

UNIVERSITÀ DEGLI STUDI DI TRIESTE
 – Dipartimento di Fisica –
 VERBALE N. 29 del 19 /12/2011
 DEL COLLEGIO DEI DOCENTI
 DELLA SCUOLA DI DOTTORATO IN FISICA

Il giorno 19 dicembre 2011 alle ore 14:30, presso il Dipartimento di Fisica dell'Università, sede di via Valerio, 2, sala docenti, si è riunito, regolarmente convocato, il Collegio dei Docenti. Presiede il Prof. Paolo Camerini. Sono presenti:

			Università di Trieste	presente	assente	assente
			Dipartimento di:			giustific.
– Componenti effettivi:						
1. ARFELLI Fulvia	RC	Fisica	X	...	...
2. BENATTI Fabio	RC	Fisica	X	...	...
3. BORGANI Stefano	PA	Fisica	...	...	...	X
4. BOSISIO Luciano	PA	Fisica	X	...	...
5. CAMERINI Paolo	PA	Fisica	X	...	...
6. DELLA RICCA Giuseppe	RC	Fisica	X	...	...
6. FRANCIOSI Alfonso	PO	Fisica	X	...	...
7. GIRARDI Marisa	RC	Fisica	X	...	...
8. GREGORIO Anna	RC	Fisica	X	...	...
9. MATTEUCCI M. Francesca	PO	Fisica	...	...	...	X
10. PARMIGIANI Fulvio	PO	Fisica	X	...	...
11. PERESSI Maria	PA	Fisica	X	...	...
12. SENATORE Gaetano	PO	Fisica	X	...	...
– Componenti in soprannumero:						
1. LANCERI Livio	PO	Fisica	...	...	...	X

Il Presidente, constatato il numero legale dei componenti effettivi del Collegio intervenuti, apre la riunione alle ore 14:30 per trattare il seguente ordine del giorno:

1. Approvazione OdG.
2. Comunicazioni del Direttore.
3. Comunicazioni dei membri del Collegio.
4. Approvazione del Verbale n. 27.
5. Relazione dei membri del Collegio a ciò delegati sulle audizioni degli studenti del XXVI ciclo ed approvazione seduta stante delle relazioni di fine anno.
6. Relazione dei membri del Collegio a ciò delegati sulle audizioni degli studenti del XXV ciclo ed approvazione seduta stante delle relazioni di fine anno.
7. Relazione dei membri del Collegio a ciò delegati sulle audizioni di studenti di cicli precedenti in recupero per sospensione ed approvazione seduta stante delle relazioni di fine anno
8. Relazione dei membri del Collegio a ciò delegati sulle audizioni degli studenti del XXIV ciclo e predisposizione ed approvazione seduta stante dei medaglioni di presentazione.
9. Assegnazione borsa di dottorato del Fondo Sociale Europeo per il XXVII ciclo.
10. Eventuale riassegnazione di posti/borse rimasti vacanti ed emissione di ulteriore bando.
Delega al direttore.
11. Pratiche studenti
12. Varie ed eventuali

1. Approvazione OdG.

L'OdG viene approvato.

2. Comunicazioni del Direttore.

Il direttore relaziona brevemente sull'ultimo bando, sui seminari di fine anno e di fine ciclo e sul consiglio scientifico che si e' riunito in data 13 e 14 dicembre 2011.

Per quanto riguarda i seminari fine anno, il direttore fa presente che i seminari di fine ciclo sono stati seguiti dal consiglio scientifico, che si e' riunito al completo. Complessivamente il risultato e' stato buono e il consiglio scientifico ha apprezzato.

Sono giunti alcuni consigli interessanti dal consiglio stesso, quali ad esempio il suggerimento di pubblicizzare meglio la relazione fra il dottorato e le occupazioni successive al diploma di dottorato dei nostri dottorandi che tipicamente e' molto buona. Tutti il consiglio scientifico si e' dimostrato molto collaborativo.

Il direttore relazione brevemente anche sull'ultima selezione legata all'FSE (Fondo Sociale Europeo). A tal proposito prende la parola il prof. Gaetano Senatore. Al bando sono state presentate cinque domande e si sono presentati quattro candidati, tutti di buon livello.

3. Comunicazioni dei membri del Collegio.

La prof.ssa Peressi fa presente che il sito web del dottorato e' ancora ufficialmente quello che gestiva lei fino ad un anno fa e quindi e' necessaria una spinta verso il nuovo sito web.

La dott.ssa Gregorio comunica che vi e' l'intenzione di pubblicare il nuovo sito in gennaio. Alcuni membri del Collegio suggeriscono di lasciare il sito solo in inglese. Nel momento in cui il sito verrà pubblicato si invitano tutti i componenti del collegio a controllarlo e verificare le diverse voci.

4. Approvazione del Verbale n. 27.

Il verbale n. 27 viene approvato previa correzione relativa alla presenza del componente dott. Della Ricca che risultava erroneamente assente.

5. Relazione dei membri del Collegio a ciò delegati sulle audizioni degli studenti del XXVI ciclo ed approvazione seduta stante delle relazioni di fine anno.

I responsabili delle varie aree relazionano brevemente sull'andamento dei seminari degli studenti del XXVI ciclo. Tutti i responsabili dichiarano che i seminari sono stati complessivamente buoni a parte alcuni casi isolati di seminari troppo tecnici. Si fa presente che talvolta sono i tutori, particolarmente se esterni, a spingere in questo senso e che nel futuro dovranno essere meglio istruiti in tal senso.

Tutte le relazioni, già precedentemente circolate al Collegio dal Direttore, vengono approvate contestualmente al passaggio d'anno di tutti gli studenti più sotto elencati.

Candidati:

BATTISTONI Andrea	(Bencivenga/Parmigiani)
BIANCO Raffaello	(R. Resta)
CANDELISE Vieri	(Della Ricca)
DONADI Sandro	(A. Bassi)
FORMATO Valerio	(Boezio/Gregorio)
GIANGRISOSTOMI Erika	(Masciovecchio / Parmigiani)
GRIECO Valentina Luciana	(Matteucci/Longo)
MUNARI Emiliano	(Biviano/Borgani)

ORLANDO Fabrizio	(Baraldi)
SALVINI Simona	(Treleani)
TAVAGNACCO Daniele	(Gregorio)

Questa parte del verbale viene approvata seduta stante.

6. Relazione dei membri del Collegio a ciò delegati sulle audizioni degli studenti del XXV ciclo ed approvazione seduta stante delle relazioni di fine anno.

I responsabili delle varie aree relazionano brevemente sull'andamento dei seminari degli studenti del XXV ciclo. Anche in questo caso i responsabili dichiarano che i seminari sono stati complessivamente buoni a parte alcuni casi isolati di seminari troppo tecnici.

In questo caso sono state evidenziate alcune problematiche specifiche, ma di scarso rilievo. Il prof. Benatti fa presente che Argentieri e' un po' in ritardo a causa di problemi oggettivi, avendo cambiato tema di ricerca e tutore dopo sei mesi dall'inizio del dottorato e a causa di seri problemi familiari. Si auspica che riesca a recuperare.

