Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of Establishment of an Interference Temperature Metric to Quantify and Manage Interference and to Expand Available Unlicensed Operation in Certain Fixed, Mobile and Satellite Frequency Bands	ET Docket No. 03-237

COMMENTS OF THE
CELLULAR TELECOMMUNICATIONS & INTERNET ASSOCIATION

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SUMMARY

The Cellular Telecommunications & Internet Association ("CTIA") commends the Commission for its continued efforts to enhance spectrum efficiency and provide additional access to radio frequencies for new services and offerings. CTIA believes, however, that implementation of an interference temperature ("ITemp") metric is fraught with potential danger in the CMRS bands, where market forces already dictate highly efficient use and the existing flexible service rules have fostered a broad menu of innovative services. In these bands, the introduction of an underlay scheme would undermine innovation and deter carriers from making capital investments in their networks to introduce new technologies, ultimately limiting, rather than fostering, the spectrum efficiency.

As detailed in these comments, the introduction of ITemp-based systems in CMRS spectrum would also adversely impact existing consumer services by reducing the coverage available from mobile networks, increasing dropped call rates, decreasing the voice quality of services relied upon by consumers, and limiting data throughputs. All of these results are fundamentally at odds with current initiatives by the FCC and by carriers to increase consumer satisfaction with mobile telephony and promote the deployment of next generation systems.

CTIA submits that implementation of ITemp-based spectrum management in the CMRS bands is also unnecessary given the highly efficient nature of incumbent systems and recently adopted secondary markets policies. Where carriers are efficiently utilizing their spectrum under flexible use policies and have the ability and incentive to lease spectrum, the implementation of an ITemp metric effectively constitutes outmoded command-and-control regulation. The Commission should instead permit its secondary markets policies to guide the deployment of new technologies in these bands.

In addition to the troubling effects on spectrum efficiency and consumer service quality, introduction of an ITemp-based system in CMRS spectrum is fraught with daunting practical problems. Problems relating to accountability and enforcement of the real world performance of ITemp-based systems appear intractable, and would make implementation of the proposal unrealistically complicated and costly.

In an attachment to CTIA's comments, a report by Economist Michael L. Katz makes several findings relating to the proposed interference temperature metric. First, government-imposed underlay rights would perpetuate a command-and-control approach that will distort and deter innovation and investment. Second, the Commission does not have the information to make an informed decision on how to set an interference temperature floor/ceiling at a level that will maximize consumer welfare and promote economic efficiency in CMRS bands. Third, regulation generally is not needed to induce underlay rights and promote efficient use of the spectrum. Fourth, from the perspective of consumer welfare and economic efficiency, a better approach to reforming spectrum policy would be to allow licensees greater flexibility to sublicense spectrum. Fifth, the interference temperature concept is not fully developed and may be the wrong measure from the perspectives of both engineering and economics. Finally, CMRS frequency bands are the wrong place to experiment with underlay rights because of the potential adverse effects on consumers of CMRS services.

The proposal detailed in the Commission's NOI creates a significant potential for adverse effects on innovation, capital investment and consumer service. CTIA submits there are better mechanisms to encourage spectrum efficiency and consumer benefits, and urges the Commission to proceed with utmost caution when considering this fundamental shift to a new spectrum management paradigm.

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The Cellular Telecommunications & Internet Association ("CTIA")[1] respectfully submits these comments on the Notice of Inquiry and Notice of Proposed Rulemaking (hereinafter "NOI") in the above-referenced proceeding.[2] The wireless industry must contend with spectrum constraints every day, and understands completely the need to explore new and creative ways to use this scarce resource. CTIA applauds the Commission for its continuing efforts to examine – and, where appropriate, revise – its spectrum policy for the 21st century consistent with this goal.

