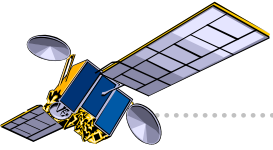


Committed to connecting the world

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

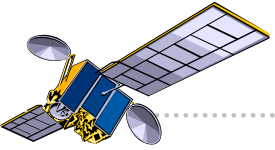
Yvon Henri
Chief, Space Services Department
ITU Radiocommunication Bureau (BR)

San Jose, Costa Rica
30 October – 1 November 2012



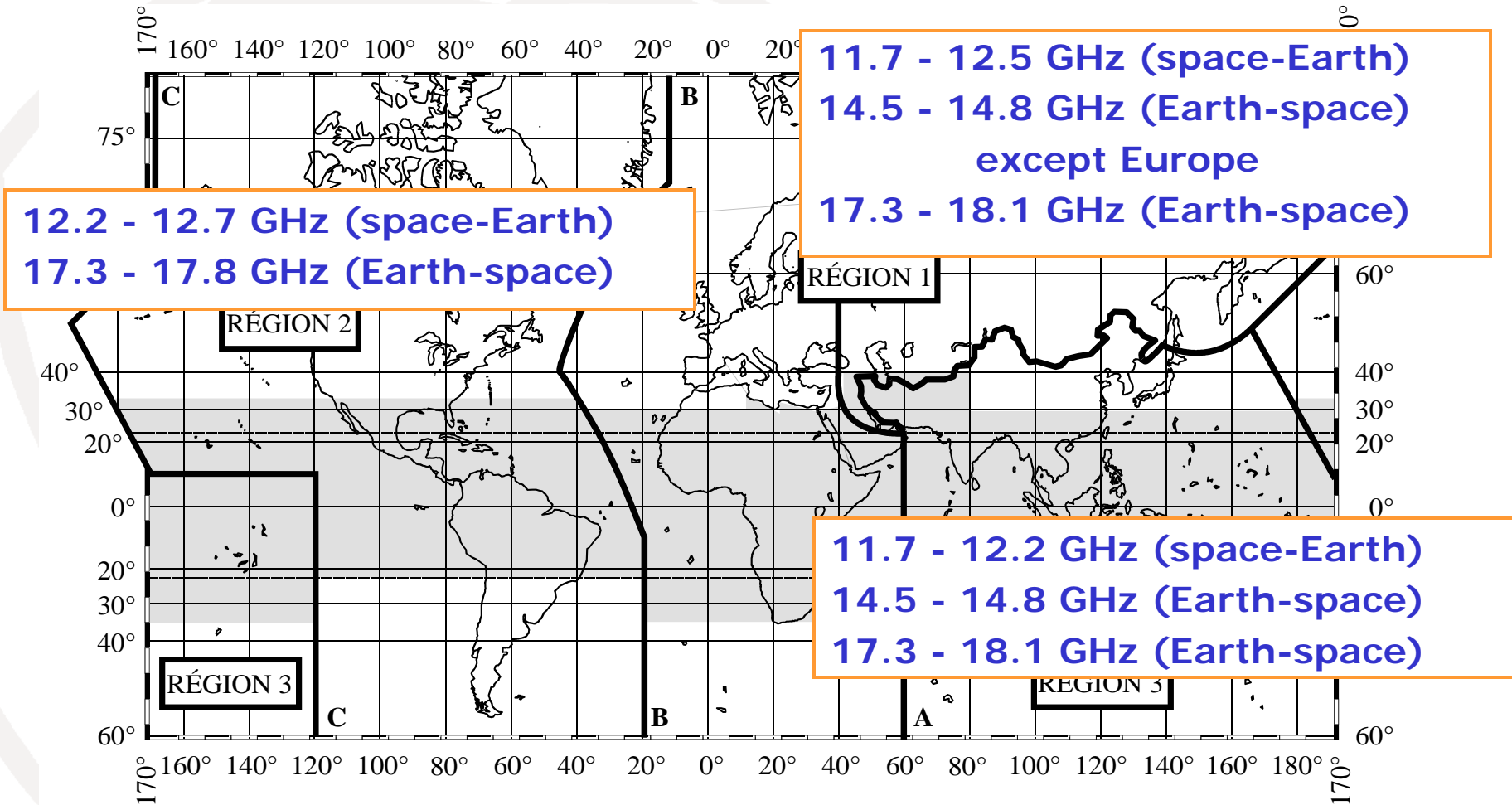
History

- 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 RRs
- 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

