

ICAO Regional Workshop
Thailand

FSS Earth Station Registration

ITU WRC-15 Agenda Items 1.1 & 9.1.5 – Defense of C-Band

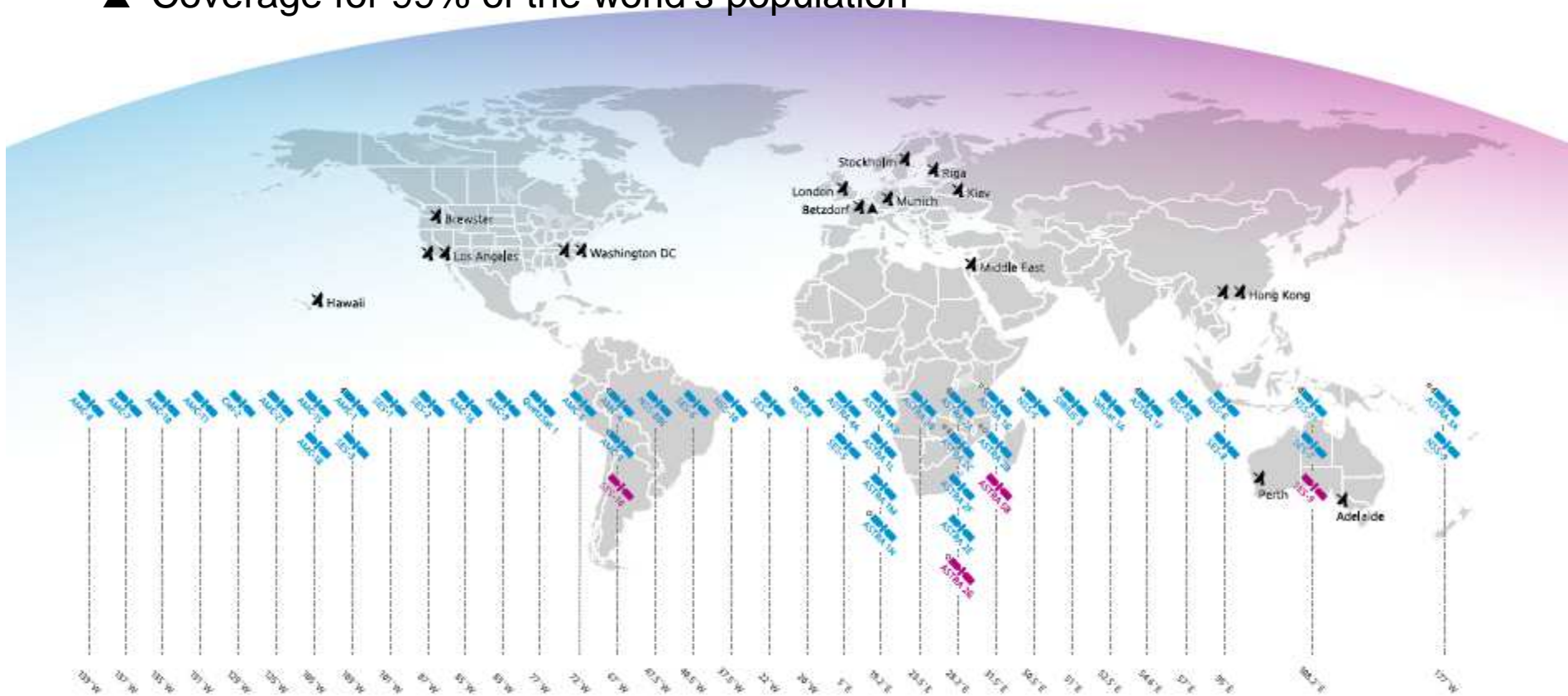
March 2014

SES – Who we are

- ▲ **A world-leading telecommunications satellite operator**
- ▲ **Premier provider of transmission capacity, related platforms and services worldwide for**
 - media
 - enterprise and telcos
 - government and institutions

SES Satellite fleet today

- ▲ Global fleet of 55 satellites provides comprehensive coverage
- ▲ Coverage for 99% of the world's population



- ▲ Headquarters
- ✕ Teleport (owned and partner teleports)
- In orbit
- To be launched
- Inclined
- Expected orbital position
- ◀ To be relocated

This configuration is based on current planning and is subject to change. SES holds a 50% interest in Ciel Satellite Limited Partnership and a 49% ownership interest in QantasSat. Yutong 10's future orbit profile is owned by Yutong, where SES holds a 25% ownership interest.

February 2016

WRC-15 A.I. 1.1– proposed IMT use of C-band

Problem...

