Multi-Mode DLDS Activity in 1998-1999 at KEK

KEK

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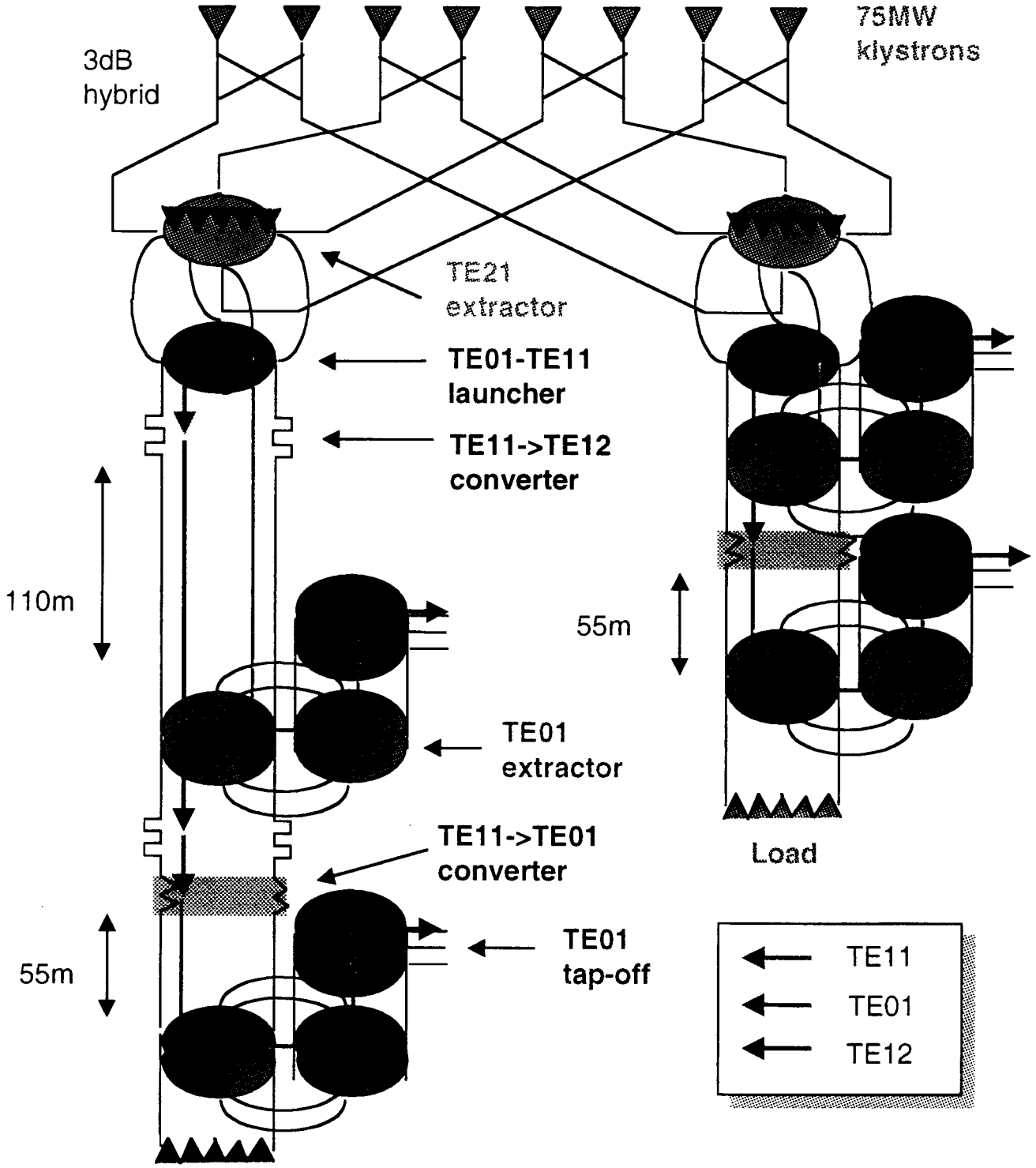
SLAC
January 25-28 , 1999

Present Status and Plan

- Main activities since July 1998
  - Design, fabrication and testing of 2x2 DLDS basic unit (cold model).
    - For details --> Yamaguchi
  - Design, fabrication and preparation for the joint mode-stability experiment at ATF
    - For details --> Next session by Chin
  - Component design development
    - New TE01 mode 90-degree bend by Kazakov
- Activity plan in 1999
  - Continuous testing of 2x2 DLDS basic unit cold model.
  - Preparation and execution of the joint mode-stability experiment at ATF with SLAC in summer
  - Design and cold model testing of new components such as 90-degree bend and tap
  - Fabrication and testing of high power models
  - Study of attachment method for flange to waveguide

2 x 2 DLDS

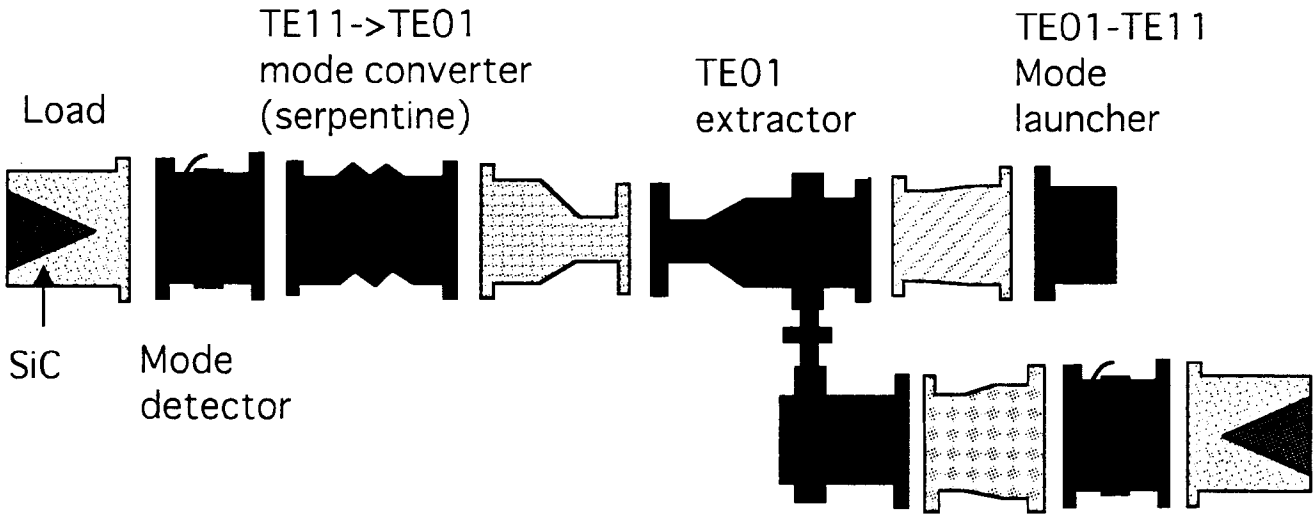

3dB
hybrid
75MW
klystrons
TE21
extractor
TE01-TE11
launcher
TE11->TE12
converter
110m
55m
TE01
extractor
TE11->TE01
converter
55m
TE01
tap-off
Load
TE11
TE01
TE12

