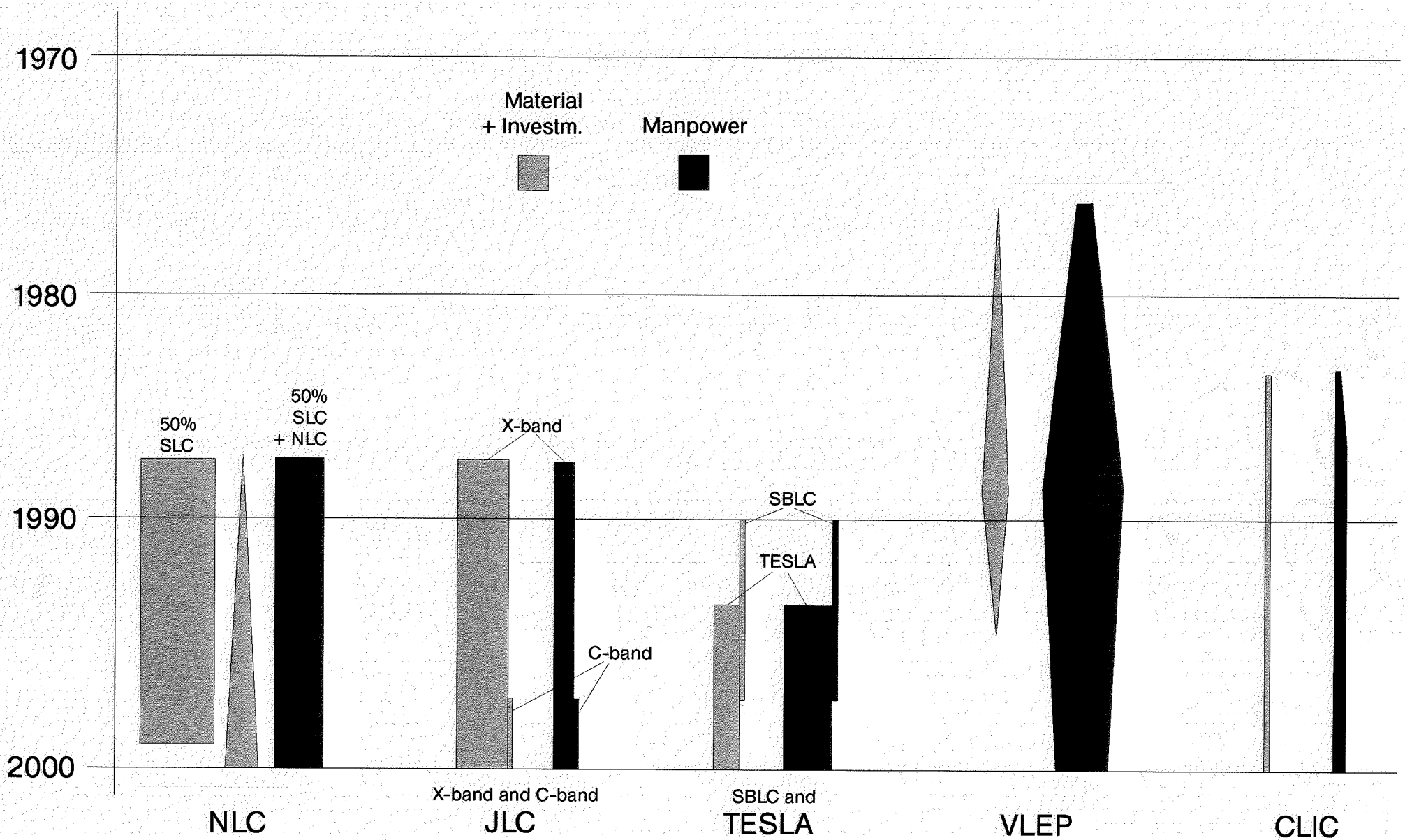
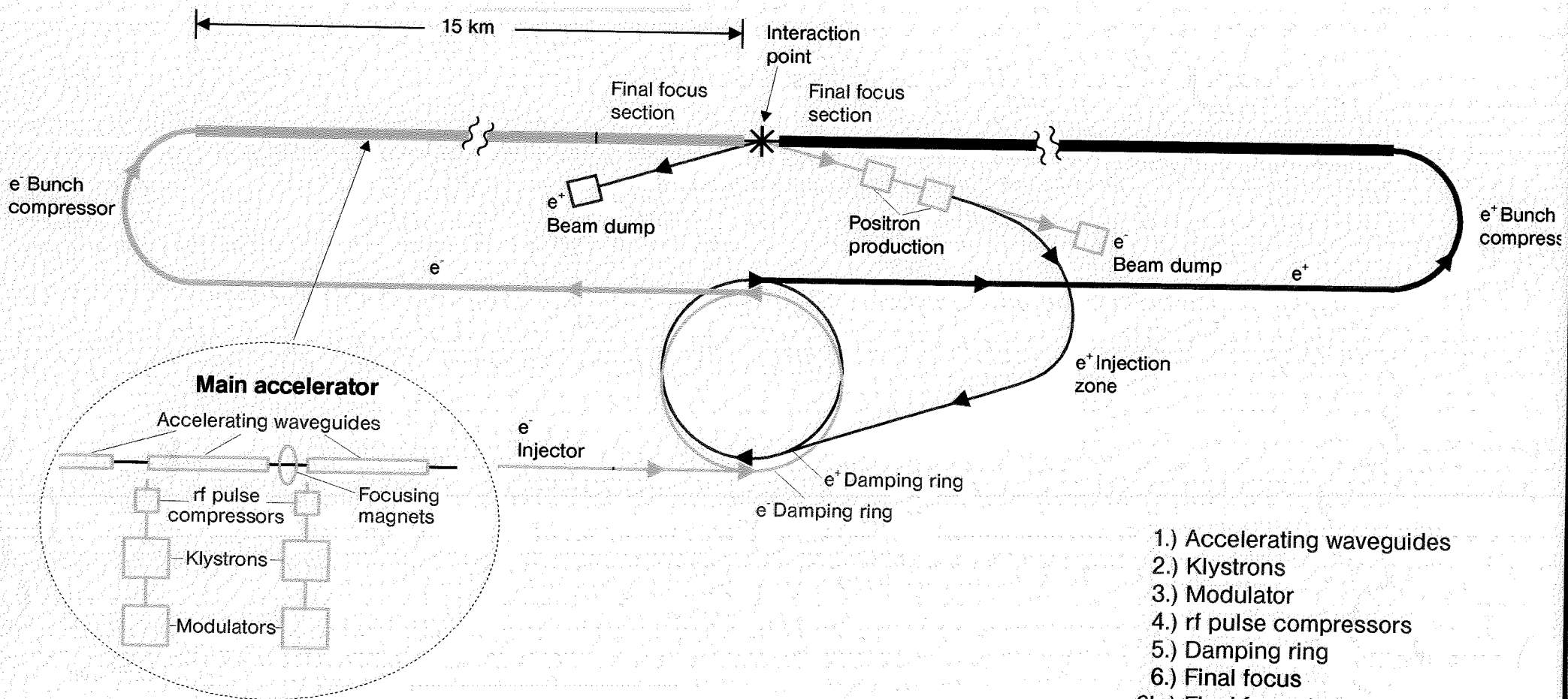

1970
1980
1990
2000
Material
+ Investm.
Manpower
50%
SLC
50%
SLC
+ NLC
X-band
C-band
SBLC
TESLA
NLC
X-band and C-band
JLC
SBLC and
TESLA
VLEP
CLIC

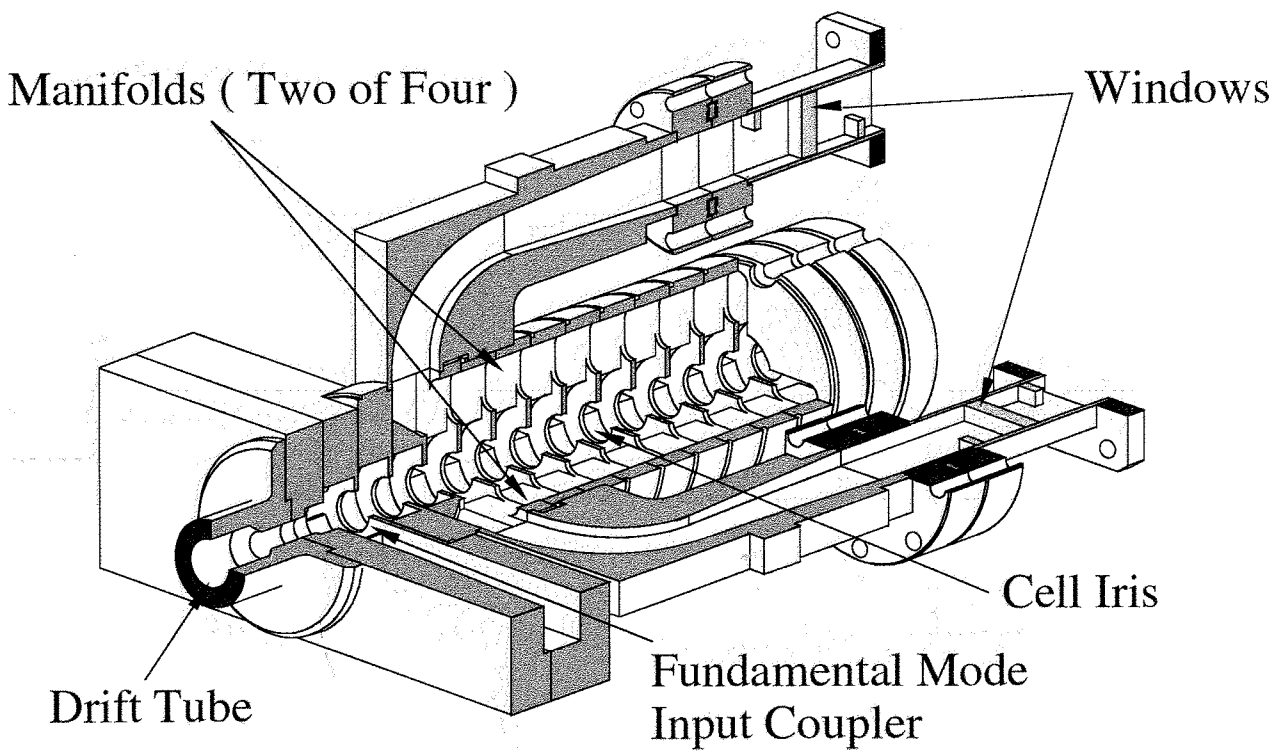


1.) Accelerating waveguides
2.) Klystrons
3.) Modulator
4.) rf pulse compressors
5.) Damping ring
6.) Final focus
6b.) Final focus test
7.) Test set-up
8.) Positron production
9.) Bunch compressors
10.) Beam dumps

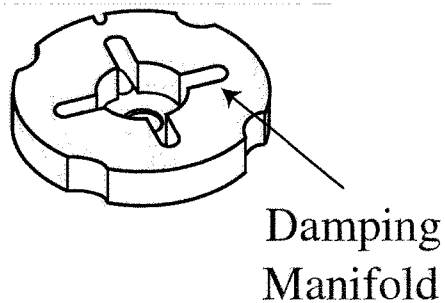
Accelerating Waveguides

GAVOSS&MPYNTVOSS, JUL15/10:42

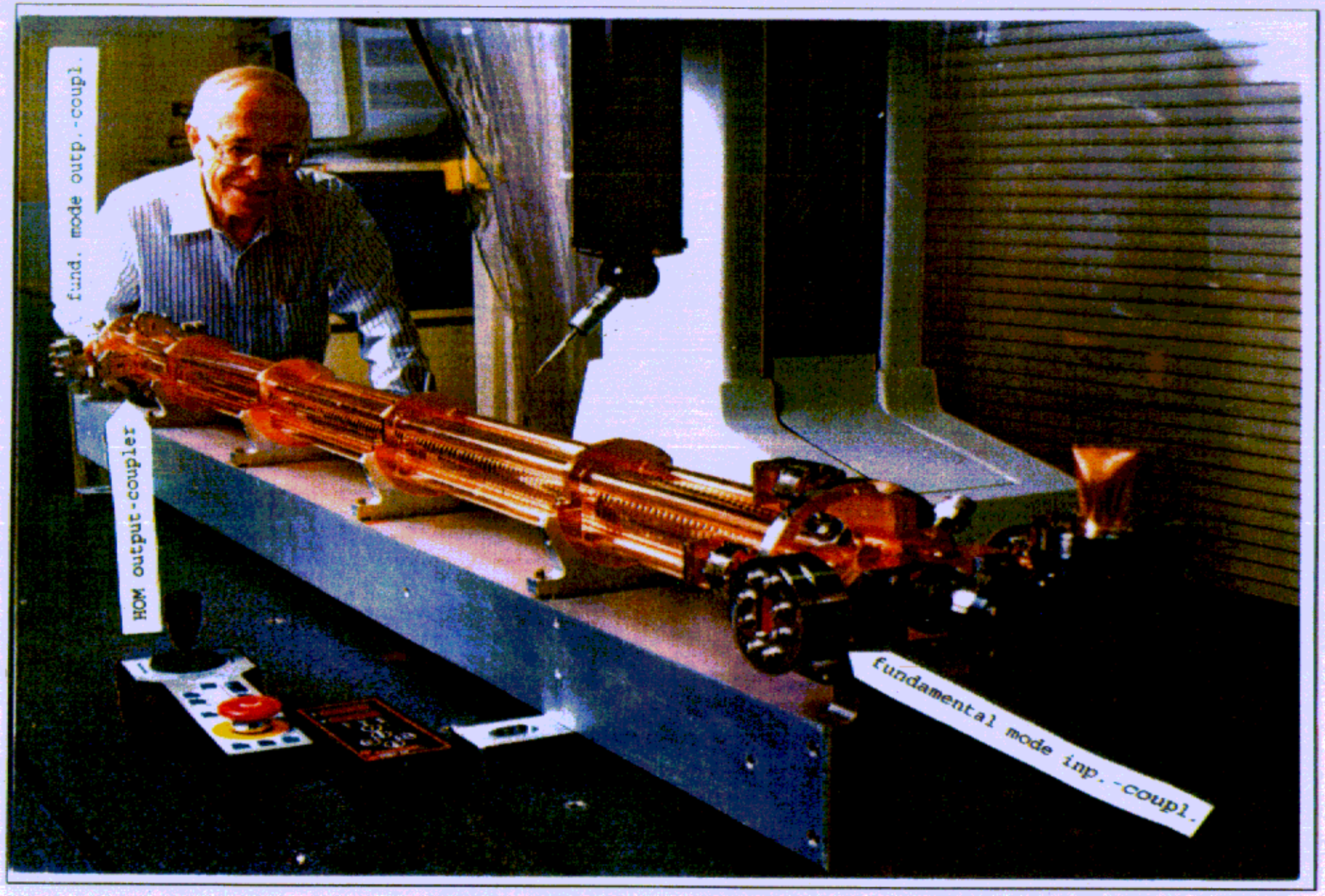
Interior Views of the Damped and Detuned Structure (DDS)

