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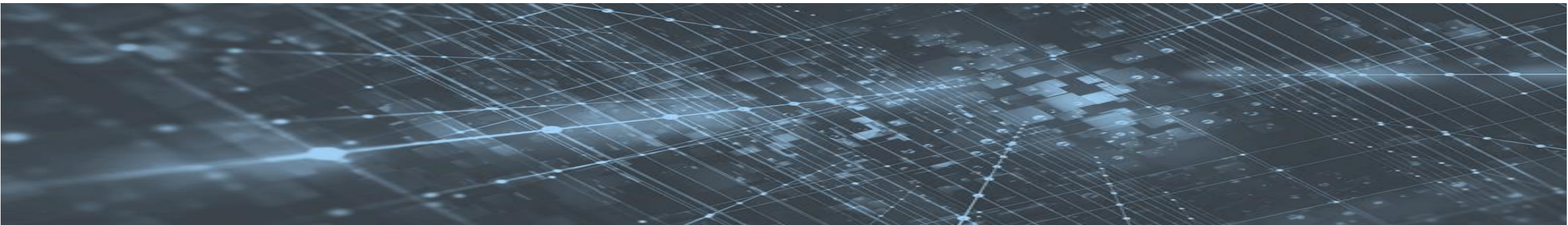
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«Satellite Radio Channels Simulation Methodology»

A G Samoylov, S A X Nasir

The purpose of the article is to create a methodology for constructing a simulator of satellite radio channels

- Task 1. Determine the laws of probability distribution of fading of received signals.
- Task 2. Find the values of the correction factors.
- Task 3. To form a mathematical model of the transfer function of a satellite radio channel.
- Task 4. To propose the structure of a satellite radio channel simulator.





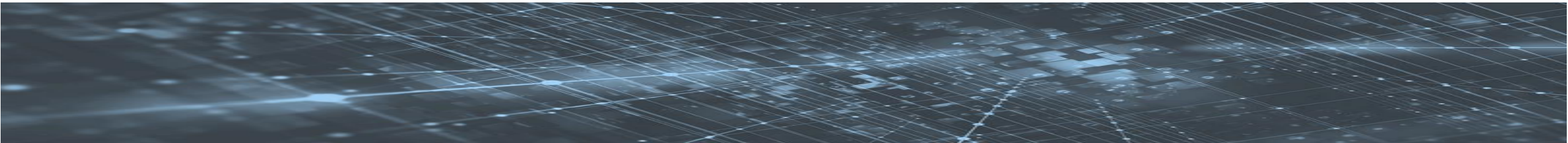
The random component of the transfer function of satellite radio channels is defined as

$$w(H) = 2HN_xN_y \exp\left(-\frac{H^2}{2\sigma_x^2}\right) \sum_{i=0}^{\infty} \sum_{j=0}^{\infty} \left[\frac{K_x^i K_y^j H^{2(i+j)}}{i! j! (i+j)!} \right] {}_1F_1 \left[(i+0,5); (i+j+1); \left(\frac{1}{2\sigma_x^2} - \frac{1}{2\sigma_y^2}\right) H^2 \right],$$

