DECLARATION UNDER 37 CFR 1.131(a)

Application Serial Number: 16/940,383

Patent Number: 11,252,005

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Inventor: Steve Shattil

Attorney Docket Number:

I, Steve Shattil, declare as follows:

1. I am the inventor of Patent No. 11,252,005 (’005).

2. 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.

3. I completed my invention as described and claimed in the subject patent 11,252,005 (’005) as evidenced by the following:

4. The subject matter of each of the rejected claims is disclosed in U.S. Pub. no. **20040086027 (’027), appl. No. 10/414,663, filed April 16, 2003**.

5. The features of claim 1 (with emphasis) and corresponding support in ’027, by way of example, but without limitation, are shown as follows:

Claim 1: A method for communication in a wireless network, comprising:

6. Written support in ’027 includes the following: (emphasis added)

Par. 0002:

"The present invention relates to a novel multicarrier spread-spectrum protocol for **wireless** and waveguide communications."

7. A person of ordinary skill in the art (POSITA) would recognize that "wireless communications" is performed in a wireless network.

producing a set of subcarrier values that equals a product of a complex-valued code matrix with a matrix of data symbols;

8. Written support in '027 includes the following: (emphasis added)

Par. 0145:

"FIG. 5B illustrates a plurality of **CI sub-carrier weights** w_1 to w_N generated from a set of data symbols d_1 to d_N mapped to a number N of orthogonal CI phase spaces. A **CI code matrix** of dimension N×N containing **polyphase code chips** is multiplied by a set of data vectors or a data matrix. In particular, each column of the CI code matrix (such as column **551**) is multiplied by a corresponding data symbol (such as symbol d_2)."

9. The POSITA would recognize that the CI sub-carrier weights w_1 to w_N are subcarrier values and the "CI code matrix… containing polyphase code chips" is a complex-valued code matrix.

selecting a set of subcarriers assigned for use by a user device; and

10. Written support in '027 includes the following: (emphasis added)

Par. 0037:

"The **subcarriers may be selected for a particular user**, such as in an orthogonal frequency division multiple access system."

11. The POSITA would understand that a user is a user device.

modulating the subcarrier values onto the set of subcarriers to produce a plurality of modulated subcarriers; and

12. Written support in ’027 includes the following: (emphasis added)

Par. 0039:

> “The subcarrier weighting module **impresses** the polyphase, poly-amplitude codes onto a predetermined set of orthogonal subcarriers selected by the sub-carrier allocator.”

Par. 0127:

> “The **IFFT** module **404** performs a **frequency-domain to time-domain conversion** of input **sub-carrier weights** to produce a pulse waveform. The CI coder **402** provides sub-carrier weights to the IFFT module **404** to shape the pulse waveform, as well as provide sub-carrier selection (i.e., allocation).”

13. The POSITA understands that “impress” describes modulation. The POSITA recognizes the IFFT as a subcarrier modulator. The POSITA understands that the “frequency-domain to time-domain conversion of input sub-carrier weights” produces a modulated time-domain waveform. The POSITA recognizes that “sub-carrier weights” implies modulation onto subcarriers.

producing a time-domain waveform from a superposition of the plurality of modulated subcarriers, the time-domain waveform to be transmitted in the wireless network by the user device;

14. Written support in ’027 includes the following: (emphasis added)

Par. 0127:

> “The **IFFT** module **404** performs a **frequency-domain to time-domain conversion** of input sub-carrier weights to produce a pulse waveform. The CI coder **402** provides sub-carrier weights to the IFFT module **404** to shape the pulse waveform, as well as provide

sub-carrier selection (i.e., allocation)."

Par. 0144:

"FIG. 5A illustrates a block waveform including a set of N orthogonal CI pulse waveforms **541** to **549** having a duration of T_s. CI pulse waveforms (such as pulse **541** to **549**) may be generated from a **superposition of orthogonal subcarriers**."

15. The POSITA understands that the IFFT, which performs a frequency-domain to time-domain conversion produces a time-domain waveform. The POSITA understands that the output of this IFFT is a superposition of orthogonal subcarriers.

wherein producing the set of subcarrier values employs a plurality of complex-valued codes that shapes interference patterns of the superposition to produce a plurality of cyclic-shifted waveforms that each have one of the data symbols modulated thereon.