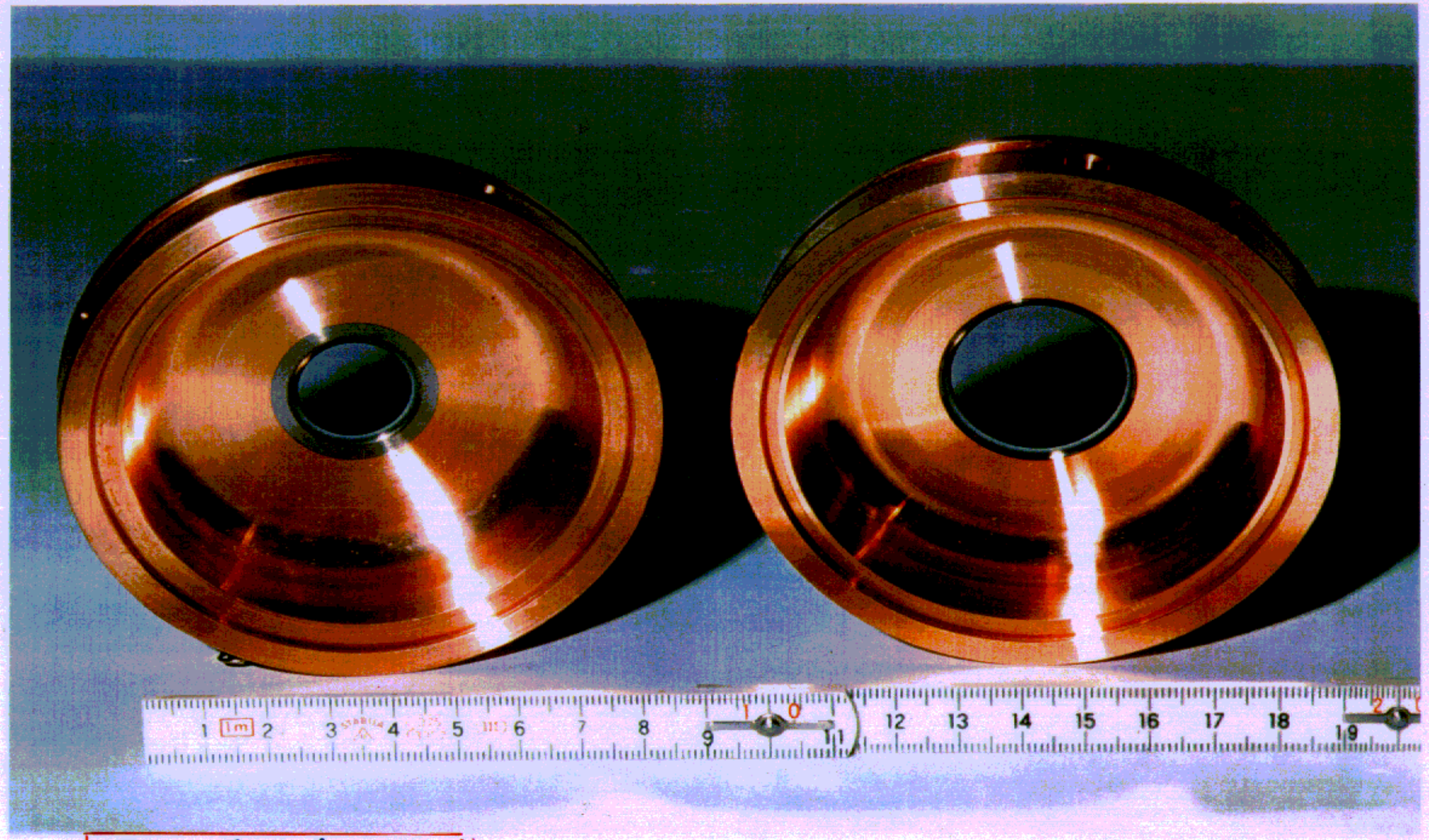


Structure Cell (1 of 206)



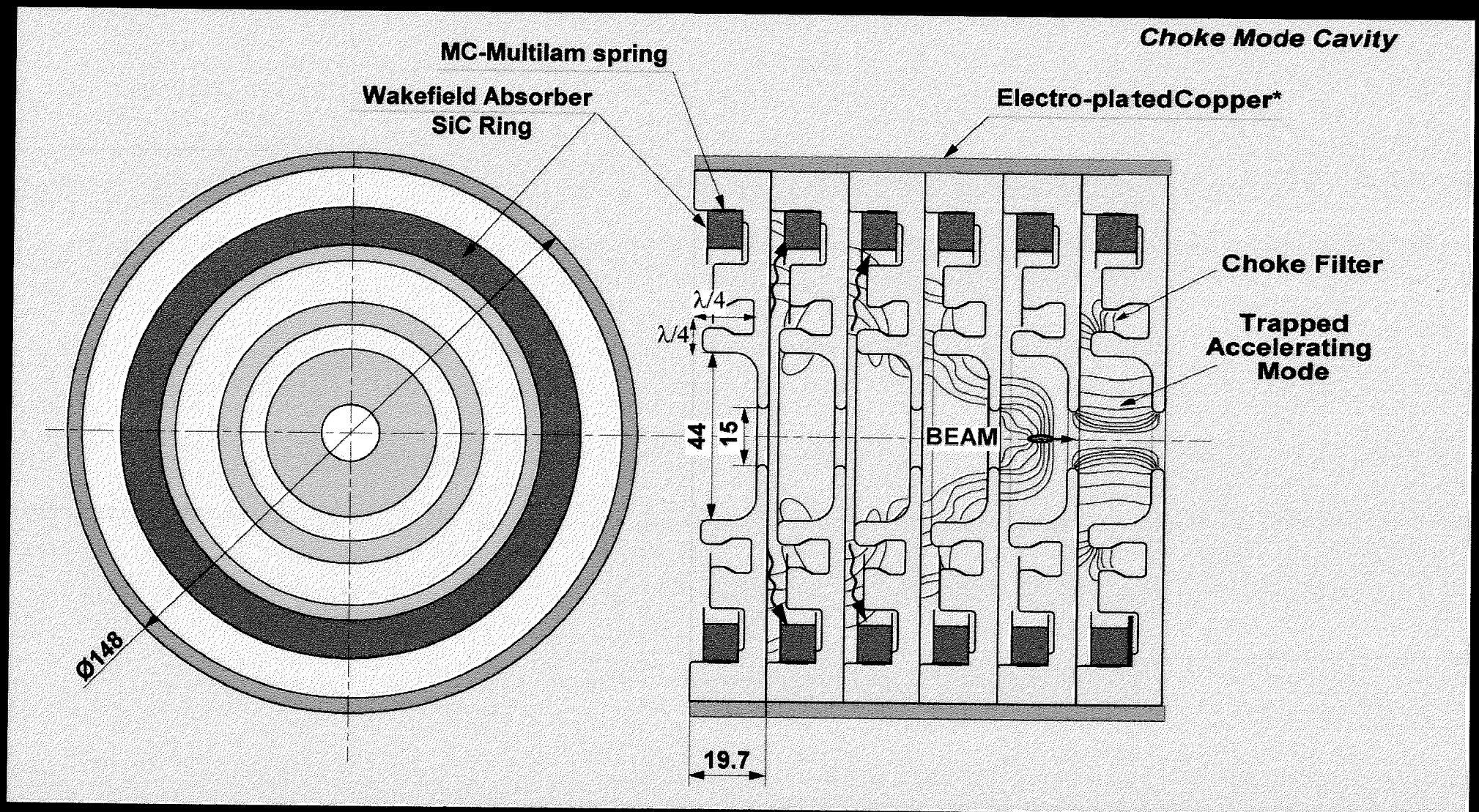
Damped Detuned 1.8m X-band Accelerating Structure

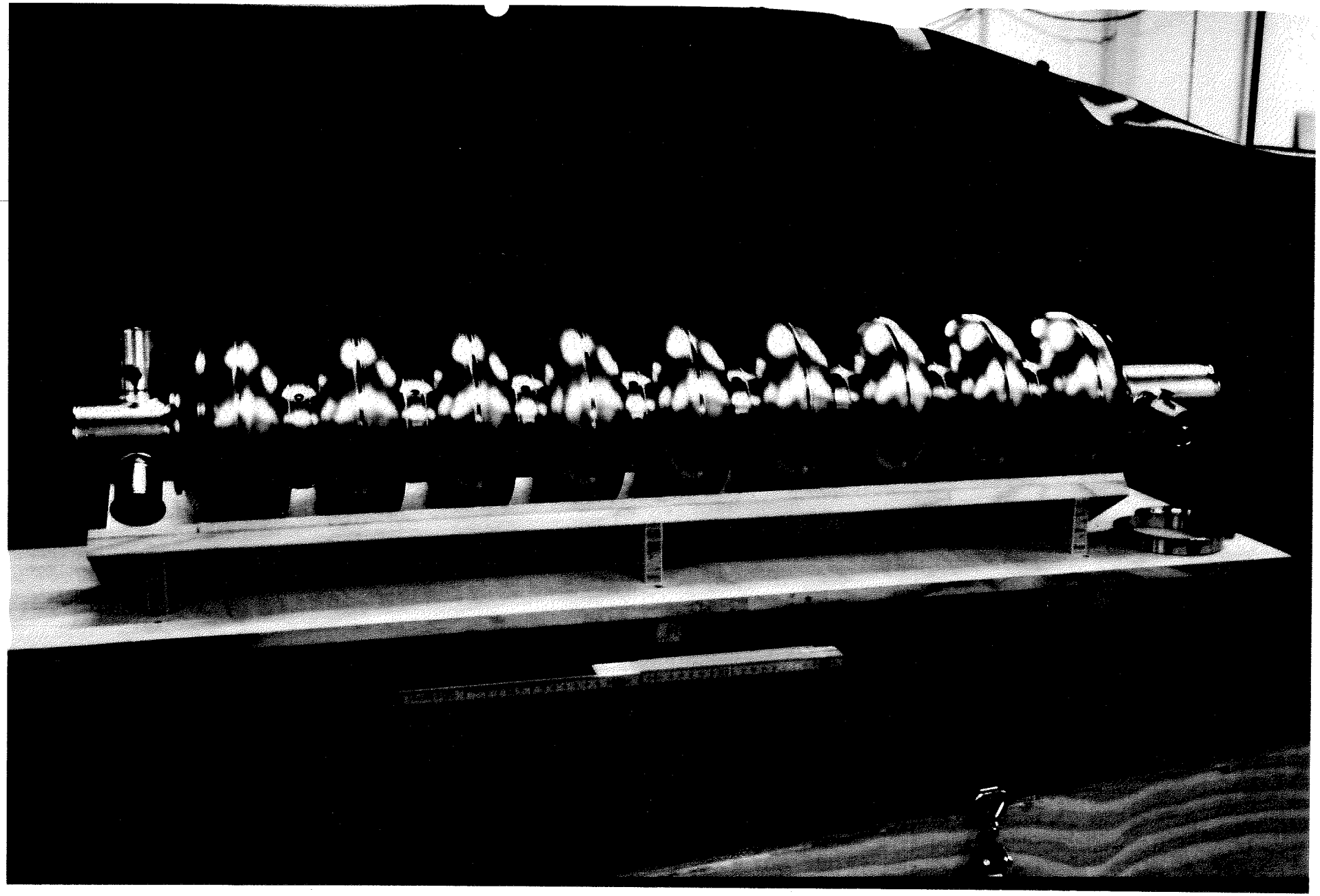




Iris Coating

HOM Free Accelerating Structure



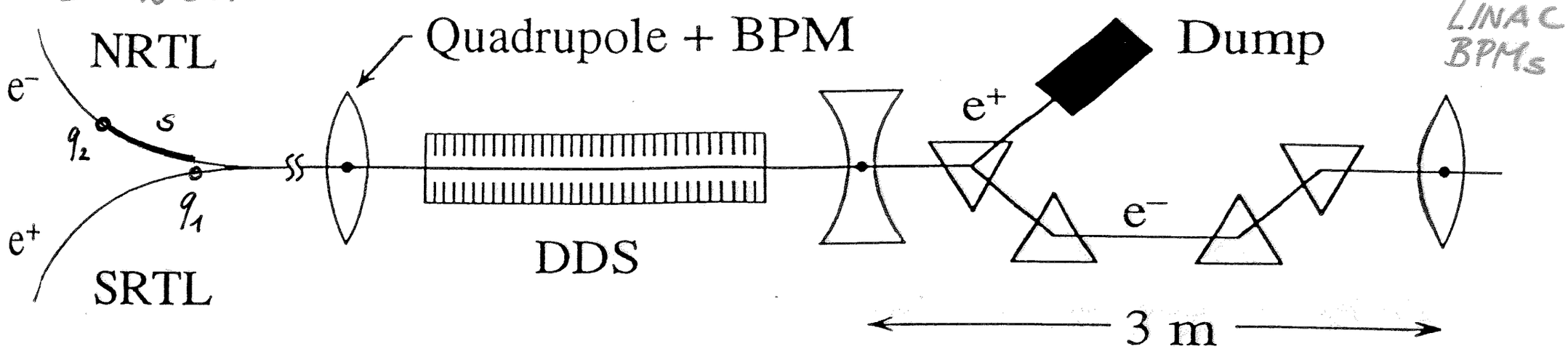


ASSET
(accelerator structure setup)

