



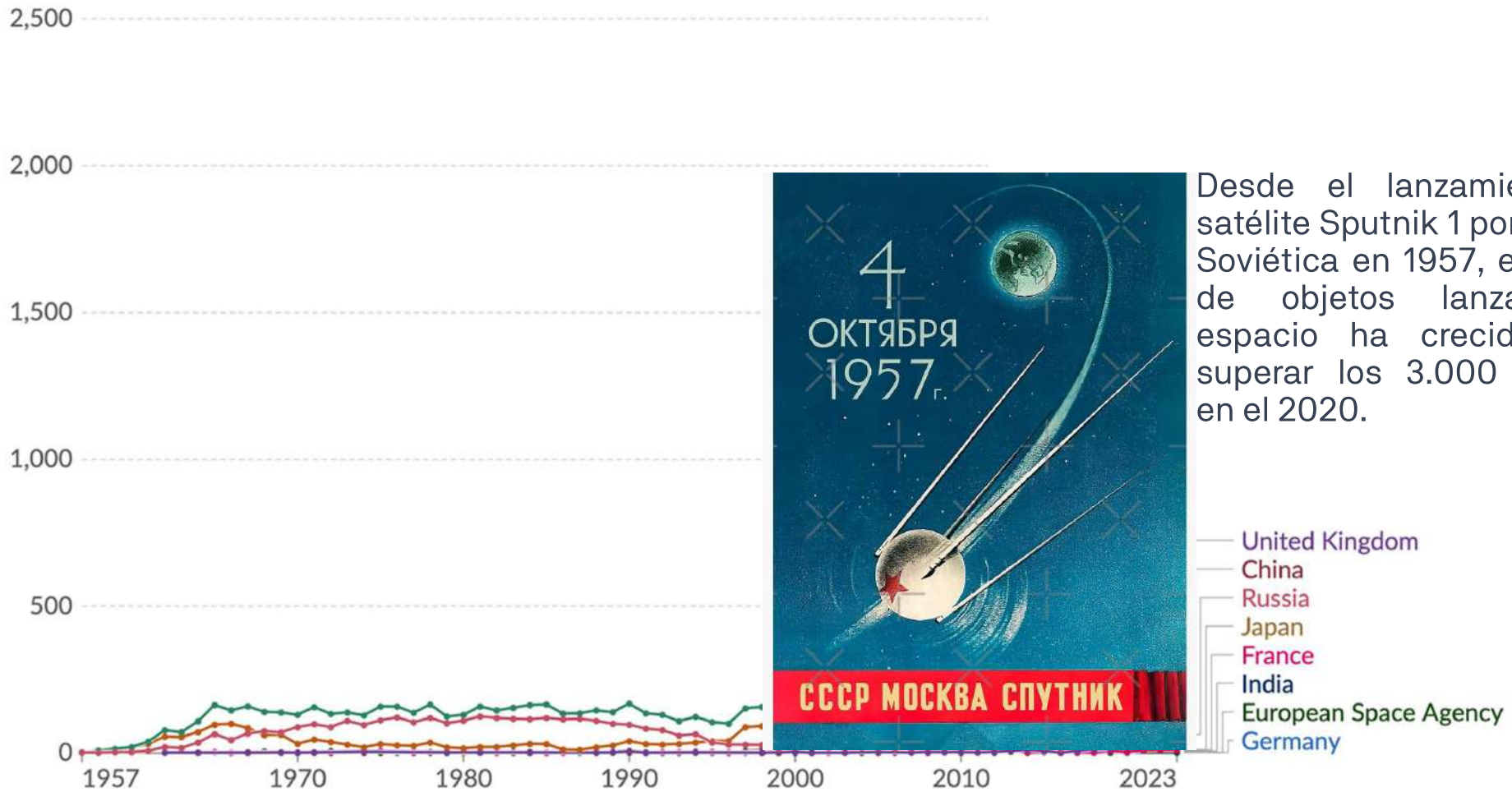
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PRECEDER

