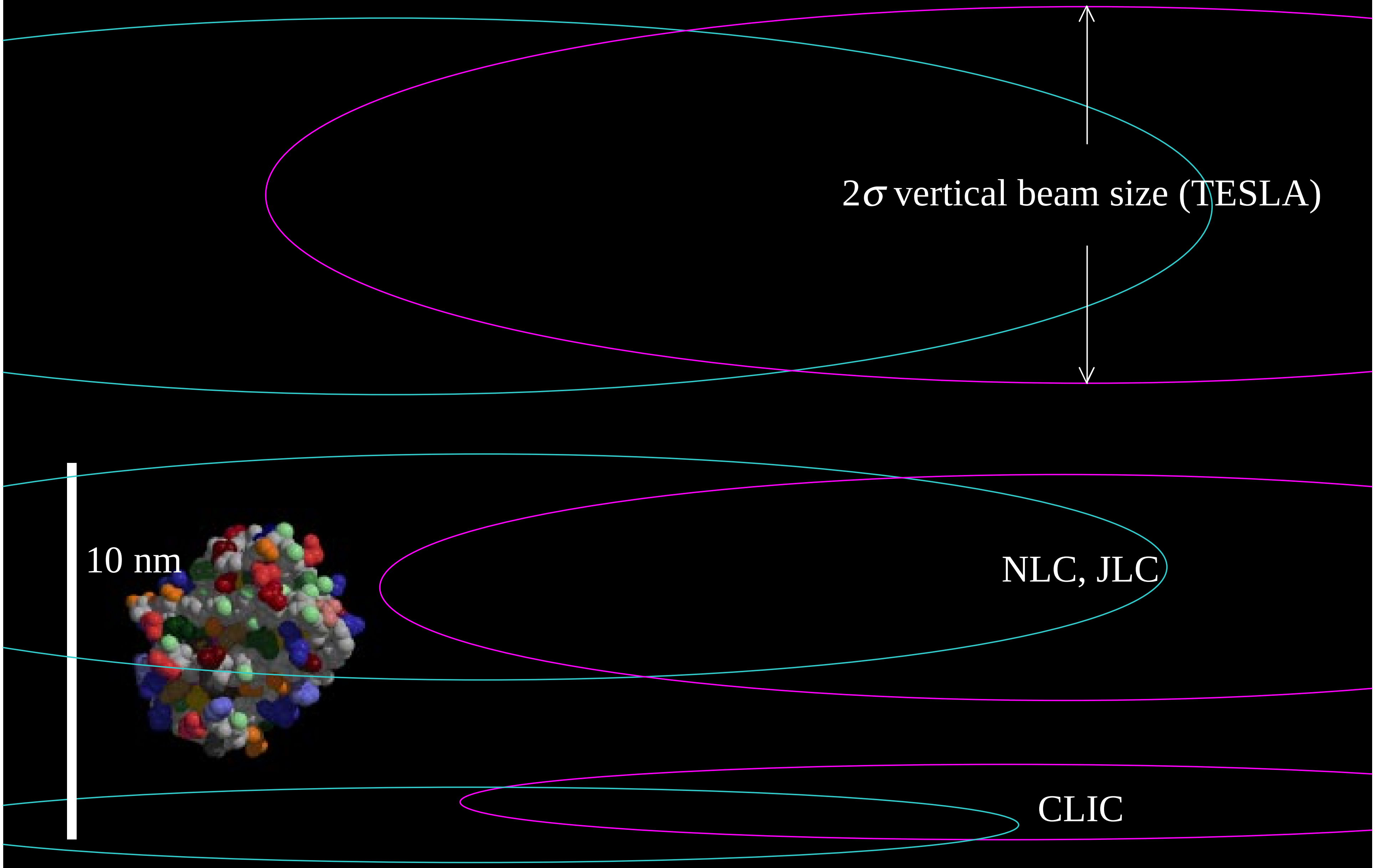
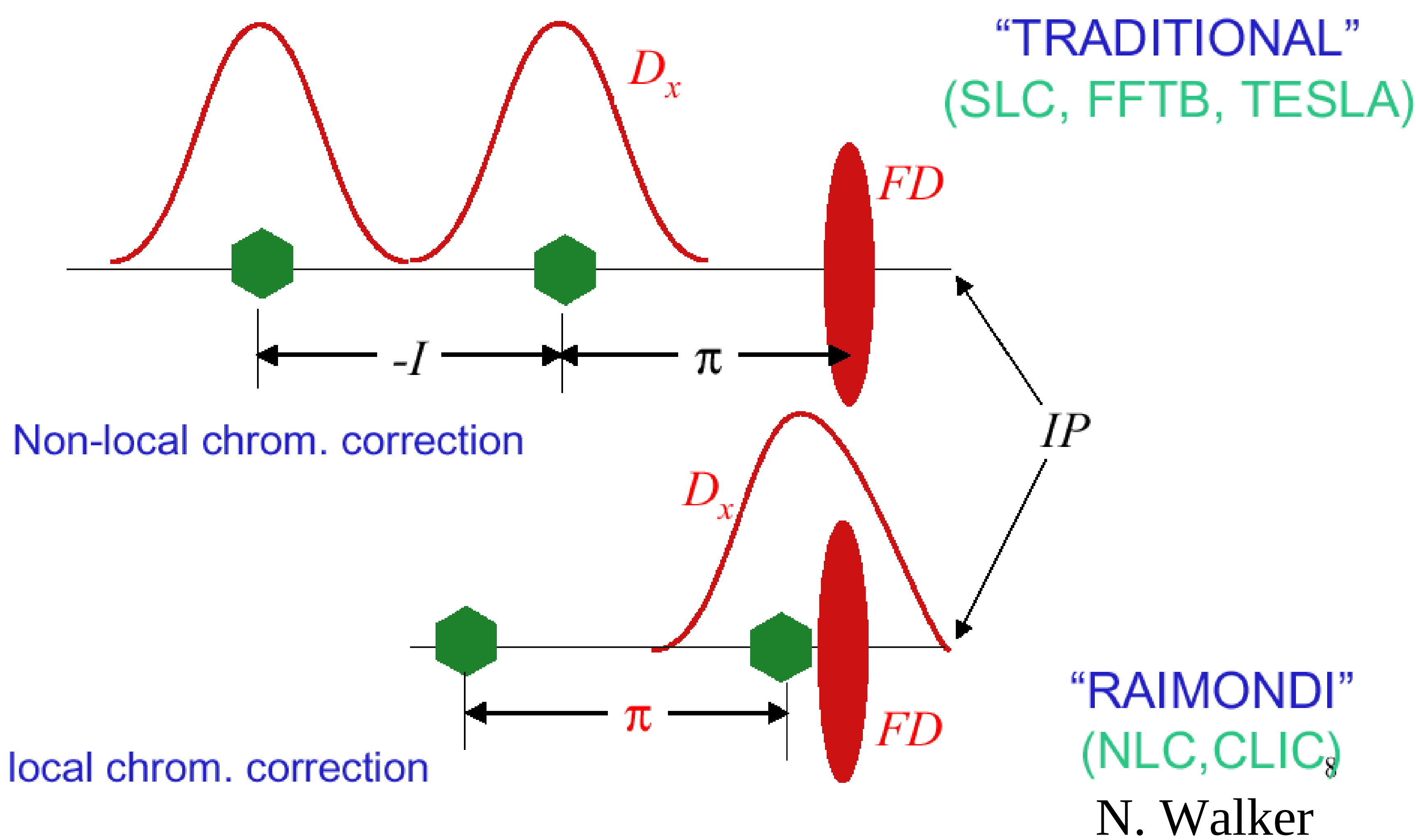
Functions of the LC beam delivery systems:

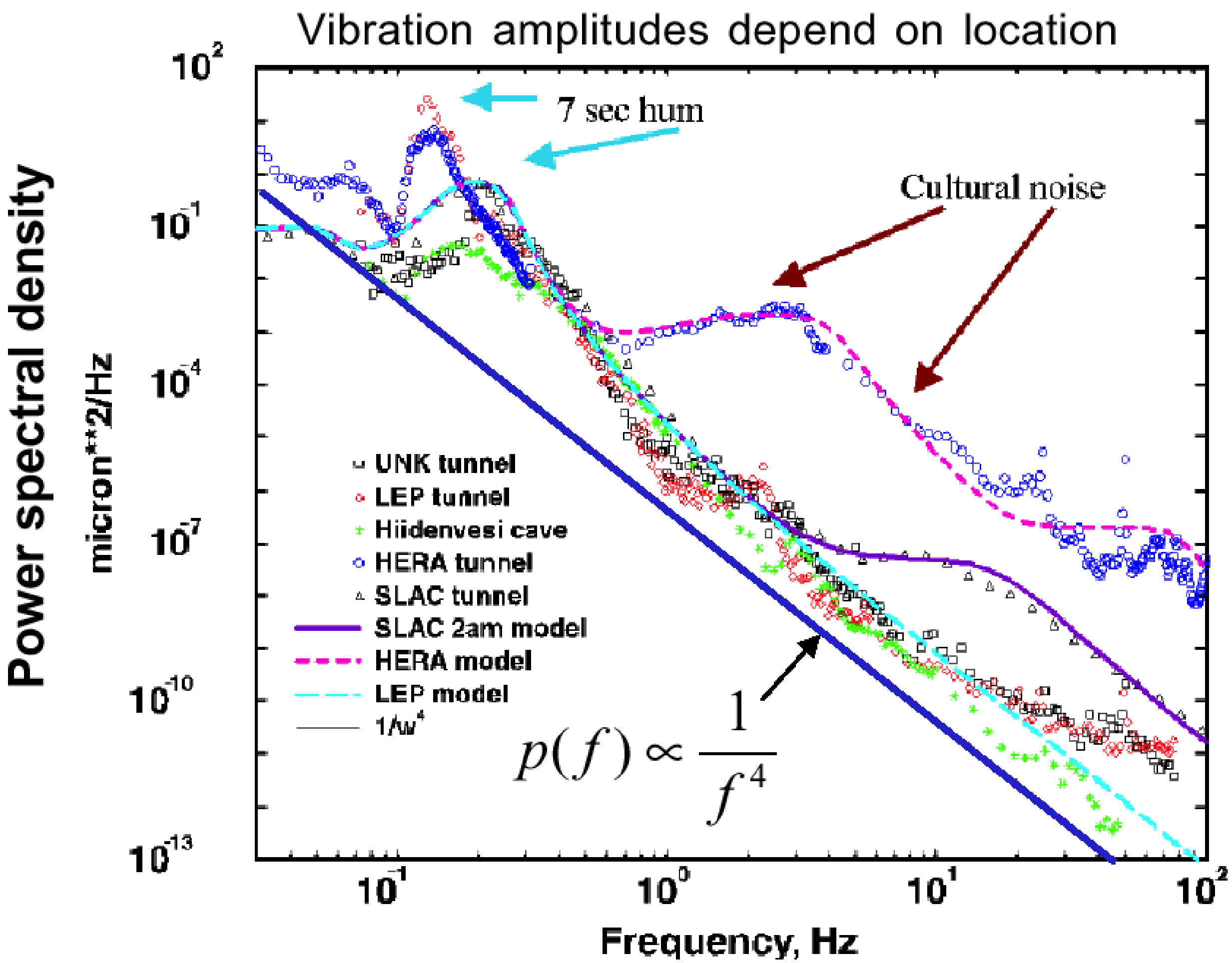
- Focus the beams to a several nanometer (vertical) size at interaction point with well-controlled aberrations.
- Keep beams in collision in the presence of ground motion and vibration.
- Minimize/collimate backgrounds.


