

MARS- plus EUROPA-INPPS Flagship Missions with High Power Electric Thrusters and Heavy Science Payload

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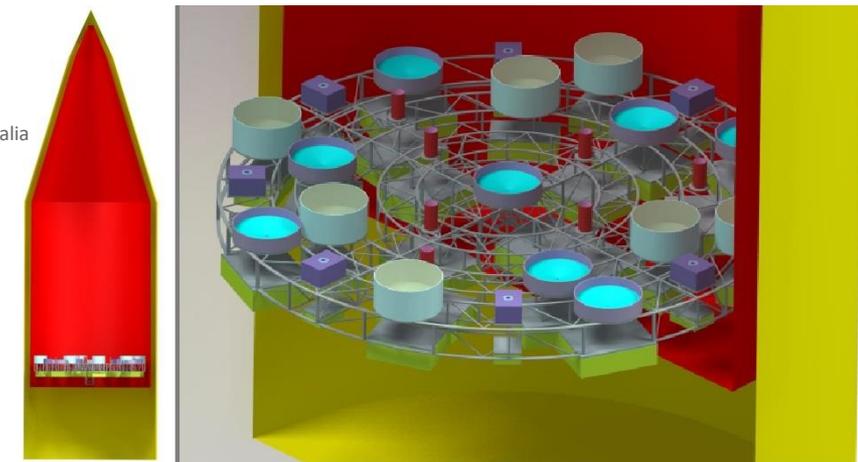
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 → HiPARC  → SX3  → IT-500  → NEO¹⁰

Russian & German CET of MARS-/EUROPA INPPS flagship in Proton rocket fairing.
 How we received the results?

Knowledge for Tomorrow

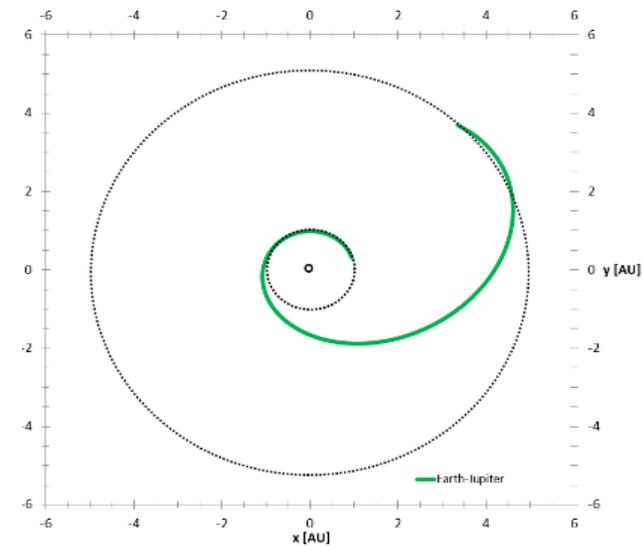
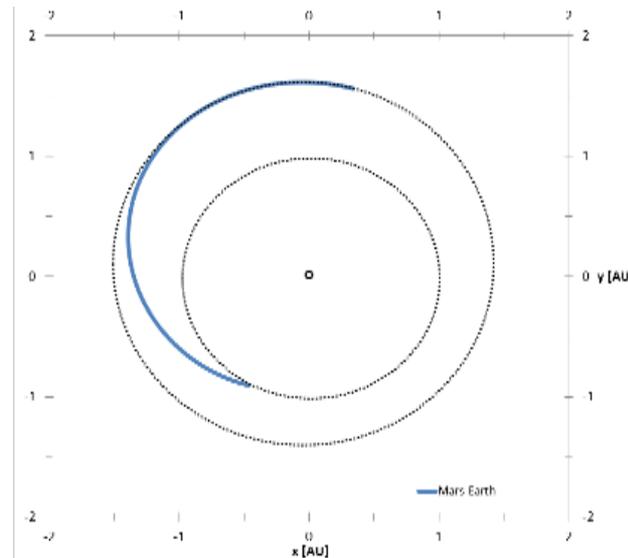
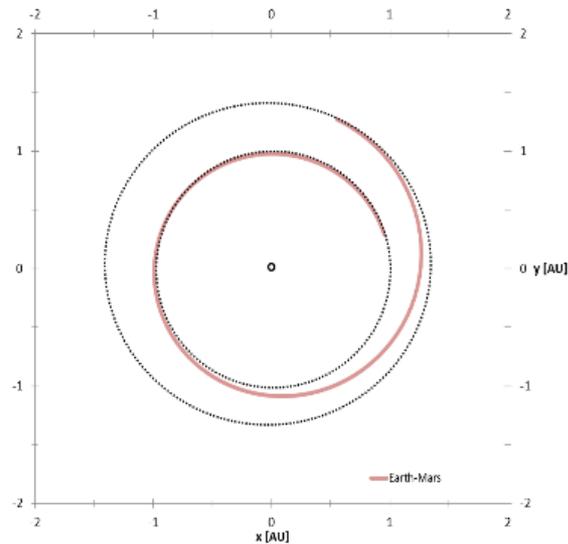


MARS- plus EUROPA-INPPS Flagship Missions with High Power Electric Thrusters and Heavy Science Payload

2020/2021 orbit calculations (DLR Bremen + MAI Moscow):

3 Orbits for one non-human MARS/EUROPA-INPPS flagship

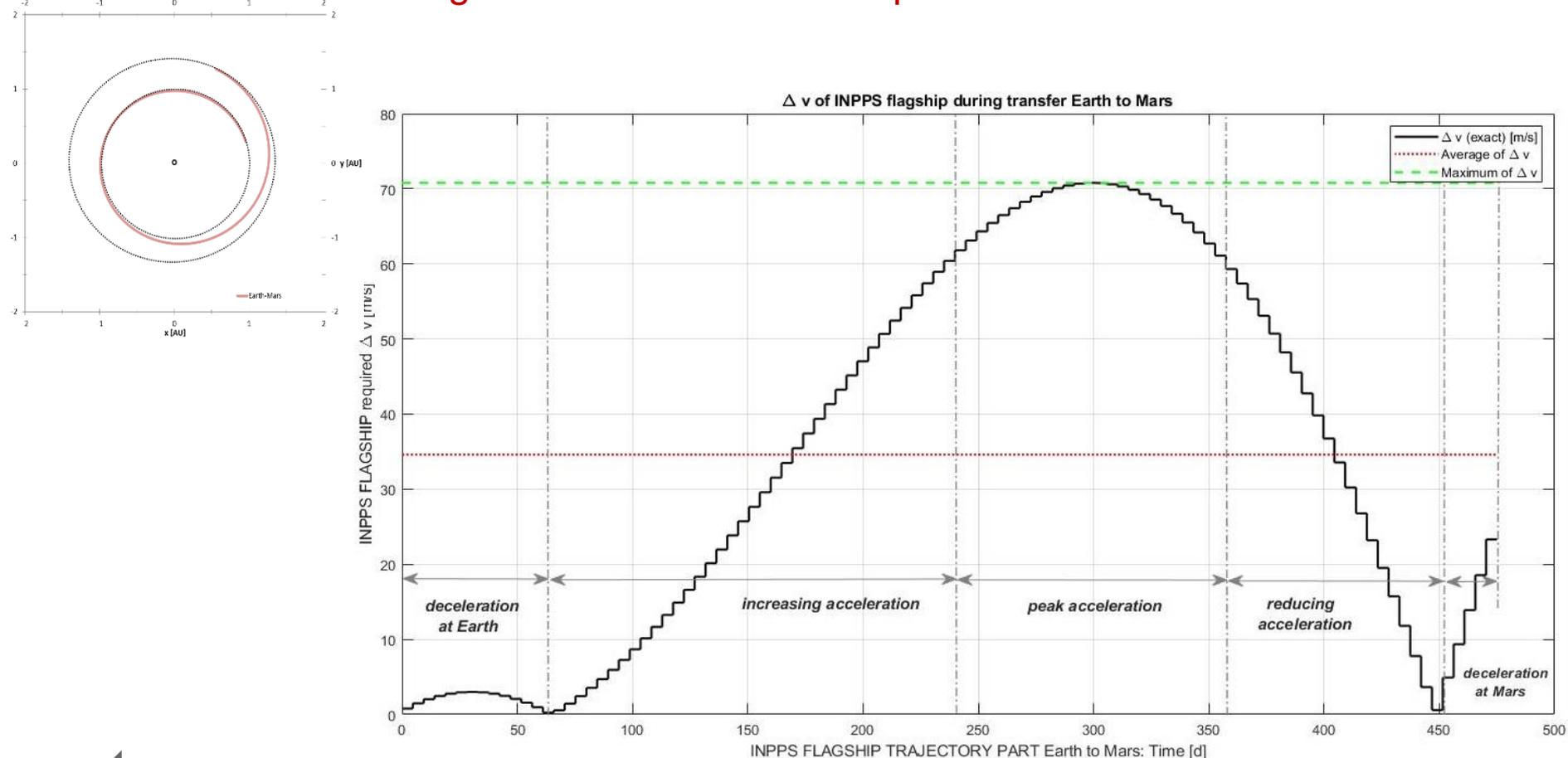
1. Orbit – Earth (11 Oct 2026) => Mars (28 Jan 2028);
2. Orbit – Mars (22 Sept 2028) => Earth (29 Jul 2029);
3. Orbit – Earth (12 Oct 2031) => Jupiter / Europa (6 Dec 2035)



