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ITU REGIONAL SEMINAR FOR EUROPE AND CIS ON SPECTRUM MANAGEMENT AND BROADCASTING
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>> We're just trying to fix an issue. We are reconnecting Jaroslaw and Mr. Sjoblom. If you are request the floor, we will try to reconnect you. Thank you very much.

>> JAROSLAW PONDER: Can you hear me?

>> Yes, I can hear you.

>> JAROSLAW PONDER: And is Mr. Sjoblom with us?

>> Yes, but we are struggling to give him the floor. So we are trying to --

>> JAROSLAW PONDER: Hmm.

>> JAROSLAW PONDER: So ladies and gentlemen, we are asking you for a little bit of patience. We are

having technical challenge, as you see. So please remain connected and we'll be starting just in a second.

>> Emilie can you hear us?

>> EMILIE VAN DEVENTER: Yes, can you hear me.

>> So I kindly ask you to disconnect and then and we will connect with Mr. Sjoblom.

>> EMILIE VAN DEVENTER: To disconnect?

>> It's the button in the red. You won't disconnect, but go back to being a viewer.

>> EMILIE VAN DEVENTER: The phone?

>> Yes, the phone. Thank you very much.

And we will try to give the floor to Mr. Sjoblom.

>> DAN SJOBLOM: Finally!

>> JAROSLAW PONDER: Can you hear me too?

>> DAN SJOBLOM: We can hear you. So please remain connected with us. Dear ladies and gentlemen, this is moment when we will be starting the seminar, the second day of the seminar. In front of us is quite busy agenda, addressing many things starting from the electronic fields and 5G implementation measurements, digital broadcasting and international frequency and coordination.

Before we will start -- I will still request to make the ITU announcements for those who didn't connect yesterday, and that we are remaining up to date and know how to use also all the functionalities of the system, including the chatroom.

The floor is yours.

>> Can you hear me?

>> JAROSLAW PONDER: Voila, we hear you?

>> Good morning. I'm the remote participation monitor for this event. I want to call your attention to the following details. Firstly, if you would like to intervene, please raise your hand with the green raise hand button to request the floor, which notifies us that you want to have the floor, and we will enable your audio and video streaming. So please turn on your many cameras when you are speaking.

Secondly, at the end of your intervention, please click on the disconnect button to stop your streaming. And you can click on the phone sign on the upper right. There's only five people maximum that can stream at one time. So when you disconnect yourself, you give other participants the possibility of

intervention.

Thirdly, you can use the chat, which you see on the right side of the screen, and you can participate with the moderator, or participants for questions, comments or technical issues.

And the last point is that this meeting will be recorded and we will have Russian and English interpretation. On the upper right corner, you see the interpreting feature and you can choose your preferred language and if you select none, you will listen to the floor. So that's it. I will stay at your disposal per chat for any other questions. Thank you very much. And have a nice meeting.

>> JAROSLAW PONDER: Thank you very much for this introduction. And dear, ladies and gentlemen, this is the moment when I have the pleasure to introduce our keynote as speaker of today. We are starting the day with the message of the chair of the body of European regulators for electronic communication, BEREC.

We have the great pleasure to sign the memorandum of understanding of the close cooperation with BEREC recently and also we were very happy with a commitment of Mr. Sjoblom to chair the global symposium for regulators 2020, which is celebrating 20 years of existence.

So with this introduction, I'm handing over to Mr. Dan Sjoblom for the keynote.

>> DAN SJOBLOM: Thank you very much, Jaroslaw and thank you very much to the ITU for allowing me to introduce this second and last day of symposium. As you mentioned, we signed last year the memorandum of understanding between BEREC and the ITU and we think this is very important and is also very relevant given the topics that are on for discussion during the sessions today, and there are many sessions, and all of them have a very international scope and importance. So electronic magnetic fields and 5G implementation is of course very topical in many, many parts of the world. We have the topic of new avenues for spectrum management and broadband measurement tools. Likewise, everyone is interested in that topic.

Digital broadcasting is becoming the norm and has a lot of international relations there as well and then, of course the international frequency

coordination, which is something that we have been doing for some time, but it is just increasing in importance and sometimes you might think also in complexity.

The increasing volume of electronic communication between countries and video is evident to all of us. It's a global industry. It means that policies, legislations and regulation must be seen from a much more global perspective. This is not new to any of us, but the pace and the trends, of course, increasing the complexity of keeping up. That's something that is -- is the same for all of us, I'm sure.

The European Union and BEREC, the Member States, have recently also been embarking on a journey towards better 5G security. It's a very important topic for us. There was a toolbox created for common conclusions. It's to achieve better effect through cooperation and collaboration, and that's true not only inside Europe, but also globally.

Regional organizations, national regulatory authorities increasingly do this. I think we all collaborate more than we did ten years ago. We had memorandas of understanding not only the one between BEREC and ITU, but these initiatives to shares between countries and regions, I think that's a very good symbol and sign that we have understood our responsibilities. And there are many other examples of our business being a truly international business as well.

And now, of course, with COVID-19 pandemic ongoing and in different phases everywhere, we really see the need for well-functioning electronic communication, and spectrum is, of course, very important in ensuring that people remain connected. Everyone is affected by pandemic, and everyone needs to remain connected.

We are in the midst of 5G auctions everywhere, Europe included. Many of them have happened. Some are ongoing, and we have to admit that at least some of them are being partly delayed or postponed because of difficulties raising out of the pandemic situation. I think it's all of our wish and responsibility to ensure that these delays and postponements are as unaffecting our ability to increase connectivity as possible because we know that when we cannot easily

meet and travel anymore, and none of us knows how long this will be. We all hope it will be a short time until we can have our physical meetings again, but again until such time it's more vital than ever to increase the abilities to connect electronically, and that is really something that we have as our strongest and most important challenge, I think, in the coming time.

So the demand for spectrum is, even if we can eventually come back to meeting in physical format again, not going to decrease. We will continue to see increases in the demand of spectrum, even in the longer run, and I think it's very much up to all policymakers to ensure that we adopt the right policies to use this resource wisely, both nationally and of course, even more important internationally so we can connect the world with each other.

I'm very much looking forward to today's discussion and thank you all for being here and for my part, welcome to day two of the symposium. Thank you.

>> JAROSLAW PONDER: Thank you very much, Dan, for this introductory remarks and the keynote speech. It's very well noted and appreciated. In this space, very good way powers our first session which will be focusing on the electromagnetic fields and the 5G implementation and being one of the challenges in many countries, but recently also the challenge in context of the COVID, where the 5G has been challenged in many European countries because of EMF and including some negative actions have been observed in a few countries, including destroying some antennas.

So therefore, this is my great pleasure to welcome with us, the distinguished speakers of this session, representing the ICNIRP, the WHO and Rohde-Schwarz. It's a great pleasure to be able and to capture your messages and pave the way at the ITU level and implementation of increased actions, letting us advance the implementation of the 5G across the Europe and CIS countries.

So to kick off this session, I have the great pleasure, first to invite Emilie van Deventer, the head of EMF Project of the WHO, who will first set the tone on the discussion of the EMF. So Emilie, the floor is yours. And I would like to request all speakers of this session to raise their hand that ITU

moderator can facilitate connecting us. So don't wait for your turn, you can already raise your hand and be ready for intervention.

And now is the moment when I'm handing over to Emilie, and for her presentation.

