

A Mars 2020 rover is shown on a rocky, reddish-brown surface. The rover is equipped with a camera masthead and a robotic arm. Two bright green laser beams originate from the camera masthead and extend across the frame towards a large rock in the background. The background features rolling hills under a hazy, orange-tinted sky.

**Contribución del grupo de investigación
ERICA (GIR UVA), al instrumento SuperCam
dentro de la Misión Mars 2020 de NASA**

F. Rull

Valladolid 9/10/2019

*ERICA: Espectroscopía Raman e Infrarroja
aplicada a Cosmogeología y Astrobiología*



Contexto : papel de la UVA en la exploración de Marte y sus lunas

Exomars 2020 (ESA): Raman Spectrometer

F. Rull, Investigador Principal **(UVA)**

S. Maurice, Co-Investigador Principal (CNES, Francia)

I. Hutchinson, Co-Investigador Principal (U. Leicester, U.K.)

Mars 2020 (NASA): SuperCam combined instrument

R. Wiens, Investigador Principal (LAN, USA)

S. Maurice, Co-Investigador Principal (CNES, Francia)

F. Rull, Investigador Responsable SCCT **(UVA)**

MMX 2024 (Mars Moons eXploration Mission)

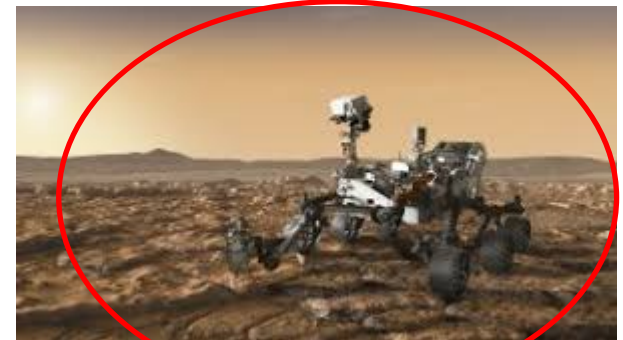
JAXA: Raman Spectrometer

U. Böttger, Investigador Principal (DLR, Alemania)

H-W. Hübers, Co-Investigador Principal (DLR, Alemania)

F. Rull, Co-Investigador Principal **(UVA)**

Y. Cho, Co-Investigador Principal (U. Tokio, Japón)



Dr. Daniel Miguel San José
Rector
University of Valladolid
Plaza de Santa Cruz 8
47002 Valladolid, SPAIN

Acuerdo NASA-UVA 2015

Dear Dr. San José:

The United States National Aeronautics and Space Administration (NASA) and the University of Valladolid (UVa) have expressed a mutual interest in cooperating on NASA's Mars 2020 mission. The purpose of this letter is to establish a cooperative agreement (hereinafter referred to as the "Agreement") between NASA and UVa (hereinafter referred to individually as "the Party" or jointly as "the Parties"), detailing the cooperation regarding the Mars 2020 mission.

ARTICLE 1 – PURPOSE OF COOPERATION

The Mars 2020 Rover will be the next strategic mission in NASA's Mars Exploration Program. NASA expects the mission to land a rover on the surface of the planet to conduct a wide range of scientific exploration. Mars 2020's goal is to continue Curiosity's success by exploring for signs of ancient life and habitable environments, and studying Martian weather, atmosphere, and geology. NASA plans to launch the Mars 2020 mission in July 2020, and land the Rover on Mars in February 2021. NASA expects that once on the surface, the Rover will conduct operations until at least August 2023.

On July 31, 2014, NASA announced the selected payload for the Mars 2020 Rover. The payload will include up to seven scientific and exploration instruments, one of which being the SuperCam: Active and Reflectance Mineralogy, Astrobiology, Chemistry, and Imaging at Remote Distances instrument suite. Dr. Roger Wiens of the Los Alamos National Laboratory (LANL) has been selected as the SuperCam Principal Investigator (PI). UVa's contribution to SuperCam includes a calibration target assembly to contain rock, synthetic glass, and ceramic targets, which will calibrate SuperCam's instruments against materials of known compositions and spectral properties. Dr. Fernando Rull of UVa has been selected as the calibration target Co-Investigator (Co-I) and Institutional Principal Investigator.



