

Project Proposal for

Tier0/Tier1 HPC access at LRZ

**Logo of your institution (if available)**:

**Period:** Give the granting period you apply for (month year - month year)

**Project title: (**as given in the online application)

**Type of project:** Either “new project” or “project extension”

**Project ID at LRZ** (if already known):

**Principal investigator:** The Principal Investigation must have proven scientific track records

(typically a PhD) and enough experience on running applications with HPC.

**Director of the proposing Instituion (name, affiliation, address):**

**Research field:** (e.g. astrophysics, climatology, chemistry etc.)

**Confidentiality:** Is any part of the project covered by (enhanced) confidentiality?
YES: ☐ NO: ☐

If YES, please give the reasons for confidentiality:

Information and technical data provided with your online proposal

(<https://www.lrz.de/services/compute/supermuc/projectproposal/>)

will automatically be included by LRZ and needs not repeated here in this proposal.

# Introduction

Give a short outline of the scientific background of your research, including references.

**(about 1 page)**

# Preliminary Work

Provide a brief summary of your preliminary work in connection with the proposed project, including references.

**(about 1 page)**

# Description of the Project

Describe your research project in detail, structured in sub-projects, if applicable. Include discussion of the scientific questions that you are planning to address and the overall scientific goals of the project.

It is important that you describe the innovative aspects, impact and topicality of the proposal.

* Scientific questions you want to address
* Scientific objectives
* Computational objectives
* Approach and expected outcome
* Expected impact on the research area
* Scientific and technical innovation potential
* Progress beyond the state-of-the-art

### Sub-project 1

**3.1.2 Sub-project 2**

**(about 0.5 - 1 page per sub-project)**

## Other Review Processes

Has the underlying research project already (successfully) undergone a scientific review process? Is the project funded by external/public grants? If yes, please also provide information about the funding source (e.g. State, BMWi, BMBF, DFG, EU, …)

# Numerical Methods and Algorithms

**Describe the numerical methods and algorithms** that you are planning to use, improve, or develop; the codes, packages or libraries that you need to undertake the project, and how these will enable the research to be achieved.

Describe the main algorithms, how they have been implemented and parallelized, and their main performance bottlenecks as well as possible solutions to any expected performance issues.

**(about 1 page)**

# Computer Resources

## Code performance and workflow

Describe the codes, packages or libraries that you need to undertake the project, and how these will enable the research to be achieved. Include for **each code to be used** information about

* Which code will be used
* How is the code parallelized (pure MPI, mixed MPI/OpenMP, Pthreads, etc.)
* The amount of memory necessary (per core, per node and in total)
* Scaling plots and tables with speedup results for runs with typical, parameter sets, problem size, and I/O of the planned project (no general benchmark results are accepted)
* Describe architecture, machine/system name, and problem size used for the scaling plots
* Current job profile (independent jobs, chained jobs, workflow, etc.)

**Important:** please take into account the corresponding technical guidelines and requirements e.g., required minimal code scalability, memory restictions. For details see: [http://www.lrz.de/services/compute/supermuc/systemdescription.](http://www.lrz.de/services/compute/supermuc/systemdescription)

If you use third-party codes, include:

* Name, version, licensing model and conditions
* Web page and other references
* Contact information of the code developers.
* Your relationship to the code (developer, collaborator to main developers, end user, etc.)

Describe the current job profile and performance of your code, requirements on interconnect, I/O, architecture, whether the are jobs independent, chained and/or workflows, etc. Here we give an example table and plot for presenting scaling and performance information.

**Table 1: Scaling behavior of <code> on <architecture and system> at <location>.**

**This test was performed with a problem size <of 5 Million particles>, absolute timings per timestep (s) and relative speedup normalized to 256 cores**

|  |  |  |  |
| --- | --- | --- | --- |
| # of cores | Walltime [secs] | Scaling | Performance per Core[MFlop/s] |
| 256 | 188.6 | 1.00 | 600 |
| 512 | 99.0 | 1.92 | 576 |
| 1024 | 55.6 | 3.41 | 511 |
| 2048 | 30.8 | 6.14 | 460 |

Figure 1: Scaling behavior of <code> on <architecture and system> at <location>. This data was obtained with a problem size of <size>.

