



Orbital Slots and Spectrum Use in an Era of Interference

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A one-day conference co-hosted in Brussels, Belgium, by Institut français des relations internationales (Ifri) and the Secure World Foundation (SWF)

Welcoming Remarks

Guilhem Penent, Research Associate (Ifri) and Victoria Samson, Washington Office Director (SWF)

This conference is a follow-up of two previous conferences: its focus is looking at the problem domains in interference, along with their context. We assume three types of interference. First there is intentional or deliberate interference which is political in nature. Secondly, there is potential interference between terrestrial and space services competing for the same part of the spectrum (mainly C-band). Lastly, there is accidental or unintentional interference. Tensions there are related to issues of orbital management coordination. These three types of interference impact the long-term sustainability of space activities.

Panel 1: Interference and Freedom of Information

Moderated by Guilhem Penent, Research Associate, Space Program (Ifri)

Simon Spanswick, Chief Executive and founder director of the Association for International Broadcasting (AIB)

Yasir Hassan, Director of Transmission Operations, Arabsat

Michel de Rosen, Chairman and CEO, Eutelsat

Yvon Henri, Chief of the Space Services Department (SSD) at the Radiocommunication Bureau, International Telecommunication Union (ITU)

Eanna O'Conghaile, Ireland's representative at the Council of Europe's Steering Committee on Media and Information Society (CDMSI) and member of the CDMSI Bureau.

Media broadcasters and satellite operators continue to experience intentional interference on broadcast signals by some actors trying to prevent information to reach the public. In addition, as satellites begin to provide more telecommunication services such as internet access, they must deal with new pressure to control or manage the free flow of information. This session examined the balance between freedom of information and national sovereignty across both of these issues.

Two potentially opposing principles exist: the freedom of information and the sovereignty of States. Mr. Spanswick of AIB spoke about the freedom of information. Deliberate harmful interference, or jamming, is not a new phenomenon. For example, the Soviet Union used to routinely and systematically jam broadcasts coming from the West, notably the BBC and Voice of America. It was jamming on a large scale and cost an estimated tens of millions of dollars: it is thought that the Soviet Union spent more money on jamming than on its own international radio services. This rendered a significant part of the short-wave radio spectrum unusable for a significant period of the day.



Intentional jamming today is aimed against satellites that carry the programs of international broadcasters. It still requires extensive resources to jam satellite broadcasting, but it is no longer only nation states that have the means to jam satellites. Jamming incidents have recently occurred in Egypt, Libya and Ethiopia. Article 19 of the 1948 *Universal Declaration of Human Rights* is clear and unambiguous on the right to hold opinion and to seek information without interference regardless of frontiers. Mr. Spanswick argued that it is believed that open and transparent regulation is the system that should be adopted on a global scale rather than resorting to the highly disruptive method of jamming satellite broadcasts.

Yasir Hassan first gave a primer on Arabsat. Established in 1976, Arabsat has six in-orbit satellites, each in different orbital locations, using a full spectrum of bands and satellite services. Turning to interference, harmful interference reached its peak in 2012, in conjunction to the Arab Spring and the political situation in the MENA region. In 2012, 1100 tickets were opened on interference incidents, 24% of which were deemed to be intentional. In 2013, 10% were thought to be intentional. Arabsat has responded to interference with industry meetings with Arabsat participation and contribution, including Cabsat conference in March 2013, at ITU in Geneva in June 2013, in an ABSU (Arab Satellite Broadcasting Union) conference in October, 2013, and at MilSatCom in Dubai in May, 2014. Their action plan promulgated by ABSU has been approved by the ITU, WBU, African, American and European Broadcasting Unions. The main issue is to confirm whether it is intentional or unintentional jamming.

