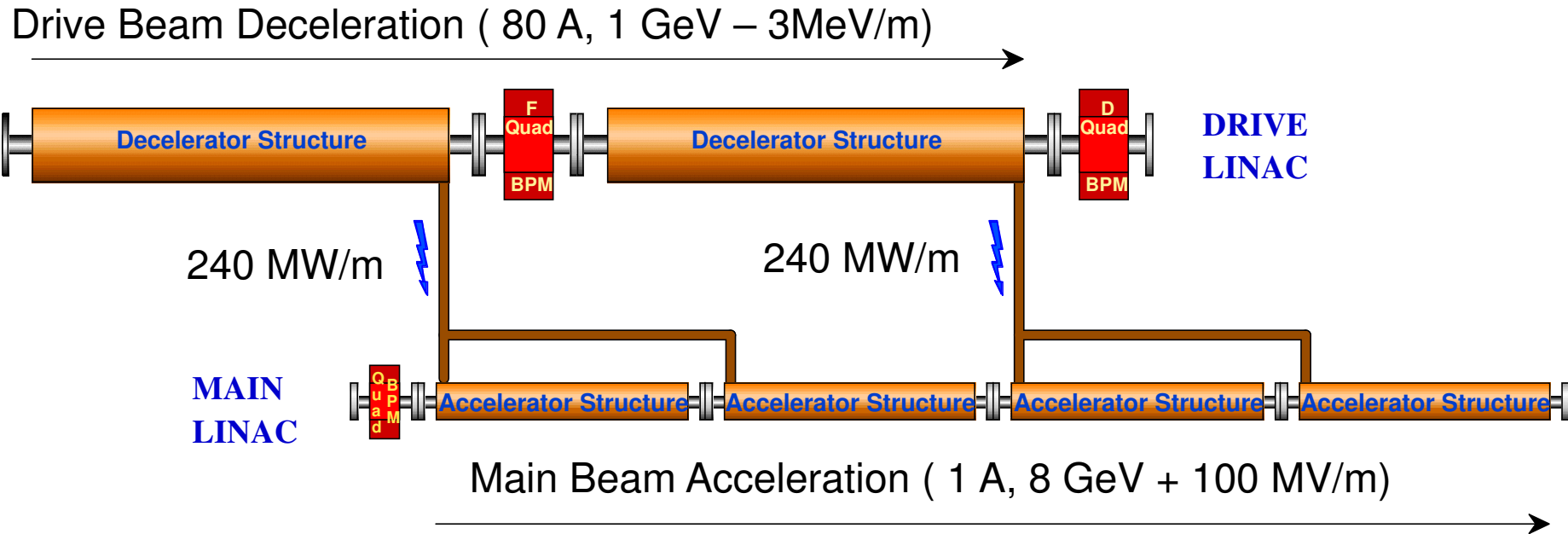

SLAC Two-Beam Test Facility

F. J. Decker, Sami Tantawi, Valerie Dolgashev, Juwen Wang, Dian Yeremian, Karl Bane, Ron Ruth, Min-Huey Wang
...Work in Progress