16. Written support in '027 includes the following: (emphasis added)

Par. 0127:

"The IFFT module **404** performs a frequency-domain to time-domain conversion of input sub-carrier weights to produce a pulse waveform. The **CI coder 402 provides sub-carrier weights to the IFFT module 404 to shape the pulse waveform**, as well as provide sub-carrier selection (i.e., allocation)."

Par. 0103:

"Since the pulse waveforms **311**, **312**, **313**, and **314** have the same starting and ending times, the waveform shapes **311**, **312**, **313**, and **314** are different from each other. For example, waveform **311** has all of its sidelobes to the right of its main lobe, whereas all of the sidelobes of waveform **314** occur to the left of the main lobe. This tends to increase the interference in systems that perform time-domain equalization and Rake reception. In particular, inter-pulse interference is not limited to nearby pulses because the side-lobe structure is periodic, or **cyclic**, over the symbol duration T_s. For example, the side-lobe

amplitude (and thus, interference) of waveform **311** diminishes across pulse **312** and increases across pulse **314**."

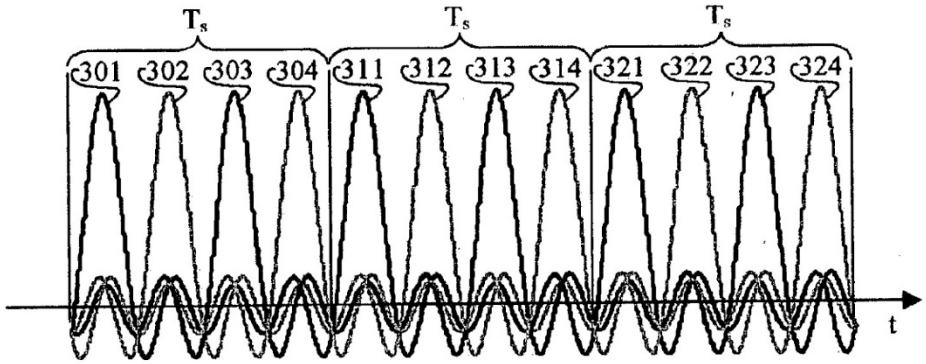


FIG. 3A

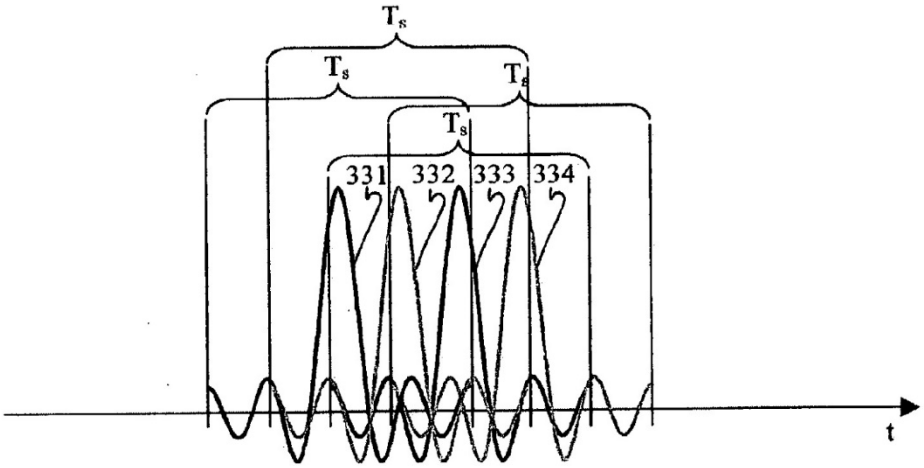


FIG. 3B

17. The POSITA understands that the CI coder shapes the superposition by virtue of the CI codes. The POSITA is taught that the waveforms in FIG. 3A are cyclic-shifted waveforms, which distinguish over the waveforms depicted in FIG. 3B.

Claim 2 (and claims 14, 26). The method of claim 1, wherein each of the plurality of

complex-valued codes comprises a different vector of linear phase offsets.

18. Written support in ’027 includes the following: (emphasis added)

Par. 0145:

> “A CI code matrix of dimension N×N containing polyphase code chips is multiplied by a set of data vectors or a data matrix… Since rows and **columns** of the basic CI code matrix resemble the vectors of complex values used in **DFTs**, the sub-carrier weights w_1 to w_N can be calculated using a fast transform algorithm.”