2σ vertical beam size (TESLA)
10 nm
NLC, JLC
CLIC



“TRADITIONAL”
(SLC, FFTB, TESLA)
D_x
FD
-I
π
IP
Non-local chrom. correction
D_x
π
FD
local chrom. correction
“RAIMONDI”
(NLC,CLIC)
8
N. Walker

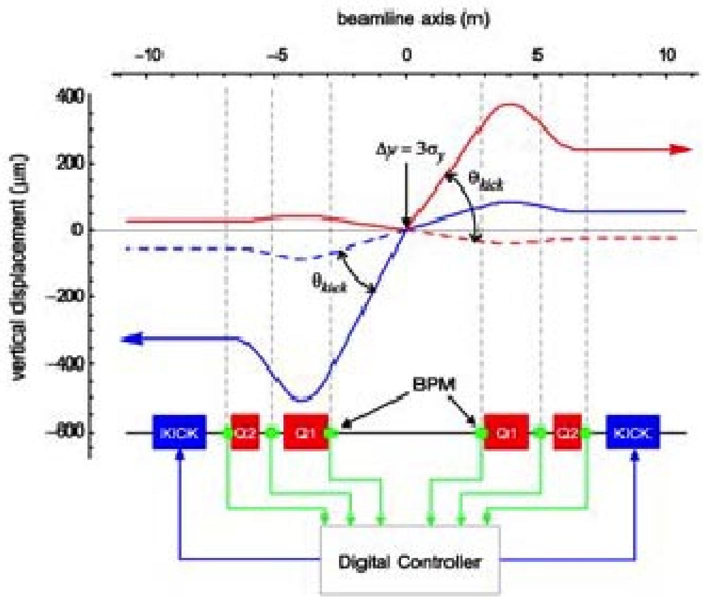
Ground motion (data and fits: A. Seryi)