$\sigma_z \approx 0.7$ mm

$q \approx \pm 3$ nC

$E = 1.2$ GeV



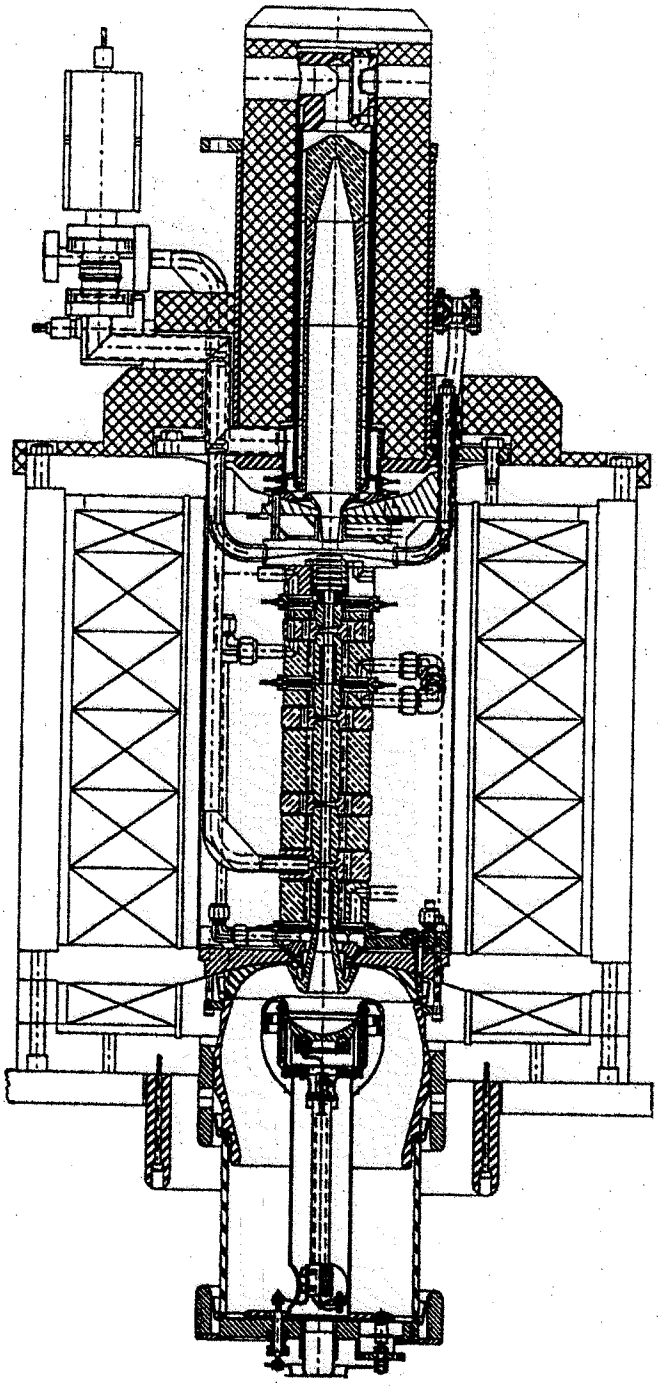
Klystrons

AVOSS@MPYNTVOSS, JUL15/10:56

KLYSTRONS

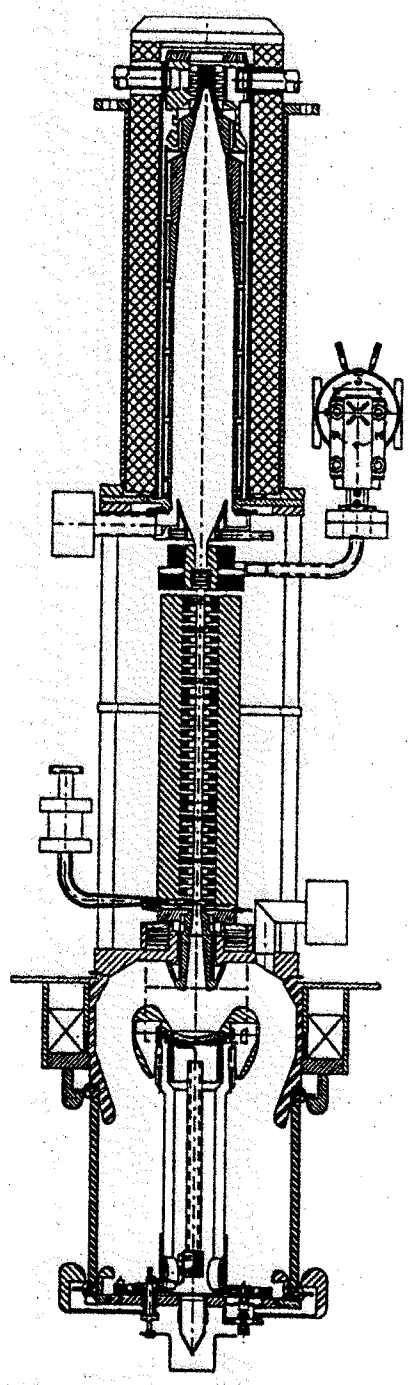
Solenoid Focused

Solenoid Power = 25 kW

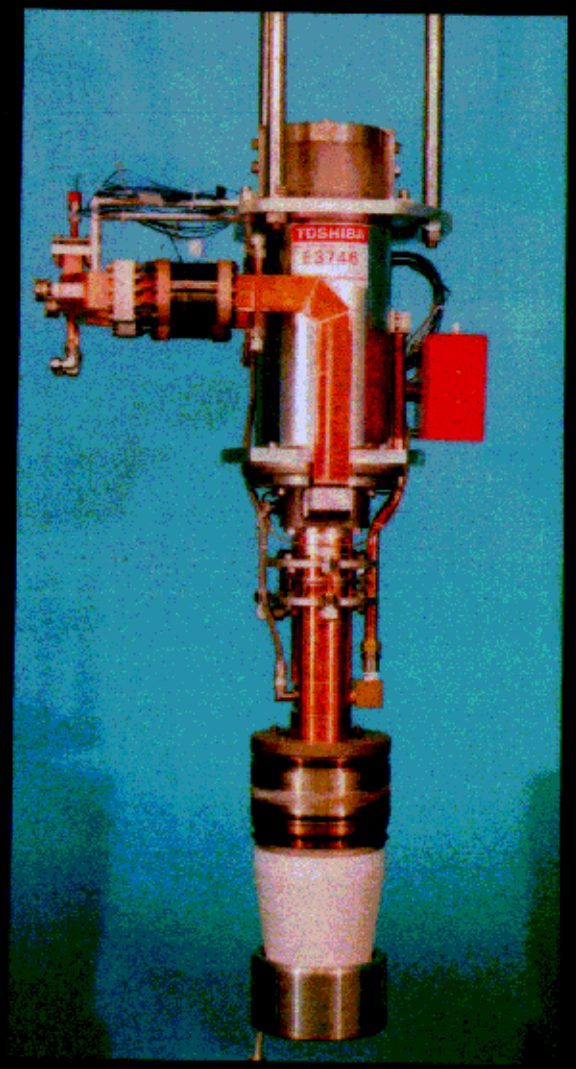


Periodic Permanent

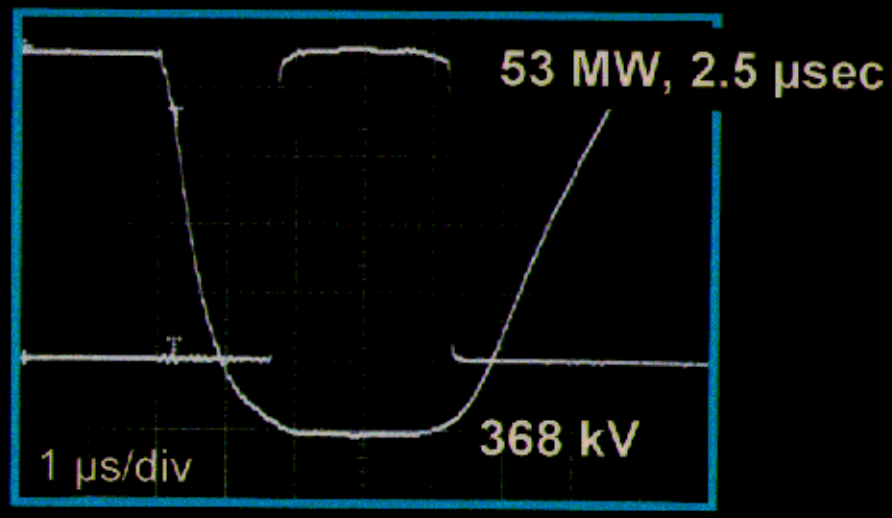
Magnet (PPM) Focused

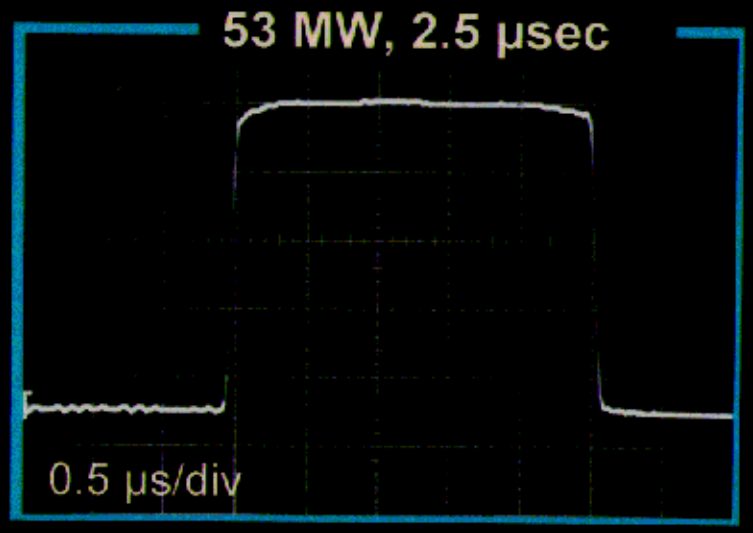


C-band Klystron Development

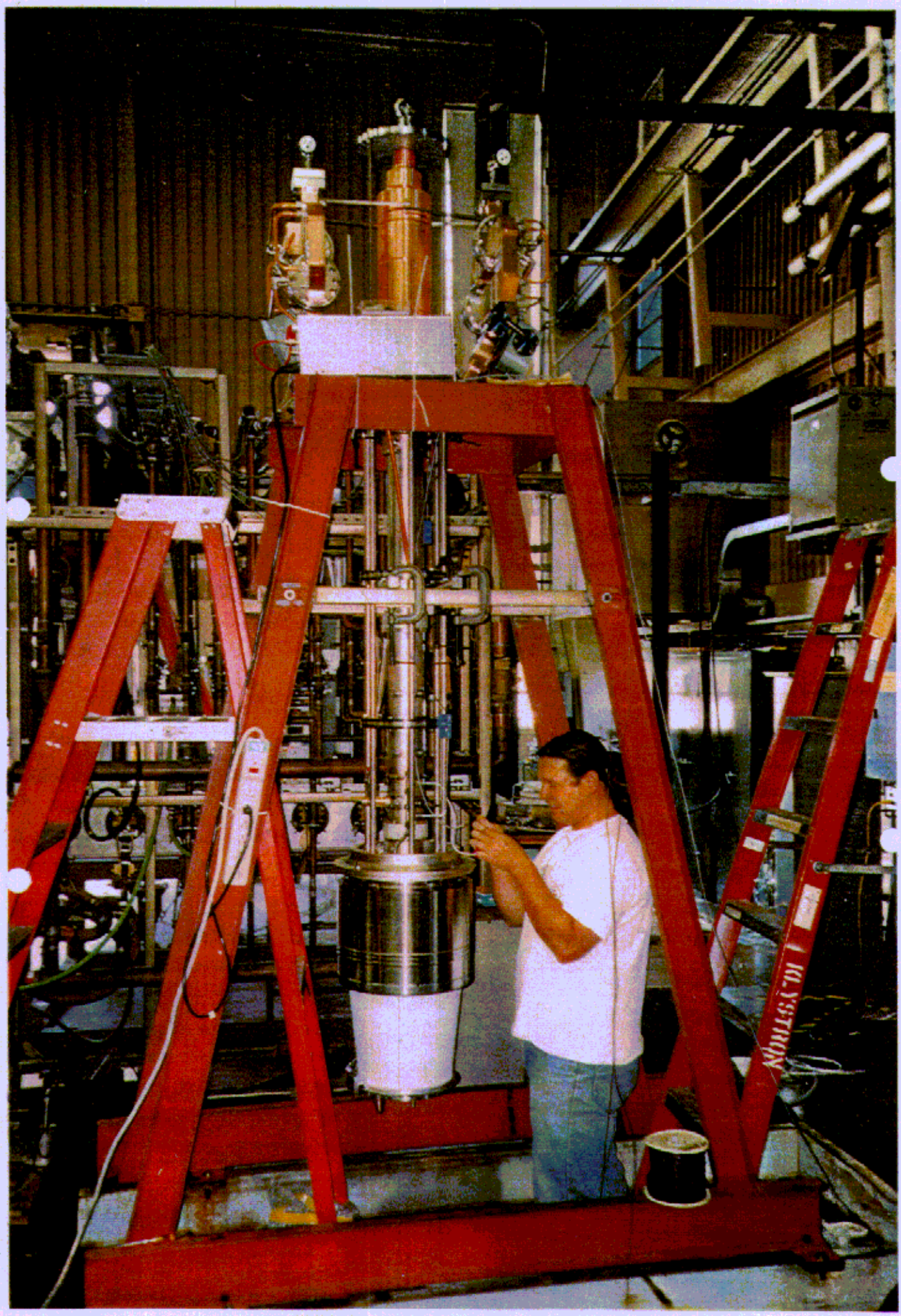


TOSHIBA E3746 No.2





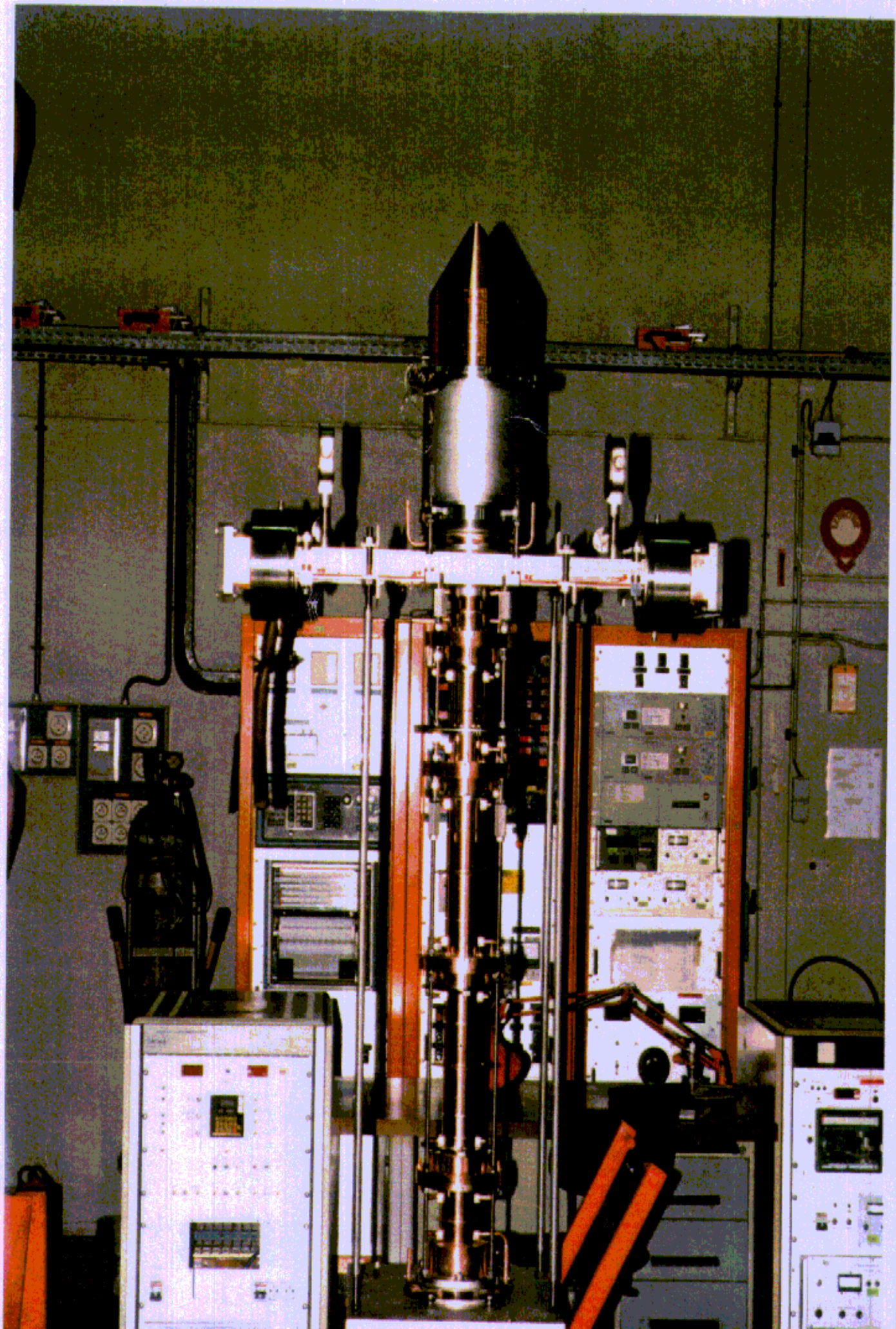
