

N_{coll} gain vs centrality with lighter ions

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L_{AA} and L_{NN} gain, minimum bias (0-100%)

	$^{16}\text{O}^{8+}$	$^{40}\text{Ar}^{18+}$	$^{40}\text{Ca}^{20+}$	$^{78}\text{Kr}^{36+}$	$^{129}\text{Xe}^{54+}$	$^{208}\text{Pb}^{82+}$
γ	3760.	3390.	3760.	3470.	3150.	2960.
$\sqrt{s_{NN}}/\text{TeV}$	7.	6.3	7.	6.46	5.86	5.52
σ_{had}/b	1.41	2.6	2.6	4.06	5.67	7.8
$\int_{\text{month}} L_{AA} dt/\text{nb}^{-1}$	1.17×10^4	1080.	799.	123.	28.9	4.92
$\int_{\text{month}} L_{NN} dt/\text{pb}^{-1}$	2980.	1730.	1280.	746.	481.	213.
$\int_{\text{month}} L_{AA} dt/\text{nb}^{-1}$	5.89×10^4	3180.	2190.	218.	38.2	4.92
$\int_{\text{month}} L_{NN} dt/\text{pb}^{-1}$	1.51×10^4	5090.	3510.	1330.	636.	213.

p=1.5

p=1.9

	Ar-Ar/Pb-Pb	Kr-Kr/Pb-Pb
$L_{AA}^{AA} / L_{AA}^{\text{PbPb}}$	220-646	25-44
$L_{NN}^{AA} / L_{NN}^{\text{PbPb}}$	8-24	3.5-6.2
Ratio of A^2	1/27	1/7

Comparing $\langle N_{\text{coll}} \rangle$ in different systems

$\langle N_{\text{coll}} \rangle$, from <http://web-docs.gsi.de/~misko/overlap/interface.html>

using $\sigma_{\text{NN}}=70\text{mb}$ and W-S profiles

Class	Pb-Pb	Ar-Ar	Kr-Kr	Pb-Pb/Ar-Ar	Pb-Pb/Kr-Kr
0-10%	1750	165	448	10.6	3.9
0-20%	1358	138	346	9.8	3.9
0-30%	1117	111	282	10.1	4.0
0-40%	928	92	232	10.1	4.0
0-50%	770	78	197	9.9	3.9
20-30%	608	62	149	9.8	4.1
40-50%	172	19.8	42.4	8.7	4.1
50-60%	78	10.9	21.6	7.2	3.6

→ The ratio of $\langle N_{\text{coll}} \rangle$ is the same in all centrality classes (b binning), up to about 50%

NN gain in centrality classes

$$NN^{AA} / NN^{PbPb} = (L_{AA}^{AA} / L_{AA}^{PbPb}) * (\sigma_{had}^{AA} / \sigma_{had}^{PbPb}) * (\langle N_{coll} \rangle^{AA} / \langle N_{coll} \rangle^{PbPb}) * (\text{class width ratio})$$

Increase in total NN collisions

Increase of number of AA events

Decrease of N_{coll}/event

73-215 for Ar-Ar/Pb-Pb

13-22 for Kr-Kr/Pb-Pb

Class	Ar-Ar/Pb-Pb	Kr-Kr/Pb-Pb
0-10%	7-22	3.2-5.5
0-20%	7-22	3.2-5.5
0-30%	7-22	3.2-5.5
0-40%	7-22	3.2-5.5
0-50%	7-22	3.2-5.5
20-30%	7-22	3.2-5.5
40-50%	7-22	3.2-5.5
50-60%	10-30	3.6-6.1

→ The hard probes statistics gain in lighter nuclei is the same in all classes up to 50%

NN gain in centrality classes, different width

$$NN^{AA} / NN^{PbPb} = (L_{AA}^{AA} / L_{AA}^{PbPb}) * (\sigma_{had}^{AA} / \sigma_{had}^{PbPb}) * (\langle N_{coll} \rangle^{AA} / \langle N_{coll} \rangle^{PbPb}) * (\text{class width ratio})$$

Increase in total NN collisions

Increase of number of AA events

Decrease of N_{coll}/event

73-215 for Ar-Ar/Pb-Pb

13-22 for Kr-Kr/Pb-Pb

Class	Ar-Ar/Pb-Pb	Kr-Kr/Pb-Pb
LightA-LightA 0-10% / Pb-Pb 0-10%	7-22	3.2-5.5
LightA-LightA 0-10% / Pb-Pb 0-20%	4.4-13	2.1-3.5
LightA-LightA 0-10% / Pb-Pb 0-40%	3.2-9.5	1.6-2.6
LightA-LightA 0-20% / Pb-Pb 0-50%	5.2-15	2.3-4

→ If one can analyze a broader class in Pb-Pb but not in Ar-Ar (system too small), the gain is reduced to a factor ~10-15 for $p=1.9$ (e.g. for Ar-Ar 0-10% and Pb-Pb 0-40%)