

**COAI COMMENTS ON ABTO'S PROPOSAL FOR
ADDITIONAL SPECTRUM IN PCS 1900 MHZ (US) TO CDMA OPERATORS IN INDIA**

DETAILED COMMENTS

The issue before the Sub-Group regarding the allocation of 1900 MHz spectrum to the CDMA operators is a contentious one as this spectrum falls under IND. 51 for IMT 2000 applications / services under NFAP 2002. It is therefore very essential and critical to understand the issues and the serious consequences thereof, if this proposal of ABTO / CDMA operators is even considered.

The Sub-Group has sought the comments of COAI on the "Note" prepared by the ABTO. While it was agreed in our earlier meetings (duly recorded), that ABTO will submit their detailed technical reasons for not being able to utilize the existing NFAP provisions (which has earmarked more than adequate spectrum for both GSM as well as CDMA), however it is observed that the entire submissions / **approach of ABTO in has little technical substance and dwells mainly on commercial aspects to attempt to justify** their proposal to be allocated additional spectrum in the frequency band which has been clearly earmarked by NFAP 2002 for IMT 2000 services in line with ITU-R recommendations and widespread international practices. It could thus be concluded that there appear to be no technological justifications for the CDMA operators to not implement their existing provisions in the current NFAP 2002.

Further, in our considered view, the ABTO "Note" has chosen to **highlight only selective aspects**, which **do not reflect the entire scenario** in totality and thus **could give a misleading perspective**.

For the above fundamental reasons, the ABTO proposal deserves to be rejected outright. However, we would on a positive note, like to raise the true technical and policy issues involved which warrant the rejection of the flawed and meritless proposal of ABTO.

Before we offer specific para-wise comments on the ABTO submission, **it is important to understand some of the policy & technical aspects** that will help us to take a logical and considered decision on this important matter. These are discussed below:

A. ADEQUATE SPECTRUM

1. We fully agree that adequate spectrum is very essential for offering high quality and affordable mobile services. But it is equally important to understand what determines “adequate spectrum”. It is a fact that **spectrum “adequacy” is directly linked to its ability to handle the traffic generated by the network (in erlangs)**. It is submitted that as per the TEC Study Report on Adequacy of Spectrum for GSM, the traffic handling capacity in any given quantum of spectrum is mainly dependent upon :
 - a. Technology (TDMA, CDMA, GSM, etc)
 - b. No of Sites in a given geographic area

2. Insofar as technology is concerned, in all submissions made at various fora, including TDSAT, it has been categorically contended by CDMA operators that the traffic handling capacity is far higher for CDMA as compared to GSM for the same quantity of spectrum (MHz). In their written submissions in TDSAT, ABTO is on record stating, **“A single 10MHz license withy CDMA yields 177% the Erlang capacity of a 30MHz license with GSM/DCS”** i.e., CDMA has 5.31 times the erlang capacity of GSM. A Copy of the relevant extract of the ABTO Written submission is enclosed as Annexure-1.

3. A presentation made by Qualcomm comparing the **voice capacity for equivalent 5Mhz spectrum (in erlangs per sector) is at least 4 times higher for CDMA 2000 1x as compared to GSM**. Insofar as **data capacity is concerned, the average data throughput comparison for 5MHz spectrum, CDMA 2000 1x is 8 times higher than GSM GPRS**. Copy of relevant extracts from the Presentation is enclosed as Annexure-2

4. It is therefore clear that when the issue of quantum of spectrum is being considered, the important parameter is to adjudge the traffic handling capacity of

the allocated spectrum. Therefore **any comparison between the spectrum allocated to GSM and CDMA operators must necessarily be based on the “traffic handling capacity” of the respective spectrums and cannot be compared on a simple MHz basis.**

5. As regards the second aspect of number of sites in a given Geographic Area, the higher the number of BTS sites in a given area, (say per square kilometer), the higher will be the erlangs generated. However, more sites means higher capex i.e higher cost of airtime production resulting in higher tariffs for the end user. While considering the adequacy of spectrum, it is thus essential to have a fix on the number of sites per square kilometer / Central Business District (CBD).
6. While considering the adequacy of spectrum for GSM, a detailed study was ordered by DoT and carried out by the TEC. For this, the Committee obtained detailed data from the GSM operators, undertook site visits to the GSM networks to verify the data provided and carried out consultations with all stakeholders, including the ABTO / CDMA operators. **The TEC Report assumed a traffic dimensioning per subscriber as 35 milli erlang (both for voice and data) and developed a “mathematical model” to determine spectrum adequacy,** keeping in mind the aspects of both the GSM technology and the number of sites. A copy of the Draft Report of DoT and a Final Report of the DoT Committee is enclosed as Annexure-3 & 4 respectively for your ready reference.
7. When a similar demand was raised subsequently by the CDMA operators for additional spectrum, a similar Committee was constituted. In our submissions to this Committee, we had provided preliminary calculations showing that even in the biggest cities like Delhi & Mumbai, assuming equal number of sites for both CDMA and GSM, the **present CDMA spectrum allocation of upto 5 MHz per operator was more than adequate to meet their traffic requirements.** As per these calculations, **even at 2.5 MHz per operator** (with 2 operators and with equal number of sites as GSM), the **CDMA operators can support 1.9 million subscribers in Delhi and 2.3 million subscribers in Mumbai. As of April 2004, the total subscriber base of the two CDMA players in Delhi was only 0.94 million and less than 0.8 million in Mumbai.** Thus it is clear that there is

no issue of inadequacy of spectrum for the CDMA operators. Calculations submitted are enclosed once again as Annexure-5, for your ready reference.. **However, for reasons not known to us, it appears that this Study has not been carried through to its logical conclusion.**