53 MW, 2.5 μsec, 50 pps, 44%



VLEPP gridded klystron with PPM focusing.

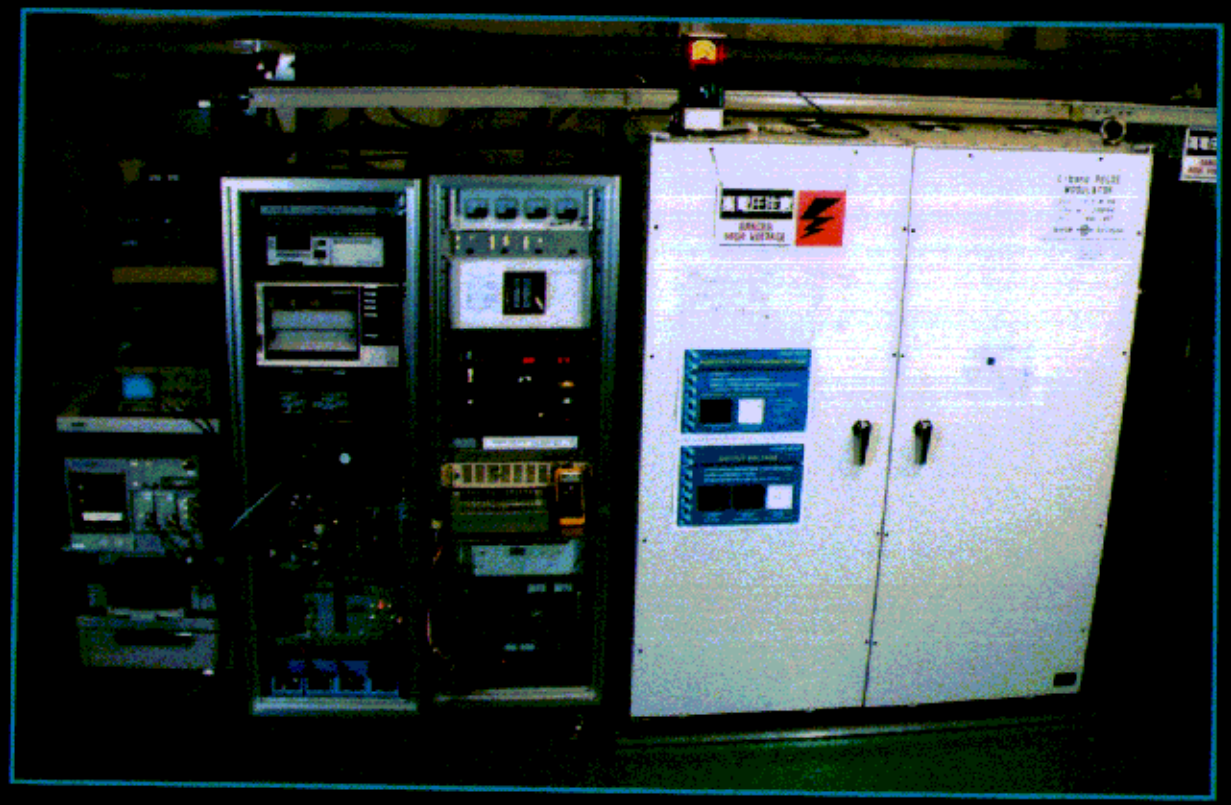
Achieved parameters :

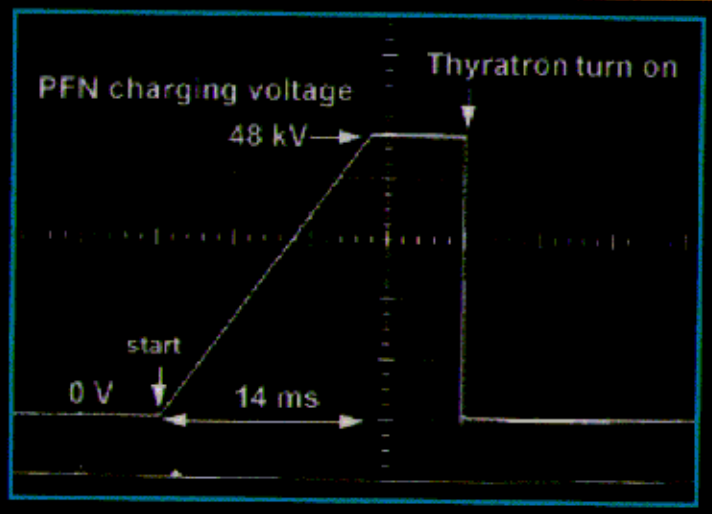
Frequency = *14 GHz* RF power = 60 | 50 *MW*



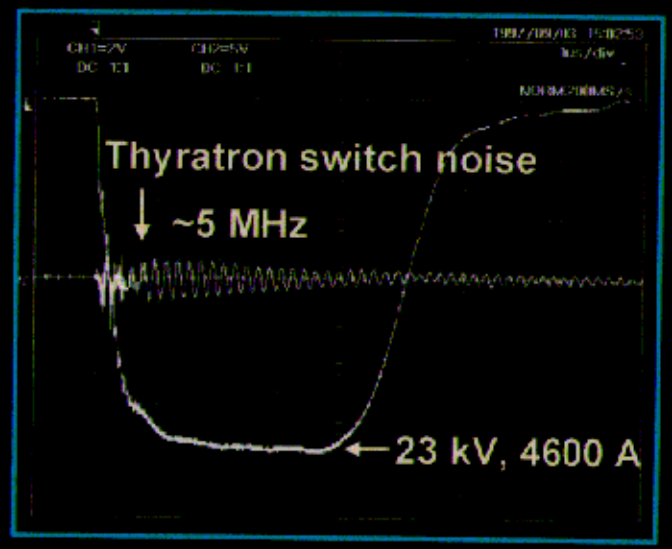
Modulators

C-band Smart Modulator No. 1





Charging voltage of EMI-303



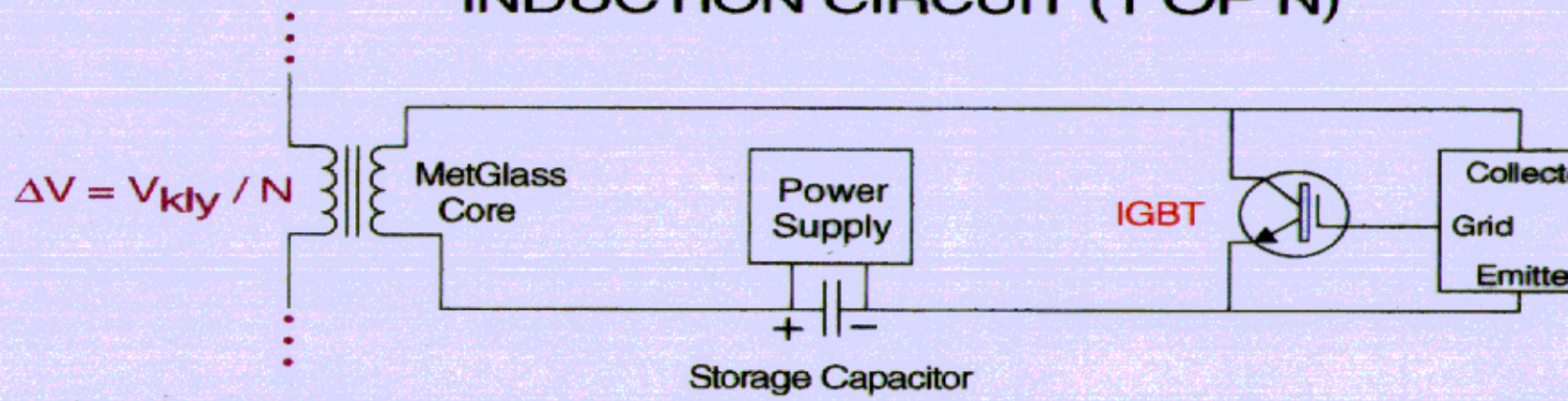
PFN output voltage

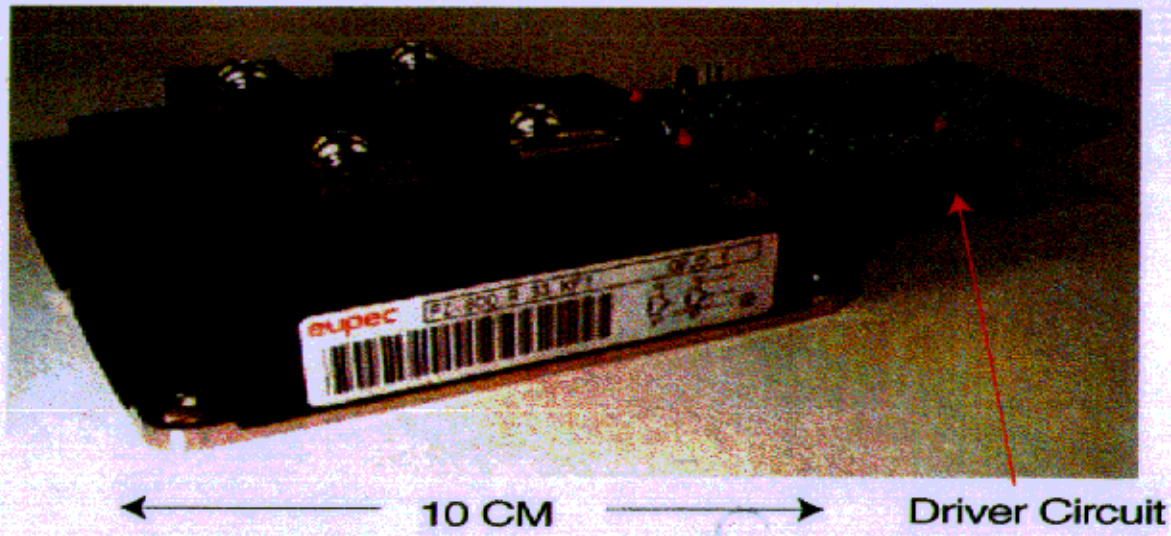
Peak power output:	111 MW
Average power output:	39 kW
Charging voltage:	47 kV
Flat top pulse width:	2.5 μsec

