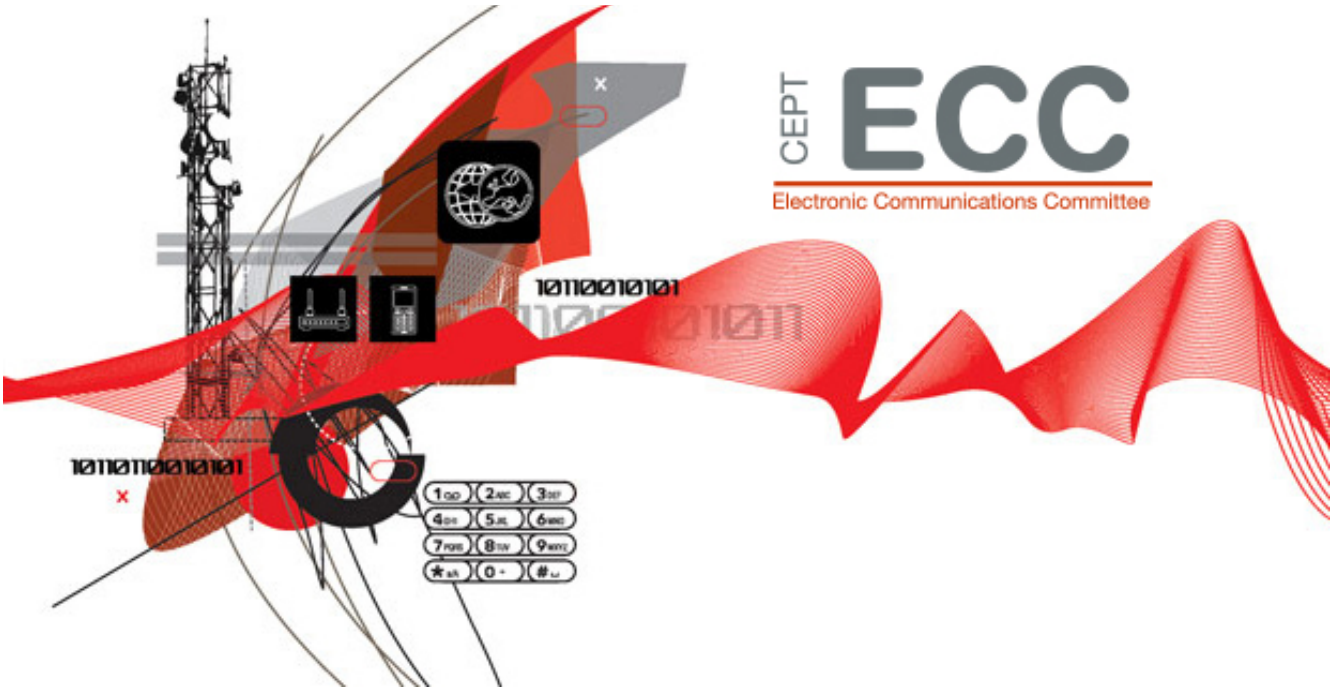


ECC Newsletter May 2023

ECC develops forward-looking measures to enable connection of drones with mobile networks

Peter Faris, ECO Spectrum Expert, explores recent developments from the Electronic Communications Committee regarding harmonisation of mobile spectrum for usage by drones

Technological advances in unmanned aerial systems, more commonly known as drones, have led to an increase in their use for various consumer, professional and governmental applications in recent years. As drones by their nature rely on wireless connectivity to operate, unique challenges for management of the radio spectrum have arisen. These were explored in ECC Report 268, as well as in a CEPT workshop and associated newsletter article in 2018.

Since then, the ECC has taken proactive measures to ensure the safe and efficient operation of drones in a number of areas, including identifying frequencies for command and control, as well as data payload communications. In this article, we explore the most recent developments related to facilitating the connection of drones with existing mobile networks.

Mobile networks to enable long-range communication

Data communication via mobile networks can provide benefits for a range of applications which need to operate over wider distances beyond the visual line-of-sight. Examples include the ability to inspect crucial infrastructure such as power lines or transport networks, as well as government surveillance applications such as search and rescue, border monitoring or anti-terrorism operations.

Figure 1: Drone monitoring of power lines

In principle such connectivity to commercial mobile networks is already feasible using existing technology, i.e. drones equipped with standard off-the-shelf mobile user equipment (UE) – referred to as "aerial UE". However, the use of these devices at altitude results in the possibility for line-of-sight radio conditions with other systems operating in adjacent frequency bands. Therefore, there is an increased risk of interference to these systems compared with from a standard smartphone operating on the ground, and it is necessary to conduct co-existence studies to verify if any enabling regulatory measures are necessary to unlock potential obstacles for the use of aerial UE.

Co-existence with other spectrum users

In this context, ECC Report 309, published in 2020, studied the impact of aerial UE on existing applications in and adjacent to current harmonised mobile bands. The report focused on the use of 4G technology. It was complemented by ECC Report 348 in 2022, which extended the studies to also consider 5G technology using active antenna systems (AAS). The latter report formed part of a wider programme in the ECC to review the suitability of current regulations for 5G to avoid unnecessary burden.

