Advanced methods of spectrum management for satellite systems

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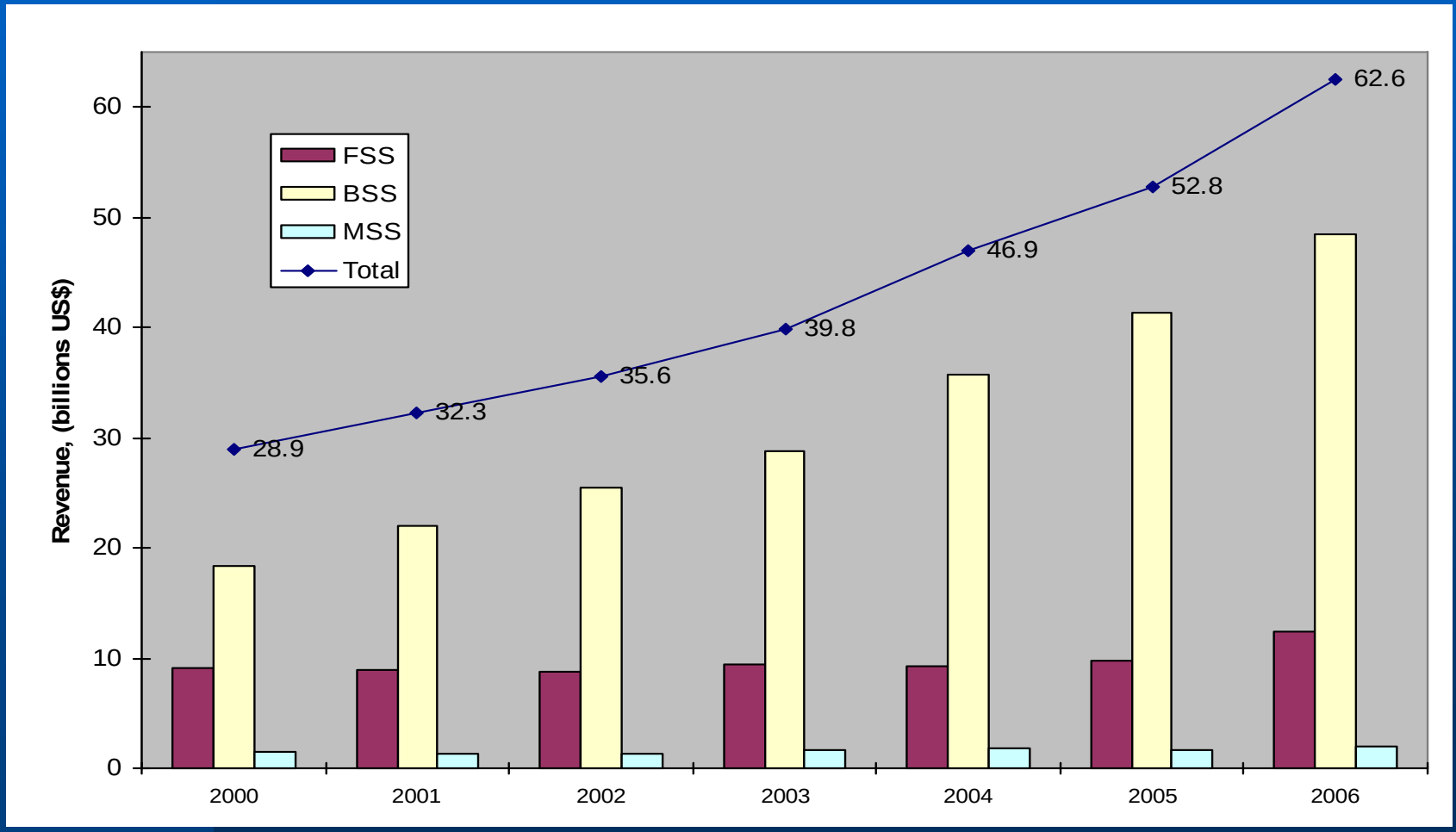
Introduction

