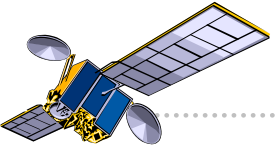


# **Broadcasting-Satellite Service Plans and Lists (Appendices 30 & 30A)**

Presented by Véronique GLAUDE

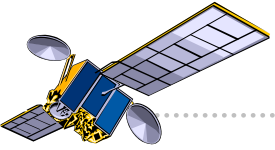
ITU – BR Space Service Department



# History

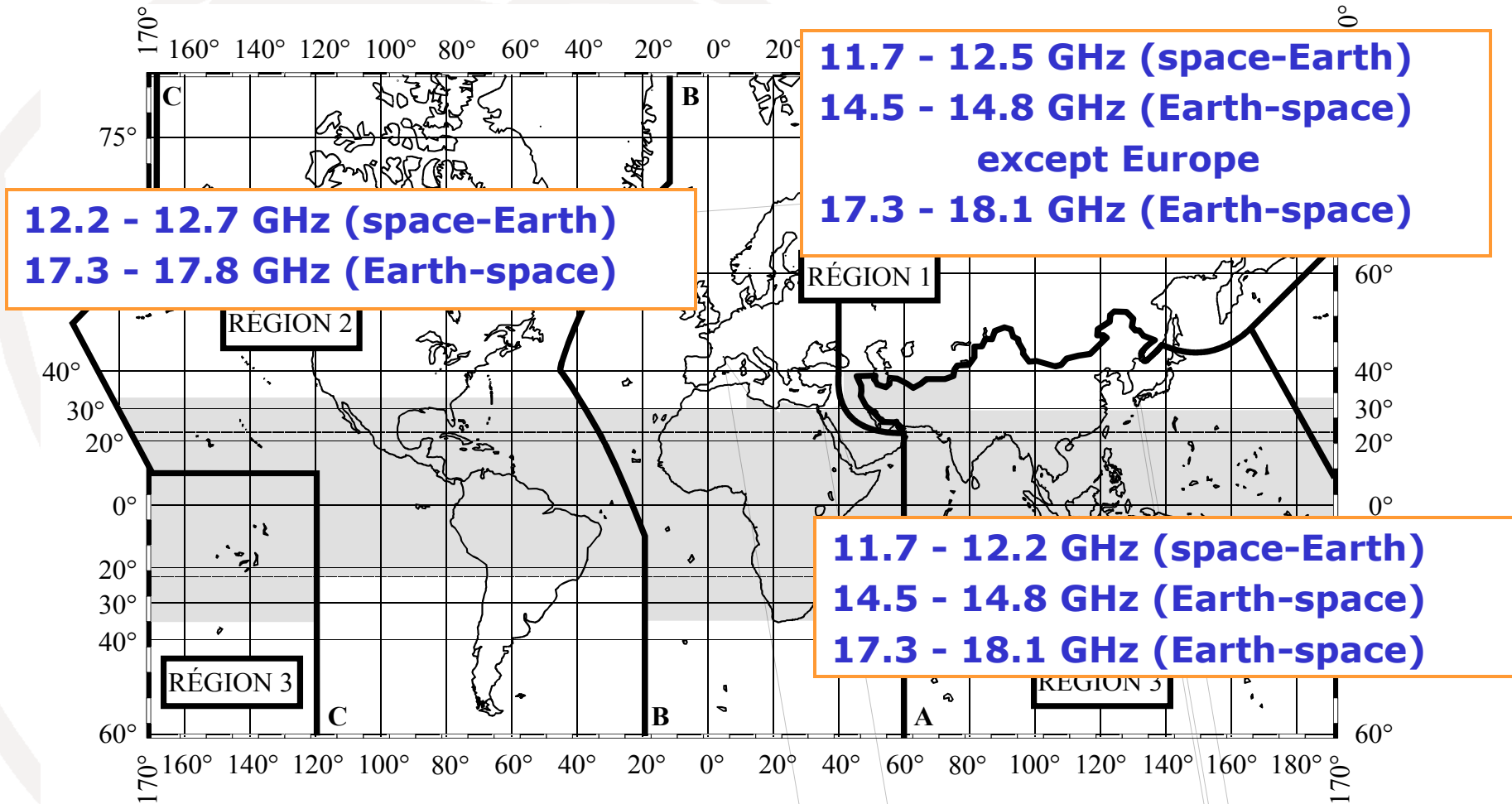
- **WARC-77** established Region 1&3 **BSS** Plan
- **RARC-83** established Region 2 **BSS** and associated Feeder-link Plan
- **WARC ORB-85** included Region 2 **BSS** and associated Feeder-link Plan into the Radio Regu
- **WARC ORB-88** established Region 1&3 **BSS** Feeder-link Plan
- **WRC-97** revised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



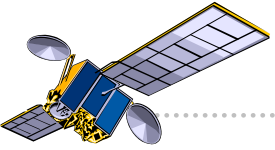


# Frequency bands

## BSS and associated Feeder-link Plans/Lists coverage



5-01



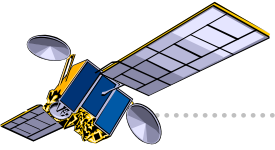
# Elements of the BSS Plans

National assignments in:



- Article 10 of AP30 for Region 2
- **Article 11 of AP30 for Regions 1 & 3**
- 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 ...

