

Broadband Multimedia Systems & Broadcasting

June 17-19 2015, Ghent, Belgium

www.ieee-bmsb.org
www.wica.intec.ugent.be/bmsb2015



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Welcome

The BMSB Symposium 2015

With great pleasure, iMinds and Ghent University welcome you to the 10th Broadband Multimedia Systems and Broadcasting symposium in Ghent, Belgium from June 17-19, 2015. As the premier international conference in the area of broadcasting and multimedia, BMSB2015 is expected to stimulate further research in this field through the exchange of ideas and lively debate on state-of-the-art knowledge, as well as the challenges in store.

The meeting venue is 'Het Pand', the

culture and congress centre of Ghent University. Het Pand is a historical monument: this unique building is a former Dominican Monastery, situated beside the river Leie in the historic center of the city of Ghent. Ghent is a must-see destination, according to Lonely Planet, it is "Europe's best kept secret". National Geographic Traveler Magazine has also listed the city as the most authentic historic city in the world. Moreover, the Ghent mayor was first runner up of the 2014 World Mayor Prize.

BMSB2015 will feature plenary talks by world-renowned scientists, a variety of sessions and a panel discussion focusing on the most pressing issues in the field of broadcasting. BMSB has been a growing international forum for the presentation, discussion and exchange of information concerning new developments and research trends in broadband and broadcast multimedia systems. Student attendance is a focus of the conference.

In light of the major challenges now faced by the broadcast industry, and the need for talented engineers and innovations. Early ca-

reer stage engineers and researchers are particularly welcome. Students from around the world will have the opportunity to present their work in an oral or poster session while developing their technical communication skills and networking. There is a special iMinds/GOLD social event focused towards students at the Ghent Brewery Gruut. The social event is held in the 'oude Vismijn', the renovated Old Fish Market. The interior is just as impressive as the outside and the view over the water is magnificent.

It is of particular pleasure for the Local Organizing Committee to

finally welcome conference delegates from around the world to our university and the wonderful city of Ghent. As ever, the conference will provide an excellent opportunity to meet old friends, make new ones and become better informed about the latest developments in the field of broadband and broadcast engineering.

The high number of contributions submitted to the conference is testimony to its continuing appeal. There have been contributions from universities, TV broadcasters, network operators, manufacturers and consultancies. BMSB presents a valuable opportunity to actively exchange research ideas and network with fellow delegates from around the world. A total of about 130 submissions were received, and after a two-stage review process, a final technical program incorporating 110 papers has been established. These various contributions will be presented across parallel sessions, running from Wednesday June 17 to Friday June 19. Furthermore, on Friday 19,

there will be a special session about the Future of Broadcast TV (FOBTV) followed by a panel discussion.

The papers presented at the BMSB Symposium will be preserved as conference proceedings and archived on IEEE Xplore for ongoing reference by the broadband and broadcast engineering community. The organization of BMSB has been supported by the dedicated efforts of many, including the hard working members of the Local Organizing Committee, the International Steering Committee and the conference support teams at Ghent University and iMinds. The conference has also been enhanced by the participation of our international keynote speakers.

Finally, thanks for prof. Pablo Angueira for all his support and special thanks to prof. Yiyang Wu, the drive behind the BMSB conferences, for his advice, input and great work with the program!

Prof. Wout Joseph





Committee for BMSB2015

June 17-19 2015, Ghent, Belgium

G General Chair

- **Wout Joseph**, iMinds - Ghent University, Belgium

G General Co-Chairs

- **Pablo Angueira**, University of the Basque Country, Spain
 - **Bill Hayes**, Iowa Public TV/IEEE BTS, USA
 - **Albert Heuberger**, Fraunhofer Institute IIS, Germany
 - **Namho Hur**, Electronics and Telecommunications Institute, Korea
 - **Ulrich Reimers**, Braunschweig University of Technology, Germany
 - **Peter Siebert**, DVB, Switzerland
 - **Jian Song**, Tsinghua University, China
 - **Yiyan Wu**, Communications Research Centre, Canada
 - **Wenjun Zhang**, Shanghai Jiao Tong University, China
 - **David Plets**, iMinds - Ghent University, Belgium
 - **Shuji Hirakawa**, Toshiba, Japan
-

T Technical Program Chairs

- **David Plets**, iMinds - Ghent University, Belgium
- **Amaia Arrinda**, University of the Basque Country, Spain
- **Christian Foster**, Fraunhofer Institute IIS, Germany
- **David Gomez Barquero**, Universitat Politècnica de València, Spain
- **Sung-Ik Park**, Electronics and Telecommunications Institute, Korea
- **Jian Xiong**, Shanghai Jiao Tong University, China
- **Demin Wang**, Communications Research Centre, Canada
- **Jintao Wang**, Tsinghua University, China

F Financial Chairs

- **Amanda Temple**, IEEE - BTS, USA
- **Isabelle Van der Elstraeten**, iMinds - Ghent University, Belgium
- **Joke Staelens**, iMinds - Ghent University, Belgium

General Programme

June 17-19 2015, Ghent, Belgium

Symposium Day 1

June 17th

09:00	Welcome to the BMSB2015 Symposium: Wout Joseph, Conference Chair
09:10	iMinds as Pioneer in Multimedia, Networking, and Broadcasting: Piet Verhoeve, Lead ICON iMinds
09:20	The Network Engineer in a Box: from Engineer Defined Networking to Software Defined Networking: Lieven Vermaele, CEO & Co-founder SDN Square, Belgium
09:50	BTS and Its Members' Contributions to Future Broadcasting: Bill Hayes, Iowa Public Television/ BTS president, USA
10:10	ATSC 3.0: Next Generation Broadcast Television: Richard Chernock, ATSC TG3 chair, CSO Triveni Digital, USA
10:30	Tea/Coffee Break
11:00	Parallel Technical Sessions 1, 2, 3
12:25	Lunch
14:00	Parallel Technical Sessions 4, 5, 6
15:40	Tea/Coffee Break
15:55 - 17:35	Parallel Technical Sessions 7, 8, 9
18:30	iMinds/GOLD Event in Brewery Gruut

Symposium Day 2

June 18th

09:00	Announcements and Introductions
09:10	Challenges in Delivering Novel Media Experiences over Current-Generation networks: prof. Peter Quax, iMinds - University of Hasselt, Belgium.
09:40	The Future Role of Broadcast in a World of Wireless Broadband: prof. Ulrich H. Reimers, Technische Universitaet Braunschweig, Germany
10:10	Broadcast at Crossroads: Peter Siebert, DVB Project, Switzerland
10:40	Tea/Coffee Break
10:55	Parallel Technical Sessions 10, 11, 12
12:35	Lunch
14:00	Parallel Technical Sessions 13, 14, 15
15:40	Tea/Coffee Break
15:55 - 17:35	Poster Session
19:00	Social event: Gala Dinner at Oude Vismijn

