PLAN OF PROPAGATION AND COMMUNICATION EXPERIMENTS USING ETS-VI

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Abstract--In 1992, an Engineering Test Satellite VI is scheduled to be launched by an H-II rocket. The missions of ETS-VI are to establish basic technologies of inter-satellite communications using millimeter waves and optical beams and fix satellite communications using multibeam antenna on board the satellite. Several kinds of frequency bands will be used for the communications missions, however, these frequencies can be used for propagation experiments.

1. Introduction

An Engineering Test Satellite VI (ETS-VI) is a 2-ton class, three axis stabilized satellite, which is scheduled to be launched in August 1992 by an H-II rocket. One of main missions of the ETS-VI is to develop basic technologies for advanced satellite communication systems in the future. Almost all experiments will be focused on subjects such as millimeter waves, inter-satellite and optical communications, however, propagation experiments will be carried out using 2.5GHz, 25GHz and 40 GHz frequency bands.

2. Experimental system

The ETS-VI has basic missions to establish advanced satellite technologies such as inter-satellite communications, mobile satellite communications and fix satellite communications (Shiomi et al; 1988) (Nakagawa et al; 1988). CRL has three missions as shown in Fig.1, and these are summarized as follows.

(1) S-band inter-satellite communications

Communications Research Laboratory (CRL) develops S-band multiple access data relay and tracking system (2.3/2.1 GHz) with 19-element phased array antenna in cooperation with NASDA. Data relay and tracking experiments between ETS-VI and low orbit satellites are planned. Figure 2 shows a concept of a S-band and optical inter-satellite communication system.

(2) Millimeter wave inter-satellite and personal satellite communications

CRL develops millimeter wave (43/38 GHz) transponder on the basis of research through the ETS-II (1977) and ECS (1979) satellite programs. The objectives of millimeter wave mission are to develop high data rate inter-satellite communication technology and to study the feasibility of personal satellite communication system. Figure 3 shows a concept of this mission.

(3) Optical inter-satellite communications

CRL develops optical communication system with a telescope of 75 mm in diameter, which has a beam pointing/tracking mechanism with a gimbal mirror. The onboard system has fundamental optical communication functions with a laser diode transmitter of wave length 0.83 micron, laser beam point-ahead mechanism, a receiver of wavelength 0.51 micron, modulation/demodulation subsystems, and so on. Figure 4 shows the concept of this mission.

3. Frequency bands for propagation experiments

The following frequency bands, which are used for corresponding missions, can be used for propagation experiments.

2.3/2.1 GHz	S-band inter-satellite communications
2.6/2.5 GHz	Mobile satellite communications
30/20 GHz	Feeder links for the ETS-VI
32/23 GHz	Ka-band inter-satellite communications
43/38 GHz	Millimeter wave communications

4. Conclusion

Experiments on advanced satellite communications will start in 1992 using an ETS-VI satellite. Propagation experiments are scheduled to carry out with several frequency bands such as 2 GHz, 20 GHz and 40 GHz.

References

Shiomi, T. et al; "Plan of Advanced Satellite Communications Experiment Using ETS-VI," International Symposium on Space Technology and Science (ISTS), Sapporo, May 1988.

Nakagawa, K. et al; "Fixed and Mobile Multibeam Communications Experiment Payload for ETS-VI," ISTS, Sapporo, May 1988.