>> EMILIE VAN DEVENTER: Thank you very much. Can you hear me?

>> JAROSLAW PONDER: We can hear you very well.

>> EMILIE VAN DEVENTER: Thank you for the opportunity to talk to you today. I will represent the World Health Organization and we have great interest in the health effect of radiation and in particular, of electromagnetic fields. So if you would like to go to the next slide, please.

Thank you.

So this represents the electromagnetic field spectrum, where you can see on the left-hand side the electromagnetic fields and the many applications that we have there from static fields to electricity, and to telecommunications. In the center, you will see the spectrum of optical radiation, including UV radiation, and on your right-hand side, ionizing radiation, whose many applications relating to medical purposes, to energy, such as nuclear power plant and also we look at emergencies such as Chernobyl or Fukushima.

Today, we will concentrate on electromagnetic fields and in particular, the part of the spectrum that relates to radio frequency fields. So these fields are unlike ionizing radiation, they cannot break nor cause ionization in the human body and they have a lot of application.

If we go to the next slide, we will see applications spanning from public utility, such as TV, radio broadcasting, and radar that you are very familiar with. Commercial applications in terms of wireless networks that have evolved very much over the past 30 years and induction ovens microwave ovens, the baby monitor and the WiFi in your home and now we are seeing a deployment of a new generation of wireless networks in terms of the 5G.

If you go to the next slide, please. Yeah.

And click through this one. 5G, the next generation is the latest one, is mobile phone technology. You know that very well. It has been

deployed since last year, around several countries. It's expected to increase the performance and wide range of new applications. What we are interested in, of course, from a health point of view, are the applications related to e-health, like telemedicine, remote surveillance and telesurgery. If you click several times, please to have the whole slide shown.

The benefits you are well aware of the speed up of the way the data transfers and the increased density of the networks but for us, it really represents an increasing performance that we are hoping to and at present, you know that this technology is using 3.5 gigahertz and the frequencies that we are already using in 4G, however, we expect that in the near future, we will go into higher frequencies, tens of gigahertz and radio waves have not been used by cellular communications so far, but really in other applications such as airport security or anti-collision radar for cars, we have already done so, and so have some information about this.

Please click. Yes, and one more. This shows you the 5G infrastructure and the difference between what we had up to now, with Internet transmitting constantly in certain directions to what we are expecting, these antennas which will be much smaller, that will be at higher frequency, used as smart antennas that will be able to be centered to individual subscribers and they will be used outside, as well as inside buildings.

If we click one more time. Next slide.

Yeah. So over time, what we have seen is that this have been a lot of concern from the public and therefore from Member States as to the health effects of electromagnetic fields and RF. Click again, please.

I'm showing you examples of -- yeah. When there are different generations have come up, we have seen a lot of concern whether it was for the mobile phones or then the smart meters, the WiFi in their home and in their schools. So this is why the electromagnetic fields project, if you go to the next slide, was established in 1996 at the World Health Organization, working with many other international agencies and with Member States, was the idea of investigating the health effects of electromagnetic fields and also

advising national authorities on radiation protection from these fields.

Next slide, please.

So what we know at this point. Click again, please. Is we have quite a bit of knowledge from over 30, 40 years of research. So we have some knowledge of biological mechanisms of interactions in the body. We have a lot of studies published on this topic, and this forms the basis for the international exposure guideline that you will hear in the next talk.

However, because of the new generations coming one after the other, there is really some scientific uncertainty that remains. Next slide, please.

For the -- and click again. I did not know I would not have access to the slides myself.

So what we know is that the fields at -- the radio frequency fields are very different from the fields at low frequency fields.

If you click again, that means that the mechanisms of interactions with the body are also quite different; whereas, at low frequencies we can have induced currents in the body at high enough levels of intensities, at high frequencies around the gigahertz, we have heating effects, if the fields are strong enough.

This is known, but what is not known is whether at low levels of intensity, we have not all the effects. This has been the topic of research for a couple of decades now.

Next slide, please.

Okay. So the way we evaluate the research on the health risks from these technologies is by looking at the evidence through epidemiological studies and looking the populations and seeing if we see any association between a certain disease and a certain population exposed to it or we look at experimental studies, studies in the laboratory setting, looking at animal or volunteers or similar studies.

Next slide, please.

So about nine years ago, our international agency for research of cancer looked at the studies don't so far with respect to cancer, and classified radio frequent sector fields as possibly causing carcinogenic to humans. This was based on studies of mobile phones and health.

Next slide.

At present, what we are doing is reviewing all the literature with respect to all the health outcome studies looking beyond cancer at adverse reproductive effects, cognitive impairment and so on.

Next slide.

When you talk about 5G and health, there has been a lot of media attention, a lot of concerns in some countries, and several national authorities are now reviewing the scientific evidence with respect to that and we hope to have this published over the next year.

Next slide.

So we have developed a Q&A, a question and answer sheet, that you can find on our website just a couple of months ago. And if you go to the next slide, I just want to mention our potential health effects of 5G, and obviously, at this point in time, we are not able to say what the overall exposure may be relating to this technology, but given what we know so far, we don't see any problem at this moment, knowing that it's still a relevant mechanism of interaction and we will be looking at the effect of these fields on the skin and the eye, because this will be the organs most affected.

Next slide.

And I would like to finish my presentation with this slide, showing you the mythbuster that we have developed a couple of months ago, based on some false information provided in social media with regard to 5G mobile networks and COVID-19. So here again, we have the link and please feel free to disseminate it. Thank you very much for your attention.

>> JAROSLAW PONDER: Thank you very much, Emilie for this very comprehensive presentation, and introductory presentation. We are very happy to collaborate with you on these items and also during the difficult times of 5G, in the crisis because of COVID, we are also issuing some communication from the ITU following the WHO and European Commission acting.

So in this context, I have the great pleasure to invite now Rodney Croft, chair of the international commission on non-izionizing radiation protection, known as ICNIRP, and the main reference in this sense. So it's a great pleasure to have you on board for this session and we're looking forward to your

presentation.

The floor is yours.

>> RODNEY CROFT: Thank you very much, and thank you for the invitation and also thank you to Emilie for providing such a great introduction. It makes my life a lot easier.

Next slide, please. So what I will be talking about is ICNIRP5G, the guidelines and health. For those of you who aren't aware, I will just give you a bit of a background on ICNIRP before going through what the guidelines do. And I guess you can leave any questions until later.

So ICNIRP itself is a not-for-profit NGO in association with the World Health Organization and ILO and its aim primarily to disseminate science-based advice on limiting exposure to NIR. We are independent from industry. Similar conflict of interest rules to WHO, different but essentially following the same kind of model and member disclosures are all available on the ICNIRP website if people are interested. Next slide, please.

Okay. So guidelines and health. Well, guidelines come in because although we are very fortunate in that we can operate 5G infrastructure without risk to health, this is not what the world necessarily thinks. This is a lot of media. There's a lot of concerned citizens out there that don't accept this and it's important, particularly in situations like this, that we do have very clear rules, that we have a normative structure with which to enable nations to manage NIR safety. And traditionally, I guess, that's what the guidelines have been seen as.

I think they are also crucial for any kind of risk communication and particularly these days, we look at quite interesting ways of reaching the community, of helping them understand what the science has to say, but I think that clear, accurate information is central to any such risk communication activity. Once that is missing, it doesn't matter how engaging, how empathic we are, we end up spinning in circles. So I think that the guidelines are very useful not only for providing safety, but also for assisting in the risk communication process itself.