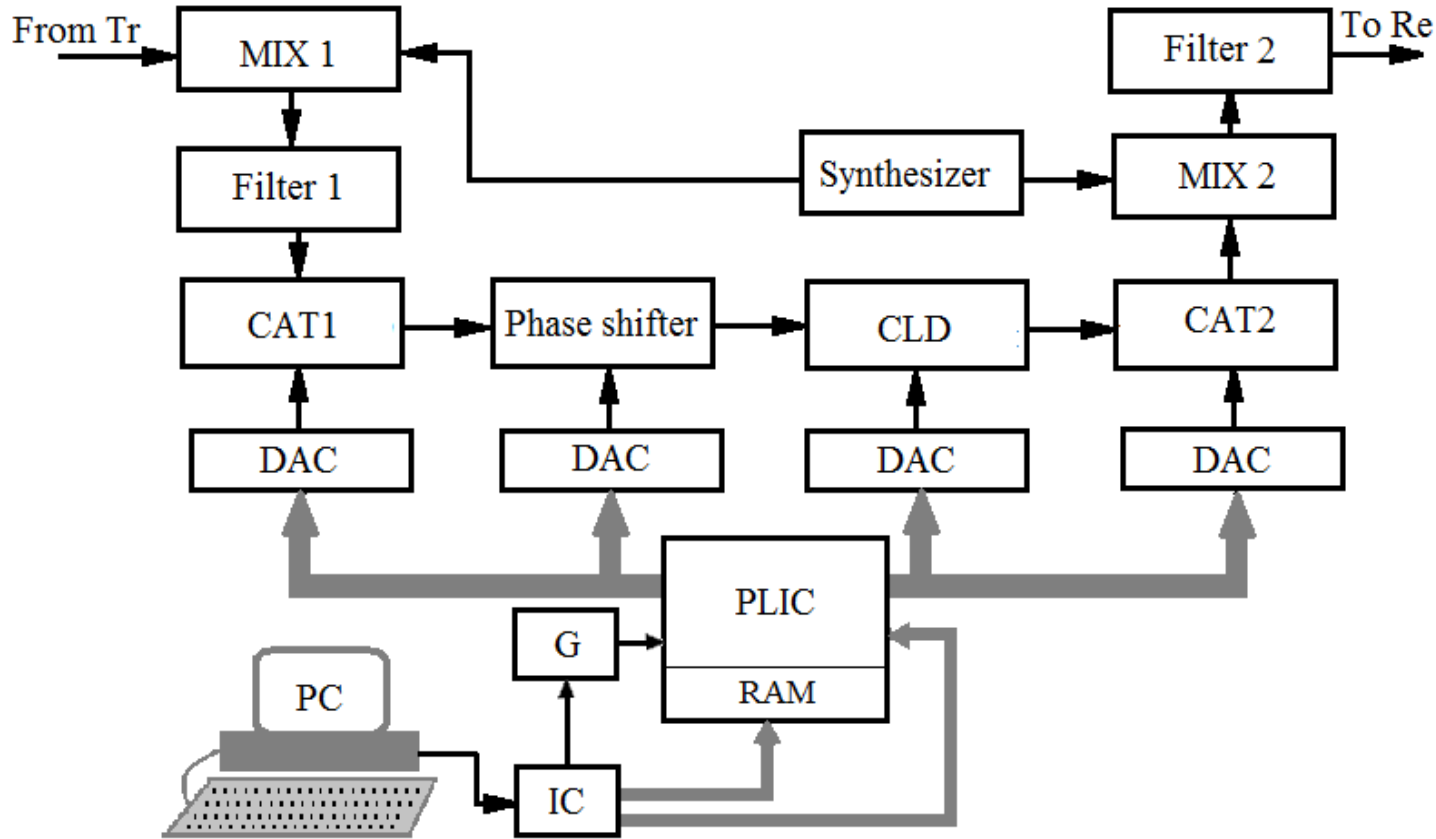
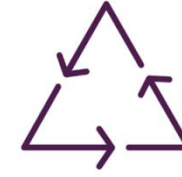
Where: ${}_1F_1[\alpha; \beta; \gamma]$ - degenerate hyper geometric function;

$$K_x = \frac{m_x^2}{4\sigma_x^4}; \quad N_x = \frac{1}{\sigma_x \sqrt{2}} \exp\left(-\frac{m_x^2}{2\sigma_x^2}\right); \quad K_y = \frac{m_y^2}{4\sigma_y^4}; \quad N_y = \frac{1}{\sigma_y \sqrt{2}} \exp\left(-\frac{m_y^2}{2\sigma_y^2}\right); \quad m_x, m_y, \sigma_x, \sigma_y$$

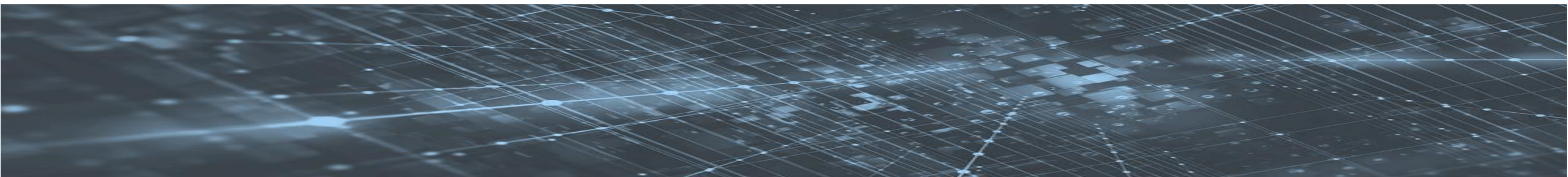
- is the parameters of distribution.



Radio channel simulator structure



CAT - controlled attenuator,
CLD - controlled line of delay ,
DAC - digital to analogy converters,
PLIC - a programmable logic
integrated circuit,
MIX – mixer, IC – controller,
G – generator.



Conclusions

Results, implementation

- A mathematical model of satellite radio channels has been developed.
- Signal losses due to hydrometeors, sandstorms, antenna tilt angles, atmospheric gases and ionosphere are taken into account.
- A simulator was developed for technical inspection, testing and verification of satellite telecommunication equipment.

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