Consultation on Administrative Incentive Pricing Framework 2017

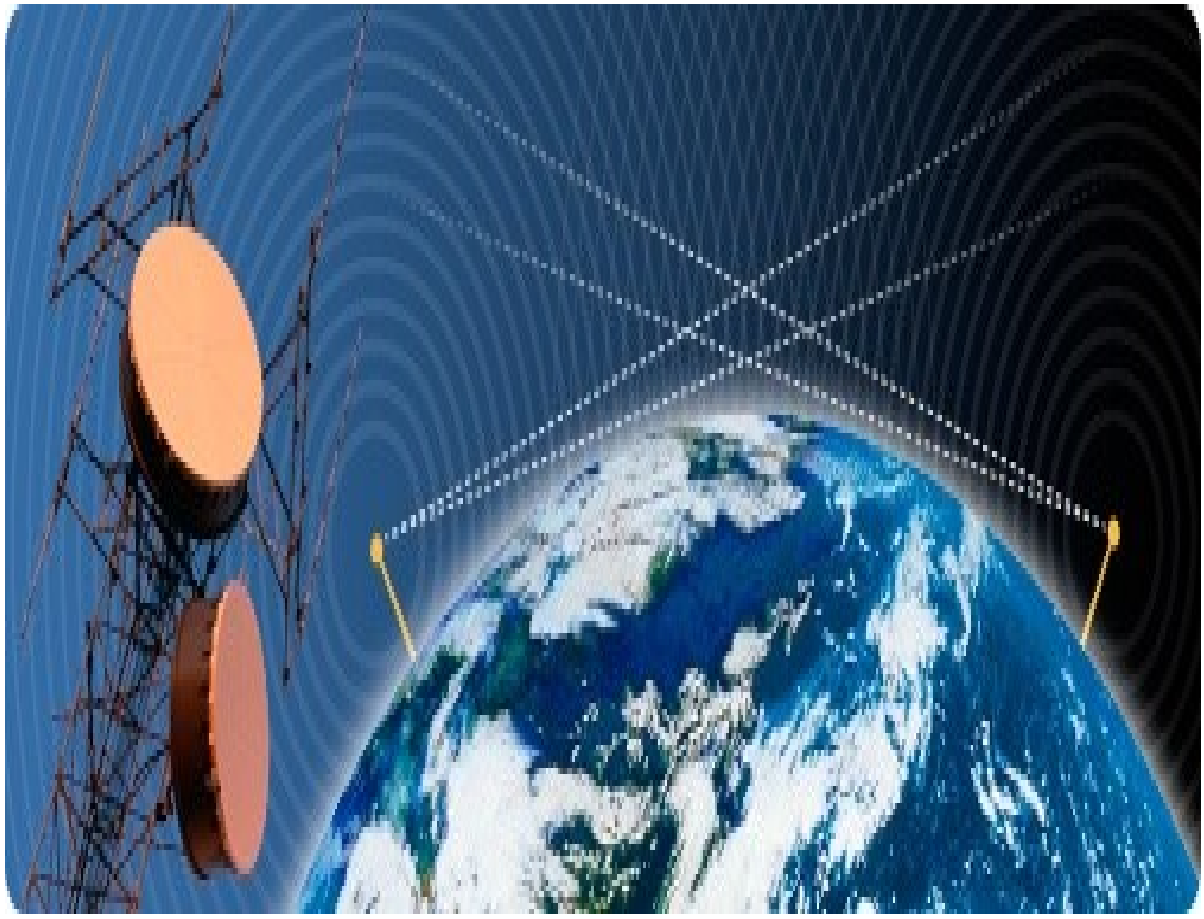

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Table of Contents

1. Executive Summary

Spectrum is not inherently valuable, but conversely, its value lies in its potential to generate a high impact on society as a whole, the spectrum underpins our modern lives. We can't see or feel it, but without it we would have no mobile phones, no TV and radio, no radar, no safety of life services and so and so forth list continues, emphasizing the importance of radio frequency spectrum.

