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(57) Abstract: The invention relates to an optical modulator control system implemented in an optical burst mode transmitter, said control system comprising means for measuring a plurality of optical power sample values and associated optical wavelength data values from a modulator at a first sampling rate, wherein an average power table is generated from said values for each sample period and stored in a memory. The control system also comprises means for performing a control error calculation from two or more stored average power tables at a second sampling rate to calculate a single error value to provide gain and/or bias control signals, wherein the second sample rate is sampled at a slower rate than the first sample rate. The control system described optimises the modulator performance over temperature and lifetime in an optical network.

Claims

1. An optical modulator control system implemented in an optical burst mode transmitter, said control system comprising:

   means for measuring a plurality of optical power sample values and associated optical wavelength data values from a modulator at a first sampling rate, wherein an average power table is adapted to be generated from said values for each sample period and stored in a memory; and

   means for performing a control error calculation from two or more generated stored average power tables adapted to be selected at a second sampling rate to calculate a single error value to provide gain and/or bias control signals, wherein the second sample rate is sampled at a slower rate than the first sample rate.

2. The optical modulator control system as claimed in claim 1 wherein the modulator comprises a chirped MZ modulator comprising a dispersion limited path.

3. The optical modulator control system as claimed in claim 2 comprising means to lock onto either a positive or negative slope of the MZ modulator transfer function, to produce positive or negative chirped optical data.

4. The optical modulator control system as claimed in claims 2 or 3 comprising means for providing a fast switchable chirp on a wavelength assigned basis for said modulator.

5. The optical modulator control system as claimed in claim 4 wherein said modulator comprises a high bandwidth

dedicated electrode on the MZ modulator comprising means to provide a fast non-disruptive bias change in between fast wavelength changes to increase said dispersion limited path.

6. The optical modulator control system as claimed in any preceding claim wherein the error calculation process comprises means to scale error values for different wavelength route assigned input parameters.

7. The optical modulator control system as claimed in claim 6 wherein the assigned input parameter comprises switchable chirp values such that a separate chirp bias electrode voltage determines whether a positive or negative MZ modulator slope is selected to increase said dispersion limited path.

8. The optical modulator control system as claimed in claim 7 wherein a difference error value is adjusted to compensate for the change in error sign due to the slope value of the MZ modulator, by using a predetermined reference table of chirp sign constants for each wavelength route, wherein chirp sign constants have a value of +1 or -1.

9. The optical modulator control system as claimed in any preceding claim wherein a dither signal is applied to the gain control signal.

10. The optical modulator control system as claimed in claim 9 wherein the dither signal comprises a small dither amplitude to minimise dither noise.

11. The optical modulator control system as claimed in any preceding claim wherein the first sampling rate is chosen

to be several orders of magnitude faster than the second sampling rate.

12. The optical modulator control system as claimed in any preceding claim wherein optical burst power is sampled asynchronously with respect to burst timing in the system.

13. The optical modulator control system as claimed in any preceding claim wherein for each optical sample power, a corresponding set laser wavelength is read, such that an FPGA is used to process the optical sample and wavelength data and send the values to the memory as an average power table.

14. The optical modulator control system as claimed in claim 13 wherein at the end of sampling period, the average power table is calculated for each wavelength entry that passes a minimum sample count criteria such that an accurate average power is calculated for the wavelengths that have enough sample counts during the sampling period.

15. The optical modulator control system as claimed in any preceding claim wherein the error calculation processes information from multiple power tables and switchable burst input parameters to calculate the single error value for gain or bias control.

16. The optical modulator control system as claimed in any preceding claim wherein the modulator comprises no optical power values, the control system comprises means for providing a dedicated ‘off’ laser wavelength to maintain optical power through the modulator during non-traffic periods.

17. The optical modulator control system as claimed in claim 16 wherein said means comprises an optical channel filter positioned at the modulator output to prevent the 'off' wavelength propagating onto an optical network.

18. The optical modulator control system as claimed in claim 16 and/or 17 wherein the 'off' wavelength is modulated with a data-like pattern to provide an error signal for the first control loop and lock to a desired optimised gain and bias point.

19. A method of controlling an optical burst mode transmitter using an optical modulator control system implemented in an optical burst mode transmitter, said method comprising the steps of:

measuring a plurality of optical power sample values and associated optical wavelength data values from a modulator at a first sampling rate on a first control loop, wherein an average power table is generated from said values for each sample period and stored in a memory;

performing a control error calculation from two or more stored average power tables at a second sampling rate to calculate a single error value to provide gain and/or bias control signals, wherein the second sample rate is sampled at a slower rate than the first sample rate.

