AEROSPACE & FLIGHT TEST RADIO COORDINATING COUNCIL®
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July 28, 2008

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street SW.
Washington DC 20554

Re: ET Docket No. 08-59
Ex Parte Filing

Dear Ms. Dortch:

This is in response to the Reply Comments of GE Healthcare ("GEH" or "Proponent") filed June 11 in the above-referenced proceeding.

GEH's filing argues that the band 2360-2395 MHz is lightly used by the flight test community; that Commission policy against new secondary allocations for medical telemetry devices like BSNs should be changed; that flight test receive sites and BSNs can operate in the presence of interference to each other; and that, in any event, there is a low probability of interference from BSNs to AMT. From this, GEH argues that the Commission should initiate a rulemaking on its proposal that the band 2360-2395 MHz be made available on a secondary basis with its proposed body sensor networks ("BSNs").

As discussed herein, there is no merit to the Proponent's arguments. Its Reply relies on supposition and mistakes of fact. It is contradictory in a number of respects. Most importantly, it disregards key facts in concluding that there is no likelihood of interference. But before dealing with these points, a few preliminary observations are in order.

A. Preliminary Points

First. GEH's proposal is a moving target. The radiated power of the proposed BSN devices has changed. The amount of spectrum requested for BSNs has changed. And now, seemingly, its deployment plan is changing: Consistently to this point, GEH has maintained that it intends its devices to be cheap enough to be disposable, and used wherever patients need monitoring: At home, at work, at school, etc. This still seems to be the case.

Yet, in the Reply GEH also seems to suggest that BSN use be confined to hospitals or other health care facilities. For example, at page 14 GEH states that "[w]hile GEHC initially proposed that [BSN] device use not be restricted to health care facilities, the most important, safety critical and highest density uses of the devices would be in hospitals." Neither AFTRCC,

other interested parties, nor the Commission itself, can be certain just what it is for which GEH seeks a major spectrum allocation. For this reason alone, GEH's invitation to the Commission to open a rulemaking -- and, in effect, figure it all out later -- should be rejected.

Second. While the Proponent argues for the benefits of BSNs, substitute technologies are available such as Wireless Medical Telemetry Service ("WMTS") monitors and legacy Part 15 devices. Likewise, Holter and other direct-wired, but portable monitors allow for patient mobility and recording.

By contrast, there is no substitute for real-time flight test telemetry. The aeronautical mobile telemetry ("AMT") enabled by the S-band allocation at issue here has been and will remain in the critical path for aircraft development and production, as well as for demonstrating compliance with certification requirements imposed by other agencies of the Federal Government including the Federal Aviation Administration and Department of Defense.

This said, there remain numerous errors in the Reply which require correction.

B. The Proponent's Arguments about S-Band Licensing and Flight Testing Are Misleading.

GEH argues that the Commission's database shows sixteen licenses for thirty-two sites. It then calculates the percentage of hospitals nationwide within 20 km (a distance which it asserts is a conservative interference range) for those thirty-two sites, and arrives at a figure of only 6.1 percent, or a total of almost 400 hospitals. *Id.* at pages 7-8.

However, what GEH's argument overlooks are the many frequency assignments issued for the twenty-four (24) major Government ranges; the extensive use of those assignments (rather than FCC licenses) by AFTRCC Member Companies performing flight test work under contract to the Government at those ranges; as well as, of course, the use of such ranges by the Department of Defense as well as the National Aeronautics and Space Administration.

The Reply argues that S-band licenses outstanding are for less than the full band, 2360-2395 MHz. *Id.* at 9. Again, however, the Petitioner fails to account for Government ranges which hold assignments for the band. Those ranges make extensive use of S-band frequencies. Assignments include not just the upper S-band, but also 2310-2320 and 2345-2360 MHz. Use of the latter two bands for AMT is secondary to the Wireless Communications Service ("WCS") which has struggled for years to find a technology and a purpose. However, Government use of these two bands is on borrowed time and as WiMax systems are deployed in the lower bands, the ranges will no longer be able to co-exist on a secondary basis. Thus, there will be yet further demand for spectrum in the upper half of the S-band.

With respect to the hospital proximity issue, AFTRCC has undertaken an analysis of certain ranges located near population centers. The ranges include both Government and Non-Government facilities. Data on hospitals and nursing homes nationwide was secured by AFTRCC from Verispan, a provider of such information. Comparing the range locations with

the hospital/nursing home data reveals that for just five of the over fifty test ranges that use S band, and the 167 that are entitled to use S band, no fewer than 127 hospital/nursing home facilities are within the 20 km referenced by GEH. The total number of beds in these facilities is in excess of 16800.[1]

Each of these facilities is a potential source of interference to AMT. Moreover, apart from test aircraft near such facilities, the impending implementation of uplink technologies in these bands by the AMT community will mean massive co-channel interference to BSNs.[2]

The Reply asserts that Government test sites are "located at some distance from populated areas" (*id*. at 17). However, a number of Government receive sites are proximate to population centers. These include places like Eglin and Tyndall Air Force Bases in the Florida Panhandle; Patuxent River Naval Air Test Center near Baltimore and Washington; and Point Mugu Naval Air Test Center at Oxnard, CA in the densely populated area just north of Los Angeles, to name a few.

GEH nevertheless argues that AMT usage of 2360-2395 MHz is mostly in daylight hours and is "unlikely to exceed 50% for a single day at any particular location." *Id.* at 9. AFTRCC is at a loss to understand how this is relevant -- particularly since GEH contemplates that BSNs would have "days of continuous operation."[3] Surely, the Proponent is not suggesting that patients simply "wait" until flight testing in their area is over for the day before starting their monitors.

The time diversity stressed by GEH (*id.* at 11) is irrelevant for another reason as well: Exactly how is patient usage at home, in the office, and even in hospitals to be reliably limited to hours when flight testing is not occurring nearby ?

More importantly, the Proponent's criticism regarding AMT usage reflects a fundamental misunderstanding: While most flight testing occurs during daylight hours, that is also when flying conditions are the safest. To suggest that daylight usage makes the band a candidate for secondary uses, is to misapprehend the purpose for which the allocation was made many years ago. It is also to misapply a set of metrics which may be relevant for consumer applications like cellphone service -- or BSNs -- but which have no relevance to a unique application like flight testing.

GEH argues that large commercial aircraft, like the Boeing 787, have space for on-board recording and therefore do not need telemetry. In particular, it states that a "disproportionate use of ... onboard recoding in lieu of telemetry will continue to expand," and quotes from a 2005

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[1] *See* attached Engineering Statement of Daniel G. Jablonski (Exhibit A). The ranges used for the analysis include urban and rural areas.
[2] These technologies are described in more detail later in this filing.
[3] March 7, 2008 submission by David Davenport, GE Global Research, to IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) at slides 10 and 16.

article for the proposition that "Currently only about 1 percent of data being recorded is being telemetered," with trends showing less in the future. *Id.* at 16.[4]

On-board recording has been, and will continue to be, an important component of flight testing for both civil and military programs. However, recording is frequently not suitable for tactical aircraft or missiles that do not have the space, weight budget, or power supply to support on-board recorders. Even when platform size allows it, on-board recording is not a substitute for telemetry.

Telemetry allows for real-time analysis by ground-based engineers backed up by sophisticated and extensive computer resources. By means of real-time transmission, engineers can clear the pilot to progress to the next increment in the test sequence such that multiple milestones can be cleared in a single flight. The number of engineers on the ground analyzing telemetry far exceeds the handful of engineers that are onboard even larger passenger aircraft during flight tests.[5] Thus, real-time telemetry greatly enhances the efficiency of the flight test process and enables U.S. manufacturers to bring aircraft to market faster and more economically than would otherwise be the case.

Even more importantly, real-time telemetry provides a capability which recording can not: Disaster analysis. In the event an aircraft is lost, real-time telemetry transmitted via the S-band enables engineers to reconstruct the cause, and make modifications to prevent a recurrence.

Insofar as the 2005 article is concerned, GEH grossly distorts the author's point which was that, due to the deluge of data required for testing modern aircraft and the limited spectrum resources, the amount of data that can be telemetered as a percentage of total data collected will continue to shrink -- <u>not</u> that flight test operators would, as a matter of choice, rely more on on-board recording as GEH suggests.[6] Had GEH quoted the article fairly, it would have included statements like "The numbers presented argue for an increase in telemetry abilities by several orders of magnitude."[7] Thus, the goal of flight test telemetry is to transmit, in real time, as much of the available data as possible, not just the amount of data which can currently be telemetered.