8. It is interesting to note that even by ABTO's own admission, CDMA 1x system can derive 1500 erlangs (300x5 sites) in 5MHz CDMA spectrum (when only 5 sites are considered in 1 square kilometer). On the other hand, GSM operators have at best been able to derive only upto 650 erlangs in CBD, even with more than double the number of sites in 1 square kilometer with 10MHz GSM spectrum with inter se distances reducing to less than 200 meters. This clearly demonstrates that **in a CBD, CDMA already has nearly 2.5 times the capacity of GSM**. This position of the GSM operators has also been extensively validated by the TEC. It is thus clear from the above, that **the traffic density handling capacity is the key to the mobile service provider, and it squarely depends upon the technology used (CDMA/GSM), number of sites and Spectrum in MHz**. Thus, adequacy of spectrum allocation has to be seen in light of equal traffic density per square kilometer, rather than on equal MHz basis (assuming equal number of sites for GSM and CDMA)

9. Further, in our view, the **issue of adequacy of spectrum for CDMA should only be considered after due diligence is carried out by the Committee in exactly the same manner as was done for the GSM operators and a Report of the above-constituted DoT/TEC Committee is made available to all stakeholders.**

B. APPROPRIATE SPECTRUM BAND

1. The National Frequency Allocation Plan 2002 (NFAP 2002) had been evolved in line with the Radio Regulations of the ITU with a view to catering for conflicting demands on the spectrum, including those of new emerging technologies without unduly constraining the existing usages and ensuring minimum scope of harmful interference.

2. It is relevant to note that when DoT announced its technology neutral policy, GSM operators had approached DoT seeking spectrum in the 800 MHz band. DoT responded to this request by stating “The cellular services are to be operated by the existing licensees in designated cellular mobile telephone service band i.e., 890-915 paired with 935-960 MHz. **The operators have been permitted to operate the Cellular Mobile Telephone Service in any technology, however the technology shall be digital and has to operate in the designated frequency band.** As such no additional frequency spectrum needs to be allocated” A Copy of the DoT Circular No. 842-309/99-VAS dated April 9, 2001 is enclosed as Annexure – 6. It thus goes without saying that **the same principles and treatment must also apply to the CDMA operators who are now full fledged cellular mobile service providers**

3. The **CDMA operators are operating under a Unified Access Service (UAS) License**. Clause 43.5 (ii) of the license stipulates the designated spectrum for UAS Licensees and states “the spectrum shall be allocated in 824-844 MHz paired with 869-889 MHz, 890-915 MHz paired with 935-960 MHz, 1710-1785 MHz paired with 1805-1880 MHz” A Copy of the relevant clause of the UAS License is enclosed as Annexure-7. Based on the principles enunciated in the above para, it is thus very clear that the **CDMA operators are technology neutral only within their designated bands of 800 MHz / 1800 MHz as per their license** and the argument of technology neutrality cannot be used to move out of their designated frequency bands.

4. It is submitted that as the UAS License as well as the current NFAP 2002 provides spectrum allocation in 800 MHz and 1800 MHz band for WLL (CDMA) operators, it is therefore not understood as to why the issue of 1900 MHz band allocation is even being considered for the CDMA operators, especially since this band has been clearly earmarked for IMT 2000 applications / services in NFAP 2000 as well as NFAP 2002.

5. As regards the Table of country examples cited by ABTO in Para 13 of their “Note”, we have the following comments to make :

- a. The Table of ABTO has listed the CDMA networks operator-wise rather than country-wise to make it look long and give a misleading impression.
- b. The ABTO has listed 48 networks in 26 countries offering CDMA 2000 services. In contrast, it is relevant to note that **GSM today operates in more than 606 networks in over 190 countries accounting for around 72% share of the total mobile market – i.e. over 1 billion GSM subscribers** out of a total of 1.38 billion mobile subscribers worldwide. On the other hand, **CDMA subscribers are only 188 million –i.e. less than 14% of the total mobile market**. Thus, **if we were to list GSM networks in the manner similar to what ABTO has done to the CDMA networks, then the GSM list would run into over 30 to 40 pages**.
- c. In terms of the countries, where CDMA 2000 networks are operational the table could be summarized as below:

Frequency Band	Countries
800 MHz	Japan, India, New Zealand Moldova, Israel, Venezuela, Indonesia, Australia, Ecuador, Panama, Thailand, Nicaragua, Vietnam, Taiwan, Peru,
1800 MHz	Korea
800/1900 MHz	USA, Brazil ⁱⁱⁱ , Canada, Puerto Rico, Columbia
1900 MHz	Chile, Mexico, Dominican Republic, China ⁱⁱⁱ , Guatemala

- d. With regard to the above countries it is observed :
 - i. The majority of the countries using CDMA technology are operating in the 800 MHz band only.
 - ii. The use of the 1900 MHz band is almost entirely confined to a few countries in the North / South America region, where 1900 MHz has been deployed for CDMA based mobile services for historical reasons.
 - iii. It is pertinent to note that **in several cases** where part of this band had been allocated to PCS 1900 (US) MHz for historical reasons, such **countries are revising / re-farming their frequency allocation**

plans so as to be in consonance with the ITU globally harmonized bands for IMT 2000 which ensure interference-free operations.

