

Exhibit E-4

Invalidity of U.S. Patent No. 10,958,296 by "A new approach for concurrent Dual-Band IF Digital PreDistortion: System design and analysis," to Cidronali et al. ("Cidronali")

The Asserted Claims of U.S. Patent No. 10,958,296 ("the '296 Patent") are anticipated and/or rendered obvious in view of "A new approach for concurrent Dual-Band IF Digital PreDistortion: System design and analysis," ("Cidronali") alone or in combination with other prior art. Cidronali was published in the *2008 Workshop on Integrated Nonlinear Microwave and Millimetre-Wave Circuits*, Malaga, Spain, in 2008, pp. 127-130, doi: 10.1109/INMMIC.2008.4745733. Cidronali, thus, is prior art to the '296 Patent at least under 35 U.S.C. § 102(b).

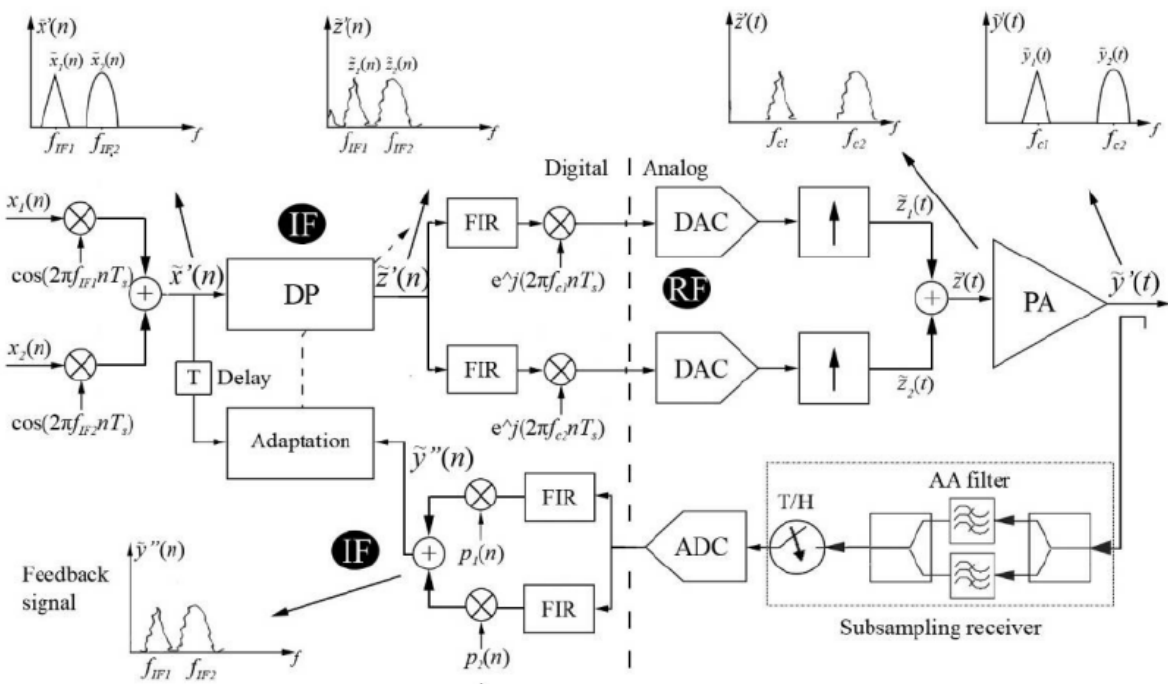
As described in detail below, Cidronali anticipates Asserted Claims 1–10 of the '296 Patent. In addition, to the extent that Smart RF asserts that Cidronali or citations below are insufficient, every limitation set forth in the claim was predictable and obvious in view of the knowledge and progression of the art. As such, it would have been obvious to one of ordinary skill in the art at the time of the alleged invention, based on the explicit and implicit teaching of this reference and the prior art, the knowledge of one of ordinary skill in the art, and/or the nature of the claimed invention and the problem(s) purportedly being solved to take the purportedly missing element from the art and combine it with the other elements in prior art identified in the cover pleading or herein.

This claim chart is based on Defendants' present understanding of the asserted claims, Smart RF's vague and overbroad infringement contentions (and corresponding, implicit claim constructions), and Defendants' investigations to date. Defendants are not adopting Smart RF's apparent constructions, nor are Defendants admitting to the accuracy of any particular construction. Defendants reserve all rights to amend this invalidity claim chart in light of any claim-construction developments or any amendment to Smart RF's infringement contentions. Further, as discovery is ongoing and Defendants continue to seek discovery from third parties regarding the references identified in Defendants' invalidity contentions as well as other potential prior art, Defendants reserve the right to amend or supplement this claim chart identified in connection with Defendants' continuing investigation. At minimum, Defendants intend to revise their invalidity contentions as appropriate to include discovery from third parties as discovery progresses. The claim chart below identifies where each limitation of the asserted claims of the '204 Patent can be found in Cidronali. The citations provided below are exemplary, rather than exhaustive, and Defendants reserve the right to rely upon any other portion of the cited references.

Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
1[pre]	A linearized transmitter comprising:	To the extent the preamble is limiting, Cidronali discloses and/or renders obvious a linearized transmitter.