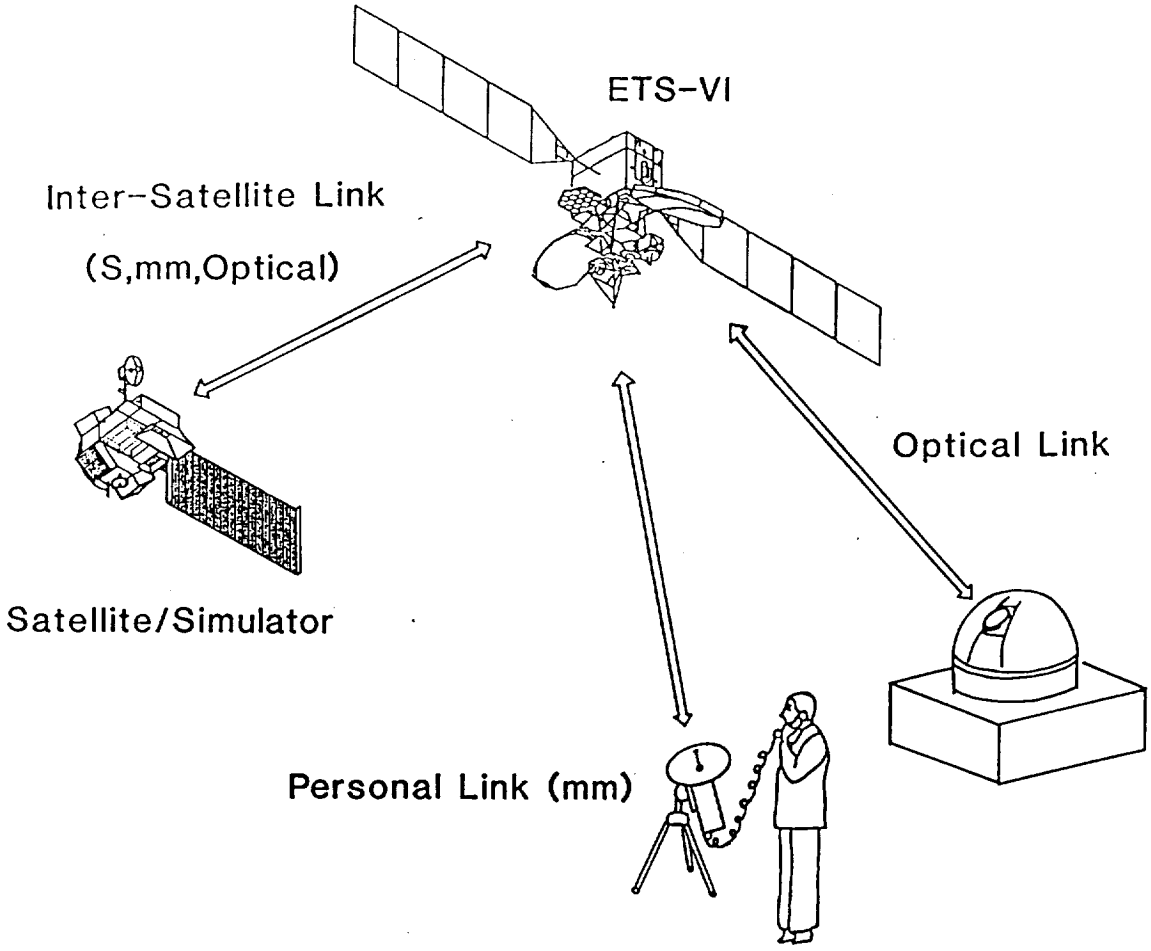

Fig.1 Advanced Satellite Communications Experiment

(CRL)