Comparison between 2X2 and 3+1 Mode DLDS

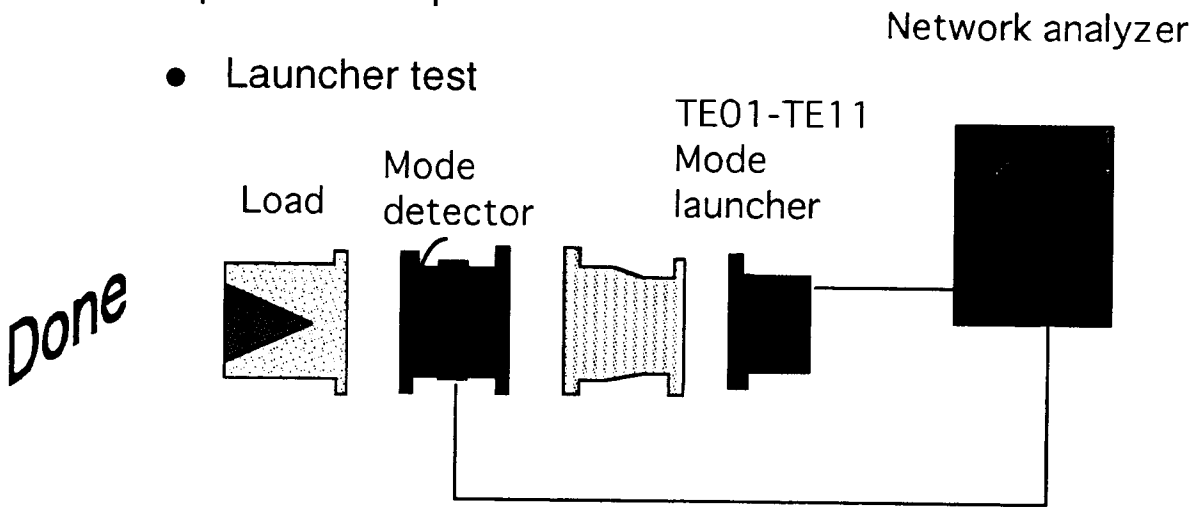
Item	2x2	3+1
■ Protection	OK	OK
■ Expandability to 4/5,4/6 DLDS	Easy	Difficult
■ Max. power in rect. pipe	150 MW	150 MW
■ Number of components	30	30
• Launcher	2	1
• TE01 extractor	4	2
• 180 degree bend	0	1
• Bellow	2	4
• Serpentine	2	2
• 3 dB hybrid	4	4
• Load	4	4
• Tap-off	12	12
■ Cost		**Cheaper**
• Total waveguide length	220m	165m
• Max. number of pipes at cross-section	10	7
■ Efficiency	**Better**	
• Total length for TE01	220 m	165 m
• Total length for TE12	110 m	165 m
• Total number of components that modes pass	11	18

Cold Model Testing of 2x2 DLDS Basic Unit

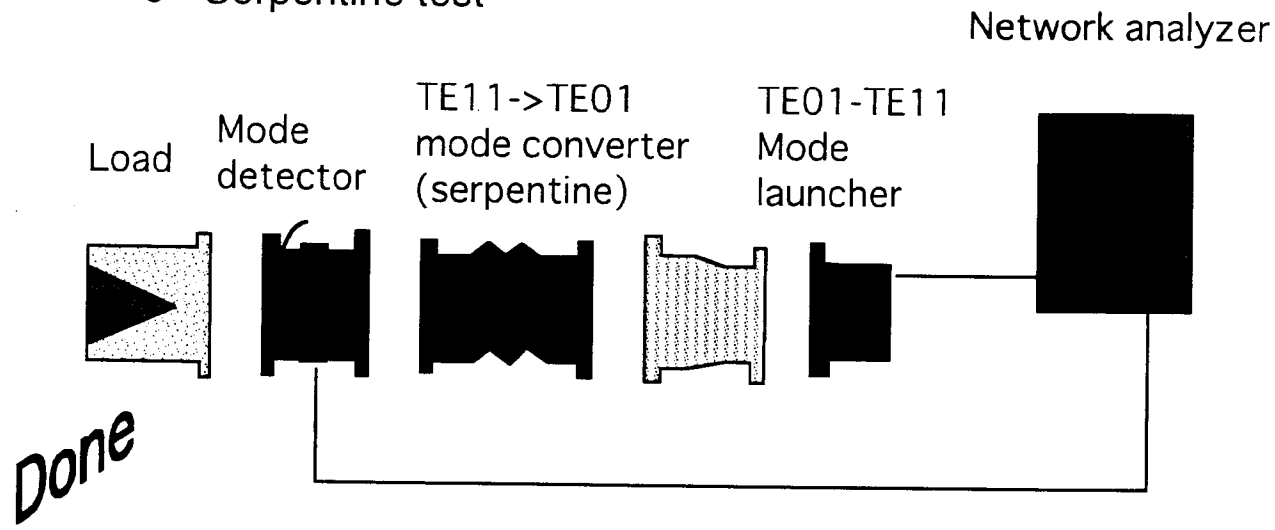
- Purposes:
  - To demonstrate that the 2x2 DLDS really works, as designed.
  - To check the accuracy of calculations
  - To find possible problems for design and fabrication of high power models
- Test unit (all ordered)
  - TE01+TE11 mode launcher
  - TE01 mode extractor
  - TE11 --> TE01 mode converter (serpentine)
  - 2 mode detector
  - 4 tapers
  - 2 loads



