



HISPASAT

Advanced Technology in Radio Communications

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Lesson 6: Hispasat

Summary

- Introduction: ¿why a domestic system?
 - Companies and organizations
- System composition
 - Bus
 - Payload
 - Missions: Hispasat 1A and 1B
- Offered services
 - TV broadcasting
 - Digital services renting
- System state
- Hispasat satellites: Hispasat 1C, 1D, 1E, Amazonas 1, 2, 3 and 4, Xtar-Eur, SpainSat, PAZ and AG1
- Conclusions

Introduction

- Motivation
- Historical sector summary
- Situation of spatial sector in Spain

Introduction, ¿why?

- It has a high risk and it needs high economic investment.
- But it is advisable to:
 - have a better coverage system on the national territory
 - promote spanish industry
 - disassociate from foreign systems
 - give advanced communications to national defense
- It works on hispanic language area
 - TV broadcasting (30° W)

Introduction

- Dates
 - 1974 Intasat: experimental satellite, first spanish satellite
 - 1982 Spain keeps in touch with France in order to build a DBS system
 - In 1988 Spain thinks about building a national satellite (RTVE, Telefónica, INTA)
 - In 1989 borns Hispasat association
 - “España 1992” factor causes a development situation
 - Hispasat 1A: it has launched in September of 1992 by Ariane IV at 30° W
 - Hispasat 1B: it was launched in 1993 by Ariane IV 30° W
 - Early 2000: Spain launches Hispasat 1C with an Atlas
- Because of a null experience, Matra is the contractor company.

Companies and organizations

- CASA (antennas)
- INDRA Espacio (old Inisel and Ceselsa)
- Sener
- GMV
- Crisa
- Ryma, Mier
- Alcatel Espacio
- Hispasat (low number of employees, subcontractor)
- CDTI and INTA: governmental organizations

System composition

- Bus
- Payload
- Missions

Bus

- Eurostar 2000: Matra commercial platform
 - Up to 2500 kg and 3600 Watts
 - same bus than Matra Telecom-2 in France
 - new designs for some elements of the payload and TT&C
- They are built twin versions 1A and 1B in 30° W position

DESCRIPTION	HISPASAT 1A	HISPASAT 1B
Stabilized platform	3 axis	3 axis
Dry weight	1044,5 kg	1050 kg
Launch weight	2190,5 kg	2206,5 kg
Payload weight	273 kg	279 kg
Total power	3792 W	3792 W
Consumed power	3463 W	3479 W
Payload consumed power	2308 W	2563 W
Lifetime	10 years	10 years
Orbital position	30° West	30° West
Orbital control	0,05°	0,05°

1A/1B missions

- Direct broadcasting
- Fixed service
- Governmental
- TV-America

SRS mission (broadcasting)

- EIRP
 - Maximum 58 dBW
 - A 56 dBW (30-40 cm antenna)
 - B 53 dBW (40-60 cm antenna)
 - C 50 dBW (60-90 cm)
 - D 47 dBW
- 5 transponders of 27 MHz
 - 17/12 GHz
- The most sophisticated antenna
 - Developed by EADS-CASA
- Just 1 circular polarization



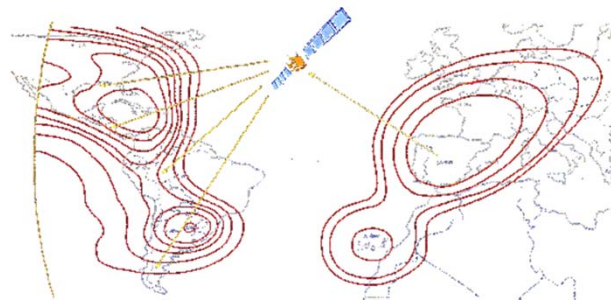
Fixed service mission

- Same trace than DBS
- Less EIRP
 - Max 54 dBW
 - a 51 dBW, b 49 dBW
 - c 46 dBW, d 44 dBW
- Ku band (18/12 GHz)
- 16 transponders
 - 4 of 72 MHz
 - 2 of 54 MHz
 - 2 of 46 MHz
 - 8 of 36 MHz
- Same coverage than DBS
- Less power



