

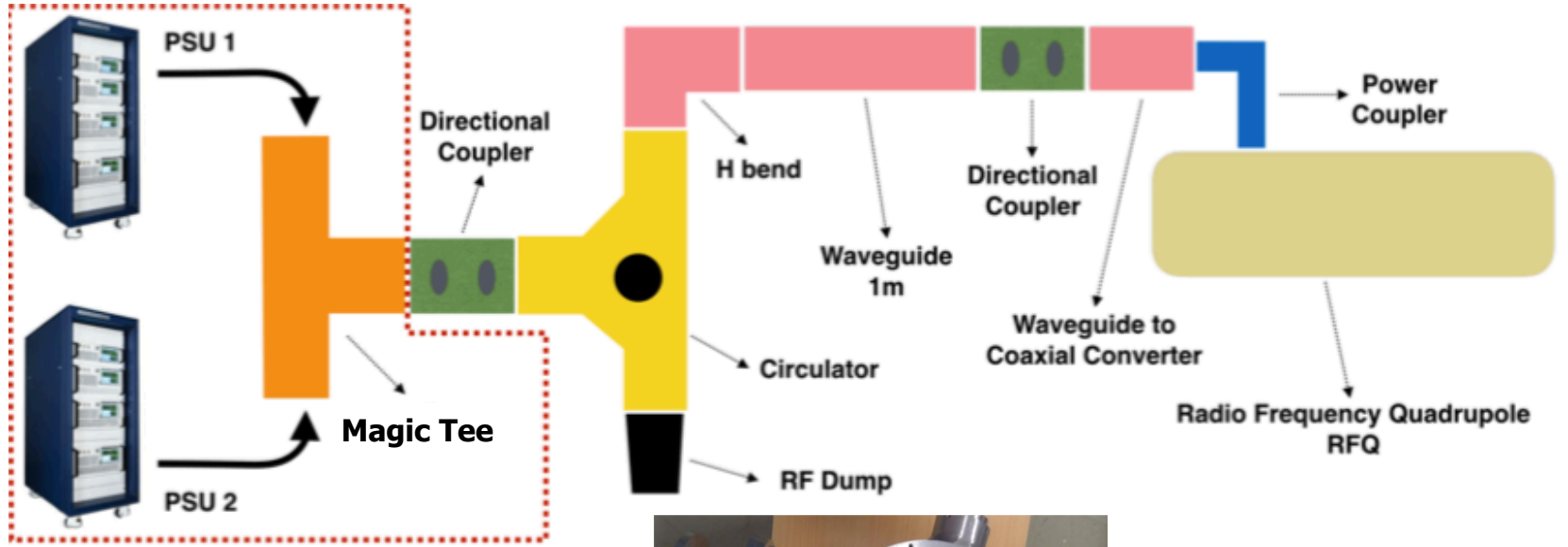
800 MHz RFQ için
RF İletim hattı Bileşenlerine ait
Benzetim ve Ölçüm Sonuçları

Fatih Yaman*, Aytül Adıgüzel, Aslıhan Çağlar, Hakan Çetinkaya,
Anıl Karatay, Oğuz Koçer, V. Erkan Özcan, Görkem Türemen,
Gökhan Ünel, H. Önder Yılmaz

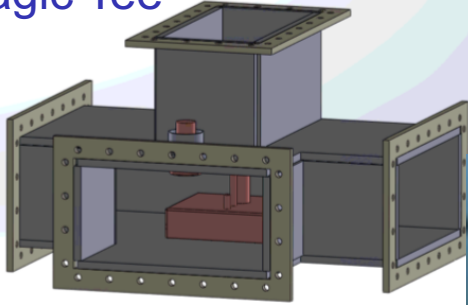


KAHVELab

RF İletim Hattı



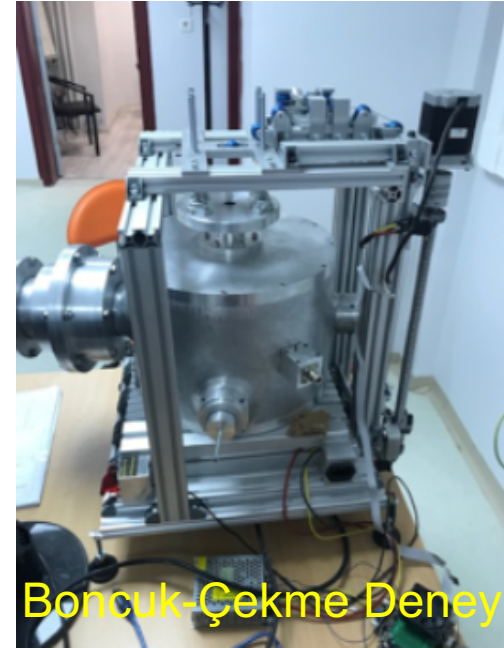
Magic Tee



Kovuk, Güç Baędařtırıcısı ve Anteni

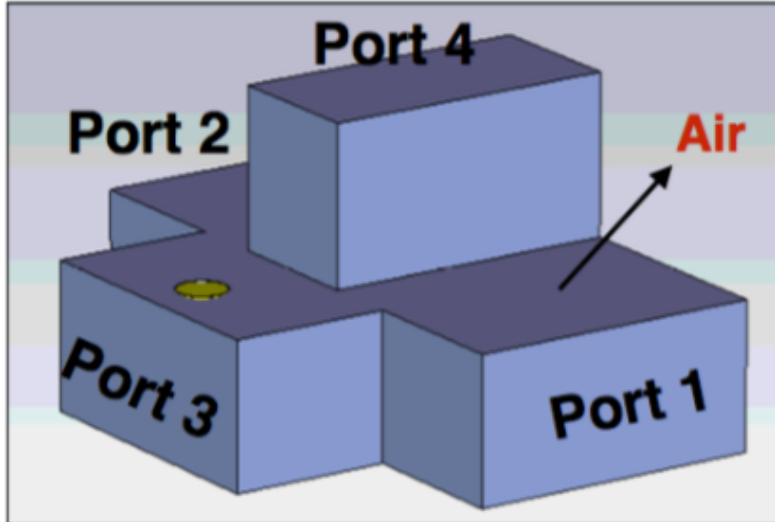
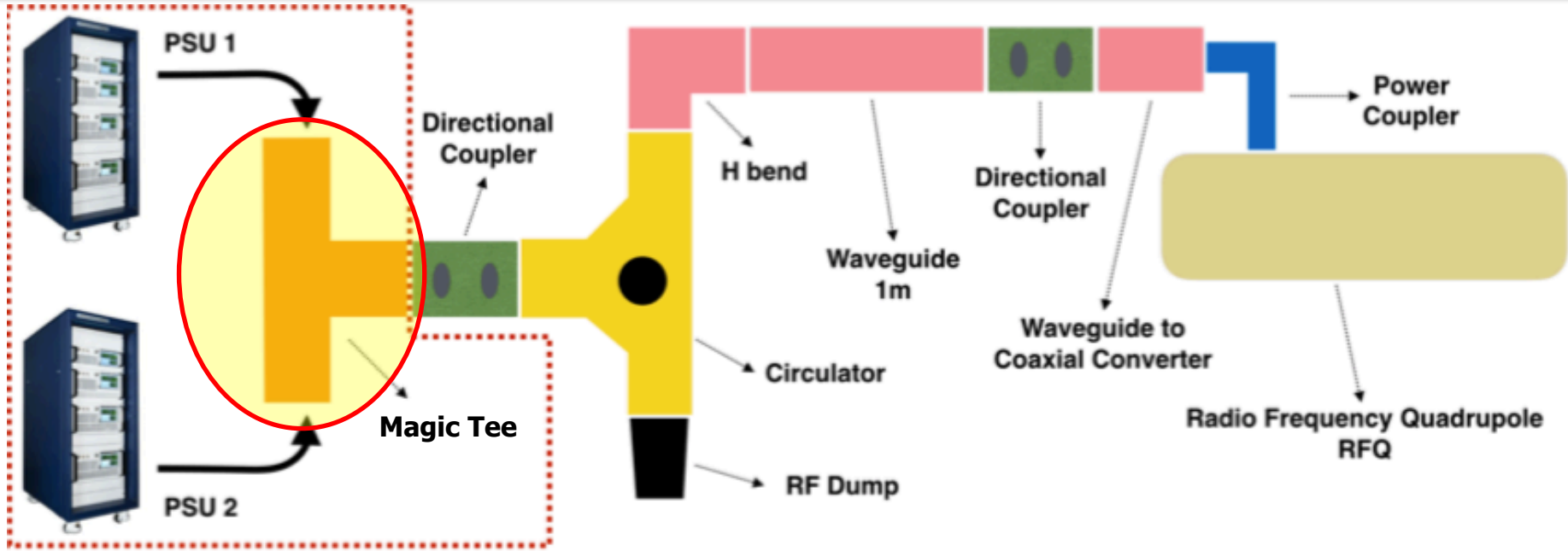


