Exhibit 1

DECLARATION UNDER 37 CFR 1.131(a)

Application Serial Number: 15/396,567
Patent Number: 10200227
Filing Date: 12/31/2016
Inventor: Steve Shattil
Attorney Docket Number: 50348.111
Reexamination Proceeding Number: 90/019,411

I, Steve Shattil, declare as follows:

1. I am the inventor of Patent No. 10200227 ('227).

2. This Declaration is submitted by the owner of the patent ('227) under examination.

3. This Declaration establishes constructive reduction to practice (and thus, invention) of the subject matter of each rejected claim prior to the effective date (under 35 U.S.C. 102(e)) of references on which the rejection is based.

4. In the Office Action (OA) mailed on 04/30/2024,

   claims 1-3, 5, 6, 11, 12, 14, 18, and 20-27 were rejected under 35 U.S.C. 103(a) as being unpatentable over Laroia (U.S. Pub. No. 20020172213A1) in view of Thoumy (U.S. Pat. No. 7039120);

   claims 4, 9, 15, and 16 were rejected under 35 U.S.C. 103(a) as being unpatentable over Laroia and Thoumy, in further view of Singh (U.S. Pat. No. 7139320);

   claims 10 and 19 were rejected under 35 U.S.C. 103(a) as being unpatentable over Laroia and Thoumy, in further view of Larsson (6842487);

   claims 13 and 29 were rejected under 35 U.S.C. 103(a) as being unpatentable over Laroia and Thoumy, in further view of Li (6904283);

claims 7, 17, and 28 were rejected under 35 U.S.C. 103(a) as being unpatentable over Laroia and Thoumy, in further view of Cimini (6891792);

5. The earliest priority date of **Laroia** is 09/13/2000, and its earliest publication is 03/21/2002.
6. The earliest Pre-AIA priority date of **Thoumy** is 11/30/1999, and its earliest publication is 05/02/2006.
7. The earliest priority date of **Singh** is 10/11/2001, and its earliest publication is 11/21/2006.
8. The earliest priority date of **Larsson** is 09/22/2000, and its earliest publication is 01/11/2005.
9. The earliest priority date of **Li** is 12/15/2000, and its earliest publication is 06/20/2002.

10. Prior to all of the following reference dates, **Laroia** 09/13/2000, **Thoumy** 11/30/1999, **Singh** 10/11/2001, **Larsson** 09/22/2000, and **Li** 12/15/2000, I completed my invention as described and claimed in the subject patent ('227) as evidenced by the following:

11. The subject matter of each of the rejected claims is disclosed in U.S. Patent appl. no. **60/163,141 ('141), filed Nov. 2, 1999**, which is before the filing and priority dates of the cited and relied-upon references, Laroia, Thoumy, Singh, Larsson, and Li.

Re: Claim 1

12. With respect to claim 1, the figures and written description throughout '141 support the claimed invention of the instant patent. For the sake of brevity, FIG. 6A of '141 is shown below.

Exhibit 1

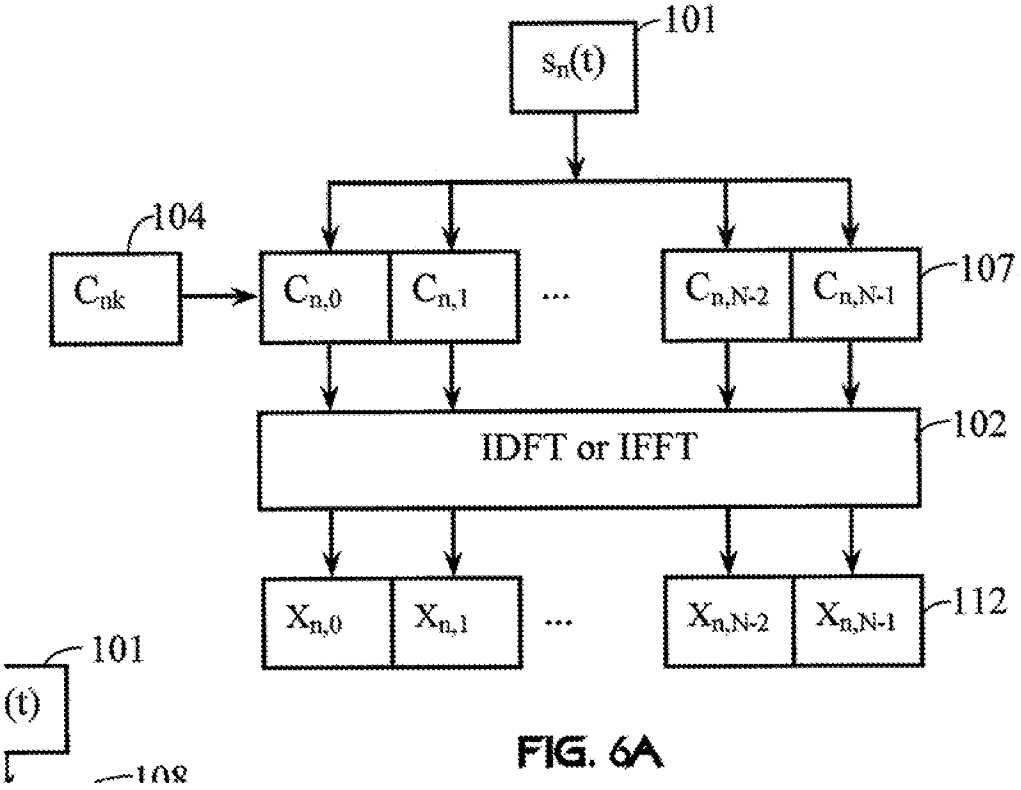

FIG. 6A

13. A portion of the written description (see '141, Page 24, third and fourth Pars.) pertaining to FIG. 6A, and corresponding features of Claim 1 in 10200227 (in parentheses) is shown below: (emphasis added)

> "A code generator **104 (employing an invertible transform to spread a plurality of data symbols)** provides the N chips c_{kn} to a serial-to-parallel converter **107 (mapping the spread data symbols to a plurality of OFDM subcarriers)** that arranges the chips c_{kn} to parallel modulate each of a plurality of carrier signals generated by a carrier-signal generator **102 (modulating the spread data symbols onto the plurality of OFDM subcarriers)**."

14. The features of claim 1 (with emphasis) and corresponding support in '141, by way of example, but without limitation, are shown as follows:

- **non-transitory computer-readable medium including computer-readable program code stored thereon, the computer-readable program code configured to be executed by at**

least one processor to implement a method for generating an Orthogonal Frequency Division Multiplexing (OFDM) transmission signal

15. FIGs. 3A, 4A, 4B, and 5B are plots of OFDM transmission signals that were produced by executing computer-readable program code on a computer processor using equations and functions disclosed in the written description, wherein the computer-readable program code comprises each of the features recited in claim 1.

