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IEEE

Broadcast Technology Society Newsletter

The technologies to deliver information and entertainment to audiences worldwide, at home and on the go.

From the President

William T. Hayes, President, IEEE Broadcast Technology Society

Greetings BTS members:

I want to thank the many members who made the effort to comment on my column in the summer 2009 issue of the Broadcast Newsletter. Evidently my observations of the globally connected yet locally isolated world struck a chord with many of you.

While writing this column I am looking out my office window at the 16 inches (41 centimeters) of snow that fell in a single night and the 5 foot (1.5 meter) icicles hanging from the 10 meter and 6.1 meter satellite antennas that are just outside. So while I don't believe that text based electronic communications is the replacement for face to face dialog, I am certainly glad to be inside writing this column as opposed to being outside trying to get to a meeting.

I think one thing that has become clearer to me over time is the need for balance in my life. Early in my career I was so enamored with my work and the business I was in, there was little time for anything else. I worked as a chief engineer at radio stations and did consulting for other radio stations as a side business. My life was all about my job. It reached a point where the job defined me, who I was and my value as a person. I don't believe that this is an uncommon phenomenon based on my conversations with other engineers. I think this is why, for many engineers and others in the traditional terrestrial broadcasting business, the transition to digital is such an unsettling event. One of the primary components, that define who we are, is undergoing a

continued on page 2

From the Editor

William Meintel, BTS Newsletter Editor

As 2009 draws to a close we can look back at another great year for our society. Early in the year was the very successful Broadband Multimedia Symposium held in Bilbao, Spain and a great tutorial at NAB 2009 on The ATSC Mobile DTV Candidate Standard. Since my last column a highly successful IBC 2009 took place in Amsterdam. This is good news since the BTS is one of the IBC partners and derives a significant portion of our income from that event. The BTS was well represented at IBC this year by holding its AdCom meeting there. In addition, at IBC the BTS presented a very timely tutorial on the hot topic of Audio Technology: Coding and Concatenation, Loudness and Lip Sync. Then, in October, to wrap up the year was the 59th annual IEEE Fall Broadcast Symposium in Alexandria VA. As always the Fall Symposium had a great program and two outstanding luncheon keynote speakers, Jules Cohen, Consulting

continued on page 2

Inside

RF Transmission Issues Still Hot at the 59th Annual IEEE Broadcast Symposium 3
London calling.... 11
ATSC Completes Work on DTV Audio RP 13
An Ideal Opportunity – Nominate a Colleague 14
Author's Query – HDTV Development. 15
IEEE BTS Montreal Chapter Report. . . 15
IEEE Montreal Section Presentation 17
BTS Argentina Report 18
BTS Japan Chapter Report 18
Joint ComSoc/BTS Chapter Ottawa Report. 19
ICUMT 2009 Conference in St. Petersburg 19
Valentino Trainotti. 20
When the Federal Government Stepped In 21
Velocity Factor and Equivalent Radius Of MOM AM Tower Models. 24
Longley-Rice's Faulty Subroutines, Part 3: Log vs. Ln Confusion 26

IEEE
Celebrating 125 Years
of Engineering the Future

From the President continued from page 1

fundamental transformation. It is forcing us to reevaluate our value and in some cases our purpose as broadcast engineers. In essence the meaning of life issue which is the basis for religion and philosophy. These issues are not covered in engineering courses or service manuals.

I would not think to try and tell any of you the reason why you are where you are. Seeking the answer to that question is probably one of the key driving forces in all of us and the answers are as unique and varied as we are. For what it is worth, I do offer one piece of advice on this question which brings me back to my earlier statement about balance.

As I said, I spent a great deal of my early career focused on my job to the exclusion of all else. I took great pride in the work that I was doing and was gratified as my reputation as an engineer grew. I remember the first time being called by a station asking me to come to work for them as opposed to me soliciting the work. At that point I figured I was on my way, and in fact I was. Calls came more frequently and I became busier and busier but at the same time, the work became less meaningful. I believe that the reason for the lack of meaning is the other side of the question why am I here – Is that all there is?

For me, without a balanced life approach, the "is that all there is" question is much more troubling. In my early radio career I reached that point where I was asking myself if this is all there is.

Remember that this is a personal issue so what other people think is not as important as what I think. My professional colleagues encouraged me to advance my engineering career and professional competitors discouraged me. But I am trying to figure out where I think my place is and what my value is. Not what anyone else thinks, good or bad. This is the point where I realized the importance of a balanced approach because of the pendulum like nature of life. "Why am I here" starts me swinging in the direction of trying to discover a finite answer to an infinite question. "Is that all there is" is the unsatisfying finite answer to the infinite question which starts me swinging back to "why am I here." Without balance in my life I wander aimlessly, with balance I move with purpose.

So as a member of one of the first IEEE founding societies we have a long history, a deep foundation and an abundance of tradition. All of these values are undergoing some very profound changes. I would encourage you all to find your personal life balance and seek with renewed wonder the answer to the question: Who am I?

William T. Hayes
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From the Editor continued from page 1

Engineer and Andrew W. Clegg, from the U.S. National Science Foundation.

In addition to the tutorials and symposiums the society also launched a distinguished lecturer program and became involved in the IEEE GOLD (Graduate of the Last Decade) program helping young engineers transition from being a student to entering the professional world. All in all it was quite a year. None of this would have been possible without the tremendous efforts of our volunteers and the IEEE BTS staff to who we owe a great deal of thanks.

Now for some good news/bad news. The good news besides the above is that the DTV transition in the U. S. has for the most part gone well. Although we are still dealing with some lingering reception problems. I will be discussing this at NAB 2010.

On the bad news side is what appears be an all out attack aimed at ending over-the-air television as we know it in the United States. It has been decided that there is a critical shortage

continued on page 10

Newsletter Deadlines

The BTS Newsletter welcomes contributions from every member. Please forward materials you would like included to the editor at wmeintel@computer.org. Here are our deadlines for upcoming issues:

Issue	Due Date
Spring, 2010	20 January 2010
Summer, 2010	04 May 2010
Fall, 2010	20 July 2010
Winter, 2010	09 November 2010

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RF Transmission Issues Still Hot at the 59th Annual IEEE Broadcast Symposium

By Ed Williams, BTS AdCom member and Broadcast Symposium Technical Program Co-Chair

While the weather was cold and drizzly outside, inside the Westin Alexandria Hotel the timely tutorials, papers, and keynote speakers of the 59th Annual IEEE Broadcast Symposium kept the audience interested and excited about broadcast transmission issues.

The 59th Annual IEEE Broadcast Symposium was held on 14–16 October 2009 in Alexandria, Virginia USA. It consists of significant technical papers from broadcast engineers from around the world and was attended by over 125 engineers, consultants, manufacturers, scientists, and representatives from academia and regulatory agencies.

Under the guidance of Broadcast Symposium co-chairs Tom Silliman and Eric Wandel, the technical program placed renewed emphasis on radio and TV broadcast transmission issues, as well as timely new tutorials.

For example, the Wednesday tutorials covered a detailed analysis of a new implementation of the Longley-Rice propagation and coverage prediction method and a demonstration using RF devices and test equipment in how to use the new IEEE P1631 Recommended Practice for measuring harmonics and spurious DTV signals. The evening featured the well attended Welcome Reception with fine music, food, and conversation.

On Thursday morning, the technical session included Coverage and Interference Issues, and papers on reviewing DTV field strength requirements in Canada, the potential for in-house wireless devices to cause interference to broadcast signal reception, the effect of wind turbines on UHF DTV reception, and how to conduct FM IBOC signal measurements.

Jules Cohen, the dean of broadcast engineering consultants, as keynote speaker for the joint IEEE/AFCCE Luncheon, spoke of issues he faced as a major participant in the development of DTV and the transition from analog to digital television in the U.S. After his talk, Bill Hayes – President of BTS, presented Jules with the Broadcast Technology Society Special Service Award for "his lifetime commitment to the broadcast industry and outstanding contribution to the IEEE Broadcast Technology Society."

Thursday afternoon featured a technical session on broadcast antenna technology and a panel discussion with antenna manufacturers and Q&A from the audience.

Following the afternoon technical session and panel discussion was a well attended reception sponsored by several broadcast antenna manufacturers. This reception provided an excellent opportunity for participants to meet each other, discuss common issues, make plans for future activities, and enjoy the camaraderie of fellow broadcast engineers.

The Friday morning technical session brought out issues in digital broadcast implementation, a significant technology for on-channel DTV repeaters, and an update on the new mobile/handheld DTV standard and testing activities. Of particular interest was a paper from FCC on the RF performance of DTV converter boxes.

At the IEEE/BTS Awards Luncheon, the keynote speaker, Andrew Clegg of the US National Science Foundation, explained why there is no US TV channel 37 and how that band of frequencies is so critical to radio astronomers and their science. Awards included the Matti Siuluka Award, for the best paper presented at the 2008 IEEE Broadcast Symposium, and the Scott Helt Award, for the best paper published in the 2008 *IEEE Transactions on Broadcasting*. (please see the photos for the winners names)

The afternoon session continued the digital implementation theme, A/V sync issues, the new display format standard, wide-screen production and transmission, and concluded with a panel discussion consisting of the session speakers.

For a detailed listing of the program and speakers, please see the IEEE/BTS Broadcast Symposium website at: www.ieee.org/bts/symposium.

Technical program co-chairs Ed Williams and James Fang managed the paper selection process and session participant presentations.

Overall, the 59th Annual IEEE Broadcast Symposium proved to be as interesting and as well attended as ever, and included papers and registrants from eight countries – Argentina, Australia, Brazil, Canada, China, Korea, Spain, and the United States.

Next year, the 60th Annual IEEE Broadcast Symposium will be held on 20–22 October 2010 at the Westin Alexandria hotel, Alexandria, VA USA.

Mark your calendars for what surely will be a significant event given all the digital transitions and new developments taking place in the broadcast industry. For more information see the Broadcast Technology Society website – www.ieee.org/bts.

