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IEEE

Broadcast Technology Society Newsletter

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

President's Report

William Meintel, BTS President

Since our last visit, much has happened within the BTS. In November, Lisa Weisser, our Society senior administrator who had joined us in May, left for a position outside the IEEE. This occurred as our other administrator, Jenn Barbato, was out on maternity leave. Although this departure was unexpected and the timing was not the best, we do wish Ms. Weisser well in her new endeavor. Since this is the second administrator to leave us in the past year, former president Bill Hayes has been giving me a hard time, as he was able to keep the same one for his entire four years as president. However, these things happen, and Bill and the other volunteers have been great in helping get us through it. I would also like to thank Faith Agnew who worked with us while Jenn was out. She did an excellent job in helping to hold things together.

As the new year is now upon us, things are looking up with the arrival on Jan. 23 of our new senior administrator, Amanda Temple. She has really been on top of things since her arrival, and as she has been with IEEE since 1999, her experience in the organization is a great asset. Also Jenn is back and once again doing her usual great job. By the way, we offer congratulations to Jenn on the arrival of her daughter, Sophia, who we hear is doing great.

In addition to Amanda and Jenn, we except to add a third member to the BTS family in the very near future.

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Inside

From the Editor

James E. O'Neal, BTS Newsletter Editor

We're now in the last full month of "official" winter, such as it is here in Northern Virginia. We've been fortunate this time round—no "snowmagedons," just a few cold and blustery days and dusting or two of snow. Spring is only a matter of weeks away and along with the warmer days, increasing hours of daylight, green landscape, there's the ramp-up to 2012 NAB Show and all of the other shows, symposia, exhibitions, conferences, and other such annual meetings and happenings that are a part of the broadcasting scene and keep a lot of us on the run.

Before I go too much further, I want to extend a warm welcome to Amanda Temple, our brand new senior administrator. While she's no stranger to the IEEE, 2012 will mark her first exposure to the myriad activities that are part of the BTS family. I'd like to ask everyone in the Society to be sure and stop in at the BTS booth at the upcoming NAB Show and say hello to Amanda.

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President's Report continued from page 1

The Society has requested and received authorization to add another staff person, and the hiring process has begun. In case you haven't noticed, the BTS has become much more active globally, but this increased activity has put a strain on the staff. The addition of this new position should really help support our volunteers as they work to provide more value to our membership.

January also found us welcoming four newly-elected members and one returning member to the Administrative Committee. We congratulate Dave Bancroft, Tom Cox, Ralph Hogan, Marisabel Rodriguez, and Bob Surette on being elected to the AdCom and thank them for taking on these positions. Of the group, Bob Surette is the only holdover from last year being elected to serve a second two-year term.

2012 will also see the launch of our "Bridging the Gap" (BTG) two-day course on IT for broadcast station engineers. This has taken a while to develop, but has been met with enthusiasm from those who have taken the beta test version, and I understand there are already requests for the program from paying customers. In addition, there are also discussions in progress about follow-on courses to delve deeper into the subject matter, as well as a reverse course for IT people who need to understand the broadcast side of things. It looks as if we have a good start on some valuable educational tools for the industry. Congratulations and many thanks to all those who worked to make this happen.

From my last column and an article in that Newsletter, you may recall the discussion about the FoBTV Summit and that BTS is one of the founding members. The purpose of FoBTV is to foster global collaboration that may lead to the development of common strategies for the future of terrestrial broadcasting, and by doing that preserve broadcasting for future generations. I am happy to report that this effort is continuing and suggest that you should consider attending the FoBTV "Supersession" that will take place at the NAB Show in Las Vegas on Tuesday morning, April 17.

2012 will also bring you great two great BTS-sponsored symposiums. The first will be the IEEE International Symposium on Broadband Multimedia Systems and Broadcasting June 27–29 in Seoul, Korea, and then the 2012 IEEE Broadcast Symposium to be held Oct. 17–19, at the Westin Hotel in Alexandria, Va. Both of these will be outstanding events that you should plan to attend.

With that in mind, I would like to share an observation with you, ask a question, and request your help. At the

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I'd also like to extend another greeting—this one goes to Jenn Barbato who just recently returned from maternity leave. In case you don't know, in addition to taking care of a lot of the Society's business matters, Jenn has a big part in putting together the Newsletter you're reading right now. Welcome back Jenn, and congratulations on the addition to your family.

I need to recognize someone else too, Faith Agnew, who worked with me in Jenn's absence in putting together the Fall Newsletter. As this was my second issue of the publication and Faith's first, we both stayed very busy attending to details. I really appreciate the support she provided.

And speaking of the Newsletter, you'll probably notice that this issue is a lot thinner than the last few. This can be chalked up to a couple of things. The first is a push to get back on schedule, as we were two issues behind when I inherited the editorship. The second factor is a lack of "raw material" from which to work. There just wasn't much in the way of manuscripts, chapter reports, or other news reports

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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 *BTSeditor@ieee.org* Here are our deadlines for upcoming issues:

Issue	Due Date
Spring, 2012	Jan. 20, 2012
Summer, 2012	May 04, 2012
Fall, 2012	July 20, 2012
Winter, 2012	Nov. 07, 2012

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BTS Holds January AdCom Meeting

The latest IEEE Broadcast Technology Society Administration Committee (AdCom) meeting was held on Friday, Jan. 13, 2012 in Las Vegas, Nev., concurrent with the Consumer Electronics Show there.

The 3:00 to 5:30 p.m. meeting was well attended, with all but one of our elected at-large members present, along with the entire executive committee and many committee heads. The group welcomed newly-elected AdCom members Dave Bancroft, Marisabel Rodriguez, Ralph Hogan and Tom Cox, as this was their first meeting after being elected last fall.

President, Bill Meintel was happy to report that Amanda Temple was hired in January as our new senior administrator. The Society has been without an administrator since the departure of Lisa Weisser in November. Also, our other administrator, Jenn Barbato, was out on maternity leave during the same time frame, creating quite a void. Fortunately, by the time you read this, Amanda will be on board and Jenn will have returned.

In recent years, the BTS has greatly expanded its activities and not having an administrator puts a significant burden on volunteers who have to take up the slack, in addition to performing their normal BTS activities, and also their "day jobs." In consideration of this, it was reported during the meeting that the BTS had requested, and was authorized, permission to hire a third person to work with Amanda and Jenn. This authorization prompted a period of discussion as to whether BTS should go ahead with the hiring, and culminated with a unanimous vote to proceed with that hire. It is expected that this will occur during the first quarter of 2012.

Ralph Hogan, along with Janet Gardner of Perspective Media, reported that the "Bridging the Gap" course that's been under development for some time is essentially complete now. The course is intended for television station engineers who need to acquire an understanding of information technology (IT), as this has now become closely intertwined with their work. Mr. Hogan reported that the two-day course has been "field tested" and he expects it will be offered at three or more venues during 2012.

Ms. Gardner said that a marketing plan for the program needed to be developed and mentioned that she and the course designers are examining the following areas of the program in connection with that:

- Description of the course and testimonials regarding it
- Feedback from students to drive possible revisions
- The use of conferences and mailing lists for distribution of information about the course
- How the IEEE will address location logistics and back-end issues

Mr. Hogan discussed course logistics and said that the addition of another administrator would help with the course registration procedure, as well as with other course needs. This led to a further discussion concerning the expected future of this course and possible follow-on courses and their need for support. After a period of discussion it was decided that BTS needed to lay the groundwork in connection with the hiring of a fourth administrator whose sole responsibility would be in administrating the BTG courses.

Another item discussed was BTS sponsorship of Advanced Television System Committee (ATSC) events. In the past our organization has sponsored the ATSC annual meeting. In addition to supporting ATSC work, this sponsorship has given BTS more visibility within the industry. After discussion it was agreed that BTS would continue its sponsorship commitment to ATSC at the same level that it has in previous years.

Background information was presented during the meeting about the FOBTV (Future of Broadcast Television) organization that came into being during the 2010 NAB Show. The focus of that organization is to achieve a common ground for all terrestrial broadcast television, with development of a program to address terrestrial broadcasting service requirements and the various technologies needed to provide these services. It was reported that a plan is in place to draft a formal memorandum of understanding concerning these activities. The organization has no office, existing instead as a cyber-organization. It seems that spectrum of issues exist worldwide, with a central issue being the continuation of commercial broadcast in light of the continuing competition for spectrum. "White space" issues are also common throughout the world. The aim of the new organization is to try and satisfy this worldwide "spectrum crunch" while still maintaining and significantly enhancing terrestrial television through a worldwide standard that will allow delivery to both fixed and mobile viewing devices.