C. GEH Offers No Basis to Revisit Commission Policy Against Additional Allocations for Wireless Medical Telemetry.

GEH argues that the Commission should change its policy against additional allocations for medical telemetry. *Id*. at 14. However, its arguments are belied by its own statements in other on-going Commission proceedings.

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[4] "What if T&E Had Infinite Spectrum?" Charles H. Jones, PhD., Edwards Air Force Base, AIAA document 2005-7619, presented at U.S. Air Force T&E Days, 6-8 December 2005 ("2005 Article").

[5] For safety reasons, testing of some aircraft requires that no engineers be aboard, even where there is space available.

[6] It was this problem which led the United States to make a determination that additional spectrum for flight testing was a matter of national priority, and to pursue over the past eight years, and successfully secure at WRC-07, additional spectrum allocations for flight testing.

[7] 2005 Article at page 9.

For example, just last Fall GEH strongly opposed new allocations for medical telemetry -- whether primary or secondary:

> "Given the frequencies available on a primary basis, [GEH] has no current plans (or need) to use the 1427-1432 MHz band on a secondary basis. Any additional WMTS designations at this time would be premature and an inefficient use of scarce spectrum."[8]

GEH went on to cite with approval the very Commission policy it now attacks.[9]

GEH even attacked the notion of secondary allocations for medical telemetry, devoting an entire section of its Comments to the issue with the lead statement: **"The Commission Should Not Risk Patient Safety By Permitting Secondary WMTS Operations in the 1427-1432 MH Band."** [10] This is more than enough, by itself, for the Commission to dismiss GEH's proposal for a secondary allocation for medical telemetry in the 2360-2395 MHz band.

The Proponent nevertheless asserts that regulatory requirements such as those adopted for the Wireless Medical Telemetry Service ("WMTS") (e.g., geographic exclusion zones, registration databases, and frequency coordination) make the Commission's policy against additional allocations for medical telemetry (whether primary or secondary) "unnecessarily restrictive." *Id*. at 14.[11] However, the Commission was well aware of the referenced regulatory measures when it adopted the policy against additional allocations: After all, the very same *Order* which adopted the policy, adopted the requirements.[12]

Moreover, despite references to geographic exclusion zones, registration databases, and the like, GEH continues to contemplate ubiquitous deployment of "disposable" BSNs whenever and wherever patients live and work. Exactly how does GEH propose to enforce a no-interference rule under these circumstances? Patients live and work in close proximity to airports. Likewise, patients are among the thousands of persons each day who use airports in close proximity to manufacturing plants where flight test operations are conducted.

GEH said it best when it recently endorsed statements by another commenter in WT Docket No. 07-100 to the effect that "[w]hile licensees familiar with the FCC, its requirements and processes understand the differences between primary and secondary use, health care

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[8] Reply Comments of GE Healthcare filed September 11, 2007 in WT Docket No. 07-100 at 6th page (emphasis added).

[9] *See id.* at note 16, citing to the *Wireless Medical Telemetry Service Report and Order*, 15 FCC Rcd 11206 (2000) (hereinafter "*WMTS Report and Order*"), and the determination made there that the Commission "does not anticipate designating any additional spectrum for primary WMTS use."

[10] *Id.* at Section III (*emphasis in original*). GEH claims to seek only a secondary allocation, and repeatedly references such a proposal. Yet, its proposed footnote NG 186 would exclude flight testing entirely where it says it wants spectrum the most, namely the AMT allocation at 2370-2390 MHz. *See* GEH *Ex Parte* Comments filed December 27, 2007 in ET Docket No. 06-135 at page 18.

[11] *See Wireless Medical Telemetry Service Report and Order*, 15 FCC Rcd 11206 at ¶¶ 11, 46 (2000) ("*WMTS Report and Order*").

[12] *WMTS Report and Order*, supra, at paras. 11 and 46, and para. 27 et seq.

facilities generally do not," and that "nearly all WMTS systems implemented at health care facilities are constructed and deployed ... by the equipment manufacturer, not by facility telecommunications staff."[13]

Yet, in the very same filing GEH sought to distance itself from responsibility for preventing interference problems. According to the Proponent, medical device manufacturers like itself should not be "strongly encourag[ed] ... to assist authorized health care providers in seeking registration with the WMTS frequency coordinator," as was proposed by the American Society for Healthcare Engineering of the American Hospital Association.[14] It goes on to contend that "manufacturers may not have the resources to engage in ... oversight of other customers' activities ..." -- even though GEH has sales of $17 billion.[15]

In other words, combined with its disavowal of any responsibility for compliance, GEH's proposal is a prescription for harmful interference to primary users and a spectrum management problem of the first order. But this is not all.

GEH argues that technological developments (such as diversity, frequency agility, and contention-based protocols) render the policy not to allocate additional spectrum for medical telemetry, overly restrictive. However, such techniques have been known and available for years. Thus, there is nothing new here to justify a reconsideration of the Commission's well-reasoned determination.

In fact, the Commission's experience is paralleled by that of hospitals themselves. According to recent press reports, hospitals are struggling with increasing instances of life-threatening interference between and among a variety of RF devices within their facilities.[16]

In any event, GEH is on record discounting the effectiveness of the very technologies it now relies upon. Sensing technology is integral to GEH's claim that BSNs can avoid interference via its contention-based protocol. However, in the TV White Space proceeding (ET Docket No. 04-186), GEH has conceded that it is "not confident that the still-undefined sensing technology to be incorporated into the TV band devices will be able to provide adequate protection to telemetry users."[17]

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[13] (Emphasis added.) Reply Comments of GE Healthcare filed September 11, 2007, at page 4, quoting from Comments of Land Mobile Communications Council.
[14] Reply Comments, *supra*, at 2d page.
[15] *Id.* at 1 and 3d page.
[16] *See* http://technology.canoe.ca/2008/06/24/5975066-ap.html and http://www.usatoday.com/tech/wireless/2008-06-24-hospital-devices_N.htm.
[17] Comments of GE Healthcare filed January 31, 2007 at 5. Interestingly, the manufacturer of the nRF24LS01 transceiver referenced for possible use in BSNs recommends specifically against using the product in the contention based protocol scenario proposed by GEH. *See* "How useful is carrier detect (CD) on the nRF24L01?," http://faq.nordicsemi.no/?q=32, accessed 7 July 08; and Ex Parte Comments of GE Healthcare filed December 27, 2007 in ET Docket No. 06-135 at 28.

Nine months later, in the same proceeding, GEH argued that "when shadowing and multipath fading are considered it may be impossible for a single radio to perform robust sensing -- even with infinite integration (scan) times."[18]

In fact, to the extent there is anything new in the Proponent's technology, the technology cuts against compatibility with AMT. AFTRCC has demonstrated how GEH's contention-based protocol, when combined with the extreme near-far problem presented by BSN-AMT co-existence, actually makes the chances for harmful interference worse.[19] GEH's Reply does not respond to this analysis. On the contrary, in opposing unlicensed TV white space devices GEH has stated:

> As the *Further Notice* recognized, there are a number of scenarios in which [sensing] technology will fail to detect an occupied channel. These limitations of spectrum sensing would be particularly problematic for preventing interference to relative low power medical telemetry devices because such devices could receive harmful interference from more powerful TV band devices located at significant distances, where low power telemetry devices would not be detectable to the TV band device.[20]

This is precisely the same near-far problem, in reverse, which AFTRCC has underscored, and which exacerbates this risk of interference from BSNs to nearby telemetry receive antennas.[21]

Finally, the Reply ignores the fact previously reported by AFTRCC that technologies are being developed that will enable flight test operators to make even more efficient use of spectrum resources by dynamically controlling test bandwidth from the ground.[22] These technologies contemplate the use of high-power (hundreds of watts or more), omnidirectional, uplink transmissions in the S-band and the companion L-band. While these new technologies may help mitigate interference, their high-power omnidirectional antennas will cause destructive co-channel interference for any BSN within line of sight of the AMT omnidirectional transmit antenna, whether the BSN is located indoors or outdoors. A conservative estimate is that BSN use within 20 km of an AMT ground station will be completely denied. This interference will affect, by GEH's own computations, hundreds of hospitals, including those in numerous major metropolitan areas including Los Angeles, Seattle, St. Louis, Wichita, Dallas and Ft. Worth, to name a few. Both military and commercial flight test operators contemplate adopting this technology. The Department of Defense has recently issued a press release dealing with this program (known as "iNet;" *see* Exhibit B).

