

## **Memorandum of Understanding**

**for the**

**CTA Design Study**

### **1 CTA Consortium**

A group of institutes known as the CTA Consortium - where CTA stands for “Cherenkov Telescope Array” - intends to design, construct and operate a next-generation facility for ground-based very high energy gamma ray astronomy, providing

- a sensitivity improvement compared to current instruments such as H.E.S.S., MAGIC or VERITAS of approximately one order of magnitude in the TeV energy range
- enlarged energy range, both towards lower energies and towards higher energies
- improved angular resolution
- enhanced flexibility of operation
- full-sky coverage

CTA will address astrophysical questions such as acceleration and propagation of high-energy particles in the Universe, as well as issues of fundamental physics and cosmology.

The CTA Consortium aims at providing arrays of Imaging Atmospheric Cherenkov Telescopes (IACTs) located at a Northern and a Southern site. The Southern site will explore the wealth of sources in the central region of our Galaxy and the richness of their morphological features. Both the Northern and the Southern site will study extragalactic objects, addressing questions such as AGN physics and cosmological galaxy and star formation and evolution. As far as appropriate, identical technology will be used for all telescopes.

These goals are endorsed in the European astroparticle physics roadmap as prepared in the context of the Eranet ASPERA, and in astrophysics roadmap prepared in the context of the Eranet ASTRONET. The European Strategy Forum on Research Infrastructures (ESFRI) lists CTA its 2008 update of the Roadmap for pan-European research infrastructures, making CTA eligible to participate in the next FP7 call concerning the Preparatory Phase of new Research Infrastructures.

CTA will be operated as an observatory open to scientific community, providing appropriate tools for data access as well as integration into the Virtual Observatory.

While the core of the CTA Consortium is currently formed by the institutes involved in the H.E.S.S. and MAGIC projects, it is intended to enlarge the Consortium toward construction of CTA and to involve additional members of the astrophysics, astroparticle physics and particle physics communities in particular. Close cooperation and open exchange with related efforts elsewhere, such as in the United States, is intended, working towards a world-wide cooperation.

The acronym “CTA” shall cover the design phase of the instrument, but may be replaced by a different name for the full-scale final installation.

## **1.1 Scope of the MoU: the CTA Design Study**

Scope of this Memorandum of Understanding is the CTA Design Study, which involves

- detailed study of expected science performance of the CTA array
- optimization of the CTA IACT array(s) on the basis of simulation studies
- design of the telescopes
- study of the infrastructure required to operate the CTA array
- study and exploration of potential sites
- design and initial implementation of tools to handle observation requests, schedule observations, to process the data and to provide efficient access to data
- investigation of options concerning the legal status and funding of CTA, in close interaction with the bodies coordinating Astrophysics and Astroparticle Physics in Europe, in particular with ASPERA

Work performed in the context of the MoU should in particular prepare for a successful participation in next FP7 call concerning the Preparatory Phase for new science infrastructures as well as in the Joint Call to be launched by ASPERA, and should serve to establish or strengthen ties between the various scientific and technical groups involved in the project.

The label “CTA” shall exclusively refer to work performed in the context of the Work Packages as defined in this MoU.

## **1.2 Beyond the CTA Design Study**

The construction, commissioning and operation of CTA prototypes as well as of the full instrument will be subject of an extension of this agreement, as will be the transition phase between the operation of current instruments by CTA Consortium Parties. In this transition phase, it is envisioned to merge the existing H.E.S.S. and MAGIC collaborations under a single framework.

## **2 Parties of MoU**

The Parties shall be the institutes of the CTA Consortium, either individually as groups, and/or the funding agencies supporting these institutes, either as Regular Parties or as Associated Parties. The Parties of the MoU and their representatives are listed in Appendix A.

### **2.1 Regular Parties**

Regular Parties are institutes, groups of institutes, or agencies committing at significant level to the CTA Design Study, with a threshold of one scientist/engineer FTE per year invested in CTA-specific tasks as defined in the work plans of the Work Packages, or equivalent financial contributions. Additional Regular Parties can be accepted by the Consortium Board. Regular Parties have full voting rights in the governance structure of the Consortium.

### **2.2 Associated Parties and Associated Members**

Additional Parties may join the CTA Consortium as institutional Associated Parties, after approval by the Consortium Board, with observer status in the Collaboration Board but without voting rights.

In addition, individuals may join the Design Study as Associated Members, after approval by the Consortium Board.

Associated Parties and Associated Members are not formally Parties of the MoU, but agree in writing to respect the conditions defined in the MoU.

### **3 Organization of CTA Consortium**

The organizational structure of the CTA Consortium includes the following entities

- the *Consortium Board* (CB) is the forum for decision- and policy-making
- the *Executive Board* (EB) is the primary body for directing the execution of the CTA design study and for direct coordination between work packages
- the *CTA Spokesperson, Deputy Spokesperson(s) and Project Coordinator(s)* have the overall responsibility for managing the CTA Design Study, together with the EB
- the *Work Packages* (WPs) conduct specific tasks in the context of the CTA design study

Plenary meetings have a prominent role with the aim to involve all Consortium members in the decision-making process and to ensure transparency.