- As per our understanding, **China has reportedly decided to close down the PCS 1900 band** operation by 2005 and has deleted this band in their revised frequency allocation plan (as updated in 2002) **to enable interference-free operations in WARC-92 identified bands for IMT-2000 applications / services.**
- Similarly, we understand that **Brazil is also changing its frequency allocation plans** and has set aside 2x55 MHz in the WARC-92 identified bands **for IMT-2000 applications / services.**

iv. It is therefore indeed **surprising that ABTO is even attempting to moot such a retrograde proposal for allocation of PCS 1900 MHZ (US) band, knowing fully well the implications involved and also the fact that this would be completely contrary to ITU recommended globally harmonized bands and trends worldwide for IMT-2000 applications / services.**

6. We also believe that to get a correct perspective, instead of relying on the Table given by ABTO, it would be more relevant to look at such countries where GSM came first as the technology and CDMA was introduced subsequently. To the best of our knowledge, there is **no such country/ example where 1900 MHZ band has been allocated in the same city/geographical area to a CDMA operator for 1x/EVDO where GSM was already operating.** This is on account of several substantive reasons that have been separately dealt with under Section – E.
7. The argument of ABTO that 1900 MHz should be allocated because CDMA infrastructure or handsets are not available in 1800 MHz bands is untrue because **as per the information available, both CDMA infrastructure (Motorola, Lucent, Ericsson, Samsung, LG, Daewoo) as well as handsets, are available in the 1800 MHz band (Samsung, LG, Pantech, Curitel, Sewon, Telson).** A list of vendors as per our information is enclosed as Annexure-8.

Thus there is no question of “reinventing the wheel” as is being made out by the ABTO.

8. It is also pertinent to note that in the case of US, till recently, USA was a protected market for only CDMA technology. Because of this, the US bands were not normally in line with most of the world. Once the US realized the need for GSM and introduced the same around 2001, **the GSM infrastructure providers made available both infrastructure as well as handsets in the 1900 MHz band to suit the particular needs of the US market.**
9. Thus any **argument of ABTO** to suggest that the 1900 MHz band should be allocated to them because **CDMA infrastructure and equipment is not presently available in the 1800 MHz band is completely untenable as not only is the equipment available, but also the same can be easily made available by other vendors as has been done by the GSM vendors for several markets like the US (as explained above), Korea, Latin America, etc.**

C. SPECTRUM FOR HIGH SPEED DATA ONLY SERVICES

1. ABTO has sought additional spectrum in 1900 MHz band only to launch high-speed data services deploying 1x /EVDO (data only) technology. This deployment requires a dedicated frequency allocation exclusively for data, with no sharing for voice on the carrier.
2. In this context, it must first be noted that as of date, **CDMA operators are already providing higher-speed data services as compared to GSM operators.**
3. It is submitted in this regard that even GSM data rates could have been increased up to the CDMA operators’ present capability (1x), had the GSM operators been given additional spectrum in 900/1800 basically for data services only. However, **TEC while evaluating the GSM request for additional spectrum, considered only traffic handling capacity (35 milli erlang per**

subscriber) within the allocated spectrum and it was **left to the operator to use that spectrum for any type of service – voice or data or both.**

4. It would thus be **unjust and unfair to adopt a discriminatory approach between CDMA and GSM operators** and consider any allocation of additional spectrum to CDMA operators to provide data only services.
5. In fact, it may also kindly be noted that **as of today, CDMA operators are already providing both voice and data services within the existing allocated spectrum** in exactly the same way as is being provided by the GSM operators.

D. ROAMING

1. ABTO has also sought spectrum allocation in the 1900 MHz band for CDMA on the grounds that “the full benefit of technology would be available to the consumer when they have the roaming facility available.”
2. Let us consider two scenarios for international roaming viz. in-roamers and out-roamers.
 - a. **For In-Roamers,**
 - Any CDMA international user who has a handset that works in 800 MHz band will be able to freely roam in India as all CDMA operators in India are already functional in 800 MHz
 - A CDMA in-roamer from the US (1900 MHz network) will require a dual band handset, which supports both 800 and 1900 MHz if he wants to roam in the India. This is exactly as would be applicable to a GSM international in-roamer from the US (800/1900 MHz) who will also need a handset that supports 900 or 1800 Mhz or both to roam on GSM networks in India. In this context, it is pertinent to note that an 800 MHz GSM in-roamer from the US will not be able to roam on Indian GSM networks. Can this example be used to justify allocation of 800 MHz spectrum to Indian GSM operators??

