

**The Reference**  
**«Multithreshold decoders**  
**- scientific and technological revolution**  
**in maintenance of high reliability of digital data transmission »**

In the Space Research Institute of the Russian Academy of Sciences under support RFFI development of new effective systems of noiseproof coding is finished on the basis of special iterative **multithreshold decoders (MTD)**. For the first time the code gain 8÷9 dB and even more at minimally possible complexity of decoder realization and **practically unlimited decoding speed**. **The advancing of foreign researches achieves 5 - 7 years.**

**Theoretical bases of the method are stated in the monography of the Winner of the premium of the Government of the Russian Federation Dr. Sc., Prof. V.Zolotarev under scientific edition of the member - correspondent of the Russian Academy of Science of the Winner of the State premium of the Russian Federation and of the Government of the Russian Federation, Dr. Sc., Professor U.B.Zubarev.**

In modern high-speed communication networks each additional decibel of a code gain (CG) is estimated **according to domestic and foreign researches in millions dollars** as thus significant growth of data transmission speed is provided, decrease in the sizes of aeriels, increase reliability of communication. MTD guarantees **an additional CG ~ 3÷5 dB** and more in comparison with usually used Viterbi algorithm which has made technological revolution in communication in XX century.

**MTD - is a basis of the second scientific and technological revolution.**

It allows to work at the greatest possible channel noise at the arbitrary big transmission speeds. In high-speed channels it in general does not have alternative. In slower rates at equal efficiency it needs in ~100 times smaller number of operations, than it is necessary for other methods!

**MTD equipment at PLIS Xilinx at speeds 320 - 980 Mbit /s realize CG~8,5÷9 dB and more, MTD at PLIS Altera guarantees 640÷1600 Mbit/s at a very large noise of the channel. In all these cases bit error probability may be achieved up to  $10^{-6}$  –  $10^{-8}$  and less.**

MTD performance for high-speed channels **are inaccessible to other methods.**

**Five generations of the coding equipment** at MTD basis was introduced in real systems. All declared characteristics of the equipment in all cases had been successfully achieved.

**Some our new MTD algorithms are just discoveries in the field of noiseproof coding for nonbinary codes.** They at many decimal exponents raise reliability of coding in comparison with Reed - Solomon codes and simultaneously appear in some times much more simple and fast, with speed of decoding till **40 Mbit/s for usual software means**. They should be applied in super large digital specialized audio and video databases with a very high reliability and integrity of storage. These results had became possible due to a large code length with respect RS codes and simple iterative decoding for arbitrary symbols in a very noisy channels. For most applications error rates of MTD decoders have performance inaccessible for all codes RS. **See our reports on MTD at ISCTA'07.**

**The most new information about MTD** - is on the web-site SRI of the Russian Academy of Sciences [www.mtdbest.iki.rssi.ru](http://www.mtdbest.iki.rssi.ru) (*samples of software MTD decoders also*), in magazines "Electrosvyaz", No.9, 2003, No.2, 2005, No.10, 2006, No.12,2008, in materials of five last International conferences on digital processing signals in Moscow (DSPA), and also in the reference book «Noiseproof coding. Methods and algorithms», Moscow,2004, and new monograph of Dr.Sc., Prof. V.V.Zolotarev **«Theory and Algorithms of Multithreshold Decoding»**, Moscow, 2006, 270 p. All new articles on MTD algorithms they can find at our web-site [www.mtdbest.iki.rssi.ru](http://www.mtdbest.iki.rssi.ru) also.

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