

Filed electronically on
September 7, 2011 - CMG

METHOD AND APPARATUS FOR SPECTRUM MONITORING

FIELD OF THE INVENTION

[0001] Certain embodiments of the invention relate to signal processing. More specifically, certain embodiments of the invention relate to a method and system for spectrum monitoring.

BACKGROUND OF THE INVENTION

[0002] Network-based services can become unacceptable if network parameters fall outside of those for which receivers in the network were designed. For example, in a cable television system there are specifications for the number of channels on the plant, the types of channels, the signal levels of those channels and the impairments that can be on the plant that would affect the performance of the receiver. If some or all of these parameters deviate outside acceptable bounds, the user may experience unacceptable performance. Conventional methods and apparatuses for monitoring network parameters are too costly and impractical for use in customer-premises equipment (CPE).

[0003] Further limitations and disadvantages of conventional and traditional approaches will become apparent to one of skill in the art, through comparison of such systems with some aspects of the present invention as set forth in the remainder of the present application with reference to the drawings.

BRIEF SUMMARY OF THE INVENTION

[0004] A system and/or method is provided for spectrum monitoring, substantially as shown in and/or described in connection with at least one of the figures, as set forth more completely in the claims.

[0005] These and other advantages, aspects and novel features of the present invention, as well as details of an illustrated embodiment thereof, will be more fully understood from the following description and drawings.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

[0006] FIG. 1 depicts an exemplary receiver operable to perform spectrum monitoring in accordance with an embodiment of the invention.

[0007] FIG. 2A depicts an exemplary RF front-end of a receiver operable to perform spectrum monitoring in accordance with an embodiment of the invention.

[0008] FIG. 2B depicts another exemplary RF front-end of a receiver operable to perform spectrum monitoring in accordance with an embodiment of the invention.

[0009] FIG. 3 depicts an exemplary channelizer which may be utilized for performing spectrum monitoring in accordance with an embodiment of the invention.

[0010] FIG. 4 is a flow chart illustrating exemplary steps for spectrum monitoring in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0011] As utilized herein the terms "circuits" and "circuitry" refer to physical electronic components (i.e. hardware) and any software and/or firmware ("code") which may configure the hardware, be executed by the hardware, and or otherwise be associated with the hardware. As utilized herein, "and/or" means any one or more of the items in the list joined by "and/or". For example, "x and/or y" means any element of the three-element set $\{(x), (y), (x, y)\}$. Similarly, "x, y, and/or z" means any element of the seven-element set $\{(x), (y), (z), (x, y), (x, z), (y, z), (x, y, z)\}$. As utilized herein, the terms "block" and "module" refer to functions that can be implemented in hardware, software, firmware, or any combination of one or more thereof.

[0012] FIG. 1 depicts an exemplary receiver operable to perform spectrum monitoring in accordance with an embodiment of the invention. Shown in FIG. 1 is a receiver circuit 100 comprising an RF front-end module 108, a channelizer module 102, a monitoring module 104, and a data processing module 106.

[0013] The RF front-end 108 may be operable to process a received RF signal S to generate a digital signal D. The signal S may be the result of a plurality, K, of channels being frequency division multiplexed into a single signal. The signal S may occupy a frequency band from F_{lo} to F_{hi} . The RF front-end 108 may, for example, amplify, down-convert, filter, and/or digitize the received signal S to generate the digital signal D. Exemplary embodiments of the RF front-end are depicted in FIGs. 2A and 2B.

[0014] The channelizer 102 may be operable to select J channels contained in the signal S and output each of the selected channels to either the monitoring module 104 or the data processing module 106, where J is an integer greater than 1. An exemplary embodiment of the channelizer 102 is depicted in FIGs. 3A and 3B.

[0015] The monitoring module 104 may be operable to analyze the channel C_j that it receives from the channelizer 102, where j is an integer between 1 and J . For example, the monitoring module 104 may be operable to measure and/or detect signal power levels, type and/or amount of modulation, code rate, interference levels, signal to noise ratio, and/or any other metric which may be pertinent to the communication system. The monitoring module may also be operable to generate one or more control signals for configuring the channelizer 102.

[0016] The data processing module 106 may be operable to process the channels C_1 – C_J conveyed to it by the channelizer 102 to recover data present in those channels of the signal S . The data processing module 106 may, for example, perform synchronization, equalization, and decoding. The data processing module 106 may also be operable to generate one or more control signals for configuring the channelizer 102.

[0017] In an exemplary embodiment of the invention, the signal S may be a cable television signal with $F_{lo} \approx 55\text{MHz}$, $F_{hi} \approx 1002\text{ MHz}$, and $K \approx 158$. These numbers are purely for illustration and not intended to be limiting.