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

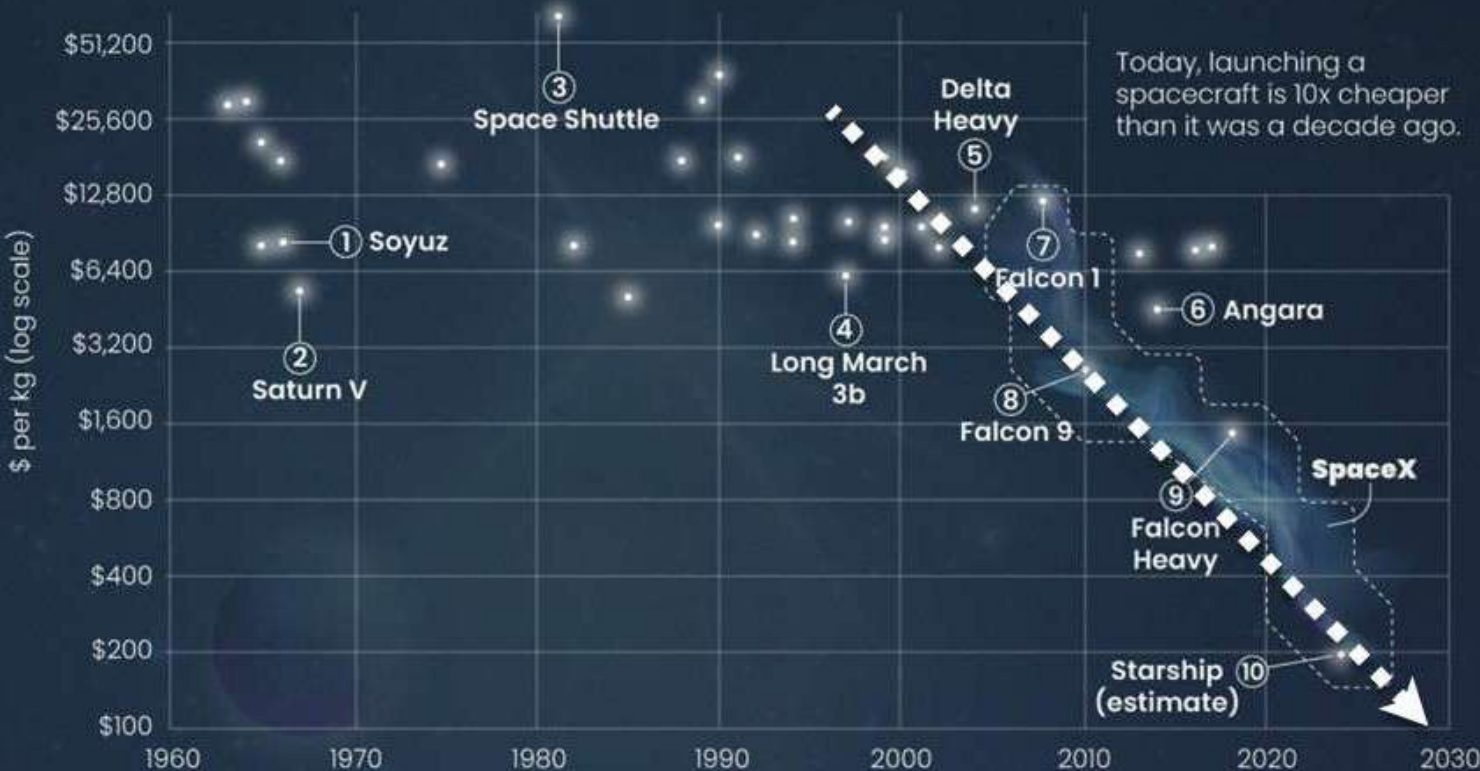


Desafíos Espaciales



The Cost of Space Flight

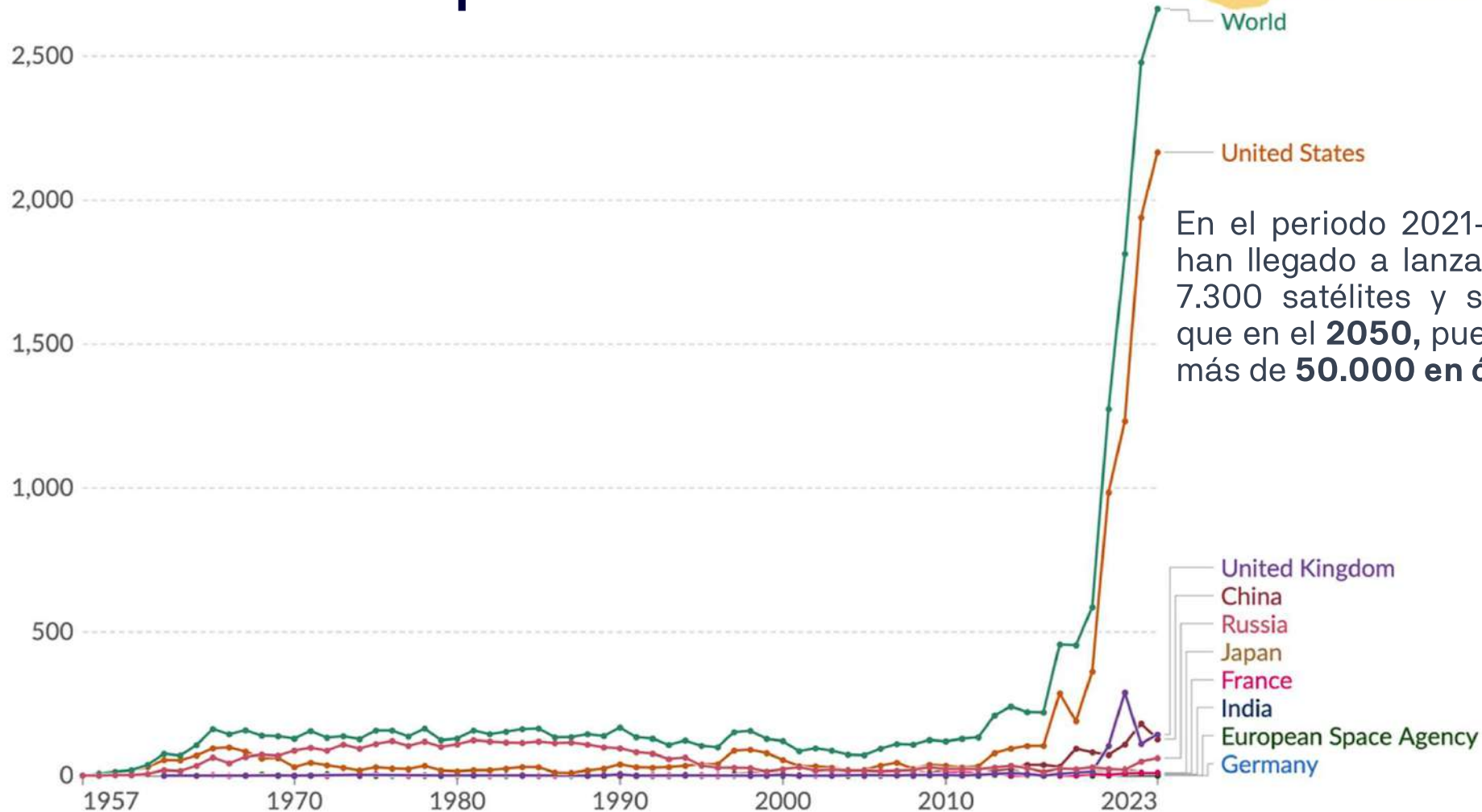
How much does it cost to launch a spacecraft into orbit? A lot less than it used to, thanks to innovation by SpaceX. Here's a look at the cost per kilogram for space launches across the globe since 1960.