All of these reports concluded on a range of measures necessary to foster the further development of drones while protecting important existing applications in adjacent frequency bands. In particular, specific out-of-band emission limits were identified as necessary from aerial UE operating in 1710-1875 MHz and 2500-2620 MHz. The reasons

for this were to protect meteorological satellites operating in 1675-1710 MHz, radio astronomy observatories receiving in 2690-2700 MHz, and air traffic control radars operating in 2700-2900 MHz. Other operational conditions include the possible need for "no-transmit zones" to be determined on a national basis for protection of:

- digital TV receivers below 694 MHz from aerial UE operating in 703-733 MHz;
- radio astronomy observatories receiving in 1400-1427 MHz and 1660-1670 MHz from second harmonic signals of aerial UE operating in 703-733 MHz and 832-837 MHz respectively;
- radio astronomy observatories receiving in 2690-2700 MHz, and air traffic control radars operating in 2700-2900 MHz, from aerial UE operating in 2500-2620 MHz

Harmonisation of spectrum for aerial UE

These technical and operational conditions were implemented in ECC Decision (22)07, published in November 2022, which harmonises six bands for aerial UE either using 4G or 5G technology. The bands are: 703-733 MHz, 832-862 MHz, 880-915 MHz, 1710-1785 MHz, 1920-1980 MHz and 2500-2620 MHz.

This harmonised framework offers numerous benefits to industry, governments and consumers. It facilitates the use of these bands for drone-based applications to connect to existing mobile networks, while ensuring protection of other users of adjacent bands.

Future work may consider the inclusion of the 3.4-3.8 GHz in the framework in a revision of the Decision.

As part of its other ongoing work, the ECC is also considering forward-looking solutions for command and control and payload links of drones to use the 1880-1920 MHz range exclusively for governmental applications. Draft ECC Report 352 is planned for publication in June, to be followed by a draft ECC Recommendation planned for publication in June 2024.

PSAP Directory saves lives

Since its introduction in 2018, the PSAP Directory has been connecting emergency services across Europe. A webinar, hosted by the European Communications Office in March, heard about real-life examples of the directory in action.

When a truck driver, on a journey through France, started to display symptoms of a stroke, he called his employers in Lithuania to tell them there was something wrong. The man could not speak very clearly. His concerned employers dialled 112 in Lithuania and told them of the emergency. The call-taker in Lithuania was able to call a PSAP in France and direct them quickly to the driver.

There was a time when such a cross-border communication would have been lengthy to resolve, because when a person in country A is informed of an incident in country B, it is not possible for them to access emergency services in country B by dialling an emergency short number (e.g. 112). However, thanks to the introduction of a Public Safety Answering Point (PSAP) Directory in 2018, there is a speedy solution. The PSAP Directory enables participating European PSAPs to communicate with each other when they are dealing with an emergency incident with a cross-border dimension.

The half-day webinar organised by the ECO in March was well attended and packed with statistics, case studies on the use of the PSAP Directory and information on how European PSAPs can join the directory. Participants heard what has been happening with the PSAP Directory in France, Lithuania, Sweden and Romania as well as numerous examples of the directory in action.

The PSAP Directory, which is hosted by the ECO, is a confidential directory containing contact information for participating PSAPs across Europe. The idea of the directory is that it is used as a back-office support tool for PSAPs to contact each other when needed. There is no cost associated with using the directory – it is free to use. Since its introduction, the number of PSAPs using the directory has been growing. As of March 2023, 27 PSAPs from 22 European countries use the directory.

Attendees were told of the harrowing, real-life case of a Lithuanian woman threatened and raped in Sweden who managed to send a text message to her sister back home. Her sister called 112 in Lithuania who in turn contacted the Swedish PSAP using the directory. Police and an ambulance were sent to the location of the woman.

The webinar was told of an incident where a Romanian woman living in another country called her sister in distress. The woman was expressing suicidal ideation. Her sister in Romania called 112 to report the emergency. The relevant call-takers took immediate action and used the PSAP Directory to send help.

Truck drivers, in particular, often call their employers or family if they run into trouble. When a Czech lorry driver experienced symptoms of a heart attack while on a trip to the UK, he called home. Eventually, the PSAP in Czechia used the directory to create a three-way call with the driver and the PSAP in the UK. The case resulted in a positive outcome.

In another example a truck driver having a stroke was so confused he did not know what country he was in, nor did he remember his age, and was unable to call 112. He did manage to contact his wife in Romania who in turn called the emergency services there. Thanks to the use of the PSAP directory, the man was saved.

The PSAP directory can be particularly useful in the case of traffic accidents involving tourists or migrants. Sometimes, when people are travelling near borders, the phone call can connect to a mobile station in the wrong country.

The webinar heard calls for more PSAPs to sign up to the directory. The aim is to get as many PSAPs in the 46 CEPT member countries as possible to participate in the directory.

Some countries have several PSAPs. While one PSAP acts as a point of reference in each country, attendees at the webinar encouraged all PSAPs within their countries to contact that point of reference to share the information contained in the directory.

The seminar also heard some interesting statistics on the use of the directory. In Lithuania, for example, the PSAP is used between 30 to 40 times each month. In Sweden, last year, 21 calls were made from Swedish PSAPs to international ones.

As Elizabeth Greenberg, Chair of CEPT/ECC Working Group Numbering and Networks, said in her closing remarks, the statistics and case studies “really brought home the value of participating in the PSAP Directory”.

Reaching new horizons – implementing digital terrain in SEAMCAT

The implementation of digital terrain in the software tool SEAMCAT is a game changer, but a complex task, writes Zeljko Tabakovic, ECO Spectrum Expert.

The Spectrum Engineering Advanced Monte Carlo Analysis Tool (SEAMCAT) is a software tool which can be used for modelling, simulation and analysis of sharing and compatibility scenarios between radiocommunications systems. The main purpose for the continuous development of SEAMCAT is to provide the ECC and its stakeholders with an open-source, free-of-charge software tool that allows them to perform co-existence studies. These can be used on the national basis supporting essential initiatives fostering developments in the telecommunication sector as well as in international fora to provide for widely accepted studies based on proven, well known methodologies making results easily comparable between different sources.

