

# **AUTHOR'S SUMMARY OF THE Ph.D. THESIS**

**ZRÍNYI MIKLÓS**  
**NATIONAL DEFENSE UNIVERSITY**  
Doctorate Council

**Mária Kissné-Akli**

**Analysis of electromagnetic compatibility issues of military  
aeronautical radionavigation systems and digital television  
stations**

**2009. BUDAPEST**

ZRÍNYI MIKLÓS NATIONAL DEFENSE UNIVERSITY

**Mária Kissné-Akli**

**Analysis of electromagnetic compatibility issues of military  
aeronautical radionavigation systems and digital television  
stations**

author's summary and official reviews of the Ph.D. thesis

Supervisor: **Dr. Gyula Zsigmond, PhD**  
**professor**

**2009. BUDAPEST**

## ACTUALITY OF THE TOPIC

The 26<sup>th</sup> July 2008 was a milestone for Hungarian terrestrial television. The National Communication Authority announced the winner of the bid<sup>1</sup> for operation rights to five terrestrial digital television broadcasting networks. The invitation to bid was announced on the 25<sup>th</sup> March 2008. According to the conditions of the contract, the winner is required to build up the digital television network with the undertaken population coverage until 1st November 2008. The winner must finish the implementation of the five networks by 2013 according to the time-frame of the pledge conditions.

The introduction of digital terrestrial television broadcasting by 2015 is a significant challenge for frequency management and implementation of digital television throughout the networks. It is necessary to take into consideration in the course of installation of the digital stations that analogous television service and military systems<sup>2</sup> operate in the common television band until 2015. According to the call for tender „*The analogue television stations and the other services using certain television channels enjoy protection in the analogue-to-digital transitional period<sup>3</sup> in Hungary and in the neighbouring countries*”<sup>4</sup>.

According to the decision of the WRC07<sup>5</sup>, the 790-862 MHz band can be used for mobile services from 2015. If mobile services will work in the television band throughout Hungary or in the neighbouring countries, it is necessary to ensure protection for these services and require protection against the mobile services. The work on the technical background of the interference situations has begun in different international working parties. The corresponding decision can be expected on the WRC12<sup>6</sup> conference.

The operational entitlement is owned for 12 years - until 2020 - irrespective of when and how the transmitters are put into operation. Considering that the deployment of five networks will not happen in a day, the service provider's investment plan can be optimized if the conditions that have potential to limit the usage of the frequencies, or the further extension of digital networks, are known in time.

## DESCRIPTION OF THE SCIENTIFIC PROBLEM

There are more questions which must be answered in the course of the implementation of the digital television networks. Which criteria ensure the necessary protection of the primary services against digital television service? How much does the application of those criteria restrict the power – and other technical parameters - of the digital stations? Whether other services operate in Hungary and neighbouring countries concerned in terms of the protection, and if so, for how long. Whether the criteria adequately serves the state, service provider, public and EU objectives, that " ... the radio spectrum, as an important national economic

---

<sup>1</sup> Antenna Hungaria Zrt.,

<sup>2</sup> Other primary services, aeronautical radionavigation systems

<sup>3</sup> From 17<sup>th</sup> June 2006 to 17<sup>th</sup> June 2015

<sup>4</sup> Tender for operation five digital television broadcasting networks, Tender documentation, NHH, 2008, page 34. Online: (<http://www.nhh.hu/dokumentum.php?cid=16371>).

<sup>5</sup> World Radiocommunication Conference 2007

<sup>6</sup> World Radiocommunication Conference 2015

resource, should be allocated and distributed efficiently between the rivalling applications and users”<sup>7</sup> currently and in the digital future.

The call for tenders does not include technical regulations regarding the network planning and electromagnetic compatibility (EMC<sup>8</sup>) examinations in an implicit manner. However it is a requirement to apply the technical frameworks implied in the Final Acts of the Regional Radiocommunication Conference for planning of the digital terrestrial broadcasting service, 2006 (GE06 Agreement).

