

(**ITU- R** **1** **1999**)

:

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1. :
2. : 1999.1.1 1999.12.31
3. :
- 4.
- 가.

[illegible]

- - o ITU- R
 - FM
 -
 - 3 (47/1. 65/1, 209/1)
 - 1
 - o SG1
 -
 - 1
 - 1
 - SG1 8 1
 - o
 - WRC- 2000 7 :
 - , ,
 - APG 2 , 3
 - 가
 - WRC (CPM)
 - 가 ,

5.

가.

- 1) FM
 - 2) ITU- R
 - 3)
 - 4) ()
- ITU- R SG1
- 1) 3
-
- 1) 2 , 3 APG- 2000 6
 - 2) WRC (CPM) 5

6.

가. (WRC)

. ITU- R

SG1

.
가

7.

가.

- 1) PC 1 CD- RW
- 2) 1
- 3) HP LJ8000N 1

- .
- 1) ITU- R WRC
INTERNET
 - 2) WRC
 - 3)

8.

가.

- 1)
o APP28

o 가

- 2) ITU- R 1 2000
o
o
o
o

SUMMARY

As developments of radiocommunications, radio spectrum, which is the one of main issues of ITU-R becomes very congested and difficult to manage. Because Radio Regulation and Recommendations of ITU-R revised at WRC affect international spectrum management, its changes has been interested with Administrators. In 1999, questions of ITU-R study groups and agendas of WRC-2000 on international or national spectrum management were studied by Korean Committee. In this paper, introduction to ITU-R and summaries of its studies were described as well as introduction to Korean Committee.

1

2 ITU- R SG1

1 ITU- R

2 ITU- R SG1

3 . ITU- R

1 ITU- R (ITU- R 1)

2 WRC- 2000

4 TG 1/6

1 ()

2

5 ()

1

2

3

4 (1) - -

5 (2) - 3.4- 40.5 GHz

6

< 1>

< 2>

1

1990 , (),
(PCS) (TRS) 가
 . , 가 가 ,
 , 가 .
 가
 ,
(IMT - 2000) , 가
 ,
 .
(ITU- R: International Telecommunication Union
Radiocommunication Sector)
 . ITU- R ,
가
ITU (RR:
Radio Regulation)
 . IT U - R
가 . , ITU- R
 , , .
ITU- R
 ,
ITU- R
ITU- R
ITU- R
' ITU- R ' 1999 1

ITU- R

ITU- R

ITU- R

1

1999

ITU- R

(SG: Study Group)1

TG 1/6

2 ITU-R SG1

1 ITU-R

1.

(ITU) 3
(ITU-R) .
,
가 ,
가
. 1906
(IRTC: International Radio Telegraph Conference)가
, 1927 ITU-R CCIR(International
Radio Communication Committee)

ITU ,
CCIR
(CCITT: International Telegraph and Telephone Consultative
Committee) (Radiocommunication
Sector) .

2.

ITU 가 .
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3.

ITU-R ITU

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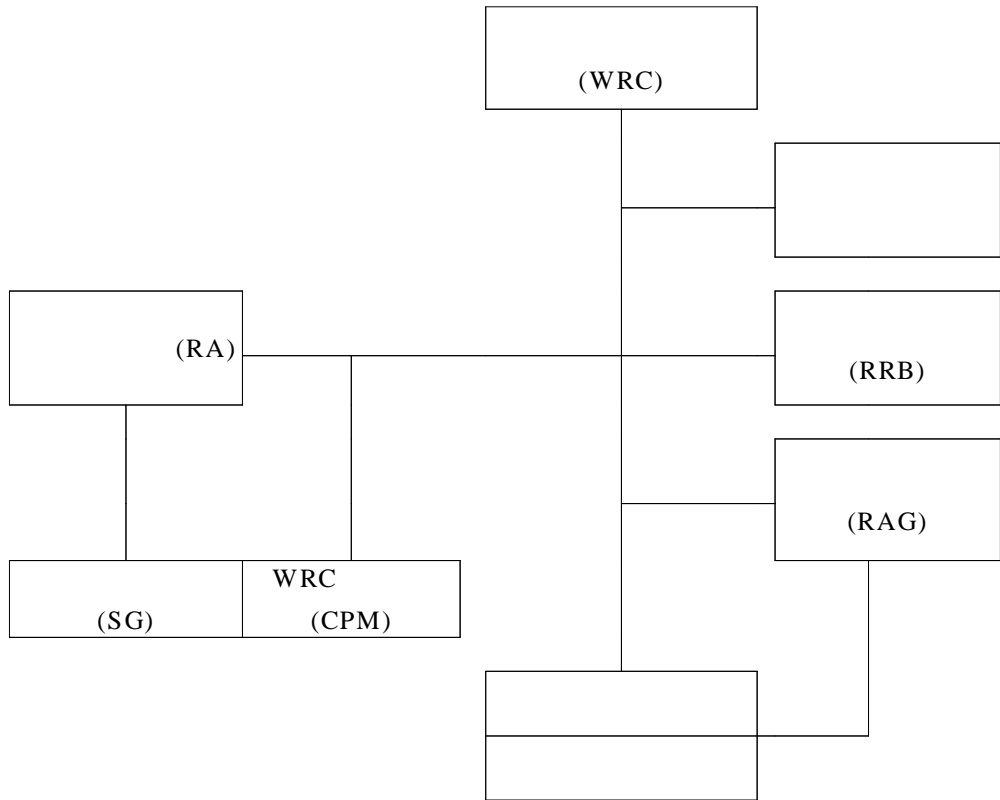
ITU-R .

