Chiara Guazzoni Curriculum Vitae

Short bio

Chiara Guazzoni, born in Milano (Italy) on December 6, 1972, is Associate Professor of Electronics (since 2009) with tenure (since 2012) at Politecnico di Milano.

She graduated in Physics (Laurea degree) in 1996 at Università degli Studi, Milano, Italy, discussing a thesis on "Confinamento di elettroni in rivelatori a semiconduttore: proposta di un nuovo rivelatore a deriva controllata" - (Electrons confinement in semiconductor detectors: proposal of a new controlled-drift detector).

In 1996 she attended a Master Course in Nuclear Physics at the same university and in 2000 she obtained the Ph.D. in Electronics and Telecommunications Engineering at Politecnico di Milano.

From 1999 up to February 2001 she had a research contract with Politecnico di Milano, Italy - Dipartimento di Elettronica e Informazione.

Since March 2001 she had worked as Assistant Professor of Electronics at Politecnico di Milano, Italy.

Since May 2008 she has been Associate Technological Researcher of the Istituto Nazionale di Fisica Nucleare (INFN) to which she was associated since 1995.

From November 2009 up to October 2011 she was visiting scientist of the Brookhaven National Laboratory where she spent short periods.

In 2014-2015 she took a 5 month maternal leave due to the birth of her daughter.

She is Member of IEEE and the Italian Physical Society (SIF).

Honors and Awards

She won two best conference talk awards (Annual Meeting of the Electronic Group in Alghero (SS), Italy, June 10-13, 1999 and 85° National Conference of the Italian Physics Society, Pavia, Italy, September 20-24, 1999 (second place).

She won the 1999 IEEE Nuclear and Plasma Sciences Society Graduate Student Award.

In 2001 she was awarded for her brilliant scientific activity by the Italian Physical Society.

In 2004 she received the 2004 IEEE Nuclear and Plasma Sciences Society Radiation Instrumentation Early Career Award, for "contributions to an innovative X-ray spectroscopic imager with fast frame rates and nuclear electronics".

Reviewer, Editorial Board and Committees

She has been reviewer for the main journals in the field of radiation detectors, electronics and instrumentation (IEEE Trans. Nucl. Sci.; Nucl. Instr. Meth. A & B; X-Ray Spectrom.)

She has been Member of the Organizing committee of the X and of the XI European Symposium on Semiconductor Detectors (Wildbad Kreuth, June 12-16, 2005 and June 7-11, 2009), of the Programme Committee of Bioimaging 2016 (Feb. 21-23, 2016, Rome, Italy), and member of the International Advisory Committee of ANSiP 2011 – Advanced School and Workshop on Nuclear Physics Signal Processing, November 21-24, 2011, Acireale (CT).

She has been one of the Editors of two Volumes (568, Issue 1, 30 November 2006 and 624, Issue) of Nuclear Instruments & Methods in Physics Research. Section A, Accelerators, Spectrometers, Detectors and Associated Equipment and Associate Editor of IEEE Transaction On Nuclear Science, Special Issue of the SORMA West 2012 Conference (Vol. 60, No.2, April 2013).

She was elected Member-at-Large of the Radiation Instrumentation Steering Committee of the IEEE Nuclear and Plasma Science Society for the term 2014-2016.

She served as Deputy Program Chair for the 2015 IEEE Nuclear Science Symposium, San Diego (California) Oct. 31 - Nov. 7, 2015. The IEEE Nuclear Science Symposium is the premier meeting on the use of instrumentation in the nuclear fields and constitutes an ideal forum for scientists and engineers in the field of nuclear science, radiation instrumentation, software engineering and data acquisition.

She was appointed Chair of the Awards Sub-Committee of the Radiation Instrumentation Steering Committee of the IEEE Nuclear and Plasma Science Society for 2016 and 2017.

She has been elected Vice-Chair of the Italian Chapter of the IEEE Nuclear and Plasma Science Society for the term 2016-2018.

She is appointed Vice-Chair of the Radiation Instrumentation Steering Committee of the IEEE Nuclear and Plasma Science Society for the term 2017-2018.

She has been external reviewer for proposals submitted to the 2015 Initiation into Research of FONDECYT of CONICYT, Chile and to PRIN2010-2011, MIUR, Italy.

Scientific Activity

Since 1994 Chiara Guazzoni has carried out her research activity in the field of Radiation Detectors and Frontend and Backend Electronics.

The main research activities are:

1) Semiconductor radiation detectors for position and energy measurements of X-rays, gamma-rays and charged particles;
2) Low-noise front-end electronics;
3) Digital Acquisition systems and filtering techniques for signal coming from radiation detectors.

She presently carries out her research activity, both theoretical and experimental, in the research laboratories of Politecnico di Milano and in the past also of Universita' degli Studi di Milano. She collaborates/collaborated with the Halbleiterlabor of Max Planck Institut in Munich (Germany), with PNSensor GmbH(Germany), with the Brookhaven National Laboratory, with Sincrotrone ELETTRA in Trieste, with University of Siegen, with LABEC laboratory (INFN - Florence University), with University College London, with INFN Sezione di Catania and Laboratori Nazionali del Sud. For her research needs she has worked for short periods at the Halbleiterlabor of Max Planck Institut in Munich (Germany) and at Brookhaven National Laboratory (Upton, USA) and she took part in several beam times at the SYRMEP beam-line (Sincrotrone ELETTRA in Trieste, Italy), at the B16 beamline of Diamond Synchrotron Source in Didcot (UK), at GSI Helmholtzzentrum für Schwerionenforschung in Darmstadt (Germany), at Laboratori Nazionali del Sud (Catania, Italy) and at INFN LABEC (Firenze, Italy).

The leitmotiv of her research activity are detectors for imaging and spectroscopy from the design to their system application together with the low-noise frontend electronics. From the beginning of her research activity she developed innovative detectors for X-ray imaging and spectroscopy based on the drift mechanism, as recognized by several awards in the field and many scientific publications. She promoted their use in innovative application fields, proposing several advances with respect to state-of-the art. Just to mention few examples: the use of silicon drift detectors and polycapillary X-ray optics in PIXE experiments and in X-ray scatter imaging and more recently for the detection of Gold NanoParticles as tumor markers. Since 2009, she started to devote her competences also towards detection instruments for multi-fragmentation measurements in nuclear physics, as demonstrated by several publications and by the responsibility of different research projects in the field.

Publications

She is author of 76 papers on international peer-reviewed journals and of more than 90 international conference proceedings. She was invited speaker for 12 talks on her research activity on radiation detectors and front-end electronics and related applications.

She is also co-inventor of an Italian, European and US patent about a novel semiconductor detector for X-ray imaging with time and energy resolution, named Controlled-Drift Detector.

Project Coordination

She is/was principal investigator of the following projects/Contracts:

- PI of the Young Researcher Project - Year 2000 for the development of a compact and flexible multichannel acquisition system for detectors for high-resolution X-ray spectroscopy. One year starting July 24, 2002.
- PI of the research contract Politecnico di Milano - Societa' EIS s.r.l. on the development of an acquisition system for X-ray detectors. Starting date: March 2003.

