

5.2. Radio Spectrum Monitoring & Control

5.2.1. Immediate Management of Interferences and Investigation of Complaints

The operation of an efficient control and monitoring mechanism is a necessary prerequisite for the rational management of the radio frequencies spectrum. Under this framework, EETT proceeds to intensive inspections performed either *ex officio* or upon complaints, aiming at the immediate management of interference.

High Priority Networks

The uninterrupted operation of wireless networks related to the protection of human life and public safety is a top priority for EETT. Indicative examples of such networks are the networks of the CAA, the Armed Forces, the Hellenic Police, the FB, and the NFAC.

Most of the problems appear to the CAA networks due to the adjacency of the Air Navigation Band (108 - 137 MHz) with the band used for FM radio broadcasts (87,5 - 108 MHz). Due to the non-harmonized broadcasting of radio stations, the smooth operation of radio aids and CAA communications may be prohibited.

EETT permanently monitors the air navigation spectrum all over the Greek Territory, aiming at dealing with the above problems. In 2004, inspections were performed with the assistance of Fixed Monitoring Stations (FMS), which have been installed by EETT in Athens International Airport (AIA) and in the airports of Heraklion and Rhodes, and also with the assistance of the Mobile Monitoring Stations (MMS) mainly for the areas outside Attica and Thessaloniki.

Moreover, EETT units performed technical inspections at the CAA telecommunications centers, emphasizing on Mount Geraneia and Mount Akarnanika. These particular telecommunication

centers are facing many problems due to the existence of radio-television transmitters which are very close to the CAA receivers. EETT's inspections led to a number of technical proposals for short-term and long-term solutions, contributing to the reduction of the aforementioned interferences with ground stations.

In total, 270 written complaints were submitted by CAA, out of which:

- 44% concerned interferences in ground stations.
- 56% concerned interferences in airplanes during flight, out of which:
 - 42% related to interferences by radio stations
 - 58% related to increased noise levels at receivers.

The majority of complaints concerned the area of the Aegean Sea (18%), the Mount Akarnanika and Mount Geraneia broadcasting centers (12% respectively) and the remaining areas of the country (35%). Finally, 23% of the complaints did not state a specific area.

Furthermore, in the context of the Olympic and Paralympic Games, EETT intensified the inspections in the frequency bands of the remaining high priority networks (Hellenic Police, NFAC, FB, etc). Following complaints as well as scheduled measurements, inspections were held in the Prefectures of Attica, Korinth, Fthiotida and Achaia. In all cases the type of interference was identified and resolution procedures were scheduled. During 2004 complaints were submitted to EETT by services associated with the protection of human live and public safety (Hellenic Police, FB, NFAC), which were processed by priority.

Television and Radio Stations

In 2004, the cases of complaints related to interferences, illegal broadcasts and illegal installations of radio-television stations amounted to 412. Their allocation all over the Greek territory is shown in the following table:

Table 21

Geographic Allocation of Complaints for Radio-Television Stations

Geographic Allocation	Television Stations	Radio Stations	Total
Prefecture of Attica	69	73	142
Thessaly, Macedonia, Thrace (area of responsibility of the Regional Office of EETT in Thessaloniki)	41	47	88
Remaining Territory	68	114	182

EETT proceeded to the investigation of the majority of the above complaints, in collaboration with the respective Prefectural Authorities in several cases regarding complaints outside Attica. As regards all the aforementioned complaints, the conclusions of technical controls were forwarded to the National Radio-Television Council (NRTC), which is competent for the imposition of administrative penalties according to the provisions of the radio-television legislation.

Mobile Telephony

The cases of complaints and inquiries regarding mobile telephony antenna constructions as already mentioned in subsection 2.2.7., amounted to 1,006 for 2004. Following a detailed investigation, it was found that 820 cases concerned licensed antennas, for whose legality the complaining parties/ applicants were informed. As regards the 186 cases regarding non-licensed constructions, EETT intervened with the performance of 161 autopsies in total, out of which 143 were made in Attica, while the remaining 25 were referred to the competent Prefectures. The autopsies were performed in order for EETT to identify the holder of the constructions and impose the provided administrative penalties. Subsequently, upon its decision, EETT proceeded to the briefing of local competent Town Planning services for the removal of each illegal installations and the Public Prosecutor of the Court of Misdemeanors in order to impose penal sanctions (see subsection Administrative- Penal Sanctions).