Symposium Day 3

June 19th

09:00	Announcements and Introductions
09:10	Countdown to the Ultimate Television: Kenichi Murayama, NHK Science and Technology Laboratories, Japan
09:40	The Broadcast Experience Beyond the UHDTV Horizon: David Wood, Consultant, EBU Innovation and Technology, Switzerland
10:10	Cloud Broadcasting Television System in China: Wenjun Zhang, Chief Engineer, National Engineering Research Center, China
10:40	Tea/Coffee
10:55	Parallel Technical Sessions 16, 17, 18
12:35	Lunch
14:00	Parallel Technical Sessions 19, 20, 21
15:40	Tea/Coffee
15:55	Panel Discussion on the Future of Broadcast TV (FOBTv)
17:00	Closing Ceremony and Photo Session



Keynote
Speakers

June 17-19 2015, Ghent, Belgium

Richard Chernock



Richard Chernock is currently Chief Science Officer at Triveni Digital. In that position, he is developing strategic directions for monitoring, content distribution and metadata management for emerging digital television systems and infrastructures. Previously, he was a Research Staff Member at IBM Research, investigating digital broadcast technologies.

Dr. Chernock is active in many of the ATSC, SMPTE and SCTE standards committees, particularly in the areas of future DTV, monitoring, metadata, and data broadcast. He is chairman of the ATSC Technology Group on ATSC 3.0 (TG3) and chairs the AHG on service delivery and synchronization for ATSC 3.0. He

was previously chairman of the ATSC Technology and Standards Group (TG1). He is also the Distinguished Lecturer Chair for IEEE BTS.

In another life, he used transmission electron microscopy to study materials characteristics for advanced ceramics packaging and semiconductor technology at IBM. His ScD was from MIT in the field of nuclear materials engineering.

Bill Hayes



Bill Hayes received a Bachelor's Degree in Communications in 1977. He has worked in broadcasting since 1973 in both radio and television. He has planned and constructed two start-up full power television stations. He has extensive experience in planning, design and the construction of all facets of a television station. He is currently responsible for the planning and development of all technology projects at Iowa Public Television including RF transmission facilities, and studio origination facilities throughout the State of Iowa. In addition to his position at IPTV,

He is also an author for TV Technology, a leading technical magazine. He is also the vice-president and junior past president of the IEEE Broadcast

Technology Society. He is the recipient of the Society of Broadcasting Engineers Educator of the Year award for 2008. He is active in future broadcast planning on the national level and serves on a number of committees developing standards for emerging technologies such as hybrid television, mobile digital television and 3D television. He is a member of the Society of Motion Picture and Television Engineers, the Institute of Electrical and Electronics Engineers, the Society of Broadcast Engineers and the Society of Cable Television Engineers.

Peter Quax



Peter Quax is an assistant professor at the Expertise Center for Digital Media (EDM), a research institute of Hasselt University in Belgium and post-doc researcher at iMinds. He obtained his MSc in Computer Science from the Transnationale Universiteit Limburg in 2000 and his PhD at Hasselt University in 2007. He is member of the Multimedia Networking group at EDM, which is part of the Future Internet department of iMinds.

His research originally focused on the scalability aspects of networked virtual environments, specifically when combined with real-time audio/video communication facilities. Since 2008, he has been involved in a number of national and international

research projects that focus on the delivery of high-quality and high-bitrate immersive video formats (panoramic and omni-directional) to large amounts of users over typical access networks. Recently, the provisioning of interactive features within the video itself has become a major topic of research, as well as the delivery of such immersive experiences on the Web as a platform.

Kenichi Murayama



Kenichi Murayama is Senior Manager in the Planning & Coordination Division of NHK (Japan Broadcasting Corporation). He joined NHK in 2002. From 2002 to 2008, he has worked at the NHK Engineering Administration Department / Transmission & Audience Reception Engineering Center. From 2008 to 2013, he has worked at the Broadcasting Network Research Division in NHK Science and Technology Research Laboratories (STRL) and has been engaged in research and development related to next generation of digital terrestrial broadcasting. From 2013, he has been working at the Planning and Coordinating Division in NHK STRL. He is a member of FOBTv.

Ulrich H. Reimers



Ulrich H. Reimers studied communication engineering at Technische Universitaet Braunschweig, Germany. Following research at the university's Institut fuer Nachrichtentechnik (IfN - Institute for Communications Technology) he joined BTS Broadcast Television Systems in Darmstadt. Between 1989 and 1993 he was Technical Director of Norddeutscher Rundfunk (NDR) in Hamburg - one of the major public broadcasters in Germany.

Since 1993 he has been a Professor at Technische Universitaet Braunschweig and Managing Director of the Institut fuer Nachrichtentechnik (Institute for Communications Technology). Prof. Reimers was chairman of the Technical Module within the

DVB Project from 1993 to 2012 and a board member of Deutsche TV-Plattform (the German institution coordinating the interests of all organisations involved in TV) from 1992 to 2012. Since 2012 he is Vice President Strategic Development and Technology Transfer of Technische Universitaet Braunschweig. He is the author of more than 120 publications, among others of various text books on DVB. Prof. Reimers received a significant number of international and national awards. Recently Prof. Reimers and the research teams at IfN invented innovative solutions for the co-existence of broadcast and wireless broadband such as "Dynamic Broadcast", "Tower Overlay over LTE-A+ (TOoL+)", or "Redundancy on Demand.

Peter Siebert



Peter Siebert is the Executive Director of the DVB Project Office in Geneva, where he is responsible for all operational aspects of the DVB organization. Prior to this he has been with Philips Kommunikations AG (PKI AG) in Nürnberg/Germany, SES in Luxembourg and Siemens Schweiz AG in Zürich/Switzerland. His professional career spans all aspects of audio-video technology such as video transmission over telecommunication networks (PDH/SDH), satellite and IPTV networks. He has been responsible for a number of ETSI standards for satellite transmission as well as for DVB specifications. He holds several patents in the area of audio-visual data transmission.

Dr Peter Siebert received his M.Sc. degree in 1984 and his Ph.D. degree in 1989 in physics from the University in Frankfurt, Germany. In addition he holds a degree in economics from the University in Hagen, Germany and an MBA from the Open University in Milton Keynes, UK.

Piet Verhoeve



Piet Verhoeve has an MSc in Electrical Mechanical Engineering from the KU Leuven (1991) and a PhD in Electronic Engineering from Ghent University (1998). He worked as a software architect in the domain of automatic speech recognition software at Lernout & Hauspie before he joined Televic in 2001.