20. A computer program comprising program instructions for causing a computer to perform the method of claim 19.

21. A computer program as claimed in claim 20 embodied on a record medium.

Dated this 11/06/2012

HRISHIKESH RAY CHAUDHURY
OF REMFRY & SAGAR
ATTORNEY FOR THE APPLICANT[S]

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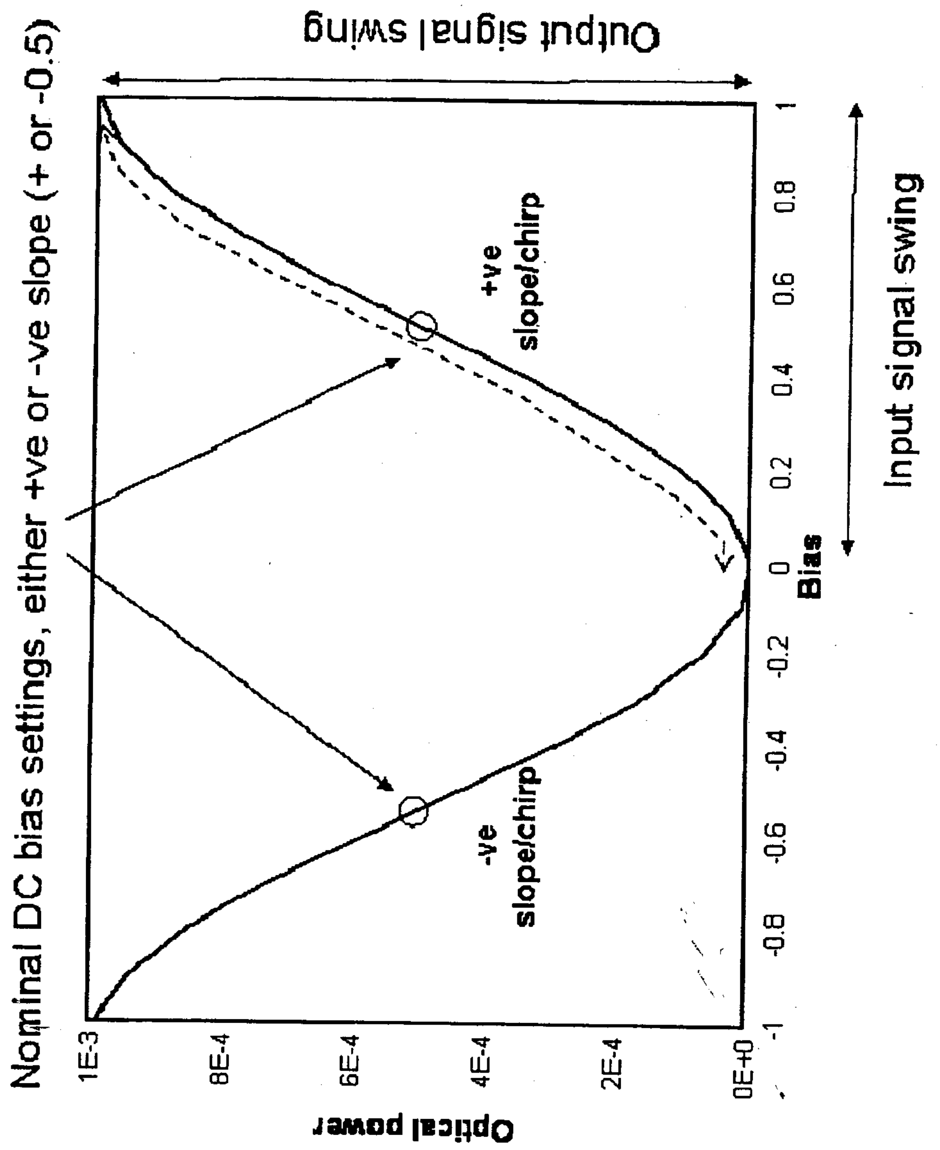

Figure 1

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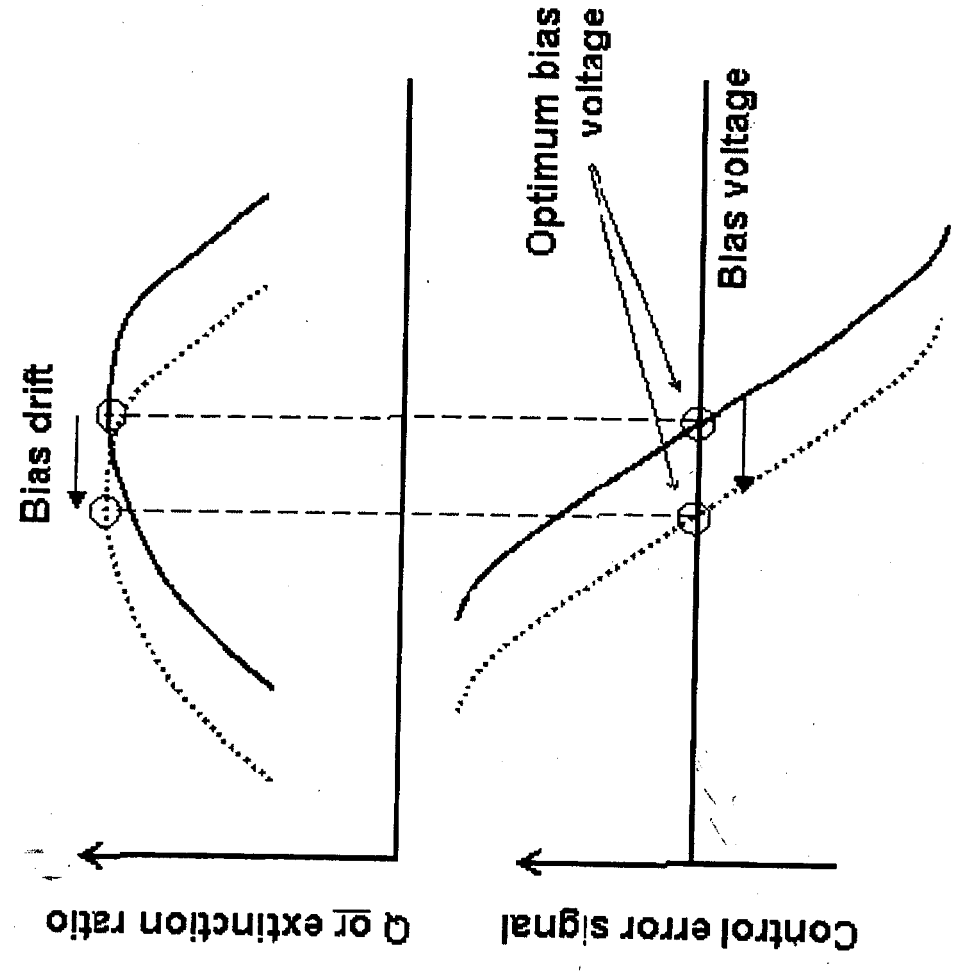