Moreover, EETT received 55 complaints from Mobile Telephony Providers (MTP) for interference to the frequencies which have been assigned to them. Out of those, 21 concerned interference within the Prefecture of

Attica, while the remaining 34 were related to the remaining Greek territory. In all cases, EETT proceeded to immediate identification of the type of interference and to the necessary actions for the resolution of the problems.

Fixed Service

During 2004, EETT received 9 complaints regarding interference from/or to radio links of the fixed service, which are distributed as follows:

- 3 from the National Meteorological Service (NMS), the Athens Observatory and from coastal navigation lines at the port of Heraklion in Crete, for interference in data reception satellite systems.
- 2 for interference in image transmission systems of the Hellenic Police helicopters.
- 3 for the free band of 2400 - 2483.5 MHz.
- 1 from CAA for interference in air frequency by a telecommand system.

The technical units of EETT identified the type of interference and the necessary actions for their resolution were scheduled. Also, before and during the Olympic and Paralympic Games, EETT, in collaboration with major spectrum users, such as radio-television stations, proceeded to the arrangement of their radio link transmissions, for the uninterrupted operation of Olympic users systems and in order to minimize potential interference.

Radio Amateurs

Following complaints as well as requests by the owners themselves, EETT was called to confirm the correct operation of radio amateur stations. It was also called to investigate complaints about illegal

broadcasts, as well as interferences in legal radio amateurs.

In 2004, 40 cases were processed in total. In all cases, the predetermined measurements and control of machinery and station documents were performed, in order to confirm proper operation and compliance with the applicable legislation.

Private Mobile Radio Networks

In view of the Olympic Games, but also throughout 2004, intensive controls and measurements were performed in the wider area of the Prefecture of Attica and in the other Olympic Cities, in the radio frequency spectrum bands which are assigned for the use of PMR Networks.

From the above, illegal broadcasting was identified, some of which caused interference and prohibited the uninterrupted operation of legally operating PMR Networks. In all cases, the necessary actions to resolve problems and impose the provided sanctions were immediately scheduled. The total number of complaints amounted to 30.

It should be noted that in several cases, citizens requested the identification of the type and purpose of antenna systems, related to PMR Networks, installed at areas adjacent to those of the complainants, expressing concerns about their health and the problems that might be caused by their operation. EETT investigated all cases and informed the interested parties accordingly. The majority of them was related to licenced Antenna Mast Construction systems the use of which was inspected according to their licence terms. In the few cases of illegal systems, EETT took the necessary actions for their removal.

Complaints for International Coordination Issues

In parallel, EETT dealt with three cases of interference, which, according to the relevant complaints, were caused by transmitters installed on Greek ground to receivers of other countries.

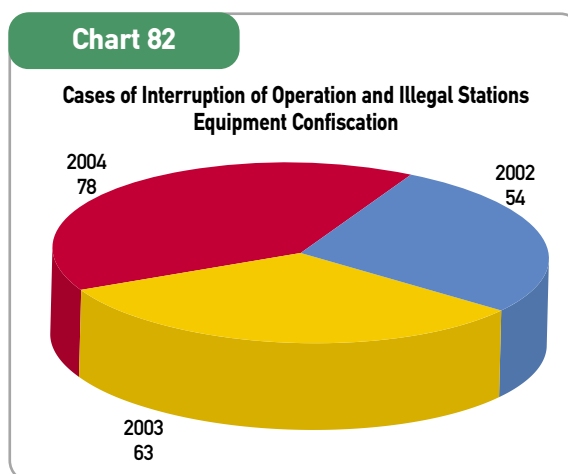
The two cases which were related to television interference to bordering countries and were resolved upon consultation with the competent bodies, highlighted the need to regulate the licensing of private radio-television stations also for reasons of international coordination.

The third complaint concerned interference in the frequency of 9MHz, to an air navigation system (communication with airplanes on flight) based in Sweden. The source of the interference was identified outside the Greek Territory following a visit of an EETT technical unit with the mobile radio direction-finding unit in the Prefecture of Ioannina.

