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Kumar

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(54) **SPREAD SPECTRUM ADJUSTMENT FOR AN LC CIRCUIT**

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(58) **Field of Classification Search**
CPC H04B 1/04
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,583,154	B1	9/2009	Kizziar	331/65
2003/0161385	A1 *	8/2003	Chang	H04B 1/7097 375/E1.036
2008/0100350	A1	5/2008	Pernia et al.	327/114
2013/0332025	A1 *	12/2013	Ziarno	G05B 23/0213 701/33.4

FOREIGN PATENT DOCUMENTS

WO	2020/159477 A1	8/2020	H03K 17/945

OTHER PUBLICATIONS

International Search Report and Written Opinion, Application No. PCT/US2022/026967, 20 pages, Oct. 17, 2022.
Partial International Search Report, Application No. PCT/US2022/026967, 15 pages, Aug. 23, 2022.

* cited by examiner

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(57) **ABSTRACT**

A controller and a method is provided for controlling a capacitance of an LC circuit having a circuit frequency including, a variable capacitor to couple with an external inductor as part of an LC circuit, a target value, a spread spectrum function to generate an adjustment value, and a circuit to poll the target value, call the spread spectrum function, and set a capacitance of the variable capacitor based on the sum of the target value and the adjustment value.

19 Claims, 5 Drawing Sheets

