



**PART
TIME
SCIENTISTS**

Google
LUNAR **X** PRIZE

The logo features a stylized 'X' on the left, formed by two overlapping white lines that create a sense of motion and depth. To the right of the 'X', the word 'PRIZE' is written in a clean, white, serif typeface. The entire logo is centered horizontally against a dark blue background.

XPRIIZE

Revolution through
Comptetition



Spirit of St. Louis

The New York Times.

LINDBERGH DOES IT! TO PARIS IN 33 1/2 HOURS; FLIES 1,000 MILES THROUGH SNOW AND SLEET; CHEERING FRENCH CARRY HIM OFF FIELD

COULD HAVE GONE 500 MILES FARTHER

Gasoline for at Least That Much More
Flew at Times from 10 Feet to
10,000 Feet Above Water.

AT ONLY ONE AND A HALF OF HIS OWN SCHEDULE

Yet Alone at Times for Quicker Landing—Stomach
of His Adventure in Brief Narrative
of the Crossing.



MAP OF LINDBERGH'S THIRTY-THREE HOUR FLIGHT, SHOWING THE SPEED OF HIS FLIGHT.

LEAVING ABANDONING TRELANDA FLIGHT

Leaving Down in an Emergency
With Wife from Flight Man-
aged to Escape Landing.

WIFE'S STORY IS NARRATED

Lindbergh's flight of 33 hours
from New York to Paris, May 20-21,
is told in this special feature.



LINDBERGH THROUGH THRILLS COURAGE

Thrilled, Calm, Brave, Sober
"Happy Man" and "Cautious"
for England and So.

CRITICAL, THUNDER WITH

Nothing More, Nothing Less
and New York Journal, Flying
Today in Being True.

CRUISING REARS THUNDEROUS WELCOME

Breaks Through Lines of Soldiers and
Police and Surging to Plane Lifts
Weary Flier from His Cockpit

WINDS BLAZE OFF FROM FRENCH AIR IN 25,000

Paris Strangers Ring With Cheers After Star
and Light March—American Flag to Collect
for and White Acclaimed.

IN PARIS, A JUBILANT
RECEPTION WAS MET BY
THE FLYER.

PARIS, May 21.—Lindbergh, who had
a hard struggle against the odds to reach
Paris, a great relief and joy was met
by a crowd of cheering and waving
people, many of whom were waving
the American flag.

When I took a second look at the
crowd, I was struck by the fact that
the crowd was not only cheering
but also waving the American flag.
The crowd was so dense that I
could not see the ground below me.
I was flying at an altitude of
10,000 feet at the time.

It was a great relief to be
met by such a warm and
enthusiastic reception. I
was flying at an altitude of
10,000 feet at the time.
The crowd was so dense that
I could not see the ground
below me. I was flying at
an altitude of 10,000 feet at
the time.

LINDBERGH'S FLIGHT HISTORY

Charles Lindbergh, a 25-year-old
aviator, was the first man to fly
across the Atlantic Ocean in a
single aircraft. He flew from
New York to Paris in 33 1/2
hours.

THE GROUND RECEPTION

Paris, May 21.—The ground
reception for Lindbergh was
one of the most enthusiastic
in the history of aviation. A
large crowd of people gathered
to meet the flyer at the
Paris-Montparnasse Airport.

Lindbergh's flight was a
great achievement. He flew
from New York to Paris in
33 1/2 hours. The flight was
a great relief and joy for
the people of Paris. Lindbergh
was met by a crowd of
cheering and waving people.
The crowd was so dense that
Lindbergh could not see the
ground below him.

