

### 3

\* \*\* \*\*\*

IMT-2000  
 Universal mobile telecommunication system)  
 Telecommunications Union) IMT-2000  
 Code Division Multiple Access)  
 (Terrestrial UMTS)  
 S-UMTS T-UMTS

S-UMTS(Satellite  
 S-UMTS ITU(International  
 W-CDMA(Wideband  
 T-UMTS

가 S-UMTS가



- I.
- II.
- III.
- IV.
- V.
- VI. SAT-CDMA
- VII.

\* ETRI /  
 \*\* ETRI /  
 \*\*\* ETRI /

### I.

IMT-2000 ITU  
 ETSI(European Tele-  
 communications Standards Institute)가  
 UMTS 2GHz 3  
 UMTS

2Mbps  
 384kbps  
 [1].

IMT-2000  
 RTT(Radio Transmission Technique)  
 가 IMT-2000  
 T-UMTS

MBMS(Multimedia Broadcast Multicast

Services) (Dual Mode)  
 가 가 T-UMTS  
 FDD(Frequency Division Duplex) TDD(Time Division Duplex) 가 가  
 S-UMTS TDD  
 FDD  
 [2].  
 < 1>  
 II~V S-UMTS T-  
 UMTS VI SAT-CDMA VII

< 1> Orbit characteristics overview[2]

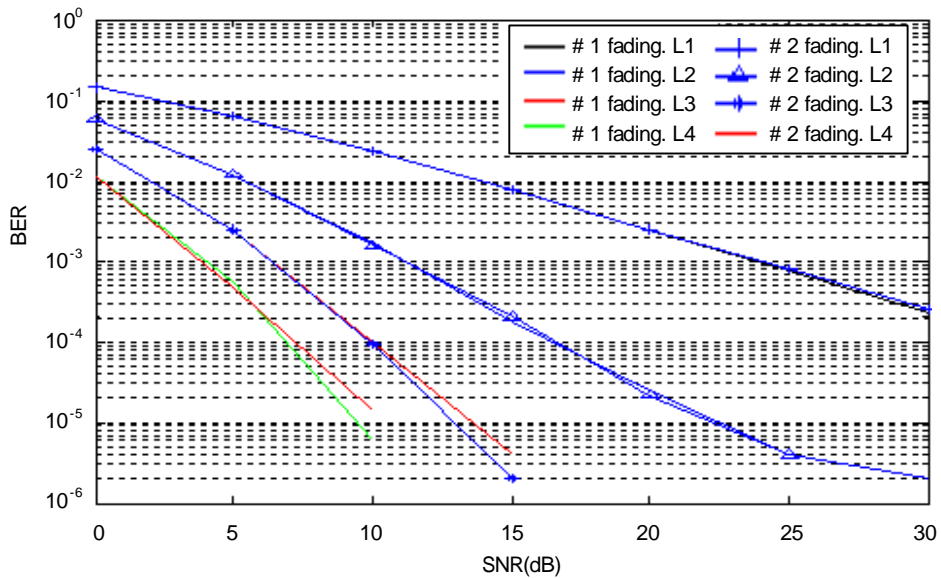
Characteristics	GSO	HEO	MEO	LEO	Remarks
Propagation delay[ms]	280	200~310	80~120	20~60	Maximum
Satellite handover during call	Unlikely	Every 4~8 hours	Every 2 hours	Every 10 minutes	Typical values
Delay jump on handover[ms]	None	12	24	4	Approx.
Doppler shift[kHz]	None	100	200	400	
Multi-path delay/delay spread in-building (echo)[ns]	200	<100	200	200	Much higher for aircraft and ships
In-call multi-path fading margin[dB]	5~10	2	5~10	10~15	
Signal/data buffer needed	No	Yes	Yes	Yes	
Protocol response timing	Fixed	Variable	Variable	Variable	
Orbit period[hours]	24	8~24	6~12	1.5	
Approx. number of gateways for global coverage	10	10	10	50	
Range of elevation angles[degrees]	>10	>40	>10	>10	
Number of satellites for near global coverage	3	5~12	10~15	>48	
Doppler jump on handover[kHz]	None	100	200	400	

II. (Propagation delay)

가 S-UMTS RTT  
 가 T-UMTS  
 LEO/MEO/GSO S-UMTS T-UMTS LOS(Line of Sight)  
 (Pico-Cellular) (Lognormal Long-Term Shadowing)  
 (Rayleigh Short-Term Multi-Path Fading)  
 S-UMTS ,  
 가 ,

[3],[4].

