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Broadcast Technology Society Newsletter

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

From the President

Bill Hayes, President, IEEE Broadcast Society

Greetings BTS members:

As I write this column, I have just returned from the National Association of Broadcasters Conference in Las Vegas. The topic that seemed to have defined this year's NAB was of course 3D. For better or worse, James Cameron's Avatar has opened a flood gate of 3D-mania. Content creators look at 3D as another tool to help tell their stories. Professional equipment manufacturers see developing and selling 3D technology for mass distribution channels like broadcasting as a key to their success. Consumer products manufacturers see 3D home devices as the next big thing in consumer electronics. There was an incredible amount of hype on the floor at NAB.

One of my roles as Director of Engineering for Iowa Public Television is to look at technology for use at my stations. It became very obvious to me in the earliest days of digital television that in order to do the job correctly, I needed to not just look at the technology that we would employ at the broadcast facility but I needed to become familiar with the technologies that would be used for distribution and the technologies that would be used by the consumers. Digital media is a complete and integrated system and the technologies all interact so changes anywhere in the system ripple thorough and may have unintended consequences so a complete understanding of the system is necessary.

On 23–26 March of this year I attended the IEEE-BTS International Symposium on Broadband Multimedia

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From the Editor

William Meintel, BTS Newsletter Editor

Let's start with some good news. The BTS continues to have great success with our Symposiums and Tutorials. The recently concluded IEEE-BTS International Symposium on Broadband Multimedia Systems and Broadcasting (BSMB) in Shanghai, China (24–26 March 2010) is reported to have been another huge success. I am told that the highlight of the Symposium was a guitar performance by our President Bill Hayes—but seriously—this Symposium has continued to grow each year. Please see the photo essay inside. Next year the BSMB is scheduled for 8–10 June 2011 in the Nuremberg, Germany area. In 2012 it will be held in Korea and in 2013 in London. Our congratulations go to the BSMB organizers and all who put in a great deal of work to make it a continued success.

The BTS followed up the BSMB with a great and timely tutorial "Audio Technology for Television" at NAB 2010 and then will present "3D TV:

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SAVE THE DATE
60th BROADCAST SYMPOSIUM
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Systems and Broadcasting in Shanghai, China. On the 23rd we presented 3D Television Workshop that drew a very large crowd as the tremendous interest in 3D is a worldwide phenomenon. The workshop started with a presentation by Dr. James Tan from the Communication Research Centre of Canada and was the one that interested me the most. Over the last few years I have attended a number of presentations on 3D technology. During this same time period, I have seen a number of 3D feature films and live broadcasts demonstrations. Most of the time I like to attend the events with my wife and friends who are not involved in the industry. Since my tendency is to focus on the technology and look for the flaws, it is great to have access to people who are attending just to see the content and to correlate my observations with theirs. Many times I find the details that I pick out to be insignificant and meaningless to the people just watching the show. In terms of the physics of the eyes, one of the interesting points that Dr. Tam illustrated was the disparity between how our eyes track objects in 3D space versus a 3D image on a screen. If you think about it, as you look around the real world and focus on objects on your desk, on the wall or out the window, there are two things happening. The actual point in space that you are mechanically focused on changes. At the same time, the relationship between your left and right eyes also changes as objects that are closer draw your eyes toward the center (your eyes become more crossed) and objects that are further away require that your eyes are less crossed. Since your brain has to control the muscles that are used to focus and orient your eyes, a relationship has been developed that tracks these muscle movements. On a 3D display, this relationship is broken because regardless where in virtual 3D space the objects that are in focus appear to you, the actual object that you are focused on (the display) never moves. I suspect this may be part of the reason why some people complain of headaches and nausea when watching some 3D content.

One of the other interesting items to consider when looking at 3D content is something a little more subtle. As I have said, I have seen a number of live action and animated 3D features. My experience from talking with non-expert viewers like my wife and friends has been that the live action content is much harder to watch in that it seems to cause more eye strain and fatigue and at times actually detracts from the story line whereas animated content puts less strain on the viewer. Given that the actual physics I

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Content, systems and visual perception" on Saturday 11 September 2010 at IBC 2010 in Amsterdam. The BTS has truly come a long way from our roots in the annual Fall Symposium held each year in the Washington, DC area.

Speaking of the Fall Symposium, it will be held this year at the Westin Hotel in Alexandria, VA (just outside Washington, DC) on 20–22 October 2010. Plans for the 60th Symposium are well underway and it looks like another outstanding program. From my prospective, one of the highlights of the program will be a special panel discussion covering spectrum allocation and management issues and is scheduled to include panelists representing the FCC, broadcasters, wireless providers and others. Items such as the National Broadband Plan and the Radio Spectrum Inventory Act (HR 3125) are on the agenda for this panel session. This session is tentatively scheduled for Friday 22 October from 3:15 to 5:45 PM. With all the concern about the impact of the FCC Broadband Plan on the future of television in the United States (see article on the FCC Broadband Plan inside) this promises to be a very "exciting" session.

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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
Winter, 2010	09 November 2010
Spring, 2011	20 January 2011
Summer, 2011	04 May 2011
Fall, 2011	20 July 2011

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The FCC National Broadband Plan – The Potential Impact on Television Broadcasting

By William Meintel, BTS Newsletter Editor

In early 2009, The United States Congress directed the Federal Communications Commission (FCC) to develop a National Broadband Plan to ensure every American has "access to broadband capability". On 15 March 2010 the FCC sent its plan "CONNECTING AMERICA – THE NATIONAL BROADBAND PLAN" to Congress.

The National Broadband Plan

The 376 page Broadband Plan submitted to Congress goes into great detail concerning the needs and benefits of broadband. Much of what is discussed would appear to relate to a "wired" service with statements such as "100 million Americans do not have broadband at home" and "Every American community should have affordable access to at least 1 gigabit per second broadband service to anchor institutions such as schools, hospitals and government buildings".

Although much of the purported needs and benefits could and probably should be met with a robust wired service, the Broadband Plan also attempts to make the case that a significant amount of additional spectrum needs to be made available for mobile broadband applications. The reasoning behind the need for the spectrum seems to be based on three assumptions. The first assumption is the growth of mobile telephone service will continue at the same rate as in the recent past, second a significant increase in demand for mobile internet related services and finally a need to support competition in each of these services. In other words there is a need for duplicate capacity to allow for competition. In addition to the reasoning behind the spectrum need, statistics are provided that purport to show that the television spectrum is significantly more valuable when used for mobile broadband than for its current use with the conclusion being that the continued use of the spectrum for television broadcasting is wasteful.

Additional Spectrum Needed

The Broadband Plan indicates that in order to accomplish its stated goals, 500 MHz of additional spectrum will be needed for mobile use by the year 2020 and that 300 MHz of the spectrum should be made available by 2015. The Broadband Plan further indicates that 120 MHz of the "required" preferably contiguous spectrum is to come from that currently allocated to television broadcasting, specifically the UHF portion of the band.

Currently television broadcasting in the U.S. occupies 49–6 MHz wide channels in three bands: 5 Low VHF (54–88 MHz), 7 High VHF (174–216 MHz) and 37 UHF (470–698 MHz; channel 37 – 608–614 MHz is reserved for radio astronomy). It is also noted that in some large metropolitan areas specific channels in the range 470–512 MHz (channels 14–20) are shared with the land mobile radio service and the Broadband Plan proposes for this sharing to continue.

The immediate implication of the Broadband Plan is that the number of channels available for television broadcasting would be reduced from 49 to 29 and the frequency range available for television broadcasting at UHF would be reduced from the current 470–698 MHz to 470–572 MHz. The Broadband Plan offers a number of proposals for freeing up the spectrum including allowing individual broadcasters to surrender their spectrum in exchange for compensation based on revenue derived from a spectrum auction. Other proposals call for existing stations to share channels, repacking the spectrum based on revised criteria for technical planning or some mixture of these proposals.

Impact

The impact of reduced television spectrum will of course be greatest in the large television markets where there will not be enough individual channels for all the existing stations. For all the stations in these markets to continue operation, sharing will be a necessity. When channels are shared, the number of services that can be provided diminishes and therefore the opportunities for high definition television, multiple program streams and mobile television would be greatly diminished.

UHF Band

The majority of the approximately 1,800 full service television stations in the United States currently operate in the UHF band with bulk of the remaining stations operating in the high VHF band. There are relatively few (about 40) full service stations operating in the low VHF band. Just as the Broadband Plan indicates UHF frequencies are prime spectrum for broadband, the same applies for mobile television. The longer wavelengths of VHF frequencies means significantly reduced efficiency when using small antennas that are compatible with handheld devices. In addition, the recently documented level of manmade noise in the VHF bands further diminishes their usefulness for mobile since it has proven to be a problem with indoor reception of current over-the-air television.

VHF Band

Therefore, the use of high VHF spectrum is likely to be problematic for handheld devices although mobile applications where larger antennas are practical could prove to be useable. However, low VHF spectrum is almost certainly not viable for handheld or mobile due to the noise levels that have made the

band problematic for current over-the-air television as evidenced by the few stations occupying the band and confirmed by extensive field measurements.

In addition to the challenges involved in using VHF spectrum for mobile and handheld service, there would also be a lack of sufficient bandwidth to transmit mobile video if stations attempt to maintain their existing program offerings when sharing channels. For mobile to be viable a sufficient number of services must be provided to entice users to invest in the needed receiving equipment. In view of the fact that the Broadband Plan proposes to take away 41% of the spectrum available for television broadcasting and 54% of the UHF spectrum, it seems unlikely that mobile could ever be viable for broadcasters or the content providers that would create programming for the mobile/handheld audience.

Secondary Services

So far this discussion has been focused on the future of approximately 1,800 full service television stations. There are, however, several thousand low power television stations, translators and boosters currently operating as well as countless wireless microphones users sharing the television spectrum. All of these would be threatened by what has been proposed in the Broadband Plan. With the need to repack the existing full service stations into 59% of the currently available spectrum, it is inevitable that many of these secondary services will be displaced. In this case, displaced almost surely means that most will no longer be able to operate because there will be no alternative spectrum available.

Spectrum Reallocation

The Broadband Plan gives some recognition to the potential impact of reallocating the spectrum but suggests that it can be mitigated by revision of the technical planning criteria. The Broadband Plan suggests that 36 MHz of television spectrum can be freed up by repacking alone and that further spectrum can be made available by redefining the technical criteria used to determine a station's service area. Although some spectrum might be reclaimed just by repacking, the purported 36 MHz seems extremely optimistic based on the experience gained in developing the original allocation plan for digital television and the more recent work on the final transition to digital. Even if the overly optimistic number is achievable, the cost to implement the repacking would be very significant and it falls significantly short of the stated need to reclaim 120 MHz from the broadcast band.

According to the Broadband Plan, redefining the technical criteria used to determine a station's service area also has the potential to free up spectrum. Although redefining the technical criteria has the potential to free up just about any amount of spectrum desired it should be noted that the current planning factors have evolved over several decades going back to the early days of television and continuing with a significant amount of new work during the digital transition. Therefore, any changes to the current criteria will only serve to increase the interference levels and reduce the level of service.

Reclaiming Spectrum

The Broadband Plan also suggests that significant spectrum could be reclaimed if some or all of the broadcast system was transitioned to a cellular architecture. Even if such a system is technically possible, and many believe it is not, the cost of implementation and operation has been shown to be prohibitive.

Are the Broadband Plan Proposals Voluntary?

Although it has been said that the proposals in this plan are voluntary, the Broadband Plan does not appear to indicate that. In fact it seems to indicate just the opposite with statements such as *"If the FCC does not receive authorization to conduct incentive auctions, or if the incentive auctions do not yield a significant amount of spectrum, the FCC should pursue other mechanisms. Through a rule-making proceeding, it should consider other approaches, potentially including:…"* The Broadband Plan also discusses the possible implementation of spectrum fees with the implication that if spectrum cannot be obtained otherwise then it might be possible to make it too expensive for the incumbents. From these statements it seems clear that this is anything but voluntary and the overwhelming impression is that the proponents have decided that the current over-the-air television system is no longer needed.

Commitment to a Wired Country

Many of the stated benefits of broadband are very worthwhile endeavors but much of what is discussed could best be implemented by a commitment to wire the entire country with high speed fiber. Although some additional spectrum may be needed to provide mobile connections to the wired network, the amount suggested seems excessive and the bands proposed may not be appropriate. A commitment to a wired country would be similar to the 1950's commitment to the interstate highway system and would likely yield similar benefits. Just as the highway system significantly improved the delivery of goods and services to every area of the country a wired nation would do the same for the delivery of data in whatever form it may take.

A commitment to wire the country would provide a significant number of jobs during the construction phase as well as for ongoing maintenance and operation. It could also provide a significantly higher bandwidth capacity than could ever be achieved by a wireless system.

Let Broadcasters Continue Implementing New Digital Services

Spectrum is a valuable and limited resource and its use needs to be

carefully considered. With that in mind broadcasters have an obligation to use theirs efficiently and maximize the services they provide. The transition to digital has given broadcasters a number of new tools that can be used to improve and expand the services they provide to the public. Many broadcasters and their content providers are just now ramping up to provide these services and they should be given the opportunity to do so before their spectrum is reallocated.

Note:

The views presented in this article represent the personal views of the author only. I want to thank my colleagues who reviewed and provided valuable comments for the article.

This article is intended to serve as a discussion piece about the potential impact of the National Broadband Plan on the spectrum assigned to television broadcasting. Your views are welcome. Please send your comments to me, Bill Meintel, Editor at william.meintel@mswdtv.com.

IEEE BTS BMSB-2010 Symposium in Shanghai, China was a Great Success!

By Yiyan Wu and Demin Wang, Communications Research Centre, Canada

The IEEE International Symposium on Broadband Multimedia Systems and Broadcasting 2010 (BMSB'2010) and a pre-conference 3D-TV Workshop were held 23–26 March 2010 in Shanghai, China.

The 3D TV workshop attracted an audience of about 120 people from many countries, which are much more than the planned 80 attendees. There were five well respected expert speakers:

Dr. James Tan, CRC Canada
Dr. Karsten Mueller, HHI Germany
Mr. Craig Todd, Dolby USA
Dr. Makoto Okui, NHK STRL Japan
Dr. Namho Hur, ETRI Korea

The workshop topics covered human visual perception studies, transmission format and coding, display technology, 3D-TV system, and portable/mobile 3D system.

This year's symposium was very successful, too. Despite the current economic conditions, we received 163 paper submissions from 22 countries and regions all-over the world. 100 papers were accepted. The paper rejection rate was about 40%. The number of conference participants were about 190. We also invited well-recognized industry leaders as keynote speakers and panelists, which included:

March Richer, President of ATSC, USA;

Ulrich Reimers, DVB Technical module Chair, Germany;

Peter Siebert, DVB executive director, Switzerland;

Craig Todd, SVP/CTO of Dolby laboratories, USA;

Toru Kuroda, Director of Broadcast Networks, NHK STRL, Japan;

Sangil Park, Next Generation Broadcasting, Korea Communications Commission

Tokumichi Murakami, Mitsubishi Electric R&D Center, Japan

Wenbo- Jiang, President of Academy of Broadcast Planning, China.

Wenjun Zhang, Vice President, Shanghai Jiao-Tong University, China;

The Keynote sessions and panel discussion were well attended.

Presentations were organized into 17 oral sessions and one poster session with 32 papers. Papers covered areas of mobile TV, IPTV, video coding and processing, 3D video, content protection, networking, field trials, channel coding and modulation, and quality evaluation.