ANSARI



PRIZE



SpaceShipOne

The First Non-Government Manned Spacecraft

Google
LUNAR X PRIZE



 - Country with registered Team

21 Teams



 - Country with registered Team

12 Nations





500m
Mooncast

Heritage

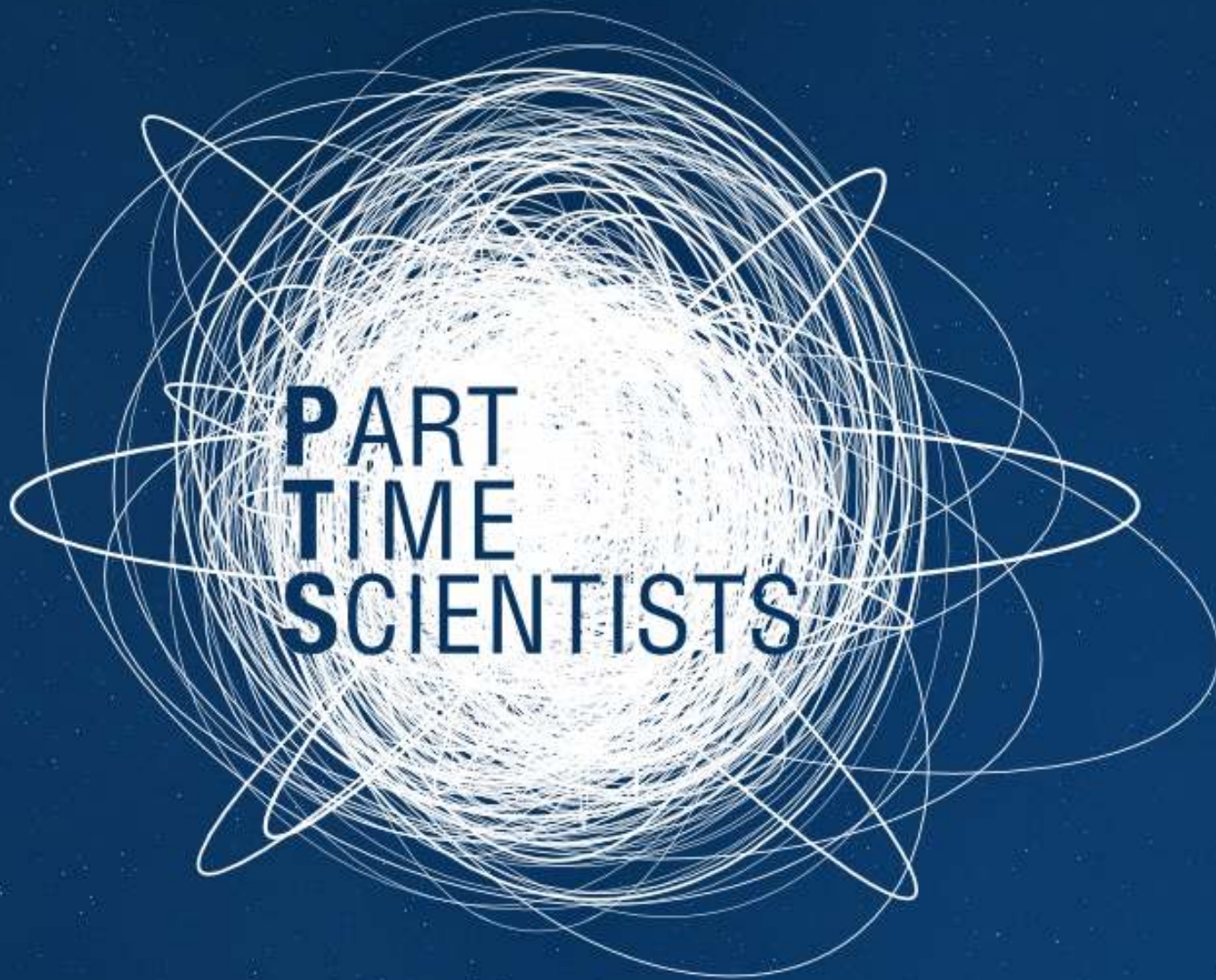
Water

Range

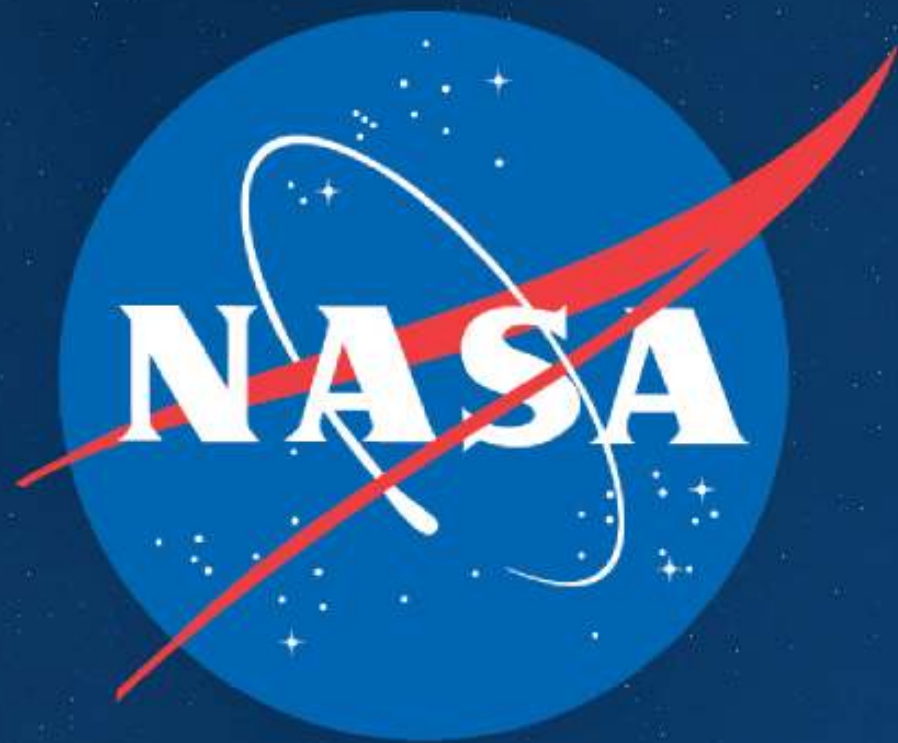
Survival

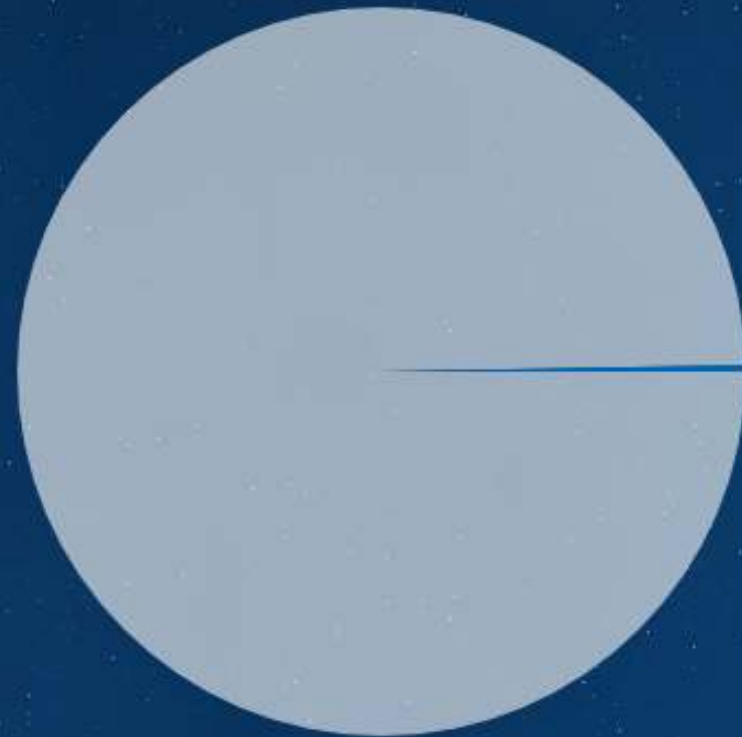
Diversity



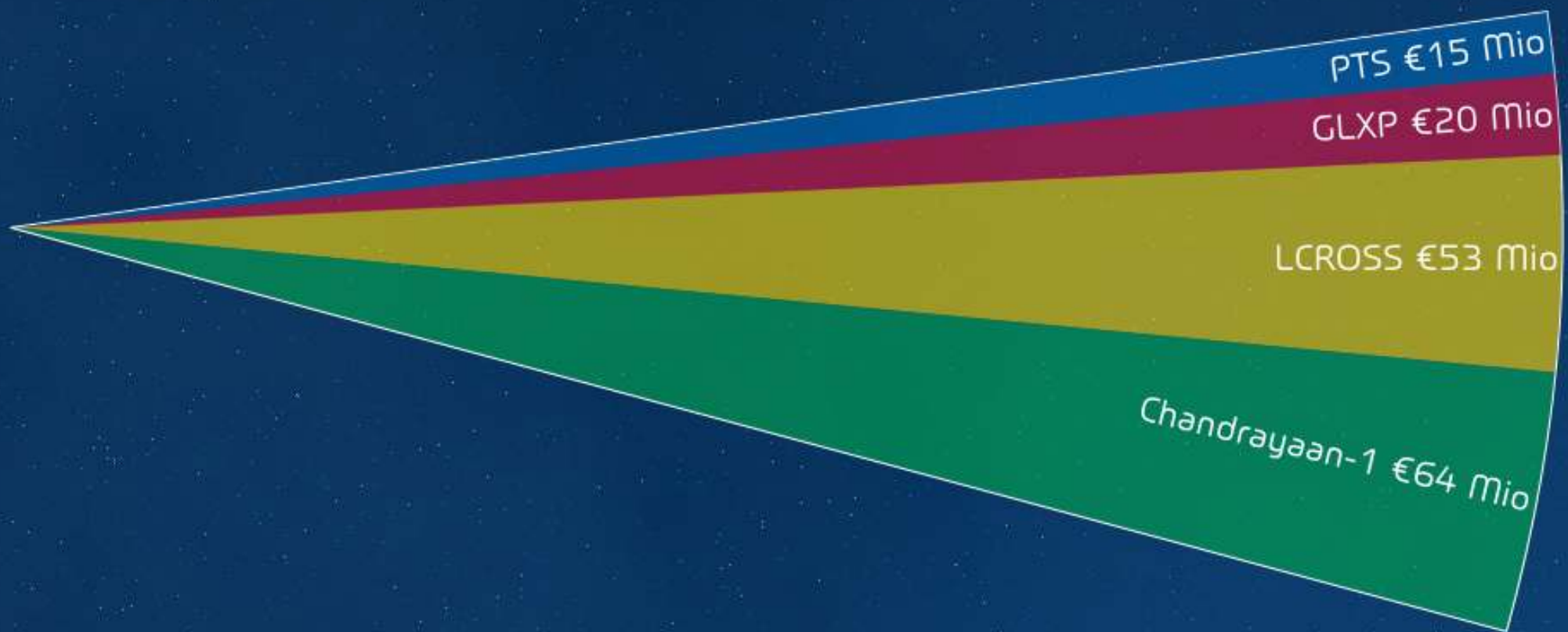


**PART
TIME
SCIENTISTS**





€ 90.870.000.000





No Rocket
existing Technology
Low Budget
Innovation
No Time
Cow



33





Engineers



Students



Broadcast Engineers

Retired Military



IT- Professionals



Retired Apollo Staff



Partners



You







- 04.10.1957 Sputnik (USSR)







- 13.09.1959 Luna 2 (USSR) Impact





- 13.09.1959 Luna 2 (USSR) Impact
- 04.10.1959 Luna 3 (USSR) Pictures





- 13.09.1959 Luna 2 (USSR) Impact
- 04.10.1959 Luna 3 (USSR) Pictures
- 04.10.1962 Alouette (Canada) Ionosphere





- 13.09.1959 Luna 2 (USSR) Impact
- 04.10.1959 Luna 3 (USSR) Pictures
- 04.10.1962 Alouette (Canada) Ionosphere
- 04.10.1963 X-15 (USA) reusable



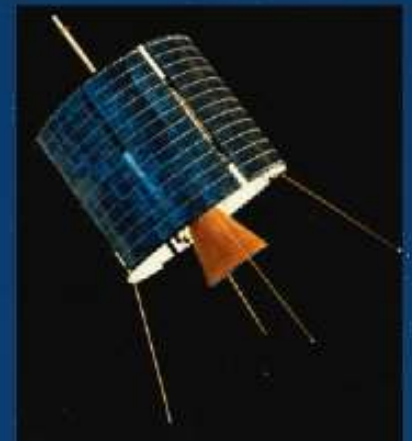


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- 04.10.1959 Luna 3 (USSR) Pictures
- 04.10.1962 Alouette (Canada) Ionosphere
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- 14.07.1965 Mariner (USA) Flyby





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- 21.06.1969 Apollo 11 (USA)



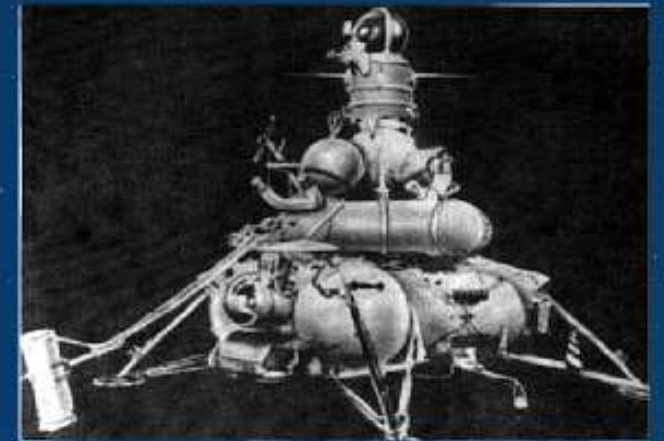


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- 24.09.1970 Luna 16 (USSR) Sample



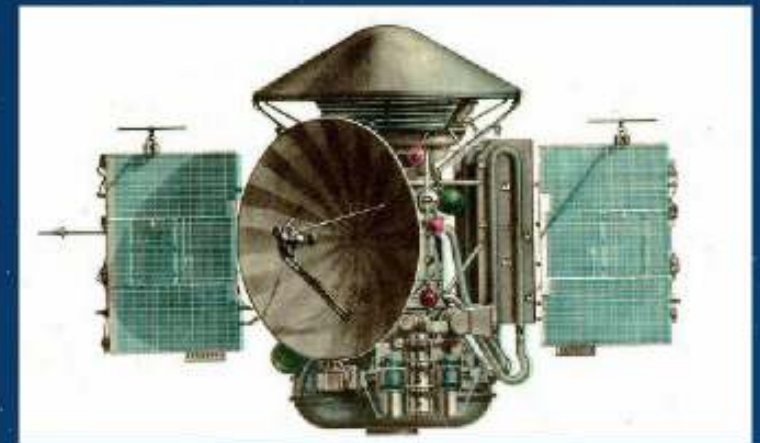


- 24.09.1970 Luna 16 (USSR) Sample
- 23.11.1970 Lunokhod 1 (USSR) Rover



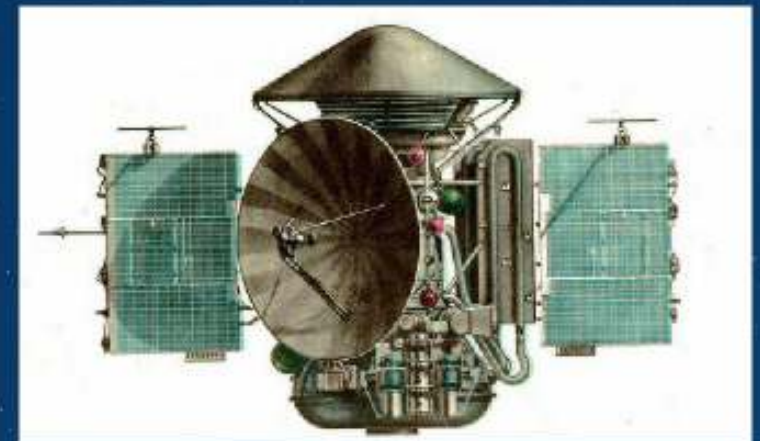


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- 02.12.1971 Mars 3 (USSR) Lander
- 23.04.1972 Salyut 1 (USSR) Station



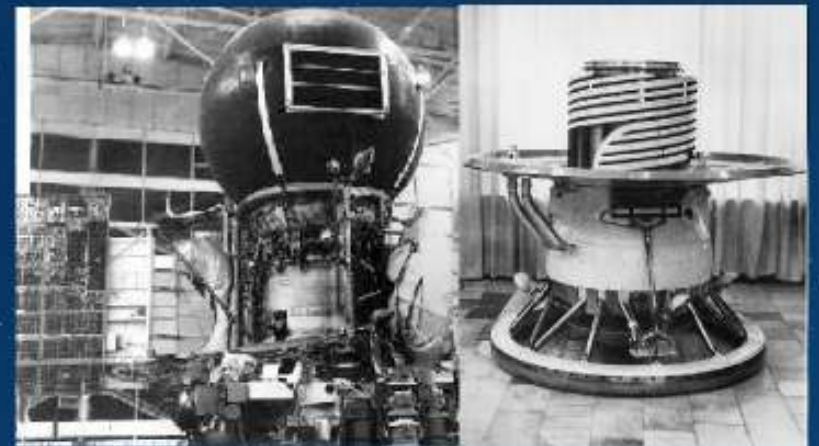


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- 23.04.1972 Salyut 1 (USSR) Station





- 22.10.1975 Venera 9 (USSR) Landing





- 22.10.1975 Venera 9 (USSR) Landing
- 26.01.1978 Explorer57 (USA/ESA/UK) Ultraviolet





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- 12.04.1981 STS-1/Columbia (USA) Reusable





- 12.04.1981 STS-1/Columbia (USA) Reusable
- 01.03.1982 Venera 13 (USSR) Venus





- 12.04.1981 STS-1/Columbia (USA) Reusable
- 01.03.1982 Venera 13 (USSR) Venus





- 19.02.1989 MIR (USSR) Space Station





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- 24.04.1990 Hubble (USA) Telescope





