

Before the  
**FEDERAL COMMUNICATIONS COMMISSION**  
Washington, DC 20554

In the Matter of	)	
	)	
Misuse of Internet Protocol (IP) Captioned	)	CG Docket No. 13-24
Telephone Service	)	
	)	
Telecommunications Relay Services and	)	CG Docket No. 03-123
Speech-to-Speech Services for Individuals	)	
with Hearing and Speech Disabilities	)	
To: The Commission		

**COMMENTS OF ULTRATEC, INC.**

Pamela Y. Holmes  
Executive Director,  
Consumer & Regulatory Affairs  
Ultratec, Inc.

October 16, 2018

## **TABLE OF CONTENTS**

I.	FUNCTIONAL EQUIVALENCE SHOULD BE THE PRIMARY OBJECTIVE OF IP CTS .....	2
A.	To Achieve Functional Equivalence, IP CTS Should Benefit All Users Under Adverse Conditions in a Transparent Manner .....	2
B.	The Commission Should Refrain from Mandating the Use of Particular Technologies by IP CTS Providers .....	4
C.	Regulations Aimed at Improving Efficiency Must Not Undermine Functional Equivalence .....	6
II.	THE FCC SHOULD RELY ON PROVIDERS TO ESTABLISH IP CTS PERFORMANCE METRICS .....	7
A.	A Transcription Accuracy Performance Measure Should Take into Account the Effect of Transcription Errors on the Meaning of a Hearing Party’s Speech .....	8
B.	Any Synchronicity Performance Measure Must Take Into Account the Need to Maintain Transcription Accuracy .....	9
C.	The Commission Should Establish Only a Minimum Transcription Speed .....	9
D.	Performance Measures Related to Dropped or Disconnected Calls Only Should Be Applied to IP CTS Provided Via an App, Website, or VoIP Link .....	10
E.	Performance Metrics Should be Evaluated by Independent and Neutral Third Parties Using Pre-Recorded Test Scripts That Reflect Ideal, Typical, and Adverse Conditions .....	10
III.	CONCLUSION .....	13

## **EXECUTIVE SUMMARY**

Consistent with its statutory mandate, the Commission's primary objective when advancing its regulatory framework applicable to Internet protocol captioned telephone service ("IP CTS") providers should be to ensure functional equivalence. IP CTS must satisfy the needs of *all* deaf and hard-of-hearing users, including those users with the most profound needs, under *all* conditions, including the non-ideal, real-world conditions in which IP CTS is actually used. In addition, an important aspect of functional equivalency is the transparency of IP CTS to both the hearing party and the user. Although encouraging the use of new and off-the-shelf technologies is beneficial, the Commission should not mandate the incorporation of any particular technology. Similarly, the Commission should refrain from adopting new regulations in an effort to promote efficiency by reducing waste, fraud, and abuse unless such regulations specifically target documented and material instances of such waste, fraud, and abuse.

The Commission should rely on IP CTS providers to develop performance measures that appropriately and accurately measure functional equivalence because only IP CTS providers have the experience serving actual users necessary to develop effective metrics. Due to the complex nature of verbal communications, developing performance measures is a complicated undertaking. The most important characteristic of IP CTS to users, and therefore the most important performance measure, is transcription accuracy. The Commission should adopt a transcription accuracy performance measure that reflects the actual effect of transcription errors on the meaning of a hearing party's speech, rather than treating all transcription errors equally. Synchronicity and transcription speed performance measures, while important, must take into account the need to maintain transcription accuracy. Neither is useful unless captions remain accurate. The Commission only should apply performance measures related to dropped or

disconnected calls to IP CTS that relies on an app, website, or VoIP link provided by an IP CTS provider. Providers have no control over dropped and disconnected calls in the context of two-line IP CTS. Finally, all performance metrics should be evaluated by independent and neutral third parties using pre-recorded test scripts that reflect ideal, typical, and adverse calling conditions.