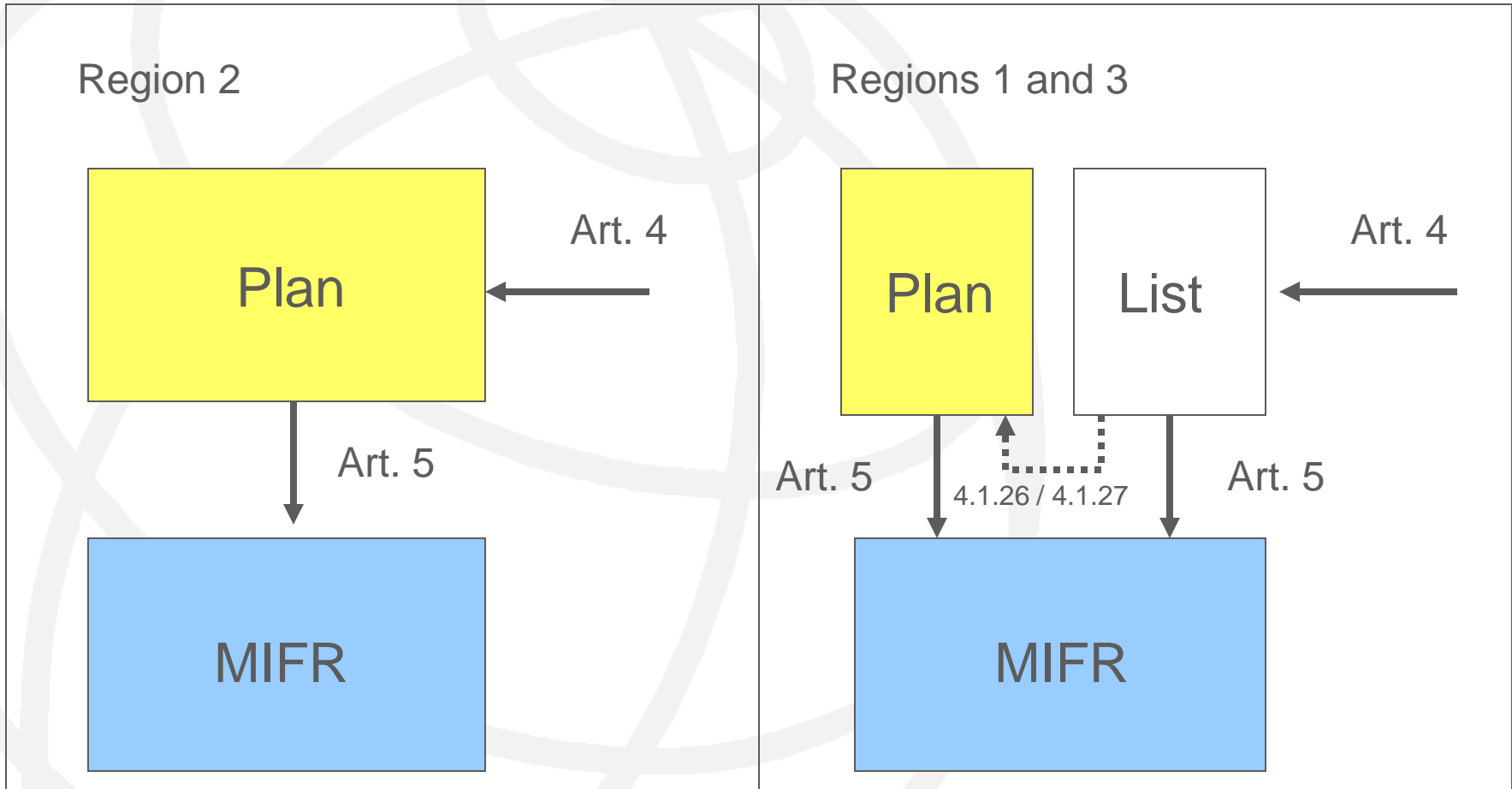


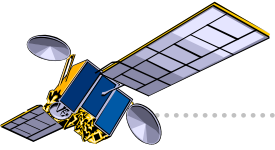
Frequency bands

BSS and associated Feeder-link Plans/Lists coverage



AP30/30A Procedure





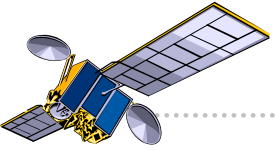
Elements of Plans

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:

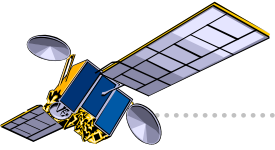
orbital position, channels, polarization, power levels, antenna patterns, emission designation, beam coverage, grouping ...



Technical data used?

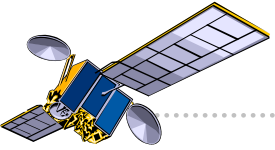
Annex 5 of Appendix 30 Annex 3 of Appendix 30A

- 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

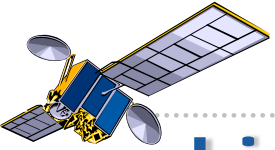
- Downlink and Feeder-link together (OEPM)
- 32 channels for a cluster
- Cluster concept
- Same status given to assignments in the Plan resulting from the application of Article 4 procedure if brought into use
- Currently 178 entries



