

Colonel (Ret.) József Bajó
electrical engineer MSc

**Limitations of the efficiency of the
non-civil frequency management,
possibilities to increase the management efficiency**

author's review of the doctoral (PhD) dissertation
and its official critiques

Supervisor:
Prof. Dr. Sándor Munk CSc

2006 Budapest

1. Justification of Choosing the Subject and Scientific Problem

Formulation.

The extension of the telecommunications infrastructure of the information society, the growth of telecommunications, the national and community economical growth, as well as the necessity to preserve the competitiveness appeared with formerly not estimated demands for telecommunications development.

In the first place, because of a particular emphasis on demands for telecommunications mobility, in the past decade of telecommunications development the role of the radiocommunications has been increased in view of its significance and proportions. Nevertheless, widening of radiocommunication applications and services is possible only to the extent of available radio frequencies.

The scarce resource character of radio spectrum, as a natural resource with limited availability is coming more and more in foreground. The unsatisfied frequency demands, having a characteristically increasing tendency, cause significant economic losses and, in addition, seriously hinder the evolvement of information society.

The utilization of radio spectrum for military purposes is, in economic sense, an element of defence economy potential. The availability of radio frequencies, necessary for military operations became an important factor, characterizing the military capabilities. The further non-civil utilization of radio spectrum – national security, defence of public order, border guard, disaster management, customs and finance guard, penalty service, as well as applications exclusively for state and governmental purposes – is carried out in support of important state tasks.

There are very important political, social and economic arguments for the economic and efficient – i.e. with greatest obtainable usefulness for society – utilization of radio spectrum.

Although in the international organizations and reputable research centers dealing with radio telecommunications regulation are carried out significant research activities for the benefit of the efficient utilization of the radio spectrum, for the Hungarian domestic research all this means an unexplored research area.

In my opinion efficiency-oriented research of our national and within that our non-civil frequency management system has an undeniable actuality.

During my activities I perceived and concluded as a contradiction the fact that while the community and Hungarian national legal regulation define requirements concerning the efficient management of the radio frequencies, none of them gives definition of efficient management as a category.

From the analysis of the models, developed for *interpretation and measurement* of the efficient use of radio spectrum *both* from technical and economic points of view, I have come to the conclusion that these methods *offer only indirect and limited opportunities* for the management efficiency estimation of the national frequency management systems.

At the same time, on the basis of my previous research and analyses I proved that for the *direct survey and evaluation* of the management efficiency of the national frequency management systems *there no methods are available*.

Considering the critical importance of efficient spectrum utilization and the unresolved control of management efficiency, *I set up a research hypothesis* for creation of a *method for direct studying and estimation of the efficiency of national and within that the non-civil frequency management*. With setting up of the hypothesis I intended to create a method of examination *suitable for drawing conclusions necessary to enhance the management efficiency of Hungarian non-civil frequency management*.

My dissertation gives a systematic summary of my research activities and verification of my research hypothesis.

2. Research Objectives

On the basis of the research hypothesis I aim to achieve the following objectives:

On the unstudied research area in Hungary developing a method for investigation and evaluation of the management efficiency of the Hungarian national non-civil frequency management.

Exploration and systematization of principal factors, determining the efficiency of the non-civil frequency management, with evaluation of the realization of these factors.

Drawing conclusions from above in order to determine goals, directions and objectives of developments for efficiency intensification of the non-civil frequency management.

In order to achieve the research objectives necessary:

1. Developing of a practicable method for investigation and evaluation of management efficiency of the Hungarian national non-civil frequency management.
2. Identification and systematization of the factors determining the efficiency of the Hungarian national frequency management as a whole. Identification and systematization of factors, directly determining the efficiency of the non-civil frequency management, with evaluation of the effect of these factors. Drawing conclusions in order to determine goals, directions and objectives of developments for management efficiency intensification.
3. Evaluation of the Hungarian national application of the most important up-to-date frequency management tools, as well as drawing conclusions concerning their applicability in the non-civil frequency management.
4. Comprehensive analysis of the requirements of allied frequency management. Based on this analysis, drawing conclusions necessary to improve the quality of the national contribution to the Alliance tasks.

