

DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a Continuation of US Serial No. 14/467,642 filed August 25, 2014 which is a Continuation of US Serial No. 13/274,290 filed October 14, 2011, all of which are in their entirety incorporated herein by reference.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

[0002] Not Applicable.

APPENDIX

[0003] Not Applicable.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates to multi-band digital predistortion linearization.

RELATED ART

[0002] Power-efficient, low-complex, and reconfigurable radio system requires the design of energy-efficient transmitter and receiver architectures. At the transmitter side, the power consumption is mainly dominated by the RF power amplification (PA) unit. Generally, PAs are the most power consuming and the least power efficient components of the RF chain. Moreover, their nonlinear behavior and non-flat frequency response introduce unwanted intermodulation distortions into the system, which could significantly degrade the output signal quality.

[0003] An efficient and proper approach to linearize the transmitter nonlinearities, including the frequency up-conversion and power amplification units, is digital predistortion (DPD) linearization technique. The DPD technique is based on developing a reverse model of the nonlinear behavior and predistorted the input signals accordingly

in order to compensate for the distortions and nonlinearities introduced by the transmitter.

[0004] In dual-band system, the nonlinear behavior of the device will introduce intermodulation, cross modulation, and harmonic products caused by the two fundamental signals. This can be extended to multi-band systems where more than two active signals are transmitted simultaneously.

[0005] The linearization of multi-band transmitter is based on the digital predistortion linearization. The DPD technique compensates for the transmitter nonlinearity while operating in the high efficiency and nonlinear region. As an example presented here in this patent, two signal processing blocks are employed to deal and compensate for the unwanted distortions and intermodulation products of the dual-band transmitter. In the scenario of multi-band transmitter (dual-band or more) this processing architecture can be expanded to multiple processing block for linearization and distortion compensation of multi-band transmitter.

[0006] In order to obtain samples of the signal from the output of the multi-band system, multi-branch or multi-band down converter is required in the feedback loop. This feedback loop can be developed using multi-band down conversion unit, multi-branch down conversion unit, or using subsampling based down conversion unit.

[0007] In one case, an energy-efficient and low-complex subsampling receiver is adopted in the feedback loop of the multi-band linearization architecture. The subsampling receiver architecture is designed to concurrently down-convert the multiple RF signals through single receiver chain. Using subsampling technique simplifies the feedback loop topology, requires fewer number of RF components, and reduces the power consumption.

[0008] Substituting the multi-band or multi-branch receiver feedback loop of the linearization topology with subsampling receiver architecture reduces the complexity of the system. The subsampling down conversion is not very common as receivers because of its insufficient performance in the presence of uncontrolled interfering signals. However, in the case of a DPD feedback loop, the problem is different and the interfering signals can be controlled such that they will not affect the signal quality. The different intermodulation, cross modulation and harmonic products make choosing the sampling frequency a complex task in order to avoid any overlap between the down-converted desired signals and their intermodulation and cross modulation products. Therefore, it is imperative to develop an algorithm to select the sampling frequency so

that it takes into account all the possible frequencies such that the target signals will not be interfered with the undesired product terms.

SUMMARY OF THE INVENTION

[0009] In one aspect of the present invention, a concurrent digital multi-band linearizer comprises a baseband signal preprocessing block, the baseband signal processing block including a digital predistortion unit; a signal up-conversion block, an RF power amplification block, the RF power amplification block including the concurrent multi-band power amplifier; and an RF power combining network.

[0010] In the description of the invention, a concurrent dual-band amplifier will be used. It is noted that a concurrent dual-band power amplifier which includes one amplification unit for two frequency bands may be considered in one sense a simple and special case of multi-band power amplifiers.

[0011] In one aspect of the present invention, the feedback loop of the digital predistortion consists of multiple RF down-conversion units associated with each of the frequency band of operation.

[0012] In another aspect of the present invention, a single feedback loop based on subsampling receiver technique is used to down-convert and extract the RF signals from all the frequency band at the same time.

[0013] Further areas of applicability of the present invention will become apparent with reference to the following drawings, description and claims. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

[0015] Figure 1 is a block diagram of the dual-band digital predistortion architecture according to an exemplary embodiment of the present invention.

[0016] Figure 2 is an alternate embodiment illustrating a detailed block diagram of the architecture of Figure 1, using subsampling based feedback loop.

[0017] Figure 3 is one embodiment illustrating a detailed block diagram of the subsampling receiver architecture of Figure 2.

[0018] Figure 4A is the fundamental signal representation at the input of the dual-band transmitter.

[0019] Figure 4B is the fundamental signal representation at the output of the dual-band transmitter and intermodulation terms at the output of the nonlinear transmitter.

[0020] Figure 5 is dual-band RF signal and the frequency position of the subsampling harmonics.

[0021] Figure 6 is a flowchart illustrating the steps of the execution of finding the possible subsampling frequencies.

[0022] Figure 7A is the power spectrum of the predistortion results for 880 MHz, using dual-band digital prediction technique with dual-branch feedback loop. Spectrums marked with circles are the output without linearization, those marked with diamonds are the output after linearization, and those marked with solid rectangles are the inputs signals.

[0023] Figure 7B is the power spectrum of the predistortion results for 1978 MHz, using dual-band digital prediction technique with dual-branch feedback loop, using the same codes as described for Figure 7A.

[0024] Figure 8 is the Power spectrum of the output of the dual-band nonlinear transmitter including the two fundamental RF signals and their inter-modulation products and harmonics.

[0025] Figure 9 is the Power spectrum of the captured signal using an ADC operating at 19.8 MHz sampling frequency.

[0026] Figure 10A is the power spectrum of the predistortion results for 880 MHz, using dual-band digital prediction technique with subsampling feedback loop.

[0027] Figure 10B is the power spectrum of the predistortion results for 1978 MHz, using dual-band digital prediction technique with subsampling feedback loop.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] The following description of the preferred embodiment(s) is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

[0029] Broadly, an embodiment of the present invention provides multiple branch digital predistortion linearization architecture and digital signal processing algorithms for impairments-free operation and linearized multi-band transmitter.

[0030] Referring to Figure 1, the system block diagram of the dual-band linearization architecture 100 is displayed. The input signals, x_1 and x_2 , 105 are fed into two distinct

predistorters blocks 110. The predistorted signals 115 are converted from digital to analog 120 and up-converted 125 to RF frequencies. Then the two RF signals are combined 130 and amplified by the power amplifier 135.

[0031] For digital predistortion linearization and identify the inverse model, the sample of the RF signal are captured using dual-band coupler 140. Then the RF signals are bandpass filtered 145, frequency down converted 150, digitized using analog-to-digital converters 155. The digital output samples 160, the input signals 105 and predistorted signals 115 are used in the analyzing stage 165 for nonlinear model identification and reverse modeling.

[0032] The feedback path of the dual-band linearizer requires the use of two down-conversion stages 150, as well as bandpass filters 145 to remove most of the imperfections caused by the power amplifier. The predistorted inputs, x_{pd1} and x_{pd2} , 115 as well as the output of each band of the PA, y_1 and y_2 , 160 are used to generate the predistorter signal processing model 110. The processing model equations of the linearization processing algorithm 165 for prediction and compensation of the distortions and intermodulations is as follows:

$$\begin{aligned} x_{pd1}(n) &= \sum_{m=0}^{M-1} \sum_{k=0}^{K-1} \sum_{j=0}^k c_{1,j,k,m} x_1(n-m) |x_1(n-m)|^{k-j} |x_2(n-m)|^j \\ x_{pd2}(n) &= \sum_{m=0}^{M-1} \sum_{k=0}^{K-1} \sum_{j=0}^k c_{2,j,k,m} x_2(n-m) |x_2(n-m)|^{k-j} |x_1(n-m)|^j \end{aligned} \quad (1)$$

[0033] Where $x_1(n)$ and $x_2(n)$ are the input signals, $x_{pd1}(n)$ and $x_{pd2}(n)$ are the predistorted signals to the input of the dual-band transmitter, $c_{1,j,k,m}$ and $c_{2,j,k,m}$ are the indentified model's coefficients, and finally M is the order of the memory effect and K is the order of nonlinearity.

[0034] Concurrent multi-band receiver architectures require a bandpass filter 145, down-conversion stage 150, and ADC 155 for the translation of each RF frequency bands to baseband. Using subsampling with a high speed ADC allows the elimination of all these components; however, the user needs to make sure that the signals don't overlap in the subsampled spectral domain.

[0035] Sampling multi-bands at the same time also eliminates the time delay taken between different band paths caused by the filters. Figure 2 displays the dual-band predistortion architecture with a subsampling feedback loop 200. At the feedback loop, it consists of optional bandpass filters 245, a track and hold 250, an analog-to-digital converter 255, a digital conversion unit 260, and analyzing stage 270.

[0036] Sampling the band-limited RF signal at frequency rates much lower than the carrier frequency, but higher than signal bandwidth folds the RF signal to the lower frequencies, where these replicates of the RF signal at baseband or intermediate frequencies can be used to reconstruct the baseband signal. To make sure that there is no aliasing between the replicas, the subsampling rate should be chosen in the following range:

$$\frac{2f_U}{n} \leq f_s \leq \frac{2f_L}{n-1} \text{ where } 1 \leq n \leq \left\lfloor \frac{f_U}{B} \right\rfloor \quad (2)$$

$$f_s \geq 2 \times B \text{ Nyquist rate}$$

[0037] where f_L and f_U are the lower and upper frequencies of the band-limited RF signal, $B = f_U - f_L$ is the signal bandwidth, and n is an integer value.

[0038] Figure 3 shows a general block diagram of subsampling-based receiver 300. It consists of RF bandpass filter 305, low-noise amplifier (LNA) 310, subsampling receiver 345 including the track and hold (T&H) 320, and ADC 325 followed by baseband digital signal processing (DSP) unit 330. The T&H 320 is required to expand the analog bandwidth of the receiver and defines the RF range of receiver operation. The sampling clock of the T&H 320 and ADC 325 are chosen from (2) to avoid any aliasing with the other RF signals.

[0039] In dual-band operation transmitter with nonlinearity, the first and second bands will produce intermodulation, cross modulation and harmonic products. Figure 4 shows the power spectrum of the input signal, and the output signal when passed through a third order nonlinear system. The input signals as two-tone signal around carrier frequencies of ω_1 and ω_2 (Figure 4(a)) the output signals are around carrier frequencies of ω_1 and ω_2 and the 3rd order intermodulation frequencies of $2\omega_1 - \omega_1$ and $2\omega_2 - \omega_1$ (Figure 4(b)). The unwanted intermodulation can be classified into three groups of cross-modulation, in-band intermodulation, and out-of-band intermodulation terms.

This latter is usually filtered out before transmission using RF filter to avoid signal quality degradation and interference with the signals at the adjacent channels.

[0040] Now considering two RF signals at carrier frequencies of ω_1 and ω_2 , with their respective bandwidths B_1 and B_2 as shown in Figure 5, the subsampling frequency, f_s , must be chosen to ensure that the two signals do not overlap in the subsampled domain. Taking into account the subsampling theorem for sampling the multi-band signals and following the neighbor and boundary constraints, an iterative process is used to find all the valid subsampling frequencies for the two fundamental frequencies.

[0041] The, out-of-band intermodulation-modulation, and harmonics generated by the fundamental signals are not required for the predistortion application; therefore, an iterative subsampling algorithm has been developed to subsample the RF signals without any overlap with the other unwanted RF signals. Figure 6 is the flowchart of the developed iterative subsampling algorithm to find the valid subsampling frequencies so that the replicas of the wanted RF signals have no overlap with the harmonics and intermodulation frequency terms.

[0042] Referring to Figure 7, there is shown the measured output spectrum of the dual-band transmitter 170 for three cases: 1) without using the dual-band digital pre-compensator 110, 2) using the dual-band digital pre-compensator 110 3) the input signal. The output spectrum of case-2 with digital pre-compensator shows that the digital pre-compensator 110 can compensate for the cross-modulation and in-band inter-modulation terms introduced by the transmitter nonlinearity.

[0043] Referring to Figure 8, there is an example of the power spectrum at the output of the concurrent dual-band nonlinear transmitter which contains two fundamental RF frequencies and their corresponding harmonics and inter-modulation products.

[0044] As an example for the application of this invention, Figure 9, points up the power spectrum after the subsampling feedback loop which shows the two fundamental RF signals at 260.2 MHz and 118.6 MHz when the subsampling frequency of 619.8 is used following is determination by the developed iterative subsampling algorithm illustrated in FIGURE 6. The spectrum in FigureE 9 shows that the harmonics and inter-modulation terms have no interference with the two desired fundamental signals.

[0045] Referring to Figure 10, there is shown the measured output spectrum of the dual-band transmitter 280 for three cases: 1) without using the dual-band digital pre-compensator 210, 2) using the dual-band digital pre-compensator 210, 3) the input signal. The output spectrum of case-2 with digital pre-compensator shows that the digital pre-compensator 210 can compensate for the cross-modulation and in-band inter-modulation terms introduced by the transmitter dynamic nonlinearity with memory effects.

Claims

What is claimed is:

1. A concurrent multi-band linearized transmitter comprising:

a concurrent digital multi-band predistortion block;

a concurrent multi-band linearized transmitter connected to said concurrent digital multiband predistortion block.

2. The concurrent multi-band linearized transmitter of claim 1, wherein said concurrent digital multi-band predistortion block further comprises:

a plurality of digital baseband signal predistorter blocks;

an analyzing and modelling stage; and

a signal observation feedback loop.

3. The concurrent multi-band linearized transmitter of claim 2, wherein said plurality of digital baseband signal predistorter blocks further comprises:

a plurality of inputs, each input corresponding to a single frequency channel;

a plurality of outputs, each output corresponding to a single frequency channel, and each output connected to an input of said concurrent multi-band transmitter.

4. The concurrent multi-band linearized transmitter of claim 2, wherein said analyzing and modeling stage further comprises:

a plurality of outputs connected to and updating the parameters of said digital baseband signal predistorter block;

a plurality of inputs connected to both (a) said outputs of said signal observation feedback loop, and (b) to said outputs of said digital baseband signal predistorter blocks.

5. The concurrent multi-band linearized transmitter of claim 2, wherein said analyzing and modeling stage is further adapted to:

perform time alignment of complex baseband signals from sampling said outputs of said concurrent multi-band transmitter; and

perform the reconstruction of the complex baseband signals from sampling said outputs of said concurrent multi-band transmitter.

6. The concurrent multi-band linearized transmitter of claim 2, wherein said signal observation feedback loop further is further adapted to:

down-convert samples of the RF signals at said output of the concurrent multi-band transmitter of claim 1; and

extract from said down-converted samples a baseband equivalent for all frequency channels.

7. The concurrent multi-band linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises for each channel an RF filter;

A signal down conversion block; and

an analog-to-digital converter (ADC).

8. The concurrent multi-band linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises:

a single subsampling-based receiver to down-convert samples output from a concurrent multi-band transmitter.

9. The concurrent multi-band linearized transmitter of claim 8, wherein said single subsampling-based receiver further comprises:

an RF filter; a track and hold (T&H) block; and an analog-to-digital converter (ADC).

ABSTRACT

A concurrent multi-band linearized transmitter (CMLT) has a concurrent digital multi-band predistortion block (CDMPB) and a concurrent multi-band transmitter (CMT) connected to the CDMPB. The CDMPB can have a plurality of digital baseband signal predistorter blocks (DBSPBs), an analyzing and modeling (A&M) stage, and a signal observation feedback loop. Each DBSPB can have a plurality of inputs, each corresponding to a single frequency band of the multi-band input signal, and its output corresponding to a single frequency band; each output connect corresponding to an input of the CMLT. The A&M stage can have a plurality of outputs connected to and updating the parameters of the DBSPBs, and a plurality of inputs connected to either both outputs of the signal observation loop or the output of the subsampling loop and to outputs of the DBSPBs. The A&M stage can perform signals' time alignment, reconstruction of signals and compute parameters of DBSPBs.