Ed Williams
Technical Program Co-chair

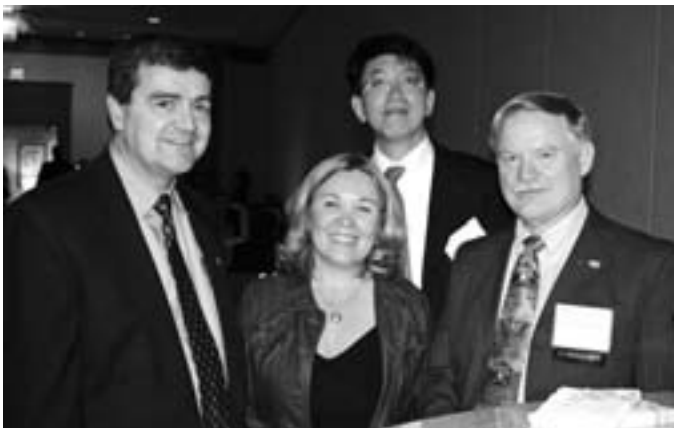
Symposium Chair Tom Silliman welcomes attendees on Wednesday morning

David Layer, NAB, introduces our first tutorial Speakers

Greg Best poses with some of the equipment used in demonstrating measurements for IEEE P1631

Kathy Colabaugh, Jenn Barbato (BTS Staff) and Alicia Zupeck (IEEE Meeting Planner) greet guests arriving at the Welcome Reception

Everyone was back in the session room on Thursday morning, to hear Pablo Angueira's presentation on "The Impact of Wind Turbines on DTV"



Joe Wozniak, Svetlana Nass, James Fang and Ralph Hogan relax after a long day

Da Vinci Strings entertained guests at the Welcome Reception. Karaoki anyone?

Ed Williams, Technical Program Chair, and Bill Meintel, BTS Vice President, enjoy dinner and drinks

Good friends and good conversation. (l-r) Bill Hayes, Ralph Hogan and Warren Williamson

We had a full house for Thursday's joint BTS/AFCCE luncheon

It's the start of a great night. (l-r) Pascal Marcoux, Alicia Zupeck and Jenn Barbato

Charles Cooper, David Snavely, and Tino Trainotti network during lunch

Old friends – James O'Neal, BTS Historian, and Ted Kuligowski, BTS Newsletter – wait for the Keynote speech

After his speech on "the Transition of Analog to Digital Television," Jules Cohen was presented the BTS Special Service Award for lifetime achievements by Bill Hayes, BTS President

Merrill Weiss, recently drafted by the NBA, discusses the "Mathematics of Mechanical Beam Tilt"

A Symposium Patron provides a demo

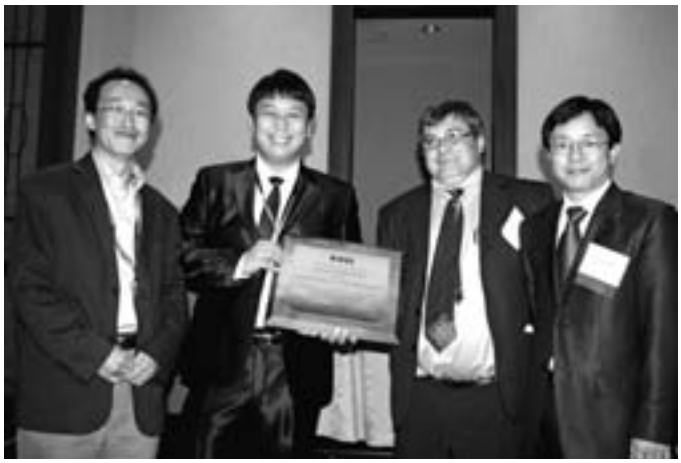
Dane Jubera, Jampro Antennas, leads off the Panel Session on TV Antennas

Ki-Hwan Suh, Pusan National University, leads off the Friday morning session on Digital Implementation

Who doesn't love scones?

Coffee Break provided time to socialize for Robert Weller and Carl Jones

Jim Kutzner, PBS, warns the audience that mobile television will soon be invading our lives



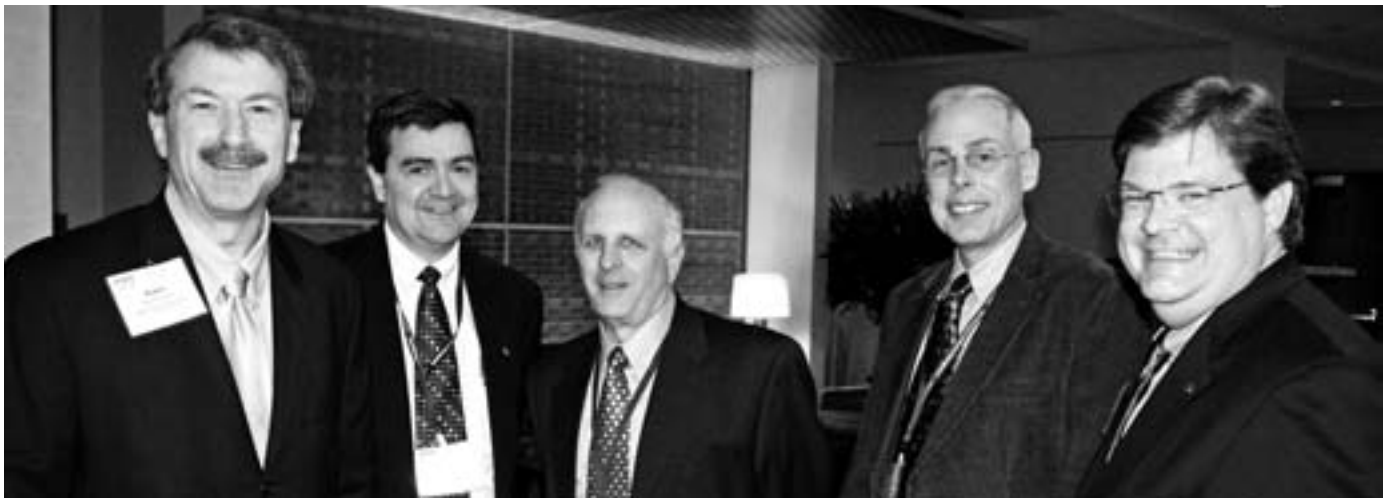
Introducing our Scott Helt Award winners, for the best paper published in the 2008 IEEE Transactions on Broadcasting. (l-r) Wangrok Oh, Sung-IK Park, Guy Bouchard (BTS Awards Chair), and Heung Mook Kim

Guy Bouchard presents Bob Seidel the Matti Siukola Award for the best paper presented at the 2008 IEEE Broadcast Symposium

Tom Silliman accepts his IEEE Fellow plaque from Guy Bouchard

Friday's Keynote speech by Andrew Clegg, of the National Science Foundation, was fascinating. The audience was able to look back in time billions of years, through photos of outer space

Adam Goldberg began the Friday afternoon session



One last chance to catch up, during the Friday afternoon coffee break. (l-r) Bob Seidel, Joe Wozniak, Bill Meintel, Lanny Nass and Dennis Wallace

John Reiser wonders when his sound equipment will be made "wireless"

Session Chair Doug McCabe prepares to introduce the next speaker

Symposium Co-Chairs Tom Silliman and Eric Wandel relax after a job well done!

Our Panel on DTV Implementation prepares for questions from the audience. (l-r) Jim Kutzner, Adam Goldberg, Jean-Claude Krelic, and Matthew Goldman

From the Editor continued from page 2

of spectrum to support the needs of wireless broadband. The U. S. Federal Communications Commission with significant support from the wireless broadband industry is now trying to solve that shortage and has the television spectrum in its sights.

Over the past 20 years the television broadcast industry and the public have spent billions of dollars developing and implementing a new digital television system. The system, now a reality, includes outstanding high definition pictures, surround sound, multiple program streams and soon to come delivery to mobile and handheld devices. Will all that effort be for naught? News reports say that the broadband proponents have indicated that their future spectrum requirements will be in the neighborhood of 800 MHz! With such a huge requirement, the 222 MHz of highly desirable UHF spectrum used for television broadcasting has emerged as the prime target with broadband proponents pushing the idea that over-to-air television is a wasteful an inefficient use of spectrum. Although the 72 MHz of VHF spectrum used for television may be less desirable for broadband use it is also not necessarily safe.

As many of you may know this is not the first time the television broadcast industry has lost spectrum. The first was the reallocation of TV channels 70–83, followed by another reallocation of channels 14–20 in certain areas of the country for land mobile use. Most recently as part of the DTV transition channels 52–69 were also lost. A total of 192 MHz (40%) of spectrum have been completely lost with an additional 42 MHz not available in some areas.

With the purported need for spectrum to support wireless broadband it is rather ironic that the TV channel 55 spectrum purchased at auction nationwide is being used not for wireless broadband but for broadcasting (a pay service to mobile/handheld devices). In addition, we believe that additional already auctioned TV spectrum is likely to also be used for broadcasting. If additional TV spectrum is auctioned is there any guarantee that it would be used for wireless broadband? The previous auction winners don't seem to think that is the best use or at least the best business model!

The other issue is that the public will still want to receive television programming but they will not have an option to receive it for free! The current argument is that most of the public receives its programming via a wired connection or by satellite (is that spectrum safe?). However, the reason for that model is probably to a great extent rooted in the limited number of over-the-air program sources available from analog television. With digital and the ability to transmit multiple streams that model could change.

Before taking spectrum away from television broadcasting there are some questions that need to be answered. Some that come to mind are:

- Is the need/demand for wireless broadband real? The answer to this question requires some real supportable hard facts concerning the applications this would support and the real benefit to the public.
- What will the services cost?
- Is there a guarantee that the spectrum will be used for the intended purpose?
- Will the segment of the public who desires to receive free over-the-air television programming be accommodated?
- What is the real value of the spectrum? This answer needs to include not just the current and future revenue of incumbent users but the value of the service they provide to the public. In addition, the value should also include the expected revenue of the new "owners" of the spectrum.

These are just some of the questions that come to mind and need to be answered before any decisions can be made concerning reallocation of spectrum.

I would really like to hear your comments on this subject. You should consider weighing in on this as it could profoundly change television in the United States. I would especially like to hear from our readers from other parts of the world as they likely have a different view than we in the U. S.

