

Group on Telecommunications (GoT)

Report of Spectrum Management Committee

Mechanism of Spectrum Management

Background

3.1. Each country uses the international Table of Frequency Allocations (TFA) of the Radio Regulations annexed to the Constitution and Convention of the ITU for spectrum management. Spectrum management and radio regulatory process is, therefore, techno-legal in character. Moreover, international aspects of radio regulatory process cannot be divorced from national radio regulatory mechanism. Those include, among others, interaction with ITU and administrations of other countries, national and international frequency planning and coordination, formulation of legislation, rules and regulations, implementation of national and international rules, formulation of channeling plans, etc. It is, therefore, essential that these limited natural resources must be utilised efficiently, economically, rationally and optimally.

3.2. In the national context, the Indian Telegraph Act, 1885 and the Indian Wireless Telegraphy Act, 1933 and Rules and procedures made thereunder provide the legal basis for spectrum management. National Frequency Allocation Plan (NFAP) 81, and subsequent revisions or amendments thereto, derived from the Table of Frequency Allocations of the Radio Regulations in consultation with the national users through the forum of Standing Advisory Committee on Radio Frequency Allocations (SACFA) provides the basis for assignment of frequencies.

Functional role of WPC

3.3. WPC Wing of the Ministry of Communication is the Radio Regulatory agency responsible for radio frequency spectrum management including licensing and caters for the needs of all wireless users in the country, government or private, security or non-security. It is also the national nodal agency for all matters related to ITU and Asia Pacific Telecommunity (APT) and is responsible for treaty obligations on behalf of the Government of India, in the capacity of Indian Administration. It is headed by Wireless Adviser to the Government of India. Under him are the WPC Wing and the field organisation known as the Wireless Monitoring Organisation. The responsibilities of WPC are as under :-

(a) Assignment of radio frequencies with associated technical parameters for all

wireless networks in the country in respect of Government as well as Private Sector.

(b) Formulation of NFAP, Frequency Channeling Plans, Standardisation of communication equipment specifications as related to spectrum management.

(c) National frequency coordination with all users for electromagnetic compatibility with a view to ensuring interference free operation of all wireless networks in the country.

(d) International coordination and international agreements with other Administrations in relation to various satellite and terrestrial based communication networks.

(e) Notification and registration of frequency assignments with ITU for international recognition and protection to fulfill National obligations.

(f) Fulfilling national obligations as contained in international treaties of the ITU, etc. in respect of all communication networks as national nodal agency.

(g) All national and international radio regulatory and other allied matters, including statutory functions.

(h) Radio Frequency (RF) Spectrum Management and Orbit/Frequency Coordination in respect of Satellite Systems (Geo-Stationary and Non Geo-Stationary).

(j) Coordination in all matters connected with ITU and APT, including preparation for and participation in their meetings and conferences after coordinating and harmonising views at national level, as national nodal agency, and formulation and ratification of international treaties.

(k) Licensing of all Wireless Stations in the country and of Radio Officers on board ships and Aircraft and Radio Amateurs.

(l) Site Clearance of all wireless installations in the country and related matters concerning the SACFA.



(m) Direction and control of Wireless Monitoring Organisation, a field organisation of the WPC Wing, to provide essential monitoring, inspection and other technical support for spectrum management with a view to ensuring interference-free operation of all wireless networks, ensuring adherence to assigned technical parameters and licensing conditions as also fulfilling the international obligations.

The broad activities of the Wireless Monitoring organisation are :-

- (i) Measurement of technical parameters such as operating frequencies, bandwidth, modulation depth/index, field strength, power, out-of-band emission, class of emission, traffic data, etc. in all frequency bands for terrestrial, space, air-borne and ship-borne emissions in order to ascertain their adherence to technical and operating conditions of licence.
- (ii) Determining spectrum occupancy/vacancy and circuit loading.
- (iii) Investigation of cases of harmful interference.
- (iv) Detection of unauthorised wireless stations.
- (v) International monitoring activities concerning spectrum management, radio regulatory processes and interference elimination.
- (vi) Monitoring for selection of interference free sites for transmitting and receiving stations.
- (vii) Technical assistance to users.
- (viii) Technical studies for standardisation of technical parameters, network feasibility, electromagnetic compatibility.
- (ix) Radio noise measurement on Industrial, Scientific and Medical (ISM) equipment, power generation and distribution systems, vehicular traffic, etc. to check radio pollution environment for mutual compatibility with radio communication services.
- (x) Inspection of radio installations for checking technical, operational, regulatory and licensing conditions.
- (xi) Issuance of possession licence for those wireless equipments which are to be regularised under suitable licence.



