

European Commission
ERASMUS MUNDUS


# Annex III <br> Report Form to be used for the submission of the 

Progress Report
and/or
Further pre-financing request

## THIS REPORT IS SUBMITTED UNDER THE FRAMEWORK PARTNERSHIP AGREEMENT

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2010-0011
$$

## In the context of:

The mandatory progress report for the first/secondspecific grant agreement with the number: 2011 - 1640(e.g. "2012-1234") and/or

The request for the further pre-financing payment for the specific agreement number: 2011 - 1640 (e.g."2012-1207")

## General instructions

- You should carefully read Chapter IV of the Administrative and Financial Handbook before submitting your report form.
http://eacea.ec.europa.eu/erasmus mundus/beneficiaries/documents/action1/sga emjd anne x_v_handbook_2012.pdf
- The report form covers the activities of the entire reporting period. The reporting period is the period elapsed since the start of the activities of the joint programme or the submission of the last report form (i.e. progress report, further pre-financing request or final report). Because of the overlapping activities between consecutive editions (/intakes) of the joint programme, the report must address all ongoing additions as well as the activities implemented for the preparation of the next edition.
- The report must cover both the activities related to the implementation and management of the Joint Doctorate programme by the consortium (including the management of the individual fellowships), and those related to the individual research projects implemented by the EM fellowship holders.
- The report form must be submitted by the beneficiary on behalf of the Erasmus Mundus Joint Doctorate consortium. The declaration at the end of the form confirms that a process of consultation and approval has been carried out by the consortium. It is therefore important that the required information is collected in good time before the deadline for submission of the report.
Beneficiary check-list ${ }^{1}$

To be enclosed in the Progress/Final (delete as applicable) report

| Project $\mathrm{N}^{\circ}: 2011-1640$ |  |  |  |
| :--- | :--- | :--- | :--- |
|  | Yes | No | $\mathrm{N} / \mathrm{A}$ |
| Report signed by the legal representativeor by an authorised person* | X |  |  |
| Agency's template for report respected | X |  |  |
| Electronic format of the report compatible with the Agency's system | X |  |  |
| Final costs are presented against the agreedcontractual budget breakdown as required in <br> the reporting instructions | X |  |  |
| In the Financial Report, the amount of interests received on pre-financing is declaredor $\mathbf{0}$ <br> EUR is reportedif no interest was received (Final report only; N/A for progress report) | X |  |  |
| Technical implementation Report (Operational part) enclosed | X |  |  |
| Financial Report part enclosed <br> (N/A for a progress report with no request for 2 ${ }^{\text {nd }}$ pre-financing) | X |  |  |
| Copy of the report enclosed | X |  |  |
| Mobility tool output is enclosed | X |  |  |
| Supporting documents enclosed (if applicable) | X |  |  |

*If the signatory is not the Legal Representative, a valid document confirming the authorisation to sign on his/her behalf must be added.

[^0]In order to facilitate and speed up the process of the assessment of your admissible report, please take also into consideration the following points which are mandatory to submit for Progress Report and $2^{\text {nd }}$ Pre-financing (check boxes) ${ }^{2}$

## CONTENT CHECK LIST

|  |  | YES | NO |
| :--- | :--- | :--- | :---: |
| 1 | The narrative part of the report has been submitted in line <br> with the instructions given in PART A; TECHNICAL PART | X | $\square$ |
| 2 | EACEA MOBILITY TOOL (EMT): <br> 3.1 All relevant data has been provided and up-dated for Cat. A <br> \& B \& Windows (candidate's data, mobility tracks, number of <br> payments, amounts received - financial data only mandatory <br> for 2 <br> 3. pre-financing request-) | X | $\square$ |
| 3.2 The candidate scholarship data has been extracted (by using <br> the progress report hyperlink) and attached to the report. <br> 3.3 The non-scholarship data has been extracted (by using the <br> "export to pdf" functionality) and attached to the report. <br> 3.4 The extracted lists have been signed and dated by the <br> coordinator. | X | X | X |
| 5 | A template ofthe employment contract(s) used is included in <br> the report | X | $\square$ |

Additionally to submit for $\mathbf{2}^{\text {nd }}$ Pre-financing (check boxes):

|  |  | YES | NO |
| :--- | :--- | :--- | :--- |
| 1 | The financial declaration on the use of the EM Grant is signed <br> by the legal representative of the coordinating institution (if the <br> signatory is not the Legal Representative, a valid document <br> confirming the authorisation to sign on his/her behalf must be <br> added). | X |  |

[^1]|  |  |  |  |
| :--- | :--- | :--- | :---: |
| 2 | Is the total expenditure as indicated in the EMT print-out (EM <br> candidate scholarships) in full coherence with the figures <br> indicated in the financial declaration of Part E? (NB: the only <br> possible difference between the amount indicated in the EMT <br> print-out compared to the financial declaration can be the flat <br> rate/lump sum amount of max. 50.000 EUR) | X | $\square$ |
| 3 | Has the lump sum/flat rate been added to the total expenditure <br> in the financial declaration of Part E? | X | $\square$ |

- The technical (/narrative) part of thereport must be submitted in the operational language of communication between the institutions involved in the consortium.
- The Doctoral Candidate's fellowship data extracted from the "EACEA Mobility Tool" (Part B of the report) must contain all the relevant information related to the candidates enrolled (with and without EM fellowship) funded by the EM Programme during the course edition(s) concerned by this report. See EACEA Mobility Tool User Manual for further information. Any empty fields in the output must be explained in the report.
- The EACEA Mobility Tool User Manual can be retrieved here:
http://iis-cfprod.eacea.cec.eu.int/mobility/docs/EACEA-Mobility-database-guidelines-EM.pdf
- The original and one copy of the report must be sent no later (as per postmark) than by the deadline $(15 / 03 / 2013)$ specified in the specific agreement to:

Education, Audiovisual and Culture Executive Agency (EACEA)<br>Unit P4 - Erasmus Mundus and External Cooperation<br>Avenue du Bourget, ${ }^{\circ} 1$ - BOUR 02/29<br>BE-1140 Brussels<br>Belgium

- An electronic version of the progress report must be sent no later than by the deadline (15/03/2013) to the following e-mail address: eacea-em-consortia@ec.europa.eu
- You are strongly advised to send your report by registered post (express courier) to ensure a record of postage. Additionally, you are advised to keep a copy of it, including any annexes.
- Please note that a late submission of the contractually required reports may result in penalties or even cancellation of the specific agreement, in accordance with the General Conditions of the framework partnership agreement.


## PART A: TECHNICAL PART

## Instructions concerning the technical part of the Report

The technical part of the Report should provide a summary of the Erasmus Mundus Joint Doctorate implementation during the period elapsed since the submission of the last report (or the beginning of EMJD in case this is the 1st report ever submitted).

This summary must cover all ongoing EMJD editions (/intakes) as well as the preparatory activities already implemented by the consortium for the next edition (/intake).

When answering the questions below the report should

- When applicable, clearly specify the edition(s)/intake(s) the information provided refers to
- Concentrate on the new elements (/developments) as compared to the last report (or the original application in case this is the 1st report ever submitted).
Sub-sections 1.a - 1.k and 2 of the report must cover each min. $1 / 2$ and max. 1 page (excluding possible enclosures).

1. Please describe the consortium activities since the submission of the last report (or the approval of the original application in case this is the 1st report ever submitted) for what concerns:
a. The consortium organisation (administrative, academic, research and financial management) and specific roles of individual partners (including, if applicable, associated partners)

- Our IRAP PhD program is composed of a Scientific Staff in charge of all the scientific part: selection of the candidates, thesis projects, supervising the progress of each candidates, preparation of the PhD School in Relativistic Astrophysics.
- This staff is directed by Prof. Remo Ruffini. In add to this staff, we have an administrative staff in Nice University.
- The coordinator is Prof. Pascal Chardonnet

After the selection meeting and the approval of the main list by the Agency, our candidates are officially informed by the coordinator (see Annexe-1). We gave them 10 days in order to accept our offer. Generally our candidates accepted immediately and then the coordinator start to write "the convention d'accueil". This document is essential in order to obtain French visa (Annexe-2). At the same time, the coordinator communicate the names of the PhD students to Marsh Insurance. In such way, we could send by email the student card (Annexe-3). This is very useful because certain consulates asked an Insurance. The original card is given to the student at his arrival in Nice.