Figure 2

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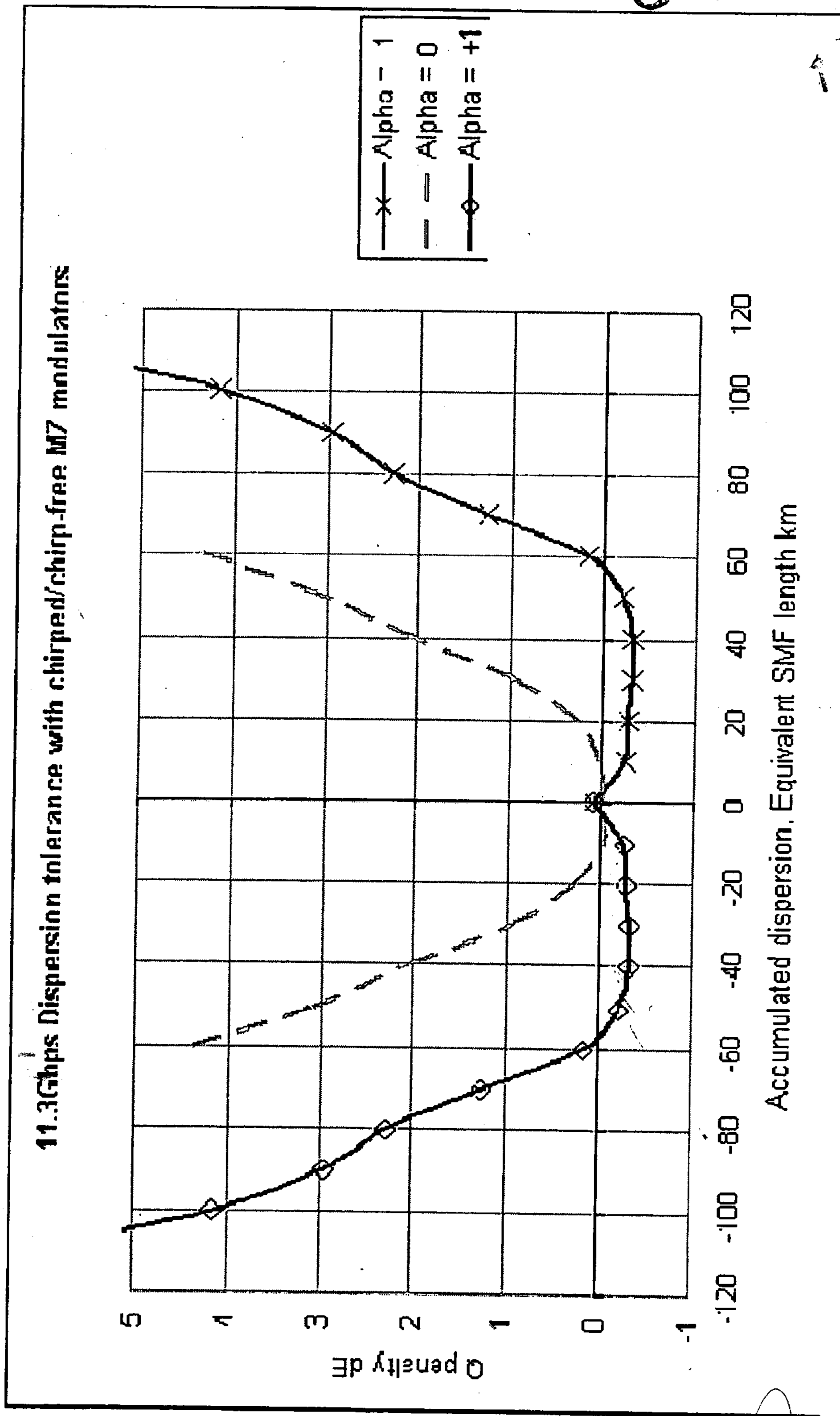