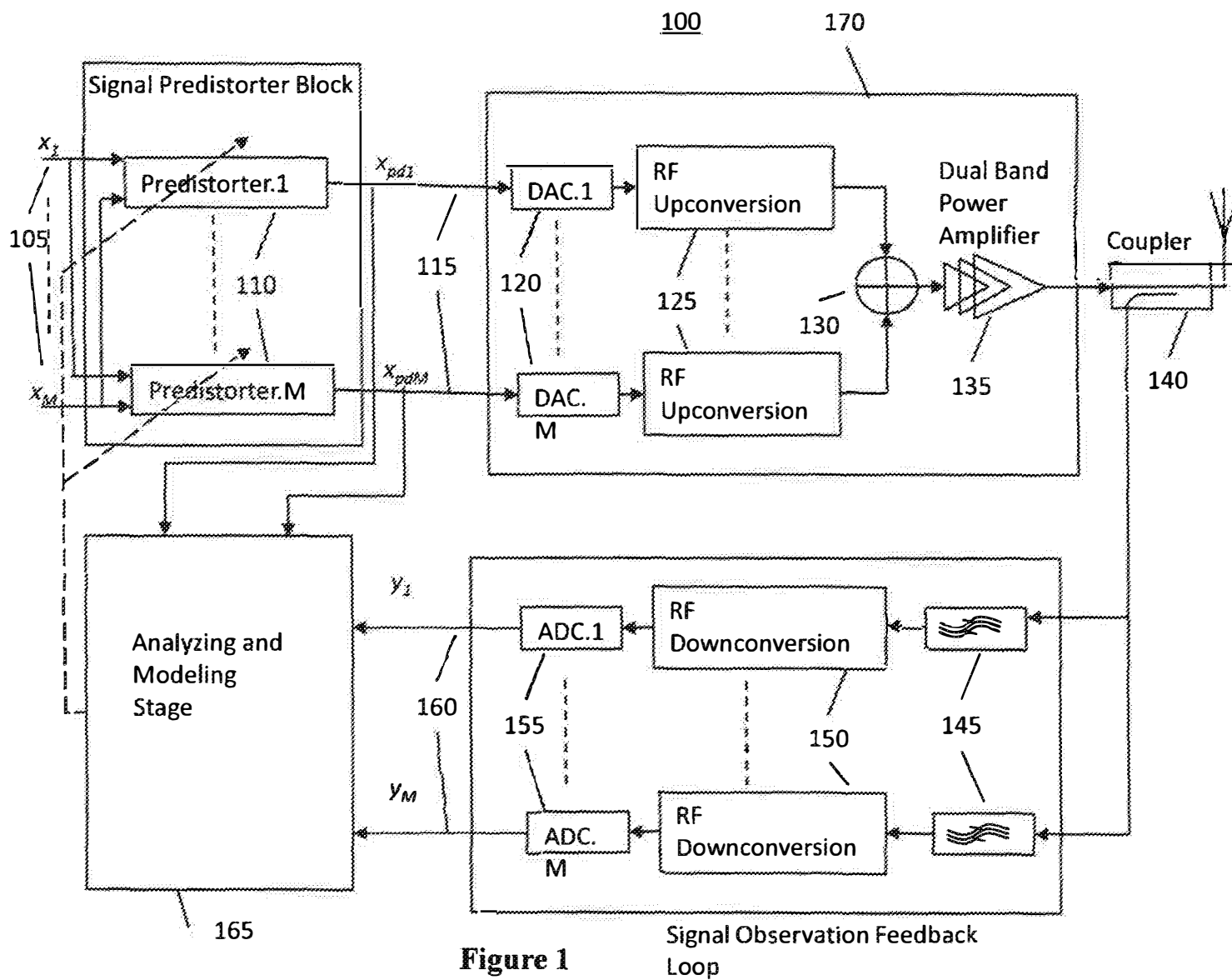


Figure 1

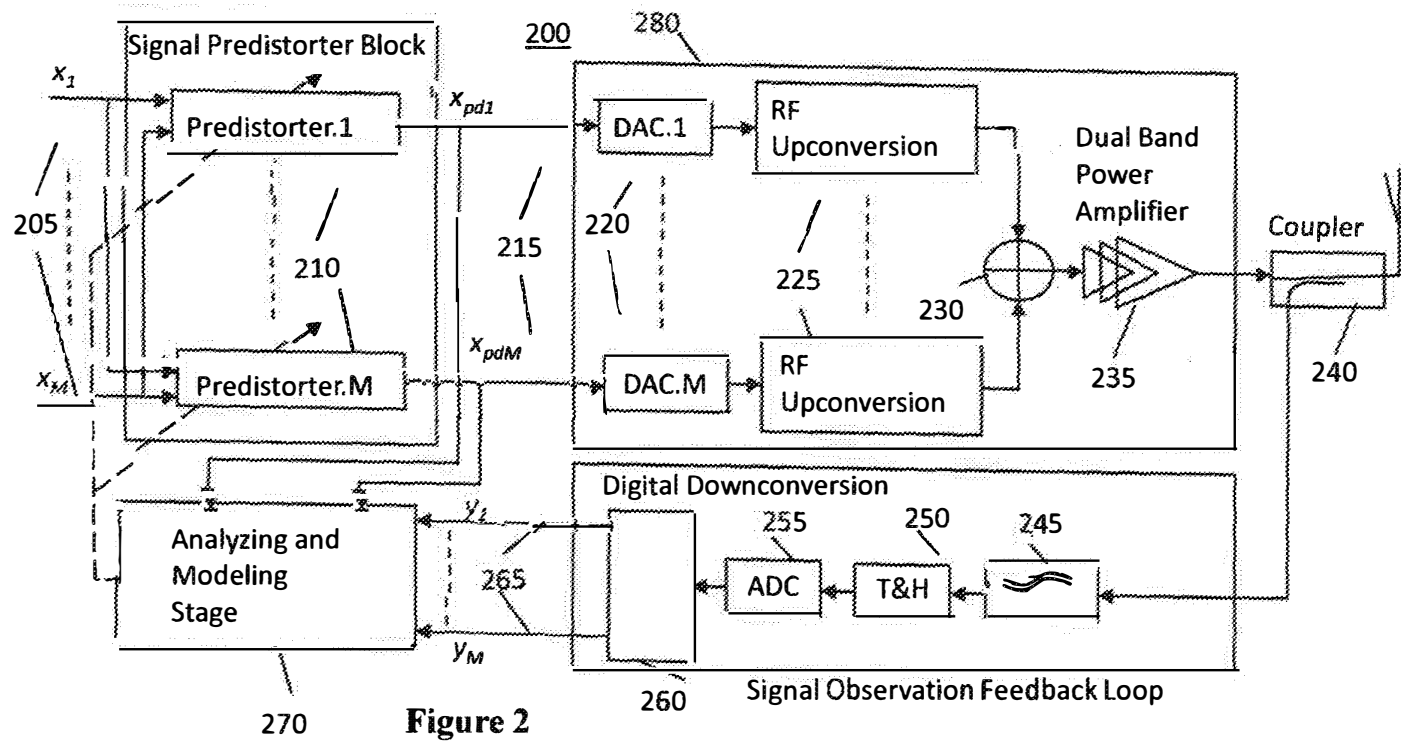


Figure 2

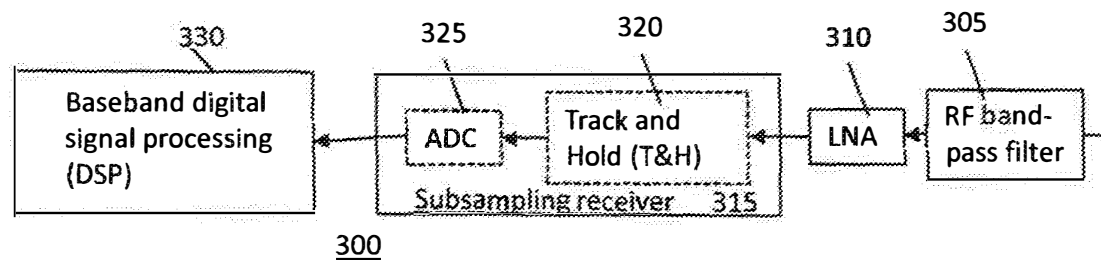


Figure 3



Figure 4A

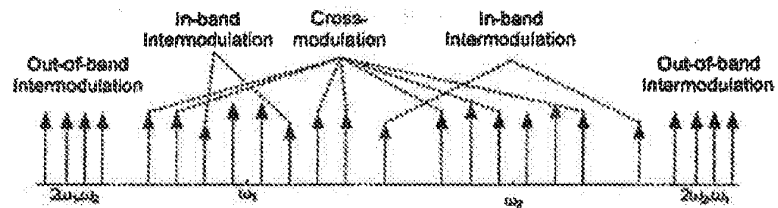


Figure 4B

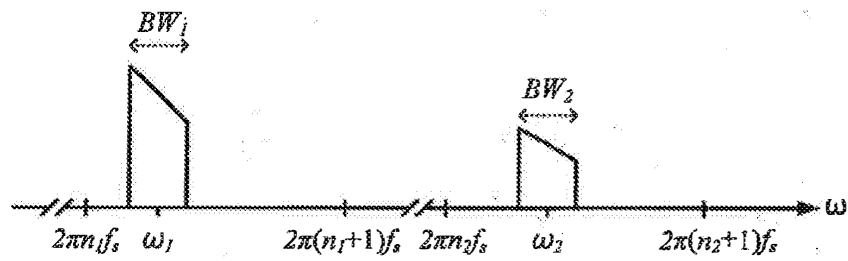


Figure 5

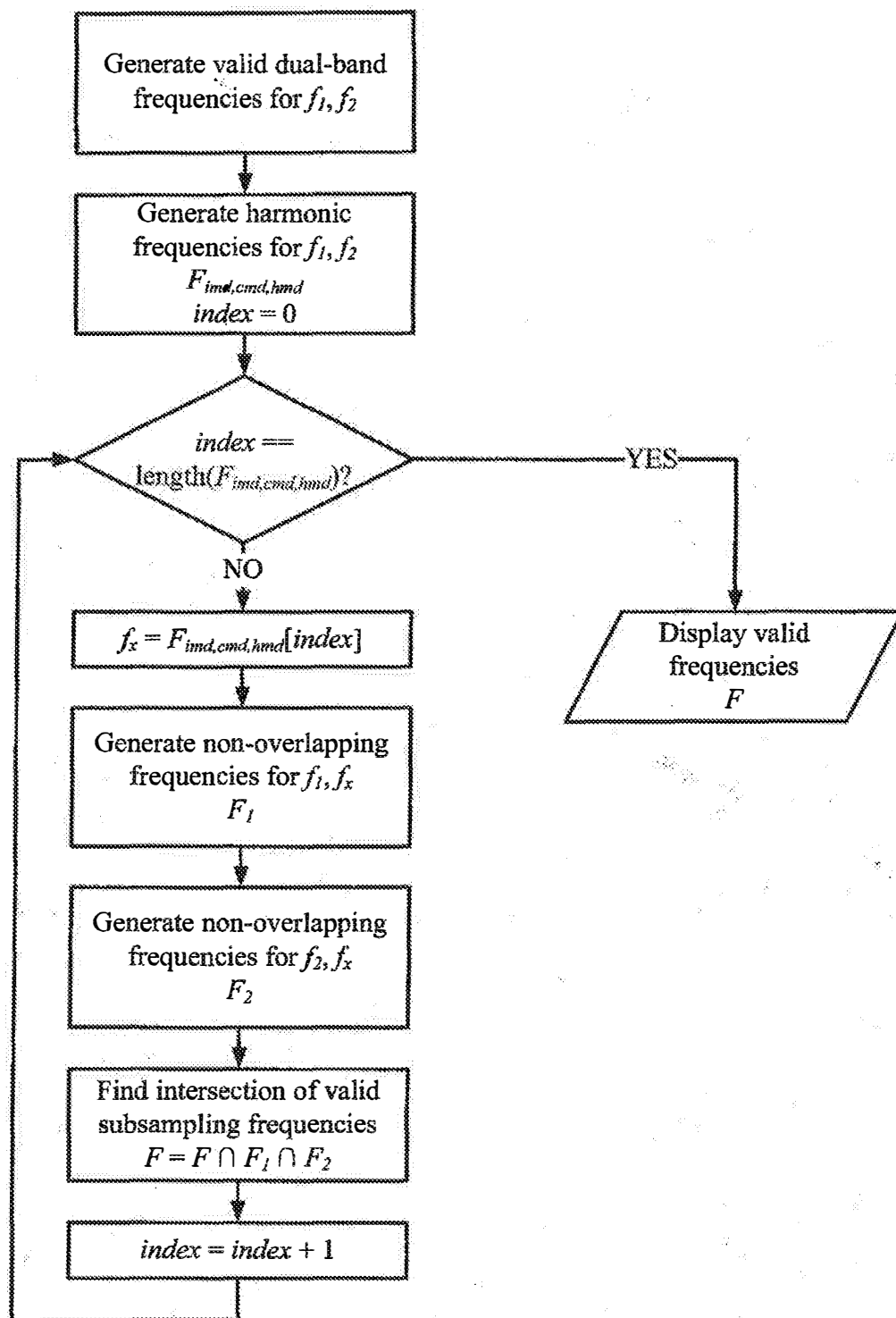


Figure 6

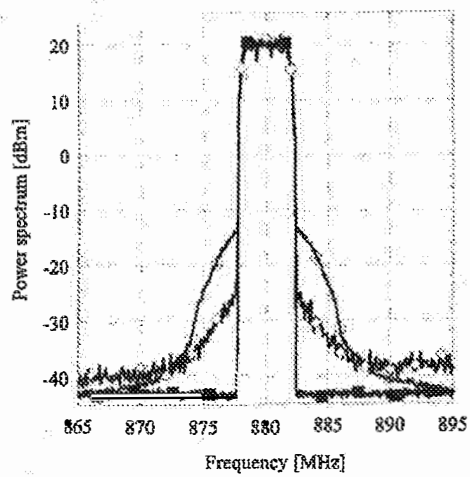


Figure 7A

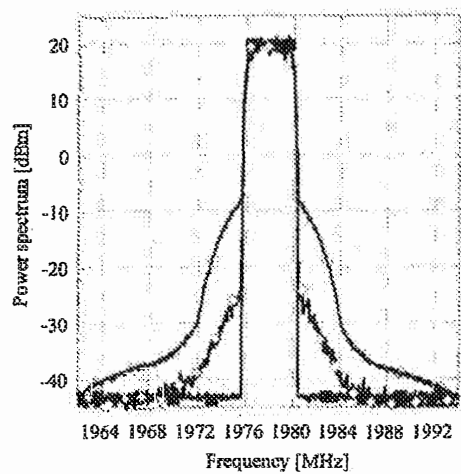


Figure 7B

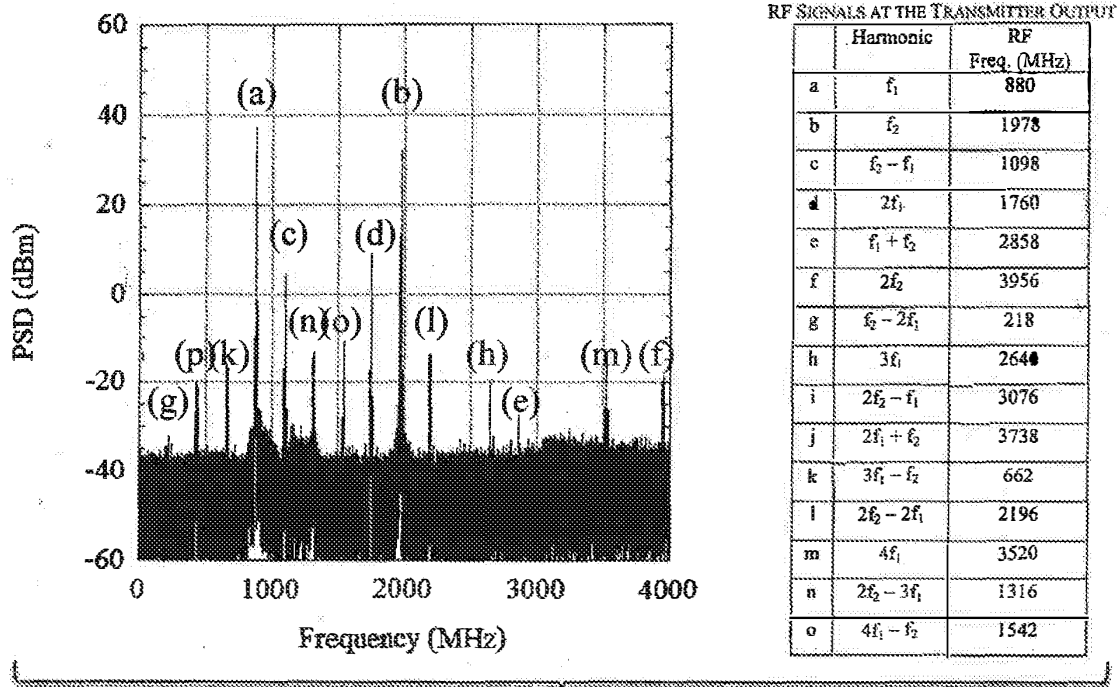


Figure 8

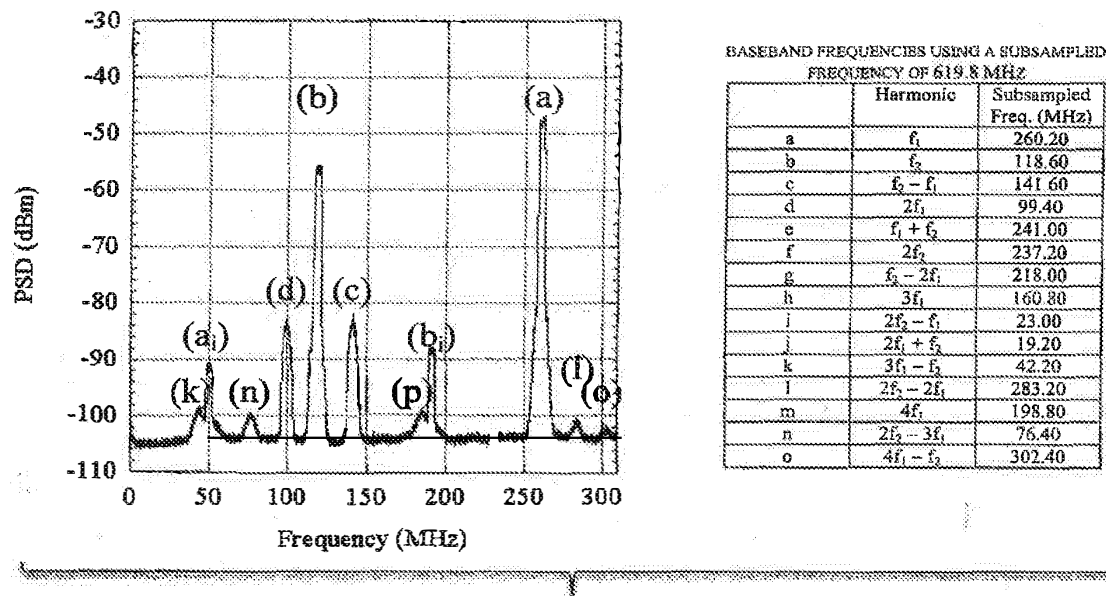


Figure 9

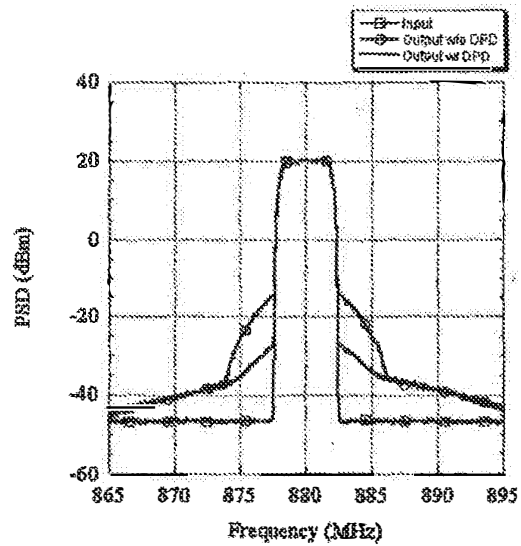


Figure 10A

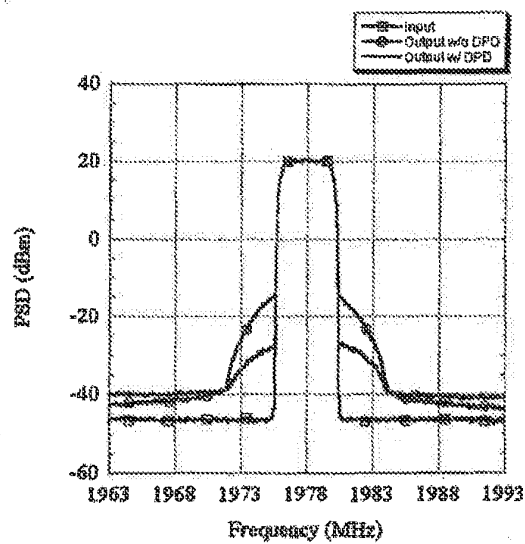


Figure 10B

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	4207-130-CNT
		Application Number	
Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NONLINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Fadhel	M.	GHANNOUCHI		
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service					
City	Calgary	Country of Residence ¹	CA		
Mailing Address of Inventor:					
Address 1		2500 University Drive, NW			
Address 2		Elec and Comp Eng Dept. Univ of Calgary, ICT 302			
City	Calgary	State/Province	AB		
Postal Code	T2N 1N4	Country	CA		
Inventor 2					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Sayed	Aidin	BASSAM		
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service					
City	Calgary	Country of Residence ¹	CA		
Mailing Address of Inventor:					
Address 1		2500 University Dr.			
Address 2		Elec and Comp Eng Dept. Univ of Calgary, ICT 302			
City	Calgary	State/Province	AB		
Postal Code	T2N 1N4	Country	CA		
Inventor 3					Remove
Legal Name					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	4207-130-CNT
		Application Number	
Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NONLINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP		

Prefix	Given Name	Middle Name	Family Name	Suffix
	Mohamed		HELAOUI	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				
City	Calgary	Country of Residence ⁱ	CA	

Mailing Address of Inventor:

Address 1	2500 University Dr. NW			
Address 2	Elec and Comp Eng Dept. Univ of Calgary, ICT 302			
City	Calgary	State/Province	AB	
Postal Code	T2N 1N4	Country ⁱ	CA	

Inventor 4	Remove			
Legal Name				
Prefix	Given Name	Middle Name	Family Name	Suffix
	Andrew		KWAN	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				
City	Calgary	Country of Residence ⁱ	CA	

Mailing Address of Inventor:

Address 1	2500 University Dr. NW			
Address 2	Elec and Comp Eng Dept. Univ of Calgary, ICT 302			
City	Calgary	State/Province	AB	
Postal Code	T2N 1N4	Country ⁱ	CA	

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

[Add](#)

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
 For further information see 37 CFR 1.33(a).

☐ An Address is being provided for the correspondence information of this application.

Customer Number	46093		
Email Address	kevin.pillay@moffatco.com	Add Email	Remove Email

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	4207-130-CNT
		Application Number	
Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NONLINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP		

Application Information:

Title of the Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NONLINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP		
Attorney Docket Number	4207-130-CNT	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	6	Suggested Figure for Publication (if any)	1

Filing By Reference :

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐ Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.			
Please Select One:	☒ Customer Number	☐ U.S. Patent Practitioner	☐ Limited Recognition (37 CFR 1.119)
Customer Number	46093		

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	4207-130-CNT
		Application Number	
Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NONLINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the application number blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	14467642	2014-08-25
Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14467642	Continuation of	13274290	2011-10-14

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)¹ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove			
Application Number	Country ¹	Filing Date (YYYY-MM-DD)	Access Code (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	4207-130-CNT
		Application Number	
Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NONLINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP		

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.
--

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application. In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application. In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.
--

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.
--

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4207-130-CNT
	Application Number	
Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NONLINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP	

Applicant 1				
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.				
Clear				
☒ Assignee		☐ Legal Representative under 35 U.S.C. 117		☐ Joint Inventor
☐ Person to whom the inventor is obligated to assign.		☐ Person who shows sufficient proprietary interest		
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:				
Name of the Deceased or Legally Incapacitated Inventor:				
If the Applicant is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
	Fadhel	M.	GHANNOUCHI	
Mailing Address Information For Applicant:				
Address 1		c/o University of Calgary, 2500 University Dr. N.W		
Address 2		Electrical and Computer Engineering Dpt. ICT 302		
City		Calgary	State/Province	AB
Country	CA	Postal Code		T2N 1N4
Phone Number		Fax Number		
Email Address				
Additional Applicant Data may be generated within this form by selecting the Add button.				

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.
Assignee 1
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number		4207-130-CNT	
		Application Number			
Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NONLINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐					
Prefix	Given Name	Middle Name	Family Name	Suffix	
Mailing Address Information For Assignee including Non-Applicant Assignee:					
Address 1					
Address 2					
City		State/Province			
Country ⁱ	Postal Code				
Phone Number		Fax Number			
Email Address					
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.					

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.					
Signature	/KEVIN PILLAY/			Date (YYYY-MM-DD)	2017-05-01
First Name	Kevin	Last Name	Pillay	Registration Number	41559
Additional Signature may be generated within this form by selecting the Add button.					

This collection of information is required by 37 CFR 1.76. 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 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:

Filing Date:

Title of Invention:

DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR
SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP

First Named Inventor/Applicant Name:

Fadhel M Ghannouchi

Filer:

Kevin Pillay

Attorney Docket Number:

4207-130-CNT

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	70	70
UTILITY SEARCH FEE	2111	1	300	300
UTILITY EXAMINATION FEE	2311	1	360	360
Pages:				
Claims:				
Miscellaneous-Filing:				
LATE FILING FEE FOR OATH OR DECLARATION	2051	1	70	70
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				800

Electronic Acknowledgement Receipt

EFS ID:	29080502
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M Ghannouchi
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	01-MAY-2017
Filing Date:	
Time Stamp:	16:04:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 800
RAM confirmation Number	050217INTEFSW16072900
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		4207-130-CNT_2017-05-01_Specification.pdf	475404	yes	12
			ebda2fef60d47dc0f0ad69714e81d4dad9c2e4c3b		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	8	
	Claims		9	11	
	Abstract		12	12	
Warnings:					
Information:					
2	Drawings-only black and white line drawings	Drawings.pdf	296051	no	7
			944d9417ba45a9b12b6dc74df2b4c731145e3497		
Warnings:					
Information:					
3	Application Data Sheet	4207-130-CNT_2017-05-01_ApplicationDataSheet_asfiled.pdf	609744	no	8
			badb6cb443916bb67748a69bcc81c77f3f1646f3		
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
4	Fee Worksheet (SB06)	fee-info.pdf	36700	no	2
			c6bc4c360975b0d3856fe0ef9deeb6aa3b5165d6		
Warnings:					
Information:					
Total Files Size (in bytes):			141 7899		

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.

New Applications Under 35 U.S.C. 111

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.

National Stage of an International Application under 35 U.S.C. 371

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.

New International Application Filed with the USPTO as a Receiving Office

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.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY DOCKET NO	TOT CLAIMS	IND CLAIMS
15/583,343	05/01/2017	2631	800	4207-130-CNT	9	1

CONFIRMATION NO. 7616

FILING RECEIPT



0000000091198450

46093
Kevin Pillay -MOFCO
1200-427 Laurier Ave. W.
Ottawa, ON K1R 7Y2
CANADA

Date Mailed: 05/08/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. 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**

Inventor(s)

Fadhel M. GHANNOUCHI, Calgary, CANADA;
Seyed Aidin BASSAM, Calgary, CANADA;
Mohamed HELAOUI, Calgary, CANADA;
Andrew KWAN, Calgary, CANADA;

Applicant(s)

Fadhel M. GHANNOUCHI, Calgary, CANADA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 14/467,642 08/25/2014 PAT 9641204
which is a CON of 13/274,290 10/14/2011 PAT 8817859

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 05/08/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/583,343**

Projected Publication Date: To Be Determined - pending completion of Corrected Papers

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING
ALGORITHM IN THE FEEDBACK LOOP

Preliminary Class

375

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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 patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and 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

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT

CONFIRMATION NO. 7616

FORMALITIES LETTER



OC00000091196451

46093

Kevin Pillay -MOFCO
1200-427 Laurier Ave. W.
Ottawa, ON K1R 7Y2
CANADA

Date Mailed: 05/08/2017

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Filing Date Granted

An application number and filing date have been accorded to this application. The application is informal since it does not comply with the regulations for the reason(s) indicated below. Applicant is given TWO MONTHS from the date of this Notice within which to correct the informalities indicated below. 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 required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
 - The drawings have a line quality that is too light to be reproduced (weight of all lines and letters must be heavy enough to permit adequate reproduction) or text that is illegible (reference characters, sheet numbers, and view numbers must be plain and legible) see 37 CFR 1.84(l) and (p)(1)); See Figure(s) 7A, 7B.
 - The drawings submitted to the Office are not electronically reproducible because portions of figures 4B are missing and/or blurry.

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
Fadhel M. GHANNOUCHI
Seyed Aidin BASSAM
Mohamed HELAOUI
Andrew KWAN

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice".
<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/ngfissha/

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/583,343	
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	9	minus 20 = *	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	minus 3 = *	x 210 =	0.00	OR		
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
				TOTAL		TOTAL	
* If the difference in column 1 is less than zero, enter "0" in column 2.							
APPLICATION AS AMENDED - PART II							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	Application Size Fee (37 CFR 1.16(s))						OR
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR
				TOTAL ADD'L FEE		TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	Application Size Fee (37 CFR 1.16(s))						OR
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR
				TOTAL ADD'L FEE		TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.							

Replacement Sheet

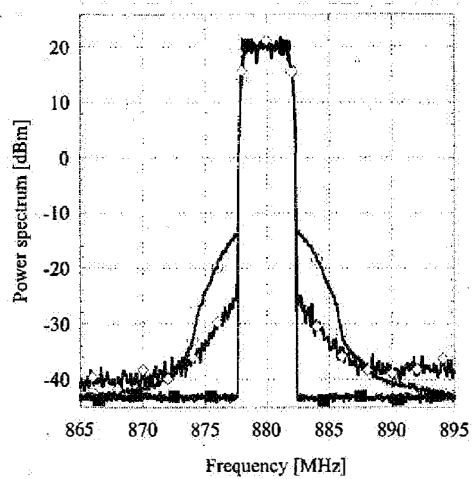


Figure 7A

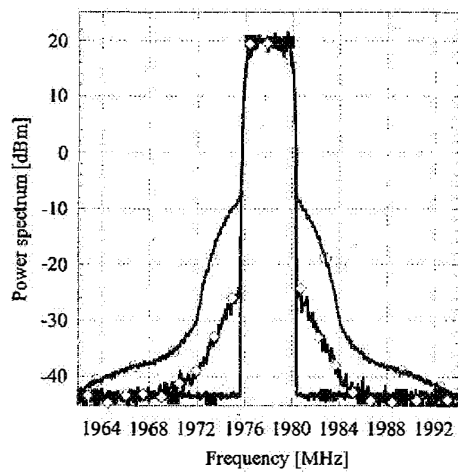


Figure 7B

Electronic Acknowledgement Receipt

EFS ID:	29714580
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	07-JUL-2017
Filing Date:	01-MAY-2017
Time Stamp:	12:12:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Response to Pre-Exam Formalities Notice	4207-130-CNT-Notice-tofile-corrected-papers.pdf	79445	no	2
			a98b6f3ff1a7b39254f7d9914db18d27968f4c80		

Warnings:

Information:					
2	Applicant Response to Pre-Exam Formalities Notice	4207-130-CNT_ResponseToFormalities.pdf	383761	no	3
			5e4bdad778c75d78da6c8923225becf73458325a		
Warnings:					
Information:					
3	Applicant Response to Pre-Exam Formalities Notice	4207-130-CNT_Replacement_FIG_4B.pdf	133100	no	1
			edeef207409a62df9e832264c90d295b3eb3a30		
Warnings:					
Information:					
4	Applicant Response to Pre-Exam Formalities Notice	4207-130-CNT_Replacement_FIG_7A_7B.pdf	151358	no	1
			21e4707d5ccede7aeb1d4bb2009ba73e21409f5		
Warnings:					
Information:					
Total Files Size (in bytes):			747664		
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.					



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT

CONFIRMATION NO. 7616

FORMALITIES LETTER



OC000000091196451

46093

Kevin Pillay -MOFCO
1200-427 Laurier Ave. W.
Ottawa, ON K1R 7Y2
CANADA

Date Mailed: 05/08/2017

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Filing Date Granted

An application number and filing date have been accorded to this application. The application is informal since it does not comply with the regulations for the reason(s) indicated below. Applicant is given TWO MONTHS from the date of this Notice within which to correct the informalities indicated below. 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 required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
 - The drawings have a line quality that is too light to be reproduced (weight of all lines and letters must be heavy enough to permit adequate reproduction) or text that is illegible (reference characters, sheet numbers, and view numbers must be plain and legible) see 37 CFR 1.84(l) and (p)(1)); See Figure(s) 7A, 7B.
 - The drawings submitted to the Office are not electronically reproducible because portions of figures 4B are missing and/or blurry.

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
Fadhel M. GHANNOUCHI
Seyed Aidin BASSAM
Mohamed HELAOUI
Andrew KWAN

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice".
<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/ngfissha/

Replacement Sheet

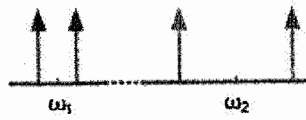


Figure 4A

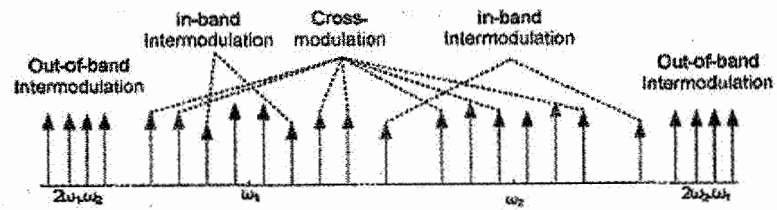


Figure 4B

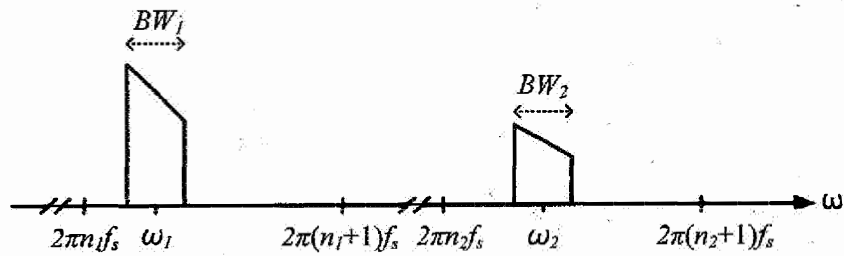


Figure 5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Fadhel Ghannouchi et al

Assignee:

Title: DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH
 NONLINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK
 LOOP

Serial No.: 15/583,343

Filing Date: 05/01/2017

Examiner:

Group Art Unit:

Docket No.: 4207-130-CNT

Customer No.: 46093

July 7, 2017

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Dear Sir:

This is in response to the Notice dated 05/08/2015. Please consider the following:

Amendments to the Drawings begin on page 2;

Remarks begin on page 3.

