

عنوان مقاله:

Pattern Measurement of Large Antenna by Sequential Sampling Method in Cylindrical Near-Field Test

محل انتشار:

مجله نوآوری های مهندسی برق و کامپیوتر، دوره 11، شماره 1 (سال: 1402)

تعداد صفحات اصل مقاله: 16

نویسنده:

M. Karimipour - Department of Electrical Engineering, Arak University of Technology, Arak, Iran

خلاصه مقاله:

Background and Objectives: Cylindrical scanning technique is a well-established indirect measurement method to characterize a wide range of antenna patterns such as fan-beam antennas and phased array antennas with versatile radiation patterns. **Methods:** Cylindrical scanning technique which is based on the nearfield-to-far-field transformation based on cylindrical mode coefficients (CMCs), cannot predict the antenna radiation pattern with a very narrow beamwidth in the azimuth plane accurately, because a remarkable error occurs during the calculation of the derivative of high-order Hankel functions in the CMCs extraction. We aim to address this issue and introduce a simple yet rigorous technique namely the sequential sampling method (SSM) in conjunction with the two-dimensional Fast Fourier Transform (2D-FFT) to efficiently calculate the far-field radiation pattern of a super-directive antenna with a very narrow beamwidth in the azimuth plane. Briefly, the SSM offers several sequences of progressive azimuth angles and the corresponding order of Hankel functions in such a way that CMCs fully span 360 degrees of azimuth angles (ϕ) in the cylindrical coordinate system in each sequence. Afterward, by putting the far-field obtained by these sequences together, the final radiation pattern will have a high angular resolution. This technique can also be applied to determine the necessary criteria in the data acquisition step which should be satisfied to precisely measure the radiation pattern of super-directive antennas. These criteria are the maximum acceptable sampling resolution and the minimum value of the required azimuth angle (ϕ) in the data acquisition step if the far-field pattern is merely desired on the front side of the antenna. **Results:** For verifications, the far-field radiation pattern of an electrically large slot array antenna including 11×15 slots is calculated at 8.75 GHz by the proposed technique and the results are compared with the array theory. The results show that the azimuth pattern can accurately be measured as small as 0.1° resolution by the SSM. **Conclusion:** By comparing the results obtained by the proposed method and the traditional cylindrical scanning method, it can be inferred that the far-field pattern of an antenna with narrow beamwidth in the azimuth plane can easily be characterized by a cylindrical scanning system without any huge computational burden

کلمات کلیدی:

Cylindrical Scanning, Fast Fourier Technique, Near-field Measurement

لینک ثابت مقاله در پایگاه سیویلیکا:

<https://civilica.com/doc/1545092>



