

Before the  
**Federal Communications Commission**  
Washington DC 20554

In the Matter of	)	
	)	WT Docket No. 02-08
Reallocation of the 216-220 MHz, 1390-	)	RM-9267
1395 MHz, 1427-1429 MHz, 1429-1432	)	RM-9692
MHz, 1432-1435 MHz, 1670-1675 MHz,	)	RM-9797
and 2385-2390 MHz Government Transfer	)	RM-9854
Bands	)	RM-9882

**REPLY COMMENTS OF HEXAGRAM, INC.**

March 18, 2002

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**REPLY COMMENTS OF HEXAGRAM, INC.**

Hexagram, Inc. hereby files these Reply Comments in the above-captioned rulemaking.<sup>1</sup>

Hexagram comments only on utility telemetry in the 1429.5-1432 MHz band. Hexagram takes no position on other bands or services at issue in the proceeding.

**A. Summary**

For the reasons explained in detail below, Hexagram supports the following positions:

- ***Protecting WMTS:*** The Commission should restrict telemetry to utility operations and to fixed telemetry, and limit power to 1 watt immediately adjacent to the WMTS band and 2 watts elsewhere.
- ***Protecting radio astronomy:*** The Commission should adopt exclusion and coordination zones around radio astronomy instrument sites.
- ***Protecting earth exploration satellite operations:*** The Commission should adopt out-of-band emissions limits that take into account the very low duty cycle of utility telemetry, and that average the interfering signal over a suitable period of time. The rules should specify an absolute out-of-band limit, rather than an emissions mask tied to in-band power.
- ***Licensing rules:*** The Commission should adopt site-by-site licensing by center coordinates and radius, with the radius chosen to be no larger than the applicant

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<sup>1</sup> *Reallocation of the 216-220 MHz, 1390-1395 MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz, and 2385-2390 MHz Government Transfer Bands, WT Docket No. 02-08, Notice of Proposed Rule Making, FCC 02-15 (released Feb. 6, 2002) (Notice).*

actually needs. Successful frequency coordination should be required prior to filing an application.

- **Technical rules:** For low cost and high spectrum efficiency, the Commission should adopt a nominal bandwidth of 12.5 kHz and retain that value indefinitely. Part 90 out-of-band emissions limits will be adequate to protect WMTS, in conjunction with the other measures supported above. Low-power utility telemetry transmitters need not be directional, and indeed cannot be made directional without incurring disabling increases in both cost and size.
- **Exemption from competitive bidding:** Utility telemetry satisfies the Commission's criteria for exemption from competitive bidding as a public safety service.

## **B. About Hexagram**

Hexagram is among the oldest vendors of automatic meter reading (AMR) systems in the country. Since 1984 Hexagram has installed, in both residences and businesses, over two million devices for collection and reporting of utility usage, including nearly 300,000 devices employing a fixed RF network. These are Part 90 transmitters operating under the low power rules, under more than 400 licenses issued to Hexagram and its customers.

**Public interest.** The newly competitive energy industry has made advanced AMR a critical element in controlling energy costs. Hexagram products efficiently collect and deliver utility consumption information that is essential for utility management and revenue collection. Reliable, comprehensive, and timely data collection is vital to efficient operation of a utility.

**Technical note.** Hexagram products are powered by a lithium battery. They transmit a data burst of under 100 milliseconds two or three times each day, for a duty cycle of about 3 parts per million. These products nonetheless achieve a very high spectrum efficiency, thanks to the very large number of transmitters deployed and their low power and limited range.

### C. Protecting the Wireless Medical Telemetry Service

The Commission has allocated the 1429.5-1432 MHz band to telemetry on a primary basis.<sup>2</sup> This band is suitable for utility AMR.