[0018] In operation of such an exemplary embodiment, the signal S may be amplified and digitized by the RF front-end 108 to generate the signal D . The channelizer 102 may then select J of the K channels to be output to the data processing module 106. The J selected channels may be any J of the K channels. The data processing module 106 may provide one or more control signals to determine which J of the K channels are selected for output to the data processing module 106. The channelizer 102 may also select one channel, channel k , to be output to the monitoring module 104, where k is an integer between 1 and K . The value of k may, for example, be configured by the monitoring module 104. The data processing module 106 may process the one or more of the J channels to recover data communicated via those one or more

channels while the monitoring module 104 may concurrently process channel k to measure characteristics of the all or a portion of the spectrum between f_{lo} and f_{hi} .

[0019] FIG. 2A depicts an exemplary RF front-end of a receiver operable to perform spectrum monitoring in accordance with an embodiment of the invention. The RF front-end 108A shown in FIG. 2A comprises a variable gain amplifier 202, and receive chains 204_1 – 204_L , where L is an integer greater than or equal to 1. Each of the receive chains 204_1 – 204_L may comprise an amplifier 210, a mixer 212, a filter 214, and an analog-to-digital converter (ADC) 216. Each of the receive chains 204_1 – 204_L may operate on a different sub-band of the frequency band between f_{lo} and f_{hi} .

[0020] FIG. 2B depicts another exemplary RF front-end of a receiver operable to perform spectrum monitoring in accordance with an embodiment of the invention. The RF front-end 108B shown in FIG. 2B comprises a variable gain amplifier 252, a mixer 254, and an ADC 256.

[0021] FIG. 3 depicts an exemplary channelizer which may be utilized for performing spectrum monitoring in accordance with an embodiment of the invention. Channel selection filters 302_1 – 302_J of the channelizer 102 may each process the signal D to recover a corresponding one of the J selected channels of the signal D , and output the channel on a corresponding one of the ports 304_1 to 304_J . A channel selection filter 302_{J+1} of the channelizer 102 may process the signal D to recover channel k from the signal D , and output channel k on the port 304_{J+1} . Which channel or channels are selected by the filter 302_{J+1} may be configured based on one or more control signals input to the channelizer 102. For example, the value of k may determine the center channel of the one or more channels to be selected by the filter 302_{J+1} , and the value of Δ may determine how many channels are to be selected for output on the port 304_{J+1} . In this

manner, all of the frequency band between F_{lo} and F_{hi} or any portion or portions thereof, may be selected for output on the port 304_{J+1}.

[0022] FIG. 4 is a flow chart illustrating exemplary steps for spectrum monitoring in accordance with an embodiment of the invention. After start step 402, in step 404, the receiver circuit 100 may receive a frequency division multiplexed (FDM) signal comprising K channels and occupying a frequency band between F_{lo} and F_{hi} . In step 406, the received FDM signal is digitized across the full band of F_{lo} to F_{hi} . In step 408, the digitized signal is channelized. In step 410, a first one or more of the channels are conveyed to a data processing module. In step 412 a second one or more of the channels are output to a monitoring module. In step 414, the data processing module processes one or more of the first one or more channels to recover data on those channels which the monitoring module concurrently processes the second one or more channels to determine characteristics of all or a portion of the frequency band from F_{lo} to F_{hi} .

[0023] Additional or supplemental information may be found in the Appendix.

[0024] Other embodiments of the invention may provide a non-transitory computer readable medium and/or storage medium, and/or a non-transitory machine readable medium and/or storage medium, having stored thereon, a machine code and/or a computer program having at least one code section executable by a machine and/or a computer, thereby causing the machine and/or computer to perform the steps as described herein for spectrum monitoring

[0025] Accordingly, the present invention may be realized in hardware, software, or a combination of hardware and software. The present invention may be realized in a centralized fashion in at least one computing system, or in a distributed fashion where different elements are spread across several interconnected computing systems. Any kind of computing system or other apparatus adapted for carrying out the methods described

herein is suited. A typical combination of hardware and software may be a general-purpose computing system with a program or other code that, when being loaded and executed, controls the computing system such that it carries out the methods described herein. Another typical implementation may comprise an application specific integrated circuit or chip.

[0026] The present invention may also be embedded in a computer program product, which comprises all the features enabling the implementation of the methods described herein, and which when loaded in a computer system is able to carry out these methods. Computer program in the present context means any expression, in any language, code or notation, of a set of instructions intended to cause a system having an information processing capability to perform a particular function either directly or after either or both of the following: a) conversion to another language, code or notation; b) reproduction in a different material form.

