Maintaining the Master International Frequency Register

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1. Introduction
The present paper is the written elaboration of a presentation held under the same title at the workshop “International Regulations of Space Communications” held in Luxembourg on 24 and 25 May 2012. Consequently, the topic of this paper, the maintenance of the Master International Frequency Register as a key tool for allowing satellite communications to be a viable international sector of space activities, is viewed through the looking glass of the session title, “WRC-12 from the Perspective of International Telecommunications Law.”

In other words, it does not purport to deal with the actual details of maintaining the Register or even what the WRC-12 added to that, but rather represents an effort to properly situate the Register and the overall rationale for its maintenance within the broader context of WRCs – of which WRC-12 is merely the most recent one. From this perspective, the Register essentially reflects the main elements of, and registers the main data relevant to, the international regulation of satellite communications.

International telecommunication law at large is a branch of public international law, and as far as satellite communications in particular is concerned forms also part of the more specific branch of public international space law that is labelled space law. This, however, concerns such more general and overarching issues as the requirement that the use of space, including if for communication purposes, be “for the benefit and in the interests of all countries.” 1 In the current paper, therefore, we will focus on the international telecommunication aspects of satellite communications, most notably the Radio Regulations, the Table of Frequency Allocations and the aforementioned Master International Frequency Register.

2. The role of the ITU
From a technological perspective, telecommunications can generally be subdivided into wired respectively wireless (or radio) communications. In the latter case the basis for relevant operations is provide by the usage of frequencies without interference, whether intentional or accidental. To the extent moreover that wireless communications uses satellites as part of its infrastructure and network, an additional requirement is the physical position (earth orbits, or in the case of the geo-stationary orbit, orbital slots) for such satellites, without other space objects operating too close for comfort.

To the extent next that such telecommunication activities have international aspects, they constitute the domain in which the International Telecommunication Union (ITU) is active. In its original fashion the ITU was established in 1865. 2 Since 1992, the ITU

Constitution and the ITU Convention, both amended a few times since, plus the Radio Regulations provide the legal basis for the ITU and all its activities in the legal and regulatory domain.

As based on those semi-constitutional documents, the ITU plays a fundamental role in ensuring that cross-border radio communications can operate as interference-free as possible – and this requires, in the context of satellite communications, also de facto coordination of orbits respectively orbital slots. The ITU Constitution in this respect provides most prominently that the organization should:

“(a) effect allocation of bands of the radio-frequency spectrum, the allotment of radio frequencies and the registration of radio-frequency assignments and, for space services, of any associated orbital position in the geostationary-satellite orbit or of any associated characteristics of satellites in other orbits, in order to avoid harmful interference between radio stations of different countries; (b) coordinate efforts to eliminate harmful interference between radio stations of different countries and to improve the use made of the radio-frequency spectrum for radiocommunication services and of the geostationary-satellite and other satellite orbits.”

Whilst the ITU Constitution and ITU Convention provide the general institutional framework for handling international radio interference and coordination issues, it is the Radio Regulations, further to Articles 4(3) and 6 of the ITU Constitution, which provide the details of the regulatory regime which has developed ever since Sputnik-I was launched.

The first organ within the ITU that occupies itself principally and on a continuing basis with the Radio Regulations is the Radio Regulations Board. Its main duty is to supervise the registration of assignments of radio frequencies deriving from the processes under the ITU system. The Radio Regulations Board – as is normally the case with organs of intergovernmental organizations – consists of independent individuals who “shall serve, not as representing their respective Member States nor a region, but as custodians of an international public trust.” Consequently, they “shall refrain from intervening in decisions directly concerning the member’s own administration.”

The second ITU organ of note is the Radiocommunication Bureau, which actually processes the information of states on the application of the Radio Regulations and applies

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5. Cf. Art. 6, ITU Constitution: “The Member States are bound to abide by the provisions of this Constitution, the Convention and the Administrative Regulations”, which include the Radio Regulations as per Art. 4(3).
6. Cf. Art. 44(2), ITU Constitution: “In using frequency bands for radio services, Member States shall bear in mind that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations;” emphasis added.
8. See Art. 14(2.a), ITU Constitution.
10. Art. 14(3.1), ITU Constitution.
the Rules of Procedure on handling possible conflicts.\textsuperscript{11} Thereby, it should “effect an orderly recording and registration of frequency assignments and, where appropriate, the associated orbital characteristics, and keep up to date the Master International Frequency Register;” it should “review entries in that Register with a view to amending or eliminating, as appropriate, those which do not reflect actual frequency usage, in agreement with the administration concerned;” and it should “assist in the resolution of cases of harmful interference.”\textsuperscript{12}

In that sense, the Master International Frequency Register is indeed the core of the ITU system addressing the issue of an international environment for using radio frequencies with as little interference as possible. At the same time, the Master International Frequency Register is embedded in, and the result of application and implementation of, other key elements of that regime, notably the Radio Regulations and the Table of Frequency Allocations.

