

ORIGINAL

BEFORE THE
Federal Communications Commission
WASHINGTON, DC 20554

In the Matter of)
)
 DOBSON CELLULAR SYSTEMS, INC.) CC Docket No. 94-102
) RM-8143
 Petition for Waiver of Section 20.18(c) for Digital)
 Wireless Systems)

RECEIVED

DEC - 4 1998

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

To: Chief, Wireless Telecommunications Bureau

**DOBSON CELLULAR SYSTEMS, INC.
PETITION FOR WAIVER OF SECTION 20.18(C)**

Dobson Cellular Systems, Inc. ("Dobson"), hereby petitions the Bureau for waiver of Section 20.18(c) of the Commission's rules in regard to its digital cellular systems, effective January 1, 1999.¹ By this filing, Dobson demonstrates its "commitment to, and plans for, complying with Section 20.18(c)." Dobson demonstrates further that there are fundamental technological barriers to carrying TTY calls over digital networks such that providing this capability is not readily achievable under Section 255. As required by the *November 13 Order*, Dobson will supplement the instant Petition with additional responsive information that may become available, including information from vendors, every three months to indicate progress made toward implementation of TTY digital capability and to maintain the instant waiver.²

I. INTRODUCTION

The record in this proceeding demonstrates that industry has long struggled to implement a backward compatible solution for digital TTY capability.³ The Commission has now finally

¹ See 47 C.F.R. § 1.3; *Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, Order*, CC Docket No. 94-102, DA 98-2323, ¶¶ 11-12 (WTB rel. Nov. 13, 1998) ("*November 13 Order*").

² *November 13 Order* ¶ 11.

³ See *E911 Reconsideration Order*, 12 FCC Rcd. 22665, 22687-22694 (1997); *E911 First*

(continued...)

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acknowledged that “users of TTY devices will not be able to operate such devices in conjunction with digital phones at any time in the near future.”⁴ In considering petitions for waiver of Section 20.18(c), the Commission must consider not only the complex technical and engineering issues, but the legal standards governing this access issue as discussed in the Access Board’s guidelines and set forth in Section 255.⁵ Further complicating this matter is the Commission’s treatment of the “consumer concerns” as *de facto* technical standards.⁶ Finally, making a solution even more elusive is that TTY devices continue to use 1940’s technology, even though there are now billions of dollars invested into digital switching equipment, handsets, cell sites and other equipment — all deployed using technologies and digital protocols deemed incompatible with existing TTY devices.⁷

Dobson’s cellular subsidiaries operate primarily analog/TDMA systems, although analog/CDMA is being deployed and will be operational in some markets in a few months. As the Commission is aware, testing of TTY devices over TDMA systems in a laboratory environment has generally revealed a CER of 2-10 percent. Dobson expects a similar CER for its own

³ (...continued)
Report and Order, 11 FCC Rcd. 18676, 18700-02 (1996); *E911 Notice of Proposed Rulemaking*, 9 FCC Rcd. 6170, 6180 (1994) (record was “not clear . . . what Commission rules or policies would be *necessary or appropriate* to ensure access to 911 services for TTY-like devices beyond *the general requirement* that services be compatible with such devices”).

⁴ *November 13 Order* ¶ 7.

⁵ See 47 U.S.C. § 255; *Architectural and Transportation Barriers Compliance Bd., Telecommunications Act Accessibility Guidelines*, 63 Fed. Reg. 5608 (Feb. 3, 1998) (“*Access Board Guidelines*”).

⁶ *November 13 Order* ¶¶ 7, 11; *Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, Order*, CC Docket No. 94-102, DA 98-1982, ¶¶ 8-9 (WTB rel. Sept. 30, 1998) (“*September 30 Order*”).

⁷ See TTY Forum Quarterly Status Report, filed October 14, 1998 in CC Docket No. 94-102, at 3 (“*October Report*”); CTIA/PCIA Comments, filed October 28, at 4-7.

TDMA systems. For the purpose of the instant Petition, Dobson will discuss its TDMA systems, but reserves the right to incorporate its future CDMA systems into the waiver in later filings.

II. DOBSON'S WAIVER SHOWING

While Dobson's ability to provide users of TTY devices with the capability to operate such devices in conjunction with digital wireless phones is entirely dependent on third party vendors, Dobson is taking necessary measures to evaluate possible solutions and provide such capability. In the near term, Dobson will continue to notify customers that TTY devices cannot be used over the digital components of its network (although they may be able to use such devices on Dobson's analog system). Currently, however, no commercially viable short-term solution is available. Moreover, Dobson's ability to effect such a technical solution is necessarily extremely limited. As the Commission is no doubt aware, standards are developed through industry consensus and, as such, except for the largest companies carrier participation is generally relegated to trade associations or technology groups. In this regard, Dobson supports and monitors the associations' efforts in the TTY Forum. Also in this regard, Dobson is entirely dependent on the availability of equipment and software from its primary vendors to comply with Section 20.18(c) and to obtain the information necessary to provide the information requested in the *November 13 Order*.⁸ Dobson has formally inquired from its vendors the commercial availability of these solutions and will provide responsive information on an ongoing basis as to the timing of deployment as it becomes available.

Subject to these limitations, Dobson has attempted to make some preliminary determinations as to which of the various solutions currently before the Commission may be feasible for the company's network and, the steps that will be necessary to implement a readily achievable

⁸ The Commission has previously acknowledged carriers' reliance on vendors for compliant equipment and software and granted waivers of the applicable rules. *See Roosevelt County Rural Tel. Coop., Inc.*, 13 FCC Rcd. 22, 42 (CCB 1997).

solution. Dobson will continue to monitor the Forum's testing and related efforts on an ongoing basis and will test the various solutions as they become commercially available from its vendors. Currently, based on information provided from vendors, it appears that a digital TTY solution is not readily achievable for Dobson's network.