Amendments to the Drawings:

Please replace the drawing sheets containing Figures 4A,4B,5 and Figures 7A,7B with corresponding new drawing sheets, each labelled, "Replacement sheet" and submitted herewith. The replacement sheets are to correct blurry lines and reference characters. No new matter has been added.

REMARKS

Applicant provides herewith two (2) sheets of replacement figures containing Figure 1, 2 and 3 to be substituted for the corresponding drawing sheets on file.

Respectfully submitted,

/Kevin Pillay/

Kevin Pillay
Registration No. 41559
Agent of Record

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/583,343			
APPLICATION AS FILED - PART I									
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY			
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)		
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A			
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A			
TOTAL CLAIMS (37 CFR 1.16(i))	9	minus 20 = *	x 40 =	0.00	OR				
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	minus 3 = *	x 210 =	0.00	OR				
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00					
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00					
			TOTAL	730		TOTAL			
* If the difference in column 1 is less than zero, enter "0" in column 2.									
APPLICATION AS AMENDED - PART II									
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	RATE(\$)	ADDITIONAL FEE(\$)		
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	x =	=		
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	x =	=		
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
			TOTAL ADD'L FEE		TOTAL ADD'L FEE				
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	RATE(\$)	ADDITIONAL FEE(\$)		
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	x =	=		
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	x =	=		
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
			TOTAL ADD'L FEE		TOTAL ADD'L FEE				
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.									



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT

CONFIRMATION NO. 7616

FORMALITIES LETTER



OC000000092676556

46093

Kevin Pillay -MOFCO
1200-427 Laurier Ave. W.
Ottawa, ON K1R 7Y2
CANADA

Date Mailed: 07/11/2017

NOTICE OF INCOMPLETE REPLY (NONPROVISIONAL)

Filing Date Granted

The U.S. Patent and Trademark Office has received your reply on 07/07/2017 to the Notice to File Missing Parts (Notice) mailed 05/08/2017 and it has been entered into the nonprovisional application. The reply, however, does not include the following items required in the Notice. A complete reply must be timely filed to prevent ABANDONMENT of the above-identified application. Replies should be mailed to: Mail Stop Missing Parts, Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450.

Applicant is given **TWO MONTHS** from the date of the Notice to File Missing Parts (Notice) mailed 05/08/2017 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).

Items Required to Avoid Abandonment:

The required items noted below SHOULD be filed along with any items required above. The filing date of this nonprovisional application will be the date of receipt of the items required above.

The application is informal since it does not comply with the regulations for the reason(s) indicated below.

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

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
 - The drawings have a line quality that is too light to be reproduced (weight of all lines and letters must be heavy enough to permit adequate reproduction) or text that is illegible (reference characters, sheet numbers, and view numbers must be plain and legible) see 37 CFR 1.84(l) and (p)(1)); See Figure(s) 7A, 7B.
 - The drawings submitted to the Office are not electronically reproducible because portions of figures 4B are missing and/or blurry.

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's

oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):

Fadhel M. GHANNOUCHI
Seyed Aidin BASSAM
Mohamed HELAOUI
Andrew KWAN

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice".
<https://portal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/s/ dtinh/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Fadhel Ghannouchi et al

Assignee:

Title: DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH
 NONLINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK
 LOOP

Serial No.: 15/583,343

Filing Date: 05/01/2017

Examiner:

Group Art Unit:

Docket No.: 4207-130-CNT

Customer No.: 46093

September 7, 2017

RESPONSE TO NOTICE OF INCOMPLETE REPLY

Dear Sir:

This is in response to the Notice dated 07/11/2017. Please consider the following:

Amendments to the Drawings begin on page 2;

Remarks begin on page 3.

Amendments to the Drawings:

Please replace the drawing sheets containing Figures 4A,4B,5 and Figures 7A,7B with corresponding new drawing sheets, each labelled, "Replacement sheet" and submitted herewith. The replacement sheets are to correct blurry lines and characters. No new matter has been added.

REMARKS

Applicant provides herewith two (2) sheets of replacement figures containing Figures 4A, 4B, 5 and 7A,7B to be substituted for the corresponding drawing sheets on file.

Respectfully submitted,

/Kevin Pillay/

Kevin Pillay
Registration No. 41559
Agent of Record



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT

CONFIRMATION NO. 7616

FORMALITIES LETTER



OC000000092676556

46093

Kevin Pillay -MOFCO
1200-427 Laurier Ave. W.
Ottawa, ON K1R 7Y2
CANADA

Date Mailed: 07/11/2017

NOTICE OF INCOMPLETE REPLY (NONPROVISIONAL)

Filing Date Granted

The U.S. Patent and Trademark Office has received your reply on 07/07/2017 to the Notice to File Missing Parts (Notice) mailed 05/08/2017 and it has been entered into the nonprovisional application. The reply, however, does not include the following items required in the Notice. A complete reply must be timely filed to prevent ABANDONMENT of the above-identified application. Replies should be mailed to: Mail Stop Missing Parts, Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450.

Applicant is given **TWO MONTHS** from the date of the Notice to File Missing Parts (Notice) mailed 05/08/2017 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).

Items Required to Avoid Abandonment:

The required items noted below SHOULD be filed along with any items required above. The filing date of this nonprovisional application will be the date of receipt of the items required above.

The application is informal since it does not comply with the regulations for the reason(s) indicated below.

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

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
 - The drawings have a line quality that is too light to be reproduced (weight of all lines and letters must be heavy enough to permit adequate reproduction) or text that is illegible (reference characters, sheet numbers, and view numbers must be plain and legible) see 37 CFR 1.84(l) and (p)(1)); See Figure(s) 7A, 7B.
 - The drawings submitted to the Office are not electronically reproducible because portions of figures 4B are missing and/or blurry.

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's

oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):

Fadhel M. GHANNOUCHI
Seyed Aidin BASSAM
Mohamed HELAOUI
Andrew KWAN

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice".
<https://portal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/s/ dtinh/

Electronic Patent Application Fee Transmittal

Application Number:	15583343			
Filing Date:	01-May-2017			
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP			
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI			
Filer:	Kevin Pillay			
Attorney Docket Number:	4207-130-CNT			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
LATE FILING FEE FOR OATH OR DECLARATION	2051	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Extension - 2 months with \$0 paid	2252	1	300	300
Miscellaneous:				
Total in USD (\$)				370

Electronic Acknowledgement Receipt

EFS ID:	30292644
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	07-SEP-2017
Filing Date:	01-MAY-2017
Time Stamp:	11:13:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 370
RAM confirmation Number	090717INTEFSW11161200
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Response to Pre-Exam Formalities Notice	4207-130-CNT_ResponseToFormalities_09_07_2017.pdf	383892	no	3
			27fa4205a267cbd2284229ee1d0109f728deb199		
Warnings:					
Information:					
2	Applicant Response to Pre-Exam Formalities Notice	4207-130-CNT-Replacement_Drawings_09_07_2017.pdf	319720	no	2
			f30df68fe9a2e39ede718c5eb6e44cb39fa7996e		
Warnings:					
Information:					
3	Applicant Response to Pre-Exam Formalities Notice	4207-130-CNT-Notice-of-incomplete-reply.pdf	92947	no	2
			94db996ae781507988ce3e7f0e93ab9f63ab291c		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	32094	no	2
			1847da8c4319b90a0a02326eb58fd54336bb45096		
Warnings:					
Information:					
Total Files Size (in bytes):			828653		

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.

New Applications Under 35 U.S.C. 111

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.

National Stage of an International Application under 35 U.S.C. 371

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.

New International Application Filed with the USPTO as a Receiving Office

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.

Document code: WFEE

United States Patent and Trademark Office
Sales Receipt for Accounting Date: 09/08/2017

VVAN11	SALE	#00000027	Mailroom Dt: 09/07/2017	15583343
		01 FC : 2622	70.00 OP	

Document code: WFEE

United States Patent and Trademark Office
Sales Receipt for Accounting Date: 09/08/2017

VVAN11	ADJ #00000005	Mailroom Dt: 09/07/2017	
	Seq No: 12744	Sales Acctg Dt: 09/07/2017	15583343
	01 FC : 2051	-70.00 OP	

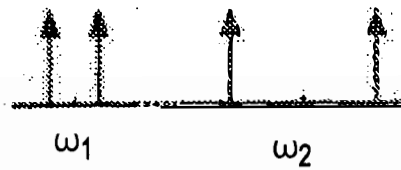


Figure 4A

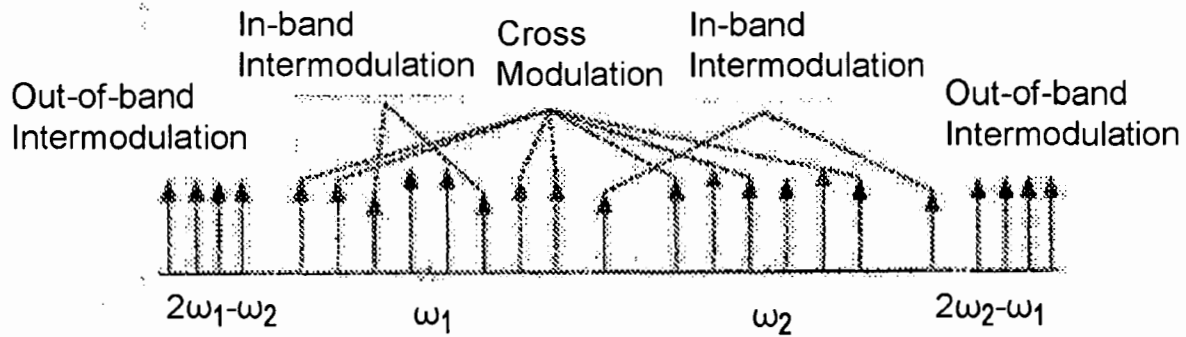


Figure 4B

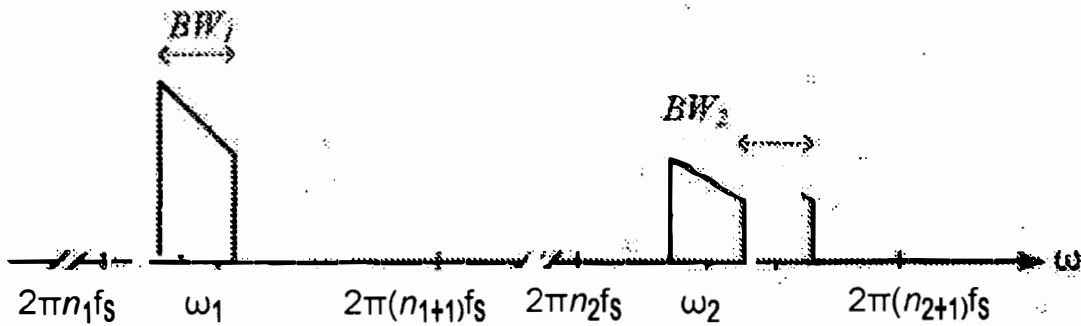


Figure 5

Replacement Sheet

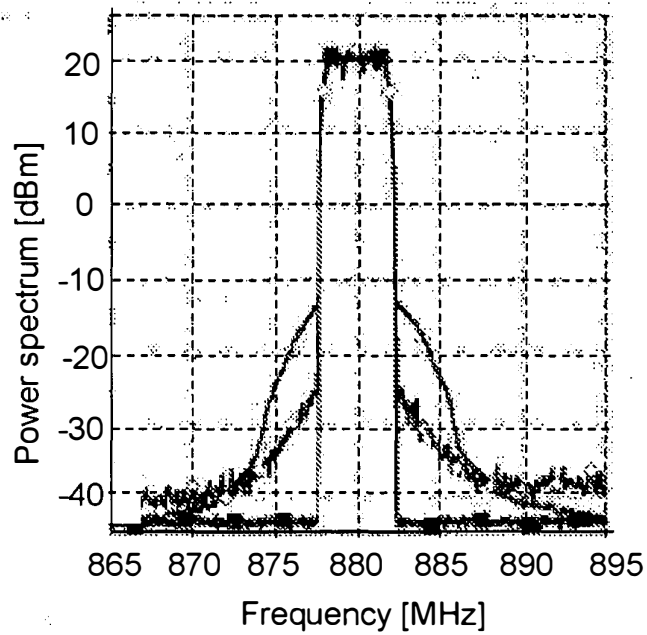


Figure 7A

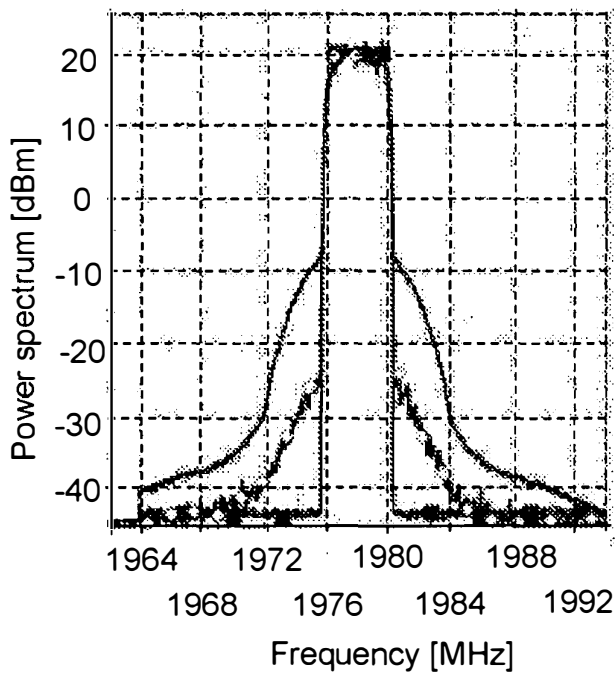


Figure 7B

Document code: WFEE

United States Patent and Trademark Office
Sales Receipt for Accounting Date: 11/14/2017

MTEKLEMI	ADJ #00000023	Mailroom Dt: 09/07/2017	
	Seq No: 27	Sales Acctg Dt: 09/08/2017	15583343
	01 FC : 2622	-70.00 OP	



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/583,343	05/01/2017	Fadel M. GHANNOUCHI	4207-130-CNT

CONFIRMATION NO. 7616

WITHDRAWAL NOTICE



46093
Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ON K1N 8J6
CANADA

Date Mailed: 09/12/2017

Letter Regarding a New Notice and/or the Status of the Application

If a new notice or Filing Receipt is enclosed, applicant may disregard the previous notice mailed on 07/11/2017. The time period for reply runs from the mail date of the new notice. Within the time period for reply, applicant is required to file a reply in compliance with the requirements set forth in the new notice to avoid abandonment of the application.

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at <http://www.uspto.gov/ebc>.

If the reply is not filed electronically via EFS-Web, the reply must be accompanied by a copy of the new notice.

If the Office previously granted a petition to withdraw the holding of abandonment or a petition to revive under 37 CFR 1.137, the status of the application has been returned to pending status.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/ebekele/

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/583,343	
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	9	minus 20 = *	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	minus 3 = *	x 210 =	0.00	OR		
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
			TOTAL	730		TOTAL	
* If the difference in column 1 is less than zero, enter "0" in column 2.							
APPLICATION AS AMENDED - PART II							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR	x =
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR	x =
	Application Size Fee (37 CFR 1.16(s))					OR	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR	
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR	x =
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR	x =
	Application Size Fee (37 CFR 1.16(s))					OR	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR	
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.							



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
15/583,343	05/01/2017	2631	870	4207-130-CNT	9	1

CONFIRMATION NO. 7616

FILING RECEIPT



0000000093974839

46093
Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ON K1N 8J6
CANADA

Date Mailed: 09/12/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. 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**

Inventor(s)

Fadhel M. GHANNOUCHI, Calgary, CANADA;
Seyed Aidin BASSAM, Calgary, CANADA;
Mohamed HELAOUI, Calgary, CANADA;
Andrew KWAN, Calgary, CANADA;

Applicant(s)

Fadhel M. GHANNOUCHI, Calgary, CANADA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 14/467,642 08/25/2014 PAT 9641204
which is a CON of 13/274,290 10/14/2011 PAT 8817859

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 05/08/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/583,343**

Projected Publication Date: To Be Determined - pending completion of Corrected Papers

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING
ALGORITHM IN THE FEEDBACK LOOP

Preliminary Class

375

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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 patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and 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

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT

CONFIRMATION NO. 7616

FORMALITIES LETTER



46093
Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ON K1N 8J6
CANADA

Date Mailed: 09/12/2017

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Filing Date Granted

An application number and filing date have been accorded to this application. The application is informal since it does not comply with the regulations for the reason(s) indicated below. Applicant is given TWO MONTHS from the date of this Notice within which to correct the informalities indicated below. 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 required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
 - The drawings must be reasonably free from erasures and must be free from alterations, overwriting, interlineations, folds, and copy marks. See Figure(s) 4B.

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

SUMMARY OF FEES DUE:

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. Small entity discount is in effect. If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- \$(70) previous unapplied payment amount.
- **\$ -70 TOTAL FEE BALANCE DUE.**

(A previous payment of \$ 70 will be applied to the additional fees indicated above.)

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
Fadhel M. GHANNOUCHI

Seyed Aidin BASSAM
Mohamed HELAOUI
Andrew KWAN

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice".
<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/ebekele/



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/583,343	05/01/2017	Fadel M. GHANNOUCHI	4207-130-CNT

CONFIRMATION NO. 7616

WITHDRAWAL NOTICE



46093
Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ON K1N 8J6
CANADA

Date Mailed: 09/12/2017

Letter Regarding a New Notice and/or the Status of the Application

If a new notice or Filing Receipt is enclosed, applicant may disregard the previous notice mailed on 05/08/2017. The time period for reply runs from the mail date of the new notice. Within the time period for reply, applicant is required to file a reply in compliance with the requirements set forth in the new notice to avoid abandonment of the application.

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at <http://www.uspto.gov/ebc>.

If the reply is not filed electronically via EFS-Web, the reply must be accompanied by a copy of the new notice.

If the Office previously granted a petition to withdraw the holding of abandonment or a petition to revive under 37 CFR 1.137, the status of the application has been returned to pending status.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/ebekele/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Fadhel Ghannouchi et al

Assignee:

Title: DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH
NONLINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK
LOOP

Serial No.: 15/583,343

Filing Date: 05/01/2017

Examiner:

Group Art Unit:

Docket No.: 4207-130-CNT

Customer No.: 46093

November 10, 2017

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Dear Sir:

This is in response to the Notice mailed **09/12/2017**. Please consider the following:

Amendments to the Drawings begin on page 2;

Remarks begin on page 3.

Amendments to the Drawings:

Please replace the drawing sheets containing Figures 4A,4B,5 with corresponding new drawing sheet, labelled, “Replacement sheet” and submitted herewith. The replacement sheet is to remove copy marks. No new matter has been added.

REMARKS

Applicant provides herewith one (1) sheet of replacement figures containing Figures 4A, 4B, 5 to be substituted for the corresponding drawing sheet on file. No fee payment is submitted herewith as a previous unapplied fee payment is to be applied to the fees required as indicated in the Notice.

Respectfully submitted,

/Kevin Pillay/

Kevin Pillay
Registration No. 41559
Agent of Record

Replacement Sheet

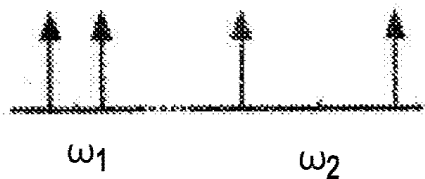


Figure 4A

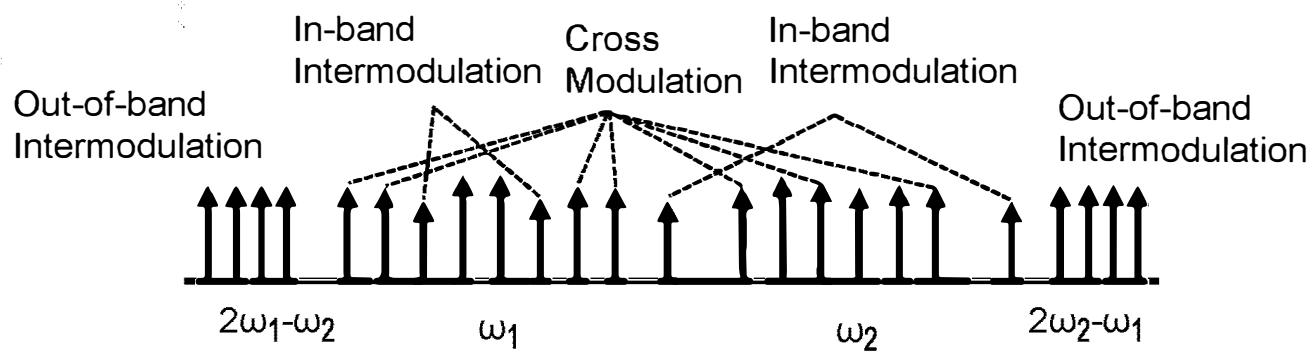


Figure 4B

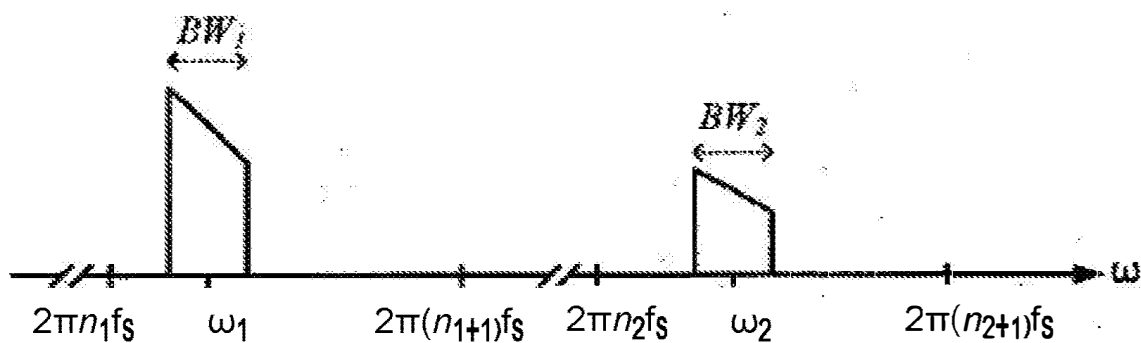


Figure 5

Electronic Patent Application Fee Transmittal

Application Number:	15583343			
Filing Date:	01-May-2017			
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP			
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI			
Filer:	Kevin Pillay			
Attorney Docket Number:	4207-130-CNT			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
LATE FILING FEE FOR OATH OR DECLARATION	2051	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				70

Electronic Acknowledgement Receipt

EFS ID:	30919092
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	10-NOV-2017
Filing Date:	01-MAY-2017
Time Stamp:	16:09:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Response to Pre-Exam Formalities Notice	4207-130-CNT_ResponseToNoticeCorrectedPapers_10_10_2017.pdf	387836 f1b3db8cdcb97c81c69d86f18b5d426936694e8f	no	3

Warnings:

Information:					
2	Applicant Response to Pre-Exam Formalities Notice	Replacement_Drawings_fig4.pdf	304111	no	1
			dd4e6d2b680d957973a5c0326fd01e0659dc2345		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30010	no	2
			5f95c9045427f256b8ca3a4243a919ebd8af8af5		
Warnings:					
Information:					
Total Files Size (in bytes):			721957		
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.					

Document code: WFEE

United States Patent and Trademark Office
Sales Receipt for Accounting Date: 11/14/2017

MTEKLEMI RF #30204983 Mailroom Dt: 11/14/2017 15583343

Credit Card Refund Total: \$70.00

Visa XXXXXXXXXXXXX2765



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT

CONFIRMATION NO. 7616

INFORMAL NOTICE



46093
Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ON K1N 8J6
CANADA

Date Mailed: 11/16/2017

INFORMATIONAL NOTICE TO APPLICANT

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):

Fadhel M. GHANNOUCHI

Sayed Aidin BASSAM

Mohamed HELAOUI

Andrew KWAN

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/mabebe/



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY DOCKET NO	TOT CLAIMS	IND CLAIMS
15/583,343	05/01/2017	2631	800	4207-130-CNT	9	1

CONFIRMATION NO. 7616

UPDATED FILING RECEIPT



0000000093430646

46093
Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ON K1N 8J6
CANADA

Date Mailed: 11/16/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. 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**

Inventor(s)

Fadhel M. GHANNOUCHI, Calgary, CANADA;
Seyed Aidin BASSAM, Calgary, CANADA;
Mohamed HELAOUI, Calgary, CANADA;
Andrew KWAN, Calgary, CANADA;

Applicant(s)

Fadhel M. GHANNOUCHI, Calgary, CANADA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 14/467,642 08/25/2014 PAT 9641204
which is a CON of 13/274,290 10/14/2011 PAT 8817859

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 05/08/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/583,343**

Projected Publication Date: 02/22/2018

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING
ALGORITHM IN THE FEEDBACK LOOP

Preliminary Class

375

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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 patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and 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

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/583,343	
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	9	minus 20 = *	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	minus 3 = *	x 210 =	0.00	OR		
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
			TOTAL	730		TOTAL	
* If the difference in column 1 is less than zero, enter "0" in column 2.							
APPLICATION AS AMENDED - PART II							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	Application Size Fee (37 CFR 1.16(s))						OR
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	Application Size Fee (37 CFR 1.16(s))						OR
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.							



