MICE

TECHNICAL UPDATE &
ISIS/RAL PLANS

ISIS

Belgium

Italy

Japan

The Netherlands

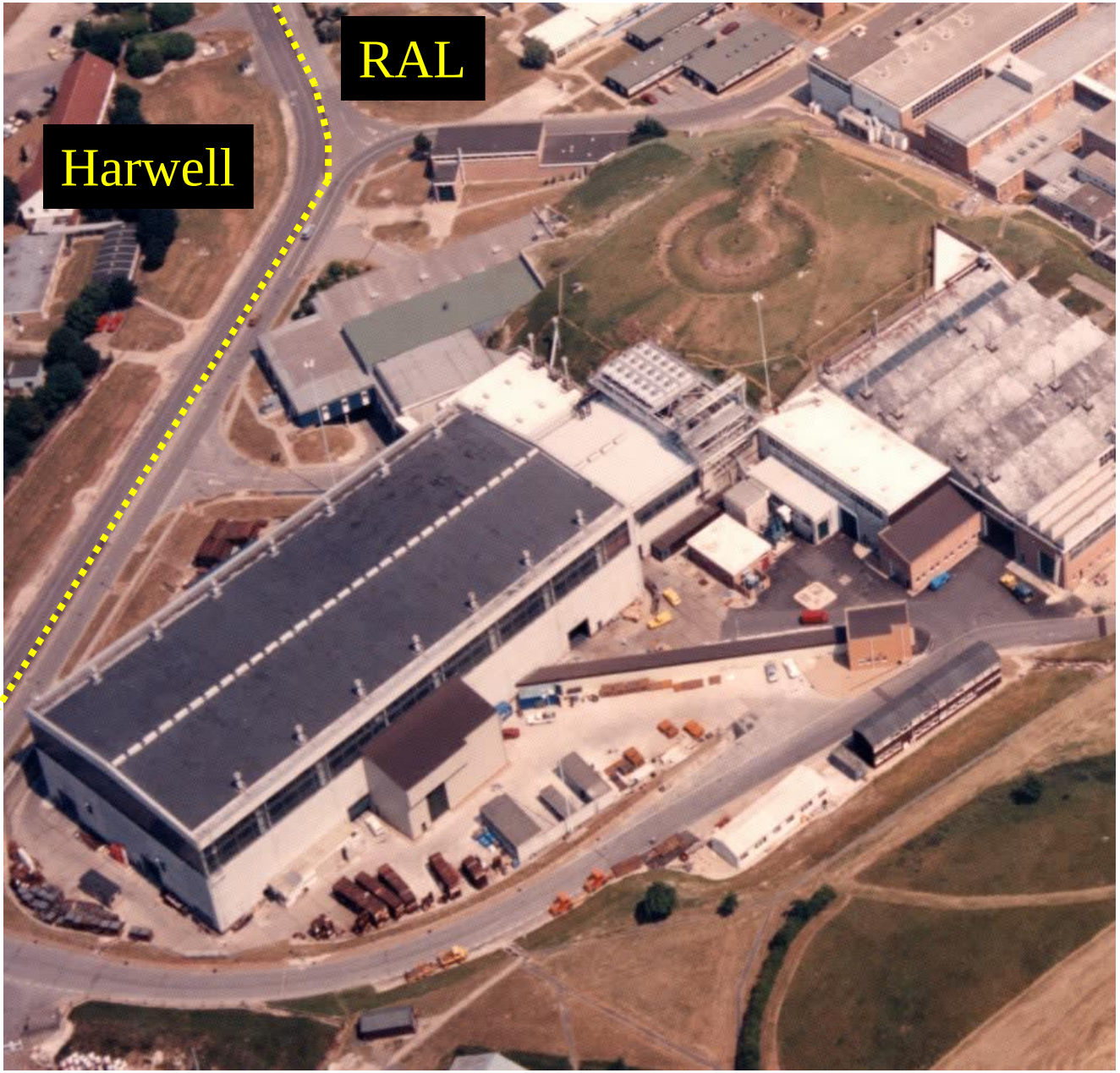
Russian Federation

Switzerland

UK