Bill Hayes, President of the IEEE Broadcast Technology Society, also attended the symposium and workshop. At the request of our Shanghai hosts and volunteers, Bill entertained the audience by playing guitar at the Thursday night banquet. His talent was immediately recognized and Mark Richer, President of the ATSC, has formally asked Bill to form an "ATSC All-Star Band". If you are interested in joining, please contact Bill at Hayes@IPTV.com

We would like to thank the BMSB'2010 local host, Shanghai Jiao-Tong University, and student volunteers. They spent countless hours to make this conference successful. Special thanks to:

Lin Gui, Technical Program Committee (TPC) co-chair

Jian Xiong, TPC co-chair and Finance Chair

Xiao Gu, Publicity Chair

Lili Dong, Conference secretary and Logistic

Bo Liu, Demonstration Chair

Local student volunteers

The BMSB now is in its 5th year. It is highly successful and well recognized world-wide. A number of institutions have lined up to host future symposiums. The BMSB'2011 will be held in Nuremburg, Germany 8–10 June 2011 hosted by University of Ilmenau and Fraunhofer Institute of Germany. BMSB'2012 will be held in Korea hosted by Korea Communications Commission (KCC) and several universities. The BMSB'2013 will be held in London, UK hosted by Brunel University.

Photo Journalism of BMSB 2010 Symposium in Shanghai

By Kathy Colabaugh, BTS Senior Administrator

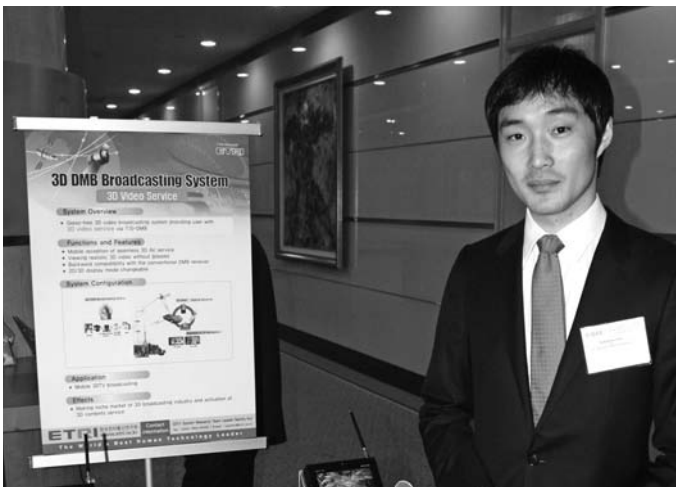
The 3D TV Workshop and Symposium were held at the Shanghai Conference Center and Hotel

The students from Shanghai Jiao Tong University were instrumental in the success of the 3D TV Workshop and the Multimedia Symposium

Things were a little frantic when the crowds appeared for the 3D TV Workshop registration

Wenjun Zhang, Vice President of Shanghai Jiao Tong University and BMSB 2010 Conference Chair, welcomes attendees to our Symposium and the city of Shanghai, China

There was standing room only during the well received 3D Television Workshop



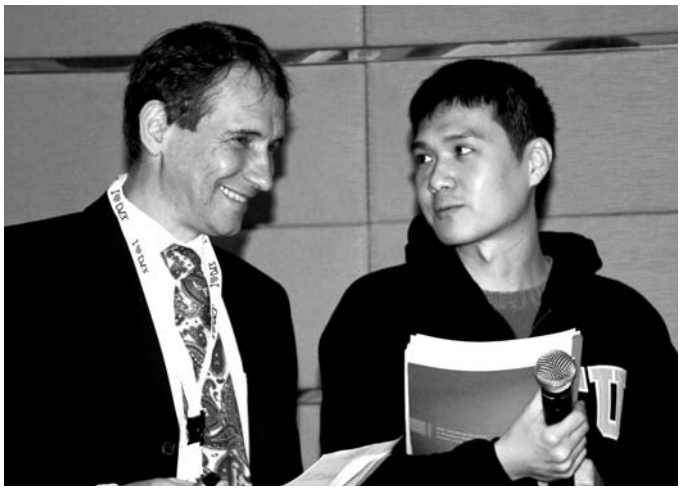
Kwangkee Jung from ETRI, demonstrates 3D images on hand-held devices

Our meeting rooms were set with precision!

The Registration Desk is now open. Special Thanks to Lin Gui, Lili Dong and the Shanghai Jiao Tong students for all of their hard work!

Technical Program Chair, Lin Gui, welcomes attendees to the conference

Registrants were treated to an opening ceremony performance, featuring traditional dress and music of an expert flutist



Peter Siebert, DVB Executive Director, prepares for the opening Plenary with the help of Shanghai Jiao Tong student, Liang Gong

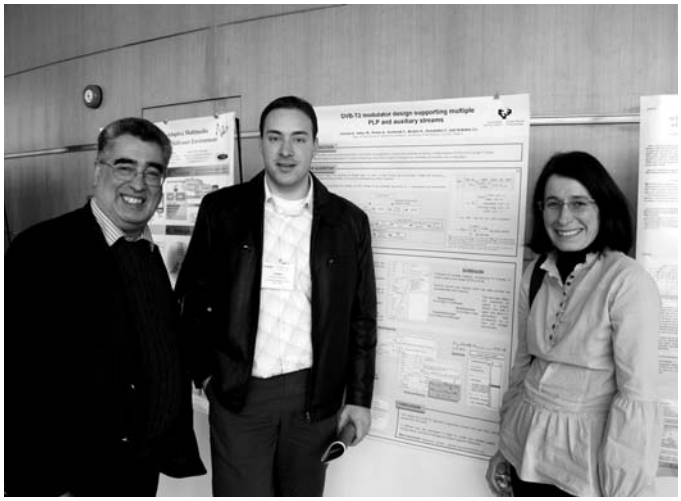
Coffee breaks create an excellent opportunity for Dirk Jaeger and Gérard Faria to network

Authors Lorena Martinez (Braunschweig Technical University) and Iñaki Eizmendi (University of the Basque Country) take a moment to relax between presentations

Hyoung-Soo Lim and Sung Ik Park of ETRI Korea enjoy the view of the Bund

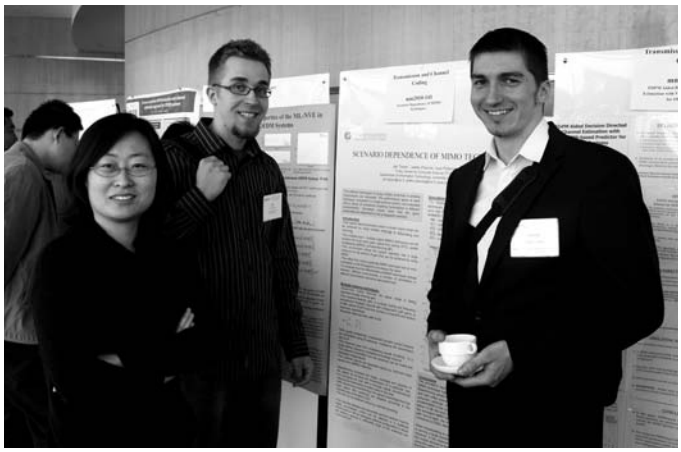
The well attended Poster Session was held in a brightly lit room overlooking the Huangpu River, and the Bund

Claus Bauer (Dolby Labs), Craig Todd (Dolby Labs), Peter Siebert (DVB) and Bill Hayes (BTS President) reconnect during the Poster Session



John Cosmas, Carlos Fernandez and Amaia Arrinda discuss new research

Olutayo Oyerinde and Peter Siebert discuss a poster. Special thanks to Olutayo for traveling all the way from South Africa to present his research!



Delegates from China, Finland and Germany discuss MIMO techniques

The Symposium Banquet was held at the Lao Shanghai restaurant. Beautiful table, good food and excellent company

A toast to our hosts for a wonderful event and meal

The evening began with an outstanding short performance of Chinese Opera. The actors facial expressions and costumes were priceless!

Conference Chair Yiyan Wu presents awards to the organizers of BMSB 2009 and BMSB 2010. (l–r) Amaia Arrinda, Lili Dong, Jian Xiong, Ruiqin Miao, Liang Gong and Pablo Angueira

BTS President Bill Hayes entertained the banquet attendees with his expertise on the acoustic guitar

Key organizers, Dignitaries, and Keynote Speakers were honored during the banquet

Lui Gui, Yiyan Wu, Ulrich Reimers, Wenjun Zhang, Wenbo Jiang, Bill Hayes and Ping-Jian Xia relax after a long day at the conference

Yiyan Wu was the moderator for the Panel Discussion "Technology Trends and the Future of Broadband Multimedia" (l–r) Yiyan Wu (CRC Canada), Wenjun Zhang (Shanghai Jiao Tung University, China), Sangil Park (Korea Communications Commission), Ulrich Reimers (Braunschweig TU, Germany), Mark Richer (ATSC, USA), Craig Todd (Dolby Labs, USA), Toru Koroda (NHK, Japan)

The GOLD (Graduates of the Last Decade) event was held in the revolving restaurant at the top of the Oriental Pearl TV Tower

The rotating restaurant offered fantastic views of Shanghai, and the pink glass cast a warm glow on our event

The GOLD event connects young researchers from all over the world

Students from Tianjin University, China and Shanghai Jiao Tong University have a lot in common

GOLD members and guests followed dinner with a fashion show performance, featuring costumes and dance from 5000 years of Chinese history

No visit to China is complete without a visit to a famous green tea farm. We learned how it was grown and processed, and even sampled some of the finest tea in China

The organizing committee enjoys a fantastic dinner at a traditional Chinese tea house

China is a country full of delicious food!

The group gathers to get back on the bus

The IEEE Broadcast Technology Society is pleased to present the folks that made BMSB 2010 such a success. We are lucky to have such dedicated members and volunteers!

Preview of the 60th Annual IEEE Broadcast Symposium

By Eric Wandel, Co-chair

The 60th Annual IEEE Broadcast Symposium will take place at The Westin Alexandria in Alexandria, Virginia on Wednesday, 20 October through Friday, 22 October 2010. The Westin Alexandria is a great home for the IEEE Broadcast Symposium and is a perfect location with ample meeting space, excellent hotel dining, reasonable cost rooms, and easy access either by a short walk from the King Street Metro station or by an easy shuttle ride from The Ronald Reagan Washington National Airport.

Under the direction of co-chairs Tom Silliman and Eric Wandel, the IEEE Broadcast Symposium program will once again emphasize broadcast transmission, interference and coverage, and digital implementation issues. In addition, special topics will include discussion of mobile television, military use of broadcast technology, and the politics, regulation and technology of spectrum allocation and management issues.

At a June 8th technical program selection meeting in Chicago, the nearly 70 proposed abstracts received were reviewed, sorted, categorized and reduced to the approximately twenty technical papers that were ultimately selected for inclusion in the Symposium. A special panel discussion covering spectrum allocation and management issues will include panelists representing the FCC, broadcasters, wireless providers and others. Items such as the National Broadband Plan and the Radio Spectrum Inventory Act (HR 3125) will be on the agenda for this panel session, which is sure to create some interesting and perhaps heated discussion. In addition, the program offers a full day of tutorials on FM IBOC transmission, broadcast standards and field test procedures. This Symposium is truly a top notch technical venue to hear about the latest advances in broadcast technology, presented by distinguished engineers and technologists from around the world.

Keynote speakers for the luncheons include Mr. James E. O'Neal, who serves as the technology editor for TV Technology magazine, , and Mr. James R. Martin, Director of Intelligence, Assistant Deputy Under Secretary of Defense for Intelligence, Surveillance and Reconnaissance (ISR) Programs.

At the joint luncheon with the Association of Federal Communication Consulting Engineers (AFCCE) on Thursday, Mr. Martin will travel from the Pentagon a few Metro stops away to speak about U.S. military application of technologies used by broadcasters. One technology of interest to Mr. Martin has been high resolution full motion video (FMV) capture, transmission, storage and intelligence gathering systems. His keynote on Thursday promises to be an enjoyable presentation on some very different applications of the broadcast technology that many Symposium attendees use every day for commercial applications, and how the military would like to further convert commercial technology successes to military use.

The Friday Awards Luncheon will feature Mr. James E. O'Neal, retired broadcast engineer with nearly four decades of experience in radio and television broadcasting and who began a second career as a technology editor and writer. If you have read Radio World or TV Technology magazines, you have likely found yourself engrossed in one of his many articles, which not only expose readers to current issues, but also provide interesting and sometimes unconventional twists on the normal implementations of broadcast technology. Mr. O'Neal has the ability to convey information on new broadcast trends and technologies with an interesting and historically grounded approach. We are very excited to have him keynote the awards luncheon for this historic 60th IEEE Broadcast Symposium.

As in the past, Continuing Education Units (CEUs) will be available with at least 2 units awarded for attendance. Importantly, the Symposium serves as an opportunity to network with top broadcast engineers, meet with old friends, and make new friends. Plan to attend the Wednesday evening Welcome Reception with music by the *Jazz Trio*. Also, the Thursday night Broadcast Manufacturers' Reception, which was very successful and popular among attendees last year, will take place in a larger room this year and promises to be another night to remember.

The preliminary technical program is available on the IEEE Broadcast Technology Society website. For details and on-line registration, please visit the IEEE Broadcast Symposium website at: www.ieee.org/bts/symposium

Please see prelim program on page 15.

From the Editor continued from page 2

In addition to this panel, a number of other very interesting topics are to be presented as well as what looks like three interesting luncheon speakers. There are entire sessions devoted to IBOC and ATSC Mobile. These are both hot topics at this time with the FCC recently authorizing a power increase for IBOC and user field trials of ATSC mobile taking place in the Washington, DC area while groups of broadcasters are banding together to plan major rollouts of ATSC mobile. As always this is a must attend event for those in the broadcast industry. If you have never attended, I highly recommend it as an outstanding learning experience as well as a great place to meet, network and discuss the topics of the day with some of the experts in our field.

In addition to the various Symposiums and Tutorials our technical publication, IEEE Transactions on Broadcasting, is in the process of putting together another special issue this one on 3D-TV Horizon: Contents, Systems, and Visual Perception. Thanks to Yiyan Wu, Editor-in-Chief, and his group of Associate Editors and authors the IEEE Transactions on Broadcasting continues to improve and has become a highly respected publication.

Our society has come a long way thanks to the leadership by President Bill Hayes, the BTS Officers and Administrative Committee (AdCom). With that thought, it is time for nominations to fill the expiring terms for some of those on our Administrative Committee. If you are interested in helping continue this great progress please contact me to learn how you can become part of the leadership.

Bill Meintel
Editor
wmeintel@computer.org

From the President continued from page 2

described above don't change based on the content, what is the difference? Partly I think the issue is that in real life we are able to perceive not only the distance in 3D space between objects but as we focus on objects that are closer, we can also perceive their actual depth. One of the comments I have often heard about live action is that the people seem to be flat or flatter than they are in reality. This gives them an unnatural look. In an animated feature, we recognize that we are not looking at reality so we do not have the same expectations about the objects. I suspect that somewhere in our brains, this recognition relaxes our visual system's rules and we are more tolerant of the discrepancies. We are therefore more comfortable with flat characters displaced in 3D space all appearing with in the same focal plane. This is just a theory and I would love to have a conversation with some experts in the field to really be able to explore this further.