- Current state and trends in satellite services development
- International spectrum management of satellite services
- Theory of common open resource management
- Options for improving international regulation

Current state



Current state

- 249 commercial GSO satellites (2006, Via Satellite)
- 7 000 transponders (2006, Futron)
- VSAT- near 1,5 million (ITU-D)
- Broadband- near 700.000 (USA) +500 000 (UK)
- BSS TV – near 120 million (ITU)
- MSS (2005) –1,4 million (ITU)
- BSS (sound)- near 17.3 million
- BSS (DMB)- near 2 millions

Trends in satellite development

Spectrum/orbit use and demand grow-
is international regulation ready?

International spectrum management

- Two mechanisms for sharing orbit / spectrum:

Coordination Approach

Planning Approach

International spectrum management

Planning Approach

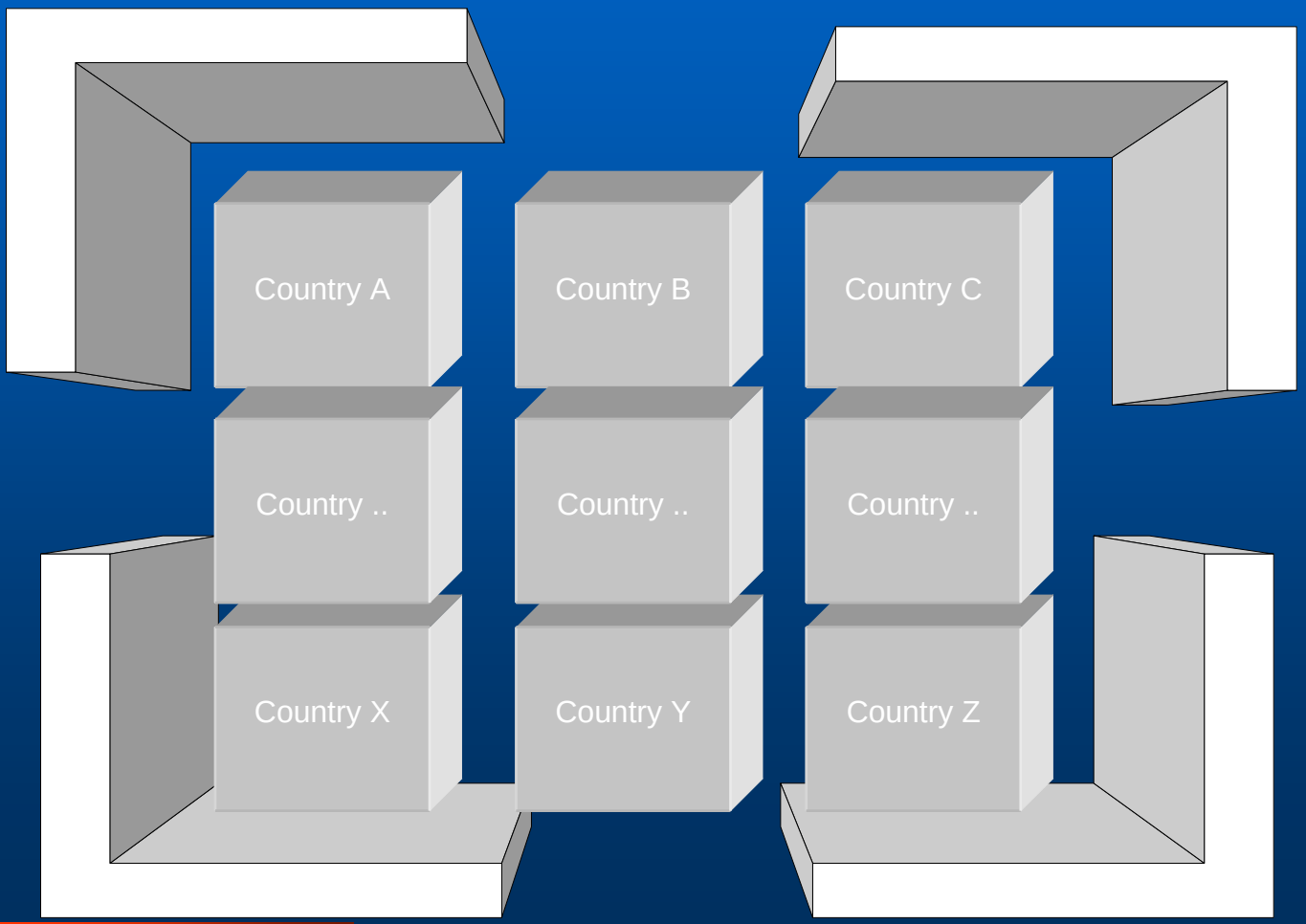
Size:

Frequency band

Orbital position

Power

National Coverage



International spectrum management

Current use

Plan BSS- 180 national allotments (Eastern hemisphere) about 10 in use

Additional use-106 networks, about 20 in use

Plan FSS-225 national allotments, about 10 in use

55 subregional and additional use systems

International spectrum management

Plans up-take practically **non-existent**

Free riders (additional use and regional systems)

Reason: lack of capital, lack of know-how,

low current demand, national coverage restrictions.

Possible future use of national allotment?

International spectrum management

Coordination Approach

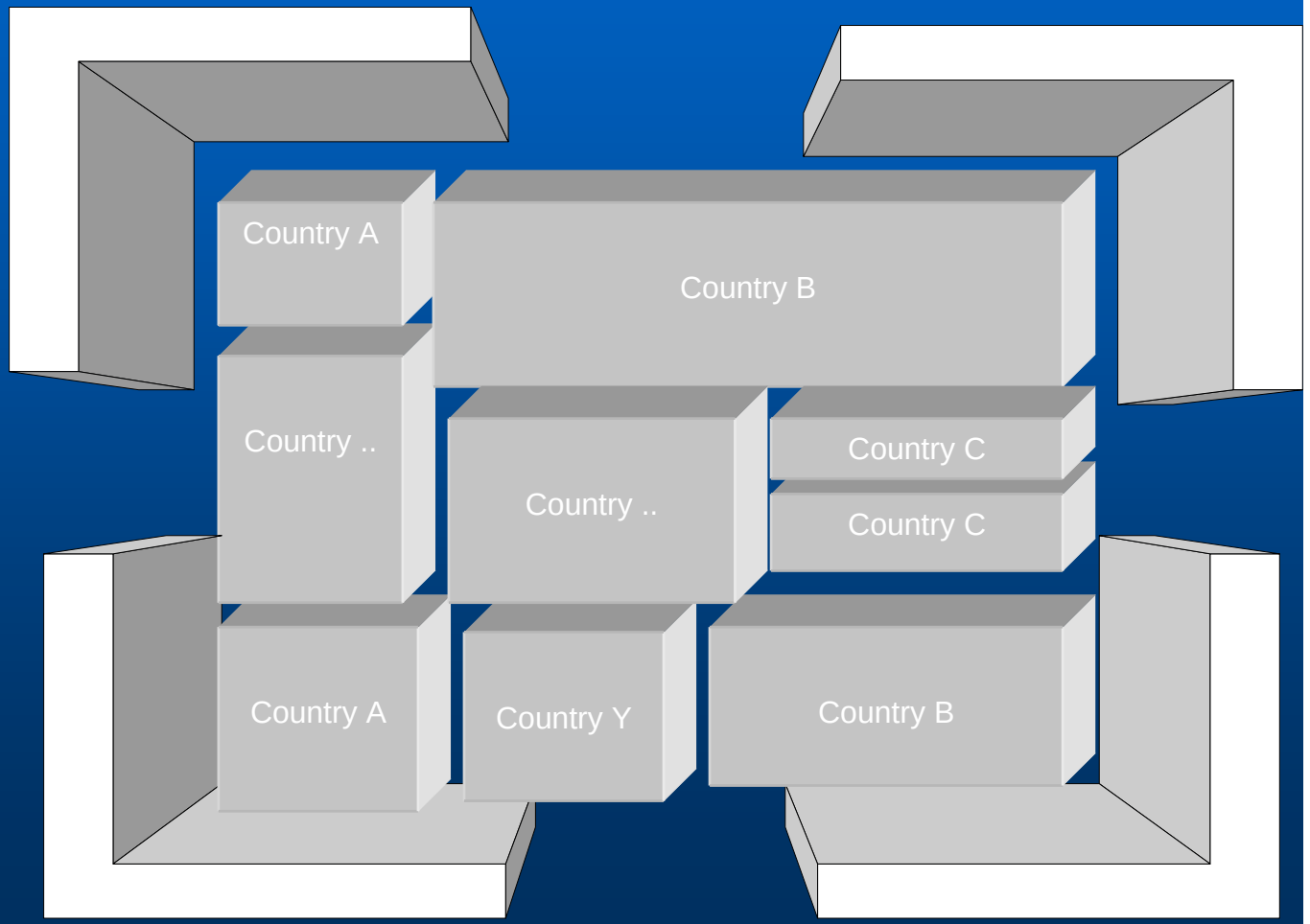
-API

-Coordination (CR/C)

