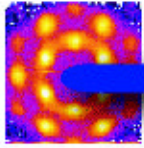


Description of 30M SANS Instrument

B. Hammouda

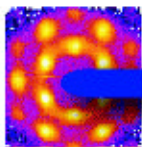
NCNR Summer School

Neutron Small Angle Scattering and
Reflectometry from Submicron Structures
June 5 - 9 2000

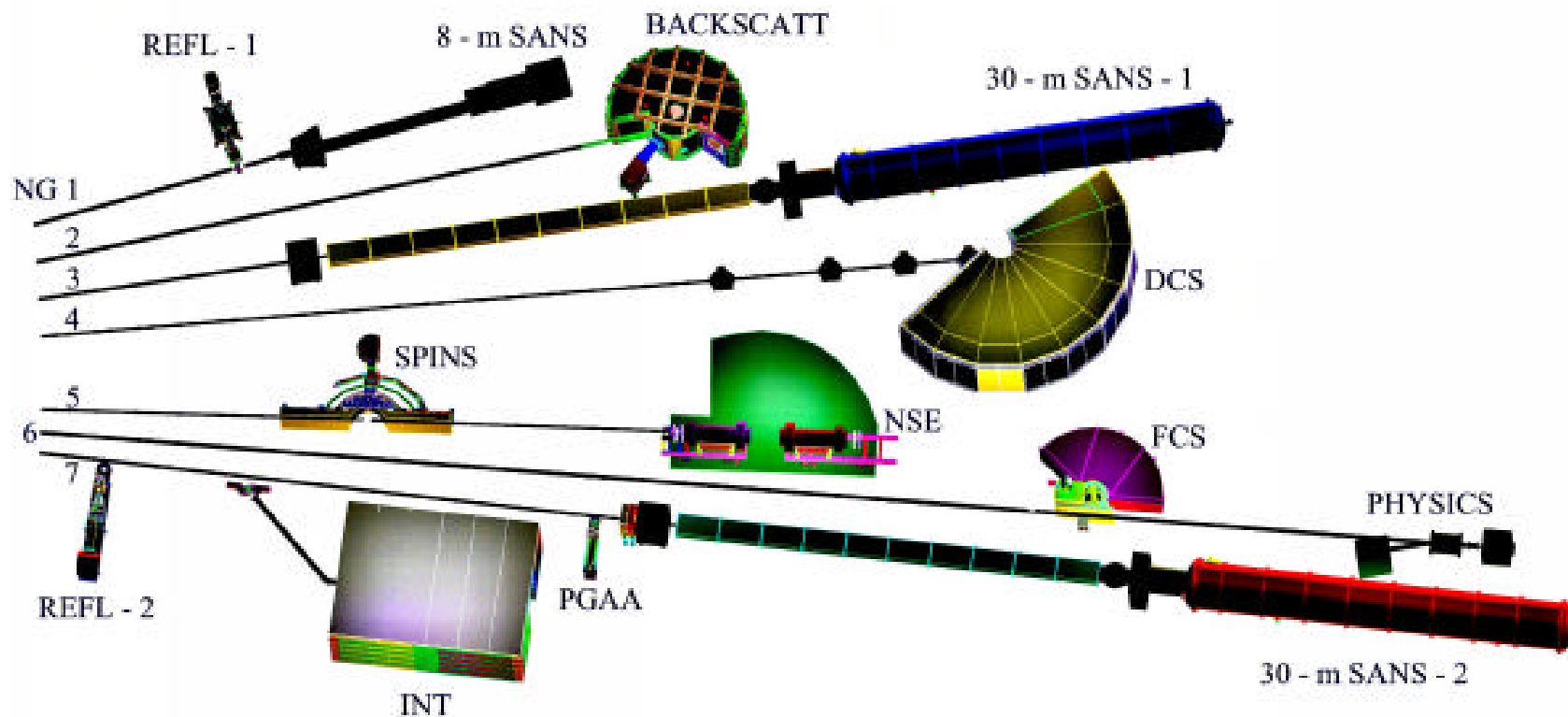


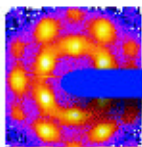
Outline

- ✍ Overall description
- ✍ Velocity selector
- ✍ Presample flight path
- ✍ Sample chamber/sample table
- ✍ Scattering vessel
- ✍ Neutron area detector
- ✍ Data acquisition system
- ✍ Sample environments (shear cells, pressure cells, magnets, etc)