Dolařtırıcı



Bonçuk-Çekme Deneyi

Magic Tee



Bağlantı Noktası 1 (Port 1) : Giriş

Bağlantı Noktası 2 (Port 2) : Giriş

Bağlantı Noktası 3 (Port 3) : Güç birleştirici

Bağlantı Noktası 4 (Port 4) : Güç fark

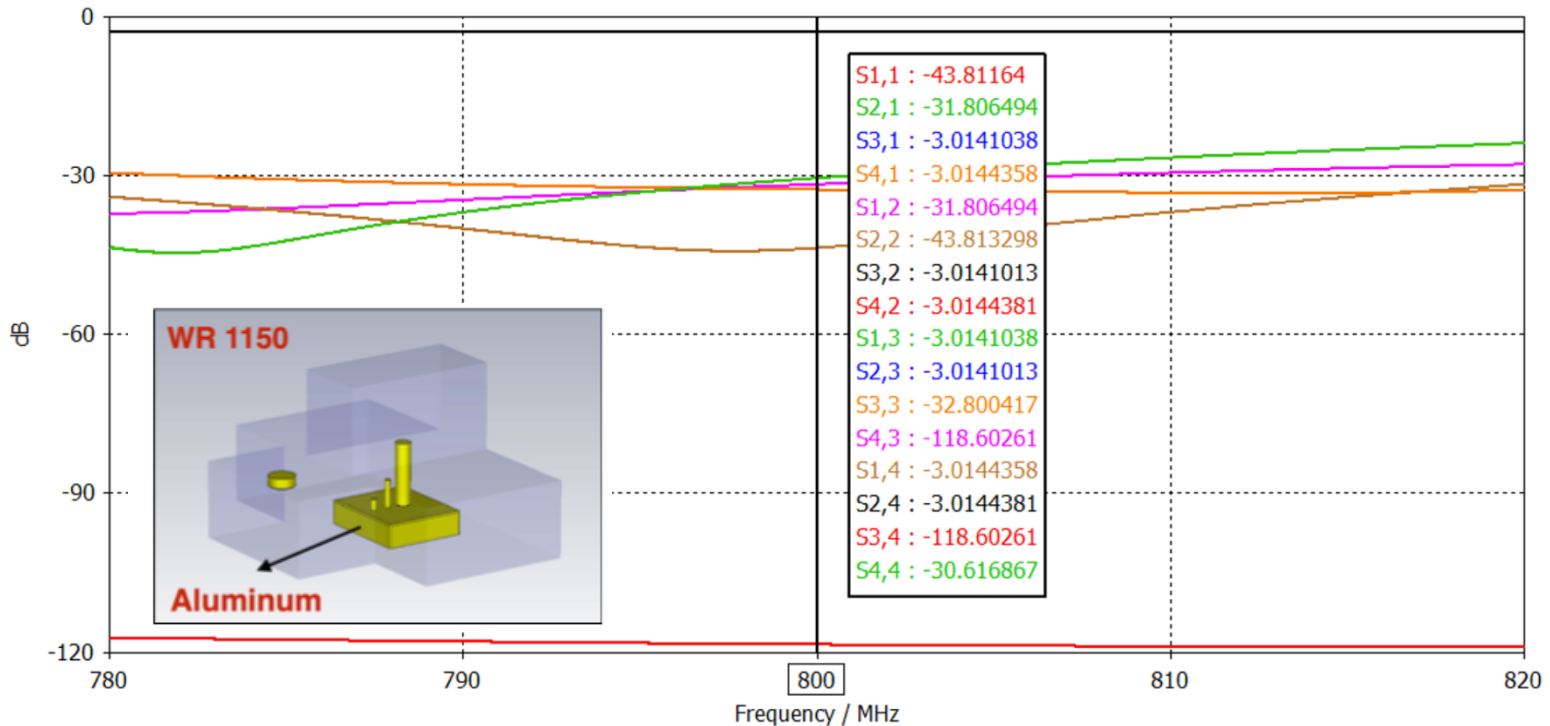
Magic Tee Benzetim

Hedeflenen Parametreler

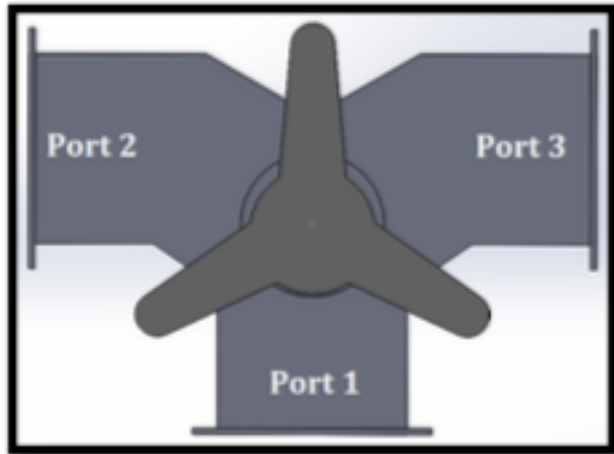
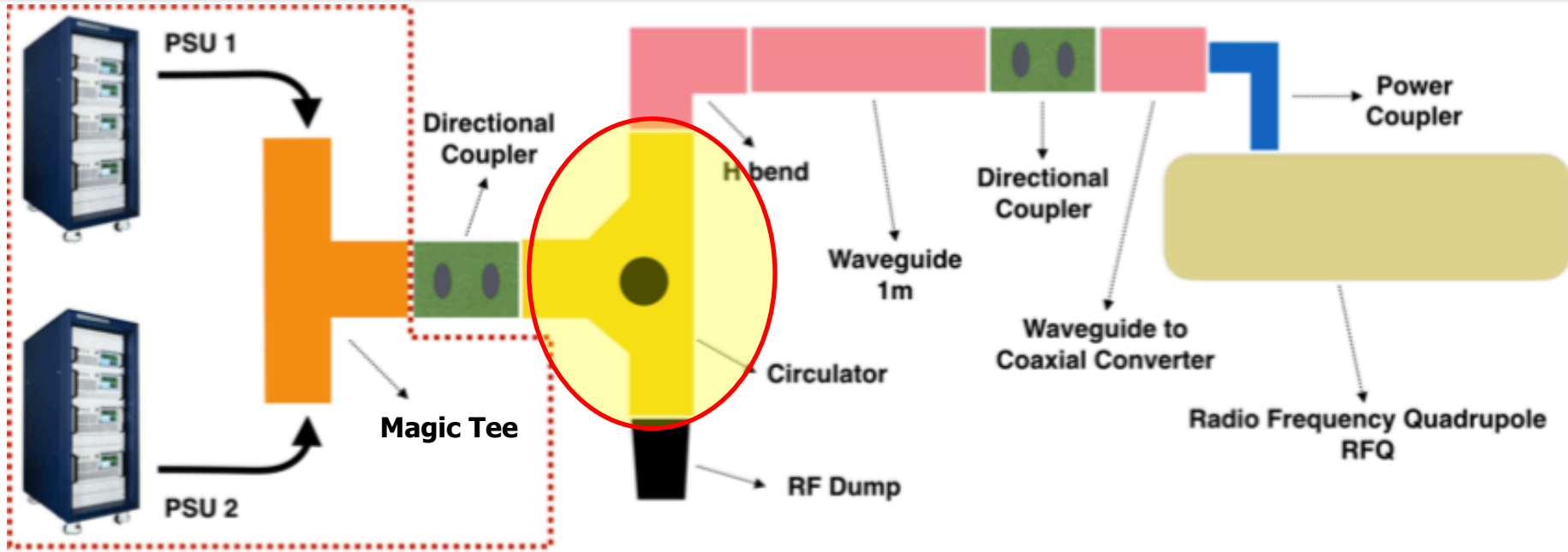
S-parametre	dB (desibel)
S_{31}, S_{32}	- 3 dB
S_{11}, S_{22}, S_{33}	< - 25 dB
S_{21}	< - 25 dB
S_{34}	< - 70 dB

