Exhibit E-7
Invalidity of U.S. Patent No. 10,958,296 by WO2012/129768 to Peroulas et al. to ("Peroulas")

The Asserted Claims of U.S. Patent No. 10,958,296 ("the '296 Patent") are anticipated and/or rendered obvious in view of WO2012/129768 to Peroulas et al. ("Peroulas") alone or in combination with other prior art. Peroulas was filed on March 28, 2011 and was published on October 4, 2012. Peroulas, thus, is prior art to the '296 Patent at least under 35 U.S.C. § 102(a).

As described in detail below, Peroulas anticipates Asserted Claims 1–10 of the '296 Patent. In addition, to the extent that Smart RF asserts that Peroulas 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.

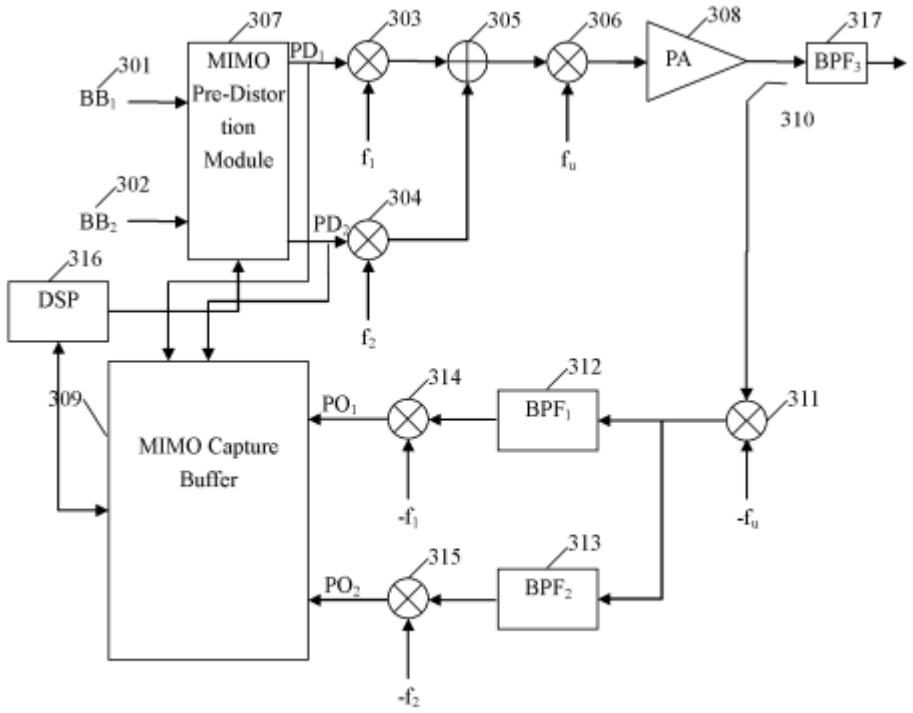
This claim chart is based on Defendants' present understanding of the asserted claims, Smart RF's vague and overbroad infringement contentions (and corresponding, implicit claim constructions), and Defendants' investigations to date. Defendants are not adopting Smart RF's apparent constructions, nor 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 Peroulas. The citations provided below are exemplary, rather than exhaustive, and Defendants reserve the right to rely upon any other portion of the cited references.

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1[pre]	A linearized transmitter comprising:	To the extent the preamble is limiting, Peroulas discloses and/or renders obvious a linearized transmitter. *See*, *e.g.*, "The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband

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		input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_ci<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25.

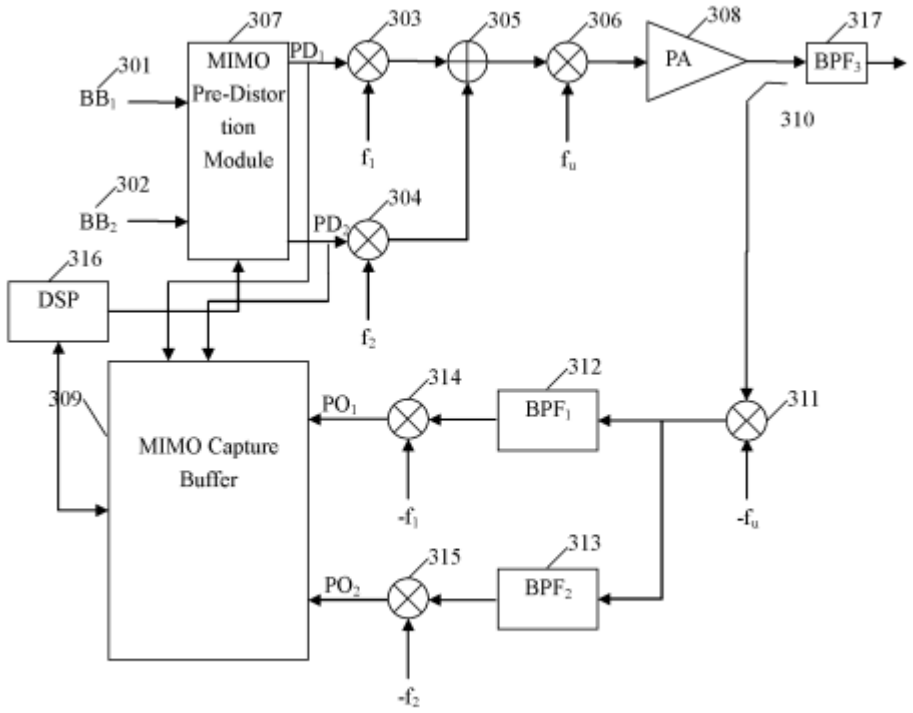
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		 FIG. 3 Fig. 3.
1[a]	a digital signal predistorter block including digital baseband signal predistorters effecting predistortion of concurrent input signals to output concurrent predistorted signals;	Peroulas discloses and/or renders obvious a digital signal predistorter block including digital baseband signal predistorters effecting predistortion of concurrent input signals to output concurrent predistorted signals. *See*, *e.g.*, “The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion

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		functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_{c}i<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9.

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		 FIG. 3 Fig. 3.
1[b]	a power amplifier block connected to amplify the predistorted signals; and	Peroulas discloses and/or renders obvious a power amplifier block connected to amplify the predistorted signals. *See*, *e.g.*, “The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband

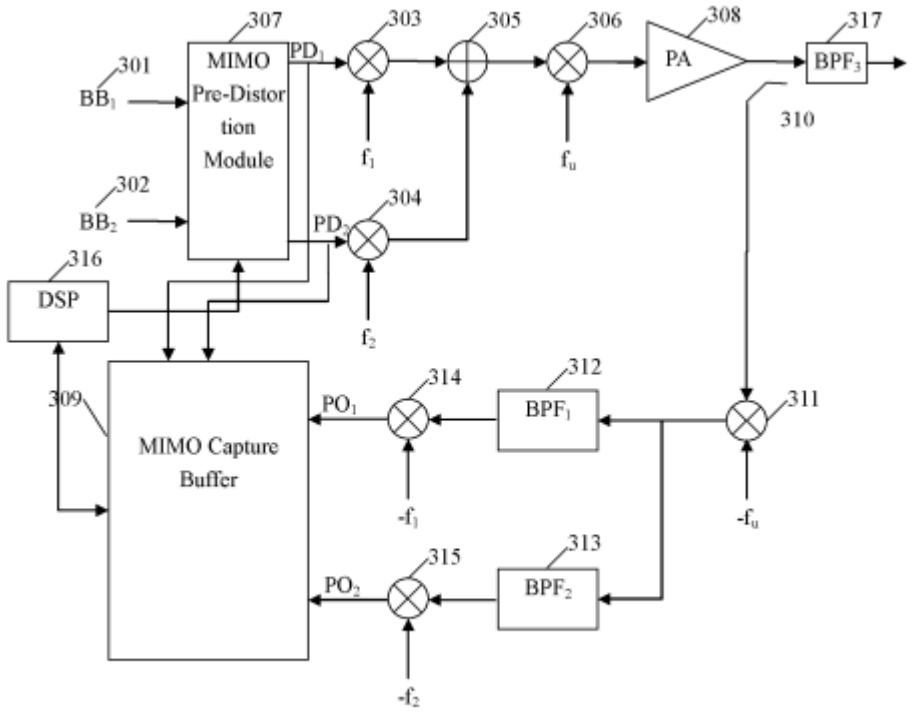
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		input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_ci<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9. "The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{cl} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{cl} and f_{c2}, the output of the PA will contain desired signals at

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		f_{c1} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{c1} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{c1} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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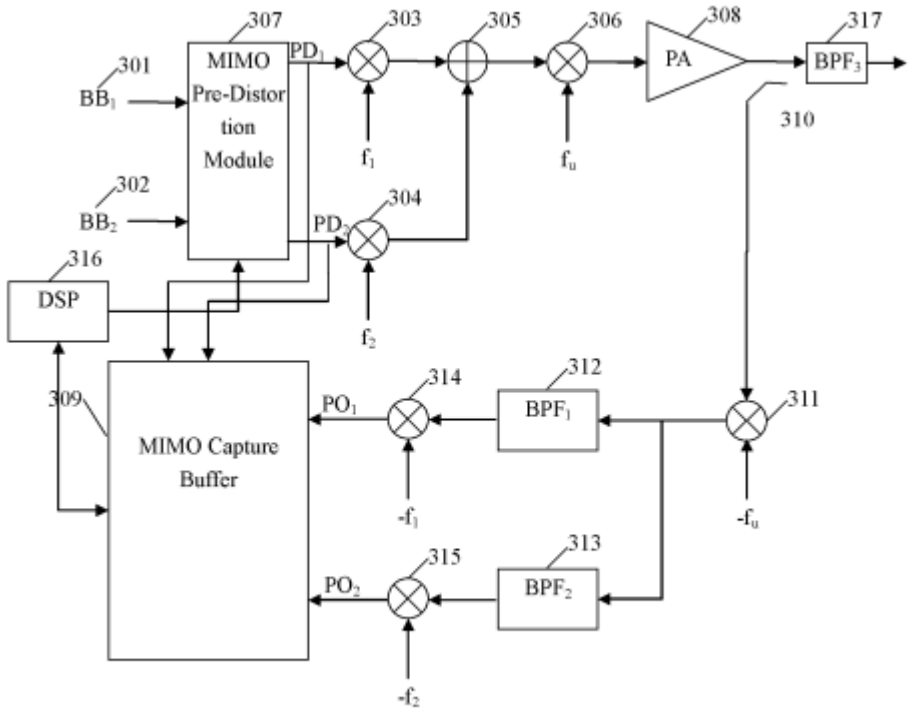
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		 FIG. 3 Fig. 3.
1[c]	an analyzing and modelling stage receiving first feedback signals taken from an output of the power amplifier, and second feedback signals taken concurrently from the concurrent predistorted signals and using the first feedback and the second feedback signals in the	Peroulas 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.

