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IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF ARIZONA

TriQuint Semiconductor, Inc., a Delaware corporation, Plaintiff/Counterdefendant, vs. Avago Technologies Limited, a Singapore corporation; Avago Technologies U.S., Inc., a Delaware corporation; Avago Technologies Wireless IP (Singapore) Pte., Ltd., a Singapore corporation, Defendants/Counterclaimants.	No. CV-09-01531-PHX-JAT **ORDER**

Before the Court are the parties' proposed constructions of the claim terms of thirteen patents.[1] The Court constructs the disputed claim terms below.

I. Background

Plaintiff/Counterdefendant TriQuint Semiconductor, Inc. ("TriQuint"), sued Defendants/Counterclaimants Avago Technologies Limited, Avago Technologies U.S., Inc., and Avago Technologies Wireless IP (Singapore) Pte., Ltd. (collectively, "Avago"), for

[1] The parties have stipulated to the construction of several claim terms. (*See* Doc. # 209 at pp. 2–3.) The Court will refer to these stipulated constructions when appropriate in this Order.

alleged infringement of three TriQuint patents and other related claims. Avago filed a counterclaim against TriQuint for alleged infringement of ten Avago patents and other related claims. The parties both design, manufacture and sell high-performance radio frequency filters, and power amplifier integrated circuits (chips) and modules (multiple chips on a circuit board) for use in wireless communications products, such as mobile telephone handsets.

The patents and technology at issue in this case concern bulk acoustic wave ("BAW") filters used in mobile telephones to filter transmitted and received radio frequency signals. BAW filters are incredibly small, and as a result, manufacturing BAW filters is a highly technical process. The patents at issue in this case concern the construction and composition of BAW filters and the parts that make up BAW filters, such as resonators.

TriQuint and Avago have filed briefs supporting their proposed constructions of the disputed claim terms in the three TriQuint patents and the ten Avago patents at issue in this case. Pursuant to *Markman v. Westview Instruments, Inc.*, 517 U.S. 370 (1996), the Court must construe the claims of the patents as a matter of law. On December 14, 2010, the Court held a *Markman* hearing during which the proposed constructions of the disputed claim terms were argued before the Court. Having considered the evidence presented in the parties' briefs, exhibits, and during the hearing, for the reasons set forth below, the Court construes the disputed claim terms as a matter of law as follows.

II. Legal Standard

"It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.'" *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111 (Fed. Cir. 2004)). Claim construction, which is the determination of the meaning of the terms in a patent, is a question of law, and exclusively within the province of the Court. *Markman*, 517 U.S. at 372. Thus,

> The determination of infringement is a two-step process. First, the court construes the claims to correctly determine the scope of the claims. Second,

> it compares the properly construed claims to the accused device. Claim construction is a matter of law . . . . However, a determination of infringement, both literal and under the doctrine of equivalents, is a question of fact.

Dow Chemical Co. v. Sumitomo Chemical Co., 257 F.3d 1364, 1372 (Fed. Cir. 2001) (internal citations omitted).

There is a specific order of evidence that the Court should consider in construing a claim. *See Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582–83 (Fed. Cir. 1996). First, the Court considers the patent itself. *Id.* at 1582. In construing the claims, the Court should "look to the words of the claims themselves" giving them "their ordinary and customary meaning" unless clearly stated otherwise. *Id.* Specifically, disputed claim terms are given "their ordinary and accustomed meaning as understood by one of ordinary skill in the art." *Dow Chem.*, 257 F.3d at 1372; *see Texas Digital Systems, Inc. v. Telegenix, Inc.*, 308 F.3d 1193, 1202 (Fed. Cir. 2002) ("The terms used in the claims bear a 'heavy presumption' that they mean what they say and have the ordinary meaning that would be attributed to those words by persons skilled in the relevant art."). "Dictionaries are always available to the court to aid in the task of determining meanings that would have been attributed by those of skill in the relevant art to any disputed terms used by the inventor in the claims." *Texas Digital*, 308 F.3d at 1202 (citing *Vitronics*, 90 F.3d at 1584 n.6).

Second, the Court looks at "the [patent] specification to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning. The patent specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication." *Vitronics*, 90 F.3d at1582.

Third, the Court may consider the prosecution history of the patent. *Id.* at 1582. "[T]he record before the Patent and Trademark Office [("PTO")] is often of critical significance in determining the meaning of the claims. *Id.* at 1582–83. Specifically, reference may be made to the patent specifications, the prosecution history, prior art, and other claims in determining the proper scope of patent claims and the meaning of any terms in dispute. *Carroll Touch, Inc. v. Electro Mechanical Systems, Inc.*, 15 F.3d 1573, 1577

(Fed. Cir. 1993). Thus,

> Prosecution history estoppel precludes a patentee from obtaining[,] in an infringement suit[,] patent protection for subject matter which it relinquished during prosecution in order to obtain allowance of the claims. It thus serves as a check on the applicability of the doctrine of equivalents. . . . The application of prosecution history estoppel is a question of law.

Mark I Marketing Corp. v. R.R. Donnelly & Sons Co., 66 F.3d 285, 291 (Fed. Cir. 1995) (internal citations omitted). In other words,

> Prosecution history estoppel requires that the claims of a patent be interpreted in light of the proceedings in the PTO during the application process. Estoppel is a "rule of patent construction" that ensures that claims are interpreted by reference to those "that have been cancelled or rejected." The doctrine of equivalents allows the patentee to claim those insubstantial alterations that were not captured in drafting the original patent claim but which could be created through trivial changes. When, however, the patentee originally claimed the subject matter alleged to infringe but then narrowed the claim in response to a rejection, he may not argue that the surrendered territory comprised unforeseen subject matter that should be deemed equivalent to the literal claims of the issued patent.

Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 733–34 (2002) (internal citations omitted). In reviewing the patent file history, it is appropriate to review the relevant patent file history for parent and grandparent applications. *Mark I*, 66 F.3d at 291.

Fourth, the Court may consider extrinsic evidence, such as expert testimony, only if the Court cannot resolve a disputed claim term based on the first three sources of evidence. *Vitronics*, 90 F.3d at 1583–84. In most situations, analysis of the patent and its prosecution history, *i.e.*, the intrinsic evidence, will resolve any ambiguity in a disputed claim term, and it is improper to rely on extrinsic evidence. *Id.* at 1583.

The disputed claims should be interpreted without reading in limitations from the patent specification. *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1326 (Fed. Cir. 2002) (citing *Comark Commc'ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1186 (Fed. Cir. 1998)). In other words, if the patent specification discloses only one exemplary embodiment, that does not require that each claim be limited to that one embodiment. *SRI Int'l v. Matsushita Elec. Corp. of Am.*, 775 F.2d 1107, 1121 n.14 (Fed. Cir. 1985) (*en banc*).

Courts should not determine a claim to be indefinite without first making a reasonable attempt at construction. *Metabolite Lab., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1366 (Fed. Cir. 2004) ("Only when a claim remains insolubly ambiguous without a discernable meaning after all reasonable attempts at construction must a court declare it indefinite."); *All Dental Prodx, LLC v. Advantage Dental Prods., Inc.*, 309 F.3d 774, 780 (Fed. Cir. 2002) ("Only after a thorough attempt to understand the meaning of a claim has failed to resolve material ambiguities can one conclude that the claim is invalid for indefiniteness.").

Finally, "a dependent claim includes all the limitations of the claim from which it depends . . . . It is axiomatic that dependant claims cannot be found infringed unless the claims from which they depend have been found to be infringed." *Wahpeton Canvas Co. v. Frontier, Inc.*, 870 F.2d 1546, 1553 (Fed. Cir. 1989).

III. Claim Construction

The following chart summarizes the Court's construction of the disputed claim terms. The full analysis supporting each construction is below.

Disputed Claim Term		Construction
TriQuint's Patents		
U.S. Patent No. 5,231,327		
the only connections to the [second/third] electrode (Claims 1, 4, 6 & 8)		no other electrical connections to the [second/third] electrode exist
U.S. Patent No. 5,894,647		
fabricating a substrate . . . having a top electrode (Claims 1 & 5)		fabricating a substrate and adding a top electrode on the substrate; this step must precede the step of "removing from a top electrode . . . ."
top electrode (Claims 1–8)		conducting material on the substrate that includes at least a portion that overlaps at least a portion of a paired electrode (bottom electrode)

Disputed Claim Term		Construction
adding a differential layer of conducting material on top of the top electrode (Claims 1 & 5)		adding a differential layer of conducting material on top of the top electrode [*No construction is necessary.*]
removing from the top electrode portions of the top electrode that include, but are not necessarily limited to, those portions of the top electrode that overlap with a portion of the bottom electrode and that are not composed of a portion of both the primary layer of the conducting material and the differential layer of the conducting material (Claim 1)		removing the portions of the top electrode that both (1) overlap with a portion of the bottom electrode and (2) are not composed of a portion of both the primary layer of conducting material and the differential layer of conducting material; "but are not necessarily limited to" means other portions of the top electrode may or may not be removed as well
the first top electrode additionally comprising a differential layer of conducting material (Claims 2 & 6)		in addition to a primary layer of conducting material, the first top electrode includes a differential layer of conducting material
fabricating a primary layer of conducting material on the top surface of the substrate to form first and second top electrodes (Claims 3, 4, 7 & 8)		fabricating a primary layer of conducting material on the top surface of the substrate to form first and second top electrodes [*No construction is necessary.*]
fabricating a differential layer of conducting material upon the first top electrode (Claims 3 & 7)		fabricating a differential layer of conducting material upon the first top electrode [*No construction is necessary.*]
U.S. Patent No. 6,114,635		
substantially non-conducting material (Claims 1–3 & 11)		largely but not wholly non-conducting material
bonding strip (Claims 1 & 11)		a separately recognizable strip where bonding material joins a portion of the lid to a portion of the die
bonding material (Claims 1, 3, 8 & 11)		material that bonds together the bonding strips
Avago's Patents		
U.S. Patent No. 7,365,619		
related to a common ground (Claim 1)		related to a common electrical ground

Disputed Claim Term	Construction
antiparallel (Claims 1 & 11)	the first electrode of the first resonator is electrically connected to the second electrode of the second resonator, and vice versa; where the first and second electrodes of a resonator are determined by the direction of polarization of the resonator
a polarization of the common piezo layer in the first area and a polarization of the common piezo layer in the second area are unidirectional (Claim 1)	a polarization of the shared layer of piezoelectric material in the first area and a polarization of the shared layer of piezoelectric material in the second area are in the same absolute direction
exhibit substantially identical shifts in terms of the amount and direction of the resonance frequency due to a Voltages Coefficient of Frequency (VCF) effect (Claims 3 & 13)	exhibit substantially identical shifts in terms of the amount and direction of the resonance frequency due to a Voltages Coefficient of Frequency (VCF) effect, *i.e.*, changes in the resonance frequency when the direct voltage varies, or is swept, within a wide range from high negative voltages to high positive voltages
architecture (Claims 6 & 16)	the number, composition, size, shape, and order of layers in the resonator
U.S. Patent 7,268,436	
wherein the bonding connections of the contact areas and the inner areas of external contacts each include a bonding arc (Claim 1)	wherein each bonding connection formed between the contact areas and the inner area of external contacts includes a bonding arc
bonding connections (Claim 1)	a connection that bonds two elements
bonding arc (Claim 1)	a bond formed by bonding the side of a bond wire to a contact area/inner area of external contact, forming an arc-like shape
U.S. Patent No. 6,841,922	
due to technological limitations in the manufacturing of this layer (Claim 1)	due to technological limitations in the manufacturing of this layer [*No construction is necessary.*]
the other layer (Claims 1–3)	the other layer [*No construction is necessary.*]

Disputed Claim Term		Construction
the acoustic reflector is a plurality of layers having a high acoustic impedance and comprises a plurality of layers having a low acoustic impedance (Claim 4)		the acoustic reflector comprises a plurality of layers having a high acoustic impedance and a plurality of layers having a low acoustic impedance
U.S. Patent No. 6,933,807		
wherein the performance of the acoustic reflector is determined by its reflectivity for a longitudinal wave existing in the BAW resonator at the resonance frequency of the BAW resonator and by its reflectivity for a shear wave existing in the BAW resonator at the resonance frequency of the BAW resonator (Claims 1 &10)		[*The disputed claim term is indefinite and incapable of construction.*]
performance of the acoustic reflector (Claims 1 & 10)		the reflectivity for a longitudinal wave existing in the BAW resonator at the resonance frequency of the BAW resonator and the reflectivity for a shear wave existing in the BAW resonator at the resonance frequency of the BAW resonator
wherein areas with layers with high acoustic impedance and areas with layers with low acoustic impedance are alternately adjacently disposed (Claims 1 & 10)		wherein areas with layers with high acoustic impedance and areas with layers with low acoustic impedance are alternately adjacently disposed, with the term "areas" including a layer having a characteristic acoustic impedance (high or low) along with any connected thin intermediate layers
wherein the layers of the acoustic reflector and layers disposed between the acoustic reflector and the piezoelectric layer are selected, with reference to their number, material, and thickness, such that the transmissivity for the longitudinal wave and the transmissivity for the shear wave in the area of the resonance frequency is smaller than -10 dB (Claims 1 & 10)		the number, the material and the thickness of the layers of the acoustic reflector and the layers between the acoustic reflector and the piezoelectric layer must all be selected for the specific purpose of achieving (a) the transmissivity for the longitudinal wave in the area of the resonance frequency of less than -10dB, and (b) the transmissivity for the shear wave in the area of the resonance frequency of less than -10dB

Disputed Claim Term	Construction
layers of the acoustic resonator are selected such that the BAW resonator has an unambiguous and desired dispersion performance (Claim 4)	the layers of the acoustic resonator must all be selected for the specific purpose of achieving an unambiguous and desired dispersion performance
unambiguous and desired dispersion performance (Claim 4)	the first shear harmonic wave and the longitudinal main resonance of the BAW resonator are separated by at least a bandwidth of the resonator
[layers] are selected such that the distance between the longitudinal main resonance and the first shear harmonic wave is greater than the bandwidth of the longitudinal main resonance of the resonator (Claim 6)	the layers of the acoustic resonator must all be selected for the specific purpose of achieving a distance between the longitudinal main resonance and the first shear harmonic wave that is greater than the bandwidth of the longitudinal main resonance of the resonator
longitudinal main resonance [of the resonator] (Claim 6)	the primary resonant frequency at which the resonator resonates longitudinally (in the direction of the elastic deflection)
U.S. Patent No. 6,909,340	
A bulk acoustic wave filter, comprising: a plurality of bulk acoustic wave resonators (Claims 1 & 12)	A bulk acoustic wave filter having at least two bulk acoustic wave resonators. [*The preamble is not a limitation.*]
bulk acoustic wave resonator[s] (Claims 1–4 & 9–12)	a resonator comprised of a layer of piezoelectric material sandwiched between a top electrode and bottom electrode with a specific effective resonator surface
surface contents (Claims 1, 2, 5–8 & 12)	area
aspect ratios (Claims 1 & 12)	the smallest dimension of the resonator within the surface plane divided by the largest dimension of the resonator within the surface plane. The directions of these two dimensions need not be perpendicular to each other.
nonrectangular shape (Claims 3 & 4)	a shape where the angles between the boundary lines of the shape are not equal to 90 degrees where they meet, *i.e.*, any shape that is not a rectangle

Disputed Claim Term		Construction
stage of a conductor filter (Claim 9)		one series resonator and one parallel resonator connected in a ladder configuration
half-stage of a conductor filter (Claim 9)		one additional parallel or series resonator included within a ladder configuration
U.S. Patent No. 6,864,619		
[a detuning layer sequence] arranged on the first piezoelectric resonator (Claims 1 & 12)		the detuning layer sequence is only applied to the first piezoelectric resonator
[the detuning layer sequence comprises at least a first layer having a first acoustic impedance and a second layer having a second acoustic impedance] in order to shift a resonance frequency of the first piezoelectric resonator relative to the resonance frequency of the second piezoelectric resonator (Claims 1 & 12)		the detuning layer sequence comprises at least a first layer having a first acoustic impedance and a second layer having a second acoustic impedance for the purpose of shifting the resonance frequency of the first piezoelectric resonator relative to the resonance frequency of the second piezoelectric resonator
U.S. Patent No. 6,812,619		
the resonator is adapted in such a way that a width of the frame-like zone and acoustical property means of the layer structure in the frame-like zone are arranged so that displacement relating to the piezoelectrically excited strongest resonance mode is substantially uniform in the center area of the resonator (Claims 1 & 35)		the resonator is adapted in such a way that a width of the frame-like zone and acoustical property means of the layer structure in the frame-like zone are arranged so that displacement relating to the piezoelectrically excited strongest resonance mode is substantially uniform in the center area of the resonator [*No construction is necessary.*]
the resonator is adapted to operate in the thickness extensional wave mode as a TE mode (Claims 1 & 35)		the resonator is adapted to operate such that the displacement of the particles of the piezoelectrical material occurs in the direction of the applied electrical field
U.S. Patent No. 6,377,137		
removing material from a bottom surface of said substrate to reduce the thickness of the substrate and to reduce an electromagnetic influence in a resulting filter (Claim 1)		removing material from a bottom surface of said substrate to reduce the thickness of the substrate and to reduce the effects caused by currents flowing through the filter