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

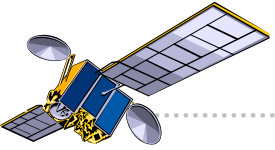


Lists - Regions 1 and 3

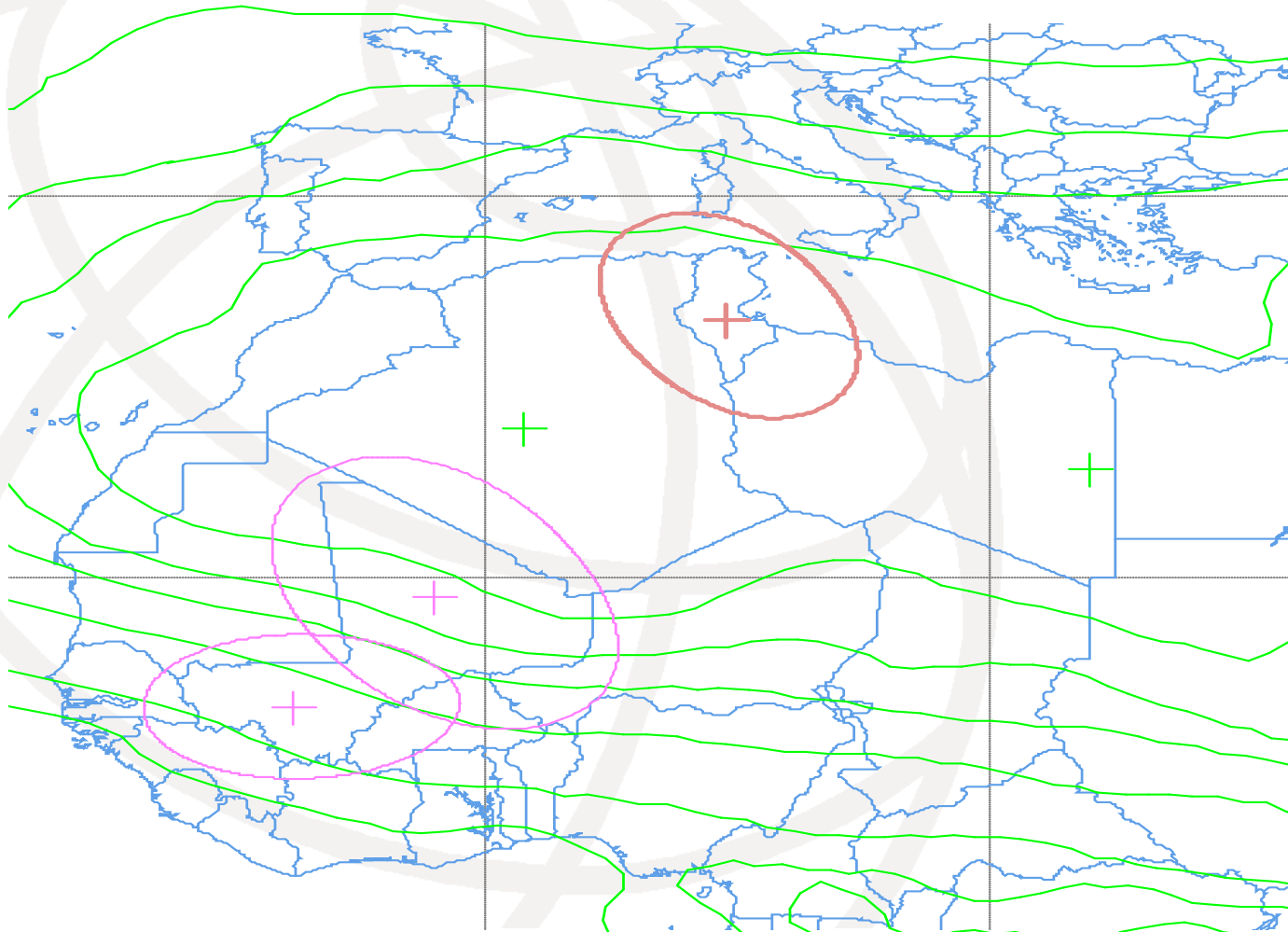
Regions 1 and 3 Lists of Additional Uses created by WRC-2000:

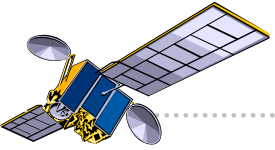
- AP30 Downlink List
 - 12 GHz (currently **62** entries)
- AP30A Feeder-link List
 - 14 GHz / 17 GHz (currently **55** entries)