Within 4 years, he transformed Televic from an unknown SME into a well valued partner in several R&D projects, collaborating with different universities at national and European levels. In 2011, Verhoeve took up the position of Director of Innovation & Technology at a strategic level of the company to define and enable long-term strategic projects and alliances for the Televic niche markets. In April

2013, he joined iMinds to lead the ICON program.

Lieven Vermaele



Since september 2013, Lieven Vermaele is the CEO of SDNsquare, a start-up company he cofounded in 2011. Based on Software Defined Networking, the company has storage and network solutions that lead to extreme efficiency, absolute reliability and easy manageability for the media, medical and military domain. Where other companies guarantee connectivity SDNsquare guarantees the end to end flow.

He started his career in 2000 at the Belgian Flemish public broadcaster VRT, where he played a key role in developing and implementing the organization's digital media strategy. He was in charge of the negotiations with Telco operators and with the Flemish Government

of VRT's management contract for 2006-2011. After more than six years with VRT he moved in 2006 to the telecommunications company Alcatel Lucent, and from there he moved to the EBU/Eurovision.

Since mid 2007, Lieven was Director of Technology and Innovation at the EBU - Eurovision, the European Broadcasting Union. Lieven Vermaele was also responsible for DVB, Chairman of DigiTAG, and the ETSI/EBU/CENELEC Joint Technical Committee, which is responsible for setting European standards for media and broadcasting systems (WorldMB, DVB, Hbb.TV).

Mr Vermaele is also member of the council of IBC, the European largest

Lieven Vermaele

media industry event.

Lieven has given many presentations across the world on the media future, and has written articles on this that have appeared in leading publications. As media organisations face a challenging period of transition, where new technologies and business models are emerging more quickly than ever before, Mr. Vermaele's passion is to ensure that media organisations are able to operate within the optimal technical frameworks in terms of cost effectiveness, maximizing their audience and reach, and enhancing the media consumer's experience.

Lieven Vermaele was born in Ghent (Belgium) in 1975. He holds

a master's degree in Science Engineering from the University of Ghent and several postgraduate degrees. He is married, has one child, and works in Switzerland and Belgium.

David Wood

David Wood is consultant for EBU Innovation and Technology. With a career in broadcasting, David Wood currently chairs ITU-R WP6C, the DVB groups on UHDTV and 3DTV, CM-UHDTV and CM-3DTV, and until the end of 2014, chaired the World Broadcasting Union Technical Committee. David writes for a number of technical journals, and has written many technical papers and articles, mostly on digital television and quality evaluation. He is a recipient of the SMPTE's highest award, the SMPTE Progress Medal.



Wenjun Zhang



Wenjun Zhang Dr. Wenjun Zhang received the B.S., M.S. and Ph.D. degrees in electronic engineering from Shanghai Jiao Tong University, Shanghai, China in 1984, 1987 and 1989, respectively.

From 1990 to 1993, He worked as a post-doctoral fellow at Philips Kommunikation Industrie AG in Nuremberg, Germany, where he was actively involved in developing HD-MAC system. He joined the faculty of Shanghai Jiao Tong University in 1993 and became a full professor in the Department of Electronic Engineering in 1995. As the project leader, he successfully developed the first Chinese HDTV prototype system in 1998. He was one of the main contributors to the Chinese Digital

Television Terrestrial Broadcasting Standard issued in 2006. He holds more than 40 patents and published more than 110 papers in international journals and conferences.

Prof. Zhang's main research interests include digital video coding and transmission, multimedia semantic processing and intelligent video surveillance. He is the chief scientist of the Chinese National Engineering Research Centre of Digital Television, an industry/government consortium in DTV technology research and standardization and the director general of Cooperative MediaNet Innovation Center (CMIC), an excellence research cluster affirmed by the Chinese Government.

Sessions and Details of BMSB2015

June 17-19 2015, Ghent, Belgium

Wednesday, June 17

11:00 - 12:25 Parallel Technical Sessions 1, 2, 3

Session 1:
MAC & DATA

Session Chairs:
Wei Li and Jian Xiong

ROOM: PRIORZAAL

MM-15-083 **Dynamic Random Access Slots Configuration Algorithm for Interactive Broadcasting System**

Xiaolu Lu, Longyu Pan, Yunfeng Guan, Liang Qian, Cheng Zhi
Shanghai Jiao Tong University, Flight Technology College of Civil Aviation University of China, China

MM-15-081 **An MMT-based Content Classification Scheme for VoD Service**

Lianghui Zhang, Yiling Xu, Wei Huang, Le Yang, Jun Sun, Wenjun Zhang
NERC and Shanghai Jiao Tong University, China

MM-15-098 **On Resource Scheduling of Hybrid Broadcasting and Cellular Networks**

Panjin Song, Jian Xiong, Lin Gui, Meikang Qiu, Yue Zhang
Shanghai Jiao Tong University, China

Session 2:
Video Coding

Session Chairs:
Ce Zhu and Jun Zhou

ROOM: RECTOR VERMEYLEN

MWM-15-011 **Fast Transform Skip Mode Decsion for HEVC Screen Content Coding**

Dahee Lee, Seungha Yang, Hiuk Jae Shim, Byeungwoo Jeon
Sungkyunkwan University, Korea

9:00 Plenary Session 1

ROOM: REFTER

Welcome by Wout Joseph

iMinds as Pioneer in Multimedia, Networking, and Broadcasting by Piet Verhoeve

The Network Engineer in a Box: from Engineer Defined Networking to Software Defined Networking by Lieven Vermaele

BTS and Its Members Contributions to the Future Broadcasting by Bill Hayes

ATSC 3.0: Next Generation Broadcast Television by Richard Chernock

MM-15-039 **Optimization of UMHexagonS Algorithm for AVS+**

Shuai Wang, Yonglin Xue
Tsinghua University, China

MM-15-059 **Gradient-based Fast Mode and Depth Decision for High Efficiency Intra Frame Coding**

Hang Chen, Rong Xie, Liang Zhang
Shanghai Jiao Tong University, China

Session 3:
UHD & New Tech

Session Chairs:
Bill Hayes and Luke Fay

ROOM: REFTER

MM-15-040 **The Video Transmission Platform for The PLC and VLC Integrated System**

Yangtian Yan, Wenbo Ding, Hui Yang, Jian Song
China

MM-15-051 **Fast Encoding for Personalized Views Extracted from Beyond High Definition Content**

Niels Van Kets, Johan De Praeter, Glenn Van Wallendael, Jan De Cock, Rik Van de Walle
Multimedia Lab, Ghent University - iMinds, Belgium