The Commission seeks comment on what, if any, restrictions are needed to protect the adjacent-band Wireless Medical Telemetry Service (WMTS) from harmful interference.<sup>3</sup> The Commission asks specifically for responses to three proposals from AHA: (1) restricting telemetry operations in this band to utility telemetry; (2) restricting telemetry in this band to fixed telemetry; and/or (3) limiting the power levels for telemetry this band from 100 watts to 10 watts to 1 watt as frequencies approach the WMTS-primary band.<sup>4</sup>

***Restricting telemetry to utility operations.*** Itron supports a limitation to utility telemetry operations, to protect both WMTS at 1427-1429.5 MHz and radio astronomy observations at 1400-1427 MHz.<sup>5</sup> Itron notes that utility telemetry systems in the 1427-1432 MHz band have co-existed with the federal government and radio astronomy for years without incident, and that Itron and AHA have developed a band plan enabling utility telemetry and wireless medical

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<sup>2</sup> Notice at para. 53.

<sup>3</sup> Notice at para. 56.

<sup>4</sup> Notice at para. 56 (citing AHA *ex parte* comments at 5 (filed Aug, 29, 2001)).

<sup>5</sup> Itron at 2-3.

telemetry to operate in adjacent bands without causing harmful interference.<sup>6</sup> UTC also supports this limitation.<sup>7</sup>

Hexagram endorses the proposed limitation of telemetry in the 1.4 GHz band to utility telemetry, where that term includes AMR, as a partial means of protecting the WMTS.

*Fixed vs. mobile telemetry.* AHA suggests the Commission limit new telemetry operations throughout the 1427-1432 MHz band to fixed operations, on the ground that intermittent mobile operations make it impossible to identify sporadic mobile sources of interference.<sup>8</sup> Itron asks the Commission to limit mobile authority to entities holding a fixed telemetry license for the band.<sup>9</sup>

Hexagram agrees with AHA that fixed-only operation offers the best protection to adjacent-band WMTS operation. Once properly coordinated, a fixed transmitter provides virtually no risk of interference -- and even if interference does occur, the offending transmitter can be identified. Mobile operation not only poses a higher risk, but makes interfering units difficult or impossible to track down. In the alternative, if the Commission does authorize mobile telemetry, it should do so at lower power.

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<sup>6</sup> Itron at 2-3.

<sup>7</sup> UTC at 5-6. UTC proposes a definition of "utility" for this purpose which specifically includes utility telemetry. UTC at 5-6 & n.13.

<sup>8</sup> Notice at para. 56.

<sup>9</sup> Itron at 9.

***Telemetry power levels.*** AHA suggests protecting the WMTS band below 1429.5 MHz by limiting maximum transmitter output power to 1 watt EIRP at 1429.5-1430 MHz, 10 watts at 1430-1431 MHz, and 100 watts at 1431-1432 MHz.<sup>10</sup>

UTC agrees.<sup>11</sup> Itron generally supports the principle of lower power levels closer to the adjacent WMTS band.<sup>12</sup> Itron notes these reduced power limits are an integral element of the AHA/Itron band plan, and are needed to prevent interference to WMTS stations in the adjacent band.<sup>13</sup>

Hexagram supports the power limitation proposal in principle, but suggests power limits of 1 watt EIRP at 1429.5-1430 MHz (similar to AHA's suggestion), and a maximum of 2 watts EIRP elsewhere in the band. Low-power systems can provide reliable, inexpensive communications, and can be sited close in to other co-channel systems for service to more areas on the same frequencies. The capability for deploying high transmitter densities translates to high spectrum efficiency. And lower transmitter powers are key to reducing the threat of interference, by pushing down out-of-band emissions along with in-band signal.

#### **D. Protecting Radio Astronomy and Earth Exploration Satellite Operations**

Hexagram acknowledges the scientific importance of observations in the 1400-1427 MHz band by the radio astronomy service (RAS) and the earth exploration satellite service (EESS).

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<sup>10</sup> Notice at para. 56.

<sup>11</sup> UTC at 12.

<sup>12</sup> Itron at 3.

<sup>13</sup> Itron at 3.