19. The POSITA understands that columns of the basic CI code matrix at least resemble vectors from a DFT, and that sub-carrier weights w_1 to w_N can be calculated using a fast transform algorithm, then the POSITA understands that different CI codes are vectors comprising different linear phase offsets, as this is a property of the DFT matrix that enables the use of a fast transform algorithm, such as an FFT.

Claim 3 (and claims 15, 27). The method of claim 1, wherein the cyclic shifted waveforms are orthogonal waveforms.

20. Written support in ’027 includes the following: (emphasis added)

Par. 0101:

> “For example, FIG. 3A illustrates a typical CI block mode of operation that may be employed by the invention. A particular block transmission characterized by symbol duration T, includes four **orthogonal** sinc- like pulse waveforms **311**, **312**, **313**, and **314**.”

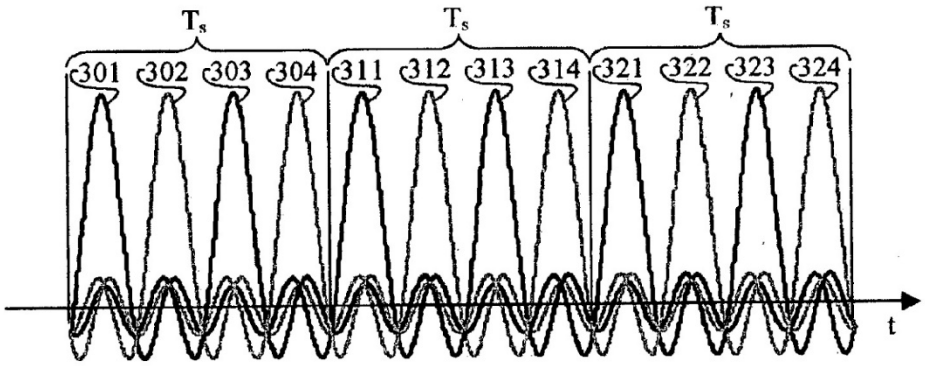


FIG. 3A

Par. 0144:

"FIG. 5A illustrates a block waveform including a set of **N orthogonal CI pulse waveforms 541** to **549** having a duration of T_s. CI pulse waveforms (such as pulse **541** to **549**) may be generated from a superposition of orthogonal subcarriers."

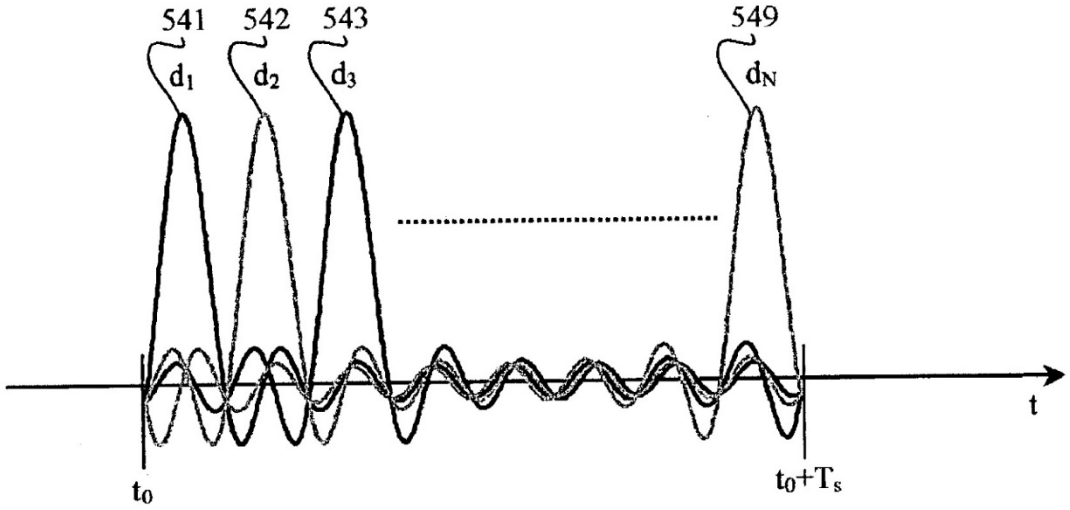


FIG. 5A

21. The POSITA finds explicit description and figures showing cyclic-shifted orthogonal waveforms.

Claim 4 (and claims 16, 28). The method of claim 1, wherein the cyclic shifted waveforms are Sinc waveforms.