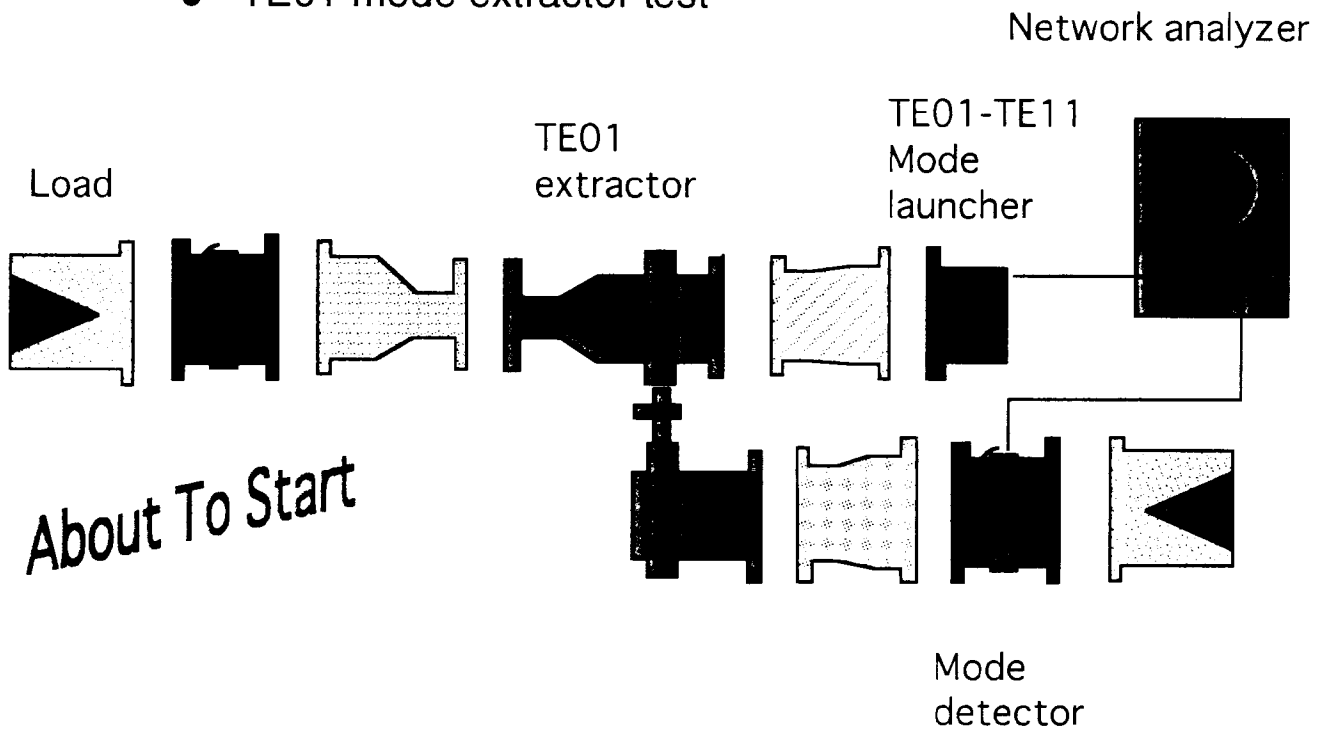
- HFSS shows that all components have efficiency of about 99%.
- Experimental procedure:
  - Launcher test