- PI for the Milano Section of INFN of the DANTE Experiment (Development of Analytical Nuclear TEchniques)2006-2008 for the development of an innovative spectrometer for PIXE measurements based on a Silicon drift Detector and on polycapillary optics.
- PI for the Milano Section of INFN of the EXOCHIM Experiment 2008-2014, since 2010, a Nuclear Physics Experiment with the goals of i) studying isospin and mass dependence of reaction mechanisms at Fermi energies; ii) studying population and decay of nuclei and resonances at the border of drip lines; iii) studying isospin dependence of asymmetry term of nuclear equation of state at high density. In the framework of this experiment she had the responsibility for the instrumental part.
- Associated investigator for the program PRIN 2009 "Development of the prototype of a high angular resolution detector array for very precise momentum measurements of light particles and fragments, aimed at dynamics and spectroscopy studies in nuclear reactions with stable and radioactive beams at low and intermediate energies", Protocol n. 2009RLCYL8
- PI for the Milano Section of INFN of the NEWCHIM Experiment 2015-2019, mainly devoted to the development of a Femtoscope Array for Correlation and Spectroscopy in which she has the responsibility of the microstrip detectors qualification and response mapping and of the frontend electronics design and qualification and collaborates to the module assembly.

She collaborates/collaborated to:

- different INFN experiments (since '96) related to the development of radiation detectors and low-noise electronics,
- to the XRF-ART project (1998-2001) in the 5° Framework of the EU, to the SIDDHARTA project (2004-2006) of the 6° Framework of the EU,
- to the X-RAPTOR project (2008-2010) MetaDistretti 2007 Regione Lombardia,
- to the DSSC Consortium for the development of pixelated detectors based on the DePMOS concept for the European XFEL (2009-2014)
- to the program PRIN 2012, protocol n. 2012Z3N9R9. Teaching and Supervisor Activity

She teaches Electronics courses since 2001 and she has supervised few tens of B.Sc. and M. Sc. Theses in Electronics Engineering and two PhD Theses.

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1 Informazioni personali

Cognome : Carminati
Nome : Leonardo
Data di nascita : 08 Novembre 1974

2015 Professore di II fascia (02/A1 - Fisica Sperimentale delle Interazioni Fondamentali, settore scientifico-disciplinare FIS/01 - Fisica Sperimentale) presso il dipartimento di Fisica dell'Università degli studi di Milano.

2006 Ricercatore a tempo indeterminato presso il dipartimento di Fisica dell'Università degli studi di Milano.

2003 Assegnista di ricerca presso il dipartimento di Fisica dell'Università degli Studi di Milano.

2003 Dottorato di Ricerca in Fisica presso l'Università degli Studi di Milano con una tesi dal titolo *Calibration of the ATLAS electromagnetic calorimeter and its impact on the H into gamma gamma decay channel.*

2000 Borsista presso la Sez. di Milano dell'Istituto Nazionale di Fisica Nuclare.

1999 Laurea in Fisica presso l'Università degli Studi di Milano con una tesi dal titolo *Realizzazione di un sistema automatico per il test dei preamplificatori e studio dell'eleborazione del segnale nel calorimetro ad Argon liquido dell'esperimento ATLAS ad LHC.* (110/110 e lode)

2 Attività di ricerca e pubblicazioni scientifiche

2.1 Attività di ricerca

La mia attività di ricerca si è svolta principalmente nell'ambito dell'esperimento ATLAS ([1]) ad LHC. Durante il mio lavoro nella collaborazione ATLAS sono stato direttamente *editor* (parte del team di analisi ristretto che ha curato la stesura dell'articolo) o *contact editor* (responsabile della scrittura dell'articolo e della gestione della revisione con la

rivista) di alcuni importanti articoli che elenco nel seguito insieme ad una sintesi delle mie principali linee di lavoro.

1. **Sviluppo di rivelatori ultra veloci per HL-LHC**
   (Periodo: 2018-oggi)
   Dall'inizio del 2018 ho incominciato ad occuparmi della possibilitá di utilizzare misure di tempo per mitigare gli effetti del pileup nella fase di alta luminositá di LHC. In questa fase la macchina verrá spinta ad una luminositá istantanea pari a 7.5 ^{34} $cm^{-1}s-1$ alla quale si potranno avere fino a 200 interazioni per bunch crossing. La misura del tempo associato alle tracce ricostruite dai rivelatori potrá essere utilizzata per la loro corretta assegnazione al vertice di produzione riducendo cosí l'impatto del pileup. A questo scopo sto lavorando alla caratterizzazione di sensori veloci al silicio (LGAD) che verranno utilizzati per la costruzione di un nuovo rivelatore (High Granularity Timing Detector) previsto per l'upgrade dell'esperimento ATLAS.

2. **Ricostruzione e calibrazione di elettroni e fotoni in ATLAS**
   (Periodo: 2000-oggi)
   Ho lavorato allo studio delle performance del rivelatore ATLAS nella ricostruzione di elettroni e fotoni assumendomi la responsabilita' della loro calibrazione. In particolare ho studiato e messo a punto un algoritmo di calibrazione basato sulla parametrizzazione della risposta intriseca del calorimetro, delle correzioni per il leakage trasversale e longitudinale evento per evento in funzione della profondita' degli sciami. Questo metodo di calibrazione è stato utilizzato dal calorimetro di ATLAS per la ricostruzione dei dati reali che hanno portato alla scoperta del bosone di Higgs. Dal 2011 al 2014 come responsabile della calibrazione di elettroni e fotoni per ATLAS ho curato il lavoro di perfezionamento delle tecniche di ricostruzione dell'energia, cruciali per le misure di precisione della massa del bosone di Higgs [2]. Sono stato direttamente editor dell'articolo di ATLAS [3] che documenta in dettaglio i risultati raggiunti dall'esperimento.

3. **Ricerca del bosone di Higgs nel canali a due fotoni e misura delle sue proprietà**
   (Periodo: 2002-oggi)
   La ricerca del bosone di Higgs è stato uno dei principali obiettivi di fisica per l'esperimento ATLAS. In particolare il canale di decadimento in due fotoni è uno dei più importanti nel caso di massa al di sotto dei 150 GeV e uno dei piu' sensibili alle performance del calorimetro elettromagnetico. Mi sono occupato di studiare la potenzialità di scoperta di ATLAS a partire da simulazione complete e dettagliate del rivelatore. Tra il 2007 e il 2008 sono stato coordinatore per ATLAS di questa analisi scrivendone poi l'articolo relativo nell'ultima importante rassegna delle performance attese dall'esperimento ATLAS prima della presa dati [4]. Ho in seguito lavorato all'analisi dei dati che hanno portato alla scoperta del bosone di Higgs [5] contribuendo agli studi nel canale di decadimento in due fotoni [6]. Mi sono poi dedicato allo studio delle proprietà del bosone di Higgs in particolare massa e sezioni d'urto di produzione partecipando alle misure finali di ATLAS utilizzando tutti i dati raccolti nel run1. Ho lavorato come editor dell'articolo pubblicato da ATLAS sulla massa del bosone di Higgs [7]. Ho inoltre lavorato come editor dell'articolo di revisione finale dei risultati finali sulle sezioni

d'urto di produzione del bosone di Higgs nel canale a due fotoni [8]. Ho partecipato alle misure delle proprietà del bosone di Higgs con i dati raccolti durante il run2, in particolare la massa [9] e l'osservazione della produzione associata con coppie di quark top [10].