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[18] September 17, 2007 ex parte in ET Docket No. 04-186 at page 14.
[19] *See* AFTRCC Comments dated May 27, 2008 at pages 18-19.
[20] Comments of GE Healthcare filed January 31, 2007 in ET Docket No. 04-186, at page 6 (footnote omitted).
[21] The Proponent cites the Medical Implant Communications Service ("MICS") as an example of successful sharing. However, the analogy to the MICS Rules does not help. MICS devices, imbedded in the human body, emit a grand total of 25 microwatts. Rule 95.639(f). BSNs are 40 times more powerful.
[22] *See* AFTRCC Comments filed May 27, 2008 at note 16.

In this light, yet other statements by the Proponent are telling. In attacking TV white space use by unlicensed devices, GEH also stated:

> "[M]ost medical telemetry systems employ distributed antenna systems that combine received signals from many antennas distributed throughout the entire coverage area – typically hundreds of thousands of square feet. In such systems, a single interferer can cause loss of monitoring to all patients, regardless of their location within the coverage area. In fact, the interferer itself, if transmitting at higher power than the medical telemetry devices, need not even be inside or proximate to the healthcare facility.[23]

And GEH has asserted that "[d]ue to the very low power of medical telemetry, [the co-channel] interference distance [from TV white space devices] is substantial – **tens of kilometers** under conservative analysis...."[24] And this is for devices the upper power of which may be no more than four watts -- a far cry from the much higher power levels contemplated for the new AMT uplink technology. In short, it seems that vulnerability to interference when GEH opposes an allocation, is no problem at all when it seeks an allocation.

No one in this debate should be unmindful of history here: Despite any nominal status as a "secondary" application, when interference arises medical telemetry has been treated as "super-primary" -- the Baylor University Medical Center episode being a widely-publicized case in point. In the event of interference, aerospace manufacturers and/or military authorities and/or NASA, as the case may be, will be under extraordinary pressure, public relations-wise and otherwise, to suspend flight testing for the sake of patient safety.[25] The costs of this would be exorbitant to aerospace manufacturers, taxpayers and the flying public.

D. GEH's Arguments About the Learjet Test Are Fallacious.

GEH takes the Learjet test to task for not being "properly representative" of BSNs. *Id*. at 19. It argues that the only part of the test that included an actual telemetry signal was conducted with the interference source at a distance of 0.7 miles (*id*. at 17); that the test signal had a "much higher power spectral density" than BSNs (*id*. at 18); and that the test dealt only with "the worst-case," considering, for example, the narrow beamwidth of AMT receive antennas and frequency-hopping of BSNs. *Id.* at 18-19.

GEH further argues that "the measurements reported by Learjet exceed the theoretically expected values by a substantial margin" given the distances involved, and that this could have been due to the presence of some unknown signal source (*id*. at 19 referencing GEH Appendix C, "Examination of Learjet Field Test Measurements"). GEH then adds that "the implausibility of the measurements certainly calls into question the overall validity of the Learjet test." *Id*.

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[23] *Ex Parte* filed by GEH Healthcare in ET Docket No. 04-186, August 27, 2007, at 3 (emphasis added).
[24] September 17, 2007 ex parte notice at p. 11 (*emphasis in original*).
[25] This phenomenon has been demonstrated previously in other contexts as well, such as military interference to secondary garage door openers and amateur operations -- uses which pale in comparison to cardiac care monitors, for example.

At the outset, it must be recognized that both AFTRCC and the Commission are at a handicap inasmuch as GEH has yet to present even an initial set of detailed specifications for BSNs. Likewise, it has presented no empirical data demonstrating that its life-critical devices can protect, and withstand interference from, flight safety communications. But entirely apart from this, GEH's criticisms of the Learjet test are unfounded. In particular, they betray fundamental engineering errors as explained in the Jablonski Engineering Statement (Exhibit A).

First. GEH's critique is based upon the modulation bandwidth of the transmitter, rather than the bandwidth of the AMT receiver. The Proponent overlooks the fact that all of the BSN power lies within the bandwidth of the AMT receiver, and thus all of the power from the BSN generates interference.

Second. GEH's critique fails to take into account the presence of the AMT receive antenna's low noise amplifier. When the vertical scale of the spectrum analyzer graph presented in GEH's Appendix C is corrected for this, the data lie well within the expected range. This demolishes GEH's notion that the results are so severe that some unknown jammer must have been present.

Third. The tests conducted by Learjet revealed that interference to the AMT receiver increased as the interference source was moved further away. As the Declaration of Donald Hoehn, Learjet, attached to AFTRCC's opening Comments notes, ground clutter (buildings and trees) was reduced as the distance from the tracking antenna increased. Thus, the fact that the interference was stronger at 3.2 miles (the maximum distance for the test) than it was at 0.7 miles should not be surprising.

Fourth. It is correct that telemetry was not being received when measurements of the interfering signal were taken at distances greater than 0.7 miles, such as 3.2 miles. However, having recorded the interfering signal strength readings at the 0.7 mile distance, and having observed the disruptive effects of that level of interference on telemetry reception, it is self-evident that the stronger interfering signals recorded at greater distances would produce even more destructive telemetry drop-outs and loss of track by the AMT antenna.

In short, there is no basis to GEH's critique. On the contrary, if it reveals anything, it is GEH's failure to appreciate the exquisite sensitivity of flight test tracking antennas and, hence, the deficiencies in its secondary allocation proposal.

E. GEH's Rec. M. 1459 Criticisms Are Unfounded.

GEH argues that interference in the S band from microwave ovens and the like already exceeds Rec. M.1459 levels (*id*. at pages 21-22), but offers no evidence in support of this assertion. On the contrary, recent test range measurements indicate that environmental noise due to microwave ovens and out-of-band emissions from unlicensed devices is generally not a problem and when it is, it is at the band edges. *See* Exhibit A

GEH argues that since telemetry equipment can malfunction, manufacturers must already incorporate mitigation techniques (diversity, extra link margin) to protect against a telemetry outage, "whatever the cause." *Id.* at 22. From this, GEH asserts that "the potential consequence of interference is more one of lost economic productivity than of impaired safety." *Id.*

While aircraft manufacturers employ techniques to enhance reliability, that does not mean there is extra link margin lying around for co-channel interference sources heretofore strictly off-limits in the band.

Least of all does it justify GEH's cavalier dismissal of safety concerns as a pretext for Company pocketbooks. All major aircraft manufacturers have had tragic accidents. Aeronautical telemetry is a critical tool in the on-going effort to prevent future tragedies. Allocation issues properly consider such scenarios and, as discussed below, it is clear that the worst-case scenario is much more likely than GEH speculates.

F. Interference From BSNs To AMT Is Likely

GEH no longer contends that there will not be interference to flight testing, just that the chances are low, 0.05% by its calculation. *Id*. at 23. GEH is wrong.

GEH fails to account for the fact that even a short duration interfering signal can entail a long-duration drop-out in the received telemetry signal. Moreover, the high speeds of aircraft make it such that before a tracking antenna can recover from interference due to BSNs at one location, it will have rotated into view of BSNs at another location, thereby prolonging the drop-out. In this regard, even a small distribution of BSNs across the azimuth view of an AMT ground station can render entire sectors of flight test airspace unusable.

As explained in the Engineering Statement, it is also incorrect to assume that AMT receive antenna azimuth angles are evenly distributed within 0 – 360 degrees.

GEH argues that aggregate PFD levels at a victim receiver "will not increase with more than, typically, four [BSN] networks, as these additional ... networks would occupy different, 1 Mhz channels and not contribute to the PFD within the given channel." *Id.* at 25. However, the typical AMT channel is five MHz wide, meaning there could be 20 BSNs in that one AMT channel. Moreover, the argument fails to account for distribution of multiple BSNs at each of multiple locations, which will be on multiple azimuth angles from the tracking antenna. This means that GEH's probability computations based on interference from a single BSN, are not a meaningful measure of the interference to AMT from BSNs. When corrected using real-world data for the locations of healthcare facilities with respect to flight test centers, the probabilities for interference to AMT ground stations from BSNs change to over 80%. *See* Exhibit A. The consequences of interference to aircraft manufacturers, their employees, and persons on the ground are potentially severe.

* * *

G. Conclusion

The U.S. continues to be the world's leader in aerospace development. This leadership has been supported by Administration after Administration, Congress after Congress. Part of that support has been a recognition by the Commission that, given the risks to safety and costs to productivity of interference, flight testing requires exclusive allocations for real-time telemetry. GEH's efforts to persuade the Commission otherwise are baseless. Its proposal should be rejected without further waste of scarce Commission and industry resources in a fruitless endeavor.

A copy of this *ex parte* filing is submitted for inclusion in the Docket.

