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Comments on the CA Consultation Paper "Arrangements for Assignment of the Spectrum in the 3.4-3.6 GHz Band for the Provision of Public Mobile Services and the Related Spectrum Utilisation Fee"

AsiaSat, 13 June 2018

1. Introduction

On 2 May. 2018, the Communications Authority (CA) has published a consultation paper[1] entitled "Arrangements for Assignment of the Spectrum in the 3.4-3.6 GHz Band for the Provision of Public Mobile Services and the Related Spectrum Utilisation Fee". This document provides AsiaSat's views and comments on the consultation paper.

2. Comments on the consultation paper

We would like to answer some of the questions listed below raised in the consultation paper.

Question 6: Do you have any views on the proposed requirements as set out in paragraphs 29 to 31 above?

Setting up restriction zones in Tai Po Industrial Estate and Stanley (where satellite TT&C Stations are located) should be one of the mitigation measures to protect satellite TT&C operations.

We agree with OFCA's decision that in case any operation of mobile base stations located outside the restriction zones cause desensitisation or other interference to the TT&C Stations, spectrum assignees shall be responsible for taking all necessary measures to prevent or rectify the situation, including removal of such mobile base stations as the last resort.

We also agree that in order to prevent inadvertent operation of mobile terminal or handset operating in the 3.5 GHz band from affecting the TT&C Station in the vicinity, spectrum assignees should take all necessary measures to avoid such interference, when these mobile terminals or handsets are in the vicinity where the TT&C Station concerned is located. This includes as a part of the licensing obligations, a requirement for handsets not to emit signals when not in contact with a base station (listen before talk).

[1] https://www.coms-auth.hk/filemanager/en/content_711/cp20180502.pdf

We observe that exclusion zones are required to protect satellite reception due to three different interference mechanisms:

1. To protect against in-band interference in the 3.4-3.6 GHz band (for satellite control and monitoring)

2. To protect against interference due to unwanted emissions from mobile transmitters falling in the 3.7-4.2 GHz band

3. To protect against non-linear operation and desensitization of satellite front-end receivers (3.4-4.2 GHz for satellite control and monitoring and 3.7-4.2 GHz for regular satellite reception)

Protection of satellite reception against interference is specified by ITU in Recommendations S.1432-1 (long-term interference) and SF.1006-0 (short-term interference) (Ref. ITU-R Reports M.2109 (Sections 6.2 and 6.3) and S.2368 (Section 5.1));

- **Long-term interference**
  Total interference from all other interfering sources having co-primary status:
  - In-band interference:
    - I/N = -12.2 dB for 100% of worst month or;
    - I/N = -10 dB for 80% of any month
  - Adjacent band interference:
    - I/N = -20 dB for 100% of the time

  - Appropriate apportionment of total interference allowance between individual services

- **Short-term interference**
  $I/N = -1.3$ dB which may be exceed by up to 0.001667% time (single entry)

- **LNA/LNB overdrive**
  - LNA/LNB gain compression (desensitization): -61 dBm at LNA/LNB input
  - LNA/LNB non-linear performance: -60 dBm at LNA/LNB input

It is noted that in determining the size of the restriction zones, OFCA only considered desensitization associated with LNA/LNB overdrive and not the other requirements. Moreover, OFCA's idea to insert bandpass filters (BPF) at the satellite earth station front-end to filter out the IMT signal only will be effective in respect of LNA/LNB overdrive and only for the case when the IMT and satellite signals are not at overlapping frequencies. For all the other interference mechanisms, the interfering signal will be in-band to the satellite signal and use of BPF will have no effect.

Moreover, we note that OFCA has assumed maximum level of interference signal receivable at the earth station front-end receiver without causing desensitization (or overload) is 60dBm. This is roughly in line with the above criteria. However, looking at commercially available LNAs/LNBs on the market, the typical conversion gain of a LNA/LNB is 60-70 dB and the output 1dB compression point is 5dBm[2] or 10dBm. -60 dBm at the input of the earth station front-end receiver using such an LNA/LNB would drive the LNA/LNB into nonlinear operation and giving gain compression.

Furthermore, we are not convinced that 20 dB margin to cater for signal aggregation of interfering mobile base stations and other unwanted effects is good enough to reflect the real situation. According to the Recommendation ITU-R S.1432-1, the protection criteria for FSS reception from other systems having co-primary status is 6%. Based on the protection criteria, we could conduct a further study and will be prepared to discuss with OFCA to determine a reasonable number for allowable aggregate interference signal power received by earth station front-end receiver.

We would like to propose two possible options as follows to satisfy the protection criteria.