IMR(Intermediate Module Repeater)  
 MSS(Mobile Satellite Service)  
 T-UMTS  
 IMR IMR Feeder Link  
 LOS T-UMTS 가 RAKE  
 가 /

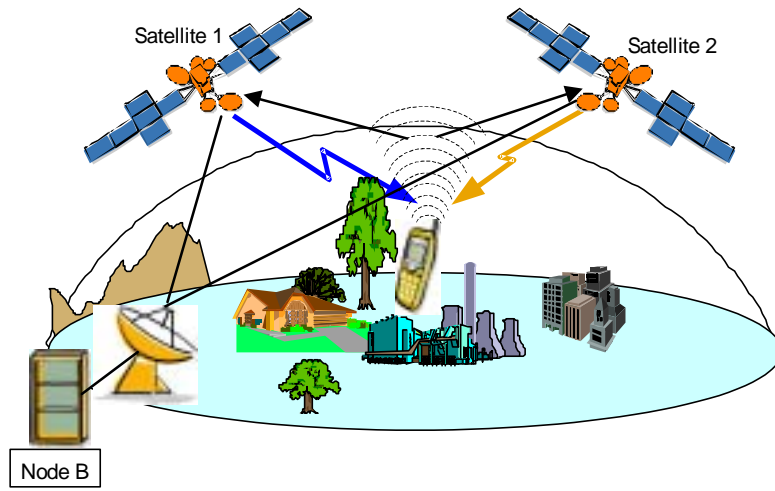


( 1) T-UMTS RAKE BER

가 .  
 가 . ( 1) T-UMTS RAKE  
 가 가 BER(Bit Error Rate) .  
 RF , S-UMTS T-UMTS LOS  
 가 . 7dB  
 15dB (Rice Factor: LOS ) 가  
 (Milder Rice( - )) [3].  
 . 240ms  
 RAKE (Threshold)  
 가 RAKE  
 . RAKE  
 (Intra-Beam) .  
 T-UMTS T-UMTS(80dB )  
 . 3~5dB  
 . RF  
 shadowing ( , , , )  
 ). , 10~20dB ,  
 [3].  
 S-UMTS  
 [3] .

III.

(Satellite diversity) , /  
 가 , ,  
 . ( 2) ,

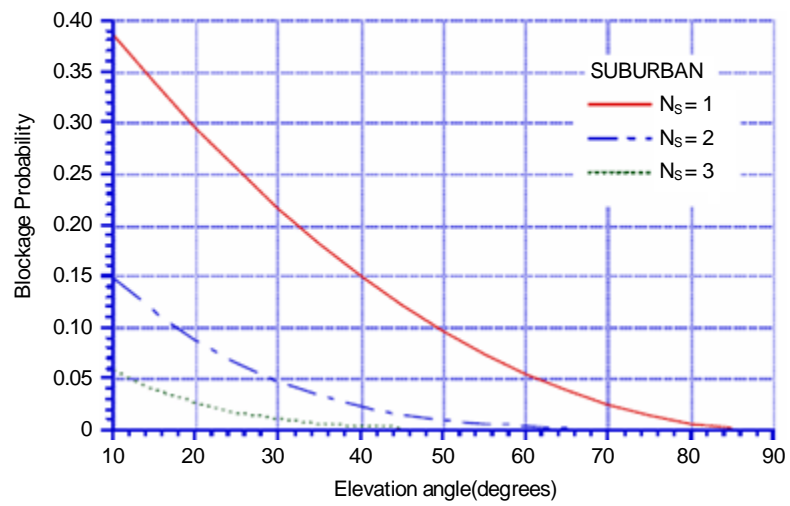


( 2) [4]