Respectfully submitted,

Darryl J. Holtmeyer
Chairman

cc: Julius Knapp
Bruce Romano
Gary Thayer

Exhibit A

Engineering Statement
FCC Docket 08-59

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This Engineering Statement has been prepared in order to address certain statements made by GE Healthcare ("GEH") concerning the compatibility of its proposed body sensor networks ("BSNs") with flight test telemetry stations (also referred to as aeronautical telemetry, or "AMT," stations).

1. The Learjet Testing

The comments by GEH in response to the interference testing performed by Learjet [Reply Comments at page 17] are unsound. GEH asserts that for testing involving a surrogate transmitter (a necessity, as there are no operable BSNs with which to conduct tests), power spectral density (PSD), rather than effective isotropic radiated power (EIRP), is the parameter that must be utilized.

However, as is well known, the total power within the receive bandwidth of a victim receiver (in this case the AMT ground station receiver) is the only parameter that matters. Power spectral density is not relevant here.

With respect to the claim that the interference source used in the Learjet tests fails to obey the inverse r-squared law, GEH in its own analyses asserts that such behavior is to be expected [Reply Comments at B-5, where the propagation exponent of 2.4 is used]. The Learjet data reproduced in Appendix C of the GEH Comments merely demonstrate the dramatic effects of local terrain on the value of the propagation exponent that should be used in interference computations.

With regard to the scaling of the vertical axis of the graph provided by GEH in the same Appendix C of their Reply Comments, the factor of 19.2 dB questioned by GEH corresponds to the system gain of the preamplifier and transmission lines located between the receiver and the AMT ground station receive antenna. The supposition that there exists "a distinct and unrelated signal from an unknown radiator that was not part of the intended test" [Reply Comments at page 19] is unfounded.

2. Noise versus interference-limited systems

GEH continues to insist, based on unsupported conjecture, that AMT systems operating at S-band within the United States are interference, rather than noise-limited. However, the Learjet measurements at Bombardier's Wichita Facility demonstrate the ability of a single BSN-equivalent interference source to render a telemetry link unusable

when the BSN is within the main beam of the AMT ground station receive antenna. If the telemetry system were interference-limited, as GEH claims, the impact of the BSN on AMT operations would have been considerably less dramatic; namely, the single BSN would not have rendered unusable an aircraft telemetry link at distances normally characterized by 100% link availability with bit error rates of 10^{-5} or better.

Additional measurements, performed at a major flight test center located adjacent to populated areas, echo these results. A 100 microWatt source, located over 2 km from the ground station receiver antenna, as received by a 15 foot diameter antenna, yielded a received signal that was 4 dB over the 750 Kelvin noise floor of the telemetry system in use.

The ability to measure a 100 microWatt source under these conditions proves that spurious emissions from, for example, microwave ovens, are typically not a factor to AMT receiver performance, as erroneously claimed by GEH [Reply Comments at page 22]. In this simple case, I/N for the BSN is 4 dB for a 100 microWatt signal at a range of 2.1 km for a system whose noise temperature is 750 Kelvin.[1]

The surrogate signal used in the test to represent the BSN is equivalent to a single 1 mW BSN operating indoors (with 10 dB of additional attenuation) at a range of 20 km -- yet it raised the effective system noise temperature of the AMT system to almost 2000 Kelvin. The practical effect of just this single device, operated indoors at long range, is to reduce the maximum operational range and corresponding flight test area significantly. Moving the device outdoors, or using multiple devices, would render the AMT link useless when the aggregation of devices lies within the field of view of the main beam of the AMT antenna.

3. Frequency Sharing among BSNs

GEH assumes that 4 BSNs will share a single 1 MHz channel [Reply Comments at page 25]. However, five of these BSN channels fit into a single 5 MHz AMT channel. As a result, 20 BSNs operating indoors in a single healthcare facility 20 km away from the AMT ground station have the potential to raise the noise floor of the AMT system by an additional 7 dB.[2] This will cause another factor of two decrease, over and above the reduction in maximum operational range caused by the single BSN described above, in the operational range of a flight test aircraft in the direction of the healthcare facility. For the 30 MHz wide AMT allocation, 120 BSNs operating in a single healthcare facility would wipe out use of the entire AMT band, from 2360-2390 MHz, in the direction of the healthcare facility.

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[1] Because of the addition of special purpose multi-coupler equipment, the telemetry system was not operating at its underlying system temperature of 250 Kelvin. For a system at 250 Kelvin, I/N will be 4.8 dB higher. Hence, the computation presented by GEH [Reply Comments at page 23] that I/N = -29 dB, is misleading. These points also underscore the exquisite sensitivity of an AMT receive system.

[2] The figure of 20 km represents the maximum line of sight distance from an AMT receive antenna on a 100 foot tower to a BSN on the ground. As this is the separation distance used in the GEH Reply Comments, the same figure has been used here to facilitate comparison of AFTRCC analyses with those of GEH.

With respect to BSNs sharing a single 1 MHz channel, consider also a single BSN producing 250 microsecond bursts once per millisecond (per the Nordic nRF24L01 data sheet transceiver, referenced in GEH's 12/27/07 *Ex Parte* Comments at page 28 as a possible circuit for use as a BSN transmitter). Although broadcasting only 25% of the time, the device will corrupt 25% of the data bits on the AMT channel, thus reducing the bit error rate of the AMT telemetry downlink from 1 in 100,000 to 1 in 4. With four (4) co-frequency BSNs, the error rate will approach unity, and the link will fail, requiring a slow reacquisition process on the part of the AMT operator – if reacquisition is even possible -- when the flight test aircraft moves out of view of the interference source.[3]

4. Aggregate analysis

The above discussion refers to the effect on AMT of a single BSN, or the effects of an aggregation of BSNs at a single location. Of critical importance is the impact of BSN operation at multiple sites spread among various azimuth angles within view of the AMT ground stations.

Returning to the Learjet testing at Mid-Continent Airport at Wichita, KS, there are 32 healthcare facilities within 20 km of the airport, with a total of 4580 beds. This is shown in Figure 1 and described in detail in Table 1.[4] Mid-Continent Airport, one of the several flight test centers that operate in or near the Wichita Airport, is located at the point (0,0) in Figures 1a and 1b. (i.e., at the center of each figure).

. It is impossible, even with a 15 foot diameter AMT antenna having a gain of 40 dBi and a corresponding main-lobe half-power beam-width of 2 degrees, to avoid main-beam conjunction with multiple BSNs when a flight test aircraft is flying east from Mid-Continent Airport. Simply put, it is not possible to draw a straight line from the point 0,0 (the center of the graph, representing the location of the airport) to an airplane flying east or northeast of the city without crossing one of the diamonds in Figure 1 that indicates a healthcare facility. Thus, to claim, as GEH does [Reply Comments at page B-1] that main-lobe conjunction of a BSN with a healthcare facility "holds for only a small percentage of situations" is not true.

The placement of 25 healthcare facilities within this approximately 60 degree range of azimuth angles means that the probability of a healthcare facility being within the 2 degree beamwidth of an antenna is 25/30 = 84%. (The antenna "sees" 2 of the 60 degrees at a time. Thus the 25 healthcare facilities can be regarded, to an accurate approximation in this example, as being separated into 30 equally spaced "viewing bins." This yields the factor 25/30.)

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[3] Interestingly, the manufacturer of the nRF24L01 recommends specifically against using their product in the contention-based protocol scenario proposed by GEH. See "How useful is carrier detect (CD) on the nRF24L01?," http://faq.nordicsemi.no/?q=32, accessed 7 July 08.

[4] Used with permission,Verispan, LLC.

Nor is it practical to limit AMT operations to areas west of the airport, or to assert that AMT operations will be distributed uniformly across all azimuth angles with respect to the airport, thus causing a reduced failure rate of the AMT link. The reality of flight test is that the portion of the airspace available for testing will vary daily, and even hourly, based on wind direction, orientation of the operational runway, air traffic considerations, and testing at the numerous other flight test centers that surround Wichita. On any given day, the patterns flown by a test aircraft, such as elongated racetrack ovals, will typically favor one direction over others, with the preferred direction changing unpredictably from test to test. Thus, it is pointless to assert, as GEH has done [Reply Comments at page 23], that there is "uniform azimuth angle distribution about the AMT site." On the contrary, limiting flight tests to one sector of airspace would cause major disruption to flight test operations.

