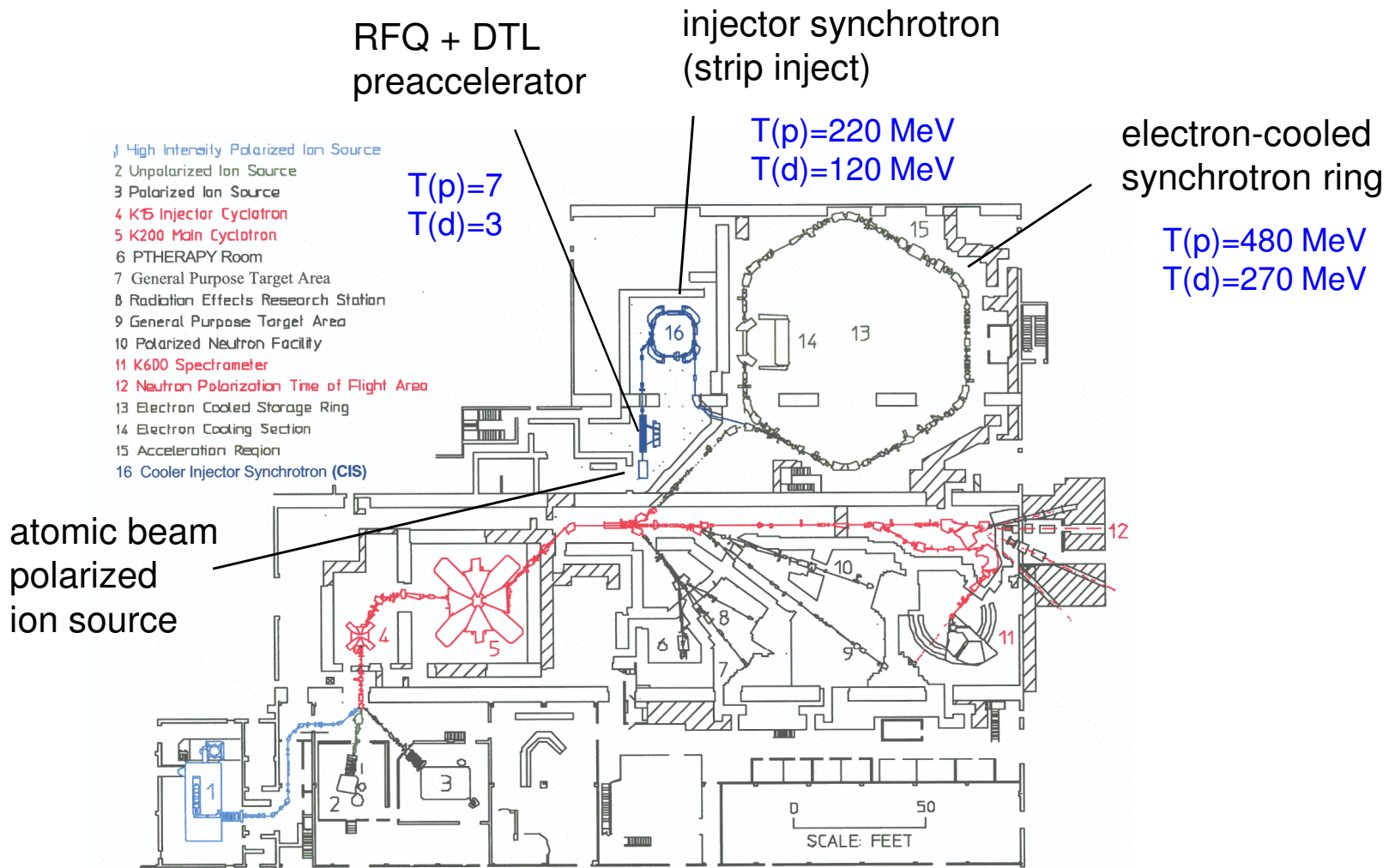