Benzetim Sonuçları

S-parametre	dB (desibel)
S_{31}, S_{32}	-3.01 dB
S_{11}, S_{22}	-43.8 dB
S_{33}	-32.8 dB
S_{21}	-32 dB
S_{34}	-118 dB



Dolařtırıcı

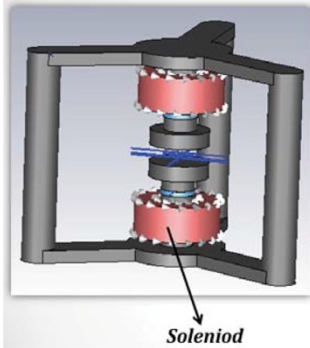


Port 1: Giriř portu

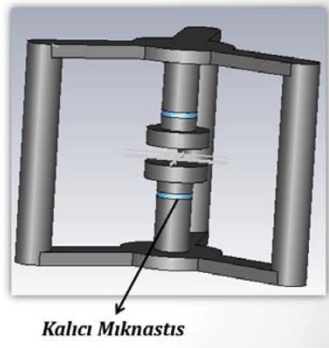
Port 2: Verilen gcn, iletilmesini istediđimiz hedefe ynlendiren port

Port 3: Yansıyan gc sođurma iřlemi iin kullanılan porttur.

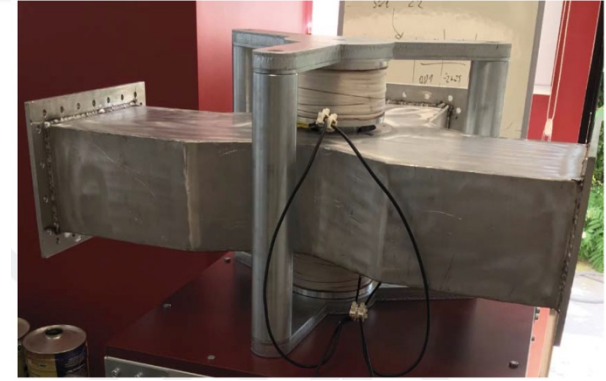
Dolaştırıcı Benzetim



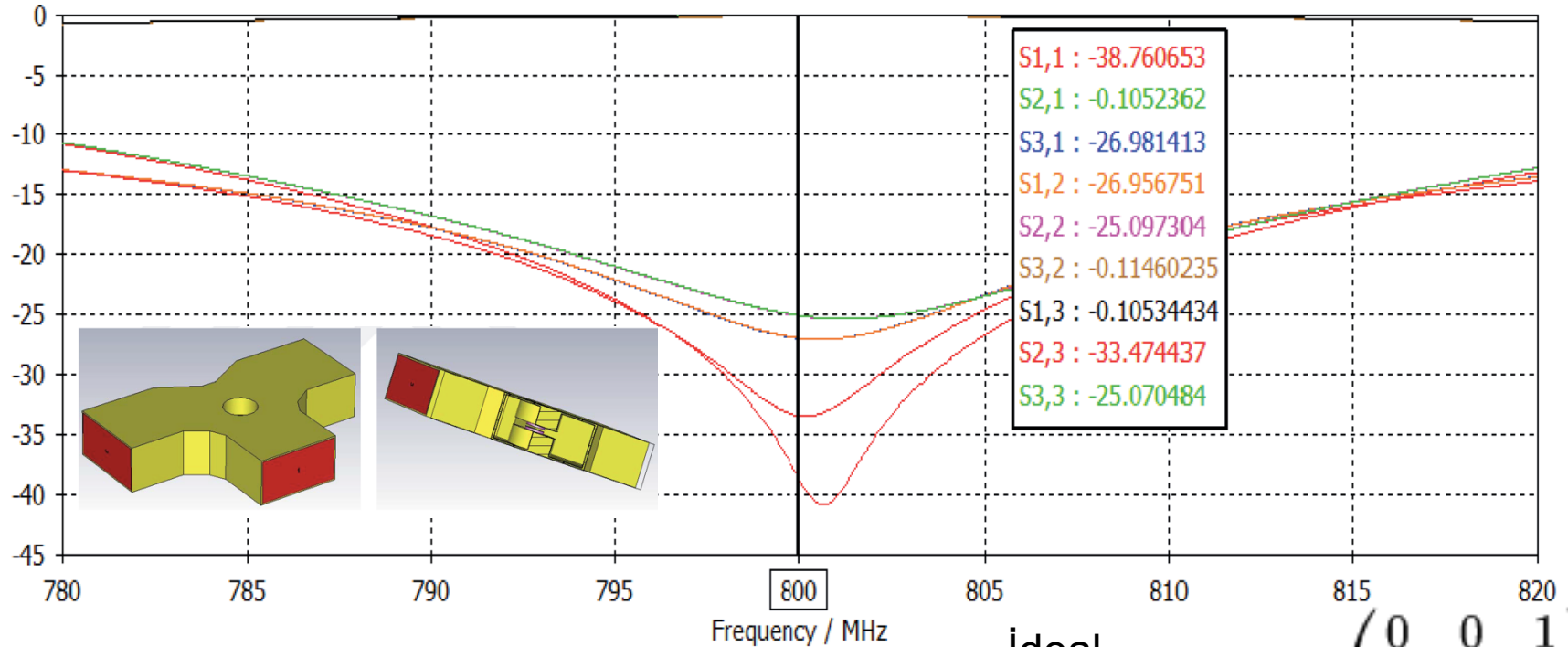
Solenoid



Kalıcı Mıknastis



S-Parameters [Magnitude in dB]



İdeal

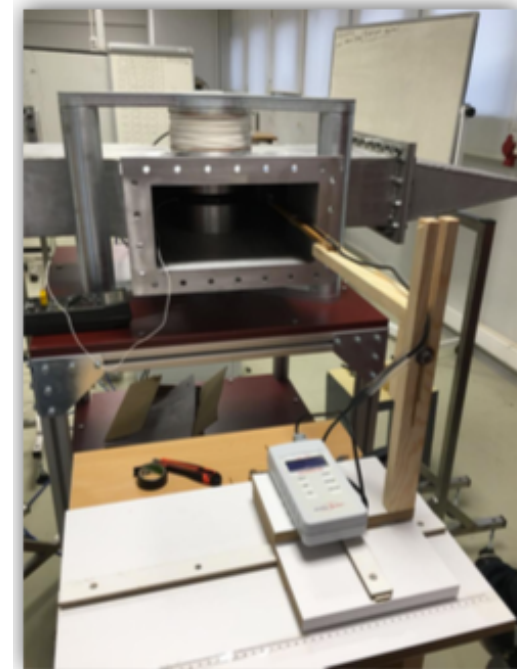
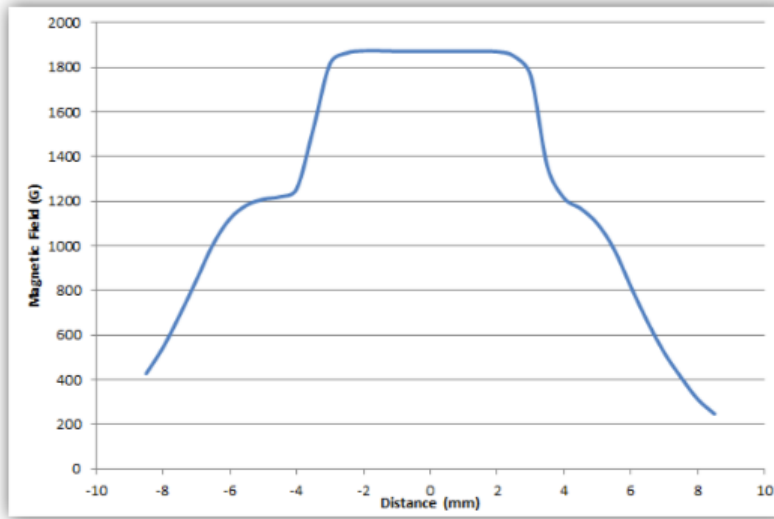
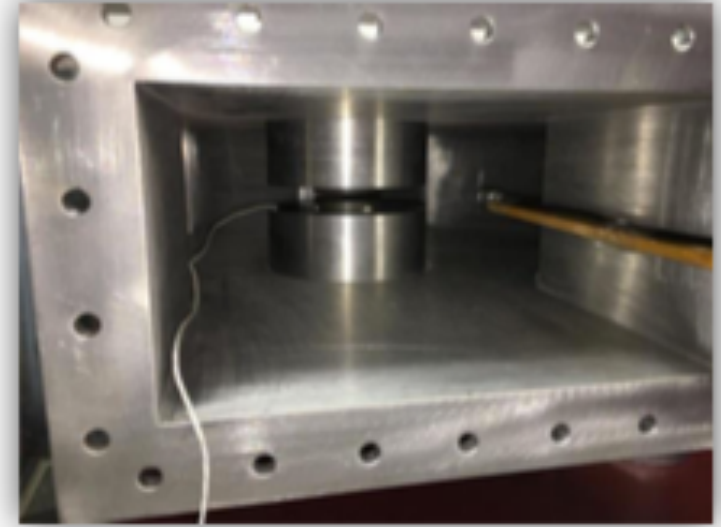
Dolaştırıcı