Functional role of SACFA

3.4. The SACFA is a high power committee, the membership of which is open to all major wireless user Ministries, administrative Departments of the Government of India. WPC Wing of the Ministry of Communications provides the

Secretariat for smooth and effective functioning of SACFA. The SACFA discharges its duties and responsibilities under a two-tier functional system, wherein, the main Committee of SACFA provides a forum for coordinating activities at the headquarters level within Ministries/Departments and the Regional Advisory Committees (RAC) provide forum at regional levels/field formations for wireless coordination aspects. The Committee is advisory in nature and the final responsibility for the decisions and related implementation rest with the Government. The main functions of the SACFA are as under :-

- (a) To recommend on major frequency allocation, issues requiring coordination amongst the various wireless users in the country.
- (b) To formulate/review the National Frequency Allocation Plans (NFAP).
- (c) To formulate national proposals for international conferences/ meetings and to coordinate nationally all activities pertaining to the ITU, etc.
- (d) To deal with frequency coordination problems referred to the committee by the administrative Ministries/Departments.
- (e) To clear sites of all wireless installations in the country.
- (f) To demarcate important cities into receiving and transmitting zones.
- (g) To finalise guidelines regarding provision of day and night obstruction markings on radio masts and towers.
- (h) To evolve technical criteria, equipment standards, channeling plans, developmental/manufacturing activities, introduction of new technologies, etc.
- (j) To explore feasibility of sharing of an antenna mast by more than one wireless users.
- (k) To evolve / develop special site clearance procedures like procedure for clearance of radio masts of foreign missions/embassies for their radio communication links.



National Frequency Allocation Plan (NFAP)

3.5. In accordance with international Radio Regulations 'allocation' is to a particular frequency band in frequency allocation table for use by one or more services under specified conditions. 'Assignment' is to a particular radio frequency or a channel for

a radio station to use under specified conditions. Accordingly, based on international Table of Frequency Allocations, Administrations evolve their national frequency allocation plans by allocating different frequency bands to one or more radio communication services. These plans do not give any ownership rights to any user of the spectrum, but are meant for development and planning purposes by industry and users. For establishment of radio communication, every radio station has to obtain frequency assignment with appropriate technical parameters and specified conditions.

3.6. Till the late fifties, operation of radio services in India was predominantly in the frequency bands below 30 MHz. As conflicting demands for this limited national resource gradually increased, a national frequency allocation plan in truncated form was developed in early sixties. As the demands and problems further escalated, the need for drawing up a national frequency allocation plan on regular footing was strongly felt and accordingly NFAP-81 was established. This plan has been modified from time to time to take care of necessities for revision on segmented basis. In those times, usage of frequency bands was primarily by the government agencies with some exploitation by private parties for their dedicated networks.

3.7. With the proliferation of new technologies inducted in the country and entry of private sector in the telecommunication field in the present and futuristic scenario, revision of NFAP-81 in its entirety has become essential so that this could form the basis for developmental, manufacturing and spectrum utilisation activities in the country in the government as well as private sectors.

3.8. The NFAP is presently under review for which projected spectrum requirements have been received from the government departments and are expected to be received shortly from the Industry. The revised Plan, NFAP-2000, will contain information regarding allocation of frequency bands for different types of radio communication services without including security information, as is done in other countries. The review is likely to be completed during 1999 and thereafter the revised Plan NFAP-2000 will be published which will serve the private and government sectors as well as the industry.



Approach for Optimising Spectrum Utilisation

3.9 Achieving high teledensity and enhanced competition are thrust areas of the proposed New Telecom Policy. Provisioning of basic telecommunication services and cellular services is essential feature of public telecommunications. In the futuristic scenario, these services have predominant dependence on wireless technologies and the spectrum availability is the key element. It is well recognised that spectrum is a scarce limited natural resource which is required to be used

efficiently, economically and optimally and is to be shared between different types of services to meet variety of needs. Repeatability of frequencies is an essential feature of optimal resource utilisation based on electromagnetic compatibility. With this in view fundamental principle of spectrum utilisation is based on the concept of coordination and coexistence as the need emerges and not on the ownership of spectrum. Recommended measures for optimising spectrum utilisation are as under :-

(a) Conceptual realities related to past spectrum allocation, inescapable need for progressive technology update and the paramount National security interests lead to the principle of co-existence, convergence and coordination between the three generations (past, present and future) of spectrum dependant equipment.

