

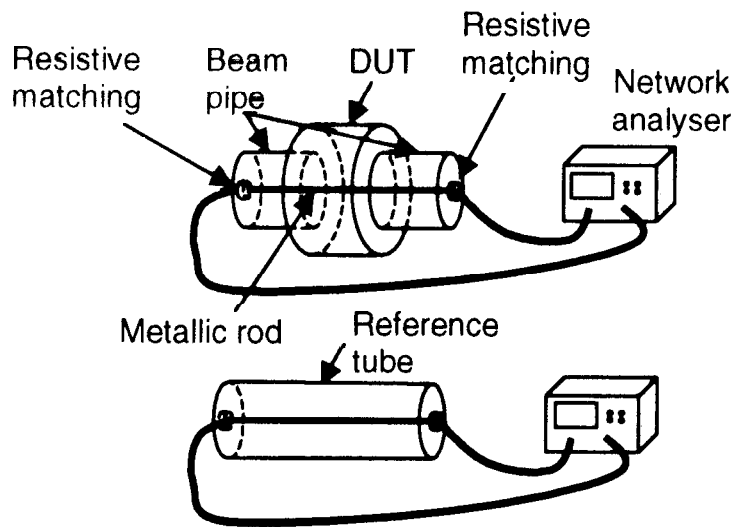
LONGITUDINAL AND TRANSVERSE
IMPEDANCE MEASUREMENTS
OF THE DAΦNE
INJECTION KICKERS

D. ALESINI , A. GALLO , A. GHIGO , F. MARCELLINI

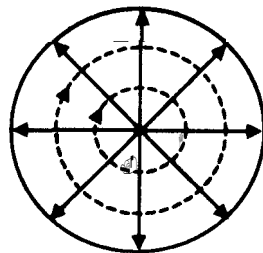
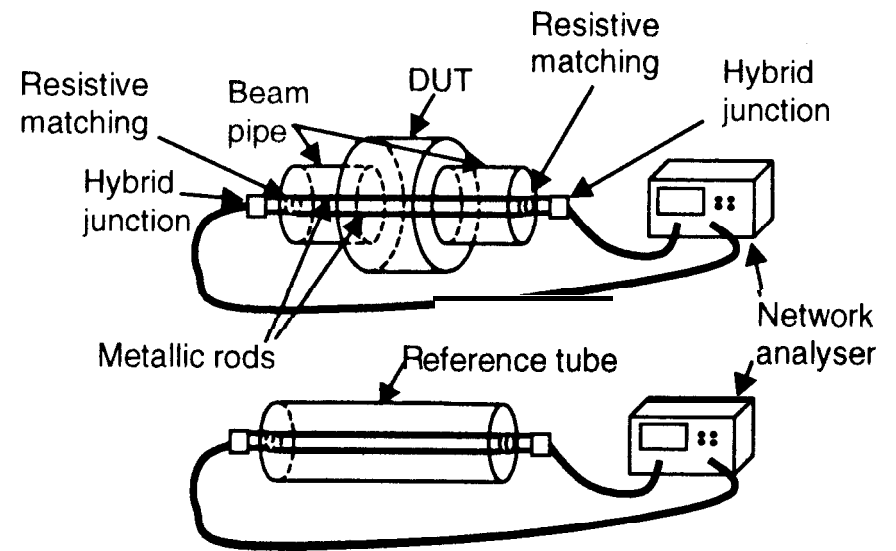
LNF - INFN

Coaxial Wire Method Technique: experimental set up.

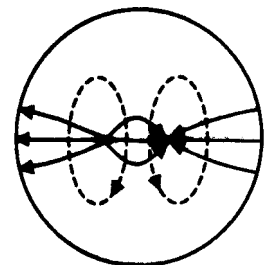
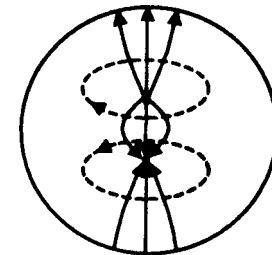
Longitudinal coupling impedance



Transverse coupling impedance

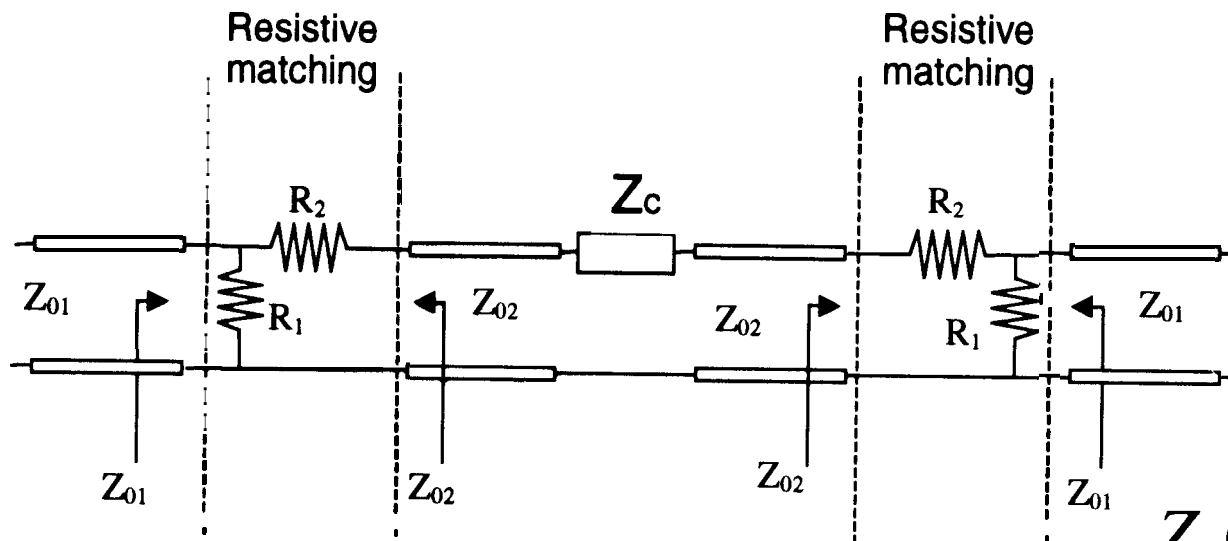


e.m. field configurations (TEM modes)



What Can We Measure?

- * coupling (longitudinal and transverse) impedance



$$R_1 = \sqrt{\frac{Z_{02} Z_{01}^2}{Z_{02} - Z_{01}}}$$

$$R_2 = Z_{02} - \frac{R_1 Z_{01}}{R_1 + Z_{01}}$$

$$Z_c(\omega) = 2Z_{02} \frac{S_{21,ref}(\omega) - S_{21,dut}(\omega)}{S_{21,dut}(\omega)}$$

transfer impedance

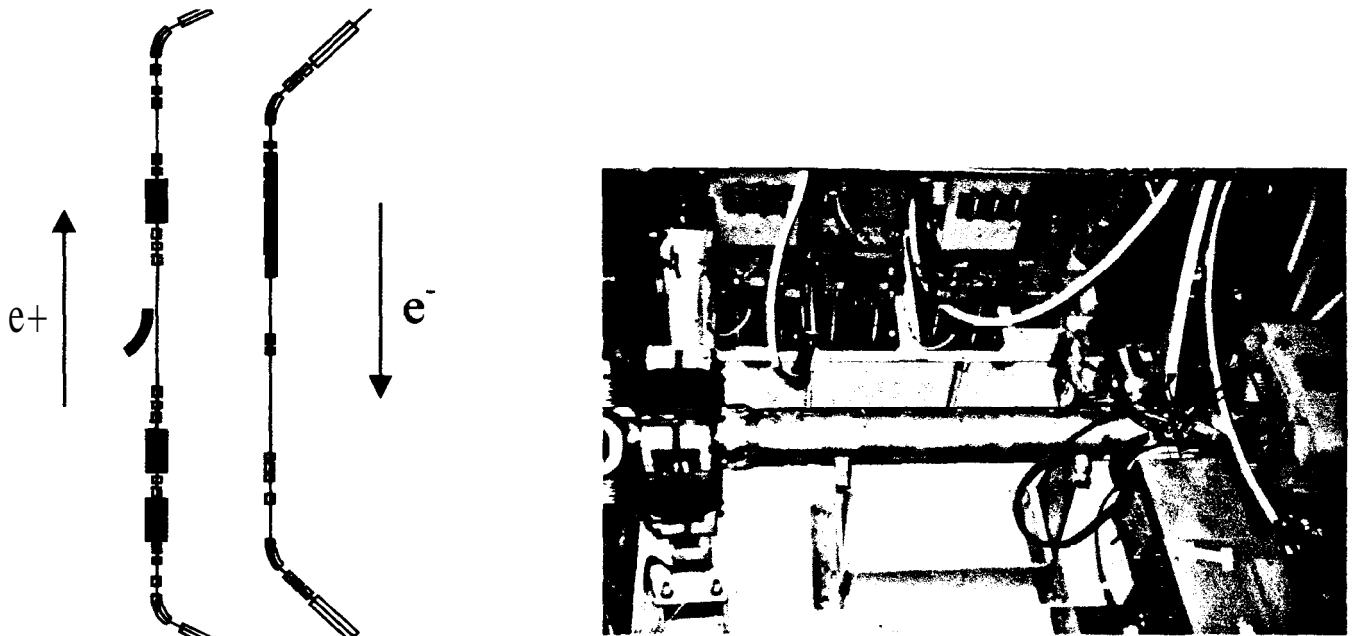
$$Z_{tr}(\omega) \equiv \frac{V_{port}}{I_{beam}} = \frac{|S_{31}(\omega)|}{|S_{21}(\omega)|} \sqrt{Z_{02} Z_{01}} \quad \Rightarrow \quad P_{port} = \sum_n \frac{1}{2Z_0} \Re\{Z_{tr}(\omega_n)\}^2 I_n^2$$

