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## AWGN and rayleigh fading behavior of the wireless decode-and-forward relay channel with arbitrary time and power allocation (Article)

Fauzi, M.Z.F.K., Elsheikh, E.M.A. ✉ 👤

Department of Electrical and Computer Engineering, Faculty of Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia

### Abstract

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Relying has in use for decades to tackle some of the challenges of wireless communication such as extending transmitting distance, transmitting over rough terrains. Diversity achieved through relaying is also a means to combat the random behavior of fading channels. In this work, effect of time and power allocation on relay performance is studied. The channel considered is the three-node channel with half-duplex constraint on the relay. The relaying technique assumed is decode-and-forward. Mutual information is used as the criteria to measure channel performance. There is half-duplex constraint and a total transmission power constraint on the relay source node and the relay node. A model is established to analyze the mutual information as a function of time allocation and power allocation in the case of AWGN regime. The model is extended to the Rayleigh fading scenario. In both AWGN and Rayleigh fading, results showed that the importance of relaying is more apparent when more resources are allocated to the relay. It was also shown that quality of the source to destination link has direct impact on the decision to relay or not to relay. Relatively good source to destination channel makes relaying less useful. The opposite is true for the other two links, namely the source to relay channel and the relay to destination channel. When these two channels are good, relaying becomes advantageous. When applied to cellular systems, we concluded that relaying is more beneficial to battery-operated mobile nodes than to base stations. © 2018 Institute of Advanced Engineering and Science. All rights reserved.

### Author keywords

[Decode-and-forward](#) [Mutual information](#) [Power allocation](#) [Relaying](#) [Three-node channel](#) [Time allocation](#)

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- 1 Ding, Z., Perlaza, S.M., Esnaola, I., Poor, H.V.  
**Power allocation strategies in energy harvesting wireless cooperative networks**  
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doi: 10.1109/TWC.2013.010213.130484  
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- 
- 2 Gu, Y., Aïssa, S.  
**RF-Based Energy Harvesting in Decode-and-Forward Relaying Systems: Ergodic and Outage Capacities**  
(2015) *IEEE Transactions on Wireless Communications*, 14 (11), art. no. 7152960, pp. 6425-6434. Cited 42 times.  
<http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?puNumber=7693>  
doi: 10.1109/TWC.2015.2453418  
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- 
- 3 Ozel, O., Tutuncuoglu, K., Ulukus, S., Yener, A.  
**Fundamental limits of energy harvesting communications**  
(2015) *IEEE Communications Magazine*, 53 (4), art. no. 7081085, pp. 126-132. Cited 25 times.  
doi: 10.1109/MCOM.2015.7081085  
[View at Publisher](#)
- 
- 4 Marchenko, N., Andre, T., Brandner, G., Masood, W., Bettstetter, C.  
**An experimental study of selective cooperative relaying in industrial wireless sensor networks**  
(2014) *IEEE Transactions on Industrial Informatics*, 10 (3), art. no. 6825848, pp. 1806-1816. Cited 39 times.  
doi: 10.1109/TII.2014.2327915  
[View at Publisher](#)
- 
- 5 Pandey, K.K., Jain, A.K., Mehrotra, S.  
**Performance analysis of cooperative communication in wireless sensor network**  
(2016) *2016 International Conference on Advances in Computing, Communications and Informatics, ICACCI 2016*, art. no. 7732348, pp. 2021-2026.  
ISBN: 978-150902028-7  
doi: 10.1109/ICACCI.2016.7732348  
[View at Publisher](#)
- 
- 6 (1968) *University of California*
- 
- 7 Iwanow, M.  
**A Study on Source-Relay Cooperation for the Outage-constrained Relay Channel**  
(2016) *WSA 2016, 20Th International ITG Workshop on Smart Antennas*, pp. 1-7.
- 
- 8 Chen, Z., Li, T., Fan, P., Quek, T.Q.S., Letaief, K.B.  
**Cooperation in 5G Heterogeneous Networking: Relay Scheme Combination and Resource Allocation**  
(2016) *IEEE Transactions on Communications*, 64 (8), art. no. 7497455, pp. 3430-3443. Cited 8 times.  
doi: 10.1109/TCOMM.2016.2584044  
[View at Publisher](#)
-

- 9 Kahveci, S.  
Some cooperative relaying techniques for wireless communication systems

(2014) *2014 22nd Signal Processing and Communications Applications Conference, SIU 2014 - Proceedings*, art. no. 6830573, pp. 1690-1693.  
ISBN: 978-147994874-1  
doi: 10.1109/SIU.2014.6830573

[View at Publisher](#)

- 10 Elsheikh, E.M.A.  
(2010) *Wireless D&F Relay Channels: Time Allocation Strategies for Cooperation and Optimum Operation*  
University College London, London-UK

- 11 Elsheikh, E.M.A., Wong, K.-K.  
Optimizing time and power allocation for cooperation diversity in a decode-and-forward three-node relay channel

(2008) *Journal of Communications*, 3 (2), pp. 43-52. Cited 4 times.  
<http://www.academypublisher.com/jcm/vol03/no02/jcm03024352.pdf>

- 12 Do, T.P., Kim, Y.H.  
Outage-Optimal Power and Time Allocation for Rate-Aware Two-Way Relaying with a Decode-and-Forward Protocol

(2016) *IEEE Transactions on Vehicular Technology*, 65 (12), art. no. 7398130, pp. 9673-9686. Cited 3 times.  
doi: 10.1109/TVT.2016.2524039

[View at Publisher](#)

- 13 Muhammad, Z.F.K.F., Elsheikh, M.A.E.  
The Impact of Time and Power Allocation on the Performance of the Three-Node Decode and-Forward Relay Channel  
*Presented at the 2017 IEEE 4Th International Conference on Smart Instrumentation, Measurement and Applications (ICSIMA 2017), Putrajaya, Malaysia*


- 14 Yang, Z., Høst-Madsen, A.  
Routing and power allocation in asynchronous gaussian multiple-relay channels

(2006) *Eurasip Journal on Wireless Communications and Networking*, 2006, art. no. 56914. Cited 22 times.  
doi: 10.1155/WCN/2006/56914

[View at Publisher](#)

- 15 Wyglinski, A.M.  
(2010) *Cognitive Radio Communications and Networks: Principles and Practice*, Burlington. Cited 80 times.  
MA: Academic Press

- 16 Grover, A., Grover, N.  
On limits of Wireless Communications in a Fading Environment: A General Parameterization Quantifying Performance in Fading Channel  
(2014) *Indonesian Journal of Electrical Engineering and Informatics (IJEI)*, 2 (3), pp. 125-131. Cited 3 times.

 Elsheikh, E.M.A.; Department of Electrical and Computer Engineering, Faculty of Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia; email:elsheikh@iiium.edu.my

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