

Status and Possible Refinement of Regulations for Satellite Services in Bhutan

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¹ It is anticipated that applicants will rely on the satellite operator to provide the information noting that this should be straightforward for the operator.

INTRODUCTION

The Bhutan InfoComm and Media Authority has contracted Hendrik Prins (Cemdia Pty, Ltd) to carry out an independent review of the current scenario of satellite services usage in Bhutan, the work and responsibilities of the Authority, a review of its regulatory role and framework, to recommend on its improvement, and to formulate rules that are in alignment with international regulation to effectively govern satellite services.

The terms of reference elaborated as follows by indicating that -

“The core objective of this Consultancy service is to review existing Policies/Rules/Guidelines/Literature available and:

- 1. analyze and assess the existing organization’s capacity in dealing with the regulation of satellite services and technology in the country,*
- 2. assess the roles and responsibilities of the regulator, and the other stakeholders in effective regulation of satellite services,*
- 3. study and assess the existing satellite services usage in the country,*
- 4. Develop a regulatory framework or “Rules.”*

The following Parts and Sections address the above.

PART 1: REVIEW OF SATELLITE SERVICE AND ITS REGULATION IN BHUTAN

1. Current satellite service situation

At face value given the unique situation of Bhutan as a small relatively isolated nation with a large proportion of the population living in rural and remote communities, it might be expected that satellite communications would already play a significant role as a key element of the domestic and international telecommunications infrastructure.

However this is currently not the case. Information provided by industry during face-to-face meetings indicated that there is only a very modest¹ reliance on satellite for the provision of domestic television relay, some back-up dedicated data links to business offices outside the capital and some cellular back-haul. This is confirmed by a review of licenses issued by BICMA for satellite services including for broadcast relay, VSAT for point-to-multipoint links for ISPs and point-to-point links for mobile operators.

The reason for this very modest reliance on satellite appears to be driven primarily by two factors -

1. High capital and operational cost of satellite service provision noting that capacity can only be sourced from foreign, third party satellite operators.
2. Relatively reliable, low cost backhaul communication available throughout most of the county via the state owned electrical distribution network using optical fiber overlay.

Notwithstanding the foregoing, there is clearly significant interest from the private and government sectors in exploring the potential of satellite communication to enhance, expand, and supplement existing terrestrial technologies with satellite technology in order to provide a higher quality of service that can reach all parts of the country where telecommunications services are required and new innovative telecommunications services are in demand.

Furthermore it is made explicit in the Bhutan Information Communications and Media Act of 2006 that the Minister has an obligation to “provide concerted Government leadership and support in the development of ICT facilities” and to “plan infrastructure development, in consultation with the Authority and the public and private sector” (Section 5 of the act).

In this respect it is reasonable to assume that the Ministry and BICMA are of the view that satellite communication could play an important role². Indeed, this is evidenced by the fact that BICMA is now seeking to independently review, and if required, improve the regulatory aspect of satellite communications in order to facilitate the delivery of satellite services.

2. Role of BICMA in facilitating satellite infrastructure development

While in general terms BICMA’s role as a “facilitator” of ICT is clear, it has other more explicit responsibilities as the agency responsible for the management of the Radiofrequency spectrum in Bhutan³.

¹ Fewer than 20 satellite links in operation

² Confirmed during a meeting with senior Ministry officials during first visit

³ See Chapter 3 section 25(a) of the Information Communications and Media Act 2006

The key documents pertaining to domestic spectrum management are the “National Radio Rules” of the Kingdom of Bhutan. These documents provide a comprehensive, framework for national spectrum management for all types of service allocations. Together with the relevant provisions in the Bhutan Information communications and Media Act, they provide a solid legal basis and framework for the effective and efficient management of the radiofrequency spectrum in Bhutan.

In this respect, the critical point is that the focus of this review can concentrate on the practical “implementation” aspects of satellite service spectrum management.

In broad terms, there are two distinct areas that need to be managed, namely -

1. Planning and licensing for the most efficient use of spectrum allocated nationally for satellite only use or multiple services use, and managing the potential for interference within and/or between the respective services.
2. Dealing with the inherent international regulatory aspect of satellite communications and specifically with the potential to cause harmful interference to protected assignments of other administrations.⁴

For both of these areas an assessment has been made of the effectiveness of the current satellite regulations, together with proposals for additional “rules” aimed at improving spectrum management if required, along with an opinion on the capability or otherwise of BICMA as currently structured and staffed to properly perform its role as spectrum manager.

3. Review of the “Bhutan Radio Rules”

In the case of Bhutan, the “Radio Rules” contain all information pertinent to the management of the radiofrequency spectrum. The Radio Rules properly and adequately reflect the obligation of the national spectrum manager to “authorise assignments” that involve emissions in any portion of the radiofrequency spectrum in an appropriate manner as part of its treaty obligations for as outlined in the Radio Regulations⁵.

3.1 Allocation related matters

Schedule 1 to Part IV of the Radio Rules contains the first (highest order) criteria for “potential” authorization (licensing) of assignments in the form of a The “Table of Frequency Allocations”. In this respect the schedule represents the spectrum management foundation for the kingdom of Bhutan”⁶. Indeed it has added significance because it also constitutes the “spectrum plan” for the Kingdom of Bhutan.⁷ A key feature of the plan is that it mirrors the allocations applicable for Region 3 in the Radio Regulations Article 5 “*Table of Frequency allocations*”.

