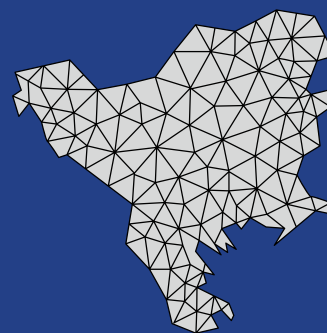# BalkanCom 2024

Seventh International Balkan Conference on
Communications and Networking

Ljubljana, Slovenia, June 3-6, 2024

AI-Enabled Fluid Connectivity

PROGRAM

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TIMETABLE

	MON June 3	TUE June 4	WED June 5	THU June 6
08:30		Opening and Welcome Ceremony	Session 3 Signal Processing	Session 6 ML and Edge Computing
08:45				
09:00		Session 1 Antenna arrays, RIS and THz communications		
09:15				
09:30				
09:45				
10:00				
10:15			Coffee break	Coffee break
10:30		Coffee break	Keynote 3 Prof. Osvaldo Simeone	Keynote 4 Prof. Emil Björnson
10:45		Keynote 1 Prof. Elza Erkip		
11:00				
11:15			Break	Break
11:30		Break	Session 4 Student Session	Special Session on B5G orchestration platforms and use cases
11:45		Session 2 IoT and BANs		
12:00				
12:15				
12:30				
12:45				
13:00	Tutorial Prof. Zibar	Lunch	Lunch	Lunch
13:15				
13:30				
13:45				
14:00		Keynote 2 Prof. Michele Zorzi	Panel Challenges and Key Techniques for Future Networking	Special Session on AI/ML empowered IoT Connectivity
14:15				
14:30				
14:45		Coffee break & Poster Session		
15:00	Coffee break			
15:15	Special Session on Optical wireless communications I	Special Session on Optical wireless communications II		
15:30			Coffee break	Coffee break
15:45			Session 5 Security	Special Session on Blockchain and Decentralized Systems
16:00				
16:15				
16:30				
16:45				
17:00	End of day 1	End of day 2	End of day 3	Closing Session
17:15				End of day 4

18:30	Welcome reception	18:00 City walk 20:00 Gala Dinner

SESSIONS

Antenna arrays, RIS and THz communications

Near-field Beam Steering with Planar Antenna Array	Aleš Simončič, Grega Morano, Tomaž Javornik, Andrej Hrovat and Teodora Kocevska (Jožef Stefan Institute, SI)
Realizing RF Wavefront Copying with RIS for Future Extended Reality Applications	Stavros Tsimpoukis (Institute of Computer Science, GR); Dimitrios Tyrovolas (Aristotle University of Thessaloniki & Technical University of Crete, GR); Sotiris Ioannidis (Technical University of Crete, GR); Ian F. Akyildiz (Georgia Institute of Technology, USA); George K. Karagiannidis (Aristotle University of Thessaloniki, GR); Christos Liaskos (University of Ioannina, GR & Foundation of Research and Technology Hellas, GR)
Terahertz Drone Communications Under Fog and Beam Misalignment	Akhtar Saeed and Ozgur Gurbuz (Sabanci University, TR)
Optimal Deployment of UAV-Mounted Reconfigurable Intelligent Surfaces for Millimeter-Wave Transmission	Abdurrahim Gun, Kutluhan Taylan İren and Tolga Girici (TOBB University of Economics and Technology, TR)
Mobility Matters at Nanoscale: Rendering the Received Terahertz Signal Power in Human Blood Vessels	Jorge Torres Gomez (TU Berlin, DE); Jennifer Simonjan (Technology Innovation Institute, United Arab Emirates); Johan Engstrand (Uppsala University, SE); Sergi Abadal (Universitat Politècnica de Catalunya (UPC) & NaNoNetwoking Center in Catalunya (N3Cat), ES); Robin Augustine (Uppsala University, SE); Thiemo Voigt (RISE Computer Science & Uppsala University, SE); Falko Dressler (TU Berlin, DE)

