



EUROPEAN COMMISSION  
RESEARCH DG HUMAN RESOURCES  
AND MOBILITY

RTN Periodic Activity Report

**Project No.:** 503369

**Project Acronym:** QUEST FOR UNIFICATION

**Project Full Name:** THE QUEST FOR UNIFICATION : THEORY  
CONFRONTS EXPERIMENT

## Marie Curie Actions

# RTN Periodic Activity Report

**Period covered:** from 01/10/2005 to 30/09/2006

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ECOLE POLYTECHNIQUE

**Version:** 2

# Marie Curie Actions

## RTN Periodic Activity Report

### GENERAL INFORMATION

<b>Project No.:</b>	503369
<b>Project acronym:</b>	QUEST FOR UNIFICATION
<b>Project full name:</b>	THE QUEST FOR UNIFICATION : THEORY CONFRONTS EXPERIMENT
<b>Period number:</b>	2nd
<b>Period covered - start date:</b>	01/10/2005
<b>Period covered - end date:</b>	30/09/2006
<b>Project start date:</b>	01/10/2004
<b>Project duration [months]:</b>	48
<b>Project coordinator name:</b>	Prof. IGNATIOS ANTONIADIS
<b>Project coordinator organisation name:</b>	ECOLE POLYTECHNIQUE
<b>Date of submission:</b>	13/11/2006

## SUMMARY OF THE RECRUITMENT DURING THE REPORTING PERIOD

**Contractor:** ECOLE POLYTECHNIQUE

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				
Francesco Nitti	ER (4-10 years)	IT-Italy	No	Male	01/09/2005	31/08/2006	11
Pablo Camara	ER (4-10 years)	ES-Spain	No	Male	01/09/2006	31/08/2008	1

**Contractor:** COMMISSARIAT A L'ENERGIE ATOMIQUE

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				

**Contractor:** RHEINISCHE FRIEDRICH-WILHELMS-UNIVERSITAET BONN

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				
Andrei Micu	ER (4-10 years)	RO-Romania	Yes	Male	01/10/2005	30/09/2008	12

**Contractor:** ARISTOTLE UNIVERSITY OF THESSALONIKI

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				
Iain Nicholas Richard Peddie	ER (4-10 years)	UK-United Kingdom	No	Male	06/09/2005	05/09/2007	12

**Contractor:** ISTITUTO NAZIONALE DI FISICA NUCLEARE

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				
Vyacheslav Rychkov	ER (4-10 years)	RU-Russian Federation	No	Male	01/09/2005	31/08/2007	12

**Contractor:** SCUOLA INTERNAZIONALE SUPERIORE DI STUDI AVANZATI

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				
Nicolas Moeller	ER (4-10 years)	DE-Germany	No	Male	01/10/2005	30/09/2007	12

**Contractor: INSTITUTO SUPERIOR TECNICO**

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				
Maria Amparo Tortola	ER (4-10 years)	ES-Spain	Yes	Female	01/02/2006	31/01/2008	8

**Contractor: UNIVERSIDAD AUTONOMA DE MADRID**

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				
Stefan Antusch	ER (4-10 years)	DE-Germany	No	Male	01/09/2005	31/08/2007	12

**Contractor: UNIVERSITAT DE VALENCIA**

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				

**Contractor: THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD**

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				
Gianmassimo Tasinato	ER (4-10 years)	IT-Italy	No	Male	01/09/2005	31/08/2007	12
Andreas Athenodorou	ESR (<4 years)	CY-Cyprus	No	Male	01/10/2005	30/09/2008	12

**Contractor: UNIWERSYTET WARSZAWSKI**

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				
Kin-ya Oda	ER (4-10 years)	JP-Japan	No	Male	01/10/2005	31/03/2006	6
Oliver Eyton-Williams	ER (4-10 years)	UK-United Kingdom	No	Male	16/05/2006	15/11/2006	4.5