Without question, incorporating the Interference Temperature ("ITemp") concept into the FCC's spectrum management policy would be a fundamental paradigm shift.[3] Implementation of the ITemp metric would change the current long-standing FCC spectrum management

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[1] CTIA is the international organization of the wireless communications industry for both wireless carriers and manufacturers. CTIA membership covers all Commercial Mobile Radio Service ("CMRS") providers and manufacturers, including cellular, broadband PCS, ESMR, as well as providers and manufacturers of wireless data services and products.

[2] FCC 03-289, rel. Nov. 28, 2003 ("NOI").

[3] NOI at ¶ 1.

approach, focused primarily on regulating RF transmitters, to a more fluid approach based upon a real-time assessment of the actual RF environment and the interaction between receivers and transmitters. Establishing such a quantitative approach to interference management is a laudable goal. The ITemp metric, however, is still at best a concept, untested on both a theoretical and a practical level. A substantial amount of work must be completed before its usefulness at quantifying and managing interference – as well as its impact on licensed operations – is fully understood.[4] More importantly, before embracing any ITemp framework, the Commission must consider whether this regime would undermine consumer welfare and economic efficiency in competitive markets such as CMRS. The ITemp framework could risk inhibiting innovation and spectrum efficiency in such markets, which would ultimately not serve consumers' interests.

The information available today suggests that it would not make sense to apply the ITemp metric in the CMRS bands, where competitive market forces continue to drive innovative and highly efficient spectrum use. Defining a level of interference that state-of-the-art CMRS systems are required to "accept" would adversely impact current CMRS operations and curb further innovation. From a practical perspective, the level of interference that a non-primary user may cause to licensed users is extremely difficult to measure and, consequently, control. In the mobile communications environment, such measurement and control is all the more important and all the more difficult given the dynamic nature of such communications. CTIA submits that, in CMRS spectrum, the available technical and economic analyses indicate that the costs of implementing the ITemp framework far outweigh any benefits.

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[4] NOI at ¶¶ 1, 20-26. The Interference Temperature ("ITemp") metric was one of many recommendations of the FCC's Spectrum Policy Task Force. *See* FCC Spectrum Policy Task Force Report, ET Docket No. 02-135, Nov. 2002 ("SPTF Report") at 34.

I. AN INTERFERENCE TEMPERATURE APPROACH SHOULD NOT BE APPLIED TO CMRS SPECTRUM

Consumers have enjoyed more innovative and competitively-priced offerings in CMRS than in any other spectrum-based service, thanks to competitive markets and innovative design advances in mobile communications technology that have significantly expanded spectrum utilization. Implementing ITemp-based systems in the CMRS bands would not only undercut the effectiveness of competitive market forces in those bands, it would undermine the potential to maximize spectrum efficiency. Shoehorning disparate users into a band by imposing additional burdens on competitive service providers is unnecessary and inappropriate. Where market forces already provide the framework within which carriers can make the most efficient use of spectrum, imposing an interference management mechanism, like the ITemp metric, in an attempt to promote additional spectrum use would actually undermine innovation and negatively impact the quality, coverage, and capacity of services for end users.

A. Intense Wireless Industry Competition, The FCC's Flexible Service Rules, and Consumer Demand Have Fueled Innovation By CMRS Providers

Consumers in both urban and rural areas have been quick to embrace the convenience of the many CMRS offerings on the market today. The American workforce is highly mobile and the economy is rapidly moving towards the expectation that all communications products will be available on a seamless basis at all times. Countless technological advances have improved – and increased – the diversity and quality of CMRS offerings, particularly for wireless data, which is being delivered at ever faster rates due to advances in spectrum efficiencies. These advances are the product of the FCC's flexible regulatory regime, intense wireless industry competition, and seemingly insatiable consumer demand.