- 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

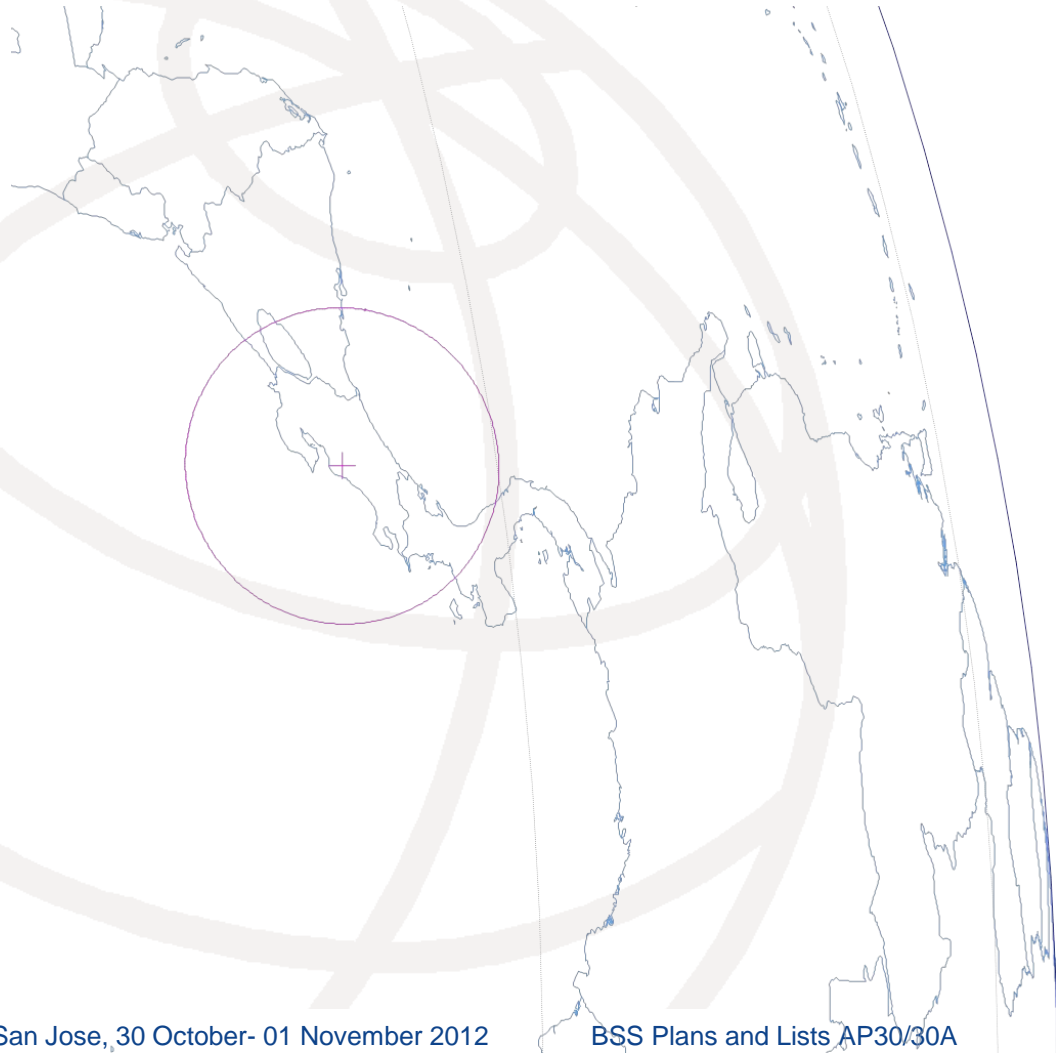


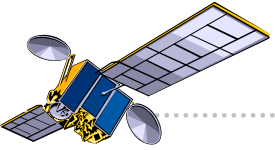
Plan & List Beams





Plan Beams

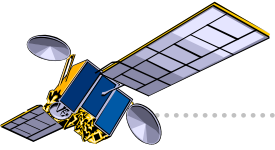




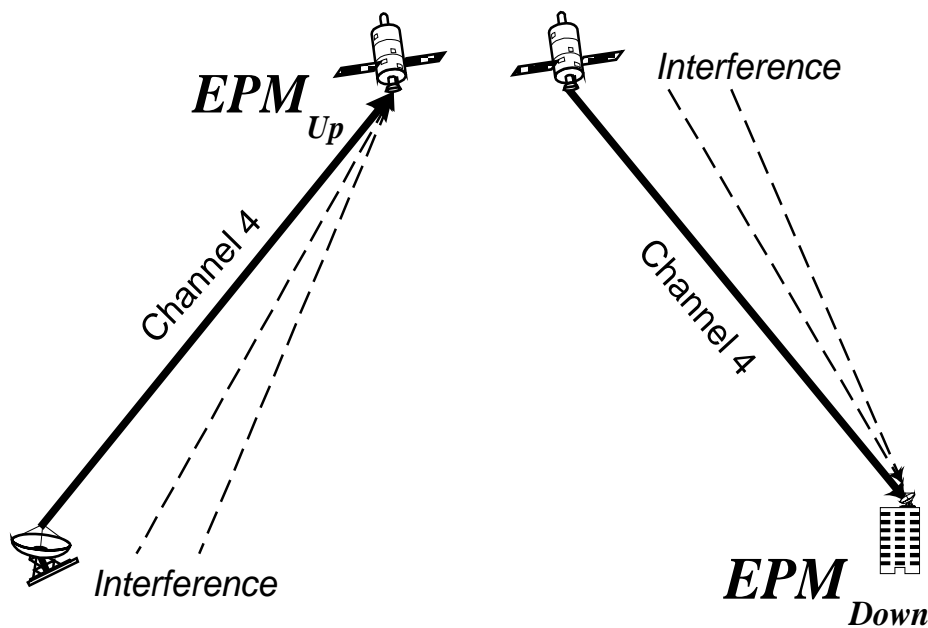
Establishment of the Plans (Lists)

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

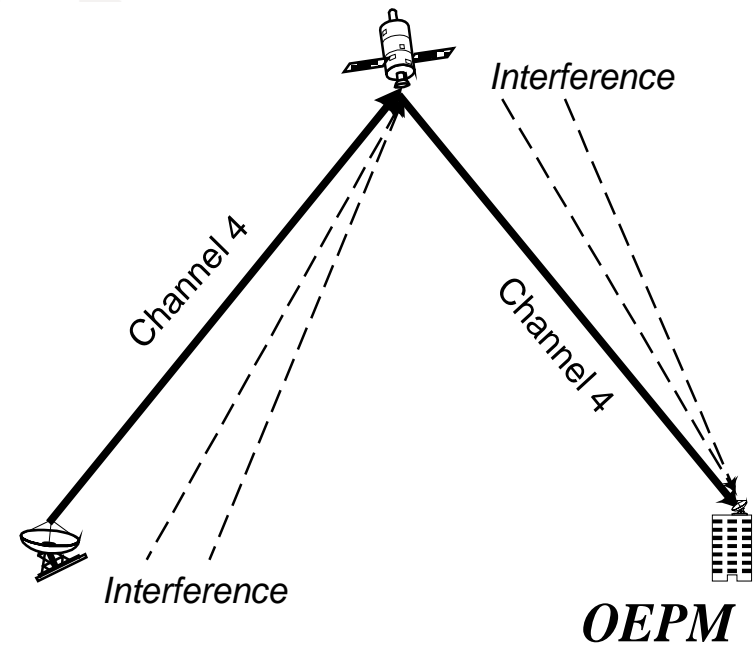
- Compatibility between Plan and other services or Plan in other Regions
 - PFD, $\Delta T/T$
 - Regulatory mechanism:
Remarks in Art. 10 and 11 of AP30,
Art. 9 and 9A of AP30A,
Art. 9 and 11 of RR for specific feeder-link earth station



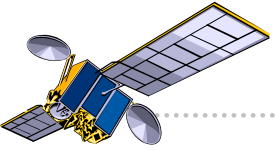
Difference between EPM and OEPM



Regions 1 and 3 Approach
(separated links)



