Broadcasting-Satellite Service Plans and Lists (Appendices 30 & 30A)

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Space Notification and Plans Division

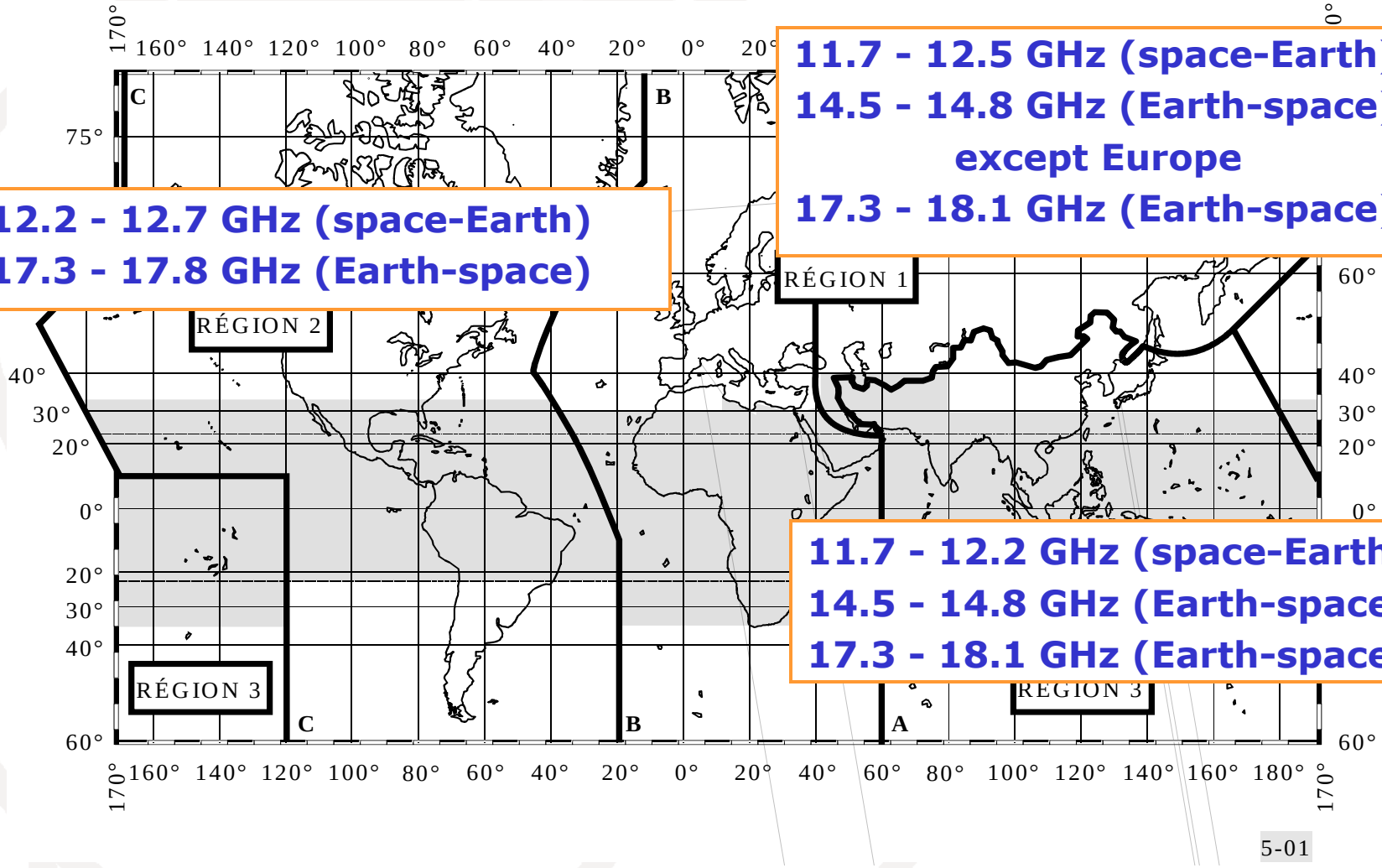
International Telecommunication Union

History

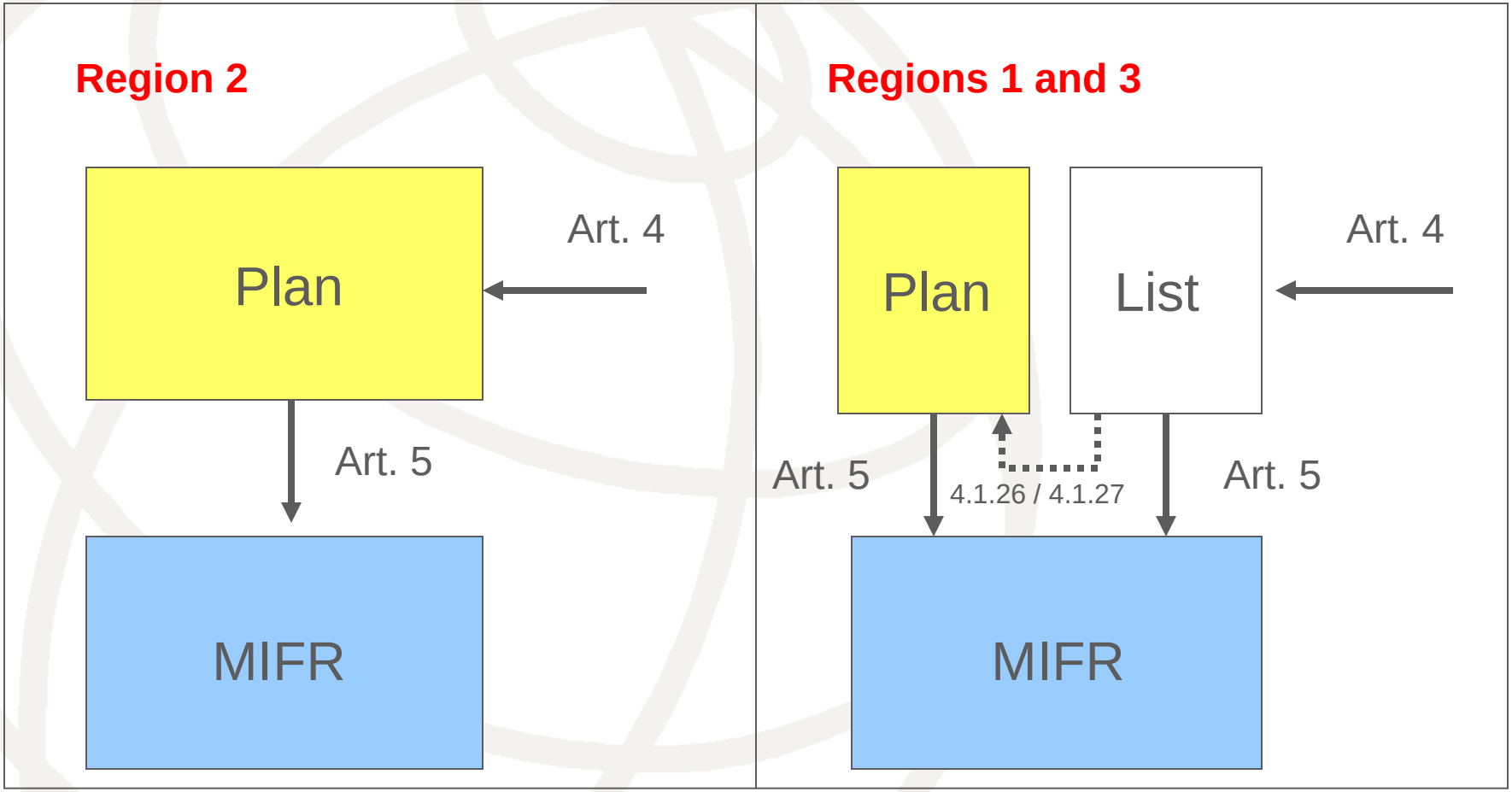
- **WARC-77** established Region 1&3 BSS Plan
- **RARC-83** established Region 2 BSS and associated Feeder-link Plan
- **WARC ORB-85** included Region 2 BSS and associated Feeder-link Plan into the Radio Regulations
- **WARC ORB-88** established Region 1&3 BSS Feeder-link Plan
- **WRC-97** revised Region 1&3 BSS and associated Feeder-link Plans
- **WRC-2000** revised Region 1&3 BSS and associated Feeder-link Plans