Spectrum is vital for a wide variety of other devices, technologies and industries that are critical to the economic and cultural success of the nations. These attributes and uses are essential enablers for the a variety of services that go beyond just telecommunications and Media/Broadcasting, as a catalyst the radio frequency spectrum creates efficacy in financial services, online shopping, logistics management, manufacturing, security and many other areas. Spectrum enables radar for safety in radio navigation areas for safety and traffic control, meteorological services, emergency services, security and defense, operation of satellite networks, telemetry and monitoring services ensuring uninterrupted energy requirements as well as the operation of other critical national infrastructure. New applications, such as the health sector, have the potential to transform how we deliver and use public services.

Spectrum values reflect the economic and social benefits to be gained by society from spectrum use whereas spectrum prices reflect economic value obtained through some form of market exchange or set by authorities. A range of differing spectrum values and prices obtained from varying mechanisms for a given spectrum band. If the spectrum prices are set too high this will result in underutilization of the spectrum, while if set too low, hoarding or congestion may arise. Finding the right balance, which is achieved through finding the right prices, is critical to ensure that the economic efficiency is achieved.

In this proposed framework, we propose the pricing mechanisms in light of Telecom Policy 2015, for the spectrum usage, which are not assigned through auctions, however, administrative, technical, and logistic efforts are made to administer spectrum by the regulating authorities. The salient features of this pricing mechanism are:

- In-line with policy guidelines;
- Fair and transparent pricing structure;
- Simple and practical;
- Promotes efficient usage;
- Link based fee on M/W Backhaul;
- Transformation from Annual Spectrum Administrative Fee (ASAF) to Administrative or Administered Incentive Pricing (AIP).

2. Telecommunications Policy 2015

Clause 8 of Telecommunications Policy 2015 deals with Spectrum, which states: *The goal of GoP in relation to the management of spectrum is to have a sound process for:*

Allocation and assignment of spectrum to maximize social and economic benefits that can be derived from the use of this scarce resource.

Clause 8.1.1. *Obtaining a balance between competing needs and finitely available spectrum will be a key to maximizing economic growth potential of the ICT and digital media sectors.*

Clause 8.1.2. *Recognizing that spectrum is a valuable public resource belonging to the State and must be used in public interest, the overriding spectrum policy goals are to:*

- *Use spectrum in an efficient and flexible manner;*
- *Maximize social and economic benefits;*
- *Promote stability and transparency;*
- *Support the emergence of future telecommunications services.*

Clause 8.7.1 *where spectrum is licensed, a fee will be charged based on the most appropriate of the following methods:*

a) ***Administrative Incentive Pricing (AIP)*** *reflects the opportunity cost of spectrum to encourage efficient use of spectrum and will be introduced for congested spectrum that has not been subject to an auction, for example microwave spectrum. AIP improves the efficient use of spectrum by setting the price for spectrum at a level that encourages the user to consider alternatives and encourages spectrum use to move to the highest value application.*

Clause 8.7.3 states *The ASAF will continue as defined in Section 4.4 and Appendix B of the 2004 Mobile Cellular Policy till AIP is introduced consequent to this policy. The fee structure will be redefined by the PTA to include additional spectrum assigned to mobile services. The ASAF will not be charged on spectrum assignments subject to ACR.* ***The ASAF will be taken into account in determining any AIP price. The ASAF will be replaced by AIP, when AIP payments cover at least FAB budget requirements that are currently funded through the ASAF. The determination of the budgetary elements covered by the ASAF till the time it exists, will be fair to all spectrum users and will not discriminate between them.*** *Therefore, a cost allocation study will be conducted by PTA for the purpose of allocating the costs of the FAB Budget to various types of spectrum assignees.*

Clause 8.12 *Introduction of AIP for microwave spectrum assignments*

Clause 8.12.1 states *AIP will be introduced for microwave spectrum assignments. In the past microwave spectrum for backhauling purposes was assigned to operators in line with Federal Government policies based on the market conditions prevailing at that time. It has been observed that operators are requesting additional spectrum for backhaul transmission instead of utilizing alternate means or utilizing their existing assignments more efficiently. There is a need to introduce an appropriate charging mechanism for the microwave spectrum assignments in order to ensure efficient and economical use of the scarce resource as per international best practices. The existing licenses will be modified accordingly.*

