

**BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION**

In the Matter of) ET Docket No. 04-186
Unlicensed Operation in the TV Broadcast)
Bands)
Additional Spectrum for Unlicensed Devices) ET Docket No. 02-380
Below 900 MHz and in the 3 GHz Band)

TECHNICAL REPLY COMMENTS OF

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MEDIA ACCESS PROJECT,
MICROSOFT CORPORATION,
SHARED SPECTRUM COMPANY,
ADAPTRUM, INC.,
CHAMPAIGN-URBANA COMMUNITY WIRELESS NETWORK,
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COMMENTORS

Commentors in this proceeding include professors and other knowledgeable specialists in spectrum issues; commercial providers of products and/or wireless internet services using unlicensed spectrum access; and non-profit organizations using or promoting the use of unlicensed spectrum to improve education, increase broadband internet access and narrow the digital divide.

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Adaptrum, Inc. is a newly formed company developing state-of-the-art spectrum sharing technologies for military and commercial applications.

The **Champaign-Urbana Community Wireless Network**, a project of the Urbana-Champaign Independent Media Center Foundation, has deployed an extensive mesh network using Part 15 spectrum in the Champaign-Urbana metro area. The three-part mission is to (a) connect more people to Internet and broadband services; (b) develop open-source hardware and software for use by wireless projects world-wide; and, (c) build and support community-owned, not-for-profit broadband networks in cities and towns around the globe. www.cuwireless.net

Media Access Project (MAP) is a thirty year old non-profit tax exempt public interest telecommunications law firm which promotes the public's First Amendment right to hear and be heard on the electronic media of today and tomorrow. MAP's work is in the courts, the FCC, and in active outreach as a coalition builder among other public interest organizations. MAP is the only Washington-based organization devoted to representing listeners' and speakers' interests in electronic media and telecommunications issues before the Federal Communications Commission, other policy-making bodies, and in the courts. <http://www.mediaaccess.org/>

In 1991, **Microsoft Corporation** became one of the first software companies to create its own computer science research organization. There are currently more than 700 people in the Microsoft Research organization, working in more than 50 areas. These include speech recognition, user interface research, programming tools and methodologies, operating systems and networking, graphics, natural language processing, machine learning, and mathematical sciences. Prestigious national and international honors bestowed upon Microsoft researchers include the National Medal of Technology, the Turing Award of the Association for Computing Machinery, the Kyoto Prize in Advanced Technology, the Fields Medal of the International Mathematical Union and the British Knighthood. Several Microsoft researchers are members of the National Academy of Engineering, and others have received the Academy of Motion Picture Arts and Sciences Award for Technical Achievement. <http://research.microsoft.com>

The **New America Foundation** is a nonpartisan, non-profit public policy institute based in Washington, DC, which, through its Spectrum Policy Program, studies and

advocates reforms to improve our nation's management of publicly-owned assets, particularly the electromagnetic spectrum. www.newamerica.net

Shared Spectrum Company develops Advanced Technologies for Government and Industry customers with challenging RF and networking needs. The Company's staff consists of advanced degree scientists and engineers with core competencies in ad-hoc networking algorithms, RF propagation, RF field measurements, spectrum policy, distributed simulations, system analysis, mathematics, signal processing, DSP/FPGA design, RF information warfare technology, and RF hardware design. The Company is developing dynamic spectrum management applications and high performance, low cost transceivers that operate from VHF frequencies to 3 GHz. This technology enables frequency agile radios to dynamically share the spectrum on a non-interference basis with existing users. By providing a vast amount of bandwidth, this technology will revolutionize the military and commercial use of the radio spectrum. <http://www.sharedspectrum.com/>

Vanu, Inc. has been at the forefront of software radio innovation since 1998. Vanu, Inc.'s revolutionary software radio technology enables wireless operators to deploy new wireless standards and services, enhance a single device, or upgrade their entire network—all by downloading software. www.vanu.com

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INTRODUCTION

These reply comments are being filed by a coalition of the New America Foundation and other entities (NAF *et al.*) listed on the cover page. These entities include nonprofits, corporations, and professors of engineering, and they have joined in urging the Commission to complete positive action in its proposals in this proceeding. These entities have explicitly reserved the right to file reply comments individually. These coalition comments only concern issues on which the above entities were able to reach consensus.

Increasing use of TV broadcast spectrum in a way that protects existing users will also further the Commission's goal of using spectrum more efficiently. The spectrum is an exceedingly valuable resource and increasing its utilization will contribute to economic growth in both FCC-regulated industries and throughout the rest of the economy. The proposals in the Notice basically are valid as will be shown below. Some legitimate concerns about the specific proposals have been raised in the comments and New America *et al.* address those concerns in these Reply Comments and show how modifications of the original proposals could eliminate concerns about interference.

While some would like to portray this Notice as an unprecedented step to use unproven technology, it actually builds on precedents in FCC action, commercial products, and military R&D. Cordless telephones have used dynamic frequency selection for about a decade to improve spectrum use and minimize interference. The Commission has already authorized software-defined radio and in an ongoing rulemaking is considering improving the security of the software. The Commission has already authorized a software-defined radio developed by one of the members of this coalition.

The Commission proposed in its Notice three different techniques that could be used to enable unlicensed use in TV band "white space": geolocation/GPS with comparison to database of licensed facilities, listen-before-talk systems that look TV signals before selecting a free channel, and systems using local beacons that identify free channels.

Geolocation technology using GPS is already widespread and has been recognized by the Commission in the E-911 context. Other geolocation technologies with better indoor coverage are under development. Fail-safe applications of such geolocation technology can be implemented in a straightforward way that would allow unlicensed transmitters to turn on only if they are in "white space" where they cannot cause interference. Ironically, the limiting factor of such systems may be the present accuracy and timeliness of the Commission's publicly available databases. This problem can and should be resolved independent of this proceeding.

The *Notice* proposes that portable unlicensed devices could detect and avoid TV signals by having a detection system much more sensitive than normal receivers.¹ It is a basic technical fact that it is much easier to detect a signal than to demodulate. A

¹ The unlicensed device could be "shadowed" by a building or terrain and the TV signal strength could be much less than at a nearby TV antenna. Sometimes, this is called "the hidden node problem". But while the TV signal strength at the unlicensed device is less than that at the TV receiver, it is not zero. Hence a detector more sensitive than the TV receiver can detect the TV signal.

detection system can accumulate signals for a long time before it makes a decision about whether a specific type of signal is present. By contrast, a normal receiver must decide what signal is present very quickly, which in the case of DTV is about 20,000,000 decisions/second.² Several commentators have said that it is possible to have a TV signal detector that is more sensitive than a TV receiver by simply using a very narrow bandwidth. Other commentators have pointed to “cyclostationary” or “feature” detector technology, featured at a Commission Tutorial on February 12, 2003, which is even more sensitive than the narrow filter approach. Thus technology is available to reliably detect weak TV signals and prevent interference.

