Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of	)	
	)	
Revision of the Commission's	)	CC Docket No. 94-102
Rules to Ensure Compatibility	)	RM- 8143
With Enhanced 911 Emergency	)	
Calling Systems	)	

PETITION OF CELLULAR COMMUNICATIONS OF PUERTO RICO, INC.
FOR WAIVER OF SECTION 20.18(C)

Pursuant to Section 1.3 of the Commission's rules, 47 C.F.R. § 1.3, Cellular Communications of Puerto Rico, Inc.. ("CCPR"), by its attorneys, hereby respectfully requests a waiver of Section 20.18(c)[1/] of the Commission's rules until such time as there is an industry solution to the problems associated with the provision of TTY over digital wireless systems.

The Commission is well aware that Section 20.18(c) poses significant technical challenges to digital providers. In recognition of these challenges, the Commission determined that it would not enforce Section 20.18 until October 1, 1998.[2/] This compliance period was granted to allow the wireless industry to "work[] with organizations representing individuals with hearing and speech disabilities to overcome technical barriers and compatibility problems

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[1/] Section 20.18(c) requires all licensees subject to that section "to be capable of transmitting 911 calls from individuals with speech or hearing disabilities through means other than mobile radio handsets, e.g. through the use of Text Telephone Devices." 47 C.F.R. § 20.18(c).

[2/] *Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Report and Order and Further Notice of Proposed Rulemaking, 11 FCC Rcd 18676 (1996).

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involved in implementing solutions for TTY users on digital wireless systems."[3/] The October 1, 1998 deadline, however, proved to be overly optimistic and the Commission granted a limited suspension of its enforcement of Section 20.18(c) for digital wireless systems until November 15, 1998.[4/] On the heels of the *TTY Extension Order* the Commission discovered that the November 15, 1998 date was equally unworkable and granted a further extension until December 31, 1998.[5/] These extensions were wisely implemented to avert a situation in which digital providers unavoidably violate the Commission's rules.

The Commission's recognition that there is no current solution to the TTY problem has also led the agency to establish procedures under which wireless carriers subject to the requirements of Section 20.18(c) may petition the Commission for waiver of the rule. In that regard, the *Second TTY Extension Order* requires waiver requests to specify: (1) what steps the carrier is taking or intends to take to provide users of TTY devices with the capability to operate such devices in conjunction with digital wireless phones; (2) when the carrier intends to make this capability available to TTY users; and (3) what reasonable steps the carrier will take to address the consumer concerns referenced in the *TTY Extension Order*.[6/] Essentially, the

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[3/] *Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Order on Reconsideration, 12 FCC Rcd 22665 at 22695 (1997).

[4/] *In the Matter of Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-102, RM-8143, *Order*, DA 98-1982 (rel. Sept. 30, 1998) ("*TTY Extension Order*").

[5/] *In the Matter of Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-102, RM-8143, *Order*, DA 98-2323 (rel. Nov. 13, 1998) ("*Second TTY Extension Order*").

[6/] *See TTY Extension Order at* ¶ 9 & Appendix.

Commission's three-part waiver standard requires carriers to use their "best efforts" to ensure that TTY users will have digital technology available in the near future. As explained below, CCPR meets this standard because it is doing all it can to ensure the timely roll out of TTY services over its digital network. Therefore, the Commission should waive enforcement of Section 20.18(c).

The answer to the Commission's three-fold waiver inquiry can be summed up in one straightforward commitment: CCPR will rely on and implement either the industry solution that is currently under development by the Wireless TTY Forum ("the Forum") or any other reasonable solution that becomes available and is economically feasible. As recognized by the Commission, the Forum has worked hard over the past sixteen months to develop solutions that will enable TTY users to make 911 calls on digital networks.[7/] CCPR enthusiastically supports these efforts and will closely monitor the progress of the Forum.

Recently, the Forum released its Workplan of the Wireless TTY Forum ("Workplan"),[8/] which promises to be a comprehensive solution to the TTY problem that answers each of the Commission's waiver inquiries. The Workplan presents several voice based solutions including Direct Audio Connection, RJ-11-type Modular Connections (an analog solution), acoustic

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[7/] "[T]he Bureau is cognizant of the fact that the Forum has striven to develop voice-based and data-based solutions to the problems associated with successfully transmitting TTY calls over such systems." *Second TTY Extension Order* at ¶ 5.

