IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

CONSTELLATION DESIGNS, LLC, Plaintiff, v. LG ELECTRONICS, INC., LG ELECTRONICS USA, INC., and LG ELECTRONICS ALABAMA, INC., Defendants.	§ § § § § § § § § § §	Case No. 2:21-cv-0448-JRG

CLAIM CONSTRUCTION ORDER

In this patent case, Constellation Designs, LLC, alleges infringement by LG Electronics, Inc., LG Electronics USA, Inc., and LG Electronics Alabama, Inc., (together, "LG") of 60 claims from seven related patents. Each of the patents "relates to bandwidth and/or power efficient digital transmission systems and more specifically to the use of unequally spaced constellations having increased capacity." U.S. Patent 8,842,761 at 1:25–28; *see also* U.S. Patent 9,743,290 at 1:41–44; U.S. Patent 10,567,980 at 1:36–39; U.S. Patent 10,693,700 at 1:38–41; U.S. Patent 11,018,922 at 1:51–54; U.S. Patent 11,019,509 at 1:38–41; U.S. Patent 11,039,324 at 1:57–60.

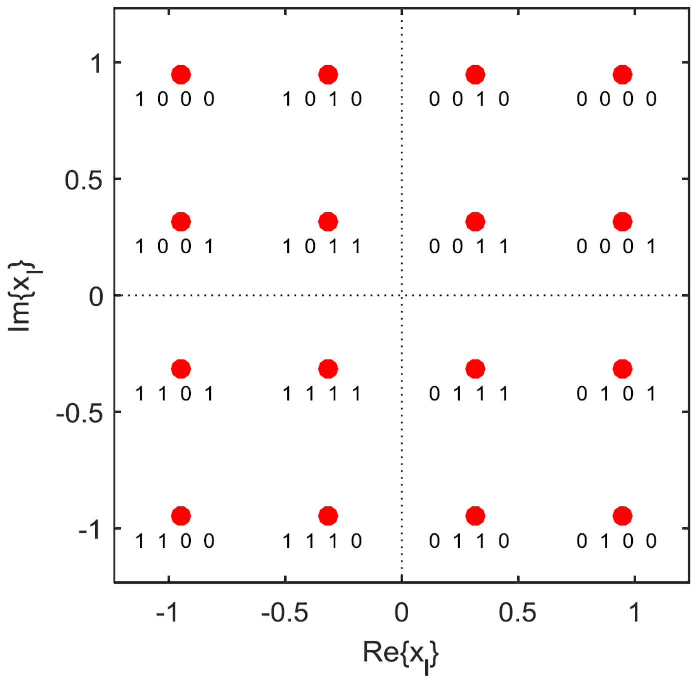
The parties present two disputes about claim scope,[1] with LG contending three terms render certain claims indefinite. Having considered the parties' briefing and arguments of counsel during the February 14, 2023 hearing, the Court rejects that contention.

[1] Constellation's opening brief presents seven disputes. Dkt. No. 75 at i. In its response, LG withdrew its challenges to four of those disputes and did not respond to Constellation's briefing on a fifth. Dkt. No. 81 at 18. *See also* Joint Cl. Constr. Chart, Dkt. No. 83.

I. BACKGROUND

The patents concern the use of unequally spaced constellations in digital communication systems. In the context of such systems, a "constellation" is a set of symbols mapped to the amplitudes of carrier waves during a time slot. *See* '922 Patent at 1:55–67. Generally, a transmitter has a mapper to encode bits into symbols of a constellation and a modulator to generate a signal corresponding to the symbols. *See id.* at 2:51–59. At the receiver, the values of the received amplitudes are demapped to determine the transmitted symbols. *See id.* at 2:59–64.

As an example, quadrature amplitude modulation (QAM) uses two carrier waves of the same frequency that are 90° out of phase: the "in-phase" (or I) carrier and the quadrature (or Q) carrier. Each symbol of the constellation can thus be represented as a point in an I-Q plane based on the amplitudes of the I and Q carriers. For example, an *equally* spaced constellation diagram for a 16 QAM scheme might look like this:



See Non-Uniform Constellations for ATSC 3.0, Dkt. No. 75-4 at 199 (Fig. 3; noting "[t]he constellation points are uniformly located on an orthogonal grid with the same minimum Euclidean distance of points to their closest neighbours"). Here, if both axes are at the maximum amplitudes during a time slot, the demapper at the receiver would likely interpret the symbol as "0000." Similarly, if both carriers are at their minimum amplitudes during a time slot, the demapper would likely interpret the symbol as "1100."

