

**IN THE UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF TEXAS
WACO DIVISION**

ZENTIAN LTD.,

Plaintiff,

v.

AMAZON.COM SERVICES LLC and
AMAZON WEB SERVICES, INC.,

Defendants.

C.A. No. 6:22-cv-00123-ADA

JURY TRIAL DEMAND

DEFENDANTS' FIRST AMENDED INVALIDITY CONTENTIONS

I. INTRODUCTION

Pursuant to the Court's Scheduling Order (Dkt. 33) and Order Governing Proceedings, defendants Amazon.com, Inc., Amazon Web Services, Inc., and Amazon.com Services LLC (collectively "Amazon" or "Defendants") provide these amended invalidity contentions to plaintiff Zentian Ltd. ("Zentian" or "Plaintiff"), regarding the currently asserted claims of U.S. Patent Nos. 7,979,277 ("the '277 patent"), 7,587,319 ("the '319 patent"), 10,062,377 ("the '377 patent"), 10,839,789 ("the '789 patent"), and 10,971,140 ("the '140 patent") (collectively the "Asserted Patents"). Defendants reserve the right to provide supplemental contentions in view of additional information or documents received from third parties or that Defendants locate from ongoing investigations.

Zentian asserts the claims identified in the table below (collectively, the "Asserted Claims").

Patent	Asserted Claims
U.S. Patent No. 7,979,277	1, 4, 5, 7, 9, 10, 12, 14-16
U.S. Patent No. 10,062,377	1-6

Patent	Asserted Claims
U.S. Patent No. 10,839,789	1, 2, 4, 6-14, 16-18, 20-29, 32, 34, 35, 37-39, 44, 45
U.S. Patent No. 7,587,319	46-51, 53, 54, 58, 64, 65, 67
U.S. Patent No. 10,971,140	1-6

Defendants are providing invalidity contentions for the above-identified Asserted Claims. To the extent Zentian later attempts to assert additional claims from other patents, Defendants will amend and supplement these invalidity contentions to address any additional claims. Nothing in these contentions constitutes an admission of validity as to any claims of the Asserted Patents.

Pursuant to the Court's Scheduling Order (Dkt. 33) and based on Defendants' investigation and knowledge developed to date, Defendants serve invalidity contentions in the form of (1) a chart setting forth where in the prior art references each element of the Asserted Claims is found, and (2) an identification of any limitations Defendants contend are indefinite or lack written description under 35 U.S.C. § 112. Defendants reserve the right to show that claims are directed to ineligible subject matter under 35 U.S.C. § 101. Consistent with the requirements of the Scheduling Order, these contentions do not include the bases for any unenforceability arguments Defendants may advance, or any invalidity positions other than those based on anticipation/obviousness in view of prior art or based on 35 U.S.C. § 112.¹ Defendants are concurrently producing the prior art referenced herein.

Defendants incorporate by reference all prior art references, charts, theories, and disclosures served on Zentian in any prior or pending court action or proceeding before the Patent Trial and Appeal Board, including but not limited to, *Zentian Ltd. v. Apple Inc.*, No. 6:21-cv-815-ADA (W.D. Tex.).

¹ References to 35 U.S.C. refer to the pre-AIA version of the statute.

Should Zentian be permitted to assert more or different claims from the Asserted Patents, or any other patents, than it does now, Defendants will identify additional/alternative invalidity grounds and prior art as appropriate and will amend or supplement these invalidity contentions accordingly.

Defendants' invalidity contentions are based on information reasonably available at this time and may require subsequent amendment, modification, or supplementation. Full fact discovery has not yet opened, and Defendants have not obtained third-party discovery, including discovery related to system prior art. Defendants also reserve the right to present additional knowledge and/or information regarding prior art located during the course of discovery or further investigation, for example from consultation with experts, prior art authors, and others. Defendants have not yet obtained deposition testimony from any named inventor of the Asserted Patents. Defendants expect that discovery will reveal not only additional prior art, but also related disclosures and evidence for many of the prior art references identified herein. As such, Defendants have not yet completed their investigation, discovery, or analysis of matters relating to the validity or enforceability of the Asserted Claims. Accordingly, nothing in these invalidity contentions should be construed as a statement that no other persons have discoverable information, that no other documents, data compilations, and/or tangible things exist that Defendants may use to support their claims or defenses, or that no other legal theories or factual bases will be pursued. Defendants reserve the right to amend, modify and/or supplement these invalidity contentions as additional information is discovered, identified or otherwise appreciated, including testimony about the scope and content of the prior art and the claimed inventions.

Further, these invalidity contentions are based on Defendants' present understanding of Zentian's Preliminary Infringement Contentions served on September 1, 2022 ("preliminary infringement contentions"). Nothing in these invalidity contentions should be thought to concede that Zentian's preliminary infringement contentions are legally or factually adequate or

as necessarily reflecting the proper interpretation of the claims or an interpretation of the claims that Defendants agree with or propose. Indeed, Zentian's preliminary infringement contentions are largely incoherent and lack the detail required by the Court's rules. Defendants reserve the right to amend these contentions should Zentian raise any new infringement theories in its final infringement contentions or provide any new applications and interpretation of the scope of the claims in those final infringement contentions.

Nothing in these invalidity contentions should be treated as an admission that any of Defendants' accused technology meets any limitation of the Asserted Claims. Defendants do not infringe any of the Asserted Claims. To the extent that any prior art reference identified by Defendants contains a claim element that is the same as or similar to an element in Defendants' accused technology, inclusion of that reference in Defendants' invalidity contentions shall not be deemed a waiver of any claim construction or non-infringement position. Any use of these invalidity contentions to support any allegation of infringement would be misleading, false, and wrong as a matter of law and fact.

Further, nothing in these contentions constitutes an admission concerning the priority dates of the Asserted Claims that Zentian asserts. These invalidity contentions, unless otherwise specified, are based on the following priority dates asserted by Zentian: (1) September 14, 2004 for the '277, '377, and '789 patents, and (2) February 4, 2002 for the '319 and '140 patents.

II. IDENTIFICATION OF PRIOR ART

The concepts disclosed and claimed in each Asserted Patent are not new, and had been disclosed, used, offered for sale, sold, and practiced by others before the claimed priority date of the patents. The prior art identified herein and in Exhibits A-F, individually or in combination, invalidates the Asserted Claims under 35 U.S.C. §§ 102 (a), (b), (e), (g) and 103. Because full fact discovery has yet to open, Defendants expect to gather more information about the identified prior

art, and other prior art, through third party discovery or other discovery, and may thus amend and supplement these invalidity contentions once they obtain that discovery and have reasonable time to analyze it in a meaningful way.

As described in more detail below, claims of the Asserted Patents are also invalid under 35 U.S.C. § 112.

A. THE '277 PATENT

1. Identification of Invalidity Grounds

Based on the reasons identified herein and the accompanying charts and references, a person having ordinary skill in the art would have found the Asserted Claims of the '277 patent invalid under 35 U.S.C. §§ 102 and/or 103. The '277 patent invalidity charts attached as Exhibit A set forth herein, for corresponding limitations of each asserted claim, exemplary disclosures from each identified reference in an invalidity ground below where applicable. Defendants reserve the right to amend their invalidity grounds or charts, or provide supplemental grounds or charts, based on any amendments to Plaintiff's infringement contentions, or information or documents that may be obtained as discovery begins including third party discovery.

Defendants provide the following identification of exemplary invalidity grounds for the currently Asserted Claims of the '277 patent:

Claim No.	Exemplary Invalidity Grounds ^{2, 3} Under 35 U.S.C. §§ 102 and/or 103 ⁴
1	Mathew alone or in combination with Tran Mathew alone or in combination with Bailey Mathew alone or in combination with Lund TMS320C alone or in combination with Tran TMS320C alone or in combination with Bailey TMS320C alone or in combination with Mathew TMS320C alone or in combination with Melnikoff TMS320C alone or in combination with Melnikoff II TMS320C alone or in combination with Stogiannos TMS320C alone or in combination with Lund Bailey alone or in combination with Tran Bailey alone or in combination with Mathew Bailey alone or in combination with Melnikoff Bailey alone or in combination with Melnikoff II Bailey alone or in combination with Stogiannos Bailey alone or in combination with Lund Stogiannos alone or in combination with Tran Stogiannos alone or in combination with Bailey Stogiannos alone or in combination with TMS320C Stogiannos alone or in combination with Lund Melnikoff alone or in combination with Tran

² For brevity, each reference in this table is identified by its short cite, which is defined later in subsections II.A.2 and II.A.3 below.

³ To the extent the grounds identified in the below table for a particular asserted claim refer back to the grounds identified for another claim, the grounds disclose the particular asserted claim for the reasons identified in the corresponding claim charts for the particular asserted claim.

⁴ Defendants contend that any combination of references identified in this table as a ground invalidates the relevant asserted claim under 35 U.S.C. § 103. In addition, each reference identified by itself as a ground invalidates the relevant asserted claim under 35 U.S.C. §§ 102 and 103, as “it is well settled that a disclosure that anticipates under § 102 also renders the claim invalid under § 103, for anticipation is the epitome of obviousness.” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1373 (Fed. Cir. 2019) (citations and quotations omitted) (finding no error in § 103 invalidity determination based on a single reference).