The final enabling mechanism in the notice was the use of a beacon signal to signal what TV channels are available. The proposal in the *Notice* did not specify adequately that the range of the beacon signal had to be comparable to the validity of its contents since “white space” is location dependent. New America *et al.* suggest below a clarification that eliminates this concern.

NAF *et al.* are organizing these reply comments to focus initially on the points raised in the Joint Comments of The Association for Maximum Service Television, Inc. and the National Association of Broadcasters (MSTV/NAB) filed November 30, 2004. MSTV/NAB represent a large number of entities concerned about the proposals in this proceeding and their comments cover more issues than other commentators who were opposed to the proposals. After the points raised by MSTV/NAB are discussed, NAF *et al.* will address points raised in other comments. In each case the Commission can adequately address each raised issue with either the proposed rules in the *Notice* or straightforward modifications of the proposed rules in the *Notice*.

The coalition members all agree that making additional unlicensed spectrum available in lower bands is very important to the development of the information society in the US and in removing barriers to broadband in rural areas. Additional alternatives to broadband service, such as proposed in this docket, will also spur competition, innovation, and decreased costs in the provision of broadband services.

MSTV/NAB ISSUES

I. “ADOPTION OF THE NOTICE’S UNLICENSED DEVICE PROPOSAL WOULD COME AT THE EXPENSE OF THE TRANSITION TO DIGITAL TELEVISION.” MSTV/NAB AT P. 3

MSTV/NAB choose to start their comments with this “doomsday scenario” and then go on to predict that this unlicensed use could lead to a delay of the return of 24 MHz of spectrum from broadcasting to interoperable public safety use. These predictions of MSTV/NAB assume that unlicensed devices will cause large-scale interference to DTV reception. MSTV/NAB presuppose harmful interference from unlicensed devices that they claim will derail the transition. A couple of factors mitigate this concern. First,

² Without getting too mathematical, the ratio of the time the ordinary receiver needs to make a decision, .05 microseconds in the case of DTV, and the time the detector has to make a decision, easily in the seconds range, is the sensitivity improvement the well designed detector has over an ordinary receiver.

contrary to what MSTV/NAB assert, there is technology (actually a variety of techniques are available) available now that will allow unlicensed devices to avoid occupied – or even reserved but not in use – television channels. So, for example, if in Knoxville channels 2-13 are all needed during the transition, those can be avoided if it can be shown that nonuse of certain unoccupied channels is critical to the transition. The other factor is that if the current DTV transition date is adhered to, interference during the “transition” should be a non-issue

MSTV/NAB even quoted the Commission’s Spectrum Policy Task Force (SPTF) Report out of context and implied that this report recommended against actions such as the proposals. The quote that MSTV/NAB cited on p. 4 of their comments was in Section D.1 (p.46) of the SPTF report. This section deals with the recommended transition from the present “command-and-control” model to a “flexible use” model by the licensees. MSTV/NAB did not include the introduction to this section which explained the context:

In determining whether and how to transition legacy command-and-control bands to more flexible rights models, the Commission should focus first on initiating transition in those bands where additional flexibility will provide the greatest benefits at the least cost. In general, the greatest benefits will be realized in those bands in which the current regulatory regime has led to *significant underutilization or inefficient use of the spectrum*. However, the Commission must also weigh the potential cost of transition, both in terms of its impact on incumbents and on the public. (Emphasis added.)

Thus MSTV/NAB’s quote dealt with rights of licensees, *not* interference-free overlays as proposed in the *Notice*. Even here, the SPTF suggested special consideration be given to increasing spectrum use – exactly what is proposed in the *Notice*.

In its original context the SPTF quote used by MSTV/NAB echoes what the Commission found in the Report and Order of Docket 83-114 – that interoperability standards had a very high priority “in helping in the introduction of new services involving large public participation” 99 FCC 2d. 903, 27 (1984). This section of the SPTF Report clearly did *not* deal with a freeze on secondary emissions in broadcast spectrum during the transition as MSTV/NAB allege. Rather, it recommends that technical standards for DTV transmissions not be modified during the transition to DTV.

The Commission has drafted its proposals in this proceeding to be very conservative. The Commission sought comments to address any concerns it might not have fully understood – concerns it can use to reduce the likelihood of interference to an arbitrarily low level. The Commission is aware that only a minority of households presently receive television signals through over the air signals, with most relying on cable systems or satellite. A very low risk of interference to a minority of households is not going to interrupt the DTV transition.

Broadcast interests may wish to think that all households within their nominal viewing area can presently receive over the air signals without difficulty. But in defining TV reception contours statistically, the Commission recognized that over the air reception is statistical in nature, especially near fringes. A more appropriate test of the interference associated with a rule change may be to compare it with naturally occurring reception

problems and confirm that it is *de minimis* as the Commission has already done in the case of Multichannel Video Distribution and Data Service licensees in §101.1440 with respect to their protection of Direct Broadcast Satellite service.

II. “OPERATION OF UNLICENSED DEVICES UNDER THE PARAMETERS PROPOSED BY THE NOTICE WOULD CAUSE HARMFUL INTERFERENCE TO BOTH ANALOG AND DIGITAL TELEVISION RECEPTION.” (MSTV/NAB AT P. 6)

MSTV/NAB base this allegation on two hypotheses. The first is most startling: it states that due to “desensitization”, the proposed unlicensed systems “will prevent consumers in the average American home from watching television on any channel – whether over the air or on cable.” (Emphasis added).

Before getting into a detailed rebuttal of this allegation, the following few paragraphs provide a simple explanation of why it is so surprising.

Desensitization is a real phenomenon in actual receivers in many radio services for a variety of services. In the case of FM broadcasting it is usually called “blanketing interference” and the Commission has adopted a rule, §73.318, specifically to deal with such interference in the neighborhood of an FM station. Desensitization/blanketing occurs when a very strong signal is present in the receiver on a frequency other than the one that has been selected. A “perfect” receiver might reject such signals, but practical limitations of real receivers limit the amount of rejection. Desensitization is thus associated with very strong signals such as those found near an FM transmitter which has a low antenna and is surrounded by homes.

TV receivers do not now live in a virgin environment in which the only signal present is the one they are trying to receive.

- In the TV broadcast band today there are numerous 5,000,000 Watts UHF stations.
- There are many stations of lower power.
- There are Private Land Mobile Radio Service stations authorized by Subpart L of Part 90 in 13 cities enumerated in §90.303 which have been operating since the 1970s. These include fixed base stations (1000 Watt maximum power) and mobile and portable units.
- Under the provisions of §15.209 manufacturers have the right to produce and sell unlicensed systems at the power level specified in this section.
- Under the provisions of §15.231 manufacturers have the right to produce and sell much higher power unlicensed systems for intermittent use. These are often used for home security systems, for example.
- In most homes there are also numerous unintentional emitter unlicensed devices whose emissions are limited by the same §15.209 out-of-band emissions proposed in this proceeding as well as unintentional emitters which are not presently regulated – such as fluorescent lights and electric motors.