S-matrisi

$$S = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$$

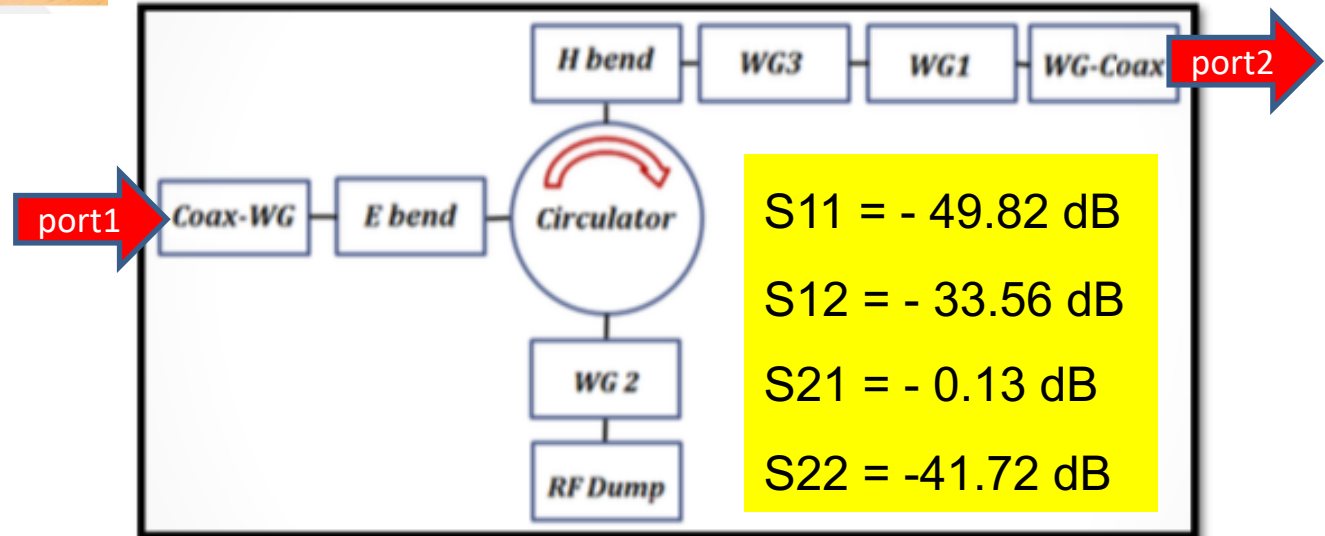
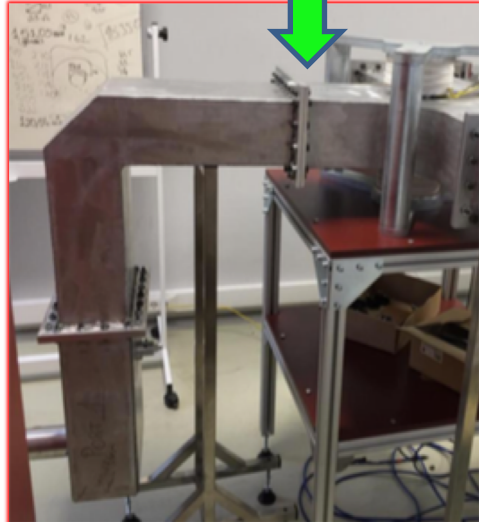
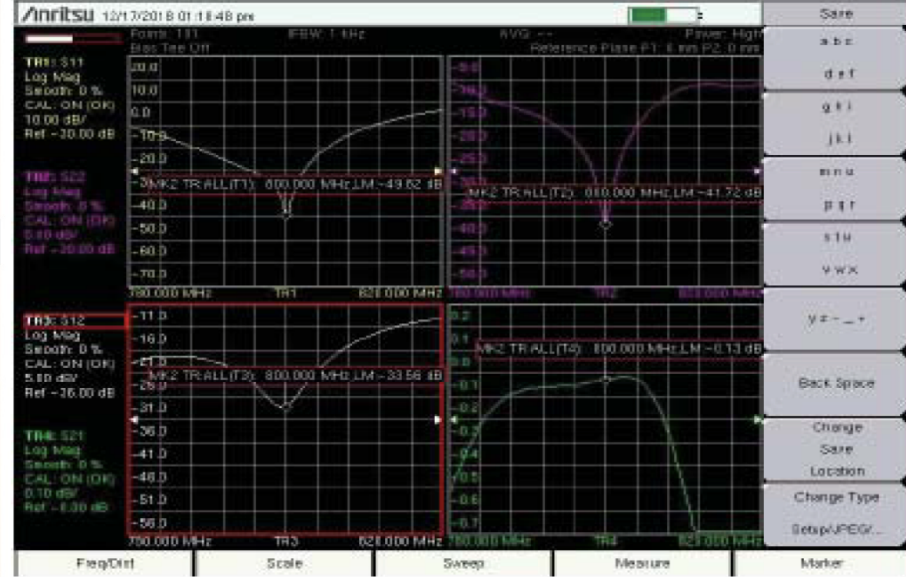
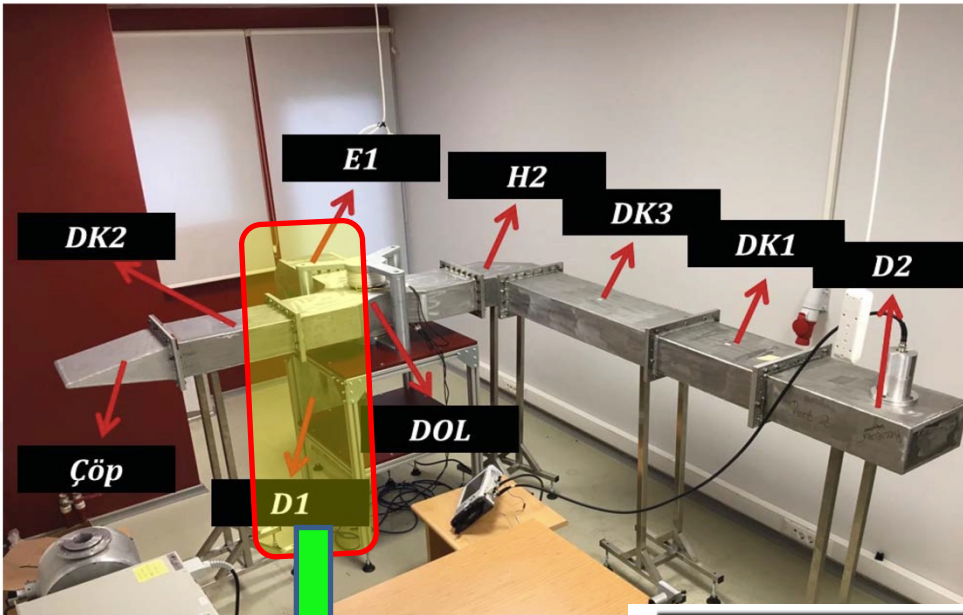
O. Kocer, UHF Bandında RF Dolaştırıcı Tasarımı, Üretimi ve Ölçümleri, İÜ Yüksek Lisans Tezi, 2019.