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	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.	*See*, *e.g.*, "The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "The goal of the pre-distortion function, which is also a non-linear function, is to create a signal to be sent to the PA such that the output signal of the PA contains little or no distortion. In other words, although the pre-distortion function and the PA are individually non-linear, the cascade of the pre-distortion function and the PA produces a system that is linear overall."1:27-2:2. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_{c}i<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the

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		signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9. "The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{cl} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{cl} and f_{c2}, the output of the PA will contain desired signals at f_{cl} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{cl} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{cl} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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		 FIG. 3 Fig. 3. “In one example, this model is created by capturing the samples of several signals using a MIMO capture buffer 309. The number of samples required to be captured by the MIMO capture buffer 309 varies based on the PA 308 and the type of signals to be transmitted, but typically, between 2000 and 10000 samples of each signal coming into the MIMO capture buffer 309 will need to be captured.” 25:10-14. “Two of the signals recorded by the MIMO capture buffer 309 in this example are PDi and PD_2, which are produced by the multiple input multiple output (MIMO) pre-distortion module 307. The

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		other two signals recorded by the MIMO capture buffer 309 are derived from a signal output from a coupler 310 which extracts a small portion (typically less than 1% of the PA output power) of the signal output from the PA 308. The key property of the coupler 310 is that it produces a signal which is an accurate representation of the actual output of the PA 308. The output of the coupler 310 is connected to a frequency shifter 311 which shifts the signal down by f_u Hz." 25:15-22. "It should be clear to one skilled in the art that although this application describes a specific method to construct the p^ , H_a , and h_a vectors and matrices (a is either 1 or 2), an vast number of variations are possible that do not depart from the scope of this application. For example, any two rows of can be exchanged as long as the same rows of H_a are exchanged. Furthermore, any two columns (j and k) of H_a can be exchanged as long as the same rows (j and k) of h_a are exchanged." 28:8-13. "The general operation of the multiband digital pre-distorter is that when the multiband digital pre-distorter is first turned on, initially, $h_{1;0;0;0}$ and ^{n}2,o,o,o will both be set to 1 and all other values for $h_{l\,a\,b\,c}$ and $h_{2\,a\,b\,c}$ will be set to zero. When some samples are captured by the MIMO capture buffer 309, the samples are analyzed by the DSP so as to produce the vectors and h_2 and all of values in $_{j\,\wedge\,k}$ and $h_{2\,j\,\wedge\,k}$. After these values have been calculated, the DSP transmits these values to the MIMO pre-distortion module and all of the hij;ki,k2 and h2j,ki,k2 values of the MIMO pre-distortion function in the MIMO pre-distortion module will be simultaneously updated and replaced with the $_{j\,\wedge\,ki}$ and $h_{2\,j\,\wedge\,k}$ values." 28:14-21. "The sampling rates of the signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals coming from the feedback frequency shifters (POi, $P0_2$), are usually the same, which are represented in this application by a variable f_s." 28:26-29:2. "According to the pre-distortion functions expressed in Eq 15 and Eq 16, because the signals BBi 301 and BB_2 302 have bandwidths Bi and B_2 respectively, and both signal BBi 301 and BB_2 302 are baseband signals, so the bandwidths of the signal output from the Eq 15 and Eq 16 are equal to lager one of Bi and B_2, which are not a function of Bdeadspace- Besides, as the pre- distortion function in the prior art (such as the dual band digital pre-distortion system shown in FIG. 1), the MIMO pre-distortion function in this example expands the bandwidth of the signal going through it for the purpose of sufficiently linearizing the PA 308. For example, although signals BBi 301 and

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		BB_2 have bandwidths Bi and B_2 respectively, the bandwidth of PDi and PD_2 respectively coming out of the MIMO pre-distortion function will be much larger than the lager one of Bi and B_2. Although the actual bandwidth of PDi depends on the specific power amplifier being used and the specific signals being transmitted, typically, this bandwidth will be about 5 to 7 times the larger one of Bi and B_2. In order to simplify the description in this application, it will be assumed that the bandwidth of PDi and PD_2 will be 7*max(Bi,B_2).” 29:3-15. “It has been previously stated that the bandwidth of the POi and $P0_2$ signals will be about 6Bi and $6B_2$ respectively. Thus, the maximum bandwidth that must be supported by any of the baseband signals of interest (signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals (POi, $P0_2$) coming from the feedback frequency shifters 314 and 315) will be 7*max(Bi,B_2). Thus, in the example of the present invention, the minimum sampling frequency of the system, and the frequency at which the MIMO pre-distortion function will operate, is: Eq 29 /,mm—„ = 7 * max(5_1,5_2)” 29:16-23.
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.	Peroulas 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. *See*, claim 1, *supra*, which is incorporated by reference herein. *See also*, *e.g.*, “The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every

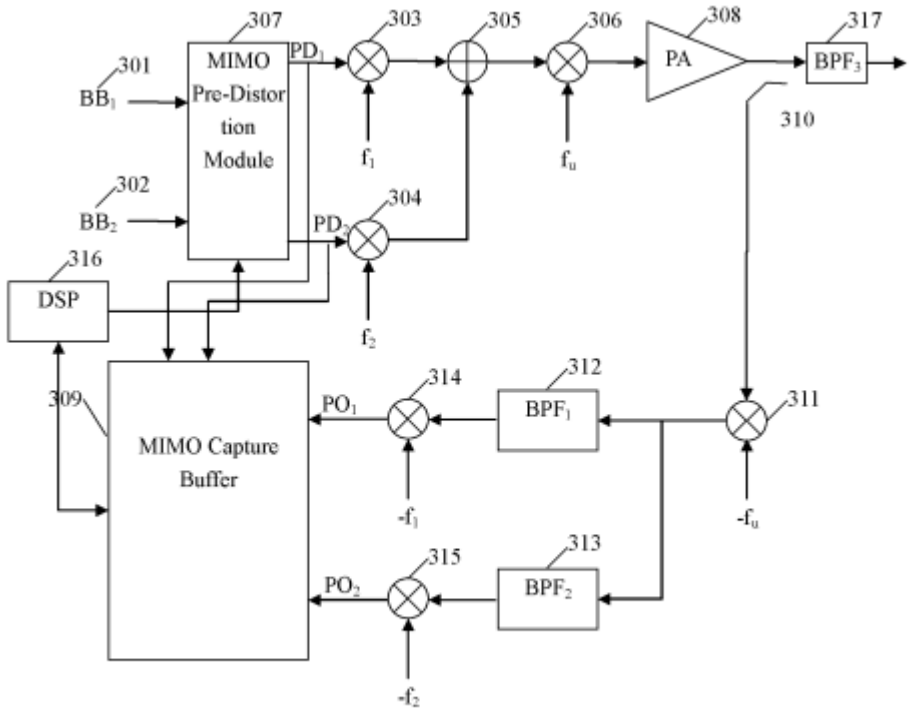
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		pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "The goal of the pre-distortion function, which is also a non-linear function, is to create a signal to be sent to the PA such that the output signal of the PA contains little or no distortion. In other words, although the pre-distortion function and the PA are individually non-linear, the cascade of the pre-distortion function and the PA produces a system that is linear overall."1:27-2:2. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_ci<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9.

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		"The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{c1} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{c1} and f_{c2}, the output of the PA will contain desired signals at f_{c1} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{c1} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{c1} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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		 FIG. 3 Fig. 3. “In one example, this model is created by capturing the samples of several signals using a MIMO capture buffer 309. The number of samples required to be captured by the MIMO capture buffer 309 varies based on the PA 308 and the type of signals to be transmitted, but typically, between 2000 and 10000 samples of each signal coming into the MIMO capture buffer 309 will need to be captured.” 25:10-14. “Two of the signals recorded by the MIMO capture buffer 309 in this example are PDi and PD_2, which are produced by the multiple input multiple output (MIMO) pre-distortion module 307. The

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		other two signals recorded by the MIMO capture buffer 309 are derived from a signal output from a coupler 310 which extracts a small portion (typically less than 1% of the PA output power) of the signal output from the PA 308. The key property of the coupler 310 is that it produces a signal which is an accurate representation of the actual output of the PA 308. The output of the coupler 310 is connected to a frequency shifter 311 which shifts the signal down by f_u Hz." 25:15-22. "It should be clear to one skilled in the art that although this application describes a specific method to construct the p^ , H_a , and h_a vectors and matrices (a is either 1 or 2), an vast number of variations are possible that do not depart from the scope of this application. For example, any two rows of can be exchanged as long as the same rows of H_a are exchanged. Furthermore, any two columns (j and k) of H_a can be exchanged as long as the same rows (j and k) of h_a are exchanged." 28:8-13. "The general operation of the multiband digital pre-distorter is that when the multiband digital pre-distorter is first turned on, initially, $h_{1;0;0;0}$ and $^{n}2,o,o,o$ will both be set to 1 and all other values for $h_{l\,a\,b\,c}$ and $h_{2\,a\,b\,c}$ will be set to zero. When some samples are captured by the MIMO capture buffer 309, the samples are analyzed by the DSP so as to produce the vectors and h_2 and all of values in $_{j}\,\hat{}\,_{k}$ and $h_{2\,j}\,\hat{}\,_{k}$. After these values have been calculated, the DSP transmits these values to the MIMO pre-distortion module and all of the hij;ki,k2 and h2j,ki,k2 values of the MIMO pre-distortion function in the MIMO pre-distortion module will be simultaneously updated and replaced with the $_{j}\,\hat{}\,_{ki}$ and $h_{2\,j}\,\hat{}\,_{k}$ values." 28:14-21. "The sampling rates of the signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals coming from the feedback frequency shifters (POi, $P0_2$), are usually the same, which are represented in this application by a variable f_s." 28:26-29:2. "According to the pre-distortion functions expressed in Eq 15 and Eq 16, because the signals BBi 301 and BB_2 302 have bandwidths Bi and B_2 respectively, and both signal BBi 301 and BB_2 302 are baseband signals, so the bandwidths of the signal output from the Eq 15 and Eq 16 are equal to lager one of Bi and B_2, which are not a function of Bdeadspace- Besides, as the pre- distortion function in the prior art (such as the dual band digital pre-distortion system shown in FIG. 1), the MIMO pre-distortion function in this example expands the bandwidth of the signal going through it for the purpose of sufficiently linearizing the PA 308. For example, although signals BBi 301 and

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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		BB_2 have bandwidths Bi and B_2 respectively, the bandwidth of PDi and PD_2 respectively coming out of the MIMO pre-distortion function will be much larger than the lager one of Bi and B_2. Although the actual bandwidth of PDi depends on the specific power amplifier being used and the specific signals being transmitted, typically, this bandwidth will be about 5 to 7 times the larger one of Bi and B_2. In order to simplify the description in this application, it will be assumed that the bandwidth of PDi and PD_2 will be 7*max(Bi,B_2)." 29:3-15. "It has been previously stated that the bandwidth of the POi and $P0_2$ signals will be about 6Bi and $6B_2$ respectively. Thus, the maximum bandwidth that must be supported by any of the baseband signals of interest (signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals (POi, $P0_2$) coming from the feedback frequency shifters 314 and 315) will be 7*max(Bi,B_2). Thus, in the example of the present invention, the minimum sampling frequency of the system, and the frequency at which the MIMO pre-distortion function will operate, is: Eq 29 /,$_{mm—}$,, = 7 * max(5_1,5_2)" 29:16-23.
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	Peroulas 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. *See* claim 2, *supra*, which is incorporated by reference herein. *See also*, *e.g.*, "The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure

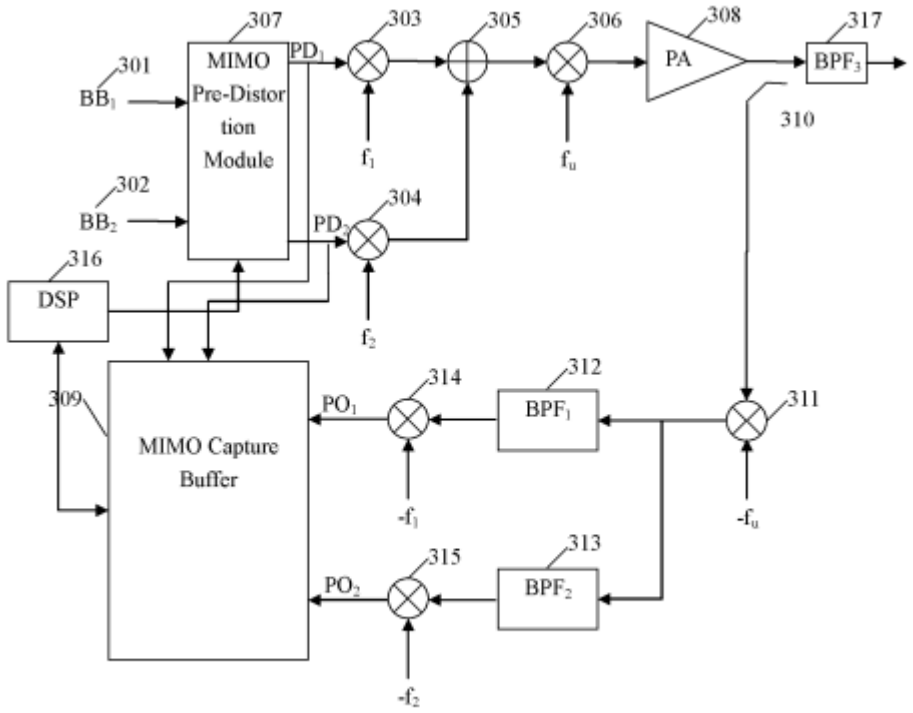
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		to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "The goal of the pre-distortion function, which is also a non-linear function, is to create a signal to be sent to the PA such that the output signal of the PA contains little or no distortion. In other words, although the pre-distortion function and the PA are individually non-linear, the cascade of the pre-distortion function and the PA produces a system that is linear overall."1:27-2:2. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_c i<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9.

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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		"The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{c1} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{c1} and f_{c2}, the output of the PA will contain desired signals at f_{c1} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{c1} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{c1} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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Claim No.	’296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		 FIG. 3 Fig. 3. “In one example, this model is created by capturing the samples of several signals using a MIMO capture buffer 309. The number of samples required to be captured by the MIMO capture buffer 309 varies based on the PA 308 and the type of signals to be transmitted, but typically, between 2000 and 10000 samples of each signal coming into the MIMO capture buffer 309 will need to be captured.” 25:10-14. “Two of the signals recorded by the MIMO capture buffer 309 in this example are PDi and PD_2, which are produced by the multiple input multiple output (MIMO) pre-distortion module 307. The

Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		other two signals recorded by the MIMO capture buffer 309 are derived from a signal output from a coupler 310 which extracts a small portion (typically less than 1% of the PA output power) of the signal output from the PA 308. The key property of the coupler 310 is that it produces a signal which is an accurate representation of the actual output of the PA 308. The output of the coupler 310 is connected to a frequency shifter 311 which shifts the signal down by f_u Hz." 25:15-22. "It should be clear to one skilled in the art that although this application describes a specific method to construct the p^ , H_a , and h_a vectors and matrices (a is either 1 or 2), an vast number of variations are possible that do not depart from the scope of this application. For example, any two rows of can be exchanged as long as the same rows of H_a are exchanged. Furthermore, any two columns (j and k) of H_a can be exchanged as long as the same rows (j and k) of h_a are exchanged." 28:8-13. "The general operation of the multiband digital pre-distorter is that when the multiband digital pre-distorter is first turned on, initially, $h_{1;0;0;0}$ and $^{n}2,o,o,o$ will both be set to 1 and all other values for $h_{l\,a\,b\,c}$ and $h_{2\,a\,b\,c}$ will be set to zero. When some samples are captured by the MIMO capture buffer 309, the samples are analyzed by the DSP so as to produce the vectors and h_2 and all of values in $_{j}\,\hat{}\,_{k}$ and $h_{2\,j}\,\hat{}\,_{k}$. After these values have been calculated, the DSP transmits these values to the MIMO pre-distortion module and all of the hij;ki,k2 and h2j,ki,k2 values of the MIMO pre-distortion function in the MIMO pre-distortion module will be simultaneously updated and replaced with the $_{j}\,\hat{}\,_{ki}$ and $h_{2\,j}\,\hat{}\,_{k}$ values." 28:14-21. "The sampling rates of the signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals coming from the feedback frequency shifters (POi, $P0_2$), are usually the same, which are represented in this application by a variable f_s." 28:26-29:2. "According to the pre-distortion functions expressed in Eq 15 and Eq 16, because the signals BBi 301 and BB_2 302 have bandwidths Bi and B_2 respectively, and both signal BBi 301 and BB_2 302 are baseband signals, so the bandwidths of the signal output from the Eq 15 and Eq 16 are equal to lager one of Bi and B_2, which are not a function of Bdeadspace- Besides, as the pre- distortion function in the prior art (such as the dual band digital pre-distortion system shown in FIG. 1), the MIMO pre-distortion function in this example expands the bandwidth of the signal going through it for the purpose of sufficiently linearizing the PA 308. For example, although signals BBi 301 and

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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		BB_2 have bandwidths Bi and B_2 respectively, the bandwidth of PDi and PD_2 respectively coming out of the MIMO pre-distortion function will be much larger than the lager one of Bi and B_2. Although the actual bandwidth of PDi depends on the specific power amplifier being used and the specific signals being transmitted, typically, this bandwidth will be about 5 to 7 times the larger one of Bi and B_2. In order to simplify the description in this application, it will be assumed that the bandwidth of PDi and PD_2 will be 7*max(Bi,B_2)." 29:3-15. "It has been previously stated that the bandwidth of the POi and $P0_2$ signals will be about 6Bi and $6B_2$ respectively. Thus, the maximum bandwidth that must be supported by any of the baseband signals of interest (signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals (POi, $P0_2$) coming from the feedback frequency shifters 314 and 315) will be 7*max(Bi,B_2). Thus, in the example of the present invention, the minimum sampling frequency of the system, and the frequency at which the MIMO pre-distortion function will operate, is: Eq 29 /,mm—„ = 7 * max(5_1,5_2)" 29:16-23.
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.	Peroulas 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. *See* claim 2, *supra*, which is incorporated by reference herein. *See*, *e.g.*, "The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure

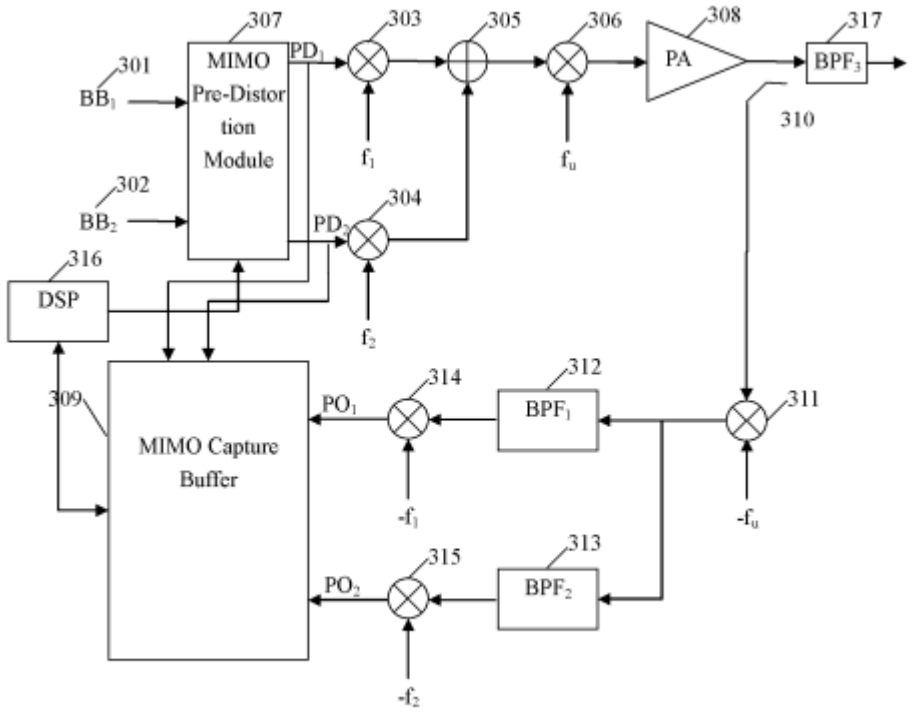
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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "The goal of the pre-distortion function, which is also a non-linear function, is to create a signal to be sent to the PA such that the output signal of the PA contains little or no distortion. In other words, although the pre-distortion function and the PA are individually non-linear, the cascade of the pre-distortion function and the PA produces a system that is linear overall."1:27-2:2. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_c i<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9.