If TV receivers are as susceptible to this type of interference in the TV band as MSTV/NAB allege, why has this not been a problem in the past? There has never been a need for a TV band analog to §73.318 because TV receivers do not readily experience desensitization as FM receivers do. Thus TV receivers have coexisted for years with TV stations in residential neighborhoods, private land mobile base stations and mobiles/portables that use TV channels 14-20, and the ubiquitous personal computers which are subject also to the §15.209 limit.

Intel has filed detailed comments rebutting this specific allegation of MSTV/NAB. NAF *et al.* summarize these points below and recommends to the Commission and the public the Intel Reply Comments for more detailed information.

MSTV/NAB base their conclusions in great part on a study performed under contract for them by The Communications Research Center (CRC), an entity which is part of the Canadian government agency Industry Canada. In its tests, CRC consistently created and tested worst case scenarios using multiple worst case combinations but neither they nor MSTV/NAB comment on the reality of these scenarios.

In the first part of their tests, CRC used the setup below (Figure 1 of the CRC report):

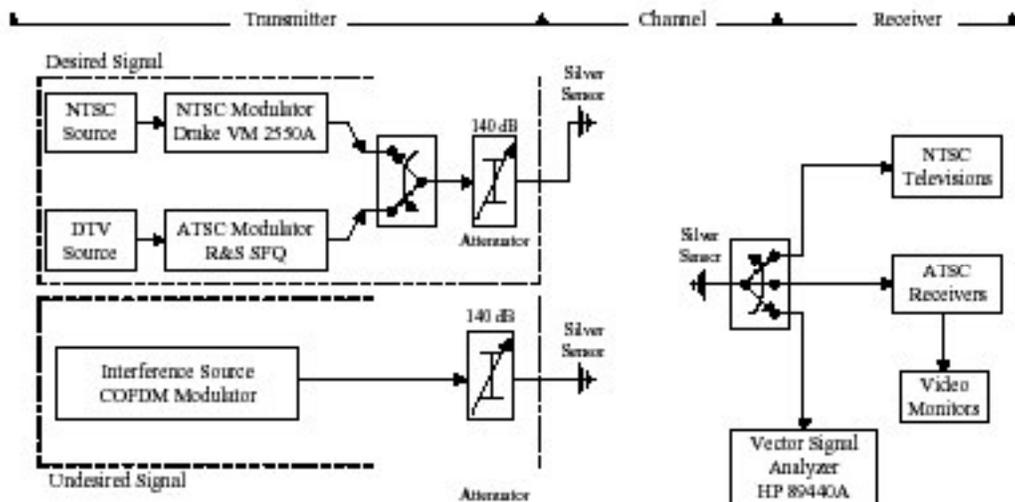


Figure 1. CRC Test Setup

Both the simulated unlicensed device in the lower left corner (labeled as “Interference Source”), and the TV receivers use Zenith “Silver Sensor” antennas. A photograph of this antenna is shown in Figure 2.



Figure 2. Zenith “Silver Sensor” antenna

(Source: http://www.zenith.com/sub_prod/product_Display.asp?cat=49&id=131)

This is a log periodic type antenna, the same type as many traditional outdoor TV antennas. It is reasonable to expect many of the minority of households who receive TV signals over the air will use this antenna or similar ones. As can be seen from its shape, it is very directional and CRC states that it has 5 dBi gain, a measure of its directionality. (By contrast, the British manufacturer of the antenna claims it is even more directional, having a gain of “6-7 dB.” See <http://www.antiference.co.uk/sensor/>)

The directionality of this antenna is shown in Figure 3.

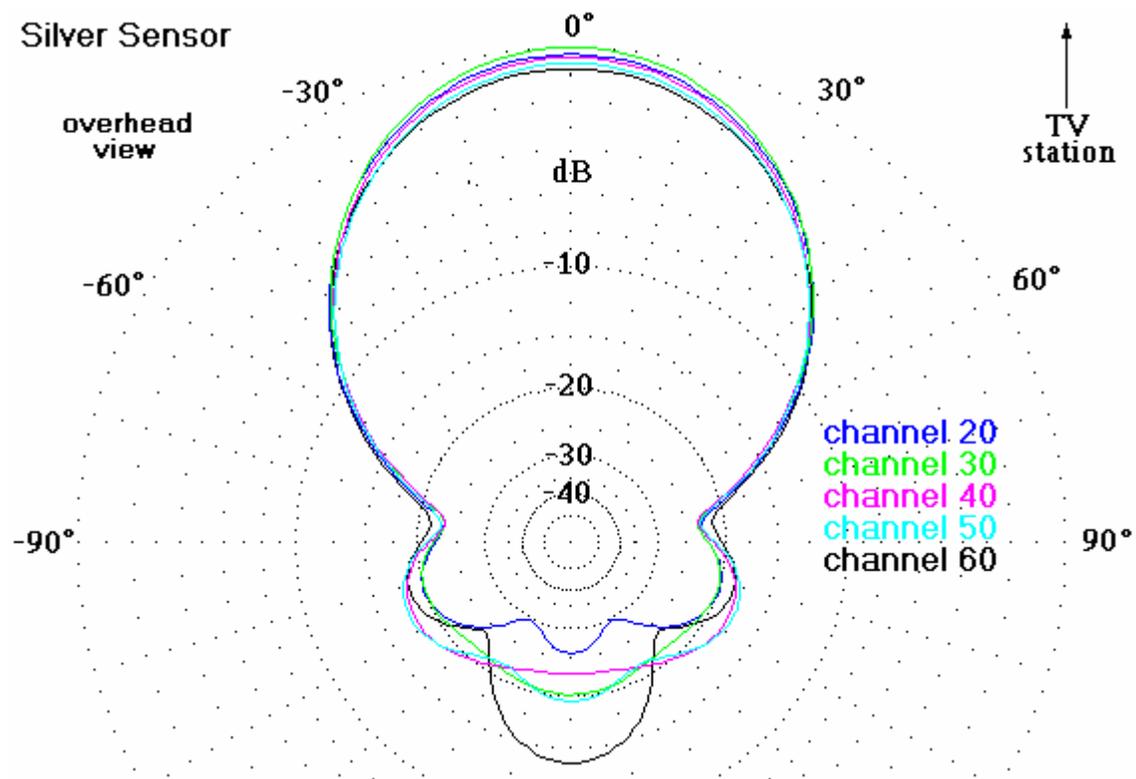


Figure 3: Antenna Pattern of Silver Sensor Antenna

(Source: <http://www.hdtvprimer.com/ANTENNAS/silver.html>)

In reviewing the CRC setup in Figure 1, two observations can be made: (1) A mobile device in a home or near a home user for fixed wireless access is very unlikely to use the antenna used by CRC to represent the unlicensed device, and (2) Assuming an indoor directional antenna like the Silver Sensor is used, it is unlikely to be pointing at the TV receiver's antenna.