Overview of Devices and Components Characterized by Wire Method Measurement

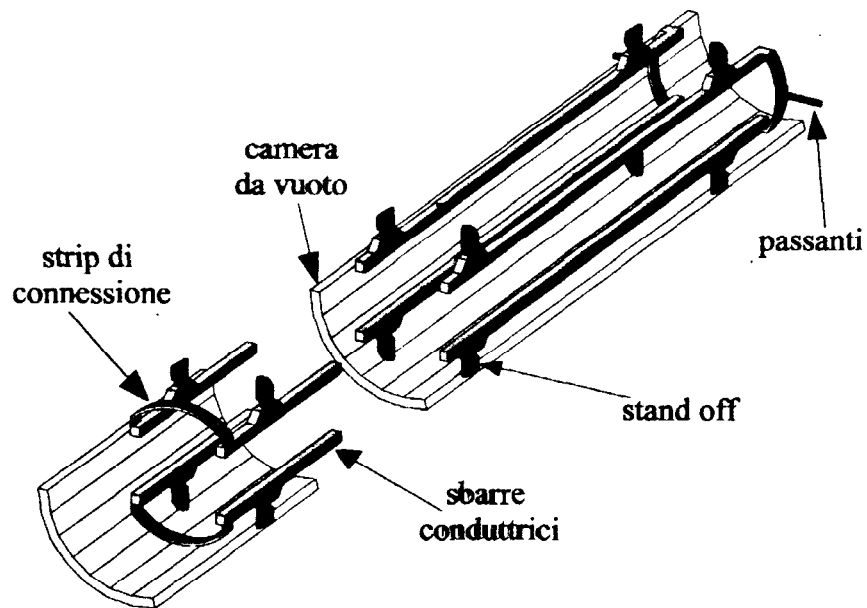
	HOM longitudinal impedance	Beam transfer impedance
Longitudinal feedback kicker	√	√
Transverse feedback kicker	√	√
DAFNE RF cavity	√	
Pick-up for feedback systems	√	√
Arc section bellows shields	√	
Straight section bellows shields	√	
Injection kicker	√	√
Ceramic gap for current monitors	√	√
IR KLOE vacuum chamber	√	
Ion clearing electrodes	√	

KICKERS DI INIEZIONE DI DAΦNE

• COLLOCAZIONE NELLA MACCHINA



• STRUTTURA E PRINCIPIO DI FUNZIONAMENTO

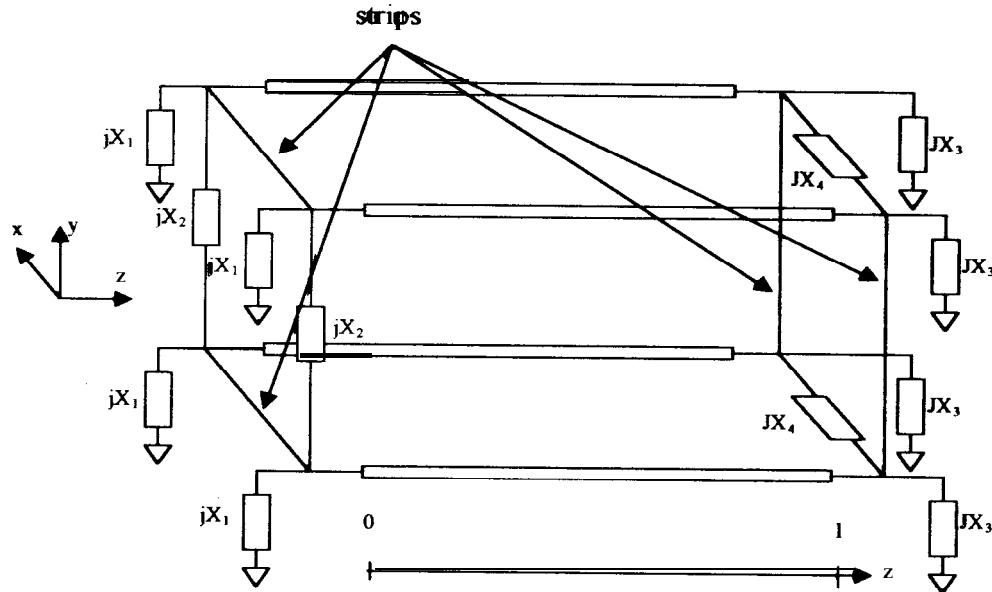


• SCHEMA DELLA TESI:

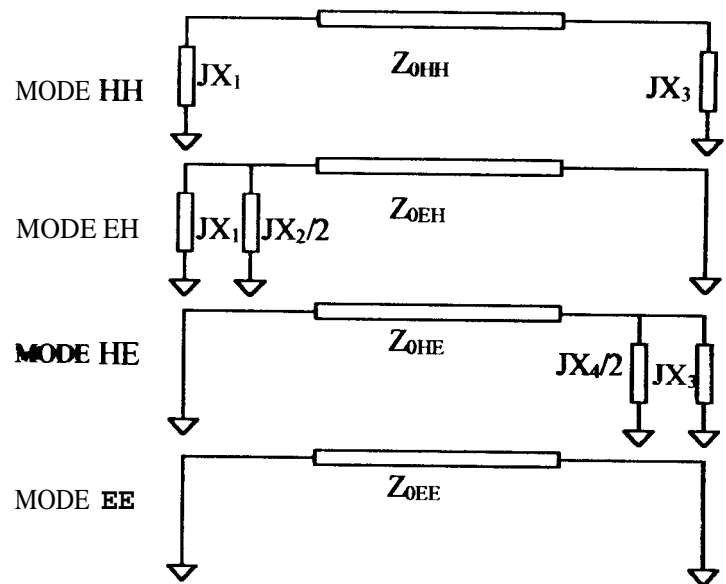
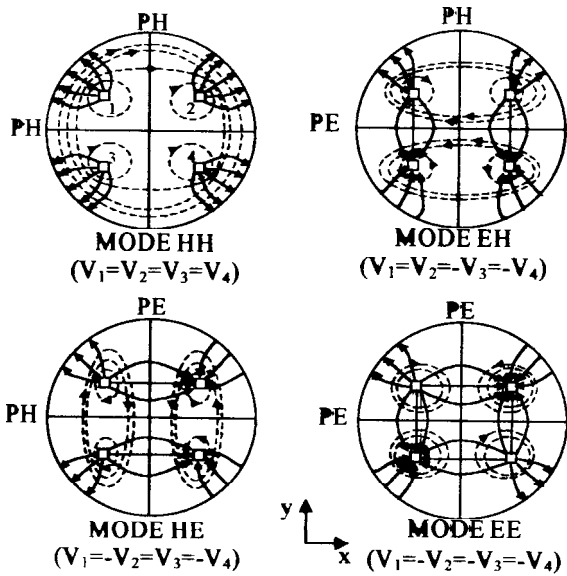
- 1A) ANALISI TEORICO-NUMERICA DEI CAMPI ELETTROMAGNETICI NEL KICKER;
- 1B) MISURE SU PROTOTIPO;
- 2A) PROGETTO DELL'ANTENNA PER L'ASSORBIMENTO DEI CAMPI RISONANTI NELLA STRUTTURA;
- 2B) VERIFICA SPERIMENTALE SU PROTOTIPO MODIFICATO.