Claim No.	Exemplary Invalidity Grounds ^{2, 3} Under 35 U.S.C. §§ 102 and/or 103 ⁴
	Melnikoff alone or in combination with Bailey Melnikoff alone or in combination with TMS320C Melnikoff alone or in combination with Lund Melnikoff II alone or in combination with Tran Melnikoff II alone or in combination with Bailey Melnikoff II alone or in combination with TMS320C Melnikoff II alone or in combination with Lund Melnikoff II alone or in combination with Nguyen Tran in combination with Bailey Tran in combination with Mathew Tran in combination with Melnikoff Tran in combination with Melnikoff II Tran in combination with Stogiannos Stolzle in combination with Tran Stolzle in combination with Bailey Stolzle in combination with TMS320C Stolzle in combination with Lund
4	<i>See grounds of claim 1.</i>
5	<i>See grounds of claim 1.</i>
7	<i>See grounds of claim 1.</i>
9	<i>See grounds of claim 1.</i>
10	<i>See grounds of claim 1.</i>
12	<i>See grounds of claim 1.</i>
14	<i>See grounds of claim 1.</i>
15	<i>See grounds of claim 1.</i>
16	<i>See grounds of claim 1.</i>

2. Identification of Invalidity Due to Anticipation

The table below lists the prior art references that anticipate one or more of the Asserted Claims of the '277 patent under 35 U.S.C. § 102. The attached claim charts in Exhibit A demonstrate

where each limitation of the Asserted Claims is found in the references listed below, either expressly or inherently in the larger context of the passage, as understood by a person having ordinary skill in the art. The following references are prior art under at least 35 U.S.C. §§ 102(a), (b), or (e).

a. Prior Art Patents and Patent Publications that Anticipate the Asserted Claims of the '277 Patent

Patent No.	Filing Date / Priority Date	Date of Issue or Publication	Short Cite
U.S. Patent No. 5,459,798	March 19, 1993	October 17, 1995	Bailey

b. Prior Art Publications that Anticipate the Asserted Claims of the '277 Patent

Prior Art Publications Title	Date of Publication	Author/Publisher	Short Cite
A Low-Power Accelerator for the SPHINX 3 Speech Recognition System	2003	Binu Mathew et al.	Mathew
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	1994	Texas Instruments	TMS320C
A Configurable Logic Based Architecture for Real-Time Continuous Speech Recognition Using Hidden Markov Models	2000	Panagiotis Stogiannos et al.	Stogiannos
Speech Recognition on an FPGA Using Discrete and Continuous Hidden Markov Models	2002	Stephen Melnikoff et al.	Melnikoff
Performing Speech Recognition on Multiple Parallel Files Using Continuous Hidden Markov Models on an FPGA	January 12, 2002	Stephen Melnikoff et al.	Melnikoff II

3. Identification of Invalidity Due to Obviousness

The tables below list prior art references that render one or more of the Asserted Claims of the '277 patent invalid as obvious under 35 U.S.C. § 103, alone or in combination with the knowledge of a person having ordinary skill in the art and/or other prior art. The attached claim charts in Exhibit A demonstrate where each limitation of the Asserted Claims is found in the references listed below, either expressly or inherently in the larger context of the passage, as understood by a person having ordinary skill in the art. The following references are prior art under at least 35 U.S.C. §§ 102(a), (b), or (e).

a. Prior Art Patents and Patent Publications that Render Obvious the Asserted Claims of the '277 Patent

Patent or Patent Publication No.	Filing Date / Priority Date	Date of Issue or Publication	Short Cite
U.S. Patent No. 5,459,798	March 19, 1993	October 17, 1995	Bailey
U.S. Patent No. 6,490,559	October 10, 1997	December 3, 2002	Budde
U.S. Patent Publication No. 2003/0200085	April 22, 2002	October 23, 2003	Nguyen
U.S. Patent No. 6,080,140	November 4, 1998	June 27, 2000	Tran
International Patent Application Publication No. WO 2000060577	April 1, 1999	October 12, 2000	Lund
Chinese Patent No. 1503220	November 20, 2002	May 11, 2005	Jiang
U.S. Publication No. 2002/0049582	August 2, 2001	April 25, 2002	Baumgartner
U.S. Patent No. 6,374,219	February 20, 1998	April 16, 2002	Jiang II
U.S. Patent No. 6,879,954	April 22, 2002	April 12, 2005	Nguyen II
U.S. Patent No. 5,819,222	March 31, 1994	October 6, 1998	Smyth
U.S. Patent No. 5,699,456	January 21, 1994	December 16, 1997	Brown

b. Prior Art Publications that Render Obvious the Asserted Claims of the '277 Patent

Title	Date of Publication	Author/Publisher	Short Cite
Integrated Circuits for a Real-Time Large-Vocabulary Continuous Speech Recognition System	January 1991	Anton Stolzle et al.	Stolzle
A Low-Power Accelerator for the SPHINX 3 Speech Recognition System	2003	Binu Mathew et al.	Mathew
A Low-Power VLSI Design of a HMM Based Speech Recognition System	2002	S. Yoshizawa et al.	Yoshizawa
A High-Speed HMM VLSI Module with Block Parallel Processing	December 2002	Shingo Yoshizawa et al.	Yoshizawa II
Speech Recognition on an FPGA Using Discrete and Continuous Hidden Markov Models	2002	Stephen Melnikoff et al.	Melnikoff
Architectural Optimizations for Low-Power, Real-Time Speech Recognition	2003	Rajeev Krishna et al.	Krishna
Performing Speech Recognition on Multiple Parallel Files Using Continuous Hidden Markov Models on an FPGA	January 12, 2002	Stephen Melnikoff et al.	Melnikoff II
A Configurable Logic Based Architecture for Real Time Continuous Speech Recognition Using Hidden Markov Models	2000	Panagiotis Stogiannos et al.	Stogiannos
A VLSI Implementation of Pdf Computations in HMM Based Speech Recognition	1996	Johnny Pihl et al.	Pihl
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	1994	Texas Instruments	TMS320C
Efficient Algorithms for Speech Recognition	May 15, 1996	Mosur K. Ravishankar	Ravishankar

Title	Date of Publication	Author/Publisher	Short Cite
A Low-Power VLSI Design of an HMM Based Speech Recognition System	2002	S. Yoshizawa, et all.	Yoshizawa

c. Prior Art Systems/Services that Render Obvious the Asserted Claims of the '277 Patent

System/Service	Relevant Dates	Persons/Entities Involved in Prior Use, Sale, and/or Offers for Sale	Short Cite
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	At least by 1994	Texas Instruments	TMS320C
Sphinx II	At least by 1996	The Sphinx Group at Carnegie Mellon University	Sphinx II

d. Motivations for Combining Prior Art

The Asserted Patents are invalid in view of the combinations of references disclosed above. A person having ordinary skill in the art (“POSITA”) at the effective filing date of the Asserted Patents would have naturally consulted each of these references and combined the teachings, for at least the reasons provided below. Accordingly, a POSITA would have been motivated to combine elements of the references identified above, recognizing that the combination would be a predictable use of elements known in the art to solve known problems by using known techniques, resulting in expected outcomes. Defendants’ expert(s) may elaborate on the motivation to combine prior art and why the asserted claims of the asserted patents are invalid as obvious in accordance with the case schedule. Nothing herein is intended to limit or preclude such future expert opinion.

A POSITA would have understood the references listed above, alone or in combination, to contain explicit and/or implicit teaching, suggestion, and/or rationales to combine them for at least the following exemplary reasons.⁵

(1) Speech recognition systems

A POSITA would have known that “speech recognition systems,” were known in the art, as the specification admits, and that “prior art schemes have been proposed to increase the efficiency” of them. ’277 patent at 1:36-38; *see also id.* at 1:39-2:6 (identifying speech recognition prior art). The specification explains that prior art speech recognition systems typically used one of “a wide variety of probability distributions that can be used for the distance calculation stage” and a “lexical tree . . . because it greatly reduces the amount of storage space required to store a word vocabulary, by avoiding duplication of common word beginnings.” *Id.* at 3:57-60, 10:38-40. The patent therefore admits that speech recognition systems were known in the prior art.

The prior art identified in these invalidity contentions describe such speech recognition systems. For example, Bailey describes a “high performance real-time pattern recognition within a general purpose computer system that may be utilized for . . . voice recognition applications.” Bailey at 5:28-30. The system “includes a specially optimized multiprocessing hardware unit capable of performing, in parallel, a multitude of steps required for pattern recognition procedures, such as . . . Hidden Markov Models.” *Id.* at 5:31-35. Mathew likewise describes “a special-purpose coprocessor architecture which improves the performance of Sphinx 3 while

⁵ In *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), the Supreme Court held that prior art need not disclose the precise teachings of a patented invention to render it obvious, because a court “can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *Id.* at 418. Under *KSR*, an explanation for why a combination of prior art items renders a claim obvious may be found in the “interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art . . .” *Id.* at 418.

simultaneously reducing the energy requirements to the point where real-time, speaker-independent speech recognition is viable on embedded systems.” Mathew at 2. Mathew explains that “real-time large vocabulary speech recognition can be done within a power budget commensurate with embedded processing using” existing technologies. *Id.* at 1. Melnikoff is also directed to “a speech recognition system.” Melnikoff at 3. And Stogiannos describes “[a]n architecture . . . for real-time continuous speech recognition based on a modified hidden Markov model.” Stogiannos at Abstract. Stogiannos describes an algorithm that is “adapted to the needs of continuous speech recognition by efficient encoding of the state space.” *Id.* Yoshizawa II “discusses speed improvement by parallel processing and VLSI design, aiming at the realization of a high-speed speech recognition LSI.” Yoshizawa at 1.