A. Steps Taken to Provide Digital TTY Capability and Preliminary Timetables

Dobson's engineering personnel are evaluating the feasibility of implementing the various data solutions currently under consideration at the TTY Forum. Dobson has formally requested information from its vendors as to the availability of potential solutions and the necessary steps for implementing such a solution. The information herein is based on currently available information and material provided by Dobson's vendors and is necessarily preliminary.⁹ Dobson will update the Commission as new information becomes available.

1. Problems with TDMA Generally

As CTIA and PCIA have reported to the Commission, the primary causes for incompatibility between TTY devices and TDMA systems are vocoder distortion, received signal level, multi-path fading effects, receiver attack time, handoffs, adjacent and co-channel interference, various network effects, and the performance of TTY devices.¹⁰ As the Forum has recently reported to the Commission, TDMA handsets and systems have already been tested using a variety of vendors' products.¹¹ TDMA standardized vocoders are optimized for voice, and are not designed to carry TTY calls. Testing by Nokia, as reported to the Commission, reveals that under favorable *laboratory* conditions, the CER resulting from vocoder distortions along ranges

⁹ See Attachment A, Declaration of Verland Brewster.

¹⁰ CTIA/PCIA Comments at 5.

¹¹ See October Report, at 4-7.

from between 2-6 percent and, indeed, "Nokia cautions that . . . actual field conditions may provide a much higher CER."¹²

2. No Reliable Voice-Based Solutions Are Commercially Available or Readily Achievable

General Obstacles to Short Term Solutions. As discussed below, the Forum has already determined that the voice-based solutions currently before the Commission, whereby the Baudot signal passes through the vocoder, would result in an unacceptably high CER. Dobson's vendor Nortel has done some testing and informed the Company that with *some* handset/TTY device combinations, completion of a 911 call *may be* feasible over its TDMA air interface equipment with sufficient error free text to elicit proper 911 response. This is dependent upon a variety of factors, however, including the type of vocoder used in the system, the type of TTY equipment used, and the type of handset used. Thus, proper 911 response is not guaranteed, as indicated by the CER range discussed above. Moreover, industry standards to support TTY operation are not currently defined, and it typically takes 12-18 months from the adoption of standards to the commercial availability of products. Nortel also has indicated that *TTY manufacturers* must be integrally involved in the standards process as well, as the vast majority of TTYs are not designed to connect to wireless handsets, and that it is unaware of any TTY device that has been designed for its tones to be carried error-free over digital vocoders. While Dobson will continue to discuss possible solutions with its vendors, it does not appear that a reliable voice-based solution is currently commercially available or readily achievable.

Direct Audio Connection. Dobson understands that this requires modification of and an adapter to TTY devices, yields no improvement in the CER, and supports only limited features.

¹² CTIA/PCIA Comments at 5-6. Lucent, a Dobson vendor, has reached similar conclusions *with respect to static conditions*, but has indicated that the CER increases considerably under drive conditions. Ericsson's TDMA testing also has resulted in a CER of 6-10 percent. *Id.* at 6.

Furthermore, the timetable for developing the necessary equipment has not been set by a manufacturer. Even where a 2.5 mm jack is supported, moreover, the vocoders in the handset will not reliably pass the audio tones generated by a TTY device, resulting in an unacceptably high CER. Dobson thus agrees with the Forum that this is not a viable short-term solution and is not currently pursuing this proposed solution.

Acoustic Solution. Dobson agrees with the Forum that this is not a viable short-term solution. It is Dobson's understanding that the vocoders in the handset will not reliably pass the audio tones generated by a TTY device, thus resulting in an unacceptably high CER; that it is highly susceptible to background noise; and that it requires a landline handset and cable. A timetable also has yet to be developed by the manufacturer. Dobson is therefore not currently pursuing this proposed solution.

RJ-11-Type Modular Connection/Jack and True RJ-11 Connection. Presumably, connecting a TTY device to a TDMA handset using a RJ-11 connection will transmit analog tones. Thus, when a RJ-11 connection is provided to connect an external TTY device to a TDMA handset, the vocoders in the handset will not reliably pass the audio tones generated by a TTY device, resulting in an unacceptably high CER. Dobson also understands that the equipment required is large and bulky, use of the handset is limited, an additional power supply is required, and it is expensive. Dobson thus agrees with the Forum that this is not a viable short-term solution and is therefore not currently pursuing this as an option.

Proprietary Solutions. By definition, other carriers' proprietary solutions are not available to Dobson to evaluate and test, and such solutions would need to be tested against its network. Dobson will evaluate the feasibility of such solutions as they become available.

Receiver/Repeater Solution. The receiver-repeater solution proposed by Lucent holds promise and, if feasible, would likely enable customers to use voice-based solutions. It is

Dobson's understanding, however, that this solution will require both handset and network modifications, the availability (and timing) of which is strictly dependent on vendors. It is also Dobson's understanding that this solution is based only upon simulation results in a lab environment. It will be necessary, moreover, to find a mobile manufacturer that would agree to implement the receiver/repeater on a terminal. It is Dobson's understanding that Lucent has had encouraging discussions with one vendor. However, this solution would require additional testing and an analysis has not been produced by the TTY Forum.