Disputed Claim Term		Construction
reduce an electromagnetic influence (Claim 1)		reduce the effects caused by currents flowing through the filter
die cavity (Claims 5, 6, 14 & 16)		a hollow area in a package where the die is mounted
victim loop (Claims 7, 15 & 18)		a current path from the output pad to the ground pad such that the signal bypasses the filter elements
victimizer loop (Claims 7, 15 & 18)		a current path from the input signal pad to the ground pad such that the signal bypasses the filter elements
U.S. Patent No. 6,262,637		
film bulk acoustic resonator (FBAR) (Claims 1 & 20–22)		a bulk acoustic wave (BAW) resonator fabricated using thin film technology
a 90° phase shifter (Claim 1)		a phase shifter that shifts the phase of a signal by 90 degrees
in series with a second band-pass filter (Claim 1)		in series with a second band-pass filter [*No construction is necessary.*]
U.S. Patent No. 6,051,907		
Thin Film Bulk Acoustic Wave Resonators (FBARs) (Claims 1, 7 & 10)		a thin film bulk acoustic wave resonator (FBAR) comprised of a plurality of layers having respective thicknesses, and exhibiting at least one of a series resonance and a parallel resonance at respective frequencies that are a function of the thickness of at least one of the layers
calculating an average of the measured frequencies (Claim 10)		calculating a mean of the measured frequencies
simultaneously altering the thickness of each of the plurality of the FBARs [by the amount (A)] (Claim 10)		altering the thickness of each film bulk acoustic resonator to be detuned on a wafer by the same amount (A) at the same time

A. TriQuint's U.S. Patent No. 5.231.327 — "the only connections to the [second/third] electrode" (Claims 1, 4, 6 & 8)

TriQuint acquired U.S. Patent No. 5,231,327, titled "Optimized Piezoelectric Resonator-Based Networks" (the "'327 patent"), through its acquisition of TFR

Technologies, Inc. ("TFR"). The '327 patent describes a way of designing a piezoelectric resonator so that electrical connections are more conveniently located. The '327 patent describes two top resonators, each with their own top electrode, that are electrically connected to each other by one shared bottom electrode. (*See* Doc. # 196-1, Ex. A at Fig. 4B.)

TriQuint's proposed construction for "the only connections to the [second/third] electrode" is "no other conductive electrical connections to the [second/third] electrode exist." Avago's proposed construction for this disputed claim term is "the [second/third] electrode is not electrically connected to any other component of the circuit."[2]

Based on the disputed claim term, which appears in four of the patent claims, if the bottom electrode of a resonator is connected to another component or device, then it is not covered by the '327 patent. TriQuint contends that the relevant connections are *conductive* electrical connections; whereas, Avago contends that the electrode may not have *any* electrical connections to any other component in the circuit. Avago's proposed construction is more closely supported by the patent or the plain meaning of the term "connections" as used in the relevant art.

TriQuint argues that the "connections" described in the disputed claim term refer to electrical connections. The '327 patent supports this construction, and Avago does not disagree. Avago argues, and the Court agrees, that the disputed claim term is not limited to *conductive* electrical connections as proposed by TriQuint. Claims 1 and 4 refer to electrical connections: "a pair of series connected piezoelectric resonators sharing a first electrode"; "a shunt element connected to the first electrode and to a signal ground"; and "a first pair of resonators sharing a first electrode for connection to other circuitry." (Doc. # 196-1, Ex. A. at 11:37–38, 11:39–40, 12:6–7.) Figure 4B of the '327 patent shows the primary preferred embodiment for the invention. (*Id.* at 3:11–14.) The patent specification describes electrode

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[2] During the *Markman* hearing, Avago revised its proposed construction of the disputed claim term to remove the requirement that the electrode cannot be *physically* connected to any other component.

M2 as "a floating electrode that does not connect to other circuitry." (*Id.* at 6:25–26.) The patent compares electrode M2 to electrodes M1 and M3, which "are referred to as connecting electrodes since they connect the network to other circuitry, such as resistors." (*Id.* at 5:67–68, 6:1–2.)

As understood by a person of ordinary skill in the art, the term "connections" in the disputed claim term refers to electrical connections, but not specifically *conductive* electrical connections. An industry dictionary defines a "floating network or component" as "having no terminal at ground potential." IEEE STANDARD DICTIONARY OF ELECTRICAL & ELECTRONIC TERMS 380 (4th ed. 1988).

The Court finds the ordinary and customary meaning of the term "connections" as understood by person of ordinary skill in the art, *see Phillips*, 415 F.3d at 1313, means electrical connections. TriQuint seeks to limit the disputed claim term to "conductive" electrical connections. There is no support in either the '327 patent, or TriQuint's brief, to limit the construction to "conductive" electrical connections. Accordingly, the Court construes the disputed claim term as "no other electrical connections to the [second/third] electrode exist."

B. TriQuint's U.S. Patent No. 5,894,647

TriQuint acquired U.S. Patent No. 5,894,647, titled "Method for Fabricating Piezoelectric Resonators and Product" (the "'647 patent"), through its acquisition of TFR. The '647 patent describes how to shift a resonator's resonant frequency by a small amount by adding layers of material to the top electrode. However, the layers may not be aligned perfectly creating "parasitic" resonators. The '647 patent describes the removal of the portions of the top electrode that overlap the bottom electrode.

1. "fabricating a substrate . . . having a top electrode" (Claims 1 & 5)

TriQuint's proposed construction for "fabricating a substrate . . . having a top electrode" is "fabricating a substrate and adding a top electrode on the substrate; this step must precede the step of 'removing from a top electrode . . . .'" Avago's proposed

construction for this disputed claim term is "fabricating a substrate and defining[3] on the substrate a top electrode; this step must precede the step of 'removing from a top electrode . . . .'" The parties agreed that the top electrode must be initially added on the substrate before portions are removed in the "removing" step. The parties dispute whether an "electrode," as used in the '647 patent, means a defined electrode of an individual resonator, or whether it refers to a general layer of the conducting material in which an electrode is later etched out.

The '647 patent teaches various ways of removing the portions of the top electrode that overlap the bottom electrode and that are not composed of both primary and differential layers. The first method is to deposit primary and differential layers in areas slightly larger than the ultimately desired electrodes, and then to remove the excess strips. (Doc. # 196-1, Ex. B at 5:33–6:17.) The second method is to deposit a primary layer on the substrate and then to deposit a differential layer in the general area to be occupied by the electrode, and then to use a masking and etching process to remove material so as to leave the desired two electrodes. (*Id.* at 6:38–49.) The Court finds the claims in the '647 patent are broad enough to include both methods. The '647 patent uses the term "top electrode" to refer to electrode layers during the manufacturing process, as well as after that process has been completed (after "the step of removing"). Avago argues that this second method was disclaimed in the prosecution history; however, it appears that the inventor's alleged disclaimer is taken out of context. (Doc. # 197-2, Ex. B.2 at p. 5–6) (distinguishing the claimed invention from prior art stating that the "essence" of the invention is the removal of narrow strips of metal along the edges of the electrode, and not disavowing the scope of the relevant claims).

Based on the foregoing fabrication methods, the Court finds Avago's proposed construction that the top electrode must be defined on the substrate is misleading. The parties agree that a removing step occurs after the top electrode is added. As described

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[3] After filing its initial brief, Avago appears to have changed its proposed construction to use the word "patterned" rather than "defining." This change does not affect the Court's analysis.

above, there is no specific "defining" of the top electrode, other than to add layers to the substrate, prior to the removal process. The outer limits of the top electrode are not fixed or defined until after the "removing" step, which both parties agree follows the addition of the primary and differential layers on the substrate.

Therefore, the Court construes the disputed claim term as "fabricating a substrate and adding a top electrode on the substrate; this step must precede the step of 'removing from a top electrode . . . .'"

2. "top electrode" (Claims 1–8)

TriQuint's proposed construction of "top electrode" is "conducting material on the substrate that includes at least a portion that overlaps at least a portion of a paired electrode (bottom electrode)." Avago's proposed construction of this disputed claim term is "a top electrode of an individual resonator."

The '647 patent supports Avago's proposed construction of the disputed claim term to the extent that the overlapping portions of the top electrode and bottom electrode define the resonator. (Doc. # 196-1, Ex. B at 7:8–10.) The patent describes a device comprised of two resonators, with the claims describing the fabrication of the electrodes on the device. The claims repeatedly describe a top electrode overlapping with a portion of a bottom electrode to define an individual resonator. (*See e.g.*, *id.* at 7:8–10, 7:40–45, 8:54–60.) The patent provides that the two top electrodes are components of a first and second resonator. (*Id.* 7:40–45.) The '647 patent also describes the addition of "a differential layer of conducting material to the first top electrode so as to shift the resonant frequency of the first resonator relative to the resonant frequency of the second resonator." (*Id.* at 9:11–14.) However, the claim term "top electrode" does not need to be constructed in a manner that takes into account its formation of a resonator.

The claims clearly describe a device comprised of two resonators with each resonator having its own top electrode. In support of its position that a top electrode is split among two or more resonators, TriQuint directs the Court to the '327 patent. Upon reviewing the claims in the '647 patent at issue here, the Court does not find support for the contention that "top

electrode" in the '647 patent is not limited to an individual resonator. However, the Court does not find it necessary to read "an individual resonator" into the construction of "top electrode," because the claims clearly states how the resonator is formed.

For the foregoing reasons, the Court construes "top electrode" as "conducting material on the substrate that includes at least a portion that overlaps at least a portion of a paired electrode (bottom electrode)."

3. "adding a differential layer of conducting material on top of the top electrode" (Claims 1 & 5)

TriQuint proposes that no construction is necessary, because "adding a differential layer of conducting material on top of the top electrode" is clear on its face. Avago's proposed construction for this disputed claim term provides that "this step [adding a differential layer of conducting material on top of the top electrode] must come after the step of fabricating the top electrode as it requires that the differential layer be formed 'on top of the top electrode.'"

While it is clear from the disputed claim term that the top electrode exists prior to adding a differential layer, the '647 patent does not explicitly include a prior step of "fabricating the top electrode." The patent requires "fabricating a substrate having a top and bottom surface and having a top electrode on the top surface." (*Id.* at 7:1–2.) Adding the implicit step "fabricating the top electrode" would only add ambiguity to the disputed claim term.

Avago's proposed construction also appears to require that the boundaries of the top electrode must be fixed before adding the differential layer to the top electrode. Such a construction is not supported by the patent claims. Claims 1 and 5 describe fabricating a piezoelectric resonator by, among other steps, "adding a differential layer of conducting material on top of the top electrode." (Doc. # 196-1, Ex. B at 7:11–12, 8:26–27.) Then, "removing from the top electrode portions of the top electrode that . . . overlap with a portion of the bottom electrode that are not composed of a portion of both the primary layer . . . and the differential layer." (*Id.* at 7:16–21, 8:31–35.) Before these two steps occur, the top

electrode already exists on the substrate, and is comprised of "a primary layer of conducting material." (*Id.* at 7:5–6.)

Avago's proposed construction muddles a claim term that is clear on its face when read in context. Accordingly, the Court finds that no further construction is required.

4. "removing from the top electrode portions of the top electrode that include, but are not necessarily limited to, those portions of the top electrode that overlap with a portion of the bottom electrode and that are not composed of a portion of both the primary layer of the conducting material and the differential layer of the conducting material" (Claim 1)

TriQuint's proposed construction for "removing from the top electrode portions of the top electrode that include, but are not necessarily limited to, those portions of the top electrode that overlap with a portion of the bottom electrode and that are not composed of a portion of both the primary layer of the conducting material and the differential layer of the conducting material" is "removing from the portions of the top electrode that both (1) overlap with a portion of the bottom electrode and (2) are not composed of a portion of both the primary layer of conducting material and the differential layer of conducting material." TriQuint also proposes that "but are not necessarily limited to" means "other portions of the top electrode may or may not be removed as well." Avago proposes that "but not necessarily limited to" is vague and renders the claim indefinite.

Avago argues that because the patent examiner originally found the use of the phrase ". . . but not necessarily limited to . . ." vague in light of the preceding word "including" (Doc. # 197-2, Ex. B-3 at p. 2), the Court should strike claim 1 of the '647 patent as invalid. The inventors attempted to amend the claims to remove "but are not necessarily limited to" from claim 1. (Doc. # 197-2, Ex. B-4 at p.2.) However, the PTO issued the '647 patent with the phrase still contained in claim 1, which is likely the result of a ministerial error. While perhaps not an example of superbly concise writing, the Court does not find the use of the phrase "but not necessarily limited to" renders the entire claim indefinite.

A person of ordinary skill in the art would understand the phrase "including, but not necessarily limited to, X" means the category includes X, but may also contain Y and Z. In fact, as TriQuint points out, Avago uses the phrase "including, but not limited to" in

discussing its proposed construction of a subsequent disputed claim term. (*See* Doc. # 197 at p. 35.) Additionally, TriQuint's brief cites a patent statute that contains the allegedly indefinite phrase. *See* 35 U.S.C. § 210(a) ("This chapter shall take precedence over any other Act . . . including, but not necessarily limited to the following: . . . ."). Clearly, the phrase is not insolubly ambiguous.

TriQuint's proposed construction rearranges the disputed claim term to remove the phrase "but not necessarily limited to," and adds a provision to define the meaning of that phrase. The Court will adopt TriQuint's proposed construction and construe the disputed claim term as "removing the portions of the top electrode that both (1) overlap with a portion of the bottom electrode and (2) are not composed of a portion of both the primary layer of conducting material and the differential layer of conducting material; 'but are not necessarily limited to' means other portions of the top electrode may or may not be removed as well."

5. "the first top electrode additionally comprising a differential layer of conducting material" (Claims 2 & 6)

TriQuint's proposed construction for "the first top electrode additionally comprising a differential layer of conducting material" is "in addition to a primary layer of conducting material, some or all of the first top electrode includes a differential layer of conducting material." Avago's proposed construction for this disputed claim term is "a differential layer of conducting material is added only to the first top electrode of an individual first resonator."

In its brief, Avago states that its proposed construction requires that the differential layer of conducting material is applied only to the first electrode (not to the second electrode). TriQuint understands Avago's proposed construction to also require that the differential layer may be added only *after* the primary layer has been deposited, which is inconsistent with the patent. The '647 patent permits the sequence to be reversed and the differential layer could be deposited on the substrate followed by the primary layer. (Doc. # 196-1, Ex. B. at 6:20–25, 8:11–13, 10:4–6.) Accordingly, the Court finds Avago's proposed construction to be ambiguous and potentially in conflict with other claims in the

’647 patent.

TriQuint’s proposed construction states that the differential layer may be added to “some or all” of the first top electrode. However, the Court does not find it necessary to read this phrase into the disputed patent claim. For the foregoing reasons, the Court construes the disputed claim term as “in addition to a primary layer of conducting material, the first top electrode includes a differential layer of conducting material.”

6. “fabricating a primary layer of conducting material on the top surface of the substrate to form first and second top electrodes” (Claims 3, 4, 7 & 8)

TriQuint proposes that no construction is necessary, because “fabricating a primary layer of conducting material on the top surface of the substrate to form first and second top electrodes” is clear on its face. Avago’s proposed construction for this disputed claim term is “fabricating a primary layer of conducting material on the top surface of the substrate to form the first top electrode of a first resonator and to form the second top electrode of a second resonator.”

Avago’s only construction of the disputed claim term is the addition of “of a first resonator” and “of a second resonator.” It is not necessary to introduce the concept of individual resonators into the construction of this disputed claim term, as Avago proposes. The disputed claim term concerns the formation of the electrodes upon the substrate, and does not reference the formation of resonators or the composition of resonators. As noted above, the ’647 patent often uses the term “electrode” to refer to the electrode layer before the final electrode boundaries are carved out. Therefore, the Court agrees with TriQuint that the disputed claim term is clear on its face, and no construction is necessary.

