ICANS IX

INTERNATIONAL COLLABORATION ON ADVANCED NEUTRON SOURCES

22-26 September, 1986

STATUS REPORT ON LANSCE, 1986

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The most significant development at the Los Alamos Neutron Scattering Center (LANSCE) this past year has been the appointment of Roger Pynn as director.

Referring to Fig. 1, LANSCE is defined as the target/moderator and neutron scattering instrumentation complex. This area, previously known as Target 1 is part of a larger complex which has been known as WNR. The ion source and beam acceleration operations are still a part of LAMPF as before. The Proton Storage Ring (PSR) and the rest of the beam delivery system have been turned over to the LAMPF operations people as well. The other target areas serviced by the beam are still referred to as WNR.

Before presenting where we are in the commissioning of the PSR, let me remind you of our design goals, as given in Fig. 2. The remark about hands-on maintenance needs a little amplification. We desire to keep the hardware in the PSR as non-radioactive as possible and hoped for a total loss in the beam of from 100 to 1000 nA, knowing that maintenance would be simplified. The 100 nA figure was clearly an optimistic one. We are able to have hands-on maintenance but as you will see later, we would like to reduce the beam losses to simplify our maintenance problems. Our commissioning goals are shown in Fig. 3.

At the end of our last run cycle, December 1985, we reached 30 microamperes which was our goal for that cycle. That was a world record at the time. Figure 4 shows a TV monitor in the control room at the time. We were able to supply beam to local users at this rate for several experiments. On December 22 we reached about half the design goals in stable peak current.

As of this conference date, the 1986 run cycle has just begun and most of the time is spent in commissioning efforts. The latter half of this cycle we will emphasize reliable beam to users. Figure 5 indicates that we have reliable computer controls in cool weather; the other way to say that is, we found we have a cooling problem in hot weather. Other issues we are addressing in this phase of the commissioning are indicated in Fig. 6. So far we have been able to "tune" away from beam instabilities at the highest currents but they seem to remain just beyond us and we may have to add damping components before we reach full design.

We can now tune to 25 microamperes very quickly. We are able to supply 25 microamperes to users routinely. Though as mentioned, much of the time is actually spent exploring beam stability space. The ion source (by the end of the conference) is able to supply full design current of 100 microamperes.