3. Long-Term Data-Based Solutions

Dobson has reviewed the data-based solutions currently before the Commission in the Workplan. As with any solution, Dobson can definitively determine their feasibility for its network only as they become commercially available — a date entirely dependent on vendors. As they are not commercially available, they also are not readily achievable, as required under Section 255. Further, while some of the solutions may be technically feasible, they can be implemented only at considerable cost and, in any event, will not likely be commercially available for a considerable period of time.

v.18/IWF Solution. This solution involves the use of an Inter-Working Function ("IWF") platform that converts TTY-generated Baudot signals to ASCII and performs other TTY call functions. According to vendors, these solutions would provide reliable communications equivalent to landline service, require little or no modifications to existing TTY devices, and are also compatible with nearly all Baudot standards. However, not all carriers may choose to implement wireless data services and Dobson does not currently provide such service. For carriers that provide such service, a mobile connection interface to existing TTYs will be required. Also, there is no known vendor/manufacturer that is producing the necessary v.18 modem. Moreover, IWF also does not support VCO, and IWF with Baudot is not commercially

available. The Forum has indicated that the minimum expected period for development and manufacturing is 12-18 months, and Dobson believes additional time would be needed for carrier testing and implementation. Thus, while Dobson will consider this solution, for these reasons this is not a solution that appears to be readily achievable for Dobson at this time.

Third Party Gateway. Dobson understands that this approach entails providing a TTY-911 user with a number to access an IWF operated by a third party. This IWF would then complete the call to a landline TTY. Dobson has not explored this in detail and will continue to monitor Forum efforts to evaluate the viability of this option. Timetables and cost estimates are not presently available. Dobson understands, however, that it may be prohibitively expensive to operate and maintain.

B. Steps to Address Consumer Concerns

The Commission has decided to require carriers to “specify with sufficient particularity” the “reasonable steps the carrier will take to address the consumer concerns referenced in the *September 30 Order*” in order to obtain a Section 20.18(c) waiver.¹³ Dobson hereby reserves the right to challenge such action if the Commission deems the consumer concerns to be mandatory technical standards, as they have not gone on public notice and are not part of the rules.

As the Commission is aware from the most recent Forum report, industry has determined that the various voice- and data-based solutions support the consumer concerns in varying degrees.¹⁴ As discussed above, while the voice-based solutions would address most customer concerns, the various voice-based solutions are not feasible for Dobson’s network, as the CER is unacceptably high. It appears, however, that the Lucent repeater/receiver solution, if commer-

¹³ *November 13 Order*, ¶¶ 10-11.

¹⁴ See TTY Forum Workplan at 11-17 (“Workplan”). For reference purposes, the Forum’s Workplan indicating the extent to which the various solutions appear to support the consumer concerns is attached. See Attachment B.

cially available, may make voice-based solutions viable, and Dobson will evaluate this proposal as it evolves through the standards process. It also appears that the data-based proposals which may be feasible for Dobson's network support most of the consumer concerns, with the notable exception of VCO. Dobson, however, does not currently provide wireless data capability. Moreover, Dobson cautions that additional testing may be required to confirm the extent to which the consumer concerns are supported.

III. DIGITAL TTY COMPATIBILITY IS NOT YET READILY ACHIEVABLE AND GOOD CAUSE EXISTS FOR WAIVER OF THE RULES

The Americans with Disabilities Act ("ADA") and Section 255 of the Act form the principal basis for the Commission's wireless TTY requirement.¹⁵ Dobson agrees that Section 255 clearly applies to digital TTY compatibility.¹⁶ Importantly both the ADA and Section 255 limit the Commission to requiring carriers to take appropriate compliance measures where "readily achievable"¹⁷ — *i.e.*, "easily accomplishable and able to be carried out without much difficulty or expense" taking into account factors relating to the nature and cost of the action.¹⁸ The Commission has proposed a three-step inquiry for determining "whether a particular telecommunications access feature" is "readily achievable": (1) is the feature feasible? (2) if so, what would be the expense of providing the feature? and (3) given its expense, is the feature practical? By this standard, and any reasonable interpretation of Section 255, digital/TTY

¹⁵ See *E911 Reconsideration Order* at 22686-87; *E911 First Report and Order*, 11 FCC Rcd. at 18699; *E911 NPRM* 9 FCC Rcd. at 6180, n.55.

¹⁶ Section 255 requires service providers to "ensure that [its] service is compatible with *existing peripheral devices or specialized customer premises equipment commonly used by individuals with disabilities* to achieve access, *if readily achievable.*" 47 U.S.C. § 255(a) (emphasis added). Indeed, the Access Board has already determined that specialized customer premises equipment includes some TTY devices. 63 Fed. Reg. at 5615-16.

¹⁷ 47 U.S.C. § 255(c).

¹⁸ See 42 U.S.C. § 12181(9), 47 U.S.C. § 255(a)(2).

compatibility is not readily achievable by January 1, 1999, and will not be readily achievable for a considerable period of time.¹⁹

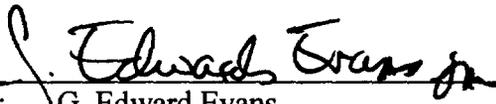
Finally, for the reasons discussed herein, circumstances warranting waiver of Section 20.18(c) are present here and the public interest will be served by grant of the waiver.²⁰ Users of TTY devices may continue to use analog wireless handsets, and Dobson will continue to notify consumers of the need to use to analog technologies until a digital solution is implemented.

V. CONCLUSION

For the foregoing reasons, Dobson respectfully requests that the Commission grant the instant petition waiver of Section 20.18(c) until a long-term TTY solution is readily achievable and implemented.

Respectfully submitted,

DOBSON CELLULAR SYSTEMS, INC.