It can be reasonably expected that unlicensed users in a residence will use their systems in either of two modes: as a wireless local area network (WLAN) similar to the use of Wi-Fi devices in many homes today, or as a fixed wireless access (FWA) system, connecting to a higher power fixed node. Today's Wi-Fi residential WLAN systems use omnidirectional low gain antennas – nothing resembling the antenna pattern of the Silver Sensor. A user of FWA in these bands would likely use either an omnidirectional antenna, or an external directional antenna pointed at a fixed node some distance away. The former Metricom Ricochet system was a mobile and FWA system in the nearby 902-928 unlicensed band that used omnidirectional antennas. It can be viewed reasonably as a model for future systems in the TV bands, which will not have the bandwidth limitations of this early system. Pure FWA applications bringing broadband to homes in both urban and rural area will likely use either Ricochet-like omnidirectional antennas for their home node if they are close to the fixed FWA base station, or outdoor directional antennas if they are further away. It is unlikely that consumers will use indoor directional antennas, *let alone* one which is pointed at and collinear with an indoor directional antenna used in the minority of homes receiving over the air signals.

MSTV/NAB go on to discuss how the proposed unlicensed signals could enter a cable television or direct broadcast satellite system. The CRC test showed that this could happen if the high gain Silver Sensor antenna transmitted the simulated unlicensed device signal *and* it was 1 m away from the cable (MSTV/NAB Comments at Appendix p. 39) *and* the cable was either RG-59 cable or unterminated RG-6 cable. RG-6 and RG-59 refer to different types of coaxial cable used in the communications industry and elsewhere for transporting radio signals and video signals. RG-6 is the standard cable in the CATV industry and is better shielded from outside interference than RG-59. One does not have to have a technical background in electrical engineering to know this: Radio Shack, a likely source of cable for many homeowners, states in its online catalog for RG-6 cable:

“Antenna installation is easy with the right cable! Great for mini-dish satellite, outdoor TV antenna or cable -TV hookups.”

See

<http://www.radioshack.com/product.asp?catalog%5Fname=CTLG&product%5Fid=15-1569>

Indeed, a search of the websites of both Radio Shack and Home Depot shows that *neither* sells RG-59 cable at present and both only sell RG-6.

At radio frequencies, and even audio frequencies, cables behave in ways that are unlike what is encountered at direct current or 60 Hz AC household power. A cable is

said to be “impedance matched” or “terminated” if it is connected to a piece of equipment or just a simple resistor that matches the characteristic impedance of the cable, which is 75 ohm in the case of most TV cables. This “termination” prevents the cable end from either reflecting the signal back into the cable or radiating some of it. A cable connected to a piece of equipment with the correct impedance, including an antenna, at both ends is properly terminated. Alternatively, an inexpensive 75 ohm terminator can also be used to close the end of a cable.

A home cable distribution system that does not have unused sockets “terminated” is subject to signal ingress from many possible sources. For this reason, industry standard ANSI/TIA-570-B calls for termination of unused outlets. Their termination is similar in nature to the termination households must use in order to get reliable DSL service over the telephone line, but the terminator is smaller and less expensive. Figure 4 shows an example of what a terminator for an unused household CATV looks like. These units retail for less than a dollar and are typically included with a professional installation. These are robust passive devices and would be expected to never wear out or break down in normal use.



Figure 4: Typical CATV 75 ohm terminator (Actual size is less than half of this photo) (Source: <http://www.trianglecables.com/200-075.html>)

However, the CRC study did not consider another factor that probably eliminates the need for terminators to prevent ingress of unlicensed signals in most home installations. The cable industry has long recognized the potential of other signals to ingress into home cabling so the common terminals in home are either designed to be one way (with extra loss in the wrong direction) or to insert loss between the cable and the TV set. In either case, the study did not consider the effect of such loss which would minimize unwanted signal ingress. Hybrid splitters in common use have isolation in excess of 20 dB.³

Finally, MSTV/NAB do not consider in their analysis that radio propagation is reciprocal, that is, the propagation loss from source A to destination B is exactly the same

³ Channel Master Model 7992 has an isolation of 23 dB. See <http://www.channelmaster.com/Pages/TVS/Passives.htm>.

as that from B to A.⁴ In the rare instance that a cable TV installation or intercomponent wiring in the home used RG-59 or unterminated RG-6 cable, the cabling would also *radiate* in the TV band. If we further assume that the unlicensed system used a high gain antenna, such as the Silver Sensor, pointed at this nonstandard cable, the antenna would be able to pick up the radiated TV band signal and using its more sensitive detector block out the channels in use for its use.

III. “UNLICENSED DEVICES ARE NOT ABLE TO DETERMINE WHETHER A TELEVISION CHANNEL IS VACANT.” MSTV/NAB P. 12

The first point MSTV/NAB raise in this section is that of the “existing, static database.” They point out that the “existing databases are not sufficiently timely or detailed to identify precise geographic locations where unlicensed devices may operate.” (MSTV/NAB p. 13). Note that this concern only applies to the fixed/access devices proposed in para. 26 of the *Notice*, and not to personal/portable operation, proposed in para. 21-23 of the *Notice* that use direct sensing and do not rely on the FCC’s data base.

In many ways MSTV/NAB is correct on this point, there are real problems with the timeliness and accuracy of the Commission’s broadcast databases. But this rulemaking should not focus on solving these problems. Then the ability to allow the proposed fixed/access use for WISP-like service in rural areas will be another benefit of the database upgrade. As will be discussed below, upgrading the existing databases to ensure timeliness and accuracy and creating a database of translator input channels and cable headends in weak signal areas will ensure that unlicensed base stations can protect all types of TV reception.

In traditional Part 73 and Part 74 spectrum management, there was never a need for perfect accuracy or timely updates. Licensing activities were usually subject to notice and comment or coordination with the modest number of licensees in an area. The Media Bureau’s publicly available databases, like the databases of the other FCC licensing bureaus, are not updated daily and have a residual error rate of a few errors in every thousand licensing records. Anyone who has ever tried to use a computer to plot a large number of FCC license locations is familiar with seeing locations that appear to be located in the oceans or Canada or Mexico due to occasional large errors in the longitude and latitude fields, or seeing microwave links that appear to have endpoints thousands of miles apart – defying physical reality. Indeed, one reason why companies such as Comsearch have built a successful business is that they have a more accurate version of FCC licensing information than FCC itself.

But the TV spectrum is a very valuable commodity. People may vary on the estimates of its net worth, but many would agree on estimates in excess of \$100 billion, putting the overall value of the spectrum much higher considering other spectrum values. The problem here is that the FCC has underinvested in databases to manage this valuable resource and hence has limited its possible utilization in the current environment.

⁴ There are minor exceptions dealing with extremely large powers but these do not occur in the context of non-Federal Government systems regulated by the Commission.