Before the  
**FEDERAL COMMUNICATIONS COMMISSION**  
Washington, DC 20554

In the Matter of	)	
	)	
Misuse of Internet Protocol (IP) Captioned Telephone Service	)	CG Docket No. 13-24
	)	
Telecommunications Relay Services and Speech-to-Speech Services for Individuals with Hearing and Speech Disabilities	)	CG Docket No. 03-123
	)	

**COMMENTS OF ULTRATEC, INC.**

Ultratec, Inc. (“Ultratec”)<sup>1</sup> submits these Comments in response to the Notice of Inquiry in the above-referenced proceeding (“NOI”).<sup>2</sup> Ultratec offers this input in the instant proceeding as the primary developer of IP CTS and the most experienced CTS and IP CTS technology company in the world, with over 17 years of experience providing CTS in four different countries. Ultratec devotes substantial resources to the further development and testing of IP CTS technologies and appreciates this opportunity to share with the Federal Communications Commission (“Commission”) some of the conclusions that Ultratec has derived from these activities.

---

<sup>1</sup> Ultratec was the original inventor and remains an active innovator of captioned telephone services (“CTS”) provided over the public switched telephone network (“PSTN”). Ultratec has maintained its role as an industry leader with respect to Internet Protocol-based CTS (“IP CTS”) as a customer premises equipment manufacturer and technology provider. In addition, Ultratec’s affiliate, CapTel, Inc. (“CapTel”), has over 17 years of experience providing CTS in four countries. Together, Ultratec and CapTel are the most experienced CTS and IP CTS companies in the world. *See* Ultratec, About Us, <http://www.ultratec.com/about> (last visited Oct. 16, 2018) and CapTel, <http://www.captel.com> (last visited Oct. 16, 2018).

<sup>2</sup> *Misuse of Internet Protocol (IP) Captioned Telephone Service, Telecommunications Relay Services and Speech-to-Speech Services for Individuals with Hearing and Speech Disabilities*, Report and Order, Declaratory Ruling, Further Notice of Proposed Rulemaking, and Notice of Inquiry, CG Docket Nos. 13-24 & 03-123, FCC 18-79 (rel. June 8, 2018) (“*NOI*”).

**I. FUNCTIONAL EQUIVALENCE SHOULD BE THE PRIMARY OBJECTIVE OF IP CTS**

**A. TO ACHIEVE FUNCTIONAL EQUIVALENCE, IP CTS SHOULD BENEFIT ALL USERS UNDER ADVERSE CONDITIONS IN A TRANSPARENT MANNER**

Ultratec agrees with the Commission’s tentative determination that the primary goal of the IP CTS program should be “to make communications services available to individuals with communications disabilities that are functionally equivalent to communications services used by individuals without such disabilities.”<sup>3</sup> Section 225 of the Communications Act of 1934, as amended, requires this objective.<sup>4</sup> Ultratec also generally shares the Commission’s support for the consumer groups’ April 2011 definition of functional equivalence.<sup>5</sup> However, there are additional practical factors that should be considered when effectuating the Commission’s functional equivalence objective through the adoption of IP CTS regulations.

First, to implement Section 225’s mandate of functional equivalence, minimum performance metrics measuring IP CTS quality should be established in a manner that ensures that IP CTS meets the needs of *all* deaf and hard-of-hearing users under *all* conditions. In

---

<sup>3</sup> *NOI* ¶ 157.

<sup>4</sup> 47 U.S.C. § 225(b) (“[T]he Commission shall ensure that interstate and intrastate *telecommunications relay services* are available, to the extent possible and in the most efficient manner, to hearing-impaired and speech-impaired individuals in the United States.”) (emphasis added); *id.* § 225(a)(3) (“The term ‘telecommunications relay services’ means telephone transmission services that provide the ability for an individual who is deaf, hard of hearing, deaf-blind, or who has a speech disability to engage in communication by wire or radio with one or more individuals, in a manner that is *functionally equivalent* to the ability of a hearing individual who does not have a speech disability to communicate using voice communication services by wire or radio.”) (emphasis added).

<sup>5</sup> *See NOI* ¶ 158 (proposing to define functional equivalence to mean “enabling ‘[p]ersons receiving or making relay calls . . . to participate equally in the entire conversation with the other party or parties and . . . experience the same activity, emotional context, purpose, operation, work, service, or role (function) within the call as if the call is between individuals who are not using relay services on any end of the call.’”) (citations omitted).

particular, IP CTS must provide functional equivalence to those users with the greatest need. In an effort to drive efficiency and reduce the overall cost of the IP CTS program, the standards adopted by the Commission should not cater to those users with the least degree of need merely because such users can be less expensively served. Instead, the Commission's objective should be to ensure that functional equivalence is provided to all users, included those with the most profound need.

