



## 5G Communication with a Heterogeneous, Agile Mobile network in the Pyeongchang Winter Olympic competition

Grant agreement n. 723247

# Deliverable D7.5 Showcasing Proof-of-Concept results at a key event

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### Abstract

As a key objective of the 5G CHAMPION project, a Proof-of-Concept platform comprising key 5G features has been demonstrated at the 2018 Pyeongchang Winter Olympic Games. An overview on this event is provided in the present document.

### Index terms

5G, 5G CHAMPION, Dissemination, Regulation, Standardization.



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## 1 Introduction

5G CHAMPION has been highly visible and successful in showcasing its Proof-of-Concept platform comprising key 5G features at the 2018 Pyeongchang Winter Olympic Games.

Key features which have been demonstrated by 5G CHAMPION at the 2018 Pyeongchang Winter Olympic Games include

- A complex 5G set-up operating inside and close to the PyeongChang Olympic venue, addressing indoor and outdoor propagation channels in mmWave & below 6GHz spectrum;
- High-speed broadband connection via mmWave high capacity backhaul in 24-28 GHz, using novel antenna arrays for wireless back/front-hauling, enabling the provision of >2Gbps;
- Advanced evolved packet core solutions for efficient system management with virtualization through NFV/SDN in a secure backhaul architecture as well as a novel SDN-based IPsec tunnel architecture;
- Novel accurate positioning solutions (<1m accuracy) using mmWave combined with GNSS PPP;
- Direct UL/DL communication between satellites and 5G User Equipment 'as is' – a corresponding first ever proof-of-concept will set-up;
- Better mobility support through a novel small cell architecture & hybrid adaptive beamforming.

With the above-mentioned activities, 5G CHAMPION ensured world-wide visibility and impact of its research results.



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## 2 5G CHAMPION Proof-of-Concept Platform at the 2018 Pyeongchang Winter Olympic Games

### 2.1 EU-Korean Symposium on 5G: “From the 5G challenge to 5G CHAMPION Trial at Winter Olympic Games”

On the 23<sup>rd</sup> of February 2018, the 5GCHAMPION Consortium has co-organized with IITP, the European Commission, the French Embassy to Korea and the Finish Embassy to Korea the first “From the 5G challenge to 5G CHAMPION Trials at Winter Olympic Games”. The workshop took place at the Conference Hall, Content Korea Lab CKL, K’OCCA

16th Fl, 40 Cheonggyecheon-ro, Jung-gu, Seoul. **More than 80 people** have attended the 23/02 symposium including the **French Ambassador to Korea**, the vice-president of IITP and the **Vice-Ambassador of Finland**. The participants have interacted, witness the achievements, and related Proof of Concepts of the 5GCHAMPION project and its consortium.

The program of the event is the following (also available on the 5GCHAMPION website):

**Moderator: IITP (Kwang ho CHUN, [khchun@iitp.kr](mailto:khchun@iitp.kr))**

**Organizers:**

**French Embassy (LEMAIRE Oriane, [Oriane.LEMAIRE@cea.fr](mailto:Oriane.LEMAIRE@cea.fr))**

**CEA (Emilio CALVANESE STRINATI, [emilio.calvanese-strinati@cea.fr](mailto:emilio.calvanese-strinati@cea.fr))**

**ETRI (Taesang CHOI, [choits@etri.re.kr](mailto:choits@etri.re.kr))**

09:00 - 09:20	Opening of Registration
09:20 – 9:30	<b>Opening address:</b> 5G CHAMPION EU / Korea coordinators (Dr. Emilio Calvanese Strinati, Dr. Hyun Kyu Chung)
09:30 – 9:40	<b>Welcome address:</b> Fabien Penone, French Ambassador to Korea
9:40 – 09:50	<b>Speech of encouragement:</b> Kim Gwangsu, Director General for Information and Communication Industry Policy, Korea’s Ministry of Science and ICT