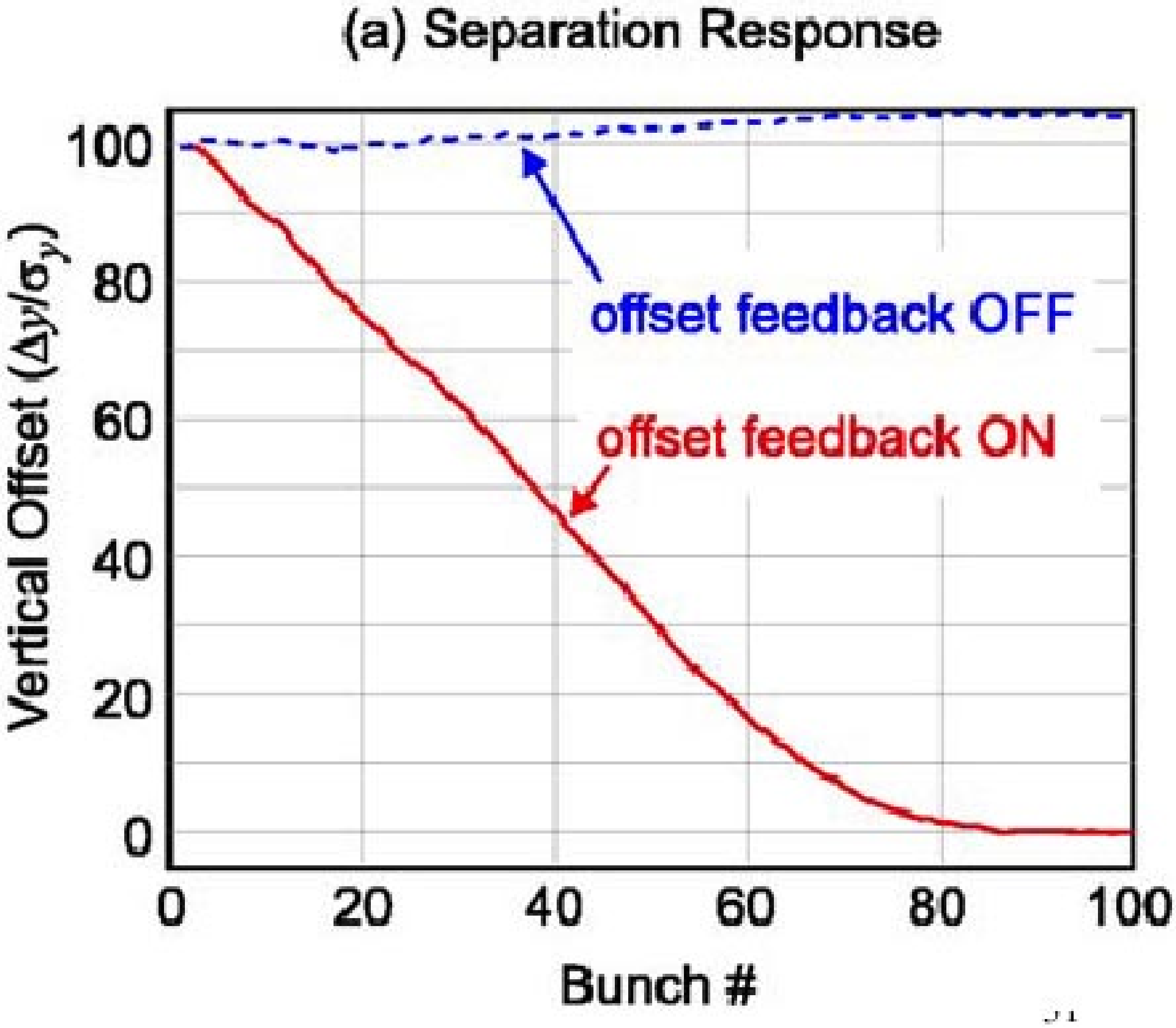
IP beam feedback systems

NLC/JLC forsee pulse-by-pulse feedback possibly augmented by fast analog bunch-by-bunch feedback.

TESLA requires bunch-by-bunch feedback within its long train.



TESLA feedback simulation



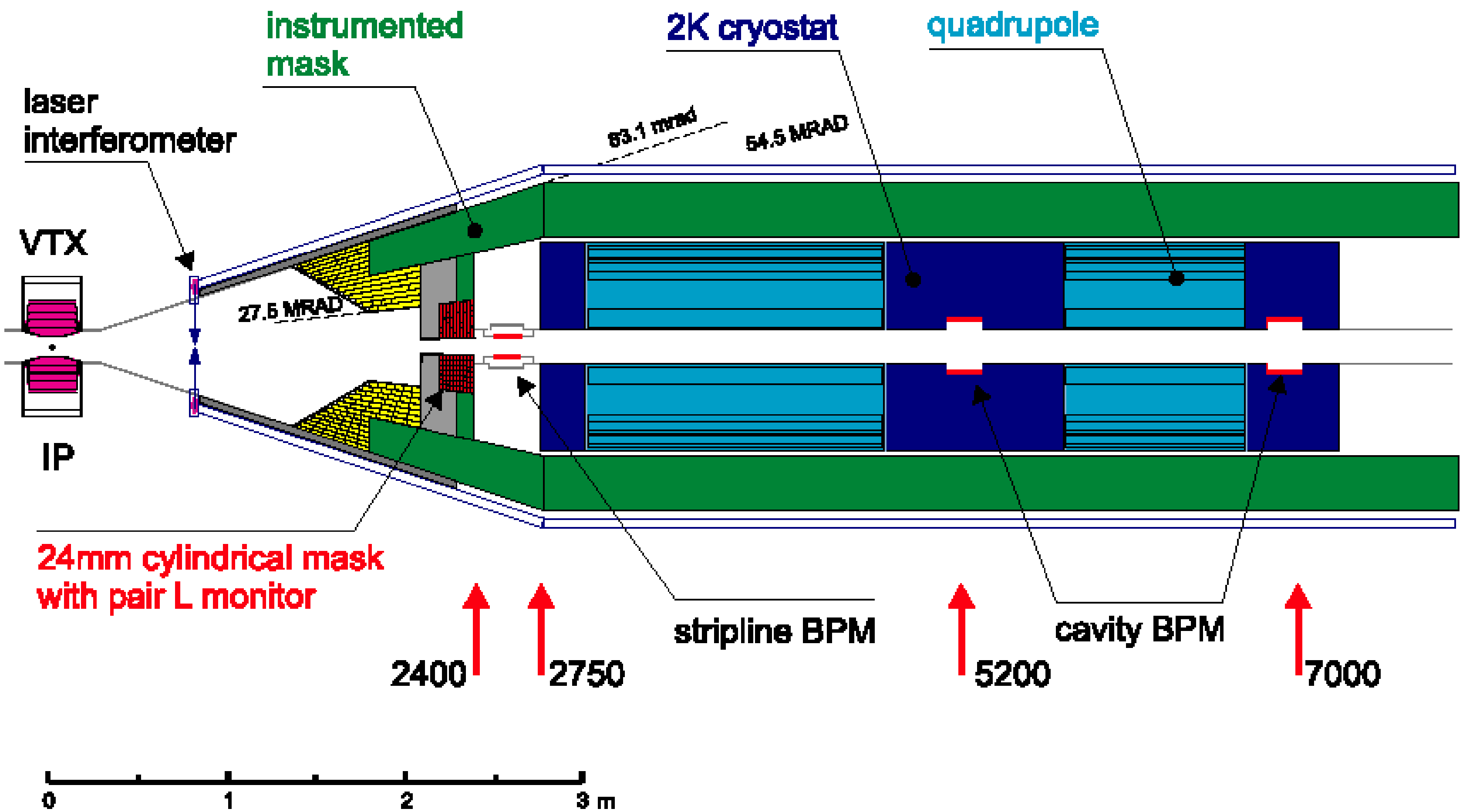
TESLA has superconducting final focus quadrupole doublets. The beams collide head-on in the 4T field of the detector solenoid and are separated electrostatically as they exit the IP.