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		<i>See, e.g.,</i> “<i>Abstract</i> — In this paper we propose a Dual Band Digital Predistorter (DB-DPD), suitable for concurrent dual-band power amplifiers. A sub-sampling receiver is at the basis of the feedback path, while the vectorial gain adjuster is achieved at the proper digital intermediate frequency. The proposed method adopts a conventional memory polynomial DPD for linearization. The approach is tested by system-level simulations and it was proven to be able to correct most of the nonlinearity, with only a modest performance loss with respect to single-band architectures.” Abstract. “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1.
1[a]	a digital signal predistorter block including digital baseband signal predistorters effecting predistortion of concurrent input signals to output concurrent predistorted signals;	Cidronali discloses and/or renders obvious a digital signal predistorter block including digital baseband signal predistorters effecting predistortion of concurrent input signals to output concurrent predistorted signals. <i>See, e.g.,</i> “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility

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		and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to f_{IF1} and f_{IF2} then summed thus creating $\tilde{x}(n)$, which is about a proper IF and passed through the gain adjuster; the output of this process is the numeric signal $\tilde{z}(n)$. The next step is operated by a numeric diplexer which separates again the two frequency bands. A pair of numeric frequency down- conversions translates to baseband the two signal which are then converted in the analogue domain. This latter numeric process is required when the ADC clock frequency is an issue. The analogue PA input $\tilde{z}(t)$ is obtained by frequency shifting to the RF frequencies f_{c1} and f_{c2}, and combining them. The PA output $\tilde{y}(t)$, is spilled and a portion of it is used to create the feedback signals. The feedback path proposed in this paper consists of the coherent dual-band subsampling receiver discussed in the previous section. The two bands composing $\tilde{y}(t)$ are aliased side-by-side in the baseband, then digitized by a single ADC. In the digital domain, the bands are separated and shifted to IF, composing the signal $\tilde{y}(n)$ that is compared to $\tilde{x}(n)$ by the direct learning training algorithm. The block diagram of the whole system is shown in Fig. 4.” Pgs. 2-3.

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		 Fig. 4. DB-DP system with IF predistortion and subsampling feedback Fig. 4.
1[b]	a power amplifier block connected to amplify the predistorted signals; and	Cidronali discloses and/or renders obvious a power amplifier block connected to amplify the predistorted signals. <i>See, e.g.,</i>

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		“In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $f_{IF} 1$ and $f_{IF} 2$ then summed thus creating $\tilde{x}(n)$, which is about a proper IF and passed through the gain adjuster; the output of this process is the numeric signal $\tilde{z}(n)$. The next step is operated by a numeric diplexer which separates again the two frequency bands. A pair of numeric frequency down- conversions translates to baseband the two signal which are then converted in the analogue domain. This latter numeric process is required when the ADC clock frequency is an issue. The analogue PA input $\tilde{z}(t)$ is obtained by frequency shifting to the RF frequencies f_{c1} and f_{c2}, and combining them. The PA output $\tilde{y}(t)$, is spilled and a portion of it is used to create the feedback signals. The feedback path proposed in this paper consists of the coherent dual-band subsampling receiver discussed in the previous section. The two bands composing $\tilde{y}(t)$ are aliased side-by-side in the baseband, then digitized by a single ADC.” Pg. 2.

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		“A) <i>Combined dedicated PAs</i> One out of the two dual-band architectures considered in this work is based on the schematic representation reported in Fig. 1. It represents the most straightforward solution which makes use of two dedicated PAs combined by a diplexer. While for the PA units the designer can access to the most mature and advances design methodologies and technologies, the passive diplexer still represents a very critical part of the entire PA structure. Indeed, this component must guarantee an almost lossless behavior in the transmission paths and an as much as possible isolation. In particular the former feature is required to preserve the combined efficiency of the entire structure, while the latter is a required feature to avoid the cross-modulation between the two dedicated PAs. The constraints on the diplexer become more critical in the case of closer operative spectrum bands. During the two dedicated PAs design, the eventual combination with the diplexer doesn’t require specific additional PA design consideration, only an accurate evaluation of the out-of band termination which might degrade the output power and efficiency of the two units.” Pg. 1. “B) <i>Dual-band single PA</i> The PA architecture under investigation in this paper is represented by the dual-band single PA, i.e. a circuit designed around a single active device and able to simultaneously operate at two different frequency bands. The schematic of the concurrent PA is reported in Fig. 2, where the dual-tuned matching networks are synthesized by either passive and/or distributed elements properly dimensioned, without external tuning controls. The basic principle discussed in [5]-[6], for the development of dual-tuned matching network can be effectively considered for the concurrent dual-band PA. In this configuration the two signal sources are combined prior to be applied to the PA input. The design method of concurrent dual-band PA based on multi-tuned networks composed of lumped elements is discussed in detail in [7].” Pg. 1-2.

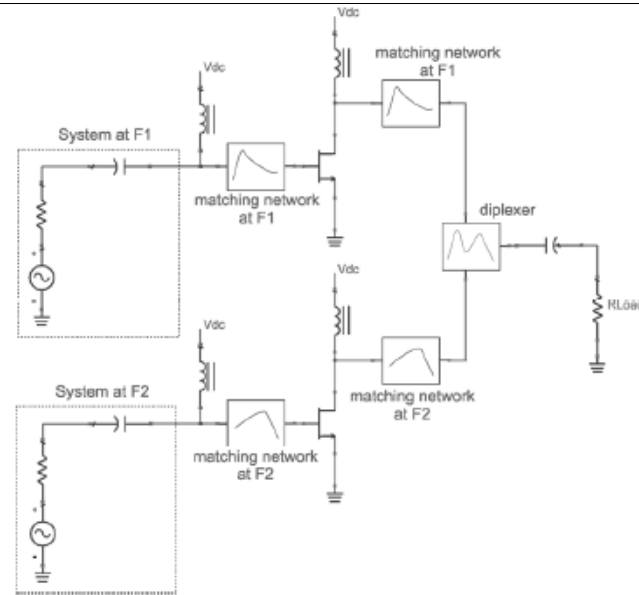


Fig. 1. Schematic of the concurrent dual-band PA implemented by two combined dedicated PAs.