The Commission should allow the fixed/access unlicensed devices proposed in para. 25-28 of the *Notice* and commence an upgrade of its Part 73 and Part 74 database system for TV spectrum. Such an upgrade will reduce the present parameter error rate significantly and allow timely updating of the information as facilities change rapidly in the DTV transition. While the Commission might choose to do this upgrade with its appropriated funds, it may wish to work with affected parties to consider alternative approaches. The type of creative thinking the Commission and NTIA showed in Docket 02-146 in building a new database – with a new way to interact online with licensees – is the type of thinking needed here.⁵ 18 FCC Rcd 23318, 25-28 (2003)

Pending the completion of the upgrade, the existing databases could have their error rate reduced significantly through voluntary error correction filings by broadcast licensees. License parameters are now readily available to licensees and the public on the Commission's website. Adoption of rules comparable to those in the Notice will put broadcast licensees on notice to check the validity of their parameters in the present generation of databases and file corrections with the FCC using existing procedures. While accurate surveying to verify transmitter locations used to be expensive, common and inexpensive GPS receivers can now determine and check these locations. These receivers are already present in many households and businesses and can be bought for less than \$100, thus allowing concerned broadcasters the ability to verify their transmitter location as documented in the database at little or no cost.

MSTV/NAB next go on to criticize the Commission's "control signal" approach (*Notice*, para. 21). MSTV/NAB posit two different problems that could lead to interference: inability to receive the control signal and receiving a control signal that was intended for a different area. The final rules in this proceeding can easily address both of these issues.

New America *et al.* believe that proposed 15.244(f) must clearly state that if the unlicensed unit depends on only reception⁶ of control signals to enable transmissions on specified channels, then the unlicensed device must receive a valid control signal within the 10 minutes preceding the present time in order to allow transmissions to continue. No control signal, no unlicensed transmissions would be allowed *unless* one of the other two techniques has been implemented and confirms that transmissions are allowed. Generally available electronic signature techniques can be used to confirm the validity of the control signal and time encoding can be combined with electronic signatures to ensure that unlicensed devices cannot be "spoofed" by malicious retransmission of recorded signals in a different location.

The rules can also address the issue of receiving signals outside their area of validity. Using a clear channel AM station with a coverage of hundreds and, at times, thousands, of miles is inappropriate for a signal that has a validity in an area of perhaps 10 miles in diameter. New America *et al.* urge the Commission to include in the final version of the rules a specific requirement that the control information transmitted must be valid within the area where unlicensed devices have a greater than 1% probability, considering both location variability and time variability, of receiving the signal. This will be simple for low power unlicensed transmitters, low power TV stations and translators, and low power FM stations. In many cases, full power broadcast stations will

⁵ See *Report and Order*, WT Docket No. 02-146, (Released November 4, 2003) at para. 48-57

⁶ Implying that no other authorization is available, e.g. through geolocation or a listen-before-talk receiver.

have such a wide coverage area they will not be able to carry the control signal since the control signal information about which TV channels could be used would not be valid throughout the whole reception area of the station transmitting. The 1% rule proposed above would quantify the requirement to assure that control signals are valid where they are received.

III. “THE NOTICE’S PROPOSAL DOES NOT PROVIDE A FEASIBLE MECHANISM FOR ENFORCEMENT AGAINST HARMFUL INTERFERENCE FROM UNLICENSED DEVICES.” MSTV/NAB P. 15

In general, the method the Commission has used to prevent interference for unlicensed equipment has been to keep irresponsible equipment out of the marketplace. Indeed, the veteran staff of the Commission’s Enforcement Bureau well recall the advice of Richard M. Smith, chief of EB’s predecessor. Early in his career, Mr. Smith was charged with locating and turning off a number of then-unregulated garage door opener receivers⁷ that were causing harmful interference to military aircraft in the Los Angeles area. After succeeding in this Herculean task, Mr. Smith repeatedly told his colleagues at the Commission that careful regulation rather than post-market enforcement should prevent these problems.

We live in an era in which most high tech radio products include a microprocessor. This technology enables solutions that were not realistic or even conceivable during Mr. Smith’s time at the Commission. These solutions can ensure that unlicensed equipment use properly authorized software and require that such software be updated periodically as the Commission’s Rules change and as operation experience is gathered.

This is an era in which electronic distribution of software updates is common practice and is familiar to most consumers. Cellular operators update some of the software in cellular handsets through over the air downloads. Major software vendors routinely download system updates to their users. While computer viruses are a well known problem, this type of download has been consistently shown to be secure and an effective countermeasure to viruses. Software with a specified expiration date is also often used today and is a proven technology.

The technique of secure downloads of software and software expiration data give the Commission new tools that it can use for new problems. The Commission can require that the unlicensed radios to be authorized in this proceeding be partially implemented in software, that such software must have an expiration date of a few months after manufacture, and that once such software has expired the emissions from the device are time and power limited – analogous to §15.231 – until it either gets updated software off the air or by a wire connection. Thus, for the first time, the Commission can direct that errors in equipment authorization or even the rules can be corrected after “horses leave the barn.”

These new mechanisms will be consistent with the Commission’s responsibilities and its realistic enforcement resources and priorities.

⁷ Now regulated with respect to unintentional emissions under 15.101(b) as a result of this problem.

IV. “DURING THE DIGITAL TRANSITION, THERE IS LITTLE OR NO ‘WHITE SPACE’ SPECTRUM AVAILABLE OUTSIDE OF UNPOPULATED AREAS.” (MSTV/NAB P. 17)

There seems to be a major difference of opinion on this issue among the commenting parties. For reasons stated below, New America *et al.* believe this issue is of no decisional significance.

Different parties have submitted different analyses about the specific amount of spectrum available at different times. They differ greatly on how many MHz*km² might be available on a noninterference basis in different parts of the country in different years. But even MSTV/NAB admit that there will be “white space” spectrum available after the transition in populated areas, in rural areas during the transition. The devices proposed in this proceeding are not immediately available for production. The rules in the *Notice* and the changes advocated by New America *et al.* are designed to be fail-safe; that is, to only allow unlicensed transmissions where they will not cause interference to the broadcast service. Thus, New America *et al.* suggest to the Commission that it does not have to make a finding on whose quantitative analysis is correct or even how many MHz*km² of white space without risk of interference will be available each year. The equipment manufacturing marketplace will decide when the availability of white space is adequate to justify the final development, manufacturing, and retailing of this unlicensed equipment. As in many other areas, this “invisible hand” is more likely to be accurate than an administrative determination of timing in a rulemaking. New America *et al.* urge the Commission not to get distracted on this issue and focus on issues that both protect broadcast reception *and* allow new unlicensed use.

When the Commission authorized the first use of cognitive radio technology in the 5 GHz band in Docket 03-122, it did *not* make a definitive finding about how much spectrum would be available in how much of the country. *See*, 18 FCC Rcd 14,582 (2003) Rather, it made a threshold determination that some spectrum use was available, that it would be in the public benefit, and that the technology was available to protect reliably the primary user (military radar). New America *et al.* urge the Commission to take the same approach and not get bogged down in dueling analyses of little, if any, decisional significance.

