IEEE

BTS IEEE Broadcast Technology Society

2015 IEEE Broadcast Symposium

Technical Program

14-16 October 2015

Caribe Royale Hotel

Orlando FL, USA

For more information about the
IEEE Broadcast Technology Society
please visit us on the web at:
bts.ieee.org

Welcome Message from the Symposium Co-Chairs

Roz Clark and I as this year's symposium co-chairs, along with the IEEE Broadcast Technology Society and the symposium technical program committee wish you a warm welcome to the 2015 IEEE Broadcast Symposium at the beautiful Caribe Royal Resort in Orlando, FL. We meet at a time when the future of broadcasting is full of both promise and challenges. It is up to technology professionals like yourself to advise and guide this future utilizing the best available information. To that end, our team has attempted to put together an action packed, cutting edge, sometimes controversial, and always informative three day symposium program.

Day one Wednesday has three tutorial based sessions covering RF for radio, Cybersecurity and advanced audio. Our lunch keynote speaker, Frank Artes, is a leading expert in the field of cyber security and he is sure to provide us all with some useful tips on protecting your valuable information and media. Thursday's sessions provide updates and details on the future of TV and ATSC 3.0, information on alternative delivery methods and a panel discussion of AES67 audio technology. Our Thursday lunch keynote speaker really is a rocket scientist! Jon Cowart from NASA will be with us to discuss the future of space exploration. Last but most assuredly not least, Friday promises to hold your interest with a session on the TV spectrum auction/repack in the morning, as well as a lively radio audience measurement panel discussion and an ATSC 3.0 implementation session in the afternoon. Ron Rackley provides us with an entertaining look back at the history of AM transmission in conjunction with the BTS awards luncheon on Friday.

This is now the third year of holding the symposium outside Washington DC in an effort to attract local engineers by changing the regional location each year and it has been a resounding success. Next year we travel to the northeast at the Marriott Hartford, Connecticut on October 12-14, 2016. We look forward to seeing you at the historic **65th year** of this fantastic event! Roz and I would like to thank ALL the volunteers and IEEE staff who work so hard all year to make this event a success. It could not be done without them.

Best Regards, Jim Stenberg and Roswell Clark

Distinguished Lecturer Program

Mission: To serve the needs of the members of the Broadcast Technology Society to enhance their professional knowledge and vitality by keeping them informed of the latest research results and their practical applications. The BTS Distinguished Lecturer Program exists for the purpose of providing BTS chapters with a list of quality lecturers who can potentially give talks at local chapter meetings, as well as funding to support the travel expenses of the lecturer. The program provides a means for chapters to have access to individuals who are well known educators and authors in the fields of Broadcast Technology to lecture at chapter meetings.

- DTV & MPEG
- ATSC 3.0
- Display Monitors
- Cameras
- Satellite
- Audio Loudness
- Video & Audio Compression & Coding technologies
- Channel Rate allocation techniques
- 3D TV
- Digital Radio
- Broadcast Regulatory & Legislative Issues
- 8-VSB
- AM, FM, TV antennas
- Image Artifacts
- Directional Pattern design for antennas
- Multimedia Broadcast Services w/ Distributed Transmission Network
- Signal Processing in Broadband Multimedia Communications
- Transmitter ID for Digital Video Broadcast
- SFN, Distributed & Cloud Transmission Systems
- Wind Turbine impact to UHF Band DTV
- Video Streaming w/Multiple Description Coding & Network Diversity
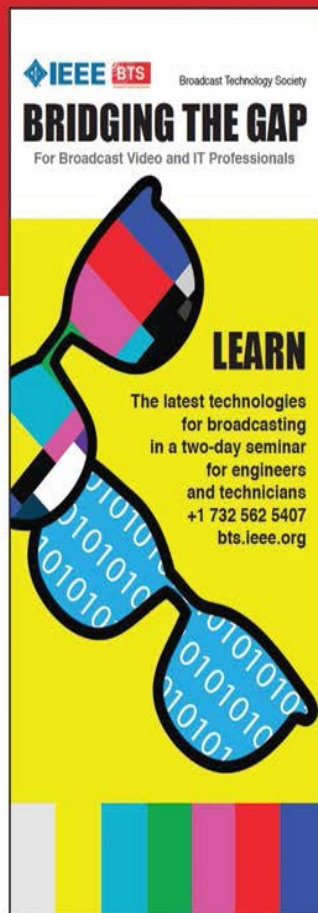- Temporal Dependant Rate Distortion Optimization in Motion Compensated Video Coding