The importance of SEAMCAT for the CEPT is underlined by the management through the SEAMCAT Technical Group (STG), a permanent group chaired be the ECO.

A forward looking initiative of the Working Group on Spectrum Engineering, known as work item STG_07, calls for implementing digital terrain data to be used in combination with propagation models. In the last couple of years there has been a lot of SEAMCAT development relating to implementing digital terrain in the tool. Implementing this feature is quite a complex task, but it is a game changer for SEAMCAT, extending tool functionalities to the next level to cope with the ever-growing number and density of radio transmitters serving essential needs in modern societies.

When starting with implementing terrain there were some prerequisites which needed to be fulfilled to have meaningful implementation in SEAMCAT. These were:

- do not change the purpose and logic of the tool, i.e. keep the Monte-Carlo stochastic tool for sharing and compatibility simulation, for example, positions of Tx and Rx are randomly generated according to user settings with a geo-reference point enabling geo-positioning,
- enable the use of publicly available digital terrain data from different satellite missions (e.g. SRTM, ASTER, etc.), which user can download and put in the computer folder for the area of interest,

- develop readers of the most common formats of digital terrain data, where the user can use all digital terrain data available (not limited to public sources), determine which format of data to use in specific study and choose data precision raster,
- have in-tool embedded functionality to load data tiles and extract terrain height profile from Tx and Rx coordinates,
- use a SEAMCAT library of propagation model plugins to calculate propagation loss with terrain height profile in tools, simulation, interference analysis, EPPs, user defined plugins and integrate these functionalities seamlessly.

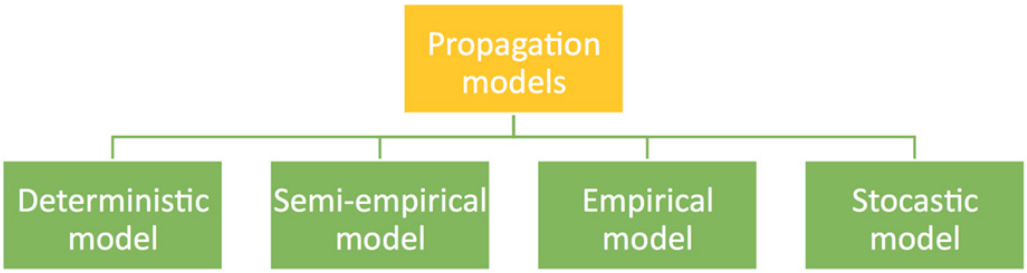


Figure 1: General classification of the propagation models

Implementation steps

STG recognised the complexity of the implementation of terrain functionalities in SEAMCAT and therefore decided for an incremental implementation of the functionalities which can be checked in subsequent test versions of the tool. For that purpose, work has been divided into several phases.

Overview of phases of implementation:

1. Implementation of the Terrain Profile Tool – implementing terrain data reader, extracting terrain height profiles and calculation of path loss
2. Implementation of digital terrain data for path loss calculation in SEAMCAT simulation and interference calculations
   a. Implementation of digital terrain data in SEAMCAT scenario and simulation
   b. Implementation in generic and cellular-like systems
   c. Calculation of transmission loss using terrain for victim system, interfering system, and interference links
3. New features
   a. Extending terrain features to CommandLine, EPPs, External PMPs
   b. View and extract terrain height profiles data, export / import

c. Adding Terrain settings to workspace settings, enabling exchange and loading workspaces with terrain settings among users

d. Consistency checks for existence of terrain data (heuristic approach)

e. Implementing multiple terrain data readers (4 DEM formats)

f. Implementing support for terrain in multiple propagation models (4 PMP models supported)

4. Additional features and enhancements
   a. Including more terrain data readers and propagation model plugins
   b. Improving void filling algorithm for terrain tiles
   c. Extending GUI displays to allow implementation of some mapping functionalities e.g. in simulation outline map overlay view functionality
   d. Performance enhancements in calculation speed, memory management and handling bottlenecks.

When implementing new functionalities, tests have been developed in parallel to proof the proper implementation. STG members tested features implemented in consecutive phases, comparing results with those implemented in other independent tools.

Overview of implemented features

The algorithms in SEAMCAT use the process of repeated random sampling of parameters which allows statistical modelling of diverse complex spectrum engineering and wireless compatibility scenarios. The tool assesses the potential interference between different radiocommunication systems that operate in shared, overlapping or adjacent frequency bands. It is not designed as a black box and users can design, adapt, and exchange system and simulation parameters, as well as view intermediate results of calculations and export results.

Digital terrain phases 1 to 3 have been implemented and are fully functional in SEAMCAT in a test version. SEAMCAT (from version 5.4.3A4 onwards) supports the digital terrain model in simulation and tools (terrain profile tool and test propagation model). The latest features are available in SEAMCAT test version 5.5.0 A3, which was released in February 2023, and there is further ongoing work and tests performed before new terrain features are released in an official version.