Second, IP CTS must provide functional equivalence under non-ideal, real-world conditions. Any performance measures ultimately adopted by the Commission should require providers to offer a functionally equivalent service even under adverse circumstances. Consequently, testing conditions should mimic the challenges of providing IP CTS in the real world, including background noise, poor line connections, fast speakers, and regional dialects, accents, and grammar, among other circumstances.

Third, when defining functional equivalence, the FCC should expressly acknowledge and support the transparent nature of IP CTS. The use of IP CTS by a deaf or hard-of-hearing user should be transparent to the hearing party to a call. It should not expose the user's disability or otherwise interfere with the user's ability to participate on a call in the same manner as a hearing person. Such transparency is a fundamental benefit of IP CTS relative to other forms of TRS. It helps deaf and hard-of-hearing people avoid some of the discrimination and prejudice that they regularly experience day-to-day. For example, if the Commission imposes transcription accuracy requirements that are not sufficiently robust, the user may be required to repeatedly ask the hearing party to repeat themselves, which may expose the use of IP CTS by the user and thereby demonstrate the user's disability. IP CTS transparency also requires that users not be burdened with modifications or alterations of the hearing party's speech that disrupt the users' ability to

fully understand and participate in a conversation. IP CTS must accurately convey the words spoken by the hearing party without changing, summarizing, altering, or otherwise modifying them.

**B. THE COMMISSION SHOULD REFRAIN FROM MANDATING THE USE OF PARTICULAR TECHNOLOGIES BY IP CTS PROVIDERS**

Ultratec agrees that to maintain functional equivalence IP CTS must continue to evolve as available communications technologies advance. The FCC, however, should refrain from mandating the incorporation into IP CTS offerings of particular technologies, including both nascent and off-the-shelf commercial technologies. Section 225 merely requires the Commission to “encourage” the use of existing technologies and to refrain from discouraging or impairing the development of improved technologies.<sup>6</sup> It does not require the Commission to impose the use of particular technologies. Further, the Commission’s technology mandates aimed at promoting efficiency may undermine the functional equivalence objectives of IP CTS if the required technologies are not best suited to achieve these objectives for all users under real-world, non-ideal conditions and in a transparent manner.

IP CTS providers solely should determine what technologies to utilize to provide IP CTS. Providers are better positioned than the Commission to accurately understand the advantages and disadvantages of particular technologies and the effect of such technologies on the experience of users. Providers already expend significant resources to improve their IP CTS technologies by increasing scale, captioning quality, and efficiency. Profit maximization necessarily drives these efforts. Further, users effectively vote on the relative functional equivalence of particular technologies every day when they elect which IP CTS provider to use. By contrast, despite its

---

<sup>6</sup> 47 U.S.C. § 225(d)(2).

best intentions, the Commission may not possess the real-world experience serving IP CTS users that is needed to make the types of commercially driven technology determinations that IP CTS providers must make. Consequently, the FCC should not foist new technologies, including automated speech recognition (“ASR”), on IP CTS providers.

For these reasons, the Commission should not mandate the use by IP CTS providers of currently available commercial communications technologies. Although amplified telephones, high-definition VoIP services over wired and wireless networks, video over broadband and cellular networks, and text-based communications (i.e., electronic messaging services, such as e-mail, short messaging service (“SMS”), instant messaging, and online chat sessions) all are valuable communications tools for the deaf and hard-of-hearing community,<sup>7</sup> they are not a functionally equivalent supplement to a voice telephone call or an adequate substitute for IP CTS. They are slower, more cumbersome, and communicate less information relative to voice communications, and they are not a recognized replacement for voice calls in all situations. Because the other party’s voice is an important part of an IP CTS call, fully text-based communication technologies, including SMS, email, and TTY, are particularly inadequate substitutes for IP CTS.

