**EUROPEAN SPACE AGENCY**

**GSTP PRE-PROPOSAL TEMPLATE**

*The GSTP “Quantum Technologies for Space” framework allows economic operators (companies, research organisations…) to improve the reliability and maturity of quantum technologies for space applications. A key aspect to this framework is that these entities shall draw from the expertise and know-how of a recognised applied research organisation, experienced in applying quantum technologies. The total cost for a single within this activity shall not exceed 250 k€. The maximum duration shall be 12 months.*

**PART 1 TECHNICAL AND APPLICATION PART**

1.1 TECHNICAL OBJECTIVES AND REQUIREMENTS

*Outline the main technical and programmatic objective(s) and end goal(s) of the proposal.*

*Indicate how the achievement of those objectives will be demonstrated.*

*Identify and discuss the technical requirements to be able to achieve the specific Technical Objectives. When appropriate the requirements shall be associated to a quantitative value. The verification approach for each requirement shall be identified. Provide a justification/ reasoning for such requirements.*

1.2 TECHNOLOGY READINESS LEVEL:

*Identify with justification the current level of maturity of the technology (TRL) and the level of technical maturity to be reached at the end of the activity. Please refer to the Annex for the TRL descriptions.*

1.3 ENGINEERING APPROACH (Technical Steps and Implementation aspects)

*Present and discuss in detail the scientific/technical steps to achieve the objectives and the committing requirements outlined in section 1.1. Note: the steps shall be consistent with those reflected in the Work Logic Diagram in section 1.6.1.*

*Present a first iteration of the concept and the baseline design/approach. The baseline design covers for instance the system architecture and a functional decomposition presented in block diagrams, providing also internal and external interfaces. Discuss the current state of the art and the trade-offs that need to be taken into account and show the overall logic of the work being proposed including any key review and decision points. Discuss how the work performed will be validated (e.g. test plan and test approach) and how achievement of the objectives will be proven/ demonstrated*

1.4 TECHNICAL FEASIBILITY, PROBLEM AREAS AND DEVELOPMENT RISK:

*Provide evidence as to the feasibility of meeting the objectives and requirements identified in section 1.1. Identify, present and discuss the main technical problem areas and key development risks that may be expected during the execution of the activity in order to reach the proposed TRL level. Propose mitigation and preventative actions to reduce the likelihood and potential impact of such risks/problems and discuss credible alternative design or implementation solutions to avoid identified potential technical problems becoming showstoppers.*

1.5 APPLICATION OF TECHNOLOGY DEVELOPMENTS RESULTING FROM THE PROPOSED ACTIVITY

*Please describe the targeted products and applications linked to the technical objectives. Please provide indications of the potential differentiating advantage of the product to be developed with respect to the state-of-the art. Also, discuss the expected benefits of the proposed activity to your company/institution. If the application is pertinent to an ESA Programme(s) please identify which programme would be relevant to your proposal; indicate the structuring effect of the proposed activity, in terms of possible continuation in ESA programmes, the relevant time frame, targeted missions, and cooperation potential.*

* 1. TECHNICAL IMPLEMENTATION / PROGRAMME OF WORK

1.6.1 Proposed Work Logic

*Insert a flow chart showing the logical flow of work from step to step, with reviews, dependencies, and critical path clearly shown. Note that this shall be consistent with section 1.3, the WBS and the schedule.*

1.6.2 Work Breakdown Structure (WBS) and Work Package Description (WPD)

*For the total scope of the activity; clearly showing each foreseen Work Package (WP) with its title and the name of the responsible company/institute. Ensure work packages are split adequately such that sub-contracted work has its own work packages. Main contractor and subcontractor project management activities shall be identified in the WBS.*

* + 1. Work Package Description (WPD)

*Individual WPD shall be established per work package identified in the WBS, describing the following:*

* + - * *responsible company*
      * *beginning and end date of each work package*
      * *person responsible for the work package*
      * *description of the activities in the work package, sufficient to understand clearly the scope and depth of the work being performed.*
      * *inputs to the work package*
      * *outputs of the work package*
      * *the outputs to the work packages are to be identified (e.g. TN1 etc.) and shall be included in the List of Deliverables.*

*Please include a dedicated work package for Management and Reporting. All management tasks, such as meetings, progress reports and final documentation shall be carried out under this work package.*

* 1. BACKGROUND OF THE COMPANY(IES)

*Present an overview of the company addressing the number of personnel; the year in which the company was established; location of sites; and*

*Briefly describe the directly relevant experience for the Contractor and Sub-contractor(s), if any, for the performance of such a work (The tenderer may submit additional information on the general background of the entities in an Annex).*

* 1. FACILITIES

*Identify the facilities (including s/w tools) required to perform the proposed work.*

**PART 2 MANAGEMENT PART**

1. TEAM ORGANISATION - KEY PERSONNEL, TIME DEDICATION and CVs

*By means of an organigram, describe the overall team composition, including participants from all sub-contractors, if any, and including all key and non-key personnel. The organigram shall clearly show the tasks, position, authority and name of the persons proposed for the work and in particular the project manager and the contracts officer. NOTE: A “key person” is a person, who substantially contributes, in terms of effort and knowledge, to the work carried out under a Contract and who is explicitly nominated to perform such duties.*

*Concise CVs including the directly relevant information for the proposed activity for all key personnel and showing that all major elements of expertise needed are present in the team.*