1A) ELECTROMAGNETIC ANALYSIS OF TRAPPED MODES

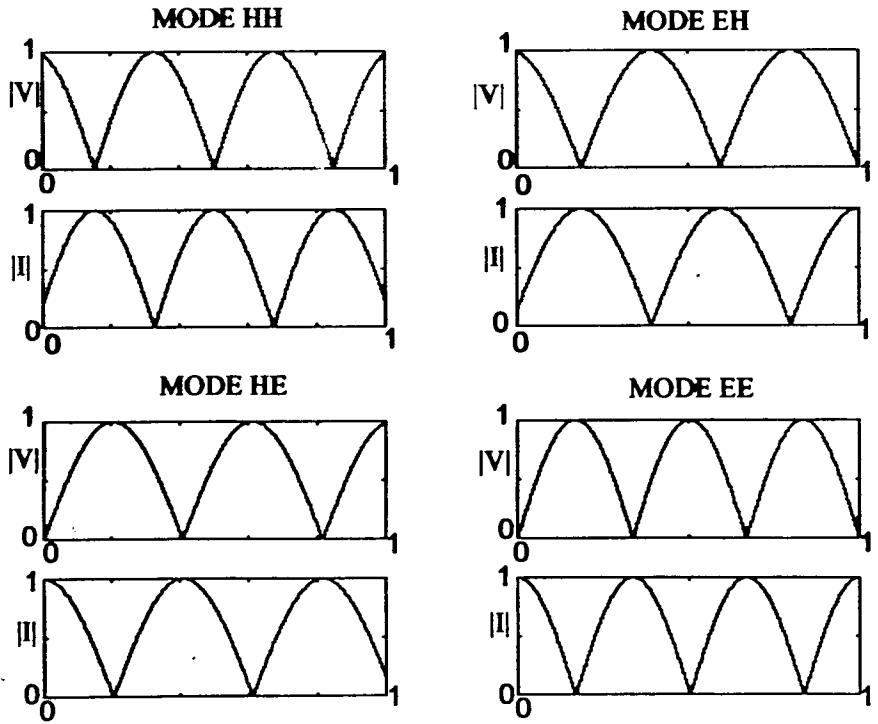
1A.1 TRANSMISSION LINE MODEL



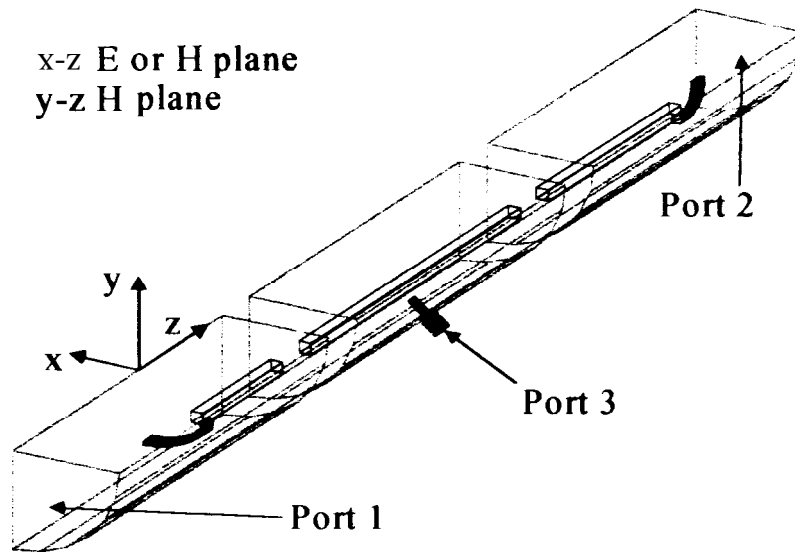
• RESONANT INDEPENDENT MODES



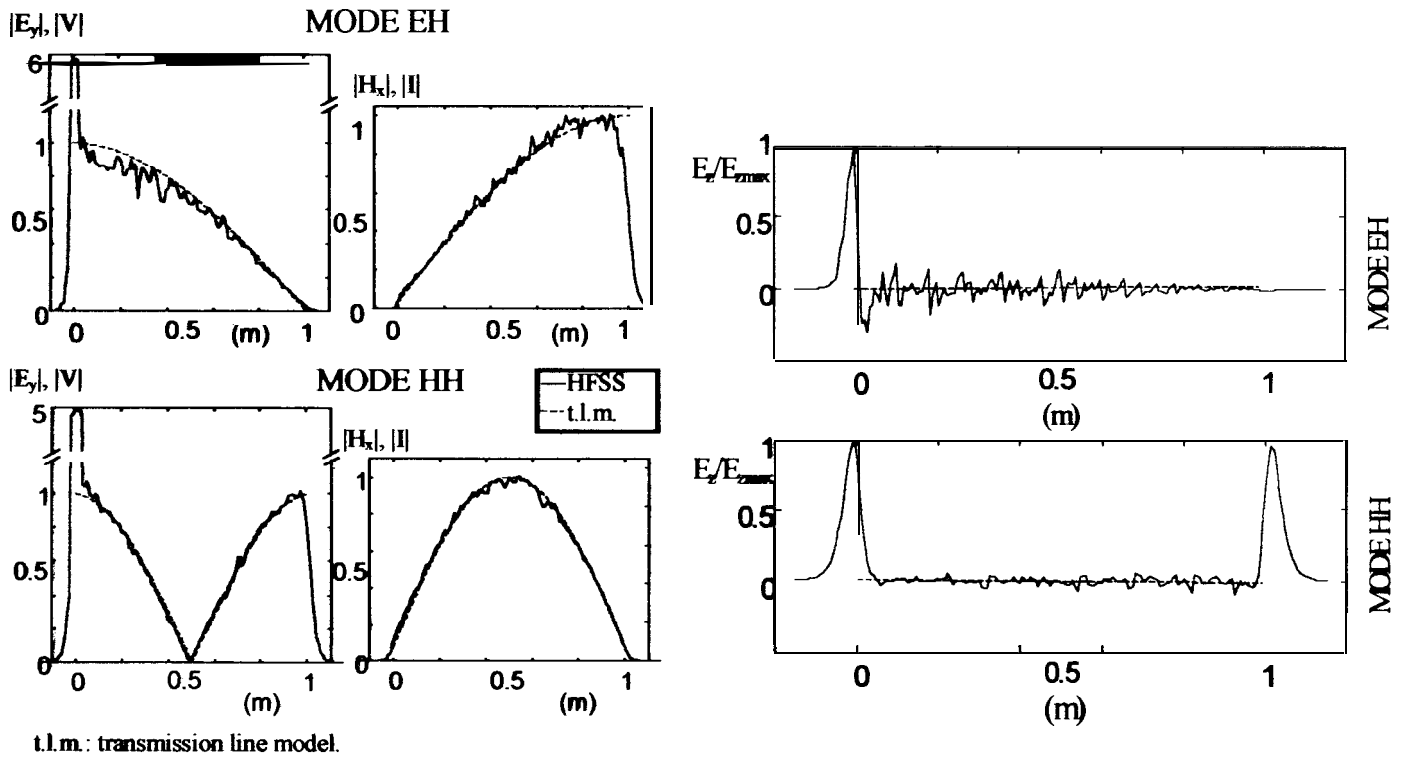
MODE HH	MODE EH	MODE HE	MODE EE
143.23	73.73	73.25	149.70
286.52	221.21	219.76	299.40
429.93	368.69	366.31	449.10
573.51	516.20	512.92	598.80
717.29	663.75	659.63	748.50
861.31	811.33	806.44	898.20
1005.60	958.96	953.38	1047.90
1150.16	1106.64	1100.45	1197.60
1295.01	1254.38	1247.65	1347.31
1440.14	1402.18	1395.00	1497.01
1585.54	1550.05	1542.48	1646.71
1731.22	1697.98	1690.09	1796.41
1877.15	1845.98	1837.84	1946.11
2023.33	1995.04	1985.72	2095.81
2169.73			2245.51
2316.35			2395.21
2463.17			2544.91
2610.18			2694.61



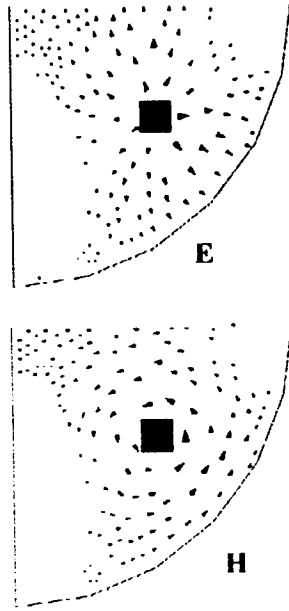
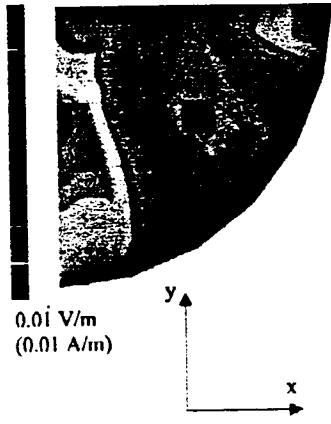
1A.2 HFSS SIMULATIONS



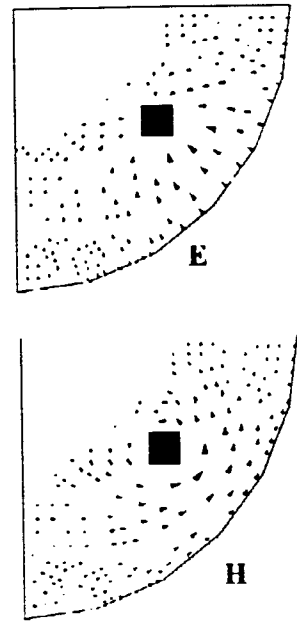
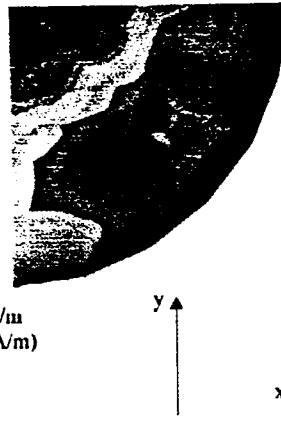
• FIELD DISTRIBUTION ALONG THE STRUCTURE



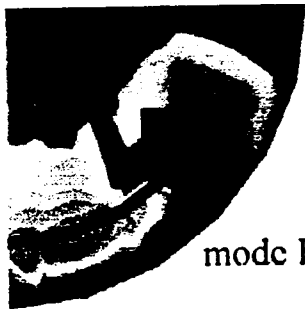
1 V/m
(1 A/m)
0.01 V/m
(0.01 A/m)



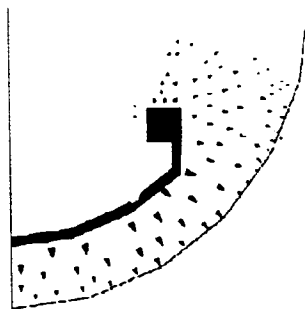
1 V/m
(1 A/m)
0.01 V/m
(0.01 A/m)



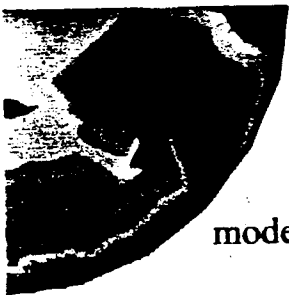
1 V/m
(1 A/m)