- 24.04.1990 Hubble (USA) Telescope





- 26.04.01 Dennis Tito (Private) Tourist





- 26.04.01 Dennis Tito (Private) Tourist
- 15.10.03 Shenzhou 5 (China) New





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- 14.01.2005 Cassini-Huygens (USA/ESA/ASI) Titan





- 14.01.2005 Cassini-Huygens (USA/ESA/ASI) Titan





Rocket

Type Falcon 1E



Falcon 1E RazakSAT

Modified Falcon 1E

<10.000\$ / kg Orbit

1010kg mass to LEO

80% Fuel



Rocket

Type Falcon 1E

Lander

Mass 300Kg

Task Sample Return

Rocket

Type Falcon 1E

Lander

Mass 300Kg

Task Sample Return

Rover

Specs



Rocket

Type Falcon 1E

Lander

Mass 300Kg

Task Sample Return

Rover

Specs

MCU

What ?
Specs

FPGA

Xilinx Virtex 4/5 Series FPGA

Full Analog/Digital control

Fully HiRel certified Components

I/O

Standardized Protocols

Ethernet for Falcon 1E control BUS

Gigabit Ethernet as Interconnect / Ethernet BUS

Storage

Persistent HiRel Datastorage

Customized ECC Algorithms for both Flash and RAM



Rocket

Lander

Rover

mCU

maxon motor

Schneider
KREUZNACH



EAGLE

3D
SolidWorks
SolidLine AG



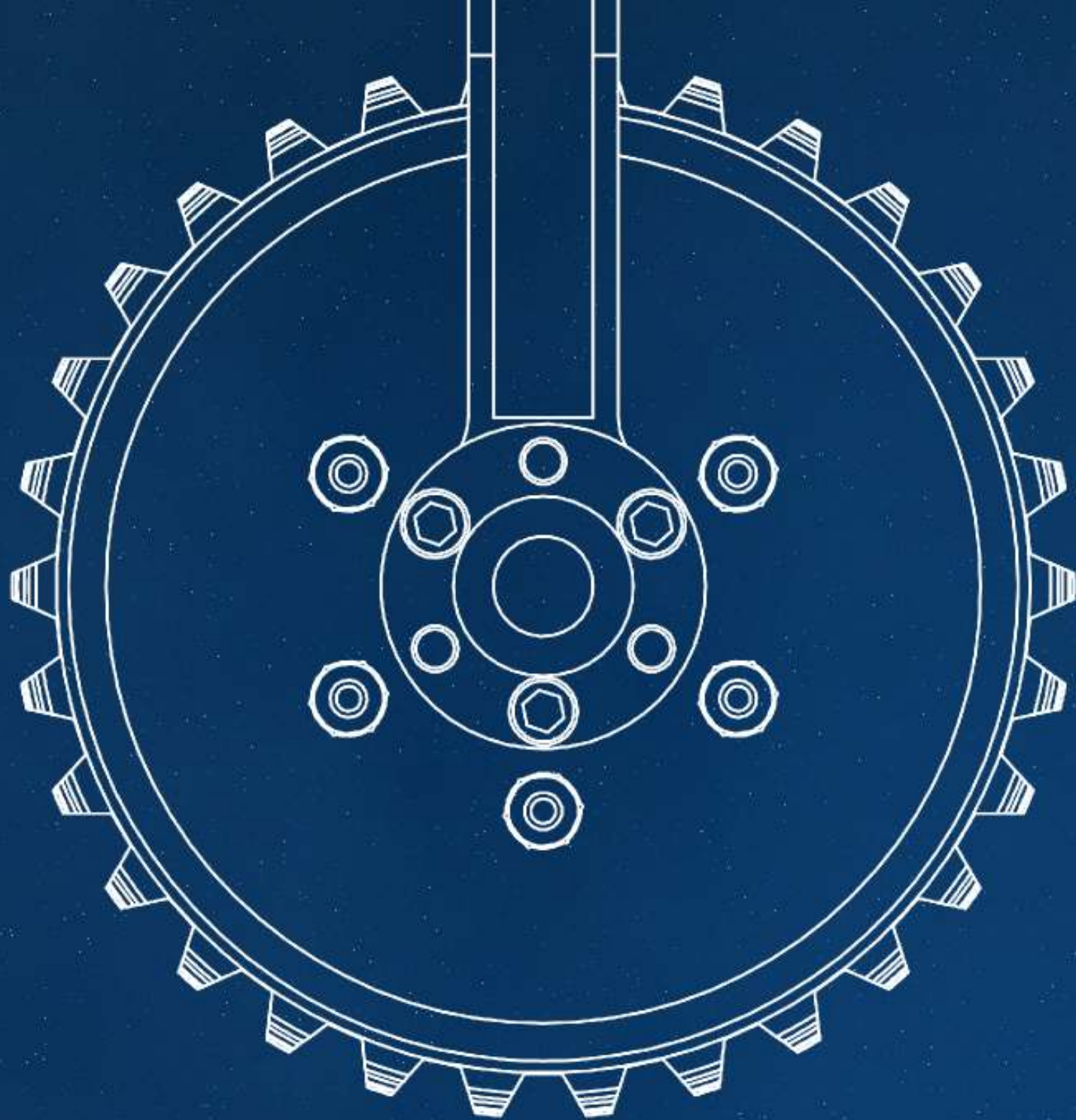
XILINX[®]

PART
TIME
SCIENTISTS



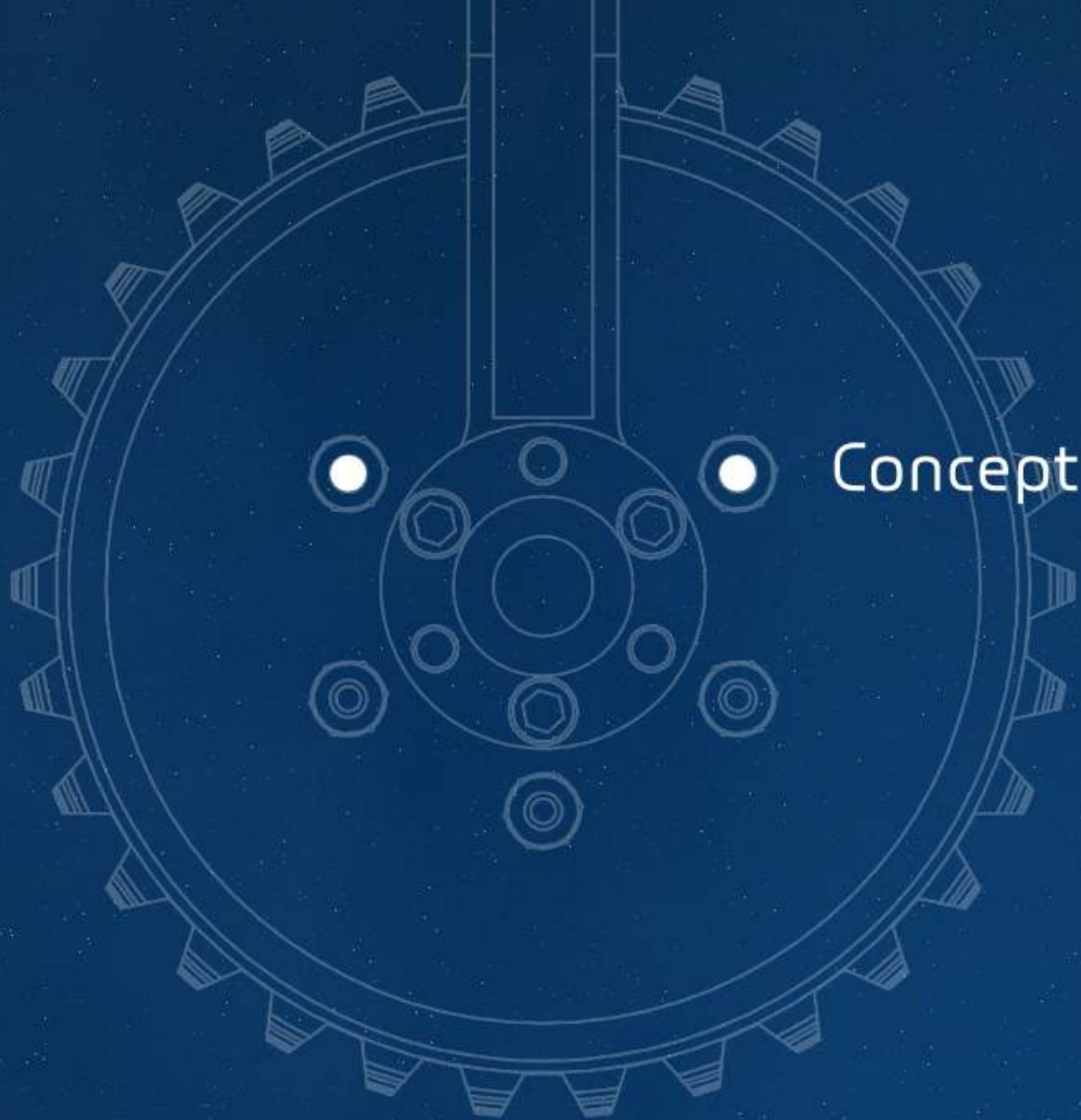
O'REILLY





Requirements





Concept

Asimov Jr.





