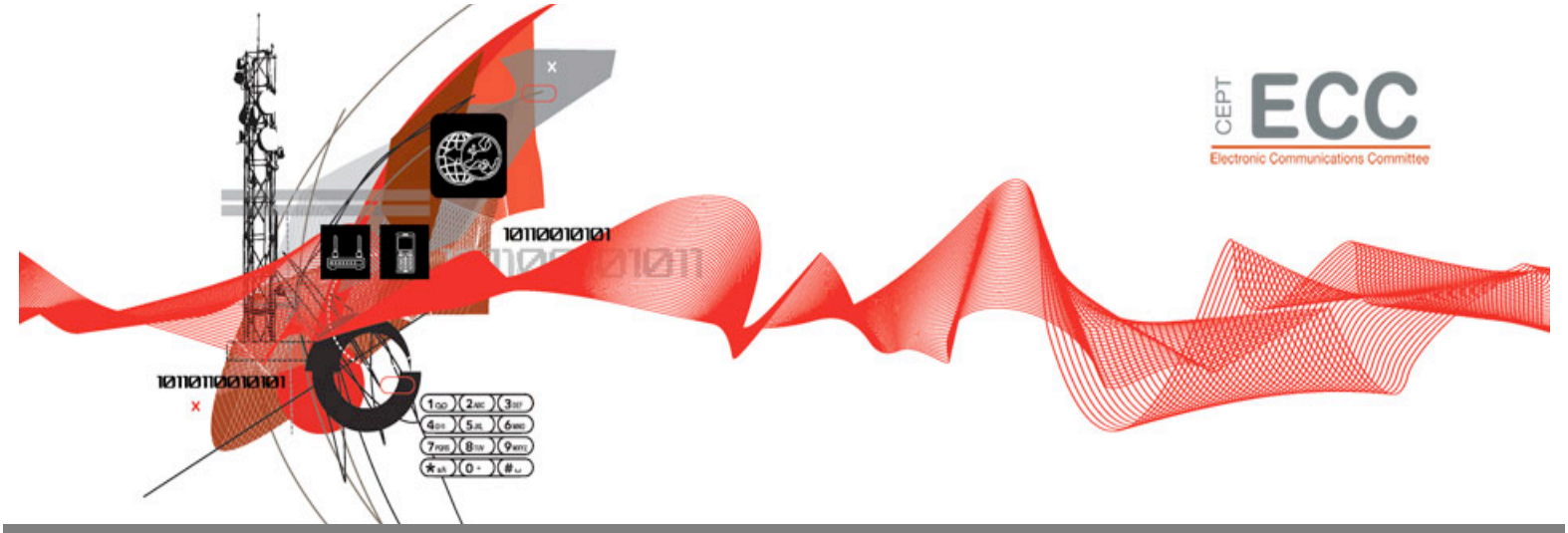


ECC NEWSLETTER **January 2015 Special Edition**

ECC preparations so far

On 2nd November 2015 the World Radiocommunication Conference 2015 (WRC-15) will bring together countries from all over the world for four weeks of international discussion about the state of the art in radiocommunication – how it is today and how it is changing. The result will be an update to the international treaty on the regulatory framework of radio spectrum, the Radio Regulations.

CEPT has set up its Conference Preparatory Group (CPG) specifically for the purpose of preparing for this conference. The activities started in 2012 shortly after the end of WRC-12 and are aiming to develop and agree European Common Proposals (ECPs) supported by – ideally – all 48 CEPT member states. An ECP contains the specific proposal for the changes to a particular part of the Radio Regulations, or a position that the existing relevant part of the Regulations should remain as they are ('No Change'). In addition to ECPs, the CPG develops and agrees papers which compile and set out CEPT's position on the various WRC Agenda items, including the necessary background information. These papers are called 'CEPT Briefs'.

The CPG is already a long way through its preparation activity to agree CEPT Briefs for every one of the Agenda items and issues of WRC-15. And there are a lot of them: 18 specific agenda items, seven standing agenda items and eight issues considered within the Report of the Director of ITU´s Radiocommunication Bureau. Those eight issues are either very specific questions regarding the spectrum use by specific applications, or general regulatory matters (e.g. changing some of the definitions which are used in the Radio Regulations), which are more related to comprehensive work within the ITU-R's ongoing study programme. However any change which may have a large impact on the international regulatory environment is monitored by the CPG, which will carefully consider its position.

Overall, one may say that the CPG has already reached 70-75% of its preparation tasks. Even when we have 100% prepared, there will be intensive debates when we get to the Conference itself. And some of the agenda items are already causing intensive international debates.

