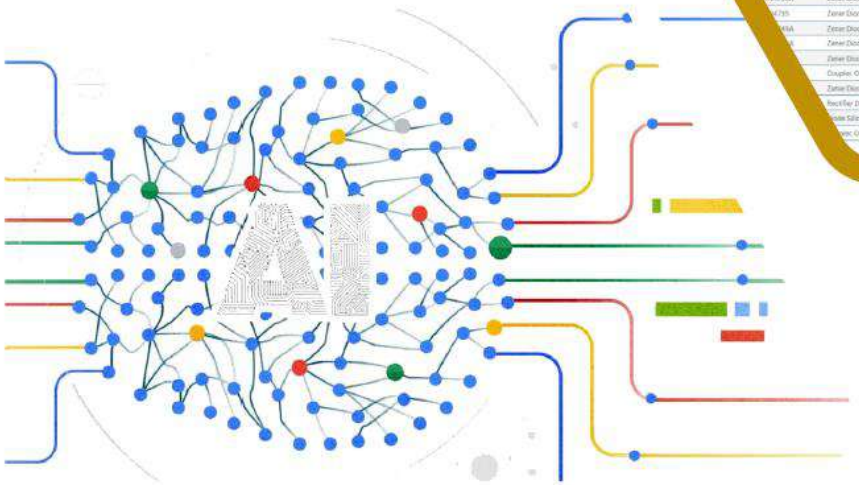
PRECEDER (Prediction of the Electrical Behavior of Electronic Devices under Radiation, Spanish acronym)

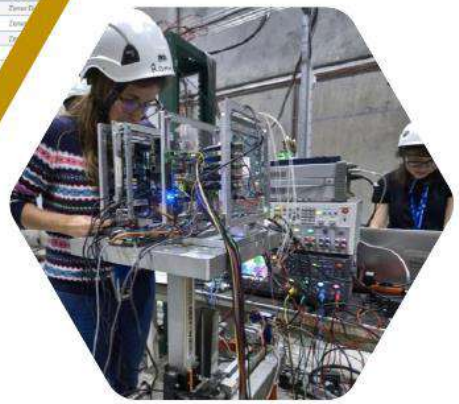
PRECEDER in a nutshell

PRECEDER

The strategy

PRECEDER extracts information from **experimental data** and **predict** what will be the **behavior** of similar **components** without the need to test them under radiation.