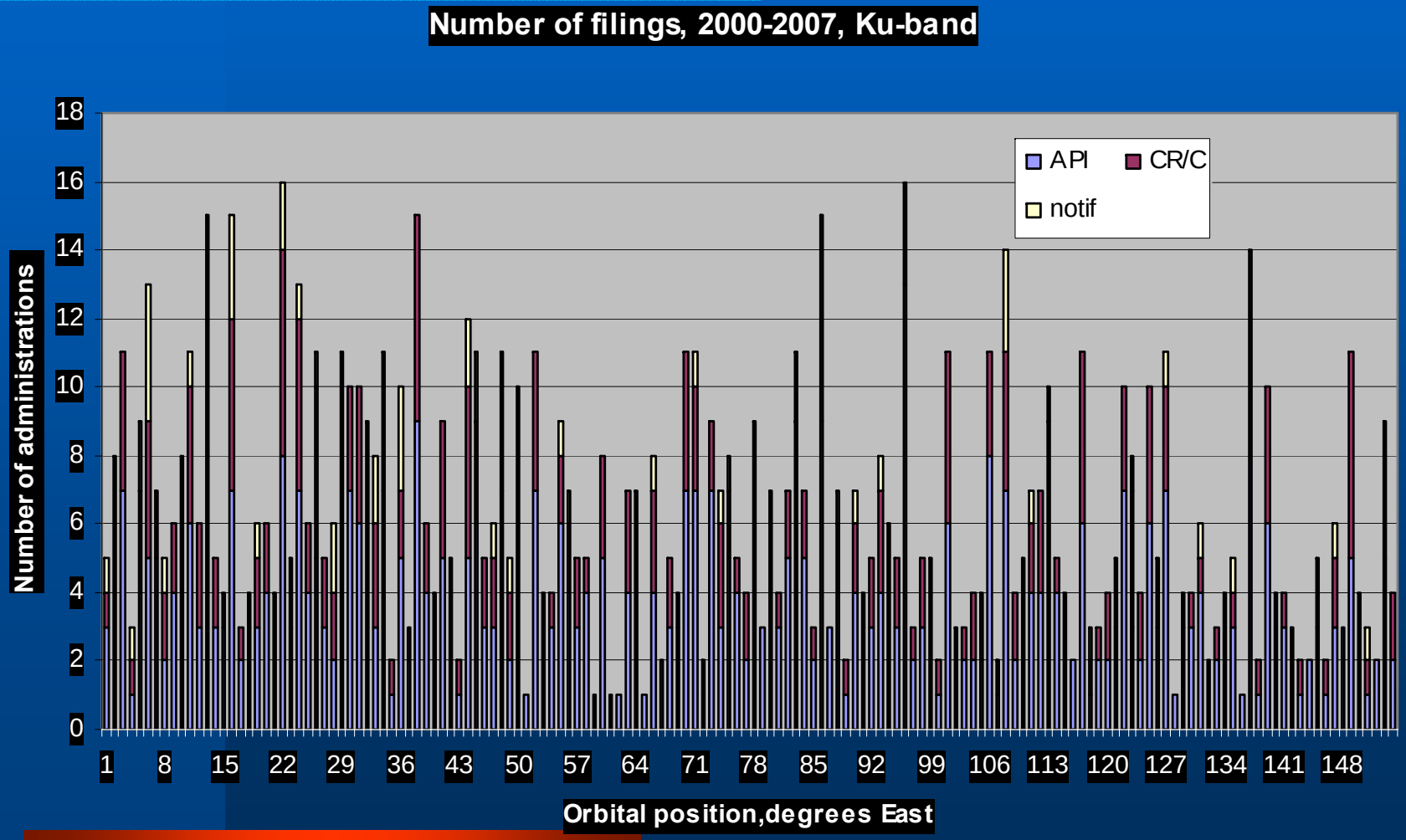
-Notification

-3000 filings in processing.

- 400 MIFR entries



International spectrum management



International spectrum management

Current problems:

- **01.06.07, 34.5 East, C-Ku, Europe Coordination with 36 administrations (300 networks concerned)**
- **Coordination requirements are calculated based upon SRS date base.**