3. Research methods

During my personal and systematic participation on the most significant fora of the international and regional regulation of the radiocommunication (WRCs, CEPT/ECC (ERC) WGFM) I *observed and studied* the regulation processes, as well as their efficiency-oriented elements.

With *comparative analysis* I studied the documents of various European research centers, the CEPT/ECC (ERC) as well as the European Union, discussing the modern frequency management tools and their application. On the basis of the *comparative analysis* I generalized the relevant to the modern frequency management requirements, which served as a reference for the study of the Hungarian national application practice.

I have collected, *expediently explored and* systematized the theoretical models of radio spectrum use efficiency measurement from different approaches. With the comparative analysis of different models I draw conclusions on the applicability of these methods for study and evaluation of the management efficiency of the national frequency management systems.

On the basis of the research results I established a detailed requirement system and based on this I set up a research hypothesis, which is assessed in Paragraph 2.

With regard to accession of Republic of Hungary the European Union, I extended my research activity to the *analysis of the radio spectrum policy of the Community*. On the basis of my analyses I have *re-evaluated my statements and conclusions*, originating from my previous researches.

As a new research area, I analyzed the comparative relation and harmony of international, regional and community regulations, pertinent to the efficient spectrum use. Based on comparative *analysis I draw conclusions* concerning aggregate effects of different levels of international radiocommunication regulations of different levels on the efficiency of national frequency management systems.

During my four-year-long participation in the research activities of ITU-R Study Group SG1 *I have collected, systemized and analyzed* the documents of Working Party WP1B about study results on the development of modern frequency management tools, the economic approach to the national frequency management, as well as on the modernization of national radiocommunication regulation systems.

I have located and analyzed international examples for application of modern frequency management tools in the non-civil frequency management. I *published* in a scientific journal my conclusions, giving justification for introduction of the modern frequency management tools in the Hungarian national non-civil frequency management.

I have analyzed the requirements of the NATO Defence Capability Initiative to the Alliance frequency management and its conception on enhancement of management efficiency. *Additionally I have analysed* the requirements of NATO for use of radio spectrum, and the practice and results of promotion of NATO interests in the international and regional regulation of radiocommunication. On the basis of my analyses I have *drawn conclusions* concerning the improvement of the national contribution to the performing of the Alliance frequency management tasks. I have *published* my conclusions in a scientific journal.

In order to determine the algorithm for evaluation of efficiency of non-civil frequency management, I have analyzed the European Union's method for measurement of the development of the information society. The results of my analyses I have published in a scientific journal.

On the basis of the *analysis* of the authority and economical activities of the Hungarian national and within that the non-civil frequency management, *I have identified* the factors influencing or determining the management efficiency. I have explored the

relationship and action mechanism of these factors. With a *synthesis* of the management efficiency influencing factors and their relationships I have established a system of these factors (an algorithm), serving for examination and evaluation of the efficiency of the non-civil frequency management.

From the investigation of the predominance of the factors influencing the management efficiency, I draw conclusion on those shortages of the non-civil frequency management, which at present mean the limits of management efficiency, but at the same time they mark the possibilities to increase the efficiency.

4. Overview of research

The dissertation has been divided into three chapters. In the **First Chapter** titled „**Efficiency of the national frequency management**” after the defining of subject of the frequency management I have demonstrated that during the historical evolution of terminology of „frequency management” the efficient use of radio spectrum has become the fundamental goal of the frequency management.

I have introduced my proposed access for determination and analysis of efficiency of the national frequency management systems.

In harmony with my research hypothesis I have defined the terminology of efficiency of national frequency management systems.

Based on typical chosen patterns I have analysed the theoretical models had been elaborated from technical, economic and complex point of view for measuring of effective use of radio spectrum. From my analyses I have concluded on applicability of studied models relating to the analysing and evaluating of efficiency of national frequency management systems.