Figure 3

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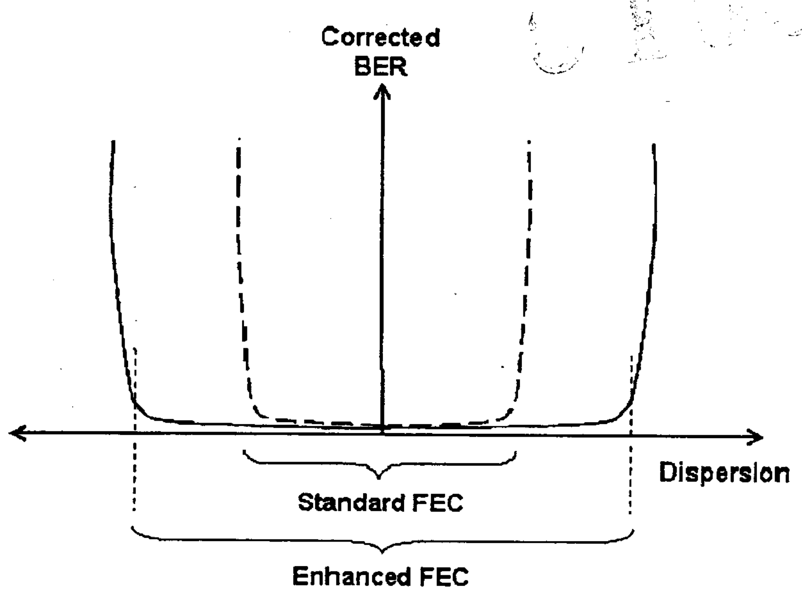

Figure 4

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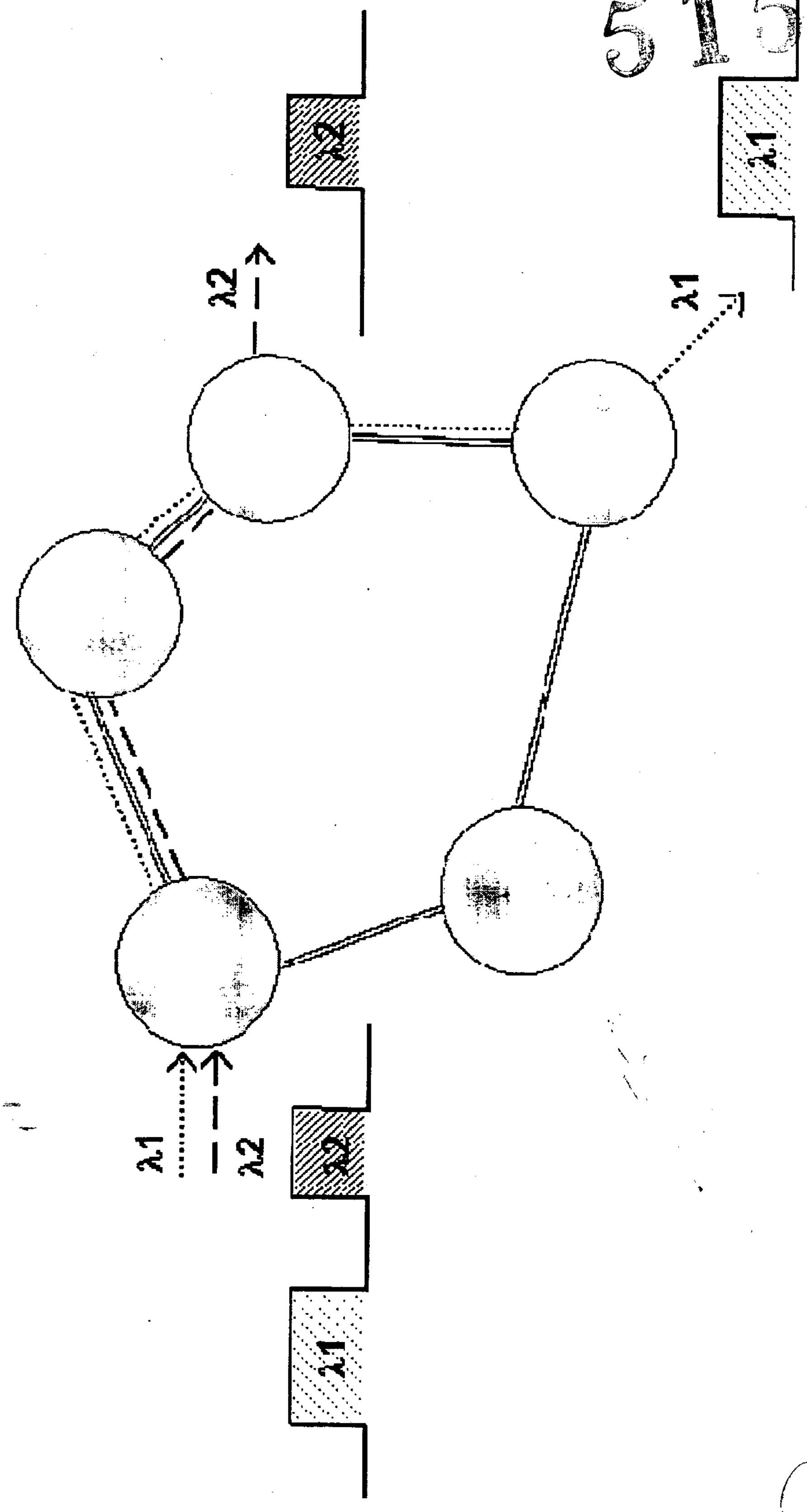

