K. Harrison
CERN, 2/11/00

Status of simulation upgrade

* detector representation in SICBMC
- details of RPC materials provided by Giovanni C, included by Sandra in CAF
- SICBMC with new muon geometry run by Annette and Andrei
  ⇒ times for program initialization and event generation found to be much higher than previously:

	old geometry	new geometry
initialization	15 s	545 s
time per event	112 s	392 s

two factors suspected of worsening performance:

i) thin layers of material included in chamber descriptions (e.g. 50 μm copper either side of gas gap in wire chambers), possibly causing problems for GEANT (tracking precision)

ii) all material layers positioned directly in LHCB mother volume rather than creating chamber volumes to contain components

- REMOVAL OF THIN LAYERS BY MIXING THEM IN WITH THEIR SUBSTRATES GIVES SOME IMPROVEMENT: GENERATION TIME REDUCED BY 30%
- INTRODUCTION OF GEOMETRY HIERARCHY GIVES TIME PER EVENT SIMILAR TO THAT WITH OLD GEOMETRY, EVEN WITH THIN LAYERS

⇒ PROBLEM STUDIED AND SOLVED BY SANDRA AND ANDREI

- ERRORS FOUND BY ANDREI IN RELATION TO DEFINITIONS OF FRAMES AND CHAMBER GAS

⇒ CORRECTIONS WILL BE INTRODUCED BY SANDRA

SOFTWARE FOR NEW MUON GEOMETRY ESSENTIALLY COMPLETED, BUT NEEDS THOROUGH TESTING (USE INTERACTIVE GEANT?)

* BACKGROUND PACKAGE

- STATUS UNCHANGED SINCE MEETING IN MILANO:
  - SPILLOVER IMPLEMENTED
  - LEFT WITH WORK ON REINTERPRETATION OF BACKGROUND PARAMETERISATION

PAUL NOW SETTLED IN RIO, AIMING TO HAVE EVERYTHING READY FOR END OF NEXT WEEK

* digitization

- additions since milano meeting are:
  - crosstalk simulation, from giovanni p
  - electronic-noise simulation, from helder
  - time gate and time analysis for deadtime, from sergio and karl
- mapping from frontend outputs to logical channels now at test phase
- left with filling of mupd bank (relatively trivial)

development of digitization code should be finished next week

* conclusion

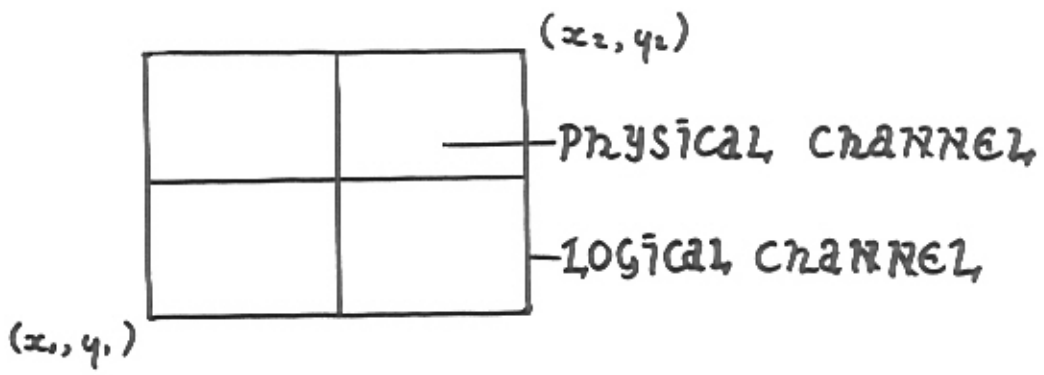
new muon software passing from development phase to test phase