In accordance with my research hypothesis, my research goals, and my conclusions I have elaborated an algorithm for direct analysing and evaluating of efficiency of national non-civil frequency management sub-system.

In **Chapter Two** titled „**Influencing factors on efficiency of the national frequency management system**” I have explored and analysed of influencing and direct defining factors on efficiency of the national frequency management system.

Based on my analyses as primary external influencing factors I have analysed the international (ITU-R), the European regional (CEPT/ECC) and the EC regulation of radiocommunications.

Taking into account the importance of research, which are being conducted in the ITU-R Study Groups, the most significant European frequency harmonisation process (DSI), and the special role of the Civil-Military cooperation in European regional regulation of radiocommunications I have evaluated them in a distinguished way.

From my analyses I have concluded on limitations of accessible efficiency of national frequency management systems.

I have identified, explored and analysed the most important *internal factors* determining the efficiency of the Hungarian national frequency management system. I have concluded on the quality of organizational and institution structure, and legal regulation of the national frequency management. Moreover I have concluded on the impacts of internal factors on the management efficiency.

In my dissertation I have dealt with distinguished importance of modern frequency management tools, which are capable of influence on management efficiency in a large measure. Using as a reference of analysed and generalized results of the international research in the Annex 3 I have analysed the national application experience of modern frequency management tools. I have concluded on deficiencies of our national application and on impacts of deficiencies on efficiency of the national frequency management.

In a separated subsection I have evaluated the future regulatory tools and related technical and technological concepts for enhancement of efficiency of frequency management.

In **Chapter Three** titled „**Possibilities for enhancement of efficiency in the non-civil frequency management**” I have identified, and evaluated the *most important direct defining factors* of efficiency of the national non-civil frequency management system.

I have analysed the strategical goals of our national non-civil frequency management and the role of determination of goals in enhancement of management efficiency. In order to improve of national contribution to the allied frequency management I have paid distinguished attention to evaluation of national *fulfilment of NATO frequency requirements*.

I have analysed in details the frequency requirements of NATO, the experience and results of promotion of NATO interests in the international and regional regulation process of radiocommunication. I have analysed in details as well the NATO “National Pillar” program, which had been launched for improvement efficiency of the allied frequency management.

I have analysed and evaluated the *legal measures*, which *regulate directly our national non-civil frequency management*, the deficiencies of measures and the harmony of measures with regulation of civil frequency management. I have determined the main objectives and tasks of development of legal measures for the national non-civil frequency management.

In accordance with its importance I have evaluated the cooperation between civil and non-civil frequency management subsystems. In my opinion the cooperation between the two subsystems is very important from point of view of establishment and maintenance of harmony among them.

I have paid particular attention to evaluating of *application of modern frequency management tools in non-civil frequency management*.

As a possibility of enhancement of efficiency of non-civil frequency management I have evaluated the *instruction and training of non-civil frequency managers*. I have concluded on impacts of deficiencies of instruction and training on efficiency of non-civil frequency management. I have made proposals for improvement instruction and training of non-civil frequency managers, for enlargement of instruction opportunities and for better utilization of present available opportunities.

In accordance with its significant role in shaping and promotion of most important factors which define directly the efficiency of management, I have evaluated the requirements for operating of the *non-civil frequency management authority*.

5. Summary of conclusions

There are very important political, social and economic arguments for the economic and efficient – this means, with the greatest obtainable usefulness for society – utilization of radio spectrum.

The efficient use of the radio spectrum became an important regulation goal for the international and regional telecommunication regulatory organizations, as well as for the European Union.