The intensity of debates to be expected at WRC will be indicated at the second and final meeting of ITU's Conference Preparatory Meeting (CPM) in March. This is a major milestone in the WRC preparations, where all the results of recent technical and regulatory studies are compiled and amended to produce one big Report. This sets out the agreed assumptions which will apply to all of the Agenda items. After the CPM all interested parties will concentrate their efforts on finalising their positions and gaining support for them.

CEPT looks for global solutions

For all of the WRC-15 Agenda Items, the CPG has already established its policy that regionally-specific solutions are not preferable and should therefore be a fall-back option only where necessary. The CPG is looking for globally harmonised spectrum allocation and regulations which ensure security in investment and spectrum planning and which also provide a good opportunity for future development of radio applications.

Therefore, the CPG management team is in constant dialogue with the leadership and coordinators of the other five regional organisations; these are ASMG for the Arabic region, ATU for Africa, CITEL for the Americas, APT for Asia-Pacific and RCC for the Russian region.

CEPT was the first one to focus the preparatory activities for WRCs in a self-standing working group. This idea gained more and more support by the other regional organisations and all of them have now installed working groups with similar tasks. The CPG really appreciates the continuous exchange of views and status of work with its colleagues in other regions, which ensures one of the necessary baselines for a successful outcome at the WRC in balancing all the different interests: common understanding!

CEPT: 48 diverse countries

But it is not sufficient to look only to the worldwide scene. The CPG also has to balance the different views within CEPT itself. The relation to the European Union and its member states is one factor, which should not be underestimated as well as the double membership of some CEPT Administrations also in RCC. That's the reason why the CPG is also holding coordination meetings and workshops between both organisations.

CEPT and the EU

Regarding the role of the European Union, it needs to be noted that this is defined by the Treaty of Functioning of the European Union (TFEU) primarily and secondarily by Article 10 of the EU Decision on a first Radio Spectrum Policy Programme. According to this, the member states must coordinate their positions to avoid any conflict between the Radio Regulations and their obligations under the TFEU, resulting in a standing declaration of all EU countries at a WRC expressing their intention that in any case of conflict their EU obligations will prevail. On the one hand a coordinated positioning of 28 countries within the CPG may help to conclude on a decision, but on the other hand it is no guarantee that all the other 20 Administrations are following this interest as well. Overall it is therefore again a question of the right balance, which ensures the support of up to 48 CEPT Administrations for each proposal. Areas of specific interest of the European Union are electronic communication services and all items which may have an impact to the development of the internal market, e.g. transport telematics, or the Galileo satellite navigation system.

Beyond WRC-15

Looking further ahead than WRC-15, there is the question of what is coming next. The CPG is currently collecting all ideas. Taking a first glimpse of the possible items, it seems necessary to address at WRC-19 the frequency requirements of 5G and electronic navigation systems in the maritime sector. This indicates already that the preparation time to WRC-19 will be fully filled.

CPG website; special topics in the ECC Newsletter

The CPG pages on the ECC website act as a window to more detail on the CPG's work, including a compilation and index to all the WRC Agenda Items, the CPG teams dealing with them, and the emerging ECPs and CEPT Briefs.

Elsewhere in this Newsletter, and the previous one, we have focused on four specific topics.

1) Mobile broadband at WRC -15

Inevitably, one of the most important issues on the WRC-15 agenda is the future of Mobile Broadband, which has received a lot of interest and attention right from the start of the cycle. Indeed, it is really a continuation of the subject as addressed in the previous round. This time the issue is the subject of two Agenda items (1.1 and 1.2). It is also one of the main focus areas within the CPG, explaining why those items are prepared within a separate Project team – PTD.

In this Newsletter we present a separate article, set out as two tables which illustrate the significant bandwidth already harmonised within CEPT for mobile broadband, and also the principal bands which will be subject to debate at WRC about further allocations in the Radio Regulations. The use of these bands in this way may in some cases be supported by CEPT, and in others opposed, notably where the requirements of existing services would, on present evidence, make suitable sharing arrangements impractical.

2) Satellite services at WRC - 15

Notwithstanding the importance of mobile broadband, many other items are also of specific interest to CEPT's Administrations. Satellite issues are usually very prominent in WRCs, especially because of the large size of the coverage and interference zones compared with the areas of the regional groupings like CEPT. In purely terrestrial applications, a group like CEPT can act alone if it acts together, independently of the general detail of the Radio Regulations, if it does not compromise implementation and protection of the primary services in neighbouring areas.

The satellite community will have an intensive look at the proposals for the update of satellite coordination and notification procedures, as well as for new satellite allocations. The scientific community is faced with several challenges. In our October Newsletter we looked at Agenda Items 1.11 and 1.12 of WRC-15: new frequencies for satellite uplink and increased demand for more accurate resolutions of the Earth Exploration Satellite Systems.

3) Very small satellites: do they need new regulations?