Bill Meintel
Editor
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London calling...

A brief report on IBC2009, RAI, Amsterdam, the Netherlands, September 10th–15th 2009

By Mike Bennett, Adcom member representing IEEE BTS on the IBC Partnership Board

As members of the Broadcast Technology Society (BTS) you should be aware that the Society is a Partner/Stakeholder in the prestigious International Broadcasting Convention (IBC).

This event takes place every year in September in Amsterdam, the Netherlands.

The short report below reflects news and observations made during the recent IBC2009. Some of the information given has been taken from the official press releases of the event.

Despite some pessimistic predictions, IBC2009 exceeded expectations, delivering a final attendance of 45,547, just 7% down on the 2008 figure. Taking exhibitors out of the calculation, visitor numbers were even more impressive, falling by less than 5%.

"Judging the success of an event like IBC purely on numbers does not do justice to the whole experience," emphasized Michael Crimp, chief operating officer of IBC. "IBC is about the quality of the interactions, and that is where we delivered once again, through a conference illuminated by some remarkable keynote speakers and an exhibition where virtually all of the world's leading manufacturers met virtually all of the world's key decision makers.

"Our main aim is not to be a trade show but to be an experience," he continued. "One of the ways in which we do that is through the content we provide which puts the technology on the exhibition floor into context. We knew that in 2009 our constituents needed to invest in knowledge to enable them to compete in the new media landscape as well as the new economic climate, and this is what we provided."

IBC added value to the experience of its visitors in ways as diverse as keynote addresses from Marty Pompadur and Rory Sutherland; movie screenings in stereoscopic 3D (including a 16 minute extract of James Cameron's stunning new 3D movie, Avatar); a unique opportunity to study both the ASC and the BSC digital camera tests and question the experts behind them; and the chance to let off steam in virtual motor races in the Games Arena.

Visitor reaction to IBC2009 was uniformly positive. Ma Ju, president of ABS SARFT in China said: "Many international giants come to IBC, bringing with them the most advanced technologies and the ideas that will guide industry development forward. IBC is a barometer for international broadcasting development."

David Hill, chairman and CEO at Fox Sports established IBC's place in the industry: "IBC is the most important media technology meeting in the world," he commented. Dieter Engel, senior vice president of Deutsche Telekom, agreed, saying: "IBC is the most important show for me – more important than CES or NAB. This year it has been even more relevant than last year. All the vendors who are important to me are here."

In conclusion, IBC's Michael Crimp underlined the importance of IBC being **run by the industry for the industry**, and the way that meant the event could move quickly to respond to changing requirements. "We are all about sustainability, for us, for our exhibitors and our visitors," he said. "We build an event that is right for the mood of the market, and create a buzz around it to ensure that the right audience attends. I believe we have exceeded expectations in 2009, and I look forward to welcoming everyone to IBC when it returns to Amsterdam in September 2010."

A decision has now been made to remain in Amsterdam for the next three years, 2010, 2011 and 2012.

During IBC2009 the IEEE Broadcast Technology Society (BTS) was responsible for organizing an afternoon session on Sunday the 13th of September chaired by Yiyan Wu (AdCom member) on the subject of Audio Technology coding and concatenation, loudness and lip sync". This session was very well attended as there has been considerable interest in audio as it relates to the new digital arena. Normally most sessions are devoted to advances in digital television technologies. Audio has become an even more essential part of current TV broadcasting and distribution.

A full report on the conference can be found on the IBC web page www.ibc.org

IBC Awards

One of the annual highlights of IBC is the prestigious awards ceremony, which was held on Sunday night in the Auditorium. The awards recognise those who have made a real contribution and whose careers have changed our industry. This year's attendees were also treated to a 16-minute extract of James Cameron's stunning new 3D movie, Avatar. This film was released on 18 December, 2009, worldwide.

IBC Innovation Awards

Unique in the sense that they recognise how suppliers and customers worked together to create something truly innovative, the innovation awards celebrate the application of technology in bringing creative, commercial or operational benefits to the end user.

They are divided into three categories including:

- the most innovative projects in content creation
- content management
- content delivery

There is also a fourth award presented to one of the category winners, that most impressed the international judging panel, this is known as the Judges' Prize.

Talking about one of the 2009 winners, Michael Lumley, chairman of the judging panel, said: "What impressed

us about this entry most was the way that the partners worked together to harness the technology in a project to move the business forward. It is an innovative solution to a real, practical, commercial requirement …"

The highest honour was reserved for the individual or organisation that has made an outstanding contribution to the creative, commercial or technical advance of our industry, over an extended period, and on a global scale. Past winners include Jeffrey Katzenberg, the CEO of DreamWorks Animation SKG; Steve Wozniak, co-founder of Apple; audio innovator Ray Dolby; director James Cameron; media pioneers Ted Turner and Sam Chisholm; Leonardo Chiariglione who was one of the fathers of MPEG compression; and Aardman Animations, the studio responsible for Wallace & Gromit and Creature Comforts.

IBC Special Award

From time to time the IBC Council presents a special award to honour some particular achievement in technology or its application. Often these special awards go to world-renowned research bodies or programme makers, names on the lips of all of us. This year the special award went to a public body and a company which is perhaps less well known. But it is presented for a new application that fulfils a real and vital need, a practical and rapid response to one of the most frightening and emotionally charged events imaginable.

IBC Conference Award

The papers sessions at IBC remain the world's leading forum for the presentation and development of the latest research in electronic media technology. Recognising the best of the best, the papers committee select the paper that they believe best matches original content with clarity of presentation. Proposals for papers were submitted earlier in the year and were carefully evaluated by a committee of experts who considered each one for innovative content. Competition was fierce, with many more submissions than can be accepted for the programme.

The winners of the above awards can be found on the IBC website *www.ibc.org*

An important date for your diary is IBC2010, Conference 9–13 September 2010, Exhibition 10–14 September 2010, RAI Centre Amsterdam, The Netherlands.

About IBC

Established in 1967, IBC has evolved from its roots in terrestrial broadcasting to become the leading event for professionals involved in the creation, management and delivery of entertainment and news content worldwide. The exhibition attracts over 1400 exhibitors including all the major equipment suppliers. IBC draws over 45,000 attendees from more than 130 countries that visit each year to see the state-of-the art. The world-renowned IBC conference tackles all the hot creative management and technical issues.

The IBC mission statement is "**For the industry, By the Industry**".

The BTS Administrative Committee met at IBC in Amsterdam to discuss future plans for the Society

Sébastien Laflèche, Yiyan Wu and Charlie Einolf relax at the IBC Partnership village after a busy day at the show

The Partnership village was busy all week with members, clients and visitors

The BTS tutorial, Chaired by Yiyan Wu, on "Audio Technology" was followed by a panel discussion. Speakers/panelists (l-r): Patrick Waddell - Harmonic, USA, Florian Camerer – Austrian Broadcasting Corporation, Austria, Tony Spath – Dolby Laboratories, UK, Gerhard Stoll – Institut fur Rundfunktechnik GmbH, Germany, Craig Todd - Dolby Laboratories, USA

ATSC Completes Work on DTV Audio RP

By Jerry Whitaker, VP of Standards Development, ATSC

The ATSC has published a new Recommended Practice (RP) intended to address the issue of large variation in loudness among programs, commercials, and other interstitial elements. The new document is A/85, "Techniques for Establishing and Maintaining Audio Loudness for Digital Television." The RP can be downloaded at no charge from the ATSC Web site: http://www.atsc.org/standards/practices.php. A/85 is broad in scope, covering all facets of the audio delivery system, from implementation of the key ATSC Standards to mix room monitoring. The RP also includes two unique elements: "Quick Reference Guides" intended to get operators and content creators up to speed quickly on critical guidelines. It also contains links to audio test signals that should be used for monitoring environment setup.

The RP provides guidance for broadcasters and content creators. The document recommends production, distribution, and transmission practices needed to provide the highest quality audio soundtracks to the digital television audience. Specifically, the document:

Recommends measurement methods for creation, postproduction and quality control for long and short form content

- Provides guidance on production and postproduction monitoring techniques
- Recommends methods to effectively control loudness for content delivery or exchange
- Recommends methods to effectively control program-to-interstitial loudness
- Discusses metadata systems and use
- Describes modern dynamic range control
- Provides specific information on loudness management at the boundaries of programs and interstitial content

The RP was written by audio experts representing the television networks, program production, manufacturing and other stakeholders.

Background

The ATSC Board of Directors, in its 2006 Strategic Plan, noted that some areas of DTV audio implementation continue to be problematic, in

particular loudness variation and audio synchronization with video. Because these issues can only be corrected throughout the broadcast environment through a cross-industry effort, the ATSC established two groups within the Specialist Group on Video and Audio Coding (TSG/S6), led by Pat Waddell of Harmonic, to focus on audio:

- Audio Loudness Group (S6-3), led by Jim Starzynski of NBC Universal
- Audio Synchronization Group (S6-4), led by John Henderson of CEA

The first order of business for each group was to identify the scope of the problem and what elements in the signal chain from the studio to the receiver in the consumer's home contributed to it. It was determined that initial work on the synchronization issue, with respect to receivers, should be undertaken by the Consumer Electronics Association (CEA). Accordingly, CEA developed CEB-20, a Recommended Practice on "A/V Synchronization Processing", which was published in July.

Study within S6-3 on the audio loudness issue led to development of the A/85 Recommended Practice – a two-year effort that ended on November 4 with final approval of the document.

Loudness Variations

It is important for the digital television system to provide uniform subjective loudness for all audio content. Consumers find it annoying when audio levels vary when changing channels, and when watching a single channel. Dialog, the spoken word, has been identified as the element that audiences typically adjust their volume to. Achieving an approximate match for average dialogue level from all content is a desirable goal. While the AC-3 audio specifications in ATSC Standard A/52, "Digital Audio Compression (AC-3, E-AC3) Standard," provide syntax that makes this goal achievable, system implementation in the real world has proven more difficult than expected.