7. “fabricating a differential layer of conducting material upon the first top electrode” (Claims 3 & 7)

TriQuint proposes that no construction is necessary, because “fabricating a differential layer of conducting material upon the first top electrode” is clear. Avago’s proposed construction for this disputed claim term is “fabricating a differential layer of conducting material only upon the first top electrode” and that “this step must come after the step of

fabricating the first top electrode as it requires that the differential layer be formed 'upon the first top electrode.'" TriQuint argues that there is no "step of fabricating the first top electrode."

Avago seeks to add the word "only" into the claim term. The Court finds no reason for this addition. As TriQuint points out in its brief, some of the differential layer may be deposited onto the substrate during the fabrication process. The '647 patent teaches a fabrication method in which primary and differential layers are deposited in areas slightly larger than the ultimately desired electrodes, and then the excess strips are removed, (Doc. # 196-1, Ex. B at 5:33–6:17), and a fabrication method in which the primary layer is deposited on the substrate and then the differential layer is deposited in the general area to be occupied by the electrode, and then a masking and etching process is used to leave the desired two electrodes (*id.* at 6:38–49). Adding "only" to the disputed claim term would render the construction inaccurate. Avago argues that "only" is required to clarify that the differential layer is applied *only* to the first electrode, and not to the second electrode. The claim term clearly states "upon the first top electrode." The Court does not find it necessary to clarify that "first top electrode" does not mean "first top electrode *and* second top electrode."

Finally, and as stated above, it is clear from the disputed claim term that the top first electrode exists prior to adding a differential layer. Contrary to Avago's proposed construction, the '647 patent does not explicitly include a prior step of "fabricating the top electrode." The patent requires "fabricating a substrate having a top and bottom surface and having a top electrode on the top surface." (*Id.* at 7:1–2.) Adding the implicit step "fabricating the first top electrode," as Avago proposes, would only add ambiguity to the disputed claim term and conflict with the patent specification.

Based on the foregoing, the Court finds that it is not necessary to construct the disputed claim term.

C. TriQuint's U.S. Patent No. 6,114,635

TriQuint acquired U.S. Patent No. 6,114,635, titled "Chip-Scale Electronic

Component Package" (the "'635 patent"), through its acquisition of TFR. The '635 patent describes a compact package for an acoustic wave device located on a substrate or a die. The package includes a lid that covers part of the die, which is made of a "substantially non-conducting material," and provides space above the acoustic device so that it can deform or vibrate. The lid and the die are connected with "bonding strips" by "bonding material."

1. "substantially non-conducting material" (Claims 1–3 & 11)

The '635 patent calls for "a lid made out of substantially non-conducting material." (Doc. # 196-1, Ex. C at 4:14, 4: 36–37, 4:46–47, 5:24.) TriQuint's proposed construction for "substantially non-conducting material" is "a material with sufficient resistivity to prevent significant electrical conduction in areas between conducting structures at operating conditions (not limited to insulators)." Avago's proposed construction for this disputed claim term is "insulators (*e.g.*, sapphire or alumnia)."

As an initial matter, Avago's proposed construction conflates "substantially" with "not at all." "Substantially" is defined as "largely but not wholly that which is specified." MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY 1174 (10th ed. 1993). In its reply brief, Avago acknowledges that the term "substantially" by itself means "largely but not wholly that which is specified." (Doc. # 213-1 at p. 10 n.9.) The patent specification supports this reading: "a lid [] made out of alumnia, sapphire or other suitable material." (*Id.* at 2:58–59.) As TriQuint points out in its brief, alumnia and sapphire are insulators, but "other suitable material" leaves open the possibility of a lid made out of a non-insulating material, so long as that material is substantially non-conducting. The prosecution history confirms that "substantially non-conducting material" is not limited to insulators. (*See* Doc. # 196-3, Ex. 4 at p. 3) (referring to U.S. Patent No. 4,905,075 in which a lid made of substantially non-conducting material was made of a silicon wafer, a semiconducting material.) The Court finds that insulators form a subset of "substantially non-conducting materials," but the plain meaning of "substantially non-conducting materials" can include other materials, such as semiconductors.

The Court also finds that those of ordinary skill in the art would not limit the disputed

claim term to "insulators." However, TriQuint's proposed construction is not without issues. Avago speculates that the terms "sufficient" and "significant" in TriQuint's proposed construction will raise new construction claims, and the Court agrees. Accordingly, the Court construes the disputed claim term as "largely but not wholly non-conducting material."

2. "bonding strip" (Claims 1 & 11)

TriQuint's proposed construction for "bonding strip" is "strip where bonding material joins a portion of the lid to a portion of the die." Avago's proposed construction for this disputed claim term is "a strip, distinct from the die or lid itself, that has a given thickness and is capable of being bonded." The parties disagree as to whether the bonding strips must be separate and distinct from the die, the lid, and the bonding material.

The '635 patent provides that the bonding strip "may be used simply to provide a surface to which lid 6 is bonded." (Doc. # 196-1, Ex. C at 3:52–53.) The patent also provides that the bonding strip must be "electrically conducting" (*id.* at 2:64). Therefore, it must be distinct from the lid, which is made of "substantially non-conducting material" (*id.* at 4:46–47). TriQuint acknowledges that the bonding strip must be distinct, in that it is separately recognizable, from the die and the lid, but that the bonding strip, the lid and the die can be comprised of similar base material. TriQuint argues that the bonding strips and the bonding material (discussed below) are separately recognizable *at some point* during the manufacturing process, but not at all times.

The '635 patent provides that the bonding strips and the bonding material must have a thickness to "provide sufficient free space above the surface of the die." (*Id.* at 3:13–14.) Avago's proposed construction of "bonding strips" requires the bonding strips to have "a given thickness." However, the term "a given thickness" is nonspecific and unhelpful. The patent specification does not provide that each layer must have a characteristic, or given, thickness. The Court finds no reason to import a "given thickness" limitation into the claims.

Based on the foregoing, the Court construes the disputed claim term as "a separately recognizable strip where bonding material joins a portion of the lid to a portion of the die."

3. "bonding material" (Claims 1, 3, 8 & 11)

TriQuint's proposed construction for "bonding material" is "material that bonds together the bonding strips." Avago's proposed construction for this disputed claim term is "material, separate and distinct from the bonding strips, capable of bonding together the bonding strips and having a given thickness."

The patent specification provides that "bonding strip 5 on die 1 and bonding strip 8 on lid 6 are joined together in the package of this invention by a thin layer of bonding material 9." (Doc. # 196-1, Ex. C at 3:2–4.) The patent specification makes it clear that bonding material is distinct from the bonding strips; however, contrary to Avago's proposed construction, the bonding material does not need to have a different composition from the bonding strips. As TriQuint states in its brief, the preferred bonding material, a gold/tin alloy (*id.* at 3:4–5), can be used for both the bonding material and the bonding strips, and the separation between the bonding material and the bonding strips may not be observed in a final bonded package. During the *Markman* hearing, TriQuint argued that *at some point* in the manufacturing process the bonding material is separately recognizable from the bonding strips.

As described above, the use of the phrase "a given thickness" in Avago's proposed construction is likely to cause confusion. The '635 patent provides that the bonding strips and the bonding material must have a thickness to "provide sufficient free space above the surface of the die." (*Id.* at 3:13–14.) That the bonding material has an observable thickness is made clear by the patent's description of the assembly of the invention. However, the patent specification does not provide that each layer must have a characteristic, or given, thickness. The Court finds no reason to import a "given thickness" limitation into the claims.

For the foregoing reasons, the Court construes the disputed claim term as "material that bonds together the bonding strips."

D. Avago's U.S. Patent No. 7,365,619

Avago is the owner by assignment of U.S. Patent No. 7,365,619, titled "BAW Apparatus" (the "'5,619 patent"). The '5,619 patent describes a method of reducing "non-

linear" properties of BAW resonators used in communications filters. According to the '5,619 patent, the resonance frequency will shift upward and downward when a direct voltage is applied across the resonator, and this effect is referred to as the voltages coefficient of frequency effect or VCF effect. The '5,619 patent teaches that by subdividing a resonator into two separate resonators and connecting them in "antiparallel," the non-linear effects can be reduced.

1. "related to a common ground" (Claim 1)

Avago proposes that no construction is necessary, because "related to a common ground" is clear on its face. TriQuint's proposed construction for this disputed claim term is "using a shared terminal within the filter that electrically connects the reference voltages of the input and output signals to the device's ground voltage."

TriQuint argues the disputed claim term requires construction because "its meaning and limits are not plain to a layperson." (Doc. # 196 at p. 12.) However, the Court is required to construct claims in the manner in which a person of ordinary skill in the art would understand the disputed claim term. *See Phillips*, 415 F.3d at 1313 (stating that "the ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention"); *Dow Chem.*, 257 F.3d at 1372.

"Ground" is defined as "[a] conducting connection to a structure that serves a function similar to that of an earth ground." IEEE 100: THE AUTHORITATIVE DICTIONARY OF IEEE STANDARD TERMS 489 (7th ed. 2000). Accordingly, "related to a common ground" means related to a common conducting connection to a structure. The patent specification provides: "Both signal input 102E (IN) and signal output 102A (OUT) relate to the common electrical ground 102G (GND)." (Doc. # 196-1, Ex. D at 6:25–26.) This specification refers to Figure 2, which provides an illustration of how the signals relate to the common electrical ground.

As TriQuint notes in its brief, each system has only one ground voltage. However, TriQuint's proposed construction introduces concepts such as "shared terminal," "reference voltages," and ultimately refers back to "the device's ground voltage." Introducing these

additional concepts into the disputed claim term would only require further construction. A person of ordinary skill in the art would understand "related to a common ground" to mean "related to a common electrical ground." Accordingly, the Court construes the disputed claim term as "related to a common electrical ground."

2. "antiparallel" (Claims 1 & 11)

"Antiparallel" was term coined by the inventors; therefore, the definition in the patent specification controls. *Edwards Lifesciences LLC v. Cook Inc.*, 582 F.3d 1322, 1329 (Fed. Cir. 2009) (adopting a definition different from the ordinary meaning when "the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history") (quoting *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F3d 1359, 1366 (Fed. Cir. 2002)). Avago's proposed construction for "antiparallel" is:

> the first electrode of the first resonator is electrically connected to the second electrode of the second resonator, and vice versa; where the first and second electrodes of a resonator are determined by the direction of polarization of the resonator.[4]

Avago argues that its proposed construction is supported by the definitions in the specification of the '5,619 patent.

TriQuint's proposed construction for this disputed claim term is "a parallel connection with mutually inverse polarization." TriQuint further proposes the claim term be constructed as follows:

> A parallel connection means that the resonators are connected between two common points in the circuit, but along different branches.
>
> Mutually inverse polarization requires a connection such that (a) the electric field applied to the first area of piezoelectric layer is in the same direction as the polarization of first area, and (b) the electric field applied to the second

[4] During the *Markman* hearing, Avago revised its proposed construction to exclude the following final phrase: ". . . and where the first electrodes are on one surface of the piezoelectric layer, and the second electrodes are on an opposing surface."

area is in the opposite direction of the polarization of the second area.[5]

TriQuint defines "polarization" in the claim construction below. TriQuint's proposed construction is derived from the patent specification, which provides "the present invention is based on the findings that harmonic waves of the two BAW resonators mutually reduce one other and . . . cancel one other out because of the antiparallel connection, *i.e.*, their parallel connection with mutually inverse polarization." (Doc. # 196-1, Ex. D at 3:25–29.) Avago argues that this phrase was not intended to provide a substantive definition of "antiparallel," which is evidenced by TriQuint's need to further define terms in its own construction. Avago also argues that TriQuint's proposed construction departs from the patent specification and improperly relies on extrinsic evidence.

The patent specification describes the antiparallel connection of the BAW resonators, depicted by Figure 2 of the '5,619 patent, as the exchange of the first electrode of a second BAW resonator with the first electrode of a first BAW resonator; thus, "*first electrode* 84T, 90T, 96T *of first BAW resonator* 84, 90, 96 of BAW apparatus 82, 88, 94 *is electrically connected to second electrode* 86B, 92B, 98B *of second BAW resonator* 86, 92, 98 of BAW apparatus 82, 88, 94, and vice versa." (Doc. # 196-1, Ex. D at 6:31–45) (emphasis added). The patent specification also describes, with reference to Figure 1, a BAW resonator pair connected antiparallel as:

> The only thing that is essential for the inventive BAW apparatus and/or antiparallel connections of the two BAW resonators 72, 74 is that *the polarizations* 72R, 74R *of the two BAW resonators* 72, 74 *have the same direction with regard to the first electrode* 72T, 74T *and the second electrode* 72B, 74B. Alternatively, for example, the polarization of both BAW resonators 72, 74 may also be pointing in the direction from the second electrode 72B, 74B to the first electrode 72T, 74T.

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[5] In its reply brief, TriQuint is willing to modify its proposed construction to state that "[m]utually inverse polarization requires a connection such that *when* the electric field applied to the first area of the piezoelectric layer is in the same direction as the polarization of the first area, the electric field applied to the second area is in the opposite direction of the polarization of the second area, and vice versa." TriQuint offers this modification to avoid confusion as to whether the electric fields applied to resonators must always be in the same direction and of the same magnitude. (Doc. # 208 at p. 14.)

(*Id.* at 5:32–39) (emphasis added). The Court finds Avago's proposed construction is consistent with the patent specification.

Avago revised its proposed construction of the disputed claim term so that it no longer requires the resonators to be on opposing surfaces of a piezoelectric layer. TriQuint argued that the use of "the piezoelectric layer" in Avago's proposed construction rendered the term "common piezo layer" in claim 1 superfluous is without merit. Based on Avago's revised construction, the Court does not have to resolve this dispute. Avago's description of the first BAW resonator and second BAW resonator connected antiparallel does not conflict with the second part of claim 1 stating that the resonators comprise a common piezo layer, nor does it conflict with claim 11, which does not explicitly require a "common piezo layer."

Based on the foregoing, the Court construes "antiparallel" as:

> The first electrode of the first resonator is electrically connected to the second electrode of the second resonator, and vice versa; where the first and second electrodes of a resonator are determined by the direction of polarization of the resonator.

3. "a polarization of the common piezo layer in the first area and a polarization of the common piezo layer in the second area are unidirectional" (Claim 1)

The parties have stipulated that "unidirectional" means "in the same absolute direction," and "common piezo layer" means "a shared layer of piezoelectric material." (*See* Doc. # 209 at p. 2.) With respect to the disputed claim term, Avago proposes that no construction is necessary, because "a polarization of the common piezo layer in the first area and a polarization of the common piezo layer in the second area are unidirectional" is clear on its face. TriQuint's proposed construction for this disputed claim term is:

> absent application of an electric field, the first and second areas of the piezoelectric layer exhibit significant net electric dipole moments that point in the same direction. An electric dipole moment is a value representing the non-uniform distribution of positive and negative electrical charges within a material.[6]

[6] During the *Markman* hearing, TriQuint revised its proposed construction of the disputed claim term to remove the final sentence: "The electric dipole moments must be

TriQuint's proposed construction of the disputed claim term focuses on the physics of polarization, which is a level of detail Avago contends is not necessary to understand the invention. Avago argues that it is the direction of the polarization that is relevant to understanding of the invention, not the physics or the process by which material is polarized. The Court agrees, and finds that TriQuint's proposed construction with "net electric dipole moments" and "non-uniform distribution" of electrical charges serves to obfuscate meaning of the disputed claim term.

The '5,619 patent uses polarization as a directional concept. (Doc. # 196-1, Ex. D at 5:28–32.) The patent specification states that polarization is a property "impressed upon the BAW resonator during manufacturing." (*Id.* at 1:54–56.) The patent specification also states that the BAW resonators exhibit electric polarization, and "[t]he direction of mechanical deformation, expansion or contraction, of the BAW resonator depends on the direction of the electric field applied to first electrode T and second electrode B and on the direction of polarization of BAW resonator 30." (*Id.* at 1:59–64.) According to the '5,619 patent, "if the polarization of the BAW resonator and the direction of the electric field are pointing in the same direction, BAW resonator 30 contracts, whereas BAW resonator 30 expands when the polarization of BAW resonator 30 and the direction of the electric field are pointing in the opposite direction." (*Id.* at 1:64–2:2.)

