

# **Lewis Investigates Frequency Sharing Between Future NASA Space Systems and Local Multipoint Distribution Systems in the 27-GHz Band**

At the request of the Federal Communications Commission (FCC), the NASA Lewis Research Center undertook an intensive study to examine the feasibility of frequency sharing between future NASA space services and proposed Local Multipoint Distribution Systems (LMDS) in the 25.25- to 27.5-GHz band. This follows NASA's earlier involvement in the FCC's 1994 Negotiated Rule Making Committee which studied frequency sharing between Ka-band Fixed Satellite Services and LMDS in the 27.5- to 29.5-GHz band (ref. 1).

LMDS is a terrestrial, cellular, wireless communication service primarily intended to provide television distribution from hub stations located within relatively small cells to fixed subscriber receivers. Some proposed systems, however, also plan to offer interactive services via subscriber-to-hub transmissions. LMDS providers anticipate that their systems will be a cost-effective alternative to cable television systems, especially in urban areas. LMDS proponents have expressed an interest in using frequencies below 27.5 GHz.

NASA, however, plans to operate three types of space systems below 27.5 GHz. The H, I, and J follow-on satellites for the Tracking and Data Relay Satellite System (TDRSS), which are planned for launch beginning in 1999, are designed to receive high-data-rate transmissions (up to 800 Mbps) from low-Earth orbiting "user" spacecraft in the 25.25- to 27.5-GHz band. In this case, the potential interference is the aggregate interference from LMDS transmitters (both hubs and subscribers) into the TDRSS tracking receive beams as they sweep over the Earth's surface while tracking lower altitude user spacecraft.

NASA is also developing the Proximity Operations Communications System (POCS) in the 25.25- to 25.55-GHz and 27.225- to 27.5-GHz bands for interorbit communications between the space station and robotic vehicles and astronauts. Again, there is the possibility of harmful interference from a collection of LMDS transmitters on the ground.

Finally, NASA is seeking a wideband allocation near 26 GHz to support future downlinks. Here, the concern is potential harmful interference from LMDS transmitters (both hubs and subscribers) into the Earth Exploration Satellite's Earth station receivers when they are located in an LMDS service area.

Interference into TDRSS and POCS was studied with LMDS characteristics from four proponents who plan to implement LMDS systems. System characteristics varied widely, since each of the proponents envisioned several different implementations that would allow certain types of service.

Results of the interference analysis showed that three of the four proposed LMDS systems would produce excessive interference into both TDRSS and POCS. Although LMDS interference into the Earth Exploration Satellite's Earth station receivers was not analyzed in this study, earlier analysis results indicate that LMDS would also cause harmful interference in this case without proper coordination and site shielding. In light of the study results, NASA concluded that sharing between its future space services and LMDS is not feasible in the 27.5-GHz frequency band.

## Reference

1. Wayne A. Whyte, Jr.: Lewis Helps Examine Feasibility of Fixed Satellite Service and Local Multipoint Distribution Service Sharing the Same Frequency Band. Research & Technology 1995. NASA TM-107111, 1996, pp. 119-120. Available WWW: <http://www.grc.nasa.gov/WWW/RT1995/5000/5610w.htm>

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