Dolařtırıcı ve Magnetik Alan Ölçümü

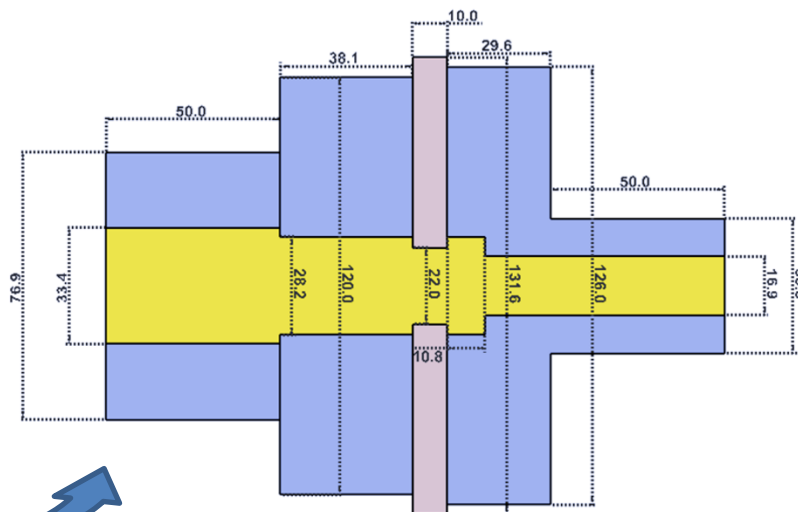
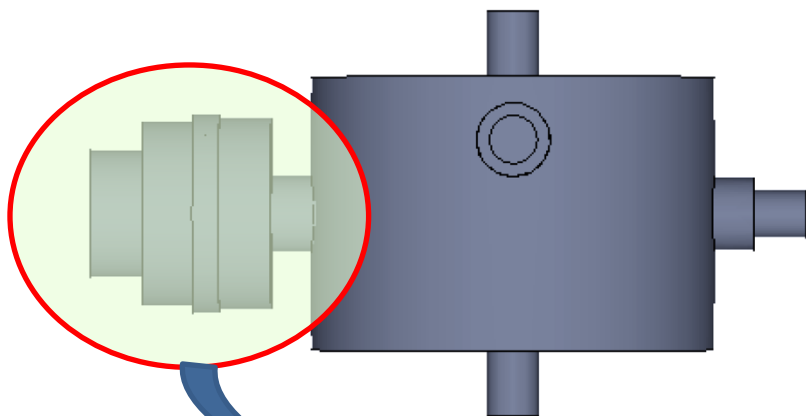


O. Kocer, UHF Bandında RF Dolařtırıcı Tasarımı, Üretimi ve Ölçümleri, İÜ Yüksek Lisans Tezi, 2019.

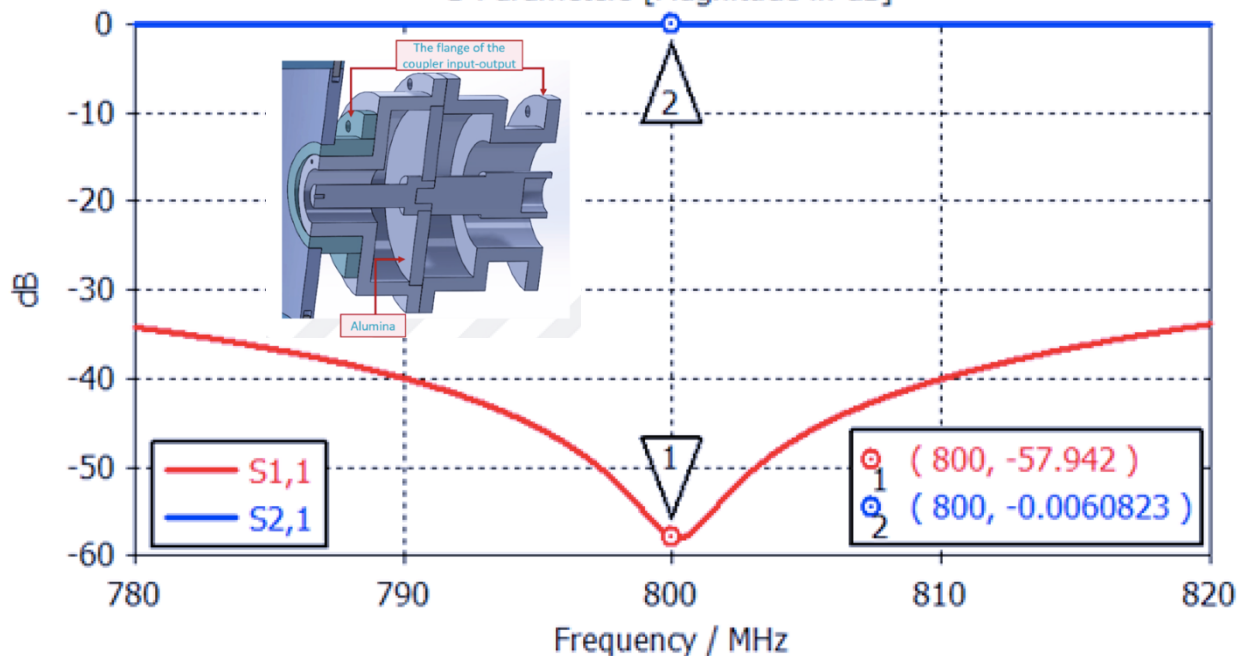
İletim hattı S-parametresi ölçümü



800MHz Test Kovuk için Güç Bağdaştırıcısı



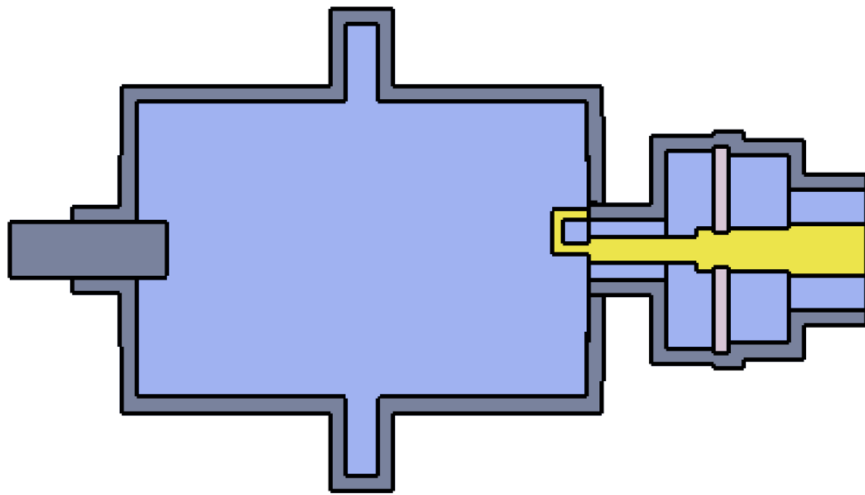
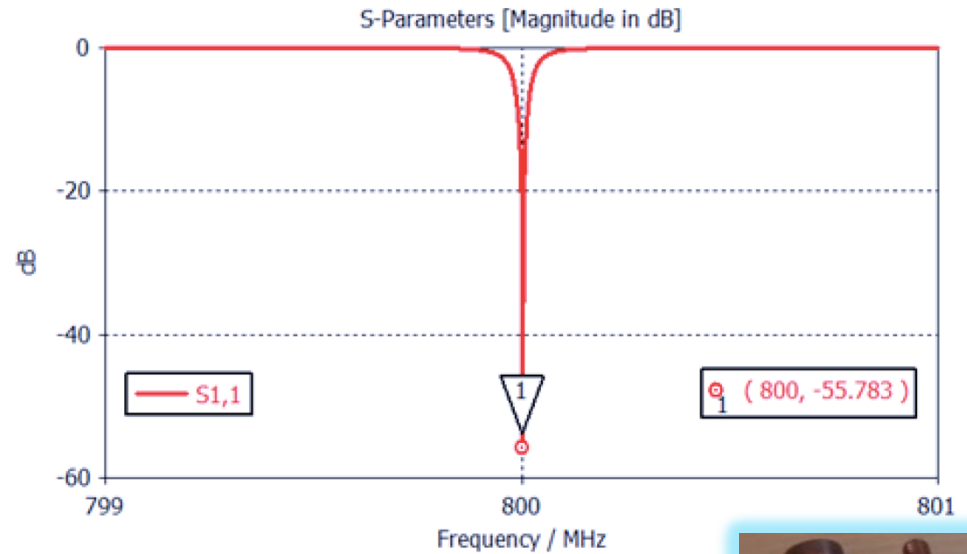
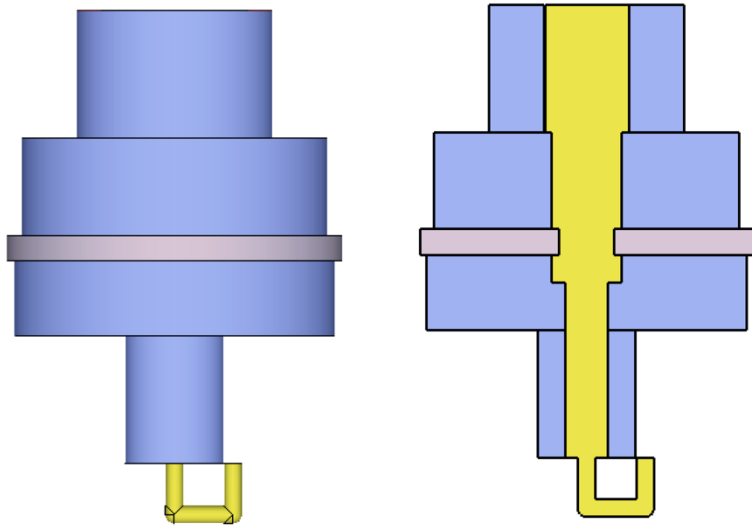
S-Parameters [Magnitude in dB]