The utilization of radio spectrum for military purposes has a specific military value, on the other hand in economic sense is an element of the defence economy potential. The availability or absence of necessary radio frequencies for military operations became an important factor, characterizing the availability of military capabilities. The further non-civil utilization of radio spectrum – national security, defence of public order, public safety border guard, disaster management, customs and finance guard, penalty service, as well as applications exclusively for state and governmental purposes – is carried out in support of important state tasks. The societal usefulness of non-civil utilization of the radio spectrum can not be separated and can not be opposed to other, for example economical, utilizations. *The national utilization of the radio spectrum shall be treated taking into consideration the harmony and balance of management sub-systems.*

In my opinion there is a need for much more conscious strivings after efficiency enhancement of our national frequency management system.

The efficiency-oriented research of our national and within that our non-civil frequency management system has an undeniable actuality.

Possibilities for measurement of the management efficiency in the national frequency management systems.

I perceived and concluded as a contradiction the fact that while the EU and domestic law define requirements concerning the efficient management of the radio frequencies, none of them gives definition of effective management as a category.

Using typical examples, chosen on the basis of generalized experiences of my previously performed comparative analyses, I investigated the theoretical models, composed for interpretation and measurement of the efficiency of radio spectrum utilization.

On the basis of the analysis of the models, developed for *interpretation and measurement* of the *efficient use of* radio spectrum *both* from technical and economic points of view, I have come to the conclusion that these methods and their results *offer only indirect and limited opportunities* for the estimation of the management efficiency of national frequency management systems.

A common character of the studied methods is that they not cover the whole radio spectrum, only the examined for some reason frequency bands, and moreover, they are radio-

application-dependant, or application oriented and, finally, the regulatory interventions, based on their application, have no influence for the whole national frequency usage.

The analysed indirect measurement methods do not provide for direct measurement results of the management efficiency of national frequency management systems and are also not suitable for comparative assessment of the status or level of the management efficiency.

The research hypothesis

- On the basis of my analyses and conclusions I set up my research *hypothesis* with the objective to create a method for efficiency-oriented study and evaluation of our national frequency management system and within that the non-civil frequency management sub-system.

On the basis of my research hypothesis efficiency of the national frequency management system is determined by factors, having effect on the frequency management processes, as well as having effect inside of the processes, resulting in and contributing to the efficient use of the radio spectrum, and forming a system in interaction with each other.

In accordance with the research hypothesis *I defined my own interpretation of the concept of the management efficiency of the national frequency management systems.*

Further, in accordance with the research hypothesis I have determined an algorithm for bench-marking assessment of management efficiency of the Hungarian national *non-civil frequency management* and for comparison of different assessed status.

Justification of the research hypothesis

In order to justify the research hypothesis, I explored by the analysis of economic processes of national and the non-civil frequency management the factors, influencing or determining the management efficiency and determined the character of relation between individual factors as well as the extent of predominance of individual factors.

On the basis of my analyses I consider as *external factors*, primarily influencing the efficiency of the Hungarian national frequency management:

- *the international of radiocommunication regulation;*
- *the European regional of radiocommunication regulation;*
- *and the radio spectrum policy and the regulatory work for electronic communication of the European Union.*

The actual limits of the management efficiency are framed by the divergences of the regulation of national frequency usage from the international, regional and community regulations. The divergences mark the possible areas for enhancement of the efficiency. According to the above, *the efficiency of national frequency management can be characterized by indicators, expressing the extent of adjustment to the external factors.*

On the basis of my research I came to the conclusion that the determining the efficiency of the whole Hungarian *national frequency management* most important internal factors are:

- *the institution system and the quality of legal regulation of the frequency management;*
- *the status of application of modern frequency management tools, stimulating the effective use of the radio spectrum; and*
- *the application of spectrum-effective technologies.*

I ascertained that the national organization and institution system of frequency management has no shortages, having an adverse effect on the frequency management efficiency.

