TCSET'2012

MODERN PROBLEMS OF RADIO ENGINEERING, TELECOMMUNICATIONS AND COMPUTER SCIENCE

Proceedings
of the XIth International Conference
TCSET'2012
Dedicated to the 60th anniversary of the Radio Department
at the Lviv Polytechnic National University

Lviv – Slavske, Ukraine
February 21–24, 2012

Ministry of Education and Science, Youth and Sport of Ukraine
Lviv Polytechnic National University

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Lviv
Publishing House of Lviv Polytechnic
2012

Міністерство освіти і науки, молоді та спорту України
Національний університет “Львівська політехніка”

СУЧАСНІ ПРОБЛЕМИ РАДІОЕЛЕКТРОНІКИ, ТЕЛЕКОМУНІКАЦІЙ, КОМП’ЮТЕРНОЇ ІНЖЕНЕРІЇ

Матеріали
XI Міжнародної конференції
TCSET’2012
присвяченої 60-річчю заснування радіотехнічного факультету у Львівській політехніці

21–24 лютого 2012
Львів – Славське, Україна

Львів
Видавництво Львівської політехніки
2012

УДК 338.24-658.014
С 57

У книзі зібрано матеріали конференції, присвяченої науково-технічним проблемам у галузі радіоелектроніки, телекомунікацій та комп'ютерної інженерії.

Видання призначене для науковців, інженерів та аспірантів.

TCSET'2012

International Conference
"Modern Problems of Radio Engineering, Telecommunications, and Computer Science"

Organized by

Lviv Polytechnic National University
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The Ukrainian State Centre of Radio Frequencies

Papers are presented in authors' edition
Матеріали подано в авторській редакції

IEEE Catalog Number: CFP1238R-PRT
ISBN: 978-617-607-208-9

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COMPUTER SIMULATION OF ELECTRO-TECHNICAL AND ELECTRO-ENERGETIC SYSTEMS

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A Two Channels I/Q-Demodulator

Slyusar V.I., Serduk P.E.

Abstract – **In this article are analyzed one-cascade and multicascade I/Q-demodulators with two channels.**

Keywords - **I/Q-demodulator, analog-to-digital convertor (ADC), amplitude-frequency response (AFR).**

I. Introduction

Formation quadrature making OFDM signals at their reception is expedient for combining with the preliminary frequency selection, allowing to provide additional noise immunity of a communication channel. In the report the two-channel variant of the I/Q-demodulator effectively realizing a combination of specified functions is offered.

II. Main Text

Provided that on I/Q-demodulator inputs digital readout of signals from exits quadrature analog-digital converters arrive, the block diagram of an one-cascade variant of the I/Q-demodulator is presented on fig. 1. Thus as module I/Q-demodulator in everyone quadrature the channel the device [1] is used, and the target signal is formed according to expressions:

$$C = U1^c + U2^s \text{ и } S = U1^s - U2^c. \quad (1)$$

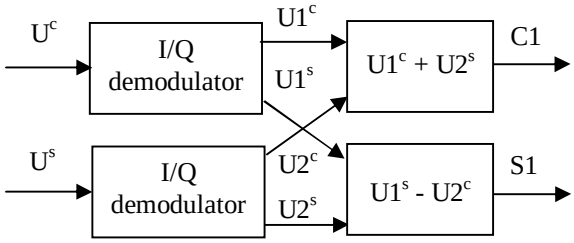

Fig. 1. The block diagram of the one-cascade The I/Q-demodulator

Results of calculation of the peak-frequency characteristic (AFR) the one-cascade I/Q-demodulator (fig. 1) for 8- and 16-readouts of measuring options are shown in fig. 2. Methods of calculating the coefficients for the 16-readouts I/Q-demodulator is given in [2]. At the same sets of coefficients are used for one independent variable (C = 1) and two independent variables (option 2).

