Special Article on Satellite Packet Communication Service
Operation and Maintenance Method

A Satellite Packet Processing Module (S-PPM) and Satellite Packet Modulation and Demodulation Equipment (SPMDE) have been developed for the current Satellite Mobile Packet Communication System. And a new Operation and Maintenance (OAM) method for monitoring and controlling this satellite system has also been developed.

This article outlines the operation of the satellite mobile packet communication system and describes the operation functions unique to its operation method.

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1. Introduction

The Operation System (OPS (Satellite Operation Terminal)) of the Satellite Mobile Packet Communication System is independent of the Mobile Communication Operation System (MOS) [1] in the Satellite Mobile Communication System and the Operation Control Information Store Equipment-PDCP (OCSE-P) [2] in the PDC Mobile Packet Data Communication System (PDC-P). A satellite operation terminal is equipped with the monitoring and control function unique to the satellite mobile packet communication method.

This article describes the functions unique to the satellite mobile packet communication method such as Satellite Base Station (SBS) monitoring and controlfunction, sun transit control function, base station switchover control function, and test calling function.

2. Operation and Maintenance of the Network

Figure 1 shows the OPS configuration of the network system OAM method. The Satellite Packet Processing Module (S-PPM) is installed in each communication station office and connected with the satellite remote operation terminal installed in the operation center. The S-PPM is monitored and controlled from this satellite remote operation terminal. In addition, satellite site operation terminal collectively controls monitoring for equipment such as Router (RT) s. And the terminal has a function for transferring failure reports to the satellite remote operation terminal.

3. Operation Function Unique to the Satellite Mobile Packet Communication Method

3.1 Satellite Base Station (SBS) Monitoring and Control Function

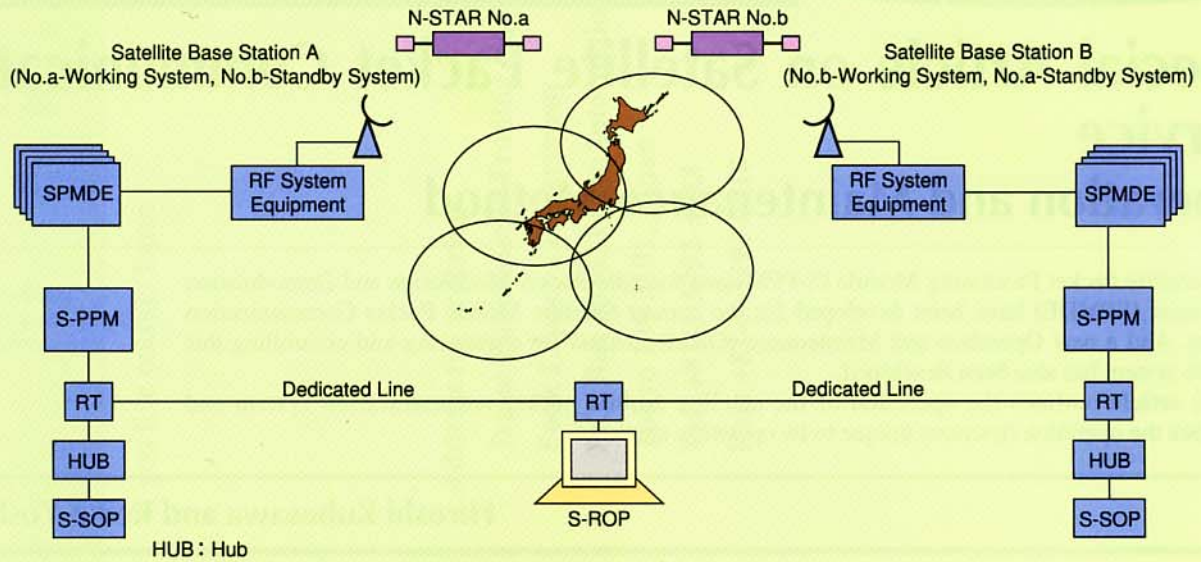
Signals concerning from Satellite Packet Modulation and Demodulation Equipment (SPMDE) are transmitted and received at the S-PPM used in both call processing and monitoring control systems. Consequently, SPMDE can be monitored and controlled by registration of it into the satellite operation terminal, in the same way as network equipment. Additionally, alarms, etc at the SPMDE can be displayed in real-time, and messages from the past few days can be retrieved and displayed.Furthermore, the SPMDE can be remote controlled by inputting commands and graphical user interface (GUI).