- ▲ IMT use is not compatible with the existing operations in C-band, including FSS, radar systems and fixed point-to-point links

Reality...

- ▲ C-band is heavily used by FSS systems around the world, and its use is continuing to grow
 - Around 170 C-band satellites are in geostationary orbit today
 - More than 40 of these satellites cover Africa
 - There is substantial ongoing investment in C-band satellite capacity worldwide:
 - At least 52 satellites with C-band payloads have been launched in 2007-2012, representing \$12-15 billion in investment
 - At least 35 satellites with C-band payloads are under construction and are scheduled to be launched globally in 2012-2015, representing \$9-10 billion in investment
- ▲ IMT use of C-band would severely constrain growth in satellite operations:
 - Depriving the market from a competition that benefits everyone, and affecting a major contributor to African Digital Migration & Broadband Policy goals.

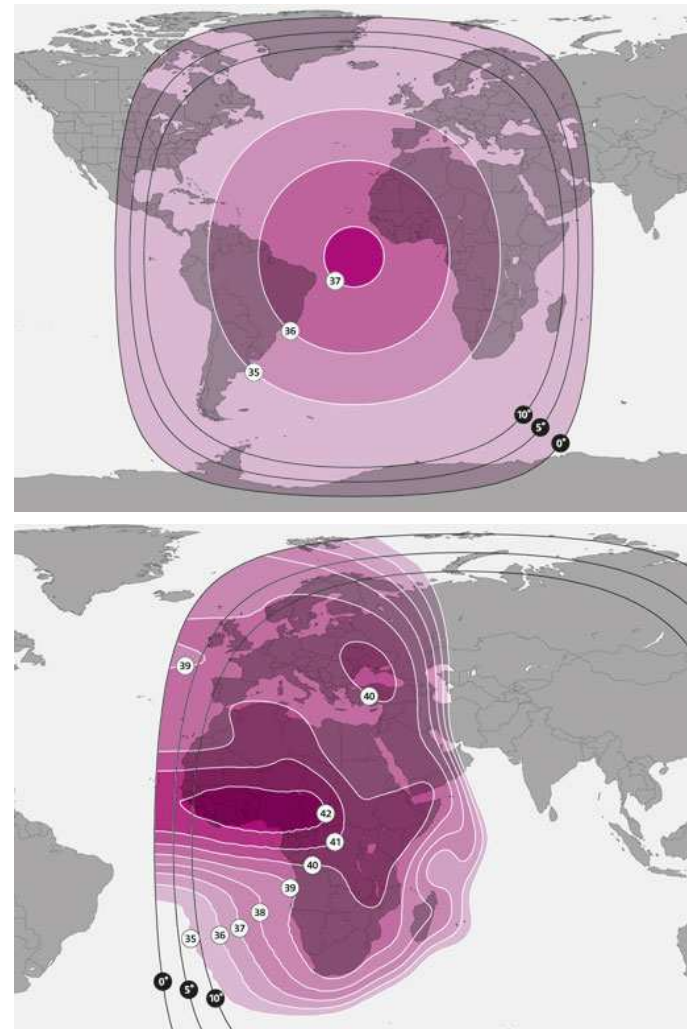
Use of C-band

▲ C-band usage

- Satellite communications in C-band are extensively used worldwide, both for national and international connectivity, and are suitable for the delivery of video and data / voice services for corporate networks & government networks but also to bring TV / video signals to everyone.

▲ C-band unique advantages:

- Wider Coverage
- Higher availability
- Higher efficiencies
- Lower cost



Key services provided by satellite C band

C band is used for a variety of critical satellite applications worldwide:

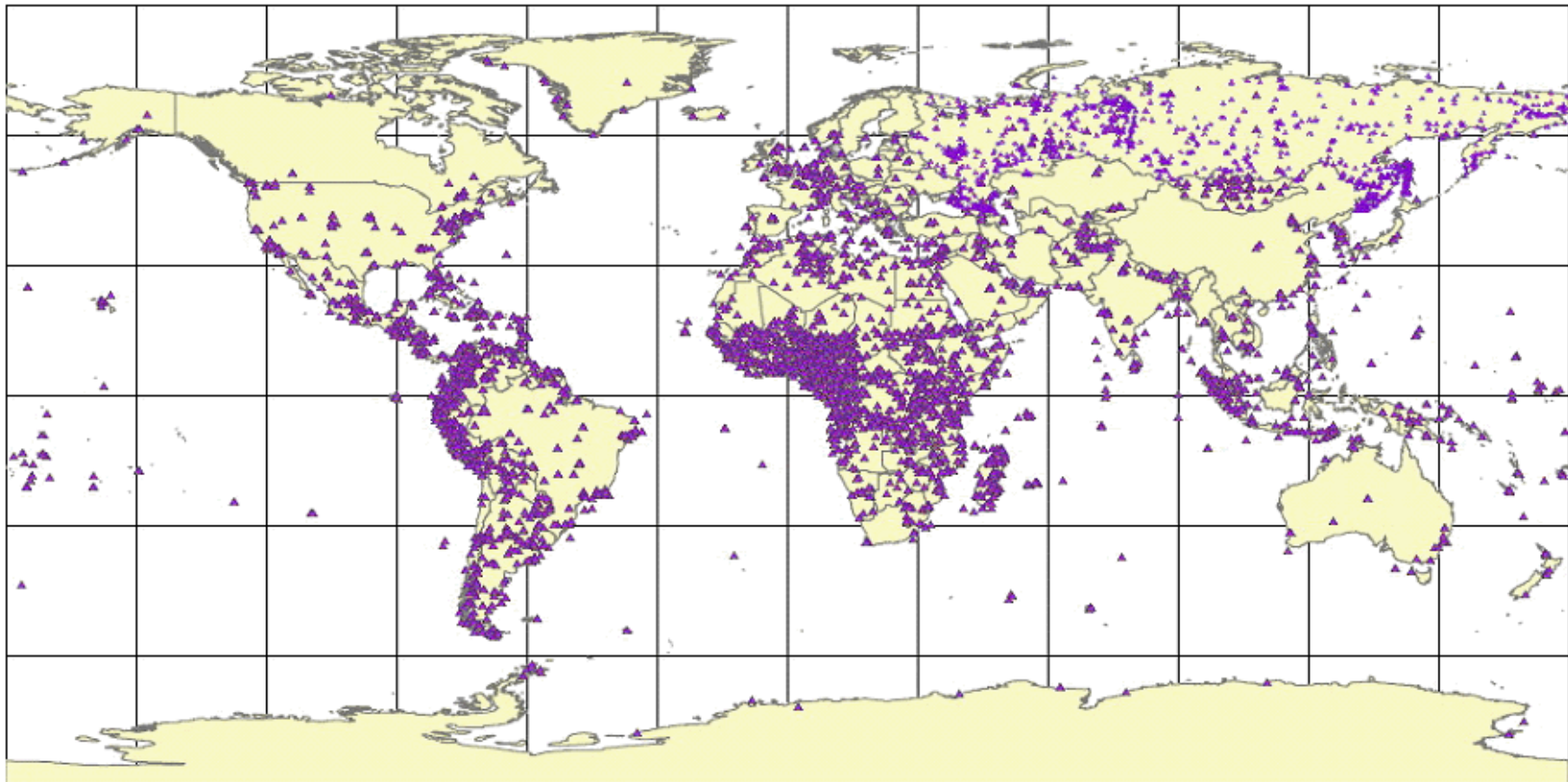
- Distribution of TV programs
- Contribution (Special events coverage, satellite news gathering)
- Telephony and carrier
- Enterprise data
 - VSAT
 - IP trunking
 - Cellular backhaul
 - Oil, gas and mining applications
- Governmental use
 - Distance learning
 - Telemedicine
 - E-elections
- Disaster recovery and relief operations
- Distribution of critical aeronautical and meteorological applications via VSAT networks
- Commercial mobility (maritime communications)



Why Register Earth Stations?

- ▲ In the absence of ITU and/or national registration, the widespread use of C-Band is not documented, and often “overlooked” by those with alternative uses such as IMT
 - In the United States, there are over 7,000 C-Band antennas receiving cable television feeds at cable headends that are not registered with either the FCC or ITU. IMT use of C-Band has the potential to disrupt television distribution to over 100 MM households
 - The ITU-BR supports registration of earth stations as a method to protect FSS from IMT
- ▲ ITU registration affords potential protection, based on date priority of the notification
- ▲ Africa is particularly vulnerable as only a small number of earth stations have ITU registration
 - Registration can serve as foundation to defense of aviation FSS networks under attack under WRC-15 Agenda Items 9.1.5 and 1.1

C-band Earth Stations (as of 2012)



- ▲ Earth Stations transmitting & receiving C-Band as reported to satellite operators (excludes TVROs)

ITU Recorded C-band Earth Stations (Up to 2007)



ITU Recorded C-band Earth Stations (Up to 2013)



Earth Station Registration Overview

▲ Step 1: Coordination of the FSS earth station

- Step 1.1 : Administration A sends out the request for coordination
- Step 1.2 : Administration B acknowledges receipt of the request for coordination
- Step 1.3 : Coordination between Administrations A and B
- Step 1.4 : Completion of coordination