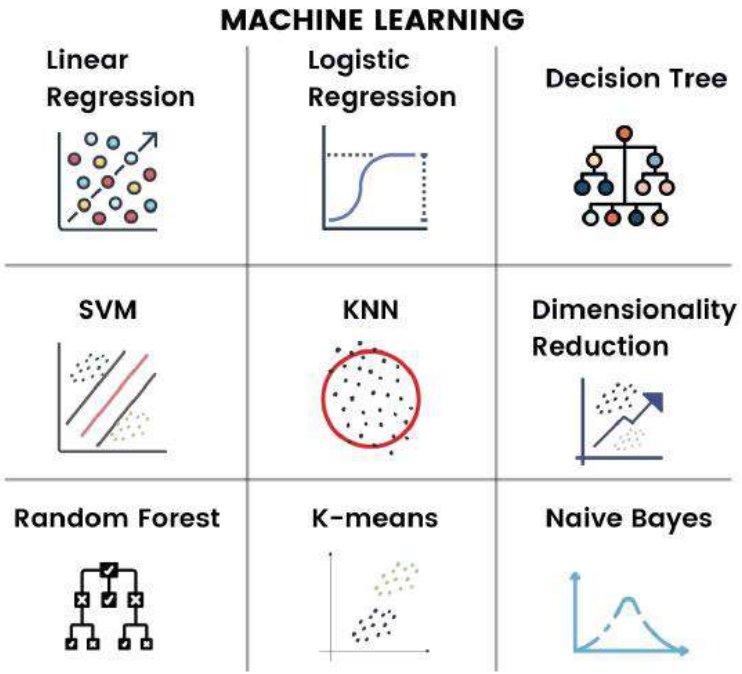


PRECEDER

PRECEDER in a nutshell

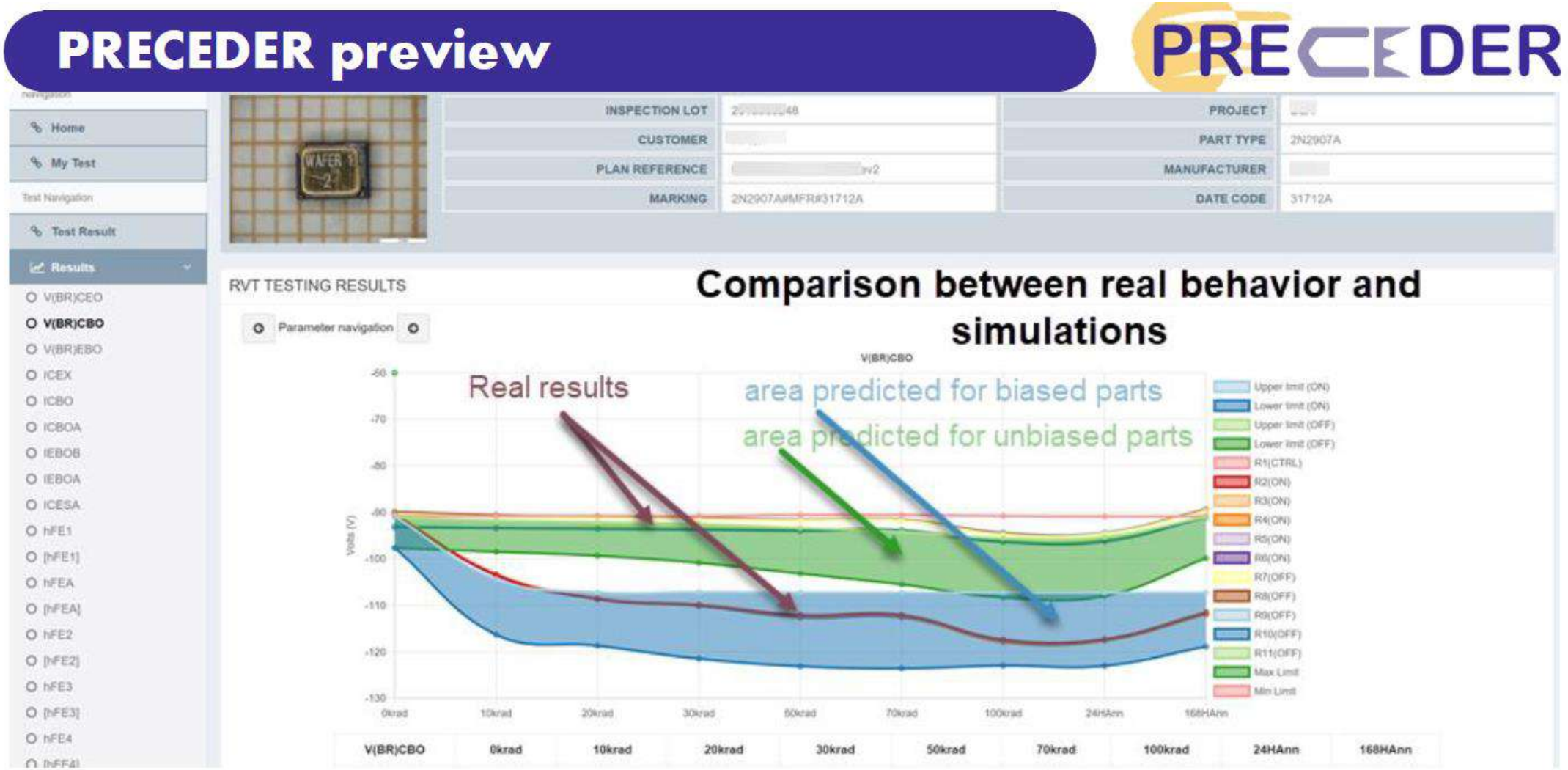
PRECEDER

The problem solved



PREDICTIONS

PRECEDER


PRECEDER preview
PRECEDER
Home
My Test
Test Navigation
Test Result
Results
V(BR)CEO
V(BR)CBO
V(BR)EBO
ICEX
ICBO
ICBOA
IEBOB
IEBOA
ICESA
hFE1
[hFE1]
hFEA
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hFE2
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hFE4
INSPECTION LOT
CUSTOMER
PLAN REFERENCE
MARKING
PROJECT
PART TYPE
2N2907A
MANUFACTURER
DATE CODE
31712A
RVT TESTING RESULTS
Parameter navigation
Comparison between real behavior and simulations
V(BR)CBO
Real results
area predicted for biased parts
area predicted for unbiased parts
Volts (V)
0krad
10krad
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30krad
50krad
70krad
100krad
24HAnn
168HAnn
V(BR)CBO
0krad
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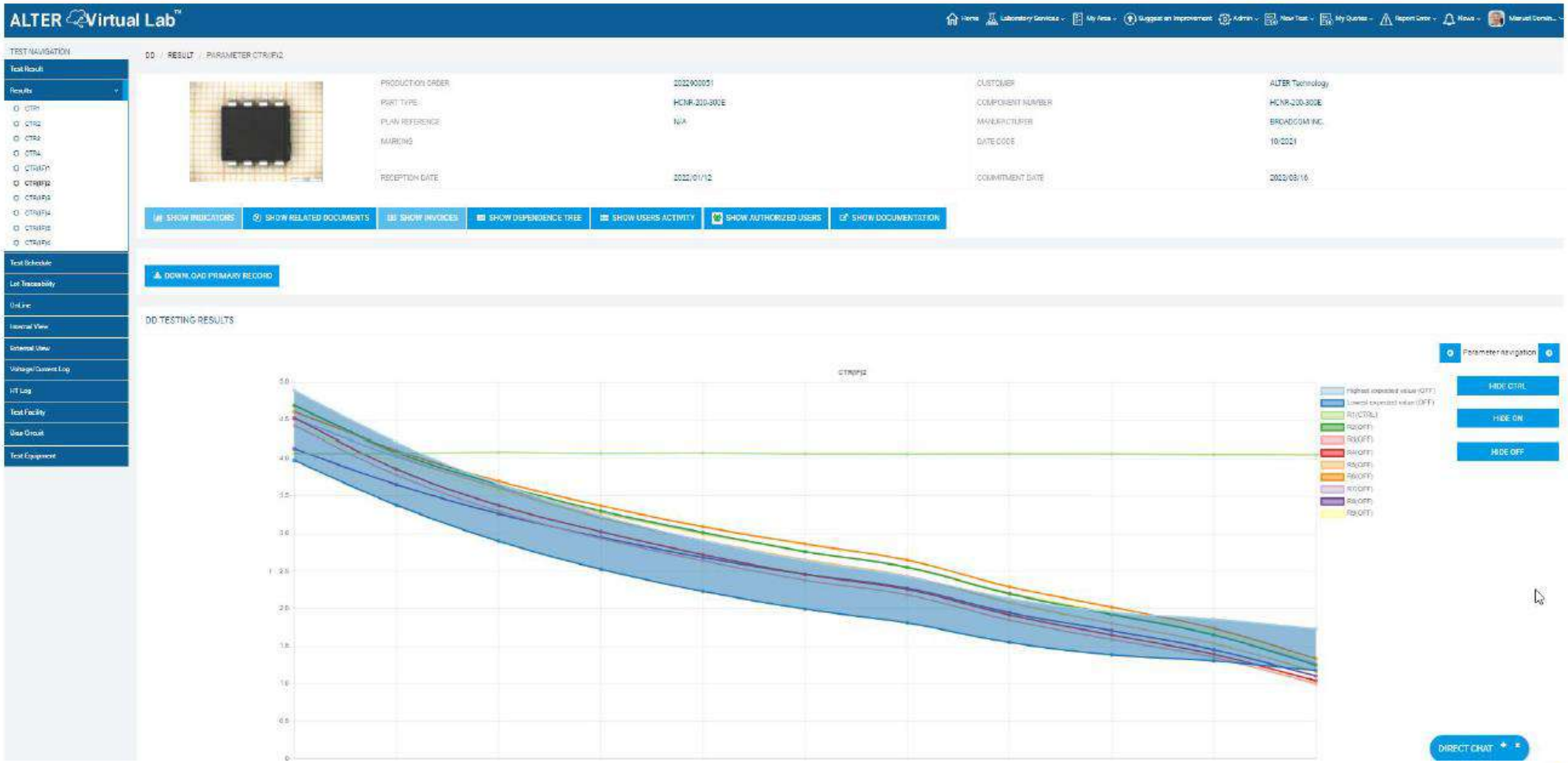
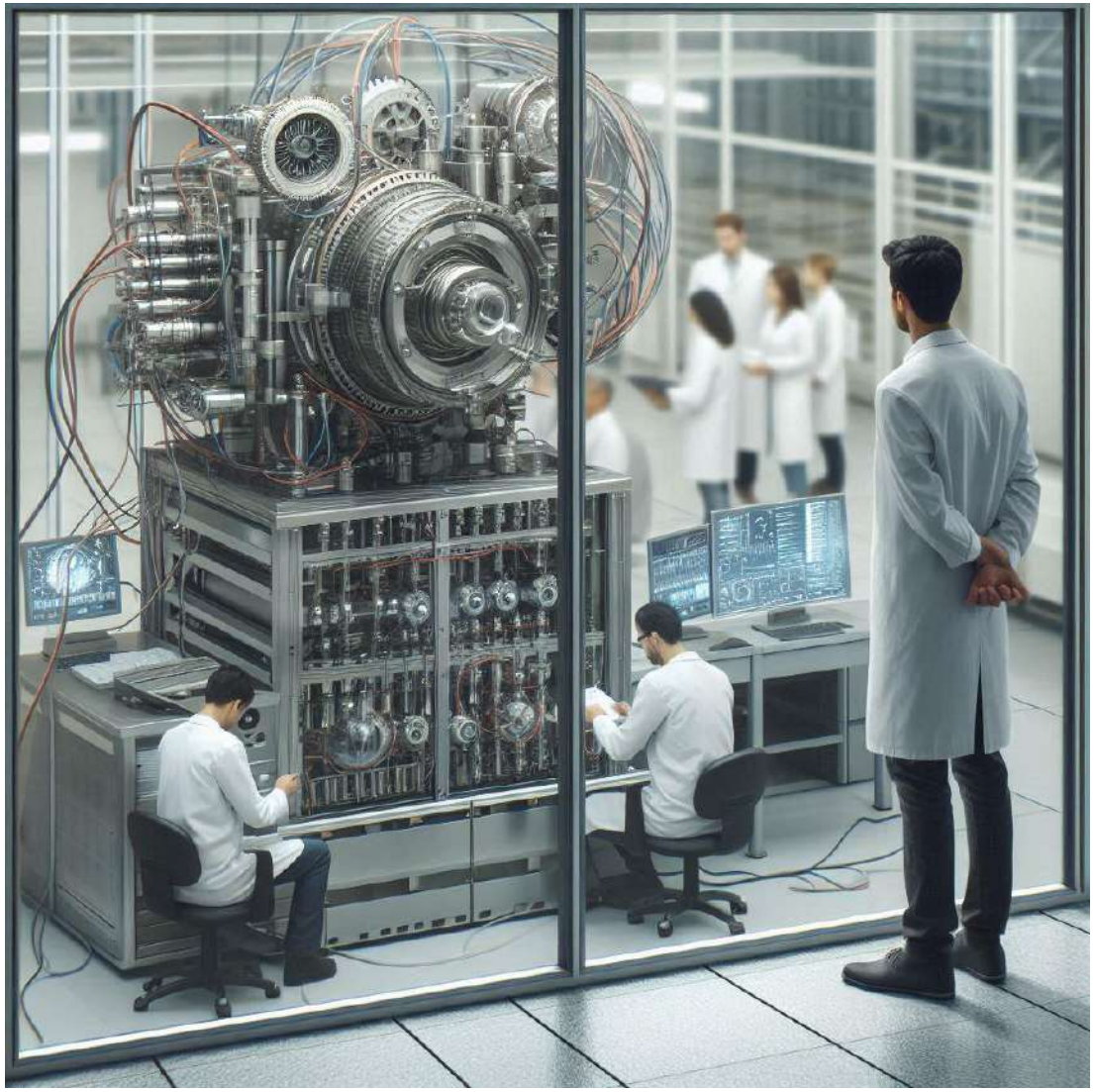
70krad
100krad
24HAnn
168HAnn