Between 1993 and the end of 2003, the CMRS industry changed dramatically, evolving from a practically all-analog duopoly to a 92 percent digital, multi-carrier market. Wireless subscribership grew from 16 million at year-end 1993 to almost 160 million at year-end 2003. Over those ten years, wireless licensees invested more than $132 billion in capital to improve their networks in response to consumer demands. More than 150,000 additional cell sites were deployed and went into operation between December 1993 and December 2003. Wireless usage grew dramatically too, from 19 billion minutes of use in 1993 to more than 830 billion minutes of use in 2003.[5]

The last decade has also been a period of significant innovation in commercial mobile services technology. Multiple technologies have been deployed, and new products and services have been introduced by carriers, providing consumers with more choices and more options. Starting from an AMPS-only cellular platform, wireless carriers have subsequently offered N-AMPS, CDPD, MIRS, iDEN, TDMA, GSM / GPRS, EDGE and CDMA in a variety of versions, making possible more advanced digital capabilities for consumers.[6] The impressive increase in patents related to CMRS offerings is further testament to the success of the CMRS model.[7]

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[5] CTIA's semi-annual wireless industry survey has tracked the growth of the wireless industry since 1985, and collects data quantifying subscribership, capital investment, operational cell sites, and the extent to which the wireless industry has digitalized both subscribership and channels. *See Background on CTIA's Semi-Annual Wireless Industry Survey* at http://www.wow-com.com/industry/stats/surveys/. *See also* Digital Migration chart at http://www.wow-com.com/images/survey/2003_endyear/752x571/Digital_Migration_Dec03.jpg.

[6] *See e.g.*, Implementation of Section 65002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, Eighth Report, 18 FCC Rcd. 14783, 14803-04 (2003) at paras. 35-37.

[7] Review of the U.S. Patent and Trademark Office's database of patent grants reveals that wireless-related patents have increased dramatically over time as the FCC has adopted policies providing for both more licenses and more flexibility in the selection of alternate technologies. The *annual* issuance of wireless-related patents increased from 20 cellular-related patents in 1983, when cellular service was first licensed, to more than 80 in 1988, when the FCC

The CMRS industry can also claim a track record in efficient spectrum utilization that would be hard for any other spectrum-based service to match. The evolution from an all-analog service to one which is now over ninety percent digital nationwide has been accompanied by the implementation of multiple approaches to foster efficiency. These include not only digitalization of air interfaces, but advances in compression, the deployment of smart antennas, cell splitting, and more frequency reuse. Measured on a geographic basis, in 1993 a 10 km cell would have averaged fewer than seven subscribers per MHz. In 2003, in the same 10 km area, wireless averaged just under 500 subscribers per MHz.

The fact that consumers throughout the country benefit from an intensely competitive market is no doubt a significant factor in the unparalleled success of the CMRS industry.[8] But the Commission's evolution to a regulatory approach that allows carriers a great deal of flexibility in how they design their equipment and offer their services has been a key driver in enabling carriers to maximize the value of their spectrum to deliver services to consumers. Maintaining such equipment design flexibility for CMRS operations is critical to the future success of mobile services. As the Spectrum Policy Task Force explained:

> Flexibility enables spectrum users to make fundamental choices about how they will use spectrum (including whether to use it or transfer their usage rights to others), taking into account market factors such as consumer demand, availability of technology, and

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authorized digital overlays to the analog network, and more than 400 CMRS-related patents in 1994, when the FCC began auctioning PCS licenses. *See e.g.,* Robert F. Roche, "Options and Implications of U.S. Competition Policy: The Case of Wireless Telecommunications" (Ph.D. diss., George Washington University, 1997), at 213 *et seq*. Recent research indicates that more than 2,000 CMRS-related patents were issued in 2001, when the FCC raised the spectrum cap, and more than 15,000 CMRS-related patents have been issued over the past 20 years.

[8] Last year, the Commission found that over 95 percent of Americans could choose from between three to eight wireless providers, with 83 percent having a choice of five or more carriers. *Eighth Report*, 18 FCC Rcd. at 14824, para. 84. CTIA's recent research indicates that 98 percent of Americans can now choose between three or more wireless providers.

> competition. *By leaving these choices to the spectrum user, this approach tends to lead to efficient and highly-valued spectrum uses*.[9]

Equipment design flexibility and many other mechanisms recommended by the Spectrum Policy Task Force have been successfully introduced and/or refined by wireless equipment makers and service providers as a matter of course.[10] Consumers have been the beneficiaries of these successful policies.