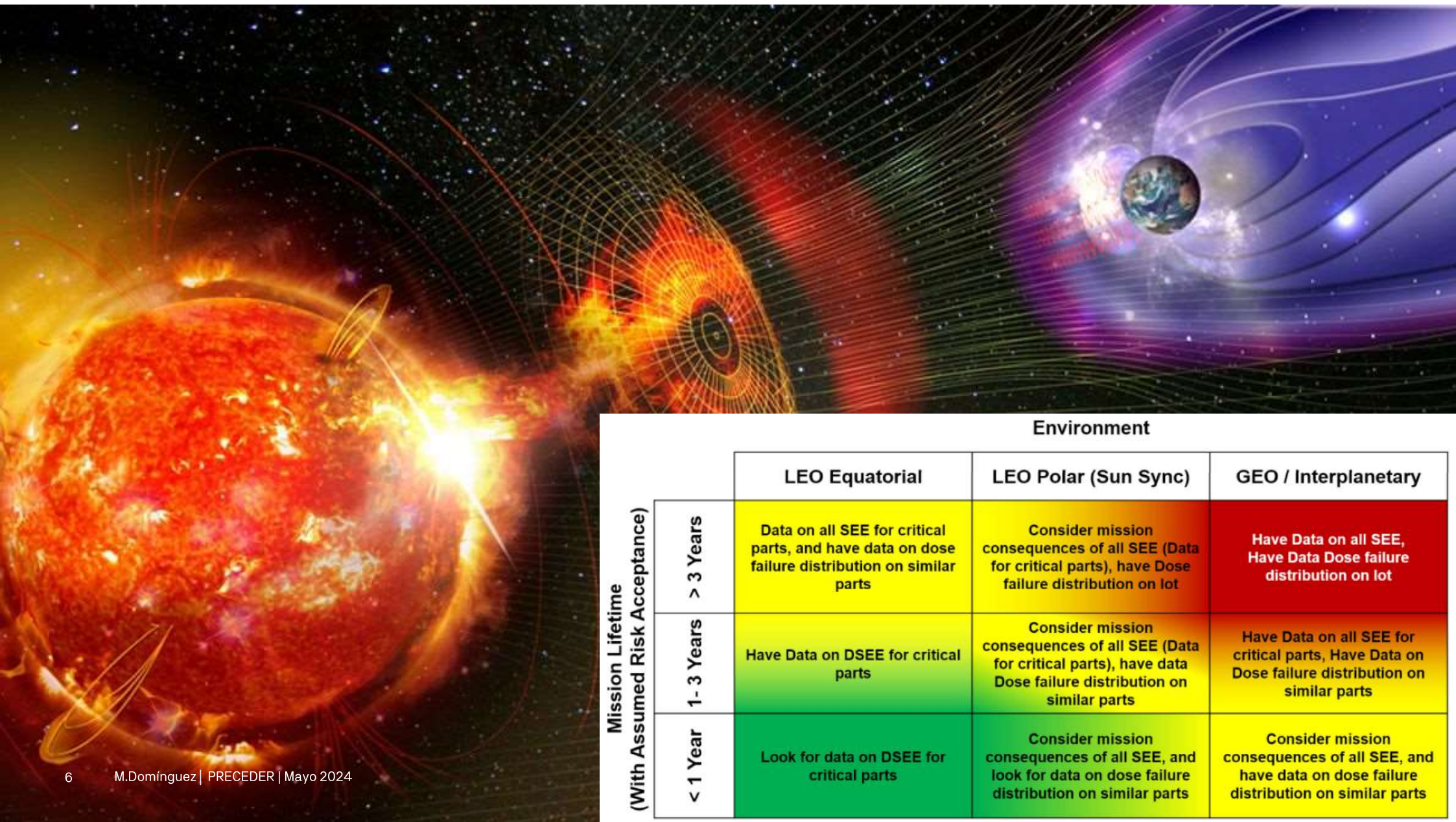
El coste de lanzamiento de satélites ha experimentado una disminución drástica desde 1960 hasta 2020. En términos porcentuales, podría decirse que los **costos han caído más de un 95%**

