HWG | HARRIS, WILTSHIRE & GRANNIS LLP

1919 M STREET NW
SUITE 800
WASHINGTON DC 20036

TEL +1 202 730 1300
FAX +1 202 730 1301
HWGLAW.COM

ATTORNEYS AT LAW

May 6, 2020

BY ELECTRONIC FILING

Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, DC 20554

Re: *Space Exploration Holdings, LLC, IBFS File No. SAT-MOD-20200417-00037*

Dear Ms. Dortch:

This is to inform you that, on May 4, 2020, representatives of Space Exploration Holdings, LLC ("SpaceX") had a conference call with members of the Commission's International Bureau to discuss the above referenced application to modify SpaceX's existing authorization to deploy and operate a non-geostationary orbit satellite system.[1] The topics of discussion are reflected in the attached presentation, which SpaceX provided to the staff in advance of the call.

Sincerely,

William M. Wiltshire
Counsel to SpaceX

Attachments

cc: International Bureau particpants

[1] Participants on the call are listed in Exhibit 1 hereto.

EXHIBIT 1

CALL PARTICIPANTS

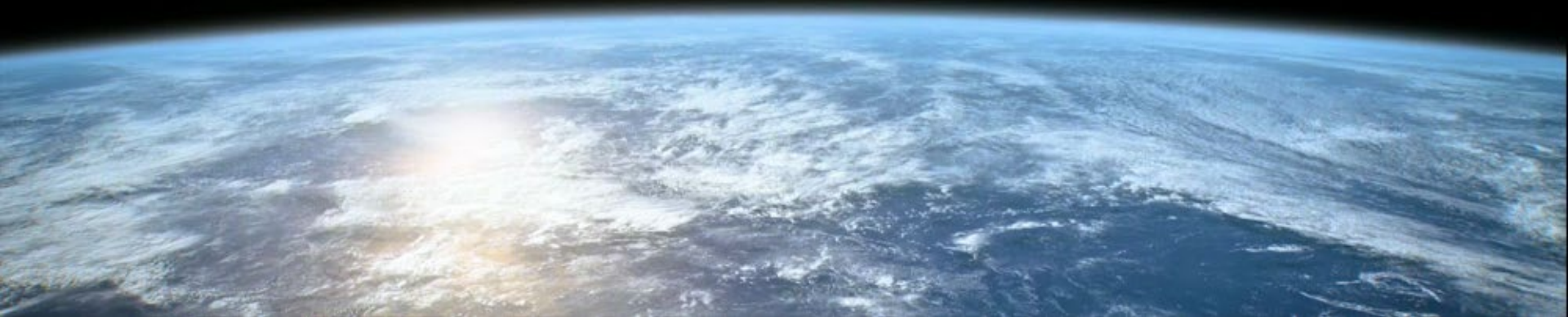
International Bureau

Jose Albuquerque
Joe Hill
Karl Kensinger
Kerry Murray
Jay Whaley

SpaceX

David Goldman
Mihai Albulet
Jonathan Herman
Zahid Islam
Jared Greene
Will Seidel
Kevin Wu
Bill Wiltshire

Starlink April 2020 Modification

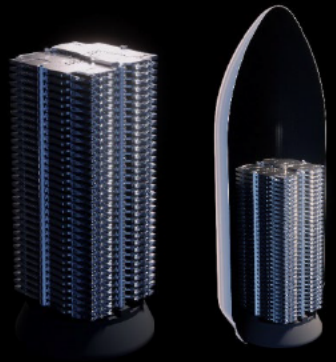


Starlink will provide high speed, low-latency broadband connectivity across the globe, including to locations where traditionally internet has been too expensive, unreliable, or entirely unavailable.

System Update

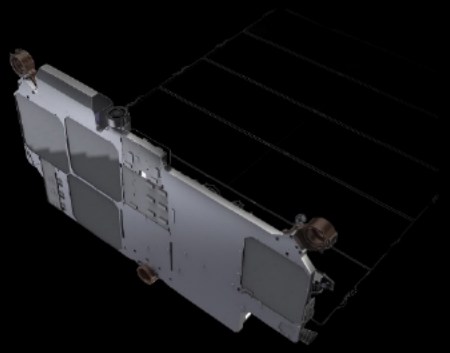
- Launched more than 420 satellites as of April 22, 2020
- One million user terminals authorized
- Gateways across the United States
- On target for service to American consumers this year

KEY COMPONENTS



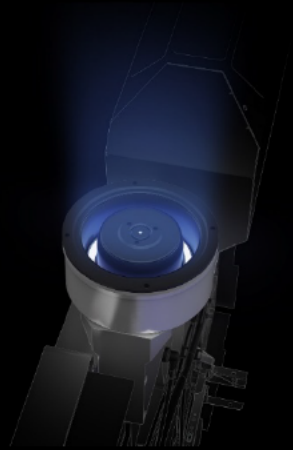
AN EFFICIENT, COMPACT DESIGN

allows for approximately 60 satellites to launch on each Falcon 9 rocket, enabling rapid constellation deployment