The digital audio system is greatly different than analog, and it can provide a significant increase in dynamic range – exceeding 120 dB with modern systems. Further, there is no technical reason for dialogue to be encoded near 100 percent, a common NTSC practice. Even so, there is no assurance that all digital program channels, or all content on a given DTV channel, will have dialogue encoded at the same level. Without a uniform loudness level for dialogue or the proper use of DTV audio metadata components, there will be inevitable audio-level fluctuations between channels, and between programs and commercials on a single channel.

Addressing the loudness issue encompasses a number of elements, which include mixing, monitoring, and proper encoding of local and network programs, commercials, promos, and other content. The S6-3 study group explored all facets of DTV loudness, with a goal to identify problem areas and recommend practical solutions.

Audio Seminar

On November 4 (the same day the ATSC Membership ballot on the RP closed) the ATSC organized a day-long seminar focused on audio loudness issues. The program examined key audio topics such as industry outreach, real-world applications, loudness measurement, monitoring, program interchange, interstitial loudness, and metadata. Related legislative activities were also discussed. The event was attended by members of the broadcast, cable, and satellite industries; as well as equipment manufacturers and consulting engineers.

Speakers at the event reviewed in detail the key points in the RP, explaining the recommendations contained in the document and how they were arrived at.

The event, held in Washington, D.C., was sponsored by the IEEE Broadcast Technology Society, DaySequerra, Dolby, Jünger Audio, Linear Acoustic, National Association of Broadcasters (NAB), National Cable & Telecommunications Association (NCTA), RTW, and Wiley Rein.

Get Involved

Work within ATSC is open to all organizations with a direct and material interest. If you would like to be involved in ongoing work of the organization, please contact the author.

All ATSC Standards, Recommended Practices, and informational documents are available at no charge from the ATSC Web site: http://www.atsc.org.

An Ideal Opportunity – Nominate a Colleague

Do you know a colleague that fits the criteria for an IEEE Fellow? Is this person an IEEE Senior Member or IEEE Life Senior Member with contributions that have advanced engineering, science and technology bringing significant value to society? Well, the opportunity is at hand to nominate this person as an IEEE Fellow in one of four categories: application engineer/practitioner, educator, research engineer/scientist, or technical leader. Whether you are in industry, government or academia, we are sure you know a deserving individual who may be eligible to become an IEEE Fellow. Only 1/10 of 1% of the total membership can be elevated and your nominee could be in the upcoming class. Why not start the nomination process and have this individual become a member of the elite group of 6000 IEEE Fellows?

The nomination period is now open for the Class of 2011 and will continue through 01 March 2010. Start by visiting our IEEE Fellow website at http://www.ieee.org/fellows. All the information you need is there from the detailed instructions for preparing the application

to all the forms necessary – nomination, reference and endorsement. Once you have read the instructions we highly recommend and encourage you to use the online application method of nomination. With this method, once you have submitted the completed application, notification is automatically sent to references and endorsers, telling them that they have been asked to help with the nomination process. This method will save you a great deal of time and you can monitor their replies throughout the entire procedure.

The IEEE Fellow Staff is ready to assist you in any phase of this process and with any questions you may have. You can reach them via e-mail at fellows@ieee.org.

Author's Query – HDTV Development

Your input is requested for a book exploring the development and deployment of HDTV, to be published by McFarland & Company, a publisher of scholarly, reference and academic books. Especially helpful would be personal memories, insights and comments about any aspect of engineering (R &D, prototype, system, facility and receiver), facility and studio construction, and initial HDTV broadcasts.

Insights from the global effort – including all three regions, Japan, Europe and the US – will also enable the documentation of the full scope of HDTV's genesis. Input from those involved in HDTV in South America, China, Australia and Africa would also be appreciated.

Please contact the author, Philip Cianci, at philipjcianci@verizon.net, or visit www.hdtvarchiveproject.com for additional information.

IEEE BTS MONTREAL CHAPTER REPORT

First Presentation Under IEEE BTS Distinguished Lecturer Program (DLP)

Topics in Digital TV: DTV Basics (advanced), DTV Monitoring and ATSC Mobile DTV

By Dr. Manijeh Khataie, Chair

On 21 October 2009, IEEE Broadcast Technology Society, Montreal chapter, had the distinct pleasure of hosting the first presentation of the new BTS Distinguished Lecturer Program (DLP) on Digital TV at Concordia University.

The goal of the new program is to foster the discussion and review of the latest advances and practical applications within the field, in order to improve the knowledge base of the members of the society as well as the public.

Building off of last year's successful 2-day seminar on 8VSP with Gary Sgrignoli, a larger than expected crowd of over 100 people attended the day-long seminar, which played host to two exceptional speakers.

To kick-off the memorable day, Dr. William Lynch, Chair of Electrical and Computer Engineering at Concordia University, welcomed the group. The Montreal chapter is grateful for the continued support and partnership of Concordia University in realizing the BTS conferences and seminars.

The morning session began with a captivating presentation by Mr. Guy Bouchard, the Senior Manager of New Broadcast Technologies at CBC/Radio-Canada, and a BTS ADCOM officer. The topic of discussion was the general theory and drivers behind MPEG-2 Transport Streams. Mr. Bouchard's deep knowledge and experience in this area, coupled with his expert presentation skills resulted in an excellent learning experience.

During the lunch break the participants had the opportunity to network amongst themselves and with the distinguished speakers, as well as to discuss the topics of interests.

Dr. Chernock with the other audiences

The second part of the seminar was handed over to the day's distinguished lecturer, Dr. Richard Chernock. Dr. Chernock is currently the CTO at Triveni Digital, driving the technical roadmap for the company whose core business is DTV; in addition to his day job, he is also the chair of the BTS DLP.

The topics which were covered in the second half of the day included

- Advanced Topics in MPEG Transport Stream
  This part covered advanced topics in MPEG-2 transport stream and PSIP, including the current state of the ATSC standards.
- DTV Monitoring
  In this part Dr. Chernock discussed techniques for monitoring and analyzing DTV systems, including the ATSC Recommended practice on bit stream monitoring (ATSC A/78). Approaches and strategies for monitoring simple and complex distributed systems were also covered.
- ATSC Mobile DTV
  In this part Dr. Chernock described the new ATSC standard for Mobile DTV (ATSC A/153) – both the technological underpinnings and some aspects of implementation. The primary focus of this discussion was on the system layers above the RF.

Dr. Chernock's vast knowledge in the area of DTV easily attributed to an incredibly informative afternoon; his vast experiences in lecturing were also evident as he touched on the key areas of each topic.

At the end of each session, Dr. Manijeh Khataie, chair of IEEE BTS Montreal chapter, presented the IEEE BTS certificate of appreciation to each speaker.

The BTS Montreal chapter would like to thank the IEEE Montreal Section for their contribution and support of this event. We would also like to thank again the guest speakers for their excellent presentations as well as the participants for their enthusiastic turnout. The participants represented both academia and industry from: Radio Canada/CBC (Canadian French & English Broadcast Company), TVA (French Broadcast company), Tele Quebec, Miranda, Concordia University, McGill University, Ecole Technology Superior, Videotron (Canadian cable company), PSQ Technologies Inc., Applied Electronics, Incospec, Sony Canada, Industry Canada, and more than 10 other local companies. Special thanks also goes out to the Montreal SMPTE section for their support in distributing the invitation letter amongst their members.

Guy Bouchard during his presentation for more than 100 engineers

Manijeh Khataie, Guy Bouchard and Rich Chernock

Mr. Gerar Terreault from BTS Montreal at BTS stand

Rich Chernock during his presentation on DTV Technology

Biography of Lecturer

Dr. Richard Chernock has 15 years direct digital television and broadcast industry experience plus 13 years of research and development in advance electronics materials. He is the CTO of Triveni Digital with broad responsibilities for the future directions of Triveni products, especially with regards to emerging markets (for example ATSC Mobile, IPTV and Digital Cable build-outs). He started there as Senior Member Technical Staff in 2002.

Before that he was with IBM for 8 years leading many projects including research in enhancements to television using digital broadcast and MPEG technologies. He developed broadcast interactive applications on digital TV set-top boxes. He also developed MPEG data insertion systems to provide real-time, synchronized data insertion capabilities. He designed highly reliable content distribution system (based on MPEG transport) for delivery of content for digital ad insertion systems.

Rich is an active participant in ATSC and SCTE standards subcommittees: Vice-chair of ATSC TSG (Distribution Technology) and leader of numerous ad hoc groups tasked with the revision of or creation of ATSC standards. He is a Senior Member IEEE BTS, Distinguished Lecturer Chair, author of more than 50 technical publications in journals, conference proceedings & books and 8 Patents issued.

He earned his B.S. in Materials Engineering in 1973 at Brown University. He then went on to MIT where he earned his M.S., and in 1981 his ScD. in Materials Engineering specializing in Nuclear Materials.

Mr. Guy Bouchard is senior manager for New Broadcast Technologies (NBT) at CBC/Radio-Canada. He is responsible for digital delivery technologies studies and projects within CBC Technology. During his 25 years with the CBC, Guy has worked in analog and digital television transmission and production systems, as well as satellite and terrestrial microwave communication systems. He is a member of the IEEE Broadcast Technology society. Guy has served the broadcast industry since 1979 with a special interest in digital communications systems. He has written and delivered papers and tutorials on MPEG & DTV for the IEEE, Canadian Digital Television (CDTV), and the Society of Motion Picture and Television Engineers (SMPTE). Guy received the 2007 CBC Technology award for the design of IPOS based unified communication systems for SNG vehicles operating in the white space of Ku band satellite transponders.