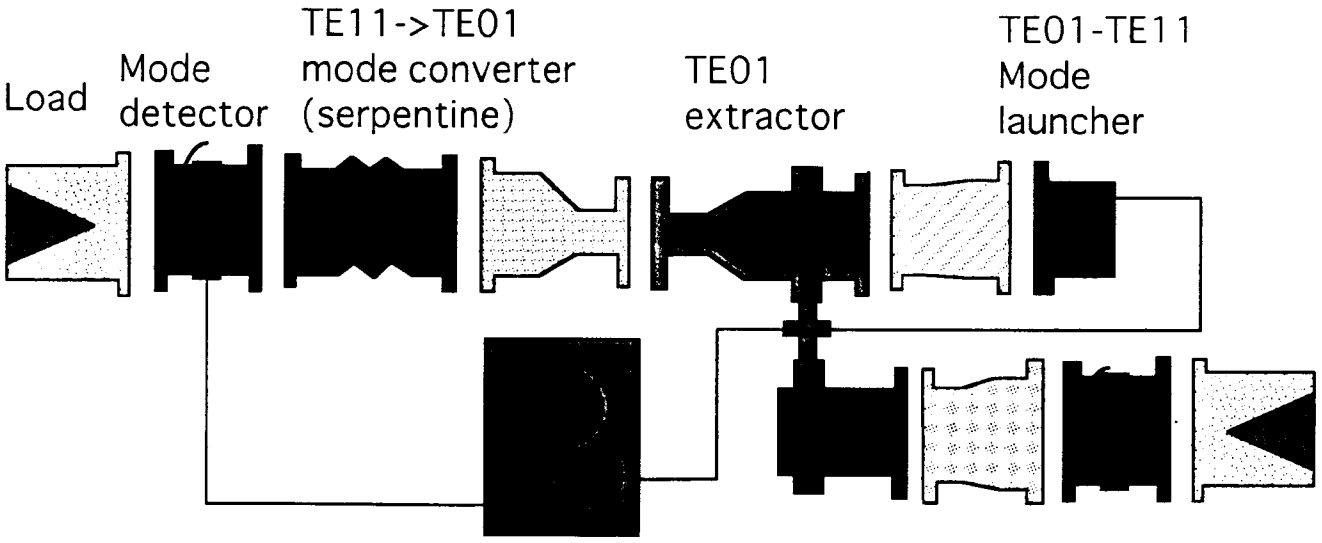
  - Serpentine test

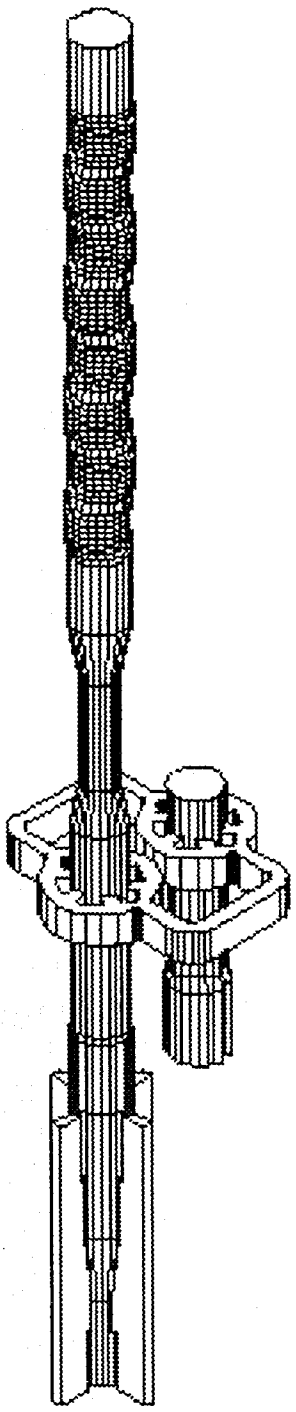


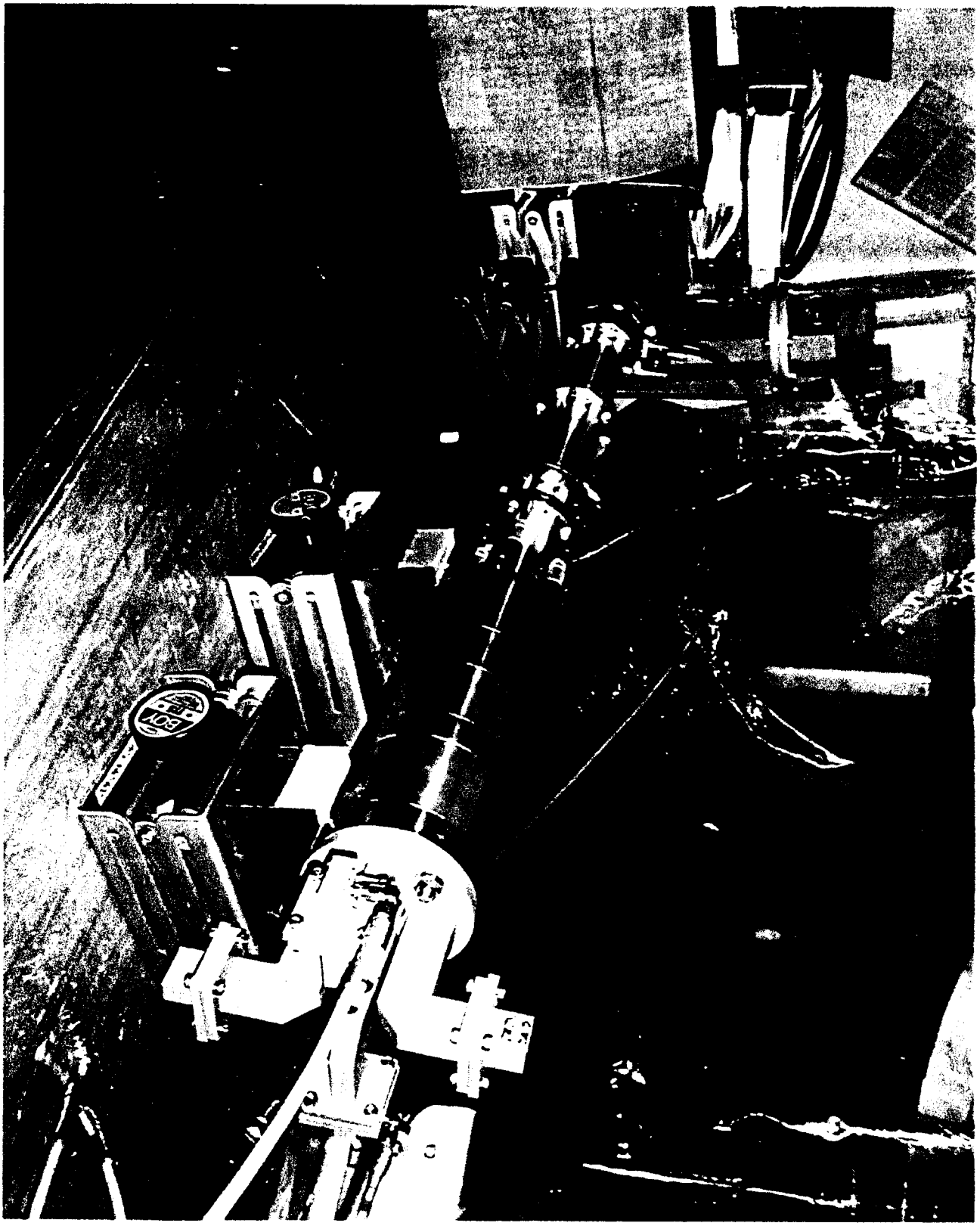
- TE01 mode extractor test

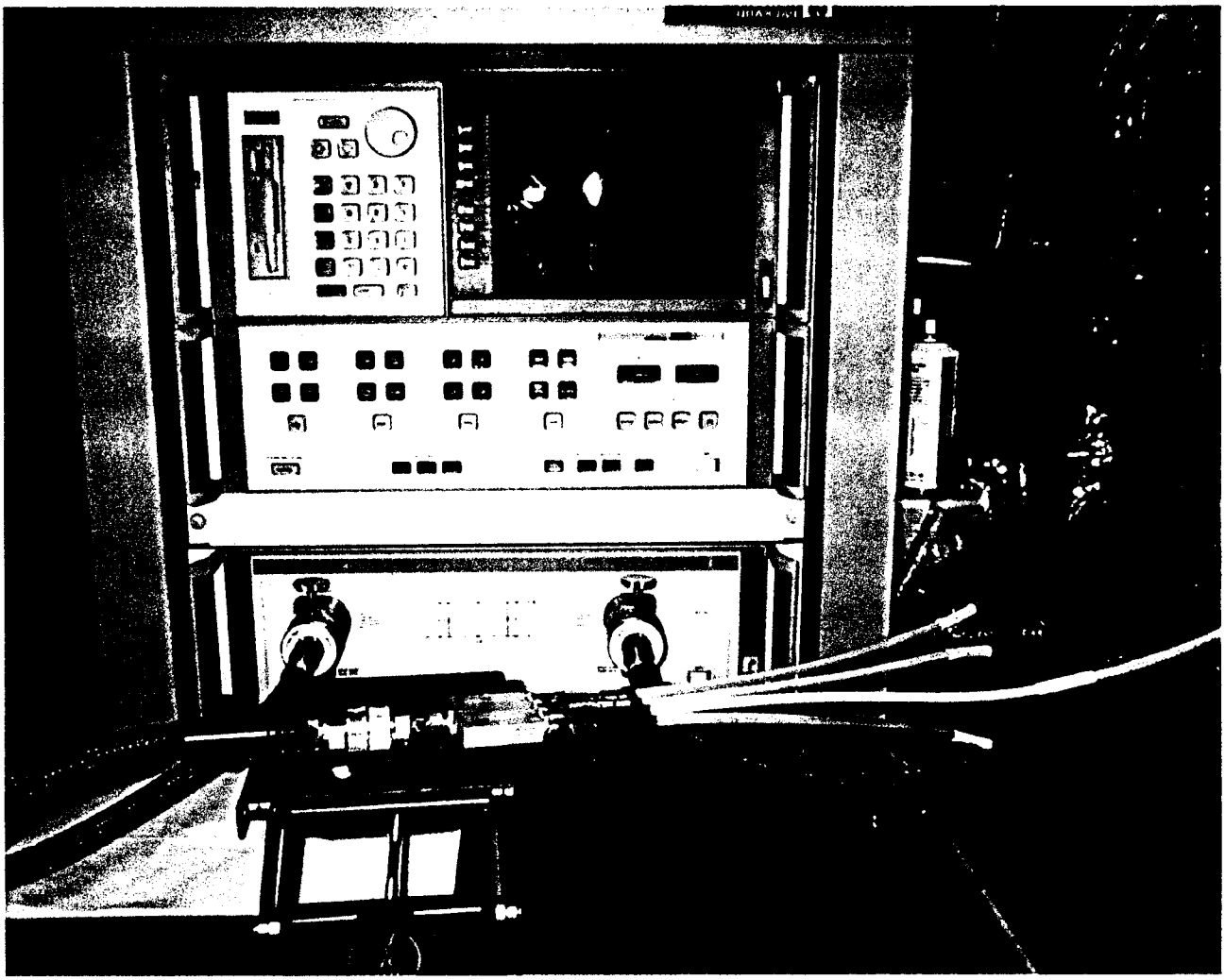


- Test of the whole unit

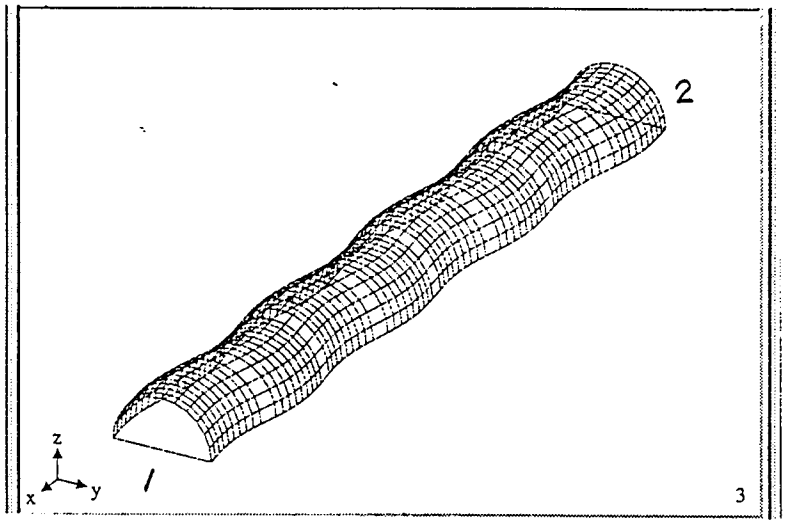








Serpentine

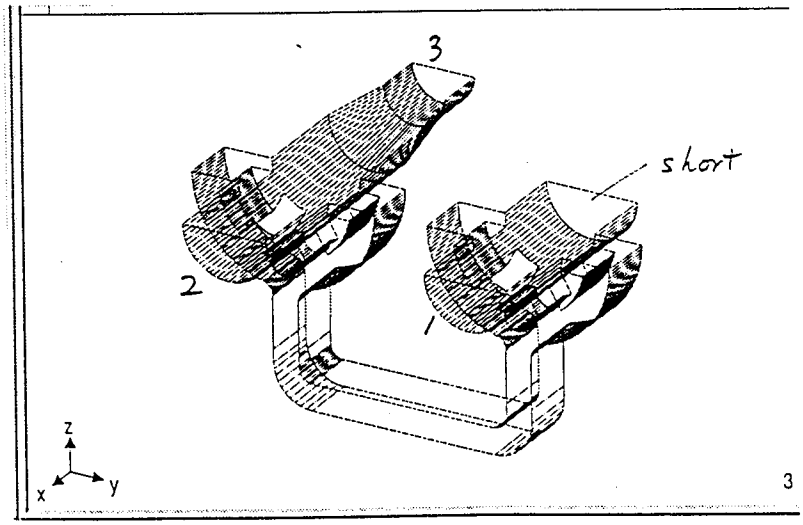


$TE_{11} \longrightarrow TE_{01}$