Other actions taken by the AdCom included continuation of BTS support of a student paper competition at Russia's St. Petersburg University, with winners receiving a trip to the IBC Show, and approval of two new Distinguished Lecturer Program candidates, Eric Wandel and Professor Ce Zhu.

The next AdCom meeting is scheduled to be held during the 2012 NAB Show, That meeting is set for 4:00 to 7:30 p.m. on Sunday, April 15 and will be held at the LVA Hotel (formerly the Las Vegas Hilton.)

BTS Distinguished Lecturer Program Update

By Rich Chernock, Chair, BTS Distinguished Lecturer Program

The Distinguished Lecturer (DL) program for the IEEE Broadcast Technology Society has been successfully operating since 2009. Lectures have been given at BTS chapters around the world. The goal of this program is to provide a resource for the BTS chapters—serving the needs of the members of the Society to enhance their professional knowledge and vitality by keeping them informed of the latest research results and practical applications. Funding is available through BTS to support these visits (with some limitations).

BTS maintains a list of available DLs and lecture topics. All of the DLs in this program are well-respected in the field and have considerable experience in presenting technical information. Further information about the DL program is available through the BTS Website.

BTS chapter chairs can see a list of available DLs (below), the lecture topics that each can provide, and the geographical area that each will cover. Currently, worldwide chapter support can be provided. After selecting a potential DL and topic, the chair will discuss availability and other details directly with the DL. Once an agreement has been reached, I have to approve the visit. There are requirements for announcement of the events and a follow-up, with further details available on the Website. There is also a limitation to the number of DLP talks each DL may give in a year, so please plan early.

The current list of DLs (and their lecture topics) is as follows:

David Bancroft

- Reference monitoring for broadcast production in the flat panel era
- Comparing image characteristics of television cameras with different optical formats and sensor architectures

Lap-Pui Chau

- Source and channel rate allocation techniques for digital video transmission applications
- Multi-program video coding for digital video broadcasting applications

Rich Chernock

- DTV technology tutorials
- DTV monitoring
- ATSC mobile television
- ATSC 2.0 (including NRT and connected TV)

Matt Goldman

- Broadcast television analog turn-off
- Advances in video compression technology for contribution and distribution
- MPEG-2 technology
- MPEG-4 AVC technology

David Layer

- Digital radio
- Digital TV
- Broadcast regulatory and legislative issues

Gary Sgrignoli

- 8-VSB fundamentals and measurements overview
- Post-transition DTV reception issues

Valentino Trainotti

- AM low and medium frequency transmitting antennas
- Transmitting antennas for FM and TV broadcasting in VHF and UHF bands

Eric Wandel

- Using NEC for directional pattern design of VHF and UHF antennas for FM and TV

Xianbin Wang

- Robust system design for multimedia broadcasting services under distributed transmission networks
- Emerging technology and new applications for ATSC DTV systems

Hsiao-Chun Wu

- Digital transmission and signal processing in broadband multimedia communications
- Transmitter identification for digital video broadcasting

Yiyan Wu

- DTV transmission systems
- SFN, distributed transmission and cloud transmission
- Wind turbine impact on UHF band DTV reception

Ce Zhu

- 3DTV system with depth-image-based rendering
- View synthesis and artifact reduction techniques in 3D video
- Advanced video streaming with multiple description coding and network diversity

All BTS chapter chairs are encouraged to take advantage of this resource.

ITU-T IPTV-GSI Meeting Report

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

The 17th IPTV-GSI meeting took place in Geneva, Switzerland Nov. 21–25, 2011, with Masahito Kawamori, PTV-GSI technical and strategic review coordinator, chairing the event which combined the activities of Study Groups (SG) 9, 16 and 17.

About 50 delegates attended the meetings, along with 180 registrants to SG-16 and also 40 registrants to SG-9 activities, resulting in very active participation. The delegates represented various industries, research institutions, and standardization bodies.

The Telecommunication Standardization Bureau (TSB) also provided a demonstration of ITU IPTV Application Challenge content on Nov. 23, with H.761 and H.762 content being displayed using an H.721-compliant set-top box and a TV set purchased from the retail market.

The CRC represented the IEEE BTS, and submitted seven contribution proposals. These focused on two ITU-T draft Recommendations. For the first of these, H.IPTV-TDES.4 "IPTV Terminal Device: Mobile Model," CRC proposed additional texts describing the quality of service (QoS) for mobile IPTV terminal devices, quality, and performance assessment applied to mobile terminal devices, video/audio and media distribution adaptations, as well as codecs relevant to mobile models. For the second draft Recommendation, HSTP.IPTV-3D "Technical Paper: Multimedia application system for three-dimensional IPTV services," CRC proposed additional texts addressing various issues, such as compatibility in connection with 2D/3D delivery issues, use and delivery of metadata, content and service integration, synchronization, as well as 3D advertising, linear and on-demand services, and mobile 3D IPTV.

Meeting Details

A plenary session was held early during the first day's proceedings. A draft agenda and work plan were presented and adopted by the attendees, who then broke up into separate study groups to discuss questions related to their own areas of expertise.

The attention of participants was focused on Question 13/16 (Q13/16) "Multimedia application platforms and end systems for IPTV", as Q13/16 addresses issues of interest to broadcasters, such as audience measurement, mobile and 3D IPTV, IPTV service over multiple terminal devices, the inter-operability of devices, digital signage, and similar issues.

Q13/16 was addressed in 18 sessions during the SG-16 meeting. Some 27 contributions were reviewed, and 32 output documents were produced, in addition to eight liaison statements. One of these asked DVB to start work on specifying the carriage of Multimedia Application Frameworks (MAFR) applications over the DVB signal.

Q13/16 agreed to propose H.IPTV. AM.0-0 "IPTV application event handling: Overall aspects of audience measurement for IPTV services" for consent at this SG-16 meeting. It also agreed to propose HSTP.CONF-H701 (Conformance testing specification for H.701) and HSTP.CONF-H762 (Conformance testing specification for H.762) for approval. Q13/16 agreed to create a new work item, "IPTV Terminal Device: Interworking-enabled model of multiple devices" (H.IPTV-TDES.5). A joint meeting was held with Q4/9 on "Integrated Broadcast Broadband Application Control" and two joint meetings took place with Q3/13. One of these involved e-health, with the World Health Organization and the Continua Health Alliance being invited. The other was on mobile IPTV. It discussed and changed the text of its Terms of Reference. Q13/16 prepared eight outgoing Liaison Statements. The group planned to hold one interim meeting during the IPTV-GSI event in Feb. 2012.

The following points summarize the discussions that were most relevant to broadcasters:

- C.774 – ETRI, Proposal of a new work item on audience measurement for digital signage services (H.AMDS)—This proposes the creation of a work item on audience measurement for digital signage services. The group discussed the meaning of audience measurement within this context. Contributors were asked to clearly point the DSS scenarios that IPTV-AM and UVS cannot cover in order to make a case for the proposed work item. However, the creation of such a new work item was postponed for the present, as more contributions are expected.
- C.775 – Cisco Systems, H.IPTV-AM.x: Proposed Plan—This proposal would take H.IPTV-AM.0 (TD 664 (WP 2/16), which is now 135 pages long with many outstanding issues unevenly spread across the topics covered, and break it up into several new draft recommendations. The scope and the title of those new drafts were discussed. Another AM document, TD665-WP2/16, was renamed H.IPTV-AM 0-3 in accordance with this process. The group agreed with that the new overall document taken from TD664 be proposed for consent. The proposal was accepted.
- C.720 – Mitsubishi Electric Corporation, NTT, NEC Corp., OKI H.FDSS: Proposal for Additions on Disaster information services—This proposes text on disaster information services via digital signage. An important issue was selection of appropriate wording. One example given was "what constitutes a 'temporary house'?" After some changes to wording, the proposal was accepted.
- C.764 – Sumitomo Electric Industries, Ltd. HSTP.CONF-H701: Proposed draft text of Technical Paper "Conformance testing specification for H.701" for Approval—This proposed editorial modifications to HSTP.CONF-H701 to raise the quality of the document. The proposal was accepted. The group agreed that this document would be proposed for approval at the SG16 plenary on Dec. 2, 2011.