▲ Step 2 : Notification of the FSS earth station

Step 1: Coordination of the FSS earth station

- ▲ Coordination is performed based on the provisions of Articles **9**, Appendix **5** and Appendix **7** of the ITU Radio Regulations (RR)
- ▲ Under RR No. **9.17** coordination of a specific earth station is required with terrestrial services of other countries in frequency bands allocated with equal rights to space and terrestrial services when the coordination contour of the earth station extends into these countries

Step 1.1: Administration A sends out the request for coordination

- ▲ Administration A (responsible for the FSS earth station) sends out the request for coordination

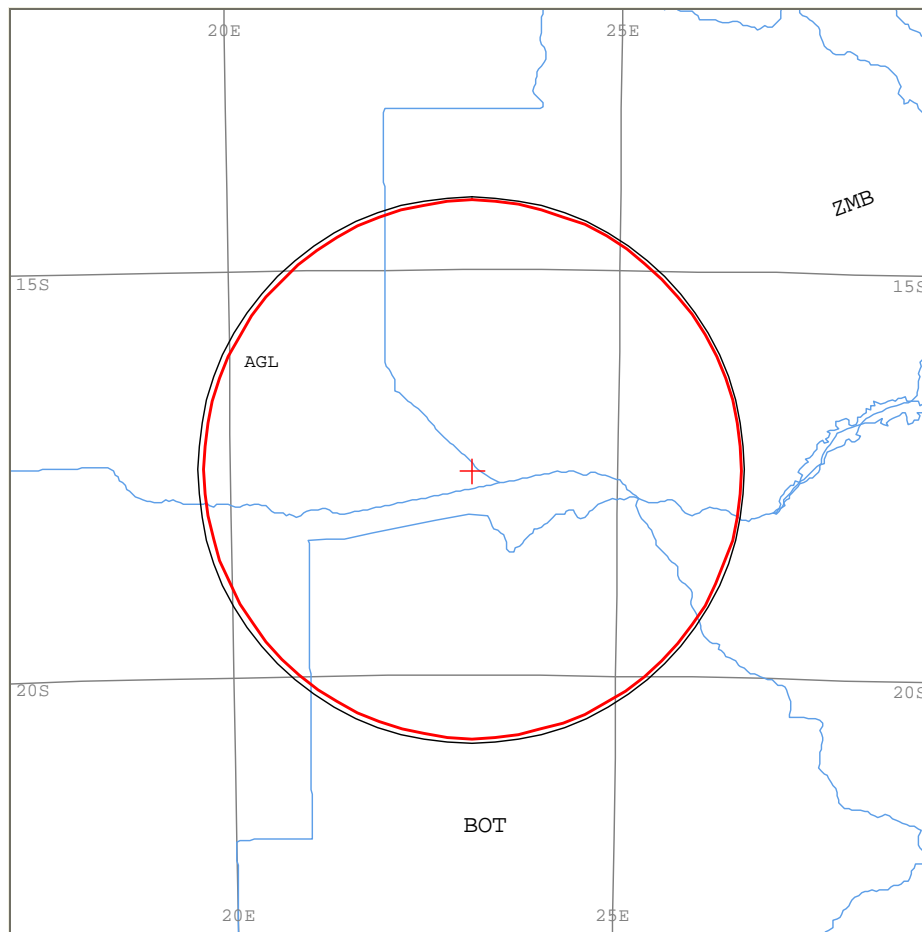
- ▲ The following items need to be prepared
 - Coordination data (the required data is described in Annex 2 to Appendix 4 of the RR)

 - Earth station coordination contours and calculations (generated using AP7 in GIBC software
 - AP4/III forms (earth station electronic forms available in the SpaceCap software)
 - Data to complete the AP4/III form can be supplied by the satellite operator and antenna manufacturer

- ▲ From the coordination contours, the affected administrations whose territories fall partially or completely within the coordination contours can be identified

Step 1.1: Administration A sends out the request for coordination (cont'd)

▲ Example of coordination contour



Step 1.1: Administration A sends out the request for coordination (cont'd)

- ▲ Example of AP7 software

The screenshot shows the 'AP7 Input Capture' software interface. The main window title is 'AP7 Input Capture'. The menu bar includes 'File', 'Edit', and 'Help'. The interface is divided into several sections:

- Earth Station Parameters:**
 - Earth Station Name: AGL 2.4M 2MBPS
 - Date Recv: 1/14/2009, Adm: AGL, Ctry: AGL
 - Long: 23 E 6 9, Lat: 17 S 28 6
 - Satellite Name: NSS-FSS-57E, Long nom: 57, GSO
- Satellite Beam Table:**