Region 2 Approach
(overall link analyses)



Compatibility Criteria Region 2 Plan Assignments

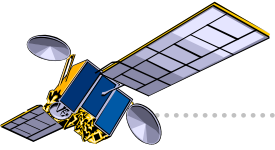
Overall Equivalent Protection Margin (OEPM) is used:

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

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

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



Compatibility Criteria

Regions 1 & 3 Plan Assignments

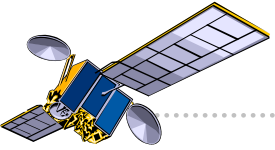
Equivalent Protection Margin (EPM) is used:

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

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

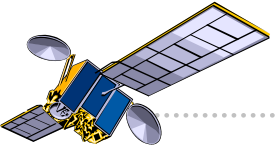
i = interference type
(1 = co-channel,
2 & 3 = upper & lower first adjacent channels)

PR_i = protection ratio for a given interference type i



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 years Regulatory period from Article 4 submission

- 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



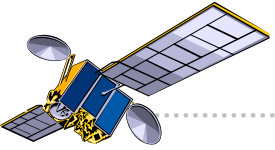
Year -8

Year -3

Year -2

Year 0

Extension

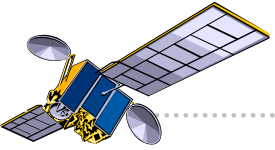


Main Regulatory Aspects

Feeder-link earth station

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

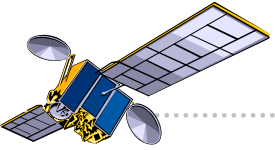




Main Regulatory Aspects

Space Operation/TT&C in the Guardbands

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



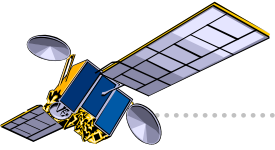
Main Regulatory Aspects

Terrestrial

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

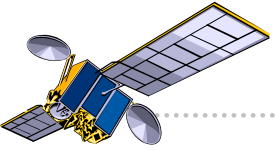
FSS

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



Article 5 Notification

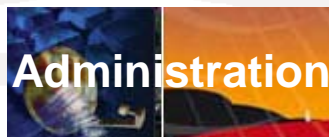
- Final characteristics for Plan and Lists assignments
- Confirmation of date of bringing into use
- Recorded in MIFR
(not taken into account in subsequent technical examination)
- Appendix 4 data should be submitted not earlier than 3 years but not later than 3 months before planned date of bringing 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)



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

Fail

Validation Check



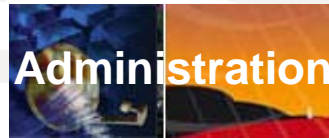
OK

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)



Completeness examination and telefax

Reply must be sent within 30 days
(receivability ROP)

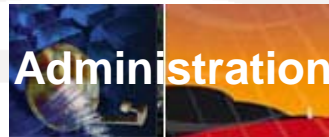
Regulatory/technical examination



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)



UIT-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



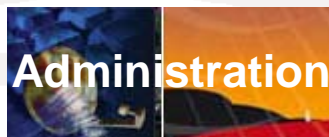
SpaceCom software compulsory as from 01.07.2009 (CR/301 on RES55)



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



Processing of Article 4 Submissions (4)



UIT-BR

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

Fail

Validation Check

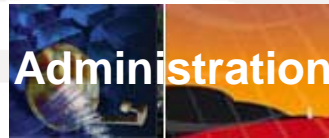
OK

Acknowledgement by telefax

Completeness examination



Reply must be sent within 30 days
(receivability ROP)

Processing of Article 4 Submissions (5)



Regulatory/technical examination

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

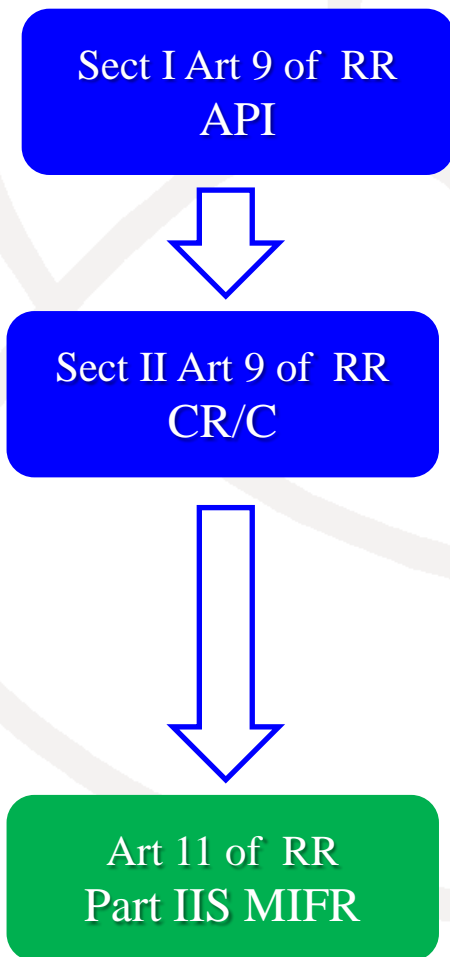


Submission of notification
(confirmation of bringing into use),
Res.49 due diligence information