Figure 5

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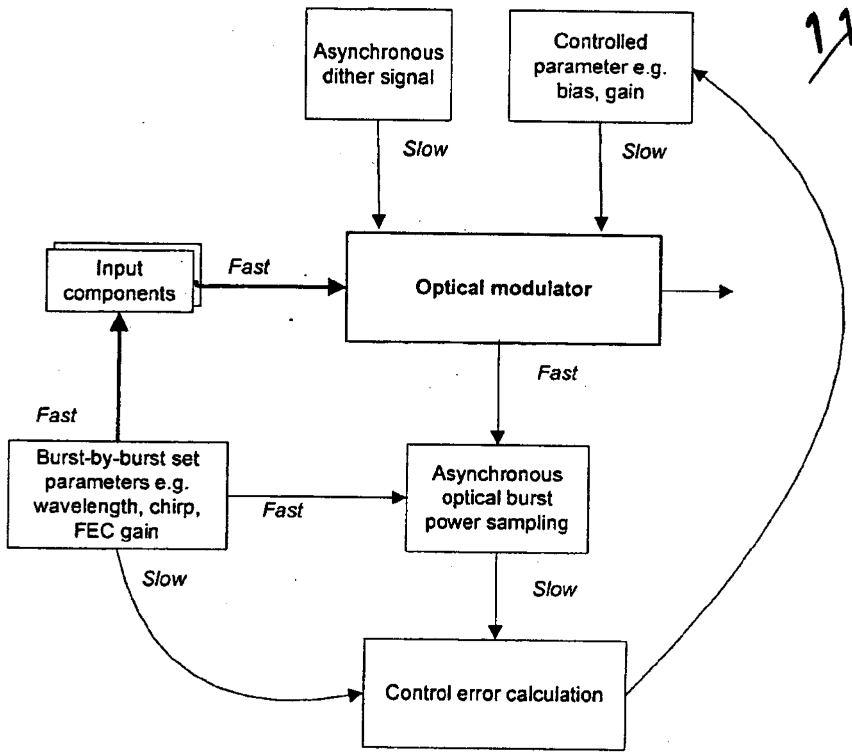

Figure 6

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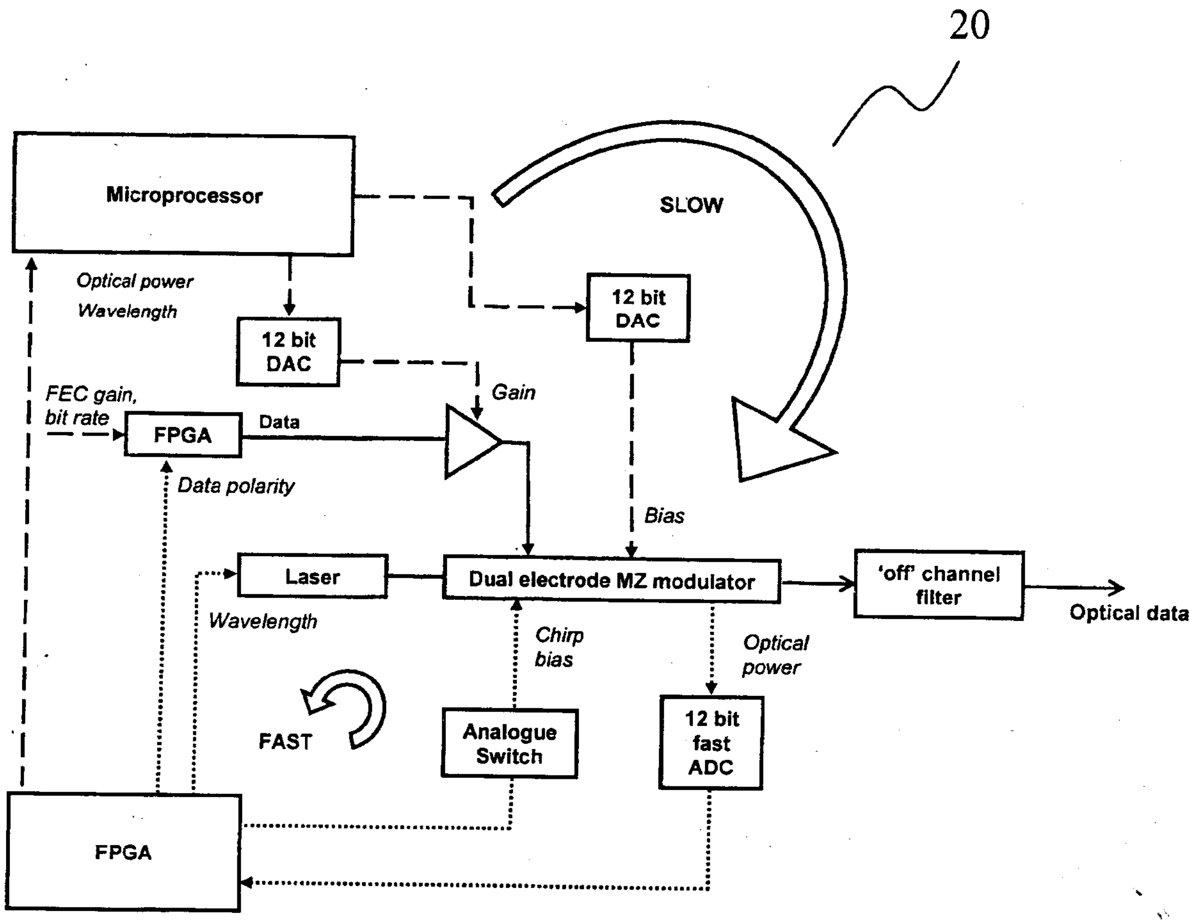