Michel de Rosen of Eutelsat spoke about increasing the ITU's enforcement ability. Whenever there is jamming, there is a breach of freedom of access to information and freedom of expression. Intentional jamming is unequivocally condemned by international law. Eutelsat has undergone a lot of intentional jamming recently but it has been improving somewhat lately. In January 2011, Eutelsat had 148 minutes of intentional jamming. In March 2012, there were 4,714 minutes of intentional jamming, while in May 2013, there were 46,000 minutes of intentional jamming. In August 2013, it had 53,000 minutes of intentional jamming. This jamming originated from Iran, Syria, and Bahrain. Since then, the situation has improved and jamming has decreased: in January 2014, there were 6,250 minutes of intentional jamming, and in May 2014, 1,610 minutes.

Mr. de Rosen stated that we should remember that jamming is focused on content. International governance is insufficiently efficient. The system remains fundamentally unchanged since its inception and suffers as a result from two shortcomings. First, when a complaint for jamming is filed, geolocation is provided by the complaining body, and it cannot be challenged nor confirmed by the regulating body. Secondly, it is impossible to challenge the response by the responding state. These defects can only be solved by strengthening the ITU and creating a "naming and shaming" process. He believed that the ITU should have the means to identify the originator of a jamming incident and accuse them officially, which would improve the system. The European statement of the CEPT (European Conference of Postal and Telecommunications Administrations) has offered a range of measures which would increase the ITU's power. The upcoming plenipotentiary of the ITU (PP-14) in Busan, South Korea, will focus on these issues. ITU should have the means to monitor and measure jamming and be able to maintain an international database. Yes, the total minutes of interference has decreased, but only 10-15% of the existing jamming has been geolocated. Jammers are



becoming smarter and geolocation is more difficult. In conclusion, he argued that all countries should support the European Common Proposals to be offered at Busan¹.

Yvon Henri (ITU) presented on the role of the ITU in an era of interference. He started with harmful interference by explaining that article 45 of the ITU Radio Regulation defines harmful interference as (RR1.169) “interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with RR (CS1003).” However, there is no distinction between deliberate (intentional) and unintended interference. There is no specific level to define from permissible interference (RR1.167) to accepted interference (RR1.168) to harmful interference. Finally, there is no real enforcement mechanism when harmful interference occurs, outside of Article 56 of ITU Constitution and the Optional Protocol.

Regarding freedom of information and its relationship to State sovereignty, Mr. Henri noted that the public has the right to use the international telecommunication services without discrimination and that States have committed to implement any regulations in a manner that respects and upholds their human rights obligations. However, States keep their sovereignty when establishing telecommunication services and particularly the right to stop private telecommunications, as stated in ITU Constitution Article 34, in accordance with national law, if the transmission appears dangerous to the security of the State or contrary to its laws, to public order, or to decency. States have the right also to suspend international services under ITU Constitution Article 35, requiring immediate notification to the other Member States, and Member States are allowed freedom regarding military radio installations (Article 48).

Mr. Henri also discussed the latest statistics on interference, based on information and statements provided by notifying administrations reporting cases of harmful interference (either deliberate or not) to the ITU Radiocommunication Bureau. Several actions are being taken by the ITU, including the extension of the international monitoring system; the exchange of experience, strengthening of cooperation, co-organization, and participation in related fora; providing assistance to ITU Members when needed; the development of new recommendations; and a new recommendation on Carrier ID. The Bureau also is developing an international registry of interference to space services. In conclusion, Mr. Henri emphasized that Member States’ utmost goodwill, cooperation, and exchange of information among parties is essential to resolve harmful interference issues, noting that deliberate interference correlated with geopolitical conflicts. Regulatory mechanism is working, but there is always room for updates and improvements and only continuous synergistic actions by all sectors of satellite community would guarantee that the issue of harmful interference would be resolved.