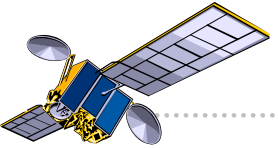
Frequency bands

BSS and associated Feeder-link Plans/Lists coverage



AP30/30A Procedure





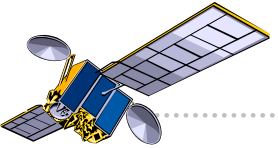
Elements of Plans

National assignments in:

- BSS Plan:
  - **Article 10 of AP30 for Region 2**
  - Article 11 of AP30 for Regions 1 & 3
- Feeder-link Plan:
  - **Article 9 of AP30A for Region 2**
  - Article 9A of AP30A for Regions 1 & 3

Description:

orbital position, channels, polarisation, power levels, antenna patterns, emission designation, beam coverage, grouping ...



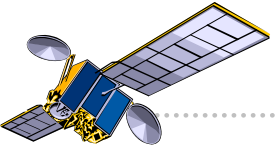
Technical data used?

Annex 5 of Appendix 30
Annex 3 of Appendix 30A

- Type of modulation (digital for R1&3), Polarization, C/N, Protection ratio, System noise, Channel, Antenna, Necessary bandwidth, satellite station keeping etc.
- Most of them are characteristics used for establishing Plans → can be different for modifications
- However, when "shall" is used → has to be observed

Plan - Region 2 in numbers

- Downlink and Feeder-link together (OEPM)
- 32 channels for a cluster
- Cluster concept
- Same status given to assignments in the Plan resulting from the application of Article 4 procedure if brought into use
- Currently 178 entries



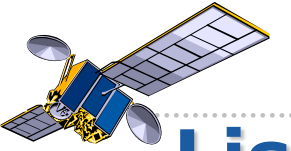
Plans - Regions 1 and 3 in numbers

WRC-2000 developed a new Plan that included:

- 10 channels in Region 1
  12 channels in Region 3

- 223 downlink entries
  301 feeder-link entries

- 5 extended-coverage national beams for 15 administrations
- 30 "composite" beams



