



EXERCISE 3

- Uplink
- Interference from TVFM to Digital (narrow)
- Wanted
 - THAICOM-AK2 (78.5°E)
 - Group ID : 96604123
 - Emission : 22K0G7W
- Interfering
 - INTERSPUTNIK-75E-Q(75°E)
 - Group ID : 108643494
 - Emission : 36M0F8W



Exercise 3

Wanted:

Interfering:

Interference from TVFM to digital narrow

THAICOM-AK2 (78.5E)

INTERSPUTNIK-75E-Q (75E)

Longitudinal Tolerance

0.1

Longitudinal Tolerance

0.1

UPLINK

	Wanted
Beam	RK1
Group ID	96604123
Emission	22K0G7W

Wanted E/S long	100.02
Wanted E/S Lat	21.41

Frequency (MHZ)	14340
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Pes	
Ges	
FSL	-206.89
Gs	
ES relative to beampeak	-4.87
Ts	
BW(Hz)	22000

Carrier	-211.76
Noise	#NUM!
C/N	#NUM!
C/I basic	-4.93
adj factor	-43.42
C/I adj	-48.35
C/I req'd	#NUM!
Margin	#NUM!
to add 1.87	#NUM!

	Interfering
Beam	DKS
Group ID	108643494
Emission	36M0F8W
Sidelobe	REC-580
interfering E/S long	100.53
Interfering E/S Lat	13.57
Topocentric angle	3.79

Pes		Pdes	
Ges()		Ges()=29-25log()	
FSL	-206.83		

ES relative to beampeak	0
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Interference	-206.83
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Equivalent BW (Hz)	1
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C/N+5.5+3.5log(wanted carrier BW(in MHz))

Sect B3 ROP Attachment2 para 5

Wanted Carrier is Digital



Exercise 3

Interference from TVFM to digital narrow

Wanted: THAICOM-AK2 (78.5E)
 INTERSPUTNIK-75E-Q
 (75E)

Longitudinal Tolerance 0.1
Longitudinal Tolerance 0.1

UPLINK

	Wanted
Beam	RK1
Group ID	96604123
Emission	22K0G7W

	Interfering
Beam	DKS
Group ID	108643494
Emission	36M0F8W
Sidelobe	REC-580
interfering E/S long	100.53
Interfering E/S Lat	13.57
Topocentric angle	3.79

Wanted E/S long	100.02	Slide 7
Wanted E/S Lat	21.41	

interfering E/S long	100.53	Slide 8
Interfering E/S Lat	13.57	
Topocentric angle	3.79	

Frequency (MHZ)	14340
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Pes	-15	Slide 5
Ges	57	Slide 5
FSL	-206.89	
Gs	38.8	Slide 5
ES relative to beampeak	-4.87	Slide 7 8 9
Ts	603	Slide 5
BW(Hz)	22000	

Pes	27	Pdes	-39	Slide 6
Ges()	14.53	Ges() =29-25log()		Slide 6
FSL	-206.83			

ES relative to beampeak of wanted satellite	0	Slide 7 8 9
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Carrier	-130.96	
Noise	-157.37	
C/N	26.41	
C/I basic	-4.46	Slide 16 17
adj factor	22.58	Slide 12 13
C/I adj	18.12	

Interference	-126.5
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Equivalent BW (Hz)	3981072	Slide 12 13
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Beam	RK1
Group ID	96604123
Emission	22K0G7W

Wanted E/S long	100.02	Slide 7
Wanted E/S Lat	21.41	

Frequency (MHZ)	14340
------------------------	-------

Pes	-15	Slide 5
Ges	57	Slide 5
FSL	-206.89	
Gs	38.8	Slide 5
ES relative to beampeak	-4.87	Slide 7 8 9
Ts	603	Slide 5
BW(Hz)	22000	

Carrier	-130.96	
Noise	-157.37	
C/N	26.41	
C/I basic	-4.46	Slide 16 17
adj factor	22.58	Slide 12 13
C/I adj	18.12	
C/I req'd	26.11	$C/N+5.5+3.5\log(\text{wanted carrier BW(in MHz)})$
Margin	-8.00	
to add 1.87	-6.13	Sect B3 ROP Attachment2 para 5

Beam	DKS	
Group ID	108643494	
Emission	36M0F8W	
Sidelobe	REC-580	
interfering E/S long	100.53	Slide 8
Interfering E/S Lat	13.57	
Topocentric angle	3.79	

Pes	27	Pdes	-39	Slide 6
Ges()	14.53	$Ges()=29-25\log()$ Slide 6		
FSL	-206.83			

ES relative to beampeak of wanted satellite	0	Slide 7 8 9
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Interference	-126.5
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Equivalent BW (Hz)	3981072	Slide 12 13
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Slide14