Figure 7

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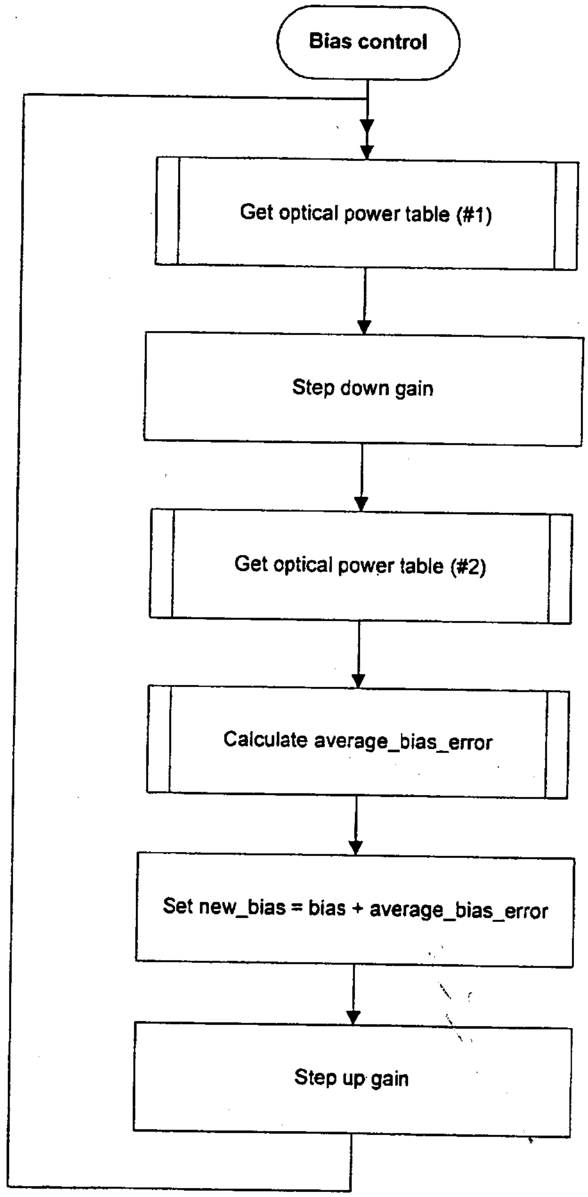

Figure 8

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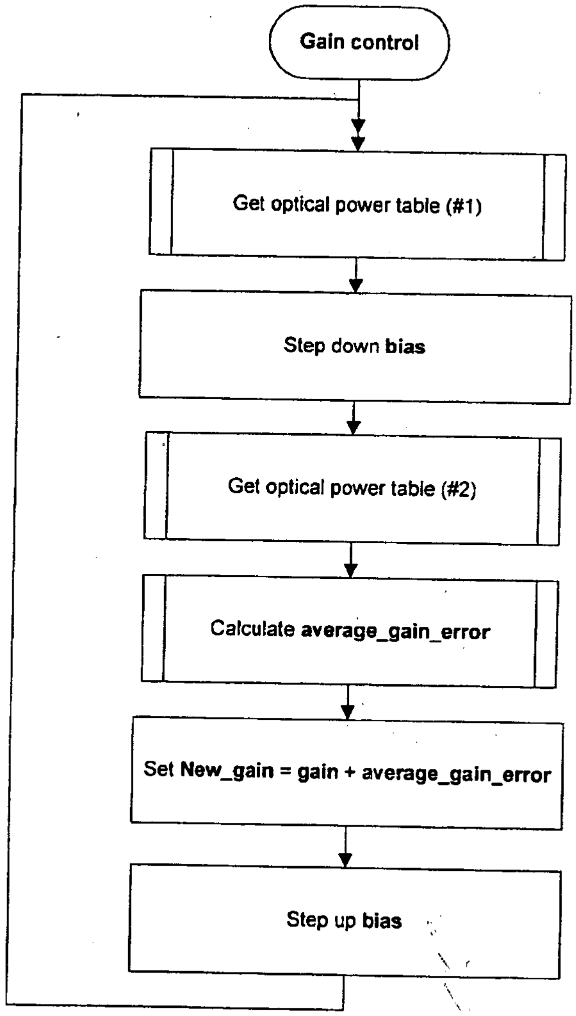

