Geometry data-base, Magnetic field data-base, Momentum resolution program, Pattern recognition program.

Outline

1/ Amdb_simrec

http://atlasinfo.cern.ch/Atlas/GROUPS/MUON/resolution/Dtb/amdb_simrec.html

2/ Bmagatlas

http://atlasinfo.cern.ch/Atlas/GROUPS/MUON/magfield/mag_page1.html

3/ Resolution

http://atlasinfo.cern.ch/Atlas/GROUPS/MUON/resolution/resolution.html

4/ Muonbox

http://atlasinfo.cern.ch/Atlas/GROUPS/MUON/resolution/Dtb/vk/Muonbox50004Lhctor40400.html

L.Chevalier, C.Guyot, JF.Laporte and M.Virchaux

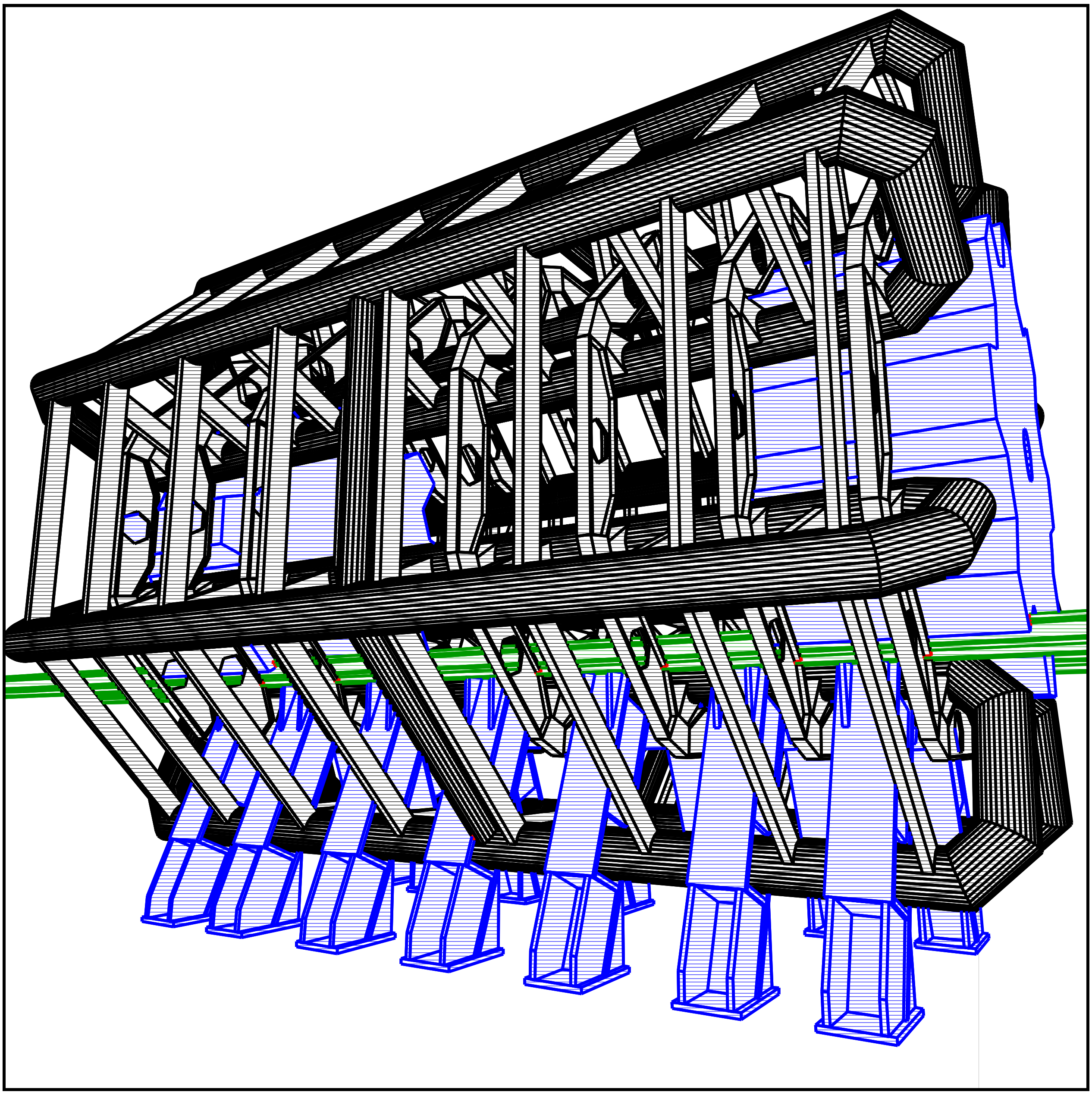
1/ Amdb_simrec [1]