- b. For **out-roamers** :
- Similarly, an Indian CDMA out-roamer will be able to freely roam in all international CDMA networks that operate on 800 MHz.
 - As for a CDMA out-roamer to a 1800 MHz / 1900 MHz network, he will require a handsets that supports these bands, much like the GSM out-roamer to the US requiring a tri-band handset.
3. It is thus clear from the above, that **international roaming is not an issue and cannot be used as a justification to get spectrum allocated in 1900 MHz.**
- E. WHY 1900 MHZ IS NOT ALLOCATED TO CDMA WHERE GSM IS ALREADY PRESENT IN THE SAME GEOGRAPHICAL AREA?**

Let us now understand the issues involved if the PCS 1900 MHz (US) band is allocated to CDMA operators.

I. IT WILL BLOCK GSM MIGRATION PATH TO IMT-2000 APPLICATIONS /SERVICES

1. Based on ITU-R recommendations, **it took more than 10 years for the industry to come out with commercially available infrastructure for IMT-2000** applications / services in the WARC 92 identified band i.e., 1920-1980 MHz / paired with 2110-2170 MHz.
2. As of today, **120 operators /licenses** have been awarded in **40 countries**, which have **either commercially deployed IMT-2000/FDD mode (WCDMA)** access standard (i.e., the 3GPP path for the GSM operators to migrate to IMT-2000) **or are in different stages of deployment / launching** (26 networks are already commercial with almost 5 million users; 50 networks are expected to be commercial by end 2004). The frequency spectrum allocation for these networks is the ITU-R globally harmonized WARC-92 identified paired band (1920-1980 MHz / 2110-2170 MHz). A list of such countries is enclosed as Annexure-9.

3. **If any bands other than the above WARC-92 identified band, such as the WRC-2000 identifications are considered for IMT-2000, then there is absolutely no chance/ possibility of any infrastructure being commercially available in the next few years, if not more. Thus, if the PCS 1900 MHz band is considered for allocation to CDMA as proposed by ABTO, then it is tantamount to denying the existing GSM operators their logical migration to IMT-2000, which will have far reaching consequences.**
4. There is also **no international precedent to allocate PCS 1900 MHz band to CDMA 1x operators where GSM is the incumbent technology.** In fact, even in countries such as **South Korea, where CDMA is the dominant and incumbent technology, the ITU-R WARC-92 identified band has been allocated for IMT 2000 applications / services.** Similarly, Japan too, has also issued licenses for both WCDMA and CDMA 2000 in the IMT-2000 WARC-92 paired bands. Further, as already mentioned earlier, Brazil has also changed their frequency plans in favour of IMT-2000 WARC-92 bands. China too, has assigned WARC-92 identified band for IMT-2000 /FDD operations and so on. (Please refer to Diagrams 1 & 4 in Annexure-10.)
5. Thus, **contrary to ABTO submissions, almost all countries are allocating spectrum as per the ITU globally harmonized bands WARC-92 identified** and in cases where part of this band had been allocated to PCS 1900 MHz (US) for historical reasons, those countries are revising / re-farming their frequency allocation plans so as to be in consonance with the ITU globally harmonized WARC-92 identified bands for IMT-2000. It is therefore indeed **surprising that ABTO is even attempting to moot such a retrograde proposal for allocation of PCS 1900 MHZ (US) band, knowing fully well the implications involved** and also the fact that this would be **completely contrary to ITU recommended globally harmonized bands and trends worldwide for IMT-2000 applications / services.**
6. It must be emphasized that adherence to the ITU-R frequency arrangements enables both CDMA 2000 and WCDMA to co-exist without interference for IMT-2000 operations and without the need for guard bands

II. COMPATIBILITY ASSESSMENT OF MIXED USAGE OF PCS 1900 (US) BAND AND IMT-2000 (WARC-92) 2GHz BAND

1. The PCS 1900 MHz (US) band is 1850-1910 MHz (UL) / paired with 1930-1990 MHz (DL). **Compatibility assessment/study** (1999) had indicated **serious interference problems by mixed usage of the PCS 1900 (US) band and IMT-2000 (WARC-92) bands in the same geographical area**, because of the down link (DL) of PCS band, 1930-1990 MHz is adjacent (or, co-channel) to the uplink (UL) of IMT-2000 core band, 1920-1980 MHz; thereby preventing operation of IMT-2000.
2. It is to be noted that **when different band plans are implemented in the adjacent frequencies, there will be interference requiring the introduction of guard bands, resulting in in-efficient use of spectrum**. Besides, this **directly reduces the availability of usable frequencies too**. The following Table presents the spectrum ranges in their relevant (overlapping) parts, GSM 1800, PCS 1900, and IMT-2000 core (WARC-92) band

GSM 1800	Downlink 1805-1880 MHz	
PCS 1900	Uplink 1850-1910 MHz	Downlink 1930-1990 MHz
IMT-2000, WARC-92 band/FDD		Uplink 1920-1980 MHz

3. In case, the PCS 1900 uplink allocation is given between 1850-1910 MHz, it directly reduces both the available GSM 1800 MHz band as well as the IMT-2000 band. It is heartening to note that the IMT-2000 band (identified by WARC-92) is already under coordination by the Department of Telecommunication (DoT) and that the 'Defence' is actively considering vacation of (60+60) MHz for IMT-2000 services in the country, which would be just sufficient for four operators of '3G' services.

