

# Analisa probabilitas outage pada komunikasi nirkabel dua arah dengan menggunakan sistem full-duplex mimo = Outage probability analysis in bidirectional nirkabel communication using full duplex mimo system

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## Abstrak

### **ABSTRAK**

Pada tugas akhir ini, saya menganalisa probabilitas outage dari teknologi full-duplex dengan menggunakan sistem MIMO (2x2) dengan memperhatikan faktor dari self-interference. Faktor self-interference pada tugas akhir ini diasumsikan telah ditekan dengan menggunakan active dan passive cancellation. Diasumsikan kanal yang dilalui sinyal antar 2 node merupakan kanal Rayleigh dan kanal yang dilalui sinyal interferensi merupakan kanal Rician. Selanjutnya, akan diperhatikan nilai dari probabilitas outage akibat dampak dari perubahan faktor K,  $\gamma$ ; adalah SINR (Signal to Interference plus Noise Ratio), threshold rate (R) dan jumlah antena (N). Pada hasil perhitungan dengan nilai dari K = 35 dB atau lebih serta SINR = 70 dB dan R = 10 bps/Hz, probabilitas outage bernilai lebih dari  $10^{-2}$  namun, dengan nilai SINR = 70 dB dan R = 10 bps/Hz, probabilitas outage bernilai lebih kecil dari  $10^{-4}$  untuk nilai K = 15 dB atau kurang, maka didapat bahwa probabilitas outage meningkat jika nilai K meningkat. Selanjutnya, dengan nilai K = 10 dB didapat nilai dari probabilitas outage sebesar  $10^{-4}$  ketika nilai SINR = 60 dB dan probabilitas outage sebesar  $10^{-6}$  ketika nilai SINR = 70 dB, maka didapat probabilitas outage menurun jika nilai SINR meningkat. Hasil perhitungan lainnya dengan nilai K = 10 dB, didapat nilai dari probabilitas outage lebih dari 0,2 ketika nilai R = 6 bps/Hz dan probabilitas outage sebesar 0,8 ketika nilai R = 8 bps/Hz, didapatkan Probabilitas outage meningkat jika nilai R meningkat. Selanjutnya, dengan nilai K = 15 dB dan R = 20 bps/Hz, didapatkan nilai probabilitas outage sebesar 0,4, namun ketika nilai dari K = 15 dB dan R = 20 bps/Hz, nilai dari probabilitas outage dibawah 0,1, maka probabilitas outage menurun jika nilai N meningkat.

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### **ABSTRACT**

In this report, I analyze an outage probability in bidirectional nirkabel communication using full-duplex MIMO system with consider effect of self-interference. The self-interference in this report is mitigated by active and passive cancellation, yet there is still interference happens in this system, called residual interference. Assumed, transmit information signal (channel between node-1 and node-2) using Rayleigh fading channel and express interference signal stream using Rician fading channel. I derive a closed-form solution of outage probability towards effect of Rician factor (K),  $\gamma$ ; is SINR (Signal to Interference plus Noise Ratio), threshold rate (R) and number of antenna (N). With SINR is 70 dB and R is 10 bps/Hz, value of outage probability is more than  $10^{-2}$ , yet with SINR is 70 dB and R is 10 bps/Hz, we get value of probability is below  $10^{-2}$  for value of K is 15 dB or below, we obtain that value of outage probability increases when we increasing value of K. At value of K is 10 dB, we get outage probability is  $10^{-4}$  when SINR is 60 dB and outage probability is  $10^{-6}$  when SINR is 70 dB, from the result we conclude that for certain value of R, as SINR increases outage probability decreases for given K. Furthermore, at value of K is 10 dB, we get outage probability is more than 0.2 when R is 6 bps/Hz and outage probability is

0.8 when  $R$  is 8 bps/Hz. We get that as threshold rate increases outage probability increases for given SINR. Moreover, at value of  $K$  is 15 dB and  $R$  is 20 bps/Hz, we get outage probability is 0.4 but when value of  $K$  is 15 dB and  $R$  is 20 bps/Hz, we get outage probability is below 0.1. We obtain that increases number of antenna will decreases value of outage probability.