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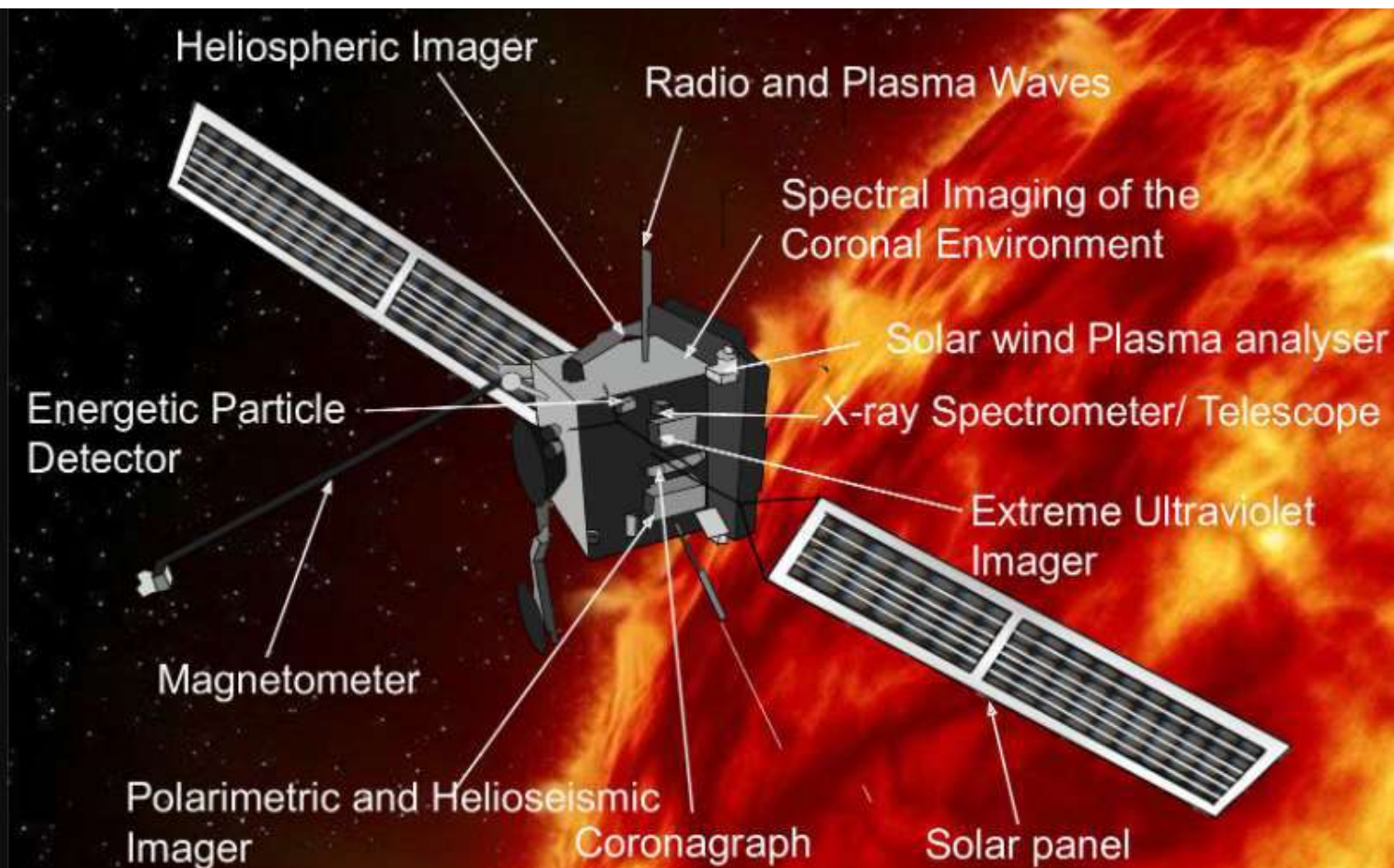
Crecimiento Exponencial de Satélites



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**.



		Environment		