22. Written support in ’027 includes the following: (emphasis added)

Par. 0101:

> “A particular block transmission characterized by symbol duration T, includes four orthogonal **sinc-** like pulse waveforms **311**, **312**, **313**, and **314**.”

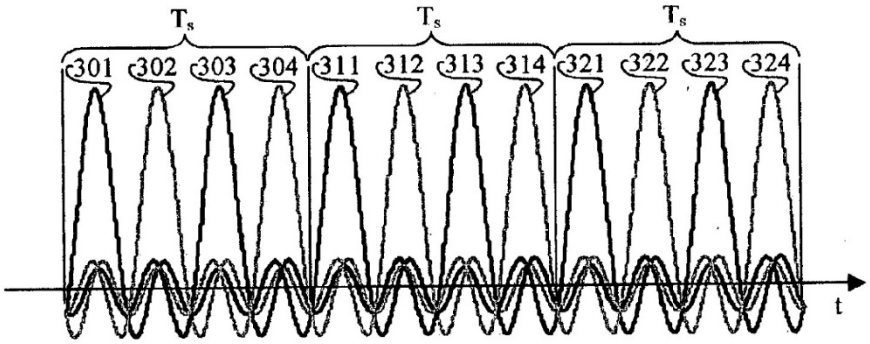


FIG. 3A

23. The POSITA finds explicit descriptions and illustration of sinc-shaped waveforms.

Claim 5 (and claims 17, 29). The method of claim 1, wherein the set of subcarriers have a frequency spacing f_s, and the plurality of cyclic-shifted waveforms are each periodic over a symbol interval $T_s=1/f_s$.

24. Written support in ’027 includes the following: (emphasis added)

Par. 0103:

> “In particular, inter-pulse interference is not limited to nearby pulses because the side-lobe structure is **periodic**, or cyclic, over the **symbol duration T_s**.”

Par. 0112:

> “The **frequency spacing f_s** between the subcarriers provides a **symbol duration of $T_s=1/f_s$**.”

25. The POSITA finds explicit mathematical descriptions of the cyclic-shifted waveforms being periodic over a symbol interval of $\mathbf{1/f_s}$.

Claim 6 (and claims 18, 30). The method of claim 1, wherein modulating and producing the time-domain waveform is performed using an inverse discrete Fourier transform.

26. Written support in ’027 includes the following: (emphasis added)

Par. 0127:

> “The **IFFT** module **404** performs a **frequency-domain to time-domain conversion** of input sub-carrier weights to produce a pulse waveform. The CI coder **402** provides sub-carrier weights to the IFFT module **404** to shape the pulse waveform, as well as provide sub-carrier selection (i.e., allocation).”

27. The POSITA finds explicit instruction to perform modulation with an IFFT module, which performs an inverse discrete Fourier transform.

Claim 7 (and claims 19, 31). The method of claim 1, wherein selecting the set of subcarriers comprises selecting one of a plurality of selectable subcarrier spacings.

28. Written support in ’027 includes the following: (emphasis added)

Par. 0198:

> “In some applications, subcarrier allocation can include pulse shaping, controlling symbol durations, and/or **selecting subcarrier frequency spacing**.”

29. The POSITA finds explicit instruction to select or adjust subcarrier frequency spacing.

Claim 8 (and claims 20, 32). The method of claim 1, further comprising prepending the data symbols with zeros before producing the set of subcarrier values, or adding at least

one of a cyclic prefix and a cyclic postfix to the time-domain waveform.

30. Written support in ’027 includes the following: (emphasis added)

Par. 0093:

> “The data is **prepended with zeros** and unwanted parity bytes and output zeros are truncated… **Guard intervals**, or **cyclic prefixes**, are provided by a CP block **212**.”

Par. 0155:

> “The time-domain output of the converter **604** is processed in a transmission system **606**, which may optionally provide a **guard interval** or **cyclic prefix** (and/or **postfix**), perform digital-to-analog conversion, up convert the signal, provide amplification, optionally filter the signal, and provide for coupling the signal into a communication channel.”

31. The POSITA finds instructions to prepend zeros, a cyclic prefix, postfix, etc.

Claim 9 (and claims 21, 33). The method of claim 1, wherein selecting the set of subcarriers provides for orthogonal frequency division multiple access for the user device and at least one other user device.

32. Written support in ’027 includes the following: (emphasis added)

Par. 0037:

> “The subcarriers may be selected for a particular user, such as in an **orthogonal frequency division multiple access** system.”