가. **(WRC: World Radiocommunication Conference)**
(WRC: World Radiocommunication Conference)

2 . WRC

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-
-



1. ITU-R

4

2

ITU

가

,
가

(RA: Radiocommunication Assembly)

WRC

, .
 2 ITU-R
 WRC . RA
 WRC WRC
 .
 RA .
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 - , 가
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 - WRC
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 - WRC WRC
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(RRB: Radio Regulation Board)
 ITU-R
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 , . RRB
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-

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가

가

RRB

가

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WRC

RA

가

가

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가

가

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가

가

가

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4

가

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2/3

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가

2/3

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(RAG: Radiocommunication Advisory Group)

,

(1994)

. RAG

가

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,

RA

가

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RAG

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- RA, SG, CPM

-

- RRB

ITU- R

- , ,

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-

. WRC (CPM: Conference Preparatory Meeting)

CPM WRC

WRC 2 .

WRC 1 2 WRC CPM

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WRC 6 WRC

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. (BR: Radiocommunication Bureau)

ITU-R , .

, WRC, RA SG

. (RR: Radio Regulation) 가

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- 가 .
- ,
- .
- , ITU-R
- , , .

2 ITU-R SG1

ITU-R SG RA .

SG RA ,

() . () RA , RA가

RA

. SG .

1.

SG			
1		()	(SG1)
3		WP3J	
		WP3K	- -
		WP3L	
		WP3M	- - -
4		WP4A	/
		WP4B	, , 가
		WP4SNG	
		JWP4- 9S	
		JTG4- 9- 11	, FSS, BSS ,
7		WP7A	
		WP7B	
		WP7C	
		WP7D	
8	, ,	WP8A	IMT - 2000 ,
		WP8B	GMDSS ,
		WP8D	
		WP8F	(IMT - 2000)
9		WP9A	가 ,
		WP9B	, ,
		WP9C	HF
		WP9D	
		JRG 7D- 9D	
		JRG 8A- 9B	LAN
		JRG 9D/10- 11S	FS BSS()

2. ()

SG			
10	-	WP10A	30 MHz
		WP10B	30 MHz
		WP10C	
		JWP10- 11Q	SG10 11 (SG11)
		JWP10- 11R	
		JWP10- 11S	
		JTG10- 11	
		TG10/6	30 MHz
11	- TV	WP11A	TV
		WP11B	TV()
		WP11C	TV()
		JWP10- 11Q	가
		JWP10- 11R	
		JWP10- 11S	
		JTG10- 11	가
		TG11/5	TV
SCRPM	/		
CCV			

1. ITU- R SG1

ITU- R SG1(SG1)
ITU- R (RR) SM ()
.

2.

ITU- R 5 (Study Group)
SG1(Study Group 1) , ,
ITU- R (Radio Regulations)
() . SG1 31
WP(Working Party)1A, WP1B, WP1C, TG(Task Group) 1/5
, TG 1/6 . , 3
(WP : Working Party) 3 (TG : Task Group)

, Mr. R. MAYHER()가 , WP 1A Mr. T. JEACOCK(), WP1B Mr. A. PAVLIOUK(), WP1C Mr. N. KISRAWI ()가 .

2. Study Group 1

WP1A

. WP 1B

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. WP 1C

WP 1C

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FM

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. TG 1/5

TG 1/5

ITU-R

SM. 328

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. TG 1/6

TG 1/6

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TG 1/6

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1 ITU- R (ITU- R 1)

1. ITU- R

ITU- R 가 1990

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가

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ITU- R

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ITU- R

’가

1999

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가.

(ITU- R SG)

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가, ITU- R SG

(),

가

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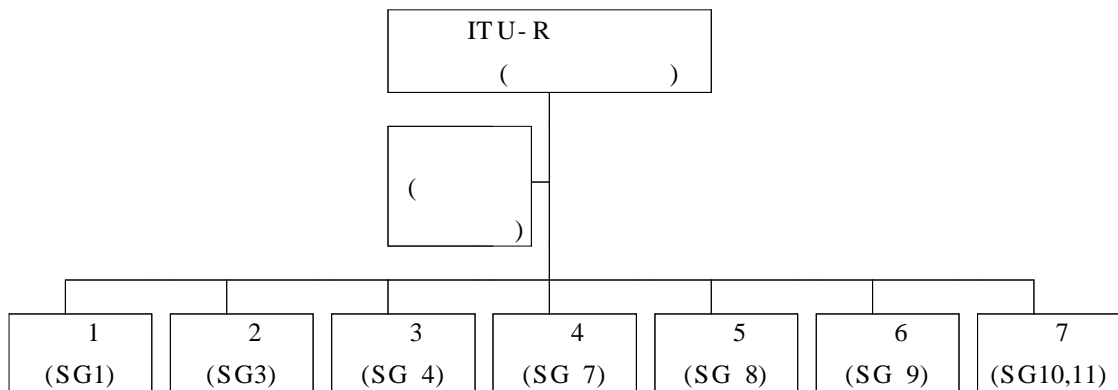
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,

()

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2. 1 (SG1)

SG1 34 (1999 가
) 1 ,
, ITU-R
1 , 2 3
(1 : , 2 :
, 3 : ,
ITU-R , .)