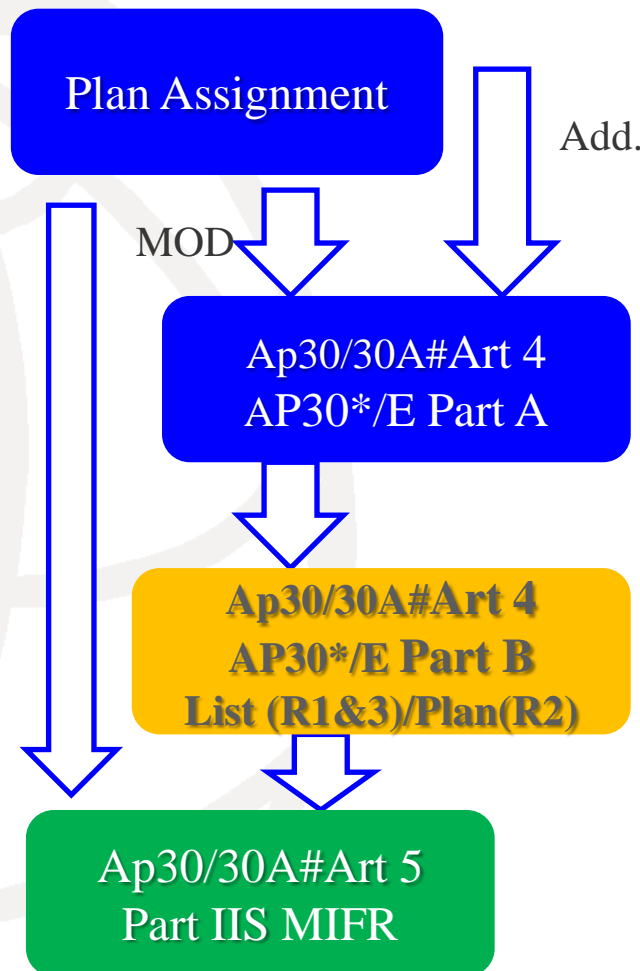
Request for extension of period of
operation for assignments in the List
(15 years), if required

Comparison between AP30/30A and Non Plan procedures

Non Plan BSS GSO

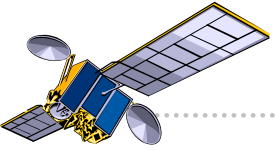


AP30/30A BSS Plan



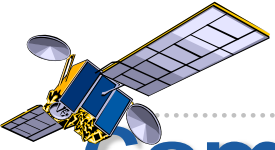
Compatibility

Examination, publications, data



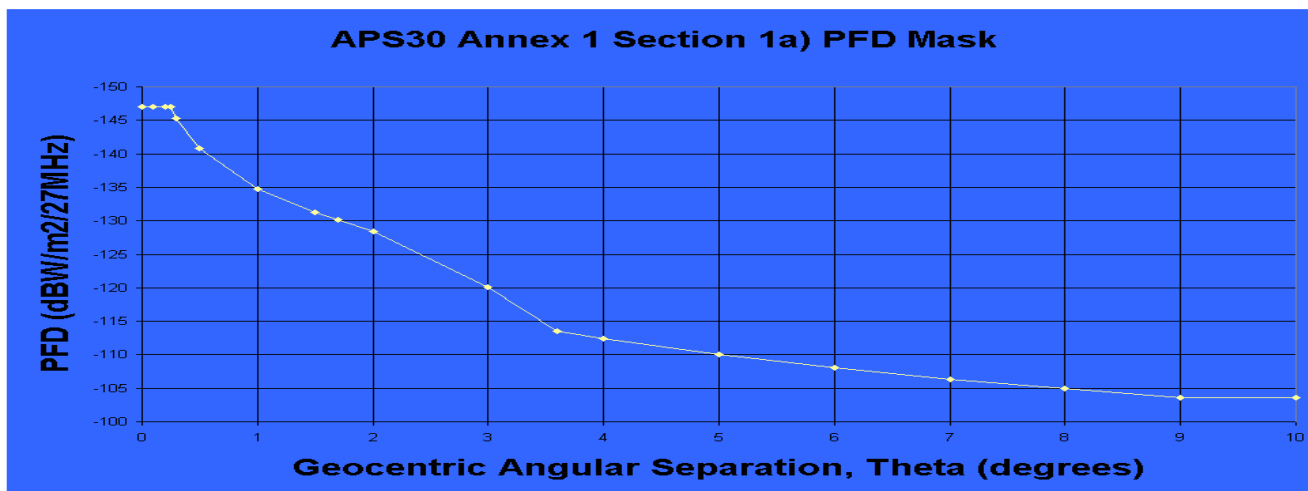
Compatibility between Plan and List Assignments

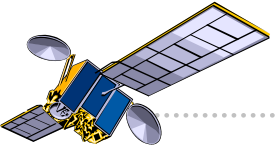
- Region 2 Plan based on OEPM
- Regions 1 & 3 Plan and List based on:
 - 9 degree Coordination Arc
 - EPM and PFD (Downlink)
 - EPM, PFD hard limit at any point in the GSO and Off-axis e.i.r.p (Feeder-link)



Compatibility Criteria for Regions 1 & 3 List Assignments

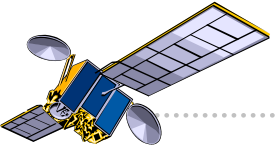
- Based on both EPM and (hard & trigger) PFD criteria
 - EPM criteria as per the Regions 1 & 3 Plan
 - PFD criteria also used to identify affected assignments as per Annex 1 of AP30





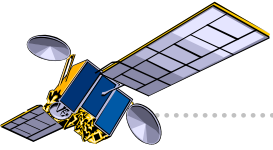
Article 4 Examination (Appendix 30, Region 2)

- 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



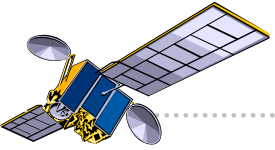
Article 4 Examination (Appendix 30A, Region 2)