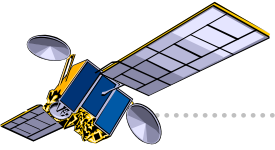


# Technical data used?

## Annex 5 of Appendix 30 Annex 3 of Appendix 30A



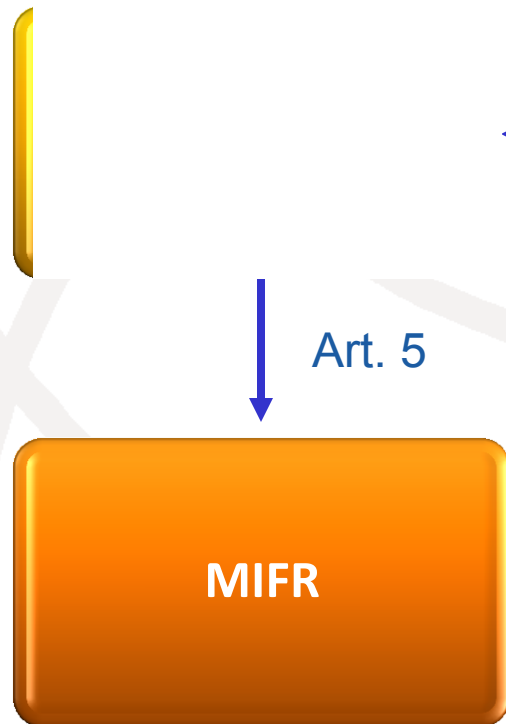
- Type of modulation (digital for R1&3), Polarization, C/N, Protection ratio, System noise, Channel, Antenna, Necessary bandwidth, satellite station keeping etc.
  - Most of them are characteristics used for establishing Plans → can be different for modifications
- However, when “shall” is used → has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



# Appendices 30/30A Procedure

Region 2

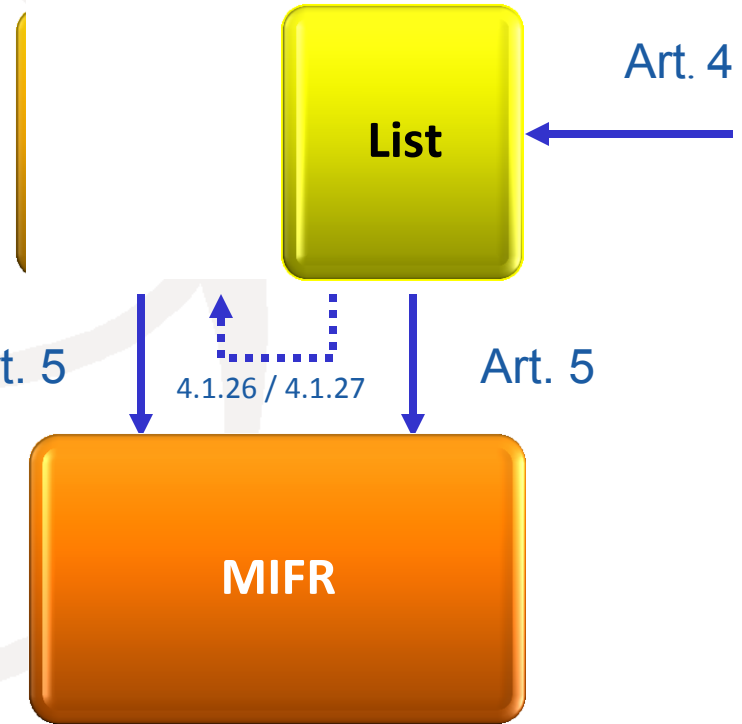
Regions 1 and 3



Art. 4

Art. 5

MIFR



Art. 4

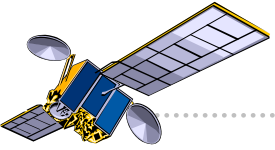
List

Art. 5

4.1.26 / 4.1.27

Art. 5

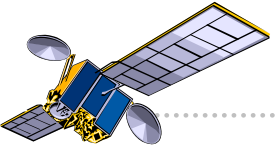
MIFR



# 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



## 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





# Lists of additional uses - Regions 1 and 3

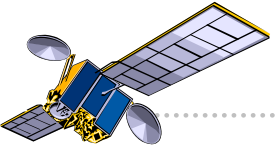


➤ AP30 12 GHz (currently **62** entries)