B. There Is No Margin Available For Underlay Operations In The CMRS Bands

Market pressures, spectrum constraints and increasing consumer demand have motivated CMRS carriers to take full advantage of their available spectrum. All existing mobile systems based on cellular network topologies must balance, as a design matter, grade of service, capacity and coverage. Each of these factors is inextricably related to the noise environment in which the system operates. To take full advantage of licensed spectrum, CMRS systems are now designed to operate down to the noise floor. As a consequence, any unwanted signals, such as those from unlicensed devices in the bands, will cause degradation of the service to consumers.[11] For example, third party interference can create a local rise in the noise floor to the point where the required carrier-to-interferer ratio exceeds the design specifications for a mobile operating at the fringes of a cell site's reliable service area. This would manifest itself to consumers through lower voice quality, slower data transmission with greater numbers of packet retransmissions, decreased coverage, and more dropped calls in cell-to-cell hand-off.

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[9] SPTF Report at 16 (emphasis added).

[10] *See* SPTF Report at 3-6.

[11] *See* Spectrum Policy Task Force Briefing to the FCC TAC available at http://www.fcc.gov/oet/tac/TAC_December_2002.ppt *accessed* Mar. 25, 2004, at 5 ("License Holders Design System to Operate down to the Noise Floor. Any additional interfering signals (including aggregation of unlicensed devices) can cause degradation.").

An even greater factor for the future of CMRS network design is that the migration path for wireless systems relies on wideband spread spectrum modulation techniques, a technology that is dependent upon maintaining an adequate signal-to-interference ratio. Specifically, with conventional CDMA, CDMA2000, and ultimately wideband CDMA systems, the noise floor is tied directly to system performance – service quality, coverage and capacity. For the uplink channels in these systems, the per-data bit transmit power of each mobile unit is continuously controlled so that the signals from each unit arrive at the base station at about the same level. Thus, the mobile unit transmit power is controlled so that the received signal at the base station remains at a level sufficient to allow reception within a target frame error rate to maintain service quality. When the noise and interference level at the input base station receivers are raised, the average transmit power of each mobile unit must increase accordingly to maintain a consistent level of service.[12] Similarly, when the noise plus interference floor is raised, the coverage area decreases by a proportional amount.

The evolutionary path for GSM-based services through EDGE (Enhanced Data Rates for GSM Evolution) relies upon an adaptive modulation approach to operate both near and far from base station sites, and uses the margins to provide higher data rates in closer proximity to the site. Thus, the margin is used to protect against system interference and to provide coverage at the cell edge, and is used by EDGE's eight-phase-shift keying (8PSK modulation) to offer higher data rates in good conditions closer to the cell site. The proposed underlay operations would interfere with such dynamic/adaptive modulation, and impact both the types and quality of service CMRS customers will receive.

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[12] CDMA uplink channel coverage varies with loading, and the maximum tolerable path loss – which defines coverage – drops by 3 or 4 dB when the channel is fully occupied.

Allowing underlay operations in licensed CMRS spectrum, which will raise the noise plus interference floor, will limit channel capacity and reduce coverage.[13] In short, realistically there is no margin available in the CMRS bands for underlay operations. The imposition of an ITemp metric to permit such operations will directly impact the level of service provided by licensed wireless service providers to their customers.

C. Underlay Operations in CMRS Bands Would Negatively Impact CMRS Consumers

Use of the ITemp metric to permit underlay operations in the CMRS bands would reduce service quality for licensed wireless technologies that consumers now expect to be on par with wireline connections. The research firm in-Stat/MDR recently found that 14.4 percent of *all* U.S. consumers use their wireless phone as their primary phone – and 26.4 percent of the remaining consumers would consider replacing their landline phone with a wireless phone.[14] These trends fuel the fact that consumers increasingly expect reliable, high-quality signals to their mobile phones, and will not tolerate any unnecessary interference.