GEH's sidelobe/backlobe analyses also need to be considered. In their Reply Comments [at Appendix B, referring to "the MBANs transmitter"], GEH analyzes the situation where a single BSN is in a sidelobe or backlobe of the AMT receive antenna. What it does not consider is the situation, shown in Figure 1, where all of the 35 Wichita-area healthcare facilities within a 20 km radius, with their 4580 beds, will simultaneously be in view of a side- or back-lobe of the AMT antenna. Although these antenna lobes have a reduced sensitivity, their wider field of view simultaneously receives interference from more of the BSNs. Thus, the reduced sensitivity of the AMT ground station receiver to signals picked-up outside the main-lobe of the antenna will be offset by the larger number of healthcare facilities seen by the larger angular expanse of the side- and back-lobes.

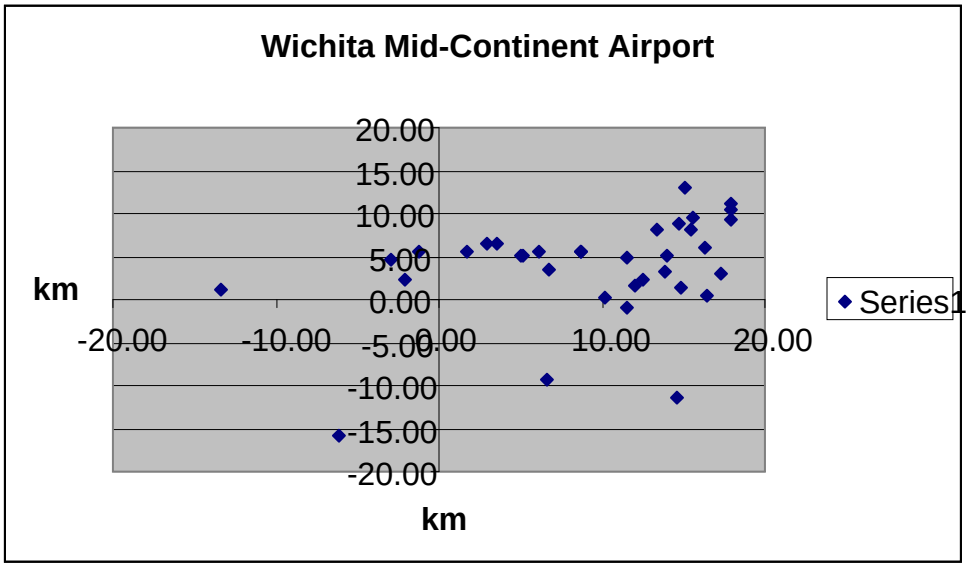

Figure 1a. Distribution of healthcare facilities with respect to the Bombardier/Learjet AMT site at Mid-Continent Airport in Wichita, Kansas.

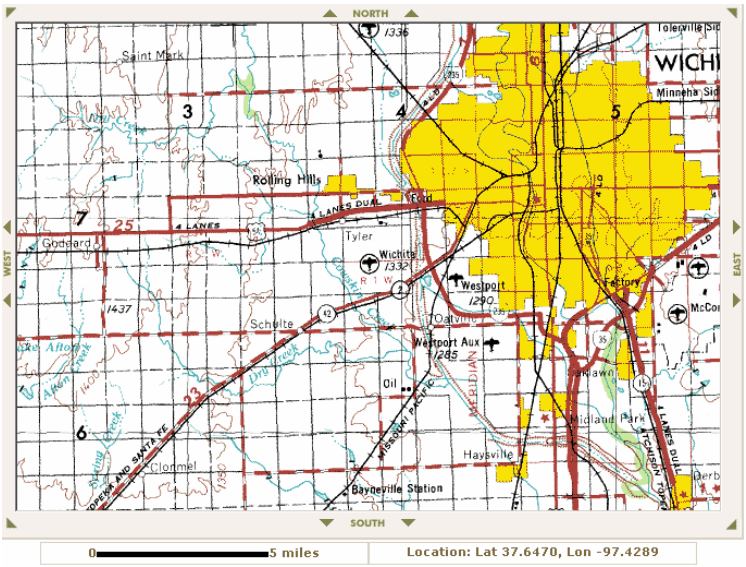

Figure 1b. USGS-derived topographic map centered on Mid-Continent Airport, Wichita, KS. The 5 mile reference scale corresponds to 8 km. The 20 km separation distance is equivalent to 12.5 miles. (map used with permission, Mytopo.com)

	name_1	add_1	city	latitude	longitud	Beds	AMT lat	AMT long	sep km
NH	Lakewood Health Care Center	1319 Seville St	Wichita	37.669889	-97.453231	100	37.65	-97.43	3.01
NH	Park West Plaza	505 N Maize Rd	Wichita	37.690769	-97.462835	118	37.65	-97.43	5.38
HO	Wesley Rehabilitation Hospital	8338 W 13th St	Wichita	37.700510	-97.444360	65	37.65	-97.43	5.76
NH	Sandpiper Bay Healthcare Center	5808 W 8th St N	Wichita	37.699964	-97.411116	152	37.65	-97.43	5.80
HO	Via Christi Riverside Medical Center	2622 W Central Ave	Wichita	37.694950	-97.372829	88	37.65	-97.43	7.10
NH	Wichita Presbyterian Manor	4700 W 13th St N	Wichita	37.709057	-97.397153	91	37.65	-97.43	7.18
NH	Riverside Village Snr Living Campus	777 N McLean Blvd	Wichita	37.696460	-97.371542	36	37.65	-97.43	7.30
NH	Lakepoint Retirement & Rehab	1315 N West St	Wichita	37.707558	-97.389726	196	37.65	-97.43	7.32
NH	Kansas Masonic Home	401 S Seneca St	Wichita	37.680461	-97.353138	120	37.65	-97.43	7.57
NH	Meridian Nursing & Rehab Center	1555 N Meridian St	Wichita	37.700060	-97.360450	106	37.65	-97.43	8.28
NH	Medicalodge Of Wichita	2280 S Minneapolis St	Wichita	37.653111	-97.314608	73	37.65	-97.43	10.17
HO	Select Specialty Hospital - Wichita	929 N Saint Francis St	Wichita	37.700149	-97.331758	65	37.65	-97.43	10.30
HO	Via Christi Regional Medical Center - St Francis	929 N Saint Francis St	Wichita	37.700149	-97.331758	875	37.65	-97.43	10.30
NH	Haysville Healthcare Center	215 N Lamar Ave	Haysville	37.566131	-97.355131	119	37.65	-97.43	11.43
NH	Abal Home	2840 S Hillside St	Wichita	37.641486	-97.298705	66	37.65	-97.43	11.61
HO	Via Christi Regional Medical Center	3600 E Harry St	Wichita	37.664670	-97.293662	389	37.65	-97.43	12.12
HO	Wesley Medical Center	550 N Hillside St	Wichita	37.694576	-97.298971	510	37.65	-97.43	12.57
NH	Golden Living Center	4007 E Lincoln St	Wichita	37.671836	-97.288433	59	37.65	-97.43	12.71
NH	Medicalodge Of Goddard	501 Easy St	Goddard	37.660739	-97.582269	85	37.65	-97.43	13.47
HO	Robert J Dole VA Medical Center	5500 E Kellogg Dr	Wichita	37.679805	-97.271963	48	37.65	-97.43	14.31
NH	Infinia at Wichita	1600 S Woodlawn St	Wichita	37.663250	-97.262110	93	37.65	-97.43	14.87
NH	Life Care Center of Wichita	622 N Edgemoor St	Wichita	37.695971	-97.271315	120	37.65	-97.43	14.89
NH	College Hill Nursing & Rehab Center	5005 E 21st St N	Wichita	37.722902	-97.278188	96	37.65	-97.43	15.64
HO	Wichita Specialty Hospital	8080 E Pawnee St	Wichita	37.654664	-97.242985	26	37.65	-97.43	16.49
NH	Clearwater Manor	620 E Wood St	Clearwater	37.508370	-97.499601	64	37.65	-97.43	16.91
HO	Galichia Heart Hospital	2610 N Woodlawn St	Wichita	37.730427	-97.262241	55	37.65	-97.43	17.28
HO	Via Christi Rehabilitation Center	1151 N Rock Rd	Wichita	37.703993	-97.244699	58	37.65	-97.43	17.40
NH	ManorCare Health Services	7101 E 21st St N	Wichita	37.722955	-97.254264	119	37.65	-97.43	17.48
HO	Via Christi - Good Shepherd Campus	8901 E Orme St	Wichita	37.676525	-97.233562	80	37.65	-97.43	17.56
NH	Larksfield Place	2828 N Governeour St	Wichita	37.736275	-97.253671	90	37.65	-97.43	18.26
NH	Westview Manor of Derby	445 N Westview Dr	Derby	37.546899	-97.264508	120	37.65	-97.43	18.55
NH	Catholic Care Center	6700 E 45Th St N	Wichita	37.766875	-97.258517	298	37.65	-97.43	19.94

Table 1. Healthcare facilities near Mid-Continent Airport in Wichita, KS. HO = hospital, NH = nursing home. There are 4580 beds within 20 km of Mid-Continent Airport.