가.

			WP
44- 1/1	가	S3	WP1A
47/1		S2	WP1B
65/1		S1	WP1A
66/1		S3	WP1B
201/1		S2	WP1A
203/1		S2	WP1A
205- 1/1		S2	WP1A
206/1	가	S1	WP1B
207/1	가	S1	WP1B
208/1	가	S1	WP1B
209/1		S1	WP1A
212/1		C1	TG1/6

.

			WP
45- 4/1		S2	WP1B
54- 1/1		C2	WP1A
60- 1/1		S2	WP1A
71- 1/1		S2	WP1B
80- 1/1		S2	WP1B
204- 1/1	MF/HF	S2	WP1A
210/1		S3	WP1A
211/1	(WRC- 20007)	C2	TG1/5
213/1	,	S2	WP1A

			WP
22- 2/1		S2	WP1C
26- 3/1		S2	WP1C
28- 3/1		S2	WP1C
29- 4/1		S2	WP1C
32- 4/1		S2	WP1C
34- 3/1		S2	WP1C
67/1	FM	S2	WP1C
202/1		S2	WP1C
214/1		S2	WP1C
215/1	가	S2	WP1C

2 WRC- 2000

2 WRC SG

ITU- R . 1 SG1

7 WRC

. 1

WRC .

1. 1.1 : (S5)

가.

o WRC- 97 (S5)

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o

: S5.176, S5.183, S5.186, S5.192, S5.221, S5.418,
S5.453, S5.477, S5.483, S5.500, S5.505, S5.524, S5.542 13

2. 1.2 : RR S3()

가.

- o WRC- 97 S3
WRC- 2000 ()

- o ITU- R SG1 TG1/5

- o CEPT
가

3. 1.7 : HF (Res. 346)

가.

- o 1999 2 1 GMDSS
HF

GMDSS 가

- o ,

- o APT 32

GMDSS

가

S32.13 : VHF/HF DSC

S32.31 : HF DSC

4. 1.8 : 3,700~4,200 MHz 5,925~6,425 MHz
FSS

가.

o 3700- 4200MHz 5925- 6425MHz FS FSS

o FSS FS 가

. SC

o SC- 2

o CEPT(ERC Project Team 1)가

SC- 2

o 3700- 4200MHz 5925- 6425MHz S1.29

1

S9.17 S9.18

o

S9.11 S9.14

o S9.11 S9.14

가

o , pdf ,

, (km)

o RR 가

o

가 UNCLOS(;United

Nations Convention on the Law of the Sea) S18 S19

o , ,

o S9.17 S9.18

o , Xkm(WRC
) UNCLOS S18

가

o MSS , WP4- 9S

가 .

5. 2 :

가.

o WRC- 95

ITU- R ITU- T 27 28

o ,
가 27

. SC

o SC BR(Radiocommunication Bureau) 1

o ITU- R RR 가

o ITU- R M.1170 ITU- R M.1171 RR

가 .
o 가

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.
o BR 98 12 SC

가 .