Two additional boards are foreseen for interaction with the community at large, and with the funding agencies and science organizations:

- An *Advisory Board* of external advisors will assist in guiding the project and in reviews in preparation for decision milestones.
- A *Resource Board* will be composed of representatives of the organizations or funding agencies to which the Parties are associated, or/and of country representatives from within CTA. The Resource Board may not be required in the initial stage of the CTA Design Study and will be established as appropriate in interaction with ASPERA/ApPEC and, where appropriate, ASTRONET.

#### **3.1 Consortium Board (CB)**

Concerning all scientific matters and organizational issues, the CTA Consortium is governed by the CB. The CB represents the ultimate internal authority in the CTA Consortium. It is the body through which all major decisions are endorsed. The CB is composed of one representative from each institute representing a Regular Party, with voting right. Spokesperson, Deputy Spokesperson(s) and Project Coordinator(s) participate as ex-officio members, without voting right. The ex-officio members cannot at the same time represent a Party. Each Associated Party may send one observer into the Board.

The CB elects its chairperson among its members. The CB defines election procedures, and all details of the organization which are not addressed in this document, and which will be specified as a separate governance document.

In particular, the CB

- addresses issues of Consortium membership
- appoints the CTA Spokesperson, Deputy Spokesperson(s) and Project Coordinator(s) and the EB members
- prepares funding strategies and other joint initiatives
- establishes publication policies.

The CB will usually meet twice per year.

The CB shall strive to decide by consensus, but on specific issues votes may be required. Voting procedures in the CB shall take the relative contributions of Parties into account. Initially, votes will be weighted by the number FTE contributed to the CTA Design Study by a given Party. Financial contributions should be factored in once known. Details will be specified in a separate governance document

### **3.2 Executive Board**

The Executive Board (EB) will guide and oversee the design of CTA and the progress towards the construction of prototypes. Decisions which go beyond the scope of individual WPs will be discussed in the EB, and, depending on the scope and urgency of the issue, be decided or brought forward to the CB (see also 3.5). The EB will serve to coordinate between WPs, will monitor the progress of the WPs and interface issues between WPs, and identify possible problems. The EB will also schedule and coordinate the use of common resources, and deal with technical and administrative issues arising in this context.

The EB includes the Spokesperson, the Deputy Spokesperson(s), the Project Coordinator(s), the Chair of the CB, the WP Coordinators and additional members chosen to ensure an overall balance and competence in the complete EB. The EB should strive to decide by consensus; if no consensus is reached, decisions are taken by a majority vote, with the Spokesperson casting the decisive vote in case of a tie.

The EB is chaired by the Spokesperson. It will meet regularly and frequently, either in person or using remote-conferencing tools. Minutes of meeting of the EB are open to all members of the CB.

### **3.3 Spokesperson, Deputy Spokesperson and Project Coordinator**

The CTA Design Study is managed by the Spokesperson, the Deputy Spokesperson(s), and the Project Coordinator(s), together with the EB.

The Spokesperson shall be appointed by the CB. He/she represents the collaboration and serves as a contact person to the outside, and is in charge of the overall internal management of the project, assisted by the Deputy Spokesperson(s) and the Project Coordinator(s), in interaction with the EB.

The CB shall also, in agreement with the Spokesperson, appoint the Deputy Spokesperson(s). The sharing of tasks between the Spokesperson and the Deputy Spokesperson(s) is arranged between them. Tasks assigned in this document to the Spokesperson may be delegated to the Deputy Spokesperson(s), or, in special cases, to a third person.

The Project Coordinator(s) assist the Spokespersons in the overall management of the Design Study. Responsibilities of the Project Coordinator(s) include the common project construction guidelines, the technical integration of all components, the overall project schedule and the monitoring of project milestones. He or she should also overview the implementation of engineering standards and procedures, and the operation of the project office and documentation.

Election procedures, terms of duty etc. will be specified in a separate governance document.

### **3.4 Work Packages**

The design of CTA and the construction of prototypes will be divided into Work Packages (WPs) which are to a significant extent self-contained. WPs may be terminated, added or redefined by the CB as appropriate in the course of the CTA Design Study.

Work within a WP is coordinated by a WP Coordinator, within the scope of the WP definition, as defined in a WP work plan and following specific guidelines and requests by the CB and the EB. The WP Coordinator represents the WP in the EB and reports to the CB and the EB.

WP Coordinators shall be appointed by the CB, in agreement with the Parties involved in a WP. WPs may internally appoint deputy coordinators as appropriate, in agreement the Parties involved in a WP.

The initial definition of WPs and WP Coordinators is given in Appendix B.

### **3.5 Working procedures and decisions**

Decisions shall be taken at the lowest appropriate level, i.e. in the WPs, where possible. Major decisions, in particular all those with impact beyond the immediate scope of the WP, shall be prepared, and proposed, by the WP Coordinators to be discussed in the EB. Depending on the scope and urgency of the issue, decisions shall be taken in the EB, or brought forward to the CB.