Clause 8.12.2. Therefore, PTA will establish a regulatory framework for the introduction of AIP for microwave spectrum for new and existing assignments. Practice hitherto has been to bundle microwave spectrum used for backhaul from base stations with spectrum for fixed and mobile access in a single license fee payment. The introduction of AIP will require payments for microwave spectrum to be made separately. This unbundling of the fee structure will improve the efficiency with which licensees use microwave spectrum. ***It is not intended to increase the fees paid overall by licensees for spectrum already acquired****. Hence, the framework for the introduction of AIP for microwave spectrum will:*

a) *Estimate the value of microwave spectrum on an AIP basis taking account of other means, including fibre, of providing backhaul.*
b) *Allow for a phased introduction of AIP that recognizes that licensees will need time to review and revise their use of microwave spectrum, implement alternative methods of providing backhaul and recognizes also the investment that has been made in microwave equipment.*
c) *Encourage the implementation of alternative methods of providing backhaul and increased efficiency in the use of microwave spectrum.*
d) *Enable operators that keep up with the phased introduction of AIP not to increase the overall cost of backhaul.*

Clause 8.12.3 *PTA will consult stakeholders on the framework for AIP prior to its approval by the Federal Government (MoIT).*

(Source: http://www.moitt.gov.pk/moit/userfiles1/file/policies/Telecommunications%20Policy%202015.pdf)

3. Pakistan's Existing Backhaul Scenario

a) Authority has made efforts to rationalize spectrum charges in past as well but the same was not effective in the absence of a clear Policy Guideline by the GoP.

b) Currently, ASAF is billed to the licensed CMOs/NGMOs with reference to the amount of access spectrum allocated to them through auction process, in lieu of which, no separate charges are applied on the Microwave Spectrum required for the backhauling purposes.

c) For a mobile operator, the choice of backhaul is a challenging one, because many factors have to be taken into account. Fiber, spectrum availability and cost are typically the main determinants. Base station density, building materials, construction density, weather, and labour costs all can have a strong impact on the choice. Currently, it is pertinent to mention here that backhauling of all CMOs is reliant on Microwave spectrum and almost 95% of the total existing backhaul is based on Microwave P2P links.

d) Presently, in Pakistan the allotment of carriers for MW point-to-point links is mostly done in the 12 GHz, 13 GHz, 14 GHz, 15 GHz, 17 GHz, 19 GHz , 21 GHz , 23 GHz, 37GHz and 39GHz bands.

4. Spectrum Pricing Principles and Approaches

Spectrum management includes activities such as planning spectrum use, allocating and assigning spectrum licences, coordinating shared spectrum use, harmonizing regional and global spectrum standards and monitoring and control its actual use. High-level economic, technical and social objectives (mainly related to universal access/service) associated with spectrum use have evolved with the spectrum management reform trend prevalent in the past ten years with less focus on the traditional command and control approach and greater emphasis on market-based systems. High level policy objectives require consistency in government approaches to matters such as access, competition, non-discrimination, user protection, equity and fairness in the manner spectrum is allocated and assigned to users

Principles have emerged with the spectrum reform efforts of countries such as Australia, European Union, New Zealand, Singapore, United Kingdom, and United States of

America, when modernizing their approaches to spectrum management and are now reflected in key framework documents on how to govern spectrum management in the future. These national spectrum management principles reflect economic and behavioural aspects as stated below:

- Spectrum should be allocated to the highest value use or uses to ensure maximum benefits to society are realized;
- Mechanisms should be put in place to enable and encourage spectrum to move to its highest value use;
- Greater access to spectrum will be facilitated when the least cost and least restrictive approach is chosen in achieving spectrum management goals and objectives;
- To the extent possible, regulators and spectrum managers need to promote both regulatory certainty and flexibility in how spectrum is used;
- Balance should be achieved between the cost of interference and the benefits obtainable from greater spectrum utilization;
- Fairness and objectivity require that fees are based on objective factors and all licence holders in a given frequency band should be treated on an equitable basis. This would preclude, for example, different treatment of different users in a given frequency band;
- Transparency requires that the basis on which fees are calculated should be made clear in a published document resulting from consultation with stakeholders and that all fees should be set based on a published schedule;
- Administrative costs will be lower if the fee schedule is simple to administer. The simplest fee schedule would be one involving a flat fee payment; however this may not promote efficient spectrum use; and
- Administrative simplicity needs to be balanced against the requirement to encourage efficiency of spectrum use if fees are set taking account of parameters such as bandwidth, frequency band or coverage.