Tutte le relazioni, già precedentemente circolate al Collegio dal Direttore, vengono approvate contestualmente al passaggio d'anno di tutti gli studenti, più sotto elencati.

Candidati:

ARGENTIERI Giuseppe	(Benatti)
CAPOGROSSO Valentina	(Parmigiani)
CONTINI Emanuele	(Borgani/DeI Lucia)
DORIGO Mirco	(Zanetti/Vitale)
GIACOBBE Paolo	(Lattanzi / Matteucci)
LEA Ramona	(Camerini)
LOPEZ Francs Caroline	(Longo Renata)
MOHAMMADI Sara	(Tromba/Parmigiani)
MONTANINO Damiana	(Cossutti/Della Ricca)
NOVELLI Fabio	(Parmigiani)
OLIVIERI Giorgia	(Morgante)

Questa parte del verbale viene approvata seduta stante.

7. Relazione dei membri del Collegio a ciò delegati sulle audizioni di studenti di cicli precedenti in recupero per sospensione ed approvazione seduta stante delle relazioni di fine anno

La dottoranda JERSE Giovanna (ciclo XXIII, supervisor Boezio e Gregorio) ha ripreso a lavorare solo negli ultimi tre mesi dopo un periodo di sospensione per malattia. La relazione di fine anno e la presentazione sono approvate.

Questa parte del verbale viene approvata seduta stante.

8. Relazione dei membri del Collegio a ciò delegati sulle audizioni degli studenti del XXIV ciclo e predisposizione ed approvazione seduta stante dei medaglioni di presentazione.

I responsabili delle varie aree relazionano brevemente sull'andamento dei seminari degli studenti del XXIV ciclo. Anche in questi caso tutti i responsabili dichiarano che i seminari sono stati di buon livello, anche se alcuni sono stati troppo tecnici.

Si predispongono ed approvano i medaglioni dei candidati del XXIV ciclo (più sotto elencati) per la presentazione all'esame finale, come da file allegato.

Candidati:

CILENTO FEDERICO	(Fisica della materia, supervisore Parmigiani)
ELIA CARMINE	(Fisica Nucleare e subnucleare, supervisore Martin)
PICCIRILLI FEDERICA	(Fisica della materia, supervisore Comelli)
PINAMONTI MICHELE	(Fisica Nucleare e subnucleare, supervisore Verzegnassi)
SARTORIS BARBARA	(Astrofisica, supervisore Borgani)
ZHAN RONGRONG	(Fisica della materia, supervisore Baraldi)
FAN XI-LONG	(Astrofisica, supervisore Matteucci)

Questa parte del verbale viene approvata seduta stante.

9. Assegnazione borsa di dottorato del Fondo Sociale Europeo per il XXVII ciclo.

La Commissione d'esame ha concluso i propri lavori redigendo una graduatoria di idonei. Al primo posto risulta Mario Filiasi. Il Collegio propone di assegnare pertanto a Mario Filiasi la borsa FSE.

Questa parte del verbale viene approvata seduta stante.

10. Eventuale riassegnazione di posti/borse rimasti vacanti ed emissione di ulteriore bando. Delega al direttore.

Il direttore relaziona brevemente sulle selezioni del ciclo XXVII, ricordando che sono possibili rinunce che renderebbero necessario offrire le borse liberatesi agli idonei senza borsa e forse ad una successiva riapertura del bando.

Il collegio si trova unanime nel dare al direttore tutte le deleghe necessarie per la riassegnazione delle borse e la definizione delle caratteristiche e tempi di un eventuale nuovo bando.

Questa parte del verbale viene approvata seduta stante.

11. Pratiche studenti

Non ci sono pratiche studenti.

12. Varie ed eventuali

Non ci sono varie ed eventuali.

La seduta si chiude alle ore 16:15.

IL PRESIDENTE
Prof. P. Camerini

IL SEGRETARIO
Dr. Anna Gregorio

Presentazione del candidato Federico Cilento.**(supervisore: Prof. Fulvio Parmigiani)****Referees della tesi:****Prof. Andrey Chubukov, University of Wisconsin****Prof. Jure Demsar, University of Konstanz**

Federico Cilento has fruitfully accomplished the required educational activities as approved by the Teachers Board, including PHD courses, lectures and the attendance to schools and conferences.

The scope of Federico Cilento's thesis is to study complex systems (Cuprates, Pnictides, CuGeO_3 , VO_2) showing strong electronic correlation effects by time resolved optical spectroscopies in the femtosecond time domain.

In particular, the studies reported by Cilento consist in novel approaches and models suitable for measuring the differential dielectric function by interpreting the time evolution of the optical response of materials far from equilibrium.

For performing such experiments a new optical setup capable of providing spectroscopic information in the time and frequency domains has been designed and developed.

For this reason the work described by Federico Cilento had required not only the design of innovative pump-probe systems but also new detector devices and methods capable to provide the proper calibration of super-continuum ultrafast (~ 100 fs) laser pulses.

These experimental setups along with the development of effective and original models have brought very important results that can be summarized in the following points:

1. redefinition of the phase diagram of the Bi2212 high temperature superconductor;
2. development of new model for interpreting the optical properties of a HTSC far from equilibrium;
3. design and development of new optical devices, detectors and methodologies for characterizing ultrafast broad-band optical pulses in the visible, near and mid IR.

In my opinion the scientific achievements obtained by Federico Cilento are quite important and they represent the outcome of a research activity of very high quality and to some extent exemplar.

The significant number of high quality publications and manuscripts presented by the candidate supports this appraisal.

My final judgment about the PhD research and education of Federico Cilento is excellent, while in the meantime the target of forming a new and brilliant young experimental physicist has been completed.

Publications:

1. C. Giannetti, F. Cilento, S. Dal Conte, G. Coslovich, G. Ferrini, H. Molegraaf, M. Raichle, R. Liang, H. Eisaki, M. Greven, A. Damascelli, D. van der Marel, and F. Parmigiani, Revealing the high-energy electronic excitations underlying the onset of high-temperature superconductivity in cuprates, *Nature Communications* 2, 353 (2011) and <http://arxiv.org/abs/1105.2508>.

2. G. Coslovich, C. Giannetti, F. Cilento, S. Dal Conte, G. Ferrini, P. Galinetto, M. Greven, H. Eisaki, M. Raichle, R. Liang, A. Damascelli, and F. Parmigiani; Evidence for a photoinduced nonthermal superconducting-to-normal-state phase transition in overdoped

Bi₂Sr₂Ca_{0.92}Y_{0.08}Cu₂O_{8+d} by ultrashort laser pulses, Phys. Rev. B 83, 052907 (2011) and <http://arxiv.org/abs/1005.4320>

3. G. Galimberti, S. Pagliara, S. Ponzoni, S. Dal Conte, F. Cilento, G. Ferrini, S. Hofmann, M. Arshad, C. Cepek, and F. Parmigiani; The photoinduced charge transfer mechanism in aligned and unaligned carbon nanotubes, Carbon 49, 5246 (2011).