JLC has a conventional iron final focus doublet in a superconducting coupling compensation magnet. The beams cross at 6 mrad in the 2T field of the detector solenoid, and exit through the coil pocket of the final focus quadrupole magnets.

NLC is considering two detector options: ``Large'' (LD) and ``Silicon'' (SD). The LD option uses a 3T solenoid and SD uses a 5T solenoid. The final focus doublet are permanent magnet quadrupoles, which are not mechanically connected. Active feedback (an optical anchor) is used to stabilize them relative to the bedrock. The beams cross at a 20 mrad angle and exit past the outer radius of the permanent magnet final focus quads into an extraction line at 6 m from the IP.

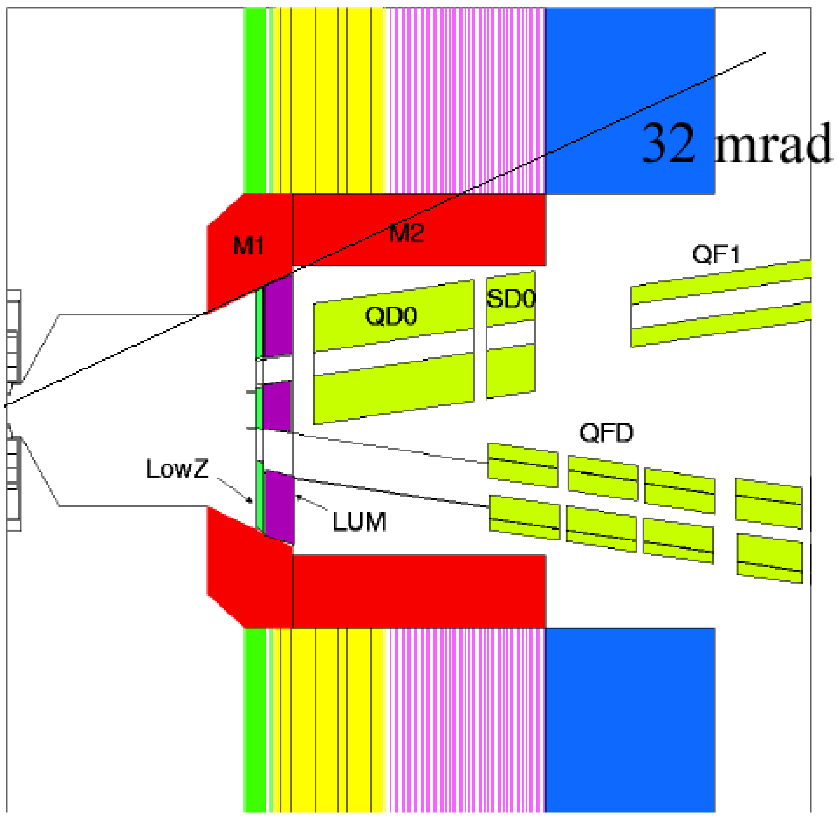
CLIC is considering superconducting and permanent magnet final focus doublets. The beams cross at at 20 mrad angle in the 4T field of the detector solenoid.