INDUCTION MODULATOR :

SUM MANY LOW VOLTAGE SOURCES INDUCTIVELY

INDUCTION CIRCUIT (1 OF N)





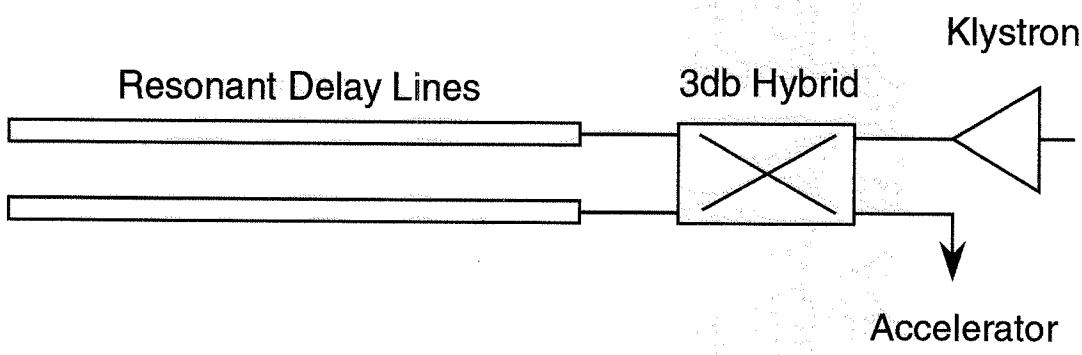
Isolated Gate Bipo

Rated: 3.3 kV @

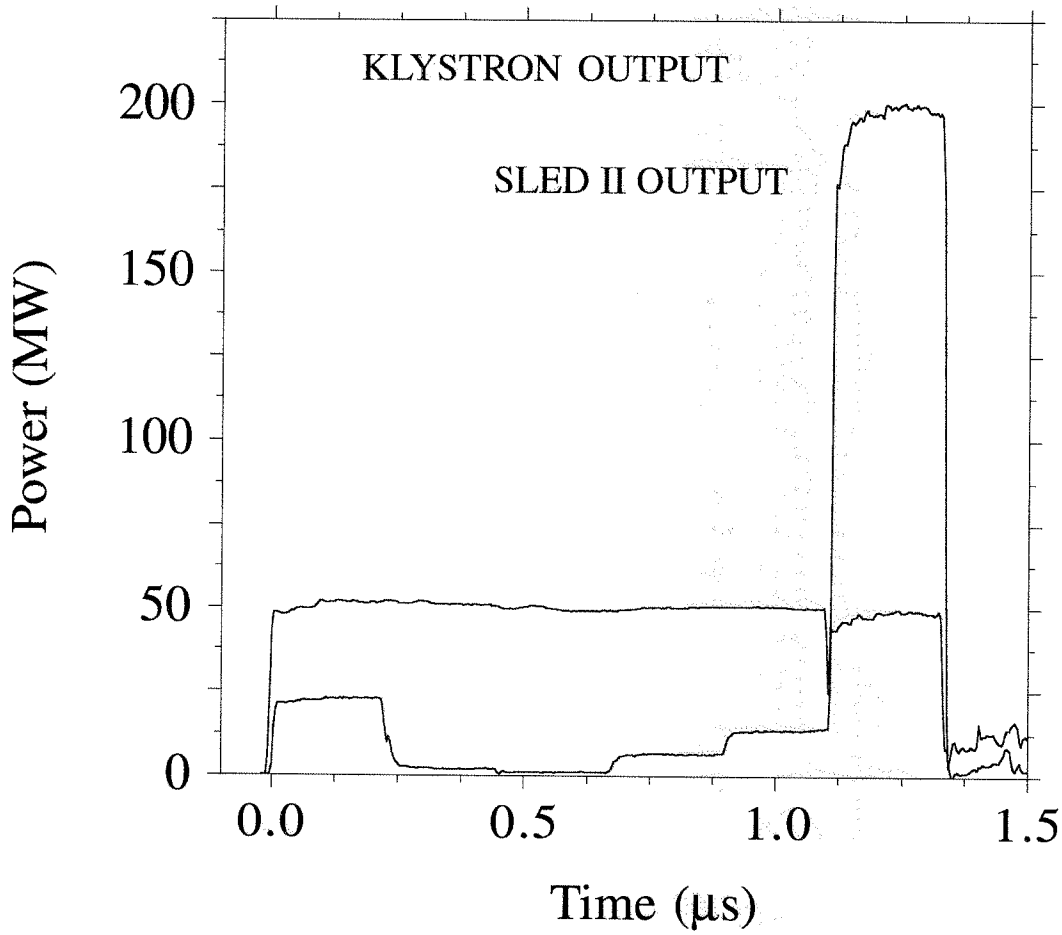
Tested: 2.0 kV @ 1

Future: 5.0 kV @ 2

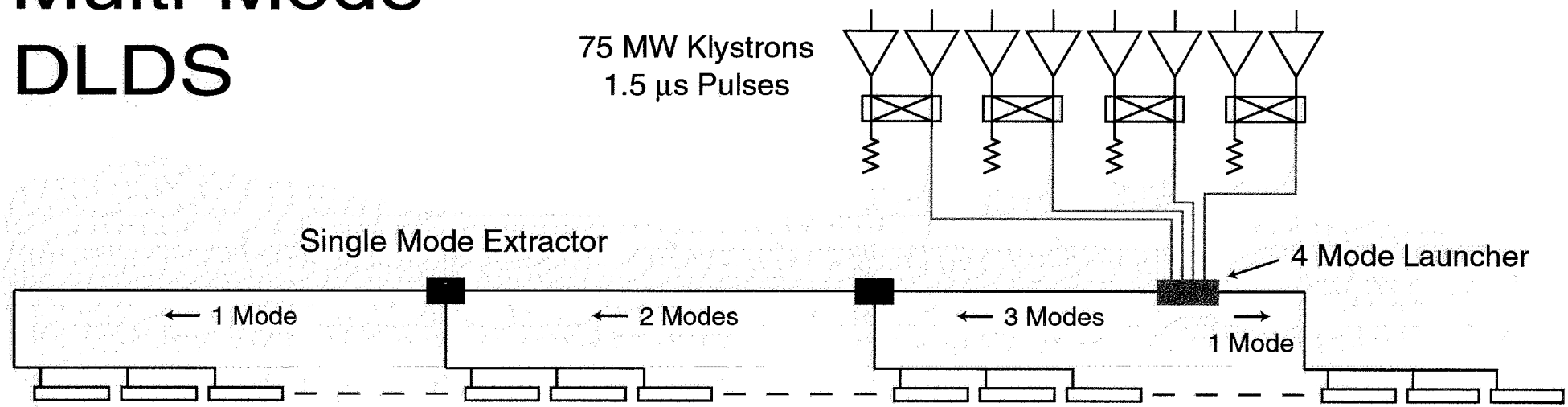
RF Pulse Compression (SLED II)



XL-4 Klystron and SLED II Output Power

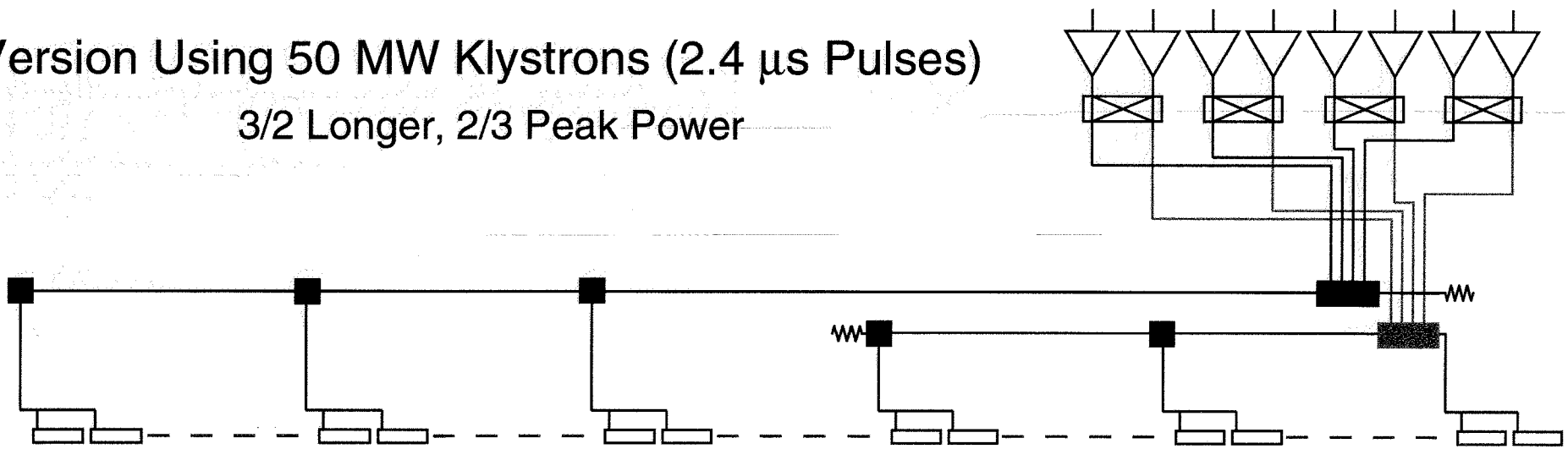


Multi-Mode DLDS



Version Using 50 MW Klystrons (2.4 μs Pulses)

