

Nuclear Theory

Phase diagram of dilute cosmic matter

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(Submitted on 3 Jul 2011 (v1), last revised 21 Feb 2012 (this version, v4))

Enhancement of nuclear pasta formation due to multi-nucleus simultaneous collision is presented based on time-dependent density functional calculations with periodic boundary condition. This calculation corresponds to the situation with density lower than the known low-density existence limit of the nuclear pasta phase. In order to evaluate the contribution from three-nucleus simultaneous collisions inside the cosmic matter, the possibility of multi-nucleus simultaneous collisions is examined by a systematic Monte-Carlo calculation, and the mean free path of a nucleus is obtained.

Consequently the low-density existence limit of the nuclear pasta phase is formed to be lower than believed up to now.

Comments: Modification [02/2012] to the mistake in the density representation of Monte-Carlo results; Right panel of Fig. 2, Table 1, and so on. No change is necessary to the conclusion

Subjects: **Nuclear Theory (nucl-th)**; Solar and Stellar Astrophysics (astro-ph.SR)

Journal reference: Eur. Phys. J. Web of Conferences 17 (2011) 16004

Cite as: [arXiv:1107.0494](https://arxiv.org/abs/1107.0494) [nucl-th]

(or [arXiv:1107.0494v4](https://arxiv.org/abs/1107.0494v4) [nucl-th] for this version)

Submission history

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[v1] Sun, 3 Jul 2011 20:59:10 GMT (2168kb)

[v2] Fri, 8 Jul 2011 12:40:33 GMT (2169kb)

[v3] Wed, 7 Sep 2011 08:40:32 GMT (2169kb)

[v4] Tue, 21 Feb 2012 00:00:54 GMT (3154kb)

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