[8/] Joint Comments of the Cellular Telecommunications Industry Association and Personal Communications Industry Association, Appendix C (filed Oct. 30, 1998). (Attached as Exhibit A).

solutions, True RJ-11 Connections and Vocoder Modifications.[9/] The Workplan also presents Inter-Working Function and Third Party Gateways as data-based solutions.[10/] Each of these solutions are thoroughly evaluated in the Workplan, which includes analysis of the (i) testing/implementation; (ii) advantages/disadvantages; (iii) consumer requirements supported; and (iv) milestones for each option. If the Commission determines that the TTY Forum's solutions satisfy its criteria, CCPR will promptly implement the first commercially available option mentioned in the Workplan as soon as the necessary equipment is manufactured and is made available at commercially reasonable terms. In fact, CCPR is committed to implement *any* economically feasible industry solution approved by the Commission (including those suggested by private entities) so long as the equipment is commercially available.

Implementing an industry solution is the only available option for CCPR. The company cannot unilaterally solve the TTY dilemma because it is a problem of technology, not compliance. Currently, CCPR provides cellular service only in Puerto Rico and the U.S. Virgin Islands. Due to its size, CCPR can neither coax its vendors into implementing a TTY solution nor independently develop and implement a solution to the intractable problem of TTY compatibility on digital systems.

In the interim, CCPR will continue to ensure that customers using TTYs are able to access CCPR's network via analog handsets. CCPR pledges to begin using the equipment necessary to provide service over its digital signals whenever it is commercially available at

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[9/] Workplan at 15-19.

[10/] Workplan at 20-21.

reasonable terms. In other words, once the technology exists that will make CCPR's compliance feasible, the company will promptly comply with the requirements of Section 20.18(c). Until such a time, it would be inequitable for the Commission to require CCPR to comply with a requirement that is not within the company's reach. Therefore, the Commission should waive the requirements of Section 20.18(c) until an industry solution is available.

Respectfully submitted,

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EXHIBIT A

BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
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JOINT COMMENTS OF THE
CELLULAR TELECOMMUNICATIONS INDUSTRY ASSOCIATION
AND
PERSONAL COMMUNICATIONS INDUSTRY ASSOCIATION

The Cellular Telecommunications Industry Association ("CTIA")[1] and the Personal Communications Industry Association ("PCIA")[2] ("Joint Commenters"), on behalf of its members, submit its

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[1] CTIA is the international organization of the wireless communications industry for both wireless carriers and manufacturers. Membership in the association covers all Commercial Mobile Radio Service ("CMRS") providers, including 48 of the 50 largest cellular and broadband personal communications service ("PCS") providers. CTIA represents more broadband PCS carriers and more cellular carriers than any other trade association.

[2] PCIA is the international trade association created to represent the interests of both the commercial and private mobile radio service communications industries. PCIA's Federal of Councils includes: the Paging and Messaging Alliance, the Broadband PCS Alliance, the Site Owners and Managers Association, the Association of Wireless Communications Engineers and Technicians, the Private Systems Users Alliance, and the Mobile Wireless Communications Alliance. In addition, as the FCC-appointed frequency coordinator for the 450-512 MHz bands in the Business Radio Service, the 800 and 900 MHz Business Pools, the 800 MHz General Category frequencies for Business Eligibles and conventional SMR systems, and the 929 MHz paging frequencies, PCIA represents and services the interests of tens of thousand of licensees.

responses in the above-captioned proceeding pursuant to the Commission's Order granting a 45-day extension of the suspension of enforcement Section 20.18(c) of the Commission's Rules from October 1, 1998, to November 15, 1998.[3]

In the Extension Order, the Wireless Telecommunications Bureau requested answers to specific questions to help inform the their decisionmaking and to advise the Commission as to whether they should continue the suspension of the Commission's enforcement of Section 20.18(c).of its rules.[4] Attached as Appendix A, and incorporate herein, are the Joint Commenters responses to these questions.

In its response, the Joint Commenters demonstrate that there does not appear to be a near-term solution that will allow the Baudot signal of a TTY device to pass through the Vocoder of a digital air interface and achieve a character error rate comparable to analog technology, *i.e.*, less than one percent.
Commission staff, however, has made it very clear that the wireless industry must continue further testing in order to compare the character error rates among the various digital air interfaces. Although the wireless industry has concluded that additional testing will not yield any new or significant information on

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[3] See In the Matter of Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102,Order, DA98-1982, (rel. Sept. 30, 1998)("Extension Order").