 By: G. Edward Evans
 President and Chief Operating Officer

13439 North Broadway Extension
 Oklahoma City, OK 73114
 (405) 391-8500

December 4, 1998

¹⁹ The Access Board has determined that its guidelines are “‘prospective in nature’, and apply to *future* products. *Access Board Guidelines*, 63 Fed. Reg. at 5612; Indeed, the Commission itself has agreed, tentatively concluding that “once a product is introduced in the market without accessibility features that were not readily achievable at the time, Section 255 *does not require that the product be modified to incorporate subsequent, readily achievable access features.*” *Section 255 NPRM* ¶ 120 (emphasis added).

²⁰ Waiver of the Commission’s rules is warranted where special circumstances warrant a deviation from the general rule and such deviation will serve the public interest. *See Northeast Cellular Tel. Co., L.P. v. FCC*, 897 F.2d 1164, 1166 (D.C. Cir. 1990); *WAIT Radio v. FCC*, 418 F.2d 1153, 1159 (D.C. Cir. 1969).

DECLARATION/VERIFICATION

I, Verland Brewster, state as follows:

1. I am Vice President, Network Operations at Dobson Cellular Systems, Inc. ("Dobson").
2. As such, I am familiar with Dobson's efforts to comply with Section 20.18(c) of the Federal Communications Commission's rules and with the subject matter of the attached Petition for Waiver.
3. I have read the foregoing Petition for Waiver and the facts and statements contained therein are true and correct to the best of my knowledge, information and belief.


Verland Brewster

Dated: 12-4-98



CTIA

Cellular Telecommunications Industry Association

EX PARTE OR LATE FILED

Andrea D. Williams
Assistant General Counsel

November 9, 1998

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FEDERAL COMMUNICATIONS COMMISSION

Ms. Magalie Salas
Secretary
Federal Communications Commission
1919 M Street, N.W., 2nd Floor
Washington, DC 20554

Re: CC Docket No. 94-102✓
E9-1-1/TTY Compatibility Requirements

Dear Ms. Salas:

On November 9, 1998, the Cellular Telecommunications Industry Association ("CTIA") on behalf of the Wireless TTY Forum hand-delivered the attached letter and documents to the following:

The Honorable William E. Kennard, Chairman
The Honorable Susan Ness, Commissioner
The Honorable Harold Furchtgott-Roth, Commissioner
The Honorable Michael K. Powell, Commissioner
The Honorable Gloria Tristani, Commissioner

Mr. Ari Fitzgerald, Legal Advisor, Office of the Chairman
Mr. Dan Connors, Legal Advisor, Office of Commissioner Ness
Mr. Paul Misener, Senior Legal Advisor/Chief of Staff,
Office of Commissioner Furchtgott-Roth
Mr. Peter Tenhula, Legal Advisor, Office of Commissioner Powell
Ms. Karen Gulick, Legal Advisor, Office of Commissioner Tristani

Office of Engineering and Technology

Mr. Dale Hatfield, Chief

Wireless Telecommunications Bureau

Mr. Daniel Phythyon, Bureau Chief
Mr. John Cimko, Chief, Policy Division
Ms. Nancy Booker, Deputy Chief, Policy Division
Ms. Elizabeth Lyle, Senior Legal Advisor, Office of the Bureau Chief
Mr. Marty Liebman, Engineer, Policy Division



FCC Disabilities Issues Task Force

Ms. Meryl Iove, Director

Ms. Pam Gregory, Deputy Director

Pursuant to Section 1.1206 of the Commission's Rules, an original and one copy of this letter and its attachments are being filed with your office. If you have any questions concerning this submission, please contact the undersigned.

Sincerely,

A handwritten signature in cursive script that reads "Andrea D. Williams". The signature is written in black ink and is positioned above the printed name and title.

Andrea D. Williams

Assistant General Counsel

Attachments



CTIA

Cellular Telecommunications Industry Association

Andrea D. Williams

Assistant General Counsel

November 9, 1998

The Honorable William Kennard
Chairman
Federal Communications Commission
1919 M Street, NW, Room 814
Washington, DC 20554

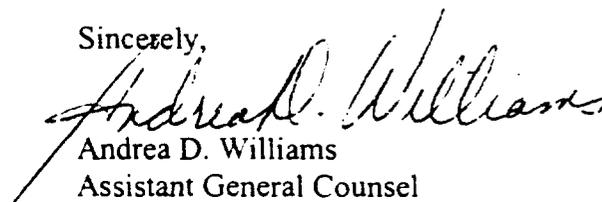
**Re: CC Docket No. 94-102
E9-1-1/TTY Compatibility Requirements
Revised Workplan**

Dear Mr. Kennard:

Wireless TTY Forum – 9 met on November 4-5, 1998, in Baltimore, Maryland to finalize its Workplan and the Standard Test Procedure for CDMA, GSM, TDMA and iDEN digital technologies. The attached Workplan and cover report of the Standard Test Procedure have been updated to reflect decisions made by the Forum last week. These documents should be included with the documents filed on October 30, and November 3, 1998, in response to the Wireless Telecommunications Bureau's Order granting a 45-day extension of the suspension of enforcement of the Commission's rules governing TTY access to 9-1-1 over digital wireless systems.

If you have any questions concerning this submission, please contact me at (202) 736-3215.

Sincerely,


Andrea D. Williams
Assistant General Counsel

Attachments (2)



WIRELESS TTY FORUM WORKPLAN: TTY ACCESS OVER DIGITAL WIRELESS SYSTEMS

Since September 1997, the wireless telecommunications industry (wireless carriers and phone manufacturers), manufacturers of TTY equipment, emergency and relay service provider (9-1-1 and TRS), and consumer organizations that represent individuals who are deaf and hard-of-hearing ("Stakeholders") have undertaken intensive collaborative efforts through the Wireless TTY Forum to develop technically feasible solutions for TTY users to access 9-1-1 over digital wireless systems. To date, the TTY Forum's primary focus has been voice-based solutions in an effort to find an acceptable short-term solution and to meet the FCC's compliance date. The TTY Forum has also proposed several data-based solutions for TTY access to digital wireless systems.