Wanted Carrier is Digital

Wanted

B1a/BR17 Beam designation		RR1	B1b Steerable			B2 Emi-Rcp		R	B3a1 Max. co-polar gain		38.8	B3d Pointing accuracy		0.08		
BR7a/BR7b Group id.		96604123	BR1 Date of receipt		08.01.1996	C2c RR No. 4.4										
A2a Date of bringing into use		17.12.1993	A2b Period of valid.		35	A3a Op. agency		1	A3b Adm. resp.		A	BR16 Value of type C8b				
BR62 Expiry date for bringing into use		06.08.2000	BR63 Confirmed date of bringing into use		17.12.1993	BR64 Date of receipt of 1st Res49										
BR14 Special Section																
C4a Class of station		EC	C3a Assigned freq. band		54000	C5a Noise temperature		603								
C4b Nature of service		CP	C6a Polarization type			C6b Polarization angle										
C11a1 Service area no.		1	C11a2 Service area			C11a3 Service area diagram			1							
A5/A6 Coordinations/Agreements		RR1060	0	G TON URS USA USA/IT												
C2a1 Assigned frequency																
14.3429	GHz	14.4055	GHz	14.4681	GHz											
A13 Ref. to Special Sections		C7a Design. of emission		C8a1/C8b1 Max. peak pwr	C8a2/C8b2 Max. pwr dens.	C8c1 Min. peak pwr	C8c2 Attch.	C8c3 Min. pwr dens.	C8c4 Attch.	C8e1 C/N ratio	C8e2 Attch.					
		1	22K0G7W--	-15	-58.4											
C10b1 Assoc. earth station id.		C10b2 Type	C10c1 Geographical coord.		C10c2 Ctry	C10d1/C10d2 Cls. / Nat.	C10d3 Max. iso. gain	C10d4 Bmwdth	C10d7 Ant. diameter	C10d9 Ant. dim. (DGSO)	C8g1 Max. aggr. pwr.	C8g2 Aggr. bandwidth	C8g3 Transp. bandwidth = Aggr. bandwidth			
TYPICAL K2 (6/1.2)		T				1 TC CP	57	0.25								
C10b1 Assoc. earth station id.		C10d5a Co-polar antenna pattern		Coef. A		Coef. B		Coef. C		Coef. D		Phi1		Co-polar rad. diag.		
TYPICAL K2 (6/1.2)		A-25*LOG(FI)		29												
Findings	2D Date of protection		08.01.1996	13A Conformity with RR		A-	A-	--	13B1 Provision			13B2 Remarks			13B3 Date of Review	
13C Remarks																

Form



Interfering

INTERSPUTNIK-75E-Q (105500291)