Avago argues that the effect of the polarization on the resonator (expansion or contraction) is the important concept with regard to the invention, not the physics describing polarization. The Court does not find it necessary to define polarization in the manner proposed by TriQuint in order to construct how polarization is used in the disputed claim term. Further, the Court finds a person of ordinary skill in the art, *see Texas Digital*, 308 F.3d at 1202, understands the meaning of polarization as it relates to the distribution of positive and negative electrical charges.

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impressed (imposed) upon the piezoelectric material during manufacture."

Applying the stipulated terms, the Court constructs the disputed claim term as "a polarization of the shared layer of piezoelectric material in the first area and a polarization of the shared layer of piezoelectric material in the second area are in the same absolute direction."

4. "exhibit substantially identical shifts in terms of the amount and direction of the resonance frequency due to a Voltages Coefficient of Frequency (VCF) effect" (Claims 3 & 13)

Avago proposes that no construction is necessary, because "exhibit substantially identical shifts in terms of the amount and directions of the resonance frequency due to a Voltages Coefficient of Frequency (VCF) effect" is clear on its face. Alternatively, Avago proposes the disputed claim term means "exhibit substantially identical shifts in terms of the amount and direction of the resonance frequency due to a Voltages Coefficient of Frequency (VCF) effect, *i.e.*, changes in the resonance frequency when the direct voltages varies, or is swept, within a range from negative to positive voltages." TriQuint's proposed construction for this disputed claim term is "during the operation of the BAW filter, the voltages applied to the first and second resonators cause the resonant frequencies of those resonators to simultaneously shift in the same direction by insignificantly different amounts due to something called the Voltages Coefficient of Frequency effect." TriQuint argues that the term "due to a Voltages Coefficient of Frequency effect" is indefinite because there is no way to tell when a resonance frequency shift is "due to a VCF effect" or due to some other cause.

As stated above, a court should declare a claim term indefinite "[o]nly when a claim remains insolubly ambiguous without a discernable meaning after all reasonable attempts at construction." *Metabolite*, 370 F.3d at 1366. Contrary to TriQuint's assertion, the VCF effect is not insolubly ambiguous. The term is explained in the patent specification:

> It has been proven that the resonance frequency changes upward and downward in an almost linear manner, while the direct voltage varies, or is swept, within a wide range from high negative voltages to high positive voltages. This effect is referred to as VCF effect (VCF = voltages coefficient of frequency)

(Doc. # 196-1, Ex. D at 3:53–58.) Avago's proposed construction takes into account this explanation of the VCF effect. TriQuint argues that the '5,619 patent does not explain how

to distinguish between frequency shifts caused by the VCF effect and frequency shifts caused by other factors. However, the patent specification makes it clear that the VCF effect occurs when direct voltage varies across a resonator. Accordingly, the Court finds the term "VCF effect" is capable of construction.

TriQuint's proposed construction, notwithstanding its argument that the claim term is indefinite, contains limitations not found in the plain language of claims 3 and 13. Specifically, TriQuint reads into the claim term that the shifts occur "during the operation of the BAW filter." This limitation is unnecessary. The patent specification explains that the VCF effect occurs when direct voltage is applied to the resonator. TriQuint also seeks to add the limitation that shifts in resonator frequency occur "simultaneously." There is nothing in the '5,619 patent requiring the shifts to occur simultaneously. Finally, TriQuint seeks to introduce the concept that the resonators shift in the same direction "by insignificantly different amounts." This phrase is in lieu of the claim term's "substantially identical shifts." The Court finds no reason to redefine a phrase that is already clear.

For the foregoing reasons, the Court construes the disputed claim term as "exhibit substantially identical shifts in terms of the amount and direction of the resonance frequency due to a Voltages Coefficient of Frequency (VCF) effect, *i.e.*, changes in the resonance frequency when the direct voltage varies, or is swept, within a wide range from high negative voltages to high positive voltages."

5. "architecture" (Claims 6 & 16)

Avago proposes that no construction is necessary, because "architecture" is clear on its face. Alternatively, Avago proposes the disputed claim term means "the number, composition, and order of layers in the resonator." TriQuint's proposed construction for this disputed claim term is "the overlap of piezoelectric layer and the top and bottom electrodes is substantially identical in geometric shape and size in both resonators, and the composition and thickness of each layer is the same in both resonators."

Claims 6 and 16 require the two BAW resonators to be "substantially identical in architecture." The term "architecture" is used only once outside of claims 6 and 16 where

the patent specification provides that "[p]referably, BAW resonators 72, 74 having the same architecture are used for an inventive BAW apparatus." (Doc. # 196-1, Ex. D at 5:59–61.)

TriQuint points out that Avago's alternate proposed construction (considering number, composition and order of layers) makes sense if only the side view of the resonators is taken into account. However, because resonators are three-dimensional objects, the size and shape of the resonators must be considered in addition to the layer structure. This is supported by the prosecution history of the '5,619 patent, in which the patent examiner stated, "the BAW resonators have the same architecture because they are made of the same materials, have the same size electrodes and the same thickness of electrode layers and piezoelectric layers." (Doc. # 196-3, Ex. 11 at p. 4–5) (parentheticals omitted). For the foregoing reasons, the Court construes the term "architecture" as "the number, composition, size, shape, and order of layers in the resonator."

E. Avago's U.S. Patent No. 7,268,436

Avago is the owner by assignment of U.S. Patent No. 7,268,436, titled "Electronic Device with Cavity and a Method for Producing the Same" (the "'436 patent"). The '436 patent describes an acoustic wave filter device in a compact package that includes a semiconductor chip with the filter itself, a cavity frame positioned on top of the chip, and a cavity cover on top of the frame. Because the cavity frame on the semiconductor chip surrounds the region of the circuit structure, the device can be reduced in size.

1. "wherein the bonding connections of the contact areas and the inner areas of external contacts each include a bonding arc" (Claim 1)

Avago proposes that no construction is necessary, because "wherein the bonding connections of the contact areas and the inner areas of external contacts each include a bonding arc" is clear on its face. Alternatively, Avago proposes the disputed claim term means "wherein each connection between the contact areas and the inner areas of external contacts includes a bonding arc." TriQuint's proposed construction for this disputed claim term is "each connection between the bond wire and a contact area or inner area of external contact includes a bonding arc. In other words, there is a bonding arc at each end of the

bonding wire."

The parties' disagreement concerns whether there is a "bonding arc" at each connection area, or whether there is a single bonding arc in the connection of two areas. The first interpretation (TriQuint's) does not permit the use of thermocompression heads in the bond wire; whereas, the second interpretation (Avago's) permits a thermocompression head at one end of the bond wire and a bonding arc at the other end of the bond wire. The plain meaning of the disputed claim term is unclear: "each" could refer to each connection area (requiring a bonding arc at each connection area), or "each" could refer more generally to each bonding connection between two connection areas (requiring only one bonding arc).

Figure 1 of the '436 patent is unsupportable under TriQuint's proposed construction of the disputed claim term, because this depiction of the electronic device shows a thermocompression head at the contact area, and a bonding arc at the inner area of the external contact. TriQuint's proposed construction of the disputed claim term only supports the depiction of the electronic device in Figure 2 of the '436 patent, in which there are two bonding arcs in the bond wire. However, Avago's proposed construction supports the depiction of the invention in both Figure 1 and Figure 2. Where the proposed embodiments of the invention permit Avago's broader construction of the disputed claim terms, and the claims do not explicitly exclude both embodiments, the Court will not limit unnecessarily the invention.

The patent specification also supports Avago's proposed construction of the disputed claim term: "The contact areas 12 can be connected via thermocompression head 24 and bonding wires 22 to a bondable coating 25 on inner areas 13 of the external contacts 14. *The entire bonding connection 11 can be embedded* in the plastics housing composition 18." (Doc. # 196-1, Ex. E at 4:46–50) (emphasis added). Based on the Figures and the patent specification, a "bonding connection" does not refer to each point where the bond wire is connected to a connection site. Rather, a bonding connection has three components: (1) a bond at a contact area; (2) a bond wire; and (3) a bond at the inner area of an external contact. The disputed claim term requires only that each bonding connection have a bonding

arc. The '436 patent clearly permits thermocompression heads at a connection site, provided that the other connection site has a bonding arc, and the plain language of the disputed claim term can be constructed to support this interpretation.

TriQuint directs the Court to the patent examiner's original rejection of certain claims. (*See e.g.*, Doc. # 196-3, Ex. 17 & 18.) However, as Avago discusses in its reply brief, the patent examiner's rejection of certain claims concerned a patent reference unrelated to the types of bonds formed at the connection sites. (Doc. # 213-1 at p. 17.) The Court does not find the prosecution history to be elucidating in construing the disputed claim term.

Based on the foregoing, the Court adopts Avago's understanding of "wherein the bonding connections of the contact areas and the inner areas of external contacts each include a bonding arc." The Court construes the disputed claim term as "wherein each bonding connection formed between the contact areas and the inner area of external contacts includes a bonding arc."

2. "bonding connections" (Claim 1)

Avago proposes that no construction is necessary, because "bonding connections" is clear on its face. Alternatively, Avago proposes the disputed claim term means "a connection that bonds two elements." TriQuint argues the construction of the disputed claim term is apparent from the construction of the claim term above: a connection between the bond wire and a contact area.

Based on the Court's construction of the disputed claim term above, the Court finds that "bonding connections" are formed by a bond wire between the contact areas and the inner areas of external contacts of an electronic device. The Court does not find support in the '436 patent for TriQuint's proposed construction without reading out certain preferred embodiments of the invention. Accordingly, the Court construes the disputed claim term as "a connection that bonds two elements."

3. "bonding arc" (Claim 1)

Avago's proposed construction for "bonding arc" is "a bond formed at least partially by mechanical deformation of a portion of the bond wire, on its side, against the contact

area/inner area of external contact." TriQuint's proposed construction for this disputed claim term is "a bonding connection formed by bonding the side of the bond wire to a contact area/inner area of external contact, forming an arc-like shape." TriQuint also proposes the disputed claim term be constructed to provide that: "A 'bonding arc' does not include a 'thermocompression head' or ball bond."

Avago argues that while a bonding arc is distinguishable from a thermocompression head, the patent specification does not require the bonding arc to have any particular shape or geometry. The Court disagrees. TriQuint's proposed construction states the bond wire forms an "arc-like shape." The Court does not think this is an additional limitation on the disputed claim term. The particular shape or geometry, "an arc-like shape," is implicit in the claim term "bonding *arc*." The Figures in the '436 patent depicting the electronic device support a construction that requires a bonding arc to be in the shape of an arc.

For the foregoing reasons, the Court construes the disputed claim term as "a bond formed by bonding the side of a bond wire to a contact area/inner area of external contact, forming an arc-like shape."

F. Avago's U.S. Patent No. 6,841,922

Avago is the owner by assignment of U.S. Patent No. 6,841,922, titled "Piezoelectric Resonator Apparatus with Acoustic Reflector" (the "'922 patent"). To reflect leaked sound waves at the operating frequency back into the piezoelectric layer, the thickness of the layers of the acoustic mirror should be ¼ the acoustic wavelength of the BAW resonator's operating frequency. This thickness is known as λ/4 thickness or ¼ lambda thickness. The '922 patent describes how to construct an acoustic mirror with non-λ/4 thick layers that is capable of reflecting the sound waves.

1. "due to technological limitations in the manufacturing of this layer" (Claim 1)

Avago proposes that no construction is necessary, because "due to technological limitations in the manufacturing of this layer" is clear on its face. TriQuint's proposed construction for this disputed claim term is "the layer is manufactured at a thickness different

from ¼ of the wavelength in this layer at the operating frequency because technological limitations make it difficult to manufacture the layer at a thickness of ¼ of the wavelength."[7]

The claim term plainly states layers are "set different from a quarter of the acoustic wavelength" due to "limitations" in technology, and not due to an inability of technology. The patent specification supports a plain reading of the claim term, and provides that realization of the ¼ wavelength thickness "*may be* problematic for technological reasons," and "[m]etal layers with such thickness can be realized technologically *only with difficulty*." (Doc. # 196-1, Ex. I at 2:21, 30–33) (emphasis added).

The disputed claim term explicitly provides that the technological limitations relate to the *manufacturing* of this layer. TriQuint argues that Avago deems non-manufacturing processes, such as parasitic capacitances and different temperature coefficients of the layers, to be technological limitations referred to in the claim. Because the disputed claim term plainly states that the technological limitations relate to the manufacturing of the layer, the Court agrees with TriQuint's line of reasoning. However, the manufacturing limitation (as opposed to operational limitations) is explicit in the claim, and it is not necessary to read extraneous manufacturing-related limitations into the disputed claim term.

A person having ordinary skill in the art would understand the disputed claim term to mean that the technological limitations in the manufacturing process referred to in the '922 patent make λ/4 thick layers difficult to manufacture, but not impossible to manufacture. Accordingly, the Court gives "due to technological limitations in the manufacturing of this layer" its plain and ordinary meaning.

2. "the other layer" (Claims 1–3)

Avago proposes that no construction is necessary, because "the other layer" is clear on its face. TriQuint proposes that "the other layer" is insolubly ambiguous and renders the

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[7] During the *Markman* hearing, TriQuint revised its proposed construction to provide that technological limitations *make it difficult*, but do not *prevent* the manufacture of the layer at the certain thickness. TriQuint argued that its use of "prevent" in the original proposed construction was misinterpreted by Avago, and revised its construction to clarify its intent.

claim indefinite, because it lacks antecedent basis.

The '922 patent describes "an acoustic reflector comprising a sequence of stacked layers having alternating high and low acoustic impedance." (Doc. # 196-1, Ex. I at 6:13–15.) Therefore, where one layer has a high acoustic impedance, *the other layer* has a low acoustic impedance. This sequence can repeat to create a stack of layers, or as the patent describes "a plurality of layers." It is clear that, because each layer alternates in terms of high or low impedance, the reference to "the other layer" refers to the next layer in the stack having the opposite impedance (high vs. low) as the previous layer (low vs. high). For example, Claim 3 of the '922 patent provides "wherein the one layer is the layer having a low acoustic impedance, and wherein the other layer is the layer having a high acoustic impedance." (*Id.* at 6:32–35.) The Court does not find this disputed claim term is insolubly ambiguous as TriQuint proposes. The claim term "the other layer" is clear on its face and does not need to be construed by the Court.

3. "the acoustic reflector is a plurality of layers having a high acoustic impedance and comprises a plurality of layers having a low acoustic impedance" (Claim 4)

Avago proposes that no construction is necessary, because "the acoustic reflector is a plurality of layers having a high acoustic impedance and comprises a plurality of layers having a low acoustic impedance" is clear, because the use of "is" and "comprises" is an obvious typographical error. Alternatively, Avago proposes the disputed claim term means "the acoustic reflector comprises a plurality of layers having a high acoustic impedance and a plurality of layers having a low acoustic impedance." TriQuint proposes that the disputed claim term is unconstruable and must be struck down as indefinite, because the acoustic reflector cannot be (consist of) layers having high acoustic impedance, and also comprise layers with low acoustic impedance.

TriQuint asks the Court to find the disputed claim term is indefinite due to the use of "is" and "comprises" in the same sentence. TriQuint argues that it is not an obvious typographical error, and that Avago is stuck with any purported drafting errors in a patent. *See Chef Am., Inc. v. Lamb-Weston, Inc.*, 358 F.3d 1371, 1374 (Fed. Cir. 2004) ("Thus, in

accord with our settled practice we construe the claim as written, not as the patentees wish they had written it. As written, the claim unambiguously requires that the dough be heated to a temperature range of 400° F. to 850° F."). However, the Court finds the word "is" used in the context of the disputed claim term is synonymous with the term "comprises." The use of "is" and "comprises" is not insolubly ambiguous. Accordingly, the disputed claim term is not indefinite, because the meaning discernible after a reasonable attempt at construction. *See Metabolite*, 370 F.3d at 1366.

The patent specification makes it clear that the acoustic reflector is made up of a "sequence of stacked layers having alternating low and high impedance." (Doc. # 196-1, Ex. I at 3:14–15.) Claim 1 of the '922 patent similarly states that the resonator apparatus is comprised of "an acoustic reflector comprising a sequence of stacked layers having alternating low and high acoustic impedance." (*Id.* at 6:13–15.) The Court construes this disputed claim term as "the acoustic reflector comprises a plurality of layers having a high acoustic impedance and a plurality of layers having a low acoustic impedance."

