Overview and aims of planned IN2P3 contributions

Meeting motivations & organisation

Philip Bambade

LAL-Orsay

ATF2-IN2P3-KEK kick-off meeting,
Annecy, 9-11 October 2006

Main present French ILC activities

- Linac technology: RF couplers, SC cavities (processing & control), cryogenics (DESY & TTF)
- Injectors, sources (Compton based e+)
- MDI & BDS ↔ ATF2 (experimentation)
- Detector R&D: → EM calorimetry (CALICE), Silicon sensors (vertexing & tracking), TPC
- Physics studies, phenomenology
- Communication & outreach

established R&D programs ▪▪▪▪▪► contribute to global ILC project

ATF2 = SLAC ↔ KEK + UK (BDS !) + France & others

French should be effort well focused given limited resources : (LAL Scientific Council, 09/2005)

ATF2 MoU submitted for signature to CNRS

ANR grant : 400000 euros in 2007-2010

LAL: beam tuning & commissioning
P.Bambade background calculations
(instrumentation development)

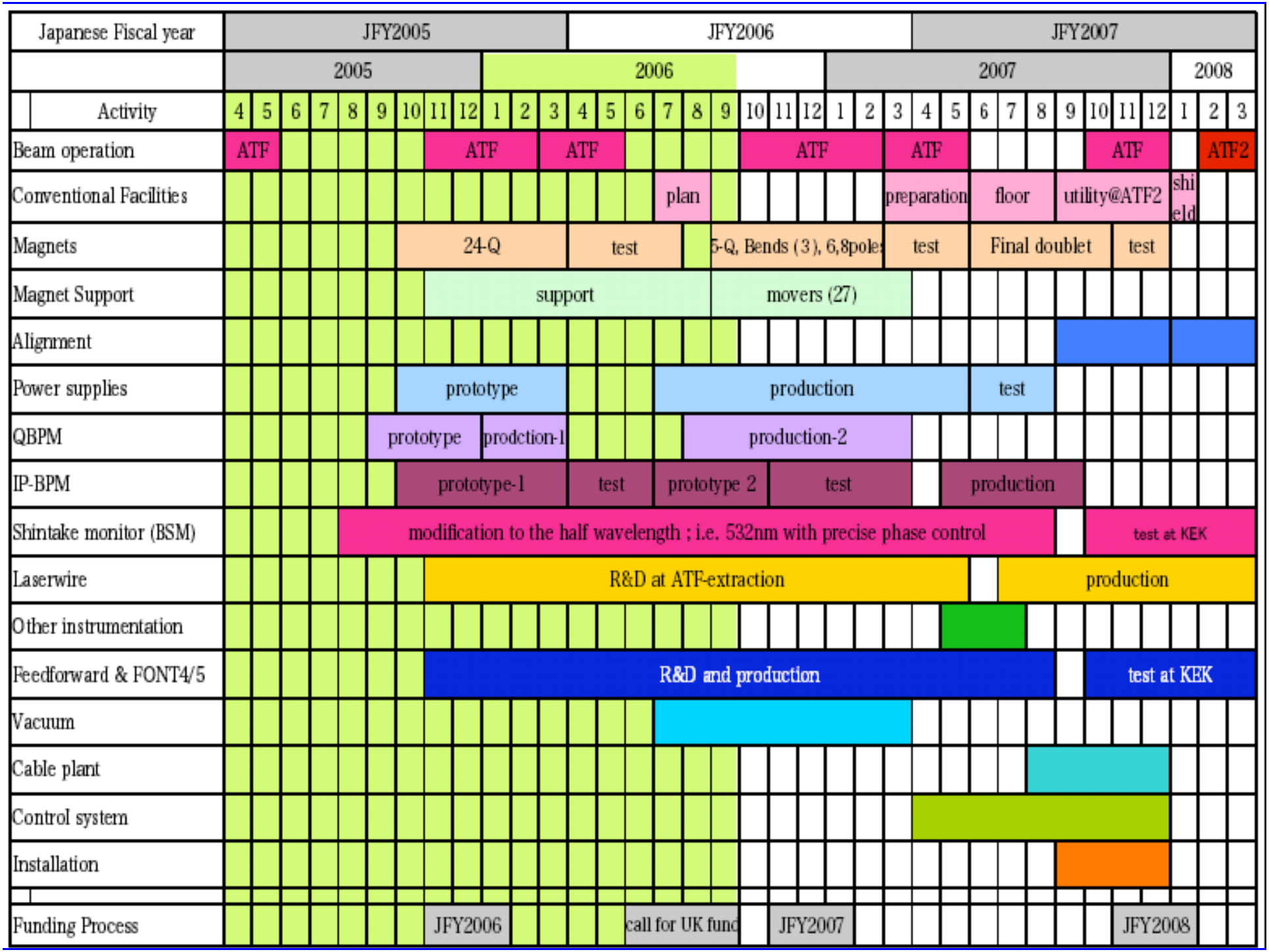
LC impact

complementary

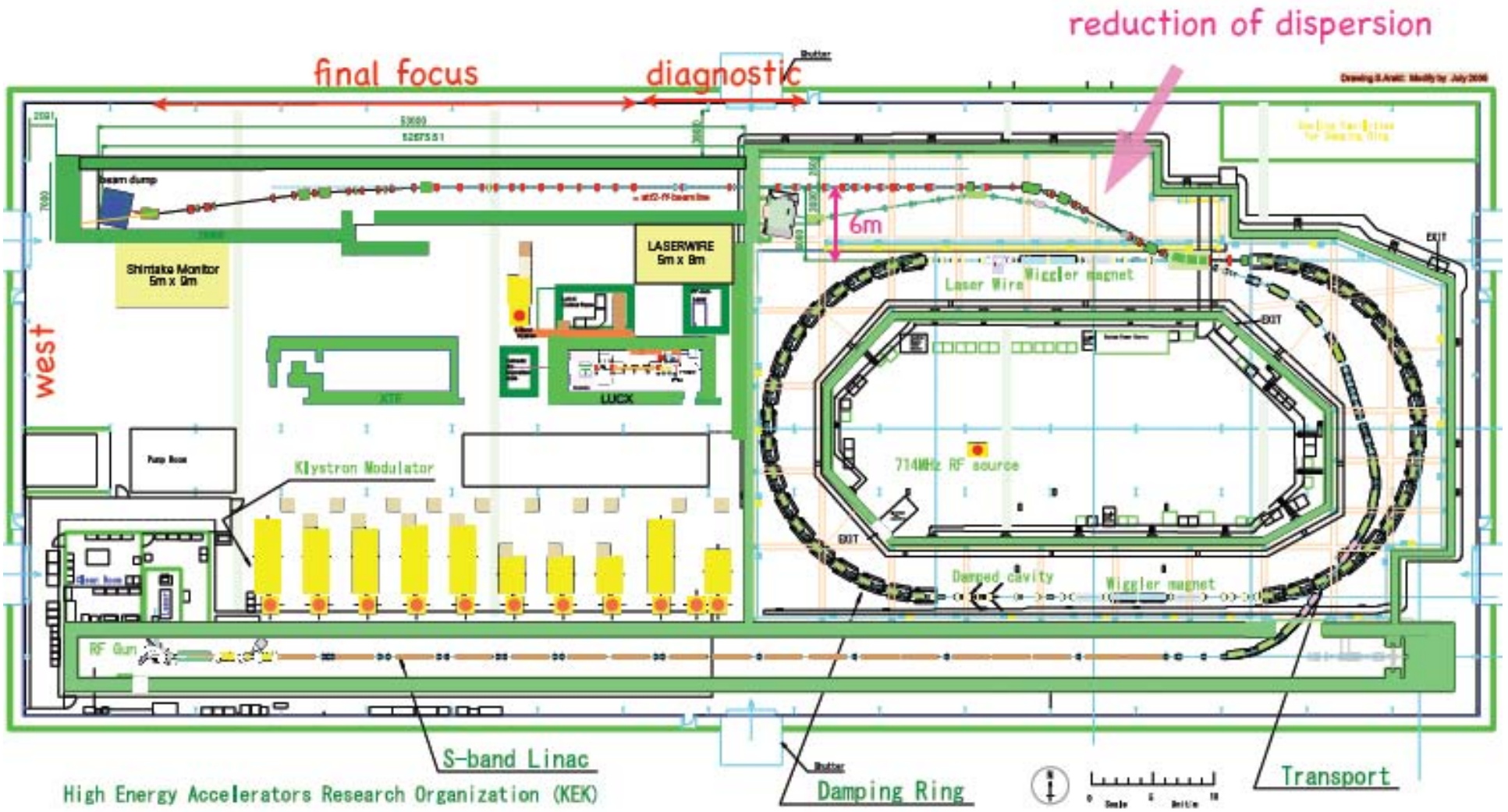
LAPP: mechanical support & stabilisation of FD
A.Jérémie characterisation & impact in beam operation