Next, please.

So what do we do with these guide lines? Well, what we have is a set of guidelines which only came out a few months ago. The previous ones came out in 1998. So clearly people weren't thinking about 5G at the time, but these new guidelines are here to deal with everything from 3G, 4G, 5G, radar, everything else that is RF, and essentially what they do at the end of the day is provide exposure levels that if a device complies with will not cause harm.

And the reason for the picture here is that the guidelines are a bit like this yellow beam across the top. 2.1 meters is the maximum. If you are 2 meters tall or 1 meter tall it makes no difference. You walk through, you are not going to hurt your head. The difference, I guess, between the guidelines and this picture is that in most cases you can go a long, long way above this beam and still be safe. But I guess for the sake of public safety, public health, the crucial thing is if we can get people to stay below that beam, then people will be safe, and that's what 5G devices do. They stay below that beam.

Next, please.

So a little bit about how we actually determine these values. The idea is that we first idea a harm threshold. Okay, the lowest exposure level that can actually cause harm. This is difficult in many ways.

In some cases -- well, with a mobile phone or a base station, if we increase the power dramatically essentially we have a microwave oven. A microwave oven can cook you and kill you. At super high levels we know there's harm, but trying to identify the lowest level where harm can still occur is quite difficult.

What we actually do in this case, for instance, is we take a 1 degree body core temperature rise as indicative of health, and we then say what kind of exposure is required to produce that? It turns out 4 watts per kilogram can produce a 1 degree Centigrade increase in body core temperature rise and then we apply reduction factors to arrive at a level that we're comfortable that the general public can be exposed to. In this case for whole body exposure for the general public, we have the reduction factor of 50 that reduces 4 watts down to .08 watts per kilogram averaged over the whole body and this is far too low

to cause any increase in body core temperature or any other effects that science has been able to identify.

Next, please.

So this really is how we arrive at our -- at our limits, our restrictions and importantly, each step of the way is extremely conservative. So 1 degree temperature certainly could be a problem, but it's also something that most of us experience a lot. The circadian rhythm in many people will change temperature over 24-hour period by about one degree. Serious exercise will increase this by substantially more than that, but we still don't want to go there, but what it means is that it will not necessarily be harmful at that level but then, of course, we have other things like our production factor of 50 to reduce it substantially, and even the four watts per kilogram is extremely conservative. The modeling suggests that it's more likely 6 to 8 watts per kilogram to get to that level. So we're applying conservative steps to ensure that we are really getting a long, long way from any kind of harm.

Next, please.

So overall, this is what we end up with. If on the Y axis we have exposure magnitude and we see down at the bottom that we have a dotted line, horizontal line, which is representing the restrictions, that line says that anything such as 5G is not permitted to operate in a way that can produce exposures that go above those levels, but to actually get to health effects we have to go a long, long way. So the red box threshold for health effect would be the lowest level that we think is going to conceivably cause a health effect. Now, being the lowest level, that means that you can even go higher than that, and there's a good chance everything is still going to be all right, but we have an awful lot of green there above the restrictions and below the thresholds, which are accounted for by our reduction factor.

So even if we go a long way over the limits, the chances are we still don't have any issue to do with health. So the guidelines, setting restrictions are setting a very conservative set of restrictions that will provide very, very strong protection for the general community.

Next, please.

And very briefly, a few changes in the guidelines relative to '98, which are particularly relevant for 5G. One of the things I guess in general is just that because 5G was not envisaged back in '98 that have come to bear. We spent far greater time in looking at this frequency range between about 6 and 100 gigahertz to understand it and a lot of changes are -- are bearing on 5G because of that.

Next, please.

The first thing is that in the previous guidelines, there were only whole body exposure restrictions up to 6 gigahertz. Now, of course, as we move up to 24, 26, 64, and so forth, gigahertz, we -- we are starting to do things that weren't conceived of in '98. There is indirect evidence suggesting that whole body restrictions are important for health and so we have extended these up to 300 gigahertz.

The degree that they will be efficient is based on science. It would be expected that we could have issues. Local exposure restrictions for greater than six-minute exposures, there were changes to the crossover frequency of going from quantity of SAR to the power density. This moved to 6 gigahertz to avoid inappropriate use of SAR between 6 and 10 gigahertz. There's no ideal frequency, but that was what we believed to be the best compromise. What is important is that the spatial averaging reduced from 20 down to 4 centimeters squared.

Now for a homogenous source, what you are not -- not source, but field, what you are going to find is that there's no difference between the two, but what this does avoid is the possibility of people coming up with versions of 5G or other technologies which have particularly focus beams at very high levels and take the local temperature beyond a point that we think is safe.

Next, please.

And there's also local exposure, restriction changes for less than 6 minutes because these tended to be focused more on radar, discreet pulses, maybe of 100 microseconds but as technologies developed, we are finding that -- that still relatively brief but longer than that 100 microsecond exposures can be quite important, and they weren't met effectively with the previous guidelines.

Even if it's a brief three or four-minute burst of -- of continuous wave exposure, there is a new restriction that will ensure that there is no over exposure. Next, please.

And finally, the guidelines have introduced a number of new reference levels. It relates to exposure, but there's ways to do compliance assessment, or easier ways to do compliance assessment, which uses the field in the environment, rather than the actual exposure within the body, but there weren't many offered in the '98 guidelines. Here we have matched all of our basic restrictions with reference levels. So in principle, there's much greater flexibility. It should make it easier for people to do compliance testing with 5G, but I should warn you, there still are some situations, particularly in the near field, that we just do not believe can be assessed this way and so it will be a matter of there will be more situations where reference levels can be used, but not necessarily all situations.

Next, I'm not sure if I have another slide, but I better check. Nope. That's it.

I'm just leaving those for your slides you can get from the website.

Thank you very much.

>> Thank you very much, Mr. Croft. I think this is a very, very comprehensive overview of ICNIRP and the recently published guidelines. So thank you very much for that. I'm chipping in because Jaroslaw had an emergency. I will be moderating this session. I would kindly ask the next speaker, Fryderyk Lewicki to ask for the floor. Fryderyk is the chair of ITU-T Study Group 5, and in particular, he's rapporteur for question, 3/5 on human exposure on electromagnetic fields from information and communication technologies.

I see you are connected. The floor is yours.

>> FRYDERYK LEWICKI: Thank you very much. Thank you very much for inviting me to present ITU results of work. Please go to the first slide of my presentation. The first one.

So, again, good morning, are ladies and gentlemen. I would like to present you information concerning ITU outcomes concerning assessment of human

exposure to electromagnetic field. Please go to the next slide.

The electromagnetic spectrum was presented here many times. I would like to stress, but to -- the main division concerning frequency and below some frequency, we have non-ionizing, and is used in radiocommunication. Then we have visible light and then utilizing radiationly gamma rays, and as we know with the non-ionizing radiation, it's a problem, however, it's used, assuming some treatment. And then it is coming to the frequency where we have visible light and no one is thinking that it is general however, if it's very big and long, for example, many hours in, it may be unhealthy, and when there are frequencies used in radiocommunication.

So between these frequencies and our frequencies, you see radio communication, we have visible light. And in the table in the right, you can see that the electric are requires, it is one electromagnetic volt however, radio frequent electromagnetic fields have much lower -- three lower levels.

Please go to the next slide.