G. Avago's U.S. Patent No. 6,933,807

Avago is the owner by assignment of U.S. Patent No. 6,933,807, titled "Acoustic Reflector for a BAW Resonator Providing Specified Reflection of Both Shear Waves and Longitudinal Waves" (the "'807 patent"). The '807 patent teaches reducing a BAW resonator's energy loss by building an acoustic mirror that reflects both shear and longitudinal waves back into the piezoelectric mirror. The '807 patent describes the proper materials, number of layers, and thickness of layers to make an acoustic mirror that minimizes longitudinal and shear waves.

1. "wherein the performance of the acoustic reflector is determined by its reflectivity for a longitudinal wave existing in the BAW resonator at the resonance frequency of the BAW resonator and by its reflectivity for a shear wave existing in the BAW resonator at the resonance frequency of the BAW resonator" (Claims 1 &10)

Avago proposes that no construction is necessary, because the following disputed claim term is clear:

[W]herein the performance of the acoustic reflector is determined by its

> reflectivity for a longitudinal wave existing in the BAW resonator at the resonance frequency of the BAW resonator and by its reflectivity for a shear wave existing in the BAW resonator at the resonance frequency of the BAW resonator.

TriQuint proposes that the disputed claim term is unconstruable and must be declared invalid, because the "wherein the performance" limitation is fatally indefinite.

As stated throughout this Order, courts should not determine a claim to be indefinite without first making a reasonable attempt at construction. *Metabolite*, 370 F.3d at 1366. Avago's brief offers no elucidation on the proper construction of the claim term. Rather, Avago directs the Court to the patent specification, in which the disputed claim term appears verbatim, and without further elaboration. (Doc. # 196-1, Ex. F at 6:23–28.)

TriQuint argues that the claim is indefinite, because it is unclear how and when the limitation is satisfied. The Court agrees. The disputed claim term appears as a limitation, set apart from other clauses of claims 1 and 10; however, the claim term states that the performance of the acoustic reflector is determined by longitudinal and shear wave reflectivity at the acoustic resonator's resonance frequency. This claim term does not add to the invention, or describe the construction or functionality of the invention. Further, the claim term does not describe how, when or what happens as a result of its reflectivity of longitudinal and shear waves in the claimed invention.

Similar to the analysis of whether a preamble is limiting, *Biolitec*, 618 F.3d at 1358–59 (considering whether deletion of the preamble phrase affects the structure or steps of the claimed invention), deletion of the disputed claim term from claims 1 and 10 does not affect the remaining terms, claims or invention.

Accordingly, the Court finds the disputed claim term is indefinite and incapable of construction. The disputed claim term is invalid and must not be considered in determining whether the '807 patent has been infringed.

2. "performance of the acoustic reflector" (Claims 1 & 10)

Avago's proposed construction for "performance of the acoustic reflector" is "the acoustic reflector's reflectivity of both the longitudinal and shear waves at the resonance

frequency of the resonator." TriQuint proposes that the disputed claim term is indefinite.

Avago directs the Court to the patent specification for a definition of the "performance of the acoustic reflector":

> [W]herein the performance of the acoustic reflector is determined by its reflectivity for a longitudinal wave existing in the BAW resonator at the resonance frequency of the BAW resonator and by its reflectivity for a shear wave existing in the BAW resonator at the resonance frequency of the BAW resonator.

(Doc. # 196-1, Ex. F at 6:23–28.) Although the Court agrees that Avago's proposed construction is the correct construction for the disputed claim term, the Court has already determined, in Section III(G)(1) of this Order, that the disputed claim term embodying the construction of "performance of the acoustic resonator" is fatally indefinite.

Therefore, to the extent the disputed claim term is required to determine whether the '807 patent has been infringed, the Court construes the disputed claim term as "the reflectivity for a longitudinal wave existing in the BAW resonator at the resonance frequency of the BAW resonator and the reflectivity for a shear wave existing in the BAW resonator at the resonance frequency of the BAW resonator." However, the Court's construction of "performance of the acoustic reflector" does not alter the Court's earlier conclusion that the disputed claim term that embodies this construction is indefinite, and must be excluded from claims 1 and 10 of the '807 patent.

3. "wherein areas with layers with high acoustic impedance and areas with layers with low acoustic impedance are alternately adjacently disposed" (Claims 1 & 10)

Avago proposes that "wherein the areas with layers with high acoustic impedance and areas with layers with low acoustic impedance are alternately adjacently disposed" should be constructed to provide that "'areas' includes a layer having a characteristic acoustic impedance (high or low) along with any connected thin intermediate layers." TriQuint's proposed construction for this disputed claim term is that "'areas' includes a layer having a characteristic acoustic impedance (high or low) along with any connected thin intermediate layers that do not need to be taken into account acoustically." The parties agree that "areas"

can include "connected thin intermediate layers," but disagree as to whether these intermediate layers may be taken into account acoustically.

In each of their briefs, the parties draw the Court's attention to the same description of the connected thin intermediate layers in the patent specification:

> With respect to the electrode materials . . . single layer electrodes or other combinations of materials with high acoustic impedance and materials with low acoustic impedance may also be used. Furthermore, it is to be understood that between the layers there may also be thin intermediate layers, as they are conventional in semiconductor technology for priming, as seed layers, or as etch stop. These have not been mentioned here, because *they are typically so thin they do not have to be taken into account acoustically.*

(Doc. # 196-1, Ex. F at 10:41–52) (emphasis added). Avago argues that although the thin intermediate layers are "typically" so thin they do not have to be taken into account, typically does not mean these layers are *never* taken into account acoustically. TriQuint argues to the contrary. According to TriQuint, the disputed claim term means the thin intermediate layers do not have to taken into account acoustically. TriQuint ignores the word "typically" in the patent specification, and takes the position that the thin intermediate layers "must be thin enough to be acoustically insignificant." (Doc. # 196 at p. 31.)

The Court finds TriQuint's proposed construction of the disputed claim term goes too far in stating that the thin intermediate layers do not need to be taken into account acoustically. While the thin intermediate layers "typically" do not need to be taken into account, the patent does not state they are *never* taken into account acoustically. TriQuint's limitation contradicts the patent specification.

Accordingly, the Court construes the disputed claim term as "wherein areas with layers with high acoustic impedance and areas with layers with low acoustic impedance are alternately adjacently disposed, with the term 'areas' including a layer having a characteristic acoustic impedance (high or low) along with any connected thin intermediate layers."

4. wherein the layers of the acoustic reflector and layers disposed between the acoustic reflector and the piezoelectric layer are selected, with reference to their number, material, and thickness, such that the transmissivity for the longitudinal wave and the transmissivity for the shear wave in the area of the resonance frequency is smaller than -10 dB" (Claims 1 & 10)

Avago proposes that no construction is necessary, because the following disputed claim term is clear:

> [W]herein the layers of the acoustic reflector and layers disposed between the acoustic reflector and piezoelectric layer are selected with reference to their number, material, and thickness, such that the transmissivity for the longitudinal wave and the transmissivity for the shear wave in the area of the resonance frequency is smaller than -10 dB.

Avago also proposes an addition to the disputed claim term's plain meaning:

> With the understanding that the layers need not all be selected for the specific purpose of achieving (a) a transmissivity for the longitudinal wave in the area of the resonance frequency of less than -10dB and (b) a transmissivity for the shear wave in the area of the resonance frequency of less than -10 dB.

TriQuint's proposed construction for this disputed claim term is:

> [T]he number, the material and the thickness of the layers of the acoustic reflector and the number, the material and the thickness of the layers between the acoustic reflector and the piezoelectric layer must all be selected for the specific purposes of achieving (a) a transmissivity for the longitudinal wave in the area of the resonance frequency of less than -10 dB and (b) a transmissivity for the hear wave in the area of the resonance frequency of less than -10dB, and must achieve those effects.

The parties main disagreement concerns whether the layers "need not all," as Avago proposes, or "must all," as TriQuint proposes, be selected for the two specific purposes outlined in the proposed claim constructions. TriQuint argues that the phrasing "are selected . . . such that" indicates that the selection of layers must be designed to achieve the transmissivity result specified in the disputed claim term. The Court agrees with TriQuint that some design intent is required, because the inventors included the phrase "are selected with reference to their number, material and thickness" in claims 1 and 10 of the '807 patent. This phrase emphasizes how the BAW resonator is constructed to achieve longitudinal and shear wave transmissivities of less than -10dB.

Throughout its brief and reply, Avago argues that intent to infringe is irrelevant, and that it is improper to construe a claim to require a design intent. This is incorrect. First, Avago conflates an intent to infringe with an intent to assemble an invention in a certain manner or an intent to select certain materials. Second, intent may be an element of a claim

when a claim reflects a design purpose, and that purpose is treated as a limitation of the claim. *Jansen v. Rexall Sundown, Inc.*, 342 F.3d 1329 (Fed. Cir. 2003) ("[The preamble] is a statement of the intentional purpose for which the method must be performed."); *Koito Mfg. Co. v. Turn-Key-Tech, LLC*, 381 F.3d 1142, 1150 n.2 (Fed. Cir. 2004) (constructing the term "predetermined general direction," and finding that the "designer must be aware of the flow direction that will result upon an injection of plastic so that he can assure himself that the next flow direction will be different."). While intent may not be automatically imputed into claims, an applicant is not prevented from include an intent element in the claims. *See Paragon Solutions, LLC v. Timex Corp.*, 566 F.3d 1075, 1091 (Fed. Cir. 2009) ("Absent an express limitation to the contrary, any use of a device that meets all of the limitations of an apparatus claim written in structural terms infringes that apparatus claim.").

Contrary to Avago's proposed construction that "the layers need not all" be selected with the specific purposes in mind, the disputed claim term states "*the layers* of the acoustic reflector and *layers* disposed between the acoustic reflector and the piezoelectric layer." As TriQuint points out, the disputed claim term does not state "some of the layers" or "most of the layers." The disputed claim term states "*the* layers," which implies *all* of the layers. This understanding of the disputed claim term is confirmed by the patent specification in which "all layers below the piezoelectric layer . . . are to be taken into account in their effect as acoustic reflector," (*id.* at 4:28–31), and "'reflectivity' can only be associated with the entirety of all layers lying beneath the piezoelectric layer" (*id.* at 4:35–37).

TriQuint also directs the Court's attention to the portions of the patent specification, where the specific numbers, materials, and thicknesses of the layers are described in detail. (Doc. # 196-1, Ex. F at 8:4–27, 9:58–66, 10:20–30.) The specification of the material and thickness of the individual layers and the number of the individual layers supports TriQuint's proposed construction that all the layers are selected to achieve the desired transmissivity.

Avago argues that the patent does not require "that each layer individually must be selected with the intent of achieving the desired transmissivity." (Doc. # 197 at p. 40.) The Court agrees. However, TriQuint's proposed construction does not require *each* layer

individually be selected to achieve the desired result. Rather, TriQuint's proposed construction requires that each layer is selected such that, when combined or stacked, the layers achieve the desired transmissivity. The patent specification discloses the number material and thickness of each layer in order to achieve the desired transmissivity. This, of course, does not mean the layers cannot be selected for, or achieve, other results.

For the foregoing reasons, the Court construes the disputed claim term as:

> The number, the material and the thickness of the layers of the acoustic reflector and the layers between the acoustic reflector and the piezoelectric layer must all be selected for the specific purpose of achieving (a) the transmissivity for the longitudinal wave in the area of the resonance frequency of less than -10dB, and (b) the transmissivity for the shear wave in the area of the resonance frequency of less than -10dB.

5. "layers of the acoustic resonator are selected such that the BAW resonator has an unambiguous and desired dispersion performance" (Claim 4)

Avago proposes that no construction is necessary, because "layers of the acoustic resonator are selected such that the BAW resonator has an unambiguous and desired dispersion performance" is clear "with the understanding that the layers of the acoustic resonator need not be selected for the specific purpose of achieving an 'unambiguous and desired dispersion performance' for the BAW resonator." TriQuint's proposed construction for this disputed claim term is "the layers of the acoustic resonator must each be selected for the specific purpose of achieving a predetermined and unambiguous dispersion performance for the BAW resonator and have that effect."

The parties' disagreement over the construction of this disputed claim term is similar to their disagreement over the prior disputed claim term. Specifically, TriQuint argues that each layer must be selected for the specific purpose set forth in the claim term, and Avago argues that the layers do not need to be selected for the specific purpose. Again, the phrase "are selected such that" is at the core of the parties' disagreement.

Avago's proposed construction conflicts with the plain meaning of the disputed claim term. Avago proposes that "the layers of the acoustic resonator *need not be selected* for the specific purpose of achieving an 'unambiguous and desired dispersion performance' for the

BAW resonator." However, the claim term explicitly states that the layers "*are selected*" to achieve the specified result. The Court finds Avago's proposed construction is inconsistent with the plain meaning of the disputed claim term.

Avago argues that *each and every* layer does not need to be selected for the specified result. The Court disagrees. The disputed claim term states "the layers," not "some of the layers" or "most of the layers." As stated above, the use of "*the* layers" in the disputed claim term implies *all* of the layers. Similar to the Court's discussion of the disputed claim term above, even though all of the layers are selected for a specific result, that does not mean the layers cannot be selected for, or achieve, other results, as well.

For the foregoing reasons, the Court construes the disputed claim term as "the layers of the acoustic resonator must all be selected for the specific purpose of achieving an unambiguous and desired dispersion performance."

6. "unambiguous and desired dispersion performance" (Claim 4)

Avago's proposed construction for "unambiguous and desired dispersion performance" is "the first shear harmonic wave and the longitudinal main resonance are separated by at least a bandwidth of the resonator." TriQuint's proposed construction for this disputed claim term is "the layers are selected such that the first shear harmonic wave and the longitudinal main resonance of the BAW resonator are separated by at least the bandwidth of the longitudinal resonance." TriQuint's proposed construction reads into this disputed claim term the limitations of the prior disputed claim term: that the layers "are selected such that . . . ." It is not necessary to construe this disputed claim term with this extraneous limitation, because the Court has addressed the issue in the preceding claim construction.

The patent specification provides that "unambiguous and desired dispersion performance" occurs when "the distance between the longitudinal main resonance and the first shear harmonic wave is greater than a bandwidth of the resonator, preferably greater than the bandwidth of the longitudinal main resonance of the resonator." (Doc. # 196-1, Ex. F at 6:52–56.) A subsequent definition in the patent specification describes the unambiguous

and desired dispersion performance as "the frequency distance of first shear harmonic wave and longitudinal main resonance is greater than the bandwidth of the longitudinal main resonance." (*Id.* at 9:47–51.)

The parties' proposed constructions reflect the definition in the patent specification. However, TriQuint requires that the bandwidth distance be at least the distance of the bandwidth of the longitudinal resonance. The patent specification initially states that this bandwidth is "preferable," and the subsequent definition describes the bandwidth as greater than that of the longitudinal main resonance. The Court will apply the less specific definition in constructing the disputed claim term. *See Teleflex*, 299 F.3d at 1326 (citing *Comark Commc'ns*, 156 F.3d at 1186). Accordingly, the Court construes the disputed claim term as "the first shear harmonic wave and the longitudinal main resonance of the BAW resonator are separated by at least a bandwidth of the resonator."

7. "[layers] are selected such that the distance between the longitudinal main resonance and the first shear harmonic wave is greater than the bandwidth of the longitudinal main resonance of the resonator" (Claim 6)

Avago proposes that no construction is necessary, because "[layers] are selected such that the distance between the longitudinal main resonance and the first shear harmonic wave is greater than the bandwidth of the longitudinal main resonance of the resonator" is clear. TriQuint's proposed construction for this disputed claim term is "the layers of the acoustic resonator must each be selected for the specific purpose of achieving a distance between the longitudinal main resonance and the first shear harmonic wave that is greater than the bandwidth of the longitudinal main resonance of the resonator and have that effect."

Again, the parties' disagreement concerns whether there is an element of intent in the phrase "are selected such that . . . ." However, this time Avago argues that the disputed claim term is clear and does not require construction, rather than arguing, as it does in prior constructions, that the phrase "are selected such that" does not require each layer to be selected with the specific purpose in mind.

The Court agrees with TriQuint's construction that the layers are *selected* for the

purpose of achieving a specific result, namely a certain distance between the longitudinal main resonance and the first shear harmonic wave. Further, the use of "*the layers* of the acoustic resonator" implies that all of the layers, not some or most of the layers, are selected to achieve a specific result. Again, the Court finds that even though all of the layers are selected for a specific result, that does not mean the layers cannot be selected for, or achieve, other results, as well.

Based on the foregoing, the Court construes the disputed claim term as "the layers of the acoustic resonator must all be selected for the specific purpose of achieving a distance between the longitudinal main resonance and the first shear harmonic wave that is greater than the bandwidth of the longitudinal main resonance of the resonator."

