

the Internet was so widely used for the coverage of media needs. Moreover, the penetration of mobile telephony was significantly higher compared to previous Games and for the first time 3rd Generation mobile telephony services were so extensively released.

EETT timely scheduled and implemented the necessary actions and proceeded to the coordination of all organizations involved, which resulted in the uninterrupted operation of wireless systems and telecommunications networks.

Operation of the Postal Market

In the context of EETT's competences, a main goal during the Games was the coverage of additional needs in postal services due to the increased volume in mail for that period, as well as ensuring uninterrupted operation of the postal market.

To this end, EETT's intervention was deemed appropriate for the full service of users, both in the area surrounding the Olympic venues and in other areas of Athens and the Olympic Cities, mainly within the Controlled Entrance and Traffic Zones (CETZ) and Controlled Parking Zones (CPZ). In this context, in collaboration with the Athens Organizing Committee (ATHOC) 2004, access permits were issued within the CETZ and CPZ for the vehicles of licensed postal undertakings. Also, aiming at facilitating the public and especially foreign visitors, EETT published on its web site the postal undertakings which provided their services in Athens and the Olympic Cities.

3.2. Actions for the Smooth Operation of Radiocommunications

3.2.1. Operational Plan

Already from 2002, EETT had prepared an "Operational Plan for the Provision of a Secure and Reliable

Radiocommunications Environment" during the 2004 Olympic Games, in which all its actions were based on, for the smooth operation of wireless communications of the Games. Also, since 2003 it had prepared the necessary procedures in collaboration with the remaining competent bodies (ATHOC 2004, Ministry of Transportation and Communications - MTC, etc.).

The main priorities of EETT's actions, based on its Operational Plan, were the following:

- Early planning of spectrum use.
- Granting of temporary spectrum use licences to Olympic users.
- Ensuring radio equipment operation according to the terms of spectrum use licences.
- Continuous monitoring of the radio frequency spectrum, particularly at the Olympic venues and the wider area of Attica, thus ensuring immediate and effective dealing with any interference.

3.2.2. Spectrum Use Planning

Already since 2003, EETT had proceeded to the detailed recording of requirements for radio frequency use, taking into account spectrum availability. In the cases where limited availability was ascertained, EETT saw to the provision of additional frequency bands. Moreover, it placed particular emphasis on the coordination of available frequencies in order to avoid interference, ensure optimum spectrum exploitation and enable processing of new users' requests, even during the Games.

Frequency Plan

A benchmark of the spectrum use planning was the preparation of Frequency Plans which had begun before the end of 2003. Those Plans included the allocation of all services managed by EETT per frequency band, according to their technical characteristics (Table 16).

Table 16**Services managed by EETT**

| | |
|------------------------------------|---------------------------|
| Wireless Cameras | Fixed Point Links |
| Fixed Point Satellite Links | Mobile Wireless Service |
| Land Mobile Service | Mobile Microcell Links |
| Portable Satellite Station Service | Telemetry and Telecommand |
| Talk-back Service | |

For the implementation of those Plans, the data of the respective services/ applications were examined in detail, as well as the existing availability of the radio frequency spectrum. More specifically:

- A priority list of all services was compiled, based on their critical character.
- The priority of each category of users was identified.
- All locations of venues were recorded per complex.
- The required geographical area of coverage was identified per venue/ sport.
- The equipment operating frequency bands were recorded per service.
- Spectrum availability was examined per geographic area, based on the National Frequency Allocation Table (NFAT) and on the National Radio Frequency Registry (NRFR) kept by EETT.
- Spectrum occupation measurements were performed at various bands and venues.

Temporary Availability of Additional Spectrum

The design of Frequency Plans, combined with users' requests, the operating band of the equipment and the measurements performed revealed that the available frequency bands did not suffice to satisfy the increased requests in specific frequency bands and geographic areas.

For this reason, EETT made agreements for the temporary granting of spectrum by main users and in particular the Armed Forces, OTE and radio amateurs. In parallel, EETT consulted the radio and

television stations to move their broadcasting radio links to specific frequency bands and geographic areas. The aim was to coordinate with the Games communication systems and minimize potential interference caused to them.

Coordination Study

In order to achieve effective coordination between users, EETT carried out a technical coordination study for each frequency band, based on the following principles:

- Satisfaction of all requests for radio frequencies and ensuring equipment's operation within the range of its operating frequency band.
- Ensuring satisfactory coverage within the requested geographic area.
- Avoidance of interference in existing systems (permanent/ temporary basis) by setting up the proper technical characteristics (channel, power, polarization) of the requested equipment.
- Ability to re-use the same frequency at another remote geographic area by setting up the suitable equipment power, in order to achieve spectrum saving.
- Suitable selection of VHF-UHF frequencies for the avoidance of intermodulation phenomena.
- Sufficient spatial-frequency isolation of VHF-UHF transmitters and receivers for protection from spurious emissions.