**Radio astronomy.** The National Academy of Sciences (NAS) proposes protecting RAS observations by adopting exclusion and coordination zones for fixed and mobile services, respectively, around RAS instrument sites.<sup>14</sup> Hexagram supports this proposal. In accordance with appropriate rules, Hexagram will cordon off areas around these sites at a distance sufficient to prevent interference.<sup>15</sup>

**Earth exploration.** The NAS calls for strict out-of-band emissions limits to protect EESS observations in the 1400-1427 MHz band. The NAS derives these out-of-band limits from the maximum permissible power over a given area, divided by the product of an assumed number of transmitters and the power of each.<sup>16</sup> But this calculation implicitly assumes that all of the transmitters are operating 100% of the time. That is emphatically not the case for utility telemetry.

As noted above, each transmitter in a Hexagram system might operate for 100 milliseconds two or three times each day, for a duty cycle of about 3 parts per million. (The low duty cycle is an integral part of the system design, in order to achieve a battery life equal to the expected useful life of the equipment.) In a typical metropolitan installation of, say, a quarter-million transmitters, the expected value of the number of transmitters operating at any instant is less than one. The simultaneous operation of any significant number of transmitters for any

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<sup>14</sup> National Academy of Sciences at 5.

<sup>15</sup> National Academy of Sciences (at 5) asks the Commission to expand the coordination requirements of Section 1.924, as to the 1.4 GHz bands, to include the zones described in Section 2.106, footnote US311. Hexagram has no objection in principle. Because adoption of this measure may affect the value of the bands at auction, Hexagram suggests the Commission provide early notice of its intent in this regard. *But see* Part G, below.

<sup>16</sup> National Academy of Sciences at 6-7.

significant period of time is highly improbable. Systems such as EESS will accommodate these occasional, brief, and out-of-band transmissions as if they were common noise pulses.

In setting out-of-band emissions limits to protect EESS systems, Hexagram asks the Commission to specify an absolute out-of-band limit, rather than an emissions mask tied to in-band power, so a provider that uses low power can specify a less steep emission mask, yet still achieve the same degree of out-of-band protection. Hexagram also asks the Commission to regulate time averages of the out-of-band signal, over an integration period consistent with the needs of EESS, rather than instantaneous noise levels.

#### **E. Licensing Rules**

*Site-by-site licensing.* The Commission proposes site-by-site licensing in the 1429.5-1432 MHz band, and further proposes a co-channel separation distance of 70 miles.<sup>17</sup> Itron supports both aspects of the proposal.<sup>18</sup>

Hexagram strongly supports site-by-site licensing. Because competitive bidding is not required, site-by-site licensing reduces the both the cost and the time needed to access spectrum. Being more targeted than geographic licensing, it also increases the number of users, resulting in more efficient spectrum use. Moreover, we show in Part G, below, that utility telemetry is exempt from competitive bidding.

Instead of a uniform 70 mile separation distance, Hexagram favors licensing by center coordinates and radius chosen to meet the needs of the licensee. The 70-mile proposal appears to contemplate high-powered stations. But many providers, including Hexagram, use systems of 1-2

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<sup>17</sup> Notice at para. 60-61.

<sup>18</sup> Itron at 5.

watt transmitters that can be spaced more closely. The licensing area should be no larger than necessary.

Until recently, the Commission routinely licensed low-power telemetry systems as mobiles, even though each transmitter operated from a fixed location. This arrangement allowed licensing by center coordinates and radius, and hence made it possible to install, remove, and relocate units inside the license area without filing individual applications -- an important capability for a system that might include hundreds of thousands of units. Mobile licensing also allowed an applicant to specify the needed radius. The Commission removed the requirement for mobile licensing in 1999,<sup>19</sup> and subsequently clarified that low power operations may, but are not required to, supply their station coordinates and be licensed on a site-specific basis.<sup>20</sup> The Commission also issued a private letter ruling that authorized continued coordinate-and-radius licensing of low-power telemetry systems.<sup>21</sup>

Hexagram opposes extending service areas to a full 70 mile separation distance, unless the applicant shows a need for that size licensing area. Instead, the Commission should adopt site-by-site licensing on a coordinate-and-radius basis, as it does for low-power UHF telemetry. This mechanism has worked well in the past. Moreover, it improves spectrum efficiency by allowing an applicant to license only the area actually needed.