4. As earlier mentioned, the main problem in **using 3rd generation systems (IMT-2000) in countries where PCS 1900 band is in use** is that the duplex directions of PCS 1900 and IMT-2000 WARC-92 bands are the opposite; this means that the IMT-2000 base station receiver (BSRx) band is adjacent (or co-channel) to the high power PCS 1900 base station transmitter (BSTx) band, **creating high level of harmful interference and thereby the need for a large guard band, or, mitigation by additional filters/site coordination along with a certain guard band.**

5. **Thus, the mixed use of PCS 1900 MHz and IMT-2000 in WARC-92 bands leads to the inefficient use of spectrum in terms of guard bands.** It is appropriate to follow the ITU-R identified globally harmonized bands and avoid deployment of the 1900 MHz PCS band within the IMT-2000 band (identified by WARC-92), in line with the international practice.

III. HARMFUL INTERFERENCE WITH EXISTING / FUTURE GSM NETWORKS

1. There are a number of serious operating issues, severe harmful interference problems and wastage of spectrum by guard bands that will arise as a result of the mixed usage of PCS 1900 MHz (US) and IMT-2000 (WARC-92 identified) 2GHz bands. A recent analysis on Interference levels and mitigation techniques had indicated that:
 - a. The main interference mechanisms at the border are the blocking of IMT-2000 BSRx in the WARC-92 bands, and spurious emissions from PCS 1900 BSTx falling into the IMT-2000 BSTx band in the WARC-92 bands.
 - b. WCDMA Rx operating in WARC-92 bands filter has typically very little attenuation across 1930-1990 MHz, in conformity to the relevant 3GPP standards, the -40 dBm blocking requirement applies in the case.
 - c. For blocking of IMT-2000 Base stations, based on 3GPP for WCDMA and 3GPP2 for CDMA 2000 standards, the required isolation would be 43dBm [cdma Tx power] -57dB [ACS2] - (-110) dBm = 96 dB. That is, without site

coordination (with the 30 dB Minimum Coupling Loss / MCL assumption), the WCDMA external filters would need to provide 66 dB additional attenuation at each WCDMA Base station site. The MCL value of 30 dB is commonly used as a minimum coupling loss between antennas of uncoordinated radio networks. (Refer Diagram-2 in [Annexure-10](#))

- d. For spurious (unwanted) emissions from PCS 1900 falling into IMT-2000 WARC-92 bands, normal PCS 1900 full-band duplexer filter will provide no attenuation across most of the IMT-2000 Rx band, in the WARC-92 bands.
- e. For offsets > 2.25 MHz from the CDMA 2000 carrier centre frequency, the cdma 2000 spurious emissions levels still are > -7dBm/3.84 MHz (the specified upper limit prescribed by 3GPP2).
- f. The required isolation at the CDMA 2000 base station would be $-7\text{dBm}/3.84\text{ MHz} - (-110\text{ dBm}) = 103\text{ dB}$, that is, for spurious emissions from PCS 1900 base stations without site coordination (with the 30 dB MCL assumption), the CDMA 2000 external filters would need to provide 73 dB additional attenuation at each CDMA 2000 Base station Rx site, after a certain guard band. (Refer Diagram-3 in [Annexure-10](#))
- g. An earlier (1999) compatibility assessment between PCS (IS-95 specifications) and IMT-2000, and assuming normal duplexer filtering in PCS 1900 band, had indicated that increase in guard band beyond a critical point does not solve the compatibility situation and does not improve the isolation, i.e., the geographical separation distances between the base stations, as the PCS mask was observed to be flat after 1.98 MHz from the carrier centre frequency.
- h. As the spurious emissions from PCS 1900 BSTx of $-7\text{dBm}/3.84\text{ MHz}$ cover the band 1930-1990 MHz, which overlaps with most of the IMT-2000 WCDMA / BSRx band, no filtering at the IMT-2000 BS in the WARC-92 bands helps to remove such 'In-band' interference. If all networks are independently built for interference free operation, i.e., without site

coordination (with the 30 dB MCL assumption) and without any external additional filters, large guard band (say, in the range of 20-25 MHz) would be necessary, to prevent interference to a standard 2 GHz WCDMA base station operating in the WARC-92 bands. Obviously, CDMA 2000 cannot be deployed in 1930-1990 MHz downlink without high level of harmful interference on to the IMT-2000 /WCDMA Base Station.

- i. Any attempted solution by deploying external filters, would imply trade-off in terms of guard band, site separation distances (also operators to bear full burden of keeping track of each other site data, like location, antenna parameters) as well as increased complexity of the filter design. The size of the guard band (for the slope of the filters) determines the complexity and cost of the required filters.
- j. Thus, if CDMA 2000 is implemented in 1930-1990 MHz, or part thereof, say in 1980-1990 MHz, then site coordination and external additional filtering is a must for all WCDMA Base stations (BSRx) in the IMT-2000 band (not only the ones just below 1980 MHz), as well as all the PCS 1900 Base stations (BSTx).
 - i. This situation would thus require the 'cdma 2000' operator to employ heavy external filter in each Base station Transmit side (BSTx) to provide 73 dB attenuation at each site to prevent impairment of the IMT-2000 band, after deploying a certain guard band. In addition, every WCDMA operator would need to have heavy external filters to provide 66 dB attenuation in each Base station Receive side (BSRx) to prevent blocking.
 - ii. The external filters would downgrade the network performance implying loss in quality of service, both for WCDMA and CDMA operations, as well as require additional sites; wastage of spectrum by guard bands is inevitable.