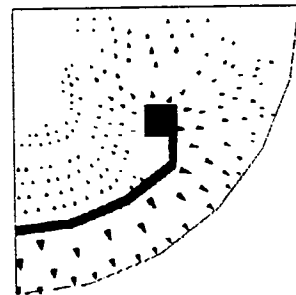
mode HH



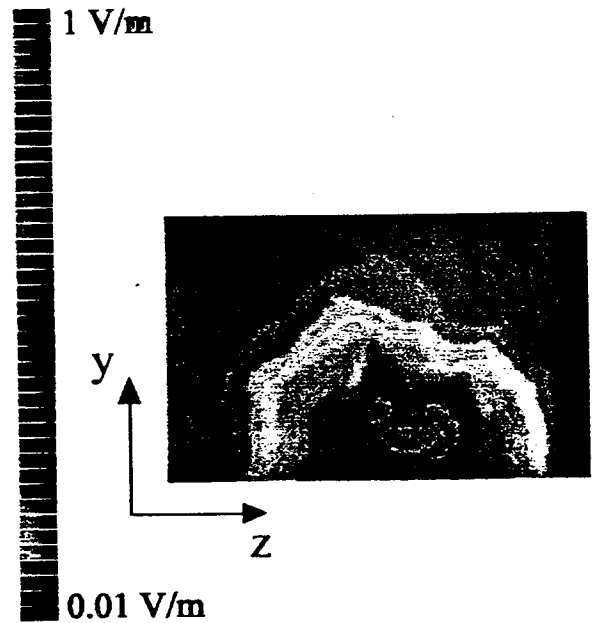
0.01 V/m
(0.01 A/m)



mode EH

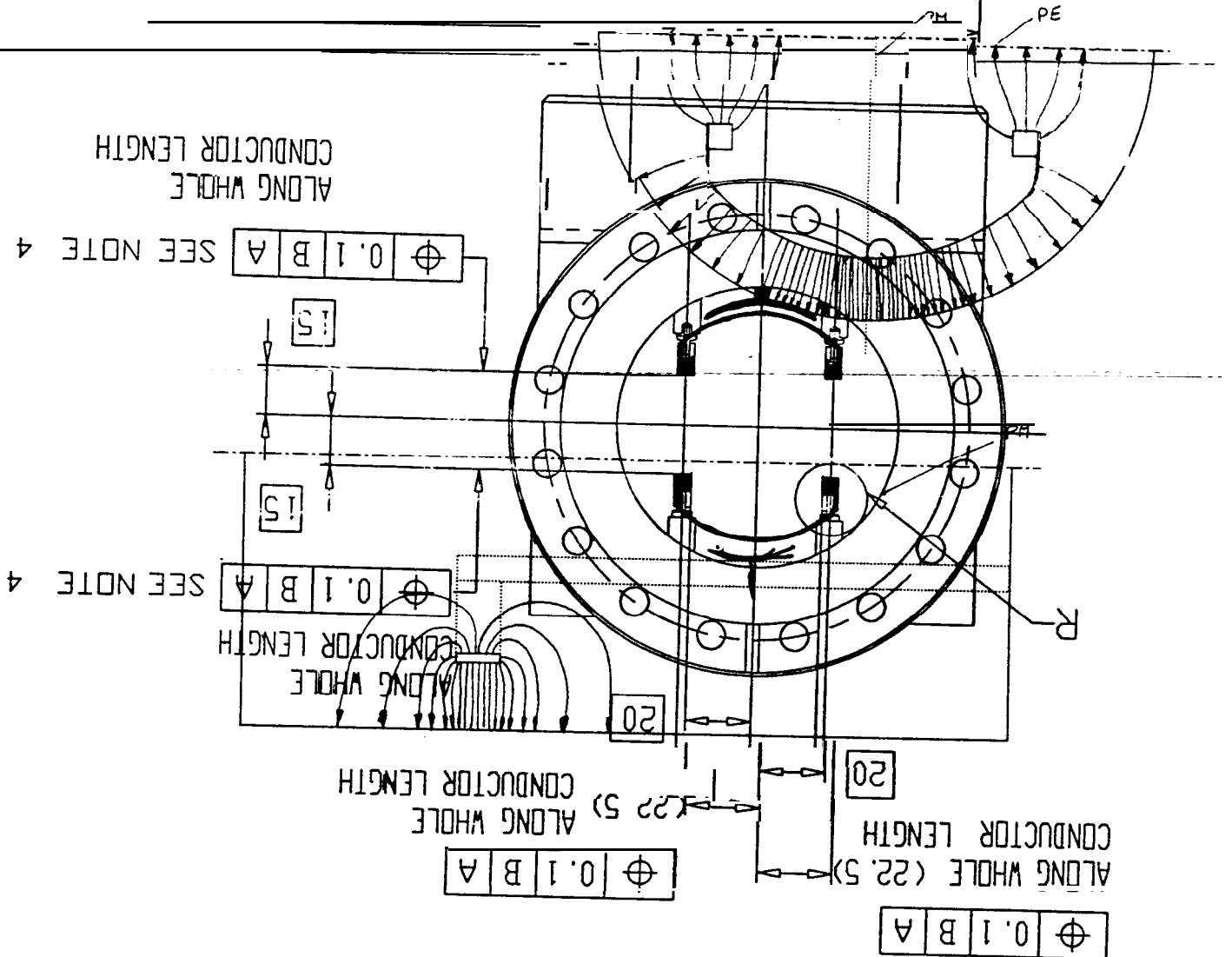
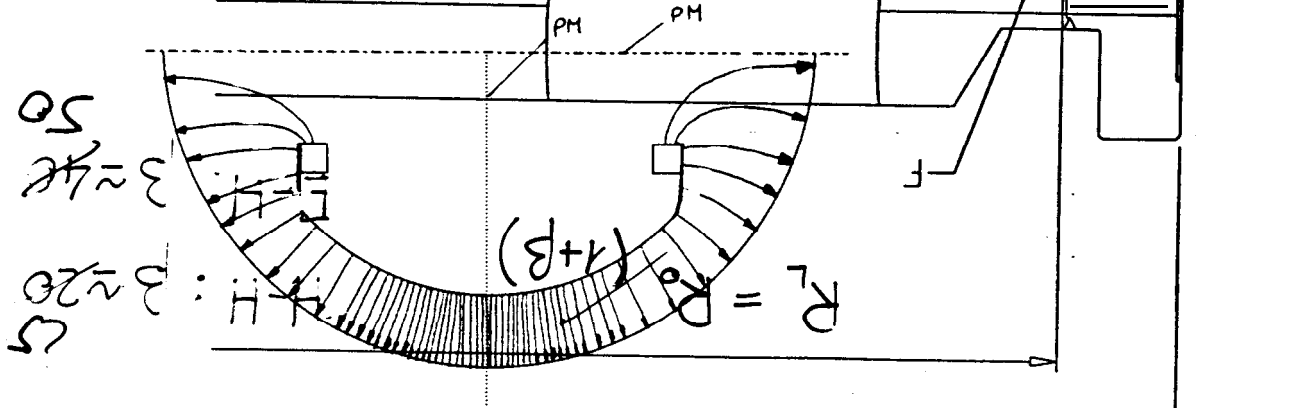