[4] Extension Order at 5.

character error rates, it reluctantly has agreed to proceed with additional tests.

The Workplan and the Test Procedures filed by CTIA on behalf of the Wireless TTY Forum demonstrate that additional time is needed for wireless carriers to comply with the Commission's rules governing TTY access to 9-1-1 over digital wireless systems. Accordingly, the Joint Commenters respectfully request that the Bureau, pursuant to its delegated authority, continue the suspension of enforcement of Section 20.18(c)of the Commission's Rules with respect to digital wireless systems.

Respectfully submitted,

/s/
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October 30, 1998

APPENDIX A

1. **What specific actions are being taken by individual carriers to comply with the notification requirements outlined in the E911 Reconsideration Order (i.e., the requirement that carriers make every reasonable effort to notify current and potential subscribers that they will not be able to use TTYs to call 911 with digital wireless devices and services)?**
   In response to this question, CTIA and PCIA recently surveyed a cross-section of its membership in order to provide the Commission with industry data on wireless carriers' reasonable efforts to notify current and potential subscribers concerning digital wireless services incompatibility with TTY devices. The member companies responding to the survey represent virtually every size of service provider, from one market to hundreds of markets. These companies hold over 1,485 licenses -- approximately 41% of all cellular and PCS licenses -- with a total of one billion aggregated pops. Attached as Appendix B is a compilation of the data.

2. **Has any carrier been able to meet the October 1, 1998, deadline? If so, what steps has the carrier taken that led to its ability to meet the deadline?**
   Based on the discussions at the TTY Forum and informal discussions with several representatives of our member companies,[5] no CMRS carrier offering digital wireless was able to meet the October 1, 1998, deadline. As explained in CTIA's and PCIA's request for an extension of time, no manufacturer of wireless digital handsets has a commercially available product that will allow the Baudot signal of a TTY device to pass through the Vocoder of a digital air interface and achieve a character error rate comparable to analog technology, i.e., less than 1%. It is technically impossible for CMRS carriers to comply with the Commission's rules governing TTY access to 9-1-1 over digital wireless systems until the appropriate equipment is commercially available.

3. **For each of the digital technologies (i.e., TDMA, CDMA, GSM, and iDEN), have manufacturers been able to determine the root**

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[5] While CTIA and PCIA have not spoken to every wireless carrier in the United States, we have informally polled a significant cross-sample of our member companies to determine whether compliance by October 1, 1998 was attainable. Based on the overwhelming response that compliance by October 1st was not attainable, CTIA and PCIA filed the request for an extension of time on behalf of its members.

technical causes for the incompatibility between TTY devices and their systems? If so, what is the nature of these root technical causes for each technology?

Several manufacturers have opined on the root technical causes for the incompatibility between TTY devices and various digital wireless systems. The following are their observations.

CDMA Technology - CDG's Observations

The CDMA Development Group ("CDG") indicates that the root technical cause for the incompatibility between TTY devices and CDMA systems is the Frame Erasure Rate ("FER") of CDMA systems when using voice service. These systems are precisely tuned to operate at an FER of 1%. For typical voice signals, this FER does not cause much distortion. However, due to the slow nature of the TTY Baudot signals, this 1% FER translates into about a 7-9% Character Error Rate ("CER") -- one TTY character spans 9 CDMA voice frames. Lucent Technology's presentation at TTY Forum 5 illustrated this very clearly based on analysis, simulation, and field test results.[6] The CDMA Development Group has made it very clear to the Wireless TTY Forum that it understands the technical limitations that cause TTY incompatibility with CDMA voice service.