- k. The cost and complexity of the external filters is dependent on the size of guard band (for the slope). It is difficult to say who could carry the cost of developing, manufacturing and deploying such external filters at each base station over the complete life cycle along with implied degraded performance of the networks/services??
 - l. Extensive studies in 3GPP and 3GPP2 have shown that co-existence of WCDMA and CDMA 2000 within the IMT-2000 / WARC-92 band pose no problems, so long as the band plans, as identified by ITU-R for IMT-2000 (WARC-92) are implemented (same is not true, if band plan of PCS 1900 MHz is deployed).
6. **The mixed use of PCS 1900 and IMT-2000 in WARC-92 bands thus leads to in-efficient use of the available spectrum in terms of large guard bands, besides other implications like coordination, usage of external additional filters and associated degraded network performance.** The best choice is to follow the ITU-R identifications and avoid to introduce deployment of the PCS 1900 band within the WARC-92 bands for IMT-2000 in line with the worldwide practice.
7. Further, it may be pertinent to note that the uplink of PCS 1900 MHz band, namely 1850-1910 MHz, would be causing severe harmful interference to the downlink of GSM 1800 band, namely 1805-1880 MHz (Refer to Paras 2 and 3 of Section E-II). Thus, if PCS 1900 uplink allocation is given in the 1850-1910 MHz, it directly reduces the GSM 1800 band allocation for 2G / 2.5 G services, besides wastage of spectrum by guard bands and harmful interference problems.
8. Keeping in view the need for availing the benefits of the economics of scale of globally available standard equipment as well as, 'roaming', and to avoid harmful interference problems from the spurious emissions of PCS 1900 MHz band (DL), ITU-R identified globally harmonized WARC-92 frequency bands have been/are being allocated world wide for IMT-2000 services.

9. The position of frequency spectrum allocation in some Asian countries (Japan, Korea, China), Latin American countries (Brazil) and the US has been detailed in Diagrams 1 & 4 in Annexure-10.

10. Since it is an established fact beyond doubt that in the same geographical area both WCDMA (GSM Road Map/3GPP path) and PCS 1900 MHz (US) cannot co-exist, any consideration of this request of ABTO for part or whole of the PCS 1900 MHz (US) band, is wholly untenable, unjustified and against international practices. **Acceptance of this request will block the migration path of GSM to 3rd Generation mobile services and deprive the 30 million GSM subscribers of BSNL, MTNL and private operators from availing of the benefits of 3rd Generation applications and services.** This will also not be in public interest, as GSM operators who are the pioneers of mobile communications in this country will find their future services endangered.

F. RECOMMENDATIONS BY ITU WORKING PARTY 8F (ITU WP8F)

1. At the outset, we would like to state that the ABTO has misinterpreted the recommendations of the ITU Working Party 8F (ITU-R Recommendations M.1036) under the cover that ITU permits “flexibility”, merely to provide misleading support to their proposal.

2. The correct position is as below:
 - a. The ITU WP8F Report on spectrum for IMT-2000 had considered the possible / preferred harmonized frequency arrangements in the 806-960 MHz, 1710-2200 MHz and 2500-2690 MHz, keeping in view the approved frequency bands by WARC-92 as well as subsequently by WRC-2000 (referred as extension bands) for interference-free IMT-2000 applications / services.

 - b. The Report has indicated Options A1 & A2 as the two possible preferred frequency arrangements in the 806-960 MHz as identified for IMT-2000

(WRC-2000) with the remark that no common solution would be possible in the near and medium terms.

- c. The Report has considered paired frequency arrangements in the band 1710-2200 MHz and indicated different combinations of options B4, B5, B6 for optimized use of spectrum for paired IMT-2000 operations, based on harmonization with B1, B2, B3 basic frequency arrangements already in use by public mobile systems.
- d. B1 and B2 are fully complementary and B3 overlaps with B1 and B2 frequency arrangements.
 - i. Option B4 has been indicated to optimize use of spectrum for paired IMT-2000 operations, as the option for countries having implemented B1 frequency arrangement i.e. (1920-1980 / 2110-2170 MHz).
 - ii. Option B5 enables maximization of the use of spectrum for paired IMT-2000 operation for such countries where Option B3 (1850-1910 / 1930-1990 MHz) is implemented and where the whole band 1710-1850 MHz is available.
 - iii. Option B6 enables maximization of the use of spectrum for IMT-2000 operations for such countries where B3 is implemented and where the band 1710-1850 MHz is not available in the initial phase of deployment of IMT-2000 in this frequency band.
- e. It would **be seen from above that mixed band plan of frequency arrangements** PCS 1900 with IMT-2000 WARC-92 bands for paired IMT-2000 operation (as indicated in Table–2 in ABTO submission) **does not find a place in the recommended options.**

3. In simple terms, the options B4, B5, B6 by ITU WP 8F indicate the preferred combination of harmonized frequency arrangement with the prevailing / current usage of the paired frequency bands B1, B2, B3 (in part or whole) for public mobile systems in the country so as to enable optimal usage of the spectrum for paired IMT-2000 operations. In case combination of non-harmonized frequency arrangements (i.e., other than B4, B5, B6) are attempted to be deployed then the

prevailing / current usage of the frequency arrangement for public mobile system in the country would get disturbed. It may not be out of place to mention that the availability of equipment in the non-harmonized frequency arrangements is also questionable.