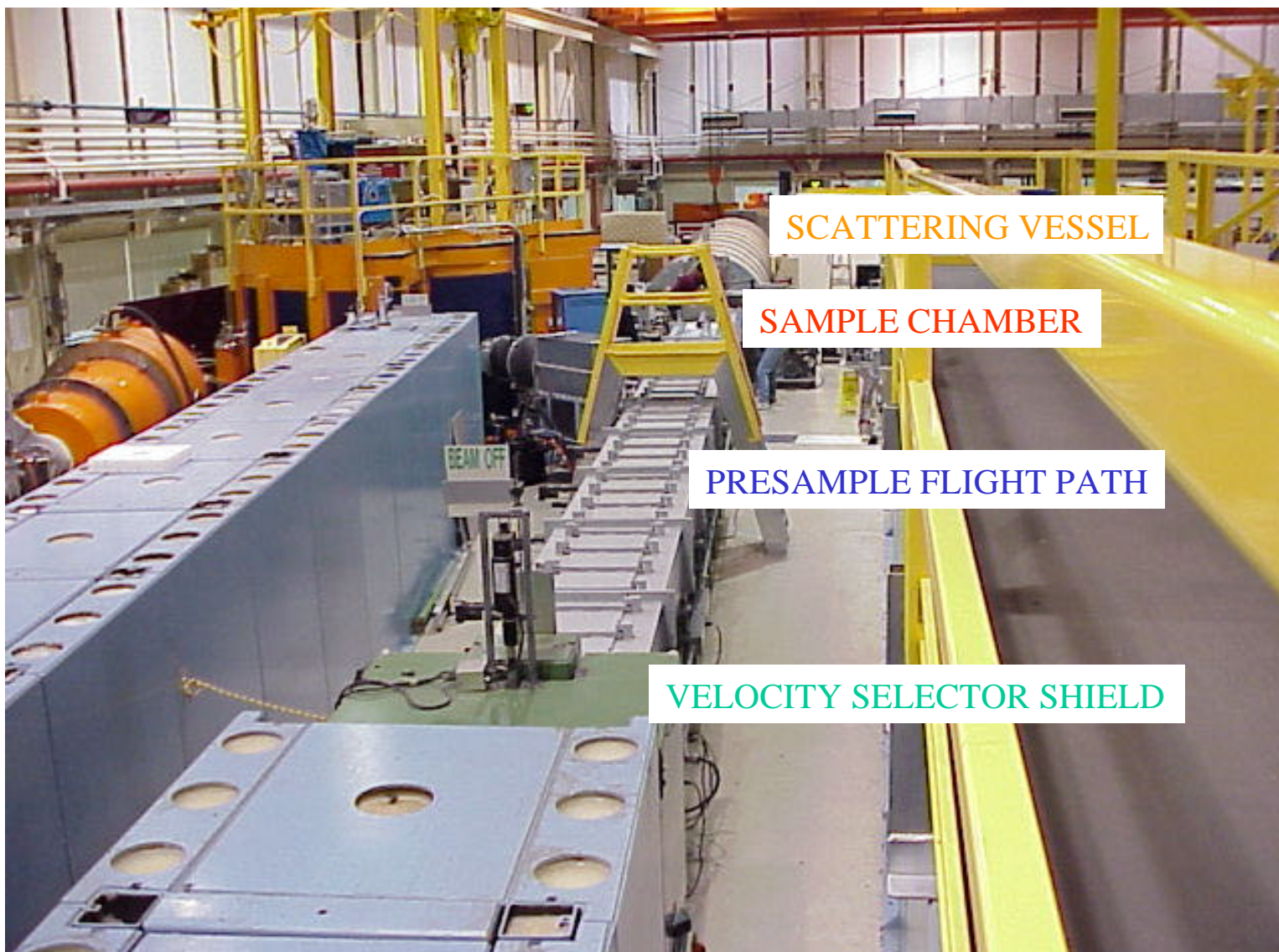


Guide Hall Instruments





NG3 SANS Instrument



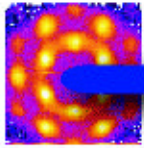
SCATTERING VESSEL

SAMPLE CHAMBER

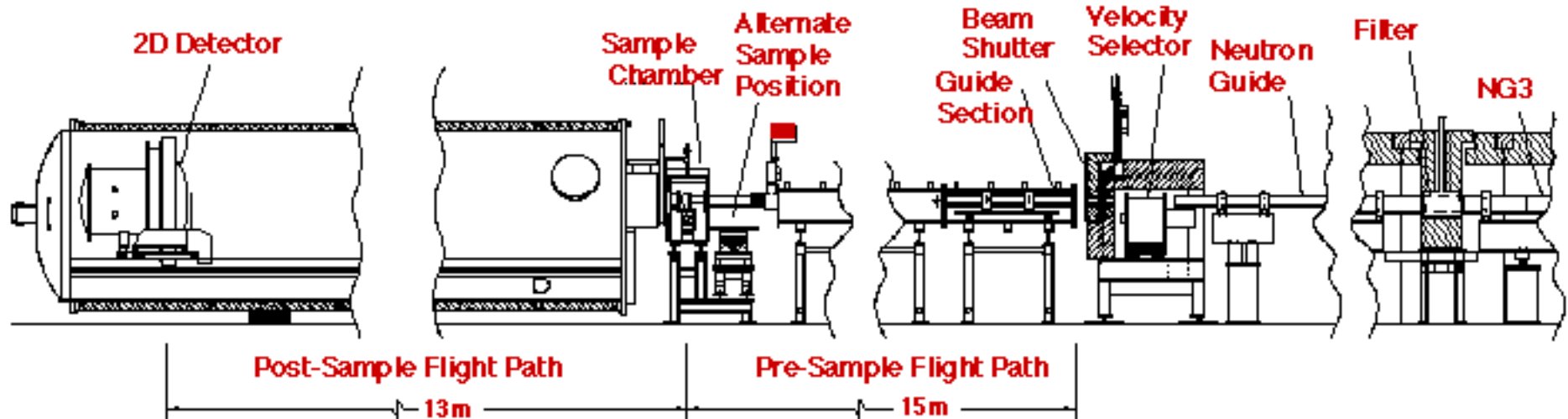
PRESAMPLE FLIGHT PATH

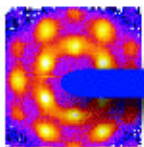
VELOCITY SELECTOR SHIELD

BEAM OFF

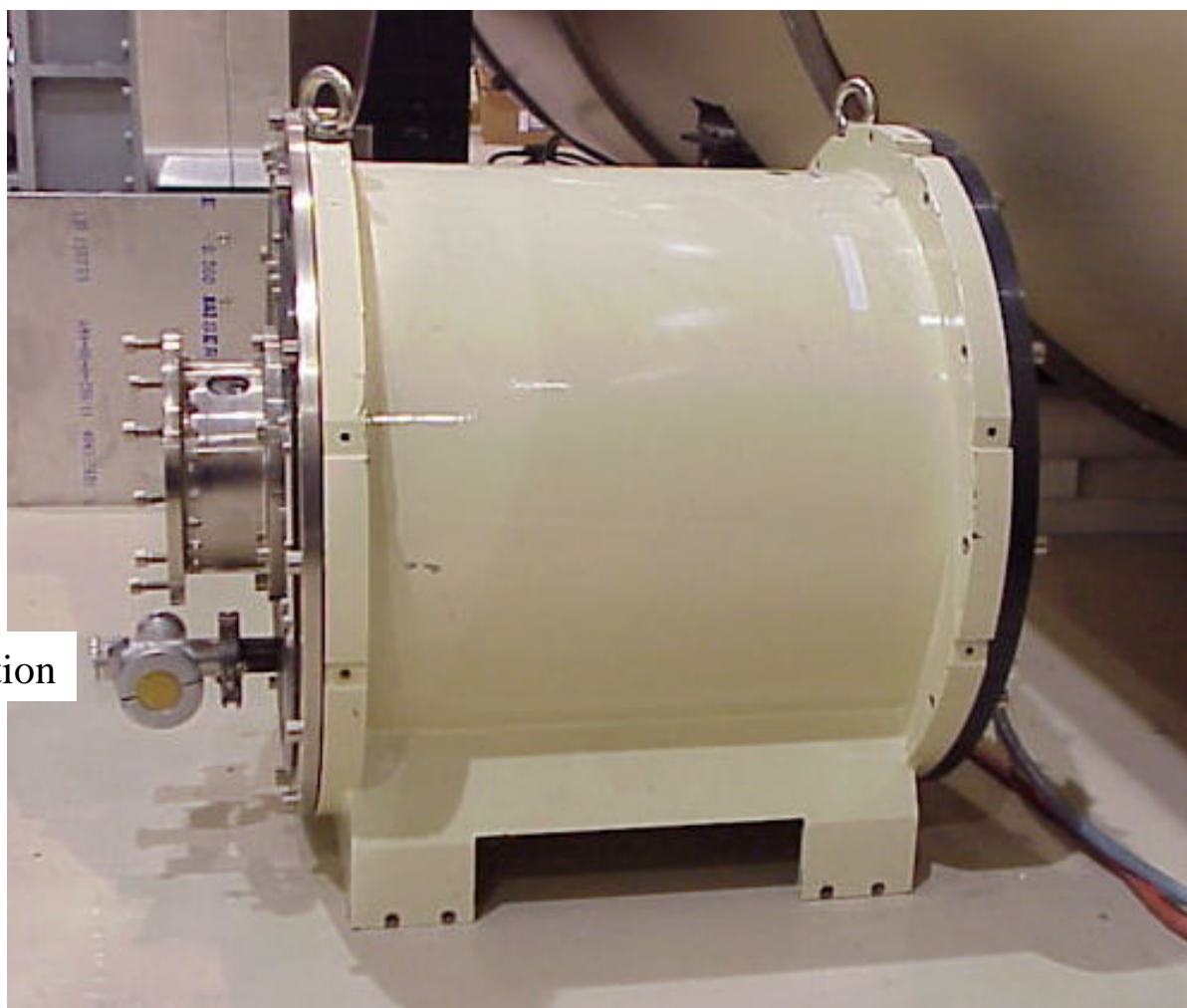


CHRNS 30M SANS Instrument

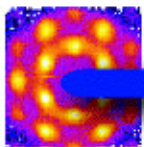




Velocity Selector

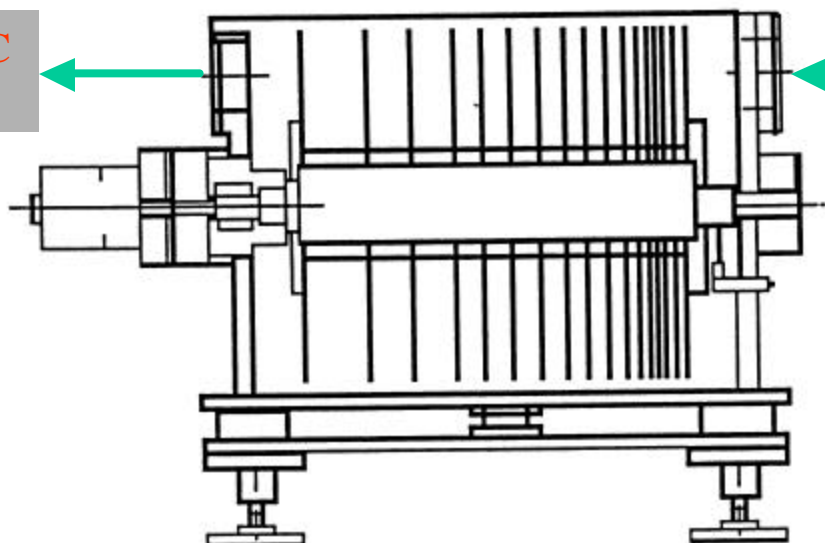


Vacuum Pump Connection

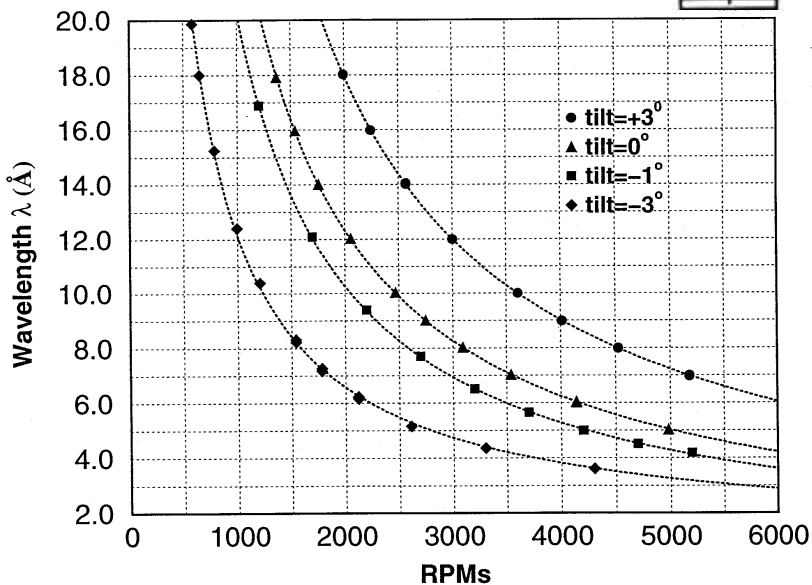


Multidisk Velocity Selector

