

amateur radio if these frequencies are withdrawn from amateur use, or if amateur operators are forced to operate in close physical proximity to users incompatible with the amateur and amateur-satellite services.

2. For example, Loral/Qualcomm urges the Commission to allocate 2390-2400 MHz and 2402-2417 MHz for mobile satellite uplinks, but didn't address sharing with the amateur services. In an environment of large numbers of mobile terminals accessing mobile satellites, interference to amateur and amateur-satellite operations could be significant. Even if spread-spectrum techniques are used, the noise-floor created by the many uplink terminals involved would seriously impede weak-signal experimentation by the amateur and amateur-satellite community. In addition, significant potential would exist for such mobile terminals to experience interference when operated in close proximity to amateur stations.

3. AT&T urges retaining 2400-2483.5 MHz for spread-spectrum Part 15 devices, especially for wireless LAN applications. They said that sharing with the amateur services would be acceptable but that they would want to prohibit any new users in the 2402-2417 MHz band. This would indicate that they, like so many others offering comments in this proceeding, look on amateur use of this band in terms of its present level of occupancy, rather than the growth that is certain to occur in the future. At the current rate of growth, the amateur population is expected to double in the next ten years. In addition, also as addressed in our Comments, the use of this band by the amateur and amateur-satellite services is virtually certain to grow at far higher rates.

4. If the amateur services are forced to share these valuable frequencies with nearby high-density users, such as the kind of Part 15 spread-spectrum devices which AT&T is

discussing, the noise-power density may significantly degrade amateur and amateur-satellite communications, especially in weak-signal applications such as amateur-satellite downlinks, except perhaps in sparsely-populated areas, where few amateurs reside. Also of great concern to us is the potential for such Part 15 users to experience interference from licensed amateur stations. Although Part 15 devices are required by current FCC regulations to accept such interference, we are very concerned that, in practice, amateurs may be pressured by users of such devices to suspend or cease operations. In addition, interference complaints to the Commission by users of such devices may cause an administrative and budgetary burden, regardless of the merits of such claims.

5. The Forestry-Conservation Communications Association claims that secondary amateur use may be a problem because of the difficulty of identifying sources of interference. Whatever frequency needs this organization has in this portion of the spectrum might best be accommodated near 2450 MHz. Since their principal use would be expected to be in remote areas, they should suffer little from microwave ovens and other ISM devices. With respect to their concern about identifying sources of interference, since amateur radio operators are required to identify their transmissions with their call-letters, there should be little difficulty identifying amateur sources of interference, should interference occur.

6. The Association of Public-Safety Communications Officials International claims that 2390-2400 MHz and 2402-2417 MHz would be particularly suitable for the advanced private mobile communications technologies described in the COPE Petition, including transmission of broad-band, high-resolution images and for private operational fixed service microwave operation at remote, high-elevation sites. Certainly such statements

could be made about any band of frequencies in the microwave region of the spectrum. Just because frequencies would be "particularly suitable" for a contemplated application does not necessarily mean that these frequencies should be re-allocated from their current use to that application or that such frequencies can be shared with the present users.

7. Once again, we are very concerned about the possibility of having to share these frequencies with high-density services such as mobile communications. However, there would be far less difficulty in sharing with point-to-point microwave links since the chances of interference would be relatively slight and could be dealt with on a case-by-case basis.

8. The American Association of State Highway and Transportation Officials Special Committee on Communications claims in their comments, that the 2400-2402 MHz segment is sufficient for existing amateur-satellite operations. We strongly disagree with this conclusion. They have never contacted us to inquire as to our current or future needs. Here again, we are faced with being judged on our "current" needs while other, "blue sky" services are apparently asking to be judged on yet uninvented means of communication. In the readily foreseeable future, AMSAT anticipates greatly increased demand for amateur-satellite operations in the 2400-2410 MHz portion of the spectrum, far more than can reasonably be accommodated within a 2 MHz wide band. Such a narrow band would certainly be too restricted to accommodate such wideband techniques as fast-scan television, even if compression techniques are employed. AMSAT hopes to be able to employ such modes on future spacecraft, if appropriate frequency spectrum is available. The 10 MHz wide 1260-1270 MHz uplink-only amateur-satellite service allocation is available for such applications, and a similar bandwidth is needed as a paired

downlink near 2400 MHz. The amateur service has already lost 80 MHz of the 2.4 GHz band (2310-2390 MHz), withdrawn on the basis of being needed for airborne telemetry¹.