( 3)

RAKE

S-UMTS



( 3)

[2]

RAKE S-UMTS LOS T-UMTS  
 S-UMTS 가 T-UMTS  
 6 가 , S-UMTS 3  
 [4].  
 가

가 가 MRC

가 가

가

가 CDMA T-UMTS S-UMTS

가

가

(Quasi Omni-Directional Antenna) 가 UE(User Equipment)

가

가

(Deep Space Probes Ground Reception Techniques) LOS RAKE

EIRP(Effective Isotropic Radiated Power)

S-UMTS

UE

) ( > )

(Finite Size Interleaver)

가

[5].

#### IV.

S-UMTS T-UMTS 가

##### 1.

S-UMTS T-UMTS (Power Control)

PRACH(Physical Random Access CHannel) . PRACH

, UE

P-CCPCH(Primary Common Control Physical CHannel)

P-CCPCH BCH(Broadcast CHannel)

P-CCPCH

SIR(Signal to

Interference Ratio) , UE PRACH

SIR BCCH(Broadcast Control CHannel)

##### 2.

1 3GPP(3rd Generation Partnership Project) (1 TPC  
(Transmit Power Control)/slot) , 3GPP 1

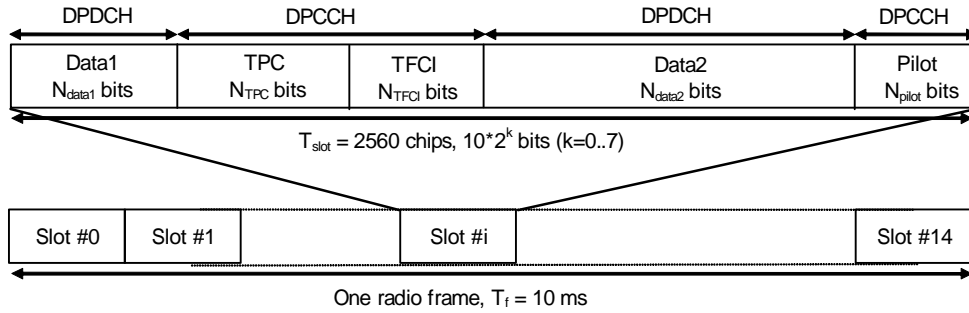
.( 4) T-UMTS DCH

T-UMTS GSO(Geo Stationary Orbit) 240ms

[3],[4]. T-UMTS 3GPP , (Fast  
Fading Correction) , 가

TPC

TPC



( 4) T-UMTS DCH [6]-[16]

( ) S-UMTS , 5

3GPP 2

가 [6]-[9].

S-UMTS

. T-UMTS

FER(Frame Error Rate)

to Noise Plus Interference Ratio) RAKE SNIR(Signal  
FER SNIR

SNIR

가

가

FER

FER

SNIR

T-UMTS

3GPP

2

S-UMTS

1) PCC(Power control command)

2) SNIR

3)

T-UMTS

4

SNIR

(III-1) [1].

$$\epsilon_0 = \text{SNIR}_{\text{meas}} - \text{SNIR}_{\text{target}} \quad (\text{dB}) \quad (1)$$

,  $\text{SNIR}_{\text{meas}}$  SNIR ,  $\text{SNIR}_{\text{target}}$  FER  
SNIR SNIR 4



.....

$\Delta_1^{PC}$  : (Small power - control steps)

$\Delta_2^{PC}$  : (Large power - control steps)

$N_1^{UP}$  : ( $N_d$ )

$N_2^{UP}$  : ( $N_d$ )

$N_1^{DW}$  : ( $N_d$ )

$N_2^{DW}$  : ( $N_d$ )

(error threshold) (dB) , SNIR  $(\Delta_2^{PC})$  , (III-2)

$$\varepsilon_c = \varepsilon_0 + (N_1^{UP} - N_1^{DW})\Delta_1^{PC} + (N_2^{UP} - N_2^{DW})\Delta_2^{PC} \quad (2)$$