Below are screenshots of some of the implemented features relating to digital terrain. All information on the SEAMCAT itself, user documentation and a free download of the tool can be found on the following dedicated web page link. User documentation explaining how to use these new features and where to download DEM Data can be found in the document DEM terrain use in SEAMCAT.

a. Setting the environment

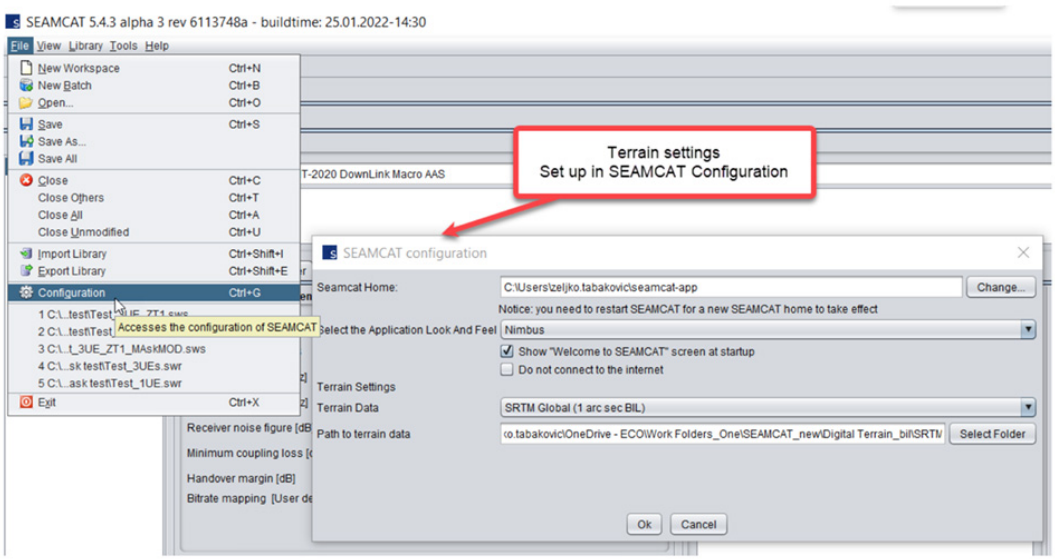


Figure 2: Terrain settings input in SEAMCAT configuration

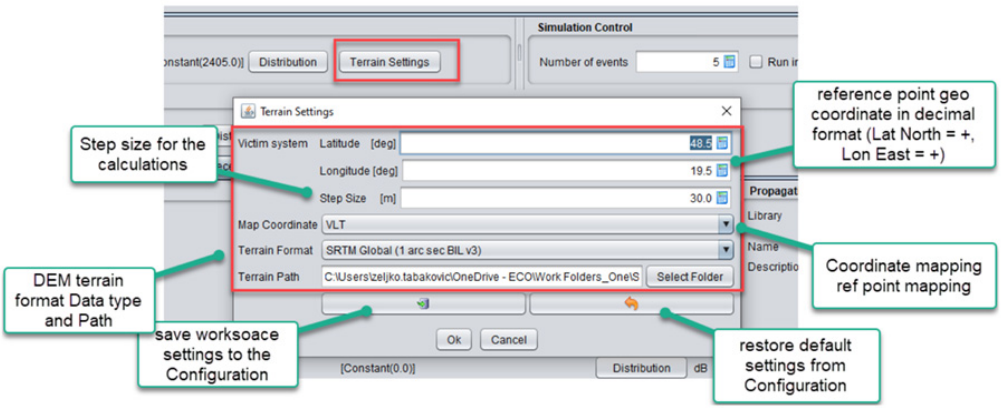


Figure 3: Terrain settings in the simulation scenario

b. Running simulation and exploring simulation results

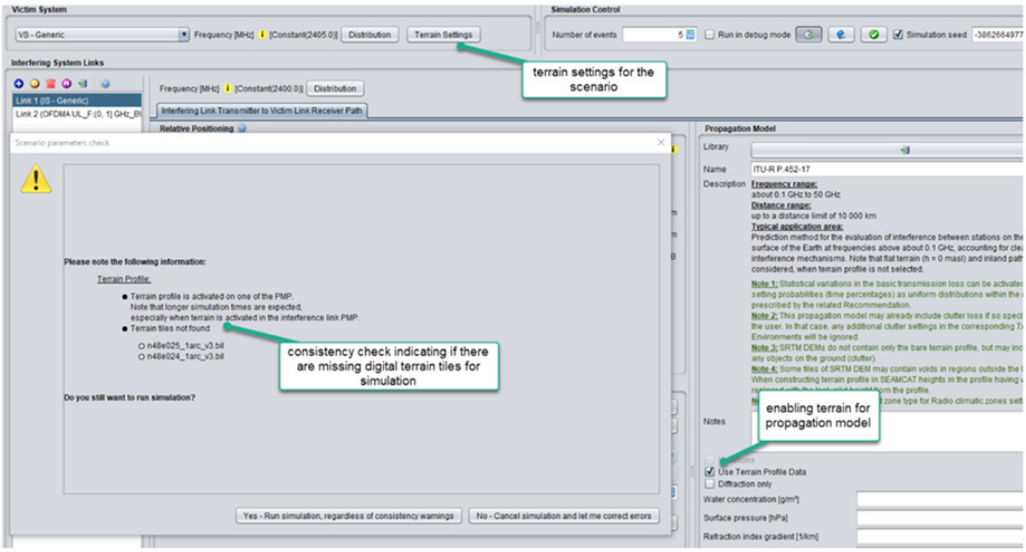


Figure 4: Enabling usage of terrain in propagation model and consistency check results

