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論 文 要 旨
Abstract of Dissertation

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専　攻 Department	Department of Physics, Electrical and Computer Engineering
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論文題目 Title	Free-access transmission line using coplanar waveguide for on-body communication
和訳または英訳 Translation (J->E, or E->J)	体内通信用コプレーナ線路を用いたフリーアクセス伝送線路

We propose an approach to enhance transmission quality between on-body sensors or antennas by using a free access segmented coplanar waveguide (SCPW).

The utilization of supplementary waveguides embed into garments such as “smart suit” to enhance transmission characteristics between on-body antennas or sensors has been previously presented. The supplementary waveguides create a coverage area around themselves, and wireless devices can electromagnetically couple with them at any discretionary position. Moreover, users of on-body wireless communication devices utilize their personal waveguides freely, and therefore, a high security level can be acquired. Thus, the idea of use of supplementary waveguides for improving the transmission on body is a new, much simpler, and high security solution as compared to other solutions like wired connections, diversity reception or increment of ground plane size to lessen body impacts, that making on-body system become more complex, less adaptable and sensitive to body postures.

Getting from this thought, we propose a novel single-layer transmission line or SCPW with non-contact coupling for antennas to improve NLOS links of on-body wireless communication. The SCPW is associated electromagnetically by two half-wavelength resonators put in an order on both sides of the center line. The resonators equip the function to couple the SCPW with top and bottom antennas at arbitrary positions along the transmission line, which is a unique feature of the proposed geometry.

The fundamental effectiveness of SCPW is affirmed at 5.12 GHz by a thin dielectric substrate and at 2.45 GHz by a flexible paper substrate and a silver-ink conductor. The propagation loss is greatly reduced more than 20 dB by this SCPW in on-body communication between abdomen and back sides, which is confirmed by measured results on the PEC plane, a phantom and a real body. In addition, the specific absorption rate (SAR) is fulfilled when SCPW are set close human body.

Finally, the execution of the SCPW is compared with a conductive strip line (CSL) which has a good performance in improving on-body communication in some particular cases. Thus, the CSL can be a simple answer for paths on body.

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