Administrative - Penal Sanctions

In the context of the aforementioned ex officio controls and complaints of agencies and citizens, EETT proceeded in 2004 to the tracing, interruption of operation and confiscation of broadcasting equipment of 78 illegal stations, out of which 55 were in Athens, 21 in Thessaloniki and 2 in the remaining Greek Territory. These concerned 75 radio-television stations, 2 fixed service radio link stations and 1 Citizen Band (CB) station.

Out of the above operations, an increase of 24% was noted in comparison to 2003 (Chart 82).



Source: EETT

As regards illegal Antenna Mast Constructions, 108 fines were imposed in total in 2004 for illegal Antenna Mast Constructions, according to Table 22.

Provider	Number of Fines	Total Fines (euro)
COSMOTE	48	501,176
INFO QUEST	4	52,022
INTRACONNECT	3	34,348
OTE	5	73,370
TIM HELLAS	19	173,066
VODAFONE	34	407,176

5.2.2. Preventive Control of the Radio - Television Spectrum Use

The observance of specific broadcasting characteristics contributes to the prevention of interference among various services and users of the same service and also ensures rational use and proper exploitation of the radio frequency spectrum.

ITU, by means of Recommendations, suggests the harmonization among various services, imposing concrete technical specifications on broadcasting, mainly related to the transmission frequency, the distance between channels and broadcasting centers, the effective radiated power and the radiation pattern of the used Antenna Mast Construction system.

Specifically, Recommendation 1009⁵ imposes the harmonization of radio broadcasts with air navigation frequencies and its compliance is necessary for the smooth operation of CAA communications and the safety of flights.

The current situation in Greece, regarding in general the radio-television scene, is considered to be transitional, since the organization of broadcasting centers into antenna parks and the licensing of all television and radio broadcasts is still pending. The MTC has taken up efforts for the creation of the first park in Athens. EETT actively participates in these efforts, acknowledging their importance to secure legal spectrum use and protection from illegal broadcasts.

Recording and Control of Transmissions Technical Characteristics

In 2004, EETT continued the inspections in the Mount Hymettus broadcasting centre, which hosts part of the state-owned radio and television stations, the majority of the licensed private radio stations and part of the private television stations. Similar inspections were performed in Parnitha, Mount Poikilo and Aegina broadcasting centers.

Moreover, in addition to the on-the-spot technical inspections, systematic recordings of the radio spectrum and broadcasting characteristics were performed on a daily basis in order to certify compliance with the specifications laid down, as these are outlined in the FM Radio Frequency Map of the Prefecture of Attica. The main technical elements investigated were the frequency (tracing a transmission in non-assigned frequency), maximum standard deviation (control of overmodulation) and maximum effective radiated power.

During 2004, EETT was reporting to the NRTC, on a monthly basis, the standard frequency deviation of all state and private radio stations broadcasting in Attica.

The investigation of maximum effective radiated power of the aforementioned radio stations was performed with the assistance of all FMS and Mobile

⁵ ITU – R Recommendations, 1994 - IS.1009.

Monitoring Stations. Measurements were conducted at 10 different points in Attica, in order to form the active radiation pattern of the radio stations and to identify the maximum radiated power and direction. A relevant report with the results of the above measurements was forwarded to the MTC.

Imprinting of Antenna Mast Constructions at Broadcasting Centers

The imprint of the broadcasting centers all over the Greek Territory and of their broadcasts is necessary for the elimination of illegal broadcasting. Since 2002, EETT, in collaboration with the local prosecution authorities (Police, Public Prosecutor), had proceeded to the imprint of installations in Athens and Thessaloniki, updating it at regular intervals. Also, it has performed autopsies in various Prefectures of the country for the processing of submitted complaints.

In 2004, EETT's technical units performed recordings in the Prefectures of Thessaloniki, Heraklion, Ioannina, Cyclades (Syros - Paros), Messinia, Arkadia, Chalkidiki, Imathia, Magnisia and Larissa. Furthermore, units equipped with the Mobile Monitoring Stations of the NSMMS visited the Prefectures of Fthiotida, Achaia, Etoloakarnania, Argolida, Messinia, Korinth, Kilkis, Serres, Kavala, Pella and Imathia in order to deal with complaints.

Table 23 presents the results of the recording of operating private radio stations, compared to the number of frequencies assigned as provided by the applicable laws.