Taken into account in amdb_simrec.m1.1:

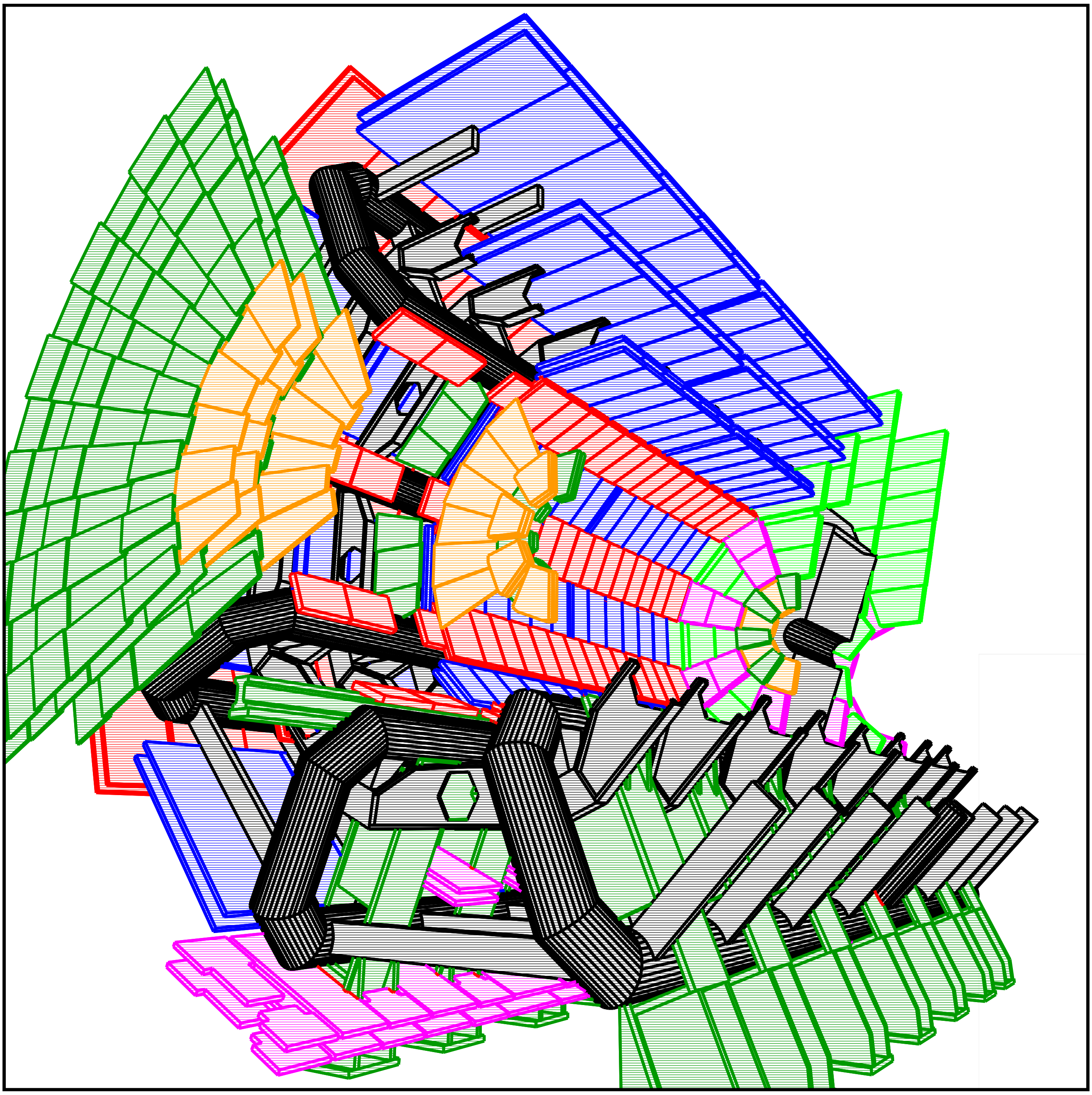
- **Excel tables (from J.Wotschack and M.Vreeswijk)**
  - → MDT, RPC, TGC, CSC parameters
  - → cut-outs
- **RPC inner structure (from A.Di Ciaccio)**
- **TGC parameters (from D.Lellouch)**
- **CSC inner structure (from S.Baranov)**
  - → a version with CSC replaced by MDT is available
- **Future improvements**
  - → include description of toroids matter (feet,cryostats,cond...)
  - → automatic reading of the Excel tables
  - → use the objectivity/C++ interface (C.Arnault)