- C.716 – ZTE Corp. H.IPTV-TDES.3: Proposal to Add IPTV Multi-device Features—This proposed additional text for TDES.3. After discussion, it was agreed that it was more appropriate to include this text in the newly created TDES.5, rather than TDES.3. In the future, TDES.3 may refer to this part of TDES.5 to enable TDES.3 terminals to be compatible with multiple terminal devices. With these modifications, the proposal was accepted.
- C.683 – IEEE BTS/CRC. H.IPTV-TDES.4: Proposed Addition to Clause 11.10 "Adaptability"—This proposed that text be included in the Adaptability section of TDES.4 describing SVC and DASH. It was pointed out that a specific reference to the standard(s) of DASH may be necessary. We can discuss the nature and definition of DASH with MPEG. With these notes, the proposed text was adopted.
- C.682 – IEEE BTS/CRC. H.IPTV-TDES.4: Proposed Addition to Clauses 11.8 and 11.9 ("QoS" and "Quality and Performance Monitoring")—This proposed additional text be included as part of the QoS section. It was suggested that a reference to ITU-T Rec. H.701 "Content Error Recovery for IPTV services" should be made in the text. Otherwise, the proposed text was accepted and inserted in H.IPTV-TDES.4.
- C.688 – IEEE BTS/CRC, HSTP.IPTV-3D: Proposed addition to Clause 9 "Applications using 3D IPTV service" – This proposed that explanatory text be included in HSTP. IPTV-3D. It was pointed out that the references and bibliography should include more documents, and the references to ITU-T Recommendations should be updated, as some of them are obsolete. It was noted that advertisement[s] should make a specific reference to "overlay" technology. With such modifications, the proposal was accepted.
- C.685 – IEEE, HSTP.IPTV-3D: Proposed Addition to Clause 8.1 "General Requirements"—The document proposed additional text be included in the current HSTP.IPTV-3D. It was pointed out that in the Y.1910, the requirements were described as being applied to "IPTV architecture," and therefore the requirements in this document should also be phrased as "3D-IPTV architecture, which means IPTV architecture for 3D services." In this context it was noted that 3D-IPTV architecture required to handle metadata was too demanding. It was agreed to change wording to "is recommended to." There was the discussion as to why "at least two seconds" was specifically mentioned in the "Integration with 2D content and service" clause. This number came from b-DVB-Bluebook-A154, but an explanation was deemed necessary. With these modifications, the proposal was accepted.

Other Business

- *TD 471-GEN – Reply Liaison Statement (LS) from ATIS IIF on services over multiple terminal devices (COM16-LS-262)* – For this liaison statement, participants agreed to ask them to point to those areas where they "found several new functions and definitions that were unclear to us." This LS also mentioned ATIS-DASH (Dynamic Adaptive Streaming over HTTP) use cases. We will coordinate with MPEG to see how we can harmonize our Recommendations (e.g. H.721) with ATIS-DASH and MPEG-DASH. We consider adding a clause for DASH in H.721.
- *Joint meeting with Q4/9* – Q13/16 held a joint meeting with Q4/9 on Nov. 23, 2011, with Masahito Kawamori (NTT, Japan) and Masaru Takechi (NHK, Japan) co-chairing. The groups discussed J.acf-req and J.acf-arch. Q4/9 and Q13/16 and successfully harmonized the text of this draft Recommendation by replacing the term "Hybrid" with "Integrated Broadcast and Broadband," and mentioning the natural characteristics of this draft Recommendation. The group agreed on the text of the new draft Recommendation J.acf-req, "Requirements for Integrated Broadcast and Broadband DTV application control framework," and proposed it for consent.
- *Joint meeting with Q3/13 on mobile* – Q13/16 held a joint meeting with Q3/13 on mobile IPTV and multiple terminal devices on Nov. 23, 2011 with Marco Caruggi (ZTE, China) and Masahito Kawamori (NTT, Japan) co-chairing. We discussed the definition of mobile IPTV service and no disagreement found. However, it was pointed out that further investigation is necessary to clarify the wording. Q13/16 reported that they have created a new work item on multiple terminal devices, and expressed the desire to receive clarification from Q3/13 on the differences between three-screen service and mobile IPTV.
- *Future work* – Meeting participants agreed to start work on a new item, H.IPTV-TDES.5 "IPTV Terminal Device: Interworking-enabled model of multiple devices." An agreement was also reached to initiate work on the following items:
  - MAFR for DSS
  - MAFR for Interworking Terminal Devices (TDES.5)
  - Touchscreen for MAFR (extension to H.761 and H.762 or H.IPTV-MAFR.7 DOM)
  - RIA (Rich Interactive Application) for advertisement (HSTP.IPTV-RIA)
  - AM for DSS

The next IPTV-GSI meeting dates were set for Feb. 13–17, 2012 in Geneva, Switzerland.

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.

UHF Digital TV Broadcasting Using Variable Payload for Delivery of Graceful Degradation of Service Throughout the Coverage Area

By Oded Bendov, President, TV Transmission Antenna Group, Inc.

Introduction

It is well known that incident field strength is not a predictor of digital television (DTV) reception. The incident field can be very strong though contaminated with interference and multipath. Ultimately, such contamination is sufficient to block reception. Nevertheless, field-strength contours and a multipath-free channel, a model borrowed from analog TV, have continued to be the tools of choice for service prediction. The future of DTV broadcasting depends on robust reception by handheld devices everywhere within the radio horizon. That mandates a network of distributed transmitters. Further, in order to provide adequate payload in a harsh multipath environment typical for most consumers, DTV transmission must be based on channel and source coding1 with hierarchical modulation characterized by discrete, graceful degradation of decodable payload throughout the coverage area.

Gracefully degraded and decodable payload contours are not picture-quality contours. For a given payload, the subjective picture quality depends on the size of the picture within the available physical screen. Thus, even in a harsh environment some kind of picture should be displayable on small and large screens. On small screens of handheld devices, low payload suffices for high picture quality. On larger screens, the displayed picture of low payload may be configured over a smaller area of the available screen area.

This paper shows how a future DTV broadcasting network can be configured and its service predicted with Quality of Service (QoS) payload contours.

Definition of Coverage Area

The coverage area of DTV broadcasting is the area bounded by the radio horizon. Beyond the radio horizon, the combination of shadowing and diffraction makes reception of television impossible. The service area, the area where reception is possible, is always smaller than or equal to the coverage area depending on the levels of multipath, interference and on the receiver's performance.

The distances and angles to the flat earth radio horizon are shown in Table I for various antenna heights AMSL.

Table I

	K = 4/3	
Height	**Radio Horizon**	
Meters	**Km**	**Deg**
50	29	0.20
75	36	0.24
100	41	0.28
125	46	0.31
150	50	0.34
175	55	0.37
200	58	0.39
225	62	0.42
250	65	0.44
275	68	0.46
300	71	0.48

Propagation Path Loss and CNR Inside the Coverage Area Bounded by the Radio Horizon

The technical literature is rife with propagation path loss models for various point-to-point and point-to-area links. It is fair to say that there is no proven universal model for broadband DTV. The models now in use in the United States, F(50 percent of locations, 90 percent of time) and LR(50 percent of locations, 90 percent of time), have been shown to over-predict the incident field strength2, and in any case these field-strength models cannot serve as predictors of actual reception indoors or outdoors.

One of the best known empirical propagation path loss models in rural and suburban areas is the Egli's model, that when modified to include ground clutter[3], gives the median propagation loss at 50 percent of the locations as:

$$L_{50}(dB) = 20\text{Log}(f) + 40\text{Log}(D) - 20\text{Log}(h_t) - 10\text{Log}(h_r) + 76.3 \quad h_r \leq 10 \text{ meters} \tag{4}$$

where f is in MHz, and the transmitting and receiving antenna heights AMSL, h_t and h_r, are in meters, and D is the path length in kilometers.

Egli's model was developed for analog television, which is a narrow-band transmission within a wide-band channel. In analog TV, multipath was not a path loss factor. DTV is truly a broadband signal and its spectrum is subject to distortion by variable attenuation and group delay due to multipath. For all practical transmitting antenna heights, the path loss factor due to multipath is[4]:

$$L_M(dB) = 2.6\text{Log}\left(\frac{P}{50}\right) \tag{5}$$

where P is percentage of time for which the multipath loss is not exceeded for the median values of location. For P = 1%, L_M = −4.42 dB.