Technology



Future



GLXP

500m

Mooncast

PTS

5000m

Lunar Night

Moon

Temperature

Surface

Regolith



Mass / Components

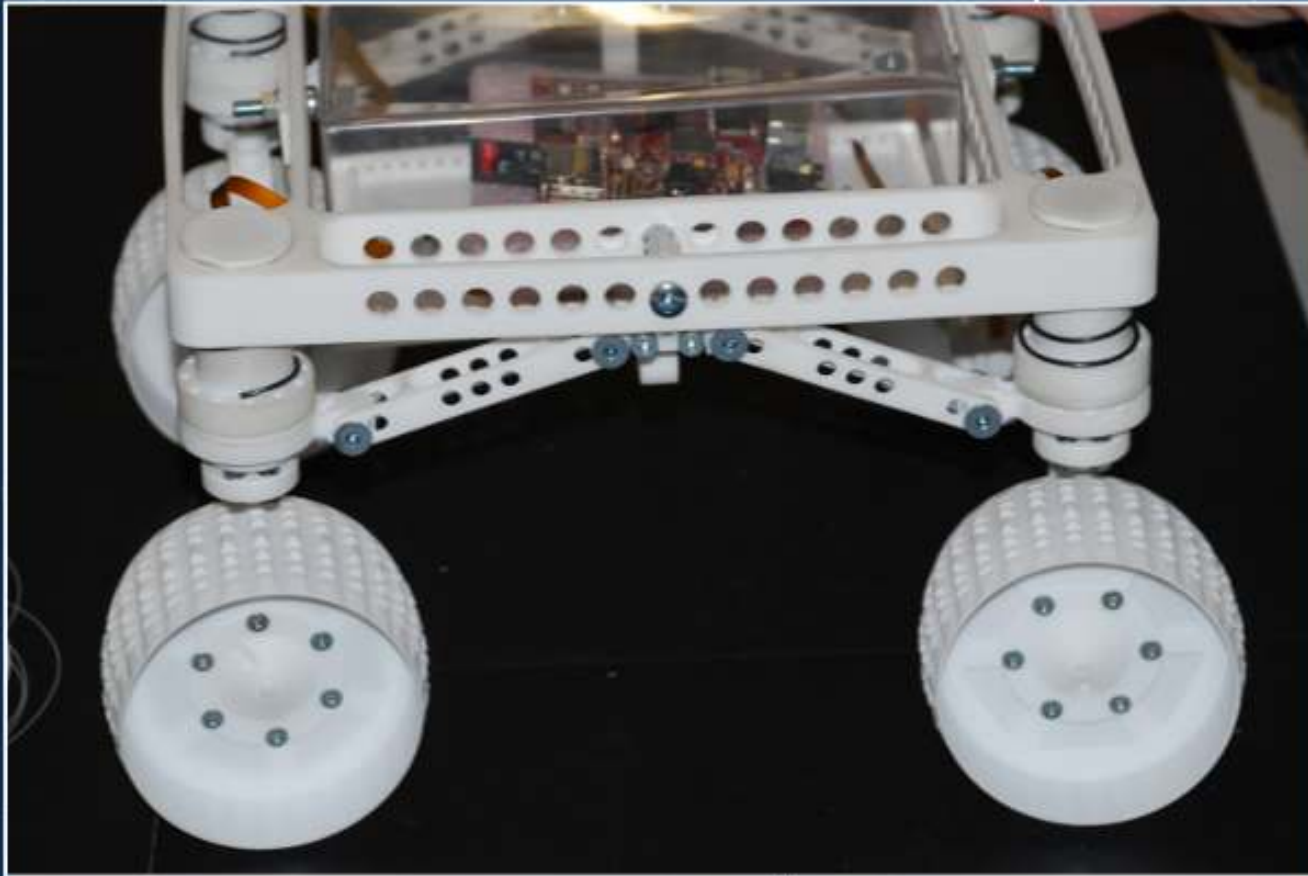
Mobility	4 Wheels 360°	1000g
Tower	HD Stereo Vision Optics Total	1000g
Control	Main Computing Unit	500g
Energy	Solar Panel with Slot Array Antenna Total	1000g
Reserved	XPF Payload	500g
	Scientific Payload	-
Total	Weight with Interconnections	5Kg



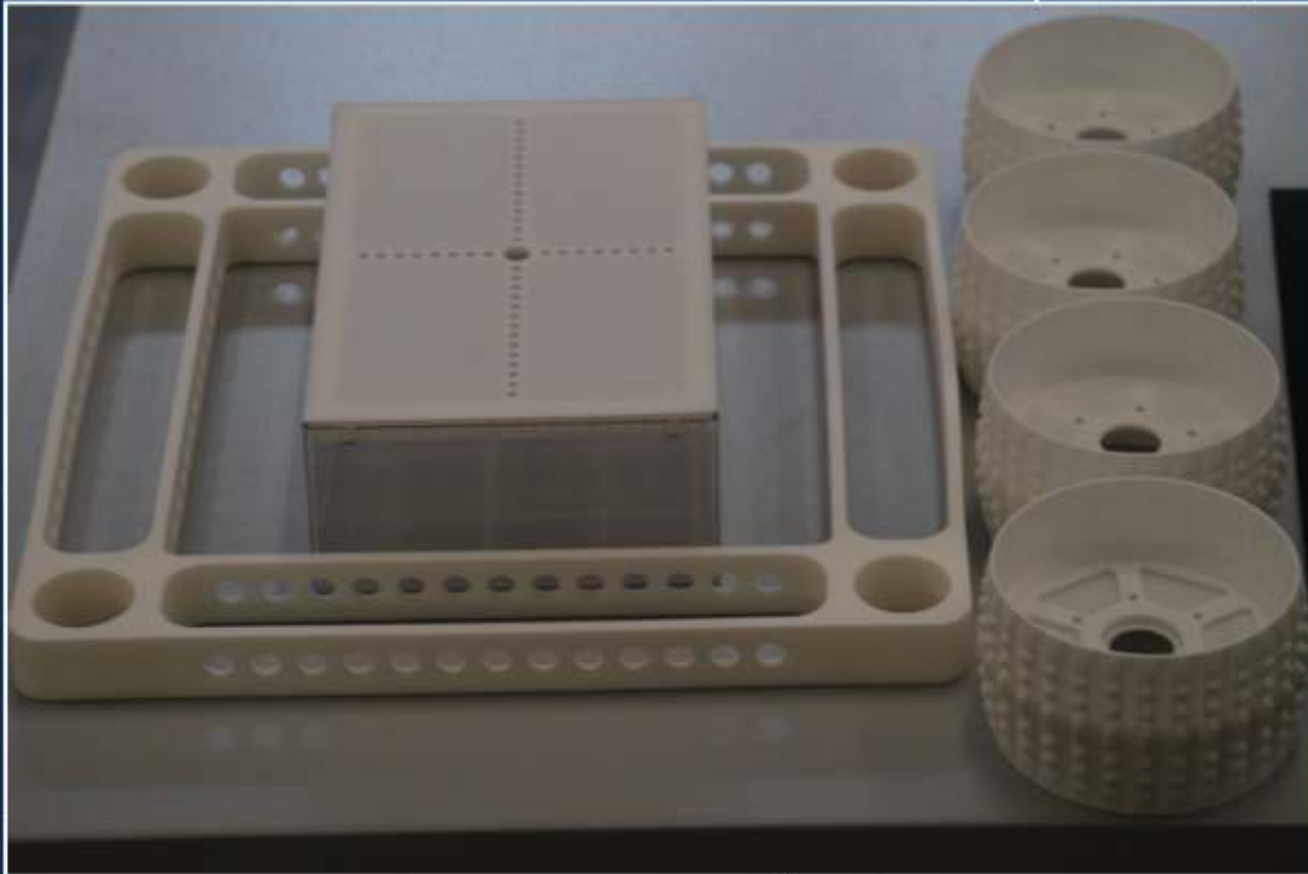
A white line starts at the top center of the image, goes down vertically, then turns diagonally down and to the right, ending at the word "Video".

Video

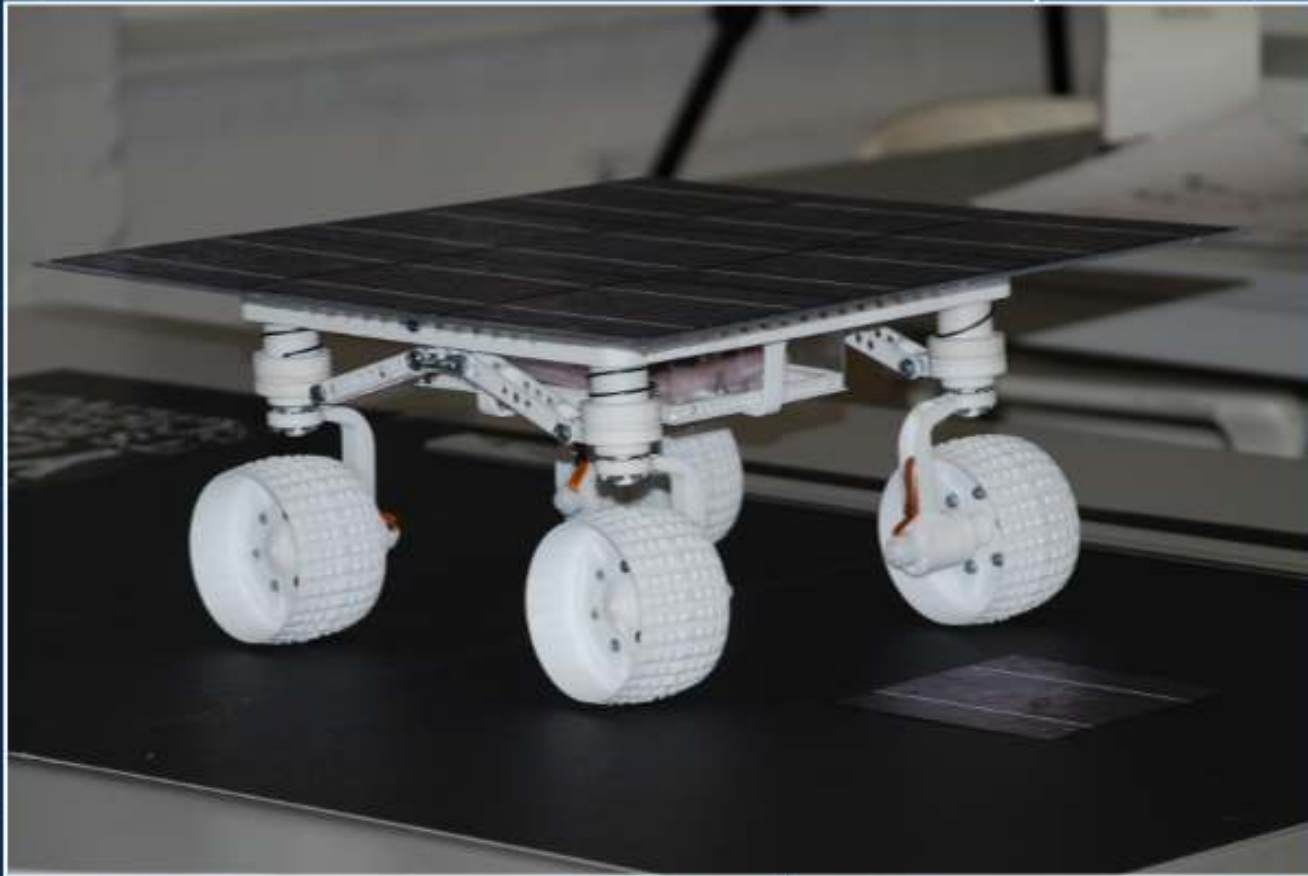




- wheels



- wheels
- frame



- wheels
- frame
- solar panel



- wheels
- frame
- solar panel
- optics



2010

new materials

new design

check out our new hp, twitter, blog and ...
visit us at our booth after the talk !