TV-America and governmental antenna

- TV-America
 - 2 channels
 - 14/12 GHz
- Governmental (military)
 - In 1999 it was made a Madrid- Kosovo link
 - 1 fixed beam, 1 mobile
 - X band
 - 3 transponders
- Power
 - TV 100 W
 - The rest 50 W
- Coverage



TV-America

- Europe → America direction (15 and 6 SFS channels)
 - Fixed service frequencies with more power (Ku, 110 W)
 - A digital channel (4 programs) and an analogical one (channel 6)
 - It broadcasts in NTSC standard
 - Receiver antennas from 0,6 to 1m
- America → Europe direction (16 and 18 SFS channels)
 - Fixed service frequencies
 - For TV broadcasting to headers, data transmission, telephony

Terrestrial control

- Satellite control station
 - Hispasat:
 - In Arganda del Rey (Madrid)
 - Maspalomas (Canary Island)
 - Hispamar:
 - In Rio de Janeiro (Brazil)
 - Supervision and maintenance works
 - Payload and bus

Services

- TV broadcasting
- Digital services renting

Services

- TV broadcasting
- Transponders renting
 - 24-hours service
 - Part time service (on demand or temporary)
- Digital services (digital carriers)
 - Open networks
 - Very Small Aperture Terminal (VSAT)
 - Transponder fraction
- Network infrastructure
 - Insular links (Telefónica)

VSAT networks

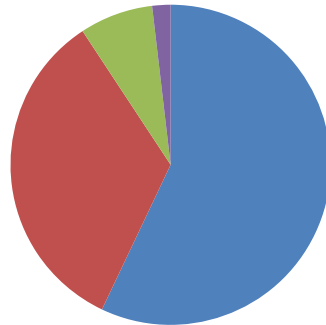
- Unidirectional (news agencies)
 - TDM
 - 19,2 kbps-2 Mbps
- Interactives (star)
 - SCADA radio-controlled system
 - TDM-TDMA
 - 64 kbps-2 Mbps
- Corporates (interactives in mesh)
 - TDM-TDMA
 - 2-34 Mbps

System state

- Shareholders
- Common services
- Digital +

Shareholders

Hispasat Shareholders



- Abertis Telecom (57,05%)
- Eutelsat (33,69%)
- SEPI (7,41%)
- CDTI (1,85%)

Updated in November 2013

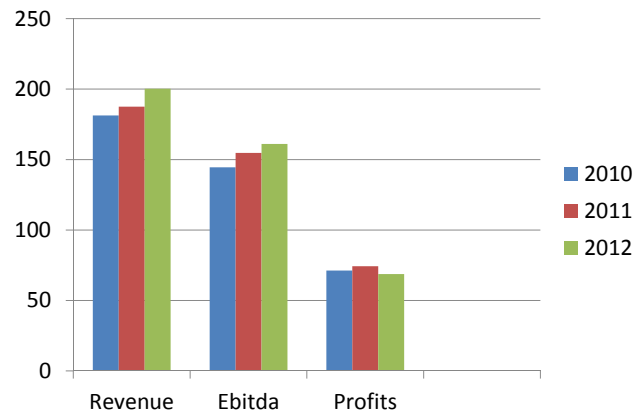
- Eutelsat shareholders
 - Abertis Telecom (5 %)
 - China Investment Corporation (7,1%)
 - FSI (25,6 %)
 - Stock Exchange (62,3 %)

Updated in November 2013

Common services

- Almost exclusive occupation of Canal + (47%): It takes up 11 transponders
 - 4 radio broadcasting services (SRS) in LHCP
 - 7 of SFS (horizontal and vertical) from 11.5 to 12.75 GHz
- TV broadcasting to terrestrial network (TVE-1, la 2, Tele 5, A3) and national radio stations (26%)
- RTVE to America (9%)
- Network infrastructures (Telefonica) (9%)
- VSAT networks (9%): 5000 terminals in 40 networks
 - Lottery (2500), Post mail (600), CLH (300)
 - Newspapers (Marca, AS, ABC, El Pais, El Mundo)
 - News agency (EFE, Europa Press)
 - Seeking radio, Watersheds, Net banking

