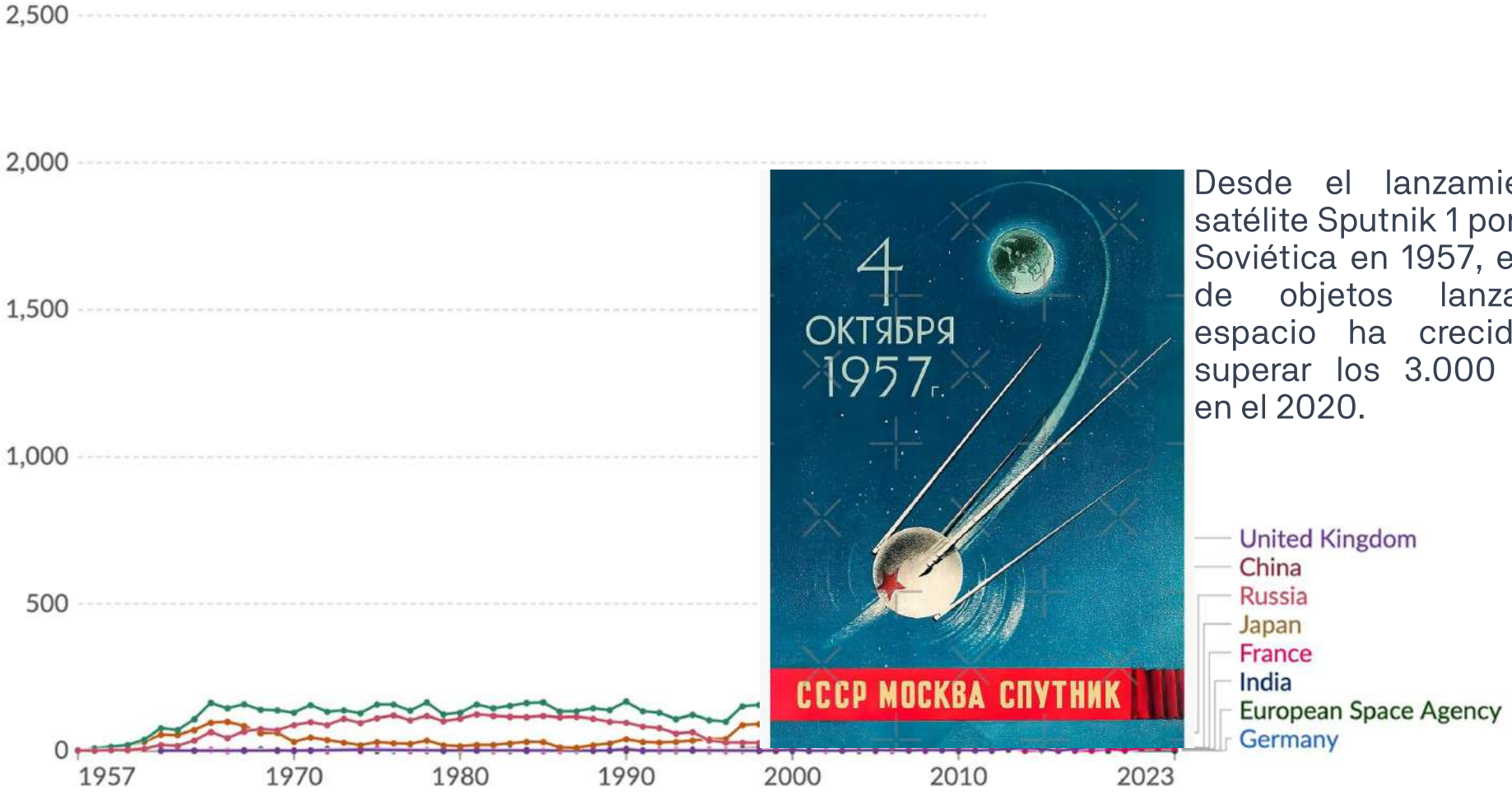
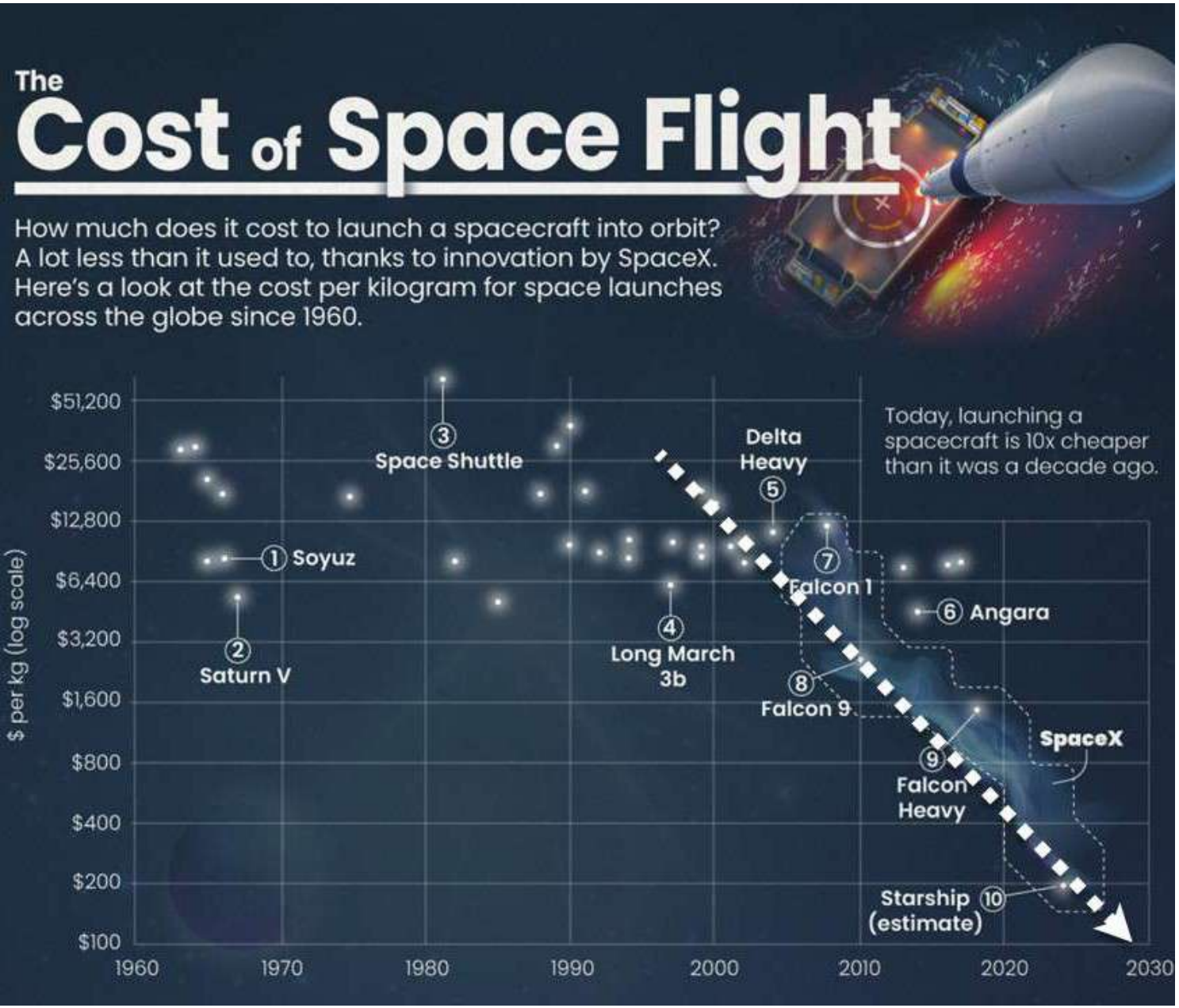