**Contractor: EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH**

Name of the Researcher (as stated at time of selection)	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months covered by this recruitment during this reporting period
		Country	LFR				

## SUMMARY OF THE EMPLOYMENT FORECAST FOR THE NEXT REPORTING PERIOD

**Contractor:** ECOLE POLYTECHNIQUE

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Pablo Camara	ER (4-10 years)	ES-Spain	No	Male	01/09/2006	31/08/2008	12
Arunansu Sil	ER (4-10 years)	IN-India	No	Male	01/10/2006	31/05/2007	8

**Contractor:** COMMISSARIAT A L'ENERGIE ATOMIQUE

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Arunansu Sil	ER (4-10 years)	IN-India	No	Male	01/06/2007	30/09/2008	4

**Contractor:** RHEINISCHE FRIEDRICH-WILHELMS-UNIVERSITAET BONN

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Andrei Micu	ER (4-10 years)	RO-Romania	Yes	Male	01/10/2005	30/09/2008	12

**Contractor:** ARISTOTLE UNIVERSITY OF THESSALONIKI

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Iain Nicholas Richard Peddie	ER (4-10 years)	UK-United Kingdom	No	Male	06/09/2005	05/09/2007	11

**Contractor:** ISTITUTO NAZIONALE DI FISICA NUCLEARE

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Vyacheslav Rychkov	ER (4-10 years)	RU-Russian Federation	No	Male	01/09/2005	31/08/2007	11
Olga Mena Requejo	ER (4-10 years)	ES-Spain	No	Female	01/10/2006	30/09/2008	12

**Contractor:** SCUOLA INTERNAZIONALE SUPERIORE DI STUDI AVANZATI

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Nicolas Moeller	ER (4-10 years)	DE-Germany	No	Male	01/10/2005	30/09/2007	12

**Contractor:** ISTITUTO SUPERIOR TECNICO

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Maria Amparo Tortola	ER (4-10 years)	ES-Spain	Yes	Female	01/02/2006	31/01/2008	12

**Contractor: UNIVERSIDAD AUTONOMA DE MADRID**

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Stefan Antusch	ER (4-10 years)	DE-Germany	No	Male	01/09/2005	31/08/2007	11

**Contractor: UNIVERSITAT DE VALENCIA**

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Satoru Utsunomiya	ER (4-10 years)	JP-Japan	No	Male	01/10/2006	30/09/2008	12

**Contractor: THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD**

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Gianmassimo Tasinato	ER (4-10 years)	IT-Italy	No	Male	01/09/2005	31/08/2007	11
Andreas Athenodorou	ESR (<4 years)	CY-Cyprus	No	Male	01/10/2005	30/09/2008	12

**Contractor: UNIWERSYTET WARSZAWSKI**

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Oliver Eyton-Williams	ER (4-10 years)	UK-United Kingdom	No	Male	16/05/2006	15/11/2006	1.5

**Contractor: EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH**

Name of the Researcher	Type	Origin		Gender	Start date of recruitment	End date of recruitment	No. of full-time equivalent months in the next reporting period
		Country	LFR				
Cedric Delaunay	ESR (<4 years)	FR-France	No	Male	01/12/2006	28/02/2007	3

# PROJECT ACHIEVEMENTS DURING THE REPORTING PERIOD

## Research Achievements

General progress and comparison with the Work Programme:

Progress has been made in essentially all the main directions of our work plan. The scientific highlights in the six research topics of the network are described in a separate document. As can be seen from the publication list, the network during the second year of the contract produced 150 joint publications (involved at least two different nodes) that have received already about 1000 citations.

There was no essential difference in the distribution of tasks planned in the Work Programme. From the description of the scientific highlights, it appears that there was somewhat less activity than expected on extra dimensions (task e), while there was more research effort on supersymmetry and string related phenomenology. The main topics of activity where breakthroughs were obtained are (i) naturalness and electroweak precision tests, (ii) methods of supersymmetry breaking mediation, (iii) holographic description of QCD, (iv) tachyon condensation.

