**mEMORANDUM for the ESTABLISHMENT of the**

**INTERNATIONAL scientific coordination NETWORK (GDRI)**

**“Delay Systems/Systèmes à Retards – DelSys”**

**CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE**, hereinafter referred to as **CNRS**, a public scientific and technological institution, with headquarters at 3, rue Michel Ange, 75794 Paris Cedex 16, France, represented by its **President**, **Mr. Alain FUCHS**,

acting in its own name and on behalf of:

- Laboratoire Grenoble Image, Parole, Signal, Automatique (GIPSA), UMR 5216, Director: Mr. Jean-Marc Thiriet

- Laboratoire d'analyse et d'architecture des systèmes (LAAS), UPR 8001, Director: Mr. Jean-Louis Sanchez

- Laboratoire des signaux et systèmes (L2S), UMR 8506, Director: Mr. Silviu-Iulian Niculescu

And

**INSTITUT POLYTECHNIQUE DE GRENOBLE**,hereinafter referred to as **GRENOBLE INP,** a public scientific, cultural and professional institution, with headquarters at46, avenue Félix Viallet, 38031 Grenoble Cedex, France, represented by its **Administrator General**, **Mrs. Brigitte PLATEAU**,

And

UNIVERSITÉ JOSEPH FOURIER-GRENOBLE 1, hereinafter referred to as UJF, a public scientific, cultural and professional institution, with headquarters at Domaine universitaire, 621, avenue Centrale, 38400 Saint Martin d’Hères, France, represented by its President, Mr. Farid OUABDESSELAM,

And

UNIVERSITÉ STENDHAL-GRENOBLE 3, hereinafter referred to as Université Stendhal, a public scientific, cultural and professional institution, with headquarters at Domaine universitaire, 1180, avenue Centrale, 38400 Saint Martin d’Hères, France, represented by its President, Mrs. Lise DUMASY,

acting in their own names and jointly on behalf of:

- Laboratoire Grenoble Image, Parole, Signal, Automatique (GIPSA), UMR 5216, Director: Mr. Jean-Marc Thiriet

And

**ÉCOLE SUPÉRIEURE D’ÉLECTRICITÉ GIF-SUR-YVETTE**, hereinafter referred to as **SUPÉLEC**, a public institution for higher education and research, with headquarters at Plateau du Moulon, 3, rue Joliot-Curie, 91192 Gif-sur-Yvette cedex, France, represented by its **Director General**, **Mr. Alain BRAVO**,

acting in its own name and on behalf of:

- Laboratoire des signaux et systèmes (L2S), UMR 8506, Director: Mr. Silviu-Iulian Niculescu

AND

**KATHOLIEKE UNIVERSITEIT LEUVEN**, hereinafter referred to as **K.U. Leuven**,a private University, with headquarters at Oude Markt 13, 3000 Leuven, Belgium, represented by its **Rector**, **Mr. Mark Waer**,

acting in its own name and on behalf of:

- Department of Computer Science, Head: Mr. Ronald Cools

And

**Fonds Wetenschappelijk Onderzoek – Vlaanderen**, hereinafter referred to as **FWO**, a foundation of public utility, with headquarters at 5, rue d’Egmont, Brussels-1000, Belgium, represented by its **Secretary General**, **Mrs. Elisabeth MONARD**,

And

**KUNGL. TEKNISKA HÖGSKOLAN (Royal Institute of Technology)**,hereinafter referred to as **KTH**, a public technicalUniversity, with headquarters at SE-100 44 Stockholm, Sweden, represented by the **Vice Rector for Research, Mr. Björn BIRGISSON**,

acting in its own name and on behalf of:

- School of Electrical Engineering, Director: Mr. Stefan Östlund

And

**University of KeNt**, a public University, with headquarters at The Registry, University of Kent, Canterbury, Kent, CT2 7NZ, United Kingdom, represented by the **Director of Research Services, Mr Simon Kerridge.**

acting in its own name and on behalf of:

- School of Engineering and Digital Arts, Head of School: Mrs. Sarah Spurgeon

AND

**UniversitA POLITECNICA DELLE MARCHE**,hereinafter referred to as **UNIVPM**, a public University, with headquarters at Piazza Roma 22, Ancona, 60121, Italy, represented by its **Rector**, **Mr. Marco PACETTI**,

acting in its own name and on behalf of:

- Dipartimento di Ingegneria dell'Informazione, Director: Mr. Sauro Longhi

**Hereinafter referred to individually as the “Party” or collectively as the “Parties”**.

**PREAMBLE**

Time delay systems represent a wide class of dynamical systems which appears in many fields as, for example, in biology (modeling population dynamics), in mechanical or electrical engineering (modeling lossless propagation in hydraulics or in electrical circuits), in communication (modeling congestion mechanisms in communication networks), in transportation (car following models) to cite only a few. As mentioned in the generic examples cited above, delays appear as a natural way in the representation of transport or interconnected systems where either information or materials are exchanged between several entities. In this context, it naturally appears a real need of a *better understanding* of the *effects* caused by *delays* (constant or time-varying, distributed or not) on the dynamics of interconnected systems in order to improve the dynamical behavior using strategies adapted to the specific cases considered.

The *International scientific coordination network on Delay Systems* “DelSys” gathers several European research teams working in the field of time-delay systems. The main objectives of "DelSys" are twofold: first, to *better organize* the *European research* on such topics and second to *better emphasize* the *research trends* in the field. In this sense, we will organize regular joint meetings, invited sessions at international conferences and symposia as well as we will edit monographs and special issues (at various international journals) covering the topics presented and discussed at these various manifestations. A particular attention will be also paid to *educational issues* as, for example, by proposing appropriate Master and PhD introductory lectures to the delay area or spring/summer/autumn schools.

**It has been agreed as follows**:

**Article 1 – Purpose**

The purpose of this Memorandum is the establishment of an International scientific coordination network, (hereinafter referred to as the “Network”), a non-incorporated means of cooperation, named **“Delay Systems - DelSys”**, the purpose of which is to exchange information on the following scientific theme: Time-delay systems and their application to Networked control systems, biologic systems, partial differential equations, hereinafter referred to as the Network Theme.

The scientific purpose of the Network within the framework of the Theme and the activities resulting from it are stated in Annex 1.

Article 2 – Composition

The Network is composed of the laboratories/institutes/departments listed above.

The activities to be coordinated by the Network shall extend only to the scientific work inherent to the Network Theme of the laboratories/institutes/departments.

All personnel of the said laboratories/institutes/departments contributing to the Network activities shall remain assigned to their home laboratory/institute/department and institution.

Article 3 – Resources

Each Party shall undertake to make available to the members of the Network affiliated to said Party the means it deems necessary to promote their activities within the framework of the regulations of the individual Parties and in particular:

a/ The exchange of information between Network members through the organization of conferences, seminars, colloquia, workshops, thematic schools or work meetings on said Theme.

b/ Discussion on the setting up and running, if necessary, of joint research projects on said Theme at a later stage.

c/ Cooperation in terms of information and scientific documentation in particular through the exchange of publications and scientific reviews on the Network Theme.

d/ Facilitate contacts and exchanges of researchers participating in the Network on said Theme.

**Article 4 – Organization**

A Coordinator, whose identity is given in Annex 2, shall be appointed jointly by the Parties for a four (4) year period.

The role of the Coordinator is to steer the Network activities and the Theme with the Scientific Committee, and to transmit the information submitted by the Parties to the Scientific Committee and Network members.

The Coordinator shall be assisted by a Scientific Committee. The Scientific Committee is composed of sitting representatives from member laboratories/institutes/departments, appointed by the Party (or Parties) to which the laboratory/institute/department is affiliated. The composition of the Scientific Committee selected is set forth in Annex 3.

The Scientific Committee shall meet at least once a year and as often as needed at the initiative of the Coordinator or of one third (1/3) of its members. As necessary and with the unanimous consent of the Scientific Committee members, these meetings may be held by videoconferencing. All minutes shall be distributed to the Parties.

Each Party shall transmit to the Coordinator the names of the scientists participating in the activities of the Network, for each member laboratory/institute/department affiliated to said Party. The Coordinator shall compile the list and transmit it to all the members of the Network. The Coordinators shall update the list whenever necessary.

For information purposes only, the list of the staff of the signatory Parties to the Memorandum and of external interested participants is attached to the present Memorandum.

The Coordinator shall draw up an annual scientific and financial report of the Network’s activities which shall be submitted to the Parties.

Article 5 – Implementation of Network activities

The conferences (after consultation with the Network laboratories and institutes), seminars, colloquia, workshops, thematic schools or work meetings on the Network Theme are organized under the sole responsibility of the Party that takes the initiative to do so. Each Party shall fund the participation of each of its members in Network activities.