[0027] While the present invention has been described with reference to certain embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted without departing from the scope of the present invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the present invention without departing from its scope. Therefore, it is intended that the present invention not be limited to the particular embodiment disclosed, but that the present invention will include all embodiments falling within the scope of the appended claims.

CLAIMS

What is claimed is:

1. A method is provided, substantially as shown and described with respect to FIGs. 1–4 for spectrum monitoring.
2. A machine-readable storage having stored thereon, a computer program having at least one code section for networking, the at least one code section being executable by a machine for causing the machine to perform steps comprising those substantially as shown and described with respect to FIGs. 1–4 for spectrum monitoring.
3. A system is provided, substantially as shown and described shown and described with respect to FIGs. 1–4 for spectrum monitoring.

ATTORNEY DOCKET NO. 24351US01

ABSTRACT

Aspects of a method and apparatus for spectrum monitoring are provided.

ATTORNEY DOCKET NO. 24351US01

APPENDIX

METHOD AND APPARATUS FOR CONTINUOUS FULL SPECTRUM MEASURING IN RECEIVERS WHILE SIMULTANEOUSLY PROCESSING CHANNELS FOR CONSUMPTION

Patrick Tierney, Tim Gallagher, Jun Huang

1. INTRODUCTION

In broadband communications applications such as television, it is desirable for receiving equipment to monitor the incoming spectrum in its entirety (e.g., 54MHz to 1002GHz for cable television) and report back parameters such as power levels over frequency to the transmitting equipment to allow statistical analysis and/or adjustments in the transmission to the receiving equipment. This monitoring by the receiver is typically only done in an initialization phase when the receiving equipment is powered on or reset and not while the receiver is processing channels to be viewed or otherwise used by the end user of that equipment. However, this is only a snapshot of the spectrum and does not allow for real time or near real time monitoring.

This invention describes a method for implementing a continuous, full spectrum monitoring system in a receiver that can simultaneously process the discrete channels for the user of that equipment without interruption of service to the user.

2. BACKGROUND AND MOTIVATION

Television or broadband service can become unacceptable if the parameters for the transmitted signals fall outside of those for which receivers in the network were designed. For example, in a cable television system there are specifications for the number of channels on the plant, the types of channels, the signal levels of those channels and the impairments that can be on the plant that would affect the performance of the receiver. Some or all of these parameters are measured continuously at various points in the system so that adjustments can be made to prevent the interruption of service to the end users of the system. Unfortunately, it has been too expensive and impractical to do this type of continuous monitoring where it matters most, at the receiver in the users place of consumption (e.g., a STB or cable modem in a cable television subscriber's home). Some monitoring can be done at the receiver, but frequently at the cost of interrupting the user's service as scanning of the input spectrum can be mutually exclusive of receiving and processing the channels for consumption. It is highly desirable to have a cost effective method for continuously monitor the input spectrum at the receiver without disrupting service. This can be done with a receiver described herein.