Session 1

**Tuesday, June 4
09:00-10:30**

Chair:
**Özgür Gürbüz,
Sabanci University,
Turkey**

IoT and BANs

Design Optimization of RF Energy Harvesting Networks for Federated Learning	Marija Poposka, Valentin Rakovic and Daniel Denkovski, Hristijan Gjoreski, Zoran Hadzi-Velkov (Ss. Cyril and Methodius University in Skopje, MK)
Fast Wireless Streaming Protocol for Biomechanical Feedback Systems: Indoor and Outdoor Test Results	Timotej Gruden and Sašo Tomažič (University of Ljubljana, SI)
Wearable haptic interface for feedback in swimming	Matevž Hribernik and Anton Umek (University of Ljubliana, SI); Milivoj Dopsaj (University of Belgrade, RS); Anton Kos (University of Ljubljana, SI)
Wearable Networks for Semantics-Driven FASPAS Approach to Fatigue Management	Milorad Tosic (University of Nis, RS); Nenad Petrovic (University of Nis, Faculty of Electronic Engineering, RS); Olivera Tosic (Virtuona, RS)

Session 2

**Tuesday, June 4
11:45-13:00**

Chair:
**Milica Petković,
University of Novi
Sad, Serbia**

Signal processing

A Low-Latency and Programmable Band-Pass Filter	Mojtaba Mahdavi (Ericsson, SE)
Optimizing Switching Pattern to Reduce CFO Effects in Single RF Chain Direction Finding Systems	Aleš Simončič, Andrej Hrovat, Aleš Švigelj, Grega Morano and Tomaž Javornik (Jožef Stefan Institute, SI)
Examining System Behaviour in Mode Division Multiplexing for Bidirectional Mobile In-Building Solutions	Ahmed Sayed Mohamed and Eszter Udvary (Budapest University of Technology and Economics, HU)

Session 3

**Wednesday, June 5
8:30-10:15**

Chair:
**Tomaž Javornik,
Jožef Stefan
Institute, Slovenia**

Single Optical Micro-Ring Resonator-Based Fading Compensation for Single-Sideband Modulated Radio over Fibre Link	Kristjan Vuk Bališ and Boštjan Batagelj (University of Ljubljana, SI)
Waveform Design for Over-the-Air Computing under Sampling Error	Nikos G. Evgenidis, Nikos Mitsiou, Sotiris A. Tegos and Panagiotis D. Diamantoulakis (Aristotle University of Thessaloniki, GR); Panagiotis Sarigiannidis (University of Western Macedonia, GR); George K. Karagiannidis (Aristotle University of Thessaloniki, GR)
Time-Frequency Spatial Precoding Design for TDD Massive-MIMO Systems	Alexander Sherstobitov (Moscow Radio Transmission Technology Laboratory, RU); Anton Strelnikov (National Research University of Electronic Technology, RU); Vladimir Lyashev (Moscow Institute of Physics and Technology & Moscow Radio Transmission Technology Laboratory, RU)

Session 4

**Wednesday, June 5
11:30-13:00**

Chairs:
**Gordana Gardašević,
University of Banja
Luka, BiH** and
**Jernej Hribar, Jožef
Stefan Institute,
Slovenia**

Student session

Sensitivity of radio frequency phase stabilization system to temperature changes in a fiber optic link	Luka Podbregar, Uroš Dragonja and Janez Krč (University of Ljubljana, SI); Marton Czermann (Budapest University of Technology and Economics, HU); Aljaž Blatnik and Boštjan Batagelj (University of Ljubljana, SI)
Phase Noise Measurement for Improving the Performance of High-Order Modulation Scheme Wireless Links	Andrej Lavrič and Boštjan Batagelj (University of Ljubljana, SI)
Detecting Severe Plant Water Stress with Machine Learning in IoT-Enabled Chamber	Imen Bekkari, Silvia Lombardo, Antonio Coviello and Maurizio Magarini (Politecnico di Milano, IT)
Experimental Validation of UWB CIR Estimation with VNA Measurements in Indoor Scenario	Martin Murko, Aleš Simončič, Andrej Hrovat and Teodora Kocevska (Jožef Stefan Institute, SI); Luka Zmrzlak Tomi Mlinar and Bošjan Batagelj (University of Ljubljana, SI); Tomaž Javornik (Jožef Stefan Institute, SI)
Passive Tag-Based Indoor Navigation and Localization System Using QR Codes: A Proof of Concept	Matevž Ogrinc (Jožef Stefan Postgraduate School, SI); Robert Modic, Andraž Simčič, Bojan Blažica and Drago Torkar (Jožef Stefan Institute, SI)