Universidad de Valladolid

Karen C. Feldstein
Director, Science Division
NASA

July 21, 2015

Dear Ms Feldstein

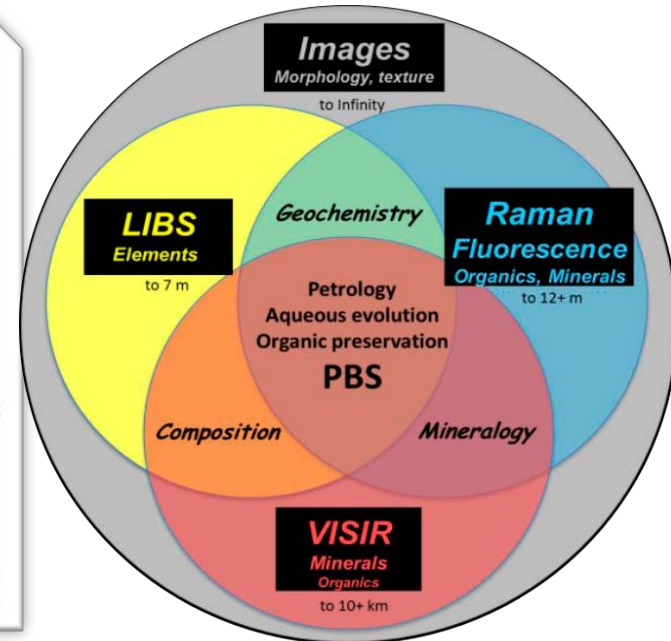
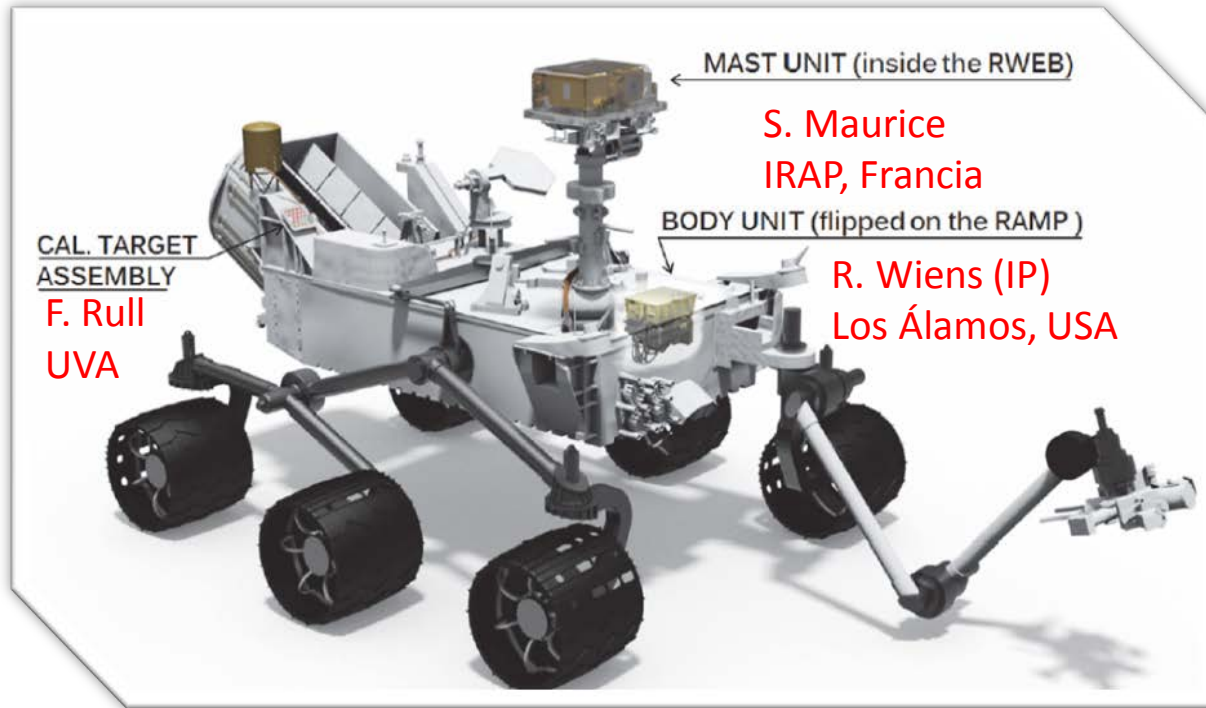
I would like to express my conformity with the terms of the Agreement contained in your letter of March 12, 2015 about the participation of Dr. Fernando Rull of the University of Valladolid in the SuperCam instrument and the actions mentioned in your letter.