CMRS coverage areas, system capacity, and throughput would all suffer if wireless mobile operations had to contend with signals from underlay operations in CMRS bands. As an initial matter, any increase in noise will reduce the coverage available to the public. For mobile carriers, the reliable coverage area is mathematically defined by the ambient local noise floor, the immunity of the receiver, and the transmit power of a cell site. Any increase in the noise floor will result in some compression of the reliable service area because, for a fixed base station

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[13] This problem with introducing the ITemp metric into the CMRS bands is described in detail in Elliott Drucker, "Time to Take 'Noise Temperature' at FCC," WIRELESS WEEK (Mar. 22, 2004) at 58.

[14] Eric Gwinn, ”Getting Wired In to Go Wireless,” *Chicago Tribune*, March 25, 2004, 2004 WL 74097331.

transmit power, some areas at the edge of the reliable service area will no longer have a desired signal that meets the design specification for the signal-to-noise ratio of the mobile unit. For a cell site in the outer boundary of a carrier's system, customers will experience this interference as lost coverage. For customers traveling between cells, this same effect can result in dropped hand-offs.

Any increase in noise will also reduce the quality of end users' call experiences. For analog transmissions, an increased noise floor will sound like added background auditory noise. In a digital voice environment, the effects can be varied, and may include drop-outs, where a customer receives intermittent dead air because the bit error rate drops below the threshold for the vocoder, or other audible effects. In a digital data environment, the result will be lost data packets, which require retransmission (thereby also reducing the capacity of the system). Importantly, operators cannot simply compensate for an increased noise floor by raising the transmit power of their base stations. Specifically, cellular systems typically incorporate a pattern of frequency re-use that is built upon a predicted level of base station to base station interference. If a base station's power is increased, the amount of noise from that base station experienced by base stations re-using those frequencies is increased. As a result, frequencies can only be re-used at greater distances, limiting the number of frequencies available at any site and reducing the available capacity of the system.

As a final matter, increasing the noise floor will adversely affect fundamental public safety services, such as E-911 call processing, threatening a lower level of reliability for such essential services. This negative impact on wireless service coverage and quality as a consumer

service is at odds with FCC initiatives to improve CMRS service quality and stimulate intermodal competition.[15]

Another key consideration is that any FCC decision to arbitrarily define a level of interference that must be accepted by CMRS operators would have the perverse effect of discouraging innovation. Licensees who would otherwise seek to deploy cutting-edge technologies that necessarily operate with a lower signal-to-interference ratio will not bring those offerings to the public if they fear the introduction of secondary signals will detract from the quality of their service offering. This is a major concern since, as newer CMRS technologies increase the density of information per hertz, CMRS signals are becoming more – not less – susceptible to interference.

In response to marketplace demand for advanced services, terrestrial mobile systems have transitioned to "interference-limited" digital modulation designs over the past decade in a manner that is entirely consistent with the Spectrum Policy Task Force recommendation to encourage interference-limited policies.[16] These designs feature multiple, low-power base stations with intensive frequency reuse and mobile hand-off from cell-to-cell throughout a small geographic area.[17] The continued refinement of CMRS networks, by incorporation of digital modulation techniques to accommodate consumer demand (by increasing capacity, extending

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[15] *See* New Part 4 of the Commission's Rules Concerning Disruptions to Communications, ET Docket 04-35, FCC 04-30, rel. Feb. 23, 2004.

[16] *See* FCC Spectrum Policy Task Force Report, ET Docket No. 02-135, Nov. 2002, at 32, 34.

[17] Many other recommendations have also been implemented by CMRS, including transceiver enhancements to control interference, such as use of transmitter control systems, *e.g.*, transmit power, the tightening of out-of-band emissions, and the use of uniform signal levels within a service area.

range, and providing advanced services), has resulted in systems that are in fact *more* susceptible to third party interference.