1 V/m



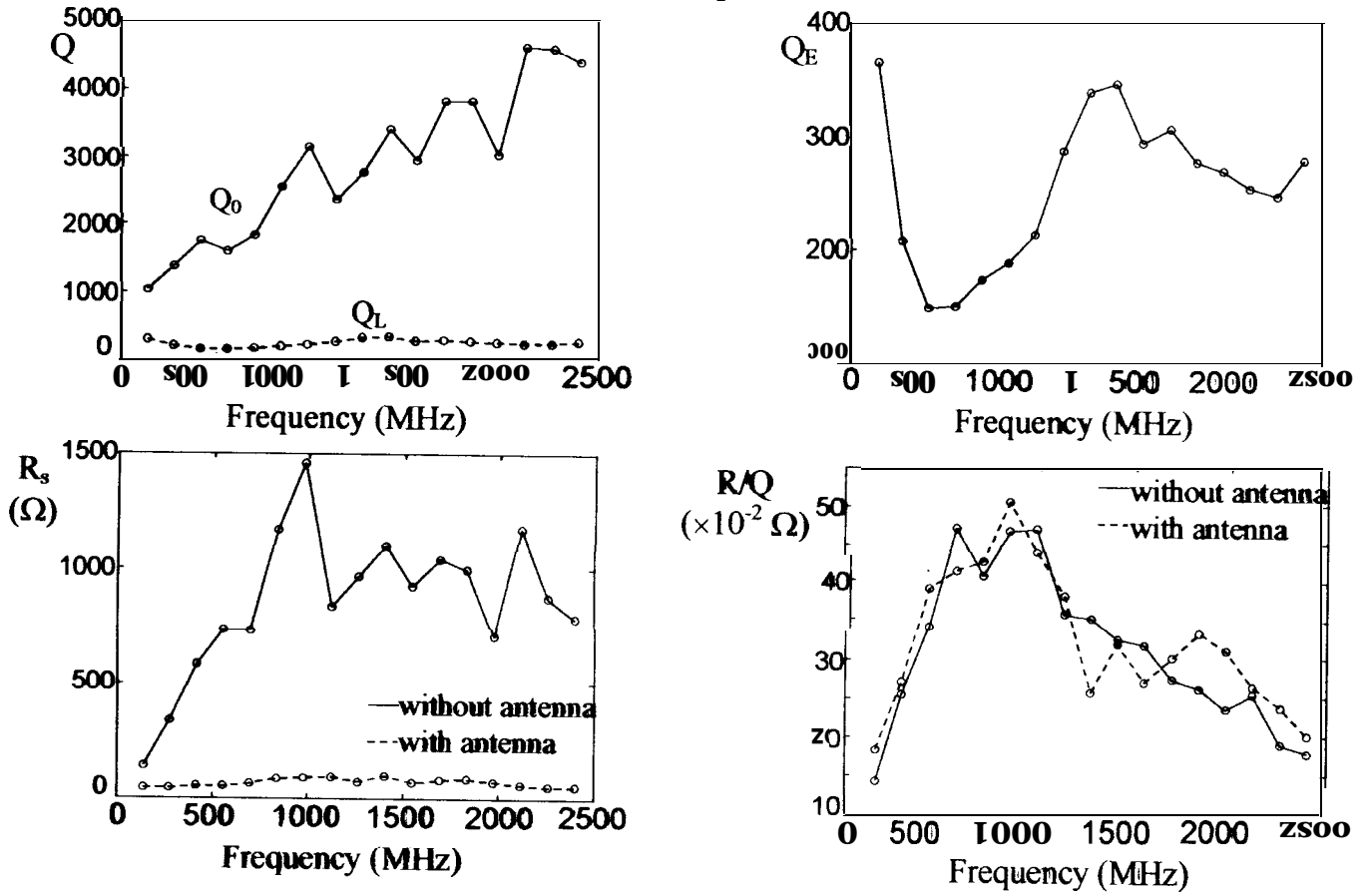
0.01 V/m

ANDAMENTO DEL CAMPO ELETTRICO IN PROSSIMITA' DELLE STRIPS DI CONNESSIONE

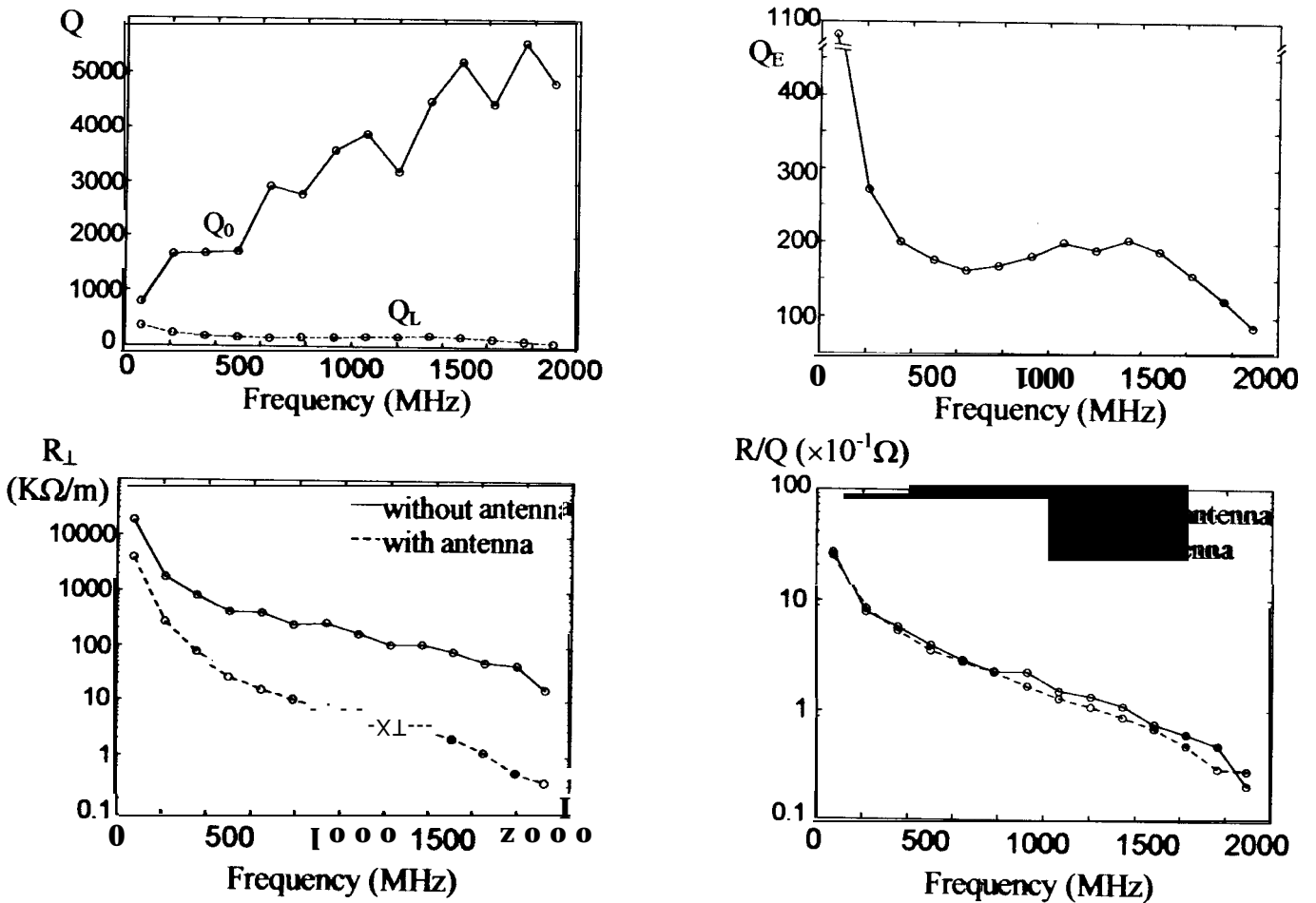


2A.2 HFSS SIMULATIONS

longitudinal impedances

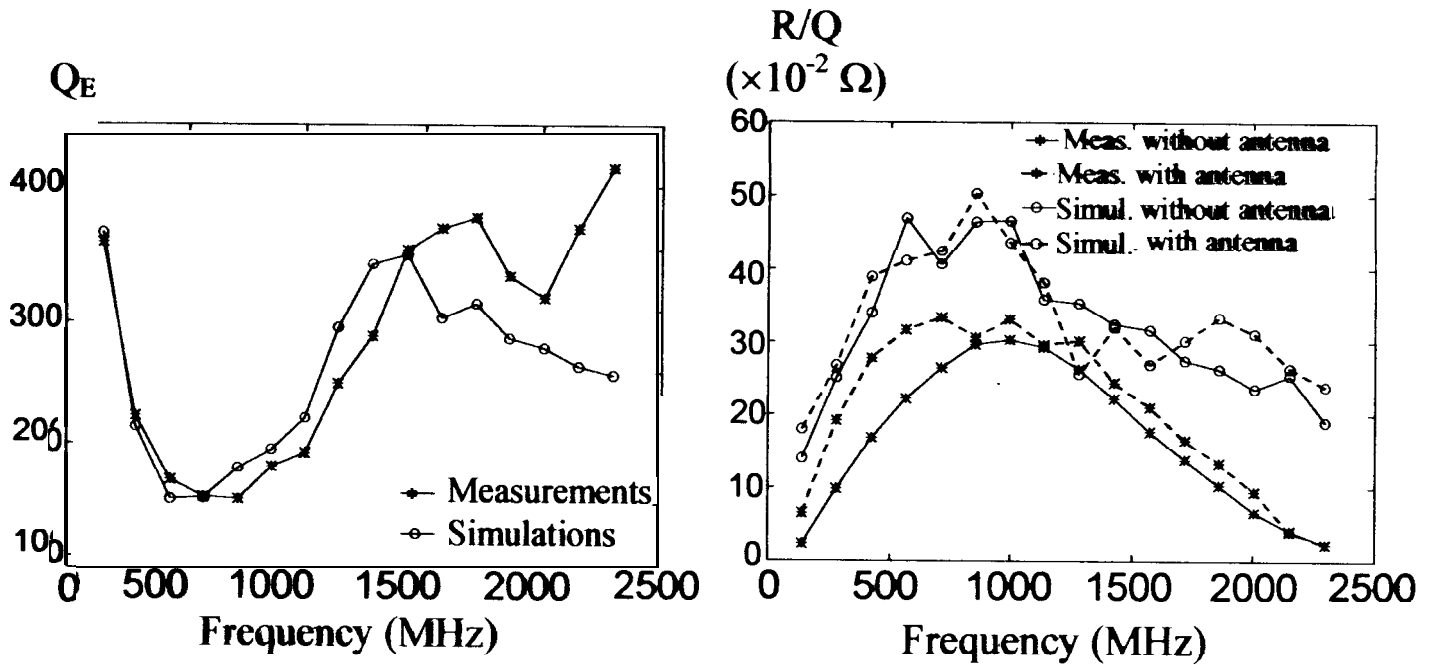