In the case where an AMT site is surrounded on all sides by healthcare facilities, as is the case for Boeing Field in Seattle, shown in Figure 2, this is a zero-sum situation: For a uniform distribution in azimuth of BSNs, the total power received by an AMT ground station antenna will be constant, independent of the gain of the antenna or the direction in which it points.

This important fact is worthy of further clarification. The main-beam of an antenna is made smaller and more directive by increasing the diameter of the parabolic dish. As the main-beam becomes narrower and more sensitive, the back and sidelobes become less sensitive, but also wider.

Suppose that one has an omnidirectional antenna that receives interference equally from 360 healthcare facilities distributed uniformly at 1 degree intervals (thus using the GEH assumption of uniform distribution in azimuth). If the antenna is modified so that it only receives interference from 180 of the healthcare facilities, it will be twice as sensitive to each of these 180 interference sources. Thus, the net interference is the same: 1 times 360 = 2 times 180, and so forth. This underscores the need to consider main, side, and back-lobe interference not just for a single BSN, but for the actual distribution of large numbers of ubiquitous BSNs distributed among healthcare facilities that are located at all angles with respect to an AMT ground station receive site. (Of course, this does not even begin to deal with the unpredictable distribution of BSN-equipped patients in homes and offices.)

In addition, the fact that some healthcare facilities are as close as 3 km to the AMT ground station at Wichita further exacerbates this interference problem, independently of whether the BSN lies in the main or in the side lobe of the AMT receive antenna.

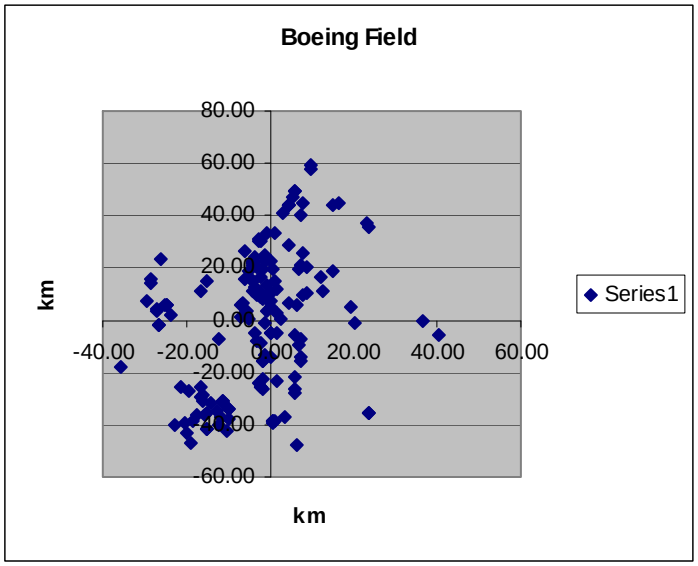

Figure 2a. Distribution of healthcare facilities with respect to the Boeing AMT site at Boeing Field in Seattle, WA.

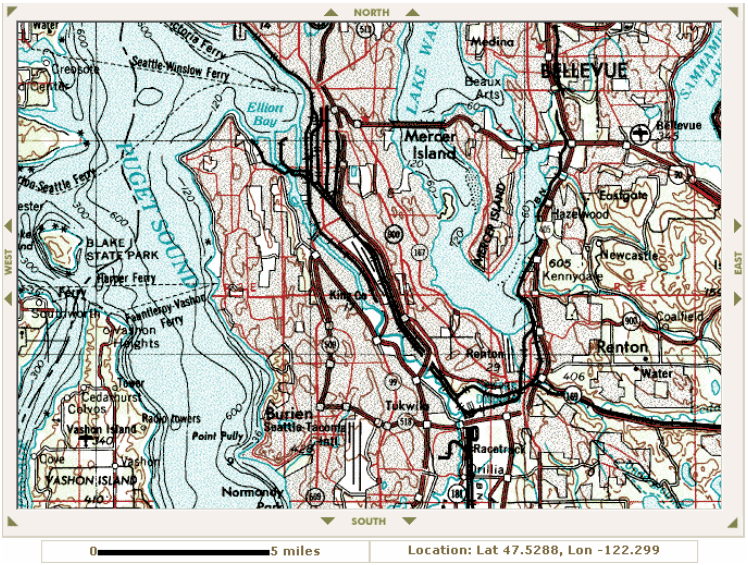

Figure 2b. USGS-derived topographic map centered on Boeing Field in Seattle. (map used with permission, Mytopo.com)

These issues are not limited to civilian flight test ranges. Similar effects will occur due to interference from BSNs located at healthcare facilities near Government flight test ranges, such as Eglin Air Force Base as shown in Figure 3 and Table 3, and Kirtland Air Force Base in Figure 4 and Table 4. For Eglin, note that healthcare facilities line the coast, as expected for an area known for its beachfront living along the Gulf of Mexico. Despite this, there are 9 healthcare facilities within 20 km of the AMT ground station with a total of 896 beds.

Figures 4a and 4b echo this result. Data are shown for Kirtland Air Force Base in Albuquerque, New Mexico. This government facility is used for flight test in the 2360 – 90 MHz band (as are all of the other example sites presented herein). Within 10 km of the airport there are 2781 healthcare beds. A total of 4068 beds are within 20 km of the airport. The runways at Kirtland are used jointly with Albuquerque's International Sunport Airport, which is located in the city itself. Albuquerque is neither remote nor small. It's 2007 population was 518,000, and it was the 34th largest city in the United States.

At the opposite extreme, consider the Leadville, Colorado Airport. This is the highest altitude airport in the United States, and is used for high altitude testing of commercial and military aircraft. Leadville is remote from urban areas, as is its only hospital. However, the airport and this 25 bed hospital are not remote from each other; the hospital is located only 3 km from the airport. At 3 km, a single BSN will create 44 times the interference of a comparable BSN located at a separation distance of 20 km.

Thus, the interference from BSNs to AMT ground station receivers located at both military and civilian test ranges will be significant.

