uni-edit
English Editing & Translation

Sample of Level 2 English Editing

Field of research: Telecommunications

***Abstract*—This paper proposes~~In this paper,~~ a simple mathematical formula~~formula has been proposed~~ for computing the coupling coefficient between two arbitrary antennas that are placed within the other's ~~near~~electric field~~ of each each other~~. T~~All t~~he information required by this expression consists of~~needed includes~~ the associated normalized vectors of far-field patterns, their relative orientations, and the antenna spacing. To validate~~erify~~ our~~the~~ proposed expression~~formula,~~, ~~the~~ coupling coefficients in several near-field scenarios are computed, including for the case of a practical near~~-~~field ultra-high frequency (UHF) radio-frequency identification (RFID) system. ~~, are computed and~~These results are then compared to practical measurements~~those measured~~ and~~–~~ to the outcome of full-wave simulations generated~~ed~~ using Ansoft HFSS. ~~They are a~~All~~ll~~ results are in good agreement. Additionally, in this paper, it is ~~–~~shown that several factors may influence the coupling coefficient, such as the impedance matching of the receiving antenna and the directivities of both antennas. With the aid of our~~the proposed~~ formula, the ~~near field~~near-field read range can be determined and~~ the~~ near-field coupling phenomena can be investigated. The results thus obtained may be useful in ~~the~~ near-field communication systems.**

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***Index Terms*—Electromagnetic coupling, power transmission, RFID, UHF antennas.**

~~I.~~ I. INTRODUCTION

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IN~~ THE~~ PAST YEARS, there has~~ve~~ been increasing research interest~~s~~ in near-field communication systems, and the emergent~~ing~~ technology has been deployed in various applications. For instance~~example~~, the near~~-~~field ultra-high frequency (UHF) radio-frequency identification (RFID) system in the 860-960 MHz band has been used in item-level tagging~~, such as~~ in pharmaceuticals and retailing [1]-[3]. L~~The l~~ow frequency (LF) and high frequency (HF) RFID systems have been extensively used in ~~the~~ access control and public transportation ticketing. Considerable attention is also given to t~~T~~he Near Field Communication (NFC) system [4]-[6] that enables contactless payment via any hand-held device~~, say a~~ (e.g. a mobile phone)~~, also receives considerable attentions [4]-[6]~~. ~~There are s~~Still many other applications exist, such as~~ the~~ health monitoring [7], ~~the~~ mCoupons [8], and~~ the~~ magnetic resonance imaging (MRI) [9]~~, etc~~. In order to successfully design and optimize~~ the~~ near-field communication systems, it is critical to investigate the antenna coupling that occurs when~~between~~ antennas ~~that~~ are placed ~~in the near zone of each other~~in close proximity. In the lower frequency range, such as the LF (125-134 KHz) and the HF (13.56 MHz) bands, depending on antenna type, it is either the electric~~-~~ or the magnetic field that is~~would be~~ more pronounced in the antenna's near zone~~ depending on the antenna type~~. For example~~example~~, the magnetic field becomes more significant in the near zone of an electric loop antenna and, t~~. T~~herefore,~~ in the near-field magnetic (inductive) coupling system, the~~ transmitting and receiving antennas used in the near-field magnetic (inductive) coupling system are mostly loop antennas. Some attempts have been made to compute the LF/HF inductive~~-~~coupling power transfer [10]-[15]. However, in the UHF band and~~or even~~ higher, such as the 860-960 MHz, 2.4 ~~-~~GHz, and 5.8 ~~-~~GHz bands, the field distribution in the same near zone becomes more complex and may also include an electrostatic or magnetostatic component. Although some empirical and experimental approaches have been employed to evaluate the performance~~s~~ of~~ the~~ UHF RFID and NFC devices [16], [17], to the authors' best knowledge, few~~not manyfew~~ ~~-~~theoretical studies have~~ so far~~ been conducted~~done~~ that~~on~~ emphasize~~emphasizing~~ the generality for~~ any~~ different antenna types and relative orientation of the antennas in~~for~~ calculating~~ the~~ near-field antenna coupling in the microwave region.

In this paper, an analytical form is proposed to compute the near-field coupling coefficient as a function of the spacing between two arbitrary antennas~~ has been presented~~. This form~~It~~ is based primarily~~mainly~~ on the coupling quotient expressed in terms of the antenna far fields [18]. However, the associated numerical complexity, due to the usage of the fast Fourier transform (FFT) and~~ the~~ tedious truncation methods, has been greatly reduced. In the proposed method, the three-dimensional (3D) vector far-field patterns,~~ and ~~ the relative orientation of the transmitting and receiving antennas and the antenna spacing are required~~needed as well as the antenna spacing~~ to calculate the coupling coefficient. One may use closed-form expressions, if any, for the 3D far-field patterns or data acquired via simulation or measurement. The proposed formula is a near-field counterpart of the Friis transmission equation, and is applicable to any antenna type~~s~~ used in~~ the~~ near-field communication systems. For verification purposes, we used this~~the~~ formula