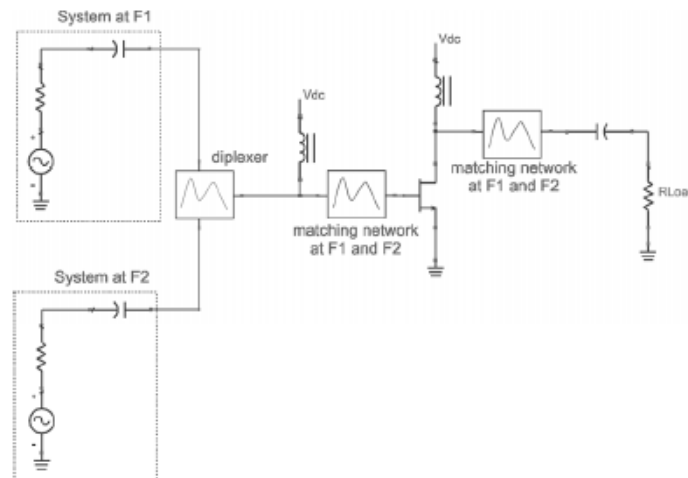
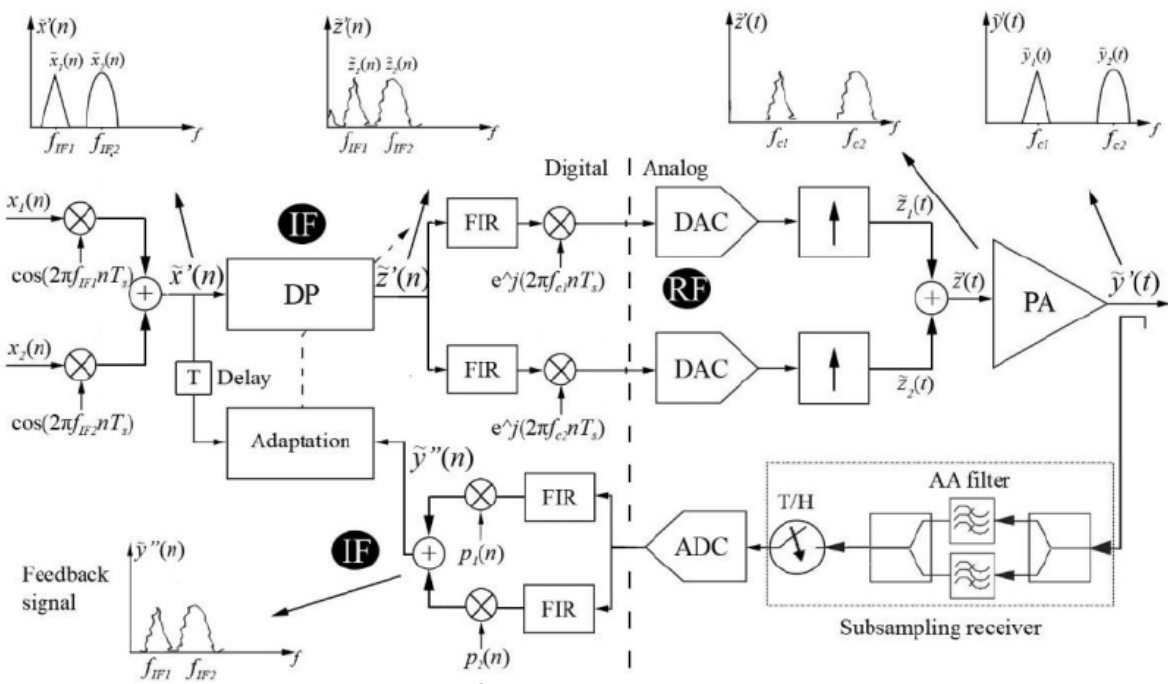


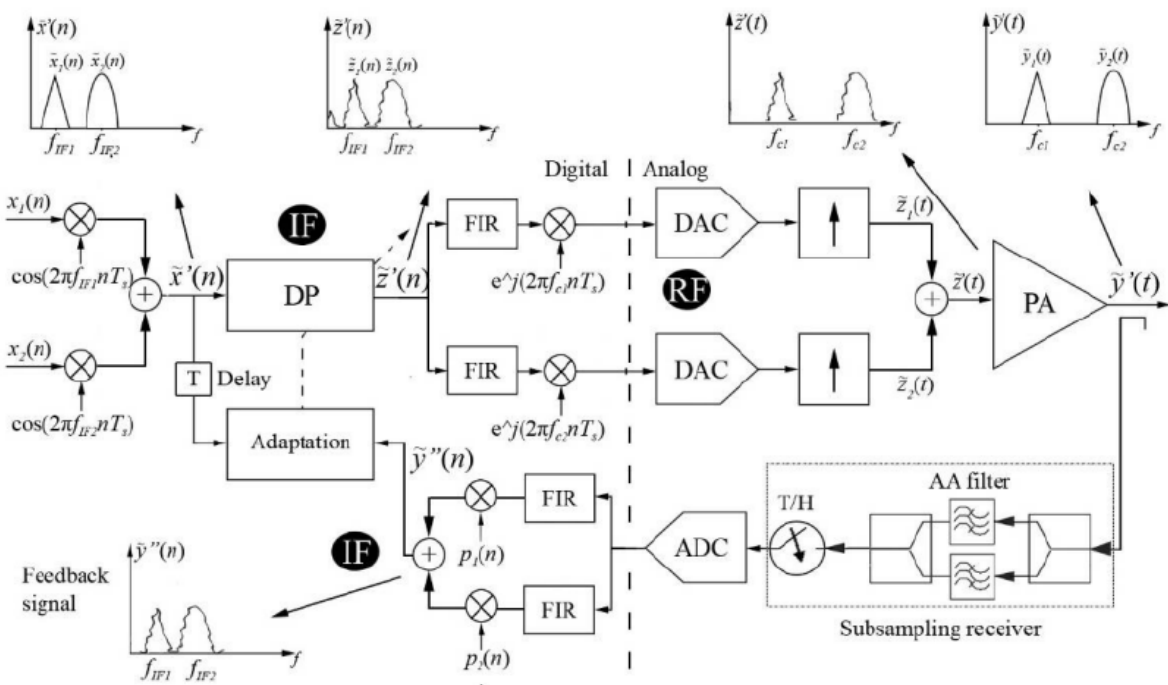
Fig. 2. Concurrent dual-band PA schematic, implemented by a dual-band PA.