us_ty	name_1	add_1	city	latitude	longitud	Beds	AMT lat	AMT long	sep km
NH	Sea Mar Community Care Center	1040 S Henderson St	Seattle	47.523095	-122.318511	100	47.53	-122.3	1.59
NH	Caroline Kline Galland Home	7500 Seward Park Ave S	Seattle	47.534378	-122.267009	205	47.53	-122.3	2.53
NH	Kin On Health Care Center	4416 S Brandon St	Seattle	47.553435	-122.277840	100	47.53	-122.3	3.09
HO	V A Puget Sound Health Care System	1660 S Columbian Way	Seattle	47.562027	-122.311033	226	47.53	-122.3	3.66
HO	Regional Hospital for Respiratory and Complex Care	12844 Military Rd S	Seattle	47.488291	-122.296941	27	47.53	-122.3	4.65
HO	Highline Medical Center - Specialty Campus	12844 Military Rd S	Tukwila	47.488291	-122.296941	88	47.53	-122.3	4.65
NH	Washington Center for Comp Rehab	2821 S Walden St	Seattle	47.572120	-122.296116	165	47.53	-122.3	4.70
HO	Virginia Mason Medical Center	925 Senaca St	Seattle	47.488352	-122.275897	260	47.53	-122.3	4.98
HO	West Seattle Psychiatric Hospital	2600 SW Holden St	Seattle	47.533755	-122.366197	40	47.53	-122.3	4.99
NH	Life Care Center of Burien	1031 SW 130th St	Seattle	47.486583	-122.348611	140	47.53	-122.3	6.06
NH	Providence Mount St Vincent	4831 35th Ave SW	Seattle	47.558657	-122.376296	215	47.53	-122.3	6.56
NH	Kenney Home	7125 Fauntleroy Way SW	Seattle	47.539208	-122.390993	20	47.53	-122.3	6.92
NH	Leon Sullivan Health Care Center	2611 S Dearborn St	Seattle	47.595497	-122.298618	165	47.53	-122.3	7.29
NH	Mercer Island Care Center	7445 SE 24th St	Mercer Island	47.589095	-122.239650	100	47.53	-122.3	7.99
NH	Seattle Keiro	1601 E Yesler Way	Seattle	47.601626	-122.311458	150	47.53	-122.3	8.02
NH	Regency At Renton Rehab Center	80 SW 2nd St	Renton	47.482150	-122.219640	99	47.53	-122.3	8.05
HO	Harborview Medical Center	325 9th Ave	Seattle	47.603586	-122.323035	368	47.53	-122.3	8.37
HO	Swedish Medical Center- Cherry Hill Campus	500 17th Ave	Seattle	47.606239	-122.310149	224	47.53	-122.3	8.52
NH	Covenant Shores Health Center	9107 Fortuna Dr	Mercer Island	47.582132	-122.216427	43	47.53	-122.3	8.55
NH	Seattle Medical & Rehab Center	555 16th Ave	Seattle	47.606746	-122.311623	103	47.53	-122.3	8.58
NH	Bessie Burton Sullivan	1020 E Jefferson St	Seattle	47.606275	-122.319087	139	47.53	-122.3	8.61
HO	Highline Medical Center	16251 Sylvester Rd SW	Burien	47.457269	-122.341095	155	47.53	-122.3	8.66
HO	Swedish Medical Center - First Hill Campus	747 Broadway	Seattle	47.608618	-122.320831	673	47.53	-122.3	8.89
NH	Life Care Center of West Seattle	4700 SW Admiral Way	Seattle	47.581156	-122.392049	106	47.53	-122.3	8.96
HO	Schick Shadel Hospital	12101 Ambaum Blvd SW	Seattle	47.451180	-122.331420	48	47.53	-122.3	9.08
NH	Exeter House	720 Seneca St	Seattle	47.609015	-122.330827	32	47.53	-122.3	9.09
NH	Park West Care Center	1703 California Ave SW	Seattle	47.587981	-122.386314	137	47.53	-122.3	9.15
NH	Horizon House	900 University St	Seattle	47.610683	-122.329184	56	47.53	-122.3	9.24
HO	Group Health Central Hospital	201 16th Ave E	Seattle	47.619779	-122.311471	14	47.53	-122.3	10.03
HO	Group Health Eastside Hospital	2700 152nd Ave NE	Redmond	47.617516	-122.345094	132	47.53	-122.3	10.31
HO	Valley Medical Center	400 S 43rd St	Renton	47.463540	-122.204310	228	47.53	-122.3	10.32
NH	Bailey Boushay House	2720 E Madison St	Seattle	47.622965	-122.297162	35	47.53	-122.3	10.35
HO	Seattle Cancer Care Alliance	825 Eastlake Ave E	Seattle	47.626386	-122.329324	20	47.53	-122.3	10.95
NH	Talbot Center for Rehab & Hlthcare	4430 Talbot Rd S	Renton	47.444453	-122.211321	135	47.53	-122.3	11.62
NH	Bayview Manor	11 W Aloha St	Seattle	47.627225	-122.356926	50	47.53	-122.3	11.63
NH	Park Shore	1630 43Rd Ave E	Seattle	47.634107	-122.277041	30	47.53	-122.3	11.71
NH	The Fountain at Pacific Regent	919 109th Ave NE	Bellevue	47.618537	-122.194256	54	47.53	-122.3	12.66
NH	Queen Anne Healthcare	2717 Dexter Ave N	Seattle	47.643836	-122.346145	130	47.53	-122.3	13.13
HO	Overlake Hospital Medical Center	1035 116th Ave NE	Bellevue	47.620433	-122.185787	245	47.53	-122.3	13.23
HO	University of Washington Medical Center	1959 NE Pacific St	Seattle	47.651578	-122.309803	390	47.53	-122.3	13.55
NH	Wesley Homes Health Center	1122 S 216th St	Des Moines	47.408509	-122.319015	148	47.53	-122.3	13.59
NH	Vashon Community Care Center	15333 Vashon Hwy SW	Vashon	47.468058	-122.460377	30	47.53	-122.3	13.88
NH	Stafford Healthcare	2800 S 224th St	Des Moines	47.401016	-122.297011	165	47.53	-122.3	14.35
HO	Childrens Hospital and Regional Medical Center	4800 Sand Point Way NE	Seattle	47.664021	-122.283476	250	47.53	-122.3	14.96
NH	Columbia Lutheran Home	4700 Phinney Ave N	Seattle	47.662979	-122.353919	116	47.53	-122.3	15.34
NH	Judson Park Retirement Community	23620 Marine View Dr S	Des Moines	47.389430	-122.323717	96	47.53	-122.3	15.74
NH	Masonic Retirement Center-Washington	23660 Marine View Dr S	Des Moines	47.389302	-122.323715	47	47.53	-122.3	15.76
NH	Norse Home Retirement Center	5311 Phinney Ave N	Seattle	47.667222	-122.354513	12	47.53	-122.3	15.81
NH	Benson Heights Rehabilitation Center	22410 Benson Rd SE	Kent	47.401061	-122.200051	91	47.53	-122.3	16.19
NH	Hearthstone	6720 E Green Lake Way N	Seattle	47.678290	-122.328911	44	47.53	-122.3	16.64
HO	Swedish Medical Center - Ballard Campus	5300 Tallman Ave NW	Seattle	47.670190	-122.378900	147	47.53	-122.3	16.69
NH	Mission Health Care at Bellevue	2424 156th Ave NE	Bellevue	47.631949	-122.132229	129	47.53	-122.3	16.96
NH	Sunrise Haven	24423 100th Ave SE	Kent	47.387070	-122.199640	10	47.53	-122.3	17.60
NH	Ballard Care and Rehab	820 NW 95th St	Seattle	47.697892	-122.367474	142	47.53	-122.3	19.36
HO	Kindred Hospital - Seattle	10560 5th Ave NE	Seattle	47.705178	-122.323068	49	47.53	-122.3	19.57
NH	St Anne Nursing & Rehab	3540 NE 110th St	Seattle	47.708405	-122.289659	47	47.53	-122.3	19.86
NH	Providence Marianwood	3725 Providence Point Dr SE	Issaquah	47.573190	-122.043122	120	47.53	-122.3	19.90

Table 2. Healthcare facilities within 20 km of Boeing Field in Seattle, WA. HO = hospital, NH = nursing home. There are 100 beds within 2 km and 7290 beds within 20 km of Boeing Field.

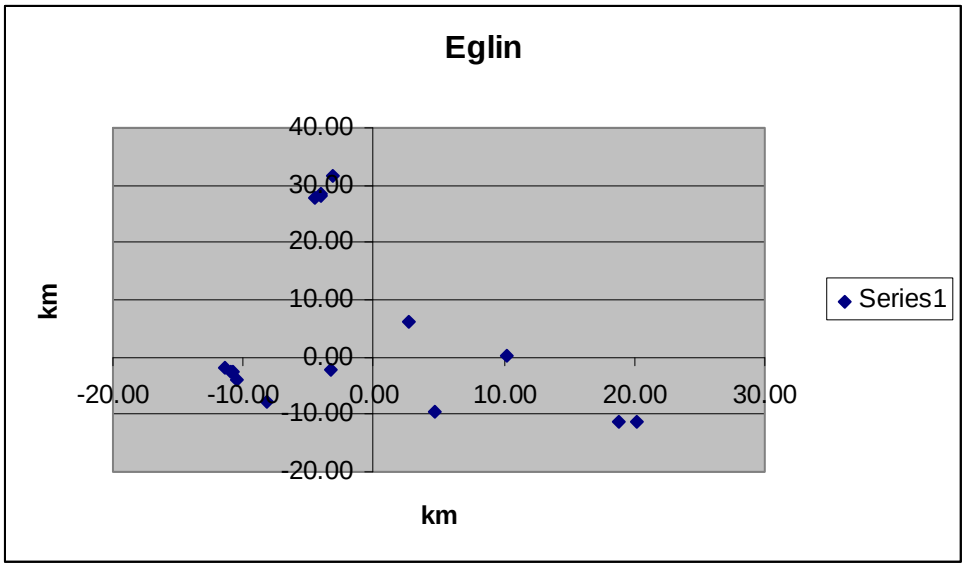

Figure 3a. Distribution of healthcare facilities near Eglin Air Force Base, Ft. Walton Beach, Florida.