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT	7616

46093	7500	01/16/2018
Kevin Pillay - NUA-IP 503-85 Range Road Ottawa, ON K1N 8J6 CANADA		

EXAMINER	
JOSEPH, JAISON	

ART UNIT	PAPER NUMBER
2633	

NOTIFICATION DATE	DELIVERY MODE
01/16/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

kpillay.ot@gmail.com
kpillay@nuaipservices.com

Office Action Summary	Application No. 15/583,343	Applicant(s) GHANNOUCHI ET AL.	
	Examiner JAISON JOSEPH	Art Unit 2633	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 5/1/2017.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-9 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-9 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☐ All b) ☐ Some** c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ____.
- 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 4) ☐ Other: ____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 – 6 are rejected under pre-AIA 35 U.S.C. 102b as being anticipated by Suzuki et al (US 2005/0168283).

Regarding claim 1, Suzuki et al teach a concurrent multi-band linearized transmitter comprising: a concurrent digital multi-band predistortion block (see figure 6, component 100); a concurrent multi-band linearized transmitter connected to said concurrent digital multi-band predistortion block (see figure 6).

Regarding claim 2, which inherits the limitations of claim 1, Suzuki et al further teach wherein said concurrent digital multi-band predistortion block further comprises: a plurality of digital baseband signal predistorter blocks (see figure 6, component 100); an analyzing and modeling stage (see figure 6, component 31)); and a signal observation feedback loop (see figure 6, feedback loop).

Regarding claim 3, which inherits the limitations of claim 2, Suzuki et al further teach wherein said plurality of digital baseband signal predistorter blocks further comprises: a plurality of inputs (see figure 6), each input corresponding to a single

frequency channel (see figure 6); a plurality of outputs, each output corresponding to a single frequency channel, and each output connect to an input of said concurrent multi-band transmitter (see figure 6).

Regarding claim 4, which inherits the limitations of claim 2, Suzuki et al further teach wherein said analyzing and modeling stage further comprises: a plurality of outputs connected to and updating the parameters of said digital baseband signal predistorter block (see figure 6, component 31); and a plurality of inputs connected to both (a) said outputs of said signal observation feedback loop (see figure 6), and (b) to said outputs of said digital baseband signal predistorter blocks (see figure 6).

Regarding claim 5, which inherits the limitations of claim 2, Suzuki et al further teach wherein said analyzing and modeling stage is further adapted to: perform time alignment of the complex baseband signals from sampling said outputs of said concurrent multi-band transmitter (see figure 6); and perform the reconstruction of the complex baseband signals from sampling said outputs of the said concurrent multi-band transmitter (see figure 6).

Regarding claim 6, which inherits the limitations of claim 2, Suzuki et al further teach wherein said signal observation feedback loop is further adapted to: down-convert samples of the RF signals at said output of the concurrent multi-band transmitter of claim 1; and extract from said down-converted samples a baseband equivalent for all frequency channels (see figure 6 and paragraph 0028).

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 – 9 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Fuller (US 8,391,809).

Regarding claim 1, Fuller teaches a concurrent multi-band linearized transmitter (see figure 1 and 2) comprising: a concurrent digital multi-band predistortion block (see figure 1, component 101); a concurrent multi-band linearized transmitter connected to said concurrent digital multiband predistortion block (see figure 1).

Regarding claim 2, which inherits the limitations of claim 1, Fuller further teaches wherein said concurrent digital multi-band predistortion block (see figure 1 and 2) further comprises: a plurality of digital baseband signal predistorter blocks (see figure 1, components 102 – 106); an analyzing and modelling stage (see figure 1, component 108); and a signal observation feedback loop (see figure 1, Component 105, 108).

Regarding claim 3, which inherits the limitations of claim 2, Fuller further teaches wherein said plurality of digital baseband signal predistorter blocks (see figure 1) further comprises: a plurality of inputs, each input corresponding to a single frequency channel (see figure 1, plurality of inputs); a plurality of outputs, each output corresponding to a

single frequency channel, and each output connected to an input of said concurrent multi-band transmitter (see plurality of outputs $Y_1(n) \dots Y_m(n)$).

Regarding claim 4, which inherits the limitations of claim 2, Fuller further teaches wherein said analyzing and modeling stage further comprises: a plurality of outputs connected to and updating the parameters of said digital baseband signal predistorter block (see component 108 outputting plurality of coefficients and component 208 in figure 2); a plurality of inputs connected to both (a) said outputs of said signal observation feedback loop, and (b) to said outputs of said digital baseband signal predistorter blocks (see figure 1 and 2).

Regarding claim 5, which inherits the limitations of claim 2, Fuller further teaches wherein said analyzing and modeling stage (see figure 2) is further adapted to: perform time alignment of complex baseband signals from sampling said outputs of said concurrent multi-band transmitter (see figure 2, component 242); and perform the reconstruction of the complex baseband signals from sampling said outputs of said concurrent multi-band transmitter (see figure 2).

Regarding claim 6, which inherits the limitations of claim 2, Fuller further teaches wherein said signal observation feedback loop further is further adapted to: down-convert samples of the RF signals at said output of the concurrent multi-band transmitter of claim 1 (see figure 2, component 230, or figure 1, component 130); and extract from said down-converted samples a baseband equivalent for all frequency channels (see figure 1 and 2).

Regarding claim 7, which inherits the limitations of claim 2, Fuller further teaches wherein said signal observation feedback loop further comprises for each channel an RF filter (see figure 2, component 246); A signal down conversion block (see figure 2, component 230, or figure 1, component 130); and an analog-to-digital converter (ADC) (see figure 2, component 244).

Regarding claim 8, which inherits the limitations of claim 2, Fuller further teaches wherein said signal observation feedback loop further comprises: a single subsampling-based receiver to down-convert samples output from a concurrent multi-band transmitter (see figure 2, component 244).

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7 – 9 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Suzuki et al (US 2005/0168283).

Regarding claim 7, Suzuki et al does not expressly teach a single down conversion block. However using single down conversion block is within the scope of one of ordinary skilled in the art.

Regarding claim 8 and 9, Suzuki et al does not expressly teach a single subsampling receiver. However using single subsampling receiver is within the scope of one of ordinary skilled in the art.

Claim 9 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Fuller (US 8,391,809).

Regarding claim 9, which inherits the limitations of claim 2, Fuller et al further teaches wherein said single subsampling-based receiver further comprises: an RF filter (see figure 2, component 246); and an analog-to-digital converter (ADC) (see figure 2, component 244). Fuller is silent on a track and hold (T&H) block. However using a track and hold (T&H) block is within the scope of one of ordinary skilled in the art. At the time the invention was made, it would be obvious to an ordinary skilled in the art to a track and hold (T&H) block in Fullers predistortion system. Applicant has not disclosed that a track and hold (T&H) block provides an advantage, is used for a particular purpose, or solves a stated problem. Therefore it would be obvious to an ordinary skilled in the art to modify Fuller to obtain the inventions as specified in claim 9.

Conclusion

Examiner's Note: Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicants. Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages and figures may apply as

well. It is respectfully requested from the applicants in preparing responses, to fully consider the references in their entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner.

In the case of amending the claimed invention, Applicant is respectfully requested to indicate the portion(s) of the specification which dictate(s) the structure relied on for proper interpretation and also to verify and ascertain the meets and bounds of the claimed invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAISON JOSEPH whose telephone number is (571)272-6041. The examiner can normally be reached on M-F 9:00 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sam K. Ahn can be reached on (571) 272-3044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Application/Control Number: 15/583,343

Page 9

Art Unit: 2633

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jaison Joseph/
Primary Examiner, Art Unit 2633

Notice of References Cited	Application/Control No. 15/583,343		Applicant(s)/Patent Under Reexamination GHANNOUCHI ET AL.	
	Examiner JAISON JOSEPH		Art Unit 2633	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2005/0162225 A1	07-2005	Suzuki, Yasunori	H03F1/3241	330/149
*	B	US-2005/0168283 A1	08-2005	Suzuki, Yasunori	H03F1/3241	330/149
*	C	US-2006/0276147 A1	12-2006	Suzuki; Yasunori	H03F1/3258	455/114.3
*	D	US-2011/0156815 A1	06-2011	Kim; Wan Jong	H03F1/304	330/149
*	E	US-2012/0069880 A1	03-2012	Lemson; Paul	H04B1/18	375/220
*	F	US-2012/0069931 A1	03-2012	Gandhi; Hardik P.	H03F1/3247	375/296
*	G	US-2012/0154038 A1	06-2012	Kim; Wan Jong	H03F1/3247	330/149
*	H	US-8,294,516 B2	10-2012	Young; Christopher	H03F1/3247	330/149
*	I	US-8,380,144 B1	02-2013	Bai; Chunlong	H03F1/3247	375/296
*	J	US-2013/0064325 A1	03-2013	KILAMBI; Sai Mohan	H03F1/3247	375/297
*	K	US-8,391,809 B1	03-2013	Fuller; Arthur Thomas Gerald	H04B1/0475	455/114.3
*	L	US-8,606,197 B2	12-2013	Bai; Chunlong	H03F1/3252	375/296
*	M	US-2015/0049841 A1	02-2015	Laporte; Pierre-Andre	H03F1/3247	375/297

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 7616

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
15/583,343	05/01/2017	375	2633	4207-130-CNT		
APPLICANTS Fadhel M. GHANNOUCHI, Calgary, CANADA; INVENTORS Fadhel M. GHANNOUCHI, Calgary, CANADA; Seyed Aidin BASSAM, Calgary, CANADA; Mohamed HELAOUI, Calgary, CANADA; Andrew KWAN, Calgary, CANADA; ** CONTINUING DATA ***** This application is a CON of 14/467,642 08/25/2014 PAT 9641204 which is a CON of 13/274,290 10/14/2011 PAT 8817859 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** * SMALL ENTITY ** 05/08/2017						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and Acknowledged /JAISON JOSEPH/ Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY CANADA	SHEETS DRAWINGS 7	TOTAL CLAIMS 9	INDEPENDENT CLAIMS 1
ADDRESS Kevin Pillay - NUA-IP 503-85 Range Road Ottawa, ON K1N 8J6 CANADA						
TITLE DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP						
FILING FEE RECEIVED 800	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

<i>Index of Claims</i> 	Application/Control No. 15583343	Applicant(s)/Patent Under Reexamination GHANNOUCHI ET AL.
	Examiner JAISON JOSEPH	Art Unit 2633

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	01/07/2018								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								

EAST Search History**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:21
S2	2487665	multi adj2band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:22
S3	15	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:22
S5	26	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/29 09:25
S6	87	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/01/24 18:08
S7	8	("6549067" "6999523" "7142615" "7170344" "7183847" "7634238" "8294516").PN. OR ("8391809").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2014/01/26 16:36
S8	28	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S9	54	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S10	88	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S11	4	"20090126213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/14 09:36

S12	3	"20090169213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/14: 09:36
S13	0	14/467642	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15: 12:36
S14	46	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15: 12:36
S15	122	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15: 12:36
S16	46	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15: 12:36
S17	8	"20090126213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15: 12:36
S18	82	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15: 12:36
S19	2	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15: 12:36
S20	5	("20050162225" "20050168283" "20060276147" "7183847" "8391809") .PN.OR ("8817859").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/15: 12:37
S21	136	multi near2 band with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10: 15:44
S22	66	concurrent with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10: 16:03
S23	63	dual near2 band with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10: 16:04

EAST Search History

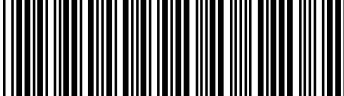
S24	3	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10: 16:13
S25	1	14/467642	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/12: 22:58
S26	18	subsampling same multi near2 band	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/12: 23:23

EAST Search History (Interference)

< This search history is empty >

1/ 7/ 2018 12:53:10 AM

C:\ Users\ jjoseph1\ Documents\ EAST\ Workspaces\ 15583343.wsp

Search Notes 	Application/Control No. 15583343	Applicant(s)/Patent Under Reexamination GHANNOUCHI ET AL.
	Examiner JAISON JOSEPH	Art Unit 2633

CPC- SEARCHED		
Symbol	Date	Examiner
H03F3/189 H04L25/03	1/7/2018	JJ

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Name Search	1/7/2018	JJ
East	1/7/2018	JJ

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

--	--



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/583,343	05/01/2017	Fadel M. GHANNOUCHI	4207-130-CNT

CONFIRMATION NO. 7616

PUBLICATION NOTICE



OC000000097577254

46093
Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ON K1N 8J6
CANADA

Title: DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP

Publication No. US-2018-0054225-A1

Publication Date: 02/22/2018

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/PublicPair>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT	7616

46093	7500	09/06/2018
Kevin Pillay - NUA-IP 503-85 Range Road Ottawa, ON K1N 8J6 CANADA		

EXAMINER	
JOSEPH, JAISON	

ART UNIT	PAPER NUMBER
2633	

NOTIFICATION DATE	DELIVERY MODE
09/06/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

kpillay.ot@gmail.com
kpillay@nuaipservices.com

Notice of Abandonment	Application No.	Applicant(s)
	15/583,343	GHANNOUCHI ET AL.
	Examiner	Art Unit
	JAISON JOSEPH	2633

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

This application is abandoned in view of:

1. ☒ Applicant's failure to timely file a proper reply to the Office letter mailed on 16 January 2018.
 - (a) ☐ A reply was received on _____ (with a Certificate of Mailing or Transmission dated _____), which is after the expiration of the period for reply (including a total extension of time of _____ month(s)) which expired on _____.
 - (b) ☐ A proposed reply was received on _____, but it does not constitute a proper reply under 37 CFR 1.113 to the final rejection. (A proper reply under 37 CFR 1.113 to a final rejection consists only of: (1) a timely filed amendment which places the application in condition for allowance; (2) a timely filed Notice of Appeal (with appeal fee); or (3) if this is utility or plant application, a timely filed Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. Note that RCEs are not permitted in design applications.)
 - (c) ☐ A reply was received on _____ but it does not constitute a proper reply, or a bona fide attempt at a proper reply, to the non-final rejection. See 37 CFR 1.85(a) and 1.111. (See explanation in box 7 below).
 - (d) ☒ No reply has been received.
2. ☐ Applicant's failure to timely pay the required issue fee and publication fee, if applicable, within the statutory period of three months from the mailing date of the Notice of Allowance (PTOL-85).
 - (a) ☐ The issue fee and publication fee, if applicable, was received on _____ (with a Certificate of Mailing or Transmission dated _____), which is after the expiration of the statutory period for payment of the issue fee (and publication fee) set in the Notice of Allowance (PTOL-85).
 - (b) ☐ The submitted fee of \$_____ is insufficient. A balance of \$_____ is due.
The issue fee required by 37 CFR 1.18 is \$_____. The publication fee, if required by 37 CFR 1.18(d), is \$_____.
 - (c) ☐ The issue fee and publication fee, if applicable, has not been received.
3. ☐ Applicant's failure to timely file corrected drawings as required by, and within the three-month period set in, the Notice of Allowability (PTO-37).
 - (a) ☐ Proposed corrected drawings were received on _____ (with a Certificate of Mailing or Transmission dated _____), which is after the expiration of the period for reply.
 - (b) ☐ No corrected drawings have been received.
4. ☐ The letter of express abandonment which is signed by the attorney or agent of record or other party authorized under 37 CFR 1.33(b). See 37 CFR 1.138(b).
5. ☐ The letter of express abandonment which is signed by an attorney or agent (acting in a representative capacity under 37 CFR 1.34) upon the filing of a continuing application.
6. ☐ The decision by the Board of Patent Appeals and Interference rendered on _____ and because the period for seeking court review of the decision has expired and there are no allowed claims.
7. ☐ The reason(s) below:

	/JAISON JOSEPH/ Primary Examiner, Art Unit 2633
--	--

Petitions to revive under 37 CFR 1.137, or requests to withdraw the holding of abandonment under 37 CFR 1.181, should be promptly filed to minimize any negative effects on patent term.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)		Docket Number (Optional) 4207-130-CNT																																		
Application Number 15/583,343	Filed 05/01/2017																																			
For DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP																																				
Art Unit 2633	Examiner Jaison Joseph																																			
This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application. The requested extension and fee are as follows (check time period desired and enter the appropriate fee below): <table style="width: 100%; border-collapse: collapse;"><thead><tr><th></th><th style="text-align: center;"><u>Fee</u></th><th style="text-align: center;"><u>Small Entity Fee</u></th><th style="text-align: center;"><u>Micro Entity Fee</u></th><th></th></tr></thead><tbody><tr><td>☐ One month (37 CFR 1.17(a)(1))</td><td style="text-align: center;">\$200</td><td style="text-align: center;">\$100</td><td style="text-align: center;">\$50</td><td>\$ _____</td></tr><tr><td>☐ Two months (37 CFR 1.17(a)(2))</td><td style="text-align: center;">\$600</td><td style="text-align: center;">\$300</td><td style="text-align: center;">\$150</td><td>\$ _____</td></tr><tr><td>☒ Three months (37 CFR 1.17(a)(3))</td><td style="text-align: center;">\$1,400</td><td style="text-align: center;">\$700</td><td style="text-align: center;">\$350</td><td>\$ 700</td></tr><tr><td>☐ Four months (37 CFR 1.17(a)(4))</td><td style="text-align: center;">\$2,200</td><td style="text-align: center;">\$1,100</td><td style="text-align: center;">\$550</td><td>\$ _____</td></tr><tr><td>☐ Five months (37 CFR 1.17(a)(5))</td><td style="text-align: center;">\$3,000</td><td style="text-align: center;">\$1,500</td><td style="text-align: center;">\$750</td><td>\$ _____</td></tr></tbody></table> ☒ Applicant asserts small entity status. See 37 CFR 1.27. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously. ☐ A check in the amount of the fee is enclosed. ☐ Payment by credit card. Form PTO-2038 is attached. ☐ The Director has already been authorized to charge fees in this application to a Deposit Account. ☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____. ☒ Payment made via EFS-Web. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. I am the ☐ applicant/inventor. ☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96). ☒ attorney or agent of record. Registration number 41559 ☐ attorney or agent acting under 37 CFR 1.34. Registration number _____. <table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 50%; padding: 5px;">/Kevin Pillay/ _____ Signature</td><td style="width: 50%; padding: 5px;">02/17/2019 _____ Date</td></tr><tr><td style="padding: 5px;">Kevin Pillay _____ Typed or printed name</td><td style="padding: 5px;">613 614-7146 _____ Telephone Number</td></tr></table> NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*. ☐ * Total of 1 forms are submitted.				<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>		☐ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____	☐ Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ _____	☒ Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ 700	☐ Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____	☐ Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____	/Kevin Pillay/ _____ Signature	02/17/2019 _____ Date	Kevin Pillay _____ Typed or printed name	613 614-7146 _____ Telephone Number
	<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>																																	
☐ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____																																
☐ Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ _____																																
☒ Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ 700																																
☐ Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____																																
☐ Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____																																
/Kevin Pillay/ _____ Signature	02/17/2019 _____ Date																																			
Kevin Pillay _____ Typed or printed name	613 614-7146 _____ Telephone Number																																			

This collection of information is required by 37 CFR 1.136(a). 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 6 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	15583343			
Filing Date:	01-May-2017			
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP			
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI			
Filer:	Kevin Pillay			
Attorney Docket Number:	4207-130-CNT			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
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:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 3 months with \$0 paid	2253	1	700	700
Miscellaneous:				
Total in USD (\$)				700

Electronic Acknowledgement Receipt

EFS ID:	35173802
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	17-FEB-2019
Filing Date:	01-MAY-2017
Time Stamp:	09:08:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 700
RAM confirmation Number	021919INTEFSW09101000
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	4207-130CNT_Resp_OA1_final.pdf	240456	no	8
			b3a2337685054f25c859e1cbfd61645105f3f10b		
Warnings:					
Information:					
2	Extension of Time	4207-130CNT-sb0022.pdf	178271	no	2
			392de5cf41293ba37e08313595d4f937abe7e73a		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30542	no	2
			3e9599d1ee98ef934348a4f2e0888e310fbf1cd6		
Warnings:					
Information:					
Total Files Size (in bytes):			449269		
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.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Fadhel M. Ghannouchi

Assignee:

Title: **DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR
SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP**

Serial No.: 15/583,343 Filing Date: 05/01/2017

Examiner: Joseph, Jaison Group Art Unit: 2633

Docket No.: 4207-130-CNT Customer No.: 46093

7616

February 17, 2019

RESPONSE TO OFFICE ACTION

Dear Sir:

This is in response to the Office Action dated **01/16/2018**. Please consider the following:

Amendments to the Claims are reflected in the Listing of Claims which begins on
page 2;

Remarks begin on page 6.

Amendments To The Claims

Listing of Claims

This Listing of Claims will replace all prior versions, and listings of claims in the application:

1. (Currently amended) A ~~concurrent multi-band~~ linearized transmitter comprising:
a ~~concurrent~~ digital multi-band predistortion signal predistorter block including digital baseband signal predistorters effecting predistortion of concurrent input signals to output predistorted signals;
a power amplifier block ~~a concurrent multi-band linearized transmitter~~ connected to said ~~concurrent digital multiband predistortion block;~~ amplify the predistorted signals; and
an analyzing and modelling stage receiving first feedback signals taken from an output of the power amplifier, and second feedback signals taken from the predistorted signals and using the first feedback and the second feedback signals in the analyzing and modelling stage to model a nonlinearity in the power amplifier, wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage.
2. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 1, wherein said concurrent digital multi-band predistortion block further comprises:
a plurality of the digital baseband signal predistorters each corresponding to a respective channel blocks;
~~an analyzing and modelling stage;~~ and
a signal observation feedback loop for generating said first feedback signals.
3. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, wherein said plurality of digital baseband signal predistorters ~~blocks~~ further comprises:
a plurality of inputs, each input corresponding to a single frequency channel; and

a plurality of outputs, each output corresponding to a single frequency channel, and each output connected to an input of ~~said a~~ concurrent multi-band transmitter.

4. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, wherein said analyzing and modeling stage further comprises:

a plurality of outputs connected to ~~and updating~~ update the parameters of said digital baseband signal predistorters ~~block~~; and

a plurality of inputs connected to both: (a) ~~said~~ outputs of said signal observation feedback loop comprising said first feed back signals, and (b) to ~~said~~ outputs of said digital baseband-signal predistorter ~~blocks~~ block.

5. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, wherein said analyzing and modeling stage is further adapted to:

perform time alignment of complex baseband signals from sampling said ~~outputs of said concurrent multi-band transmitter~~ first and second feedback signals; and

perform ~~the~~ reconstruction of the complex baseband signals from said sampling.
~~sampling said outputs of said concurrent multi-band transmitter.~~

6. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, ~~wherein said signal observation feedback loop further is further adapted to:~~

said first feed back signals corresponding to a baseband equivalent for all frequency channels and wherein the baseband equivalent signals being extracted from down-converted samples of RF signals output from said power amplifier block ~~down-convert samples of the RF signals at said output of the concurrent multi-band transmitter of claim 1; and~~

~~extract from said down converted samples a baseband equivalent for all frequency channels.~~

7. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises a plurality of channels, for each channel comprising:

an RF filter;

~~A~~ a signal down conversion block; and

an analog-to-digital converter (ADC).

8. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises:

a single subsampling-based receiver to down-convert samples output from ~~a concurrent multi-band transmitter~~ said power amplifier block.

9. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 8, wherein said single subsampling-based receiver further comprises:

an RF filter; a track and hold (T&H) block; and an analog-to-digital converter (ADC).

10. (New) A method for linearizing a transmitter, said method comprising:
effecting predistortion of concurrent input signals to output predistorted signals using a digital signal predistorter block including digital baseband signal predistorters;
amplifying the predistorted signals using a power amplifier block;
receiving in an analyzing and modelling stage first feedback signals taken from an output of the power amplifier, and second feedback signals taken from the predistorted signals; and

using the first feedback and the second feedback signals in the analyzing and modeling stage to model a nonlinearity in the power amplifier, wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage.

REMARKS

Independent claim 1 has been amended to better define the subject matter. Dependent claims 2-9 have been amended to conform to the amendments to claim 1.

New independent method claim 10 has been added.

No new matter has been added by the amendments.

Claim Rejections – 35 USC § 102

- i. Claims 1-6 are rejected under 35 U.S.C. 102b as being anticipated by Suzuki.

Independent claim 1 has been amended to recite amongst others the features of “second feed back signals taken from the predistorted signals and using the first feedback and the second feedback signals in the analyzing and modelling stage to model a nonlinearity in the power amplifier”.

While Suzuki describes a digital predistortion circuit 100 (Fig.6) outputting predistorted signals from combiner 14A in the predistortion circuit, there is no teaching or suggestion of a feedback signal being taken from the predistorted signals. Claim 1 as amended recites “second feed back signals taken from the predistorted signals”. Suzuki does not recite this second feedback signal.

Furthermore, claim 1 as amended recites an “analyzing and modelling stage to model a nonlinearity in the power amplifier”. The Action equates the controller **31** of Suzuki to the analyzing and modelling stage in the subject claims. Applicant disagrees. As described in Suzuki the controller **31** outputs signals that control the vector adjusters in the predistortion circuit **100** in such a manner as to minimize the 3rd and 5th -order distortion components. As stated in par. [0038] “signal detector **28** detects the 3rd- and 5th-order distortions produced by the power amplifier **25** in connection with the transmission signals T₁ and T₂ and applies the detected output signals to the controller **31**. The controller **31** controls the vector adjusters **V3-1**, **V5-1** and **V3-2**, **V5-2** in such a manner as to minimize the detected 3rd- and 5th-order

distortions”. In other words controller 31 maintains the vector adjusters in an “as-initialized” state (par.[0024]). Applicant submits that the controller 31 in Suzuki does not “model a nonlinearity of the amplifier” nor does the controller 31 provide an “analyzing and modelling stage”. Accordingly, Suzuki neither teaches nor suggests an “analyzing and modelling stage to model a nonlinearity in the power amplifier”, as recited in amended claim 1.