PRECEDER

Predictions – Opto DDD example



You need something (3)



I need to

follow/witness the test someone is doing on my

- Board
- EEE part
- Inspection
- Audit
- ….

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VirtualLab

Our Lab and Knowledge at your fingertips

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Virtual Lab ™

Online platform to provide full visibility of your test and communications with technicians

- Real time status of test performed
- Immediate communications with technicians in charge of your test
- Analytical results, showing parameter trends
- Implementation of Machine learning and prediction tolos
- Implementing management of Parts Approval Documents and visualization of Project records

Virtual Lab ™

virtuallab.altertechnology.com

ALTER Virtual Lab™ | Home | Crew | Laboratory Services | My Area | Suggest an Improvement | Admin | New Test | My Quotes | Report Error | News | Manuel Domin...

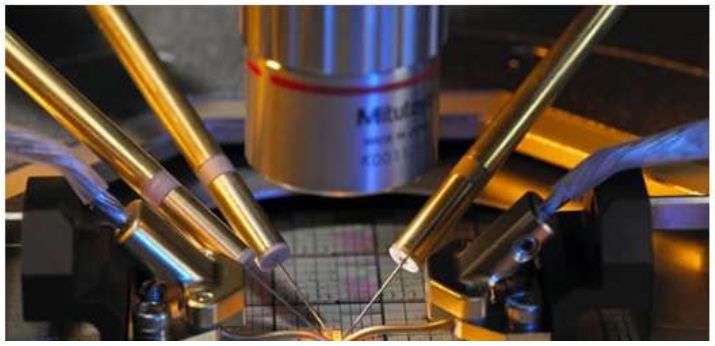
ALTER TECHNOLOGY is an expert, trusted supplier in engineering and **testing** of **EEE components**, **systems** and **equipment**, within the space and other technology markets. We offer a wide range of services, from radiation testing, screening, failure analysis, destructive physical analysis, qualification, environmental testing and many more.

Laboratory Services.

- Non-Destructive Techniques
- Destructive Techniques
- Environmental Testing
- Material & Procceses Testing
- Microwave Testing
- Electrical Measurement Testing
- Radiation Verification
- Mechanical Testing
- Acoustic Microscopy Inspections
- Innovation Solutions

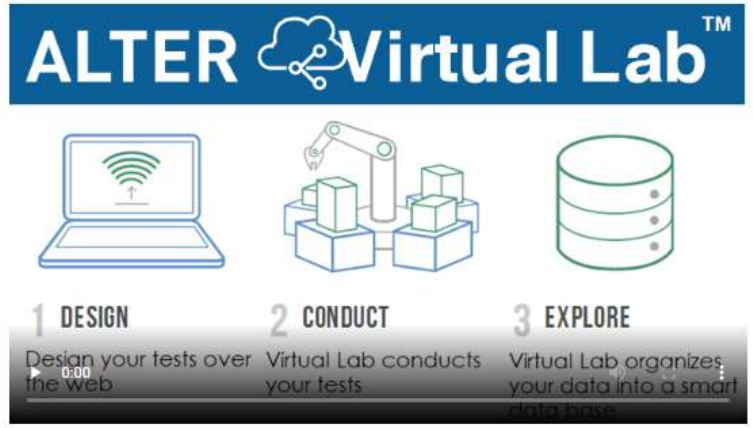
Main Testing Activities and Processes.