**(about 1 to 2 pages including figures and tables)**

## Justification of number of core hours requested

Outline the amount of resources you request for the current granting period, structured in sub-projects, if applicable. This should include information such as

* Type of run (e.g. pre- /post-processing run, production run, etc.)
* Problem size for planned runs (e.g. # particles or the like)
* Number of runs planned
* Number of steps per run
* Wall-clock time per run
* Number of cores used per run
* Total amount of requested computing time

This information should take the form of a table like the example table shown below. Please, specify the requested time in appropriate units, preferred unit is core hours (core-h).*.*

**Table 2: Example for table of core hours**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Subproject | Type of run | ProblemSize | # of runs | # ofsteps per run | Walltimeper step[hours] | # CPUcores | Total corehours |
| 1l | Preprocessing | various | R1 | S1 | W1 | C1 | R1\*S1\*W1\*C1 |
| 2 | Scenario 1 | 1 Mio | R2 | S2 | W2 | C2 | R2\*S2\*W2\*C2 |
| 3 | Scenario 2 | 10 Mio | R3 | S3 | W3 | C3 | R3\*S3\*W3\*C3 |
| Total |  |  |  |  |  |  | SUM of above |

**(about 0.5 to 1 page)**

# Resource Management and Work Schedule

## Resource management

Describe how you intend to manage the resources you have requested. This should include a description of the methods you will deploy to monitor progress of the project and how project results are documented. as well as a work plan including milestones.

Discuss the routes that you intend to use for dissemination of the project and for any resulting knowledge transfer.

**(about 0.5 to 1 page)**

## Work schedule

Please, provide a short work schedule, structured in sub-projects, if applicable. Include a table and/or Gantt chart.

Figure 2: Example for a Gantt chart

**(about 1 page)**

# Key Personnel and Experiences

* Give a short introduction of the key persons involved in the project and their experience (max 3 persons)
* If you have already received a test account at LRZ, please describe the results and
experiences
* Do you have any other support for this application e.g., from national funding councils,
the EC or other international collaborations? Please give details on this.
* Do you have applied for ressources at other centres? If yes, please provide details.

**(max 1 page, max 3 persons)**

# Other Applications for Compute Time

Please disclose all proposals for compute time on this and on any other system in the last three years for which your institution and/or the researchers in your project have applied, as well as the amount of the applied and awarded compute resources. If you have several other proposals, please justify why the current proposal should also be awarded. Use a table like the example table shown below to provide the information.

**If incomplete information is given, the proposal will be rejected!**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Call, proposal, etc | HPC system | Requested amount of of compute time [million core-h] | Granted amount of of compute time[million core-h] |
|  |  |  |  |  |
|  |  |  |  |  |

# Bibliographic References

Provide recent/most important bibliographic references that are relevant to the project.

**(max 0.5 pages, max 8 references)**

#  Optionally: Assistance needed from LRZ / Collaborations with LRZ

**Optionally,** Describe which type of support or assistance you would like to receive from LRZ for the proposed project, and how you would like to interact with LRZ. Collaborative work can include, but is not limited to following:

* Porting applications to the high end system
* Providing specific software
* Consultancy to enable the user’s adoption of the research infrastructure
* Performance analysis and/or monitoring
* Optimizing codes to efficiently utilize specific resources
* Assistance with parallelization
* Improving the scalability of the code
* Code development with support from experts
* Assistance with visualization, workflows and data handling

Please estimate the amount of work needed and justify your request.

Who in your research team will collaborate with the LRZ staff and be the point of contact?

(max 1 page)

#  Optionally: Reviewers

Reviewers will be independently selected by the steering committee. However, **you can point to three experts in your field.**

Please note that the experts you nominate should not be a member of your research group or a member of a group with whom you work on a regular basis. Preferably, you should nominate at least one expert from outside your own country.

#  Mandatory Acknowledgement

After your proposal has been successfully evaluated, please always include an acknowledgement in your publications such as:

**Computer resources for this project have been provided by the Gauss Centre for**

**Supercomputing/Leibniz Supercomputing Centre under grant: <project-ID>.**

#  Upload

Upload this Project Proposal to: <https://www.lrz.de/services/compute/supermuc/upload-report/>

Select „Detailed Project Description“ as type of the document.