ALTER
PRECEDER
Artificial Intelligence to
Predict the Damage produced
by Radiation In Electronic Components

Desafíos Espaciales

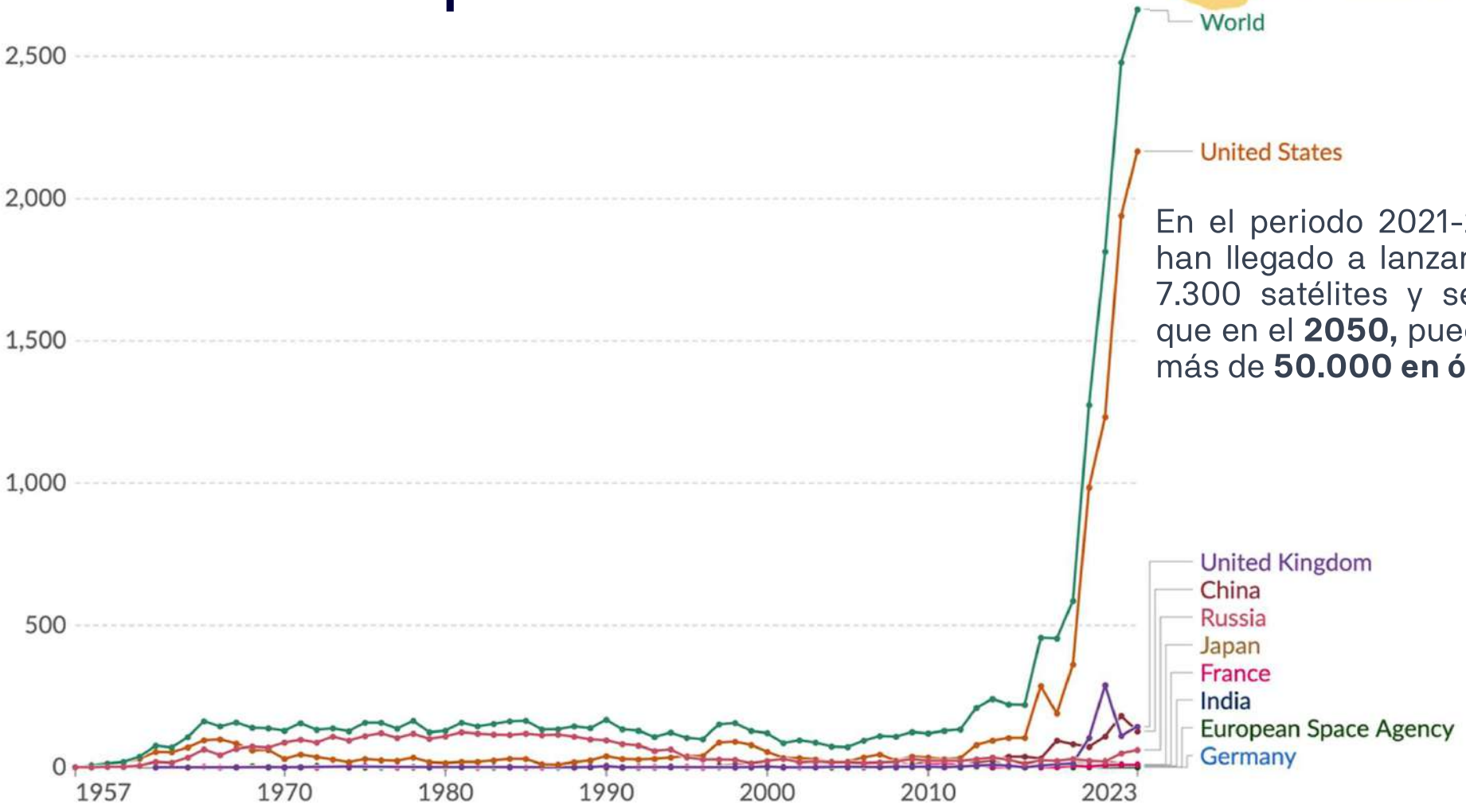


Desde el lanzamiento del satélite Sputnik 1 por la Unión Soviética en 1957, el número de objetos lanzados al espacio ha crecido hasta superar los 3.000 satélites en el 2020.