MEMBERSHIP BENEFITS:

- Access to Society Publications
- Worldwide Chapters
- Support of IEEE Standards
- Annual Broadcast Symposium
- Annual Broadband Multimedia Symposium
- Awards and Recognition
- Cutting Edge Training for Broadcast Engineers and Technicians

bts.ieee.org

BRIDGING THE GAP
For Broadcast Video and IT Professionals

LEARN

The latest technologies for broadcasting in a two-day seminar for engineers and technicians
+1 732 562 5407
bts.ieee.org

MISSION: The mission of the BTS is to serve its members by helping them maintain and enhance their technical proficiency and professional standing through the activities of the Society and its chapters worldwide.

IEEE Broadcast Technology Society

President
William T. Hayes– Iowa Public Television, USA
Vice-President
Ralph Hogan - KJZZ/KBAQ, USA
IEEE Broadcast Technology Society Awards Chair
Guy Bouchard - CBC Radio, Canada

2015 Broadcast Symposium Co-chairs
Roz Clark - Cox Media, USA
Jim Stenberg - American Tower, USA
Guy Bouchard - CBC Radio, Canada

2015 Broadcast Symposium Technical Program Committee
Rich Chernock - Triveni Digital, USA
Ben Dawson - Hatfield & Dawson Consulting Eng. USA
Christine DiLapi - Harris Corporation, USA
James Fang - Consultant, USA
Ralph Hogan - KJZZ/KBAQ, USA
David Layer, National Association of Broadcasters, USA
William Meintel - Meintel, Sgrignoli & Wallace, USA
Maryann Seidler - Telos Alliance, USA
Tom Silliman - Electronics Research, Inc, USA
Paul Shulins - Greater Media Boston, USA
Eric Wandel - Wavepoint Research, Inc, USA
S. Merrill Weiss - Merrill Weiss Group, USA
Robert Weller - National Association of Broadcasters, USA
Edmund Williams - Florida, USA

BTS Staff
Amanda Temple - IEEE, USA
Jennifer Barbato - IEEE, USA

Wednesday, 14 October 2015
Morning Session
Tutorial Session 1 - Advanced RF Technology for Radio
9:15AM-12:00AM

Session Chair - Roswell Clark - Cox Media Group, USA

8:00AM - CONTINENTAL BREAKFAST
9:00AM - Registration and opening remarks

♦ Interleaving IBOC Signals for a Digital HD Radio - Philipp Schmid, Nautel, USA
♦ 10db IBOC at Combined Transmission Sites - John Schadler, Dielectric, USA

10:15-10:30-BREAK

Tutorial Session 1 - Advanced RF Technology for Radio (continued)

Session Chair - Glynn Walden - CBS, USA

♦ NAB Labs Radio Technology Update - David Layer, NAB, USA
♦ New Technologies in Single Frequency Networks, A Case Study - WSUN Holiday, Florida - Hal Kneller, CPBE, USA

STREAMING into the FUTURE
IP Video for Media Professionals

WHY "STREAMING INTO THE FUTURE" TRAINING?

This course will provide a detailed look at the key technologies used to transmit video signals over IP networks to viewers, for contribution and distribution, and within production facilities. The emphasis will be on explaining the underlying technologies and showing practical applications for them. Students will become familiar with a range of terminology and industry standards, and gain an understanding of how IP video technologies will impact their current and future plans for video networking and delivery.

BECOME A 'STREAMING INTO THE FUTURE' HOST AND EXPERIENCE THE BENEFITS

Streamline implementation of IP-based video technology
After taking this course, your staff will have the tools and skills necessary to smoothly integrate IP technologies into workflows.

Improve the efficiency of your in-house networks
Engineers and technicians learn how to design, use and maintain IP-based video systems that lie at the core of the modern production facility.

Receive your training ONSITE
We come to you. You and your engineers will receive training within the convenience of your own facility.

Personalized instruction from renowned broadcast expert
The course is taught by industry veteran and well-respected broadcast consultant Wes Simpson.

