

# Freedom to Operate Search Report

REPORT

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## Executive Summary

A comprehensive patent search is conducted to identify the relevant patent publications. We have identified 2 relevant patent publications. A detailed analysis of each relevant patent publication is presented in the following report.

### Results Summary Table:

D.No	Publication Number	Legal Status	Corresponding Family Members	F1	F2	F3	F4
<b>D1</b>	<a href="#">US8223859B2</a>	Active	US20100002755, WO2010008492	✓	✗	✓	✗
<b>D2</b>	<a href="#">US7792220B2</a>	Active	US20080144743	✗	✓	✓	✓

### Observation

The prior art patent publications discloses a circuit-based apparatus comprises a decimator module configured to produce, in response to a variable decimation rate, a decimated input digital signal. However, the concept of one or more processing circuits configured and arranged to provide an analog to digital converter module for generating an input digital signal from an analog signal that was received at the transceiver circuit is not explicitly disclosed.

## Key Features

- F1.** A circuit-based apparatus comprises a transceiver circuit configured and arranged to communicate over power distribution lines that carry power using alternating current (AC).
- F2.** A circuit-based apparatus comprises one or more processing circuits configured and arranged to provide an analog to digital converter module configured to generate an input digital signal from an analog signal that was received at the transceiver circuit.
- F3.** A circuit-based apparatus comprises a decimator module configured to produce, in response to a variable decimation rate, a decimated input digital signal; A reference signal generator module configured to generate a reference signal having a frequency responsive to the decimation rate.
- F4.** A decimation modification module configured and arranged to modify, in response to an indication of change in a phase difference between the reference signal and the AC, the decimation rate to counteract the phase difference.

## Active Patents

<b>Document Number</b>	D1
<b>Publication Number</b>	<a href="#">US8223859B2</a>
<b>Title</b>	Method and apparatus for a multi-tone modem
<b>Priority Date</b>	25 Jun 2008
<b>Filing Date</b>	25 Jun 2008
<b>Publication Date</b>	17 Jul 2012
<b>Assignee</b>	Ikanos Communications, Inc.
<b>Legal Status</b>	No maintenance fees are due at this time.  7.5 year window opens on 07/17/2019.
<b>Family Members</b>	US20100002755, WO2010008492
<b>Abstract</b>	A multi-tone modem with shared and discrete components forming a transmit path and a receive path configured to couple to a wired communication medium to communicate at least one multi-tone modulated communication channel thereon. The modem includes a multi-tone modulator component and a configurable frequency up converter component. The multi-tone modulator component is configured for multi-tone modulation and demodulation of a transmitted and received communication channel at a base band frequency range. The configurable frequency up converter component is coupled to the multi-tone modulator to selectably up convert the frequency range of the transmitted base band signal from the multi-tone modulator to that of a selected communication band and down convert received signals from the selected communication band to the base band for demodulation by the multi-tone modulator.
<b>Relevant Text</b>	<b><u>IN CLAIMS:</u></b>  1. A multi-tone modem with a plurality of shared and discrete components

	<p>forming a transmit path and a receive path configured to couple to <b>an alternating current (AC) power line wired communication medium to communicate at least one multi-tone modulated communication channel thereon.</b></p> <p>6. The multi-tone modem of claim 1, wherein the at least at least one configurable <b>frequency up converter</b> component comprises:</p> <p><b>at least one of a digital up converter and an analog up converter.</b></p> <p>23. The means of claim 16, wherein the multi-tone modulating and demodulating means and the selectable up and down converting means further comprise:</p> <p>means for multi-tone modulating and demodulating two discrete communication channels at the base band frequency range; and</p> <p>means for up and down <b>converting the two discrete communication channels between the base band frequency range and a corresponding one of two discrete selected communication bands, thereby supporting communications on any selected two of a plurality of discrete frequency bands supported by the wired communication medium.</b></p>
<b>Summary</b>	<p>The patent discloses:</p> <ol style="list-style-type: none"><li>1. An alternating current (AC) power line wired communication medium to communicate at least one multi-tone modulated communication channel thereon.</li><li>2. Modulating and demodulating two discrete communication channels at the base band frequency range; and means for up and down converting the two discrete communication channels between the base band frequency range and a corresponding one of two discrete selected communication bands</li></ol>

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<b>Document Number</b>	<b>D2</b>
<b>Publication Number</b>	<a href="#">US7792220B2</a>