In the Tunnel Two Beam Looks Relatively Passive

Two-Beam Module Layout



The SLAC Linac Housing



Basic parameters of a possible facility

Linac Current 10 A

Final energy 1 GeV

Drive Beam Accelerator Structure 1 m long

Drive Beam gradient 6.8 MV/m

Number of structures 160

Drive Beam pulse length 300x8 + extra nsec

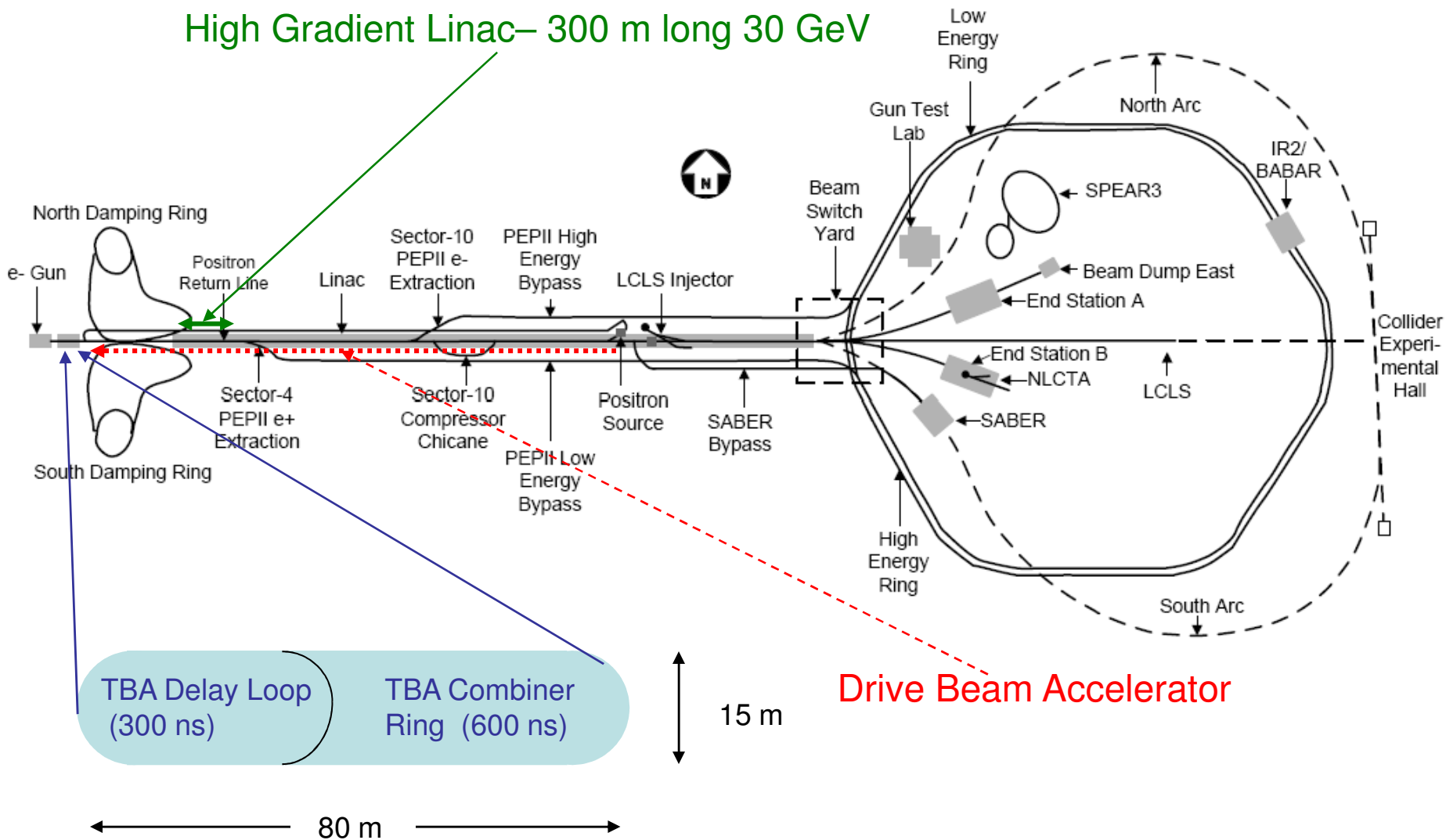
One delay loop x2 (300 nsec circumference)