In my opinion, the application of modern frequency management tools is an indispensable condition of the efficient management. On the basis of my research and analyses I determined that the Hungarian frequency management currently is not supported by application of modern frequency management tools, and this restricts seriously the *achievable management efficiency.*

During evaluation of the factors, influencing or directly determining the efficiency of the Hungarian national frequency management as a whole, I determined the limits and inefficiencies of realization of individual factors. *On the basis of investigation of the relationship between individual factors I came to the conclusion that the management efficiency of non-civil frequency management first of all and in decisive measure can be enhanced by increasing the extent of realization of factors, having influence on the whole national frequency management.*

I consider being the most important factors, directly determining the management efficiency of the non-civil frequency management, as follows:

- *choosing strategic objectives of the non-civil frequency management;*
- *satisfying the frequency requirements of the NATO;*
- *legal measures for direct regulation of the non-civil frequency management;*
- *cooperation of the frequency management sub-systems;*
- *application of modern frequency management tools;*
- *instruction and training of frequency managers; and*
- *an effectively functioning authority organization.*

The extent of realization of individual factors as well as insufficiencies of this realization define the limits of the non-civil frequency management, but at the same time mark the possible areas of enhancement of management efficiency. During detailed investigation of the individual factors in parallel with *the determination of insufficiencies of factor realization I made proposals for their improvement and by this means for enhancement of the non-civil frequency management efficiency.*

The *system of goals and objectives of the non-civil frequency management is currently not sufficiently shaded*, it is not fostering to the necessary extent the realization of all important factors, determining *management efficiency. Consequently, besides systematic review of the system of goals and objectives there is also a need for its adequate enlargement.*

I determined that the Hungarian national regulation of the frequency use supports the executeability of the Alliance operations in everything, *without substantial restrictive effects.*

Influencing the international radio telecommunication regulation – via the member states – in the Alliance’s interests became a factor, characteristic to the efficiency of frequency management systems of the member states. There is a need for more initiative participation from Hungarian side *in the working out of the NATO military position concerning the WRCs.* In order to form a well-considered common position there shall be improved the cooperation between Ministry of Information Technology and Communication (NRA) and Governmental Frequency Management Agency (GFMA) concerning the CEPT/ECC/CPG and CEPT ECC Civil – Military meetings. *Shall be improved as well the national handling of the clashes of interests between the frequency use requirements of the European Union and the NATO.*

The quality of the execution of the NARFA tasks should be *systematically evaluated* on the basis of the requirement system determined in the „National Pillar” program of the NATO FMSC.

The legal regulation of the non-civil frequency management has been realized completely. The stimulating and enforcing the lawful behaviour character of legal regulation of non-civil frequency management shall be improved and strengthened

I consider the balance and harmony between frequency management sub-systems being of determinant significance from the point of view of the efficiency of Hungarian national and non-civil frequency management. The improvement of the cooperation between the management sub-systems is an *important tool to increase the efficiency* of the national, and within that the non-civil frequency management.

The legal measures in force regulate in detail the obligations for cooperation between frequency management authorities. The real improvement of the cooperation between authorities could be realized by qualitative development, mutual evaluation and actualization of compulsorily and annually renewed cooperation agreement between NRA and GFMA.

I treated the examination of the application of the modern frequency management tools in non-civil frequency management with a special significance. In my opinion the practically full absence of application of frequency management tools discussed in the dissertation and the absence of national willingness for their application significant limits the management efficiency of the Hungarian national non-civil frequency management. I am of the opinion that because of their proved advantages the Hungarian non-civil frequency management can not abstain from the application of management tools, stimulating or enforcing the efficient frequency use.

In accordance with the basic principles of the modern incentive spectrum pricing I worked out the most important principles of the establishment of frequency tariffs applicable in the non-civil frequency management. I determined *the basic principles and conditions for the introduction of spectrum pricing*.

From the Hungarian regulation of frequency management there are missing some essential conditions of application of certain frequency management tools. These missing conditions could not be created within the framework of the non-civil frequency management sub-system. On this area the inadequacies of the *national regulation constitute the limits of non-civil frequency management efficiency, and therefore the improvement of it can be*

realized by the enlargement of the national management. In the non-civil management the budgetary practice of handling of compensation costs shall be re-regulated.

The absence and shortages of appropriate training and preparation of the frequency managers are hindering and limiting the effective non-civil frequency management.