3. The Radio Regulations

The Radio Regulations provide the highest-level set of legal arrangements directly pertinent to the use of frequencies in the international context. They constitute a single huge document prone to relatively frequent change, in order to reflect the constantly evolving need for specific frequencies for specific (space) services, (space) telecommunication systems and (space) operators.

The first part of the Radio Regulations, however, is generally speaking of a more permanent nature, as it sets out the baseline elements of the ITU system for coordination of international usage of frequencies and, as relevant, the attendant satellite orbits or positions, \textit{inter alia} by way of providing a set of key definitions.

Following from such definitions and the way in which the Radio Regulations and further implementing regulation apply them, the assignment of radio frequencies – which the aforementioned Radio Communications Bureau is in charge of recording and registering – is actually a third step in the complicated ITU system for coordination of the use of any such frequencies in an international context.

The first step in that process is \textit{allocation}, which refers to the ‘reservation’ at the international level of frequency bands (and, if relevant, associated orbits or orbital slots) to categories of services using radio waves. The Radio Regulations in this respect define “allocation (of a frequency band)” as “[e]ntry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radiocommunication services or the radio astronomy service under specified conditions. This term shall also be applied to the frequency band concerned.”\textsuperscript{13}

This part of the process is usually handled by way of the World Radio Conferences (WRCs), previously called World Administrative Radio Conferences (WARCs), usually held every two or three years.\textsuperscript{14} At the WRCs, the ITU member states thus “may partially or, in exceptional cases, completely, revise the Radio Regulations.”\textsuperscript{15}

\textsuperscript{11} See Art. 12 (2.2.c-d), ITU Convention.
\textsuperscript{12} Art. 12(2.2.e-f), ITU Convention.
\textsuperscript{13} Art. 1(16), Radio Regulations.
\textsuperscript{14} See Art. 13(2), ITU Constitution. The \textit{modus operandi} of the WRCs is further regulated in particular by Art. 7, ITU Convention.
\textsuperscript{15} Art. 13(1), ITU Constitution.
In effect, this means that, as technical, economic and other developments change the
(perceived) need for certain bandwidth, at the WRCs it will be decided to ‘reserve’ new
frequency bands for specific services and/or ‘take away’ certain bandwidth from others
apparently not so much in need thereof.

For example, once following Sputnik’s launch in 1957 it became clear that
telecommunications would soon start to use satellites as part of their networks, at the 1959
WARC the concept of ‘space services’ was introduced, and a certain amount of bandwidth
set aside for it. An Extra-ordinary Administrative Radio Conference (EARC) in 1963,
exclusively dedicated to space communications, amongst others promulgated the ‘first
come, first served’ principle as the leading one in allowing space system operations to use
certain frequencies. After space communications had undergone yet further development,
it was decide in 1971 to separate ‘space services’ into fixed satellite services (FSS), mobile
satellite services (MSS) and broadcasting satellite services (BSS), with appropriate
amounts of bandwidth set aside for each of them. Nowadays, amongst a total of 42 separate
services more than a dozen separate space services are distinguished, more recently
including such precisely delineated fields as radionavigation-satellite services and
radiolocation-satellite services.16

The second step in the process of arranging the international use of the radio frequency
spectrum is allotment, which refers to the ‘reservation’ of specific frequencies, with where
relevant associated orbits or orbital slots, to states for the purpose of specific satellite
projects and the services these intend to provide. The Radio Regulations define “allotment
(of a radio frequency or radio frequency channel)” as “[e]ntry of a designated frequency
channel in an agreed plan, adopted by a competent conference, for use by one or more
administrations for a terrestrial or space radiocommunication service in one or more
identified countries or geographical areas and under specified conditions.” 17
‘Administration’ here refers to “[a]ny governmental department or service
responsible for discharging the obligations undertaken in the Constitution of the International
Telecommunication Union, in the Convention of the International Telecommunication
Union and in the Administrative Regulations.”18

If indeed the radio frequencies thus allotted were to be used by the state concerned itself,
read a public operator somehow part of the governmental system, the third step – of
‘assignment’ properly speaking – would follow automatically. ‘Assignment’ in other
words concerns the ‘reservation’ of specific frequencies to specific operators for purposes
of the services these intended to provide.