16. Written support in '141 includes the following:

Page 26, first Par.: (emphasis added)

"The modulated symbols may be processed in a carrier-signal generator 102, which may be a **digital signal processor**. The signal generator 102 performs an inverse Fourier Transform, and may perform other **digital processing methods**, such as filtering and pulse shaping."

Page 26, third Par.: (emphasis added)

"A combiner, such as the combiner 109 is any device or process that has an input of a plurality of signals and an output representing a superposition of the signals. A combiner may be a physical device, such as a wavelength multiplexer, splitter, voltage divider, a summer, or a difference amplifier. A combiner may be a combining process performed by a **computer processor**. A combiner may provide phase shifts to one or more input signals, filtering, inversion, interleaving, de-interleaving, or amplitude adjustment prior to combining the input signals."

Page 36, second Par.: (emphasis added)

"A Fourier transform, as used herein is defined as any of the direct or inverse Fourier transform methods including Fourier transforms, Fourier series, discreet-time Fourier transforms, discreet Fourier transforms, and polynomial transforms. **Fourier transforms may be implemented using any number of computational techniques**, such as fast Fourier transforms, and they may be supported using additional mathematical relationships such as Laplace transforms."

- **a method for generating an Orthogonal Frequency Division Multiplexing (OFDM) transmission signal:**

17. Written support in '141 includes the following:

Page 43, third Par.: (emphasis added)

"Redundantly modulated **multicarrier signals** may be used as a multiple-access communication protocol such as CIMA, MC-CDMA, or an **OFDM** protocol that transmits data over multiple carriers."

Page 18, fourth Par. – Page 19, first Par.: (emphasis added)

"The signal generator 102 produces a **multicarrier signal. A multicarrier signal is defined as a plurality of carrier signals having different orthogonalizing properties (also referred to as orthogonality parameters or diversity parameters), such as** time, differential power, location, mode, **frequency**, polarization, phase space, directivity, spread-spectrum code, or any combination of orthogonalizing properties. An orthogonalizing property (such as polarization) may not be completely orthogonal. For example, polarized signals having less than 90-degrees separation between them have cross-polarization (interference) terms. A multicarrier signal may be defined by any signal property that affects propagation characteristics, such as velocity, reflections, and refraction. Each multicarrier signal may be defined by a different propagation mode.

A multi-frequency signal generator is a type of multicarrier-signal generator. A multi-frequency signal generator is any signal generator that generates electromagnetic signals having frequency-diverse characteristics, such as multiple signal frequencies.

Frequency-diverse signals may have diversity according to other diversity parameters, such as time, location, mode, polarization, or diversity parameters resulting from any other orthogonalizing property. The multicarrier signals may have any frequency in the electromagnetic frequency spectrum."

- **employing an invertible transform to spread a plurality of data symbols with complex-valued coefficients to generate a plurality of spread data symbols;**

18. Written support in '141 includes the following:

Page 24, third Par. – Page 25, first Par. (emphasis added)

"FIG. 6A shows a multicarrier transmitter and transmission method of the present invention. **An nth information signal $s_n(t)$, such as for an nth user, is applied to an nth code c_n having N chips c_{kn} (k = 0 to N-1). The information signal $s_n(t)$ may modulate the code or it may be modulated by the code c_n.**

A code generator 114 provides the N chips c_{kn} to a serial-to-parallel converter 107 that arranges the chips c_{kn} to parallel modulate each of a plurality of carrier signals generated by a carrier-signal generator 102. If the carriers are multi-frequency carriers, the carrier-signal generator 102 may be represented by the operation or implementation of a digital method for generating multi-frequency carriers, such as an inverse Discreet Fourier Transform or an inverse Fast Fourier Transform. Each chip c_{kn} may be applied to a frequency bin of a transform process. **The chips c_{kn} may have** binary, real, or **complex values**. The modulated carriers are optionally coupled to an output processor 112, which processes the carriers prior to coupling them into a communication channel (not shown).

The code generator 114 can be used as an information-signal encoder or a carrier encoder. **An information signal may be used to modulate at least one code sequence.** The code generator 114 may be a multi-stage code generator. **Code generators may include one or more N-point transforms. N-point transforms include Discrete Fourier Transforms (DFT),** Fast Fourier Transforms (FFT), Walsh Transforms (WT), Hilbert Transforms (HT), Randomizer Transforms (RT), Permutator Transforms (PT), Inverse DFTs, Inverse FFTs, Inverse WTs, Inverse HTs, Inverse RTs, Inverse PTs, and any other reversible transform."

19. The claimed "**complex-valued coefficients**" are the disclosed "**chips c_{kn}**" which **"may have** … **complex values**". These complex-valued chips are disclosed throughout '141, such as Page 20, fifth Par.:

"Unlike a chip sequence in MC-CDMA (which uses binary values, such as ±1), CIMA signals use values of $e^{in\Delta\phi}{}_{k}$."

20. The claimed "spread symbols" is produced when the disclosed "**n^{th} information signal $s_n(t)$, such as for an n^{th} user, is applied to an n^{th} code c_n having N chips c_{kn} (k = 0 to N-1)**". In the art of spread spectrum, the term "chip" refers to each value in a spread-spectrum code. By way of example, on Page 24, third Par.: (emphasis added)

"**The information signal $s_n(t)$ may modulate the code or it may be modulated by the code c_n.**"

and the corresponding decoder is a spread-spectrum decoder, such as described in Page 37, first Par.: (emphasis added)

"An **information decoder** decodes an encoded information signal. The decoder may provide encryption, error-correction, or **spread-spectrum decoding** (or any combination of decoding) **to decode an encoded information signal**."

And in Page 37, third Par.: (emphasis added)

"A **spread-spectrum decoder** can be used as an information decoder or carrier decoder. The decoder may decode an information or multicarrier signal according to a code sequence generated by a code generator. The decoder may include a multi-stage decoder. Decoders may generate one or more N-point transforms. N-point transforms include DFTs,

Exhibit 1

FFTs, WTs, HTs, RTs, PTs, Inverse DFTs, Inverse FFTs, Inverse WTs, Inverse HTs, Inverse RTs, Inverse PTs, and any other reversible transform."