, 가 [1],[9],[15],[16].

i)  $|\varepsilon_c| < \varepsilon_0$  ,  $\varepsilon_0 < 0$  ,  $\Delta_1^{PC}$  .

ii)  $|\varepsilon_c| < \varepsilon_0$  ,  $\varepsilon_0 > 0$  ,  $\Delta_1^{PC}$  .

iii)  $|\varepsilon_c| > \varepsilon_0$  ,  $\varepsilon_0 < 0$  ,  $\Delta_2^{PC}$  .

iv)  $|\varepsilon_c| > \varepsilon_0$  ,  $\varepsilon_0 > 0$  ,  $\Delta_2^{PC}$  .

, 3  $(\Delta_2^{PC})=0$

, 2  $\varepsilon_I = \infty$

T-UMTS SNIR

(1) ,  $G_{dw}$  SNIR .

(2) ,  $N_d$  SNIR

(3) 가 , 0 ,  $G_{dw}$

SNIR 가 .

UE B(Node B) ( 2) 3GPP

TPC S-

UMTS

가 ,

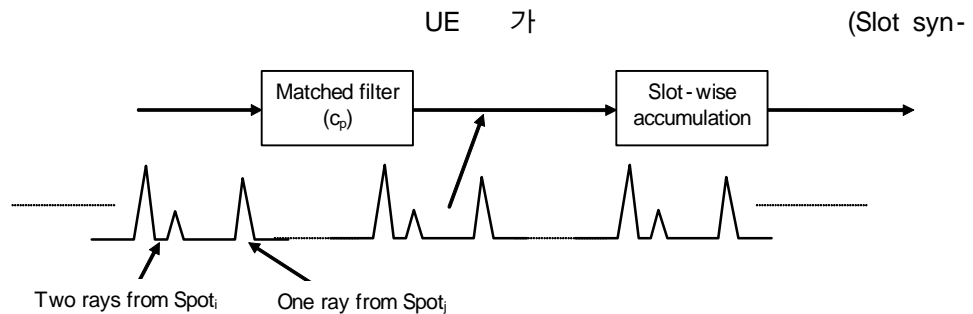
TPC

T-UMTS RRC(Radio Resource Control)가  
 DPC\_MODE [10]. TPC 가 RRC  
 3GPP [0(  
 TPC), 1( TPC )]. 15  
 15 TPC  
 1 TPC (Power  
 oscillation) TPC TPC  
 TPC  
 DPCH(Dedicated Physical Channel) SF(Spreading Factor)=256  
 10%

V.

(Cell Search) S-UMTS T-UMTS P-  
 CCPCH, P-SCH(Primary synchronization) S-SCH(Secondary synchronization)  
 S-UMTS SCH P-CCPCH (Long  
 Scramble Code)가 T-UMTS  
 가 [1].  
 (Spot) UE 가  
 S-UMTS [4],[17].

1.1 :



( 5) Matched-filter search for primary synchronization code

chronization) P-SCH .  
PSC(Primary synchronization code) Cp MF(Matched filter) 가 .  
MF ( ) UE  
(Peak) . ( 5) .

## 2.2 : (Frame synchronization/code-group identification)

, UE SSC(Secondary synchronization  
code) , 가  
SSC SSC (Correlation) .  
PSC SSC SSC

## 3 : (Scrambling-code identification)

, UE (Primary scrambling  
code) . CPICH  
, P-CCPCH , (Super-frame synchronization)  
BCCH .

## VI. SAT-CDMA

IMT-2000 RTT TTA  
SAT-CDMA RACH , CPCH  
T/S-UMTS 가 .  
RACH SAT-CDMA T-UMTS < 2>  
T-UMTS CPCH UE RACH  
(AP) . UE 가 RAN(Radio access network) UE  
CDP(Collision detection preamble) . UE RAN  
CPCH .