Best regards

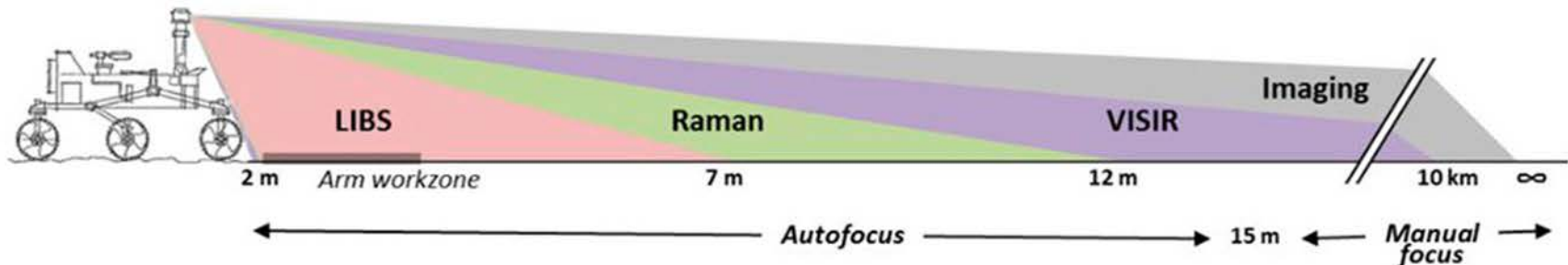

Daniel Miguel



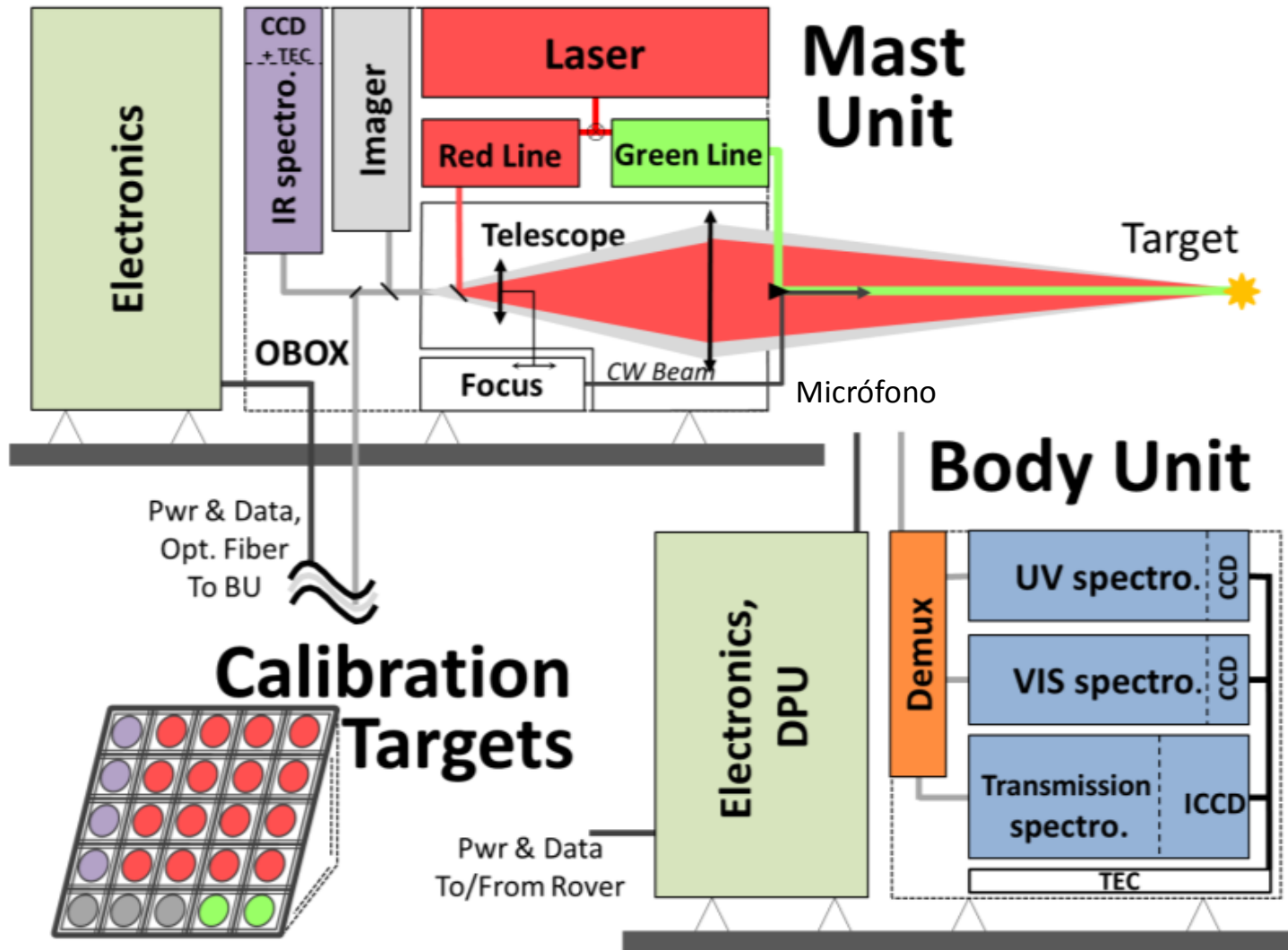
SuperCam. Disposición de las tres unidades esenciales sobre el rover Mars 2020 y sus responsables