Main- Computing- Unit

Requirements

Realtime HD video

Flexible design (IP Cores)

Fully HiRel certified

Goals

Lifetime

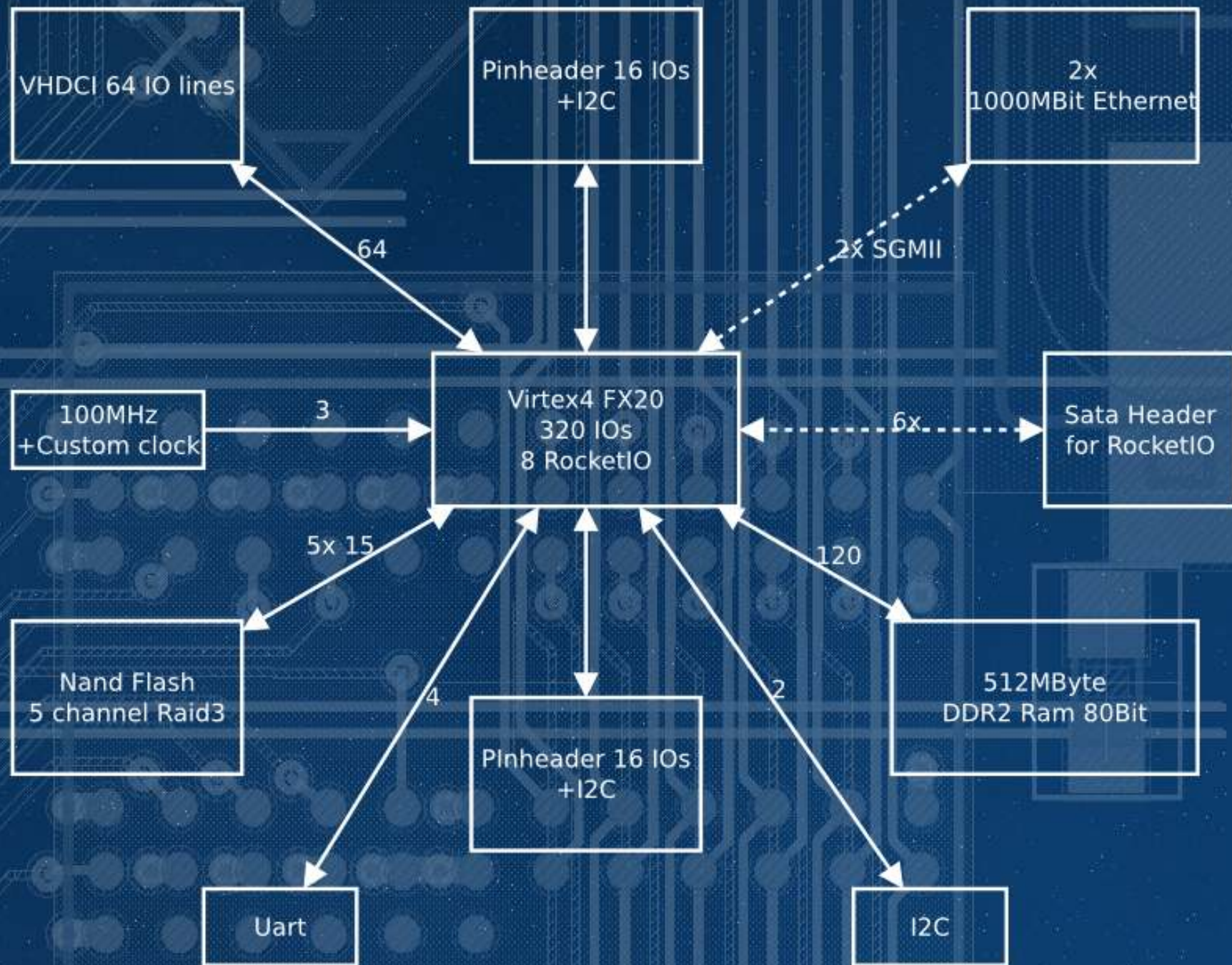
KISS

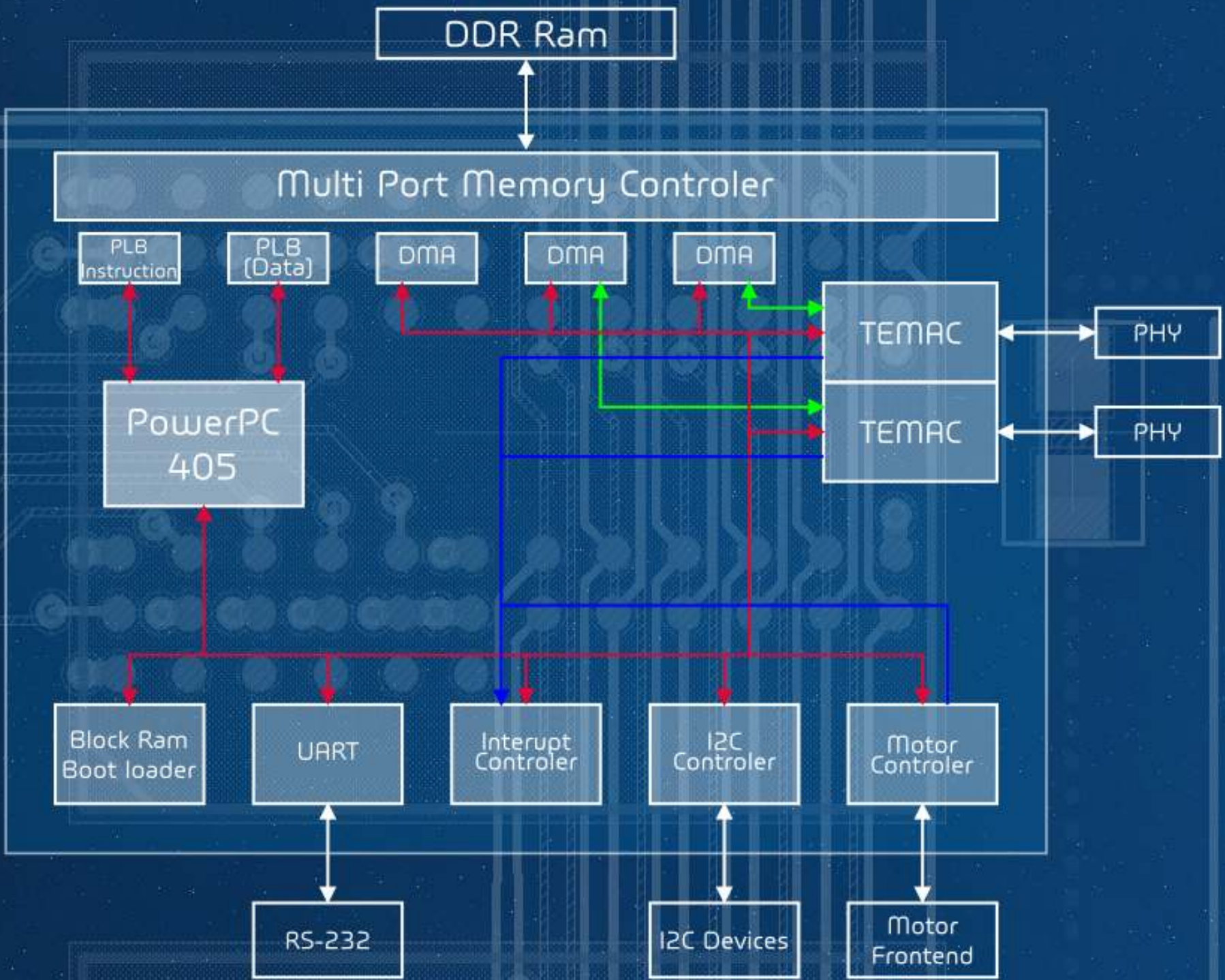
What is HiRel?

Temperature differences of -55° to $+125^{\circ}$
"single event effects"