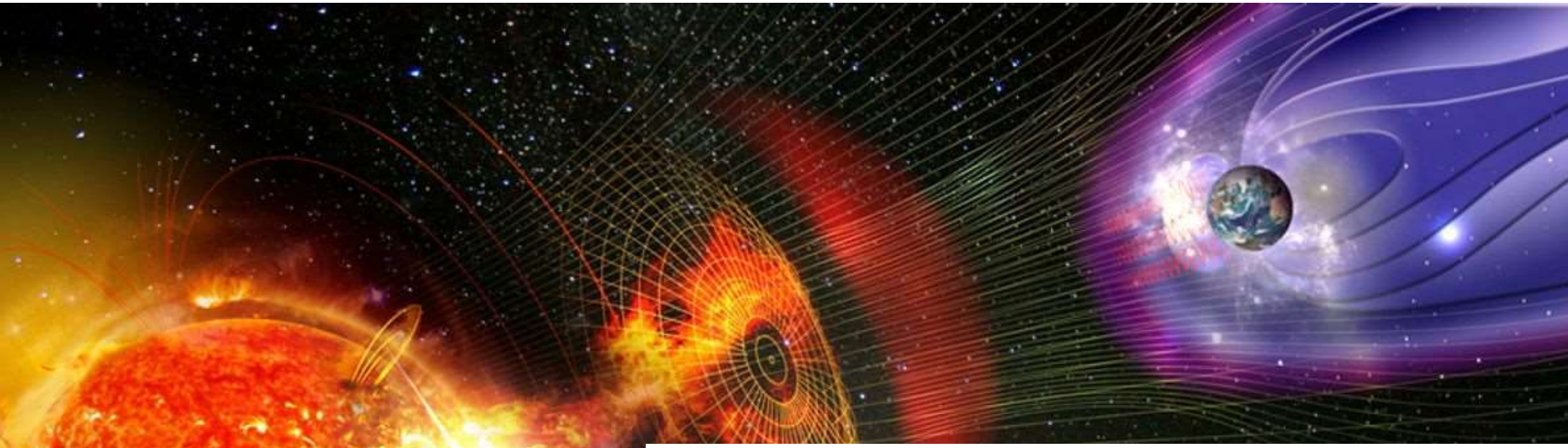


El coste de lanzamiento de satélites ha experimentado una disminución drástica desde 1960 hasta 2020. En términos porcentuales, podría decirse que los **costos han caído más de un 95%**

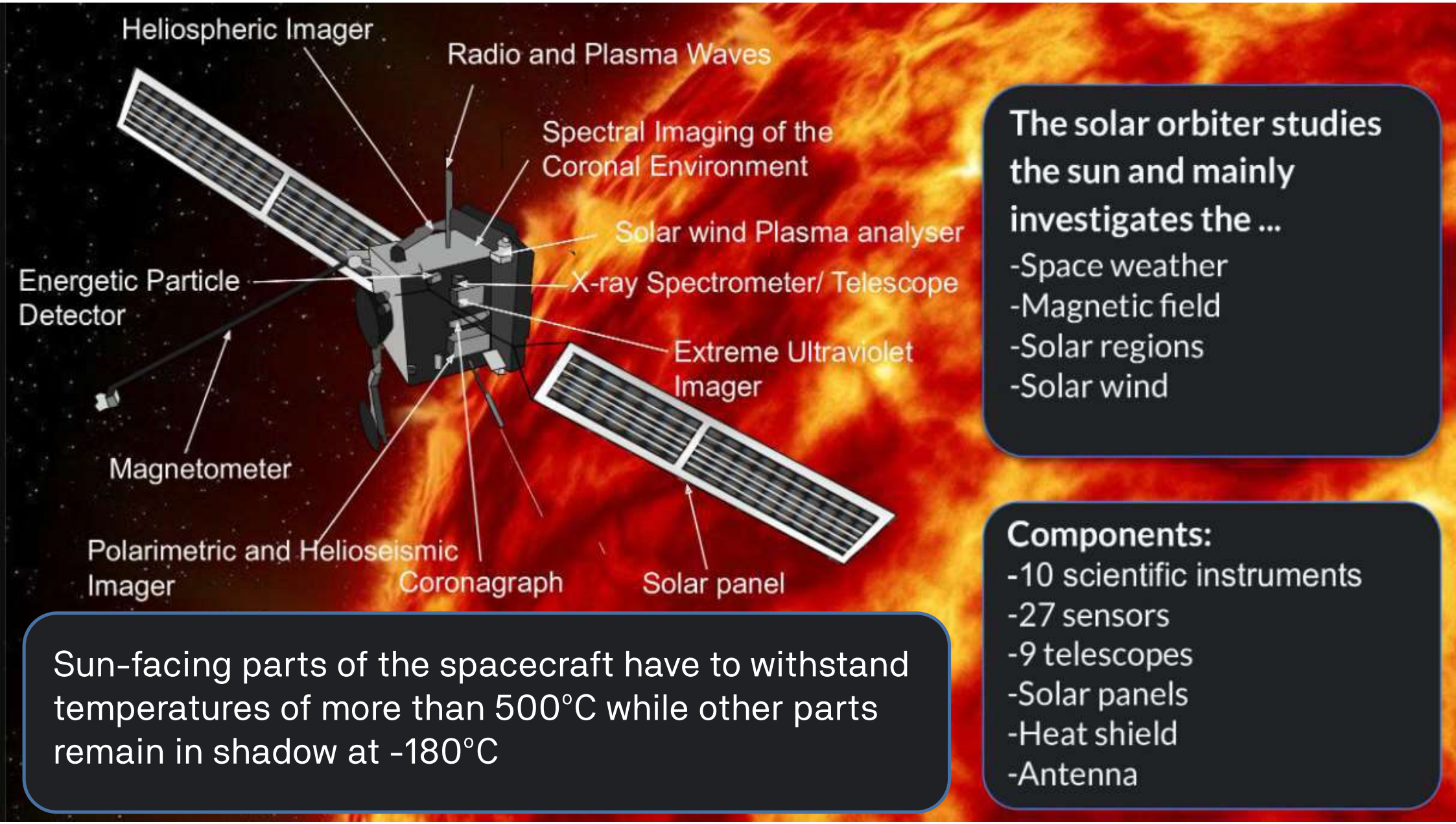
Crecimiento Exponencial de Satélites



En el periodo 2021-2023, se han llegado a lanzar más de 7.300 satélites y se espera que en el **2050,** pueda haber más de **50.000 en órbita**.



