This subtopic seeks innovative technologies for long-range RF telecommunications supporting the needs of space missions. Proposals are sought in the following areas:

- Ultra-small, light-weight, low-cost, low-power, modular deep-space transceivers, transponders and components, incorporating MMICs and Bi-CMOS circuits;

- MMIC modulators with drivers to provide large linear phase modulation (above 2.5 rad), high-data rate (10 - 200 Mbps), BPSK/QPSK modulation at X-band (8.4 GHz), and Ka-band (26 GHz, 32 GHz and 38 GHz);

- High-efficiency (> 60%) Solid-State Power Amplifiers (SSPAs), of both medium output power (10 W - 50 W) and high-output power (150 W - 1 KW), using power combining techniques and/or wide-bandgap semiconductor devices at X-band (8.4 GHz) and Ka-band (26 GHz, 32 GHz and 38 GHz);

- Epitaxial GaN films with threading dislocations less than 1e6 per cm2 for use in wide band-gap semiconductor devices at X- and Ka-Band;

- Utilization of nanomaterials and/or other novel materials and techniques for improving the power efficiency or reducing the cost of reliable vacuum electronics amplifier components (e.g., TWTAs and Klystrons);

- Long lifetime, radiation hard SSPAs, modulators and MMICs for 26 GHz Ka-band (lunar communication);

- TWTAs operating at higher millimeter wave frequencies (e.g., W-Band) and at data rates of 10 Gbps or higher;

- Ultra low-noise amplifiers (MMICs or hybrid) for RF front-ends (MEMS-based RF switches and photonic control devices needed for use in reconfigurable antennas, phase shifters, amplifiers, oscillators, and in-flight reconfigurable filters. Frequencies of interest include VHF, UHF, L-, S-, X-, Ka-, V-band (60 GHz) and W-band (94 GHz). Of particular interest is Ka-band from 25.5 - 27 GHz and 31.5 - 34 GHz.)