Agenda of Presentation

08:00 – 8:30 Registration and Breakfast
08:30 – 8:45 Welcome, Dr. Lynch, chair of ECE,
08:45 – 10:30 DTV Basic in MPEG-2 Transport stream, Guy Bouchard
10:30 – 10:45 Break
10:45 – 12:00 DTV Monitoring, Rich Chernock
12:00 – 13:00 Lunch Break
13:00 – 14:00 DTV Monitoring Rich Chernock
14:00 – 15:00 ATSC Mobile DTV, part 1 Rich Chernock
15:00 – 15:15 Break
15:15 – 16:15 ATSC Mobile DTV, Part 2 Richard Chernock

IEEE Montreal Section Presentation

By Dr. Manijeh Khataie IEEE BTS Montreal Chapter Chair

The IEEE Montreal Section combines Chapters of the Communications Society, the Information Theory Society and the Broadcast Technology Society Hosted a presentation on "Converged Services and NGN". Presented by the IEEE ComSoc Distinguished Lecturer Dr. Bhumip Khasnabish*, the session was held at Concordia University on Monday, 13 July 2009.*

In this 2 hour discussion, Dr. Khasnabish explored the current activities of the traditional service providers aimed at finding implementable and operable solutions to the problems inherent to evolving Next Generation Networks (NGNs). The objective is to support VOIP, IPTV, and other multimedia services seamlessly over a variety of interconnected networks using emerging IP multimedia subsystem (IMS) and service oriented architecture/network (SOA/SON) based standards.

Coincidentally, the presentation also turned into a mini-reunion for BNR employees as more than 30% of the audience consisted of these former employees.

Dr. Khasnabish is a Distinguished MTS of Verizon Network and Technology, Waltham, MA, USA. He is the founding chair of the recently created ATIS Next Generation Carrier Interconnect (NG-CI) Task Force. He is also the founder of MSF Services Working Group and led the world's first IMS-based IPTV interop during GMI08. At Verizon, he focuses on NGN and Carrier Interconnection projects related to delivering enhanced multimedia services, and represents Verizon in the Standards activities of MSF and ATIS NG-CI.

BTS Argentina Report

By Valentino Trainotti, Chapter Chair

Antenna Seminar

The Argentina Chapter of the IEEE Broadcast Technology Society together with the IEEE Student Branches of FIUBA and UTN-FRBA participated in a 'Seminar on Antennas' presented by Valentino Trainotti, IEEE Life Senior Member and BTS Distinguished Lecturer.

The Seminar was held conducted on 22–24 September 2009, 7:00 to 9:00 PM daily in the Buenos Aires University Engineering Faculty Conference Room, Paseo Colon 850, Buenos Aires. The event was open to all IEEE members and non-members.

This new Seminar provided updated current knowledge of basic antenna design, parameters and measurements. A summary of the Seminar's topics included:

- Historic background
- Antenna Parameters
- Soil Parameters
- Monopoles and Dipoles
- Loops, Antenna Arrays
- Reflector Antennas
- Wide Band Antennas
- Parabolic Antennas
- Broadcast Antennas for AM and FM Bands
- Broadcast Antennas for VHF and UHF Bands

Professor Valentino Trainotti presenting a Seminar on Antennas at Buenos Aires University

The Seminar was attended by approximately 50 persons who received Certificates of Attendance.

BTS Argentina Chapter Elections

The newly elected officers beginning their terms in 2010 are:

Chair: Valentino Trainotti
CoChair: Gerardo De Marco
Secretary: Javier Bonini
Treasurer: Ruben Correa

Argentina Section

The Argentina Section of the IEEE (Institute of Electrical and Electronics Engineers) was founded in 1939 and currently has 11 chapters of 15 Technical Societies, a GOLD Affinity Group (Graduates of the Last Decade), 24 Student Branches and Subsection Cordoba.

BTS Japan Chapter Report

By Shuji Hirakawa, Chapter Chair

The BTS Japan Chapter held a joint meeting with the Institute of Image Information and Television Engineers (ITE) during August 2009 to October 2009.

A technical meeting was held on 23 October 2009 at NHK Nagoya Broadcasting Station, Nagoya, Japan.

There were 3 technical presentations on general topics below:

- "A study of the SFN-GF system design technology – Estimate of reflection point of multipath–" by Sho NABATAME, Takamasa KUGE, Kohei OHNO, Makoto ITAMI, Hiroki OHTA, Hiroshi SUGAWARA, and Kazuki KUMAGAI.
- "A study of the propagation characteristics analysis by the channel bandwidth connection" by Hiroki OHTA, and Makoto ITAMI.
- "A Multiplexing Scheme for IP Packets in Digital Multimedia Broadcasting Systems" by Shuichi AOKI, Katsunori AOKI, and Makoto YAMAMOTO.

And one invited presentation titled:

- "Broadcast live program production of total solar eclipse on 22 July, 2009" by Junji MATSUOKA.

The BTS Japan Chapter is planning to have two joint meetings below with the Institute of Image Information and Television Engineers (ITE).

28–29 January 2010 at Saga University, Saga, Japan.

10 February 2010 at NHK Hiroshima Station, Hiroshima, Japan.

Joint ComSoc/BTS Chapter Ottawa Report

By Dr. Wahab Almuhtadi, P.Eng. Chapter Chair, and Executive Conference Chair of ICC 2012

Ottawa Won the Competition for Holding the ICC in June 2012.

On 17 June 2009 at the International Conference on Communications (ICC) 2009 in Dresden, Germany, the ComSoc GIMS Committee announced that the IEEE Ottawa Section (www.ottawa.ieee.ca) won the competition against other major international cities for holding the *IEEE International Conference on Communications (ICC) in Ottawa in 2012*.

The ICC 2012 will be held at the Ottawa Convention Centre in Ottawa, Ontario, Canada from June 10 through 15 June 2012.

The estimated number of the conference attendees will be 1500 to 2000. The conference will have a significant impact in enhancing the reputation and business of the Canadian telecom and high tech companies that have been facing many challenges during recent years. ICC 2012 will serve to raise the profiles and visibility of the telecom and high tech companies. Also the conference will benefit the academia, scientific and engineering research, industry and local business in Ottawa.

Recent and future ICC conference locations and web pages are:

- ICC 2008) was held in Beijing, China www.ieee-icc.org/2008.
- ICC 2009 was held in Dresden, Germany www.ieee-icc.org/2009
- ICC 2010 will be held in Cape Town, South Africa www.ieee-icc.org/2010
- ICC 2011 will be held in Kyoto, Japan www.ieee-icc.org/2011
- **ICC 2012 will be held in Ottawa, Canada**.

I believe that the IEEE Ottawa Section, with strong experience in organizing successful conferences, and with the help of a dedicated team of volunteers (organizing committee, technical committee, operation and exhibition committee), and with the help of Mr. Ibrahim Gedeon, CTO, Telus and General Chair of ICC2012, as well as with assistance of the advisory committee (from industry, government, academia, and research institutes) will make the ICC 2012 a successful event.

For more information, please contact:

Dr. Wahab Almuhtadi, P.Eng.
Executive Conference Chair,
ICC 2012
Chair of IEEE Communications Society and BTS Ottawa Joint Chapter
almuhtadi@ieee.org

ICUMT 2009 Conference in St. Petersburg

By Dmitry Tkachenko, IEEE Russia Northwest BT/CE/COM Chapter Chair

The International Conference on Ultra Modern Communications was held in St.Petersburg (Russia) on 12–14 October 2009. The conference was organized by SPIIRAS (an institute of Russian Academy of Sciences), St. Petersburg University of Telecommunications and Tampere University of Technology (Finland). IEEE Russia Northwest BT/CE/COM Chapter was a technical co-sponsor of the conference along with Popov Society (a professional society of Russian radio and communications engineers). Other patrons and supporters of the conference were the Government of St.Petersburg, Nokia, Nokia Siemens Networks and other organizations.

The technical program of ICUMT 2009 included 9 keynote talks from the internationally recognized speakers, 13 specialized workshops and the main conference track. Conference proceedings included more than 300 papers that were selected from more than 500 submissions with the help of more than 300 technical program committee members, reviewers and workshop chairs.

New radio technologies for the wireless communications systems were among key topics of the conference. Keynote speakers presented details of LTE that could be seen as the next generation technology after GSM and WCDMA. Other issues that were considered in keynotes are extensions of the IEEE 802.16 WiMAX system, relaying technologies in modern wireless communications, mobile ad hoc networking, numerical methods of the queuing theory, adaptive self-improving web tools capable of learning and understanding contents and predictive routing algorithms in the postmodern Internet. Papers concerning many other technical fields and technologies have been also presented and discussed at the conference, such us wireless sensor networks, wireless network protocols, physical layer issues for wireless networks (e.g., MIMO, OFDM, UWB), cross-layer optimization, RFID technologies, etc.

The conference was truly international. Speakers and attendees arrived to St.Petersburg from 45 countries. The conference proceedings will be available in IEEE Xplore. Some results of the conference are also available at the conference Web site http://www.icumt.org/.

Valentino Trainotti

BTS Argentina Chapter Chair

A BTS Member Profile

By Jennifer Barbato, BTS Publications/Newsletter Coordinator

The BTS takes great pleasure in introducing you to Valentino (Tino) Trainotti, the IEEE Argentina BTS Chapter Chair. If you have not already met Tino at one of the many IEEE Broadcast Technology Society functions, below is a small peek into Tino's career.

Tino formed the IEEE Argentina BTS Chapter ten years ago after observing that the IEEE Argentina Section did not have technical activities related to broadcast engineering. The BTS Aregentina Chapter provided a setting for Tino and others to exchange information and teach broadcast/ multimedia technologies to working engineers, academics and students. Tino has served several terms as Chapter Chair during the past decade as well as helping to organize and facilitate many educational programs and technical seminars on current broadcast topics presented at Chapter meetings.

In this article, the BTS would like you to learn a little more about Tino and his activities in the broadcast engineering profession.

An Early Interest in Engineering

Tino was born in Trento, Italy in 1935 and moved to Argentina in 1950. He graduated from the Universidad Tecnologica Nacional UTN, Argentina as an Electronic Engineer in 1963 after 6 years of study. His post graduate studies were completed at the California State University, Northridge in 1981 and Ohio State University in 1985.

Before retiring 2003 and becoming a part time full professor for the Buenos Aires University, Tino worked at Broadcasting LR6 Radio Mitre for 10 years. He was also the Chief Engineer in the Antenna and Propagation Division at the Argentine Research Institute CITEFA for 30 years.

Tino first became interested in broadcast technology while studying

Valentino Trainotti

in secondary school to become a Radio Telegraph Operator and Electronic Technician. He became an Amateur Radio Operator LU1ACM in 1953. When Tino was asked what led to him studying engineering he stated "After studying in the secondary school, it was the logical next step." And so began his exciting career in engineering.