Based on the detailed examination of the GE06 agreement, it was established that the procedural rules of the implementation of the digital television networks were worked out in detail and that they were accepted as well. The technical concepts, definitions and technical parameters were applied in the course of the procedure were involved into the document thoroughly, but the compatibility criteria can be found only partly in the GE06 Agreement. The procedure of the conformity check, which has to be applied during the implementation of the digital plan entries belonging to the GE06 Agreement, contains exactly those technical conditions which can ensure the protection of the other digital television stations. However, the criteria defining protection of the analogue television did not get into the agreement even with an information aim. It is known what kind of criteria was applied to the protection of the earthly stations of the other primary services in the course of the completion of the plan. However the application of the criteria is an option, but not obligation in the course of the extension of the plan. In case of protection of the onboard devices the free space propagation model has to be applied in the interference calculations according to the GE06 Agreement. The compatibility criteria to be applied in the coordination procedure requested during the modification of the digital plan or implementation of new digital transmitters are also missing from the Agreement.

Operation of the analogue television and military services without harmful interference, the fast introduction and quick spread of the digital television, the efficient use of frequency are all equally preferred state and EU objectives. One of the tools to achieve these aims is the electromagnetic compatibility examinations based on the parameters worked out carefully and accepted internationally. If the mentioned technical conditions are missing, or incomplete, additional or complementary technical criteria are advised to work out, and accept with bi- or multilateral agreements. If the neighbouring countries cannot reach agreements on a technical basis, long and/or unsuccessful negotiations can be expected.

After considering all these issues, I feel that the following researches between

- 1. digital television and analogue television**
- 2. digital television and military services**
- 3. digital television and digital television**

services can facilitate the implementation of the Hungarian digital networks:

- already applied compatibility criteria and conditions of the applicability
- definition of missing compatibility criteria,
- presentation of the effect of the different compatibility criteria on the protected and potential interfering services,
- familiarization of the results with the interested parties.

---

<sup>7</sup> Spectrum strategy. NHH, 2006, page 4.

<sup>8</sup> Electromagnetic Compatibility

## RESEARCH OBJECTIVES

1. To systematize and to outline the international and domestic environment of regulation concerning the usage of the UHF<sup>9</sup> television band, the protection of the analogue and digital television transmitters, and the military aeronautical radionavigation devices. To reveal the potential contradictions or deficiencies of the regulation. To explore the regulatory frameworks that may provide the opportunity to accept the absent or modified compatibility criteria.
2. To explore and to outline the definitions concerning the criterion of the harmful interference, measurement results, and computational methods between the radio equipments. To examine whether quantified criteria are defined and accepted regarding the harmful interference between primary services in the UHF television band. To compare the known compatibility criteria, and to draw the conclusions regarding their adaptability on the area of the digital television broadcasting.
3. To choose a feature of the television stations whose change can give the bases to measure and judge the effect of the applied compatibility criterion on the protected service. To work out an examination method and to make calculations in the interest of exploration of the connection between the compatibility criterion and the selected transmitter feature. To analyze the results with the help of the mathematical statistics, to reveal contexts and to create a mathematical model.
4. To make calculations, and to demonstrate - based on the examination - what kind of measure the different compatibility criteria and known protection parameters applied for protection of the analogue television networks and military services may restrict the usage of the digital frequencies until 2015.
5. To analyze and to synthesize the possibility of the extension of the GE06 Digital Plan. To work out an examination method and to make calculations in order to determine the radiation parameters of the new DVB-T<sup>10</sup> stations. To demonstrate with quantified results how the application of the different compatibility criteria may influence the extension of the digital networks and the coverage area of the DVB-T transmitters.

## RESEARCH METHODS

1. Exploration and processing of the relevant international and domestic literature, systematization of the knowledge, drawing up the conclusions.
2. Introduction of the harmful interference definitions between radio systems applying the historical method. Examination of their adaptability during the implementation of the Hungarian digital plan with the comparative critical analysis method.
3. Exploration of the contexts with the method of synthesis and mathematical statistics.
4. Comparison of theoretical and practical experiences, drawing up conclusions regarding the determination of the threshold of the harmful interference with the application of the analysis and the synthesis method.
5. Participation in the work of international working groups. Analysis of the content of the working documents and explorations of analogies on the researched area.
6. Modelling of the cases of harmful interference in the UHF television band, drawing conclusions which can be generalized, developing of mathematical models.

---

<sup>9</sup> Ultra High Frequency

<sup>10</sup> Digital Video Broadcasting Terrestrial

## **STRUCTURE OF THE DISSERTATION**

In the first chapter I present the international and domestic system of the regulation regarding the radio frequencies, particularly the broadcasting frequencies. I research those devices of regulation with which technical regulations can get obligatory status. I examine those agreements and the way leading to them, which allow the common use of the television band with administrative and technical means for analogue and digital television and other services, creating a framework for the GE06 Agreement. I present the primary services operating in the television band, analyze the plans belonging to the GE06 Agreement and emphasize those milestones that can lead to the introduction of the Hungarian digital terrestrial television.