Satellite Beam Name	E/R	Gain	Cls of Stn	Min freq in MHz	Max freq in MHz	Noise Temp	Pwr ds max	Antenna pattern	Co
H1	E	42.80	TC	5,925.00000	6,725.00000		-47.6	REC-465-5	
H1	R	37.40	TC	3,400.00000	4,200.00000	143		REC-465-5	
*									
- A7a. Horizon Elevation Table:**

Row No	Azimuth	Elevation Angle	Distance km
*			

1 Horizon Elevation rows
- A7e. Min Antenna Elevation Table:**

Row No	Azimuth	Elevation Angle
*		

Buttons on the right side include 'Save', 'Save As', 'Back to List', and 'Close'. The taskbar at the bottom shows the Windows Start button and several open applications, including 'AP7 Inp...'.

Step 1.1: Administration A sends out the request for coordination (cont'd)

- ▲ Administration A shall send to the affected administration(s) (Administration B) the coordination information (RR No. **9.29**) which comprises (RR No. **9.31**):
 - The completed AP4/III forms
 - The earth station coordination contours

Step 1.2: Administration B acknowledges receipt of the request for coordination

- ▲ Upon receipt of request for coordination, Administration B shall acknowledge receipt by telegram within 30 days (RR No. **9.45**).
- ▲ Administration A may seek the assistance of the ITU if there is no acknowledgement of receipt from Administration B (RR No. **9.46**).
- ▲ Should there be no acknowledgement of receipt from Administration B after the intervention from the ITU, then this will mean that Administration B accepts any interference into its terrestrial stations and shall ensure that its terrestrial stations will not cause harmful interference into the earth station of Administration A (RR Nos. **9.47**, **9.48** and **9.49**)

Step 1.3: Coordination between Administrations A and B

- ▲ Administration B shall within 4 months from the date the request for coordination was sent, provide its agreement or disagreement (RR No. **9.50** and **9.51A**)
- ▲ Administration A may request the assistance of the ITU if there is no response from Administration B within the period of 4 months (RR No. **9.60**). Should Administration B fail to respond after the intervention of the ITU, the consequences shall be similar to Step 1.2 (RR No. **9.62**)
- ▲ In the case of a disagreement, Administration B shall provide information on its own assignments upon which the disagreement is based, and suggestions to resolve the coordination. Both administrations shall consult each other in order to resolve the potential interference between the terrestrial station and the earth station (RR No. **9.52**)
- ▲ Depending on the complexity of the coordination, it may be completed within the four months, or after a longer period of time. There is no particular time limit within which the coordination of earth stations needs to be completed.

Step 1.4: Completion of coordination

- ▲ Upon successful completion of the coordination, Administration A can proceed to notify the earth station.
- ▲ After notification, Administration A will have the right to operate the earth station with its coordinated characteristics with respect to the terrestrial stations of Administration B.
- ▲ In the future, should Administration B have a need to operate terrestrial stations within the coordination contour of an earth station and these were not considered during the coordination of the earth station, Administration B shall seek the agreement and request coordination with Administration A before bringing them into use.

Step 2: Notification of the FSS earth station

- ▲ Before notifying the earth station, the administration must ensure that:
 - Coordination of the FSS earth station is complete.
 - Notification has been initiated or completed for the associated satellite network filing.
 - The earth station is located within the service area as defined for the associated satellite network filing for the given frequency band.
 - The frequency band notified for the earth station is covered in its entirety by the associated satellite network filing.
 - The technical parameters used in the notification of the specific earth station are within the envelope of those contained in the associated satellite network filing.
 - Notice must have been submitted to the ITU no earlier than 3 years prior to bringing earth station into service.

Step 2: Notification of the FSS earth station

- ▲ To have the assignments of the earth station recorded in the MIFR, an administration must conduct notification in accordance with Article **11** of the RR.
- ▲ The administration needs to submit the following information to the ITU via email and confirm the submission with a fax within 7 days:
 - AP4/III forms (earth station electronic forms available in the SpaceCap software)
 - Earth station coordination contours and calculations (generated using AP7 in GIBC software)
 - The validation results for the AP4/III forms (validated using SpaceVal software)
- ▲ If the examination of the notice by the ITU leads to a favorable finding, the assignments are recorded in the Master International Frequency Register.

Registration Assistance

- ▲ ITU BR Space Services Department
Radiocommunications Sector
International Telecommunications Union
Geneva, Switzerland
<http://www.itu.int/ITU-R/go/space/en>

- ▲ SES John Nelsen john.nelsen@ses.com
4 Research Way
Princeton, NJ 08540
USA

Thank you!