4. F. Cilento, C. Giannetti, G. Ferrini, S. Dal Conte, T. Sala, G. Coslovich, M. Rini, A. Cavalleri, and F. Parmigiani; Ultrafast insulator-to-metal phase transition as a switch to measure the spectrogram of a supercontinuum light pulse, Appl. Phys. Lett. 96,021102 (2010) and <http://arxiv.org/abs/0910.3785>.

5. G. Coslovich, C. Giannetti, F. Cilento, G. Ferrini, and F. Parmigiani; Quasi-particles dynamics in underdoped Bi₂212 under strong optical perturbation AIP Conference Proceedings 1162, pp. 177-185 (2009) .

6. C. Giannetti, G. Coslovich, F. Cilento, G. Ferrini, H. Eisaki, N. Kaneko, M. Greven, and F. Parmigiani; Discontinuity of the ultrafast electronic response of underdoped superconducting Bi₂Sr₂CaCu₂O_{8+d} strongly excited by ultrashort light pulses Phys. Rev. B 79, 224502 (2009) and <http://arxiv.org/abs/0804.4822>

This paper was selected for the Virtual Journal of Applications of Superconductivity.

This paper was selected for the Virtual Journal of Ultrafast Science.

Manuscripts submitted

1. S. Dal Conte, C. Giannetti, G. Coslovich, F. Cilento, D. Bossini, T. Abebaw, F. Banfi, G. Ferrini, H. Eisaki, M. Greven, A. Damascelli, D. van der Marel, and F. Parmigiani; Disentangling the electronic and phononic glue in a high-T_c superconductor
Under reviewing with Science;

Manuscripts in preparation

1. G. Coslovich, C. Giannetti, F. Cilento, S. Dal Conte, G. Ferrini, M. Raichle, R. Liang, A. Damascelli, and F. Parmigiani. The relation between pseudogap and superconductivity: Causality or Casualty?

2. F. Cilento, C. Giannetti, S. Dal Conte, G. Coslovich, A. Damascelli, and F. Parmigiani. Pseudogap Phase: temperature dependent glue function.

3. F. Cilento, C. Giannetti, S. Dal Conte, G. Coslovich, A. Damascelli, and F. Parmigiani. Non-equilibrium phase diagram

Presentation of the PhD student Carmine Elia
Supervisor: prof. Anna Martin

Carmine Elia has fruitfully accomplished the required educational activities as approved by the Teachers Board, including PHD courses, lectures and the attendance to schools and conferences.

In the 3 years of activity as PhD student, Carmine Elia worked on the COMPASS experiment, a fixed target experiment at the CERN SPS managed by an international collaboration consisting in about 240 physicists. During all this period he participated actively at the experiment, following all the different aspects, and dedicating most of the time to data analysis.

The main topic of his thesis is the measurement of azimuthal transverse spin asymmetries in hadron production in deep inelastic lepton-nucleon scattering (SIDIS) at high energies, and in particular the measurement of the transverse spin asymmetry in the production of pairs of opposite charge hadrons (the 'two-hadron asymmetry'). This process is of particular interest because it gives access to the third distribution function needed to describe the nucleon structure at leading order, the transversity distribution, which is related to the probability of finding a quark with polarisation parallel to spin of the parent nucleon. At variance with the number distributions and the helicity distributions, the transversity distributions are still poorly known. The only informations are presently coming from the measurements of the so-called Collins asymmetry recently measured in SIDIS off transversely polarised nucleons by the COMPASS and HERMES experiments combined with the measurements of azimuthal asymmetries in measured by the Belle Collaboration. At variance with the Collins asymmetry, which is measured from the single hadron azimuthal distributions, the two-hadron asymmetry does not involve the intrinsic transverse momentum of the quarks. This is a remarkable advantage, and makes this channel particularly interesting.

In COMPASS the two-hadron asymmetry has been first measured using a transversely polarised deuteron target from the data collected in the years 2002-2004, and the results are compatible with zero. In the mean time HERMES, at lower energy and with a proton target, found evidence for a signal different from zero. In 2007 COMPASS collected the first data with a transversely polarised target, and the two-hadron asymmetry turned out to be different from zero in the valence region, and of the same strength and sign of the Collins asymmetry for positive hadrons. The finding of a clear transverse spin effects also at the COMPASS energies and the limited useful statistics collected in 2007 justified the request for a full year of data with transversely polarised protons. The data taking took place in 2010.

Carmine Elia started his PhD work in 2009. At that time the analysis of the data collected in 2007 was not yet over because of non negligible systematic effects which required a lot of investigation, and Carmine Elia started working on this topic. In particular he developed a new method based on the elastic scattering to study the time stability of the experimental apparatus. He also started to develop his own programs to estimate the single and the two-hadron asymmetries from the measured azimuthal asymmetries. The year 2010 has been almost completely dedicated to the preparation of the data taking and to the data taking itself. Carmine Elia contributed to the 6 months of run taking shifts on the experiment and analysing the samples of data which were processed in real time in order to check the quality of the data, a very important task. He also dedicated a relevant part of time to characterize the two new hodoscopes used to trigger on muons scattered at large angle, implemented in August 2010, and to study the efficiency and purity of this new trigger. In the following, in collaboration with the Trieste and Erlangen colleagues, Carmine Elia started the complete analysis of the 2010 data. In particular he studied, improved and used an existing tool used to study the stability of the data grouped in spills. This is one of the data quality tests which are applied for measurements of all the transverse spin asymmetries. Once the final data set was defined, Carmine Elia, in collaboration with Erlangen, started the work to measure the two-hadron asymmetry and to estimate the systematic uncertainties, first for charged hadrons and then for charged hadrons identified with the RICH detector. The analysis for the two-hadron asymmetry was over in August, and the results were shown at Transversity2011 and soon later by Carmine Elia at Dubna-SPIN2011. The new results

have been largely appreciated by the international community since they reduce the statistical uncertainty by almost a factor of two with respect to the results from the 2007 data, and are quite precise measurements over the a wide range in x and in two hadron invariant mass. The results will be published soon. The agreement with the theory is presently not very good, but the COMPASS measurements are really new, and the large effort ongoing in this field will allow in the near future for relevant progress in the data interpretation. In addition to the 'standard' analysis Carmine Elia has also performed different analysis to deeper understand the spin effects in the two-hadron channel and the possible connections with the Collins asymmetry and fragmentation function.

Summarising, during his PhD Carmine Elia has carried on a complete work, following all the aspects related to the experimental activity, in a very satisfactory way. He also demonstrated his capability of giving original contributions and to do high quality work. It has also to be mentioned that his achievements are particularly appreciated since his previous experiences (thesis on the Opera experiment followed by a few years of work in the industry) were completely different. In a short time he has been able to contribute in a new experiment, with new physics goals and new hardware and software systems. The fact that Carmine Elia started to work in COMPASS with the PhD thesis had also implications on number of papers he signed. The COMPASS rules require that only people working since at least two years on the experiment can be authors of papers. It is only because of his recognised contribution to the 2007 data analysis that Carmine Elia could sign the paper on the Collins and Sivers asymmetries measured from the 2007 data which has been published in 2010. Finally, for different reasons, the year 2011 has been a particularly bad for the COMPASS publications (a lot of papers in preparation, but still in the pipeline, including the paper on the two-hadron asymmetry from the 2007 data!). Carmine Elia will sign several papers, but in 2012. Finally, Carmine Elia has reach a level of scientific maturity and independence in the work which would by sure justify the continuation of the research activity. Also because of the present situation in Italy, it is however very likely that Carmine Elia will only continue his activity in the field for a short period.