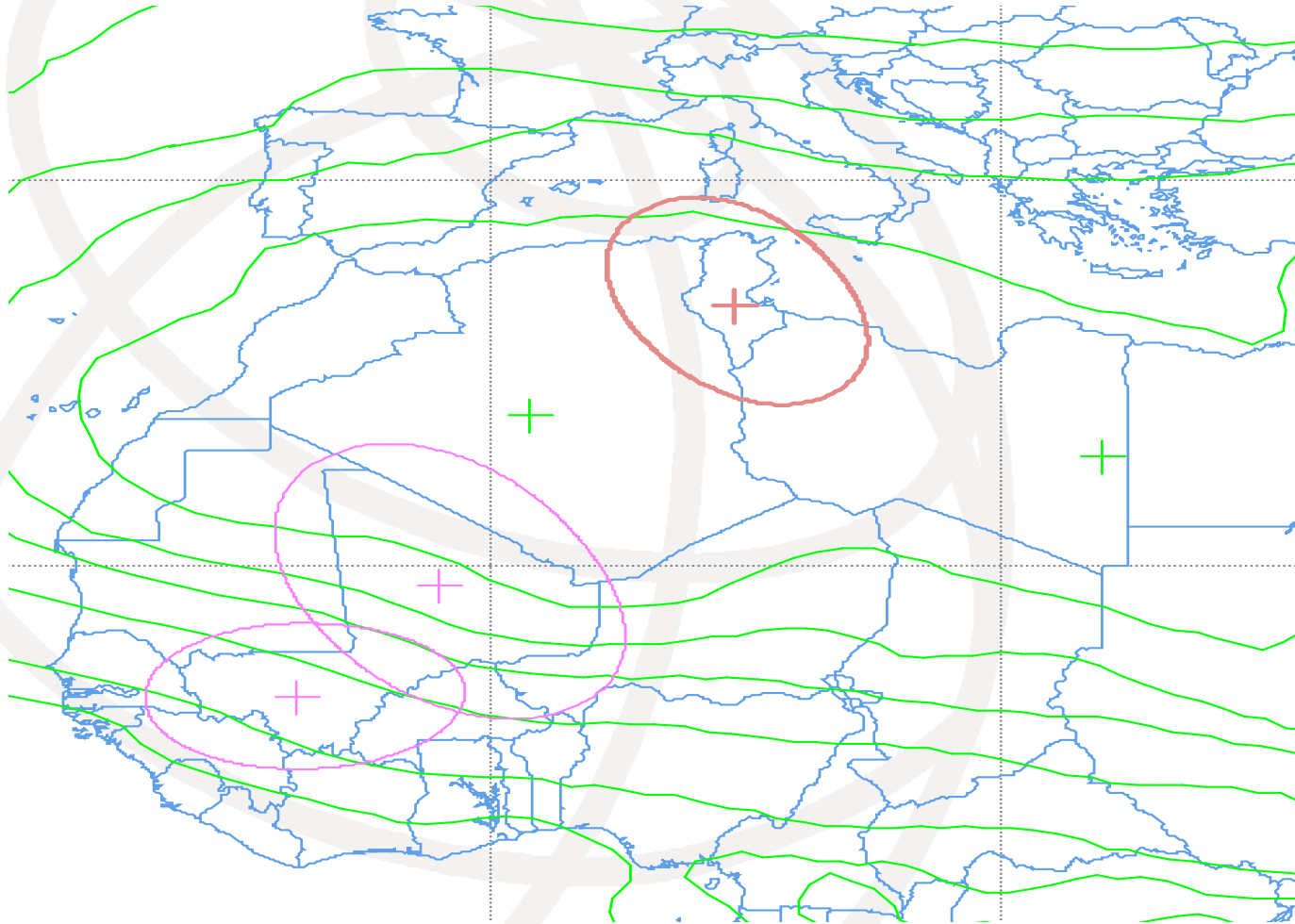


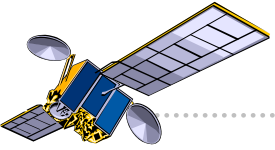
➤ AP30A 14 GHz / 17 GHz (currently **55** entries)

- ✓ Created by WRC-2000
- ✓ 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



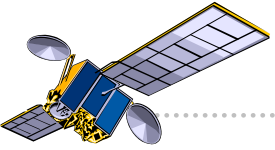
# Plan & List Beams



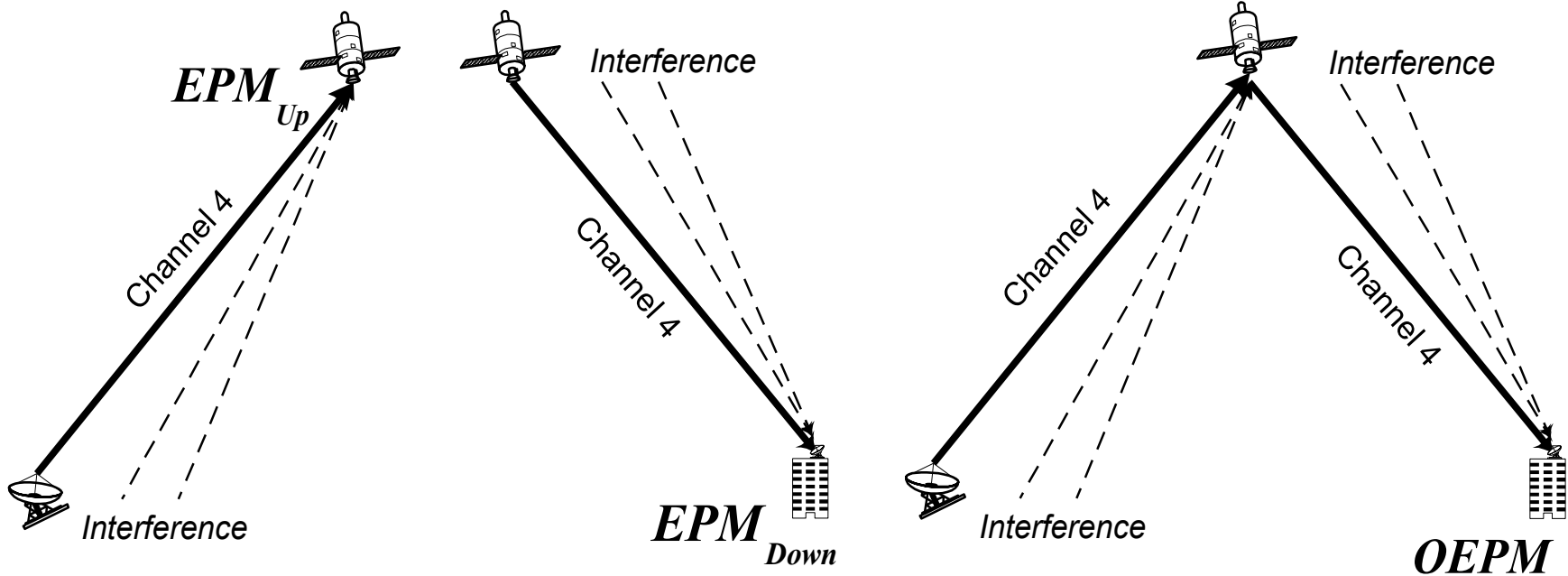


# Establishment of the Plans (Lists)

- Compatibility among assignments in Plan and List
  - EPM or OEPM
  
- Compatibility between Plan and other services or Plan in other Regions
  - PFD,  $\Delta T/T$
  - 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

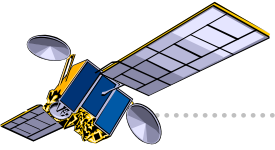


# Difference between EPM and OEPM



**Regions 1 and 3 Approach**  
(separated links)

**Region 2 Approach**  
(overall link analyses)



# Compatibility Criteria Regions 1 & 3 Plan Assignments

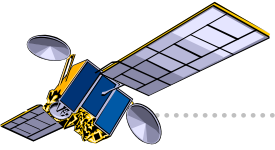
**Equivalent Protection Margin (EPM) is used:**

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

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

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

$PR_i$  = protection ratio for a given interference type  $i$



# Compatibility Criteria Region 2 Plan Assignments

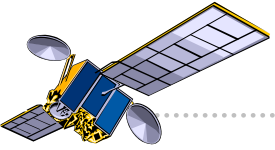
Overall Equivalent Protection Margin (OEPM) is used:

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



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

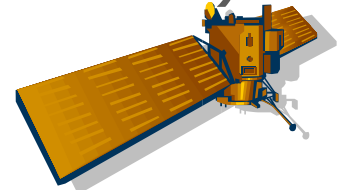
$i$  = interference type  
( 1=co-channel,  
2&3=upper & lower first adjacent channels,  
4&5=upper & lower second adjacent channels)

