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# STRUCTURE OF THE SPANISH SYSTEM OF SATELLITE OF COMMUNICATIONS

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## ABSTRACT

The objectives of satellites HISPASAT are oriented towards the search to satisfy necessities derived from the transport of television and radio signals. It tries the supplying of a basic and safe support of communications for the defence and security of the national territory, the creation of an infrastructure of channels for official networks, routes of data, restoration of connections, rural telephony. Also is wanted to foment the provision of television channels for the Hispanic community in the south and center of America and the broadcasting of services of television for people in general.

KEYWORDS: Informative satellites, communication, means

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## 1. CONCEPTION

The HISPASAT, S.A. society was conceived from its birth as a national system of multimission satellite constituted by two units of flight (HISPASAT 1A, HISPASAT 1B), a control center of the Satellite and two control centers of the payload. The nominal position of both satellites is 30° West, corresponding to the Spanish allocation for the Broadcasting service Direct. The platform of the satellites counts with a life utility of 10 years.(1). Satellites HISPASAT 1A and 1B have covers perfectly adapted to the Spanish territory that provides a great power of signal on Spain, which allows that the receiving stations are simpler and with antennas of minor size.

## 2. SATELLITE HISPASAT – 1 SYSTEM

The design of the system of satellite communications HISPASAT-1 began in 1988, being approved in April of 1989, by resolution of PSOE Government, the corresponding program of authorizing. In July of 1989, the supply presented by MATRA as principal contractor was chosen to construction of the satellites, and in February of 1990 the launchings were also contracted with ARIANESPACE. The HISPASAT-1 project consists in a national system of satellite communications that completes, develops and extends the infrastructure of telecommunications of Spain. The communications by satellite constitute a basic complement. The HISPASAT, S.A. society offers good services of telecommunication. Other important function is the direct diffusion: two programs of TVE, one of CANAL PLUS +, five of ANTENA 3 TV, one of TELE 5 and also others. In 1996, four regional channels (Canal Sur, Television of Catalonia, Television of Galicia and Euskal Telebista) had predicted to offer a programming, different by satellite with projection to all Spain, good part of Western and North Europe of Africa(4).

With regard to the services contracted by HISPASAT 500 terminals of network subscribed by CORREOS, 300 of CAMPSA for the control of pipe lines must be mentioned, the 130 terminals of SAICA project for the verification of quality of waters in rivers and SAHI project for monitoring of the river basins hydrographical. Also it exists an important network of data transmission that is used specially by TELEFÓNICA DE ESPAÑA, S.A. and foreign telecommunications companies as British Telecom and others. Finally to say that the Commission of Science and Technology(CICYT) approved in February of

1996 a technological and industrial plan that was going to allow to the manufacture and putting into orbit of the third satellite of the HISPASAT-1 series, the HISPASAT C in 1998.

### 3. OBJECTIVES

The objectives of the putting into orbit of the systems of satellites HISPASAT are oriented towards the search to satisfy necessities derived from the transport of television and radio signals. It tries the supplying of a basic and safe support of communications for the defence and security of the national territory, the creation of an infrastructure of channels for official networks, routes of data, rural telephony,... Also is wanted to foment the provision of television channels for the Hispanic community in the south and center of America and the broadcasting of services of television for people in general. In summary, HISPASAT is designed to work as a multimission system destined to satisfy with unified way the national necessities in satellite communications. All these objectives have to be obtained within a calendar limit for the development of the satellites, without increase of risks, with proportional costs to the benefits, and with an active and decided participation of the Spanish aerospace industry.