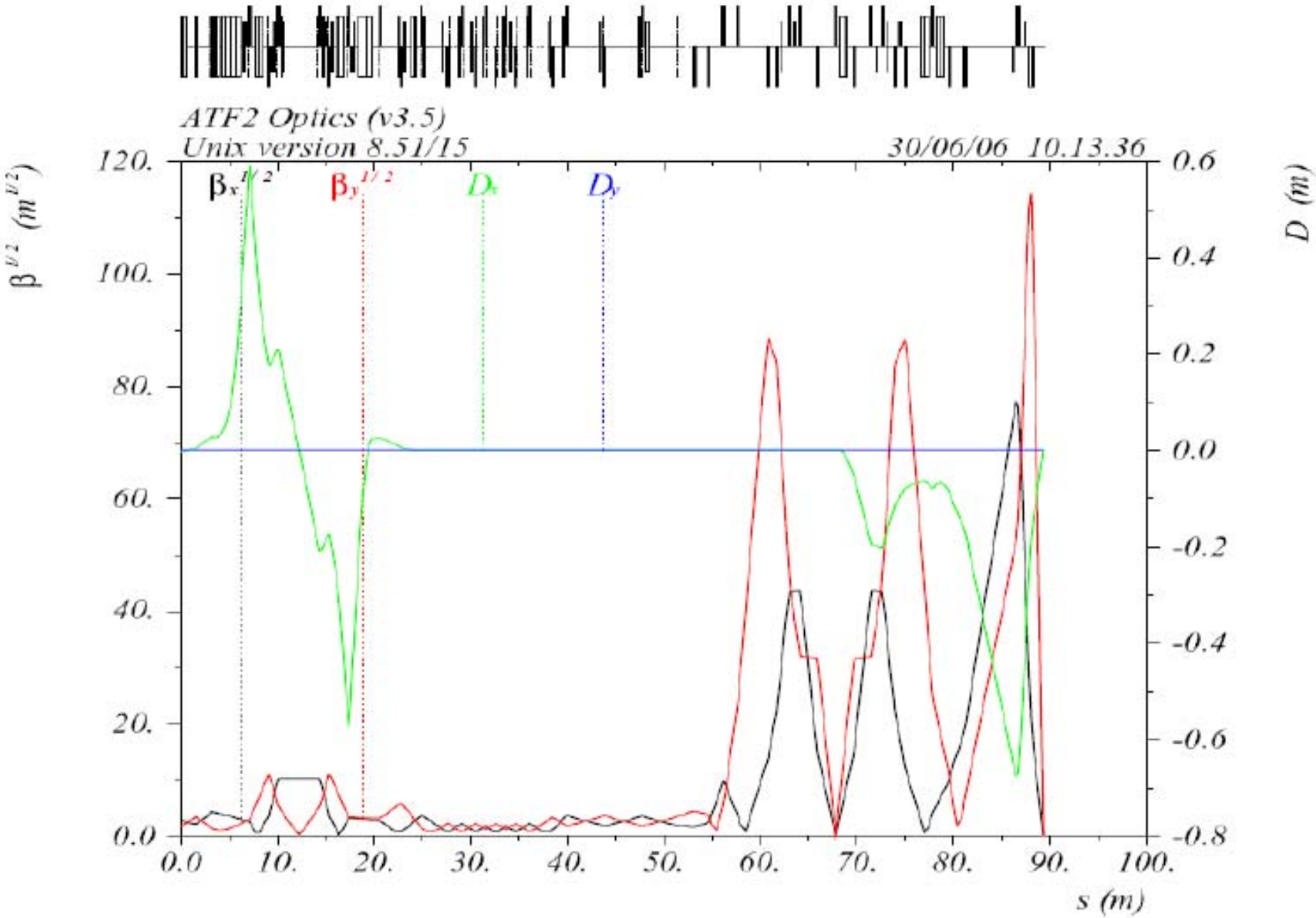
LLR: background calculations (algorithm, GEANT4)
M.Verderi (instrumentation to measure in beam operation)

KEK direct partner + UK, DESY, SLAC, CERN, Valencia


Japanese Fiscal year
JFY2005
JFY2006
JFY2007
2005
2006
2007
2008
Activity
4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3
Beam operation
ATF
ATF
ATF
ATF
ATF
ATF
ATF
ATF2
Conventional Facilities
plan
preparation
floor
utility@ATF2
shield
Magnets
24-Q
test
5-Q, Bends (3), 6,8poles
test
Final doublet
test
Magnet Support
support
movers (27)
Alignment
Power supplies
prototype
production
test
QBPM
prototype
prodction-1
production-2
IP-BPM
prototype-1
test
prototype 2
test
production
Shintake monitor (BSM)
modification to the half wavelength ; i.e. 532nm with precise phase control
test at KEK
Laserwire
R&D at ATF-extraction
production
Other instrumentation
Feedforward & FONT4/5
R&D and production
test at KEK
Vacuum
Cable plant
Control system
Installation
Funding Process
JFY2006
call for UK fund
JFY2007
JFY2008

Optics v3.5, 1 July 2006




ATF2 Optics (v3.5)
Unix version 8.51/15
30/06/06 10.13.36
$\beta_x^{1/2}$
$\beta_y^{1/2}$
D_x
D_y
$\beta^{1/2}$ ($m^{1/2}$)
D (m)
s (m)
120.
100.
80.
60.
40.
20.
0.0
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
0.0
10.
20.
30.
40.
50.
60.
70.
80.
90.
100.