It is notable however that the Radio Rules do not go to the next step often used by spectrum managers, such as the development and promulgation of supplementary technical guidelines or licensing instructions aimed at ensuring coexistence of multiple services in the same or

⁴ See Articles 11.2, 11.3 & 11.4 of the Radio Regulations

⁵ See Article 18.1

⁶ Radio Rules Part IV

⁷ See section 1.1(e) of Part III of the Radio Rules.

adjacent coverage areas without adverse interference impact the respective services, with the exception of the certain “band plans” designed to foster competitive provision of public mobile voice and data services.

In the case of Bhutan, where arguably there is only modest demand for access to spectrum leading to a situation where demand probably rarely exceeds supply, the situation can be managed by avoiding frequency overlap as an integral aspect of the licensing procedure. This has proven to be practical in Bhutan, because most license applications for wideband services (and those not subject to a band plan) are for “nationwide coverage” and a database of current licenses is in place. This suggests that the possibility of frequency overlap can be identified, and if necessary steps taken to avoid such instances on a case-by-case basis.

However it may not be prudent to assume that this spectrum management approach can continue indefinitely; particularly in the case of satellite when there is an assumed reliance of foreign networks and systems for which all the necessary information may not be readily available.

3.2 Licensing related matters

The preamble to Part III of the Radio Rules contains the following important text; *“The fair and efficient regulation of spectrum amongst numerous radio applications and a variety of users requires the adoption and implementation of transparent executive rules and terms of reference”....“Issues such as planning, licensing, permitting, spectrum pricing, trading, certificating, accrediting and enforcement are the essential objectives of Part III.”*

The pivotal role of “licensing” or “permitting” plays as a spectrum management tool is clear from the above, and indeed it is one of the most important functions of all national spectrum managers. As an essential prerequisite for the practical utilization of the radiofrequency and orbital resources for the benefit of Bhutan, it represents the practical outcome/output of the spectrum management process, and therefore the way it is managed and implemented is crucial.

Part III chapter 2.1 of the Radio Rules prescribes a number of license types, and for satellite services the only suitable applicable “division” for licensing would appear to be division 2 dealing with “Spectrum licenses”. A review of existing license documents supports the use of this category for satellite services.

Chapter 2.6 sets out the required content of spectrum licenses. The key elements are “geographical areas” and “maximum permitted levels of radio emissions that may be caused by the operation of radiocommunications apparatus under the license”. Clearly the licensing process must address both of these elements appropriately.

4. Spectrum planning and management issues for satellite services

With the above in mind it is useful to make an assessment of how, in practical terms, satellite services currently fit, or future services may fit⁸ within the current established spectrum management framework of the “spectrum plan” and “spectrum license” regime.

In the case of satellite, the manner in which those portions of spectrum that are typically used for satellite services are “allocated” in the “spectrum plan” is a pertinent factor. Not surprisingly, given the limited spectrum resource below 30 GHz, coupled with the objective of giving individual administrations maximum flexibility to use the spectrum to meet their national needs, the Table of Frequency Allocations in Article 5 of the Radio Regulations (and therefore also in the schedule in Part IV), typically lists multiple service categories in bands used for commercial satellite services.

In particular it is common for Fixed Satellite Services (FSS) bands with a primary allocation to be listed alongside a range of terrestrial services such as the Fixed and Mobile services also with a primary allocation. This is the case for core FSS bands including 3.4 ~ 4.2, 7.25 ~ 7.75, 10.7 ~ 11.7, 14.0 ~ 14.8, 17.3 ~ 18.6, 19.7 ~ 22.2 and 27.5 ~ 30.0 GHz.

The second issue of importance relates to the fact that because Bhutan has to rely totally on foreign satellite networks and systems for the provision of satellite services domestically, it has no direct control over the characteristics of the assignments used for such services. This has implications and ramifications for the licensing of satellite services. For example, there is a requirement to include information concerning the characteristics of the assignments to be licensed (authorized) including “maximum permitted levels of radio emissions” but these characteristics relate to assignments belonging to other administrations and the license applicant would typically not have any direct knowledge of them.

In the context of the above, a number of interference management related considerations come into focus including developments in satellite technology that should be addressed and they are discussed in some detail in Part 2.

5. Developments in satellite technology

Satellite technology development has picked up pace in recent years, and now appears set to pave the way for the delivery of lower cost, reliable, high capacity, high speed, low latency broadband connectivity directly to rural and remote enterprises, communities, government facilities, schools, and individual households. These developments will have a bearing on future satellite regulatory requirements and so will also need to be kept in mind when reviewing the current regulatory regime.

5.1 Advances in NGSO satellite technology suitable for higher frequencies

Technological advances focused on the higher frequency bands (Ka and above) coupled with large constellations of small low and medium earth orbiting satellites now appear certain to make the achievement of the economies of scale required to make the above a reality⁹. In this respect they have the potential to supplement the both mainstream terrestrial and GSO satellite telecommunications infrastructure deployments in many countries including Bhutan.

⁸ The section also takes account of future developments in satellite technology described in section 5

⁹ For examples see - www.O3B.com , www.onewb.com , www.spacex.com <http://www.boeing.com/space/>

5.2 Earth Stations in Motion (ESIMS)

The idea of expanding the utilization of the FSS by facilitating the use of mobile terminals as a supplement to fixed terminals has been under consideration in the ITU-R for some years. While a strong case can be made that expanding the use of the FSS would lead to spectrum and orbital utilization efficiency gains, it has also been recognised that a convergence of mobile and fixed has the potential to create regulatory difficulties and make the task of interference management more difficult in those bands where this would be sanctioned.

The other hurdle concerns the Service definition for FSS in the Radio Regulations of the FSS because arguably under this definition associating a mobile terminal with the FSS would be contrary to the Radio Regulations and therefore ESIMS were not notifiable and therefore could only be authorized under Article 4.4.