O. Gonzales et al.
'Electromagnetic Simulations of the Input Power Couplers for the ESS-Bilbao RFQ', Proc. of IPAC 2011, San Sebastian, Spain

A. Caglar, Design and Measurements of a Microwave Cavity and Coupler Full RF Transmission Line for a Klystron Test Stand,, İYTE MSc. Thesis, 2019.

Güç Bağdaştırıcısı ve Anteni

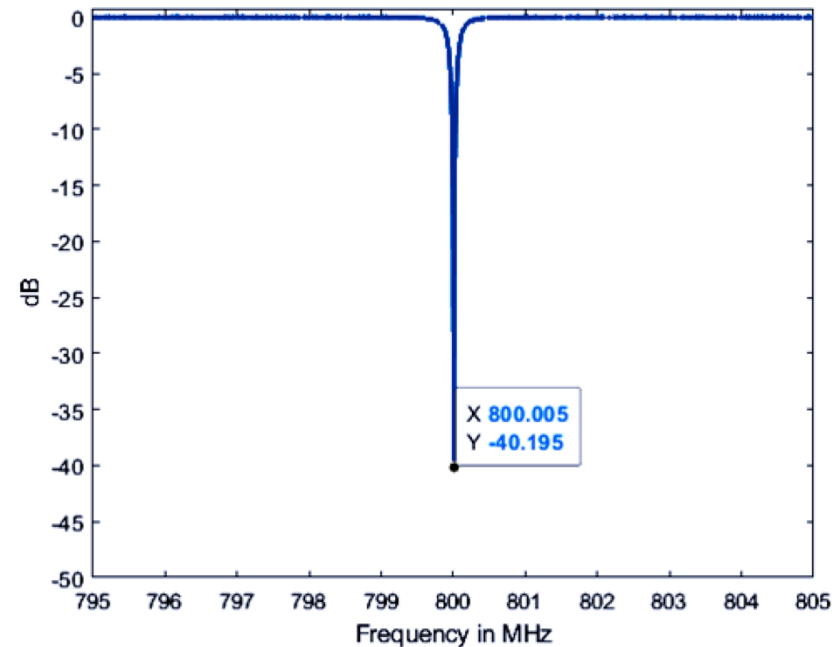


 A. Caglar, Design and Measurements of a Microwave Cavity and Coupler Full RF Transmission Line for a Klystron Test Stand,, İYTE MSc. Thesis, 2019.

Kovuk Kalite Faktörü Ölçümü



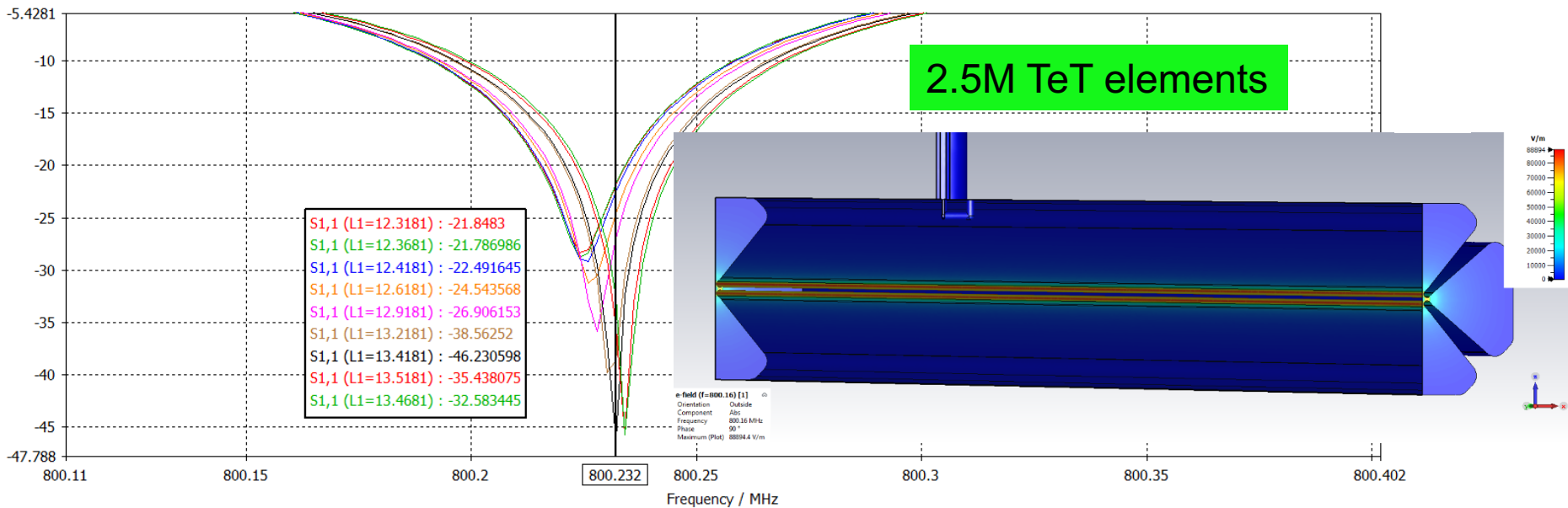
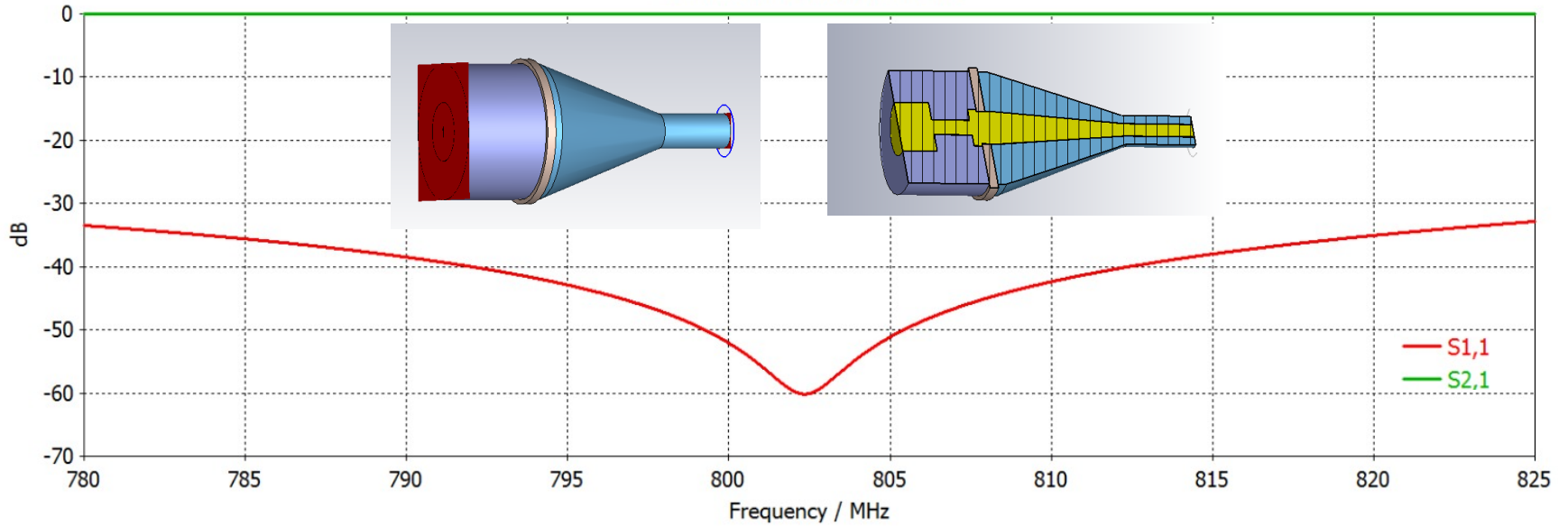
S_{11} Magnitude in dB