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<sup>19</sup> *Replacement of Part 90 by Part 88*, 14 FCC Rcd 8642 at para. 36 (1999).

<sup>20</sup> *Low Power Operations in the Private Land Mobile Radio 450-470 MHz Band*, 16 FCC Rcd 14946 at para. 27 (2001).

<sup>21</sup> Letter from D'wana R. Terry, Chief, Public Safety and Private Wireless Division, Wireless Telecommunications Bureau to Mitchell Lazarus, Counsel for Hexagram, Inc. (dated June 26, 2000).

***Frequency coordination.*** The Commission raises the possibility of mutually exclusive site-by-site applications, which could trigger a need for competitive bidding.<sup>22</sup> Hexagram believes competitive bidding would cause so much delay in application processing as to be unworkable. Instead, *Hexagram recommends the Commission preclude the occurrence of mutually exclusive applications by making successful frequency coordination a condition precedent to filing.*

The Commission proposes land-mobile-type frequency coordination for telemetry.<sup>23</sup> UTC supports this proposal.<sup>24</sup> AHA asks the Commission to require registration of licensed telemetry facilities in the 1427-1432 MHz band with the American Society of Healthcare Engineers (ASHE), the WMTS frequency coordinator.

Hexagram supports mandatory frequency coordination for 1.4 GHz telemetry as the most efficient mechanism to avoid harmful interference. Combined with a first-come, first-served licensing plan, proper frequency coordination also eliminates the possibility of mutually exclusive applications. Hexagram does not object to registration of utility telemetry coordination data with ASHE, but opposes any scheme that would give ASHE authority to block non-WMTS coordinations.

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<sup>22</sup> Notice at para. 61.

<sup>23</sup> Notice at para. 65.

<sup>24</sup> UTC at 9-10.

## **F. Technical Rules for Telemetry**

The Commission seeks comment on power limits, antenna heights, directionality requirements, frequency stability, bandwidth limits, out-of-band emissions, and channel plan.

With certain exceptions noted below, Hexagram urges the Commission to adopt the applicable Part 90 technical rules for telemetry in the 1429.5-1432 MHz band.

*Authorized bandwidth.* UTC proposes that primary telemetry in the 1429.5-1432 MHz band be licensed with a nominal bandwidth of 25 kHz.<sup>25</sup> UTC also argues that licensees should be permitted both to aggregate up to 500 kHz of contiguous spectrum, and to subdivide each channel into 6.25 kHz increments.<sup>26</sup>

AMR telemetry derives high spectrum efficiency from a very large number of units over the license area. The density of deployment is highly sensitive to unit cost, and unit cost tends to go up with decreasing bandwidth. Thus, to keep costs low and spectrum efficiency high, Hexagram urges the Commission to adopt a nominal bandwidth of 12.5 kHz, and to retain that bandwidth indefinitely.<sup>27</sup>

*Out-of-band emissions.* Spacelabs Medical, Inc., recommends a limit on emissions from 1429.5-1432 MHz into the adjacent WMTS band at levels equivalent to those in Section 15.209.<sup>28</sup> This is the same protection as the Commission affords to the most sensitive restricted bands, such

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<sup>25</sup> UTC at 11.

<sup>26</sup> UTC at 11.

<sup>27</sup> See 47 C.F.R. Sec. 90.267(b) (permitting licensees on designated low-power 450-470 MHz channels to operate on a primary basis with bandwidths over 11.25 kHz).

<sup>28</sup> Spacelabs Medical, Inc. (pages not numbered).

as satellite downlinks, from interference due to millions of unlicensed devices, including ubiquitous digital devices.<sup>29</sup> This level of protection is excessive for a service such as WMTS. Hexagram submits that the measures proposed above -- *i.e.*, restricting 1427-1429.5 MHz telemetry to utility operations, limiting mobile authorizations to fixed licensees, and limiting power to 1 watt at 1429.5-1430 MHz, and 2 watts elsewhere -- are adequate to protect WMTS.