- **“paper” satellites, “paper” parameters**

⇛“paper” congestion

International spectrum management

What to do?

Theory of common property resources

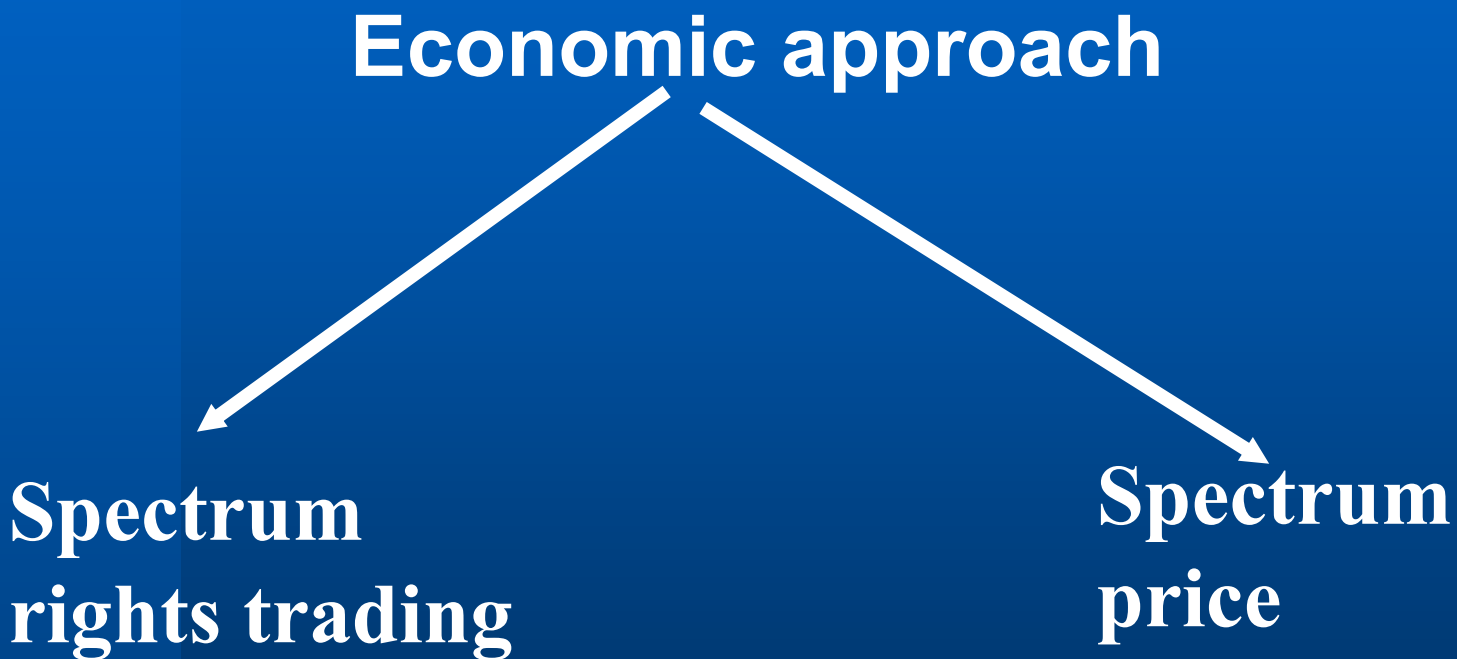
- Tragedy of commons
- Methods to improve efficiency:
  - independent public regulation body,
  - economic approaches,
  - effective enforcement mechanism.