From the above recordings, it arises that the delays in licensing of radio-television stations all over the Greek Territory and the subsequent failure to implement the applicable Frequency Map have led to the creation of a chaotic situation as regards radio-television broadcasts. As a result, in many cases, interferences with air navigation frequencies were observed.

Table 23

Operating Radio Stations - Frequency Map

Prefecture	Number of Frequencies			
	Recording Results		Frequency Map Forecast	
	Private	State	Private	State
Messinia	39	6	18	9
Ioannina (city)	48	4	6	17
Heraklion	59	7	9	9
Cyclades	42	2	6	8
Arkadia	26	5	7	10
Achaia	58	4	7	6
Viotia	9	0	10	0
Arta	11	0	4	3
Imathia	112 (reception from adjacent Prefectures as well)		7	4
Chalkidiki	32	1	-	-
Magnisia	47	6	10	5
Larissa	52	1	7	4

In order to deal with this situation, global management and systematic resolution methods for problems arising are required from all bodies involved (EETT, Forest Authority, Ministry of Environment, Physical Planning and Public Works- MEPPPW, PPC). To this end, EETT forwarded the results of the recordings coupled with the necessary remarks to the competent bodies. Moreover, for 2005 EETT plans to complete the recording and the systematic coverage of all radio-television signal broadcasting centers all over the Greek Territory with on-the-spot autopsies performed by its technical units.

5.2.3. Optimization of Radio Frequency Spectrum Monitoring and Control Mechanisms

NSMMS Integration in the Spectrum Monitoring and Control Operations

In 2004, the largest part of procurement and installation of spectrum monitoring equipment was completed in the framework of Phase A of the NSMMS, which fully meets the monitoring needs of Attica and Thessaloniki (Figure 2).

Specifically, Phase A included the procurement and installation of 5 FMS (3 in Attica and 2 in Thessaloniki) and 7 Mobile Monitoring Stations (5 in Attica and 2 in Thessaloniki). The Mobile Monitoring Stations are also used to meet monitoring needs in the rest of Greece. Moreover, 7 Transportable Monitoring Stations and 16 Portable Monitoring Sets were included to meet the monitoring needs at locations where access is not feasible through the Mobile Monitoring Stations. The installation of the aforementioned sub-systems has been completed and they are already operational, with the exception of one of the Attica FMS.

For the more complete exploitation of the NSMMS, the following were developed:

- The National Control Center (NCC) in EETT's headquarters in Athens, which hosts the Spectrum Management System and coordinates the operation of Regional Control Centers (RCC).
- Two RCC, one in Athens and one in Thessaloniki, monitoring the spectrum on a daily basis.

The installation, integration and operation of the NSMMS in the daily procedures of the Spectrum