Despite those hurdles, WRC-15 approved the use of Earth Stations in Motion (ESIMSs) as elements of the FSS for up-links in the 29.5 to 30.0 GHz portion of the a portion of the Ka band, and WRC-19 will consider regulatory measures to facilitate ESIMS up-links in the 27.5 to 29.5 GHz portion of the Ka band. There are expectations that ESIMS will play an important role in the delivery of high-speed broadband using terminals located on vessels, aircraft and vehicles and that mobile access via the FSS may also be of interest for Bhutan.

Given the low potential for interference to other services that may be licensed in Bhutan, and the fact that ESIM emissions must remain within the coordination “envelope” of the associated satellite network, authorization of ESIMS could be managed on a case-by-case basis by seeking assurances from the network operator in question that it the ESIM elements of FSS networks will be operated in conformity with Resolution 155 WRC-15 and not cause harmful interference.

5.3 Pico-sats and Nano-sats

There has been growing interest in the use of Pico-sats and Nano-sats as a potential means of providing some very basic data access to rural and remote communities. They represent a category of small to very small NGSO low earth orbit satellites that are quick to be put into operation at low cost that. In situations where the capacity requirement is small and latency is not a key consideration they have the potential to fill a service niche in many countries including potentially in Bhutan.

Unfortunately a significant barrier to their broader adoption stems from the fact that there are no dedicated regulations for these types of satellites and so they must comply with the complex and costly procedures in place for more typical GSO networks and NGSO systems. Until this matter is resolved at anticipated no later than WRC-23, the full potential of this new category of satellite technology is very unlikely to be realized.

PART 2: SUMMARY OF REGULATORY SHORTCOMINGS

6. Managing interference

An analysis of the current regulatory regime for satellite services in Bhutan reveals that there are a number of shortcomings. These, if not adequately addressed, will constitute an ongoing regulatory risk for BICMA.

6.1 Domestic considerations

In the absence of supplementary technical guidelines and/or licensing instructions there is nothing to prevent interested parties applying for spectrum licenses for the same part of the frequency band and for geographically overlapping service areas.

Furthermore in the absence of supplementary technical guidelines and/or licensing instructions, it would be problematic for BICMA to refuse to grant licenses to applicants, and this opens the potential for mutual interference between the respective services if licenses were granted without careful prior mutual interference analysis studies either on the part of BICMA, the license applicant, or both, and mitigation methods were implemented on a case by case basis via additional license conditions.

For example, emissions from an earth station could interfere with fixed and mobile service receiving stations unless considerable separation distances were enforced. Conversely the emissions from fixed and mobile transmitting stations could interfere with earth station receivers unless exclusion zones were mandated.

In both cases there are no guidelines or regulations in place to forestall mutual interference and this has the potential to cause difficulties not only for the licensee but also for BICMA as the spectrum manager and recipient of the license fees. The regulatory risks associated with the difficulties identified above need to be mitigated appropriately.

6.2 International considerations

From an international perspective the primary concern is that space station assignments that are used to provide a service to Bhutan are not under Bhutanese jurisdiction. Furthermore as they are under foreign control it cannot be assumed that the downlink emissions providing satellite services to Bhutan are actually “authorized” (licensed) or that the assignments used for the reception of those downlink emissions have “protected” status, and thus can be assumed as safe to operate without being constrained by interference from other satellite downlink signals sharing the same portion of the spectrum.

Conversely, licensing the emissions from earth stations in Bhutan is problematic when third party satellite networks are involved. For example the characteristics of the earth station emissions must conform not only to the notified characteristics for the network in question, but to the conditions contained in all applicable coordination agreements in order to prevent harmful interference.

To further complicate matters it is not uncommon for satellite networks to be brought into use prior to notification, and even after notification for a significant proportion of the assignments to be subject to Article 11.41 of the Radio Regulations (no protection no interference conditions).

In other words, licensing assignments that form elements for a satellite network of another administration and operated by a commercial entity presumably authorized to do so by another administration, carries a significant degree of regulatory risk.

In summary, the risks implicit in the continued application of the current regulatory regime are the following -

1. The spectrum plan and licensing regime is not refined sufficiently to prevent licensing of assignments with allocations for different services in the same portion of spectrum and overlapping geographic areas, and as a consequence, the occurrence of mutual interference between services cannot be precluded.
2. The licensing regime is not refined enough to prevent the licensing of multiple satellite services in the same portion of spectrum and overlapping geographic areas using networks with close orbital spacing, and as a consequence, the occurrence of mutual interference between services licensed for the purpose of providing services in Bhutan in both uplink and downlink cannot be precluded.
3. There are no licensing procedures or provisions that would ensure that emissions from earth stations located in Bhutan do not cause harmful interference to the assignments of other administrations.
4. It is not clear from the license documentation whether or not license holders are entitled to any form of protection of their services.

PART 3: PROPOSALS FOR IMPROVEMENT OF SATELLITE SERVICE REGULATION

7. “Recommendations” for addressing shortcomings with respect to satellite services spectrum planning and management

It is recommended that very practical solutions are considered that, where possible -

- a) address the problem at a macro level,
- b) avoid complexity,
- c) are simple to implement and administer,
- d) are open and transparent,
- e) recognize the fact that industry stakeholders who choose to use foreign satellites can reasonably be expected to accept a share of the regulatory risk and part of the burden of managing and mitigating this risk,
- f) take advantage of the fact that the ITU-R procedures for satellite coordination and notification¹⁰ can be leveraged by national regulators as a core component of their role as national regulators,
- g) try to devise procedures that do not require a significant increase of existing BICMA human resources, or require significant additional specialist technical or regulatory skill to implement,
- h) devise supplementary procedures that can be implemented in a timely manner.