- **mapping the spread data symbols to a plurality of OFDM subcarriers;**

21. Written support in '141 includes the following:

Page 24, third Par. – Page 25, first Par.: (emphasis added)

"FIG. 6A shows a multicarrier transmitter and transmission method of the present invention. An n^{th} information signal $s_n(t)$, such as for an n^{th} user, is applied to an n^{th} code c_n having N chips c_{kn} (k = 0 to N-1). The information signal $s_n(t)$ may modulate the code or it may be modulated by the code c_n.

A code generator 114 provides the N chips c_{kn} to **a serial-to-parallel converter 107 that arranges the chips c_{kn} to parallel modulate each of a plurality of carrier signals** generated by a carrier-signal generator 102. If the carriers are multi-frequency carriers, the carrier-signal generator 102 may be represented by the operation or implementation of a digital method for generating multi-frequency carriers, such as an inverse Discreet Fourier Transform or an inverse Fast Fourier Transform. **Each chip c_{kn} may be applied to a frequency bin of a transform process**. The chips c_{kn} may have binary, real, or complex values. The modulated carriers are optionally coupled to an output processor 112, which processes the carriers prior to coupling them into a communication channel (not shown).

The code generator 114 can be used as an information-signal encoder or a carrier encoder. An information signal may be used to modulate at least one code sequence. The code generator 114 may be a multi-stage code generator. Code generators may include one or more N-point transforms. N-point transforms include Discrete Fourier Transforms (DFT), Fast Fourier Transforms (FFT), Walsh Transforms (WT), Hilbert Transforms (HT), Randomizer Transforms (RT), Permutator Transforms (PT), Inverse DFTs, Inverse FFTs, Inverse WTs, Inverse HTs, Inverse RTs, Inverse PTs, and any other reversible transform."

The "mapping" is performed by the **serial-to-parallel converter 107**, which **arranges** the chips (i.e., the spread data symbols resulting from "information signal $s_n(t)$… applied to an n^{th} code c_n having N chips") **to parallel modulate each of a plurality of carrier signals generated by a carrier-signal generator 102**. The mapping is performed when each chip is **applied to a frequency bin of a transform process**. In an Inverse DFT or an Inverse FFT, each frequency bin corresponds to one of a plurality of OFDM subcarriers.

The recited "**plurality of OFDM subcarriers**" is the "**plurality of carrier signals**" disclosed in '141 corresponding to the frequency bins of the transform process to which the chips are applied. The transform process may be "**an inverse Discreet Fourier Transform**", which produces OFDM subcarriers.

- **responsive to the mapping, modulating the spread data symbols onto the plurality of OFDM subcarriers…**

22. Written support in '141 includes the following:

Page 24, third Par. – Page 25, first Par.: (emphasis added)

"FIG. 6A shows a multicarrier transmitter and transmission method of the present invention. An n^{th} information signal $s_n(t)$, such as for an n^{th} user, is applied to an n^{th} code c_n having N chips c_{kn} (k = 0 to N-1). The information signal $s_n(t)$ may modulate the code or it may be modulated by the code c_n.

A code generator 114 provides the N chips c_{kn} to a serial-to-parallel converter 107 that arranges the chips c_{kn} to **parallel modulate each of a plurality of carrier signals generated by a carrier-signal generator 102. If the carriers are multi-frequency carriers, the carrier-signal generator 102 may be represented by the operation or implementation of a digital method for generating multi-frequency carriers, such as an inverse Discreet Fourier Transform or an inverse Fast Fourier Transform.** Each chip c_{kn} may be applied to a **frequency bin of a transform process**. The chips c_{kn} may have binary, real, or complex values. **The modulated carriers** are optionally coupled to an output processor 112, which processes the carriers prior to coupling them into a communication channel (not shown).

The code generator 114 can be used as an information-signal encoder or a carrier encoder. An information signal may be used to modulate at least one code sequence. The code generator 114 may be a multi-stage code generator. Code generators may include one or more N-point transforms. N-point transforms include Discrete Fourier Transforms (DFT), Fast Fourier Transforms (FFT), Walsh Transforms (WT), Hilbert Transforms (HT), Randomizer Transforms (RT), Permutator Transforms (PT), Inverse DFTs, Inverse FFTs, Inverse WTs, Inverse HTs, Inverse RTs, Inverse PTs, and any other reversible transform."

23. Since the **carrier-signal generator 102** (e.g., "a digital method for generating multi-frequency carriers, such as an inverse Discreet Fourier Transform") generates the OFDM subcarriers, the carrier-signal generator is **responsive to** its inputs (i.e., the arrangement of "the chips c_{kn} to parallel modulate each of a plurality of carrier signals") via **the mapping**, i.e., "serial-to-parallel converter 107 that arranges the chips c_{kn} to parallel modulate each of a plurality of carrier signals generated by the carrier-signal generator 102". Specifically, the carrier-signal generator 102, "such as an inverse Discreet Fourier Transform" is **responsive to** "each chip is applied to a frequency bin of a transform process" for generating the multi-frequency carriers.

- **to produce the OFDM transmission signal comprising a superposition of the OFDM subcarriers**

24. Written support in '141 includes the following:

Page 13, thirteenth and fourteenth Pars.: (emphasis added)

"FIG. 5A is a plot of relative amplitudes of a set of multi-frequency carriers that produce a composite signal 130 (shown in FIG. 5B) having time-domain characteristics of a direct-sequence CDMA signal.

Exhibit 1

FIG. 5B is a time-domain plot of a **superposition of the carrier signals** shown in FIG. 5A."

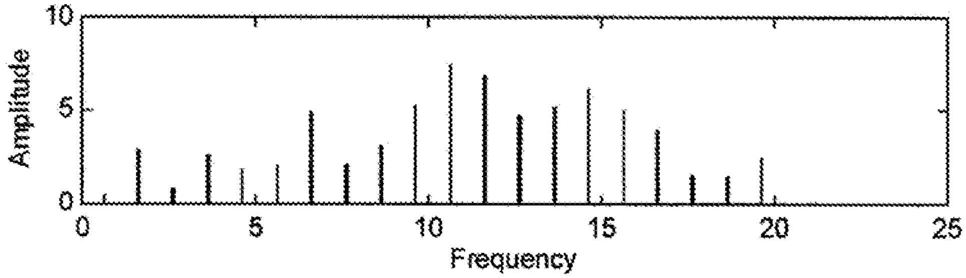

FIG. 5A

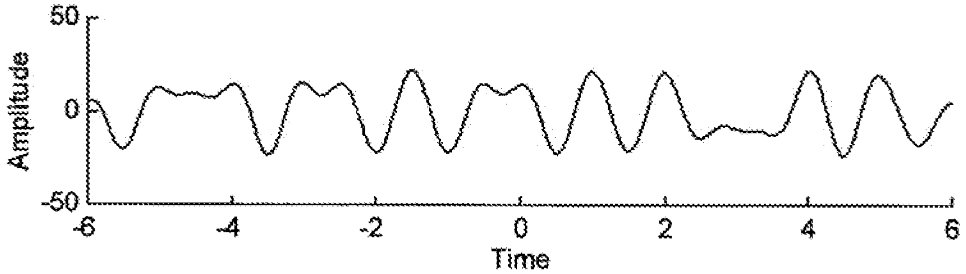

FIG. 5B

- **wherein employing the invertible transform is configured to provide the superposition with a reduced peak-to-average power ratio.**

25. It was well-known in the art that a direct-sequence signal is a single-carrier signal. It was well-known in the art that a single-carrier signal has lower peak-to-average power ratio than a prior-art multicarrier signal. FIG. 5B illustrates how the amplitude of the multicarrier signal produced by the invention has a reduced peak-to-average power ratio.