The laboratories/institutes/departments involved in this Network can fund their participation to their own activities in the Network using their respective grants.

Within the framework of the exchanges referred to in Section d of Article 3 above, the relationship between the institution to which the researcher belongs and the host institution shall be strictly bilateral and their terms and conditions are not governed by this Memorandum.

The Parties shall make mention of the financial resources that they intend to allocate to their participation in Network activities for information purposes in Annex 4.

If two or more Parties intend to carry out research work jointly within the framework of the Network Theme, they shall establish the terms and conditions of said cooperation in a separate agreement binding on the signatory Parties, particularly with regard to Intellectual Property, the ownership and the exploitation of results.

Article 6 – Duration

This Memorandum is entered into for a period of four (4) years as of 1 January 2012.

Any Party may withdraw from this Memorandum by giving six (6) months advance notice by registered letter with acknowledgement of receipt addressed to the other Parties.

Article 7 – Confidentiality

Each Party shall undertake to treat confidentially and not to reveal to third parties any information that comes to them within the framework of the coordination.

Information received by the Parties shall not be confidential information if:

- it was already publicly known at the time of its disclosure hereunder, or becomes thereafter publicly known otherwise than through the fault of a Party;

- it is demonstrably developed at any time by the Parties without any connection with the information received hereunder;

- it is rightfully obtained at any time by the Parties from a third party without restrictions in respect of disclosure or use;

- it is disclosed and/or communicated due to complying with national law, national regulation, a decision by a national authority, and/or national court order. If this is the case, the Party complying with such requirement shall, if legally possible, endeavour to notify the disclosing Party as quickly as possible.

Article 8 – Disputes

It is agreed that, in the event a problem arises from the interpretation or performance of this Memorandum, or if the Parties identify new problems not covered by this Memorandum, the Parties shall enter into amicable negotiations to resolve the problems. If it is necessary, the results of these negotiations could be the subject of amendments to this Memorandum.

If no amicable settlement is reached, the appellant shall request a settlement of the dispute before a competent court, which shall rule in accordance with the rules of international law.

Article 9 – Copies

Drafted in ten (10) copies. Each Party signs one copy and returns it to CNRS. CNRS collates and archives these copies, and sends a certified copy of the signed Memorandum to each of the Parties.

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| --- | --- |
| Date......................... Place.........................  **For CNRS**  **Alain FUCHS**,President | Date......................... Place.........................  **For GRENOBLE INP**  **Brigitte PLATEAU**,Administrator General |
| Date......................... Place.........................  **For UJF**  **Farid OUABDESSELAM**,President | Date......................... Place.........................  **For Université Stendhal**  **Lise DUMASY**,President |
| Date......................... Place.........................  **For SUPÉLEC**  **Alain BRAVO**,Director | Date......................... Place.........................  **For KU Leuven**  **Mark Waer, Rector** |
| Date......................... Place.........................  **For FWO**  **Elisabeth MONARD**,Secretary General | Date......................... Place.........................  **For KTH**  **Björn BIRGISSON**,Vice Rector for Research |
| Date......................... Place.........................  **For UNIVPM**  **Marco PACETTI**,Rector | Date......................... Place.........................  **For University of Kent**  **Mr Simon Kerridge, Director of Research Services** |
|  |  |

**ANNEX 1**

**description of the cooperation**

**Introductory remarks:** Time delay systems represent a wide class of dynamical systems which appears in many fields as, for example, in biology (modeling mainly population dynamics or the transfer phenomena between compartments), in mechanical or electrical engineering (modeling lossless propagation in hydraulics or in electrical circuits), in communication (fluid approximations in communication networks or networked control systems), in transportation (car following models), in economics (modeling consumer memory and fluctuation prices in commodity markets) to cite only a few. As mentioned in the generic examples cited above, delays appear as a natural way in the representation of transport or interconnected systems where either information or materials are exchanged between several entities. In this context, it naturally appears a real need of a *better understanding* of the *effects* caused by *delays* (constant or time-varying, distributed or not) on the dynamics of interconnected systems in order to define and to propose appropriate strategies for improving the dynamical behavior using strategies adapted to the specific cases considered.