8. "longitudinal main resonance [of the resonator]" (Claim 6)

Avago's proposed construction for "longitudinal main resonance" is "the primary resonant frequency of the resonator in the direction of the applied electrical field." TriQuint's proposed construction for this disputed claim term is "the primary frequency at which the resonator resonates longitudinally (in the same direction as its elastic deflection)." The parties agree that this claim term relates to the primary resonant frequency, but disagree on how to construct "longitudinal."

Longitudinal waves shown in Figure 1B of the '807 patent are labeled as 204 and 210. The patent specification provides that, as illustrated in Figure 1B, "the longitudinal waves 210 moving in a direction not exactly perpendicular to the substrate plans (*see* Fig. 1B) are at least partly converted to shear waves 212." (Doc. # 196-1, Ex. F at 4:4–6.) TriQuint proposes that longitudinal waves travel in the same direction as the resonator's elastic deflection. Avago argues that TriQuint's proposed construction directly contradicts the patent specification, because the resonator's elastic deflection is perpendicular to the substrate, but the longitudinal waves do not always move exactly perpendicular to the substrate; therefore, the longitudinal waves cannot travel in the same direction as the resonator's elastic deflection. Although Avago is correct that the longitudinal waves and the elastic deflection may not both be exactly perpendicular to the substrate, TriQuint's proposed

construction is taken directly from the patent specification.

The patent specification defines longitudinal waves as "waves propagating in the direction of the elastic deflection." (*Id.* at 3:26–27.) The Court does not find that TriQuint is seeking to add a limitation to the disputed claim term by defining "longitudinal" as the same direction of elastic deflection. Rather, the Court finds TriQuint has applied the definition of longitudinal waves contained in the '807 patent to its proposed construction of the disputed claim term.

For the foregoing reasons, the Court construes the disputed claim term as "the primary resonant frequency at which the resonator resonates longitudinally (in the direction of the elastic deflection)."

H. Avago's U.S. Patent No. 6,909,340

Avago is the owner by assignment of U.S. Patent No. 6,909,340, titled "Bulk Acoustic Wave Filter Utilizing Resonators with Different Aspect Ratios" (the "'340 patent"). The '340 patent describes a design for BAW filters that allow for the suppression of "spurious modes" by designing each resonator in the BAW filter to have a different "surface shapes," "surface contents," and "aspect ratios" to wash out the effect of the spurious modes.

1. "A bulk acoustic wave filter. comprising: a plurality of bulk acoustic wave resonators" (Claims 1 & 12)

The parties agree that "a plurality of bulk acoustic wave resonators" means "at least two bulk acoustic wave resonators." Avago proposes that "[a] bulk acoustic wave filter, comprising: a plurality of bulk acoustic wave resonators," which is the preamble to claims 1 through 12, is limiting. TriQuint disagrees and asks the Court to find the preamble is not limiting.

"Whether to treat a preamble as a claim limitation is determined on the facts of each case in light of the claim as a whole and the invention described in the patent." *Storage Tech. Corp. v. Cisco Sys., Inc.*, 329 F.3d 823, 831 (Fed. Cir. 2003) (citing *Catalina Mktg. Int'l v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002)). Generally, the preamble does not limit the claims. *Am. Med. Sys., Inc. v. Biolitec, Inc.*, 618 F.3d 1354, 1358 (Fed.

Cir. 2010) (citing *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002)). The preamble may be construed as limiting "if it recites essential structure or steps, or if it is 'necessary to give life, meaning and vitality' to the claim." *Catalina Mktg.*, 289 F.3d at 808 (quoting *Pitney Bowes v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999)). However, a preamble is not limiting "when the claim body describes a structurally complete invention such that deletion of the preamble phrase does not affect the structure or steps of the claimed invention." *Biolitec*, 618 F.3d at 1358–59 (citing *Catalina Mktg.*, 289 F.3d at 809).

Avago relies on *Poly-America, L.P. v. GSE Lining Technology, Inc.*, 383 F.3d 1303 (Fed. Cir. 2004), to support its position that the preamble is limiting. The preamble at issue in *Poly-America* was the phrase "blown-film." In *Poly-America*, the Federal Circuit agreed with the district court's conclusion that "blown-film" disclosed a fundamental characteristic of the claimed invention, rather than state a purpose or an intended use of the invention. *Id.* at 1310.

In this instance, the preamble "[a] bulk acoustic wave filter, comprising: a plurality of bulk acoustic wave resonators" does not affect the structure of the claimed invention. *See Biolitec*, 618 F.3d at 1358–59. The preamble does not recite an essential structure, because the claims are written in terms of the structure and characteristics of bulk acoustic wave resonators, and not bulk acoustic wave filters. Accordingly, the deletion of the preamble phrase does not affect the structure or steps of the bulk acoustic wave resonators with different aspect ratios. The Court finds the preamble states the purpose or intended use of the invention, and is not necessary to give meaning to the claims.

Based on the foregoing, the Court finds the preamble to claims 1 through 12 is not limiting.

2. "bulk acoustic wave resonator[s]" (Claims 1–4 & 9–12)

The parties agree that a "bulk acoustic wave resonator" or BAW resonator must include a layer of piezoelectric material between two electrodes. Avago's proposed construction for "bulk acoustic wave resonator[s]" is "an electromechanical resonator

comprising a layer of piezoelectric material sandwiched between a top electrode and bottom electrode, wherein the active portion of the piezoelectric material is generally confined to the region of the piezoelectric material defined by the overlap of the top and bottom electrodes." TriQuint's proposed construction for this disputed claim term is that "bulk acoustic wave resonators include a layer of piezoelectric material arranged between two electrodes," and "need not be manufactured on-chip in a very-large scale integration (VLSI) process, and include, but are not limited to, various designs such as thin film resonators (TFR), semiconductor bulk acoustic resonators (SBAR), and film bulk acoustic resonators (FBAR)."

The '340 patent states that "[b]ulk acoustic wave resonators typically include two electrodes and a piezo-electric layer, which is arranged between the two electrodes." (Doc. # 196-1, Ex. G at 1:19–21.) TriQuint seeks to limit this construction by describing the manufacturing process. As TriQuint notes in its brief, the patent itself does not state that the chips are manufactured using the VLSI process. Further, the Court does not find any support in the patent to construe the disputed claim term as explicitly including or excluding TFRs, SBARs, or FBARs. The Court does not find it necessary to either include, or exclude, the additional limitations in TriQuint's proposed construction concerning the method of manufacture of the resonators.

Avago states that its proposed construction includes a clause that reflects the description in the '340 patent that "the 'effective resonator surface' is regarded as the surface of the electrodes which results from the overlapping area of the electrodes when the two electrodes are projected in a plane." (*Id.* at 2:16–19.) The parties have stipulated that the "effective resonator surfaces" means "the overlapping area of the electrodes when the two electrodes are projected onto a plane." (Doc. # 209 at p. 3.) However, the Court does not find the second part Avago's proposed construction consistent with the '340 patent. Accordingly, the Court construes the disputed claim term as "a resonator comprised of a layer of piezoelectric material sandwiched between a top electrode and bottom electrode with a specific effective resonator surface."

3. "surface contents" (Claims 1, 2, 5–8 & 12)

Avago's proposed construction for "surface contents" is "area." TriQuint proposes that "surface contents" is insolubly ambiguous and renders the claim indefinite. However, TriQuint concedes in its brief that "the [patent] specification is consistent with Avago's construction."

As set forth above, in construing a disputed claim term, the Court must first consider the words of the claim term itself. Next, the Court looks at "the [patent] specification to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning." *Vitronics*, 90 F.3d at1582. The meaning of "surface contents" is not readily apparent from the words themselves. Claim 1 states that bulk acoustic wave resonators have "different surface shapes and/or different surface contents." (Doc. # 196-1, Ex. G at 6:61–62.) Accordingly, surface shapes and surface contents are different concepts.

While the patent claims make it clear that "surface contents" are not the same as "surface shapes," the patent specification indicates that "surface contents" is properly construed as "area." The patent specification states that Figure 5 "is a plan view of an inventive two-stage conductor filter formed from bulk acoustic wave resonators with the effective resonator surfaces *having different surface contents*." (*Id.* at 5:40–43) (emphasis added). Figure 5 is a depiction of four resonators each with a different area, that is each with a different length and different width.

Avago further supports its proposed construction with reference to its German patent application. The term "surface contents" in the '340 patent corresponds to the German word "Flächeninhalt" in the German patent application. Flächeninhalt translates to "area." (Doc. # 197-2, Ex. H-2, HARRAP'S CONCISE GERMAN & ENGLISH DICTIONARY (1982).)

Based on the foregoing, the Court finds that the claim term "surface contents" is not insolubly ambiguous, as TriQuint contends. Rather, the Court construes the disputed claim term to mean "area."

4. "aspect ratios" (Claims 1 & 12)

The parties agree that the term "aspect ratios" is defined in the patent specification.

However, the parties disagree as to whether the claim can be constructed. Avago's proposed construction for "aspect ratios" is "the smallest dimension of the resonator within the surface plane divided by the largest dimension of the resonator within the surface plane," and that "[t]he directions of these two dimensions need not be perpendicular to each other." TriQuint proposes that "aspect ratios" is insolubly ambiguous and renders the claim indefinite.

During the examination of the '340 patent application, the examiner stated, "[t]he specification needs to define 'aspect ratio' at the first occurrence thereof." (Doc. # 198-1, Ex. H.3 at ¶2.) The patent examiner further stated, "if 'aspect ratio' is considered to be width : length, then the specification is unclear . . . as to how one would determine the 'aspect ratio' when the effective resonator surface is 'nonrectangular.'" (*Id.*) Avago responded to the patent examiner by adding Avago's proposed construction of the disputed claim term to the patent specification. (Doc. # 196-1, Ex. G at 3:50–54.) The patent specification also offers an example for calculating the aspect ratio of a non-rectangular shape: "For a parallelogram, for instance, the aspect ratio would be the distance between the two opposing acute-angled corners divided by the distance between the two long opposing sides." (*Id.* at 3:53–54–57.) This example provides an aspect ratio in which the two dimensions are not perpendicular to each other, as described in the patent specification and in the proposed construction. The patent examiner accepted this definition and example, and issued a "Notice of Allowance."

The Court disagrees with TriQuint that the disputed claim term is indefinite. The term "aspect ratio" is properly given its meaning that the inventors of the '340 patent provided, and that the patent examiner found acceptable. Accordingly, the Court construes "aspect ratio" as "the smallest dimension of the resonator within the surface plane divided by the largest dimension of the resonator within the surface plane. The directions of these two dimensions need not be perpendicular to each other."

5. "nonrectangular shape" (Claims 3 & 4)

Avago's proposed construction for "nonrectangular shape" is "a shape where the angles between the boundary lines of the shape are not equal to 90 degrees where they meet, *i.e.*, any shape that is not a rectangle." TriQuint's proposed construction for this disputed

claim term is "a shape whose outer adjacent boundary lines are all at 90° angles to each other." TriQuint argues that "[w]here the corners of an object are rounded, its rectangularity is determined by examining the angles where the boundary lines would intersect if extended in a straight line. Thus, a rectangle with rounded corners qualifies as rectangular." TriQuint proposes a construction in which the rectangularity of a shape is determined by examining the angles where the boundary lines *would* intersect if extended in a straight line, and not where the boundary lines actually intersect, as Avago's proposed construction states. The dispute over this claim term exists because Avago asserts that TriQuint's resonators are "nonrectangular" because they have rounded corners. (*See* Doc. # 196 at p. 40.)

In order to construct the meaning of "nonrectangular shape," the Court must first understand what constitutes a rectangular shape. The *American Heritage Science Dictionary* defines "rectangle" as "a four-sided plane figure with four right angles." Accordingly, a shape that does not have four 90 degree angles (right angles) is not a rectangular shape.

The '340 patent specification provides: "A nonrectangular shape . . . means a shape in which the angles between the boundary lines of the effective resonator surface are not equal to 90°." (Doc. # 196-1, Ex. G at 4:4–7.) The patent specification further provides that "the individual resonators have a nonrectangular shape (the angles between the boundary lines of the effective resonator surfaces of the individual resonators are not equal to 90°)." (*Id.* at 6:47–50.) The patent specification makes it clear that the angles of the shape are measured "between the boundary lines," and not beyond the boundary lines as TriQuint proposes.

In further support of its proposed construction, Avago directs the Court's attention to the prosecution history. During the examination, the patent examiner found the shapes in a prior patent were "nonrectangular resonators because the corners are cut away." (Doc. # 197-2, Ex. H.3 at p. 8.) Applying TriQuint's proposed construction, a rectangle without corners would constitute a rectangular shape, because its outer adjacent boundary lines would intersect at 90 degree angles. Instead, the patent examiner applied the same understanding of a nonrectangular shape as Avago proposes.

The Court finds a plain meaning of the term "nonrectangular shape," together with the definitions in the patent specification, requires construction of the claim term such that the angles between boundary lines of the effective resonator are not all equal to 90 degrees. TriQuint's proposed construction narrows the plain meaning of the term "nonrectangular shape" to an extent that permits plainly nonrectangular shapes to be considered rectangular. There is no support in the patent or the prosecution history for this construction.

Based on the foregoing, the Court construes the claim term as "a shape where the angles between the boundary lines of the shape are not equal to 90 degrees where they meet, *i.e.*, any shape that is not a rectangle."

6. "stage of a conductor filter" (Claim 9)

The parties have stipulated that the claim term "conductor filter" means "ladder filter." (*See* Doc. # 209 at p. 3.) Avago proposes that no construction is necessary, because the meaning of "stage of a conductor filter" when used with reference to a ladder filter is readily apparent. Alternatively, Avago proposes the disputed claim term means "one series segment and one parallel segment of a ladder filter." TriQuint's proposed construction for this disputed claim term is "one series resonator and one parallel resonator connected in a ladder configuration." In the industry, "stage" can refer to either of the parties' proposed constructions; therefore, the Court must look to the '340 patent in construing the disputed claim term.

In support of its proposed construction that a stage constitutes one series and one parallel resonator, TriQuint relies on Figures 9 through 12 of the '340 patent. Each of these figures shows a "stage" that has exactly one series resonator and exactly one parallel resonator. Avago, in contrast, argues that in addition to the stages shown in the Figures 9 through 12 of the '340 patent, a stage also can be a series branch combined with a parallel branch, and can include two resonators in parallel. To support this proposition, Avago cites to Figure 2 in the '5,619 patent. The Court does not find it necessary to look to another patent in construing the claim terms of the '340 patent.

In further support of its proposed construction, TriQuint quotes the patent

specification, which states that a 2-stage conductor filter has four resonators and a 3-stage conductor filter has six resonators:

> [Bulk acoustic wave filters] are connected in the form of a one and half-stage conductor filter, *in the form of a two-stage conductor filter*, in the form of a two and a half-stage conductor filter, *in the form of a three-stage conductor filter* or in the form of a three and a half-stage conductor filter, with three, *four*, five, *six* or seven bulk acoustic wave resonators being interconnected.

(Doc. # 196-1, Ex. G at 5:2–8) (emphasis added). The patent specification does not support Avago's proposed construction that multiple resonators may be included in each branch of the stage.

The Court finds TriQuint's proposed construction of the disputed claim term is consistent with the patent. Accordingly, the Court will construe "stage of a conductor filter" to mean "one series resonator and one parallel resonator connected in a ladder configuration."

7. "half-stage of a conductor filter" (Claim 9)

As stated above, the parties agree that a "conductor filter" is a "ladder filter." Avago proposes that no construction is necessary, because the meaning of "half-stage of a conductor filter" when used with reference to a ladder filter is readily apparent. Alternatively, Avago proposes the disputed claim term means "a parallel or series segment of a ladder filter." TriQuint's proposed construction for this disputed claim term is "one additional parallel or series resonator included within a ladder configuration."

As stated above, TriQuint relies on Figures 9 through 12 of the '340 patent to support its proposed construction of the disputed claim term. TriQuint also quotes the patent specification, which states that a 1½-stage conductor filter has three resonators, a 2½-stage conductor filter has five resonators, and a 3½-stage conductor filter has seven resonators:

> [Bulk acoustic wave filters] are connected *in the form of a one and half-stage conductor filter*, in the form of a two-stage conductor filter, *in the form of a two and a half-stage conductor filter*, in the form of a three-stage conductor filter or *in the form of a three and a half-stage conductor filter*, with *three*, four, *five*, six or *seven* bulk acoustic wave resonators being interconnected.