One thing that is apparent however is that there is concern about some of this. People who go to 3D cinema presentations often have trouble during the early parts of the movie with eye strain, headaches and nausea. For most, the problems decrease as they spend more time watching the presentation. It appears that their visual systems and brains adjust to the discrepancies and they become more comfortable. It also appears that once they leave the virtual 3D world and enter back into the real world, their systems quickly restore to normal. However, there doesn't seem to be too much study done on the effects in the long term and on developing systems such as in children. One set manufacturer has a warning posted on its website telling viewers to stop watching 3D immediately if they experience: altered vision; lightheadedness; dizziness; involuntary movements such as eye or muscle twitching; confusion; nausea; loss of awareness; convulsions; cramps; and/or disorientation. The site lists a number of other recommendations and warnings, some potentially serious. I suspect that many of these concerns will need to be addressed if wide spread deployment of 3D technology is going to be successful.

Finally, while 3D was a hot item at NAB, it was not the only interesting topic. On Monday, 12 April the BTS conducted a tutorial entitled "Audio Technology for Television" that was particularly well received. It included presentations from Dolby, TC Electronics, Wohler, Linear Acoustics, Time Warner, Harmonic, NAB and a panel discussion that addressed two of the hottest topics related to audio in the digital world, loudness and audio/video synchronization. Dr. Yiyan Wu did an excellent job in putting together this panel of experts. The panelists and attendees had to deal with some very unexpected and sad news as the night before the session we received word that panelist Gerhard Stoll from the IRT passed away. Gerhard's contributions to the industry through his work at the IRT and his participation with the EBU, MPEG and AES are well known and he was honored with an Emmy Award for his contributions. I hope that you will join the people involved in the session and the members of the BTS AdCom as we express our sincere condolences to Gerhard's family, friends and colleagues. Please see Gerhard's obituary at the end of this Newsletter.

Bill Hayes
President,
IEEE Broadcast
Technology Society
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60TH ANNUAL IEEE BROADCAST SYMPOSIUM

20–22 October 2010
Westin Alexandria, Alexandria, VA USA

Preliminary Program
(Subject to Change)

Wednesday–20 0ctober 2010

Tutorial Day

Session Chairs: **Roswell Clark – Cox Radio, USA** and **David Layer – NAB, USA**

"FCC and NRSC Emission Mask Compliance Measurements for FM IBOC stations"
Greg Best–Greg Best Consulting, USA

"The Design and Use of the HD Radio Coverage Model"
John Kean, NPR Labs – National Public Radio, USA

"IBOC SFN Booster Design and Testing"
Russ Iannuzzelli, Russ Mundschenk – iBiquity Digital Corp., USA

"ATSC Mobile DTV 201: A Technical/Practical Tutorial"
Rich Chernock – Triveni Digital, USA

"Performance of Various Modes Defined by ATSC A/153 MDTV Standard"
Tim Laud – Zenith Electronics, USA

"Audio Processing Considerations for Mobile and Hand Held Digital Television"
Tim Carroll – Linear Acoustic, USA

"Mobile DTV 101"
Jim Ocon – Gray Television Group, USA

EVENING WELCOME RECEPTION

Thursday–21 October 2010

Radio Engineering (AM)

Session Chair: **Paul Shulins – Greater Media, USA**

"The Slant Wire Shunt Fed Monopole: A Neglected but Invaluable Technique"
Ben Dawson – Hatfield & Dawson Consulting Engineers, LLC

"AM Directional Antenna Parameters and Pattern Inversion Techniques"
Ronald D. Rackley, P.E. – du Treil, Lundin & Rackley, Inc, USA

"HD Radio Data Application–Now and Future"
Paul Brenner – Broadcast Traffic Consortium, USA

"The Lindenblad Antenna"
Manuel Sone – Shively Labs, USA

"Transmission System Solutions to Increase IBOC Power and Coverage"
Geoff Mendenhall – Harris Broadcast Communications, USA

Joint BTS/AFCCE Luncheon
Keynote Speaker: Jim Martin – Director, ISR Programs for USD (Intelligence), USA
"DoD Info Broadcasts; Status and Trends"

ATSC Systems (PM)

Session Chair: **Christine DiLapi – The Mitre Corporation, USA**

"Technical Feasibility of Single Frequency Networks for the ATSC DTV Signal"
Oded Bendov – Consultant, USA and Mark Aitken – Sinclair Broadcast Group, USA

"Watermarking ATSC Terrestrial DTV Broadcasting Signals with a Low Rate Channel Coded Data"
Wangrok Oh – Chungnam National University, Korea

"Field Test Study on Location Finding using ATSC Mobile DTV Signals"
Bo Rong – Communications Research Centre CA, Canada

"ATSC Receiver Behavior in a Single-Frequency Network Environment"
Yiyan Wu – Communications Research Centre CA, Canada

"Design Realities for Fixed, M/H, and "All-SFN" Single-Frequency Network Applications – Reprise"
S. Merrill Weiss – Merrill Weiss Group LLC, USA

MANUFACTURERS RECEPTION

Friday–22 October 2010

DTV Transmission I (AM)

Session Chair: **Doug McCabe–Jampro, USA**

"An Empirical Comparative Study of Prediction Methods for Estimating DTV Signal Scattering from Wind Turbines"
Itziar Angulo – University of the Basque Country, Spain

"Variable Polarization Technology (VPT)"
Jay S. Martin – Radio Frequency Systems, USA

"Post Analog Cutoff-Adventures in DTV"
Jim DeFilippis – FOX Technology Group, USA

"Brazilian Digital Public TV Network"
Gunnar Bedicks – Mackenzie Presbyterian University, Brazil

"Performance Evaluation of HDTV IP Transmission System Adapting to Available Network Bandwidth"
Shuhei Oda – Japan Broadcasting Corporation (NHK), Japan

"CBC's Next Generation Converged Network"
Pascal Marcoux – Radio-Canada, Canada

BTS AWARDS LUNCHEON
Keynote Speaker: James O'Neal – Technology Editor, TV Technology
"Making and Modulating RF: A Brief Look at 100 Years of Transmitter Evolution"

DTV Transmission II (PM)

Session Chair: **Joe Giardina–DSI RF Systems, Inc, USA**

"A New Method of Terrestrial 3DTV Broadcasting System"
Wonseok Baek – Korea Communications Commission, Korea

"Update on Advanced TV"
Rich Chernock – Triveni Digital, USA

Panel discussion on Spectrum Issues related to the FCC's Broadband Plan,
with presentations by Panelists
Moderator: Charles Cooper – du Treil, Lundin & Rackley, Inc., USA

Confirmed Panelists include:
Bill Meintel – Meintel, Sgrignoli & Wallace, USA

Nominate a Colleague for IEEE Fellow, Class of 2012

Deadline March 1, 2011

The IEEE Fellow is a distinction reserved for select IEEE members whose extraordinary accomplishments in any of the IEEE fields of interest are deemed fitting of this prestigious grade elevation.

Election to IEEE Fellow grade is one of the highest honors that can be bestowed upon an individual by the Institute. One tenth percent of the total IEEE voting membership, excluding Students and Associates, may be elected each year.

Nominations for the IEEE Fellows Class of 2012 are now being accepted. Nominate a colleague, co-worker or friend whose career and body of work you consider eligible for elevation to the IEEE Fellow Grade. Online application is available as are all the forms you may need. Deadline date is 01 March 2011.

We invite and encourage you to nominate candidates for the grade of

IEEE Fellow, by going to www.ieee.org/fellows

Whatever their careers, candidates must have made an outstanding contribution to the electrical and electronics engineering profession. Candidates from any field, including academia, government, and industry, may be nominated if they meet the following requirements at the time the nomination is submitted: 1) candidate must be an IEEE Senior Member; 2) candidate must have completed five years of service in any IEEE grade (Note: IEEE Affiliate membership does not apply; and 3) candidate's membership dues must be paid in full.

Any person is eligible to serve as a nominator with the following exceptions: members of the IEEE Board of Directors, members of the IEEE Fellow Committee, IEEE Technical Society/Council Fellow Evaluating Committee Chairs, members of IEEE Technical Society/Council Evaluating Committees (only if a nomination will be reviewed by their committee) or IEEE staff.

Before you Submit an IEEE Fellow Nomination Form

As a nominator, you initiate the process to nominate a colleague who has made outstanding contributions to the advancement or application of engineering, science and technology. The first thing you need to do is fill out a nomination form. The process of completely the form is not an easy task. You need to check and see if the nominee meets all the requirements, assemble the names of the individuals who will be supporting the nomination and then explain why the nominee's contributions are worthy of this honor. It is a lot of work. So give yourself plenty of time to do it right. To avoid mistakes, use the below checklist prior to your submission.

1) **Meet the deadline.** All forms (nomination, reference, endorsement) must be received no later than 1 March 2011. Keep in mind, when you complete a nomination form and submit it very close to the deadline that References and Endorsers need time to complete their form. Waiting until the last minute is not a good idea.
2) **Use current forms for the nomination process.** Unfortunately, there are times old forms are submitted, and they cannot be accepted. We strongly encourage you to use the Online Nomination Process. This way there is a guarantee that all the forms (nomination, reference, endorsements) are current.
3) **Make sure the nominee is eligible for nomination.** The nominee must be an IEEE Senior Member or IEEE Life Senior Member in good standing (dues must be current) and who has been an IEEE member for five years or more preceding 1 January of the year of elevation. Don't assume that your colleague holds the correct member grade, that he/she is in good standing, or has met the minimum requirement for membership years. All forms are checked thoroughly and the ones that do not meet the requirements are not accepted. We verify the actual date that the nominee joined IEEE versus the years of service noted on the IEEE membership cards; system validation counts by date joined!
4) **Know how to spell the nominee's name.** Many times the nominee's names are misspelled and the first and last name are transposed. Pay special attention to international names with special characters and/or names that are hyphenated. This can cause problems later on in the nomination process. Our system validates the nominee's name against our IEEE membership database.
5) **Check references eligibility.** A reference must be an IEEE Fellow or IEEE Life Fellow in good standing with an exception for Region 9 (Refer to instructions for explanation). In addition, verify that your references do not currently serve on Boards or Committees that would make them ineligible to support the nomination. We strongly encourage you to solicit the maximum of 8 references rather than 5. This way you have a stronger chance of fulfilling the reference requirement in case some references do not qualify.
6) **Listing endorsers on the nomination form.** When entering a name of an endorser, input the last name, first name and e-mail address in the appropriate fields. If entering the name of a society, corporation, chapter or region, input the information in the "organization name" field and leave the "first name" field blank, then enter the e-mail address for the contact issuing the endorsement.
7) **Entering e-mail addresses.** Input_only "one" e-mail address for references and/or endorsers. Entering multiple e-mail addresses causes system errors.
8) **Nominees who are "self-employed" or "retired".** Do not enter anything in the "organization's name" field.
9) **Proposed Citation.** This should always begin with the word "FOR", e.g. for contributions to…; for the development of….
10) **Printable version.** Prior to submitting the nomination form, remember to hit the printable version button and print a copy of the completed nomination form for your records.

To nominate a Senior or Life Senior Member for IEEE Fellow, please visit the Fellow Web site at http://www.ieee.org/fellows

Report on Committee on Man and Radiation (COMAR) Activities for the BTS 2010 Summer Newsletter

Eric R. Wandel, Broadcast Technology Society Liaison to COMAR

Introduction

The Committee on Man and Radiation (COMAR) is a committee of the IEEE Engineering in Medicine and Biology Society. The IEEE Broadcast Technology Society (BTS) participates in COMAR activities through a liaison relationship which has been active for many years. Until recently, Jules Cohen served as the appointed BTS liaison to COMAR. Jules provided years of expert and professional representation of BTS in this role, and his level of knowledge and proficiency cannot be replaced. When Jules retired in 2009, I was appointed to the position.

The Committee on Man and Radiation (COMAR) is a group of experts on health and safety issues related to electromagnetic fields, from power line through microwave frequency ranges. Richard A. Tell is currently the Chair of COMAR. Additional information can be found at: http://ewh.ieee.org/soc/embs/comar.

COMAR is a Technical Committee of the Engineering in Medicine and Biology Society (EMBS) of the Institute of Electrical and Electronics Engineers (IEEE). It reports to the EMBS President and Administrative Committee.

COMAR's primary area of interest is biological effects of non-ionizing electromagnetic radiation. It examines and interprets the biological effects and presents its findings in an authoritative manner, usually in Technical Information Statements (TIS's) or Position Papers. These papers are subject to an extensive review process within the Committee and represent the consensus of the Committee.

COMAR does not establish safety standards, but it has an interest in the standards activity within its scope.

This article reviews activities of the Committee on Man and Radiation (COMAR) during the last year.

Recent COMAR Activities

In the past couple of years, COMAR has addressed the so-called BioInitiative Report (BIR) which was released on the Internet in 2007. In 2009, COMAR submitted commentaries about the BioInitiative Report in the form of a letter to the President's Cancer Panel (PCP) as well as in the form of a Technical Information Statement for journal publication.

COMAR prepared and sent a letter on 14 July 2009, to the President's Cancer Panel (PCP) regarding use of certain information presented to the PCP by representatives of the BioInitiative group. As stated in the opening of this COMAR letter: "The Committee on Man and Radiation (COMAR) wishes to express its concerns regarding the information on radiofrequency (RF) exposure and cancer in the Summary of the President's Cancer Panel. COMAR is concerned that the Summary does not provide a balanced and objective analysis of the currently available scientific and medical evidence describing the association of RF exposure and tumor development. Many statements in the Summary are derived from the BioInitiative Report (BIR), a report that has been characterized by international public health organizations as lacking scientific objectivity in its analysis of the published research data. COMAR's judgment is that the Summary is not consistent with current scientific consensus on the carcinogenic potential of RF energy."

In a reply letter dated 22 July 2009 PCP Executive Secretary Abby B. Sandler, Ph.D. acknowledged receipt of the letter stating that the "information you have provided regarding the scientific objectivity of the BioInitiative Report will be considered during the writing of the upcoming annual Panel report." It appears that the PCP refrained from using the BIR information as a scientific source for recommendations within the annual report that was finally released in 2010.

A Technical Information Statement by COMAR – "Expert Reviews on Potential Health Effects of Radiofrequency Electromagnetic Fields and Comments on the BioInitiative Report" – was published in the scientific journal Health Physics, Volume 97, Number 4, October 2009 on pages 348–356. A copy of this Statement was also provided to the President's Cancer Panel.

As stated in the abstract of the Statement in Health Physics, "The public interest in possible health effects attributed to RF energy, such as emitted by mobile phones, wireless telephone base stations, TV and radio broadcasting facilities, Wi-Fi systems and many other sources, has been accompanied by commentary in the media that varies considerably in reliability and usefulness for their audience. The focus of this COMAR Technical Information Statement is to identify quality sources of scientific information on potential health risks from exposure to RF energy. This Statement provides readers with references to expert reports and other reliable sources of information about this topic, most of which are available on the Internet. This report summarizes the conclusions from several major reports and comments on the markedly different conclusions in the BioInitiative Report."

The abstract concludes with, "COMAR concludes that the weight of scientific evidence in the RF bioeffects literature does not support the safety limits recommended by the BioInitiative group. For this reason, COMAR recommends that public health officials continue to base their policies on RF safety limits recommended by established and sanctioned international organizations such as the Institute of Electrical and Electronics Engineers International Committee on Electromagnetic Safety

and the International Commission on Non-Ionizing Radiation Protection, which is formally related to the World Health Organization."

A COMAR meeting was held at the FDA Silver Spring campus in January 2010 in conjunction with International Committee on Electromagnetic Safety (ICES) Technical Committee (TC)-95 meetings. The purpose of TC-95 is "Development of standards for the safe use of electromagnetic energy in the range of 0 Hz to 300 GHz relative to the potential hazards of exposure of man, volatile materials, and explosive devices to such energy. It is not intended to include infrared, visible, ultraviolet, or ionizing radiation. The committee will coordinate with other committees whose scopes are contiguous with TC-95."

