Annex A

1. Problem statement and goal of the project

Due to its high build-up rates, the LMD process offers great potential to reduce costs of AM. However, the process is characterized by different instabilities (geometry of individual layers, local elevations, varying heat transfer, etc.). These instabilities go beyond the common influence factors of laser power and powder flow. As a result, the produced parts lack consistent quality.
To solve this problem, Fraunhofer IAPT and Siemens will develop together with the other clients a Cloud-based quality control tool to increase the yield rate of the LMD process. The clients will support the project financially subject to section 3 of the contract and actively as detailed in the following section 2 of Annex A. The clients have the possibility to influence the development in an early stage and to define their requirements by way of participating in regular telephone conferences and in the steering committee meetings.
Siemens AG will work actively together with Fraunhofer on the development of the quality control solution.

The developments and experiments will be conducted on a BeAM Modulo 400 at Fraunhofer IAPT, although attention will be paid that a transferability to other LMD Systems or AM technologies is possible.
The sensor devices, which will be integrated during the project, are: Precitec OCT, NIT CLAMIR as well as standard sensors for environmental temperature and humidity. The quality control tool will provide a form-based UI to enter additional data (e.g. workpiece specific quality measures) and to display results of the analytics pipeline. The focus of the quality control will be to analyze and visualize the quality KPIs of the LMD process. These quality KPIs, such as process stability with respect to density or mechanical properties of parts, will be defined in the beginning of the project in agreement with all partners. In addition, the effect of the influencing factors on the quality KPIs should be investigable with the tool (correlation between influence factor and quality KPI).