$S_{21} = 0.9952$

Power: ~ 99%

Mode Extractor



TE_{11} TM_{11}

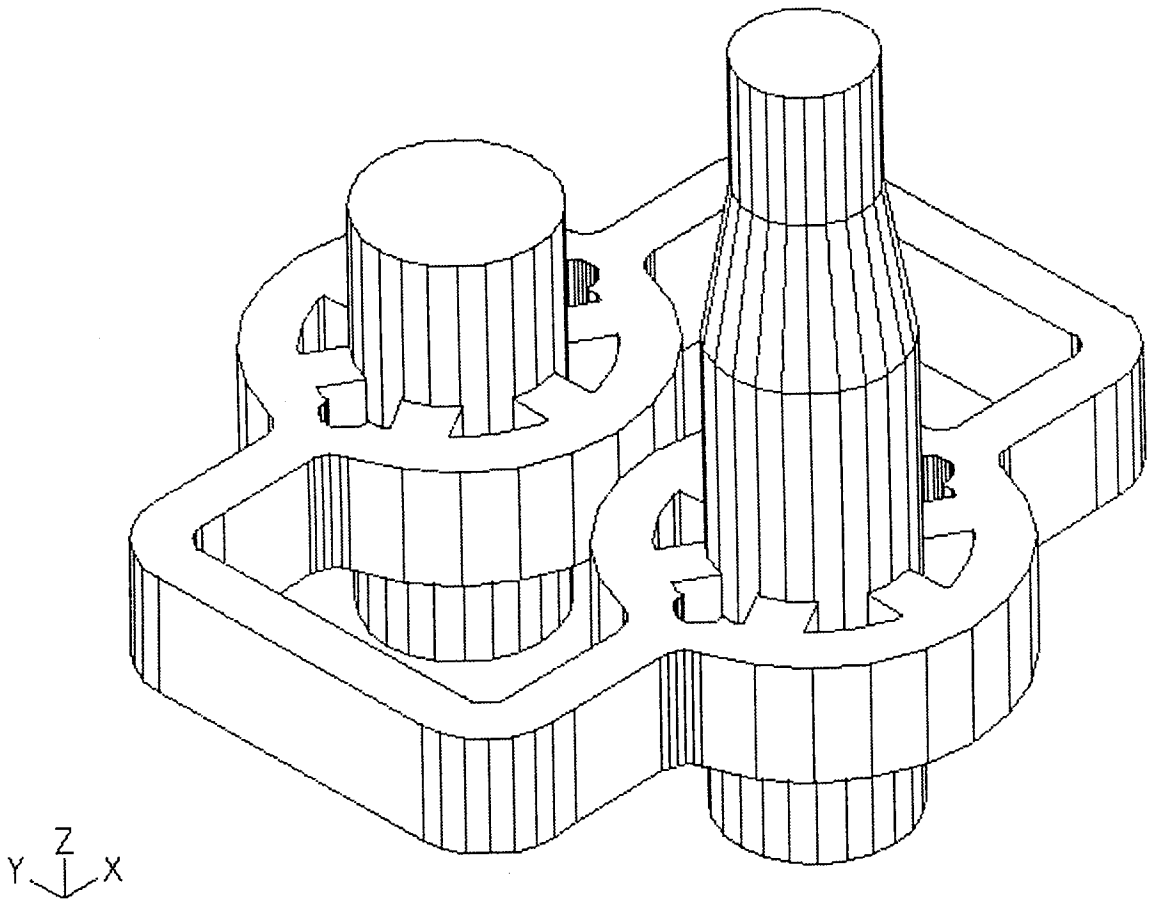
$S_{32} = 0.9866$ $S_{22} = 0.15$

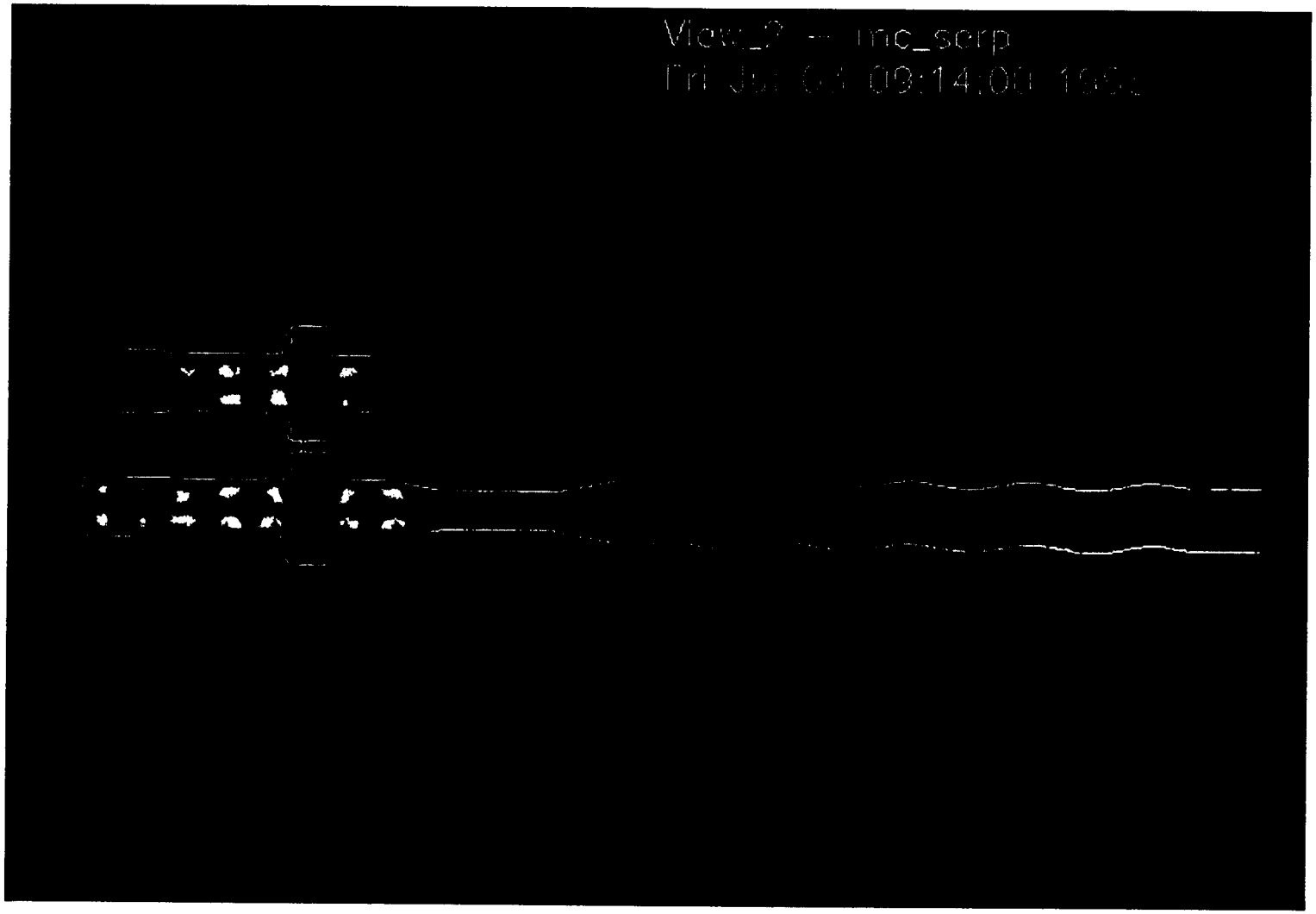
Power: ~ 97%

TE_{01}

$S_{12} = 0.9960$

power: ~ 99%


Z
Y
X



TE_{01}

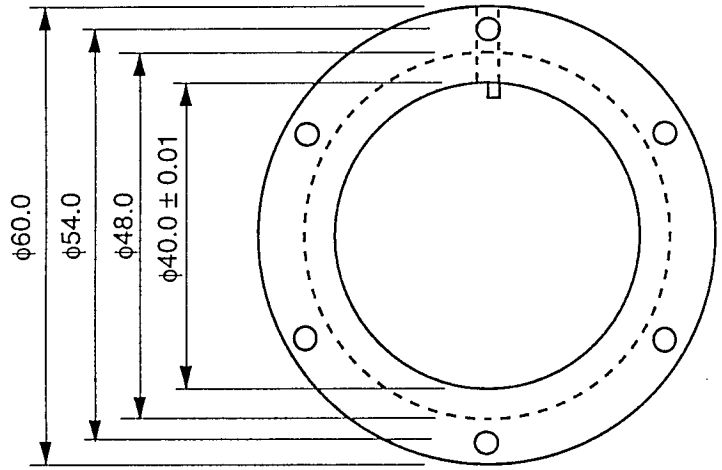
$S_{21} = 0.9832$

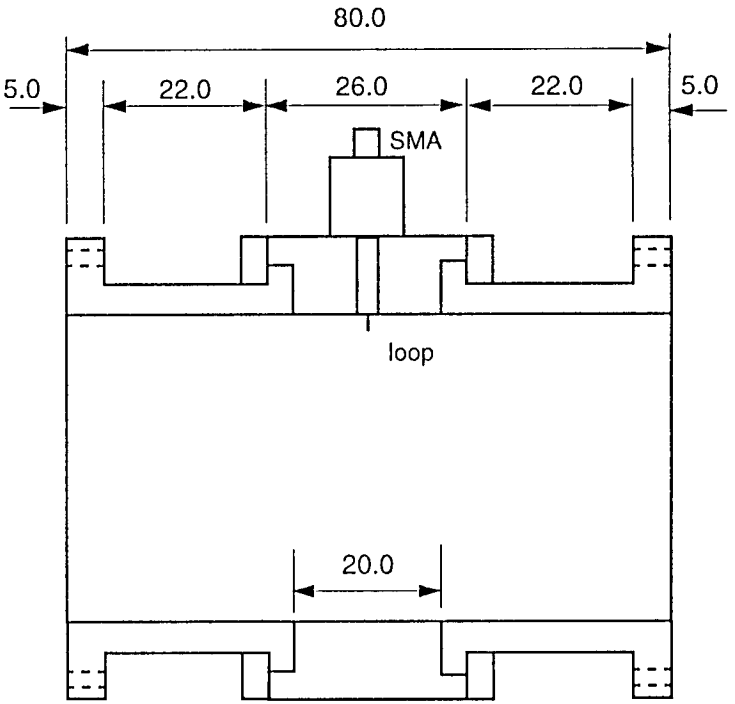