MM-15-091 **Quantifying UHDTV's Immersion Parameters**

Adi Kouadio, Dagmar Driesnack, Richard Salmon, Manish Pindoria, Andrea Gabriellini, Andy Quested
EBU, Switzerland, IRT, BBC, NHK, RAI

14:00 - 15:40 Parallel Technical Sessions 4, 5, 6

Session 4:
broadcast systems

Session Chairs:
Rich Chernock and Sungho Jeon

ROOM: RECTOR VERMEYLEN

MM-15-010 **NGB-E: Cable, Wireless and Satellite Convergence Network**

Zou Feng, Shi Yuhai, Wang Feng
Academy of Broadcasting Science, SARFT, China

MM-15-018 **Brief Introduction on the Key Technologies of NGB-W Broadcasting Channel China**

Wenjun Zhang, Dazhi He, Yunfeng Guan, Yajun Kou, Songlin Feng, Yijun Shi
Shanghai Jiao Tong University, China

MM-15-026 **Research and Simulation for An Ultra-High-Speed Mobile Broadband Multimedia Transmission System**

Chang Liu, Jintao Wang, Hui Yang, Changyong Pan
Tsinghua University, China

MM-15-045 **Adaptive Broadcast Beamforming Techniques in a Multiple Frequency Network**

Peter Bagot, Mark Beach, Andrew Nix, Joe McGeehan, Peter Moss
University of Bristol, BBC R&D, UK

Session 5: LDM/Cloud Txn 1	Session Chairs: Jian Song and Lachlan Michael
	ROOM: REFTER

- MM-15-030 Mobile and Indoor Reception Performance of LDM-Based Next Generation DTV System**
- Liang Zhang, Yiyang Wu, Wei Li, Khalil Salehian, Zhihong Hong, Heung Mook Kim, Sung-Ik Park, Jae-young Lee, Pablo Angueira, Jon Montalban, Manuel Velez
CRC, Canada, ETRI and University of Basque Country
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- MM-15-031 Hardware Implementation and Complexity Analysis of Layered Division Multiplexing (LDM) System for ATSC 3.0**
- Sung Ik Park, Yiyang Wu, Liang Zhang, Jon Montalban, Jae-Young Lee, Pablo Angueira, Sunhyoung Kwon, Heung Mook Kim, Namho
ETRI, Korea, CRC, and University of Basque Country
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- MM-15-044 Cloud Transmission for Dynamic Cognitive Radio Communications**
- Meisong Zhu, Guanghui Liu, Yanyan Wang, Liaoyuan Zeng
University of Electronic Science and Technology of China, China
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- MM-15-052 Time Frequency Slicing for Layer Division Multiplexing**
- Eduardo Garro, Jordi Joan Giménez, David Gómez-Barquero, Sung Ik Park
University of Valencia, Spain and ETRI

Session 6: 3D	Session Chairs: John Cosmas and Byeungwoo Jeon
	ROOM: PRIORZAAL

- MM-15-005 A Depth Map Estimation Approach for Trinocular Stereo**
- Jun Zhou, Ling Wang, Xiao Gu, Kang Xu, Ya Zhang
Institute of Image Communications and Network Eng. Shanghai Jiao Tong University, China
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- MM-15-049 Visual Comfort Assessment of Stereoscopic Images with Multiple Salient Objects**
- Xiaonan Zhang, Jun Zhou, Jianyu Chen, Xiao Gu
Shanghai Jiao Tong University, China
-
- MM-15-124 Depth Filter Design by Jointly Utilizing Spatial-Temporal Depth and Texture Information**
- Xin Wang, Ce Zhu, Shuai Li, Jimin Xiao, Tammam Tillo
*School of Electronic Engineering, University of Electronic Science and Technology of China, Chengdu, China
Shanghai Jiao Tong University, China*
-
- MM-15-105 Low Complexity Sub-Block Perceptual Distortion Assessment for Mode Decision and Rate-Control**
- Y. G. Joshi, J. Loo, P. Shah, S. Rahman, A. Tasiran
Middlesex University, UK

15:55 - 17:35 Parallel Technical Sessions 7, 8, 9

<p>Session 7: LDM/Cloud Txn 2</p>	<p>Session Chairs: David Gomez-Barquero and Jingtao Wang</p> <p>ROOM: REFTER</p>
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MM-15-072 Framing and Multiple PLP Structures for LDM-Based Next Generation Terrestrial Broadcasting Systems

Jae-young Lee, Sung Ik Park, Sunhyoung Kwon, Heung Mook Kim, Yiyang Wu, Liang Zhang, , Wei Li, Jon Montalban, Pablo Angueira
ETRI, Canada, CRC and University of Basque Country

MM-15-082 Cloud Transmission: Complexity Analyses of a Receiver using ISDB-T OFDM Structure

Luiz Fernando da Silva, Cristiano Akamine, Gunnar Bedicks Junior
Mackenzie Presbyterian University, Brazil

MM-15-090 Comparison Study of Non-Orthogonal Multiple Access Schemes for 5G

Bichai Wang, Zhaohua Lu, Tian Xie, Jinguo Quan
Tsinghua National Lab, China

MM-15-127 LDM and TDM Performance Evaluation for Next Generation Broadcasting

J. Montalban, C. Regueiro, M. Vélez, L. Zhang, Y. Wu, W. Li, H-M. Kim, S-I. Park, J-Y. Lee
University of Basque County, Spain, CRC, Broadcasting System Review Department

<p>Session 8: Coverage and networks</p>	<p>Session Chairs: Jim Kutzner and David Plets</p> <p>ROOM: PRIORZAAL</p>
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MM-15-003 Coverage Optimization for DVB-T2 SFNs using ITU-R P.1546 and ITU-R P.1812

Matteo Anedda, Andrea Anedda, Maurizio Murrioni
University of Cagliari, Italy

MM-15-102 Comparative Study of Radio Mobile and ICS Telecom Propagation Prediction Models for DVB-T

Octavian Fratu, Alexandru Marțian, Răzvan Crăciunescu, Alexandru Vulpe, Simona Halunga, Pavlos Lazaridis, Zaharias Zaharis
University Politehnica of Bucharest, Roumenia, Alexander Technological Educational Institute of Thessaloniki

MM-15-119 Longley-Rice Model Prediction Inaccuracies in the UHF and VHF TV Bands in Mountainous Terrains

Stylianos Kasampalis, Pavlos I. Lazaridis, Zaharias D. Zaharis, Aristotelis Bizopoulos, Lidija Paunovska, Spiridon Zettas, Ian A Glover, D. Drogoudis, John Cosmas
Brunel University, UK, University of Huddersfield, Aristotle University