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2020/2021 orbit calculations (DLR Bremen + MAI Moscow): example

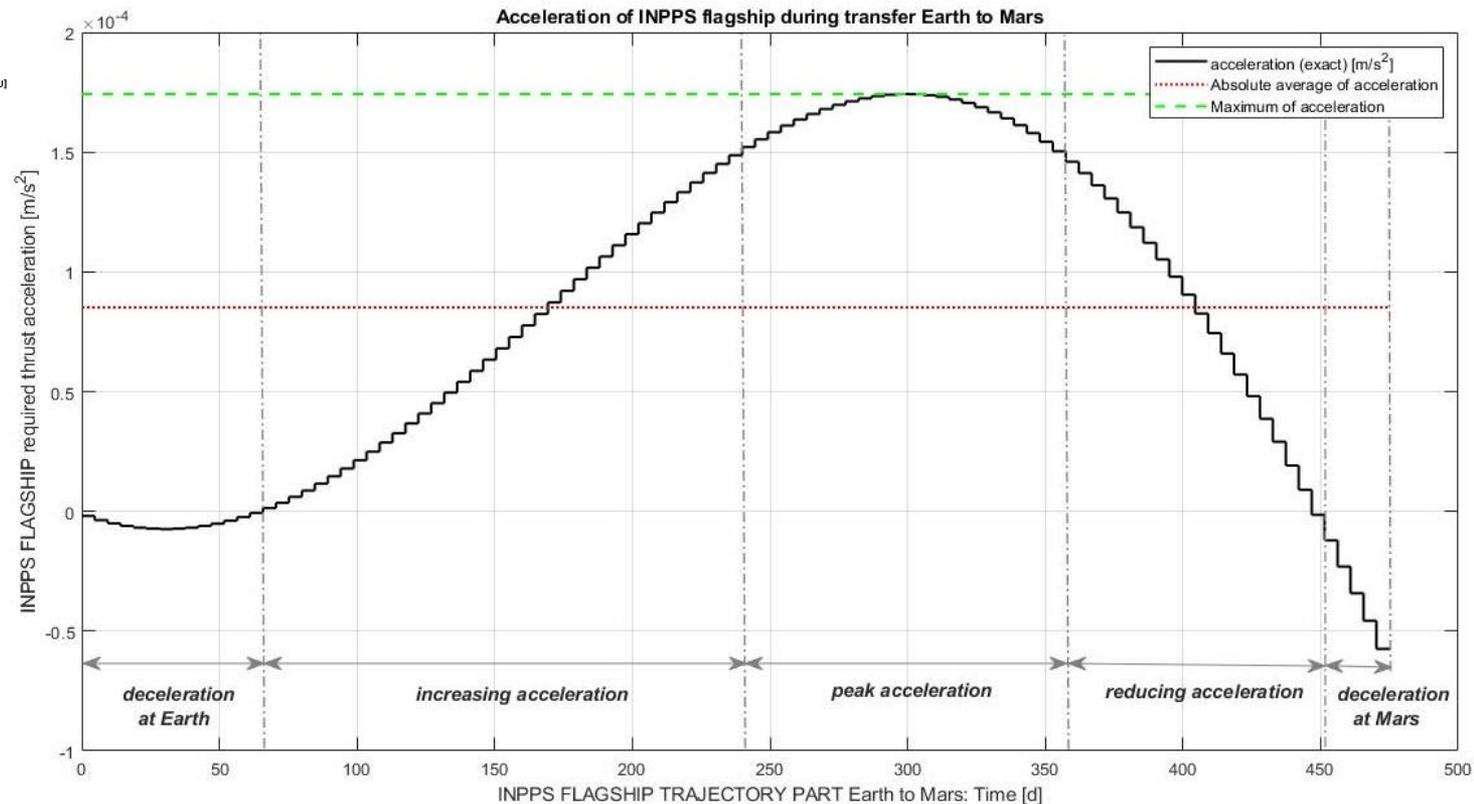
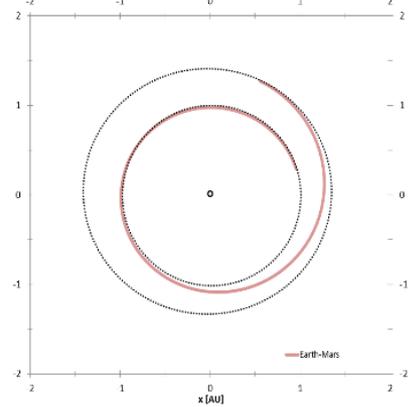
1. Orbit – Earth=>Mars figure for delta v and orbit phases.



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2020/2021 orbit calculations (DLR Bremen + MAI Moscow): example

