

Acknowledgements

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التجربة

ان هذه الاطروحة تبحث في ما يتعلق بنظم الاستقبال المستخدمة مع الهوائيات الذكية في الاتصالات بالهاتف السيار، حيث يهدف البحث الى تصميم دائرة تقوم بتغيير زاوية فرق الطور، و ذلك من اجل التحكم في اتجاهية الاشعاع الصادر من الهوائيات.

ان تصميم الدائرة سيتم اعتمادا على اسس و قوانين خطوط النقل و كيفية ارتداد الاشارة عند وجود حمل غير موائم موصل بنهاية خط النقل. من الصفات الواجب توفرها في الدائرة الموائمة الجيدة و قلة التوهين بالاضافة الى المقدرة على توفير فرق الطور بدقة متناهية كما ان التصميم سيتم باستخدام برنامج محاكاة مخصص لدوائر الترددات العالية. لتقييم فعالية الدائرة، سيتم التركيز على الكسب الكلي للدائرة وفقد الادخال و مدى الزوايا التي يمكن ان تقدمها الدائرة.

كذلك تم طرح المبادئ و المفاهيم الاساسية لانظمة الهوائيات الذكية، و كيفية تصميم دوائر تغيير زاوية فرق الطور و طرق تصنيعها تجاريا، كما تقديم بعض نتائج البحوث التي تم تقديمها مسبقا. ان التحكم في زاوية فرق الطور تم باستخدام عنصر ذو سعة متغيرة، و ذلك عن طريق جعل الترانسستور ذو التأثير المجالي يعمل كسعة متغيرة. تحتوي الدائرة على قارن ذو كسب 3 dB، محاثات، ترانسستورات التأثير المجالي بالاضافة الى مفتاح و حيد المدخل متعدد المخارج. ان خطوات التصميم و نتائج المحاكاة مضمنة بالبحث و تمت مناقشتها بنمغن.

Abstract

This dissertation presents a research performed in the area of smart antenna transceivers in mobile communications. A circuit is developed to serve as a phase shifter for use in smart antenna arrays for beam control in Base Station Transceivers. The circuit is designed based on the reflection theory to implement a phase shift. The circuit has a good matching characteristics, low attenuation, and accurate phase shift. The design is tested by high frequency simulation software. Finally, to evaluate its overall performance, the return loss, insertion loss, and phase angle are studied.

Fundamental theory for multiple antenna systems, phase shifters' topologies and fabrication methods are presented. Theory and some of the earlier research results are discussed. The control of phase is enabled by controlling the capacitance of the varactor optimized using field effect transistors. The circuit comprises a 3-dB directional coupler, inductors as resonating loads, junction field effect transistors (J-FETs) and single pole multiple terminals switching elements. The design steps of the circuit are described, and measurement results from are summarized and discussed thoroughly.

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