Based on at least the above differences, Suzuki cannot anticipate claim 1 as amended nor claims 2-9 dependent thereon. Accordingly, the rejection of claims 1-6 under 35 U.S.C. 102(b) is overcome. Withdrawal of the rejection is requested.

ii. Claims 1-9 are rejected under 35 U.S.C. 102(e) as being anticipated by Fuller

Fuller does not teach or suggest an “an analyzing and modelling stage receiving first feedback signals taken from an output of the power amplifier, and second feedback signals taken from the predistorted signals” as recited in amended claim 1. As shown in Figure 1 and Figure 2 of Fuller the feedback signals are taken from i) the undistorted input signals and ii) the output of the amplifier. Fuller does not teach or suggest “feedback signals taken from the predistorted signals” as recited in amended claim 1. It follows also that Fuller cannot disclose an “analyzing and modelling stage” as recited in amended claim 1. Accordingly, applicant submits that for at least the above discussed reasons claim 1 is patentable over Fuller and the rejection of claim 1 and claims 2-9 dependent thereon is overcome. Withdrawal of the rejection is requested.

Claim Rejections – 35 USC § 103

i. Claims 7-9 are rejected under 35 U.S.C. 103a as being unpatentable over Suzuki.

Based on at least the above discussion Applicant submits that amended independent claim 1 is allowable over Suzuki, therefore claims 7-9 which depend thereon are also allowable, rendering the rejection moot. Withdrawal of the rejection is requested.

ii. Claim 9 is rejected under 35 U.S.C. 103a as being unpatentable over Fuller.

Based on at least the above discussion Applicant submits that amended independent claim 1 is allowable over Fuller, therefore claim 9 which depends thereon is also allowable, rendering the rejection moot. Withdrawal of the rejection is requested.

CONCLUSION

In view of the amendments and remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the examiner is requested to telephone the undersigned at 613 614 7146

Respectfully submitted,

/Kevin Pillay/
Kevin Pillay
Registration No. 41559
Agent of Record

Under the Paperwork Reduction Act of 1995, no person is required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

☒

Practitioners associated with Customer Number:

46093

OR

☐

Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number

Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

☒

The address associated with Customer Number:

46093

OR

☐

Firm or individual name		
Address		
City	State	Zip
Country		
Telephone		Email

Assignee name and address:

Fadhel M. Ghannouchi
2500 UNIVERSITY DRIVE N.W. , Calgary, Canada, T2N1N4

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature/Fadhel Ghannouchi/

Date 02/17/2019

Name Fadhel M. Ghannouchi

Telephone

Title Dr.

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)Applicant/Patent Owner: Fadhel MGHanouchiApplication No./Patent No.: 15/583,343

Filed/Issue Date: _____

Titled: DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP

_____, a _____

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.
2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):
- ☐ The extent (by percentage) of its ownership interest is ____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.
- ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

- A. ☒ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.
- B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). 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 12 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.☐ Additional documents in the chain of title are listed on a supplemental sheet(s).☒ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/kevin pillay/

02/17/2019

Signature

Date

Kevin Pillay

41559

Printed or Typed Name

Title or Registration Number

[Page 2 of 2]

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PATENT
Att'y Doc't No.: GHA-003

ASSIGNMENT NUNC PRO TUNC

In consideration of One Dollar and other good and valuable considerations, the receipt and sufficiency of which are hereby acknowledged, the undersigned hereby assign to Fadhel M. Ghannouchi, an individual, having an address at 2500 University Drive N.W., Electrical and Computer Engineering Dept., ICT 302, Calgary, Alberta, Canada, T2N 1N4, his successors and assigns (hereinafter "Assignee"), the entire right, title and interest in the invention or improvements of the undersigned disclosed in the following applications and/or United States Letters Patent:

Non-Provisional Patent Application

Ser. No. 13/274,290

Titled: Digital Multi-band Predistortion Linearizer with Nonlinear Subsampling Algorithm in the Feedback Loop

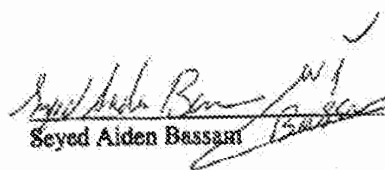
Filed: October 14, 2011

and any and all other applications for Letters Patent which the Assignee or the undersigned may file, either solely or jointly with others, on said invention or improvements, and in any and all Letters Patent of the United States which may be obtained on any of said applications, including any identified above, and in any reissue or extension thereof.

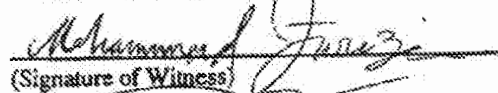
The undersigned hereby authorize and request the Commissioner of Patents to issue said Letters Patent to said Assignee.

For said considerations, the undersigned hereby agree, upon the request and at the expense of said Assignee, to execute any original, divisional, continuation, continuation-in-part or substitute application for said invention or improvements, and any oath or affidavit relating thereto, and any application for the reissue or extension of any Letters Patent that may be granted upon said application(s), and, in the event of any application or Letters Patent assigned herein becoming involved in an interference, to cooperate to the best of the ability of the undersigned in the matters of preparing and executing the preliminary statement and giving and producing evidence in support thereof. The undersigned agrees to perform, upon request, any affirmative acts to obtain said Letters Patent of the United States and hereby vests in said Assignee all rights therein, whereby said Letters Patent will be held and enjoyed by said Assignee, to the full end of the term for which said Letters Patent may be granted as fully and entirely as the same would have been held and enjoyed by the undersigned if this assignment has not been made.

And for said consideration, the undersigned hereby assign to said Assignee the entire right, title and interest in said invention or improvements for all non-U.S. countries, including all priority rights, and agrees to execute, at the request of said Assignee, all documents in connection with any application for non-U.S. Letters Patent therefor.


Seyed Aiden Bassam

In witness of the signature of Seyed Aiden Bassam


(Signature of Witness)

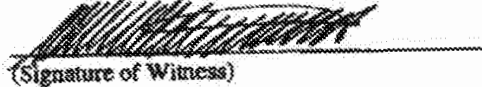
Date 2/22/2013


(Signature of Witness)

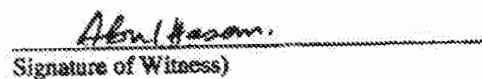
Date 2/25/2013


Mohamed Helaoui

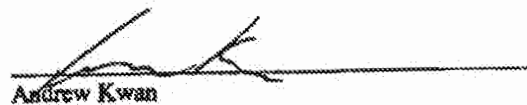
In witness of the signature of Mohamed Helaoui


(Signature of Witness)

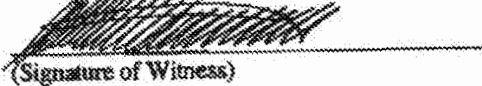
Date FEB 28 2013


Signature of Witness)

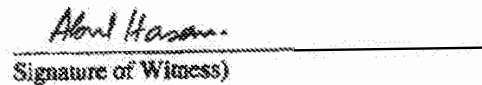
Date FEB 28 2013


Andrew Kwan

In witness of the signature of Andrew Kwan


(Signature of Witness)

Date FEB 28 2013


Signature of Witness)

Date FEB 28 2013

Electronic Patent Application Fee Transmittal

Application Number:	15583343			
Filing Date:	01-May-2017			
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP			
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI			
Filer:	Kevin Pillay			
Attorney Docket Number:	4207-130-CNT			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
PROCESSING FEE, EXCEPT PROV. APPLS.	2830	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				70

Electronic Acknowledgement Receipt

EFS ID:	35173855
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	17-FEB-2019
Filing Date:	01-MAY-2017
Time Stamp:	11:14:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 70
RAM confirmation Number	021919INTEFSW11170200
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	POA_to_prosecute_aia0080.pdf	452298	no	2
			9b68a26189b7a0cbdf34995b48b176e3d7c191be		
Warnings:					
Information:					
2	Assignee showing of ownership per 37 CFR 3.73	statement_under_3_73_aia0096.pdf	116484	no	3
			8a3cb4c6962f31db98077c68e6673f2f24a0234d		
Warnings:					
Information:					
3	Assignee showing of ownership per 37 CFR 3.73	nunc_pro_tunc_assignment.pdf	396359	no	2
			2ee3ff008827cc0320be12ab89d6d8059124faa7		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30176	no	2
			534de1eab202b2b6f6e24c93d6e7a09c3c944d94		
Warnings:					
Information:					
Total Files Size (in bytes):			995317		

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.

New Applications Under 35 U.S.C. 111

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.

National Stage of an International Application under 35 U.S.C. 371

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.

New International Application Filed with the USPTO as a Receiving Office

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 Patent Application Fee Transmittal

Application Number:	15583343			
Filing Date:	01-May-2017			
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP			
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI			
Filer:	Kevin Pillay			
Attorney Docket Number:	4207-130-CNT			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
PET. REVIVE ABANDON APP, DELAY PYMT-RESP	2453	1	1000	1000
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1000



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Decision Date February 17, 2019
In re Application of Fadhel GHANNOUCHI
Application No. 15583343
Filed: 01-May-2017
Attorney Docket No. 4207-130-CNT

DECISION ON PETITION
UNDER CFR 1.137(a)

This is an electronic decision on the petition under 37 CFR 1.137(a), February 17, 2019, to revive the above-identified application.

The petition is **GRANTED**.

The above-identified application became abandoned for failure to reply in a timely manner to the outstanding Office communication. The date of abandonment is the day after the last day of the period set for reply in the Office action plus any applicable extensions of time properly requested.

The electronic petition satisfies the conditions for revival pursuant to the provisions of 37 CFR 1.137(a) in that (1) the reply in the form of a response; (2) the petition fee as set forth in 37 CFR 1.17 (m); and (3) the required statement of unintentional delay have been received. Accordingly, the response is accepted as having been unintentionally delayed.

The statement of unintentional delay is being treated as having been made as the result of a reasonable inquiry into the facts and circumstances of such delay and by a person having firsthand or direct knowledge of the facts and circumstances of the delay at issue. See 37 CFR 10.18(b) and Changes to Patent Practice and Procedure; Final Rule Notice, 62 Fed. Reg. 53131, 53178 (October 10, 1997), 1203 Off. Gaz. Pat. Office 63, 103 (October 21, 1997). In the event that such an inquiry has not been made, petitioner must make such an inquiry. If such inquiry results in the discovery that it is not correct that the entire delay in filing the required reply from the due date for the reply until the filing of a grantable petition pursuant to 37 CFR 1.137(a) was unintentional, petitioner must notify the Office.

Telephone inquiries concerning this decision should be directed to the Patent Electronic Business Center (EBC) at 866-217-9197.

This application file is being directed to the Technology Center.

Office of Petitions

Electronic Acknowledgement Receipt

EFS ID:	35173872
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	17-FEB-2019
Filing Date:	01-MAY-2017
Time Stamp:	11:49:35
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1000
RAM confirmation Number	021919INTEFSW11493200
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition automatically granted by EFS	petition-request.pdf	33767	no	2
			ea55f272be9c6498f7e14e09d76d87113f4c1245		
Warnings:					
Information:					
2	Amendment/Req. Reconsideration-After Non-Final Reject	4207-130CNT_Resp_OA1_final.pdf	240456	no	8
			b3a2337685054f25c859e1cbfd61645105f3f10b		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30120	no	2
			1b5c90720299d20cb04c75fc6115a1c5adaea380		
Warnings:					
Information:					
Total Files Size (in bytes):			304343		
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.					

Doc Code: PET.AUTO Document Description: Petition automatically granted by EFS-Web		PTO/SB/64 U.S. Patent and Trademark Office Department of Commerce
Electronic Petition Request	PETITION FOR REVIVAL OF AN APPLICATION FOR PATENT ABANDONED UNINTENTIONALLY UNDER 37 CFR 1.137(a)	
Application Number	15583343	
Filing Date	01-May-2017	
First Named Inventor	Fadhel GHANNOUCHI	
Attorney Docket Number	4207-130-CNT	
Title	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALG;	
The above-identified application became abandoned for failure to file a timely and proper reply to a notice or action by the United States Patent and Trademark Office. The date of abandonment is the day after the expiration date of the period set for reply in the office notice or action plus any extensions of time actually obtained. APPLICANT HEREBY PETITIONS FOR REVIVAL OF THIS APPLICATION NOTE: A grantable petition requires the following items: (1) Petition fee; (2) Reply and/or issue fee; (3) Terminal disclaimer with disclaimer fee - required for all utility and plant applications filed before June 8, 1995; and for all design applications; and (4) Statement that the entire delay was unintentional		
Petition Fee		
☒ Small Entity		
☐ Micro Entity		
☐ Regular Undiscounted		
2. Reply and/or fee		
☐ I certify, in accordance with 37 CFR 1.4(d)(4) that the amendment and response have already been filed in the above-identified application on		
☒ Amendment and response are attached		
RCE request, submission, and fee.		
☐ I certify, in accordance with 37 CFR 1.4(d)(4) that the RCE Request, Submission, and Fee have already been filed in the above-identified application on		
☐ RCE Request, Submission, and Fee are attached		
Notice of Appeal		
☐ I certify, in accordance with 37 CFR 1.4(d)(4) that the Notice of Appeal and Fee have already been filed in the above-identified application on		

☐ Notice of Appeal and Fee are attached

3. Terminal Disclaimer is not required, since the Electronic Petition format is not support for Design applications and applications filed before June 8, 1995. Please file using regular petition format for review by the Office of Petitions.

☒ STATEMENT: The entire delay in filing the required reply from the due date for the required reply until the filing of a grantable petition under 37 CFR 1.137(a) was unintentional.

THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

- ☐ An attorney or agent registered to practice before the Patent and Trademark Office who has been given power of attorney in this application.
- ☒ An attorney or agent registered to practice before the Patent and Trademark Office, acting in a representative capacity.
- ☐ A sole inventor
- ☐ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application
- ☐ A joint inventor; all of whom are signing this e-petition

Signature	/kevin pillay/
Name	kevin pillay
Registration Number	41559

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Fadhel M. Ghannouchi

Assignee:

Title: **DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR
SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP**

Serial No.: 15/583,343 Filing Date: 05/01/2017

Examiner: Joseph, Jaison Group Art Unit: 2633

Docket No.: 4207-130-CNT Customer No.: 46093

7616

February 17, 2019

RESPONSE TO OFFICE ACTION

Dear Sir:

This is in response to the Office Action dated **01/16/2018**. Please consider the following:

Amendments to the Claims are reflected in the Listing of Claims which begins on
page 2;

Remarks begin on page 6.

Amendments To The Claims

Listing of Claims

This Listing of Claims will replace all prior versions, and listings of claims in the application:

1. (Currently amended) A ~~concurrent multi-band~~ linearized transmitter comprising:
a ~~concurrent~~ digital multi-band predistortion signal predistorter block including digital baseband signal predistorters effecting predistortion of concurrent input signals to output predistorted signals;
a power amplifier block ~~a concurrent multi-band linearized transmitter~~ connected to said ~~concurrent digital multiband predistortion block;~~ amplify the predistorted signals; and
an analyzing and modelling stage receiving first feedback signals taken from an output of the power amplifier, and second feedback signals taken from the predistorted signals and using the first feedback and the second feedback signals in the analyzing and modelling stage to model a nonlinearity in the power amplifier, wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage.
2. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 1, wherein said concurrent digital multi-band predistortion block further comprises:
a plurality of the digital baseband signal predistorters each corresponding to a respective channel blocks;
~~an analyzing and modelling stage;~~ and
a signal observation feedback loop for generating said first feedback signals.
3. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, wherein said plurality of digital baseband signal predistorters ~~blocks~~ further comprises:
a plurality of inputs, each input corresponding to a single frequency channel; and

a plurality of outputs, each output corresponding to a single frequency channel, and each output connected to an input of ~~said a~~ concurrent multi-band transmitter.

4. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, wherein said analyzing and modeling stage further comprises:

a plurality of outputs connected to ~~and updating~~ update the parameters of said digital baseband signal predistorters ~~block~~; and

a plurality of inputs connected to both: (a) ~~said~~ outputs of said signal observation feedback loop comprising said first feed back signals, and (b) to ~~said~~ outputs of said digital baseband-signal predistorter ~~blocks~~ block.

5. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, wherein said analyzing and modeling stage is further adapted to:

perform time alignment of complex baseband signals from sampling said ~~outputs of said concurrent multi-band transmitter~~ first and second feedback signals; and

perform ~~the~~ reconstruction of the complex baseband signals from said sampling.
~~sampling said outputs of said concurrent multi-band transmitter.~~

6. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, ~~wherein said signal observation feedback loop further is further adapted to:~~

said first feed back signals corresponding to a baseband equivalent for all frequency channels and wherein the baseband equivalent signals being extracted from down-converted samples of RF signals output from said power amplifier block ~~down-convert samples of the RF signals at said output of the concurrent multi-band transmitter of claim 1; and~~

~~extract from said down converted samples a baseband equivalent for all frequency channels.~~

7. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises a plurality of channels, for each channel comprising:

an RF filter;

~~A~~ a signal down conversion block; and

an analog-to-digital converter (ADC).

8. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises:

a single subsampling-based receiver to down-convert samples output from ~~a concurrent multi-band transmitter~~ said power amplifier block.

9. (Currently amended) The ~~concurrent multi-band~~ linearized transmitter of claim 8, wherein said single subsampling-based receiver further comprises:

an RF filter; a track and hold (T&H) block; and an analog-to-digital converter (ADC).

10. (New) A method for linearizing a transmitter, said method comprising:
effecting predistortion of concurrent input signals to output predistorted signals using a digital signal predistorter block including digital baseband signal predistorters;
amplifying the predistorted signals using a power amplifier block;
receiving in an analyzing and modelling stage first feedback signals taken from an output of the power amplifier, and second feedback signals taken from the predistorted signals; and

using the first feedback and the second feedback signals in the analyzing and modeling stage to model a nonlinearity in the power amplifier, wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage.

REMARKS

Independent claim 1 has been amended to better define the subject matter. Dependent claims 2-9 have been amended to conform to the amendments to claim 1.

New independent method claim 10 has been added.

No new matter has been added by the amendments.

Claim Rejections – 35 USC § 102

- i. Claims 1-6 are rejected under 35 U.S.C. 102b as being anticipated by Suzuki.

Independent claim 1 has been amended to recite amongst others the features of “second feed back signals taken from the predistorted signals and using the first feedback and the second feedback signals in the analyzing and modelling stage to model a nonlinearity in the power amplifier”.

While Suzuki describes a digital predistortion circuit 100 (Fig.6) outputting predistorted signals from combiner 14A in the predistortion circuit, there is no teaching or suggestion of a feedback signal being taken from the predistorted signals. Claim 1 as amended recites “second feed back signals taken from the predistorted signals”. Suzuki does not recite this second feedback signal.

Furthermore, claim 1 as amended recites an “analyzing and modelling stage to model a nonlinearity in the power amplifier”. The Action equates the controller **31** of Suzuki to the analyzing and modelling stage in the subject claims. Applicant disagrees. As described in Suzuki the controller **31** outputs signals that control the vector adjusters in the predistortion circuit **100** in such a manner as to minimize the 3rd and 5th -order distortion components. As stated in par. [0038] “signal detector **28** detects the 3rd- and 5th-order distortions produced by the power amplifier **25** in connection with the transmission signals T₁ and T₂ and applies the detected output signals to the controller **31**. The controller **31** controls the vector adjusters **V3-1**, **V5-1** and **V3-2**, **V5-2** in such a manner as to minimize the detected 3rd- and 5th-order

distortions”. In other words controller 31 maintains the vector adjusters in an “as-initialized” state (par.[0024]). Applicant submits that the controller 31 in Suzuki does not “model a nonlinearity of the amplifier” nor does the controller 31 provide an “analyzing and modelling stage”. Accordingly, Suzuki neither teaches nor suggests an “analyzing and modelling stage to model a nonlinearity in the power amplifier”, as recited in amended claim 1.

Based on at least the above differences, Suzuki cannot anticipate claim 1 as amended nor claims 2-9 dependent thereon. Accordingly, the rejection of claims 1-6 under 35 U.S.C. 102(b) is overcome. Withdrawal of the rejection is requested.

ii. Claims 1-9 are rejected under 35 U.S.C. 102(e) as being anticipated by Fuller

Fuller does not teach or suggest an “an analyzing and modelling stage receiving first feedback signals taken from an output of the power amplifier, and second feedback signals taken from the predistorted signals” as recited in amended claim 1. As shown in Figure 1 and Figure 2 of Fuller the feedback signals are taken from i) the undistorted input signals and ii) the output of the amplifier. Fuller does not teach or suggest “feedback signals taken from the predistorted signals” as recited in amended claim 1. It follows also that Fuller cannot disclose an “analyzing and modelling stage” as recited in amended claim 1. Accordingly, applicant submits that for at least the above discussed reasons claim 1 is patentable over Fuller and the rejection of claim 1 and claims 2-9 dependent thereon is overcome. Withdrawal of the rejection is requested.

Claim Rejections – 35 USC § 103

i. Claims 7-9 are rejected under 35 U.S.C. 103a as being unpatentable over Suzuki.

Based on at least the above discussion Applicant submits that amended independent claim 1 is allowable over Suzuki, therefore claims 7-9 which depend thereon are also allowable, rendering the rejection moot. Withdrawal of the rejection is requested.

ii. Claim 9 is rejected under 35 U.S.C. 103a as being unpatentable over Fuller.

Based on at least the above discussion Applicant submits that amended independent claim 1 is allowable over Fuller, therefore claim 9 which depends thereon is also allowable, rendering the rejection moot. Withdrawal of the rejection is requested.

CONCLUSION

In view of the amendments and remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the examiner is requested to telephone the undersigned at 613 614 7146

Respectfully submitted,

/Kevin Pillay/
Kevin Pillay
Registration No. 41559
Agent of Record

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/583,343	Filing Date 05/01/2017	☐ To be Mailed
---	---	----------------------------------	---------------------------------------

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

(Column 1) (Column 2)

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (j), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

(Column 1) (Column 2) (Column 3)

AMENDMENT	02/17/2019	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 10	Minus	** 20	= 0	X \$50 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X \$230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

(Column 1) (Column 2) (Column 3)

AMENDMENT	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	X \$ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	X \$ =	
	☐ Application Size Fee (37 CFR 1.16(s))					
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
 ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
 *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

TOTAL ADD'L FEE

LIE
ROSA WEST

This collection of information is required by 37 CFR 1.16. 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 1.14. This collection is estimated to take 12 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/583,343	05/01/2017	Fadel M. GHANNOUCHI	4207-130-CNT

46093
Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ON K1N 8J6
CANADA

CONFIRMATION NO. 7616
POA ACCEPTANCE LETTER



Date Mailed: 03/05/2019

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/17/2019.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/sleutchit/



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P. O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/583,343	05/01/2017	Faheh M. GHANNOUCHI	4207-130-CNT	7616
46093	7590	05/16/2019	EXAMINER	
Kevin Pillay - NUA-IP 503-85 Range Road Ottawa, ONTARIO K1N 8J6 CANADA			JOSEPH, JAISON	
			ART UNIT	PAPER NUMBER
			2633	
			NOTIFICATION DATE	DELIVERY MODE
			05/16/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

kpillay.ot@gmail.com
kpillay@nuaipservices.com

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Response to Arguments

Applicant's arguments with respect to claims 1 - 10 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Regarding independent claims, Applicant's arguments directed toward newly amended limitations, which was not present in the previous rejection. Furthermore newly made amendments have changed the scope of the claims. However, upon further consideration, a new ground(s) of rejection is made in view Suzuki et al (US 2005/0162225) in view of Kim et al (US 2012/0154038).

With respect all other claims the Applicant makes same argument as the argument applied to claim 1. Therefore, the same response applied to the argument with respect to independent claims above is applied here.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

(a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 5 rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding claim 5, claim recite the limitations "sampling said first and second feedback signals". However, present specification only disclose sampling the first feedback signal. There is no mention in the original specification about sampling the second feedback signal. Therefore, the claim contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 - 10 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Suzuki et al (US 2005/0162225) in view of Kim et al (US 2012/0154038).

Regarding claim 1, Suzuki et al teach a linearized transmitter (see figure 5) comprising; a digital signal predistortion block (see figure 6, component digital predistortion circuit) including digital baseband predistorters effecting predistortion of concurrent input signals to output predistorted signals (see figure 6, Digital predistorer); a power amplifier block connected to amplify the predistorted signals (see 6, component 28 Power amplifier); and an analyzing and modeling stage (see figure 6, Digital predistorer) receiving first feedback signals taken from an output of the power amplifier (see figure 6, the feedback path), and using the first feedback signals in analyzing and modelling stage to model a nonlinearity in power amplifier (see figure 6, Digital predistorer), wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage (see figure 6) Suzuki et al does not expressly disclose a second feedback signal from the output pf the predistorer. However, in analogous art, Kim et al teach a digital predistortion block perform the predistortion based on the first feedback from the output of the power amplifier and a second feedback from the output of the predistorters (see figure 2 (feedback from PA and DPD and paragraph 0070). Therefore, it would have been obvious to an ordinary skilled in the art at the time the invention was made to use second feedback for determining DPD values. The motivation or suggestion to do so is to accurately compensate the power amplifier distortions.

Regarding claim 2, which inherits the limitations of claim 1, Suzuki et al in view of Kim et al further teach wherein said concurrent digital multi-band predistortion block further comprises: a plurality of digital baseband signal predistorter each corresponding to respective channel (see figure 6, component 100); and a signal observation feedback loop for generating said first feedback signals (see figure 6, feedback loop).