MONOCHROMATIC
NEUTRON BEAM



WHITE NEUTRON
BEAM



$$\lambda = (3.14 \times 10^4 / \omega) \cdot (1 + 2.39 \omega^2 / \omega^2)$$

Wavelength (Å)
4Å < λ < 20Å

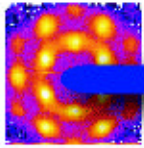
Speed (RPM)
0 to 5000 RPM

$$\Delta \lambda / \lambda = 0.038 / (1 + 2.39 \omega^2 / \omega^2)$$

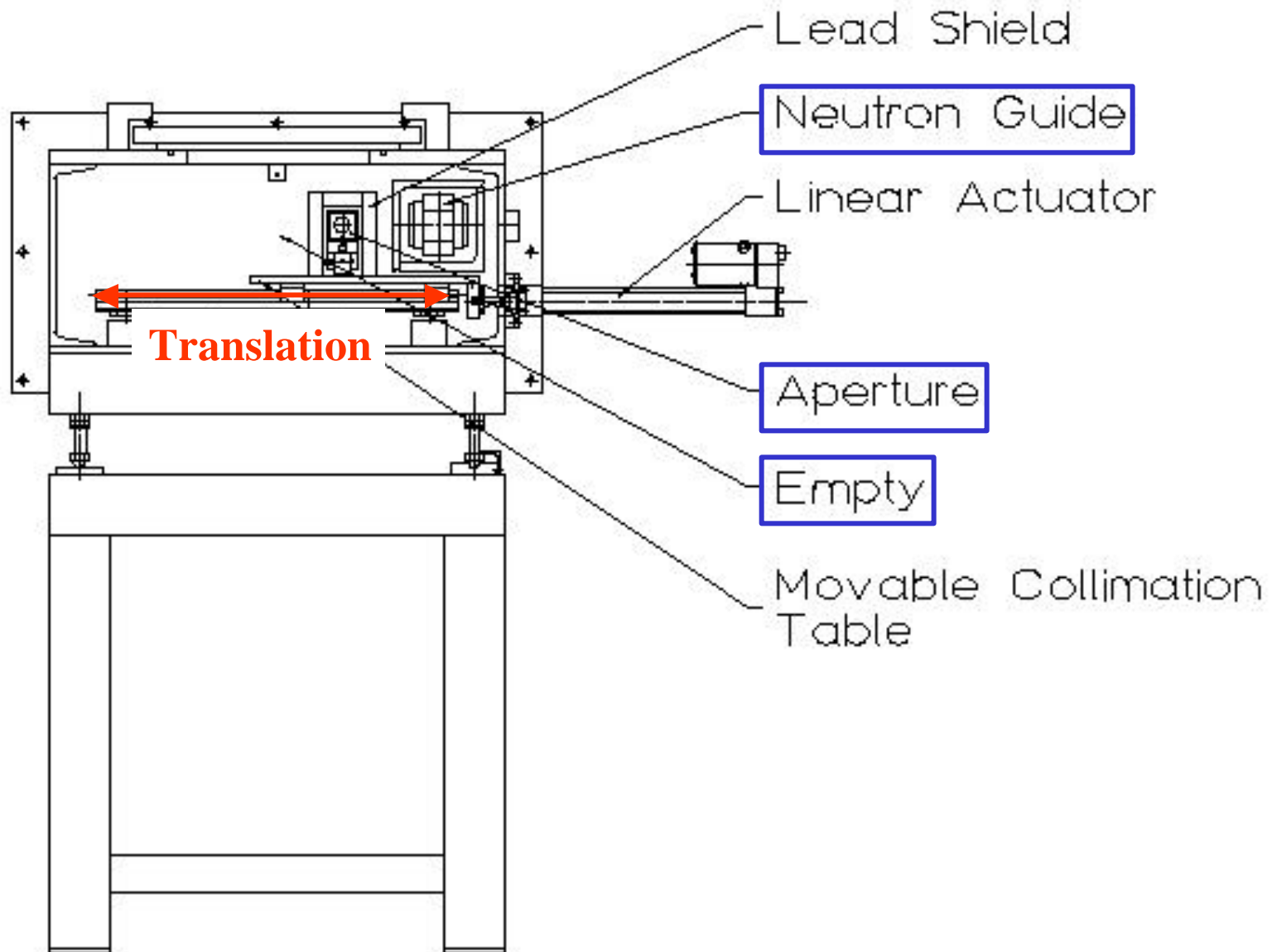
Wavelength spread
10%, 15%, 30%

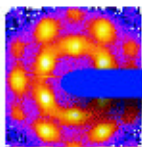
Tilt -3° < θ < 3°

θ = 20°

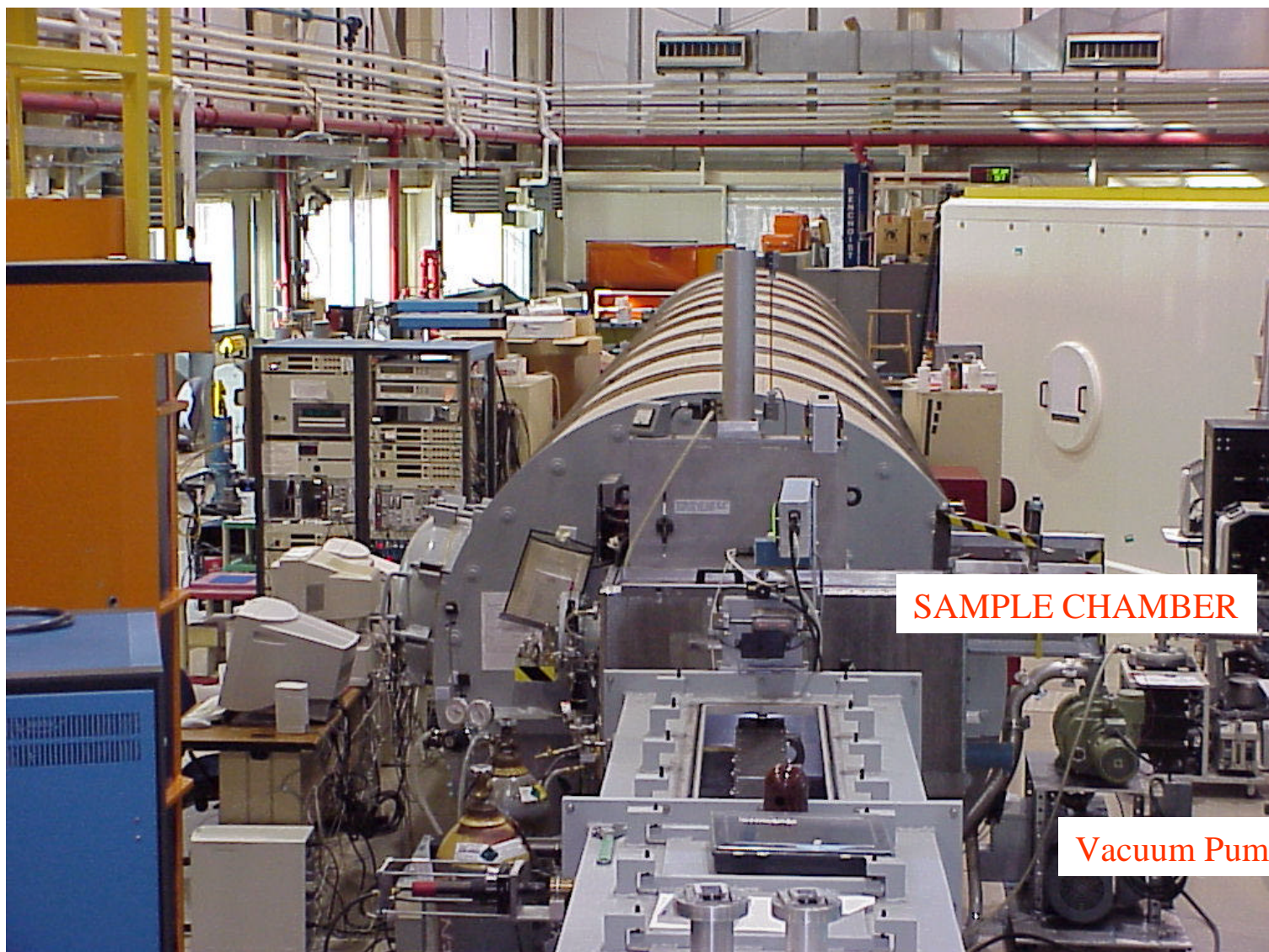


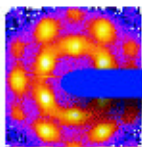
Cross Section of a Presample Flight Path Unit