TDMA Technology - Nokia's Observations

Nokia indicates that fundamentally the root technical causes are the same for all wireless digital technologies. While one technology may be more sensitive to a certain parameter than another technology, Nokia believes that all technologies are affected in various degrees by most parameters. Nokia has indicated that the primary root causes for incompatibility between TTY devices and TDMA wireless systems are: Vocoder distortion, received signal level, multi-path fading effects, receiver attack time, hand offs, adjacent and co-channel interference, various network effects, and the performance of TTY devices. The October 1998 Quarterly Status Report provides Nokia's test results from its laboratory testing of TDMA and AMPS technologies. These test results provide useful insight on the root technical causes. The data illustrates the effect of dividing the CER versus the received signal power plot into two regions: Vocoder limited and link noise limited. When the link conditions are favorable, the CER is only attributed to Vocoder distortions (CER ranged between 2 to 6%). As the link conditions

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[6] See In the Matter of Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, Wireless TTY Forum: Seeking Solutions to TTY through Wireless Digital Systems, Quarterly Status Report, Appendix A, filed July 10, 1998 ("July Quarterly Status Report").

worsen, the CER increases exponentially around the phone sensitivity level (approximately -113 dBm). Nokia cautions that while laboratory measurements represent the best possible case, actual field conditions may provide a much higher CER. Nokia also references field measurements performed by Philips Consumer Communications to illustrate the impact of TTY performance standards, or lack thereof, on the CER.

GSM Technology - Ericsson's Observations

Both GSM and TDMA standardized Vocoders are optimized for voice. Essentially, they are designed to carry voice calls, not TTY calls. Within TDMA and GSM technologies, test results supporting TTY calls made through a digital cellular Vocoder have not met the consumer organization's criterion, i.e., less than 1% CER. In every test, the CER has been higher than the level defined as "acceptable" by consumers. GSM tests indicate error frame rates ("EFR") of 3-6%. TDMA tests indicate EFR of 6-10%.

According to Ericsson, character errors are primarily due to the operation of the digital Vocoder. The Vocoder takes 20ms long samples of the audio input from the TTY device and tries to identify the sound in terms of filter parameters for the vocal tract model and an excitation sequence approximating the air flow through the vocal tract. A TTY FSK Baudot signal is very different from speech so the Vocoder will consistently have difficulty reproducing a sound that matches the Baudot tones. The differences lie both in the actual sound content but also in how the sound is interpreted. A Baudot tone is transmitted at 45 baud, i.e., 45 characters per second. A human will most likely not utter more than 10 syllables per second. If a human speaks 10 syllables per second, each syllable will last for 100ms. This means that the sound will not change drastically from each 20ms segment to each subsequent 20ms. For a Baudot tone, the interpretation of the sound content is made every 22ms (1/45) which means that if one 20ms frame is misinterpreted a whole character is lost while for speech this would only affect the sound of one fifth of a syllable. Baudot places different and more stringent requirements on the Vocoder.

Cellular and PCS Vocoders are somewhat different in design. According to Ericsson, the GSM Vocoder has a higher success rate in passing TTY calls than the IS-136 TDMA Vocoder due to the fact that a GSM Vocoder uses a higher data rate in the Vocoder. The higher data rate makes it possible for the GSM Vocoder to handle more sounds than the TDMA Vocoder. Overall, the GSM is designed to identify and match more tones which reduces the number of character errors during a transmission.

iDEN Technology - Motorola's Observation

iDEN is a digital air interface used by Enhanced Mobile Radio Service providers. Currently, there is one service provider deploying this technology on a nationwide basis. Motorola has performed extensive testing, both in the lab and in the field, using the iDEN handset with Baudot TTY equipment that is readily available.

According to Motorola, testing TTY Baudot tones in the lab with a strong RF signal results in few errors. However, in field tests, the TTY Baudot tones are subject to an unacceptable CER, particularly when there is not a strong signal. The majority of the TTY devices in the market today do not emit tones that are as robust as the human voice. While iDEN continues to work with TTY manufacturers that are enhancing the Baudot tones, it will continue to provide ASCII data to customers who are deaf and hard-of-hearing.

4. **What potential solutions have been submitted to appropriate standard-setting bodies or forums for their review and analysis?** Philips Consumer Communications has submitted a proposal advocating the development of a new service option using the EVRC Vocoder to provide simultaneous voice and dedicated user data on a CDMA fundamental traffic channel. This proposal has been submitted to the appropriate standard-setting body, TIA's TR45.5 Committee, as a Request for Project Number to Support Development of a Service Option to Provide Simultaneous Voice. It has been remanded to TR45.5 Working Group I for review. Philips estimates 18 to 24 months for the development of a standard.

The TTY Forum has drafted a Technical Information Document for a modified voice-based solution, i.e., coupling via a direct electrical connection between the TTY device and a digital wireless handset. The TTY Forum plans to finalize the TID at the next TTY Forum Meeting which is scheduled for November 4-5, 1998, and make it available shortly thereafter for those carriers that prefer this modified voice-based solution. According to the Workplan of the Wireless TTY Forum, a Standards Requirements Document ("SRD") will be drafted and submitted to TR45.1 for review and analysis after the TID is finalized by the Forum.