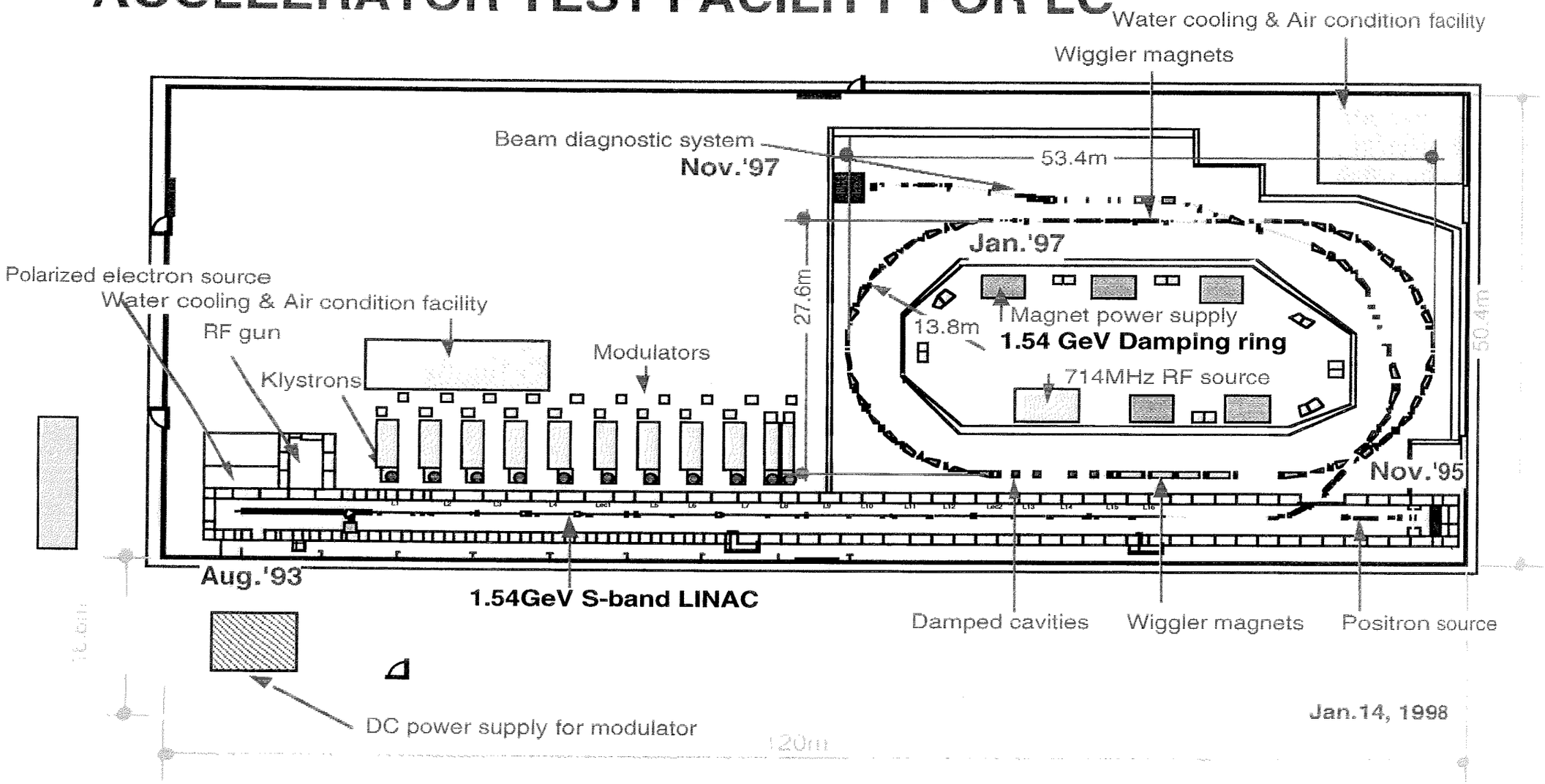
3/2 Longer, 2/3 Peak Power



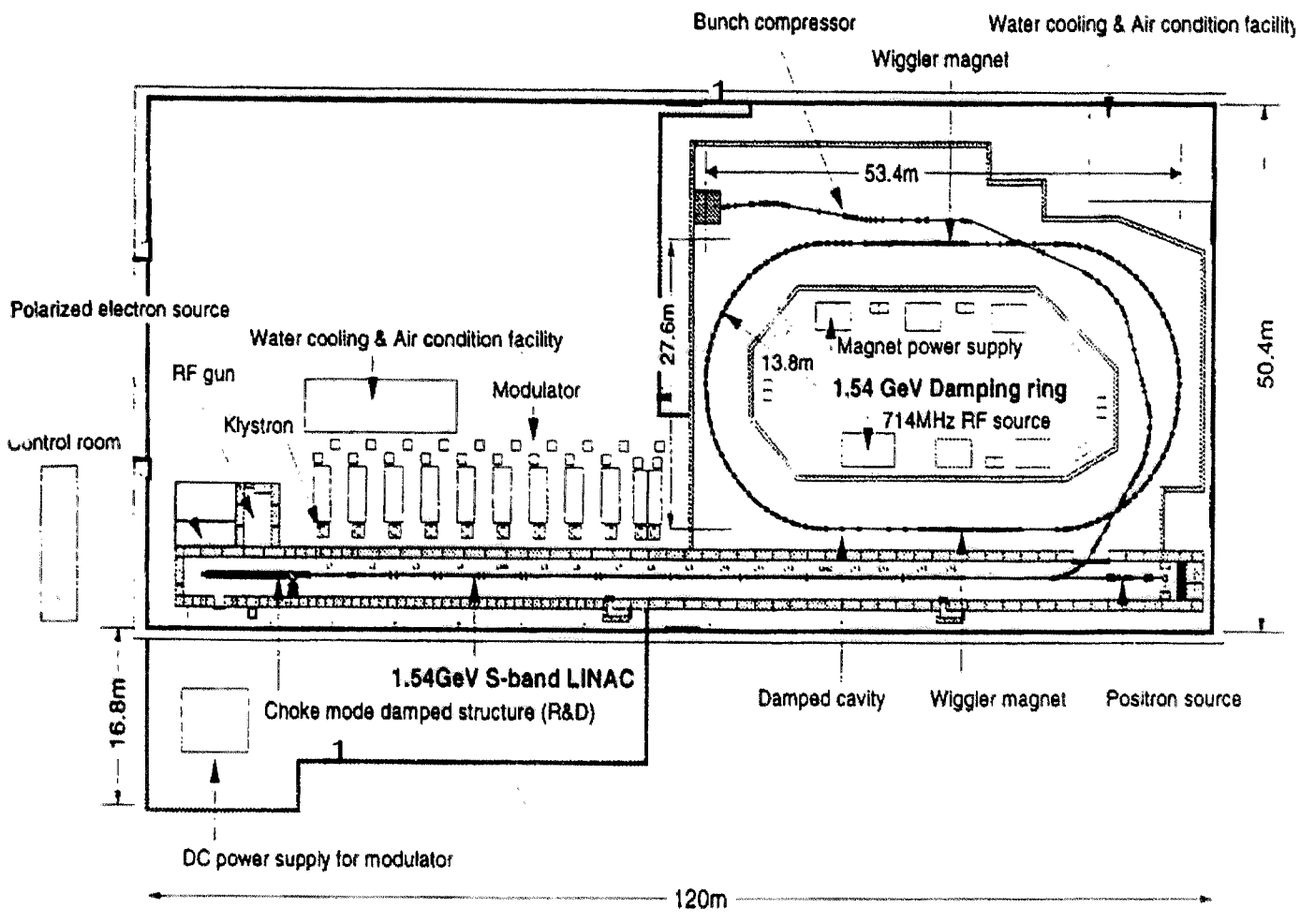
Damping Rings

s, JUL 15/11:04

ACCELERATOR TEST FACILITY FOR LC



Accelerator Test Facility (KEK)



	goal	achieved	
beam energy	1.54	1.28	GeV
# of bunches p. train	20	1	
# of trains	5	-	
charge N_{bunch}	2	0.6…0.8	10^{10}
hor. Emittance $\gamma\varepsilon_x$	3	4…5	10^{-6} m
vert. Emittance $\gamma\varepsilon_y$	3	3…10	10^{-8} m
damping time τ_y	9	30	ms

→ T. OKUGI, TUDR5

IPYNTBRINKMANN, MAR23/15:06

FFTB Collaborating Institutions

BINP (Novosibirsk/Protvino)

DESY

Fermilab

IBM

Kawasaki

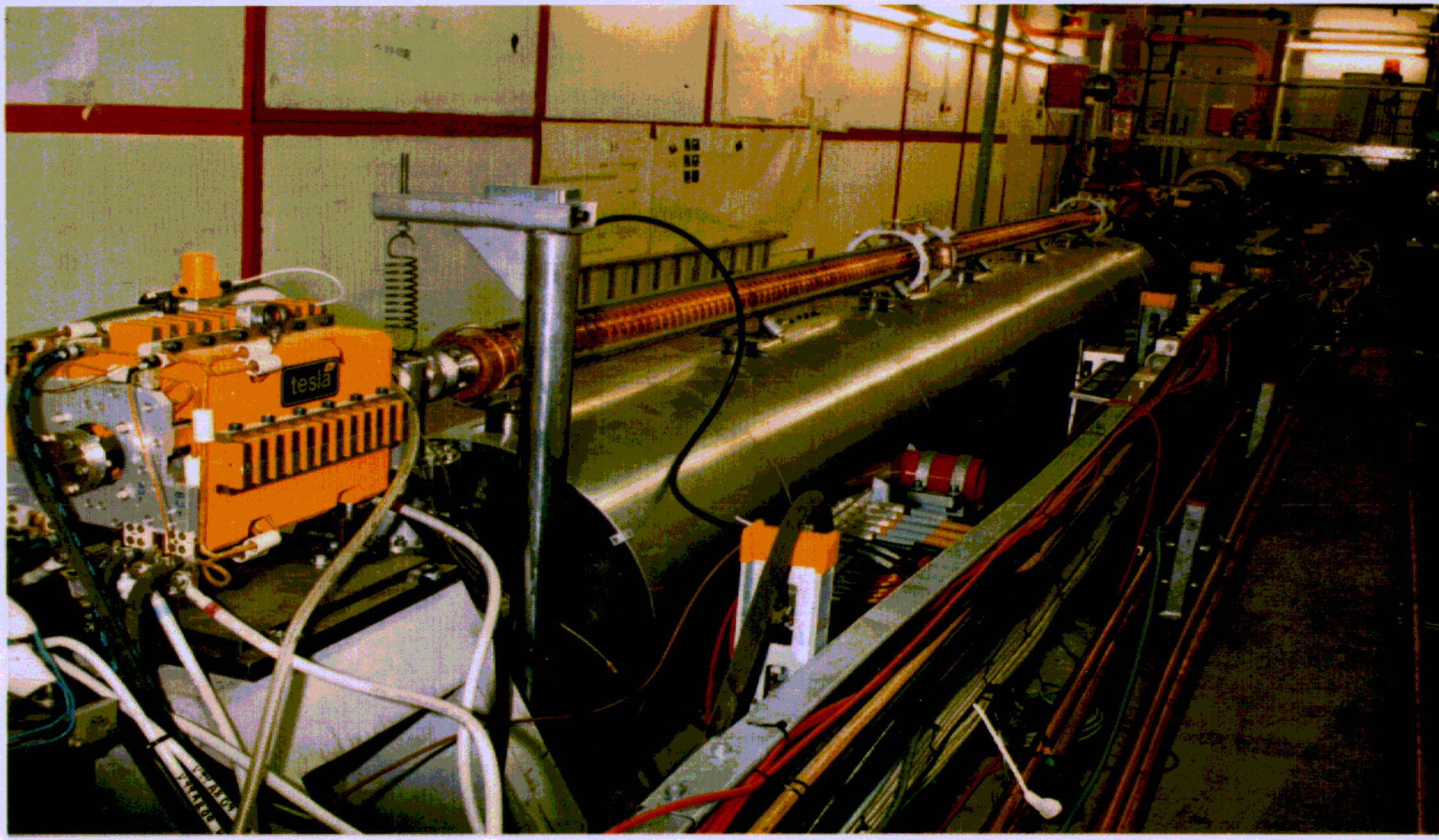
KEK

LAL(Orsay)

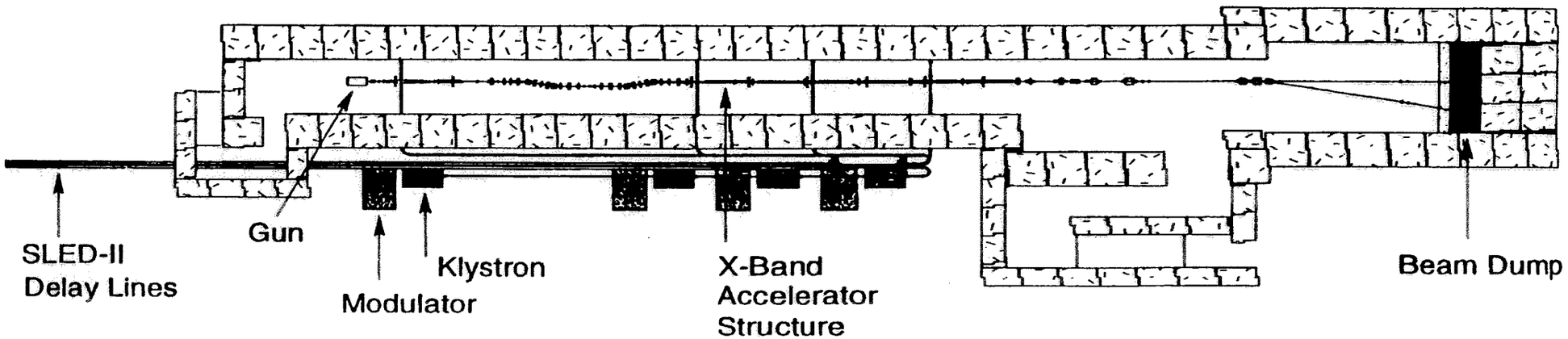
MPI(Munich)

Rochester

SLAC


tesla

Next Linear Collider Test Accelerator

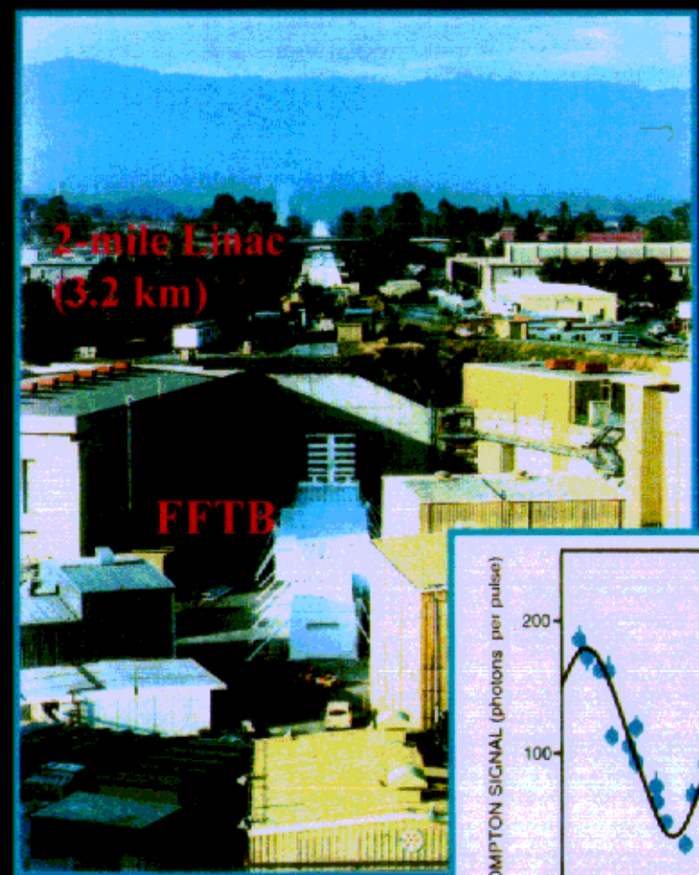


	goal	achieved	
active length	12	9	m
loaded gradient	57 (NLC)	40	MV/m
beam current	0.6	0.3	A
En. Spread (90 bunches)	0.1% rms	0.3% peak	
Klystron power	50 (75)	>50 @1.5μs, 75 @1.2μs	MW
SLED-II RF compr.	×4	×4	
ppm klystron	50 (75)	50 @ 2μs, η=55%	MW