It follows that Milestone 14 (non-perturbative string dynamics and AdS/CFT correspondence) and Milestone 6 (supersymmetry breaking and mediation mechanisms) were already achieved, much earlier than expected (3rd and 4th year, respectively). Moreover, Milestone 2 (study of models of flavor), Milestone 5 (models of neutrino masses and mixing and prospects for neutrino long baseline and factory experiments) and Milestone 12 (systematic construction of unification models) were also achieved, according to the schedule, while decisive progress was made towards Milestone 9 (brane cosmology) whose completion is expected for next year.

On the other hand, Milestone 3 (study of CP violation in K and B physics in extensions of the Standard Model), Milestone 7 (comparison with observations of the predictions of inflationary models) and Milestone 11 (study of moduli stabilization from non-trivial fluxes) were already achieved during the first year of the contract, according to the plan. However, further results were obtained mainly in Milestone 7 (curvature models, racetrack models, inflation from landscape of vacua, sources of non-gaussianity in CMB) and Milestone 11 (moduli stabilization in M-theory, effective supergravity of flux compactifications and supersymmetry breaking).

Finally, significant progress was made towards the remaining Milestones of the Work Programme: Milestone 1 (Higgs phenomenology from Palaiseau, Saclay, INFN, Oxford, CERN), Milestone 8 (lepto/baryo-genesis from Saclay, Greece, INFN, Trieste, Oxford), Milestone 13 (gravitational phenomena in brane constructions from Palaiseau, Saclay, Greece, Oxford, CERN), Milestone 4 (experimental tests of supersymmetry from Greece, Lisbon, Valencia, Oxford, Warsaw, CERN), and Milestone 10 (brane construction of the Standard Model from Palaiseau, Bonn, Oxford, Madrid, CERN).

The participation of network members in international conferences and workshops is given in a separate document. The visits and secondments are listed below:

From Palaiseau

to Greece: D. Orlando (12/05), I. Antoniadis (04/06)

to Trieste: I. Antoniadis (03/06)

to CERN: C. Papineau (03/06), S. Vempati (02/06, 04-06/06), E. Dudas (sabbatical)

to Madrid: H. Partouche (12/05), I. Antoniadis (12/05, 07/06)

to US team: I. Antoniadis (11/05, 08/06), C. Papineau (06/06)

to Oxford: I. Antoniadis (03/06)

to INFN: I. Antoniadis (09/06)

From Saclay

to US team: C. Grojean (06/06)

to CERN: C. Grojean (long term), G. Servant (long term), C. Savoy (10/05, 04/06, 07/06)

to Oxford: P. Brax (12/06, 03/06), C. Grojean (12/05)

to INFN: M. Frigerio (02/06), C. Savoy (10/05)

to Bonn: M. Thormeier (8 times in 06)

From Bonn

to Madrid: H.-P. Nilles (12/05), H. Samtleben (12/05)  
to Palaiseau: H.-P. Nilles (06/06), O. Lebedev (05/06), Michael Ratz (05/06)  
to Oxford: H.-P. Nilles (12/05)  
to CERN: O. Lebedev (12/05, 02/06), A. Hebeker (04/06), C. Wetterich (03/06)

From Greece

to Palaiseau: G. Zoupanos (01/06)  
to CERN: N. Tetradis (08/06), G. Zoupanos (08/06)

From INFN

to CERN: A. Sagnotti (sabbatical), A. Riotto (sabbatical), M. Passera (08/06), M. Pietroni (11/05), F. Feruglio (09/06), V. Rychkov (08/06)  
to Palaiseau: F. Zwirner (11/06)  
to Madrid: F. Zwirner (12/05), A. Strumia (12/05), F. Feruglio (01/06), A. Brignole (09/06)  
to Lisbon: F. Joaquim (09/06)  
to Valencia: M. Pietroni (05/06)  
to Oxford: M. Passera (02/06)  
to Saclay: I Masina (06/06)