The issues to be addressed at WRC-15 include a big issue for small satellites: the regulatory necessities of nano and pico satellites. These are reaching the point of commercial potential having grown from the academic environment, and they challenge the traditional way of managing satellite regulation and space assets. The issues concern managing interference but also raise the matter of increasing risks from space debris. Thus CEPT, which was supportive of this agenda item, has to find a good way forward to set a stable framework for the use of this new kind of satellite, so that not only will they function well with each other, but also that they do not prejudice the many services and systems which depend on existing types of satellite. You can read our article here.

4) Every second counts. Or does it?

One WRC question which attracts public attention outside the radiocommunications community is whether the 'leap second' should be abolished. This item already gained a lot of attention at WRC-12 and it is expected that this will continue up to and during WRC-15, in particular as one leap second is scheduled to be inserted on 30th June this year.

What appears to be an interesting but perhaps academic subject actually has some significant impacts for systems on which aspects of our normal lives now depend. Tony Azzarelli, Chairman of CPG PT A, and others, explain why in this article.

Alexander Kühn, Chairman of the ECC's Conference Preparatory Group
Mark Thomas, Director of the ECO

Mobile Broadband and WRC-15

The diagrams below show CEPT's current position in relation to mobile broadband frequencies.

The first shows frequency bands where CEPT has already put harmonisation frameworks in place.

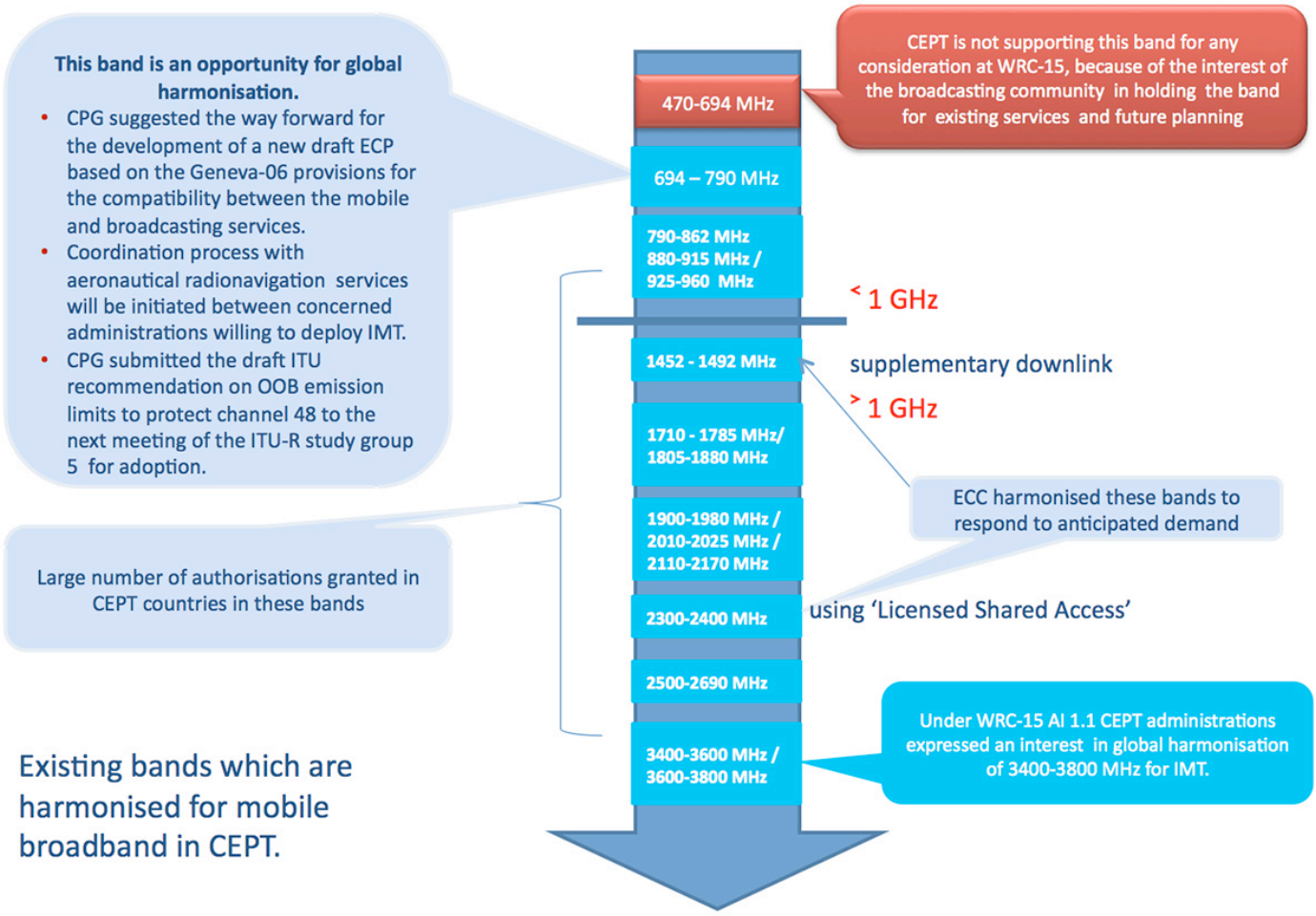


Diagram 1: Existing bands which are harmonised for mobile broadband in CEPT.