Cost effectiveness



It provides an income that have increased the system cost effectiveness

— Profits about 70 million of euros

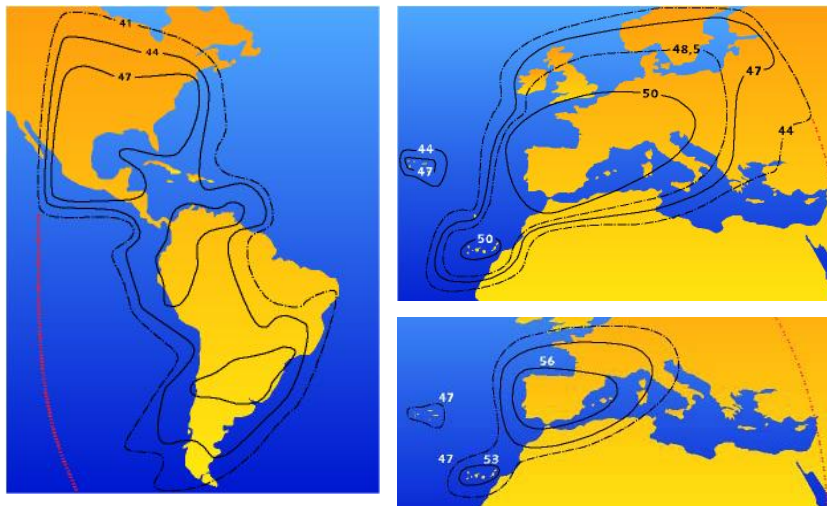
Actual and future Hispasat satellites

- Characteristics
- Coverage
- Repeater structure

Hispasat 1C

- It provides a new offer located at 30° W
- Iberia/Europe/America coverage improve
 - European (Mediterranean area) coverage improve
 - American (Brazil) coverage improve
 - Portuguese market: it includes Madeira and Azores
- Bus: Spacebus 3000 of Aeroespaciales
 - 15 years of life, 5950 Watts (3 x 2,5 x 5,1 m) → (7 x 29 x 5,1 m)
 - Launch with Atlas 2 (2000), 0.07° orbital precision
- More flexibility with a conmutation matrix

1C: America, Europe, Iberia



Hispasat 1C

- 3 antennas for 3 coverages

Coverage	PIRE (dBW)	G/T (dBK ⁻¹)
Iberia/Europe	54.5/44	8/-5
America	47/41	1/-5

- Conmutation matrix: 24 transponders of 110 W
 - More flexibility than 1A/1B (actual mixing for Vía Digital)

Downlink	Uplink	# Transponders
Iberia/Europe	Iberia/Europe 12	+8*
	America	8*
America	America	4** +8*
	Iberia/Europe	4** +8*

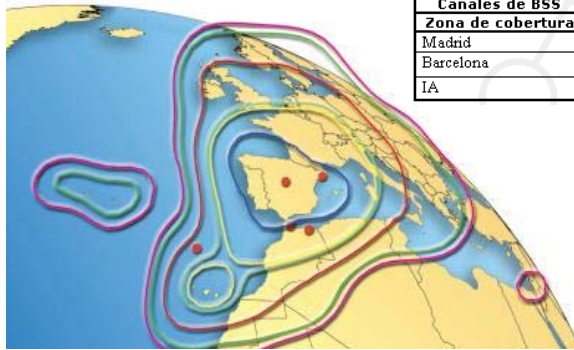
Hispasat 1D



Hispasat 1D

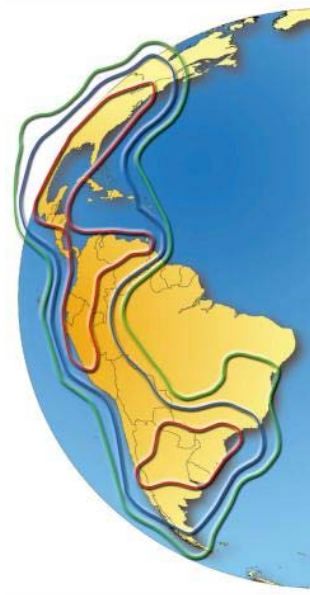
Canales de FSS		
Zona de cobertura	Mínimo G/T	Mínima PIRE
— Zona IA	8 dB/K	53.5 dBW
— Zona IA'	5 dB/K	51.5 dBW
— Zona IB	3.5 dB/K	52 dBW
— Zona IB'	-8 dB/K	46 dBW
— Zona IC'	0 dB/K	49 dBW
— Zona EA	3 dB/K	48 dBW
Tel Aviv	-6 dB/K	45 dBW