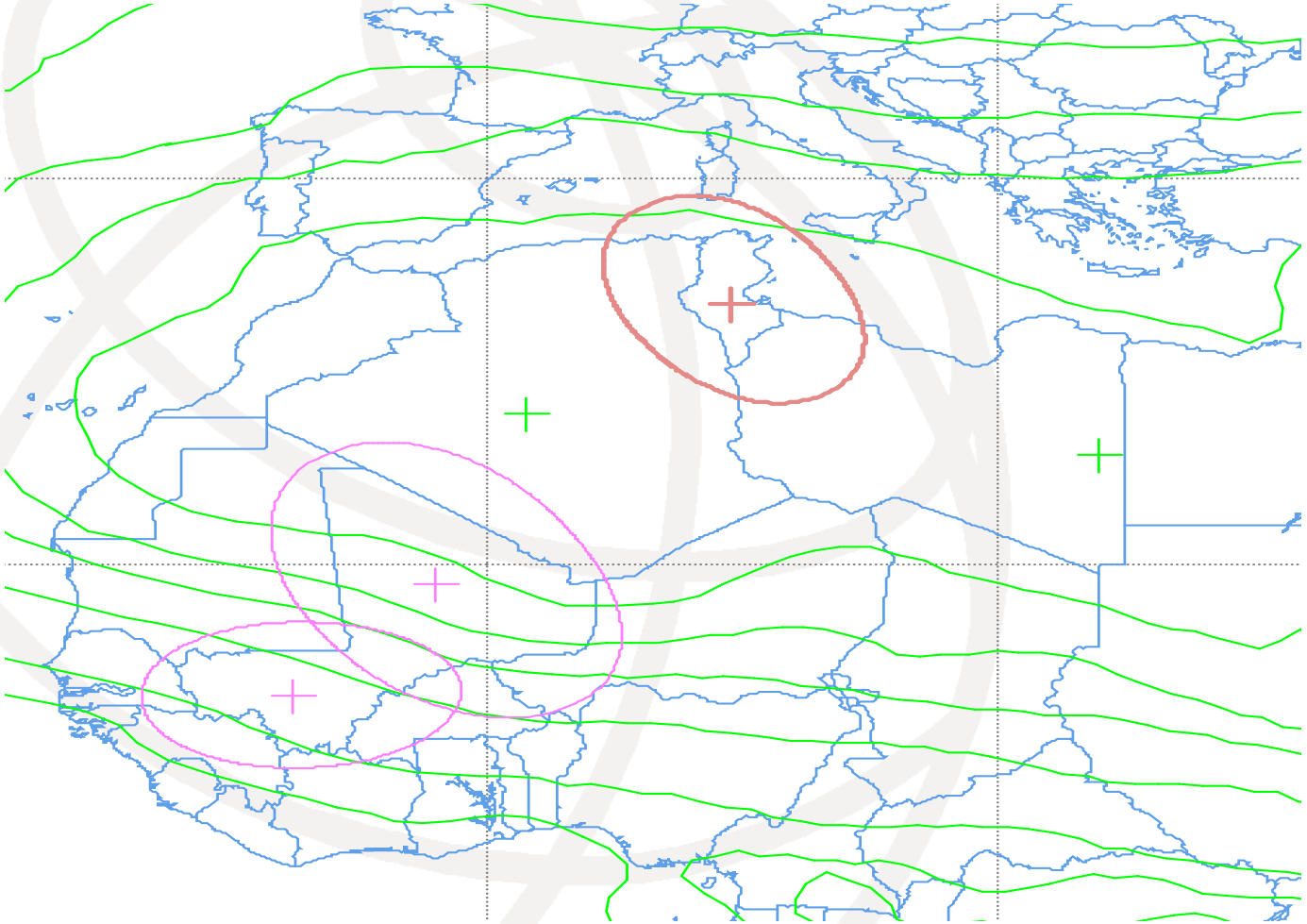
Lists - Regions 1 and 3

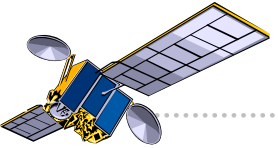
Regions 1 and 3 Lists of Additional Uses created by WRC-2000:

- AP30 Downlink List
  - 12 GHz (currently 62 entries)
- AP30A Feeder-link List
  - 14 GHz / 17 GHz (currently 55 entries)

- Separated from the Plans, Annexed to MIFR
- Lists are evolving, Updates are published by BR
- Assignments in the Lists must be compatible with the Plans and other services
- Digital modulation only
- 15 year time limit
- Provisions for use of assignments on a non-interference basis in case of disagreements
- Provision to accommodate assignments for new ITU Member States
- Limitation on application of the grouping concept

Plan & List Beams





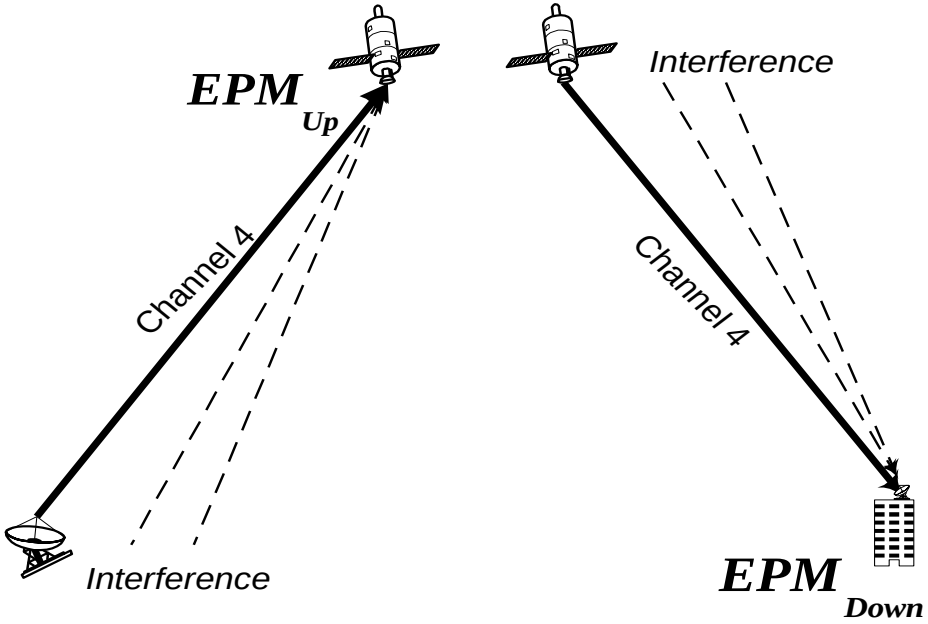
Establishment of the Plans (Lists)

- Compatibility among assignments in Plan and List
  - EPM or OEPM

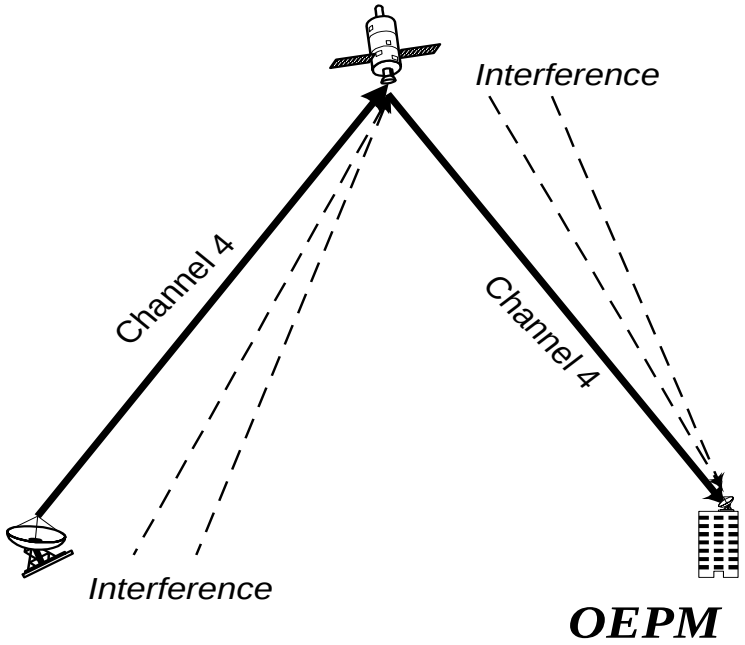
- Compatibility between Plan and other services or Plan in other Regions
  - PFD, ΔT/T
  - Regulatory mechanism:

    Remarks in Art. 10 and 11 of AP30,
    Art. 9 and 9A of AP30A,
    Art. 9 and 11 of RR for specific feeder-link earth station