- Screening, plan preparation and engineering support.
- DPA (Destructive Physical Analysis).
- Constructional analysis, reverse engineering.
- Failure analysis investigation.
- LAT (Lot Acceptance Test), QCI (Qualification Conformance Inspection).
- Initial and Final Customer Source Inspections (Pre-cap and Buy-Off inspections with worldwide presence: anytime, anywhere).
- Relifing Inspection.
- Evaluation analysis on commercial parts for space suitability.
- Thermal characterization.
- Authenticity test; Counterfeit investigation.
- Element evaluation (on hybrid add-on parts).
- Storage with special conditions (hot & cold, dry atmosphere with nitrogen, etc).
- Dice managing, inspection and storage.



Virtual Lab Capabilities.

- Full access in real time to the output of the on-going test.
- Direct link to the analysts performing the tests.
- Permanent access to historical results.
- Full access to the biggest picture bank available in the market.
- Training material.
- Documentation management.
- Push Notifications.



Industry.

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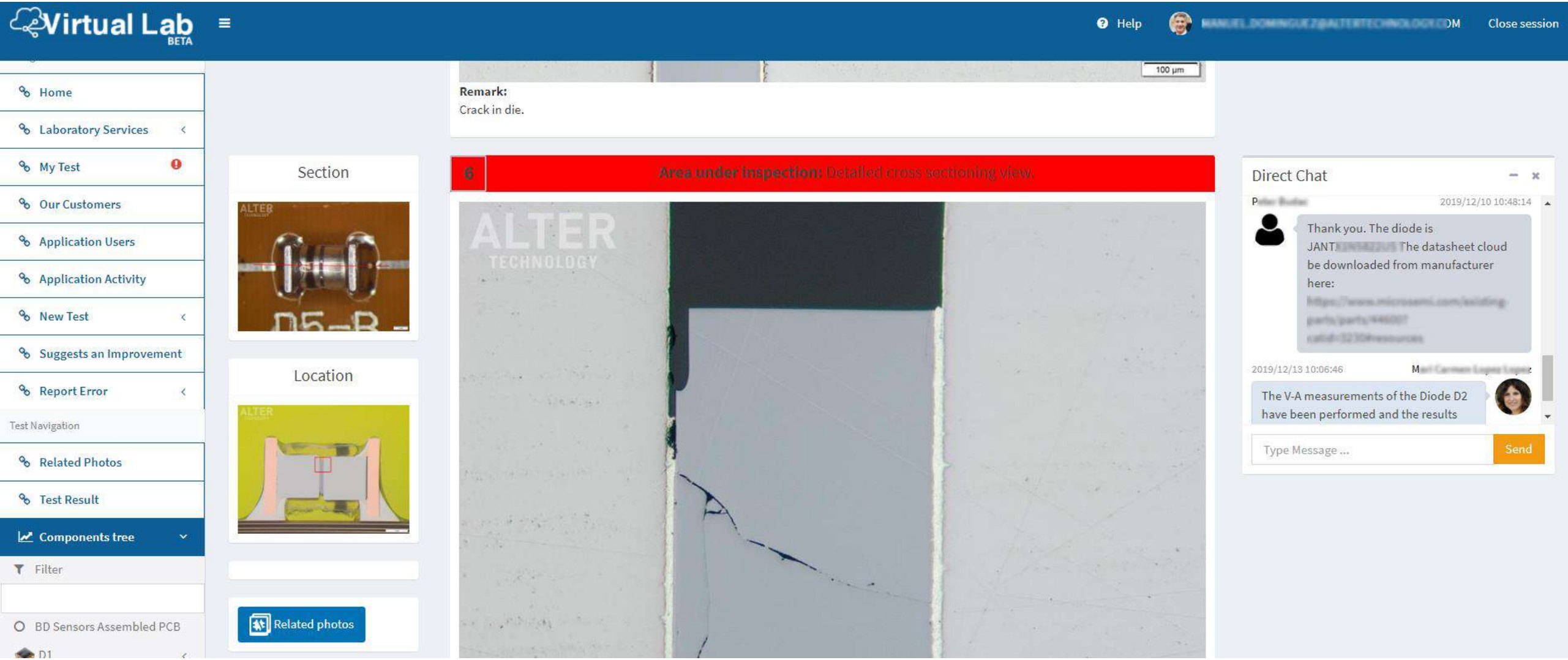