***Antenna height.*** Hexagram's own products are mounted directly on the device they monitor, or on the wall nearby, and need no antenna height. In order to accommodate a range of applications, consistent with minimum interference, Hexagram proposes a limitation on antenna height of three meters.

***Antenna directionality.*** In view of the low power levels we propose, a directionality requirement is unnecessary. If the Commission adopts the AHA/UTC proposal to allow 10 watt and 100 watt operations, and in consequence imposes a directionality requirement, it should also provide an exemption from that requirement for transmitters at 2 watts and below. A low-power AMR transmitter, antenna and all, fits in a small box attached to the utility meter or an adjacent wall. It has no directional properties, and cannot be made directional without incurring disabling increases in both cost and size.

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<sup>29</sup> See 47 C.F.R. Sec. 15.205.

**G. Auction Exemption for Utility Telemetry**

Utility meter-reading services such as Hexagram's are exempt from competitive bidding.

Congress excluded public safety radio services from spectrum auctions.<sup>30</sup> The Commission determined that the exemption applies also to "utilities, railroads, transit systems, and others"<sup>31</sup> that meet two tests: (1) provision of an essential service, and (2) need for reliable communications to protect the public.<sup>32</sup>

*Provision of an essential service.* Utility services are essential; and AMR is essential to the growing number of utilities that have installed it.

Utility meter reading is part and parcel of the essential service of delivering electricity, gas, and water. Beyond merely gathering data to bill customers, meter reading equipment also collects and delivers consumption information and system status data that is essential to managing the

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<sup>30</sup> Section 309(j)(2)(A) of the Communications Act provides:

The competitive bidding authority granted by this subsection shall not apply to licenses or construction permits issued by the Commission --

(A) for public safety radio services, including private internal radio services used by State and local governments and non-government entities and including emergency road services provided by not-for-profit organizations, that --

- (i) are used to protect the safety of life, health, or property; and
- (ii) are not made commercially available to the public[.]

47 U.S.C. Sec. 309(j)(2).

<sup>31</sup> *Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended*, 15 FCC Rcd 22709 at para. 5 (2000).

<sup>32</sup> *See id.* at paras. 77-80.

utility and its resources. Forecasts of future need, determination of supply requirements, distribution of products, and acquisition and allocation of future supplies all depend on timely and reliable data of actual use. Utility system safety and reliability depend on this data. In a utility that depends on radio-based AMR, radio-delivered data is the only source of this information, making this use of the radio spectrum an integral part of the utility's infrastructure for providing essential service.

*Need for reliable communications to protect the public.* Before AMR, the men and women who walked the meter-reading route also kept an eye on the system infrastructure. They routinely reported leaks, evidence of theft of service, and even simple wear and tear that threatened the system's continued integrity. In a modern system, all of these conditions must be deduced from information flowing through the AMR channels. This makes the safety and well-being of the public dependent on reliable and efficient AMR communications. Failure of those communications can lead to breakdown in utility operations, and hence create a dangerous condition for members of the public.<sup>33</sup> AMR thus satisfies the second part of the test for auction exemption.

Finally, Hexagram notes that the exemption from competitive bidding applies even in spectrum such as the 1.4 GHz band that is shared with non-public-safety applications.<sup>34</sup>

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<sup>33</sup> *Id.* at para. 78.

<sup>34</sup> *National Public Radio, Inc. v. FCC*, 254 F.3d 226, 228-230 (D.C. Cir. 2001) (auction exemption for non-commercial educational broadcast stations depends on the character of the entity providing the service, not on the character of the spectrum).

## CONCLUSION

The proposals endorsed above will lead to rules for telemetry in the 1.4 GHz band that will serve the needs of utilities and others dependent on reliable, inexpensive telemetry, while fully protecting adjacent spectrum users, including the Wireless Medical Telemetry Service, the Radio Astronomy Service, and the Earth Exploration Satellite Service.

Respectfully submitted,

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March 18, 2002

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