

# Optical Communications in a Legal Vacuum?

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## Abstract

The use of optical communications has many technical advantages. The thesis that it stands outside of any legal framework can, however, be hardly defended. Despite of the fact that the intensity of legal rules regulating the use of optical communication is lower than e.g. as concerns the use of radio frequencies, both ITU basic texts and the UN space treaties contain binding rules which have to be respected, the core of them being the principle of due regard to the corresponding interests of other Parties.

## I Introduction

There are many areas of using optical waves in space: In the area of support for manned space activities, for data transmission from observation satellites or as means of inter-satellite communications<sup>1</sup>. In contrast to radio frequencies<sup>2</sup>, the use of optical communications offers many advantages in terms of mass, power, system flexibility and cost<sup>3</sup>; and is immune to jamming and interception by adverse parties. At the same time it is believed by many to be “unregulated”<sup>4</sup>. Whereas the issue of potential jamming and interception will be left to scientists and engineers, the correctness of the thesis that there are no rules regulating the utilization of optical communications, especially in the relation to space communications, will be assessed. In doing so, relevant legal sources of

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1 See M. Toyoshima, Trend in Satellite Communications and the Role of Optical Free-Space Communications, *Journal of Optical Networking*, Vol. 4, Issue 6, pp. 300-311 (2005).

2 Both radio frequencies and optical waves are electromagnetic waves.

3 B. Furch, Z. Sodnik, H. Lutz, Optical Communications in Space – a Challenge for Europe, *International Journal of Electronics and Communications*, 56(2002), No. 4, 223-231.

4 As example, see Space Frequency Coordination Group, SFCG Successes at WRC-12, 6-7.

the International Telecommunication Union will be taken into account; this analysis will be followed by a short overview of the provisions of the UN law of outer space which may be applicable in this context.

## II Framework of the International Telecommunication Union (ITU)

The scope of competences of the International Telecommunication Union is very broad: According to the Preamble of the ITU Constitution, “all” forms of “efficient telecommunication services” should be used for strengthening international cooperation and facilitating peaceful relations. Also No 3 (Article 1.1) of the Constitution requires maintaining international cooperation for the improvement and rational use of telecommunications of “all kinds”. Optical communications are *expressis verbis* mentioned in the definition of telecommunication which is understood as any transmission, emission or reception of signs, signals, writing, images and sounds of intelligence or any nature by wire, radio, optical or other electromagnetic system.<sup>5</sup> The variety of technical bases of telecommunication should not prevent the ITU to undertake studies, make regulations, adopt resolutions, formulate recommendations and opinions, and collect and publish information concerning telecommunication matters (No. 18, Article 1.2. h of the Constitution).

Some provisions of the ITU Constitution, typically those concentrated in its Chapters II (Radiocommunication Sector) and VII (Special Provisions for Radio) deal with the use of a specific part of the electromagnetic spectrum, the radio spectrum. The allocation of bands and the registration of orbital positions in the geostationary orbit concern exclusively the radio-frequency spectrum; only radio frequencies and associated orbits, including the geostationary-satellite orbit, are treated as limited natural resources (No 196, Article 44 of the Constitution).

Other rules are less specific and include provisions dealing with the whole range of the electromagnetic spectrum: Typically, chapter III of the Constitution dealing with the Telecommunication Standardization Sector aims at fulfilling the purpose of the Union by studying technical, operating and tariff questions and adopting recommendations on them with the view to standardizing all forms of telecommunications on a worldwide basis. These activities are performed on the basis of a high representation of the private sector which could represent 95% of the work in the ITU-T<sup>6</sup>; its representatives are included in Study groups<sup>7</sup> which conclude their work by recommendations called “standards”. So was the issue “Optical Transport Network and Access Network Infrastructures” dealt with by a Study Group 15 which is understood as “the focal point

5 Annex to the ITU Constitution, No 1012.

6 H. Schink, Standards for Optical Communications, 2012, [http://www.itu.int/en/ITU-T/studygroups/com15/Documents/tutorials/Standards\\_for\\_optical\\_communication.pdf](http://www.itu.int/en/ITU-T/studygroups/com15/Documents/tutorials/Standards_for_optical_communication.pdf).

7 F. Lyall, International Communications, 2011, 141-142.

in ITU-T for the development of standards in optical and other transport network infrastructures”<sup>8</sup>. In 2010, the group adopted some 40 recommendations related to these infrastructures<sup>9</sup>.

However, the ITU Basic Texts avoid any exact delimitation of competencies of both sectors in the area of studies and recommendations: So can the Radiocommunication Sector which is in principle in charge to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by radio-communication services (Chapter II of the Constitution) carry out studies “without limit of frequency range”, including studies on optical communications (No 78, Article 12 of the Constitution). Regarding a potential overlap of competencies of both sectors, the Constitution adopts a pragmatic approach: The precise responsibilities of the Telecommunication Standardization and the Radiocommunication Sector shall be subject to continuing review “in close cooperation”, with regard to matters of common interest to both Sectors, in accordance with the relevant provisions of the Convention (No 105, Article 17 of the Convention).