Example of microsectioning and communication with technician

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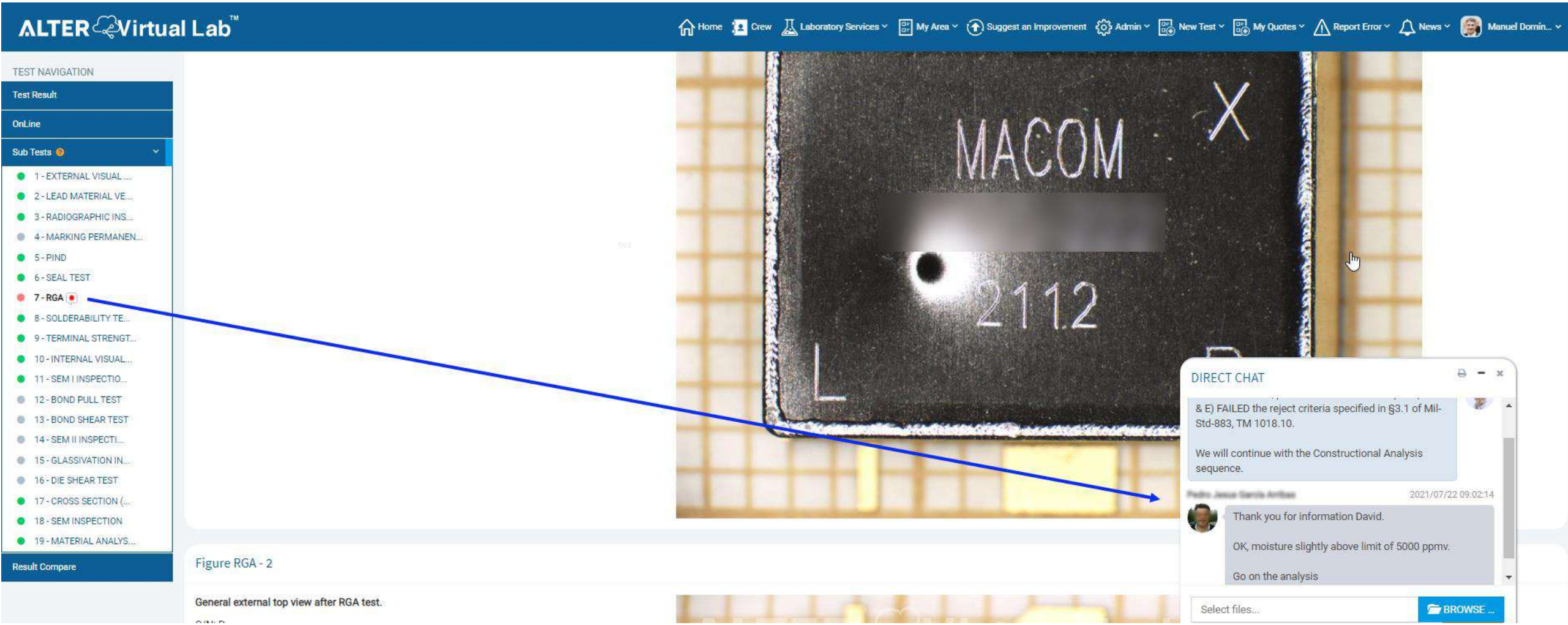

Example RGA data and interaction

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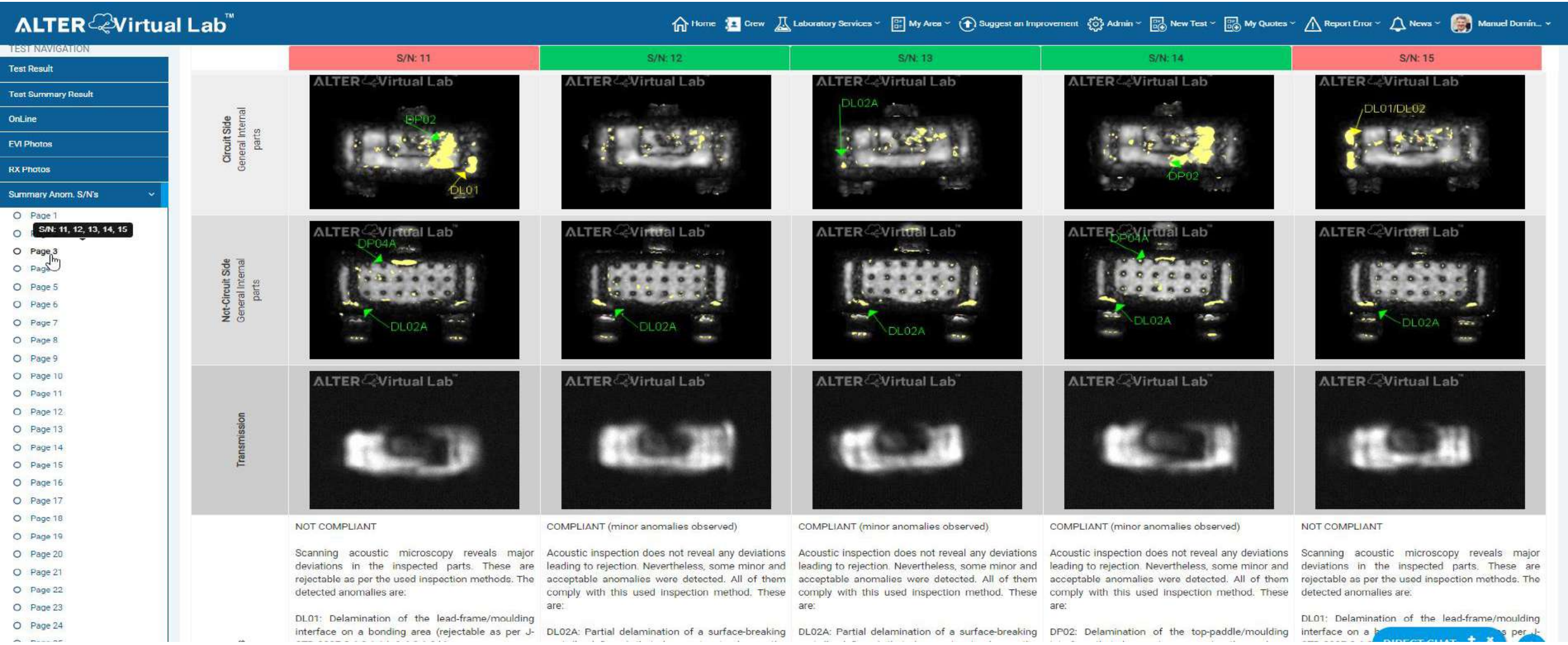