V. “IF THE COMMISSION CHOOSES TO PROCEED WITH THE NEW SHARED USES OF BROADCAST TELEVISION SPECTRUM, IT

MUST SPECIFY, TEST, AND SOLICIT PUBLIC COMMENT ON PARAMETERS INTENDED TO PROTECT THE PUBLIC’S FREE, OVER-THE-AIR TELEVISION SERVICE.” (MSTV/NAB P. 22)

MSTV/NAB do not cite any statutes, case law, or previous FCC decisions to justify their use of the word “must” in this section of their comments. The applicable section of the Administrative Procedures Act, 5 U.S.C. §553(b)(3) requires the agency to give “either the terms or the substance of the proposed rule or a description of the subjects and issues involved” before seeking comments, considering comments, and adopting rules.⁸ This is exactly what the Commission has done in the *Notice*.

The Commission has always been very judicious in protecting the broadcasting service, one of its original charges under Title III of the Communications Act. But the Commission has great flexibility on the procedures it can use in adopting rules. *New America et al.* urge the Commission to adopt rules in this proceeding to enable the capital formation necessary for final development of the systems proposed here.

New radio technology products require both technology and funding for their development. Since radio technology is one of the most highly regulated technical areas, the perceived risk for investors is a combination of technical risk (can the product actually be developed on schedule and within budget), market risk (will customers want to buy the new product at the anticipated price) and regulatory risk. By dragging out this proceeding without resolution, as requested by MSTV/NAB, the Commission would raise the regulatory risk of investing in this technology to the point that R&D would be unattractive compared to less regulated technologies. By sending the right signal, the Commission can encourage capital formation in promising radio technologies such as cognitive radio. The Commission may wish to consider that it adopted the Report and Order in Docket 81-413 authorizing civil use of spread spectrum for the first time in the world against much opposition from established industries in May 1985 and that Qualcomm was incorporated two months later. 1 FCC 2nd 419 (1985) This is a striking example of how the Commission’s technical leadership and positive action with new technologies can enable the capital formation that creates entire new industries.

VI. “THE COMMISSION ALSO SHOULD RE-EVALUATE THE EFFECT OF ITS PROPOSAL ON OTHER STAKEHOLDERS OF LICENSED SPECTRUM.” (MSTV/NAB P. 24)

MSTV/NAB use this section of their comments to suggest that the Commission auction the “white spaces” which it just said do not exist, arguing that this approach is superior to the unlicensed approach proposed in the *Notice*. MSTV/NAB propose a novel licensed approach but give few details about how it would work or why it is more in the overall public interest than the proposal in the *Notice*. *New America et al.* urge the Commission to reject this vague alternative and proceed in the direction it started with in the *Notice* as it has received substantial public comment and substantial support.

⁸ In addition §1.429 of the Commission’s Rules allows for reconsideration and 5 U.S.C. §§701,706 allow for judicial review.

VII. “ADOPTION OF THE UNLICENSED PROPOSAL WOULD UNDERCUT CONGRESSIONAL EXPECTATIONS FOR AUCTION REVENUE OF LICENSED SYSTEMS.” (MSTV/NAB P. 26)

MSTV/NAB base this conclusion on an unsupported hypothesis that unlicensed use immediately below the 700 MHz band would decrease the auction value of the 700 MHz band. New America *et al.* urge the Commission to adopt strict rules in this proceeding that protect both the cochannel broadcast licensees and *all* adjacent band users, including the 700 MHz users. MSTV/NAB have presented no factual information about why this would be a major concern to 700 MHz users or why it would adversely impact the spectrum other than perhaps *some* of the applications of this spectrum may be crosselastic with licensed uses at 700 MHz. In any case, Congress has also told the Commission that maximization of auction revenue is not to be the overarching concern of spectrum management and that unlicensed spectrum is a legitimate member of the family of approaches to authorize public use of the spectrum.⁹

VII. “ADOPTION OF THE NOTICE’S PROPOSALS WOULD VIOLATE THE PRINCIPLES OF ADMINISTRATIVE PROCEDURE.” (MSTV/NAB P. 28)

MSTV/NAB start off here by criticizing the flexibility of the proposed rule that “would allow for myriad uses not specifically articulated in the *Notice*.” MSTV/NAB must not have noticed that for the past quarter century this type of deregulation has been typical outside of Parts 73 and 74. The ubiquitous Wi-Fi technology, which is present in the FCC’s headquarters, results from rules, now codified as §15.247, *that allow for myriad uses not specifically articulated in the rules that were adopted, let alone the notice*

⁹ Not only has Congress instructed the Commission to not use expected revenue generation as the basis for deciding to auction spectrum, but it is also law. 47 U.S.C. § 309(J)(7) which states in part:

(7) Consideration of revenues in public interest determinations.

(A) Consideration prohibited. In making a decision pursuant to section 303(c) [47 USCS § 303(c)] to assign a band of frequencies to a use for which licenses or permits will be issued pursuant to this subsection, and in prescribing regulations pursuant to paragraph (4)(C) of this subsection, the Commission may not base a finding of public interest, convenience, and necessity on the expectation of Federal revenues from the use of a system of competitive bidding under this subsection.

Congress has also explicitly supported identifying new spectrum for unlicensed devices. For example, in the its spectrum relocation legislation adopted last December, Congress states, “Except as provided with respect to the bands of frequencies identified in section 113(g)(2)(A) of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923(g)(2)(A)) as amended by this title, nothing in this title or the amendments made by this title shall be construed as limiting the Federal Communications Commission’s authority to allocate bands of frequencies that are reallocated from Federal use to non-Federal use for *unlicensed*, public safety, shared, or non-commercial use.” (Emphasis added) *See* H.R. 5419, 108th Cong. § 208 (2004).

that proposed them. CMRS carriers are allowed great flexibility in both their modulation choice and the service offered to the public including fixed services. Even DTV licensees have been given flexibility to use their transmission for other than traditional broadcast services. MSTV/NAB do not cite any sources for these “principles of administrative procedure” that forbid the Commission from given the public flexibility in using the spectrum.

Next MSTV/NAB say that the proposal “does not comply with the Administrative Procedures Act (APA), which requires the Commission to publish an NPRM containing the “terms or substance of the proposed rule.” MSTV/NAB’s copy of the United States Code must have had a printing error, because the actual language of the statute follows the quoted words with “or a description of the subjects and issues involved.” The *Notice* contained two and a half pages of proposed rules as well as 20 pages of substantive discussion. NAB points to no case law that would indicate this is inadequate. They seem most concerned on the issue of what radio propagation model might be acceptable to calculate signal levels. This is an issue most appropriately resolved during this type of notice and comment proceeding.

OTHER ISSUES

In addition to these issues raised by MSTV/NAB, a variety of other issues were raised in the comments.