IEEE Transactions on Broadcasting Continues Reaching New Heights among Technical Journals

By Yiyan Wu, Communications Research Center, Canada

The BTS is pleased to announce that its flagship publication, the IEEE Transactions on Broadcasting achieved a substantial gain by attaining a ranking of 7 as measured by its Impact Factor when compared to 76 Telecommunications Journals worldwide as reported by the 2009 Journal Citation Report.

Below, the trend gain by the Transactions in Broadcasting can be seen for the past eight years as measured by impact factor against all Telecommunications Journals.

Year	2009	2008	2007	2006	2005	2004	2003	2002
Ranking	**7**	13	16	11	14	20	33	20
No. of Telecom Journals	**76**	67	66	59	59	57	56	53

In addition the IEEE Transactions on Broadcasting advanced to an impressive ranking of 33 among 245 Electrical Engineering Journals worldwide. Below, the constant improvement can be seen for the past eight years.

Year	2009	2008	2007	2006	2005	2004	2003	2002
Ranking	**33**	65	77	54	61	92	139	103
Total No. Journals in EE	**245**	226	227	206	208	209	205	203

Journal Impact Factor

The above rankings for the IEEE Transactions on Broadcasting, measured relative to other Telecommunications and Electrical Engineering Journals, is based on the Impact Factor which is determined by the Journal Citation Report for 2009, a product of Thomson ISI (Institute for Scientific Information). JCR provides quantitative tools for evaluating journals. The impact factor is one of these; it is a measure of the frequency with which the "average article" in a journal has been cited in a given period of time.

The Impact Factor is very important for research and academic institutions. It is also used to evaluate the research works and projects by many government organization and agencies.

The Impact Factor for the IEEE Transactions on Broadcasting for 2009 is 2.242. Its upward trend in Impact Factor and number of citations during the past eight years can be seen in the table below.

Journal Impact Factor and Total Citations

Year	2009	2008	2007	2006	2005	2004	2003	2002
Impact Factor	**2.242**	1.673	1.102	1.235	1.213	0.702	0.423	0.556
Total citations	**1317**	1168	526	514	364			

The BTS is proud of the quality papers and continuous improvement of the IEEE Transactions on Broadcasting with each issue published. The success of this Journal is due to the outstanding leadership and dedication of Yiyan Wu, who has served as its Editor-in-Chief since 2004. In addition, its success is due to an impressive group of hard working Associate Editors, Reviewers and the IEEE BTS Office Administration and Publications Support Staff.

Other factors which added to the Transactions on Broadcasting to reaching higher levels of excellence and recognition is due to the fact that this Journal has shorter submission to publication time for papers. The Transactions on Broadcasting also has published several special issues on high interest technical topics for industry, research and academia.

In addition, the Transactions on Broadcasting has successfully completed an in-depth, comprehensive five year review by the **IEEE Technical Activities (TAB) PERIODICALS COMMITTEE PERIODICALS REVIEW AND ADVISORY COMMITEEE (PRAC).**

All members of the BTS can be proud of its Transactions on Broadcasting journal which serves as a valuable reference for industry professionals, researchers and academia. We look forward to its continuing improvement in future issues and special publications.

Ralph Hogan

Chair, BTS Education Committee and Membership Development Committee

A BTS Member Profile

By Jennifer Barbato, BTS Publications/Newsletter Coordinator

The BTS takes great pleasure in introducing Ralph Hogan, AdCom member, who is serving as Chair of BTS Education Committee and Chair of the Membership Development Committee.

Ralph has been a member of the IEEE for over 40 years and a member of BTS for 33 years. He has served on many of the Broadcast Technology Society and IEEE Section committees over those years. Ralph has not only generously volunteered his time for BTS, but he has also been a member of the Society of Broadcast Engineers for 20 years and is currently serving as Vice President for the 2009–2010 term. In addition, he serves as President of the Association of Public Radio Engineers.

An Early Interest in Engineering

Ralph was born and grew up in New Orleans, Louisiana. He became interested in technology at a very young age since his father owned an electronics repair business servicing radios and TVs. Ralph said he had "many opportunities to take apart electronic devices down to their component parts to see what was inside and how they worked."

In high school, Ralph had a strong interest in science and technology. He took classes in advanced math and physics as elective courses, which he said, prepared him for pursuing an engineering degree in college. Ralph earned his B.S. in 1971 from Louisiana State University in New Orleans, LA. Since graduation, Ralph continues to take courses in engineering and management to maintain and upgrade his professional skills.

Ralph presently serves as Associate General Manager of the Phoenix cable station MCTV, NPR Radio stations KBAQ FM/KJZZ FM, and Sun Sounds of Arizona Radio Reading Service at Rio Salado Community College, Tempe Arizona.

Interesting projects

Ralph has worked on many interesting projects since he started his career in broadcast engineering. In 1983, he installed public radio's first touch screen capable master control system and enabled it to be remotely controlled from an alternate studio located five miles distant. In 1999, he directed a project to investigate the feasibility of building an Advanced Digital Distribution Entity for distribution of television programs throughout the Pacific

Ralph Hogan

Northwest US region by using a single master control system located in a central facility. Then in 2004 he developed a virtual master control system for Northwest Public Radio, located in Pullman, Washington State, where the Pullman facility provides programming, which is uplinked in Denver, Co to thirteen transmitters in the NWPR network. Discrete non-real time content is distributed on a data channel via the uplink, then played locally at each of the networks transmitter sites on a time-scheduled basis.

When Ralph was asked what he most enjoys about his engineering career, he stated "the satisfaction of designing and building broadcast facilities and systems that utilize new or innovative technologies".

Ralph currently serves in leadership positions with a number of national and international organizations representing broadcast engineers. In particular, he is actively leading efforts to provide education and training for SBE members so they can stay current in the vast and ever changing world of broadcasting. Ralph stresses the importance for today's broadcast engineers that they not only need to know how to keep a station on the air, but they need to know all components of the workplace, which can include maintaining and repairing equipment, budgeting, purchasing, planning, programming, etc. He assiduously works with SBE to continue to expand its membership base and educational workshops in support of these efforts.

Other Activities

Ralph has a personal interest in many activities, which promote engineering careers. He particularly enjoys participating in career fairs at high schools talking with students and encouraging them to intern at broadcast facilities while attending college and technical schools. In his spare time, Ralph camps and spends his time outdoors.

Looking to the Future

Ralph believes that continuing education is a critical requisite in today's environment. His passion for education has led him to assume the Chair of the BTS Education Committee through which he is actively exploring ways to improve and develop lifelong education and technical information services for its members to assist them in advancing their careers. In addition, Ralph notes, "By offering BTS workshops and tutorials at IBC, NAB, and our international symposiums, we

provide many opportunities to attract new engineers to the BT Society."

Ralph has taken a lead role in developing a major BTS education project "Bridging the Broadcast/IT Gap." Its goal is to create specialized courseware which will be taught in a two day course and also provide online modules for self study. He states, "this product addresses the industry identified, universal need to bridge the knowledge gap between engineers in the broadcast technology and Information technology fields of work."

The BTS is proud to have Ralph Hogan lead its Education and Membership Development initiatives to improve and expand our Society's technical services for our members. If you interested in having more information, or want to offer recommendations or would like to serve on the BTS Education or Membership Development Committees, please contact Ralph Hogan at rhogan@ieee.org

Interest Continues in Uncovering Television's Past

By James E. O'Neal

Hilliard, Ohio

Mobile DTV and 3D television didn't make the program this year, but the items that were on the agenda at the annual Early Television Foundation (ETF) conference drew as much or more attention from the attendees at this eighth such gathering of television historians.

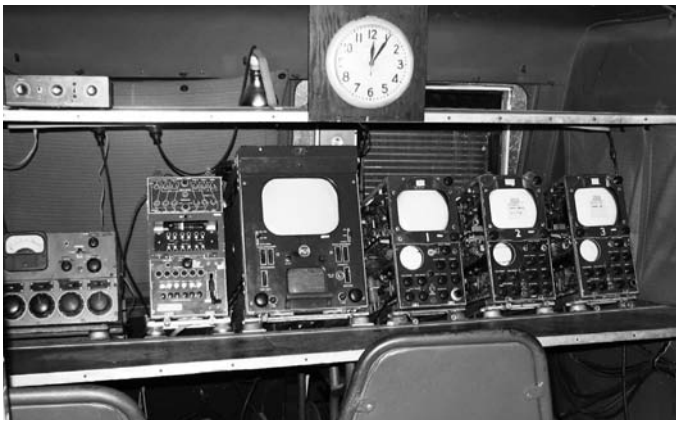
The three-day event is organized by Steve McVoy, founder of the Early Television Museum, and this year attracted more than 100 persons from the United States and abroad. McVoy explained that the event provides those with more than just a passing interest in the long technological path leading to today's high-definition TV imagery and its influence on society with a chance to exchange information, meet each other face-to-face and show off items from their collections of television artifacts.

Television Cameras, 1939-Style

One highlight of the conference was the display of two early iconoscope television cameras – one branded with the NBC-RCA logo (complete with lightning bolts to signify broadcasting) and another branded as experimental. It's believed that

This 1948 model RCA television remote truck was a familiar sight at many outside broadcast events. This particular vehicle saw service into the 1970s and is still equipped with three RCA image orthicon cameras and a tube-type microwave transmitter. It is on display at the ETF Museum.

These two iconoscope cameras were on display at this year's Early Television Foundation conference. They date from the late 1930s and at least one is believed to have seen service at the 1939–1940 New York World's Fair.



The operating position inside the remote truck is very Spartan when compared to today's mobile production vans. Thousands of hours of television originated from this equipment during the truck's active life.

This RCA model TT-25A (L/H) high-power television amplifier was a familiar site in many transmitter buildings in the 1950s, and was used well into the 1980s by some broadcasters. It could provide up to 25 kW and was referred to by some as a "Franklin stove" due to its unique shape. The amplifier is part of a complete RCA television transmitter on display at the ETF Museum.

both saw service at the 1939–1940 New York World's Fair, an event marking the start of regular television broadcasting in the United States. A very early RCA television field strength meter used in the early field testing of television signals was also on display, along with dozens of U.S. and British TV receivers from that period.

Attendees also got to view a working example of an unusual 1965 vintage Mitsubishi color television receiver that did not use a conventional tricolor CRT. The production model receiver was constructed around three 9-inch monochrome tubes optically multiplexed together with dichroic mirrors to provide a full color NTSC image. Despite a rather narrow viewing angle and some spotting of the dichroics due to age, this 45-year-old set provided very bright and clear images. Its physical size too was a topic of interest, as it was designed to fit within the tight confines of typical Japanese living quarters and was a far cry from its bulky triniscope ancestors used by RCA to display compatible color television in 1950.

Although RCA produced a great deal of early television broadcast gear, it was not the only manufacturer. This image orthicon camera was manufactured by General Electric. The design dates from the late 1940s.

Getting the Colors Right

Presentation of papers dealing with early television topics are an important part of the conference, with half a day reserved for this. This year's topics ranged from modern day replication of the color filters used in the 1940s/1950s CBS field sequential system to a cradle-to-grave history of a 1948 vintage RCA television remote truck use by a small market broadcaster.

Collector and historian Cliff Benham described his ongoing experiences in finding suitable replacements for the red/blue/green Kodak Wratten filters used in the 1950 color receivers produced by CBS's Hytron division.

"The original filters are now 60 years old and they have faded", Benham said. "You can't make a comparison because of the fading. The Wratten filters are also very, very expensive now. You would be spending $2,300 for the filter material (to refurbish a color wheel)".

Benham described his efforts to use present-day theatrical lighting gel samples and a colorimeter to develop economic replacements for restoration of surviving early mechanical color sets.

CRTs for 56-Year Old Color Sets

One of the hottest topics was an update of the efforts to rebuild 15GP22 cathode ray tubes. This CRT was developed by RCA for use in their CT-100 receivers and was the first color cathode ray tube made in production quantities. In addition to the first RCA color set, it was also used by virtually all other manufacturers of NTSC color receivers until larger tubes could be developed. The 15GP22 hasn't been produced for nearly half a century, and most of the tubes that survive have lost their vacuum due to leaks in the extensive glass-to-metal seal employed in their fabrication. By comparison, a relatively large number of first-generation color receivers exist in the hands of collectors, but restoring the sets to working condition is impossible without operational 15GP22s.

Several restorers have been involved in a long-term project to successfully rebuild this CRT, but success has been very elusive. The rebuilding task is made even more difficult due to the use of a non-standard electron gun and basing/stem arrangement. (Dynamic convergence of the 15GP22 was achieved electrostatically through the use of internal convergence electrodes

These three sets are among the first NTSC color television receivers ever produced and all have been restored to working condition. On the left is RCA's model 5 pre-production set. Only four are known to exist. In the middle is the Westinghouse H840CK15 receiver. It premiered in early 1954 and sold for $1,295. The RCA CT-100 on the right was released almost a month after the Westinghouse set entered the marketplace. The price tag was $1,000. All three sets used the same 15-inch tri-color kinescope made by RCA.

This early NBC logo appeared on one of the iconoscope cameras on display at the ETF Conference. In the 1930s, lightning bolts were used to signify both radio and television broadcasting. Curiously, this NBC logo contains some of the elements used later in the CBS "eye" television logo that was first used in 1951.

in the tube's gun structure. A user control was provided for adjusting the convergence in this fashion. Later color CRTs replaced this electrostatic convergence system with electromagnetic convergence adjustments, eliminating the convergence electrodes and user adjustment)

Many first-generation color sets using such CRTs await replacements. This has necessitated a fairly extensive privately funded R&D effort by those trying to replicate the gun and stem assemblies in the 21st century from the rather meager surviving 1954 production information. Two of the individuals most involved in this effort are John Folsom and Bob Galanter. Galanter brought attendees up to date on this research effort, which has involved a number of technology companies and skilled individuals.

Galanter reported that while the special stem has been successfully replicated, efforts to process the re-gunned 15GP22s have been unsuccessful. Air leakage around the glass-to-metal interface at the front of the tube has caused several failures, and in one case, the high temperatures involved in processing the tubes before vacuum seal-off caused the CRT's inner glass substrate (upon which the color phosphor triads were deposited) to crack. Folsom and Galanter have even enlisted mass spectrometer technology to try and solve the air leakage problems. (The complete report is available at http://www.earlytelevision.org/15GP22_rebuild_report.)

Jerome Halpen, who represents the French firm RACS, also spoke about that company's efforts to rebuild satisfactory 15GP22 CRTs. He brought along a reworked example that had been holding vacuum for several weeks. It was installed in one of the Museum's 1954 color receivers and performed satisfactorily for the duration of the conference.

The Early Television Foundation ETF was established in 2000 by Steve McVoy after he retired from the cable television business. McVoy started collecting early television receivers as a hobby and his collection soon outgrew his living space, leading to the creation of the Early Television Museum in Hilliard, Ohio, a suburb of Columbus. At the suggestion of fellow television collectors, McVoy organized the ETF conference a few years later. It has now grown into a three-day event.

The Early Television Museum is open to the public on a scheduled basis, and contains some 300 television artifacts, including about 40 pre-war television receivers. Complete information, as well as photographs of some of the items in the collection can be obtained at the organization's Web site, http://www.earlytelevision.org/museum_information.

Additions to the museum's collection in recent years include a complete RCA TT-5 VHF transmitter and its outboard RCA 25 kW linear amplifier. There's also a 1947 RCA television remote truck with vintage tube-type image orthicon cameras and microwave transmitter.