4. **Misura della sezione d'urto di fotoni diretti**
(Periodo: 2008-2015)
La ricerca del bosone di Higgs in due fotoni è strettamente collegata allo studio piu' generale della produzione di fotoni diretti in interazioni adroniche come predetta dalla QCD perturbativa. Queste misure forniscono utili indicazioni per la determinazione delle distribuzione partoniche nel protone e una conferma sprimentale della QCD perturbativa in una regione di elevato momento trasverso. Dal 2008 al 2010 sono stato il coordinatore per l'esperimento ATLAS delle attivita' relative allo studio di fotoni diretti di alto momento trasverso. Ho seguito la pubblicazione delle prime misure di fotone diretto di ATLAS: sono stato editor degli articoli sulla prima misura di sezione d'urto di fotone inclusivo [11], del canale fotone + jet [12] e di-fotone [13]. Nel contesto delle misure di fotone diretto ai collisioni adronici ho collaborato con i colleghi teorici per studiare e proporre nuove definizioni dei criteri di isolamento (discussi in [14]). Un'altro importante progetto che ho seguito con altri colleghi teorici è quello di valutare l'impatto delle misure di fotone diretto nella riduzione delle sistematiche sulle PDF, in particolare del gluone: le misure di accoppiamenti dell'Higgs (e in generale tutte le misure di precisione ad ATLAS) incominciano ad essere dominate dalle incertezze teoriche di cui quelle sulle PDF sono una parte importante. In [15] abbiamo mostrato che una sensibile riduzione delle incertezze sistematiche può essere raggiunta con misure accurate di sezioni d'urto fotone + jet. In questo contesto ho partecipato al network europeo HiggsTools (http://higgstools.org).

5. **Ricerche di nuova fisica in stati finali con fotoni**
(Periodo 2012-oggi)
Dal 2012 in poi ho incominciato a occuparmi di ricerche di nuova fisica oltre il Modello Standard. In particolare ho lavorato sulla ricerca di produzione diretta di Dark Matter in eventi con fotoni ed energia trasversa mancante [16]. Dal 2013 ho incominciato a lavorare alla ricerca di Extra Dimensions nel canale a due fotoni: tra il 2015 e il 2016 ho guidato il team di analisi dell'esperimento ATLAS dedicato a questa ricerca. Ho lavorato anche alla ricerca di stati eccitati di quarks e produzione di black holes nel canale fotone + jet : in particolare sono stato responsabile della scrittura dell'articolo corrispondente [17]. Tra il 2014 e il 2017 ho anche lavorato alla ricerca di nuova fisica nel canale a due fotoni [18][19] e alla ricerca di supersimmetria nel canale a due fotoni e momento trasverso mancante [20].

6. **Studio problematiche di analisi distribuita**
(Periodo: 2005-oggi)
Mi sono inoltre interessato alle problematiche relative al modello di analisi per esperimenti di fisica delle alte energie e ho contribuito allo sviluppo del centro di calcolo e analisi di Milano. La quantita' di dati da analizzare agli esperimenti LHC richiede strutture di calcolo estremamente avanzate basate sul concetto di analisi distruita : svariati centri di calcolo (Tiers) localizzati in diverse parti

del mondo vengono utilizzati come una unica infrastruttura (grid) di calcolo a cui sottomettere l'analisi dei dati che viene automaticamente smistata al centro di calcolo piu' disponibile. In questo contesto sono attualmente vice-responsbile del Tier2 di Milano. Ho partecipato inoltre al progetto PRIN *Sviluppo di tecnologie per l'ottimizzazione dell'accesso ai dati di LHC, trasferibili ad altri domini scientifici, mediante l'approccio del grid e del cloud computing* di cui coordino il lavoro dell'unitá di Milano. Ho lavorato inoltre come responsabile della produzione dei dati derivati per l'analisi finale per il gruppo Higgs e Standard Model di ATLAS. Dal 2017 sto inoltre seguendo un progetto di ottimizzazione delle risorse di calcolo di dipartimento tramite un modello di uso opportunistico basato su HTCondor *condor*, un sistema di object-storage e tecniche di virtualizzazzione basate su strumenti tipo Docker/Singularity.

7. **Sviluppo di software di controllo per il sistema di alta tensione del calorimetro elettromagnetico dell'esperimento ATLAS**
   (Periodo: 2004-2015)
   Ho progettato e sviluppato il sistema di controllo dell'alta tensione dal calorimetro elettromagnetico di ATLAS. Esso è basato sul concetto della Finite State Machine, un sistema strutturabile in livelli gerarchici in cui gli stati dei livelli superiori sono definiti a partire dalle condizioni dei livelli inferiori mentre dai livelli superiori è possibile inviare comandi e istruzioni ai livelli inferiori. Il sistema di controllo delle alte tensioni del calorimetro è integrato nel sistema di controllo di ATLAS e attualmente utilizzato durante la presa dati.

8. **Ricerca del bosone di Higgs nel canale di decadimento in un fotone e un bosone Z**
   (Periodo: 2013-2014)
   Questo decadimento è predetto dal Modello Standard con un branching ratio molto piccolo. L'osservazione di questo decadimento è importante per completare il quadro della comprensione del meccanismo di rottura spontanea della simmetria associato al bosone di Higgs. Ho partecipato all'analisi dei dati del run1 i cui risultati sono discussi in [21]: come atteso non si ha evidenza di segnale nei dati accumulati ma si sono stabiliti limiti sulla sezione d'urto di produzione.

9. **Caratterizzazione dei preamplificatori 0T del calorimetro elettromagnetico del rivelatore ATLAS**
   (Periodo: 1998-2000)
   Ho lavorato alla progettazione e alla realizzazione di una stazione automatica per la caratterizzazione dei preamplificatori del calorimetro elettromagnetico di ATLAS. La stazione di test è stata utilizzata per qualificare i circa 100000 canali di lettura prodotti in Italia secondo le performance richieste dall'esperimento in termini di guadagno, rumore e tempo di picco del segnale.

2.2 Responsbilità ricoperte nell'esperimento

All'interno dell'esperimento ATLAS ho ricoperto ruoli di responsabilità e coordinamento nel campo delle performance elettroni/fotoni e nelle principali misure con fotoni.

1. **coordinatore del working group sull'analisi del decadimento del bosone di Higgs in due fotoni** (2006-2008) : ho avuto la reponsabilità della gestione del working group di ATLAS dedicato all'analisi del decadimento del bosone di Higgs in due fotoni. In questa fase sono stati approntati tutti i principali strumenti per l'analisi su dati simulati in termini di performance e potenzialità di scoperta. In particolare ho curato la stesura della sezione dedicata all'analisi del decadimento del bosone di Higgs in due fotoni in [4].