The second shows a number of candidiate bands for IMT being considered under Agenda Item 1.1 of WRC-15.

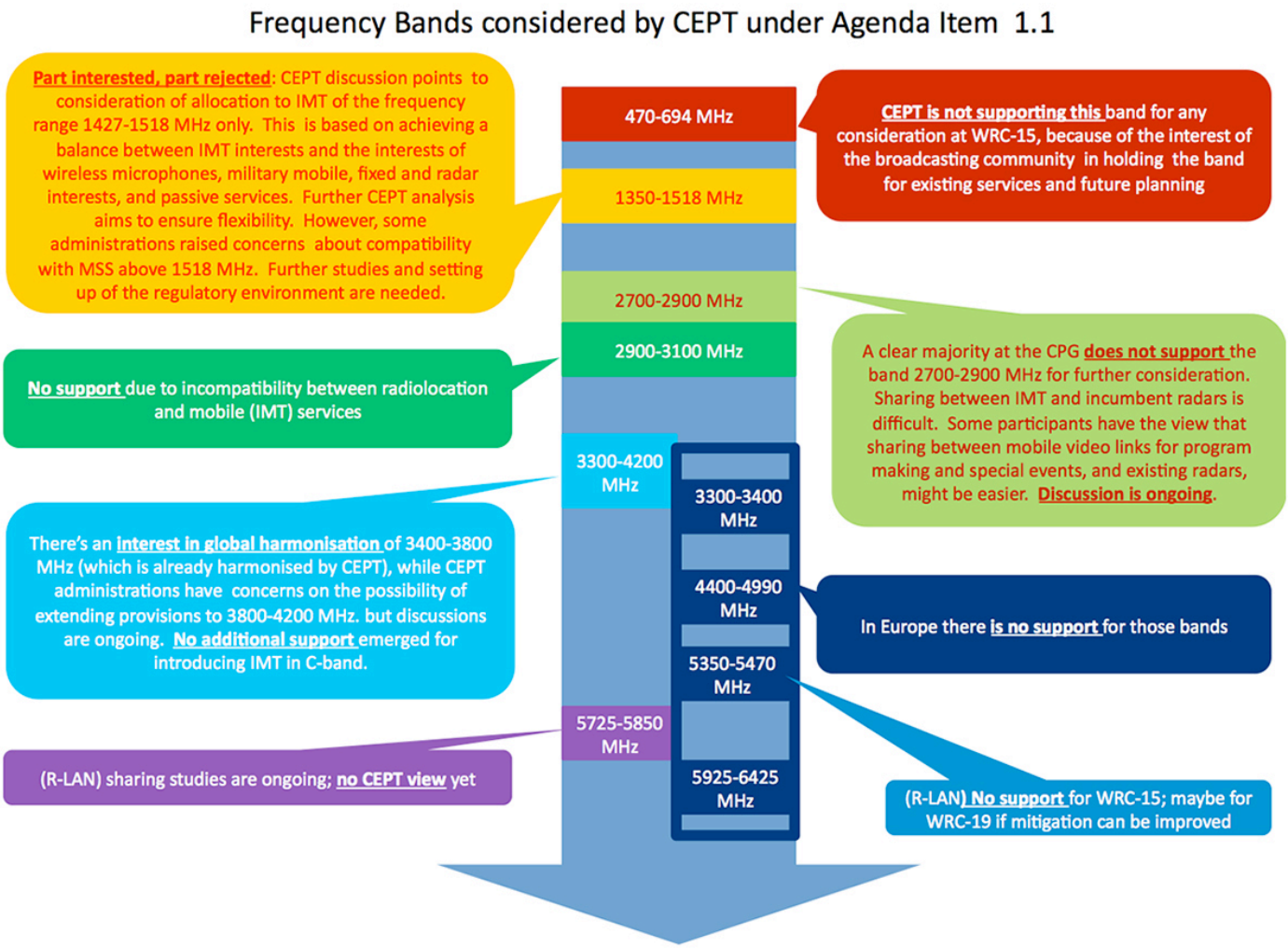


Diagram 2: Frequency Bands considered by CEPT under Agenda Item 1.1

Interest in the frequencies around 5 GHz is mainly driven by the fact that a large amount of mobile broadband traffic is carried on site-specific R-LAN (Wi-Fi) networks, and that there is already a range of frequencies at 5.8 GHz designated for R-LAN, as well as the heavily-used 2.4 GHz range.