Publications of Carmine Elia:

1. M.G. Alekseev et al. [COMPASS Collaboration], Measurement of the Collins and Sivers asymmetries on transversely polarized protons, Phys. Lett. B 692 (2010) 240.

Talks at International Conferences:

1. Carmine Elia for the COMPASS Collaboration, Measurement of two-hadron single spin asymmetries at COMPASS, DSPIN 2011: XIV Workshop on High Energy Spin Physics, Dubna, Russia, 20-24 September 2011, Proceedings in preparation.

Participation at International Conferences:

1. Grid Computing: a new tool for Science and Innovation, Veli Losinj, Croatia, 25-29 August 2009
2. IWHSS10, 10th International Workshop on Hadron Structure and Spectroscopy, Venice International University, March 14 - 17, 2010
3. IWHSS11, 11th International Workshop on Hadron Structure and Spectroscopy, Paris, April 4-6, 2011
4. Transversity 2011, III International Workshop on Transverse Polarization Phenomena in Hard Scattering, Veli Losinj, Croatia, 29 August-2 September 2011

Schools:

1. Giornate di Studio sui Rivelatori, Villa Gualino, Torino, 10 - 13 febbraio 2009
2. Transverse Momentum Dependent Parton Distribution Functions, Ferrara International School Niccolò Cabeo, IUSS, Ferrara, 24-28 May 2010
3. Three-dimensional partonic structure of the nucleon, Varenna International School of Physics "Enrico Fermi", Varenna, 28 June - 8 July 2011

Presentation of Mr. Xilong Fan
Supervisor: Prof. Francesca Matteucci

Xilong Fan has fruitfully accomplished the required educational activities as approved by the Teachers Board, including PHD courses, lectures and the attendance to schools and conferences.

Mr. Xilong Fan is concluding the third year of his PhD fellowship at the University of Trieste. His thesis advisors are Dr. Laura Silva and myself. Xilong Fan will present a thesis on chemical and spectrophotometric evolution of galaxies. During his thesis he has learned how to use detailed chemical evolution models for galaxies of different morphological type.

These models include detailed stellar nucleosynthesis as well as dust production and destruction mechanisms. They can predict in great detail the evolution of the abundances of several chemical species in the ISM of galaxies. He has also learned how to use detailed spectrophotometric models aimed at predicting the stellar energy distribution (SED) of galaxies once their chemical evolution has been computed. He applied this knowledge to the study of high redshift objects, in particular Lyman Break Galaxies and Quasars. He also studied the nature of the hosts of GRBs at low and high redshift. Xilong Fan during his PhD training has demonstrated a lot of initiative and the will of broadening his knowledge in Astrophysics. He is a clever student and a hard worker.

During his thesis period he has published two papers on Astronomy & Astrophysics and at the moment he is finishing two important papers: one on the effects of the integrated star initial mass function (IGIMF), as suggested by Weidner & Kroupa, on the evolution of LBGs and the other on the study of the SEDs of galaxies of different morphological type.

Xilong has a very nice character and a strong will of succeeding in the astronomical career. His spoken English is good, as demonstrated by the talks that he has presented at important international meetings, whereas his written English still needs to improve.

In particular, he has presented a talk at a meeting in Paris in June 2011 (title of the workshop: From Dust to Galaxies) and another at a meeting in Sesto (Pusteria), Italy (title of the meeting: Chemical Evolution of Galaxies Hosting GRBs). He is planning to spend at least one more year outside China and he has applied to many Post-doc positions all over the world. He seems highly motivated in pursuing a career in scientific research.

Schools and Workshops:

- Francesco Lucchin School of Astrophysics: GAIA-the milestone of the distance scale and The Infrared Universe-the Herschel and Alma eras,” 2009, Tuscany, Italy;
- Workshop on VO-DAY, 2009, Trieste, Italy;
- Francesco Lucchin National Ph.D School of Astrophysics: Simulations of complex phenomena in Astrophysics and First light after the dark ages ,2010, Asiago, Italy.

Conferences:

- ”From Dust to Galaxies”, 2011, Paris, France;
- ”Chemical Evolution of GRB Host Galaxies”, 2011, Sexten, Italy

Presentations:

- “Spectral Evolution of Galaxies”, Apr., 2009, Trieste University, Italy;
- “Lyman Break Galaxies”, Jun., 2009, Trieste University, Italy;
- “Galaxy evolution from chemical abundances and SED”, Jul., 2009, Trieste University, Italy;
- “Chemical evolution of elliptical galaxies”, Dec., 2009, Trieste University, Italy;
- “Chemical evolution of elliptical galaxies with dust”, Dec., 2010, Trieste University, Italy
- “Modeling the galaxies in IR”, Feb., 2011, Trieste University, Italy;

- “From LGRB-DLAs to LGRB host galaxies: an evolution sequence \mathcal{E}_i ”, Jul., 2011, Trieste University, Italy
- “Dust from galactic chemical evolution and SED model” in “From Dust to Galaxies, 2011, Paris, France”,
- “The nature of long-GRB host galaxies from chemical abundances” in “Chemical Evolution of GRB Host Galaxies, 2011, Sexten, Italy”,

Publications:

1. X. L. Fan, F. Calura, C. Weidner & F. Matteucci. “IGIMF on $[\alpha/\text{Fe}]$ of starburst galaxy”, 2011, in progress .
2. X. L. Fan. “The nature of LBGs at $z \sim 3$ from pan-spectral energy distribution modeling”, 2011, Astronomy & Astrophysics submitted.
3. X. L. Fan, J. Yin, & F. Matteucci. “The nature of Long-GRB host galaxies from chemical abundances”, 2010, Astronomy & Astrophysics, 521,73;
4. A. Pipino, X. L. Fan, F. Matteucci, F. Calura, L. Silva, G. Granato, & R. Maiolino. “The chemical evolution of elliptical galaxies with stellar and QSO dust production”, 2011, Astronomy & Astrophysics, 525, 61 ;

Presentation of Federica Piccirilli

Supervisors: Prof. G. Comelli, Dr. A. Perucchi

Thesis Title: High-Pressure Studies of Amyloid Proteins

Federica Piccirilli has fruitfully accomplished the required educational activities as approved by the Teachers Board, including PHD courses, lectures and the attendance to schools and conferences.

The PhD project of the candidate has represented a completely new activity within the SISSI infrared beamline group at Elettra. The infrared study of proteins at high-pressures is a technique developed during the 90's, mainly in the group of Prof. Heremans at University of Leuven. Despite its great potentials, and because of the technical difficulties inherent to this approach, this technique is only employed by a handful of groups worldwide.