(Doc. # 196-1, Ex. G at 5:2–8) (emphasis added). Avago's proposed construction that a stage

may refer to a parallel or series segment, and that a segment may comprise multiple resonators is not supported by the '340 patent. Accordingly, the Court construes "half-stage of a conductor filter" as "one additional parallel or series resonator included within a ladder configuration."

I. Avago's U.S. Patent No. 6,864,619

Avago is the owner by assignment of U.S. Patent No. 6,864,619, titled "Piezoelectric Resonator Device Having Detuning Layer Sequence" (the "'4,619 patent"). The '4,619 patent describes a detuning layer sequence of at least a first layer having a high acoustic impedance and a second layer having a low acoustic impedance. This sequence of layers shifts the resonant frequency of a resonator as compared to other resonators in the filter, and allows for trimming without significantly affecting the frequency difference between the detuned and non-detuned resonators.

1. "[a detuning layer sequence] arranged on the first piezoelectric resonator" (Claims 1 & 12)

Avago's proposed construction for "[a detuning layer sequence] arranged on the first piezoelectric resonator" is "the detuning layer sequence is only added to the first piezoelectric resonator." TriQuint's proposed construction of this disputed claim term is "a sequence of detuning layers is only applied to the first piezoelectric resonator and is arranged above and in contact with the first piezoelectric resonator." The parties main disagreement concerns the scope of "arranged on."

TriQuint's proposed construction conforms with Avago's proposed construction to the extent that first resonator has a detuning layer sequence while the second resonator does not have a detuning layer sequence. However, TriQuint's proposed construction requires that the detuning layer sequence is not only arranged *above* the piezoelectric resonator, but is also *in contact with* the piezoelectric resonator. TriQuint argues that Avago's proposed construction fails to account for the use of "on" in the disputed claim term.

In support of its proposed construction, TriQuint cites to Figure 4A of the '4,619 patent. The patent specification provides that "[p]referably, layers of the electrodes [28 and

30] and layers of the detuning layer sequence 52 which basically have the same acoustic properties are abutting." (Doc. # 196-1, Ex. H at 7:39–41.) However, the depiction of the detuning layer sequence between two top electrode layers of the first piezoelectric resonator in Figures 3 and Figure 4A is not the only location where the detuning layer sequence can be arranged on the resonator. (*Id.* at 9:16–28.) In fact, in its reply brief, TriQuint states that "Avago is correct that the specification indicates that a detuning layer sequence could be located in various places." (Doc. # 208 at p. 26.)

The parties disagree whether it is proper to state the detuning layer sequence must be in contact with the piezoelectric resonator. The Court finds this limitation is obvious from the claim term itself, which requires the detuning layer sequence to be arranged on the first piezoelectric resonator. While the Court does not find TriQuint is attempting to impose an extraneous limitation to the disputed claim term, the Court finds TriQuint's proposed construction with the "clarifications" creates confusion, rather than alleviates ambiguity. The patent specification makes it clear where and how the detuning sequence is arranged on the first piezoelectric resonator. Further, using TriQuint's proposed term "applied," the *Random House Dictionary* defines "applied" as "to place in contact with."

For the foregoing reasons, the Court construes the disputed claim term as "the detuning layer sequence is only applied to the first piezoelectric resonator."

2. "[the detuning layer sequence comprises at least a first layer having a first acoustic impedance and a second layer having a second acoustic impedance] in order to shift a resonance frequency of the first piezoelectric resonator relative to the resonance frequency of the second piezoelectric resonator" (Claims 1 & 12)

Avago proposes that no construction of the bracketed language is necessary, because "the detuning layer sequence comprises at least a first layer having a first acoustic impedance and a second layer having a second acoustic impedance" is clear on its face. Avago's proposed construction for "[the detuning layer sequence comprises at least a first layer having a first acoustic impedance and a second layer having a second acoustic impedance] in order to shift a resonance frequency of the first piezoelectric resonator relative to the resonance frequency of the second piezoelectric resonator" is "the detuning layer sequence

comprises at least a first layer having a first acoustic impedance and a second layer having a second acoustic impedance to change the resonant frequency of the first resonator so that it is different than the resonant frequency of the second resonator which does not have a detuning layer." TriQuint's proposed construction of this disputed claim term, including the construction of the bracketed language, is "the first layer of the detuning sequence has a first acoustic impedance and the second layer has a second acoustic impedance for the purpose and effect of causing a shift in the resonance frequency of the first piezoelectric resonator relative to the resonance frequency of the second piezoelectric resonator."

TriQuint argues that its proposed construction construes the phrase "in order to" consistent with its plain meaning "for the purpose of." *See* AMERICAN HERITAGE DICTIONARY 1273 (3d ed. 1992) (defining "in order to" as "for the purpose of"). However, in constructing the disputed claim term, TriQuint further construes "in order to" as "for the purpose *and effect* of." The Court finds the additional limitation goes beyond the plain meaning of the phrase. Contrary to TriQuint's proposed construction, Avago's proposed construction does not even address the phrase "in order to." Rather, Avago's proposed construction focuses on construing the phrase "shift a resonance frequency."

The '4,619 patent provides that the detuning layer sequence has advantages "when trimming, that is when fine-adjusting the resonance frequency." (Doc. # 196-1, Ex. H at 7:54–46.) It is clear that the detuning layer sequence serves a *purpose*, which purpose is described in the disputed claim term as shifting the resonance frequency of the first detuned resonator relative to the second resonator in an advantageous manner. The Court agrees with TriQuint that "in order to" is an important phrase in the disputed claim term, because intent can be a requirement of the claims when they are drafted in such a manner. *See Combined Sys., Inc. v. Defense Tech. Corp. of Am.*, 350 F.3d 1207, 1214 (Fed. Cir. 2003) (affirming the district court's construction of "forming folds . . ." as requiring a "deliberate and systematic" construction).

Avago also argues that TriQuint's proposed construction reads out the phrase "at least" in the disputed claim term. The disputed claim term explicitly provides that the

detuning layer sequence has *at least* a first and second layer of material. In its reply brief, TriQuint states that it will not object if the Court changes TriQuint's proposed construction to read "have at least" rather than "have." (Doc. # 208 at p. 27.)

For the foregoing reasons, the Court construes the disputed claim term as "the detuning layer sequence comprises at least a first layer having a first acoustic impedance and a second layer having a second acoustic impedance for the purpose of shifting the resonance frequency of the first piezoelectric resonator relative to the resonance frequency of the second piezoelectric resonator."

J. Avago's U.S. Patent No. 6,812,619

Avago is the owner by assignment of U.S. Patent No. 6,812,619, titled "Resonator Structure and a Filter Comprising Such a Resonator Structure" (the "'2,619 patent"). The '2,619 patent describes a BAW resonator that includes a "frame-like zone" on the top of the BAW resonator to suppress unwanted resonances by causing the piezoelectric material to expand and contract more consistently over the surface of the center region of the resonator.

1. "the resonator is adapted in such a way that a width of the frame-like zone and acoustical property means of the layer structure in the frame-like zone are arranged so that displacement relating to the piezoelectrically excited strongest resonance mode is substantially uniform in the center area of the resonator" (Claims 1 & 35)

Avago proposes that no construction is necessary, because the following claim term is clear:

> [T]he resonator is adapted in such a way that a width of the frame-like zone and acoustical property means of the layer structure in the frame-like zone are arranged so that displacement relating to the piezoelectrically excited strongest resonance mode is substantially uniform in the center area of the resonator.

TriQuint's proposed construction for this disputed claim term is "the resonator is specifically designed so that the width of the frame-like zone and the 'acoustical property means' cause particles in the center area of the resonator to exhibit uniform displacement at all times during operation of the resonator."

Avago argues that TriQuint's proposed construction adds limitations that are not present in the disputed claim term. Specifically, Avago notes that the disputed claim term

provides for displacement that "is substantially uniform." TriQuint's proposed construction provides that particles must "exhibit uniform displacement at all times." However, in its reply brief, TriQuint agrees that the displacement should be "substantially uniform," not "uniform," and amends its brief accordingly.

TriQuint argues that the use of "adapted" and "arranged" in the disputed claim term indicates that the results of the resonator being *adapted* and the frame-like zone and acoustical property means being *arranged* are intentional. In further support of its argument, TriQuint cites the patent specification, which provides "[t]he acoustical properties and width of the frame-like zone in a resonator . . . *are chosen* so that . . . the displacement . . . is substantially uniform in the center area of the resonator." (Doc. # 196-1, Ex. J at 5:40–44) (emphasis added). The Court agrees that the use of these terms indicates purposeful construction of the device to achieve the result described. However, the Court does not find it necessary to combine and construe the terms "adapted" and "arranged" as "specifically designed," as TriQuint proposes.

TriQuint also argues that it is necessary to construe the disputed claim term to resolve the issue of when the substantially uniform displacement occurs. In support of this time limitation, TriQuint cites the patent specification, which provides, "[w]hen the piezoelectrically excited wave is a thickness extensional wave, this means that the thickness of the center area varies as a function of time so that *at each time instance* the thickness of the center area, at substantially each point of the area, is the same." (*Id.* at 5:57–62) (emphasis added). Based on the language in the '2,619 patent, the Court finds support for TriQuint's proposed time limitation of "at all times." However, because the patent specification is clear as to when the displacement is substantially uniform at the center area of the resonator, the Court does not find it necessary to read this limitation into the disputed claim term.

In construing the disputed claim term, the Court looks to the words of the claims themselves and gives them their ordinary and customary meaning, unless clearly stated otherwise. *Vitronics*, 90 F.3d at 1582. There is nothing in the '2,619 patent that requires the

Court to give the words in the disputed claim term anything but their ordinary and customary meaning. Accordingly, the Court finds that no construction is necessary.

2. "the resonator is adapted to operate in the thickness extensional wave mode as a TE mode" (Claims 1 & 35)

Avago proposes that no construction is necessary, because "the resonator is adapted to operate in the thickness extensional wave mode as a TE mode" is clear. TriQuint's proposed construction for this disputed claim term is "the resonator is specifically designed to operate such that the displacement of the particles of the piezoelectric material occurs only in the direction of the applied electrical field."

As argued with respect to the prior disputed claim term, TriQuint argues that "adapted" should be construed as "specifically designed." The Court does not find the term "adapted" to be confusing or ambiguous. However, the Court does agree that the phrase "TE mode" requires construction.

The patent specification distinguishes between TE modes and shear modes:

> In the presence of a piezoelectrically excited thickness extensional wave[,] the particles of the piezoelectrical material experience displacement in the vertical direction, in other words in the direction of the applied electrical field. In the presence of a piezoelectrically excited shear wave[,] the particles of the piezoelectrical material experience displacement in the horizontal direction, in other words in a direction perpendicular to the applied electric field.

(Doc. # 196-1, Ex. J at 5:47–54.) The inventors were required to amend the claims "to emphasize that the claimed device is actually operating in the TE mode." (Doc. # 196-4, Ex. 28 at p. 11.) This amendment was required in light of prior art. The patent examiner noted that "if the claims were limited to a device actually operating in the TE mode, then the claims would be allowable." (*Id.*) The Court finds the disputed claim term is clearly limited to operation in TE mode, and does not provide that the resonator is adapted to operate in shear modes.

Based on the foregoing, the Court construes the disputed claim term as "the resonator is adapted to operate such that the displacement of the particles of the piezoelectrical material occurs in the direction of the applied electrical field."

K. Avago's U.S. Patent No. 6,377,137

Avago is the owner by assignment of U.S. Patent No. 6,377,137, titled "Acoustic Resonator Filter with Reduced Electromagnetic Influence Due to Die Substrate Thickness" (the "'137 patent"). The '137 patent describes a method for reducing electromagnetic influence in a BAW resonator filter circuit by reducing the substrate upon which the BAW resonators are formed. By reducing the substrate, the distance between magnetic fields is reduced, which reduces the current induced by the magnitude of the magnetic fields.

1. "removing material from a bottom surface of said substrate to reduce the thickness of the substrate and to reduce an electromagnetic influence in a resulting filter" (Claim 1)

Avago's proposed construction for "removing material from a bottom surface of said substrate to reduce the thickness of the substrate and to reduce an electromagnetic influence in a resulting filter" is "removing material from a bottom surface of said substrate to reduce the thickness of the substrate and to reduce the effects caused by currents flowing through the filter." TriQuint's proposed construction of this disputed claim term is "removing material from the bottom surface of the substrate for the purposes of and with the effects of (a) reducing the thickness of the substrate and (b) reducing an electromagnetic influence in the filter."

Avago's proposed construction provides for an explanation of "an electromagnetic influence," while keeping the remaining disputed claim term in tact. TriQuint argues that Avago's proposed construction would leave the jury confused and misdirected. As stated throughout this Order, the Court does not construe the claim terms in a manner to be understood by a juror. Rather, disputed claim terms are given "their ordinary and accustomed meaning as understood by one of ordinary skill in the art." *Dow Chem.*, 257 F.3d at 1372; *see also Phillips*, 415 F.3d at 1313.

TriQuint's seeks to construe "to reduce" as "for the purposes of and with the effects of [reducing]." The disputed claim term explicitly states "removing material . . . to reduce." The Court finds the purpose of removing material from the substrate is clear in the disputed claim term without further construction. It is not necessary to construe the claim term in the

manner proposed by TriQuint.

According to the patent specification, electromagnetic influence is "caused by the currents flowing through FBAR filter 226." (Doc. # 196-1, Ex. K at 7:2–4.) Avago's proposed construction of the disputed claim term reflects this explanation of electromagnetic influence.

For the foregoing reasons, the Court construes the disputed claim term as "removing material from a bottom surface of said substrate to reduce the thickness of the substrate and to reduce the effects caused by currents flowing through the filter."

2. "reduce an electromagnetic influence" (Claim 1)

Avago's proposed construction for "reduce an electromagnetic influence" is contained in Avago's proposed construction of the prior claim term. Avago proposes that the disputed claim term means "reduce the effects caused by currents flowing through the filter." TriQuint's proposed construction of this disputed claim term is "reduce the effects caused by currents flowing on alternate paths from input to output such that the signal bypasses the filter elements."

Because the disputed claim term currently at issue is contained in the prior construction, the Court must construe these claim terms consistently. As stated above, an electromagnetic influence is "caused by the currents flowing through FBAR filter 226." (Doc. # 196-1, Ex. K at 7:2–4.) Avago argues that TriQuint's proposed construction of the disputed claim term confuses electromagnetic influence with victimizer loop and victim loop. (*Id.* at 7:9–17.) Victimizer loop and victim loop are both disputed claim terms and subject to construction below.

The Court finds Avago's proposed construction is consistent with the patent specification, and construes the disputed claim term as "reduce the effects caused by currents flowing through the filter."

3. "die cavity" (Claims 5, 6, 14 & 16)

Avago proposes that no construction is necessary, because "die cavity" is clear. TriQuint's proposed construction for this disputed claim term is "a recess in a support

structure, positioned to receive a die."

In support of its proposed construction, TriQuint argues that the disputed claim term has no plain meaning to jurors. However, the Court is not required to construe a disputed claim term in a manner that can easily be understood by jurors. Rather, the Court is required to construe the disputed claim term in a manner that would be understood by a person of ordinary skill in the art. *Dow Chem.*, 257 F.3d at 1372.

Both parties cite to the same description in the patent specification: "The die with FBAR resonators . . . form a single FBAR filter 226. FBAR filter 226 may then be mounted into a die cavity 229 with a ceramic package 288, as shown in Figs. 9–10." (Doc. # 196-1, Ex. K at 6:38–43.) Figure 10 shows a cross-section of the device, in which die cavity 229 is a hollow space in which the filter is mounted. According to Avago's brief, a "die cavity" is "an area in a package where the die is mounted." (Doc. # 197 at p. 56.) Avago argues that TriQuint's proposed construction should be rejected, because it introduces concepts such as "recess" and "support structure," which are not found in the patent specification. However, Avago's proposed construction does not attribute for the term "cavity" in the claim term. "Cavity" is defined in the *American Heritage Science Dictionary* as a "hollow area."

Because TriQuint's proposed construction lacks support in the '137 patent, and the disputed claim term is not entirely clear on its face, the Court construes the disputed claim term as "a hollow area in a package where the die is mounted."