Difference between EPM and OEPM



Regions 1 and 3 Approach
(separated links)



Region 2 Approach
(overall link analyses)

Compatibility Criteria
Region 2 Plan Assignments

Overall Equivalent Protection Margin (OEPM) is used:

$$OEPM = -10 \log \left(\sum_{i=1}^{5} 10^{(-M_i/10)} \right)$$

M_i = protection margin = $\frac{C}{I_{i_{aggr}}} - PR_i$ (dB)

i = interference type
(1=co-channel,
2&3=upper & lower first adjacent channels,
4&5=upper & lower second adjacent channels)

PR_i = protection ratio for a given interference type i

Compatibility Criteria
Regions 1 & 3 Plan Assignments

Equivalent Protection Margin (EPM) is used:

$$EPM = -10 \log \left(\sum_{i=1}^{3} 10^{(-M_i/10)} \right)$$

M_i = protection margin $= \dfrac{C}{I_{i_{aggr}}} - PR_i$ (dB)

i = interference type
(1=co-channel,
2 & 3 = upper & lower first adjacent channels)

PR_i = protection ratio for a given interference type i

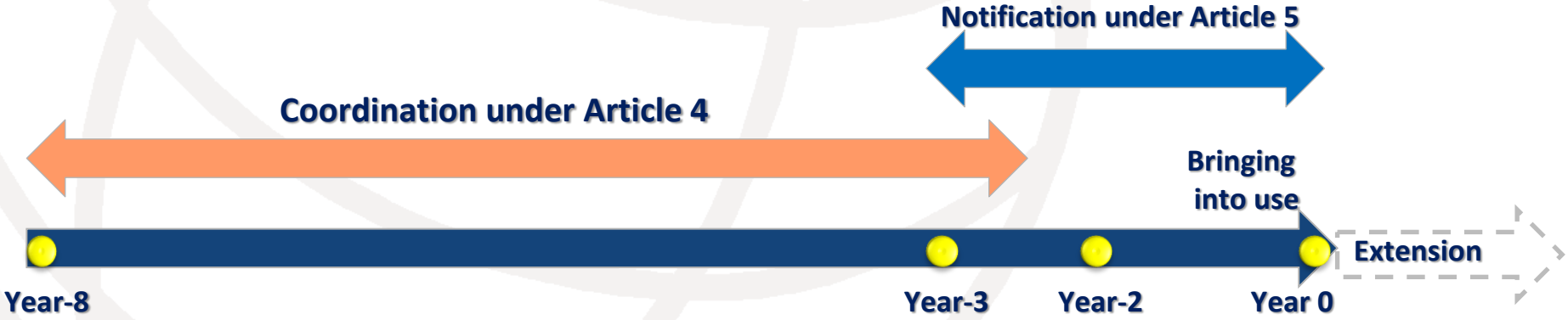
Main Regulatory Aspects: BSS Downlink/ Feeder-link

- Modification/Addition (Article 4)
- Notification/Implementation (Article 5)
- Due diligence information (Resolution 49)

Main Regulatory Aspects: BSS Downlink/ Feeder-link

8-year Regulatory period

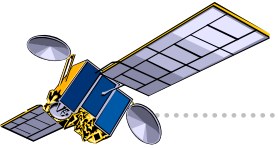
- to complete Article 4 procedure to be included in the Plan/List
- to bring into use assignments (confirmation through notification procedure)
- to submit due diligence information (Res.49)
- can be extended to maximum 3 years in case of launch failure



Main Regulatory Aspects:

Feeder-link earth station

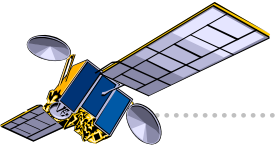
- Modification/Addition (Article 9 of RR)
- Notification/Implementation (Article 11 of RR)



Main Regulatory Aspects:

Space Operation/TT&C in the Guardbands

- Coordination (Article 2A)
- Notification (Article 11 of RR)



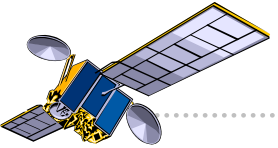
Main Regulatory Aspects

Terrestrial

Coordination w.r.t Plan/List (Article 6)

FSS

Coordination w.r.t. Plan/List (Article 7)



Article 5 Notification

- Final characteristics for Plan and Lists assignments
- Confirmation of date of bringing into use
- Recorded in MIFR
  (not taken into account in subsequent technical examination)
- Appendix 4 data should be submitted not earlier than 3 years but not later than 3 months before planned date of bringing assignments into use
- Published in Part I-S → Part II-S or Part III-S
- data in MIFR in: BR IFIC and
  - http://www.itu.int/ITU-R/space/plans/MIFR/

Processing of New Submissions

Article 4

Processing of Article 4 Submissions (1)

ITU-BR

Submission of validated Appendix 4 data
(8 years before planned date of bringing into use)

Fail

Validation Check

OK

Acknowledgement by telefax

Publication of the submitted information as received
(BR IFIC &
SNL Part C http://www.itu.int/ITU-R/space/snl/)

Processing of Article 4 Submissions (2)

ITU-BR

Completeness examination and telefax

Reply must be sent within 30 days (receivability ROP)

Regulatory/technical examination

Publication of Part A Special Section (BR IFIC) that contains the filed satellite network characteristics and potentially affected administrations. Results of the Bureau's MSPACEg calculations are also included in the BR IFIC.

Processing of Article 4 Submissions (3)

ITU-BR

Administrations should examine each BR IFIC to see if their assignments are affected and respond within 4 months

Affected administrations that do not comment within the 4 month period are **deemed to have agreed** **(implicit agreement)**

SpaceCom software compulsory from 01.07.2009 (*resolves 4* of Res.55)

After the 4 month period has expired, the BR prepares a list of agreements required to complete the coordination procedure and publishes it in a Part D Special Section.

Processing of Article 4 Submissions (4)

ITU-BR

Submission of validated Appendix 4 data (final characteristics) with agreement (request for Part B publication)

Fail

Validation Check

OK

Acknowledgement by telefax

Completeness examination

Reply must be sent within 30 days (receivability ROP)

Processing of Article 4 Submissions (5)

ITU-BR

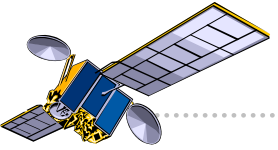
Regulatory/technical examination

Publication of Part B Special Section (BR IFIC) that contain the final characteristics

Submission of notification (confirmation of bringing into use), Res.49 due diligence information

Request for extension of period of operation for assignments in the List (additional 15 years), if necessary.