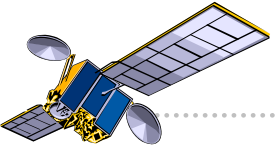
$PR_i$  = protection ratio for a given interference type  $i$



# Main Regulatory Aspects: BSS Downlink/ Feeder-link

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

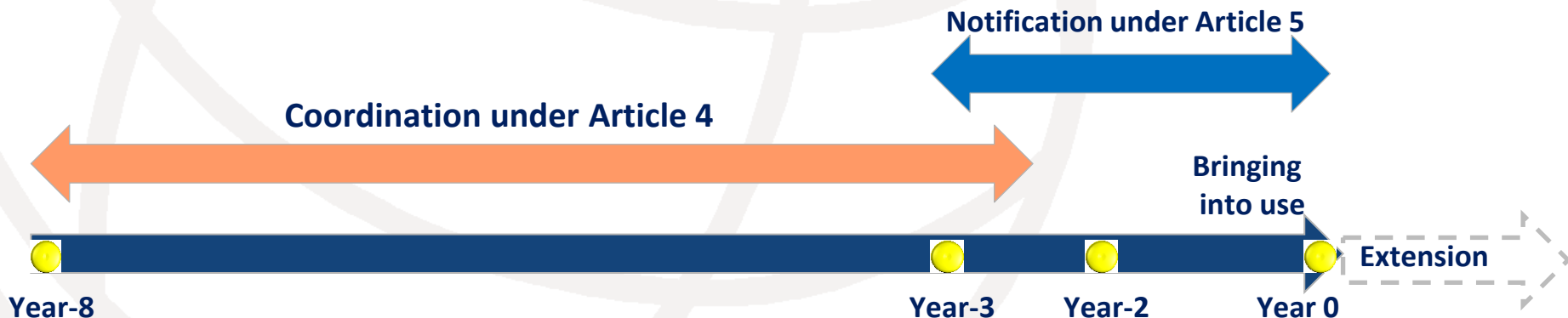




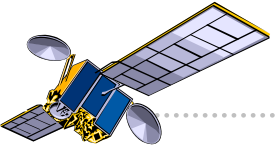
# Main Regulatory Aspects: BSS Downlink/ Feeder-link

## 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 and application of No. 11.44B of continuous use)
- to submit due diligence information (Res.49)
- can be extended to maximum 3 years in case of launch failure





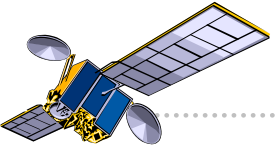


# Main Regulatory Aspects:

## Feeder-link earth station

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

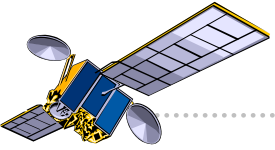




## Main Regulatory Aspects:

# Space Operation/TT&C in the Guardbands

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



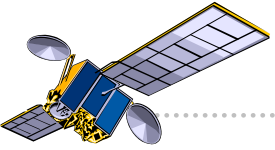
# Main Regulatory Aspects

## Terrestrial

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

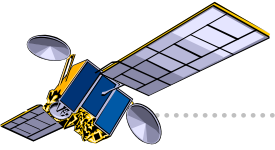
## FSS

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



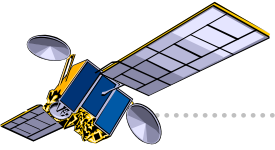
# Article 5 Notification

- Final characteristics for Plan and Lists assignments
- Confirmation of date of bringing into use (11.44B)
- 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/>

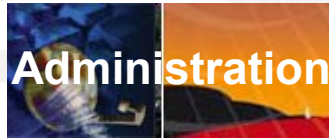


# Processing of New Submissions

## Article 4



# Processing of Article 4 SUBMISSION (1)



ITU-BR



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

Fail

Validation Check

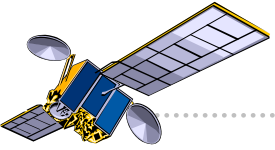


OK

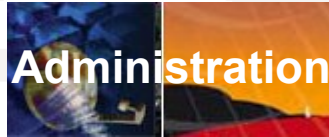
Acknowledgement by telefax

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





# Processing of Article 4 EXAMINATION (2)



ITU-BR



Completeness examination and tele...

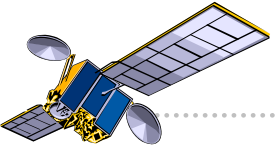
Reply must be sent within 30 days  
(receivability ROP)

Regulatory/technical examination

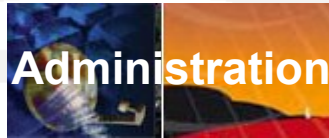


Publication of Part A Special Section (BR IFIC) that contains the filed satellite network characteristics and potentially affected administrations. Results of the Bureau's MSPACEg calculations are also included in the BR IFIC.





# Processing of Article 4 COMMENTS (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)

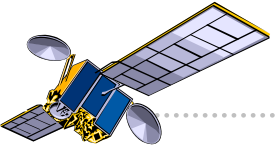
**SpaceCom** software compulsory from 01.07.2009  
(resolves 4 of Res.55)



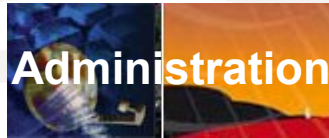
After the 4 month period has expired, the BR prepares a list of agreements required to complete the coordination procedure and publishes it in a Part D Special Section.