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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		"The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{c1} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{c1} and f_{c2}, the output of the PA will contain desired signals at f_{c1} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{c1} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{c1} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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Claim No.	’296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		 FIG. 3 Fig. 3. “In one example, this model is created by capturing the samples of several signals using a MIMO capture buffer 309. The number of samples required to be captured by the MIMO capture buffer 309 varies based on the PA 308 and the type of signals to be transmitted, but typically, between 2000 and 10000 samples of each signal coming into the MIMO capture buffer 309 will need to be captured.” 25:10-14. “Two of the signals recorded by the MIMO capture buffer 309 in this example are PDi and PD_2, which are produced by the multiple input multiple output (MIMO) pre-distortion module 307. The

Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		other two signals recorded by the MIMO capture buffer 309 are derived from a signal output from a coupler 310 which extracts a small portion (typically less than 1% of the PA output power) of the signal output from the PA 308. The key property of the coupler 310 is that it produces a signal which is an accurate representation of the actual output of the PA 308. The output of the coupler 310 is connected to a frequency shifter 311 which shifts the signal down by f_u Hz." 25:15-22. "It should be clear to one skilled in the art that although this application describes a specific method to construct the p^ , H_a , and h_a vectors and matrices (a is either 1 or 2), an vast number of variations are possible that do not depart from the scope of this application. For example, any two rows of can be exchanged as long as the same rows of H_a are exchanged. Furthermore, any two columns (j and k) of H_a can be exchanged as long as the same rows (j and k) of h_a are exchanged." 28:8-13. "The general operation of the multiband digital pre-distorter is that when the multiband digital pre-distorter is first turned on, initially, $h_{1;0;0;0}$ and ^{n}2,o,o,o will both be set to 1 and all other values for $h_{l\,a\,b\,c}$ and $h_{2\,a\,b\,c}$ will be set to zero. When some samples are captured by the MIMO capture buffer 309, the samples are analyzed by the DSP so as to produce the vectors and h_2 and all of values in $_{j}\,\hat{}\,_{k}$ and $h_{2\,j}\,\hat{}\,_{k}$. After these values have been calculated, the DSP transmits these values to the MIMO pre-distortion module and all of the hij;ki,k2 and h2j,ki,k2 values of the MIMO pre-distortion function in the MIMO pre-distortion module will be simultaneously updated and replaced with the $_{j}\,\hat{}\,_{ki}$ and $h_{2\,j}\,\hat{}\,_{k}$ values." 28:14-21. "The sampling rates of the signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals coming from the feedback frequency shifters (POi, $P0_2$), are usually the same, which are represented in this application by a variable f_s." 28:26-29:2. "According to the pre-distortion functions expressed in Eq 15 and Eq 16, because the signals BBi 301 and BB_2 302 have bandwidths Bi and B_2 respectively, and both signal BBi 301 and BB_2 302 are baseband signals, so the bandwidths of the signal output from the Eq 15 and Eq 16 are equal to lager one of Bi and B_2, which are not a function of Bdeadspace- Besides, as the pre- distortion function in the prior art (such as the dual band digital pre-distortion system shown in FIG. 1), the MIMO pre-distortion function in this example expands the bandwidth of the signal going through it for the purpose of sufficiently linearizing the PA 308. For example, although signals BBi 301 and

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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		BB_2 have bandwidths Bi and B_2 respectively, the bandwidth of PDi and PD_2 respectively coming out of the MIMO pre-distortion function will be much larger than the lager one of Bi and B_2. Although the actual bandwidth of PDi depends on the specific power amplifier being used and the specific signals being transmitted, typically, this bandwidth will be about 5 to 7 times the larger one of Bi and B_2. In order to simplify the description in this application, it will be assumed that the bandwidth of PDi and PD_2 will be 7*max(Bi,B_2)." 29:3-15. "It has been previously stated that the bandwidth of the POi and $P0_2$ signals will be about 6Bi and $6B_2$ respectively. Thus, the maximum bandwidth that must be supported by any of the baseband signals of interest (signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals (POi, $P0_2$) coming from the feedback frequency shifters 314 and 315) will be 7*max(Bi,B_2). Thus, in the example of the present invention, the minimum sampling frequency of the system, and the frequency at which the MIMO pre-distortion function will operate, is: Eq 29 /,mm—„ = 7 * max(5_1,5_2)" 29:16-23.
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	Peroulas 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. *See* claim 2, *supra*, which is incorporated by reference herein. *See*, *e.g.*, "The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure

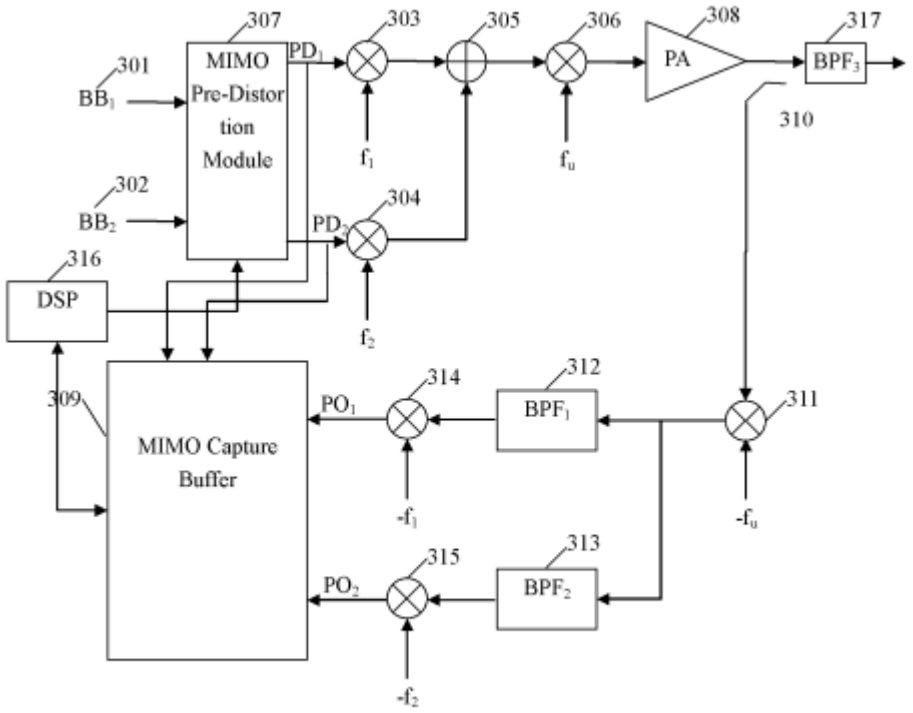
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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "The goal of the pre-distortion function, which is also a non-linear function, is to create a signal to be sent to the PA such that the output signal of the PA contains little or no distortion. In other words, although the pre-distortion function and the PA are individually non-linear, the cascade of the pre-distortion function and the PA produces a system that is linear overall."1:27-2:2. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_c i<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9.

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		"The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{c1} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{c1} and f_{c2}, the output of the PA will contain desired signals at f_{c1} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{c1} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{c1} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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Claim No.	’296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		 FIG. 3 Fig. 3. “In one example, this model is created by capturing the samples of several signals using a MIMO capture buffer 309. The number of samples required to be captured by the MIMO capture buffer 309 varies based on the PA 308 and the type of signals to be transmitted, but typically, between 2000 and 10000 samples of each signal coming into the MIMO capture buffer 309 will need to be captured.” 25:10-14. “Two of the signals recorded by the MIMO capture buffer 309 in this example are PDi and PD_2, which are produced by the multiple input multiple output (MIMO) pre-distortion module 307. The

Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		other two signals recorded by the MIMO capture buffer 309 are derived from a signal output from a coupler 310 which extracts a small portion (typically less than 1% of the PA output power) of the signal output from the PA 308. The key property of the coupler 310 is that it produces a signal which is an accurate representation of the actual output of the PA 308. The output of the coupler 310 is connected to a frequency shifter 311 which shifts the signal down by f_u Hz." 25:15-22. "It should be clear to one skilled in the art that although this application describes a specific method to construct the p^ , H_a , and h_a vectors and matrices (a is either 1 or 2), an vast number of variations are possible that do not depart from the scope of this application. For example, any two rows of can be exchanged as long as the same rows of H_a are exchanged. Furthermore, any two columns (j and k) of H_a can be exchanged as long as the same rows (j and k) of h_a are exchanged." 28:8-13. "The general operation of the multiband digital pre-distorter is that when the multiband digital pre-distorter is first turned on, initially, $h_{1;0;0;0}$ and ^{n}2,o,o,o will both be set to 1 and all other values for $h_{l\,a\,b\,c}$ and $h_{2\,a\,b\,c}$ will be set to zero. When some samples are captured by the MIMO capture buffer 309, the samples are analyzed by the DSP so as to produce the vectors and h_2 and all of values in $_{j}\,\hat{}\,_{k}$ and $h_{2\,j}\,\hat{}\,_{k}$. After these values have been calculated, the DSP transmits these values to the MIMO pre-distortion module and all of the hij;ki,k2 and h2j,ki,k2 values of the MIMO pre-distortion function in the MIMO pre-distortion module will be simultaneously updated and replaced with the $_{j}\,\hat{}\,_{ki}$ and $h_{2\,j}\,\hat{}\,_{k}$ values." 28:14-21. "The sampling rates of the signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals coming from the feedback frequency shifters (POi, $P0_2$), are usually the same, which are represented in this application by a variable f_s." 28:26-29:2. "According to the pre-distortion functions expressed in Eq 15 and Eq 16, because the signals BBi 301 and BB_2 302 have bandwidths Bi and B_2 respectively, and both signal BBi 301 and BB_2 302 are baseband signals, so the bandwidths of the signal output from the Eq 15 and Eq 16 are equal to lager one of Bi and B_2, which are not a function of Bdeadspace- Besides, as the pre- distortion function in the prior art (such as the dual band digital pre-distortion system shown in FIG. 1), the MIMO pre-distortion function in this example expands the bandwidth of the signal going through it for the purpose of sufficiently linearizing the PA 308. For example, although signals BBi 301 and

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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		BB_2 have bandwidths Bi and B_2 respectively, the bandwidth of PDi and PD_2 respectively coming out of the MIMO pre-distortion function will be much larger than the lager one of Bi and B_2. Although the actual bandwidth of PDi depends on the specific power amplifier being used and the specific signals being transmitted, typically, this bandwidth will be about 5 to 7 times the larger one of Bi and B_2. In order to simplify the description in this application, it will be assumed that the bandwidth of PDi and PD_2 will be 7*max(Bi,B_2)." 29:3-15. "It has been previously stated that the bandwidth of the POi and $P0_2$ signals will be about 6Bi and $6B_2$ respectively. Thus, the maximum bandwidth that must be supported by any of the baseband signals of interest (signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals (POi, $P0_2$) coming from the feedback frequency shifters 314 and 315) will be 7*max(Bi,B_2). Thus, in the example of the present invention, the minimum sampling frequency of the system, and the frequency at which the MIMO pre-distortion function will operate, is: Eq 29 /,mm—„ = 7 * max(5_1,5_2)" 29:16-23.
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.	Peroulas 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. *See* claim 2, *supra*, which is incorporated by reference herein. *See*, *e.g.*, "The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure

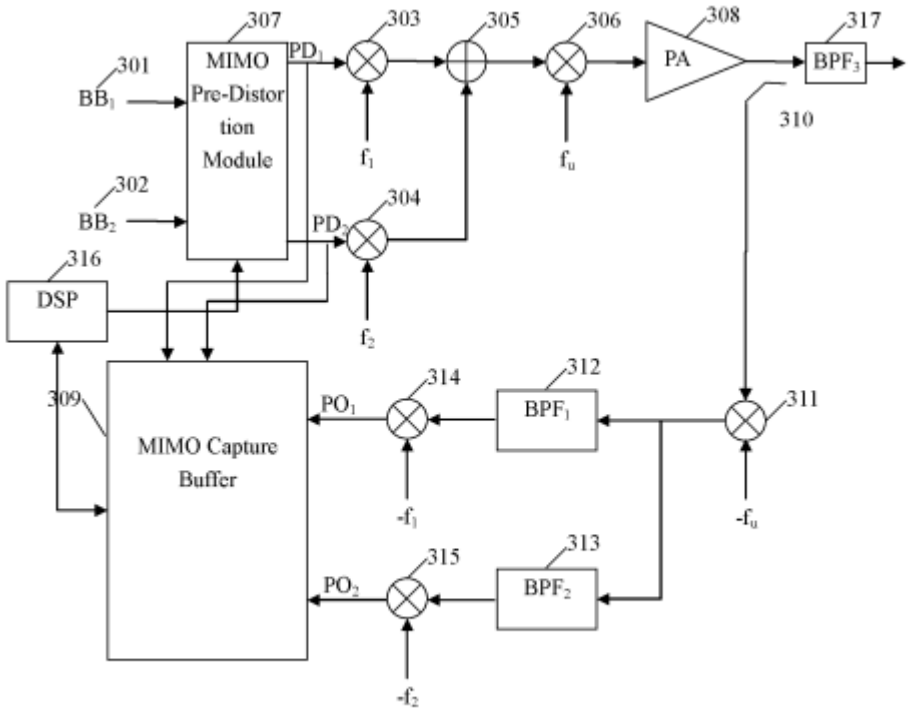
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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "The goal of the pre-distortion function, which is also a non-linear function, is to create a signal to be sent to the PA such that the output signal of the PA contains little or no distortion. In other words, although the pre-distortion function and the PA are individually non-linear, the cascade of the pre-distortion function and the PA produces a system that is linear overall."1:27-2:2. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_c i<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9.