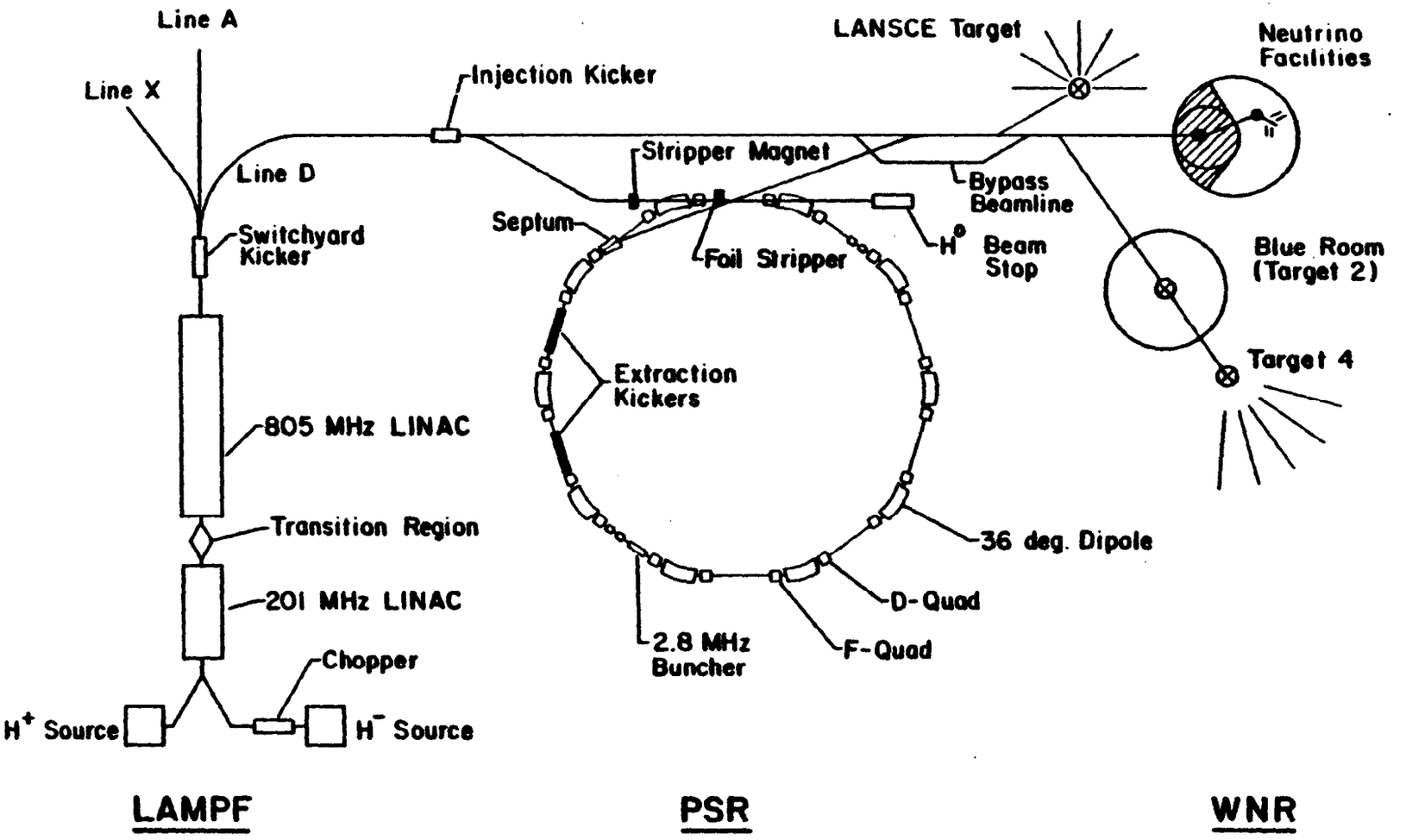
The ring performance is good, though as shown in Fig. 7, we are concerned about beam losses. The evidence is that the losses are associated with the stripper foil, but in a way we do not yet understand.

Figure 8 details our instrumentation progress. The new data system is being added to the instruments most requiring it as soon as fabricated.

Beam losses are shown in Fig. 9. They are measured as contact readings shortly after beam shut down. The highest readings are near the septum magnet and the stripper foil as already mentioned. This question is more fully discussed in the talk by Bob Hardekopf.

The construction project for the new experimental hall and the support building is underway, at least in the sense that the architectural/engineering firm is under contract. Figure 10 shows the ground plot of the existing structure, and the location of the experimental hall and the support building. They are shown in the heavy dark outline. Figure 11 gives the construction schedule. We expect to begin to move our instrumentation into the building at the end of the 1987 run cycle.

In summary, our commissioning of the PSR is on schedule and the construction project is on schedule. I have indicated those areas we are working on, but hurry to remind you that the reason there is a commissioning period in all accelerator development projects is because there are always unknowns to deal with. So far we are finding only garden variety problems and have been able to deal with each of them as they arise.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Line X
Line D
Switchyard Kicker
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Transition Region
201 MHz LINAC
Chopper
H+ Source
H- Source
LAMPF
Injection Kicker
Stripper Magnet
Septum
Foil Stripper
Extraction Kickers
2.8 MHz Buncher
D-Quad
F-Quad
36 deg. Dipole
PSR
LANSCE Target
Bypass Beamline
H0 Beam Stop
Neutrino Facilities
Blue Room (Target 2)
Target 4
WNR

Fig. 1

PRIMARY DESIGN GOALS

- 5.2×10^{13} protons per pulse

  ➡ 46 A peak current

- 100 μA time averaged current (on target)