2. **convener del working group sull'analisi dei fotoni diretti** (2008-2010) : ho avuto la responsabilità della gestione del working group di ATLAS dedicato alle analisi di fotoni diretti QCD proprio nel momento in cui è incominciata la presa dati. In questa posizione ho gestito direttamente la pubblicazione delle primissime analisi con fotoni (misura della sezione d'urto del fotone inclusivo, misura della sezione d'urto della produzione di difotoni e misura della sezione d'urto per produzione di fotoni isolati e jets) : la pubblicazione di queste misure ha costituito il background forndamentale per le ricerche del bosone di Higgs nel canale a due fotoni.

3. **convener del working group sulla calibrazione elettroni e fotoni** (2011-2014) : in questo ruolo ho curato la revisione delle procedure di calibrazione per elettroni e fotoni in una fase critica in cui si è passati dalla scoperta del bosone di Higgs alle misure di precisione delle sue proprietà come la massa. Questo lungo progetto [7] ha permesso di ridurre drasticamente le incertezze sperimentali sulla misura della massa dell'Higgs e costituito uno degli ingredienti fondamentali per produrre la presente migliore misura discussa in [3].

4. **responsabile della produzione di simulazioni matecarlo con fotoni** (2011-2013): sono stato responsabile per il gruppo Standard Model della creazione e validazione dei principali campioni montecarlo con fotoni utilizzando vari generatori (PYTHIA, Herwig++, Sherpa, Alpgen)

5. **contact person per photon performance del gruppo Higgs** (2011-2013) : in questo ruolo sono stato il riferimento per il gruppo Higgs per il corretto utilizzo degli strumenti di performance relativi alla calibrazione, identificazione e isolamento del fotone nell'analisi dati.

6. **responsabile per la produzione dei dati utilizzati per l'analisi Higgs in due fotoni** (2008-2014). In questo ruolo mi sono occupato per molti anni della preparazione dei dati finali utilizzato per l'analisi, mantenendo il codice di selezione degli eventi e gestendo la produzione delle ntuple finali utilizzando strumenti di produzione grid-based.

7. **responsabile analisi di ricerca nuova fisica nel canale a due fotoni** (2015-2016). In questo ruolo sono stato responsabile dell'analisi della ricerca di nuova fisica nel canale a due fotoni. L'analisi dei primi dati raccolti nel 2015 aveva evidenziato un eccesso statisticamente significatico (circa 4 sigma) ad una massa invariante di 750 GeV. Eq̀uindi stata creata una task-force dedicata per l'analisi dei dati 2016 di cui sono stato responsabile. Purtroppo i nuovi dati non hanno confermato l'osservazione iniziale.

2.3 Altre responsabilità

1. **deputy responsabile del centro di calcolo Tier2 di Milano** (2010-oggi) : dal 2010 ho la corresponsabilità della gestione del Tier2 di Milano. Il Tier2 è un centro di calcolo di media grandezza (circa 1000 job slots e 1PB di disco) inserito nella grid che ATLAS utilizza per il calcolo dell'esperimento. Il sito di Milano occupa anche una farm di calcolo dedicate agli utenti locali con circa 300 CPU ed alcune centinaia di TB di disco dedicato.

2.4 Partecipazioni a progetti e collaborazioni

Attualmente partecipo ai seguenti progetti:

1. *Sviluppo di tecnologie per l'ottimizzazione dell'accesso ai dati di LHC, trasferibili ad altri domini scientifici, mediante l'approccio del grid e del cloud computing,* un progetto PRIN finanziato dal ministero. In particolare seguo lo sviluppo del lavoro della sezione milanese che si occupa di studiare soluzioni avanzate per l'utilizzo ottimale delle risorse di calcolo del dipartimento di fisica con soluzioni tipo Condor, Proof on Demand e cloud computing.

2. *HiggsTools: The Higgs quest, exploring electroweak symmetry breaking at the LHC,* Initial Training Network (ITN) supported by the 7th Framework Programme of the European Commission (PITN-GA-2012-316704). Il network è dedicato a studi sulla rottura spontanea della simmetria elettrodebole attraverso il meccanismo di Higgs. La sezione di Milano di cui faccio parte si occupa della riduzione delle incertezze teoriche sulle gluon PDF per ridurre le incertezze sistematiche sulle misure di accoppiamenti del bosone di Higgs con fermioni e bosoni.

2.5 Presentazioni a conferenze

Ho presentato a conferenze nazionali ed internazionali:

1. *Study of the $H \to \gamma\gamma$ decay with the ATLAS detector* talk given at 12th International Workshop on Deep Inelastic Scattering (DIS 2004). Strbske Pleso, Slovakia, 14-18 April 2004

2. *Electrons and photons reconstruction in ATLAS and CMS* talk given at II workshop italiano sulla fisica di ATLAS e CMS. Napoli,Italy, 13-15 October 2004

3. *The ATLAS Liquid Argon Electromagnetic calorimeter* talk given at IFAE 2005: XVII Incontri de Fisica delle Alte Energie. Catania, MAR 30-APR 02, 2005

4. *The Calibration of the ATLAS and CMS Calorimetric Detectors* talk given at III Italian Workshop on ATLAS and CMS physics. Bari, 20-22 ottobre 2005

5. *Search for a Standard Model Higgs boson in the H ->gamma gamma channel with the ATLAS detector* talk given at ."Physics for LHC", Cracow, Poland, July 03-08 2006,

6. *Overview of analysis models for high energy physics* talk given at IFAE 2007, Napoli, 11-13 april 2007

7. *Photon measurements in ATLAS* talk given at "US ATLAS Analysis Jamboree" 17-18 November 2010, Argonne National Laboratory, USA

8. *Physics with Photons in ATLAS* talk given at "CERN-PH LHC Seminar" on Tuesday 5th of July 2011, CERN

9. *ATLAS photon* talk given at "Standard Model Benchmarks at the Tevatron and LHC", November 19 - 20, 2010, Fermilab USA

10. *Experimental Introduction to photon physics*, talk given at "Confronting Theory with Experiment: Puzzles, Challenges and Opportunities in the LHC Era" 17-18 November, 2011, Fermilab USA

11. *Experimental problems connected to photon isolation and photon xsections*, talk given at the "Workshop on Photon Physics and Simulation at Hadron Colliders", March 30th , Parigi

12. *Photon and photon+jet production measured with the ATLAS detector*, talk given at "DIS 2012", Bonn, 26-30 March 2012

13. *Photons/Diphotons at ATLAS*, talk given at "Physics @ LHC", 2012 20th-24th August 2012 at Michigan State University

14. *Ultimi risultati dell'analisi* $H \to \gamma\gamma$ *e* $H \to Z\gamma$ *dall'esperimento ATLAS*, talk given at IFAE 2013, April 5th 2013, Cagliari

15. *Photon and Jet measurements in pp collisions at the LHC*, talk given at the VI Italian Workshop on p-p physics at the LHC, Genova 8th-10th May 2013.