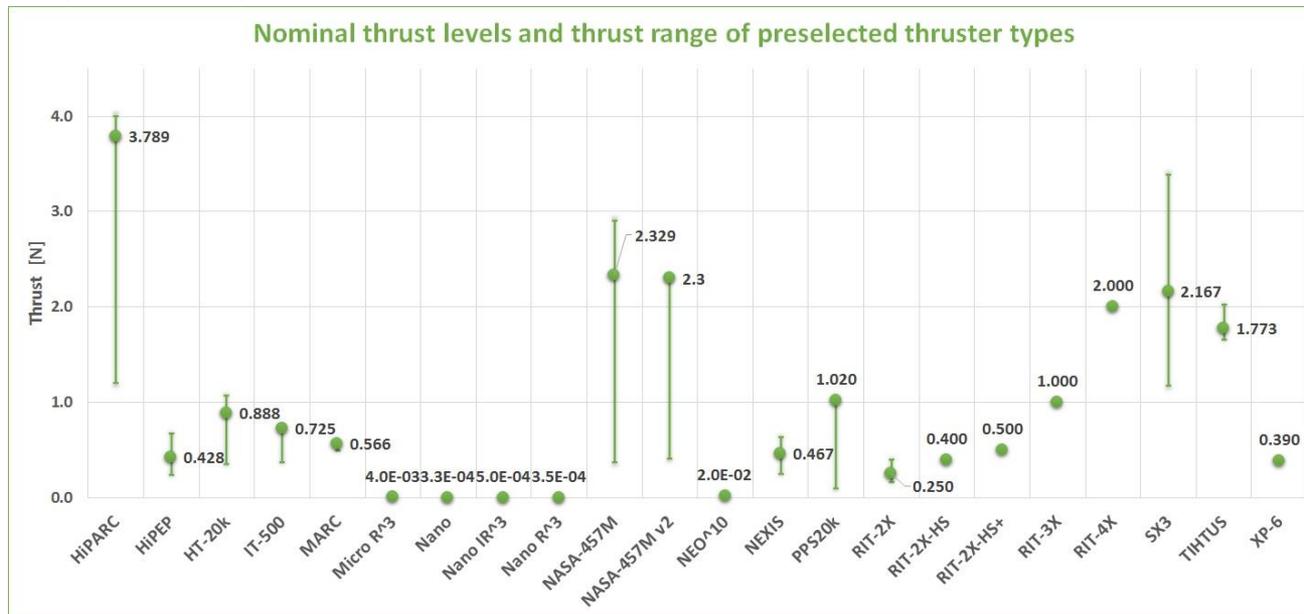
1. Orbit – Earth=>Mars figure for acceleration and orbit phases.



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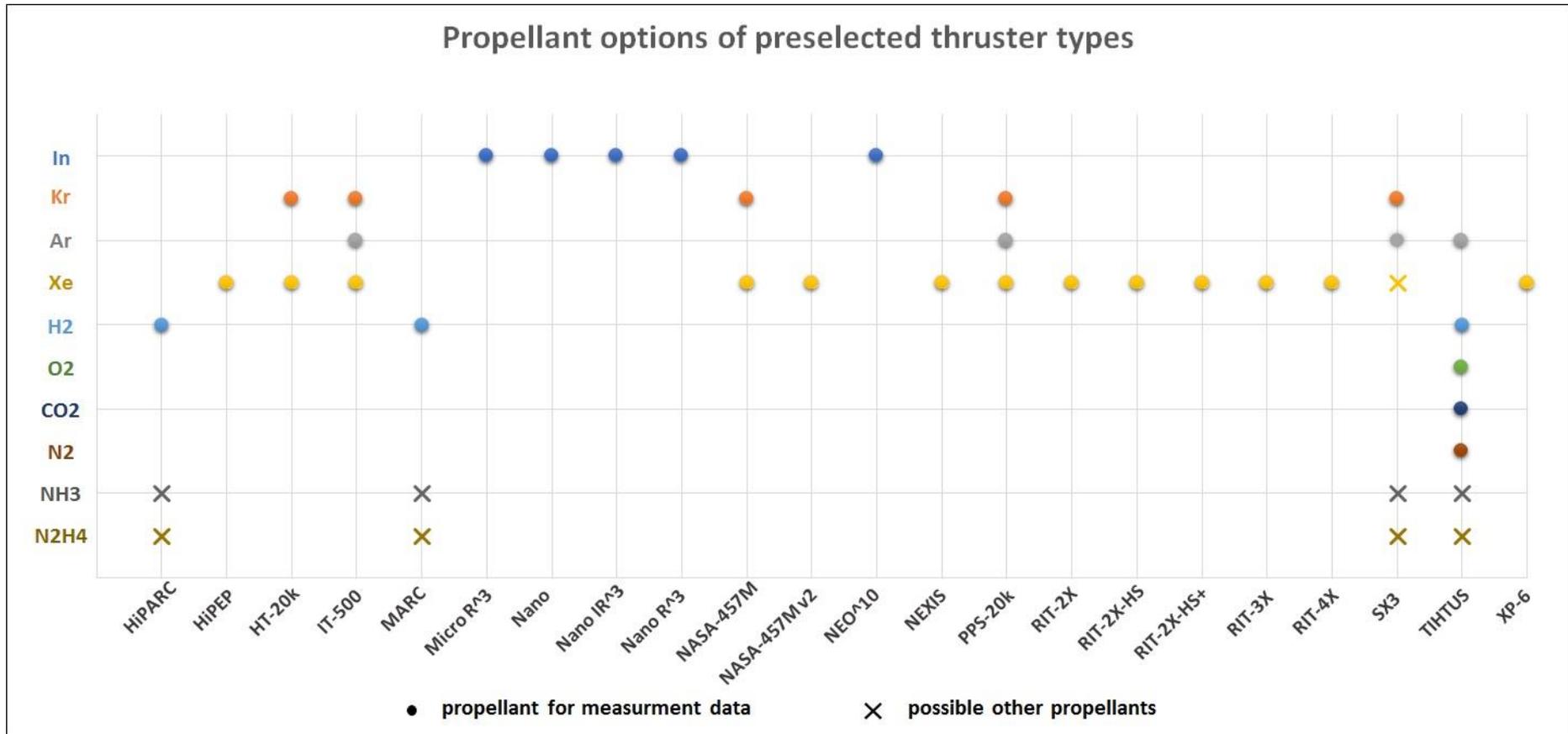
22 ET's (for the MARS/EUROPA-INPPS flagship CET): example below thrust

- 1) Russian - IT-500,
- 2) German - HiPARC, MARC, SX3, THITUS and RIT-2X, RIT-2X-HS, -2X-HS+, 3X, 4X,
- 3) Austrian – Nano, Nano R³, Nano IR³, Micro R³, NEO,
- 4) French – PPS-20k,
- 5) Italian – HT-20k,
- 6) Japanese – XP-6,
- 7) US – HiPEP, NEXIS, 457M and 457Mv2.