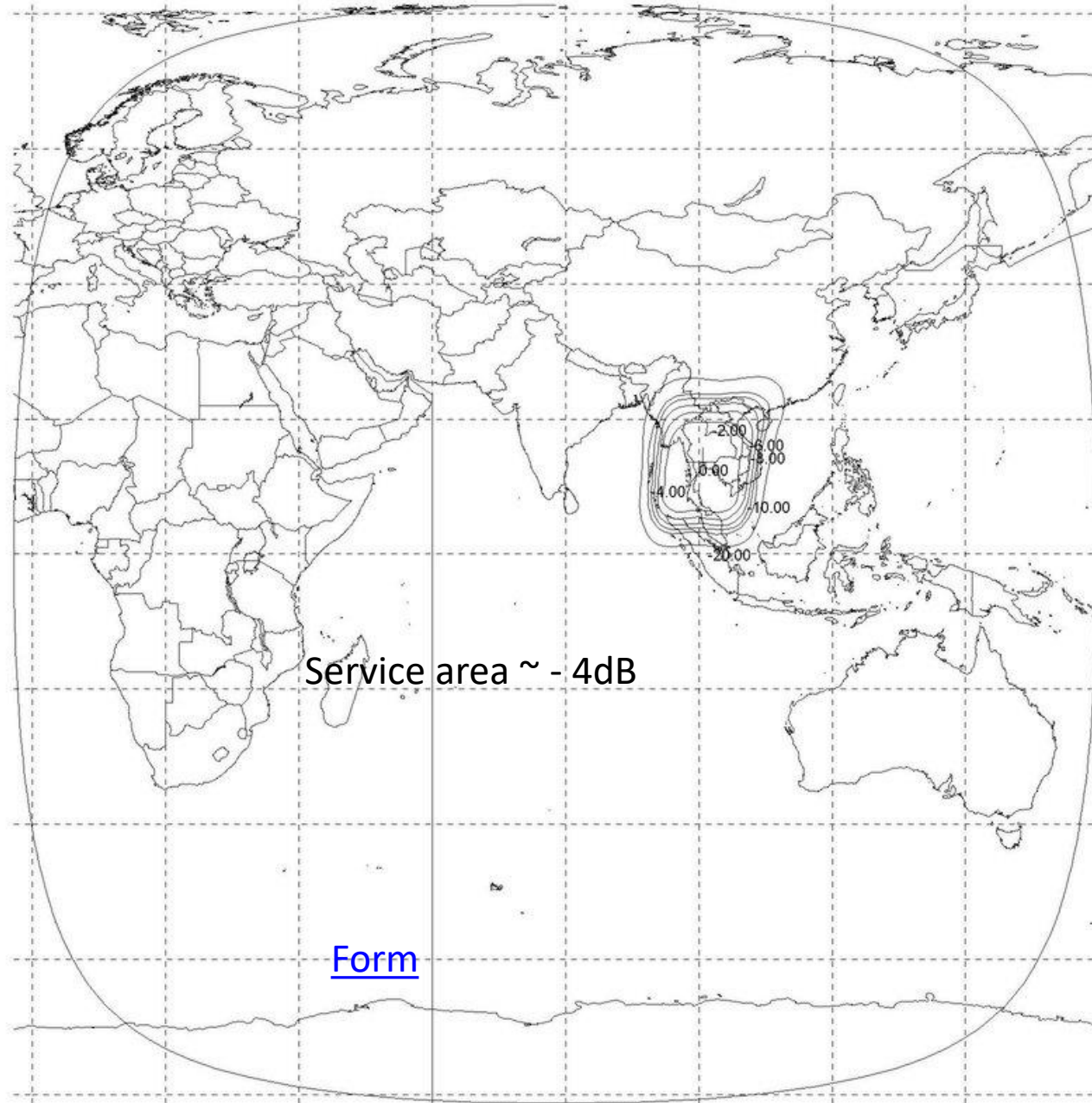
B1a/BR17 Beam designation <input type="text" value="DKS"/>		B1b Steerable <input type="checkbox"/>		B2 Emi-Rcp <input type="text" value="R"/>		B3a1 Max. co-polar gain <input type="text" value="37"/>		B3d Pointing accuracy <input type="text" value="0.1"/>															
BR7a/BR7b Group id. <input type="text" value="108643494"/>		BR1 Date of receipt <input type="text" value="27.05.2008"/>		C2c RR No. 4.4 <input type="text"/>																			
A2a Date of bringing into use <input type="text" value="01.09.2005"/>		A2b Period of valid. <input type="text" value="40"/>		A3a Op. agency <input type="text" value="2"/>		A3b Adm. resp. <input type="text" value="A"/>		BR16 Value of type C8b <input type="text"/>															
BR62 Expiry date for bringing into use <input type="text" value="07.09.2005"/>			BR63 Confirmed date of bringing into use <input type="text" value="01.09.2005"/>			BR64 Date of receipt of 1st Res49 <input type="text"/>																	
BR14 Special Section <input type="text"/>																							
C4a Class of station <input type="text" value="EC"/>		C3a Assigned freq. band <input type="text" value="40000"/>			C5a Noise temperature <input type="text" value="1400"/>																		
C4b Nature of service <input type="text" value="CP"/>		C6a Polarization type <input type="text" value="M"/>			C6b Polarization angle <input type="text"/>																		
C11a1 Service area no. <input type="text" value="1"/>		C11a2 Service area <input type="text"/>			C11a3 Service area diagram <input type="text" value="8"/>																		
A5/A6 Coordinations/Agreements		<input type="text" value="11.41"/> <input type="text" value="9.7"/> <input type="text" value="N/9.7"/>		<input type="text" value="X"/> <input type="text" value="O"/> <input type="text" value="O"/>		IND BRU CHN F/EUT G INS LAO MLA RUS SNG THA TUR UAE USA VTN TON																	
C2a1 Assigned frequency																							
<input type="text" value="14.02"/> GHz		<input type="text" value="14.1"/> GHz		<input type="text" value="14.18"/> GHz		<input type="text" value="14.26"/> GHz		<input type="text" value="14.34"/> GHz		<input type="text" value="14.42"/> GHz		<input type="text"/>		<input type="text"/>		<input type="text"/>							
<input type="text" value="14.06"/> GHz		<input type="text" value="14.14"/> GHz		<input type="text" value="14.22"/> GHz		<input type="text" value="14.3"/> GHz		<input type="text" value="14.38"/> GHz		<input type="text" value="14.46"/> GHz		<input type="text"/>		<input type="text"/>		<input type="text"/>							
A13 Ref. to Special Sections		C7a Design. of emission		C8a1/C8b1 Max. peak pwr		C8a2/C8b2 Max. pwr dens.		C8c1 Min. peak pwr		C8c2 Attch.		C8c3 Min. pwr dens.		C8c4 Attch.		C8e1 C/N ratio		C8e2 Attch.					
API/A/428		1 36M0F8W--		27		-39		15.5				-50.5				11							
CR/C/144		2 6M60G7W--		16.5		-50.5		5.5				-61.5				8.6							
		3 45K0G1X--		-1.5		-48		-12.5				-59				9.5							
C10b1 Assoc. earth station id.		C10b2 Type		C10c1 Geographical coord.		C10c2 Ctry		C10d1/C10d2 Cls. / Nat.		C10d3 Max. iso. gain		C10d4 Bmwdth		C10d7 Ant. diameter		C10d9 Ant. dim. (DGSO)		C8g1 Max. aggr. pwr.		C8g2 Aggr. bandwidth		C8g3 Transp. bandwidth = Aggr. bandwidth	
TYPICAL-4.5		T						1 TC CP		54.5		0.32											
C10d5a Co-polar antenna pattern																							
C10b1 Assoc. earth station id.		Co-polar ref. pattern		Coef. A		Coef. B		Coef. C		Coef. D		Phi1		Co-polar rad. diag.									
TYPICAL-4.5		REC-580																					
Findings 2D Date of protection <input type="text" value="19.08.2005"/>		13A Conformity with RR <input type="text" value="A-"/> <input type="text" value="N-"/> <input type="text" value="N-"/>		13B1 Provision <input type="text" value="11.41"/>		13B2 Remarks <input type="text"/>		13B3 Date of Review <input type="text"/>															
13C Remarks <input type="text" value="E/270508"/>																							