If, by contrast, the actual intended operator would either be an intergovernmental
organization or a private operator, neither of those having independent competence to ask
for ‘allotment’ of frequencies, ‘assignment’ would effectively constitute a distinct third
step whereby formally the state to which the frequencies were allotted would permit that
operator to use them – or, as the Radio Regulations provide: the “assignment (of a radio
frequency or radio frequency channel)” refers to “[a]uthorization given by an
administration for a radio station to use a radio frequency or radio frequency channel under
specified conditions.”19 In the case of an intergovernmental organization, that would

16. See Art. 1(43), resp. 1(49), Radio Regulations.
18. Art. 1(2), Radio Regulations; emphasis added.
normally be the host state of that organization; in the case of a private operator, it would likely be the state under whose (territorial) jurisdiction that operator falls.

This system is most succinctly summarized by the Radio Regulations by way of the following matrix:20

<table>
<thead>
<tr>
<th>Frequency distribution to</th>
<th>French</th>
<th>English</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Services</td>
<td>Attribution</td>
<td>Allocation</td>
<td>Atribución</td>
</tr>
<tr>
<td></td>
<td>(attribuer)</td>
<td>(to allocate)</td>
<td>(atribuir)</td>
</tr>
<tr>
<td>Areas or countries</td>
<td>Allotissement</td>
<td>Allotment</td>
<td>Adjudicación</td>
</tr>
<tr>
<td></td>
<td>(allotir)</td>
<td>(to allot)</td>
<td>(adjudicar)</td>
</tr>
<tr>
<td>Stations</td>
<td>Assignation</td>
<td>Assignment</td>
<td>Asignación</td>
</tr>
<tr>
<td></td>
<td>(assigner)</td>
<td>(to assign)</td>
<td>(asignar)</td>
</tr>
</tbody>
</table>

Figure 1. Matrix of key terminology of the Radio Regulations, as per Art. 5 – Introduction.

In practice the above system meant that a state could request allotment of certain frequencies either for its own purposes or for specific assignment to a private or intergovernmental operator at any one particular time. Obviously, firstly such requests for allotment/assignment would have to fit within the allocations ruling at that moment in time. If, for instance, the proposed satellite system was intended for radionavigation-satellite purposes, the specific frequencies whose allotment/assignment was requested should fit within the frequency bands allocated to that type of service.

Secondly, then, the coordination process taking place under auspices of the ITU would amount to possibilities for all other member states than the one requesting the allotment/assignment to report threats of possible interference with their respective systems (whether actual or intended, in the latter case of course having formally entered the ITU process before the system whose allotment/assignment is now at issue). If such potential interference was reported, the requesting state had the primary obligation to accommodate, which usually meant that it had to propose alternative frequencies (in which case the process would start all over again) or other methods by which such interference would be avoided. Once no other ITU member state could reasonably claim its communication operations to be at risk by the newly proposed system, the frequencies in question would be allotted/assigned and included in the Master International Frequency Register, and as such be legally protected against interference by others.

4. The Table of Frequency Allocations

Following the above general analysis, the Table of Frequency Allocations constituted, beyond the Radio Regulations, the second level of detailed regulation of international coordination of radiofrequency usage, as it were one level above the Master International Frequency Register. Actually, Article 5 of the Radio Regulations incorporates that Table of Frequency Allocations – for a total of 136 pages, subdivided in a number of various relevant sections.

Section I of Article 5 provides for the delineation of the three ITU regions and the areas, which they comprised. This represented the first instance at which allowance was made

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20 Drawn from Art. 5 – Introduction, Radio Regulations.
within the ITU for allocations, allotments or assignments not being of worldwide scope. A system could after all well operate without interference in one particular area of the world when the only other operator using the same frequency would operate exclusively in a different part of the world.

Thus, following the perspective from the geo-stationary orbit almost 36,000 km above the equator (still by far the most interesting orbit for satellite communication purposes), the earth is divided into three main ITU regions: Region 1 roughly encompassing Europe, Africa and (for political purposes) Russia; Region 2 combining North- and South-America, and Region 3 being Asia, Australia and the Western part of the Pacific, with certain further sub-divisions for certain (once again largely political) reasons.21

Section II of Article 5 provides for a second instance of such recognition of the desirability to be flexible in allocating frequencies to certain areas, by listing various categories of services and allocations. A distinction is made between ‘primary services’ and ‘secondary services’, whereby the latter

“a) shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date; b) cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date; [yet] c) can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date.”22

Next, the possibility is offered to allocate frequency bands, through the mechanism of ‘footnotes,’ to a certain country or group of countries only.23 If those are ‘additional allocations,’ they are essentially entitled to the same rights as primary services for the country or countries to which the footnote applies; if they are by contrast ‘alternative allocations,’ they are on a par with secondary services for the country or countries at issue.24 Finally, services may even enjoy without further ado the possibility to use certain frequencies under a strict ‘no harmful interference, no protection against harmful interference’ regime.25

Section III, comprising paragraphs 5.46 through 5.52, provides for a brief ‘Description of the Table of Frequency Allocations,’ which is then followed by Section IV, comprising the bulk of the Table of Frequency Allocations. Over a total of 130 pages it provides for the actual implementation and application of the above concepts, definitions and principles with reference to a wide range of frequency bands.