MM-15-125 A Comparison between Theoretical and Practical Planning Approaches for DVB-T2 Single Frequency Networks

Telemi Sato, Brugger Roland, Angueira Pablo, Peña Ivan
Institut für Rundfunktechnik, München, Germany, University of the Basque Country, University of Toledo

Session 9: HBBTV & streaming	Session Chairs: Cristina Hava Muntean and Yiling Xu
	ROOM: RECTOR VERMEYLEN

MM-15-060 Efficient Production and Synchronization of Linked Content for Two-Screen Systems

Yoshihiro Fuhita
Ehime University, Japan

MM-15-089 User Interface Adaptation for Multi-Device Web-Based Media Applications

Mikel Zorrilla, Iñigo Tamay, Angel Martin
Viacomtech, Spain

MM-15-101 An Optimized Adaptive Streaming Framework for Interactive Immersive Video Experiences

Peter Quax, Maarten Wijnants, Gustavo Roveló Ruiz, Wim Lamotte, Johan Claes, Jean-Francois Macq
iMinds - EDM - University of Hasselt, Belgium, and Alcatel Lucent Bell Labs

MM-15-108 Signing Provision in Connected TV: HBB4ALL Project

Carlos Alberto Martín, Prof. Pilar Orero, Prof. José Manuel Menéndez, Prof. Guillermo Cisneros
Universidad Politécnica de Madrid, Universitat Autònoma de Barcelona, Spain

Thursday, June 18

9:00 Plenary Session 2

ROOM: REFTER

Challenges in delivering novel media experiences over current-generation networks by prof. Peter Quax

The Future Role of Broadcast in a World of Wireless Broadband by prof. Ulrich H. Reimers

Broadcast at Crossroads by Peter Siebert

10:55 - 12:35 Parallel Technical Sessions 10, 11, 12

Session 10:
 LDPC

Session Chairs:
 Shuji Hirakawa and Junghwan Kim

ROOM: PRIORZAAL

MM-15-019 Hybrid Constellation Mapping for Punctured-Node LDPC

Yijun Shi, Dazhi He, Yunfeng Guan, Yao Wang, Wenjun Zhang
NERC, Shanghai Jiao Tong University, China

MM-15-042 Combining Advanced Constellations and SSD Techniques for Optimal BICM Capacity

Jon Barrueco, Cristina Regueiro, Jon Montalbán, Manuel Vélez, Pablo Angueira, Heung Mook Kim, Sung Ik Park, Jae Young Lee
University of Basque Country, Spain and ETRI, Korea

MM-15-073 Lowering the Error Floors by Removing Dominant Trapping Sets of Low-Density Parity-Check Codes for Broadcasting Systems

Kyung-Joong Kim, Seho Myung, Hongsil Jeong
DMC R&D Center, Samsung, Korea

Session 11: ATSC 3.0 PHY Layer	Session Chairs: Yiyan Wu and Wout Joseph ROOM: REFTER
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MM-15-032 Modulation and Coding for ATSC 3.0

Lachlan Michael, David Gómez-Barquero, Sung-Ik Park
Sony, Japan, University of Valencia, and ETRI

MM-15-099 ATSC 3.0 Physical Layer Progress

Luke Fay
Sony, Japan

MM-15-132 Predicted ATSC 3.0 Broadcast Coverage

Jim Kutzner, Tom Hankinson, Bill Hayes, Ira Goldstone, Doug Lung/, Kent Walker, Dennis Wallace, Merrill Weiss
PBS, Disney-ABC, Iowa Public TV, Univision, NBCU, Qualcomm, MSW, MWG

Session 12: MIMO & diversity	Session Chairs: Yue Zhang and Liljana Gavrilovska ROOM: RECTOR VERMEYLEN
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MM-15-016 A Study on MIMO OFDM Transmission using Inter-Polarization Spread

Hiroaki Miyasaka, Yoshikazu Narikiyo, Madoka Nakamura, Masahiro Okano, Kenichi Tsuchinda, Masayuki Takada
Japan Broadcasting Corp. and NHK Engineering System Inc, Japan

MM-15-041 Numerical Analysis on the Net Gross MISO-SFNG in DVB-T2 System

SungHo Jeon, Junghyun Kim, Jae-Shin Han, Sang-Hun Kim, Jeong-Deok Kim, Jong-Soo Seo
KBS, Yonsei University, Korea

MM-15-058 A MIMO DVB-T2 System with a Newly Designed Bit Mapper for UHDTV Broadcasting

In-Woong Kang, Kyu-Soon Ok, Youngmin Kim, Jae Hyun Seo, Heung Mook Kim, Hyoung-Nam Kim
Pusan National University, Korea

MM-15-113 Inter-Carrier Interference Cancelation for Alamouti Coding Single Frequency Network

Zhecheng An, Jun Wang, Jintao Wang, Su Huang, Jian Song
Tsinghua University, China

14:00 - 15:40 Parallel Technical Sessions 13, 14, 15

Session 13: Transmission & signal processing 1	Session Chairs: Jong-Soo Seo and Jon Montalbán
	ROOM: REFTER

MM-15-038 Robust Pilot-Detection Technique for Channel Estimation in Single-Carrier Frequency-Domain Equalization Systems

Hongting Zhang, Hsiao-Chun Wu, Yiyang Wu
Louisiana State University, USA

MM-15-043 A Novel Spectral Efficient Spatial Modulation Scheme

Yong Feng, Longzhuang He, Jintao Wang
Hebei University of Technology, and Tsinghua University, China

MM-15-053 Delay-Doppler Search for Matching Pursuit Algorithms in Time-Variant Channels

Nasimi Eldarov, Guoping Tan, Thorsten Herfet
Saarland University, Germany

Session 14: Audio quality	Session Chairs: Hsiao-Chun Wu and Margot Deruyck
	ROOM: PRIORZAAL

MM-15-025 Improving Headphone User Experience in Ubiquitous MultiMedia Content Consumption: A New Universal Cross-Feeder Filter

Francis Li
University of Salford, UK

MM-15-066 Audio Quality in Audio Description: Getting the Priorities Right

Alicia Rodríguez
Universitat Autònoma de Barcelona, Spain

MM-15-070 Impulsive Noise Characterization and Its Effect on Digital Audio Quality

Iratxe Landa, Manuel Velez Amaia Arrinda, Ruben Torre, Marta Fernandez
University of the Basque Country, Spain

