Subject: FRS-AGATA-LYCCA dead time
Posted by a_boso on Sun, 24 May 2015 05:56:20 GMT
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Dear all,

how can we take into account the detectors dead time?

In our cross section measurement, for example, we need:

1) the total number of incoming ions: we obtain this from the FRS ID plot, requiring trigger 10 (FRS downscaled) and no strict-merging

2) the number of gammas in the peak. Here we require coincidences between AGATA-FRS-LYCCA.

I suppose the dead time of the system is different in these two situations, so it will not cancel out in the cross section calculation. Do you have any idea about this?

Thank you very much!!
Cheers,
Alberto

Subject: Re: FRS-AGATA-LYCCA dead time
Posted by a_boso on Sun, 24 May 2015 05:57:59 GMT
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[THIS WAS MICHAEL REPLY TO THE ABOVE QUESTION IN ANOTHER THREAD]

Hi Alberto,

This is an interesting and difficult question and most of what I write here has to be labeled with "as far as I know".

I was trying to get the cross section from the gamma yield and the number particles in the commissioning data. So far without much success (I see about 3 times less counts in the gamma spectrum as I would expect based on number of particles and AGATA efficiency).

The number of particles can be obtained:
1) Take the sum of Sc41 scaler. This doesn't take the dead time into account because the scaler module scales, even when the DAQ is busy.
2) Count reduced trigger 10. This should take the dead time into account because the event is only recorded if the DAQ was not busy.

But to be honest, I really don't know how to reliably estimate the number of incoming particles: in principle I agree, for counting number of trigger 10 one should not use strict merge to not loose some trigger 10 that by chance did not get any gamma. But I think it is not that simple. MBS and AGATA DAQ were not always started at the very same time. So there is in the beginning or end of the data stream always a number of events that don't have a "partner" (i.e. either AGATA only or MBS only). I think you do not want to count the trigger 10 for these parts

of the data. Another question that bothers me a bit: shouldn't there always be a gamma recorded, when MBS validated the trigger? At least in case of trigger 9 or 10? What is the meaning of a trigger 9 or trigger 10 event, that doesn't have AGATA data? Additionally, you mentioned already the different dead times in different situations. But this is even worse: the dead-time depends on the size of data that MBS reads in the slowest VME crate and this is different from event to event. So the dead time differs from event to event.

I was thinking if it is not more promising to use strict merge, i.e. select a subset of events where all information is present. From this subset of data, one takes the fully identified particles and selects the desired channel, e.g. Coulex by gating on the same isotope in incoming and outgoing ID. For this subset one should be able to (somehow) calculate an excitation probability for Coulomb excitation (given the cross section) and estimate the expected yield (given the AGATA efficiency).

The best method (in my opinion) until someone finds out how to count the particles: produce target and projectile peak under the same conditions and make a relative estimate of the cross section.

I hope more people could contribute their opinion/experience to this point. Maybe this deserves its own topic in the forum.

Cheers
Michael

Subject: Re: FRS-AGATA-LYCCA dead time
Posted by a_boso on Mon, 25 May 2015 05:15:35 GMT
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Hi Michael,

trigger 10 is FRS downscaled, so in principle it does not require a gamma detected in AGATA, right?

Actually the effect or using or not the --strict-merge-option makes a difference. I don't know what these "pure mbs events" are, but they are ~ 1/3 of the total mbs events. But, as you said, if the two DAQs were not initialised properly, we can not use this option.

But if we require a strict-merge, aren't we overestimating the cross section? I mean, if an ion passes through the target without interacting and without producing any gamma ray, we will not count it with the strict-merge option, while we should in our cross section measurement. Am I right?

If we are not able to take into account the dead time, the only way seems to be the comparison between target and beam peaks..

Cheers,
Alberto

Subject: Re: FRS-AGATA-LYCCA dead time
Posted by Damian Ralet on Tue, 26 May 2015 10:16:43 GMT
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Hi Alberto,

Sorry for the delay in answering. I was not following so closely the forum.

First, to answer to your last questions.
Indeed, T10 is FRS downscale and do not require a Gamma in AGATA. You can estimate the number of gamma (from hector/agata) that are in coincidence with the Hit-pattern. The hit-pattern can also help you to count the number of ions detected in the SC41 scintillators that have hit the LYCCA calorimeter detectors. what you get with the hit-pattern does not depend on the dead time. It depends only on the threshold set for the trigger of the MBS DAQ.

I am not so familar with the strict merge option but I can tell you what the "pure mbs events are". They consist of the data taken for any of the MBS trigger (12 different numbers in total). In addition to the T9 (particle-gamma(AGATA) you have T3 (gamma(AGATA) alone) that should be in coincidence with AGATA (with the GTS system, with a matching time-stamp). All the other triggers could have a gamma in coincidence but not necessary. For example, T10 might be in coincidence with AGATA. T8 (particle-gamma(HECTOR)) should not be in coincidence with AGATA, or very rarely (this proportion would depends on your time windows that you use for the data merging).

I think, the two different time of opening file is not a big issue to estimate the number of counts. One just need to restrict the data analysis to the given time-stamp windows where you are sure to have both files open. The other option (that I am using) is to look at the adf file of the mbs data (it is in the folder of the run).This one is ope at the same time as the other AGATA data.

The strict merge option should not be used for cross-section measurement. As you wrote, asking for strict (meaning both a MBS event and a AGATA one, if I understand it right) would mean requiring that a gamma was emited. Which is not the case. In a previous estimate of the technical commissioning, only 3% of the particle hitting the S421 scintillator were having a gamma ray in coincidence.

To have an estimation of the dead time of the MBS DAQ, you can use two information.
- the first one is from the FRS file sheet, where the 10kHz and 10khz-veto-dead-time give you an average dead time over one spill. (It is better to look at more than one file-sheet since people on shift were not always really cautions in looking at these numbers).
- the second one is, as Michael mentioned it, to look at the scalers (recorded in the data files).

Cheers,
Damian