3.2.3. Licensing

The licensing of Olympic users (national delegations, technicians for the coverage of the Games, the Media) in 2004 was the crowning of all preparation actions of previous years. The effective spectrum use planning ensured optimum allocation of services per frequency band and geographic area, based on the technical characteristics of the used equipment. At the same time, urgent requests have been served, even during the Games. The expected high number of requests created the need to apply a more flexible and fast licensing procedure.

In this light, a special Internet application, "e-spectrum", was designed, which aimed at the fully electronic submission, monitoring and processing of frequency assignment applications. Members of EETT in collaboration with members of ATHOC 2004 prepared the technical specifications and supervised the implementation of the application, which was published on the site of ATHOC 2004.

The management of "e-spectrum" application requests started in early 2004.

The frequency pre-assignment procedure for satellite services began on 7th January 2004 and in early March 2004 for all the remaining services. The proposed frequencies for use were registered in the e-spectrum application coupled with the relevant cost, and the interested users were notified. In the cases where satisfaction of the initial requests of users was not possible, the optimum alternative solutions were proposed.

In some cases it was required to make last minute adjustments in order to meet high priority user needs, who revised their requests, due to lease of equipment with a different operating frequency, just before the commencement of the Games.

7,860 applications were processed in total, submitted by 108 international users, among which 77 international Media and international news agencies. Total fees for spectrum use collected by Olympic users stood at about 735,000 euros.

Additional Requirements

In parallel to the above actions which ensured radio frequency spectrum to Olympic users, EETT successfully responded to the increased needs of institutions involved in the Olympic Games, such as security forces and Mobile Telephony Operators (MTOs).

Specifically, EETT assigned the following operational frequencies to support the significant task of security forces:

- 36 frequencies to security and escort groups for VIPs (Presidents, Prime Ministers, etc.) as well as to delegations of diplomats.
- 20 frequencies to the Ministry of Public Order.
- 72 frequencies to the Hellenic Army General Staff (HAGS) for use by the North Atlantic Treaty Organization (NATO).

As regards MTOs, due to the increased traffic during the Games, they designed the expansion of their networks aiming at the best service of all visitors. In this light, a while before the Games, EETT gave priority to applications for Antenna Mast Constructions, in Attica and specifically in Olympic venues. More specifically, 94 mobile telephony antennas were licensed at Olympic venues. Furthermore, following this procedure, the companies COSMOTE, TIM HELLAS and VODAFONE were granted a licence to use an additional spectrum of 2x5MHz in the area of 1800 MHz during the Games, for 344,000 euros.

The requirements of other organizations, who offered services for the needs of the Games and to whom spectrum on a temporary basis was granted, were also increased. A characteristic example was the assignment of 67 frequencies for temporary operation of Private Mobile Radio (PMR) networks to Radio-Taxi Associations in Attica, in order to deal with the increased traffic of visitors in the basin.

3.2.4. Radio Equipment Control

In the implementation of its Operational Plan, EETT prepared, in collaboration with ATHOC 2004, procedures for the effective radio equipment control. The aim was to use at the Olympic venues, equipment conformed to the conditions mentioned in the relevant radio frequency assignment licence.

Subsequently, EETT provided to users and visitors information regarding radio equipment control and marking procedures, as well as the requirements and types of radio equipment which could be used in Greece during the Games. Information was provided through a special form which was published on the EETT and ATHOC 2004 websites.

According to the aforementioned procedures, sampling controls were scheduled and performed per user and per application for the radio equipment intended to be used in the Olympic Games. The controls were made on various equipment categories, such as portable transceivers with or without base stations, telemetry and telecommand equipment, wireless microphones, talk-back systems and in-ear monitors. Controls were focused on technical characteristics of the devices, such as power and frequency of emission, frequency deviation, and spurious emissions, according to the frequency assignment licence, granted by EETT. A special label (EETT self-adhesive label) was placed on those devices that were in compliance with the relevant licence terms.



Image 1: Self-Adhesive Radio Equipment Label

For the optimum planning of measurements and in order to facilitate radio equipment users, EETT, in collaboration with the Telecommunications Division of ATHOC 2004, operated 3 radio equipment control centers; at the International Broadcasting Centre (IBC), at the Main Press Centre (MPC) and at the Olympic Village. The controls were performed on a

daily basis for the period from 19th July 2004 until the end of the Games on 28th September 2004, by the EETT scientific and technical staff.

568 devices belonging to 83 different users were subject to sampling control, such as radio-television stations, press agencies and athletes delegations. On the basis of results from the representative controls, use was allowed to 15,359 devices which were labeled, while problems were encountered in 32 devices not complying with the frequency assignment licence conditions.

3.2.5. Radio Frequency Spectrum Monitoring – Effective Resolution of Interferences

Spectrum Clarity Control

The control of clarity for the bands included in the prepared Frequency Plans, as well as the ascertainment of legal use of the permanently assigned frequencies according to the NRFR were particularly crucial actions for the smooth operation of communications systems of the Games. For this reason, already from 2003, EETT had begun the implementation of a program for spectrum clarity control and elimination of illegal broadcasts.