Canales de BSS	
Zona de cobertura	Mínimo G/T
Madrid	9
Barcelona	9
IA	6

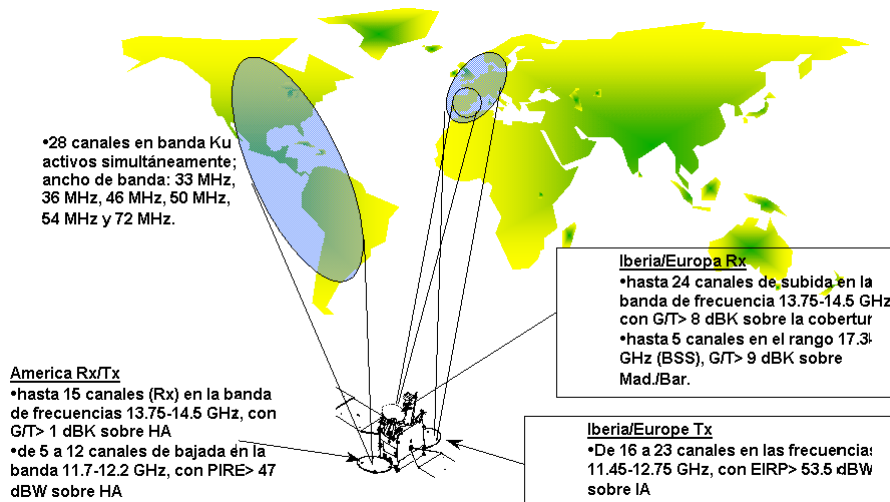


Hispasat 1D

Zona de cobertura	Mínimo G/T	Mínima PIRE
— Zona HA	1 dB/K	47 dBW
— Zona HB	-2 dB/K	44 dBW
— Zona HC	-5 dB/K	41 dBW



Hispasat 1D

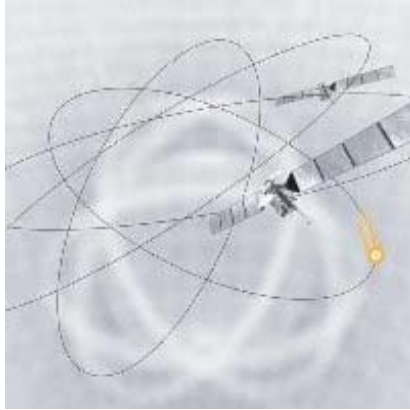


Hispasat 1E



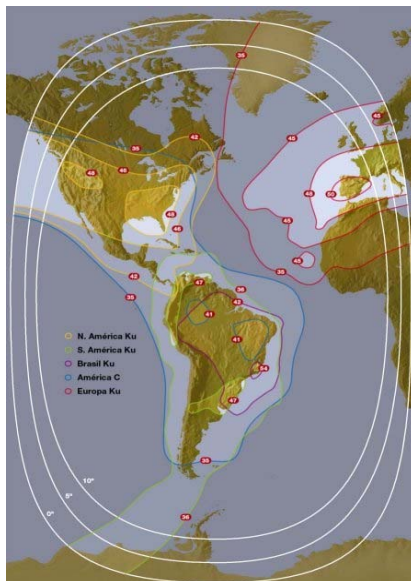
- 30° W orbital position
- Launch with Ariane 5, 29/12/2010
- LS 1300 platform
- 53 transponders in Ku band simultaneously
- Launch weight of 5.270 kg.

Hispasat 1F



- 30° W orbital position
- It is going to replace Hispasat 1C and 1D
- Launching forecast: 2016
- 58 transponders in Ku band simultaneously
- Will use an Ariane 5.