From Trieste

to CERN: M. Serone (02/06), K.S. Narain (11/05, 02/06)  
to Saclay: B. Bojc (11/05)  
to Valencia: F. Bazzocchi (two times in 10/05)

From Lisbon

to Valencia: J.C. Romao (11/05, 04/06, 09/06), M. Tortola (04/06, 09/06)  
to Madrid: J.C. Romao (12/05)  
to CERN: G. Branco (11/05, 02/06, 05/05), M. Rebelo (11/05, 01/06, 07/06), J. Silva-Marcos (01/06)  
to Trieste: G. Branco (10/05)

From Madrid

to Palaiseau: J.R. Espinosa (05/06), A. Ibarra (06/06)  
to CERN: A. Pomarol (sabbatical), L. Ibanez (07-08/06)  
to Saclay: T. Hambye (11/05)

From Valencia

to Lisbon: J. Valle (02/06), A. Villanova del Moral (02/06)  
to CERN: W. Porod (11/05, 05/06), N. Rius (08/06)

From Oxford

to Madrid: S. Sarkar (12/05, 06/06)  
to CERN: G. Ross (07/06), J. March Russell (03/06, 04/06, 07-08/06)  
to US team: G. Ross (08/06), F. Quevedo (08-09/06)  
to INFN: J. March Russell (09/06)  
to Greece: S. Sarkar (04/06)  
to Warsaw: S. Sarkar (05/06)  
to Saclay: A. C. Davis (06-08/06)

From Warsaw

to Palaiseau: S. Pokorski (06/06)  
to Madrid: Z. Lalak (12/05)  
to CERN: P. Chankowski (01/06), S. Pokorski (03/06)

From CERN

to INFN: R. Rattazzi (02/06, 06/06), A. Uranga (06/06)  
to Oxford: G. Veneziano (04/06)  
to Palaiseau: G. Veneziano (05/06), A. Uranga (05/06), A. Delgado (06/06), M. Perez-Victoria (06/06), A. Falkowski (06/06)

to US team: A. Uranga (08/06), G. Giudice (08/06)  
to Warsaw: A. Delgado (05/06), A. Falkowski (07/06)  
to Saclay: S. Pascoli (01/06)

From US team

to INFN: L. Hall (06/06), S. Dimopoulos (06/06)  
to CERN: G. Perez (11/05), (S. Dimopoulos (08/06), M. Schmaltz (01/06)  
to Palaiseau: P. Fox (05/06), M. Papucci (05/06), M. Schwartz (06/06), S. Dimopoulos (08/06)  
to Madrid: L. Hall (12/05)

Scientific prizes:

- Gabriele Veneziano (CERN node): University of Berne Albert Einstein Medal (2006)
- Giovanni Villadoro (Rome/INFN node): "INFN Sergio Fubini Prize 2006" for the best Ph.D. theses in theoretical physics. His work, under the supervision of Fabio Zwirner, was part of the network activities.

Outreach activity:

US-team: L. Hall is the Director for the Berkeley Center of Theoretical Physics, and has been involved with fund-raising for the Center and for the Physics Department. In particular, he circulated a brochure that resulted in well over \$100,000 in donations for the center.

Greek node: i) In March 06, N.D. Vlachos and N. Tracas organized the 2nd "Master Classes" in Particle Physics. About 250 high school students were gathered at the premises of Athens University, National Technical University, N.R.C. Demokritos and University of Thessaloniki, and followed whole-day seminars on Particle Physics (theory, accelerators and detectors). In April 06, 50 students of the Technological Institute of Lamia followed the same course, while a number of high school teachers in Athens attended similar activities.

ii) Seminars to three high schools were delivered by N. Tracas in the island of Lefkada during the international conference on "Exact Renormalization Group" (September 06). In numerous high schools of Athens, N. Tracas delivered seminars to final-year students who take the national exams for university entry.

iii) The National Technical Univ. of Athens Press has published in greek the book 'The charm of strange quark' by Barnett, Muhry and Quinn, under the supervision of N. Tracas.