Session 5

**Wednesday, June 5
15:45-17:00**

Chair:
**Ilir Capuni,
Barleti University,
Albania**

Security

Experimental Time-of-Arrival Quantum Random Number Generation with Dead Time Overestimation	Ágoston Schranz (Budapest University of Technology and Economics & HUNREN-BME Information Systems Research Group, HU); Balázs Solymos (Budapest University of Technology and Economics, HU); Miklos Telek (Budapest University of Technology and Economics, HU; HUNREN-BME Information Systems Research Group, HU)
Verification of Coherent One-way Quantum Key Distribution protocol robustness against polarization changes	Ondrej Klicnik, Petr Munster, Tomas Horvath and Adrian Tomasov (Brno University of Technology, CZ)
Malicious Domain Detection with Machine Learning for Financial Systems	Egemen Gülserliler and Burak Özgen (Yapı Kredi Teknoloji, TR); Serif Bahtiyar (Istanbul Technical University, TR)
Enhancing Academic Credentials: The Synergy of Blockchain and Artificial Intelligence	Avni Rustemi (State University of Tetovo, MK); Fisnik Dalipi (Linnaeus University, SE); Vladimir Atanasovski (Ss Cyril and Methodius University in Skopje, MK); Aleksandar Risteski (Ss. Cyril and Methodius University in Skopje, MK)
Wearable Networks for Semantics-Driven FASPAS Approach to Fatigue Management	Milorad Tosić and Nenad Petrović (University of Niš, RS); Olivera Tosić (Virtuona, RS)

ML and Edge Computing

Session 6

**Thursday, June 6
08:30-10:15**

Chair:
**Carolina Fortuna,
Jožef Stefan
Institute, Slovenia**

Building Zero-touch Service Management Framework for Automotive Services Using the Smart Highway Testbed	Raúl Cuervo Bello (IMEC & University of Antwerpen, BE); Nina Slamnik-Krijestorac (University of Antwerp-IMEC, BE); Matic Pokorn, Jernej Hribar and Carolina Fortuna (Jožef Stefan Institute, SI); Johann M. Marquez-Barja (University of Antwerpen, BE)
Proactive Edge Caching with LSTM-based Popularity Prediction	İlhan Demirci (Marmara University & TÜBİTAK, TR); Omer Korcak (Marmara University, TR)
A Stochastic Knapsack Model for Energy Efficient Management of Multi-Server Queues	Raffaele Bolla (University of Genoa, IT); Roberto Bruschi (CNIT, IT); Franco R. Davoli (University of Genoa & National Inter-University Consortium for Telecommunications, IT); Alessandro Carrega (UNIGE, IT); Chiara Lombardo (University of Genoa & CNIT- Research Unit of the University of Genoa, IT); Beatrice Siccardi (DITEN - University of Genoa, IT)
Cooperative learning by knowledge transfer in vehicular networks for applications with user-environment interactions	Joannes Sam Mertens (University of Catania & CNIT-National Inter-University Consortium for Telecommunications, IT); Giacomo Morabito, Laura Galluccio, Salvatore D. Cafiso and Giuseppina Pappalardo (University of Catania, IT)
Can We Learn to Compress RF Signals?	Yagna Kaasaragadda, Armani Rodriguez and Silvija Kokalj-Filipović (Rowan University, USA)
Evaluating the Efficacy of AI Techniques in Textual Anonymization: A Comparative Study	Dimitrios Asimopoulos (MetaMind Innovations, GR); Ilias Siniosoglou (University of Western Macedonia, GR); Vasileios Argyriou (Kingston University, GB); Sotirios Goudos (Aristotle University of Thessaloniki, GR); Kostas Psannis (University of Macedonia, GR); Nikoleta Karditsioti (Sidroco Holdings Ltd., CY); Theocharis Saoulidis (Sidroco Holdings Ltd, CY); Panagiotis Sarigiannidis (University of Western Macedonia, GR)

