J. Seeman
June 7, 2000

PEP-N General Parameters

Goals:

e+e- collider at 3.1 GeV x 0.3 to 0.5 GeV based at PEP-II with little interference to the operation BaBar.

Cost for the accelerator to be less than 10M$. –

→ Use as many PEP-II, linac, and damping ring parts,

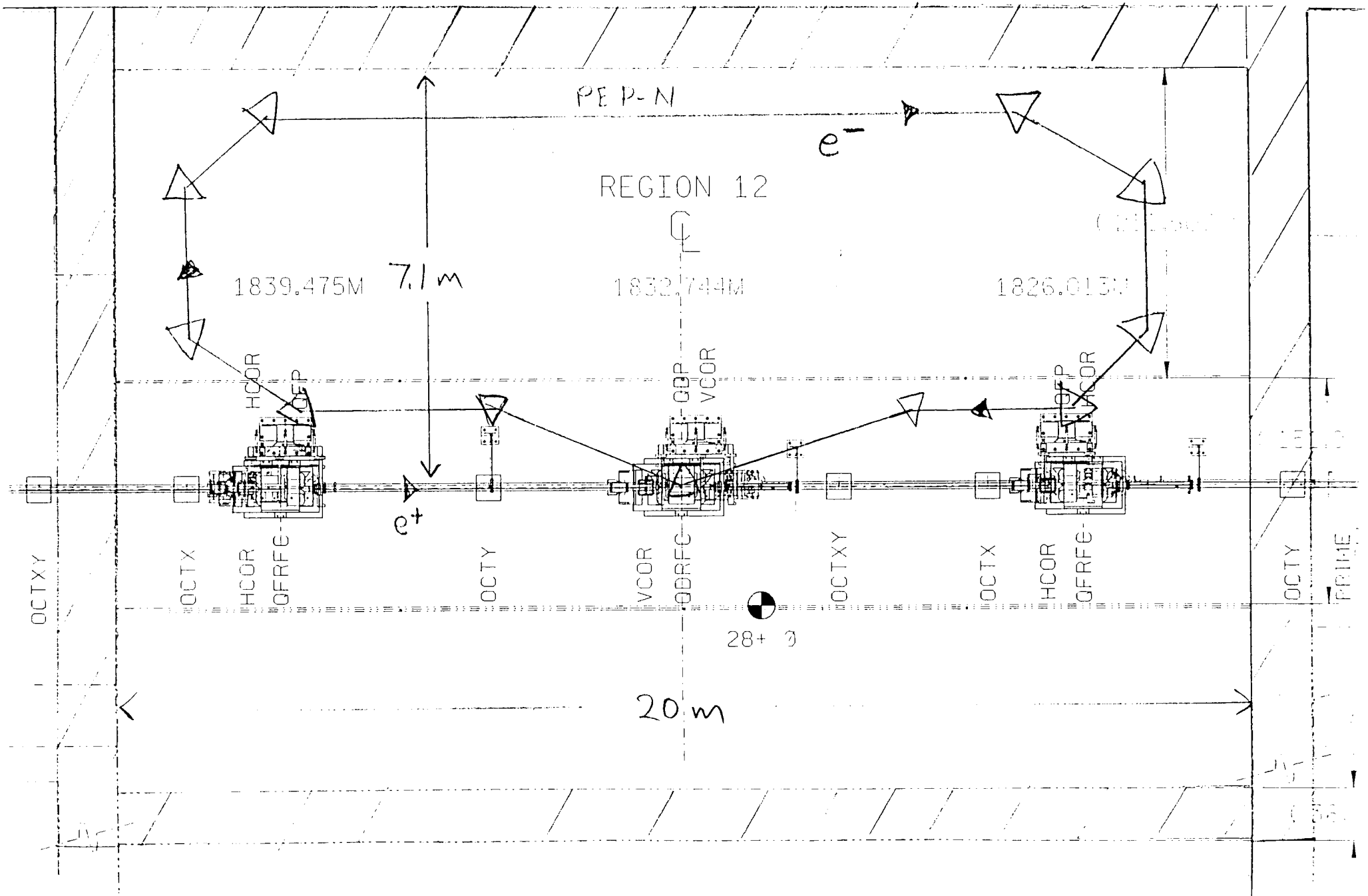
→ designs, concepts as possible.