The organization chart is attached in hereby (please notice that the name of the new President of Nice University is Prof. Frédérique Vidal. It should be changed in the EM Mobility Tool)


Being assigned to the Office of International Projects Erasmus Mundus, Mr Emmanuel Losero deals with the "EMJD International Relativistic Astrophysics" in taking care of orders, mission's orders and refunds or bills payment as well as verifying that the students are paid every month and by maintaining the budget. At the accounting office, Mrs. Julie Coquin is responsible for collecting EACEA revenue in order to place the dates of opening and closing of the agreement. She manages the "project builder", that is to say that she organizes the credits in 2 parts: one part "operating costs" and one "payroll" in accordance with the convention established by the EACEA. She also establishes thresholds limiting expenditures and the financial center where the credits are. On the other hand, Emmanuel Losero closely works with the Finance department of the Faculty of Sciences, led by Mrs. Annie Vidal, through Mrs. Cathy Siveri who checks the expenses, then Mrs. Veronica Gallo from accounting agency makes payments. Finally, Julien Chabert saves providers records on the software "SIFAC" so that banking informations could be stored in the database. The Accounting office also performs the grants' payment. Pina Barbaro is in close contact with the students for Bank account, Social security problem, booking rooms in Nice

- Before the arrival of the students the coordinator communicates to the staff in Nice the names and identity of the winner.
- In such way, the employment contract is prepared before the arrival of the students.
- At the arrival in Nice in September, our non European student open a bank account in Nice. We have an agreement with a Bank: the credit card is free and the bank give 50 euros welcome for all our students.
- At the same period, our students will also do the other formalities for Social Insurance Card and for Residence Permit.


## b. The payment modalities of the individual fellowships

Since all bureaucratic part are well prepared the students can received their salary on the European bank very easily. The participation cost are also sent directly to the host institution.

## c. Promotion activities for ongoing and future editions/intakes

First of all we have a dedicated website: www.irap-ph.eu
This allows us to promote all the activities of our PhD program: all the thesis subjects are online. This year, we have add three important part:

- a full integrate online registration (see numerous annexes on web) with possible help at any stage of application. All our candidates are very satisfy by this new procedure. It is very easy and each candidate can return up to the deadline to its own application and modify. This is a very good process. Then the referee have, invited by candidates, can also have access to the application and put an evaluation and upload easily a letter of recommendation. In add, the coordinator could invite numerous evaluators that have access to all applicants and put individual evaluation. At the end of the call, we could extract a full pdf (or excel table ) of all candidate or individual file for each candidate. This procedure is quite new and very powerful. I have put in annexe all the pages, and I hope that the Erasmus Mundus Team help us also to improve this procedure. I already asked candidates. They find this procedure "easy" and "friendly".
- An intranet section for all partner members and for all our EMJD students. We notice that to send important documents by emails is "old fashion" and the best is to have a secure place where to store all important of the live of our consortium. I have put also the presentation of students during meeting, so prof could have access to the presentation of other students. (see Annexe 5 and http://irapphd.eu/page15/page15.html button "intranet")
- This year we have bough a independent server to be sure that all documents regarding the calls couldn't be violate from external part. Only our consortium member have access to this server. We have declare this activity to the CNIL in agreement to their request. When the candidate apply, they are all informed individually about the personal treatment of their personal data (see page "submit" in Annexe)
- Now, regarding promotion, for this new call 2013 (fourth edition) we have realized 2000 posters sent all over the world using ICTP network as previous years. This year we do not have realized advertisement in Nature and CERN. But, in addition, we have used the network Campus France to distribute our activities and also : http://www.inspirehep.net. Apparently this new method is very successful since we
get more students (162) than last year (129) and we spend lest money in adverts. This is an example of good practice that could be underline.
- Using the network of Campus France, we get many candidates, most of them are weak, but this also tells us some expectation of these countries in from of European Program in Education. I notice reading the application a great hope toward Europe. May be it should be a way to come up to somebody's expectations.
- The coordinator has created a dedicated page on Facebook where some activities of our program are given: Irap Phd-Program
- We have also created a global document for all the cycle accessible online ( 63 Mb ): http://lapth.cnrs.fr/pg-nomin/chardon/IRAP_PhD/EMJD-Students.pdf
- Acknowledgements : we have imagine a canonical way for the students to thank ERASMUS MUNDUS in their papers. This is a way to promote the Erasmus Mundus Program inside the scientific community :
for the cycle I (2010-2013):
"Student Name Student Surname" is supported by the Erasmus Mundus Joint Doctorate Program by Grant Number 2010-1816 from the EACEA of he European Commission
for the cycle II(2011-2014):
"Student Name Student Surname" is supported by the Erasmus Mundus Joint Doctorate Program by Grant Number 2010-1640 from the EACEA of he European Commission
for the cycle III(2012-2015):
"Student Name Student Surname" is supported by the Erasmus Mundus Joint Doctorate Program by Grant Number 2010-1710 from the EACEA of he European Commission
d. The procedures followed and measures taken for the identification of research projects, the selection of candidates and the allocation of individual research projects,

This is the domain of the Faculty. The coordinator is also the web manager and asks regularly the Faculty for new thesis projects. Once they are approved, they are put on the website. The Faculty is also in charge of the selection process in January-February. A secure web site has
been created. All personal data are deleted after selection. Only the coordinator keep this data only for a limited period : the duration of the edition. We have informed the CNIL of our procedure to select candidates since personal data are involved. We have obtained their agreement provided we put the following sentence in our personal application form for the candidates
"The candidate is informed and has agreed to the fact that if he/she is selected (proposed for a fellowship, put on the reserve list, or enrolled on a self paying basis) his data may be used for the purposes of evaluating the Erasmus Mundus Programme and will be made available to the Agency, the EM National Structures, the EU Delegations and the Erasmus Mundus Doctorale candidate and Alumni Association (EMA), acting as stakeholders of the programme. The personal data is collected and used in accordance with Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on "the protection of individuals with regard to the processing of personal data and on the free movement of such data". The candidate is informed and has agreed to the fact that his data will be also transferred to Non-EU partners of our consortium for the quality assessment of the applications. please read this text carefully. by Clicking the "I agree" button at the top, YOU AGREE TO THESE CONDITIONS. "

## e. The delivery of the taught part of the EMJD

- The specificity of our program is the creation of European PhD Training School in Relativistic Astrophysics. We organized each September a one-month meeting in Nice. This help us to do the administrative formalities for the new students and to create a "spirit of a School" at Doctoral Level since we mix all editions. Now all our students know themselves and it happens that they visit each other in special occasions like birthday. They also exchange scientific information on links, interesting papers. The feedback from them is that our idea is very welcome. They didn't expected such "School" at PhD level.
- We are thinking to use also iTunes $U$ to promote video of our courses.
- All the courses of our PhD Schools are online and therefore are accessible to everyone:
http://irap-phd.eu/page9/page9.html

These courses given by leading experts in the fields have a great success not only among our PhD students but also to other students and researchers that have access freely to the result of our PhD School in Relativistic Astrophysics.

## f. The overall supervision of doctoral candidates

This is the matter of the Faculty. But we also used the expertise of external professor visiting us during our PhD Schools.

- The Doctoral Candidate is required to provide her/his Thesis Adviser (and Co-Adviser, if applicable) of all necessary reports. It is her/his duty to point to the Thesis Adviser
(Co-Adviser) any difficulty encountered. The frequency of regular work meetings (e.g. weekly periodicity) is agreed upon at the beginning of the thesis between Doctoral Candidate and Adviser/Co-Adviser. All parties are bound to conform to the obligation of regular work meetings.
- Two yearly reports on the progress of the thesis work is prepared by the Doctoral Candidate and presented in the two one-month joint scientific activities. A full list of courses, seminars, conferences and other relevant activities carried out is included. These reports is also submitted to the Faculty.
- The Thesis Adviser accepts to reserve a significant part of her/his time to follow the Doctoral Candidate's work and takes full responsibility for the thesis supervision, even when a Thesis Co- Adviser contributes to it. She/he will actively participate in deciding how the work should progress on the basis of partial results, will point out to the Doctoral Candidate the scientific progress that her/his results are bringing, as well as the possible objections and criticism.
- The Thesis Adviser, with the assistance of the Co-Adviser (if applicable), discuss twice a year the progress report with the Doctoral Candidate, assess its content and propose the necessary modifications before it is sent to the Faculty. The Thesis advisor may submit an assessment to the Faculty, if deemed necessary, and particularly whenever problems with the Doctoral Candidate's work begin to appear. The Doctoral Candidate receives a copy of such an assessment.
- The services offered to doctoral candidates (and more particularly with regards to the mandatory mobility parts of their EMJD) and the languages used (regarding research activities and language learning possibilities)
- The Faculty monitors the scientific progress of each Doctoral Candidate. In agreement with the Thesis Adviser and, if necessary, of additional experts sought for this purpose, the Faculty may suggest ways of improving the Candidate's overall progress.
g. The concrete measures taken by the consortium with the relevant ethics committees and/or national/local authorities to address, where applicable, ethical issues arising from the research activities of the Doctoral Candidates

This is the matter of the Faculty. But we also used the expertise of external our scientific subject "Relativistic Astrophysics" is not related directly to ethical issues. But we took care of personal data using the service and the control of the CNIL ( http://www.cnil.fr/ ) where we have declare our website and our activities of promotion and recruitment of PhD students.
h. The services offered to doctoral candidates (and more particularly with regards to the mandatory mobility parts of their EMJD) and the languages used (regarding research activities and language learning possibilities)

The mobility of our students is enhanced due to the fact that we have a solid scientific network and each partner provide with great facility the lodging house, office and local help for students during mobility period.