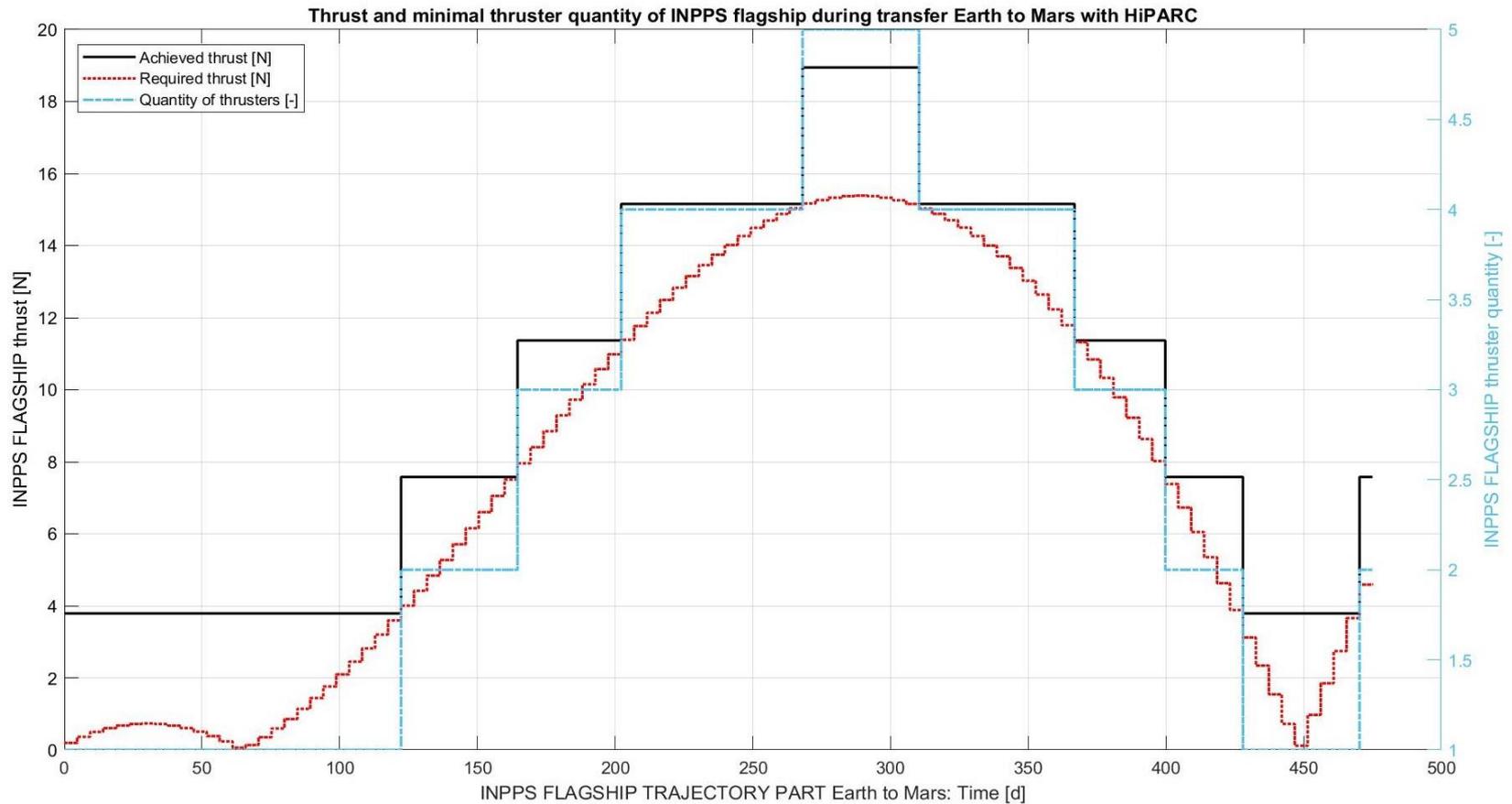
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22 ET's (for the MARS/EUROPA-INPPS flagship CET): example below propellant options



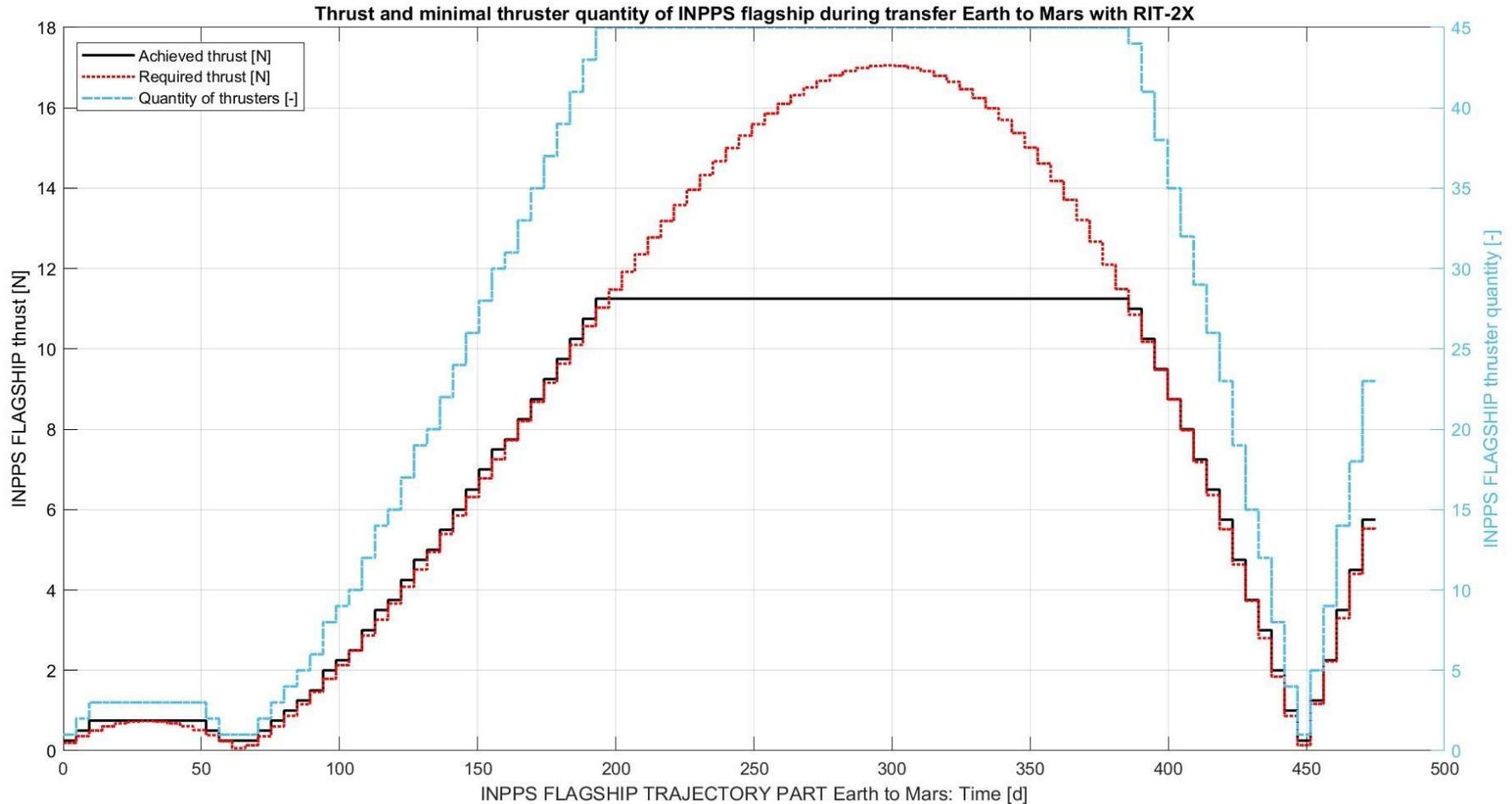
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22 ET's (for the INPPS flagship CET): example German – University of Stuttgart HiPARC