MM-15-107 Hybrid Real-time Quality Monitoring Model in Voice over IP

Yi Han, Gabriel-Miro Muntean
Dublin City University, Ireland

Session 15: Video quality	Session Chairs: Gabriel-Miro Muntean and Rafael Sotelo
	ROOM: RECTOR VERMEYLEN
	MM-15-001 Link Quality-Aware Overlay for Video Delivery over Wireless Mesh Networks
	Quang Le-Dang, Jennifer McManis, Gabriel-Miro Muntean <i>RINCE Institute School of Electronic Engineering, Ireland</i>
	MM-15-028 Dynamic Optimization of the Quality of Experience during Mobile Video Watching
Toon De Pessemier, Luc Martens, Wout Joseph <i>iMinds - Ghent University, Belgium</i>	
MM-15-029 On the Impact of Video Content Type on the Mobile Video Quality Assessment and Energy Consumption	
Ramona Trestian, Quoc-Tuan Vien, Huan X. Nguyen, Orhan Gemikonakli <i>Middlesex University, UK</i>	
MM-15-095 Subjective Video Quality Test: Methodology, Database and Experience	
Rafael Sotelo, José Joscowicz, Juan Pablo Garella, Diego Durán, Marcos Juayek <i>Universidad de Montevideo and Universidad de la República, Uruguay</i>	

15:55 - 17:35 Poster Sessions	
	Session Chairs: David Plets, Sung-Ik Park, Jian Song, and Pablo Angueira
	ROOM: KLOOSTERGANG NOORD
	Poster Session: Encryption & security
MM-15-008 On The Voice and Image Data Encryption using Advanced Encryption Standard (AES) in Counter Mode for Multimedia Broadcasting	Junghwan Kim, Srinivasa R. Basavarasu <i>University of Toledo, USA</i>
MM-15-013 Practically Secure Update of Scrambling Scheme	Kazuto Ogawa, Tomoyuki Inoue <i>NHK, Japan</i>
Poster Session: HBBTV & streaming	
MM-15-093 HBB4ALL: Deployment of HBBTV Services for All	Pilar Orero, Carlos Alberto Martín Edo, Mikel Zorrilla <i>Universitat Autònoma de Barcelona, Spain, Universidad Politécnica, Vicometch</i>

Poster Session: LDPC

MM-15-035 High Throughput LDPC Code and Decoder Design for HINOC 2.0 Systems

Yijin Zhao, Yin Xu, Kang Zhao, Dazhi He, Wenjun Zhang, Hongbin Li, Jingfei Cui
Shanghai Jiao Tong University, China

MM-15-116 Efficient Modulation and Coding Scheme Based on Low-Density Parity-Check Codes

Seho Myung, Kyung-Joong Kim, Hyunjae Lee, Sang-Hyo Kim
Samsung and Sungkyunkwan University, Korea

Poster Session: MAC & DATA

MM-15-037 Efficient Cooperative Caching Scheme for Data Access in Disruption Tolerant Networks

Feng Tian, Bo Liu, Jian Xiong, Lin Gui
Shanghai Jiao Tong University, China

Poster Session: MIMO & diversity

MM-15-014 DVB-T2-Lite Profile using Diversity Technique under Different Channel Conditions

Ladislav Polak, Ondrej Kaller, Tomas Kratochvil
Brno University of Technology, Czech Republic

MM-15-033 Improved Preamble Scheme Utilizing Hybrid Differential Modulation in Polarized DVB-T2 MISO System

Zifeng Kui, Jae-Shin Han, Jeong-Min Choi, Sungho Jeon, Youngho Oh, Jong-Soo Seo
Yonsei University, KBS, Samsung, Korea

MM-15-034 Low Complexity Signal Detector Based on SSOR Method for Massive MIMO Systems

Jiaqi Ning, Zhaohua Lu, Tian Xie
Tsinghua University, China

Poster Session: Transmission & signal processing

MM-15-085 A Low Complexity Frequency Offset Estimation for Dual PN TDS-OFDM

Jingxian Liu, Jinxing Hao, Jintao Wang
Tsinghua University, China

MM-15-120 Performance Comparison of LS, LMMSE and Adaptive Averaging Channel Estimation

Spiridon Zettas, Pavlos. I. Lazaridis, Zaharias D. Zaharis, Stylianos Kasampalis, Neeli Prasad, Ian A. Glover, John.P. Cosmas
Brunel University, UK, University of Huddersfield, Aristotle University

Poster Session: Video Coding

MM-15-057 Which Metric Can Predict Coding Gain of H.265/HEVC over H.264/AVC?

Jianhua Xiao, Li Song, Zhengyi Luo
Shanghai Jiao Tong University, China

MM-15-086 Optimizing the MPEG Media Transport Forward Error Correction Scheme

Xuguo Tang, Wei Huang, Yiling Xu, Le Yang, Jun Sun
Shanghai Jiao Tong University, China

Poster Session: Video Quality

MM-15-065 Shape Detector for Generic Ball Detection

Yuncheng Li, Yukun Zhu, Rui Zhang

MM-15-126 Incidence of Specific Semantic Characteristics on the Performance of Recommender Systems of Audiovisual Content

Rafael Sotelo
Universidad de Montevideo, Uruguay

Poster Session: Wireless

MM-15-067 Practical Evaluation of TDoA, AoA and Hybrid Methods for Geolocation of Wireless Transmitters

Aleksandar Grambozov, Vladimir Atanasovski,
Liljana Gavrilovska
*Agency for Electronic Communications and Ss. Cyril and Methodius University
in Skopje, Macedonia*

MM-15-076 Efficient Spectrum Management Exploiting D2D Communication in 5G Systems

L. Militano, A. Orsino, G. Araniti, A. Molinaro, A. Iera, L. Wang
Brunel University, UK

MM-15-118 Energy Consumption Analysis of Cloud-based Video Games Streaming to Mobile Devices

Ioana Ghergulescu, Arghir-Nicolae Moldovan, Cristina Hava
Muntean
National College of Ireland, Ireland

Poster Session: Wireless interference

MM-15-123 Co-Channel and Adjacent Channel Interference for DTMB with 6MHz Channel

Rodney Martínez Alonso, Ernesto Fontes Pupo
LACETEL, Cuba

Poster Session: Wireless: LTE and Relay

MM-15-078 On the Management of Unicast and Multicast Services in LTE Networks

M. Condoluci, S. Pizzi, G. Araniti, A. Molinaro, A. Iera,
Gabriel-Miro Muntean
University of Mediterrenia, Italy

Poster Session: WW PAR reduction

MM-15-015 Peak-to-Average Power Ratio Reduction for OFDM Based on Dynamic Range Compression

Stanislaw Gorlow, Zsolt Kollar
ZK - Budepest Univ of Technology and Economics, Romania, SG Sony Comp Science Lab, France