Due to our spirit of «PhD School» the mobility is also seen improved by the fact that all students know themselves. In some case they already visited the new institute for mobility because they have visited their friends there for birthday occasion !

Doctoral Candidate must validate at least 180 hours of courses, lectures and seminars every year - as attested by the Faculty .

In the host institutions, in addition to courses, seminars and participation in topical schools, the students also follow language courses in order to foster their practice and knowledge in languages such as English, French, German, Italian or Swedish.

## i. The EMJD evaluation and monitoring mechanisms

One of our evaluation is obtained directly from our PhD students. Each year the coordinator asks the students to write a free report about all the activities of the past year. Then the coordinator present this report to the consortium and propose improvements related to students 'suggestions.

The IRAP PhD Faculty, composed of up to three Members for each Institutions is in charge of evaluating and monitoring the Program. Namely :

- Defines the admission procedure of the students to the IRAP PhD program, defines the academic curriculum of the program, assigns thesis topics, assigns the first and second supervisor to each candidate, decides whether candidates performance is good enough to grant continuation of the program,
- Authorizes the defence of the thesis and approves the composition of the defence committee.
- Oversees the fulfilment of the duties of the IRAP PhD candidates, the duty of the host Institutions and the duty of the coordinating Institution
- It activates mediation procedure for any problems would arise in the IRAP PhD Program
- Appoints eligible new partners to the Consortium, organizes workshops
- Decides marketing/advertising strategies of the program as well as the networking between current, past and perspective candidates and their relationship with the labour market
- Oversees the quality of the program, also by collecting evaluation forms from the candidates

We have add an intranet page to all students and all the consortium members where all relevant documents are accessible (progress reports, guide, presentations of students, PhD School, Consortium agreement, Candidate Doctorale Agreement, consortium meeting..).
http://irap-phd.eu/page15/page15.html
In such way, each member of our consortium (Professors, Administrative Stall and also students) can have access to all information about our PhD program. See Annexe-4

## j. The final degree recognition status in each of the degree awarding institutions (and more particularly the progress made toward the award of joint degrees)

During the year 2011 an important step has been overcame by a text of the French Ministry of Education on Joint Diploma.

This full text can be downloaded using the link :
http://www.2e2f.fr/docs/circulaire-diplomes-conjoints-du-9-juin-2011.pdf


Bulletin officiel $\mathrm{n}^{\circ} 23$ du 9 juin 2011


On the basis of this text we are building an exemplary of Joint Diploma (Annexe-6)

- The thesis is subject to only one examination (thesis defence) recognized by all Degree Awarding Institutions.
- The thesis defence will take place at the Host Institution following the local rules and regulations. The Thesis Adviser and Co-Adviser (if applicable) shall be present at the Defence.
- The thesis is written in English as the common language to all the Institution of the IRAP PhD a summary in the language of the Host Institution may be required, depending on local regulations.
- The Thesis Adviser, in agreement with the Candidate, proposes to the Faculty at least two Referees, external to the IRAP PhD and its Partner Institutions, whose duty is to assess the quality of the manuscript and its correctness.
- The Faculty immediately informs the Doctoral Schools, of its decision and nominates the Referees. The latter receives the complete manuscript with sufficient time for a review - in any case no less than 2 weeks.
- Each Referee, following her/his assessment duly and amply documented in a written report in English, recommend or not the authorization for the Thesis Defence.
- The authorization to defend the Thesis is granted by the Host Institution hosting the Proceedings in agreement with the regulations stipulated in the Consortium Agreement.

Here we report the Article $5-\mathrm{A}$ ) of our Consortium Agreement regarding the degree awarded :
"

ARTICLE 5A) - DEGREE AWARDING INSTITUTION
§1. Degree-Awarding: At the end of their curriculum the Students are awarded a joint Ph.D. title signed by the Rectors/ Presidents of the six Academic Institutions of the IRAP PhD consortium. See also paragraph 11 of the Doctoral Candidate Agreement ( see Annexe 3)
§2. The language of the thesis, the authorization to defend the thesis, the composition of the defence committee, the thesis defend procedure and intellectual property have been outline in the paragraph 10.1, 10.2, 10.3, 10.4, 12 of the Doctoral Candidate Agreement ( see Annexe 3)"

## k. Other related activities that may directly benefit the EMJD

2. Describe any positive experiences and/or, problems encountered during the period covered by this report related to the Erasmus Mundus Joint Doctorate course management and possible improvements to be envisaged

This year we have modified our application procedure via a new website on a server dedicated uniquely to our PhD program. It is very easy to apply and the student can modify their application up to the deadline by adding new documents. There is a part for evaluators and for referee. If we look to the reaction of students of this year, they are very satisfy by this procedure. Of course there is always the possibility to request help at any moment of the application. See Annexe-Web
3. If applicable, provide herein the necessary feedback where a follow-up has been requested by the Agency in the previous progress report and/or final report.

Summary Data

|  | Edition | $3^{\text {rd }}$ Country Doctoral Candidates |  | EU Doctoral Candidates |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | With an EM fellowship | Without an EM fellowship | With an EM fellowship | Without an EM fellowship |
| Number of Doctoral candidates enrolled (for the ongoing editions) | 1 | 6 |  | 4 |  |
|  | 2 | 6 |  | 3 |  |
|  | 3 | 6 |  | 3 |  |
|  | 4 |  |  |  |  |
|  | 5 |  |  |  |  |


|  | Name of the Degree awarding institution <br> (add rows if necessary) | Name of the Erasmus Mundus <br> Degree awarded |
| :---: | :---: | :---: |
| $\mathbf{A}$ | University of Nice Sophia Antipolis | PhD in Relativistic Astrophysics |
| $\mathbf{B}$ | University of Savoie | PhD in Theoretical Physics |
| $\mathbf{C}$ | University of Roma La Sapienza | PhD in Relativistic Astrophysics |
| $\mathbf{D}$ | University of Ferrara | PhD in Physics |
| $\mathbf{E}$ | University of Stockholm | Doctor of Philosophy Degree |
| $\mathbf{F}$ | Freie University of Berlin | PhD in Natural Things |
| $\mathbf{G}$ |  |  |

4. 

## PART B: EM FELLOWSHIP HOLDERS REPORT

| Doctoral Candidate name (first name - LAST NAME) | Enrolment date in the Joint <br> Programme* |
| :--- | :--- |
| Damien Bégué | $01 / 09 / 2011$ |
| Name and Institution of the Doctoral Candidate Supervisors* |  |
| Advisor: Prof. Remo Ruffini (Universita' La Sapienza and ICRANet) <br> Co-advisor: Dr. G.V. Vereshchagin (ICRANet) |  |
| Title of the EMJD research project* |  |
| Expansion of optically thick plasma in GRB and its photospheric emission. |  |
| Short summary of the EMJD research project* (the summary must include the mandatory <br> mobility elements as well as the taught/training components and the main milestones for the <br> doctoral candidate supervision and/or research deliverables) |  |

Following the recent revival of interest in the photospheric emission of Gamma-Ray Bursts (GRBs) we numerically investigate the emission from highly relativistic finite outflows for different initial conditions compatible with the GRB physics.

The goals are twofold. Firstly we want to constrain the shape of the spectra and light-curves according to the initial conditions. And secondly, from the observations of spectra and lightcurves of the photospheric emission of GRBs we would like to constrain the different parameters of the central engine.

Mobility elements :

- Attendance to the "Erasmus Mundus School", Nice, France, 5th- 16th of September, 2011.
- Attendance to the "IRAP-PHD, Erasmus Mundus Workshop", Les Houches, France, 2nd-6th of October, 2011.
- Attendance to the "Third Galileo-Xu Guangqi meeting", Beijing, China, 11th-15th of October, 2011.
- Attendance to the SIGRAV school, Como, Italy, 21st-26th of May, 2012.
- Attendance to the "Erasmus Mundus School", Nice, France, 4th-9th of June, 2012.
- Attendance to the Marcel Grossmann Meeting 13, Stockholm, Sweden, 1st-7th of June, 2012.
- Attendance to the "Erasmus Mundus School", Nice, France, 3rd- 21st of September, 2012.


## Main activities implemented by the doctoral candidate since the delivery of the last report

- Numerical study of photon scattering close to the photosphere of finite relativistic expanding outflows with a Monte-Carlo code. The results are accepted for publication in the Astrophysical Journal.
- Ongoing: study of the emission from a pure electron-positron plasma using an
analytical solution for the relativistic hydrodynamics equations.
- Ongoing: study of the physical interpretation of the filling factor of the afterglow emission in the fireshell model.