About the Author

James E. O'Neal is technology editor at TV Technology Magazine. He is a member of the IEEE, SMPTE and SBE. James is a graduate of the University of Arkansas.

Acknowledgement

BTS Argentina Chapter

By Valentino Trainotti, Chair

On 28 May 2010 from 18:00 to 20:30, in Buenos Aires, the BTS Argentina Chapter hosted a technical meeting on "Digital TV Measurements" presented by Rodrigo Admir Vaz.

His presentation dealt with the current Digital TV situation throughout South America (including Panama). Topics included the current DTV status, adopted systems, and the broadcast situation in each country.

Rodrigo reported on field tests conducted in various countries including Brazil, Colombia, Chile, Peru and Panama to evaluate the DTV receiver's behavior, broadcasted signal configuration, effects of imperfect configuration on DTV receiver operation and how to deal with these issues.

Eighteen persons consisting of representatives from business, academia and students attended the presentation. After the formal presentation, Rodrigo Vaz answered questions from the audience.

Rodrigo Admir Vaz (left) and BTS Argentina Chapter Chair, Valentino Trainotti

Technical Program Agenda

Rodrigo Admir Vaz covered the following topics during his presentation:

1) Current DTV Status in South America:
   a) Which DTV system was adopted by each country
   b) Main dates and milestones
2) DTV measurements made in different countries:
   a) Field Tests objectives
   b) Current Status of DTV Broadcast:
      i) Broadcasters
      ii) Experimental Commercial Broadcast
      iii) Broadcast DTV Features
   c) Equipment used in Field Tests
   d) Field Test Points
   e) Some considerations about the received signal
   f) Errors found in the DTV Transport Stream
   g) How can these errors affect DTV Receivers?
3) Countries Visited for Field Test Purposes (so far): Brazil, Chile, Colombia, Peru, and Panama
4) Conclusions.

About the Presenter Rodrigo Admir Vaz

Rodrigo Admir Vaz graduated with a degree in Telecommunications Engineering from the Polytechnic School of the University of São Paulo (USP) in 2003. He earned his Master's degree in 2007 specializing in Digital TV, wireless communication and interactivity channel areas.

Rodrigo started working with DTV in 2002. He performed his internship working in the USP DTV lab by researching DTV receivers (Set-Top Boxes). In 2005 he continued working in USP DTV Lab concentrating on the reference DTV model (in the DTV receiver area) project which helped the Brazilian Government choose the Brazilian DTV system.

In 2007 Rodrigo joined the Samsung Brazil R&D Center working in the DTV receiver group where he tested DTV receivers by conducting measurement tests such as streams, field, conformance, and other tests. He presented a paper at the 2008 IEEE Broadcast Symposium in Washington titled "Implementation of the Interactivity Channel of Terrestrial Brazilian DTV System Using Concepts of Software Defined Radio Reconfigurability."

At the Samsung Brazil R&D Center Rodrigo's duties also include responsibility for Samsung internal projects in the area of Software Quality Assurance/ Software Quality Engineer (SQA/SQE).

Meeting Report for IEEE PCJS BT Chapter for the Dec 17, 2009 Meeting Sponsored by the IEEE Broadcast Technology Society Under Its Distinguished Lecturer Program

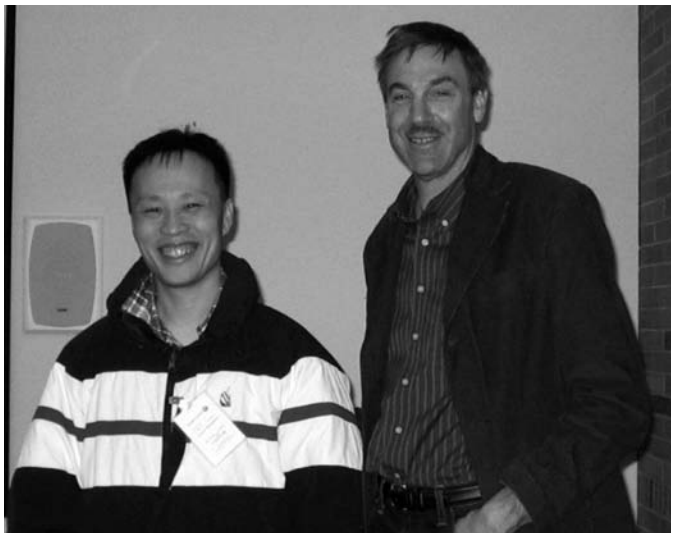
By Joe Stack, Chair

Dr. Hsiao-Chun Wu, Ph. D., BTS Distinguished Lecturer and Associate Professor, Department of Electrical and Computer Engineering, Louisiana State University, presented "Sequence Design for Transmitter Identification and PMEPR (Peak-to-Mean-Envelope-Power Ratio) Technologies on December 17, 2009 at Bell Labs in Murray Hill, NJ. There were 15 anticipated attendees, of which only 6 were in attendance because of bad weather. The attendees learned the basics about mobile identification and the details and differences between Kasami sequences and Golay sequences and how they are used.

IEEE BTS Distinguished Lecturer Dr. Hsiao-Chun Wu shows an outline as he begins the lecture on "Sequence Design for Transmitter Identification and PMEPR (Peak-to-Mean-Envelope-Power Ration) Techniques". Just prior, the attendees enjoyed a dinner of sandwiches and sodas and ad hoc discussion on video compression issues

In the hour-long lecture by Dr. Wu, the audience learned that the Kasami sequence is used in the watermarking of RF signals from devices transmitting an OFDM signal. The sequence is arranged so that each separate transmitter can be identified and so, this set up is designed to prevent interference among the transmitters. The second sequence that was covered in the lecture, the Golay sequence, provides control of the peak to average power ratio in OFDM systems. The Golay sequence allows the highest coding rate with the lowest PMEPR.

The presentation was followed up by a question and answer period during which examples were given on the practical applications of mobile identification and the Sequences. A short tour of Bell Labs wrapped up the night.



BTS Distinguished Lecturer Dr. Hsiao-Chun Wu greets Paul Wilford, Senior Director of Bell Labs (Alcatel-Lucent) just before beginning the IEEE PCJS BT Chapter lecture. Bell Labs hosted the presentation on December 17, 2009

Dr. Hsiao-Chun Wu describes how the Sequences are created along with the OFDM modulation during the IEEE PCJS BT Chapter lecture. Dr. Wu is Associate Professor of the Department of Electrical and Computer Engineering, Louisiana State University as well as a BTS Distinguished Lecturer. The event was sponsored by the IEEE Broadcast Technology Society, Distinguished Lecturer Program

ATSC Completes Work on A/74 Revision

By Jerry Whitaker, VP of Standards Development, ATSC

The ATSC has published an update of Recommended Practice (RP) A/74, "Receiver Performance Guidelines." First published in 2004, this document has seen wide distribution and use. A/74 provides recommended performance guidelines for the portion of a DTV receiver known as the "front-end," which includes all circuitry from the antenna through the process of Forward Error Correction (FEC) that is associated with recovery and demodulation of the 8-VSB signal. The output of the receiver front-end is the input to the Transport Layer decoder. Specifically, the circuits whose performance contributes to meeting these guidelines are:

- Antenna and antenna control interface (e.g., the CEA-909 "smart antenna" interface standard).
- Tuner—including radio frequency (RF) amplifier(s), associated filtering, and the local oscillator (or pair of local oscillators in the case of double conversion tuners)—and mixer(s) required to bring the incoming RF channel frequency down to that of the intermediate frequency (IF) amplifier/filter.
- Intermediate frequency amplification (with automatic gain control) and filtering, including the major portion of pre-decoding gain, channel selectivity, and at least a portion of the desired-channel band-shaping.
- Digital demodulation, including in-band interference rejection, multipath cancellation, and signal recovery.
- Forward Error Correction (FEC), wherein errors in the demodulated digital stream caused by transmission impairments are detected and corrected for incoming signals with signal-to-impairment ratios above a threshold. Packets with uncorrectable errors are "flagged" for possible mitigation in the video and audio decoders.

A/74 does not discuss optional means by which receivers might attempt to conceal or otherwise mitigate the visible or audible consequences of uncorrected bit stream errors. Although most receivers include circuits that effect some degree of error concealment, the results are subjective and not quantified so easily as the performance of the circuits listed above.

The A/74 performance guidelines are divided into four general categories:

- Sensitivity
- Selectivity
- Interference rejection
- Multipath handling

A basic block diagram representation of the digital terrestrial television broadcast system is shown in Figure 1. The video subsystem, the service multiplex and transport, and the RF/transmission system are described in ATSC A/53, the Digital Television Standard.

Figure 2 shows a block diagram of the front-end sub-system of a DTV receiver.

The revisions to A/74 reflect both improved receiver technology and a more complete understanding of the signal conditions faced by receiving devices. Topics on which new or significantly changed material has been introduced include:

- **Dynamic range**: The range of expected signal strength is extended upward to −5 dBm; previously, this number had been −8 dBm. This change reflects the performance of such products as the NTIA converter boxes and evidence of the need to handle multiple strong signals. The low signal level remains at −83 dBm, and text is added to clarify that the designation of −68 dBm as "ATSC weak" is an historic and convenient test point, not the lowest signal that receivers are expected to recover.
- **Adjacent channel interference**: A new Annex has been added that provides a more complete explanation of the effects of adjacent channel transmitter sideband splatter and how the presence of third-order nonlinearity in the tuner can turn this splatter into additional in-channel noise. Quantitative examples are provided.
- **Interference from two or more undesired signals**: New material has been added that explains and quantifies how two or more strong undesired signals can, in the presence of receiver non-linearity, generate intermodulation that can produce an elevated noise spectrum

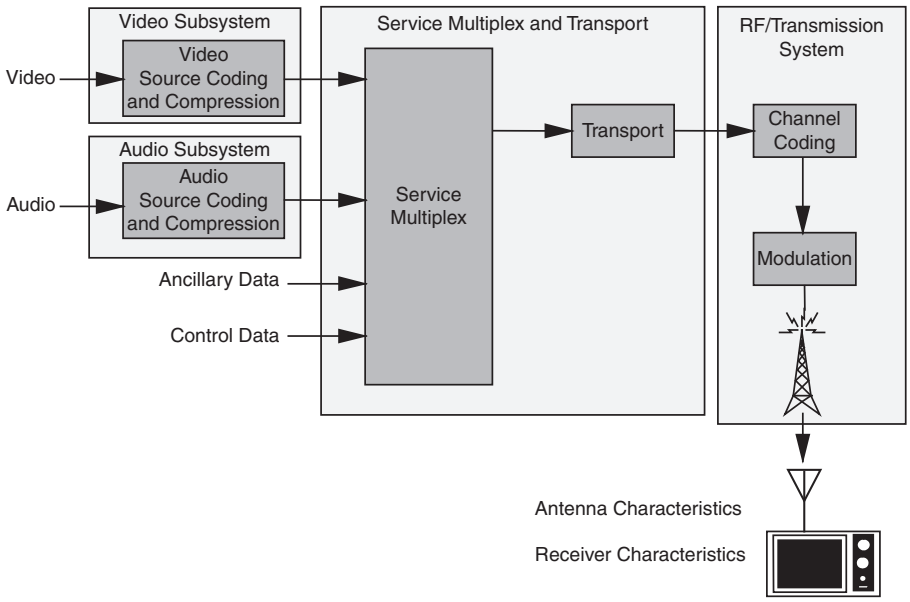


Figure 1 – Overall block diagram of the digital terrestrial television broadcasting model

that can occupy three contiguous channels. Examples of potential interferers in addition to DTV stations include FM transmitters.

- **Multipath**: The examination of multipath has been expanded with discussion of observed examples of large multipath with long time delay. Text on single static echoes, including the target performance profile, has been revised with new material and a more stringent echo profile. The recommendation for better performance reflects new field observations of the presence of strong echoes of long time displacement and the observation that equalizer designs have evolved to achieve better performance than the original A/74 recommendation.
- **Antenna interface**: Discussion of the CEA-909-A "smart" antenna interface has been expanded. The advantages of such an antenna and interface in mitigating some difficult reception conditions (e.g., multipath, interference) are discussed.

As with the original version of A/74, the revised document includes captured field ensembles as an example of the various conditions that can be observed in practice. Most of the field ensembles contain data captured at sites where reception was difficult. The field ensembles are not meant to represent the statistics of overall reception conditions but rather to serve as examples of difficulties that are commonly experienced in the field. The data includes outdoor and indoor captures in different types of environments, such as rural, residential, and suburban areas. Details on obtaining the capture files can be found in A/74.

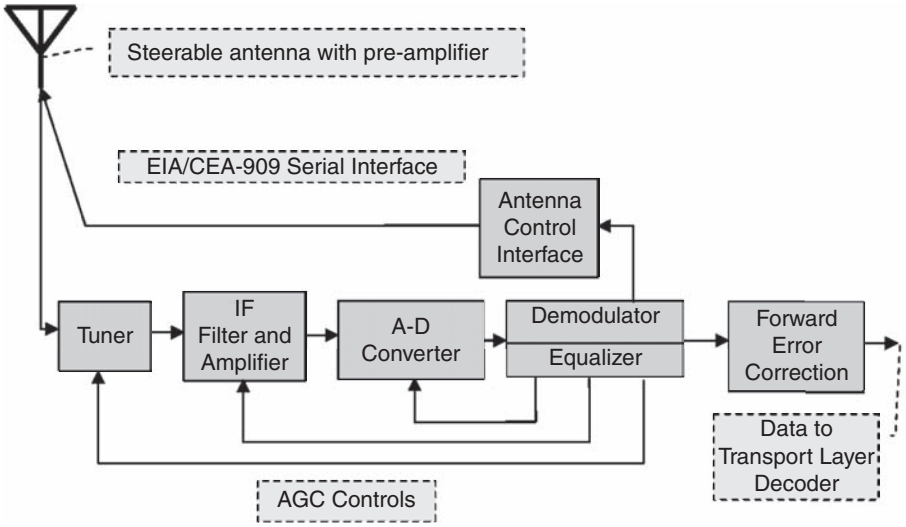


Figure 2 – Digital television receiver front-end subsystem block diagram

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.

Simple Formula Relating dBm and dBu

By Jeremy K. Raines, Ph.D., P.E.

1. Introduction

Standards and specifications for electronic devices, especially those used in wireless communications, are often expressed in dissimilar terms, either dBm (decibels above one milliwatt) or dBu (decibels above one microvolt per meter). For example, the boundary of the CGSA (Cellular Geographic Service Area) is defined by the FCC to be that distance at which a 32 dBu electric field intensity is broadcast. On the other hand, the sensitivity of a cell phone is usually described in terms of dBm, typically on the order of −110 dBm.

At first glance, it might appear that these two units are unrelated to each other, or at least not simply related. But they are. In this brief note, we will derive that relationship. The resulting formula is simple, requiring no more than a little algebra to evaluate. It is a relationship that should be at every engineer's fingertips; however, it is often our bad luck that, just when we need some quick answers, the formula is usually misplaced or buried in some reference where we cannot conveniently find it.

We will find such a relationship essential for answering practical questions such as, Can a cell phone with sensitivity of −115 dBm be expected to operate in a rural region with only 20 dBu coverage from a distant base station? We will return to this question after deriving the formula.

2. Derivation of Formula

Fig. 1 shows the configuration of interest. An electromagnetic plane wave from a distant source is incident upon an electronic device. The power received by the latter is:

$$P = SA \qquad (1)$$

In eqn. 1, S is the power density incident upon the device in watts per square meter, and A is the effective area of the device as an antenna in square meters.