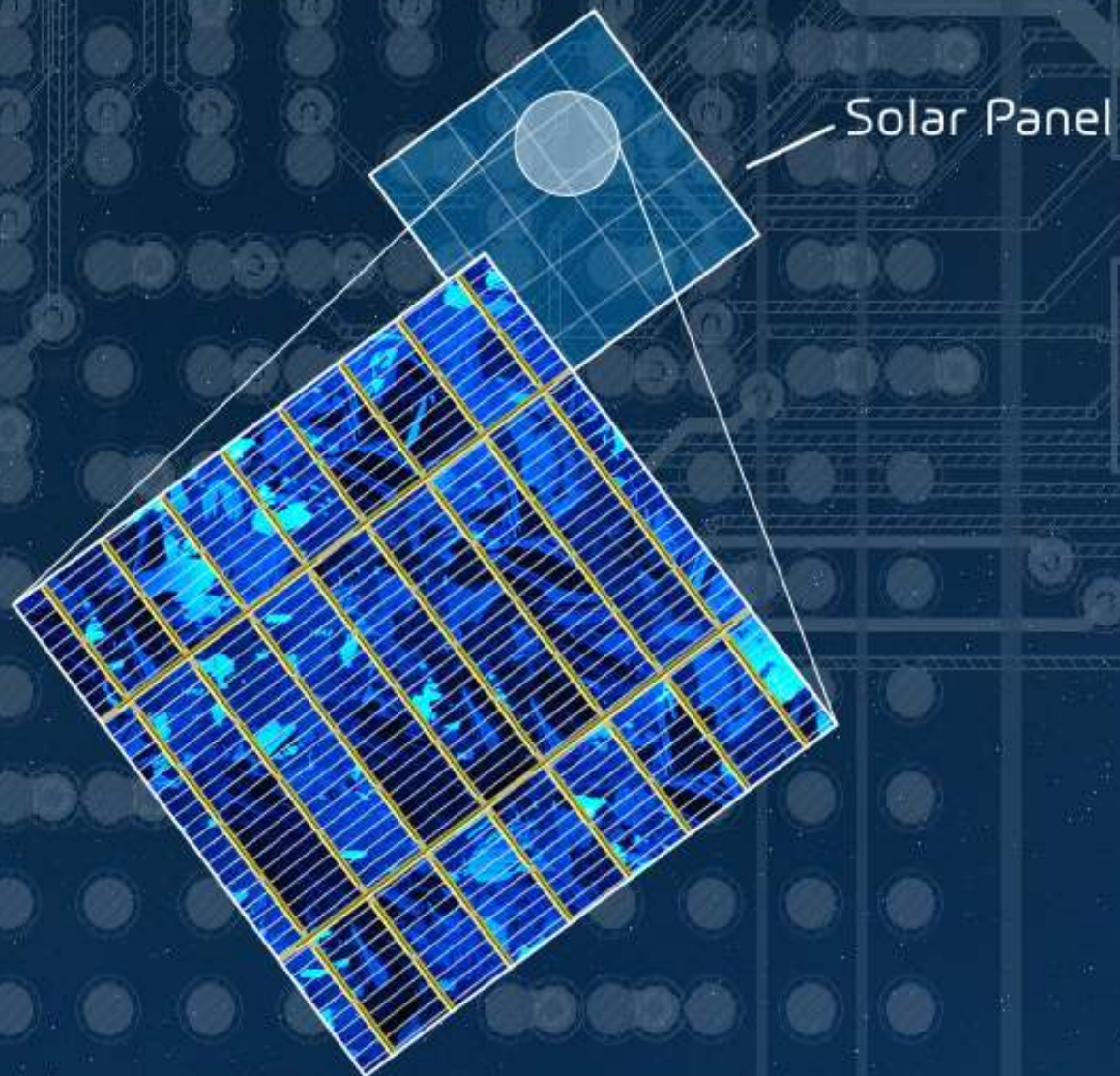


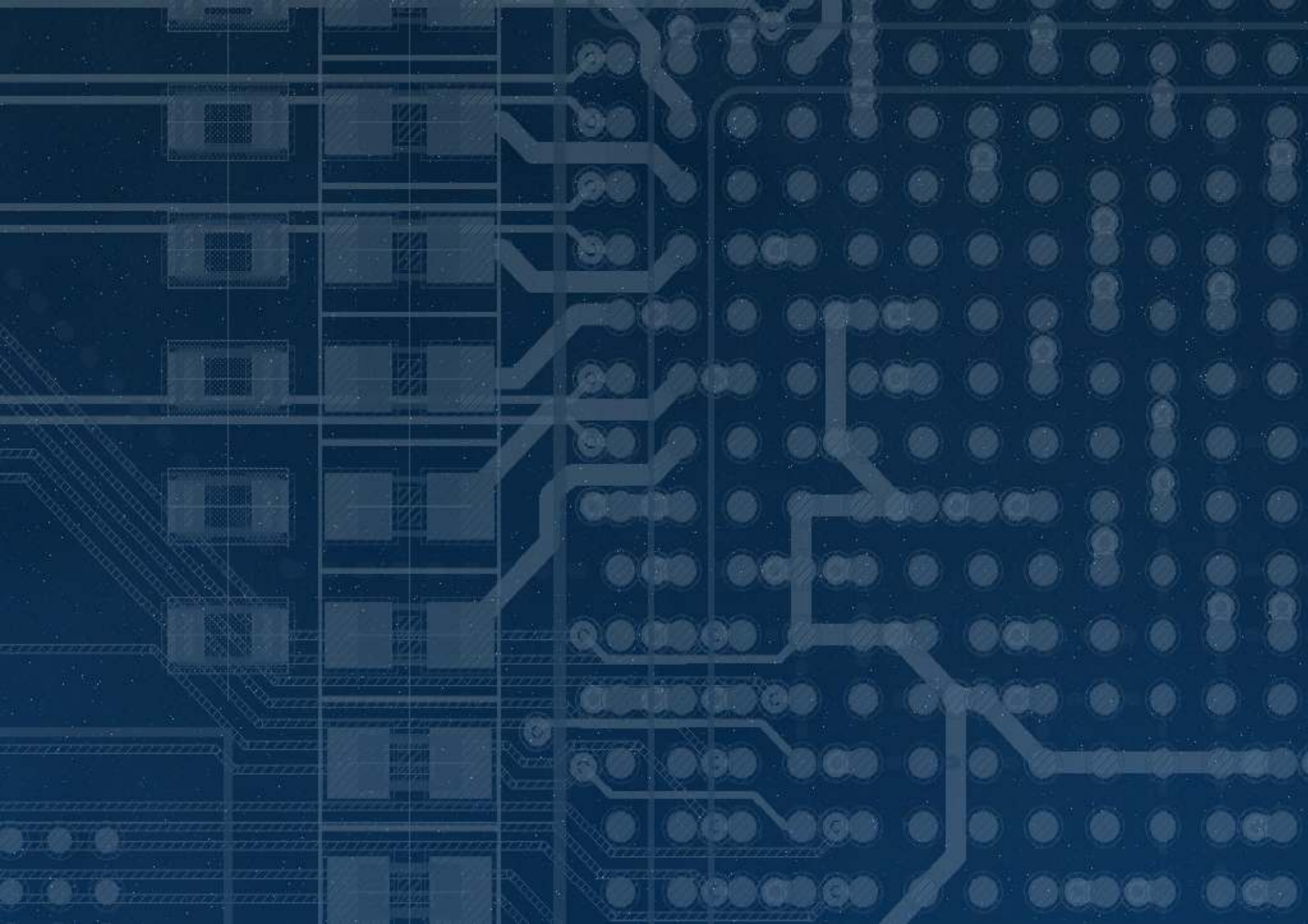
"total ionizing dose"