Mission Lifetime (With Assumed Risk Acceptance)	Environment: LEO Equatorial	Environment: LEO Polar (Sun Sync)	Environment: GEO / Interplanetary
> 3 Years	Data on all SEE for critical parts, and have data on dose failure distribution on similar parts	Consider mission consequences of all SEE (Data for critical parts), have Dose failure distribution on lot	Have Data on all SEE, Have Data Dose failure distribution on lot
1- 3 Years	Have Data on DSEE for critical parts	Consider mission consequences of all SEE (Data for critical parts), have data Dose failure distribution on similar parts	Have Data on all SEE for critical parts, Have Data on Dose failure distribution on similar parts
< 1 Year	Look for data on DSEE for critical parts	Consider mission consequences of all SEE, and look for data on dose failure distribution on similar parts	Consider mission consequences of all SEE, and have data on dose failure distribution on similar parts



The solar orbiter studies the sun and mainly investigates the ...

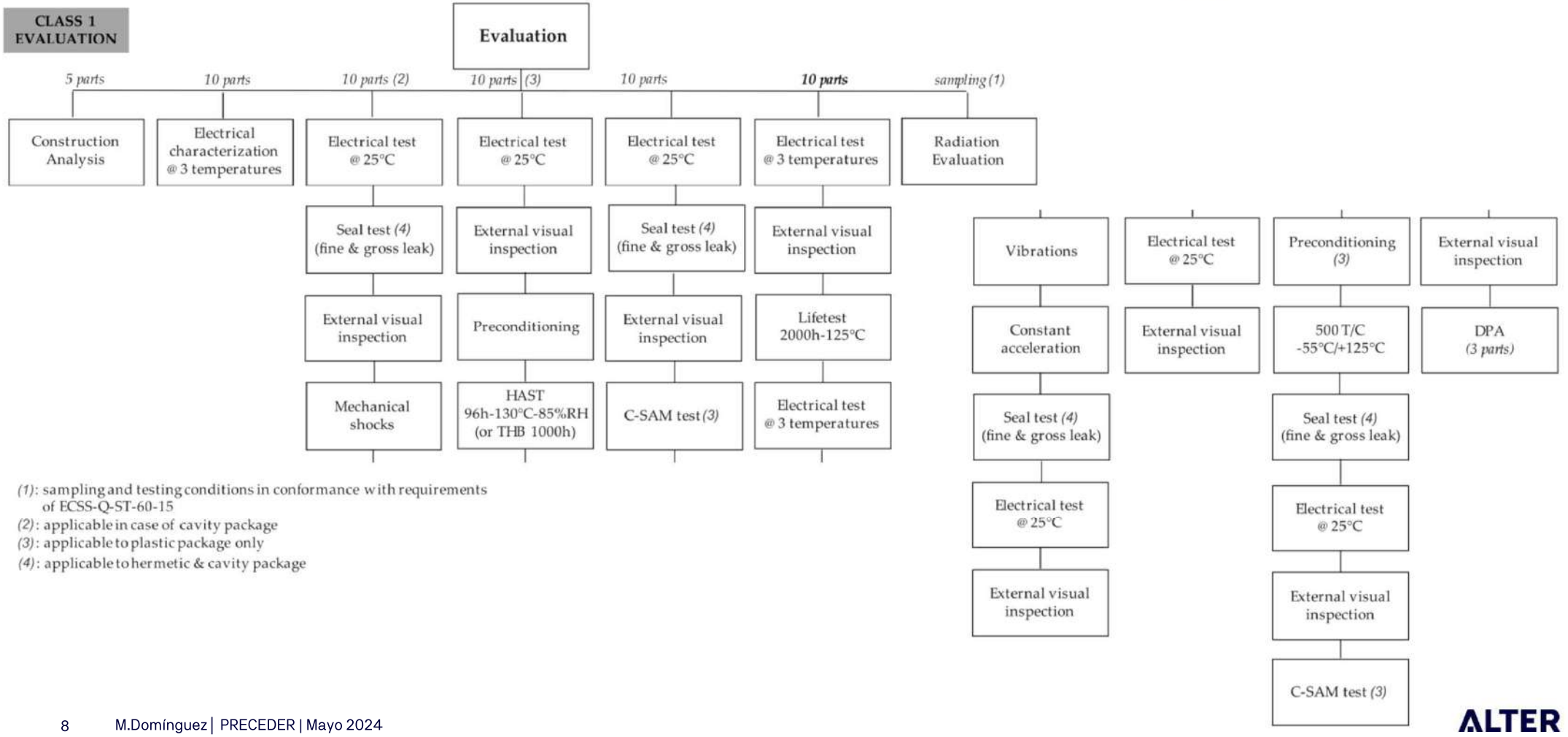
-Space weather
-Magnetic field
-Solar regions
-Solar wind

Components:

-10 scientific instruments
-27 sensors
-9 telescopes
-Solar panels
-Heat shield
-Antenna

Sun-facing parts of the spacecraft have to withstand temperatures of more than 500°C while other parts remain in shadow at -180°C

Fases de una evaluación



(1): sampling and testing conditions in conformance with requirements of ECSS-Q-ST-60-15
(2): applicable in case of cavity package
(3): applicable to plastic package only
(4): applicable to hermetic & cavity package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TECHNOLOGYGROUP


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Letonia
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Londres
Berlín
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Bélgica
HTV Conservation GmbH
París
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Mar Mediterráneo

ALTER Technology: Liderazgo en Ingeniería

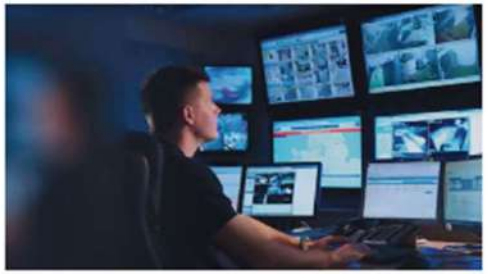
ALTER Technology

Hi-Rel components

Engineering, Testing and Procurement

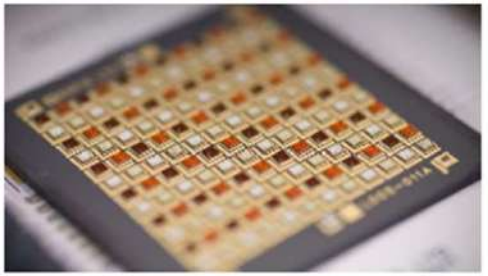
Electronic Systems

Testing and CE Marking



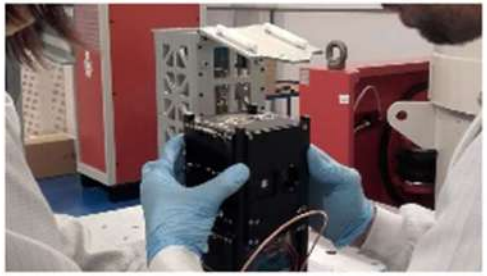
Alarm Systems

Conformity of security systems



Packaging and Assembly

For opto and microelectronic devices



Small Satellites

Quality assurance and test to small satellites

Drones

Compliance and assurance of safety standards

Automotive

Engineering, testing and certification services.