At the beginning of her PhD, Federica Piccirilli received some training both in infrared spectroscopy and high-pressure techniques. The coupling of these two techniques, which is routinely done at the beamline to study condensed matter, was never employed before in our laboratory to address biophysical studies. Thanks to her background as an experimental biophysicist Federica was committed to start this new, highly interdisciplinary activity by exploiting the instrumentation already present in our laboratory.

During the years the candidate has developed all the necessary procedures and techniques in order to perform the infrared characterization of proteins and amyloid aggregates at high pressures. She has rapidly learned how to take advantage of the equipments and expertise from the biology laboratories at ELETTRA, in order to properly handle biological materials. The quality of the measurements was steadily improved along the years because of her increasing progresses both in biological sample preparation, and experimentalist skills. She has also acquired great competences in IR data treatment, by making use of several different deconvolution algorithms, and by learning modern mathematical tools as the two-dimensional correlation analysis.

Since the beginning, the PhD project has strongly relied on Federica's great enthusiasm, willingness to take risks and critical thinking. All these qualities have been strictly necessary to the success of this project. In these years Federica has also participated to the beamline activities, by providing assistance to external users, from different scientific fields.

Besides already established collaborations, and the proposals she has herself submitted, three high-pressure bioscience proposals have been submitted to the SISSI beamline, thanks to Federica's presentations at conferences. In particular, her participation to the Italian High-Pressure workshop in 2010, was at the origin of the collaboration with the groups of Prof. P. Mariani at Università Politecnica delle Marche and Prof. L. Bubacco at University of Padova, for the study of alpha-synuclein at high-pressure. This represents the topic of one chapter of her PhD thesis.

At moment of writing, the candidate has three accepted publications in peer-reviewed international journals. At least two other publications, of which Federica will be the first author, are presently in preparation. These latter publications will be based on the materials presented in this thesis.

List of Publications

- 1) Infrared microspectroscopy of biochemical response of living cells in microfabricated devices
Vibrational Spectroscopy 53, 6-11 (2010)
G. Birarda, G. Greci, L. Businaro, B. Marmiroli, S. Pacor, F. Piccirilli, L. Vaccari
Development of the computational tool used for the Mie scattering correction

2) Raman analysis of insulin denaturation induced by high-pressure and thermal treatment

Journal of Raman Spectroscopy, in press (2011)

S. Mangialardo, F. Piccirilli, A. Perucchi, P. Dore, P. Postorino

Preparation of the samples, participation to the Raman measurement Strong involvement in the planning of the experiment, in the discussion of the results, and in the preparation of the manuscript.

3) IRMS study of insulin crystals at high pressure

Journal of Physics: Conference Series, accepted for publication (2012)

F. Piccirilli, S. Mangialardo, S. Lupi, P. Postorino, A. Perucchi

Preparation of the samples, experiment planning and execution, data analysis, preparation of the manuscript

Presentation of the candidate Michele Pinamonti
Supervisor: Prof. C. Verzegnassi, Prof. M Cobal

Michele Pinamonti has fruitfully accomplished the required educational activities as approved by the Teachers Board, including PHD courses, lectures and the attendance to schools and conferences.

The top quark, discovered at the Tevatron pp collider in 1995, has been observed in pp-collisions at the LHC by both ATLAS and CMS experiments in 2010. Michele Pinamonti gave an essential contribution to the first measurement of the $t\bar{t}$ production cross section with the ATLAS experiment at a center of mass energy of 7 TeV. He produced the plots which showed the first evidence of a top signal in our experiment, shown at the HCP2010 and EPS2010 conferences. The work presented in Michele Pinamonti's thesis has been the subject of the first publication of the ATLAS experiment on top quark physics: the measurement of the $t\bar{t}$ total production cross-section (see Section 'Publications', ATLAS papers nr. 16). For this paper, he developed the analysis strategy, calculated the main backgrounds to the $t\bar{t}$ signal and evaluated the relevant systematics. He then updated the analysis with the full 7 TeV pp collision data collected between August 2010 and August 2011.

In some more details, Michele studied the so-called single lepton decay channel to identify $t\bar{t}$ events, selecting final states containing one electron or muon, jets and missing energy, requiring at least one of the jets to be tagged as a b-quark jet. He then extracted the cross-section using a simple counting method, for which an accurate background estimation is crucial. For this reason, he developed data-driven methods to extract the main QCD and W+jet backgrounds as described and discussed in the thesis, and in several internal and public notes of the ATLAS experiment for which he is an author (see Section 'Publications', under ATLAS Conference notes and ATLAS Public notes). These methods are now used by the ATLAS top group, for different analyses. He also used his results of the cross-section measurement with 2011 data to derive an indirect measurement of the top quark mass.

Analysing the data collected in 2010, corresponding to an integrated luminosity of 35 pb^{-1} he got a cross-section of: $\sigma = 156^{+36}_{-30} \text{ pb}$ while with the 2.05 fb^{-1} of data analysed in 2011 he obtained a cross-section of: $\sigma = 163^{+22}_{-17} \text{ pb}$.

He then used the latter result to extract a top mass value of: $m_{\text{top}} = 173.2^{+6.8}_{-6.3} \text{ GeV}/c^2$.

The cross-section results presented in Michele Pinamonti's thesis are in good agreement with the theoretical predictions and with the other measurements done in ATLAS and CMS. The top mass obtained from this cross-section measurement agrees with the world average value.

Michele presented already his work at many working group meetings at CERN and also at International Conferences, as listed in the Section 'Presentations at Conferences'. Michele is creative and fast but at the same time very precise, independent but also capable to work in harmony within a team of people, even in a high competition environment. He is now very well known in ATLAS, and the collaboration has a very high opinion of him and really appreciate his reliability. We can say, without any doubt, that he is the most brilliant PhD student we had the chance to work with.

Presentations at conferences

- 22 September 2008: XCIV Congresso Nazionale della Società Italiana di Fisica (Genova), communication 'Misura della sezione d'urto per la produzione di coppie top-antitop in ATLAS, utilizzando il canale di decadimento semi-leptonico';
- 15 April 2009: IFAE 2009 - VIII Edizione (Bari), talk 'Misura della sezione d'urto per la produzione di coppie $t\bar{t}$ ad ATLAS';
- 7 April 2010: IFAE 2010 - IX Edizione (Roma), poster ' $t\bar{t}$ production crosssection measurement at ATLAS';

- 22 September 2010: XCVI Congresso Nazionale SIF (Bologna), communication ‘Towards top quark ‘rediscovery’ at LHC with the ATLAS detector’;
- 17 March 2011: 46th Recontres de Moriond, Electroweak Interactions and Unified Theories (La Thuile), student talk ‘Top-quark pair cross-section measurement in the lepton+jets channel at ATLAS’;