Working Group 2 of the Wireless TTY Forum has finalized its work on the Standards Requirements Document for a Circuit-Switched Data Solution. Working Group 2 has attempted to present the final draft of the SRD to the TTY Forum for adoption. However, the Forum has focused on voice-based solutions and the FCC's October 1st compliance date and has not voted on the item. The SRD is essentially ready and may be submitted to TR45 as early as December 1998. The Working Group is very optimistic that the

TTY Forum will consider the SRD for adoption at the November 1998 TTY Forum Meeting.

Qualcomm's White Paper, which proposes a hybrid data solution,[7] has been reviewed by the CDMA Development Group's TTY Team and their comments have been incorporated into the White Paper. The White Paper has been submitted to TIA's TR45.5 subcommittee for review.

5. **Are there any segments of the wireless industry that might be crucial to the development of the potential solutions that are not represented in the Forum, e.g., manufacturers of Inter-Working Functions (IWF), who would have to modify IWF software as part of a data solution) and is their representation necessary for implementation of such solutions?**
Manufacturers of IWF are crucial to the development of Qualcomm's Proposed Hybrid Solution for CDMA Technology[8] and Philips Consumer Communications' proposed method of providing nearly error-free transmission of TTY FSK Baudot text over CDMA digital air interface.[9] Manufacturers of adapters and a common level interface are crucial to the development of the modified voice-based solution which allows coupling of the TTY to a digital wireless handset via direct electrical connection.

While manufacturers of IWF, adapters and interface devices have a critical role in the development of the potential solutions, their representation at the TTY Forum is always welcomed and may provide additional insight to the technical challenges. However, it would be far more productive and efficient for these manufacturers to work directly with the various wireless digital technology groups and standard-setting bodies to develop the necessary IWF software, adapters and interface devices. In that regard, the TTY Forum is drafting a letter to IWF manufacturers concerning the implementation of V.18 standard. It is anticipated that the TTY Forum will finalize the draft at the next TTY Forum meeting scheduled for November 4-5, 1998.

6. **Explain the possible negative consequences of any potential**

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[7] See In the Matter of Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, Wireless TTY Forum: Seeking Solutions to TTY through Wireless Digital Systems, Quarterly Status Report, Appendix L, filed Oct. 13, 1998 ("October Quarterly Status Report").

[8] October Quarterly Status Report at 11.

[9] October Quarterly Status Report at 12-13.

solutions for TTY users, e.g., the reduction in throughput that would result from the insertion of additional bits between transmitted characters.

The Wireless TTY Forum has developed a matrix which provides information concerning the advantages and disadvantages of proposed voice-based solutions and data-based solutions. See Appendix C for this information.

7. **For each of the digital technologies, what would be the timetable for implementation of a data solution on an equitable basis with voice services offered?**

   Based on the information provided in the Workplan and the associations' experience in the standards-setting process, estimated implementation time frames range between 12 and 18 months. While the standards for GSM, TDMA, iDEN and CDMA support the IWF functionality, implementation requires completion of product development and deployment, including billing capabilities for data, installation of TTY software in the subscriber terminal, installation of the IWF infrastructure which may be installed per switch or shared among a carrier's switches. In addition, V.18 capable modems need to be manufactured for use in the United States. The estimated timeframes are contingent upon several factors: availability of modems incorporating V.18 standard or other enhanced protocols; timely resolution of any unanticipated technical glitches in product development and deployment as well as installation of the IWF infrastructure; and the availability of the appropriate engineering staff.

8. **If an extension were granted in order to reach a long-term solution to the problem of incompatibility between TTY devices and various digital systems, what could each carrier do in the interim to accommodate TTY users on wireless systems?**

   Based on the survey,[10] an overwhelming majority of the carriers that provide analog and digital services offer and will continue to offer analog service and products as an interim accommodation for TTY users in those markets where they provide both analog and digital services.

   Several responding carriers offer only digital services in some or all of their markets. Some of these carriers are advising TTY users to purchase or use analog cellular service until a data solution is developed. Several are considering the possibility of developing proprietary solutions that may accommodate TTY users in their markets where they offer only digital service. In both cases, the carriers are notifying subscribers and potential subscribers of the limitations of

[10] See Appendix B.

their digital systems with respect to the use of TTYs.