So as I said, frequency is just one factor. Very important. The second one is exposure level. And here are various comparison of exposure limits reference levels for the general public for whole body exposure. From ICNIRP per 1998, ICNIRP 2020, IEEE2019. So 10 megahertz, there's really no difference. So from 1998, we have about 30 hours difference, and when in this time, there was very view mobile communication devices, a low one, the limits are not changed.

There are some changes as Rodney was presenting, but in general, for whole body, there's no changes. Please go to the next slide.

Electromagnetic fields are around us, even if you are exposed in mobile communication or broadcasting, they are around microwave oven, electricity, and electrical devices. So there is no possibility to live in an environment without electromagnetic exposure.

Please go to the next slide.

For mobile devices, the most important is local exposure, and widely accepted limit is 2 watts per kilogram. It's difficult to understand this quantity.

So to show it's better, I could say that one Watt per kilogram, it's for human in rest position. So we have to work, and we have to go through our organs, and we have to breathe and so on. So even in rest position, in our body, there is dissipated energy on the -- (No audio).

If we are standing, also our muscles are working. So 2 watts per kilogram. If we are running, then 12 watts per kilogram inside our organisms. So these limits for mobile devices is related to human and standing position.

Very important is the proper level. It has to be from box side. It has to be from base station and also from handset, and if we are in shadow here for example, in this chart, then the signal from the base station is very low, but, again, also signal which will be transmitted from user equipment has to be very high in order to reach this space station, because communication has to work in two ways, two directions. And each user equipment have automatic power control. So it's set to the lower level for good connection.

If we have -- if we are in worse conditions, for example, outside the hill, our equipment will be working with very, very high power. Please go not next slide, which shows this more detail. It is the result of measurement during my trip to Warsaw, and from Warsaw, and in the chart, in the bottom, you can see the results of measurements, where measurements were taken every few seconds. And you can see in the test box, it's high level and it's representing my trip in the train. When in the medium part of this chart, you can see that the level is much lower. In visiting Warsaw, it's walking on the street, and in the office, and in the right side, you can see again my trip back into train. And you can see that the highest level of exposure was inside the train, not in the office, not in the street. Even in such big city as Warsaw.

It is because the conditions of communication inside the train is very difficult, because train is metallic and working screen. And so all devices of all passengers has to work with almost the highest possible power.

Please go to the next slide.

Now I would like to tell about ITU outcome. ITU

plenipotentiary conference, in resolution 176, the obligation on ITU for work on EMF. And all three sectors of ITU are working on that, but the biggest work is conducted in ITU-T, especially in Study Group 5 under question 3. Please go not next slide.

Here is a list of our outcomes. Up until now, we have 11 recommendations, it means standards. I do not intend to go through them. Many of them are in 2019, and 2020, and many of them are updated according to needs and radio communications. You will note that many of these recommendations are with appendix, with some software, with support of this recommendation. Please go to the next slide. Maybe I would like to mention K-91. That's like another recommendation. It means that it has references to all other recommendations, not only from ITU, but also to IEC standards and IEEE guidelines and ICNIRP and WHO guidelines.

And we have informative documents called supplements. It's addressed to the general public. So it's written in very simple way, with very simple language and answers many questions. Please go to the next slide. We have eight supplements up to now. Some of them, as you can see also are dealing with 5G, directly. And if you will go to the next slide, I will go now to 5G and EMF.

Maybe one more here. I feel an interesting slide showing the example of the United States. Two things, this blue line in the top of this chart, it is the number of cases of cancer in the population of United States by 1 million inhabitants. This orange bar represents the use of mobile phones for different years from 1975 up to 2015. And you can see that the number of cases of cancer are stable, and the number of cases. It's difficult to see any correlation between them. It's addressed, but very -- there is at least very weak correlation between cancer and the use of mobile phones. Please go to the next slide.

As concerning mobile communication, of course, there's very rapid development during the years 1G and 2G, and 3G, 4G and 5G. The first devices was only for voice connection. Then it was data transmission, and then other connections and 5G will offer many, many new services and as you can see in the chart of right side, also 5G is much more efficient if we are

considering bit rates per health per second.

So in 5G, using the same amount of energy, we can send much bigger amount of information and 5G, of course, it's not the final system. It will be developed over time. And ITU-T since 2019 is working on 6G, not only ITU, but many other entities are working on 6G because 5G is now in implementing phase.

Please go to the next slide.

This triangle was presented many times from EMF point of view. We only have different categories of equipment. It houses mobile broadband and massive machine type communications and ultra reliable and law latency is communications. Each of them have a different impact on the EMF. Please go to the next slide.

In 5G, there will be substantial increase in number of small cells. Why? I will tell a little bit later. And finally give even lower exposure levels when use only microcells, but there's a big variation of exposure level in space. Because antennas, with beamforming will be widely used. So the area of coverage will be following only the user location, not -- not the whole area.

So the result, the exposure will vary with big variation. And there will be a big variation in time because time division duplex will be used. And it means the proportion between the uplink and the downlink will be flexible and depending on the needs, there will be only up link or only downlink or only some amount of uplink or downlink.

>> I will kindly ask you to wrap up because we are running out of time.

>> FRYDERYK LEWICKI: Please go to the next slide. Go to the next slide. Maybe we -- next slide.

The beam, it will not be in the whole arena and the total exposure level will be lowers for current system. Please go to the next slide.

It means very low coverage. So the requirement for small base station is mainly because of propagation restriction and low coverages. Please go to the next slide.

I think it is almost last one. As concerning IoT devices, there will be a meeting EMF only in some part of time, not only time, they have to be battery supplied because there's no possibility to have so big

device with fixed power supply lines and there's no possibility to charge them every day or every month and they are battery supplies and this battery has to be sufficient for the whole life of these batteries.

So finishing my presentation, 5G is new generation of system, which is dedicated to the more efficient use of energy. And lower exposure level around base station, but also from devices, and the first system design in -- taking into account all of these factors.

Thank you very much. This closes my presentation.

>> MODERATOR: Thank you very much, Fryderyk, much appreciated. Also thank you for the work that you do in the ITU-T groups.

I would invite the presentation, we are running out of time, Mr. Manuel Mielke, mobile network testing for Rohde-Schwarz. If you can request the floor, we will give you the floor. Excellent. The floor is yours.

>> MANUEL MIELKE: The audio works?

>> MODERATOR: Yes, it's a bit low.

>> MANUEL MIELKE: Let me see if I can improve that.

Okay. So in my presentation, I will show how a code selective EMF measurement can look like. I will look at how to measure code selective EMF in 5GNR and a bit about the solution. Please go to the next solution.

It's very important and we want to perform code selective 5G measurement on which signals we are measuring. So 5G is a different approach compared to LTE. So there are less always on signals compared to LTE. So the only signals we can focus on with a passive calibrated receivers, that's the SSBs. The nice thing is the SSBs they have been formed and the SSBs, they are changing over time. So the beams that are transmitted are changing over time. So different directions are provided after each other.

Of course, when we are informing, we can get a problem with EMF, because we have very strong hotspots because the beam can be narrow because of the network configuration.

Okay. Please go to the next slide.

So let me show you how a code selective EMF

procedure could look like. As I explained we have the beams transmitted from the keynote, and we can decode that with a measurement receiver and very important, now we have to sum them up. If you go to the next animation point maybe.