Basically this encompasses all frequencies useful for telecommunication purposes, currently running from 9 kHz to 1,000 GHz, which largely for convenience’s sake have been subdivided in a number of frequency-band groupings. For each such frequency-band-grouping the Table of Section IV falls apart in two subsections.

The first subsection comprises the Table properly speaking: three columns which, while listing the boundary frequencies at issue, indicate the allocations specific to that band in the ITU region concerned – or sometimes in all three at the same time. In each box, the

21. See Art. 5(2), Radio Regulations, in conjunction with the further provisions of Art. 5(3)-(22).
22. Art. 5(29)-(31), Radio Regulations; see also Art. 5(23)-(28).
23. See Art. 5(32)-(33), Radio Regulations.
24. See Art. 5(34)-(41), esp. (36) & (40), Radio Regulations.
25. See Art. 5(43)-(43A), Radio Regulations.
primary services within that frequency band (and, as applicable, ITU region) are indicated in CAPS and secondary services in normal characters, whereas references to footnotes indicate there are further, sub-region level divergences from worldwide allocation. Thus, by way of example the very first page of the Table looks as follows:  

9-110 kHz

<table>
<thead>
<tr>
<th>Region 1</th>
<th>Region 2</th>
<th>Region 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Not allocated)</td>
<td>5.53</td>
<td>5.54</td>
</tr>
<tr>
<td>9-14</td>
<td>RADIONAVIGATION</td>
<td></td>
</tr>
<tr>
<td>14-19.95</td>
<td>FIXED</td>
<td>MARITIME MOBILE 5.57</td>
</tr>
<tr>
<td></td>
<td>5.55</td>
<td>5.56</td>
</tr>
<tr>
<td>19.95-20.05</td>
<td>STANDARD FREQUENCY AND TIME SIGNAL (20 kHz)</td>
<td></td>
</tr>
<tr>
<td>20.05-70</td>
<td>FIXED</td>
<td>MARITIME MOBILE 5.57</td>
</tr>
<tr>
<td></td>
<td>5.56</td>
<td>5.58</td>
</tr>
<tr>
<td>70-72</td>
<td>RADIONAVIGATION 5.60</td>
<td></td>
</tr>
<tr>
<td>70-90</td>
<td>FIXED</td>
<td>MARITIME MOBILE 5.57</td>
</tr>
<tr>
<td></td>
<td>MARITIME RADIO-NAVIGATION 5.60</td>
<td>Radiolocation</td>
</tr>
<tr>
<td>70-72</td>
<td>RADIONAVIGATION 5.60</td>
<td>Fixed</td>
</tr>
<tr>
<td></td>
<td>Maritime mobile 5.57</td>
<td>5.59</td>
</tr>
<tr>
<td>72-84</td>
<td>FIXED</td>
<td>MARITIME MOBILE 5.57</td>
</tr>
<tr>
<td></td>
<td>84-86</td>
<td>RADIONAVIGATION 5.60</td>
</tr>
<tr>
<td>84-86</td>
<td>RADIONAVIGATION 5.60</td>
<td>Fixed</td>
</tr>
<tr>
<td></td>
<td>Maritime mobile 5.57</td>
<td>5.59</td>
</tr>
<tr>
<td>86-90</td>
<td>FIXED</td>
<td>MARITIME MOBILE 5.57</td>
</tr>
<tr>
<td></td>
<td>86-90</td>
<td>RADIONAVIGATION 5.60</td>
</tr>
<tr>
<td>90-110</td>
<td>RADIONAVIGATION 5.62</td>
<td>Fixed</td>
</tr>
<tr>
<td></td>
<td>5.64</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2. The Table of Frequency Allocations for the frequency range 9-110 kHz, as per Art. 5 – Section IV, Radio Regulations.

Secondly, additional and alternative allocations for specific countries or groups of countries (here indicated through footnotes ## 5.53–5.64), with specific conditions as applicable, are spelled out on the following page, which in this case looks as follows:

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5.53 Administrations authorizing the use of frequencies below 9 kHz shall ensure that no harmful interference is caused thereby to the services to which the bands above 9 kHz are allocated.