Comparison between AP30/30A and Non-Plan procedures



Non-Plan BSS GSO

Sect I Article 9 of RR
API

Sect II Article 9 of RR
CR/C

Article 11 of RR
Part II-S MIFR

AP30/30A BSS Plan

Plan Assignment

Add

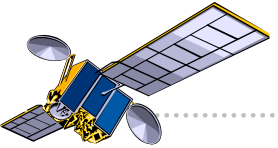
Mod

Article 4 of AP30/30A
AP30*/E Part A

Article 4 of AP30/30A
AP30*/E Part B

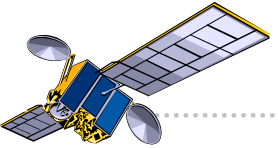
Enter into R1/3
List or R2 Plan

Article 5 of AP30/30A
Part II-S MIFR



Compatibility

Examination, publications, data



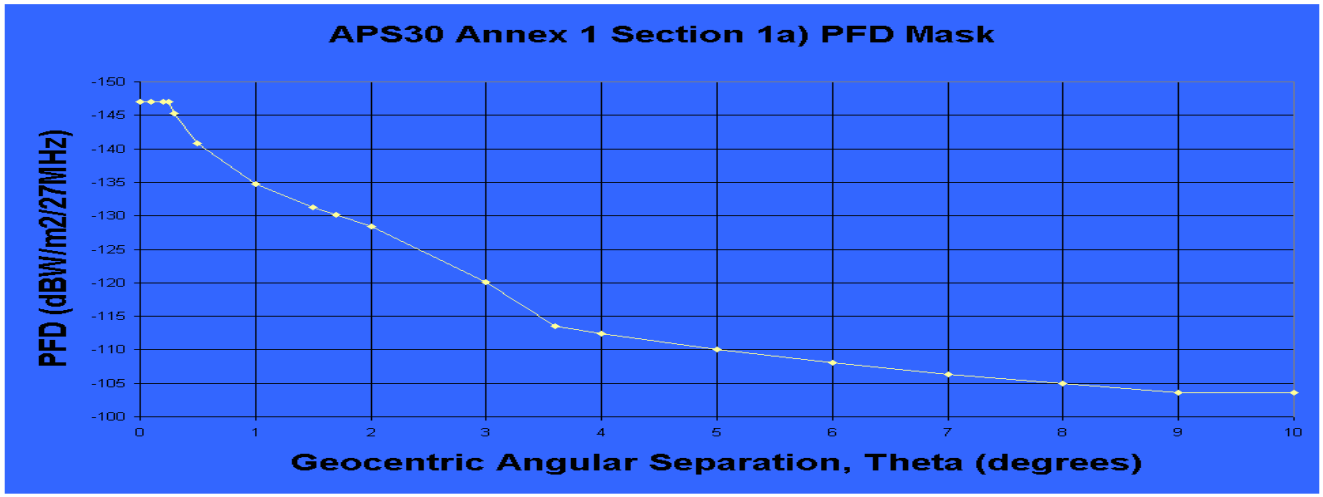
Compatibility between Plan and List Assignments

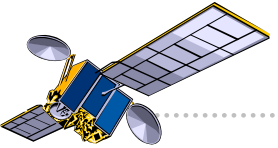
- Region 2 Plan based on OEPM

- Regions 1 & 3 Plan and List based on:
  - 9 degree Coordination Arc
  - EPM and PFD (Downlink)
  - EPM, PFD hard limit at any point in the GSO and Off-axis e.i.r.p (Feeder-link)

Compatibility Criteria for Regions 1 & 3 List Assignments

- Based on both EPM and (hard & trigger) PFD criteria
  - EPM criteria as per the Regions 1 & 3 Plan
  - PFD criteria also used to identify affected assignments as per Annex 1 of AP30





Article 4 Examination (Appendix 30, Region 2)

- Protection of the Region 2 Plan
  SPS/MSPACE: OEPM calculations
- Protection of Regions 1 & 3 Plan and List
  GIBC(PFD space)/GIMS: PFD
- Protection of Terrestrial Services
  GIBC(PFD terrestrial)/GIMS: PFD
- Protection of Regions 1 & 3 FSS
  GIBC(PFD space)/GIMS: PFD

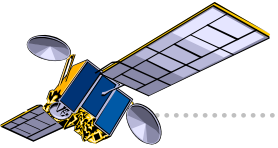
Article 4 Examination (Appendix 30A, Region 2)

- Protection of Region 2 Plan

  SPS/MSPACE: OEPM calculation

- Protection of Regions 1 & 3 Plan and List

  GIBC (Appendix 8): delta T/T



Article 4 Examination (Appendix 30, Regions 1 & 3)

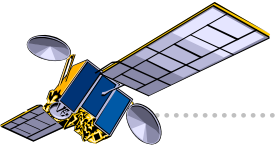
- Protection of the Regions 1 & 3 Plan and List
  SPS/MSPACE: EPM & PFD calculations
- Protection of Region 2 Plan
  GIBC(PFD space)/GIMS: PFD
- Protection of Terrestrial Services
  GIBC(PFD terrestrial)/GIMS: PFD
- Protection of Region 2 and Region 3 FSS
  GIBC(PFD space)/GIMS: PFD

Article 4 Examination (Appendix 30A, Regions 1&3)

- Protection of Regions 1&3 Plan and Lists
  SPS/MSPACE: EPM calculation
- Protection of Region 2 Plan
  GIBC(Appendix 8): delta T/T
- Protection of Region 2 FSS receiving feeder-link space station (17.8-18.1GHz)
  GIBC(Appendix 8): delta T/T

Publication of Examination Results

- Article 4 procedure
  - **Special Sections AP30-30A/E, AP30/E and AP30A/E**
    - Part A: Publication of proposed characteristics and administrations considered affected
    - Part D: Establishment of requirements for agreement
    - Part B: Final characteristics entered into the Plan/List
    - Part C: Cancellation
  - SPS_ALL_IFICnnnn, MSPACEg_results_IFICnnnn



Commenting on Special Sections

Important to comment within 4 months of Part A publication:

AP30/E, AP30A/E, AP30-30A/E & AP30-30A/F/C Special Sections

using **SpaceCom** software

No reply within the time-limit → **Affected Administration accepts an increase of harmful interference**

↓

Protection level from subsequent networks reduced !