Spectrum Pricing Approaches usually consider few of the following parameters:

- The amount of spectrum used measured by the bandwidth sterilized;
- Geographic location to reflect coverage;
- The type of service supplied often with higher fees for public mobile as compared with other services;
- The frequency band, with higher values in bands that are internationally harmonized, that offer better propagation characteristics and that are more likely to be congested;
- The location of use with higher values in more congested areas e.g. higher values in urban versus rural areas;
- The fraction of the national population covered as a proxy for the value of a regional as compared with a national license;
- The percentage of revenue;
- Location within the spectrum to reflect degree of congestion-higher values for the most congested parts;
- Time element to reflect the development of service;
- Power levels to reflect level of interference caused to other users; and

- Constant to calibrate the result to have different values of spectrum for different categories.

(Source: http://www.itu.int/en/ITU-D/Spectrum-Broadcasting/Documents/Publications/Guidelines_SpectrumFees_Final_E.pdf)

5. Countries Case Studies

Different countries follow spectrum management techniques best suited to their market dynamics and demographics. Hence, Spectrum Pricing techniques differ in accordance with the government objectives and policy requirements mandated by the regulators. In this regard, few case studies of administered pricing structures is attached as Annexure-A.

5.1 Sri Lanka: TRCSL

Frequency Bands allocated for wireless backhaul networks in Sri Lanka are 4GHz, 5.8GHz, 6GHz, 7.1GHz, 7.4GHz, 7.9GHz, 11GHz, 13GHz, 15GHz, 18GHz, 23GHz, 26GHz and 38GHz. The Bandwidths used most commonly are 1.75/3.5/7/14/28/56MHz.10.5GHz and 28GHz bands are allocated for point-to-multi points applications with bandwidths of 3.5/7/14/28/56MHz. 70/80GHz band was very recently allocated to high capacity short distance applications and applicable bandwidths are 250/500MHz.

Spectrum is assigned on link basis and charge accordingly. License Fee consists of two parts:

- **Frequency Charge**
- **Power Charge**

Frequency charge depends on frequency band and assigned bandwidth. Power charge is depends on the output power of the transmitter. Assignment is on first come first serve basis. Nearly 5 Billion LKR (35 Million USD) revenue is collected yearly by frequencies for backhaul networks.

Frequency charges are as below:

Frequency Band	Frequency Range	Fees Payable per kHz of assigned bandwidth of emission (Rs.)
VLF	3- 30 kHz	375.00
LF	30 -300 kHz	375.00
MF	300- 3000 kHz	375.00
HF	3 -30 MHz	375.00
VHF I	30 - 100MHz	225.00
VHF II	100- 300 MHz	375.00
UHF I	300 -1000 MHz	125.00
UHF II	1000 -3000 MHz	18.75

SHF I	3-9 GHz	10.00
SHF II	9-20 GHz	7.50
SHF III	20-30 GHz	5.00
EHF I	30-40GHz	2.50
EHF II	40-50 GHz	2.00
EHF III	50-60 GHz	1.50
EHF IV	60 -70GHz	1.00
EHF V	70- 90 GHz	0.50
EHF VI	90-300 GHz	0.25

Power Charges are as below:

	Fees payable per Annum (Rs.)		
Transmitter Output Power (Watts))	HF and below	VHF Band I & II	UHF Band I & II SHF Band I, II III &EHF Band I,II,II III,IV,V,VI
< 1	750.00	3,125.00	2,500.00
1-5	1,875.00	3,750.00	3,125.00
5-10	3,750.00	5,625.00	5,000.00
10-15	5,625.00	7,500.00	5,625.00
15-20	5,625.00	9,375.00	7,500.00
20-25	5,625.00	18,750.00	12,500.00
25-30	9,375.00	31,250.00	18,750.00
30-50	9,375.00	50,000.00	37,500.00
50-75	12,500.00	62,500.00	Rs.3,750.00 per additional Watt or part thereof above 50 Watts
75-100	18,750.00	125,000.00	
100-150	50,000.00	Rs.3,750.00 per additional Watt or part thereof above 100 Watts	
150-500	93,750.00		
500-1000	187,500.00		

1000 and above	Rs.500.00 per additional Watt or part thereof above 1000 Watt

Example: For an assignment in 23GHz band for full duplex link with 28MHz bandwidth and links radios with output power of 1W.