The luminosity should be: > 1E30 in parasitic operation
(> 1E31 in dedicated mode ???)

Operation in parasitic mode for 8 months per year.

Operation in dedicated mode ??? (Maybe never?)

Install PEP-N accelerator and the detector in summer downtimes which are about two to three months per year.



Schematic PEP-N Electron Ring Layout in IR12

Parameters for a Neutron-Anti-Neutron Collider at PEP-II						J. Seeman
Parameter	Units	**320 MeV**	**500 MeV**	**320 MeV**	**500 MeV**	
		Dedicated	Dedicated	Parasitic	Parasitic	
Date		PEP-N	PEP-N	PEP-N	PEP-N	
		6/3/00	6/3/00	6/3/00	6/3/00	
Circum.	m	45.35	45.35	45.35	45.35	
E+	GeV	3.1	3.1	3.1	3.1	
E-	GeV	0.32	0.5	0.32	0.5	
Beta x +	cm	450	300	450	300	
Beta y +	cm	150	100	150	100	
Emit x +	nm	49	49	49	49	
Emit y +	nm	1.5	1.5	1.5	1.5	
Beta x -	cm	30	30	30	30	
Beta y -	cm	3	3	3	3	
Emit x -	nm	180	180	180	180	
Emit y -	nm	180	180	180	180	
Num Bunch		34	34	34	34	
I+	mA	2140	2140	2140	2140	
I-	mA	370	550	20	30	
N+		5.95E+10	5.95E+10	5.95E+10	5.95E+10	
N-		1.03E+10	1.53E+10	5.56E+08	8.34E+08	
Sig x +	microns	469.6	383.4	469.6	383.4	
Sig y +	microns	47.4	38.7	47.4	38.7	
Sig x -	microns	232.4	232.4	232.4	232.4	
Sig y -	microns	73.5	73.5	73.5	73.5	
r0	cm	2.83E-13	2.83E-13	2.83E-13	2.83E-13	
fc	Hz	6.61E+06	6.61E+06	6.61E+06	6.61E+06	
Cap Sig X	microns	523.9	448.3	523.9	448.3	
Cap Sig Y	microns	87.5	83.1	87.5	83.1	
Lum calc	/cm2/s	4.78E+31	8.74E+31	2.58E+30	4.77E+30	
Tune shift x+		0.0484	0.0480	0.0026	0.0026	
Tune shift y +		0.0510	0.0506	0.0028	0.0028	
Tune shift x-		0.0529	0.0508	0.0529	0.0508	
Tune shift y -		0.0524	0.0503	0.0524	0.0503	

Beam-Beam Tune Shifts

We assume 0.05 for the maximum tune shifts for both rings.

PEP-II has 0.06 in x and 0.03 in y right now.

For the e- ring, the emittances in x and y are equal meaning round beams potentially are available. Cornell has seen tune shifts of 0.1+ with round beams! Maybe it works here too.

J. Seeman
June 8, 2000

PEP-N Electron Injection

Linac pulse rate: 1 Hz (could have 120 Hz if needed)