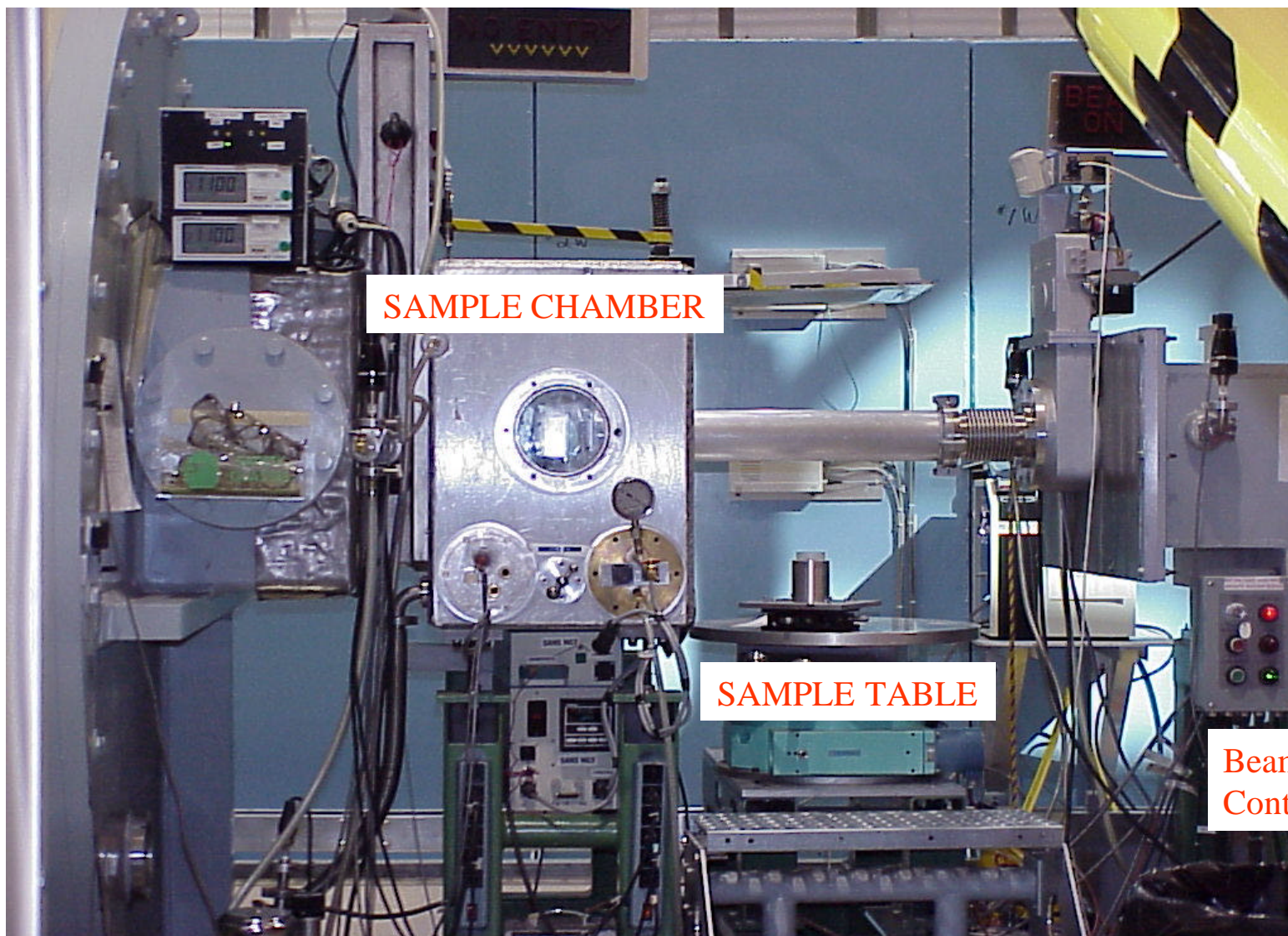


Sample Chamber





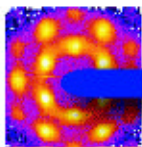
Sample Chamber & Table



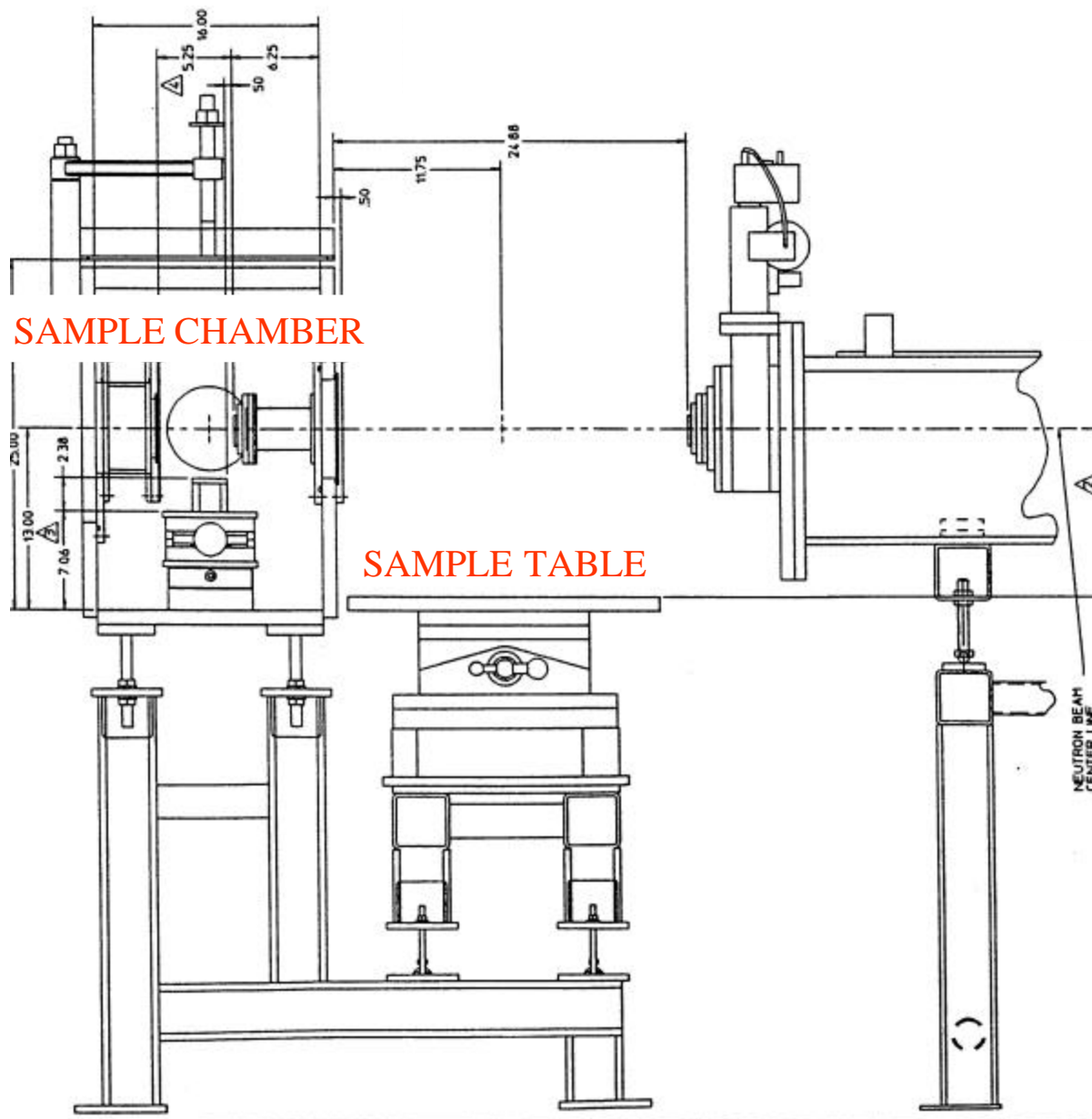
SAMPLE CHAMBER

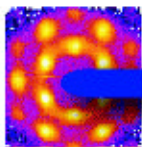
SAMPLE TABLE

Beam Shutter
Control

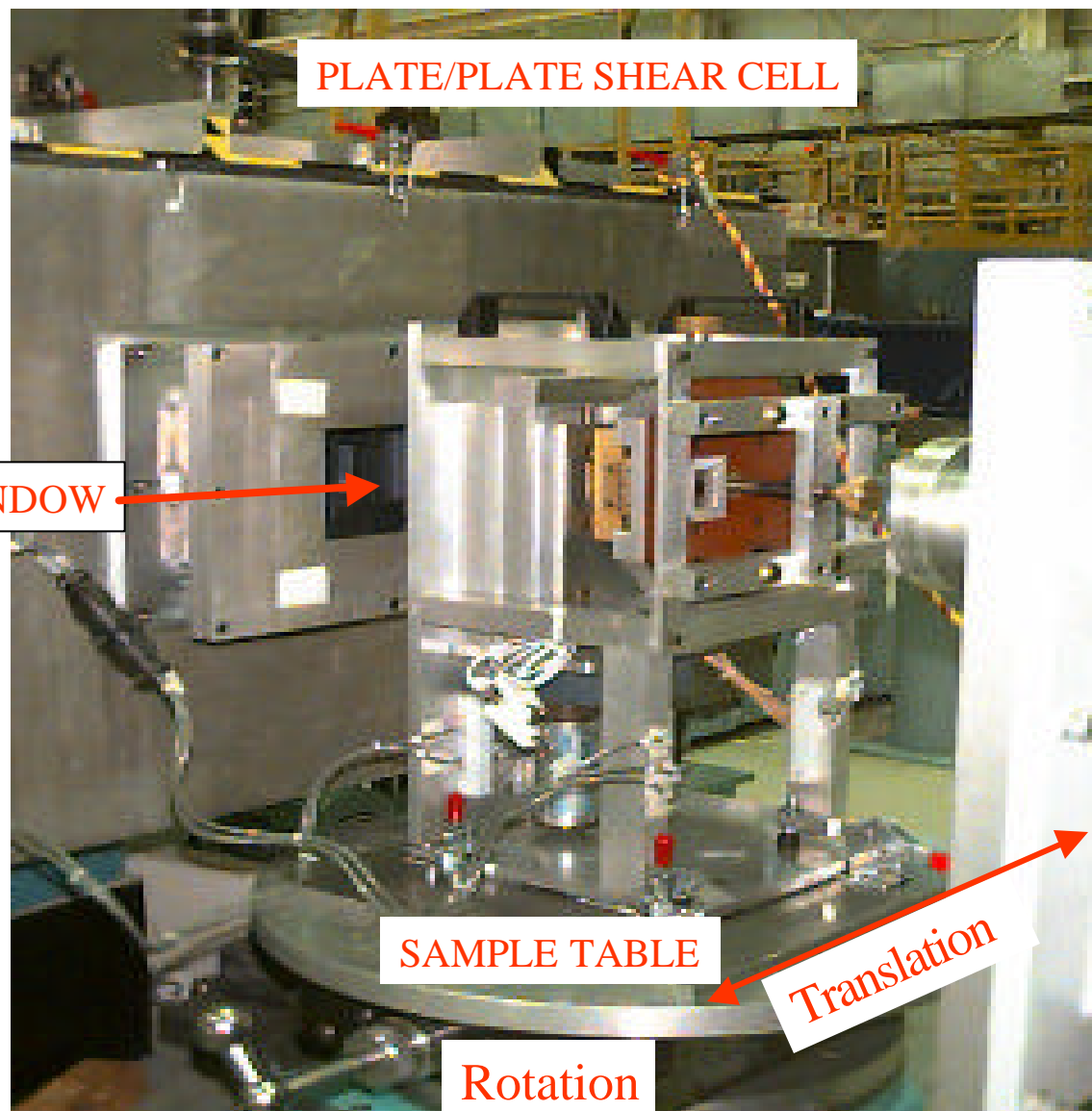


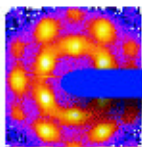
Sample Chamber & Table



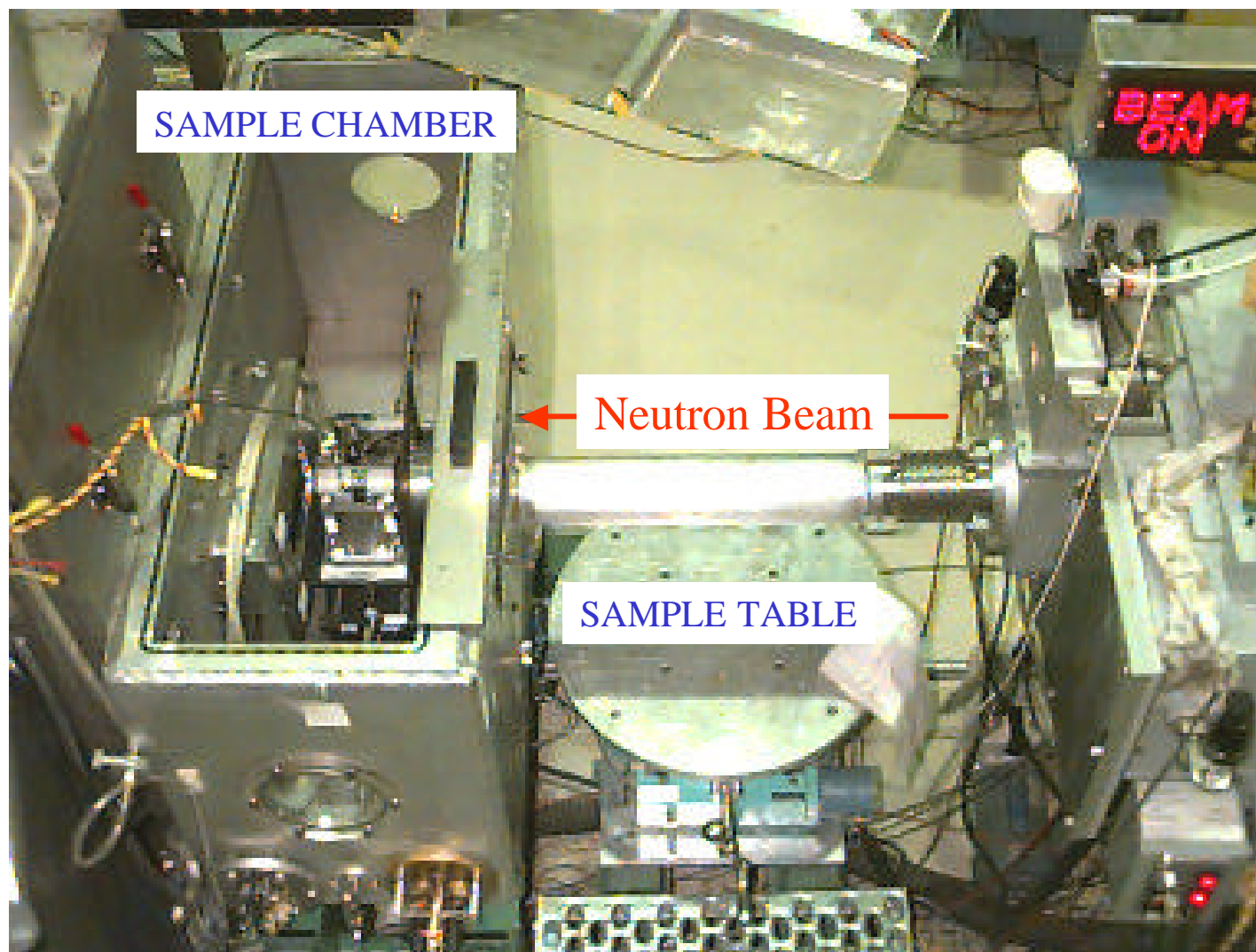