<b>Title</b>	Demodulator system and method
<b>Priority Date</b>	19 Dec 2006
<b>Filing Date</b>	19 Dec 2006
<b>Publication Date</b>	7 Sep 2010
<b>Assignee</b>	Sigmatel, Inc.
<b>Legal Status</b>	No maintenance fees are due at this time.  7.5 year window opens on 09/07/2017.
<b>Family Members</b>	US20080144743
<b>Abstract</b>	A demodulator system and method is disclosed. In an embodiment, the demodulator system can include a Coordinate Rotation Digital Computer (CORDIC) mixer to mix a first signal substantially to baseband using a first input frequency and to mix a second signal substantially to baseband using a second input frequency. In another embodiment, the demodulator system can include a phase detector to receive a pilot signal and to generate a control signal to adjust a decimation rate based on the pilot signal. In another embodiment, the demodulator system can include a symbol decoder to determine a symbol from a phase signal.
<b>Relevant Text</b>	<p><b><u>IN CLAIMS:</u></b></p> <p>1. A demodulator system comprising:  <b>an analog-to-digital converter (ADC) configured to sample a modulated signal and to output a digital signal;</b></p> <p>a Coordinate Rotation Digital Computer (CORDIC) mixer coupled to an output of the ADC, the CORDIC mixer to generate an Inphase (I) signal and a Quadrature (Q) signal based on the digital signal output by the ADC and further based on an input frequency;</p> <p><b>8.</b> A demodulator system comprising:  a Coordinate Rotation Digital Computer (CORDIC) mixer to generate an Inphase (I) signal and a Quadrature (Q) signal based on a modulated input</p>

	<p>signal and an input frequency;</p> <p><b>a decimator to perform decimation of the I signal and the Q signal at an adjustable decimation rate;</b></p> <p>a phase detector to receive a pilot signal and including decimation rate logic to generate a control signal to adjust the decimation rate based on the pilot signal; and</p> <p>a demodulation stage to demodulate a filtered output of the decimator, wherein the demodulation stage includes a CORDIC demodulator.</p> <p>21. The demodulator system of claim 20, <b>wherein the symbol recognition logic includes logic to modify a value of the phase accumulator based on a difference between an adjusted sample and the nearest predetermined phase value.</b></p>
<b>Summary</b>	<p>The patent discloses:</p> <ol style="list-style-type: none"><li>1. An analog-to-digital converter (ADC) configured to sample a modulated signal and to output a digital signal.</li><li>2. A decimator to perform decimation of the I signal and the Q signal at an adjustable decimation rate.</li><li>3. The symbol recognition logic includes logic to modify a value of the phase accumulator based on a difference between an adjusted sample and the nearest predetermined phase value.</li></ol>

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## Search Strategy

### Database:

Search was conducted in the following databases:

1. AcclaimIP
2. USPTO
3. Espacenet
4. GooglePatents

**Keywords:** Below mentioned different aspects and its synonyms are used in the search strategy:

ASPECTS					
I	II	III	IV	V	VI
Analog signal	Power distributed lines	Phase difference	Variable decimation	Analog digital convertor to	decimator
digital signal	power lines	phase error	adjustable decimation	ADC	signal generator
analog current	Power line communication				
digital current	Wired communication				

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### Classification Codes:

IPC/CPC		
Main Class	Sub Class	Definition
H04L27	H04L27/28	H04L27: Modulated-carrier systems  <b>H04L27/28: With simultaneous transmission of different frequencies each representing one code element</b>
H04L27	H04L27/22	H04L27: Modulated-carrier systems  <b>H04L27/22: Demodulator circuits; Receiver circuits</b>
G11B7	G11B7/00	G11B7/00: Recording or reproducing by optical means, e.g. recording using a thermal

		beam of optical radiation, reproducing using an optical beam at lower power; Record carriers therefor
<b>USPTO</b>		
375	375/260	375: PULSE OR DIGITAL COMMUNICATIONS  <b>375/260: Plural channels for transmission of a single pulse train</b>
375	375/324	375: PULSE OR DIGITAL COMMUNICATIONS  <b>375/324: Particular demodulator</b>
369	369/59.21	369: DYNAMIC INFORMATION STORAGE OR RETRIEVAL  <b>369/59.21: Including sampling or A/D converting</b>

\*\*\*\*\*END OF THE REPORT\*\*\*\*\*