Publications, Conference Proceedings

1. Measure of the $t\bar{t}$ pair production cross section at ATLAS; M. Pinamonti, on behalf of the ATLAS Collaboration; *Il Nuovo Cimento C - Colloquia on Physics*, Vol. 32, 2009;
2. Perspectives for $t\bar{t}$ cross-section measurement at ATLAS; M. Pinamonti, on behalf of the ATLAS Collaboration; *Il Nuovo Cimento C - Colloquia on Physics*, Vol. 33, 2010;
3. Top-quark pair cross-section measurement in the lepton+jets channel; M. Pinamonti, on behalf of the ATLAS Collaboration; ATL-PHYS-PROC-2011-059; arXiv:1106.3833; 20 Jun 2011;

ATLAS Conference Notes:

1. Search for top pair candidate events in ATLAS at $\sqrt{s} = 7$ TeV; ATLAS-CONF-2010-063; 28 Jul 2010. - 12 p.;
2. Background studies for top-pair production in lepton plus jets final states in $\sqrt{s} = 7$ TeV ATLAS data; ATLAS-CONF-2010-087; 11 Oct 2010. - 10 p.;
3. Top Quark Pair Production Cross-section Measurements in ATLAS in the Single Lepton+Jets Channel without b-tagging; ATLAS-CONF-2011-023; 17 Mar 2011. - 16 p.;
4. Measurement of the top quark-pair cross-section with ATLAS in pp collisions at $\sqrt{s} = 7$ TeV in the single-lepton channel using b-tagging; ATLAS-CONF-2011-035; 23 Mar 2011. - 19 p.;
5. Measurement of the charge asymmetry in top quark pair production in pp collisions at $\sqrt{s} = 7$ TeV using the ATLAS detector; ATLAS-CONF-2011-106; 04 Aug 2011. - mult. p.;

ATLAS Public Notes:

1. Prospects for the Top Pair Production Cross-section at $\sqrt{s} = 10$ TeV in the Single Lepton Channel in ATLAS; ATLAS Collaboration; ATL-PHYS-PUB-2009-087; CERN, 2009;
2. Prospects for measuring top pair production in the dilepton channel with early ATLAS data at $\sqrt{s} = 10$ TeV; ATLAS Collaboration; ATL-PHYS-PUB-2009-086; CERN, 2009;

ATLAS Papers:

1. Readiness of the ATLAS Liquid Argon Calorimeter for LHC Collisions; ATLAS Collaboration; arXiv:0912.2642; CERN-PH-EP-2010-041.- Geneva: CERN, 2010 - 31 p. - Published in: *Eur. Phys. J. C* 70 (2010) 723-753;
2. Drift Time Measurement in the ATLAS Liquid Argon Electromagnetic Calorimeter using Cosmic Muons; ATLAS Collaboration; arXiv:1002.4189; CERN-PHEP-2010-042.- Geneva: CERN, 2010 - 30 p. - Published in: *Eur. Phys. J. C* 70 (2010) 755-785;
3. Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC; ATLAS Collaboration; arXiv:1003.3124; CERN-PH-EP-2010-004.- Geneva: CERN, 2010 - 40 p. - Published in: *Phys. Lett. B* 688 (2010) 21-42;

4. The ATLAS Inner Detector commissioning and calibration; ATLAS Collaboration; arXiv:1004.5293; CERN-PH-EP-2010-043.- 2010 - 34 p. - Published in: Eur. Phys. J. C 70 (2010) 787-821;
5. The ATLAS Simulation Infrastructure; ATLAS Collaboration; arXiv:1005.4568; CERN-PH-EP-2010-044.- 2010 - 53 p. - Published in: Eur. Phys. J. C 70 (2010) 823-874;
6. Performance of the ATLAS Detector using First Collision Data; ATLAS Collaboration; arXiv:1005.5254; CERN-PH-EP-2010-015.- Geneva: CERN, 2010 -65 p. - Published in: J. High Energy Phys. 09 (2010) 056;
7. Commissioning of the ATLAS Muon Spectrometer with Cosmic Rays; ATLAS Collaboration; arXiv:1006.4384; CERN-PH-EP-2010-045.- 2010 - 58 p. – Published in: Eur. Phys. J. C 70 (2010) 875-916;
8. Readiness of the ATLAS Tile Calorimeter for LHC collisions; ATLAS Collaboration; arXiv:1007.5423; CERN-PH-EP-2010-024.- Geneva: CERN, 2010 – 64 p. - Published in: Eur. Phys. J. C 70 (2010) 1193-1236;
9. Search for New Particles in Two-Jet Final States in 7 TeV Proton-Proton Collisions with the ATLAS Detector at the LHC; ATLAS Collaboration; arXiv:1008.2461; CERN-PH-EP-2010-028.- Geneva: CERN, 2010 - 20 p. - Published in: Phys. Rev. Lett. 105 (2010) 161801;
10. Measurement of the $W \rightarrow l\nu$ and $Z/\gamma^* \rightarrow ll$ production cross sections in protonproton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector; ATLAS Collaboration; arXiv:1010.2130; CERN-PH-EP-2010-037.- Geneva: CERN, 2010 - 57 p.- Published in: J. High Energy Phys. 12 (2010) 060;
11. Observation of a Centrality-Dependent Dijet Asymmetry in Lead-Lead Collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS Detector at the LHC; ATLAS Collaboration; arXiv:1011.6182; CERN-PH-EP-2010-062.- Geneva: CERN, 2010 -19 p. - Published in: Phys. Rev. Lett. 105 (2010) 252303;
12. Search for Quark Contact Interactions in Dijet Angular Distributions in pp Collisions at $\sqrt{s} = 7$ TeV Measured with the ATLAS Detector; ATLAS Collaboration; arXiv:1009.5069; CERN-PH-EP-2010-033.- Geneva: CERN, 2011 - 22p. - Published in: Phys. Lett. B 694 (2011) 327-345;
13. Measurement of inclusive jet and dijet cross sections in proton-proton collisions at 7 TeV centre-of-mass energy with the ATLAS detector; ATLAS Collaboration; arXiv:1009.5908; CERN-PH-EP-2010-034.- Geneva: CERN, 2011 - 67 p.- Published in: Eur. Phys. J. C 71 (2011) 1512;
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15. Studies of the performance of the ATLAS detector using cosmic-ray muons; ATLAS Collaboration; arXiv:1011.6665; CERN-PH-EP-2010-070.- 2011 - 33 p. - Published in: Eur. Phys. J. C 71 (2011) 1593;
16. Measurement of the top quark-pair production cross section with ATLAS in pp collisions at $\sqrt{s} = 7$ TeV; ATLAS Collaboration; arXiv:1012.1792; CERN-PHEP- 2010-064.- Geneva: CERN, 2011 - 50 p. - Published in: Eur. Phys. J. C 71 (2011) 1577;

17. Charged-particle multiplicities in pp interactions measured with the ATLAS detector at the LHC; ATLAS Collaboration; arXiv:1012.5104; CERN-PH-EP- 2010-079.- Geneva: CERN, 2011 - 70 p. - Published in: New J. Phys. 13 (2011) 053033 ATLAS-STDM-2010-06 (2010-12-27);
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28. Search for high-mass states with one lepton plus missing transverse momentum in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector; ATLAS Collaboration; arXiv:1103.1391; CERN-