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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		"The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{c1} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{c1} and f_{c2}, the output of the PA will contain desired signals at f_{c1} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{c1} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{c1} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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Claim No.	’296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		 FIG. 3 Fig. 3. “In one example, this model is created by capturing the samples of several signals using a MIMO capture buffer 309. The number of samples required to be captured by the MIMO capture buffer 309 varies based on the PA 308 and the type of signals to be transmitted, but typically, between 2000 and 10000 samples of each signal coming into the MIMO capture buffer 309 will need to be captured.” 25:10-14. “Two of the signals recorded by the MIMO capture buffer 309 in this example are PDi and PD_2, which are produced by the multiple input multiple output (MIMO) pre-distortion module 307. The

Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		other two signals recorded by the MIMO capture buffer 309 are derived from a signal output from a coupler 310 which extracts a small portion (typically less than 1% of the PA output power) of the signal output from the PA 308. The key property of the coupler 310 is that it produces a signal which is an accurate representation of the actual output of the PA 308. The output of the coupler 310 is connected to a frequency shifter 311 which shifts the signal down by f_u Hz." 25:15-22. "It should be clear to one skilled in the art that although this application describes a specific method to construct the p^ , H_a , and h_a vectors and matrices (a is either 1 or 2), an vast number of variations are possible that do not depart from the scope of this application. For example, any two rows of can be exchanged as long as the same rows of H_a are exchanged. Furthermore, any two columns (j and k) of H_a can be exchanged as long as the same rows (j and k) of h_a are exchanged." 28:8-13. "The general operation of the multiband digital pre-distorter is that when the multiband digital pre-distorter is first turned on, initially, $h_{1;0;0;0}$ and ^{n}2,o,o,o will both be set to 1 and all other values for $h_{l\,a\,b\,c}$ and $h_{2\,a\,b\,c}$ will be set to zero. When some samples are captured by the MIMO capture buffer 309, the samples are analyzed by the DSP so as to produce the vectors and h_2 and all of values in $_{j\,\wedge\,k}$ and $h_{2\,j\,\wedge\,k}$. After these values have been calculated, the DSP transmits these values to the MIMO pre-distortion module and all of the hij;ki,k2 and h2j,ki,k2 values of the MIMO pre-distortion function in the MIMO pre-distortion module will be simultaneously updated and replaced with the $_{j\,\wedge\,ki}$ and $h_{2\,j\,\wedge\,k}$ values." 28:14-21. "The sampling rates of the signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals coming from the feedback frequency shifters (POi, $P0_2$), are usually the same, which are represented in this application by a variable f_s." 28:26-29:2. "According to the pre-distortion functions expressed in Eq 15 and Eq 16, because the signals BBi 301 and BB_2 302 have bandwidths Bi and B_2 respectively, and both signal BBi 301 and BB_2 302 are baseband signals, so the bandwidths of the signal output from the Eq 15 and Eq 16 are equal to lager one of Bi and B_2, which are not a function of Bdeadspace- Besides, as the pre- distortion function in the prior art (such as the dual band digital pre-distortion system shown in FIG. 1), the MIMO pre-distortion function in this example expands the bandwidth of the signal going through it for the purpose of sufficiently linearizing the PA 308. For example, although signals BBi 301 and

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Claim No.	’296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		BB_2 have bandwidths Bi and B_2 respectively, the bandwidth of PDi and PD_2 respectively coming out of the MIMO pre-distortion function will be much larger than the lager one of Bi and B_2. Although the actual bandwidth of PDi depends on the specific power amplifier being used and the specific signals being transmitted, typically, this bandwidth will be about 5 to 7 times the larger one of Bi and B_2. In order to simplify the description in this application, it will be assumed that the bandwidth of PDi and PD_2 will be 7*max(Bi,B_2).” 29:3-15. “It has been previously stated that the bandwidth of the POi and $P0_2$ signals will be about 6Bi and $6B_2$ respectively. Thus, the maximum bandwidth that must be supported by any of the baseband signals of interest (signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals (POi, $P0_2$) coming from the feedback frequency shifters 314 and 315) will be 7*max(Bi,B_2). Thus, in the example of the present invention, the minimum sampling frequency of the system, and the frequency at which the MIMO pre-distortion function will operate, is: Eq 29 /,mm—„ = 7 * max(5_1,5_2)” 29:16-23.
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.	Peroulas 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. *See* claim 2, *supra*, which is incorporated by reference herein. *See also*, *e.g.*, “The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every

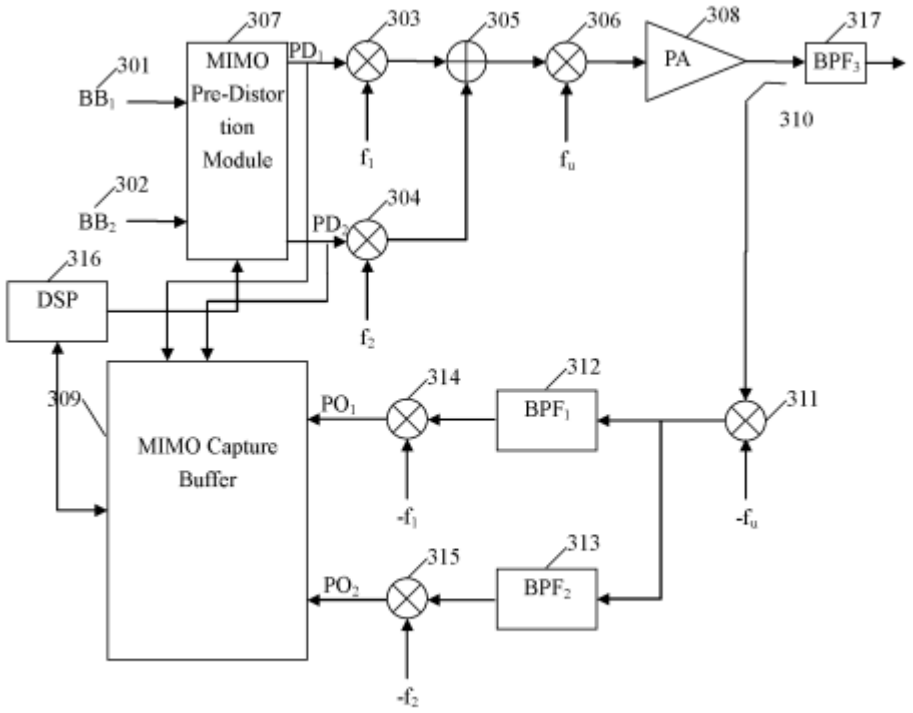
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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "The goal of the pre-distortion function, which is also a non-linear function, is to create a signal to be sent to the PA such that the output signal of the PA contains little or no distortion. In other words, although the pre-distortion function and the PA are individually non-linear, the cascade of the pre-distortion function and the PA produces a system that is linear overall."1:27-2:2. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_ci<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9.

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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		"The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{c1} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{c1} and f_{c2}, the output of the PA will contain desired signals at f_{c1} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{c1} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{c1} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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Claim No.	’296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		 FIG. 3 Fig. 3. “In one example, this model is created by capturing the samples of several signals using a MIMO capture buffer 309. The number of samples required to be captured by the MIMO capture buffer 309 varies based on the PA 308 and the type of signals to be transmitted, but typically, between 2000 and 10000 samples of each signal coming into the MIMO capture buffer 309 will need to be captured.” 25:10-14. “Two of the signals recorded by the MIMO capture buffer 309 in this example are PDi and PD_2, which are produced by the multiple input multiple output (MIMO) pre-distortion module 307. The

Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		other two signals recorded by the MIMO capture buffer 309 are derived from a signal output from a coupler 310 which extracts a small portion (typically less than 1% of the PA output power) of the signal output from the PA 308. The key property of the coupler 310 is that it produces a signal which is an accurate representation of the actual output of the PA 308. The output of the coupler 310 is connected to a frequency shifter 311 which shifts the signal down by f_u Hz." 25:15-22. "It should be clear to one skilled in the art that although this application describes a specific method to construct the p^ , H_a , and h_a vectors and matrices (a is either 1 or 2), an vast number of variations are possible that do not depart from the scope of this application. For example, any two rows of can be exchanged as long as the same rows of H_a are exchanged. Furthermore, any two columns (j and k) of H_a can be exchanged as long as the same rows (j and k) of h_a are exchanged." 28:8-13. "The general operation of the multiband digital pre-distorter is that when the multiband digital pre-distorter is first turned on, initially, $h_{1;0;0;0}$ and ^{n}2,o,o,o will both be set to 1 and all other values for $h_{l\,a\,b\,c}$ and $h_{2\,a\,b\,c}$ will be set to zero. When some samples are captured by the MIMO capture buffer 309, the samples are analyzed by the DSP so as to produce the vectors and h_2 and all of values in $_{j}$ ^ $_{k}$ and $h_{2\,j}$ ^ $_{k}$. After these values have been calculated, the DSP transmits these values to the MIMO pre-distortion module and all of the hij;ki,k2 and h2j,ki,k2 values of the MIMO pre-distortion function in the MIMO pre-distortion module will be simultaneously updated and replaced with the $_{j}$ ^ $_{ki}$ and $h_{2\,j}$ ^ $_{k}$ values." 28:14-21. "The sampling rates of the signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals coming from the feedback frequency shifters (POi, $P0_2$), are usually the same, which are represented in this application by a variable f_s." 28:26-29:2. "According to the pre-distortion functions expressed in Eq 15 and Eq 16, because the signals BBi 301 and BB_2 302 have bandwidths Bi and B_2 respectively, and both signal BBi 301 and BB_2 302 are baseband signals, so the bandwidths of the signal output from the Eq 15 and Eq 16 are equal to lager one of Bi and B_2, which are not a function of Bdeadspace- Besides, as the pre- distortion function in the prior art (such as the dual band digital pre-distortion system shown in FIG. 1), the MIMO pre-distortion function in this example expands the bandwidth of the signal going through it for the purpose of sufficiently linearizing the PA 308. For example, although signals BBi 301 and