Capacidades y alcance de las diferentes técnicas incluidas en SuperCam



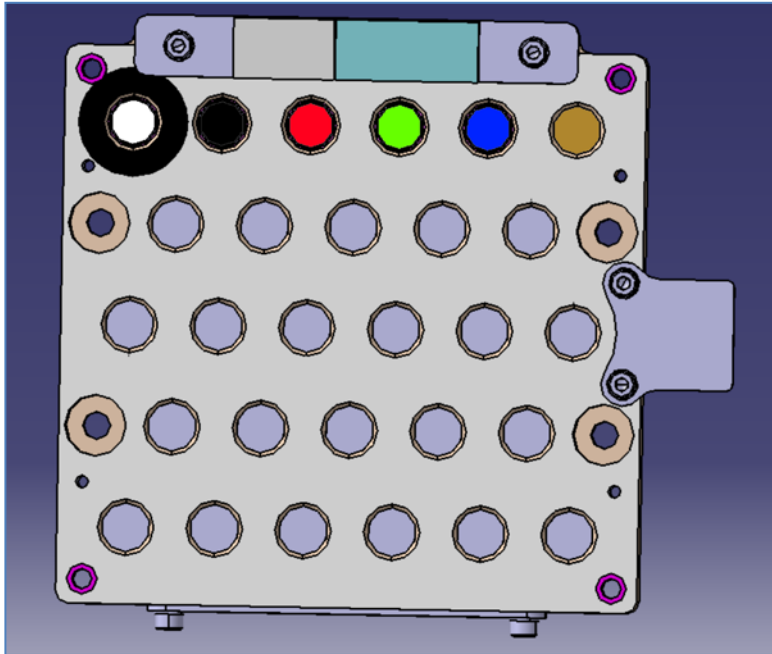
SuperCam Block Diagram



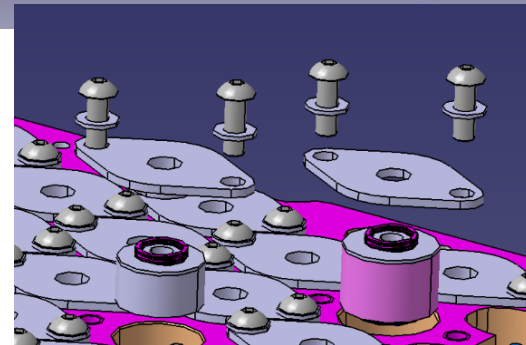
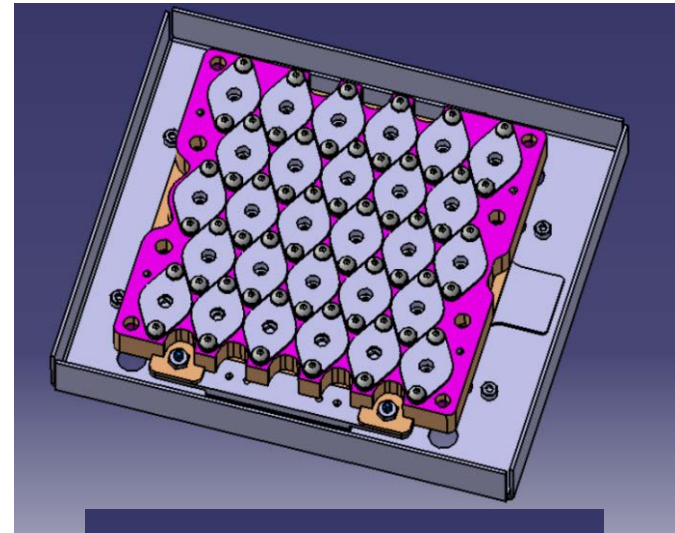
Sistema de calibración de SuperCam

El sistema consta de dos partes:

- 1- Conjunto de muestras seleccionadas para cumplir los objetivos científicos del instrumento
- 2- Sistema de fijación de las muestras