We are receiving the direct path of the beams. Then the next slide, please. So we are receiving the direct path of the beams. We are decoding and receiving all the beams and after that, we have to sum them up that we get total power of the SSBs from all PCIs received a certain location. Okay. Next slide, please. In the second step we have to apply the extrapolation factors. The reason for that is the SSBs, they are broadcasted on a bandwidth of 3.6 or 7.2 megahertz in FR1, but the total carrier has much more than 7.2 megahertz. It could be up to 100 megahertz on FR1 and we have to add an extrapolation factor.

Then please click. Then as a second extrapolation factor, you have to consider the beam or the gain offset between the SSB and the data beams. So the beams could have a different shape and a different intensity compared to the data beams and for that, of course, we have to add an extrapolation factor. And this, of course, depends on how the network is configured, and which, let's say, algorithms, the infrastructures apply as used.

Then please click for the next extrapolation factor.

Yes, that's the uplink and the downlink relation factor in TD D. networks. So it depends, of course, how much slots are reserved for uplink and downlink, and this affects, of course, the irradiated power. So that's one more thing we have to consider when adding extrapolation factors. The nice thing is this can be taken from the system information messages, that is using ASICs protocols.

Now let's take a look at the code selective EMF measurement in detail. And by the way, this procedure was specified by a regulator. So how is the process? So we see this TSMA6, and that's a massive measurement receiver and a directional antenna or Omni directional antenna. The receiver itself can detect all 5G carriers on air. Then decode the PC Is and the SSBs and the MIPs and the SIPs. You can then import the

antenna factor or the antenna game table and having that, you can calculate now from powers or DBM to work per meters. We are then getting the electro strength per SSB.

And now when you click a second time on that slide. We see the next step and after that you have to sum up all SSBs to get electrical fuse strength per PCI and we have to search for the maximum by moving the antenna around.

Okay. Then we have one value per PCI, and after that, so when you click again on the slide, then we have to apply the extrapolation factors. This has to be done per PCI because depending open the network configuration, some parameters could change or could be different between the cells. And then with the pulse processing routine, we can then calculate the total electric fuse strength after applying the extrapolation factors.

Okay. Next slide, please. So now let's take a closer look how the measurement setup looks like. So at Rohde-Schwarz we have TSMA6, and this connects a phone via a Bluetooth. On this phone, Android phone, Qualipoc Android, it applies the TSMA6 as a measurement. And it calibrated and it now detects the carriers and the PCs and the SSBs and measures the power.

This can be installed open every tablet. We are displaying everything. So there we see the VoIP per meter value. We can set data ports and at the end we can export the measured or the calculated values for the pulse processing routine.

This is how the screen on the phone looks like. And here we can see that we can configure two bands. Band 71 and 78. So we found two carriers there. And when you click again. Maybe two times. Yeah, then we can see it automatically detects the carriers and after that, when you click again maybe. We can see that we are measuring on the carriers and we can see the PC Is and the SSBs and the corresponding power values.

Then on the next slide, we can see how the EMF values are represented. Maybe it makes sense to click one -- yeah. Perfect.

So on the left screen, we can see then you are now doing the calculation from DBM to per meters per

PCI and at the bottom of the screen we can see this EMF monitor. We can see 3.612 in this case. So we can see that in realtime.

And then we are moving the antenna to find the maximum. Once the maximum is found, we get the right screen and then we get a summary. So we get the self-specific identifiers like PC I. and channel and we get the feel strength per cell, and the power values in DBM per SSB and after that, we can export the measurement data as a CSV file for further post processing.

Okay. So I think that's all. Yeah. So thanks a lot for the slot. Yeah, I hope you enjoyed the presentation how such a measurement solution could look like.

>> MODERATOR: Thank you very much, Manuel. I think that was very, very insightful presentation and all the participants, the delegates will make the most of it. I will invite against to submit the questions through the chat. Our time for this session has now finished. So while I think this session provided the very, I would like to thank the speakers very much, because the session provides a very comprehensive overview of the work done on the EMF and I think it's clear that more discussion between the science and the policy must be facilitated, especially to support the Member States in the implementation of the 5G.

So this, I would then -- I would close this session, and I would invite the moderator for the next session.

Mr. Albert Nalbandian, chairman of the Working Group on WRC-23 from the regional Commonwealth in the field of communications, Section 6 will address new avenues in the Spectrum Management and broadband measurement methods and tools, with a discussion on the experience with these new tools.

So I think Albert is connecting.

>> ALBERT NALBANDIAN: Yes.

>> MODERATOR: Perfect. We can hear you. Albert, the floor is yours. I will just -- well, please go ahead, and I would already invite Mr. Filipe Aubineau to raise your hand. Albert, the floor is yours.

>> ALBERT NALBANDIAN: Thank you very much, Chair. Dear colleagues and dear participants, and everybody who is listening to us at this session. The topic is

new areas and new methods of Spectrum Management and broadband measurements. It's a very broad topic.

And it's an exceedingly important topic, because the problems associated with the fact that the spectrum is difficult to access are obvious and once again, we should stress that the radio spectrum, the radio frequency spectrum which we use all the time and becomes more and more all the year, is a limited natural resource. And in terms of comparing one kilohertz to one gigahertz, this represents a gigantic distance. We still feel and especially those of us who implements and prepares new systems so we experience a severe lack of spectrum because the success of any system is predicated open the availability of the spectrum and the standards. And so from time to time, we have difficult accessibility of the spectrum.

I would like to briefly remind you, we have a certain -- well, three times of spectrum access determined in the Radio Regulations, allocation of frequency bands to various services., determination of frequency bands frequency allocation and the last method is assignment, frequency assignment.

All of us know that today we have three types of spectrum users. In every country, they may vary, but if you integrate all of them, these will be the following users, government agencies, civilian agencies and commercial agencies or commercial users.

And at this stage, I would like to draw my presentation to a close, because we have a very reputable and well-known group of speakers and I'm sure they will address these issues in their presentations. The last time we fundamentally addressed organizing Spectrum Management, well, this was at the time when we completely overhauled the ITU structure, which happened back in 1992.

So now, without further ado, I would like to turn the floor over to Philippe Aubineau. And Dan, and I apologize if I mispronounce your name, and Dan, who spoke earlier today and then Mindaugas Zilinskas, they will make their presentations and then depending how the situation unfolds, we will try to summarize it. I would like to turn the floor over to Philippe Aubineau.

>> PHILIPPE AUBINEAU: Everyone, thank you,

Mr. Nalbandian for giving me the floor, and thank you very much for the organizer to give us this opportunity to present to you the -- some ITU-R activities on Spectrum Management.

The proposal of this presentation this morning would be to not, of course, address and present to you all the related activities in ITU-R but some of them, which are more specifically related to the topic of this morning's session.

So before that, let's go to the next slide, and then I wanted to -- yes, please, the next slide, and I wanted to start by showing you the framework under which we are working in the radio communication sector. Of course, this information on this slide presents to you all the levels of our framework, and starting, of course, with the top level of the ITU, the constitution and the convention, and the plenipotentiary conference, which contain high level principles. Then we have what we call an administrative regulation which is a radio regulation, international treaty, and which is containing all the rights and obligations, the satellite, orbital and terrestrial plans and several also procedures and sharing conditions, sharing limits, which are needed to use radio frequency spectrum.

In addition to the international treaties, the radio regulation, which is maintained by WRC, the radio conference, we have a bilateral or multilateral agreements. We have the GO6 agreements that governs the use of the VHF had and VHS, in Region 1 and some countries in Region 3.