  ➡ 6.2×10^{13} protons/sec

  ➡ 12 Hz

- Hands on Maintenance

  ➡ Total loss $\leq \underline{100}$ − 1000 nA

  ⬆

  {Taken as design goal}

Fig. 2

GOALS FOR LANSCE
BEAM DELIVERY SYSTEM

FY–86

- Correct Known Problems
- Demonstrate 3.5 – 4 x 10^{13} ppp and 100 μA Ave. @ 18 Hz
- Operate at ≥ 20 μA for Users
- 40% Scheduled Production
- 70% Availability

FY–87

- Demonstrate 5.2 x 10^{13} ppp If Available from Ion Source
- Production at ≥ 50 μA for Users
- 50% Scheduled Production
- 75% Availability
- Consider New Source

FY–88

- 100 μA Production for Users
- 80% Scheduled Production
- 80% Availability

Fig. 3

PSR/WNR STATUS 15-DEC-1985 23:08

	BEAM	RATE	LENGTH	PSR CHOPPING PATTERN	
SRBG:	ON	12	770 us	Pattern Width:	255 ns
LEBG:	OFF	0	10 us	Countdown:	1
LDBG:	OFF	0	100 us	LBOG Width:	730 us

RUN PERMIT LINE-D MODE: PSR-1L
PSR MODE: WNR

LDCM01	-35.44 ua	RICM01	-36.09 ua
LDCM02	-35.50 ua	RICM02	-32.02 ua
LDCM04	-0.05 ua	RICM03	-0.09 ua
LDCM05	0.02 ua	RICM04	3.11 ua

30 MICROAMPERES REACHED---22:45 DEC 15, 1985---WORLD RECORD!!!

LANSCE PRODUCTION UNTIL 16:00 12/17

Dec. 22, 1986
-- 2.7×10^{13} ppp accumulated in the ring
and extracted to neutron target

Fig. 4

STATUS OF LANSCE
COMMISSIONING

1985 — 30 μA for users 2 1/2 days

— 2.7×10^{13} protons/pulse
for beam stability check
in storage ring (→ 50 μA)

1986 — To date, run cycle just beginning
(as of 9/13)

- Source improved, up 40%
- Storage Ring Set Points
  much better, near goal,
  operates readily at 25 μ.
- Computer controls reliable
  in cool weather

Fig. 5

ISSUES SO FAR:

BEAM AVAILABILITY POOR OWING TO

- Injector Reliability
- PSR Control System Bugs
- Beam Losses in Ring
- Beam Stability at Highest Intensities

Fig. 6

RING PERFORMANCE

- Injection Process Works as Expected
- Beam Size Well Within Ring Aperature
- Basic Parameters Check Out
  - Fractional Tune
  - Chromaticity ?
- Losses A Puzzle
  - Lifetime
  - Foil Scattering Implicated
  - Extraction
  - Activation
- Stability at High Intensity
  - Evidence for an Instability
  - Threshold Pushed Beyond 2.7×10^{13} pp