# Processing of Article 4 LIST submission(4)



ITU-BR

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

Fail

Validation Check

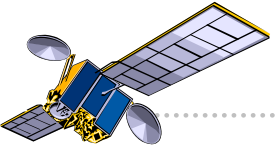
OK

Acknowledgement by telefax

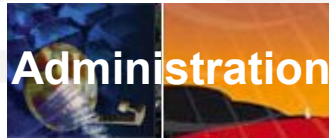
Completeness examination

Reply must be sent within 30 days (receivability ROP)






# Processing of Article 4 LIST examination (5)



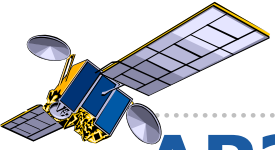
Regulatory/technical examination

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



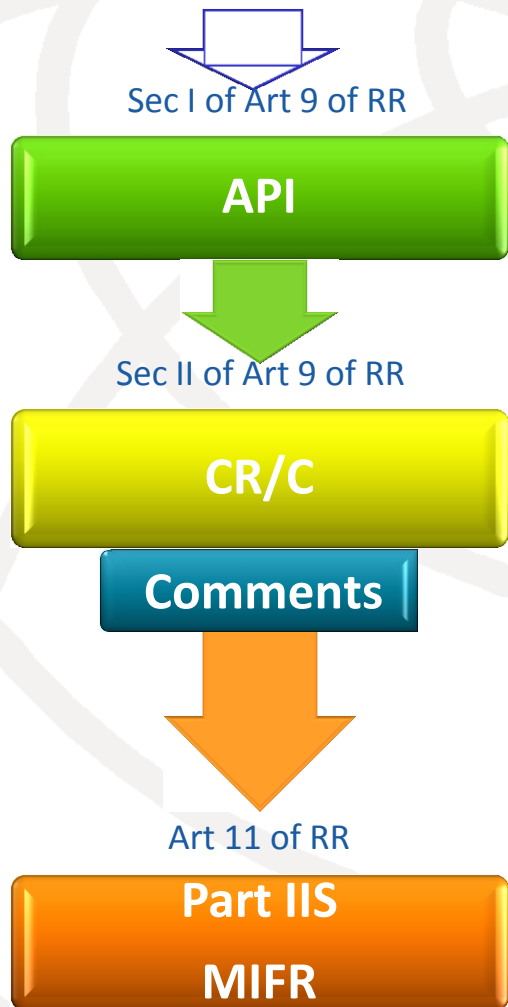
Submission of notification (confirmation of bringing into use 11.44B), Res.49 due diligence information

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

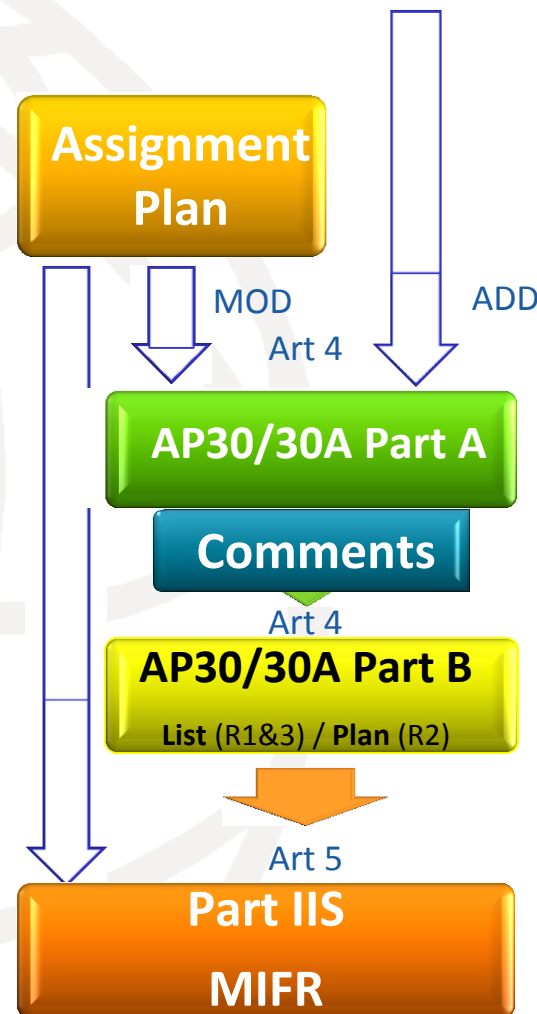


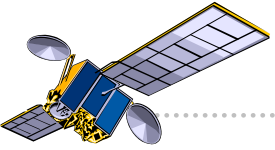
# Comparison between AP30/30A and Non-Plan procedures

## Non Plan BSS GSO



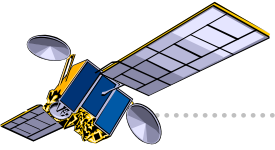
## APPENDICES 30/30A





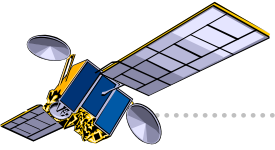
# Compatibility

Examination, publications, data



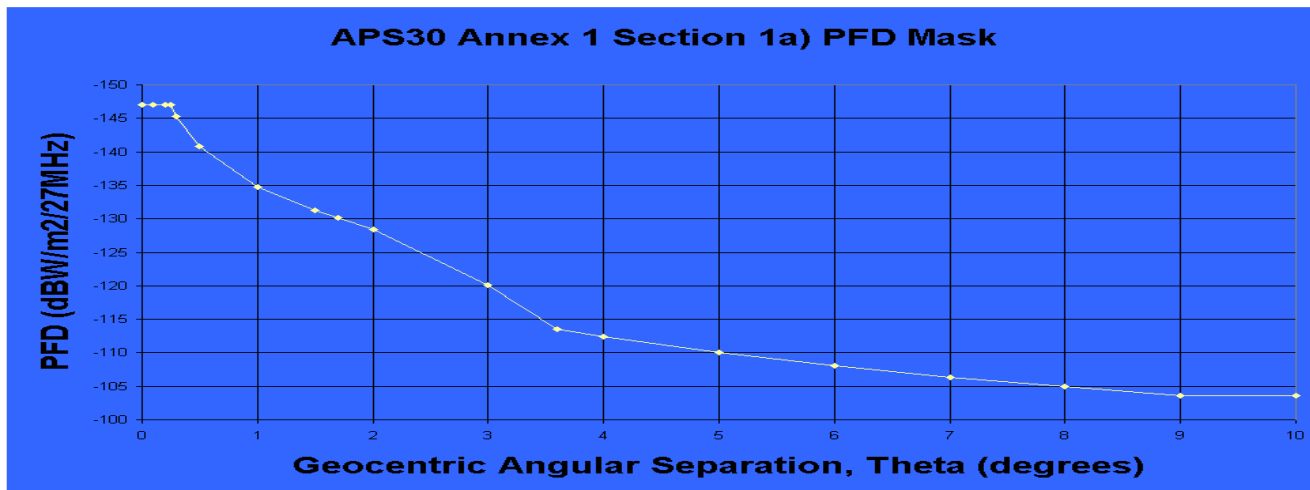
# Compatibility between Plan and List Assignments