transverse impedances

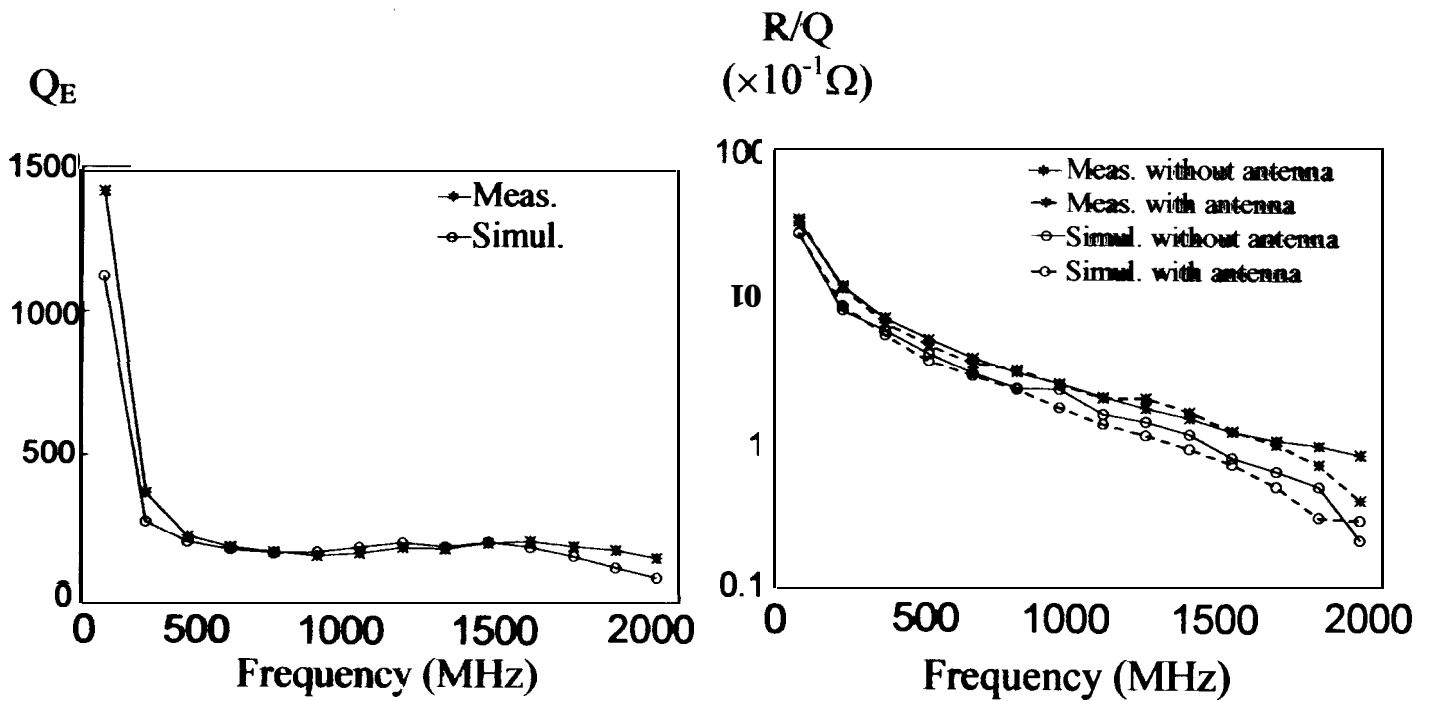


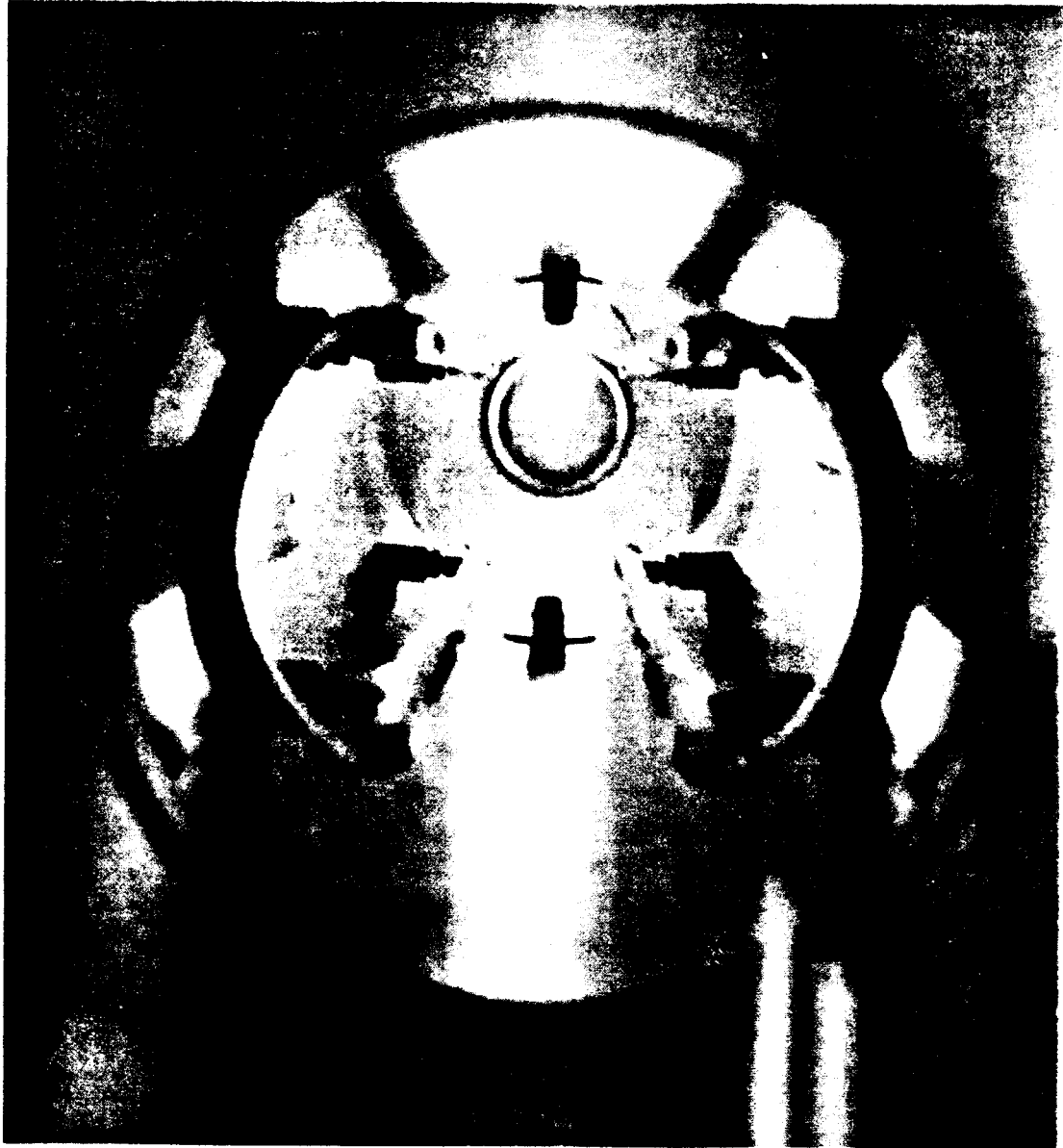
2B.1 WIRE MEASUREMENTS ON A PROTOTYPE

longitudinal impedances



transverse impedances

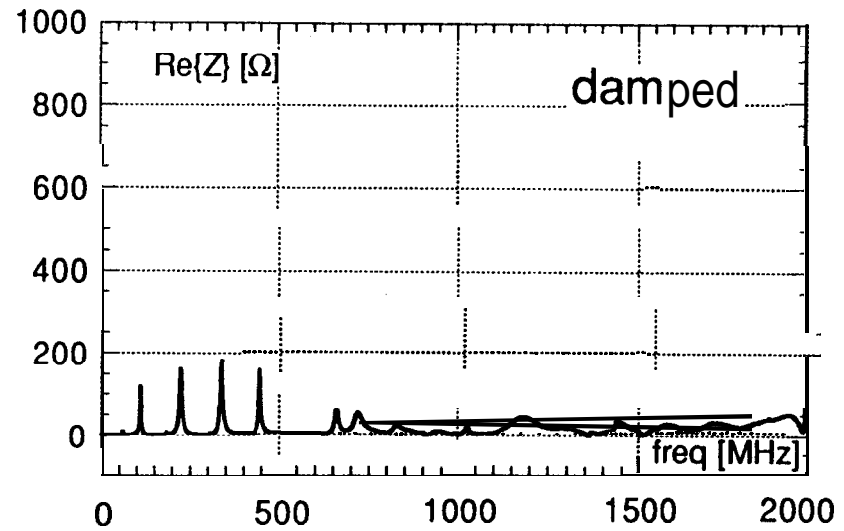
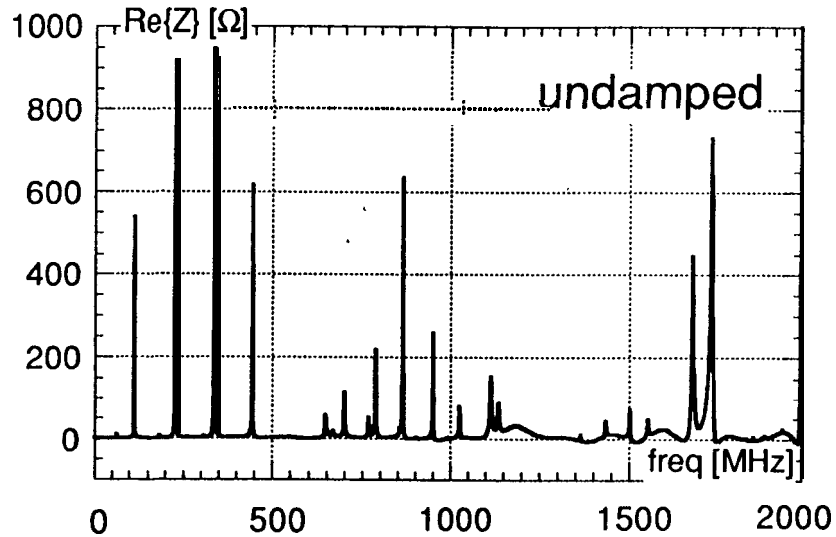