G.Hardin, R.Pindyck,C. Runge

Options to improve international regulation

- the Union shall …**effect allocation** of bands of the radio-frequency spectrum, the allotment of radio frequencies and the registration of radio-frequency assignments and, for space services;
- **to improve the use made of the radio-frequency spectrum for radio-communication services and of the geostationary-satellite and other satellite orbits**;
- Radiocommunication Sector … ensuring the **rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including those using the geostationary-satellite or other satellite orbits**

Options to improve international regulation



Options to improve international regulation

- **Spectrum rights trading**

  First theorem of social welfare economics:

  in a competitive market, all possible mutually profitable transactions end up taking place sooner or later, resulting in the economically efficient distribution of resources.

  Conditions – right of resource use

  has to be very well defined

R.Coase

Options to improve international regulation

EC Radio Spectrum Policy Group	Existing FSS Plan
Spectrum right	National allotment
Name of the public authority that assigns the right	Name of Administration
Name of holder	
Spectrum bandwidth	800 MHz (up- and down- links), orbital position
Max in band power or Max out of band power or Spectrum mask	Aggregate C/I=21 dB, single entry C/I=25 dB C/N↓≥15 dB, C/N↑≥15 dB
Service area and maximum in-band power beyond geographical limits	National coverage, Test points
Duration and rights of renewal	

Options to improve international regulation

Bands subject to a Plan

- **Spectrum right is very well defined**
- **Regulatory framework to promote leasing of allotments- mod of Radio Regulation**
- **BR- list of vacant allotments, legal and technical aspects of trading agreement**

Options to improve international regulation

Non- plan bands

- Leasing impossible, as spectrum rights remain undefined
- API and coordination stages- paper filings give flexibility and options to reach agreement, cost recovery is already introduced- no spectrum fee, NOC

Options to improve international regulation

Non-plan bands

Registered in MIFR

Wrong picture of spectrum and orbit utilisation- paper blocking of resourse access

agreements

- Max and minimum parameters are not used for operation

Options to improve international regulation

- Spectrum price for networks in MIFR
- Bandwidth, gain contour, C/N, power
- Basic principle: stronger interferer and more protecton (more pollution) - more to pay

Options to improve international regulation

Enforcement mechanism

- Independent radio monitoring (example- MOU in CEPT)
- Victim asks to check
- RRB decides based on results
- Measure to be applied- regulatory outcome, fines….

Options to improve international regulation

- Merging of services (Res.951)
- General service
- General principle- EMC, sharing criteria between services, allowable technical parameters (antenna diameters, C/N…)

Conclusions

1)SatCom prospects remain good

2)Existing system for international spectrum management system needs to be looked at

3) Methods to increase efficiency of spectrum use for satellite systems

Questions?