In Europe, time delay systems represent an extremely active research field during the last decades but *without* any particular *coordination* between the research groups working in the area. In this frame, the “DelSys” *International scientific coordination network on Delay Systems* gathers several European research teams working in the field of time-delay systems. The *main objectives* of "DelSys" are twofold: first, to *better organize* the *European research* on such topics and second to *better emphasize* the *research trends* in the field. In this sense, we will organize regular joint meetings, invited sessions at international conferences and symposia as well as we will edit monographs and special issues (at various international journals) covering the topics presented and discussed at these various manifestations. A particular attention will be also paid to *educational issues* as, for example, by proposing appropriate Master and PhD introductory lectures to the delay area or spring/summer/autumn schools.

**On the current dynamics of research:** The modeling of congestion in communication networks and in traffic or the use of delays in the modeling of population dynamics are some examples explaining the interest on delay systems is in full expansion, but also is in the process of change (methods and tools adapted to large-scale systems such as networks, or biology by taking into account the dynamics constraints as, for example, the positivity). In this context, it seems as obvious that we need to communicate quickly the latest results, but also to better structure the research on this topic by defining open European-based teams sharing common research interests. Without pretending to completely fulfill this objective, the project has the ambition to establish a research network between the countries in this research area.

In a broader context, the interest of scientific collaborations between different nations is well established and makes more sense in defining an ambitious European space of research in the forthcoming period. It is worth mentioning that many possibilities exist in the European perspective with the European Community and individual projects through international programs such as PHC (“Partenariats Hubert Curien”) or EU-FP (European Framework program) for instance. Our goal is, through this proposal, to participate in a common dynamic for changing a theme.

**Scientific themes:** The *objectives* of Network “DelSys” are to provide an *appropriate coordination* of the research teams, which are involved in the network, on the scientific issues related to time delay systems. As briefly mentioned earlier, at the scientific level, we aim to have a *better understanding* of the *effects* caused by *delays* (constant or time-varying, distributed or not) on the dynamics of interconnected systems to improve the dynamic behavior using appropriate strategies adapted to the specific cases considered. The "strategies" can be either local control laws (as, for example, in power distribution networks), methods of treatment (for instance, the case of chronic leukemia) or implemented algorithms (in case of congestion communication networks or transportation).

The scientific objectives which are addressed within "DelSys" concerns mainly **four** general **themes**:

(a) interactions between delays/modeling, (b) interactions between delays/structure of the controller, (c) interactions between delays/constrained dynamics and (d) interactions between delays/distributed systems. Without any lack of generality, some of the interesting topics included in each theme are briefly presented in the sequel:

1. ***Interactions between delays / modeling.*** Among the problems not completely solved in the open literature, we mention the inclusion of the structure of interconnections (topology of the associated graph), the use of a model using distributed delays instead of a stochastic model with the advantage of a simplified analysis of the overall system. Such views open up new perspectives in the analysis of systems encountered in the modeling of dynamic immune to chronic leukemia, but also to other problems in hematology. A similar observation is valid in the modeling of regulatory mechanisms specific to genetic networks. At the same time, it should also be noted that the interconnection of dynamical systems is characterized by an increased role of the medium supporting information. In addition to propagation and/or transport delays, there are also other phenomena such as communications forcing the loss of information, synchronization issues, packaging and the amount of information carried (encoding, decoding, number of bits, etc.).. The first phenomenon is inevitable in certain types of networks (including, for instance, communication networks without noise) could be modeled by using delays. The second point is related to the problem of synchronizing clocks as well as asynchronous transmissions and can be modeled in terms of time-varying delays;
2. ***Interactions between delays / structure of the controller.*** Networked control systems are complex dynamic systems composed of many simple systems interacting through a communication network. Such a class of systems has naturally emerged from models which include the natural components from the new technologies (miniaturized components, wireless communication etc.). They may represent engineering problems such as sensor networks, autonomous mobile robots but also to biological problems such as grouping and flocking of animals. The two points common to these examples are as follows: first, they are complex systems that can be modeled with differential equations and/or recurrence, and second, the search for globally optimal behavior of such systems requires the solutions of appropriate large-scale optimization problems. It is worth mentioning that these systems require a specific analysis including, for example, a study of robustness with respect to disturbances and an adaptation to environmental changes. The interaction of various elements of the complex system inevitably introduces constraints for communication over a network. Among the constraints, delays in transmission are undeniably taken into account in the development of control laws and estimates. More constraints on the structure of the controller are typical of large systems, where control laws are generally of type PI (proportional-integral), PI or PID (proportional-integral-derivative) including eventually appropriate filters (limits of traditional automation systems). Instruments of controlled thermonuclear fusion (research area of ​​prime importance in the development of sustainable energy), as, for instance, the "Reverse Field Pinch Extrap T2" in Sweden, provide an example of such systems. The same situation is encountered in the case of cryogenic systems used in large instruments such as particle accelerators or Tokamaks;
3. ***Interactions between delays / constrained dynamics***. Among the problems, one has to face to the inclusion of constraints (either on control law or on the state or on the measure). This type of situations is typical for distribution networks, in general, and energy, in particular. Finally, the problem of estimating distributed under the constraints of restricted information (see, e.g. the calculation of a Kalman filter) and in the presence of delays is still an open problem. In the case of biological systems, any conduct in relation to one or more time scales can be interpreted in a context of dynamical systems. The variables must evolve in a certain area of space, "regulators" biological functions should be monotonic and / or bounded. Tools of analysis or synthesis may be useful, such as the concepts and methods developed in the framework of positive systems and / or constraints and delays. An interesting example of the use of these tools is the control of drug delivery in anesthesia.
4. ***Interactions between delays / distributed systems.*** Finally, we consider here the use of the analytical framework provided by time-delay systems to describe hydro- or aerodynamic phenomena, such as irrigation canals or mining ventilation systems. A model with distributed delays, i.e. where the delay is associated with the state of the system can address the problems of interconnection flow and minimizing overall energy expenditure. A particular attention will be taken to the discretization methods, used to represent distributed systems as interconnected systems, and to the impact of an approach behind the residual calculation. The intrinsic properties of controllability and observability of the different models will be particularly analyzed and compared.