With the foregoing objectives in mind it is recommended that attention should be focused on three mechanisms, namely -

- ❖ Modest adjustment to the “Spectrum Plan”.
- ❖ Refinement and elaboration of the licensing procedures and associated prerequisite requirements for the licensing of satellite services using fixed earth stations including the adoption of applicant “letters of assurance”.
- ❖ Measures that take advantage of internationally recognized regulations related to the global circulation of mobile satellite terminals to “permit” the operation of such terminals. .

7.1 Recommended Spectrum Plan adjustments

The risk concerned with the potential to cause harmful interference between assignments of different services in the domestic context can be ameliorated by modifying the “spectrum plan” for certain bands that are potentially of most interest for commercial satellite operations. Specifically some sections in Schedule 1 in Part IV of the Radio Rules for Bhutan could be modified to eliminate multiple allocations and retain just the Fixed Satellite Service allocation for certain bands.

¹⁰ Radio Regulations Articles 9 & 11 and associated Appendices

While it is acknowledged that this would reduce flexibility in use of the spectrum, and arguably reduce overall spectrum efficiency, this would only be a problem if the demand for access to the radiofrequency spectrum for the bands under consideration exceeded supply.

In the case of Bhutan this would appear not to be the case so a “macro” approach would make good practical sense.

The question then is which bands should be considered for such a high level targeting for satellite allocation only. In this respect it is useful to look more broadly at the commercial FSS bands both in terms of their potential for FSS in Bhutan, as well as the demand for spectrum in these bands for other service applications particularly the Fixed Service (FS). The interesting aspect here is that while there is a general perception the lower frequency bands will generate more demand than higher frequency bands, this is not always the case and in any event is service dependent.

For example there is growing use of the Ka band for both FSS and FS globally but fortunately for both FSS and FS there are large allocations. That said in the context of Bhutan, it is likely that there will be continued demand for access to lower bands for FS, while at the same time for the FSS, Bhutan will be far more dependent of international trends, and in this case it is becoming clear that the focus will be the higher bands.

The other relevant factor here is that sharing between the FSS and the FS is also dependent on the type of orbit used by the FSS. Importantly, the feasibility of co-existence without undue constraint is far easier when NGSO is used for the FSS rather than the GSO.

With the above in mind it may make good practical sense to set aside just a portion of the Ka band for satellite and leave the other allocations unchanged. The reason being that in very general terms, over time it is anticipated that C band FSS use will diminish, the focus of NGSO FSS will be Ku and Ka, and for GSO FSS it will be Ka and above.

In the case of the FS, techniques such as extensive frequency re-use can be employed and this means that only modest portions of spectrum are required for applications such as backhaul point to point links and spectrum can be made available even if a significant portions of certain bands are dedicated to satellite.

Taking all of the above into account it is recommended that consideration be given to adjusting the Spectrum Plan to remove the FS and MS allocations from the following bands¹¹ -

- ❖ 17.7 ~ 19.7 GHz
- ❖ 27.5 ~ 29.5 GHz

7.2 Recommended refinement of licensing procedures for up-link emissions from fixed earth stations.

It would be prudent to refine the current licensing procedures to mitigate the risk of intra-service, mutual interference between assignments respectively for fixed earth stations in the

¹¹ The bands listed are the core Ka FSS bands and are the focus of many new commercial FSS developments.

FSS¹², BSS and MSS used by Bhutanese license holders for the provision of services in Bhutan. Examples of earth stations in this category would include -

- ❖ Hub stations for FSS networks and systems.
- ❖ VSATS for FSS networks and systems.
- ❖ Feeder link stations for the BSS networks.
- ❖ Hub or feeder link stations for MSS networks or systems.

A refinement of the procedures for licensing can also be used as an opportunity to clearly indicate which entity is responsible for dealing with incidences of interference if and when they arise, and how such interference events must be dealt with.

The recommended approach is to use the licensing process to first identify, and then logically compile all the relevant technical information associated with assignments that are associated with the service that is the subject of the license application. This information can be derived directly from ITU-R filing data for the satellite network or system that the license applicant intends to use for the provision of services in Bhutan.

The key point being that the ITU-R satellite filing data already contains all the information concerned with service area, orbital location/type, emissions power densities, regulatory status, priority etc that is normally required for the “authorization” or “licensing” of satellite transmissions by administrations, and this is the case also for Bhutan.

From BICMA’s perspective the licensing procedure could be used to gather the information required for it to identify and quantify its regulatory exposure and therefore perform an assessment of its potential exposure to risk. With this information it would be in a position to make prudent licensing decisions.

With this in mind it is recommended that the current license procedures be bolstered and refined by requiring applicants for satellite licenses to furnish information as a prerequisite for potential licensing. As already noted, the fact that applicants for satellite licenses of necessity must rely on the use of foreign satellite networks or systems introduces certain difficulties for national regulators. The main one relates to the challenge of properly identifying, attributing and then apportioning the risk associated with the potential for causing and or receiving harmful interference in situations where multiple entities are involved. In this respect, simply providing technical information along the lines suggested above is a good starting point.

The challenge is not unique to Bhutan. The fact is that by definition satellite operations have an international dimension, even for so called “domestic” satellite networks, and in any event most commercial satellite networks and systems are designed to provide services of an international nature.

¹² Post WRC-15 approved the use of Earth Stations in Motion (ESIMSS) as elements of the FSS for up-links in the 29.5 to 30.0 GHz portion of the a portion of the Ka band, and WRC-19 will consider regulatory measures to facilitate ESIMS up-links in the 27.5 to 29.5 GHz portion of the Ka band.