## Training and ToK

According the Work Plan, most of the young researchers were employed during the second year of the contract but were selected in the first year, as described in the 1st annual report. Five of them had started their employment in September 05: Francesco Nitti (ER in Ecole Polytechnique/Palaiseau), Iain Peddie (ER in Thessaloniki/Greece), Vyacheslav Rychkov (ER in Pisa/INFN), Stefan Antusch (ER in Madrid), Gianmassimo Tasinato (ER in Oxford). Four more started beginning of October 05: Andrei Micu (ER in Bonn), Nicolas Moeller (ER in SISSA/Trieste), Kin-ya Oda (ER in Warsaw), Andreas Athenodorou (ESR in Oxford), while three more started during 2006: Maria Amparo Tortola (ER in Lisbon from February 06), Oliver Eyton-Williams (ER in Warsaw from May 06), and Pablo Camara (ER in Ecole Polytechnique/Palaiseau from September 06). Finally, S. Antusch, who was initially hired for three years, will stay only two (until 31.08.07) because he was offered a 5-years position in T.U. Munich. Therefore Madrid has one year vacancy for the last year of the contract.

Their expected employment is two years, except for A. Micu and the ESR A. Athenodorou who are expected to stay three years. On the other hand, F. Nitti was paid one year (until 30.09.06) and then was moved on different funds but remains a member of the coordinating node. Moreover, K. Oda stayed only six months in Warsaw and then moved back to Japan in a longer term position. He was replaced by O. Eyton-Williams who will be paid from the contract for the remaining six months (until 15.11.06). Three more young researchers have arrived in the beginning of the third year of the contract. These are (besides P. Camara who started already in September 06): Arunasu Sil (ER partly in Ecole Polytechnique/Palaiseau and partly in Saclay), Olga Mena Requejo (ER in INFN/Rome),

Satoru Utsunomiya (ER in Valencia).

All vacancies were published in the Web (on the home page of the network, as well as of the local institutes, and in the Web site of CORDIS) and were announced to the main institutions active in our research field, world-wide. All available standards were used, as well as modern electronic means: Robot Jobmenu, High Energy Physics Information Center (HEPIC), Physics Jobs, TIPTOP and CERN. In addition, the announcements were sent to many institutions in Europe and to special mailing lists of senior people who sent suggestions for candidates. A large number of applications was received, varying between 50 and 100 per node with vacancy. The selection procedure was made locally and was based mainly on scientific excellency on the main research topics of the network. The majority of the selected ER's (9/15) were previously in institutes related to (other) network nodes, either as students or as postdocs (P. Camara in Madrid, A. Micu in Hamburg/Sussex, I. Peddie in Southampton, O. Mena in Madrid, M. Tortola in Valencia, S. Antusch in Southampton, K. Oda in Bonn, G. Tasinato in SISSA/Bonn and O. Eyton-Williams in Southampton). Up to now, four of the twelve your researchers employed by the network came from a country "outside" EU: V. Rychkov for 2 years (included in the 1st report), K. Oda for 6 months (2nd report), A. Sil for 2 years and S. Utsunomiya for 2 years (both in the 3rd report).

Compared to the initial planing, appart from minor modifications in the expected starting dates of the appointment contracts (in four nodes by one month earlier and in two by a few months later), the main difference is that in three nodes (Saclay, Greece and Valencia) the employment was delayed by a year. These changes are not significant for the Work Plan but, on the contrary, made the employment rate of young researchers more balanced over the remaining years of the contract. We also decided to make a minor redistribution of months between the two french nodes (Ecole Polytechnique and Saclay) mainly for complementarity of training for the recruited ER (string theory and phenomenology) but also for financial reasons. A. Sil started his appointment in October 06 in EP for 8 months on fixed stipend and then will move to Saclay for the remaining 16 months. During his stay in EP, he has also an office in Saclay where is expected to spend a maximum of 30% of his time. This implies that there will be a corresponding redistribution of funds (8 person months of stipend will be transfered from Saclay to the Coordinating node), as described in the Periodic Management and financial reports.