Main activities planned to be implemented during the 12 months following the submission of this report

- To finish the 2 ongoing works and eventually to published the results.
- Period of mobility in Germany at Albert Einstein Institute for 3 months.


## PART B: EM FELLOWSHIP HOLDERS REPORT

(This table is to be completed for each of the EM fellowship holders currently enrolled in the consortium. To be copied as necessary)

| Doctoral Candidate name (first name - LAST NAME) | Enrolment date in the Joint <br> Programme* |
| :--- | :--- |
| Giovanni Battista PISANI | $01 / 09 / 2011$ |
| Name and Institution of the Doctoral Candidate Supervisors* |  |
| Remo Ruffini <br> Dipartimento di Fisica and ICRA, Università di Roma "La Sapienza", Piazzale Aldo Moro 5, I-00185 <br> Roma, Italy. <br> ICRANet, Piazzale della Repubblica 10, I-65122 Pescara, Italy. <br> ICRANet, Université de Nice Sophia Antipolis, Grand Chateau, BP 2135, 28, avenue de Valrose, 06103 <br> NICE CEDEX 2, France. |  |
| Pascal Chardonnet <br> Université de Savoie, LAPTH - LAPP, BP 110, F-74941 Annecy-le-Vieux Cedex, France. <br> ICRANet, Piazzale della Repubblica 10, 65122 Pescara, Italy. <br> ICRANet, Université de Nice Sophia Antipolis, Grand Chateau, BP 2135, 28, avenue de <br> Valrose, 06103 NICE CEDEX 2, France. |  |

## Title of the EMJD research project*

Gamma Ray Bursts, Black Holes and Neutron Stars.
Short summary of the EMJD research project* (the summary must include the mandatory mobility elements as well as the taught/training components and the main milestones for the doctoral candidate supervision and/or research deliverables)

## EMJD research project

Gamma Ray Bursts (GRBs) are among the most puzzling astronomical objects since their first detection by the Vela satellites in the late 1960s. GRBs are flashes in gamma-rays observed in distant galaxies. They can last from milliseconds to several minutes with an isotropic energy released up to the order of one solar mass. This peculiarity makes them the most powerful events ever observed in the Universe. A variety of models have been developed to theoretically explain the observational properties of GRBs. My PhD research project includes the reduction and analysis of GRBs data from different satellites, such as Batse, Swift or Fermi. I investigate GRBs observations within the fireshell model scenario, which predicts that GRBs originate from an optically thick e+e- plasma at thermal equilibrium created by vacuum polarization during the formation of a Black Hole. My attention is now focused on GRBs associated with Supernovae (SN). Since the first discovery of this association (GRB 980425 - SN1998wt), various mechanisms have been proposed to explain it. Recently Prof. Ruffini and his collaborators have proposed the Induced Gravitational Collapse (IGC) occurring in a particular class of binary systems as progenitors for these GRB-SN sources. Together with them we are further developing the IGC scenario. One of the most exciting outcomes of this work is the possibility to consider this class of GRB-SN events as distance indicators. If confirmed, this result could provide new independent challenges on the current cosmological model.

Main activities implemented by the doctoral candidate since the delivery of the last report

## Scientific publications

1. On the thermal and double episode emissions in GRB 970828.

Izzo L., Ruffini R., Bianco C. L., Dereli H., Muccino M., Penacchioni A. V., Pisani G. B., Rueda Jorge A. 2012, Arxiv e-prints:1205.6651
2. A common behavior in the late X-ray afterglow of energetic GRB-SN systems.

Izzo L., Pisani G. B., Muccino M., Rueda J. A., Wang Y., Bianco C. L., Penacchioni A. V., Ruffini R. 2012, Arxiv e-print:1210.8034
3. GRB 121217A theoretical estimate of redshift and of supernova occurrence.

Ruffini R., Izzo L., Pisani G. B., Bianco C. L. 2012, GRB Coordinates Network, 14095, 1
4. GRB 110709B in the induced gravitational collapse paradigm.

Penacchioni A. V., Ruffini R., Bianco C. L., Izzo L., Muccino M., Pisani G. B., Rueda J. A. 2013, A\&A, 551, A133
5. GRB 090510 , explosion of a GRB in the highest circumburst medium ever inferred: a disguised short GRB.
Muccino M., Ruffini R., Bianco C. L., Izzo L., Penacchioni A. V., Pisani G. B. 2013, accepted in ApJ Letters (in press)
6. Novel distance indicator for Gamma-Ray Bursts associated with Supernovae Pisani G. B., Izzo L., Ruffini R., Bianco C. L., Muccino M., Penacchioni A. V., Rueda J. A., Wang Y. 2013, accepted in A\&A Letters (in press)

## Proceedings

1. Needs for a new GRB classification following the fireshell model: "genuine short", "disguised short" and "long" GRBs.
Bianco C. L., Bernardini M. G., Caito L., De Barros G., Izzo L., Muccino M., Patricelli B. Penacchioni A. V., Pisani G. B., Ruffini R. 2012, POS GRB 2012 Conference, http://pos.sissa.it/archive/conferences/152/043/GRB\ 2012_043.pdf
2. The proto-black hole concept in GRB 101023 and its possible extension to GRB 110709B. Penacchioni A. V., Pisani G. B., Ruffini R., Bianco C. L., Izzo L., Muccino M. 2012, POS GRB 2012 Conference, http://pos.sissa.it/archive/conferences/152/042/GRB\ 2012_042.pdf

## List of schools and meetings attended

"Erasmus Mundus School", Nice, France, 5th - 17th September, 2011;
"IRAP PhD. Erasmus Mundus Workshop", Les Houches, France, 2nd - 6th October, 2011;
"Third Galileo-Xu Guangqi" meeting, Beijing, China, 11th - 15th October, 2011.
"Fermi/Swift GRBs Conference 2012", Munich, Germany, 7th -11th May, 2012;
"Erasmus Mundus School", Nice, France, 4th - 8th June, 2012;
"XIII Marcel Grossmann Meeting", Stockholm, Sweden, 1st - 7th July, 2012;
"Erasmus Mundus School", Nice, France, 3rd - 19th September, 2012;
"III Congresso Nazionale GRB 2012", Napoli, Italy, 20th - 22th September, 2012
"ICRANet Italian-Korean Meeting", Seoul, South Korea, 4th -6th October, 2012.

## Fulfilled mobility: France (40 days)

"Erasmus Mundus School", Nice, France, 5th - 17th September, 2011;
"IRAP PhD. Erasmus Mundus Workshop", Les Houches, France, 2nd - 6th October, 2011;
"Erasmus Mundus School", Nice, France, 4th - 8th June, 2012;
"Erasmus Mundus School", Nice, France, 3rd - 19th September, 2012.
Main activities planned to be implemented during the 12 months following the submission of this report

## List of schools and meetings to be attended

"Huntsville GRB Symposium", Nashville, Tennessee, USA, 14th - 18th April, 2013
"Erasmus Mundus School", Nice, France, May, 2013
"Erasmus Mundus School", Nice, France, September, 2013

## Mobility to be fulfilled: France ( 2 months)

"Erasmus Mundus School", Nice, France, May, 2013
"Erasmus Mundus School", Nice, France, September, 2013

* This relevant information should be provided only once for the entire duration of the doctoral candidate EM joint programme's activities, unless changes have occurred since the submission of the first report

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| :---: | :---: |
| $Y$ | Se |
| Name and Institution of the Doctoral Candidate Supervisors* |  |
| She-Sheng Xue, ICRANet and Università di Roma "La Sapienza" Hagen Kleinert, Freie University of Berlin and ICRANet |  |
| Title of the EMJD research project* |  |
| Strong Fields, Neutron stars, and Black Hole |  |
| Short summary of the EMJD research project* (the summary must include the mandatory mobility elements as well as the taught/training components and the main milestones for the doctoral candidate supervision and/or research deliverables) |  |
| From September 2011, I attended all the Erasmus Mundus schools and meetings in this program. Under the supervision of Prof. Xue, I am studying in the topic of strong fields, Neutron stars and Black holes, a topic works over a wide range of subjects. The research mainly concerns the effects of strong, weak, and especially electromagnetic interactions on the properties of Neutron stars and Black holes. |  |
| Main activities implemented by the doctoral candidate since the delivery of the last report |  |
| When taking into account strong, weak, electromagnetic, and gravitational interactions and fulfilling the global charge neutrality of the system, a transition layer will happen between the core and crust of neutron stars, at the nuclear saturation density. This result gives us a new concept and a better understanding of neutron stars. Using the Relativistic Mean Field Theory together with the Thomas-Fermi approximation, we study the detailed structure of this transition layer and its surface tension, near the saturation density of nuclear matter. We analyze the stability of this structure. <br> Extracting energy from a black hole has been an interesting topic for many decades. Taking into account one loop nonperturbative QED effects, we construct the Einstein-EularHeisenberg theory. We find out the solutions of the Einstein-Eular-Heisenberg field equations. We study the entropy of black holes and the maximal energy that can be extracted from a black hole. |  |
| Main activities planned to be implemented during the 12 months following the submission of this report |  |
| I will attend the Erasmus Mundus schools and meetings in this program. And I will visit some institutions under the suggestions of my supervisors. <br> We will continue the studying of the Einstein-Eular-Heisenberg black holes for better understanding. Analogously to nuclei, we plan to construct a mass formula for nrutron stars, and then try to find out others stable islands of superheavy nuclei due to the gravitational interactions. In order to understand the QED vacuum better and provide theoretical predictions for QED vacuum experiments, we plan to study the pair production when two laser beams interact and laser beams interact with a strong constant field. |  |


| Doctoral Candidate name (first name - LAST NAME) | Enrolment date in the Joint <br> Programme* |
| :--- | :--- |
| Shabnam Iyyani | September 2011 |
| Name and Institution of the Doctoral Candidate Supervisors* |  |
| Prof. FELIX RYDE, ROYAL INSTITUTE OF TECHNOLOGY, ALBANOVA, STOCKHOLM, <br> SWEDEN |  |