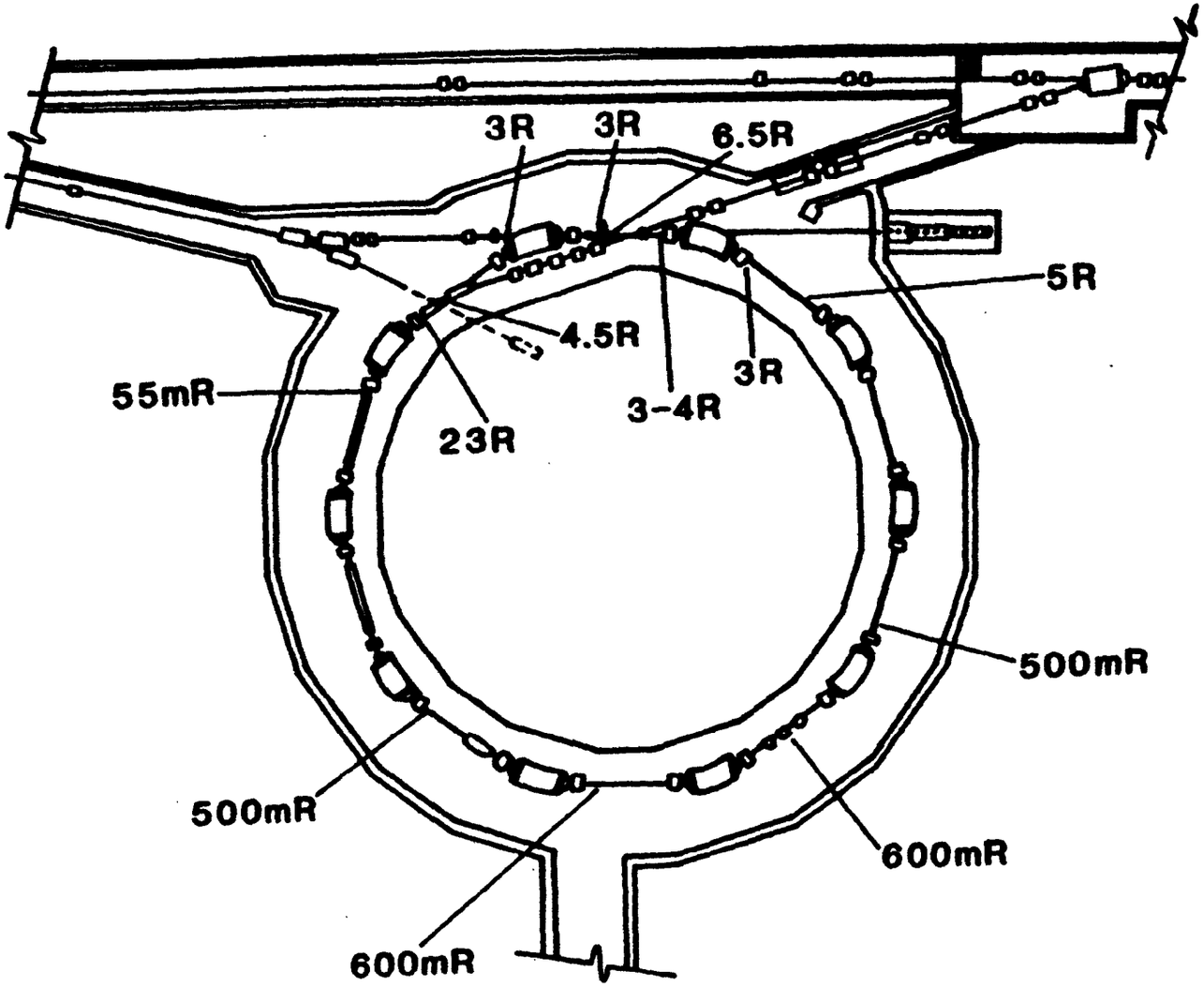
Fig. 7

INSTRUMENTATION

- Low Q Diffractometer—rebuilt and taking beam
- 4 Micro Vax — FastBus Systems in operation for both Powder Diffractometers
  - Low Q Diffractometer
  - Single Crystal Diffractometer

  Other instrumentation still using old Mod Com — CAMAC
- New rotating shutter with variable collimation on Low Q Diffractometer
- 32 Meter Powder Diffractometer fully rebuild and operational; new Sample Environment
- High Intensity Powder Diffractometer at 9 meters