Another modification of the employment plan is due to a leftover of funds resulting from the marital status of the recruited researchers (single versus married according to the original plan). The issue was discussed in the 2nd annual administrative meeting of scientists in charge and decided to use the leftover in hiring students (ESRs) that can be exchanged among different nodes. A first estimate allows the exchange of three students for three months each, which is the minimum stay required as ESR. One of them is already included in the employment forecast of CERN node (Cedric Delaunay from Saclay), while the other two are expected to be hired during the 4th year of the contract.

The young researchers have been very well integrated into the research programme of the network. They had beneficial interactions with the other postdocs and students, and they participated actively in the scientific activity of their host institutes. Furthermore, they have been encouraged to travel and get contacts with other network nodes and establish collaborations. They also attended and presented their work to major network meetings, as well as to international conferences and workshops related to the network research activity. They enlarged considerably their expertise and acquired complementary skills: presentation skills, computer skills, and knowledge of the language of the host country. Many of them were also in charge of research seminars organization and acquired organizational as well as teaching skills. All Career Development Plans were established on time and have been followed closely during the reporting year.

Following the Work Programme of the contract, training of young researchers had two components:

(a) Individual training through:

- a1. Active participation in the joint research programme, that led in particular to 14 publications during the 2nd year of the contract. Eleven of them were in collaboration with senior and other members of the host institutes, while 5 were joint involving at least two different network nodes.
- a2. Frequent exchanges among participating nodes and extended stays outside their home institutes.
- a3. Special training measures of every host institute.

(b) Common training through:

- b1. Active participation in the network meetings.
- b2. Participation in European and other International Schools.

The ER and ESR activity is summarized below (the duration of visits is usually one week, unless otherwise indicated):

Francesco Nitti (ER, Ecole Polytechnique/Palaiseau)

- 2nd Network meeting: Madrid, 12-13.12.05 (talk)
- Visits: CERN (March 06, July 06), Warsaw (April 06)
- Conferences/Workshops: 'Particle Physics and Cosmology: the Interface' (Warsaw 29.04-03.05.06)
- Schools: RTN Winter school (CERN 16-20.01.06)
- String seminar organizer in Ecole Polytechnique

Andrei Micu (ER, Bonn)

- 2nd Network meeting: Madrid, 12-13.12.05 (talk)
- Visits: Hamburg (January 06), Durham and Sussex (February 06, talk), Oxford (March 06)
- Visits outside the network: Utrecht (September 06, seminar)
- Conferences/Workshops: XI IFT-UAM/CSIC Christmas Workshop (Madrid 14-16.12.05), Eurostrings 06 (Cambridge 02-07.04.06, talk), 'Particle Physics and Cosmology: the Interface' (Warsaw 29.04-03.05.06, talk)
- Schools: RTN Winter school (CERN 16-20.01.06)
- Theoretical physics seminar organizer in Bonn University

Iain Peddie (ER, Thessaloniki/Greece)

- 2nd Network meeting: Madrid, 12-13.12.05 (talk)

Vyacheslav Rychkov (ER, Pisa/INFN)

- 2nd Network meeting: Madrid, 12-13.12.05 (talk)
- Visits: INFN/Rome 'Tor Vergata' (April 06, talk), ICTP/Trieste (May 06, talk), INFN/Gran Sasso (July 06), CERN (1-31 August 06)
- Visits outside the network: SUNY Stony Brook, New York University, University of Maryland, University of Pennsylvania (US, November 05, talks)
- Conferences/Workshops: 'Algebraic Geometry & Topological Strings Program', (IST-Lisbon, 10.10-12.11.05, talk), Polyakov-Fest (Princeton, USA, November 5-6.12.05), XI IFT-UAM/CSIC Christmas Workshop (Madrid 14-16.12.05), Workshop on Monte Carlo - Physics and Simulations at LHC (Frascati 27-28.02.06), Workshop on "Black Holes, Black Rings, and Topological Strings" (Munich 31.03-04.04.06), Johns Hopkins Workshop "Where do we go from the Standard Model?" (Florence 6-8.06.06, talk)
- Schools: Winter School on "Attractor Mechanism" (Frascati 20-24.03.06), Cargese Summer School on "Strings and Branes" (Cargese 22.05-03.06.06), XV Parma School of Theoretical Physics (Parma 2-5.09.06, lectures)