Page 23, third Par.: (emphasis added)

"The modulator 104 may provide weights to each of the carriers according to a predetermined code. **The coded weights may be applied to the carriers in order to**

Exhibit 1

generate a predetermined time-domain profile, such as a direct-sequence signal. A preferred embodiment of the invention includes a process of **applying complex weights to a multicarrier signal in order to create a predetermined time-domain signal. A predetermined time-domain signal (or profile) is defined herein as a specific shape of at least one signal parameter, such as amplitude**, frequency, polarization, and phase in the time domain."

Page 13, thirteenth and fourteenth Pars. (emphasis added); and FIG. 5B depicts a single-carrier signal, i.e., a direct-sequence CDMA signal, with low PAPR.

"FIG. 5A is a plot of relative amplitudes of a set of multi-frequency carriers that produce a composite signal 130 (shown in FIG. 5B) **having time-domain characteristics of a direct-sequence CDMA signal**.

FIG. 5B is a time-domain plot of a superposition of the carrier signals shown in FIG. 5A."

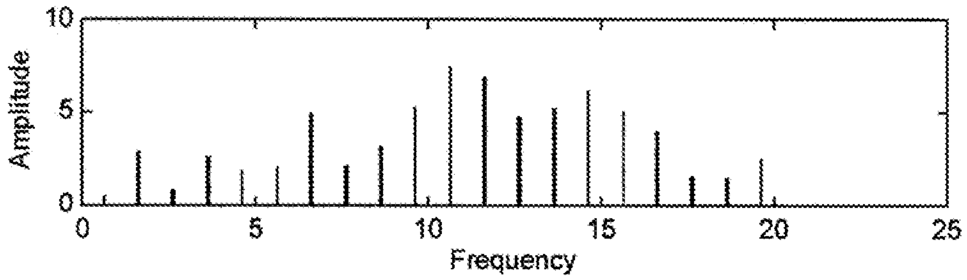

FIG. 5A

Exhibit 1

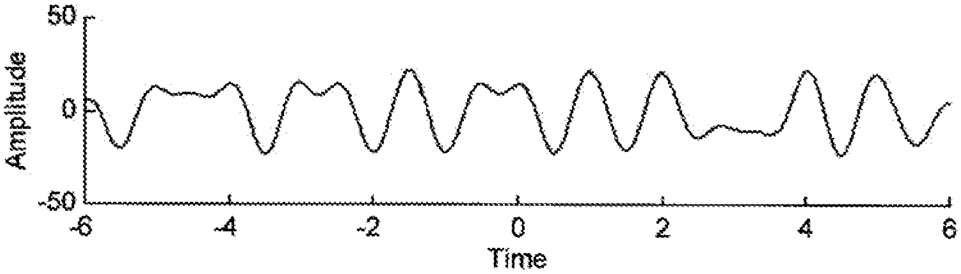

FIG. 5B

Page 70, first Par.: (emphasis added)

> "Furthermore, **constant-modulus signals may be transmitted** in the communication system. Constant-modulus transmissions can simplify the demultiplexing of received signals."

Page 6, second Par.: (emphasis added)

> "The frequency-diversity of CIMA signals greatly **reduces transmission power requirements**…"

Claim 2: The non-transitory computer-readable medium recited in claim 1, wherein the invertible transform comprises an N-point discrete Fourier Transform (DFT), and the modulating comprises performing an M-point inverse-DFT, wherein M>N.

26. Written support in '141 includes the following:

Page 24, fifth Par. – Page 25, first Par.: (emphasis added)

> "Code generators may include one or more N-point transforms. N-point transforms include **Discrete Fourier Transforms (DFT)**, Fast Fourier Transforms (FFT), Walsh Transforms (WT), Hilbert Transforms (HT), Randomizer Transforms (RT), Permutator

Exhibit 1

Transforms (PT), Inverse DFTs, Inverse FFTs, Inverse WTs, Inverse HTs, Inverse RTs, Inverse PTs, and any other reversible transform."

Page 24, fourth Par. (emphasis added)

"…the carrier-signal generator **102** may be represented by the operation or implementation of a digital method for generating multi-frequency carriers, such as an **inverse Discreet Fourier Transform** or an inverse Fast Fourier Transform."

27. M > N is depicted in several of the plots of digital transmission signals, such as FIG. 5B. M > N is required to produce a pulse waveform. For example, FIG. 5A shows 20 subcarrier amplitudes, but FIG. 5B shows many more than 20 samples, so M > N. In the case of M = N, there would be only 20 time-domain samples in FIG. 5B instead of 20 pulse waveforms.

28. Annotated FIG. 5B (below) is a plot of a digital time-domain signal produced by a computer that is programmed to generate digital transmission signals described in '141. Annotated FIG. 5B shows a magnified portion of the plot, which clearly depicts M > N time-domain samples.

29. FIG. 3A (below) is a plot of a digital time-domain signal produced by a computer that is programmed to generate digital transmission signals described in '141. FIG. 3A depicts a single time-domain pulse centered at time 0. Since the pulse envelope depicts an oscillating waveform therein, the pulse comprises more than one sample point, thereby illustrating M > N.