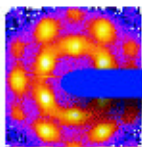
Sample Table



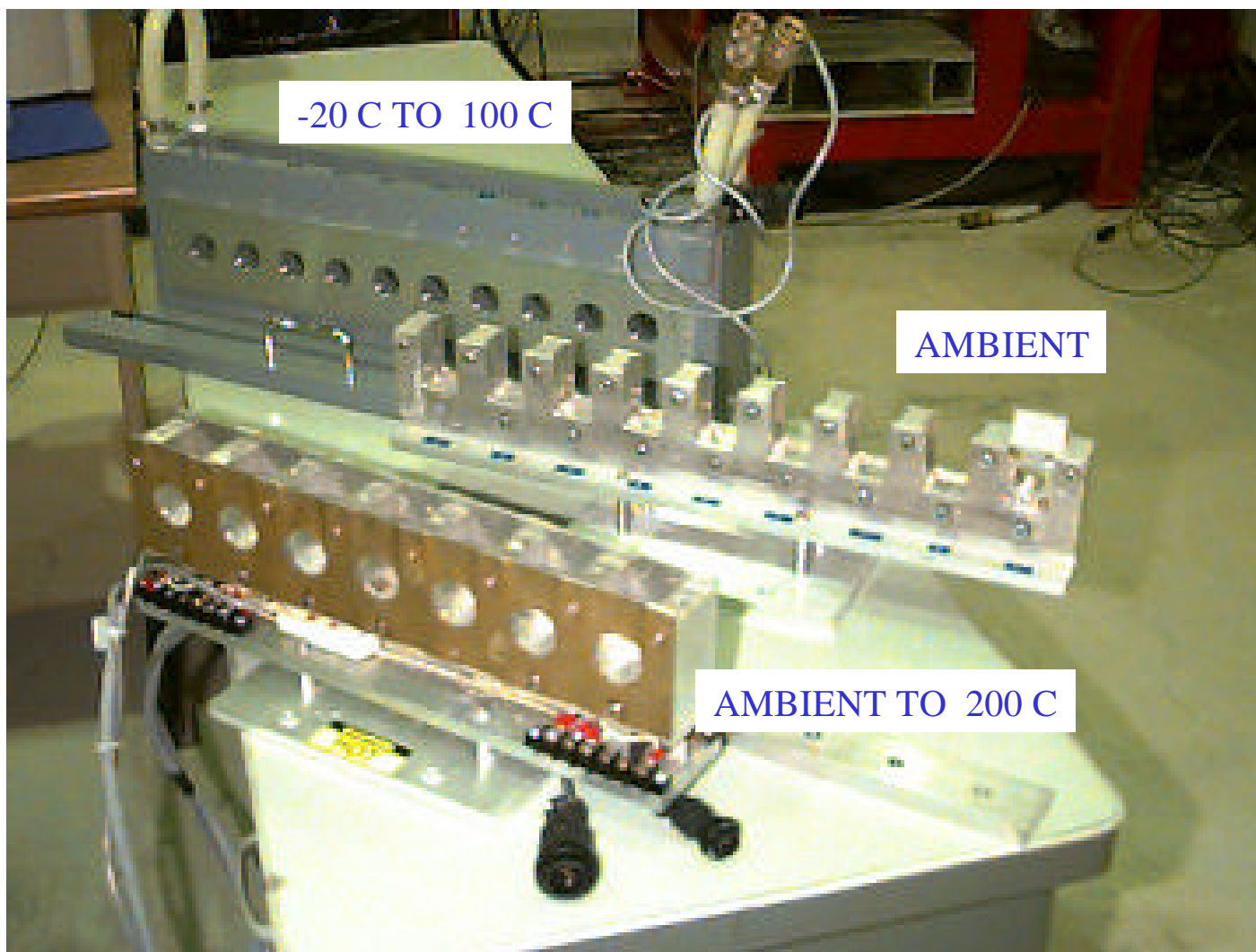


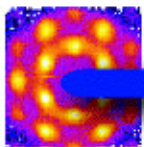
Sample Chamber & Table



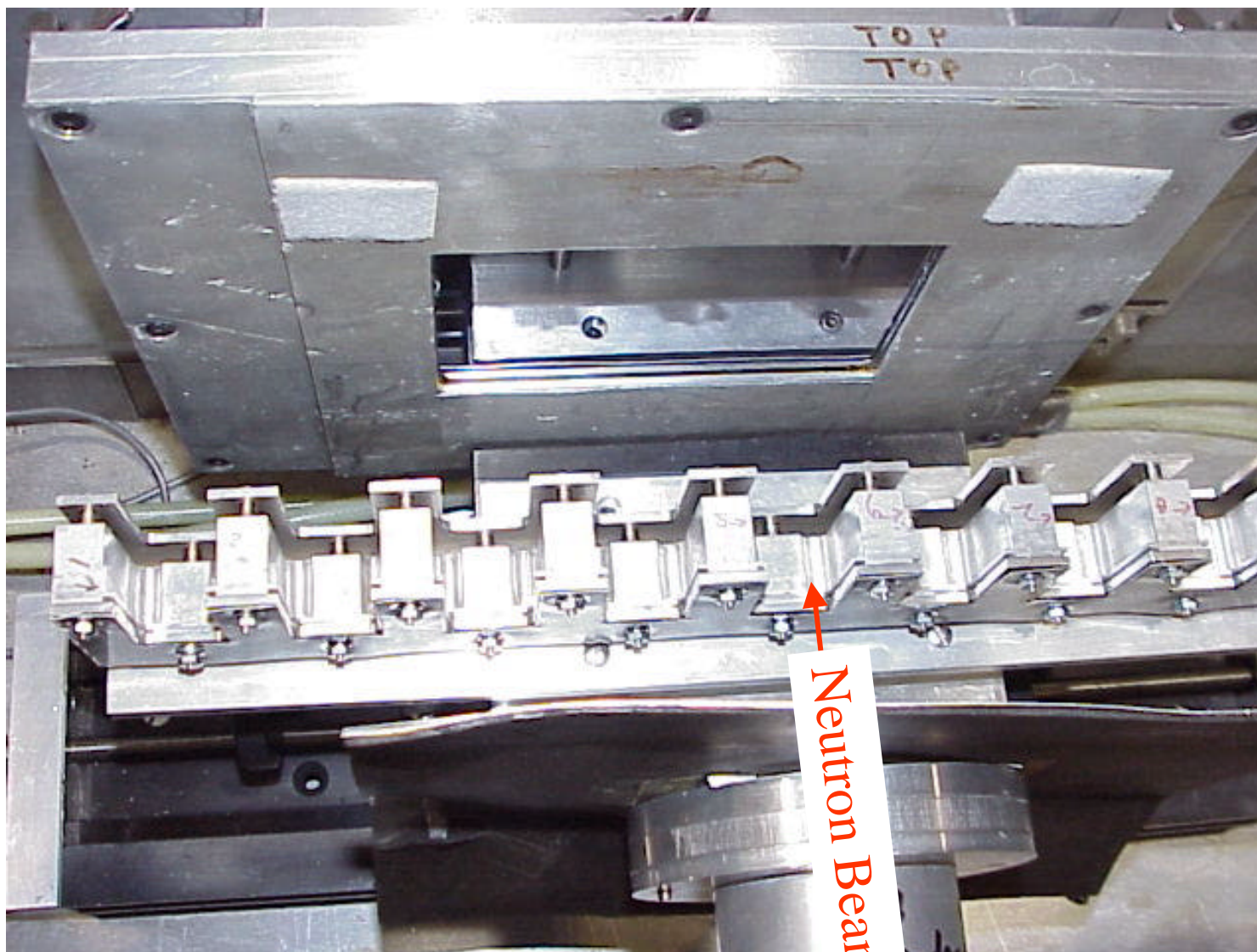


Sample Changers

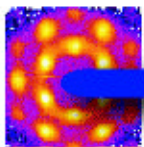




Sample Changer

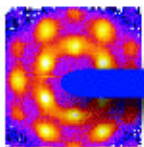


Neutron Beam



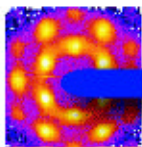
Scattering Vessel



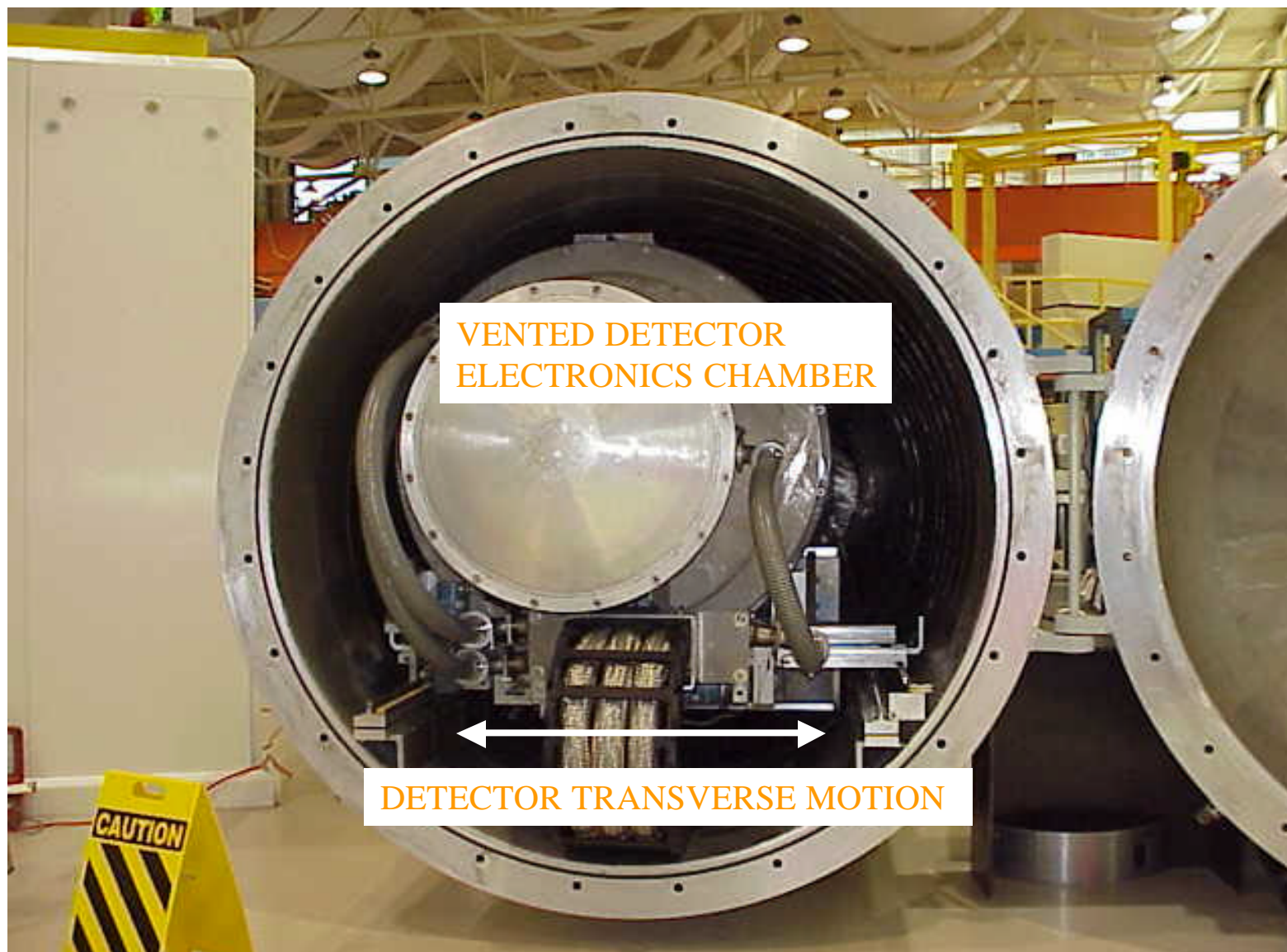