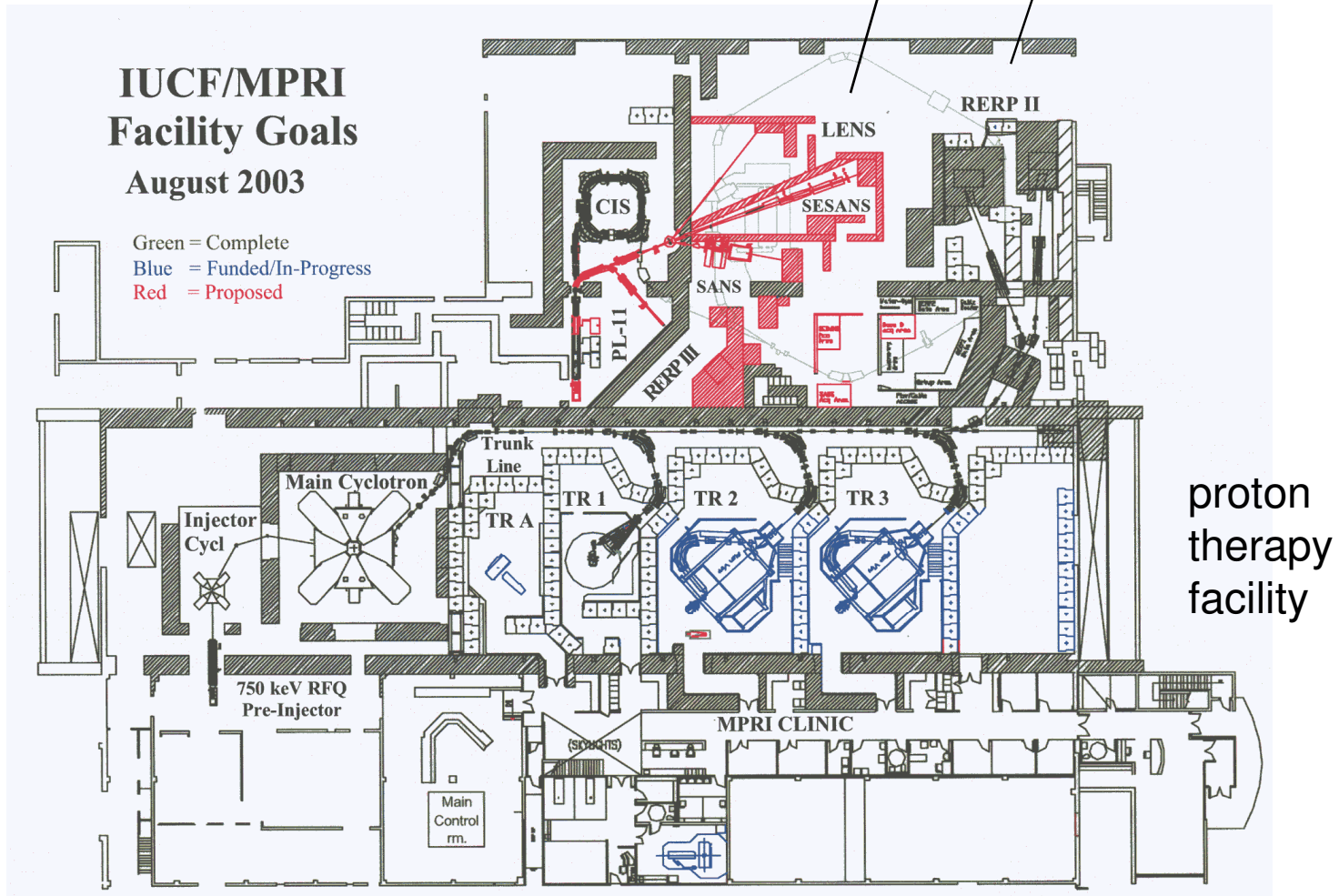