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



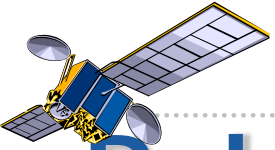
Article 4 Examination (Appendix 30, Regions 1 & 3)

- 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



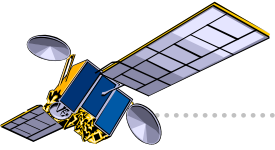
Article 4 Examination (Appendix 30A, Regions 1&3)

- 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 Results of Examination

- 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**

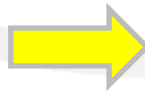


Comments on Special Sections

- **4 months** from publication in BR IFIC of:
AP30/E, AP30A/E and AP30-30A/E - Part A
AP30-30A/F/C

▶ using SpaceCom software

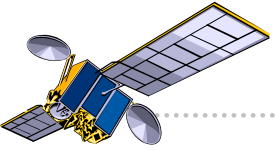
No reply within the time-limit



Affected Administration accepts the increase of interference

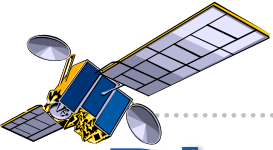


Protection level diminished for subsequent examinations !



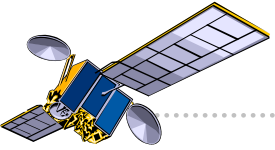
Publication of Results of Examination

- **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



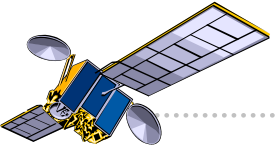
Plan and List data

- All Plan and List assignment data can be found on the BR IFIC & the ITU website at:
 - <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



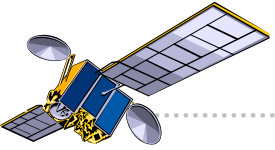
Useful Website addresses for more information

- <http://www.itu.int/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 (Rev.Res.547)
- **Suspension** of notified R1&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



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

Merci!

San Jose, Costa Rica
30 October – 1 November 2012

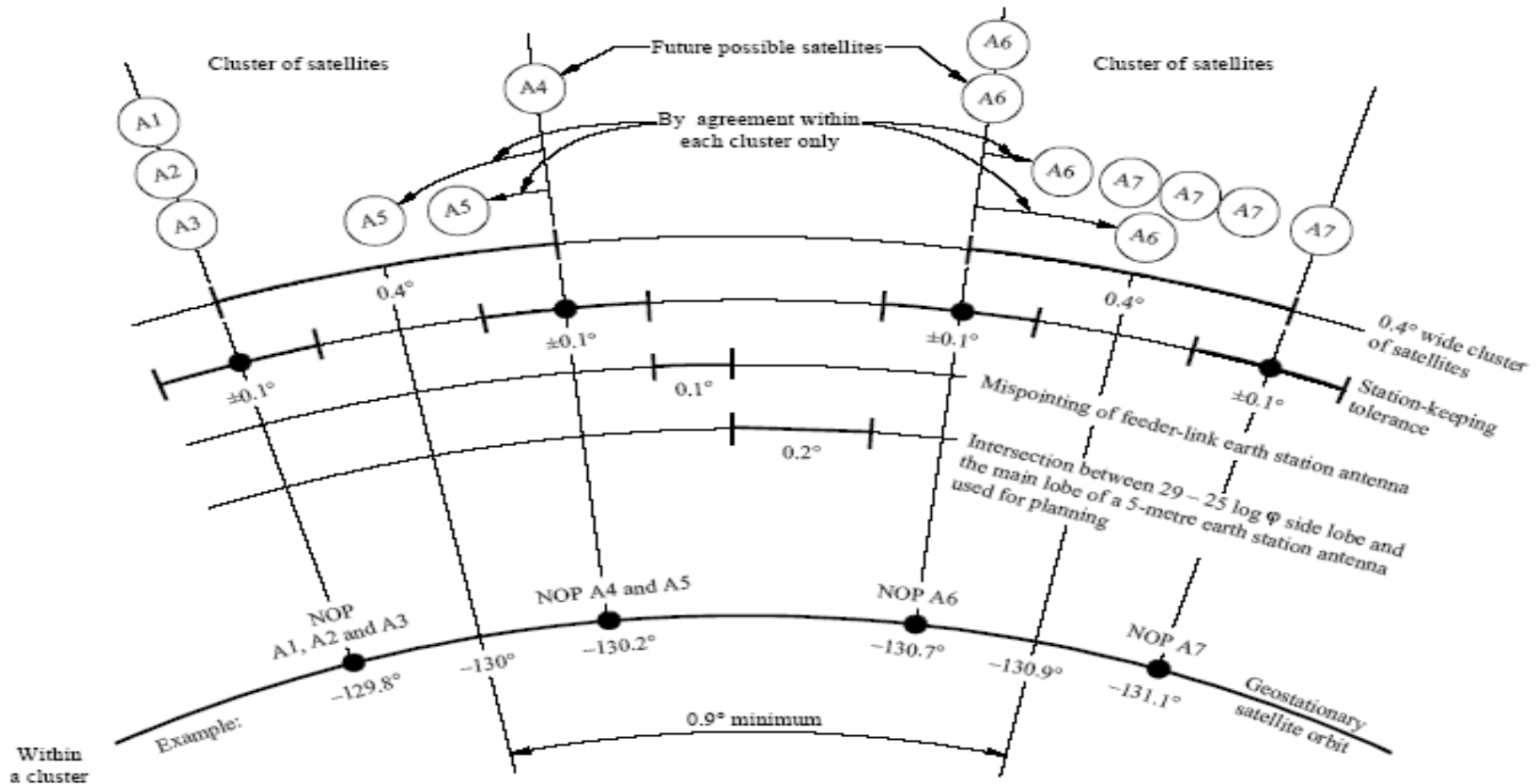
Original Plan (e.g. Region 2)