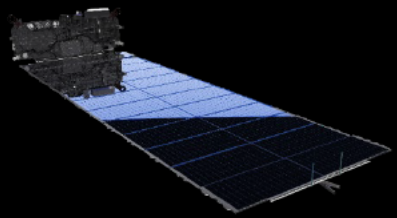
POWERFUL PHASED ARRAY ANTENNAS

and electronically steerable beams on each satellite enable precision placement of large data throughput



KRYPTON ION THRUSTERS & ON-BOARD GPS

provide efficient maneuvering capability on orbit, and autonomous collision avoidance with space debris and other satellites



FULLY DEMISEABLE MATERIALS

and a low ~550km orbital altitude enable rapid disposal at end of life, more than 5x faster than industry standards

MODIFICATION OF FCC KU/KA-BAND LICENSE

Partial constellation modification
- Move remaining satellites to lower altitudes of 540 km to 570 km
- Align polar shells to speed deployment to Polar Regions, including Alaska

Further enhance space safety
- Update orbital debris showing

Slightly reduce number of satellites
- Now 4,408 satellites
- Demonstrate EPFD, PFD compliance to protect space, terrestrial systems
- Demonstrate lack of significant impact on other licensed NGSO systems

ITU Filings
- Will modify NOR-USA STEAM & US USASAT filings to correspond

SpaceX System Constellation

SPACEX PROPOSED MODIFICATION					
Orbital Planes	72	72	36	6	4
Satellites per plane	22	22	20	58	43
Altitude	550 km	540 km	570 km	560 km	560 km
Inclination	53º	53.2º	70º	97.6º	97.6º

RF COMPLIANCE APPROACH: NO SIGNIFICANT INTERFERENCE

- Similar or lower Downlink PFD
- Similar or lower ES EIRP
- Same sidelobe levels
- Same GSO avoidance angles

- **EARTH STATION ELEVATION:**
  - at ≥ 25^{o} (except for gateways in the polar regions using ≥ 5^{o})

- **LOWER ALTITUDE → SMALLER SPOT SIZE, FEWER SATELLITES IN VIEW**

KEEPING SPACE CLEAN

At end of life, the satellites will utilize their on-board propulsion system to deorbit over the course of a few months. In the unlikely event the propulsion system becomes inoperable, the satellites will burn up in Earth's atmosphere within 1-5 years, significantly less than the hundreds or thousands of years required at higher altitudes.

SATELLITE BRIGHTNESS REDUCTION EFFORTS

Objectives

1. Make the satellites generally invisible to the naked eye within a week of launch.

2. Minimize Starlink's impact on astronomy by darkening satellites so they do not saturate observatory detectors.

Schedule (context: next launch is launch 7)

Launch 7:

- Roll orbit raising satellites
- Fly sun visor demo

This summer:

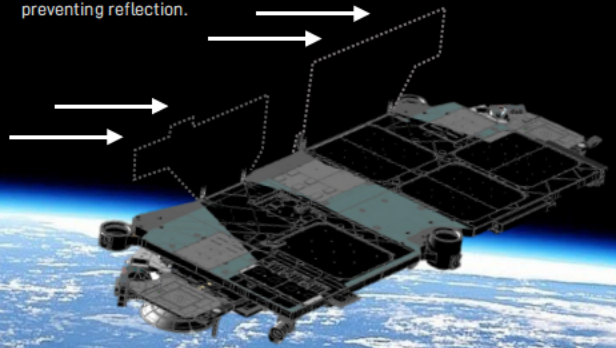
- Add sun visors to all satellites

Strategy

VISORSAT

ANTENNAE MITIGATION ON STATION

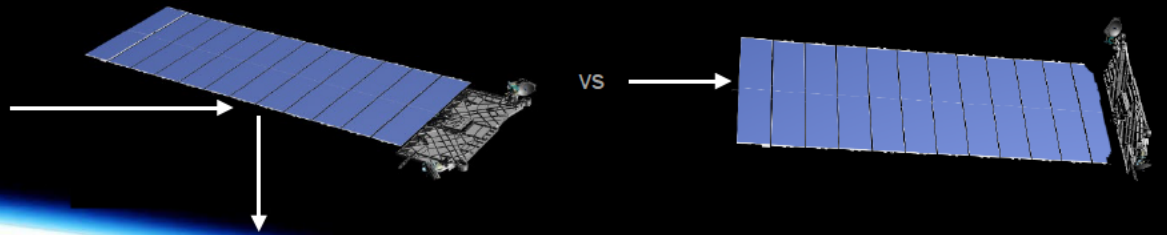
On station, the sun shade blocks sunlight from reaching the antennas, preventing reflection.



ORIENTATIONAL ROLL

ANTENNAE MITIGATION DUR NG ORBIT RAISE

Rolling the satellite makes sunlight bounce off the smaller 'knife edge' of array, reducing reflection.




SPACEX