Form



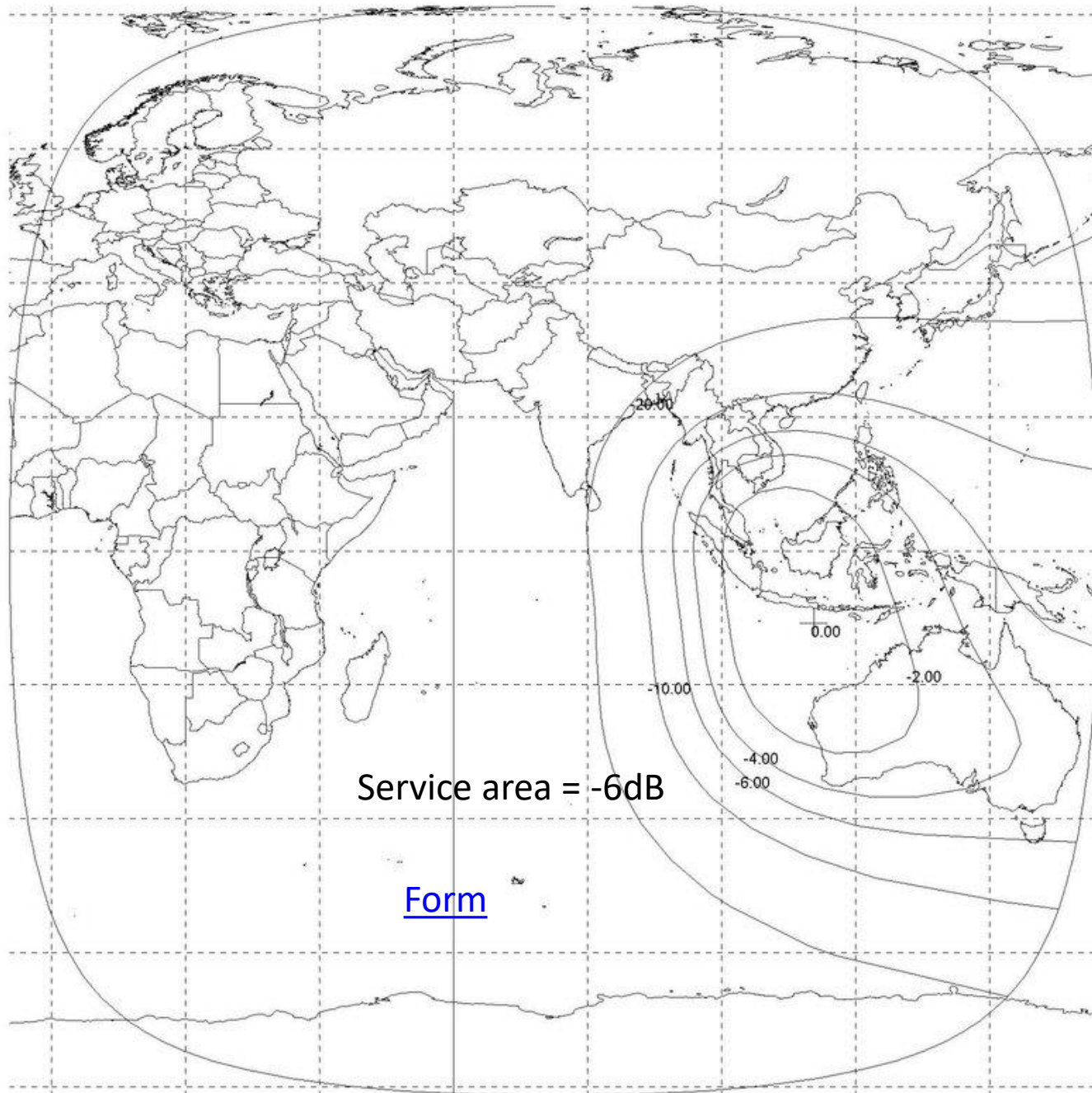


THAICOM-AK2 Receive Beam RK1



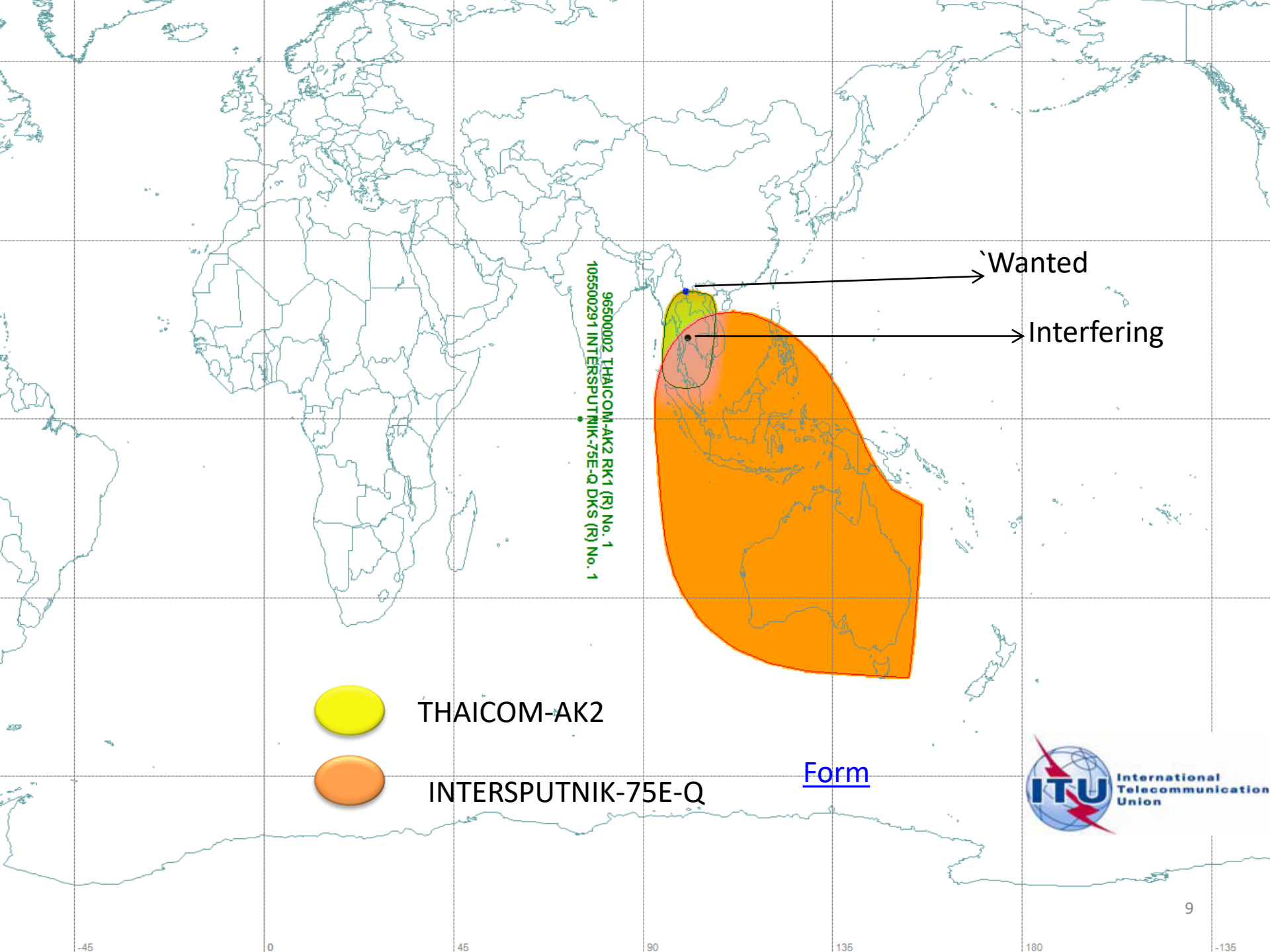


INTERSPUTNIK-75E-Q Receive Beam DKS



Service area = -6dB

Form

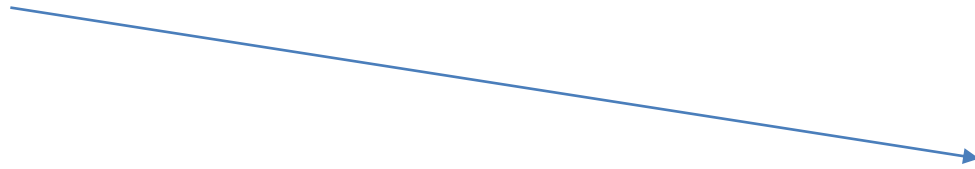




27M0G1W



Bandwith of wanted
Carrier 27.0 MHz