Example of CSAM results

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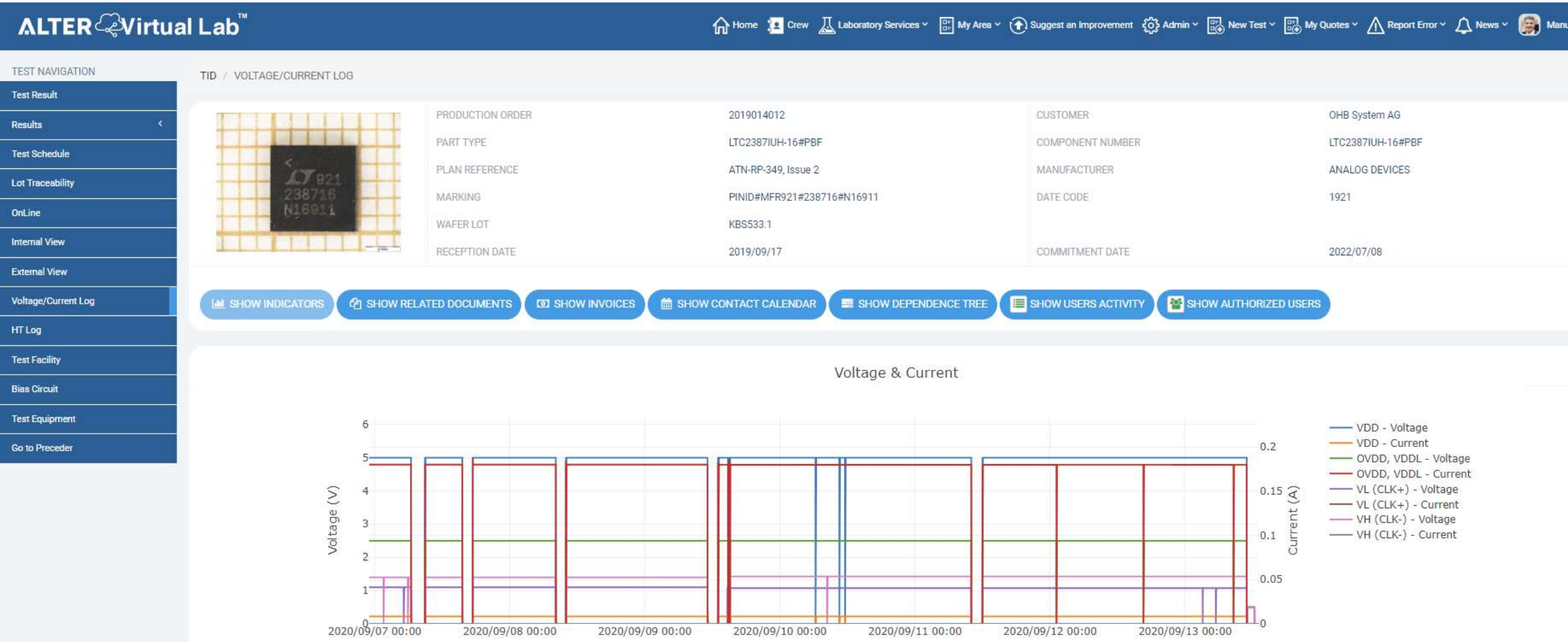

Example of TID test on COTS parts

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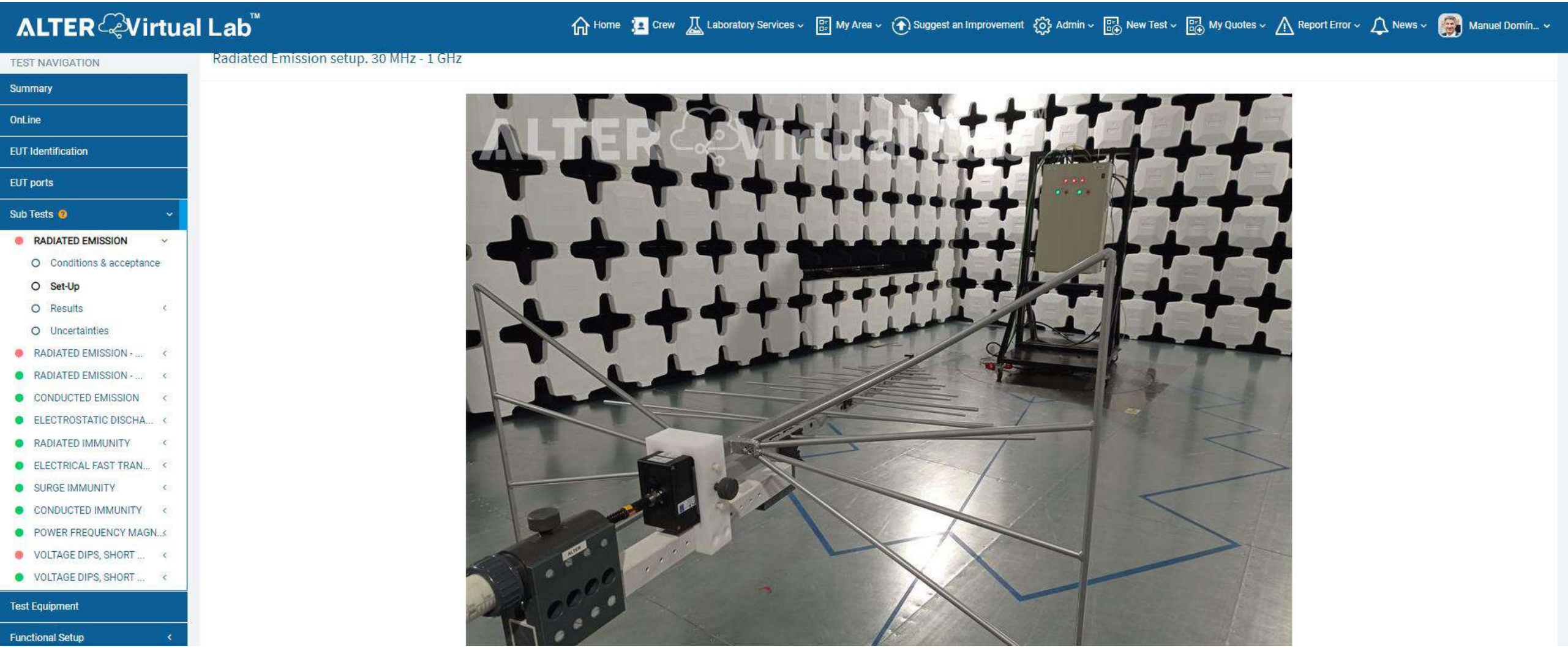