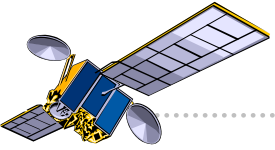
- Regions 1 & 3 Plan and List based on:
  - 9 degree Coordination Arc
  - EPM and PFD (Downlink)
  - EPM, PFD hard limit at any point in the GSO and Off-axis e.i.r.p (Feeder-link)
- Region 2 Plan based on OEPM



# Compatibility Criteria for Regions 1 & 3 List Assignments

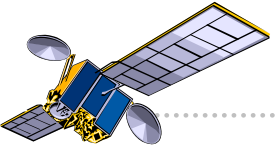
- Based on both EPM and (hard & trigger) PFD criteria
  - EPM criteria as per the Regions 1 & 3 Plan
  - PFD criteria also used to identify affected assignments as per Annex 1 of AP30





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

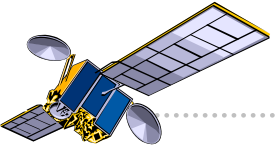
- Protection of the Regions 1 & 3 Plan and List  
SPS/MSPACE: EPM & PFD calculations
- Protection of Region 2 Plan  
GIBC(PFD space)/GIMS: PFD
- Protection of Terrestrial Services  
GIBC(PFD terrestrial)/GIMS: PFD
- Protection of Region 2 and Region 3 FSS  
GIBC(PFD space)/GIMS: PFD



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

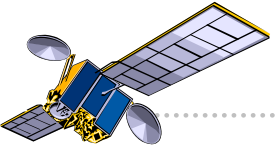
- Protection of Regions 1&3 Plan and Lists  
SPS/MSPACE: EPM calculation
- Protection of Region 2 Plan  
GIBC(Appendix 8):  $\Delta T/T$
- Protection of Region 2 FSS receiving  
feeder-link space station (17.8-18.1GHz)  
GIBC(Appendix 8):  $\Delta T/T$





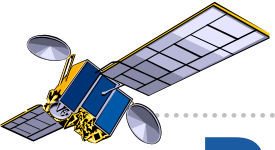
# Article 4 Examination (Appendix 30, Region 2)

- 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



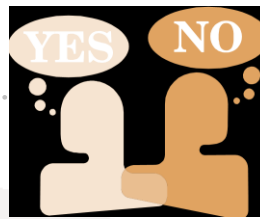
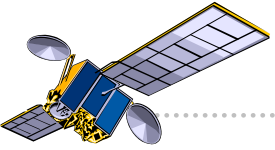
# Article 4 Examination (Appendix 30A, Region 2)

- Protection of Region 2 Plan  
SPS/MSPACE: OEPM calculation
- Protection of Regions 1 & 3 Plan  
and List  
GIBC (Appendix 8):  $\Delta T/T$



# 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



# Comments within 4 months

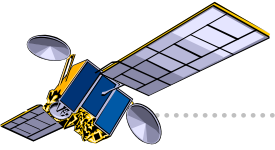
Publications:

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

using **SpaceCom** software

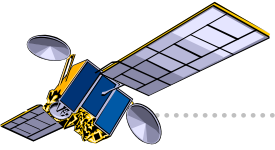
**No reply within the time-limit** → **Affected Administration accepts an increase of harmful interference**

**Protection level from subsequent networks reduced !**



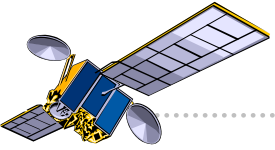
# Publication of Examination Results

- **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



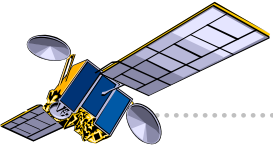
# Plan and List data

- 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



# WRC-12 Changes

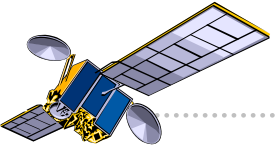
- Update of Remarks Columns of Article 11 of AP30 & Article 9A of AP30A (Resolution 547)
- **Suspension** of notified Regions 1&3 List assignments for up to 3 years – new provision §5.2.10 added to Article 5 of AP30/30A.
- **DBIU**: Appendix 4 data item revised. Defined in Nos. **11.44B** and **11.44.2**.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



# Useful Website addresses for more information

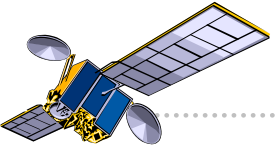
- <http://www.itu.int/en/ITU-R/space/plans/>  
(General information relating to Space Plans)
- [http://www.itu.int/en/ITU-R/space/plans/Pages/SpaceCap\\_FAQ.aspx](http://www.itu.int/en/ITU-R/space/plans/Pages/SpaceCap_FAQ.aspx)  
(Guidelines for capturing Appendix 4 data)
- <http://www.itu.int/ITU-R/space/snl/>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