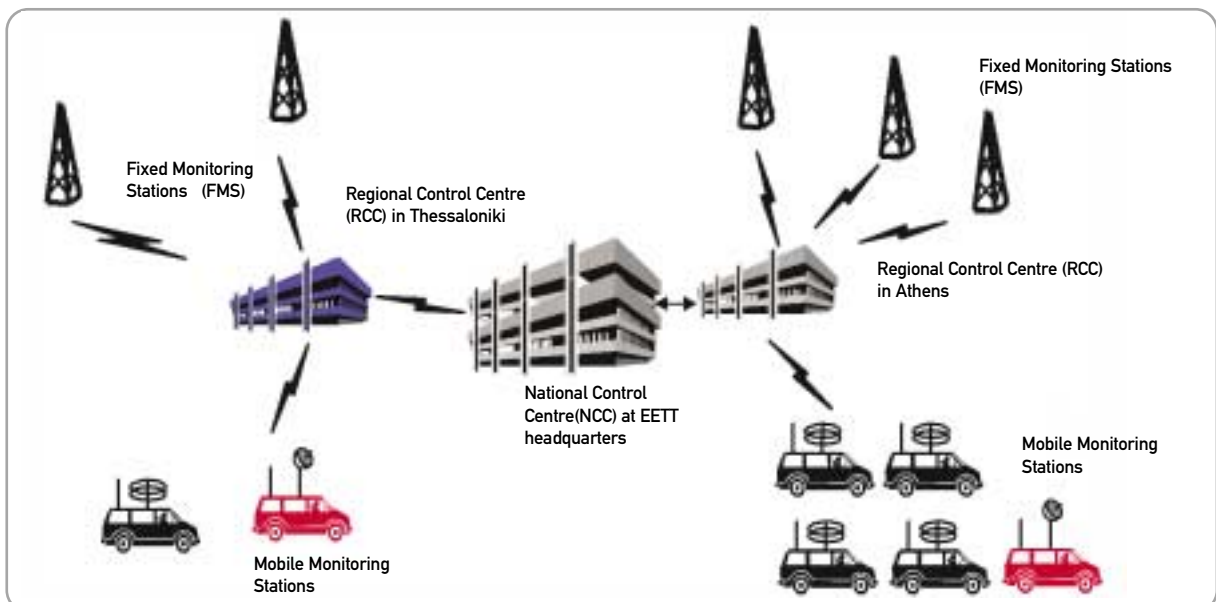


Figure 2: NSMMS Representation

Monitoring and Control Department has upgraded the spectrum monitoring capabilities of EETT and resulted to the following:

- Improved response time and complaint management.
- Accuracy in tracing.
- Monitoring and control of significantly wider frequency bandwidth.
- Measurement of various broadcasting technical characteristics.
- Possibility of immediate comparison of measured characteristics in terms of Registry entries.
- 24-hour monitoring of transmissions.
- Central monitoring and problem and crisis management.

The response and processing time of complaints has been significantly reduced. EETT's staff, with the aid of the FMS, is able to perform measurements and controls as well as to activate the problem investigation procedure, from the local control centers.

The introduction of even more modern wireless services in high frequency bands renders necessary the ability to effectively manage and monitor spectrum in those bands. Mobile Monitoring Stations V/UHF enable measurements up to 26 GHz while Mobile Monitoring Stations SHF up to 40 GHz.

The new technologies offered through the NSMMS software combined with the stations equipment ensure accurate measurements of transmissions' technical characteristics, according to the ITU recommendations. In this framework, measurements have now been incorporated and performed by the operations of the Spectrum Monitoring and Control Department as regards spectrum occupation, standard deviation, radiated power, as well as other technical

characteristics, resulting in proper monitoring and therefore management of the scarce source of spectrum.

At the same time, the software system enables 24-hour monitoring and performance of measurements for the above characteristics, without requiring continuous presence of technical staff (see Image 10). The measurements results are consequently available for processing and extracting of conclusions for the proper frequencies management.

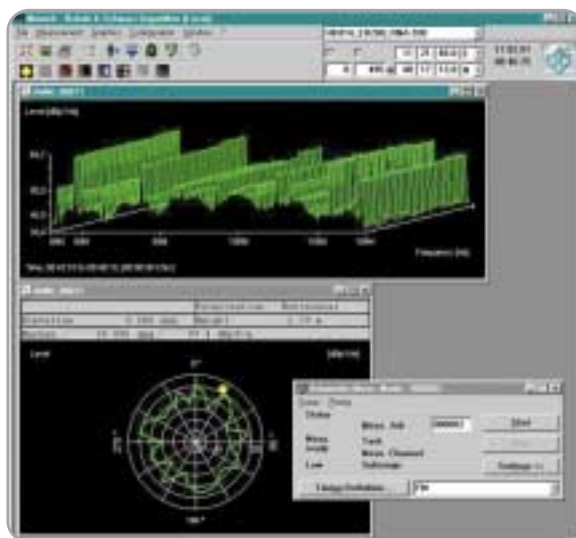


Image 10: Automatic Monitoring of Radio Frequency Spectrum

The ability of FMS and Mobile Monitoring Stations remote management combined with all the above, enables the management of serious situations and crises by the NCC. It should be noted that Mobile Monitoring Stations, even in cases located outside Attica or Thessaloniki where FMS are installed can transmit measurement data in real time.

Even though 2004 was the first year in which the NSMMS was used, the spectrum monitoring by EETT was significantly improved, as shown in Table 24.