Carriers are already encountering many challenges in delivering the reliability and service quality consumers expect due to spectrum limitations and the constant difficulty of siting new towers. Establishing an ITemp benchmark in CMRS bands would add significantly to these challenges by undermining the successful regulatory policies for licensees in those bands, which allow substantial design flexibility and innovation. Even if the ITemp methodology were ultimately proven feasible – a very big "IF" at this point – the additional engineering and capital resources that would be required to preserve service quality for consumers would far outweigh any potential benefits of shoehorning an additional use into these spectrum bands.

II. FOSTERING SECONDARY MARKETS IN CMRS SPECTRUM IS A BETTER WAY TO MAXIMIZE CONSUMER WELFARE AND ECONOMIC EFFICIENCY THAN THE INTERFERENCE TEMPERATURE PROPOSAL

A fundamental concern with the interference temperature concept is that it is, in essence, another experiment in Government-mandated command and control spectrum management. This proposal contemplates the Government picking an interference temperature floor/ceiling that will necessarily favor *either* the licensed incumbents *or* the unlicensed underlay new entrants. Such a Government-imposed threshold would not be technology neutral, and would ultimately end up dictating terms of engagement for these spectrum bands that may well prevent service providers from designing service offerings that meet consumers' demands.

In the attached report, economist Michael Katz argues that there is a better way to foster underlay operations in CMRS bands than regulation.[18] Instead of mandating underlays through

[18] *See* Report of Michael L. Katz, "Don't Let Short Term Reforms Interfere with Long-Term Policy Goals, ET Docket No. 03-237.

an ITemp regime, the FCC could rely on primary users sublicensing underlay rights, through secondary markets. If underlay operations prove to be technically feasible and efficient, primary licensees would have the economic incentive to sublease the right to use their spectrum to such uses. The FCC could help advance this trend by continuing its important work to expand the scope and availability of secondary markets.[19]

Ultimately this approach would be an extension of the flexible rights policy the FCC has followed now for many years – with dramatic success. CMRS consumers have unquestionably benefited from the flexibility the FCC has granted CMRS licensees, enjoying new digital applications and many other innovative offerings that would not have been possible if the FCC had imposed rigid technical constraints. Consumer welfare, economic efficiency and spectrum efficiency will all be furthered if the FCC *removes* obstacles to spectrum usage in competitive markets like CMRS, instead of imposing new constraints. An unproven regime like the ITemp proposal would create an unfortunate *dis*incentive to invest in the new technologies and services consumers want and deserve.

III. IMPLEMENTATION OF THE INTERFERENCE TEMPERATURE METRIC IN CMRS BANDS IS FRAUGHT WITH MANY PRACTICAL PROBLEMS

In addition to the troubling effects on consumer service quality and spectrum efficiency, introduction of an ITemp metric in CMRS spectrum is also fraught with daunting practical problems. Mobile communications signals are constantly varying, and the real-time measurement of such signals in a given band is a constantly moving target. Measuring and subsequently controlling the level of interference that a non-primary user may cause – given the

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[19] *See generally* Principles for Promoting Efficient Use of Spectrum By Encouraging the Development of Secondary Markets, Policy Statement, 15 FCC Rcd 24,178 (2000); Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, 18 FCC Rcd 20,604 (2003).

constantly changing nature of mobile communications – is extremely difficult because any such ITemp metric would necessarily change continuously with location, time, and frequency band. Indeed, the wireless communications environment could be dramatically different right after a non-primary user *decides* that it *can* transmit: A particular signal from a non-primary user that may be allowable one millisecond may cause interference once it begins transmitting during the next millisecond.

As noted above, CMRS networks have been carefully designed to utilize all available margin for their day-to-day operations. The introduction of operations "below" an ITemp metric would destroy this delicate balance and cause CMRS systems to mitigate this encroachment. Such design modifications will add significant economic costs for providers as they will be required to examine both base station and mobile transmitters to guard against the threat posed by underlay systems. Moreover, underlay devices must have mitigation techniques, such as DFS and TPC, built into all their products. Such mitigation techniques would require extensive testing to ensure that they are properly employed and that all primary users are fully protected.