We have besides the ITU-R regulations, we have a recommendation unlike the standard in ITU, and in ITU, our recommendations are, again, containing different characteristics and different sharing parameters, sharing conditions to be used between radiocommunication systems, but it's important to note here, of course, normally ITU-R recommendations are not mandatory. When the ITU-R recommendations are incorporated by reference in the radio regulation, they become binding like any other provisions of the radio regulation. Those recommendations are developed by ITU-R Study Groups. That is -- and those are Radiocommunication Assembly and the ITU-R Study Groups are developing ITU reports, and all the software tools

and the radio propagation issues and these reports contain further details on the characteristics of the system, also on the Spectrum Management methods or monitor techniques and so on and so forth.

So this gives you a broad overview of the international Spectrum Management framework that we are working on. On the next slide, you have the recent, thank you -- you have the Radiocommunication Assembly 2019 information, that was held at the end of last year, and this is the body in ITU-R which organized the work in the Study Groups. So you could see some figures from this assembly of last year. I will turn to the next slide please to show you the structure which is our stable structure of the ITU-R Study Groups for almost two cycles now and we have here all the different services that are addressed by different Study Groups whether it's satellite, whether this is terrestrial, broadcasting or science services. So you see them in Study Group 4 to 7, but in Study Group 3, we are mainly focusing on radio wave propagation. And the purpose of today is more focusing on Study Group activity dealing with Spectrum Management.

You have also on the right side of this slide, all the different working parties and the group of work into those Working Groups.

On the next slide, please, this is what the Study Groups are preparing and I will not repeat what I said before that. On the next slide, you have the different publications. You can go to the next slide, please.

Thank you. So you have here all the different series of publications and I express the Spectrum Management, which I will further comment on.

So on the next slide, another important piece of information for those who would like to form the work in the different Study Groups on the different Study Groups that we see in red is the document which really contain all the texts that are being considered by the different Study Groups and where they are considered, in other words, in which Working Party.

And I would like to stress also the important collaboration of the ITU-R sector with other sector of the ITU, as well as with other organizations, which is also the activity of our Study Groups.

On the next slide, I will now focus on one aspect that is being considered in Study Group 1 which is related to the aspect of the spectrum management. I would say we have a permanent topic or permanent study in Study Group 1 in order to identify different principles and objectives, as regulators would have to consider for an efficient use of the spectrum from an economic standpoint.

So this report, 2012 is kind of handbook that describing the different principles and it discusses the economic benefits, taking into account national factors, of course, and you could find in that report also guidelines and methodology for establishing spectrum formula and system and all of this very well demonstrated by many administration experiences, which are listed here and we have really regular update of this report provided by different countries and more could come in the future.

And as important publication relates to what we are forming, redeployment, and this is also somehow related to economic aspect of spectrum because in that recommendation you can find example of redefinement costs of funds and in some countries, which are used to facilitate the inclusion of new technology and the use of new technology in -- in the spectrum allocation and the spectrum use by different operators.

So on the next slide, you could see the evolution of that activity, on the economic aspects through development of a new question, which would look further at the spectrum efficiency and the economic value. So the questions that are under consideration relates to the method to quantify the spectrum efficiency and the factors that define the economic value of the spectrum:

We have a working document that is being prepared and that working document would include more recent methodology, more recent auctioning systems that have been used in some countries and we hope to compliment already existing recommendation like 46, and other reports and the efficiency of radio system.

So that is ongoing. In parallel to that, we also have other activities. As you go to the next slide, please.

So as I said, the spectrum management of bands evolving and prior to WRC-15, there was the appearance

of digital divide some bands, in the UHF bands and in Study Group 1, and 1B, we developed a report that naming at identifying the different challenges and the opportunities that would result from the transition to digital terrestrial television in U. HF bands. This is still in consideration in preparation for the next WRC, the WRC-23, where as you know, there is an agenda item that is trying to identify the best way to share the UHF band between broadcasting and IMT, international mobile telecommunication.

So all the ditch elements of this report, the banding principles and the coordination, and also some technical, socioeconomic aspects and all of this is included there and it will be further considered in other studies.

So I would like also to stress as one way to view some of this spectrum is through the frequency band and we have developed another report. As you all know and heard about the issue of the TBY spaces in the UHM and Study Group 1 has developed this report 2405 to study the way to the dynamic access to frequent sector bands and in doing so using some cognitive capabilities and there were different study cases reported to us and we identified different techniques and challenges and related issues. In particular, regarding the sensing technology.

So this was also done some years ago and it's evolving from new study cases from Colombia and we hope to have more information on this as well.

On the next slide, you have also some related issues which regard the new regulatory tools that have been developed which was developed to facilitate the use of the frequency band. And also some other sharing consideration, for instance sharing prospects and sharing spectrum access by similar technologies. So these have been described in this report 2404.

We also developed another report preparing for WRC -- WTCC, in order to identify some new tools, first of all new technology solutions so not only what I mentioned before in terms of what I already mention, but high attitude platform systems and geo-satellites and providing wireless broadband in different types of areas, including underserved areas.

These are well-recognized by the radio sector communication, and they have been provided additional

spectrum to be further developed.

The report to DTDC17 included a good assessment of the Spectrum Management solutions using the license approaches, as well as it's a said before, other techniques for dynamic spectrum access.

And so if you go to the next slide, you will see that we have a question -- a new question also under consideration in Study Group 1 to further consider the entire information methodology that could be used for assessing and predicting spectrum credibility. This would include the new approaches using events that are analysis methods, included measured learning.

With that, we would hope to have a more dynamic approach for using efficiently the spectrum.

So we will go to the next slide now, to show you another -- when we talk about analyzed spectrum, we often talk about short range devices. And in Study Group, is we have this report, 2153, which will describe many technical and operating parameters for the spectrum use of SRDs and this includes also a lot of applications that are used and I would say, continue to be developed today -- and require the use of the spectrum, including a different application using use for Internet of Things.

So the -- from the application, we have tried to categorize them in the Recommendation 2103 that you see here and we continue to develop frequency range from the original SRDs, for instance by including new frank for assistive listening system that's being proposed now under this recommendation.

If you go to the in. Slide, you will see other types of studies that we are doing in Study Group 1, which are equally important for the good protection of the radio communication services, and this tried to assess the electromagnetic compatibility and the electromagnetic caused by different devices and radio application to the application -- through the radio communication services.

I have included some of them here, such as the wireless power transmission which are used to transfer power of the radio frequency beam or the type of application, induction, for instance, and use for mobile charging or even car charging, which is also more effective of the radio services. This is included in Study Group 1.

We are looking at power and telecommunication, including the use of new technology in that respect, as well as the power smart grid management system. What is becoming also a higher interest for the protection of radio services is the increasing radiates of household appliances. As we develop the Internet of Things this is becoming more of a concern for the protection of radio services.

We try to keep a close eye on the mission limits in the product-based standards and with that, we have a very close collaboration with other standardization organizations, for instance, the CISBR and IRC in order to that the radio noise by the other devices.

So on the next slide, I would like to briefly show you some other study we do in Working Party 1A, regarding the new application in the bands of both 275 gigahertz, but also for higher bands for the visible light for broadband communication VLC, where there is also promising new technology to the use that may, and also facilitate -- the spectrum in the lower part of the spectrum.