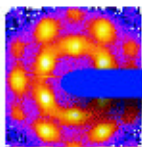
Scattering Vessel Flight Path



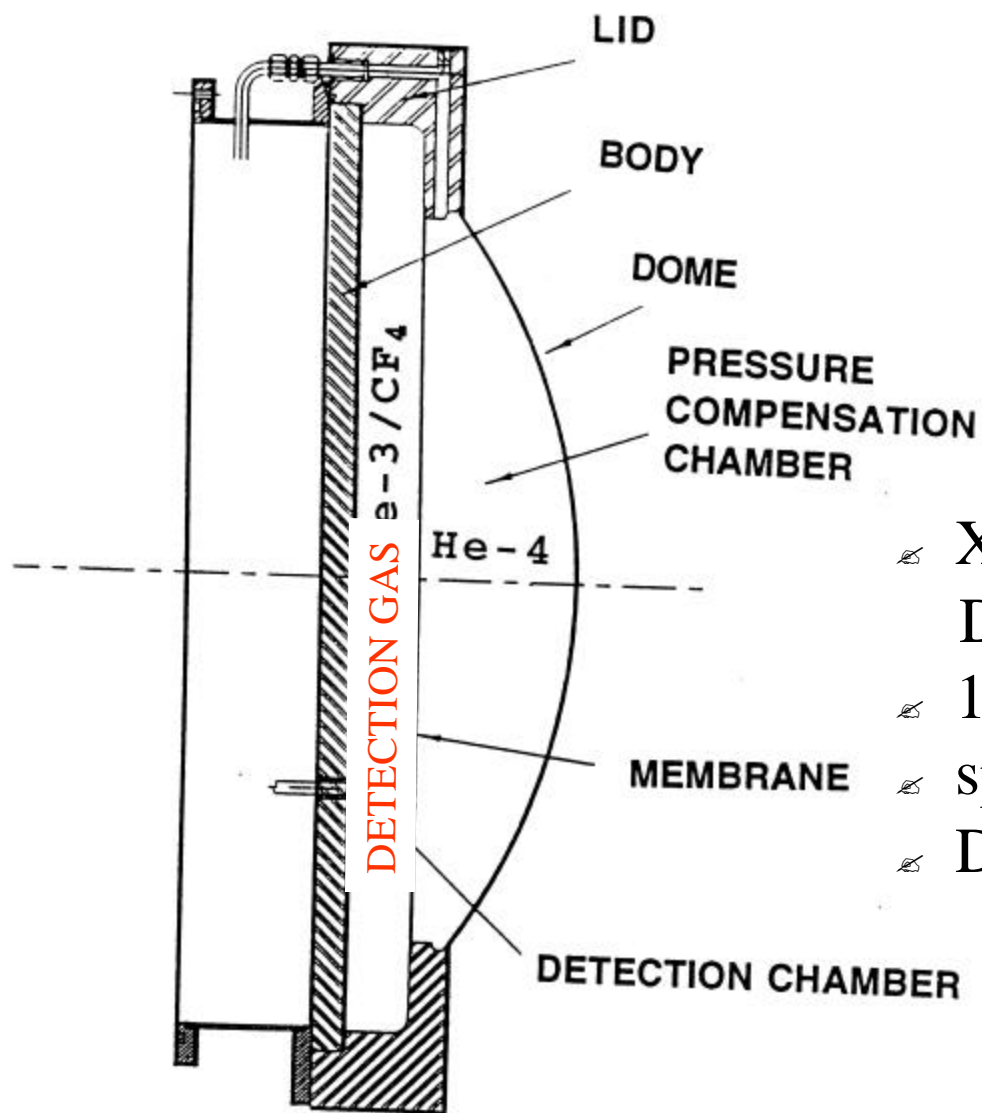


Neutron Detector

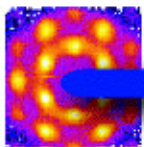




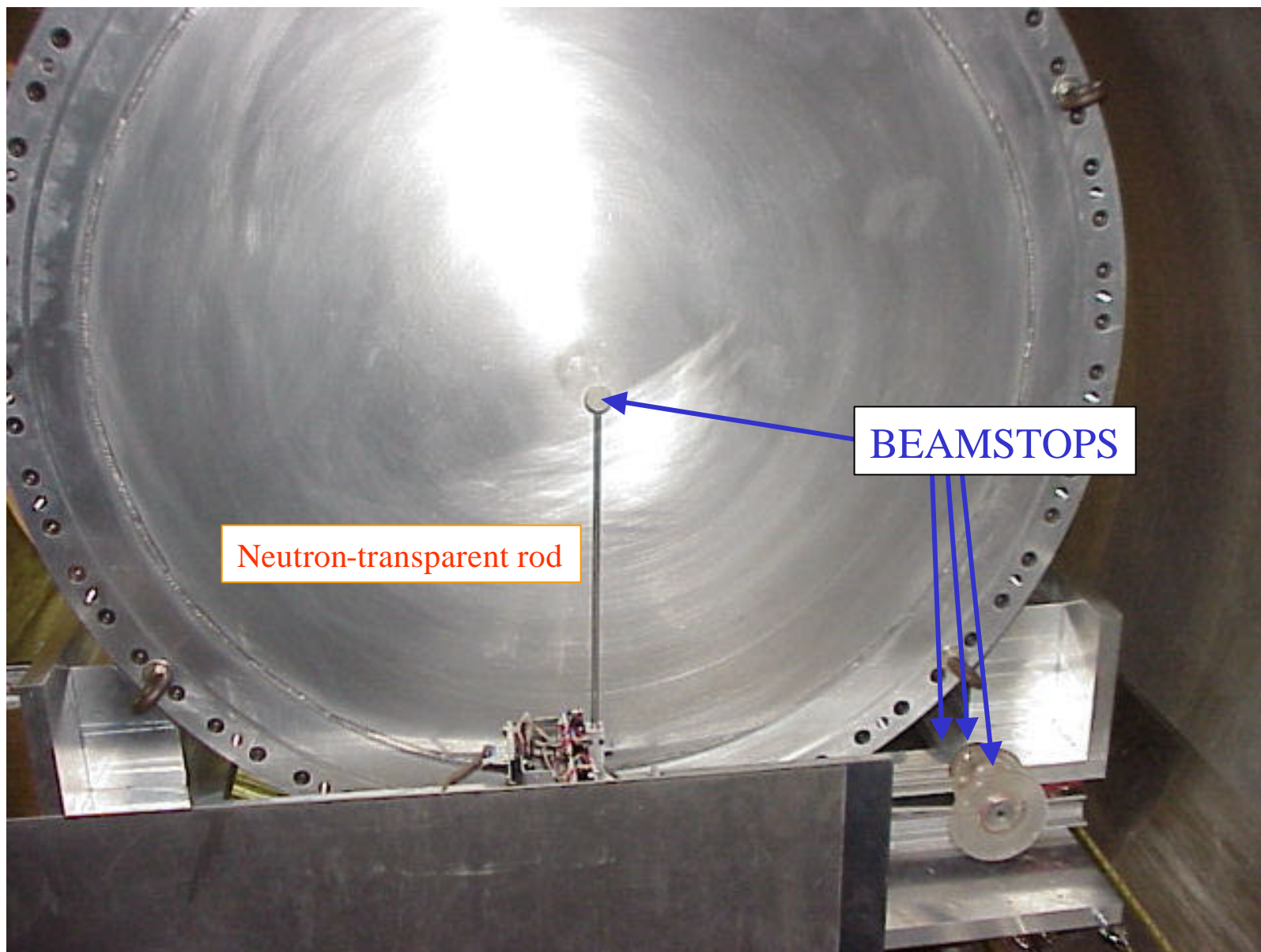
Neutron Detection

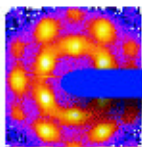


- ✦ X-Y coincidence events are Detected
- ✦ 14-bit encoded signal generated
- ✦ spatial resolution: 1cm
- ✦ Detection area: 64cm x 64 cm