In my opinion the permanent enlargement of the role of electronic communications in societal-economic processes make it justified and necessary to eliminate or improve the disadvantageous position concerning the instruction and training of the potential *non-civil frequency managers*. In favour of this is necessary to create such training possibilities for non-civil frequency managers and users, which could create a desirable balance with the civil education, and the available (ITU-R, NATO and other) training possibilities shall be better exploited.

The authority executing the tasks of non-civil frequency management in its organization and circle of activity integrates all those areas and possibilities, on which or by utilizing of which the non-civil frequency management efficiency can be increased. In order to exploit the possibilities guaranteeing the increase of the efficiency has an essential *importance the effective* functioning of authority organization of the non-civil frequency management.

Validity of the research results

The huge tempo of the technological development of the electronic communications, the expansion of radiocommunication applications and services and the difficulties of regulation in keeping pace with them made the frequency management itself also a dynamically developing activity. It is typical that while I have done most of my research and have written my dissertation, in our country there is already the third act regulating the frequency management.

I believe to be the most important result of my dissertation that besides the already existing indirect analytical, measurement and evaluation methods I defined a procedure for direct examining and evaluating the effectiveness of the non-civil frequency management.

The analytical and evaluation procedure fulfils those requirements, which I have set up for my research hypothesis. The most important of them are perhaps that the procedure examines and evaluates the frequency management activities and processes directly interprets the efficiency of the radio spectrum utilization from the point of view of achievable largest

societal usefulness, and assesses the efficiency of the non-civil frequency management in the framework of and in relations to the whole national management.

The analytical and evaluation procedure can be utilized for the time-to-time benchmarking-type evaluation of the management efficiency as well as for registering the tendencies of changing of the management efficiency.

6. New Scientific Results

As new scientific results, gained by the elaboration of this dissertation I consider the following items:

1. Elaboration of practically applicable definition and approach for interpretation of efficiency of the non-civil frequency management, forming an algorithm suitable for analysis of management efficiency and for quantitative comparison.
2. Identification of factors, practising essential influence on the efficiency of the national and non-civil frequency management, with identification and exploration of the currently existing limitations on the realization of these factors, as well as determination of the possible directions, methods and objectives of enhancement of management effectivity.
3. Justification of the necessity to apply in the non-civil frequency management modern, management efficiency enhancing frequency management tools, with determination of the basic principles and conditions of introduction and application of those tools.
4. Drawing conclusions on the basis of a detailed analysis of the Alliance's requirements and elaboration of recommendations for improvement of the national contribution to fulfilment of frequency management tasks of the Alliance.

7. Recommendations

On the basis of the ascertainment and conclusions of the dissertation I recommend carrying out further research on the following subject matters:

- Determination of the detailed conditions for the introduction and application of the incentive administrative spectrum pricing in non-civil frequency management;

- Detailed elaboration of tariff assessment principles concerning the non-civil frequency use;
- Elaboration of calculation methods, applicable in non-civil frequency management as conditions for frequency redeployment;
- Treatment of the frequency redeployment compensation costs in the budget of the non-civil frequency users;
- Elaboration of contents and objectives of the non-civil frequency management contribution to the national application of the flexible frequency management.

8. Practical applicability of the research results

In order to the conclusions, deductions and scientific results of the dissertation utilize in practice, I recommend the followings:

- application of this dissertation in the analysis and evaluation processes of the national frequency management;
- application of the results of this dissertation for regular revision and evaluation of the Hungarian national non-civil frequency management from the point of view of the efficiency, and for numerically characterizeable comparison of specific statuses;
- utilization of the deductions and conclusions of this dissertation in the elaboration of the necessary, but currently missing national spectrum strategy;
- taking into consideration of the results of this dissertation in the strategic frequency usage planning of the state, for the more provident interpretation and more conscious enforcement of the non-civil frequency use interests;
- taking into consideration the deductions and conclusions of this dissertation in order to improve the conformity and cooperation of the national civil and non-civil frequency management;

