

# Web-page on UrQMD Model Validation

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## Аннотация

Создана WEB-страница, содержащая материалы о сравнении расчетов по модели UrQMD с экспериментальными данными. Страница представляет пользователю возможность познакомиться с кругом задач, решаемых с помощью модели, оценить точность описания экспериментальных данных и т.д. Страница может быть полезной при анализе новых экспериментальных данных или при планировании новых экспериментов. Модель UrQMD упоминается в более чем 270 публикациях. Однако только в 44 из них представлены оригинальные расчеты. Основные результаты именно этих работ и представлены на странице.

Monte Carlo event generators play a very important role in high energy physics. One can mark the following areas of their application: pragmatics or practical tasks, analysis of new experimental data and new investigations planning, scientific or cognition aims only and so on. The final aim of all the efforts is creation of a theory of processes that could predict effects with any predetermined exactness. The aim of present work is a creation a WEB-page containing materials for the second trend on the well-known Ultra-relativistic Quantum Molecular Dynamics model application.

According to the electronic database of scientific publications (<http://www-spires.fnal.gov/spires/hep/search/>), the milestone papers on the UrQMD model [1, 2] were mentioned in 272 publications at the beginning of the year 2006. All of them were looked through, and some of them presenting materials on the model were selected. The last publications were studied for original calculations with model usage. Only 44 publications were selected. Graphical materials from the papers were put on the WEB-page.

All published calculations in comparison with experimental data were sorted according to the following sections: production cross sections; particle multiplicities; particle multiplicity ratios; multiplicity distributions and correlations; rapidity distributions of pions, kaons, protons and others;  $m_T$ -distributions, temperature;  $P_T$ -distributions; flow; event-by-event fluctuations; dileptons, J/Psi production; others.

Three subdivisions were introduced in each of the section – hadron-nucleon, hadron-nucleus, and nucleus-nucleus interactions. As a result, the main page looks as it is presented in Fig. 1.

Each cell of the table contains references on the pages with corresponding materials. Each of the reference has a form XX\_YY, where XX is an order number of the paper in the list of used papers, and YY is an order number of the figure in the paper.

Section 1.1 (Production cross sections, hh-interactions) collects descriptions of cross sections of various reactions in hadron-nucleon collisions. Mainly, they have been presented

## CHARACTERISTICS

		hN	hA	AA
1	Production cross sections	<a href="#">1</a> <a href="#">3</a> <a href="#">13</a> <a href="#">1</a> <a href="#">3</a> <a href="#">8</a> <a href="#">3</a> <a href="#">13</a> <a href="#">3</a> <a href="#">22</a> <a href="#">3</a> <a href="#">23</a> <a href="#">3</a> <a href="#">25</a> <a href="#">3</a> <a href="#">26</a> <a href="#">3</a> <a href="#">27</a> <a href="#">23</a> <a href="#">13</a>		
2	Particle multiplicities	<a href="#">1</a> <a href="#">3</a> <a href="#">11</a> <a href="#">1</a> <a href="#">3</a> <a href="#">18</a> <a href="#">1</a> <a href="#">3</a> <a href="#">19</a> <a href="#">3</a> <a href="#">t89</a> <a href="#">10</a> <a href="#">1</a> <a href="#">14</a> <a href="#">1</a> <a href="#">14</a> <a href="#">2</a> <a href="#">36</a> <a href="#">1</a>	<a href="#">14</a> <a href="#">3</a> <a href="#">28</a> <a href="#">7</a> <a href="#">28</a> <a href="#">t1</a> <a href="#">2</a> <a href="#">28</a> <a href="#">t3</a> <a href="#">29</a> <a href="#">6</a> <a href="#">29</a> <a href="#">8</a>	<a href="#">10</a> <a href="#">3</a> <a href="#">13</a> <a href="#">4</a> <a href="#">14</a> <a href="#">3</a> <a href="#">33</a> <a href="#">2</a> <a href="#">34</a> <a href="#">2</a> <a href="#">39</a> <a href="#">1</a> <a href="#">45</a> <a href="#">3</a>
3	Particle multiplicity ratios	<a href="#">22</a> <a href="#">1</a> <a href="#">50</a> <a href="#">1</a>		<a href="#">1</a> <a href="#">4</a> <a href="#">17</a> <a href="#">15</a> <a href="#">5</a> <a href="#">17</a> <a href="#">3</a> <a href="#">19</a> <a href="#">6</a> <a href="#">25</a> <a href="#">4</a> <a href="#">26</a> <a href="#">7</a> <a href="#">32</a> <a href="#">1</a> <a href="#">32</a> <a href="#">6</a> <a href="#">33</a> <a href="#">3</a> <a href="#">34</a> <a href="#">4</a> <a href="#">35</a> <a href="#">4</a> <a href="#">42</a> <a href="#">5</a> <a href="#">46</a> <a href="#">9</a> <a href="#">50</a> <a href="#">1</a> <a href="#">55</a> <a href="#">1</a>
4	Multiplicity distributions and correlations		<a href="#">28</a> <a href="#">3</a> <a href="#">28</a> <a href="#">5</a> <a href="#">28</a> <a href="#">10</a>	<a href="#">53</a> <a href="#">10</a>

Fig. 1: View of the main page

in [1, 2]. Note that the set of the cross sections represents only a small part of the cross-sections collected in the well-known compilation [3]. One can think that analysis of a larger set of experimental data allows one to define more precisely the boundary between the binary model of the hadron-hadron interactions implemented in the UrQMD model at low energies and the FRITIOF model [4] used at high energies. This may improve the ratio between the cross sections of multi-meson and few-meson reactions in the UrQMD model.

Section 2 (Particle multiplicities) gives calculations of multiplicities of  $\pi$ -mesons,  $K$ -mesons, protons, anti-protons and other particles. It is on the alert that the model underestimates the multiplicities of  $\pi$ -mesons, and overestimates the multiplicities of strange baryons, anti-protons in NN-interactions (see pages [1\\_3\\_11](#), [3\\_t89](#), [14\\_2](#)). At the same time, the model overestimates meson multiplicities and underestimates multiplicities of protons, anti-protons, and hyperons in nucleus-nucleus collisions (see Section 2.3).

Analogous descriptions of other sections can be found in the original publication [5]. The page is available at [http://hepweb.jinr.ru/urqmd1\\_3/validation/urqmd\\_model\\_validation.htm](http://hepweb.jinr.ru/urqmd1_3/validation/urqmd_model_validation.htm)

## References

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