ANNEX I

LIST OF PARTICPANTS AND DESCRIPTION OF WORK

Network Title:
Algebraic K-Theory, Linear Algebraic Groups and Related Structures

Network Short Title: **K-Theory and Algebraic Groups**

Part A – The Participants

The Principal Contractor ant the Members listed below shall be jointly and severally liable in the execution of work defined in Part B of this Annex:

The Principle Contractor

1.	University of Bielefeld	established in Germany

The Members

2.	University of Regensburg	established in Germany
3.	Université de Franche Comté, Besançon	established in France
4.	Université Paris 7-Denis Diderot [UP7-DD]	established in France
5.	Université catholique de Louvain [UCL]	established in Belgium
6.	Universitá di Genova [DIMA UGOA]	established in Italy
7.	University of Edinburgh [UEDIN]	established in United Kingdom
8.	University College Dublin [NUID/UCD]	established in Ireland
9.	École Polytechnique Fédérale de Lausanne [EPFL]	established in Switzerland
10	Bar-Ilan University	established in Israel
11.	Institute of Mathematics, National Academy of Sciences [Minsk]	established in Belarus
12.	A. Razmadze Mathematical Institute [RMI]	established in Georgia
13.	St. Petersburg Branch of Steklov Mathematical Institute Russian Academy of Sciences [RAS]	established in Russia

The Principal Contractor and the Members are referred to jointly as "the Participants".

Part B – The Joint Programme of Work

1 Project Objectives

The objectives of this proposal are:
To investigate problems in algebraic K-theory, linear algebraic groups, in particular, reductive groups, and their related structures like Azumaya algebras, Jordan algebras, Brauer groups, quadratic and Hermitean forms, by applying and combining methods from all these disciplines, in order to gain methodological synergy and to thereby considerably extend and stretch the range of the underlying theories.
Due to recent progress in these fields already made, and due to the fact that the proposed network combines leading experts in all its areas, major breakthroughs can be expected in all fields covered by this network, in particular in algebraic K-theory, in the theory of anisotropic reductive groups, their internal structures, and their cohomological invariants, and in the related theories mentioned above.
While reductive groups are well understood insomuch they are isotropic, due to the fruitful research of the last century, initiated by Killing in 1888, it still is a major challenge to understand anisotropic reductive groups and their underlying structures, about which still very little is known in general.
Homological methods like Galois Cohomology and K-Theory will play a prominent role in these research efforts.
It is the main objective of this proposal to bring together the expertises of these fields in order to promote their research significantly by mutual benefit, and, in particular, to attract young researchers at the postdoc level into this broad area by international exchange and intensive training.

2 Research Method

This project combines areas which have developed their own "mathematical culture", like algebraic K-theory, linear algebraic groups, quadratic and Hermitean forms, Brauer groups, Azumaya algebras and others.
As history and recent research have shown that these fields can influence each other in a very fruitful way, it is the incentive of this proposal to bring scientists of these various branches together for useful cooperation.
Since the scientific resources of the single EC countries are limited, it is intended to overcome these limitations by extensive exchange of scientists, in particular, of postdoc scientists.

In order to solve all project tasks given below, a sequence of 14 conferences, workshops, and summerschools are organized in order to enable the participants to work jointly by cooperation and consulting.
Postdocs should have the possibility to work for 12 to 18 months, say, in a team of a country different from their nationality in order to be trained by the host team's expertises. Since individual research or research in small groups is the appropriate method in the field of mathematics, and since all the teams involved in this project are guided by internationally very well recommended end experienced researchers, who have significant experiences in the training and the educating of young scientists it is guaranteed that this methodological approach is appropriate and consistent with the objectives of this proposal.
The work in small teams is accompanied by a reasonably chosen number of conferences and workshops, which allow a regular exchange of new ideas in the various scientific areas of this project.
Since all the fields mentioned in the proposal are represented in the teams of this proposal by internationally leading experts, it is also obvious that the proposed network integrates complementary techniques in an adequate and effective manner.
Each team integrates its postdocs in regular research seminars, workshops, etc. in such a way that they can learn an expertise which is complementary to the one they learned in their home country.