IUCF as a nuclear physics laboratory



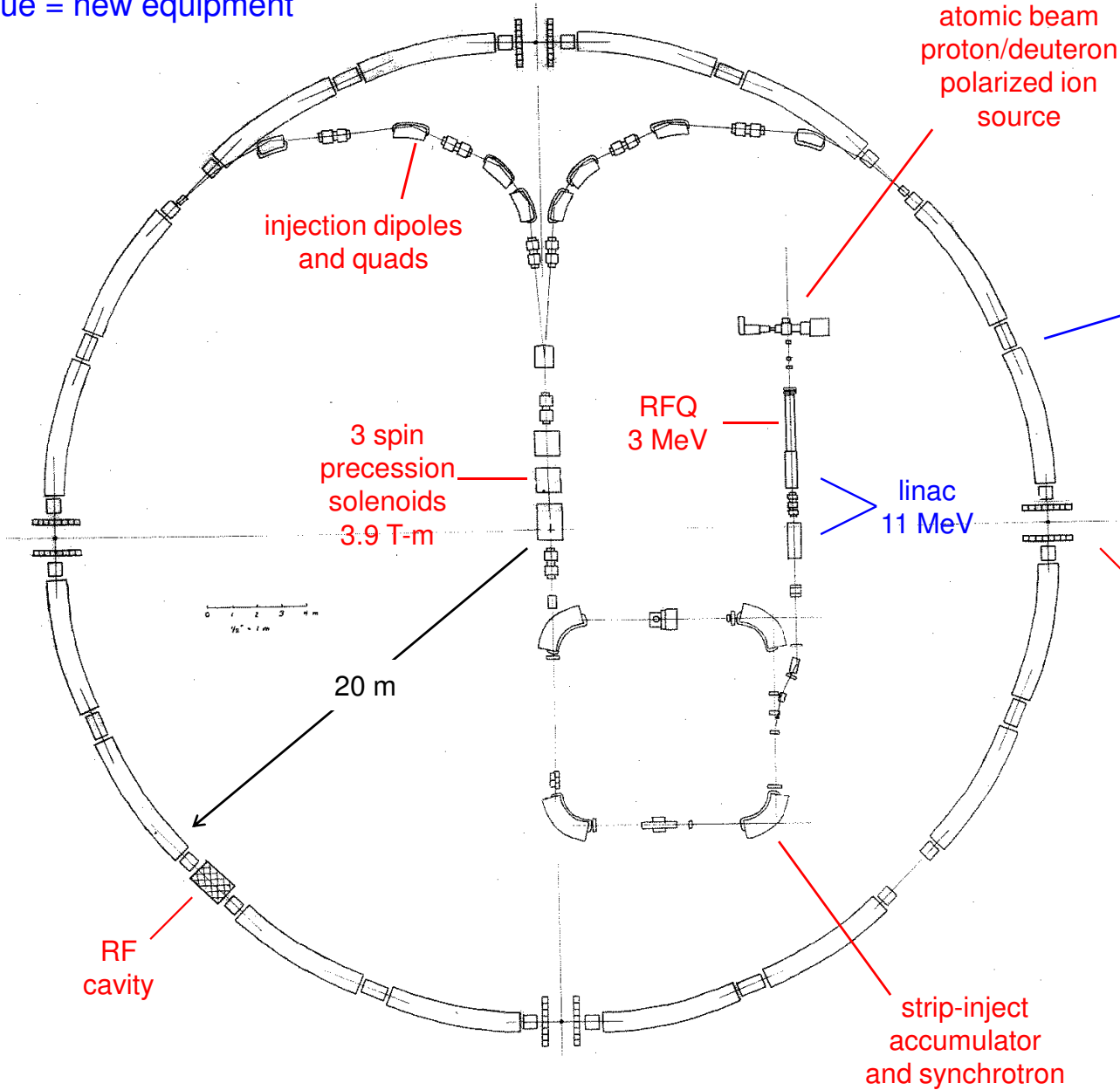
Cooler decommissioned
 Radiation Effects Research Program get 2 beam lines
 Low Energy Neutron Source
 (eventually) remove polarized
 source and injector



Red = equipment at IUCF

Blue = new equipment

IUCF
EDM ring
(draft)



Ring Properties:

- $E = 2.5 \text{ MV/m}$
- $B = 1.6 \text{ kG}$
- $T(d) = 116 \text{ MeV}$
- $p = 0.67 \text{ GeV/c}$
- $\beta = 0.34$
- $\gamma = 1.06$
- ring radius = 20 m
- dipole radius = 14.2 m

Polarized deuterons:
 5×10^8 /bunch

Intensity improvements:
higher energy x 8
(intensity $\propto T^{3/2}$)
larger circumference x 2
[multiple bunches x 5,
if polarization lifetime
long and DAQ OK]

Estimated Costs k\$

detailed
rough estimate

Re-establish IUCF injector
polarized ion source 120
injector ring 463
injection 126
stacking 159 = 868

LINAC sections 2000

EDM ring
magnets 2164
vacuum 444
RF cavity 153
standard diagnostics 460 = 3221

Building 6000

Manpower (design) 6300

Contingency (25%) 4600

TOTAL = \$ 23 M

Value of equipment 5450

Detail:
dipoles 1200
supplies 220
switchgear 62
trim coils 72
quads 240
supplies 250
steerers 80
corrections 80

should have overhead crane,
shielding, HVAC, power substation,
DAQ/control area, utilities, service
rooms, setup rooms

Not included: electrostatics
special EDM gear

Features of the IUCF option:

- Land is available north of the present accelerator building.
- Timescale fits well after completion of proton therapy clinic and neutron source.
- Staff has experience with accelerator building and operation, polarized beam.
- Staff is on call.
- Single user mode can offer:
 - continuous access or operation at will
 - experimenter operation (except for setup?) with no permanent staff

Rates

$$\text{intensity/bunch} = 5 \times 10^8 \times 14 = 7 \times 10^9$$

10 s cycle

take data for 10^7 s, see 7×10^{15} deuterons

polarimeter efficiency = 0.26 %, collect 1.8×10^{13} events (4 quadrants)

average $A = 0.52$

$$\delta p = 1/AN^{1/2} = 6.4 \times 10^{-7}$$

NOTE: This value is small enough that parity violating d+C scattering may produce a left/right asymmetry. Such an effect does not vary with ω_a like an EDM signal.