Enforcement of an ITemp metric is another problem. There are technical issues to overcome with regard to enforcement, such as how to deal with rogue transmitters, and economic issues, such as the cost to implement such enforcement mechanisms into ITemp metric-based equipment. Even assuming that an ITemp metric could be established, the Commission must then determine how to handle transmitters that either fail to comply with the limitations – or comply but still cause harmful interference to primary users. Policing the unlicensed transmitters would present enormous difficulties in any underlay use of licensed spectrum. Unlike licensed transmitters, unlicensed devices will proliferate through a variety of commercial marketplaces in a fairly uncontrolled fashion. Indeed, once "ITemp metric" based devices are unleashed on the

marketplace, any FCC enforcement to mitigate interference or seek technical changes to devices would be extraordinarily difficult.

A very significant problem in the CMRS context is that CMRS users will not be able to discern the cause of service disruptions, and they will likely attribute lost or degraded calls to the CMRS provider's network rather than to disruptions caused by unlicensed users, and simply churn to another provider. In such cases, no report of harmful interference would be generated, and the CMRS provider would be unable to manage its network effectively. The Commission must give a great deal of consideration to this issue and ensure that it does not embark down the ITemp path unless it has a credible and effective means of locating, modifying, and shutting down harmfully interfering devices.

Underlay operations based on the ITemp metric should not be introduced into the CMRS bands unless such operations can clearly demonstrate that CMRS service quality, coverage, and capacity are not adversely affected. The future development of the licensed spectrum, as desired by the Commission, should not be inhibited and existing primary spectrum users should not be required to devote significant additional capital to mitigate the effects of new ITemp metric users of the spectrum.[20] The many challenging practical implementation problems that are posed by the ITemp proposal indicate that this issue should be approached with extreme caution.

IV. THE INTERFERENCE TEMPERATURE PROPOSAL WOULD REQUIRE EXTENSIVE ADDITIONAL STUDY BEFORE IT COULD BE IMPLEMENTED

The Commission should not consider implementing the ITemp metric until additional studies are carefully conducted and the results closely analyzed. The FCC is still unclear on the

[20] Previous FCC treatments of "harmful interference" (*e.g.*, Northpoint, LMS, Aircell) would not make sense in a CMRS environment (where there is no "margin" available that would allow unlicensed operations to be introduced without interfering with the consumer experience).

feasibility of the overall concept and the answers to many foundational questions, including: (i) how to determine whether systems with widely varying "protection" needs are compatible; (ii) who "should be parties to the process of setting" applicable ITemp metrics; and (iii) how to "gauge the success" of the introduction of the ITemp metric.[21] These questions need well-reasoned answers before the Commission travels further down the path toward ITemp implementation.

Most importantly, and as the Spectrum Policy Task Force emphasized, ITemp thresholds can only be set after a broad review of the RF environmental conditions in each band, which, at a minimum, requires a systematic study of the noise floor.[22] Such a study is an extensive undertaking – but a critical element in determining whether application of an ITemp metric in a given band is feasible. Indeed, as the Commission recognizes, monitoring and measuring the noise floor is a "substantial, time consuming, and … resource intensive undertaking," and the agency is presently unsure how to go about the process.[23] But it is essential that this analysis be completed *before* any ITemp framework is developed because it is entirely possible that such a

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[21] *See generally* NOI at ¶¶ 19-26. Several Commissioners' statements in this proceeding recognize that much work must be done before ITemp can be considered a viable approach. See Separate Statement of Michael K. Powell (noting that the ITemp model "has the *potential* to tremendously improve radio spectrum management" and that the NPRM proposes "to begin experimenting" with the ITemp approach); Separate Statement of Commissioner Michael J. Copps (stating "[W]e do not have an adequate way to determine what the right interference temperature is for a given band.… The inappropriateness and inadequacy of [the interference and harmful interference] concepts for the job of prospectively setting interference temperature will make this new metric very hard to use predictably and non-arbitrarily in the real world."); Separate Statement of Commissioner Jonathan S. Adelstein, Approving in Part, Concurring in Part (noting that ""[W]e do not have an adequate way to determine what the right interference temperature is for a given band.… The inappropriateness and inadequacy of [the interference and harmful interference] concepts for the job of prospectively setting interference temperature will make this new metric very hard to use predictably and non-arbitrarily in the real world.").