3 Work Plan

The work will consist in research on the topics metioned below.
Milestones which can be used as assessment criteria for the midterm or final report are any of the network workshops and conferences given below as well as any major publication in an area marked by a '$\star$' in the list of tasks below, but also it could turn out that a research result in any other topic should be counted as a "milestone'.
For most research projects, a list of team numbers of cooperating teams (in square brackets) is given.

Team 1: Bielefeld

(Cooperation with Duisburg, Göttingen, Münster, Osnabrück)

- Algebraic K-Theory of non-linear projective spaces and of non-linear toric varieties [4,7,12]

$\star$ Exotic ring maps of $\mathbf{Z}$ (the ring of natural integers) distinguished by means of formal group laws [4,7,12]
$\star$ The algebraic closure of the sphere spectrum [4,7,12]
$\star$ Topological Hochschild homology and A_∞ rings [4,7,12]
$\star$ Structure of maximal tori in anisotropic semisimple groups [2,10,13]

⋆ Crystallographic subgroups of a linear group [10]
• Galois cohomological invariants of semisimple groups [9,10,13]

Team 2: Regensburg

⋆ Composition and Jordan algebras, exceptional simple algebraic groups [1,13]
⋆ Book project: Specialization of quadratic and symmetric bilinear forms [1,8]
⋆ Higher-dimensional class field theory for varieties over local fields, Hasse principles and rigidity for complexes of Bloch-Ogus type [4,6]
• Diophantine equations [6,13]

Team 3: Besançon

Cooperation with Strasbourg)
⋆ Quadratic forms over arbitrary fields (stable birationality, birationality, motivic equivalence, similarity), and invariants of fields with respect to quadratic forms [1,2,4,5,8,9,13]
⋆ Rationality questions for algebraic groups [5,9,13]
• Algebras with involution, in particular invariants of such algebras and of their involutions [5,9,13]
• Trace forms of algebras [5,9,13]

Team 4: UP7 – Paris

⋆ Motivic cohomology and homotopy theory of schemes [6,13]
⋆ Number theory and cyclic homology [1,3,9]
⋆ Knot invariants, topological field theories [1,7]
• Mac Lane homology, homotopy theory of functors [1,7,12]
• Representation of discrete groups and K-theory [1]
⋆ A project milestone is the IHP semester planned during Spring and Summer 2004 : it will start on March 1st and will end in July with a 2-weeks conference. See the section "Training" below.

Team 5: UCL – Louvain-la-Neuve

(Cooperation with Ghent, Lens)
⋆ Systems of quadratic forms over fields. [1,2,3,8]
⋆ Model theoretic methods and quadratic forms. [1,2,3,8]
⋆ Quadratic forms, classical groups and their cohomological invariants. [1,3,8,9]
• Field invariants associated to division algebras and quadratic forms [10,11]
• Splitting patterns of quadratic forms of dimension at most 20. [1,2,3]
⋆ Motives of homogeneous varieties. Pfister neighbors in terms of Rost projectors. [1,3,6,13]
⋆ Orthogonal representations of classical groups [4,9,10].

Team 6: DIMA – Genova

(Cooperation with Roma, Napoli, Bologna)
⋆ Algebraic cycles and motivic cohomology [5,13]
• Real geometry [1,4]
⋆ A^1- homotopy of schemes [1,4,13]

⋆ Chow motives of complex surfaces [1,4,13]
• Homological properties of graded algebras, applications to computer algebra [3,4,12]

Team 7: UEDIN – Edinburgh

(Cooperation with Aberdeen, Durham)
⋆ Applications of algebraic K-theory to the classification of manifolds in topology [1,4,12]
⋆ Algebraic K-theory of spaces [1,4,12]
• The theory of n-valued groups [1,4,12]

Team 8: NUID/UCD – Dublin

⋆ Quadratic forms and central simple algebras with involution. [1,2,5,9,11,13]
⋆ Exterior and symmetric powers of forms, Schur functors and quadratic forms. [1,2,5]
• K_2 of integers in number fields, tame and wild kernels [1,4,6]
• Group-invariant integral lattices [1,10]

Team 9: EPFL – Lausanne

(Cooperation with UNI Lausanne and ETH Zürich)
⋆ Galois Cohomology of Linear Algebraic Groups [1,3,5]
• Finite Subgroups of Linear Algebraic Groups [1,10]
• Algebras with Involution [3,5]
⋆ Quadratic and Hermitean Forms [1,2,3,5,7,8,13]
⋆ Ideal Lattices and Tamagawa Numbers [1]