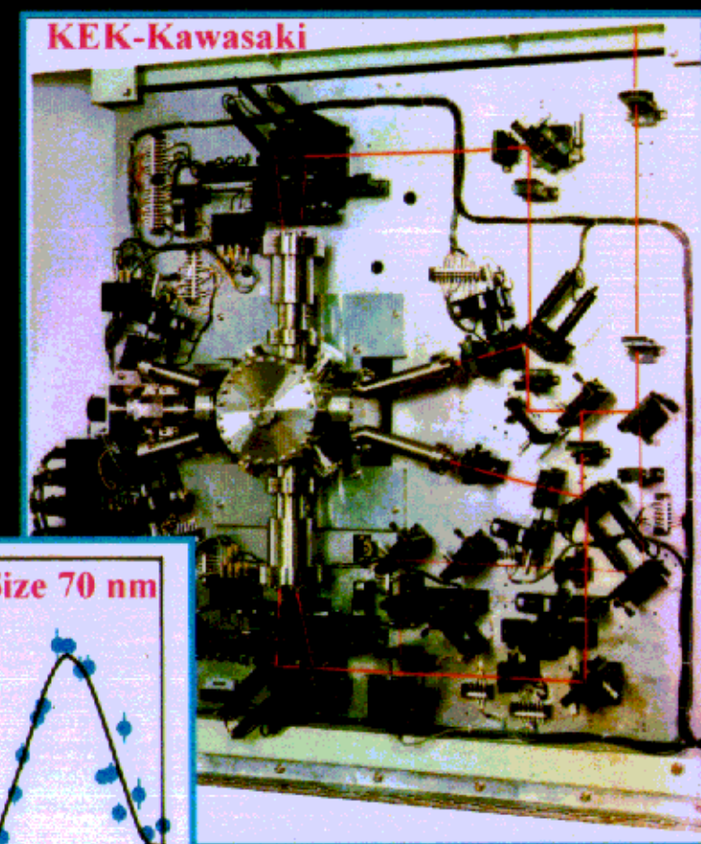
Test Set-ups

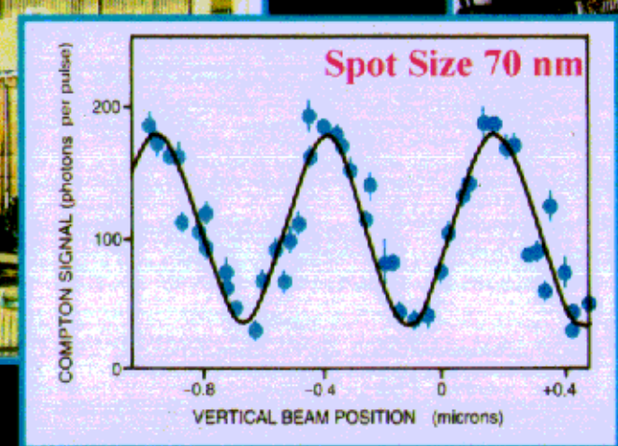
Experimental Test at FFTB

SLAC Two-mile Accelerator & FFTB



Laser Interferometer Table

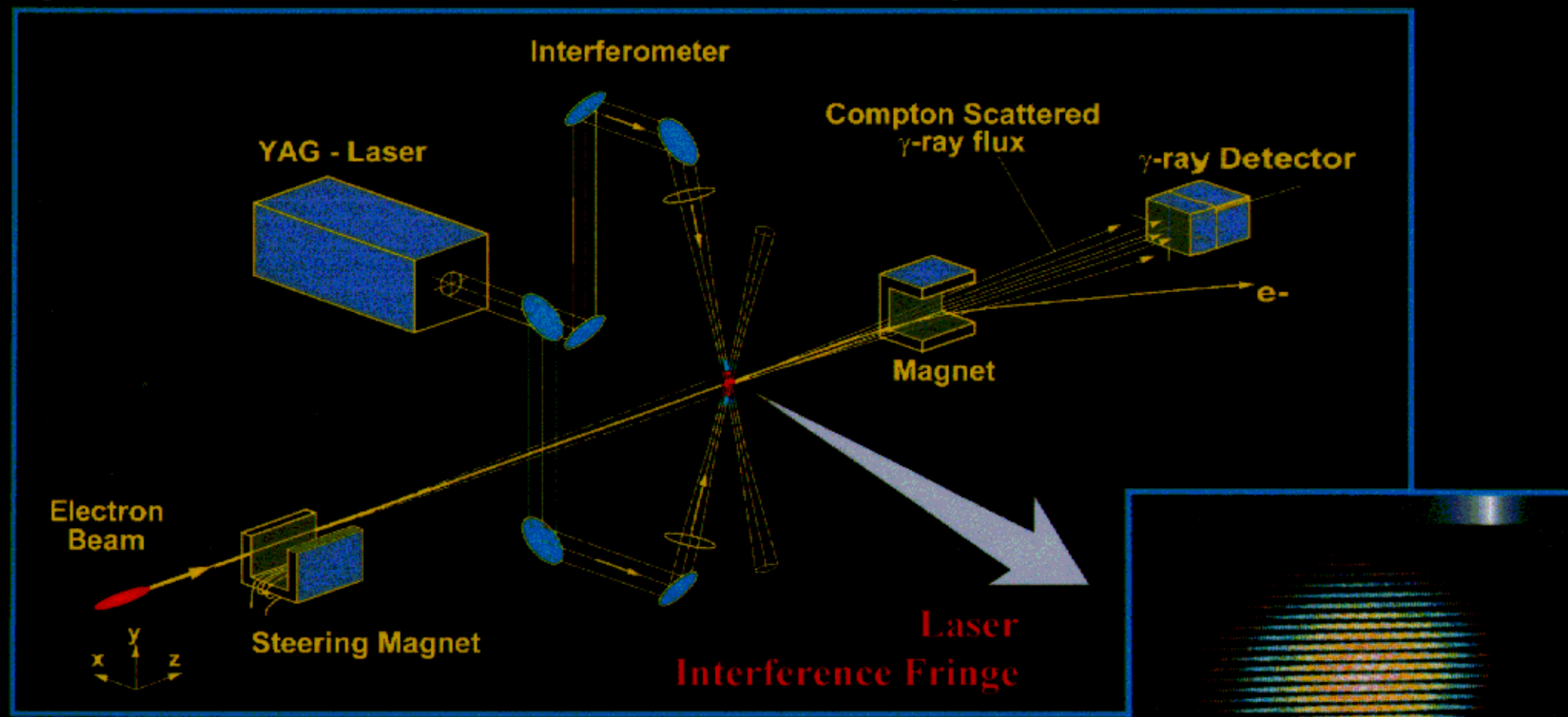




Nanometer Beam Size Measurement

e+e- Linear Collider R&D

Spot-size Monitor based on Laser Interferometry



T. Shintake 1990

Members of the TESLA-Collaboration

Yerevan Physics Institute

IHEP
Academia Sinica, Beijing

Tsinghua-University, Beijing

Institute of Physics,
Helsinki

CEA/DSM
(DAPNIA, CE-Saclay)

IN2P3
(IPN Orsay + LAL Orsay)

RWTH Aachen

Max-Born-Institut,
Berlin-Adlershof

TU Berlin

TU Darmstadt

TU Dresden

Universität Frankfurt

GKSS, Geesthacht

DESY, Hamburg und Zeuthen

Universität Hamburg

FZ Karlsruhe

Universität Rostock

Universität Wuppertal

INFN Frascati

INFN Legnaro

INFN Milano

INFN and Univ. Roma II

Polish Academy of Science

University of Warsaw

Institute of Nuclear Physics,
Cracow

Univ. of Mining & Metallurgy

Polish Atomic Energy
Agency

Soltan Inst. for Nuclear
Studies, Otwock-Swierk

JINR Dubna

IHEP Protvino

INP Novosibirsk

INR Troitsk

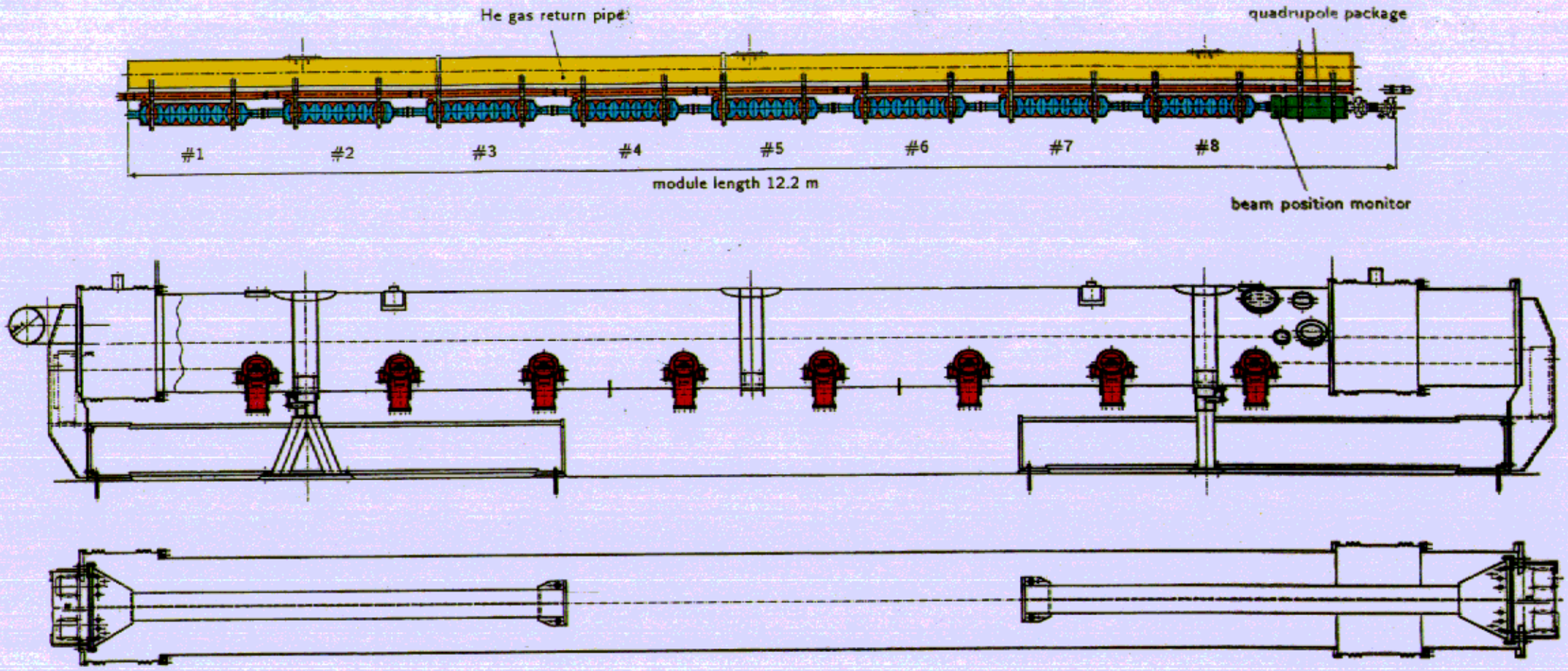
ANL
Argonne IL

Cornell University,
Ithaca NY

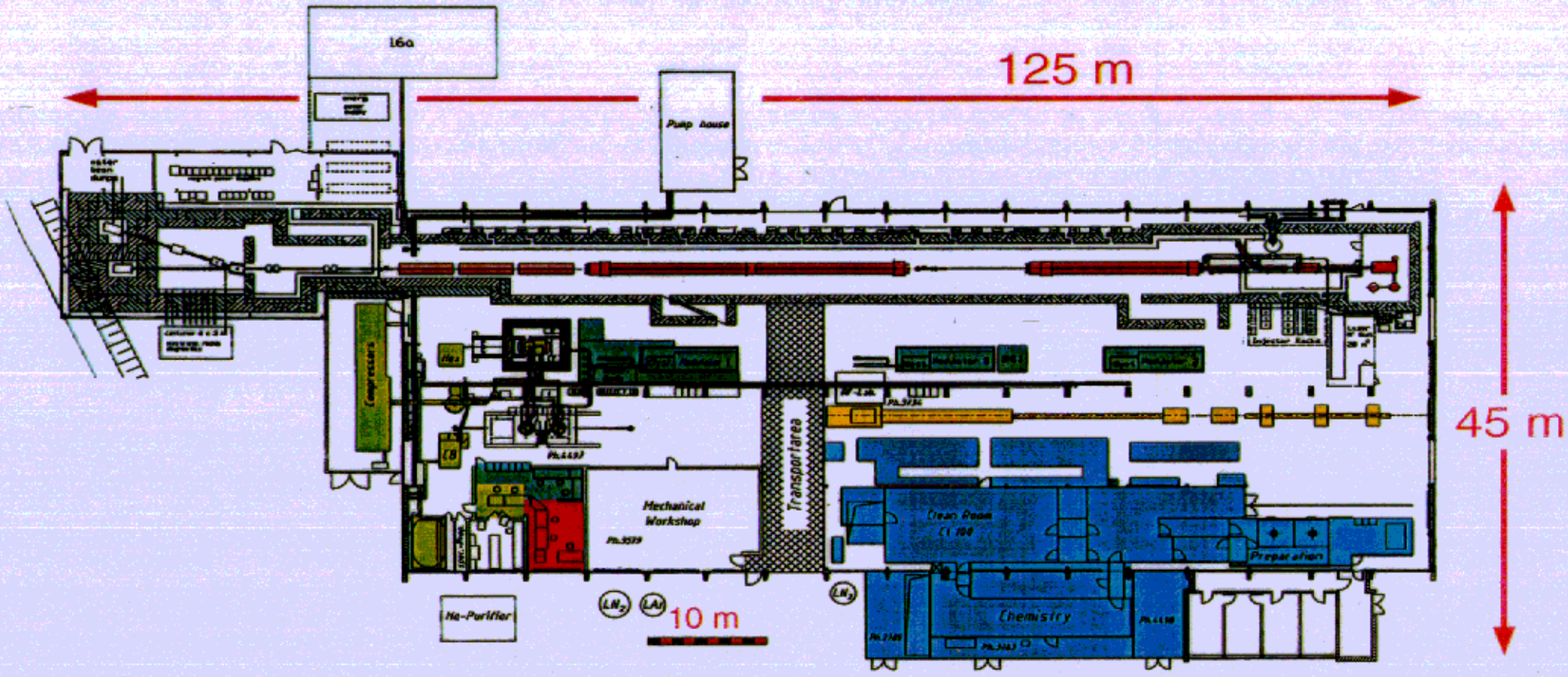
FNAL,
Batavia IL

UCLA
Los Angeles CA

Januar '99


He gas return pipe
quadrupole package
#1
#2
#3
#4
#5
#6
#7
#8
module length 12.2 m
beam position monitor

TESLA TEST FACILITY (HALL 3)



Cavity Treatment and Assembly

Cavity Testing (RF System / He Plant)