16. *Ricerche di nuova fisica nel canale a due fotoni in ATLAS e CMS*, talk given at IFAE2016, March 29th 2016, Genova

17. *Diphoton searches in ATLAS*, talk given at "Charting the Unknown: interpreting LHC data from the energy frontier", August 5th 2016, CERN

18. *Search for high mass bosonic resonances with the ATLAS detector* , talk given at EPS, July 6th 2017, Venezia

3 Attività di didattica, di didattica integrativa e di servizio agli studenti

3.1 Corsi istituzionali

Ho svolto attività didattica sia nella laurea triennale e magistrale sia per il dottorato di ricerca in Fisica.

1. ho lavorato come assistente *Laboratorio di calcolo 1* (2006-2008) e al *Laboratorio di calcolo 2* (2006).

2. dal 2008 ad oggi sono titolare del corso di *Trattamento numerico dei dati sperimentali* (eccetto per l'anno accademico 2010-2011).

3. dal 2008 tengo una parte del corso di dottorato *Collider Physics* relative alla calorimetria elettromagnetica e adronica ai colliders.

4. dal 2014 al 2016 ho svolto le esercitazioni per il corso di *Fisica Generale 2* presso il dipartimento di Matematica.

5. dal 2013 svolgo una parte del corso di *Rivelatori di particelle* per la laurea magistrale in Fisica.di cui sono responsabile dal 2015.

3.2 Supervisore summer students

Ho seguito alcuni progetti per summer students :

1. *Isolated Photon + jets cross section using Jetphox*, A. O'Toole, DOE-INFN summer students projetc, 2011.

2. *Fast photon+jet parameterisations for Higgs to diphoton background using Jetphox*, A. Fero, DOE-INFN summer students projetc, 2012.

3.3 Tesi di Laurea Triennale

1. *Misura della purezza di fotoni inclusivi ad ATLAS con i primi 37 pb^{-1} di dati*, S. Mazza (Dicembre 2010).

2. *Misura della sezione d'urto per produzione di fotoni isolati ad ATLAS con i primi 37 pb^{-1} dati*, S. Manzoni (Aprile 2011).

3. *Studio della purezza del campione di fotone inclusive del Run I di ATLAS con il metodo 2D-sidebands e caratterizzazione del modello di accesso ai dati*, E. Guiraud (Dicembre 2013).

4. *Studio della purezza del campione di fotone inclusive del Run I di ATLAS con il metodo isolation template fit e caratterizzazione del modello di accesso ai dati*, G. Parolini (Febbraio 2014).

5. *Tecniche di identificazione dei fotoni per il RUN 2 all'esperimento ATLAS ad LHC*, A. Poli (Febbraio 2015).

6. *Ricerca di risonanze ad alta massa nel canale a due fotoni in collisioni pp a $\sqrt{8}$ TeV con il rivelatore ATLAS*, A. Martini (Febbraio 2015).

7. *Stima del fondo di jet rivelati come fotoni nella ricerca di materia oscura nel canale mono-photon dell'esperimento ATLAS*, D. Mungo (Ottobre 2015).

8. *Search for new physics in photon plus jet events in pp collisions at 13 TeV with the ATLAS detector*, D. Nole' (Dicembre 2015).

9. *Studio di una regione di validazione per l'analisi mono-photon dell'esperimento ATLAS a LHC*, M. Perri (Ottobre 2016).

10. *Ricostruzione di protoni secondari per il range monitoring in adroterapia*, D. Rei (Dicembre 2017).

11. *Search for new phenomena in events with a photon and missing transverse momentum in pp collisions with the ATLAS detector in the context of Minimal Dark Matter model*, A. Demela (Febbraio 2018).

3.4 Tesi di Laurea Magistrale e laureandi

1. *Studio delle reazioni $Z \to \tau\tau$ con i primi dati di ATLAS ad LHC. Prova generale del canale $A/H \to \tau\tau$*, C. Pizio (Ottobre 2007).
2. *Estimate of the QCD background with misidentified electrons in W plus jets measurements with the ATLAS detector*, Meloni Federico.
3. *Search for a Standard Model Higgs boson in the diphoton+MET channel with the ATLAS detector*, S. Mazza (Aprile 2013).
4. *Search for Higgs boson decays to a photon and a Z boson in pp collisions at center-of-mass energies of 7 and 8 TeV with the ATLAS detector*, S. Manzoni (Aprile 2013).
5. *Higgs mass measurement in the di-photons decay channel with the ATLAS experiment*, M. Rimoldi (Aprile 2013).
6. *Search for dark matter direct production in the mono-photon plus missing energy chanllen in pp collisions at center of mass energy of 8 TeV with the ATLAS detector*, M. Perego (Ottobre 2014).
7. *Analysis of final states with large missing transverse momentum and a high momentum photon for the earch of dark matter with the ATLAS detector at the LHC*, M.G. Ratti (Ottobre 2014).
8. *Measurement of the isolated photon plus jet cross section in pp collisions at a center-of-mass energy of 8 TeV with the ATLAS detector*, S. Comotti. (Ottobre 2014)
9. *Search for SuperSymmetry in the di-photon plus missing transverse momentum final state with the ATLAS detector in $\sqrt{s}$=13 TeV pp collisions*, G. Zecchinelli (Marzo 2016).

3.5 Tesi di Dottorato, dottorandi e assegnisti

1. Co-tutore della dott. R. Simoniello, *MET performance studies for the $H \to \tau\tau$ search in ATLAS*, (2010-2013), Universitá di Milano.
2. Supervisore della dott. C. Pizio, assegnista universitaria (2013-2014).
3. Ho supervisionato il lavoro di una borsista INFN, dott. Iro Koletsou (2010-2012).
4. Tutore del dott. S. Mazza, *Search for new physics in the di-photon channel at the ATLAS experiment at the LHC* (2013-2016).
5. Tutore del dott. S. Manzoni, *Physics with photons with the ATLAS Run2 data: calibration and identification, measurement of the Higgs boson mass and search for supersymmetry in the di-photon final state* (2014-2017).

6. Tutore del dott. M.G. Ratti, *Searching for Dark Matter in the mono-jet and mono-photon channels with the ATLAS detector* (2014-2017).