The POSITA would thus have been familiar with speech recognition systems. There were many such systems, and the POSITA would have found such systems highly relevant in designing a system similar to that of the Asserted Patents because they are analogous. Therefore, the POSITA would have engaged in the practice of learning about, consulting the teachings of, and adopting and combining improvements from known systems and other references related to speech recognition, as further detailed below. The rationale to combine or modify prior art references is strong when references seek to solve similar problems, come from the same field, and correspond well. *In re Inland Steel Co.*, 265 F.3d 1354, 1362 (Fed. Cir. 2001).

(2) Feature vector extraction

The POSITA, already familiar with prior art speech recognition technologies would have also been familiar with the concept of extracting feature vectors for speech recognition. For example, Melnikoff explains that “[a] typical speech recognition system starts with a pre-processing stage, which takes a speech waveform as its input, and extracts from it feature vectors or observations which represent the information required to perform recognition.” Melnikoff at 2.

Melnikoff describes a “continuous HMM implementation” that extracts “continuous observation vectors.” *Id.* at 9. Tran similarly notes that “[w]ith respect to the feature extractor 180, a wide range of techniques is known in the art for representing the speech signal.” Tran at 11:11-13. A POSITA would have known that these techniques “include the short time energy, the zero crossing rates, the level crossing rates, the filter-bank spectrum, the linear predictive coding (LPC), and the fractal method of analysis.” *Id.* at 13-16. Stogiannos discloses that “front-end processor typically performs a short-time Fourier analysis and extracts a sequence of observation vectors (or acoustic vectors).” Stogiannos at 2 (alterations omitted); *see also* Melnikoff at 2 (explaining that “feature vectors” are synonymous with “observations”). Nguyen discloses an “exemplary speech recognizer [that] performs the recognition process in three steps”:

First, speech analysis and feature extraction 10 is performed on the input Speech. This Step generates a Sequence of acoustic feature vectors representing the temporal and Spectral behavior of the Speech input. In general, an input Speech Signal is partitioned into a Sequence of time Segments or frames. Spectral features are then extracted from each frame using a variety of well known techniques.

Nguyen at [0013]. Lund also discloses a “feature extractor.” *Id.* at 1, 13-14.

The POSITA would have been motivated to combine the teachings of any of the references describing feature vector extraction with other references describing speech recognition systems to aid in speech recognition by distilling received audio into key features that a computer can analyze. Extracting feature vectors for this reason was common in speech recognition systems as demonstrated by the references described above. To the extent a speech recognition system did not include these features, the POSITA would have found it obvious to include the features in the system because it would merely be a combination of prior art elements according to known methods to yield predictable results, a simple substitution of one known element for another for another to obtain predictable results, and/or use of a known technique to improve a similar system in the same way.

(3) Hidden Markov Models

The specification acknowledges that “[a]n important class of distance computation in speech recognition is the calculation of output state probabilities in recognisers using Hidden Markov Models.” ’277 patent at 4:15-17. The prior art confirms that “[t]he most widespread and successful approach to speech recognition is based on the Hidden Markov Model (HMM), which is a probabilistic process that models spoken utterances as the outputs of finite state machines.” Melnikoff at 4; *see also* Stogiannos at 2 (“state-of-the-art speech recognizers are based on statistical techniques, with the hidden Markov models being the dominant approach”). A POSITA would have appreciated that the “hidden Markov model is used . . . to evaluate the probability of occurrence of a sequence of observations” using a “probabilistic function.” Tran at 22:50-57. Yoshizawa II describes an “HMM circuit is composed of four modules, namely, the control, Gaussian distribution calculation, addlog operation, and Viterbi algorithm modules.” Yoshizawa II at 132. Thus, a POSITA would have known that a hidden Markov model could have been used in speech recognition systems because an HMM was a “highly successful model in continuous speech recognition.” Nguyen at [0012].

The specification admits that “[t]here are a wide variety of probability distributions that can be used for the distance calculation stage of a speech recognizer” that are “widely documented in the literature.” ’277 patent at 3:57-62. A POSITA would have known that “[a] common choice is to use Gaussian Distributions and correspondingly the Mahalanobis Distance metric.” *Id.* at 4:62-63. The specification acknowledges that “[t]he Mahalanobis Distance (MHD) is extensively described in the literature.” *Id.* at 12:51-53.

Indeed, a POSITA would have known that “[i]f the front-end vector quantizes the acoustic vectors, the output distributions take the form of discrete probability distributions.” Stogiannos at 3. One way to calculate a probability distribution is a “Mahalanobis distance of the feature from

a set of references used while training the recognizer.” Mathew at 2. Bailey also discloses a method for using a Hidden Markov model (HMM) that “first determines the probability that [an] unknown state 1 will be found with [a] probability distribution of the first state of [a] reference pattern,” and then “computes the probabilities that the unknown state 1 is within each of the other states of the test pattern (2 to n) along [a] first vertical lattice line . . . starting from the lowest state and sequentially processing lattice points.” Bailey at 8:2-12. And Tran discloses an HMM that uses “multivariate Gaussian function probability densities.” Tran at 22:6-9. A POSITA would have also known that probability density could have been calculated using “a probability density function $b_j(O_t)$ which determines the probability that state j emits a particular observation O_t at time t .” Melnikoff at 4.

To the extent a reference does not disclose using an acoustic model or calculating probability distributions as performed in HMMs, the POSITA would have found it obvious to do so. The POSITA would have recognized the many benefits of using an HMM for speech recognition, including the efficiency of training the model using raw data received by the system. The POSITA would naturally have looked to existing solutions that provide this benefit such as the exemplary references described above. Such a combination is no more than a combination of prior art elements according to known methods to yield predictable results, and a simple substitution of one known element for another to obtain predictable results.

(4) **Pipelining**

The specification admits that pipelining techniques, like speech recognition systems, feature vector extraction, and hidden Markov models, were “well-known” in the art. ’277 patent at 34:6-14. The patent explains that “[p]ipelining may comprise processing data in different parts of a circuit at the same time, i.e. parallel processing.” *Id.* at 37:64-65.

Yoshizawa II describes a “vector pipeline” that is used to perform “parallel processing.” Yoshizawa II at 13. Mathew likewise describes a speech recognition system that includes “several levels at which [the] system may be integrated into a speech recognition task pipeline” Mathew at 8. Melnikoff also describes a speech recognition circuit that uses “a fully pipelined architecture.” Melnikoff at 8. And Bailey discloses a speech recognition system that uses two pipelines: an “arithmetic pipeline” for “executing arithmetic instructions” and a “pointer pipeline” for “executing pointer instructions . . . in parallel with the step of executing arithmetic instructions.” Bailey at 4:10-14. The POSITA would have found it obvious to include such features in a speech recognition system because it would merely be a combination of prior art elements according to known methods to yield predictable results and/or use of a known technique to improve a similar system in the same way.

4. Invalidity Under § 112

The Asserted Claims are invalid under 35 U.S.C. § 112. The Asserted Claims, read in light of the specification and prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the purported invention and are therefore indefinite. *See Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). The asserted patent does not enable one of skill in the art to practice the full scope of the invention claimed without undue experimentation. It instead seeks to improperly “monopolize an entire class of things defined by their function.” *Amgen Inc. v. Sanofi*, No. 21-757, 2023 WL 3511533, at *2 (U.S. May 18, 2023).

The following identification of claims/claim elements are only exemplary and Defendants reserve the right to supplement the identification of claims and claim elements that do not comply with the requirements of 35 U.S.C. § 112. Specifically, to the extent an element identified below, or its variation, appears in claims other than the ones specified below, it also renders those additional claims invalid under 35 U.S.C. § 112. Claims that depend on these additional claims

and on the claims identified below are also invalid under 35 U.S.C. § 112. Defendants reserve the right to identify additional claims and claim elements that do not comply with the requirements of 35 U.S.C. § 112 should Zentian make further allegations based on claim scope lacking the requisite § 112 support, including in its final infringement contentions. Furthermore, this identification of claims/claim elements should not be interpreted as reflecting Defendants' position on the construction of any claim/claim element.