4. It may also be pertinent to note, that equipment rollout based on WRC identified bands is a time consuming and an involved process, both at the levels of ITU study groups and investments / equipment planning, etc., by the global equipment manufacturers. If past experience is any guide, like commercial availability of infrastructure equipment, based on WARC-92 identified bands for IMT-2000 operations (it has taken more than 10 years), the **commercial availability of equipment based on WRC-2000 identified bands** (referred as extension bands) is unlikely to **emerge in the near future**.
5. Further, for the reasons given above, the **suggestions given by ABTO** for NFAP 2004 for long term solution in Para 28 of their “Note”, **are neither appropriate nor acceptable for consideration / implementation in our country**. On the contrary, **their suggestions are clearly an attempt to create confusion and block the well-set migration path of the GSM operators to IMT-2000 / 3rd Generation application / services and futuristic applications**.
6. It may also be noted that **almost all countries are adopting the principles of harmonized spectrum use and are allocating spectrum as per the ITU globally harmonized bands** (WARC-92 identified) for IMT-2000 and in cases where part of this band had been allocated to PCS 1900 (US) MHz for historical reasons, those countries are **revising / re-farming their frequency allocation plans so as to be in consonance with the ITU globally harmonized bands for IMT 2000**.
7. It is thus indeed very surprising that **while the rest of the world is moving forward to a globally harmonized spectrum environment**, that ABTO is attempting to moot such a retrograde proposal for allocation of PCS 1900 MHz (US) **band**, knowing fully well the implications involved **and also the fact that**

this would be completely contrary to ITU recommended globally harmonized bands and trends worldwide for IMT-2000 applications / services.

G. IMPORTANCE OF SPECTRUM HARMONIZATION

1. We are all aware that the aim of the spectrum management is to ensure that the spectrum is used most efficiently and spectrum efficiency is achieved when the guard bands are minimized and systems operate interference free and the amount of acceptably transferred traffic is as high as possible.
2. Spectrum harmonization is an important aspect of spectrum efficiency in global radio communications. To avoid interference amongst systems, not only the frequency bands, but also the direction of transmission (i.e., from base station to mobile and from mobile to base station) must be harmonized.
3. Global harmonization of spectrum offers an opportunity and an incentive for manufacturers to develop and engage in the production of large quantities of low cost telecom equipment.
4. Implementation /use of ITU-R globally harmonized common spectrum, WARC-92 identified, thus leads to:
 - a. Interference-free operations
 - b. Optimal utilization of spectrum (no wastage by guard bands etc),
 - c. Facilitation of Global roaming
 - d. Availing of the benefits of the economies of scale of globally available standard equipment, etc
5. In this connection reference is invited to the **recent recommendations made by the ITU Regional Working Group on Private Sector Issues**, which met on April 26-27 in New Delhi. The recommendations of the Group, which were **consensually agreed between all stakeholders**, including representatives from **several Asia Pac and other countries** as **also representatives of DoT, WPC, TEC, ABTO and COAI**, are reproduced as under:

- a. “Harmonized frequency allocation is essential for facilitating global roaming, economies of scale, wide competitions and benefits to the end-users.
 - b. Consistency in identifying global spectrum for specified services also provides regulatory certainty for operators, investors, manufacturers and administrators and facilitates development of global standards.
 - c. Long-term spectrum plans should consider ITU-R globally harmonized spectrum use as well as the technological evolution paths of different wireless systems in a given market. The adequate accommodation of these requirements in national spectrum allocation should aim to give operators certainty in their long-term plans and strategies.
 - d. ITU has identified certain bands for the IMT 2000 / 3G applications, without precluding the use of these bands for other wireless applications. It was pointed out by the ITU expert that the thrust of the ITU Recommendations was achieving global harmonization of spectrum use and that the same should be implemented.”
9. It is therefore clear that use of the ITU-R identified globally harmonized IMT-2000 bands (WARC 92 identified) increase the equipment commonality, facilitates global roaming and brings benefits of economies of scale for the consumers. Lack of harmonization with the majority of administrations worldwide (which will implement IMT-2000 system in the ITU agreed upon bands) could prevent countries (such as the Americas) from enjoying the benefits of a quasi-global large-scale production of common equipment.
10. We believe that it is important for **India to integrate itself with the global community and also deploy the ITU-R globally harmonized, frequency band** i.e. 1920-1980 MHz / paired with 2110-2170 MHz for IMT-2000 services, as already earmarked in NFAP-2002 and identified by WARC-92 and as is being done by other countries worldwide including Japan, Korea, China, Brazil etc.