9. **At what laboratory location will the upcoming testing of digital wireless phones be conducted? Will carriers ensure that representatives from all Forum member groups participate in the testing? Will field tests be conducted, including tests involving actual TTY users, following completion of the laboratory tests?**
Please refer to Test Plan developed by the Wireless TTY Forum for location of laboratories.

The Test Plan indicates that laboratory and simulated field tests will be conducted. The TTY Forum will provide advance notice of the test dates, location of the test laboratories, and contact person to all interested parties. Technical representatives of TTY manufacturers, Gallaudet University, PSAPs and the FCC are encouraged to participate in the testing and should contact the appropriate manufacturer or carrier conducting the test to discuss participation.

10. **Have carriers provided equipment and wireless service to TTY users so that users can conduct their own field tests? If equipment and service have not been provided, what obstacles have prevented carriers from doing so? What are the carriers' plans for providing equipment and service to facilitate future field tests by TTY users?**
Two wireless carriers serving the Washington, DC-Baltimore area initially provided Gallaudet University with equipment and wireless services to conduct field tests. Although the initial subscriptions expired, both carriers were amenable to extending the subscriptions in accordance with their respective company policies and procedures concerning free subscriptions for test purposes. Gallaudet University accepted the offer of one service provider. However, it rejected the offer of the other carrier, because Gallaudet University considered it too burdensome to provide the appropriate documentation and information requested by the carrier in accordance with its company policies and procedures.

This issue was raised at the October 1998 TTY Forum Meeting, and Brian Fontes, CTIA's Senior Vice President of Policy and Administration, offered to facilitate the provision of equipment and wireless services between CTIA member companies serving the Washington, DC-Baltimore area and Gallaudet University. Mr. Fontes was willing to explore various alternatives, subject to legal review and in accordance with the regulations of local and state public service commissions and the carriers' corporate policies and procedures for handling such matters. Mr. Fontes inquired whether Gallaudet University has and could provide the

appropriate documentation and information requested, Gallaudet again indicated that it was too burdensome to do so and would obtain service and equipment without CTIA's assistance. CTIA is still willing to facilitate Gallaudet University's request for equipment and services for the purpose of conducting field tests with CTIA member carriers.

APPENDIX B

SURVEY OF WIRELESS COMPANIES ON TTY ACCESS TO DIGITAL WIRELESS SYSTEMS: NOTIFICATION & INTERIM MEASURES

- **COMPANIES RESPONDING: 29**

- **RESPONDING COMPANIES THAT OFFER DIGITAL SERVICES: 23**
  - ◊ **CDMA - 9**
  - ◊ **GSM - 4**
  - ◊ **TDMA - 13**

    ***Note: Several carriers offer more than one type of wireless digital technology.**

- **RESPONDING COMPANIES THAT OFFER ANALOG SERVICES ONLY AS OF 10/30/98: 6**

- **ACTIONS TAKEN OR METHODS USED TO NOTIFY SUBSCRIBERS & POTENTIAL SUBSCRIBERS**
  - ◊ **Message Directly on Bill or Bill Inserts - 19**
  - ◊ **Point of Sale (brochures, buck slips, stickers, displays and other collateral materials) - 9**
  - ◊ **Customer Welcome Guides & User Guides - 2**
  - ◊ **Customer Newsletters - 1**
  - ◊ **Written materials, *e.g.*, letters, fact sheets, Q&As, for customer service and sales/marketing reps to answer consumer questions - 5**
  - ◊ **Company's Internet Website - 3**
  - ◊ **Terms of Service Agreements/Customer Contracts - 3**
  - ◊ **Placement of notice in publications targeted specifically to the deaf and hard-of-hearing -2 (notice placed in publications that reach more than 800,000 TTY users.)**
  - ◊ **Other Efforts: prepaid card - 1; modified packaging of handsets & distribution of equipment sheets in retail outlets - 1**

- **RECOMMENDED TEXT PROVIDED BY CTIA, PCIA, OR WIRELESS TTY FORUM**
  - ◊ **Recommended Text - 7**
  - ◊ **Recommended Text with Modifications - 6**
  - ◊ **Other Text (developed by carrier) - 5**