Carrier=Digital

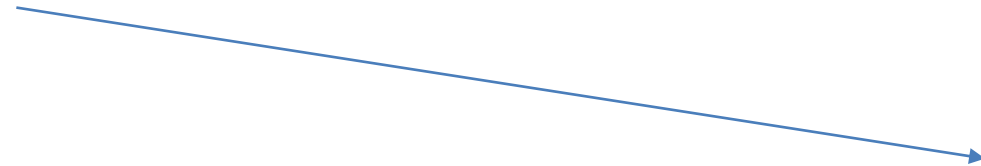
Form



36M0F8W



Bandwith of wanted
Carrier 45.0 kHz



Carrier=ANALOG

Form



Get Adjustment Factor

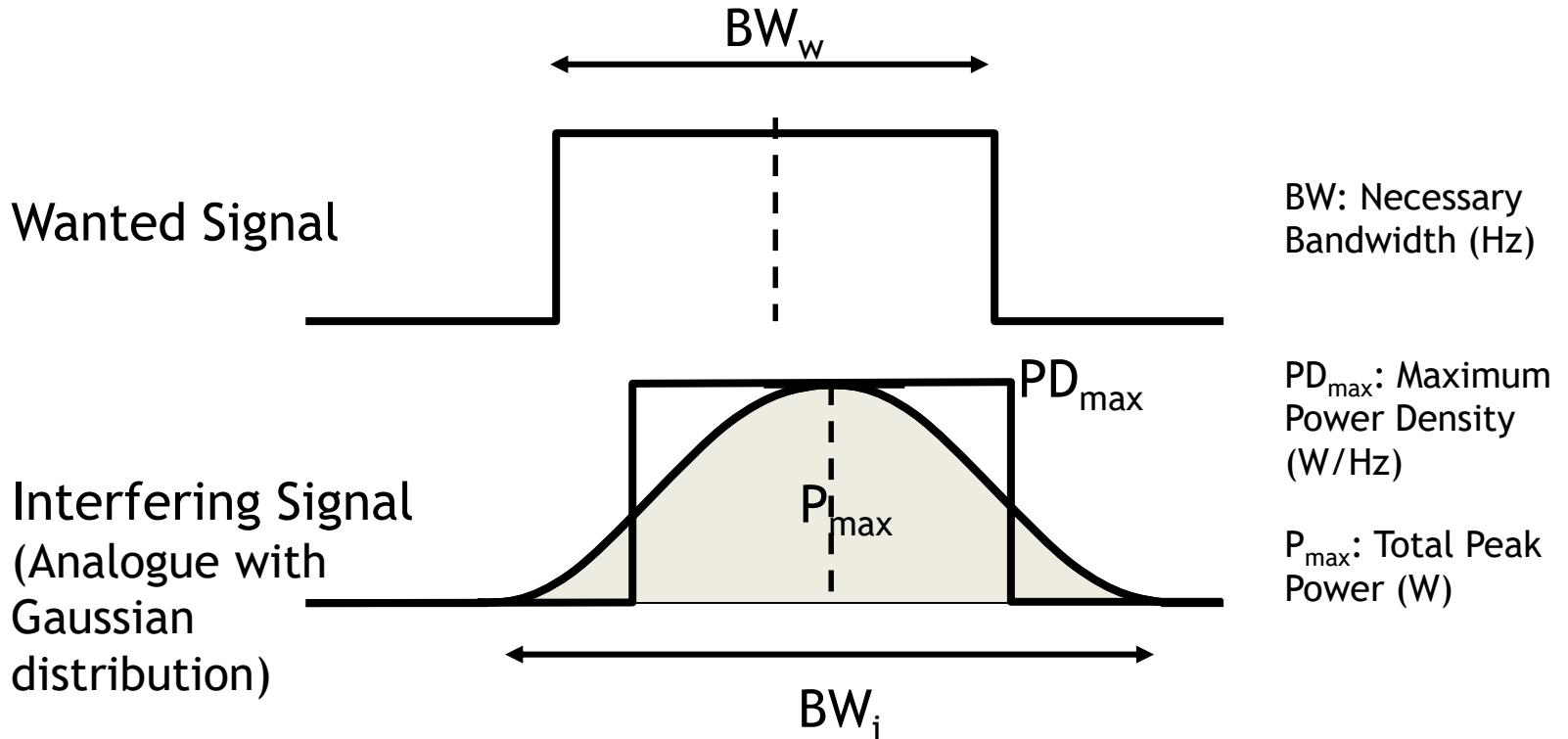
Wanted \ Interfering	Digital	Analogue (Other than TV/FM)	Other	TV/FM
	Digital	METHOD 1: Wanted Bandwidth (BW) to Interfering BW Overlapping Ratio Adjustment		
TV/FM	METHOD 2: Wanted BW to Interfering Equivalent BW Overlapping Ratio Adjustment		METHOD 1: Co-freq.	
Analogue (Other than TV/FM)			METHOD 3: Non co-freq. (Relative Protection Ratio)	
Other			METHOD 2	