Mission Lifetime (With Assumed Risk Acceptance)		LEO Equatorial	LEO Polar (Sun Sync)	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 ...

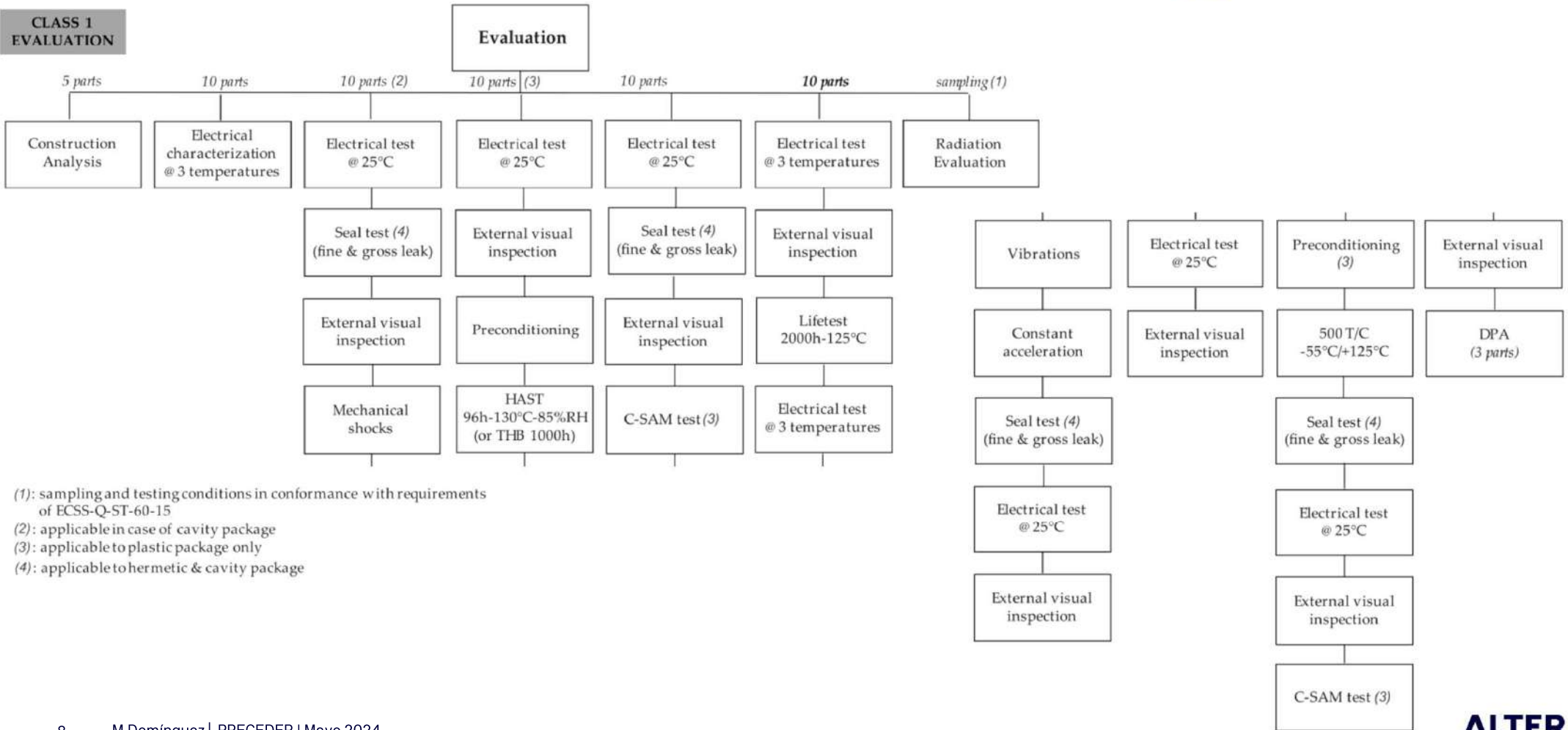
- Space weather
- Magnetic field
- Solar regions
- Solar wind