At least the following claims, and all claims depending on these claims, are invalid for failing to meet the requirements of 35 U.S.C. § 112:

Claim Element	Claims	§ 112 Grounds
"calculating distances indicating the similarity between a feature vector and a plurality of predetermined acoustic states of an acoustic model"	1	Indefinite pursuant to pre-AIA § 112, para. 2.
"using said calculated distances to identify words within a lexical tree"	1, 14	Indefinite pursuant to pre-AIA § 112, para. 2.
"wherein said audio front end and said search stage are implemented using a first processor, and said calculating circuit is implemented using a second processor"	1	Indefinite pursuant to pre-AIA § 112, para. 2.
"the said calculating circuit is configured to autonomously calculate distances for every acoustic state defined by the acoustic model"	5	Indefinite pursuant to pre-AIA § 112, para. 2.
"the speech accelerator has an interrupt signal to inform the front end that the accelerator is ready to receive a next feature vector from the front end"	9	Indefinite pursuant to pre-AIA § 112, para. 2.
"the accelerator signals to the search stage when the distances for a new frame are available in a result memory"	10	Indefinite pursuant to pre-AIA § 112, para. 2.

Claim Element	Claims	§ 112 Grounds
“calculating a feature vector from an audio signal”	1, 14	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“calculating distances indicating the similarity between a feature vector and a plurality of predetermined acoustic states of an acoustic model”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“using said calculated distances to identify words within a lexical tree”	1, 14	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“said audio front end and said search stage are implemented using a first processor”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“said calculating circuit is implemented using a second processor”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“data is pipelined from the front end to the calculating circuit to the search stage”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“calculating a distance indicating the similarity between a feature vector and a predetermined acoustic state of an acoustic model”	14	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“enable pipelined data flow”	14	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“calculating a feature vector from an audio signal using an audio front end”	15	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“calculating a distance indicating the similarity between a feature vector and a predetermined acoustic state of an acoustic model using a calculating circuit”	15	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.

Claim Element	Claims	§ 112 Grounds
“using a search stage to identify words within a lexical tree using said calculated distances, the lexical tree comprising a model of words”	15	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“data is pipelined from the front end, to the calculating circuit, and to the search stage”	15	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“controlling at least one processor to implement a speech recognition method”	16	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“controlling the processor to calculate a feature vector from an audio signal”	16	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“controlling the processor to calculate a distance indicating the similarity between a feature vector and a predetermined acoustic state of an acoustic model”	16	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“controlling the processor to identify words within a lexical tree using said calculated distances, the lexical tree comprising a model of words”	16	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“data is pipelined by the processor pursuant to the code from the feature calculation, to the distance calculation, and to the word identification”	16	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.

B. THE '377 PATENT

1. Identification of Invalidity Grounds

Based on the reasons identified herein and the accompanying charts and references, a POSITA would have found the Asserted Claims of the '377 patent invalid under 35 U.S.C. §§ 102 and/or 103. The '377 patent invalidity charts attached as Exhibit B set forth herein, for corresponding limitations of an asserted claim, exemplary disclosures from each identified

reference in an invalidity ground below where applicable. Defendants reserve the right to amend their invalidity grounds or charts, or provide supplemental grounds or charts, based on any amendments to Plaintiff's infringement contentions, or information or documents that may be obtained as discovery begins including third party discovery.

Defendants provide the following identification of exemplary invalidity grounds for the currently Asserted Claims of the '377 patent:

Claim No.	Exemplary Invalidity Grounds^{6, 7} under 35 U.S.C. §§ 102 and/or 103⁸
1	Stogiannos alone or in combination with Mathew Stogiannos alone or in combination with Tran Stogiannos alone or in combination with Bailey Stogiannos alone or in combination with TMS320C Stogiannos alone or in combination with Lund Stogiannos alone or in combination with Nguyen Melnikoff alone or in combination with Mathew Melnikoff alone or in combination with Tran Melnikoff alone or in combination with Bailey Melnikoff alone or in combination with TMS320C Melnikoff alone or in combination with Lund Melnikoff alone or in combination with Nguyen Melnikoff II alone or in combination with Mathew Melnikoff II alone or in combination with Tran Melnikoff II alone or in combination with Bailey Melnikoff II alone or in combination with TMS320C

⁶ For brevity, each reference in this table is identified by its short cite, which is defined later in subsections II.B.2 and II.B.3 below.

⁷ To the extent the grounds identified in the below table for a particular asserted claim refer back to the grounds identified for another claim, the grounds disclose the particular asserted claim for the reasons identified in the corresponding claim charts for the particular asserted claim.

⁸ Defendants contend that any combination of references identified in this table as a ground invalidates the relevant asserted claim under 35 U.S.C. § 103. In addition, each reference identified by itself as a ground invalidates the relevant asserted claim under 35 U.S.C. § 102 and 103.

Claim No.	Exemplary Invalidity Grounds^{6, 7} under 35 U.S.C. §§ 102 and/or 103⁸
	Melnikoff II alone or in combination with Lund Melnikoff II alone or in combination with Nguyen Bailey in combination with Melnikoff Bailey in combination with Melnikoff II Bailey in combination with Stogiannos Bailey in combination with Jou Tran in combination with Melnikoff Tran in combination with Melnikoff II Tran in combination with Stogiannos Tran in combination with Jou TMS320C in combination with Melnikoff TMS320C in combination with Melnikoff II TMS320C in combination with Stogiannos TMS320C in combination with Jou
2	<i>See grounds of claim 1.</i>
3	<i>See grounds of claim 1.</i>
4	<i>See grounds of claim 1.</i>
5	<i>See grounds of claim 1.</i>
6	<i>See grounds of claim 1.</i>

2. Identification of Invalidity Due to Anticipation

The table below lists the prior art references that anticipate one or more of the Asserted Claims of the '377 patent under 35 U.S.C. § 102. The attached claim charts in Exhibit B demonstrate where each limitation of the Asserted Claims is found in the references listed below, either expressly or inherently in the larger context of the passage, as understood by a person having ordinary skill in the art. The following references are prior art under at least 35 U.S.C. §§ 102(a), (b), or (e).

Title	Date of Publication	Author/Publisher	Short Cite
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A Configurable Logic Based Architecture for Real-Time Continuous Speech Recognition Using Hidden Markov Models	2000	Panagiotis Stogiannos et al.	Stogiannos
Speech Recognition on an FPGA Using Discrete and Continuous Hidden Markov Models	2002	Stephen Melnikoff et al.	Melnikoff
Performing Speech Recognition on Multiple Parallel Files Using Continuous Hidden Markov Models on an FPGA	January 12, 2002	Stephen Melnikoff et al.	Melnikoff II
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	1994	Texas Instruments	TMS320C

3. Identification of Invalidity Due to Obviousness

The tables below list prior art references that render one or more of the Asserted Claims of the '377 patent invalid as obvious under 35 U.S.C. § 103, alone or in combination with the knowledge of a person having ordinary skill in the art and/or other prior art. The attached claim charts in Exhibit B demonstrate where each limitation of the Asserted Claims is found in the references listed below, either expressly or inherently in the larger context of the passage, as understood by a person having ordinary skill in the art. The following references are prior art under at least 35 U.S.C. §§ 102(a), (b), or (e).

a. Prior Art Patents and Patent Publications that Render Obvious the Asserted Claims of the '377 Patent

Patent or Patent Publication No.	Filing Date / Priority Date	Date of Issue or Publication	Short Cite
U.S. Patent No. 5,459,798	March 19, 1993	October 17, 1995	Bailey

Patent or Patent Publication No.	Filing Date / Priority Date	Date of Issue or Publication	Short Cite
U.S. Patent No. 6,490,559	October 10, 1997	December 3, 2002	Budde
U.S. Patent Publication No. 2003/0200085	April 22, 2002	April 12, 2005	Nguyen
U.S. Patent No. 6,080,140	November 4, 1998	June 27, 2000	Tran
International Patent Application Publication No. WO 2000060577	April 1, 1999	October 12, 2000	Lund
Chinese Patent No. 1503220	November 20, 2002	May 11, 2005	Jiang
U.S. Patent No. 6,879,954	April 22, 2002	April 12, 2005	Nguyen II
U.S. Patent No. 5,819,222	March 31, 1994	October 6, 1998	Smyth
U.S. Patent No. 5,699,456	January 21, 1994	December 16, 1997	Brown
U.S. Patent No. 6,374,219	February 20, 1998	April 16, 2002	Jiang II

b. Prior Art Publications that Render Obvious the Asserted Claims of the '377 Patent

Title	Date of Publication	Author/Publisher	Short Cite
An Efficient VLSI Architecture for HMM-Based Speech Recognition	2001	Jer Min Jou et al.	Jou
Speech Recognition on an FPGA Using Discrete and Continuous Hidden Markov Models	2002	Stephen Melnikoff et al.	Melnikoff
Performing Speech Recognition on Multiple Parallel Files Using Continuous Hidden Markov Models on an FPGA	January 12, 2002	Stephen Melnikoff et al.	Melnikoff II
A Configurable Logic Based Architecture for Real Time Continuous Speech Recognition Using Hidden Markov Models	2000	Panagiotis Stogiannos et al.	Stogiannos

Title	Date of Publication	Author/Publisher	Short Cite
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	1994	Texas Instruments	TMS320C
Efficient Algorithms for Speech Recognition	May 15, 1996	Mosur K. Ravishankar	Ravishankar

c. Prior Art Systems/Services that Render Obvious the Asserted Claims of the '377 Patent

System/Service	Relevant Dates	Persons/Entities Involved in Prior Use, Sale, and/or Offers for Sale	Short Cite
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	At least by 1994	Texas Instruments	TMS320C
Sphinx II	At least by 1996	The Sphinx Group at Carnegie Mellon University	Sphinx II

d. Motivations for Combining Prior Art

Defendants incorporate by reference the reservation of rights, legal standard, and motivation to combine set forth in Section II.A.3.d, *supra*, as though fully set forth herein. The motivations to combine such references identified in Section II.A.3.d, *supra*, are equally applicable to the prior art identified above, and are incorporated by reference as though fully set forth herein.