TESLA

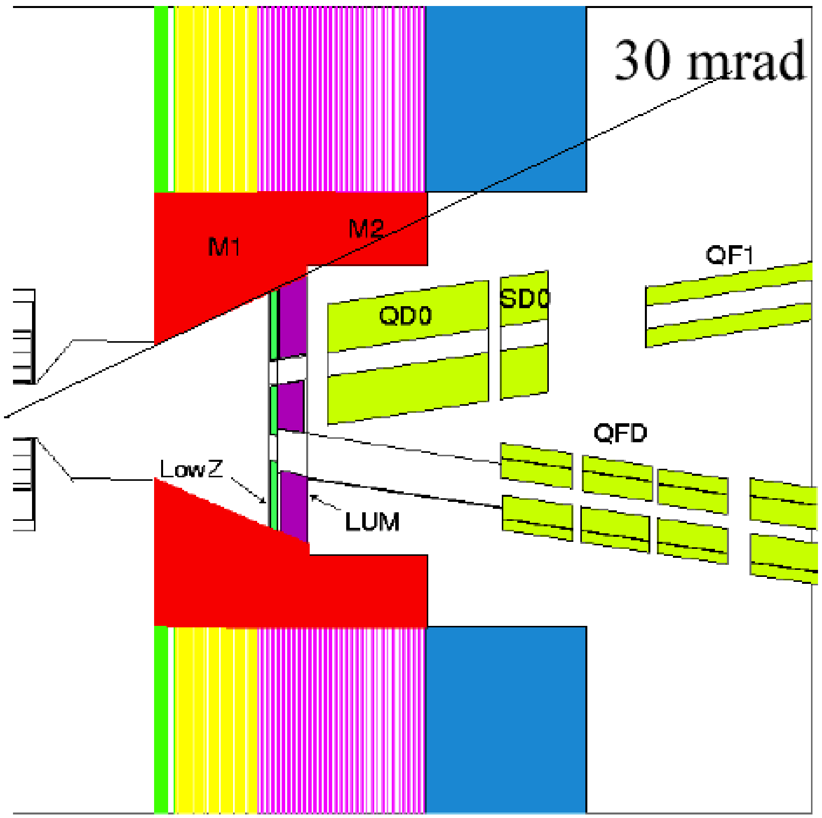

instrumented mask
2K cryostat
quadrupole
laser interferometer
63.1 mrad
54.5 MRAD
VTX
27.5 MRAD
IP
24mm cylindrical mask with pair L monitor
stripline BPM
cavity BPM
2400
2750
5200
7000
0
1
2
3 m