However, there is some standardisation activity on LTE at 5 GHz, and also some similarities of size and implementation dynamics between Wi-Fi and very small cells in mobile networks, as well as the obvious differences. The ECC's spectrum evaluation studies assume use of the most likely technologies, but the policy approach is technology neutral.

Stella Lyubchenko, Spectrum Expert, ECO

Size matters for satellites – big or small

In the closing decades of the 20th century satellite dishes on the ground – 'earth stations' – got smaller. The first sites were large earth stations with impressive parabolic dishes as antennas – and these still have a role to play. But the use of even very small satellite dishes to receive TV programmes brought the idea of signals from space to the general population's everyday consciousness. Now we have satellite phones and applications such as VSATs (very small aperture terminals) in a variety of applications.

But what of the satellites themselves? The reduction in size of the antennas on earth was enabled by a set of complementary technical developments which increased capabilities of the satellites in space, including that they became larger and more powerful: obviously the design of a given link depends on the situation you are designing for.

The international management of frequency use for these satellites is always evolving at World Radiocommunication Conferences (WRCs), but it is essentially a mature environment of allocations, procedures and criteria for introducing new satellite transmissions, whilst protecting existing satellite and terrestrial services on related frequencies, including passive satellite services such as earth sensing. And these procedures vary by application and by frequency band according to context.

But not all satellites are getting bigger. There is also a branch of development opening up in the other direction; so-called 'nano-' and 'pico-' satellites. This is an exciting development which raises some interesting challenges.

Nanosatellite - Image courtesy of Gomspace

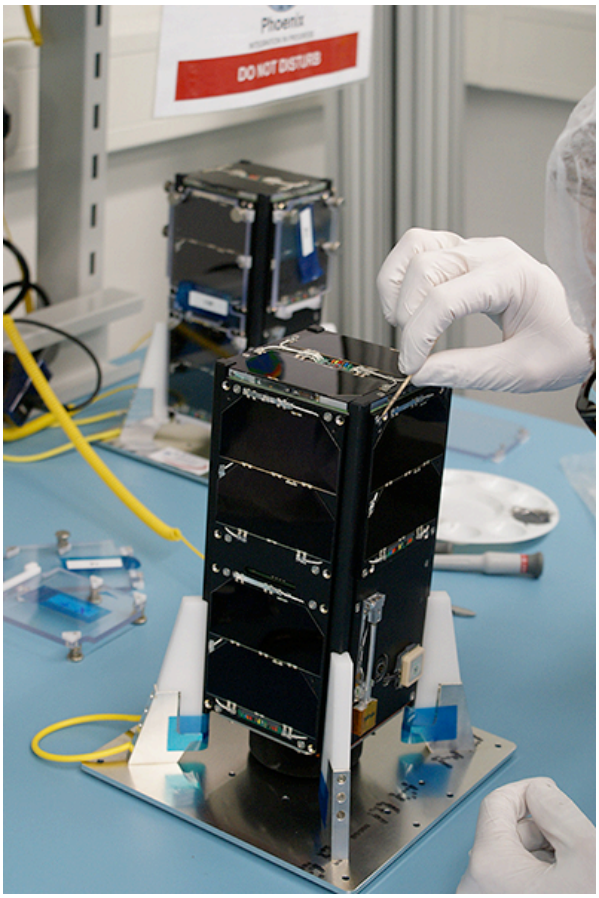
Past

At the World Radiocommunication Conference in 2012 (WRC-12), a number of CEPT countries proposed an agenda item on nanosatellites and picosatellites. WRC-12 subsequently developed Resolution 757: 'regulatory aspects of nano- and picosatellites', which called for a review of the regulatory procedures, and put the item on the provisional agenda for WRC-19. Furthermore, ITU-R study Question 254/7 called for a study of the 'characteristics and spectrum requirements of nano- and picosatellites'.

The Administrations proposing this agenda item were responding to the advent of small satellites, most notably the so-called 'CubeSats'. A CubeSat is a satellite adhering to a standard proposed back in 1999 by Bob Twiggs of Stanford University and Jordi Puig-Suari of the California Polytechnic Institute.

The CubeSat standard is based on a 10x10x10cm 1kg cube called a 'U' (for 'Unit'). The first CubeSats which were launched were mainly 1Us, but nowadays many variations exist with people exploring 6U satellites and up. But this is unprecedentedly small.

The original CubeSat 'inventors' never envisaged such a rapid adoption of their standard. Ten years after its conception hundreds of these CubeSats are being developed worldwide. Initially, universities have led this, as the CubeSats proved to be excellent hands-on educational tools, but the concept is being more and more adopted by the scientific and commercial space community. Moreover, they offer a low-entry barrier for new entrants in spaceflight activities.



