

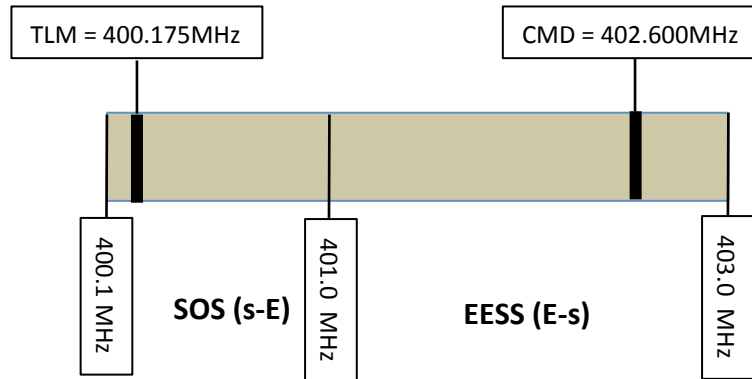


Landmapper Constellation Frequency Utilization

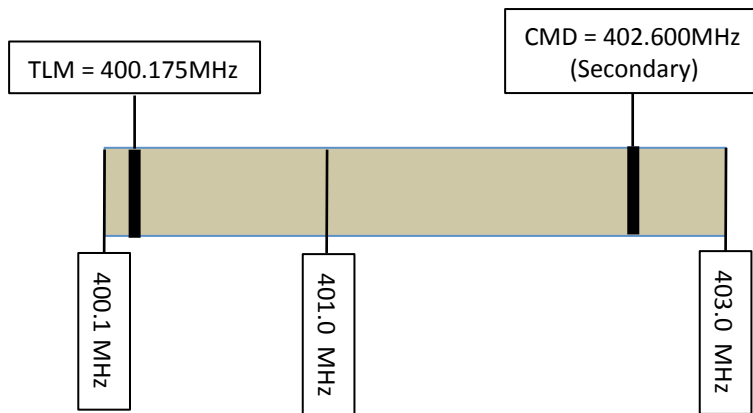
Attachment to Form 312,
Question 24



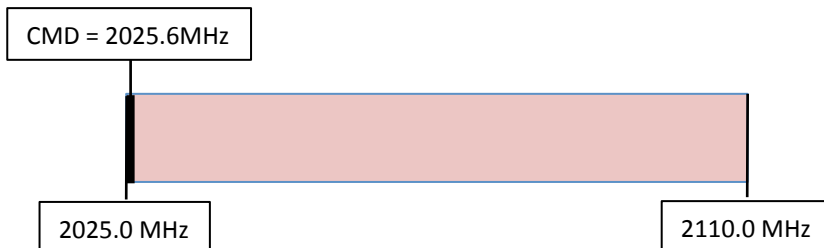
Landmapper Constellation Frequency Utilization (T & C Links)



- Landmapper Phase 1 (2017 - 2018)
- TLM (SOS) = 400.175 MHz; 40 kHz BW
- CMD (EESS) = 402.600 MHz; 40 kHz BW
- TLM EIRP \approx 2 Watts (Omni Antenna)

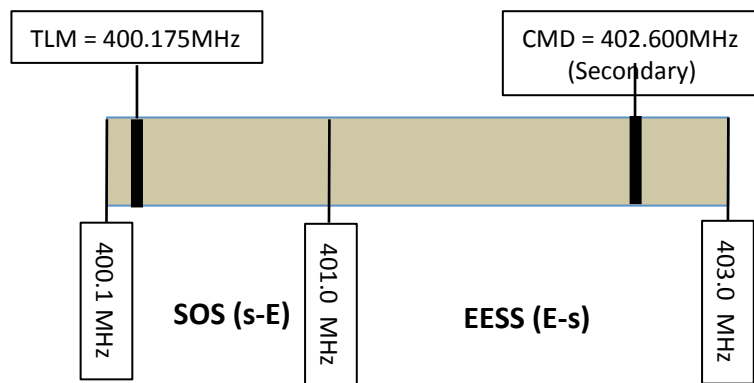


- Landmapper Phase 2 (2018 - 2019)
- TLM (SOS) = 400.175 MHz; 40 kHz BW
- CMD (EESS) = 402.600 MHz; 40 kHz BW
- CMD (EESS) = 2025.6; **300 kHz BW**
- TLM EIRP \approx 2 Watts (Omni Antenna)

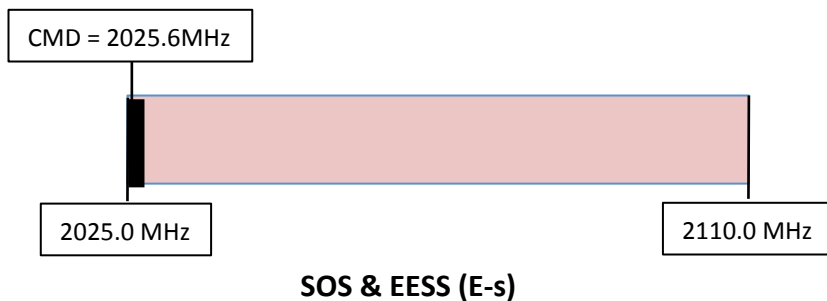




Landmapper Constellation Frequency Utilization (T & C Links)