Power ~ 96%

$TE_{11} \dashrightarrow TE_{01}$

$S_{23} = 0.9743$

Power ~ 95,





$f_c = 9.1$ GHz for TE_{01}

$f_c = 4.4$ " " TE_{11}

1	WAVE GUIDE	BRASS		
PART NO.	NAME	MATERIAL	SIZE	SPEC

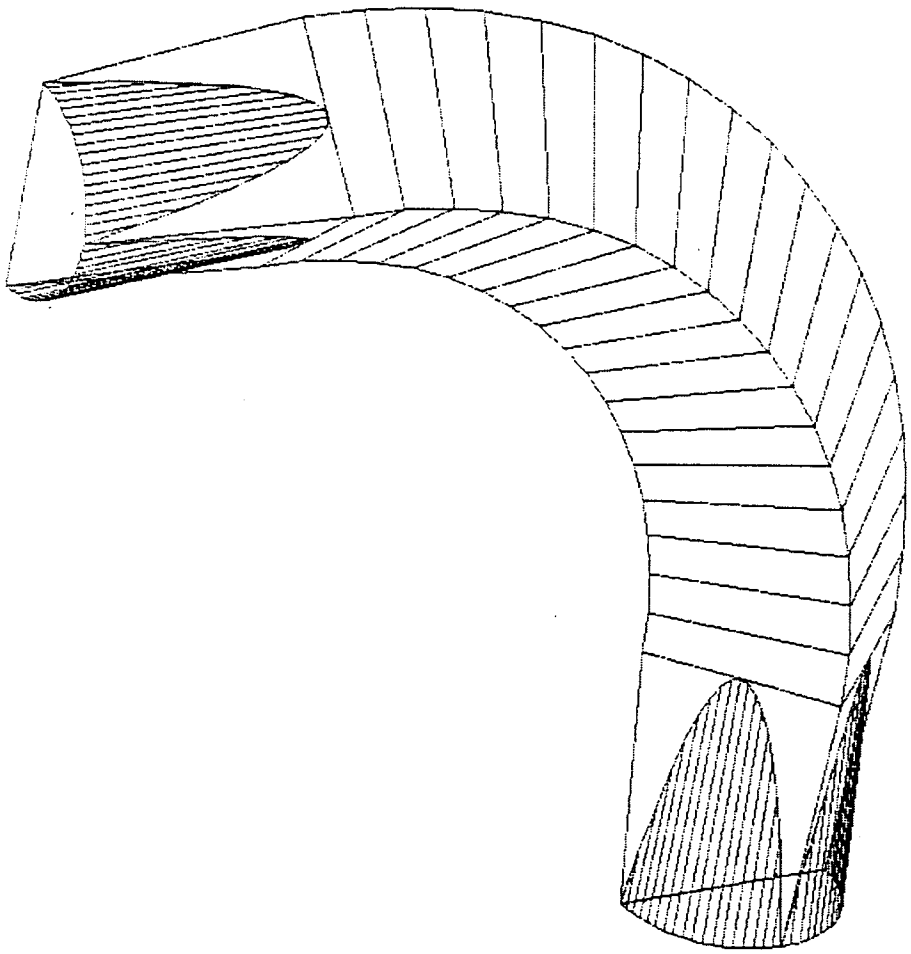
TITLE

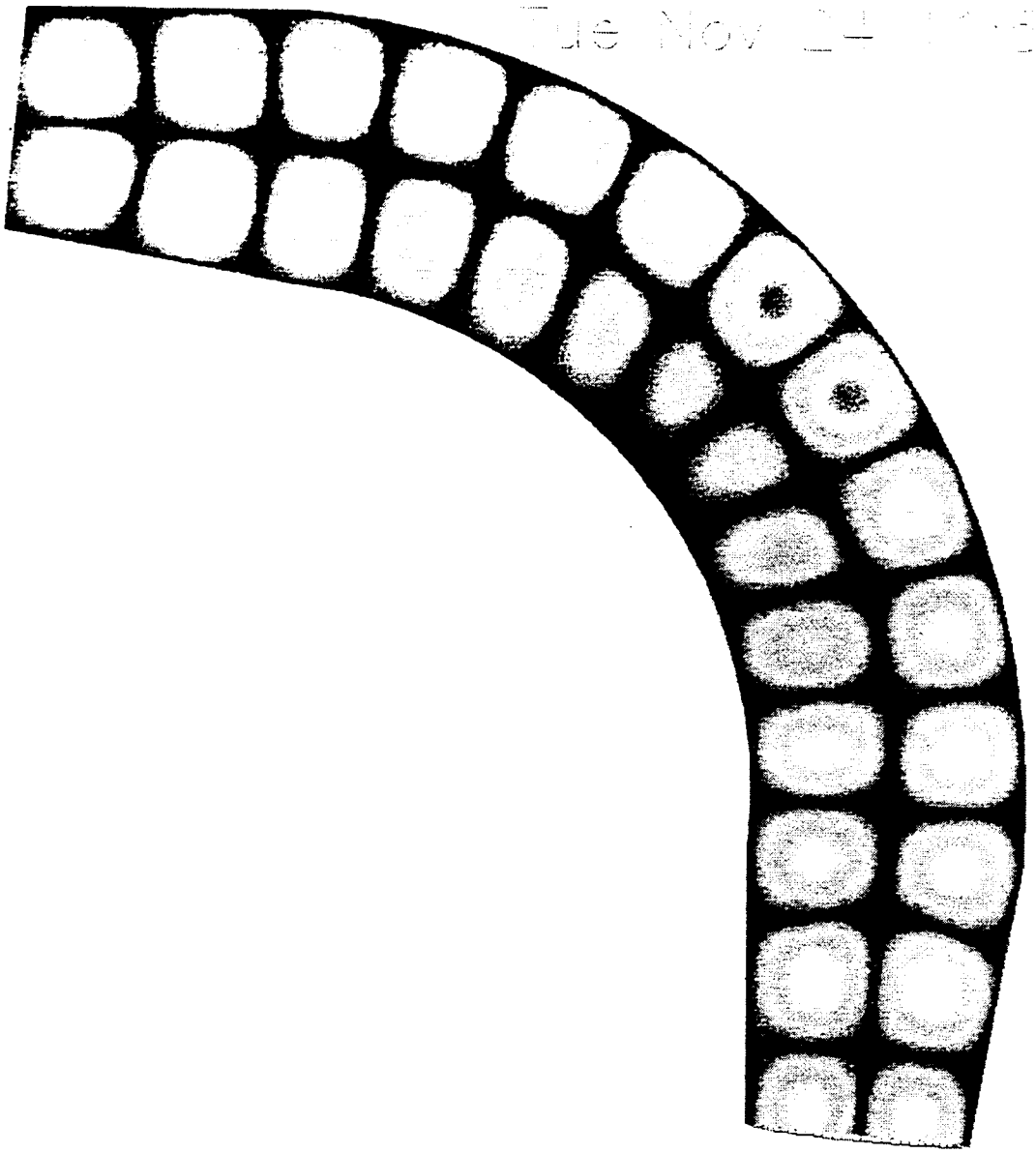
Detecting device for DLDS cold tests

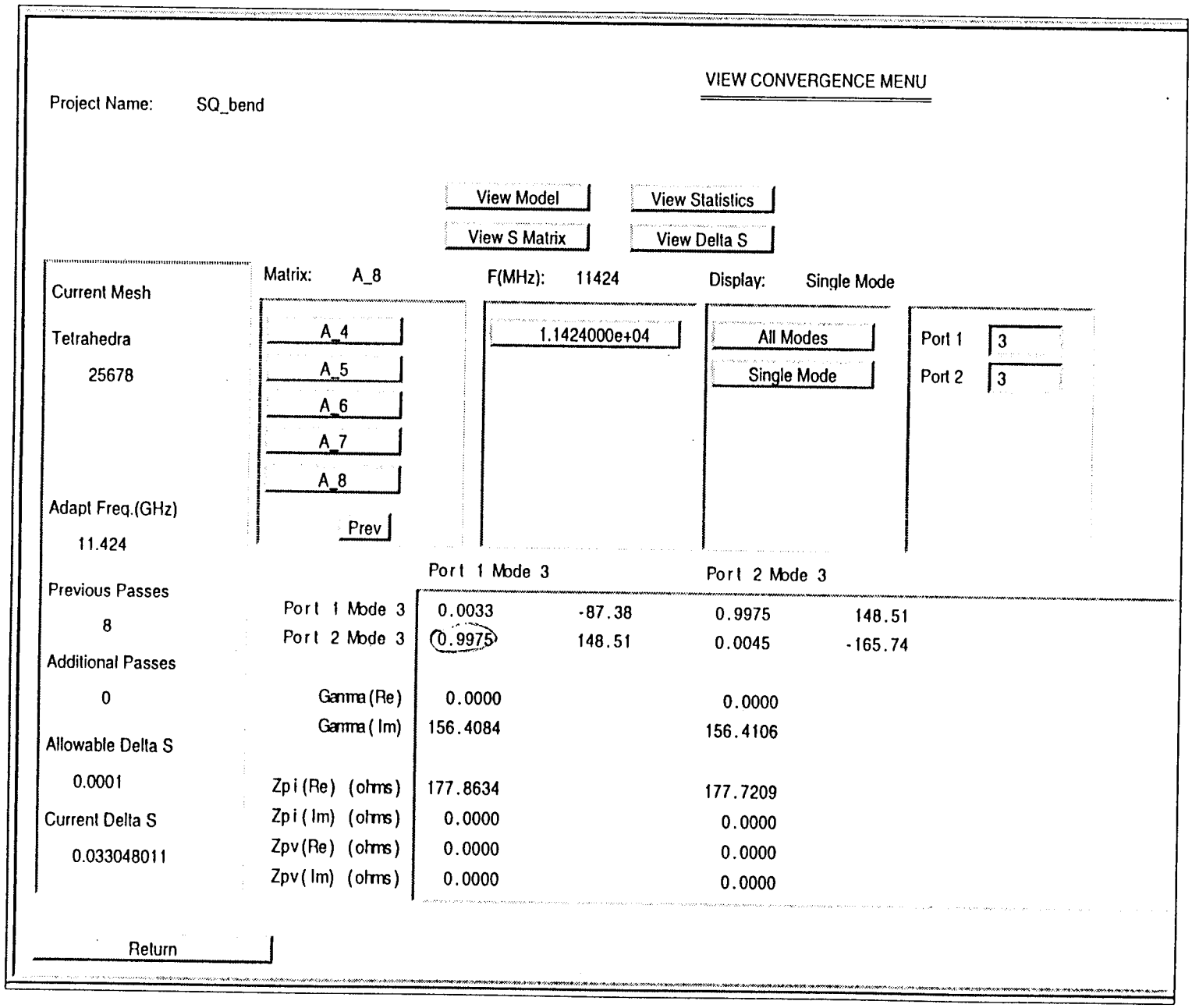
KEK	DR S.Y.	SCALE 1/1	DWG NO. 980630001

TE01, 90deg. BEND

24-Nov-98






VIEW CONVERGENCE MENU
Project Name: SQ_bend
View Model
View Statistics
View S Matrix
View Delta S
Matrix: A_8
F(MHz): 11424
Display: Single Mode
Current Mesh
Tetrahedra
25678
A_4
A_5
A_6
A_7
A_8
Prev
1.1424000e+04
All Modes
Single Mode
Port 1 3
Port 2 3
Adapt Freq.(GHz)
11.424
Previous Passes
8
Additional Passes
0
Allowable Delta S
0.0001
Current Delta S
0.033048011
Port 1 Mode 3
Port 2 Mode 3
Port 1 Mode 3 0.0033 -87.38 0.9975 148.51
Port 2 Mode 3 0.9975 148.51 0.0045 -165.74
Gamma (Re) 0.0000 0.0000
Gamma (Im) 156.4084 156.4106
Zpi (Re) (ohms) 177.8634 177.7209
Zpi (Im) (ohms) 0.0000 0.0000
Zpv (Re) (ohms) 0.0000 0.0000
Zpv (Im) (ohms) 0.0000 0.0000
Return