The wireless industry is committed to continuing intensive collaborative efforts to provide viable and practical solutions for TTY access over digital wireless systems not only for 9-1-1 purposes but also to meet the industry's obligations under Sections 225 and 255 of the Communications Act of 1934, as amended. The wireless industry acknowledges that it cannot resolve this issue in a technical vacuum, and that the wireless industry must continue to work cooperatively with TTY manufacturers, the appropriate consumer organizations and organizations representing public safety answering points ("PSAPs") to resolve this issue. Accordingly, the Wireless TTY Forum proposes the following Workplan with scheduled milestones for developing and implementing technical solutions for TTY users to access 9-1-1 over digital wireless systems.

PROPOSED WORKPLAN

I. Assessment of Test Results and Finalization of Test Plan

The TTY Forum has provided preliminary test results and demonstrations on several potential methods for addressing incompatibility between TTYs and the different wireless digital technologies. The TTY Forum developed a uniform test script that manufacturers representing various digital technologies and at least one TTY manufacturer have used in their testing. Test results, however, indicate a wide variance in the character error rate. Furthermore, trying to isolate the cause of the problem within a short time period has been a Herculean yet circumspect task with no conclusive results to date. While the goal is to minimize the character error rate, particularly in 9-1-1 situations, a certain character error rate is inherent with wireline and wireless, both analog and digital technology, and TTY devices.

The co-chairs of the TTY Forum have acknowledged the need for the development of a consistent test methodology, a uniform method of evaluating the test results ("test plan") and TTY performance standards to determine the minimal level of character error rate that TTY users can expect with certain digital technologies used with certain TTY devices.¹

A. Independent review and assessment of tests conducted to date.

The TTY Forum has requested Dr. Dale Hatfield, Chief of the FCC's Office of Engineering and Technology ("OET") to review and assess the tests conducted to date. It is anticipated that Mr. Hatfield will provide guidance to the TTY Forum on the soundness of the research conducted to date and identify any discontinuity or gaps in such research that should be explored in the development of a standardized test procedure.

¹ Since the September 1998 TTY Forum, the wireless industry has reviewed the initial test results and has concluded that additional testing would not yield new or significant information on character error rates. The wireless industry has acknowledged that there does not appear to be a voice-based solution in the near future which 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 the character error rate achieved with analog air interface, *i.e.*, less than 1%. Nevertheless, the wireless industry has agreed to conduct further testing to assess character error rates and in accordance with the standardized Test Procedure.

Target Date

Review and assess tests conducted to date -**Task Completed**

B. Finalization of a Standard Test Procedure

The TTY Forum with the assistance of the wireless digital technology groups² shall develop a uniform test process designed to limit and control test variables and establish a test methodology yielding better consistency in determining and comparing character error rates ("CER") across the various digital wireless technologies (CDMA, TDMA, GSM 1900, iDEN). Each wireless digital technology group has assumed responsibility for modifying the test process to accommodate testing variances of that technology.

- ◇ Draft Test Procedure – **Task Completed**
- ◇ Submit Test Process to Wireless Digital Technology Groups – **Task Completed**
- ◇ Responses due from wireless digital technology groups regarding modifications, locations of test facilities and test schedules – **10/28/98**
- ◇ Review responses from wireless digital technology groups (Test Plan Sub-task Group) – **10/28/98 – 10/29/98**
- ◇ Submit Test Procedure to FCC and distribute to wireless manufacturers and carriers – **10/30/98**
- ◇ Status Report to TTY Forum – **11/4/98**
- ◇ Review and Feedback on Test Procedures – **TBD by FCC**

C. Conduct additional tests using Test Procedures and compare new results

Each wireless digital technology group shall identify at least one test facility and advise the TTY Forum as to the availability of the test facility in order to commence testing prior to April 1999.³ Wireless manufacturers and carriers will conduct tests in accordance with the test schedules submitted and return results to

² For purposes of the Workplan, wireless digital technology groups refers to the CDMA Development Group ("CDG"), GSM North America, and Universal Wireless Communications Consortium ("UWC Consortium").

³ GSM NA has indicated that it plans to commence testing as soon as possible with a target date of January 1999 to provide test results to the TTY Forum and the FCC, provided that the following are true: 1) the test specification with modifications suggested by the GSM NA is approved and released by October 30, 1998; 2) lab based testing with real world conditions is accepted; 3) the test specification does not change dramatically; 4) manufacturers can assist the test facilities to set up the test; and 5) no unforeseen restrictions are placed on the testing.

the TTY Forum and the FCC as soon as available. TTY Forum members shall concurrently continue to research acceptable error rates, voice-based and data-based solutions during the test schedule.

The TTY Forum will provide advance notice to all interested parties of the test dates, location of the test laboratories, and contact person. 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.

Goals and Target Dates

Refer to Test Procedure for list and availability of test labs and scheduled target dates for conducting the additional tests.

D. Analysis of test results and recommendations

The TTY Forum will appoint a sub-group comprised of representatives from each of the Stakeholder groups. The sub-group will review and analyze the test results and provide specific comments and recommendations to the TTY Forum and the FCC based on the test results.

Goals and Target Date

January 1999

II. User Requirements

Consumer representatives of the TTY Forum have provided the TTY Forum with two documents outlining their criteria with respect to solutions: *Consumer Approved Criteria for Acceptance of 'One Phone Model Per Service Provider as of October 1' Proposal* ("Consumer Criteria Document") and *September 10, 1998 Memorandum from Consumer Representatives to TTY Forum* ("September 1998 Consumer Memo").