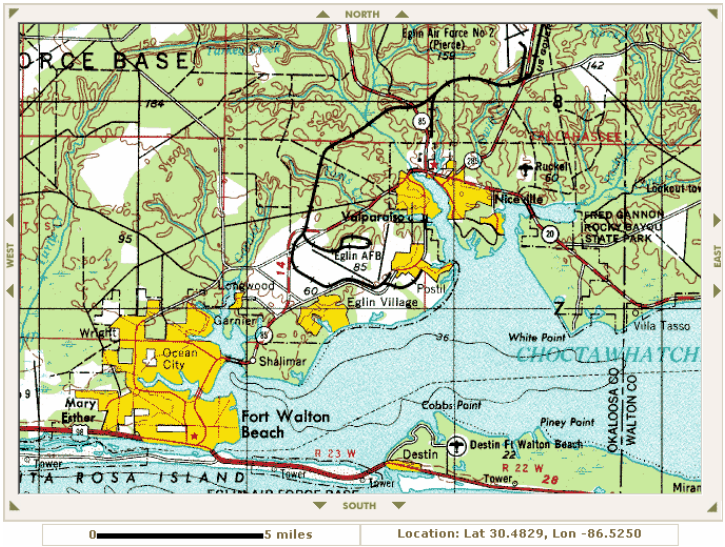

Figure 3b. USGS-derived topographic map centered on Eglin Air Force Base in Florida. (map used with permission, Mytopo.com)

	name_1	add_1	city	latitude	longitud	Hosp_Staf_Beds	AMT lat	AMT long	sep km
HO	US Air Force Regional Hospital	307 Boatner Rd	Eglin AFB	30.460533	-86.553902	34	30.48	-86.52	3.91
HO	Twin Cities Hospital	2190 Hwy 85 N	Niceville	30.535000	-86.492610	65	30.48	-86.52	6.66
NH	Manor at Blue Water Bay	1500 N White Point Rd	Niceville	30.481801	-86.413852	120	30.48	-86.52	10.18
NH	Destin Health Care & Rehab Center	195 Mattie M Kelly Blvd	Destin	30.395421	-86.471156	119	30.48	-86.52	10.51
NH	Westwood Healthcare Center	1001 Marwalt Dr	Fort Walton Beach	30.445690	-86.629080	60	30.48	-86.52	11.14
HO	Fort Walton Beach Medical Center	1000 Mar Walt Dr	Fort Walton Beach	30.455455	-86.633227	234	30.48	-86.52	11.20
HO	Gulf Coast Treatment Center	1015 Mar Walt Dr	Fort Walton Beach	30.455561	-86.634247	24	30.48	-86.52	11.29
NH	Emerald Coast Healthcare & Rehab	114 3rd St SE	Fort Walton Beach	30.408558	-86.605532	120	30.48	-86.52	11.42
NH	Parthenon Healthcare of Fort Walton	1 L B J Sr Dr	Fort Walton Beach	30.462024	-86.638300	120	30.48	-86.52	11.52

device specifically recommends against the use of contention-based protocols for its implementation.[5] This is another example of the incomplete system design put forth by GEH which makes compatibility analyses difficult.

6. Networked Telemetry

The Department of Defense has been developing a networked flight test telemetry system known as "iNet." The iNET system will offer the ability, using dynamic frequency allocation, for individual aircraft to telemeter orders of magnitude more data to the ground during critical phases of a test flight using the limited amount of existing L- and S-band AMT spectrum. It is anticipated that this system would also be utilized for commercial flight testing.

To accomplish this, both the iNET ground transmit antennas and iNET-compatible aircraft receive antennas will have omnidirectional coverage. Under these conditions, in order to maintain an uplink over the fading channel with a bandwidth of 2-20 MHz and a bit error probability of 10^{-5} or better, the effective isotropic radiated power of the omnidirectional AMT ground-based iNET broadcast antenna will be several hundred Watts or more.

The net effect will be to cause destructive interference to the operation of all BSNs in the 2 – 20 MHz wide iNET channel that are within line of sight of the iNET transmission tower. This will be the case whether the BSNs are indoors or not.

Conclusion

GEH has failed to present a sharing study which demonstrates that the proposed BSNs could operate compatibly with flight testing. As shown above, BSNs cannot share spectrum with AMT.

I have read and am familiar with the attached letter being filed on behalf of the Aerospace and Flight Test Radio Coordinating Council ("AFTRCC"). The statements made herein and in the letter are true and correct to the best of my knowledge and belief.

Daniel G. Jablonski
July 25, 2008.

[5] Ref. 3, Ibid.

Table 3. Healthcare facilities near Eglin AFB, Florida. HO = hospital, NH = nursing home. There are 896 beds within 20 km.

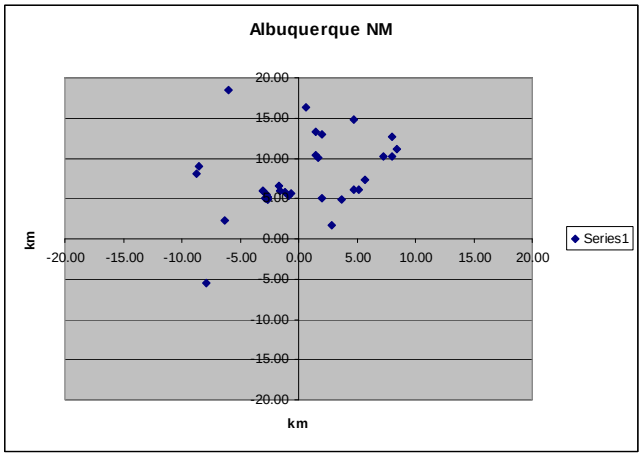

Figure 4a. Distribution of healthcare facilities near Kirtland Air Force Base, Albuquerque, New Mexico

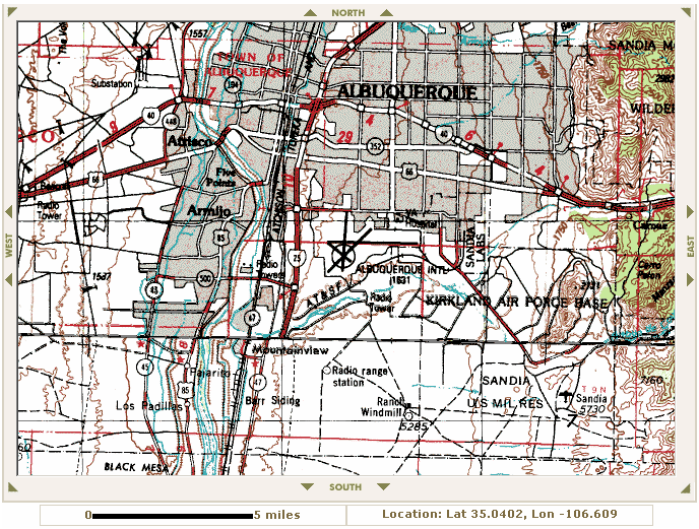

Figure 4b. USGS-derived topographic map centered on Kirtland Air Force Base, Albuquerque, New Mexico. (map used with permission, Mytopo.com)

5. Contention-based Protocols

GEH relies heavily on the use of contention-based protocols to assign vacant spectrum in real-time to BSNs while avoiding interference to and from other BSNs and AMT ground stations. GEH suggests the Nordic nRF24L01 device for implementation as the wireless transmitter for a prototype BSN. [Comments of GE Healthcare filed January 31, 2007 in ET Docket No. 04-186, at page 6] However, the manufacturer of this

Exhibit B

U.S. Department of Defense
Office of the Assistant Secretary of Defense (Public Affairs)

News Release

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http://www.defenselink.mil/releases/release.aspx?releaseid=11998
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IMMEDIATE RELEASE

No. 516-08
June 19, 2008

DoD Achieves Major Networking And Spectrum Management Enhancement Event

The Department of Defense's integrated Network Enhanced Telemetry (iNET) program office has completed development of the Telemetry Network System (TmNS) network architecture, a major event in the programs's effort to provide the DoD research test and evaluation community with new radio spectrum-enhancing technology.

With the completion of this achievement, the iNET program office will now develop TmNS standards for data link, ground and airborne networks. This phase, scheduled for completion in 2009, will include extensive tests of alternative spectrum-efficient technologies to facilitate development of these standards.

Once fully operational, the TmNS will provide wideband wireless capability with hundreds of square miles of coverage to DoD computer networks at DoD installations. As a result, the system will offer several significant enhancements to the department's test range management of its radio spectrum resource.

For example, through use of the TmNS, flight test centers will be able to dynamically adjust the spectrum required for test vehicles. Vehicles requiring a temporary increase in bandwidth will have that spectrum made available to them, while test vehicles temporarily requiring less bandwidth will have reduced throughput rates. In addition, test centers, program managers, and aircraft manufacturer personnel will be able to monitor tests from remote locations. This will help achieve greater efficiencies and cost-savings in test programs and test range operations.

A limited prototype system of the TmNS is projected to be operational by 2011, with initial operational capability (IOC) will follow completion of full field testing of the prototype.

The TmNS high-poweruplink transmissions, which enable dynamic control of the spectrum resource, will be implemented in the 1435-1525 MHz and 2360-2390 MHz bands.