1. used in DICE , ATLSIM and ATLFAST

1/ Amdb_simrec (cont.)



1/ Amdb_simrec (cont.)



2/ Bmagatlas[1]

Taken into account in bmagatlas02.data:

- **All magnets at nominal position (TDR muon)**
  - → toroid barrel, toroid endcap, solenoid
- **Magnetic masses**
  - → hadron calorimeter, iron return yoke, shielding disk
- **Calculation**
  - → 8 fold symmetric model ($0<\varphi<45$, Z+)
  - → finite element calculation (Tosca package, F.Bergsma)
  - → only Tosca for R<4.230 m and Z<6.815 m
  - → Biot-Savart + non linear contribution (from Tosca) in the muon spectrometer region (SaMuSoG) 20 times finer mesh than in Tosca region
  - → accuracy in the spectrometer region is: 4 mT
  - → map limit: R_{max}=15.0 m and Z_{max}=23.0 m

1. used in DICE , ATLSIM and ATLFAST

• Recent improvements

→ improvement of the field routines speed (fast computation of pointers...)

→ bmagsolonly.data: new magnetic field map with toroids OFF and solenoid ON (with all magnetic masses)
magnetic field slightly high (100% hysteresis for toroids)

• Future developments

→ reading routine in C++ for atlfast ++

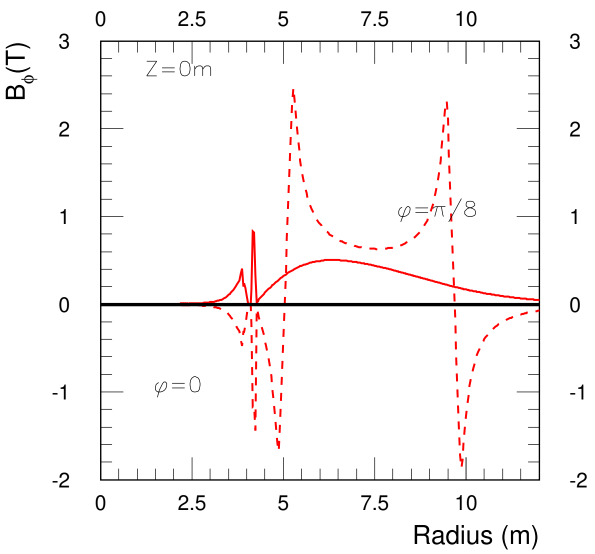


Figure 0-1 Bφ vs Radius for Z=0m for φ=0 and φ=pi/8

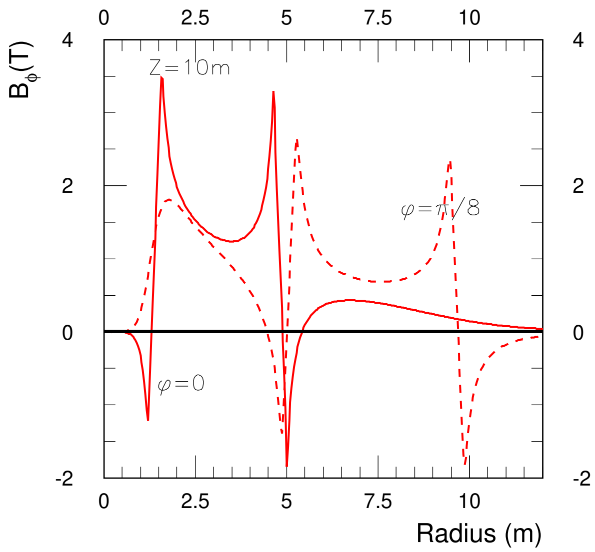


Figure 0-2 Bφ vs R for Z=10m for φ=0 and φ=pi/8

3/ Resolution[1]

Taken into account in resolution001.cmz:

- **Magnetic deflection[2]**

$\rightarrow D_B^i = \frac{0.3}{p}\int_0^{L_i}(L-l)B\,dl$

- **Dimensions and positions of chambers[3]**
- **Measurement and alignment accuracy**

  → averaged resolution of one multi layer ~65 µm
- **Multiple scattering**

  → toroids: coils, cryostats, voussoirs, struts, ribs, feet

  → chambers; MDT, RPC, TGC, CSC
- **Angle effect**

  → $\int B\,dl$ uncertainty $\delta\phi$~0.86 mrd for $\eta<1$
- **Energy loss fluctuation in the calorimeter**

  → $\sigma_{Eloss} = (0.380 + 0.105 * E\mu/100.)$

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1. used in ATLFAST
2. bmagatlas02.data
3. amdb_simrec.m

3/ Resolution (cont.)