Regarding claim 3, which inherits the limitations of claim 2, Suzuki et al in view of Kim et al further teach wherein said plurality of digital baseband signal predistorters further comprises: a plurality of inputs (see figure 6), each input corresponding to a single frequency channel (see figure 6); and a plurality of outputs, each output corresponding to a single frequency channel, and each output connect to an input of a concurrent multiband transmitter (see figure 6).

Regarding claim 4, which inherits the limitations of claim 2, Suzuki et al in view of Kim et al further teach wherein said analyzing and modeling stage further comprises: a plurality of outputs connected to update the parameters of said digital baseband signal predistorter (see figure 6, components 17); and a plurality of inputs connected to both (a) outputs of said signal observation feedback loop comprising first feedback signals (see figure 6), and (b) to said outputs of said digital signal predistorter blocks (see figure 6 and Kim et al figure 2).

Regarding claim 5, which inherits the limitations of claim 2, Suzuki et al in view of Kim et al further teach wherein said analyzing and modeling stage is further adapted to: perform time alignment of the complex baseband signals from sampling said first and second feedback signals (see figure 6); and perform reconstruction of the complex baseband signals from said sampling (see figure 6).

Regarding claim 6, which inherits the limitations of claim 2, Suzuki et al in view of Kim et al further teach said first feedback signals corresponding to baseband equivalent for all frequency channels and wherein the baseband equivalent signal being extracted from down converted samples of RF signal output from said power amplifier (see figure 6).

Regarding claim 7, which inherits the limitations of claim 2, Suzuki et al in view of Kim et al further teach Suzuki et al does not expressly teach a single down conversion block. However using single down conversion block is within the scope of one of ordinary skilled in the art.

Regarding claim 8 and 9, Suzuki et al does not expressly teach a single subsampling receiver. However using single subsampling receiver is within the scope of one of ordinary skilled in the art.

Regarding claim 10, the claimed method including the features corresponds to subject matter mentioned above in the rejection of claim 1 is applicable hereto.

Claims 1 - 10 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Fuller (US 8,391,809) in view of Kim et al (US 2012/0154038).

Regarding claim 1, Fuller teaches a linearized transmitter (see figure 1 and 29) comprising; a digital signal predistortion block (see figure 1, component 101 digital predistortion) including digital baseband predistorters effecting predistortion of concurrent input signals to output predistorted signals (see figure 1, Digital component 101 and input signals $X(n)$); a power amplifier block connected to amplify the predistorted signals (see 1, component 112 Power amplifier); and an analyzing and

modeling stage (see figure 1, component 105) receiving first feedback signals taken from an output of the power amplifier (see figure 1, the feedback path), and using the first feedback signals in analyzing and modelling stage to model a nonlinearity in power amplifier (see figure 1, Digital predistorter), wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage (see figure 1 and 2) Fuller does not expressly disclose a second feedback signal from the output of the predistorter. However, in analogous art, Kim et al teach a digital predistortion block perform the predistortion based on the first feedback from the output of the power amplifier and a second feedback from the output of the predistorters (see figure 2 (feedback from PA and DPD and paragraph 0070)). Therefore, it would have been obvious to an ordinary skilled in the art at the time the invention was made to use second feedback for determining DPD values. The motivation or suggestion to do so is to accurately compensate the power amplifier distortions.

Regarding claim 2, which inherits the limitations of claim 1, Fuller in view of Kim et al further teach wherein said concurrent digital multi-band predistortion block further comprises: a plurality of digital baseband signal predistorter each corresponding to respective channel (see figure 1, component 101, 102, 104, and 106); and a signal observation feedback loop for generating said first feedback signals (see figure 1, feedback loop).

Regarding claim 3, which inherits the limitations of claim 2, Fuller in view of Kim et al further teach wherein said plurality of digital baseband signal predistorters further comprises: a plurality of inputs (see figure 1), each input corresponding to a single frequency channel (see figure 1); and a plurality of outputs, each output

corresponding to a single frequency channel, and each output connect to an input of a concurrent multiband transmitter (see figure 1).

Regarding claim 4, which inherits the limitations of claim 2, Fuller in view of Kim et al further teach wherein said analyzing and modeling stage further comprises: a plurality of outputs connected to update the parameters of said digital baseband signal predistorter (see component 108 outputting plurality of coefficients and component 208 in figure 2); and a plurality of inputs connected to both (a) outputs of said signal observation feedback loop comprising first feedback signals (see figure 1 and 2), and (b) to said outputs of said digital signal predistorter blocks (see Fuller figure 1 and 2 and Kim et al figure 2).

Regarding claim 5, which inherits the limitations of claim 2, Fuller in view of Kim et al further teach wherein said analyzing and modeling stage is further adapted to: perform time alignment of the complex baseband signals from sampling said first and second feedback signals (see figure 2, component 242)); and perform reconstruction of the complex baseband signals from said sampling (see figure 1 and 2).

Regarding claim 6, which inherits the limitations of claim 2, Fuller in view of Kim et al further teach said first feedback signals corresponding to baseband equivalent for all frequency channels and wherein the baseband equivalent signal being extracted from down converted samples of RF signal output from said power amplifier (see figure 1 and 2).

Regarding claim 7, which inherits the limitations of claim 2, Fuller in view of Kim et al further teach wherein said signal observation feedback loop further comprises for each channel an RF filter (see figure 2, component 246); a signal down conversion

block (see figure 2, component 230, or figure 1, component 130); and an analog-to-digital converter (ADC) (see figure 2, component 244).

Regarding claim 8, which inherits the limitations of claim 2, Fuller in view of Kim et al further teach wherein said signal observation feedback loop further comprises: a single subsampling-based receiver to down-convert samples output from a concurrent multi-band transmitter (see figure 2, component 244).

Regarding claim 9, which inherits the limitations of claim 2, Fuller in view of Kim et al further teach Fuller et al further teaches wherein said single subsampling-based receiver further comprises: an RF filter (see figure 2, component 246); and an analog-to-digital converter (ADC) (see figure 2, component 244). Fuller is silent on a track and hold (T&H) block. However using a track and hold (T&H) block is within the scope of one of ordinary skilled in the art. At the time the invention was made, it would be obvious to an ordinary skilled in the art to a track and hold (T&H) block in Fullers predistortion system. Applicant has not disclosed that a track and hold (T&H) block provides an advantage, is used for a particular purpose, or solves a stated problem. Therefore, it would be obvious to an ordinary skilled in the art to modify Fuller to obtain the inventions as specified in claim 9.

Regarding claim 10, the claimed method including the features corresponds to subject matter mentioned above in the rejection of claim 1 is applicable hereto.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAISON JOSEPH whose telephone number is (571)272-6041. The examiner can normally be reached on M-F 8 - 4.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sam K Ahn can be reached on 571 272 3044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Application/Control Number: 15/583,343
Art Unit: 2633

Page 11

Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JAISON . JOSEPH
Primary Examiner
Art Unit 2633

/JAISON JOSEPH/
Primary Examiner, Art Unit 2633

<i>Notice of References Cited</i>	Application/Control No. 15/583,343		Applicant(s)/Patent Under Reexamination GHANNOUCHI et al.	
	Examiner JAISON JOSEPH		Art Unit 2633	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Code-Number-Kind Code	Country Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20110156815-A1		06-2011	Kim; Wan Jong	H03F1/304	330/149
*	B	US-20120069880-A1		03-2012	Lemson; Paul	H04B1/18	375/220
*	C	US-20120069931-A1		03-2012	Gandhi; Hardik P.	H03F1/3247	375/296
*	D	US-20120154038-A1		06-2012	Kim; Wan Jong	H03F1/3247	330/149
*	E	US-8294516-B2		10-2012	Young; Christopher	H03F1/3247	330/149
*	F	US-8380144-B1		02-2013	Bai; Chunlong	H03F1/3247	455/114.3
*	G	US-20130064325-A1		03-2013	KILAMBI; Sai Mohan	H03F1/3247	375/297
*	H	US-8606197-B2		12-2013	Bai; Chunlong	H03F1/3252	375/296
*	I	US-20150049841-A1		02-2015	Laporte; Pierre-Andre	H03F1/3247	375/297
	J						
	K						
	L						
	M						

FOREIGN PATENT DOCUMENTS

*		Document Number Code-Number-Kind Code	Country Code	Date MM-YYYY	Country	Name	CPC Classification
	N						
	O						
	P						
	Q						
	R						
	S						
	T						

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20190303

<i>Search Notes</i> 	Application/Control No. 15/583,343	Applicant(s)/Patent Under Reexamination GHANNOUCHI et al.
	Examiner JAISON JOSEPH	Art Unit 2633

CPC - Searched*		
Symbol	Date	Examiner
H03F3/189 H04L25/03	1/7/2018	JJ
Updated Search	05/08/2019	JJ

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Inventor Name Search	1/7/2018	JJ
East	1/7/2018	JJ
East Updated	05/07/2019	JJ

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

--	--

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:21
S2	2487665	multi adj2band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:22
S3	15	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:22
S5	26	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/29 09:25
S6	87	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/01/24 18:08
S7	8	("6549067" "6999523" "7142615" "7170344" "7183847" "7634238" "8294516").PN. OR ("8391809").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2014/01/26 16:36
S8	28	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S9	54	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S10	88	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S11	4	"20090126213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/14 09:36

S12	3	"20090169213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/14 09:36
S13	0	14/467642	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S14	46	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S15	122	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S16	46	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S17	8	"20090126213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S18	82	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S19	2	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S20	5	("20050162225" "20050168283" "20060276147" "7183847" "8391809").PN. OR ("8817859").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/15 12:37
S21	136	multi near2 band with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10 15:44
S22	66	concurrent with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10 16:03
S23	63	dual near2 band with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10 16:04

EAST Search History

S24	3	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10 16:13
S25	1	14/467642	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/12 22:58
S26	18	subsampling same multi near2 band	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/12 23:23
S27	10	("20020021764" "20050168283" "6999523" "7515651" "7539464" "7634238" "8391809" "8417197").PN. OR ("8606197").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/03/17 15:36
S28	10	("20020021764" "20050168283" "6999523" "7515651" "7539464" "7634238" "8391809" "8417197").PN. OR ("8606197").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/05/07 20:35
S29	45	11/961,969	US-PGPUB; USPAT; USOCR	OR	OFF	2019/05/07 20:39
S30	33	("2012/0154038").URPN.	USPAT	OR	OFF	2019/05/11 15:31

5/ 11/ 2019 5:23:56 PM

C:\Users\jjoseph1\Documents\EAST\Workspaces\15583343.wsp

UNITED STATES PATENT AND TRADEMARK OFFICE
COMMISSIONER FOR PATENTS
P.O.BOX 1450
ALEXANDRIA VA 22313-1451

PRESORTED
FIRST-CLASS MAIL
U.S. POSTAGE PAID
POSTEDIGITAL
NNNNN

Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ON K1N 8J6
CANADA



**Courtesy Reminder for
Application Serial No: 15/583,343**

Attorney Docket No: 4207-130-CNT

Customer Number: 46093

Date of Electronic Notification: 05/16/2019

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

kpillay@nuaipservices.com

kpillay.ot@gmail.com

To view your correspondence online or update your email addresses, please visit us anytime at **<https://ppair-my.uspto.gov/pair/PrivatePair>**.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.

Electronic Acknowledgement Receipt

EFS ID:	36601996
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	16-JUL-2019
Filing Date:	01-MAY-2017
Time Stamp:	17:29:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Response After Final Action	4207-130CNT__Resp_FOA2_final.pdf	276850 8cd7b71a3069d69a6f097745315fdf10769C24a2	no	7

Warnings:

Information:	
Total Files Size (in bytes):	276850
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.	

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Fadhel M. Ghannouchi

Assignee:

Title: **DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR
SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP**

Serial No.: 15/583,343 Filing Date: 05/01/2017

Examiner: Joseph, Jaison Group Art Unit: 2633

Docket No.: 4207-130-CNT Customer No.: 46093

7616

July 16, 2019

RESPONSE TO FINAL OFFICE ACTION

Dear Sir:

This is in response to the final Office Action dated **05/16/2019**. Please consider the following:

Amendments to the Claims are reflected in the Listing of Claims which begins on page 2;

Remarks begin on page 6.

Amendments To The Claims

Listing of Claims

This Listing of Claims will replace all prior versions, and listings of claims in the application:

1. (Currently amended) A linearized transmitter comprising:
_____ a digital signal predistorter block including digital baseband signal predistorters effecting predistortion of concurrent input signals to output concurrent predistorted signals;
a power amplifier block connected to amplify the predistorted signals; and
an analyzing and modelling stage receiving first feedback signals taken from an output of the power amplifier, and second feedback signals taken concurrently from the concurrent predistorted signals and using the first feedback and the second feedback signals in the analyzing and modelling stage to model a nonlinearity in the power amplifier, wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage.
2. (Previously presented) The linearized transmitter of claim 1, wherein said concurrent digital multi-band predistortion block further comprises:
a plurality of the digital baseband signal predistorters each corresponding to a respective channel; and
a signal observation feedback loop for generating said first feedback signals.
3. (Previously presented) The linearized transmitter of claim 2, wherein said plurality of digital baseband signal predistorters further comprises:
a plurality of inputs, each input corresponding to a single frequency channel; and
a plurality of outputs, each output corresponding to a single frequency channel, and each output connected to an input of a concurrent multi-band transmitter.

4. (Previously presented) The linearized transmitter of claim 2, wherein said analyzing and modeling stage further comprises:

a plurality of outputs connected to update the parameters of said digital baseband signal predistorters; and

a plurality of inputs connected to both: (a) outputs of said signal observation feedback loop comprising said first feed back signals, and (b) to outputs of said digital signal predistorter block.

5. (Currently amended) The linearized transmitter of claim 2, wherein said analyzing and modeling stage is further adapted to:

perform time alignment of complex baseband signals from sampling said first ~~and second~~ feedback signals; and

perform reconstruction of the complex baseband signals from said sampling.

6. (Previously presented) The linearized transmitter of claim 2,

said first feed back signals corresponding to a baseband equivalent for all frequency channels and wherein the baseband equivalent signals being extracted from down-converted samples of RF signals output from said power amplifier block.

7. (Previously presented) The linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises a plurality of channels, each channel comprising:

an RF filter;

a signal down conversion block; and

an analog-to-digital converter (ADC).

8. (Previously presented) The linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises:

a single subsampling-based receiver to down-convert samples output from said power amplifier block.

9. (Previously presented) The linearized transmitter of claim 8, wherein said single subsampling-based receiver further comprises:

an RF filter; a track and hold (T&H) block; and an analog-to-digital converter (ADC).

10. (Currently amended) A method for linearizing a transmitter, said method comprising:

effecting predistortion of concurrent input signals to output concurrent predistorted signals using a digital signal predistorter block including digital baseband signal predistorters; amplifying the predistorted signals using a power amplifier block;

receiving in an analyzing and modelling stage first feedback signals taken from an output of the power amplifier, and second feedback signals taken concurrently from the concurrent predistorted signals; and

using the first feedback and the second feedback signals in the analyzing and modeling stage to model a nonlinearity in the power amplifier, wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage.

REMARKS

Independent claims 1 and 10 have been amended to better define the subject matter. Dependent claim has been amended.

No new matter has been added by the amendments.

Claim Rejections - 35 USC § 112

Claim 5 is rejected under 35 U.S.C. 112(a) as failing to comply with the written description requirement.

Applicant has amended claim 5, rendering the objection moot. Withdrawal of the rejection is requested.

Claim Rejections – 35 USC § 103

- i. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Kim. Applicant refers the Examiner to the following discussion.

The present claims teach an **indirect learning scheme** for predistortion wherein feedback signals are taken from the predistorted signals and the output of the power amplifier which are used in an analyzing and modelling stage which is then used to update the predistorters, as for example shown in Figure1. This is in contrast to a direct learning scheme as taught by Suzuki.

Furthermore, independent claims 1 and 10, have ben amended to recite amongst others that:

“second feedback signals taken concurrently from the concurrent predistorted signals”

Suzuki does not provide concurrent predistorted signals. In Suzuki the predistorted signals from each channel is summed (14A) to form a single multi-channel signal to drive the amplifier. Thus Suzuki does not teach or suggest feedback signals taken concurrently from the concurrent predistorted signals, as no concurrent predistorted signals are provided.

Kim on the other hand does not remedy the deficiencies in Suzuki. Kim teaches a single input single output predistorter showing an indirect learning scheme. Accordingly, Kim does not teach or suggest “concurrent predistorted signals”. For example, FIG. 3 of Kim show a block diagram of a distorter where a single predistorted signal $z(n)$ is output.

Furthermore, paragraph [0070] of Kim makes a distinction between Direct Learning, and Indirect Learning as two separate embodiments. Even to Kim it was not evident to combine the two schemes. It follows therefore there is no suggestion or teaching in Kim that direct learning (as taught in Suzuki) may be combined with indirect learning. Accordingly, the combination of Suzuki and Kim does not teach or suggest the subject matter of the present amended independent claims 1 and 10 nor claims 2-9 dependent thereon. Withdrawal of the rejection is requested.

ii. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuller in view of Kim. Applicant provides the following discussion.

Applicant agrees that as stated in the Action Fuller does not expressly disclose a second feedback signal from the output of the predistorter. However Applicant submits that Kim does not remedy this deficiency. Similar to Suzuki described above, Fuller discloses a direct learning scheme predistorter. To use the terminology of Kim[par.0070] “*In one embodiment of the DPD algorithm, the reference signal and the aliased Sampled Feedback Aliased Signal $y_a[n]$ are used in the Direct Learning adaptive algorithm*”.

Thus, Fuller falls within Kim’s definition of direct learning. However in reading the disclosure of Kim it is not evident to combine the two schemes of direct learning (as taught by Fuller) with indirect learning (Kim, “*In another embodiment of the DPD algorithm, the aliased predistorted signal $z_a[n]$ (Predistorted Output Aliased Signal) and the Sampled Feedback Aliased Signal $y_a[n]$ are used in an Indirect Learning adaptive algorithm*”). Applicant submits that there is no suggestion or teaching in Kim that direct learning (as taught in Fuller) may be combined with indirect learning.

Accordingly, applicant submits that for at least the above discussed reasons amended independent claims 1 and 10, which recite “feedback signals taken concurrently from the concurrent predistorted signals” are not taught or suggested by Fuller or Kim taken singly or in combination. The rejection of independent claims 1 and 10 and claims 2-9 dependent thereon is overcome. Withdrawal of the rejection is requested.

CONCLUSION

In view of the amendments and remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the examiner is requested to telephone the undersigned at 613 614 7146

Respectfully submitted,

/Kevin Pillay/

Kevin Pillay

Registration No. 41559

Agent of Record



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P. O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/583,343	05/01/2017	Faheh M. GHANNOUCHI	4207-130-CNT	7616
46093	7590	09/05/2019	EXAMINER	
Kevin Pillay - NUA-IP 503-85 Range Road Ottawa, ONTARIO K1N 8J6 CANADA			JOSEPH, JAISON	
			ART UNIT	PAPER NUMBER
			2633	
			NOTIFICATION DATE	DELIVERY MODE
			09/05/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

kpillay.ot@gmail.com
kpillay@nuaipservices.com

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Response to Arguments

Applicant's arguments with respect to claims 1 – 10 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Regarding independent claims, Applicant's arguments directed toward newly amended limitations, which was not present in the previous rejection. Furthermore newly made amendments have changed the scope of the claims. Therefore, the proposed amendments filed after the Final Rejection, but before the filing of the brief, will not be entered because the amendments would raise new issues that require further search and consideration.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAISON JOSEPH whose telephone number is (571)272-6041. The examiner can normally be reached on M-F 8 - 4.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

Application/Control Number: 15/583,343
Art Unit: 2633

Page 3

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sam K Ahn can be reached on 571 272 3044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JAISON . JOSEPH
Primary Examiner
Art Unit 2633

/JAISON JOSEPH/
Primary Examiner, Art Unit 2633

Advisory Action Before the Filing of an Appeal Brief	Application No. 15/583,343	Applicant(s) GHANNOUCHI et al.	
	Examiner JAISON JOSEPH	Art Unit 2633	AIA (FITF) Status No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 16 July 2019 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:

a) ☐ The period for reply expires _____ months from the mailing date of the final rejection.

b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires _____ months from the mailing date of the prior Advisory Action or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANTS FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because

a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);

b) ☐ They raise the issue of new matter (see NOTE below);

c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: because the amendments would raise new issues that require further search and consideration (See 37CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicants reply has overcome the following rejection(s): _____

6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☒ For purposes of appeal, the proposed amendment(s): (a) ☒ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____

9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because:
See attached.

13. ☐ Note the attached Information Disclosure Statement(s). (PTO/SB/08) Paper No(s). _____

14. ☐ Other: _____

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
 Claim(s) allowed: _____
 Claim(s) objected to: _____
 Claim(s) rejected: 1-10.
 Claim(s) withdrawn from consideration: _____

/JAISON JOSEPH/ Primary Examiner, Art Unit 2633	
--	--

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Fadhel M. Ghannouchi

Assignee:

Title: **DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR
SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP**

Serial No.: 15/583,343 Filing Date: 05/01/2017

Examiner: Joseph, Jaison Group Art Unit: 2633

Docket No.: 4207-130-CNT Customer No.: 46093

7616

July 16, 2019

RESPONSE TO FINAL OFFICE ACTION

Dear Sir:

This is in response to the final Office Action dated **05/16/2019**. Please consider the following:

Amendments to the Claims are reflected in the Listing of Claims which begins on page 2;

Remarks begin on page 6.

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL **(Submitted Only via EFS-Web)**

Application Number	15583343	Filing Date	2017-05-01	Docket Number (if applicable)	4207-130CNT	Art Unit	2633
First Named Inventor	Fadhel M. Ghannouchi			Examiner Name	Joseph, Jaison		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
 Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☐ Other _____

☒ Enclosed

☒ Amendment/Reply

☐ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
 (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☐ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No _____

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	Kevin Pillay/	Date (YYYY-MM-DD)	2019-10-16
Name	Kevin Pillay	Registration Number	41559

This collection of information is required by 37 CFR 1.114. 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 12 minutes 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.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	15583343			
Filing Date:	01-May-2017			
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP			
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI			
Filer:	Kevin Pillay			
Attorney Docket Number:	4207-130-CNT			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
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:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 2 months with \$0 paid	2252	1	300	300
Miscellaneous:				
RCE- 1ST REQUEST	2801	1	650	650
Total in USD (\$)				950

Electronic Acknowledgement Receipt

EFS ID:	37469287
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	16-OCT-2019
Filing Date:	01-MAY-2017
Time Stamp:	11:13:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 950
RAM confirmation Number	E20190FB14400033
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	4207-130CNT_RCE_sb0030efs.pdf	1349886	no	3
			5960ae529c78e00ce7bb4f8fa24f54831eb480e9		
Warnings:					
Information:					
2	Amendment Submitted/Entered with Filing of CPA/RCE	4207-130CNT__Resp_FOA2_final_RCE.pdf	275141	no	7
			b7e3f6ea501485bec34e48abf854c44711892744		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	32363	no	2
			8b7edde2aa1108a48c69b276d657c1b5806ee6c0		
Warnings:					
Information:					
Total Files Size (in bytes):			1657390		
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.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Fadhel M. Ghannouchi

Assignee:

Title: **DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR
SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP**

Serial No.: 15/583,343 Filing Date: 05/01/2017

Examiner: Joseph, Jaison Group Art Unit: 2633

Docket No.: 4207-130-CNT Customer No.: 46093

7616

October 16, 2019

RESPONSE TO FINAL OFFICE ACTION

Dear Sir:

This is in response to the final Office Action dated **05/16/2019** and Advisory Action mailed **09/05/2019**. A Request for Continued Examination is filed concurrently herewith. Please consider the following:

Amendments to the Claims are reflected in the Listing of Claims which begins on page 2;

Remarks begin on page 6.

Amendments To The Claims

Listing of Claims

This Listing of Claims will replace all prior versions, and listings of claims in the application:

1. (Currently amended) A linearized transmitter comprising:
_____ a digital signal predistorter block including digital baseband signal predistorters effecting predistortion of concurrent input signals to output concurrent predistorted signals;
a power amplifier block connected to amplify the predistorted signals; and
an analyzing and modelling stage receiving first feedback signals taken from an output of the power amplifier, and second feedback signals taken concurrently from the concurrent predistorted signals and using the first feedback and the second feedback signals in the analyzing and modelling stage to model a nonlinearity in the power amplifier, wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage.
2. (Previously presented) The linearized transmitter of claim 1, wherein said concurrent digital multi-band predistortion block further comprises:
a plurality of the digital baseband signal predistorters each corresponding to a respective channel; and
a signal observation feedback loop for generating said first feedback signals.
3. (Previously presented) The linearized transmitter of claim 2, wherein said plurality of digital baseband signal predistorters further comprises:
a plurality of inputs, each input corresponding to a single frequency channel; and
a plurality of outputs, each output corresponding to a single frequency channel, and each output connected to an input of a concurrent multi-band transmitter.

4. (Previously presented) The linearized transmitter of claim 2, wherein said analyzing and modeling stage further comprises:

a plurality of outputs connected to update the parameters of said digital baseband signal predistorters; and

a plurality of inputs connected to both: (a) outputs of said signal observation feedback loop comprising said first feed back signals, and (b) to outputs of said digital signal predistorter block.

5. (Currently amended) The linearized transmitter of claim 2, wherein said analyzing and modeling stage is further adapted to:

perform time alignment of complex baseband signals from sampling said first ~~and second~~ feedback signals; and

perform reconstruction of the complex baseband signals from said sampling.