Figure 9

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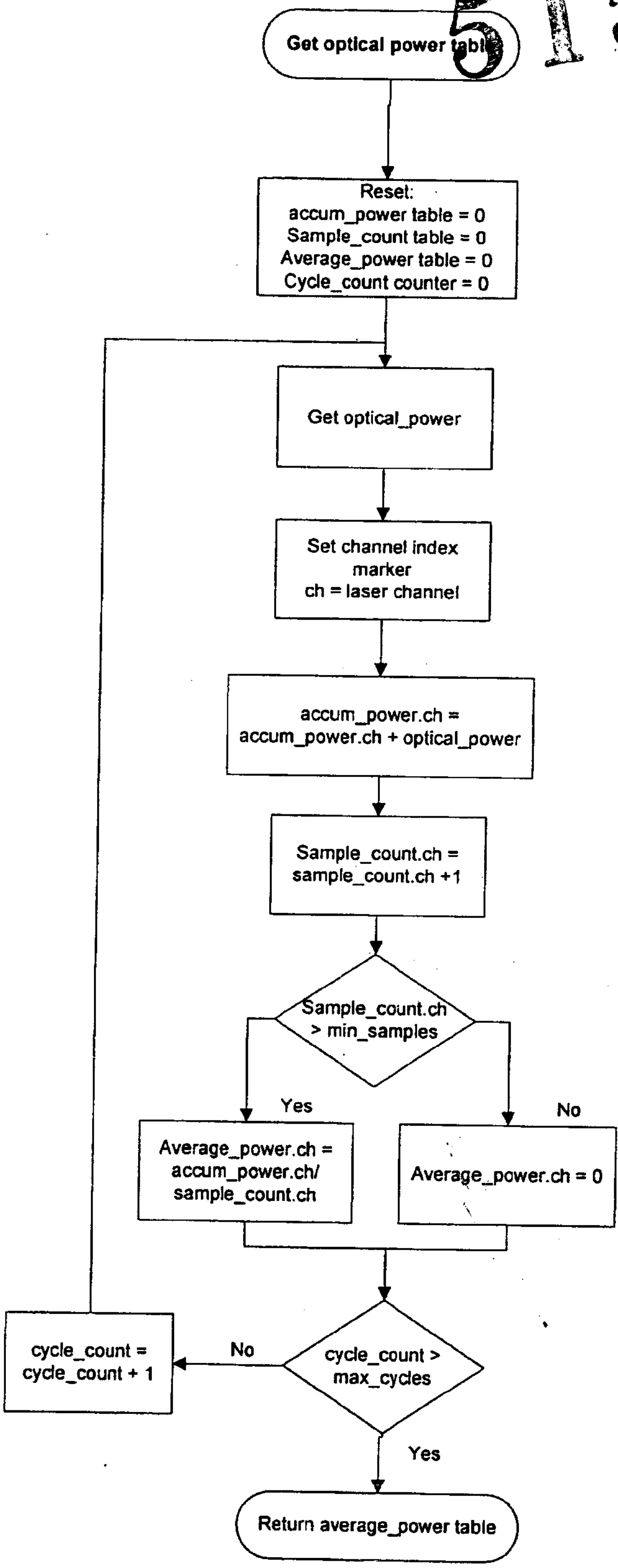

Figure 10

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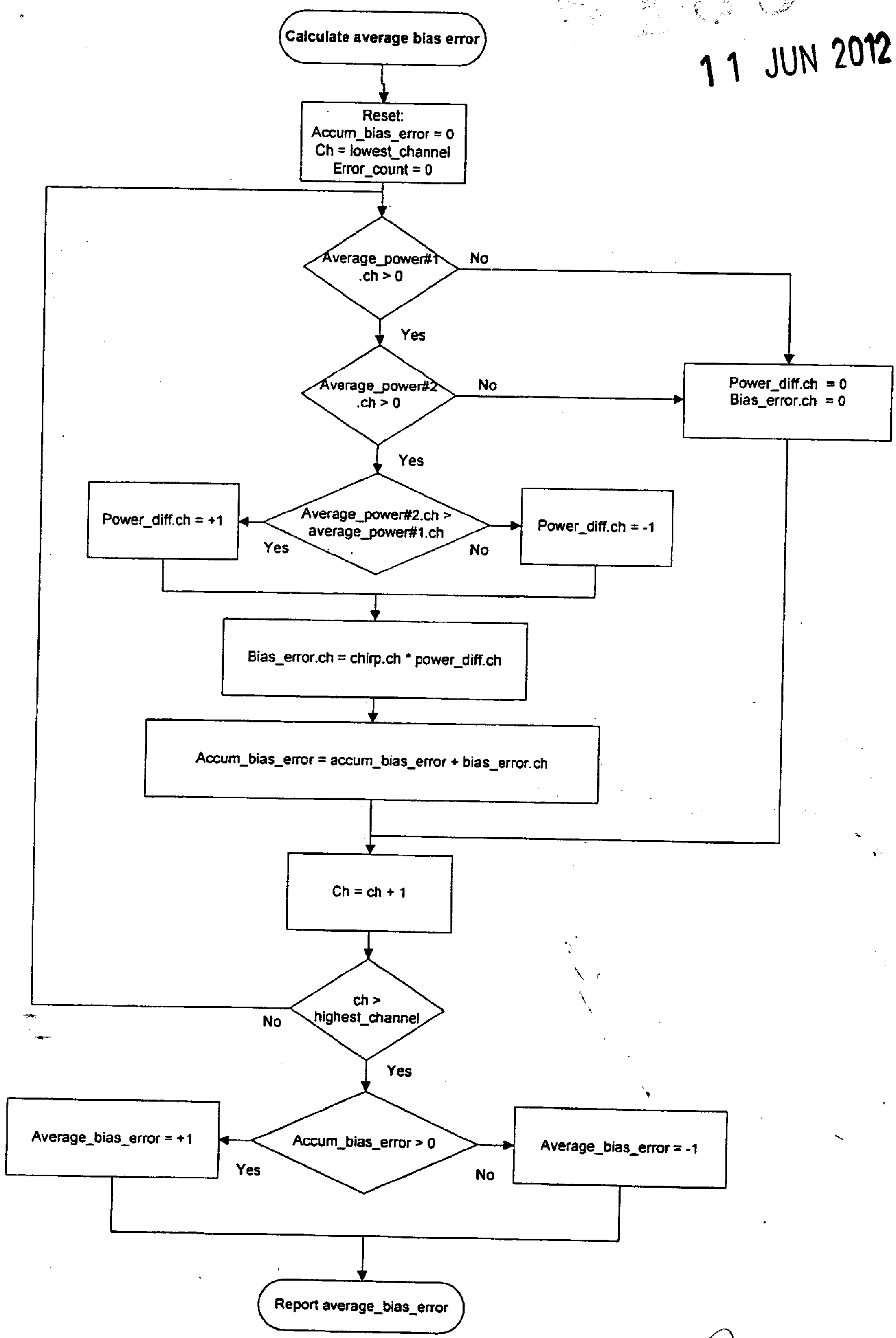