3. DESCRIPTION OF THE INVENTION

3.1. EMBODIMENT DESCRIPTION

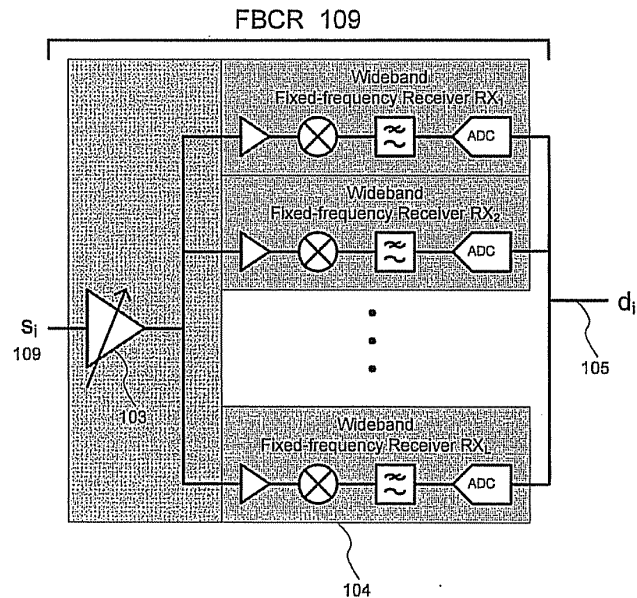


Figure 1. Broadband receiver embodiment using a multichannel approach

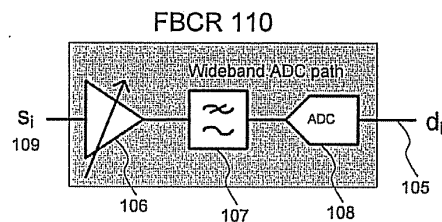


Figure 2. Broadband receiver embodiment using a full-capture approach

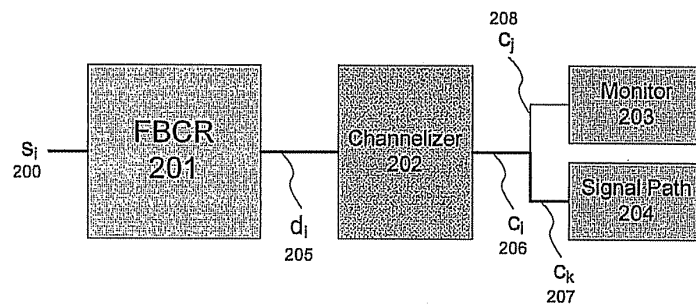


Figure 3. Embodiment of full-spectrum monitoring

Figures 1 and 2 illustrate two possible embodiments 109 and 110 of a broadband receiver which produces a digitized representation d_i 205 of the input signal s_i 200. With 109, the signal s_i may also be downconverted

prior to digitization. Figure 3 shows the invention with the channelizer 202 which selects a set of arbitrary channels from d_i by applying frequency translation and filtering for example, as is typically done in a communication system to produce channels c_j 206. In a traditional communication system, these channels are then provided to the signal path for synchronization, equalization and decoding. This invention introduces a monitor 203 which takes as its input one of the channels c_j 208 which can be scanned across an arbitrary portion of the spectrum occupied by s_i and measures any number of characteristics of that portion of the spectrum. This portion may comprise the entire spectrum or some fraction of it. Monitor 203 may use c_j to assess signal power levels across s_i , the modulation, code rate and other information present in c_j , the channel conditions and interference in c_j , or any other information about the signal and channel that may be pertinent to the communication system.

4. CLAIMS

1. A broadband receiver operating in a band of the frequency spectrum, which incorporates main signal path for receiving information in the signal, and a monitor path for assessing characteristics of the signal or the channel at some or all of the spectrum.
2. The receiver of 1 where the monitor assesses the power in some or all of the spectrum.
3. The receiver of 1 where the monitor assesses the channel conditions in some or all of the spectrum, where channel conditions may include the channel response, Doppler, or interference levels.
4. The receiver of 1 where the monitor assesses the modulation and code rate of the transmitted signals in some or all of the band.
5. The receiver of 1 where the broadband receiver comprises a broadband ADC which captures substantially the entire band of operation.
6. The receiver of 1 where the broadband receiver consists of a plurality of receivers which each capture a portion of the band so that the receiver altogether captures some or all of the band.
7. The receiver of 1 where the broadband receiver is used for receiving MoCA signals.
8. The receiver of 1 where the broadband receiver is used for receiving cable signals such as DOCSIS or video channels.
9. The receiver of 1 where the broadband receiver is used for receiving satellite signals such as may be received at the dish by an LNB.
10. The receiver of 1 where the broadband receiver is used for receiving satellite signals such as may be delivered at the output of a LNB.
11. The receiver of 1 where the broadband receiver is used for receiving satellite signals such as may be received inside a premise from a dish.

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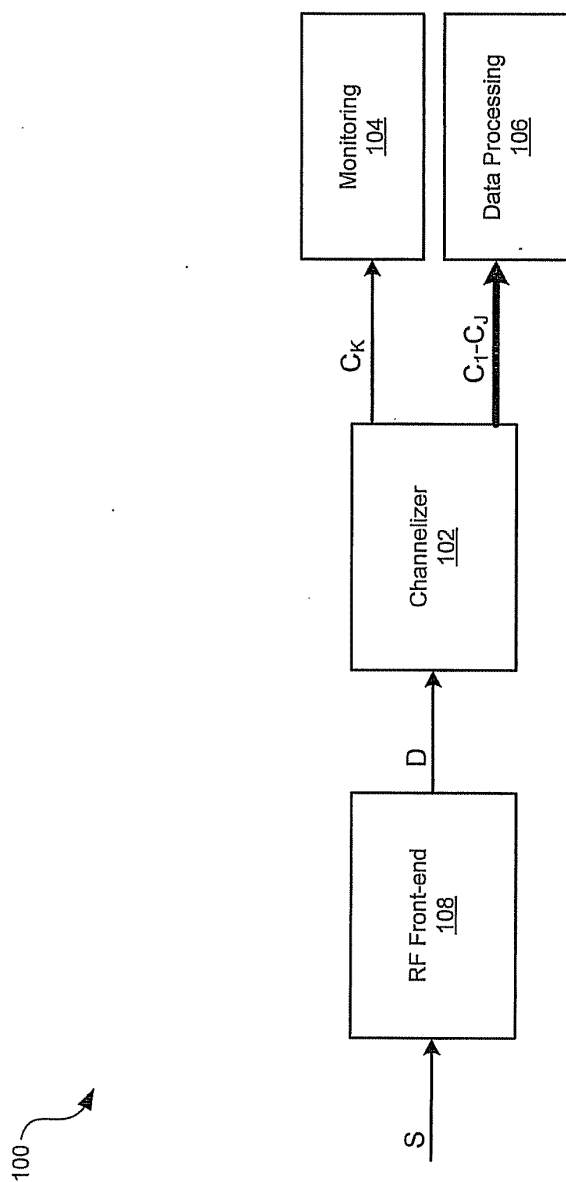