Optical wireless communications I

Special Session

**Monday, June 3
15:15-17:00**

Chair:
**Ali Khalighi,
Ecole Centrale
Méditerranée,
France**

On the Application of Slotted ALOHA in Optical Wireless Body Area Networks	Christos Giachoudis (Ecole Centrale Méditerranée, FR); Konstantinos G. Rallis (Aristotle University of Thessaloniki, GR); Ali Khalighi (Ecole Centrale Méditerranée, FR); Vasilis K. Papanikolaou (Friedrich-Alexander-University Erlangen-Nuremberg, DE); Sotiris A. Tegos and Panagiotis D. Diamantoulakis (Aristotle University of Thessaloniki, GR); Robert Schober (Friedrich-Alexander University Erlangen-Nuremberg, DE); George K. Karagiannidis (Aristotle University of Thessaloniki, GR)
IRON: an Integrated RF-OWC System for Interoperability in IoT Systems	Anna Maria Vegni (Roma TRE University, IT); Pietro Manzoni (Universitat Politècnica de València, ES); Milica Petković (Faculty of Technical Sciences, University of Novi Sad, RS)
Photonics-based full duplex millimeter-wave fronthaul links for future mobile communications	Marta Botella-Campos (Universitat Politècnica de València, ES); Jan Bohata (Czech Technical University in Prague, CZ); Luis Vallejo (Bangor University, GB); Jan Vocílka (Czech Technical University in Prague, CZ); Jose Mora (Universidad Politécnica de Valencia, ES); Dong Nhat Nguyen (TNO, The Netherlands); Stanislav Zvanovec (Czech Technical University in Prague, CZ); Beatriz Ortega (ITEAM Research Institute, ES)
Experimental Investigation of a High-Accuracy Optical Delay Stabilization Method in Free Space	Marton Czermann (Budapest University of Technology and Economics, HU); Uroš Dragonja and Boštjan Batagelj (University of Ljubljana, SI); Eszter Udvary (Budapest University of Technology and Economics, HU); Ágoston Schranz (Budapest University of Technology and Economics & HUNREN-BME Information Systems Research Group, HU); Luka Podbregar (University of Ljubljana, SI)
Precision Assessment of Pulsed Optical Wireless Time Difference of Arrival Estimation	Jorik De Bruycker (KU Leuven, BE); Shivani Rajendra Teli (Czech Technical University, CZ); Stanislav Zvanovec (Czech Technical University in Prague, CZ); Zabih Ghassemlooy (Northumbria University, GB); Lieven De Strycker, François Rottenberg and Nobby Stevens (KU Leuven, BE)

Optical wireless communications II

Effect of Lateral Displacement Distribution on Vehicular Visible Light Communication	Bassam Aly Mohamed (CARIAD SE, DE); Mohammed Elamassie (Özyeğin Üniversitesi, TR); Murat Uysal (Ozyegin University, TR)
A Study on Audio Signal Quality Assessment in Visible Light Communication	Jovan Galić (Faculty of Electrical Engineering in Banja Luka, BA); Milan Mlađen and Gordana Gardašević (University of Banja Luka, BA); Milica Petković (Faculty of Technical Sciences, University of Novi Sad, RS); Boris Malčić and Slavko Šajić (University of Banja Luka, BA)
PV powered neuromophic sensors with optical connectivity	George-Iulian Uleru and Alexandru Barleanu (Gheorghe Asachi Technical University of Iasi, RO); Mircea Hulea (Technical University Gheorghe Asachi of Iasi, RO); Zabih Ghassemlooy (Northumbria University, GB)
Experimental Demonstration of a Self-Clocking Pulse-Amplitude Modulation for Optical Camera Communication in Artificial Ambient Light	Vicente Matus (IDeTIC-ULPGC, ES); Atiya Fatima Usmani (University of Aveiro, PT); Monica Figueiredo (Polytechnic Institute of Leiria, PT); Pedro Fonseca (University of Aveiro & Instituto de Telecomunicações, PT); Stanislav Zvanovec (Czech Technical University in Prague, CZ); Rafael Perez-Jimenez (IDeTIC, Las Palmas University of Technology, ES); Luis Nero Alves (DETI, Universidade of Aveiro, Instituto de Telecomunicações & Instituto de Telecomunicações, PT)
Non-Blind Image Restoration Technique in Screen-to-Camera based Optical Camera Communications	Vaigai Nayaki Yokar and Hoa Le Minh (Northumbria University, GB); Luis Nero Alves (DETI, Universidade of Aveiro, Instituto de Telecomunicações & Instituto de Telecomunicações, PT); Stanislav Zvanovec (Czech Technical University in Prague, CZ); Wai Lok Woo (Northumbria University & Newcastle University, GB); Zabih Ghassemlooy (Northumbria University, GB)

