

## Electromagnetic modeling of microstrip reflectarrays using scale changing technique

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### SUMMARY

An efficient numerical technique called scale changing technique is applied here for the electromagnetic modeling of microstrip reflectarrays. Based on the partition of the array surface into further planar sub-domains at various scale levels, this technique allows the computation of the equivalent multipole from the simple cascade of scale changing networks. Each network models accurately the electromagnetic coupling between the various sub-domains, including the coupling between non-identical cells in arrays. The high flexibility of the approach associated with advantages of the integral equation formulation renders this original technique powerful and rapid for designing antenna arrays. Because the computation of scale changing networks is mutually independent, processing and memory requirements can be reduced enormously by using multiple processing units. Copyright © 2012 John Wiley & Sons, Ltd.

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**KEY WORDS:** numerical techniques; integral equation formulations; electromagnetic modeling; surface impedance; scale changing approach; multiscale structures; reflectarray

### 1. INTRODUCTION

The accurate prediction of electromagnetic (EM) scattering from finite size planar antennas is of great practical interest in the domain of design and optimization of modern reflectarrays, transmit arrays and frequency selective surfaces, but because of their large electrical size and complex cell patterns, full-wave EM analysis of such multiscale structures requires enormous amount of computational resources to resolve prohibitively large number of unknowns. Moreover, the characterization of large array structures would normally require a second step for optimization and fine-tuning of several design parameters as the initial design procedure assumes several approximations. Therefore, a full-wave analysis of the initial design of complete structure is necessary prior to fabrication, to ensure that the performance conforms to the design requirements. A modular analysis technique that is capable of incorporating geometrical changes at individual cell-level without the need to rerun the entire simulation is extremely desirable at this stage.

Historically, several approaches have been followed when analyzing large planar structures. In the case of uniform arrays where periodicity in the geometry exists, an infinite array approach is often applied [1,2]. By using set of Floquet harmonics, the entire computation domain is effectively equivalent to solving for a single unit-cell, thus, significantly reducing the number of unknowns and hence the execution times and memory resources. Although the periodic boundary conditions take the effect of

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# Computational Electromagnetic Modeling And Experimental

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feb 14 2011 1 prior to supping the well or the first time that bop is installed on the well 2 after repairing or disconnecting of any pressure sealing elements of bop 3 as per mms you can use bop for 21 days 3 weeks before you need to test it

### **bop testing petrowiki** - May 15 2023

apr 17 2023 bop test plan bop testing consists of several pressure tests with different valve line ups in order to test all the components of the bop system careful planning is required to ensure all components are tested and in a minimum number of pressure tests in order to ensure efficient execution of drilling operations

### **wireline bop pressure testing procedure** - Mar 01 2022

wireline bop pressure testing procedure rogi form 1 4 date of issue 03 02 2016 april 28th 2018 where required to follow the reporting procedure by regulation 4 during testing immediately prior to for bop stacks indicate the design pressure rating list of abbreviations in oil and gas exploration and

### **condition based maintenance for bop testing ipt** - Dec 10 2022

dec 27 2021 bop testing procedures operators must periodically pressure test and function test bop stack components which decreases efficiency of drilling operations bop pressure tests are performed at regular intervals typically ranging from 14 to 30 days as set by local regulatory bodies

### **wireline bop wireline valve wincent** - Jun 04 2022

a wireline bop must always be installed between the wellhead and wireline lubricators this bop is a piece of pressure control equipment that can close around the wire and seal off the well pressure below it this enables the pressure to be bleed off above it allowing work or repairs to be carried out on equipment above the bop without pulling

### **wireline intervention pressure control system video slb** - Nov 09 2022

jun 23 2021 the wireline intervention pressure control wipc system enables the wireline crew to focus on downhole operations without worrying about surface well integrity the system meets api spec 16b and nace mr0175 simplifying compliance with operator requirements

### *wireline pressure test units nov* - Aug 06 2022

this unit is a pressure test system intended for pressure testing 5 000 10 000 and 15 000 psi rated pressure control equipment to maximum working pressure before performing intervention work the unit is intended for use in atex zone 1 hazardous environments and complies to norsok regulations

### irp 13 wireline operations energy safety canada - Jan 11 2023

the scope of irp 13 is to define recommended practices for the selection implementation and maintenance of pressure control equipment for land based wireline operations in canada this includes all types of wireline i e slickline braided line and coated

line