Exhibit 1

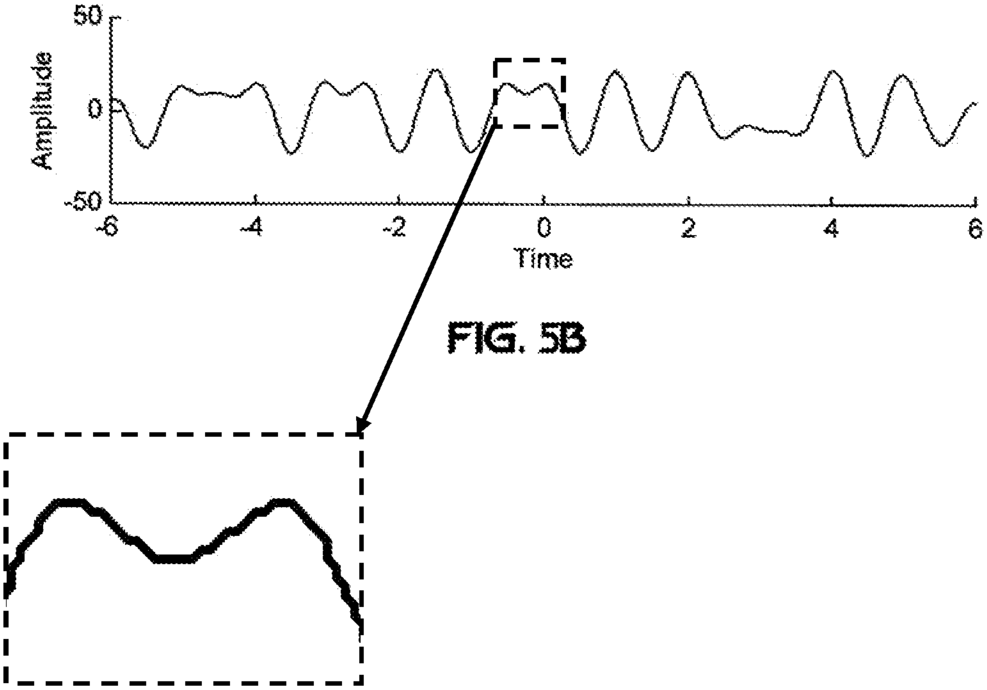

FIG. 5B

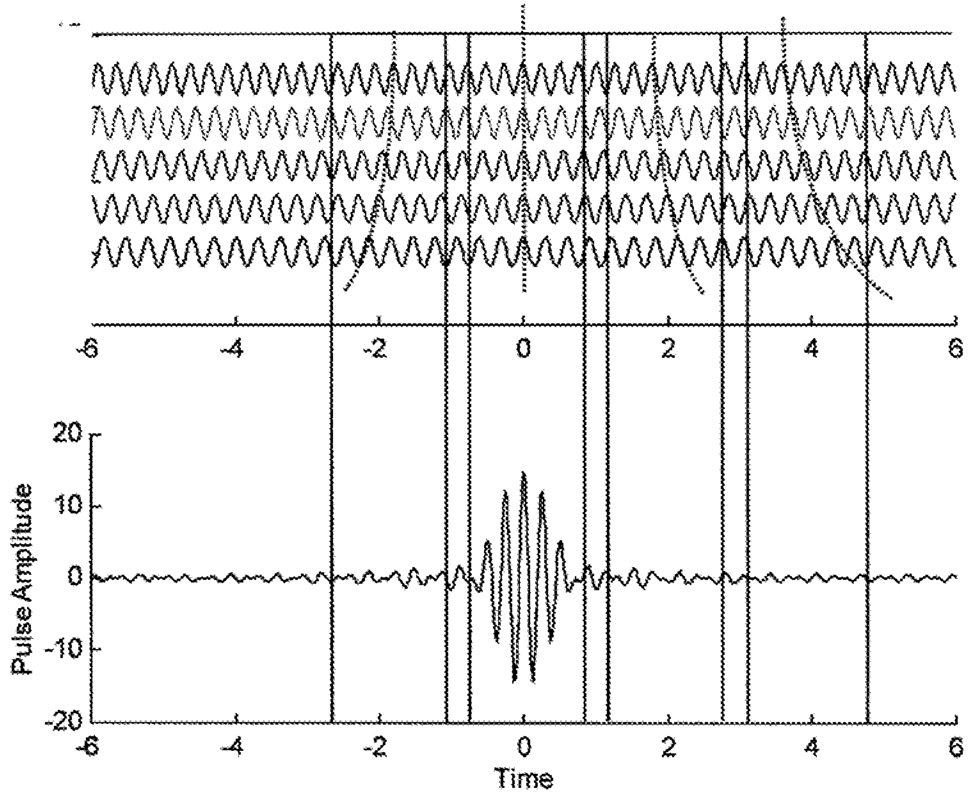

FIG.3A

30. Furthermore, a POSITA, upon reading "OFDM" and "inverse Discreet Fourier Transform" in '141, would employ M > N, as the inverse Discreet Fourier Transform is usually larger than the number of frequencies. For example, Cimini (6891792: col. 2 lines 57 – 64) states (emphasis added):

> "Typically, the **OFDM** transmitter would be implemented by generating a series of complex numbers, representing the phase of the individual tones, and using the Inverse Discrete Fourier Transform (IDFT) to convert the series of tones into a time domain waveform. For practical reasons, in order to make the analog reconstruction and antialiasing filters realizable, **the size of the IDFT (or more often the Inverse Fast Fourier Transform (IFFT)) is usually larger than the number of tones**."

Claim 3: The non-transitory computer-readable medium recited in claim 1, wherein the modulating comprises performing an inverse fast Fourier transform.

31. Written support in '141 includes the following:

Page 24, fourth Par.: (emphasis added)

"…the carrier-signal generator **102** may be represented by the operation or implementation of a digital method for generating multi-frequency carriers, such as an inverse Discreet Fourier Transform or an **inverse Fast Fourier Transform**."

Claim 4: The non-transitory computer-readable medium recited in claim 1, wherein the data symbols comprise reference-signal symbols, which comprise at least one of known training symbols and synchronization symbols.

32. Written support in '141 includes the following:

Page 68, second Par.: (emphasis added)

> "**Training sequencers** may be used in transmitters to transmit **training sequences consisting of predetermined signals**."

Page 67, second Par.: (emphasis added)

> "The central unit or other transceiver may respond with **information indicating phase shifts or delays to be applied to the transmitted signals to synchronize the transmissions** with respect to other transmissions that the transceiver is receiving."

Claim 5: The non-transitory computer-readable medium recited in claim 1, wherein the plurality of OFDM subcarriers comprise at least one of contiguous OFDM subcarriers and equally spaced non-contiguous OFDM subcarriers.

33. Written support in '141 includes the following:

Page 21, first Par.: (emphasis added)

> "A CIMA signal corresponding to the superposition on N carriers **uniformly spaced in frequency** by f_s has a waveform envelope according the equation:
>
> $$E(t) = \left| \frac{\sin(N\pi f_s t)}{\sin(\pi f_s t)} \right|$$
>
> The CIMA envelopes are periodic with a period of $1/f_s$."