6. (Previously presented) The linearized transmitter of claim 2,

said first feed back signals corresponding to a baseband equivalent for all frequency channels and wherein the baseband equivalent signals being extracted from down-converted samples of RF signals output from said power amplifier block.

7. (Previously presented) The linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises a plurality of channels, each channel comprising:

an RF filter;

a signal down conversion block; and

an analog-to-digital converter (ADC).

8. (Previously presented) The linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises:

a single subsampling-based receiver to down-convert samples output from said power amplifier block.

9. (Previously presented) The linearized transmitter of claim 8, wherein said single subsampling-based receiver further comprises:

an RF filter; a track and hold (T&H) block; and an analog-to-digital converter (ADC).

10. (Currently amended) A method for linearizing a transmitter, said method comprising:
effecting predistortion of concurrent input signals to output concurrent predistorted signals using a digital signal predistorter block including digital baseband signal predistorters;
amplifying the predistorted signals using a power amplifier block;
receiving in an analyzing and modelling stage first feedback signals taken from an output of the power amplifier, and second feedback signals taken concurrently from the concurrent predistorted signals; and
using the first feedback and the second feedback signals in the analyzing and modeling stage to model a nonlinearity in the power amplifier, wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage.

REMARKS

Independent claims 1 and 10 have been amended to better define the subject matter. Dependent claim has been amended.

No new matter has been added by the amendments.

Claim Rejections - 35 USC § 112

Claim 5 is rejected under 35 U.S.C. 112(a) as failing to comply with the written description requirement.

Applicant has amended claim 5, rendering the objection moot. Withdrawal of the rejection is requested.

Claim Rejections – 35 USC § 103

- i. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Kim. Applicant refers the Examiner to the following discussion.

The present claims teach an **indirect learning scheme** for predistortion wherein feedback signals are taken from the predistorted signals and the output of the power amplifier which are used in an analyzing and modelling stage which is then used to update the predistorters, as for example shown in Figure1. This is in contrast to a direct learning scheme as taught by Suzuki.

Furthermore, independent claims 1 and 10, have ben amended to recite amongst others that:

“second feedback signals taken concurrently from the concurrent predistorted signals”

Suzuki does not provide concurrent predistorted signals. In Suzuki the predistorted signals from each channel is summed (14A) to form a single multi-channel signal to drive the amplifier. Thus Suzuki does not teach or suggest feedback signals taken concurrently from the concurrent predistorted signals, as no concurrent predistorted signals are provided.

Kim on the other hand does not remedy the deficiencies in Suzuki. Kim teaches a single input single output predistorter showing an indirect learning scheme. Accordingly, Kim does not teach or suggest “concurrent predistorted signals”. For example, FIG. 3 of Kim show a block diagram of a distorter where a single predistorted signal $z(n)$ is output.

Furthermore, paragraph [0070] of Kim makes a distinction between Direct Learning, and Indirect Learning as two separate embodiments. Even to Kim it was not evident to combine the two schemes. It follows therefore there is no suggestion or teaching in Kim that direct learning (as taught in Suzuki) may be combined with indirect learning. Accordingly, the combination of Suzuki and Kim does not teach or suggest the subject matter of the present amended independent claims 1 and 10 nor claims 2-9 dependent thereon. Withdrawal of the rejection is requested.

ii. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuller in view of Kim. Applicant provides the following discussion.

Applicant agrees that as stated in the Action Fuller does not expressly disclose a second feedback signal from the output of the predistorter. However Applicant submits that Kim does not remedy this deficiency. Similar to Suzuki described above, Fuller discloses a direct learning scheme predistorter. To use the terminology of Kim[par.0070] “*In one embodiment of the DPD algorithm, the reference signal and the aliased Sampled Feedback Aliased Signal $y_a[n]$ are used in the Direct Learning adaptive algorithm*”. Thus, Fuller falls within Kim’s definition of direct learning. However in reading the disclosure of Kim it is not evident to combine the two schemes of direct learning (as taught by Fuller) with indirect learning (Kim, “*In another embodiment of the DPD algorithm, the aliased predistorted signal $z_a[n]$ (Predistorted Output Aliased Signal) and the Sampled Feedback Aliased Signal $y_a[n]$ are used in an Indirect Learning adaptive algorithm*”). Applicant submits that there is no suggestion or teaching in Kim that direct learning (as taught in Fuller) may be combined with indirect learning. Accordingly, applicant submits that for at least the above discussed reasons amended independent claims 1 and 10, which recite “feedback signals taken concurrently from the concurrent predistorted signals” are not taught or suggested by Fuller or Kim taken singly or in combination. The rejection of independent claims 1 and 10 and claims 2-9 dependent thereon is overcome. Withdrawal of the rejection is requested.

CONCLUSION

In view of the amendments and remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the examiner is requested to telephone the undersigned at 613 614 7146

Respectfully submitted,

/Kevin Pillay/

Kevin Pillay

Registration No. 41559

Agent of Record



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P. O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/583,343	05/01/2017	Faheh M. GHANNOUCHI	4207-130-CNT	7616
46093	7590	11/18/2019	EXAMINER	
Kevin Pillay - NUA-IP 503-85 Range Road Ottawa, ONTARIO K1N 8J6 CANADA			JOSEPH, JAISON	
			ART UNIT	PAPER NUMBER
			2633	
			NOTIFICATION DATE	DELIVERY MODE
			11/18/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

kpillay.ot@gmail.com
kpillay@nuaipservices.com

Office Action Summary	Application No. 15/583,343	Applicant(s) GHANNOUCHI et al.	
	Examiner JAISON JOSEPH	Art Unit 2633	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 October 2019.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-10 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-10 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☐ All b) ☐ Some** c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ____.
- 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____.
- 4) ☐ Other: ____.

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Response to Arguments

Applicant's arguments with respect to claims 1 - 10 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Regarding independent claims, Applicant's arguments directed toward newly amended limitations, which was not present in the previous rejection. Furthermore newly made amendments have changed the scope of the claims. However, upon further consideration, a new ground(s) of rejection is made in view Suzuki et al (US 2005/0162225) in view of Bai (US 2013/0183915).

With respect all other claims the Applicant makes same argument as the argument applied to claim 1. Therefore, the same response applied to the argument with respect to independent claims above is applied here.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 - 10 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Suzuki et al (US 2005/0162225) in view of Bai (US 2013/0183915).

Regarding claim 1, Suzuki et al teach a linearized transmitter (see figure 5) comprising; a digital signal predistortion block (see figure 6, component digital predistortion circuit) including digital baseband predistorters effecting predistortion of concurrent input signals to output predistorted signals (see figure 6, Digital predistorter); a power amplifier block connected to amplify the predistorted signals (see 6, component 28 Power amplifier); and an analyzing and modeling stage (see figure 6, Digital predistorter) receiving first feedback signals taken from an output of the power amplifier (see figure 6, the feedback path), and using the first feedback signals in analyzing and modelling stage to model a nonlinearity in power amplifier (see figure 6, Digital predistorter), wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage (see figure 6) Suzuki et al does not expressly disclose a second feedback signal from the output of the predistorter. However, in analogous art, Bai teaches a digital predistortion block perform the predistortion based on the first feedback from the output of the power amplifier and a second feedback from the output of the predistorters (see figure 1 (feedback from PA and DPD and paragraph 0030 and 0031). Therefore, it would have been obvious to an ordinary skilled in the art at the time the invention was filed to use second feedback for determining DPD values. The motivation or suggestion to do so is to accurately compensate the power amplifier distortions.

Regarding claim 2, which inherits the limitations of claim 1, Suzuki et al in view of Bai further teach wherein said concurrent digital multi-band predistortion block further

comprises: a plurality of digital baseband signal predistorter each corresponding to respective channel (see figure 6, component 100); and a signal observation feedback loop for generating said first feedback signals (see figure 6, feedback loop).

Regarding claim 3, which inherits the limitations of claim 2, Suzuki et al in view of Bai further teach wherein said plurality of digital baseband signal predistorters further comprises: a plurality of inputs (see figure 6), each input corresponding to a single frequency channel (see figure 6); and a plurality of outputs, each output corresponding to a single frequency channel, and each output connect to an input of a concurrent multiband transmitter (see figure 6).

Regarding claim 4, which inherits the limitations of claim 2, Suzuki et al in view of Bai further teach wherein said analyzing and modeling stage further comprises: a plurality of outputs connected to update the parameters of said digital baseband signal predistorter (see figure 6, components 17); and a plurality of inputs connected to both (a) outputs of said signal observation feedback loop comprising first feedback signals (see figure 6), and (b) to said outputs of said digital signal predistorter blocks (see figure 6 and Bai figure 1).

Regarding claim 5, which inherits the limitations of claim 2, Suzuki et al in view of Bai further teach wherein said analyzing and modeling stage is further adapted to: perform time alignment of the complex baseband signals from sampling said first and second feedback signals (see figure 6); and perform reconstruction of the complex baseband signals from said sampling (see figure 6).

Regarding claim 6, which inherits the limitations of claim 2, Suzuki et al in view of Bai further teach said first feedback signals corresponding to baseband equivalent for

all frequency channels and wherein the baseband equivalent signal being extracted from down converted samples of RF signal output from said power amplifier (see figure 6).

Regarding claim 7, which inherits the limitations of claim 2, Suzuki et al in view of Bai further teach Suzuki et al does not expressly teach a single down conversion block. However using single down conversion block is within the scope of one of ordinary skilled in the art.

Regarding claim 8 and 9, Suzuki et al does not expressly teach a single subsampling receiver. However using single subsampling receiver is within the scope of one of ordinary skilled in the art.

Regarding claim 10, the claimed method including the features corresponds to subject matter mentioned above in the rejection of claim 1 is applicable hereto.

Claims 1 - 10 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Fuller (US 8,391,809) in view of Bai (US 2013/0183915).

Regarding claim 1, Fuller teaches a linearized transmitter (see figure 1 and 29) comprising; a digital signal predistortion block (see figure 1, component 101 digital predistortion) including digital baseband predistorters effecting predistortion of concurrent input signals to output predisorted signals (see figure 1, Digital component 101 and input signals $X(n)$); a power amplifier block connected to amplify the predistorted signals (see 1, component 112 Power amplifier); and an analyzing and modeling stage (see figure 1, component 105) receiving first feedback signals taken from an output of the power amplifier (see figure 1, the feedback path), and using the

first feedback signals in analyzing and modelling stage to model a nonlinearity in power amplifier (see figure 1, Digital predistorter), wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage (see figure 1 and 2) Fuller does not expressly disclose a second feedback signal from the output of the predistorter. However, in analogous art, Bai teaches a digital predistortion block perform the predistortion based on the first feedback from the output of the power amplifier and a second feedback from the output of the predistorters (see figure 1 (feedback from PA and DPD and paragraph 0030 and 0031)). Therefore, it would have been obvious to an ordinary skilled in the art at the time the invention was filed to use second feedback for determining DPD values. The motivation or suggestion to do so is to accurately compensate the power amplifier distortions.

Regarding claim 2, which inherits the limitations of claim 1, Fuller in view of Bai further teach wherein said concurrent digital multi-band predistortion block further comprises: a plurality of digital baseband signal predistorter each corresponding to respective channel (see figure 1, component 101, 102, 104, and 106); and a signal observation feedback loop for generating said first feedback signals (see figure 1, feedback loop).

Regarding claim 3, which inherits the limitations of claim 2, Fuller in view of Bai further teach wherein said plurality of digital baseband signal predistorters further comprises: a plurality of inputs (see figure 1), each input corresponding to a single frequency channel (see figure 1); and a plurality of outputs, each output corresponding to a single frequency channel, and each output connect to an input of a concurrent multiband transmitter (see figure 1).

Regarding claim 4, which inherits the limitations of claim 2, Fuller in view of Bai further teach wherein said analyzing and modeling stage further comprises: a plurality of outputs connected to update the parameters of said digital baseband signal predistorter (see component 108 outputting plurality of coefficients and component 208 in figure 2); and a plurality of inputs connected to both (a) outputs of said signal observation feedback loop comprising first feedback signals (see figure 1 and 2), and (b) to said outputs of said digital signal predistorter blocks (see Fuller figure 1 and 2 and Bai figure 1).

Regarding claim 5, which inherits the limitations of claim 2, Fuller in view of Bai further teach wherein said analyzing and modeling stage is further adapted to: perform time alignment of the complex baseband signals from sampling said first feedback signals (see figure 2, component 242)); and perform reconstruction of the complex baseband signals from said sampling (see figure 1 and 2).

Regarding claim 6, which inherits the limitations of claim 2, Fuller in view of Bai further teach said first feedback signals corresponding to baseband equivalent for all frequency channels and wherein the baseband equivalent signal being extracted from down converted samples of RF signal output from said power amplifier (see figure 1 and 2).

Regarding claim 7, which inherits the limitations of claim 2, Fuller in view of Bai further teach wherein said signal observation feedback loop further comprises for each channel an RF filter (see figure 2, component 246); a signal down conversion block (see figure 2, component 230, or figure 1, component 130); and an analog-to-digital converter (ADC) (see figure 2, component 244).

Regarding claim 8, which inherits the limitations of claim 2, Fuller in view of Bai further teach wherein said signal observation feedback loop further comprises: a single subsampling-based receiver to down-convert samples output from a concurrent multi-band transmitter (see figure 2, component 244).

Regarding claim 9, which inherits the limitations of claim 2, Fuller in view of Kim et al further teach Fuller et al further teaches wherein said single subsampling-based receiver further comprises: an RF filter (see figure 2, component 246); and an analog-to-digital converter (ADC) (see figure 2, component 244). Fuller is silent on a track and hold (T&H) block. However using a track and hold (T&H) block is within the scope of one of ordinary skilled in the art. At the time the invention was filed, it would be obvious to an ordinary skilled in the art to a track and hold (T&H) block in Fullers predistortion system. Applicant has not disclosed that a track and hold (T&H) block provides an advantage, is used for a particular purpose, or solves a stated problem. Therefore, it would be obvious to an ordinary skilled in the art to modify Fuller to obtain the inventions as specified in claim 9.

Regarding claim 10, the claimed method including the features corresponds to subject matter mentioned above in the rejection of claim 1 is applicable hereto.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAISON JOSEPH whose telephone number is (571)272-6041. The examiner can normally be reached on M-F 8 - 4.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sam K Ahn can be reached on 571 272 3044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JAISON . JOSEPH
Primary Examiner
Art Unit 2633

/JAISON JOSEPH/
Primary Examiner, Art Unit 2633

<i>Notice of References Cited</i>	Application/Control No. 15/583,343		Applicant(s)/Patent Under Reexamination GHANNOUCHI et al.	
	Examiner JAISON JOSEPH		Art Unit 2633	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20130183915-A1	07-2013	BAI; Chunlong	H03F1/3252	455/114.3
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<i>Search Notes</i> 	Application/Control No. 15/583,343	Applicant(s)/Patent Under Reexamination GHANNOUCHI et al.
	Examiner JAISON JOSEPH	Art Unit 2633

CPC - Searched*		
Symbol	Date	Examiner
H03F3/189 H04L25/03	1/7/2018	JJ
Updated Search	05/08/2019	JJ
Updated Search	11/12/2019	JJ

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Inventor Name Search	1/7/2018	JJ
East	1/7/2018	JJ
East Updated	05/07/2019	JJ
East Updated	11/12/2019	JJ

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

--	--

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L7	5	"47501383".FMID.	US-PGPUB; USPAT; FPRS; JPO	OR	OFF	2019/11/12 10:47
S1	1	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:21
S2	2487665	multi adj2band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:22
S3	15	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:22
S5	26	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/29 09:25
S6	87	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/01/24 18:08
S7	8	("6549067" "6999523" "7142615" "7170344" "7183847" "7634238" "8294516").PN. OR ("8391809").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2014/01/26 16:36
S8	28	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S9	54	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S10	88	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S11	4	"20090126213"	US-PGPUB;	OR	ON	2014/04/14

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			09:36
S12	3	"20090169213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/14 09:36
S13	0	14/467642	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S14	46	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S15	122	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S16	46	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S17	8	"20090126213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S18	82	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S19	2	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S20	5	("20050162225" "20050168283" "20060276147" "7183847" "8391809").PN. OR ("8817859").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/15 12:37
S21	136	multi near2 band with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10 15:44
S22	66	concurrent with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10 16:03
S23	63	dual near2 band with predistort\$5	US-PGPUB; USPAT; USOCR;	OR	ON	2015/12/10 16:04

EAST Search History

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S24	3	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10 16:13
S25	1	14/467642	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/12 22:58
S26	18	subsampling same multi near2 band	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/12 23:23
S27	10	("20020021764" "20050168283" "6999523" "7515651" "7539464" "7634238" "8391809" "8417197").PN. OR ("8606197").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/03/17 15:36
S28	10	("20020021764" "20050168283" "6999523" "7515651" "7539464" "7634238" "8391809" "8417197").PN. OR ("8606197").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/05/07 20:35
S29	45	11/961,969	US-PGPUB; USPAT; USOCR	OFF	OFF	2019/05/07 20:39
S30	33	("2012/0154038").URPN.	USPAT	OFF	OFF	2019/05/11 15:31

11/ 12/ 2019 11:01:46 AM

C:\Users\joseph1\Documents\EAST\Workspaces\15583343.wsp

STATEMENT OF DELAY DUE TO COVID-19 OUTBREAK

(Page 1 of 1)

Applicant or Patent Owner	Fadhel M. Ghannouchi		
Application No. or Patent No.	15/583,343	Filing Date or Issue Date	05/01/2017
Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP		
This statement accompanies a filing or payment that was delayed due to the COVID-19 outbreak. A practitioner, applicant, patent owner, petitioner, third-party requester, inventor, or other person associated with the filing or fee was personally affected by the COVID-19 outbreak, including, without limitation, through office closures, cash flow interruptions, inaccessibility of files or other materials, travel delays, personal or family illness, or similar circumstances, such that the outbreak materially interfered with timely filing or payment.			
Signature	/Kevin Pillay/	Date	May 18, 2020
Name (Print or Type)	Kevin Pillay	Practitioner Registration Number	51449
Note: This form must be signed in accordance with 37 CFR 1.33. Please see 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required and indicate below the total number of forms submitted.*			
☐ *Total of _____ forms are submitted.			

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	15583343			
Filing Date:	01-May-2017			
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP			
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI			
Filer:	Kevin Pillay			
Attorney Docket Number:	4207-130-CNT			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
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:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 2 months with \$0 paid	2252	1	300	300
Miscellaneous:				
Total in USD (\$)				300

Electronic Acknowledgement Receipt

EFS ID:	39464991
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	18-MAY-2020
Filing Date:	01-MAY-2017
Time Stamp:	13:01:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 300
RAM confirmation Number	E20205HD03081573
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	4207-130CNT__Resp_OA3_NF.pdf	225216	no	6
			893c9d5a0b7255ce967357fd3c50233dfb9dd206		
Warnings:					
Information:					
2	Request for extension under COVID-19	4207-130CNT_SB0449-2.pdf	35269	no	1
			8f66fcb9ba822a6bcd3bcbcb315e7142b8110b35		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30502	no	2
			d39508158c13026bbcd04b9e11f574be496t6af9a		
Warnings:					
Information:					
Total Files Size (in bytes):			290987		
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.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Fadhel M. Ghannouchi

Assignee:

Title: **DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP**

Serial No.: 15/583,343 Filing Date: 05/01/2017

Examiner: Joseph, Jaison Group Art Unit: 2633

Docket No.: 4207-130-CNT Customer No.: 46093

7616

May 18, 2020

RESPONSE TO OFFICE ACTION

Dear Sir:

This is in response to the Office Action with notification date **11/18/2019**. Please consider the following:

Amendments to the Claims are reflected in the Listing of Claims which begins on page 2;

Remarks begin on page 6.

Amendments To The Claims

Listing of Claims

This Listing of Claims will replace all prior versions, and listings of claims in the application:

1. (Previously presented) A linearized transmitter comprising:
 - a digital signal predistorter block including digital baseband signal predistorters effecting predistortion of concurrent input signals to output concurrent predistorted signals;
 - a power amplifier block connected to amplify the predistorted signals; and
 - an analyzing and modelling stage receiving first feedback signals taken from an output of the power amplifier, and second feedback signals taken concurrently from the concurrent predistorted signals and using the first feedback and the second feedback signals in the analyzing and modelling stage to model a nonlinearity in the power amplifier, wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage.
2. (Previously presented) The linearized transmitter of claim 1, wherein said concurrent digital multi-band predistortion block further comprises:
 - a plurality of the digital baseband signal predistorters each corresponding to a respective channel; and a signal observation feedback loop for generating said first feedback signals.
3. (Previously presented) The linearized transmitter of claim 2, wherein said plurality of digital baseband signal predistorters further comprises:
 - a plurality of inputs, each input corresponding to a single frequency channel; and
 - a plurality of outputs, each output corresponding to a single frequency channel, and each output connected to an input of a concurrent multi-band transmitter.
4. (Previously presented) The linearized transmitter of claim 2, wherein said analyzing and modeling stage further comprises:

a plurality of outputs connected to update the parameters of said digital baseband signal predistorters; and

a plurality of inputs connected to both: (a) outputs of said signal observation feedback loop comprising said first feed back signals, and (b) to outputs of said digital signal predistorter block.

5. (Previously presented) The linearized transmitter of claim 2, wherein said analyzing and modeling stage is further adapted to:

perform time alignment of complex baseband signals from sampling said first feedback signals; and

perform reconstruction of the complex baseband signals from said sampling.

6. (Previously presented) The linearized transmitter of claim 2,

said first feed back signals corresponding to a baseband equivalent for all frequency channels and wherein the baseband equivalent signals being extracted from down-converted samples of RF signals output from said power amplifier block.

7. (Previously presented) The linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises a plurality of channels, each channel comprising:

an RF filter;

a signal down conversion block; and

an analog-to-digital converter (ADC).

8. (Previously presented) The linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises:

a single subsampling-based receiver to down-convert samples output from said power amplifier block.

9. (Previously presented) The linearized transmitter of claim 8, wherein said single subsampling-based receiver further comprises:

an RF filter; a track and hold (T&H) block; and an analog-to-digital converter (ADC).

10. (Previously presented) A method for linearizing a transmitter, said method comprising:
effecting predistortion of concurrent input signals to output concurrent predistorted signals using a digital signal predistorter block including digital baseband signal predistorters;
amplifying the predistorted signals using a power amplifier block;

receiving in an analyzing and modelling stage first feedback signals taken from an output of the power amplifier, and second feedback signals taken concurrently from the concurrent predistorted signals; and

using the first feedback and the second feedback signals in the analyzing and modeling stage to model a nonlinearity in the power amplifier, wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage.

REMARKS

Claims 1 to 10 remain in the application.

No new matter has been added.

Claim Rejections – 35 USC § 103

- i. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Suzuki** in view of **Bai** (2013/0183915). Applicant refers the Examiner to the following discussion.

Suzuki does not provide concurrent predistorted signals. In Suzuki the predistorted signals from each channel is summed (14A) to form a single multi-channel signal to drive the amplifier. Thus Suzuki does not teach or suggest feedback signals taken concurrently from the concurrent predistorted signals, as no concurrent predistorted signals are provided.

Bai on the other hand does not remedy the deficiencies in Suzuki. Applicant submits that Bai may be improperly cited as Bai appears to have an earliest date of January 16, 2012. In contrast the subject application claims priority benefit to US Serial No. 13/274,290 filed October 14, 2011, which predates Bai. Under pre-AIA 35 U.S.C. 103(a) provides that “...the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made...”. Further, Applicant submits that to be used in an obviousness rejection under §103 a prior art reference must nevertheless qualify under §102. Thus, Bai is disqualified as prior art.

Accordingly, the combination of Suzuki and Bai do not teach or suggest the subject matter of the present claims 1 to 10. Withdrawal of the rejection is requested.

- ii. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuller in view of Bai. Applicant provides the following discussion.

Applicant agrees that as stated in the Action Fuller does not expressly disclose a second feedback signal from the output of the predistorter. However Applicant submits that Bai does not remedy this deficiency. Similar to Suzuki described above, Fuller discloses a direct learning scheme predistorter.

Further for the reasons mentioned above under (i) Bai does not remedy the deficiencies in Fuller. Accordingly, the combination of Fuller and Bai do not teach or suggest the subject matter of the present claims 1 to 10. Withdrawal of the rejection is requested.

CONCLUSION

In view of the remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the examiner is requested to telephone the undersigned at 613 614 7146

Respectfully submitted,

/Kevin Pillay/

Kevin Pillay

Registration No. 41559

Agent of Record

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 15/583,343		Filing Date 05/01/2017		☐ To be Mailed	
ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO									
APPLICATION AS FILED - PART I									
		(Column 1)			(Column 2)				
FOR		NUMBER FILED			NUMBER EXTRA	RATE (\$)	FEE (\$)		
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A			N/A	N/A			
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))		N/A			N/A	N/A			
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A			N/A	N/A			
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 =	*			x \$40 =			
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =	*			x \$210 =			
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL			
APPLICATION AS AMENDED - PART II									
		(Column 1)			(Column 2)	(Column 3)			
AMENDMENT	05/18/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))	* 10	Minus	** 20	= 0	x \$ 50 =	0		
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	x \$ 230 =	0		
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE	0		
		(Column 1)			(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$ 0 =			
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$ 0 =			
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						SLIE			
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/LISA E FULTON/			
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".									
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									

This collection of information is required by 37 CFR 1.16. 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 1.14. This collection is estimated to take 12 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

46093 7590 08/06/2020
Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ONTARIO K1N 8J6
CANADA

EXAMINER

JOSEPH, JAISON

ART UNIT

PAPER NUMBER

2633

DATE MAILED: 08/06/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT	7616

TITLE OF INVENTION: DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	11/06/2020

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

46093 7590 03/06/2020
Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ONTARIO K1N 8J6
CANADA

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT	7616

TITLE OF INVENTION: DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	11/06/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
JOSEPH, JAISON	2633	375-296000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

- (1) The names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
- (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____
- 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

- ☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT	7616
46093	7590	08/06/2020	EXAMINER	
Kevin Pillay - NUA-IP 503-85 Range Road Ottawa, ONTARIO K1N 8J6 CANADA			JOSEPH, JAISON	
			ART UNIT	PAPER NUMBER
			2633	
DATE MAILED: 08/06/2020				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

<i>Notice Requiring Inventor's Oath or Declaration</i>	Application No. 15/583,343	Applicant(s) Fadhel M. GHANNOUCHI	
	Examiner JOSEPH, JAISON	Art Unit 2633	

This notice is an attachment to the Notice of Allowability (PTOL-37), or the Notice of Allowability For A Design Application (PTOL-37D).