5.54 Administrations conducting scientific research using frequencies below 9 kHz are urged to advise other administrations that may be concerned in order that such research may be afforded all practicable protection from harmful interference.

5.55 Additional allocation: in Armenia, Azerbaijan, Bulgaria, the Russian Federation, Georgia, Kyrgyzstan, Tajikistan and Turkmenistan, the band 14-17 kHz is also allocated to the radionavigation service on a primary basis.  (WRC-2000)

5.56 The stations of services to which the bands 14-19.95 kHz and 20.05-70 kHz and in Region 1 also the bands 72-84 kHz and 86-90 kHz are allocated may transmit standard frequency and time signals. Such stations shall be afforded protection from harmful interference. In Armenia, Azerbaijan, Belarus, Bulgaria, the Russian Federation, Georgia, Kazakhstan, Mongolia, Kyrgyzstan, Slovakia, the Czech Rep., Tajikistan and Turkmenistan, the frequencies 25 kHz and 50 kHz will be used for this purpose under the same conditions.  (WRC-03)

5.57 The use of the bands 14-19.95 kHz, 20.05-70 kHz and 70-90 kHz (72-84 kHz and 86-90 kHz in Region 1) by the maritime mobile service is limited to coast radiotelegraph stations (A1A and F1B only). Exceptionally, the use of class J2B or J7B emissions is authorized subject to the necessary bandwidth not exceeding that normally used for class A1A or F1B emissions in the band concerned.

5.58 Additional allocation: in Armenia, Azerbaijan, the Russian Federation, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan, the band 67-70 kHz is also allocated to the radionavigation service on a primary basis.  (WRC-2000)

5.59 Different category of service: in Bangladesh and Pakistan, the allocation of the bands 70-72 kHz and 84-86 kHz to the fixed and maritime mobile services is on a primary basis (see No. 5.33).  (WRC-2000)

5.60 In the bands 70-90 kHz (70-86 kHz in Region 1) and 110-130 kHz (112-130 kHz in Region 1), pulsed radionavigation systems may be used on condition that they do not cause harmful interference to other services to which these bands are allocated.

5.61 In Region 2, the establishment and operation of stations in the maritime radionavigation service in the bands 70-90 kHz and 110-130 kHz shall be subject to agreement obtained under No. 9.21 with administrations whose services, operating in accordance with the Table, may be affected. However, stations of the fixed, maritime mobile and radio-location services shall not cause harmful interference to stations in the maritime radionavigation service established under such agreements.

5.62 Administrations which operate stations in the radionavigation service in the band 90-110 kHz are urged to coordinate technical and operating characteristics in such a way as to avoid harmful interference to the services provided by these stations.

5.63 (SUP - WRC-97)

5.64 Only classes A1A or F1B, A2C, A3C, F1C or F3C emissions are authorized for stations of the fixed service in the bands allocated to this service between 90 kHz and 160 kHz (148.5 kHz in Region 1) and for stations of the maritime mobile service in the bands allocated to this service between 110 kHz and 160 kHz (148.5 kHz in Region 1). Exceptionally, class J2B or J7B emissions are also authorized in the bands between 110 kHz and 160 kHz (148.5 kHz in Region 1) for stations of the maritime mobile service.

Figure 3. The Table of Frequency Allocations’ footnotes for the frequency range 9-110 kHz, as per Art. 5 – Section IV, Radio Regulations.

Legend: WRC[-year] – means incorporated at applicable WRC; SUP = suppressed.

As indicated, it is thus within the various parameters and boundary conditions provided by the Table of Frequency Allocations, that national authorities should consider requesting allotments and handing out assignments, of course as far as frequency usage with international effects is concerned. For those reasons, many national authorities provide
copies of the Table of Frequency Allocations backed up with their own national version of implementation of that Table.

Thus, the following excerpt of the US national Table shows how, in the United States, the Federal Communications Commission (FCC) as the responsible government body has dealt with these issues at a federal as well as non-federal level:

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<table>
<thead>
<tr>
<th>Region 1 Table</th>
<th>Region 2 Table</th>
<th>Region 3 Table</th>
<th>Federal Table</th>
<th>Non-Federal Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 9 (Not Allocated)</td>
<td>9-10 RADIONAVIGATION</td>
<td>9-14 RADIONAVIGATION</td>
<td>Below 9 (Not Allocated)</td>
<td>US18 US18</td>
</tr>
<tr>
<td>14-19.95 FIXED MARITIME MOBILE 5.57</td>
<td>14-19.95 FIXED MARITIME MOBILE 5.57</td>
<td>14-19.95 Fixed</td>
<td>US2 US2</td>
<td></td>
</tr>
<tr>
<td>19.5-20.20 STANDARD FREQUENCY AND TIME SIGNAL (20 kHz)</td>
<td>19.5-20.20 STANDARD FREQUENCY AND TIME SIGNAL (20 kHz)</td>
<td>US2 US2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.05-20.89 FIXED MARITIME MOBILE 5.57</td>
<td>20.05-20.89 FIXED MARITIME MOBILE 5.57</td>
<td>US2 US2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-61 STANDARD FREQUENCY AND TIME SIGNAL (60 kHz)</td>
<td>50-61 STANDARD FREQUENCY AND TIME SIGNAL (60 kHz)</td>
<td>US2 US2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-70 FIXED MARITIME MOBILE 5.57</td>
<td>61-70 FIXED MARITIME MOBILE 5.57</td>
<td>US2 US2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70-80 FIXED MARITIME MOBILE 5.57 RADIODIRECTION</td>
<td>70-80 FIXED MARITIME MOBILE 5.57 RADIODIRECTION</td>
<td>US2 US2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80-90 FIXED MARITIME MOBILE 5.57 RADIODIRECTION</td>
<td>80-90 FIXED MARITIME MOBILE 5.57 RADIODIRECTION</td>
<td>US2 US2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4. The FCC Table of Frequency Allocations for the frequency range 9-90 kHz, as per 47 C.F.R. § 2.106, as revised 30 August 2011.

Legend: US = footnote specific to the United States.

Also in this case, the footnotes – now both the international ones and the national ones – are explained further down in the document.

5. The Master International Frequency Register

The system of international and national Tables of Frequency Allocations finally brings us to the third level: the Master International Frequency Register. It is, of course, within appropriate allocations as per these Tables that states can notify assignments with the ITU in order to be recorded in the Master International Frequency Register, seeking (and at least in law also receiving) international recognition of the right to uninhibited and interference-free usage of those frequencies for the purposes intended.

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27. FCC Online Table of Frequency Allocations; 47 C.F.R. § 2.106; Revised on August 30, 2011, p. 1.
The Register thus comprises authorized frequencies for existing systems, further containing relevant technical data of satellite networks. Such detailed data on satellite networks are only entered in the Register after the coordination process has shown that no state can make a valid objection to the proposed network operations, in particular from the perspective of its own allotments being potentially threatened by interference.

For space systems it is particularly noteworthy that the on-line Space Network Systems (SNS) database\textsuperscript{29} contains, in addition to a brief overview of the Radio Regulations referring to space services (and general information concerning statistics), data on more than 10,600 geostationary satellite filings, 1,070 non-geostationary satellite filings and 7,900 earth station filings. Within this database, a freely navigable query system allows searching for specific information.\textsuperscript{30} Targeting, for example, the frequencies from 2,000 to 2,200 MHz and geostationary orbital positions from $-10^\circ$ to $+10^\circ$ longitude such a query comes forth with the following results:

![Space Network List Online](http://www.itu.int/snl/freqtab_snl.html)

**Legend:** A = advanced notification; C = coordination; N = notification.

For each individual satellite, by clicking on its name, information beyond the category of the submitted notice, the code of the notifying administration, and the code of the satellite network organization can be retrieved. For example, for MSG-S2 the following parameters will be offered:

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\textsuperscript{29} At [http://www.itu.int/sns](http://www.itu.int/sns).

\textsuperscript{30} At [http://www.itu.int/snl/freqtab_snl.html](http://www.itu.int/snl/freqtab_snl.html).
Figure 6. Data for MSG-S2, as per the Space Network List Online database.
Legend: ID number = identification number; adm = Notifying Administration; F = France; ORG = (international) organization; ESA = European Space Agency; MSG-S2 = Meteosat Second Generation-Satellite 2; long_nom = nominal longitude; ssn_ref = space systems network; ssn_no = space systems network number; WIC/IFIC = Weekly Information Circulars/International Frequency Information Circular.

Viewing the frequencies for MSG-S2 would further deliver the following results:

![Table of frequencies for MSG-S2]

Figure 7. Data for MSG-S2, as per the Space Network List Online database.
Legend: ADVP = Algorithm Development and Verification Plan; EM = space station in the meteorological-satellite service; ED = space telecommand space station; EK = space tracking space station; ER = space telemetering space station.
Without going into the specific technical details of the data thus provided, it is, therefore, on the basis of this Master International Frequency Register that states and operators interested in operating space services, respectively the ITU officials, can determine in the most efficient and precise way whether a particular new proposed satellite system would be likely to result in interference with existing or earlier-registered satellites – and thus how to likely avoid protracted problems in having their own intended frequencies registered and thereby legally protected.