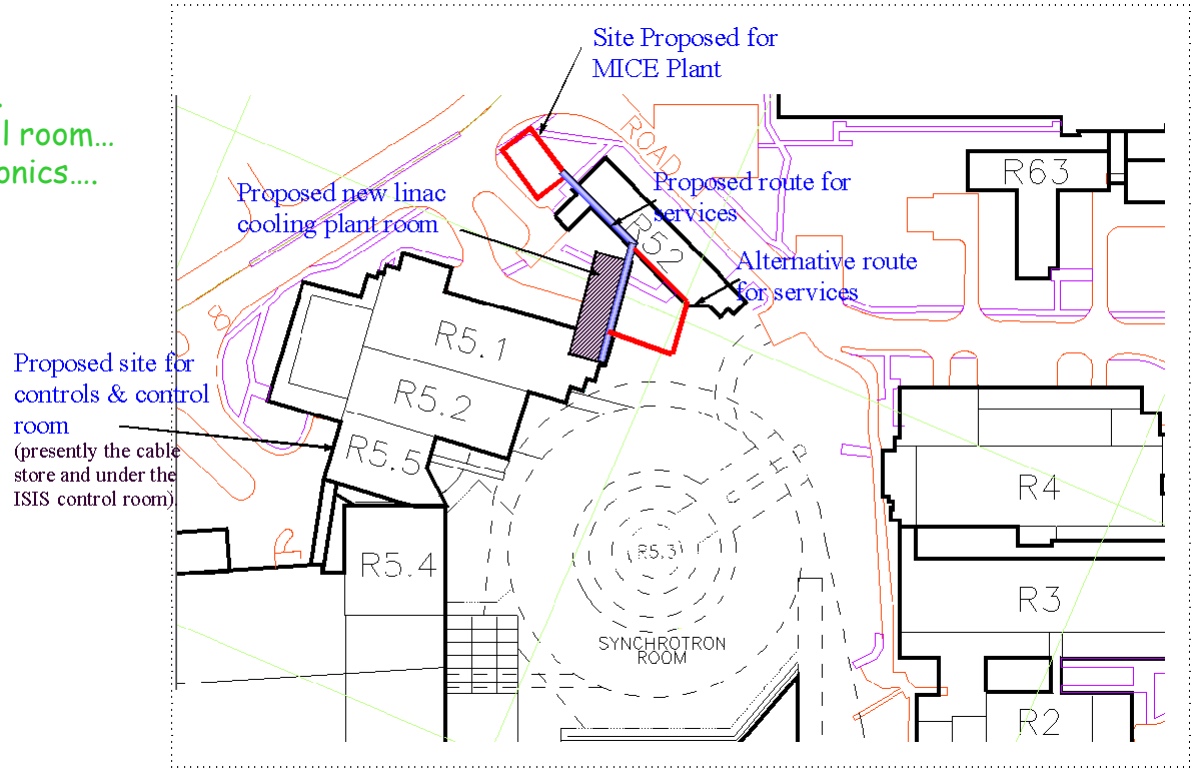
USA

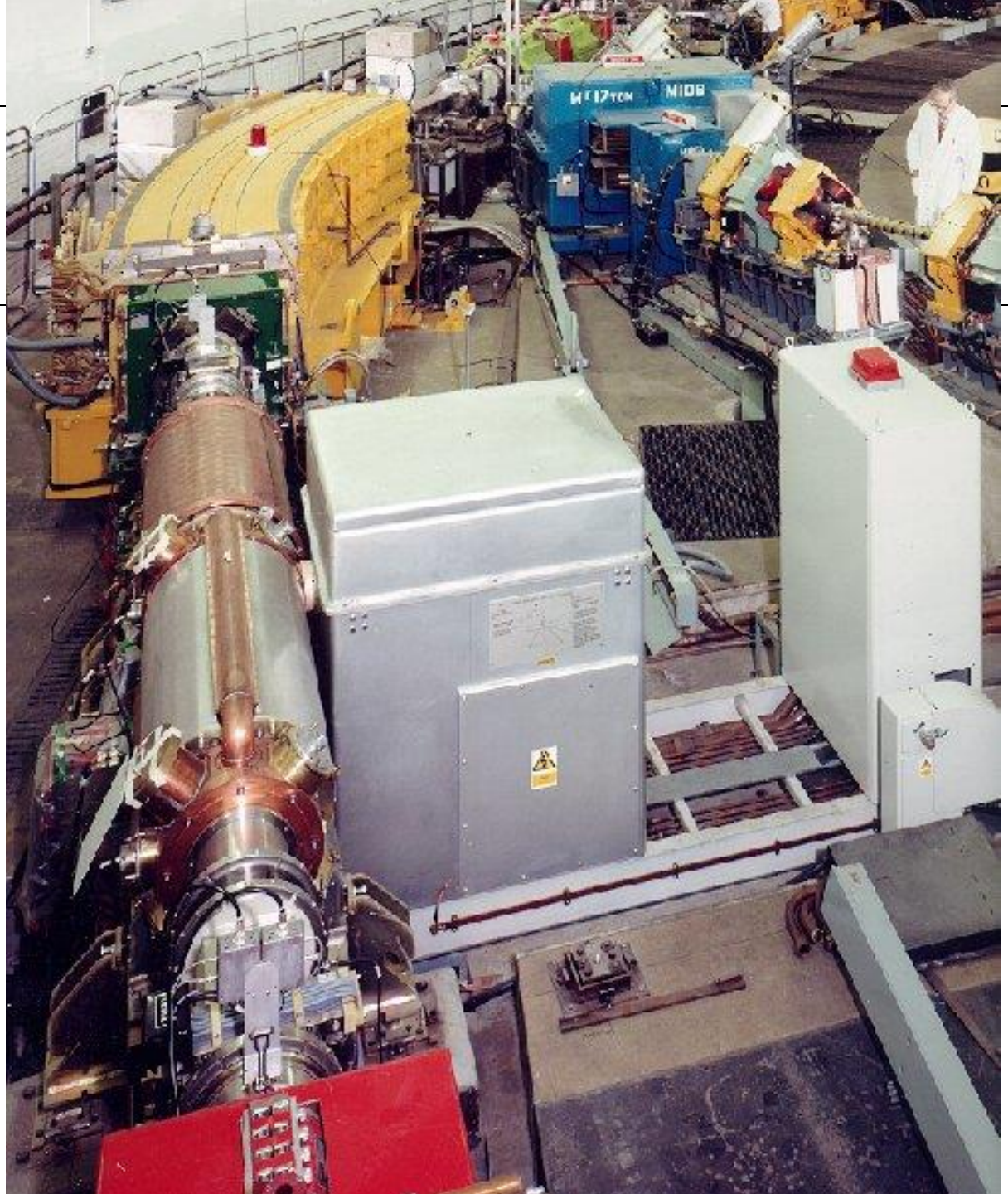
ISIS

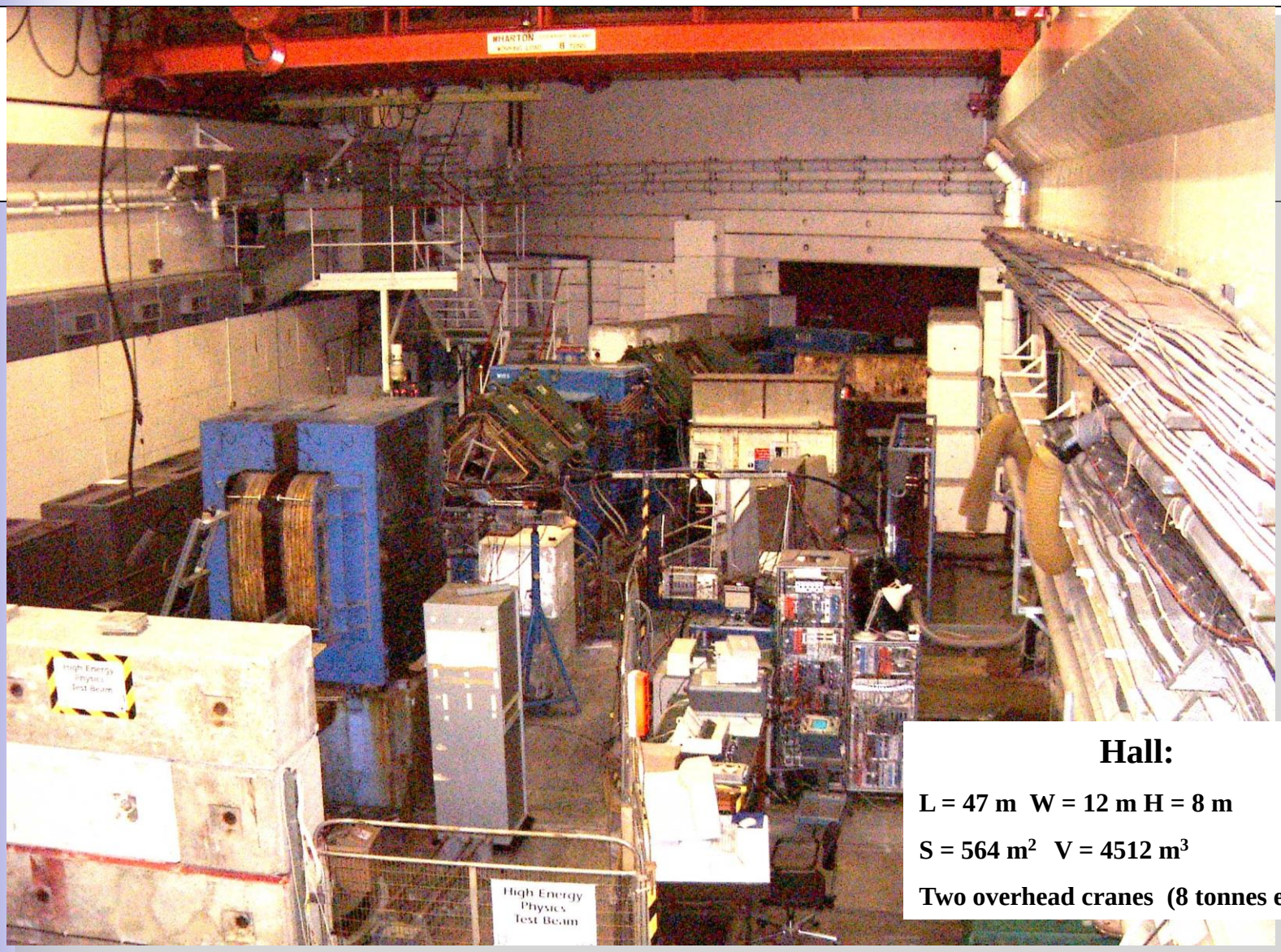


Location

Plant….
Control room…
Electronics….