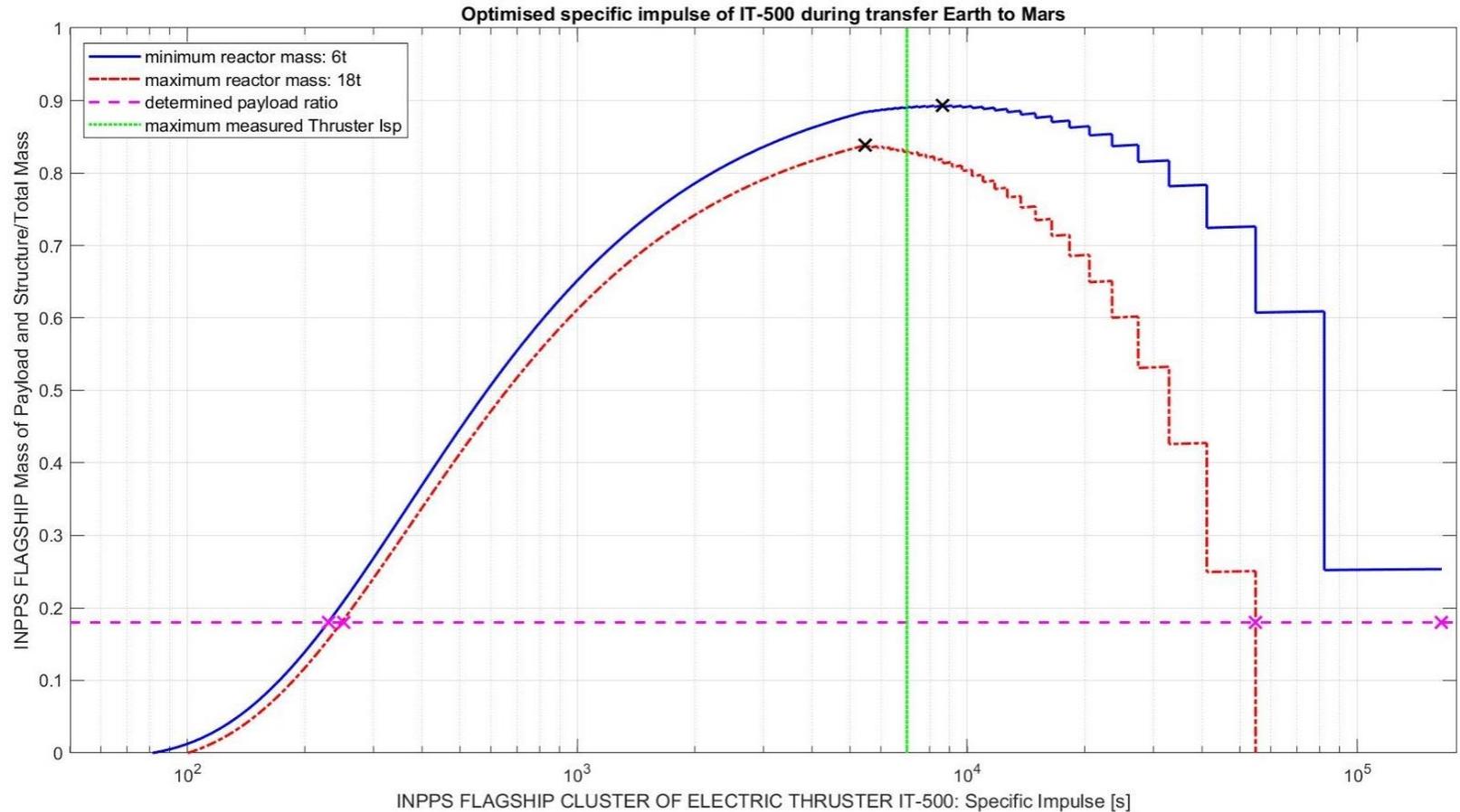
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22 ET's (for the INPPS flagship CET): example German – Airbus RIT-2X



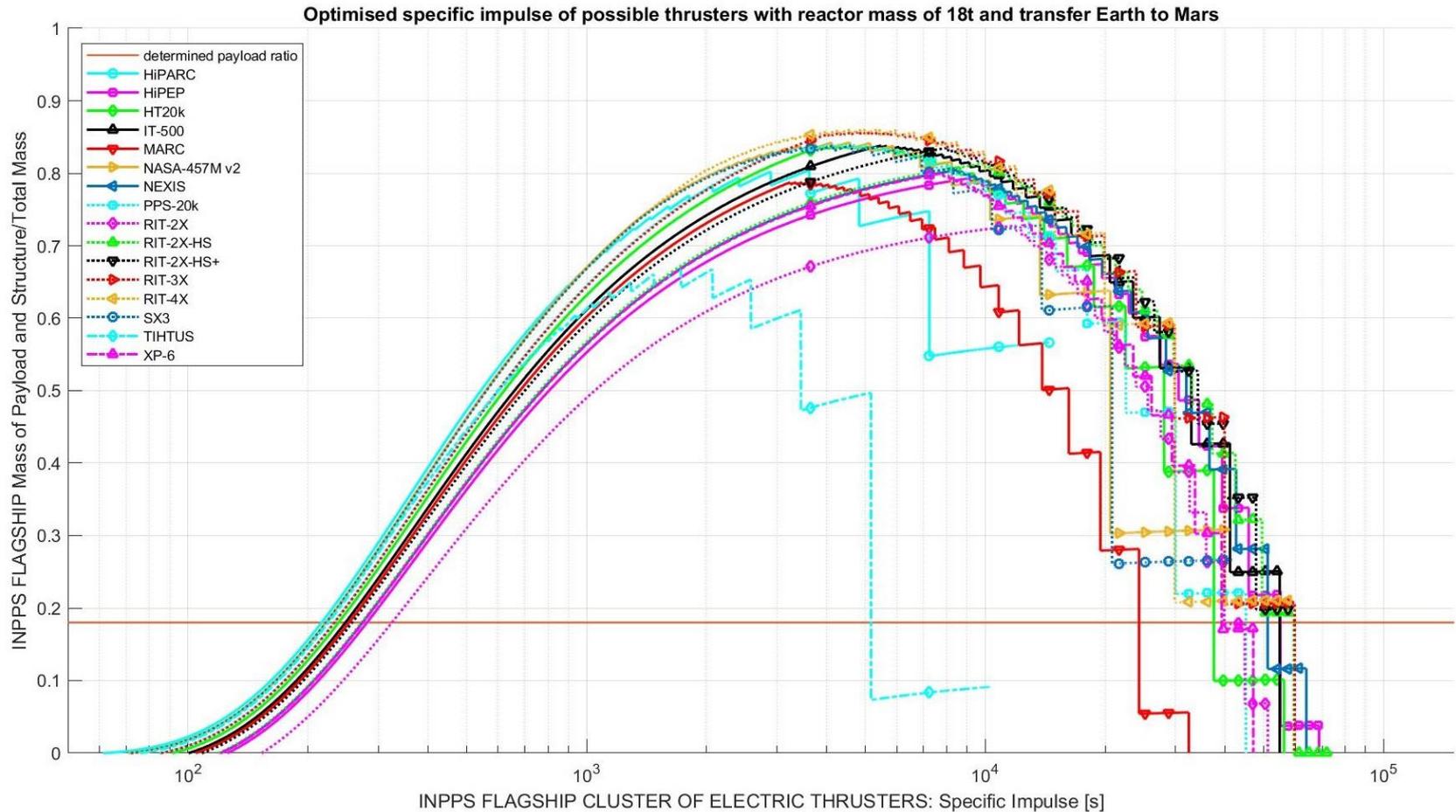
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22 ET's (for the INPPS flagship CET): example Russian – KeRC IT-500