- In line with the conclusions drawn in ITU-R Reports M.2109 and S.2368, it is proposed that larger restriction zones than those proposed by OFCA in the Statement of the Communications Authority entitled "Change in the Allocation of the 3.4-3.7 GHz Band from Fixed Satellite Service to Mobile Service" published on 28 March 2018 should be adopted, in line with the prescribed protection requirements in respect of the different interference mechanisms to protect the Tai Po and Stanley control and monitoring stations in the 3.4-3.7 GHz band to ensure a safe operation of the satellites.

- It is possible to keep the size of the current restriction zones proposed by OFCA unchanged given that the maximum level of interference signal receivable at the earth station is guaranteed to meet the ITU prescribed protection requirements for the different interference mechanisms. This means that the transmitting power of base stations outside the restriction zones shall be individually controlled and possibly reduced. Our further studies would be required to verify that the suggested deployment scenarios can guarantee such protection.

Question 7: Do you have any views on the proposed subsidy scheme for the upgrade of existing SMATV systems, including the funding and administrative arrangements for issuing the amount of subsidies to the affected system owners/users?

In order to protect the FSS reception, our antennas in Tai Po/Stanley earth stations have to connect a bandpass filter (BPF) proposed by OFCA to LNA/LNBs of the antennas.

[2] Norsat International Inc. LNB C-Band 5200 PLL

Figure 1 shows a 6.3 m antenna in AsiaSat Tai Po earth station. The dimension of a typical C-band BPF operating in 3.7-4.2 GHz is about 120mm×100mm×70mm[3]. It can be seen that there is no room to insert an extra bandpass filter before a LNA at all. Even a LNA embedded with a BPF is commercially available now, the cost to replace the existing LNAs (three in total in a dual-pol antenna, of which one is for backup) involving hardware, modifying the system, installation etc. will far exceed the amount of the subsidy proposed by OFCA.

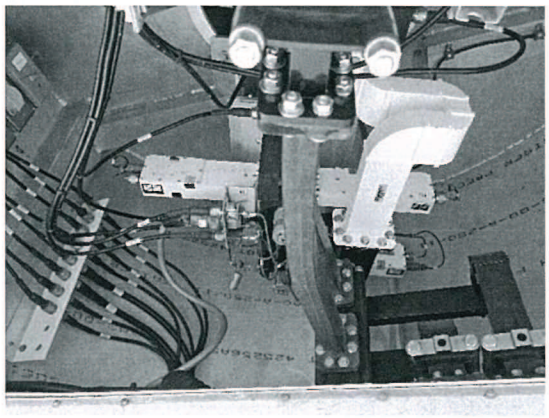

Figure 1 LNAs in a 6.3m antenna in AsiaSat Tai Po earth station

We believe that the receiving antennas in Tai Po Industrial Estate/Stanley earth stations and the SMATV antennas might be in different conditions and need different upgrade measures tailored for each case. A universal solution and same amount of the subsidy would not work.

It should also be noted that the quality of the services provided by AsiaSat must meet certain quality objectives. Insertion of a BPF in between the feed horn and LNB/LNA of earth station antennas will increase the loss before the front-end amplifier and degrade the quality of the services we provide. For example, a BPF with an insertion loss of 1 dB will cause 1-2 dB degradation on satellite link performance. To achieve the same service quality, we therefore would have to replace the antenna with a larger one and in this case, costs way beyond those of the BPF would be incurred.

We have informed OFCA that there are transponders on board our satellite fleet operating in the 3.6-3.7 GHz band. We are providing services and most importantly we are monitoring, in our Tai Po and Stanley earth stations, the functioning of and the service quality provided through those transponders to the Asia-Pacific region.

Consequently, we request OFCA to protect the FSS reception in the 3.6-3.7 GHz band in Tai Po/Stanley earth station.

[3] Norsat International Inc. C-Band Pass Filter Model # BPF-C-1

Question 8: Do you have any views on the adoption of a technology neutral approach in respect of the use of spectrum in the 3.5GHz band?

AsiaSat has no objection for the adoption of a technology neutral approach in respect of the use of spectrum in the 3.5 GHz band as long as the technology could provide adequate protection for Tai Po/Stanley earth stations operating in 3.4-4.2 GHz band and 4.5-4.8 GHz band.

3. Conclusion

As a conclusion, AsiaSat proposes:

- Either the size of restriction zones should be enlarged to provide the prescribed ITU protection or the transmitting power of base stations outside the restriction zones shall be controlled and, if necessary, reduced to obtain the same objective if the size of the current restriction zones proposed by OFCA remain unchanged.
- A more flexible and detailed subsidy scheme/funding for the upgrade of existing SMATV systems should be discussed and adopted;
- A subsidy scheme for upgrade of ES antennas in Tai Po Industrial Estate/Stanley should also be discussed.