Eanna O’Conghaile from the Steering Committee on Media and Information Society of the Council of Europe spoke about the balance between freedom of information and national sovereignty. Paragraph 1 of Article 10 of the European Convention for the Protection of Human Rights and Fundamental Freedoms states that “everyone has the right to freedom of expression. This right shall include freedom to hold opinions and to receive and impart information and ideas without interference by public authority and regardless of frontiers. This article shall not prevent States from requiring the licensing of broadcasting, television or cinema enterprises.” Article 10 has been

¹See Resolution COM5/2 on “Strengthening the role of ITU with regard to transparency and confidence-building measures in outer space activities.”



interpreted to apply not just to content of information but to means of transmission. Paragraph 2 of Article 10 of the European Convention for the Protection of Human Rights and Fundamental Freedoms includes the following warning: “The exercise of these freedoms, since it carries with it duties and responsibilities, may be subject to such formalities, conditions, restrictions or penalties as are prescribed by law and are necessary in a democratic society.”

Panel 2: Interference and Telecommunication Services

Moderated by Aarti Holla-Maini, Secretary General, European Satellite’s Operator Association (ESOA)

Nigel Fry, Head of Distribution BBC World Service Group

CécilAmeil, Senior Manager EuropeanAffairs, SES

Frank Zeppenfeldt, Directorate of Telecommunications and Integrated Applications, European Space Agency (ESA).

A second area of concern is about existing and potential interference occurring as a result of mobile terrestrial services deploying into the frequencies which have been allocated to, and used by, the satellite industry. This panel will shed light on issues of sharing and compatibility between terrestrial systems and space systems using in particular the C-band. It explored the regulatory, economic, and industrial ramifications of this issue in the context of the upcoming WRC-15 conference.

Telecommunications interference between terrestrial and satellite services is different from the intentional interference as discussed above. Worldwide there is an explosion of mobile devices, and we all want to use them and rely on their high reliability and quality. Consequently, more radiofrequency spectrum is being asked for by the mobile telecom industry. The upcoming World Radio Conference (WRC) in winter 2015 will decide on whether the mobile community should get access to more spectrum, and which portions of the spectrum. This first appears as a technical question, but behind that is a question about the value of services provided by satellite services.

Mr. Fry of the BBC World Service spoke about interference in the C-band, and BBC’s role in promoting the debate surrounding C-band. BBC broadcasts in 28 languages, and BBC has the mission to inform, educate, and entertain. One satellite covers a quarter of the world, and consequently 4 satellites can broadcast to the entire world far beyond the limits of current fiber optic availability. C-band is the backbone for most if not all international TV and radioservices, as it can handle large amounts of rainfall. Sharing part of the C-band will affect all C-band receivers. The BBC has 5000 receiver locations around the world. Less than 2 percent of the C-band receivers are registered, so it is likely that anything affecting C-band use would have a bigger effect than anticipated.

Mr. Ameil of SES spoke about the necessity of satellite operators to have access to the C-band in order to provide wireless extension services, maritime communications, aviation security, telemedicine, distance education, disaster preparedness, TV contribution, peacekeeping, internet connectivity, and corporate networks. There are also some unique attributes of satellite C-band, and he argued that these services cannot be easily replicated at other satellite bands or via terrestrial means. The C-band easily covers entire continents and oceans and offers an economically viable way of providing intercontinental and global communications. Like Mr. Fry, he noted that there is great geographic reach and resistance to rain-fade in the C-band.



Mr. Ameil asked if spectrum sharing is feasible. There are a few examples of fixed satellite services sharing, and satellite services have had to share their spectrum with fixed terrestrial wireless for years. This is still the case in C-band in Europe and also with some parts of the Ka-band. However, this only works with specific conditions and can constrain some satellite services. What if mobile terrestrial wireless deploys in the C-band? You need to know where the receivers and transmitters are located so that you can limit the impact; if you don't know the distance or if you put them too close, there can be interference. A recent ITU-R study found that "sharing between IMT-Advanced and FSS is not feasible in the same geographical area since no minimum separation distance can be guaranteed. Deployment of IMT-Advanced would constrain future FSS earth stations from being deployed in the same area in the bands 3 400-4 200 MHz and 4 500-4 800 MHz as shown by the studies." The ITU has determined that one would need protection distances of tens to thousands of kilometers in order to allow for co-frequency sharing between satellite services and international mobile telecommunications (IMT), as shielding and filters can only do so much.