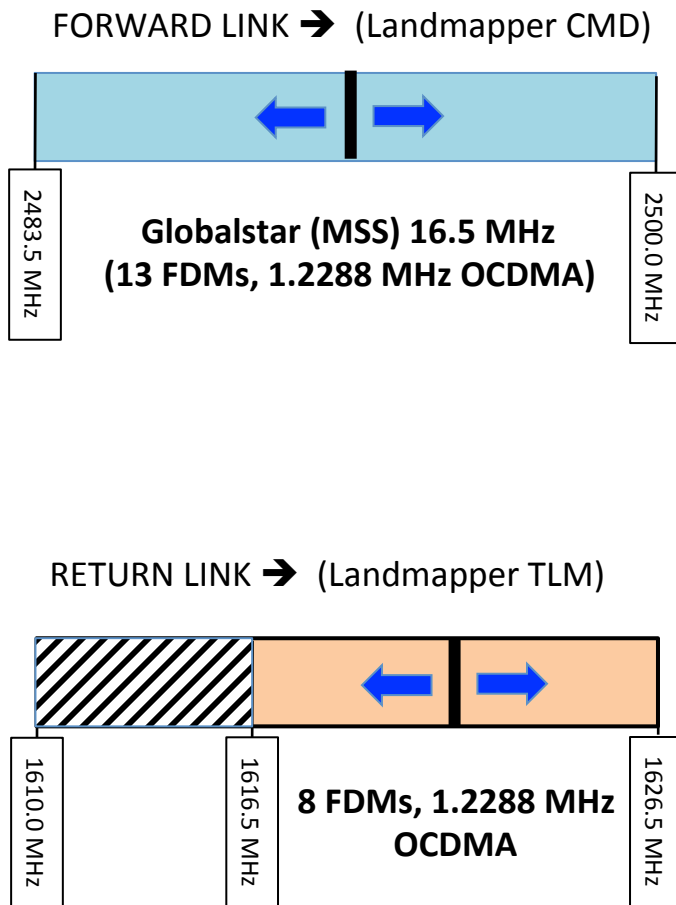


- Landmapper Phase 3 (2019 - Beyond)
- TLM (SOS) = 400.175 MHz; 40 kHz BW
- CMD (EESS) = 402.600 MHz; 40 kHz BW
- CMD (EESS) = 2025.6; **1.0 MHz BW**
- TLM EIRP \approx 2 Watts (Omni Antenna)





Landmapper Constellation Frequency Utilization (T & C Links – Via Globalstar)



← Globalstar (MSS) 16.5 MHz →

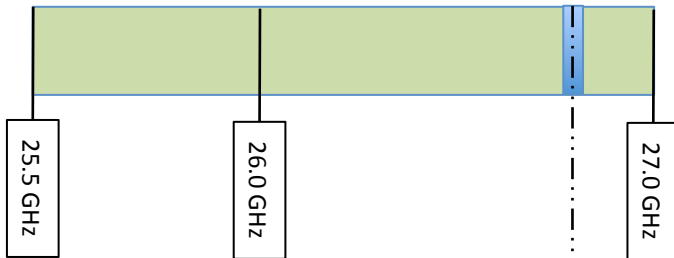
- **Landmapper Phase 1,2 and 3 (2017 - Beyond)**
- CMD via G* Forward Transponder (s)
- Uses Inter-Satellite Service (Requires Waiver)
- 1 FDM = 1.2288 MHz BW; 13 FDMs per Xpdr
- Dynamically Assigned
- TLM via G* Return Transponder(s)
- Uses Inter-satellite Service (Requires Waiver)
- 1 FDM = 1.2288 MHz BW
- Dynamically Assigned in Upper Channels Only
- Avoids Radio Astronomy Service Issues
- Multiple 3-5 min. Contacts/S/C/Orbit
- This Allows EESS Dynamic Task Assignment
- More Rapid Termination of Emissions
- Strong Back-up Support
- Low Cost T & C Option (Full Duplex 8 kbps Link)



Landmapper High Speed Data Links at Ka-Band Using DVB-S2

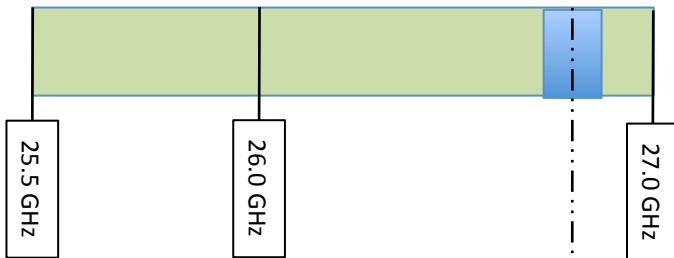
Landmapper Phase 1: (2017 - 2018)

Center Frequency:	Necessary Bandwidth:	Symbol Rate:	Peak Data Rate:
26.800 GHz	86.4 MHz	72.00 Msps	320.62 Mbps



Landmapper Phase 2: (2018 - 2019)

Center Frequency:	Necessary Bandwidth:	Symbol Rate:	Peak Data Rate:
26.800 GHz	220.0 MHz	183.33 Msps	816.39 Mbps



Landmapper Phase 3: (2019 - Beyond)

Center Frequency:	Necessary Bandwidth:	Symbol Rate:	Peak Data Rate:
26.700 GHz	600.0 MHz	500.0 Msps	2.2265 Gbps