Publication of Examination Results

- Article 5 procedure
  - Part I-S, II-S and III-S of BR IFIC
  - SNS-on-Line or SPS_ALL_IFICnnnn
- Article 2A procedure
  - Special Section AP30-30A/F/C
  - Special Section AP30-30A/F/D
  - SNS-on-Line or SPS_ALL_IFICnnnn
- Article 7 procedure
  - Special Section CR/C
  - SNS-on-Line or SRS_ALL

Plan and List data

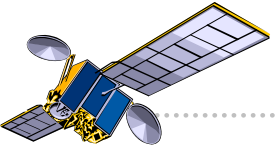
- All Plan and List assignment data can be found in the BR IFIC & at the ITU website:
  - http://www.itu.int/ITU-R/go/space-plans/
- Contained in the SPS database (SNS format)
- Contains the technical characteristics and reference situation for all Plan, List and pending Article 4 assignments
- The SPS database is evolving and is updated regularly

Useful Website addresses for more information

- http://www.itu.int/en/ITU-R/space/plans/
  (General information relating to Space Plans)
- http://www.itu.int/en/ITU-R/space/plans/Pages/SpaceCap_FAQ.aspx
  (Guidelines for capturing Appendix 4 data)
- http://www.itu.int/ITU-R/space/snl/
  (SNL-on-Line; list of published networks, networks in the backlog)
- http://www.itu.int/sns/
  (SNS-online; online query on SPS_ALL database)

WRC-12 Changes

- Update of Remarks Columns of Article 11 of AP30 & Article 9A of AP30A (Resolution 547)
- Suspension of notified Regions 1&3 List assignments for up to 3 years – new provision §5.2.10 added to Article 5 of AP30/30A.
- DBIU: Appendix **4** data item revised. Defined in Nos. **11.44B** and **11.44.2**.
- Correction of some typographical errors



Questions?

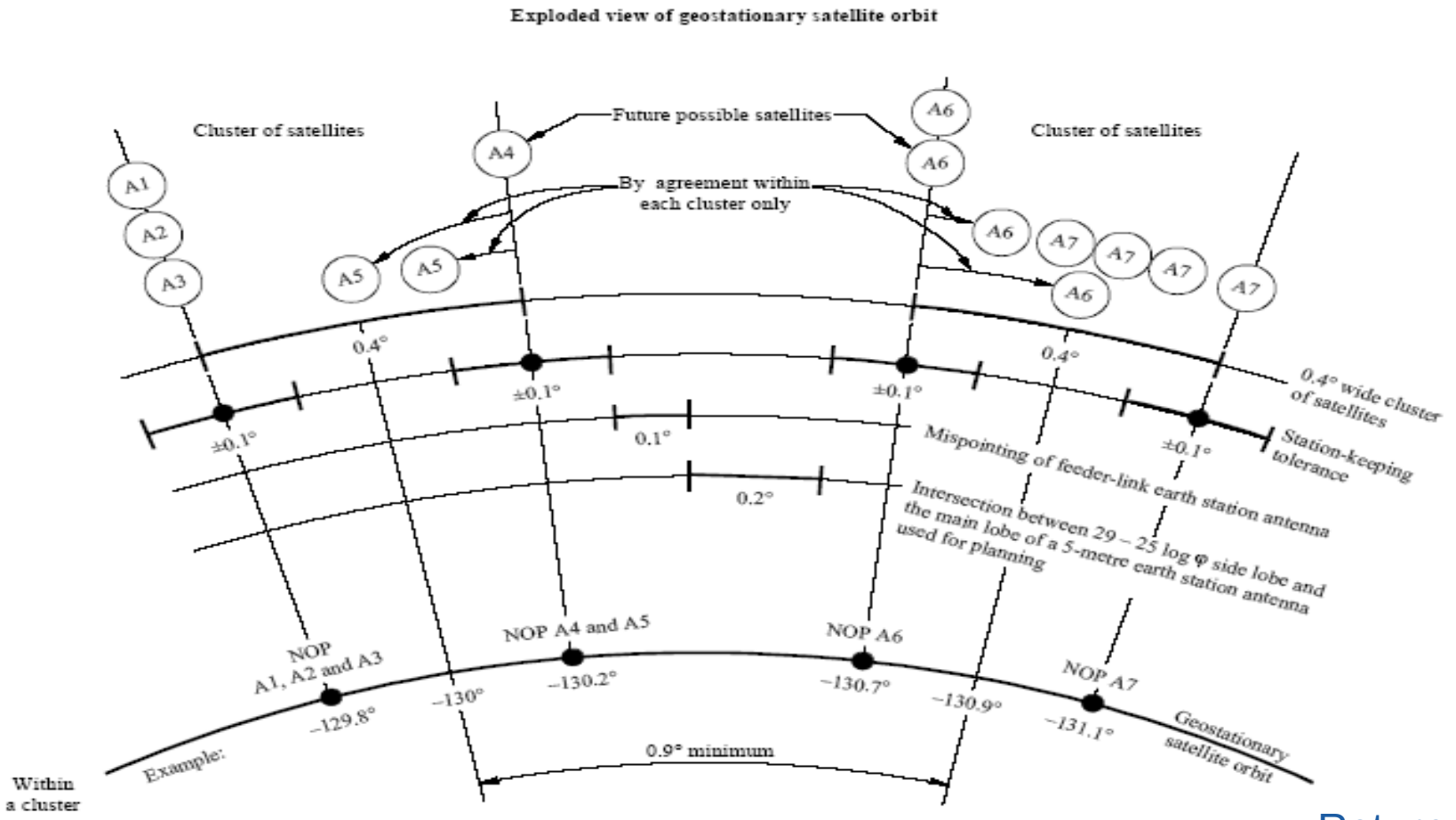
Original Plan (e.g. Region 2)

12 224.00 MHz (1)