The SPMDE rack screen is shown in Photo 1 and the SPMDE card monitoring and control screen in Photo 2.

3.2 Sun-Transit * Control Function

When a Base Station (BS), the satellite, and the sun align in a straight line before and after the vernal or autumnal equinox, communication is hindered because of sun-noise reception at the BS. Hence, the mobile station should migrate to an area under the control of a non-sun-transit satellite.

* sun-transit : When a BS, the satellite, and the sun align in a straight line before and after the vernal or autumnal equinox, return link communication becomes temporarily difficult because sun noise is also received at the BS.



HUB : Hub
RT : Router
SPMDE : Satellite Packet Modulation and Demodulation Equipment
S-PPM : Satellite Packet Processing Module
S-ROP : Satellite Remote Operation Terminal
S-SOP : Satellite Site Operation Terminal

Figure 1 Operation System Configuration

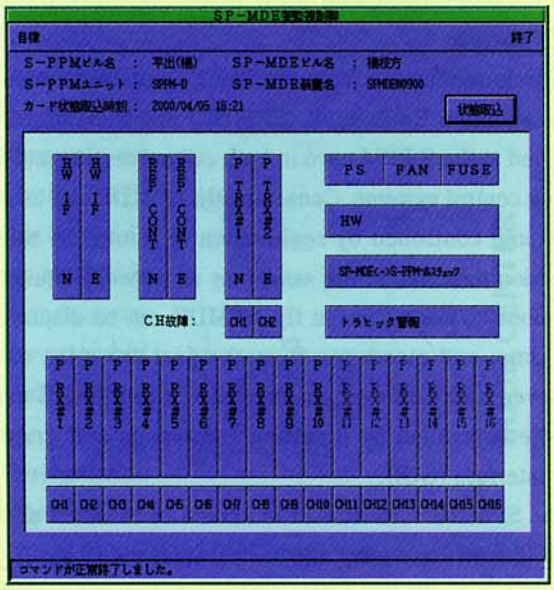


Photo 1 SPMDE Rack Monitoring Screen

Photo 2 SPMDE Card Monitoring and Control Screen

In the Satellite Mobile Communication System, all mobile terminals that visit an area under the control of sun-transit satellite are forced to migrate into an area under the control of non-sun transit satellite. However, the Satellite Mobile Packet Communication System can control the migration of only Mobile Station (MS) s, which visit packet channels and transmit and receive data, into an area under the control of a non-sun transit satellite [3].To put it concretely, when the forward link signals occurs, network initiative handover control is conducted. (Figure 2), and when the uplink signals occurs, the autonomous channel switchover of the mobile terminal is controlled (Figure 3).

The S-PPM has a function for controlling for SBS equipment and monitoring the control situation according to the sun-transit occurrence time. In this occasion, the sun transit occurrence time is implemented by setting it in office