Combining (4) and (5), the Egli model modified for ground clutter and multipath loss is:

$$L_{50}(dB) = -2.6\,\mathrm{Log}\left(\frac{P}{50}\right) + 20\,\mathrm{Log}(f) + 40\,\mathrm{Log}(D) - 20\,\mathrm{Log}(h_t) - 10\,\mathrm{Log}(h_r) + 76.3 \quad h_r \le 10 \text{ meters} \tag{6}$$

For robust DTV reception by handheld devices building entry loss must be added and the percentage of time and location availability must be raised from 50 percent to 99 percent. The total propagation path loss for DTV service indoors:

$$L_{99,99}(dB) = 20\,\mathrm{Log}(f) + 40\,\mathrm{Log}(D) - 20\,\mathrm{Log}(h_t) - 10\,\mathrm{Log}(h_r) + 114.4 \quad h_r \le 10 \text{ meters} \tag{12}$$

For reference, at the best 50 percent of locations at least 90 percent of the time the path loss is:

$$L_{50,90}(dB) = 20\,\mathrm{Log}(f) + 40\,\mathrm{Log}(D) - 20\,\mathrm{Log}(h_t) - 10\,\mathrm{Log}(h_r) + 94.5 \quad h_r \le 10 \text{ meters} \tag{14}$$

Ultimately, the accuracy and usefulness of (12) and (14) must be adjusted through field tests in different zones. The shown loss increases at the rate of 12 dB per octave. For comparison, free-space loss is 6 dB per octave and diffraction loss is 20 to 30 dB per octave.

The available carrier power at the input to the receiver, excluding interference, depends on the receiver's antenna gain and on the impedance mismatch at the input:

$$P_R(dBm) = 10\,\mathrm{Log}(ERP) + 2.15 + G_R - L_{X,Y} \tag{15}$$

where ERP (mW) is the effective radiated power in the direction of the receiver and G_R (dBd) is the effective gain including impedance mismatches and antenna-to-tuner line loss. G_R = 0 dBd has been proposed for planning purposes and is adopted here.

The carrier power-to-noise (CNR) at the input is:

$$CNR(dB) = P_R(dBm) - NF(dBm) \tag{16}$$

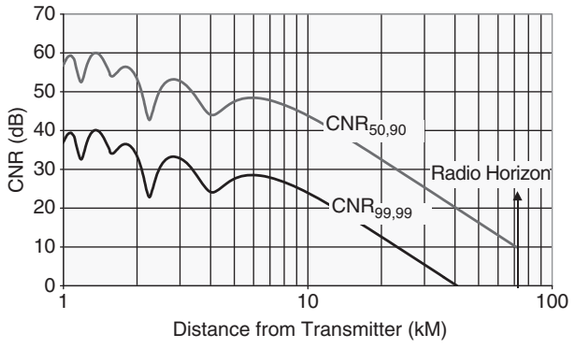
where N_F is the effective noise floor at the input.

Figure 2 shows the CNR *indoors at 1.5 meters* available from a tall tower with an antenna radiating 250 kW using equations (13)-(16). Figure 3 shows the CNR *indoors at 1.5 meters* available from a short tower with an antenna radiating 50 kW. Standard TV broadcast antenna elevation patterns were used in Figures 2–3. The 250 kW ERP antenna's RMS gain is 16 (12 dBd) and the 50 kW ERP antenna's RMS gain is 8 (9 dBd). Also, the noise floor was set to –97.2 dBm based on thermal noise being –106.2 dBm over 6 MHz, factory noise figure of 7 dB and allowing for 2 dB increase in noise figure due to impedance mismatch between the tuner input and the receive antenna.

In digital television, CNR and SNR are not interchangeable as SNR refers to a post-detection measure that includes the degradation caused by multipath and other undesired signals. Further, the quality of digital television service is defined by the size of the payload at a certain bit-error rate (BER). That payload is killed ungracefully, or rather abruptly, if the SNR drops below its payload threshold value.

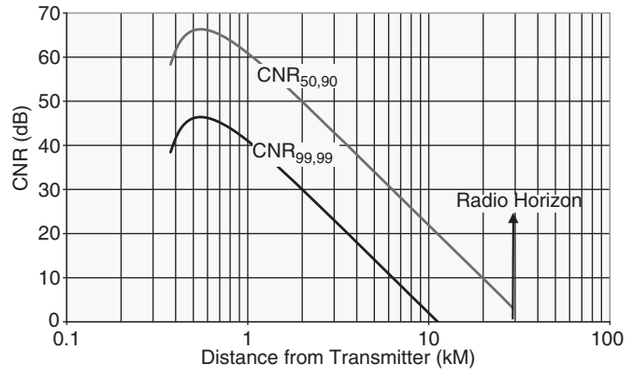
QoS Payload Contours for Digital Television

As discussed earlier, in digital television SNR is measured not at the RF input to the receiver, but rather at the output of the demodulator. Between the RF input and the demodulator output, signal processing includes error correction and channel equalization. In other words, the channel's SNR depends not just on the thermal noise at the input of the tuner but also on all undesired energy components inserted from the input to the modulator at the transmitter to the output of the demodulator at the receiver. Therefore, any power level at the input to the receiver is insufficient as a reception indicator of digitally transmitted video and audio.



Frequency (MHz)	:	600
ERP (kW)	:	250
Tx Antenna Height (m)	:	300
Rx Antenna Height (m)	:	1.5
Gain of Receive Antenna (dBd)	:	0
Receiver Noise Floor (dBm)	:	–97.2

Fig. 2 – Available cnr indoors, tall transmitter tower and high ERP



Frequency (MHz)	:	600
ERP (kW)	:	50
Tx Antenna Height (m)	:	50
Rx Antenna Height (m)	:	1.5
Gain of Receive Antenna (dBd)	:	0
Receiver Noise Floor (dBm)	:	–97.2

Fig. 3 – Available cnr indoors, short transmitted tower and low ERP

Whereas the availability of threshold SNR is a necessary and sufficient condition for decoding the transmitted payload at a prescribed BER, SNR is not a useful measure for describing the QoS. A far better measure is the available payload. The payload is indicative of picture quality for a given display screen size. By definition:

QoS(P,L,T) = Quality of Service(Payload Mbps, best L percent of Locations, at least T percent of time)

A family of QoS contours is a necessary tool to portray the performance of hierarchical modulation transmission designed to deliver variable payload at the same BER that could provides continuous, albeit discrete, degradation of payload throughout the entire coverage within the radio horizon.

The QoS(P,L,T) contours are derived from Shannon's law, modified for practical digital modulations. A modified Shannon's law for 6 MHz wide AWGN channel is:

$$C(Mbits/\sec) = 6 * \mathrm{Log}_2(1 + SNR * K) \qquad (17)$$

where $K \leq 1$ is the modulation efficiency gap.

The modulation efficiency gap, shown in Figure 6, represents the potential gain in payload that currently applies to all known digital television modulation systems relative to Shannon's maximum theoretical payload.

The modulation efficiency gap was first explained in Shannon's classical paper[5]. Shannon's comparison of the theoretically derived and modulation-independent limit with the actual payload of PCM and PPM modulations shows a gap of about 8 dB. More recently[6], the gap of adaptive coded modulation has narrowed to within 6 dB of Shannon's payload limit, which is the case for the DTV gap shown in Figure 6. That 6 dB gap applies to both ATSC 8-VSB and to COFDM modulations.

Four hypothetical QoS contours using hierarchical modulation are defined in Figure 6. If the SNR > 23 dB the modulation could be 16-PAM and the highest-priority payload would be 30 Mbps. If the SNR drops below 9 dB, the modulation could be a variant of PSK and the lowest-priority payload would drop to 2 Mbps. Although the steps shown in Figure 6 were selected arbitrarily, such a scheme would provide discrete QoS contours within the radio horizon for all practical values of the SNR.