MM-15-028 Peak-to-Average Power Ratio Analysis to LDM signals

J. Montalban, J. Barrueco, I. Angulo, L. Zhang, Y. Wu, W. Li, H-M. Kim, S-I. Park, J-Y. Lee
University of Basque County, Spain CRC

Friday, June 19

9:00

Plenary Session 3

ROOM: REFTER

Countdown to the Ultimate Television by Kenichi Murayama

The Broadcast Experience Beyond the UHDTV Horizon by David Wood

Cloud Broadcasting Television System in China by Wenjun Zhang

10:55 - 12:35

Parallel Technical Sessions 16, 17, 18

Session 16:
Transmission &
signal processing 2

Session Chairs:
Pavlos. I. Lazaridis and Dazhi he

ROOM: REFTER

MM-15-055 Optimal Pilot Pattern for Sparse Channel Estimation in TFT-OFDM Systems

Xuesi Wang, Jintao Wang, Wenbo Ding
Tsinghua University, China

MM-15-061 **A Novel Transmission Scheme Employing Virtual Subcarrier in TDS-OFDM System**

Shuai Zhang and Chao Zhang
Tsinghua University, China

MM-15-062 **Hierarchical QoE Model for Wireless Video Streaming With Fountain Codes**

Wei Huang, Lianghai Ding, Yiling Xu, Feng Yang, Dazhi He, Wenjun Zhang
Shanghai Jiao Tong University, China

MM-15-071 **Simplified Non-Uniform Constellation Demapping Scheme for the Next Broadcasting System**

Sunhyoung Kwon, Sung Ik Park, Jae-young Lee, Heung Mook Kim, Namho Hur, Jeongchang Kim
ETRI, Korea

MM-15-109 **Evolution of Crowd Behavior in Surveillance Video**

Yueguo Zhang, Lili Dong, Shenghong Li, Jianhua Li
Shanghai Jiao Tong University, China

MM-15-112 **Online Pedestrian Tracking via Saliency-based H-S Histogram**

Bo Zhang, Shen Tan, Yi Zeng, Yi Xu
Shanghai Jiao Tong University, China

Session 17: Video processing	Session Chairs: Liang Zhang and Toon De Pessemier ROOM: RECTOR VERMEYLEN
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MM-15-007 **Exploiting Global and Local Information for Image Quality Assessment with Contrast Change**

Haining Gu, Guangtao Zhai, Min Lin, Ke Gu
Shanghai Jiao Tong University, China

MM-15-047 **CNN-Based Shot Boundary Detection and Video Annotation**

Wenjing Tong, Li Song, Xiaokang Yang, Hui Qu
Shanghai Jiao Tong University, China

Session 18: Wireless	Session Chairs: Chihpeng Li and Emmeric Tanghe ROOM: PRIORZAAL
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MM-15-112 **TV White Space Utility in Urban and Rural Environments**

Piotr Palka
Technische Universitaet Braunschweig, Germany

MM-15-068 **Throughput Optimization Strategies for Large-Scale Wireless LANs**

Mostafa Pakparvar, David Plets, Jeroen Hoebeke, Dirk Deschrijver, Michael Mehari, Wout Joseph
iMinds - Ghent University, Belgium

MM-15-006 **Interference Measurements for Unlicensed 802.11p Communication in the TV Bands**

Mauro Fadda, Maurizio Murrone, Vlad Popescu
University of Cagliari, Italy, Transilvania Univ

MM-15-023 **Interference Suppression and Link Selection for Non-Regenerative Multiple Full Duplex Relaying**

Jae-Shin Han, Jeong-Min Choi, Sungho Jeon, Jong-Soo Seo
Yonsei University, Korea

14:00 - 15:40 Parallel Technical Sessions 19, 20, 21

<p>Session 19: Transmission & signal processing 3</p>	<p>Session Chairs: Maurizio Murrone and Heung Mook Kim</p> <p>ROOM: REFTER</p>
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MM-15-084 Iterative Zero Forcing Detection Scheme for Generalised Spatial Modulation

Yue Sun, Jintao Wang, Longzhuang He
Tsinghua University, China

MM-15-094 An Enhanced DFT-Based Channel Estimation for LDM Systems over SFN Channels

Liang Zhang, Yiyang Wu, Wei Li, Khalil Salehian, Zhihong Hong, Heung Mook Kim, Sung-Ik, Jae-Young Lee, Pablo Angueira, Jon Montalban, Manuel Velez
CRC, Canada, ETRI, University of Basque Country

MM-15-100 Capacity-based Comparison of Several Superimposed Pilot Schemes

Farah Zaarour, Eric Pierre Simon, Marie Zwingelstein-Colin, Iyad Dayoub
University of Lille, France

MM-15-050 SVC and LDM Techniques for HD/UHD TV Indoor Reception

C. Regueiro, J. Barrueco, J. Montalbán, U. Gil, I. Angulo, I. Eizmendi, P. Angueira, M. Velez
University of Basque Country, Spain

<p>Session 20: wireless: LTE and Relay</p>	<p>Session Chairs: Liang-Lu Zhang and Wout Joseph</p> <p>ROOM: RECTOR VERMEYLEN</p>
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MM-15-036 A Cell Specific Reference Signal Interference Cancellation Scheme for LTE Cellular Access Systems

Wei Li, Yue Zhang, Li-ke Huang, John Cosmas, Qiang Ni
University of Bedfordshire, Brunel University, UK

MM-15-077 Evaluating the Performance of Multicast resource Allocation Policies Over LTE Systems

G. Araniti, M. Condoluci, A. Orsino, A. Iera, A. Molinaro, J. Cosmas
Brunel University, UK

MM-15-114 Relay Selection in Non-Reciprocal TWRNs with Limited Feedback

Jyun-Wei Pu, Sheng-Hong Li, Chih-Peng Li, Hsueh-Jyh Li
National Taiwan University, National Sun Yat-sen University

MM-15-129 Practical evaluation of LTE-800 and DVB-T coexistence

Daniel Denkovski, Vladimir Atanasovski, Liljana Gavrilovska
Ss. Cyril and Methodius University, Macedonia

Session 21: Broadcast Technologiess	Session Chairs: Kenichi Murayama and Guanghui Liu
	ROOM: PRIORZAAL

MM-15-027 A Weighted Cooperative Spectrum Sensing Method Based on Double-Threshold Credibility in DTMB Systems

Ziwei Luo, Jun Wang, and Changyong Pan
 Jinghui Zhu, Xunchun Li
Tsinghua University and academy of Broadcasting Science, China

MM-15-097 Study of Emerging Warning Broadcasting Systems

Marco Esteban Silva Chuquillanqui , Alejandro José Llanos
 García
INICTEL-UNI, Peru

MM-15-104 Network Coding Based Mechanism to Provide Reliable Multimedia Content Distribution in Harsh Environments