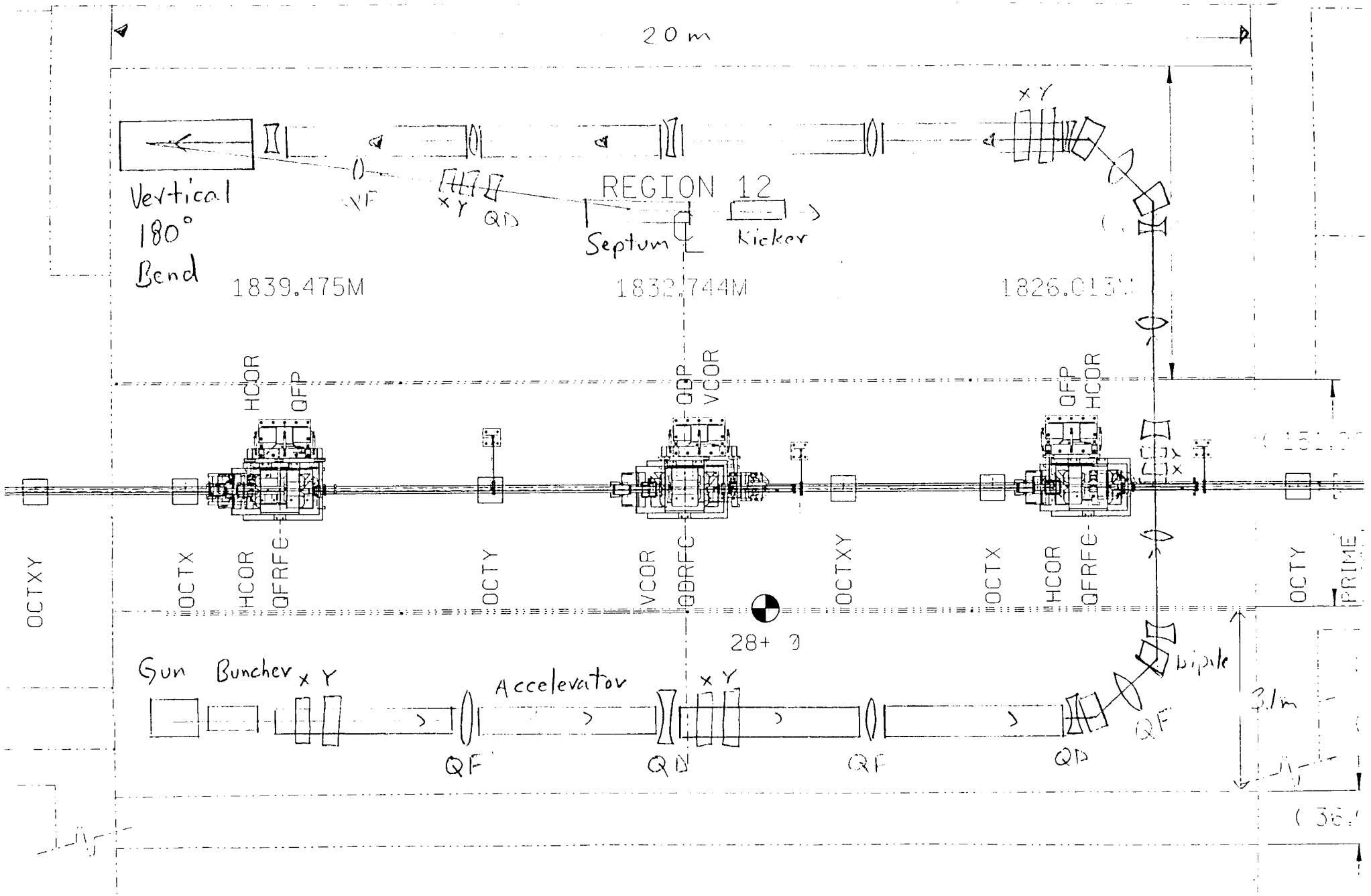
The linac can produce 10**11 electron over 130 nsec injection pulse (same as SLC)

10**11 per pulse -→ 105 mA per pulse.

This means that in the parasitic mode where PEP-N needs 30 mA the ring can be refilled in **one linac pulse.**

In dedicated mode the fill times are about 10 seconds (at one Hz).

Emittance: The damping rings have injection invariant emittances of 10**-4 rad-m which is about 170 nm at 300 MeV. Just right for PEP-N!