Amazonas 1



- Eurostar 3000s serie
- Built by Astrium (EADS)
- The same manufacturer as 1A and 1B of Hispasat satellites
- Launch by ILS through PROTON M Breeze M, in Kazajistan, August of 2004.

Amazonas 1

- Dry weight: 2135 Kg
- Launch weight: 4605 Kg
- Time of life: 15 years
- Payload: 7.5 KW
- maximum PIRE : 52 dBW (Brazil)



Amazonas 2

- Launch with Ariane 5 ECA from Kourou on October, 2009
- It will duplicate capacity of Hispasat services in America
- 64 transponders (54 in Ku band and 10 in C band)
- Eurostar 3000 platform of EADS Astrium
- Time of useful life: 15 years
- AmerHis processor incorporation (flexibility in wide-band services)



Amazonas 3

- Launch with Ariane 5 ECA from Kourou on February, 2013
- First satellite with Ka Band covering Latin America
- Spanish participation: EADS (antennas), Thales Alennia (telemetry), RYMSA (RF Filter), Mier (Power dividers)
- 52 transponders (33 in Ku band and 19 in C band)
- LS 1300 platform of Space Systems/Loral
- Amazonas 1 replacement
- Lifetime: 15 years



Amazonas 4

- Scheduled to launch 6th December 2013
- Delayed the launch due to adjustments to increase the reliability of the satellite
- 24 transponders in Ku Band
- EIRP: 46 to 48,5 dBw in South America



Government communications

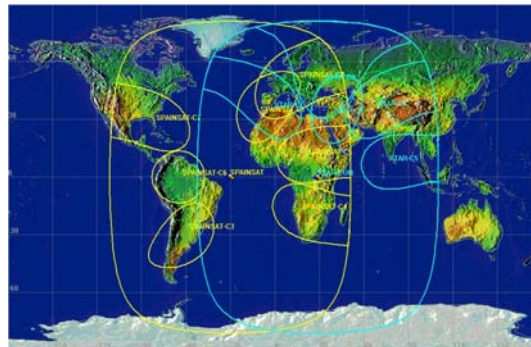
- Xtar-Eur: this satellite gives communication services to Spanish Defense Department and to another governmental institutions and organizations.
- **HISPASAT**, through HISDESAT STRATEGIC SERVICES, has launched Spainsat satellite in order to governmental use.
- Spainsat, in association to Xtar-Eur launched on 12th February of 2005, completes spanish governmental communication via satellite program.
- Xtar-Eur is located at 29° East.
- 12 X.



Xtar-Eur satellite launch

Governmental communications

- Spainsat: it has been manufactured by Space System Loral north American company, the same that manufactured Xtar-Eur, in collaboration with six spanish companies.
- It permits free interference communications in X band.
- It is located at 30° West.
- 13 X, 1 Ka.
- Launched in February of 2006.



SpainSat and Xtar-Eur total coverage

Governmental communications

- PAZ: Provide diurnal and nocturnal images in any meteorological condition through its Synthetic Aperture Radar (SAR).
- Will be able to provide 100 pictures per day, covering around 300.000 Km square approximately.
- Heliosynchronous to altitude of 514 Km.
- Capacity for transmission of images to 300 Mbits/s on X Band.
- It will be Launched in 2014.



Hispasat AG1

- Small GEO mission.
- It incorporates REDSAT advance communication payloads (active antennas and on-board processing, it is promoted by CDTI).
- 24 transponders in Ku and Ka frequency bands, 2013 launch forecast.
- It collaborates with Thales Alenia Space Spain and EADS-CASA Space.
- Reconfigurable antenna DRA-ELSA
- Bus Luxor of OHB System.



Conclusions

- Internationalization
- Improvement of detected faults
- New technologies promotion

Conclusions

- Satellite system it is already a success, it is internationalized.
- System has adapted to the demand
 - It passed through a first stage with less used, now is fully used.
 - It requires more flexibility, it is obtained with 1C and later satellites.
- New technologies promoter:
 - DVB-RC (with return)
 - TDT development for digital TV
 - Small GEO (Hispasat AG1 in 2013)
 - R&D projects: HD pay per view, satellite global TDT , SIMBAD, FURIA, MEDNet



Satellite launch of Galileo constellation.