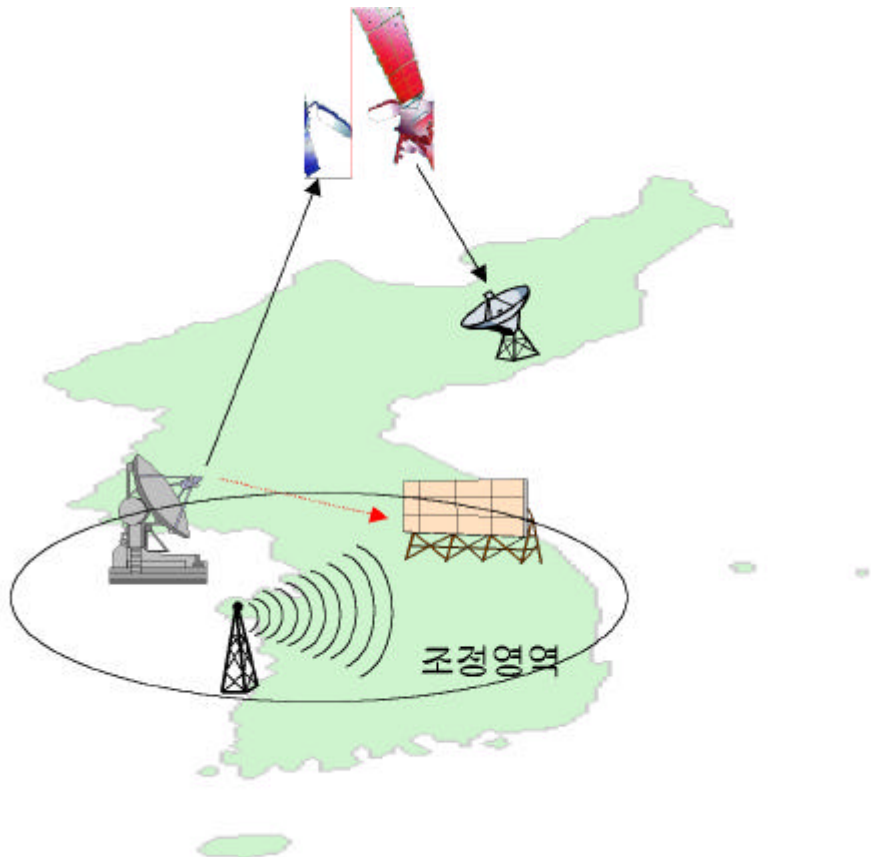
o 가

.

4 TG 1/6

1 ()

1.



4.

가 ,
 가 가
 ITU- R (RR)
 ITU- R (RR) S7
 . TG 1/6
 SG1 .

. TG 1/6 100 MHz
 105 GHz ,
 ,
 GSO(GSO: Geostationary Satellite Orbit, ‘GSO’ ‘ ,
) ,
 GSO ,
 ,
 ,
 .

2. TG 1/6

(RR) S7
 . 가
 .
 BR
 .
 . 100 MHz 105 GHz
 .
 .
 .
 . GSO
 .
 .
 .
 ,
 . ()
 가 . (TIG: Time Invariant Gain)

가 가 .

,

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3. TG 1/6 ,

TG 1/6

,

.

- 1
() S7
- 2
() S7
- 3
() S7
- 4
() S7 ()
- 5
()
S7 , S5
S7
() S7
.
- WRC , ITU- R IS.847- 1, IS.848- 1 , IS.849- 1
4
- S5 ITU- R IS.847- 1, IS.848- 1 , IS.849- 1
(가 S7 S7)가
- 60(WARC- 79) S7

. (WRC S7
 .)
 가
 - S21 1 GHz 가
 .
 - (

3.

S1.171	가	가 ,
S1.173	가	가 ,

- S4 가 가 .
 , TG 1/6

4. TG 1/6

WRC- 2000 TG 1/6 .

· ()

()

· 1% VHF/UHF

·

가

,

S7 .

2

ITU- R (RR)

. (1997)

1. S9.29

RR S9.15~S9.19()

S4 .

2. S9.30

RR S9.7~S14 & S9.21()

S4 .

3. S9.32

RR S9.7~S14 S4

.

4. S9.32A

RR S9.15~S9.19

S4

.

5. S9.33

가 S9.29

가

ITU

.

6. S9.45

S9.29

30

,

30

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7. S9.46

S9.45

15

ITU

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8. S9.47

ITU

.

9. S9.48

S9.47

10. S9.49

가

.

11. S9.50

S9.7~S9.21 S9.41()

12. S9.51

S9.7~S9.9

4 S9.52

.

13. S9.51A

S9.15~S9.19

4 , S9.52

.

14. S9.60

S9.7~S9.9 S9.15~S9.19 4 S9.51

S9.51A 가

.

15. S11.2

ITU-R (RR) 가

, 가 ITU-R .

5 ()

1

1.

가

· ,

$p\%$

“ ”

·

$p\%$

·

(1)

:

$$Lk(p) = Pt + Gt + Gr - Pr(p) \quad \text{dB} \quad (1)$$

:

$Lk(p)$: $p\%$ (1) (dB); $p\%$

(1)

·

Pt :

가

(dBW)

$Pr(p)$:

$p\%$

(dB)

가

·

Gt :

(

dB).

,

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,

·

Gr.

(dB). , ;
 , .

(2)

(가

() TG 1/6 .)

가

가

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(가) .

(2)

. (2) 1 :

$$L (p) = P t - P r (p) \quad \text{dB} \quad (2)$$

:

$L (p)$: $p\%$ (2) (dB); $p\%$

(2)

.

,

$$P t - P r (p)$$

- () $Lb(p) - P r (p)$.

TG 1/6

1

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5 2 2

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, (1)

5 3

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(, ,) ,
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()

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가

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가

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가

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가

가

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((1))

()

가

가

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((2))

4.4

가

가

(d_{min} km)

가

(s km)

(1 km

가

)

2.

가

가.

가

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(RR)

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(

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/

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가

가

가

가 . 5

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5 2 1

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2.1 가

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2.1.1 가 .

가 가

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, (2)

가

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(2)

(1)

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(1)

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(2)

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(2) 2.1

(1) 2.2 -

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가 가 ,
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가 ,
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3

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가

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가

(4.3)

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3.

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:

(100- 150 km) “ ”

•

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:

, (500 km

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가

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“ - ”

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“ ”

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-

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가

-

(500 km)

“ - ”

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:

/

가

가 .