FIG. 1

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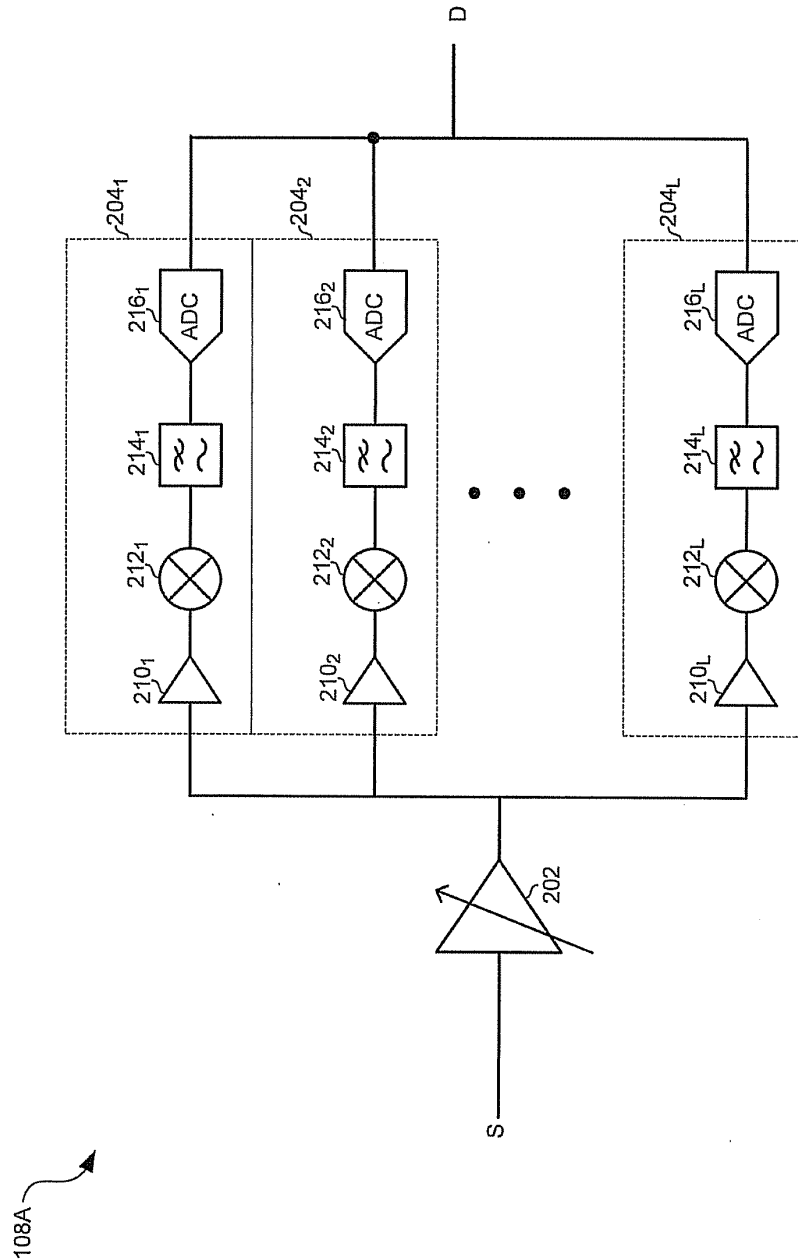


FIG. 2A

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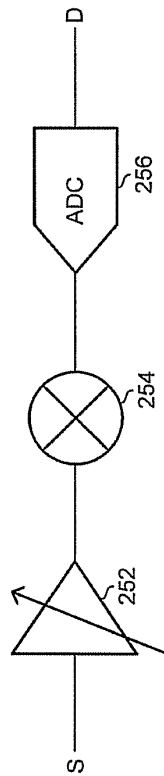