The link between each of the QoS SNR/Payload ranges of Figure 6 and the available CNR of Figures 2–3 is given by:

$$SNR_{\mathrm{MIN}}(dB) \leq CNR(dB) \leq SNR_{\mathrm{MAX}}(dB) + Y(dB) \qquad (18)$$

where Y is the noise penalty incurred by the receiver's acquisition and equalization circuits that convert the distorted channel at the input to the tuner into a stable and an essentially AWGN channel, essentially free of inter-symbol interference at the output of the demodulator. The magnitude of Y can be determined through theoretical[7] and experimental system simulation. For DVB-T (COFDM) modulation systems and a single, essentially 0 dB static echo, $Y \approx 7$ dB[8].

Referring to Figure 6, the 20 Mbps QoS contour has an SNR that ranges from SNR_{MIN} = 16 dB to SNR_{MAX} = 23 dB. If the available CNR is between 16 dB with a flat spectrum and 23 dB with a distorted spectrum, then if the CNR = 23 dB and $Y < 7$ dB, the 20 Mbps priority stream (out of the total of 30 Mbps that is transmitted) will be decoded. If the CNR is 20 dB and $Y = 7$ dB, the 10 Mbps priority will be decoded.

Applying these rules to the available SNR/Payload that is shown in Figure 6, the relevant QoS contours are summarized in Table II. This hierarchical modulation system is designed for four levels of service. The important point is that reliable service of variable, albeit discrete, payload is available for all practical CNR values and such service can be made available throughout the coverage area and without subjecting ordinary consumers to the dreaded "cliff edge" effect of HDTV.

With analog TV, multiple grades of service within the coverage area that include picture degradation by multipath were defined based on subjective viewers' responses to perceptible to picture quality changes. Those service grades were sensible because the picture quality of analog TV degrades gracefully. With digital TV, graceful degradation can be achieved only with hierarchical modulation, but the definition of service grades must be related to and be compatible with Shannon's Law. As shown in Table II, with a tall

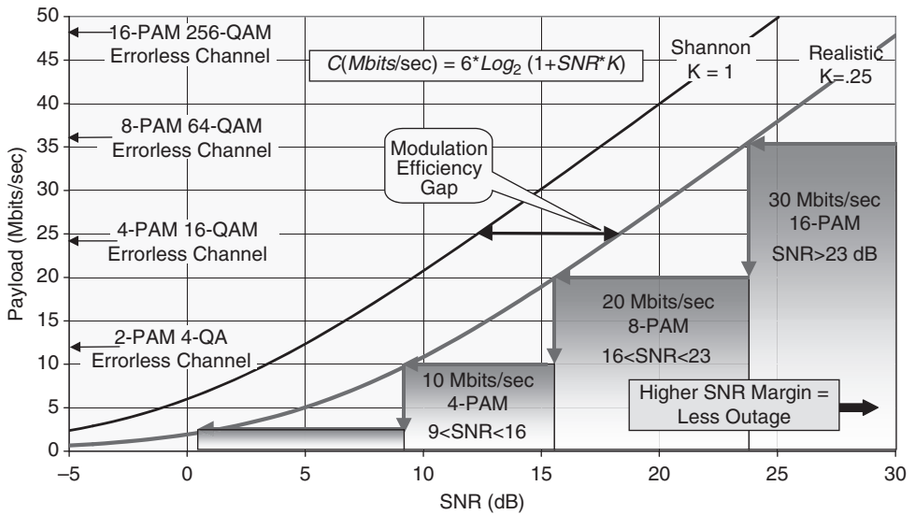


Fig. 6 – Theoretical maximum (K = 1) and realistic implementation (K = .25) payload for 6 MHz awgn channel with discrete graceful degradation

Table II – QoS(P,99,99) and QoS (P,50,90) contour radius for indoor reception 1.5 meters AG

			Tall Tower	Short Tower	Tall Tower	Short Tower
		Height (meters) =	300	50	300	50
		Radio Horizon (km) =	71	29	71	29
		ERP (kW) =	250	50	250	50
		Azimuth Pattern =	Omni	Omni	Omni	Omni
CNR (dB)	**Grade**	**Payload (Mbit/Sec)**	**(99,99) Radius (km)**		**(50,90) Radius (km)**	
<9	c–	2	>26	>7	RH @ 71	21–29
9–16	c	2 or 10	17–26	4.5–7	50–71	15–21
16–23	B	10 or 20	10–17	3–4.5	34–50	9–15
23–30	A	20 or 30	6–10	2–3	22–34	6–15
>30	A+	30	1–6	1–2	1–22	1–6

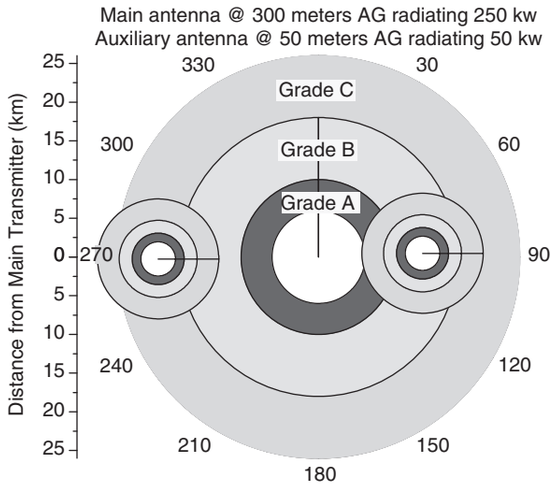


Fig. 7 – QoS(99,99) contours for the main and auxiliary transmitters

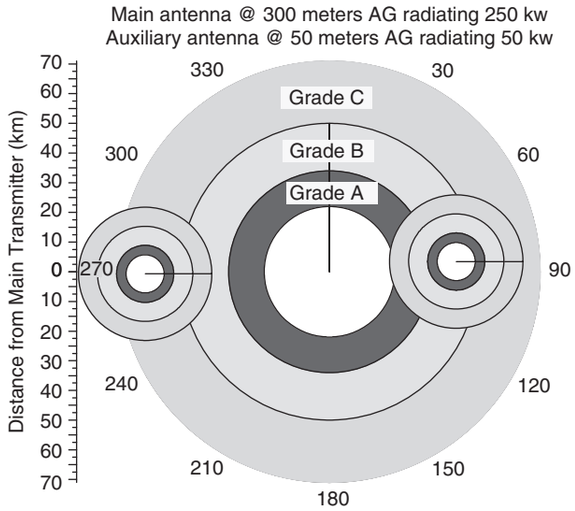


Fig. 8 – QoS(50,90) contours for the main and auxiliary transmitters

tower radiating 250 kW and hierarchical modulation, continuous payloads from 2 Mbps at the radio horizon with (50,90) reliability up to 30 Mbps within 6 km from the tower and (99,99) reliability are feasible. Thus, throughout the coverage area there would be some level of payload delivery without the "cliff edge" characteristic of single-level modulation. Service can be improved with higher transmitter power, increased height above ground of the transmitter antenna, a higher gain receive antenna and space diversity reception. High and even payload throughout the service area would be ideal, but as Figures 2 and 3 and Table II demonstrate, such an ideal is not possible with a single transmitter.

Adding Auxiliary Transmitters

Applying Shannon's law and its related QoS Contours shown in Figure 6, makes clear that the available payload degrades as the distance between the transmitter and receiver increases. To increase the available payload above that available from a single transmitter, additional transmitters must be deployed. Figures 7 and 8 show how short towers and low radiated power (ERP = 50 kW) from auxiliary transmitters can extend Grades A and B of the tall main tower with high radiated power (ERP = 250 kW). Figure 7 shows the QoS(P,99,99) contours and Figure 8 the QoS(P,50,90) contours.

The importance of variable payload modulation is made clear in Figure 8. With a fixed payload of 20 Mbps there would be a "cliff edge" in service at 34 km. With variable payload, the payload would gracefully degrade down to at least 2 Mbps at the radio horizon, enough for hand held devices. Since the radio horizon is at 71 km, the area serviced by a fixed 20 Mbps payload would be only 23 percent of the available area.

Clearly, the selected distance from the tall tower to the short tower depends on the desired QoS. For QoS(P,99,99) the short tower that extends Grade A eastward would have to be located 14 km away, whereas to extend the same grades for QoS(P,50,90) it would have to be located 42 km away. Similarly, extending Grade B to the west requires that the short tower be located further away than the distance required for extending Grade A westward.