- : -

가

.

2가 :

- (1): (, /) .

-

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- (2): -

,

,

5 2 3

,

.

가. (1)

(1) , 가

.

- 0.1 GHz 0.79 GHz VHF/UHF

1% 50% .

- 0.79 GHz 60 GHz 0.001% 50%

: , /

- 60 GHz 105 GHz 0.001% 50%

: 가

TG 1/6 1

I § 1 .

, 0.1 GHz 105.0 GHz

가

.

(1) , 4 -

.

.

- A1 : , B C ()

100m , 가 가

B C 50 km ; 100m

가 , (300 feet)가

. 50% ,

100m 가 90% 7800 km²

A1 .

- A2 : A1

- B : Meiterranean , 30 “

가 ” , “ ”

7800 km² 가

90%

100m 가

.

- C : Meiterranean , 30

“ 가 ” ,

.

(2)

(2) ,

. 1 GHz , 40.5 GHz

. 1 GHz

, 40.5 GHz (

)

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- 가 가

.

가 .

(20%)

() ()

), .

,

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(0.001% 1%

)

() .

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,

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가 . 가

(, /)가 가

.

가

.

, ()

가 .

가 .

1)

가

.

,

(*dmin*) .

5 4 2 .

(1) (2) .

2)

(1) (2) (*dmx1 dmx2*) .

(1)(*dmx1*) [5 4 3]

(2)(*dmx2*) TG 1/6

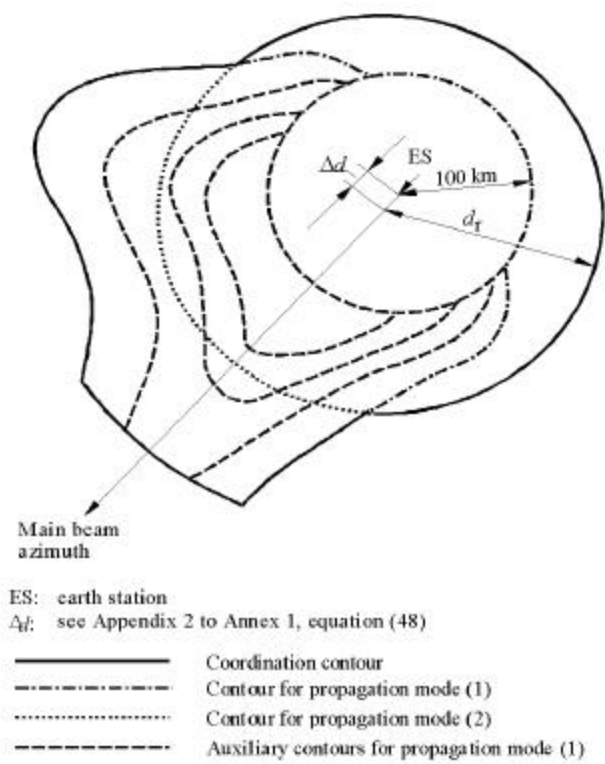
I II § 3 .

4.

()

가

5



5.

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(1)

(2)

$d1$

$d2$

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(1)

(2)

가. 가

()

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가 , 가
가

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() 가 가

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1/6 2 1 2 . 가

(5

1 4.) 가 .

가

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e.i.r.p가

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가 .

가

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(1)

(5 4 4)

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(1)

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(2)

(1)

가

가 .

(2)

e.i.r.p

(

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, 가 .

가

.

(가) .

1)

(1)

(1)

5 4 4

18

5, 10, 15, 20

dB (1) e.i.r.p가 TG 1/6
 . (1)
 2 1 2 가

2) (2)
 (2)
 가
 , (2) - ,
 . ,
 가 . ([]
) (2)
 TG 1/6 1 V

·
 (2) 2 , 5 , 10 , 20 30
 (가) .
 ,
 . TG 1/6 1
 V 3 .

5.
 가.

·
 ,
 가 .
 .
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 [10 GHz

, .]
 [가
 가 가
 가
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 가
 . 가
 . , (1)
 가
 (2) 가
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2

, -
 가 . -
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1.

Gt Gr 가 , (1)
 $Pr (p)$ p .
 ,
 .
 / - 가 ,
 가 . ,
 24 8 .

, ,
 ,
 (TG 1/6 1 III
) 가 .
 , 가 .
 , 가
 -
 , 가 . - ()
 ()
 , .

가. (1)

(1)

가

가 . (1) 5 1 1
 ((1) Lb(p) dB (1)
) $dI(km)$.

$$Lb(p) = Pt + Ge + Gx - Pr(p) \text{ dB} \quad (3)$$

:

$$Pt - Pr(p) \quad 5 \quad 1 \quad 1$$

$$Ge: \quad Gt \quad Gr$$

(dBi) .