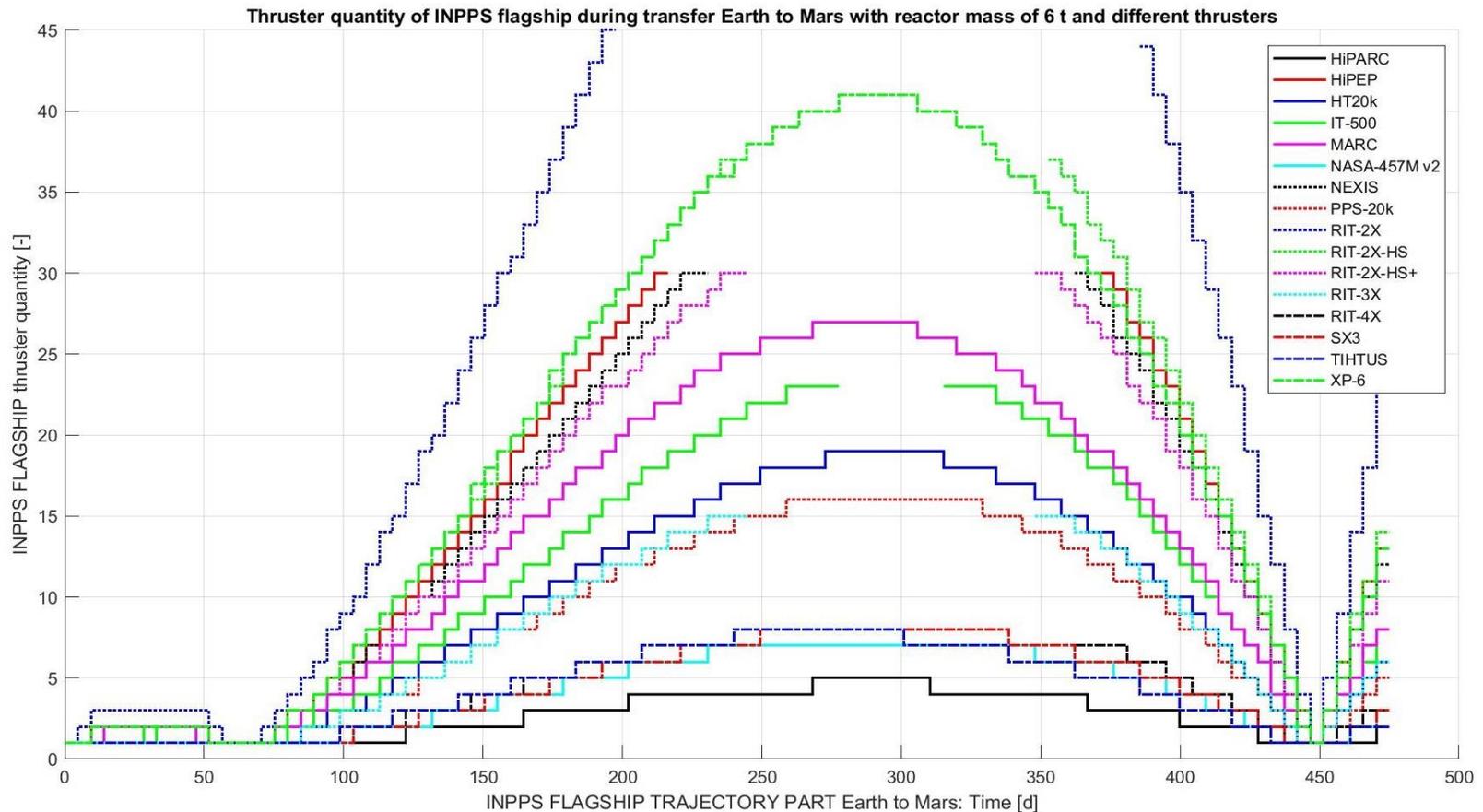
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All considered ET's for Earth => Mars orbit and Isp / 18t reactor mass example.



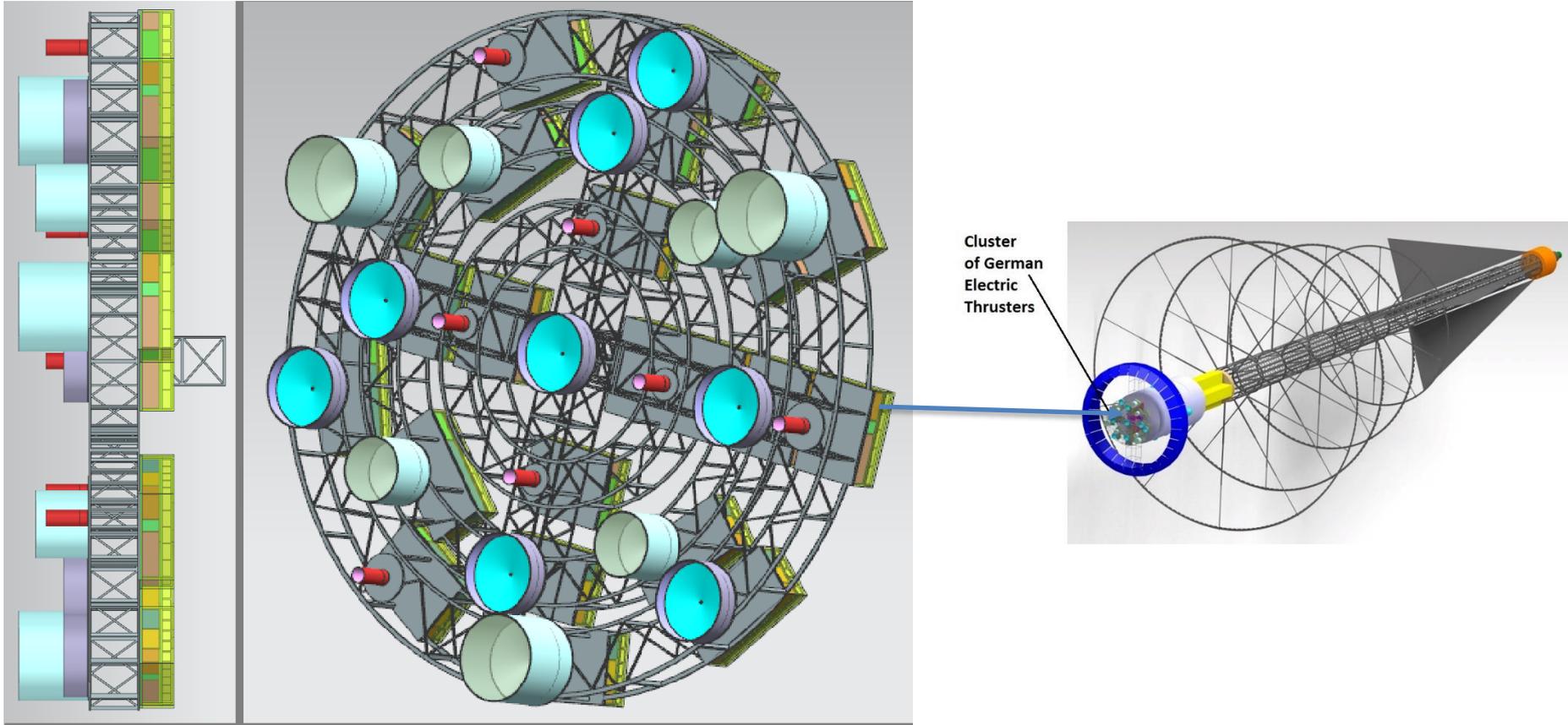
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All considered ET's for Earth => Mars orbit and number of needed ET's in a flagship CET (example 6 t reactor mass example)



MARS- plus EUROPA-INPPS Flagship Missions with High Power Electric Thrusters and Heavy Science Payload