Other services

Certification, CE Marking, Alarm Systems

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TüV NORD: Conocimiento y Seguridad

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.

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Reconocimientos

ESA Accredited Lab

- First ESA-recognized Laboratory for Small Satellites below 500kg in 2022.
- All equipment-level small satellites testing activities
  - EMC
  - SRS testing
  - Thermal Vacuum
  - TID irradiation
  - Vibration testing
  - Static magnetic field
  - Constant acceleration test

Reconocimientos

RadLab - DLA Accredited Lab

Virtual Lab™ CREW AUTH. DOC LABORATORY SERVICES MY AREA SUGGEST AN IMPROVEMENT ADMIN NEW TEST MY QUOTES REPORT ERROR NEWS APP MANUEL D...

Radiation testing is stated as mandatory for qualifying devices for space missions. However, only few laboratories around the world are available for this purpose. RADLAB® is able to achieve not only the standard test conditions demanded by the industry, but also meets special demands from customers requiring stringent test conditions, and monitoring-control needs. RADLAB® has one of the most versatile gamma radiation equipment for research on the market today, the model Gammabeam ® X200 manufactured by Best Theratronics, its dosimetry system is made through a large number of Farmer ionization chambers (0.6 cm3) in order to monitor the dose rate in different measurement points. **This system allow remote monitoring of both dose rate and accumulated dose.**

RADLAB® is fully available 24 hours a day, 7 days a week, which allows performing electrical measurements at any irradiation steps required by the customer.

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- Preparation of radiation test procedures and plans.
- The Uniformity of each irradiation area is guaranteed through measurements of the relative dose rate in profiles.
- Low and high dose rate (from 0 to >30 Krad(si)/h).
- Static and dynamic biasing.
- Panoramic, cell and pool Co60 radiation sources.
- Coverage of all potential annealing and accelerated aging conditions.

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- A fully flexible source.
- Unlimited availability.
- Extensive electrical parameter measurement capability.
- Full in-house control.
- Established to serve your needs for radiation testing from a brand new perspective.
- RADLAB® is recognized Centre of Excellence for ESA and DLA (USA) for radiation testing.
- Approved service provider to O.E.M.'s and Space Agencies worldwide.
- ISO/IEC 17025:2017 accredited.
- Laboratory Suitability Status VQE-15-028801, Control Number 044647.

DEFENSE LOGISTICS AGENCY
LAND AND MARITIME
POST OFFICE BOX 3990
COLUMBUS, OH 43218-3990

April 30, 2021

Mr. Juan Carlos Hidalgo

RADLAB Testing Capabilities

RADLAB® has accumulated extensive experience in developing test software to

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Colaboraciones Estratégica

PRECEDER

THE TEAM

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Manuel Domínguez
Project Responsible