A small satellite being prepared for flight - Image courtesy of Innovative Solutions in Space BV

In the early days of the CubeSats, these satellites were often regarded as amateur, educational or scientific, but nowadays, the first commercial applications have started to emerge. Commercial Earth observation, asset tracking and others are just a few of the possibilities. In fact, the timing for proposing this agenda item could not have been better, given that constellations of hundreds of these satellites could be technically ready to be launched soon.

One of the driving factors behind this growth is the fact that these satellites are – unlike their traditional counterparts – mostly based on off-the-shelf, commercial or industrial grade, electronic components. The rapid miniaturisation of these components (mainly driven by the consumer electronics industry, e.g. smartphones) allows these satellites to be small yet capable.

Back at WRC-12, the Administrations proposing the agenda item recognised that these CubeSats (after that more generally referred to as 'nanosatellites' and 'picosatellites') have characteristics which (besides their size) are different from traditional satellite systems, such as their relatively short development time, modest cost, and different form of launch arrangements. By virtue of their small size, they can be launched relatively easily as so-called 'secondary payloads', using opportunistic launch arrangements rather than dedicated launches planned long in advance. Taken together these factors constitute a major step forward.

But is the current frequency management environment suitable, given the density of use and quick timescales which may be associated with these tiny satellites? And would changes to accommodate them threaten the effective operation of the existing services on which we have come to rely? We explore these questions below.

Present

During the current study cycle, ITU Working Party 7B (WP7B) has been working on two reports. One report, ITU-R SA.2312 'Characteristics, definitions and spectrum requirements of nanosatellites and picosatellites', as well as systems composed of such satellites, addresses study question 254/7. A second report, which is close to finalisation, addresses the invitation to ITU-R to examine the procedures for notifying space networks and to consider possible modifications.

WP7B concludes in its report ITU-R SA.2312 that the difference between traditional satellites and nanosatellites and picosatellites is becoming less distinct. In fact, WP7B concluded that, given that there are many variations of the original CubeSat concept under development, these aspects are not strictly bound to nanosatellites and picosatellites, but more broadly relevant to 'small' satellites in general. As such, a unique definition of nanosatellites and picosatellites would be outdated from the moment it was defined.

Furthermore, the studies undertaken within ITU-R have identified a number of challenges, both regulatory and non-regulatory. Some of the most notable ones are outlined below:

1. Late knowledge of detailed orbital parameters as a result of the opportunistic launch arrangements. Furthermore, since many of these satellites are not equipped with a propulsion system their orbit will decay over mission time;

2. The short development time of nanosatellites and picosatellites which is not in line with the usual timeline of the regulatory process according to Article 9;

3. Limited experience with the applicable regulatory procedures by some of the Administrations involved as well as some of the developers of nanosatellites and picosatellites.

As for the third point, since many developers of small satellites are newcomers to the space arena, their Administrations are in many cases relatively uninvolved in the relevant fora such as the Space Frequency Coordination Group, or have little experience in the application of the regulatory procedures under Article 9 and 11 of the Radio Regulations. These regulatory procedures have good grounds for existence, and the past has proven that coordination is necessary. Developers are not always aware that the provisions of the Radio Regulations under Article 9 and 11 also serve to protect their rights and are not just one more regulatory obligation to fulfil.

Future

As for the near future, it is apparent that it is becoming more important to consider the rapid growth of small satellites from a spectrum management perspective. And even though, as WP7B concluded, satellite size is not relevant from a spectrum management viewpoint, their small size has been a key factor enabling their growth and widespread adoption. Some developers and commercial operators are planning to launch as many as 100 on a single launch for a single application. A recent market study conducted by Spaceworks Enterprises Inc. provides an estimate of future numbers of small satellites launched. Furthermore, most bands currently used for satellite telemetry and control, such as the 2200-2290MHz SRS/SOS/EESS allocation, are heavily crowded and this issue offers new challenges which have not been faced before.

Now is the right time to address this growth, and make sure that an effective regulatory framework is in place in order to protect the incumbent users while at the same time enabling small satellites to be deployed and realise their potential. Studying possible allocations is not within the current scope of the provisional WRC-19 agenda item. However, the question about whether and how this growth can be accommodated within the existing regulatory framework and allocations needs to be addressed as the issue is becoming more and more relevant.

Wouter Jan Ubbels, Innovative Solutions In Space BV, CEPT coordinator for Agenda Item 9 - Issue 9.1.8

WRC-15 AI 1.14 (Co-ordinated Universal Time and Leap Seconds

Every Second Counts

Time has always been important to humans. The concept of annual cycles in farming and other activity, the celebration of an event such as a New Year, the principle of a week, aligning with cycles of rest or alternative activity to punctuate the normal activity of farming, building, writing, or whatever. A way to measure progress.