**Thematic organization:** To clarify the organization of the network, the activities will be spread over four areas to be developed in successive semesters on the project four years:

1. ***Networked Control System***
2. ***Robustness and delays***
3. ***Tools for control***
4. ***Applications and delays***

In favor of this proposed collaborative project, we would like to point out the following issues:

• *“IFAC Research Group on Time-Delay Systems”:* the International Federation for Research in Automatic Control (IFAC) through its committee “Linear Systems” decided (October 2007) to create an ***IFAC Research Group on time-delay systems***. The objectives of this research group is to coordinate the *organization* of *IFAC Workshops on Time-Delay Systems* (10th edition at Boston in June 2012) as well as to interact with other research groups of IFAC (for example, the research group "fractional systems" on the modeling of diffusive processes and the research group on "distributed parameter systems" on problems of analysis and control) or other scientific societies (see, e.g, the research group of IEEE on “distributed parameter systems”, the research group of SIAM on “dynamic systems” or the “system control” of the ASME);

• *“E-delay-letter”:* Inspired by the model of "E-letters" (Automatic Control, Signal Processing, Mathematics), this “electronic journal” exists for several years by now (started in December 2006) and represents a tool for disseminating information on the about the delay systems worldwide (more than 1,500 researchers and faculty members have subscribed to this newspaper). With regard to the content but also its editorial policy see, for example, the contents of the first number on the website: http://www1.coe.neu.edu/~rifat/e-delay-main.htm

This project, from its construction and the theme of the topics, is a *multidisciplinary* project built around three keywords ***"interconnections"***, ***"dynamics"*** and ***"delays"***. The project description and the examples show a unitary framework for studying a wide class of dynamical systems encountered in the physical sciences, engineering, economics or life sciences and having as goals: an increased knowledge on systems with delay, but also the development of tools for analysis, control and / or decision-making in such systems.

Without being exhaustive, among the expected *outcomes*, we cite:

1. ***Conferences*** (more precisely, invited sessions and pre-conference workshops at main conferences and symposia in the control area);
2. ***Edition of monographs***;
3. ***Education*** (Master and PhD level introductory lectures to delay systems, spring/summer/autumn schools on the field);

## ANNEX 2

**Coordinator of the NETWORK as of JanuarY 1, 2012**

The signatory Parties to the Memorandum for the establishment of the International scientific coordination network (GDRI) entitled “**Delay Systems - DelSys”**hereby appoint **Mr. Alexandre SEURET** (Laboratoire d'analyse et d'architecture des systèmes (LAAS), UPR 8001) as Coordinator of the Networkas of January 1, 2012 for a period of four (4) years.