9. Even most of the other amateur groups who submitted comments, with the exception of the American Radio Relay League, do not seem to have much of an idea how the 2.4 GHz band might be used in the immediate future by the amateur-satellite service, much less 10 to 20 years from now. If history is any guide, some of these commenters who display little or no knowledge of the technologies which they are addressing, will become big and enthusiastic users of them. For example, fifteen years ago, virtually no amateurs were familiar with packet radio. Now, the amateur community has made noteworthy contributions toward developing this technology and it is currently in use by a sizable fraction of the amateur community. We feel certain that some of the new applications that are even now under development by the amateur-satellite community, will have a similar impact. But, that cannot happen if the amateur services do not have sufficient access to appropriate frequencies. These amateur commenters, again with the exception

¹The concept of sharing with that application was not addressed in that proceeding, and to make matters worse, the frequencies were not used for the stated purpose. Instead, they were offered as a U.S. home for digital radio broadcasting - an allocation employed by almost no other country in the world. If that application for 2310-2390 MHz had been specified as the rationale for removing these frequencies from the amateur service, a better defense could have been mounted by the amateur community to preserve them. Now, after losing these frequencies, powerful forces are lined up to try to take away almost all of the rest of the usable part of this band. AMSAT suggests that they look elsewhere to find a service which has not already been decimated in this part of the spectrum.

of ARRL, evidently represent certain terrestrial users which are not significantly involved in the amateur-satellite service; they also never contacted us for information.

10. Motorola's comments include an expectation that the 2.4 GHz ISM band will serve as one home for the next generation of unlicensed digital devices including consumer cordless telephones, wireless PBX units and wireless LAN units. If this includes the portions of the band needed for amateur satellites and weak-signal work, there is no question whatever but that it will lead to such amateur operators being driven from the band because of widespread interference to and from such devices.

11. Moreover, as few if any amateurs would be able or even willing to withstand the pressure from their neighbors (local industries, etc.) that would undoubtedly result from the amateur interference to such devices, amateur satellite uplink and terrestrial services would disappear from this band. Designers and manufacturers of amateur equipment would be effectively deterred from producing and marketing equipment for a band shared with such services. In addition, as noted above in connection with Part 15 devices, the Commission itself would be likely to be deluged with interference complaints.

12. In other cases where amateurs have shared with high-density commercial users, such as in the 902-928 MHz band, a significant number of conflicts have arisen. From the amateur standpoint, such sharing has not been successful with high-density commercial users under any circumstances. Amateur use of this band has, consequently, been very sparse, and equipment manufacturers have chosen not to produce and market amateur equipment for it.

13. In evaluating the feasibility of frequency-sharing with the amateur-satellite service, it is important to realize that two distinct types of satellites are employed in this service,

now and in the future. One is the high-altitude, elliptical orbit type of satellite such as Phase 3D described in our Comments. The other, more numerous type is the low-earth-orbit (LEO) satellite, generally in circular orbits below 1,000 miles altitude. During approximately half the time in which an amateur LEO satellite is within range of an earth station, it is less than 10 degrees above the horizon. Thus, unlike commercial services using geostationary spacecraft, the elevation angle of amateur earth station antennas is unlikely to provide much, if any relief from interference from and to terrestrial services.

14. Except for ours and those of ARRL, none of the comments we have reviewed have addressed the international implications of this proceeding. Because the amateur-satellite service utilizes satellites in low or highly elliptical orbits, which serve all or most of the globe with one set of uplink and downlink frequencies, amateur-satellite frequency allocations must be coordinated internationally so that they are available for use on a worldwide basis². If this is not done, in effect the amateur-satellite service is precluded from using the band anywhere in the world, as is presently the case in the 3.3-3.5 GHz band because it is available only in ITU Regions 2 and 3. Cost considerations make the use of geostationary satellites all but impossible in the amateur-satellite service. None have been built or launched to date. Internationally, the ITU allocation in the 2.4 GHz band to the amateur-satellite service is 2400-2450 MHz. Any reallocation of frequencies in the United States from this service to another, or any introduction of additional or substituted sharing services would have adverse effects on the amateur-satellite service

²It is also important to remember that amateur satellites are constructed by groups in many countries, not just in the United States.

worldwide, and we believe that it would be inconsistent with treaty obligations for the U.S. to do so unilaterally without fully coordinating with the other national administrations involved.

15. In addition to satellite and weak-signal work, many amateur experimenters are interested in relatively short-range terrestrial activities, such as amateur television and high-speed data transmission. Some of that type of work is already being done in the 2.4 GHz band. These kinds of activities generally require relatively large bandwidths and higher received signal levels than do satellite, long-haul tropospheric or earth-moon-earth work. These wider-band, shorter-range activities are certain to increase in number over the next 10 to 20 years, and will need to be accommodated.

Recommendations

16. In view of these considerations and the anticipated near-term future needs of the amateur and amateur-satellite communities, AMSAT reiterates the recommendations made in our original filing in this proceeding. We respectfully urge the Commission to take the following actions:

a. Establish a 10 MHz wide portion of the existing amateur and amateur-satellite band from 2400-2410 MHz on a primary basis, with no sharing partners except for the existing ISM assignment.

b. Retain access to 2390-2400 MHz for the amateur service, and to 2410-2450 MHz for the amateur and amateur-satellite services, shared with what are, according to the Commission's determination, the most compatible sharing partners. As discussed herein, these partners should not include high-density services.

c. Provide at least 1 to 2 MHz of spectrum on a primary basis, for the amateur service in order to accommodate weak-signal terrestrial and earth-moon-earth experimentation. This small window should be as far from 2450 MHz as possible, preferably near the presently used 2304 MHz amateur frequency.

RESPECTFULLY SUBMITTED,

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