6 m from DR-line,
1.2m hight beam line

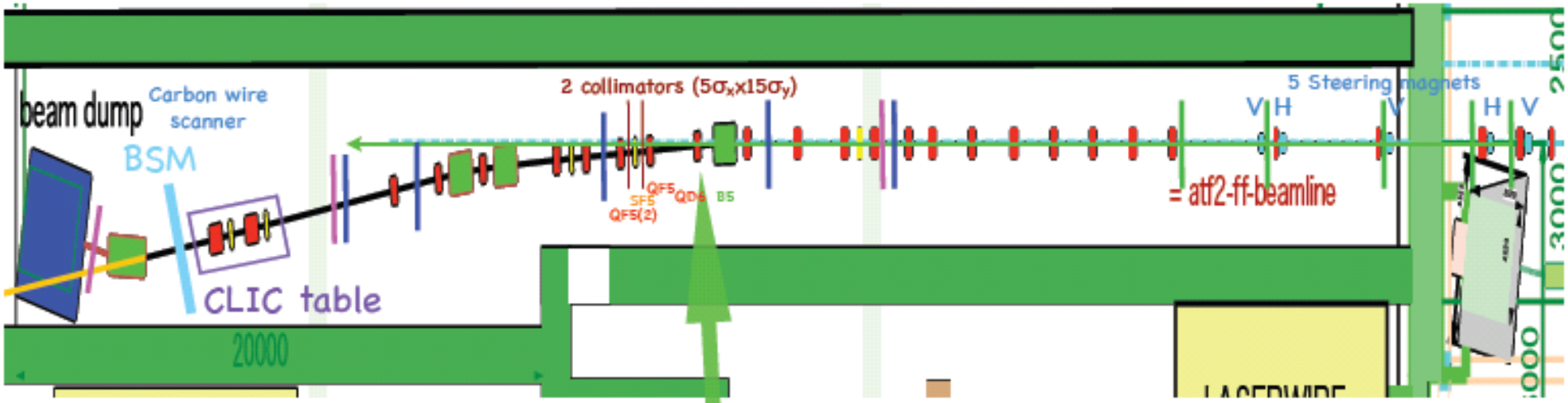

ATF2 Area
view from west

Beam Instrumentation and Magnets at FF

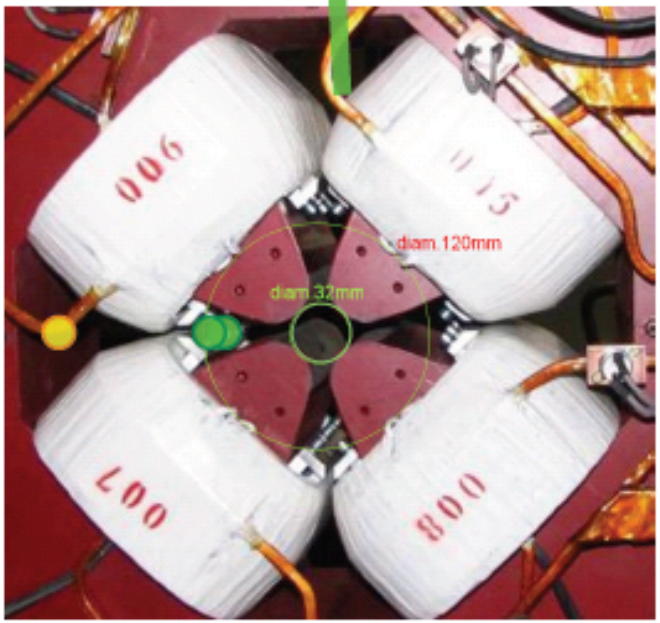
4 Screen monitors for commissioning, (1 at the ATF-EXT)