Page 27, third Par.: (emphasis added)

> "Information modulated onto carriers may be coded, such as according to a multiple-access, error-correction, or encryption code. **Interleaving** may be employed to reduce distortion effects caused by the channel **99**."

Page 21, last Par.: (emphasis added)

> "CIMA signals may be **spaced in frequency by large amounts** to achieve a large system bandwidth relative to the coherence bandwidth. In this case, CIMA signals make use of the frequency diversity parameter to achieve uncorrelated fading."

Claim 6: The non-transitory computer-readable medium recited in claim 1, further comprising computer-readable program code configured to perform pulse-shaping module to provide the OFDM transmission signal with a predetermined pulse shape.

34. Written support in '141 includes the following:

Page 26, first Par.: (emphasis added)

> "The signal generator **102** performs an inverse Fourier Transform, and may perform other digital processing methods, such as filtering and **pulse shaping**."

Claim 7: The non-transitory computer-readable medium recited in claim 1, further comprising computer-readable program code configured to append at least one of a cyclic prefix, a postfix, and a guard interval to the OFDM transmission signal.

35. In the art of OFDM, it was well-known to add extra samples to the transformed waveform produced by the Inverse Discrete Fourier Transform. For example, Cimini (6891792: col. 2 line 57 – col. 3, line 4) states (emphasis added):

> "Typically, the **OFDM** transmitter would be implemented by generating a series of complex numbers, representing the phase of the individual tones, and using the Inverse Discrete Fourier Transform (IDFT) to convert the series of tones into a time domain waveform. For practical reasons, in order to make the analog reconstruction and antialiasing filters realizable, the size of the IDFT (or more often the Inverse Fast Fourier Transform (IFFT)) is usually larger than the number of tones. In addition**, extra samples are prepended and appended to the transformed waveform. These "cyclic prefix" and "cyclic suffix" samples make the transmitted signal more robust against time dispersion and timing offset**—as long as the received signal, plus its various delayed copies, are sampled within the cyclic extension, **the constant amplitude of the received spectrum will be preserved**."

Exhibit 1

36. Furthermore, the Patent Office admits that "the cyclic prefix is well known and expected in the OFDM art" and that "it would have been obvious to one of ordinary skill in the art to implement a circuit for adding the cyclic prefix in the OFDM signal…" (see non-final rejection mailed 07/08/2005; appl. No. 09/805,887 (Laroia)).

37. A POSITA would have known that the orthogonality of OFDM is maintained by appending or prepending a guard interval, or cyclic prefix, between each symbol. This ensures that **the constant amplitude of the received spectrum will be preserved (see Cimini above)**, which enables the channel to be characterized by **flat fading**. The '141 application discloses OFDM, orthogonal multicarrier signals, and flat fading, and such disclosure would have directed a POSITA to append a cyclic prefix, postfix (i.e., cyclic suffix), or guard interval to the OFDM signal. For example,

Page 43, third Par.: (emphasis added)

"Redundantly modulated multicarrier signals may be used as a multiple-access communication protocol such as CIMA, MC-CDMA, or an **OFDM** protocol that transmits data over multiple carriers."

Thus, a POSITA, upon reading "OFDM" in '141, would employ a cyclic prefix or postfix (i.e., suffix), also known as a "guard interval", which was common parlance in the field of OFDM.

Page 61, third Par. states: (emphasis added)

"Frequency diversity mitigates **flat fading**. Information signals $s_n(t)$ transmitted on different carriers are combined in the receiver 200 to generate a plurality of composite information signals $s'_n(t)$."

38. Thus, a POSITA, upon reading "**flat fading**" in '141, in view of Cimini (e.g., "**the constant amplitude of the received spectrum will be preserved**), would employ a cyclic prefix or

postfix (i.e., suffix), also known as a "guard interval", to preserve the "constant amplitude of the received spectrum", which is known as flat fading.

39. MPEP **715.02 How Much of the Claimed Invention Must Be Shown, Including the General Rule as to Generic Claims [R-08.2017]** states,

> Further, a **37 CFR 1.131(a)** affidavit is not insufficient merely because it does not show the identical disclosure of the reference(s) or the identical subject matter involved in the activity relied upon. If the affidavit contains facts showing a completion of the invention commensurate with the extent of the invention as claimed is shown in the reference or activity, the affidavit or declaration is sufficient, whether or not it is a showing of the identical disclosure of the reference or the identical subject matter involved in the activity. See *In re Wakefield,* 422 F.2d 897, 164 USPQ 636 (CCPA 1970).
>
> Even if applicant's **37 CFR 1.131(a)** affidavit is not fully commensurate with the rejected claim, the applicant can still overcome the rejection by showing that the differences between the claimed invention and the showing under **37 CFR 1.131(a)** would have been obvious to one of ordinary skill in the art, in view of applicant's **37 CFR 1.131(a)** evidence, prior to the effective date of the reference(s) or the activity. Such evidence is sufficient because applicant's possession of what is shown carries with it possession of variations and adaptations which would have been obvious, at the same time, to one of ordinary skill in the art.

40. Cimini shows that knowledge of how the OFDM transmitter is "typically" implemented would guide the POSITA, upon reading "OFDM" or "flat fading" in '141, to append at least one of a cyclic prefix, a postfix, and a guard interval to the OFDM transmission signal.

Claim 8 was not rejected, so it is not discussed here.

Claim 9: The non-transitory computer-readable medium recited in claim 1, wherein the plurality of data symbols are at least one of time-multiplexed with reference-signal symbols, frequency-multiplexed with reference-signal symbols, and code-multiplexed with reference-signal symbols.

41. Time multiplexing provides for transmitting different symbols or data channels in different time slots (e.g., orthogonal time intervals). Frequency multiplexing provides for transmitting different symbols or data channels in different orthogonal frequencies. Code multiplexing

provides for employing different spread-spectrum codes to encode different symbols or data channels.

42. A POSITA would have known that a training sequence is a reference signal. Thus, '141 supports Claim 9, such as in the following:

Page 53, third Par.: (emphasis added)

> "…a known training sequence may be used to optimize the separation quality. **The training sequence may be performed in a predetermined orthogonal channel, such as a time interval, spread-spectrum code, frequency band**, directivity, phase space, or polarization."

Claim 10: The non-transitory computer-readable medium recited in claim 1, further comprising computer-readable program code to provide Cyclic Delay Diversity (CDD) to the OFDM transmission signal.

