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Telecom Regulatory Authority of India
A-2/14, Safdarjung Enclave
New Delhi – 110 029

Kind Attention   **Advisor (MN)**

Your reference   **Consultation Paper no. 11/2004**

Subject   **Spectrum related issues: Efficient Utilisation, Spectrum Allocation, and Spectrum Pricing**

Dear Sir,

The Authority has recognized the importance of wireless for growth of Internet and Broadband in the country and accordingly, made some path-breaking recommendations as part of the comprehensive set of recommendations released on 29 April 2003. May we hereby suggest that the same be pursued and reiterated in the recommendations – due from the instant consultation exercise.

We do have specific responses to the following 2 questions related to spectrum pricing in the context of fixed wireless access systems:

4.10 (viii)   Does M X C X W formulae for fixed wireless spectrum pricing need a revision? If so, suggest the values for M, C, W?

> Before we look at the formula *per se*, we must remember that this formulation was developed when wireless links were basically set up as an alternative to terrestrial cables using directional, high power directional antennae. Presumably, the spectrum pricing was aligned towards the prevailing prices for leased lines.
> The leased line prices had come down significantly in 1999 thanks to the TTO, 1999 and recently, the Authority has released another consultation paper, proposing further significant cuts.
>
> Besides, usage of wireless links is shifting more and more towards using low power, point to multipoint access networks with a focus on reuse of the frequency.

Similarly, the prevailing formula does not address the spectrum pricing applicable for mesh networks, which are emerging fast and becoming more and more commonplace. Going forward, there should be a possibility of obtaining such licenses as well (e.g. for a particular city) and plan the network in the most efficient manner rather than designing the same with respect to the applicable royalty on a per BTS basis.

For a certain level of radiated power from a particular design of antenna, the higher is the frequency range of operation, the wider is the typical RF carrier, the higher is the data rate achievable but the distance keeps going down. Thus, the revised regime should be able to address distances lower than 5 kilometers as well as have more slab ranges.

At the same time, congestion is less in the higher frequency range while competing demand pressure in the lower frequency range is considerably higher. Thus, spectrum pricing should be such that offers incentive for such users / usages reflecting one or more of the following characteristics:

- ?? **Ability to manage with minimum spectral bandwidth**
- ?? **Ability to manage minimum power radiation**
- ?? **Ability to contain minimal harmful interference to others**
- ?? **Ability to sustain interference from others**
- ?? **Ability to reach farther distances without increase in the emitted power**
- ?? **Ability to serve more number of users in a certain territory**
- ?? **Ability / risk in using less crowded bands**

The spectrum pricing should be aligned towards recovering appropriate costs of spectrum management and regulation rather than as a source of revenue to the government.

We would suggest a framework that not only significantly reduces the prevailing royalty in general and aligns the same with the leased line charges but also has finer granularity.

Value of 'x' MHz in 1 GHz band is different from that of 'x' MHz in 5 GHz band which is still different from that of 'x' MHz in the 10 GHz band but the current formulation does not take this factor into account.
Accordingly, we suggest a review of the formula for computation of spectrum royalty in case of microwave links / networks such that:

$$R = M \times W \times C$$

'R' is the annual royalty in Rupees

'C' is twice the number of duplex RF channel pairs

'M' is a distance-based constant multiplier

Suggested value of 'M'	Applicable Distance (in Kilometers) for Microwave Link(s) / Network(s)
40	0.5
60	1
120	2
200	3
300	5
500	7
750	10
1000	15
1200	25
2400	50
5000	100
10000	250
15000	500
20000	> 500

'W' is the weighting factor arrived at using the following computation:

$$W = \frac{\text{'spectral bandwdith (in MHz) of each carrier x 10'}}{\text{'Frequency band (in GHz) of the carrier(s)'}}$$

Accordingly, value of 'W' would be 100, 50 & 25, depending on whether the carrier is in the '1 GHz band', '2 GHz band' or the '5GHz' band.

Besides, there should be no additional license and/or license fee for each remote site / antenna; currently, it is Rs. 1000/- per remote site (Customer Premises Equipment) per annum. The license fee for the cellular handsets and pager terminals has already been done away with.

All spectrum prices (royalty) should be payable quarterly in advance rather than annually in advance.

It should be possible to pay a single license fee based on a mesh network basis in a particular SDCA to establish access network. Beyond that, the requirement should be limited to intimating the locations of the BTS and remote sites only rather than BTS-wise licensing.

We would also suggest that no royalty should be payable for the downlink signal in case of a satellite terminal.

We believe that such multi-graded, predictable and transparent pricing would incentivise sharing of spectrum as well as motivate the users to manage with the barest minimum spectral bandwidth. It will also enable the users to plan and rollout their links in an optimal fashion, coupled with significant reduction in the attendant paperwork.

4.10 (ix)   Should there be different pricing levels for shared spectrum versus spectrum that is allocated with protection? How should this be determined?

Of course.

Spectrum assignment with protection is like leasing a piece of property to the licensee (of wireless telegraphy) while shared spectrum is like a public road / park. While the lessee of the former can effectively ward off any encroacher(s) the latter case implies usage by the 'commons' as long as they pay for the development and maintenance of the infrastructure / facility and respect rights of other users as well.

While we do appreciate that almost all the spectrum may be shared at any given place across various users, 'protection and non-sharing spectrum assignment' should be considered in case the same spectrum with similar parameters is not assigned to any other user in a particular area with similar parameters and for similar usage. For example, frequencies assigned in the 2.4 – 2.4835 GHz for microwave links should be considered as 'shared' since similar assignments can be made to multiple users in a particular area while exclusive frequencies are assigned for GSM and CDMA networks to different users within a particular area.

Typically, the licensee having spectrum assigned for exclusive usage would be able to derive not only more commercial value by having flexibility in its usage but would also be able to create additional values by unique usage with little competition. On the other hand, licensees of

spectrum assigned on the basis of non-protection, non-interference and non-exclusiveness have little flexibility in the intended usage as well as may have unlimited number of competitors.

Hence, it is legitimate to expect that the **users with shared spectrum should not be made to pay more than 10% compared to what the users with protected spectrum would pay**. The proposal for spectrum royalty mentioned in the previous question are meant for spectrum assigned with protection. Spectrum royalty for shared spectrum should be calibrated accordingly, using that as the base and diluting it further, e.g. by applying a factor 0.1 (equivalent of 10%).

We sincerely believe that the Authority would consider our inputs and responses in the perspective. We keenly look forward to comprehensive and forward-looking recommendations and their acceptance & subsequent implementation.

Yours truly,
for **Sify Limited**

Deepak Maheshwari
General Manager – Corporate Affairs