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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		BB_2 have bandwidths Bi and B_2 respectively, the bandwidth of PDi and PD_2 respectively coming out of the MIMO pre-distortion function will be much larger than the lager one of Bi and B_2. Although the actual bandwidth of PDi depends on the specific power amplifier being used and the specific signals being transmitted, typically, this bandwidth will be about 5 to 7 times the larger one of Bi and B_2. In order to simplify the description in this application, it will be assumed that the bandwidth of PDi and PD_2 will be 7*max(Bi,B_2)." 29:3-15. "It has been previously stated that the bandwidth of the POi and $P0_2$ signals will be about 6Bi and $6B_2$ respectively. Thus, the maximum bandwidth that must be supported by any of the baseband signals of interest (signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals (POi, $P0_2$) coming from the feedback frequency shifters 314 and 315) will be 7*max(Bi,B_2). Thus, in the example of the present invention, the minimum sampling frequency of the system, and the frequency at which the MIMO pre-distortion function will operate, is: Eq 29 /,mm—„ = 7 * max(5_1,5_2)" 29:16-23.
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.	Peroulas 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. *See* claim 2, *supra*, which is incorporated by reference herein. *See*, *e.g.*, "The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every

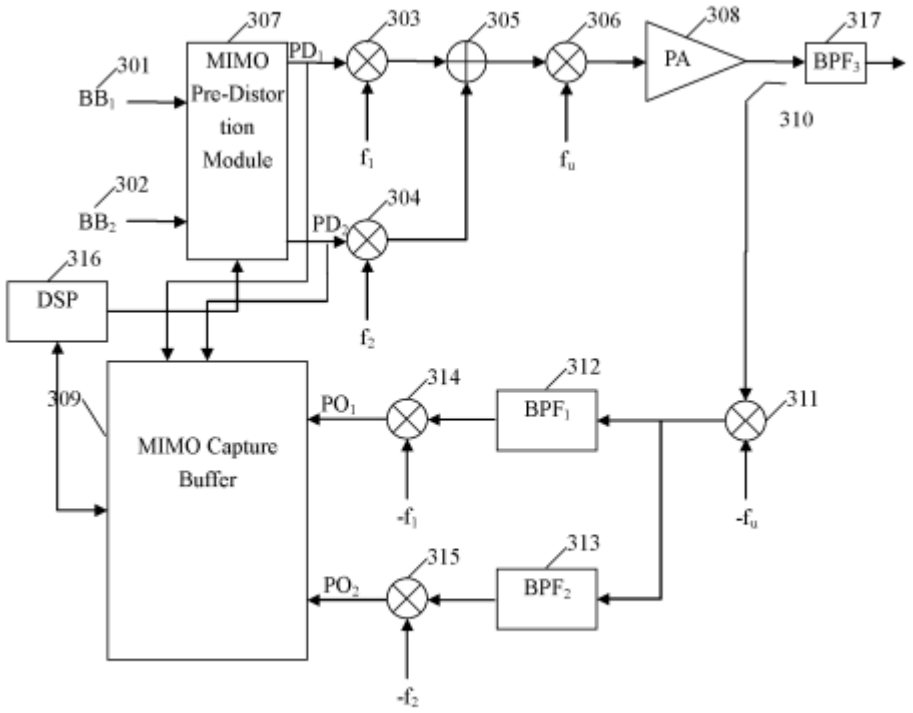
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		pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "The goal of the pre-distortion function, which is also a non-linear function, is to create a signal to be sent to the PA such that the output signal of the PA contains little or no distortion. In other words, although the pre-distortion function and the PA are individually non-linear, the cascade of the pre-distortion function and the PA produces a system that is linear overall."1:27-2:2. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_ci<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9.

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		"The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{c1} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{c1} and f_{c2}, the output of the PA will contain desired signals at f_{c1} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{c1} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{c1} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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Claim No.	’296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		 FIG. 3 Fig. 3. “In one example, this model is created by capturing the samples of several signals using a MIMO capture buffer 309. The number of samples required to be captured by the MIMO capture buffer 309 varies based on the PA 308 and the type of signals to be transmitted, but typically, between 2000 and 10000 samples of each signal coming into the MIMO capture buffer 309 will need to be captured.” 25:10-14. “Two of the signals recorded by the MIMO capture buffer 309 in this example are PDi and PD_2, which are produced by the multiple input multiple output (MIMO) pre-distortion module 307. The

Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		other two signals recorded by the MIMO capture buffer 309 are derived from a signal output from a coupler 310 which extracts a small portion (typically less than 1% of the PA output power) of the signal output from the PA 308. The key property of the coupler 310 is that it produces a signal which is an accurate representation of the actual output of the PA 308. The output of the coupler 310 is connected to a frequency shifter 311 which shifts the signal down by f_u Hz." 25:15-22. "It should be clear to one skilled in the art that although this application describes a specific method to construct the p^ , H_a , and h_a vectors and matrices (a is either 1 or 2), an vast number of variations are possible that do not depart from the scope of this application. For example, any two rows of can be exchanged as long as the same rows of H_a are exchanged. Furthermore, any two columns (j and k) of H_a can be exchanged as long as the same rows (j and k) of h_a are exchanged." 28:8-13. "The general operation of the multiband digital pre-distorter is that when the multiband digital pre-distorter is first turned on, initially, $h_{1;0;0;0}$ and ^{n}2,o,o,o will both be set to 1 and all other values for $h_{l\,a\,b\,c}$ and $h_{2\,a\,b\,c}$ will be set to zero. When some samples are captured by the MIMO capture buffer 309, the samples are analyzed by the DSP so as to produce the vectors and h_2 and all of values in $_{j\,\wedge\,k}$ and $h_{2\,j\,\wedge\,k}$. After these values have been calculated, the DSP transmits these values to the MIMO pre-distortion module and all of the hij;ki,k2 and h2j,ki,k2 values of the MIMO pre-distortion function in the MIMO pre-distortion module will be simultaneously updated and replaced with the $_{j\,\wedge\,ki}$ and $h_{2\,j\,\wedge\,k}$ values." 28:14-21. "The sampling rates of the signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals coming from the feedback frequency shifters (POi, $P0_2$), are usually the same, which are represented in this application by a variable f_s." 28:26-29:2. "According to the pre-distortion functions expressed in Eq 15 and Eq 16, because the signals BBi 301 and BB_2 302 have bandwidths Bi and B_2 respectively, and both signal BBi 301 and BB_2 302 are baseband signals, so the bandwidths of the signal output from the Eq 15 and Eq 16 are equal to lager one of Bi and B_2, which are not a function of Bdeadspace- Besides, as the pre- distortion function in the prior art (such as the dual band digital pre-distortion system shown in FIG. 1), the MIMO pre-distortion function in this example expands the bandwidth of the signal going through it for the purpose of sufficiently linearizing the PA 308. For example, although signals BBi 301 and

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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		BB_2 have bandwidths Bi and B_2 respectively, the bandwidth of PDi and PD_2 respectively coming out of the MIMO pre-distortion function will be much larger than the lager one of Bi and B_2. Although the actual bandwidth of PDi depends on the specific power amplifier being used and the specific signals being transmitted, typically, this bandwidth will be about 5 to 7 times the larger one of Bi and B_2. In order to simplify the description in this application, it will be assumed that the bandwidth of PDi and PD_2 will be 7*max(Bi,B_2)." 29:3-15. "It has been previously stated that the bandwidth of the POi and $P0_2$ signals will be about 6Bi and $6B_2$ respectively. Thus, the maximum bandwidth that must be supported by any of the baseband signals of interest (signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals (POi, $P0_2$) coming from the feedback frequency shifters 314 and 315) will be 7*max(Bi,B_2). Thus, in the example of the present invention, the minimum sampling frequency of the system, and the frequency at which the MIMO pre-distortion function will operate, is: Eq 29 /,mm—„ = 7 * max(5_1,5_2)" 29:16-23.
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).	Peroulas 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). *See* claim 2, *supra*, which is incorporated by reference herein. *See also*, *e.g.*, "The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure

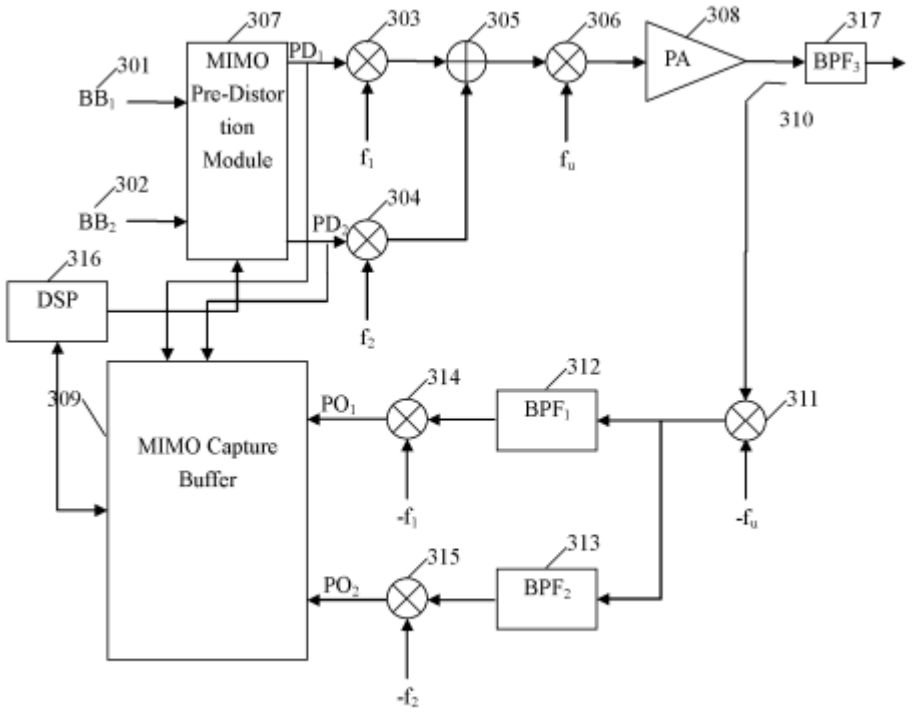
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		to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "The goal of the pre-distortion function, which is also a non-linear function, is to create a signal to be sent to the PA such that the output signal of the PA contains little or no distortion. In other words, although the pre-distortion function and the PA are individually non-linear, the cascade of the pre-distortion function and the PA produces a system that is linear overall."1:27-2:2. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_c i<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9.