A. Consumer Criteria Document

The purpose of the document was to stimulate discussion and solicit the views of the wireless carriers and manufacturers participating in the TTY Forum. At the September 1998 TTY Forum Meeting, CTIA, on behalf of its members, submitted its comments to the criteria set forth in the Consumer Criteria Document.⁴ CTIA's senior staff and the drafters of the Consumer

⁴ Letter from Andrea Williams, Assistant General Counsel, Cellular Telecommunications Industry Association, to Ed Hall and Mary Madigan, Co-

Criteria Document shall meet at a mutually agreeable time to address the criteria in the context of CTIA's inter-disciplinary approach to accessibility under Section 255.

Goals and Target Date

Meeting to be held on a mutually agreeable date but no later than December 15, 1998.

B. September 1998 Consumer Memo

On September 10, 1998, representatives of the consumer groups circulated a document to members of the TTY Forum outlining a new set of criteria to address only functional characteristics of any proposed solution for TTY access to digital wireless systems.⁵ In accordance with the FCC's Extension Order, the TTY Forum shall consider whether the criteria set forth in the September 1998 Consumer Memo is supported in the proposed voice-based and data-based solutions set forth in this Workplan. Consideration of the criteria shall be documented in a matrix of proposed technical solutions.

Goals and Target Date

- ◇ Develop matrix of proposed technical solutions - **Task completed**
- ◇ Finalize matrix (Task Force Members) - **Task Completed**
- ◇ Submit matrix with Workplan to FCC - **10/30/98**

III. Performance Standards for TTY Devices

Over the past several months, there has been significant discussion concerning the lack of uniform performance standards among TTY devices. Manufacturers of wireless handsets have indicated that such standards are critical in trying to address the technical challenges of voice-based solutions, including passing the Baudot signal of a TTY device over a digital air interface without any modification to the handset

Chairs, Wireless TTY Forum, Sept. 8, 1998. Attached to October Quarterly Status Report as Appendix Q.

⁵ Memorandum from Consumer Representatives to TTY Forum, Sept. 10, 1998. Attached to October Quarterly Status Report as Appendix R.

The FCC's Wireless Telecommunications Bureau has elevated the new list of criteria by attaching it to the Extension Order as an appendix and holding it out as an example of what consumer groups would like to have incorporated into any solution implemented by the Forum, and therefore the workplan. See Extension Order at 4.

or the TTY device. The TTY Forum also discussed the need for a list of "most often used" TTY devices and specifications for each device if TTY manufacturers are not using the EIA Draft Standard.⁶ Two TTY manufacturers (Ultratec and Ameriphone) have agreed to identify the typical operating characteristics of the majority of existing TTYs and submit this information as a contribution to the TTY Forum. The TTY Forum will also compile a list of the TTY devices used in the tests. A letter will be sent to a third TTY manufacturer (Krown) again requesting their participation in the TTY Forum, specifically providing typical operating characteristics of its existing TTYs.

Goals and Target Dates

Discussion of TTY manufacturers' willingness to incorporate EIA Draft Standard - **TTY Forum - 9 (11/4/98-11/5/98)**

Submission of document listing typical operating characteristics of the majority of existing TTYs – **Week of 11/9/98**

Letter to third TTY manufacturer – **Week of 11/9/98**

IV. Proposed Technical Solutions

To provide TTY users with a variety of solutions and to allow manufacturers and service providers maximum flexibility to develop innovative technology and services for TTY users, the TTY Forum has posed several voice-based and data-based solutions. The TTY Forum presently does not support any one solution over others. The TTY Forum has developed a matrix of proposed voice-based and data-based solutions. The matrix sets forth the implementation stages, the advantages and disadvantages of each solution, whether the consumer requirements set forth in the September 1998 Consumer Memo are supported, and the corresponding milestones scheduled for each phase of implementation. Please refer to Appendix C: Solutions Matrix and WorkPlan for target dates where applicable.

A. Proposed Voice-Based Solutions

The TTY Forum defines voice-based solutions as those solutions whereby the Baudot signal passes through the Vocoder. Proposed voice-based solutions include connection method solutions such as:

- ◆ Direct Audio Connection
- ◆ RJ-11-type Modular Connection/Jack (Analog Solution)
- ◆ True RJ-11 Connection

⁶ See Electronic Industries Association, Memorandum to Parties Interested in EIA Standards Project PN 1663, Telecommunications Devices for the Deaf, May 16, 1988, 1. Attached to October Quarterly Status Report as Appendix J.

- ◆ Acoustic Solution
- ◆ Proprietary Solutions

Other proposed voice-based solutions include solutions that may require modification of the Vocoder.

Direct Audio Connection

It appears that coupling via a direct audio connection between the TTY device and a digital wireless handset, *i.e.*, a 2.5 mm audio interface, is a preferred voice-based solution for some wireless carriers. A proposal for a wireless phone 2.5mm audio interface to TTY devices has been submitted to the TTY Forum.⁷ The proposal noted that audio output and input levels are different for each make and model phone. Thus, manufacturers of wireless phones would need to provide a special adapter with standard levels. Moreover, audio output and input levels of TTY devices have yet to be defined. The proposal recommended a "common interface" to resolve the variance in output and input levels.⁸ While the TTY Forum has reviewed a draft Technical Information Document ("TID"), the TID will be finalized at TTY Forum-9 and will be distributed to manufacturers and carriers shortly thereafter. Members of the TTY Forum will also prepare a Standards Requirements Document ("SRD") for submission to TIA TR45 in early December 1998.