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		Figs. 1-2.
1[c]	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.	Cidronali discloses and/or renders obvious 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. <i>See, e.g.,</i> “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $f_{IF} 1$ and $f_{IF} 2$ then

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		summed thus creating $x\sim'(n)$, which is about a proper IF and passed through the gain adjuster; the output of this process is the numeric signal $z\sim'(n)$. The next step is operated by a numeric diplexer which separates again the two frequency bands. A pair of numeric frequency down- conversions translates to baseband the two signal which are then converted in the analogue domain. This latter numeric process is required when the ADC clock frequency is an issue. The analogue PA input $z\sim'(t)$ is obtained by frequency shifting to the RF frequencies $fc1$ and $fc2$, and combining them. The PA output $y\sim'(t)$, is spilled and a portion of it is used to create the feedback signals. The feedback path proposed in this paper consists of the coherent dual-band subsampling receiver discussed in the previous section. The two bands composing $y\sim'(t)$ are aliased side-by-side in the baseband, then digitized by a single ADC. In the digital domain, the bands are separated and shifted to IF, composing the signal $y\sim''(n)$ that is compared to $x\sim'(n)$ by the direct learning training algorithm. The block diagram of the whole system is shown in Fig. 4.” Pgs. 2-3.

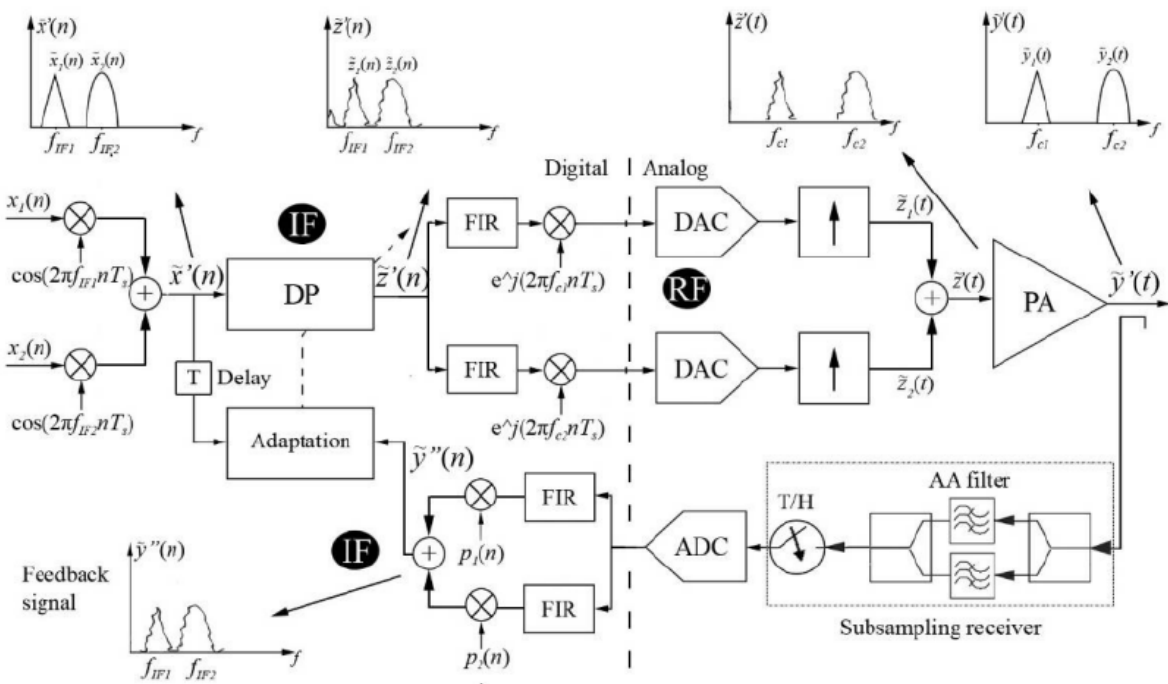
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		 Fig. 4. DB-DP system with IF predistortion and subsampling feedback Fig. 4. “The proposed DB-DPD system architecture exploits a memory polynomial predistorter and a subsampling receiver as a feedback path. The DB-DP implements a memory polynomial predistorter and a direct learning training method similar to those involved in single band DP. It operates at a proper digital IF and it is able to correct most NLS, even those due to memory effect, both in single and dual band operation. The introduced technique can be effectively used in conjunction with concurrent dual-band PAs. Comparison with conventional DPD shows that the performance decreases slightly when a concurrent dual band signal is predistorted.” Pg. 4.

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2	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.	Cidronali discloses and/or renders obvious 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. <i>See</i>, claim 1, <i>supra</i>, which is incorporated by reference herein. <i>See also, e.g.</i>, “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $f_{IF} 1$ and $f_{IF} 2$ then summed thus creating $x_{\sim}(n)$, which is about a proper IF and passed through the gain adjuster; the output of this process is the numeric signal $z_{\sim}(n)$. The next step is operated by a numeric diplexer which separates again the two frequency bands. A pair of numeric frequency down- conversions translates to baseband the two signal which are then converted in the analogue domain. This latter numeric process is required when the ADC clock frequency is an issue. The analogue PA input $z_{\sim}(t)$ is obtained by frequency shifting to the RF frequencies f_{c1} and f_{c2}, and combining them. The PA output $y_{\sim}(t)$, is spilled and a portion of it is used to create the feedback signals. The feedback path proposed in this paper consists of the coherent dual-band subsampling receiver

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		discussed in the previous section. The two bands composing $y_{\sim}'(t)$ are aliased side-by-side in the baseband, then digitized by a single ADC. In the digital domain, the bands are separated and shifted to IF, composing the signal $y_{\sim}''(n)$ that is compared to $x_{\sim}'(n)$ by the direct learning training algorithm. The block diagram of the whole system is shown in Fig. 4.” Pgs. 2-3.  Fig. 4.DB-DP system with IF predistortion and subsampling feedback Fig. 4. “The proposed DB-DPD system architecture exploits a memory polynomial predistorter and a subsampling receiver as a feedback path. The DB-DP implements a memory polynomial