43. The principle of CDD is to transmit different cyclic delayed versions of the original signal on different transmit antennas. In the case of OFDM transmission, a cyclic shift of the time-domain signal corresponds to a frequency-dependent phase shift before OFDM modulation (see US 6842487, Larsson).

44. The '141 application incorporates by reference PCT Pat. Appl. No. WO99/41871 ('871), which transmits a different frequency of an orthogonal multicarrier spread signal on each antenna. Specifically,

Page 70, second Par.: (emphasis added)

> "This invention claims the methods of controlling signal parameters in multiple diversity dimensions to achieve specific signal processing capabilities (such as diversity benefits and capacity enhancement) in other diversity dimensions. For example, PCT Pat.

Appl. No. WO99/41871 (‘871) describes how **different-frequency carriers transmitted from different spatial locations cause a time-varying superposition beam pattern** (and a time-varying spatial gain distribution).”

45. Written support in ‘871 includes the following:

‘871: Page 8, lines 26-35: (emphasis added)

“The separation d between the antenna elements 24n of the transmitter 70 (shown in FIG. 3) results in an **azimuthal variation** of the beam pattern produced by the array 24n due to the **time-dependent phase-space characteristic** of the CIMA signal. In other words, **as the phase space of the CIMA signals changes with time, the beam pattern of the array 24n scans**.”

46. This causes cyclic shifts in the transmitted signal (depicted as dotted lines in FIG. 3 of ‘871 below) due to the phase shifts between the frequencies.

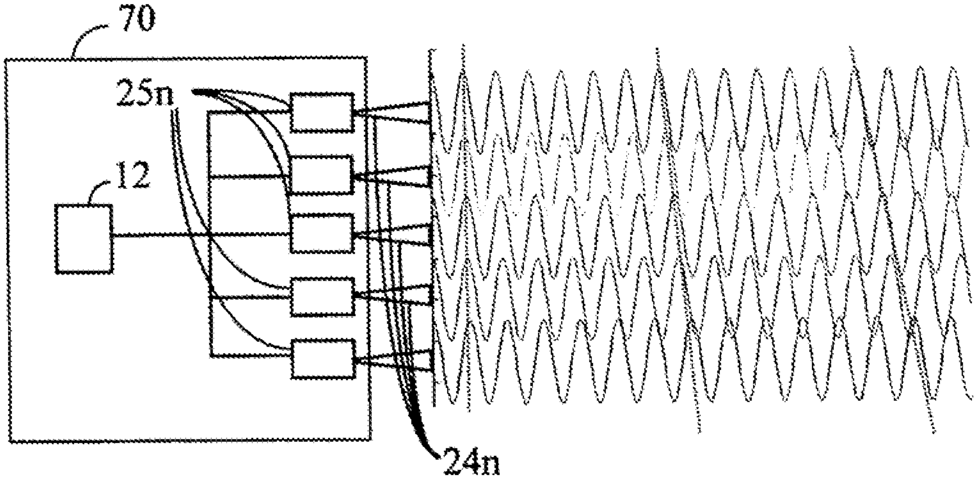

FIG. 3

47. **Claims 11 and 22** recite similar features as those recited in claim 1.

Exhibit 1

48. **Claims 12 and 23** recite similar features as those in claim 5.

Claim 13: The method recited in claim 11, wherein the plurality of OFDM subcarriers is selected based on measured channel quality of the subcarriers.

49. A POSITA would know that correlated fading, dispersion, and SNR are measured channel qualities of the subcarriers. Written support in '141 includes the following:

Page 21, fourth and fifth Par.: (emphasis added)

> "A CIMA signal **has a number of carrier signals that may each have a bandwidth that is less than the coherence bandwidth of the communication channel**. The coherence bandwidth is the bandwidth limit in which **correlated fading** occurs. The total bandwidth of the CIMA signal preferably exceeds the coherence bandwidth.
>
> **CIMA signals may be spaced in frequency by large amounts to achieve a large system bandwidth relative to the coherence bandwidth**. In this case, CIMA signals make use of the frequency diversity parameter to achieve **uncorrelated fading**."

Page 33, fourth Par.: (emphasis added)

> "The process of providing the carrier-phase relationship may include providing at least one initial carrier-phase relationship between the carriers and **selecting the values of at least one carrier's orthogonalizing properties** (such as frequency and/or polarization) that affect **dispersion** of the signals in the channel 99."

Page 68, third Par.: (emphasis added)

> "FIG. 35 illustrates a method of adjusting reception parameters and **assigning transmissions to signal spaces in order to optimize system-operating parameters**. Signals are received in a first step 295. The signals may be information or training signals. The spatial gain(s) of the received signals are determined in a measurement step 296. **Signal**

parameters are optimized in an optimization step 297. The optimization step 297 includes optimizing signal parameters (such as SNR, signal power, and BER). A second optimization step 298 includes distributing signals into optimized signal spaces. The optimization is based on system parameters (such as power efficiency and system complexity)."

Claim 14: The method recited in claim 11, wherein the mapping is configured to provide the spread OFDM signal with reduced PAPR.

50. A POSITA is taught how to configure mapping (e.g., select the number of carriers and frequency spacing) to produce a waveform envelope that allows N signals to be positioned orthogonally in time, which reduces PAPR (see an example of such a low-PAPR signal in FIG. 5B above). Written support in '141 includes the following:

Page 21, first Par.: (emphasis added)

"A CIMA signal corresponding to the superposition on **N carriers uniformly spaced in frequency by f_s** has a **waveform envelope** according the equation:

$$E(t)=\left|\frac{\sin(N\pi f_s t)}{\sin(\pi f_s t)}\right|$$

The CIMA envelopes are periodic with a period of $1/f_s$. The mainlobe of the envelope has a width of $2/Nf_s$, and the N-1 sidelobe widths are $2/Nf_s$. Applying a phase shift of $n\Delta\phi_k$ to each n^{th} carrier shifts the CIMA envelope in time by $\Delta t = \Delta\phi_k/2\pi f_s$. Therefore **N signals can be positioned orthogonally in time**. The phase shifts provide the necessary phase relationships to create the desired timing of the information signal received by at least one receiver (not shown)."

Claim 15: The method recited in claim 11, wherein at least one of the spreading matrix and the mapping is configured to provide a spread reference signal comprising a coherent superposition of reference symbol components on different subcarriers.

51. The training sequence can be in a channel defined by a spreading code, which can be a DFT code, which produces a coherent superposition (i.e., the mainlobe of the envelope given by the formula in the first Par. of Page 21):

Page 53, third Par.: (emphasis added)

> "The training sequence may be performed in a predetermined orthogonal channel, such as a time interval, **spread-spectrum code**, frequency band, directivity, phase space, or polarization."