Cover all your bases with extensive course material
All of the major uses of IP video are discussed in depth, including contribution networks, in-studio production systems, and delivery to consumers using IP and OTT networks.

DISCOUNTED PRICING FOR THE HOST ORGANIZATION IS AVAILABLE.
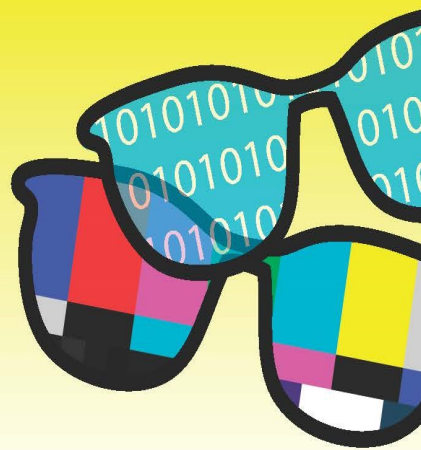
CUSTOMER TESTIMONIAL

"
The course was great in helping me understand the basics of IP video. Not only what works, but also understanding the limitations. It was also good to see the forward-looking technology.
"

BRIDGING THE GAP

INCREASE YOUR FACILITY'S OPERATIONAL EFFICIENCY AND VERSATILITY WITH BRIDGING THE GAP TRAINING

WHY "BRIDGING THE GAP" TRAINING?

The IEEE BTS' "Bridging the Gap" technical training program is **the only** industry training dedicated to resolving the knowledge gap between IT technicians and video engineers.

The 2-day comprehensive training course features hands-on instruction spanning more than 30 current and emerging broadcast technologies. The course is open to everyone, with special, discounted pricing available for host organization attendees. Throughout the course, a model broadcast infrastructure is designed in phases, teaching students how to implement a state-of-the-art broadcast facility.

HOST A "BRIDGING THE GAP" TRAINING PROGRAM TODAY!

Discounts are available for host organizations – please contact the IEEE BTS for additional details. Courses are designed to accommodate 30 or more students at a cost of $395 per student.

EXPERIENCE THE BENEFITS

- **Streamline communications between different departments.**
  After taking this course, your staff will have the tools and skills necessary to resolve daily video and IT tech issues.
- **Improve the quality of your on-air presentation.**
  Engineers and technicians learn how to proactively respond to IT and A/V technology challenges to produce a superior broadcast.
- **Receive your training ONSITE.** We come to you.
  You and your engineers will receive training within the convenience of your own facility.
- **Personalized instruction from renowned broadcast experts.** The course is taught by industry veterans and well-respected broadcast consultants John Luff and Wes Simpson.
- **Cover all your bases with extensive course material.**
  More than 30 critical topics are covered, ensuring your engineers develop a thorough understanding of IT and A/V technologies. For a full list of course topics, see the back of this brochure.
- **Discounted pricing for the host organization is available.**

CUSTOMER TESTIMONIAL

"The IEEE BTS 'Bridging the Gap' training program is a great opportunity for our broadcast teams to better understand and utilize IT-based philosophies and solutions within an evolving broadcast environment."

- Mike Bivona, vice president of engineering
  Viacom Media Networks

IEEE

BTS IEEE Broadcast Technology Society

2015 IEEE Broadcast Symposium

Wednesday Lunch Keynote
Keynote Speaker– Frank Artes - Maxplay, USA
12:00PM -1:30 - Boxed Lunch

Francisco Artes is a recognized information security executive who has helped form many of the best practices for securing intellectual property within the computer gaming, motion picture, and television industries. Mr. Artes is also known for his work on cybercrime, hacking, and forensic security with various federal, state and local government organizations as well as law enforcement agencies such as the US Dept. of Homeland Security, FBI, Texas Rangers, US Marshals, and Europol. Mr. Artes serves as the head of Information Technology and Security for MaxPlay Inc., where they are working on a SaaS-based game and 3D development engine. Prior to joining MaxPlay, Mr. Artes served as Chief Technology Architect / Principal Engineer for NSS Labs, Vice President, Chief Architect / Content Protection for Trace3, Vice President, Security Worldwide for Deluxe Entertainment Services Group, and as the Information Security Officer for Electronic Arts. Mr Artes has presented on six of the seven continents and serves on several boards.