* 1. PLANNING

2.2.1. Gantt chart

*Insert a Gantt chart schedule for the proposed activity, covering from the start of the activity until the end of the Contract and where all proposed Work Packages (WP), meetings, milestones, etc. can be traced, show dependencies and highlight the critical path. The schedule from the start of the activity until the end of the contract shall in principle not exceed one year unless fully justified.*

2.2.2 Proposed Schedule

*Provide a synthetic summary of the schedule including duration, planning assumptions (e.g. envisaged start date, holidays etc.) and identifying and explaining key planning drivers and dependencies*

2.3 DELIVERABLE ITEMS

*A list of foreseen deliverables shall be included. The List of Deliverable Items shall be grouped in Documentation, Hardware and Software and shall include sufficient explanation to unambiguously represent the scope of the deliverable. For Documentation, the proposal shall indicate, a) list of technical notes b) list of the final deliverables as defined in the Table here below.*

*Note that the TDP, FR, FP and CCD are mandatory deliverables for all activities.*

2.3.1 Documentation

*For each of the deliverable documents proposed by the Tenderer, a description, in the form of a bullet list of the main contents shall be added. This shall be sufficient to understand the contents, scope and depth of the envisaged document or report*

|  |  |  |  |
| --- | --- | --- | --- |
| **Doc ID** | **Title** | **Milestone** | **Description of documents \*** |
| *D1* | *To be completed by the Tenderer* | *(e.g. end of Task 1 / PDR…).* |  |
| *D2* | *To be completed by the Tenderer* | *…end of Task 2* |  |
| *D3* | *To be completed by the Tenderer* | *…end of Task 3* |  |
| TDP | Technical Data Package | Final Review |  |
| ESR | Executive Summary Report | Final Review | see above |
| FR | Final Report | Final Review | see above |
| CCD | Contract Closure Documentation | Contract Closure | see above |
| FP | Final Presentation | Final Review |  |
| TAT | Technology Achievement Template | Final Review | Will be provided by Technical Officer |

*\* Example for the description of documents*

*D1 Test Plan: Purpose, goal and scope of testing, Test Flow including flow diagram (For each test: Description of test, goal of test, test setup and test article, test levels), Identification of test equipment and facilities, Test schedule*

2.3.2 Other Deliverables (Hardware, Software, Models, Data, etc.)

*Example (for illustration purposes only):*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item Identifier** | **Title** | **Milestone** | **Quantity to be delivered** | **Format / Description** |
| SW1 | XYZ software | (e.g. End WP3/ TRB) |  | Object Code only / Deliver on DVD-ROM / Source code (matlab) |
| HW1 | ZYX B/B | Contract Closure |  | Incl. all cables /, partial breadboard using COTS components and implementing processing module only. |
| MOD1 | QQQ Model |  |  | Zeemax model |
| Data1 | AAA Raw test data |  |  | From tests TBD and TBD |
|  |  |  |  |  |
| SW2 | ABC software | Contract Closure |  | Source and Object Code / Deliver on DVD-ROM |

**PART 3 FINANCIAL PART**

* 1. PRICE QUOTATION FOR THE CONTEMPLATED CONTRACT:

*Enter here the total amount quoted as a Firm Fixed Price (FFP), in Euro, delivery duty paid, exclusive of import duties and value added taxes in ESA Member States, etc.*

*Please provide a cost breakdown for each of the work packages defined in section 1.6.2 and a cost breakdown per main and sub-contractor.*

*The cost breakdowns shall include costs for manpower, costs for resources (facilities, materials, etc.) and other costs.*

* 1. COST TO COMPLETION

*A cost to completion is required for all other activities with a completion TRL of 6 or less. This information is provided for information only and is not binding in any way for either party (ESA or Tenderer).*

* + 1. Further steps/ Activities needed to complete the development

*Identify the main development steps/ activities that would be needed AFTER COMPLETION OF THIS ACTIVITY to progress the work to TRL 8. Include a brief description of each step (e.g. key objective, aspects to be addressed, expected start and end TRL) e.g.*

*Step 1: Functional Demonstration*

*Goal: Demonstration of all functionality via test on Engineering Model*

*Key aspects: Completion of design and analyses work, manufacture and test of EM*

*Start TRL: 4, End TRL: 5*

*Step 2: Qualification*

*…*

* + 1. Estimated Cost per step

*Provide a rough estimate of the expected cost of each further step or activity that would be needed in order to reach TRL 8.*

|  |  |  |  |
| --- | --- | --- | --- |
| *Further Step/ Activity* | *Estimated cost (Euro)* | *Estimated start date* | *Estimated end date* |
|  |  |  |  |

**ANNEX**

*This annex is for your information only and does not need to be part of your proposal.*

**Technology Readiness Level (TRL)**

|  |  |
| --- | --- |
| TRL1 | Basic principles observed and reported |
| TRL2 | Technology concept and/or application formulated |
| TRL3 | Analytical and experimental critical function and/or characteristic proof-of-concept |
| TRL4 | Component and/or breadboard functional verification in laboratory environment |
| TRL5 | Component and/or breadboard critical function verification in a relevant environment |
| TRL6 | Model demonstrating the critical functions of the element in a relevant environment |
| TRL7 | Model demonstrating the element performance for the operational environment |
| TRL8 | Actual system completed and accepted for flight (“flight qualified”) |
| TRL9 | Actual system “flight proven” through successful mission operations |