NLC

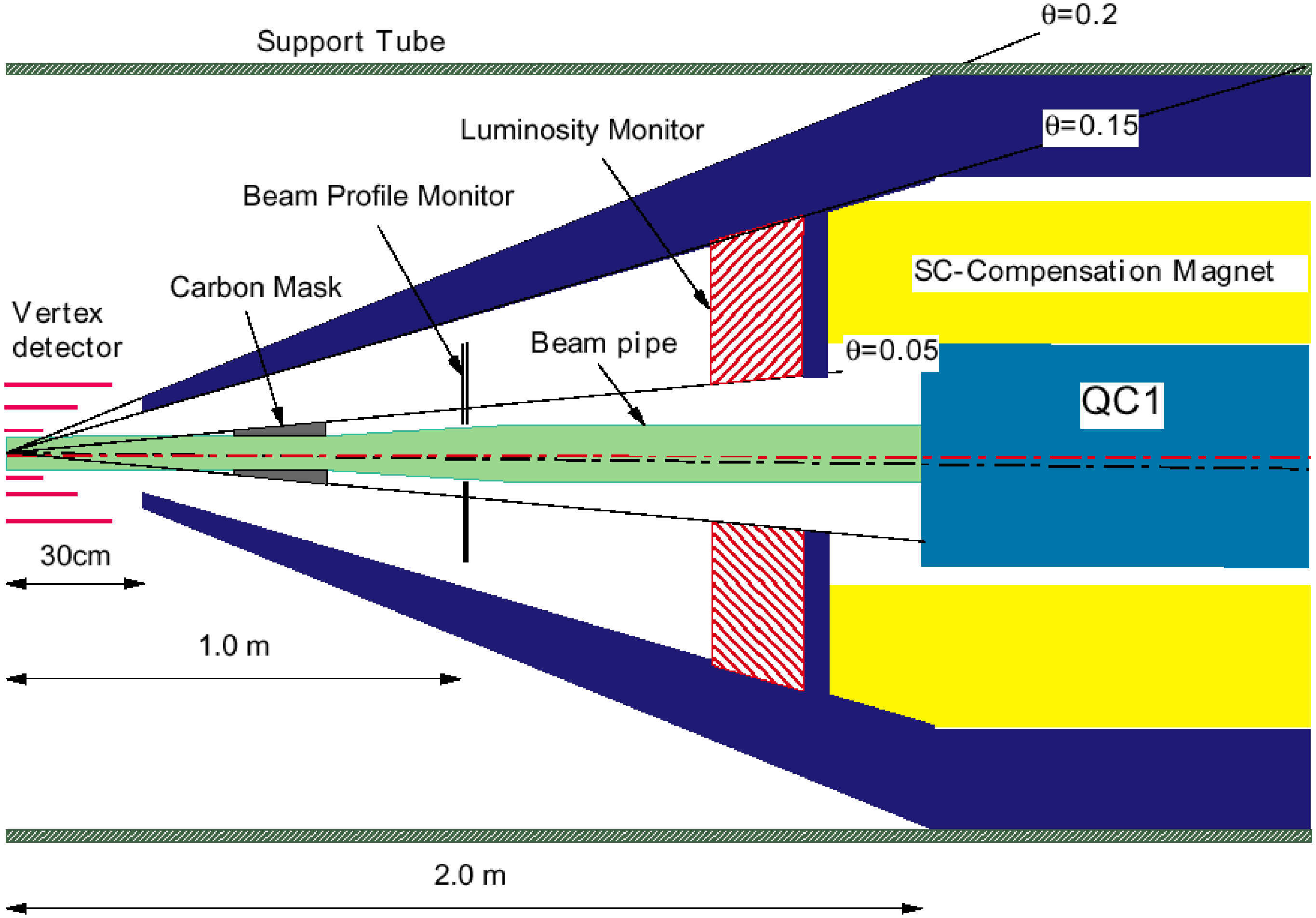
Large Det.- 3 T



Silicon Det.- 5 T



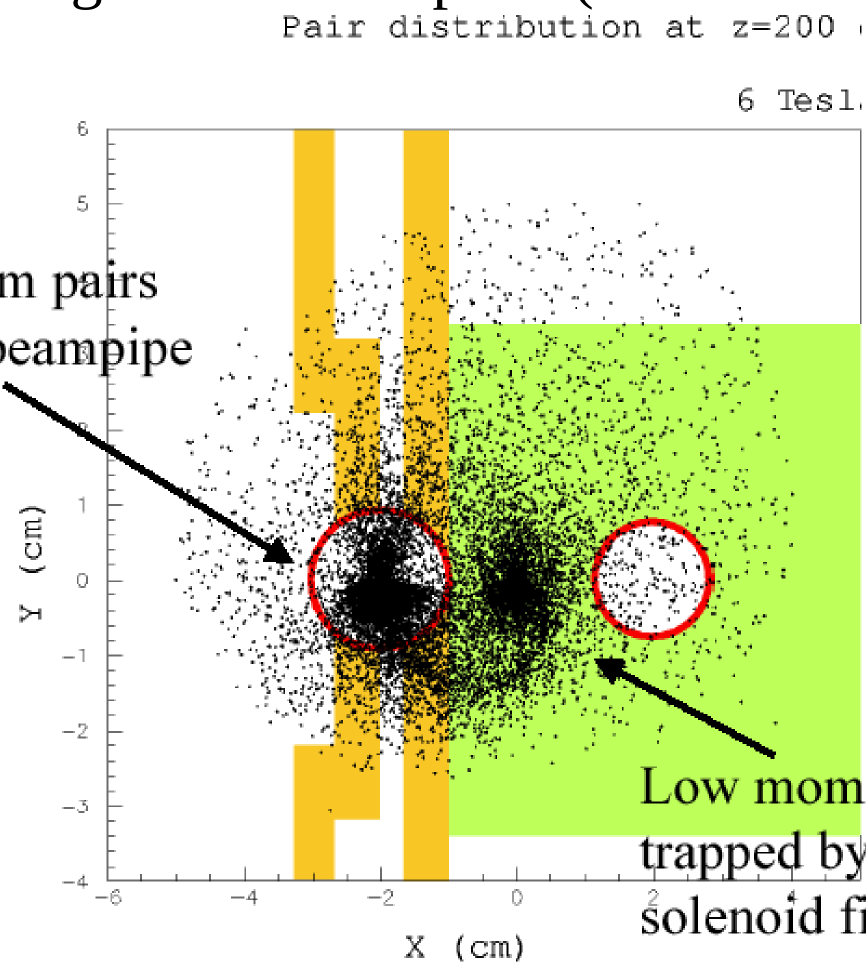
JLC


θ=0.2
Support Tube
θ=0.15
Luminosity Monitor
Beam Profile Monitor
SC-Compensation Magnet
Carbon Mask
Vertex detector
Beam pipe
θ=0.05
QC1
30cm
1.0 m
2.0 m

Backgrounds:

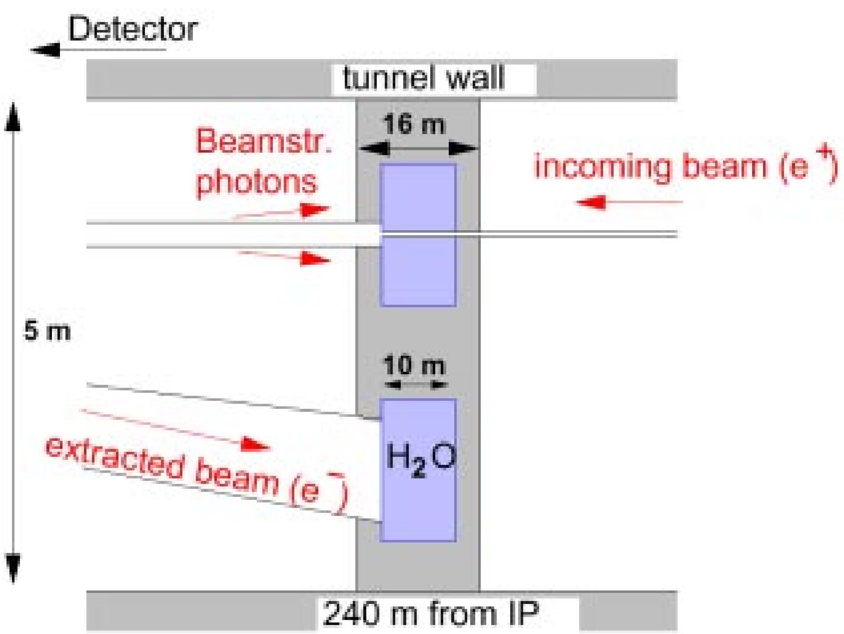
- Synchrotron radiation from beam “tails” in IR quads
- Pairs produced in field of opposing bunch during collision
- Hadrons produced by beam-beam gamma-gamma processes
- Beamstrahlung photons.
- Secondaries (photons, neutrons, electrons) produced when pairs hit material near IP.
- Neutrons from dump.
- Muons produced at collimators