WESTON
MIDS

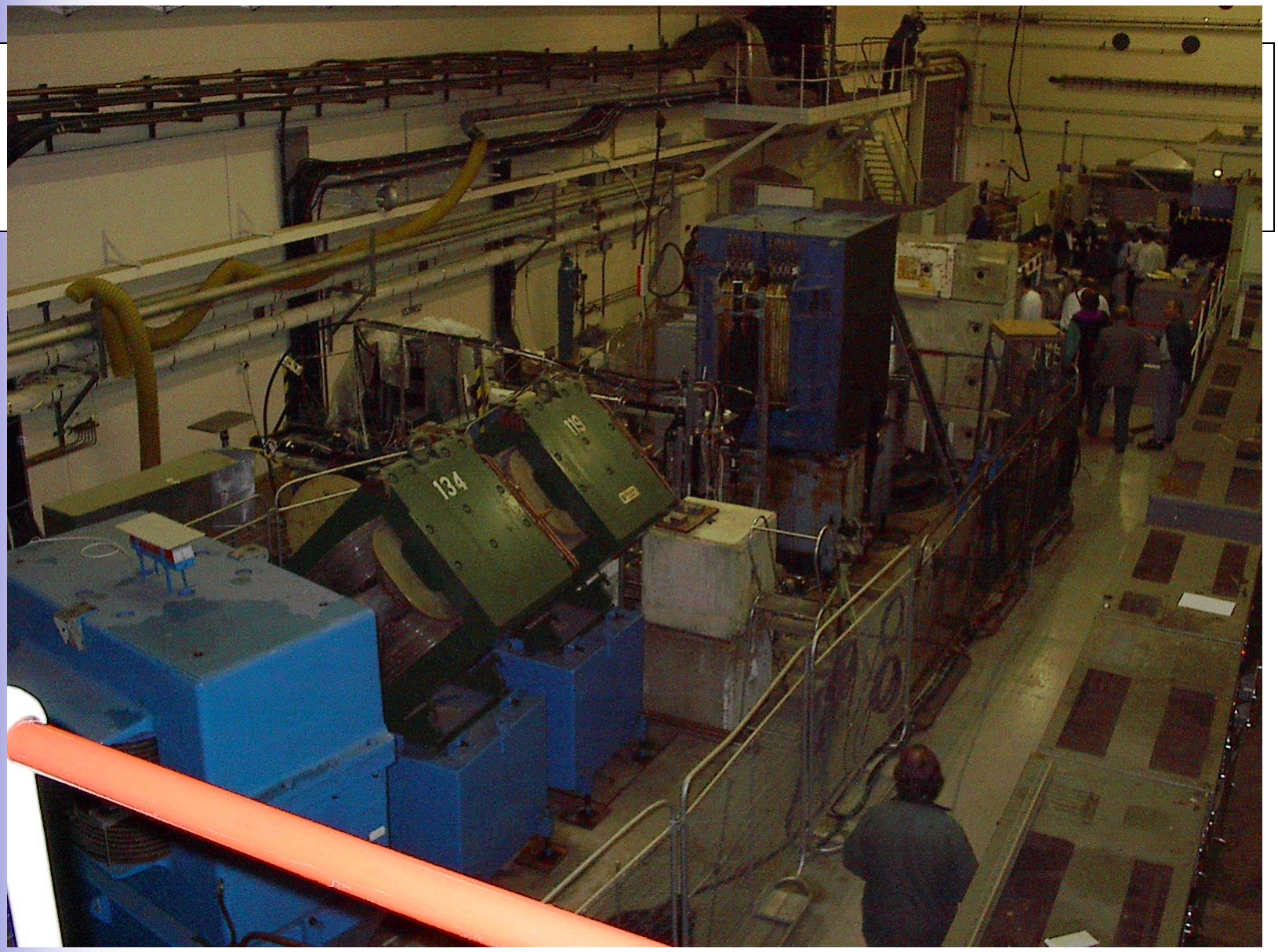


Hall:

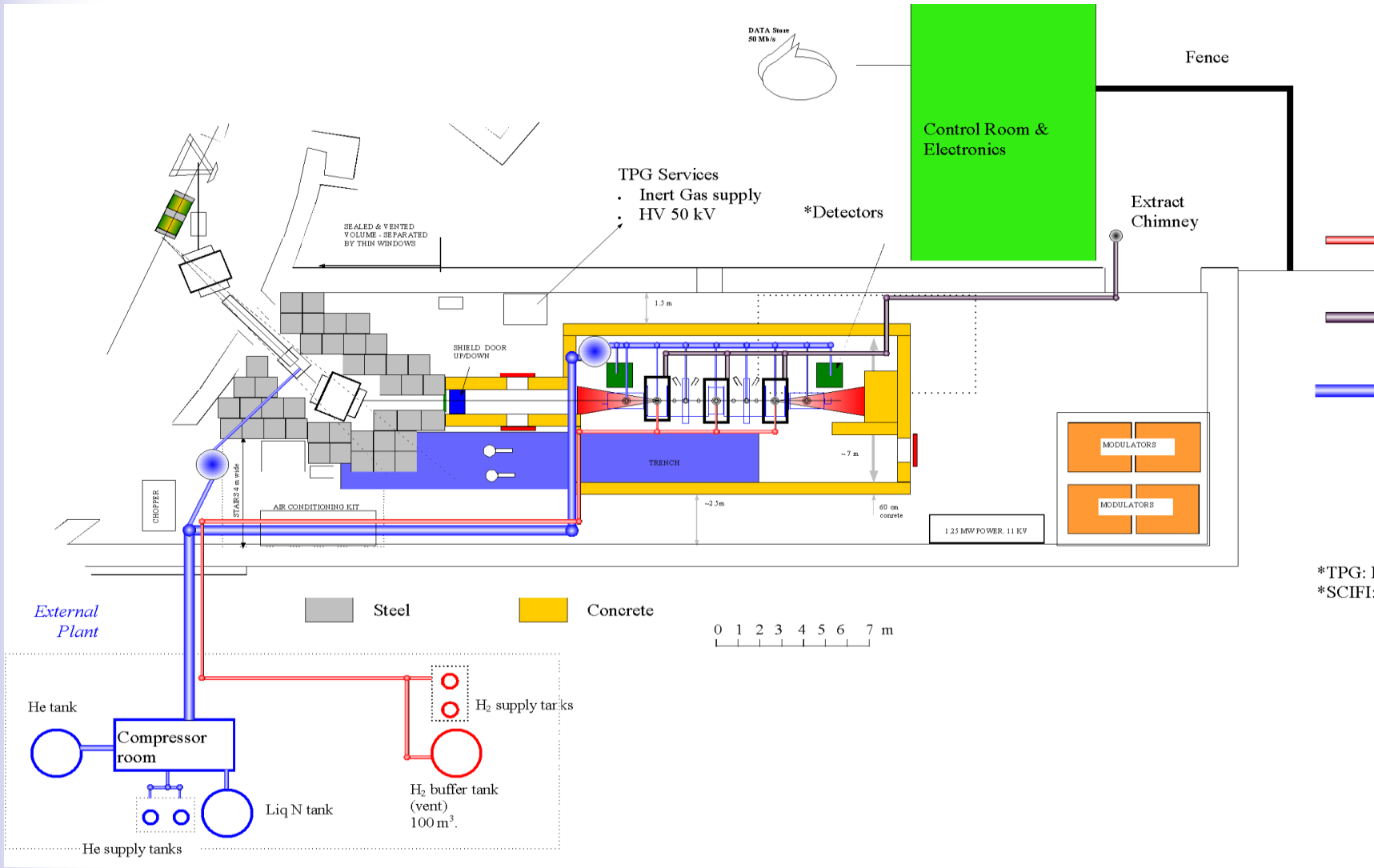
L = 47 m W = 12 m H = 8 m

S = 564 m^2 V = 4512 m^3

Two overhead cranes (8 tonnes each)


134
115

Mice Layout


DATA Store
50 Mb/s
Fence
Control Room &
Electronics
TPG Services
. Inert Gas supply
. HV 50 kV
*Detectors
Extract
Chimney
SEALED & VENTED
VOLUME - SEPARATED
BY THIN WINDOWS
1.5 m
SHIELD DOOR
UP/DOWN
TRENCH
~7 m
~2.5m
60 cm
concrete
MODULATORS
MODULATORS
1.25 MW POWER. 11 KV
CHOPPER
STAIRS 4 m wide
AIR CONDITIONING KIT
External
Plant
Steel
Concrete
0 1 2 3 4 5 6 7 m
He tank
Compressor
room
Liq N tank
He supply tanks
H_2 supply tanks
H_2 buffer tank
(vent)
100 m^3.
*TPG:
*SCIFI:

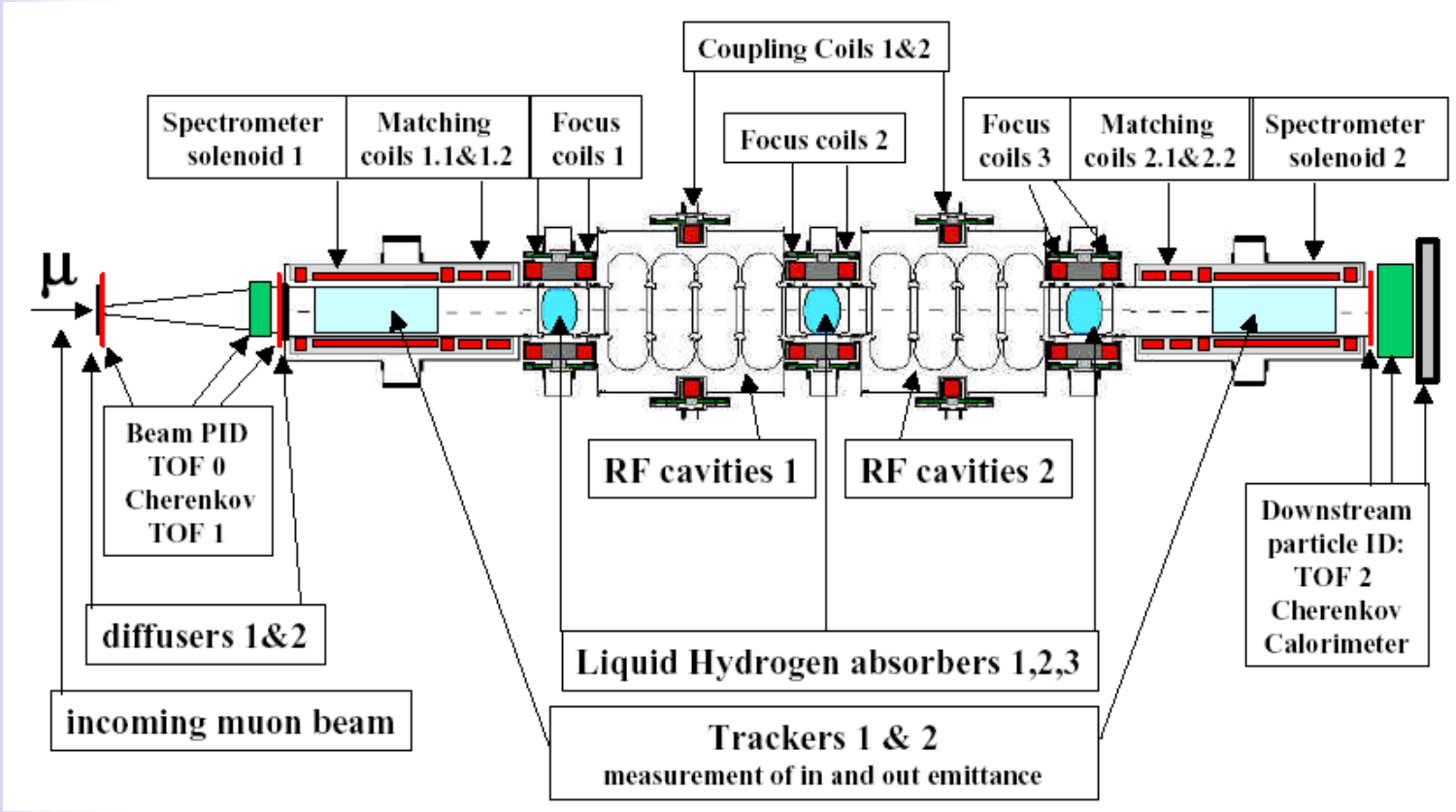
Technical Update & Issues

- Beam Line
- RF System
- Absorbers
- Magnets & Cryogenics
- Detectors

- Infrastructure & Layout

- RAL & ISIS Perspectives
- Programme
- Expected Progress

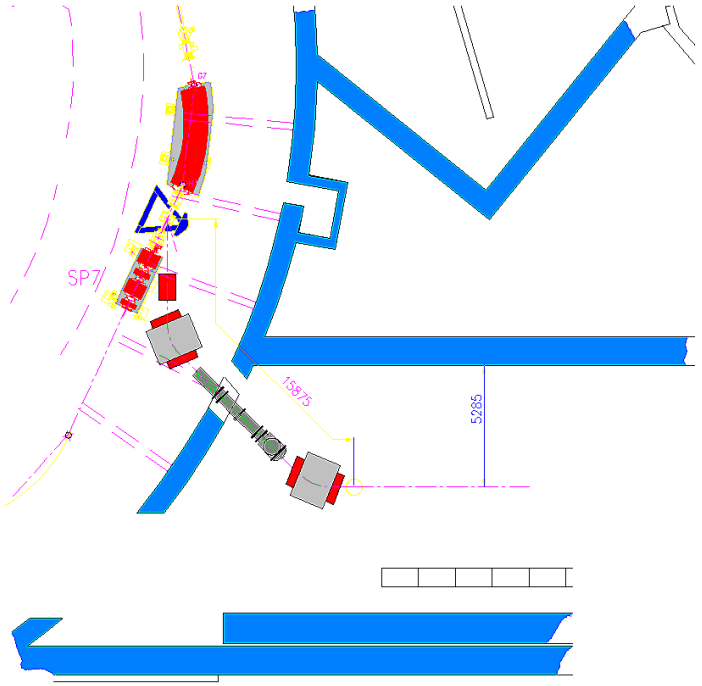
MICE Layout


Coupling Coils 1&2
Spectrometer solenoid 1
Matching coils 1.1&1.2
Focus coils 1
Focus coils 2
Focus coils 3
Matching coils 2.1&2.2
Spectrometer solenoid 2
μ
Beam PID
TOF 0
Cherenkov
TOF 1
RF cavities 1
RF cavities 2
Downstream particle ID:
TOF 2
Cherenkov
Calorimeter
diffusers 1&2
Liquid Hydrogen absorbers 1,2,3
incoming muon beam
Trackers 1 & 2
measurement of in and out emittance