* DETERMINATION OF (x,y) COORDINATES RELATIVE TO LOGICAL CHANNEL

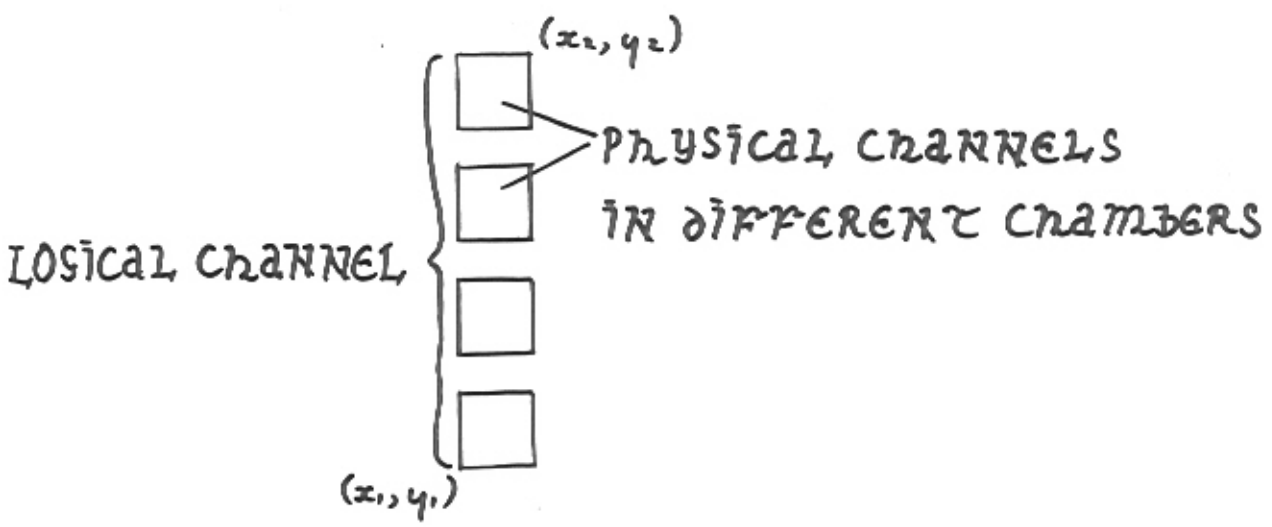
- LOGICAL CHANNEL CAN BE A MAPPING FROM ANY OF SEVERAL PHYSICAL CHANNELS

⇒ EXAMPLES:

- REGION 2 OF STATION 1, MAPPING TO PADS, FOR EACH OF 4 GAS LAYERS:

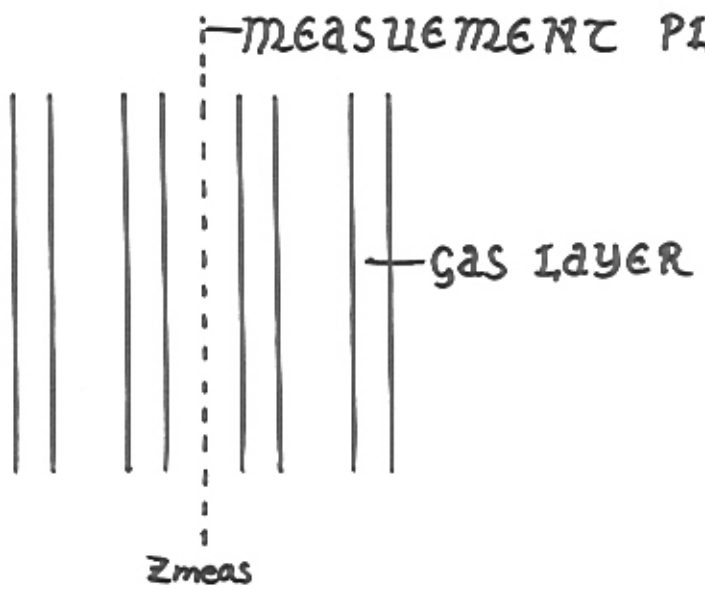


- REGION 4 OF STATION 3, MAPPING TO VERTICAL STRIPS, FOR EACH OF 4 GAS LAYERS:



- DETERMINE CORNER COORDINATES FOR ALLOWED PHYSICAL CHANNELS

- DEFINE MEASUREMENT PLANE AS PLANE AT MEAN z OF GAS LAYERS ASSOCIATED WITH LOGICAL CHANNEL:



- IN PROJECTION ONTO STATION AXIS AT z_{stat}, LOGICAL CHANNEL COORDINATES (x,y) ARE EVALUATED AS:

$$x = \frac{1}{2}(x_1 + x_2)\, z_{stat} / z_{meas}$$

$$y = \frac{1}{2}(y_1 + y_2)\, z_{stat} / z_{meas}$$

- EFFECTIVE CHANNEL DIMENSIONS $(\Delta x, \Delta y)$ ARE:

$$\Delta x = |x_2 - x_1|\, z_{stat} / z_{meas}$$

$$\Delta y = |y_2 - y_1|\, z_{stat} / z_{meas}$$

DISCUSSION OF DETECTOR LAYOUT

- FIRST AIM IS TO DEFINE LAYOUT FOR NEXT SIMULATION PRODUCTION
- THIS BASELINE CONFIGURATION WON'T NECESSARILY REPRESENT FINAL DETECTOR SETUP, BUT SHOULD BE A <u>POSSIBLE</u> SETUP:
  - TECHNICALLY VIABLE
    ⇒ MUST TAKE INTO ACCOUNT MECHANICAL CONSTRAINTS (LESS USEFUL TO SIMULATE A DETECTOR THAT CAN'T BE BUILT)
  - ACCEPTABLE PERFORMANCE
    ⇒ TO BE EVALUATED USING SIMULATION
- ONCE BASELINE CONFIGURATION IS DEFINED, CAN WORK ON OPTIMIZATION (FINE TUNING)

POINTS TO BE DISCUSSED IN RELATION TO CHOICE OF BASELINE:

- VIABILITY OF SYMMETRIC SETUP ⇒ S. MARTINEZ
- NEED FOR PROJECTIVITY IN X ⇒ G. MARTELLOTTI
- TECHNICAL CONSTRAINTS ⇒ B. SCHMIDT

SHOULD ALSO DEFINE OPTIMIZATION STRATEGY (E.G. FOR CHOOSING CHAMBER OVERLAP)