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9:50 – 10:00	Time for celebratory photo
<b>Session 1</b>	<b>5G CHAMPION Trials – Results, Lesson Learnt and Perspectives</b>
10:00 – 10:30	<i>5GCHAMPION: Challenges, Achievements and Perspectives</i> Dr. Emilio Calvanese Strinati, CEA-LETI, 5GCHAMPION EU Coordinator Dr. Hyun Kyu Chung, ETRI, 5GCHAMPION KR Coordinator
10:30 – 11:00	<i>mmW Moving Hotspot Trial – Results and Lesson Learned</i> Prof. Jouko Niinimäki, Rector of the University of Oulu Dr. Giuseppe Destino, University Oulu, Dr. Ilgy Kim, ETRI
11:00 – 11:30	<i>5G ready: Orchestration of 5G services – Core network aspects</i> Dr. TaeSang Choi, 5GCHAMPION Korean Technical Manager, ETRI
11:30 – 12:00	<i>5GCHAMPION Trial at the Olympic Games Venue: Experience of immersive 5G services: Korea-Finland connected</i> Aki Korvala, Program Manager, Nokia
12:00 – 13:00	Lunch Break & Demos Exposition
<b>Session 2</b>	<b>Industrial session : 5G Trials and Future of 5G Services</b>

Session 3	Panel discussion: Challenges for an Efficient Implementation of 5G Services
16:20 – 16:40	<p><i>Roadmap towards 5G testbeds in Europe</i></p> <p>Bernard Barani Deputy Head of Unit, Future Connectivity Systems, European Commission</p>
16:40 – 17:00	<p><i>Korea's roadmap towards 5G</i></p> <p>Jaehak Yi, Mobile Communication PM, IITP</p>
17:00 – 17:50	<p><i>Round table: The Importance of 5G Trials at Olympic Games – Today's Experience and Tomorrow's Perspectives and Open Challenges</i></p> <p>Moderator: Dr. E. Calvanese Strinati, CEA-LETI</p> <p>Participants: Dr. H. Chung (ETRI), Daegyun Kim, Sr. Director Samsung Electronics , Jong-Sik Lee, Intra Research center of KT Director, (KT), Jean-Michel Serre, CEO, Orange Japan</p> <p>Jaehak Yi, Mobile Communication PM, IITP</p>
17:50 – 18:00	<p>Closing Remarks</p> <p>Ms. Anna Huovila, Deputy Head of Mission, Embassy of Finland in Korea</p>
15:00 – 15:30	<p><del><i>Orange: On the road to 5G technology and service plans of European carriers</i></del></p> <p>Jean-Michel Serre, CEO, Orange Japan</p>
15:30 – 16:00	<p><i>Enhanced EMBB for 5G Services</i></p> <p>Thales-Alenia Space – Focus 5G-Satellite future services</p> <p>Dr. Nicolas Chuberre, Solution Line Manager, Thales Alenia Space</p>
16:00 – 16:20	Coffee Break & Demos Exposition

This workshop has presented the **results of the 5GCHAMPION trials** started during the opening of Olympic Games but has also focused on **specific demonstrations** (including the **5Gb/s 28GHz mmW mobile hotspot link**) and the **intercontinental interactive experience between Oulu and the K-ICT Square demo area in Korea**.

The introduction speech has been given by the French Ambassador to Korea Mr. F. Penone, Dr. Kim Gwangsu, Director General for Information and Communication Industry Policy and