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		"The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{c1} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{c1} and f_{c2}, the output of the PA will contain desired signals at f_{c1} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{c1} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{c1} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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Claim No.	’296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		 FIG. 3 Fig. 3. “In one example, this model is created by capturing the samples of several signals using a MIMO capture buffer 309. The number of samples required to be captured by the MIMO capture buffer 309 varies based on the PA 308 and the type of signals to be transmitted, but typically, between 2000 and 10000 samples of each signal coming into the MIMO capture buffer 309 will need to be captured.” 25:10-14. “Two of the signals recorded by the MIMO capture buffer 309 in this example are PDi and PD_2, which are produced by the multiple input multiple output (MIMO) pre-distortion module 307. The

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		other two signals recorded by the MIMO capture buffer 309 are derived from a signal output from a coupler 310 which extracts a small portion (typically less than 1% of the PA output power) of the signal output from the PA 308. The key property of the coupler 310 is that it produces a signal which is an accurate representation of the actual output of the PA 308. The output of the coupler 310 is connected to a frequency shifter 311 which shifts the signal down by f_u Hz." 25:15-22. "It should be clear to one skilled in the art that although this application describes a specific method to construct the p^ , H_a , and h_a vectors and matrices (a is either 1 or 2), an vast number of variations are possible that do not depart from the scope of this application. For example, any two rows of can be exchanged as long as the same rows of H_a are exchanged. Furthermore, any two columns (j and k) of H_a can be exchanged as long as the same rows (j and k) of h_a are exchanged." 28:8-13. "The general operation of the multiband digital pre-distorter is that when the multiband digital pre-distorter is first turned on, initially, $h_{1;0;0;0}$ and ^{n}2,o,o,o will both be set to 1 and all other values for $h_{l\,a\,b\,c}$ and $h_{2\,a\,b\,c}$ will be set to zero. When some samples are captured by the MIMO capture buffer 309, the samples are analyzed by the DSP so as to produce the vectors and h_2 and all of values in $_{j\,\wedge\,k}$ and $h_{2\,j\,\wedge\,k}$. After these values have been calculated, the DSP transmits these values to the MIMO pre-distortion module and all of the hij;ki,k2 and h2j,ki,k2 values of the MIMO pre-distortion function in the MIMO pre-distortion module will be simultaneously updated and replaced with the $_{j\,\wedge\,ki}$ and $h_{2\,j\,\wedge\,k}$ values." 28:14-21. "The sampling rates of the signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals coming from the feedback frequency shifters (POi, $P0_2$), are usually the same, which are represented in this application by a variable f_s." 28:26-29:2. "According to the pre-distortion functions expressed in Eq 15 and Eq 16, because the signals BBi 301 and BB_2 302 have bandwidths Bi and B_2 respectively, and both signal BBi 301 and BB_2 302 are baseband signals, so the bandwidths of the signal output from the Eq 15 and Eq 16 are equal to lager one of Bi and B_2, which are not a function of Bdeadspace- Besides, as the pre- distortion function in the prior art (such as the dual band digital pre-distortion system shown in FIG. 1), the MIMO pre-distortion function in this example expands the bandwidth of the signal going through it for the purpose of sufficiently linearizing the PA 308. For example, although signals BBi 301 and

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Claim No.	’296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		BB_2 have bandwidths Bi and B_2 respectively, the bandwidth of PDi and PD_2 respectively coming out of the MIMO pre-distortion function will be much larger than the lager one of Bi and B_2. Although the actual bandwidth of PDi depends on the specific power amplifier being used and the specific signals being transmitted, typically, this bandwidth will be about 5 to 7 times the larger one of Bi and B_2. In order to simplify the description in this application, it will be assumed that the bandwidth of PDi and PD_2 will be 7*max(Bi,B_2).” 29:3-15. “It has been previously stated that the bandwidth of the POi and $P0_2$ signals will be about 6Bi and $6B_2$ respectively. Thus, the maximum bandwidth that must be supported by any of the baseband signals of interest (signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals (POi, $P0_2$) coming from the feedback frequency shifters 314 and 315) will be 7*max(Bi,B_2). Thus, in the example of the present invention, the minimum sampling frequency of the system, and the frequency at which the MIMO pre-distortion function will operate, is: Eq 29 /,$_{mm—,,}$ = 7 * max(5_1,5_2)” 29:16-23.
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.	Peroulas 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. *See* claim 2, *supra*, which is incorporated by reference herein. *See also*, *e.g.*, “The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one

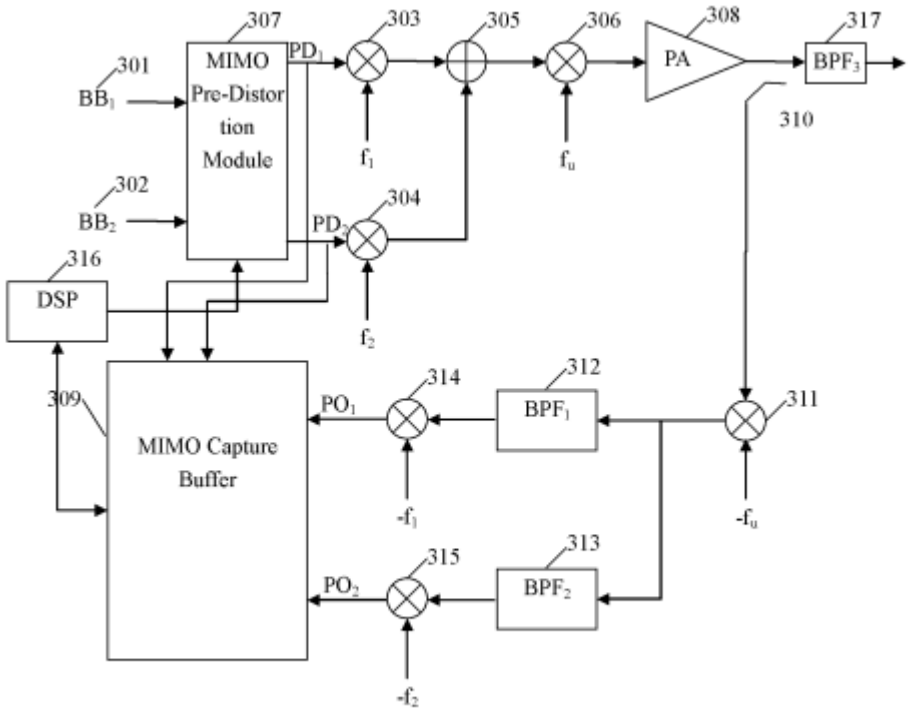
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		output; an adder, which is configured to combine all of the pre-distorted signals output from every pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "The goal of the pre-distortion function, which is also a non-linear function, is to create a signal to be sent to the PA such that the output signal of the PA contains little or no distortion. In other words, although the pre-distortion function and the PA are individually non-linear, the cascade of the pre-distortion function and the PA produces a system that is linear overall." 1:27-2:2. "One method that can be used to calculate the coefficients $h_{j;k}$ is the indirect learning architecture. The concept of the indirect learning architecture is that a model, which models the input of the PA based on the output of the PA, is created. Once such a model is created, the model is used directly as the pre-distortion function. For example, suppose that several samples input into and output from the PA are captured and are denoted as p; for the samples input into the PA, and p_0 for the samples output from the PA. The required number of samples varies from one PA to another PA but typically, the required number of samples is between 2000 and 10000." 2:11-14. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_ci<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module

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		307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9. "The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{cl} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{cl} and f_{c2}, the output of the PA will contain desired signals at f_{cl} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{cl} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{cl} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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Claim No.	’296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		 FIG. 3 Fig. 3. “In one example, this model is created by capturing the samples of several signals using a MIMO capture buffer 309. The number of samples required to be captured by the MIMO capture buffer 309 varies based on the PA 308 and the type of signals to be transmitted, but typically, between 2000 and 10000 samples of each signal coming into the MIMO capture buffer 309 will need to be captured.” 25:10-14. “Two of the signals recorded by the MIMO capture buffer 309 in this example are PDi and PD_2, which are produced by the multiple input multiple output (MIMO) pre-distortion module 307. The

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		other two signals recorded by the MIMO capture buffer 309 are derived from a signal output from a coupler 310 which extracts a small portion (typically less than 1% of the PA output power) of the signal output from the PA 308. The key property of the coupler 310 is that it produces a signal which is an accurate representation of the actual output of the PA 308. The output of the coupler 310 is connected to a frequency shifter 311 which shifts the signal down by f_u Hz." 25:15-22. "It should be clear to one skilled in the art that although this application describes a specific method to construct the p^ , H_a , and h_a vectors and matrices (a is either 1 or 2), an vast number of variations are possible that do not depart from the scope of this application. For example, any two rows of can be exchanged as long as the same rows of H_a are exchanged. Furthermore, any two columns (j and k) of H_a can be exchanged as long as the same rows (j and k) of h_a are exchanged." 28:8-13. "The general operation of the multiband digital pre-distorter is that when the multiband digital pre-distorter is first turned on, initially, $h_{1;0;0;0}$ and ^{n}2,o,o,o will both be set to 1 and all other values for $h_{l\,a\,b\,c}$ and $h_{2\,a\,b\,c}$ will be set to zero. When some samples are captured by the MIMO capture buffer 309, the samples are analyzed by the DSP so as to produce the vectors and h_2 and all of values in $_{j}$ ^ $_{k}$ and $h_{2\,j}$ ^ $_{k}$. After these values have been calculated, the DSP transmits these values to the MIMO pre-distortion module and all of the hij;ki,k2 and h2j,ki,k2 values of the MIMO pre-distortion function in the MIMO pre-distortion module will be simultaneously updated and replaced with the $_{j}$ ^ $_{ki}$ and $h_{2\,j}$ ^ $_{k}$ values." 28:14-21. "The sampling rates of the signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals coming from the feedback frequency shifters (POi, $P0_2$), are usually the same, which are represented in this application by a variable f_s." 28:26-29:2. "According to the pre-distortion functions expressed in Eq 15 and Eq 16, because the signals BBi 301 and BB_2 302 have bandwidths Bi and B_2 respectively, and both signal BBi 301 and BB_2 302 are baseband signals, so the bandwidths of the signal output from the Eq 15 and Eq 16 are equal to lager one of Bi and B_2, which are not a function of Bdeadspace- Besides, as the pre- distortion function in the prior art (such as the dual band digital pre-distortion system shown in FIG. 1), the MIMO pre-distortion function in this example expands the bandwidth of the signal going through it for the purpose of sufficiently linearizing the PA 308. For example, although signals BBi 301 and

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Claim No.	'296 Patent	Exemplary Evidence of Anticipation and/or Obviousness
		BB_2 have bandwidths Bi and B_2 respectively, the bandwidth of PDi and PD_2 respectively coming out of the MIMO pre-distortion function will be much larger than the lager one of Bi and B_2. Although the actual bandwidth of PDi depends on the specific power amplifier being used and the specific signals being transmitted, typically, this bandwidth will be about 5 to 7 times the larger one of Bi and B_2. In order to simplify the description in this application, it will be assumed that the bandwidth of PDi and PD_2 will be 7*max(Bi,B_2)." 29:3-15. "It has been previously stated that the bandwidth of the POi and $P0_2$ signals will be about 6Bi and $6B_2$ respectively. Thus, the maximum bandwidth that must be supported by any of the baseband signals of interest (signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals (POi, $P0_2$) coming from the feedback frequency shifters 314 and 315) will be 7*max(Bi,B_2). Thus, in the example of the present invention, the minimum sampling frequency of the system, and the frequency at which the MIMO pre-distortion function will operate, is: Eq 29 /,mm—„ = 7 * max(5_1,5_2)" 29:16-23.
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).	Peroulas 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). *See* claim 8, *supra*, which is incorporated by reference herein. *See also*, *e.g.*, "The present invention discloses a pre-distorter, which comprises: a pre-distortion module, which is configured to pre-distort a plurality of baseband input signals by an equal number of pre-distortion functions to obtain equal number of pre-distorted signals respectively, wherein all of the baseband input signals input into every pre-distortion function, and each pre-distortion function has one output; an adder, which is configured to combine all of the pre-distorted signals output from every pre-distortion functions into one combined signal; and a power amplifier (PA), which is configure