Source: Table 1 in Section B3 of Rules of Procedures, ITU-R S.741-2



Get Adjustment Factor

Method 2:



$$BW_{eq} = P_{max} / PD_{max}$$

$$BW(Hz) = 10^{((27 - (-39)) / 10)}$$

$$= 3981072 \text{ Hz}$$



Finding C/I Required

Interfering Wanted	TV/FM or Other	Digital	Analogue (Other than TV/FM)
TV/FM	C/N + 14 (dB)		
Digital	<p>If $BW_w \leq BW_{eqi}$ then $C/N + 5.5 + 3.5 \cdot \log(BW_w)$ (dB) $26.41 + 5.5 + 3.5 \cdot \log(0.022) = 26.11$</p> <p>else if $BW_w > BW_{eqi}$ then $C/N + 12.2$ (dB)</p>	C/N + 12.2 (dB)	
Analogue (Other than TV/FM)	$11.4 + 2 \cdot \log(BW_w)$ (dB)	C/N + 12.2 (dB)	
Other	$11.4 + 2 \cdot \log(BW_w)$ (dB)	C/N + 14 (dB)	

Source: Table 2 in Section B3 of Rules of Procedures, ITU-R S.741-2

BW_w : Necessary bandwidth of wanted carrier (MHz)

BW_{eqi} : Equivalent bandwidth of interfering carrier (MHz)

C/N: Carrier to Noise ratio (dB)

[FORM2](#)



Exercise 3

Wanted:

Interfering:

Interference from TVFM to digital narrow

THAICOM-AK2 (78.5E)

INTERSPUTNIK-75E-Q (75E)

Longitudinal Tolerance

0.1

Longitudinal Tolerance

0.1

UPLINK

	Wanted
Beam	RK1
Group ID	96604123
Emission	22K0G7W

Wanted E/S long	100.02
Wanted E/S Lat	21.41

Frequency (MHZ)	14340
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Pes	-15
Ges	57
FSL	-206.89
Gs	38.8
ES relative to beampeak	-4.87
Ts	603
BW(Hz)	22000

Carrier	-130.96
Noise	-157.37
C/N	26.41
C/I basic	-4.46
adj factor	22.58
C/I adj	18.12
C/I req'd	26.11
Margin	-8.00
to add 1.87	-6.13

$C/N+5.5+3.5\log(\text{wanted carrier BW}(\text{in MHz}))$

Sect B3 ROP Attachment2 para 5

	Interfering
Beam	DKS
Group ID	108643494
Emission	36MOF8W
Sidelobe	REC-580
interfering E/S long	100.53
Interfering E/S Lat	13.57
Topocentric angle	3.79

Pes	27	Pdes	-39
Ges()	14.53	$Ges()=29-25\log()$	
FSL	-206.83		

ES relative to beampeak of wanted satellite	0
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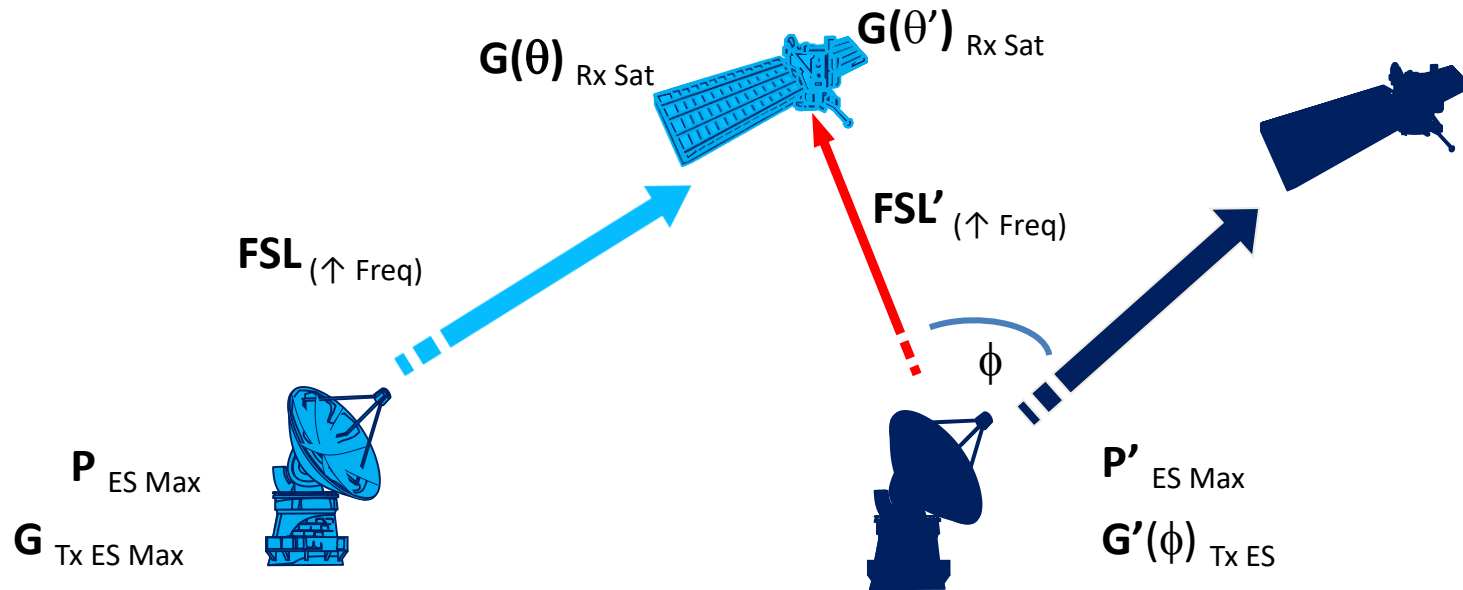
Interference	-126.5
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Equivalent BW (Hz)	3981072
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Wanted Carrier is Digital