When taking a decision, the WP, the EB, or the CB may require a review. Depending on the scope of the decision, referees can be members of the Consortium, members of the Advisory Board, or ad-hoc appointed external experts.

## **4 Contributions, responsibilities, and resource management**

### **4.1 Personnel matters**

The employees of each Party shall retain the status they originally had; their organisation of affiliation shall retain its duties as employer, and pay and manage this person pursuant to the applicable legislation and internal policies.

Each Party will facilitate the movement and stay of personnel from other Parties in its own laboratories and to the experiment site(s).

Each Party will encourage local recruitment, supported if necessary, by training actions.

### **4.2 Management of funds**

The funds linked to the completion of the technical and scientific contributions by the Parties of the Consortium shall be directly allocated and managed by their relevant authority.

When a Party bears the expenses for joint items, this Party will invoice the other Parties according to fraction of cost decided by the CB.

In case of contracts concerning multiple Parties or the whole Consortium, to be signed with third persons, as notably scientific programme collaborations, European contracts, Party specific commitments or other financial contracts, the CB shall designate, case by case, the Party duly mandated to sign them in the name of the Parties.

A common fund may be established to support common expenses, with contributions shared according to the number of participants from a given institution. The CB appoints a Party administering the common fund, and approves its use for specific items.

#### **4.3 Funding applications**

Funding applications requesting funding for CTA-related work by a Party or a combination of Parties have to be coordinated with the Spokesperson and the EB prior to submission of the application.

#### **4.4 Ownership of equipment**

The Parties shall remain the owner of the equipment and material they provide towards the construction of monitoring equipment or prototypes.

The Parties shall place without charge this material and equipment at the disposal for the duration of this Memorandum. Parties as owners of equipment and material will warrant its proper operation and compliance with safety and use standards pursuant to their national law and to laws of the country where the equipment is located, and will provide the relevant documentation. Each Party is in general responsible for the maintenance and repair of the components which it has provided, including necessary materials and equipment.

In the case of withdrawal, the concerned Party shall leave, unless otherwise agreed, the equipment at the disposal of the others Parties, under conditions to be defined in a specific agreement.

#### **4.5 Dismantling**

In case of obsolescence of some elements of the equipment or on specific request of the CB or at this end of this MoU, each Party shall be responsible for the dismantling and the removal of its equipment unless otherwise unanimously agreed.

### **5 Intellectual property**

In the context of the Design Study program, each Party shall be entitled to use for its own purposes any acquired knowledge, whether patentable or not, as well as any expertise developed during the manufacture of components. The institute agrees to make accessible to all partners of the collaboration without cost all these results that it obtained in connection with its work on the CTA instrument, for use within the project.

Experimental data as well as standard utilities for data analysis and simulation are available without restrictions to all Parties.

New results or views presented in papers, conference contributions, seminars, web pages etc. or in contacts with the media need to be presented to, and agreed upon by the Consortium prior to public presentation. Detailed rules concerning authorship on publications, presentations at conferences etc. will be specified in a separate document.

The authors of publications shall remain subject to the rules of their respective employer.

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If a patentable invention or a virtually profitable technique is developed by one of the Parties in the context of the Consortium, the others shall be informed thereof in order to decide on the appropriate ownership. Pending such decision, the Parties will refrain from action that would prejudice patent-taking or licensing.

## **6 Liability**

The Parties of the Consortium will be mutually liable only for damage done intentionally or through gross negligence by their own employees or other persons working under their responsibility, against persons or property of other Parties of the Consortium.

## **7 Change of Consortium membership**

It is anticipated that the Consortium will grow towards the realization of the CTA facility. Depending on national funding decisions, Parties of the Consortium may also wish to or be forced to leave the Consortium.

### **7.1 New parties**

In case of admission of new Party, the CB shall define the conditions of admission. Any admission shall be stated in an amendment.

### **7.2 Leaving the consortium**

A Party or institute may withdraw its support for this agreement by giving not less than a one year written notice to the Consortium. Requests of parties to leave the CTA Consortium are addressed to the Spokesperson and the CB who should take care of the fact that, before leaving, the respective party endeavours to make sure that their responsibilities are taken over by other members of the Consortium.

## **8 Duration**

The Memorandum concerning the design study remains valid until extended or superseded by an agreement relating to the construction operation of prototypes telescopes, or the construction of CTA, unless denounced by Parties holding at least 2/3 of the votes.

## **9 Amendment**

This agreement and its annexes may be amended at any time. An amendment becomes effective when signed by Parties holding at least at least 2/3 of the votes.

## **10 Effective date**

tbd

## **11 Legal status**

Nothing in this Agreement shall create a partnership or agency among the Parties or any of them.

## **12 Disputes**

All disputes or differences arising from this Memorandum which cannot be amicably resolved by the CB shall be finally settled through arbitration under the Rules of Arbitration of the International Chamber of Commerce (ICC).

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The arbitration award shall be final and binding upon the Parties, not subject to appeal, and honoured by the Parties without having resort to any court.