PEP-N Injection Schematic Layout

Present Linac Acceleration per klystron

KLYSTRON ENERGY FOR BEAM 10 (bsy e+/e) RATE = 10

SECTOR	UNIT ENERGY (MeV)								SECTOR TOTAL (MeV)	RUNNING TOTAL (GeV)	KLYS COUNT
LI00	0	0	0	0	0				0	0.00	0
LI01	255	240	231	218	135				1078	1.08	5
LI02	0	140	136	245	221	241	224	197	1404	2.48	12
LI03	0	0	248	0	239	249	236	0	971	3.45	16
LI04	140	134	202	224	206	235	244	223	1609	5.06	24
LI05	209	207	206	182	185	226	207	208	1631	6.69	32
LI06	218	222	222	216	212	214	200	0	1504	8.20	39
LI07	0	0	0	0	0	0	0	0	0	8.20	39
LI08	0	0	0	0	0	0	0	0	0	8.20	39
LI09	0	0	195	208	216	187	218	175	1198	9.40	45
LI10	143	145	80	63	205	214	224	170	1242	10.64	53
LI11	220	239	0	0	177	155	223	163			
	200								1377	12.01	60
LI12	228	227	244	241	218	215	0	199	1573	13.59	67
LI13	245	255	234	244	216	252	251	246	1944	15.53	75
LI14	236	222	231	183	206	209	251	213	1751	17.28	83
LI15	228	223	225	236	203	243	218	253	1830	19.11	91
LI16	222	227	209	221	233	244	226	184	1766	20.88	99
LI17	183	184	188	172	0	175	206	181	1289	22.17	106
LI18	180	166	174	142	173	174	178	177	1365	23.53	114
LI19	278	289	286	252	284	0	0		1389	24.92	119
LI20	0	0	0	0	0	0	0		0	24.92	119
LI21	0	0	0	0	0	0	0	0	0	24.92	119
LI22	0	0	0	0	0	0	0	0	0	24.92	119
LI23	0	0	0	0	0	0	0	0	0	24.92	119
LI24	0	0	0	0	0	0	0	0	0	24.92	119
LI25	0	0	0	0	0	0	0	0	0	24.92	119
LI26	0	0	0	0	0	0	0	0	0	24.92	119
LI27	0	0	0	0	0	0	0	0	0	24.92	119
LI28	0	0	0	0	0	0	0	0	0	24.92	119
LI29	0	0	0	0	0	0	0	0	0	24.92	119
LI30	0	0	0	0	0	0	0	0	0	24.92	119

TOTAL ENERGY = 24.92 GeV

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Schedule and Costs

Schedule: If money is available now, we could install half the ring and injector a year from now and the rest in Summer 2001. (It might take three summer downs.)

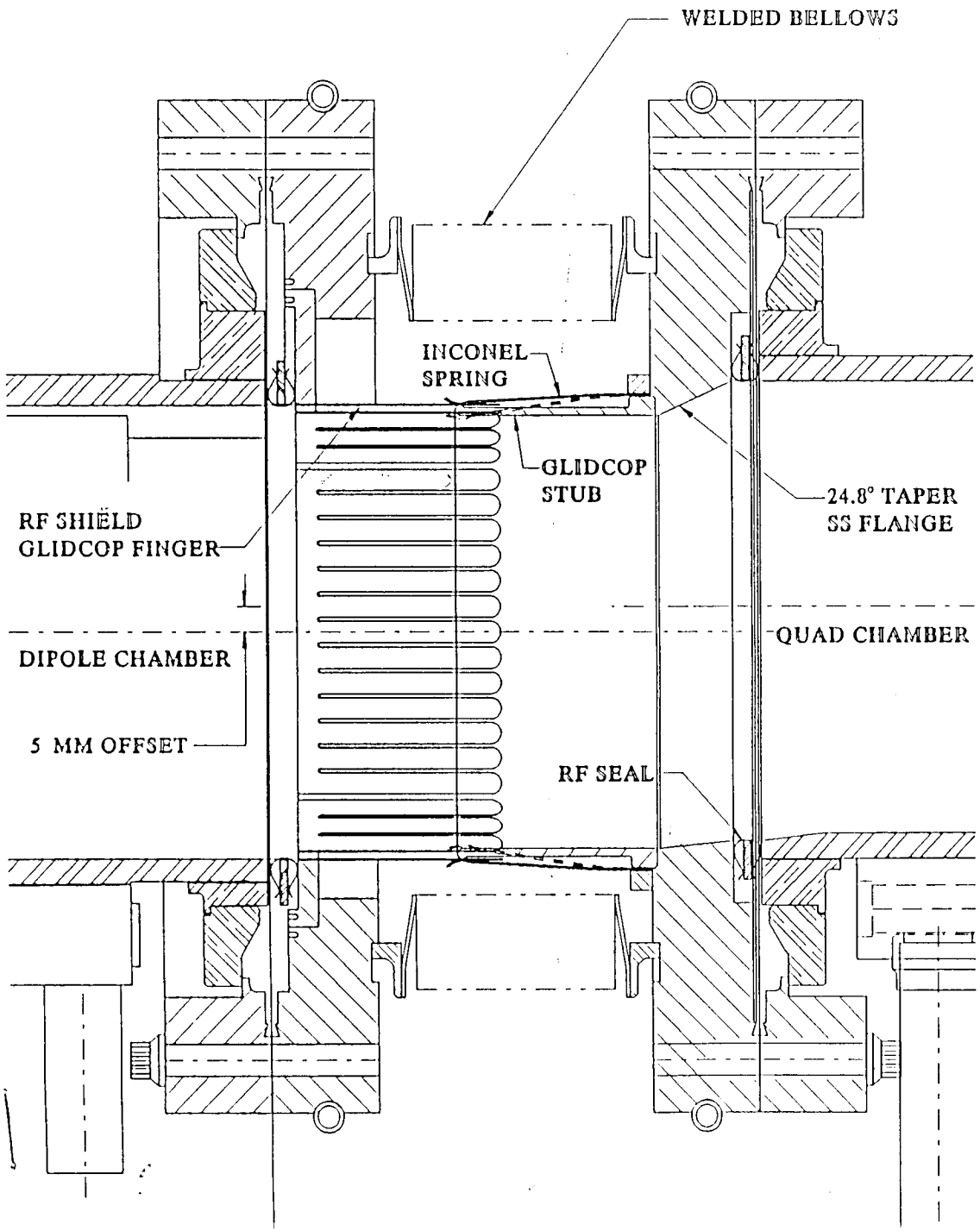
Costs: The 10 M$ is still possible:

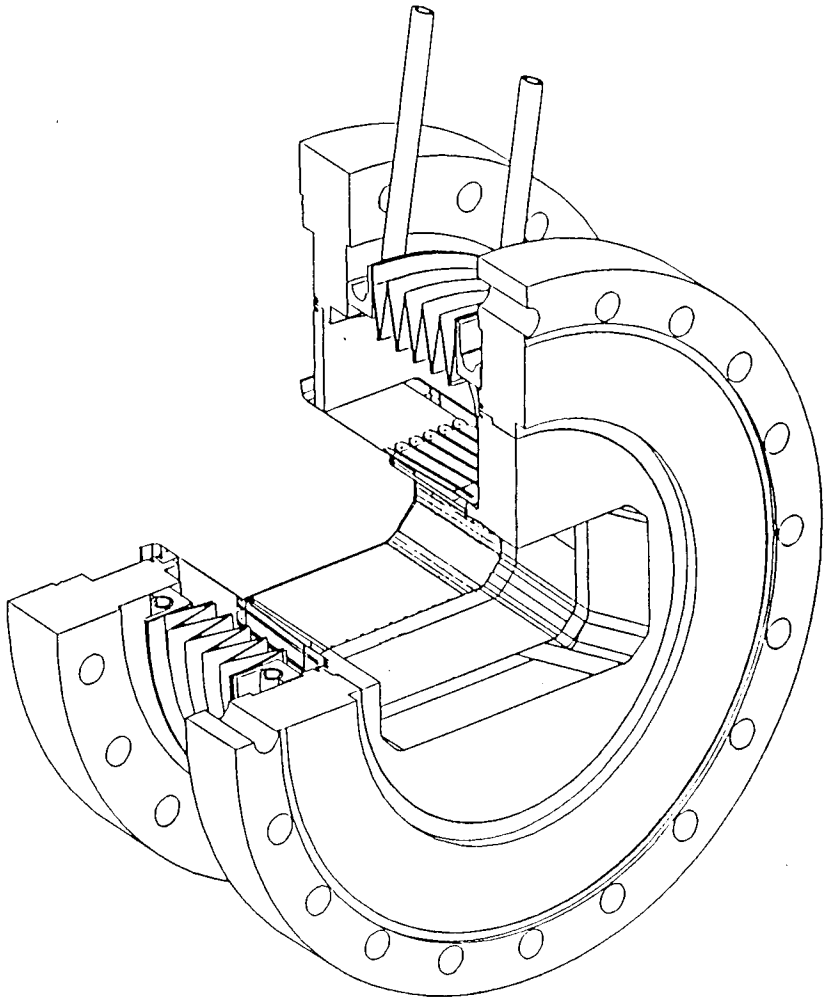
We own the following parts:

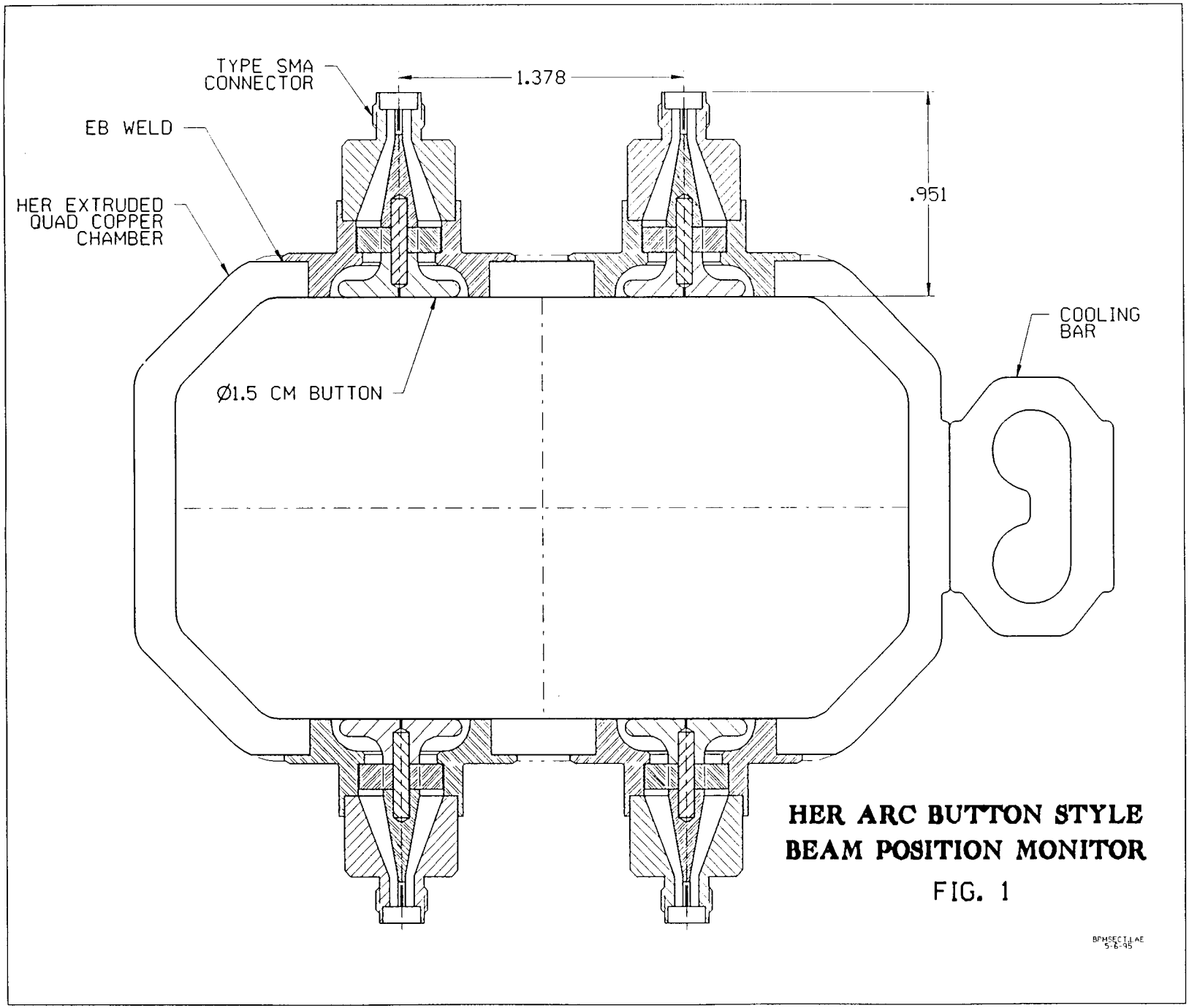
1. Gun.
2. Eight 3 m long accelerator structures
3. 20 linac quadrupoles
4. Linac dipole correctors
5. Linac klystrons
6. Linac modulators
7. Linac SLED cavities
8. Ring RF cavity
9. Ring vertical dipole correctors
10. Water cooling system
11. Ring and linac control computer
12. Vacuum pumps

We have designs and drawings for:

1. Ring dipoles
2. Ring quadrupoles
3. Ring vacuum chambers
4. Most controls and diagnostics


WELDED BELLOWS
INCONEL SPRING
GLIDCOP STUB
24.8° TAPER SS FLANGE
RF SHIELD GLIDCOP FINGER
QUAD CHAMBER
DIPOLE CHAMBER
5 MM OFFSET
RF SEAL





HER ARC BUTTON STYLE
BEAM POSITION MONITOR

FIG. 1