4. "victim loop" (Claims 7, 15 & 18)

Victim loop is a term coined by the inventors, and does not have a plain meaning outside the '137 patent. Avago's proposed construction for "victim loop" is "a current path from the output pad to the ground pad."[8] TriQuint's proposed construction of this disputed claim term is "a current path formed by an output signal pad and a ground pad." TriQuint

[8] Avago revised its proposed construction of the disputed claim term in its reply brief from "the nearest ground pad" to "the ground pad." TriQuint argued, and the Court agrees, that Avago's prior focus on the nearest ground pad was improper, because it is unclear from Figure 9 of the '137 patent, which ground pad is in fact "nearest."

further defines the relationship between the victim and victimizer loops in the proposed claim construction below. The parties agree that the victim loop is formed on the output side.

The patent specification explains that the victim loop is on a path "such that the signal bypasses the filter elements." (Doc. # 196-1, Ex. K at 7:8–11.) Figure 9 of the '137 patent depicts the victim loop as the current path between an output pad (240c) and a ground pad (240d). Therefore, the Court construes the disputed claim term as "a current path from the output pad to the ground pad such that the signal bypasses the filter elements."

5. "victimizer loop" (Claims 7, 15 & 18)

Victimizer loop, like the prior disputed claim term, is a term coined by the inventors, and does not have a plain meaning outside the '137 patent. Avago's proposed construction for "victimizer loop" is "a current path from the input signal pad to the ground pad."[9] TriQuint's proposed construction of this disputed claim term is "a current path formed by an input signal pad and a ground pad." TriQuint also proposes the Court construct the relationship between the victim loop and the victimizer loop as follows: "Current passing along the victimizer loop must create an image current in a ground plane beneath the victimizer loop. The image current and the victimizer loop current must together generate a current in the victim loop that is measurably reduced as a result of thinning the substrate." The parties agree that the victimizer loop is formed on the input side.

TriQuint's proposed construction attempts to explain the relationship between the victim loop and the victimizer loop as current paths formed by an output/input signal pad and a ground pad. Avago argues that TriQuint's proposed construction of the relationship between the claim terms is incorrect, and that output/input signal pads and ground pads can not form current pads. Rather, the patent specification provides that the current paths are formed by the "mutual inductance" between the victim loop and the victimizer loop and form

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[9] Avago revised its proposed construction of the disputed claim term in its reply brief from "the nearest ground pad" to "the ground pad." TriQuint argued, and the Court agrees, that Avago's prior focus on the nearest ground pad was improper, because it is unclear from Figure 9 of the '137 patent, which ground pad is in fact "nearest."

between the output/input signal pads and the ground pads. (Doc. # 196-1, Ex. K at 7:8–16.) The Court does not find it necessary to read TriQuint's proposed limitation into the construction of either "victim loop" or "victimizer loop." The relationship between these two loops is explained in the patent specification. (*Id.* at 7:19–8:18.)

The patent specification also explains that the victimizer loop is on a path "such that the signal bypasses the filter elements." (*Id.* at 7:8–11.) Figure 9 of the '137 patent depicts the victimizer loop as the current path between an input pad (240a) and a ground pad (240b). For the foregoing reasons, the Court construes the disputed claim term as "a current path from the input signal pad to the ground pad such that the signal bypasses the filter elements."

L. Avago's U.S. Patent No. 6,262,637

Avago is the owner by assignment of U.S. Patent No. 6,262,637, titled "Duplexer Incorporating Thin-Film Bulk Acoustic Resonators (FBARs)" (the "'637 patent"). A duplexer allows a device to receive signals within one band of frequencies and to transmit them at another band of frequencies while preventing the device's transmit signal from overloading the receive filter. The '637 patent describes a 90° phase shifter in series with either the transmit or receive filter to effectively decouple the transmit signal from the receive signal in a BAW duplexer. The 90° phase shifter protects the receive filter from being overloaded by the transmit signal by raising the impedance (flow resistance) of the receive path to block the transmit signal from following the receive path.

1. "film bulk acoustic resonator (FBAR)" (Claims 1 & 20–22)

Avago's proposed construction for "film bulk acoustic resonator (FBAR)" is "a bulk acoustic wave (BAW) resonator fabricated using thin film technology." TriQuint's proposed construction of this disputed claim term is "a piezoelectric resonator comprising a layer of piezoelectric material sandwiched between a top electrode and bottom electrode and suspended at its edges over a well in the substrate." TriQuint argues that Avago's proposed construction is intentionally vague with respect to thin-film technology. However, TriQuint acknowledges that the '637 patent describes thin-film technology in detail and explains its importance to the invention.

The patent specification supports Avago's proposed construction of the disputed claim term. The patent specification repeatedly defines FBAR as "a thin-film bulk acoustic resonator." (Doc. # 196-1, Ex. L at 4:25–26, 4:45–46.)

TriQuint argues the FBAR must be suspended at its edges over a well in the substrate. However, there are multiple types of FBARs. The '637 patent incorporates U.S. Patent No. 5,5867,602. (*Id.* at 4:45–49.) Because this patent was expressly incorporated by referenced into the patent specification of the '637 patent, the Court may rely on the incorporated patent in constructing the disputed claim term. *See Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000) ("Incorporation by reference provides a method for integrating material from various documents into a host document . . . by citing such material in a manner that makes clear that the material is effectively party of the host document as if it were explicitly contained therein."). The incorporated patent describes FBARs suspended over air (Doc. # 198-1, Ex. L.1 at 1:23–26), and also FBARs constructed on a membrane (*id.* at 2:45–47, 3:31). Accordingly, the inventor did not depart from the broad or generic meaning of FBAR, which is understood by a person of ordinary skill in the art to be a thin-film bulk acoustic resonator.

The Court finds the claim term "FBAR" does not necessarily mean a resonator suspended over a well in the substrate. The '637 patent may further limit the construction of the particular FBAR described in the patent; however, the Court does not find it necessary to limit the claim term as narrowly as TriQuint proposes. When a term is known in the art and is used in the patent consistent with the known meaning, then the Court will not redefine the term, unless term is redefined in the patent specification. *See Carroll Touch*, 15 F.3d at 1577. The '637 patent specification does not redefine FBAR.

Further, it is a general principle of claim construction that while "a claim must be read in view of the specification," a court "may not read a limitation into a claim from the specification." *Innova/Pure Water*, 381 F.3d at 1117. The patent specification repeatedly describes FBAR as "a thin-film bulk acoustic resonator," and the Court does not find there is a clear intention to limit the scope of the claims to a resonator suspended over a well in the

substrate, as TriQuint proposes.

Accordingly, the Court construes "film bulk acoustic resonator (FBAR)" as "a bulk acoustic wave (BAW) resonator fabricated using thin film technology."

2. "a 90° phase shifter" (Claim 1)

Avago's proposed construction for "a 90° phase shifter" is "a phase shifter that shifts the signal by approximately 90°." TriQuint's proposed construction of this disputed claim term is "a circuit that is designed to cause and does cause a 90° (quarter wavelength) phase shift at the center frequency of the other band pass filter" in which "[t]he 'other band pass filter' is the transmit or receive filter with which the circuit is not in series." TriQuint also proposes that the 90° phase shifter is located "between (1) the junction of the transmit path and the receive path and (2) either the transmit filter or the receive filter." However, during the *Markman* hearing, TriQuint acknowledged that the term "90° phase shifter" would be clear to someone of ordinary experience in the art.

A 90° phase shifter is something that shifts a signal's phase by 90 degrees or ¼ of a wavelength. TriQuint argues that the 90° phase shifter must cause a 90° phase shift at the center frequency of the other band pass filter, because that is the logical place to measure the phase shift. Avago argues that the patent does not indicate that the 90° phase shift must occur at the center frequency of the other band pass filter.

Claim 1 describes a duplexer comprising, among other things, "a series circuit connected between the second port and the third port, the series circuit including a 90° phase shifter in series with a second band-pass filter." (Doc. # 196, Ex. L at 14:64–66.) Claim 1 clearly states that the 90° phase shifter is located between the second port and the third port. The Court does not find it necessary to limit the location of the 90° phase shifter in the manner proposed by TriQuint. The patent specification states: "Circuits suitable for use as the 90° phase shifter are known in the art. For example, the 90° phase shifter may be composed of lumped inductors and capacitors or a λ/4 transmission line." (*Id.* at 7:5–8.) Although the patent provides little detail about the 90° phase shifter in the patent specification, TriQuint acknowledges that "those skilled in the art understood what 90° phase

shifters do and why." (Doc. # 196 at p. 59.)

TriQuint also proposes to add an intent limitation to the claim term. The Court does not find any reason to read "designed to cause and does cause" into the claim term. A 90° phase shifter is an object that shifts the phase of a signal. The verb "shifts" is sufficient to describe what the object does without adding further intent qualifiers. It is not necessary to read additional limitations into the '637 patent.

For the foregoing reasons, the Court construes "a 90° phase shifter" as "a phase shifter that shifts the phase of a signal by 90 degrees."

3. "in series with a second band-pass filter" (Claim 1)

Avago proposes that no construction is necessary, because "in series with a second band-pass filter" is clear. TriQuint's proposed construction for this disputed claim term is "the circuit is located between (1) the junction of the transmit path, the receive path and the antenna port and (2) either the transmit filter or the receive filter."

TriQuint states that its proposed construction will be helpful to the jury to specify the location of the 90° phase shifter using language enabling the jury to locate it in the circuit. However, the Court does not construct claims so that the claim terms may be understood by potential jurors. *Dow Chem.*, 257 F.3d at 1372 (stating that disputed claim terms are given "their ordinary and accustomed meaning as understood by one of ordinary skill in the art").

Figure 4 in the '637 patent shows the location of the 90° phase shifter (labeled as number 134), the transmit band-pass filter (130), and the second band-pass filter (132). Arrows in Figure 4 indicate the direction of the current. The numbered components in Figure 4 are explained clearly in the patent specification. (Doc. # 196-1, Ex. L at 5:61–67, 6:1–7.) The Court does not find it necessary to define the claim term "in series with a second band-pass filter" when Figure 4 depicts the location of the claim term precisely. TriQuint's description could only serve to confuse the jury, and add unnecessary limitations to the claim term. Therefore, the Court finds that no construction is necessary.

M. Avago's U.S. Patent No. 6,051,907

Avago is the owner by assignment of U.S. Patent No. 6,051,907, titled "Method for

Performing On-Wafer Tuning of the Thin Film Bulk Acoustic Wave Resonators (FBARS)" (the "'907 patent"). The '907 patent describes a method for tuning multiple BAW resonators in one processing step by adjusting the thickness of multiple resonators on a semiconductor wafer by determining the average frequency across the resonators and adding or removing material from the resonators to reach the desired resonant frequency.

1. "Thin Film Bulk Acoustic Wave Resonators (FBARs)" (Claims 1, 7 & 10)

Avago's proposed construction for "Thin Film Bulk Acoustic Wave Resonators (FBARs)" is "a bulk acoustic wave (BAW) resonator fabricated using thin-film technology." TriQuint's proposed construction of this disputed claim term is "a FBAR is a Thin Film Bulk Acoustic Resonator that includes multiple layers having respective thicknesses, and exhibits series and/or parallel resonance at frequencies that are a function of the thickness of at least one of the layers."

The disputed claim term is defined in the patent specification as: "The [Thin Film Bulk Acoustic Wave Resonator] FBAR comprises a plurality of layers having respective thicknesses, and exhibits at least one of a series resonance and parallel resonance at respective frequencies that are a function of the thickness of at least one of the layers." (Doc. # 196-1, Ex. M at 2:16–19.)

Avago proposes the same construction for the disputed claim term as it proposed for the same claim term in the '637 patent. As Avago argues in its brief, when a term is known in the art and is used in the patent consistent with the known meaning, then the Court should not redefine the term, unless term is redefined in the patent specification. *See Carroll Touch*, 15 F.3d at 1577 ("[T]he words of a claim are generally given their ordinary and accustomed meaning, unless it appears from the specification or the file history that they were used differently by the inventor."). Here, the disputed claim term is defined in the patent specification, and the Court finds the inventor intended to apply this specific definition to the disputed claim term. *Vitronics*, 90 F.3d at1582 ("The patent specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication."). There is no evidence in the '907 patent that the inventor intended the disputed claim term to

have a broad or more generic meaning.

The '637 patent and the '907 patent are unrelated; neither patent incorporates the other patent, nor refers to the other in any manner. The '907 patent provides its own definition for "Thin Film Bulk Acoustic Wave Resonators (FBARs)," which the Court will apply in constructing the disputed claim term. The Court finds no reason to bind itself, with respect to the '907 patent, to the definition of "film bulk acoustic wave resonator (FBAR)" contained in the '637 patent.

Based on the foregoing, the Court construes the term as it was used in the '907 patent: "a thin film bulk acoustic wave resonator (FBAR) comprised of a plurality of layers having respective thicknesses, and exhibiting at least one of a series resonance and a parallel resonance at respective frequencies that are a function of the thickness of at least one of the layers."

2. "calculating an average of the measured frequencies" (Claim 10)

Avago proposes that no construction is necessary, because "calculating an average of the measured frequencies" is clear. TriQuint's proposed construction for this disputed claim term is "calculating a mean of all the measured frequencies."

The Court finds that a person of ordinary skill in the art would calculated the average of the measured frequencies by calculating the sum of the measured frequencies and then dividing that sum by the number of measured frequencies. However, the term "average" can generically refer to the arithmetic mean, the median, or the mode. Avago acknowledged, during the *Markman* hearing, that an average can be determined in a number of ways. TriQuint's proposed construction reflects the most common usage of the word "average." The *American Heritage Science Dictionary* defines average as "[a] number, especially the arithmetic mean, that is derived from and considered typical or representative of a set of numbers." The claim term expressly requires calculations, which involves performing a mathematical function. Merely selecting an intermediate value does not involve "calculating an average." During the *Markman* hearing, Avago argued that a person of ordinary skill in the art would know how to calculate the average, and would know to disregard any outlying

measured frequencies. This restriction on outliers is not apparent from either the disputed claim term, or the patent specification. Contrary to Avago's position, the disputed claim term is not clear on its face. Accordingly, the term "average" as used in the '907 patent shall be construed as the "mean."

TriQuint further proposes to construe the disputed claim as "*all* measured frequencies." The Court finds no support in the '907 patent for this limitation. The Court therefore construes "calculating an average of the measured frequencies" as "calculating a mean of the measured frequencies."

3. "simultaneously altering the thickness of each of the plurality of the FBARs [by the amount (A)]" (Claim 10)

Avago's proposed construction for "simultaneously altering the thickness of each of the plurality of the FBARs by the amount (A)" is "altering the thickness of each film bulk acoustic resonator to be detuned on a wafer in one continuous processing step by the amount (A)." TriQuint's proposed construction of this disputed claim term is "changing the thickness of all the FBARs by the same amount (A) at the same time." The parties' primary dispute is whether "simultaneously" means "in one continuous processing step" or "at the same time."

The term "simultaneous" is defined as "existing, occurring, or operating at the same time." RANDOM HOUSE WEBSTER'S COLLEGE DICTIONARY 1205 (2d ed. 1997). There is nothing in the patent specification that supports constructing the term "simultaneously" in a manner other than the plain meaning. Avago cites to the patent specification for support that the thickness of the plurality of each resonator is altered in one processing step; however, the Court finds this citation supports TriQuint's proposed construction. The patent specification provides that "the reduction of the top electrode thicknesses of the FBARs . . . causes the respective FBARs to yield series resonant frequencies that are substantially equal to the design series resonant frequency . . . . In this manner, each of the FBARs on the wafer is tuned simultaneously." (Doc. # 196-1, Ex. M at 6:35–45.) Accordingly, the Court will construct the term "simultaneously" as "at the same time."

TriQuint's proposed construction provides for the changing of the thickness of "all the FBARs." However, the disputed claim term states that the thickness of "the plurality of the FBARs" will be simultaneously altered. Plurality of the resonators does not mean *all* of the resonators, and in this manner, TriQuint's proposed construction contains an extraneous limitation. *See York Prods. v. Cent. Tractor Farm & Family Ctr.*, 99 F.3d 1568, 1575 (Fed. Cir. 1996) ("The term [plurality] means, simply, 'the state of being plural.'") (quoting AMERICAN HERITAGE DICTIONARY SECOND COLLEGE EDITION 955 (2d ed. 1982)). The Court will not construct the term "plurality" to mean "all."

Based on the foregoing, the Court construes the disputed claim term as "altering the thickness of each film bulk acoustic resonator to be detuned on a wafer by the same amount (A) at the same time."

IV. Conclusion

For the foregoing reasons, the Court construes the disputed claim terms as set forth in the table above.

IT IS SO ORDERED.

DATED this 12th day of January, 2011.

James A. Teilborg
United States District Judge