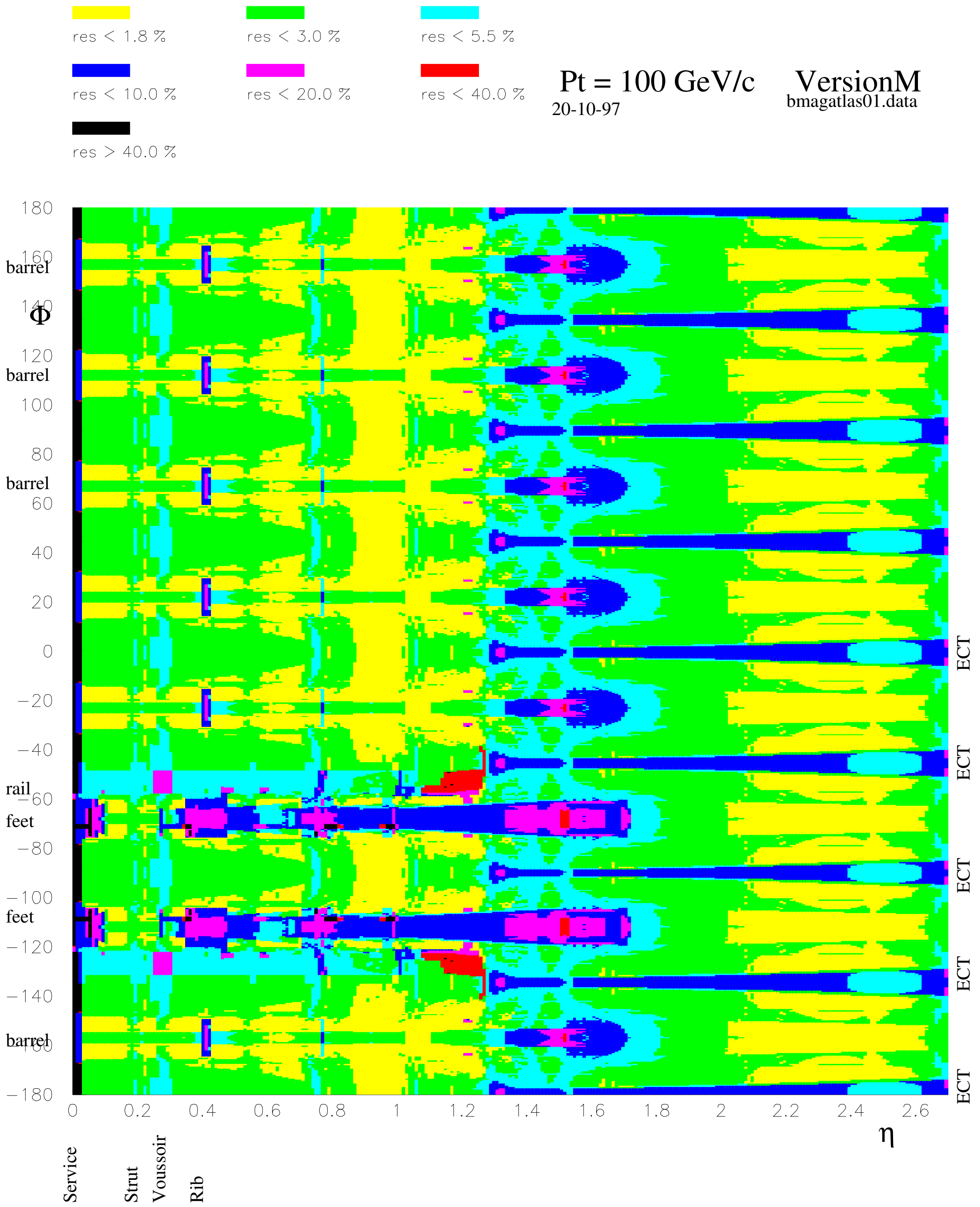


Figure 0-3 momentum esolution as function of . η–ϕ

3/Resolution (cont.)

