

# TIMING CONSTRAINTS FOR MARS MISSIONS: EXAMPLE OF COMMUNICATIONS COMMANDS FOR EXOMARS CLUPI INSTRUMENT

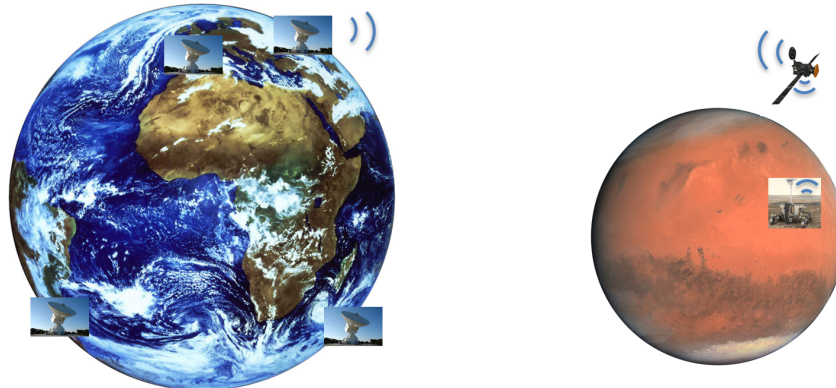
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**The ESA ExoMars 2020 Rover contains numerous instruments CLUPI being one that generates large amounts of data, the communication is aggregated and relayed to earth – the challenges are multiple**

*Key words: CLUPI, ExoMars 2020, CLUPI communication commands, CLUPI mission operations planning*

## 1. ExoMars mission communication with Earth

The ExoMars 2020 rover shall have a telecommunications link with the earth for receiving the daily telecommand plans and for transferring the maintenance and scientific telemetry from Mars down to Earth. The link would nominally use the Mars Trace Gas Orbiter (TGO), although the use of other orbiters is possible. From the orbiter the signal is then directly transmitted to Earth based antennas. The pace of communication and its organisation is influenced by many parameters and in this presentation an overview is given on these parameters and on the foreseen mission communication planning.



## 2. CLUPI Instrument communication with the Rover

The CLUPI instrument has a communication interface to the Rover. The Rover software unpacks telecommands and operates CLUPI according to the daily plan for each day of the mission. Similarly, all CLUPI telemetry is aggregated with other data on the Rover, compressed, and send back to Earth. CLUPI operations have a defined time and power consumption profiles as well as predefined windows of execution in function of the available bandwidth, ambient temperature, ambient light, and available power.

## References

- ESA ExoMars Trace Gas Orbiter (TGO) <http://exploration.esa.int/mars/46475-trace-gas-orbiter/>  
ESA ExoMars Mission overview <http://exploration.esa.int/mars/48088-mission-overview/>  
Space-X Exo Mars Mission overview <http://www.space-x.ch/missions/exomars/>  
Space-X CLUPI instrument overview <http://www.space-x.ch/missions/exomars-clupi/>

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