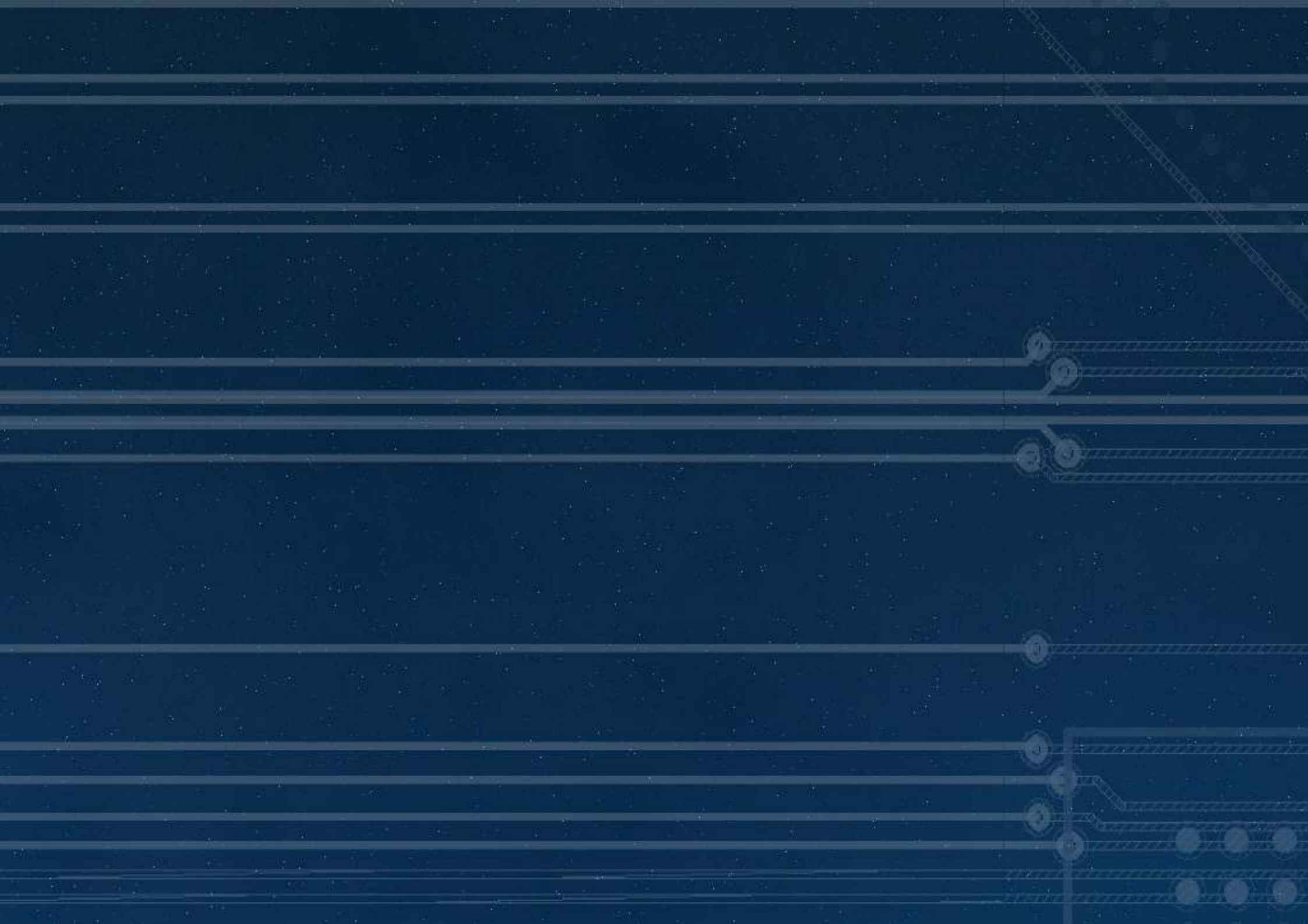




slot phased array solar antenna







Special Guest appearance

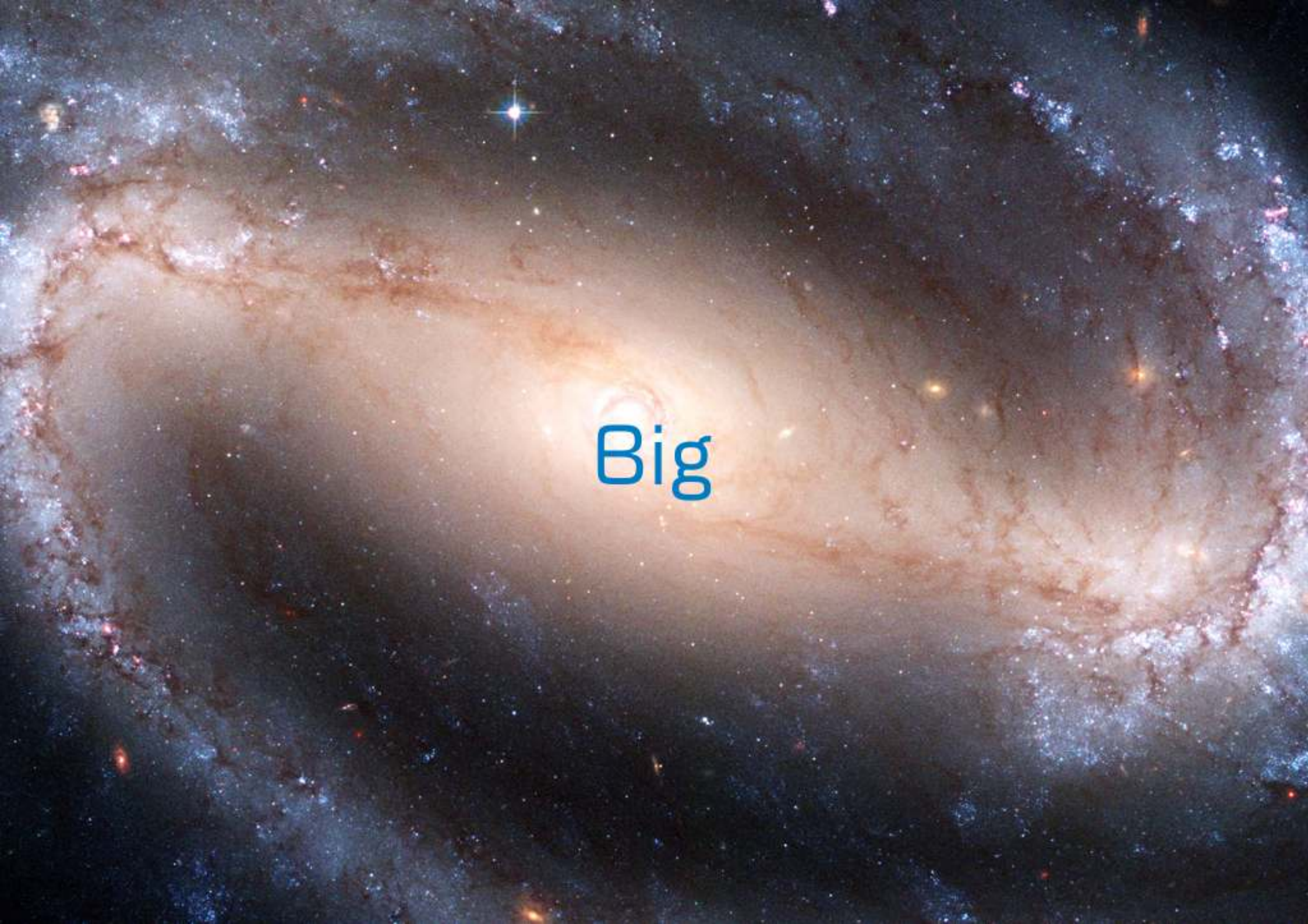
48



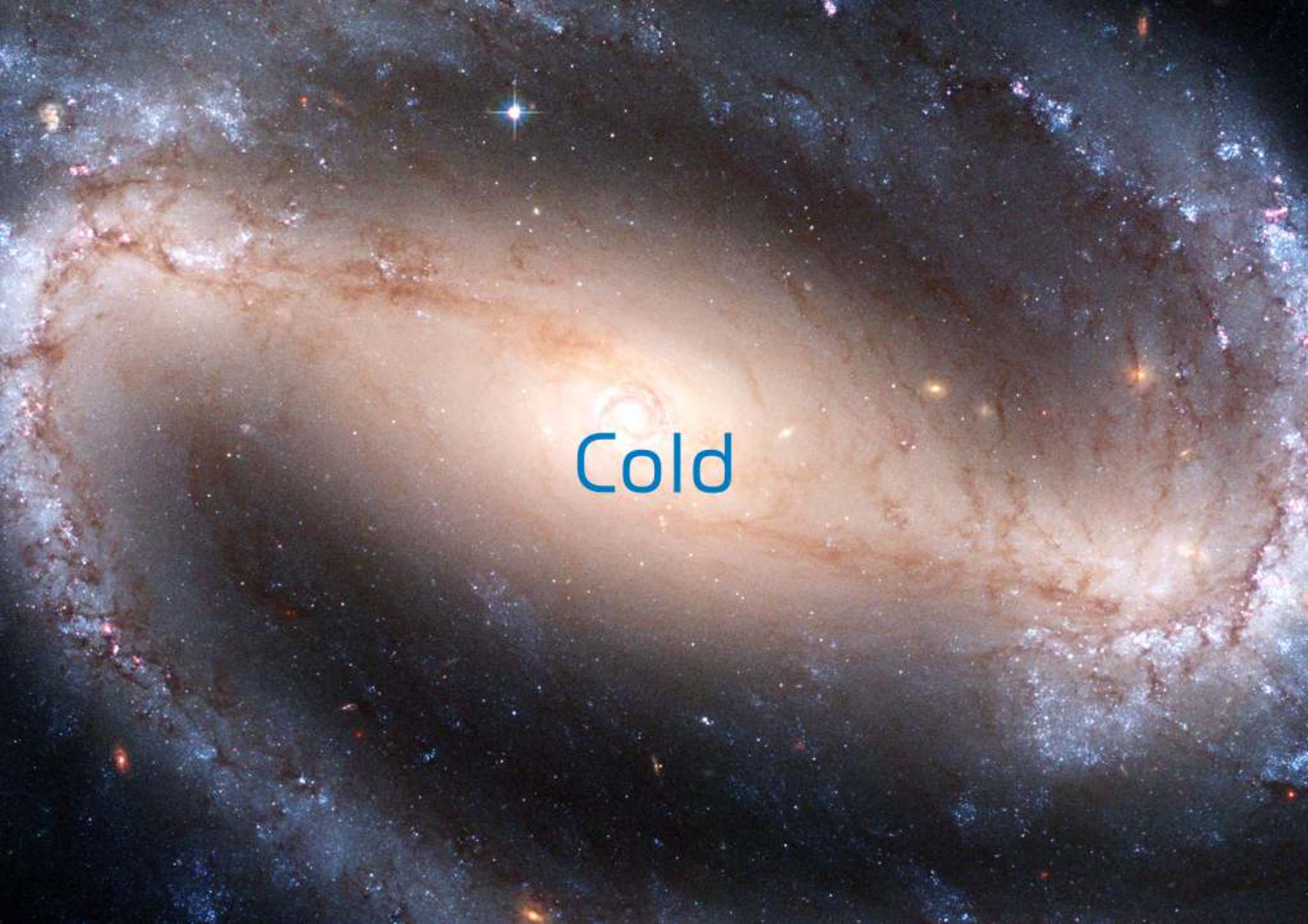
And Now For Something
Completely Different

The Problem

Space



Big



Cold



And ...

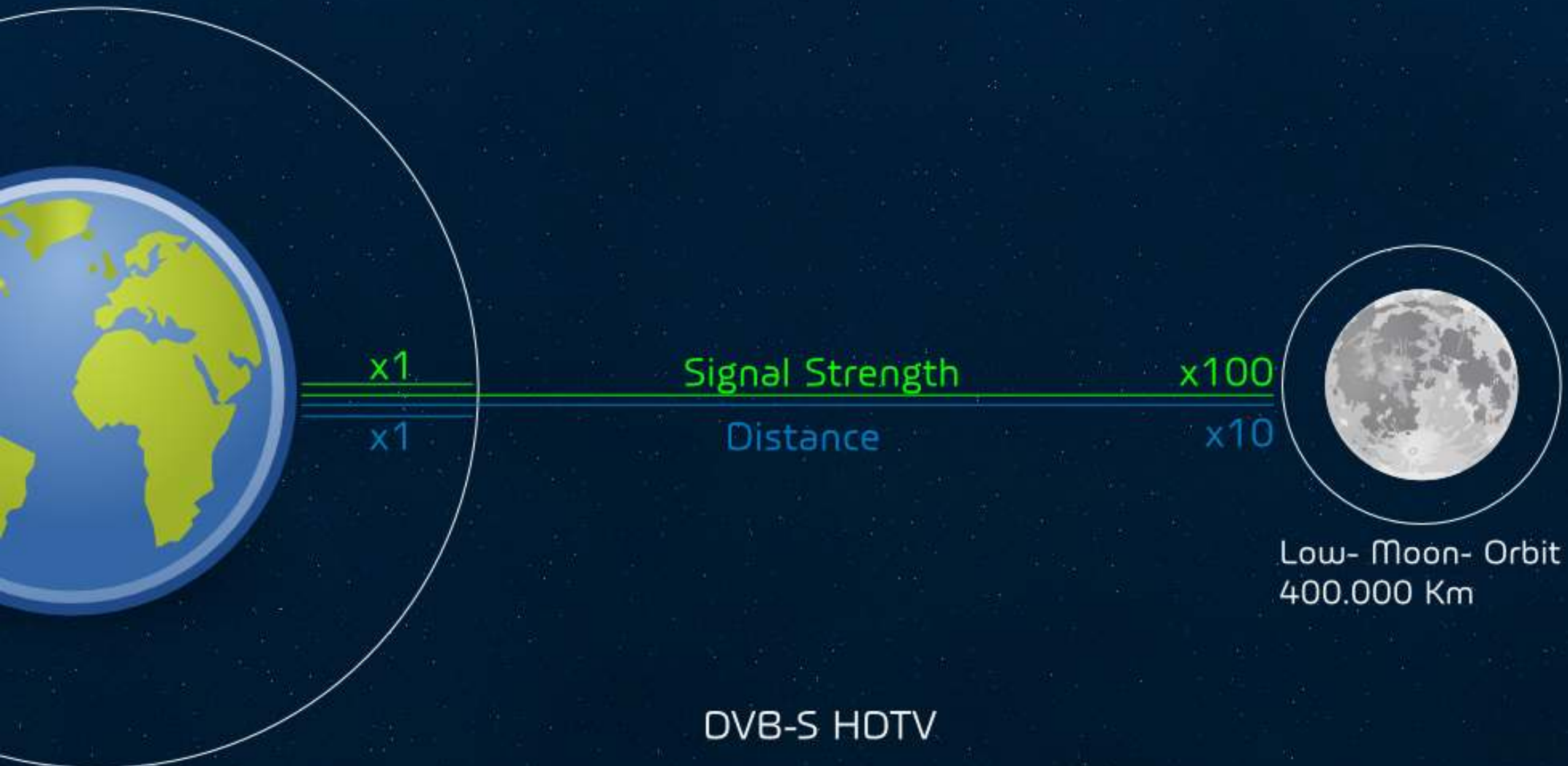
Empty



Distance

$\frac{1}{R^2} = \text{Signal Strength by Distance}$

Distance



Geostationary- Orbit
36.000 Km

Low- Moon- Orbit
400.000 Km

DVB-S HOTV

Distance

Greater distance leads to ...