شكرا

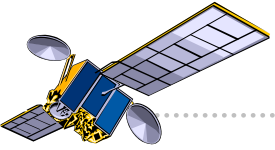
**Thank you!**



# Original Plan (e.g. Region 2)

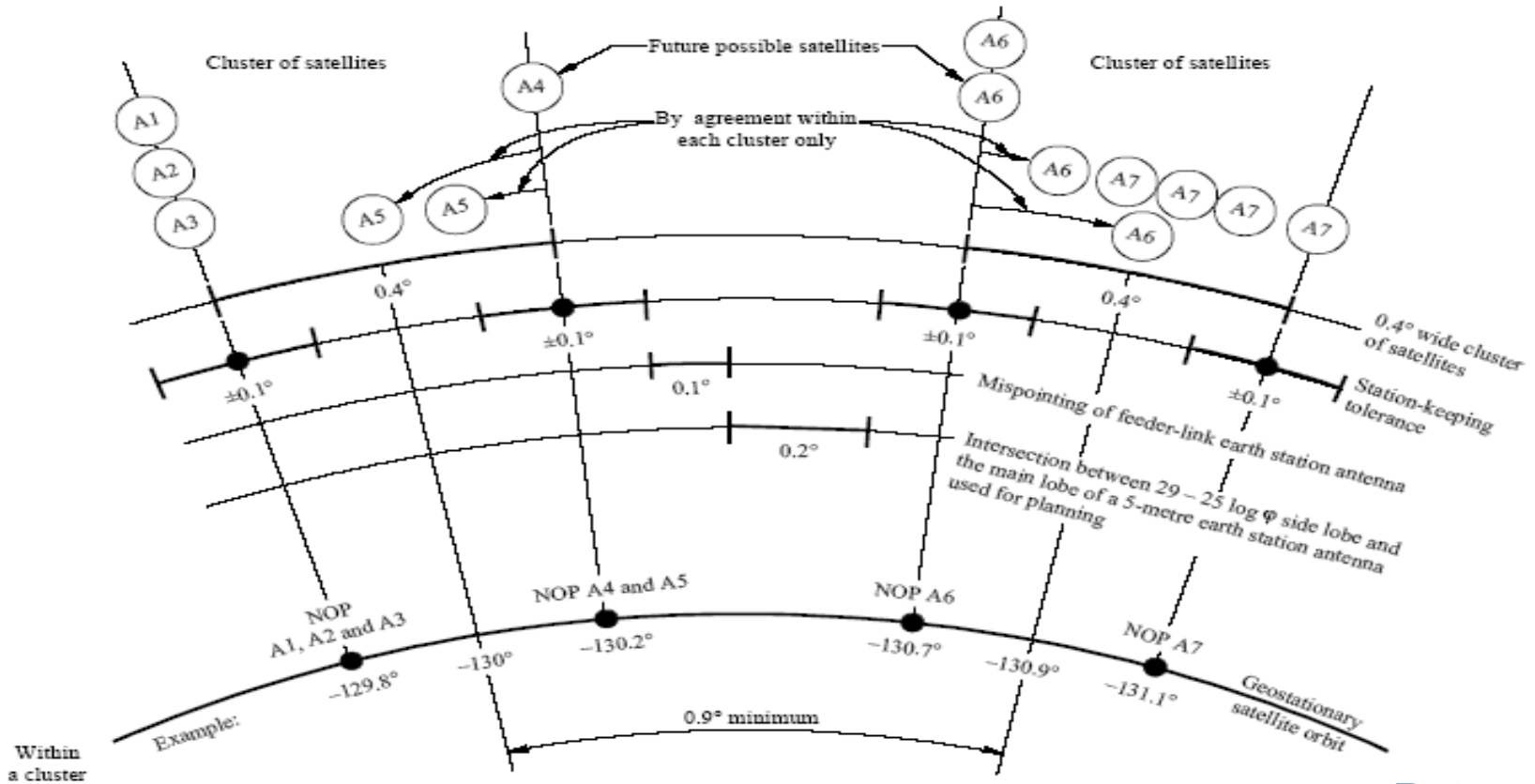
12 224.00 MHz (1)

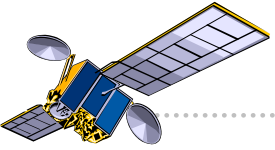
1	2	3	4	5	6	7	8	9			
ALS00002	-166.20	1	-149.66	58.37	3.76	1.24	170	1	59.7	9/GR1	10
ALS00003	-175.20	1	-150.98	58.53	3.77	1.11	167	1	60.0	9/GR2	10
ARGINSU4	-94.20	1	-52.98	-59.81	3.40	0.80	19	1	59.9	9/GR3	
ARGSUR04	-94.20	1	-65.04	-43.33	3.32	1.50	40	1	60.7	9/GR3	10
B CE311	-64.20	1	-40.60	-6.07	3.04	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	10
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		



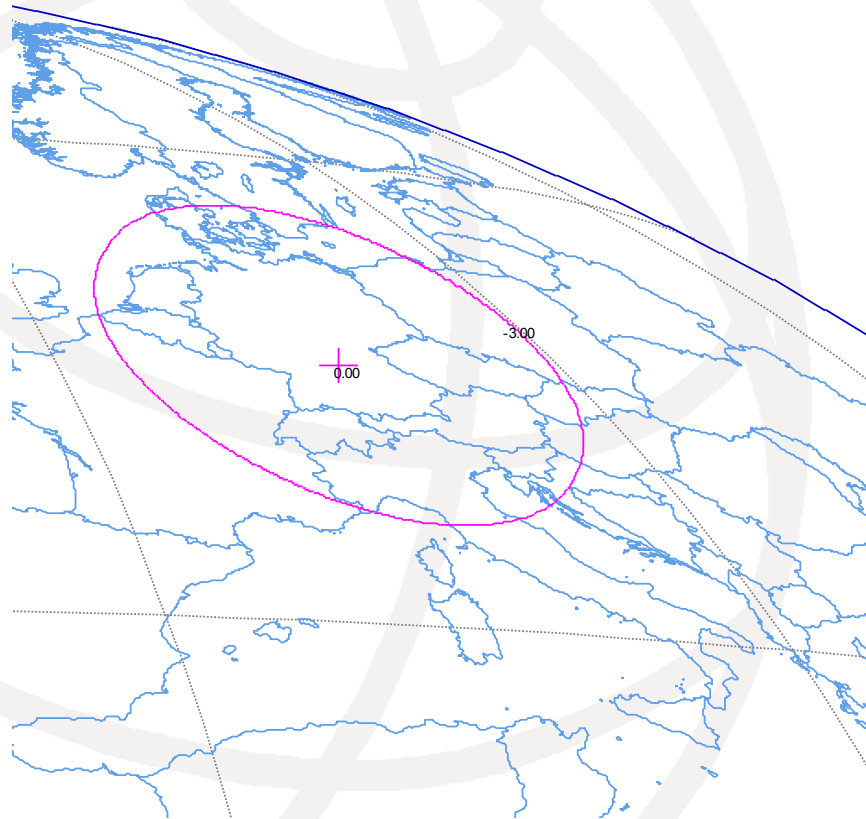
# Cluster Concept

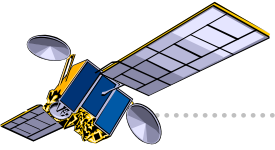
Exploded view of geostationary satellite orbit