From the practical perspective of the national regulators, a key concern is first of all that its obligations under the Radio Regulations are properly fulfilled, and then that its national legal obligations are taken care of. This requires procedures that adequately deal with all possible situations, and that are transparent to all entities involved.

It is recommended, that in order to manage this regulatory task, the licensing procedure is supplemented with a requirement for license applicants to provide “letter of assurance” that deal with the apportionment and acceptance of particular elements of the broader interference risk, together with undertakings to properly deal with interference events.

Specifically, it is recommended that acknowledgments and undertakings along the lines detailed in Annex 2 are sought from applicant as a mandatory requirement for applicants of licenses for satellite services. It should be noted that the undertakings would differ depending on the current regulatory status¹³ of the assignments in question as defined in the Radio Regulations. The reason being that, in the case of FSS, BSS, and MSS it is common for assignments to be brought into use at different points in the regulatory cycle.

Moreover often without full completion of the required international frequency coordination, in which case, entry into the Master International Frequency Register (MIFR) would only be partial or conditional. The following cases are pertinent -

- ❖ **Case “A” Article 4.4 stage** (no protection no interference) - namely networks or systems brought into use prior to the submission of coordination request (CR/C) filing data and therefore not in conformity with all relevant provisions of the Radio Regulations. Those networks or systems can only be operated under condition of not causing harmful interference and not claiming protection. While it is “legal” for administrations to authorize/license assignments under Article 4.4 this carries a high degree of regulatory risk for the authorizing administration, and is typically not pursued except under exceptional circumstances such as for emergency communications.

- ❖ **Case “B” CR/C stage** (coordination request stage) - namely networks or systems brought into use prior to notification. While technically arguably not in full accordance with the Radio Regulations, it is not uncommon for networks or systems to be brought into use while still at the Article 9 coordination request filing stage. Assignments that are included in the published CR/C filing data have been checked for conformity with the Radio Regulations and therefore the risk associated with authorizing/licensing is considerably less than for the Article 4.4 case, particularly if significant progress has been made with international frequency coordination for the assignments in question. Under these circumstances it would be a matter of judgment on the part of the licensing administration whether or not to agree to authorization, noting that such authorization would still be subject to non-interference and no protection conditions.

¹³ The nature of the assurances should reflect the status of the assignment that will be involved in terms of stage reached in the regulatory cycle the network to be used.

- ❖ **Case “C” Part IIS stage (notified but subject to Article 11.41)** - namely networks or systems that have been notified but not yet “recorded”. Assignments listed in special section Part IIS are ones that have been notified under Article 11, but coordination has not been completed with all the requisite administrations but can be operated subject to Article 11.41 conditions, namely no interference and protection with respect to the administrations for which coordination has not been completed. Noting that around 50% of all assignments are currently brought into use while subject to Article 11.41 with at least one administration, it is clear that this is a very common occurrence. Indeed it is unusual for licensing administrations to refuse authorization even if certain assignments are subject to Article 11.41. In this case a degree of discretion is required on the part of the regulator, and the necessary steps should be taken to ensure that harmful interference is not caused to the services of those administrations that are identified in Part IIS.

- ❖ **Case “D” Part IIS stage (notified and entered into the Master International Frequency Register MIFR)** - For licensing administrations, the safest course of action is to consider only those assignments included in Part IIS and that also include their own territory. License conditions can then be imposed simply to ensure that the emissions of the licensed assignments remain within the “envelope” of the notification filing data.

It is recommended that the following procedures be adopted as a general rule for each of the above cases -

Case A - licenses are not granted on the grounds that it cannot be confirmed that assignments are in conformity with the Radio Regulations, and it is not possible to assess the risk of harmful interference to other services.

Case B - License is granted provided all the filing information specified in Annex 2 together with a letter of assurance of the type shown in Annex 3 for case “B” is provided.

Case C - License is granted provided all the filing information specified in Annex 2 together with a letter of assurance of the type shown in Annex 3 for case “C” is provided.

Case D - License is granted provided all the filing information specified in Annex 2 together with a letter of assurance of the type shown in Annex 3 for case “D” is provided.

7.3 Recommended licensing procedures for private/individual user mobile satellite terminal devices associated with Mobile Satellite Networks (MSS)

Currently there do not appear to be any licensing or authorization procedures to permit individuals to access voice, data or satellite news gathering (SNG) service using satellite networks or systems via mobile satellite terminals including hand-held devices.

Dealing with the licensing or authorization of such terminals and devices represents a regulatory challenge for all administrations. To date the ITU-R has not developed Recommendations or regulations concerned with global circulation of such devices. Neither do the terminals and devices in question currently fall under the ambit of global circulation

agreements of the WTO, as is the case for terrestrial terminals that come under the IMT (International Mobile Telecommunications) umbrella of standards.

Administrations have addressed the issue of licensing, authorization or permitting the use of such devices in various ways. In many cases they have brought such devices within the ambit of a “class licensing” regime, or have simply anticipated that operators of the respective networks and systems and their filing administrations will deal with the potential for harmful interference. From a practical “interference management” perspective such a self regulatory approach has apparently worked satisfactorily, but it is worth pointing out that this self regulation is supported in in most cases by stringent equipment standards and compliance measures either imposed by the operators themselves. Such measures involve equipment “type approval” supported by stringent technical standards and proof of compliance via the attachment of labels to the equipment.

The above approach is also made more practical by the fact that given the cost and complexity of mobile satellite networks and systems, there are only a modest number of regional or global operators involved. Furthermore, in many cases those operators make considerable effort to inform administrations about their service offerings in order to pave the way for the authorization of terminal devices¹⁴.

An good model for the regulatory approach to the authorization of globally circulating mobile satellite terminals is the European Electronic Communications Committee decision (12)01 “*Exemption from individual licensing and free circulation and use of terrestrial and satellite mobile terminals operating under the control of networks*” 01 June 2012¹⁵.