3.6 Partecipazione a commissioni di dottorato extra dipartimento

Ho preso parte ad alcune commissioni di dottorato esterne al dipartimenti di Fisica di Milano :

1. Università di Parigi XI : Recherche du boson de Higgs dans le canal diphoton au LHC avec le detecteur ATLAS, dott. Iro Koletsou (2008)
2. Università di Pavia : Ricerche di supersimmetria con il rivelatore ATLAS, dott. F. Uslenghi (2012)
3. Università della Calabria : Measurement of isolated-photon plus jet production in pp collisions at $\sqrt{s}$ = 13 TeV with the ATLAS detector at the LHC, dott. G. Callea (2018)

4 Attività istituzionali, organizzative e di servizio

4.1 Eventi organizzati

Ho organizzato alcuni eventi scientifici :

1. Comitato organizzatore di *ATLAS Egamma performance workshop* (Belgirate, 24-28 ottobre 2011)
2. Comitato organizzatore di *Mini-workshop on photon physics* (Milano, gennaio 2011)
3. *Latest update in the search for the Higgs boson* (Milano, 4 luglio 2012)
4. Convener della sessione EW a IFAE 2013, Cagliari
5. Comitato organizzatore del *Workshop on Photon Physics at the LHC* (Paris, 18-19 maggio 2015)

4.2 Collaborazioni con riviste scientifiche

1. Collaboro come revisore alla rivista internazionale Physics Letters B, Elsevier (IF 6.019)

5 Altre informazioni

Mi occupo attivamente di divulgazione scientifica: tra le varie conferenze e incontri divulgativi vorrei citare l'organizzazione della sessione milanese della *physics masterclass* (http://www.physicsmasterclasses.org), la partecipazione al percorso *Learning Week 2012 - Oltre i miei confini: orientamento Lungo le frontiere della fisica*, organizzato dalla provincia di Milano. Ho partecipato ad eventi di divulgazione organizzati

dall'università di Milano come la notte europea dei ricercatori e agli spettacoli *Facciamo luce sulla materia.*
Ho collaborato con il Cern Courier (http://cerncourier.com/cws/latest/cern)

6 Riferimenti bibliografici

References

Alla data di stesura di questo cv risulto autore di 756 pubblicazioni (fonte Scopus). Riporto nel seguito le pubblicazioni che ritengo più significative della mia attività scientifica.

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[1] G. Aad et al. "The ATLAS Experiment at the CERN Large Hadron Collider". In: *JINST* 3 (2008), S08003. DOI: 10.1088/1748-0221/3/08/S08003.

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processi di fondo e la verifica della bontà delle stime, sono poi diventati parte integrante delle ricerche di supersimmetria di ATLAS fino alla data presente.

Nel frattempo lavoravo allo sviluppo di un analisi per la ricerca di squark e gluini, e sucessivamente di top squark, in eventi con due elettroni o muoni. Ho anche coordinato il gruppo di persone che si occupava di questo canale, e che ha incluso negli anni colleghi di cinque istituti italiani e tre stranieri, tra il 2009 ed il 2014. Questa attività ha portato alla pubblicazione di cinque articoli [55, 56, 109, 215, 310]. Dopo il completamento delle analisi sui dati del primo run di LHC (2009-2012) e in attesa di quelli del secondo run (2015-2018) ho poi contribuito ad altre tre analisi, riguardanti la ricerca di top squark in eventi con leptoni tau [498], in eventi con un leptone [464] e i vincoli posti da tutte le ricerche SUSY sullo spazio dei parametri del modello supersimmetrico minimale [476].

Tra il 2011 ed il 2013 ho coordinato le ricerche di squark della terza generazione. A causa del ruolo del quark stop nel cancellare le correzioni radiative alla massa del bosone di Higgs, queste ricerche hanno grande interesse ed hanno portato alla pubblicazione di sei articoli coi dati raccolti nel 2011 [171, 203, 205, 209, 213, 215] e sei articoli con quelli raccolti nel 2012 [285, 309, 310, 335, 343, 345] che sono stati completati sotto la mia direzione.

Tra il 2014 ed il 2016 sono stato coordinatore delle ricerche di supersimmetria di ATLAS, un gruppo di lavoro che include la partecipazione attiva di circa 300 ricercatori e studenti. Mi sono occupato del completamento delle analisi sui dati raccolti nel 2012 : 34 articoli [285, 286, 291, 292, 301, 307, 309, 310, 315, 322, 328, 335, 342, 343, 344, 345, 347, 374, 392, 404, 407, 409, 414, 421, 441, 450, 464, 468, 469, 476, 492, 494, 498, 529] sulla ricerca di SUSY sono stati pubblicati da ATLAS con tutta la statistica disponibile tra il 2013 ed il 2016. Inoltre mi sono occupato della preparazione e dello svolgimento delle analisi dei dati raccolti nel secondo run di LHC. Alla scadenza del mio mandato, 11 articoli erano stati sottomessi a rivista con i dati del 2015 [535, 537, 552, 558, 559, 563, 575, 580, 584, 585, 591].

Con l'aumentare della luminosità integrata disponibile, ricerche di particelle prodotte con minore sezione d'urto diventano sempre più interessanti. Tra Aprile 2017 e Marzo 2018 ho coordinato le ricerche di produzione mediante interazione elettrodebole di particelle supersimmetriche, occupandomi in particolare della pubblicazioni delle analisi con i dati raccolti nel 2015 e 2016 [686,727]. Ho anche partecipato direttamente alle analisi per la ricerca di produzione diretta di leptoni scalari [PR32a, PR32b] e alla ricerca di neutralini e chargini con spettri di massa compressi [PR33, 727], uno scenario che si riteneva fosse accessibile solo a collisori leptonici. Ho poi contribuito ad un analisi i cui risultati preliminari [PR34a, PR34b] mettono forti limiti sulla produzione diretta di chargini che decadono in bosoni W e neutralini, migliorando di oltre un fattore due i limiti precedenti esistenti.

Ho inoltre presentato a nome della collaborazione rassegne riguardanti i risultati delle analisi dei dati di LHC per ricerche di supersimmetria o di Nuova Fisica in generale a diverse conferenze internazionali [C9, C10, C11, C12, C13] e nazionali [C18, C19].

libro, elenco in calce al CV; [C2] presentazione a conferenze, elenco sopra; [T3] tesi di cui sono stato supervisore, elenco in calce al CV

Esperimento ATLAS, analisi dati

Ricerche di Supersimmetria prima della presa dati (2003-2009). Prima che fossero disponibili i dati raccolti ad LHC ho lavorato allo sviluppo di strategie di analisi. Mi sono occupato in particolare dello studio della regione di "Focus Point" dei modelli mSUGRA, caratterizzata da un segnale costituito dalla produzione di gluini che decadono mediante quark di terza generazione in neutralini e chargini. Oggi questo è una tipologia di segnale tra le più cercate nelle analisi dei dati di LHC, ma nel 2003 sono stato tra i primi a studiarla. Ho mostrato i miei studi alla conferenza *Physics at LHC* nel 2004 [C6] ed agli *Incontri di Fisica delle Alte Energie* nel 2005 [C15]. I risultati di questo studio sono poi diventati oggetto di una pubblicazione [6]. Un altro articolo [8] tratta della complementarietà tra le misure effettuabili ad LHC e quelle basate sull'osservazione di raggi γ provenienti dall'annichilazione di neutralini al centro della Galassia. Ho anche studiato per la prima volta la possibilità di rivelare di coppie di top scalari relativamente leggeri (100-150 GeV/c^2) ad LHC, definendo punti di benchmark nello spazio dei parametri in collaborazione con teorici, e sviluppando una tecnica basata sui dati per la stima del difficile fondo di top. Questo studio e' documentato in una nota interna di ATLAS [PR8] e nei proceedings del workshop di Les Houches 2005 [PR36]. Ho inoltre presentato a nome della collaborazione rassegne riguardanti la preparazione delle analisi di supersimmetria di ATLAS in diverse conferenze internazionali [C7, C8] e nazionali [C16].