The potential problem is noise, which might cause the received signal to vary from the transmitted signal in one or both directions in the plane. The further apart the symbols on the diagram, the more tolerant the system in interpreting a noisy received signal. *See* '922 Patent at 1:59–61 ("The minimum distance (d_{min}) between constellation points is indicative of the capacity of a constellation at high signal-to-noise ratios (SNRs)."). For this reason, system designers attempt to maximize the spacing between symbols, but the tradeoff is smaller constellations and therefore less-efficient systems. *See id.* at 1:62–63 ("Therefore, constellations used in many communication systems are designed to maximize d_{min}."); Constellation Design via Capacity Maximization, Dkt. No. 75-3 at 1821 (noting "constellations have most often been designed to maximize d_{min}," which "is not necessarily a good measure at low SNRs typical of coded systems, particularly with capacity approaching codes").

The patents concern *unequally* spaced (i.e., "non-uniform") constellations. For example, FIG. 21 of the '922 Patent shows a QAM-64 constellation diagram in which the spacing between the symbols is smallest near the two axes. This specific constellation is beneficial because it allows for the use of low-complexity demappers. *See* '922 Patent at 15:8–12.

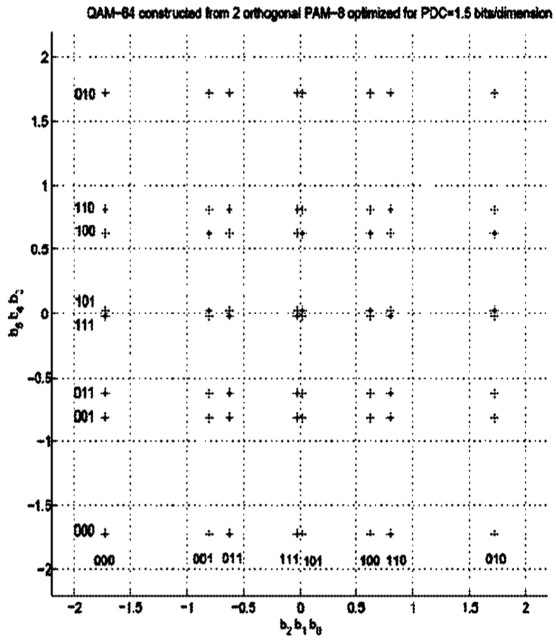


FIG. 1 of the '922 Patent

The patents more specifically concern processes for selecting optimized unequal constellations based on specific coding rates and SNRs. The patents explain that process with respect to the iterative loop shown in FIG. 5. *See generally* '922 Patent at 10:5–11:64. At the end of the process, the output constellations have increased capacity relative to conventional constellations for a fixed code rate and modulation scheme. *Id.* at 11:65–12:2.

The claims at issue specify the desired constellations. For example, Claim 1 of the '922 Patent requires a transmitter with a coder and a mapper "capable of mapping the encoded bits to symbols in a non-uniform quadrature amplitude modulation 1024-point symbol constellation (NU-QAM 1024)." '922 Patent at 20:65–21:12. The claim then specifies:

> the NU-QAM 1024 constellation comprises an in-phase component and a quadrature component, where each component comprises 32 levels of amplitude such that the amplitudes scaled by a scaling factor are within 0.55 from the following set of amplitudes: -38.424, -31.907, -24.169, -26.796, 38.425, 31.908, -20.038, -19.169, -7.759,

-7.759, -11.460, -11.460, -4.850, -4.850, −15.014, -15.205, 20.038, 19.170, 15.206, 15.015, 24.170, 26.797, 11.460, 11.460, 1.326, 1.326, 4.849, 4.849, -1.328, -1.328, 7.759, and 7.759.

Id. at 21:13–23. Each claim at issue is similarly structured and concerns either a transmitter that maps symbols to a NU-QAM 1024 constellation or a receiver that demaps the received signal into a NU-QAM 1024 constellation. *See id.* at 24:27–51 (reciting, in Claim 24, a receiver with "a demapper . . . capable of determining likelihoods using the demodulated signal and a non-uniform quadrature amplitude modulation 1024-point symbol constellation (NU-QAM 1024); '324 Patent at 35:38–63 (Claim 24), 39:44–67 (Claim 47), 41:19–37 (Claim 60), 41:57–42:8 (Claim 62).

LG challenges these six claims as indefinite for two reasons. First, LG argues two terms in Claim 47 of the '324 Patent lack antecedent basis and are therefore indefinite. Second, LG contends "scaling factor" in each of the claims renders the claims boundless and therefore indefinite.

II. GENERAL LEGAL STANDARDS

A. Generally

"[T]he 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) (en banc). As such, if the parties dispute the scope of the claims, the court must determine their meaning. *See, e.g.*, *Verizon Servs. Corp. v. Vonage Holdings Corp.*, 503 F.3d 1295, 1317 (Fed. Cir. 2007); *see also Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 390 (1996), *aff'g*, 52 F.3d 967, 976 (Fed. Cir. 1995) (en banc).

Claim construction, however, "is not an obligatory exercise in redundancy." *U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997). Rather, "[c]laim construction is a matter of [resolving] disputed meanings and technical scope, to clarify and when necessary to

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.

WHAT WILL YOU BUILD? | sales@docketalarm.com | 1-866-77-FASTCASE

fastcase® Smarter legal research.