DESIGN OF Ku-BAND AXIAL MODE HELICAL ANTENNA

BY

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(M.ENG./SEET/2007/1869)

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

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A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL IN
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DECLARATION

I declare that this thesis "Design of Ku-band axial mode helical antenna" was done by me and has never been presented elsewhere for the award of a Master Degree. It is the result of my own research work except for works that have been cited in the References.

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Iliya Solomon Zakwoi                           Date
CERTIFICATION

This thesis titled "Design of Ku-band axial mode helical antenna" by Iliya Solomon Zakwoi (M.ENG/SEET/2007/1869) meets the regulation governing the award of the degree of Master of Engineering (M.Eng) of the Federal University of Technology, Minna and is approved for its contribution to scientific knowledge and literary presentation.

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ABSTRACT

Helical antenna designs for much higher frequencies have been a very challenging task for most antenna designers. This, therefore, necessitated the need to develop a simplified approach for the design of helical antenna which has frequency range between 12 GHz and 14 GHz. The purpose of this thesis, Design of Ku-band axial mode helical antenna, is to design helical antennas that could be utilized for much higher frequencies than the available WLAN and C-band frequencies. Design curves drawn using MATLAB for the design of Ku-band helical antenna, enables the prediction of the gain and bandwidth in relation to the axial length and pitch angle. The pitch angle was increased between 8° and 20° to achieve the objective of this thesis. The increase in pitch angle led to a small increment in axial length, thus necessitating the need to keep the pitch angle within the radiation zone for the axial mode helical antenna. Calculated values of the normalized axial length (in free space) \( L_1 \) lie between 0.5\( \lambda \) and 14\( \lambda \), which gave the maximum gain of 21.0295 dB at an axial length of 14\( \lambda \). Saturation in bandwidth of about 13% was obtained as against the 30% that was achieved for the C-band which is not so critical because many techniques aimed at maximizing bandwidths in communication systems have been developed. An improvement in gain was achieved in this design when compared to the gain obtained for the existing C-band designs.