B5G orchestration platforms and use cases

Harnessing Spatial Analysis for Next-Gen Industry 4.0 Connectivity Beyond 5G	Rok Ušaj, Luka Koršič, Janez Sterle and Rudolf Sušnik (INTERNET INSTITUTE Ltd, SI)
Next-Gen Industry 4.0 with 5G: Enabling Secure and High-Performance Services for Critical Infrastructure	Julio Diez-Tomillo, Javier Saez-Perez and Ignacio Martinez-Alpiste (University of the West of Scotland, GB); Christina Lessi (OTE Group SA, GR); Thanos Xirofotos (UBITECH, GR); Kiatos Athanasios (Public Power Corporation SA, GR); Dimitrios Klonidis (UBITECH, GR); Qi Wang and Jose Alcaraz-Calero (University of the West of Scotland, GB)
Architecting Orchestrators in Dynamically Evolving Scenarios: From Network-Aware Micro-Services to Application-Aware Network Slices	Franco R. Davoli (University of Genoa & National Inter-University Consortium for Telecommunications, IT); Roberto Bruschi (CNIT, IT); Diego San Cristobal (Ericsson ES, ES); Manuel Fuentes (Fivecomm, ES); Laura González (ABB, ES); Dimitrios Klonidis (UBITECH, GR); Chiara Lombardo (University of Genoa & CNIT- Research Unit of the University of Genoa, IT); Lorenzo Manuel (Ericsson, ES); Miguel Angel Martinez-Lopez (YBVR, ES); Pablo Trelis (Fivecomm, ES); Thanos Xirofotos (UBITECH, GR)
Smart Energy Efficient Non Terrestrial Networks: towards 6G	Saviour Zammit (University of Malta, MT); Franco R. Davoli (University of Genoa & National Inter-University Consortium for Telecommunications, IT); Nour Badini (University of Genoa, IT); Victor Buttigieg (University of Malta, MT); Hector Fenech (University of Malta, MT); Antoine Sciberras, Jean Marie Mifsud, Etienne-Victor Depasquale and Mario Cordina (University of Malta, MT)
Telekom Slovenije's 5G Testbed	Peter Zidar (Telekom, SI)

AI/ML empowered IoT Connectivity

Performance Analysis of UAV-Assisted RF-UOWC Systems	Tijana Devaja (University of Novi Sad, RS); Milica Petković (University of Novi Sad, RS); Marko Beko (ULHT/UNINOVA & UNINOVA, Caparica, PT); Dejan Vukobratović (University of Novi Sad, RS)
QoS and Burst Transmission Enabled MAC Protocol for Ambient IoT	Sohail Sarang, Goran Stojanović (University of Novi Sad, RS); Micheal Drieberg (Universiti Teknologi PETRONAS, MY); Varun Jeoti (University of Novi Sad, RS); Mikko Valkama (Tampere University, FI)
Energy-aware UAV Parcel Delivery Assignment	Viviana Arrigoni, Giulio Attenni, Novella Bartolini and Matteo Finelli (Sapienza University of Rome, IT)
UAV-assisted Distributed Learning for Environmental Monitoring in Rural Environments	Vukan Ninković (University of Novi Sad, RS & The Institute for Artificial Intelligence Research and Development of Serbia, RS); Dejan Vukobratović (University of Novi Sad, RS); Dragiša Mišković (The Institute for Artificial Intelligence Research and Development of Serbia, RS)

Special Session

Thursday, June 6
14:00-15:30

Chair:
Dejan Vukobratović, University of Novi Sad, Serbia

Blockchain and Decentralized Systems

Stochastic analysis and cryptography as key pillars for micro-credentials skills for Bitcoin's Basic Knowledge	Dimitrios E Kiriakos (University of West Attica & DIEK Aigaleo, GR); Dimitrios Kotsifakos (University of Piraeus, GR); Parisa Ghodous (University of Lyon I, FR); Matevž Pustišek (University of Ljubljana, SI); Paraskevi Kotsifakou (National and Kapodistrian University of Athens, GR); Yannis Psaromiligkos (DigiT DSS Lab, GR)
Decentralized Solutions through Micro-credentials at University of Ljubljana	Argene Superina and Andrej Kos and Matevž Pustišek (University of Ljubljana, SI)
STAMP: Blockchain and DAO-based Student Attendance Management Platform	Mubashar Iqbal, Henry Marie Mont and Raimundas Matulevičius (University of Tartu, EE)
Layered Blockchains and Proving Systems: Unlocking New Use Cases	Jay Bojič Burgos, Andrej Kos and Matevž Pustišek (University of Ljubljana, SI)
Use of modular composable non-fungible tokens in advanced use cases	Jan Turk (SI); Matevž Pustišek (University of Ljubljana, SI)