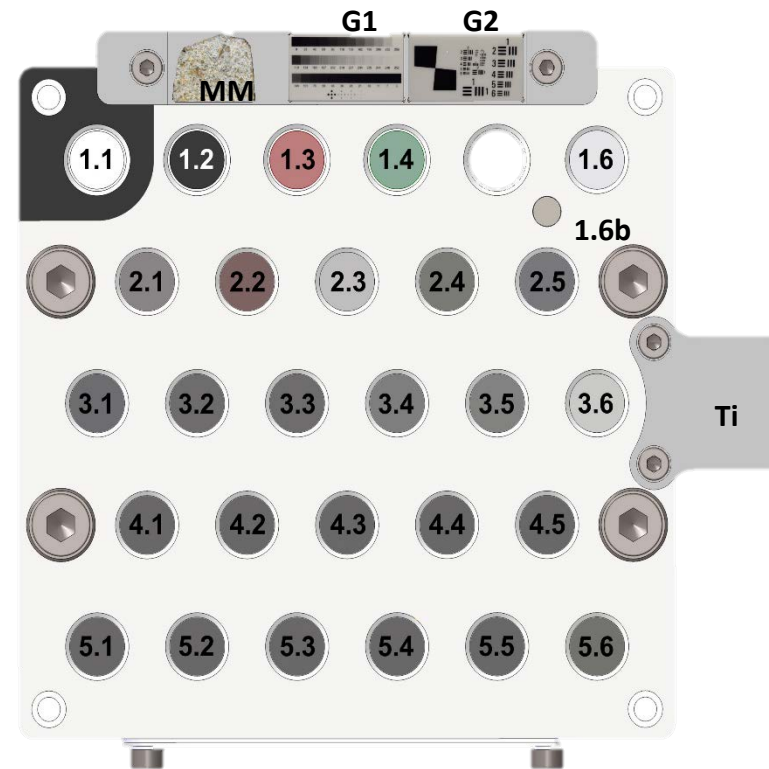
Parte superior, disposición de muestras



Parte inferior, sistema de fijación

1.1	White passive sample (Aluwhite98)	3.6	Serpentine (Silicate)
1.2	Black passive sample (AeroglazeZ307)	4.1	Basalt standard BHVO-2
1.3	Red passive target (LUCIDEON)	4.2	Martian soil analogue JSC-1
1.4	Green passive target (LUCIDEON)	4.3	Ankerite (Ca, Fe, Mg, Mn carbonate)
1.5	Cyan passive target (LUCIDEON)	4.4	Siderite (Fe carbonate)
1.6	Ertalyte organic sample (PET)	4.5	Manganese nodule Standard (silicate)
1.6b	Diamond	5.1	
2.1	Sulfur rich target	5.2	Minor elements samples:
2.2	Chert (Quartz mostly)	5.3	trachybasalts doped in Cu, Cr,
2.3	Calcite (Ca Carbonate)	5.4	Mn, Zn, Ba, Rb, Li, Sr, Ni
2.4	Ferrosilite (orthopyroxene)	5.5	
2.5	Apatite (phosphate)	5.6	Chemcam Shergottite
3.1	Orthose (feldspar)	M	
		M	Martian meteorite (NWA10170)
3.2	Diopside (Clinopyroxene)	G1	Geometric target 1 (grey scale)
3.3	Olivine (silicate)	G2	Geometric target 2 (USAF)
3.4	Andesine (plagioclase)	Ti	Titanium plate
3.5	Enstatite (pyroxene)		