JJ González
RadTest Engineer

JL García
SW Developer

José de Martín
Data Scientist

CNA
Centro Nacional de Aceleradores

Yolanda Morilla
Project Responsible

Pedro Martín
Irradiation Unit

Amor Romero
Irradiation Unit

UNED

Fernando Morilla
University Professor

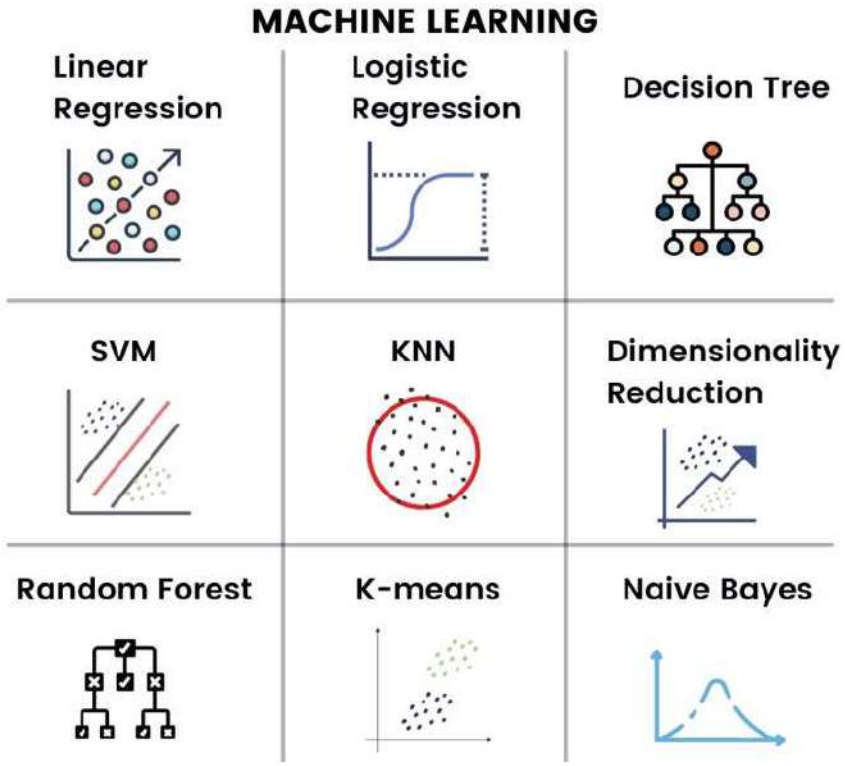
CERN

Rubén García
R2E project leader

RadLab

El problema

Acceso a Datos y Machine Learning

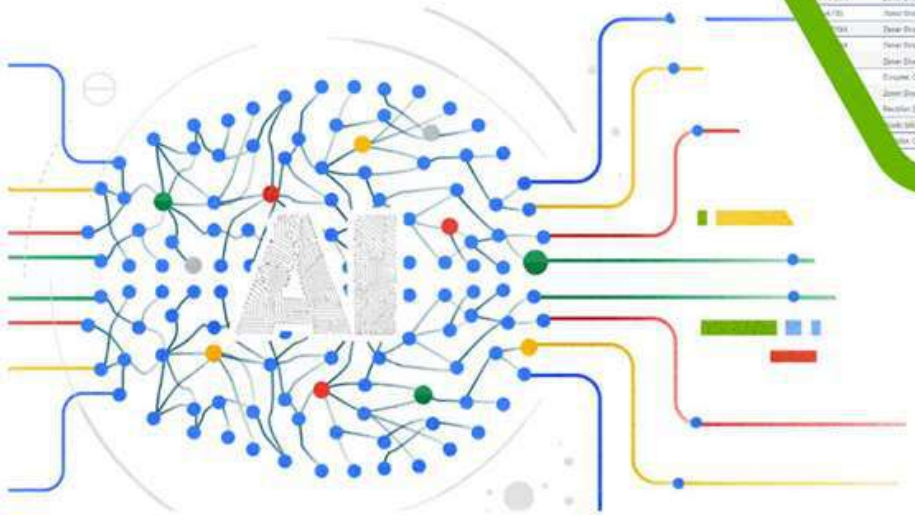


PREDICTIONS ←

La estrategia

Modelos y validación.

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



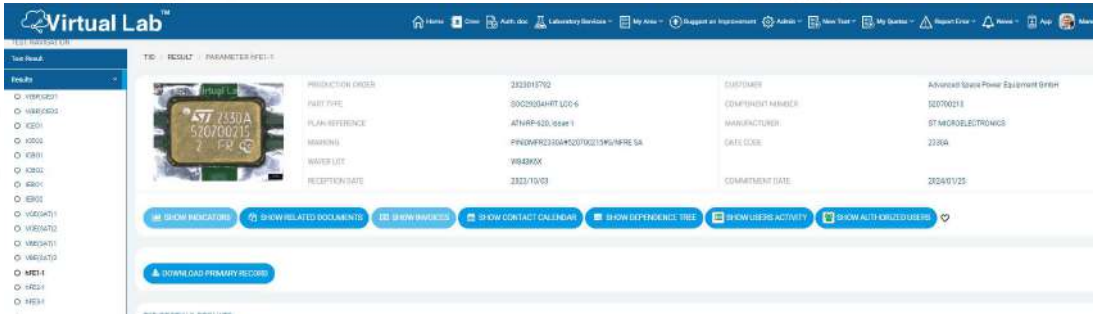
Laboratorio de radiación neutrónica

Ensayos de neutrones

FNG **Target** holder is designed with a small amount of material downstream, in order to **reduce spectrum contamination** due to neutron scattering

Experimental hall

Beam pipe



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Certificación de cubesats

Ensayos de vacío térmico

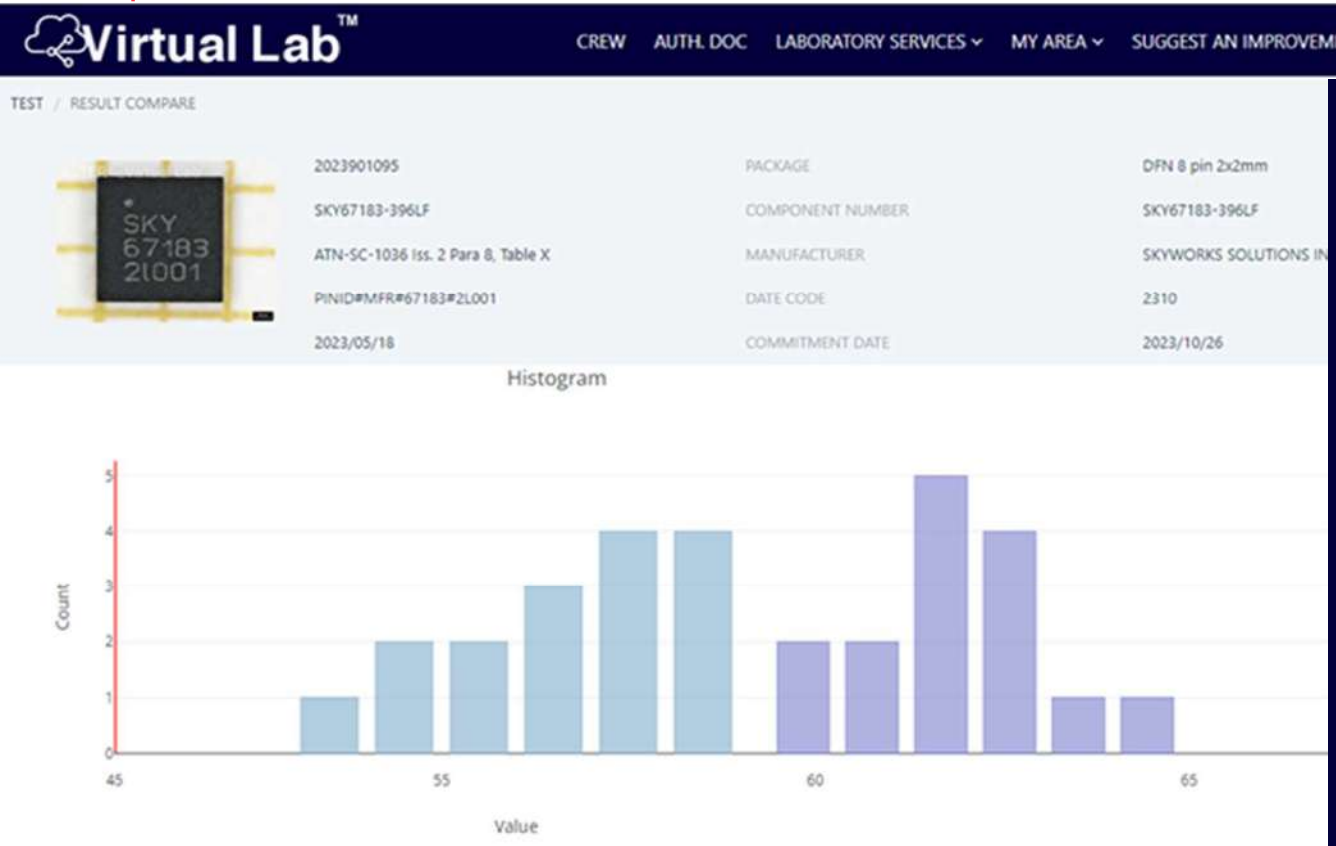
Modelado de Comportamiento

Componentes

Detectando diferencias gracias al modelo generado por el algoritmo.