In some locations it may be advantageous to use directional antennas on the short towers because of their higher gain and thus increased radiated power, and also because a directional azimuth radiation pattern can provide additional interference protection to stations in adjacent markets. Noting that beyond 1 km the CNR slopes of Figure 3 satisfy a straight line can facilitate plotting the payload contours of directional antennas. The CNR slopes of Figure 3 are first approximated by:

$$\text{CNR} = a - b \text{ Log } D \tag{19}$$

for omnidirectional antennas where D is the distance from the transmitter in km and the parameters a and b are:

	QoS(P,50,90)	QoS(P,99,99)
a	62	42
b	40	40

Solving (19) for the distance to a fixed CNR of directional antennas:

$$D(\phi) = 10^{\left[\frac{a - CNR + \Delta ERP + \Delta P(\phi)}{b}\right]} \tag{20}$$

where ΔERP is the dB increase in the peak radiated power due to the increase in the gain of the directional antenna relative to the omnidirectional antenna of Figure 3 and $\Delta P(\phi)$ is the reduction in dB of the radiated power relative to its peak power as a function of the antenna's directional azimuth pattern.

The directional azimuth pattern used is shown in Figure A1, and the CNR of the auxiliary antennas in are shown in Figure A2, of Appendix A.

Design of an Interference-free Network of Transmitters for Indoor Service to Handheld Devices

The first step is to define the radio horizon contours of the main and auxiliary towers. These contours depend only on the antenna heights and on the terrain. The second step is to choose the geographic locations of the auxiliaries' towers. The third step is to design the azimuth patterns for the antennas of the main and auxiliary transmitters. Lastly, the transmitter powers and antenna gains are adjusted for maximum service within the radio horizon.

Figure 13 shows an example of a network made up of a main tower 300 meters AG and four auxiliary towers 100 meters AG all in flat terrain. The main transmitter radiates 250 kW with a 25 kW/polarization transmitter and the auxiliary transmitter radiates 360 kW with a 10 to 15 kW/polarization transmitter. The receiver's antenna height was set at 1.5 meters AG.

Several TV stations can be multiplexed on the main and auxiliary towers. But the channels chosen for the auxiliary towers cannot be co-channels or adjacent channels to those on the main tower. For example, two or more existing channels can share one main antenna as well as share their payloads on only one additional channel that is unused in their own market or reused from another market.

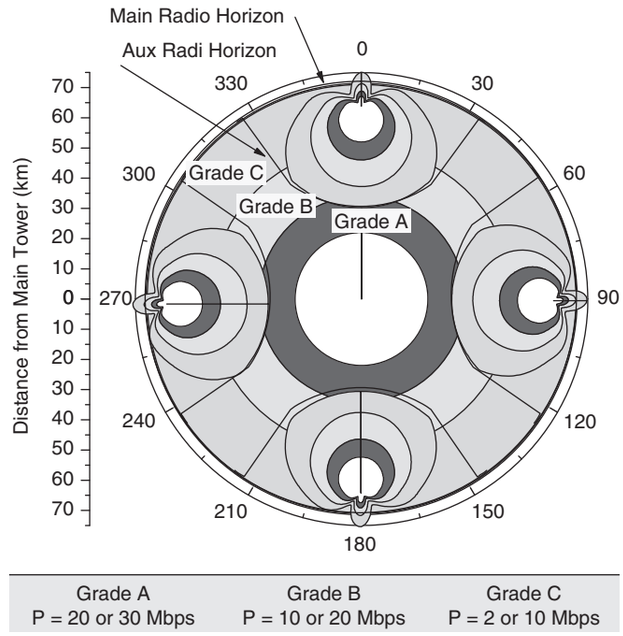


Fig. 13 – Interference-free network QoS(P,50,90) to handheld devices auxiliaries' channel frequency not equal to main's channel frequency

There is no interference into adjacent markets or among the auxiliaries due to the severe loss of signal beyond their radio horizon as shown in Figure A3 of Appendix A.

Only four auxiliaries are shown but since the arc of their radio horizon is 68 degrees, up to five such auxiliaries could be placed around the azimuth.

Although the auxiliaries all share the same frequencies, there is no need to synchronize them or provide each with the same guard interval or programs. The auxiliaries' frequency (or frequencies) can be either taboo channels within the main's radio horizon or reused channels from other markets.

This design shows the methodology of designing a spectrally-efficient network of transmitters that can be cost effective by sharing facilities and can deliver adequate payload up to the radio horizon without a "cliff edge" effect. In actual designs, the propagation loss algorithm should be adjusted for known local conditions.

Summary

1) With a single transmitter and hierarchical modulation, based on channels and source coding, it is possible to deliver a payload of at least 2 Mbps to handheld devices up to the radio horizon without the "cliff edge" effect, the no-picture threshold that is symptomatic of non-hierarchical modulation. Closer to the transmitter, delivery of 30 Mbps to handheld devices is possible. In effect, with a single transmitter and fixed 20 Mbps

payload, the service area to handheld devices is just 23 percent of the area inside the radio horizon.

2) QoS(P,L,T) contours in which each payload, P, is consistent with Shannon's Law, are used to describe the available payloads from the transmitter to the radio horizon.
3) Adding a network of auxiliary transmitters can extend the delivery of high payloads to hand held devices up to the radio horizon. The network would be interference-free and not require synchronization because the channels used by the auxiliaries are not co- or adjacent to the main transmitter channels and because all transmissions are bounded by radio horizons. The network is scalable and sharable and thus can be spectrally efficient and cost-effective.
4) The definitions of the radio horizon for each geographical zone and local terrain, and the realistic calculation of the propagation loss in that zone, must be subject to regulation.

Dr. Oded Bendov is president of TV Transmission Antenna Group, Inc. He has been a major contributor to the invention, analysis and design of many broadcast television antenna systems, analog and digital, the most complex being at the World Trade Center in New York City and at Mt. Sutro in San Francisco. He is the principal author of fundamental papers on DTV planning factors, coverage and service analysis, and interference. Dr. Bendov is the author of chapters on Transmitting Antennas in the ***TV Engineering Handbook*** *and the* ***Encyclopedia for Electrical and Electronics Engineering****. He was the 2003 recipient of the M. Siukola Memorial Award and the 2005 NAB Television Engineering Achievement Award.*

This is a condensed version of the full paper to be posted at *http://www.tvantenna.tv/papers.asp*.

Appendix A

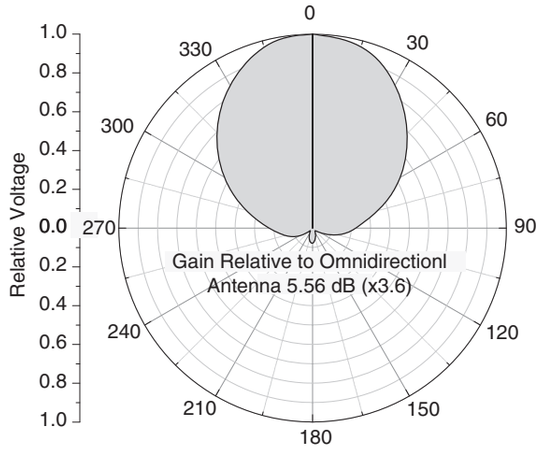
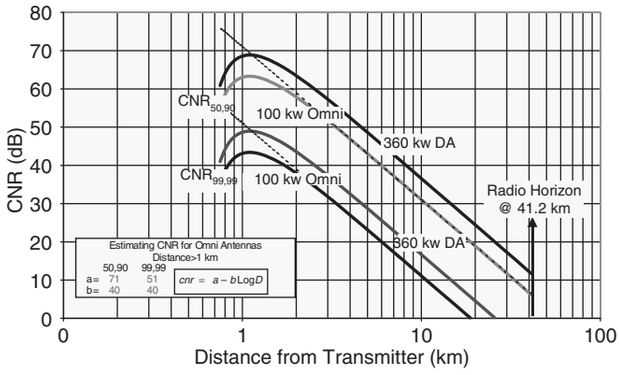


Fig. A1 – Azimuth Pattern of the directional antenna



Frequency (MHz)	:	600
Omnidirectional ERP (kW)	:	100
Tx Antenna Height (m)	:	100
Rx Antenna Height (m)	:	1.5
Gain of Receive Antenna (dBd)	:	0
Receiver Noise Floor (dBm)	:	–97.2
Depression Angle to RH (deg)	:	0.278
Distance to RH (km)	:	41.2

Fig. A2 – Auxiliary transmitters with antennas 100 meters AG omnidirectional ERP 100 kw; directional ERP 360 kW