- **INTERIM MEASURES TO ACCOMMODATE TTY USERS UNTIL DATA SOLUTIONS AVAILABLE**
  - ◊ **Offer analog service and products - 17**
  - ◊ **Inform customer that carrier does not provide analog service and direct them to other service providers in the market that may provide analog service - 1 (in markets where only digital service is offered)**
  - ◊ **Consider development of proprietary solution - 2 (provides only digital service)**
  - ◊ **No interim solutions available at this time - 5 (provides only digital service)**

WIRELESS COMPANIES PARTICIPATING IN SURVEY

1. Advantage Cellular Systems, Inc.
2. AirTouch Communications
3. ALLTEL
4. AT&T Wireless Services
5. Bell Atlantic NYNEX Mobile
6. BellSouth Cellular Corp.
7. Bluegrass Cellular, Inc.
8. BMCT, L.P.
9. Cellcom
10. C.C. Cellular
11. CommNet Cellular, Inc.
12. Farmers Cellular Telephone, Inc.
13. Glacial Lakes Cellular 2000
14. GTE Wireless
15. Maine Wireless, L.P.
16. Omnipoint Communications
17. Powertel
18. PrimeCo Personal Communications, L.P.
19. RCC Atlantic, Inc.
20. SBC Communications (Southwestern Bell Wireless, Pacific Bell Mobile Services, Nevada Bell Mobile Systems, Cellular One)
21. SNET Wireless (SNET Cellular, Inc., Springwich Cellular, L.P., SNET Mobility, Inc.)
22. Sprint Spectrum, L.P.
23. Thumb Cellular
24. Triton Cellular Partners of Lincoln LLP (RSA Oregon - 4)
25. United States Cellular Wireless Communications
26. U S West Wireless, L.L.C.
27. Vanguard Cellular Systems, Inc.
28. Wireless One Network, L.P.
29. Xit Cellular

APPENDIX C

SOLUTIONS MATRIX AND WORKPLAN

Task Force Members to Complete the Data Base Solutions Matrix:

- Todd Lantor
- Norm Williams
- Judy Harkins
- Ron Schultz
- Nikolai Leung
- Mohamed El-Rayes
- UWCC member
- Steve Coston
- John Suprock
- Brye Bonner

Group is empowered to complete matrix below on behalf of the TTY Forum.

PROPOSED VOICE-BASED SOLUTIONS
(Passing Baudot signal through the VOCODER)

Proposed Solution	Testing/ Implementation	Advantages/ Disadvantages	Consumer Requirements Supported	Milestones
Direct Audio Connection (2.5 mm Jack – Preferred Method)	1. Finalize Technical Information Document, 2. SRD, 3. Develop Standard, SDO 4. Notify TTY Phone Manufacturers	Advantages: • Cost effective • Small in size • Rapid to implement • High Immunity to interference • Recognized industry connector • Does not require additional power supply • May allow connection to other devices Disadvantages: • Requires modification/ adapter to TTY • Yields no inherent improvement to CER • Supports only limited features	1. Preferred over acoustic 2. Supported 3. Supported 4. Supported 5. TBD 6. Supported 7. Supported 8. Supported 9. Supported 10. N/A 11. N/A 12. N/A 13. N/A	1. Nov 1998 2. Submit to TR45.1 – (Ericsson liaison) date TBD 3. Ericsson to identify timetable with TR45.1 – actual date to be posted on listserve 4. TBD by #3

Proposed Solution	Testing/ Implementation	Advantages/ Disadvantages	Consumer Requirements Supported	Milestones
RJ11-type Modular Connection/ Jack (Analog Solution)	5. Develop Technical Information Document, 6. SRD, 7. Develop Standard 8. Notify TTY Phone Manufacturers	Advantages: • Could support full functionality • Could support some of the embedded base of TTYs Disadvantages: • Physical size • Cannot use handset for VCO functions (may require separate device for HCO/VCO)	1. Preferred over acoustic 2. Supported 3. Supported 4. Supported 5. TBD 6. Supported 7. Supported 8. Supported 9. Supported 10. N/A 11. N/A 12. N/A 13. N/A	This option is not considered a short-term solution by the Forum and therefore is not being pursued by this Forum at this time.