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		predistorter and a direct learning training method similar to those involved in single band DP. It operates at a proper digital IF and it is able to correct most NLs, even those due to memory effect, both in single and dual band operation. The introduced technique can be effectively used in conjunction with concurrent dual-band PAs. Comparison with conventional DPD shows that the performance decreases slightly when a concurrent dual band signal is predistorted.” Pg. 4. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of this reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention.
3[a]	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	Cidronali discloses and/or renders obvious 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. <i>See claim 2, supra</i>, which is incorporated by reference herein. <i>See also, e.g.,</i> “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion

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		In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $f_{IF} 1$ and $f_{IF} 2$ then summed thus creating $x_{\sim}'(n)$, which is about a proper IF and passed through the gain adjuster; the output of this process is the numeric signal $z_{\sim}'(n)$. The next step is operated by a numeric diplexer which separates again the two frequency bands. A pair of numeric frequency down- conversions translates to baseband the two signal which are then converted in the analogue domain. This latter numeric process is required when the ADC clock frequency is an issue. The analogue PA input $z_{\sim}'(t)$ is obtained by frequency shifting to the RF frequencies f_{c1} and f_{c2}, and combining them. The PA output $y_{\sim}'(t)$, is spilled and a portion of it is used to create the feedback signals. The feedback path proposed in this paper consists of the coherent dual-band subsampling receiver discussed in the previous section. The two bands composing $y_{\sim}'(t)$ are aliased side-by-side in the baseband, then digitized by a single ADC. In the digital domain, the bands are separated and shifted to IF, composing the signal $y_{\sim}''(n)$ that is compared to $x_{\sim}'(n)$ by the direct learning training algorithm. The block diagram of the whole system is shown in Fig. 4.” Pgs. 2-3.

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3[b]	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.	Cidronali discloses and/or renders obvious 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. <i>See claim 2, supra, which is incorporated by reference herein.</i> <i>See, e.g.,</i> “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $f_{IF} 1$ and $f_{IF} 2$ then summed thus creating $x_{\sim}(n)$, which is about a proper IF and passed through the gain adjuster; the output of this process is the numeric signal $z_{\sim}(n)$. The next step is operated by a numeric diplexer which separates again the two frequency bands. A pair of numeric frequency down- conversions translates to baseband the two signal which are then converted in the analogue domain. This latter numeric process is required when the ADC clock frequency is an issue. The analogue PA input $z_{\sim}(t)$ is obtained by frequency shifting to the RF frequencies f_{c1} and f_{c2}, and combining them. The PA output $y_{\sim}(t)$, is spilled and a portion of it is used to create the feedback signals. The feedback path proposed in this paper consists of the coherent dual-band subsampling receiver

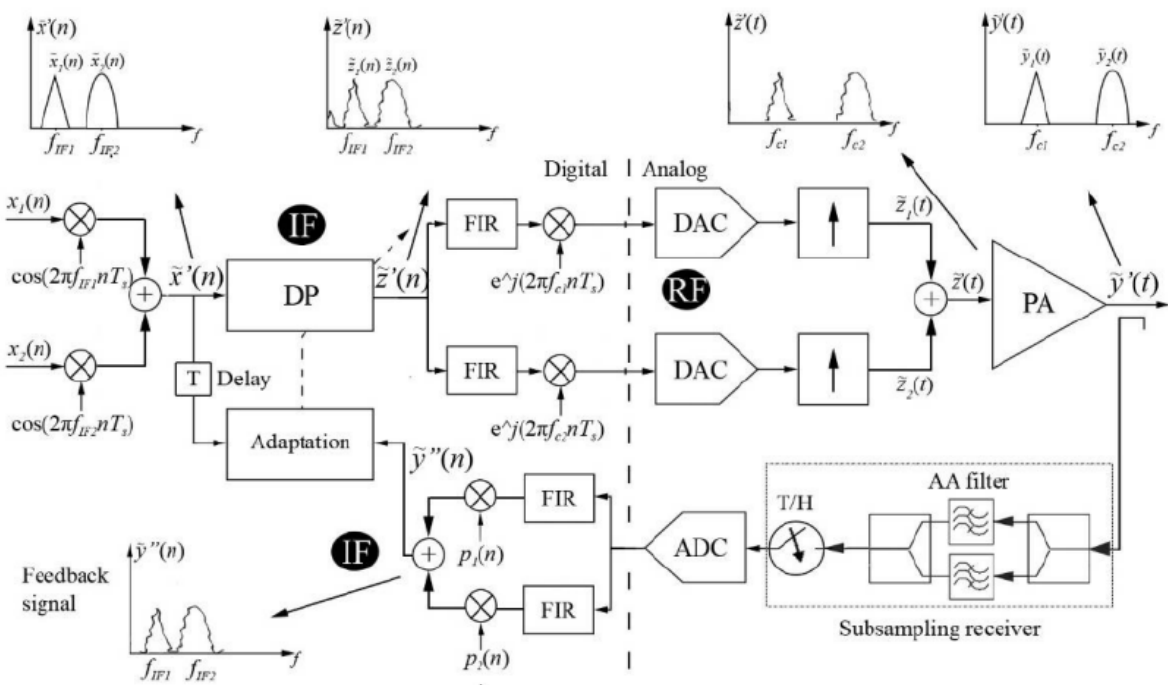
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4[a]	The linearized transmitter of claim 2, wherein said analyzing and modeling stage further comprises: a plurality of outputs connected to update the parameters of said digital baseband signal predistorters; and	Cidronali discloses and/or renders obvious 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. <i>See claim 2, supra</i>, which is incorporated by reference herein. <i>See, e.g.,</i> “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $fIF\ 1$ and $fIF\ 2$ then summed thus creating $x_{\sim}(n)$, which is about a proper IF and passed through the gain adjuster; the output of this process is the numeric signal $z_{\sim}(n)$. The next step is operated by a numeric diplexer which separates again the two frequency bands. A pair of numeric frequency down- conversions

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		translates to baseband the two signal which are then converted in the analogue domain. This latter numeric process is required when the ADC clock frequency is an issue. The analogue PA input $z_{\sim}'(t)$ is obtained by frequency shifting to the RF frequencies $fc1$ and $fc2$, and combining them. The PA output $y_{\sim}'(t)$, is spilled and a portion of it is used to create the feedback signals. The feedback path proposed in this paper consists of the coherent dual-band subsampling receiver discussed in the previous section. The two bands composing $y_{\sim}'(t)$ are aliased side-by-side in the baseband, then digitized by a single ADC. In the digital domain, the bands are separated and shifted to IF, composing the signal $y_{\sim}''(n)$ that is compared to $x_{\sim}'(n)$ by the direct learning training algorithm. The block diagram of the whole system is shown in Fig. 4.” Pgs. 2-3.