So on the next slide, you can see we have activity in terms of spectrum metering. It was difficult to fit all of that on one slide. So I just stress here some new, I would say, techniques that are being used for spectrum measurements and the associated presenters, and transform the small satellites are being considered and used. And also we have studies to better assess and better measure the population coverage, the wireless networks and this is to the benefit of the public, of course.

We also had this new report on EMF measurements, that would have to be taken into account the ICNIRP guidelines that were presented this morning. And I think the information, from Rohde-Schwarz will very much fit on that report of EMF measurements and we try in 1C to improve our reporting facilities to resolve the cases of deference, if any, and that's I didn't using new equipment, for the direction finding units and also to facilitate and clarify the different expressions that have to be put into place for the equipment.

So the last slide -- the next slide, sorry is to recall and remind the importance of a clear regulatory framework for national Spectrum Management. This

report 2093 stresses -- we recall the important ITU-R instrument or international regulatory frameworks presented at the beginning. It's the regional Harmonization mechanism. I listed the six groups which are achieving very much the this objective and besides that, we have of course, the national activity and it is important that the national activity is very well structured and in particular, to ensure good consultation with the different stakeholders and also with the public. It is very important. And could you see that report a different way, some countries are structured and organized. So on the last slide, I would like also to stress the other important aspect of the ITU-R Study Groups in the WRC process, and the way all the preparatory technical and regulatory studies on the agenda of the future conference, this is done in ITU-R Study Groups and we are there and what is important to note also here is the opportunity for many stakeholders to contribute to this activity directly in ITU-R Study Group. It's not only the administration that can contribute, but also all the different stakeholders, sector members, associate or even academia.

Thank you very much, Mr. Chairman.

>> ALBERT NALBANDIAN: Thank you. Thank you, Philippe. Can you hear me? Can you hear me?

Thank you, Philippe Aubineau. Basically your presentation included all the aspects of the Spectrum Management, and many thanks to you for this presentation.

So we are going to get -- actually, we have received the latest information about the commission of number 1, together with number 3, they study all the issues relating to the radiocommunications. Thank you.

The next speaker Dan Sjoblom, if I pronounced his name correctly.

If I didn't do it the right way, my apologies. So the floor is yours.

>> DAN SJOBLOM: Thank you. Just checking first that I'm heard hasn't seen.

>> ALBERT NALBANDIAN: Yes, indeed. And please go on.

>> DAN SJOBLOM: And also thanks to Philippe for a very comprehensive review of all the good work done by

ITU-R. Of course, I'm here in my capacity as this year's chair for BEREC, the body for European regulators for electronic communication, but I'm also, of course, head of the Swedish national regulator and my organization, as well as many of my colleagues in BEREC are very happy to ten I have actively and participate in the work of ITU which is very important because we need to ensure that these matters are dealt with. As collaboratively as possible, including at the global level.

I should also say that BEREC, inside the European Commission, is no the duplicating the work. And in Europe we have the radio spectrum policy group which is doing a lot of good work in this area and, again, many members of BEREC are contributing in parallel to the work in BEREC.

We also have a body called ENISA which is the organization where the situation is the sim. We participate, many of us in parallel to the work in BEREC.

And what I wanted to say, I think, is on this topic, we recognize and we note the continuous need for close cooperation between different regulatory bodies and associations of bodies. We are very happy to have -- BEREC last year signed an MOU with the ITU because we see there's a lot of scope to collaborate closer and more continuously.

The role that BEREC can play in these markets, the broadband markets, the Spectrum Management areas, is to support legislators and other authorities in understanding a little bit the consequences of posting or increased levels of requirements and regulations. We are very much looking at market functioning as the core of our activities and to discuss that in pay sort of -- between regulators, setting is often very useful.

Market dynamics are, of course, immediately affected by new regulation, and all stakeholders cannot always be participating in all the discussions. That's a little bit the role that we in BEREC are happy to take.

We benefit, on the other hand, a lot from collaborating with the NRAs in other regions with international regulator networks and with policymakers, such as the ITU, but also the OECD is an

important platform for us, which I will mention again a little bit later.

When we do have these collaboration, and cooperation cross border, on common issues, we as on organization as BEREC, we improve continuously, I think our understanding of the technology and the changing circumstances that continuously evolve in the sector for electronic communication. And understanding how that affects business model, how business models are evolving is very important.

I would like to say a couple of things about two relatively recent BEREC projects. One on broadband management and on spectrum management. In 2020, March, we published guidelines setting out a number of quality of service parameters, including parameters for end users with disabilities. We looked at the applicable measurement methods and content informed for publication of information, and quality certification mechanisms.

While we do this, we do this because that's part of the task that we were given in the new electronic communication code from the European institutions and notably Article 104 of that regulation.

We do a lot of things that are actually about consistent application of regulation, because that is coming back to the market functioning focus, if you can have -- and that includes a better investment possibility for those who are building our networks, getting more investments is, of course, critical to getting more connections. So that's -- that's the reason we are doing this.

And we did work there together, with the OECD that I want to mention here. A few weeks back, we had the opportunity to have a workshop together with the OECD, also virtual, online, because the COVID-19 situation, but we had a good number of sessions there on exactly these topics of quality of service, and quality of experience where the OECD has done some work.

It's very important that we continue to work on improving our joint efforts in these manners. I would also like to say, as I mentioned a few words on 5G, which, of course, is something where BEREC is following with a lot of interest and we did a report in 2019, last year on the role of 5G and the role of

enabling 5G ecosystems. We did that after speaking a lot to stakeholders which is normally the way we do our work. We have experts in our organizations, but we want always to connect early and intensely with the real experts which are out there, actually providing the services.

He with had a report at the end of that work, resulting in what we called horizon scanning exercise, and it looked like important things like new value chains emerging from the changing business models, infrastructure sharing, which was mentioned earlier by speakers here, exposure to EMF, electromagnetic fields and I think topical issue for most Member States in Europe. Convergence with broadcasting services and the availability of spectrum which is continuously needed to be increased.

So some part of the report can be seen as follow-up to an early report from 2018 and spectrum authorization and award procedures. So you can see the story here. This is something that we are continuously following. I would like to end by mentioning that this year, in our work program for BEREC, we are looking at the impact of 5G on regulation and the role of regulation in enabling the 5G Equi system. There's still a lot to do. There's a lot of 5G variance coming online, a lot of allocation procedures are ongoing and coming on stream as well.

So I think what we will see and continue to see is a need to follow this work, very attentively and to collaborate with all other parts of the ecosystem that is involved in creating the best ability for us to continue to connect well with each other.

As we see 5G will continue to be gradually introduced over the coming years. So thank you very much again for allowing me to intervene here.

Back to control.

>> ALBERT NALBANDIAN: Thank you. The next speaker is Mr. Zilinskas. You have the floor.

Do we have problems?

Are there any problems? Hello? Hello?

(No audio).

>> ALBERT NALBANDIAN: Mindaugas Zilinskas, are you taking part in this particular session? Can you hear me?

Well, you can hear -- you can hear me, but that

means we have problems S. there anyone who can help us?

Okay. Clear.

I see. Once again, Mindaugas Zilinskas, you have to raise your hand and you have the icon there and the pictogram is your palm. You have to click on it so you will be able to make your presentation.

>> Excellent. Excellent. I think Mr. Mindaugas Zilinskas is connecting right now.

>> ALBERT NALBANDIAN: I'm just waiting when he will start his presentation or intervention. Okay?