Gx: 가 . TG 1/6

$$2 \quad 1 \quad 2 \quad Gx$$

$$(1) \quad 5 \quad 4 \quad , \quad 5 \quad 4 \quad 4$$

P_t 가 (1) (2) (5 1
 5) 가 .
 . (2)
 (2)
 .
 ()
 . (2)
 .
 (2) d
 .
 가 가 .
 (2) (2)
 (2) $L(p)$) .
 가 ,
 가 - ()
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 ,
 가 가 -
 .
 . 가
 가 가 .
 (2) 5 5 .

2. -

-
 ,
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 :
 가

- - (TIG: Time Invariant Gain) ,

-

TIG 가 .

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TIG 가 가

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. TIG

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TG 1/6

1

VI

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, 가 $Pr (p)$

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가 .

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가

가 가

$$\begin{array}{c}
 \text{IV} \\
 1 \quad \text{III} \\
 , \quad 5 \quad 4 \quad (1) \quad 5 \\
 4 \quad 4
 \end{array}$$

가. (TIG)

TIG

$$(1) \quad 5 \quad 2 \quad 1 \quad 1$$

$$\begin{aligned}
 G_e &= G_{max} & \text{for} & \quad (G_{max} - G_{min}) \leq 20 \text{ dB} \\
 G_e &= G_{min} + 20 & \text{for} & \quad 20 \text{ dB} < (G_{max} - G_{min}) < 30 \text{ dB} \\
 G_e &= G_{max} - 10 & \text{for} & \quad (G_{max} - G_{min}) \geq 30 \text{ dB}
 \end{aligned}$$

:

$$Ge \quad (3) \quad Gt \quad Gr$$

,
(dBi)

$$G_{max}, G_{min}, \quad (dBi)$$

(dBi).

.

-

.

$$(1) \quad (3)$$

:

$$Lk(p') - Ge(pi) = Pt + Ge - Pr(p) \text{ dB} \quad (4)$$

:

$$Pt, Pr(p): \quad 5 \quad 1 \quad 1 \quad p$$

가 $Pr(p)$;

$Ge(pi): p\%$ (dB)

$Lb(p'): p'\%$ (1) (dB);

$p'\%$ (1)

.

$pi \quad p':$:

$p(Ge \quad Gei) = pi$

$p(Lb \quad Lbi) = p'$

$Lb \quad Gt$ 가 ,

(, $Pr(p)$ p) $p' \quad pi$ $\{Pt + Gx -$

$Pr(p)\}$:

$p \quad (Lb \quad Ge \quad Lbi \quad Gei) = p'pi$ (5)

$p = p'pi$ $p' \quad pi$, (4) Lb

Ge .

, $p\%$ Gei

Gei . , $Gei \quad pi$. (4)

:

$Lbi(p') = Pt + Gei(pi) + Gx - Pr(p) \quad dB$ (6)

$Lbi(p')$ Gei

. $Lbi(p')$,

가 .

:

1) TG 1/6 1 IV

-

(cdf: cumulative distribution function) .

.

2) cdf , ($Gemin$) ($Gemax$)

. 가 s (dB)

$\{Gemin, Gemin + s, Gemin + 2s, ..., Gemax\}$. $s = 0.1 \quad 0.5 \quad dB$

- 3) G_{ei} , p_i . p_i
 G_{ei} .
- 4) $p_i(p/p_i = 0 \quad p/p_i = 100\%$.)
 (1) $p' = p/p_i$.
 $p/p_i \geq 100\%$,
 . , 0 $Z\%$ p'
 , :
 $p' = p/p_i$ $p/p_i = Z\%$
 $p' = Z$ $p/p_i = Z\%$
 Z [50%] .
- 5) (1) :
- 6) 5 4 , $d_i(\text{km})$.
- 7) G_{min} G_{max} G_{ei} 3- 6
 . 6 $d_i(\text{km})$,
 .
- 8) $d(\text{km})$ 가 (d_{min})
 (d_{max}) :
 $d(\text{km}) = d_{min}$.
 $d(\text{km}) = d_{max}$.
 d_{min} d_{max} 5 4 .
- 9) 1- 8 . , 5
 가 .

- , (-) , - 가 .

Pt 5 1 1 . (1) $Pr (p)$

TG 1/6 2 3 .

Lb(P)

, 가

5 4 5 5

(1) (2)

TG 1/6 2 3 ()

- . ,

- . 4

() . 가

4.

-	-	Gt Gr		
GSO	GSO	3 1	1	“GSO ”
	GSO	3 2. 가	1	“ GSO ”
	GSO GSO	3 1 3 2. 가	2	“GSO ” “ GSO ”
NGSO	GSO	3 2.	1	“GSO ”
	GSO	3 2.	1	“ GSO ”
	GSO GSO	3 2. 3 2.	2	“GSO ” “ GSO ”

1. GSO

(Gt) TG 1/6 1
 III
 (Gr) 5 3 1
 .
 가. (1)
 가 ,
 ,
 () 가
 가 . , 가 가 :
 ;
 가 0
 가
 (1) ,
 (,
 ,) .
 ,
 (+/- 180) 가
 .
 5 2 1
 Gr :
 -
 .
 - 가
 , Gr ,
 TG 1/6 1 III 2
 가 .
 가
 ,
 ,