4. Invalidity Under § 112

The Asserted Claims are invalid under 35 U.S.C. § 112. Defendants incorporate by reference the discussion in Section II.A.4 set forth above.

At least the following claims, and all claims depending on these claims, are invalid for failing to meet the requirements of 35 U.S.C. § 112:

Claim Element	Claims	§ 112 Grounds
“a second programmable device programmed to calculate distances indicating the similarity between a feature vector and a plurality of acoustic states of an acoustic model”	1	Indefinite pursuant to pre-AIA § 112, para. 2.
“calculate a feature vector from a digital audio stream”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“calculate distances indicating the similarity between a feature vector and a plurality of acoustic states of an acoustic model wherein said feature vector is received by the second programmable device after it is calculated by the first programmable device”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“identify spoken words in said digital audio stream using Hidden Markov Models and/or Neural Networks wherein said word identification uses one or more distances that were calculated by the second programmable device, wherein said identification of spoken words uses one or more distances calculated from a first feature vector”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“using the calculated distances to identify words within a lexical tree”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.

C. THE '789 PATENT

1. Identification of Invalidity Grounds

Based on the reasons identified herein and the accompanying charts and references, a POSITA would have found the Asserted Claims of the '789 patent invalid under 35 U.S.C. §§ 102 and/or 103. The '789 patent invalidity charts attached as Exhibit C set forth herein, for

corresponding limitations of an asserted claim, exemplary disclosures from each identified reference in an invalidity ground below where applicable. Defendants reserve the right to amend their invalidity grounds or charts, or provide supplemental grounds or charts, based on any amendments to Plaintiff's infringement contentions, or information or documents that may be obtained as discovery begins including third party discovery.

Defendants provide the following identification of exemplary invalidity grounds for the currently Asserted Claims of the '789 patent:

Claim No.	Exemplary Invalidity Grounds^{9, 10} under 35 U.S.C. §§ 102 and/or 103¹¹
1	Mathew alone or in combination with Bailey Mathew alone or in combination with Melnikoff Mathew alone or in combination with Melnikoff II Mathew alone or in combination with Stogiannos Bailey alone or in combination with Mathew Bailey alone or in combination with Melnikoff Bailey alone or in combination with Melnikoff II Bailey alone or in combination with Stogiannos Tran alone or in combination with Mathew Tran alone or in combination with Melnikoff Tran alone or in combination with Melnikoff II Tran alone or in combination with Stogiannos TMS320C alone or in combination with Tran TMS320C alone or in combination with Bailey

⁹ For brevity, each reference in this table is identified by its short cite, which is defined later in subsections II.C.2 and II.C.3 below.

¹⁰ To the extent the grounds identified in the below table for a particular asserted claim refer back to the grounds identified for another claim, the grounds disclose the particular asserted claim for the reasons identified in the corresponding claim charts for the particular asserted claim.

¹¹ Defendants contend that any combination of references identified in this table as a ground invalidates the relevant asserted claim under 35 U.S.C. § 103. In addition, each reference identified by itself as a ground invalidates the relevant asserted claim under 35 U.S.C. § 102 and 103.

Claim No.	Exemplary Invalidity Grounds ^{9, 10} under 35 U.S.C. §§ 102 and/or 103 ¹¹
	TMS320C alone or in combination with Mathew TMS320C alone or in combination with Melnikoff TMS320C alone or in combination with Melnikoff II TMS320C alone or in combination with Stogiannos TMS320C alone or in combination with Lund Pihl alone or in combination with Tran Pihl alone or in combination with Bailey Pihl alone or in combination with Mathew Pihl alone or in combination with Melnikoff Pihl alone or in combination with Melnikoff II Pihl alone or in combination with Stogiannos Pihl alone or in combination with Lund Melnikoff in combination with Tran Melnikoff in combination with Bailey Melnikoff II in combination with Tran Melnikoff II in combination with Bailey Yoshizawa in combination with Tran Yoshizawa in combination with Bailey Yoshizawa II in combination with Tran Yoshizawa II in combination with Bailey
2	<i>See grounds of claim 1.</i>
4	<i>See grounds of claim 2.</i>
6	<i>See grounds of claim 4.</i>
7	<i>See grounds of claim 6.</i>
8	<i>See grounds of claim 7.</i>
9	<i>See grounds of claim 7.</i>
10	<i>See grounds of claim 1.</i>
11	<i>See grounds of claim 10.</i>
12	<i>See grounds of claim 10.</i>
13	<i>See grounds of claim 10.</i>

Claim No.	Exemplary Invalidity Grounds^{9, 10} under 35 U.S.C. §§ 102 and/or 103¹¹
14	<i>See grounds of claim 10.</i>
16	<i>See grounds of claim 10.</i>
17	<i>See grounds of claim 10.</i>
18	<i>See grounds of claim 17.</i>
20	<i>See grounds of claim 18.</i>
21	<i>See grounds of claim 20.</i>
22	<i>See grounds of claim 21.</i>
23	<i>See grounds of claim 22.</i>
24	<i>See grounds of claim 23.</i>
25	<i>See grounds of claim 22.</i>
26	<i>See grounds of claim 25.</i>
27	<i>See grounds of claim 26.</i>
28	<i>See grounds of claim 26.</i>
29	<i>See grounds of claim 28.</i>
32	<i>See grounds of claim 26.</i>
34	<i>See grounds of claim 26.</i>
35	<i>See grounds of claim 26.</i>
37	<i>See grounds of claim 27.</i>
38	<i>See grounds of claim 27.</i>
39	<i>See grounds of claim 38.</i>
44	<i>See grounds of claim 39.</i>
45	<i>See grounds of claim 39.</i>

2. Identification of Invalidity Due to Anticipation

The table below lists the prior art references that anticipate one or more of the Asserted Claims of the '789 patent under 35 U.S.C. § 102. The attached claim charts in Exhibit C demonstrate where each limitation of the Asserted Claims is found in the references listed below, either expressly or inherently in the larger context of the passage, as understood by a person having ordinary skill in the art. The following references are prior art under at least 35 U.S.C. §§ 102(a), (b), or (e).

a. Prior Art Patents and Patent Publications that Anticipate the Asserted Claims of the '789 Patent

Patent No.	Filing Date / Priority Date	Date of Issue or Publication	Short Cite
U.S. Patent No. 5,459,798	March 19, 1993	October 17, 1995	Bailey
U.S. Patent No. 6,080,140	November 4, 1998	June 27, 2000	Tran

b. Prior Art Publications that Anticipate the Asserted Claims of the '789 Patent

Prior Art Publications Title	Date of Publication	Author/Publisher	Short Cite
A Low-Power Accelerator for the SPHINX 3 Speech Recognition System	2003	Binu Mathew et al.	Mathew
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	1994	Texas Instruments	TMS320C
A VLSI Implementation of Pdf Computations in HMM Based Speech Recognition	1996	Johnny Pihl et/ al.	Pihl

3. Identification of Invalidity Due to Obviousness

The tables below list prior art references that render one or more of the Asserted Claims of the '789 patent invalid as obvious under 35 U.S.C. § 103, alone or in combination with the knowledge of a person having ordinary skill in the art and/or other prior art. The attached claim charts in Exhibit C demonstrate where each limitation of the Asserted Claims is found in the references listed below, either expressly or inherently in the larger context of the passage, as understood by a person having ordinary skill in the art. The following references are prior art under at least 35 U.S.C. §§ 102(a), (b), or (e).

a. Prior Art Patents and Patent Publications that Render Obvious the Asserted Claims of the '789 Patent

Patent or Patent Publication No.	Filing Date / Priority Date	Date of Issue or Publication	Short Cite
U.S. Patent No. 5,459,798	March 19, 1993	October 17, 1995	Bailey
U.S. Patent No. 6,490,559	October 10, 1997	December 3, 2002	Budde
U.S. Patent Publication No. 2003/0200085	April 22, 2002	April 12, 2005	Nguyen
U.S. Patent No. 6,080,140	November 4, 1998	June 27, 2000	Tran
International Patent Application Publication No. WO 2000060577	April 1, 1999	October 12, 2000	Lund
Chinese Patent No. 1503220	November 20, 2002	May 11, 2005	Jiang
U.S. Patent No. 6,629,073	April 27, 2000	September 30, 2003	Hon II
U.S. Patent No. 6,832,194	October 26, 2000	December 14, 2004	Mozer
U.S. Patent No. 6,879,954	April 22, 2002	April 12, 2005	Nguyen II

b. Prior Art Publications that Render Obvious the Asserted Claims of the '789 Patent

