Summary of Experimental Beamline Needs
from X-ray Science Workshop with Energy Recovery Linac, Cornell Univ, 2 & 3 December 2000

Experiment Type	*Important Machine Parameters*	*Undulator Needs*	*Special Concerns*	*Facilitator*
Microbeam Diffraction	Source size 5 to 50 μm Tapered undulator Scan quickly	10 to 20 keV polychromatic 40 – 40 keV Riso approach Brilliance 100 to 1000 fold improvement	Beam Stability of 10% of source size Thermal stability Long term reproducible beam position	Gene Ice
Microbeam Fluorescence	Source size 5 to 50 μm	4.5 to 20 keV Scan quickly, Tapered undulator		Gene Ice
High Pressure Diffraction	Same as Microprobes above	20 to 70 keV Most often: 30 to 35 keV		John Parise
High Pressure Spectroscopy		4 to 10 keV pink beams polarized (circular)		John Parise
Femtosecond Spectroscopy	10 fs to 1 ps high current/bunch flux of $1x10^{10}$/bunch/0.1% bw at 10 kHz synchronizing to laser	100 eV to 14 keV Most often: 3 to 10 keV	At sample need 50 υm spot and 100 μmrad divergence	Phil Heinmann
Femtosecond Diffraction	100 fs to 1 ps separation between pulse of 1 μs flux of $1x10^{9}$/bunch/0.1% bw	Tapered undulator		Phil Heinmann
Spectromicroscopy Coherent tomography Holograpy & Diffraction with zone plates Single molecule imaging	Need average brilliance Beyond $1x10^{18}$ to 1×10^{19} Short pulse ~ 50 fs Large bunch charge at kHz rep rate	x-ray of ~ 2 to 4.5 nm, also 0.3 nm Tapered undulator for spectroscopy with 50 eV range Circular polarization for magnetics	Beam stability, especially for scanning Need enough info from 1 pulse to align sample	Chris Jacobsen
Photon Correlation Spectroscopy	As much brillance as possible Repetition rate > 10 MHz	5 to 12 keV pink beam high energy opportunity at 100 keV	Sample coherence diameter: 10 to 50 υm $\delta E/E \sim 10^{-4}$ to 10^{-2}	Joel Brock

Nuclear Resonant Scattering	Bunch to bunch separation of 20 to 200 ns High brilliance in the vertical and horizontal for polarizer/analyser experiments Variable bunch structure	First harmonic tunable between 6 and 18 keV	Large transverse coherence for quasi-elastic scattering	Ercan Alp
Inelastic x-ray scattering (sub meV to eV resolution) Time-resolved phonon measurements Quasi-elastic scattering	Brilliance Flux Low horizontal emittance	First harmonic in the 30 keV range	π polarized for horizontal scattering spectrometer note: 1 THz= 4 meV	Ercan Alp
Normal Incidence Diffraction x-ray metrology x-ray interferometry microfocusing at 10^4 to 1 demag	Low emittance		stability	Ercan Alp
Polarized Beam Experiments Resonant scattering* Faraday rotation Circular Magnetic Dichroism*	Round Beams - give uniform angular size and high throughput for 0.1 eV optics	5 to 100 keV Undulator rotatable about beampipe (or use Apple II type undulator) Standard short period Novel ID designs	That tuning ID doesn't affect other users	Ken Finkelstein

Notes: brilliance in units of x-rays/sec/mm**2/mr**2

* Polarization switching on input (as opposed to low signal end).