Following are key extracts from this decision -

“Licensing is an appropriate tool for administrations to regulate the use of radio equipment and the efficient use of the frequency spectrum. However, the technical characteristics of mobile radio equipment require less intervention from the administrations as far as the installation and use of equipment is concerned. When radio equipment is subject to an exemption from individual licensing, it may be used without any prior individual permission from the administration.

The use of the equipment can be subject to general provisions or general authorization conditions.

When the efficient use of the frequency spectrum is not at risk and as long as harmful interference is unlikely, the installation and use of radio equipment should be exempted from individual licensing.”

The above could be used as a guide by BICMA. However, it should be noted that many administrations do in fact place certain conditions on the use of MSS terminals. The most straightforward way is to “class license” the terminals on condition that are certified by the respective network or system operators as being compliant to certain technical standards via type testing procedures and then appropriately labeled to reflect this fact¹⁶.

¹⁴ Operators include Intelsat, Inmarsat, GlobalStar, Iridium, Thuraya, O3b

¹⁵ <http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDec1201.pdf>

¹⁶ <http://www.erodocdb.dk/docs/doc98/official/pdf/REC0106E.PDF>

In the case of Bhutan introducing a new category of class licenses for such a purpose is difficult to justify, however it would be feasible to resort to certain provisions of Part III of the Radio Rules Chapter 3 dealing with “Permitting Relative to Radiocommunications”¹⁷. Noting that MSS terminals are already type approved and labeled as such, they would qualify as “standard equipment” and therefore it would be possible to issue permits to operate such terminals under conditions deemed appropriate by BICMA.

It is recommended that the provisions contained in Part 3 referenced above are used along with a requirement for users to provide basic information including type approval information as a condition of being permitted to use global roaming MSS terminals. Annex 4 outlines a “Template for the provision of information for a Mobile Satellite Service terminal in Bhutan that uses a network authorized by a foreign administration” that can assist in this regard. Requiring users to acquire permits would deter misuse, and the provision of basic information along the lines set out in Annex 4 would assist in keeping track of the devices and in case there are unanticipated problems such as interference in deal with them.

It is recommended that BICMA publish a simple guideline for the purpose permitting global roaming small MSS terminals in order to formalize the new procedure.

7.4 Recommended license application format

The current process for license application is very basic. Application can be made using a standard form that requires applicants to provide just the bare minimum of information regarding the planned operations of the service. Alternatively application can be made in writing. Once the license is granted some of the details related to the licensed service are entered into a database.

It is recommended that the license application procedure be improved to ensure that all the technical and other details required for vetting and subsequently authorizing transmissions are included. In the case of spectrum licensing for satellite services, this should be in a common standard format. Doing so will not only ensure that BICMA has the information necessary for it to perform its interference management role, but it would also ease the task of transferring the technical details of the emissions covered by licences to the BICMA license database.

The increased use of internet based methods for radiocommunications license application and management is now very evident world-wide. They seem to be most appropriate for Bhutan as well, and so is recommended that this method is adopted to the maximum practical extent.

While it is true that some effort is required to implement on-line application submission, including new application forms suitable for electronic submission, new forms will in any event be required if the above recommendations are implemented. This aspect has been considered as a relevant factor for proposals concerned with licensing “rules” in Part 3.

¹⁷ The relevant provisions can be found in Division Two articles 3.7 (a) and 3.2 (a) (VIII)

8. Summary remarks concerning the “recommendations”

It is explicit in the Bhutan Information Communications and Media Act, as well as the Radio Rules that considerable latitude is afforded to the Authority in relation to the manner in which it authorizes/licenses assignments in terms of the specific procedures it wants to mandate¹⁸.

The practical implementation of the licensing process is clearly at the discretion of the authority, and so it would be a matter of judgment on the part of BICMA as to how it wants to deal with the issue of supplementary “rules” for satellite services regulation.

The thrust of the above recommendations and associated “rules” (set out in Part 3) concern consideration of more detailed “licensing” procedures as a practical approach to meeting the satellite regulatory deficiencies identified in Part 1 of the report. In summary, the perceived objective being to -

1. Ensure that BICMA’s obligations as set out in the Bhutan Information, Communications and Media Act, the Bhutan Radio Rules and the ITU-R Radio Regulations are met.
2. Ensure that as an element of the licensing procedure, the key emission parameters are identified in a transparent manner.
3. Implement a transparent standardized process for license application and approval that will enable BICMA to identify the party or entity responsible for managing the potential for harmful interference.
4. Implement the most efficient methods for license application and processing noting that Internet based “on-line” electronic processing methods may assist in this regard¹⁹.
5. In the case of fixed earth station uplinks in the FSS, BSS and MSS, ensure that license applicants provide assurances that certain obligations related to managing the potential for harmful interference are met.
6. In the case of the MSS, take advantage of existing globally recognized directives, standards and recommendations related to equipment type approval and marking to manage the use of terminals associated with the MSS as a practical means to authorise or “permit” the use of such devices and thereby to control the potential for harmful interference.

Part 4 of this report sets out the specific proposals concerned with new licensing “rules” (requirements) along with some suggestions on how they could be implemented in an administrative sense, noting however that it should be made explicit in one form or another that the authority will consider applications on a case-by-case basis, and use its discretion when evaluating individual applications.

¹⁸ Information Communications and Media Act 2006 Chapter 3 section 27 (3)(e) and Radio Rules Part I Chapter 1 section 1.7

¹⁹ The current Application for Radiocommunication service except Broadcasting and Land mobile service, can be adapted for this purpose.