(b) All frequency bands are shared between different types of services and there are no exclusive allocations for a particular service. Therefore, spectrum is needed to be used on shared basis, with maximum repeatability.

(c) To ensure improvement of spectral usage efficiencies, a stratified spectrum price based on the economic utility value be levied on various users, excluding defence.

(d) Spectrum requirement of all public telecommunication services viz. fixed, and mobile shall be dealt with in an integrated manner to ensure optimum exploitation of the available spectrum.

(e) Requisite frequency bands will be viewed as separate entities and spectral windows will be allocated on the basis of non-interference and co-existence.

(f) Wireless Monitoring Organisation under the WPC will need to be reinforced to effectively monitor spectrum usage with respect to frequency, power output, modulation, height of antennae and so on and need to be given the statutory powers to penalise or cancel the license.

(g) Spectrum allocation is best described as a procedure for specifying compatibility standards with clear cut functional communication channels between specific types of equipment which protect them from interference.

(h) While allocating the spectrum, due weightage and preference need to be given to 'spectrum efficient' technologies. Spectrum availability will be ascertained from the WPC before induction/introduction of any technology.

(j) To further facilitate optimal coexistence, industry should focus its technology plans for additional spectrum in the higher frequency bands of 2000 to 2300 MHz and 3-4 GHz range. The focus should also be for broad band applications in 24-38 GHz band.



Present Status

3.10. In the present context, scope of discussions hinges on Wireless in Local Loop (WLL) and Cellular technologies around 900 MHz and 1800 MHz bands. It is well recognised that security of the country is paramount and as such defence forces which per se need specialised features with due regard to diversity, frequency agility, strategies and electronic warfare, should not be compromised. Defence has always believed in the spirit of co-operation and mutual understanding while dealing with frequency spectrum requirements of other users. It has co-ordinated the requirements of a number of Government and private telecommunication networks and has not only accommodated the requirements of DoT and Government Licensed Operators for PMRTS from 806-821 MHz; for WLL from 824-845 MHz; for Cellular from 935-947.5 MHz; but also facilitated police networks to share the band. Further, in the 1800 MHz band, it has co-ordinated 20 MHz band, for WLL applications and accommodated around 100 individual requirements of Government and private telecommunication networks. This co-ordination was done inspite of the fact that defence operates strategic and tactical equipment in these bands and had to operate on lesser bandwidth and lower number of channels. The present exercise has been carried out in the same spirit of spectrum sharing, coordination and coexistence.

3.11. Review of 800/900 MHz Band

(a) Equipment capability for cellular operation (GSM based in 900 MHz) is in the frequency band 890-915 MHz / 935-960 MHz (25+25 MHz) which is known to be extendable to 880-890 MHz/925-935 MHz.

(b) Equipment capability for WLL technologies is in the frequency band 824-849 MHz / 869-894 MHz (25+25 MHz).

(c) National coordination was effected to make available about 12.5+12.5 MHz spectrum for cellular operations by relocating existing operations of other users in the remaining 12.5+12.5 MHz spectrum to the extent possible.

(d) Upto 4.5+4.5 MHz have been given to each of the two cellular operators depending on their justified needs. In metro cities (Delhi, Mumbai, Chennai and Calcutta) spectrum has been enhanced upto 6.2+6.2 MHz depending on the availability and justification.

(e) As regards WLL technologies for fixed applications for basic services, spectrum upto 20+20 MHz has been coordinated in 800 MHz band which varies from location to location depending on existing usage. Appropriate spectrum has been

earmarked/given to two basic service operators.



3.12. Review of 1700-2300 MHz Band

(a) Several terrestrial based technologies have been developed in 1.7-2.0 GHz. Predominantly, these are DCS 1800 (1710-1785/1805-1880 MHz) which support cellular as well as WLL technologies; PCS (1850-1910 MHz/ 1930-1990 MHz), DECT & Cor-DECT (1880-1900 MHz), PHS (1895.1-1918.1 MHz) and IMT-2000 (1885-2025 MHz/2110-2200 MHz).

(b) Presently, 1880-1900 MHz has been opened up for DECT based WLL technologies subject to coordination on case by case basis.

(c) Frequency band 2000-2300 MHz is predominantly being used for public telecommunications.