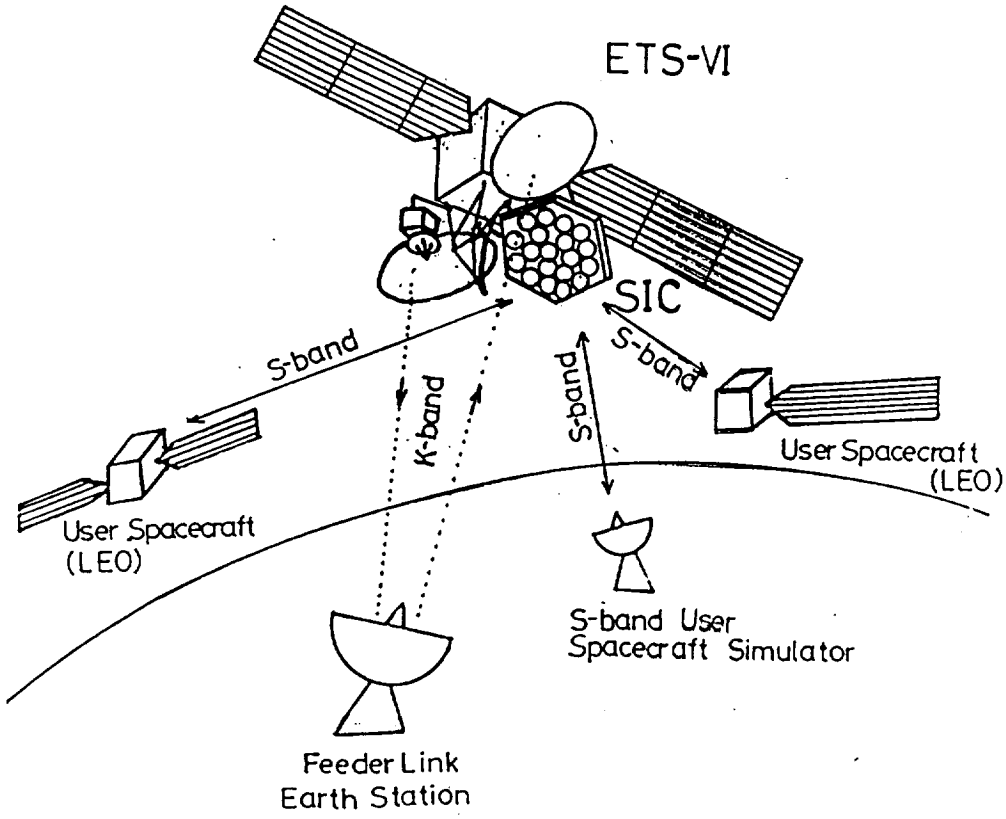

Fig.2 S-band Tracking and Data Relay

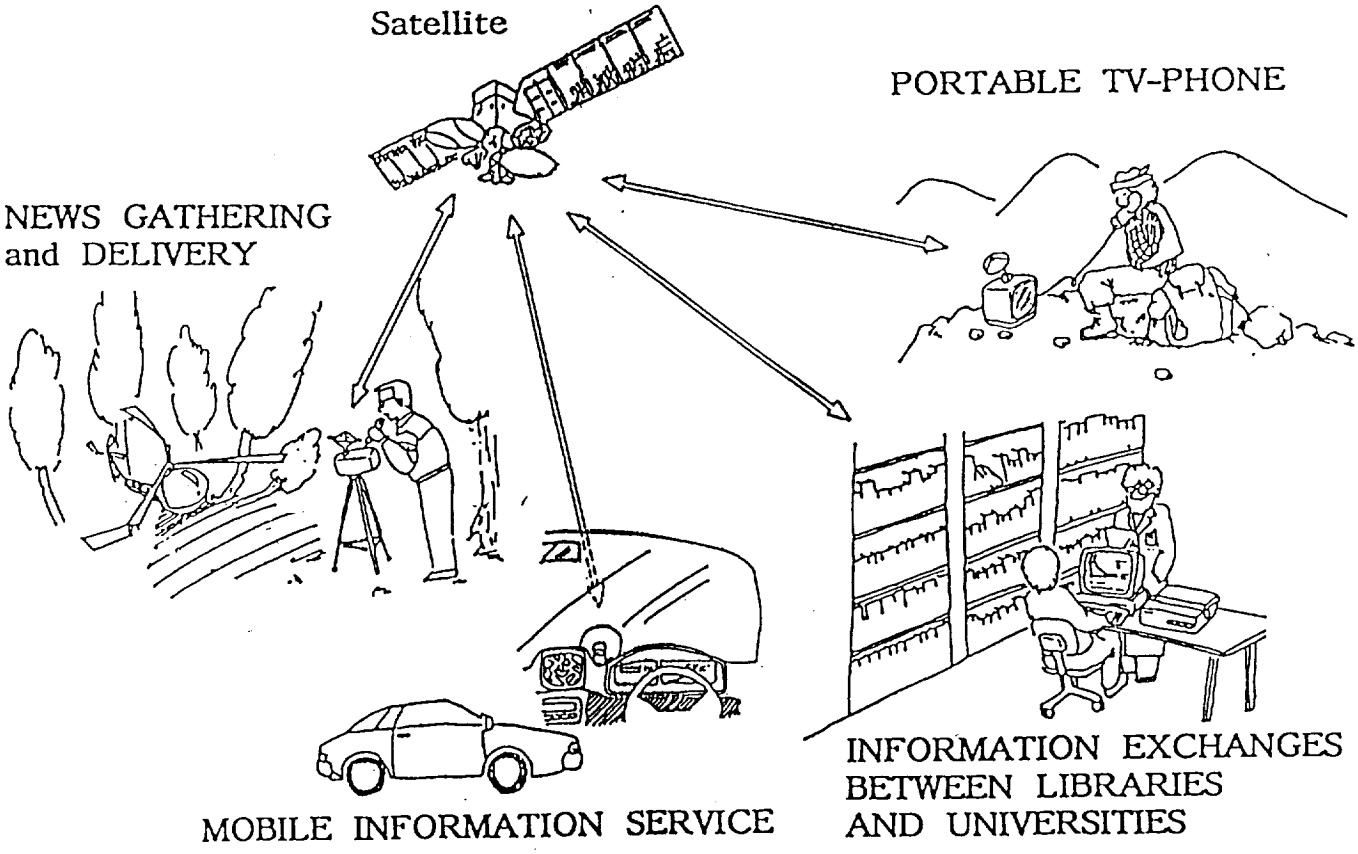