## Title of the EMJD research project*

## OBSERVATIONAL STUDY OF THE PROMPT EMISSION IN GAMMA-RAY BURSTS WITH THE FERMI TELESCOPE: THE ROLE OF PHOTOSPHERE OF THE RELATIVISTIC JET

Short summary of the EMJD research project* (the summary must include the mandatory mobility elements as well as the taught/training components and the main milestones for the doctoral candidate supervision and/or research deliverables)
Gamma-ray bursts are the largest known explosions in the universe. Due to their huge brightness we are able to detect them from very large distances, thereby viewing the very early universe. Most of the observable energy in a GRB is released in the gamma-rays. In spite of this fact we do not yet know how it arises. This problem is therefore one of the most fundamental in high-energy astrophysics today, and much attention has been devoted to it both observationally and theoretically. The aim of Ms. Iyyani's PhD project is to attack this problem by studying the photosphere in the relativistic jet in GRBs, in combination with studies of the spectral and temporal data available from the Fermi Gamma-ray Space Telescope. In particular, Shabnam will study the second (pair) photosphere which is expected to be formed if there is energy dissipation below or close to the original photosphere. The conditions under which such a photosphere will be studied. This will allow a calculation of the dynamics of the flow based on observables, such as the temperature and fluxes. These results will be applied on Fermi bursts. The mobility activity will be performed in France.

Main activities implemented by the doctoral candidate since the delivery of the last report

1. Written and submitted an 18 page review paper on the observational status of the study of the GRB photospheres. This paper will appear in the World Scientific Publishing Co. proceedings series.
2. Currently completing a paper on the time dependent outflow dynamics of GRB110721A.
3. Co-author on the paper Axelsson M., Baldini L., et al. 2012, ApJ, 757, L31 which presented the results of time resolved analysis of GRB110721A.
4. Working together with Michael Burgess (Fermi Colloboration) on the paper Burgess et al. 2013 in preparation which discusses the time resolved study of Fermi GRBs with fast and slow cooled synchrotron photon models.

Main activities planned to be implemented during the 12 months following the submission of this report

1. Time resolved analysis of a sample of Fermi bursts that would be relevant for the study of photospheric emission in GRBs.
2. Completion of the analysis of the pair photosphere and application to a few strong bursts such as GRB110721A and GRB100724B. Writing results into a first journal paper.
3. Further visits to French partner institutes.

| Doctoral Candidate name (first name - LAST NAME) | Enrolment date in the Joint <br> Programme* |
| :--- | :--- |
| Bruno - Sversut ARSIOLI | February 2012 |
| Name and Institution of the Doctoral Candidate Supervisors* |  |
| Dr. Paolo Giommi : Italian Space Agency (ASI), Science Data Center ESRIN <br> Prof. Remo Ruffini : University La Sapienza, Rome. ICRA |  |
| Title of the EMJD research project* |  |
| Fermi (Multi-frequency) data from Active Galactic Nuclei |  |
| Short summary of the EMJD research project* (the summary must include the mandatory <br> mobility elements as well as the taught/training components and the main milestones for the <br> doctoral candidate supervision and/or research deliverables) |  |

## Summary of the research project:

We are dealing with Multi-Frequency data coming from sky surveys covering a vast range of energies, from radio to TeV photons, as an attempt to identify new blazars and describe their spectral energy distribution (SED). Usually, the activity in the central regions of elliptical galaxies generates powerful jets of particles that can be pointing towards us. As a result, relativistic effects may boost the luminosity of the jet, which can overcome the whole thermal luminosity of the galaxy. Basically, two main physical processes are assumed to describe the shape of the observed SEDs from blazars: the synchrotron radiation coming from relativistic electrons moving in a feeble magnetic field, and the inverse Compton process where low energy photons can be scattered to higher energies by the interaction with relativistic electrons.

We have been developing methods for selecting extreme AGNs, where the flux density peak associated with the synchrotron radiation reaches the X-ray band. This sample of high synchrotron peak (HSP) objects may enclose bright sources of TeV photons, being responsible for the majority of the TeV background radiation.

During the research we shall give attention to time variability of the photon flux in different frequencies, looking for correlations and trying to uncover physical mechanisms that may be generating them. In particular, the selected HSPs may be important targets for studding X-ray flux variability (with NuStar and probably, in the near future, with Loft). Open questions in this field are very thought provoking, inviting us to think about the physical nature of the central engines and how they could produce such high energy TeV photons.

## Mobility Elements, taught/training/Conferences:

-SIGRAV Graduate School in Contemporary Relativity and Gravitational Physics, Villa Olmo, Como (Italy), 21-26 May, 2012.
-10th Agile Workshops ASDC, Rome Italy. 18, April, 2012
-Erasmus Mundus School, Nice, France, 5-8 June, 2012.
-Erasmus Mundus School, Nice, France, 3rd - 19th September, 2012. Presentation; Active Galactic Nuclei: Blazars
-Marcel Grossmann meeting, Stockholm, Sweeden, 1st - 7th July, 2012
-Magic AGN WG Meeting, Frascati, 11 to 14 February 2013 ASI Science Data Center, ESRIN

Main activities implemented by the doctoral candidate since the delivery of the last report
-Data analyses from Active Galactic Nuclei using the ASDC tools: Data Explorer and SED (Spectral Energy Distribution) builder; Provided by Agenzia Spaziale Italiana (ASI Science Data Center).
-Course: "General Relativity" held by Professor Remo Ruffini. 03/2012 - 07/2012

## Work in Progress

-Article: A large sample of High Synchrotron peaked Blazars. Based on Wise all-sky survey and multi-frequency data; To be submitted for Astronomy \& Astrophysics Journal.

Main activities planned to be implemented during the 12 months following the submission of this report
-Work with selection schemes trying to build a large sample of Low Synchrotron Peak.(LSP) blazars. Those objects may be responsible for a significant fraction of the cosmic microwave background (CMB) and could contaminate the primordial fluctuation spectrum measured by the Planck CMB anisotropy mission. It has been estimated by [1] that the blazars integrated emission may cause an apparent temperature increase of $5-50 \mu \mathrm{~K}$ in the frequency range $50-$ 250 GHz . We will access this possibility by cross correlating data from a large sample of radio loud AGN with the incoming data from Planck (to be released in March).
[1] Giommi P., 2008, Non-thermal Background from Blazars: The contribution to the CMB, Xray and $\gamma$-ray Backgrounds, A\&A.

| Doctoral Candidate name (first name - LAST NAME) | Enrolment date in the Joint <br> Programme* |
| :--- | :--- |
| Daniele GREGORIS |  |
| Name and Institution of the Doctoral Candidate Supervisors* |  |
|  | Title of the EMJD research project* <br> Short summary of the EMJD research project* (the summary must include the mandatory <br> mobility elements as well as the taught/training components and the main milestones for the <br> doctoral candidate supervision and/or research deliverables) <br> The role of the matter content and of the equation of state in a cosmological model is <br> investigated. <br> The motion of a test particle inside specific distribution of matter undergoing friction effects is <br> studied. <br> The research activity is completed by the exams that I passed at the Stockholm University and <br> by the schools of physics in Nice that I attended. <br> I spent three months of my mandatory mobility at the Albert Einstein Institute in Potsdam. <br> Main activities implemented by the doctoral candidate since the delivery of the last report <br> Publications on journals with referees: <br> D. Bini, D. Gregoris, S. Succi, EPL (Europhysics Letters) 97,40007 (2012) <br> Bini, Gregoris, Rosquist, Succi, Particle motion in a friction gas: friction matters, General <br> Relativity and Gravitation: Volume 44, Page 2669-2680 Issue 10 (2012) <br> Bini, Gregoris, Rosquist, Succi, Effects of friction forces on the motion of objects in smoothly <br> matched interior/exterior spacetimes, Class. Quantum Grav. 30 (2013) 025009 (17pp) <br> Bini, Geralico, Gregoris, Succi, Friction forces in cosmological models, European Physical <br> Journal C, accepted, (2013) <br> Proceedings: <br> Bini, Gregoris, Kinetic theory in curved space-times: applications to black holes, proceeding <br> for the 12th Italian-Korean Symposium on relativistic astrophysics <br> Bini, Gregoris, Rosquist, Friction forces in general relativity, submitted as proceeding for the <br> MG13, 2012 <br> Exams that I passed during my Ph.D.: <br> Swedish, Course 1 for international students and researchers (4.5 credits) <br> Cosmology and Astroparticle Physics (7.5 credits) <br> Path integral methods in QFT (7.5 credits) <br> Advanced Non-relativistic Quantum Field Theory (7.5 credits) <br> Mathematical physics (7.5 credits) <br> Qualitative and approximate methods in theoretical physics (5 credits) <br> Oral presentations given in international meetings and schools: <br> " Friction forces in General Relativity ", Erasmus Mundus school, June 2012 <br> " Friction forces in General Relativity ", MG13, July 2012 |