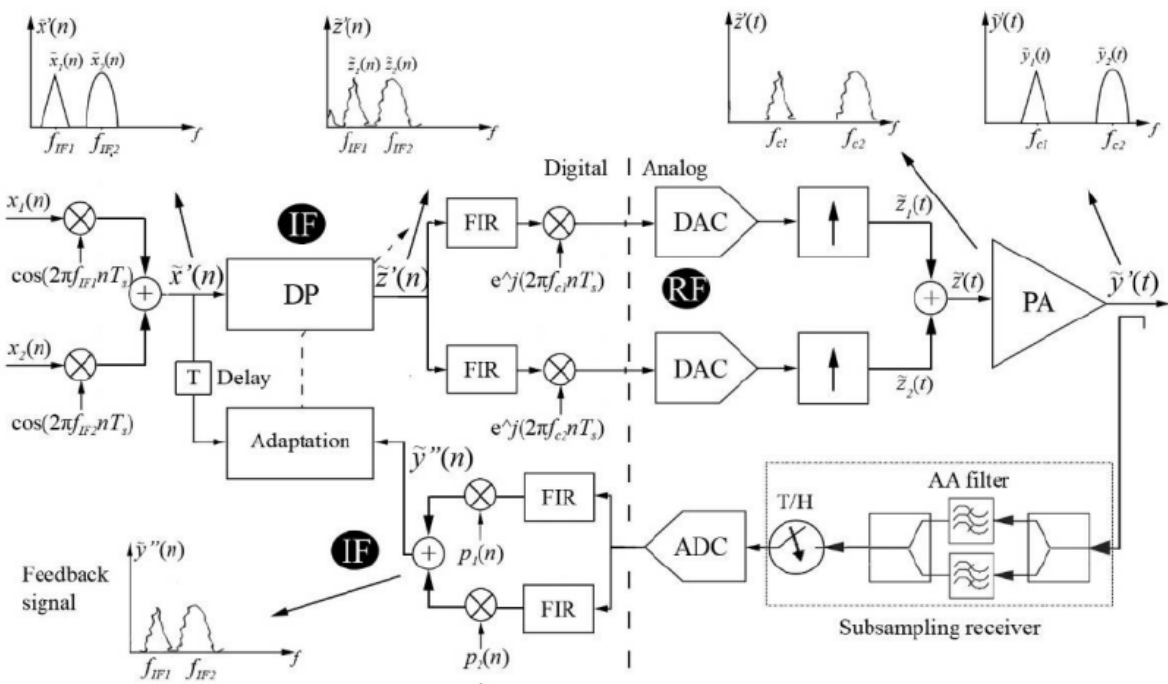
Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		Fig. 4. DB-DP system with IF predistortion and subsampling feedback Fig. 4. “The proposed DB-DPD system architecture exploits a memory polynomial predistorter and a subsampling receiver as a feedback path. The DB-DP implements a memory polynomial predistorter and a direct learning training method similar to those involved in single band DP. It operates at a proper digital IF and it is able to correct most NLS, even those due to memory effect, both in single and dual band operation. The introduced technique can be effectively used in conjunction with concurrent dual-band PAs. Comparison with conventional DPD shows that the performance decreases slightly when a concurrent dual band signal is predistorted.” Pg. 4.

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4[b]	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.	Cidronali discloses and/or renders obvious 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. <i>See claim 2, supra, which is incorporated by reference herein.</i> <i>See, e.g.,</i> “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $f_{IF} 1$ and $f_{IF} 2$ then summed thus creating $\tilde{x}(n)$, which is about a proper IF and passed through the gain adjuster; the output of this process is the numeric signal $\tilde{z}(n)$. The next step is operated by a numeric diplexer which separates again the two frequency bands. A pair of numeric frequency down- conversions translates to baseband the two signal which are then converted in the analogue domain. This latter numeric process is required when the ADC clock frequency is an issue. The analogue PA input $\tilde{z}(t)$ is obtained by frequency shifting to the RF frequencies f_{c1} and f_{c2}, and combining them. The PA output $\tilde{y}(t)$, is spilled and a portion of it is used to create the feedback signals. The feedback path proposed in this paper consists of the coherent dual-band subsampling receiver

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		discussed in the previous section. The two bands composing $y \sim '(t)$ are aliased side-by-side in the baseband, then digitized by a single ADC. In the digital domain, the bands are separated and shifted to IF, composing the signal $y \sim ''(n)$ that is compared to $x \sim '(n)$ by the direct learning training algorithm. The block diagram of the whole system is shown in Fig. 4.” Pgs. 2-3.  Fig. 4.DB-DP system with IF predistortion and subsampling feedback Fig. 4. “The proposed DB-DPD system architecture exploits a memory polynomial predistorter and a subsampling receiver as a feedback path. The DB-DP implements a memory polynomial

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		predistorter and a direct learning training method similar to those involved in single band DP. It operates at a proper digital IF and it is able to correct most NLs, even those due to memory effect, both in single and dual band operation. The introduced technique can be effectively used in conjunction with concurrent dual-band PAs. Comparison with conventional DPD shows that the performance decreases slightly when a concurrent dual band signal is predistorted.” Pg. 4.
5	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.	Cidronali discloses and/or renders obvious 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. <i>See claim 2, supra</i>, which is incorporated by reference herein. <i>See also, e.g.,</i> “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $f_{IF} 1$ and $f_{IF} 2$ then summed thus creating $\tilde{x}'(n)$, which is about a proper IF and passed through the gain adjuster; the output of this process is the numeric signal $\tilde{z}'(n)$. The next step is operated by a numeric diplexer