Special Session

Thursday, June 6
15:45-17:00

Chair:
Matevž Pustišek, University of Ljubljana, Slovenia

Poster Session		
Poster Session **Tuesday, June 4** **14:45-15:15** Chairs: **Mojca Volk,** **University of** **Ljubljana, Slovenia** and **Aleš Švigelj, Jožef** **Stefan Institute,** **Slovenia**	***Smart Energy Management in an University Campus Microgrid***	Galia Marinova (Technical University of Sofia, Bulgaria); Edmond Hajrizi (University for Business and Technology, Austria); Vassil Guliashki (Institute of Information Technologies - BAS, Bulgaria)
	System proposal for integration of offline blockchain payment models in a fully offline EV authentication and charging procedure	Nexhibe Sejfuli - Ramadani (University of Tetova, MK); Jelena Gjorgjev (American Univerity of Europe FON in Skopje, MK); Valentina Angelkoska (University of Skopje, MK); Florim Idrizi (State University of Tetova, MK); Marko Porjazoski (Sts Cyril and Methodius University & Faculty of electrical engineering and information technologies, MK); Aleksandar Risteski (Ss. Cyril and Methodius University in Skopje, MK)
	Exploratory Dataset Analysis for 6G AI Model Development	Carolina Fortuna, Leila Mokrovič, Blaž Bertalanič, Jernej Hribar and Mihael Mohorčič (Jožef Stefan Institute, SI)
	Timing Precision of Data Acquisition Devices Applicable in Free-Space QKD Systems	Marton Czermann, Mate Galambos and Gergely Janosi (Budapest University of Technology and Economics, HU)
	Usage of Kalman Filter for preprocessing sensor signals for golf swing classification	Val Vec, Sašo Tomažič, Anton Umek and Andrej Košir (University of Ljubljana, SI)

TUTORIAL

Monday, June 3 13:00-15:00	Chair: **Boštjan Batagelj, University of Ljubljana, Slovenia**	***Machine Learning Approaches for Fiber-Optic Communication Systems and Phase Noise Metrology***	**Darko Zibar**, Technical University of Denmark, DK

KEYNOTE

Tuesday, June 4 **10:45-11:30**	Chair: **Dejan Vukobratović,** **University of Novi Sad, Serbia**	***Energy-Efficiency and Security in Hardware Constrained Wireless Communications***	**Elza Erkip**, New York University, USA
Tuesday, June 4 **14:00-14:45**	Chair: **Mihael Mohorčič, Jožef Stefan Institute, Slovenia**	***The Potential of Non-Terrestrial Networks for 6G***	**Michele Zorzi**, University of Padova, IT
Wednesday, June 5 **10:30-11:15**	Chair: **Filip Lemic, i2CAT Foundation, Spain**	***Beyond Best Effort: How to Ensure Reliability in AI-Based Wireless Systems***	**Osvaldo Simeone**, King's College London, UK
Thursday, June 6 **10:30-11:15**	Chair: **Özgür Gürbüz, Sabanci University, Turkey**	***Massive Near-Field Spatial Multiplexing: Higher Capacity Without More Bandwidth***	**Emil Björnson**, KTH Royal Institute of Technology, SE

PANEL

Wednesday, June 5 **14:00-15:30**	Chairs: **Liljana Gavrilovska, SS Cyril and Methodius University in Skopje, North Macedonia** and **Wolfgang Gerstacker, University of Erlangen-Nuernberg, Germany**	***Challenges and Key Techniques for Future Networking***	**Elza Erkip**, New York University, USA; **Osvaldo Simeone**, King's College London, UK; **Matjaž Beričič**, Telekom Slovenije, SI; **Dragi Kocev**, Jožef Stefan Institute, SI