9. Capability of BICMA to implement and administer the proposed supplementary regulatory procedures

In practical terms, the major additional tasks associated with implementing the above recommendations are largely administrative. They amount to the development and implementation of refined licensing procedures that entails more detailed license application forms, and that where possible the use of on-line submission of license applications. While it is clear that the major burden of gathering the technical information would fall on the applicants, it would still be incumbent on BICMA to verify the supplied information (perform due diligence). In part that would require some detailed ITU-R satellite database information checking by BICMA staff, and then recording the necessary information in a format that is appropriate for domestic regulatory purposes.

Beyond that, internal guidelines can be developed to aid BICMA staff charged with the responsibility of processing license applications. Noting however that as the basic idea behind the recommendations is to rely to the maximum extent possible on the procedures outlined in the Radio Regulations that all administrations are required to follow, and to then co-opt certain elements of those procedures for the purpose of national satellite spectrum management, it is very likely that additional training for the purpose of gaining a better understanding of procedures dealing with satellite in the Radio Regulations will be required.

The salient point is however, that in adopting the recommendations in this report there is unlikely to be a necessity for BICMA to engage directly in the complex technical task of mutual interference analysis and assessment that is normally required for international frequency coordination. Those tasks require considerable technical and regulatory expertise to perform and would almost certainly be beyond the current resources available to BICMA.

Based on an evaluation of existing BICMA expertise and resources it is anticipated that the recommendations outlined in this report can be implemented in a timely manner without the necessity to engage additional expert staff, noting however that some training of existing staff members will be required.

The main area where additional expertise and training is required concerns familiarity with ITU-R satellite filing procedures, and use of the Radio Bureau software for interrogating²⁰ the Space Network List (SNL) database. To verify information provided by license applicants related to the foreign operated satellite networks and systems they intend to access from Bhutan, familiarity with ITU-R satellite filing procedures will be required.

²⁰ In particular BRSoft "SpaceQry"

PART 4: SPECIFIC PROPOSALS FOR NEW LICENSING “RULES”

The following Annexes set out the core elements of a set of revised “licensing rules” or “instructions” for satellite services. In practical terms they constitute certain additional requirements on the part of applicants seeking licenses to operate a broad range of satellite services. These new “rules” represent the output of the recommendations contained in Part 3 above translated into an additional set of “forms”.²¹ -

Annex 1 - Template for the provision of technical information for a fixed earth station up-link in Bhutan that uses a foreign network.²²

Annex 2 - Examples of letter of assurance to be provided for applications related to fixed earth stations up-link assignments in the FSS, BSS and MSS.

Annex 3 - Template for the provision of information required to operate a private/individual Mobile Satellite Service terminal in Bhutan that uses a foreign network.

If accepted, the new licensing procedures articulated in this report should to be promulgated in a manner that is suitable for Bhutan. Background material and explanatory notes are yet to be developed for this purpose. Material in this report may be suitable for this purpose.

²¹ All forms should be in a format that is suitable for on-line applications

²² It is anticipated that applicants will rely on the satellite operator to provide the information noting that this should be straightforward for the operator.

Annex 1 – Requirement for the provision of Satellite Filing data by license applicants for Satellite Services – Form [xxx]

	<i>Required information</i>	<i>Source of information (Filing details from satellite operator using IFIC Preface code for reference)</i>	<i>Details</i>
General network information	Applicant name	<i>Applicant</i>	
	Satellite network commercial name	<i>Satellite operator</i>	
	ITU-R filing name	<i>A1a</i>	
	Notifying administration	<i>A1F1</i>	
	Date of receipt of notice	<i>BR1</i>	
	Notice ID (SNS)	<i>BR6a/BR6b</i>	
	Notice type (GSO/NGSO)	<i>Satellite operator</i>	
	Orbital location (GSO)	<i>A4a1</i>	
	ITU-R filing status	<i>BR3a/BR3b</i>	
	IFIC number	<i>BR20/BR21</i>	
	IFIC date	<i>Satellite operator</i>	
Parameters for Earth to Space (R) Up-links	Frequency ranges applied (GHz)	<i>Applicant / satellite operator</i>	
	Beam designation	<i>B1a/BR17</i>	
	Filing service area	<i>C11a1</i>	
	Is Bhutan included in filing service area?	<i>Applicant / satellite operator</i>	
	Associated Group IDs in filing	<i>BR7a/BR7b</i>	
	Class of station S to E	<i>C4a</i>	
	Associated earth station peak gain (dBi)	<i>C10d3</i>	
	Actual gain of earth station (dBi)	<i>Applicant / satellite operator</i>	
	Maximum PSD (dBW/Hz)	<i>C8a2/C8b2</i>	
	Actual PSD of earth station (dBW/Hz)	<i>Applicant / satellite operator</i>	
	Minimum PSD (dBW/Hz)	<i>C8C3</i>	
C/N ratio (dB)	<i>C8e1</i>		
Parameters for Space to Earth (E) Down-links	Frequency ranges applied (GHz)	<i>Applicant / satellite operator</i>	
	Beam designation	<i>B1a/BR17</i>	
	Filing service area	<i>C11a1</i>	
	Is Bhutan included in filing service area?	<i>Applicant / satellite operator</i>	
	Associated Group IDs in filing	<i>BR7a/BR7b</i>	
	Class of station	<i>C4a</i>	
	Associated earth station peak gain (dBi)	<i>C10d3</i>	
	Maximum PSD (dBW/Hz)	<i>C8a2/C8b2</i>	
	Minimum PSD (dBW/Hz)	<i>C8C3</i>	
	C/N ratio (dB)	<i>C8e1</i>	

Annex 2 - Examples of letter of assurance to be provided in support of fixed satellite earth station applications.