5 Stripline BPMS for commissioning

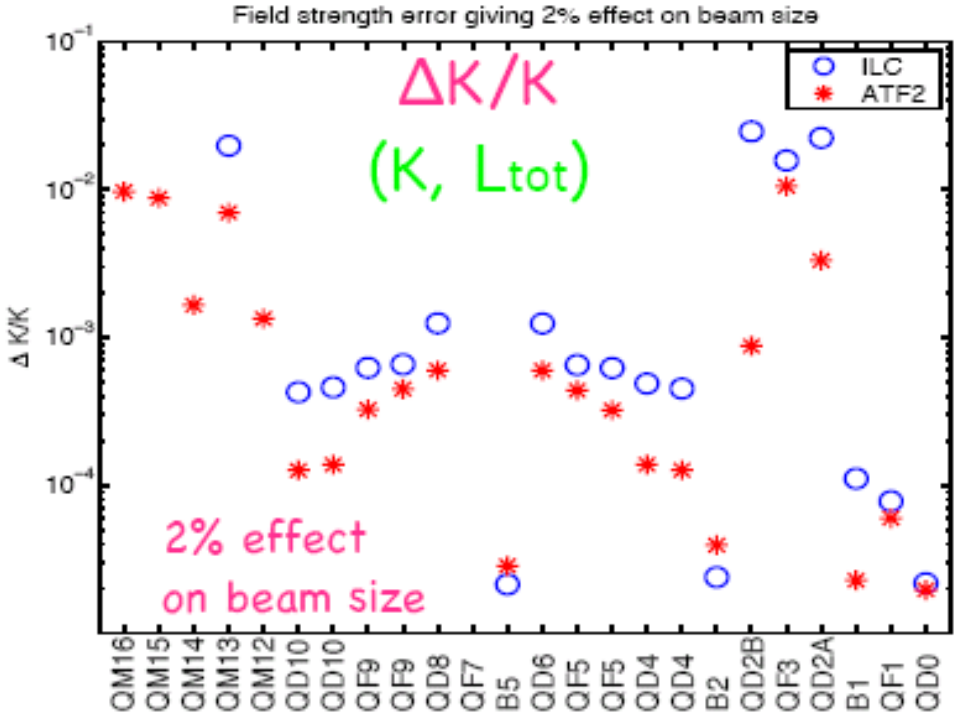
5 Wire scanners/Laserwires

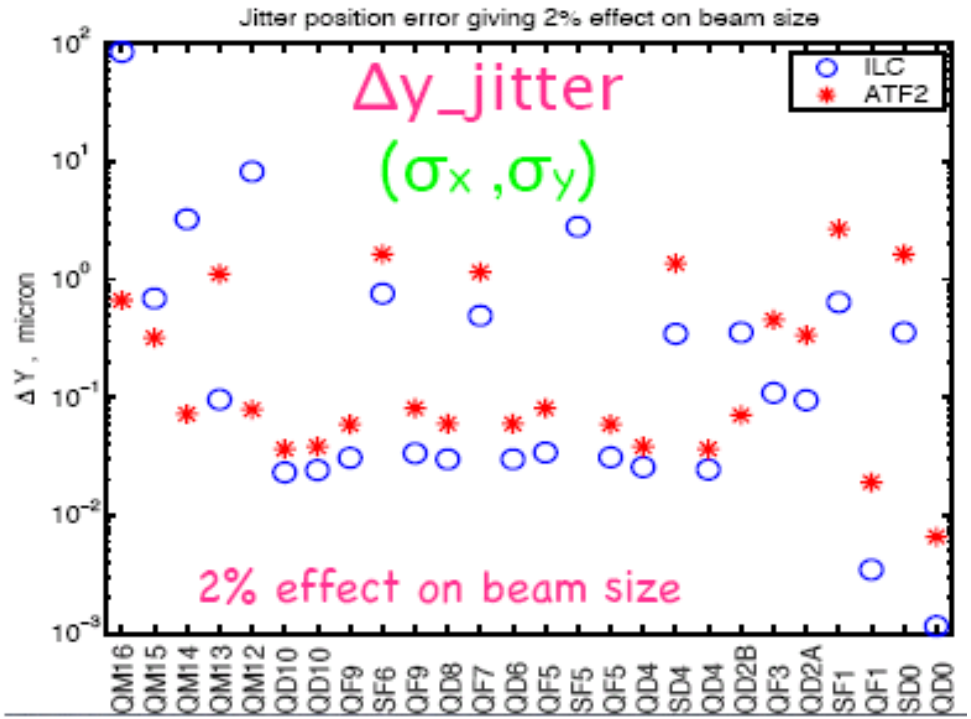


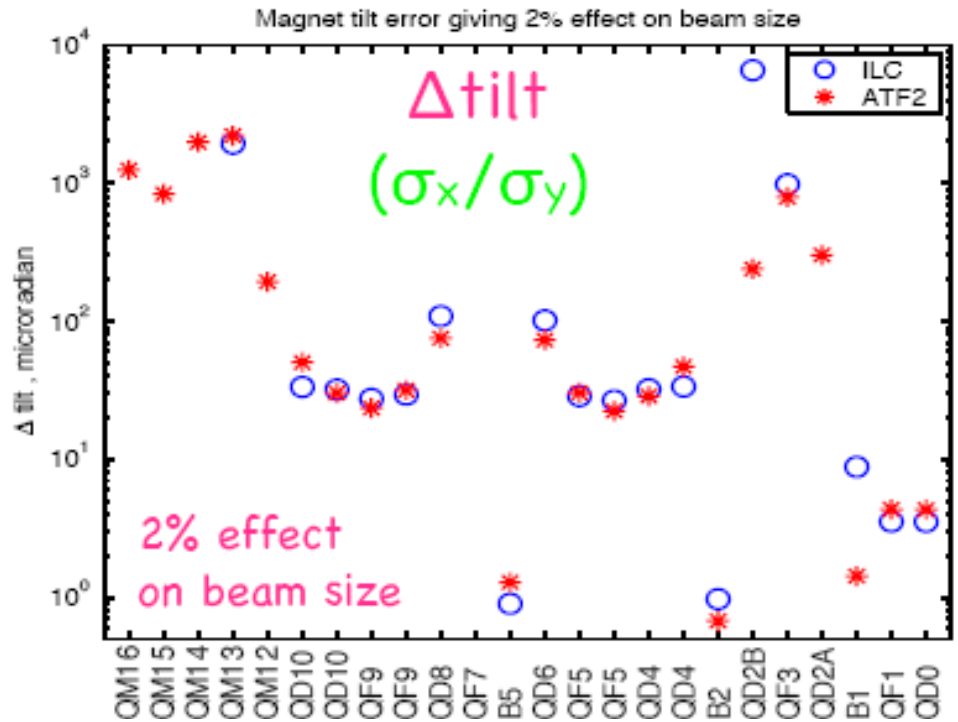
Laserwire signals at QD6 and QF5

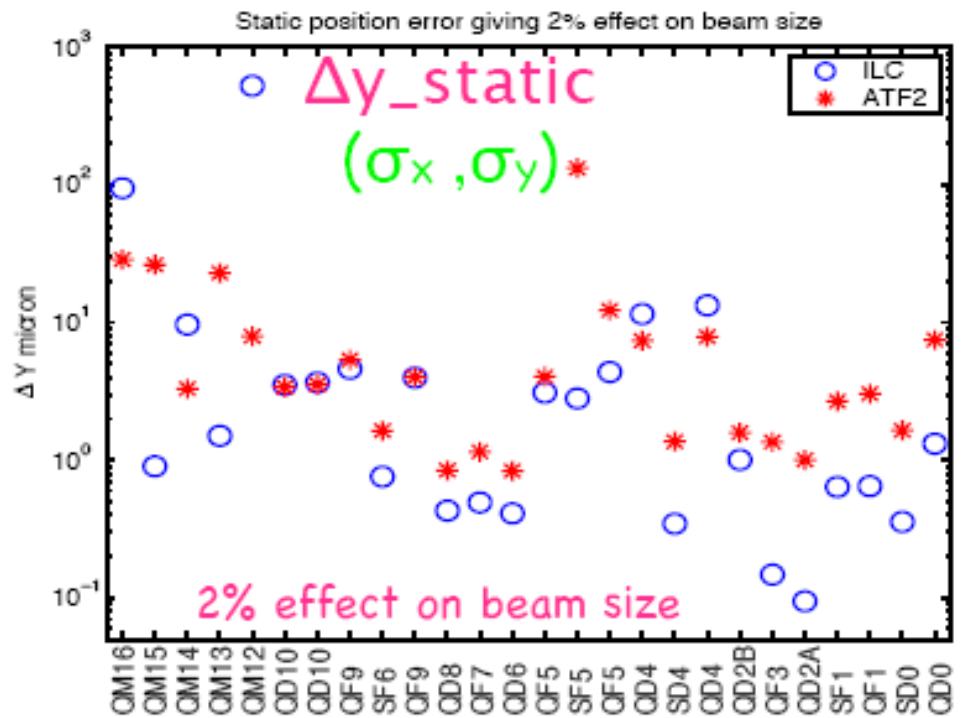


All Q- and Sext-FFs have QBPMs and FFTB movers, 4 s-band BPMs in the FD system.


Field strength error giving 2% effect on beam size
ΔK/K
(K, Ltot)
2% effect
on beam size
ILC
ATF2
Δ K/K
QM16 QM15 QM14 QM13 QM12 QD10 QD10 QF9 QF9 QD8 QF7 B5 QD6 QF5 QF5 QD4 QD4 B2 QD2B QF3 QD2A B1 QF1 QD0


Jitter position error giving 2% effect on beam size
Δy_jitter
(σx ,σy)
2% effect on beam size
ILC
ATF2
Δ Y , micron
QM16 QM15 QM14 QM13 QM12 QD10 QD10 QF9 SF6 QF9 QD8 QF7 QD6 QF5 SF5 QF5 QD4 SD4 QD4 QD2B QF3 QD2A SF1 QF1 SD0 QD0

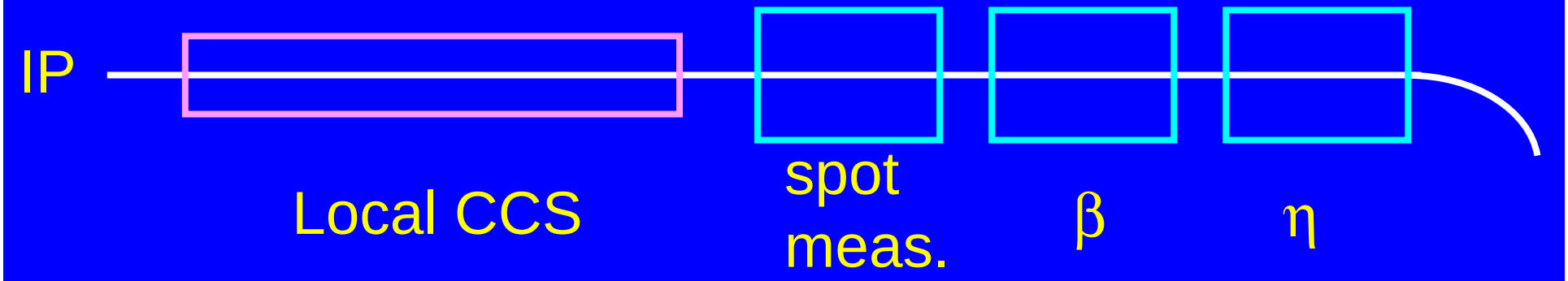

Magnet tilt error giving 2% effect on beam size
Δtilt
(σx/σy)
2% effect
on beam size
ILC
ATF2
Δ tilt , microradian
QM16 QM15 QM14 QM13 QM12 QD10 QD10 QF9 QF9 QD8 QF7 B5 QD6 QF5 QF5 QD4 QD4 B2 QD2B QF3 QD2A B1 QF1 QD0


Static position error giving 2% effect on beam size
Δy_static
(σx ,σy)
2% effect on beam size
ILC
ATF2
Δ Y micron
QM16 QM15 QM14 QM13 QM12 QD10 QD10 QF9 SF6 QF9 QD8 QF7 QD6 QF5 SF5 QF5 QD4 SD4 QD4 QD2B QF3 QD2A SF1 QF1 SD0 QD0

Possible studies & plans @ LAL

Topics : optics/trajectory tuning and correction strategy
commissioning
background calculations
(instrumentation)
impact for ILC MDI / BDS

Betatron cross-plane coupling corrections



- 10 independent parameters $\alpha_{x,y}$ $\beta_{x,y}$
  <xy'> <x'y> <xy> <x'y'>
- round emittances → only 2 independent xy parameters
- flat emittances 0.001 – 0.01 → < 4 xy parameters ?

