International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 05 Issue 07
March 2018

Joint Robust Design for Secure AF Relay Networks With SWIPT

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ABSTRACT In this paper, we investigate the physical layer security of amplification and transmission networks with simultaneous wireless information and power transmission. Specifically, by looking at the desired dual functional receiver, it is able to decode the information and harvest the energy (EH), assuming that the information can only obtain the status of the incomplete tapping channel, we propose the formation of a common strong joint package, noise Artificial, energy distribution system. We formulate the problem of strengthening the booster energy under both the confidentiality and EH restriction limits, which is not convex and difficult to process. To address this problem, we suggest a two-level improvement approach, which includes research on first dimensions and semi-defined relaxation. In addition, we see that SDRs can get the best solution from the top ranking. The simulation results show that the proposed robust scheme performs better secrecy than other plans.

INDEX TERMS Wireless information at the same time, power transfer (SWIPT), AF relay, collaborative packet formation (CB), artificial noise (AN), power division (PS).

INTRODUCTION

The demand for high data rates in wireless networks coupled with the fact that mobile devices are energy-limited by batteries has driven the concept of energy harvesting (EH) to become a promising decision for low-power applications such as sensor networks. Among the various resources available to EH, RF signals can be a new sustainable source of EH, triggering the SWIPT model, for example, [2] [3]. Specifically, the authors investigated [2] the SWIPT for a single input multiple channel (MISO) while the optimal mapping of SWIPT in a multi-input (MIMO) channel was studied in [3] Trends in the effective transfer of information and power. Security is a critical problem in SWIPT as wireless information in SWIPT systems is

susceptible to eavesdropping because of the open nature of the wireless channel. Recently, PLS technology in [4], which exploits the characteristics of wireless channels such as fading, noise, and interference to achieve secure communications, has proven to be an effective way to improve security in SWIPT systems [5] - [7]. Specifically, in [5], the authors studied the problem of secrecy in SWIPT in the SISO fading channel. While in [6], the authors investigated the problem of maximizing confidentiality rate (SRM) in the multi-user MISO SWIPT system. Later, the system model was extended in [6] to the MIMO tapping channel in [7]. Among these literature, synthetic noise (AN) is an effective way to improve safe performance, which can improve the receiving signals in both infrared and radio emission, while simultaneously causing the signals received at the dips to deteriorate. However, all of these literature assume that full knowledge of the status of the eavesdropping channel (CSI) can be obtained. For a more practical state, for example, CSI can not get fully eavesdropped or even unavailable on transmitters. The robust design was widely applied to address uncertainties in CSI in [8] - [12], including the use of the maximum rate of confidentiality (WCSRM) common to formulate the problem of effective optimization. Specifically, the authors in [8] and [9] investigated the WCSRM problems of the SWIPT MISO system without / with AN, respectively. Relay is recognized as a common approach to expanding network coverage and providing degrees of spatial freedom (DoF), which is useful for PLS as well as wireless power transmission (see [15] and [16], respectively). More recently, SWIPT's problem in safe migration systems has raised considerable concerns in [17] - [23]. Specifically, SRM problem was investigated in SWIPT migration networks subject to migration capacity budget and EH restrictions in [17], where the authors proposed concave convex concave procedure (CCCP) - based on an iterative algorithm. While the authors proposed in [18], a new scheme to improve wireless security using self-sufficient self-reliant AF migration. A joint design for the formation of beam beams and AN at the source and package was studied in sequence to maximize the rate of confidentiality while subject to EH restrictions in [19]. While the authors proposed in [20] a new destination with the help of the AN scheme and analyzed the confidentiality capacity of the two-way bi-directional AF relay network based on EH in the presence of a passive

eccentric. For the unfinished CSI scenario, in [21], researchers investigated the use of wireless EH wireless jamming devices in AF relay networks to improve security. While in [22], the authors considered non-available CSI eavesdropping and proposed the formation of a space-free cooperative package (CB) and AN system in two-way AF relay networks with SWIPT, a simple but sub-optimal strategy. Recently [23], a common CB and ES scheme was proposed to provide secure communication and efficient transmission of wireless power in AF relay networks. But all these actions were not considered PS. Inspired by this work, in this paper, we investigate PLS for SWIPT in AF relay networks. Specifically, we focus on the following settings: 1) Multiple relays use the CB and AN scheme to meet the secure communication and wireless transmission; 2) The source has a perfect CSI of relays, while the relays have a CSI ideal for Dr. but CSI is not perfect from Eves. 3) Apply DR PS to extract information and harvest energy simultaneously. Based on these settings, we formulate the strong design problem of CB, AN and PS to reduce power consumption in relays, taking into account safety limits and EH requirements. To our knowledge, such a strong joint design of SWIPT is not considered safe in AF relay networks in related literature. To resolve the problem with non-convex convexity, we proposed a two-tier improvement approach where the external problem is handled by a one-dimensional search

THE RELAY POWER VERSUS THE NUMBER OF RELAYS M draws the relay energy consumption of four different schemes versus the number of relays M. From this figure, we can see that the energy budget decreases with increasing M for all roads because of the spatial DoF increase, while our system outperforms other schemas. It should be noted that the zero strength scheme can only work when M is greater than the number of Eves. In this particular example, when M 3 3, the zero power scheme is invalid because there is not enough DoF to DR after canceling the Eve channel.

VERUS Relay The CSI UNCERTAINTY LEVEL of EVES displays the relay transmission power of four different schemes versus the CSI uncertainty level of Eves' υ 2 k. It is noted from the figure that the energy of the relay increases by υ2 k for all plans, while our proposed plan achieves the best performance. In addition, migration relay strength shows a nearly linear

relationship with the level of uncertainty in CSI E 2, which differs with phenotypes

CONCLUSION In this paper, we investigated a common strong scheme of SWIPT safe concept in AF transports with a reflection on dual-function DR. Specifically, we formulate the problem of strong power reinforcement subject to both the confidentiality rate and EH restriction. For the best CB pulse vector, a contrast ratio and a PS ratio are proposed, a two-level improvement that combines both monochrome and SDR search for the best solution. In addition, we presented a narrow analysis of this SDR approach, which shows that the optimal solution should be in the first place. Simulation results showed the proposed design effectiveness.

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