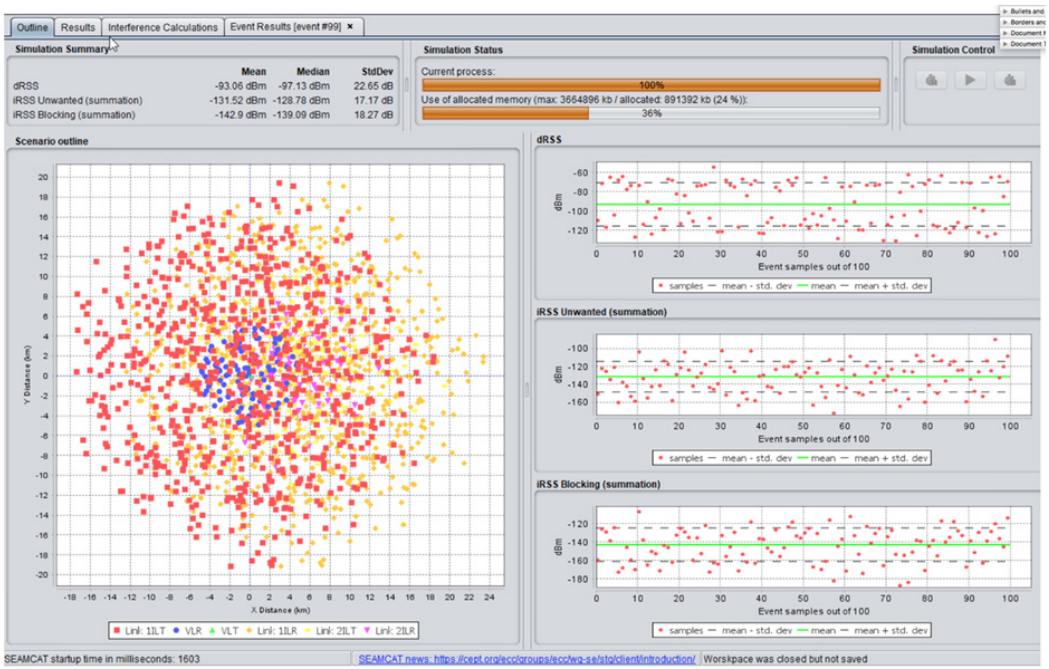


Figure 5: Outline of the simulation results

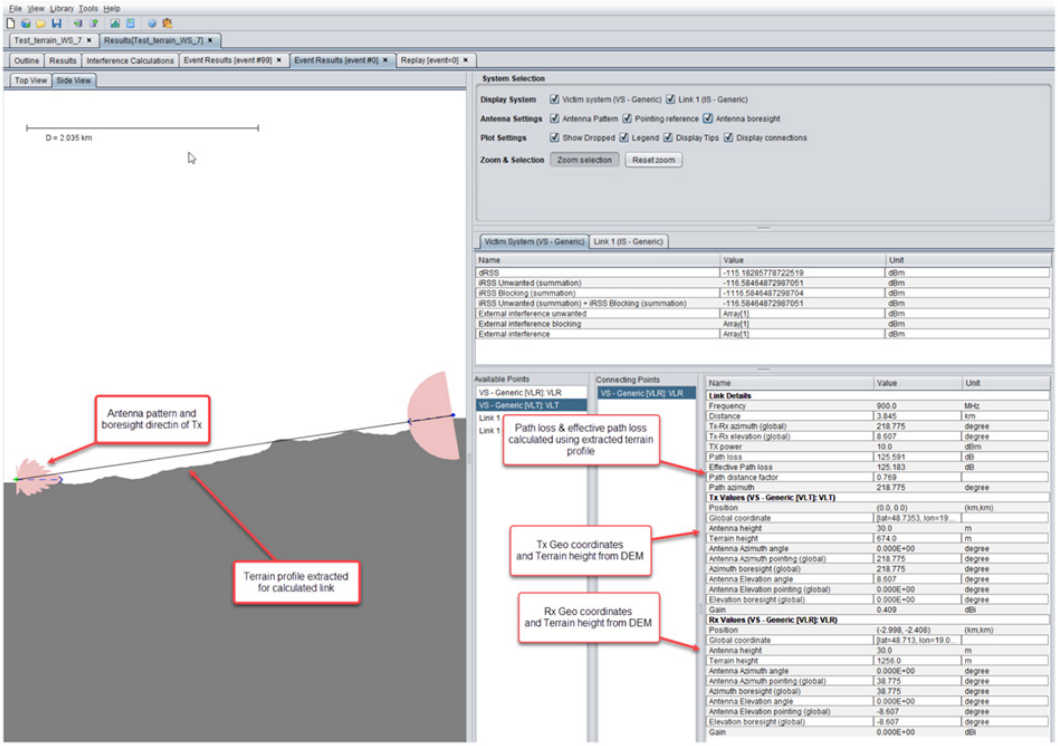


Figure 6: Event result showing terrain profiles of all links, geo data and related calculations