Page 24, last Par. – Page 25, first Par.: (emphasis added)

> "Code generators may include one or more N-point transforms. N-point transforms include **Discrete Fourier Transforms** (DFT), Fast Fourier Transforms (FFT)…"

Page 21, first Par.: (emphasis added)

> "A CIMA signal corresponding to the **superposition** on N carriers uniformly spaced in frequency by f_s has a **waveform envelope** according the equation:
>
> $$E(t) = \left| \frac{\sin(N\pi f_s t)}{\sin(\pi f_s t)} \right|$$
>
> The CIMA envelopes are periodic with a period of $1/f_s$. **The mainlobe of the envelope** has a width of $2/Nf_s$, and the N-1 sidelobe widths are $2/Nf_s$. Applying a phase shift of $n\Delta\phi_k$ to each n^{th} carrier shifts the CIMA envelope in time by $\Delta t = \Delta\phi_k/2\pi f_s$. Therefore N signals can be positioned orthogonally in time. The phase shifts provide the necessary phase relationships to create the desired timing of the information signal received by at least one receiver (not shown)."

52. **Claim 16** recites similar features as those in claim 4.

53. **Claims 17 and 28** recite similar features as those in claim 7.

Exhibit 1

54. **Claims 18 and 25** recite similar features as those in claim 2.

55. **Claim 19** recites similar features as those in claim 10.

56. **Claims 20 and 27** recite similar features as those in claim 6.

Claim 21. A User Equipment configured to perform the method recited in claim 11.

57. Written support in '141 includes the following:

Page 16, second to last Par.: (emphasis added)

> "FIG. 1 shows the basic components of a high-capacity optical-fiber network that provides last-mile information delivery to **individual users** via wireless links."

Page 21, second Par.: (emphasis added)

> "CIMA can support N orthogonal **users**."

The term, "User Equipment", is known in the art to mean any device used by an end user to communicate (see https://en.wikipedia.org/wiki/User_equipment):

> "In the Universal Mobile Telecommunications System (UMTS) and 3GPP Long Term Evolution (LTE), **user equipment (UE)** is any device used directly by an end-user to communicate."

58. **Claim 24** recites similar features as those in claim 21.

59. **Claim 26** recites similar features as those in claim 3.

Exhibit 1

60. **Claim 29** recites similar features as those in claim 13.

61. **The rejection of the claims is not based upon a U.S. patent or U.S. patent application publication which claims interfering subject matter**

62. Laroia employs a substantively different approach than the claimed invention. As the features recited in Laroia's claims are commensurate with this substantively different approach, if Laroia were prior art, its claims would neither have anticipated nor rendered obvious the subject matter of any of the claims in '227. Specifically,

63. Laroia does not teach the claimed feature, "employing an invertible transform to spread a plurality of data symbols", because it teaches constructing a discrete signal that already has the desired bandwidth (i.e., tones allocated to the transmitter, see Par. 0053).

64. Laroia discourages "mapping the spread data symbols to a plurality of OFDM subcarriers" (and then modulating the spread data symbols onto the plurality of OFDM subcarriers) because Laroia (e.g., Par. 0057) alleges that "mapping the symbols **16** in the frequency domain produces a large signal variation in the transmitted OFDM signal". Instead, Laroia teaches applying interpolation functions to data symbols mapped to time instants because that "produces an OFDM signal having a significantly reduced peak-to-average ratio" (Par. 0058).

65. Laroia fails to produce an OFDM transmission signal as a result of its time-domain approach to constructing its transmission signal. U.S. Pub. No. 20040086027 explains that interference between subcarriers occurs due to overlapping linear-shifted (temporally displaced) versions of the same sinc interpolation function, which results from applying the sinc interpolation functions to symbols mapped to different "prescribed time instants", as taught in Laroia.

66. Laroia does not configure an invertible transform to provide a reduced peak-to-average power ratio because it begins by making a discrete signal that already has low peak-to-

average power ratio (e.g., "mapping the constellation of complex symbols **16** in the time domain produces an OFDM signal **68** having a significantly reduced peak-to-average ratio", Par. 0058).

67. Exhibit 6 shows that the claimed invention maps to the technical specification for the Physical Uplink Shared Channel in 4G LTE. The claimed invention also maps to the uplink for 5G.

68. In contrast, the assignee (Qualcomm Incorporated) of the 16 patents (7,295,509; 7,623,442; 7,916,624; 7,924,699; 7,990,843; 7,990,844; 8,014,271; 8,098,568; 8,098,569; 8,199,634; 8,218,425; 8,223,627; 8,295,154; 9,426,012; 10,313,069; 11,032,035) that issued from Laroia did not include any of these 16 patents on its U.S. Cellular Essential Patent List (Exhibit 12).

69. I believe the reason that Qualcomm did not include any of the 16 patents that issued from Laroia on its U.S. Cellular Essential Patent List (Exhibit 12) is because Qualcomm determined that Laroia does not map to the 4G LTE or 5G standards.

70. I have read the filewrapper of Laroia, including the Office Actions dated 07-08-2005, 04-03-2006, and 01-02-2007 (Exhibits 7-9); the Examiner Interview Summary dated 12-20-2006 (Exhibit 10); and Interview Summary dated 01-16-2007 (Exhibit 10). In particular, I have read the Office Action dated 07-08-2005 (Exhibit 7), Page 11 that states that adding a cyclic prefix is well known and expected in the OFDM art. I have read the Examiner Interview Summary dated 12-20-2006 (Exhibit 10), Page 11; and the Interview Summary dated 01-16-2007 (Exhibit 11), Page 24 which state that adding a cyclic prefix to Laroia's interpolated signal patentably distinguishes over the applied references. I am familiar with at least some of the applied references, as they are in the OFDM art.

71. Based on my understanding of the filewrapper, and regarding what is written about the cyclic prefix in the Office Actions and in each Interview Summary, I believe that the Patent Office determined that Laroia's transmission signal is not an OFDM signal.

Exhibit 1

72. Based on the technical deficiencies in Laroia noted in Pars. 63-66 of this Declaration, the information in Par. 68 of this Declaration, and the information in Par. 70 of this Declaration, I believe that if Laroia was prior art, its claims would neither have anticipated nor rendered obvious the subject matter of any of the claims in ‘227. Thus, Laroia does not claim interfering subject matter.

DECLARATION

The declarant acknowledges that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. 1001) and may jeopardize the validity of the application or any patent issuing thereon. The declarant attests that all statements made of the declarant’s own knowledge are true and that all statements made on information and belief are believed to be true.

6/28/2024	
Date	Steve Shattil