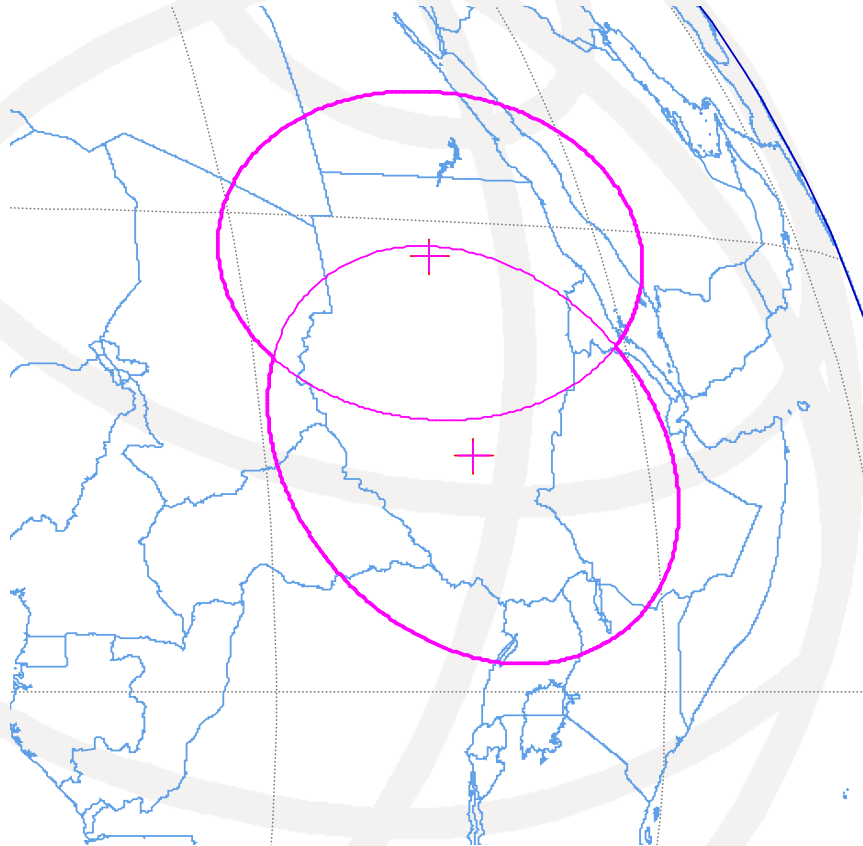


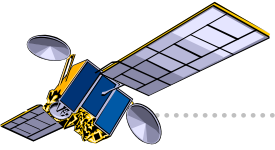
# An example of extended-coverage national beams





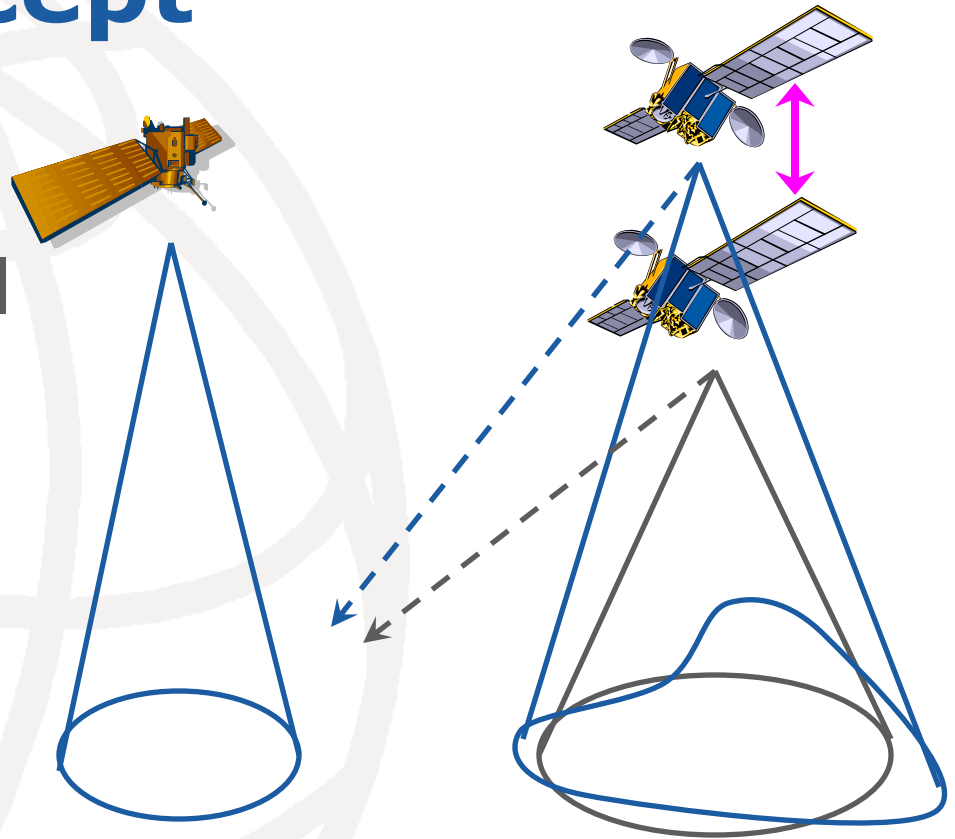
# Example of a composite beam

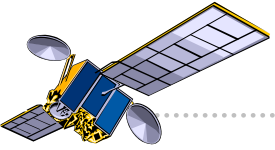




# Grouping Concept

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





# 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
ARGNSU4	-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
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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		
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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		