In the second chapter I summarize the definitions in connection with the electromagnetic compatibility. The detailed examination of the GE06 Agreement expands on the technical background of the network planning, and examine what obligatory or recommended network planning methods are included which ensure the operation of the primary services in the television band without interference. Based on the conclusion I research, systematize and compare those methods, which are recommended in other documents of regulation, or defined in broadcasting agreements in order to ensure the compatibility.

In the third chapter I select from the analogue and digital television plans and the other services database notified to the ITU<sup>11</sup> those primary radio services - based on their technical features - which can influence the Hungarian networks from interference examination point of view. I am looking for a mathematical relationship between the compatibility criteria revealed in the second chapter. I examine the context between the coverage area of the broadcasting stations and the applied compatibility criterion. I analyze how the application of the known compatibility criteria would influence the radiation parameters of the digital stations which have to be coordinated with the neighbouring countries. I examine what kind of effect would be on the introduction of the digital television in the transition period. I define the protection parameters of the other primary services proposed in the GE06 Agreement, and the effect of the protection parameters determined by measurements proceeded in Hungary on the introduction of digital television stations. I analyze what kind of opportunities the GE06 digital plan provides to extension of the plan.

Summarizing the results of my calculations in a table I demonstrate what ERP and coverage radius of the planned new stations is possible applying the different compatibility criteria.

## **SUMMARY OF THE RESEARCH ACTIVITY**

As a result of the first research objective, the overview of the documents of the international and domestic technical regulation revealed that besides on the GE06, other frameworks also do not stand for evaluation of the compatibility calculations of primary services in the television band. I established that the administrative organization of the ITU is authorized for supervision and promotion of the agreements and that decision making is based on agreements in controversial questions. I found it as a contradiction that according to the accepted coordination procedure - paragraph 4 and 5 of the GE06 Agreement - it is possible to ask the collaboration of the ITU BR in a coordination procedure when the coordination rejections are considered as undue. However the ITU BR cannot make technical examinations without criteria accepted by the administrations, consequently to make a decision. An

---

<sup>11</sup> International Telecommunication Union

additional opportunity is the examination of a technical question initiated by one of the countries at an international organization. The studies are made by the experts of participant administrations in the study groups. I established that the content of documents arising in study groups have only recommendation status. They may receive obligatory validity if they are accepted in international agreements.

The obligations concerning the usage of the frequency bands can be only incorporated in international contracts accepted by the administrations, or bi- or multilateral agreements which do not influence the interference conditions of a third country. In cases when international effects do not exist, national authorities' directives or laws may regularize even technical questions to promote the state objectives.

I drew the conclusion that comforting solution for the compatibility questions left open in the GE06 Agreement can be expected in the domestic regulation and in the agreements signed with the neighbouring countries.

As a realisation of the second research objective I revealed and outlined those concepts and contexts that are necessary during the accomplishment of the compatibility examinations. I defined concepts whose usage simplify and makes unambiguous the presentation of the additional examinations and results. I collected the existing obligatory and recommended compatibility criteria from different concerned broadcasting agreements. I was looking for a context between the compatibility criteria formulated on different manner. I used these results to examine the effect of the compatibility criteria on the digital network implementation, and the extension opportunities of the digital plan.

As a realisation of the third research objective I made calculations with an examination method selected suitably regarding how the coverage area of the protected transmitter is influenced by the interference level of the potential interfering transmitters. Based on the statistical evaluation of the results I established that the decrease of the coverage area depends on the effective radiation power and the effective antenna height of the protected transmitter, the level of the usable field strength, the presence of further interfering transmitters, and the distance between the protected and interfering transmitters. The median of the decrease of the coverage area can be given with a function depending on the quantified value of the compatibility criterion inside a margin of error which can be defined beside a given reliability level. Based on the conclusions which can be generalized, I evaluated and compared the compatibility criteria which are found as recommended or compulsory ones in the different broadcasting agreements.

