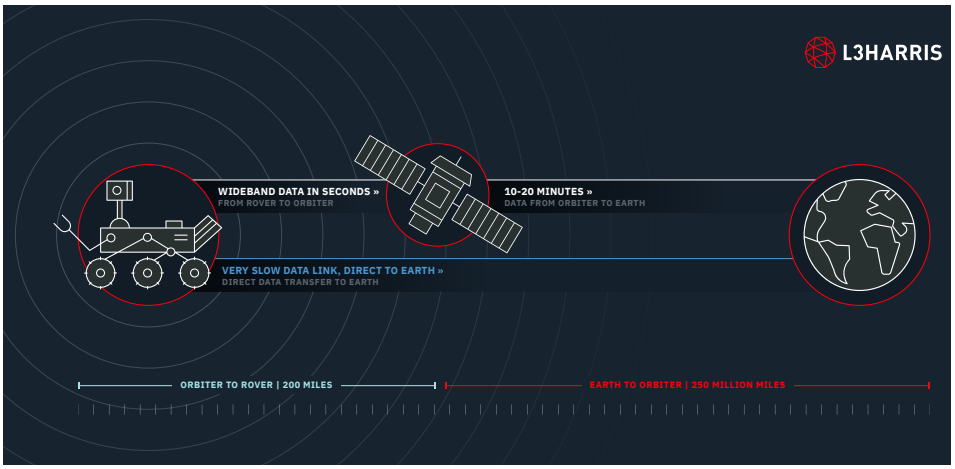
L3HARRIS™
FAST. FORWARD.

L3HARRIS PERSEVERANCE ROVER MISSION SUPPORT

L3Harris Technologies is supporting NASA's Mars 2020 space exploration mission transmitting data and imagery to Earth.



Our avionics and communications technology will connect NASA's Perseverance Rover with overhead orbiters providing a critical communications link to Earth.

L3Harris transceivers will transmit data to and from Perseverance through relay orbiters linking to NASA controllers on Earth approx. 250 million miles away. This link enables controllers to receive data, imagery and other feedback from Perseverance and send back instructions that control the rover's daily mission.

The Mars 2020 mission uses L3Harris' ultra-high frequency (UHF) transceiver (about 400 megahertz) to communicate with Earth through NASA's orbiters around Mars. Because the rover and orbiter antennas are within such close range, their communication is akin to a pair of walkie talkies or a cell phone and a cell tower.

Perseverance, the most sophisticated rover yet for a mission, is expected to last one Martian year – about 687 Earth days. The rover will operate in an extremely harsh environment requiring our most hardened, durable, and proven L3Harris solutions.

FROM MARS TO THE ORBITERS

L3Harris transceivers require only one millisecond to communicate from Perseverance to orbiters approximately 200 miles above the Mars surface, depending on the orbiter position.

Using orbiters as a relay allows significantly more data transfer because they are in closer proximity to Perseverance than the Deep Space Network (DSN) antennas on Earth.

The mass-and-power-constrained rover can achieve data rates of up to two megabits per second on the rover-to-orbiter link. This allows L3Harris' transceivers to capture and transmit a high-resolution, digitized picture or video in seconds on the relay link to the orbiters 200 miles overhead.

IT IS ALL ABOUT BANDWIDTH

L3Harris' bandwidth capability required for this volume of data transfer has increased over the years. Transfers can now contain 100x more data than previous direct planet-to-Earth link Mars missions, while adhering to stringent mass and energy constraints.

TECH SPECIFICATIONS

- **Main Job:** Transmitting data to Earth through Mars orbiters
- **Radio Frequency:** Ultra-High Frequency (UHF) band (about 400 megahertz)
- **Transmission Rates:** Up to two megabits per second on the rover-to-orbiter relay link

Photo courtesy of NASA/JPL-Caltech/FFI

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SPEED COUNTS

L3Harris transmitters, linking with the orbiters, can relay data in seconds as opposed to direct to Earth transmissions that could take more than an hour to send a single high-resolution photograph. That's like sending a photo on your smartphone today, compared to sending a photo over a dial up modem.

PARTNERING WITH NASA

L3Harris also has equipment installed on the two satellites orbiting Mars. The radios are a cooperative effort between L3Harris and NASA's Jet Propulsion Lab (JPL) in Pasadena, California. We built the hardware, procured the components, and performed the testing. JPL then wrote the software for our radios in a truly joint-collaborative effort.

L3HARRIS ON MARS

- Twenty years supporting NASA's Spirit, Opportunity, Curiosity and Perseverance vehicles
- Supported NASA programs for more than six decades
  - Early spacecraft technologies
  - Mercury, Gemini and Apollo
  - Space Shuttle
  - International Space Station
  - Previous Mars missions

Our transceivers have sent data on every U.S. Martian rover and Mars orbiting spacecraft since 2001

L3Harris has supported deep space exploration with work on the Hubble Space Telescope and now the James Webb and Roman space telescopes. In addition, the company supports space-based weather forecasting on U.S. and international satellites and has navigation technology on every U.S. GPS satellite. L3Harris.com/space

L3harris Perseverance Rover Mission Support

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L3Harris Technologies is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defense and commercial technologies across air, land, sea, space and cyber domains.