Team 10: Bar-Ilan

(Cooperation with Tel Aviv)
• Identities in linear groups [1,6,10]
⋆ Semisimple algebraic groups and their homogeneous spaces [1,5,13]
⋆ Crystallographic subgroups of linear groups [1,6,9]
• Fibrations into homogeneous varieties with prescribed local invariants [4,11,13]

Team 11: Minsk

⋆ Two-torsion of Brauer groups of curves, Shafarevich-Tate and Selmer groups of their Jacobians [1,5]
⋆ Invariants of central simple F-algebras over algebraic curves, pencils of Severi-Brauer varieties with prescribed degeneration data [1,5,8]
• Essential dimension cohomological invariants, R-equivalence for algebraic groups. [1,4,9,13]
• Motives and algebraic cycles of surfaces of general type [2,4,6,13]

Team 12: RMI – Tbilisi

⋆ Mac Lane homology, polynomial functors and functor homology [1,3,4,7]
• Homotopy invariance properties for higher K-theory of toric varieties and a generalized algebraic K-theory via groups of automorphisms of toric varieties [1,3,4,7]
⋆ Cohomological investigation of associative algebras and related objects: Lie and Leibniz algebras and algebras up to homotopy [1,3,4,7]

Team 13: RAS – St.Petersburg

⋆ Riemann-Roch theorem for a multiplicative transformation of oriented cohomology theories. [4,6,9]
⋆ Rigidity theorems for any cohomology theory (in the sense of Voevodsky and Morel) on algebraic varieties. [4,6,9]
• Extend Voevodsky's results on functors with transfers to the case of "locally extendible" functors. [4,6,9]
⋆ Fundamental class of a projective variety [1,4,9]
• Dimensions and canonical forms of intersections of conjugacy classes with cells; dimensions of products of orbits of semisimple groups. [1,4,6,9]

Table 1: Professional research effort on the network project

Participant	Young researchers to be financed by the contract (person-months) (a)	Researchers to be financed from other sources (person-months) (b)	Researchers likely to contribute to the project (number of individuals) (c)
1. Bielefeld	44	144	18
2. Regensburg	33	60	9
3. Besancon	53	144	18
4. UP7	28	144	17
5. UCL	36	144	17
6. DIMA	36	96	12
7. UEDIN	15	84	9
8. NUID/UCD	15	84	9
9. EPFL	30	228	22
10. Bar-Ilan	30	72	10
11. Minsk	0	24	3
12. RMI	0	56	7
13. RAS	0	40	5
Totals	320	1320	156

4 Organisation and Management

i) *Structure for decision making:* Decisions concerning the network as a whole will be made by the local coordinators, either on the basis of email discussions, or on network meetings the occasion of of the planned workshops or conferences. Decisions concerning meetings or other events will be made by the respective scientific committees on a similar basis.

ii) *Means of communication:* Personal email and broadcasts of bulk email are the tools to communicate about network events. A well established preprint server on "Linear Algebraic Groups and Related Structures" (http://www.mathematik.uni-bielefeld.de/LAG/) is used to dissiminate the research results among the network researchers. The meetings of the network will be used for formal and informal communication.

iii) *Workshops/meetings:* Network members/young reearchers are invited to participate in these meetings and to contribute by giving talks (see Table 2).

iv) *Tools for monitoring progress:* Progress is monitored on the occasion of the (networkwide published) annual progress reports. Research preprints are published on the network preprint server, every time such a preprint is published this is broadcasted by email to the network community.

v) 'Mentors' for foreign young researchers: Since all the partners employing young researcher are mathematical departments of Universities, the young researchers are working int the context of well established research seminars, which are guided by experienced senior scientists, who will act as mentors for the young scientists. On the occasion of the establishment of their working contract the young researchers will be informed about the network facilities, their rights and obligations.