< 2> RACH

	T-UMTS RACH	SAT-CDMA RACH
	Slotted ALOHA with fast acquisition indication	ALOHA with fast acquisition indication
(UE)	: $5 \times 2,560$ chips	: $2 \times 3,840$ chips
		$N_p$ ( )
	(16 ) 256	: (16 ) 256
	: 4,096chips	: $4,096 \times N_p$ chips

SAT-CDMA , UE RAN  
AP

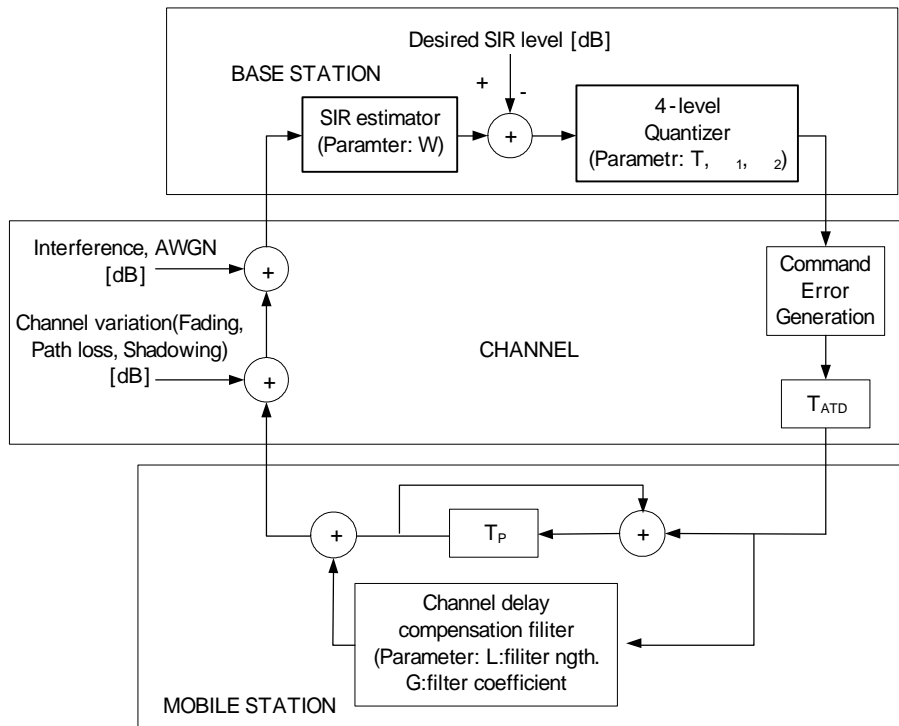
CDP

. RAN

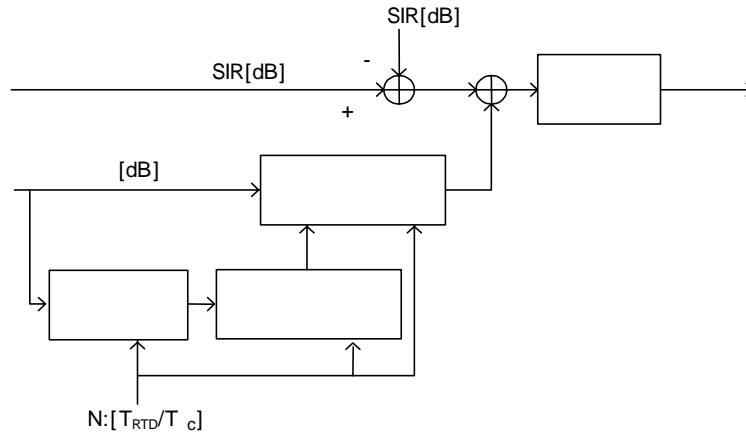
가

SAT-CDMA

. ( 6)



( 6)



( 7)

[18].  $T_{RTD}$

$T_{RTD}$   
 . ( 7)  
 (CPICH)

[19].

## VII.

S-UMTS 3 T-UMTS  
 , T-UMTS S-UMTS  
 IMT-2000  
 T-UMTS S-UMTS T-UMTS  
 가 S-UMTS 가  
 T-UMTS MUD(Multi-User Detection), (Channel  
 estimation algorithm) (Advanced receiver) SAT-CDMA  
 RACH

&lt; &gt;

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