c. Examples of usage of terrain in SEAMCAT tools and processing plugins

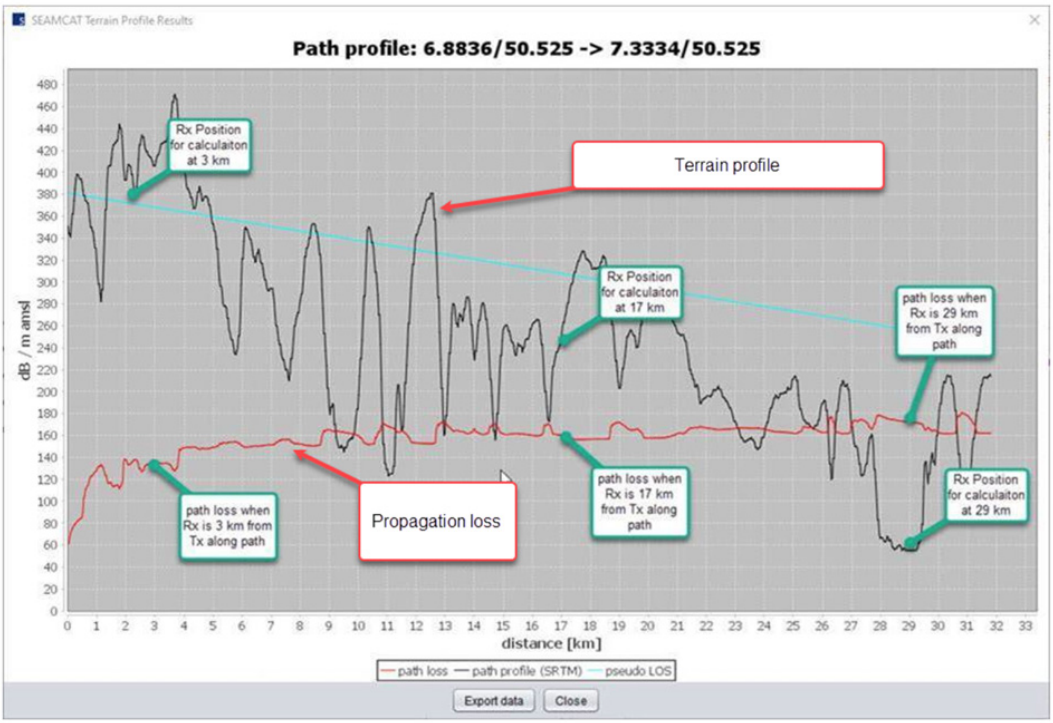


Figure 7: Terrain profile tool showing terrain heights and propagation loss

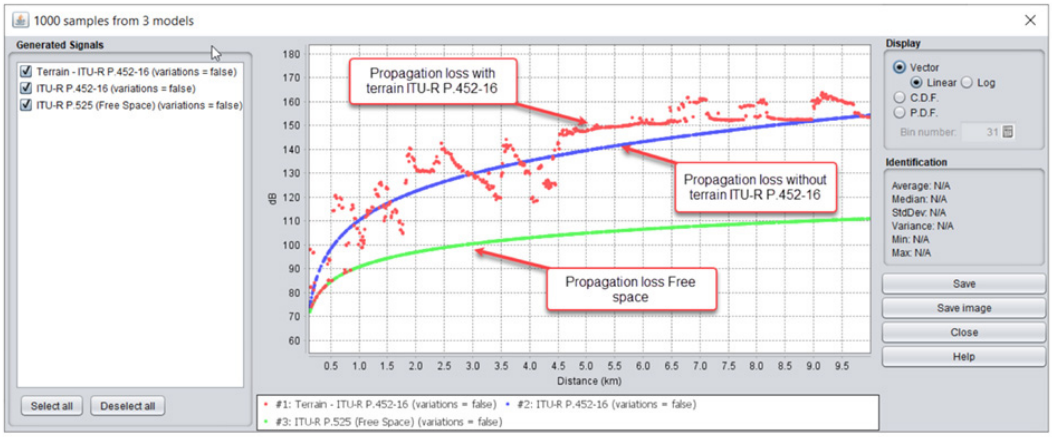


Figure 8: Test propagation models calculating propagation loss with and without terrain

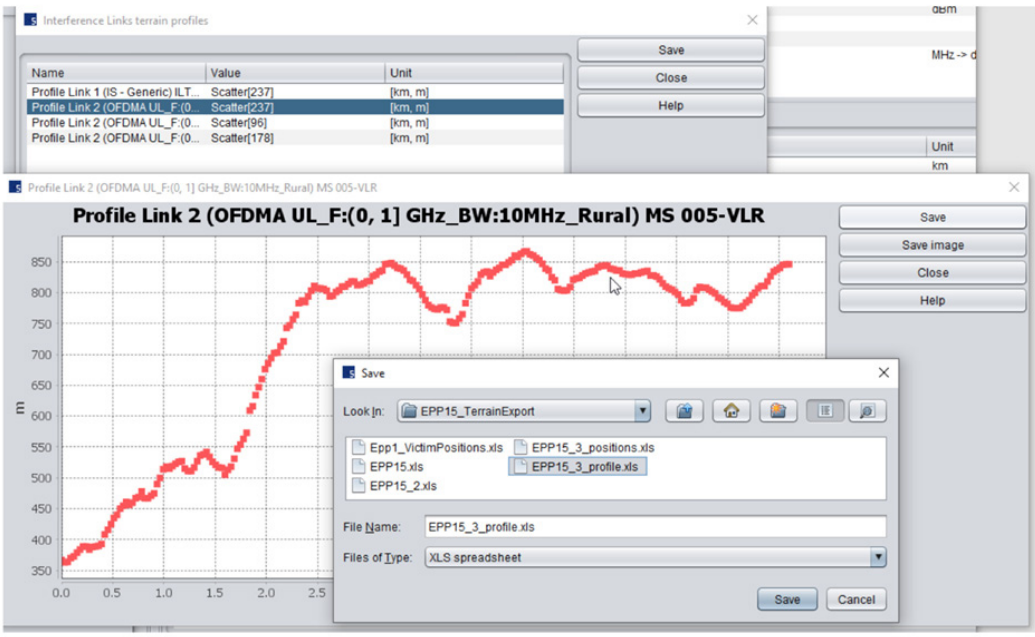


Figure 9: Usage in plugins – extracting and exporting of terrain height profiles

SEAMCAT terrain implementation: In brief

SEAMCAT is a free-of-charge software tool which can be used for simulation of various sharing and compatibility scenarios between radiocommunications systems. In recent years SEAMCAT has been extended with a number of new features and built-in functions, enabling calculations using digital terrain. The terrain is functional in the SEAMCAT test version and works in sharing and compatibility simulations, including tools and plugins. The tool itself is platform independent and terrain functionalities are implemented in both desktop application and in the CommandLine application.