As a realisation of the fourth research objective I analyzed statistically the calculations made on a big amount of sample that how the compatibility criterion - which can be chosen for the protection of analogous transmitters - influence the implementation and the maximum power of the Hungarian digital stations whose coordination are obligatory in the transition period. I examined those Hungarian planned digital stations that can cause harmful interference to the aeronautical radionavigation services notified to the ITU I defined the measure of the possible restriction based on the protection parameters accepted in the GE06 Agreement, and measured during the Hungarian measurement campaign.

As a realisation of the fifth research objective I determined - with the analysis of the GE06 Agreement and the examination of the effect of the different compatibility criteria - how radiation and coverage parameters can be allotted to the new digital stations with real opportunity to international acceptance.

## CONCLUSIONS

- Thanks to the successful tendering procedure at the end of 2008, the implementation of the digital plan could begin in Hungary. The service provider can only accomplish his undertaken obligations if the necessary international and domestic coordination procedure is fast and successful. It is possible to count on difficulties and protracted process without well defined and compulsory compatibility criteria. The problem can be a key issue for all the countries signed the GE06 Agreement. Compromise agreements with the affected neighbouring administrations and the domestic regulations will mean the solution expectedly of which the development of the missing compatibility criteria is the prerequisite.
- The problem has not appeared as a pressing question till now in Hungary, since the frequencies belonging to the first three networks implemented in the transition period basically are successfully coordinated. However there are digital frequencies whose power are restricted or cannot be used currently. The revealed interference situations with the present research and the numerical results which show the impact on the protected network can ensure the possibility to decrease the restrictions regarding the operational parameters of the digital stations.
- I drew the conclusion - based on the research, systematization and comparison of the recommended or accepted compatibility criteria in the different broadcasting agreements and other regulations - that the compatibility criteria with suitable adaptation can be applied in the field of digital television services as well. The revealed mathematical contexts between the compatibility criteria which helps the evaluation of the measure of the interference gives the possibility to use common compatibility criteria in the broadcasting band.
- The worked out and applied examination method gives the possibility to analyze the context between the selected compatibility criteria and the decreased coverage area of the analogue television station.
- Lineal regression curve can be fitted in the function of the compatibility criterion for the median and scattering values of the decreased coverage area of the examined protected station which have different radiation and geographical parameters.
- With the created mathematical model the median of the decrease of the coverage area can be given with a function depending on the quantified value of the compatibility criterion inside a margin of error which can be defined beside a given reliability level.
- The results of my calculations summarised in a table can be used as a tool to preliminary, fast evaluation without the need for complicated calculations.
- I drew the conclusion based on several interference calculations and the analysis of the results that the compatibility criterion chosen for the digital television services influence the measure of the power restriction of the digital television stations. However besides of applying very gentle compatibility criterion a given measure of the power restrictions will still remain.
- The examination results of the unique cases concerning the Hungarian digital transmitters show that the restriction of the power can be significantly smaller applying the protection values accepted in the GE06 Agreement compared to the previous practice. Additional relaxation can be reach in the restriction if the system sensitivity is considered instead of the receiver sensitivity in the compatibility analysis.
- I drew the conclusion based on the analysis of the GE06 plan and the calculation results that the different compatibility criteria influence significantly the possible ERP and coverage radius of the planned new digital transmitter.



## **NEW SCIENTIFIC RESULTS**

I regard as new scientific results of the Ph.D. thesis that

1. I analyzed and gave two generally usable formula of the compatibility criteria already used in the broadcasting area. I defined a mathematical function between the two compatibility criteria.
2. I explored the feature of the broadcasting stations which depends on the interference level. I drew up an examination method to research the connection between the compatibility criteria and the effect of the interference on the protected television station.
3. I created mathematical model which can demonstrate with numerical result of the effect of the applied compatibility criterion. The model is created based on statistical calculations made on a big amount of sample.
4. Based on the evaluation of my calculations I showed that all the obstacle of the introduction of the digital television cannot be removed by applying a suitable compatibility criteria between analogue and digital transmitters.
5. I showed with my examination results of the unique cases concerning the Hungarian and foreign aeronautical radionavigation services, that the protection of the system sensitivity – which does not jeopardize the flying safety - determined by measurement, the power restriction regarding to the digital transmitters can be relaxed significantly in the transition period.
6. I created the model of the expected claims for new digital television stations and I defined the context among the expected coverage radius of the planned digital television, the necessary separation distance and the applied compatibility criterion.