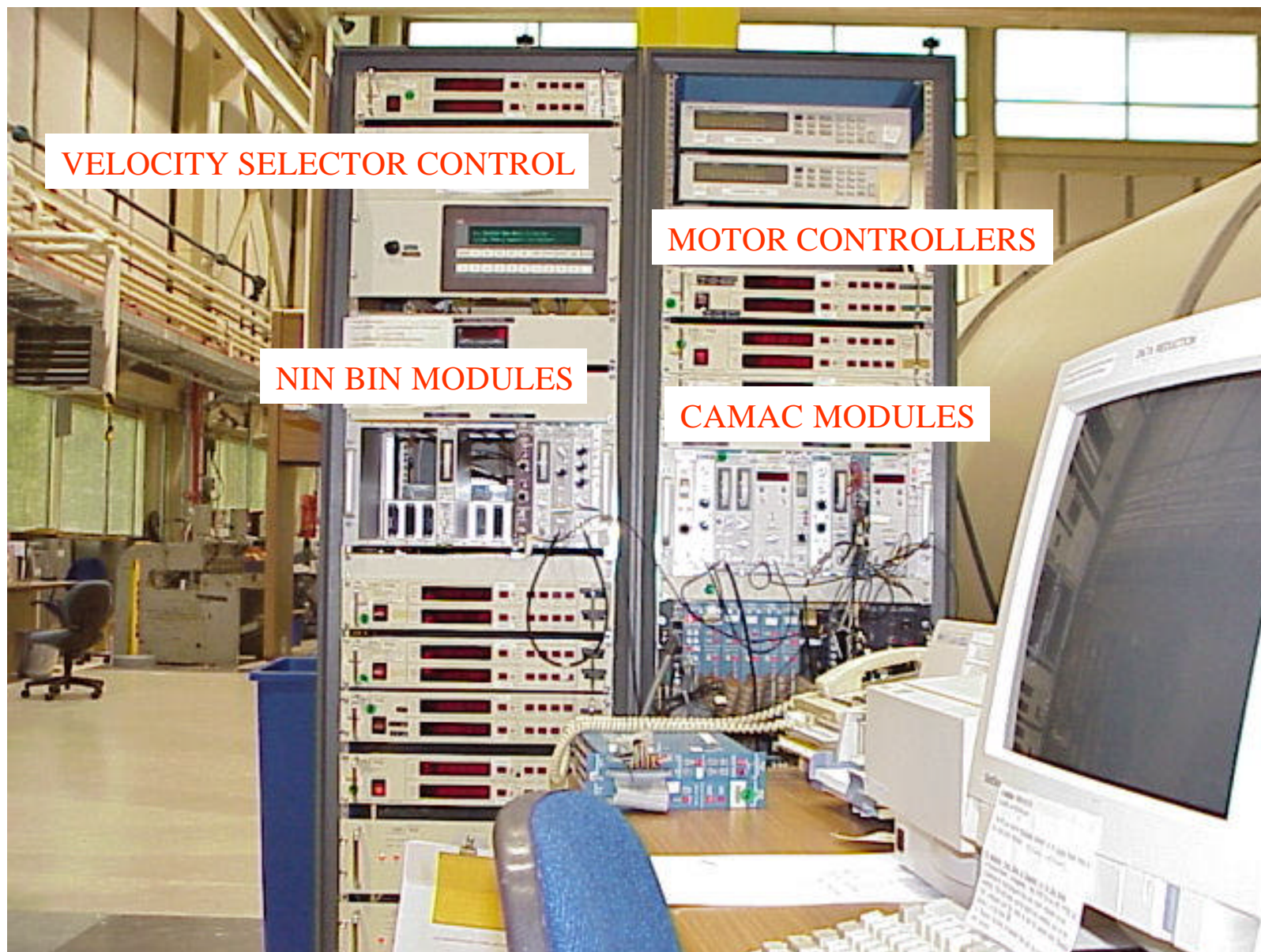


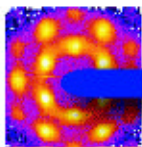
Beamstops



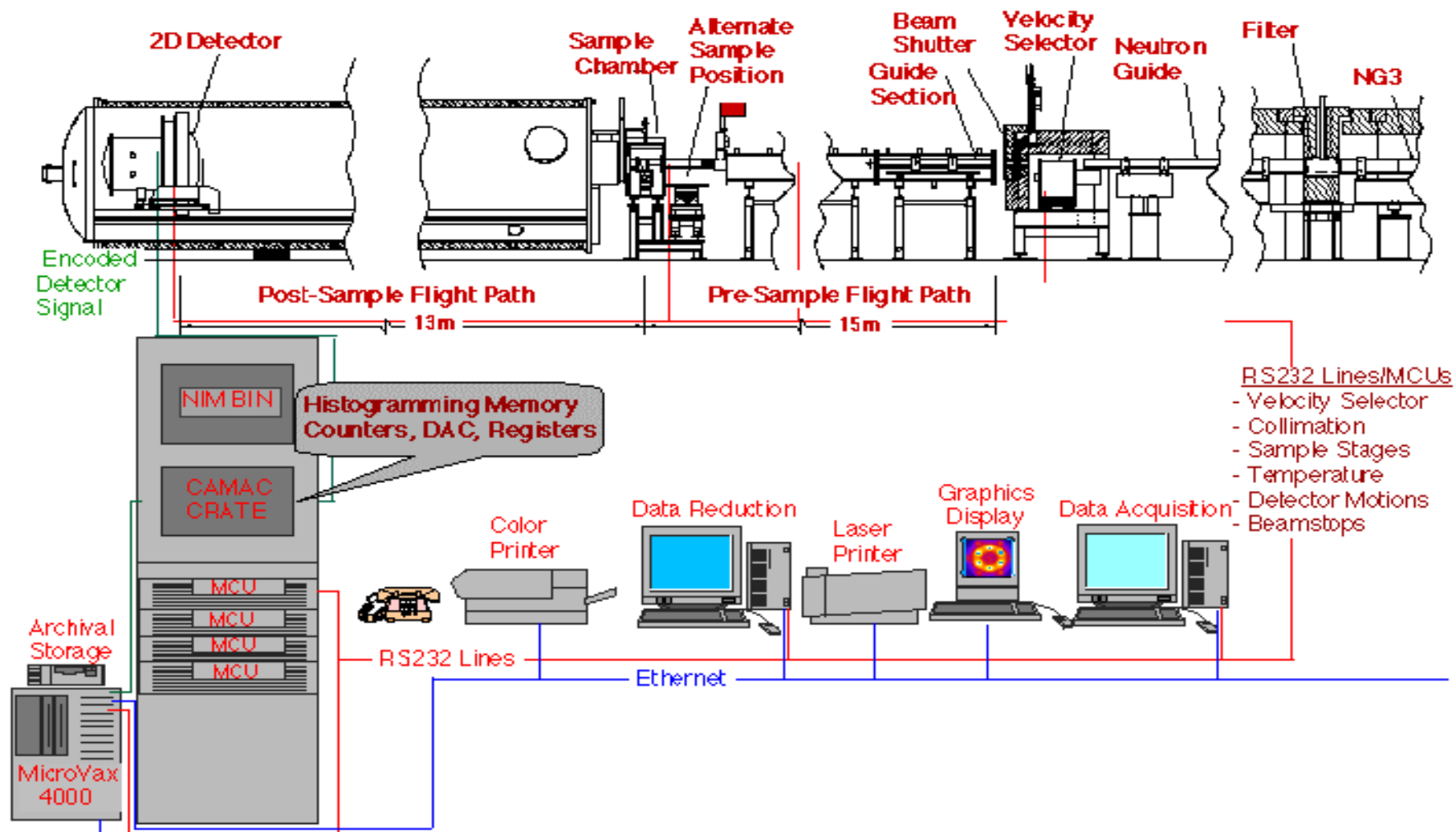


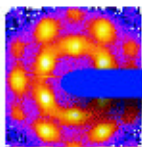
Instrumentation Control





Instrumentation Control





Data Acquisition Terminal

DATA ACQUISITION Graphics Series
G773

SANS Data Acquisition

Run	Comment	Sample	LT	Time	Int	Emax	U15A	U15B	U15C
1	OPEN BEAM UNDER VAC	BLKST	300	3	4.0	1000.00	20.00	6.0	
2	STACK OF 5 ALIN'S NE	BLKST	300	3	5.0	1000.00	20.00	6.0	
3	STACK OF 5 ALIN'S NE	BLKST	300	3	5.0	1000.00	20.00	6.0	
4	OPEN BEAM UNDER VAC	BLKST	300	3	4.0	1000.00	20.00	6.0	
5	TRAMS OPEN BEAM UND	BLKST	100	1	4.0	1000.00	20.00	6.0	
6	TRAMS STACK OF 5 AL	BLKST	100	1	5.0	1000.00	20.00	6.0	
7	OPEN BEAM UNDER VAC	BLKST	300	3	4.0	1000.00	20.00	6.0	
8	STACK OF 5 ALIN'S NE	BLKST	300	3	5.0	1000.00	20.00	6.0	

Raw Data
19-APR-2000
TESTING
Trans. 1.00
Wavelegth 6.00
Aperture 50.0

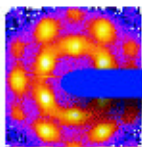
Use the UP and DOWN ARROW keys to select run no. Press RETURN to edit.
Press the 1,2,3...9 number keys to QUICKLY move to menu items 10,20,30...90.
Press the 0 number key to QUICKLY return to the top of the run list.

MARKING!! PROBLEM WITH HISTO MEMORY: SCALER-HISTO = 34445

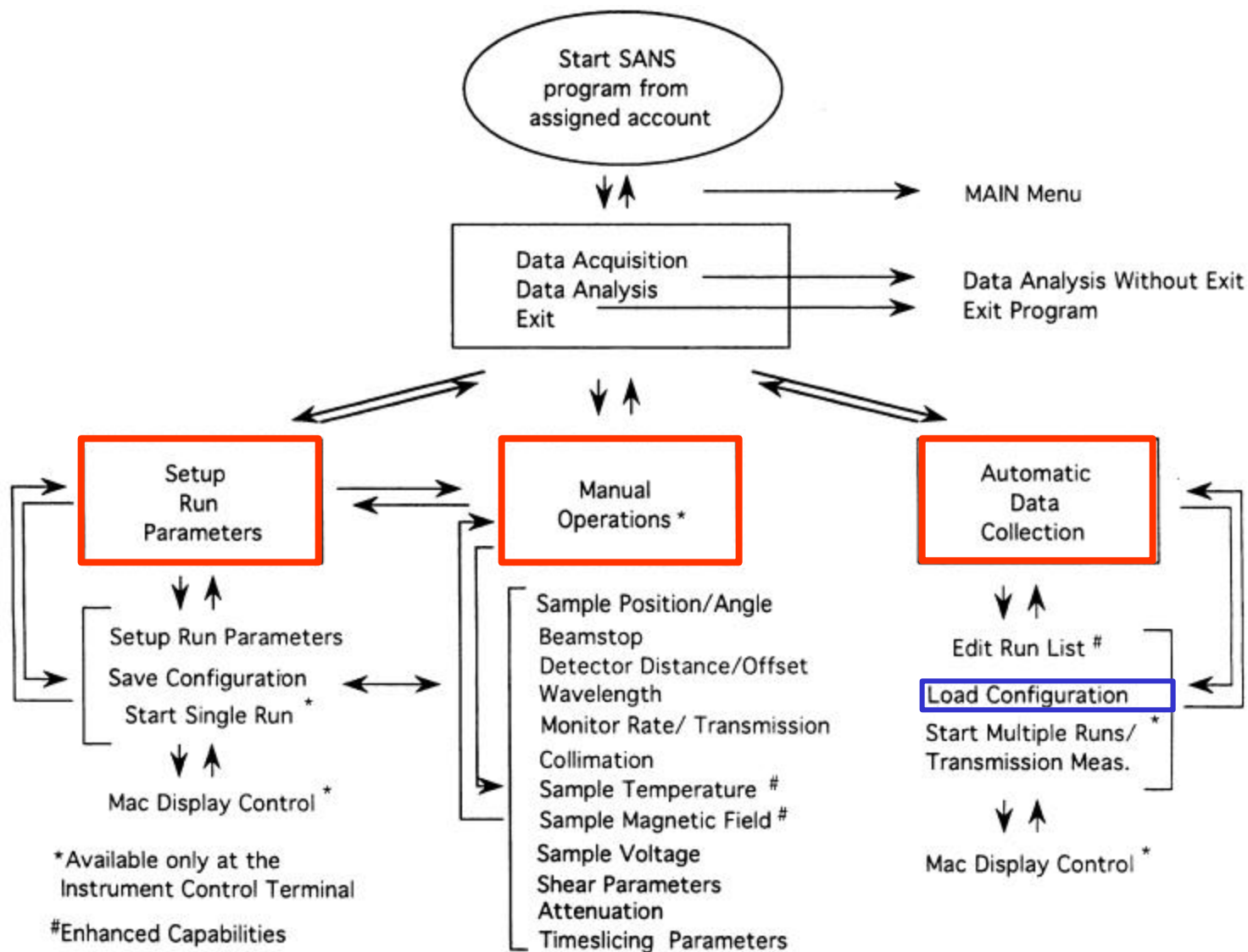
RUN COMPLETED 19-APR-2000 15:19:45 TOTAL MONITOR CTS: 0.00000E+00
DATA WRITTEN TO FILE: ORDELOC1.SR2_TST_J724 TOTAL DETECTOR CTS: 0.94446E+05