- 4 skew quad adjustments needed in β match section

Issues

- capabilities to absorb input mismatches by refitting optics upstream of CCS ?
  magnet ranges, laser IP sizes, 12 orthogonal controls
- capability to use variable magnifications (“zooming”) during commissioning, to start with larger β^* and a re-optimised local CCS
  range ? can it only be done in the initial β match ?
- tolerance on injected trajectory stability
- general $\rightarrow$ possibility to separately detect and correct
  1) variations from errors in injection phase-space
  2) variations within the FT + CCS

Planned Geant4 developments for ATF2 @ LLR

- Marc Verderi
- *Laboratoire Leprince-Ringuet,*
- *École polytechnique*

- Annecy ATF-2 meeting
- October 2006

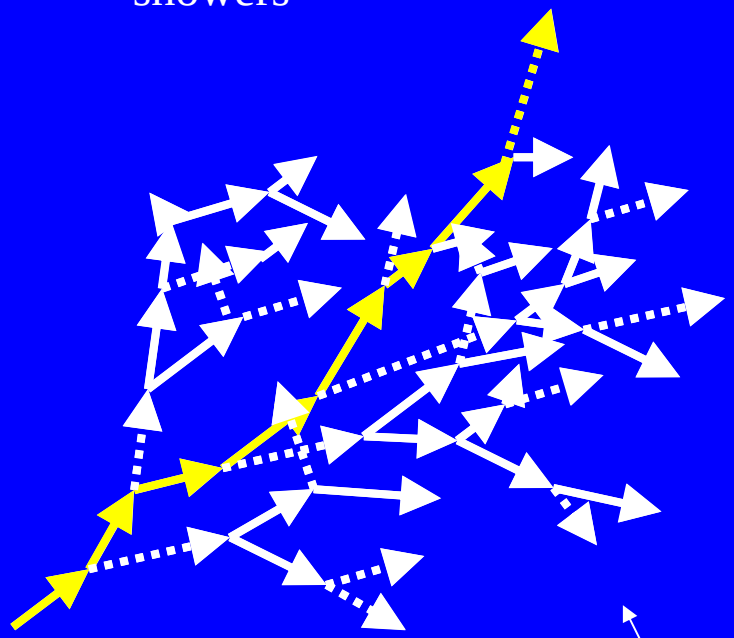
Introduction

- Goal/desire to compute/estimate background levels in sensitive parts of ATF-2
  - Beam monitor devices for example
- Background estimations can be difficult to realize as main contributions may come from complicated “topologies”:
  - (Multi)back-scattering from beam dump
  - Particles in beam halo, interacting with collimators, beam pipe wall, elements,… leading to lost particles traveling in the tunnel, etc…
- Facing difficulties with statistics
  - Large productions performed to get usable statistics in the regions of interest
- Could we estimate the background levels in other ways ?
  - We propose to study the “event biasing” technique
  - This is a variance reduction technique

Event biasing technique examples

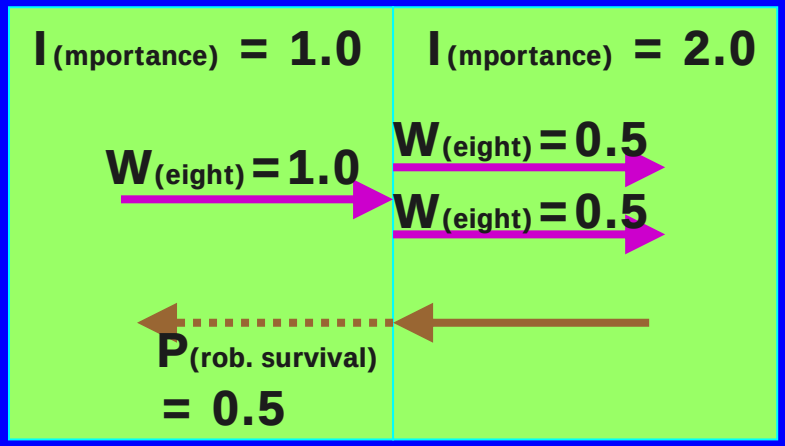
(existing in Geant4, not exhaustive)

- Leading particle biasing:
  - Useful to estimate a shield thickness, without simulating full showers