Title	Date of Publication	Author/Publisher	Short Cite
A Low-Power Accelerator for the SPHINX 3 Speech Recognition System	2003	Binu Mathew et al.	Mathew
A Low-Power VLSI Design of an HMM Based Speech Recognition System	2002	S. Yoshizawa et al.	Yoshizawa
A High-Speed HMM VLSI Module with Block Parallel Processing	December 2002	Shingo Yoshizawa et al.	Yoshizawa II
Speech Recognition on an FPGA Using Discrete and Continuous Hidden Markov Models	2002	Stephen Melnikoff et al.	Melnikoff

Title	Date of Publication	Author/Publisher	Short Cite
Architectural Optimizations for Low-Power, Real-Time Speech Recognition	2003	Rajeev Krishna et al.	Krishna
Performing Speech Recognition on Multiple Parallel Files Using Continuous Hidden Markov Models on an FPGA	January 12, 2002	Stephen Melnikoff et al.	Melnikoff II
A Configurable Logic Based Architecture for Real Time Continuous Speech Recognition Using Hidden Markov Models	2000	Panagiotis Stogiannos et al.	Stogiannos
A VLSI Implementation of Pdf Computations in HMM Based Speech Recognition	1996	Johnny Pihl et al.	Pihl
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	1994	Texas Instruments	TMS320C
A Microprocessor for Speech Recognition	March 1985	Hisao Ishizuka, et al.	Ishizuka
A Gaussian Probability Accelerator for SPHINX 3	November 18, 2002	Binu K. Mathew, et al.	Mathew II
U.S. Publication No. 2004/0039573	March 27, 2003	February 26, 2004	Vasilache
U.S. Patent No. 5,819,222	March 31, 1994	October 6, 1998	Smyth

c. Prior Art Systems/Services that Render Obvious the Asserted Claims of the '789 Patent

System/Service	Relevant Dates	Persons/Entities Involved in Prior Use, Sale, and/or Offers for Sale	Short Cite
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	At least by 1994	Texas Instruments	TMS320C

System/Service	Relevant Dates	Persons/Entities Involved in Prior Use, Sale, and/or Offers for Sale	Short Cite
OKI MSM6679 Voice Recognition Processor	At least by 1997	OKI Semiconductor	MSM6679

d. Motivations for Combining Prior Art

Defendants incorporate by reference the reservation of rights, legal standard, and motivation to combine set forth in Section II.A.3.d, *supra*, as though fully set forth herein. The motivations to combine such references identified in Section II.A.3.d, *supra*, are equally applicable to the prior art identified above, and are incorporated by reference as though fully set forth herein.

4. Invalidity Under § 112

The Asserted Claims are invalid under 35 U.S.C. § 112. Defendants incorporate by reference the discussion in Section II.A.4 set forth above.

At least the following claims, and all claims depending on these claims, are invalid for failing to meet the requirements of 35 U.S.C. § 112:

Claim Element	Claims	§ 112 Grounds
“data associated with an audio signal”	1	Indefinite pursuant to pre-AIA § 112, para. 2.
“autonomously calculating the distances for each acoustic state of the acoustic model”	17	Indefinite pursuant to pre-AIA § 112, para. 2.
“generating an interrupt”	22	Indefinite pursuant to pre-AIA § 112, para. 2.
“sequential bursts”	27	Indefinite pursuant to pre-AIA § 112, para. 2.
“wherein the second interface an industry standard interface”	32	Indefinite pursuant to pre-AIA § 112, para. 2.
“An electronic entertainment product comprising the speech recognition system of claim 39.”	44	Indefinite pursuant to pre-AIA § 112, para. 2.

Claim Element	Claims	§ 112 Grounds
“An appliance comprising the speech recognition system of claim 39.”	45	Indefinite pursuant to pre-AIA § 112, para. 2.
“processing data associated with an audio signal”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“receiving at least one feature vector, wherein the feature vector is determined from the audio signal”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“storing an acoustic model defining a plurality of acoustic states”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“calculating distances indicating a similarity between the at least one feature vector and respective acoustic states of the acoustic model read from the acoustic model memory”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“sending at least one distance calculated by the calculating apparatus”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“receiving at least one feature vector”	10	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“calculating distances indicating a similarity between the at least one feature vector and at least one acoustic state of an acoustic model read from an acoustic model memory”	10	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“sending at least one distance calculated by the calculating apparatus”	10	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.

D. THE '319 PATENT

1. Identification of Invalidity Grounds

Based on the reasons identified herein and the accompanying charts and references, a person having ordinary skill in the art would have found the Asserted Claims of the '319 patent invalid under 35 U.S.C. §§ 102 and/or 103. The '319 patent invalidity charts attached as Exhibit D set forth herein, for corresponding limitations of an asserted claim, exemplary disclosures from each identified reference in an invalidity ground below where applicable. Defendants reserve the right to amend their invalidity grounds or charts, or provide supplemental grounds or charts, based on any amendments to Plaintiff's infringement contentions, or information or documents that may be obtained as discovery begins including third party discovery.

Defendants provide the following identification of exemplary invalidity grounds for the currently Asserted Claims of the '319 patent:

Claim No.	Exemplary Invalidity Grounds^{12, 13} under 35 U.S.C. §§ 102 and/or 103¹⁴
46	Bailey alone or in combination with TMS320C Bailey alone or in combination with Anantharaman Bailey alone or in combination with Vargas Bailey alone or in combination with Fernandez Bailey alone or in combination with Stogiannos Bailey alone or in combination with Lund Bailey alone or in combination with Hon TMS320C alone or in combination with Bailey

¹² For brevity, each reference in this table is identified by its short cite, which is defined later in subsections II.D.2 and II.D.3 below.

¹³ To the extent the grounds identified in the below table for a particular asserted claim refer back to the grounds identified for another claim, the grounds disclose the particular asserted claim for the reasons identified in the corresponding claim charts for the particular asserted claim.

¹⁴ Defendants contend that any combination of references identified in this table as a ground invalidates the relevant asserted claim under 35 U.S.C. § 103. In addition, each reference identified by itself as a ground invalidates the relevant asserted claim under 35 U.S.C. § 102 and 103.

Claim No.	Exemplary Invalidity Grounds ^{12, 13} under 35 U.S.C. §§ 102 and/or 103 ¹⁴
	TMS320C alone or in combination with Anantharaman TMS320C alone or in combination with Vargas TMS320C alone or in combination with Fernandez TMS320C alone or in combination with Stogiannos TMS320C alone or in combination with Lund TMS320C alone or in combination with Hon Anantharaman alone or in combination with Bailey Anantharaman alone or in combination with Vargas Anantharaman alone or in combination with Fernandez Anantharaman alone or in combination with Stogiannos Anantharaman alone or in combination with Lund Anantharaman alone or in combination with Hon Vargas in combination with Bailey Vargas in combination with TMS320C Vargas in combination with Melnikoff II Fernandez in combination with Bailey Fernandez in combination with TMS320C Fernandez in combination with Melnikoff II Stogiannos in combination with Bailey Stogiannos in combination with TMS320C Stogiannos in combination with Melnikoff II Lund in combination with Bailey Lund in combination with TMS320C Lund in combination with Melnikoff II Hon in combination with Bailey Hon in combination with TMS320C Hon in combination with Melnikoff II
47	<i>See</i> grounds of claim 46.
48	<i>See</i> grounds of claim 47.
49	<i>See</i> grounds of claim 48.

Claim No.	Exemplary Invalidity Grounds^{12, 13} under 35 U.S.C. §§ 102 and/or 103¹⁴
50	<i>See grounds of claim 46.</i>
51	<i>See grounds of claim 50.</i>
53	<i>See grounds of claim 51.</i>
54	<i>See grounds of claim 46.</i>
58	<i>See grounds of claim 46.</i>
64	<i>See grounds of claim 46.</i>
65	<i>See grounds of claim 46.</i>
67	<i>See grounds of claim 46.</i>

2. Identification of Invalidity Due to Anticipation

The table below lists the prior art references that anticipate one or more of the Asserted Claims of the '319 patent under 35 U.S.C. § 102. The attached claim charts in Exhibit D demonstrate where each limitation of the Asserted Claims is found in the references listed below, either expressly or inherently in the larger context of the passage, as understood by a person having ordinary skill in the art. The following references are prior art under at least 35 U.S.C. §§ 102(a), (b), or (e).

a. Prior Art Patents and Patent Publications that Anticipate the Asserted Claims of the '319 Patent

Patent No.	Filing Date / Priority Date	Date of Issue or Publication	Short Cite
U.S. Patent No. 5,459,798	March 19, 1993	October 17, 1995	Bailey

b. Prior Art Publications that Anticipate the Asserted Claims of the '319 Patent

Prior Art Publications Title	Date of Publication	Author/Publisher	Short Cite
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	1994	Texas Instruments	TMS320C

A Hardware Accelerator for Speech Recognition Algorithms	1986	T.S. Anantharaman et al.	Anantharaman
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3. Identification of Invalidity Due to Obviousness

The tables below list prior art references that render one or more of the Asserted Claims of the '319 patent invalid as obvious under 35 U.S.C. § 103, alone or in combination with the knowledge of a person having ordinary skill in the art and/or other prior art. The attached claim charts in Exhibit D demonstrate where each limitation of the Asserted Claims is found in the references listed below, either expressly or inherently in the larger context of the passage, as understood by a person having ordinary skill in the art. The following references are prior art under at least 35 U.S.C. §§ 102(a), (b), or (e).