How can we then protect satellite C-band? Clearly there is a strong demand for terrestrial mobile broadcast communications, but he posited that there is also a need to balance that with the need to have other means of communications as well. He argued that there are other frequency bands that can be used for IMT that are better for its needs, and urged active participation in the upcoming WRC in 2015 in order to represent the satellite industry's perspective on this issue.

Frank Zeppenfeldt of ESA first explained how ESA supports the development of products by European and Canadian industry for the world market. ESA funds the innovation part of the satellite system, and operators thereafter commit a certain amount of funding. Concerning WRC2015, ESA believes that threats exist - specifically less radiofrequency spectrum. Or as he noted, "no spectrum, no satcom." Opportunities also exist through these discussions, for example, new satellite systems or access to new spectrum.

C-band is used for many services which need high availability (like tropical areas that receive large amounts of rainfall), and carry critical services such as emergency communications, meteorological services, and global maritime distress and safety systems, air traffic management, etc. C-band allows for large global beams to cover large regions. Over 283 satellites on orbit carry C-band transponders, with 2000 C-band transponders in operation, which represents a huge investment for the satellite communications industry.

ESA helps industrial parties to coordinate themselves, with a unified vision for WRC agenda items. Mr. Zeppenfeldt argued that the mobile industry's claims for its spectrum needs are based on excessive traffic demands. He also highlighted a study by Euroconsult on the importance of C-band to the countries of Africa. He then discussed ongoing ESA actions regarding interference, including improvements to ground-based geolocation products and on-board spectrum monitoring equipment development; the development of equipment for future frequency bands (Q and V-band); developments in Carrier ID equipment; having smaller and more satellites in low Earth orbit to try to fill in the blanks for coverage; and small, satellite-based spectrum monitoring and measurement missions.



Keynote speech

Roberto Viola, Deputy Director General, DG Connect, European Commission

Mr. Viola started out by noting that avoiding interference has always been the key part of spectrum management. He said that coordination is key, and that doing so at various levels, including at the European Union level, is beneficial to all. He discussed EU regulatory framework on this issue.

Mr. Viola then talked about the Commission's decision on C-band spectrum management and the introduction of harmonized frequency (channeling) arrangements. He brought up a May 2014 decision by the Commission on this which assures sharing the C-band (3.6-3.8 GHz) between terrestrial and satellite operators. He argued that this was done in coordination with satellite operators and that it would lead to a more efficient use of spectrum. Allowing terrestrial operators to have access to the rest of the C-band was not justified, the Commission felt. He said that the international community should be working on a way in which satellite and terrestrial services can develop, so the Commission believes that the WRC-15 should look at global harmonization of the lower C-band (3.4-3.8 GHz) for mobile telecom, with safeguards in place to protect satellite use of the 3.8-4.2 GHz band.

Panel 3: Interference and the Governance of the Geostationary Arc

Moderated by Victoria Samson, Washington Office Director, SWF

François Rancy, Director of the Radiocommunication Bureau, ITU

Gary Thatcher, U.S. International Broadcasting Bureau (IBB)

Ron Busch, Chairman and Intelsat's Executive Director of the Space Data Association (SDA)

Unintentional non-voluntary interference remains the highest contributor to the number of events witnessed by satellite actors today. These are a consequence of the growing occupation and exploitation of the geostationary arc for which accommodation must be found between neighboring satellites and services in order to maintain its full potential. This panel discussed the consequences of the arrival of new entrants on the so-called "rational" drive for more efficient use of the orbit/spectrum resource.

François Rancy explained that what the ITU wants to see now and in the future is "good quality, lower cost." The ITU Radio regulations were built up over the past fifty years, based on the goodwill of participants. He highlighted that it is the application of ITU procedures that gives rights as a user of spectrum and orbit resources. The whole ITU process is geared at avoiding the occurrence of harmful interference.