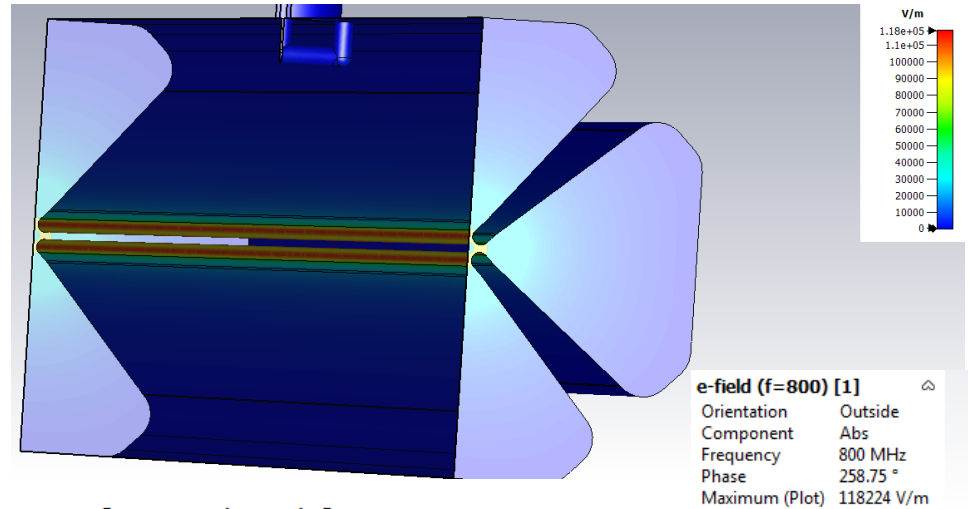
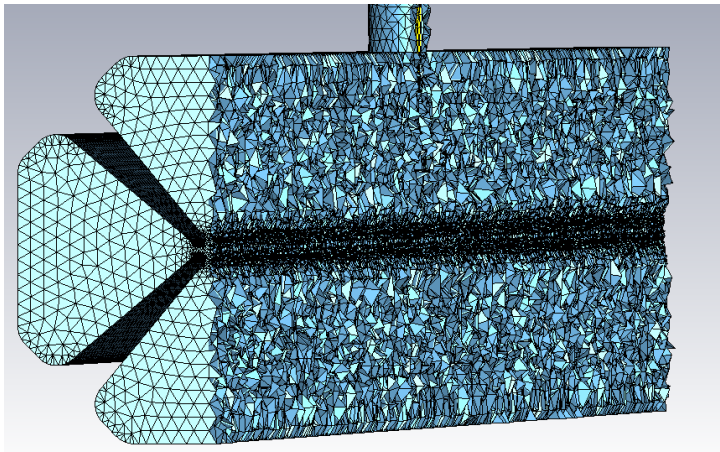
Kalite faktörü :17260 @800MHz

RFQ Bağdaştırıcı ve Anteni

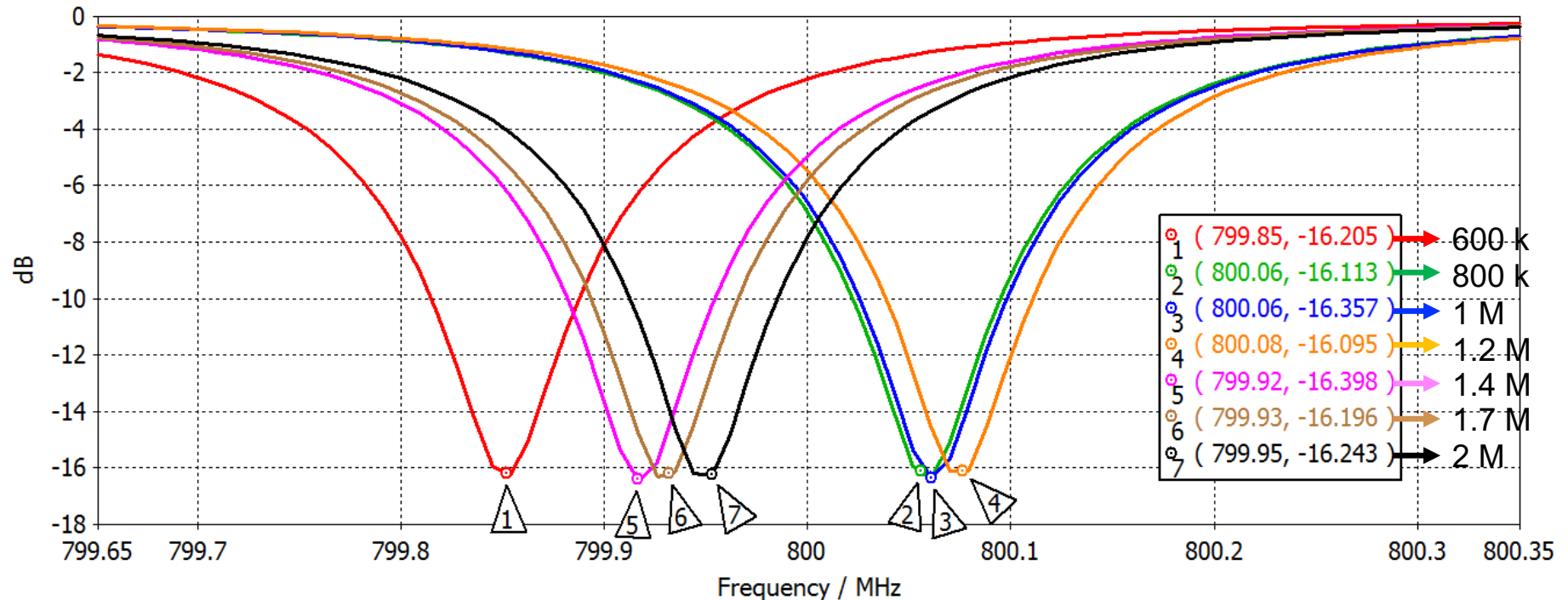
S-Parameters [Magnitude in dB]



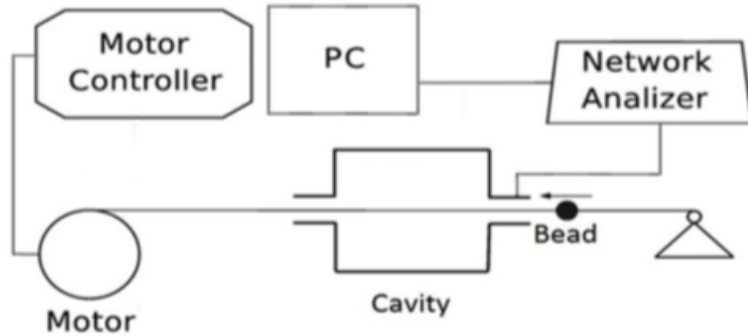
Yakınsama Eğrileri (\approx %40 daha kısa RFQ)