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		which separates again the two frequency bands. A pair of numeric frequency down- conversions translates to baseband the two signal which are then converted in the analogue domain. This latter numeric process is required when the ADC clock frequency is an issue. The analogue PA input $z_{\sim}(t)$ is obtained by frequency shifting to the RF frequencies $fc1$ and $fc2$, and combining them. The PA output $y_{\sim}(t)$, is spilled and a portion of it is used to create the feedback signals. The feedback path proposed in this paper consists of the coherent dual-band subsampling receiver discussed in the previous section. The two bands composing $y_{\sim}(t)$ are aliased side-by-side in the baseband, then digitized by a single ADC. In the digital domain, the bands are separated and shifted to IF, composing the signal $y_{\sim}(n)$ that is compared to $x_{\sim}(n)$ by the direct learning training algorithm. The block diagram of the whole system is shown in Fig. 4.” Pgs. 2-3.

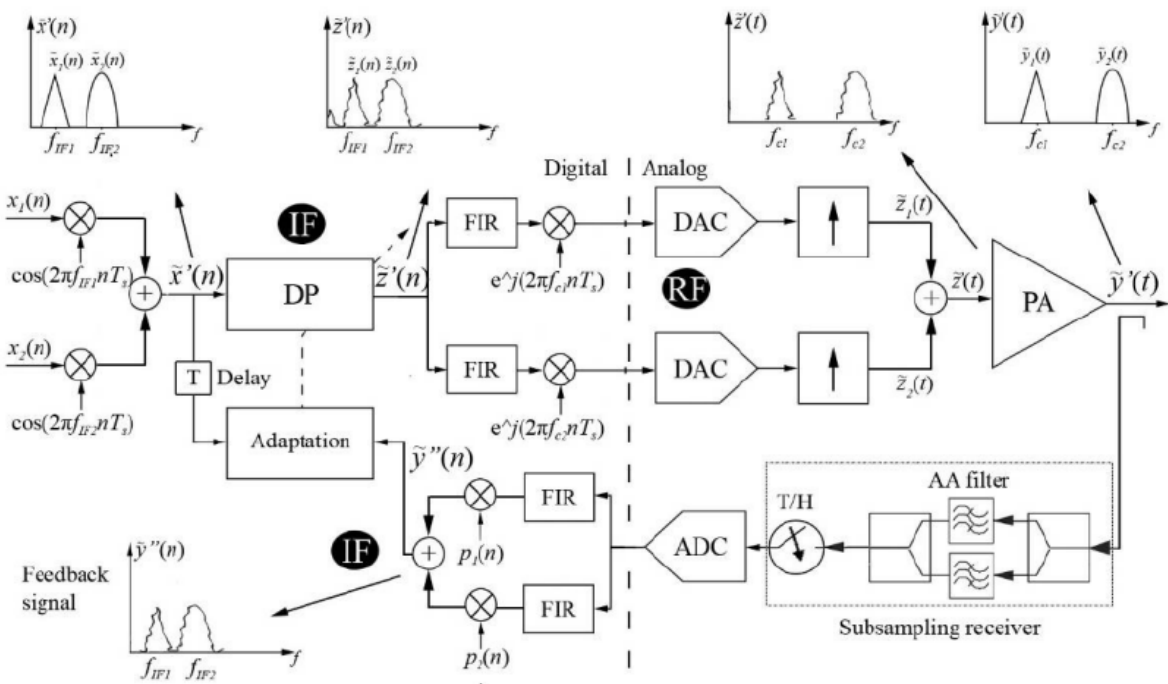
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6	The linearized transmitter of claim 2, said first feed back signals corresponding to a baseband equivalent for all frequency channels and wherein the baseband equivalent signals being extracted from down-converted samples of RF signals output from said power amplifier block.	Cidronali discloses and/or renders obvious 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. <i>See claim 2, supra, which is incorporated by reference herein.</i> <i>See, e.g.,</i> “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $f_{IF} 1$ and $f_{IF} 2$ then summed thus creating $x_{\sim}(n)$, which is about a proper IF and passed through the gain adjuster; the output of this process is the numeric signal $z_{\sim}(n)$. The next step is operated by a numeric diplexer which separates again the two frequency bands. A pair of numeric frequency down- conversions translates to baseband the two signal which are then converted in the analogue domain. This latter numeric process is required when the ADC clock frequency is an issue. The analogue PA input $z_{\sim}(t)$ is obtained by frequency shifting to the RF frequencies f_{c1} and f_{c2}, and combining them. The PA output $y_{\sim}(t)$, is spilled and a portion of it is used to create the feedback signals. The

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7	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).	Cidronali discloses and/or renders obvious 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). <i>See claim 2, supra</i>, which is incorporated by reference herein. <i>See also, e.g.,</i> “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $f_{IF} 1$ and $f_{IF} 2$ then summed thus creating $x_{\sim}(n)$, which is about a proper IF and passed through the gain adjuster; the