Nicolas Moeller (ER, SISSA/Trieste)

- 2nd Network meeting: Madrid, 12-13.12.05 (talk)

Mariam Tortola (ER, Lisbon)

- 2nd Network meeting: Madrid, 12-13.12.05 (talk)
- Visits: Valencia (April 06, September 06)
- Conferences/Workshops: Collaboration meeting of WG1 of the European Network of Theoretical Astroparticle Physics (Valencia 28-29.04.06, talk)

Stefan Antusch (ER, Madrid)

- 2nd Network meeting: Madrid, 12-13.12.05 (talk)
- Visits: CERN (February 06, June 06)
- Conferences/Workshops: Workshop of the physics working group of the 'International Scoping Study of a future Neutrino Factory and Super-Beam Facility' (London 14-21.11.05, talk), International Conference on High Energy Physics - ICHEP 06 (Cairo 14-17.01.06, talk), Plenary Meeting of the 'International Scoping Study of a future Neutrino Factory and Super-Beam Facility' (RAL/UK 24-28.04.06, talk), 'Workshop on Flavour in the era of the LHC' (CERN 15-17.05.06,

talk), International Workshop on The Dark Side of the Universe (Madrid 20-24.06.06, talk), XXXIII International Conference on High Energy Physics - ICHEP06 (Moscow 26.07-02.08.06, talk)

Gianmassimo Tasinato (ER, Oxford)

- 2nd Network meeting: Madrid, 12-13.12.05 (talk)
- Visits: Durham (January 06, seminar), Bonn (April 06, seminar), Sussex (May 06, seminar)
- Conferences/Workshops: "From strings to cosmic web" (Groningen 28.11-02.12.05), XI IFT-UAM/CSIC Christmas Workshop (Madrid 14-16.12.05), 'Particle Physics and Cosmology: the Interface' (Warsaw 29.04-03.05.06, talk), Strings 2006 (Beijing 19-24.06.06), Workshop on Brane-World Gravity (Portsmouth 09.06)
- Seminars: Oxford May 06, Cambridge May 06
- Schools: RTN Winter school (CERN 16-20.01.06)
- Research seminar organizer at Oxford University
- Teaching in the graduate programme: problem classes in quantum field theory

Andreas Athenodorou (ESR, Oxford)

- 2nd Network meeting: Madrid, 12-13.12.05
- Conferences/Workshops: XI IFT-UAM/CSIC Christmas Workshop (Madrid 14-16.12.05)

Kin-ya Oda (ER, Warsaw)

- 2nd Network meeting: Madrid, 12-13.12.05 (talk)
- Conferences/Workshops: XI IFT-UAM/CSIC Christmas Workshop (Madrid 14-16.12.05)

Oliver Eyton-Williams (ER, Warsaw)

- Visits: CERN (two weeks in June 06, September 06)

Details of training of A. Athenodorou (ESR in Oxford):