Acoustic Solution

Ericsson has indicated that it plans to pursue this option. Due to the confidential nature of Ericsson's marketing plans for this option, the TTY Forum recommends that the FCC meet with the manufacturer under confidentiality to discuss specific implementation plans and scheduled milestones.

RJ-11-type Modular Connection/Jack (Analog Solution)

The TTY Forum has discussed this option and does not consider it to be a viable short-term solution. Thus, the Forum has not pursued development or implementation of this option.

True RJ-11 Connection

⁷ See Proposed - Wireless Phone 2.5mm Audio Interface to TTY/TDD ("2.5mm Audio Interface Proposal"). Attached to October Quarterly Status Report as Appendix K.

⁸ See 2.5mm Audio Interface Proposal at 3-4. Attached to October Quarterly Status Report as Appendix K.

The TTY Forum has discussed this option and does not consider it to be a viable short-term solution. Thus, the Forum has not pursued development or implementation of this option.

Proprietary Solutions

Several proprietary solutions such as the Mobility™ TTY, an enhanced TTY device developed by Lober & Walsh Engineering, the AxCell Interface Device developed by Sendele Wireless Communications and the RangeStar™ Technology developed by RangeStar International, have been presented to the TTY Forum for consideration as solutions. Due to the proprietary nature of these solutions, the TTY Forum has not been privy to how soon these products will be made commercially available. The TTY Forum recommends that the FCC meets with each company separately and under confidentiality to discuss specific implementation plans and scheduled milestones.

B. Proposed Data-Based Solutions (Circuit-Switched)

The proposed data-based solutions include Inter-Working Function solutions, Third Party Gateway and Proprietary Data-based solutions. The TTY Forum has adopted a SRD for Circuit-Switched Data, which will be submitted to TR45 in early December 1998.

Inter-Working Function Solutions

These solutions rely on the development and installation of the appropriate inter-working function (IWF) software into a wireless carrier's network infrastructure. There are at least two proposed IWF solutions: the V.18 standard and proprietary TTY modems. While the standards for GSM, TDMA, iDEN and CDMA support the IWF functionality, minor modifications are necessary for TTY applications. Implementation of IWF solutions 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 set forth in the Matrix 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.

The TTY Forum will send a letter to IWF and modem manufacturers notifying them about the TTY Forum's work and the demonstrations of an IWF (V.18) as one type of viable data-based

solutions. The letter will also request information and the projected time period concerning the incorporation of V.18 standard.

Letter to IWF and modem manufacturers: **Week of 11/9/98**

Third-Party Gateway Solution

Another proposed data-based solution is a Third Party Gateway Solution, which is a solution, using the Inter-working function (IWF) but it need not be installed in every carrier's network. A third party vendor would supply a number for a TTY user to call into and then complete the call to a landline TTY using the IWF.

The TTY Forum discussed this option at the November 1998 Forum. The Forum and does not consider it to be a viable solution. Thus, the Forum will not pursue development or implementation of this option.

Proprietary Data-based Solutions

To be reviewed at future TTY Forums.

- V. Notification to Subscribers and Potential Subscribers who use TTYs**
In compliance with the FCC's rules, wireless carriers have notified subscribers and potential subscribers that they may not be able to use TTYs to access 9-1-1 over digital wireless systems. Wireless carriers, with the support of the wireless trade associations, the consumer advocacy groups, TTY manufacturers and wireless handset manufacturers, will continue to notify subscribers and potential subscribers at appropriate intervals until a product is commercially available.

Goals and Target Date

On-going until product is commercially available.

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 |
|--|---|--|--|---|
| <p><i>Direct Audio Connection</i> (2.5 mm Jack – Preferred Method)</p> | <ol style="list-style-type: none"> 1. Finalize Technical Information Document, 2. SRD, 3. Develop Standard, SDO 4. Notify TTY Phone Manufacturers | <p>Advantages:</p> <ul style="list-style-type: none"> • 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 <p>Disadvantages:</p> <ul style="list-style-type: none"> • Requires modification/ adapter to TTY • Yields no inherent improvement to CER • Supports only limited features | <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 1. Nov 1998 2. Submit to TR45– Dec 1998 3. Ericsson to identify timetable with TR45 actual date to be posted on listserve 4. TBD by #3 |

| Proposed Solution | Testing/ Implementation | Advantages/ Disadvantages | Consumer Requirements Supported | Milestones |
|--|---|--|--|--|
| <p><i>RJ11-type Modular Connection/ Jack</i> (Analog Solution)</p> | <ol style="list-style-type: none"> 1. Develop Technical Information Document, 2. SRD, 3. Develop Standard 4. Notify TTY Phone Manufacturers | <p>Advantages:</p> <ul style="list-style-type: none"> • Could support full functionality • Could support some of the embedded base of TTYs <p>Disadvantages:</p> <ul style="list-style-type: none"> • Physical size • Cannot use handset for VCO functions (may require separate device for HCO/VCO) | <ol style="list-style-type: none"> 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 | <p>This option is not considered a short-term solution by the Forum and therefore is not being pursued by this Forum at this time.</p> |