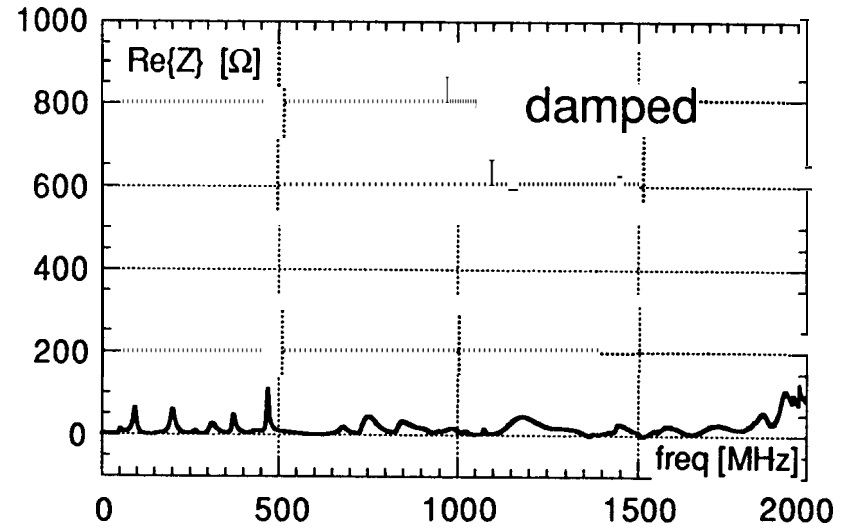
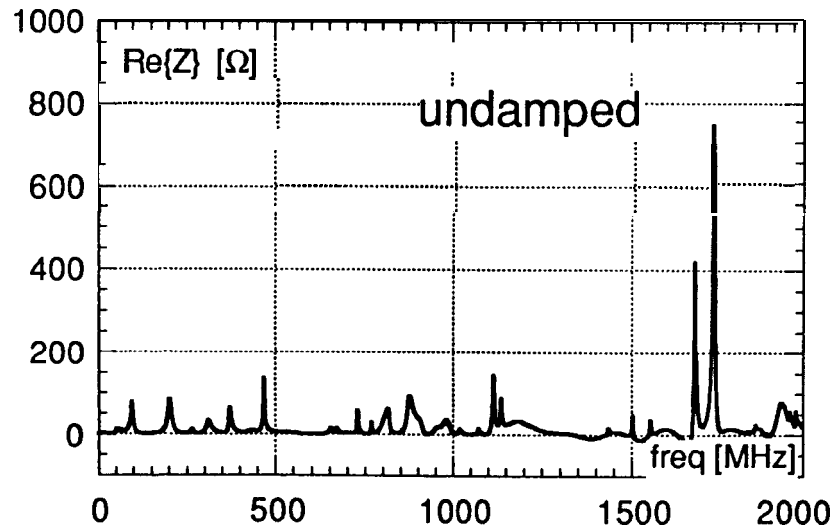
Injection Kicker (“long” type) - measured on Feb 2000

Longitudinal coupling impedances

external circuit not connected



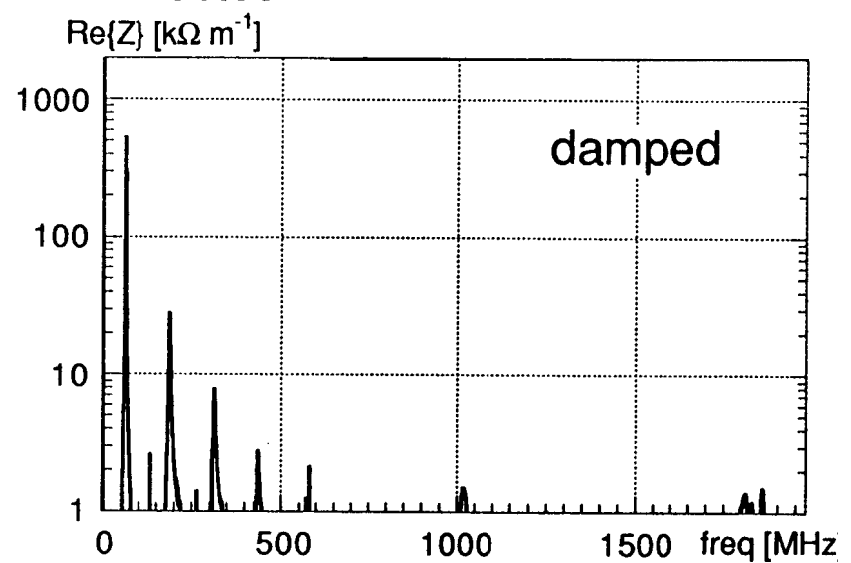
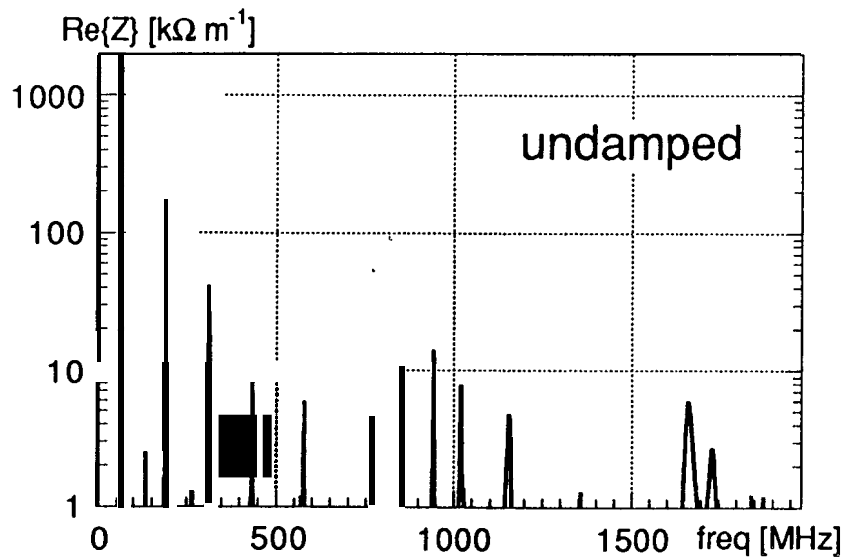
external circuit connected



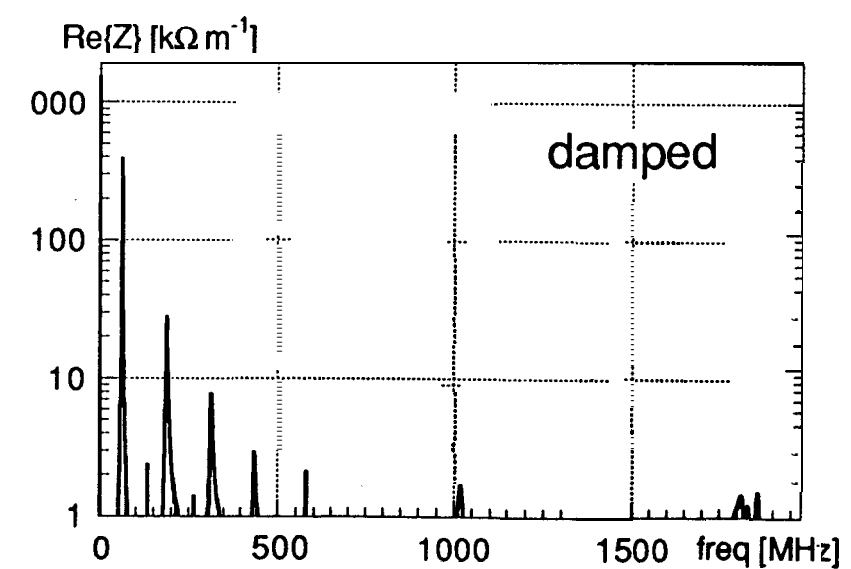
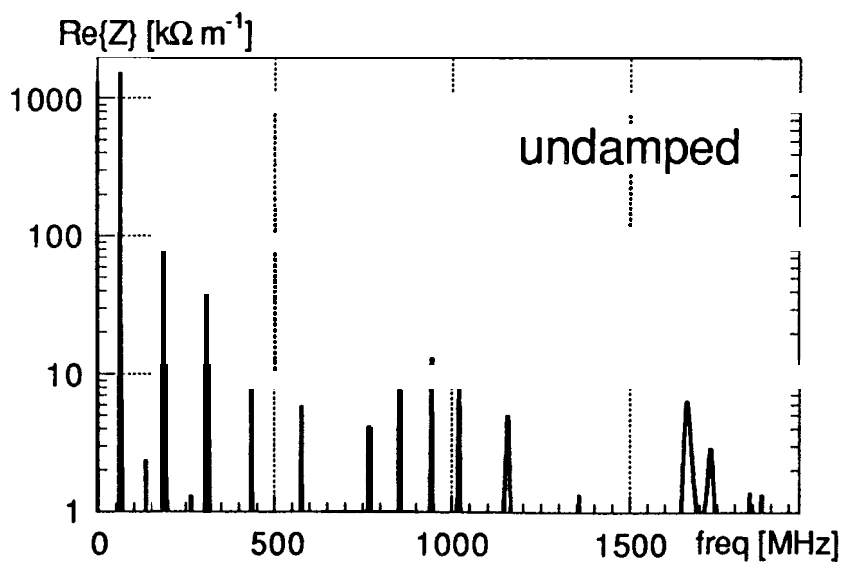
Injection Kicker ("long" type) - measured on Feb 2000