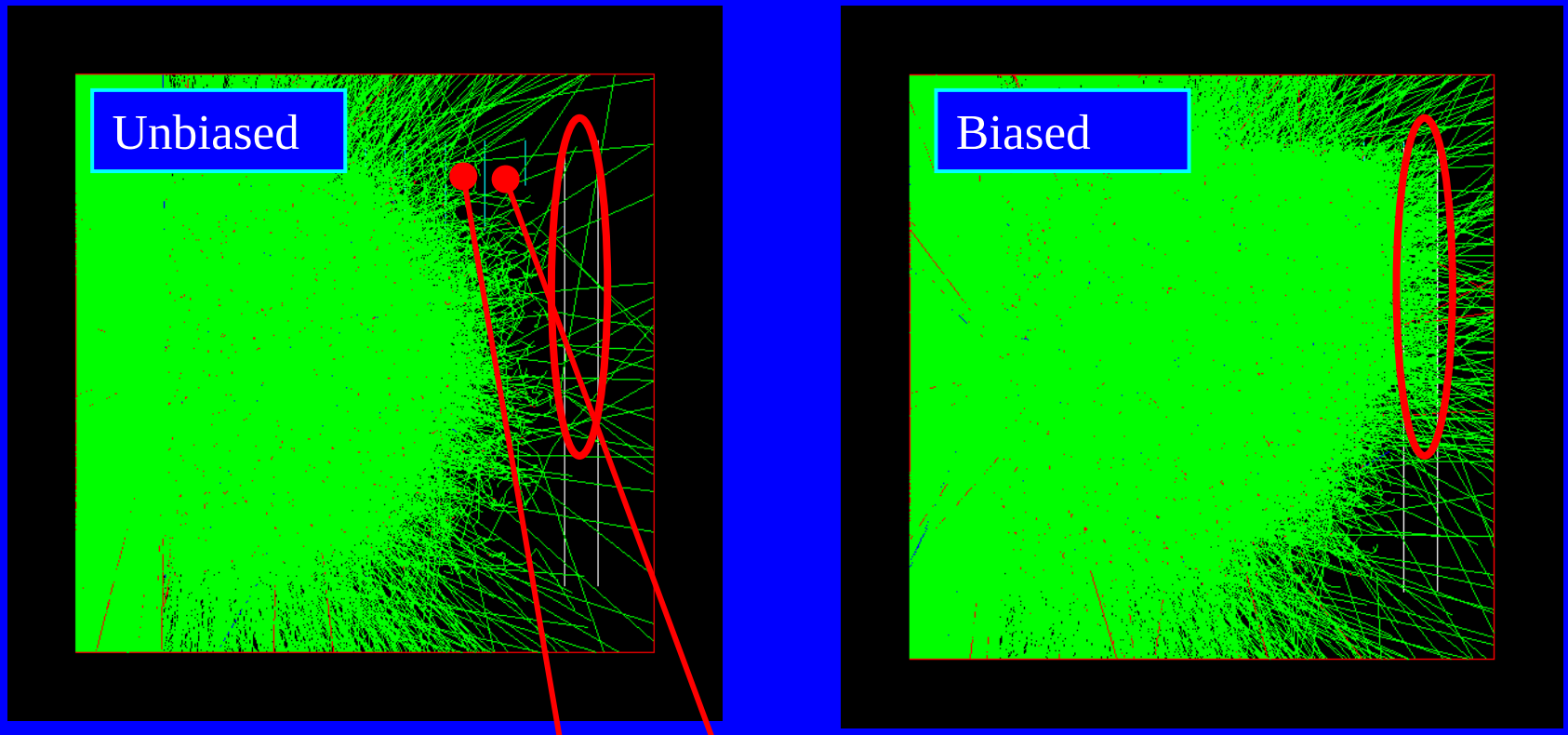
Only for hadronic processes in G4

- Geometrical biasing:
  - Define geometrical importances
  - Duplicate[kill] tracks accordingly
    - Propagate track weight



- Physics biasing:
  - Biasing secondary production in terms of particle type, momentum distribution, cross-section, etc.

Example of “Biased” events



- Low probability configurations have been enhanced by a “geometrical biasing” technique
  - From left to right, volume importance multiplied each time by 2 when going from slice *i* to slice *i*+1
  - In biased case, workable statistics obtained in the deepest slice

Roadmap

- Delicate techniques to handle !
- Assess the validity and usefulness of such techniques for the case of the background computation in ATF-2
- We will need to:
  - Learn more about these techniques
  - Prototype, on low complexity setups
  - Move to realistic ATF-2 description(s) if results are satisfactory

LAL: ANR $\rightarrow$ 111 keuros
2-year post-doc (or 3 year PhD) starting in 2008

LAPP: ANR $\rightarrow$ 184 keuros
2-year post-doc starting in 2008
equipment (vibration sensors and mechanics)

LLR: ANR $\rightarrow$ 105 keuros
2-year post-doc starting in 2007

ANR: *very (too) limited travel & consumables funds*

- AIL : travel & transport $\rightarrow$ 20 keuros in 2006-07

- JSPS/CNRS : travel request $\rightarrow$ 30 keuros in 2007-08
- IN2P3: establish as “project”, request additional support $\rightarrow$ travel + staff + post-doc / PhD funds