- He attended an intensive series of lectures and associated problem classes designed to prepare him for his first research project, which involved full time study for his first nine months at Oxford: Introduction to Quantum Field Theory [1 unit] (C,P), Non-Abelian Quantum Field Theory [1 unit] (P), Introduction to Lattice Field Theory [1/2 unit] (P), Quantum Theory of Condensed Matter Physics [1unit] (C), Statistical Physics [1 unit] (C), Theory of the Strong and Electroweak Interactions [1/2 unit] (P), Group Theory [1 unit] (C, P), Introduction to Supersymmetry [1/2 unit] (P), Supersymmetry and Beyond [1/2 unit] (P), The Physics of Extra Dimensions [1/2 unit] (P), Critical Phenomena [1/2 unit](C, P), Superstring Phenomenology [1/2 unit] (P), Topological Field Theory [1/2 unit] (C, P), Quantum Field Theory for Condensed Matter Physics [1 unit] (C), Introduction to Strings [1/2 unit] (P), Introduction to QCD [1/2 unit] (P), Theoretical Physics Problem Classes (C, P).
- The lectures were supplemented by his attendance at the British Universities summer school in particle physics in August, this year held in Edinburgh. The lectures, listed below, were presented by international experts in their fields and were supplemented daily tutorials in small groups based around problem sheets provided by the lecturers. Students were expected to give short presentations on their current research projects. Lectures: Collider Physics (Peter Zerwas, DESY), Field Theory (Cliff Burgess, Perimeter), Supersymmetry (Gregory Gabadadze, NYU), Lattice Gauge Theory (Mikko Laine, Bielefeld), Cosmology (Arjun Berera, Edinburgh), Experimental Physics (John Dainton, Liverpool), String Theory (Kellogg Stelle, Imperial), My Life as a Boson (Peter Higgs, Edinburgh), Are you ready for LHC? (Joe Lykken, FNAL).
- In addition to the formal research training he has worked closely with his supervisor, Dr M. Teper, on his first research project studying the hadronic structure of non-Abelian gauge field theories propagating on a torus (flux tubes) and comparing the results to those found in the Nambu-Goto string. Significant progress in this has been made and it is expected the work will be written up in a research paper soon. At the end of his first year, he had to pass an examination in order to proceed to his second year of study which will be devoted almost full time to research. The examination required a presentation of his research work and showed a good general knowledge of his field of research, and a very good general performance.

Finally, training of other young researchers of the participating institutes, graduate students and postdocs not employed by the network, has been very intense by systematic lectures, seminars, topical workshops, network schools and meetings. This allowed in particular an active collaboration

between them and more senior members of the nodes. CERN played a special role in these training activities, and for establishing close connection and communication among the network members.

## Management

The recruitment strategy of the network was very effective and successful both for ER and ESR. As mentioned in the training report, the vacant positions were widely publicized and there was an open competition at international level. We received several hundreds of applications distributed equally between member (and associated) states of the EU and third countries from all over the world. The number of applications from women for ER was adequately large. Although decisions were based mainly on scientific criteria, gender issues and promotion of the exchange between nodes were taken into account. One female scientist was hired as ER for two years in Lisbon during the 2nd year of the contract (M. Tortola), while a second one has started her employment in INFN/Rome for two years on October 06 (O. Mena).

The overall efficiency of the external communication was excellent, as well as in decisions making of the Network and the communication among the nodes of the network and the coordinating team. The network web site is well kept and regularly updated. During the second year of the contract, it received 2500 hits. A special role in the management was played by the network meetings that are reported in a separate list. In addition to the scientific programme, there was an administrative meeting of the steering committee to follow up the network activities and discuss organisation and management matters. Such meetings took place twice during the reporting period (during the main network meeting in Madrid on 12.12.05, and during the "Planck 06" conference in Paris on 31.05.06).

## DEVIATIONS/MODIFICATIONS TO THE ORIGINAL WORK PROGRAMME

Please indicate if the project

a) is, at this stage, being implemented as originally planned

If you answered b) or c) please include a detailed description of the modifications in the report (one page)

## ADDITIONAL INFORMATION

Please indicate any additional information, which may be considered useful to assess the work done during the reporting period.

<b>Attachments</b>	Conferences2.pdf, highlights2.pdf, Publications2.pdf, NetworkMeetings2.pdf
<b>Name</b>	
<b>Date</b>	
<b>Signature</b>	