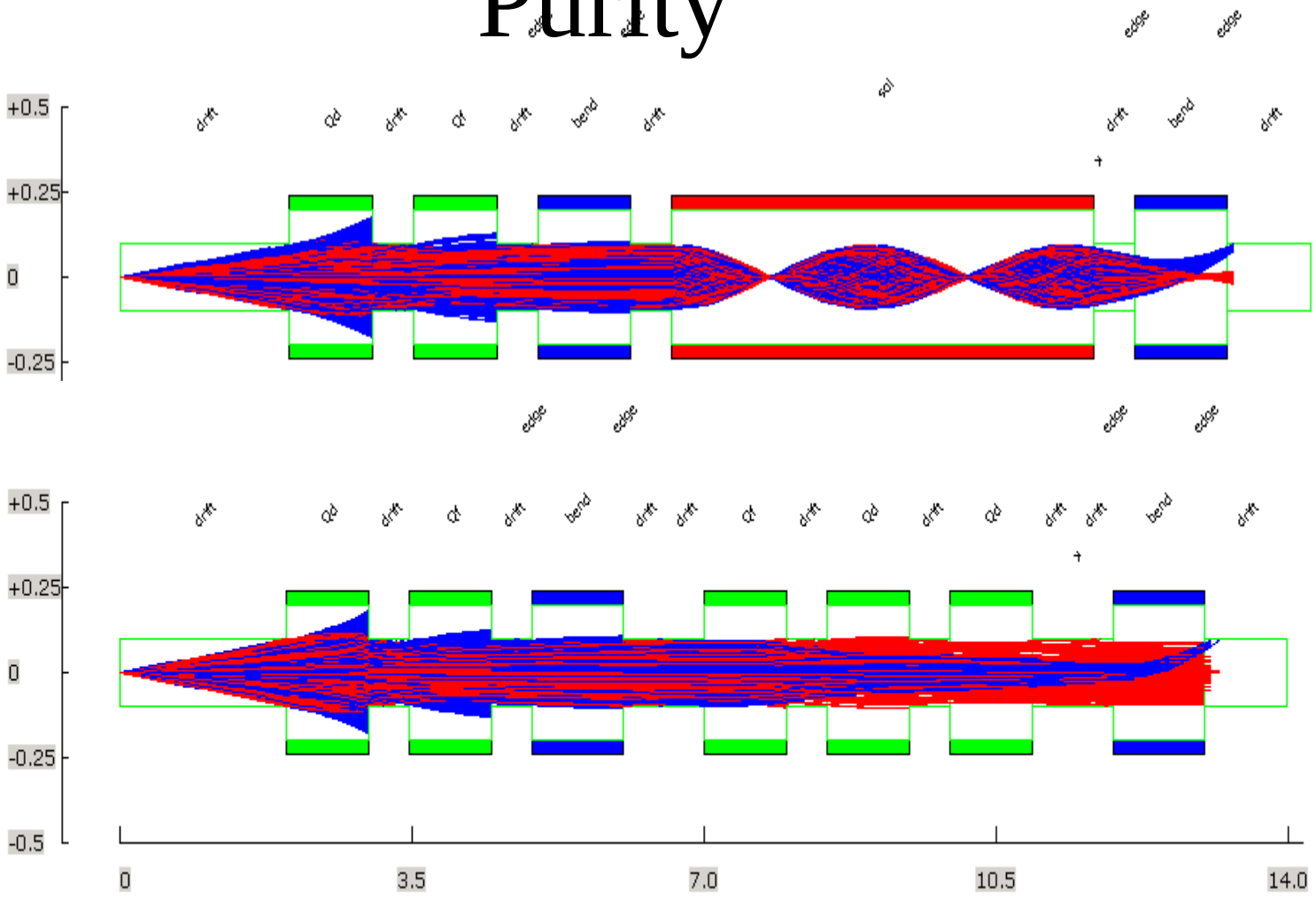
Beam Line

- Pμ < 400 MeV/c
- Rejection of protons and pions <10%
- few muons per μs

- Two solutions:
  - solenoid
    - » cryogenics ava
    - » release by PSI
  - quadrupoles



Purity


+0.5
+0.25
0
-0.25
-0.5
drift
Qd
drift
Qf
drift
bend
drift
sol
drift
bend
drift
edge
edge
edge
edge
edge
edge
drift
Qd
drift
Qf
drift
bend
drift
drift
Qf
drift
Qd
drift
Qd
drift
drift
bend
drift
0
3.5
7.0
10.5
14.0

Performance

Rate depends on muon momentum:

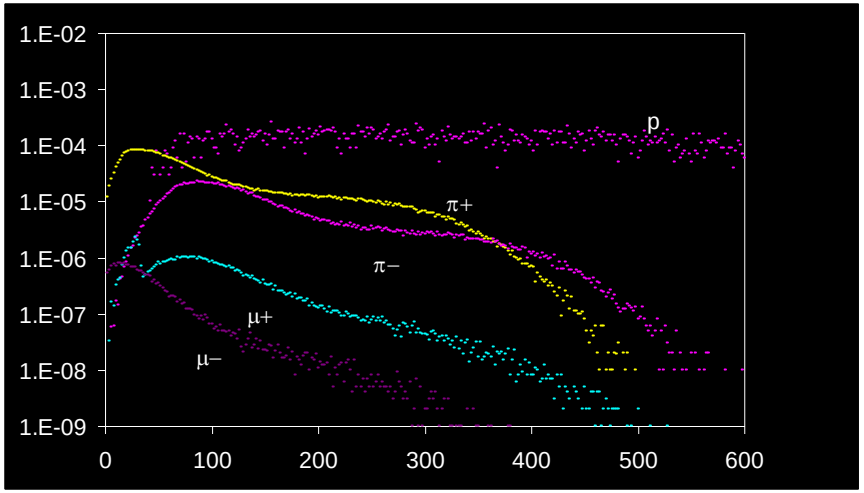
e.g. at 200 MeV/c

3000 / ms for solenoid

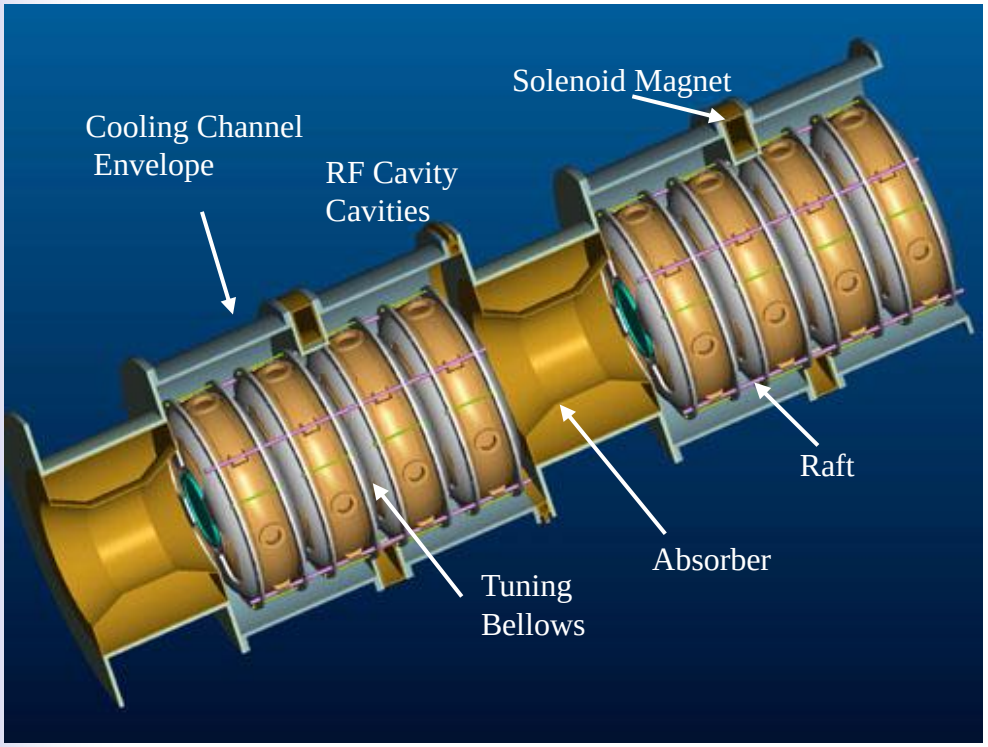
~300 /ms in quadrupole

(assumed a Ti wire target: 1cm long and 4mm Ø)