FIG. 2B

108B

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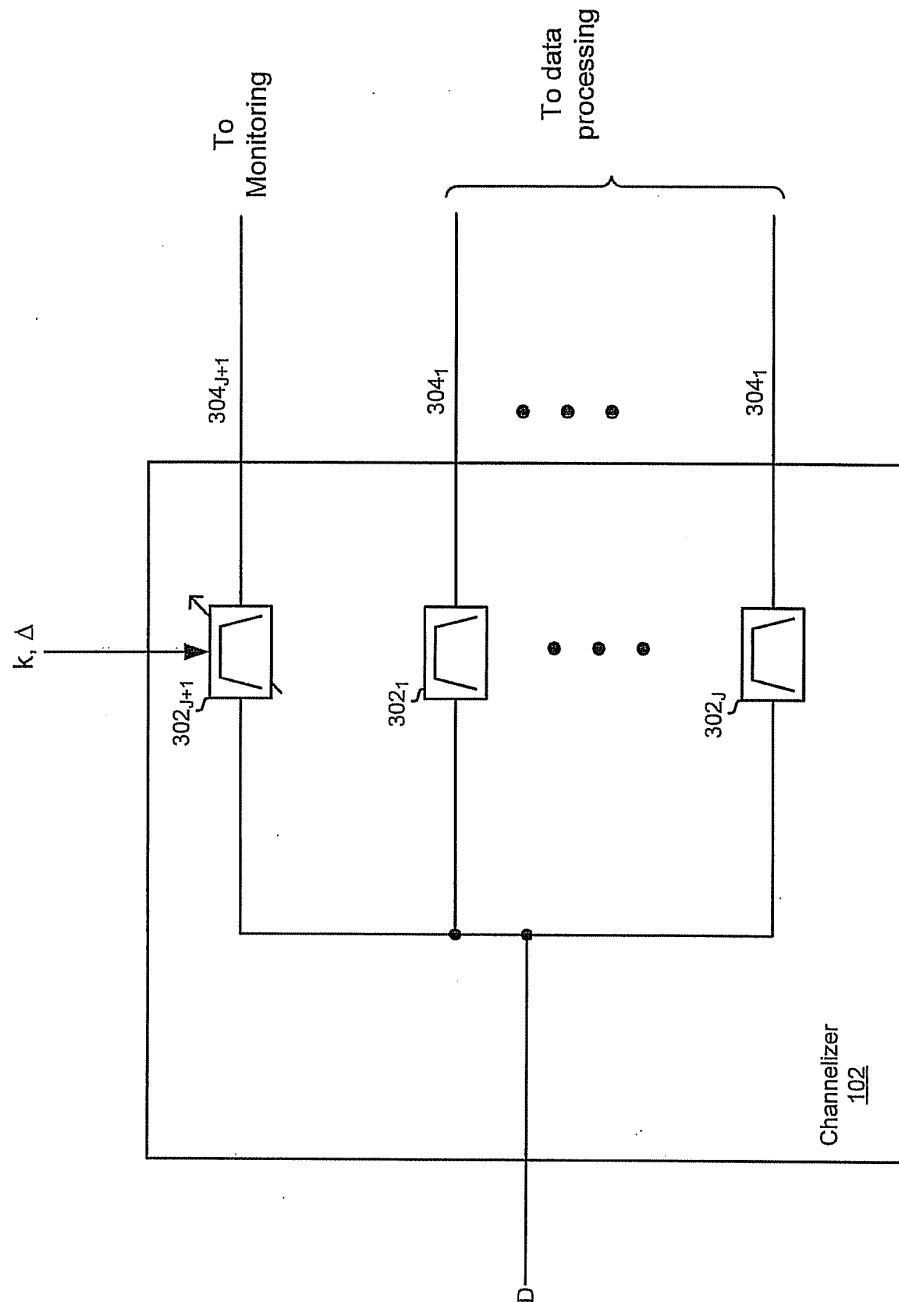