To the extent that the Commission determines to adopt regulations intended to encourage the use by IP CTS providers of particular technologies, Ultratec agrees that it is appropriate for the Commission to do so *only* if a technology enables “at least the same level as, or is an improvement over” the level of functional equivalence then offered by providers as reflected by all applicable performance measures adopted by the Commission.<sup>8</sup> It would be especially

---

<sup>7</sup> See NOI ¶ 59.

<sup>8</sup> *Id.* ¶ 176.

inappropriate for the Commission to mandate the use of particular technologies with the primary objective of reducing IP CTS costs if such mandated technologies also have the potential to reduce any aspect of the quality or functional equivalence of IP CTS.

Moreover, technology requirements have the potential to create new barriers to the use of IP CTS by users who are unable or unwilling to learn new, complicated, or unproven technologies. IP CTS users would experience a substantial loss of communication functionality if the FCC attempted to promote communications technologies with which they are unfamiliar in lieu of the IP CTS offerings on which they currently rely.

**C. REGULATIONS AIMED AT IMPROVING EFFICIENCY MUST NOT UNDERMINE FUNCTIONAL EQUIVALENCE**

Improving efficiency and reducing fraud, waste, and abuse are appropriate Commission objectives, but these factors should drive regulatory decision-making *only* when they do not undermine functional equivalence. Thus, it would be imprudent and premature to promulgate new regulations aimed at reducing waste, fraud, and abuse absent a clear understanding of exactly what types of material waste, fraud, or abuse the requirements are targeting. Any such regulations should expressly target specific instances or types of waste, fraud, and abuse that have been objectively documented to have material effect on the portion of the Telecommunications Relay Services (“TRS”) fund allocated for IP CTS.<sup>9</sup> They should not merely be intended to reduce TRS fund expenditures generally. Ultimately, it would not be worth

---

<sup>9</sup> Ultratec believes that the growth in the use of IP CTS by the deaf and hard-of-hearing community primarily is attributable to the needs of an increasing aging population, rather than to waste, fraud, or abuse. *See, e.g.,* Jonathan Vespa, *The Graying of America: More Older Adults Than Kids by 2035*, U.S. Census Bureau (Mar. 13, 2018), <https://www.census.gov/library/stories/2018/03/graying-america.html>.

the cost to the hearing loss community to sacrifice functional equivalence in order to gain efficiency.

## **II. THE FCC SHOULD RELY ON PROVIDERS TO ESTABLISH IP CTS PERFORMANCE METRICS**

Accurately measuring the functional equivalence of IP CTS is an exceedingly complicated task due to the complex nature of verbal interactions. Only IP CTS providers, the sole entities with substantial, real-world experience providing IP CTS, have the understanding of the service needed to develop accurate and useful performance measures. As a result, the Commission should rely on the IP CTS providers to develop performance measures, rather than adopting metrics developed by entities that have not themselves experienced the challenges of providing IP CTS to actual users in a real-world setting.

A joint group of IP CTS providers already have submitted an initial set of recommendations to the Commission, and the group is continuing to hone the details of testing and scoring protocols.<sup>10</sup> The Commission should wait for the IP CTS providers to complete their current efforts at developing performance measures before adopting any new regulations mandating compliance with particular metrics.<sup>11</sup> Any expediency that may be obtained from adopting new performance measures in the short term are likely to be undermined by flaws in

---

<sup>10</sup> Letter from Dixie Ziegler, Hamilton Relay; Bruce Peterson, CaptionCall, LLC; Cristina Duarte, InnoCaption; Michael Strecker, ClearCaptions, LLC; and Scott Freiermuth, Sprint Corporation to Marlene H. Dortch, Secretary FCC, CG Docket Nos. 13-24, 03-123 (filed Aug. 21, 2018).

<sup>11</sup> Ultratec stands ready to assist the IP CTS Providers Group in any manner that would be useful. Ultratec has 17 years of experience in the CTS and IP CTS sectors. The communications assistants (“CAs”) of Ultratec’s affiliate CapTel have captioned over a billion minutes of calls on behalf of IP CTS providers. In addition, Ultratec has developed sophisticated metrics that it uses to evaluate its CAs. These performance measures are reasonably achievable by CAs and effectively maximize the IP CTS user experience.

such metrics that are likely to occur if they are developed by entities that do not actually provide IP CTS.