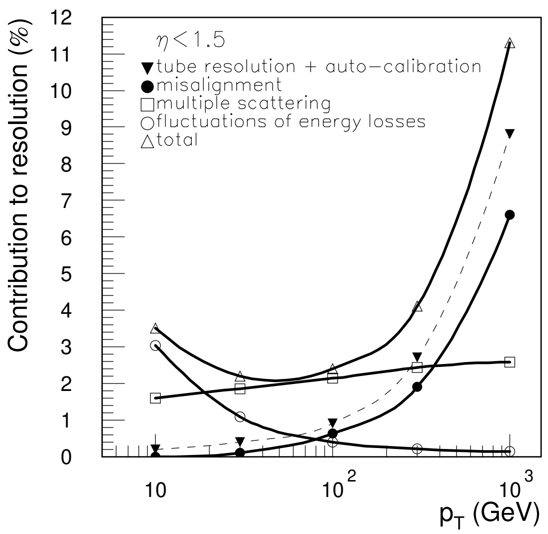


Figure 0-1 all contribution in resomu amdb_simrec.k

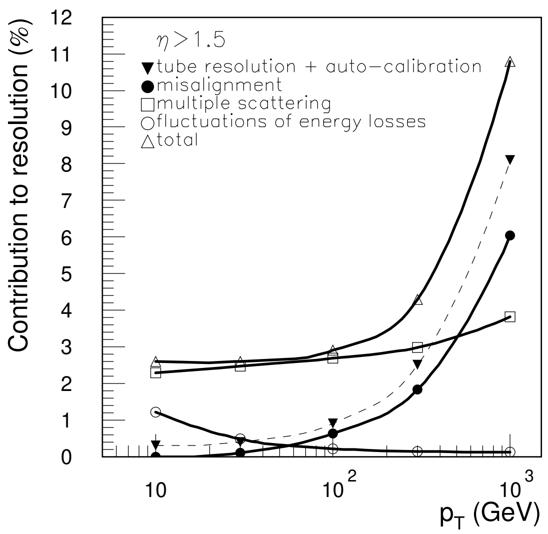


Figure 0-2 same thing for eta> 1.5

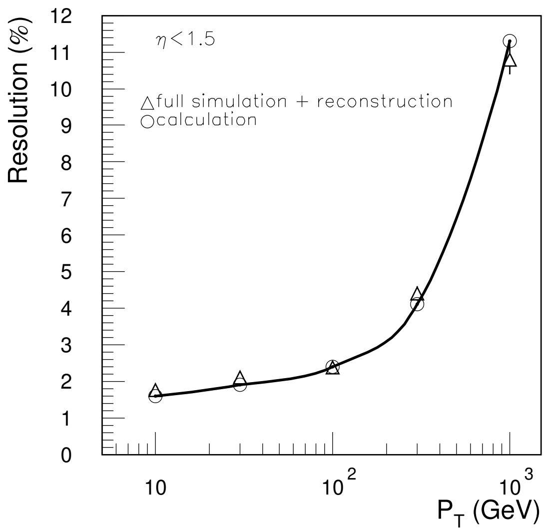


Figure 0-3 comparison between full simul and resomu

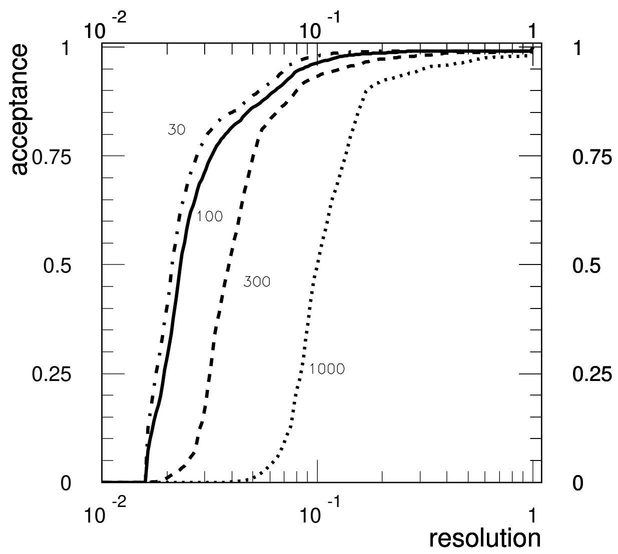


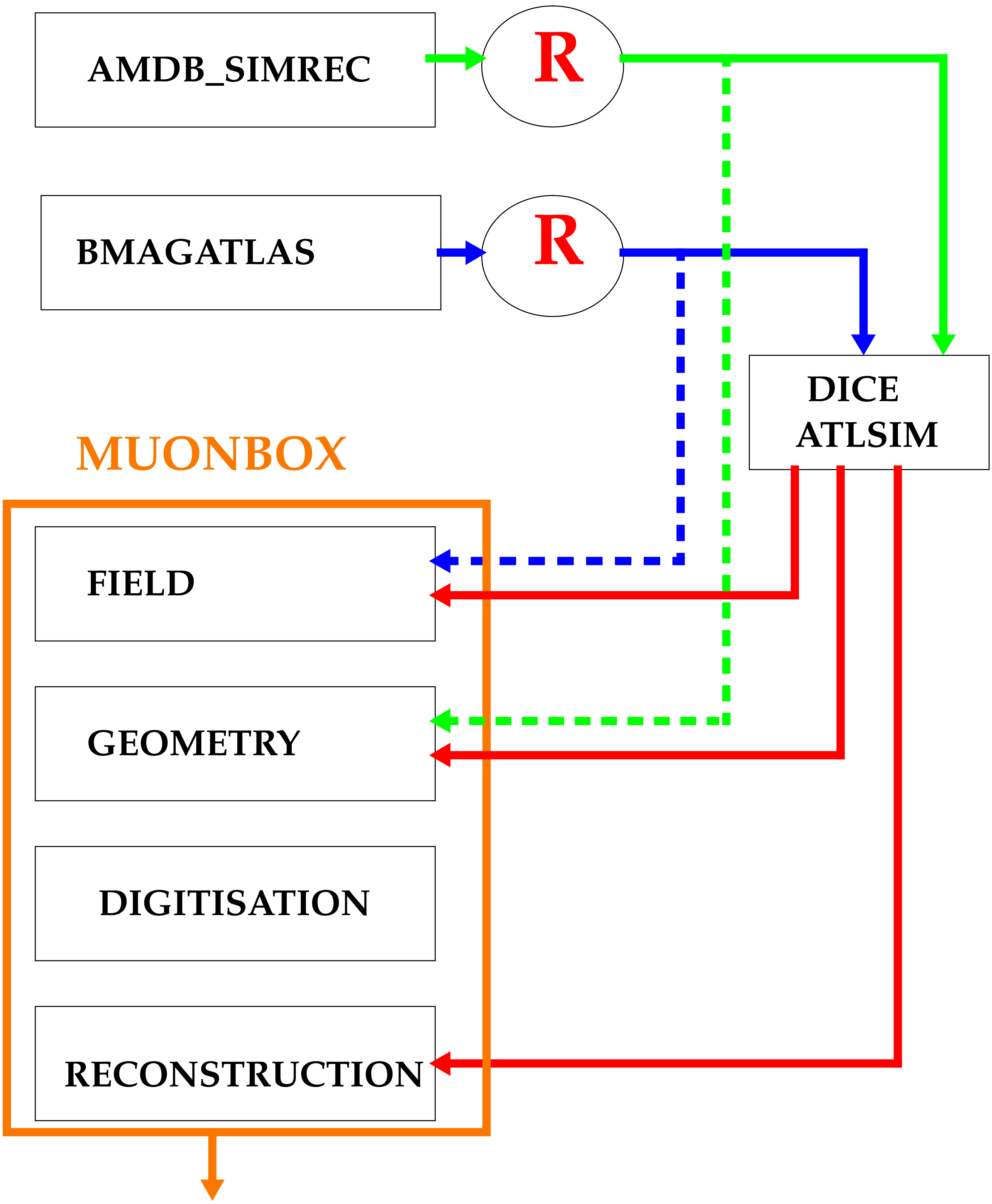
Figure 0-4 acceptance vs resolution

4/ Muonbox[1]

Taken into account in muonbox50009.cmz:

- **Talk done by M.Virchaux 24/11/97 in muon combined perfomance meeting**

1. used in DICE and ATLSIM


AMDB_SIMREC
R
BMAGATLAS
R
DICE
ATLSIM
MUONBOX
FIELD
GEOMETRY
DIGITISATION
RECONSTRUCTION

Muonbox Reconstruction 1/3

No simple algorithm because:

- **Highly inhomogeneous magnetic field**

  ⇒ no simple parametrisation of 3d trajectories (low P_T)

- **Large distancesbetween measuring stations**

  ⇒ extrapolation errors

- **Spacial separation of 1st and 2nd coor. meas.**

  ⇒ no 3d points in space

- **High level of γ–n background noise**

  ⇒ combinatory problem

  ⇒ masking of the muons hits

Muonbox Reconstruction 2/3

Rough description of algorithm:

1/ Identify $\eta-\phi$ regions of activity using rpc-tgc

- at least 1 strip hit in both coordinates

2/ Look for straight track segments in all stations and/or multi-layers

- loop on second coordinate
- define “strict” and “loose” samples

3/ Match these segments through minimisation procedures with full 3d tracking at each step

- Outer $\rightarrow$ Middle $\rightarrow$ Inner
- Middle $\rightarrow$ Outer + Inner

4/ Perform global fit using “raw” information only (i.e. digi. and not track segments)

Muonbox Reconstruction 3/3