Table 2: Schedule of Conferences, Workshops and Summerschools, and other Training Events

	Month	Date	Event	Organizing Teams
i.	(-1)	May 12–18, 2002	Oberwolfach Conference on quadratic forms	[3], [5]
ii.	(0)	Jun 2002	Lens: Summerschool (4 days)	[5],[3]
1.	1	July 8–26, 2002	Trieste: School and Conference on Algebraic K-Theory and its Applications	[6], [4]
2.	2	Aug 4–10, 2002	Oberwolfach conference on K-theory	[2], [4]
3.	11	May 2003	Regensburg: Workshop on quadratic forms: "Generic Splitting"	[2], [1]
4.	12	Jun 2003	Lens: Summerschool (4 days)	[5],[3]
5.	13	Jul 2003	Trento: Summer School "K-Theory and its applications to Algebra and Topology" (1 week)	[6],[1], [10],[13]
6.	21	May 2004	Bar-Ilan: Workshop on algebraic groups and related topics (2 weeks)	[10], [1], [11], [13]
7.	(19–24)	Feb-Jun 2004	Paris: IHP Semester on K-theory and non commutative geometry	[4]
8.	24	Jun 2004	Lens: Summerschool (4 days)	[5],[3]
9.	25	Jul 2004	Edinburgh: Summerschool on the applications of algebra to knot theory	[7], [1], [12]
10.	25	Jul 2004	Dublin: Training conference on "K-theory, quadratic forms, and algebras with involution"	[9], [1], [4], [5]
11.	27	Sep 2004	Bielefeld: Midterm Review Meeting and Postdoc Conference (5 days)	[1] + all teams
12.	35	May 2005	Regensburg: Workshop on quadratic forms: "Witt-Rings of Varieties"	[2], [13]
13.	36	Jun 2005	Lens: Summerschool (4 days)	[5],[3]
14.	45	Mar 2005	Bielefeld: Final Postdoc Conference on K-Theory, algebraic groups and related structures (1 week)	[1] + all teams

5 Training

- **Appointment of Young Researchers**

  A minimum overall total of 320 (see the table below) person-months will be provided by young researchers whose employment will be financed by the contract.

Young researchers to be financed by the contract				
Participant	Young pre-doctoral researchers to be financed by the contract (person-months) (a)	Young post-doctoral researchers to be financed by the contract (person-months) (b)	Total (a+b) (c)	Scientific specialties in which training will be provided (d)
1. Bielefeld		44	44	M02,M03
2. Regensburg		33	33	M02
3. Besançcon	12	41	53	M02
4. UP7		28	28	M02,M03
5. UCL	12	24	36	M02
6. DIMA	12	24	36	M02
7. UEDIN		15	15	M02,M03
8. NUID/UCD		15	15	M02
9. EPFL		30	30	M02
10. Bar-Ilan		30	30	M02
11. Minsk		0	0	M02
12. RMI		0	0	M02,M03
13. RAS		0	0	M02
Totals	36	284	Overall Total 320	

Position vacancies for young researchers will be published on the network home page and will be broadcasted by bulk email to lists of scientists and institutes working in appropriate areas. Also, if necessary, the newsletters of the national mathematical societies will be used to publish those vacancies.

Based on the experiences of the network during the past 4 years (contract TMR-Network ERB FMRX CT-97-0107), difficulties in hiring are not anticipated.

- **Training Programme**

  This network offers an exchange program consisting of 320 months of fellowships for pre- and postdoctoral scientists, and in addition it will organize short term visits for all participating scientists.

  Also, the network offers a total of 14 *accompanying conferences, summer schools and workshops*.

  UP7 – Paris offers a particular training semester at the Institut Henri Poincaré (IHP) in Spring 2004 with courses on Motivic cohomology, algebraic K-theory, rational homotopy of algebraic varieties, cyclic homology and related subjects. This event as well as all the workshops and summerschools will be *milestones* for the training offered by the network.

  All network teams are guided by experienced senior scientists, who are among the leading in their fields, working in well established groups, usually with many international scientific visitors, in mathematics departments with elaborated training programmes including *lectures, seminars, workshops*, on both, pre-doctoral and post-doctoral level.

  Hence visiting pre- and post-doctorals and other staff working on the project are guaranteed to receive optimal training in an academic environment.

  The organization of the workshops and summer school of this project will, for example, be based on experiences from TMR-Network ERB FMRX CT-97-0107, since many such events have been organized in that frame.

  The network will integrate the young researcher into the network organization, e.g., will encourage them to become members of scientific committees of the various workshops and conferences.

  This programme offers some intra-mathematics multidisciplinary aspects. A combined offer of training in algebra as well as in topology is given, since there are many occasions where a combination of methods yield unexpected and otherwise unreachable results.