S-Parameters [Magnitude in dB]

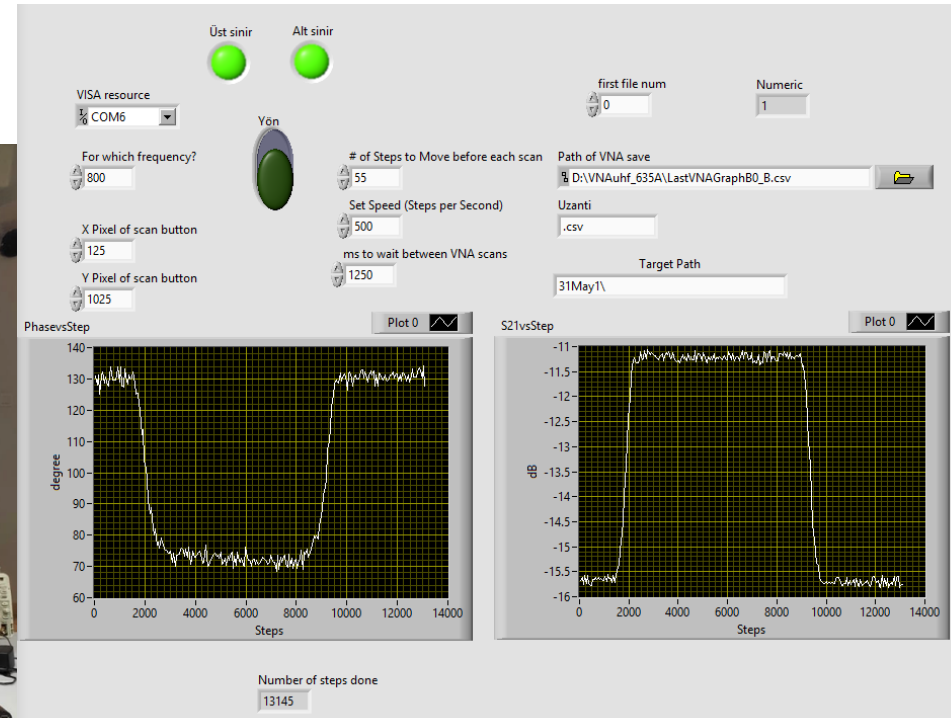


Boncuk Çekme Deneyi



Slater Perturbasyon Teorisi:

$$\frac{E_0^2}{U} = \frac{\tan[\phi(f_0)]}{-2\pi r^3 Q_L} \left[\frac{\epsilon_r + 2}{\epsilon_0(\epsilon_r - 1)} \right]$$

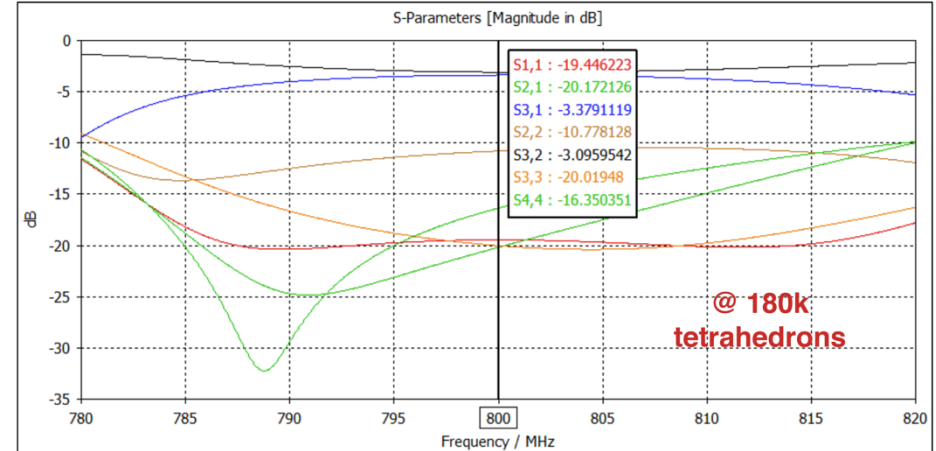
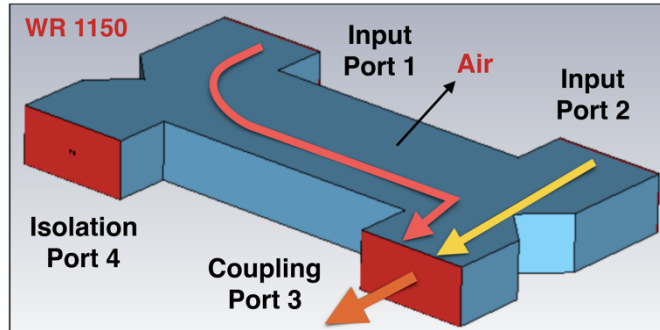
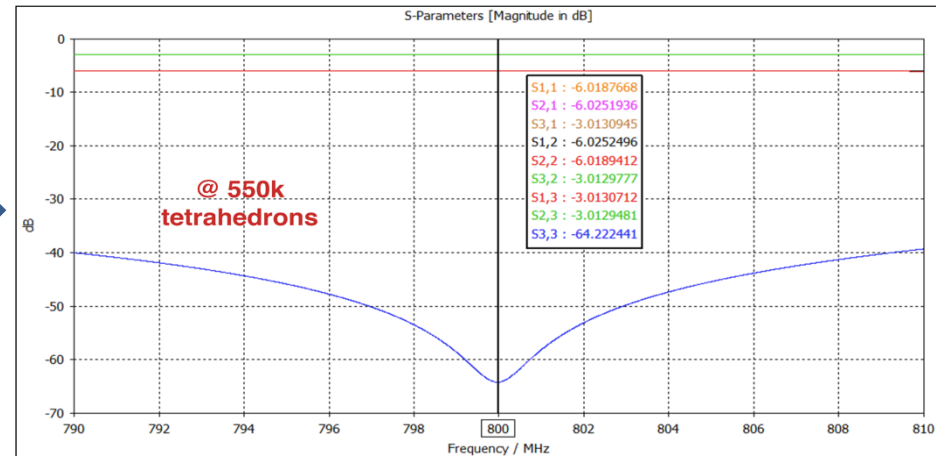
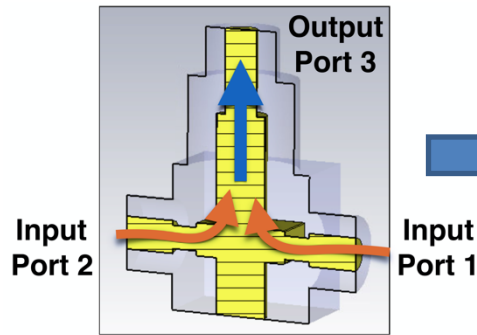
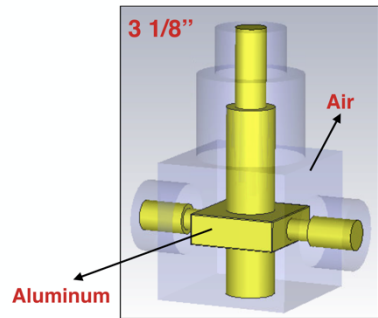


S. Öz, M. Furkan Er, Bead-Pull Measurement for an 800MHz Pillbox Cavity, TPS 35

Yapılacaklar

- **Magic Tee üretimi**
- **PSU' ların testleri**
- **Dönüştürücüleri üretimleri**
- **Bağdaştırıcı ve RFQ ısı analizleri**
- **Multipacting analizleri**
- **RFQ kanatlarının üretim hatalarına bağlı toleranslarına ait benzetimler**

T ve Hibrit Birleştiriciler



Type of Combiner	Reflection	Cross-Talk	Efficiency
Magic Tee	2.94 W	18.4 W	%99.9
Coaxial Combiner	17.5 kW	17.5 kW	%50
3dB Hybrid Coupler	700 W	700 W	%98



O. Koçer, A. Çağlar, B. Baran, H. Çetinkaya, A. Karatay, G. Türemen, G. Ünel, F. Yaman, "Kahve Laboratory 800 MHz Power Combiner Design for RFQ Transmission Line, TFD36 Int. Phys. Congress, Bodrum, Turkey, 2020.