IFR Fast Monitoring

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Preliminary

1 Introduction

In this document the Fast Monitoring of RPC is described.
IFR data are composed of strip hits and TDC measurements. They are independent streams of data produced by different hardware and so they require different and independent monitoring.

2 Fast Monitoring

The main goal of Fast Monitoring (FM) is to check the status of the detector during normal data taking and discover, as soon as possible, any hardware related problem.
Another goal of FM is the determination of quantities needed to configure the detector, e.g. dead and noisy channels. For the strips this information can be used during Feature Extraction and for the TDC it must be stored in the chip to save the event buffer memory.
Fast Monitoring is the storage of data in histograms during data taking in the Online Event processing (OEP) either before the L3 selection reading the information of the Tagged Container (TC), or after the Prompt Reconstruction using the Digi (PR).
The fast monitoring should run on the maximum number of events without affecting the performance of DataFlow.

The Distributed histogramming package (Dhp) (www.slac.stanford.edu/BFROOT/doc/www/Computing/Online/OnlineEventProc.html), written by the OEP group, will be responsible for providing histogramming facilities. The histograms, 1-D or 2-D, will be filled during the data taking and stored in the DataBase at the end of the run. Some histograms will be continuously monitored, by comparison with a reference or checking somee Confidence Level (CL).The monitor frequency must be defined, but it could be at the end of the run, or each half an hour.
An alarm message can be iussed if this comparisons fails. A limited amount of computation, like to work out the mean or the variance of the histogram should be possible at the end of the run before store them in the DB.On request of the operator all the histograms will be visible during data taking.
Ntuples will be supported only for debugging purpose due to difficulties to run them on distributed platform.

The first group of histograms in Tab[1] is devoted to check the status of the readout electronics, and must be filled before the L3 trigger wit the information provided by the TC.
(Hardware configuration:4 ROM, 2 ICC per ROM, 7 IFb and 4-5 ITB per ICC, 1024 strips per IFB and 96 Fast-OR per ITB, FEE = IFB or ITB.)

Parameter	plot type	channels	# of plots
Event size(bytes)	1-D	100	1
Tot. strips Mult.	1-D	250	1
Tot. TDC hit Mult.	1-D	100	1
FEE Occup.	1-D	92	1
Mult./FEE	1-D	50	92
Mult./crate	1-D	100	8
Occup./IFB	1-D	1024	56
Occup./ITB	1-D	96	36
Occup/FEC S(1)	1-D	96	92
Occup/FEC S(nh)	1-D	96	92
Occup/FEC S(nh)**2	1-D	96	92

Table 1: hardware plots

The last three plots, S(1), S(nh) and S(nh)**2 are useful to compute the mean and the dispersion of the multiplicity.
The second group of histograms, in Tab[2], can help to check out the status of the RPC chambers before the prompt reconstruction using information coming from strips and TDC's after the conversion of TC's to Digi.
(Barrel: 6 sectors, 19 layers and 12 FECs per layers sectors; Endcap: 4 half-doors, 18 layers and 24 FECs per layer per half-door.
The RPC module is a independent detector, e.g. in the barrel 3 modules are joined to

form a chamber.
iRPC : 4 sectors, 2 layers/sector, 16 FEC's/layer, in total 128 FEC's)

Parameter	plot type	channels	# of plots	Zone
Mod. mult.	1-D	50	1	
Mod. Occ.	1-D	774	1	
Strips mult/mod.	2-D	57X50	6	barrel
	2-D	108x50	4	endcap
	2-D	8x50	1	iRPC

Table 2: Strip plot in OEP

More plots can be added to monitor the Gas, LV, HV distributions.
The reconstructed cluster size in the IFR is very sensitive to some parameters of the detector like the gas composition. The information about the cluster size and the time spread of the cluster hits can be obtained only after the Prompt Reconstruction. In Tab[3] there is the list of requested cluster plots.

Parameter	plot type	channels	# of plots	Zone
Tot. clus. Mult.	1-D	100	1	
Tot. clus.size	1-d	100	1	
Clus.Mult./sect./mod.	2-D	57X50	6	barrel
	2-D	108x50	4	endcap
3D clus. mult.	1-D	100	1	
3D clus. theta angle	1-D	100	1	
3D clus. phi angle	1-D	100	1	
#hit layer/3D clus.	1-D	50	1	
#digi/3D clus.	1-D	50	1	
Tot. clus. T. spread	1-D	100	1	
Clus. T. spread/sect.	2-D	57X50	6	barrel
	2-D	108x50	4	endcap

Table 3: Cluster plots in PR

The alternative solution to the 2-D multiplicity plots is 1-D plots for each chamber, in total 744 plots for hit multiplicity and the same number for cluster multiplicity are requested (1548 in total). The histograms can be filled during data taking and saved in the Conditioning DataBase at the end of the run.

The last group of histograms in Tab[4] is devoted to check the global performance of the IFR by plotting some variable of physical interest, computed with the parameters available in the online. Some plots will be redone in the offline with better calibration constants.

Parameter	plot type	channels	# of plots	Zone
Prob. to be a muons	1-D	100	1	
Prob.to be a pions	1-D	100	1	
# of neutr. hadr.	1-D	20	1	
# Layer efficiency	1-D	19x3	6	barrel
	1-D	18x6	4	endcap
	1-D	8	1	iRPC

Table 4: IFR Particle Reconstruction

For performing reasons there will be limitations on the requirementes for histogramming. Each sub-system can have 2 MB for their histgrams, that translates to 500000 bins. In this documents IFR requests of the order of 200000 bins .