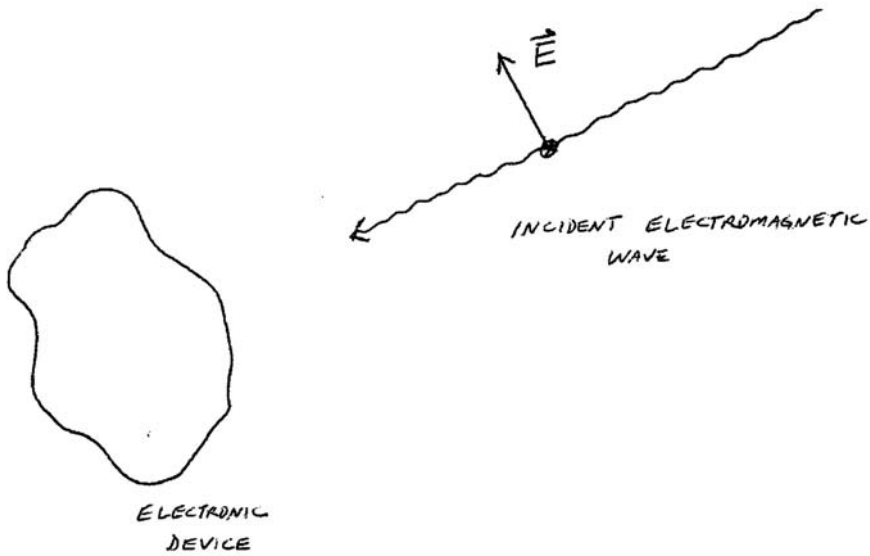


Figure 1 – An electromagnetic plane wave is incident upon an electronic device. The intensity of the plane wave is expressed as dBu, while the sensitivity of the device is expressed as dBm. Given those metrics, how do they interact?

For an electromagnetic plane wave, the power density is:

$$S = \frac{E^2}{\eta} \tag{2}$$

where E is the electric field intensity in volts per meter, and η is the impedance of free space (about 377 ohms).

For an antenna, or for any device acting as an antenna, the effective area is:

$$A = \frac{\lambda^2}{4\pi} g \tag{3}$$

where λ is the wavelength, and g is the directive gain of the antenna.

Combining eqns. 1 through 3, we obtain a simple relationship between the electric field incident upon the device, and the power received by the device:

$$P = E^2 \frac{\lambda^2 g}{4\pi\eta} \tag{4}$$

Eqn. 4 is in linear form; however, standards and specifications are usually expressed in logarithmic form. To convert from one form to the other, we simply take the logarithms of both sides:

$$10 \log P = 20 \log E + 10 \log(\lambda^2 g) - 10 \log(4\pi\eta) \tag{5}$$

To express eqn. 5 in terms of the popular units milliwatts and microvolts per meter, we note the relations:

$$P = mW \times 10^{-3} \tag{6}$$

and

$$E = \mu V/m \times 10^{-6} \tag{7}$$

Combining eqns. 5 through 7, we obtain:

$$10 \log(mW) = 20 \log(\mu V/m) + 10 \log(\lambda^2 g) - 126.76 \tag{8}$$

In eqn. 8, the left side is the expression for dBm, and the first term on the right side is the expression for dBu. So, the simple formula that we set out to derive is:

$$\boxed{dBm = dBu + 10 \log(\lambda^2 g) - 126.76} \tag{9}$$

In eqn. 9, as we have already noted, λ is the wavelength in meters, and g is the directive gain of the electronic device acting as an antenna.

Some useful values for the directive gain g are: 1) 1.5 for a short dipole, and 2) 1.64 for a half-wave dipole.

Fig. 2 is a plot of eqn. 9 for a wide range of dBu and frequencies, and for a short dipole.

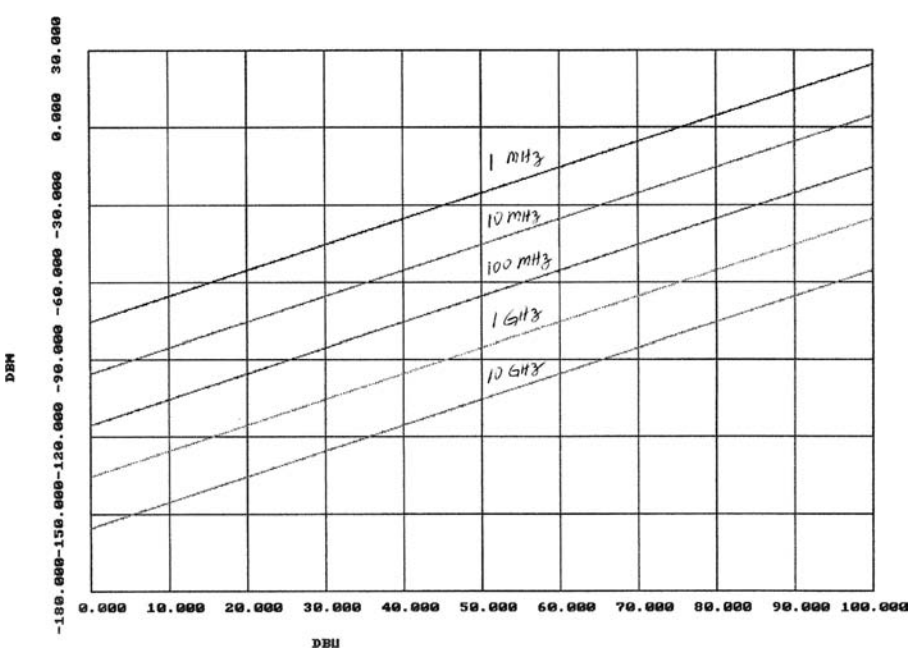


Figure 2 – dBm as a function of dBu for a short dipole and a wide range of frequencies

3. Conclusions

We have a derived a simple formula relating the sensitivity of electronic devices to an incident electromagnetic field. It depends upon the frequency or wavelength and the directive gain of the device. That directive gain may be deliberately

engineered, for example, in the case of a cell phone antenna. It may also be unintentional in cases of electromagnetic interference.

We return to the question we posed at the beginning of this note: Can a cell phone with a sensitivity of −115 dBm be expected to operate in an area of weak coverage providing only 20 dBu of signal? Let's use eqn. 9 to find the answer. We'll use the worst case of 1900 MHz, or a wavelength of 0.158 meters, and a short dipole with gain of 1.5.

$$dBm = 20 + 10\log(1.5 \times 0.158^2) - 126.76 = -121 \qquad (10)$$

The answer to our question is: No, the cell phone cannot be relied upon in this remote area. It will require a high gain antenna and/or a signal booster.

Biography

Jeremy Keith Raines received his BS degree in electrical science and engineering from MIT, his MS degree in applied physics from Harvard University and his Ph.D. degree in electromagnetics from MIT. He is a registered professional engineer in the state of Maryland. Since 1972, he has been a consulting engineer in electromagnetics. Antennas designed by him span the spectrum from ELF through SHF, and they may be found on satellites deep in space, on ships, on submarines, on aircraft, and at a variety of terrestrial sites. Dr. Raines is a senior member of IEEE. He may be contacted at www.rainesengineering.com.

Longley Rice's Most "Complex" Line of Code

By Sid Shumate, in consultation with Mr. Frederick Najmy and
Dr. Alakananda Paul, NTIA Institute for Telecommunications Sciences (NTIA-ITS)

In the Spring Issue discussion of the subroutine *alos*, I took a break after arriving at the single most complicated line of source code in the Irregular Terrain Model (ITM). This line, near the end of subroutine *alos*, is:

```
alosv = (−4.343 * log(abq_alos
        (complex<double>(cos(q),
        −sin(q)) + r)) − alosv) * wls
        + alosv.
```

To more easily understand this line of code, it could be split into:

```
alosvtsq = abq_alos(complex<double>
           (cos(q), −sin(q)) + r);
  alosvt = −4.343 * log(alosvtsq);
   alosv = (alosvt − alosv) * wls + alosv;
```

These represent the equations in the source code documentation that are combined in this one line, along with a second call to a new subroutine written for c++ to perform the ABS function in the FORTRAN version.

The first equation, but the last line split out above, was already mentioned; $A_{los} = (1 - wls)A_d + wls * A_t$ [Alg. 4.44], the equation that combines the extended diffraction losses, A_d, and the two-ray losses, A_t in a weighed manner, based on the terrain irregularity factor. To understand how it works, keep in mind that prior to its use in this line of code, the output result argument, *alosv*, holds the value of A_d, the extended diffraction value, in dB. After this line, it holds the weighted combination value of A_d and A_t. It is also the last step performed in this line of code.

The complex functions in c++ are designed to work with complex numbers that are stated in Cartesian (rectangular) coordinates. The complex values of argument *r* are stored in the c++ computer memory as a pair of values, (a, b), as the argument *r* has been declared in the code as a complex (double), i.e. as $r = (a + ib)$, where a, the real value, and b, the imaginary value, are stored in computer memory as two separate values.

We noted in the Spring 2010 article that in the original 1967 Longley-Rice code implementation, documented in Annex 3 of ITS67, that preceded the ITM, that R_e represented the magnitude of the Reflectivity factor (defined as a value between zero for no reflection to 1 for a full reflection) at the ground reflection point of the reflected ray. The new (as of 1982) version, the ITM, computes R_e from the complex ground impedance, Zgnd, and is therefore a complex number at this point in the source code, therefore R_e is a complex number, and its magnitude is defined as the modulus, the absolute value of a complex number, as $|R_e| = (a^2 + ib^2)^{0.5}$, using the Pythagorean theorem. $R_e e^{i\delta}$ is formed as per formula 3.5 in Annex 3 of the ITS67 report, which shows *r*, as Rh,v, being modulated by the current value of q, which is the 'exponential factor' in formula [ITS 3.5]. In studying this formula, one must be cognizant of the fact that the use of exp in this formula does not indicate an exponential function; rather, it follows the old complex numbers polar notation convention, indicating that the exp term is an imaginary value, a phase angle, in radians, associated with R_e. The current version of this notation is usually stated as $R_e e^{i\delta}$, but we have to keep in mind whether the actual values are in Cartesian or in Polar coordinates when we attempt to combine them, as the vector math for Cartesian (rectangular) coordinates, or (a + ib), is much different that that used for Polar coordinates.

At a far distance from the transmitter, in the two-ray calculation, the path distance of the reflection path starts to closely approach the length of the direct path. So the critical factors remaining are (1) the phase difference between the two signals, and (2) the amount of signal and it's phase angle, as reflected at the reflection point in

the reflected path. The amount of signal reflected is defined by the Effective Reflectivity ratio of the reflection point, Re. There is a significant difference between the old FORTRAN code implementation in the ESSA ITS-67 report (ITS-67), and the newer FORTRAN and c++ versions; as a result, $|R_e|$, which is calculated in Tech Note 101 and ITS-67 as a single real value, is now a complex number with real and phase components, which can be noted in complex exponential notation as $|R_e e^{i\theta r}|$, and must be multiplied with the reflected ray, which is assumed to have a value of unity, or 1; therefore $1 * |R_e e^{i\theta r}| = |R_e e^{i\theta r}|$, which represents the reflected ray multiplied by the complex reflection coefficient, i.e. the strength and phase of the reflected ray path signal arriving at the receive point. The phase difference between the two signals arriving via the direct and reflected paths, derived from the difference in distance between the two paths, is δ, and must be included. To match up with the old Tech Note 101 documentation, which uses $|R_e \exp^{i\delta}|$, to update to 1982, this can be combined with the reflected ray to form $|R_e e^{i\theta r} e^{i\delta}|$, which becomes $|R_e e^{i(\theta r + \delta)}|$. To more easily understand how this line of code works, it is clearer to consider δ to be combined with the direct ray instead. The direct ray is also at this point assumed to have a value of unity, so $1 * \delta = \delta$, which then represents the direct ray at the phase angle between the direct and reflected paths. So to follow the documentation, when we combine the direct and reflected rays, we get: 1, the direct ray, added to the combination of the difference phase angle and the reflected ray, or $= 1 + |R_e e^{i(\theta r + \delta)}| = |1 + R_e e^{i\theta r} e^{i\delta}|$. In this line of ITM code, the phase difference δ, is instead combined with 1, the direct ray, to become $1e^{i\delta} + |R_e e^{i\theta r}| = |e^{i\delta} + R_e e^{i\theta r}|$, which is where the 1 in $1 + R_e$ is hiding, in the addition that occurs in the input statement, i.e. within the ( ), to the second call to abq_alos.

Before the most complex line of code is executed, $R_e e^{i\theta r}$, the value of which is held by argument *r*, is a complex number stated in Cartesian (rectangular) coordinates, in the form of a + ib (real, imaginary) form, in undefined units representing vector values. This is stored in the c++ computer memory as a pair of values, (a, b), as the argument *r* has been declared in the code as a complex (double).

The phase angle difference between the direct and reflected ray, δ, here held by the utility variable argument *q*, is stored in the computer memory as a single real value of an angle, in units of radians, and is therefore in polar coordinates.

So the q phase value must be converted to Cartesian coordinates before being added with $R_e e^{i\theta r}$. The program attempts to first convert the phase value of δ into Cartesian, or rectangular coordinate form, using Euler's formula of complex analysis: $e^{i\theta} = \cos\theta + \sin\theta$, i.e. $e^{i\delta} = \cos\delta + \sin\delta$, before adding the direct $(1e^{i\delta})$ and reflected $(R_e e^{i\theta r})$ rays together.

Before we do this, lets look at the FORTRAN version. From Appendix A of "A Guide to the Use of the ITS Irregular Terrain Model in the Area Prediction Mode", April 1982, by G.A. Hufford, A. G. Longley, and W.A. Kissick., the lines of FORTRAN code that accomplish this are:

```
COMPLEX R
ABQ(R) = REAL(R) ** 2 + AIMAG(R) ** 2
```

And the FORTRAN version of the "most complex line in the ITM" is:

```
ALOS=(-4.343*ALOG(ABQ
(CMPLX(COS(Q), -SIN(Q)) + R)) -
ALOS) * WLS + ALOS
```

FORTRAN was designed to be scientifically accurate. C++ was designed to be practical and fast. So the handling of complex functions in c++ is different, and somewhat simplified when compared to the complex subroutines found in FORTRAN. But that does not mean c++ cannot do what is required here just as well as FORTRAN does. It does require that a subroutine, *abq_alos*, be written into the ITM source code to duplicate the function provided by ABQ (absolute value of q) in the FORTRAN code.

Now lets look at the c++ port of the FORTRAN function. Initially, I thought that there were two errors in this line of code, one due to the porting from FORTRAN to c++, and one that tracked back to the upgrade of the original irregular terrain prediction FORTRAN source code as documented in the late 1960's ESSA Technical Report ERL 79-ITS-67, "Prediction of Tropospheric Radio Transmission Loss Over Irregular Terrain (ITS-67) to the more recent FORTRAN code documented in the NTIA Report TR-82-100, A Guide to the Use of the ITS Irregular Terrain Model in the Area Prediction Mode (1982) (the Guide). After consulting via email with Fred Najmy and Dr. Paul of the NTIA-ITS at Boulder, Colorado, and writing and running further tests of this line of source code, I found that I was in error regarding the way I thought that the embedded cos and sin functions in the input statement to the second call to abq_alos read the input arguments.