Tino's area of special interest is antennas, with specific emphasis on broadcast antennas. He became interested in AM and FM antennas while working as a technician in broadcast operations in 1954. Tino designed many antennas for Aeronautical, Marine and Satellite communications, from Low toUltra High Frequencies. He conducted many field measurements to determine antenna performance, input impedance and efficiency. These measurements included the determination of diurnal and nocturnal service area of MF AM stations and coverage areas for VHF FM stations and VHF TV stations in VHF and UHF.

Teachings and Writings

Tino began his teaching career in 1963 at the Universidad Tecnologica Nacional UTN Argentine Army University and Buenos Aires University. He still teaches today with his main focus on Antennas and Propagation subjects. In addition, Tino has written three books on Electromagnetic Engineering in Spanish for undergraduate students and professionals. A fourth book is currently underway. When asked why he decided to write the books in Spanish, he stated "not many broadcast engineering books are available in Spanish especially for students and professionals. So there was a need to fill this slot". Tino has also published papers in the IEEE Transactions on Broadcasting and the IEEE Transactions on Antenna and Propagation. His goal for writing these papers, is to inform his colleagues about new technologies in transmitting and receiving antenna efficiency and designing high power transmission lines for broadcast applications. He has given several technical presentations on these topics at the annual IEEE Broadcast Symposium, held in the Washington DC, USA area, and at the Antenna Applications Symposiums in Illinois, USA. In addition to being an author and presenter Tino holds two antenna patents. One for the asymmetric vertical MF dipole and one for a wide band HF portable dipole.

Other Activities

In his spare time Tino has a passion for nature. His greatest connection with nature is sailing the world's oceans with his wife, Stella. He says "It makes you feel like you are a very small thing against the natural forces. And it gives me great pride to lead a journey with success." Tino has retired from his many years of sailing, but he will never forget the wonderful memories of his sailing days.

Getting to Know the IEEE and the BTS

Tino first got involved in IRE (Institute of Radio Engineers) in 1962. IRE then merged with AIEE and then became IEEE. He began attending

conferences in 1964 in Buenos Aires. Tino has been a long term member of the IEEE and states "IEEE is the leading institution for an engineer and researcher to stay current with the latest technical and scientific information and participate in IEEE activities with professionals in engineering and scientific fields."

Tino became interested in the BT Society because of its importance in providing educational activities not only with transmitting and studio technology, but also with radiating systems and wave propagation. Tino always looks forward to attending the annual IEEE Broadcast Symposium which he says "provides the most advanced broadcast technology information and advice from the best professionals not only in the U.S. but from several of the world's corners." Tino believes this Symposium is of paramount importance for a professional since it provides a valuable forum to exchange ideas, gain knowledge and network with colleagues.

Looking to the Future

Tino says the most exciting project he has worked on, relates to several transmitting antennas for medium frequency broadcasting, especially a new asymmetrical vertical dipole antenna without the standard 120 ground plane radials. This new antenna achieves a high efficiency and improves the night-time service area. He is also working on designing multi-band antennas for the Argentine Scientific Satellite (SAC-C). This Polar Orbit Observation Satellite launched into orbit by NASA has been working perfectly since 2000.

Tino gave this advice to young engineers just starting out in the field, "having a degree is not the only thing you need to be a great engineer. You need to work hard on your specific tasks to get the job done right because nothing is for free."

When the Federal Government Stepped In

By James E. O'Neal, BTS AdCom Member and Technology Editor, TV Technology

The Federal Communications Commission was created on 19 June 1934, and thus marks its 75th anniversary this year. Here, we look back to its roots.

In the beginning, there was a ponderous cacophony and great confusion.

Radio, basically in the form of broadband brute force spark transmissions, had been around since the turn of the 20th century. Some businesses made use of radio for dispatching ships and reporting meteorological conditions, others engaged in the transmission of personal and commercial messages for profit; but the simple truth was that anyone could build and operate a wireless station.

The U.S. Navy was one of the early adopters of radio communications; it frequently endured perfectly legal interference from amateur pranksters.

Stations could operate with as much power as they wished and for as long as they wanted. Call signs, if they were used, were self-assigned. In some cases, the identical call signs were used by multiple parties in various parts of the country.

Order Out of chaos

By the early 1910s, radio looked as if it were here to stay, and the United States and other governments had begun to step in to police an increasingly disorganized, sometimes dangerous situation.

A first stab at regulation in the United States came with the Wireless Ship Act of 1910, in which control of the airwaves was assigned to the secretary of the Department of Commerce. ("… the Secretary of Commerce and Labor shall make such regulations as may be necessary to secure the proper execution of this Act by collectors of customs and other officers of the Government."). It was limited in scope and essentially just mandated the carriage of radio gear for larger passenger ships.

Baby Steps

Two years later saw the passage of the Radio Act of 1912. This legislation was much broader in scope, and though it failed to bridle the "wild west" nature of radio operations, it can be viewed as the foundation of the modern Federal Communications Commission.

The act had some of its roots in the Berlin Convention, an international radio accord reached in 1906. The 1912 legislation for the first time defined allowable wavelengths and purity of transmitter emissions, forbade the use of "unnecessary" power, established "SOS" as a standard distress call, proscribed the divulging of contents of

FCC PHOTO

Rear Admiral W.H.G. Bullard, first chairman of the Federal Radio Commission. 'There are no czars, as some newspapers like to suggest; we are all equals – the commission and the public,' he said

transmitted messages, established the use of government issued call letters, required the licensing of stations and operators and established penalties for violations of the law.

It also covered distress operations and protection of government communications from interference.

While the act essentially confined radio transmissions to a portion of the spectrum now defined as the AM broadcast band, it did not address broadcast operations. Further, due to its legal language, it was, by and large, unenforceable.

Following the outbreak of war in Europe in 1914, and especially after the United States entered the conflict, little was done to correct flaws in the 1912 legislation.

One effect of the "Great War" was a ban by the federal government of all commercial and amateur radio activities beginning on 7 April 1917. Most stations were shut down and dismantled or pressed into government service. It became illegal for a private citizen to even possess an operational transmitter or receiver.

This monopolizing of the U.S. airwaves continued until 1919 and the return of U.S. soldiers from the European front.

Broadcasting Takes Off

The importance of radio in wartime operations did not go unrecognized.

It was not long after the end of hostilities that the idea of "broadcasting" as we know it became fairly widespread. Certainly there had been experimentation by a number of individuals before the war, but this was viewed as little more than a hobby by most.

One returning amateur, Frank Conrad, began to ramp up his experiments in transmitting to a general audience. This led to interest by his employer, Westinghouse, in creating a full-fledged radio station, KDKA, in 1921.

The nation – and the world – were ready for radio to enter homes in the early 1920s, and the chaotic situation that existed earlier now played out again. Stations sparred for dominance of a certain frequency. Frequency control was minimal; most transmitters

FCC PHOTO

Eugene O. Sykes, a Democrat, was the first Federal Communications chairman, assuming office on 11 July 1934. He remained with the FCC until 1939

were little more than modulated power oscillators, where even the changing capacitance of an antenna blowing in the wind would shift frequency. Hours of operation and power limits were subject to the whims of station owners (many of these were amateurs who were broadcasting "just for fun").

In the year following the meteoric rise of civilian broadcasting, Herbert Hoover called the first of several special national conferences about radio. He was secretary of the Department of Commerce and was trying to deal with the somewhat suicidal success of this new entertainment medium.

Little good resulted from these meetings, aside from the addition of a second wavelength (400 meters or 750 kHz) to the existing single channel set aside for broadcasting (360 meters, or 833 kHz). Power was capped at 1 kW and the use of radio for advertising was frowned upon.

Hoover however was outspoken against the prospect of using radio to advertise:

"I believe that the quickest way to kill broadcasting would be to use it for direct advertising," Hoover declared in 1924 at the third of the conferences, according to Robert L. Hilliard in his book "The Federal Communications Commission – A Primer."

Despite a succession of four conferences aimed at untangling the airwaves mess in the early and mid-1920s, stations kept proliferating and interfering with each other.

Increasing the number of channels and encouragement of time-sharing did little to ease the whistles and beats as transmitters vied for supremacy of the ether. Time-sharing also meant that each station owner could use his or her facility for only a portion of the day, in some cases no more than a couple of hours.

Hoover, to his credit, tried valiantly to sort things out. But the 1912 legislation did not recognize the concept of broadcasting; and courts were full of cases that more or less successfully sidestepped any teeth in the law.

Dill-White

The sense of the times is apparent in a comment by Nevada Senator Key Pittman in the Congressional Record:

"I do not think sir, that in the 14 years I have been here there has ever been a question before the Senate that in the very nature of the thing Senators can know so little about as this subject."

Before the Fifth Estate could be done in by its own meteoric rise, President Calvin Coolidge in 1926 stepped in and asked Congress to enact legislation to deal with the situation.

This led to the passage of the Dill-White Radio Act of 1927, which among other things created a special five-member commission to deal with growing pains of this radio infant. The unit was known as the Federal Radio Commission; it was the direct precursor of today's FCC.

One of the provisions of the legislation was the division of the country into five "radio districts," with a commissioner appointed to represent each. The 1927 act also provided sufficient regulatory "tooth" to fight abuses perpetrated by the spate of broadcasters hitting the airwaves.

The first chairman was Rear Admiral W.H.G. Bullard, who was in charge of stations in the "second zone," which

encompassed Pennsylvania, Virginia, West Virginia, Ohio, Michigan and Kentucky.

He assumed office with a simple "open door" philosophy: "The only motto we have is the doormat welcome, and there are no czars, as some newspapers like to suggest; we are all equals – the commission and the public – striving to solve many different problems and propitiate the ire of perhaps some disgruntled ones," he wrote in a report to Congress. Bullard died in November of 1927.

One of the first actions of the FRC was to silence some 150 of the nation's more than 700 stations. Additional broadcasting channels were opened up and non-broadcast traffic was migrated outside the 550 to 1500 kHz band.

Still that was not enough.