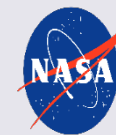
Conjunto de muestras seleccionadas



Muestra de calibración de ChemCam Curiosity



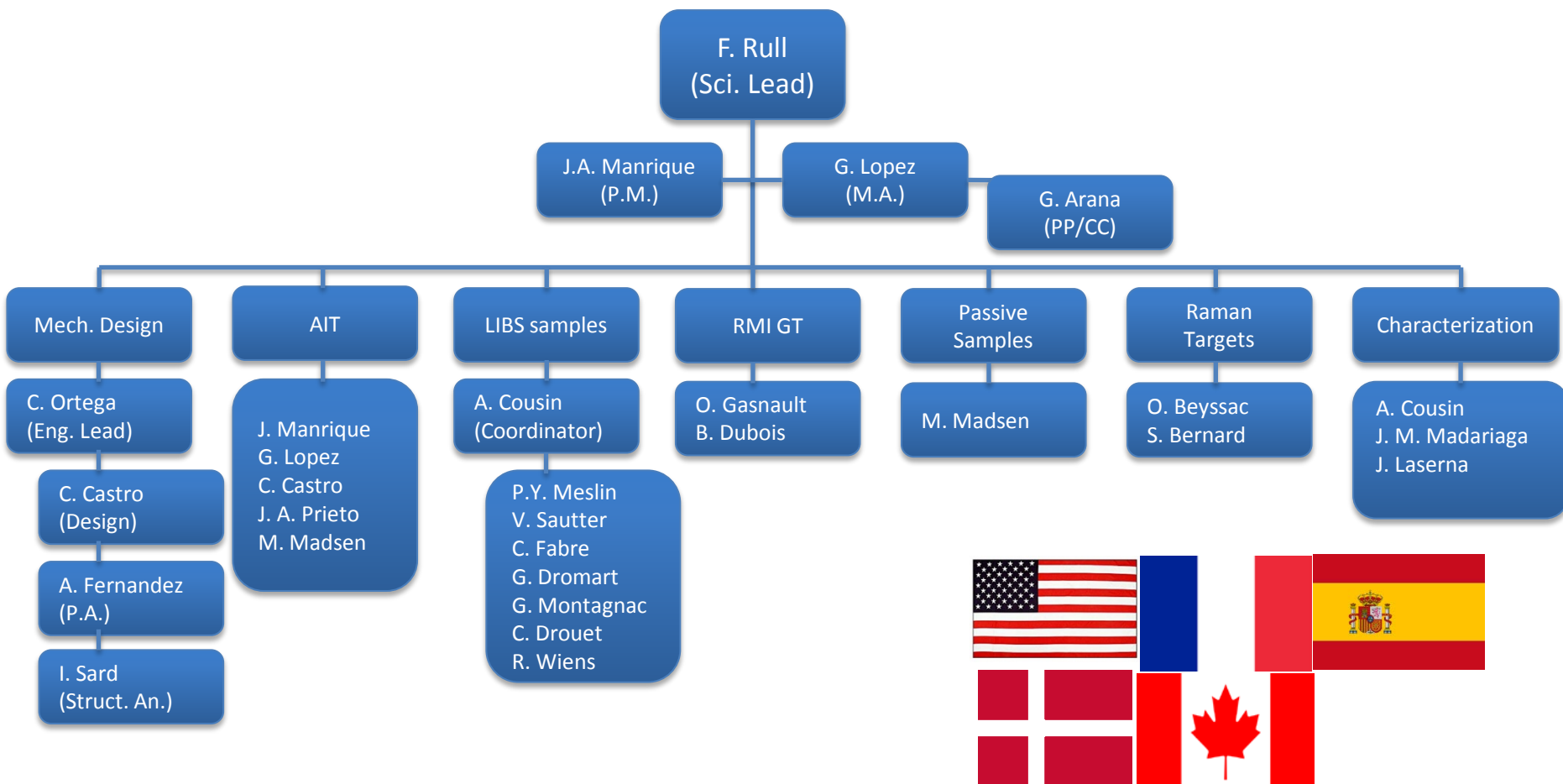
El equipo del sistema de calibración de SuperCam