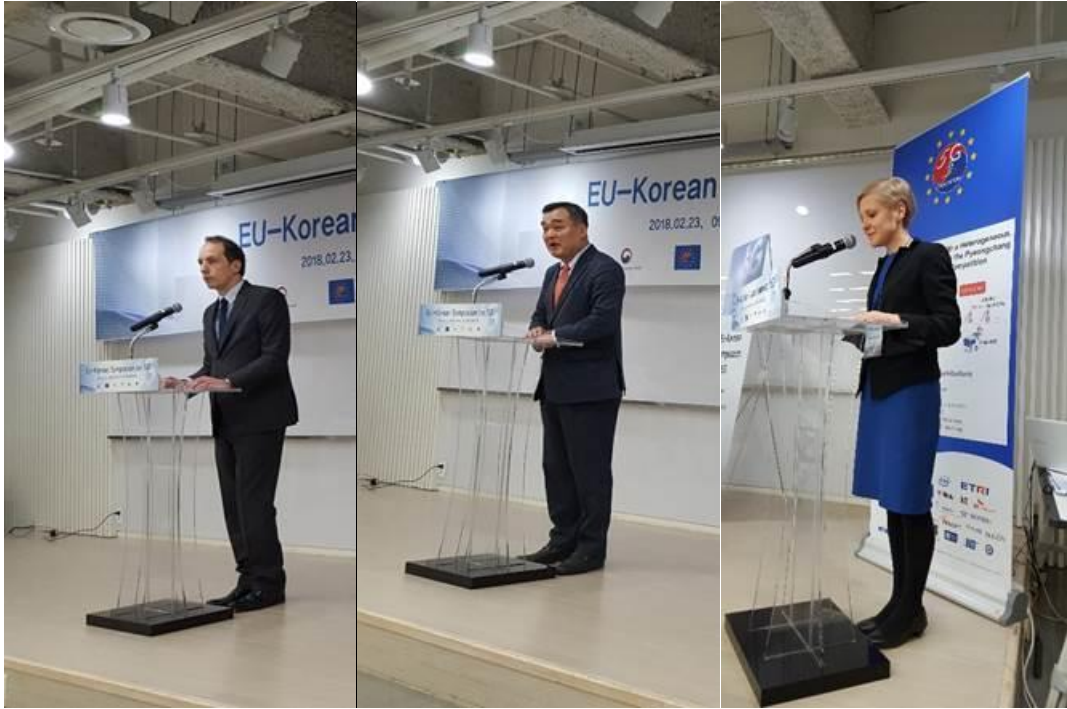
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**[Left]** The French Ambassador to Korea (Mr. F. Penone)

**[Center]:** Dr. Kim Gwansu, Director General for Information and Communication Industry Policy

**[Right]:** Ms. Anna Huovila, Deputy Head of Mission, Embassy of Finland in Korea

The participants have actively participated with questions during the presentations and the closing roundtable.



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During the symposium of the 23/02 participants had also visited our **dedicated 5GCHAMPION booth** where both **satellite link emulation testbed** and a **prototype of 28GHz advanced electronically steerable transmit-array antenna** have been showcased and presented to the audience.



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The day has been concluded with a **reception at the French Embassy** where the French Ambassador to Korea has delivered a very warm and supportive speech to 5GCHAMPION. Institutional, researchers and Industry have exchanges impression and future thoughts on 5G, their potential implications and, **collaborations between Europe and Korea** and follow up actions.



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## 2.2 Proof of Concept at K-ICT Square during the Winter Olympic Games

During the week of 19-22 of February 2018 the 5GCHAMPION consortium have deployed important resources to deliver a set of unique proof of Concepts at the K-ICT Square. While the details of the demonstrations are details in the related deliverables in WP6, hereafter we report some dissemination related events and some photos that witness the active presence of the consortium members and the interested experienced from the audience that had reached more than 4500 visitors at the 5GCHAMPION booth during the week of 19<sup>th</sup> of February 2018.

5GCHAMPION **trials** started during the opening of OG but has also focused on **specific demonstrations** (including the **5Gb/s 28GHz mmW mobile hotspot link**) and the **intercontinental interactive experience between Oulu and the K-ICT Square demo area in Korea**.