H. CONCLUSIONS AND SUGGESTIONS

1. **More than 40 countries**, including Japan, Korea, China, Brazil (Latin America) UK, France, Singapore, Malaysia, have **chosen the WARC – 92 identified bands**, for the early implementation of **IMT-2000**. **No country has opted for the ‘mixed band plan’ approach. (refer Para 2 in Section E-I)**
2. The **mixed band allocation plan**, i.e., implementation of PCS 1900 MHz frequency band in whole or part of 1850-1910 MHz (UL) /1930-1990 MHz (DL) by CDMA 2000 within the IMT – 2000 / WARC-92 frequency band, namely, 1920-1980 MHz (UL) / 2110-2170 MHz (DL) **is not considered desirable** for implementation. There is **high level of harmful interference** caused by the operation of DL of PCS 1900 band plan with the UL of IMT-2000 band plan, which **cannot be mitigated by wasting spectrum in guard band**. The spurious emissions and wide band noise from the PCS 1900 BS transmitter will severely impair any subsequent use of the WARC-92 bands for IMT-2000. No filtering in WCDMA base station can remove such ‘In band’ interference and large guard band is required for interference free operation, without coordination and without external filters.
3. **Any attempted solution for deploying mix of PCS 1900 and WARC-92 bands for IMT-2000 band would invite trade-off** in terms of mitigation techniques, like, coordination, long physical separation distance between the sites, large guard bands, **resulting in inefficient usage of spectrum** as well as the need of external filters at each base station both for IMT-2000 and PCS 1900 networks, with **associated issues of costs and filter complexities**. Even the external filters will require **wastage of some spectrum as guard band**. Further, such operations **degrade the network performance**, require more sites and have not been considered appropriate worldwide in the 2 GHz band for IMT-2000. It may be of interest to point out once again that the **preferred options by the ITU-WP8F Report** on frequency arrangements for IMT-2000 **also do not include this ‘mixed band plan’ as a possibility**.

4. The countries like Japan, Korea, US, China and Latin America like Brazil (where PCS 1900 MHz band could be in CDMA operation), have found solutions to avoid interference with the WARC-92 bands for IMT-2000, keeping in view the harmful interference problems. The implementation of the mix of PCS 1900 band and WARC-92 bands in the same geographical area/country has been avoided by the countries worldwide, either, by modifying the operation of PCS 1900 band by a different band for second generation services in the country, or, by implementing a different frequency band for IMT-2000. To the best of our knowledge, no country has adopted such 'mix band operation'. **India can ill afford even to think of changeover from the WARC-92 identified 2GHz band for IMT-2000 applications / services**, which had been earmarked by the Government in NFAP 2000 as well as in NFAP 2002, and is being implemented for IMT-2000/3G application worldwide. (Refer Para 2 of Section E-I). This is **because IMT-2000 represents the most cost effective band for India for the provision of 3G services because it offers 8-10 times the voice capacity of 2G, and it is voice telephony that is the primary requirement for India at this stage and even for quite some time to come.**

5. It is **in the larger interest that for interference free operations and for optimal utilization of spectrum** (no wastage by guard bands, etc), **ITU-R identified globally harmonized WARC-92 identified IMT-2000 bands are being deployed by the countries worldwide** including Japan, Korea, China, Brazil, etc. Such allocations also enable roaming and availing of the benefits of the economies of scale of globally available standard equipment. (Refer Para 4 of Section G)

6. Studies by GPP/3GPP2 have shown that co-existence of WCDMA and cdma 2000 within the IMT-2000, WARC-92 band poses no problem, so long as the ITU-R identified WARC-92 frequency band plan is deployed. This is how the WCDMA and cdma 2000 are being and should be deployed worldwide. Infrastructure equipment is available both for WCDMA (GSM/3GPP path) and cdma 2000 (CDMA/3GPP2 path) and such networks are operational.

7. **Globally harmonized common spectrum, identified by ITU-R increases the equipment commonality, facilitates global roaming and brings benefits of economies of scale for the consumers.**
8. **India too, should continue to remain integrated with the world community and continue to safeguard the ITU-R globally harmonized, frequency band (1920-1980 MHz / 2110-2170 MHz) for IMT-2000 services, as already earmarked in NFAP-2000 and NFAP-2002 (IND-51), from impairment for subsequent use as well as avoid its fragmentation.**
9. **Accordingly, we submit that it is important for the Government to lay down /announce a clear cut policy of Spectrum for the IMT 2000 WARC 92 identified frequency band and have the same vacated by the existing users at the earliest in order to facilitate interference free operations of 3G services in the ITU-R globally harmonized WARC-92 identified bands.**
10. **Insofar as the CDMA operators are concerned, for the important reasons cited above, it is imperative that for them, the existing provisions in the NFAP are complied with, which means that they must first exhaust available spectrum in the 800 MHz band and then move over to 1800 MHz as provided for in NFAP – 2002.**
11. **For all the above powerful reasons (backed by technical justifications and international practices) it is imperative that the ABTO proposal is rejected.**