Fig.3 Millimeter-wave Personal Satellite Communications System

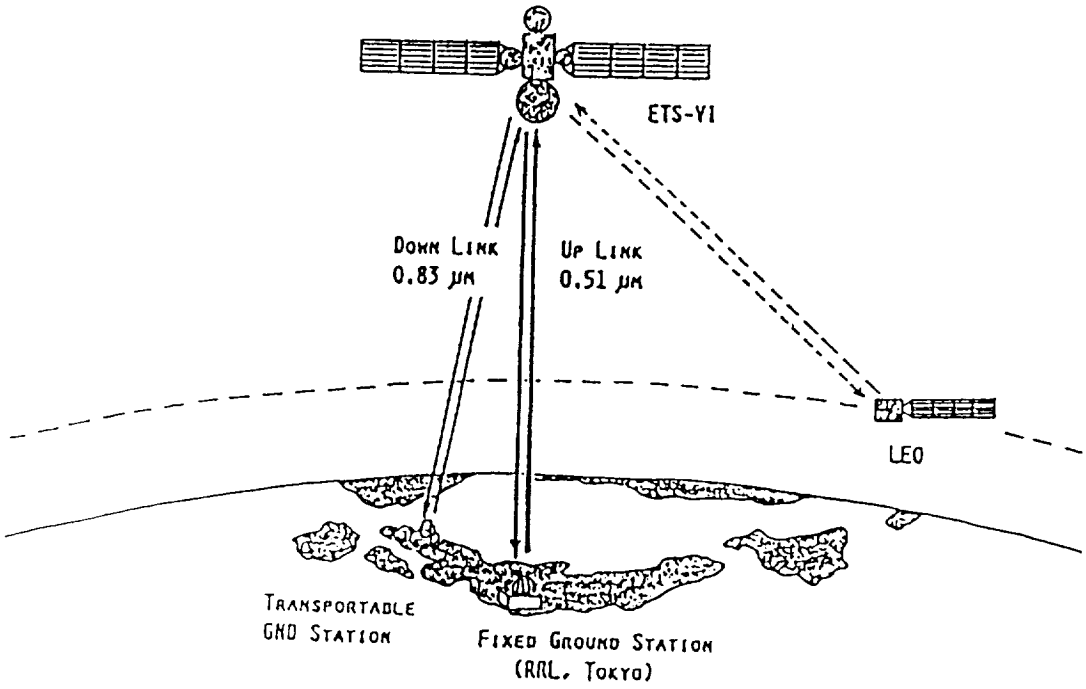

Fig.4 **Optical Satellite Communication**