Purity should be better than 90% against scattered protons



RF System



1 MW per cavity

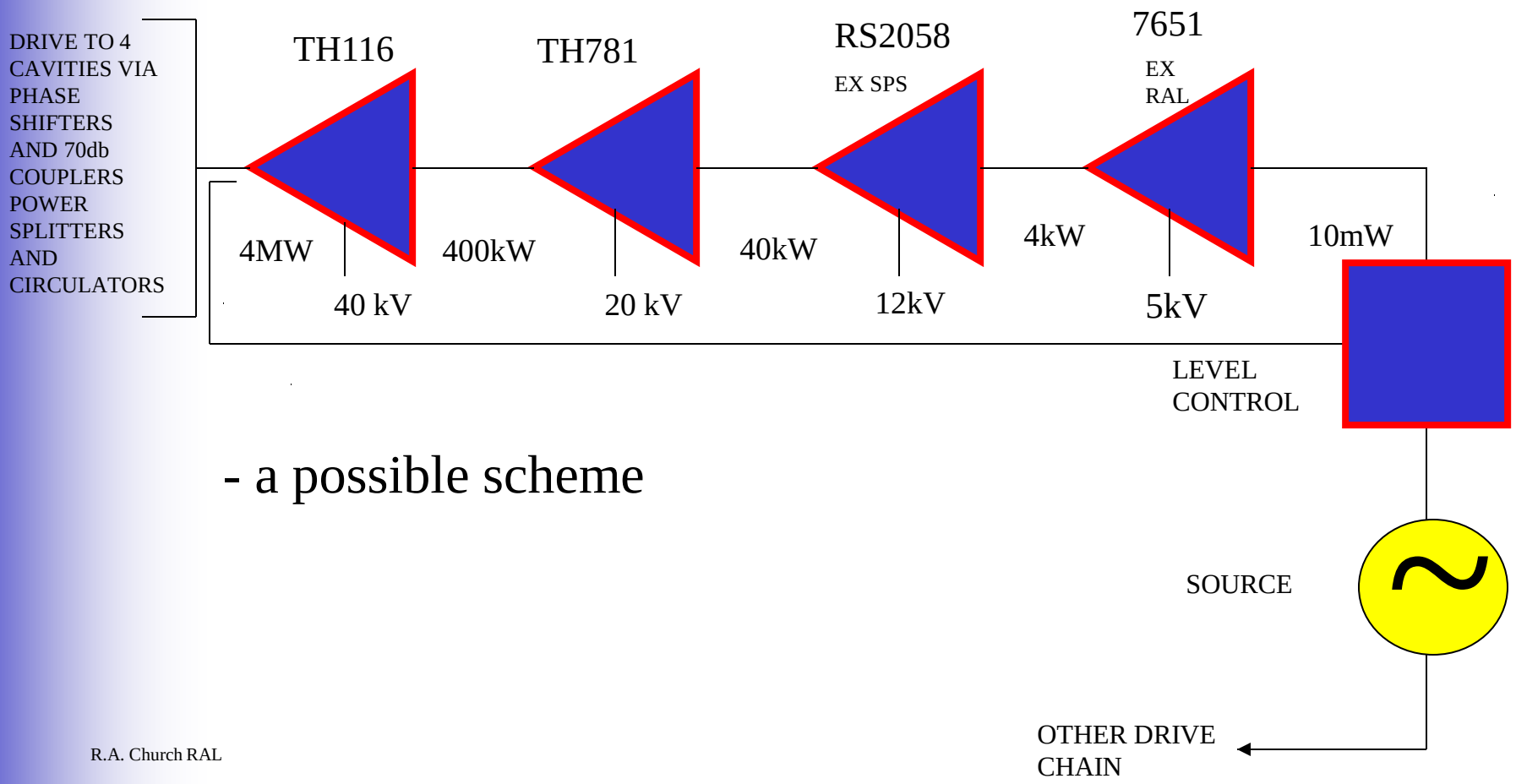
8MW total

Low Duty Factor

1-2 ms
1-10 Hz

average power
~1kW/Hz

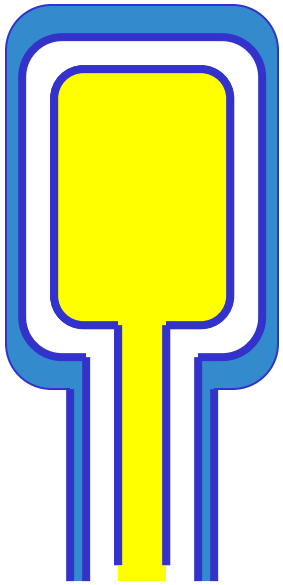
RF Drive



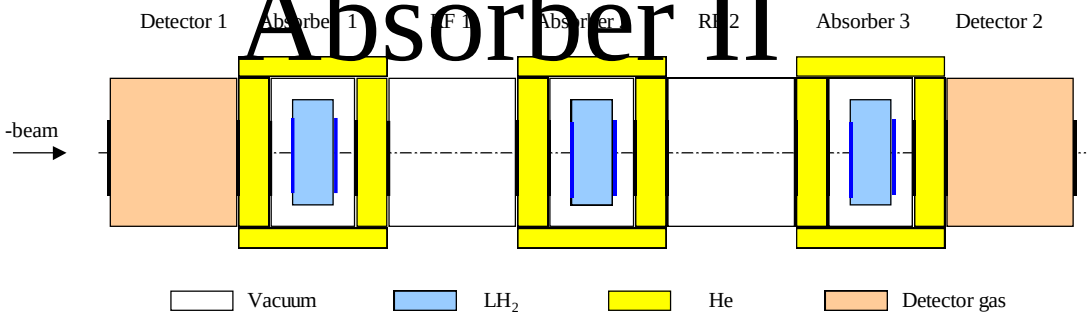
- a possible scheme

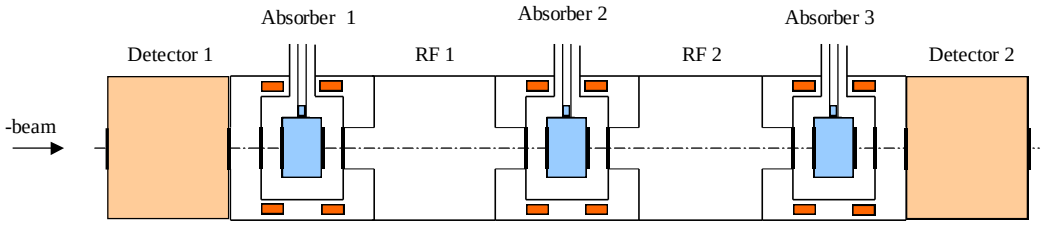
Absorber I

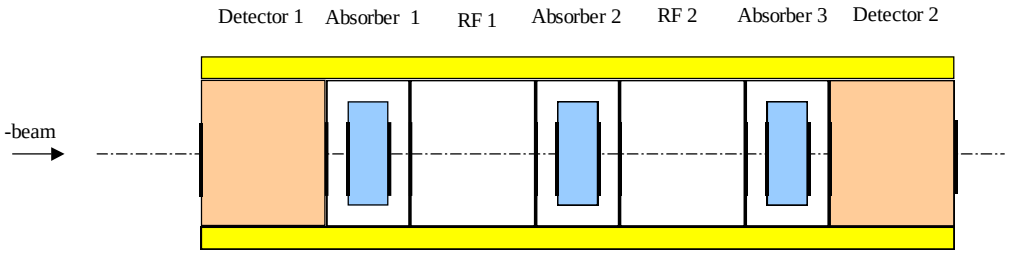
- Liquid Hydrogen – Major safety issue
  - ISIS Liquid Hydrogen Moderator



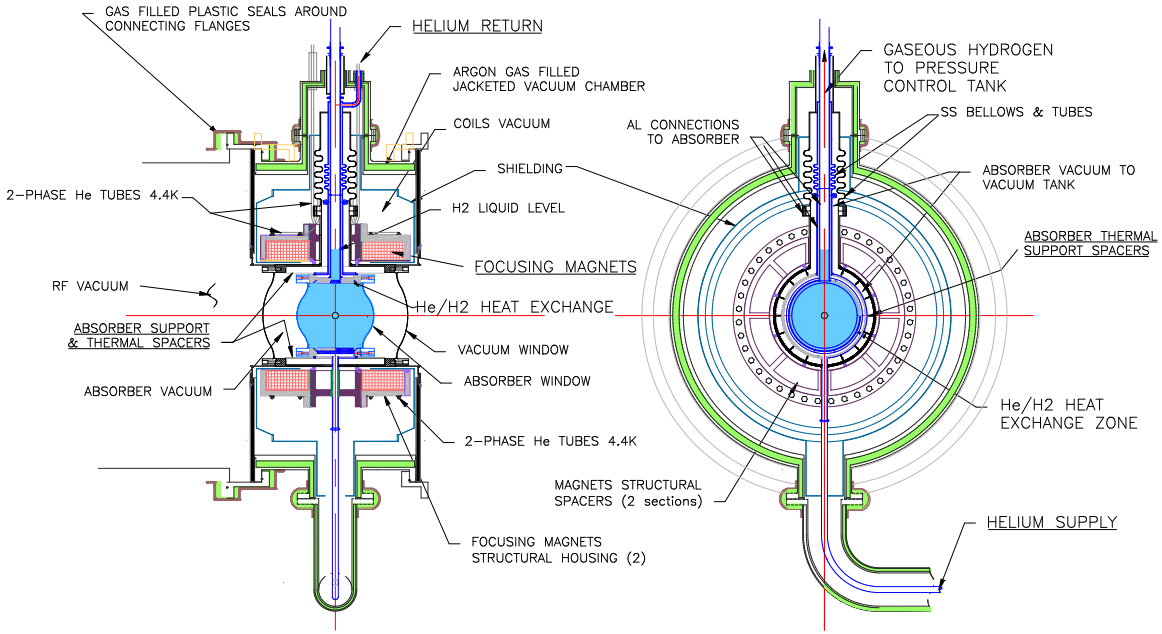
Absorber II


Detector 1
Absorber 1
RF 1
Absorber 2
RF 2
Absorber 3
Detector 2
-beam
Vacuum
LH2
He
Detector gas