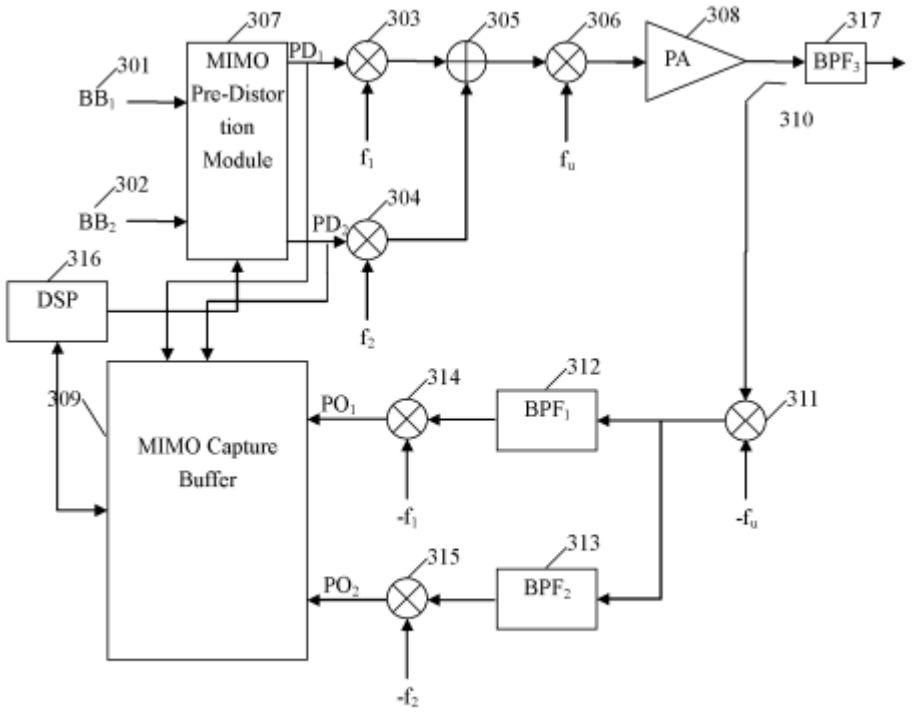
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		to amplify the combined signal, wherein the cascade of the pre-distortion functions and the PA are linear overall. And the present invention also discloses a method for distorting. The present invention reduces the implementation cost of a pre-distorer." Abstract. "The goal of the pre-distortion function, which is also a non-linear function, is to create a signal to be sent to the PA such that the output signal of the PA contains little or no distortion. In other words, although the pre-distortion function and the PA are individually non-linear, the cascade of the pre-distortion function and the PA produces a system that is linear overall."1:27-2:2. "Below the present invention will be described in detail by presenting particular examples. This example will describe two baseband input signals as an example, but the present invention is not limited to two baseband input signals. The architecture of the multiband digital pre-distorter (dual band digital pre-distorter in this example) according to this example is shown in FIG. 3. The baseband signals BBi 301 and BB_2 302 are centered at OHz and have bandwidths Bi and B_2 respectively. The intent of the multiband digital pre-distorter is that BBi 301 and BB_2 302 appear on the output of the PA 308 centered at f_{cl} and f_{c2} respectively. Without loss of generality, the discussion here will assume that both signals BBi 301 and BB_2 302 are sampled at a rate of f_s and that $f_c i<f_{c2}$. Further restrictions on the sampling rate f_s will be presented later in this application." 22:16-25. "Baseband signals BBi 301 and BB_2 302 are sent into a multiple input multiple output (MIMO) pre-distortion module 307 to produce signals PDi and PD_2, and the MIMO pre- distortion module 307 processes baseband signals BBi 301 and BB_2 302 with a MIMO pre- distortion function. Signals PDi and PD_2 are sent into frequency shifters 303 and 304 which shift the frequency of the signals PDi and PD_2 to fi and f_2 respectively. Then these shifted signals are combined by an adder 305. Wherein the MIMO pre-distortion function includes at least two pre-distortion functions, and each pre-distortion function has two inputs and one output. The number of the inputs for each pre-distortion function is equal to the number of the baseband signals input into the multiband digital pre-distorter, and the number of the pre- distortion functions is equal to the number of the baseband signals input into the multiband digital pre-distorter." 22:26-23:9.

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		"The output of the PA 308 is connected to a bandpass filter BPF_3 317 which filters out harmonics of the carrier frequencies f_{c1} and f_{c2}. As known to someone skilled in the art, if a non-linear PA is presented with a signal centered at f_{c1} and f_{c2}, the output of the PA will contain desired signals at f_{c1} and f_{c2}, but it will also contain energy at frequencies f_ci-(f_{c2}-f_ci) and fc2+(fc2-fci)- Stated in general terms, BPF_3 317 will remove the distortion products introduced by the PA 308 far away from the transmission carrier frequencies f_{c1} and f_{c2} whereas the rest of the application will remove the distortion products introduced by the PA 308 nearby and on top of the carrier frequencies. The goal of the MIMO pre-distortion function (which is also a non-linear function) is to produce signals PDi and PD_2 sent to the PA 308 such that the output of the BPF_3 317 only contains signals BBi 301 and BB_2 302 centered at frequencies f_{c1} and f_{c2}. No system is perfect and the output of the BPF_3 317 in this example will also contain some distortions, but the MIMO pre-distortion function in this example attempts to minimize these distortions as much as possible. Although the MIMO pre-distortion function and the PA 308 are individually nonlinear, the cascade of the MIMO pre-distortion function, the PA 308, and BPF_3 317 produces a system that is linear overall." 23:21-24:8.

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		 FIG. 3 Fig. 3. “In one example, this model is created by capturing the samples of several signals using a MIMO capture buffer 309. The number of samples required to be captured by the MIMO capture buffer 309 varies based on the PA 308 and the type of signals to be transmitted, but typically, between 2000 and 10000 samples of each signal coming into the MIMO capture buffer 309 will need to be captured.” 25:10-14. “Two of the signals recorded by the MIMO capture buffer 309 in this example are PDi and PD_2, which are produced by the multiple input multiple output (MIMO) pre-distortion module 307. The

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		other two signals recorded by the MIMO capture buffer 309 are derived from a signal output from a coupler 310 which extracts a small portion (typically less than 1% of the PA output power) of the signal output from the PA 308. The key property of the coupler 310 is that it produces a signal which is an accurate representation of the actual output of the PA 308. The output of the coupler 310 is connected to a frequency shifter 311 which shifts the signal down by f_u Hz." 25:15-22. "It should be clear to one skilled in the art that although this application describes a specific method to construct the p^ , H_a , and h_a vectors and matrices (a is either 1 or 2), an vast number of variations are possible that do not depart from the scope of this application. For example, any two rows of can be exchanged as long as the same rows of H_a are exchanged. Furthermore, any two columns (j and k) of H_a can be exchanged as long as the same rows (j and k) of h_a are exchanged." 28:8-13. "The general operation of the multiband digital pre-distorter is that when the multiband digital pre-distorter is first turned on, initially, $h_{1;0;0;0}$ and ^{n}2,o,o,o will both be set to 1 and all other values for $h_{l\,a\,b\,c}$ and $h_{2\,a\,b\,c}$ will be set to zero. When some samples are captured by the MIMO capture buffer 309, the samples are analyzed by the DSP so as to produce the vectors and h_2 and all of values in $_{j}$ ^ $_{k}$ and $h_{2\,j}$ ^ $_{k}$. After these values have been calculated, the DSP transmits these values to the MIMO pre-distortion module and all of the hij;ki,k2 and h2j,ki,k2 values of the MIMO pre-distortion function in the MIMO pre-distortion module will be simultaneously updated and replaced with the $_{j}$ ^ $_{ki}$ and $h_{2\,j}$ ^ $_{k}$ values." 28:14-21. "The sampling rates of the signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals coming from the feedback frequency shifters (POi, $P0_2$), are usually the same, which are represented in this application by a variable f_s." 28:26-29:2. "According to the pre-distortion functions expressed in Eq 15 and Eq 16, because the signals BBi 301 and BB_2 302 have bandwidths Bi and B_2 respectively, and both signal BBi 301 and BB_2 302 are baseband signals, so the bandwidths of the signal output from the Eq 15 and Eq 16 are equal to lager one of Bi and B_2, which are not a function of Bdeadspace- Besides, as the pre- distortion function in the prior art (such as the dual band digital pre-distortion system shown in FIG. 1), the MIMO pre-distortion function in this example expands the bandwidth of the signal going through it for the purpose of sufficiently linearizing the PA 308. For example, although signals BBi 301 and

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		BB_2 have bandwidths Bi and B_2 respectively, the bandwidth of PDi and PD_2 respectively coming out of the MIMO pre-distortion function will be much larger than the lager one of Bi and B_2. Although the actual bandwidth of PDi depends on the specific power amplifier being used and the specific signals being transmitted, typically, this bandwidth will be about 5 to 7 times the larger one of Bi and B_2. In order to simplify the description in this application, it will be assumed that the bandwidth of PDi and PD_2 will be 7*max(Bi,B_2).” 29:3-15. “It has been previously stated that the bandwidth of the POi and $P0_2$ signals will be about 6Bi and $6B_2$ respectively. Thus, the maximum bandwidth that must be supported by any of the baseband signals of interest (signals input into the MIMO pre-distortion function, signals output from the MIMO pre-distortion function, and signals (POi, $P0_2$) coming from the feedback frequency shifters 314 and 315) will be 7*max(Bi,B_2). Thus, in the example of the present invention, the minimum sampling frequency of the system, and the frequency at which the MIMO pre-distortion function will operate, is: Eq 29 $/_{,mm—,,} = 7 * \max(5_1,5_2)$” 29:16-23.
10[pre]	A method for linearizing a transmitter, said method comprising:	To the extent the preamble is limiting, Peroulas discloses and/or renders obvious a method for linearizing a transmitter. *See* above re claim 1[pre] which is incorporated by reference herein.
10[a]	effecting predistortion of concurrent input signals to output concurrent predistorted signals using a digital signal predistorter block including digital baseband signal predistorters;	Peroulas 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. *See* above re claim 1[a] which is incorporated by reference herein.

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10[b]	amplifying the predistorted signals using a power amplifier block;	Peroulas discloses and/or renders obvious amplifying the predistorted signals using a power amplifier block. *See* above re claim 1[b] which is incorporated by reference herein.
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	Peroulas 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. *See*, *e.g.*, *See* above re claim 1[c] which is incorporated by reference herein.
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 baseband signal predistorters are updated by the analyzing and modelling stage.	Peroulas 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. *See*, *e.g.*, *See* above re claim 1[c] which is incorporated by reference herein.

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