Misure di fisica del quark top (2010-2011). Con l'entrata in funzionamento di LHC alla fine del 2009, mi sono occupato dello studio della produzione di coppie di quark top, un processo di grande interesse in sè ma anche uno dei fondi principali alle ricerche di supersimmetria che avevo intenzione di effettuare successivamente. Ho contribuito alla stima del fondo dovuto alla produzione di bosoni W in associazione a getti, nell'ambito della prima misura di sezione durto di coppie di quark top con ATLAS [PR10, PR14, PR16, PR18, 36]. Ho poi contribuito alla prima misura di asimmetria di carica in eventi con coppie di top [PR20, 153].

Ricerche di supersimmetria (2009-2018). All'inizio della presa dati ero coordinatore del gruppo di lavoro sulla stima dei fondi ad analisi di ricerca di particelle supersimmetriche. Ho svolto questo incarico tra ottobre 2009 ed il settembre 2010, un periodo durante il quale si sono sviluppate quelle tecniche di stima dei fondi che sono state usate nelle prime pubblicazioni del gruppo SUSY di ATLAS [45, 47, 53]. Molti dei concetti fondamentali sviluppati in quel periodo, quali le regioni di controllo e validazione per la normalizzazione dei

- Ho tenuto il corso sulla Supersimmetria all'*Hadron Collider School* tenutasi a Gottinga nel luglio 2013[10].
- Ho tenuto il corso sulla Supersimmetria all'*Hadron Collider School* tenutasi a Gottinga nel luglio 2014[11].

Terza missione

- **Responsabile delle attività di outreach di ATLAS Italia** da Ottobre 2016 a Settembre 2017. Attività principali : mantenimento pagina Facebook e sito di Atlas Italia, preparazione e revisione di articoli su novità e iniziative di interesse per il pubblico. Da Ottobre 2017, ho continuato ad eseere membro del gruppo di outreach di ATLAS Italia.
- Guida in diverse visite al CERN organizzate per studenti del dipartimento di Fisica di Milano
- Videoconferenza dal CERN con il pubblico di Zrenjanin (Serbia) nel contesto della Notte Europea dei Ricercatori del 2012
- Guida della mostra "extreme" al Museo della Scienza di Milano durante la Notte Europea dei Ricercatori del 2017
- Responsabile delle attività di outreach di ATLAS Italia da Ottobre 2016 a Settembre 2017. Attività principali : mantenimento pagina Facebook e sito di Atlas Italia, preparazione e revisione di articoli su novità e iniziative di interesse per il pubblico.
- Pubblicazione di articoli sul CERN Courier [PR38] e sulla pagina per il pubblico di ATLAS

Attività di ricerca scientifica

Dal 1999 la mia attività di ricerca si è svolta principalmente nell'ambito di ATLAS, un esperimento del CERN per lo studio della rottura della simmetria elettrodebole e la ricerca di nuovi fenomeni a quella scala di energia. La mia attività include due linee principali. La prima è la caratterizzazione dei rivelatori a pixel dell'esperimento, con particolare attenzione agli effetti di danneggiamento da radiazione. La seconda è l'analisi dati, in particolare la ricerca di particelle supersimmetriche. Nel seguito descrivo in dettaglio il mio contributo a ciascuna di queste linee di ricerca.

Chiave per le referenze fornite nella descrizione dell'attività di ricerca : [12] articolo su rivista o libro, elenco in calce al CV; [PR1] lavoro non pubblicato su rivista o

[10] https://indico.cern.ch/event/232639/timetable/
[11] https://indico.cern.ch/event/292887/timetable/

- **C6** SUSY studies with ATLAS: hadronic signatures and Focus Point, *Physics at LHC*, Vienna 2004.
- **C7** Search for Supersymmetry with early ATLAS data, *Frontier Science 2005*, Milano 2005.
- **C8** Supersymmetry measurements with ATLAS, *LHC-DM09*, Ann Arbor 2009.
- **C9** Recent results from new physics searches at ATLAS, *Physics at LHC*, Perugia 2011.
- **C10** Searches for direct pair production of third generation squarks with the ATLAS detector, *EPS-HEP*, Stokholm 2013.
- **C11** ATLAS results on SUSY searches, *SUSY 2015*, Lake Tahoe 2015.
- **C12** Searches for direct pair production of third generation squarks in final states with no leptons with the ATLAS detector, *EPS-HEP*, Venezia 2017.
- **C13** Beyond Standard Model searches at LHC, Relazione su invito a *Pushing the boundaries of the energy and intensity frontiers*, Durham 2018.

Conferenze e workshop nazionali :

- **C14** Searches for New Physics at the LHC, *Incontri di Fisica delle Alte Energie*, Torino 2004.
- **C15** Reconstruction of sparticles masses at the LHC, *Incontri di Fisica delle Alte Energie*, Catania 2005.
- **C16** Search for Supersymmetry with early ATLAS data, *Incontri di Fisica delle Alte Energie*, Pavia 2006.
- **C17** Rassegna e stato del rivelatore a pixel di ATLAS, *Congresso Nazionale SIF*, Pisa 2007.
- **C18** Supersymmetry searches with the ATLAS detector, *Galileo Galilei Institute workshop*, Firenze 2011.
- **C19** Can the world be supersymmetric ? The scenario after the first LHC run, *Congresso Nazionale SIF*, Pisa 2014. **(su invito)**

Ruoli di docenza in scuole internazionali

- Come vicecoordinatore (2016-2017) e coordinatore (2017-2018) delle analisi di ATLAS Italia, ho selezionato le presentazioni e i poster sottomessi da ATLAS a IFAE 2017 e IFAE 2018, e ai congressi della Società Italiana di Fisica del 2017 e 2018. Ho poi revisionato i contributi accettati e (nel caso di IFAE) i proceedings.

Congressi della collaborazione ATLAS : si tratta di congressi legati a gruppi di lavoro che coordinavo in quel momento, Sono stato coinvolto nella scelta della sede, nella definizione del formato, del programma, e dei relatori, e nel caso del congresso a Milano ho gestito tutti i dettagli dell'organizzazione locale.

- *Third generation squark searches* tenutosi a Milano nel giugno 2014 cui hanno partecipato 42 persone.
- *SUSY* tenutosi a Sussex nell'aprile 2016, cui hanno partecipato 137 persone
- *SUSY and Exotics* tenutosi a Bucharest in maggio 2017, cui hanno partecipato 261 persone.
- Congresso sulle attività di *fisica e upgrade di ATLAS Italia* tenutosi a Napoli nel novembre 2016 cui hanno partecipato 110 persone.
- Congresso sulle attività di *fisica e upgrade di ATLAS Italia* tenutosi a Pavia nell'ottobre 2017, cui hanno partecipato 85 persone.

Relazioni a conferenze

Conferenze internazionali :

- **C1** Measurements of spatial resolution of ATLAS pixel detectors, *Pixel 2000*, Genova 2000.
- **C2** Test Beam results of ATLAS Pixel sensors, *Pixel 2002*, Carmel (CA), 2002.
- **C3** Measurement of trapping time constants in irradiated DOFZ silicon with test beam data, *Frontier Detectors for Frontier Physics*, La Biodola 2003.
- **C4** Radiation hardness studies of silicon pixel detectors, *Vertex 2004*, Menaggio (Lago di Como) 2004.
- **C5** Simulation of Signals in Ultra-Radiation hard silicon pixel detectors, *IEEE Nuclear Physics Symposium*, Roma 2004.