Upon completion of pre-assignment of frequencies, a proactive control of all Olympic frequencies and clearing from harmful interference was made for all services using bands, managed by EETT (Table 16, p. 69).

After the second quarter of 2004 when a large part of frequency assignment to Olympic users had been complete, the control program was enhanced. Special attention was paid to frequency areas with the highest demand per venue, e.g. Athens Olympic Sports Complex (OAKA).

In parallel, particular importance was placed to the protection and control of frequencies of the Civil

Aviation Authority (CAA), given the high traffic expected at the Athens International Airport (AIA) "Eleftherios Venizelos". Specifically, controls were performed in areas where stations for communication with aircrafts were installed and measures were proposed to enhance protection of the aforementioned stations from harmful interference.

Efficient Resolution of Interferences

During the Olympic Games, an Olympic Monitoring Centre (OMC) was operating on a 24-hour basis at the EETT headquarters for the coordination of the spectrum protection project, the resolution of any interference problems and the provision of support services to Olympic users. In parallel, technical units were constantly present and monitored all sports venues in Athens and the remaining Olympic cities.

The main operations supported by the OMC were:

1. Recording of problems due to interferences in direct communication with the ATHOC 2004 Technology Operating Centre (TOC), the Olympic Security Centre (OSC) of the Olympic Games Security Division (OGSD), the CAA operations centre, as well as technical units of EETT that covered all the Olympic facilities, on a 24-hour basis.
2. Activation of Fixed Monitoring Stations (FMS) of the NSMMS for the precautionary spectrum control and the investigation of interferences.
3. Planning and coordination of actions of technical units at Olympic facilities to resolve interferences.
4. Support of Olympic spectrum users with the provision of information and instructions.

During the Games, 210 units operations were performed in total in all sports and non-sports venues. Interference events for which relevant trouble tickets were issued through the TOC were minimum (about 20), all having low critical character and were immediately resolved.

National Spectrum Management and Monitoring System

The effective exploitation of technical infrastructures of the NSMMS greatly contributed to the successful protection of all legal spectrum users during the Games and the fast resolution of all interferences incidents which occurred.

This is a technologically advanced and high-specifications infrastructure, on which spectrum management and monitoring in Greece is based. In its implementation during the Olympic Games, the NSMMS included:

- 4 FMS (2 in Attica and 2 in Thessaloniki).
- 7 Mobile Monitoring Stations. These are vehicles carrying special equipment for spectrum measurements, such as receivers, spectrum analysers, antenna set and radio direction finders (Images 2 and 3).
- 7 Mobile Monitoring Stations and 16 portable monitoring sets, which include similar but smaller equipment than that of Mobile Monitoring Stations, which enables their use when access is not possible through the Mobile Monitoring Stations.



Image 2: Mobile Monitoring Stations



Image 3: Mobile Monitoring Stations

For the full exploitation of each NSMMS subsystem, EETT performed a number of intensive measurements in order to imprint current spectrum use, timely deal with illegal broadcasting and ensure coverage of increased requirements of spectrum Olympic users. The FMS recorded the spectrum on a 24-hour basis, under the surveillance of the EETT staff and in parallel, special units with the Mobile Monitoring Stations and the portable monitoring stations monitored and performed measurements at all Olympic facilities and adjacent areas on a daily basis.

3.3. Planning for Telecommunications Emergencies

The increased demands of the Games, the particularity and the critical nature of telecommunications for successful hosting, brought telecommunications providers before extremely significant challenges, especially as regards uninterrupted provision of high-quality telecommunications services, both for the needs of organization of the Games and visitors' needs, in parallel with the provision of equally high level of services to the remaining consumers.

EETT, in order to meet the above challenges, prepared an Emergency Operational Plan, for the

coordination of the necessary actions. The Plan provided for the set up of Working Groups with representatives of all providers involved and EETT, the primary goal being communication and provision of mutual information in case of problems. According to the Plan, the representatives of those Groups should be standby on a 24-hour basis throughout the Games, in order to immediately and efficiently deal with any problems. Moreover, the Plan provided for cases of problems with the involvement of more than one providers or other institutions and the method of resolution, and it also specified the role of EETT for the coordination of all sides.

In parallel, EETT proceeded to a number of contacts with all telecommunications providers involved, aiming at ascertaining preparation and timely dealing with any problems at that stage. The most important problems faced were related to malfunctions in collaboration of providers -such as delays in orders of telecommunications infrastructures-, as well as delays due to bureaucratic procedures during the installation of telecommunications infrastructures.

The suitable preparation of providers, but also the implementation of the Emergency Operational Plan resulted in the uninterrupted operation of telecommunications networks during the Games.

3.4. Regulating the Operation of Postal Services

In order for the market of postal services to respond to the increased mail traffic during the Games, EETT took the following actions:

- In collaboration with ATHOC 2004, EETT saw that postal undertakings operating in Olympic cities were granted access permits to CPZ and CETZ. These permits enabled access for the provision of postal services to users inside and outside CPZ and CETZ by all licensed undertakings.