" Friction forces", Erasmus Mundus school, September 2012
I also visited the Albert Einstein Institute in Potsdam in October-November-December 2012

Main activities planned to be implemented during the 12 months following the submission of this report
In the next 12 months I plan to continue the research performed this year. In particular I will analyze the role of the equation of state in the construction of a cosmological model, as well as the behaviour of the other physical quantities.

Moreover I plan to pass one exam in differential geometry at the Stockholm University, to take part at the next Erasmus mundus schools of physics and to complete my mobility.

| Doctoral Candidate name (first name - LAST NAME) | Enrolment date in the Joint Programme* |
| :---: | :---: |
|  | 01/01/2012 |
| Name and Institution of the Doctoral Candidate Supervisors* |  |
|  |  |
| Prof. ROMAIN PETROV <br> OBSERVATOIRE DE LA COTE D'AZUR |  |
| Title of the EMJD research project* |  |
| Differential interferometry of the Broad Line Region of Active Galactic Nucleus |  |
| Short summary of the EMJD research project* (the summary must include the mandatory mobility elements as well as the taught/training components and the main milestones for the doctoral candidate supervision and/or research deliverables) |  |
| Broad line region of $A G N$ is extended upto few 100 lds which is very difficult to resolve because of the modern instrumental limitation. AMBER in VLTI combining 3UTs(each Telescope has diameter 8.2 m ) simultaneously in near $I R$ wave band gives access to the BLR region of Brightest AGNs. It unable us the do the detail study of these brightest Astrophysical object. Combining the interferometric measures with reverberation mapping measures (measuring the correlation between continuum and line flux variation) one can constrain the geometry and the kinematic of the AGN. <br> Global Plan of the research project: <br> Observation with AMBER, VLTI, reduction of the data, interpretation of the observation and make physical model to constrain the geometry and kinematic of the QSO 3C273 with reverberation mapping. <br> - Check the reverberation mapping BLR size. <br> - Observation in April 2013, data reduction and interpretation. <br> - Updating physical models with better geometrical constraints. Work on Radiative transfer model of BLR of $A G N$. <br> - Specifying future programme with VLTI (AMBER+, MATISSE, GRAVITY) <br> - Modelling of inner part of accreting disc and search for the influence of accretion disc on BLR of AGNs. |  |
| Main activities implemented by the doctoral candidate since the delivery of the last report |  |
| Observation with VLTI in ESO, Paranal observatory in CHILE from 06/05/2012-17/05/012 Attended School IRAP school at NICE in France 4 ${ }^{\text {th }}$ to $9^{\text {th }}$ of June 2012. <br> Participated Marcel Grossmann 13 meeting at Stockholm in Sweden from 1 to $7^{\text {th }}$ of July. Attended and given a talk in IRAP school at NICE, France from 1 to 21 Sept 2012. <br> Meeting and Research visit on QSO 3C273 at Florence, Italy from 29 to 31 of Oct 2012. |  |
| Main activities planned to be implemented during the 12 months following the submission of this report |  |
| Observation at ESO, Paranal Observatory in Chile from 22 to 4 May 2013. <br> Reduction of data of the new observation with VLTI. <br> Planned to attend School on reverberation "Restless AGN" in Italy in June 2013. <br> VLTI School "High Angular Resolution Interferometry" in France from 9-21 Sept 2013. <br> Visit to Max planck institute of Radio astronomy at BONN, Germany at the End of This year |  |


| Doctoral Candidate name (first name - LAST NAME) | Enrolment date in the Joint <br> Programme* |
| :--- | :--- |
| Jonas Pedro PEREIRA |  |
| Name and Institution of the Doctoral Candidate Supervisors* |  |
| Prof. Remo Ruffini, ICRANet and Sapienza University of Rome <br> Dr. Jorge A. Rueda, ICRANet and Sapienza University of Rome |  |
| Title of the EMJD research project* |  |
| General Relativistic Electrodynamical Processes in Neutron Stars and Black Holes |  |
| Short summary of the EMJD research project* (the summary must include the mandatory <br> mobility elements as well as the taught/training components and the main milestones for the <br> doctoral candidate supervision and/or research deliverables) |  |

## Summary of the research project:

In our project we are interested in applying some effective non-linear electrodynamics (NLED) Lagrangians into the description of black holes and neutron stars for seeing their role into these systems. Efforts will be put into understanding the decomposition of the total energy of a given black hole in this scenario. This is of fundamental importance, because it would allow one to investigate, among many other things, the issue concerning naked singularities as well as the process of energy extraction from black holes. Perturbative analyses will also be addressed for black holes and neutron stars within these Einstein-NLED theories for investigating their subtleties and stability, as well as for enhancing our understanding of the gravitational collapse from the later to the former entities aforementioned.

## Mobility Elements, taught/training/Conferences:

-SIGRAV Graduate School in Contemporary Relativity and Gravitational Physics, Villa Olmo, Como (Italy), May 21st-26th 2012.
-Course: "Gravitational Collapse" held by Professor Remo Ruffini. March-June 2012.
-RJR 70 meeting, University of Rome, Rome, May 17 $7^{\text {th }}$-19th 2012.
-Erasmus Mundus School, Nice, France, June 5th-8th 2012.
-Marcel Grossmann meeting, Stockholm, Sweeden, July 1st - 7th 2012.
-Erasmus Mundus School, Nice, France, September 3rd-19th 2012. Talk: Effects of Nonlinear Electrodynamics in General Relativity.

Main activities implemented by the doctoral candidate since the delivery of the last report
-Investigations concerning nonlinear theories of electrodynamics (NLED) in the spherically
symmetric case (SSC).
-Analyses concerning the implementation of Thermodynamics in general relativity for NLED in the SSC and energy extraction in this scenario.
-Investigation of NLED in the context of axisymmetric spacetimes.
-Applications of the above mentioned areas in Astrophysics.

## Works in Progress

-Jonas P. Pereira, Herman J. Mosquera Cuesta, Jorge A. Rueda and Remo Ruffini, Reversible transformations in Nonlinear Electrodynamics, in preparation.
-Jonas P. Pereira, A. Geralico, Jorge A. Rueda and Remo Ruffini, Einstein-Born-Infeld Black Holes revisited, in preparation.
-Jonas P. Pereira, Herman J. Mosquera Cuesta, Jorge A. Rueda and Remo Ruffini, Nonlinear Electrodynamics in slowly rotating black holes, in preparation.