2015 IEEE Broadcast Symposium

Wednesday, 14 October 2015
Afternoon Session
Tutorial Session 2- Cybersecurity
1:45PM-3:30PM

Session Chair - James O'Neal -**TV** Technology Technical Consultant and former Technology Editor and Editor in Chief of IEEE's BTS **Broadcast Technology** Publication

♦ Cybersecurity Risk Management and Best Practices - George Waters, Gwanda, USA
♦ Grounding Concepts and Techniques for Broadcast - Tom Sillimann, ERI, USA

3:30PM-3:45PM - BREAK

Tutorial Session 3- Advanced Technology for Audio
3:45PM-6:00PM

Session Chair - Milford Smith - Greater Media, USA

Speakers:
♦ Fadi Malak - DTS, USA
♦ Jeff Riedmiller - Dolby, USA
♦ Deep Sen - Qualcomm, USA

6:00PM - WELCOME RECEPTION - Pooldeck

General Chair
Toru Kuroda
  NHK, Japan

General Co-chairs & International Steering Committee
Pablo Angueira
  Univ. of Basque Country, Spain
Yoshihiro Fujita
  Ehime Univ., Japan
Bill Hayes
  Iowa Public TV, USA
Albert Heuberger
  Fraunhofer IIS, Germany
Shuji Hirakarwa
  Toshiba Corporation, Japan
Namho Hur
  ETRI, Korea
Minoru Okada
  Nara Institute of Science and Technology, Japan
Peter Seibert
  DVB, Switzerland
Ulrich Reimers,
  TU Braunschweig, Germany
Jian Song,
  Tsinghua Univ., China
Hirokazu Tanaka
  Hiroshima City Univ., Japan
Yiyan Wu
  IEEE BTS/CRC, Canada
Wenjun Zhang
  Shanghai Jiaotong Univ., China

Technical Program Chair
Yoshiaki Shishikui
  Meiji University, Japan

Technical Program Co-chairs
David Gomez Barquero
  Universitat Politecnica de Valencia, Spain
Tetsuomi Ikeda
  NHK, Japan
Wei Li
  CRC, Canada
Kazuhiro Otsuki
  NHK, Japan
Sung Ik Park
  ETRI, Korea
Jian Xiong
  Shanghai Jiaotung Univ., China

Finance Chair
Amanda Temple
  IEEE BTS, USA
Kazuhiro Otsuki
  NHK, Japan
Masahiro Kagawa
  Proactive. Inc

Local Arrangement Chair
Minoru Okada
  Nara Institute of Science and Technology, Japan

Call for Papers
11th International Symposium on Broadband Multimedia Systems and Broadcasting
1-3 June 2016, Nara, JAPAN

The International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB 2016) is 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 will be held at a historic city of Nara, 1300-year-old ancient capital of Japan. The technical areas of the symposium include:

1. **Multimedia system and Services**
1.1. Mobile TV
1.2. IPTV and 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
1.8. Future technologies and services of broadcasting

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 device
2.5. Program guides and navigation
2.6. New human-device interaction

3. **Multimedia quality and content**
3.1. Performance evaluation
3.2. Objective evaluation techniques
3.3 Subjective evaluation techniques
3.4 Audience measurement and behavior study

4. **Multimedia processing**
4.1. Audio technology Video coding and processing
4.2. Content adaptation and scaling
4.3. Error resilient and concealment
4.4. Rate control
4.5. Retrieval and indexing
4.6. 3-D and multi-view video
4.7. 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
5.8. Next generation of broadcasting systems
5.9. Convergence of broadcasting and broadband wireless
5.10. Making better use of the spectrum

6. **Wearable system and services**
6.1 Signal processing for wearable system
6.2 Body area networks
6.3 Ultra low power techniques
6.4 Wearable devices for healthcare and entertainment services

Paper Submission Guidelines

Prospective authors are invited to submit extended abstracts of about 1000 words by submission to https://easychair.org/conferences/?conf=bmsb2016. 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 2016, and include the corresponding author's full name and contact information including: Affiliation, address, e-mail and phone number. The accepted papers are included in IEEE Xplore.