1	2	3	4		5		6	7	8	9	
ALS00002	−166.20	1	−149.66	58.37	3.76	1.24	170	1	59.7	9/GR1	10
ALS00003	−175.20	1	−150.98	58.53	3.77	1.11	167	1	60.0	9/GR2	10
ARGINSU4	−94.20	1	−52.98	−59.81	3.40	0.80	19	1	59.9	9/GR3	
ARGSUR04	−94.20	1	−65.04	−43.33	3.32	1.50	40	1	60.7	9/GR3	10
B CE311	−64.20	1	−40.60	−6.07	3.04	2.06	174	1	61.6	8 9/GR7	10
B CE312	−45.20	1	−40.27	−6.06	3.44	2.09	174	1	61.0	8 9/GR9	10
B CE411	−64.20	1	−50.97	−15.27	3.86	1.38	49	1	62.6	8 9/GR7	10
B CE412	−45.20	1	−50.71	−15.30	3.57	1.56	52	1	62.7	8 9/GR9	10
B CE511	−64.20	1	−53.10	−2.90	2.44	2.13	104	1	63.0	8 9/GR7	10
B NO611	−74.20	1	−59.60	−11.62	2.85	1.69	165	2	62.8	8 9/GR8	10
B NO711	−74.20	1	−60.70	−1.78	3.54	1.78	126	2	62.8	8 9/GR8	10
B NO811	−74.20	1	−68.76	−4.71	2.37	1.65	73	2	62.8	8 9/GR8	
B SU111	−81.20	1	−51.12	−25.63	2.76	1.05	50	1	62.8	8 9/GR6	10
B SU112	−45.20	1	−50.75	−25.62	2.47	1.48	56	1	62.2	8 9/GR9	
B SU211	−81.20	1	−44.51	−16.95	3.22	1.36	60	1	62.5	8 9/GR6	10
B SU212	−45.20	1	−44.00	−16.87	3.20	1.96	58	1	61.3	8 9/GR9	
BAHIFRB1	−87.20	1	−76.06	24.16	1.81	0.80	142	1	61.6		
BERBERMU	−96.20	1	−64.77	32.32	0.80	0.80	90	2	56.8		
BERBER02	−31.00	1	−64.77	32.32	0.80	0.80	90	1	56.9	2	10
BOLAND01	−115.20	1	−65.04	−16.76	2.49	1.27	76	1	67.9	9/GR5	
CAN01101	−138.20	1	−125.63	57.24	3.45	1.27	157	1	59.5	9/GR10	10
CAN01201	−138.20	1	−112.04	55.95	3.35	0.97	151	1	59.6	9/GR10	10
CAN01202	−72.70	1	−107.70	55.63	2.74	1.12	32	1	59.6		