Letter of Assurance pro forma - case “B”

*This pro forma is to be used when application is made for a satellite service using a foreign satellite network or system for cases where the **coordination request information for the satellite network or system has been published in a special section of the BR IFIC (CR/C stage)**.*

Further to the application for a licence to communicate with [*satellite commercial name*] as per the details in Form [xxx] [*License applicant name*] provides the following assurances to BICMA to support applications for licenses within the Kingdom of Bhutan:

1. The services to be provided via [*Commercial satellite name*] involving transmission to or from earth stations located in the Kingdom of Bhutan and under the control of [*License applicant name*] will be operated within the ITU-R CR/C filing envelope of [*Commercial satellite name*].
2. To the best of our knowledge, the operation of any element of [*Commercial satellite name*] involving transmission to or from earth stations located in the Kingdom of Bhutan and under the control of [*License applicant name*] will not cause harmful interference to any other satellite networks or systems operating in accordance with the relevant provisions of the ITU-R Radio Regulations.
3. [*License applicant name*] has successfully completed coordination²³ with other license holders of the Kingdom of Bhutan in cases of frequency overlap.
4. That in the event of any actual case of harmful interference to any other services licensed by the Kingdom of Bhutan or any other satellite networks operating as per the ITU-R Radio Regulations, all efforts will be made to immediately address and resolve such interference and if required cease the transmissions that may be the cause of the interference.
5. [*License applicant name*] acknowledges that services operated under a license that may be granted via this application are not entitled to protection.
6. [*License applicant name*] acknowledges that BICMA has discretionary powers with respect to licensing and that it will use the information provided in support of the license application to assist it processing the application.

²³ *In the case of other satellite networks such coordination may be limited to networks with 8 degrees or less of orbital separation. No coordination is required in the case of GSO to NGSO, NGSO to GSO or NGSO to NGSO.*

Letter of Assurance pro forma - case “C”

*This pro forma is to be used when application is made for a satellite service using a foreign satellite network or system for cases where the **coordination request information for the satellite network or system has been published in a special section of the BR IFIC (Part IIS notification) but relevant assignments are not recorder in the MIFR (Article 11.41 has been invoked)**.*

Further to the application for a licence to communicate with [*satellite commercial name*] as per the details in Form [xxx] [*License applicant name*] provides the following assurances to BICMA to support applications for licenses within the Kingdom of Bhutan:

1. The services to be provided via [*Commercial satellite name*] involving transmission to or from earth stations located in the Kingdom of Bhutan and under the control of [*License applicant name*] will be operated within the notified, or in the case of assignments under the provision of Article 11.41 under the CR/C ITU-R filing envelope of [*Commercial satellite name*].
2. To the best of our knowledge, the operation of any element of [*Commercial satellite name*] involving transmission to or from earth stations located in the Kingdom of Bhutan and under the control of [*License applicant name*] will not cause harmful interference to any other satellite networks or systems operating in accordance with the relevant provisions of the ITU-R Radio Regulations.
3. [*License applicant name*] has successfully completed coordination²⁴ with other license holders of the Kingdom of Bhutan in cases of frequency overlap.
4. That in the event of any actual case of harmful interference to any other services licensed by the Kingdom of Bhutan or any other satellite networks operating as per the ITU-R Radio Regulations, all efforts will be made to immediately address and resolve such interference and if required cease the transmissions that may be the cause of the interference.
5. [*License applicant name*] acknowledges that services operated under a license that may be granted via this application are not entitled to protection.
6. [*License applicant name*] acknowledges that BICMA has discretionary powers with respect to licensing and that it will use the information provided in support of the license application to assist it processing the application.

²⁴ *In the case of other satellite networks such coordination may be limited to networks with 8 degrees or less of orbital separation. No coordination is required in the case of GSO to NGSO, NGSO to GSO or NGSO to NGSO*

Letter of Assurance pro forma - case “D”

*This pro forma is to be used when application is made for a satellite service using a foreign satellite network or system for cases where the **coordination request information for the satellite network or system has been published in a special section of the BR IFIC (Part IIS notification)**.*

Further to the application for a licence to communicate with [satellite commercial name] as per the details in Form [xxx] [License applicant name] provides the following assurances to BICMA to support applications for licenses within the Kingdom of Bhutan:

1. The services to be provided via [Commercial satellite name] involving transmission to or from earth stations located in the Kingdom of Bhutan and under the control of [License applicant name] will be operated within the notified ITU-R filing envelope of [Commercial satellite name].
2. [License applicant name] has successfully completed coordination with other license holders of the Kingdom of Bhutan in cases of frequency overlap.
3. [License applicant name] acknowledges that BICMA has discretionary powers with respect to licensing and that it will use the information provided in support of the license application to assist it processing the application.

²⁵ *In the case of other satellite networks such coordination may be limited to networks with 8 degrees or less of orbital separation. No coordination is required in the case of GSO to NGSO, NGSO to GSO or NGSO to NGSO*

**Annex 3 - Template for the provision of information required to operate
a Mobile Satellite Service terminal**

<i>Required information</i>	<i>Details</i>
Applicant name	
Applicants contact details in Bhutan	
Satellite network or system commercial name	
Equipment provider name	
Equipment description (VSAT/handheld/SNG)	
If VSAT or SNG, the antenna size	
Name of terminal manufacturer	
Model number of terminal	
Equipment type approval details	
Equipment serial number	
Frequency band of operation	
Commencement date of operation	
Length of operational time period	
Continuous or intermittent operation	
Was the equipment declared at Bhutan customs on entry?	
Will the equipment be taken out of Bhutan?	
Will the equipment be on-sold in Bhutan?	