FIG. 3

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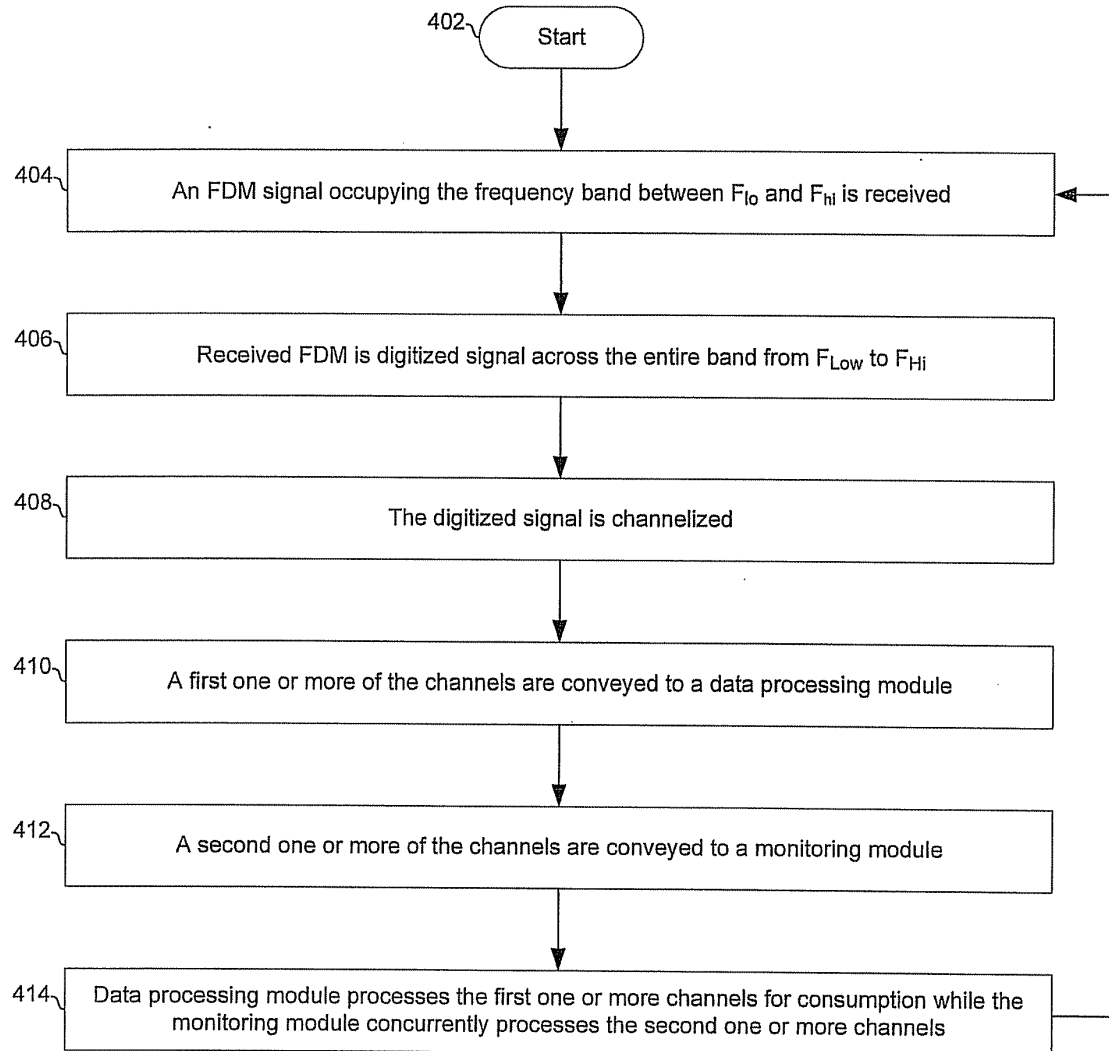


FIG. 4

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		Method and Apparatus for Spectrum Monitoring		
First Named Inventor/Applicant Name:		Patrick Tierney		
Filer:		Chad M. Gilles		
Attorney Docket Number:				
Filed as Large Entity				
Provisional Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Provisional application filing	1005	1	220	220
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				220

Electronic Acknowledgement Receipt	
EFS ID:	10899447
Application Number:	61532098
International Application Number:	
Confirmation Number:	5563
Title of Invention:	Method and Apparatus for Spectrum Monitoring
First Named Inventor/Applicant Name:	Patrick Tierney
Customer Number:	23446
Filer:	Chad M. Gilles
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	08-SEP-2011
Filing Date:	
Time Stamp:	00:33:19
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$220
RAM confirmation Number	9825
Deposit Account	130017
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1		24351US01_Provisional_application.pdf	1385030 7977c39920acd7bb9625dcd6b4ea3b6df712825	yes	19
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	11	
	Appendix to the Specification		12	14	
	Drawings-only black and white line drawings		15	19	
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	28634 4d2ed72fe656b9d21d03a8f7ee8d49f6f222715c	no	2
Warnings:					
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
61/532,098	09/08/2011	Patrick Tierney	24351US01

CONFIRMATION NO. 5563

FORMALITIES LETTER

23446
MCANDREWS HELD & MALLOY, LTD
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Date Mailed: 09/20/2011

NOTICE TO FILE MISSING PARTS OF PROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(c)

Filing Date Granted

An application number and filing date have been accorded to this provisional application. The items indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The provisional application cover sheet under 37 CFR 1.51(c)(1), which may be an application data sheet (37 CFR 1.76), is required identifying:
 - either city and state, or city and foreign country, of the residence of each inventor.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- A surcharge (for late submission of filing fee or cover sheet) as set forth in 37 CFR 1.16(g) of **\$50** for a non-small entity, must be submitted.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
61/532,098	09/08/2011		220	24351US01		