- application of the results of this dissertation for qualitative improvement of the Hungarian national contribution to the frequency management of the Alliance;
- taking into consideration this dissertation for historical processing of the national frequency management as a specific area of the electronic communication regulation;
- utilization of this dissertation to elaborate for Hungarian Defence Forces a handbook, discussing the main characteristics of the Alliance frequency management, together with the requirements of the Alliance frequency use and the national contribution to the Alliance frequency management;
- utilization of this dissertation in the 'Miklós Zrínyi' National Defence University for planning of education topics on regulation of the electronic telecommunication and for development of relevant lecture notes;
- Finally, with regard to permanent growth of the societal-economical (and military) role of the electronic communication, to increasing societal integration of the armed organs, as well as for the desirable balance with the civil education, I recommend teaching these knowledge on the environment and international and national regulation of the electronic communications in the basic and master (college and university, BSc and MSc) level of education of the 'Miklós Zrínyi' National Defence University.

9. List of Publications

Journal Articles (revised)

1. József BAJÓ: *Az újabb kihívás: a védelmi tervezés korszerűsítése* – In. Új Honvédségi Szemle, 1993. március, 47. évf. 3. sz. - p. 20-25.
2. József BAJÓ: *A kormányzati célú frekvenciagazdálkodás rendszere, sajátosságai és problémái* – In. Híradástechnika, a Híradástechnikai Tudományos Egyesület Folyóirata, 1995. július – augusztus, 46. évf. sz. - p. 12-13.
3. József BAJÓ: *A hadsereg technikai fejlesztésének tervezési rendszere a rendszerváltozás előtt és napjainkban* – In. Hallgatói Közlemények, a Zrínyi Miklós Nemzetvédelmi Egyetem Tudományos Lapja, 2000. 4. évf. Doktori „F” Alprogram Különszám - p. 7-33.

4. József BAJÓ: *A frekvenciadijazás és a katonai frekvenciahasználat* – In. Hadtudomány, 2002. szeptember, 12. évf. 3. sz. - p. 103-118.
5. József BAJÓ: *Az információs társadalom fejlődésének mérése* - In. Hadtudomány, 2003. március, 13. évf. 1. sz. - p. 109-118.
6. József BAJÓ: *Szövetségi igények és a magyar katonai frekvenciagazdálkodás* – In. Új Honvédségi Szemle, 2003. március, 57. évf. 3. sz. - p. 111-122.

Journal Articles (non-revised)

1. András Dr. GSCHWINDT– József BAJÓ: *Rövidhullámú katasztrófa hírközlés és a magyar rádióamatőr mozgalom lehetséges megújítása* – In. Rádiótechnika, Elektronikai Folyóirat, 2003. augusztus, 53. évf. 8. sz. - p. 402-403.

Presentations in foreign language

1. József BAJÓ: *Introduction of the Hungarian Governmental (non-civilian) Frequency Management*
(CEPT/ERC Civil/Military Meeting, Helsinki, 10-11 May 1995, author and lecturer)
2. József BAJÓ: *Governmental Frequency Management in the Republic of Hungary*
(1. Regional Meeting of the NATO FMSC, Brussels, 2-4 March 1998, author and lecturer)
3. József BAJÓ: *Interference between Aeronautical Radio Navigation System RSBN/PRMG and the Digital Video Broadcasting Terrestrial (DVB-T) Transmitters*
Doc. Civ./Mil (99) 4 27. 09. 99
(CEPT/ERC Civil/Military Meeting, Mainz, 8-10 November 1999, author and lecturer)
4. József BAJÓ: *Hungarian Contribution to the work of the CEPT/ERC Civil – Military Meeting: Interference between the Military Aeronautical Radio-navigation System (RSBN/PRMG) and the Terrestrial Digital Video Broad-casting (DVB-T) - Military view* *Doc. Civ./mil (01) 12 9.02.01.*
(CEPT/ERC Civil/Military Meeting, Dubrovnik, 6-7 March 2001, author)

Presentations in Hungarian

1. József BAJÓ: *Hozzászólás a Magyar-Német Katona-Közgazdász Konferencián: Aktuális katonai – közgazdasági kérdések*
(Budapesti Közgazdaságtudományi Egyetem, 1992. szeptember 29 – október 01. - p. 45-50.)