Relying on IP CTS providers to develop performance measures also will largely prevent the metrics from being gamed by providers to preserve their scores while lowering their costs, even though doing so may provide an inferior user experience. IP CTS providers will best understand, and are in the best position to prevent, other providers from taking advantage of loopholes in performance measures and the evaluation process used to police such performance measures.

**A. A TRANSCRIPTION ACCURACY PERFORMANCE MEASURE SHOULD TAKE INTO ACCOUNT THE EFFECT OF TRANSCRIPTION ERRORS ON THE MEANING OF A HEARING PARTY'S SPEECH**

Ultratec agrees that transcription accuracy is the most important component of the functional equivalence of IP CTS and thus should be the focus of the primary performance measure. However, any such metrics must take into account the difference between major and minor transcription errors. Not all transcription errors have an equal effect on the ability of an IP CTS user to fully understand the content of the hearing party's speech. A small transcription error may have no effect on the user's understanding or it could completely alter the meaning of the hearing party's speech. Consequently, the Commission should adopt a transcription accuracy performance measure that is in line with the proposal of the Disability Advisory Committee ("DAC"). Unlike the MITRE approach, which measures whether captions are truly verbatim without consideration of the relative effect of any transcription errors, DAC's approach categorizes transcription errors as major or minor.<sup>12</sup> In Ultratec's experience, this is the

---

<sup>12</sup> See *NOI* ¶ 166.

appropriate means of aligning a transcription accuracy performance measure with a user's actual experience utilizing IP CTS.

Punctuation should not be a material component of a transcription accuracy metric. Although some punctuation may improve the readability of captions under some circumstances, Ultratec has found that punctuation is not key to a user's understanding of captions—in large part because individuals often do not speak in regularized and grammatically correct sentences. Consequently, there is little benefit from a user's perspective to including punctuation as part of a transcription accuracy performance measure.

**B. ANY SYNCHRONICITY PERFORMANCE MEASURE MUST TAKE INTO ACCOUNT THE NEED TO MAINTAIN TRANSCRIPTION ACCURACY**

Measuring synchronicity is important, but any performance measure used to evaluate synchronicity must take into account that it is a dependent variable. Inaccurate captions, even if delivered instantaneously, are of little value to IP CTS user and potentially could inflict harm when the exact meaning of speech is critical. In its more than 17 years of developing and facilitating CTS, Ultratec has undertaken extensive research regarding synchronicity under real-world conditions and involving actual IP CTS users. This research uniformly has demonstrated that users depend on accurate captions in order to understand what has been said, even if such accuracy requires some delay. Thus, enhanced synchronicity, while important, can only be considered to be beneficial to the user if sufficient transcription accuracy is maintained to support an IP CTS user with a high degree of hearing loss.

**C. THE COMMISSION SHOULD ESTABLISH ONLY A MINIMUM TRANSCRIPTION SPEED**

Although a transcription speed performance measure is appropriate, it should be expressed as a minimum speed requirement under controlled conditions to ensure a skill level that will result in reasonable synchronicity and accuracy. Specifically, the Commission should

require that a provider's IP CTS offering be capable of a minimum transcription speed while maintaining a specified level of accuracy. Measuring the top speed at which an IP CTS system is capable of transcribing audio is an academic pursuit that has little or no bearing on an IP CTS user's experience.

**D. PERFORMANCE MEASURES RELATED TO DROPPED OR DISCONNECTED CALLS ONLY SHOULD BE APPLIED TO IP CTS PROVIDED VIA AN APP, WEBSITE, OR VOIP LINK**

The FCC should not apply performance measures addressing dropped and disconnected calls to two-line IP CTS architectures. Such a metric is only important in connection with IP CTS that relies on an app, website, or VoIP link that is provided by an IP CTS provider. With respect to two-line IP CTS, the CA does not sit between the two connected parties, but instead is patched into the call through the IP CTS user's telephone. As a result, the addition of the IP CTS system cannot cause such an IP CTS call to be dropped or disconnected, and any such dropped or disconnected calls are likely to be caused by the user's or hearing party's telephone service provider. However, where the IP CTS provider sits between the user and the caller, such as when the user relies on an app that carries both voice and captions, a website, or other VoIP link that is provided by the IP CTS provider, then the IP CTS provider should be responsible for any dropped calls or disconnections that its technology causes.