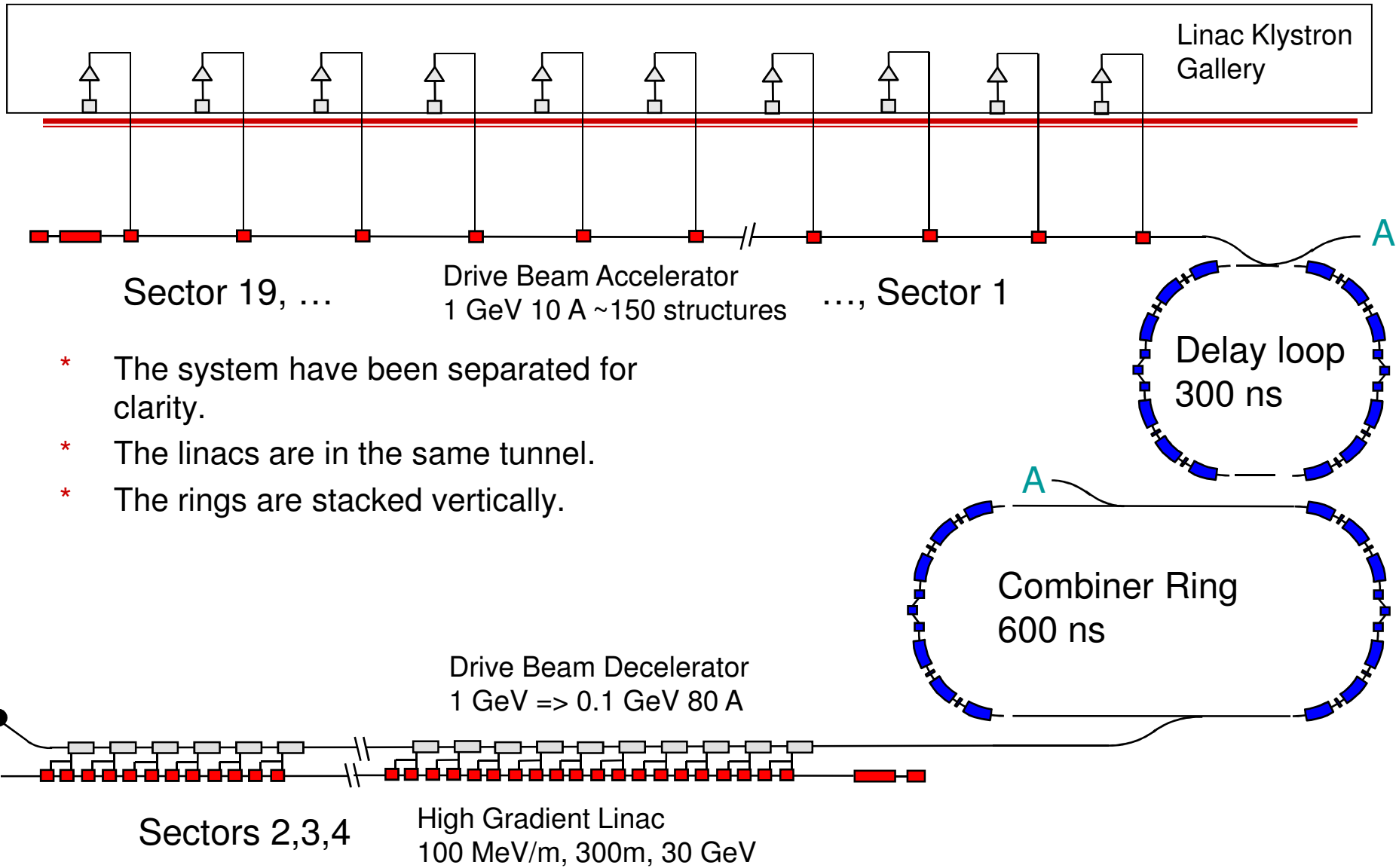
One combiner ring x4 (600 nsec circumference)