0 ° 가 . 가
 가
 2 dB 가

() Gr :
 1) TG 1/6 2 3
 (s)

(b)
 (s) :

$$\delta_b = \arccos \left(\frac{\sin \left(\varepsilon_s + \arcsin \left(\frac{\cos(\varepsilon_s)}{K} \right) \right)}{\cos(\zeta)} \right) \tag{7}$$

가

K 6.62

2) () ,
 :

a) ' .

b) ' : TG 1/6
 1 3 § 2 (')

(') 가
 1 - b +

b ;

c) '

$$Gr(\text{'})=Ga(\text{'})$$

$$Ge \quad TG \ 1/6 \quad 2 \quad 3$$

$$5 \quad 4$$

(2)

(2)

(2)

(, ,)

(hR)

(t) (t)

가

hR

$dt(\text{km})$

$$d_i = 8500 \left(\sqrt{\tan^2 \varepsilon_i + h_R / 4250} - \tan \varepsilon_i \right) \quad \text{km} \quad (8)$$

hR 2 (II- 13) (II- 14)

t dt

$dmax$

:

$$dmax = 130.4 \sqrt{h_R} \text{ km or } dmin$$

$dmax \geq dmin$

$dmin$

TG 1/6 2 3

s 가 GSO :

$$\zeta_{\max} = \arccos \left[\frac{\cos(\varepsilon_s)}{K} \right] - \varepsilon_s \quad (9)$$

가 max ,

가 - max - 71 ,

$dmin$.

1 : s

(7) b .

2 : - :

$$\psi = \arccos(\cos \zeta \cos \delta_b)$$

3 :

$$\alpha_{w1} = \arccos \left[\frac{\tan \zeta}{\tan \psi} \right]$$

그리고

$$\alpha_{w2} = 360 - \alpha_{w1}$$

4 : t

dt .

5 : n_2 wl dmx

dmx

3° . 6° 가

6 : $dmin$

가 ,

가 .

6° , ,
()

TG 1/6 VII 5

. (- 가

.)

2. -

-

가 가

5 1 2 .

가 . 5 2 2 TIG
 “ ” .

-

5 3 ;
 가 .

가. -

-

(*Gt*) TG 1/6 1 III
 . (*Gr*)
 , 가
 가 TIG (5 2 2
) .

. TG 1/6 2 3
 ,
Ge . *Ge*
 (1) *Gr* .
 , 0 ° 가 .

.

-

-
 ,
 (*Gt*) 5 2 2 .
 (*Gr*) 5 3

. -
 -
 (Gt) 5 2 2
 . (Gr) 5
 3 2 .

4 (1) - -

(1) , 가
 . 0.1 GHz 0.79 GHz VHF/UHF
 . 0.79 GHz
 60 GHz , /
 . 105 GHz - 가
 가
 (TG 1/6 1
 I § 1) , (1)
 :
 - 0.1 GHz 0.79 GHz I § 2
 ;
 - 0.79 GHz 60 GHz I § 3
 ;
 - 60 GHz 105 GHz I § 4 .
 (1)

1. -
 (1) , -
 p

p

$$\zeta_r = \begin{cases} |\zeta| - 1.8 & \text{for } |\zeta| > 1.8^\circ \\ 0 & \text{for } |\zeta| \leq 1.8^\circ \end{cases} \quad (10a)$$
$$p \qquad \qquad \qquad \vdash$$

$$\beta_p = \begin{cases} 10^{-0.015 \zeta_r + 1.67} & \text{for } \zeta_r \leq 70^\circ \\ 417 & \text{for } \zeta_r > 70^\circ \end{cases} \quad (11a)$$

$$0.79 \text{ GHz} \quad 60 \text{ GHz} \quad (1)$$

(N0)가 .

$$N_0 = 330 + 62.6 \exp^{-\left(\frac{\zeta-2}{32.7}\right)^2} \quad (12)$$

2.

f	GHz	40 GHz
---	-----	--------

$$\vdots$$

$$d'_{min}(f) = 100 + \frac{(\beta_p - f)}{2} \quad \text{km} \quad (13)$$

0.1 - 105 GHz

$$\vdots$$

$$d_{min}(f) = \begin{cases} d'_{min}(f) & \text{km for } f < 40 \text{ GHz} & (14a) \\ \frac{(54-f)d'_{min}(40) + 10(f-40)}{14} & \text{km for } 40 \text{ GHz} \leq f < 54 \text{ GHz} & (14b) \\ 10 & \text{km for } 54 \text{ GHz} \leq f < 66 \text{ GHz} & (14c) \\ \frac{10(75-f) + 45(f-66)}{9} & \text{km for } 66 \text{ GHz} \leq f < 75 \text{ GHz} & (14d) \\ 45 & \text{km for } 75 \text{ GHz} \leq f < 90 \text{ GHz} & (14e) \\ 45 - \frac{(f-90)}{1.5} & \text{km for } 90 \text{ GHz} \leq f \leq 105 \text{ GHz} & (14f) \end{cases}$$

$$(14b) \quad "d'_{min}(40)" \quad f=40 \quad (13) \quad \text{가}$$

$$(\quad (1) \quad (2) \quad)$$

$$14a - 14f \quad (d_{min}(f)) \quad .$$

3. (1)

$$I \quad (1)$$

$$(d_{maxl}) \quad . \quad 60 \text{ GHz}$$

$$\text{가} \quad , \quad 5$$

$$, \quad A1, A2, B \quad C$$

$$, \quad A1 \quad A2 \quad 500 \text{ km}$$

$$. \quad 5 \quad \text{가}$$

$$5 \quad .$$

$$60 \text{ GHz} \quad d_{maxl} \quad :$$

$$d_{maxl} = 80 - \log\left(\frac{P}{50}\right) \quad (15)$$

5. (1)