**ANNEX 3**

**scientific committee of the NETWORK as of January 1, 2012**

- **Alexandre Seuret**, Laboratoire d'analyse et d'architecture des systèmes (LAAS), UPR 8001 (CNRS)

[alexandre.seuret@gipsa-lab.inpg.fr](mailto:alexandre.seuret@gipsa-lab.inpg.fr)

**- Luc Dugard**, Laboratoire Grenoble Image, Parole, Signal, Automatique (GIPSA), UMR 5216 (CNRS/GRENOBLE INP/UJF/Université Stendhal

[luc.dugard@gipsa-lab.inpg.fr](mailto:luc.dugard@gipsa-lab.inpg.fr)

- **Silviu-Iulian Niculescu**, Laboratoire des signaux et systèmes (L2S), UMR 8506 (CNRS/SUPELEC)

[silviu.niculescu@lss.supelec.fr](file:///C:\Application%20Data\Microsoft\Local%20Settings\Temp\silviu.niculescu@lss.supelec.fr)

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[wim.michiels@cs.kuleuven.be](file:///C:\Application%20Data\Microsoft\Local%20Settings\Temp\wim.michiels@cs.kuleuven.be)

- **Karl H. Johansson**, School of Electrical Engineering (KTH), Sweden

[kallej@ee.kth.se](file:///C:\Application%20Data\Microsoft\Local%20Settings\Temp\kallej@ee.kth.se)

- **Sarah Spurgeon,** School of Engineering and Digital Arts (University of Kent), United Kingdom

[S.K.Spurgeon@kent.ac.uk](mailto:S.K.Spurgeon@kent.ac.uk)

- **Giuseppe** **Conte**, Dipartimento di Ingegneria dell'Informazione, UNIVPM

[gconte@univpm.it](mailto:gconte@univpm.it)

**ANNEX 4**

**NETWORK PROjected BUDGET FOR 2012**

| **Country** | **Resources** | **Amount (€)** |
| --- | --- | --- |
| **France** |  |  |
| **A)** **CNRS** | a) Supplementary resources from CNRS (European  Research and International Cooperation office) | 10 000 |
|  | b) Laboratory budget – UMR 5216   * UPR 8001 * UMR 8506 | 1000  1000  1000 |
|  | **Sub-total for CNRS** | **13 000** |
|  |  |  |
| **B)** **GRENOBLE INP** | a) Laboratory budget – UMR 5216 |  |
|  | b) Supplementary resources from GRENOBLE INP |  |
|  | **Sub-total for GRENOBLE INP** | **0** |
|  |  |  |
| **C) UJF** | a) Laboratory budget – UMR 5216 |  |
|  | b) Supplementary resources from UJF |  |
|  | **Sub-total for UJF** | **0** |
|  |  |  |
| **D)** **Université Stendhal** | a) Laboratory budget – UMR 5216 |  |
|  | b) Supplementary resources from Université Stendhal |  |
|  | **Sub-total for Université Stendhal** | **0** |
|  |  |  |
| **E) SUPELEC** | a) Laboratory budget – UMR 8506 | 1000 |
|  | b) Supplementary resources from SUPELEC | 1000 |
|  | **Sub-total for SUPELEC** | **2000** |
|  |  |  |
|  | **Total for France** | **15 000** |
|  |  |  |
| **Belgium** |  |  |
| **KU Leuven** | a) Department budget | 1000 |
|  | b) Supplementary resources from KU Leuven |  |
|  | **Sub-total for KU Leuven** | **1000** |
|  |  |  |
| **FWO** | Supplementary resources from FWO1 |  |
|  |  |  |
| **Sweden** |  |  |
| **KTH** | a) School budget | 1000 |
|  | b) Supplementary resources from KTH |  |
|  | **Sub-total for KTH** | **1000** |
|  |  |  |
| **United Kingdom** |  |  |
| **University of Kent** | a) Travel expenses | 1000 |
|  | b) Supplementary resources from University of Kent |  |
|  | **Sub-total for University of Kent** | **1000** |
|  |  |  |
| **Italy** |  |  |
| **UNIVPM** | a) Department budget | 1000 |
|  | b) Supplementary resources from UNIVPM |  |
|  | **Sub-total for UNIVPM** | **1000** |
|  |  |  |
|  | **TOTAL** | **19 000** |

FWO will consider each funding application by the Flemish team separately, and in competition with

other applications