Vertical coupling impedances

external circuit not connected



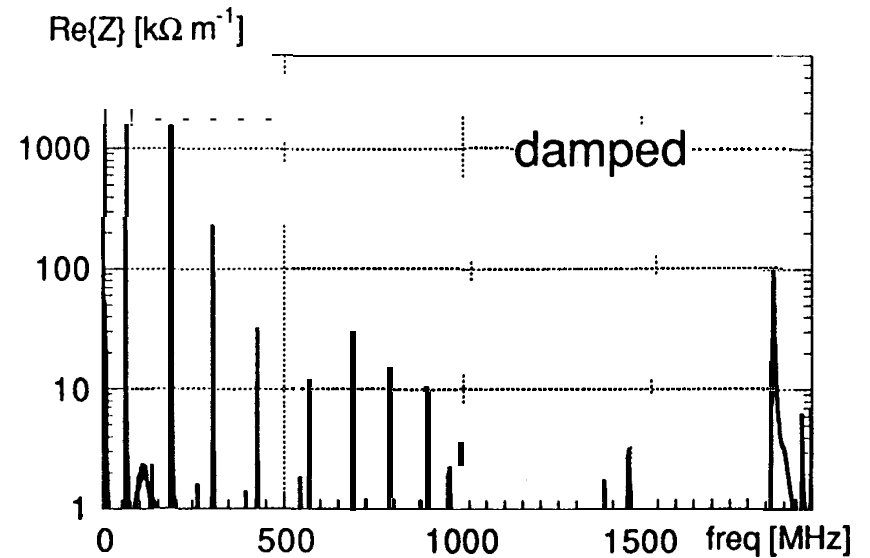
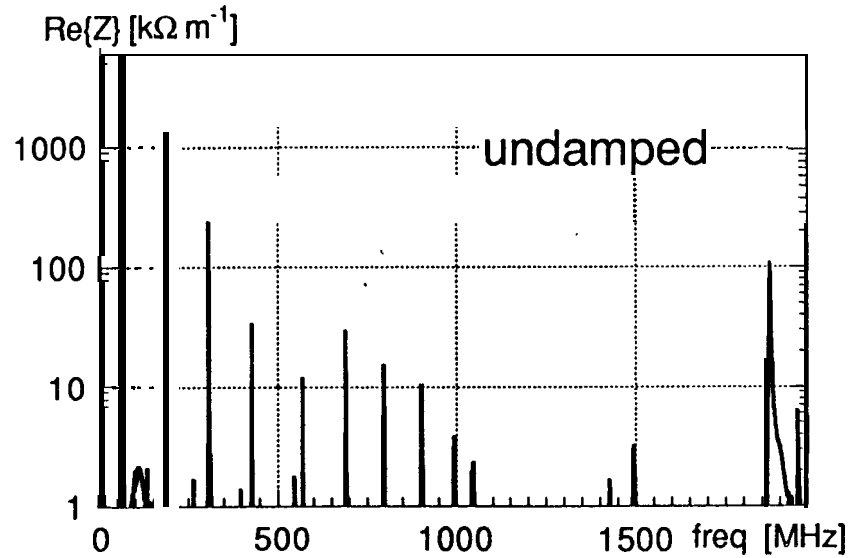
external circuit connected



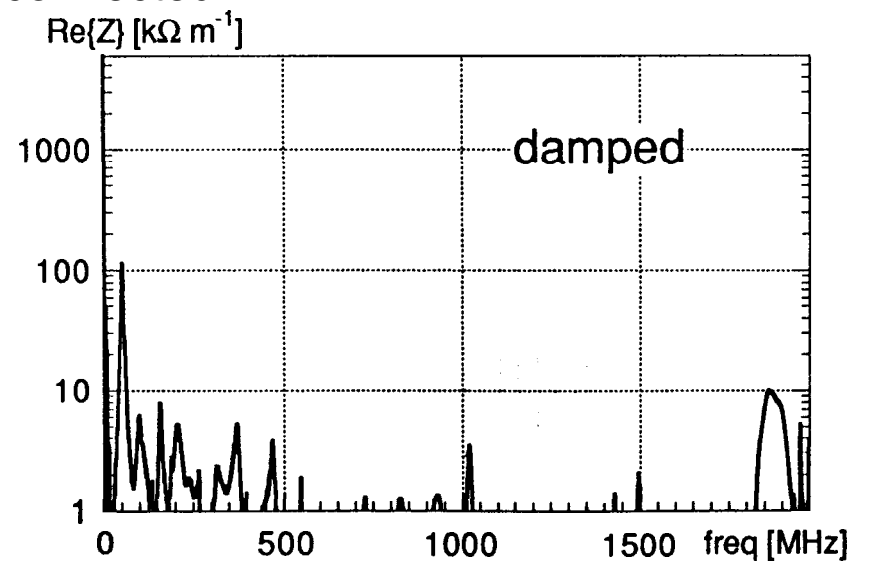
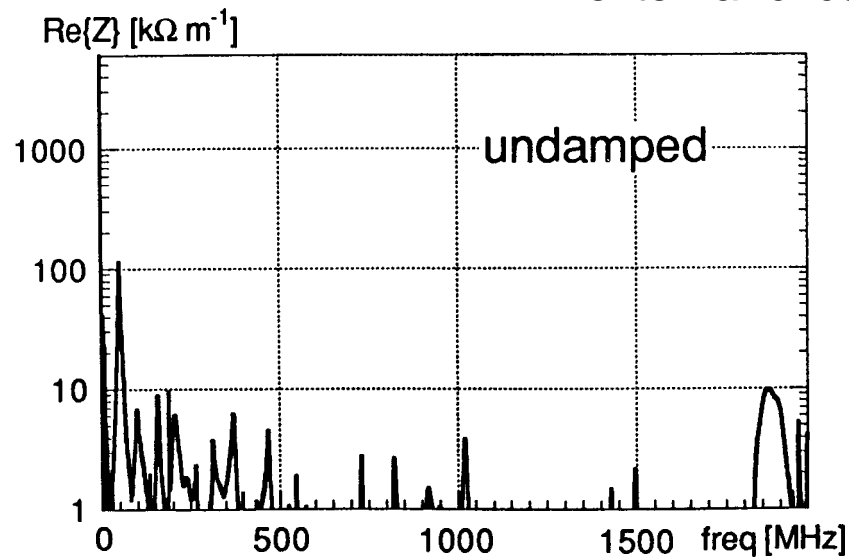
Injection Kicker ("long" type) - measured on Feb 2000

Horizontal coupling impedances

external circuit not connected

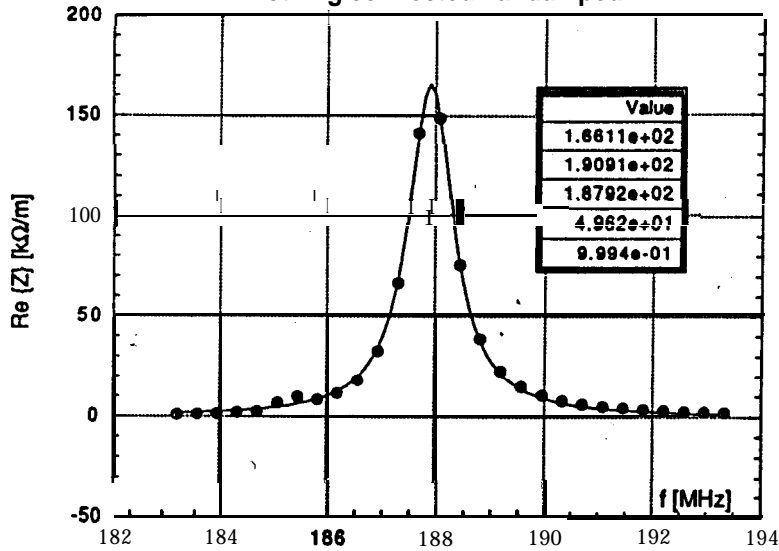


external circuit connected

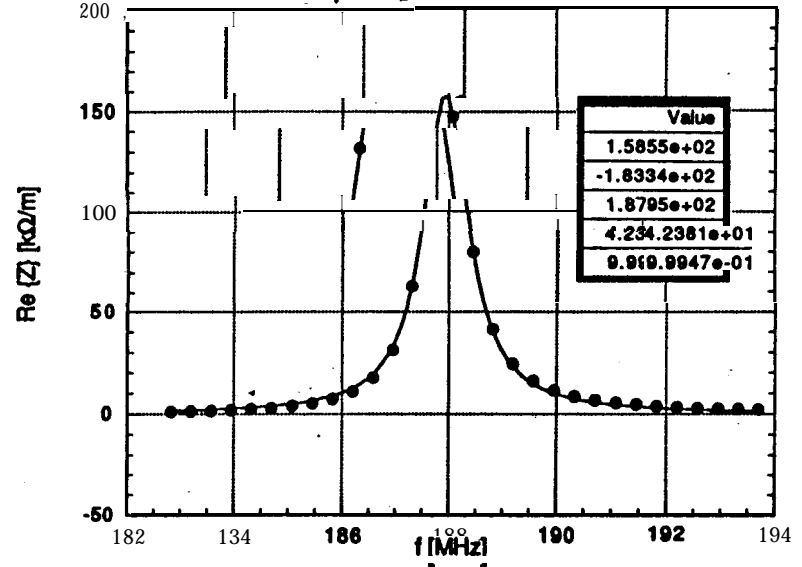


EXAMPLES OF MEASUREMENT FITS

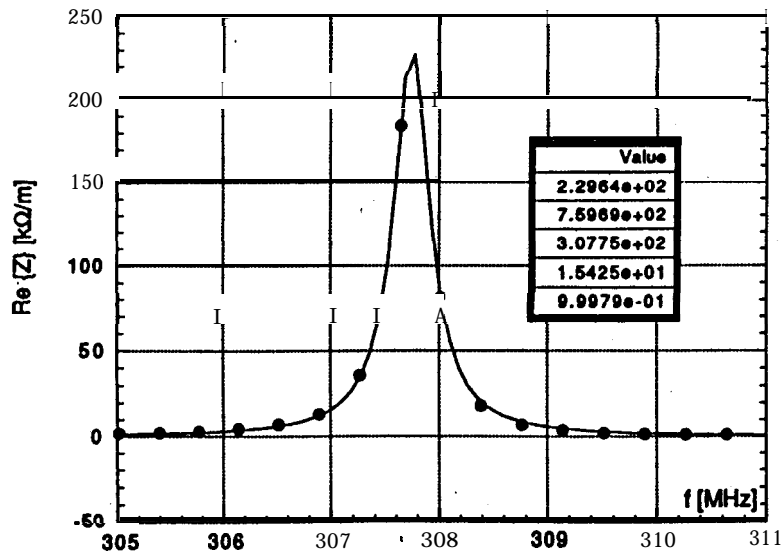
vertical
nothing connected - undamped



vertical
everything connected - undamped



horizontal
nothing connected - undamped



horizontal
nothing connected - damped