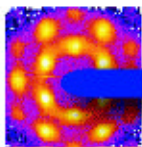
PCNG08 ip address: 129A.122.151

User's name: ngStems (user case info)
Password: CR (hit the enter key)

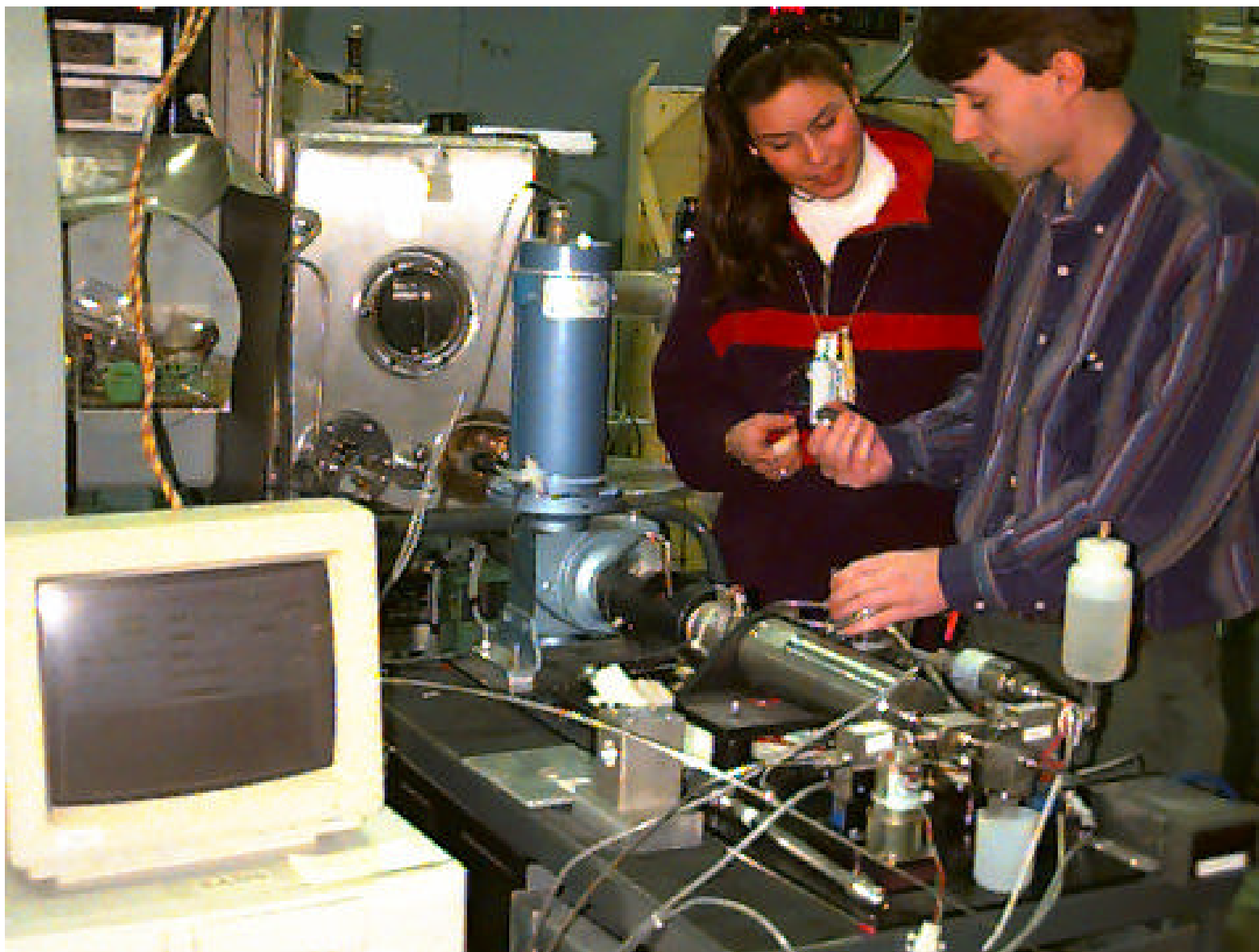


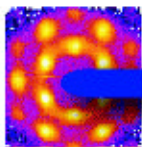
Data Acquisition Schematic





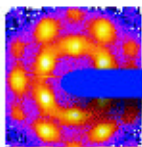
NIST Pressure Cell





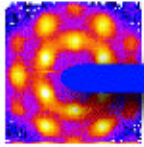
NIST Pressure Cell





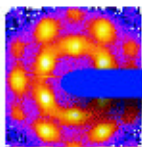
Boulder Rheometer



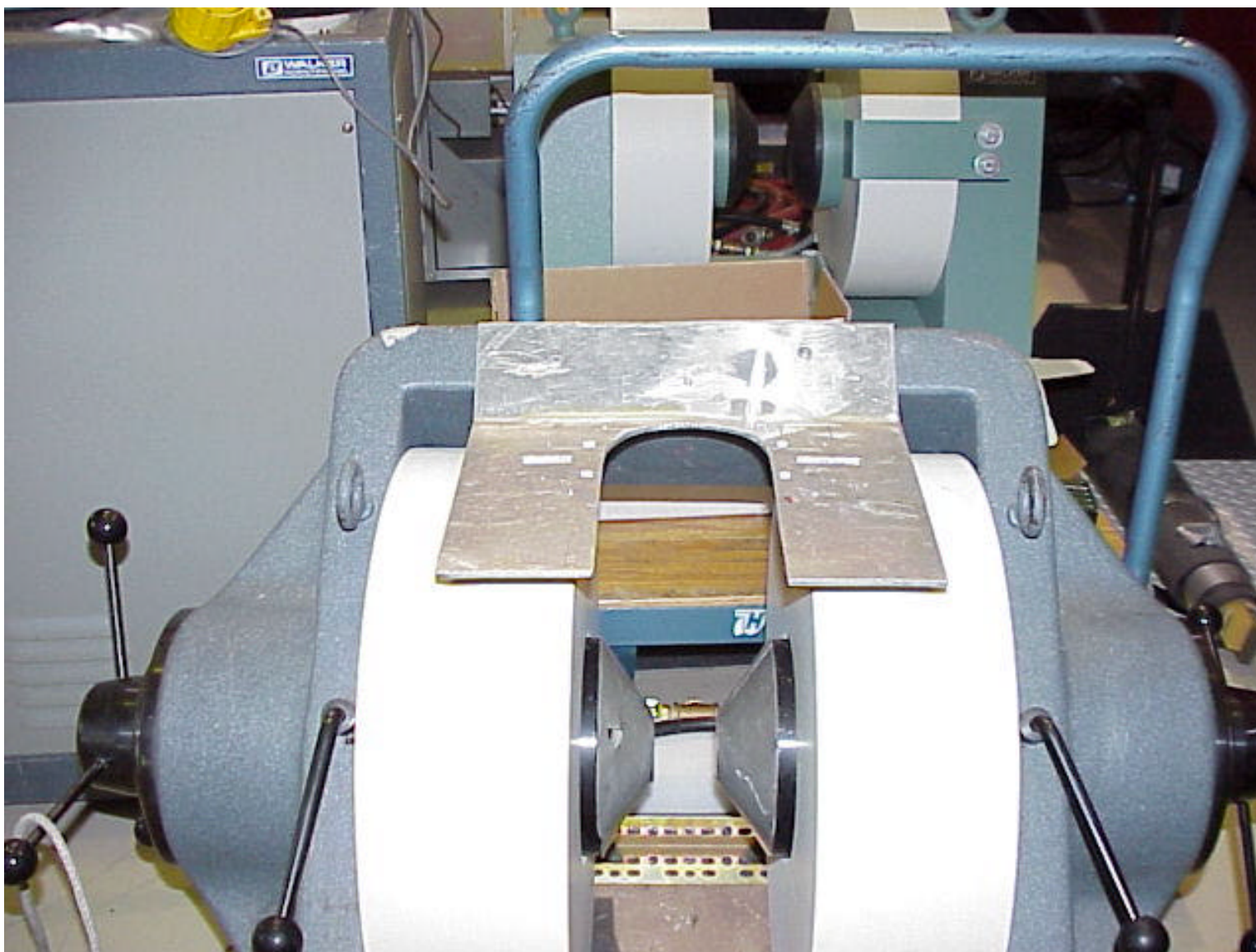


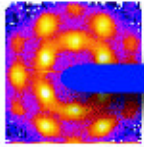
Boulder Shear Cell





Electromagnets





References

On the Web

<http://www.ncnr.nist.gov/programs/sans/>

- ✧ SANS Data Acquisition and Data Reduction Manuals
- ✧ A Tutorial on SANS from Polymers

Instrument Paper:

C.J. Glinka, J. Barker, B. Hammouda, S. Krueger, J. Moyer and W. Orts, “The 30m SANS Instruments at NIST”, J. Appl. Cryst. 31, 430-445 (1998)