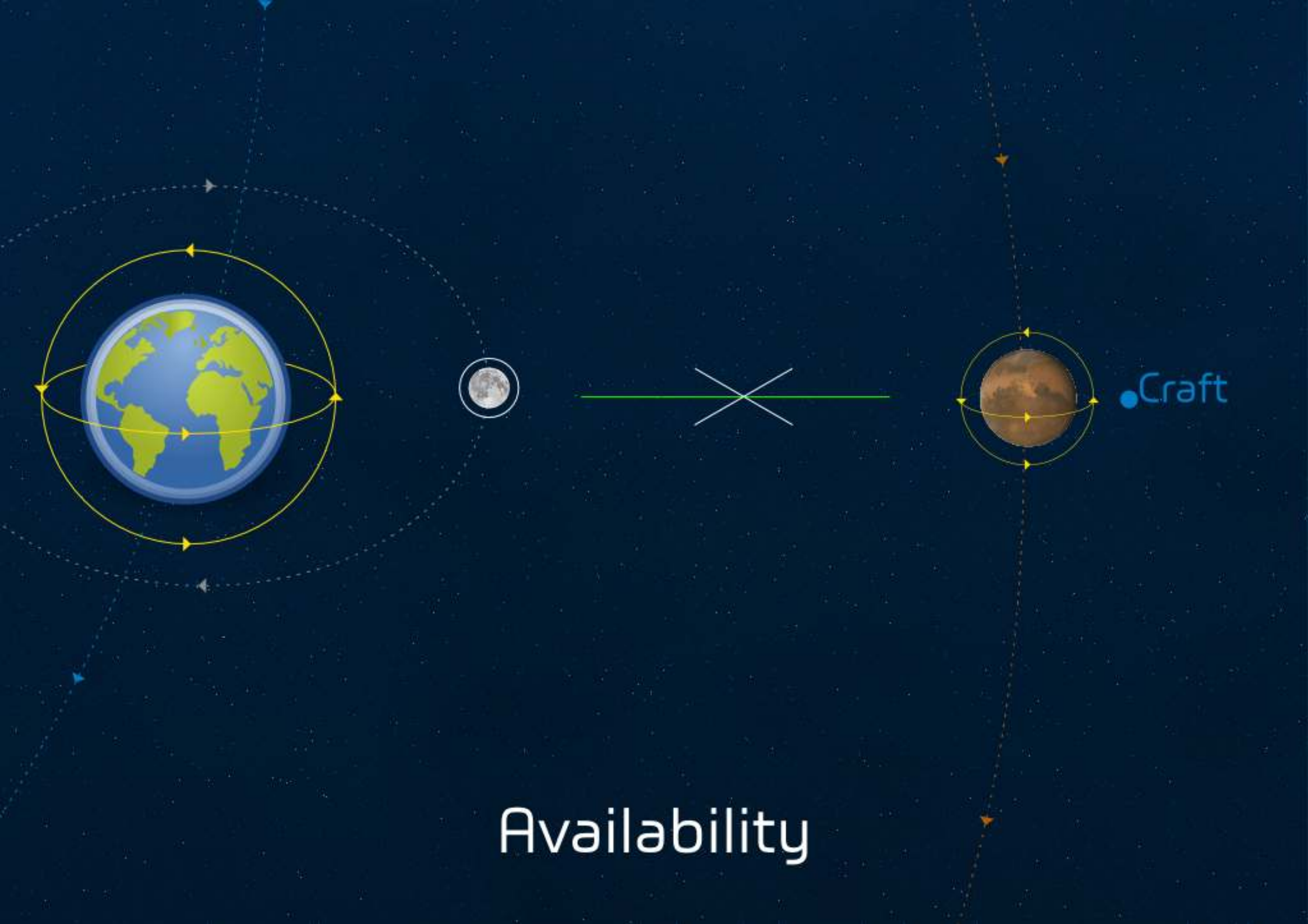
- larger send/recv antennas
- larger energy requirements
- smaller bandwidth

Distance

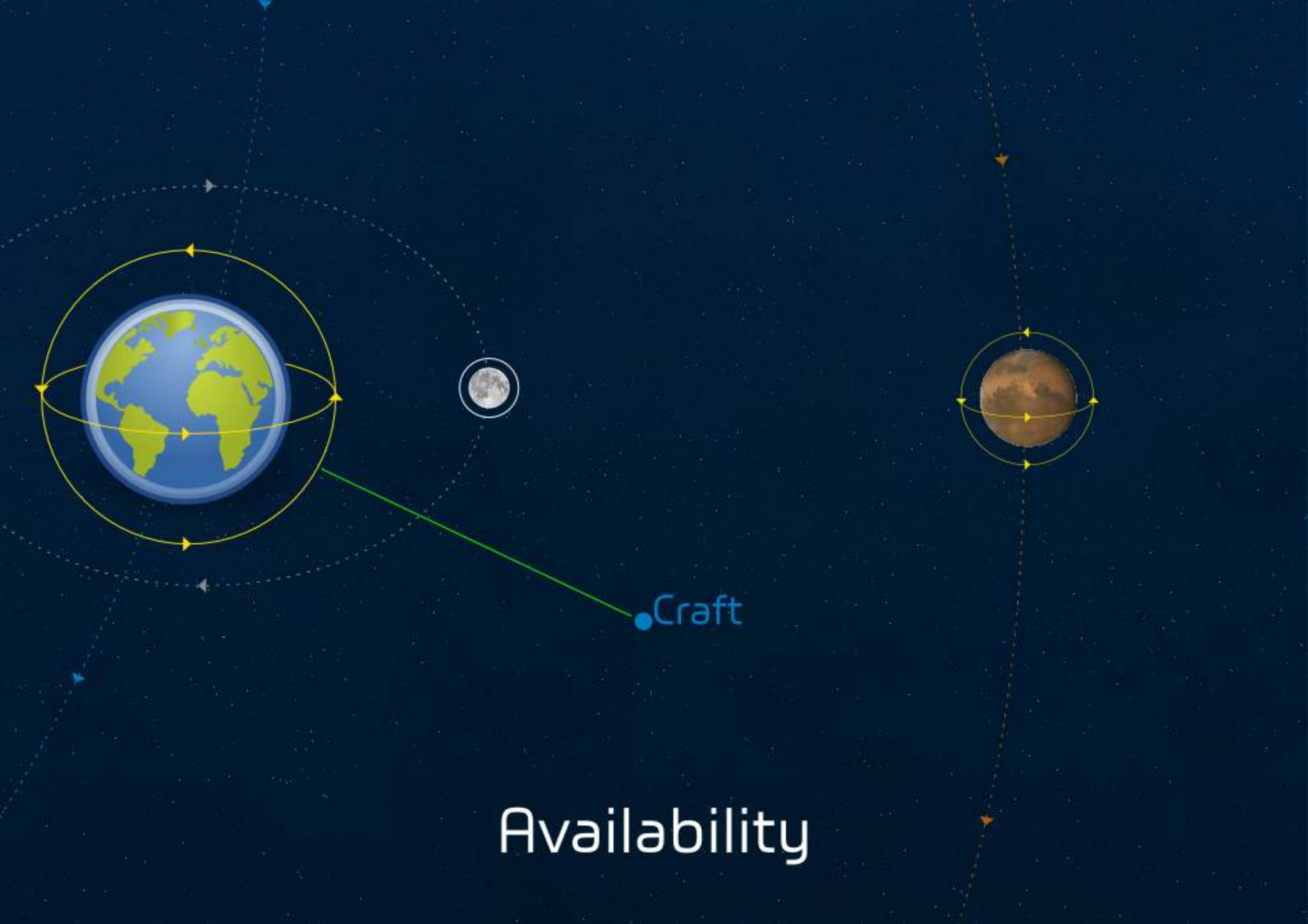
Distance

Availability

The Problem



Availability



Craft

Availability

VIEWPORT - MOON

CUBE SAT



Our Solution

Components



Dish

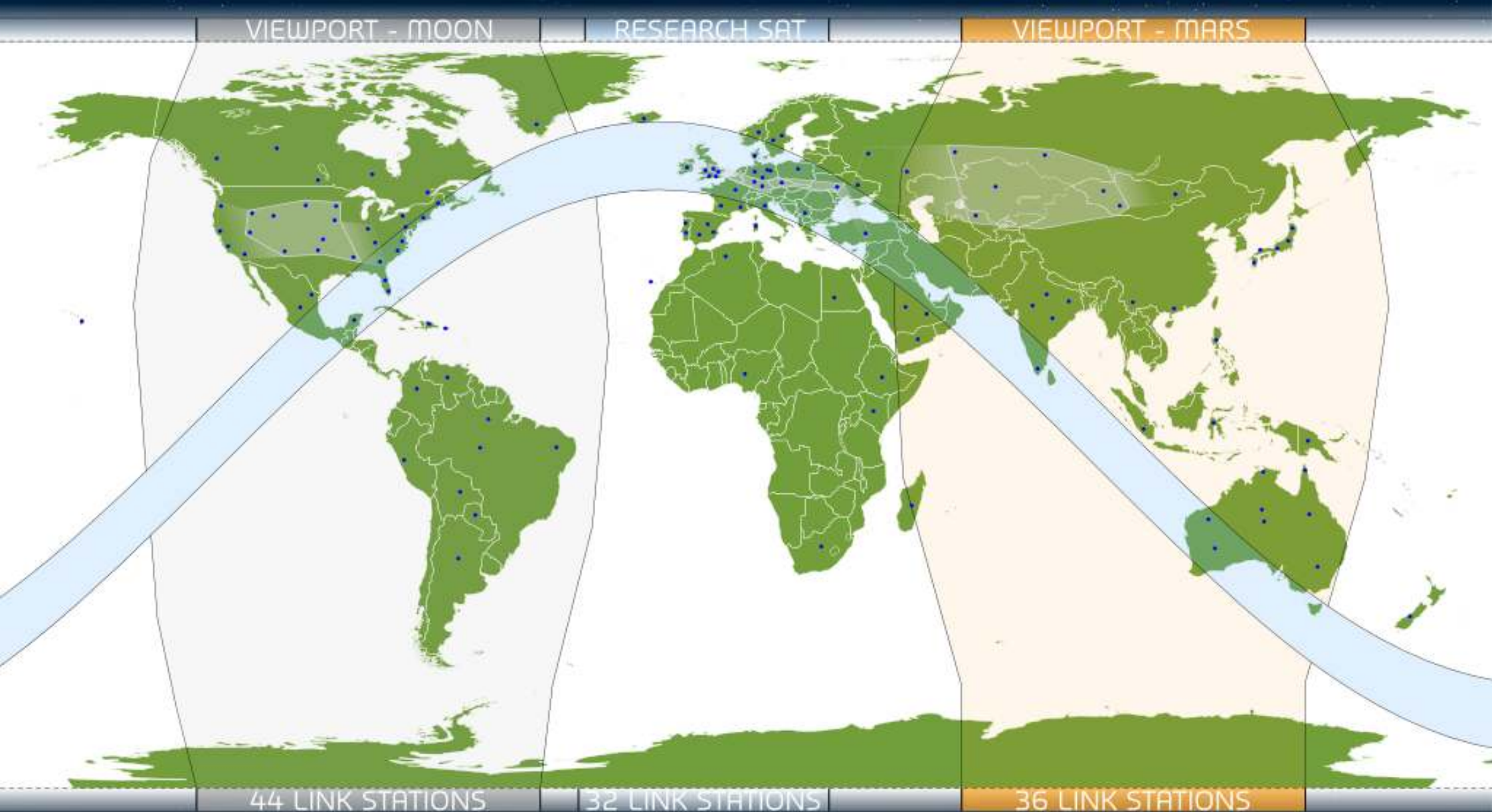
- amateur radio compliant
- minimal modifications needed
- standard dish size



FPGA

- GNU Linux based host system
- IP Core based stream modulation
- Frequency Shifting

Components



LEGEND

• - LINK-STATION

HOT STANDBY
PRE- ALLOC

LINK POOL

MARS MISSION
GLXP- MISSION
RESEARCH SATELITE UPLINK

Earth ↔ GEO

◆ +50 Mbps

..... 36.000 km

🕒 24 / 7

Earth ↔ Moon

◆ 50 Mbps

..... 400.000 km

🕒 24 / 7

Earth ↔ Mooncast

◆ 50Mbps | 500 Kbp/s

..... 400.000 km

🕒 24 / 7

Earth ↔ Mars

◆ 5 Mbps

..... 130.000.000 km

🕒 24 / 7