2. József BAJÓ: *A kormányzati célú frekvenciagazdálkodás néhány jellemző vonása és aktuális problémái*
(A Hírközlési Főfelügyelet V. Országos Fóruma, Budapest, 1996. október 18.)
3. József BAJÓ: *A távközlés nemzetközi szabályozásának tendenciái és a magyar hadiipar lehetőségei. A rádiófrekvenciás tartomány védelmi célú igénybevételek szabályai.*
(A Védelmi Információs Központ Alapítvány „A védelmi ipar részvételi lehetőségei az MH híradásának fejlesztésében” című szemináriuma, Budapest, 1998. November 17.)

10. Curriculum vitae

I was born in Budapest on 26th December 1943. I took my final examination at grammar school with eminent results in 1961. I finished my studies of the Military Technical College signum cum laude in 1965.

From 1965 to 1974 I was serving in different troop assignments at a Radar Battalion.

From 1968 to 1974 I was learning at the Communications Branch of the Electrical Engineering Faculty of the Technical University of Budapest. I took my Master degree cum laude in 1974.

In 1975 I completed cum laude the operational research course of the International Education Center of Computer technique.

From 1977 to 1981 I was learning at the Miklós Zrínyi Military Academy, where I graduated signum cum laude in 1981.

From 1974 to 1989 I was serving at Organizational Branch of General Staff of the HDF.

From 1990 to the middle of 1994 I was serving at the Planning (later Military) Main Department of the Hungarian MOD. On 1st September 1990 I was appointed deputy head of main department.

In 1991 I completed a security-policy course organized by the NATO and CSCE.

In 1992 I completed an international defence resources management course at the Navy Postgraduate School in the USA CA.

In 1992 I completed an international course of law of war at the International Institute of Humanitarian Law in Italy.

Since 1993 – as a responsible leader for the subject – I have taken part in the elaborating work of laws and different rules connected with the establishment of the Hungarian non-civil frequency management, and the governmental Frequency Management Agency (GFMA). In the spring of 1994 I applied for the director appointment of the future GFMA. On 1st of May 1994 I won the appointment. I directed the establishment of GFMA, and since the achievement of ability of its functioning I have directed the fulfilments of the tasks of non-civil frequency management.

Since 1999 – accession of Hungary to NATO – I have directed the carrying out the tasks of Hungarian NARFA, and – as the Hungarian military representative – I have taken part in the work of NATO FMSC.

As a member of the Hungarian delegation I represented the Republic of Hungary on the ITU-R WRC-95, WRC-97, WRC-00, WRC-03, and the ITU-R PP-98 and PP-2002. As a Hungarian delegate on numerous occasions I have taken part in the meetings of CEPT/ECC WG FM, and the CEPT/ECC Civil/Military meetings.

From 1999 to 2004 as a Council Member I participated in the work of the National Council of Telecommunications and Information Technology. During that time I had the opportunity to join in the research of the ITU-R Study Group 1 Working Party B.

I have interested in scientific research since 1993. In my early publications I have dealt with defence planning and defence resources management.

My accumulated experience during the organization and control of Hungarian non-civil frequency management and my personal participation in the process of the international and regional regulation of the communication has raised the need of scientific processing. In 1998 I applied for doctoral instruction of Miklós Zrínyi National Defence University. From 1998 to 2000 I participated in and completed the doctoral instruction and got my leaving certificate in December 2001.

I have got a „C” type higher state qualification in English, and an „C” type intermediate state qualification in German, both of them extended by military professional matter.

I am married, my wife is a retired fashion designer. We have got two adult children. My daughter is children psychologist, my son is professional officer of HDF.

Budapest, May 2006.