I. COGNITIVE RADIO IS UNTESTED AND THE COMMISSION SHOULD REQUIRE EXTENSIVE TESTING BEFORE PERMITTING USE.

Cognitive radio is a rather new technology. However, this is not the first time the Commission has considered this technology. The focus of Docket 03-122 was the use of cognitive radio to allow use of 5 GHz spectrum which already had a primary user. FCC 03-287 (2003) In this case, military radars with critical importance to the national security. In the context of Docket 03-122, cognitive radio was called “dynamic frequency selection”/DFS, which was defined as “a mechanism that dynamically detects signals from other systems and avoids co-channel operation with these systems, notably radar systems.”¹⁰ *Id.* at fn13. In deciding to authorize the use of this cognitive radio technology the Commission stated:

We agree with the commentators that DFS is a key element in enabling unlicensed U-NII devices to share spectrum with important U.S. Government radar operations. It is also an ITU accepted mechanism that will allow U-NII devices to be globally marketed.¹¹

¹⁰ See Report and Order, ET Docket 03-122, (Released November 18, 2003), fn. 13.

¹¹ *Ibid.* at para. 29.

The military radars that the Commission sought to protect in Docket 03-122 were very dynamic in terms of location, time variability, and frequency use. By comparison, the Part 73 systems that are to be protected in this proceeding are high power transmitters with antenna that are specifically designed for terrestrial coverage. Thus, by comparison, the challenge to cognitive radio technology in this proceeding is simpler than in the previous proceeding, which already has authorized an example of this technology.

There are applications of cognitive radio that are quite complex. One example is the DARPA Next Generation Radio (XG) Project which is attempting to find spectrum for mobile radios in an environment that has a wide variety of mobile service, fixed service, and broadcast service emitters that must be protected from interference. By comparison, the challenge in this proceeding is relatively simple: Detecting high power broadcast transmitters that have been sited for good terrestrial coverage or determining an unlicensed device's geolocation and checking it with a database of authorized transmitters. In this application, it is important that the unlicensed system be fail-safe. That is, whenever there is ambiguity about whether a given frequency can be used in a given place, the unlicensed system should err on the side of avoiding use of that frequency.

In the case of unlicensed systems that only use geolocation systems e.g. GPS to determine what frequency can be used, this can be done simply by blocking all transmissions unless a valid geolocation has been computed within a short time period. It is well known that simple GPS receivers do not work inside buildings or in some shadowed outdoors areas, this simple approach of blocking transmissions will prevent any problems to broadcast systems. A similar arrangement can be used for systems that only depend on beacon reception to choose a frequency to make them fail-safe also.

However, listen-before-talk systems can make decisions on frequency use autonomously using their own sensing only. For the listen-before-talk systems discussed in the NPRM, the Commission should pick a receiver sensitivity number significantly below the sensitivity of TV receivers and authorize mobile unlicensed devices only if they show during equipment authorization that they achieve that sensitivity. Any rules selecting a sensitivity level should give manufacturers the flexibility to reduce "false alarms" by optionally using additional technology to confirm the signal is a Part 73 or Part 74 signal. As was shown in the comments of Shared Spectrum and Marcus, reasonable-cost technology with a detection threshold *much lower* than TV receivers is available today. The Commission has recognized this point in the NPRM in Docket 03-108 stating:

There are techniques that can be used to increase the ability of a sensing receiver to reliably detect other signals in a band which rely on the fact that it is not necessary to decode the information in a signal to determine whether a signal is present. For example, the use of specialized detectors can improve the ability to sense the presence of other signals by 30-40 dB. Most applications of signal detection in commercial practice are based on "radiometric detectors" which only function if the signal is greater than the noise level in the receiver system. However, in the past decade information has become available about an alternative technology

called cyclostationary detectors or feature detectors which use longer sensing times and internal computation to achieve signal sensitivities below the noise level for signals of known format. By processing a large number of transmitted symbols, without the need to demodulate them individually, such a feature detector can achieve a processing gain over a radiometric detector which does not use knowledge of the signal format. In practice, processing gains of 30-40 dB can be achieved with computation resources typical of today's microprocessors. With such a detector capable of receiving signals more than 30 dB below the noise floor the hidden node problem. (Para. 25, Citations deleted)

By jointly selecting a listen-before-talk sensitivity number and a maximum transmitter power density for the unlicensed device, the Commission can limit the likelihood of interference to any reasonable goal. The Commission may choose to err on the conservative side in the initial rules in this proceeding and later relax the sensitivity and transmit power numbers as it and the broadcast industry has more confidence in this technology. However, there is nothing in the record that disputes the simple technical hypothesis that by picking a pair of numbers for receiver sensitivity and transmitter power for a low power mobile unlicensed device with a listen-before-talk algorithm, the likelihood of nearby interference can be reduced to any desired level.

Adaptrum has shown in its comments that networking multiple unlicensed devices with limited receiver sensitivity can result in a better group sensitivity in a multipath environment – such as is found in the TV bands – and hence improve protection of broadcast reception.¹² New America *et al.* agree on this point and in the interest of allowing the maximum technical flexibility to unlicensed manufacturers and users suggest that the Commission allow the required sensitivity be shown either by testing an individual receiver or by showing the improved network performance.

II. THE PROPOSAL IN THE NOTICE WILL CAUSE INTERFERENCE TO TRANSLATORS AND CABLE HEADENDS OUTSIDE GRADE B CONTOUR¹³.

Several parties raised concerns that TV stations would only be protected within the contours discussed in para. 29 of the *Notice*. They correctly pointed out that some TV translators in rural areas and some cable headends are able in practice to receive distant signals far beyond these theoretical contours and that the proposal could result in interference to these systems. NAF *et al.* agree that this could happen in some circumstances for the case of the higher power fixed/access devices if the translator or

¹² That is, the sensitivity of the network can be better than the sensitivity of an individual receiver.

¹³ Comments of National Translator Association, November 30, 2004, at p. 3 and comments of National Cable & Telecommunications Association, November 30, 2004, at p. 2

cable headend high gain antenna was pointed at or near the location of the fixed/access antenna.

About 25 years ago the Commission deleted the requirement that receive-only earth stations must be licensed and went to the optional licensing scheme of Section 25.131 of the Commission's Rules. These optional licenses convey protection of the receive-only system, in this case from terrestrial microwave systems. The same approach could be used here to protect rural translators and cable headends. Such an optional licensing system need not give these receiver systems protection against other new TV facilities. The Commission could craft its new rules to specify that protection is limited to certain circumstances, perhaps only protection from unlicensed devices. Such an approach would be consistent with the comments of the National Translator Association which stated:

The final rules must provide that "Intentional Radiators" not operate on a TV channel used as a translator input in the vicinity of the translator receiving antenna or in a corridor stretching back towards the signal source without coordination between the fixed intentional radiator operator and the translator licensee. The FCC will need to add the actual input channels for translators to the CDBS records, but it would be desirable to have this information more readily available anyway. (Emphasis added)

As stated previously, the TV spectrum is a very valuable commodity. In some ways the limitations of the present FCC databases limit its ultimate utilization. Such an optional licensing scheme would add a new field to a few thousand translators that are presently licensed and new records for a few thousand cable headends in rural areas. As the National Translator Association says above, there are other benefits from this improved record-keeping besides improving access to this spectrum by unlicensed devices.