Main Beam acceleration gradient 100 MV/m loaded

Overview of the SLAC Two Beam Test Facility

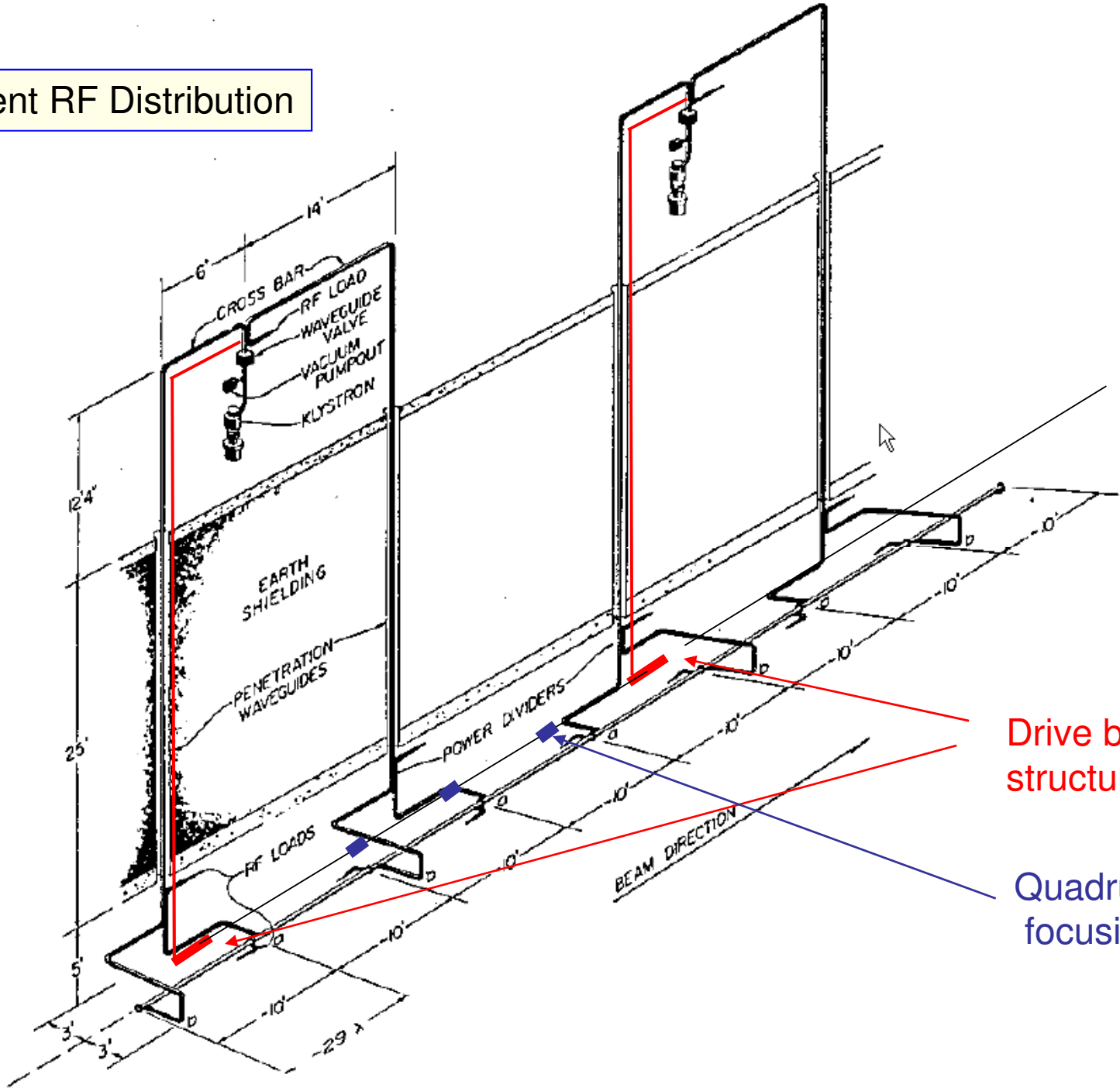
High Gradient Linac— 300 m long 30 GeV

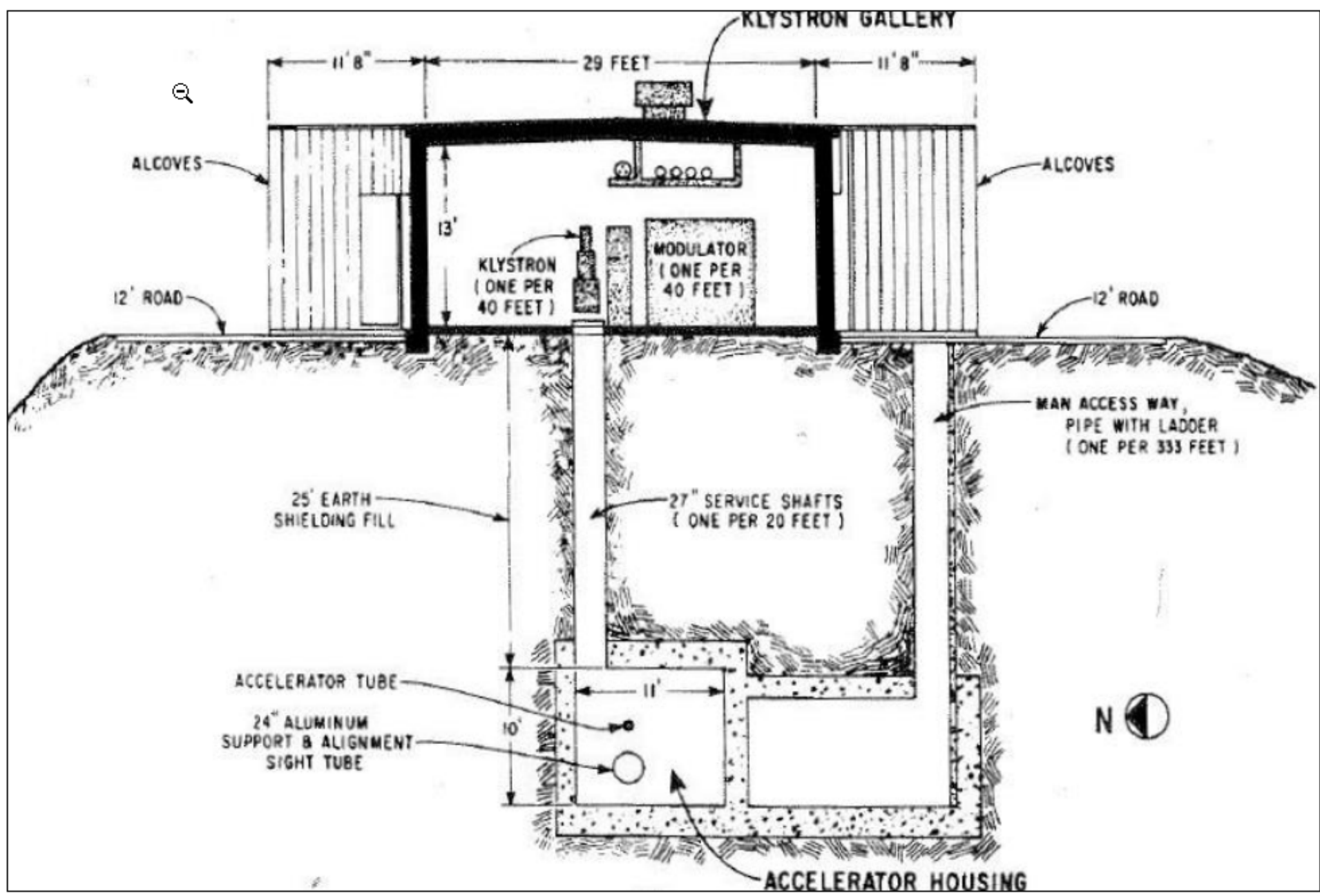


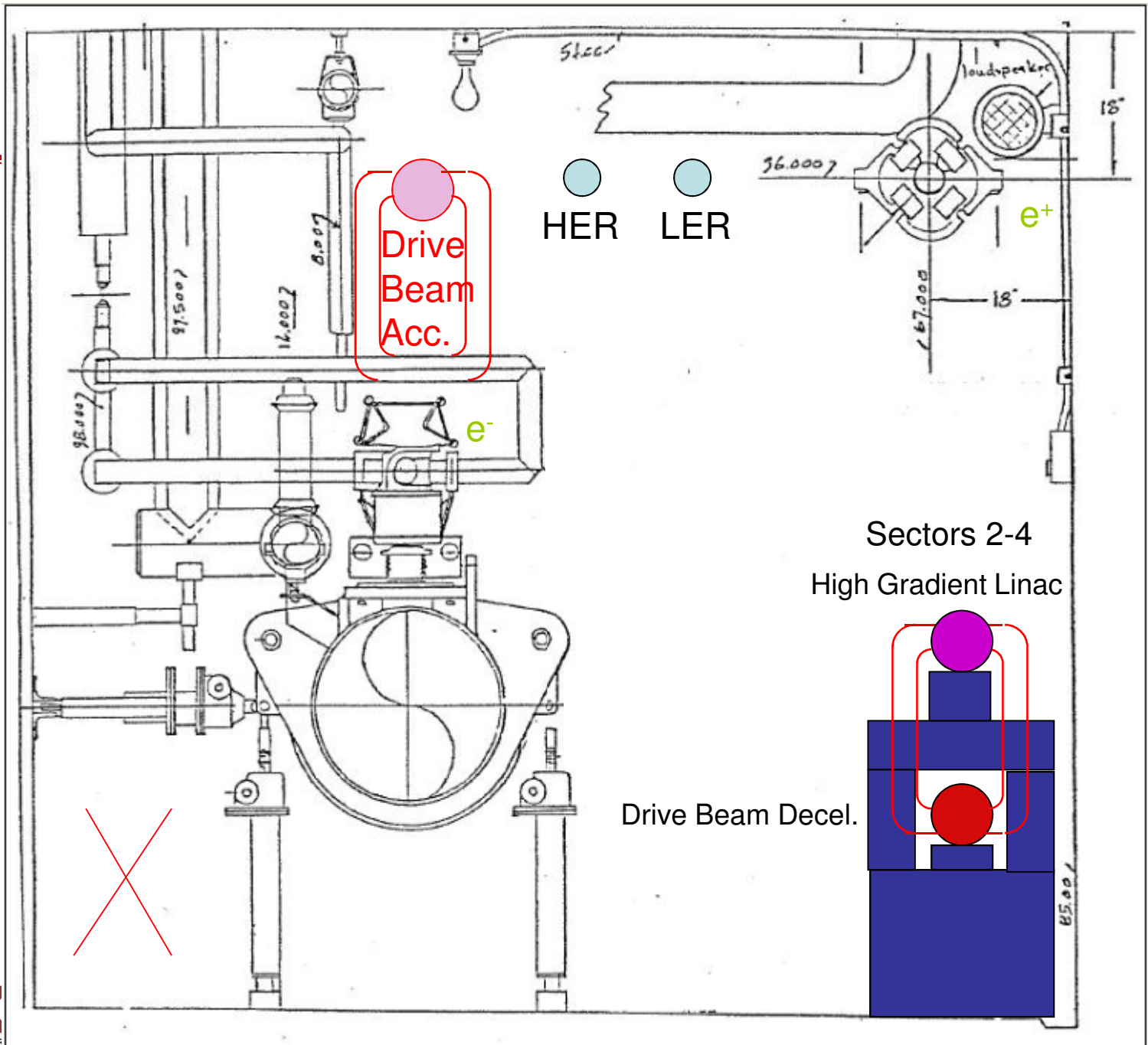


- * The system have been separated for clarity.
- * The linacs are in the same tunnel.
- * The rings are stacked vertically.

Current RF Distribution







CLIC vs CTF3 Drive beam vs S_{LAC} T_{wo} B_{eam} T_{est}

		CTF3	CLIC	STBT	Issues
Energy	GeV	0.15	2.38	1.0	Stability, Emittance, deceleration
Current	A	35	101	80	Stability, PETS impedance