Important Dates
Paper Submission : 15 December 2015
Acceptance Notification : 15 February 2016
Submission of Camera Ready Paper : 15 March 2016

SAVE THE DATE – 65TH YEAR!!!

All broadcast engineering professionals should plan to attend the IEEE Broadcast Symposium being held Oct. 12-14, 2016 in Hartford, CT. This annual event is produced by the organization's Broadcast Technology Society and is the pre-eminent conference in this field.

The three-day event will feature radio and television tutorials along with technical presentations covering such topics as RF infrastructure, network distribution, Mobile DTV, HD radio, connected TV, antennas, RF measurement techniques and more. Broadcast experts from around the world will be making these presentations and continuing Education Units (CEUs) needed to maintain professional engineering certification will be available in connection with symposium sessions.

In addition to technical presentations, attendees will have the opportunity to network and socialize at evening receptions and industry luncheons.

Plan now to attend this important broadcast engineering event, which is now in its 65th year. The Broadcast Symposium will be held in the Hartford Marriott Downtown

For details about the conference, visit the Broadcast Symposium web site:
http://bts.ieee.org/broadcastsymposium/

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

**Thursday, 15 October 2015
Morning Session
ATSC Standard
8:30AM-12:15PM**

Session Chair - Rich Chernock - Triveni Digital, USA

7:00AM - **CONTINENTAL BREAKFAST**
8:20AM - **Open Remarks**

♦ Overview of ATSC 3.0 - Skip Pizzi, NAB, USA
♦ ATSC 3.0 Physical Layer Overview - Luke Fay, Sony, USA
♦ ATSC 3.0 Management & Protocols Layer, towards broadcast IP pipe to home - Yongkwon Lim, Samsung, USA
♦ ATSC 3.0 Applications & Presentation Layer - Madeline Noland, Consultant representing LG Electronics, USA

10:00AM-10:15AM - BREAK

ATSC Standard (continued)

♦ ATSC 3.0 Security Layer - Seton Droppers, PBS, USA
♦ Advanced Emergency Altering - Peter Sockett, Capital Broadcasting Company, USA

12:15PM - LUNCH BREAK - Boca II and III

Thursday BTS/AFCCE Lunch Keynote
Keynote Speaker– Jon Cowart - NASA, USA
12:15PM-1:45PM - Lunch

Jon N. Cowart is the NASA partner manager working with Space-X for the Commercial Crew Integrated Capability initiative. He will be the mission manager for the first flight with crew during Space-X's Commercial Crew Transportation Capability contract with NASA to safely transport astronauts to and from the International Space Station. He received a Silver Snoopy in 2014 for his work with Space-X.

Mr. Cowart joined the Kennedy Space Center team in 1987 as a project engineer for Shuttle Atlantis and has led many teams, including the International Space Station flight 2A and 3A processing teams, the orbiter docking system team, U.S. Destiny Laboratory and airlock processing teams, and shuttle Discovery engineering team. In 1993, he was one of 50 people chosen from throughout NASA to participate in the Space Station Redesign. He received the NASA Exceptional Achievement Medal for that effort. He also held the manager position of the Orbiter Sustaining Engineering Office at Kennedy, representing the Orbiter Project Office located at NASA's Johnson Space Center in Houston. Mr. Cowart earned a bachelor's degree in Aerospace Engineering from Georgia Tech in 1983, took an Air Force Commission and received the Air Force Distinguished Service Medal for his work with the shuttle program.

Thank you to all of the

2015 Coffee Break Sponsors:

IEEE

BTS IEEE Broadcast Technology Society

Thank you to our

2015 Wifi Sponsor:

duTreil, Lundin & Rackley, Inc.

Thank you to all of the

2015 Breakfast Sponsors:

BURK TECHNOLOGY

SWMLAW

Thursday 15 October 2015
Afternoon Session
Alternative Delivery
2:00PM-3:30PM

Session Chair - S. Merrill Weiss - Merrill Weiss Group, USA

- ♦ IP Video Delivery Cost: An Analysis on Channel Availability for Live and Non-Live Stream Events - Vitor C. Oliveria, Mackenzie Presbyterian University, Brazil
- ♦ Second Screen Interactive Applications for ISDB-Tb Platform - Geiza Caruline Costa, Federal University of ABC, Brazil
- ♦ CBS All Access - Broadcast Service for Mobile TV and Over-The-Top Devices - Bob Siedel, CBS, USA