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



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ALTER Technology: Liderazgo en Ingeniería

ALTER Technology



Hi-Rel components

Engineering, Testing and Procurement



Electronic Systems

Testing and CE Marking



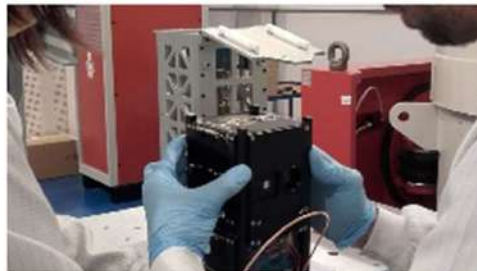
Alarm Systems

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

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.

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



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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.



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Mr. Juan Carlos Hidalgo
Alter Technology LTD Ltd C & T

April 30, 2021

RADLAB Testing Capabilities



RADLAB® has accumulated extensive experience in developing test software to

Colaboraciones Estratégica

THE TEAM



Manuel Domínguez
Project Responsible



JJ González
RadTest Engineer



JL García
SW Developer



José de Martín
Data Scientist

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CNA
Centro Nacional de Aceleradores
Yolanda Morilla
Project Responsible



Pedro Martín
Irradiation Unit



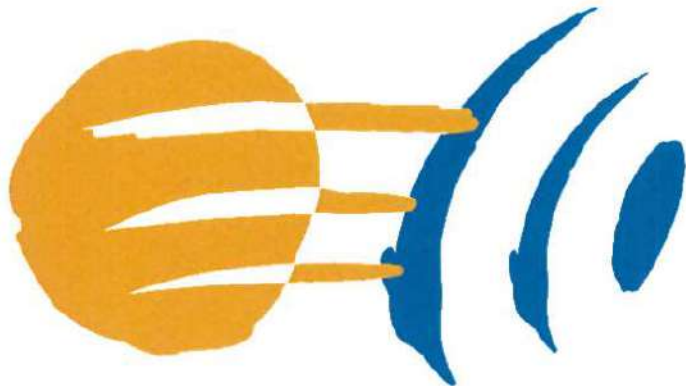
Amor Romero
Irradiation Unit



UNED
Fernando Morilla
University Professor



Rubén García
R2E project leader



RadLab

El problema

Acceso a Datos y Machine Learning



MACHINE LEARNING

Linear Regression A scatter plot with a line of best fit, representing linear regression.	Logistic Regression A graph showing a sigmoid curve, representing logistic regression.	Decision Tree A tree diagram with nodes and branches, representing a decision tree.
SVM A scatter plot with two classes separated by a line, representing Support Vector Machine (SVM).	KNN A scatter plot with a red circle around a cluster of points, representing K-Nearest Neighbors (KNN).	Dimensionality Reduction A graph showing a curve with an arrow pointing to a point, representing dimensionality reduction.
Random Forest A tree diagram with multiple nodes and branches, representing a Random Forest.	K-means A scatter plot with points clustered around a central point, representing K-means clustering.	Naive Bayes A graph showing a bell curve, representing Naive Bayes.