Análisis predictivo

Optimized Variance Identification and Detection in Electronic Components

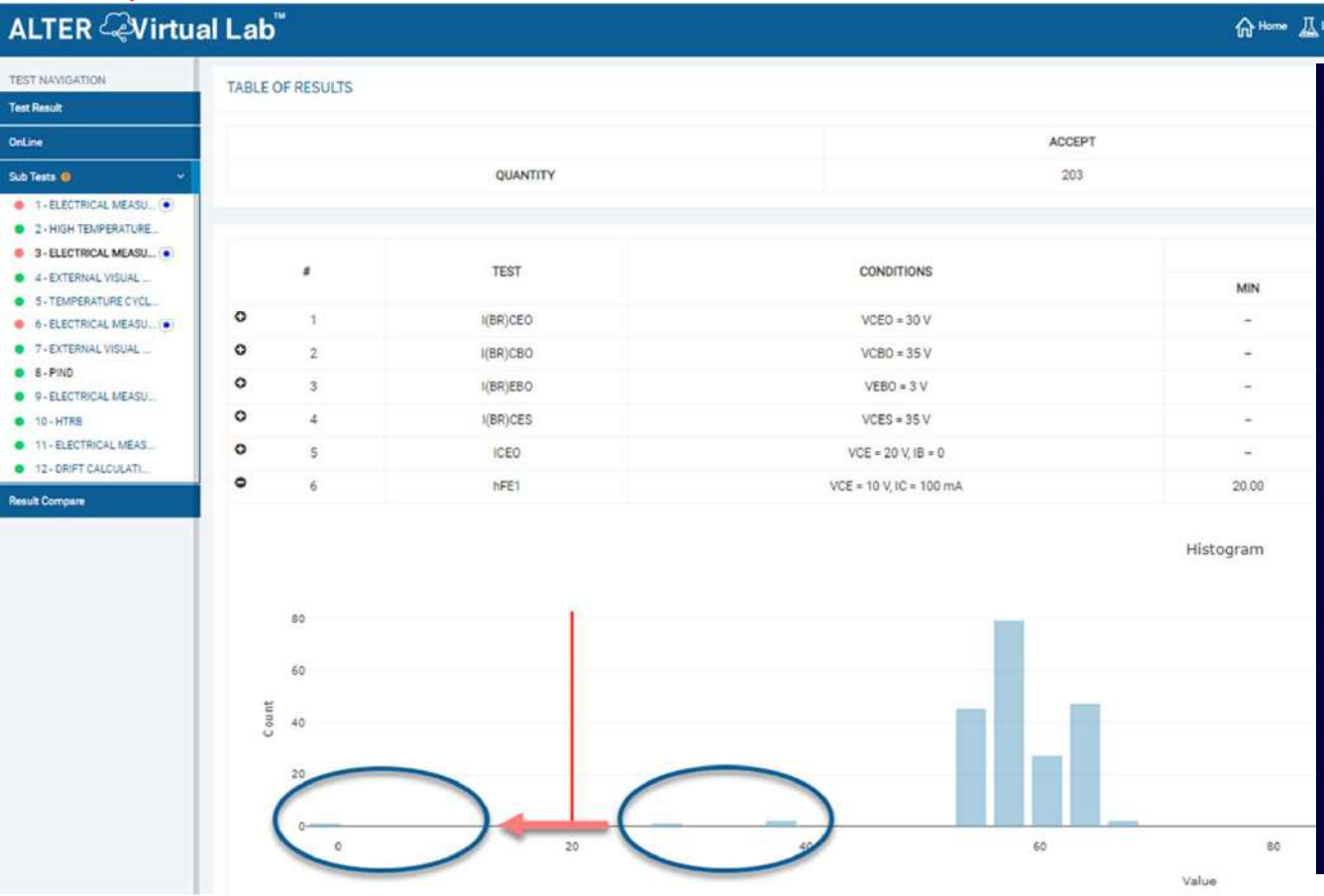


Segmentando lotes por variación de comportamiento.

All in one.