3:30PM-3:45PM-BREAK
AES 67 Panel
3:45PM

Session Chair - Paul Shulins - Greater Media, USA

- ♦ Using Livewire + AES67 to build complete facilities over IP - Greg Shay, Tellos Alliance, USA
- ♦ AVB and AES-67 Technology Update - Al Salci, SAS, USA
- ♦ Using AES67 Bridge Technology Islands - Keyur Parikh, GatesAir, USA
- ♦ Wheatstone Corporation's Current Implementation of the AES67 Standard- Practical Considerations for Interoperability, Phil Owens, Wheatstone, USA

6:00PM - MANUFACTURERS RECEPTION-Poolside

Friday 16 October 2015
Morning Session
TV Repack
8:30AM-12:00PM

Session Chair - Jim Stenberg - American Tower, USA

7:00AM - CONTINENTAL BREAKFAST
8:20AM - Opening remarks

♦ Using an Improved Two-Ray Calculation to Determine the Source of Fresnel's Constants - Sid Shumate, Givens & Bell, Inc, USA
♦ TV Repack: Post-Auction Transition Procedures - Joseph Davis, Chesapeake RF Consultants, USA
♦ Advanced Passive Components for UHF Broadcast Spectrum Reallocation, Benedikt Scheid, RFS World, USA

10:30AM-10:45AM-BREAK

TV Repack (continued)

♦ Update on Upcoming World Radiocommunication Conference 2015 (WRC-15) - Christine DiLapi, Harris Corporation, USA
♦ RF and Antenna Transition Strategies - Keith Pelletier, Dielectric, USA

12:00PM - LUNCH BREAK - Boca II and III

Thank you to all of the

2015 Bronze Sponsors:

Thank you to the

2015 Manufacturer's Reception Sponsors:

Thank you to the

2015 Welcome Reception Sponsor:

Friday BTS Awards Lunch
Keynote Speaker– Ron Rackley - duTreil Lunden Rackley, USA
12:00PM-2:00PM - Lunch

Ron Rackley is an electrical engineering graduate of Clemson University, where his studies were specialized in the area of electromagnetic fields. He worked as a radio station chief engineer and as a consultant during college. Following his formal education, he worked for two different engineering firms – Palmer A. Greer and Associates of Greenville, South Carolina and Jules Cohen and Associates of Washington, DC – as well as a major manufacturer of antenna system equipment – Kintronic Laboratories of Bristol, Tennessee – before co-founding du-Treil-Rackley Consulting Engineers with Bob du Treil in 1983. His present firm, du Treil, Lundin & Rackley, Inc., was formed in 1988 when his firm was combined with A. D. Ring & Associates, a firm that had played a pioneering role in the development of radio and television technology since its founding in 1941. Ron has worked in AM radio engineering for over 45 years, and as a consultant specialized in the design, troubleshooting and testing of broadcast antennas for over 42 of those years. He has been among the pioneers in developing modern computer modeling techniques for both antenna and RF network analysis, as used in system design and proofing of antenna radiation patterns. Ron has been a member of the IEEE for over 40 years and has served as a board member and Vice President of the Broadcast Technology Society in the past. He has served as President of the Association of Federal communications Consulting Engineers. He is a registered Professional Engineer and holds General Class Radiotelephone and Amateur Extra licenses from the FCC.

Friday, 16 October 2015
Afternoon Session
The Science of PPM
2:00PM-3:00PM

Session Chair - Paul Shulins - Greater Media, USA

- Audio Watermarking in Broadcasting is a System within a System, Barry Blesser, Telos Alliance, USA
- Overview of the PPM System, Arun Ramaswamy, Nielsen, USA

3:00PM-3:15PM - BREAK

ATSC 3 Implementation
3:15PM

Session Chair - Guy Bouchard

- Next Generation Broadcast Television - More than just a Transmission Standard, Mark Aitken, Sinclair Broadcasting Group, USA
- ATSC 3.0 toolbox empowering interactive television applications
- First Field Testing of Proposed ATSC 3.0 Physical Layer Technologies, Tim Laud, Zenith, USA

4:45 - CLOSING REMARKS

Thank you to the

2015 General Sponsors!