**E. PERFORMANCE METRICS SHOULD BE EVALUATED BY INDEPENDENT AND NEUTRAL THIRD PARTIES USING PRE-RECORDED TEST SCRIPTS THAT REFLECT IDEAL, TYPICAL, AND ADVERSE CONDITIONS**

Ultratec agrees with DAC<sup>13</sup> that the best means of measuring the compliance of providers with any performance measures adopted by the Commission is through the use of pre-recorded test scripts, and the resulting captions should be evaluated by independent and neutral third-party

---

<sup>13</sup> See *NOI* ¶ 167 n.419.

testers. The Commission’s evaluation protocol should rely on recordings of telephone calls that are based on sample scripts and that mimic the environments in which IP CTS typically is used. To accurately assess captioning performance, it is imperative that test scripts accurately depict the full range of conditions that are typically encountered by IP CTS users—ideal, typical, *and* adverse conditions.

In addition, to best evaluate the performance of an IP CTS system, tests should employ recorded telephone calls of the type most commonly found in IP CTS—i.e. conversational, two party interactions. This necessarily involves tests designed to take into account the role of captioning in the flow of conversation. The tests should allow all captions for each segment (or “turn”) of a conversation to be completely captioned before the next segment is played into the system.

The Commission should not attempt to evaluate the performance of an IP CTS system during a random sample of actual IP CTS calls. Such calls vary greatly in their conditions and content, as well as the attributes of the hearing party’s speech. These factors make it very difficult to standardize testing using live calls. In addition, using live calls for evaluation purposes would raise a host of administrative and privacy concerns.

IP CTS users rely on captions most heavily under adverse conditions, such as when the captioned audio is degraded through environmental, cultural, or technological effects. This may include line noise, wind noise, talking in the background, disfluencies, and interruptions. It also may include various accents, dialects, and manners of speech, as well as forms of nonstandard speech such as apraxia, stuttering, lisps, and deaf speech. Research on speech recognition in adverse conditions has shown that numerous types of such conditions may negatively affect an

individual's ability to recognize and comprehend speech.<sup>14</sup> Each of these adverse conditions are likely to be present at some point during the types of spontaneous telephone conversations that are typical in the IP CTS context. Consequently, it is important for any evaluation of IP CTS performance to take into account the potential for adverse conditions, rather than excluding or overlooking the challenges that adverse conditions impose. In fact, a high-quality IP CTS offering should include information provided by a CA about the non-textual aspects of a call. For example, a CA should be expected to include information such as “speaker too soft – unclear;” acknowledgement of a dog barking, music playing, or baby crying; or the hearing party laughing or yelling.<sup>15</sup>

Finally, although the FCC should rely on IP CTS providers to develop performance measures, Ultratec agrees with the Commission that it is appropriate for neutral and independent third parties to conduct evaluations of the compliance of providers with any performance measures that the Commission ultimately adopts.

---

<sup>14</sup> See Sven L. Mattys, Matthew H. Davis, Ann R. Bradlow, & Sophie K. Scott, *Speech Recognition in Adverse Conditions: A Review*, in LANGUAGE AND COGNITIVE PROCESSES 2012, 27:7-8, 953-978 (July 12, 2012).

<sup>15</sup> It currently is not possible for an ASR-based captioning platform to provide this important information to users.

### **III. CONCLUSION**

Ultratec greatly appreciates the Commission's continuing efforts to develop a regulatory framework for IP CTS that maximizes the functional equivalence of the service, as well as emphasizes efficiency without permitting efficiency concerns to undermine functional equivalence. We look forward to working with the Commission going forward in connection with the development of appropriate performance measures and evaluation processes that accurately reflect IP CTS user's actual, real-world experiences.

Respectfully submitted,

**ULTRATEC, INC.**

By: /s/ Pamela Y. Holmes

Pamela Y. Holmes  
Executive Director,  
Consumer & Regulatory Affairs  
Ultratec, Inc.

October 16, 2018