Probably I not hear him. Do you hear him?

>> MODERATOR: No, I don't hear him. He's not connected yet.

>> ALBERT NALBANDIAN: Not connected yet. Okay.

>> MODERATOR: We are trying to connect him.

>> ALBERT NALBANDIAN: Okay. I'm sorry for the audience, but we can wait a couple of minutes because we still have time. Until 12:15. We have about after hour, and I hope we can give him two or three minutes.

>> MODERATOR: Again, I think Mindaugas Zilinskas, if you can try to click the button with the hand to request for the floor. Thank you very much.

>> ALBERT NALBANDIAN: And after three minutes, after that, I will conclude our session.

Okay. No success.

>> MODERATOR: We're just trying to get in contact with him in another way. We just ask for another two minutes of patience. Thank you very much.

>> ALBERT NALBANDIAN: Well, I can wait more but we should complete our work.

Okay. I will wait two minutes now. It's 11:59, now 12:00. Two minutes more. Two minutes more.

>> MODERATOR: In the meantime, if there are any questions from participants, please go ahead through the chat. Thank you very much.

>> ALBERT NALBANDIAN: Yes, yes, we can use this time. It was my idea to propose, but in any case, up until now all of our questions were in our chat, but if you have any oral questions, says the speaker, there are to limitations.

So if any of you have any questions, the topic is very broad and information intensive. We have been dealing with this for a number of years improving spectrum access, and solving various problems related

to it. So we will proceed based on the premises, that several conferences will be dedicated to it either through the preparatory process or adopting new resolutions or the Radio Assembly will offer new ways and means of access as it was done in the early 1990, when a special task group that was set up researched various access methods and we still have the recommendations. They exist to this day.

So if you have any questions, we can discuss them.

And when Mindaugas has a chance to speak being we can stop our discussion and give him a floor. We have a very good chance of actually making it on time. So please, if you have any questions, go ahead and ask.

Yes, of course.

>> PARTICIPANT: It's not directed to this session, but the EMF session. I didn't want to break that time, but since we have time, just to add the ICNIRP presentation that the ICNIRP guideline was shared also with the ITU and we provided comments --

>> ALBERT NALBANDIAN: Sorry for interruption. Introduce yourself.

>> PARTICIPANT: I know you, but not all -- I'm not hike you, that everybody knows you.

>> ALBERT NALBANDIAN: Yes.

>> PARTICIPANT: So we provided the comments on the guidelines and especially Dr. Mazar worked on this and we are using the guidelines. Thank you very much.

>> ALBERT NALBANDIAN: Thank you. Thank you, you see our session, it's -- I mean, Spectrum Management, but Spectrum Management covers everything, starting from the electromagnetic wave and finalizing the work which is Doppler radar with our colleagues with the WHO.

Mindaugas, are you in line? You hear me?

>> MINDAUGAS ZILINSKAS: Yes, Mr. Chairman, I can hear you.

>> ALBERT NALBANDIAN: Okay. Please go.

>> MINDAUGAS ZILINSKAS: Thank you very much, and good day for everyone and I will start very quickly. Please, next slide.

Next slide, please.

So I will -- I will describe how we are implementing efficient use of spectrum in our country. Next slide. And I will speak about the competition,

how we speed -- try to speed up competition to force our mobile operators to use efficient -- in efficient way a spectrum.

Next slide, please.

Yeah. I will start with all generation of mobile communication was 3G, UMTS, and to -- you see just a simple example, when we issue the licenses for UMTS, in 2006, up to 2011, 2012, we -- we saw low development of the networks. Very few new base stations will reduce it. We put it -- we have operations. So what we have decided to do to try to publish coverage of -- first of all operators, to calculate and to publish these coverages. Please, next slide, please.

From 2012, we started to publish all coverages. Next slide, okay? Good.

Next slide. You see -- next slide is 2007 and 2014. It's for one operator. Next slide. Next slide, operator, if you could, please -- next slide, please.

We started from network, when we started to calculate and published coverages. Next slide again.

After one year. Next slide. And, again, next slide. You see it? One more slide. In two years, we got full country -- full coverage by 3G network. And by all operators. It means that transparency, before issue operator presented their own coverage, which was, of course very good, excellent, but when we try to take this calculation, they were -- we managed to speed up this -- this development of 3G and next slide. And 4G very quickly. Please, you can stop.

What is coverage map for 4G. Now being we reach such stage when all operators cover the whole country by 99%, and it seems we exhausted all of our measures, how to continue, how to keep the same competition levels and what we decided to do, was to make measurements with -- with special equipment, which could measure all the downlink speed for all operators. So next slide.

It was next slide, please.

And the results of our data speeds, before one. No, not this one. Back, please.

One back. One slide back. Yeah.

You can find here the whole information about the speed, the data speed on all four operators across the

whole country and for all possible -- for all mobile generations, starting from 2Gs, 3G, 4G. Please, next slide, but these measurements have been done only on the rolls. So the rural areas were done without control. So we collaborated our calculations and to propose -- and propose to -- for operators to supply this throughput map for two loads -- for network load, for 10% load, and 50% load.

At the beginning we were faced with some quite bigger resistance from our operators, because it -- it showed the real situation, all customers could check and found what the situation looks like in each point of the country. But we finally agree the method on all assumptions and we came to such picture, such results and knowledge, and it's officially available. You can find it on our website.

By the way, after what this calculation method and results was interpreted in the next slide, in the CEPT report, as you saw in the reports 321, measuring and evaluating quality of service mobile, Internet service quality. So it's approved and published, based on our measurements and results.

We have checked also the measurements and calculations. In general, we got quite good results of comparisons when the network is loaded about 50% of their capacity.

So briefly, it's my presentation. It's -- if you could show the last slide. Please, last slide okay. It's Vilnius and it's good coverage in every street and every house. Thank you very much, Mr. Chairman.

>> ALBERT NALBANDIAN: Okay. Thank you.

Thank you very much, Mindaugas, for your presentation.

We still have three minutes at our disposal. If you have questions, but I would strongly advise to use our chat or maybe you have some comments about our session because we are not only reviewing the results but we are setting the objectives during this session, whatever we do within the sturdy group, one or another organization, which is so -- so we still have certain results and for that, we have to provide legal status and that's a humidity volume of work. And that requires the work of the Study Groups and even the world conferences. So you have any questions, go ahead and ask them.

And if you don't have any questions, I would like to thank all the participants and especially our speakers, our presenters, Philippe Aubineau, Mr. Sjoblom, and Mr. Mindaugas Zilinskas. We over a broad range of issues and they need more than one session or more than one conference, but anyway, thank you very much for the organizers, who had some certain stress in conducting the session.

But on this note, I close our session, our sixth session, and a lunch break until 1:00, 13:00, until the next session. So thank you very much again. I'm closing this particular session.

>> MODERATOR: Excellent, excellent, moderation. And I would say to all the delegates feel free to use the chat to submit your questions that can be answered also this afternoon. I would like to thank again every one of the speakers for this moment, very insightful and comprehensive content from the EMF session, as well as interesting approaches to mobile broadband measurement and spectrum measurement with the work done in the ITU, BEREC and the Communications Regulatory Authority of Lithuania.

I would now call for the abundant half hour break. The next session will start at 13:00 hours sharp. I would ask in particular the moderator and the speakers to connect for that session earlier. Thank you very much and I will see you in a half hour.

(End of session).

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