One of the new commissioners, Henry A. Bellows, in an address to the League of Women Voters remarked on the terrible congestion that broadcasters were enduring.

"A broadcasting station is in many ways akin to a newspaper, but with this fundamental difference: There is no arbitrary limit to the number of different newspapers which may be published, whereas there is a definite limit, and a very low one, to the number of broadcasting stations which can operate simultaneously within the entire length and breath of our country.

"This limit has not only been reached; it has been far overpassed; the demand from every section of the country is to cut down the number of broadcasting stations in the interests of the listening public."

Another FRC action was the establishment of metrics necessary for a broadcaster to hold a license. Among those were requirements that a station must serve the public interest, convenience and necessity, which carry forth to this day.

It Should Only Take a Year

The 1927 Radio Act empowered the FRC only for one year; however, the commission's tasks were so daunting that Congress annually renewed the FRC's licensing authority on a continuing basis. The problems it faced in regulation of the country's growing communications systems showed no signs of going away, and a fresh Band-Aid each year was not really a solution.

It was in 1934, during Franklin Roosevelt's first term as president, that a more permanent organization was created, the Federal Communications Commission.

The "New Deal" politics of the Roosevelt administration were not the driving force in this shift from a temporary radio regulatory body to a permanent commission.

In addition to the radio boom, the decade of the 1920s also saw the coming of television and other forms of telecommunication not covered by the 1927 Radio Act.

Further, the regulation of the country's telegraph and telephone services could be described as a crazy quilt at best. The Interstate Commerce Commission claimed jurisdiction over a portion of these systems, as did the Department of State and the U.S. Post Office. Communications within the United States were burgeoning; it was time for a new consolidated regulatory body and a reworking of existing statutes.

The present-day Federal Communications Commission, created by the Communications Act of 1934, opened its doors for business on July 11 of that year. Seven commissioners were selected to lead the organization, with Mississippi Democrat Eugene O. Sykes named chairman. This number was later reduced to the present-day five. Previous regulatory efforts were placed squarely in the hands of this new organization and the FRC ceased to exist.

Since its inception, the FCC has added aircraft, cable, satellite, business and citizen's radio and other wired and wireless communications services to the FRC's authority over marine, military, amateur radio and commercial broadcasting.

During the next several decades, the new organization had a full plate. Among its memorable decisions are the creation of superpower broadcasting, with an experimental 500,000 watt license issued to Cincinnati's WLW; two extensions of the AM broadcast band; a reshuffling in 1941 of virtually all AM broadcasting frequencies; establishment of the 6 MHz television channels; creation of spectrum space for both FM and television broadcasting; the setting of standards for TV transmissions; commercialization of both television and FM broadcasting; the shift of the FM band from its original 42–50 MHz slot to the present 88–108 MHz spectrum; a complete reworking of television broadcasting allocations between 1948 and 1952; creation of additional television channels; later reductions in the number of TV channels; approval of the non-backwardly compatible CBS 405-line color standard in 1950; approval of the compatible "NTSC" color television broadcasting system in 1953; and approval of the present-day FM stereo system in 1961.

James O'Neal is technology editor for TV Technology and a frequent Radio World contributor. He is also a member of the BTS AdCom History Committee. He thanks John Reiser for his assistance in reviewing this material.

Further recommended reading: "A History of Broadcasting in the United States: Volume 1, A Tower of Babel. To 1933," by Erik Barnouw, published by Oxford University Press in 1966; "Stay Tuned: A History of American Broadcasting," by Chris Sterling and John Michael Kittross, published by Lawrence Erlbaum Assc. in 2002 (3rd edition) and "The Radio Act of 1927 as a Product of Progressivism – Vol. 2, Number 2" by Mark Goodman, available online at http://tinyurl.com/fccrw.

"This story appeared in Radio World, 3 June 2009, and is used with permission. For information including more radio history articles, visit www.radioworld.com"

Velocity Factor and Equivalent Radius Of MOM AM Tower Models

By J.L. Smith, P.E.
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Abstract

This article demonstrates the capabilities of NEC2 and NEC4 in modeling lattice type tower structures and provides insight into a popular procedure for adjusting the calculated self impedance of the model to match the measured self impedance of the physical tower. Velocity factor is calculated for both a lattice type model and a thick wire model and a means for determining the equivalent radius of a lattice tower is demonstrated.

Introduction

Newly added Section 73.151(c) of the FCC Rules requires that the integrity of the MOM tower model be verified by a favorable comparison of the computed self impedance of the tower model and the measured self impedance of the physical tower. In order to facilitate a favorable comparison, the rules allow considerable leeway in defining the tower model, including permitting the arbitrary changing of model height. Justification for this unusual relaxation has generally included an explanation that the adjustment in model height is necessary to compensate for the difference in the wave velocity on the thick wire tower model and the wave velocity on the physical lattice tower. In every application I have seen, the height of the tower model has been increased beyond the physical height to make the computed self impedance compare favorably with the measured self impedance. This suggests that the wave velocity on the model is assumed to be greater than it is on the physical tower. This assumed greater velocity is often explained as being due to the lesser distributed capacity of the single thick wire used to model the tower compared to the lattice structure actually making up the physical tower. The reasoning here being that the horizontal and diagonal members of the lattice structure add capacity to ground beyond that of a smooth thick wire thus the physical tower forms a slow wave structure.

NEC2 and NEC4 have the ability to model lattice towers with reasonable effort and thus offer an option to test those assumptions by comparing the characteristics of thick wire and lattice tower models. A brief study to that end is reported here with results that do not support the general justifications. The calculations shown later were made using the bnec.exe MOM program which is furnished with the book titled *Basic NEC with Broadcast Applications*.

Task Description

This study uses a detailed model of the Utility Tower Type 380 triangular lattice tower consisting of twelve 20 ft. sections with 24 inch face plus one six foot, tapered base section for a total tower height of 246 ft. or 75 meters. Girth wires are included every 30 inches and a diagonal brace is placed between girths on each face following the actual construction of the physical tower. Diameters of cylindrical tower legs, girths and diagonals are modeled at their physical dimensions as given on the tower spec sheet. A total of 882 wires are used in the model however this requires only 41 lines of code in the bnec.exe input file using the GM command. An interesting aside here is to note that NEC can reproduce the entire 882 wires of the lattice tower at another location simply by adding only one more GM command. The tower spec sheet is shown as Figure 1 and the model view is as shown in Figure 2.

Procedure

a) The Lattice Tower Model

The tower model was driven with arbitrary parallel source voltages at a frequency of 1000 KHz placed on the bottom segment of each of the three tower legs of the tapered base section. See Section 12.2, pp. 171–173 of *Basic NEC with Broadcast Applications* for a description of this method of driving lattice structures. The drive point impedance at 1000 KHz was calculated to be 30.1 + j20.3.

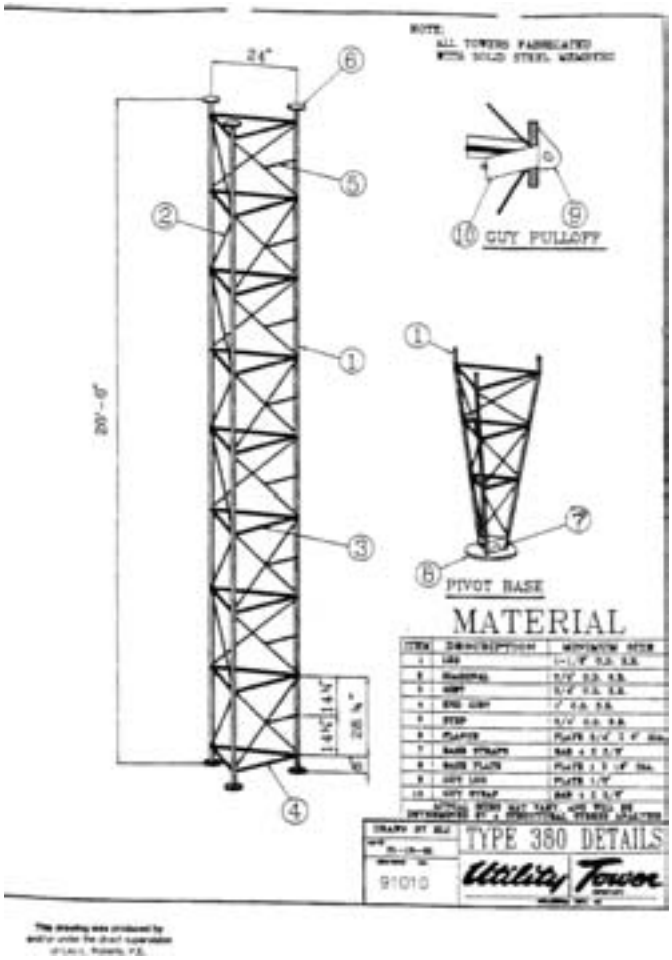

Fig. 1 – Utility Type 380 Specifications

The frequency was lowered successively to find the resonant frequency of the tower as indicated by a near zero reactive component of drive point impedance. The resonant frequency was determined to be 937.8 kHz where the drive point impedance calculated to be 31.422 + j0.0342. At this frequency the parameters are:

Free Space Wave length (λ) = 319.68 m
Electrical Height (G) = 360° × 75/319.68 = 84.46°
Velocity Factor (V_f) = 84.46°/90° = 0.938

b) The Thick Wire Model

Next a second model was defined that consisted simply of a single thick wire also of 75 meters height with a radius equal to that dictated by the FCC rules (i.e. $3F/2\pi$ where F is the face width of the triangular lattice tower). This gives the thick wire a radius of 0.2911 meters. The thick wire was divided into 17 segments to make the ratio (segment length/radius) on the thick wire nearly equal to that of the tower legs in the lattice tower. The thick wire model was driven on the bottom segment with an arbitrary voltage at the frequency 937.8 KHz. The drive point impedance thus calculated was 34.753 – j5.033.

The height of the thick wire model was varied based upon the assumption that adjusting the thick wire tower height such that the reactive component of its drive point impedance was zero would create the case where the thick wire model would also be resonant at 937.8 kHz as was the lattice model. With both tower models resonant, it would then be possible to calculate and compare the velocity factor of each model and thus gain insight into how NEC2 considers each model type.