## **RECOMMENDATIONS, PRACTICAL APPLICABILITY OF THE SCIENTIFIC RESULTS**

I recommend my research results to all the authorities, service providers, organizations and network designers, who operate primary services in the UHF television band, regulate the frequency usage, proceed the international coordination, make decisions in the discussed questions and prepare network plan for extension of the present digital plan.

According to my expectation, my results can be used for

1. Knowing more about the frequency usage possibilities of the digital television presently and in the future.
2. Setting up rational protection claims based on individual and generalized calculation results, and revision of the already claimed protection.
3. Optimization of the implementation plan of digital network taking into consideration the possible restrictions in the transition period.
4. Conducting a fast preliminary survey of the opportunities in the course of the planning of a new digital station and for reducing the number of the necessary time-consuming calculations.
5. Comparison of the different compatibility criteria, making easier the choice of the compatibility criterion which uses the spectrum efficiently, helping those decision makers who are not technical people.
6. Making fast preliminary states during the bi- and multilateral coordination meeting with the aid of the tables including numerical information for different practical cases.
7. Education of subjects being in connection with radio link planning.

## LIST OF PUBLICATIONS

### Journal articles

1. Kissné Akli Mária: Digitális rendszerjellemzők választása DVB-T adók besugárzás-tervezéséhez, In. Híradástechnika 2002/8. szám, pp. 45-50, ISSN 1788-1919.
2. Akli Mária: A digitális műsorszórás bevezetésének lehetőségei Magyarországon, In. Kommunikáció Média Gazdaság. 2003. I. szám, pp. 67-72, ISSN 0237-5206.
3. Kissné Akli Mária: A védendő térerősség választásának hatása a katonai berendezések és televízió állomások közötti kizárótávolságra. In. Bolyai Szemle, 2004. I. szám, pp. 64-74, ISSN 1416-1443.
4. Kissné Akli Mária: MFN vagy SFN? Melyik hálózati struktúrát válasszuk a földfelszíni digitális televíziózáshoz? In. Híradástechnika 2004/7. szám, pp. 8-16, ISSN 1788-1919.
5. Kissné Akli Mária: Frekvenciák biztosítása a földfelszíni digitális televíziózáshoz. In. Infokommunikáció és jog 2004/4. szám, pp. 134-138, ISSN 1786-0776.
6. Kissné Akli Mária, Bálint Irén, Pados László: Az RRC04-en elfogadott tervezési alapelvek a gyakorlatban. In. Híradástechnika folyóirat 2005/3. szám, pp. 8-15, ISSN 1788-1919.
7. Kissné Akli Mária: Térinformatika alapú EMC analízis műsorszóró adók és a műsorszóró sávban üzemelő katonai eszközök között. In. Hadmérnök, I. Évfolyam 2. szám, 2006. szeptember, pp. 35–49, ISSN 1788-1919.
8. Kissné Akli Mária: Új mérföldkő a földfelszíni televíziózásban. Bepillantás az RRC06 digitális műsorszóró frekvenciatervezői értekezlet rejtelseibe. In. Infokommunikáció és jog 2006/14. szám, pp. 133-139, ISSN 1786-0776.
9. Kissné Akli Mária, Bálint Irén, Pados László: Új lehetőségek és megváltozott szabályozási környezet a földfelszíni műsorszórásban. In. Híradástechnika, 2006/11. szám, pp. 23-33, ISSN 1788-1919.
10. Kissné Akli Mária: Gondolatok a GE06 terv magyarországi megvalósításáról. In. Híradástechnika folyóirat 2007/9. szám, pp. 2-11, ISSN 1788-1919.

### Foreign language articles

1. M. Kissné Akli: New ways of television broadcasting, In. Híradástechnika, 1999/11. szám, pp. 66-72, ISSN 1788-1919.
2. MÁRIA KISSNÉ-AKLI, GYULA ZSIGMOND: Aeronautical radionavigation and/or terrestrial digital television services in the band 645–862 MHz? In. AARMS, Year 2006, Volume 5, Issue 1, pp. 39–50, ISSN 1588-8789.

