

Dear colleagues,

We offer you cooperation in realizing the advanced scientific and technological results obtained from 1991 till present **due to the discovery of pre-arithmetic, which precedes the classical arithmetic** known to us. Pre-arithmetic generates new algebras, has a fundamental character and is approved at scientific symposiums in Slovakia (June 2003), Russia (2004-2006), and China (September 2006).

The discovery of pre-arithmetic (2003-2005) and later its basic varieties (2007-2010), **creates prerequisites for an innovation breakthrough in the field of dynamic systems of discrete time and non-regular dynamics**, especially in the part of stochastic systems and stochastic technologies. All along, due to the mutual unity of physics and mathematics, this will allow one, which is directly confirmed by the results of the performed studies, to penetrate deeper into the essence of processes proceeding in Nature and to pass to new technological advances.

Stochastic systems are dual, cover the substantially pronounced nondeterministic processes and harmony inherent in the natural Chaos. **The first** of them served to create the stochastic cryptography and **the second** – to lay the basis of the non-regular dynamics touching upon phenomena and processes lying beyond the modern world outlook.

Stochastic cryptography is the most developed part of the stochastic technologies intended for the anticipatory development and transfer of the technologies ensuring security to a qualitatively new level, as well as for the scale coverage of segments of the world economy and maximally fast practical efficiency. The latter results from the thorough groundwork, obtained during almost 20 years of scientific and technical research and developments undisclosed till now ¹.

Stochastic technologies cover all the sections of the symmetric cryptography, **are open for review and transparent for expertise not to the detriment of the cryptographic resistance**, have an overwhelming advantage over known analogues and offer new results, especially in the field of the extended Internet, Ultra-Wideband, wireless and adaptive network processing, in creating Cyber-systems, including the global ones ², favor the development of microsensor technologies and mastering of smart- and nanomaterials.

As shown in investigations performed within the research complex since 2004, stochastic technologies allow one to realize **an innovation breakthrough in the field of security provisions, RFID technologies, and microsensor and network technologies following them (Appendix I)**. In turn, according to the data of the IDTechEx expert group and special marketing research and forecasts, it will allow one to increase manifold social and financial returns of the technological market and industrial production presented by the leaders of the world's economy and to achieve dominating superiority in these markets.

To solve the vital tasks in this field and to eliminate the obstacles in the development of security systems and logical level of processing, and, along with it, to gain the fastest and substantial returns, **with a first step of the realization of the long-run Program presented in the Appendix there opens a short research and development** on systematization of the available materials and applied results, aimed at the technical and mathematical substantiation (conforming to international requirements and standards) of the introduced-into-project technology of the embedded hardware cryptographic protection from cloning, imitation (emulation) and counterfeit of the low-cost **RFID** tags.

It is worth noting that due to the exceptionally high efficiency of the stochastic technologies and very small hardware expenditures, **the use of the highly reliable cryptographic protection**, unlike the solutions obtained within the recent long-term European projects (**ECRYPT I/II, BRIDGE** and **SToP**), not only **does not lead to an increase in the cost price and energy consumption, as well as to a decrease in the radius of action of the low-cost ID RF-tags**, but along with it, **allows one**, at minimal expenditures of about 160 **GE** and cryptographic resistance in the order of 2^{64} , **to distribute the above results both to very critical organic and supercritical printed radiofrequency tags**.

In addition, stochastic technologies allow simple and efficient, as stated above, realization of the recently promoted **Physical Unclonable Function (PUF)**, used to construct high-quality random number generators, probabilistic cryptographic protocols, as well as to organize and set the production-technologic protection for the products and factory-made goods from falsification and counterfeit, and to set protection for microchip memory from direct penetration and physical attacks.

The presented technologies have no analogs and claim (according to their performance) to occupy in the nearest future and for long a dominating position and technological superiority.

To crown all, explanations are presented below in the text to those who are interested in the contribution which pre-arithmetic can make to physics and mathematics, to those who are ready to develop and promote this new field of knowledge.

I am ready to answer the questions that might interest you as well as to start a constructive dialog and present additional materials, if the directions of these works and prospects for the cooperation in these highly significant fields, possibly with taking up the shares on the intellectual property, present the corresponding commercial interest for you.

Sincerely yours,
Author and Coordinator of the works

Igor A. Kulakov, <http://en.randon-art.ru/>

Due to bulk factual materials accumulated for many years of research and due to the achievements in the field of algebra, stochastic technologies and the systems with the substantially pronounced non-deterministic character inherent in Chaos, ***the pre-arithmetic was developed and distributed to the processes related to the Harmony in chaos and to the non-regular dynamics of the system behavior.*** According to the proposed working hypothesis (May 2007), the latter of the above-mentioned properties is due to the induction component generated in pre-arithmetic, which determines the binding and conversion of the field in matter and vice versa, energy accumulation and release, transformation of matter ([Appendix II](#)).

For information, the accompanying phenomenological scientific results and physical analogues, agree with the lost knowledge of ancient civilizations and stored experimental data, ***lead to creation and development of qualitatively new technologies*** in optics, radionics, power engineering, communication, acoustics transport, material technology, geology, agriculture, ecology, medicine and biology.

To confirm the proposed working hypothesis, at the beginning of 2009 works were started to develop the approaches of the physical interpretation of pre-arithmetics. By this time, there have been developed a prototype of the experimental computer model of the electrodynamics in moving media by using the means of color graphics. ***The observed-in-experiment nonlinear effects prescribed by pre-arithmetic and the optical phenomena point to the new properties of the natural phenomena as well as to the necessity of further investigations aimed*** at expanding the obtained results, at the comprehensive complete physical interpretation of pre-arithmetics and at the development of their solutions.

The two above scientific and technological directions are formed on the common theoretical basis and are diametrically opposite. Prescribing transition to continuous time, they mutually supplement each other. They possess immense potential and offer new results, favor consistent unification and mutually enriching development of theory and practice. Due to pre-arithmetics and dualism, they exhaustively and fully cover harmonic and chaotic phenomena and processes inherent in dynamic and stochastic systems.

In turn, (according to the operating general-system principles), this leads to multiplicatively pronounced composition of the presented directions and technologies introduced by them, their successive development and natural qualitative renewal.

¹ Thus, the software **realization of the cryptographic primitives entering the composition of the stochastic technologies is brought to prototypes**, supported by the cryptanalysis models, while the hardware realization is brought to circuit solutions necessary for the development of the topology and production of the microchips

² Namely, **the presented by stochastic-technologies circuit realizations** of the cryptographic primitives composing them, being hundreds and thousands of times more efficient than those known today, which is confirmed by the results of computer imitation simulation, **even now will allow one, at the present technological basis and advanced technological level**, to service unprecedentedly, in real time, and without delay billions of users by passwords and identification keys, to authenticate hundreds of millions of objects, to perform secrete transmission, coding and hashing of terabit information flows per second.