Josu Bilbao, Igor Armendariz
IK4-IKERLAN Technological Research Centre, Spain

MM-15-110 URAN: Utility-based Reputation-oriented Access Network Selection Strategy for HetNets

Ting Bi, Zhenhui Yuan, Ramona Trestian, Gabriel-Miro
 Muntean
Dublin City University, Ireland, Middlesex University

**15:55 - 17:00 Plenary Session 4,
 Future of Broadcast TV (FOBTv)**

	Session Chairs: Bill Hayes and Yiyan Wu
	ROOM: REFTER

Panel:

Rich Chernock ATSC TG3 chair, CSO Triveni Digital, USA

Luke Fay ATSC TG3 PHY chair, Sony, USA

Kenichi Murayama NHK Science and Technology Laboratories, Japan

Ulrich H. Reimers Technische Universitaet Braunschweig, Germany

Peter Siebert Executive Director, DVB Project, Switzerland

Lieven Vermaele CEO & Co-founder SDN Square, previous director EBU, Switzerland

David Wood Consultant, EBU Innovation and Technology, Switzerland

Wenjun Zhang Chief Engineer, NERC-DTV, China

Bob Plummer Consultant, Former FOBTv Management Committee Chair/Fox TV, USA



Ghent, sparkling authentic

Belgium



Ghent,

sparkling authentic

Ghent offers a unique combination of a glorious past with a lively present and invites you to discover its many monuments and museums. Here beats the young heart of a sparkling city full of culture, arts, events and, most certainly just as important, countless cosy pubs and original restaurants.

The city of Ghent is a compact, authentic city where the past and present co-exist in perfect balance. Ghent is one of the most beautiful

historic cities in Europe and was given several pretty names: historic heart of Flanders, a city of all times, medieval Manhattan, Europe's best kept secret.

This resulted in some international tourist nominations. In 2008 National Geographic Traveler Magazine ranked Ghent third in its list of 109 most authentic destinations. In the 2011 edition of the Lonely Planet's 'Best in Travel' guide, Ghent took the 7th place on the list of must-see cities.

Ghent was founded in the 7th Century, on the confluence of the rivers Scheldt and Lys, and called 'Ganda'. During the Middle Ages, Ghent was a leading town. Under the French domination, the city lived stirring times, but in the 19th century, when Ghent came under Dutch rule, the economy flourished again and Ghent developed into a modern Metropolis.

Nowhere else can you find so much history per square metre as in the beautifully renovated and fully pedestrianised historic city centre. Walking through Ghent is like travelling through time: you turn the corner and just like that, you go from the fourteenth century to the twenty-first (and back!). Nevertheless, everything seems to astonishingly belong together.

Three grand medieval towers form the city's unique skyline. The Castle of the Counts' impressive walls and merlons let your imagination run wild. The adoration of the Mystic Lam by the Van Eyck brothers is only one of the many art treasures in the





St Bavo's Cathedral. The three beguinages are tranquil oases of peace, classified as world heritage sites by Unesco.

Old or new masters. Antiques or design. The life of the cleric, the industrialist or the common man. A visit to the city is not complete without seeing at least one of the important and original museums of Ghent such as the world-renowned Municipal Museum of Contemporary Art (S.M.A.K.), the Museum of Fine Arts, the Design museum Gent, the Museum for Industrial Archaeology and Textiles (MIAT) and the new STAM - Ghent City Museum.

Water plays a key role in Ghent. The city developed at the confluence of the rivers Lys and Scheldt. Water invariably creates a sparkling atmosphere, distinctive of water cities: you always get a holiday feel. The Municipality was rewarded for its considerable efforts to obtain clean water, full of life. Colourful parasols and cheerful chattering voices have once again conquered the banks of the

Lys and the Scheldt. Above all, water tourism attracts new visitors to the city, who will find prime anchorage in the perfectly situated Portus Ganda marina. During the Middle Ages, the port at the Graslei and Korenlei formed the story of the incredible blossoming of Ghent's economy. Nowadays, the port of Ghent is one of Belgium's largest ports.

In Ghent pounds the young heart of a dazzling city of culture with music, theatre, film and visual arts. A city where cultural perspectives are constantly renewed and en-

larged, where culture is a feast and where feasting is a form of culture.

Ghent is also known as a city of festivals. Festivals that attract people from all over the world, such as the Ghent Festivities (every year, third week of July), Gent Jazz Festival (every year in July), Ghent Festival of Flanders (every year in September - October) and the Ghent Film Festival (every year in October).



For more than 200 years, the city has hosted the Ghent Floralties. This unique five-yearly flower and plant exhibition shows the skills of ornamental gardeners, international florists and landscape gardeners.



With over 60,000 students, Ghent is the largest university town in Belgium. The presence of this young population leaves a dynamic mark on the city and this surely adds to the lively atmosphere that Ghent exudes. The Ghent University has an international reputation and is a preferred university for prominent scientists.

Major international congresses are part of the day to day life in Ghent. A number of historical buildings were refurbished and are now open to the public for the use of organising all kinds of events.

At walking distance from the historical centre, lies the international convention center (ICC Ghent) in an oasis of peace in the middle of a



green area. With an auditorium up to 1,000 people and a number of multifunctional rooms, the ICC is the ideal location for congresses and other events of various capacities.

Just outside the city, Flanders Expo allows meetings from 100 to 5,000 people and has 54,000 m² of exhibition space.

A wide range of overnight facilities, from one to four star full service conference hotels, makes sure there is a choice for every budget. Regional dishes or international cuisine. Snacks or five-course dinners. Ghent offers a restaurant suited to every degree of hunger. Being Europe's veggie capital, the city of Ghent offers plenty of possibilities for vegetarians too.

Ghent is also known for its regional beers and jenevers available in the many cosy pubs. The Town Crier can take you on a unique pub-crawl and many of the local breweries and distilleries organise guided visits, and

reveal their centuries-old tradition.

Ghent lies at the heart of East Flanders. The city is therefore the perfect base for exploring the extremely verdant surroundings. The five adjoining areas – Lys region, Meetjesland, Waasland, Scheldeland and the Flemish Ardennes – each have their own specific characteristics and count numerous museums, monuments, churches, gardens and beguinages among their many attractions.

The river Lys winds its way through the picturesque landscape to the west of Ghent (the Lys region). Internationally renowned painters here found the peace and inspiration they needed to create some of their finest works.

Because of its central location in Flanders, Ghent is an ideal operating base not only for visiting East Flanders, but for anyone who is eager to discover other Flemish Art Cities.

Ghent is ready to welcome you with open arms.

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June 17-19 2015, Ghent, Belgium



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