SAT Space Elevator communication











Proposal of PDMA (Power Division Multipla Access)







Station1

PDMA with NOMA





6

割り当てスロット





Application of NOMA

- Multiple some signals in the power domain.
- Don't implement the switching of power levels
- High throughput, but low user fairness





Application of PDMA

- Multiple some signals in the power domain.
- Implement the switching of power levels
- High throughput, and good user fairness



Application of PDMA



Space Elevator Communication

Space Elevator is one the future platforms. There are many applications employing SE. We consider it will be promising communication platform in the future. We have proposed several schemes for the SE.



Communications by Space Elevator

• In the space elevator, each station is assumed to be a communication base station for inter-station communication and station-ground communication.

 However, specific considerations for its communication have not yet been made.
Ex) What type of communication will be used.
Where each station will be located.
What level of performance will be needed.





Result of LOS rate

- The figure on the right shows LOS rate in big cities
- The next slide shows LOS rate for medium cities and small cities



Result of LOS rate





②Simulation Overview (Atmospheric Station

In case the space elevator is constructed outside of the equator1. the orbit of the space elevator was obtained2. assuming that the communication base station is installed in the atmosphere, BER characteristics were obtained.



Image of orbit when constructed outside of the equator

[4] R. Kuzuno, S. Dong, T. Okada, K. Otsuka and K. Makihara, "Dynamics and Energy Analysis of Nonequatorial Space Elevator Using Three-Dimensional Nonlinear Finite Element Method Extended to Noninertial Coordinate System

2Orbit Calculation Results



earth as the origin

In this simulation, we simulated the communication performance of a space elevator built from Okinawa, Japan, to Taiwan from an appropriate location (right figure) in order to obtain an orbit.





距離 [km]

条件	值
周波数[GHz]	2.0
設置高度[km]	88.9
距離[km]	646
EIRP[dBm]	45 - 60
熱雑音[dB]	- 95

6G Satellite Systems employing Cars and Traffic Lights relay.

Satellite Communication : 30GHz / 20GHz 5G : 28GHz / 4GHz (sub-6)



Propagations from CARS and Traffic Lights



Traffic Lights (28GHz)





Cars (28GHz)



Cars (4GHz)

DSSS-PDMA scheme for Satellite Communications







	x_1	<i>x</i> ₂	 x_8
Band	1	2	 8



DSSS-PDMA Scheme

Mobile Satellite Communication for Platooning Cars



