

Background and Binning for GSI2021 Analysis

Marco, Matilde, Riccardo

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Why a small reanalysis of GSI2021 data: ¹⁶O(400MeV/u)+C

- PRC rejected the paper without a comparison with nuclear models
- We profit of this to follow some observations by Mauro in the paper review and to fix some errors we were already ackowledged (but we were not in time to fix before submit the 31st of December !!)
- 1. Mauro observed for Li Be and B a statistical error in the last bin lower than the previous one: so maybe a rebinning was possible adding 1-2 bins

		0[0]		Arel Arel
	\mathbf{Z}	$\theta[\circ]$	$d\sigma/d\Omega \pm \Delta_{stat} \pm \Delta_{sys}$	$\Delta_{stat}^{\prime ci} \ \Delta_{sys}^{\prime ci}$
			$[b \ sr^{-1}]$	
		0 - 0.6	$110\pm13\pm5$	$11.6\% \ 4.3\%$
		0.6 - 1.2	$87\pm 6\pm 3$	$7.2\% \ 4\%$
		1.2 - 1.8	$65 \pm 3 \pm 2$	$5.2\% \ 3.1\%$
		1.8 - 2.4	$45\pm2\pm1$	$4.7\% \ \ 3.2\%$
	He	2.4 - 3	$34 \pm 1 \pm 2$	$3.6\% \ 4.4\%$
		3 - 3.6	$20 \pm 1 \pm 1$	$4.2\% \ \ 4.5\%$
		3.6-4.2	$13.9 \pm 0.6 \pm 0.5$	$4.2\% \ \ 3.5\%$
		4.2-4.8	$9.4\pm0.4\pm0.3$	$4.3\% \ \ 3.5\%$
		4.8 - 5.7	$5.3\pm0.3\pm0.7$	5% 14%
	Li	0 - 0.6	$8.9\pm3.5\pm0.3$	$40\% \ 3.7\%$
		0.6-1.2	$10.5\pm1.6\pm0.4$	$15\% \ \ 4.2\%$
		1.2 - 1.8	$6.1\pm1.0\pm0.2$	17% 3.1%
		1.8 - 2.4	$5.4\pm0.5\pm0.2$	9% $3%$
		2.4 - 5.7	$0.83 \pm 0.04 \pm 0.04$	5% $4.2%$
		0 - 0.6	$12.5 \pm 2.6 \pm 0.7$	20% 5.3%
	Be	0.6-1.2	$7.1\pm1.5\pm0.2$	21% 3.2%
		1.2 - 5.7	$0.83 \pm 0.07 \pm 0.03$	9% 3.5%
.6			$30\pm 6\pm 1$	20% 3.1%
90/	D	$\frac{1.2000}{0.0} - 1.2$	$19\pm2\pm1$	$10\% \ 4.7\%$
		1.2 - 5.7	$1.09 \pm 0.07 \pm 0.05$	7% 4.3%
		0 - 0.6	$86\pm13\pm3$	15% 3%
	С	0.6 - 1.2	$52\pm3\pm2$	$5.5\% \ 4.3\%$
		1.2 - 5.7	$1.75 \pm 0.10 \pm 0.08$	$5.6\% \ 4.6\%$
		0 - 0.6	$160\pm15\pm6$	9% 3.9%
	Ν	0.6-1.2	$42\pm3\pm3$	$6.8\% \ \ 7.5\%$
		1.2 - 5.7	$0.63 \pm 0.08 \pm 0.03$	$13\% \ \ 4.4\%$









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- 1. Mauro observed for Li Be and B a statistical error in the last bin lower than the previous one: so maybe a rebinning was possible adding 1-2 bins
- 2. An error in the application of the Intersection method already spoiled in December was having an effect on the angular distribution of bkg and signal.
- 3. An error in the geometry file was discovered and fixed (detectors were moved of 2-4 cm with respect to their real position. Combined with the point 2. the effect was to have larger angular distributions: good in the direction of adding some bins
- 4. In the reanalysis the last bin upper edge has been chosen to correspond to the last bin of backgroung with acceptable entries (not anymore all the Z species up to 5.7°). This will better constraint the nuclear models.
- 5. New MC production with more statistics neede for more bins (see Giuseppe talk). A new check on the MC efficiencis was done
- 6. The comparison with FLUKA and Geant 4 was added







Relative uncertainties in XS (only stat)

$$\sigma(Z) = \frac{1}{N_{\rm TG} \cdot \varepsilon(Z)} \cdot \left(\frac{Y_S(Z)}{N_S} - \frac{Y_B(Z)}{N_B}\right)$$
$$\frac{\Delta\sigma}{\sigma} \approx \left(\frac{1}{S-B}\right) \cdot \sqrt{S^2 \cdot \left[\left(\frac{\Delta Y_S}{Y_S}\right)^2 + \frac{1}{S^2}\right]}$$
Fragmentation physic

$$S = \frac{Y_S}{N_S} \qquad B = \frac{Y_B}{N_B}$$

 $\left(\frac{1}{N_{\mathrm{TG}}}\right) = \frac{1}{N_{\mathrm{TG}} \cdot \varepsilon(Z)} \cdot \left(S(Z) - B(Z)\right)$



- Y_S fragments yields in TG runs (S->S+B)
- N_S primaries in TG runs (S->S+B)
- Y_B fragments yields in NO TG runs
- N_B primaries in NO TG runs





He





Differential Angular Yields of TW for Z3



All Data runs - REBINNED









Differential Angular Yields of TW for Z5