PREDICTIONS



La strategia

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.

[illegible]

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

Virtual Lab™

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- [V000002](#)
- [V000001](#)
- [V000002](#)
- [M001](#)
- [V0001](#)
- [V000001](#)

TID : RES0AT - PARAMETER TEST-1

	PRODUCTION ORDER PART TYPE PLAN REFERENCE MARKING WATER LOT RECEPTION DATE	2023010702 0002020AHT J00-6 ATHRP-620, case 1 PNDVR0230AMC020023PM/NRPE SA Y0430X 2023/10/03	CUSTOMER COMPONENT NUMBER MANUFACTURER DATE CODE COMMITMENT DATE	Advanced Space Power Equipment GmbH 020700218 ST MICROELECTRONICS 27004 2024/10/25
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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.**

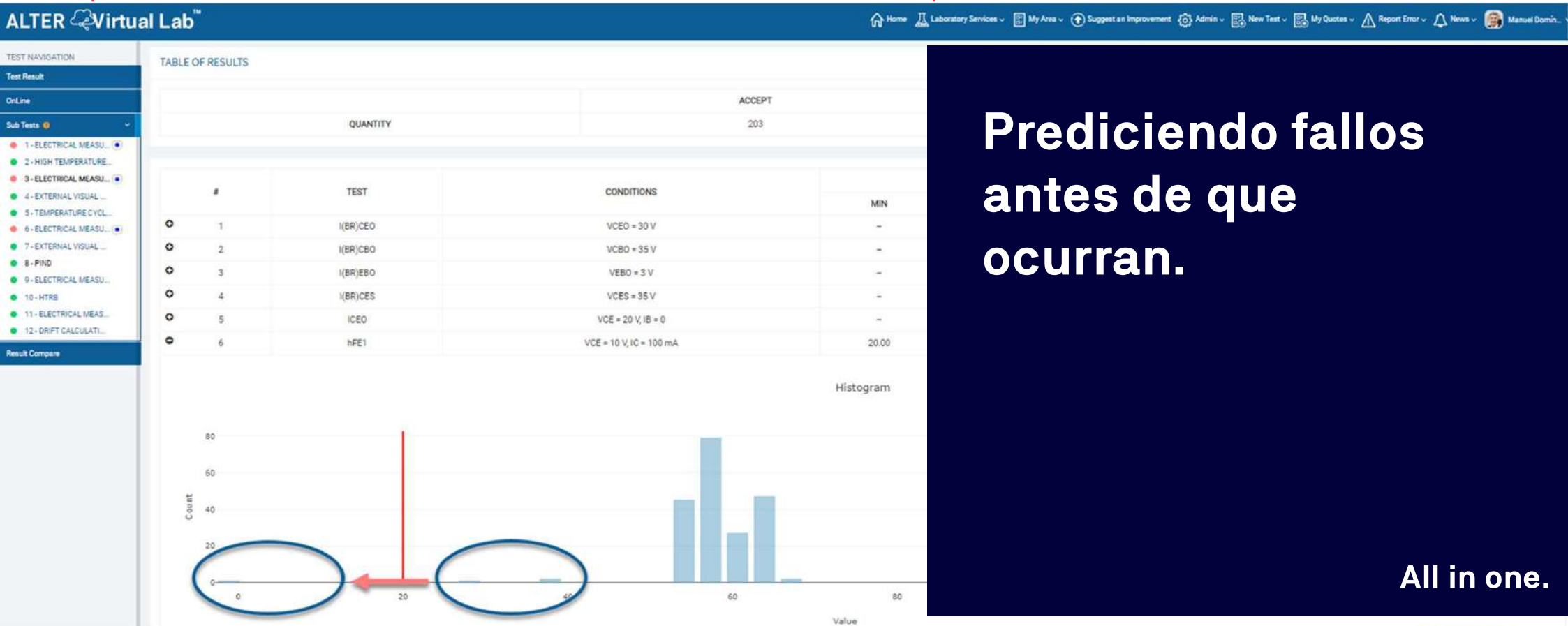
All in one.