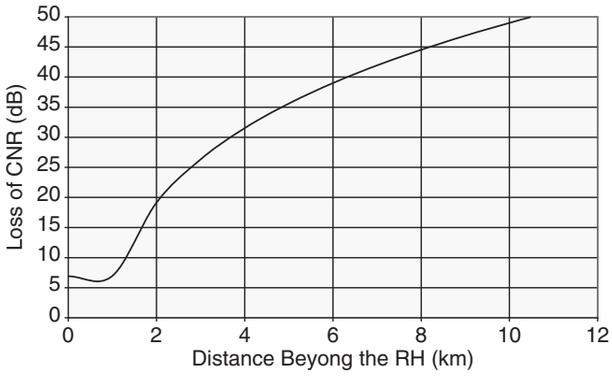


Fig. A3 – Loss of CNR beyond the radio horizon

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[6] Savo G. Glisic, Adaptive WCDMA: theory and practice, Wiley New York 2002

[7] O. Bendov, "Estimating the Loss of ATSC/8-VSB Payload Due to a Single Echo." www.tvantenna.tv Oct. 2011

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Amanda Temple Selected as New BTS Senior Administrator

The IEEE Broadcast Technology Society wishes to welcome Amanda Temple, who was named to the post of BTS senior administrator in January. She succeeds Lisa Weisser in this position.

Ms. Temple is no stranger to the IEEE, as she has been employed by the organization since 1999, first working in the travel department, then moving to the organization's Meeting Planning Services department, and transferring in 2009 to the IEEE's Sales and Marketing department.

In her new position, Ms. Temple will serve as the BTS liaison within the IEEE organization, managing day-to-day BTS administrative activities such as coordinating meetings, special projects, society planning initiatives, in concert with AdCom officers and members, as well as working with various BTS committees, society members and prospective members. She will also be working with Jennifer Barbato, publications coordinator for the BTS.

Ms. Temple will also be providing support for the BTS committees involved with planning, coordinating and staffing the annual IEEE Broadcast Symposium and other large events. She will also serve as the focal point for coordinating tutorial sessions, logistics and BTS representation in connection with the annual National Association of Broadcaster's NAB Show in Las Vegas and the International Broadcasting Convention in Amsterdam.

In her former duties within the IEEE, Ms. Temple managed meeting logistics for such large-scale events and high-profile meetings as the IEEE Board Series, the IEEE Honors Ceremony, the IEEE Conference Organizers meeting, and the IEEE Circuits and Systems flagship conference. Her knowledge of the organization and involvement in its various operations should serve the Broadcast Technology Society well in the years to come.

We wish her all the best and extend a very sincere "welcome aboard."

Yesteryear's Chapter Activities

No chapter activity reports were received in time for publication in this issue of the **Newsletter.** In the absence of contemporary reports, your editor thought it might be both interesting and entertaining to revisit some of the various chapter activities being reported 70 years ago. (They were called "Section Meetings" then.) As is evident from the "section" programs, AM directional antennas, FM broadcasting and television were all hot topics at the time. The number of chapters or sections and their city locations are interesting too. Of course there was no IEEE in 1941; our precursor organization was the Institute of Radio Engineers (IRE). The reports below were condensed from their original listings in the December 1941 **Proceedings of the IRE,** and in some cases span several months of section activities. The legendary Frederick E. Terman was president of the organization then.

- **Buenos Aires, Argentina**: Three discussions on propagation were held between in September and October; also R.H. Scott journeyed to Argentina to present a lecture on single-sideband transmission; and Frederico Malvarez discussed "Acoustic Problems in Modern Architecture."
- **Cincinnati**: L.A. de Rosa of the National Cash Register Co. provided a talk on "Auditory Phenomena in Radio Transmission" and three employees of the Lorain County Radio Corp. presented an "Historical Sketch, New Developments, and Unusual Features of the Lake Ship-to-Shore Communication System."
- **Detroit**: G. P. Brewington of the Lawrence Institute of Technology gave a talk on the "Klystron Oscillator."
- **Emporium (Pa.)**: John N. Dyer of the Columbia Broadcasting System did a presentation on "Color Television." *(Editor's note: Emporium was then home to Sylvania's vacuum tube manufacturing operation. It was one of the largest in the country at the time.)*
- **Indianapolis**: Marvin Hobbs of the E.H. Scott Labs presented "Design and Production Considerations in Frequency Modulation Receivers."
- **Los Angeles**: George Curran of the Earl C. Anthony organization spoke on "Directional Antennas, with Special Reference to the KECA Installation."
- **Pittsburgh**: "Central Distribution of Music Over Leased-Wire Services" was V.B. Bretzin's topic. He worked for the Coco Tele Music Corp.
- **San Francisco**: "Design and Adjustment of Broadcast Antenna Arrays," was one of three section presentations that fall. It was presented by Norman Webster of the McClatchy Broadcasting System.
- **Toronto**: Group-Captain C.H, Keith of the Royal Air Force Bombing and

Gunnery School gave a talk on "Electricity—The Handmai56den of the Air Force."

- **Washington**: J.D. Schantz, who was affiliated with the Farnsworth Television & Radio Corp., lectured on "Design Features of a Modern Television Receiver."

* * *

The **IEEE Broadcast Technology Society Newsletter** is interested in reporting news from BTS chapters, both in the United States and worldwide. Reports submitted for publication should be addressed to BTSeditor@IEEE.org and must be in the form of a Word attachment. Any accompanying photos should be sent as either JPG files and must be sufficiently large for publication (at least 250 KB; 1 MB preferred). Please do not embed photos within Word documents. All persons visible in photos must be clearly identified. Reports must contain the name of their author and his or her position within the chapter. While we will try to publish all chapter reports received in a timely fashion; however, due to space considerations and the date received, some reports may have to be published in future **Newsletters.** We reserve the right to edit reports for clarity and to fit space requirements.

President's Report continued from page 2

2011 Broadcast Symposium there was a session titled "Connected TV" that featured speakers from Microsoft and Yahoo, as well as several other presenters from around the world. I thought there was some very good and useful material presented that would be valuable to many people in our industry. As I looked around the room, I begin a head count, and by my rough count there were less than 50 people attending. This audience wasn't large enough to justify the expense incurred by companies in sending their employees to do the presentation or the time it took to prepare it. My question is why were there so few people?

Although some other sessions had greater attendance, none had the crowds that they should have had, based on the effort and expense incurred by both the BTS and the presenters and their employers. I am in the process of forming a committee to look into this and to try to determine what is needed to fix this problem. I'm going to instruct the committee that every aspect of this Symposium is now on the table. However, the committee will need input and that is where you come in. I am asking our readers to send me their thoughts on what needs to be done. All comments and ideas are welcome. These events are organized and presented for the industry and we would like to know what the industry would like to see, as we are obviously missing the mark in view of the low attendance.

As society president, I welcome your input about this or any other issues affecting the BTS.

Bill Meintel
President
wmeintel@ieee.org

From the Editor continued from page 2

to publish in this issue. We shrank from 32 pages in the Fall issue to 20 pages for this number. While I thank everyone who contributed material for this issue, we obviously need more content.

I needn't remind BTS members that this is your magazine. It's about you and the things that you do in all areas of broadcasting—from cameras and microphones to transmitters, tall towers and antennas, technology development, and much more. It's also about new trends in broadcasting such as Mobile DTV and pushing signals out over the Internet to numerous types of consumer devices. It encompasses many other varied initiatives that are part of the BTS—educational programs such as "Bridging the Gap," or our fall Symposium.

If you're doing something interesting, please tell the rest of us about it. Take a few moments to put it down on paper and send it to us here at the Newsletter. Good high-resolution photos are very welcome too. Ditto such group activities as chapter meetings.

I'd also like to mention some changes in the Newsletter. You may notice a "calendar of events" that's been added and will become a regular part of the Newsletter. It should be useful in keeping track of all of the conferences, meetings, deadlines and the like that involve those of us working in the broadcasting field and participating in BTS activities. I've included a lot of events, but doubtless I've missed some. Please send in information on any others that you'd like to see included. Also, watch for other changes in the Newsletter in future issues. Again, this is your publication; if you have ideas for other additions or changes please send them along. I promise that each and every one will be given careful consideration. Broadcasting is evolving and our publication should reflect this natural evolution and change. The goal is to make the Newsletter a better publication and one that is more useful to its readership.