Main activities planned to be implemented during the 12 months following the submission of this report
-We are planning to investigate the issue concerning the stability of systems composed of thin layers in General Relativity and their application to the stability of neutron stars and their gravitational collapse.
-Analyses should also be carried out concerning the energy decomposition in nonlinear theories of electromagnetism for axisymmetric spacetimes.
-Further applications to Astrophysical systems of the previous investigations.
-Participation to selected meetings, workshops and schools to present the results of these researches.
-Some mobility is planned to be done in France.

| Doctoral Candidate name (first name - LAST NAME) | Enrolment date in the Joint <br> Programme* |
| :--- | :--- |
| HÜSNE DERELI | I September 2011 |
| Name and Institution of the Doctoral Candidate Supervisors* |  |
| Massimo Della Valle, ICRANet |  |
| Michel Boer, ARTEMIS/OCA-Nice |  |
| Title of the EMJD research project* |  |
| Supernovae and Gamma-Ray Bursts |  |
| Short summary of the EMJD research project* (the summary must include the mandatory |  |
| mobility elements as well as the taught/training components and the main milestones for the |  |
| doctoral candidate supervision and/or research deliverables) |  |
| The aim of project is to investigate the relation between stripped supernovae (SNe Ib/c) that <br> result from the cataclysmic death of massive stars and long-duration gamma-ray bursts (GRBs) <br> among the most energetic events in the Universe. <br> The first step of this project is to become familiar with data reduction techniques, finalized to <br> study the photometric and spectroscopic evolution of stripped envelope SNe. So this part has <br> been completed under the responsibility of M. Della Valle in Italy. <br> The second step of this project is to bring the list of Ultra Long GRBs. This may be a new <br> element in the classification of GRBs. Our goal is to get a statistically meaningful sample to be <br> able to characterize this new class, using optical, X-ray, and gamma-ray data from different <br> satellites and telescopes. Then we should be able to study how this class is connected to the <br> others and supernovae. <br> For the last part of this project, I will study the under luminous GRBs which link GRBs and <br> SNe because of their evolution of the field. |  |

## Main activities implemented by the doctoral candidate since the delivery of the last report

I browsed some catalogs which are from the Burst and Transient Source Experiment (BATSE), the Fermi Gamma- ray Space Telescope (FGST), the Konus-wind (Aptekar et al. 1995), the International Gamma-Ray Astrophysics Laboratory (INTEGRAL) in the $\gamma$-ray band, SUZAKU, SWIFT (Gehrels et al. 2004) in X-ray and, the Rapid Action Telescopes for Transient Objects (TAROTs) (Klotz et al. 2009) in optic to find all ultra-long bursts. Mainly, we used observational data for eight longest bursts with the known redshift between 30 long GRBs, lasting more than 400 seconds from archived and public data of FGST/GBM, Swift/XRT, TAROTs (Klotz et al. 2009) as well as several optical telescopes.

We investigate the afterglow light curves observed at X-ray and optical wavelengths. We applied cosmological and absorption corrections to the X-ray afterglow flux and optical magnitude of eight sample of Gamma-Ray Burst (GRBs) of known distance at the duration limitation more than 400 s. The GRBs in our samples from three well defined class which are normal long GRBs (NL-GRBs), super-long GRBs (SL-GRBs) and ultra-long GRBs (ULGRBs). We find out all properties of these eight sources in gamma-ray with prompt emission
data from gamma-ray satellites.
Besides, I worked optical data analysis of TAROT which are in Calern and in Chili and Zadko in Australia for GRB and SNe using the tool of Audela. The aim of these telescopes to give quick report to GCN circular. I also worked on the one specific source (GRB121024A) to get

LC of this source. Mobility part:

1) To work with Maria Teresa Botticella and Massimo Dall'Ola on photometry and spectroscopy with IRAF tools on the SN2004ex data during the my mobility period which is between 1th Nowember 2011 and 30th September 2012 in Observatory of Naples, Naples, Italy.
2) To work with Luca Izzo on tamplate of GRB980425/SN1998bw with optical data using the mathematica scripts, Sapienza University of Rome, Roma, Italy, 7th- 11th of May, 2012.
3) To work with Stefano Valenti on spectroscopic data analysis with IRAF, Observatory of Padua, Padova, Italy, 12th- 16th of May, 2012.
4) Attendance to the 'Erasmus Mundus IRAP PhD School with Prof. Murray Gell-Mann', Nice University, Nice, France, 5th- 9th of June, 2012.
5) Attendance to the 'Thirteenth Marcel Grossmann Meeting (MG13) on Recent Developments in Theoretical and Experimental General Relativity, Gravitation, and Relativistic Field Theory' Stockholm University in Stockholm, Sweden July 1-7, 2012.
6) Attendance to the 'XVIII. National Astronomy and Space Science Congress' with presentation 'Photometric and spectroscopic evolution of SN 2004ex (Iib)', Inonu University, Malatya, Turkey, 27th August 1th September, 2012.
7) Attendance to the 'Erasmus Mundus IRAP PhD School', with two presentation 1-) "'The Type IIb SN 2004ex: spectral and light curve evolution" 2-) " Template analysis of observational data dedicated to the association between GRBs and Supernovae", Nice University, Nice, France, 3th- 21th of September, 2012.
8) Attendance to the 'Introduction for TAROT telescopes and database given by Alian Klotz' OHP, France, 25th -26th October, 2012.
9) Attendance to the 'Training on data analysis of TAROT for GRBs with Audela program and introduction for Zadko telescope given by Alian Klotz', IRAP, Toulouse, France, 3th- 7th of December, 2012.
10) Attendance to the 'Training on data analysis of Zadko for SNe with Audela program given by Alian Klotz' OHP, France, 17th- 18th January, 2013.
11) Attendance to the 'National meeting on High Energy',CNES , Paris, France, 11th- 12th of February, 2013
12) To work with Bruce Gendre on the optical data and X-ray data for Ultra long GRBs using matlab scripts, and to work with Alian Klotz on the data from GRB121024A observed by TAROT, IRAP, Toulouse, France, 4th- 9th of February, 2013.

Main activities planned to be implemented during the 12 months following the submission of this report
5.i) To follow the GRBs and SNe data from TAROT telescopes in Calern, France and in Chili and ZATCO telescope in Australia to give report for GCN circular and to work on some of valuable data for both sources.
6.ii) to prepare the list of GRBs observed by X-ray satellites to make statistic on Under luminous GRBs making connection with SNe using data from each satellites and to contribution on the XMM-Chandra catalog.
7.iii) to work on gravitational wave (GW) data from the GRBs and SNe with specific model

Because of that I will attend two schools about GW data analysis in OHP, France and in Warsaw, Poland in different time.

## PART C: EM MOBILITY DATABASE PRINT-OUTS

The doctorate fellowship candidates' data extracted from the "Erasmus Mundus Mobility Database" must contain the most up to date mobility tracks of all candidates enrolled in the edition/s of the Joint Doctorate covered by this Progress Report("mobility" hyperlink under each individual doctoral candidate name).

In case that the project requests the payment of the further pre-financing the mobility database must include all the necessary and updated financial information concerning payments of the Doctoral Candidates. The form/s must be signed by the project co-ordinator.The financial information in the mobility database must be consistent with the information indicated in PART E of this report.

NEW: EACEA Mobility Tool - User Manual Action 1 \& 2
http://iis-cfprod.eacea.cec.eu.int/mobility/docs/EACEA-Mobility-database-guidelines-EM.pdf

## Scholarship holders' data

(output retrieved from the home page of the course edition concerned)


## Non scholarship holders' data

(output retrieved from the "Non-Scholarship holders" list of the course edition concerned)


To be used for $\mathbf{2}^{\text {nd }}$ Pre-Financing request, Progress

## PART D: TEMPLATE OF THE EMPLOYMENT CONTRACT(S) USED

This template needs to be sent only once with the first progress report. If applicable, any possible changes/adaptations of it should be reported and justified in the reports following the first progress report.

## SEE ANNEXE-7.PDF

PART E: FINANCIAL DECLARATION ON THE USE OF THE EM GRANT
(To be filled in only in case that the report includes a request forfurther pre-financingfor an ongoing specific grant agreement)

Specific Grant Agreement Number: $2011-1640$

| A | Total amount of the Grant: | 1205600 |
| :---: | :--- | :--- |
| B | Amount of the first pre-financing <br> payment received | 843920 |
| C | Amount spent by the consortium | 606600 |
| D | Percentage of the 1 <br> (C / $/$ Bre-financing used | $71,88 \%$ |

* Please note that the second pre-financing payment may only be requested if $70 \%$ or higher of the first pre-financing has been spent.


## BENEFICIARY DECLARATION

I, the undersigned, hereby irrevocably declare that:

- the information contained in this report is accurate and in accordance with the facts.
- the duly updated doctoral candidates data extracted from the "Erasmus Mundus Mobility Database" signed by the joint programme's co-ordinatorincludes the accurate mobility information on each doctoral candidate
- the information has been checked and approved by the partners involved.
- the amounts are accurate and reflect the true expenditures of the specific grant agreement concerned
- the duly updated doctoral candidates data extracted from the "Erasmus Mundus Mobility Database" signed by the joint programme's co-ordinator includes the accurate fellowship amounts spent on each doctoral candidate.