3.13. Suggested Solutions

(a) In 800/900 MHz, additional requirements upto 6.2+6.2 MHz may be met by coordinating on case by case basis in the frequency bands 902.5-915 MHz/947.5-960 MHz. These may not be contiguous and may be in smaller chunks of 0.6 MHz as accepted by the industry. Efforts would be made to make available larger frequency chunks to the extent feasible. Further, these may not be same in all the areas.

(b) In 1700-2000 MHz, following requirements may be met in the frequency band 1710-1785 MHz/1805-1880 MHz.

(i) 10+10 MHz for whole of India may be coordinated on case by case basis.

(ii) Additional 10 + 10 MHz as reserve for metro cities (Delhi, Mumbai, Chennai, Calcutta) may be coordinated on case by case basis. This reserve of 10+10 MHz may also be coordinated on case by case basis, in places other than metro cities as the need arises with the proviso that in certain areas it may be less than 10+10 MHz. To achieve this reserve, existing user's technology would need upgradation within mutually acceptable time frame with adequate financial compensation. IAF, the major user of the band, would accordingly need a compensation of Rs 140 crore to digitise its existing analogue systems in Gujrat & Maharastra sector. The estimate for Central, Eastern and North Eastern sector is Rs 205 crores. Unless this change is affected in a time bound manner, aforesaid reserve may not be coordinated.



(c) The allocation at 3.13 (b) above may not be contiguous and may be in smaller chunks of 1.25 MHz as accepted by the industry taking into account technological necessities of the system as well as availability of spectrum for coordination, while efforts would be made to make available in larger chunks to the extent feasible. Further, these may not be same in all the areas. In this context, it is noted that whole of 20+20 MHz may not be required in one go and the requirements would be in phases as the networks expand depending on market needs and subscriber base, keeping medium term (5 years) in view.

(d) All technological solutions should be applied by the service operators to provide maximum capacity from the assigned spectrum during the entire life of the system. In other words, solution should be found by adopting technical measures for using the spectrum optimally and not by demanding excessive spectrum.

(e) Public telecom operators demand more spectrum in order to reduce the network capital expenditure. Network planning by operators in India is not considered to be optimal, since for a small subscriber base a larger bandwidth of precious spectrum is being demanded/occupied. The capital expenditure depends on the cell size and the trend world over is to go for smaller cell size in order to provide service to a larger subscriber base within the available bandwidth which increases the capital expenditure. The attempt to avoid increased capital expenditure by the operators inevitably calls for more bandwidth. Therefore the operators seek more bandwidth, which is priced low compared to the other fees and expenditure, to reduce the capital expenditure. In the opinion of the Committee, this is not an optimum solution for the nation. Also, larger cell size corresponds to taller antenna, resulting in more interference problems. From all these considerations, operators should increase their capital expenditure by decreasing cell size and lowering antenna height. This is the optimum solution evolved internationally and should be insisted upon in the National Telecom Policy. Incidentally, in the 800/900 MHz band, as compared to the allocations made by various countries cited in industry's presentation which is at Appendix B, India has already allocated, for various types of public telecommunication services, about 110 MHz of spectrum and a further 12.5 MHz spectrum is under consideration.

(f) It is to be noted that these frequency bands are being presently extensively used and there are considerable requirements for future deployment. As such above coordination measures are subject to the proviso that there will be no scope for further exploitation of these bands for public telecommunication services including other types of technologies. Further, these measures are subject to the proviso that appropriate spectrum in the frequency band 2000-2300 MHz may be coordinated progressively for meeting the requirements of the services for which the frequency

band 1700-2000 MHz is being presently exploited.

(g) The above coordination measures are also subject to the proviso that the cost implications for such relocations by the existing users, will need to be appropriately compensated e.g. to make available (10+10) MHz as reserve, IAF, the major user of the band, would need to digitise its existing analog systems in Gujrat & Maharashtra sector at the cost of Rs 140 crores. The cost of this digitisation in Central, Eastern and North-eastern sector comes to approx Rs 205 crores. This amount would need to be compensated to make the band available in a mutually acceptable and stipulated time frame.

(h) Spectrum made available by adopting above mentioned coordination measures should be used for new private operators, MTNL/DoT and existing operators, as the case may be. Amount of spectrum to be pegged for an operator and number of players are interdependent. Further, subscriber base of an operator is also dependent on number of players and hence, the spectrum requirement per operator could diminish if there are more number of players.