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		

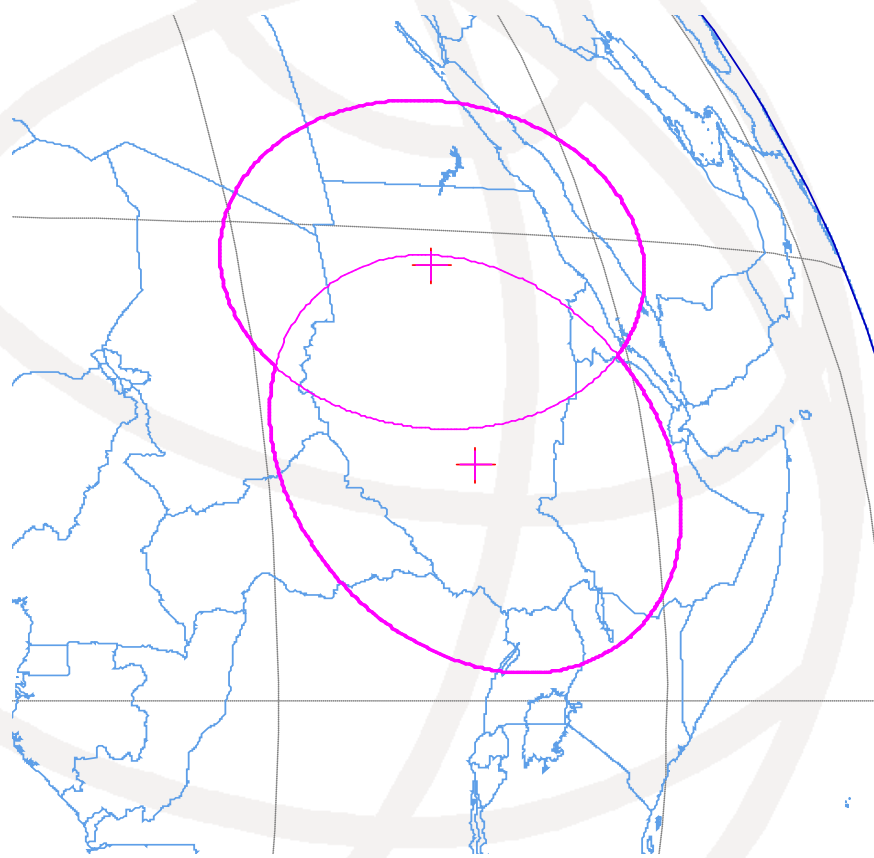
Cluster Concept

Exploded view of geostationary satellite orbit



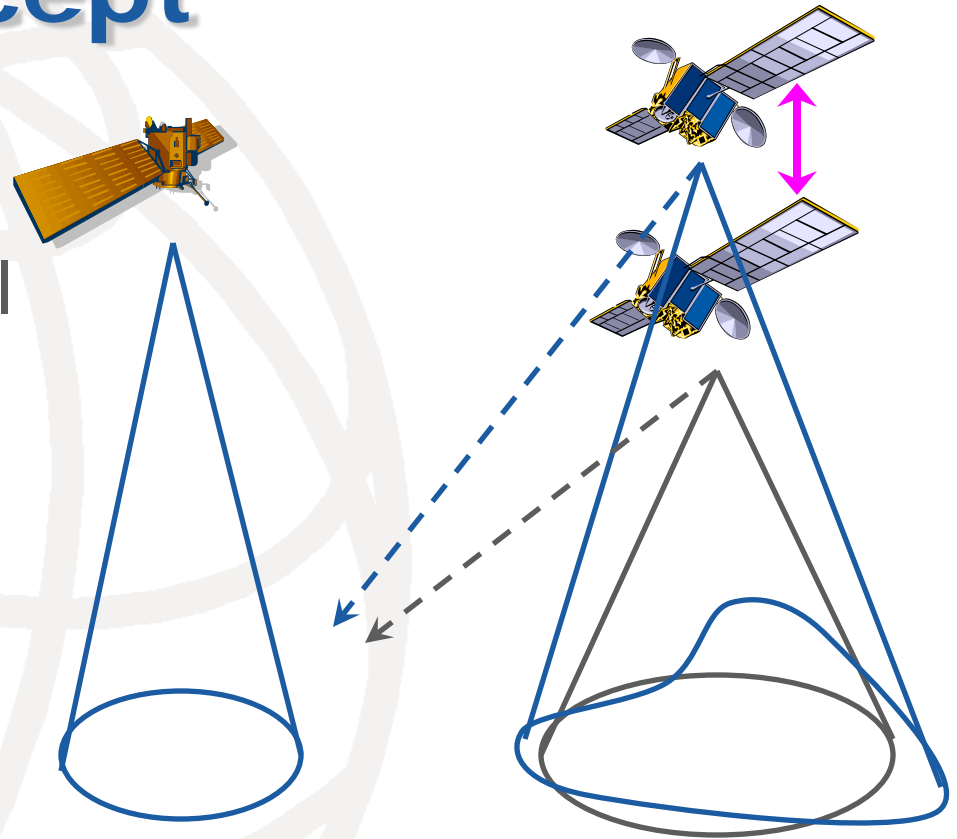
An example of extended-coverage national beams

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
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		