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35. Search for an excess of events with an identical flavour lepton pair and significant missing transverse momentum in $\sqrt{s} = 7$ TeV proton-proton collisions with the ATLAS detector; ATLAS Collaboration; arXiv:1103.6208; CERN-PH-EP-2011- 039. - 2011. - 19 p.;
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41. Search for pair production of first or second generation leptoquarks in proton-proton collisions at $\sqrt{s}=7$ TeV using the ATLAS detector at the LHC; ATLAS Collaboration; arXiv:1104.4481; CERN-PH-EP-2011-050. - 2011. - 26 p.;

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52. Measurement of the transverse momentum distribution of Z/γ^* bosons in protonproton collisions at $\sqrt{s}=7$ TeV with the ATLAS detector; ATLAS Collaboration; arXiv:1107.2381; CERN-PH-EP-2011-095. - 2011. - 22 p.;
53. Properties of jets measured from tracks in proton-proton collisions at center of mass energy $\sqrt{s} = 7$ TeV with the ATLAS detector; ATLAS Collaboration; arXiv:1107.3311; CERN-PH-EP-2011-110. - 2011. - 28 p.;
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65. Measurement of the centrality dependence of the charged particle pseudorapidity distribution in lead-lead collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS detector; ATLAS Collaboration; arXiv:1108.6027; CERN-PH-EP-2011-118. -2011. - 40 p.;
66. Measurement of the Transverse Momentum Distribution of W Bosons in pp Collisions at $\sqrt{s} = 7$ TeV with the ATLAS Detector; ATLAS Collaboration; arXiv:1108.6308; CERN-PH-EP-2011-134. - 2011. - 64 p.;
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69. Measurement of the cross-section for b-jets produced in association with a Z boson at $\sqrt{s}=7$ TeV with the ATLAS detector; ATLAS Collaboration; arXiv:1109.1403; CERN-PH-EP-2011-133. - 2011. - 20 p.;
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71. Search for displaced vertices arising from decays of new heavy particles in 7 TeV *pp* collisions at ATLAS; ATLAS Collaboration CERN-PH-EP-2011-131; arXiv:1109.2242; CERN-PH-EP-2011-131. - 2011. - 21 p.
72. Measurement of the $W \rightarrow \tau\nu\tau$ Cross Section in pp Collisions at $\sqrt{s} = 7$ TeV with the ATLAS experiment; ATLAS Collaboration; arXiv:1108.4101; CERNPH-EP-2011-122. - 2011. - 20 p.;
73. Search for a Standard Model Higgs boson in the $H \rightarrow ZZ \rightarrow l^+l^- \nu \bar{\nu}$ decay channel with the ATLAS detector; ATLAS Collaboration; arXiv:1109.3357; CERN-PH-EP-2011-142. - 2011. - 19 p.;
74. Search for a heavy neutral particle decaying into an electron and a muon using 1 fb^{-1} of ATLAS data; ATLAS Collaboration; arXiv:1109.3089; CERN-PH-EP- 2011-140. - 2011. - 17 p.;
75. Search for the Higgs boson in the $H \rightarrow WW \rightarrow l\nu jj$ decay channel in *pp* collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector; ATLAS Collaboration; arXiv:1109.3615; CERN-PH-EP-2011-130. - 2011. - 18 p.;
76. Search for New Phenomena in $t \bar{t}$ Events With Large Missing Transverse Momentum in Proton-Proton Collisions at $\sqrt{s} = 7$ TeV with the ATLAS Detector; ATLAS Collaboration; arXiv:1109.4725; CERN-PH-EP-2011-149. - 2011. - 18p.;
77. Measurement of the inclusive W^\pm and Z/γ cross sections in the electron and muon decay channels in pp collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector; ATLAS Collaboration; arXiv:1109.5141; CERN-PH-EP-2011-143. - 2011. - 43p.;
78. Measurement of the jet fragmentation function and transverse profile in proton-proton collisions at a center-of-mass energy of 7 TeV with the ATLAS detector; ATLAS Collaboration; arXiv:1109.5816; CERN-PH-EP-2011-148. - 2011. - 28p.;
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80. Measurement of the inclusive and dijet cross-sections of b-jets in pp collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector; ATLAS Collaboration; arXiv:1109.6833; CERN-PH-EP-2011-146. - 2011. - 21 p.;
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Presentation of the candidate Barbara Sartoris

Supervisor: Prof. Prof. Stefano Borgani

Co-supervisor: Dr. P. Rosati (European Southern Observatory, Garching, Germany)

External referees: Prof. James Bartlett (Paris VII, France), Prof. Cristiano Porciani (University of Bonn, Germany)

Barbara Sartoris has fruitfully accomplished the required educational activities as approved by the Teachers Board, including PHD courses, lectures and the attendance to schools and conferences.

Barbara's PhD project has focused on constraining cosmological parameters, which describe standard and non-standard cosmological models, using present and future surveys of galaxy clusters. She has been under my supervision at the University of Trieste over the last 3 years. She spent the third year of her PhD working at the European Southern Observatory (ESO, Garching, Germany) under the local supervision of Piero Rosati. The three years of duration of her PhD have been very fruitful. At the beginning of the second year she published a first paper in Monthly Notices of the Royal Astronomical Society (MNRAS) as first author ('The potential of X-ray cluster surveys to constrain non-Gaussianity'). A second first-author paper ('Probing Dark Energy with the next generation of galaxy cluster X-ray surveys') has been submitted during the third year and is now in press in MNRAS. A third paper is now in preparation and will be completed by the end of this year. Barbara is currently busy writing up her thesis, which must be submitted in one-month time. From the recent progress she has been making, I see no difficulties for her to meet this deadline.

As a general achievement of her thesis, Barbara has put together a remarkable tool kit to make forecasts on cosmological parameters (based a Fisher matrix approach) from the space density and statistics (power spectrum) of the distribution of galaxy clusters, which can easily incorporate external constraints (or priors) from other cosmological probes. The methodology and software package she has developed is extremely flexible, as one can specify a range of selection functions suitable for X-ray, Sunyaev-Zeldovich and optical/near-IR surveys of galaxy clusters. The latter is particularly suitable for cosmological forecasts in the context of the recently approved ESA Euclid mission.

The first paper, which focused on how present and future X-ray cluster surveys can constrain non-Gaussian distributions of primordial density perturbations, has not gone unnoticed in the community as underscored by numerous citations in recent meetings and articles. As a by-product of this analysis, Barbara has investigated how a single discovery of a very massive cluster at redshift $z \gg 1$ can be used to test the Λ CDM scenario; this has become very popular recently after the discovery of several massive distant clusters with $M \sim 10^{15} M_{\odot}$ at $z > 1$ from X-ray and SZ surveys. Calculations and plots from this work have been frequently used by myself and collaborators in review talks and telescope proposals. As a third first-author paper in preparation, Barbara is now using 'real' data for the first time to obtain cosmological constraints from the measured mass function at $0.8 < z < 1.3$ from the ROSAT Deep Cluster Survey in combination with follow-up X-ray and lensing observations.