22 ET's (for the INPPS flagship CET): example - gridded CET plate with combined GERMAN ET's

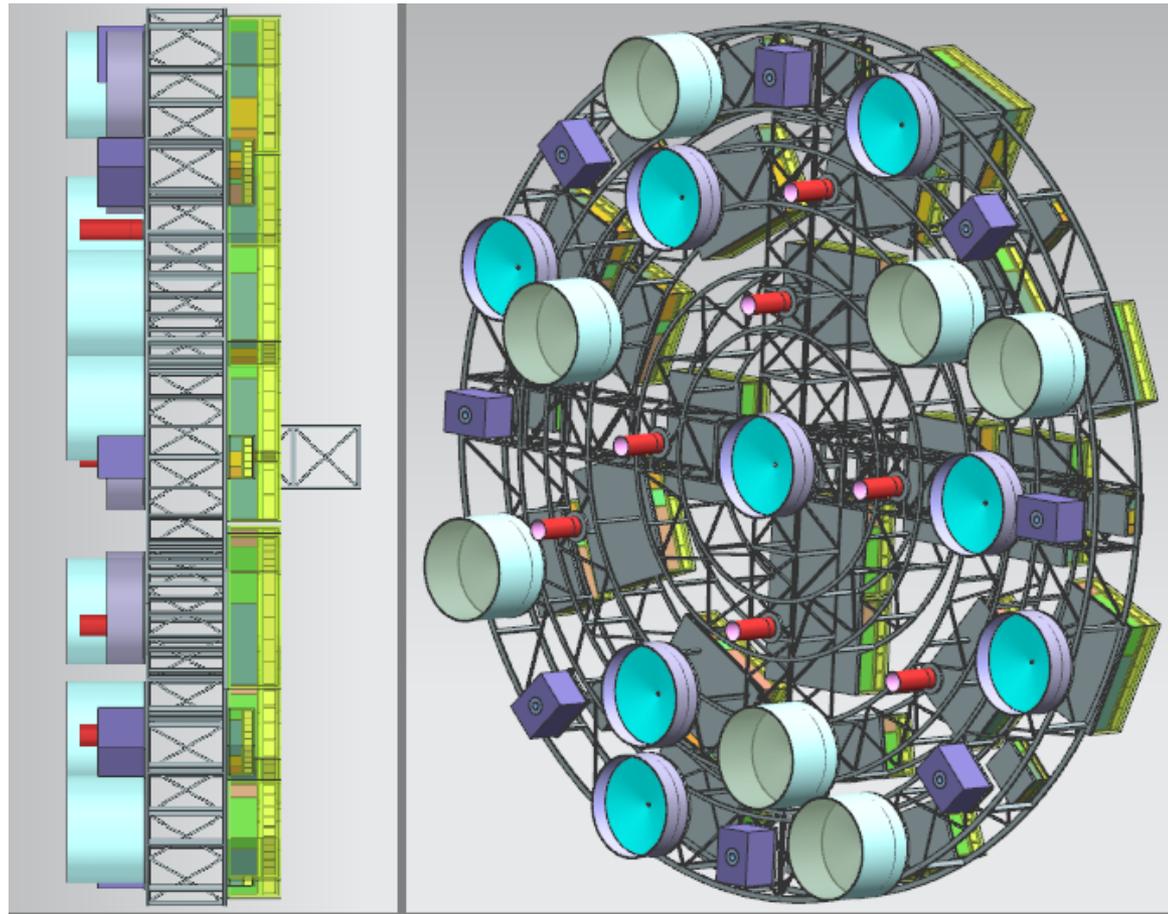


-  → HiPARC
-  → SX3
-  → RIT-3X
-  → RIT-2X-HS+



MARS- plus EUROPA-INPPS Flagship Missions with High Power Electric Thrusters and Heavy Science Payload

22 ET's (for the INPPS flagship CET): gridded CET plate with combined GERMAN-RUSSIAN-AUSTRIAN-ET's

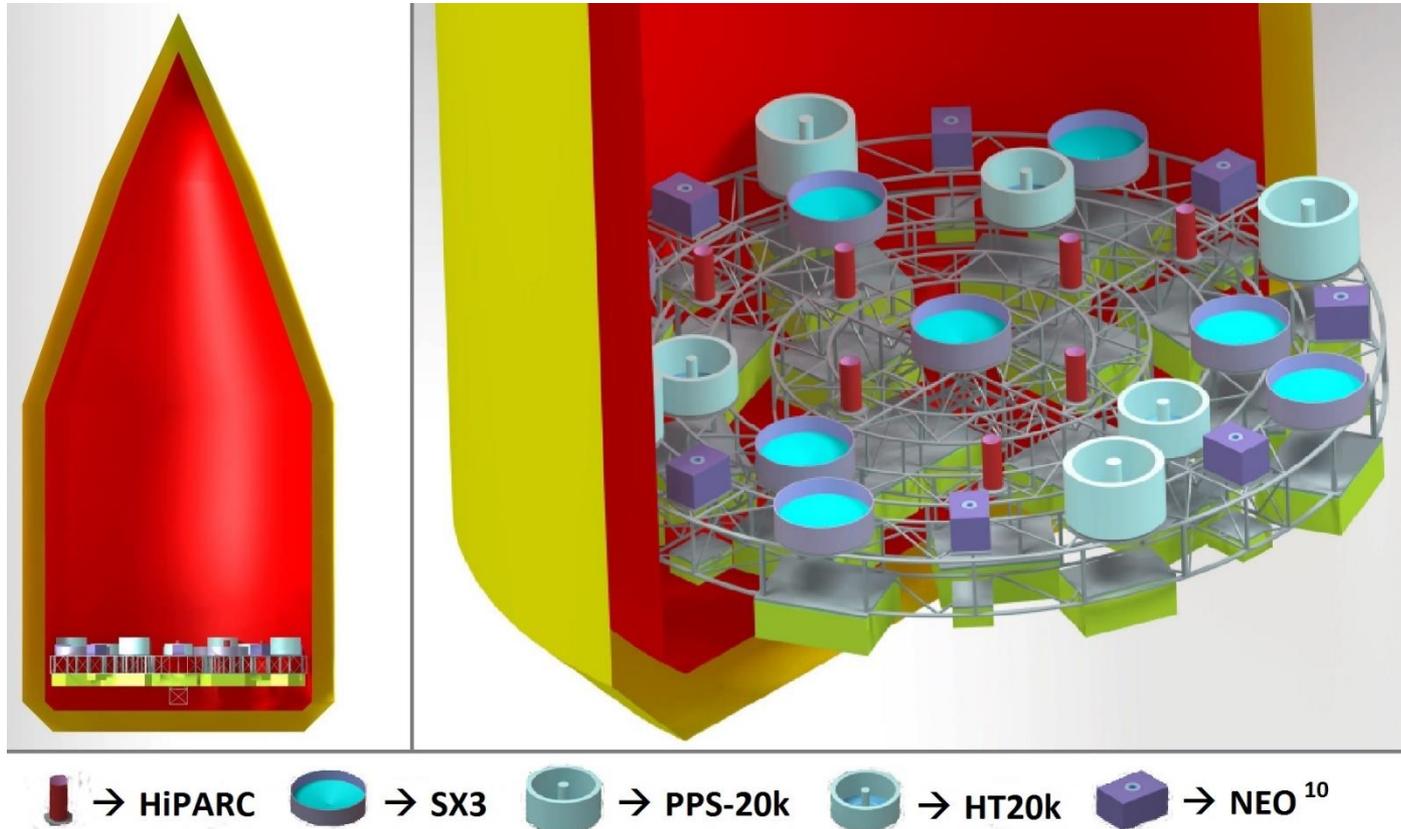


→ HiPARC → SX3 → IT-500 → NEO¹⁰



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CET Summary and next CET steps