6. Through the Looking Glass of International Law: the ITU system analysed

Of course, the ITU system with its long and rich history, wealth of regulation and documentation, and multifaceted approach to the international use of radio frequencies does not lend itself to complete analysis within the context of a single paper. Even merely targeting recent developments and the need for the ITU to adapt to an increasingly globalized, digitalized and commercialized world would probably be beyond reach here.\(^{31}\)

Limiting oneself therefore to an international perspective, ‘traditional’ international law has always focused on states as the dominant actors in the international arena whilst much of the technical and operational development in particular in the world of telecommunications is driven by private commercial operators. From such a perspective it should be possible to come up with some sensible conclusions with a view to the future, \(\textit{inter alia}\) to help judge whether the ITU is still up to the challenge of addressing the telecommunication needs of today’s world through such mechanisms as the Radio Regulations, the Table of Frequency Allocations and the Master International Frequency Register.

When analysing the system for international coordination of frequency usage summarily sketched above through the lens of public international law then, the most appropriate starting point is the ITU institutional structure. This particular system in short encompasses both the legal reality of sovereign states and the practical reality of operations, which in most cases are now undertaken by private operators interested in technical/operational transparency and consistency of regulation above everything else – and tries to reconcile the two.

On the one hand, it has been recognised that “radio frequencies and any associated orbits (…) are limited natural resources,”\(^{32}\) and that the “use of outer space [which includes the use of satellite positions and space frequencies](…) shall be the province of all mankind.”\(^{33}\) On the other hand, the ITU, charged with custodianship of those particular resources, is still very much a ‘classical’ intergovernmental organization ‘ruled’ at highest level by sovereign states.

Balancing the two, the larger role of such organizations as well as private operators in the field is being recognised within the ITU context (and increasingly so),\(^{34}\) and the involvement of individual experts through the two ITU organs mentioned ensures that to a considerable extent the actual regulation is, at least at a second and more practically oriented level largely technologically-driven.

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31. See for those interested in a thorough overview thereof e.g. Lyall, Chh. 5-6.
32. Art. 44(2), ITU Constitution.
34. Cf. e.g. Lyall, 141-3.
This then occurs through the Radio Regulations, as developed and continuously updated at WRCs by the totality of ITU member states and providing, within the context of the ITU Constitution and Convention, for a binding set of rules applicable worldwide and recognizing the need for a globally transparent, consistent and coherent system of the scarce resource which is radio frequencies (and, as applicable, orbits or orbital slots).

Yet, within this need for a worldwide regulatory system the decision-making process within the ITU on these issues as per the WRCs also recognizes the sovereignty of its member states: it fundamentally allows for individual – read, in particular, national/sovereign – deviations as long as these properly fit into this international system. The implementation of the international Table of Frequency Allocations by way of national Tables, as well as the recognition that only once properly coordinated with potentially affected other users (read the sovereign states exercising jurisdiction over them) allotments and assignments can be registered in the Master International Frequency Register and thus be entitled to legal protection, guarantees a minimum level of coherence here.

A next question then would concern the character of the ‘law’ or ‘regulation’ which is the outcome of this institutional process. It is of increasing importance in particular with a view to the on-going globalization, commercialization and privatization of the sector to precisely determine to what extent the sovereign member states of the ITU would be legally bound by that outcome, or would rather have to consider them as guidelines to which it makes simply – usually – sense to adhere.

With the ITU Constitution, ITU Convention and Radio Regulations, as indicated, there is no question regarding their binding force, but beyond that: is it (all) truly binding (international) law – or should the Table of Frequency Allocations and the Master International Frequency Register perhaps be classified as ‘soft law’?

‘Soft law’ has been variously described as a set of ‘rules’ emanating from “written instruments that might purport to specify standards of conduct, but do not emanate from the traditional ‘sources’ of public international law” or “non-binding international instruments that (...) create no obligation to States under international law” yet may “provide guidelines and codes of conduct which describe rather precisely what is to be considered desirable, reasonable and responsible behaviour in the conduct of activities in outer space,” thus for example helping to determine standards of ‘fault’ and ‘due diligence’ with respect to legally binding obligations.

Furthermore, in the present context of satellite communications at a basic level it is the laws of physics which rule: if two or more transmitters use the same frequency without further ado, white noise will result for all concerned. *Ipso facto* this provides a strong impetus to arriving at *any* sort of recognition of an international system of coordinating

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international frequency use – and to the extent necessary accepting the resulting limitations to the use of sovereign discretion in using them as deemed fit by a particular state.