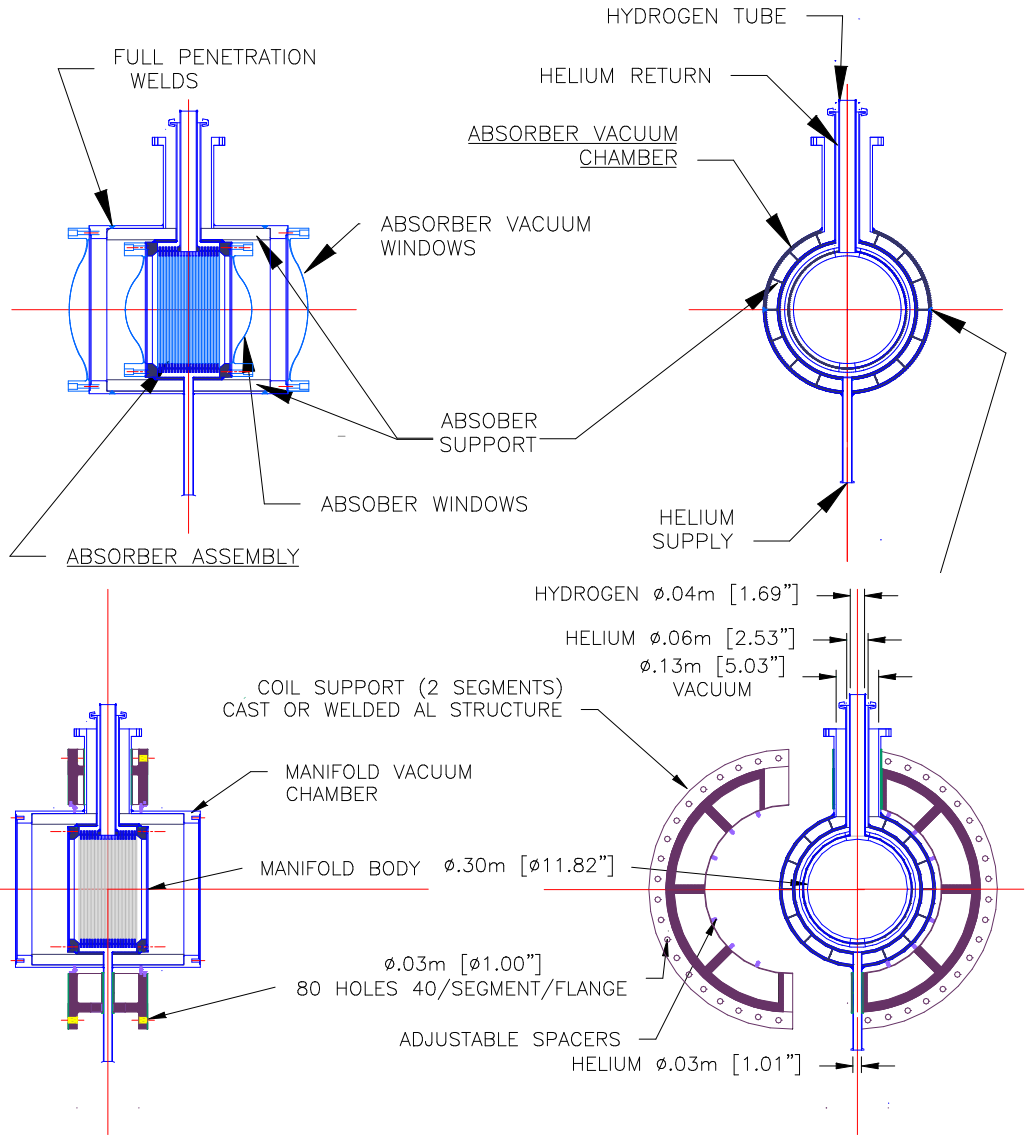

Absorber 1
Absorber 2
Absorber 3
Detector 1
RF 1
RF 2
Detector 2
-beam


Detector 1
Absorber 1
RF 1
Absorber 2
RF 2
Absorber 3
Detector 2
-beam

Absorber III



Absorber IV


FULL PENETRATION WELDS
ABSORBER VACUUM WINDOWS
ABSOBER SUPPORT
ABSOBER WINDOWS
ABSORBER ASSEMBLY
HYDROGEN TUBE
HELIUM RETURN
ABSORBER VACUUM CHAMBER
HELIUM SUPPLY
HYDROGEN ø.04m [1.69"]
HELIUM ø.06m [2.53"]
ø.13m [5.03"] VACUUM
COIL SUPPORT (2 SEGMENTS) CAST OR WELDED AL STRUCTURE
MANIFOLD VACUUM CHAMBER
MANIFOLD BODY
ø.30m [ø11.82"]
ø.03m [ø1.00"] 80 HOLES 40/SEGMENT/FLANGE
ADJUSTABLE SPACERS
HELIUM ø.03m [1.01"]

Magnets & Cryogenics

Principle Issues

– Fringe Fields

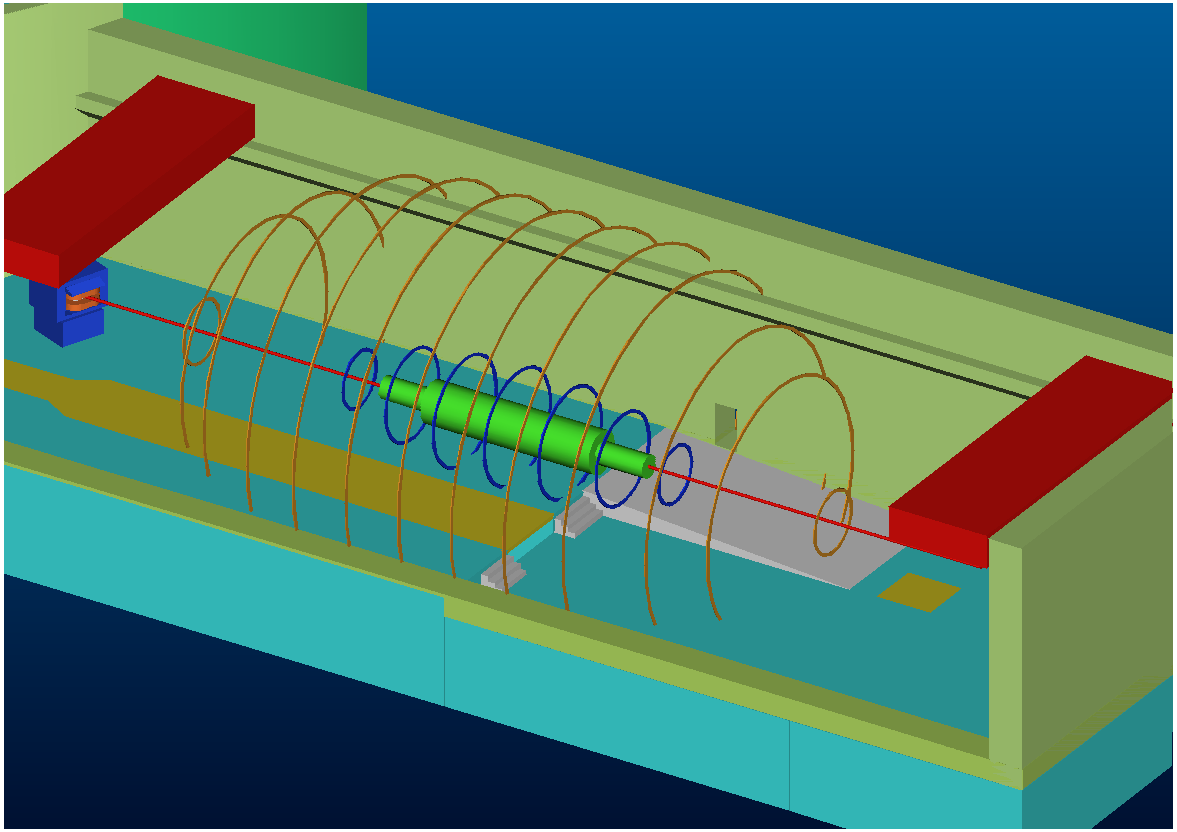
– Cryogenic Requirements

Blue contours:

10 mT

Orange:

0.5 mT



Detectors

Issues:

SiFi - Large cyro cooling needed for VLPCs

TPG – HV & flamable gas (next to Lig.H cell)

Infrastructure

Plant: Electrical Power
Cooling Power
Cryogenic System
Hydrogen Delivery & Handling

Installation
phased build of the experiment

ISIS Perspective

Critical Issues: Beam Line

Long Shutdown

Break into ISIS Synchrotron from MICE Hall

Have Shielding available+

Have Stands available

Competes with other ISIS projects

- 300 μA upgrade*
- Second Target Station*
- RFQ Installation
- delivery of contracted neutron amp.hours

* work in synch. vault

+2nd target station – friend or foe?

ISIS Schedule

Expected Progress

Proposal submitted ✓
expect the review to take place Mid Feb till May (?)
- international review panel

MICE is part of the UK's Science road map
- but funds are not yet allocated

Internal Review $\Rightarrow$ green light following international rp

Management & Oversight Structure(s) need to be in place