Mars 2020 Project
SUPERCAM



CENTRE NATIONAL D'ETUDES SPATIALES



Modelos de desarrollo

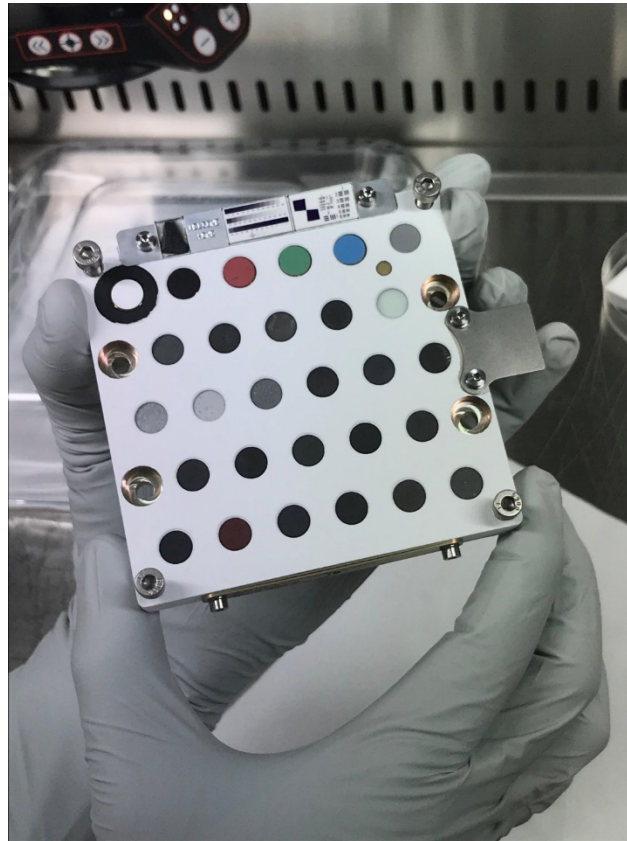
ETU



**Shock tested at Spain
(2500 and 4000 g)
Clocking evaluated
Dust issue evaluated
All the ceramic samples survived**

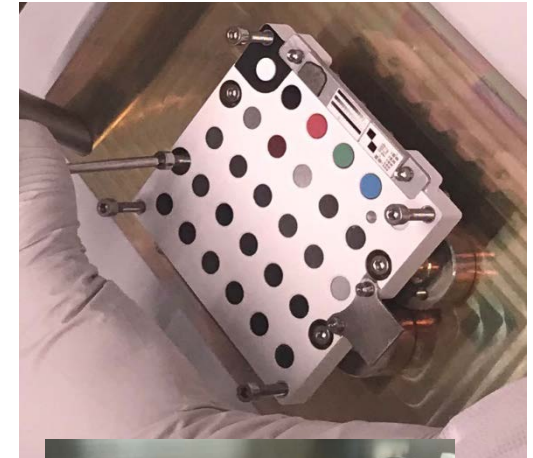
Créditos: NASA, UVA

EQM

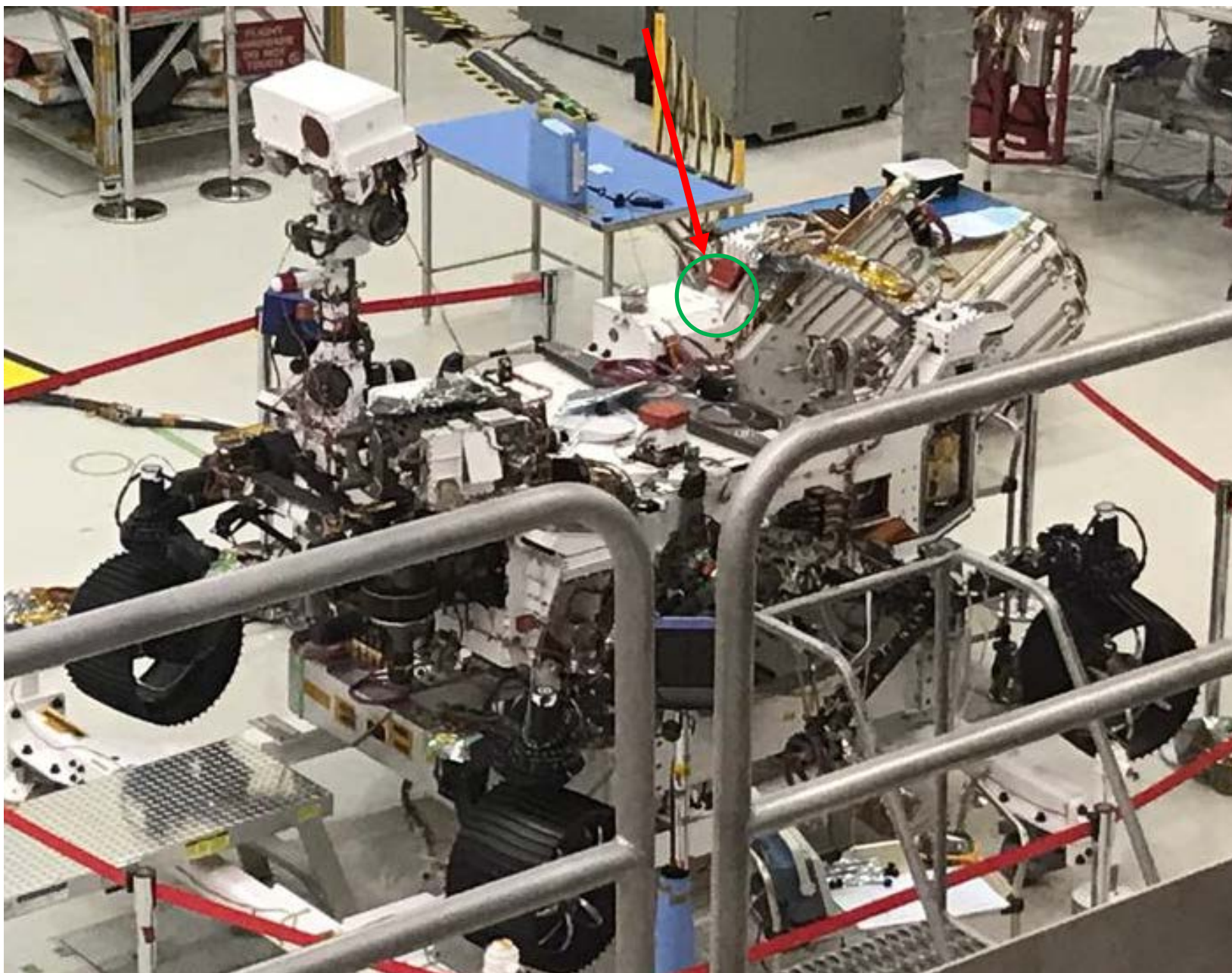


**Tests:
Vibration
Shocks @3500 g
Extended TVAC: 30 cycles (-130°C, 80°C)
Bakeout: 115 °C during 150 hours**

FM



El sistema de calibración actualmente integrado en el rover



Créditos: NASA

La ciencia y la tecnología desarrollada para el espacio tiene un importante repercutado en aplicaciones terrestres