### 4. CHRONOLOGICAL PLANNING

The chronological planning for the operability and beginning of satellites HISPASAT-1 was made according to the following temporary order:

- September of 1992: Up link of first satellite HISPASAT 1A.
- October / November of 1992: Work of the HISPASAT 1A.
- January of 1993: good condition of the HISPASAT 1A.
- July of 1993: Up link of second satellite HISPASAT 1B.
- August of 1993: Work of the second satellite reserves.
- October of 1993: good condition of the HISPASAT 1B.
- 1998: Up link of the third satellite, HISPASAT C-decided in February of 1996 -.
- 2002: The end of the life utility considered of the HISPASAT 1A.
- 2003: The end of the life utility planned of the HISPASAT 1B.

### 5. CONFIGURATION OF THE SYSTEM HISPASAT

The system is made up of next three elements:

1. Two satellites in orbit, located both in the orbital position of 31° West. With both operative satellites, the system has capacity to offer of simultaneous form 5 DBS channels-direct broadcasting-, 16 FSS channels- fixed service-, 2 TVA channels-distribution of television signals towards America-, 2 TVR channels- return of America-shared with FSS and 4 GUB-governmental-(3 channels of communications and 1 of emergency call). Although the position selected for HISPASAT 1A and 1B is 30° the West, the space stations have flexibility of location in the arc 30-31° West. The characteristics of the platform provide to each one of the satellites a life utility near the 10 years. It guarantee the nominal maintenance of orbital position with exactitude (0,14°), and it offers a power superior to the 3.5 Kw. The total mass of each satellite is about 2150 Kg. The launching of each one was made by Ariane 44LP in the base of Kourou, French Guyana.
2. Control center of satellite, with the missions of telemetry, control and monitoring of the satellites in orbit.
3. Control center of payload, destined to the verification of the correct state of operation of the lodged repeaters of telecommunication in the satellite.

## 6. CHARACTERISTICS OF SATELLITES

### 6.1. PLATFORM

The Platform or module of services has as mission the maintenance of the operability of the satellites in their orbital position during the life utility. The module includes the propulsion subsystems, controls of attitude, thermal, of power, control and telemetry, and structure(5).

### 6.2. LOAD UTIL

It is the module of communications that is constituted by the repeaters and antennas. The payloads of satellites HISPASAT 1A and 1B are practically equivalent. It exists necessary antennas (reception and transmission), a receiver or amplifier of low noise, a converter of frequencies, and an amplifying power with the corresponding filters of channel. For to save space is used a single antenna for reception and transmission.

#### 6.2.1. TECHNICAL RESOURCES OF DIFFERENT MISSIONS

##### 6.2.1.1. MISSIONS FROM DIRECT BROADCASTING (DBS)

Both satellites HISPASAT can transmit up to three direct television channels towards the national territory. The planning of frequencies is the established in meeting of Geneva (CAMR-77) by the UIT: transmission in the frequency of 12 GHz and reception in 17 GHz. The cover is obtained through an antenna that generates two beams, one towards the Balearic Iberian Peninsula and Islands, and another towards the Canary Islands. The same antenna is used for the reception of the land (emitted signals from points) The repeater of direct broadcasting is formed by a receiver that includes the frequency converter and a demultiplexor. The receiving has a 2:1 redundancy, and the amplifying of 5:3 or 5:2, for the satellites 1A and 1B. The antenna is made up of a drop-down reflector of 2.2 meters of diameter and a feeder formed by 15 horns, of which 2 are used for the cover of the Canary Islands, and the 13 rest of Spain. Two of these last ones are shared for reception and transmissions. A network of distribution of power fits to the amplitude and phases necessary to produce a conformed beam, with the purpose of taking advantage of optimal way the power available.

## 6. REFERENCES

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- [3] Beaumont, J.F. op. cit. (4), E. Fifth-Ripoll. Module de Communications of satellites HISPASAT of the seminary on "Communications via satellite" of the Superior Technical School of Engineers of Telecommunication. Universidad of Vigo, Vigo, Ed. Partnership of the Frank Zone of Vigo, July of 1992, p.164.
- [4] AMOT means Multiple Access by Division in the time.
- [5] RDSI talks about the ISDN.