An inventor's oath or declaration in compliance with 37 CFR 1.63 or 1.64 executed by or with respect to each inventor has not yet been submitted.

An oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each inventor (for any inventor for which a compliant oath, declaration, or substitute statement has not yet been submitted) **MUST** be filed no later than the date on which the issue fee is paid. See 35 U.S.C. 115(f). Failure to timely comply will result in ABANDONMENT of this application.

A properly executed inventor's oath to declaration has not been received for the following inventor(s):

If applicant previously filed one or more oaths, declarations, or substitute statements, applicant may have received an informational notice regarding deficiencies therein.

The following deficiencies are noted:

INFORMAL ACTION PROBLEMS

- A properly executed inventor's oath or declaration has not been received for the following inventor(s): **Fadhel M. GHANNOUCHI, Seyed Aidin BASSAM, Mohamed HELAOUI, and Andrew KWAN.**

Applicant may submit the inventor's oath or declaration at any time before the Notice of Allowance and Fee(s) Due, PTOL-85, is mailed.

Questions relating to this Notice should be directed to the Application Assistance Unit at 571-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 1.14. This collection is estimated to take 30 minutes 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, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b) (2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/583,343	Applicant(s) GHANNOUCHI et al.	
	Examiner JAISON JOSEPH	Art Unit 2633	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment filed on May 18, 2020.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-10. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some *c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☐ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/JAISON JOSEPH/ Primary Examiner, Art Unit 2633	
--	--

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Reasons for Allowance

The following is an examiner's statement of reasons for allowance: Claims 1 – 10 are allowable over prior art of record. The prior art of record failed to teach, alone or in combination, a linearized transmitter comprising: a digital signal predistorter block including digital baseband signal predistorters effecting predistortion of concurrent input signals to output concurrent predistorted signals; a power amplifier block connected to amplify the predistorted signals; and an analyzing and modelling stage receiving first feedback signals taken from an output of the power amplifier, and second feedback signals taken concurrently from the concurrent predistorted signals and using the first feedback and the second feedback signals in the analyzing and modelling stage to model a nonlinearity in the power amplifier, wherein the digital baseband signal predistorters are updated by the analyzing and modelling stage as claimed in independent claim 1 and similarly claimed in independent claim 10. Therefore, claims 1 – 10 are novel and non-obvious over prior art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAISON JOSEPH whose telephone number is (571)272-6041. The examiner can normally be reached on M-F 8 - 4.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sam K Ahn can be reached on 571 272 3044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <https://ppair-my.uspto.gov/pair/PrivatePair>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JAISON . JOSEPH
Primary Examiner
Art Unit 2633

Application/Control Number: 15/583,343
Art Unit: 2633

Page 4

/JAISON JOSEPH/
Primary Examiner, Art Unit 2633

<i>Search Notes</i> 	Application/Control No. 15/583,343	Applicant(s)/Patent Under Reexamination GHANNOUCHI et al.
	Examiner JAISON JOSEPH	Art Unit 2633

CPC - Searched*		
Symbol	Date	Examiner
H03F3/189 H04L25/03	1/7/2018	JJ
Updated Search	05/08/2019	JJ
Updated Search	11/12/2019	JJ
Updated Search	08/02/2020	JJ

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Inventor Name Search	1/7/2018	JJ
East	1/7/2018	JJ
East Updated	05/07/2019	JJ
East Updated	11/12/2019	JJ
East Updated	08/02/2020	JJ

--	--

<i>Search Notes</i> 	Application/Control No. 15/583,343	Applicant(s)/Patent Under Reexamination GHANNOUCHI et al.
	Examiner JAISON JOSEPH	Art Unit 2633

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	Same as above	08/01/2020	JJ

--	--

Issue Classification 	Application/Control No. 15/583,343	Applicant(s)/Patent Under Reexamination GHANNOUCHI et al.
	Examiner JAISON JOSEPH	Art Unit 2633

CPC						
Symbol					Type	Version
H04B	/	1	/	0475	F	2013-01-01
H04L	/	25	/	03343	I	2013-01-01
H03F	/	3	/	189	I	2013-01-01
H03F	/	1	/	3247	I	2013-01-01
H03F	/	3	/	245	I	2013-01-01
H03F	/	2200	/	204	A	2013-01-01
H03F	/	2200	/	207	A	2013-01-01
H03F	/	2200	/	111	A	2013-01-01
H03F	/	2200	/	408	A	2013-01-01
H04B	/	2001	/	0425	A	2013-01-01
H04L	/	2025	/	03356	A	2013-01-01

CPC Combination Sets							
Symbol				Type	Set	Ranking	Version
	/		/				

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	10	
/JAISON JOSEPH/ Primary Examiner, Art Unit 2633	02 August 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

Issue Classification 	Application/Control No. 15/583,343	Applicant(s)/Patent Under Reexamination GHANNOUCHI et al.
	Examiner JAISON JOSEPH	Art Unit 2633

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H04B1/04	/	1	/ 04

NON-CLAIMED			
/	/	/	/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	10	
/JAISON JOSEPH/ Primary Examiner, Art Unit 2633	02 August 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

Issue Classification 	Application/Control No. 15/583,343	Applicant(s)/Patent Under Reexamination GHANNOUCHI et al.
	Examiner JAISON JOSEPH	Art Unit 2633

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	10	
/JAISON JOSEPH/ Primary Examiner, Art Unit 2633	02 August 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

Bibliographic Data

Application No: 15/583,343

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged:

Examiner's Signature

Initials

Title:

DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH
NON-LINEAR SUBSAMPLING ALGORITHM IN THE
FEEDBACK LOOP

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
05/01/2017	375	2633	4207-130-CNT
RULE			

APPLICANTS

Fadhel M. GHANNOUCHI, Calgary, CANADA

INVENTORS

Fadhel M. GHANNOUCHI, Calgary, CANADA

Sayed Aidin BASSAM, Calgary, CANADA

Mohamed HELAOUI, Calgary, CANADA

Andrew KWAN, Calgary, CANADA

CONTINUING DATA

This application is a CON of 14467642 08/25/2014 PAT 9641204

14467642 is a CON of 13274290 10/14/2011 PAT 8817859

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

05/08/2017

**** SMALL ENTITY ****

STATE OR COUNTRY

CANADA

ADDRESS

Kevin Pillay - NUA-IP

503-85 Range Road

Ottawa, ON K1N 8J6

CANADA

FILING FEE RECEIVED

\$800

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L5	194	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/02 23:00
L6	122	concurrent with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/02 23:00
L7	79	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/02 23:00
L8	37	multi adj2 band adj2 predistort\$4 and (H04B1/0475 H03F1/3247 H03F3/189, H03F3/245 H04L25/03343)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/02 23:02
S1	1	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:21
S2	2,487,665	multi adj2band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:22
S3	15	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/26 17:22

S5	26	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/29 09:25
S6	87	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/01/24 18:08
S7	8	("6549067" "6999523" "7142615" "7170344" "7183847" "7634238" "8294516").PN. OR ("8391809").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2014/01/26 16:36
S8	28	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S9	54	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S10	88	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/11 15:41
S11	4	"20090126213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/14 09:36
S12	3	"20090169213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/14 09:36
S13	0	14/467642	US-PGPUB; USPAT;	OR	ON	2015/06/15 12:36

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S14	46	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S15	122	multi adj2 band near32 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S16	46	multi adj2 band adj2 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S17	8	"20090126213"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S18	82	multi adj2 band near3 predistort\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S19	2	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/15 12:36
S20	5	("20050162225" "20050168283" "20060276147" "7183847" "8391809").PN. OR ("8817859").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/15 12:37
S21	136	multi near2 band with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2015/12/10 15:44

			DERWENT; IBM_TDB			
S22	66	concurrent with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10 16:03
S23	63	dual near2 band with predistort\$5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10 16:04
S24	3	13/274290	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/10 16:13
S25	1	14/467642	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/12 22:58
S26	18	subsampling same multi near2 band	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/12 23:23
S27	10	("20020021764" "20050168283" "6999523" "7515651" "7539464" "7634238" "8391809" "8417197").PN. OR ("8606197").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/03/17 15:36
S28	10	("20020021764" "20050168283" "6999523" "7515651" "7539464" "7634238" "8391809" "8417197").PN. OR ("8606197").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/05/07 20:35
S29	45	11/961,969	US-PGPUB; USPAT; USOCR	OR	OFF	2019/05/07 20:39
S30	33	("2012/0154038").URPN.	USPAT	OR	OFF	2019/05/11 15:31

S31	5	"47501383".FMID.	US-PGPUB; USPAT; FPRS; JPO	OR	OFF	2019/11/12 10:47
-----	---	------------------	----------------------------------	----	-----	---------------------

8/2/2020 11:03:28 PM

C:\Users\jjoseph1\Documents\EAST\Workspaces\15583343.wsp

UNITED STATES PATENT AND TRADEMARK OFFICE
COMMISSIONER FOR PATENTS
P.O.BOX 1450
ALEXANDRIA VA 22313-1451

PRESORTED
FIRST-CLASS MAIL
U.S. POSTAGE PAID
POSTEDIGITAL
NNNNN

Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ON K1N 8J6
CANADA



**Courtesy Reminder for
Application Serial No: 15/583,343**

Attorney Docket No: 4207-130-CNT

Customer Number: 46093

Date of Electronic Notification: 08/06/2020

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

kpillay@nuaipservices.com

kpillay.ot@gmail.com

To view your correspondence online or update your email addresses, please visit us anytime at **<https://ppair-my.uspto.gov/pair/PrivatePair>**.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/583,343	05/01/2017	Fadhel M. GHANNOUCHI	4207-130-CNT	7616
7590 Kevin Pillay - NUA-IP 503-85 Range Road Ottawa, ON K1N 8J6 CANADA			EXAMINER JOSEPH, JAISON	
11/23/2020			ART UNIT 2633	
			PAPER NUMBER	
			NOTIFICATION DATE 11/23/2020	
			DELIVERY MODE ELECTRONIC	

Notice of Abandonment

This application is abandoned in view of:

1. ☐ The applicant's failure to timely file a proper reply to the Office letter mailed on _____.
 - (a) ☐ A reply was received on _____ (with a Certificate of Mailing or Transmission date _____), which is after the expiration of the period for reply (including a total extension of ____ month(s)) which expired on _____.
 - (b) ☒ No reply has been received.
2. ☒ Applicant's failure to timely pay the required issue fee and publication fee, if applicable, within the statutory period of three months from the mailing date of the Notice of Allowance (PTOL-85).
 - (a) ☐ The issue fee and publication fee, if applicable, was received on _____ (with a Certificate of Mailing or Transmission date _____), which is after the expiration of the statutory period for payment of the issue fee (and publication fee) set in the Notice of Allowance (PTOL-85).
 - (b) ☐ The submitted fee of \$_____ is insufficient. A balance of \$_____ is due.
The issue fee required by 37 CFR 1.18 is \$_____.
The publication fee, if required by 37 CFR 1.18(d), is \$_____.
 - (c) ☒ The issue fee and publication fee, if applicable, has not been received.
3. ☐ Applicant's failure to timely file corrected drawings as required by, and within the three-month period set in, the Notice of Allowability (PTO-37).
 - (a) ☐ Proposed corrected drawings were received on _____ (with a Certificate of Mailing or Transmission dated _____), which is after the expiration of the period for reply.
 - (b) ☒ No corrected drawing have been received.
4. ☒ Applicant's failure to timely file the inventor's oath or declaration no later than the date on which the issue fee was paid as required by the Notice Requiring Inventor's Oath or Declaration (PTO-2306).
 - (a) ☐ An inventor's oath or declaration was received on _____ (with a Certificate of Mailing or Transmission date _____), which is after the date on which the issue fee was paid.
 - (b) ☐ While an oath or declaration (or substitute statement) for one or more inventors was received, an oath or declaration (or substitute statement) for at least one other inventor has not been received.
 - (c) ☒ No inventor's oath or declaration has been received.
5. ☐ Drawings received on _____ were disapproved by examiner. See examiner's response dated _____.
6. ☐ Corrected drawings were received on _____, which is after the expiration of the one-month period for reply set in examiner's response dated _____.
7. ☐ No corrected drawings have been received in reply to one-month period set in examiner's response dated _____.
8. ☐ The reason(s) below:

Petitions to revive under 37 CFR 1.137(a) or request to withdraw the holding of abandonment under 37 CFR 1.181, should be promptly filed to minimize any negative effects on patent term.

(571)-272-4200 or 1(888)-786-0101
Patent Publication Branch
Office of Data Management
FORM PTO-ABN0 (Rev. 03/17)

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
-------------------------------	---

As the below named inventor, I hereby declare that:

This declaration is directed to: ☐ The attached application, or
☒ United States application or PCT international application number 15/583,343
filed on 05/01/2017.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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 the 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.

LEGAL NAME OF INVENTOR

Inventor: Seyed Aidin Bassam Date (Optional) : _____

Signature: /Seyed Aidin Bassam/

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
-------------------------------	---

As the below named inventor, I hereby declare that:

This declaration is directed to: ☐ The attached application, or
☒ United States application or PCT international application number 15/583,343
filed on 05/01/2017.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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 the 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.

LEGAL NAME OF INVENTOR

Inventor: Fadhel M. Ghannouchi Date (Optional) : _____

Signature: /Fadhel M. Ghannouchi/

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
-------------------------------	---

As the below named inventor, I hereby declare that:

This declaration is directed to: ☐ The attached application, or
☒ United States application or PCT international application number 15/583,343
filed on 05/01/2017.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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 the 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.

LEGAL NAME OF INVENTOR	
Inventor: <u>Mohamed Helaoui</u>	Date (Optional) : _____
Signature: <u>/Mohamed Helaoui/</u>	

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
-------------------------------	---

As the below named inventor, I hereby declare that:

This declaration is directed to: ☐ The attached application, or
☒ United States application or PCT international application number 15/583,343
filed on 05/01/2017.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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 the 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.

LEGAL NAME OF INVENTOR	
Inventor: <u>Andrew Kwan</u>	Date (Optional) : _____
Signature: <u>/Andrew Kwan/</u>	

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	15583343			
Filing Date:	01-May-2017			
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP			
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI			
Filer:	Kevin Pillay			
Attorney Docket Number:	4207-130-CNT			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
LATE FILING FEE FOR OATH OR DECLARATION	2051	1	80	80
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				80

Electronic Acknowledgement Receipt

EFS ID:	41921161
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	15-FEB-2021
Filing Date:	01-MAY-2017
Time Stamp:	08:56:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$80
RAM confirmation Number	E20212E958314268
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	aia0001-Bassam.pdf	171570	no	2
			c33c09d7c846299a63acd7bc07b247e416a5d9b		
Warnings:					
Information:					
2	Oath or Declaration filed	aia0001-Ghannouchi.pdf	171571	no	2
			d3ce5376103b67d1ded1527da3493fcd455367a7		
Warnings:					
Information:					
3	Oath or Declaration filed	aia0001-Helaoui.pdf	171522	no	2
			864253e6f5e88da5d4b48f899529a420386bfb5e		
Warnings:					
Information:					
4	Oath or Declaration filed	aia0001-Kwan.pdf	171541	no	2
			8c111a0754fb91988d37dccc4e670921087461cd		
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	30114	no	2
			75a5098793337c9b16069a076ee3e9de48345a87		
Warnings:					
Information:					
Total Files Size (in bytes):			716318		

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.

New Applications Under 35 U.S.C. 111

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.

National Stage of an International Application under 35 U.S.C. 371

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.

New International Application Filed with the USPTO as a Receiving Office

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.

Doc Code: PET.AUTO Document Description: Petition automatically granted by EFSWeb		PTO/SB/64 U.S. Patent and Trademark Office Department of Commerce
Electronic Petition Request	PETITION FOR REVIVAL OF AN APPLICATION FOR PATENT ABANDONED UNINTENTIONALLY UNDER 37 CFR 1.137(a)	
Application Number	15583343	
Filing Date	01-May-2017	
First Named Inventor	Fadhel GHANNOUCHI	
Art Unit	2633	
Examiner Name	JAISON JOSEPH	
Attorney Docket Number	4207-130-CNT	
Title	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP	
The above-identified application became abandoned for failure to file a timely and proper reply to a notice or action by the United States Patent and Trademark Office. The date of abandonment is the day after the expiration date of the period set for reply in the office notice or action plus any extensions of time actually obtained. APPLICANT HEREBY PETITIONS FOR REVIVAL OF THIS APPLICATION NOTE: A grantable petition requires the following items: (1) Petition fee; (2) Reply and/or issue fee; (3) Terminal disclaimer with disclaimer fee – required for all utility and plant applications filed before June 8, 1995; and for all design applications; (4) Statement that the entire delay was unintentional.		
Petition Fee		
☒ Small Entity		
☐ Micro Entity		
☐ Regular Undiscounted		
Issue Fee and Publication Fee :		
Issue Fee and Publication Fee must accompany ePetition.		
☒ Issue Fee Transmittal is attached		
Drawing corrections and/ or other deficiencies.		

- ☐ Drawing corrections and/ or other deficiencies are not required
- ☒ I certify, in accordance with 37 CFR 1.4(d)(4), that drawing corrections and/ or other deficiencies have previously been filed on 02-15-2021
- ☐ Drawing corrections and/ or other deficiencies are attached.

STATEMENT: The entire delay in filing the required reply from the due date for the required reply until the filing of a ☒ grantable petition under 37 CFR 1.137(a) was unintentional.

Petitioner is reminded that a delay resulting from a deliberately chosen course of action on the part of the applicant does not become an "unintentional" delay within the meaning of 37CFR 1.137 because:

- the applicant does not consider the claims to be patentable over the references relied upon in an outstanding Office action;
- the applicant does not consider the allowed or patentable claims to be of sufficient breadth or scope to justify the financial expense of obtaining a patent;
- the applicant does not consider any patent to be of sufficient value to justify the financial expense of obtaining the patent; or
- the applicant remains interested in eventually obtaining a patent, but simply seeks to defer patent fees and patent prosecution expenses.

Petitioner is further reminded that an intentional delay resulting from a deliberate course of action chosen by the applicant is not affected by:

- the correctness of the applicant's (or applicant's representative's) decision to abandon the application or not to seek or persist in seeking revival of the application;
- the correctness or propriety of a rejection, or other objection, requirement, or decision by the Office; or
- the discovery of new information or evidence, or other change in circumstances subsequent to the abandonment or decision not to seek or persist in seeking revival.

NOTE: Where the petition under 37 CFR 1.137(a) is filed more than two years after the date the application became abandoned, the United States Patent and Trademark Office requires an additional explanation of the circumstances surrounding the delay that establishes the entire delay was unintentional. This requirement is in addition to the requirement to provide a statement that the entire delay was unintentional. See *Clarification of the Practice for Requiring Additional Information in Petitions Filed in Patent Applications and Patents Based on Unintentional Delay*, 85 FR 12222 (March 2, 2020). See MPEP 711.03(c)(II)(C)-(F) for additional guidance on the information required to establish that the entire delay was unintentional.

THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

- ☒ An attorney or agent registered to practice before the Patent and Trademark Office who has been given power of attorney in this application.
- ☐ An attorney or agent registered to practice before the Patent and Trademark Office, acting in a representative capacity.
- ☐ A sole inventor
- ☐ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application
- ☐ A joint inventor; all of whom are signing this e-petition.

Signature	/kevin pillay/
Name	kevin pillay
Registration Number	41559

Typed or printed name: **KEVIN PILAY**
Authorized Signature: *[Signature]*
Date: **Feb 19, 2021**
Registration No.: **41559**

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.
☐ Applicant changing to regular unadjudicated fee status
☐ Applicant asserting small entity status. See 37 CFR 1.27
☐ Applicant certifying micro entity status. See 37 CFR 1.29
5. **Change in Entity Status** (From status indicated above)
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

4a. Fees submitted: ☒ Issue fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies
4b. Method of Payment: (Please first receipt any previously paid fee shown above)
☒ Electronic Payment via EFS-Web ☐ In-person check ☐ Non-electronic payment by credit card (Attach form PTO-2018)
The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____
Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type):
(A) NAME OF ASSIGNEE: _____
(B) RESIDENCE (CITY AND STATE OR COUNTRY): _____
PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.
1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.163):
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/121) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/121, Rev. 07-09 or more recent) attached. Use of a Customer Number is required.
2. Fee printing on the patent from page, list:
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively, registered attorney or agent and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1. _____
2. _____
3. _____

EXAMINER	ART UNIT	CLASS SUBJECT
JOSEPH, JASON	2613	375-296000
nonprovisional	SMALL	\$500
APPL. TYPE	ENTRY STATUS	ISSUE FEE DUE
11/06/2020	5800	50.00
DATE DUE	TOTAL FEES DUE	DATE DUE

FEEDBACK: _____
TITLE OF INVENTION: DIGITAL MULTIBAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE
13/583,343 05/01/2017 Padmal M. GHANNOUCHI 4207-130-CNT 7616
APPLICATION NO. FILING DATE FIRST NAMED INVENTOR ATTORNEY DOCKET NO. CONFIRMATION NO.

Signature: _____
Typed or printed name: _____
Date: _____

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop 185CE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.
Date: _____
Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.
CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)
46093 7290 08/06/2020
Kevin Pilay - NUA-IP
503-85 Range Road
Ottawa, Ontario K1N 8J6
CANADA
By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
By fax, send to: (571)-273-2885

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.
PART B - FEES) TRANSMITTAL

Electronic Patent Application Fee Transmittal

Application Number:	15583343			
Filing Date:	01-May-2017			
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP			
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI			
Filer:	Kevin Pillay			
Attorney Docket Number:	4207-130-CNT			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
PET. REVIVE ABANDON APP, DELAY PYMT-RESP	2453	1	1050	1050
UTILITY APPL ISSUE FEE	2501	1	500	500
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1550



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Decision Date : February 19, 2021

In re Application of :

Fadhel GHANNOUCHI

Application No : 15583343

Filed : 01-May-2017

Attorney Docket No : 4207-130-CNT

DECISION ON PETITION

UNDER CFR 1.137(a)

This is an electronic decision on the petition under 37 CFR 1.137(a), filed February 19, 2021 , to revive the above-identified application.

The petition is **GRANTED**.

The above-identified application became abandoned for failure to reply in a timely manner to the Notice of Allowance and Issue Fee(s) Due. The date of abandonment is the day after the expiration date of the period set for reply in the Notice.

The electronic petition satisfies the conditions for revival pursuant to the provisions of 37 CFR 1.137(a) in that (1) the reply in the form of payment of the Issue Fee and the Publication Fee (if necessary); (2) the petition fee as set forth in 37 CFR 1.17 (m); (3) the drawing correction and/or other deficiencies (if necessary); and (4) the required statement of unintentional delay have been received. Accordingly, the Issue Fee payment is accepted as having been unintentionally delayed.

Telephone inquiries concerning this decision should be directed to the Patent Electronic Business Center (EBC) at 866-217-9197.

This application file is being directed to the Office of Data Management.

Office of Petitions

Electronic Acknowledgement Receipt

EFS ID:	41975547
Application Number:	15583343
International Application Number:	
Confirmation Number:	7616
Title of Invention:	DIGITAL MULTI-BAND PREDISTORTION LINEARIZER WITH NON-LINEAR SUBSAMPLING ALGORITHM IN THE FEEDBACK LOOP
First Named Inventor/Applicant Name:	Fadhel M. GHANNOUCHI
Customer Number:	46093
Filer:	Kevin Pillay
Filer Authorized By:	
Attorney Docket Number:	4207-130-CNT
Receipt Date:	19-FEB-2021
Filing Date:	01-MAY-2017
Time Stamp:	21:38:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1550
RAM confirmation Number	E20212IL38163405
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition automatically granted by EFS	petition-request.pdf	40400	no	2
			1f45ee84f54adea1da7fd2ef4906c12d128f788		
Warnings:					
Information:					
2	Issue Fee Payment (PTO-85B)	4207-130-CNT-issue-fee.pdf	583006	no	1
			cca1f3910d2f64786310d218e203d2374f90798c		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	31601	no	2
			c72247e576e4c34210fa3a1f3f2d3c3e0d594419		
Warnings:					
Information:					
Total Files Size (in bytes):			655007		
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.					



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/583,343	03/23/2021	10958296	4207-130-CNT	7616

46093 7590 03/03/2021

Kevin Pillay - NUA-IP
503-85 Range Road
Ottawa, ONTARIO K1N 8J6
CANADA

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Fadhel M. GHANNOUCHI, Calgary, CANADA;
Fadhel M. GHANNOUCHI, Calgary, CANADA;
Seyed Aidin BASSAM, Calgary, CANADA;
Mohamed HELAOUI, Calgary, CANADA;
Andrew KWAN, Calgary, CANADA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.