a. Prior Art Patents and Patent Publications that Render Obvious the Asserted Claims of the '319 Patent

Patent or Patent Publication No.	Filing Date / Priority Date	Date of Issue or Publication	Short Cite
U.S. Patent No. 5,459,798	March 19, 1993	October 17, 1995	Bailey
U.S. Patent No. 6,080,140	November 4, 1998	June 27, 2000	Tran
International Patent Application Publication No. WO 2000060577	April 1, 1999	October 12, 2000	Lund
U.S. Patent No. 6,374,219	February 20, 1998	April 16, 2002	Jiang II
U.S. Patent No. 6,526,380	August 9, 1999	February 25, 2003	Thelen

b. Prior Art Publications that Render Obvious the Asserted Claims of the '319 Patent

Title	Date of Publication	Author/Publisher	Short Cite
A Survey of Hardware Architectures Designed for Speech Recognition	August 9, 1991	Hsiao-Wuen Hon	Hon

Title	Date of Publication	Author/Publisher	Short Cite
A FPGA-based Viterbi Algorithm Implementation for Speech Recognition Systems	2001	Fabian Luis Vargas et al.	Vargas
A Flexible VLSI-Based Hardware System for Medium-Large-Vocabulary Real-Time Speech Recognition	1994	J.M. Fernandez et al.	Fernandez
Performing Speech Recognition on Multiple Parallel Files Using Continuous Hidden Markov Models on an FPGA	January 12, 2002	Stephen Melnikoff et al.	Melnikoff II
A Configurable Logic Based Architecture for Real Time Continuous Speech Recognition Using Hidden Markov Models	2000	Panagiotis Stogiannos et al.	Stogiannos
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	1994	Texas Instruments	TMS320C
A Hardware Accelerator for Speech Recognition Algorithms	1986	T.S. Anantharaman et al.	Anantharaman

c. Prior Art Systems/Services that Render Obvious the Asserted Claims of the '319 Patent

System/Service	Relevant Dates	Persons/Entities Involved in Prior Use, Sale, and/or Offers for Sale	Short Cite
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	At least by 1994	Texas Instruments	TMS320C
Sphinx II	At least by 1996	The Sphinx Group at Carnegie Mellon University	Sphinx II

d. Motivations for Combining Prior Art

Defendants incorporate by reference the reservation of rights, legal standard, and motivation to combine set forth in Section II.A.3.d, *supra*, as though fully set forth herein. The motivations to combine such references identified in Section II.A.3.d, *supra*, are equally applicable to the prior art identified above, and are incorporated by reference as though fully set forth herein.

In addition, the POSITA would have understood the references listed above, alone or in combination, to contain explicit and/or implicit teaching, suggestion, and/or rationales to combine them for at least the following exemplary reasons.

(1) Parallel processing

The patent admits that parallel processing in speech recognition systems was known in the prior art. '319 patent at 1:30-32 (“In order to speed up the processing performed during such a search in a speech recognition system, parallel processing has been explored.”).

Indeed, Hon describes a “parallel (including pipeline) architecture” used for speech recognition. Hon at 2. Nguyen similarly discloses a speech recognition system in which “reading from the communication link can be done in parallel with processing of lexical trees.” Nguyen at [0044]. And Melnikoff II discloses “a continuous HMM speech recognition system which uses an FPGA to compute the observation probabilities and perform Viterbi decoding for three speech files in parallel” Melnikoff II at 5. Mathew “parallelizes” the prior art Sphinx speech recognition system “to see if there were any practical impediments to achieving good speedup” and found 1.67 times processing speed increase. Mathew at 5-6.

To the extent a reference does not disclose parallel processing, a POSITA would have found it obvious to perform parallel processing during speech recognition. A POSITA would have understood the advantage of parallel processing to increase the speed of processing data during

speech recognition. Such a combination is no more than a combination of prior art elements according to known methods to yield predictable results.

(2) Scoring

A POSITA would have understood that prior art speech recognition approaches included “determining a set of word sequences hypotheses associated with the utterance and then computing scores for the set of word sequence hypotheses using a second set of subword units to represent words in the word sequence hypotheses.” Lund at Abstract. Tran also discloses “a two-pass dynamic programming algorithm to find a sequence of word templates which best matches the whole input pattern” where, “[i]n the first pass, a score is generated which indicates the similarity between every template matched against every possible portion of the input pattern.” Tran at 20:12-19. “In the second pass, the score is used to find the best sequence of templates corresponding to the whole input pattern.” *Id.* Wilson likewise describes a speech recognition system that “uses an arbitration algorithm and a score ordered queue of recognition results, together with their associated recognition modules, to compare the recognition results of the recognition modules to select at least one system recognition result.” Wilson at Abstract. And Vargas discloses a speech recognition system that uses Viterbi algorithm “to compute the HMM likelihood score.” Vargas at Abstract.

To the extent a reference does not disclose scoring in speech recognition systems, the POSITA would have found it obvious to do so. A POSITA would have known the benefit of scoring to track the likelihood that a received audio signal or feature vector matches a particular phone, phoneme, word, phrase. The POSITA would have looked to existing solutions that provide this benefit, such as the exemplary references described above. Such a combination is no more than a combination of prior art elements according to known methods to yield predictable results and applies a known technique to a known system ready for improvement to yield predictable results.

4. Invalidity Under § 112

The Asserted Claims are invalid under 35 U.S.C. § 112. Defendants incorporate by reference the discussion in Section II.A.4 set forth above.

At least the following claims, and all claims depending on these claims, are invalid for failing to meet the requirements of 35 U.S.C. § 112:

Claim Element	Claims	§ 112 Grounds
“complete lexical data for word recognition”	46	Indefinite pursuant to pre-AIA § 12, para. 2.
“a control processor controlling each processor to process said speech parameters using partial lexical data read from a respective said lexical memory”	46	Indefinite pursuant to pre-AIA § 12, para. 2.
“a including language model processor providing a language model output for modifying the processing results at a word recognition event by a said processor”	51	Indefinite pursuant to pre-AIA § 12, para. 2.
“an input buffer receiving processed speech parameters”	46	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“a plurality of lexical memories containing in combination complete lexical data for word recognition, each lexical memory containing part of said complete lexical data”	46	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“a plurality of processors connected in parallel to said input buffer for processing the speech parameters in parallel, said processors being arranged in groups of processors, each group of processors being connected to a lexical memory”	46	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.

Claim Element	Claims	§ 112 Grounds
“a control processor controlling each processor to process said speech parameters using partial lexical data read from a respective said lexical memory”	46	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“a results memory storing the results of the processing of the speech parameters from said processors”	46	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.

E. THE '140 PATENT

1. Identification of Invalidity Grounds

Based on the reasons identified herein and the accompanying charts and references, a POSITA would have found the Asserted Claims of the '140 patent invalid under 35 U.S.C. §§ 102 and/or 103. The '140 patent invalidity charts attached as Exhibit E set forth herein, for corresponding limitations of an asserted claim, exemplary disclosures from each identified reference in an invalidity ground below where applicable. Defendants reserve the right to amend their invalidity grounds or charts, or provide supplemental grounds or charts, based on any amendments to Plaintiff's infringement contentions, or information or documents that may be obtained as discovery begins including third party discovery.

Defendants provide the following identification of exemplary invalidity grounds for the currently Asserted Claims of the '140 patent:

Claim No.	Exemplary Invalidity Grounds^{15, 16} under 35 U.S.C. §§ 102 and/or 103¹⁷
1	Tran Bailey Anantharaman Lund in combination with Tran Lund in combination with Bailey Lund in combination with Anantharaman TMS320C in combination with Tran TMS320C in combination with Bailey TMS320C in combination with Lund TMS320C in combination with Anantharaman TMS320C in combination with Vargas Wilson in combination with Tran Wilson in combination with Bailey Wilson in combination with Anantharaman Wilson in combination with Vargas Vargas in combination with Tran Vargas in combination with Bailey Vargas in combination with Anantharaman
2	<i>See grounds of claim 1.</i>
3	<i>See grounds of claim 2.</i>
4	<i>See grounds of claim 2.</i>
5	<i>See grounds of claim 1.</i>
6	<i>See grounds of claim 5.</i>

¹⁵ For brevity, each reference in this table is identified by its short cite, which is defined later in subsections II.E.2 and II.E.3 below.

¹⁶ To the extent the grounds identified in the below table for a particular asserted claim refer back to the grounds identified for another claim, the grounds disclose the particular asserted claim for the reasons identified in the corresponding claim charts for the particular asserted claim.

¹⁷ Defendants contend that any combination of references identified in this table as a ground invalidates the relevant asserted claim under 35 U.S.C. § 103. In addition, each reference identified by itself as a ground invalidates the relevant asserted claim under 35 U.S.C. § 102 and 103.

