Radioelectronics and Communications Systems
Vol. 48, No. 1, pp. 43–46, 2005

Izvestiya VUZ. Radioelektronika
Vol. 48, No. 1, pp. 61–65, 2005
UDC 621.391.27

REALIZATION OF PRESCRIBED AFR OF OPTIMAL PREDISTORTIVE FILTER

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The paper considers a possibility for network implementation of optimal predistortion filters for information transmission systems in such a way as to improve mutual reciprocity of AFR of the pre-emphasis and de-emphasis filters. Comparative estimation of effectiveness is made for networks using filters of the same and different structures.

The methods of adaptive predistortion and correction of signals are used for improvement of qualitative characteristics of electromagnetic compatibility (EMC) of information transmission systems (ITS) [1]. When transmitting analog messages over a radio channel, it is necessary to assure exact reproduction of the transmitted message in the receiver. In this connection, there arises a problem of hardware implementation of optimal adaptive predistortive filters in the situations when the filters used for reconstruction (correction) of signal can be realized without difficulty. To assure the prescribed EMC characteristics, we must improve the accuracy of AFR mutual reciprocity of the adaptive predistortive and corrective filters.

In the systems with adaptive pre-emphasis and de-emphasis of signals [1, 2], the required accuracy of mutual reciprocity of AFR of the predistortive and corrective filters is realized by series connection of active *RC*-filters with high quality factor provided that the equality $K_1(j\omega) = k/K_2(j\omega)$ is met, where $K_1(j\omega)$ and $K_2(j\omega)$ are complex-valued frequency responses (CFR) of the predistortive and corrective filters, respectively, and $k = \text{const}$ is a proportionality coefficient. The accurate mutual reciprocity of CFR of the filters is attained at $k = 1$. In actual practice, however, instability of filters' components, and impossibility to obtain identical quality factors result in an error, so that $k \neq 1$.

The accuracy of mutual reciprocity of AFR of the filters can be improved by utilizing the peculiar features of filter's circuitry. For example, the predistortive filter may include a corrective filter with a large gain factor (usually exceeding 100) and having uniform AFR and linear PFR in the effective pass-band. In this connection, it would be interesting to assess the energy gain of ITS with adaptive predistortion and correction of signals in the case of improved accuracy of mutual reciprocity of filters' AFR.

Figure 1 shows the block diagram of an ITS with the use of the predistortive and corrective filter. A signal from the signal source (SS), via the predistortive filter (PF) and communication channel (CC), comes to the corrective filter (CF) and, from its output — to the information receiver (IR). The adaptive predistortive filter is an operational amplifier (opamp), whose negative feedback circuit contains another corrective filter CF. The output of the predistortive filter is connected to the analyzer of the instantaneous spectrum of signal (SA). The control signal from the SA output, through a control channel CCh, is connected to the control input of the predistortive filter, and then — to the control input of the corrective filter.

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22 September 2003