

FOREWORD

I would like to express my deepest sincere gratitude to my advisor, Assoc. Prof. Bahadır Süleyman YILDIRIM, for his wide knowledge and efforts. His personal guidance have provided a great basis during this hard period. He supported from the initial to the final level enabled me to develop every parts of this thesis.

I also thank to my family for always having their belief in me, motivating and supporting me throughout my academic career.

Finally, I would like to thank to my very special thanks Halil Acıkaya for his endless love and patience. Without his encouragement and endurance, this work would not have been possible.

Istanbul, January, 2014

FUNDA CIRIK

ABSTRACT

In 1953, the microstrip antenna approach was firstly proposed by Deschamps. However, two years later, Gutton and Bassinot received the first microstrip antenna patent in France. After twenty years from this patent, the first microstrip antenna was built by Munson, and Howell, and they published a paper announcing their design and realization of the first microstrip antenna, which was first proposed by Deschamps. With this realization, the microstrip antenna and its applications gained widespread importance.

In recent years, the study of microstrip patch-type antennas has gained good momentum. Compared to conventional antennas, microstrip antennas are low-cost, low-profile, conformal, easier to fabricate, and have smaller dimensions. Because of these advantages, microstrip antennas attract many researchers in the field of wireless communications. Furthermore, the microstrip antennas can provide dual polarizations, multiband operation, feedline flexibility, and directional radiation patterns.

This thesis presents a patch-type microstrip WiMAX antenna operating at 3.5 GHz with a parasitic radiator and a raised ground plane. This high gain antenna has been designed through extensive 3-D electromagnetic simulations. The patch itself provides a realized gain of about 3.5 dBi at 3.5 GHz. When a parasitic radiator, side walls and upper dielectric layer are placed on top of the patch, the gain increases from 3.6 dBi to about 8.8 dBi that's about an improvement of 5.2 dB without the need of an amplifier.

ÖZET

1953’de, ilk olarak Deschamps, mikroşerit anten yaklaşımını ortaya koydu. Fakat Deschamps’tan 2 yıl sonra Fransa’da bilim adamları Gutton ve Bassinot, mikroşerit anten patentini aldılar. Patentin alınmasından 20 yıl sonra ise ilk mikroşerit anten Munson, ve Howell tarafından üretildi. Bu yazarlar daha sonra fikir olarak Deschamps tarafından ortaya konulan, üretilen bu ilk mikroşerit antenin tasarımını ve gerçekleştirmesini anlatan bir çalışma yayımladılar. Bu gerçekleştirmenin ardından mikroşerit anten uygulamaları daha da önem kazanmaya başladı.

İlerleyen yıllarda, mikroşerit yama anten çalışmaları iyi bir ivme gösterdi. Mikroşerit anten yapısı alışılmadık antenlere kıyasla, düşük maliyet, düşük profil, daha küçük boyutlar, kolay fabrikasyon aşaması ve uyumluluk özelliklerine sahipti. Getirdiği bu avantajlar dolayısıyla bir çok araştırmacıyı kablosuz haberleşme alanında çalışmalar yapmaya sevk etmiştir. Bunun yanında mikroşerit yama anten, çift kutuplanma, çok bantlı frekanslarda çalışabilme yeteneği, besleme kolaylığı ve çok yönlü anten örüntüsü gibi kolaylıklar da sağlamaktadır.

Bu tezde 3.5 GHz frekansında çalışan parazitik radyatörlü ve yükseltilmiş yer düzeyi üzerinde bulunan yama tipli mikroşerit WIMAX anten yapısı incelenmiştir. Bu yüksek kazançlı anten yapısı, kapsamlı üç boyutlu elektromanyetik simülasyonlar aracılığıyla tasarlanmıştır. Yama yapısı ile 3.5 GHz frekansında yaklaşık 3.5 dBi’lik bir kazanç elde edilmiştir. Yamanın üzerine eklenen parazitik radyatör, yan duvarlar ve üst dielektrik kapak ile 3.6 dBi’den yaklaşık olarak 8.8 dBi kazanç ulaşılmıştır. Bu demektir ki; herhangi bir yükseltece ihtiyacı duyulmadan 5.2 dB’lik bir kazanç artımı elde edilmiştir.

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ABBREVIATIONS

WiMAX	Worldwide Interoperability for Microwave Access
IEEE	Institute of Electrical and Electronics Engineers
Eq.	Equation
Fig.	Figure
3D	Three Dimensional
Hz	Hertz
GHz	Gigahertz
MHz	Megahertz
ϵ_r	Relative electrical permittivity
UWB	Ultra-Wideband
SMA	Sub-Miniature Version A
RF	Radio Frequency
PEC	Perfect Electric Conductors (PEC)
VNA	Vector Network Analyzer
FR4	Flame Resistant 4