Normalized (geom) emittance	μm-rad	100 (0.3)	100 (0.02)	100 (0.05)	Emittance Generation preservation
Pulse length	ns	140	241	300	RF breakdown rate, statistics
Train length in linac	μs	1.5	139	2.4	Stability, loading, losses
RF Frequency	GHz	3	1	2.856	Structure cost optimization
Energy extraction	%	50	90	90	Decelerator Stability and efficiency
Compression factor		2 x 4	2 x 3 x 4	2 x 4	RF combination system effects

Conclusion

- * CTF3 is a key test facility to demonstrate the feasibility of aspects of a two-beam system.
 - Full beam loading, efficient acceleration
 - Beam combination with RF deflectors
 - Deceleration
 - Initial component designs, ...
- * STBT may be required as a “10%” test of a Two-Beam System and 30 GeV ‘10%’ test facility
 - Stability of Drive beam Acceleration
 - Stability of Drive Beam Deceleration
 - Long pulse Main beam acceleration at high gradient
 - Emittance preservation and beam loading effects
 - RF Combination system effects, circumference feedback etc.
 - A Myriad of different issues can be tested with the main beam.
- * SLAC infrastructure provides a unique venue for the key development and tests which would be required if the world pursues a two-beam accelerator to address physics at a scale extending up to 3 TeV.