RIGA TECHNICAL UNIVERSITY

FACULTY OF ELECTRONICS AND TELECOMMUNICATION

[](https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=2ahUKEwj9zKXEs6fgAhWF1iwKHceJAlAQjRx6BAgBEAU&url=https://lv.wikipedia.org/wiki/Att%C4%93ls:RTU_logo_2017.svg&psig=AOvVaw2YftzNrZHl3gHZWIEXy3Ih&ust=1549552627423236)

5G Wireless Technologies

Laboratory work 6

**Equalization**

Ruslans Babajans, 171REB152, REGV0

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**Goal**

The current work studies dynamic systems development and implementation. The systems are based on a single adjustment parameter compensation.

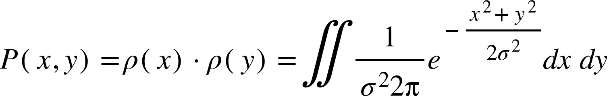
**Home task**

Show analytically that an amplitude of the complex Gaussian process is Rayleigh distributed. A complex Gaussian process is a random signal whose real and imaginary parts are normally distributed.

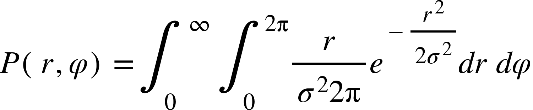
Take the 2 orthogonal Gaussian processes as x and y, their probability density functions:

rho open parentheses x close parentheses equals fraction numerator 1 over denominator sigma square root of 2 straight pi end root end fraction e to the power of negative 1 half open parentheses fraction numerator x minus mu over denominator sigma end fraction close parentheses squared end exponent
rho open parentheses y close parentheses equals fraction numerator 1 over denominator sigma square root of 2 straight pi end root end fraction e to the power of negative 1 half open parentheses fraction numerator y minus mu over denominator sigma end fraction close parentheses squared end exponent

The mean value is taken as *µ*=0. The probability density function of the two processes:



Moving from Cartesian to polar:



No šīs izteiksmes:

rho open parentheses r close parentheses equals r over sigma squared e to the power of negative fraction numerator r squared over denominator 2 sigma squared end fraction end exponent
rho open parentheses phi close parentheses equals fraction numerator 1 over denominator 2 straight pi end fraction


**Conclusions**

The current work studied dynamical systems capable of compensating different signal distortions: DC offset, gain distortion, IQ phase impairment. The said dynamical systems were developed in MATLAB software. Different distortions were applied to the signal, and all were successfully compensated. This work was especially useful in understanding concepts and performance behind AGC. The extra task with IQ impairment was challenging, and there were 2 approaches taken in implementing dynamical compensation, both successful.