Barbara has shown strong motivations all along and very good theoretical skills, with an excellent grasp of (standard and non-standard) cosmological models. She started her visit to ESO less than one year ago with relatively little knowledge of the observational side of cosmology and some lack of communication skills (partly due to English language problems and partly due to scarce communication skills). She has definitely benefited from the environment she found at ESO and at neighbor institutes, such as MPA and MPE. The continuous interactions she has had with students, fellows and faculties on campus (giving small talks, attending informal gatherings and numerous talks), as well as the attendance of two international meetings, have given her more confidence of her capabilities and more than a chance to improve her communication skills. Students and fellows often ask her questions on Cosmology and owing to the increased visibility she has gained this year she has

recently been offered a one-year post-doc at the Ludwig-Maximilian University with Prof. Jochen Weller.

In summary, I consider Barbara Sartoris PhD course as highly successful for the work she has accomplished, the results she got from her research project and for the professional skills that she acquired.

Publications

B. Sartoris, S. Borgani, C. Fedeli, S. Matarrese, L. Moscardini, P. Rosati, J. Weller
The potential of X-ray cluster surveys to constrain primordial non-Gaussianity
2010, MNRAS, 407, 2339

B. Sartoris, S. Borgani, P. Rosati, J. Weller
Probing dark energy with the next generation X-ray surveys of galaxy clusters, 2011, accepted by MNRAS

B. Sartoris & S. Borgani Forecasting cosmological constraints from future X-ray cluster surveys
Contribution to the Proceedings of the Rencontres de Moriond on Cosmology (La Thuile - 13-20 March 2010)

S. Borgani, P. Rosati, B. Sartoris, P. Tozzi, R. Giacconi
Astrophysics and cosmology with galaxy clusters: the WFXT perspective
Contribution to the Proceedings of WFXT Science Meeting (Bologna - 25-26 November 2009)

Presentation of the candidate Rong Rong Zhan

Supervisor: Prof. A. Baraldi

Rong Rong Zhan has fruitfully accomplished the required educational activities as approved by the Teachers Board, including PHD courses, lectures and the attendance to schools and conferences.

The research carried out during the three years from the candidate Rong Rong Zhan has focused on the experimental investigation of the structural properties of low dimensional systems such as ultra-thin films of oxides, pseudomorphic metallic layers and graphene by means of the photoelectron diffraction.

The study of different systems has always been complemented by numerical simulations of multiple scattering performed by the candidate.

The experimental research was mainly carried out at the Surface Physics Laboratory of Sincrotrone Trieste and TASC Laboratory of the IOM-CNR, and at the SuperESCA, VUV and Nanospectroscopy beamlines of Elettra.

The candidate has achieved a good command of the surface science experimental techniques with particular regard to the use of synchrotron radiation (high-energy resolution photoelectron spectroscopy and diffraction) and in parallel has demonstrated excellent skills in the use of computer simulations. Her contribution to the conduct of research in our laboratory was of great relevance.

The candidate has been involved in a series of collaborative projects with several research groups (Karl-Franzens University, Graz, AUSTRIA; Institute of Condensed Matter Physics-EPFL, Lausanne, SWITZERLAND; University of Aarhus, DENMARK) where our group has provided the skills and knowledge, both experimental and theoretical, acquired over the years in the structural investigation by means of photoelectron diffraction, both with conventional sources anode and through the use of synchrotron radiation.

In particular, the candidate has investigated (i) the structure of different phases of Ni oxide grown on the surface of Rh(111), (ii) the structure of Mn oxide grown on the vicinal surface of the Pd (1 1 17) and (iii) Rh oxide, formed on the Rh(100) surface. In most of these cases the experimental results of the candidate were the starting point for the interpretation of the STM results and the implementation of structural calculations based on density functional theory.

The candidate took an active part in the study of the geometry of the Pb/Ag(100) interface. Her results have highlighted that despite the differences in symmetry, the hexagonal Pb layer overlaps the square lattice of the silver substrate, thus forming a 2D ordered super-lattice.

Finally, the candidate has been involved in the investigation of various structural systems related to graphene. She initially studied the geometric and electronic structure of a K-doped graphene layer grown on the Ir(111) surface. In a second step she collaborated in the investigation of the corrugation and thermal stability of a graphene layer grown for the first time on the Re(0001) surface.

During the three years of study the candidate has gradually developed innovative methods to increase the speed and efficiency in finding the minimum in the reliability factor, for example by adopting genetic algorithms.

The candidate has participated in three international schools named 'Reactivity of nanoparticles for more efficient and Sustainable Energy Production' organized by the Danish Technical University in Sandbjerg Gods in 2009, 'School on Synchrotron and free-electron-laser sources and their multidisciplinary applications' organized by Sincrotrone Trieste and ICTP in 2010 and the 'International School of Solid State Physics: Quantum Phenomena in graphene, other low-dimensional and optical lattices' organized by the CNR-DMD at the Ettore Majorana Centre-Erice in 2011. For each of the schools the applicant has submitted a contribution in the form of posters.

The candidate has already published two papers in international journals (one in the Journal of Chemical Physics selected for the cover of Volume 133 (2011) and one in Physical Review Letters). For four other works in preparation, where the structural part of the inquiry conducted by the

candidate is already completed, we are awaiting the results of theoretical accounts of the research groups with whom we collaborate.

Publications:

- [1] **R. R. Zhan**, E. Vesselli, A. Baraldi, S. Lizzit, and G. Comelli, “The Rh oxide ultrathin film on Rh(100): An x-ray photoelectron diffraction study”, *J. Chem. Phys.* **133**, 214701 (2010). Selected as Journal Cover.
- [2] S. Surnev, F. Allegretti, **R. R. Zhan**, A. Baraldi, E. Vesselli, G. Comelli and F. P. Netzer. “Surface structure of nickel oxide layers on Rh(111)” (in preparation).
- [3] F. Allegretti, C. Franchini, **R. R. Zhan**, A. Baraldi, S. Lizzit, S. Surnev and F. P. Netzer, “Structural determination of a two-dimensional Mn_xO_y oxide on a stepped Pd(1 1 21) surface” (in preparation).
- [4] A. Crepaldi, **R. R. Zhan**, S. Moser, A. Baraldi, K. Kern, C. Carbone and M. Grioni, “ARPES and XPD study of Pb/Ag(100) $c(6\times 2)$: the role of the structural commensurability in the band structure of a Pb monolayer” (in preparation).
- [5] M. Bianchi, M. Pozzo, D. Alfè, **R. R. Zhan**, E. Vesselli, A. Baraldi, G. Comelli, Ph. Hofmann, P. Lacovig and S. Lizzit, “A structural investigation of K-doped epitaxial graphene” (in preparation).
- [6] E. Miniussi, M. Pozzo, A. Baraldi, E. Vesselli, **R. R. Zhan**, G. Comelli, T. O. Mendes, M. A. Niño, A. Locatelli, S. Lizzit, and D. Alfè, “Thermal Stability of Corrugated Epitaxial Graphene Grown on Re(0001)”, *Phys. Rev. Lett.* **106**, 216101 (2011).