Análisis predictivo

Optimized Variance Identification and Detection in Electronic Components

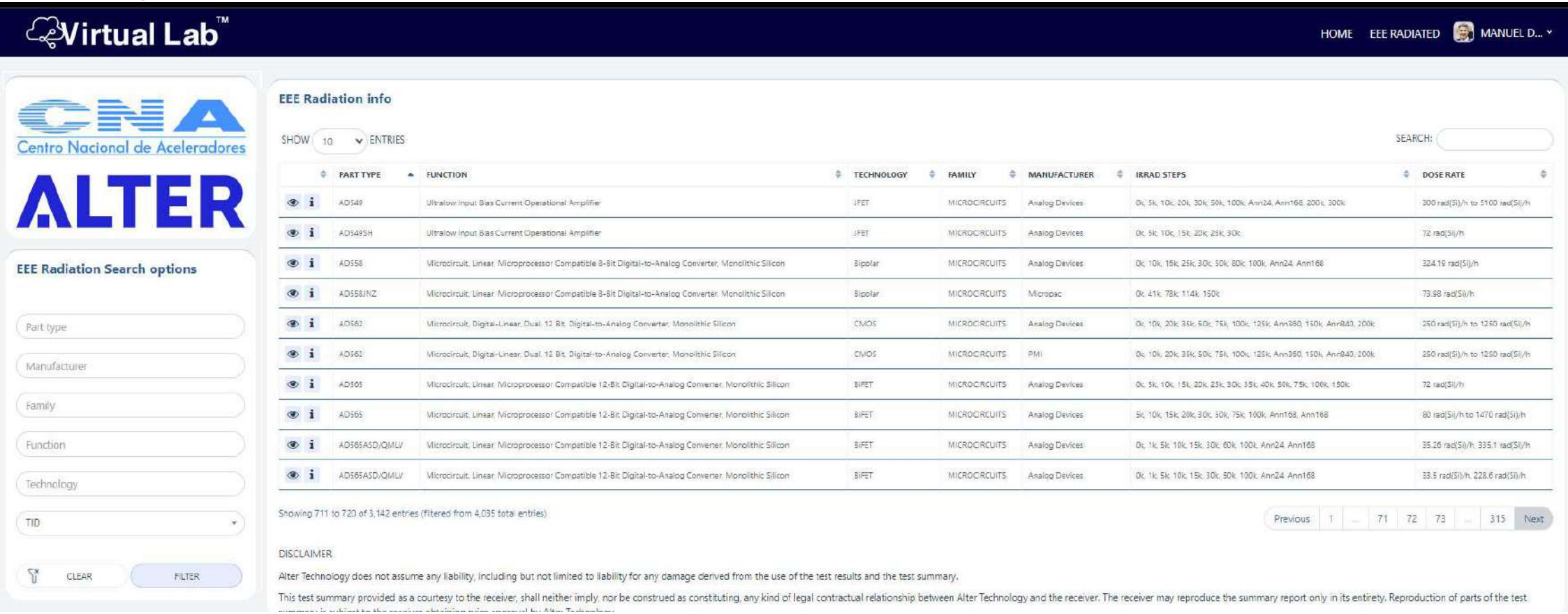


Prediciendo fallos antes de que ocurran.

All in one.

Base de datos singular

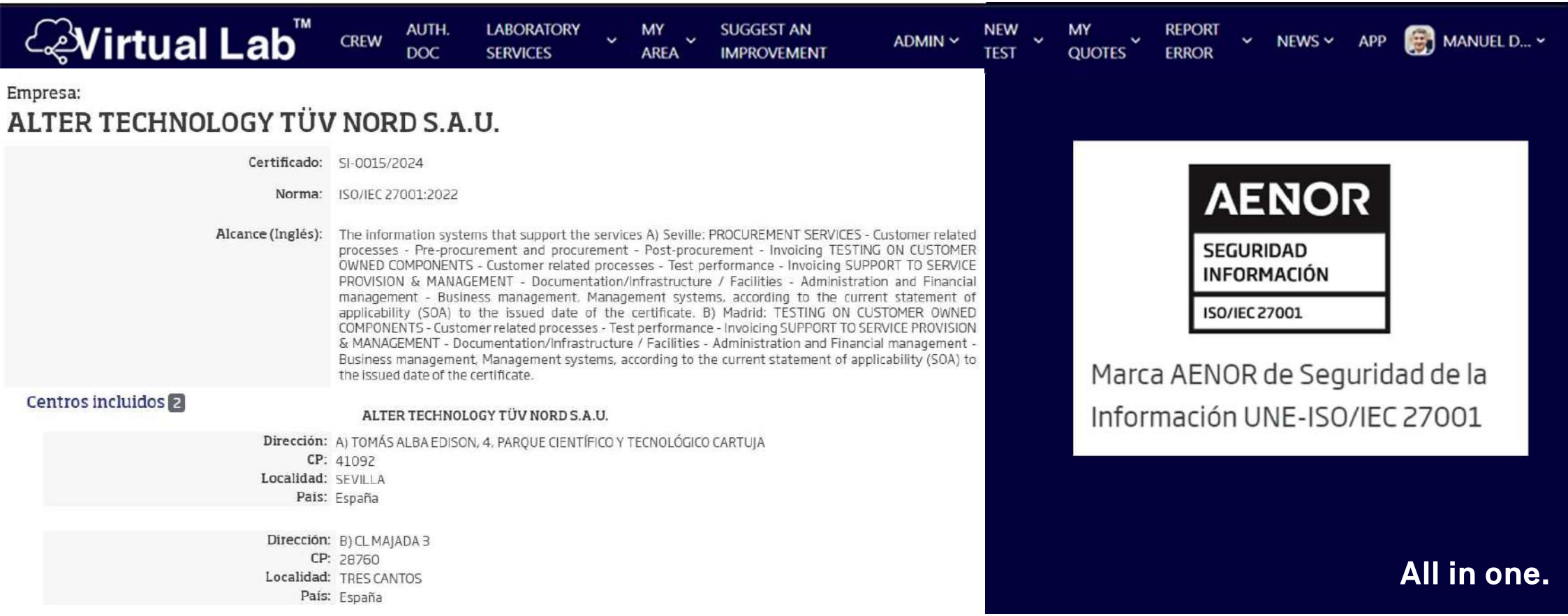
El major banco de datos del mercado



Data Security

Virtual Lab

ISO 27001 Certified VirtualLab, Ensuring Application and Infrastructure Security



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Premios

2022 & 2023

Kickbox 2022 – Seville - Spain

Innovation Award 2023 – Essen - Germany

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NEXT STEPS

Gemelo digital

Gemelo Digital

Rutas de aprendizaje personalizadas impulsadas por IA

El desarrollo de un gemelo digital para monitorizar la radiación y que integrarse en cualquier equipo embarcado ofrece numerosos beneficios.

Al replicar con precisión el comportamiento del monitor de radiación físico en un entorno virtual, los ingenieros pueden realizar extensas simulaciones y análisis de escenarios, lo que permite una mejor comprensión de los riesgos potenciales y las estrategias óptimas de mitigación.

Los primeros pasos se evaluarán en la misión Alpha.

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Gracias por su atención.

Manuel Domínguez
+34 627 922 909
manuel.dominguez@altertechnology.com

Referencias

1. Número de satélites operativos en órbita
2. General Electric y machine learning
3. Satélites lanzados en 2020
4. Reducción de costos de SpaceX
5. Satélites lanzados en 2023 y proyecciones
6. Radiación espacial
7. Temperaturas extremas en el espacio
8. PRECEDER y predicción de fallos
9. ALTER Technology en misiones espaciales
10. Certificaciones de TüV NORD
11. Certificación de cubesats por la ESA
12. Ensayos de radiación en RadLab
13. Colaboraciones estratégicas
14. Datos experimentales para machine learning
15. Modelos predictivos en laboratorios
16. Certificación de cubesats
17. Base de datos de componentes electrónicos
18. ISO 27001 y seguridad de la información
19. Premios de innovación
20. Gemelos digitales

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