Which meant that:

1) I had identified no porting error. I can now state that I found absolutely no difference between the operation of the FORTRAN source code as revealed in the "Guide", and the c++ source code that the NTIA made available on their website prior to the 2007 changes. The 2007 changes were mentioned in my first installment, and essentially make no change in the operation of the ITM, other than to replace 10 lines of code with 8 lines, remove a rarely used option, and provide new output options. Which of course, means that every problem I have identified in the c++ source code was exactly and precisely ported over from the 1982 FORTRAN source code.
2) The problem I had noticed in the results of this line of source code then tracks down to just one thing. What is that minus sign doing in front of the sin function, in both the current FORTRAN and c++ versions?

Before I discuss the minus sign question, I have to finish explaining the

rest of this line of code. To make it closely match the originating formulas as much as possible, we could restate it as:

```
alosvtsq = abq − alos(complex
           <double>(cos(q), −sin(q)) + r);
           // [Alg. 4.51, part I]
alosvtsq = sqrt(alosvtsq); (Alg. 4.51,
           part II)
  alosvt = −20 * log10(alosvtsq); //
           [Alg. 4.51, part III]
   alosv = (1 − wls) * alosv + wls * (−10
           * log 10(q)); // [Alg. 4.44]
```

First, lets look at what is happening in what I refer to as the "second call to abq_alos in alos", and analyze what is happening in the input statement to abq_alos, where we find:

(complex<double>(cos(q), −sin(q)) + r).

To best explain what is occurring here, Dr. Paul sent me the following formula to expand on George Hufford's documentation, and stated:

"The two-ray component of the attenuation in alos is closely related to:

$$\begin{aligned} \mathrm{Ln}\,|1 + R_e e^{i\delta}| &= \ln|e^{i\delta}(e^{-i\delta} + R_e)| \\ &= \frac{1}{2}\ln|e^{-i\delta} + R_e)|^2 \\ &= \frac{1}{2}\ln|\cos\delta - \sin\delta + R_e)|^{2}". \end{aligned}$$

And indicated that the ITM still relies on this equation set.

What is happening in this set of equations is that the $1 + R_e e^{i\delta}$ term is being divided by the complex conjugate, $e^{-i\delta}$. This is normally done in order to facilitate a division in the complex domain, but there is no division here. The original reason for this appears to track back to the original derivation of R_e vs. the current derivation of R_e, which produces a complex version of R_e, or $R_e e^{i\theta r}$, as stated in complex exponential notation, and which can also be stated as $R_e/\underline{\theta}$ in polar notation, or as $R_e^{i\theta r} = a+ib$ or $R_e^{i\theta r} = a+jb$, in rectangular (Cartesian) coordinates.

I stepped back to the formula origins, of which the above is an approximation:

$$\left|\frac{E_{rec}}{E_{fs}}\right|^2 \approx |1 + Re^{j\Delta}|^2$$

$$= 1 + |R|^2 + 2|R|\cos(\Delta + \xi)$$

The above is taken from the NTIA presentation "OVERVIEW OF PROPAGATION THEORY[1], page 29, available at: http://w3.antd.nist.gov/wctg/manet/propthy_r1.pdf, and which footnotes in the title:[1] Adapted from L. E. Miller "Propagation Model Sensitivity Study," J. S. Lee Associates, Inc. contract report, July 1992 (DTIC accession number AD-B166479). Dr. Miller was recently with the Wireless Communications Technologies Group at NIST in Rockville, MD, and his profile can be seen at: http://w3.antd.nist.gov/wtcg/people/lmiller.html. This approximation is reflected in ITS 67, in Annex III, equations (3.2) and (3.8), and can be traced back to Tech Note 101, equation (5.4). In ITS-67, R_e is derived as a single real positive value between 0 and 1.

Therefore, as the overview based on Dr. Miller's work points out, the <u>effective</u> reflection coefficient $R_e^{j}\Delta$, a.k.a. $R_e e^{i\theta r} e^{i\delta}$, normally has a minus value, due to the phase reversal in the reflected path that occurs at the reflection point. The complex conjugate is added to provide the negative value that is due to the phase reversal mentioned above. The problem is that when the derivation of R_e was changed to be derived from the ground impedance, prior to the 1982 FORTRAN code implementation, R_e became a complex number, and the ground impedance derivation correctly includes the phase reversal, already producing a minus value for R_e. Therefore, it is no longer necessary to divide by the complex conjugate to transfer the phase angle to the direct ray and recover the phase reversal. The equation set sent by Dr. Paul is therefore obsolete.

UPDATING THE OLD TN101-ITS-67 EQUATION:

Returning to the old mathematical statement set:

$$\mathrm{Ln}\,|1 + R_e e^{i\delta}| = \mathrm{In}\,|e^{i\delta}(e^{-i\delta} + R_e)|$$

$$= \frac{1}{2}\mathrm{In}\,|e^{-i\delta} + R_e)|^2$$

$$= \frac{1}{2}\mathrm{In}\,|\cos\delta - \sin\delta + R_e|^{2"},$$

The updated full form of the first term of the formula, for use in the current ITM implementation, is more correctly stated in complex exponential form, as:

$$\mathrm{Ln}\,|1 + R_e e^{i(\theta r + \delta)}|$$

Which by the Law of Exponents, i.e. $e^{i(\theta r + \delta)} = e^{i\theta r} e^{i\delta}$, (Eq.2)[1] can be stated as:

$$\begin{aligned} \mathrm{Ln}\,|1 + R_e e^{i(\theta r + \delta)}| &= \mathrm{Ln}\,|1 + R_e e^{i\theta r} e^{i\delta}| \\ &= \ln|e^{i\delta}(e^{-i\delta} + R_e e^{-i\theta r})| \\ &= \frac{1}{2}\ln|e^{-i\delta} + R_e e^{-i\theta r}|^2 \\ &= \frac{1}{2}\ln|\cos\delta - i\sin\delta + r(\mathrm{real}) \\ &\quad + i(-r(\mathrm{imag}))|^{2"}, \end{aligned}$$

Since $R_e e^{i\theta r}$, now a complex argument and has its own phase angle separate from the path difference phase angle, the imaginary value in Cartesian coordinates must retain the (−) sign supplied by the application of the complex conjugate of $e^{i\delta}$ to both sides of the additive term $(1 + R_e e^{i\theta r} e^{i\delta})$. Stated specifically, it all boils down to:

$R_e e^{i\theta r} e^{i\delta} / e^{i\delta}$ is $= R_e e^{-i\theta r}$, <u>not</u> $R_e e^{i\theta r}$ (the current, correct full form of R_e).

So if a corrective minus is also added to the imaginary value of argument r, which holds the value of $R_e e^{i\theta r} e^{i\delta}$, converting it to $R_e e^{i\theta r}$, then George Hufford's documentation, in "The ITS Irregular Terrain Model, version 1.2.2 The Algorithm" (Alg.) equation 4.51 could more correctly state:

$$A_t(\mathrm{dB}) = -20\log_{10}|(1e^{-i\delta} + R_e e^{-i\theta r})|.$$

Which correctly applies the complex conjugate to both sides of the additive term, where it then correctly cancels out when abq_alos squares the

imaginary value to obtain the modulus. So, to correct it according to the corrected equation set it would be necessary to also add a minus sign in front of the imaginary value of argument *r*, prior to the addition occurring in the input statement of the second call to *abq_alos* in subroutine *alos*, to complete the proper application of the complex conjugate.

My preferred cure, however, is not to apply the meaningless complex conjugate, and instead simply remove the minus sign in front of the sin function. The basis for this is:

THE BETTER CURE: RE-DERIVING THE FORMULA TO MATCH THE ITM IMPLEMENTATION.

I again step back to the formula origins, as stated by Dr. Miller: $|E_{rec}/E_{fs}|^2$

Starting from this beginning, one could say that the ITM only attempts to use the exact form of the equation, prior to the approximation sign, which it utilizes as:

$$A_t = -(|E_{rec}/E_{fs}|^2)^{0.5} = ((E_{rec}/E_{fs})^2)^{0.5}$$

Where:

A_t is the two-ray attenuation

E_{rec} = received field from the combination of the direct and reflected rays at the receive antenna.

E_{fs} = is the received field less free space loss at the received point, equal in Modulus to the direct ray alone, at the receive antenna.

Earlier in the subroutine *alos*, the difference in path distance between the direct and reflected paths, Δr, stated in wavelengths, has been converted into a phase difference stated in radians, δ. R_e, unlike in Tech Note 101 and ESSA ITS-67, is now in a complex number form, $R_e e^{i\theta r}$, due to its having been derived from ground impedance. Assuming that the transmitting and receiving antenna gains are unity (=1), and since δ is the difference between the two path vectors, one can then associate δ with either the reflected ray path, as:

$$E_{rec} = E_{fs} + (E_{fs})R_e e^{i(\theta r + \delta)}$$

Or associate δ with the direct ray, leaving the reflected ray associated with the phase angle of the complex value of $R_e e^{i\theta r}$ only, which will prove to be preferable in following how this equation is attempted to be implemented by the ITM:

$$E_{rec} = E_{fs} e^{i\delta} + (E_{fs})R_e e^{i\theta r}$$

Then:

$$A_t = -|E_{rec}/E_{fs}|$$
$$= -|(E_{fs}\, e^{i\delta} + (E_{fs})R_e\, e^{i\theta r})/E_{fs}|$$

Note that at this point, E_{fs} cancels out, leaving us with:

$$A_t = -|E_{rec}| = -|(1e^{i\delta} + R_e e^{i\theta r})|$$

Converted to units of decibels:

$$A_t(\text{dB}) = -20\log_{10}(|E_{rec}|)$$
$$= -20\log_{10}|(1e^{i\delta} + R_e e^{i\theta r})|$$

Since the output of abq_alos is: $E_{rec^2} = (1e^{i\delta} + R_e e^{i\theta r})^2$, then:

$$A_t(\text{dB}) = -20\log_{10}(|E^2_{rec}|)$$
$$= -10\log_{10}|(1e^{i\delta} + R_e e^{i\theta r})|$$

In the ITM subroutine *alos*, the conversion of $1e^{i\delta}$ from the polar form it is in, $(1/\_\delta)$, to rectangular, or Cartesian, coordinates is, as Mr. Najmy previously and correctively pointed out, occurring in the input statement to the second call to *abq_alos*, where the conversion formula used is Euler's formula:

$$1/\_\delta = 1(\cos\delta, i\sin\delta) = (\cos\delta, i\sin\delta).$$

Note that the inclusion of the complex conjugate, which is applied only to the 1 $e^{i\delta}$ term, occurs by inserting a (−) sign to reverse the polarity of the isin δ. This is not only unnecessary at this point, it is unwarranted. The simplification to a complex addition only, and the fact that it is more clearly reflected in the source code, explains why the use of the form $E_r = E_{fsf}\, e^{i\delta} + (E_{fsf})R_e e^{i\theta r}$ is preferable.

Note that $R_e e^{i\theta r}$ is represented by the complex argument r. Once $1/\_\delta$ is converted to rectangular coordinates, it is only necessary to complete the input statement by adding, in rectangular coordinate form, $1e^{i\delta} + R_e e^{i\theta r}$, which the computer <complex> class function performs in order to finish preparing the input statement to the second call to *abq_alos*, using the usual mathematical form:

$$(a + ib) + (c + id)$$
$$= ((a + c) + i(b + d)).$$

Then the subroutine *abq_alos* starts the process of obtaining the absolute value, or Modulus, by applying the Pythagorean theorem to compute $(1e^{i\delta} + R_e e^{i\theta r})^2$.

Therefore, George Hufford's documentation is incomplete. In "The ITS Irregular Terrain Model, version 1.2.2 The Algorithm" (Alg.) equation 4.51 could most simply and directly state:

$$A_t(\text{dB}) = -20\log_{10}|(1e^{i\delta} + R_e e^{i\theta r})|$$

In that, in the ITM implementation, in both the FORTRAN and c++ versions, the difference angle can be said to be associated with the direct ray, not the reflected ray. It should make no difference whether we associate the phase difference between the two with the direct ray or the reflected ray. Equation Alg. 4.51, from "The Algorithm", and its full-length predecessors, equation (5.4) in Tech Note 101, and Annex III, equation (3.2) in ITS-67, fail to make it clear that the 1 represents the direct ray at an angle of zero radians with respect to the positive x-axis. This, therefore, is a correct, and exact form of the direct formula that subroutine *alos* is attempting to implement, and would be implementing except for the misapplied complex conjugate which occurs by means of adding the negative sign to the (isinδ) term! Therefore, the second, and preferable, cure is to remove the minus sign in front of the sin function in the input to the second call to abq_alos in alos, removing the meaningless and incomplete application of the complex conjugate.

Having found and proposed a simple fix to the problem at hand, we can complete the description of the line of

code. Remember that we split apart the line, leaving:

```
alosvt = −4.343 * log(alosvtsq);
 alosv = (alosvt-alosv) * wls + alosv;
```

To be described. Remember from a previous installment that .4343 ln = $\log_{10}$, and that ln in c++ is the log function; $\log_{10}$ is the log10 function. That old substitution is in use here. We also note that the output of the abq_alos function, after the removal of the miscreant minus, is the square of $(1e^{i\delta} + R_e e^{i\theta r})$. In a log function, a square can be transferred across the log function, by dividing both sides by 2, so

$$A_t = -20 \log_{10} |(1e^{i\delta} + R_e e^{i\theta r})^2|$$
$$= -10 \log_{10} |(1e^{i\delta} + R_e e^{i\theta r})|$$
$$= -.4343*10*\ln |(1e^{i\delta} + R_e e^{i\theta r})|$$

and then, in:

```
alosv = (1−wls)*alosv + wls*(−10*log10(q)); // [Alg. 4.44]
```

The result for A_t, the line of sight two-ray loss, is then added, based on a weighting by argument wls, to the results for the extended diffraction loss, A_d. The result is the line-of-sight loss, alosv, reported out by the subroutine.

Now, from a practical standpoint, how does this little miscreant minus affect the calculation of the two-ray attenuation? We will cover this in the next installment, along with a discussion of the NTIA-ITS official reaction to my suggestion that the minus be removed.

The next installment completes the discussion of the "housekeeping" corrections that needed to be applied to the ITM so that it operates as originally intended, and allows it to be extended to use 3 arc second and 1 arc second databases without causing errors. The Winter 2011 installment, the last, will be an overview of what had to be done (or must be done, for those working on a parallel development in China, and at other locations worldwide) to take the ITM to a terrain-specific prediction system capable of being used in intensive interference studies.

[1]"Math 307, THE COMPLEX EXPONENTIAL FUNCTION", equation (2) of derivation of Law of Exponents from Euler's Formula, available at: www.math.washington.edu/~marshall/math_307/complexnos.pdf, from online lecture guides of Dr. Donald E. Marshall, Dept. of Mathematics, University of Washington, Seattle WA.

ITU-T IPTV-GSI Meeting Report

By Wei Li, Communications Research Centre (CRC), Canada

Background

A team of CRC Research Scientists represented the IEEE BTS at the ITU-T IPTV Focus Group meetings held during 2006-2007. We submitted six proposals to the Group and wrote regular reports which were published in quarterly issues of the IEEE BTS Newsletter. Our work also led to publication of a paper in the June 2009 IEEE Transactions on Broadcasting Special Issue titled "IPTV in Multimedia Broadcasting." We assumed that our mission to represent IEEE BTS at the ITU-T had ended, since a set of IPTV standards was finalized when the IPTV-FG completed its work at the end of 2007.