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Análisis predictivo



Optimized Variance Identification and Detection in Electronic Components



Prediciendo fallos
antes de que
ocurran.

All in one.

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El mayor banco de datos del mercado



Centro Nacional de Aceleradores

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EEE Radiation Search options

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EEE Radiation info

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SEARCH:

PART TYPE			FUNCTION	TECHNOLOGY	FAMILY	MANUFACTURER	IRRAD STEPS	DOSE RATE
		AD549	Ultralow Input Bias Current Operational Amplifier	JFET	MICROCIRCUITS	Analog Devices	0k, 5k, 10k, 20k, 30k, 50k, 100k, Ann24, Ann168, 200k, 300k	300 rad(Si)/h to 5100 rad(Si)/h
		AD549SH	Ultralow Input Bias Current Operational Amplifier	JFET	MICROCIRCUITS	Analog Devices	0k, 5k, 10k, 15k, 20k, 25k, 30k	72 rad(Si)/h
		AD558	Microcircuit, Linear, Microprocessor Compatible 8-Bit Digital-to-Analog Converter, Monolithic Silicon	Bipolar	MICROCIRCUITS	Analog Devices	0k, 10k, 15k, 25k, 30k, 50k, 80k, 100k, Ann24, Ann168	324.19 rad(Si)/h
		AD558JNZ	Microcircuit, Linear, Microprocessor Compatible 8-Bit Digital-to-Analog Converter, Monolithic Silicon	Bipolar	MICROCIRCUITS	Micropac	0k, 41k, 78k, 114k, 150k	73.98 rad(Si)/h
		AD562	Microcircuit, Digital-Linear, Dual, 12 Bit, Digital-to-Analog Converter, Monolithic Silicon	CMOS	MICROCIRCUITS	Analog Devices	0k, 10k, 20k, 35k, 50k, 75k, 100k, 125k, Ann380, 150k, Ann840, 200k	250 rad(Si)/h to 1250 rad(Si)/h
		AD562	Microcircuit, Digital-Linear, Dual, 12 Bit, Digital-to-Analog Converter, Monolithic Silicon	CMOS	MICROCIRCUITS	PMI	0k, 10k, 20k, 35k, 50k, 75k, 100k, 125k, Ann380, 150k, Ann840, 200k	250 rad(Si)/h to 1250 rad(Si)/h
		AD565	Microcircuit, Linear, Microprocessor Compatible 12-Bit Digital-to-Analog Converter, Monolithic Silicon	BiFET	MICROCIRCUITS	Analog Devices	0k, 5k, 10k, 15k, 20k, 25k, 30k, 35k, 40k, 50k, 75k, 100k, 150k	72 rad(Si)/h
		AD565	Microcircuit, Linear, Microprocessor Compatible 12-Bit Digital-to-Analog Converter, Monolithic Silicon	BiFET	MICROCIRCUITS	Analog Devices	5k, 10k, 15k, 20k, 30k, 30k, 75k, 100k, Ann168, Ann168	80 rad(Si)/h to 1470 rad(Si)/h
		AD565ASD/QMLV	Microcircuit, Linear, Microprocessor Compatible 12-Bit Digital-to-Analog Converter, Monolithic Silicon	BiFET	MICROCIRCUITS	Analog Devices	0k, 1k, 5k, 10k, 15k, 30k, 60k, 100k, Ann24, Ann168	35.26 rad(Si)/h, 335.1 rad(Si)/h
		AD565ASD/QMLV	Microcircuit, Linear, Microprocessor Compatible 12-Bit Digital-to-Analog Converter, Monolithic Silicon	BiFET	MICROCIRCUITS	Analog Devices	0k, 1k, 5k, 10k, 15k, 30k, 50k, 100k, Ann24, Ann168	33.5 rad(Si)/h, 228.6 rad(Si)/h

Showing 711 to 720 of 3,142 entries (filtered from 4,035 total entries)

Previous 1 71 72 73 315 Next

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Certificado:

SI-0015/2024

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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 integrase 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.

ALTER

Gracias por su atención.

Manuel Domínguez

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manuel.dominguez@altertechnology.com



Referencias

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4. [Reducción de costos de SpaceX](#)
5. [Satélites lanzados en 2023 y proyecciones](#)
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7. [Temperaturas extremas en el espacio](#)
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