- Frequency Charge
  - Frequency is in the range of 20-30GHz (SHF III) ie. Rs.5.00 per kHz
  - Frequency charge for single frequency = Rs. 28x1,000x5.00 = Rs.140,000.00
  - Frequency charge for duplex frequency = Rs.140,000.00x2=Rs.280,000.00 (per year)
- Power Charge
  - Output power is in the range of 1-5W. ie. Rs.3,125.00 for SHF III
  - Power Charge= Rs.3,125.00x2= Rs.6,250.00 (per year)
- Total license fee= Rs. 280,000.00+6,250.00= Rs.286,250.00 (per year)

(Source: TRCSL, SATRC Workshop on Spectrum, 16-18 August 2017, Islamabad, Pakistan)

5.2 South Africa: ICASA

ICASA proposed changes to its spectrum fee regulations in 2009 and conducted extensive consultations seeking input from various users and stakeholders throughout 2010 and provided several training sessions on the new fee schedule throughout 2012. The Radio Frequency Spectrum Licence Fee Regulations came into force in 2010 and are described as administrative incentive pricing (AIP) intended to provide for a new basis for calculating radio frequency spectrum licence fees in South Africa. As described in the regulations, AIP involves the use of a specific formula for the calculation of fees for four radio communication services:

- point-to-multipoint services;
- point-to-point services;
- satellite hub ground stations;
- satellite VSAT subordinate ground stations.

The policy rationale for these fees is that they should as a minimum serve to recover the administrative cost to ICASA of spectrum regulation and serve to promote greater efficiency the use of spectrum in South Africa. Although references are given to both Ofcom and AIP, upon examination both of the fee formulae incorporated in the new regulations are extensions of the universal system performance model.

Annual spectrum fees are calculated using one of two formulae:

Point-to-point

Fee = (UNIT*BW*FREQ*CG*GEO*SHR*$HOPMINI$*UNIBI)

Point-to-multi-point

Fee = (UNIT*BW*FREQ*CG*GEO*SHR**ASTER**UNIBI)

Where the fee for point-to-multipoint services equals the spectrum price determined by multiplying the unit price (UNIT) by the frequency factor (FREQ), the bandwidth in MHz, the congestion factor (CG), the geographic factor (GEO), the sharing factor (SHR), the area sterilized factor (ASTER), and the unidirectional factor.

- UNIT= is the unit price for spectrum (currently set at R2000 for paired spectrum);
- BW = is the amount of bandwidth (MHZ) expressed for paired spectrum;
- FREQ = coefficient taking into account the coverage area in km2;
- CG= coefficient taking into account radio communication congestion;
- GEO= coefficient reflecting population density;
- SHR= coefficient taking into account exclusive or shared allocations and assignments;
- ASTER factor= coefficient taking into account the coverage area in km2; and
- UNIBI= coefficient taking into unidirectional or bidirectional signal transmission.

Fees for multi-year authorization can be determined using factors established in regulation. For example, a five year authorization is equal to 4.17 times the price of a one year authorization and a ten year authorization is equal to 6.76 times the price of a one year authorization.

ICASA received documented comments from various groups and operators that expressed concerns in two main areas: (i) lack of sufficient incentives and (ii) excluding certain services and users from paying fees.

(Source:https://www.itu.int/en/ITU-D/Spectrum Broadcasting/Documents/Publications/Guidelines_SpectrumFees_Final_E.pdf)

5.3 United Kingdom: OFCOM

In April 2015, regulator of United Kingdom OFCOM commissioned a report from Plum and Aegis Systems to support its review of administered incentive pricing (AIP) fees in the frequency bands licensed for fixed links, permanent earth stations (PES) and transportable earth stations (TES).

Since 2006 fixed link fees have been set based on the following algorithm:

AIP Fee = $Reference\ fee$ ×Bandwidth factor (Bwf)×Frequency band factor (Bf) × Path length factor (Plf) ×Availability factor (Avf).

The purpose of different factors in the current fixed link fee formula for bi-directional links is to reflect the opportunity cost of use and spectrum use denied to others by a licensee.

Plum and Aegis Systems has reviewed and proposed the following formula:

AIP Fee = $Reference\ fee$ ×Bandwidth factor (Bwf)×Frequency band factor (Bf) × Availability factor (Avf) x Location Factor.