Historically, there were only a few operators which were all state-owned and there was enough spectrum for all. This has now changed as we have more operators in general and private actors specifically involved. With the increase in the number of commercial operators and the increased use of spectrum/orbit resources, there has been a drop in overall goodwill, whereas more goodwill would be necessary in this new environment.

Mr. Rancy noted that new entrants could be given more possibilities by lowering barriers to entry. The international community could facilitate investment by increasing predictability in this context. A first step would be to ensure that the database which is used by the ITU to record the rights of Member States and operators to operate satellite systems is reflecting more accurately the reality of



the current systems. This may be done using the existing facilities for satellite monitoring throughout the world. A second step would be to increase the homogeneity of satellite systems, by reducing the coordination arc, which would act as a homogenizer of the parameters. Finally, we should continue to promote more efficient use of spectrum/orbit resources and continue to explore the technical means to achieve this.

Mr. Rancy said we should regulate undesirable conducts such as “warehousing.” Due diligence information after the launch is important in this respect. Furthermore, we should align the rights with actual characteristics of satellite systems. There is a cost borne by the international community for indefinitely protecting resources which are not in use. This cost should be taken into account and reflected by the administrative and regulatory provisions.

Gary Thatcher of the IBB pointed out that broadcasters historically have not dealt well with changes in technology. He said that it is critical that as the technology changes, we advance how we deal with it as well. The IBB believes that the ITU has a critical role to play in this process. He felt that the ITU should be given the capability to do geolocation, as right now, it depends on the aggrieved parties to do the geolocation for it. He also argued for a publicly accessible database.

Mr. Thatcher said that there has been an attitudinal change by industry. When we first started talking about harmful interference, industry did not want to admit it was happening, as the way industry was set up, it was never intended to deal with deliberate interference. He felt that the standards for geolocation should be nailed down, as geolocation is absolutely critical to the process. However, he pointed out that for those determined to jam a satellite transmission, no amount of carrier identification or geolocation will stop them.

Ron Busch of the SDA said that on the ground, users are using a better modulated scheme, so there is more bandwidth and more throughput; however, this means that any interference has a bigger effect. A smaller antenna means that there is a higher possibility of interference. Mr. Busch suggested that training and equipment certification can help. Also, by promoting best practices, the international community can try to limit interference as well. The U.S. Federal Communications Commission (FCC), by mid-2016, will require Carrier ID. SDA demonstrates that the community can work together and share commercially sensitive information to preserve the spectrum/orbit resources.

Wrap-up of the day

Richard Roithner of Euroconsult gave some conclusions he took away from the day’s discussions. He said that issues and challenges of RFI are that there are an increasing number of players in orbit, with a decreasing amount of orbital separation of satellites and an overall increase in the power of the satellites’ transmission. Ground equipment is getting smaller and more mobile. There is an increase in the amount of terrestrial interference, and more communication industries are eyeing satellite spectrum. These changes can all have impacts on the use of spectrum: reduced usability of transponders, loss of revenue, impede free flow of information, and be costly to resolve or mitigate.

In looking at deliberate interference, while it is nothing new, it has become more sophisticated, and the international regulation and enforcement mechanisms are weak in dealing with it. Solutions include open and transparent regulatory standards, improving geolocation, and increasing the ITU’s mandate to deal with it. Allocating C-band to terrestrial mobile telecom providers could result in substantial interference with satellite operators and in fact would render satellite services unusable



in certain areas. C-band is a tremendous asset to many countries' socioeconomic benefit, particularly in emerging economies, so losing C-band services would have a major impact. In looking at unintentional interference, there is higher competition and an increasing amount of spectrum needed. To improve this, better training and equipment is needed, as is improvements in monitoring and sharing information via a usable database. Finally, cooperation among stakeholders is essential to mitigate interference. He wrapped up his remarks by stating that the threat from terrestrial telecom to satellite spectrum is real, and the satellite industry needs to defend itself.