Table 24

Spectrum Monitoring Data before and after the NSMMS

Spectrum Monitoring Actions	2003	2004
Recording of radio-television broadcasts	In 6 Prefectures	Full broadcasts recording in 12 Prefectures Partial broadcasts recording in 9 Prefectures
Complaints for radio-television broadcasts outside Attica	94 The majority was sent for inspection to local Prefectures	268 Significant part was dealt by EETT with the dispatch of technical units
Complaints for radio-television broadcasts in Attica	72	142
Power measurement of radio stations in Attica	Measurements from the 2 fixed stations in Maroussi and AIA	Measurements at 10 points in Athens with the use of FMS and Mobile Monitoring Stations
Autopsies of mobile telephony antennas	58 in Attica 8 outside Attica 13 were sent to Universities, Prefectures	143 in Attica 18 outside Attica 25 were sent to Prefectures
Inspections of radio amateurs	17	40
Inspections of Private Mobile Radio Networks	15	30
Confiscations	63	78
Average response/ management time of complaints concerning interferences in Attica	95% in 15 days	95% in 5 working days
Tracing procedure	With the use of mobile station only – time consuming procedure	Immediate tracing of transmission area with the use of FMS allowing direction-finding and then tracing the exact position with Mobile Monitoring Stations. Significant reduction of tracing time
Control of high frequencies (over 3 GHz)	Only with portable equipment (spectrum analyzer)	With the use of Mobile Monitoring Stations

The advanced capacity and technical infrastructures of the NSMMS were successfully exploited before (preparation stage), but also during the Olympic and Paralympic Games and contributed significantly to the protection of all spectrum users and to the fast resolution of all interference cases which occurred.

The NSMMS and its features were presented for the first time in February 2004 at a special event held in Zappeion. Specifically, part of the Mobile Monitoring

Stations functions was presented with on-the-spot measurements of wireless transmission characteristics and radio direction-finding measurements, as well as measurements of the Transportable Monitoring Stations developed in the area of Zappeion.

Resource Management System

The integration of the technologically advanced NSMMS equipment into the operations of spectrum

monitoring, in combination with the increase of human resources, rendered necessary the implementation of an effective Resource Management System. In this context, the existing system was re-designed, enabling the recording and evaluation of complaints as well as the management of available resources.

At the same time, in 2004 the recording of the needs for the procurement of an advanced, full Resource Management System was initiated. The system will enable evaluation and monitoring of the units transport cost, ensuring the best management of human resources and equipment.

5.3. Ensuring Compliance of Radio Equipment and Telecommunications Terminal Equipment

5.3.1. Regulatory Actions

In 2004, EETT, in the framework of its competencies to ensure compliance for the placing on the market, free movement and use of RTTE, focused on the following actions:

- It specified and published radio interfaces, namely the technical specifications that the radio equipment must comply with for the use of various spectrum bands.
- It published the interfaces of telecommunications providers, namely the technical specifications of their network interfaces, thus enabling the design of terminal equipment capable of connecting to the specific interfaces and using the services offered.

Publication of Radio Interfaces

In 2004, EETT prepared the interfaces for a significant number of radio equipment classes, pertaining to:

- Short range devices, such as RLANs, model control, inductive applications, medical implants, alarms, etc.

- Marine equipment, such as mobile transmitters and receivers, watchkeeping receivers on ships, VHF radio equipment for general communication and relevant equipment for Digital Selective Call (DSC) class D, emergency radio beacons, etc.
- Audio frequencies broadband links, namely communications systems for the reproduction of data audio signals or high fidelity control.

These interfaces were communicated to the European Commission and consulted upon with the member states of the European Union (EU). Subsequently EETT, having taken the remarks into consideration, proceeded to their publication upon a relevant Decision⁶.

A necessary prerequisite for the use of radio equipment is the compliance with the minimum requirements specified in each interface requirement for the provided types of equipment and radio frequency bands. These interfaces are also available on the EETT's website⁷.

Publication of Telecommunications Providers Interface

By means of its Decision⁸ in 2003, EETT had specified those providers that must publish interface specifications, through which telecommunications services are provided to the public, the types of interfaces and all details about the information to be published. According to the above Decision, those providers are:

- Public telecommunications network providers to which terminal equipment can be connected via a network terminal point or a radio interface.
- Public telecommunications network providers having access to the final subscriber via other provider networks.
- Providers of public telecommunications services, offered via other provider networks.

⁶ Decision EETT 331/70/2004, GG Issue 1911/B/24-12-2004.

⁷ http://www.eett.gr/gr_pages/telec/RadioEquip/InterfRadioReg/InterfRadioReg.htm.

⁸ Decision EETT 294/55/2003, GG Issue 1590/B/30-10-2003.