After a preparation day for setting up all the content and the demos,



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# ICT SQUARE

## 입주기업

### • 노سن(NOHSN)주식회사 •

미래기술 예측을 통해 IT&NT&BT가 융합된 헬스케어 시스템 및 서비스개발 기업

### • (주)닷 •

장애인들이 더 나은 생활을 누리고 다양한 디지털 격차를 해소할 수 있도록 IoT기기를 개발하는 개발 전문 기업

### • 닷초잇 •

위치기반 서비스를 기반으로 지역 문화관광에 특화된 서비스 플랫폼을 개발하는 회사

### • (주)라이온시큐리티 •

사용자 본인의 지문과 정밀 알고리즘이 탑재된 지문인식 스마트 카드인 ASTO 카드를 보안, 핀테크, 물류 등의 분야에 활용하는 기술개발 기업

### • (주)롤루랩 •

데이터 기반으로 최적의 제품을 추천하는 인공지능 피부 분석 솔루션 대표번호 010-3130-3548

### • (주)모픽 •

세계 최초 무안경 3D커버 "Snap3D"와 3D 최적화 플레이어 "Mplayer 3D"를 독자적으로 개발

### • 버넥트 •

증강현실(AR) 분야의 최고 전문가들이 주축이 되어 설립한 회사 국내 최고의 증강현실(AR) 기술력 보유 기업

### • (주)브이컴 •

ICT/IOT 융합컨설팅 및 콘텐츠제작, 전문 기술과 풍부한 노하우를 기반으로 스마트우편함 기술 및 아직 경험해보지 못한 다음시대의 새로운 서비스로 시장의 변화를 주도하는 기업.

### • (주)스마트박스 •

세계 최초로 IoT(사물 인터넷)기술을 활용한 제품 및 시스템을 제조, 개발, 서비스 운영하는 기업

### • (주)쓰리디팩토리 •

국내 1위 VR 게임방 브랜드인 "Camp VR"을 보유하고 있으며, 차세대 3D 기술인 "홀로그래프"과 "무안경 3D" 분야에서 국내 최고의 기술을 보유

### • (주)아이디로 •

세계최초 가시광 RFID를 중심으로 고성능 UHF RFID 장비와 시스템을 제공

### • (주)어거스트텐 •

세계최초의 디지털 이온자임 마스크를 개발/제조/판매

### • 유퍼스트(주) •

글로벌 의료 시장을 목표로 청각 장애와 난청을 해결할 수 있는 IoT 웨어러블 디바이스인 NUGUNA 솔루션을 개발

### • 웰트 주식회사 •

세계 최초 벨트형 웨어러블을 출시한 헬스케어 IoT 기업

### • 웹프라임 주식회사 •

다수의 GPU를 장착한 서버 한대로 다중 VR 게임을 지원할 수 있는 솔루션 개발 및 10만원이하의 보급형 저가 무선 HMD를 제조

### • (주)이너트론 (주)보카프 •

국내의 신기술 획득과 품질, 가격경쟁력 확보를 통하여 세계 최고 기술을 보유한 수출형 강소기업으로 스마트 식품조리기기와 글로벌 가정대체식품(HMR) 간편식 플랫폼 제공

### • 이노넷(주) •

4차 산업혁명을 위한 인지무선 기술이 적용된 배낭형 이동기저국, TVWS Device 및 버스 공공 와이파이 전문기업

### • 토도웍스(주) •

휠체어를 사용하는 장애인들을 위한 기술을 개발하는 엔지니어링 회사입니다. 휠체어용 파워어시스트에 IoT기술을 접목시켜 사회적 약자가 당면하는 문제를 하나하나 해결해 나가는 소셜벤처기업.

