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**Helical Phase Shifter
for VHF**

**Compact Ku-band
Phase Shifter**

**Additive Phase
Noise Measurement**



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FEATURES

COVER FEATURE: THEN AND NOW

22 A Helical Phase Shifter for VHF

Paul A. Crandell and Frederick J. Dominick, Sylvania Electric Products Inc.

This article, first published in September/October of 1958, described a device used to change the path length between two terminals with a minimum of mechanical motion

30 A Ku-band 4-bit Compact Octave Bandwidth GaAs MMIC Phase Shifter

Inder J. Bahl and Mark Dayton, Tyco Electronics, M/A-COM Products

Presentation of the design approach and test results of a X/Ku-band 4-bit compact gallium arsenide microwave monolithic integrated circuit phase shifter for broadband applications

TECHNICAL FEATURES

66 Additive (Residual) Phase Noise Measurement of Amplifiers, Frequency Dividers and Frequency Multipliers

Jason Breitbarth and Joe Koebel, Holzworth Instrumentation

Demonstration of a method used to create valid residual phase noise measurements with a good synthesizer, a low noise baseband amplifier and an audio card

86 A 3 to 5 GHz Ultra-wideband Low Noise Amplifier Using InGaP/InGaAs Enhancement-mode PHEMT Technology

H.C. Chiu, C.S. Cheng, C.C. Wei, Y.J. Shih and S.W. Lin, Chang Gung University; F.T. Chien, Feng Chia University

Design and implementation of a microwave monolithic integrated circuit for a 3 to 5 GHz ultra-wideband low noise amplifier using InGaP E-mode PHEMT technology

96 Applying the Slow-wave Effect in the Design of a Compact Antenna

I. Tseng Tang, National University of Tainan; Ding-Bing Lin, Institute of Computer and Communication; Tzu-Hao Lu, Industrial Technology Research Institute

Use of the slow-wave effect in modifying the width and height in the design of a compact antenna

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