### Presentations

1. Kissné Akli Mária: New ways of television broadcasting, International Conference on Infocommunication Trends '99 organized by HÍF, Budapest, Danubius Thermal Hotel Margitsziget, 1 October 1999.
2. Kissné Akli Mária: A DVB-T bevezetésének lehetőségei Magyarországon frekvenciagazdálkodási szempontból, TV 2000 9. Televízió- és hangtechnikai konferencia és kiállítás, HTE, Thermal Hotel Helia, 2000. május 23-25
3. Kissné Akli Mária: A digitális műsorszórás bevezetésének lehetőségei Magyarországon, Digitális Televíziózás és Technológia konferencia, Budapesti Kommunikációs Főiskola, 2002. május 4

4. Kissné Akli Mária: A DVB-T hálózattervezés gyakorlata, TV 2002 10. Televízió- és hangtechnikai konferencia és kiállítás (HTE), Danubius Thermal Hotel Margitsziget, 2002. május 29-30
5. Kissné Akli Mária: A digitális műsorszórás műszaki lehetőségei. A minőségi televíziózás alapelemei konferencia, Magyar Informatikai és Kibernetikai Egyesület, 2002. június 27.
6. Kissné Akli Mária: DVB-T hálózatok koordinációja, HTE, Média Klub, 2003. március 26
7. Kissné Akli Mária: A földfelszíni televíziózás frekvenciagazdálkodási kérdései V. Infokommunikációs szakmai nap (A digitális televíziózás médiapolitikai és szabályozási kérdései. Pécsi Tudományegyetem, 2004. 04. 29.)
8. Mária Kissné-Akli: Possibilities to bridge and to prevent an extension of the information gap. (13 May 2005, Vienna, DICE Conference)
9. Kissné Akli Mária: Új mozgalom Európában, avagy 8 DVB-T multiplex előegyeztetése az RRC06-ra (TV 2005 11. Televízió- és hangtechnikai konferencia és kiállítás, Bp. Thermal Hotel Helia,, 2005.06.1-2)
10. Kissné Akli Mária: Gondolatok az RRC06 előtt, avagy bepillantás az értekezlet rejtelmeibe. (Bp. HTE, Média Klub, 2006.05.10)
11. Bálint Irén, Kissné Akli Mária: Az RRC06 után: a műsorszórás lehetőségei; HTE Média Klub, 2006. június 28.
12. Kissné Akli Mária: "Újabb UHF frekvenciák a DVB-T bevezetéséhez" (Bp. HTE, Média Klub, 2006.12.13)
13. Kissné Akli Mária: Az RRC06 hazai vonatkozásai (TV 2007 12. Televízió- és hangtechnikai konferencia és kiállítás, Danubius Thermal Hotel Margitsziget, 2007.05.2-3)
14. Kissné Akli Mária: A helyi (körzeti) tévék digitális műsorszórása számára kínálkozó műszaki alternatívák (Párbeszéd a médiáról 4. A digitális technológia és a tartalomszolgáltatás változásai a helyi műsorszolgáltatás, valamint a tematikus csatornák esetében, AKTI, Budapest, 2007. június 28)
15. Kissné Akli Mária: Várhatóak-e változások a DVB-T frekvenciák felhasználásában? - gondolatok az új EU elképzelésekről- (Bp. HTE, Média Klub, 2008.01.16)

### **Other materials**

#### **Studies**

1. A műsorszóró frekvenciák felhasználási szabályzata II. Rész, Műszaki szabályozás, Műholdas televízió-műsorszórás, Földfelszíni digitális televízió-műsorszórás fejezetek, Hírközlési Felügyelet, 1998
2. A digitális televízió bevezetése Magyarországon, A DVB-T frekvenciagazdálkodási összefüggései fejezet, HTE, 1999. november.
3. A DVB sugárzás műszaki paramétereinek meghatározása, alkalmazási lehetőségek és hálózati struktúrák vizsgálata, illetve azok bevezetésének műszaki előkészítése. 2. és 3.1-3.8 fejezetek, BME, 2002.
4. Kissné Akli Mária, Bálint Irén, Pados László: Javaslatok az ITU Körzeti Rádiótávközlési Értekezletének (RRC06) második ülésére beterjesztendő magyar földfelszíni digitális műsorszóró (DVB-T és T-DAB) tervezési igények összeállítására, NHH, 2004. október.
5. Kissné Akli Mária: A „távközlési” törvény és a nem polgári híradás, ZMNE, 2005.