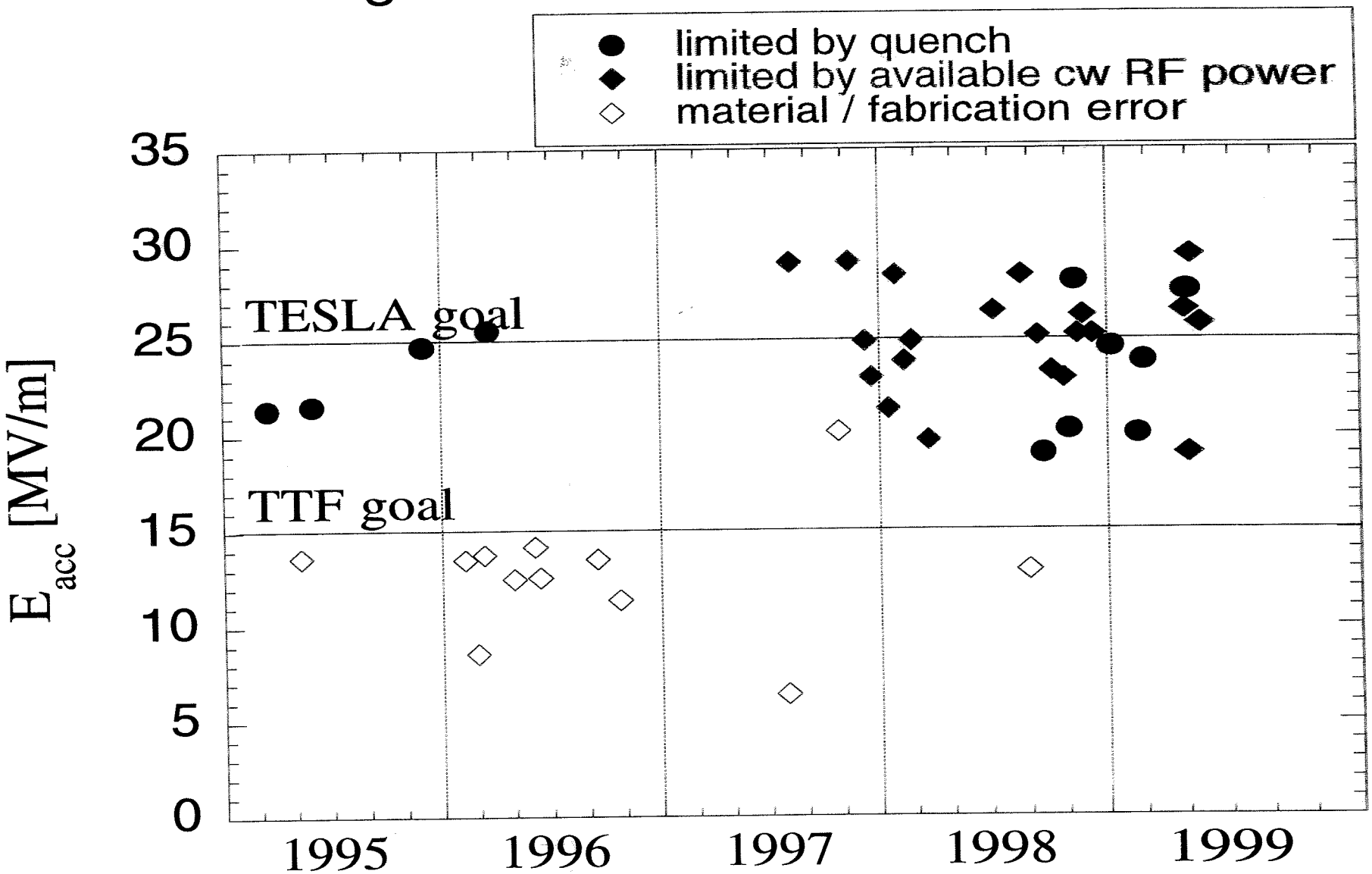
Cryomodule Assembly

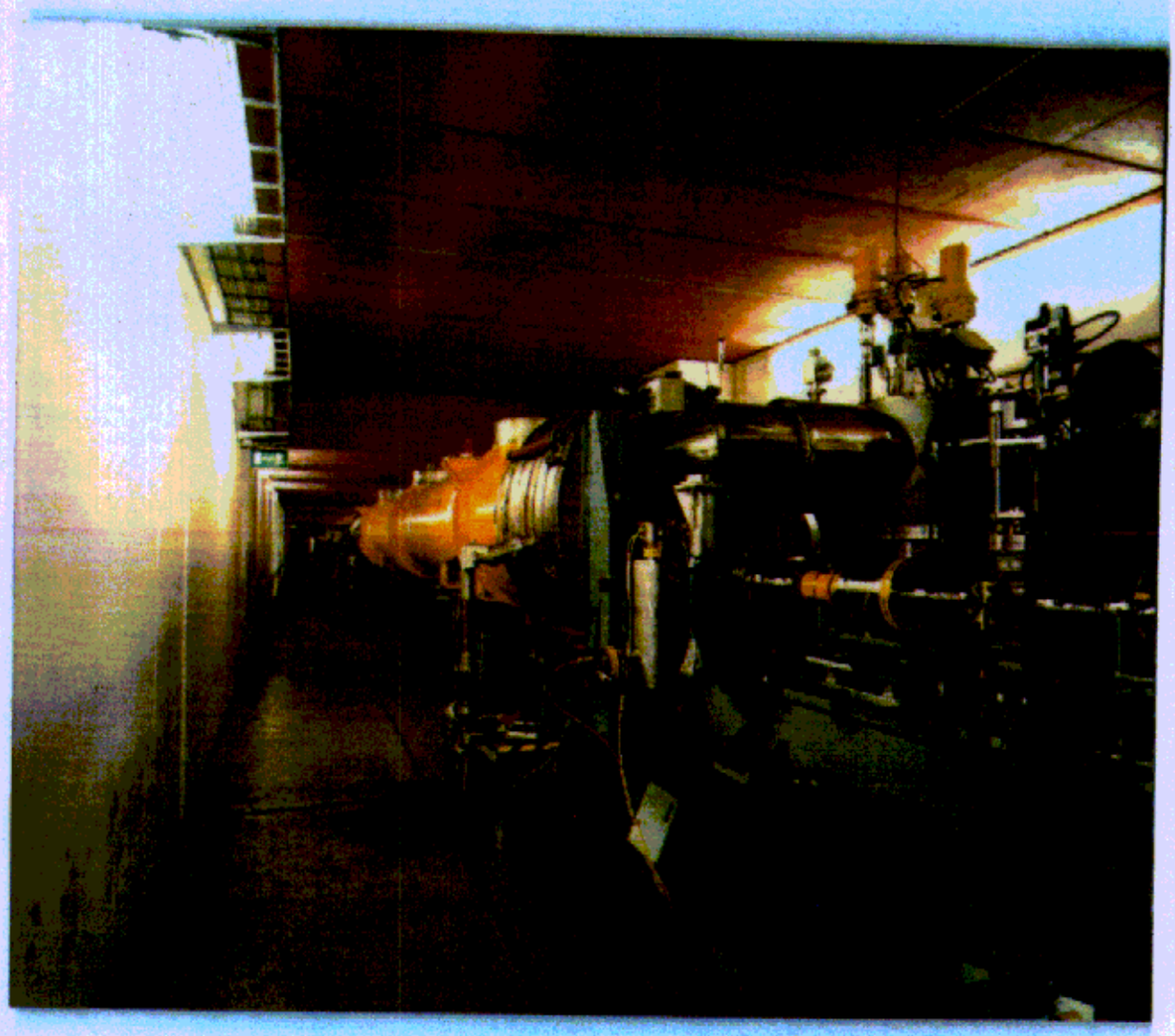
TTF Linac

H.Weise / June 24th, 1995

VORBEHANDLUNG

Maximum gradients reached in 9-cell cavities



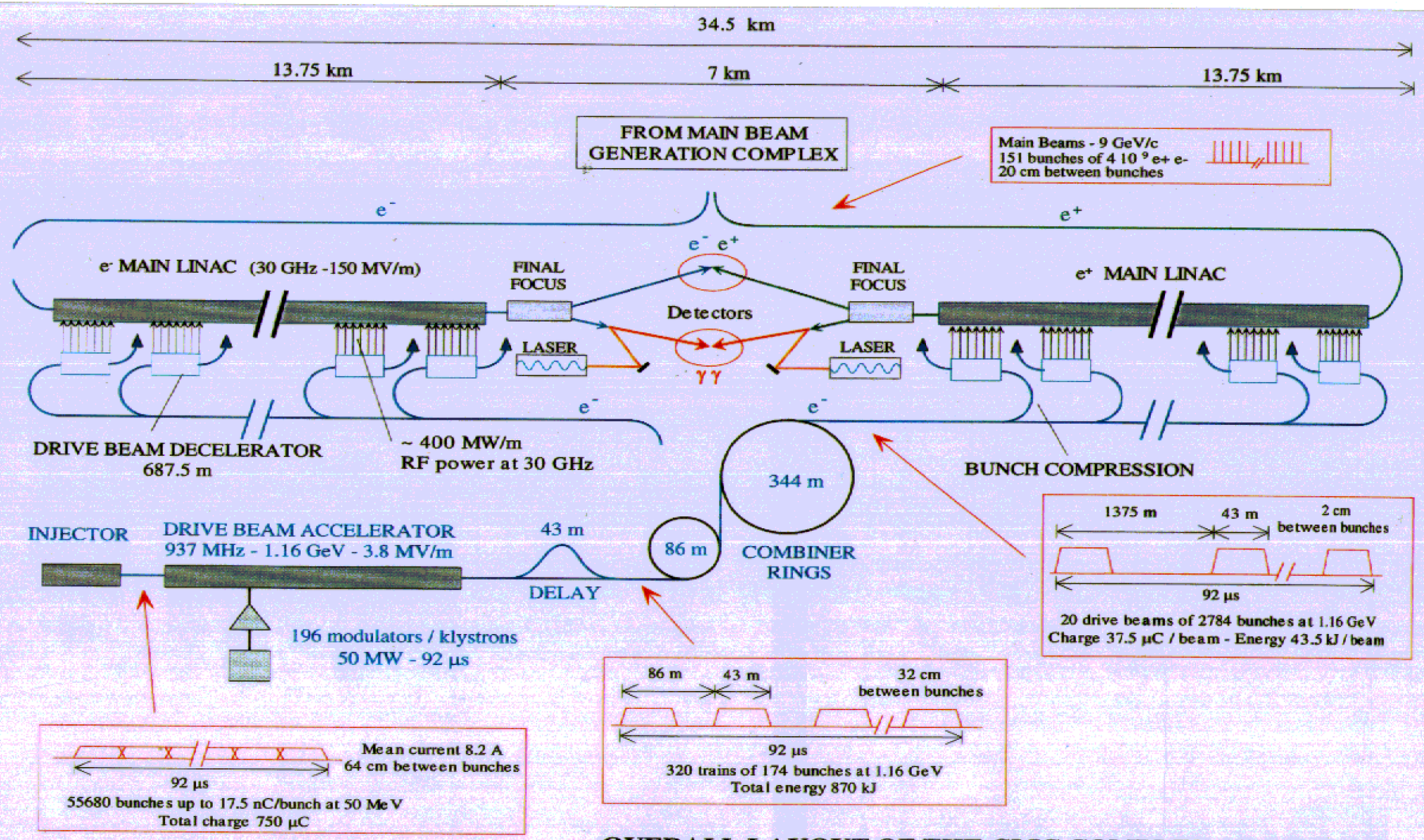


TTF Linac operation:

May 1997: 1st module, g=16 MV/m, full beam current (8mA)/low bunch charge
High Q HOM detected → S. Fartoukh MOP110

Dec.98-March 99: 2nd module, g=18.5 MV/m (beam), 20.8 MV/m†(RF meas.), RF-gun injector, high Q_b/low emittance

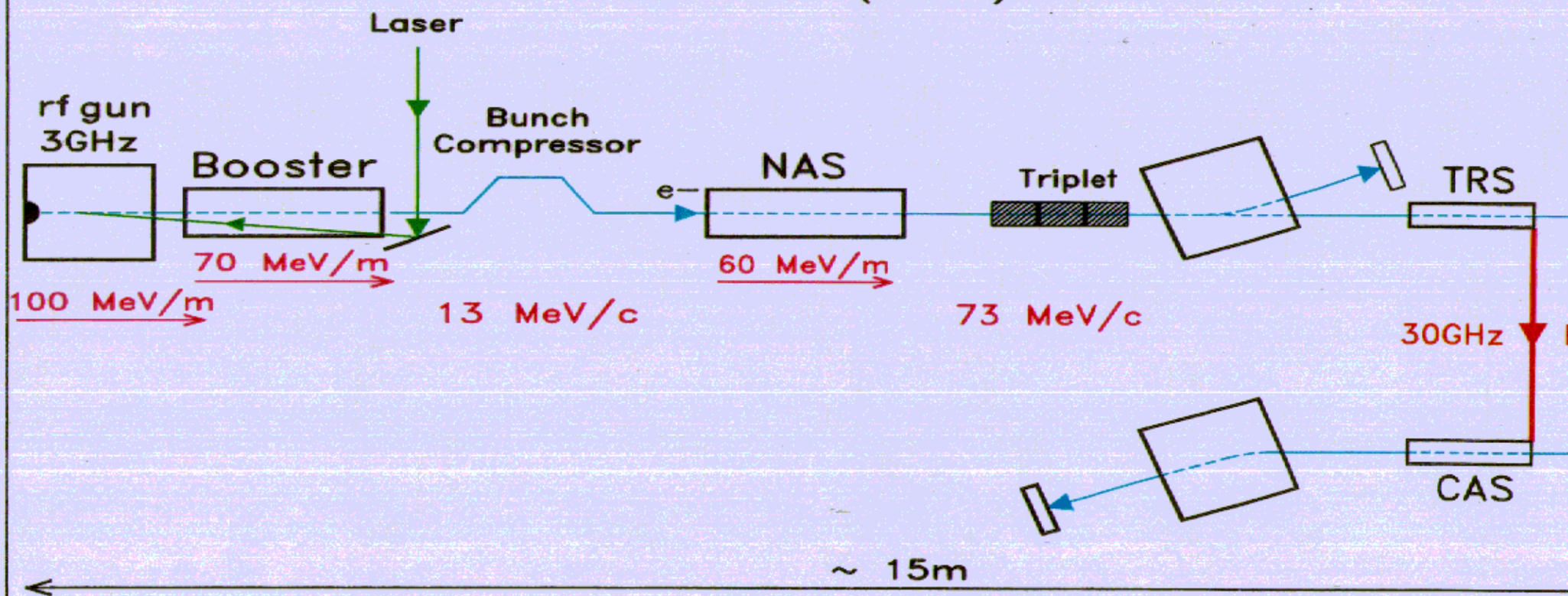
† $Q_0 = 1.3 \cdot 10^{10}$ (CRYO LOSS MEAS.)



OVERALL LAYOUT OF THE CLIC COMPLEX AT 3 TeV C.M.

Schematic Layout of CLIC Test Facility

(1995)



TRS : 30GHz CLIC structure
used as transfer structure

CAS : 30GHz CLIC structure
used as accelerating structure

NAS : 3GHz Accelerating section

CERN

PS/PO 1372 4