SEAMCAT can be downloaded here. Online user documentation for the tool is available on following link.

Users are welcome to test, use the tool and join the SEAMCAT community to contribute to the development of the software and its libraries. Be part of it!

The CEPT Network of Women for World Radiocommunication Conference 2023

"EACH ONE OF US CAN MAKE A DIFFERENCE. TOGETHER WE MAKE CHANGE"

Ahead of World Radiocommunication Conference 2023, a group of women have set up a forum for mentoring and knowledge sharing. Here, the CEPT Co-Chair of the NOW4WRC23, Amela Hatibovic-Sehic details the important reasons behind setting up such a network

It will take about 132 years to completely close the gender gap across the world. That is according to the Global Gender Gap Report 2022 from the World Economic Forum. Its findings were based on a survey of 146 countries.

Gender equality implies not only equal distribution between men and women in all domains of society. It is also about the qualitative aspects, ensuring that the knowledge and experience of both men and women are used to promote progress in all areas.

So, when the World Economic Forum looks at the evolution of gender parity it does so from four key dimensions: economic participation and opportunity; educational attainment, health and survival and political empowerment.

Ahead of the World Radiocommunication Conference in 2023, the ITU Radiocommunication sector (ITU-R) examined gender equality at the conference over the past 20 years. Statistics show that there has been very slight positive development when it comes to the percentage of women delegates participating in WRC-related activities.

At WRC-2000, just 12 per cent of delegates were women. By 2019, nearly two decades later, female delegates at WRC-19 still account for fewer than one in five of those attending. The percentage of female delegates attending was at 18 per cent. This is a clear indication of a very high grade of gender disproportionality in the ITU-R sector.

The conclusion is simple: representation of women at every level of WRC activities both within the ITU-R and CEPT, in general, needs to be improved. If women and men are treated equally in their home organisations, the chances are much greater for women to actively and meaningfully participate in work related to WRC-23. Therefore, it is essential that all the administrations and sector organisations actively work to improve the gender equality.

THE HEART OF CEPT NOW4WRC23

The CEPT Network of Women for WRC-23 (NOW4WRC23) was set up in 2020 as a forum for networking, mentoring and knowledge sharing. It is a regional part of the ITU-R NOW4WRC23 and aims to advance the goals, objectives, and achievement of the NOW4WRC19 into the ITU-R study cycle leading up to the WRC-23.

The activities of CEPT NOW4WRC23 started with the appointment of the CEPT Regional Co-chair in December 2020. By June 2021, the first members of the co-ordination team were gathered. Today, the activities of the network are co-ordinated by the team of 10 women. Members of the team come from administrations, organisations and from the ECO, covering all the project teams that work on WRC-23 preparations.

The co-ordination team is the heart of the network: Amela Hatibovic Sehic (PTS, Sweden), Cath Westcott (BBC, United Kingdom), Denise Urbach (BNetzA, Germany), Doriana Guiducci (ECO, Copenhagen), Eiman Mohyeldin (NOKIA, Germany), Isabel Martinez Ponte (MINECO, Spain), Jale Uzunboy (BTK, Türkiye), Liudmyla Karpenko (UCRF, Ukraine), Nadia Katsanou (EETT, Greece) and Soraya Contreras (BAKOM, Switzerland).

THE STATEMENT DEFINES OUR ROLE

The ECC conference preparatory group (CPG-23) has supported the CEPT NOW4WRC23 initiative from the very start. The CEPT NOW4WRC23 statement was unanimously agreed by the group back in May 2021.

1. The ITU-NOW4WRC23 is a forum for networking, mentoring and knowledge sharing. The main objective of NOW4WRC23 is to improve women's representation in the radiocommunication sector at every level, by promoting participation of women in the work prior to and during WRC-23, both in terms of quantity and in terms of quality.
2. The ITU activities of NOW4WRC23 are endorsed and further facilitated within CEPT by introducing the regional CEPT NOW4WRC23 initiative.
3. The principles of gender equality, equity and parity are fully supported in the work of CEPT towards the WRC-23.
4. CEPT NOW4WRC23 shall support all efforts in:
   - addressing the specific needs of women delegates within CEPT;
   - organising CEPT NOW4WRC23 activities during meetings of CPG and project teams tasked with the preparation of WRC-23;
   - involving and supporting women new to CEPT;
   - promoting women's leadership in CEPT's preparatory process for WRC-23;
   - encouraging active participation of CEPT women delegates in the ITU-R preparatory process for WRC-23.
5. All administrations and observers are encouraged to actively work towards the participation of women in CEPT meetings for WRC-23 preparation, at all levels, and to nominate and support women for leadership roles.

IMPROVING EQUALITY TAKES HARD WORK

Improving equality takes hard work and time. It takes bold policies that push boundaries, making society more inclusive. It takes legislation that protects everyone's right to be who they are. And it takes pioneers who challenge the status quo.

Women's empowerment cannot be achieved without equal rights and participation – in society and in family. Here is a short review of some of the activities CEPT NOW4WRC23 initiated in order to strengthen the role and position of women engaged in the CEPT preparations towards WRC-23.