III. GEOLOCATION MAY NOT BE USABLE INDOORS OR IN SOME OUTDOOR LOCATIONS WITH SKY BLOCKAGE.

Several parties pointed out correctly that many common GPS receivers do not give location when they are located indoors or when they are in outdoor locations in which a major portion of the sky is blocked. This is because the receive power budget for common GPS receivers does not have enough margin to handle the signal loss associated with building blockage and because GPS receivers must receive signals simultaneously from several satellites in different parts of the sky in order to geolocate. (GPS receivers used in CMRS E-911 systems have fewer limitations. But they also are not autonomous like the usual low cost GPS receivers. Their successful geolocation requires two-way communications with a cellular base station that has additional information and processing capability.)

New America *et al.* urge the Commission to use the general term geolocation and not to specify GPS as it did in the proposed §15.244(e)(1) for systems that use geolocation only to select frequency. GPS is an available technology today with

strengths and limitations. The key issue in geolocation-based permission for unlicensed use is the accuracy of the geolocation and the ability to sense reliably when a valid position can be found. There seems to be no public interest factor in precluding other technologies that meet these requirements.

New America *et al.* also agree with the Comments of IEEE 802 that the +/- 10 m accuracy requirement of the proposed §15.244(e)(1) is “unnecessarily stringent”. The location variability of field strength predictions at these frequencies is typically in excess of 10dB with the best propagation models, so there is no practical benefit to having such accurate locations at large distances from the broadcast transmitter. The only effect of such a high location accuracy requirement is to increase the cost of unlicensed systems. While it is true that some modest cost GPS systems can meet this accuracy outdoors, an overly strict requirement would rule out other technologies that might be able to perform adequately indoors or not be as susceptible to sky blockage outdoors. An example of such a system would be a hyperbolic navigation system using TV transmitters as signal sources. The location accuracy that is selected in the final rules should have a clear relationship with interference prevention.

By changing the needlessly strict accuracy requirement and generalizing GPS to “geolocation” the Commission would keep the deregulatory proscriptive (as opposed to *prescriptive*) approach it has generally used in technical standards in the past quarter century. This would also enable new technologies for geolocation, give more options for unlicensed systems using the proposed rules, and continue the strict protection of broadcast reception that the proposed rules are intended to have. It would appear that location accuracy requirements in the 100-200m range would be consistent with the accuracy of station coverage predictions and would allow new geolocation technologies that met this accuracy to be used without additional rulemaking activity.

The solution to the concern of commentators that the lack of “GPS” coverage would result in interference is simple: unlicensed systems using only geolocation to select frequency must demonstrate both the geolocation accuracy and its very high reliability to confirm the validity of its geolocation (which most GPS systems presently can do). Such unlicensed devices may only transmit if they have received a valid geolocation within some time period such as 10 minutes. The system then becomes fail-safe: no valid geolocation, no transmissions.¹⁴

IV. THE UNLICENSED EQUIPMENT CAN BE EASILY MODIFIED TO PERMIT INTENTIONAL HARMFUL INTERFERENCE TO TV RECEPTION.

Several commentators raised this concern, which is actually a general concern of all software defined radios, not just cognitive radios. It has always been a concern with the traditional “hardware defined radio” where the Commission has few rules requiring robustness against modification

The Commission considered this issue in the original authorization of software

¹⁴ This would not apply to systems using listen-before-transmit frequency selection since they would be autonomous and not need geolocation.

defined radios in Docket 00-47 where it adopted §2.932 (e) to address this issue. 15 FCC Rcd. 24,442 (2002) On its own initiative, the Commission is considering tightening these requirements and has asked in para. 94 of the NPRM in Docket 03-108 whether “more explicit security requirements are needed.” Technology, such as the use of electronics signatures in software with firmware validation in microprocessors of new software, is available to permit high security levels of protection against unauthorized software. As mentioned above, similar technology can enforce “sunset” dates for software in unlicensed radios so that software can be updated on the basis of operating experience, rule changes, or the discovery of an error in the software or equipment authorization procedures. *New America et al.* ask that the Commission carefully balance the need to protect the broadcast service from malicious modification of equipment and the need of manufacturers to have flexibility in their designs in order to innovate. The technology exists for high levels of robustness but if too many details are specified in the Commission’s Rules innovation may become very difficult.

The risk this proposed equipment poses to broadcast reception should be compared to the risk that exists today absent this rulemaking. Antisocial elements could convert present equipment authorized under both §15.209 and 15.231 operating in the TV bands to permit continuous operation. It would be irresponsible to show a specific block diagram for a broadcast band jammer in a publicly filed pleading, but the Commission staff is aware that such a jammer could be put together simply and without modification by using electronic test equipment that is unregulated. While such equipment is costly when top-of-the-line models are bought from prominent manufacturers, lesser quality (but adequate for jamming) equipment is available from marginal manufacturers at lower prices and high quality equipment is available on the surplus market at modest prices.

The solution to avoid jamming of broadcast transmissions with modified versions of the radios under consideration in this proceeding or the use of illegally modified unlicensed radios that unintentionally cause excessive interference is for the Commission to act decisively in its ongoing proceeding, Docket 03-108 with respect to unlicensed systems in bands shared with existing licensed system such as in the *Notice*¹⁵ *New America et al.* ask that the Commission adopt rules in that proceeding that make *all* software defined radios robust against unauthorized software so that the cost and complexity of a change is greater than the “null hypothesis” of building an illegal radio using general test equipment or other generally available components. The Commission has never required absolute robustness against illegal modification from any “hardware defined radio.” It should only require reasonable robustness from software defined radios such as the unlicensed radios proposed in this proceeding.

¹⁵ *New America et al.* takes no position with respect to robustness of software for licensed systems where the licensee is accountable or for unlicensed systems in dedicated unlicensed bands, e.g. Wi-Fi where the risk of interference to licensed users is more limited.

CONCLUSIONS

New America *et al.* have reviewed all the major concerns raised in the initial comments to this proceeding. None of the issues raised are “show stoppers.” As is usual in such complex policy proposals, commentators have raised some valid concerns, they have shown new ways of looking at issues that were not considered in the *Notice*, and they have asked probing questions. Other commentators have shown their strong support for the thrust of the proposals. New America *et al.* have used these points raised in the comments to synthesize several revisions to the proposals contained in the *Notice*. As a result of this “give and take” in the notice and comment cycle the Commission is now in a position to draft much better final rules.

New America *et al.* are prepared to work with the Commission and other parties, consistent with the Commission’s *ex parte* rules, in the coming months to help formulate a set of final rules that *both* provide new unlicensed service to the public *and* protect the broadcast TV service and its viewers. This is not a “zero sum game” where the Commission must choose between the broadcasting industry and the proponents of unlicensed use. Rather, new technologies, properly used, give today’s Commission options that were just not available to a previous generation of commissioners.

New America *et al.* urge the Commission to continue its innovative leadership role in spectrum management and commence the adoption of rules allowing the basic unlicensed use proposed in this proceeding with the safeguards enumerated above.

Respectfully,

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