2. Identification of Invalidity Due to Anticipation

The table below lists the prior art references that anticipate one or more of the Asserted Claims of the '140 patent under 35 U.S.C. § 102. The attached claim charts in Exhibit E demonstrate where each limitation of the Asserted Claims is found in the references listed below, either expressly or inherently in the larger context of the passage, as understood by a person having ordinary skill in the art. The following references are prior art under at least 35 U.S.C. §§ 102(a), (b), or (e).

a. Prior Art Patents and Patent Publications that Anticipate the Asserted Claims of the '140 Patent

Patent No.	Filing Date / Priority Date	Date of Issue or Publication	Short Cite
U.S. Patent No. 5,459,798	March 19, 1993	October 17, 1995	Bailey

b. Prior Art Publications that Anticipate the Asserted Claims of the '140 Patent

Prior Art Publications Title	Date of Publication	Author/Publisher	Short Cite
U.S. Patent No. 6,080,140	November 4, 1998	June 27, 2000	Tran
A Hardware Accelerator for Speech Recognition Algorithms	1986	T.S. Anantharaman et al.	Anantharaman

3. Identification of Invalidity Due to Obviousness

The tables below list prior art references that render one or more of the Asserted Claims of the '140 patent invalid as obvious under 35 U.S.C. § 103, alone or in combination with the knowledge of a person having ordinary skill in the art and/or other prior art. The attached claim charts in Exhibit E demonstrate where each limitation of the Asserted Claims is found in the references listed below, either expressly or inherently in the larger context of the passage, as

understood by a person having ordinary skill in the art. The following references are prior art under at least 35 U.S.C. §§ 102(a), (b), or (e).

a. Prior Art Patents and Patent Publications that Render Obvious the Asserted Claims of the '140 Patent

Patent or Patent Publication No.	Filing Date / Priority Date	Date of Issue or Publication	Short Cite
U.S. Patent No. 5,459,798	March 19, 1993	October 17, 1995	Bailey
U.S. Patent No. 6,080,140	November 4, 1998	June 27, 2000	Tran
International Patent Application Publication No. WO 2000060577	April 1, 1999	October 12, 2000	Lund
U.S. Patent No. 6,292,779	March 9, 1998	September 18, 2001	Wilson
U.S. Patent No. 6,374,219	February 20, 1998	April 16, 2002	Jiang II
U.S. Patent No. 5,983,180	February 27, 1998	November 9, 1999	Robinson
U.S. Patent No. 5,036,539	July 6, 1989	July 30, 1991	Wrench

b. Prior Art Publications that Render Obvious the Asserted Claims of the '140 Patent

Title	Date of Publication	Author/Publisher	Short Cite
A Hardware Accelerator for Speech Recognition Algorithms	1986	T.S. Anantharaman et al.	Anantharaman
A FPGA-based Viterbi Algorithm Implementation for Speech Recognition Systems	2001	Fabian Luis Vargas et al.	Vargas
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	1994	Texas Instruments	TMS320C
A Low-Power VLSI Design of a HMM Based Speech Recognition System	2002	S. Yoshizawa, et all.	Yoshizawa
A Dynamic Time Warp VLSI Processor for Continuous Speech Recognition	1986	Georges Quenot, et al.	Quenot

Title	Date of Publication	Author/Publisher	Short Cite
Efficient Algorithms for Speech Recognition	May 15, 1996	Mosur K. Ravishankar	Ravishankar

c. Prior Art Systems/Services that Render Obvious the Asserted Claims of the '140 Patent

System/Service	Relevant Dates	Persons/Entities Involved in Prior Use, Sale, and/or Offers for Sale	Short Cite
TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSPs	At least by 1994	Texas Instruments	TMS320C
Sphinx II	At least by 1996	The Sphinx Group at Carnegie Mellon University	Sphinx II

d. Motivations for Combining Prior Art

Defendants incorporate by reference the reservation of rights, legal standard, and motivation to combine set forth in Sections II.A.3.d and II.D.3.d, *supra*, as though fully set forth herein. The motivations to combine such references identified in Sections II.A.3.d and II.D.3.d, *supra*, are equally applicable to the prior art identified above, and are incorporated by reference as though fully set forth herein.

4. Invalidity Under § 112

The Asserted Claims are invalid under 35 U.S.C. § 112. Defendants incorporate by reference the discussion in Sections II.A.4 and II.D.4 set forth above.

At least the following claims, and all claims depending on these claims, are invalid for failing to meet the requirements of 35 U.S.C. § 112:

Claim Element	Claims	§ 112 Grounds
“A speech recognition circuit . . . wherein . . . the initial score is used”	1	Indefinite pursuant to pre-AIA § 112, para. 2.

Claim Element	Claims	§ 112 Grounds
“compute a probability using the acoustic model data”	1	Indefinite pursuant to pre-AIA § 112, para. 2.
“an acoustic model memory storing acoustic model data”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“compute a probability using the acoustic model data in the acoustic model memory”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“generate an initial score for an audio sample”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.
“the initial score is used to determine whether to continue processing to determine a final score via processing a larger amount of model data than that was processed to generate the initial score”	1	Lack of enablement and written description pursuant to pre-AIA § 112, para. 2.

III. INVALIDITY CHARTS

Invalidity charts, pursuant to the Scheduling Order, are attached to these invalidity contentions as Exhibits A-E. These invalidity charts identify where in the prior art references each element of the Asserted Claim is found. While each element of each asserted claim may be found in each item of prior art in multiple locations, the attached charts provide examples of citations sufficient to identify at least one such location where each claim limitation is found in each item of prior art. Each item of prior art, however, discloses each claim limitation as a whole and specific citations are only exemplary. Accordingly, Defendants and their expert(s) may rely on uncited portions of the prior art references as the citations must be interpreted in light of the entire disclosure of each reference.

In addition, because persons of skill in the art generally would appreciate an item of prior art in the context of other publications, literature, products, and understanding, Defendants and

their expert(s) may rely on other publications and expert testimony as aids in understanding and interpreting the cited portions, for providing context to the cited portions, and as additional evidence that the prior art discloses a claimed feature. Defendants may establish what was known to a person having ordinary skill in the art through other publications, products, and/or testimony, and reserve their right to rely on cited and uncited portions of the prior art references, other publications, literature, products, understanding, and/or testimony to establish that a person of skill in the art would have been motivated to combine the references rendering the claims obvious.

Defendants may modify, amend, and/or change their interpretation of the prior art based on additional analysis by Defendants' expert(s), and/or based on other circumstances that may affect the meaning or application of the claims, including positions Zentian or its expert(s) may take.

The references discussed in the claim charts in Exhibits A-E, or elsewhere identified, may disclose the elements of the Asserted Claims explicitly and/or inherently, and/or they may be relied on to show the state of the art in the relevant timeframe. The suggested obviousness combinations are provided in the alternative to Defendants' anticipation contentions and are not to be construed to suggest that any reference in the combinations is not itself anticipatory.

IV. ADDITIONAL PRIOR ART

In addition to the prior art references charted, Exhibit F, which is incorporated herein in its entirety, identifies additional prior art references that disclose or describe the general state of the art and knowledge of one skilled in the art at the time of the purported inventions and the filings of the Asserted Patents. These references (without limitation) may be used to show the state of the art and/or may be used as supporting references in an obviousness combination.

Defendants also incorporate here by reference, whether or not cited in Exhibits A-E, all prior art cited in the Asserted Patents and all prior art cited in the prosecution histories of the Asserted Patents, any prior art cited in any PTAB proceedings, and any foreign counterparts, and

any prior art identified by any party in any litigation or administrative proceeding related to the Asserted Patents or any related patents.

V. SYSTEMS SUBJECT TO FURTHER DISCOVERY

Defendants list below systems subject to ongoing investigation and pending discovery. On information and belief, these systems anticipate and/or render obvious the Asserted Claims of the Asserted Patents, whether combined with the knowledge of a person having ordinary skill in the art alone, or in combination with one or more of another one of these systems or other references identified in these invalidity contentions. Defendants intend to pursue discovery in relation to these and other related systems and expect to amend or supplement these invalidity contentions with information to be provided by third parties.

Presently known systems subject to further discovery (which individually and/or collectively invalidate the Asserted Claims in conjunction with other references) include:

1. TMS320C5x DSPs - Telecommunications Applications with the TMS320C5x DSP
2. Sphinx II
3. Sphinx 3
4. AT&T Graph Search Machine
5. SRI-Berkeley Speech Search Machine
6. AT&T ASPEN Tree-Machine
7. MARS (Microprogrammable Accelerator for Rapid Simulation)
8. CMU BEAM accelerator
9. CMU PLUS
10. MSM6679

VI. DOCUMENT PRODUCTION

Defendants are concurrently producing related prior art documents identified in these invalidity contentions, to the extent not already produced.

TABLE OF EXHIBITS

Exhibits	Description
A	Invalidity Charts for the '277 patent
B	Invalidity Charts for the '377 patent
C	Invalidity Charts for the '789 patent
D	Invalidity Charts for the '319 patent
E	Invalidity Charts for the '140 patent
F	Prior Art Reflecting the General State of the Art

Dated: June 12, 2023

Respectfully, submitted,

/s/ Dargaye Churnet

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CERTIFICATE OF SERVICE

I hereby certify that on June 12, 2023, a true and correct copy of the foregoing document was served via electronic mail on counsel of record for Plaintiff.

/s/ Dargaye Churnet _____

Dargaye Churnet