And we need to divide the day up into smaller units, to measure how long we are spending on work, to agree a rendezvous with someone else, to coordinate our mealtimes, and so on. Technological progress and the increasing sophistication of society worldwide have required these divisions to become ever smaller. Earlier civilisations didn't need accurately measured seconds. The concept of widely-used national common time only came with the railways in the 19th century, and on a worldwide basis with transport and electronic communications.

You may be wondering about the connection between time standards and radiocommunications? We will not take space here to explain exactly why the issue of worldwide time standards and measurements is on our agenda, but we can explain what the issue is and why it is of more than academic importance.

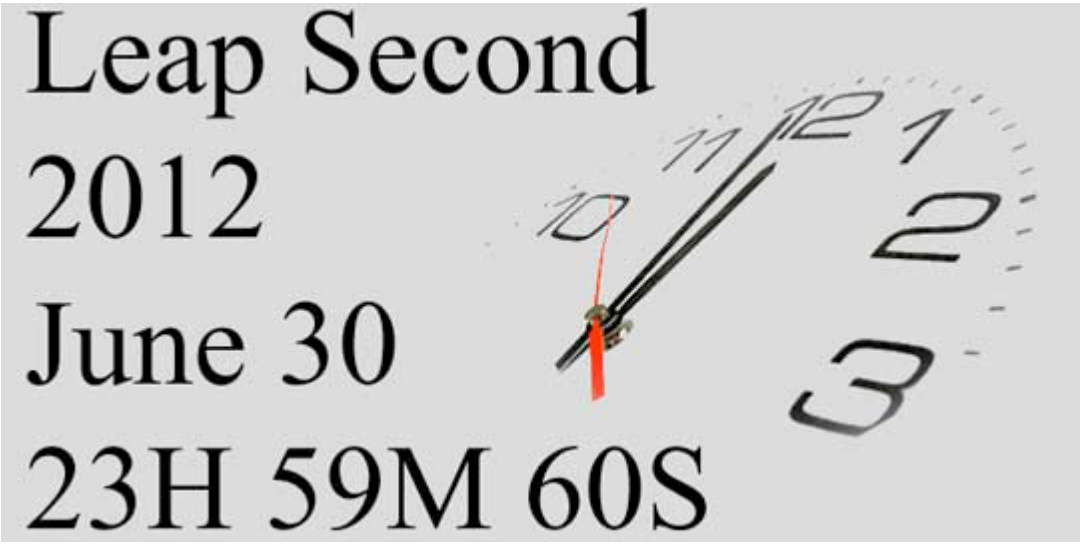
Today's use of time

The world now runs with an extremely accurate, constant and reproducible definition of a second of time; these days it is taken from a very precise atomic clock reference. And having defined it so precisely and needing it to remain as a physical constant we now want to keep it that way. Surely that is a good thing? Well, it is good for our technologically supported way of life. But thankfully the planet is part of nature and not so regimented. Its rotation on its own axis – the basis of our day and the sub-parts which we divide it into – is very gradually and erratically slowing down [1].

Therefore, the measurement of time by using the scientifically based second, used for synchronising all manner of processes including communication networks, slowly gets out of step with the natural world of which we are a part.

Until now the solution has been to introduce a 'leap second', in other words to stop 'official/scientific' time (Co-ordinated Universal Time, 'UTC'), for one second every so often. The slowdown in earth rotation is not constant, so the leap second has been applied when required, on average about every four years. This maintains UTC's link to solar time, where we have 3600 seconds per hour, and 24 hours in a day. This link is consistent with ITU-R Resolution 653 (agreed at the World Radiocommunication Conference in 2012 (WRC-12)), which identifies the need for a timescale linked to earth rotation. However, the Resolution also calls for ITU to study the feasibility and implications of establishing a continuous reference timescale, i.e. one without correction by leap seconds.

So what is the problem: why not just keep the practice of a 'leap second'?



The problem arises because so many digital systems have difficulty in coping with an interruption to a continuous time reference, for example, receiving two identical consecutive time stamps, or not being able to respond to the advance notification that is broadcast before a leap second is applied. This can impact, inter alia, internet timing, global satellite positioning systems (e.g. GPS, GLONASS), mobile phone networks, and high speed financial trading. The last leap second, in 2012, did cause problems.

This in turn is starting to lead to the adoption of limited private time standards used just for one system or group of systems, which in turn will increasingly lose the benefits of those systems being able to communicate with each other on the basis of a common time reference.