[22] *See* Spectrum Policy Task Force Briefing to the FCC TAC available at http://www.fcc.gov/oet/tac/TAC_December_2002.ppt (accessed Mar. 25, 2004).

[23] NOI at ¶ 26.

study would clearly demonstrate that in certain bands (i) there is no available margin; or (ii) the noise floor varies so much that reliable underlay communications are not possible.

Moreover, the NOI identifies an entire suite of additional problems that must be addressed.[24] First, the Commission must determine what elements should be considered (and what weight should be given to each) in setting the ITemp metric, including, but not limited to, the type of service, the state of development of the technology, and the susceptibility of the technology to interference. Second, the FCC must decide what technical factors should be incorporated into the metric, including, for example, applicable antenna requirements, power levels, and field strength limits at boundary areas. Third, the Commission must consider whether the ITemp metric applied to a particular band should be based on all users of the spectrum or only the service most susceptible to interference,[25] and how a device that exceeds the established metric should react. And fourth, the Commission must determine how it intends to monitor and enforce the interference temperature threshold, including how these functions would be funded, and how a policing approach would work.[26]

Absent resolution of these issues (and the many others identified in the NOI), the FCC stands in great danger of opening a door that cannot be closed, and that could severely damage the quality, coverage, and capacity of existing incumbent radio systems, including critical CMRS systems. Unless these difficult issues can be fully resolved, CTIA respectfully submits that the ITemp metric should not be applied to the CMRS bands.

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[24] NOI at ¶¶ 21-22.

[25] Indeed, the level of interference will depend both on the "victim" service(s) as well as the interfering service(s). Where there are three or more disparate users of the same spectrum, the interference dynamic will be increasingly difficult to ascertain. The FCC must also recognize that its decision here could impact all interested parties' future equipment designs.

[26] It is unclear that it would be economically or technically practical to rely on a "listening" rule.

V. CONCLUSION

While CTIA commends the FCC for continuing to follow up on the many Spectrum Policy Task Force Report recommendations and considering innovative spectrum management reforms, it urges the Commission to proceed very cautiously in this proceeding. As the FCC has stated, "[w]e recognize … that it will take a significant period to develop the underlying information, analyses and policy plans needed to fully implement the interference temperature concept."[27] Indeed, the Commission must first determine whether the ITemp metric should be implemented at all. Should the concept prove feasible, it must be analyzed on a band-by-band basis.

CTIA submits that there are many compelling policy reasons why the ITemp metric should not be implemented in the CMRS bands, where competitive market forces and spectrum constraints have led service providers to implement systems that are already interference-limited. Such systems will be adversely impacted by unrecognized underlay signals that add to the noise floor. Because consumer demand for wireless communications is continually motivating equipment makers to support more users and services within the same bandwidth, unwarranted

[27] NOI at ¶ 29.

additional operations in the CMRS bands will limit design flexibility and manufacturers' incentive to innovate. For the many reasons stated in these comments, CTIA submits that the costs of implementing an ITemp approach in CMRS Bands would significantly outweigh any theoretical benefits of such a proposal.

Respectfully submitted,

/s/ Diane Cornell

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CERTIFICATE OF SERVICE

I, Christine Blomquist, hereby certify that on this 5th day of April, 2004, the foregoing Comments of the Cellular Telecommunications & Internet Association were filed electronically on the FCC's Electronic Comment Filing System and copies were served via first class mail, postage pre-paid, to the following:

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