| Proposed Solution | Testing/ Implementation | Advantages/ Disadvantages | Consumer Requirements Supported | Milestones |
|---|---------------------------------------|--|---|--|
| <p><i>Acoustic solution</i> – use of external landline handset</p> | <p>1. No Standardization required</p> | <p>Advantages:</p> <ul style="list-style-type: none"> • No standardization required • Supports most embedded base of TTYs • Very Low interface cost • Short development cycle • Easily accessible to standardized landline handsets <p>Disadvantages:</p> <ul style="list-style-type: none"> • Highly susceptible to background noise • Bulky – requires a landline handset and cable | <p>1. Could negatively impact CER</p> <p>2. Supported</p> <p>3. Supported</p> <p>4. Supported</p> <p>5. TBD</p> <p>6. Supported</p> <p>7. Supported</p> <p>8. Supported</p> <p>9. Supported</p> <p>10. N/A</p> <p>11. N/A</p> <p>12. N/A</p> <p>13. N/A</p> | <p>TBD by manufacturer</p> |
| <p><i>Proprietary</i></p> <ul style="list-style-type: none"> • Phone Products • Terminals | <p>Unknown</p> | <p>Unknown</p> | <p>Unknown</p> | <p>Unknown</p> <p>FCC can meet with stakeholders</p> |

| Proposed Solution | Testing/ Implementation | Advantages/ Disadvantages | Consumer Requirements Supported | Milestones |
|------------------------------|---|---|--|--|
| <i>True RJ-11 Connection</i> | <ol style="list-style-type: none"> 1. Develop Technical Information Document, 2. SRD, 3. Develop Standard 4. Notify TTY Phone Manufacturers | <p>Advantages:</p> <ul style="list-style-type: none"> • Supports full functionality • Support some of the embedded base of TTYs <p>Disadvantages:</p> <ul style="list-style-type: none"> • Physical size • Cannot use handset for VCO functions (may require separate device for HCO/VCO) • Requires additional power supply • Expensive • Bulky | <ol style="list-style-type: none"> 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 | <p>This option is not considered a short-term solution by the Forum and therefore is not being pursued by this Forum at this time.</p> |

| Proposed Solution | Testing/ Implementation | Advantages/ Disadvantages | Consumer Requirements Supported | Milestones |
|------------------------------|-------------------------|--|--|--|
| <i>Vocoder Modifications</i> | | <p>Not cost effective</p> <p>No modification to TTY</p> <p>Using Full rate</p> <p>Extensive international standards development and implementation process.</p> <p>Could provide more reliable CER</p> <p>Potential to degrade voice quality.</p> <p>Error detection and correction would be lower for a data tone call compared to data services.</p> | <ol style="list-style-type: none"> 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 | <ul style="list-style-type: none"> • 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 |
|--|---|---|--|---|
| <p>Inter-Working Function (IWF):</p> <ul style="list-style-type: none"> • V.18 (Baudot) • Proprietary TTY Modem | <ul style="list-style-type: none"> • 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 | <p>Advantages:</p> <ul style="list-style-type: none"> • 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. <p>Disadvantages:</p> <ul style="list-style-type: none"> • 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 | <ol style="list-style-type: none"> 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 | <ul style="list-style-type: none"> • 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 |
|-------------------------------------|------------------------|--|--|---|
| <i>3rd Party Gateway</i> | | Advantages: <ul style="list-style-type: none"> • Landlines TTY do not need to be modified. Disadvantages <ul style="list-style-type: none"> • 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 is not considered a viable solution by the Forum and therefore is not being pursued by this Forum at this time. |
| <i>Proprietary</i> | 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.

STANDARD TEST PROCEDURE

In order to meet the requirements of the FCC's October 30, 1998, deadline, the TTY Forum with the assistance of the wireless digital technology groups¹ developed and are finalizing a uniform test methodology ("Test Procedure") to compare character error rates technology by technology (CDMA, TDMA, GSM 1900, iDEN). The TTY Forum has developed four (4) separate documents that are specific to these individual technologies addressed, yet are equivalent in methodology and procedural guidelines necessary to record comparable test results within each technology. These documents are considered "living" documents and are subject to modifications upon initiating the Test Plan (s) described.

While the intent of these documents are to provide uniform test guidelines whereby achieving comparable test results for all technologies, the TTY Forum clearly understands that there are differences within each technology. Therefore, all proposals for change will be reviewed to ensure that the documents do not lose the intended "standardization" between technologies for which they were developed. The Test Procedure documents for the digital wireless technologies CDMA, TDMA, iDEN, and GSM 1900 have been filed in the FCC's E9-1-1 Docket, CC Docket 94-102.

Below is a list of testing facilities, recommended dates, as provided by each wireless digital technology group.

GSMNA

Ericsson Facility

Cetecom Facility

Nokia Type Approval Center

GSM NA plans to commence testing as soon as possible with a target date of January 1999 to provide test results to the TTY Forum and the FCC, provided that the following are true: 1) the test specification with modifications suggested by the GSM NA is approved and released by October 30, 1998; 2) lab based testing with real world conditions is accepted; 3) the test specification does not change dramatically; 4) manufacturers can assist the test facilities to set up the test; and 5) no unforeseen restrictions are placed on the testing.

¹ For purposes of the Workplan, wireless digital technology groups means the CDMA Development Group ("CDG"), GSM North America, and Universal Wireless Communications Consortium ("UWC Consortium").

CDG

Sprint PCS Test Facility

Sprint PCS has commenced testing and is nearly complete with their testing activities. They have used Samsung handsets in their tests.

Bell Atlantic Mobile Test Facility

Bell Atlantic Mobile will test the following handsets: Audiovox, LGIC, Motorola, Nokia, QUALCOMM, and Sony.

Initial tests to be completed by mid-December with all tests completed by late December 1998.

UWCC

AT&T Wireless Services has offered its test facilities for TDMA tests. They anticipate testing to commence in early January 1999, if not sooner.

iDEN

Motorola Test System Facility in Plantation, Florida

Testing to commence: December 15, 1998*

*Date is subject to change. Motorola will attempt to move the date earlier, if possible.