## **Book, coursebook**

1. Kissné Akli Mária, Kiss István Csaba: Rendszertechnika II, BJKMF jegyzet, Budapest, 1993
2. A digitális televízió szolgáltatásai. Bevezetési modellek, külföldi tapasztalatok. (szerkesztette: Hazay István, 2005, Budapest, ISBN: 963 216 856 9)

## **CURRICULUM VITAE (SCIENTIFIC-PROFESSIONAL)**

### **Education:**

- 2003.2007 Zrínyi Miklós National Defense University, PhD Institute in Military Technology
- 1981-86 M.Sc in Electrical Engineer/ Faculty of Electrical Engineering, Technical University of Budapest
- 1977-1981 Krúdy Gyula Grammar School, Nyíregyháza

### **Employment:**

- 2007- Antenna Hungária Zrt., Engineering and Implementation Department, Head of RF Planning Group
- 1996-2007 National Communications Authority, Hungary, Frequency Planning and Coordination Department, Broadcasting Expert
- 1986.1996 Bolyai János Military Technical College, Department of Communications, Lecturer on Communications

### **Courses:**

- 1992-1997 BME Engineer Training Institute:
- C program language on IBM PC personal computer I,
  - C program language on IBM PC personal computer II,
  - High Speed Digital Data Systems,
  - Wideband Communication: ATM technology
  - UNIX Operation System
- 1998 „Radio Frequency Spectrum Management” and „Spectrum Management in the Civil Sector”, USTTI, USA

### **Professional experience:**

- 1986-1996 Teacher of subjects: The bases of information transfer, Wired communications, Radio transmitting and receiving techniques, Feeder lines, antennas, radio link planning.
- 1993 Participation in the modernisation of the „Rendszertechnika” subject.

- 1997-1999 Participation in the evaluation of the EMC measurement results proceeded by KFGH-HÍF-BME.
- 1997 Participation in the preparation of the standpoint of the Hungarian administration to the Chester'97 Multilateral Coordination Agreement. Working on the frequency planning and coordination tasks in connection with the early introduction of the DVB-T in Hungary.
- 1998-2008 Member of the management of the HTE „DVB Kör”. Participation in the completion of the study on „Introduction of the digital television in Hungary.
- 1996-2007 Participation in the work of international organizations' study groups like ITU, CEPT and EU RSPG (CBISS subgroup) dealing with analogue and digital television frequency management issues.
- 1999 Member of the „Digital Working Group” established by KHVM. Technical assistance to the government proposal on the promotion of the introduction of the digital television.
- 2000-2006 Participation in the work of the modernization of the standard: MSZ-17-30214:1992 „Broadcasting transmitters. Technical requirements of the television transmitters”. Comments on the draft ETSI standards on Hungarian language.
- 1998-2007 Representation of the Hungarian interests on bi- and multilateral frequency coordination negotiations.
- 1999-2006 Preparation and coordination of the Hungarian preliminary DVB-T frequency plan for the transition period. Preparation of studies on this topic.
- 2002-2006 Preparation and coordination of the frequency plan of 7 nationwide DVB-T multiplexes in the UHF band, working out the Hungarian requirements for the RRC06 Planning conference, representation of the Hungarian interests on the RRC04 and RRC06 Conference.
- 2004-2006 Chairman of the Central-East European precoordination meetings (nearly twenty) formed by 11 countries.
- 2006-2007 Technical comments on the (A)DÁS in connection with the spectrum management of the UHF band.
- 2007- Frequency planning of the digital and analogue television, radio and mobile television networks. Development of the relevant parts (frequency plans) of the DVB-T, DVB-H and T-DAB tendering documentation in connection with the operation rights of five terrestrial digital television broadcasting networks. Forming technical opinions on frequency management issues. Participation in the work of international working groups (Electromagnetic Field, DVB-H Network Planning Group).

### **Honours:**

- 1993 Collegiate senior lecturer appointment
- 1999 Honours for „outstanding professional work” (HÍF)
- 2000 „Silver badge” honours (HTE)
- 2001 „Golden badge” honours (HTE)
- 2007 „Silver badge” honours (HTE)
- 2007 Honours for „outstanding professional work” (NHH)
- 2009 „HTE 60” jubilee medallion

**Other Skills:**

- 1984- C type Beginner-level State Language Examination in Russian
- 1995 C type Intermediate-level State Language Examination in English
- 2002 B type Advanced Written Examination in English
- 2005 European Computer Driving Licence

**Others:**

- 1998- Member of Professional Section “DVB-T” of Scientific Association for Infocommunications Hungary
- 2004 Designer’s and expert’ entitlement issued by Hungarian, Chamber of Engineer

Budapest, 16 November, 2009.

Maria Kissne-Akli