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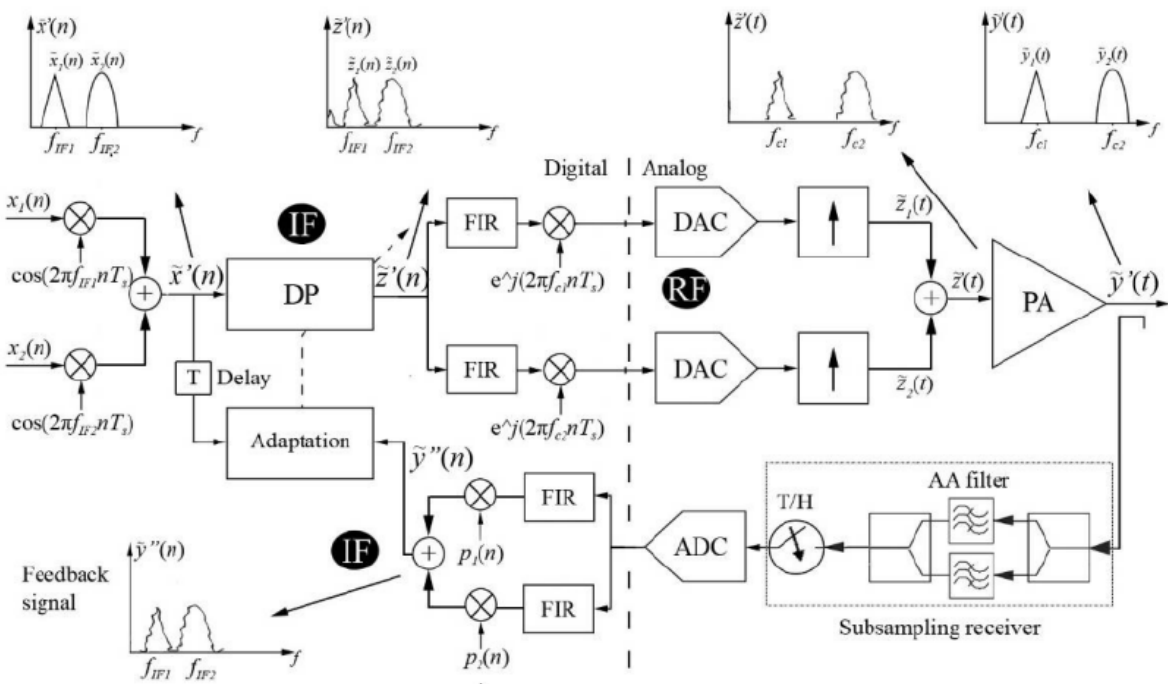
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8	The linearized transmitter of claim 2, wherein said signal observation feedback loop further comprises: a single subsampling-based receiver to down-convert samples output from said power amplifier block.	Cidronali discloses and/or renders obvious 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. <i>See claim 2, supra, which is incorporated by reference herein.</i> <i>See also, e.g.,</i> “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $f_{IF} 1$ and $f_{IF} 2$ then summed thus creating $\tilde{x}(n)$, which is about a proper IF and passed through the gain adjuster; the output of this process is the numeric signal $\tilde{z}(n)$. The next step is operated by a numeric diplexer which separates again the two frequency bands. A pair of numeric frequency down- conversions translates to baseband the two signal which are then converted in the analogue domain. This latter numeric process is required when the ADC clock frequency is an issue. The analogue PA input $\tilde{z}(t)$ is obtained by frequency shifting to the RF frequencies f_{c1} and f_{c2}, and combining them. The PA output $y(t)$, is spilled and a portion of it is used to create the feedback signals. The

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		feedback path proposed in this paper consists of the coherent dual-band subsampling receiver discussed in the previous section. The two bands composing $y_{\sim}'(t)$ are aliased side-by-side in the baseband, then digitized by a single ADC. In the digital domain, the bands are separated and shifted to IF, composing the signal $y_{\sim}''(n)$ that is compared to $x_{\sim}'(n)$ by the direct learning training algorithm. The block diagram of the whole system is shown in Fig. 4.” Pgs. 2-3. Fig. 4.DB-DP system with IF predistortion and subsampling feedback Fig. 4.

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9	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).	Cidronali discloses and/or renders obvious 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). <i>See claim 8, supra, which is incorporated by reference herein.</i> <i>See also, e.g.,</i> “In this paper we propose a novel method of Dual Band DPD (DB-DPD), capable of a simultaneous predistortion of a concurrent dual-band power amplifier at both frequency bands. The proposed method uses a single band memory polynomial DP for linearization, operating at a proper IF. As feedback path the system adopts a subsampling receiver, which allows extreme flexibility and coherent dual-band down-conversion. With the selection of an appropriate sample rate, the RF channels are translated side-by-side at a low IF with no spectral overlap. At this section of the system a low-pass ADC digitizes the entire baseband range, and after DSP channelization of the signals an indirect learning algorithm is adopted to train the DPD. The memory polynomial DB-DPD system was simulated with Matlab-Simulink®, and performance was compared with those achieved from the same system operating in single band operation.” Pg. 1. “IV. Dual Band Digital PreDistortion In the full paper we will discuss about the proposed DB- DPD system which is an extension of a single band DPD (SB- DPD) system. In this case, the predistortion is usually realized in the digital baseband, while a baseband predistortion with a unique DP is not possible in dual band concurrent systems. In DB-DP, baseband digital signals $x_1(n)$ and $x_2(n)$ are shifted to $f_{IF} 1$ and $f_{IF} 2$ then summed thus creating $x_{\sim}(n)$, which is about a proper IF and passed through the gain adjuster; the

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10[pre]	A method for linearizing a transmitter, said method comprising:	To the extent the preamble is limiting, Cidronali discloses and/or renders obvious a method for linearizing a transmitter. <i>See above re claim 1[pre] which is incorporated by reference herein.</i>
10[a]	effecting predistortion of concurrent input signals to output concurrent predistorted signals using a digital signal predistorter block including digital baseband signal predistorters;	Cidronali discloses and/or renders obvious effecting predistortion of concurrent input signals to output concurrent predistorted signals using a digital signal predistorter block including digital baseband signal predistorters. <i>See above re claim 1[a] which is incorporated by reference herein.</i>
10[b]	amplifying the predistorted signals using a power amplifier block;	Cidronali discloses and/or renders obvious amplifying the predistorted signals using a power amplifier block. <i>See above re claim 1[b] which is incorporated by reference herein.</i>
10[c]	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	Cidronali discloses and/or renders obvious 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. <i>See, e.g.,</i> <i>See above re claim 1[c] which is incorporated by reference herein.</i>
10[d]	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	Cidronali discloses and/or renders obvious 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.

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	baseband signal predistorters are updated by the analyzing and modelling stage.	<i>See, e.g.,</i> <i>See above re claim 1[c] which is incorporated by reference herein.</i>