CONFIRMATION NO. 5563

23446
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FILING RECEIPT



0C000000049857562

Date Mailed: 09/20/2011

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Patrick Tierney, Residence Not Provided;
Tim Gallagher, Residence Not Provided;
Jun Huang, Residence Not Provided;

Power of Attorney: None

If Required, Foreign Filing License Granted: 09/15/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 61/532,098**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

Method and Apparatus for Spectrum Monitoring

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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page 2 of 3

Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

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Provisional Application for Patent Cover Sheet

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1

Remove

Given Name	Middle Name	Family Name	City	State	Country i
Patrick		Tierney	San Diego	CA	

Inventor 2

Remove

Given Name	Middle Name	Family Name	City	State	Country i
Timothy		Gallagher	Encinitas	CA	

Inventor 3

Remove

Given Name	Middle Name	Family Name	City	State	Country i
Jun		Huang	San Diego	CA	

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.**Add****Title of Invention**

Method and Apparatus for Spectrum Monitoring

Attorney Docket Number (if applicable)

24351US01

Correspondence Address

Direct all correspondence to (select one):

☒ The address corresponding to Customer Number☐ Firm or Individual Name

Customer Number

23446

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.☐ Yes, the name of the U.S. Government agency and the Government contract number are:

Entity Status

Applicant claims small entity status under 37 CFR 1.27

☒ Yes, applicant qualifies for small entity status under 37 CFR 1.27☐ No**Warning**

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

Signature

Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Chad M. Gilles/			Date (YYYY-MM-DD)	2011-12-02
First Name	Chad	Last Name	Gilles	Registration Number (If appropriate)	60590

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **This form can only be used when in conjunction with EFS-Web. If this form is mailed to the USPTO, it may cause delays in handling the provisional application.**

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
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Electronic Patent Application Fee Transmittal				
Application Number:	61532098			
Filing Date:	08-Sep-2011			
Title of Invention:	Method and Apparatus for Spectrum Monitoring			
First Named Inventor/Applicant Name:	Patrick Tierney			
Filer:	Chad M. Gilles/LaTanya Williamson			
Attorney Docket Number:	24351US01			
Filed as Small Entity				
Provisional Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 1 month with \$0 paid	2251	1	75	75

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				75

Electronic Acknowledgement Receipt	
EFS ID:	11528426
Application Number:	61532098
International Application Number:	
Confirmation Number:	5563
Title of Invention:	Method and Apparatus for Spectrum Monitoring
First Named Inventor/Applicant Name:	Patrick Tierney
Customer Number:	23446
Filer:	Chad M. Gilles/LaTanya Williamson
Filer Authorized By:	Chad M. Gilles
Attorney Docket Number:	24351US01
Receipt Date:	02-DEC-2011
Filing Date:	08-SEP-2011
Time Stamp:	10:58:13
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$75
RAM confirmation Number	21035
Deposit Account	130017
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)					
Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)					
Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Provisional Cover Sheet (SB16)	24351US01_Prov_Coversheet.pdf	1060263	no	3
			d304c0a7c317f0d9a0be7ee766ac8f778cd7ca4e		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	29999	no	2
			10255416df45540a11151f3216a9efd7375287f2		
Warnings:					
Information:					
Total Files Size (in bytes):			1090262		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

Electronic Acknowledgement Receipt	
EFS ID:	11528426
Application Number:	61532098
International Application Number:	
Confirmation Number:	5563
06/01/2012 MTEKLENI 00000004 130017 61532098 01 FC:2052 25.00 DA Title of Invention:	Method and Apparatus for Spectrum Monitoring
First Named Inventor/Applicant Name:	Patrick Tierney
Customer Number:	23446
Filer:	Chad M. Gilles/LaTanya Williamson
Filer Authorized By:	Chad M. Gilles
Attorney Docket Number:	24351US01
Receipt Date:	02-DEC-2011
Filing Date:	08-SEP-2011
Time Stamp:	10:58:13
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$75
RAM confirmation Number	21035
Deposit Account	130017
Authorized User	
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
61/532,098	09/08/2011		245	24351US01		

CONFIRMATION NO. 5563

UPDATED FILING RECEIPT



OC000000054599617

23446
MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661

Date Mailed: 06/05/2012

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Patrick Tierney, San Diego, CA;
Timothy Gallagher, Encinitas, CA;
Jun Huang, San Diego, CA;

Power of Attorney: None

If Required, Foreign Filing License Granted: 09/15/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 61/532,098**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

Method and Apparatus for Spectrum Monitoring

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international

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LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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page 2 of 3

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NOT GRANTED

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