Beyond that, formally also the Table of Frequency Allocations that results from application of the – binding – Radio Regulations and forms an integral part thereof, constitutes binding law that legally requires adherence by member states including, as necessary, domestic legal implementation. Ignoring it in proceeding to operate or allowing a private party to operate a satellite using frequencies for operations not in conformity with the Table – unlikely and unprofitable as it may be with a view to the aforementioned laws of physics – as such is a violation of an international obligation.

With respect to the Master International Frequency Register the analysis becomes a bit more complicated, however. The Register is mentioned in the Convention and the Radio Regulations, which seems to suggest particular care before labelling this as binding law. Moreover, one should be aware of the considerable number of loopholes that are woven into the ITU regime, such as the right of member states to keep military usage of communication frequencies completely outside of this regime, a similar right to prohibit and prevent the use of frequencies if considered dangerous to security, or contrary to the laws, public order or decency within that state or even a more generic right to temporarily suspend certain uses of frequencies.

On the other hand, that does not as such deny binding force to the Master International Frequency Register and its registrations of orbital frequencies and their entitled users; it merely provides for exceptions to applicability of the underlying obligations emanating from the ITU Constitution, ITU Convention, Radio Regulations and Table of Frequency Allocations. Also the Register moreover obviously has its value from a practical respectively laws-of-physics perspective, strongly encouraging states and private operators to honour the rights attached to the registered frequencies and their usage.

Perhaps the ultimate test here would be how disputes on these issues would come to be solved – so far, none have arrived at a stage where properly speaking their legal character has been addressed and assessed. A brief look at dispute settlement therefore seems due in anticipation of such legal disputes, which seem likely to occur sooner or later.

The ITU regime itself does provide for a dispute settlement system. Under its terms, member states may settle disputes on the interpretation or application of the ITU Constitution, ITU Convention or Radio Regulations by negotiation, through diplomatic channels, or through procedures in bilateral or multilateral treaties for the settlement of international disputes, or by any other method mutually agreed upon – and if none of these methods is adopted, any member state may have recourse to arbitration in accordance with the procedure defined in the ITU Convention.

This clause actually refers to the Optional Protocol on the Compulsory Settlement of Disputes – which however is limited to application between member states, and does not offer any direct options for private operators (or international organizations) involved in relevant disputes. This may turn out to be a major issue, now that private operators both in practice and in the regulatory context of the ITU continue to gain importance; a dispute

37. See Art. 12, ITU Convention, resp. Art. 1, Radio Regulations.
38. See Art. 48, ITU Constitution.
40. See Art. 35, ITU Constitution.
41. See Art. 56, ITU Constitution.
settlement system which is formally blind to such developments, read actors and stakeholders, tends to become increasingly opaque. Yet neither within the ITU nor in the more general UN environment are such mechanisms readily available: also the ICJ of course has jurisdiction only with respect to disputes between sovereign states.\footnote{Cf. Art. 34(1), Statute of the International Court of Justice.}

Perhaps this means that, at least for disputes related to \textit{space} communications, the PCA Optional Rules for Arbitration of Disputes Relating to Outer Space Activities,\footnote{Optional Rules for Arbitration of Disputes Relating to Outer Space Activities, effective 6 December 2011 (hereafter PCA Optional Rules).} based on the 2010 UNCITRAL Arbitration Rules, might become an interesting option. The invocation of these rules, formally adopted December 2011, in principle is open to states, intergovernmental organizations and private parties, and can be freely applied to any dispute determined by the parties to be subjected to it.\footnote{Cf. Art. 1(1), PCA Optional Rules.} Application of the Rules by way of an agreement to arbitrate furthermore constitutes a waiver of any immunity to jurisdiction, though not of immunity \textit{vis-à-vis} execution.\footnote{See Art. 1(2), PCA Optional Rules.} Awards under the Rules are final and binding,\footnote{See Art. 34(2), PCA Optional Rules.} and individual experts may be appointed by an arbitral tribunal to cater for the potentially highly technical aspects of disputes in, for instance, satellite communication disputes.\footnote{See Art. 29, PCA Optional Rules.}

As sooner or later it might be expected that disputes on the scarce resources of frequencies, orbits and orbital slots can no longer be contained at the diplomatic, inter-state level, such dispute resolution mechanisms involving private entities more or less on a par with states would become increasingly important. To the extent that this would turn out to be relevant for such disputes to be properly settled, one should also expect some clarity to come about as regards the extent in which the Master International Frequency Register, its individual registrations and the rights attached thereto will have to be respected also by sovereign states. Needless to say, that even in the absence of a formal obligation to do so, the Register plays a fundamental role in properly regulating the use of frequencies, orbits and orbital slots for maximum usage by states and private operators alike.