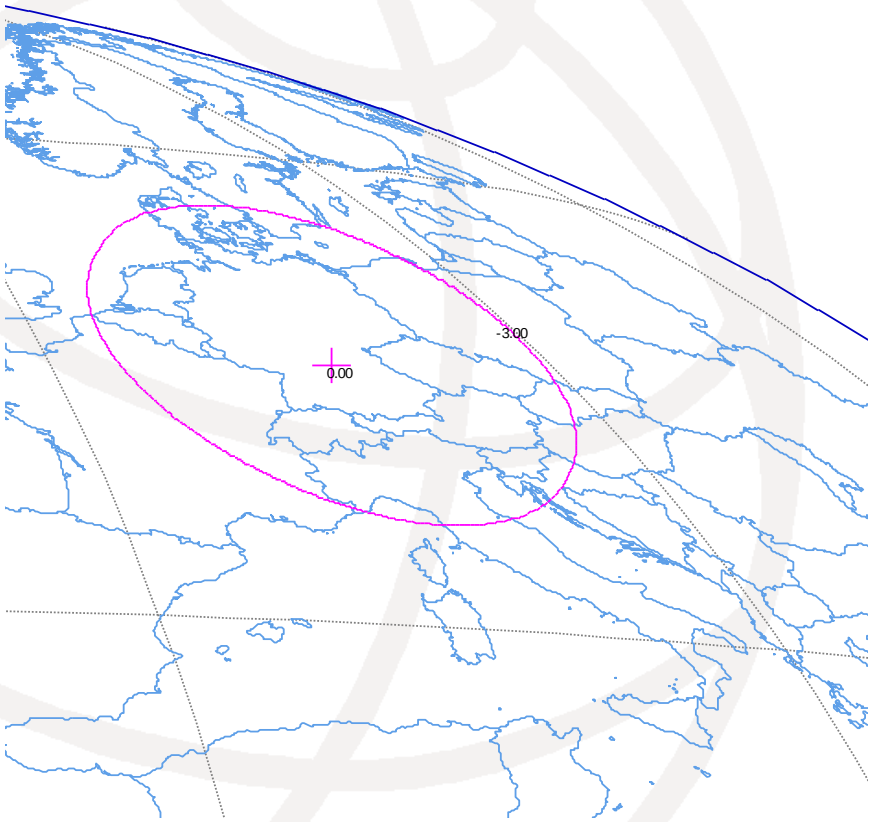
Return

Cluster Concept



Return

An example of extended-coverage national beams



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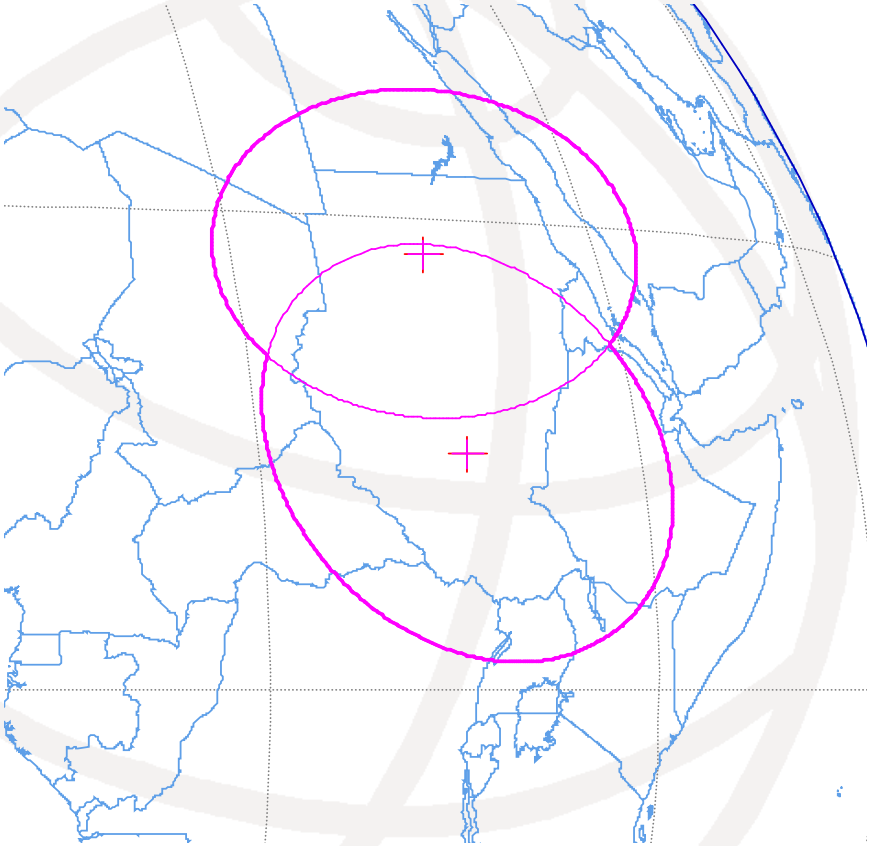
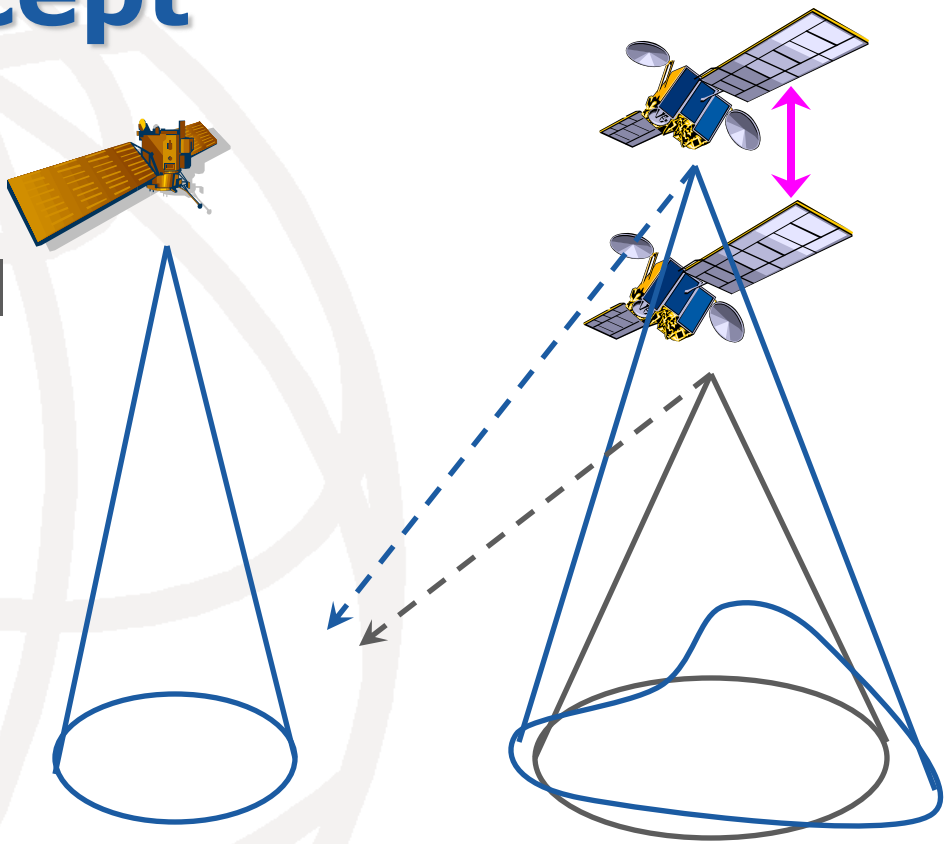
Example of a composite beam



Grouping Concept

- The worst interference signal is selected
- No interference calculation between them
- All assignments in the group are protected



Return

Remarks Column in Article 10

12 224.00 MHz (1)

1	2	3	4		5		6	7	8	9	
ALS00002	−166.20	1	−149.66	58.37	3.76	1.24	170	1	59.7	9/GR1	10
ALS00003	−175.20	1	−150.98	58.53	3.77	1.11	167	1	60.0	9/GR2	10
ARGINSU4	−94.20	1	−52.98	−59.81	3.40	0.80	19	1	59.9	9/GR3	
ARGSUR04	−94.20	1	−65.04	−43.33	3.32	1.50	40	1	60.7	9/GR3	10
B CE311	−64.20	1	−40.60	−6.07	3.04	2.06	174	1	61.6	8 9/GR7	10
B CE312	−45.20	1	−40.27	−6.06	3.44	2.09	174	1	61.0	8 9/GR9	10
B CE411	−64.20	1	−50.97	−15.27	3.86	1.38	49	1	62.6	8 9/GR7	10
B CE412	−45.20	1	−50.71	−15.30	3.57	1.56	52	1	62.7	8 9/GR9	10
B CE511	−64.20	1	−53.10	−2.90	2.44	2.13	104	1	63.0	8 9/GR7	10
B NO611	−74.20	1	−59.60	−11.62	2.85	1.69	165	2	62.8	8 9/GR8	10
B NO711	−74.20	1	−60.70	−1.78	3.54	1.78	126	2	62.8	8 9/GR8	10
B NO811	−74.20	1	−68.76	−4.71	2.37	1.65	73	2	62.8	8 9/GR8	
B SU111	−81.20	1	−51.12	−25.63	2.76	1.05	50	1	62.8	8 9/GR6	10
B SU112	−45.20	1	−50.75	−25.62	2.47	1.48	56	1	62.2	8 9/GR9	
B SU211	−81.20	1	−44.51	−16.95	3.22	1.36	60	1	62.5	8 9/GR6	10
B SU212	−45.20	1	−44.00	−16.87	3.20	1.96	58	1	61.3	8 9/GR9	
BAHIFRB1	−87.20	1	−76.06	24.16	1.81	0.80	142	1	61.6		
BERBERMU	−96.20	1	−64.77	32.32	0.80	0.80	90	2	56.8		
BERBER02	−31.00	1	−64.77	32.32	0.80	0.80	90	1	56.9	2	10
BOLAND01	−115.20	1	−65.04	−16.76	2.49	1.27	76	1	67.9	9/GR5	
CAN01101	−138.20	1	−125.63	57.24	3.45	1.27	157	1	59.5	9/GR10	10
CAN01201	−138.20	1	−112.04	55.95	3.35	0.97	151	1	59.6	9/GR10	10
CAN01202	−72.70	1	−107.70	55.63	2.74	1.12	32	1	59.6		

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