Since then, the ongoing IPTV standardization work has been carried out under the umbrella of a Global Standards Initiative (IPTV-GSI). Recently GSI has started new initiatives for the development of IPTV standards toward mobile IPTV, service protection, content consumption, audience measurement, etc. Now, IPTV-GSI is calling for IEEE BTS participation and contributions on extension of the scope of mobile IPTV and IPTV audience measurement standardization. Broadcasters are very interested in all these activities.

We believe it's time and essential for us to resume our participation in the IPTV-GSI activities: Our mission is to voice our concern as broadcasters, and to make new contributions.

The Ninth IPTV-GSI Event

This event took place at Geneva, Switzerland, on 25–29 January 2010. The meetings for IPTV-GSI Technical and Strategic Review (TSR) process was held on 25 and 29 January. IPTV-GSI TSR Coordinator, Mr. Masahito Kawamori (NTT, Japan) chaired the events.

About 50 delegates participated in the meetings. They represented industries, research institutions and standardization entities. A total of 40 contribution documents and 5 liaison documents were discussed during the meetings.

CRC, representing IEEE BTS, submitted one contribution document titled "Proposed addition to draft Recommendation H.iptv-map", which was assigned doc number IPTV-GSI-C-349. This contribution proposed additional text describing the needs of variable video resolution in order to suit the terminal devices, and the scalable video coding techniques to cope with the heterogeneity.

Meeting Results

A plenary session was held in the morning of the first day. The draft agenda and work plan were presented and adopted by the attendees. During the remainder of the session, study groups separately discussed questions related to their own interest areas.

The distribution of documents under discussion during the meetings is as follows:

I concentrated on the Q13/16 sessions (multimedia application platforms and end systems for IPTV), in which our proposal was submitted.

Question	Number of Documents Distributed
Q8/9	1
Q12/11, Q11/11, Q10/11, Q9/11, Q8/11	1
Q12/13	1
Q13/16	41
Q21/16	1

Q13/16 reviewed 37 contributions, and produced 25 documents, including 5 liaison statements. It held a joint meeting with Q8/9, Q1, 2, 5, 12/13, and Q21/16. Mr. Richard Brand, the vice-chair of ATIS-IIF, joined this meeting and greatly enhanced the collaboration between the work on IPTV in ITU-T and that in ATIS-IIF.

Discussions most relevant to broadcasters are summarized below:

- [233-GEN] ITU-R WP6B LS from ITU-R WP6B on a new multiplexing scheme for variable-length packets in digital multimedia broadcasting systems

  Informs us of their adoption of a new multiplexing scheme for variable-length packets, replacing the current MPEG-2 TS. It is based on ETSI TS 102 606, and is relevant for IP- based broadcasting. We will review this LS more in detail and will see if there are impacts on the current Recommendations that we are drafting. The assessment will also be harmonized with other Questions in SG16. We will reply to this as part of our reply to LS.
- [223-GEN] ETSI TC MCD (by way of ITU-T SG 16 Chairman) Reply LS on the work on IPTV audience measurement (COM16-LS-62)

  Informs us of their work on Audience Measurement, which was undertaken by MCD in its meeting of May 18–19, 2009 in Madrid. A Technical Report on the subject is in preparation and is expected to be completed in October, 2009. It is expected that work on Audience Measurement will continue and there will be additional revision and additions to the report. It was pointed out that since ETSI MCD is working on a report (informal document), rather than a specification, on Audience Measurement, our work on H.IPTV-AM.x will still be relevant to them.
- [349] **IEEE BTS/CRC Canada** Proposed addition to draft Recommendation H.iptv-map

  Proposes additional text be included in the video section. It was pointed out that SVC is "a" possible solution, and the text should be changed accordingly. Otherwise the proposed text was accepted and the draft Rec was updated. It was noticed that this scenario is related to 3 screen service scenario in H.IPTV-TDES.4.
- [367] OKI Proposed additions of service discovery of IPTV audience measurement

  Audience measurement is more a function than a service to the end-user, unlike linear TV, Chat, e-mail, etc, as well as those in Basic services. This will be discussed in a separate group on "service", "third party service" etc.

  The group decided to keep the contribution with some modifications in the Appendix of H.IPTV-AM.0 to stimulate more contributions. There are several options about how to treat this appendix: (1) create a new technical document, (2) insert it into main body, (3) move it into another recommendation, or (4) keep it here. More contributions are needed.
- [366] ETRI Proposed service scenario for H.IPTV-AM.1

  Proposes to move some use cases from HSTP.UMCI to H.IPTV-AM.1 that uses user profiles. A concern was expressed whether including those use cases, where the viewing information is utilized to provide enhanced services, may give the wrong idea that Audience Measurement is about using the viewer's data, and this may have consequences on privacy issues, which H.IPTV-AM.x has been very careful about. However, some of the isolated steps of those use cases may correspond to procedures of audience measurement, rather than service usage, and may be included as such in the current document.
- [369] OKI Proposed modifications of H.IPTV-AM.1

  Proposes to add some text to the current H.IPTV-AM.1. It was pointed out that the scope of AM.1 is Distributed Content Service, which includes both Linear TV and VOD, but the Linear TV will be discussed and consented first. The current document needs the definition of Distributed Content Service. Section 8 "Service specific delivery mechanisms of audience measurement data" has some corresponding materials (protocols and mechanism, etc.) in H.IPTV-AM.0, and reference should be made. Otherwise the proposal was accepted as the baseline text of the current H.IPTV-AM.0.

Other Businesses

1) Liaison from SG2

Chairman of WP2 of SG2, Mr. Leen Mak (Alcatel Lucent, Netherlands) presented the Liaison Statement [IPTV-GSI TD 224-GEN] (COM 16-LS-98) from SG2. He reported that SG2 (WP2/2) will have a meeting on 17-21 May, 2010 and will discuss IPTV issues. Q7/2 and Q8/2 will work on two documents: M.3346 "IPTV Management Requirements" and M.IPTV-ARCH "IPTV Management Architecture". These two documents are derived from ATIS-0300092 "high-level OSS/BSS functional requirements and reference architecture for IPTV." It was noted that this is not a document from ATIS-IIF, but it is from ATIS-TMOC and OBF. Since this meeting coincides with the currently planned IPTV-GSI event in May, joint-meetings between interested Questions may be planned.

2) Presentation from the Institute for Infocomm Research (I2R), Singapore

Chair of IPTV Working Group, Telecommunications Standards Technical Committee (TSTC), Singapore, Mr. Wei-Yun Yau (The Institute for Infocomm Research, Singapore) reported that Singapore hopes to host an ITU-T IPTV-GSI event during 20–27 September 2010.

It was pointed out that the date coincides with NGN-GSI, which will be

held in Geneva, and a question was raised as to whether a possible collocation had been explored. Collocation will be looked into and assessed as to its feasibility, as soon as possible.

During the discussion, it was also noted that ITU-T IPTV-GSI was invited by the Singaporean Government to present and organize an ITU-T session to introduce the ITU-T's latest activities on IPTV during their IPTV Standards Forum, 9-10 February 2010. The TSB Director expressed support for participation in this event. Brazil (FUCAPI, PUC-Rio), NEC, NTT, OKI Electric, Sumitomo Electric have expressed their interest in supporting and participating in the ITU-T presentation.

Singapore (IDA, MDA) have also invited IPTV-GSI to comment on their Project NIMS Common Featured Set-Top Box Functional Requirements (draft version 0.1). It was agreed that IPTV-GSI TSR Coordinator will provide the comments and officially reply to Singapore.

3) Interoperability Issues

Vice-chair of ITU-T SG11, Mr. Kaoru Kenyoshi (NEC, Japan), reported that SG11 discussed IPTV-GSI C-341 "NGN (Next Generation Networks) interoperability", which proposed create new Recommendations on NGN interoperability. It was decided to create three new draft Recommendations: "NGN interoperability.", "VOIP conformance testing", and "VOIP interoperability testing". It was reported during the discussion, it was pointed out that there are some service specifications missing in ITU-T Recommendations (e.g. OIP). SG11 will evaluate and try to identify those missing specifications, and create a series of Interoperability Recommendations.

Q13/16 reported that Q13/16 agreed to create a series of Recommendations for IPTV Interoperability based on the existing technical paper HSTP.IPTV-SACII ("Studies and actions on conformance and interoperability issues among IPTV Recommendations").

It was reported by Q13/16 that there is support among Q13/16 members to hold an interoperability event in Geneva during an IPTV-GSI event (May or July, 2010) to provide an opportunity for members to participate. Q13/16 will ask TSB to host an interoperability event for IPTV in which interoperability and conformance may be tested. It was agreed that such an event will be fruitful in promoting IPTV Standards.

Related to this, it was reported that MSF (Multi Service Forum) and ATIS-IIF are planning a joint event for interoperability on IPTV around the end of this year (October, 2010). Vice-Chair of ATIS-IIF, Mr. Richard Brand commented that ATIS-IIF may be interested in co-hosting a joint event for interoperability with ITU-T as well.

4) Next IPTV-GSI

The next IPTV-GSI will be held in Geneva, May 17–21, 2010.

Wei Li is a research scientist at the Communications Research Centre Canada (CRC). His current research interests include image and video processing, multimedia communications, and DTV systems. Dr. Li is a member of the IEEE and BTS. Wei Li can be contacted at wei.li@crc.gc.ca.

In Memoriam Gerhard Stoll

Gerhard Stoll, a friend and colleague of the IEEE and BTS, passed away on 09 April 2010 at the age of 59 years.

Gerhard Stoll, Dipl. Ing. studied Communications Engineering with a focus on IT and cybernetics at the Universities of Stuttgart and Munich. In 1984 he joined the IRT – the research centre of the public broadcasters in Germany, Austria and Switzerland – where he was in charge of the development of the MPEG-1 and MPEG-2 Audio Coding standards.

Gerhard was also a member of many standardization groups, such as MPEG, DAB, DVB, ITU-R and EBU. For his contributions in audio coding, he received the Prof. Cremer Award from the German Acoustical Society, the Fellowship Award of the Audio Engineering Society (AES), and, in October 2000, the Emmy Award from the National Academy of Television Arts and Sciences in the United Sates. As Senior Engineer, he was in charge of audio for TV and technical co-ordinator of European and National research projects dealing with multimedia archives and Rich Media Hybrid TV.

Gerhard Stoll

We were honored to have Gerhard serve as a presenter at IBC 2009 IEEE BTS Tutorial on "Audio Technology: Coding and Concatenation, Loudness and Lip Sync." Gerhard's presentation was on"Audio Quality Loss Due to Concatenation of Audio Codecs." He also was scheduled to be presenter on the IEEE BTS Tutorial on "Audio Technology for Television" at the 2010 NAB.

Anyone who would like to send condolences to Gerhard Stoll's family can write to his colleague: *Klaus Illgner-Fehns Dr. Ing. Managing Director, CEO of IRT, Floriansmuehlstrasse 60 80939 Munich, Germany* who will deliver the letters to the family.

60th Annual IEEE Broadcast Symposium

20-22 October 2010 **Alexandria, VA USA**

SAVE THE DATE!

Please mark your calendar to attend the **60th Annual IEEE Broadcast Symposium** to be held at the Westin Hotel in Alexandria, Virginia on 20-22 October 2010.

The IEEE Broadcast Symposium is focused on technical areas important to broadcast engineers and professionals with an emphasis on leading edge technology of interest to broadcasters.

Topic Areas:

Presentations are being scheduled who will present on topics such as the post transition performance of digital terrestrial TV, AM and FM digital radio performance, the results of increasing the level of FM IBOC carrier levels relative to the FM analog carrier power level, predictions of FM IBOC interference to adjacent channels and observed interference to adjacent channels, point to multi point TV transmission to mobile hand held devices, distributed transmission for TV and FM, advances on the use of Longley Rice modeling to determine predicted coverage contours for radio and TV, and other topics that are relevant to the modern broadcast engineer.

This event will offer Continuing Educations Units (CEUs) for attending the technical sessions. Most consultants and PE's know that those are often required to maintain professional engineer licenses. Please feel free to request the CEU accreditation when you register for the conference.

For details visit the Broadcast Symposium web site: www.ieee.org/bts/symposium

For more information about the IEEE Broadcast Technology Society,
visit our web site: **www.ieee.org/bts**

1st ATSC Symposium on Next Generation Broadcast Television

October 19, 2010
9 AM – 5 PM
Westin Alexandria Hotel
400 Courthouse Square
Alexandria, VA, 22314 USA

Registration for the symposium is now open. Registration fees are $75.00 for ATSC members and $150.00 for non-members.

Preliminary Agenda

Continental Breakfast

Welcome and Introduction
Jim Kutzner, PBS

Advanced Video Codecs: What's On The Horizon?
Transmission Technologies for Next-generation Digital Terrestrial Broadcasting

Break

Latest Trends In Worldwide Digital Terrestrial Broadcasting and Application
Toward The Construction Of Hybridcast

Lunch

Keynote Speaker

Audio

A Revolutionary Digital Broadcasting System: Making The Fullest Possible Use Of Bandwidth

Beyond Coding: Getting 3D Audio Into The Home

Break

Self-Organizing Broadcast Network

MPEG-4 HE-AAC – The Audio Codec For The Next Generation Broadcast Television

Wrap-Up Discussion

IEEE INTERNATIONAL SYMPOSIUM ON BROADBAND MULTIMEDIA SYSTEMS AND BROADCASTING




8th – 10th June 2011, Metropolitan Area Nuremberg, Germany

Call for Papers

The IEEE International Symposium on Broadband Multimedia Systems and Broadcasting 2011, the 6th in the series, will be held in the Metropolitan Area Nuremberg, Germany (http://www.ieee-bmsb2011.org). The symposium will be a premier forum for the presentation and exchange of technical advances in the rapidly converging areas of multimedia broadcasting, telecommunications, consumer electronics, and networking technologies.

The symposium seeks technical papers on the following topics:

1. Multimedia systems and services
1.1 Mobile TV
1.2 IPTV & Internet TV
1.3 DTV and broadband multimedia systems
1.4 VoD, interactivity, datacasting
1.5 Field trials and test results
1.6 Content management
1.7 Service deployments

2. Multimedia devices
2.1. Display technology
2.2. Acquisition technology
2.3. Set-top box and home networking
2.4. Mobile, portable, and handheld devices
2.5. Program guides and navigation

3. Multimedia quality: Performance evaluation
3.1 Performance evaluation
3.2 Objective evaluation techniques
3.3 Subjective evaluation techniques

4. Multimedia processing
4.1. Audio technology
4.2. Video coding and processing
4.3. Content adaptation and scaling
4.4. Error resilient and concealment
4.5. Rate control
4.6. Retrieval and indexing
4.7. 3-D and multi-view video
4.8. Content protection and watermarking

5. Transmission and networking
5.1. Channel modeling and simulation
5.2. Channel coding, modulation, multiplexing
5.3. Signal processing for transmission
5.4. Propagation and coverage
5.5. Congestion control
5.6. Traffic and performance monitoring
5.7. Networking and QoS

Call for Tutorials: Proposals for half-day tutorials are also solicited based on the topics listed above.
Call for Panels: Proposals are solicited for panels on technology, application, business, and policy-related issues and opportunities for multimedia and broadcasting industry.
Prospective authors are invited to submit extended abstracts of about 1000 words by e-mail to bts@ieee.org. Each abstract must include at least two key words chosen from the topics mentioned above. Please indicate that the abstract is submitted to the IEEE International Symposium on Broadband Multimedia Systems and Broadcasting 2011, and includes the corresponding author's full name and contact information including: Affiliation, address, e-mail, and phone number.

Important dates:
Submission of extended abstracts: November 23, 2010
Notification of acceptance: February 4, 2011
Submission of full papers: May 6, 2011

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