- Industria y tecnología: (ej. Repsol, INDRA Sistemas)**
- Medio ambiente, agroenergía, agroalimentación**
- Ciencias de la salud**
- Patrimonio histórico y artístico**

Estudio Raman remoto de la estructura del hielo en el Ártico



Análisis de aguas acidas y contaminación por sales de elementos pesados (Rio Tinto)

Contaminación ambiental en la cueva del Soplo (Cantabria)



Ciencias de la salud

Detección espectroscópica precoz de marcadores moleculares en Alzheimer a través de Raman

Detección de productos tóxicos en productos usados en operaciones de desprendimiento de retina por Raman e IR (alarma sanitaria, repercusión social)

Patrimonio histórico

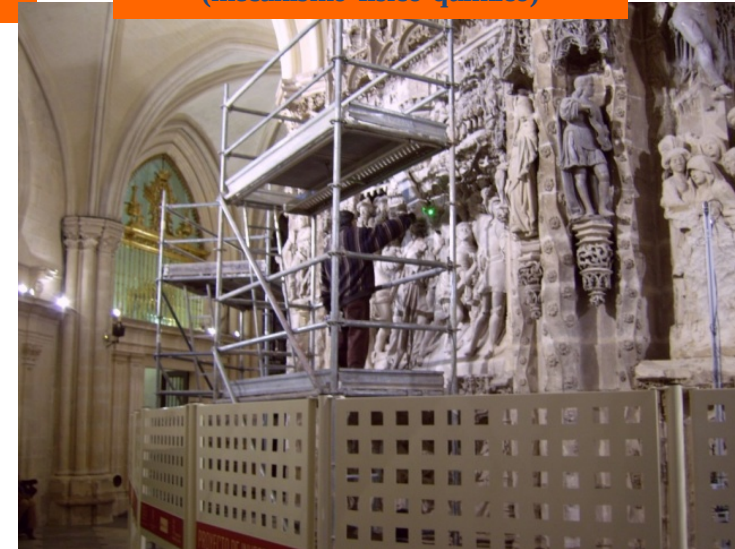
DOCUMENTO FUNDACIONAL DEL COLEGIO DE SANTA CRUZ

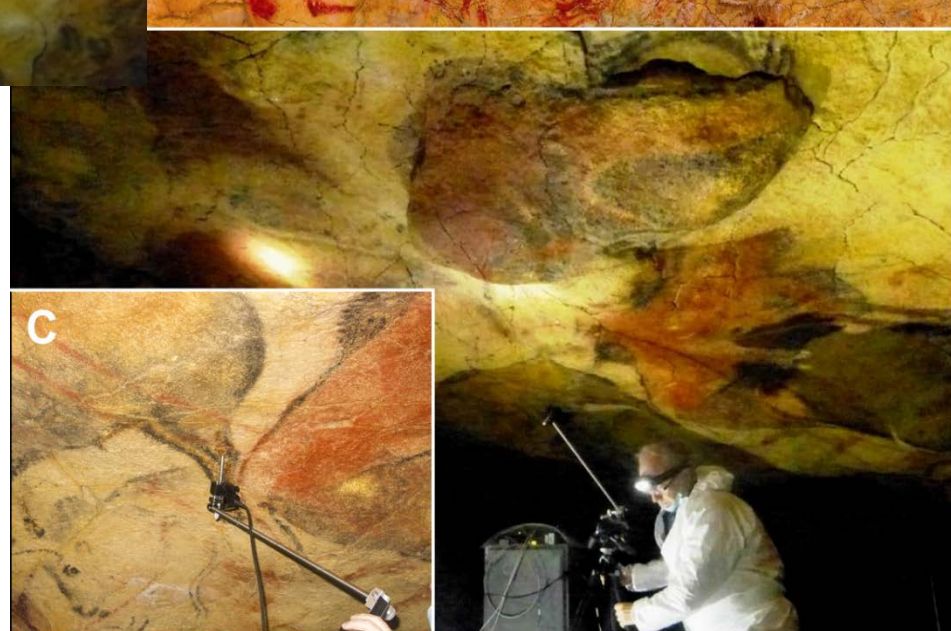


BEATO DE VALCAVADO AÑO 970 BIBLIOTECA HISTÓRICA (UVA)



DETERIORO DEL TRASLATAR DE LA CATEDRAL DE BURGOS (mecanismo físico-químico)





Estudio in-situ de los pigmentos de la sala de los bisontes de la Cueva de Altamira, la llamada “Capilla Sixtina del Paleolítico”