### • 하나마이크론(주) •

IoT Wearable & Flexible 반도체 분야 글로벌 리더, IoT 서비스 플랫폼 및 IoT 융복합 디바이스 전문 기업

### • (주)후본 •

융복합 기술 기반 IoT 보안 시스템, AR/VR/360° Real Audio 기술적용 HMD, 융합 소재 3D프린터 솔루션을 개발

### • GLS •

60 GHz 대역을 기반으로 한 근접거리 무선통신용 반도체 칩을 설계 및 제조하는 팹리스 업체



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The 5GCHAMPION team was ready to present to the visitors the different 5GCHAMPION PoC.



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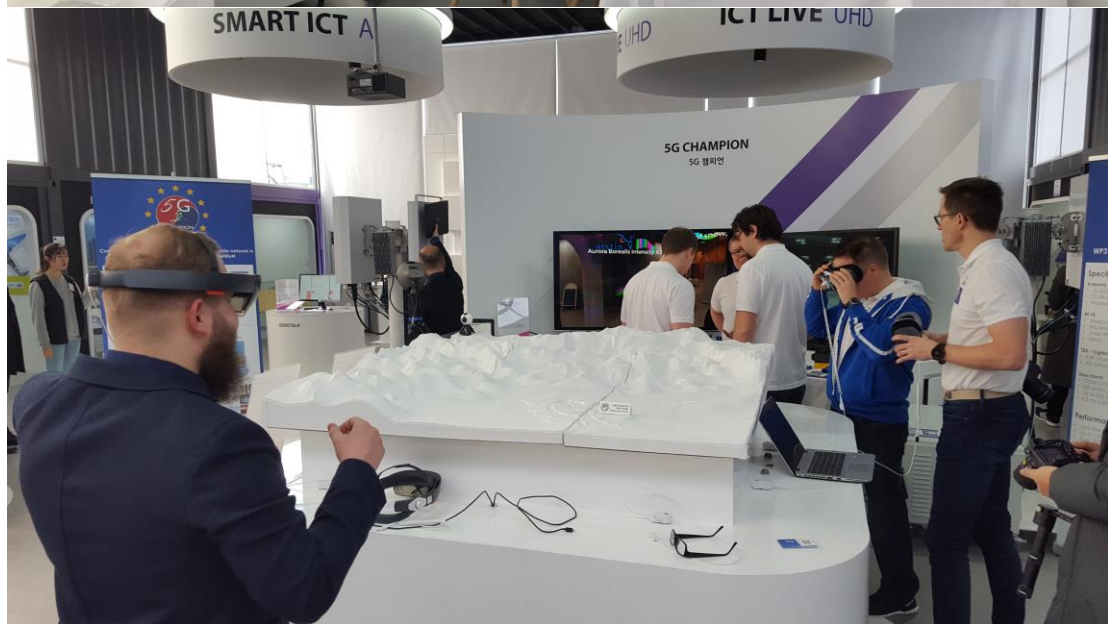
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Among the 4500 visitors of the 19<sup>th</sup> of February week at the 5GCHAMPION booth we have been honored during the 20/02 to have the **visit of the Prime Minister of Finland, the Finish Ambassador to Korea and the Olympic.**



For this special occasion, the 5GCHAMPION consortium has prepared a specific and detailed oral presentation on 5GCHAMPION activities



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And a very detailed visit of our demonstration booth and 5GCHAMPION bus.



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Showing that we reached the 5Gb/s at a speed of 60 Km/h/

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We also have been honored by the visit of IITP representatives.



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We have been also honored to have several people visiting our booth and learning about 5G and our achievements.

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### 3 Conclusion

As a conclusion, 5G CHAMPION has fulfilled the organization of showcasing Proof-of-Concept results at a key event in alignment to the overall 5G CHAMPION dissemination strategy. 5G CHAMPION has indeed been highly visible and successful in terms of technical development, impactful showcasing of the results and the interaction with key stakeholders and decision makers. 5GCHAMPION has provided a remarkable visibility to the 5G ecosystem having provided more than 40 articles in the international press, radio interviews, two IEEE spectrum articles, more than 4500 visitors at the 5GCHAMPION K-ICT boot.