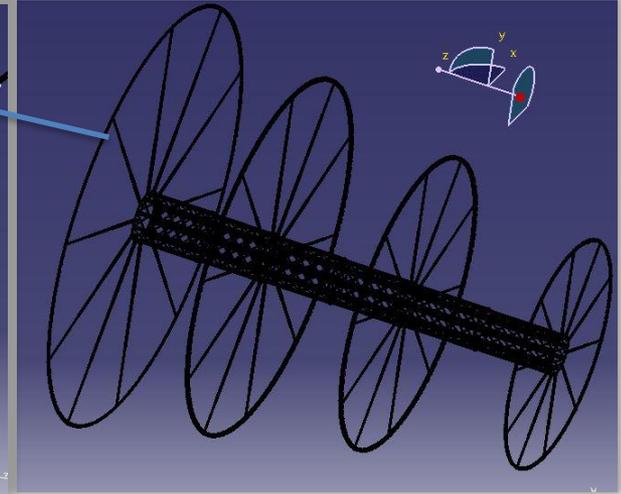
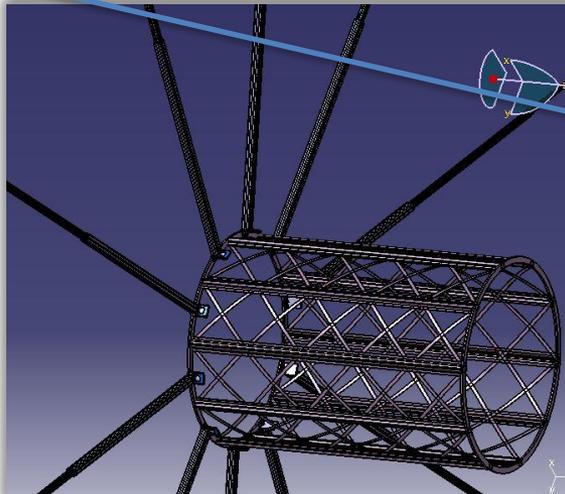
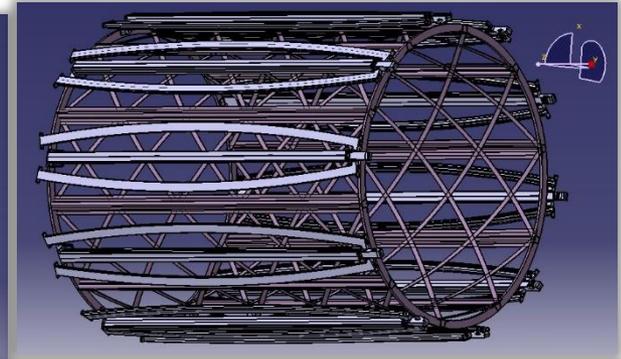
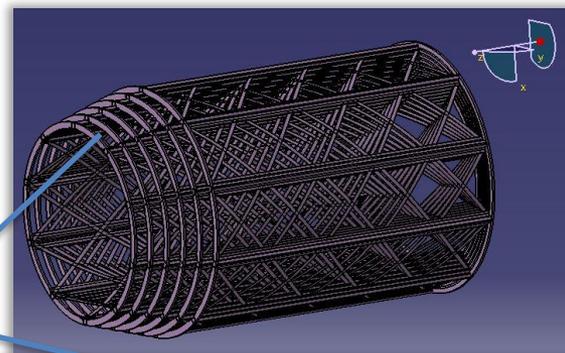
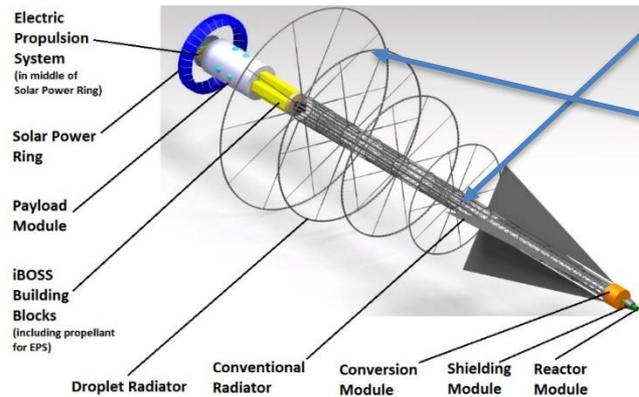
German+French+Italian+Austrian ET's in the MARS-/EUROPA INPPS flagship in Angara rocket fairing. Now: clear, how we received the results!



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2020/2021 Status Droplet Radiators

Droplet radiators results: mechanical details of DLR Boom + Russian droplet radiators (assembly, opening (boom / stiffener), droplets path & pipes mounting))



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Add on info's: related to 20/21 European Russian INPPS Flagship status

- Nuclear Electric Propulsion (DEMOCRITOS/MEGAHIT/DiPoP/TPM): Russian 1MWel core (+ China, UK, USA (also NTP Blue Origin 12/4/21)), European/Russian subsystems, contributions - Brazil, Japan and USA,
- 1992 UN principles: Nuclear Power Source in space – fulfilled (1000km, Timepix) and over-fulfilled (co-flying s/c) => GLEX St. Petersburg June 2021!
- INPPS 100 t total mass, **11-20 t (!) payload mass**
 - **CANDIDATES: Mars** - VaMEx (Valles Marineris Explorer), **Europa** – TRIPLE (ice melting probe)
 - **INVITATIONS: scientific (COSPAR), commercial, communication**

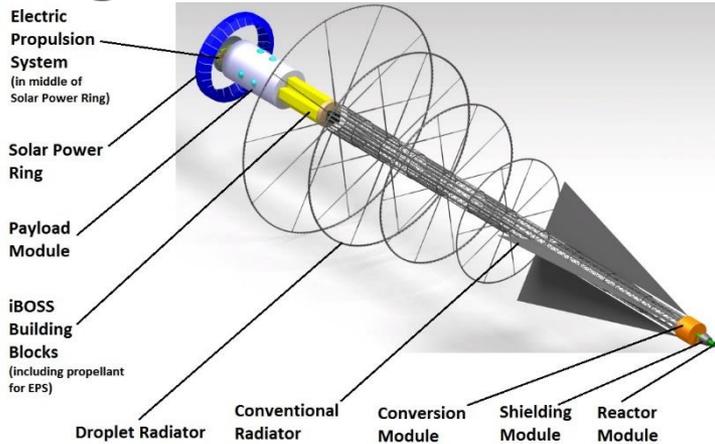


International INPPS Flagship missions in interplanetary space:

1. Mission - **Non-Human** INPPS Flagship (with only one Flagship): about **2026 – 2035 Earth->Mars->Earth** plus **Earth->Jupiter/Europa**
2. Mission - **Human** INPPS Flagship (with the second Flagship): after **2035 Earth->Mars->Earth**

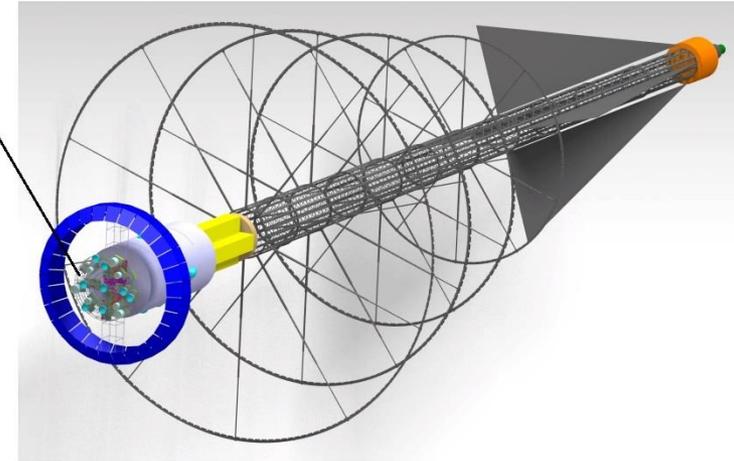


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Cluster of German Electric Thrusters

Mars- and Europa-INPPS Flagship.



Main Conclusion:

IT IS NOW CALCULATED - FEASIBILITY OF HUMAN & NON-HUMAN MARS-/EUROPA INPPS WITH INTERNATIONAL/RUSSIAN&EUROPEAN&GERMAN ET's (EP only, no chemical propulsion is needed!) in FLAGSHIP CET IS REACHABLE!

Remark: Final Results CET + INPPS Flagship +

UN NPS => Cologne Commentary on Space Law => **GLEX June 2021 St. Petersburg**

Invitation related to additional ET subsystems contributions – worldwide!

NEW SPACE TECHNOLOGY plus SPACE SCIENCE for DEEP SPACE EXPLORATION.

NEW SPACE ECONOMY for EARTH SOCIAL DEVELOPMENT with FRONTIER MENTALITY.

IF WE WISH - YES, WE CAN – HUMANS INTERNATIONALLY TO MARS!

Contact: frank.Jansen@dlr.de and co-authors