The reference fee for all bands is £42/2x1 MHz except the 3.6-3.8 GHz band which has a reference fee of £365/2x1 MHz. Fees rise in congested bands and fall in bands not considered congested.

(Source: https://www.ofcom.org.uk/data/assets/pdf_file/0030/79464/plum_report.pdf)

5.4 Lebanon: Telecom Regulatory Authority (TRA)

The TRA completed a study of spectrum administrative charges (SAC) and in draft consultation paper proposed changes in regulation to the Minister of Telecommunications. The purpose of this very advanced approach and informative study was to review the spectrum charging regime and ensure that it is non-discriminatory and transparent. SAC were to be applied to spectrum licensees and are intended to recover TRA administrative costs for spectrum management, control, and enforcement. One of the important goals was that fees should not in any way hinder the development of innovative services and competition in the market.

SACs are based on values that are directly proportional to the allocated band, occupancy and congestion. The cost of any band is derived by calculating the effective management and monitoring system cost that is based on the functions and activities that will be performed on such band in order to:

- manage spectrum efficiently;
- optimize spectrum usage;
- protect licensed spectrum;
- avoid harmful interference; and
- detection and location of unauthorized users.

Other parameters were introduced when finalizing SAC charges for each service including: power of transmission, number of sites and cells, and directivity. These variables have a direct impact on the nature and extent of spectrum management and monitoring activities. Hence resources needed to handle such activities and functions are determined accordingly. These factors are used in most countries in different ways to calculate spectrum fees and different methods are applied without any common base relation (different countries studies have different approaches). Furthermore, most of the countries do not differentiate between the right-to-use (RTU) fees and administrative charges.

The fees in a given year and over forecast period are based on the capital and operating costs incurred in managing spectrum. TRA developed a five-year forecast of these costs.

An additional interesting aspect of the work done by TRA is the development of a set of congestion factors that are applied to different ranges of bands and change over time. The concept is straight forward – over time as demand in certain bands increases, the effort and costs required to make new non-interfering assignments increases. The congestion factor formula is a multiplier factor and ranges from 0.5 to 4.5 based on the following formula:

Congestion factor = 0.5*EXP^ (2.2*X)

Where x = occupancy of the given frequency band

Table below shows the derived congestion factors to be applied over time to various bands.

B1	B1	B2	B3	B4
	30kHz-3 GHz	**3 GHz-6 GHz**	**6 GHz-18 GHz**	**18 GHz-40 GHz**
2009	2.19	1.27	3.82	0.61
2010	2.26	1.29	3.98	0.61
2011	2.33	1.32	4.15	0.61
2012	2.40	1.34	4.33	0.62
2013	2.48	1.37	4.51	0.62

By analyzing and consolidating methods used in different countries and using the data available for Lebanon, the general formula was deducted in such a way to serve the regulator approach to apply the proper SAC for each service (such as PMR, PMP, P2P, analogue and digital broadcast) and to reflect efforts required in managing and monitoring each service.

$SAC(i)(n) = C(i)(n) \times BW \times Kp$

Where SAC (i) (n) is the cost per band (i) in year (n), Band Width (BW) is the Occupied Bandwidth per service; Kp is a factor or multiple of factors that depend on the requested service.

(Source: https://www.itu.int/en/ITU-D/Spectrum Broadcasting/Documents/Publications/Guidelines_SpectrumFees_Final_E.pdf)

6. Proposed Regulatory Framework for AIP

6.1 Scope & Objective of Proposed Framework

a) Proposed framework takes in to account the methodologies as guided by Telecom Policy 2015 (discussed above) with the objective of establishing a fair and transparent pricing structure which is easy and simple to implement and promote uniformity, consistency and efficiency in spectrum usage/management. The charges are determined for the following category:

- **Administrative Incentive Pricing (AIP)**
  Radio Service Category: Fixed point to point Microwave Links
  - Major Stakeholders: Cellular/ NGMS Operators
  - Other Users: LLs, LDI and other MW P2P link users

b) Determination of charges for allocation of the access spectrum assigned through auction is beyond the scope of this consultation process.

c) All stakeholders are welcomed to review the proposed charges and provide their feedback with reference to following aspects:

- ease of implementation;
- Justification of proposed charges in light of the Telecom Policy 2015;
- Net impact on industry ; and
- In-line with international practices.