CONTACT READINGS



Los Alamos

Los Alamos National Laboratory/Operated by University of California

Fig. 9

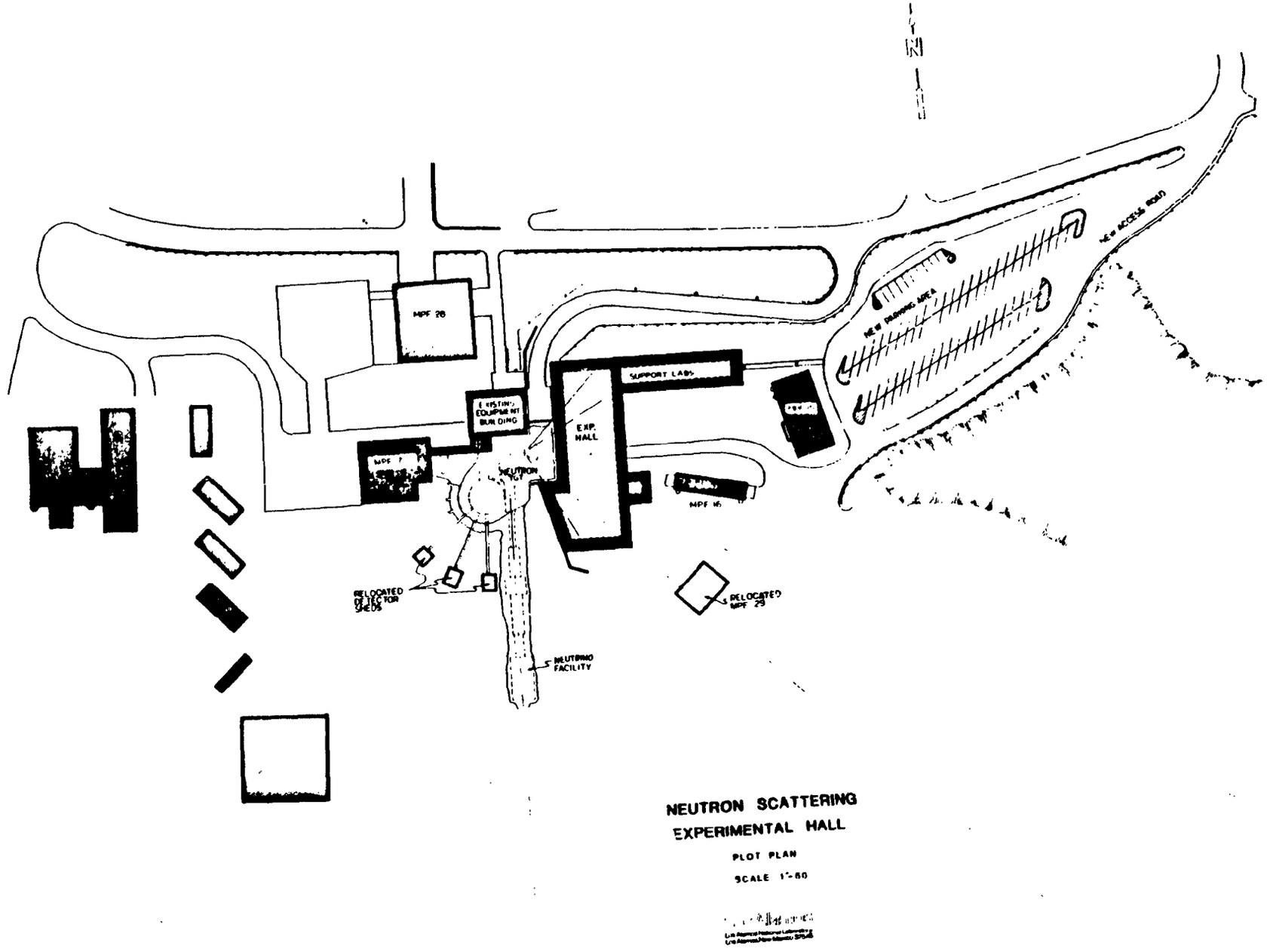

NPF 28
SUPPORT LABS
EXP. HALL
NEUTRON
NPF 16
RELOCATED DETECTOR SHEDS
RELOCATED NPF 29
NEUTRINO FACILITY
NEUTRON SCATTERING
EXPERIMENTAL HALL
PLOT PLAN
SCALE 1"=60

Fig. 10

CONSTRUCTION PROJECT

Architecture—Engineer Design Complete	End 86
Hall Construction Contract Let	Mar 87
Support Building Construction Contract Let	Oct 87
Hall Construction Complete	End 87
Support Building Complete	Feb 89

** Assumes DOE goes along with the phased design and construction program.

Fig. 11