Calculate C/I basic



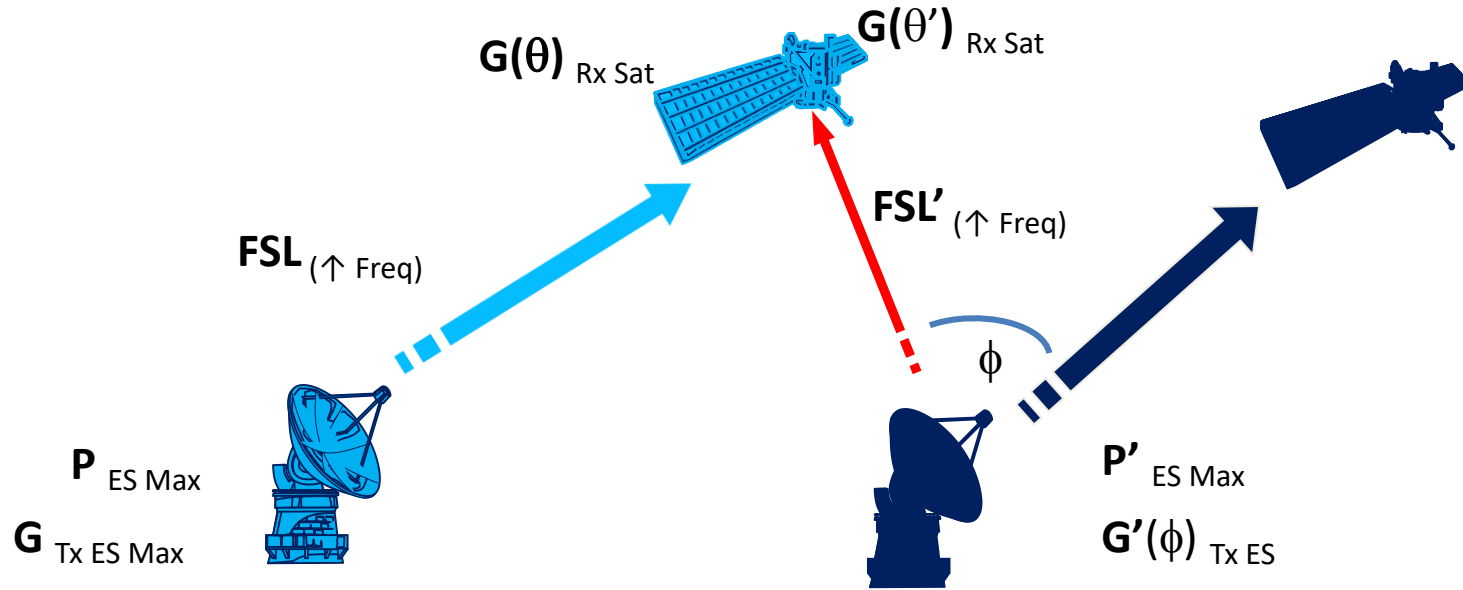
$$C \uparrow = P_{ES Max} + G_{Tx ES Max} + G(\theta)_{Rx Sat} - FSL_{(\uparrow Freq)} \text{ (dBW)}$$

$$I \uparrow = P'_{ES Max} + G'(\phi)_{Tx ES} + G(\theta')_{Rx Sat} - FSL'_{(\uparrow Freq)} \text{ (dBW)}$$

$$C/I \uparrow = C \uparrow - I \uparrow \text{ (dB)}$$



Calculate C/I basic



$$C \uparrow = -15 + 57 + (38.8-4.87) - 206.89$$

$$I \uparrow = 27 + 14.53 + (38.8-0) - 206.83$$

$$C/I \uparrow = -130.96 - (-126.50)$$

$$= -4.46 \text{ dB}$$