The core of the group's activities are the interactive sessions such as panel discussions and presentations of guest speakers, organised by our co-ordination team. All together we have had 39 NOW sessions and we had pleasure to welcome many prominent guest speakers,

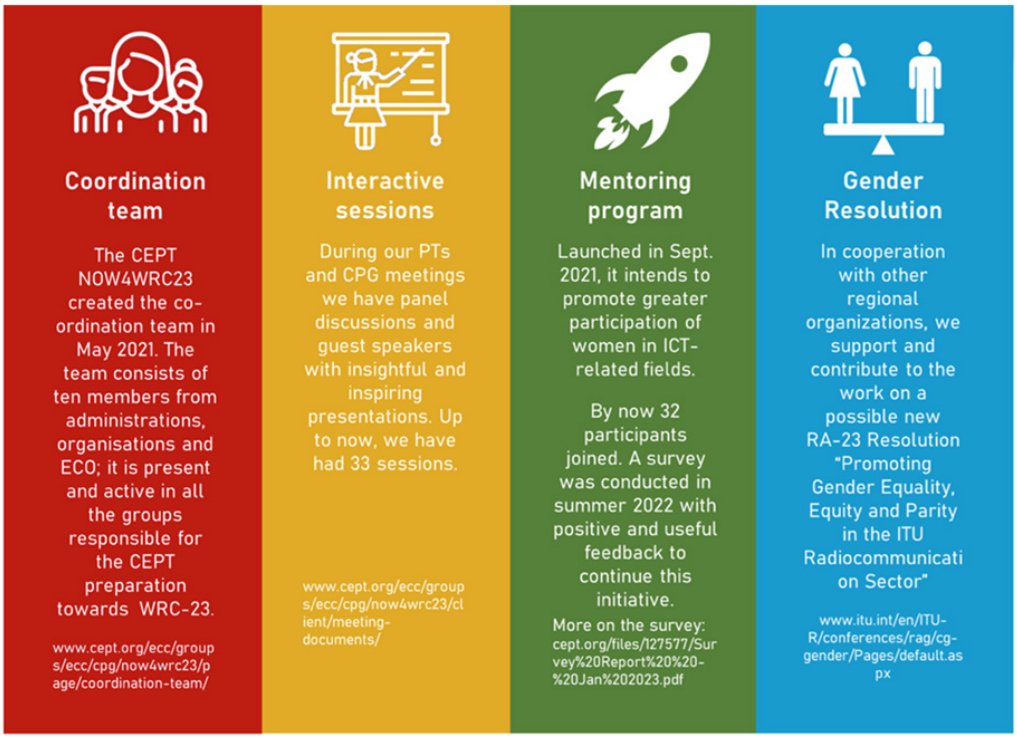
from all over the world and from different sectors, who shared their inspiring stories as well as knowledge and experience with delegates.

In September 2021, the CEPT NOW4WRC23 Mentoring Program was successfully launched, promoting gender equality, equity and parity in CEPT by providing development and sharing of knowledge and experience in accordance to the specific needs of mentees.

Through this programme women newcomers in WRC-23 preparations were matched, according to their specific needs for skills or competence, with experienced delegates, without regards to gender. By now 32 participants have joined the programme and 20 mentoring pairs have been arranged. The survey on the CEPT NOW4WRC23 Mentoring Program was conducted during the summer of 2022. Most replies on "the obstacles/difficulties that prevent more women from taking on leadership roles within CEPT and related meetings" are stated as "lack of woman participating in CEPT meetings" and most replies on "the actions that can allow more women to take on leadership roles within CEPT" are stated as "platform to share knowledge, practices and experiences". More information about the CEPT NOW4WRC23 and its mentoring programme can be found here.

At the ITU conference preparatory meeting (CPM23-2) on 28 March and 4 April 2023, CEPT NOW4WRC23 invited all CEPT delegates to an "open house". Delegates from other regional organisations were also invited and welcome to this event where the co-chair and co-ordinators were available (to women and men) to provide information on our activities and, more importantly, to offer the ad-hoc mentoring support. The open house was also an excellent opportunity to welcome delegates from other regional organisations' NOW-initiatives.

The CEPT NOW4WRC23 appealed, at several occasions, to the CPG-23 as well as to the individual administrations, to commit themselves to support women delegates to get actively involved at all levels of the organisation of WRC-23. The CPG-23 gathers many competent women who are interested in the work at WRC-23 but support from their home organisations in that engagement is absolutely essential.



THE ITU-R GENDER RESOLUTION IS A MILESTONE

The CEPT NOW4WRC23, in close co-operation with other regional organisations, supported and contributed to the work of the Radiocommunication Advisory Group (RAG) Correspondence Group on the implementation of WRC-19 Gender Declaration. This group prepared a proposal to the Radiocommunication Assembly 2023 (RA-23) for a new ITU-R Resolution "Promoting Gender Equality, Equity and Parity in the ITU Radiocommunication Sector" for submission to RA-23.

The resolution on gender, specifically adopted for the ITU-R Sector, would be of crucial importance and a milestone for empowerment of women in radiocommunications. That is why the CEPT NOW4WRC23 invited all CEPT administrations to actively support the proposal for this resolution at RA-23.

What now?

The CEPT NOW4WRC23 has established its organisation and arranged a large number of activities with the aim to change and strengthen the position of women in the work of the CPG-23 and its project teams. There is an awareness that this is not an easy task, that a lot of time and efforts are required to make that change. That is why this network needs to continue its work even during the next study period.

The CEPT NOW4WRC23 asked for support from the CPG-23 and CEPT administrations to continue this initiative in the next study period by establishing the CEPT NOW4WRC27 after WRC-23.