Local neutron backgrounds from pairs (T. Markiewicz, LC02 presentation)

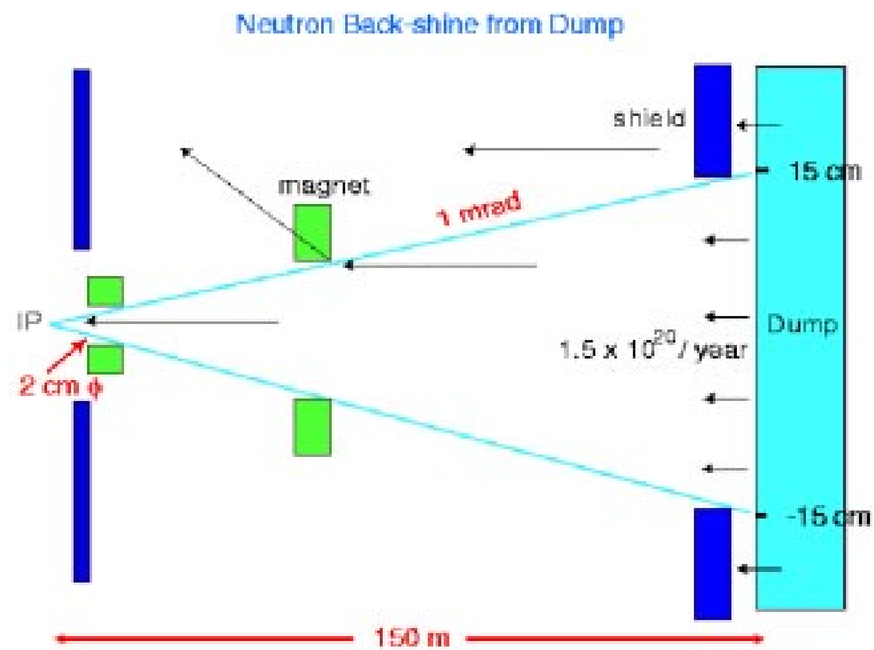


Neutron backgrounds from beam dumps

TESLA



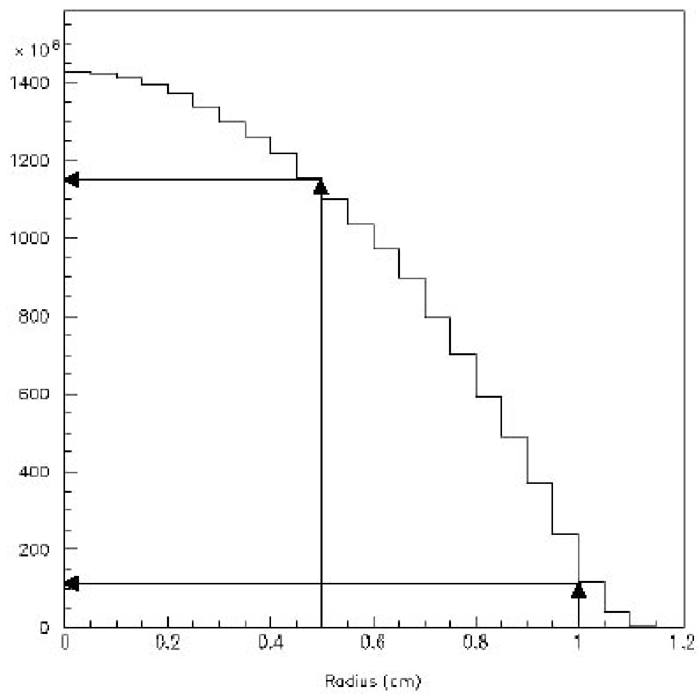
NLC



Neutron backgrounds from beam dumps (from T. Markiewicz, Snowmass 2001)

NLC - The Next Linear Collider Project

Integrated Dump Neutron Flux vs. Radius



Detector Group Constantly Asking why inner VXD radius can't be x2 SMALLER

As Beampipe radius is reduced by x2

- Flux from dump up x10
- Hit density up by x40
- dump becomes equal to pairs as source of neutron hits
- SR issues (S. Hertzbach talk)

Fairly complete designs and calculations exist for all LC projects (less well-developed for CLIC).

Detector and machine people are communicating with each other to some degree.

Detector designs tend to have several variants, which presents problems for integrating the machine and detector.