	$d_{max}(km)$
A1	500
A2	375
B	900
C	1200

4. (1)

5 1 1 ,

(1)

가

(16)

. X

15 dB 25 dB . 100 MHz 400 MHz
, 60 GHz 105 GHz

가 , 0 dB . [400 MHz 790
MHz] 4.2 GHz 60 GHz (16)

f(GHz)

:

$$X(f) = \begin{cases} 0, & f \leq 0.4 \\ 3.3833X(\log f + 0.3979), & 0.4 < f \leq 0.79 \\ 0, & 0.79 < f \leq 4.2 \\ -0.8659X(\log f - 1.7781), & 4.2 < f \leq 60 \\ 0, & f > 60 \end{cases} \text{ dB} \quad (16)$$

$X(f)$. ,

가

,

$X(f)$

375 km (d_{min} 0dB

)

가 $Z(f)$ dB/km . :-

$$Z(f) = \frac{X(f)}{375 - d_{\min}} \quad \text{B/km} \quad (17)$$

375 km

$X(f)$

0 dB

(1)

TG 1/6

1

I

C_i $C_{\bar{i}}$

(TG 1/6

1

I

)

$$Z(f) = 0 \text{ dB/km}$$

(1)

, (5 1 1) p

(1)

$L_b(p1)$ (2)

:

$$L_{bq}(p1) = L_b(p1) + Q \text{ dB} \quad (18)$$

: Q

(dB)

가

5

(2)

- 3.4- 40.5 GHz

()

-

가

1. (2)

(2)

(1)

-

(2) TG 1/6

(2) 가

1

II

3.4 GHz

40.5 GHz

neglect

, (2)

(14)

6

1999 1 .

CPM () ,

. , , 4 1 3 5가

2000 5

WRC- 2000 ,

가 가

ITU- R

APP28 .

1999

.

< 1>

		(S7
)	
		(km)	
-	()	500	<p>3 GHz 1 & 2(S5 1 3)</p> <p>3 GHz (5725- 7075 MHz)</p>
()	-	500	<p>3 GHz 1 & 2(S5 1 3)</p> <p>1 GHz S5 S5- 1(N ° S9.17)</p>
()	()	1000	
- : 400.15- 401 MHz 1675- 1700 MHz	()	580	<p>1 & 2(S5 1 3)</p>
(): 400.15- 401 MHz 1675- 1700 MHz	()	1080	
- : 454- 456 MHz 459- 460 MHz	-	500	<p>1(S5 1 3)</p>

()

<p>- (RDSS) - : 1610- 1626.5MHz 2483.5- 2500MHz 2500- 2516.5MHz</p>	-	100	<p>$S5$ $S5-1(N^{\circ}S9.17)$</p>
<p>- (RDSS) : 1610- 1626.5MHz 2483.5- 2500MHz 2500- 2516.5MHz</p>	-	400	
		<p>$4/3$ 가 20 km - 가 가 · (1)</p>	
			<p>$S5$ $S5-1(N^{\circ}S9.17)$</p> <p>$ITU-R IS.850-1$ 3</p>

1 -

-

$d(\text{km})$ 20 km

가

() :

$$d = 582 \left(\sqrt{1 + (0.254\theta)^2} - 0.254\theta \right) \quad \text{for } \theta > 0,$$

$$d = 582 \quad \text{for } \theta \leq 0$$

100 km 582 km , 11 ° 0 °

.

< 2> - MSS -

		(
	()	<i>S7</i>
FSS가	-	- 170(19.3- 19.7 GHz) - 300(6700- 7075 MHz)	3(<i>S5</i> 1 3) <i>S7</i> <i>TG 1/6</i> () .
15.4- 15.7 GHz - GSO MSS		“ - : - (ALS) 515 km - (MPR) 600 km - 270 km	<i>S5.511C</i> <i>ITU - R S.1340</i> (<i>S1.173</i>) , () <i>600 km</i> . , “ ”가 <i>S5</i> .

15.4- 15.7 GHz - GSO MSS		11.5 dBi MSS - : - (ALS) 150 km - 600 km - 60 km	<i>S5.511A</i> <i>ITU-R S.1341</i> (<i>S1.173</i>) , () <i>600 km</i> . , “ ” <i>7f</i> <i>S5</i> . 60
	()	500	3(<i>S5</i> <i>1 3</i>)

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