Tests on equipments - example

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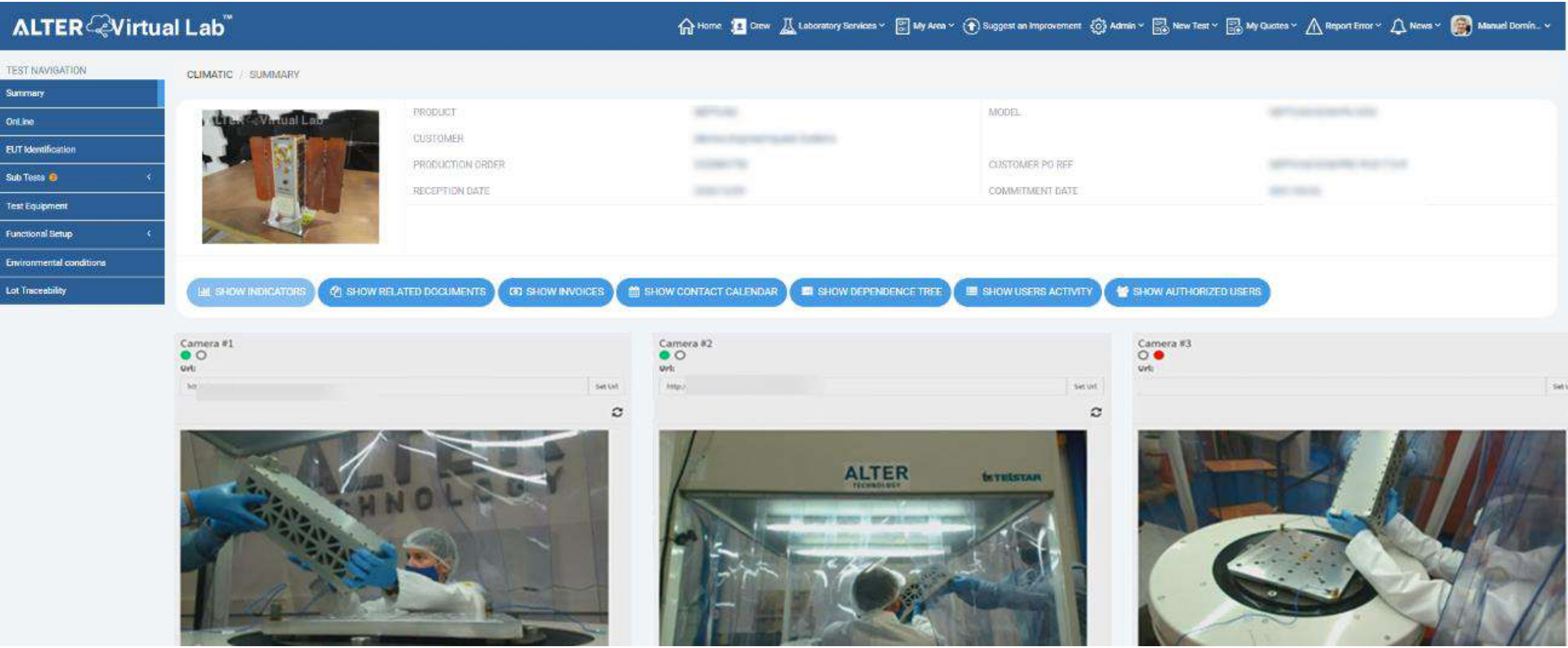
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Admin
New Test
My Quotes
Report Error
News
TEST NAVIGATION
Summary
OnLine
EUT Identification
Sub Tests
Test Equipment
Functional Setup
Environmental conditions
Lot Traceability
CLIMATIC / SUMMARY
PRODUCT
CUSTOMER
PRODUCTION ORDER
RECEPTION DATE
MODEL
CUSTOMER PO REF
COMMITMENT DATE
SHOW INDICATORS
SHOW RELATED DOCUMENTS
SHOW INVOICES
SHOW CONTACT CALENDAR
SHOW DEPENDENCE TREE
SHOW USERS ACTIVITY
SHOW AUTHORIZED USERS
Camera #1
Camera #2
Camera #3
ALTER
TESTAR

Virtual Lab ™

Vibration – Realtime monitoring

Thermal Vacuum Cycling

Virtual Lab ™

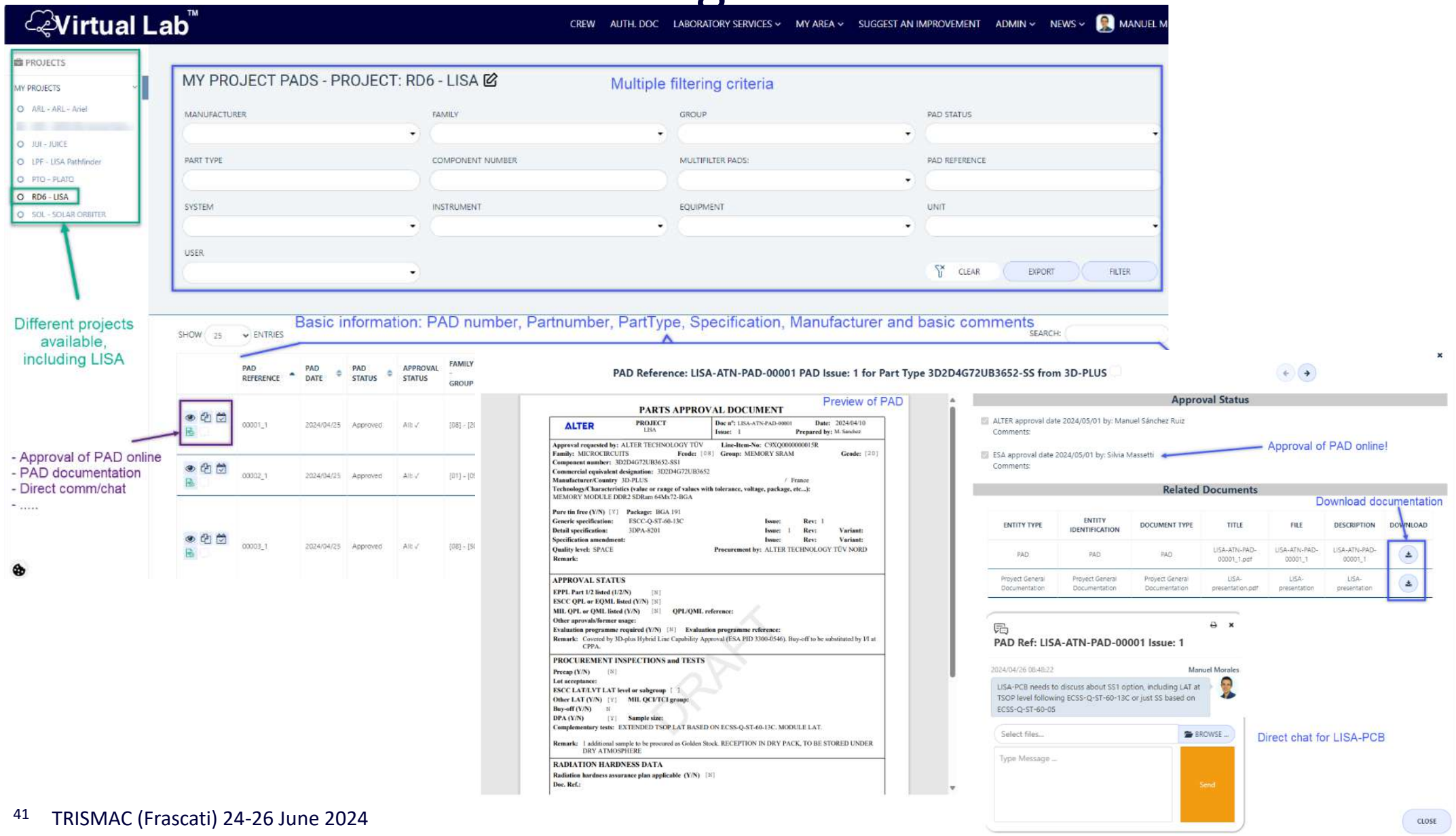
For coordinated procurements (and now extended for any mission type), review and approval of documentation is not an easy task:

- EEE Parts Approval Documents (PAD)
- Non-conformance overview and quality records

Additional features:

- Follow-up of orders and delivery
- Access to laboratory reports from VirtualLab
- Customised Dashboard for each user, including actions and new information

Virtual Lab ™. PAD manager



You need something (4)

I need to

have a quick estimation in terms of radiation for my unit

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RAD-E4SPACE

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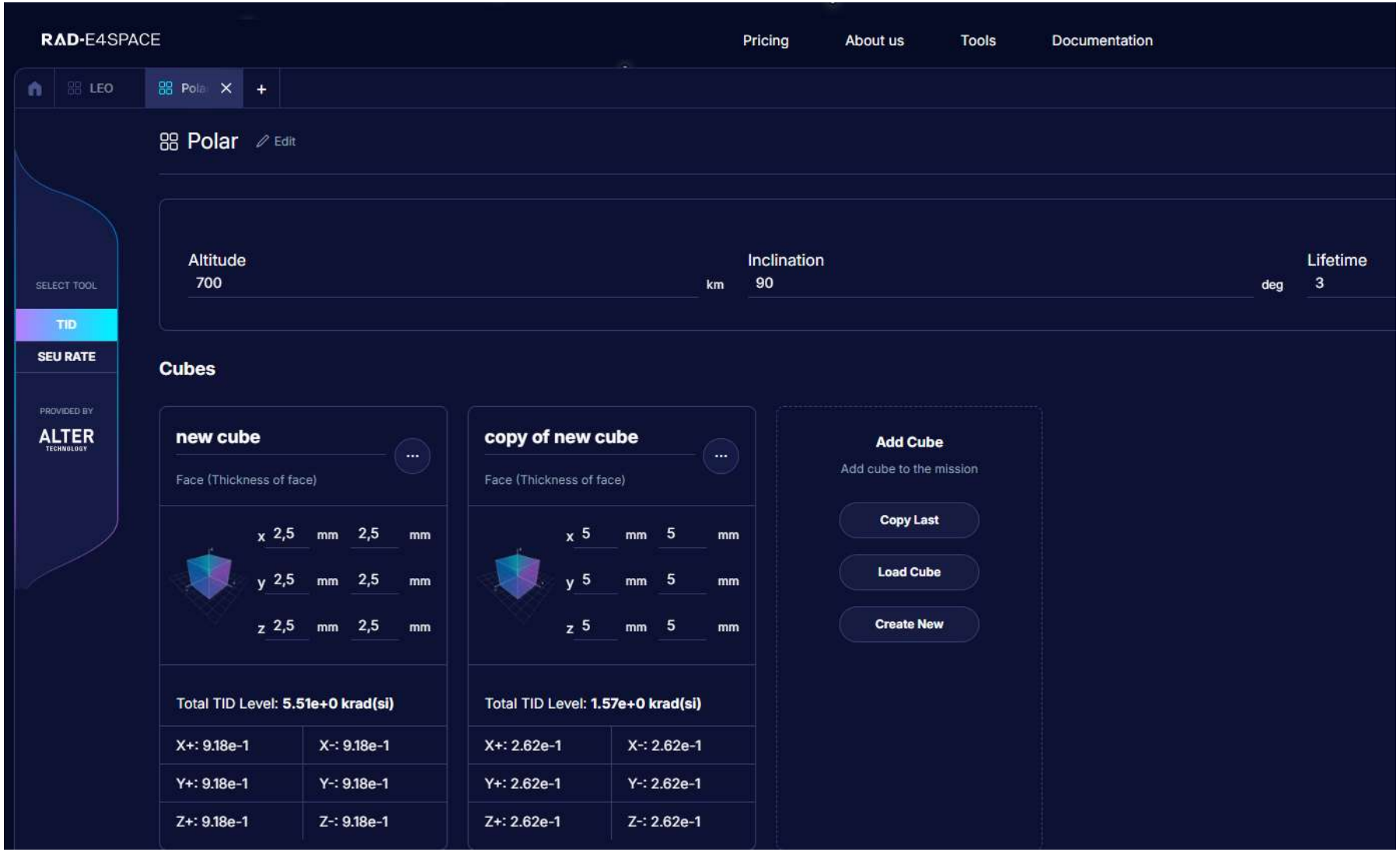
RAD-E4SPACE


RAD-E4SPACE
Pricing
About us
Tools
Documentation
LEO
Polar
Edit
SELECT TOOL
TID
SEU RATE
PROVIDED BY
ALTER TECHNOLOGY
Altitude
700
km
Inclination
90
deg
Lifetime
3
Cubes
new cube
Face (Thickness of face)
x 2,5 mm 2,5 mm
y 2,5 mm 2,5 mm
z 2,5 mm 2,5 mm
Total TID Level: 5.51e+0 krad(si)
X+: 9.18e-1
X-: 9.18e-1
Y+: 9.18e-1
Y-: 9.18e-1
Z+: 9.18e-1
Z-: 9.18e-1
copy of new cube
Face (Thickness of face)
x 5 mm 5 mm
y 5 mm 5 mm
z 5 mm 5 mm
Total TID Level: 1.57e+0 krad(si)
X+: 2.62e-1
X-: 2.62e-1
Y+: 2.62e-1
Y-: 2.62e-1
Z+: 2.62e-1
Z-: 2.62e-1
Add Cube
Add cube to the mission
Copy Last
Load Cube
Create New

Conclusion

- New Projects require new Product Assurance approach, co-existing with the traditional Space.
- Problems and questions are always the same. From IOD cubesat to class 1 mission
- Don not re-invent the wheel!, just think on a different way to solve same question considering your mission boundary condition
- Take benefit of the new tools and technology!

PA people are friendly (most cases…). Do not be scared to ask your PA engineer

Thank you for your attention!

Contact details:

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EEE Parts Engineer and Product Assurance

manuel.morales@altertechnology.com

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