6.2 Proposed Framework (AIP)

Telecom Policy 2015 guides to apply AIP in a manner that it doesn't increase the overall burden on the Cellular industry as AIP shall replace the ASAF. Keeping in view the international practices and suitability for adaptation in Pakistan, following simple formula is proposed for applying AIP on Microwave Point to Point Links:

Link Fee = (Reference Fee) x (Bandwidth Factor) x (Frequency Band Factor) x Annual Adjustment Factor (k)

Where

Link Fee

Link Fee refers to the fee of a bidirectional Microwave Point to Point Link.

Reference Fee

Telecom Policy 2015 suggests that there is a need to introduce an appropriate charging mechanism for the microwave spectrum assignments in order to ensure efficient and economical use of the scarce resource as per international best practices. In line with the directions contained in Telecom Policy 2015, ASAF has been taken into account in determining the AIP price with the objective to recover at least the FAB budget requirements that are currently funded through the ASAF. The value of the Reference Fee for the AIP Price determined to recover at least FAB budget requirements that are currently funded through the ASAF is PKR 494.025 M (reference fee per link turns out to be PKR 12,788/-). In determining this value the FAB budget amount to be recovered through ASAF has been linked to FAB Approved Budget FY 16-17 which is PKR 658.698 Million. The reference fee amount is standard and the adjustments are made through the bandwidth, frequency band and annual adjustment factors.

Frequency Band Factor

Transmissions in lower bands tend to travel further and interference is therefore more likely thereby reducing the potential for frequency re-use and so increasing opportunity cost. Thus an inverse relation exists between allocated frequency bands and its opportunity cost. Same relationship is utilized in determining the frequency band factor values available in the below mentioned table.

Frequency Band Range (fb)	*Proposed Band Factor*
3.60<=fb<3.80	3
3.80<=fb<5	3
5<=fb<10	1.8
10<=fb<16	1
16<=fb<20	0.7

20<=fb<24	0.4
24<=fb<40	0.3
40<=fb<57.0	0.2
57.0<=fb<100	0.1

(Source: https://www.ofcom.org.uk/data/assets/pdf_file/0030/79464/plum_report.pdf)

Bandwidth Factor

The amount of bandwidth that is assigned per link will have a direct impact on the amount of spectrum available for use by others. Thus, a direct relation exists between allocated bandwidth and its opportunity cost. Same relationship is utilized in determining the Bandwidth Factor, values are available in the below mentioned table. Through this factor the users are encouraged to use the spectrum efficiently. 14 MHz Bandwidth has been used as reference value. All other values are determined with reference to 14 MHz allocation. The formula used to determine the bandwidth factor is as follows:

Bandwidth Factor= Bandwidth Utilized/14

The values of Bandwidth Factor for some of the bandwidths currently utilized by the CMOs are available in the following table.

Bandwidth Utilized (MHz)	***Proposed Bandwidth Factor***
7	0.50
14	1.00
28	2.00
40	2.86

Annual Adjustment Factor (k): Annual Adjustment factor shall take in to account any changes in market dynamics in relation to FAB Budget and the value of ' k 'shall be adjusted accordingly. Currently, the value of 'k' is 1.

6.3 Sample Link Fees

The sample 'Link Fee' calculated for most extensively used Bands & Bandwidths is attached in the following table:

Frequency Band	Band width	Existing Fee (applicable to all users of MW P2P links)	Proposed AIP Fee using formula **Link Fee = (Reference Fee) x (Bandwidth Factor) x (Frequency Band Factor) x Annual Adjustment Factor (k)**
12.75-13.25 GHz	7	2100	6,394
	14	4200	12,788
	28	8400	25,577

17.7-19.7 GHz	7	2100	4,476
	14	4200	8,952
	28	8400	17,904
21.2-23.6 GHz	7	2100	2,558
	14	4200	5115
	28	8400	10231
37-39.5 GHz	7	2100	1,918
	14	4200	3,836
	28	8400	7,673

7. Comments/Feedback Submission

Written comments/feedback on this consultation document may be provided to PTA as follows:

- Email : aip-2017@pta.gov.pk

- Post or hand delivered to:
  Director General (S&D)
  Pakistan Telecommunication Authority, HQ
  F-5/1, Islamabad.
  Fax No: +92-51-9225321

The deadline for stakeholders' comments is 30 November, 2017