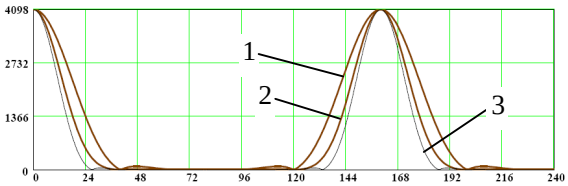

Fig. 2. AFR the two-channel I/Q-demodulator :

1) 8-readouts reference filter (a = C, b = 11C, c = 15C, d = 5C, C = 1) [1], 2) 16-readouts reference filter option on the basis of calculation of the 8- readouts filter (a = C, b = 79C, c = 793C, d = 2431C, e = 3003C, f = 1573C, g = 299C, h = 13C, C = 1) [2], 3) 16-readouts reference filter, second version (a = 1, b = 46, c = 265, d = 550, e = 627, f = 418, g = 131, h = 10) [2]

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On fig. 3 in logarithmic scale are shown AFR the I/Q-demodulators, presented on fig. 2.

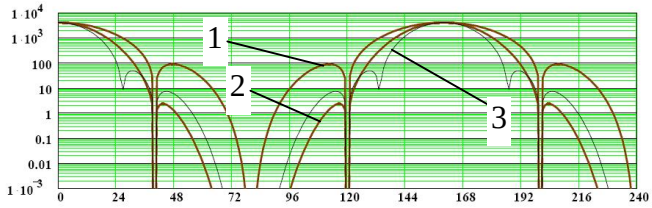

Fig. 3. The logarithmic scale AFR, presented on fig. 2.

For increase of frequency selectivity of procedure of I/Q-demodulation it is necessary to use multicascade inclusion of I/Q-demodulators. The principle of formation of multicascade schemes of demodulation is explained on fig. 4 on an example of two-cascade inclusion of I/Q-demodulators.

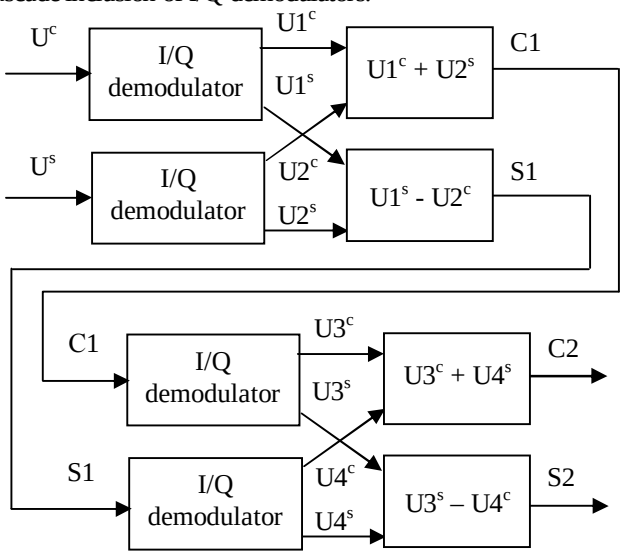

Fig. 4. The two-cascade scheme of the I/Q-demodulator

III. Conclusion

Use of multicascade inclusion allows decrease dimension of I/Q-demodulators for achievement of the set level of noise immunity, and also to lower a dynamic range of weight factors.

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Матеріали
Міжнародної конференції
TCSET'2012
присвячена 60-річчю заснування радіотехнічного факультету
у Львівській політехніці

21–24 лютого 2012
Львів – Славське, Україна

Відповідальний за випуск – д-р техн. наук, проф. Прудиус І.Н.

Технічний редактор *Лілія Саламін*
Художник-дизайнер *Уляна Келеман*

Здано у видавництво 04.02.2012. Підписано до друку 13.02.2012.
Формат 60×84$^{1}/_{8}$. Папір офсетний. Друк на різографі.
Умовн. друк. арк. 64,2. Обл.-вид. арк. 55,2.
Наклад 150 прим. Зам. 120079.

Видавець і виготівник: Видавництво Львівської політехніки
Свідоцтво суб'єкта видавничої справи ДК № 751 від 27.12.2001 р.

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