Proposed Solution	Testing/ Implementation	Advantages/ Disadvantages	Consumer Requirements Supported	Milestones
Acoustic solution – use of external landline handset	1. No Standardiza-tion required	Advantages: • No standardizatio n required • Supports most embedded base of TTYs • Very Low interface cost • Short development cycle • Easily accessible to standardized landline handsets Disadvantages: • Highly susceptible to background noise • Bulky – requires a landline handset and cable	1. Could negatively impact CER 2. Supported 3. Supported 4. Supported 5. TBD 6. Supported 7. Supported 8. Supported 9. Supported 10. N/A 11. N/A 12. N/A 13. N/A	TBD by manufacturer
Proprietary • Phone Products • Terminal s	Unknown	Unknown	Unknown	Unknown FCC can meet with stakeholders

Proposed Solution	Testing/ Implementation	Advantages/ Disadvantages	Consumer Requirements Supported	Milestones
True RJ-11 Connection	1. Develop Technical Information Document, 2. SRD, 3. Develop Standard 4. Notify TTY Phone Manufacturers	Advantages: • Supports full functionality • Support some of the embedded base of TTYs Disadvantages: • Physical size • Cannot use handset for VCO functions (may require separate device for HCO/VCO) • Requires additional power supply • Expensive • Bulky	1. Preferred over acoustic 2. Supported 3. Supported 4. Not Supported 5. TBD 6. Supported 7. Supported 8. Supported 9. Supported 10. N/A 11. N/A 12. N/A 13. N/A	This option is not considered a short-term solution by the Forum and therefore is not being pursued by this Forum at this time.

Proposed Solution	Testing/ Implementation	Advantages/ Disadvantages	Consumer Requirements Supported	Milestones
Vocoder Modifications		Not cost effective No modification to TTY Using Full rate Extensive international standards development and implementa-tion process. Could provide more reliable CER Potential to degrade voice quality. Error detection and correction would be lower for a data tone call compared to data services.	1. TBD 2. Supported 3. Supported 4. Supported 5. TBD 6. Supported 7. Supported 8. Supported 9. TBD 10. Supported 11. Supported 12. TBD 13. TBD	• Develop new standard. • Test new standard for baudot and voice.

PROPOSED DATA-BASED SOLUTIONS – Circuit-Switched

Proposed Solution	Testing/ Implementation	Advantages/ Disadvantages	Consumer Requirements Supported	Milestones
Inter-Working Function (IWF): • V.18 (Baudot) • Proprietary TTY Modem	• Complete Data SRD • CDMA existing IS-707 • TDMA existing IS-135 • Standards Modifications TBD based on SRD. • Test with existing TTYs for both inbound and outbound calls. • Test with PSAP, existing TTY using existing standards	Advantages: • Reliable Communications, as good as wireline. • World-wide Standard • Requires little or no modifications to existing TTY • Could support more platforms, TTYs, PDAs, and Laptops. Disadvantages: • Not all Carriers may choose to implement data services. • Compatible with all current Baudot standards, except Ultratec's Turbocode. • Require mobile connection interface to existing TTYs. • IWF do not support VCO • IWF with Baudot not commercially available	1. Supported 2. TBD 3. TBD 4. N/A 5. TBD 6. Supported 7. Supported 8. Supported 9. Not Supported 10. Supported 11. TBD 12. Supported 13. Supported	• Est. Timetable 12-18 months • Implement Baudot/V.18 in the IWF • Widespread deployment of the IWF • Update handsets to support data service.

Proposed Solution	Testing/ Implementation	Advantages/ Disadvantages	Consumer Requirements Supported	Milestones
3rd Party Gateway		Advantages: • Landlines TTY do not need to be modified. Disadvantages • Expensive to operate and maintain.	1. TBD 2. Not Supported 3. Not Supported 4. Supported 5. TBD 6. Supported 7. Supported 8. Supported 9. TBD 10. N/A 11. Not Supported 12. Supported 13. TBD	This option has not been fully explored by any members of the TTY Forum.
Proprietary	Unknown	Unknown	Unknown	Unknown FCC can meet with stakeholders

*V.18 Letter to modem manufacturers will be drafted by Dick Brandt under the TTY Forum letterhead requesting support for TTY issue.

CERTIFICATE OF SERVICE

I, Uzoma Onyeije, hereby certify that on this 4th day of December 1998, I caused copies of the foregoing "Petition for Waiver of AT&T Wireless Services, Inc." to be sent to the following by either first class mail, postage prepaid, or by hand delivery (*):

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Federal Communications Commission
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