This compromise-oriented approach led to the inclusion of the topic of optical links into the agenda of the 2012 World Radiocommunication Conference (WRC-12). The legal basis for this fact was the decision of the 2002 ITU Plenipotentiary Conference<sup>10</sup> which decided that world radiocommunication conferences can include in their agendas items relevant to spectrum regulation of frequencies above 3000 GHz and take any appropriate measures, including revisions of the Radio Regulations. So has the 2007 World Radiocommunication Conference adopted a Resolution 955 which resolved that possible procedures for free-space optical links should be considered by WRC-12<sup>11</sup>, taking into account the result of ITU-studies covering at least sharing aspects with other services, a clear definition of the band limits and the measures to be considered if allocations to various services in the Radio Regulations above 3000 GHz are considered feasible.

The group responsible for carrying out preparatory studies on free space optical links in the framework of the Radiocommunication Sector was the ITU-R Study group 1 (Spectrum Management). The group came to the conclusion that no evidence had been provided that interference between free-space optical systems is a concern and, therefore, there was no time for adopting any specific recommendatory or binding rules dealing with optical communication. As the results of the WRC-12 are subject of a thorough analysis of my colleague from the ITU, this paper is limited to the fact that no changes to the Radio Regulations for free space optical systems were perceived, by the 2012 World Radiocommunication Conference, as necessary at the moment in this respect; the

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8 H. Schinck, slide No 7.

9 Together with the group 6, see <http://www.itu.int/ITU-T/studygroups/com15/index.asp>.

10 Resolution 118, Marrakesh, 2002.

11 WRC-12 Agenda item 1.6-2.

Resolution 955 empowering the conference to consider “possible procedures for free-space optical links” could be “suppressed”.

This result does not mean, however, that the use of satellite optical links is free from any legal regulations: it does not constitute a “law-free zone”. As the role of the ITU is to promote international telecommunication in general, its activities, including the regulatory ones, extend also to optical communications. More precisely, ITU Members have to respect provision No 189A (Article 38) of the Constitution requiring them to take “practical measures to prevent the operation of installations of all kinds from disrupting the operation of telecommunications installations of other States” – the due regard principle embodied in the ITU framework. Neither is the area of optical telecommunications excluded from the scope of International Telecommunications Regulations (ITR), which, as revised, include e.g. provisions on absolute priority to transmit all telecommunications regarding safety of life (Article 5.2 ITR). But it is evident that in comparison with the international administrative management of the radio frequency spectrum, the intensity of legal binding rules relevant for optical communication is very low.

### III Framework of the UN Law of Outer Space

If optical communications should take place in outer space, they are covered by the framework regulating the activities in outer space. The 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space (Outer Space Treaty) is the main source of binding rules in this respect<sup>12</sup>. The Treaty is based on the principle of the freedom of exploration and use of outer space (Article I). However, States Parties have to carry out all their activities in accordance with international law, including the Charter of the United Nations which *inter alia* prohibits any form of international aggression. All activities in exploration and use of outer space have to be guided by the principle of cooperation and due regard to the corresponding interests of other States Parties of the Outer Space Treaty (Article IX). Furthermore, the Treaty expressly envisages e.g. a prohibition of any military use of the Moon and other celestial bodies (Article III). The activities of non-governmental entities in outer space require authorization and continuing supervision by the “appropriate State party” which also bears responsibility for all national activities in outer space (Article VI). Most probably, also in case of damage which occurs to another State Party or to its natural or juridical persons on the Earth, in air space or in outer space by the means of optical communications, the State that launched or procured the launch of a damaging space object would be internationally liable for both the material and/or immaterial damage (Article VII) and obliged to pay compensation: It is broadly acknowledged today that the source

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12 For the international legal framework of space activities see e.g. R. S. Jakhu, *International Space Law*, 2012; N. Jasentuliyana, *International Space Law and the United Nations*, 1999; etc.

of damage can emanate both from material and non-material objects such as electromagnetic interference.<sup>13</sup>

Other UN treaties dealing with activities in outer space are even more specific: The 1972 Convention on International Liability for Damage Caused by Space Objects contains detailed procedural rules of presenting a claim for compensation, and the 1975 Convention on Registration of Objects Launched into Outer Space enumerates the categories of information concerning each space object which have to be furnished to the Secretary General of the UN. The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial bodies interprets in detail the principle of peaceful uses of outer space in relation to activities on celestial bodies.

#### **IV Conclusion**

The use of optical space communication is evidently less intensively regulated than it is the case of radio communication. As long as this *status quo* is perceived as sufficient by the ITU members, there is no need to over-regulate and impede technical developments in this sphere of activities. This does not mean, however, that optical communication can be used outside of any international legal framework: Both the ITU legal framework and the provisions of UN space treaties provide for a general legal background which has to be respected. Specifically, both sets of rules prohibit interference with the interests of other States which could materialize in many forms, including the form of disruption of operation of telecommunication networks or collision with space activities of other States Parties. As sad it might sound for a visionary researcher, a completely law-free activity is hardly imaginable in today's world including outer space.

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13 S. Hobe et al. (eds.), *Cologne Commentary on Space Law*, Vol. 1, 2009, p. 142 (55, 58).