The results of these height variations revealed that at a tower height of 75.851 meters, the thick wire model was resonant at 937.8 kHz with a drive point impedance of 35.95 + j0.0345. At this height, the parameters are:

λ = 319.68 m
G = 360° × 75.851/319.68 = 85.42°
V_f = 85.42°/90° = 0.949

Comparisons

The height of the resonant thick wire model (75.851 m) exceeded the height of the resonant lattice model (75.0 m) by only slightly more than 1%. This is significantly less than the 5 to 15% increases used to match calculated/measured self impedances in the FCC applications and certainly significantly less than the 25% allowed by the rules.

The calculated velocity of propagation on the lattice model (0.938) is only 1% less than that on the thick wire model (0.949) and thus cannot be considered a justification for increasing the model height to match calculated/measured self impedances.

Equivalent Radius

Of the several factors that affect self impedance, tower radius should not be overlooked. (See Figure 8-3(b) on page 112 of *Basic NEC with Broadcast Applications*.) The calculations used in MOM analyses use a thick wire cylindrical model whose radius generates a circumference equal to the perimeter of the physical tower ($a = 3F/2\pi$ for a triangular tower). That value was used in my book, *Basic NEC with Broadcast Applications*, following the reference in Morecroft's book, *Principles of Radio Communication*, last copyrighted in 1933, where it appears intuitively as a statement with no derivation. Apparently others have accepted the relation as well and it has been elevated to a requirement in the FCC rules. Our analytical ability has progressed since 1933, however, and we can now get a better view of the equivalent radius of a lattice tower by continuing the study started at the beginning of this article.

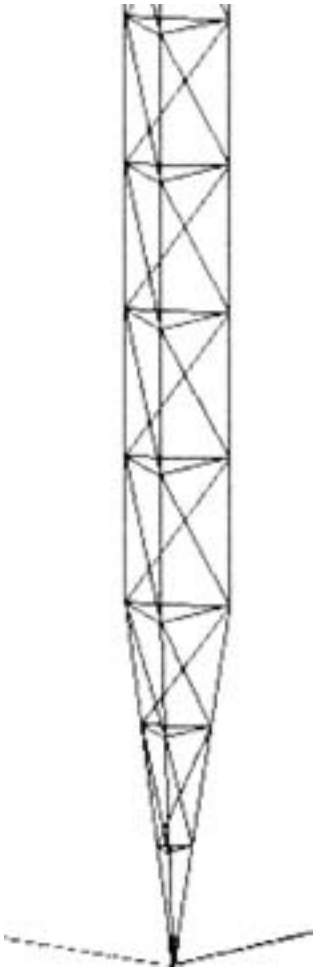

Fig. 2 – Lattice tower as modeled

Procedure (a) above finds the resonant frequency of the 75 meter lattice tower model to be 937.8 KHz. If we set the height of the thick wire tower model to be the same height as the lattice model, then adjust the thick wire radius until the thick wire model resonates at the same frequency as the lattice tower model, then we can conclude that the two models have very nearly equal radii. This was done and it was found that with a radius of 0.5885 meters, the thick wire model showed resonance with a self impedance of 35.9461 + j0.0341. This is 2.0216 times the radius dictated by the FCC rules for a 24" triangular tower. Therefore, it appears that a better approximation of the equivalent radius of a triangular lattice tower would be $a = 3F/\pi$. When this value is used, a much closer calculated/measured self impedance comparison is obtained. The reader is encouraged to consider using this larger radius value when making MOM calculations.

This author is indeed interested in seeing a justification for the $a = 3F/2\pi$ expression and welcomes correspondence to that end.

The Author

J.L. Smith is former Manager, Broadcast Systems Engineering, for Collins Radio Co. and is author of *Basic NEC with Broadcast Applications*. He is now retired and lives in Covington, LA.

Longley-Rice's Faulty Subroutines, Part 3: Log vs. Ln Confusion

By Sid Shumate, Givens & Bell

First, I want to thank everyone who took the time and went to the expense of attending my Longley-Rice tutorial on Oct. 14 at the 59th Annual IEEE-BTS Broadcast Symposium. We had a very good attendance despite the current hard economic times.

If you could not attend, but would like a mailed copy of the supplemental tutorial CD, send me an email at: sshumate@bia.com. The CD includes the tutorial slides, copies of all previous articles in this series, previous white papers and worksheets, and full written results of the Washington DC FM market demo comprehensive reception analysis in tabbed worksheet form, including results for both the full reception area and for within the protected area, and a map sampler for one station. If the full mapping Washington DC demo DVD is ready, I will include it also.

In this series of articles, we will continue with the details of the "fixes" for the Longley-Rice Irregular Terrain Model, the ITM, which were only mentioned in the tutorial. We continue with the easiest fix: in fact, one that does not have to be made! It is useful primarily to those who are attempting to study how the ITM works, and are attempting to study the source code, either the FORTRAN or c++ source code, by comparing it to the detailed formula references provided by George Hufford, now retired from the NTIA-ITS, in his three key sets of documentation for the ITM: [1] "A Guide to the Use of the ITS Irregular Terrain Model in the Area Prediction Mode", available at http://www.its.bldrdoc.gov/pub/ntia-rpt/82-100/index.php, [2] in "The Irregular Terrain Model, version 1.22, The Algorithm", itm_alg.pdf, and [3] "(The definitive representation of the) ITS Irregular Terrain Model, itm.pdf. The last two are available at: http://flattop.its.bldrdoc.gov/itm.html, where you can also access the source code. All are free downloads, and all three need to be printed out and open on the desk in front of you to compare and cross-reference the formulas and notes, (as well as having available both volumes of the Tech Note 101, also available for download from the NTIA) in order to understand the ITM.

One of the difficulties in comparing the source code to the documentation is that the use of logarithmic functions in the source code dates back to the 1960's, when FORTRAN did not have a logarithmic base 10 function. In FORTRAN 66 (which I learned as FORTRAN IV in 1973), the ln, or natural logarithm function, is implemented in the command ALOG. Later, by the time FORTRAN 77 came along in the late 1970's, the logarithm to the base 10 function, ALOG10, had been added. Today, in c++ code, it is implemented as the function command "log10". In c++, the ln function is confusingly implemented as the function command "log", following the old FORTRAN convention. To show how old the ITM source code actually is, all of the logarithm base 10 functions in the FORTRAN version are the old ln function, ALOG, multiplied by 0.4343, the conversion factor to convert results from the natural logarithm, ln, to the results from the logarithm base 10 function. This is also found in the c++ version, which was ported from FORTRAN long after the ALOG10 and log10 functions existed. To reduce confusion, for this discussion I will refer to log, the base 10 logarithm function, as $\log_{10}$, except when referring to the exact use in the NTIA documentation and source code.

Confusingly, in all of the above NTIA-ITS documentation except the source code, the formulas and references follow the convention in the original Tech Note 101 documents. This convention is to refer to the natural logarithmic function as "ln", which is ALOG and log in the source code, and to refer to "log" in the documentation formulas instead of log10, which should by now have been updated to reference to LOG10 (FORTRAN) and $\log_{10}$ (c++) in the source code.

The accuracy of the calculation is only slightly affected, as the accuracy of using log10 instead of 0.4343*log in c++ is only a little bit better for the purposes of the Longley-Rice software. And in applying the correction, one has to be careful to make sure that the conversion factor is in use, as the statistical calculations in the Longley-Rice ITM do use ln functions. I have implemented the updated functions in the new ITWOM source code. And knowing this simple fact, to look for the 10*0.4343 conversion factor, 4.343, and to know that 4.343*log should actually be 10*log10 in the c++ source code, certainly helps in trying to compare the ln or log functions in the documentation formulas to the source code. WARNING; also note that in at least one instance, the 0.4343 conversion is not on the same line of code as the ALOG or log function.

Knowing all this will prove useful in the next article, which will be far longer and more complex. In the next article, we go after the one difference between the FORTRAN and c++ source code versions. This will involve studying the most complex line of code in the c++ version of the ITM source code, a line found near the end of the *alos* subroutine.

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   Mr. Craig Todd CTO, Dolby Laboratories, USA
4. 3D-TV System Based on Spatial Imaging Method for Future Broadcasting
   Dr. Makoto Okui NHK Science and Technology Research Labs, Japan
5. 3D DMB: A Portable/Mobile 3D-TV System
   Dr. Namho Hur Electronics and Telecommunications Research Institute (ETRI), Korea

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ABSTRACT

An introduction to MPEG-4 AVC Technology
MPEG-4 AVC has now been adopted for Blu-ray discs and IPTV deployments, and is moving into more applications that are the bastion of MPEG-2 Video. This technical tutorial will give an introduction to MPEG-4 AVC, how it differs from MPEG-2 Video and how those differences achieve the dramatic bandwidth savings.

Video Compression Advances for Contribution & Distribution
This tutorial will discuss two recent advances in video compression for Contribution and Distribution applications. The concatenation effect of transcoding MPEG-4 AVC to MPEG-2 Video will be explored and the impact of bit-rate on each stage will be discussed. The MPEG-4 AVC Hi422 Profile (4:2:2 10-bit) will be explained and what benefits it will provide. Practical examples will be shown and discussed.

SPEAKER

Matthew Goldman
Matthew Goldman is Vice President of Technology for TANDBERG Television, part of the Ericsson Group. Mr. Goldman has been actively involved in the development of DTV systems since 1992. He was a prominent participant in the Moving Picture Experts Group where he helped create the MPEG-2 Systems standard. He served as project editor for the MPEG-2 DSM-CC standard, the control signalling used in video-on-demand systems, switched digital video, and for DTV data downloads and carousels. Committed to improving the Advanced Television Systems Committee DTV standards, Mr. Goldman was a co-developer of the Program and System Information Protocol (PSIP) standard. He also has been influential in other industry organizations including the SMPTE, SCTE, the ATIS IPTV Interoperability Forum and the Consumer Electronics Association. Mr. Goldman holds six patents related to digital video transport. He is a SMPTE Fellow, also a senior member of the IEEE.