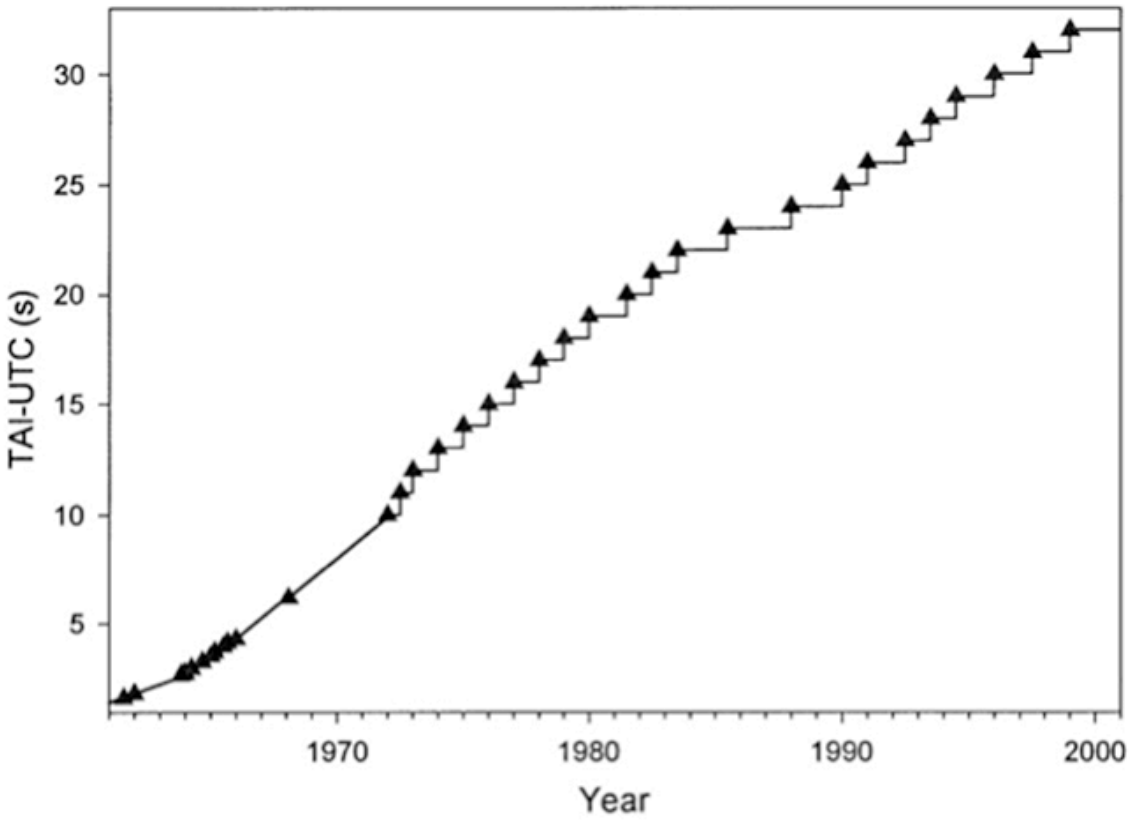


Figure 1: how leap seconds have tracked the increasing difference between the continuous count of the atomic clock (TAI), and the Coordinated Universal Time (UTC)

This issue has been debated for a long time in ITU-R, over 15 years now, without reaching any agreement and consensus. Although not a specific radio-spectrum issue, it is again on the agenda of WRC-15.

The ECC is currently studying various options to find a solution and we have provided contributions to ITU-R on the development of the Conference Preparatory Meeting (CPM) text and the methods to satisfy this agenda item.

One such option we have studied would remove the use of leap seconds, with UTC then becoming a continuous time scale, thus breaking the link between civil time (using UTC) and the Earth's daily rotation (which is slowing down). Several concerns have been raised on this solution, such as the potential impact to one global navigation satellite system (GNSS), the impact to civil and legal time keeping, and also the uncertainty and impact on existing systems and software which are designed to operate on the UTC using leap seconds.

Therefore, the ECC is also giving further consideration to the option of disseminating (i.e. broadcasting) two time scales in parallel, which might solve the differences between the two opposing camps and which may accommodate the differing needs. Hence, one study concluded that it is worth keeping the insertion of leap seconds in UTC, as done presently and which avoids ambiguity for civil users, and then allowing experts to extract from such dual broadcast the continuous pseudo-reference time scales required for the specific more automated applications.

The next Conference Preparatory Group project team (CPG PT-A) meeting this January is planning to consider the option of retaining UTC as currently defined (i.e. which introduces leap seconds as and when required) and modifying the Radio Regulations to recognise, on an equal basis, a continuous reference atomic time-scale with an offset which can be derived from the UTC broadcast. This method could be acceptable as a compromise and possibly the only way forward in satisfying different users of the international time scale reference.

Tony Azzarelli, Chairman of the ECC's CPG - PT-A
Mark Thomas, Director of the ECO

i The Earth slows down due to its interactions with the moon; the slowing is erratic because of the redistribution of mass within the Earth, in the mantle layer.