33. The POSITA finds explicit instructions in the disclosure to employ orthogonal frequency division multiple access.

Claim 10 (and claims 22, 34). The method of claim 1, wherein an mth one of the plurality of complex-valued codes is expressed as a set of N code chips, wherein each code chip is expressed by $e^{i2\pi nm/N}$, where e is Euler's number, i is the square root of −1, π is Pi, and n is

an integer.

34. Written support in ’027 includes the following: (emphasis added)

Par. 0145:

> “A CI code matrix of dimension N×N containing polyphase code chips is multiplied by a set of data vectors or a data matrix. In particular, each column of the CI code matrix (such as column **551**) is multiplied by a corresponding data symbol (such as symbol d_2)… Since rows and columns of the basic CI code matrix resemble the vectors of complex values used in **DFTs**, the sub-carrier weights w_1 to w_N can be calculated using a fast transform algorithm.”

35. The POSITA understands that columns of the basic CI code matrix at least resemble vectors from a DFT, so the POSITA understands that CI code chips are expressed by $\mathbf{e^{i2\pi nm/N}}$, which are elements in the DFT matrix.

Claim 11 (and claims 23, 35). The method of claim 1, wherein producing the set of subcarrier values employs a fast transform.

36. Written support in ’027 includes the following: (emphasis added)

Par. 0145:

> “A CI code matrix of dimension N×N containing polyphase code chips is multiplied by a set of data vectors or a data matrix… Since rows and columns of the basic CI code matrix resemble the vectors of complex values used in DFTs, the sub-carrier weights w_1 to w_N can be calculated using a **fast transform algorithm**.”

37. The POSITA understands that since the basic CI code matrix employs values in a DFT a fast Fourier transform may be used to calculate the sub-carrier weights w_1 to w_N.

Claims 12 (and claims 24, 36). The method of claim 11, wherein selecting the set of subcarriers comprises selecting a subset of a plurality of input frequency bins of the fast

transform to be zero or non-zero.

38. Written support in ’027 includes the following: (emphasis added)

Par. 0037:

> “The subcarriers may be selected for a particular user, such as in an **orthogonal frequency division multiple access** system. Subearriers allocated to a particular user may be interleaved in frequency with subcarriers allocated to one or more other users. In another aspect of the invention, a different set of subcarriers is selected for each of a plurality of data symbols or data symbol groups transmitted by and/or to a particular user.”

Par. 0198:

> “Sub-carrier allocation may include generating subcarriers, providing for receiving input subcarriers, retrieving subcarriers or superposition waveforms from memory (e.g., a look-up table), or selecting **non-zero** (or equivalently, **zero**) valued **input bin weights of an invertible transform**, such as a DFT.”

39. The POSITA finds explicit instruction to employ non-zero (or equivalently, zero) valued input bin weights, as claimed. Furthermore, this feature is implicit in orthogonal frequency division multiple access.

Claim 13:

at least one processor; and

at least one non-transitory computer-readable memory in electronic communication with the at least one processor, wherein instructions stored in the at least one non-transitory computer-readable memory are executable by the at least one processor:

40. Written support in ’027 includes the following: (emphasis added)

Par. 0238:

"Similarly, it should be appreciated that any flow charts, flow diagrams, signal diagrams, system diagrams, codes, and the like represent various processes which may be substantially represented in **computer-readable medium** and so executed by a computer or **processor**, whether or not such computer or processor is explicitly shown."

41. The POSITA finds explicit instructions to employ a processor and computer-readable medium.

Claim 25. A computer program product, comprising at least one non-transitory computer-readable memory having computer-readable program code stored thereon, the computer-readable program code containing instructions executable by one or more processors:

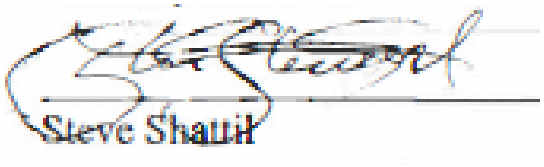
42. Written support in '027 includes the following: (emphasis added)

Par. 0238:

"Similarly, it should be appreciated that any flow charts, flow diagrams, signal diagrams, system diagrams, codes, and the like represent various processes which may be substantially represented in **computer-readable medium** and so executed by a computer or **processor**, whether or not such computer or processor is explicitly shown."

43. The POSITA finds explicit instructions to employ a processor and computer-readable medium.

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.

Date: May 9, 2025