Signature of the beneficiary's legal representative*:
Name and position (in capital letters):
Date:

Signature:

*if the signatory is not the legal representative (as indicated to the Agency) add a valid document confirming their authorisation to sign on his/her behalf

[^2]Doctoral Candidates - Main List
Family Name First Name
Gender Nationality Residence Ranking University of origin Country of University of Origin Nr Schol. Amount
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DOCTORAL CANDIDATES

| Family Name | First Name | Gender | Nationality | Institution / University of origin | Country | Host institution/ University | Country | Mobility Start Date | Mobility End Date | Title of the research Project/Thesis | Amount received |
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| DOCTORAL CANDIDATES - CATEGORY A |  |  |  |  |  |  |  |  |  |  |  |
| IYYANI | Shabnam Sya msunder | F | Indian | Indian Institute o f Technology Roork ee |  | UNIVERSITE D E NICE - SOP HIA ANTIPOLI | France | 04-09-2011 | 18-09-2011 | Observational study of the prompt emission in gamma-ray bursts with the Fermi telescope |  |
| IYYANI | Shabnam Sya msunder | F | Indian | Indian Institute o f Technology Roork ee |  | STOCKHOLM UN IVERSTIY | Sweden | 19-09-2011 | 31-08-2012 | Observational study of the prompt emission in gamma-ray bursts with the Fermi telescope |  |
| IYYANI | Shabnam Sya msunder | F | Indian | Indian Institute o f Technology Roork ee |  | UNIVERSITE D E NICE - SOP HIA ANTIPOLI | France | 01-09-2012 | 22-09-2012 | Observational study of the prompt emission in gamma-ray bursts with the Fermi telescope |  |
| IYYANI | Shabnam Sya msunder | F | Indian | Indian Institute o f Technology Roork ee |  | STOCKHOLM UN IVERSTIY | Sweden | 23-09-2012 | 15-03-2013 | Observational study of the prompt emission in gamma-ray bursts with the Fermi telescope |  |
| Total for IYYANI, SHABNAM SYAMSUNDER : 4 |  |  |  |  |  |  |  |  |  |  | 72700.00 |
| PEREIRA | Jonas | M | Brazilian | Federal University of Itajuba |  | UNIVERSITE D E NICE - SOP HIA ANTIPOLI | France | 04-09-2011 | 18-09-2011 | General Relativistic Electrodynamical Processes in Neutron Stars and Black Holes |  |
| PEREIRA | Jonas | M | Brazilian | Federal University of Itajuba |  | SAPIENZA - U NIVERSITÁ DI ROMA | Italy | 19-09-2011 | 30-06-2012 | General Relativistic Electrodynamical Processes in Neutron Stars and Black Holes |  |
| PEREIRA | Jonas | M | Brazilian | Federal University of Itajuba |  | STOCKHOLM UN IVERSTIY | Sweden | 01-07-2012 | 15-07-2012 | General Relativistic Electrodynamical Processes in Neutron Stars and Black Holes |  |
| PEREIRA | Jonas | M | Brazilian | Federal University of Itajuba |  | SAPIENZA - U NIVERSITÁ DI ROMA | Italy | 16-07-2012 | 31-08-2012 | General Relativistic Electrodynamical Processes in Neutron Stars and Black Holes |  |

[^3]$\square$
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16－07－2012 31－08－2012 Fermi Data from Active Galactic Nuclei
01－09－2012 22－09－2012 Fermi Data from Active Galactic Nuclei
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Total for Category A： $\mathbf{3 5}$ mobilities by 5 Doctoral Candidates
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DOCTORAL CANDIDATES－CATEGORY B

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| Family Name | First Name | Gender | Nationality | Institution / University of origin | Country | Host institution/ University | Country | Mobility Start Date | Mobility End Date |  |  |
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| BEGUE | Damien | M | French | Université Joseph Fourier |  | SAPIENZA - U NIVERSITÁ DI ROMA | Italy | 23-09-2 | 2012 15-03-2013 | Photospheric emission of Gamma-ray Bursts |  |
| Total for BEGUE, DAMIEN : 8 |  |  |  |  |  |  |  |  |  |  | 65200.00 |
| GREGORIS | Daniele | M | Italian | University of Roma La Sapienza |  | UNIVERSITE D E NICE - SOP HIA ANTIPOLI | France | 04-09-2 | 2011 18-09-2011 | Discrete inhomogeneous relativistic cosmology |  |
| GREGORIS | Daniele | M | Italian | University of Roma La Sapienza |  | STOCKHOLM UN IVERSTIY | Sweden | 19-09-2 | 2011 31-08-2012 | Discrete inhomogeneous relativistic cosmology |  |
| GREGORIS | Daniele | M | Italian | University of Roma La Sapienza |  | UNIVERSITE D E NICE - SOP HIA ANTIPOLI | France | 01-09-2 | 2012 22-09-2012 | Discrete inhomogeneous relativistic cosmology |  |
| GREGORIS | Daniele | M | Italian | University of Roma La Sapienza |  | STOCKHOLM UN IVERSTIY | Sweden | 23-09-2 | 2012 30-09-2012 | Discrete inhomogeneous relativistic cosmology |  |
| GREGORIS | Daniele | M | Italian | University of Roma La Sapienza |  | $\begin{aligned} & \text { AEI - POTSDA } \\ & \text { M } \end{aligned}$ | Germany | 01-10-2 | 2012 31-12-2012 | Discrete inhomogeneous relativistic cosmology |  |
| GREGORIS | Daniele | M | Italian | University of Roma La Sapienza |  | STOCKHOLM UN IVERSTIY | Sweden | 01-01-2 | 2013 15-03-2013 | Discrete inhomogeneous relativistic cosmology |  |
| Total for GREGORIS, DANIELE : 6 |  |  |  |  |  |  |  |  |  |  | 65200.00 |
| PISANI | Giovanni Ba ttista | M | Italian | University of Roma La Sapienza |  | UNIVERSITE D E NICE - SOP HIA ANTIPOLI | France | 04-09-2 | 2011 18-09-2011 | Gamma-ray bursts, Black-holes and neutron stars |  |
| PISANI | Giovanni Ba ttista | M | Italian | University of Roma La Sapienza |  | INTERNATIONA L CENTER FOR RELATIVISTI | Italy | 19-09-2 | 2011 30-06-2012 | Gamma-ray bursts, Black-holes and neutron stars |  |
| PISANI | Giovanni Ba ttista | M | Italian | University of Roma La Sapienza |  | STOCKHOLM UN IVERSTIY | Sweden | 01-07-2 | -12 15-07-2012 | Gamma-ray bursts, Black-holes and neutron stars |  |
| PISANI | Giovanni Ba ttista | M | Italian | University of Roma La Sapienza |  | INTERNATIONA L CENTER FOR RELATIVISTI | Italy | 16-07-2 | 2012 31-08-2012 | Gamma-ray bursts, Black-holes and neutron stars |  |
| PISANI | Giovanni Ba ttista | M | Italian | University of Roma La Sapienza |  | UNIVERSITE D E NICE - SOP HIA ANTIPOLI | France | 01-09-2 | 2012 22-09-2012 | Gamma-ray bursts, Black-holes and neutron stars |  |
| PISANI | Giovanni Ba ttista | M | Italian | University of Roma La Sapienza |  | INTERNATIONA L CENTER FOR RELATIVISTI | Italy | 23-09-2 | 12 15-03-2013 | Gamma-ray bursts, Black-holes and neutron stars |  |
| Total for PISANI, GIOVANNI BATTISTA : 6 |  |  |  |  |  |  |  |  |  |  | 65200.00 |
| Total for Category B: 20 mobilities by $\mathbf{3}$ Doctoral Candidates |  |  |  |  |  |  |  |  |  |  | 195600.00 |
| DOCTORAL CANDIDATES - WESTERN BALKANS AND TURKEY WINDOW |  |  |  |  |  |  |  |  |  |  |  |
| DERELI | Husne | F | Turkish | Cukurova Universit y, Adana |  | UNIVERSITE D E NICE - SOP HIA ANTIPOLI | France | 04-09-2 | 2011 18-09-2011 | Supernovae and Gamma-ray Bursts |  |
| DERELI | Husne | F | Turkish | Cukurova Universit y, Adana |  | OBSERVATOIRE DE LA CÔTE D'AZUR | France | 19-09-2 | 2011 25-09-2011 | Supernovae and Gamma-ray Bursts |  |
| DERELI | Husne | F | Turkish | Cukurova Universit y, Adana |  | INTERNATIONA L CENTER FOR RELATIVISTI | Italy | 26-09-2 | 011 01-10-2011 | Supernovae and Gamma-ray Bursts |  |

02-10-2011 08-10-2011 Supernovae and Gamma-ray Bursts
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05-06-2012 09-06-2012 Supernovae and Gamma-ray Bursts
10-06-2012 30-06-2012 Supernovae and Gamma-ray Bursts
01-07-2012 15-07-2012 Supernovae and Gamma-ray Bursts
16-07-2012 02-09-2012 Supernovae and Gamma-ray Bursts




[^0]:    ${ }^{1}$ Please note that if one (or more) of the above replies are negative, the report will be rejected

[^1]:    ${ }^{2}$ Please note that if the Agency during the assessment of the above mentioned report detects a problem/a missing or wrong document related to the mandatory points of the content check list, this will lead to a request for additional information or even a rejection of the report which cause unnecessary delays in its treatment.

[^2]:    | Report: | Export list |
    | :--- | :--- |
    | Project: | International Relativistic Astrophysics Doctorate Program (Edition 2011) |
    | Agreement number: | $2010-0011$ |

    Agreement number: 2010-0011

[^3]:    