See you in Las Vegas!

James E. O'Neal
BTS Newsletter Editor
BTSeditor@ieee.org

Upcoming Events of Interest to BTS Members

- April 14–19, 2012—NAB Show and Exhibition; Las Vegas, Nev.
- April 15, 2012 - Adcom meeting, 4:00–7:30 p.m. Las Vegas Hilton (tentative time and location)
- April 17, 2012 FoBTV "Supersession" (part of NAB Show program) April 26–29, 2012 – Audio Engineering Society conference and exhibition; Budapest, Hungary
- June 12, 2012 (tentative date) Fall Symposium Paper selection meeting, Hilton Chicago O'Hare Airport Hotel
- June 27–29, 2012—IEEE International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB); Seoul, Korea

- Sept. 6–11, 2012—IBC 2012 conference and exhibition; Amsterdam, Netherlands
- Oct. 19–21, 2012—IEEE BTS Annual Broadcast Symposium; Alexandria, Va.
- Oct. 22–25, 2012—SMPTE Annual Technical Conference & Exhibition; Hollywood, Calif.
- Oct. 23, 2012—Society of Broadcast Engineers National Meeting; Denver, Colo.
- Oct. 26–29, 2012 - Audio Engineering Society conference and exhibition; San Francisco, Calif.

If you have information on broadcast-related events that may be of interest to other Broadcast Technology Society members, please submit them at least three months in advance to the BTS Newsletter editor at BTSeditor@ieee.org.

Letters to the Editor

The IEEE Broadcast Technology Society Newsletter welcomes correspondence from its readers regarding articles published in the Newsletter or other subject matter that may be of interest to BTS membership. All correspondence will be read and acknowledged; however, due to space limitations there is no guarantee that every letter will be published. Please limit your comments to no more than 600 words. We reserve the right to edit letters received for clarity and to fit space requirements. The Newsletter assumes no responsibility for any statements made by its correspondents. E-mail comments should be addressed to *BTSeditor@IEEE.org*.

Employment Opportunity

Postdoctoral Research Associate for Telematics, Broadcasting or Navigation

The Chair for Information Technologies (LIKE) at the Friedrich-Alexander-Universität Erlangen-Nürnberg specializes in telematics by combining its expertise in telemetry, broadcasting and navigation. A close cooperation with the Fraunhofer Institute for Integrated Circuits offers unique opportunities to further the activities even beyond the academic level. The tasks comprise research activities, coaching PhD students and teaching.

You need to be a PhD holder in telematics, communications, navigation, positioning or related areas. In addition you have excellent grades and a relevant publication profile.

With respect to further preconditions for the job, legal provisions apply.

Please refer to http://www.like.eei.uni-erlangen.de/infocenter/stellen.shtml for further information or contact Prof. Jörn Thielecke (thielecke at like.eei.uni-erlangen.de, Tel. +49 9131 85 25118, Secretary +49 9131 85 25101).

Deadline for submission: April 30, 2012.

Technical Program

Plenary Sessions by Invited Speakers
Half-day Tutorials with topics related to next generation broadcast tech.
Oral and Poster Sessions about the following five areas:

- Multimedia Systems and Services
- Transmission and Networking
- Multimedia Processing
- Multimedia Quality (Performance Evaluation)
- Multimedia Devices

Please explore a variety of programs to broaden your horizons by visiting the official website ***http://www.ieee-bmsb2012.org***.

The IEEE International Symposium on Broadband Multimedia System and Broadcasting(BMSB) 2012, the 7th in the series, will be held at Yonsei University, Seoul, Korea.
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.

IEEE International symposium on broadband multimedia systems and broadcasting

June 27-29, 2012, Yonsei University, Seoul, Korea

Korea

Because of its unique geographical location, Korea is a very valuable piece of land and an international hub of Asia. Following its miraculous development over the last 50 years, Korea is now a modernized vibrant nation that still maintains its traditional culture. Learn all about this fascinating country.

Registration

Early Registration Deadline: May 25, 2012
(April 27, 2012 for authors)

Includes:

- Admission to Oral/Poster Sessions
- Conference Material on USB
- Lunches on June 27, 28 and 29
- Coffee & Korean Snacks
- Welcome Reception on June 27
- Banquet on June 28
- Traditional Performance at Banquet
- Symposium bag

The industry-oriented symposium will bring together content originators and distributors, wireless service providers, and technology developers and suppliers of equipment, systems, and consumer platforms, focusing on research and development, applications, and implementation of mobile and portable multimedia systems.

http://www.ieee-bmsb2012.org

2012 IEEE Broadcast Symposium

October 17-19, 2012 Alexandria, VA USA

Call for Papers

Final Deadline for Abstracts: May 15, 2012

Please mark your calendar to attend the **2012 IEEE Broadcast Symposium** to be held at the Westin Hotel in Alexandria, Virginia on October 17-19, 2012. This Symposium is produced by the IEEE Broadcast Technology Society.

The Symposium Committee seeks timely and relevant technical papers relating to all aspects of broadcast technology, in particular on the following topics:

- Digital radio and television systems: terrestrial, cable, satellite, Internet, wireless
- Mobile DTV systems (all aspects, both transmission and reception)
- Technical issues associated with the termination of analog television broadcasting
- Transmission, propagation, reception, re-distribution of broadcast signals
- AM, FM, and TV transmitter and antenna systems
- Tests and measurements
- Cable & satellite interconnection with terrestrial broadcasters
- Transport stream issues – ancillary services
- Unlicensed device operation in TV white spaces
- Advanced technologies and systems for emerging broadcasting applications
- Digital TV & digital radio reception issues and new technologies
- ATSC & other broadcast standards developments
- Broadcast spectrum issues – re-packing, sharing

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 the broadcasting industry.

Prospective presenters are invited to submit extended abstracts of 500-1000 words by e-mail to *bts@ieee.org*. Please indicate that the abstract is submitted to the *2012 IEEE Broadcast Symposium,* and include the corresponding author's full name and contact information including: affiliation, address, e-mail, and phone number. **Final deadline for abstracts is May 15, 2012.**

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

Plan to attend NAB2012

Conferences April 14-19, 2012 and Exhibits April 16-19
Las Vegas Convention Center, Las Vegas, Nevada USA

Visit the IEEE BTS Information Booth
Located at NAB site "L30" South Hall Upper Lobby near
The bridge meeting rooms of the Las Vegas Convention Center

The IEEE Broadcast Technology Society will present a tutorial on

"Broadcast and the Internet Connected TV"

Monday, April 16, 2012 from 1:00 pm - 5:00 pm

Chaired by: Yiyan Wu, Communications research Centre Canada (CRC)
and William T. Hayes, Iowa Public Television

With the recent advances in digital television deployment and the ever popular Internet connections to devices, including smart-phones and tablet computers that have strong video capabilities and Internet connected TVs, the convergence of television and Internet is becoming a reality. The combination of the Internet's interactivity and data mining power with the pervasive, easy-to-use television might lead to fundamental changes in the way that broadcast digital media are being produced, delivered and consumed.
This tutorial will present a picture of the state-of-the-art practices of various industry projects offering Internet connected TV services. It will cover topics on how TV should be bundled with Internet, such as:
The TV portal strategy;
Seamless navigation within the best of both worlds (Internet and TV);
Synchronization of television and Internet content on a technical basis.
Broadcast linkages to Internet content
Technologies behind the interoperability of Internet enhanced TV, including various set-top-box implementations, middleware options and user services for web-based content will be presented. Discussions will also be focusing on practical issues in making Internet enhanced TV a reality, such as distribution, data ownership protection and production dilemmas.
The tutorial will conclude with an interactive Q&A panel session.

Presenters include:

Klaus Illgner-Fehns	CEO, Institut für Rundfunktechnik GmbH (IRT), Germany
Rich Chernock	CTO, Triveni Digital, USA
Hisakazu Katoh	Director, NHK Scientist & Technology Research Laboratories, Japan
John Simmons	Architect, Media Platform, Microsoft, USA

Please visit the following websites for more information on the program and schedule:

IEEE Broadcast Technology Society ***www.ieee.org/bts***
NAB2012 ***www.nabshow.com***

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We have redesigned our Website!!!!

Please visit our new Website at *http://bts.ieee.org/* to see all the changes that have been made. If you have any suggestions for our Website please send an e-mail to *bts@ieee.org*