Figure 11

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OF REMFRY & SAGAR
ATTORNEY FOR THE APPLICANTS

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Ch	chirp	average_power#1	average_power#2	power_diff	bias_error
1	-1	2346	2340	-1	+1
2	1	2419	0	0	0
3	1	0	0	0	0
4	1	2888	2889	+1	+1

Figure 12

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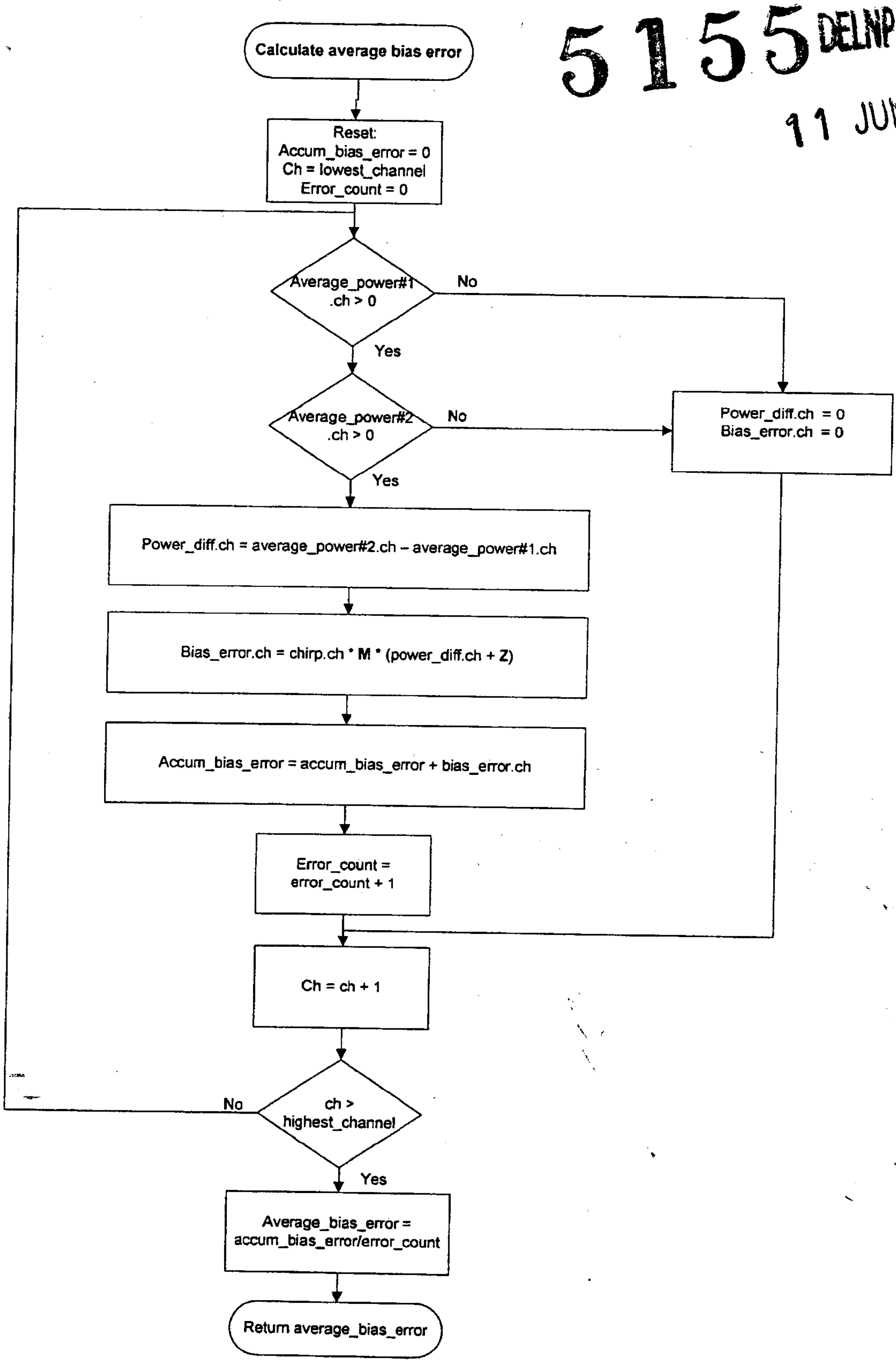

Figure 13

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