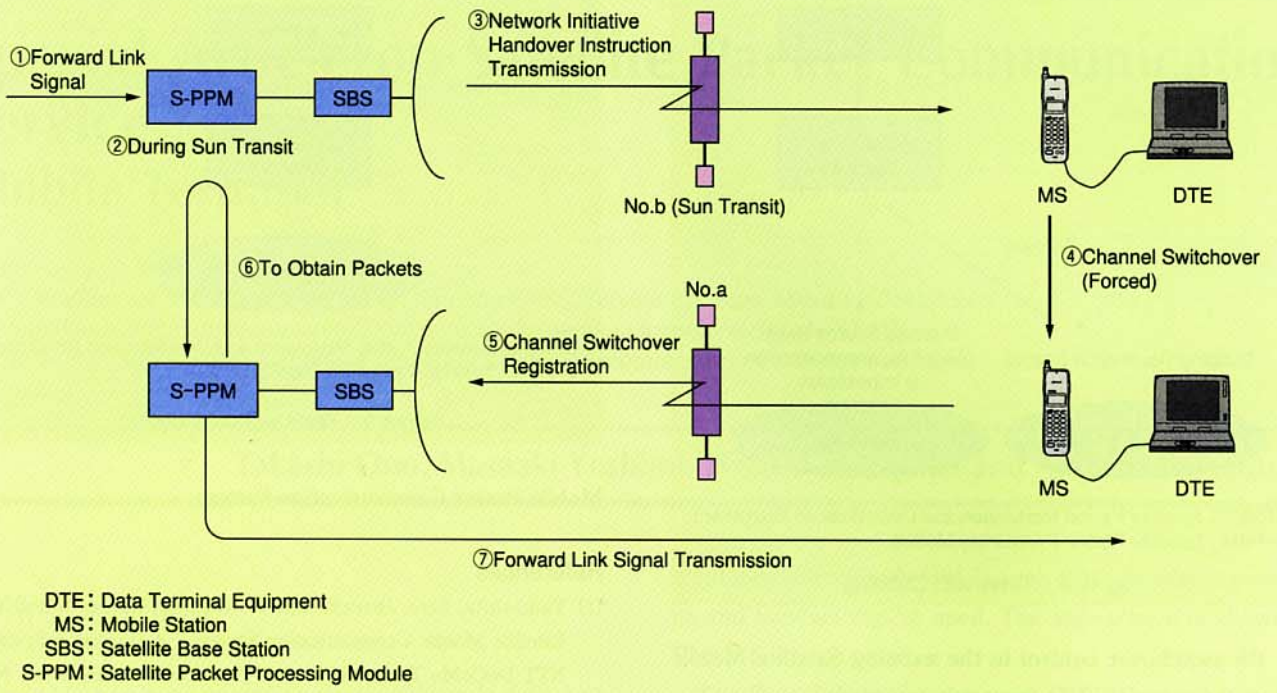


Figure 2 Sun Transit Control During Forward Link Signal Occurrence

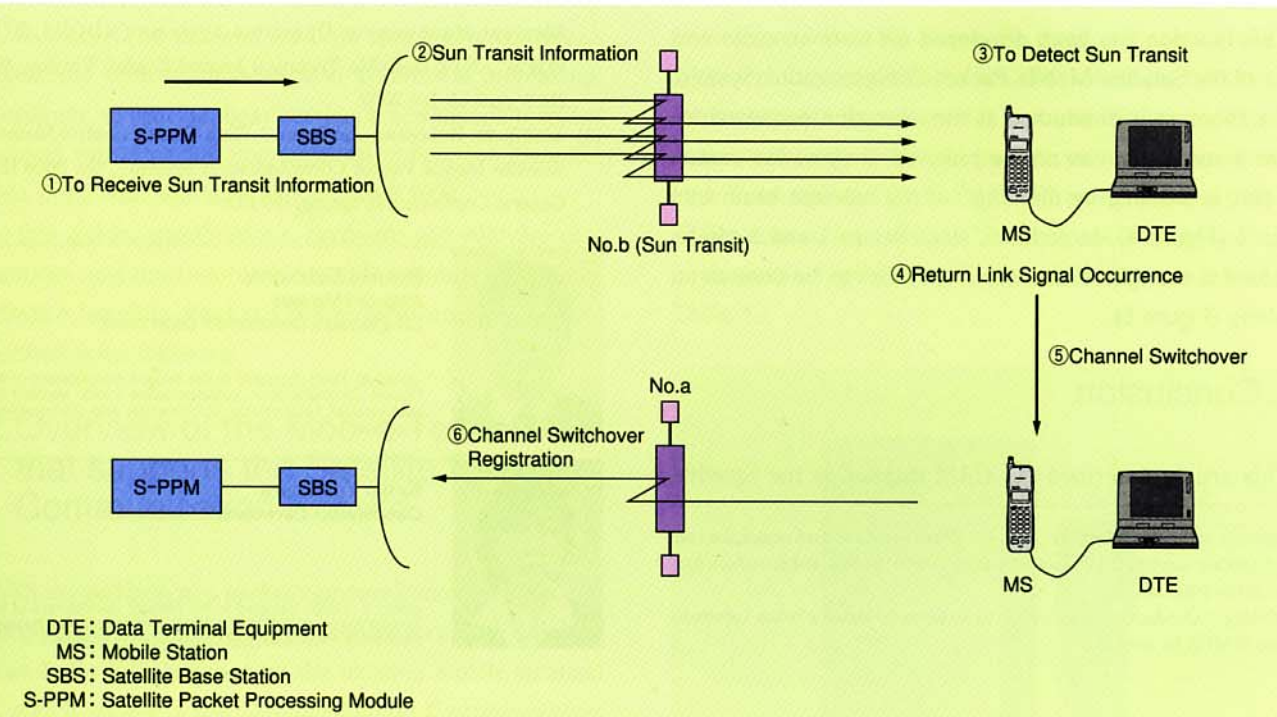


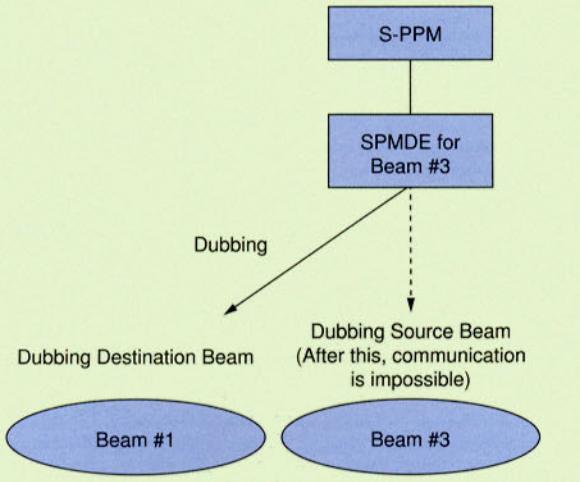
Figure 3 Sun Transit Control During Return Link Signal Occurrence

data and transferring it from satellite operation terminal to S-PPM.

3.3 Base Station (BS) Switchover Control Function

As a rule, the BS should be operated by the working system. However, the BS is switched to another by the standby system of the BS when a failure occurs at the working system of the BS. The procedure for this "BS switchover" is as follows.

① Network initiative handover control* of the MS while it continues existing packet system in the relevant BS area is conducted.



SPMDE: Satellite Packet Modulation and Demodulation Equipment
S-PPM : Satellite Packet Processing Module

Figure 4 Tests with Dubbing

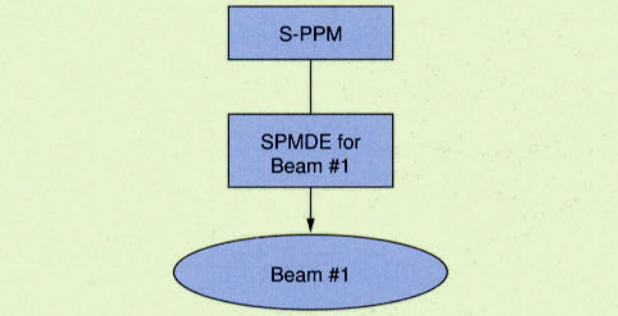
② BS switchover control in the existing Satellite Mobile Packet Communication System is executed.

3.4 Test Call Function

This function has been developed for tests on radio sections of the Satellite Mobile Packet Communication System. Since this test is conducted at the operation center, since beam 3 and 4 that can not be received at operation center, the test is possible by dubbing* of the relevant beam into beam 1 (Figure 4). In addition, since beams 1 and 2 can be received at the operation center, test calls can be done as no dubbing (Figure 5).

4. Conclusion

This article described the OAM method in the Satellite Mobile Packet Communication System.



SPMDE: Satellite Packet Modulation and Demodulation Equipment
S-PPM : Satellite Packet Processing Module

Figure 5 Tests without Dubbing

References

[1] Yamashita, Sato, Ibaraki, and Kawachi : "Feature Article on Satellite Mobile Communication System : 4 Operation System", NTT DoCoMo Technical Journal Japanese Version, Vol.4, No.2, pp.20-23, Jul.1996.

[2] Takahashi, Kato, Ishida, Sakuramoto, Mizumoto, Sekita, Mouri and Terunuma : "Feature Article on Operation System : Network Element Management Operation Systems (NDOPS, HOPS, POPS)", NTT DoCoMo Technical Journal English Version, Vol.2, No.1, pp.8-18, Jun.2000.

[3] Yoshihara, Kubosawa and Inoue : "Sun Transit Control Method in Satellite Mobile Packet Communication System", the 2000 IEICE General Conference in Spring, B-5-123.

* Network inititiative handover control : Channel information under the control of another satellite is transmitted unit by unit to the MS, and it enables handover to the other satellite.
* dubbing : Conduct communication up to beam by blowing beam 1 frequency into SPMDE for beam 3.