Incarichi istituzionali

- Da Gennaio 2017 sono membro della commissione assegni di ricerca della Sezione INFN di Milano.
- A partire dall'anno accademico 2014-2015 alla data presente, sono membro del Collegio dei Docenti del corso di Dottorato in Fisica dell'Università di Milano.

Organizzazione di conferenze

Conferenze e congressi internazionali :

- Convener del gruppo *New Physics of Electroweak Symmetry Breaking* del workshop *Physics at TeV Colliders* (Les Houches, 2005) [1] [2].
- Convener del gruppo di lavoro *Flavour Physics at high Q* del workshop *Flavour physics in the era of the LHC* (CERN, 2005-2007) [3] [4].
- Convener delle sessioni "SUSY" di *LHCP 2015* (Saint Petersburg, 2015)[5].
- Convener delle sessioni "Search for supersymmetry" di *LHCP 2016* (Lund, 2016)[6].
- Convener delle sessioni "Searches" di *LHCP 2017* (Shanghai, 2017)[7].

Conferenze e congressi nazionali :

- Chair della sessione parallela di *Nuova Fisica* agli *Incontri di Fisica delle Alte Energie* (Napoli, 2007) [8].
- Convener della sessione *SUSY+Exotica* agli *Incontri di Fisica delle Alte Energie* (Cagliari, 2013) [9].

[1] Web page : https://phystev.cnrs.fr/Houches2005/
[2] Proceedings : https://arxiv.org/pdf/hep-ph/0602198.pdf
[3] Web page : http://mlm.home.cern.ch/mlm/FlavLHC.html
[4] Proceedings : T. Lari et al., Eur. Phys. J. C57, 183, DOI https://doi-org.ezproxy.cern.ch/10.1140/epjc/s10052-008-0713-4
[5] Web page : https://indico.cern.ch/event/389531/sessions/78346/
[6] Web page : https://indico.cern.ch/event/442390/page/5281-scientific-programme-overview
[7] Web page : https://indico.cern.ch/event/517784/sessions/223842/
[8] Web page : https://indico.cern.ch/event/14815/
[9] Web page : https://agenda.infn.it/conferenceTimeTable.py?confId=5829

Ruoli e responsabilità di coordinamento

A meno che non sia diversamente specificato, tutti i ruoli riportati sono stati svolti insieme ad un collega, secondo lo standard diffuso nell'esperimento ATLAS di avere due coordinatori per ogni gruppo di lavoro.

- Convener del gruppo di **Supersimmetria** di ATLAS (Ottobre 2014 - Settembre 2016). Ruolo : coordinamento del lavoro di circa 300 ricercatori e studenti per analisi di ricerca di segnali supersimmetrici.
- Convener del gruppo di **Supersimmetria background forum** di ATLAS (Ottobre 2009 - Settembre 2010). Sottogruppo di Supersimmetria. Responsabilità : messa a punto e scrutinio delle procedure di stima dei fondi e della produzione MonteCarlo per le analisi del gruppo di Supersimmetria.
- Convener del gruppo di **Supersimmetria third generation squarks** di ATLAS (2011 - 2013). Sottogruppo di Supersimmetria, circa 60 ricercatori e studenti attivi.
- Convener del gruppo di **Supersimmetria electroweak production** di ATLAS (Aprile 2017 - Marzo 2018). Sottogruppo di Supersimmetria, circa 60 ricercatori e studenti attivi.
- Convener del gruppo di **Fast Chain** di ATLAS (Dicembre 2016 - presente). Responsabilità : sviluppo del futuro programma di simulazione dell'esperimento, con l'obiettivo di ridurre il consumo di CPU per evento di circa un fattore cento.
- Coordinamento delle **analisi di ATLAS Italia** (Ottobre 2016 - Settembre 2018, il primo anno come deputy ed il secondo come coordinatore principale). Fino a Settembre 2017, il ruolo prevedeva anche il coordinamento delle **iniziative di terza missione di ATLAS Italia**.

Curriculum del Dott. Tommaso Lari

Titoli accademici, contratti e attività professionale

- Laurea in Fisica presso l'Università di Bologna il 12/06/1998 con la votazione di 110/110 e lode.
- Borsa di studio dell'INFN presso i Laboratori Nazionali del Gran Sasso, (Aprile 1998 - Marzo 1999).
- Dottorato di Ricerca presso l'Università di Milano (Marzo 1999 - Dicembre 2001) e conseguimento del titolo di Dottore di Ricerca in Fisica.
- Borsa di studio post-dottorato presso l'Università di Bonn (Germania) (Gennaio-Agosto 2002)
- Assegno di Ricerca dell'INFN presso la sezione di Milano (Marzo 2002 - Dicembre 2005).
- Ricercatore di III livello dell'INFN presso la sezione di Milano (tempo determinato : Dicembre 2005 - Maggio 2009; a tempo indeterminato dal Maggio 2009)
- Borsa di similfellow per svolgere attività di ricerca al CERN : Settembre 2008 - Agosto 2009 e Gennaio-Dicembre 2013)

Partecipazione a progetti di ricerca internazionali

- ATLAS, esperimento del CERN per lo studio della rottura della simmetria elettrodebole e della fisica alla scala del TeV, dal 1999 alla data presente.
- MACRO, rivelatore per lo studio della radiazione cosmica e ricerca di monopoli magnetici ai LNGS, dal 1997 al 1999
- RD50, progetto del CERN per lo sviluppo di rivelatori resistenti alla radiazione, dal 2002 al 2004

Esperimento ATLAS : rivelatore di vertice a Pixel

Tra il 1999 ed il 2009 ho lavorato al programma di ricerca e sviluppo legato alla costruzione del rivelatore (installato nel 2007) e al suo commissioning con raggi cosmici.

Ho partecipato alla realizzazione del programma di ricostruzione dei dati di test beam [PR5] e alla loro analisi, studiando la risoluzione spaziale, la raccolta di carica, l'efficienza, lo spessore di svuotamento e l'angolo di Lorentz dei rivelatori. In particolare ho sviluppato algoritmi per una migliore ricostruzione della posizione, ed un metodo per misurare la vita media dei portatori di carica in silicio irraggiato.

Ho sviluppato un modello dettagliato di raccolta delle coppie elettrone buca create da particelle cariche nei sensori, tenendo conto della variazioni di angolo di Lorentz con il campo elettrico e degli effetti di danneggiamento da radiazione.

Ho studiato con dati presi con un fascio ad alta intensità la dipendenza dell'efficienza di rivelazione e della risoluzione spaziale dalla sincronizzazione dell'elettronica di lettura rispetto alle particelle del fascio, nonchè l'uniformità nella risposta temporale dei singoli canali di lettura.

Questi studi costituiscono il cuore della mia tesi di dottorato [PR2] e di una pubblicazione [18]. Sono anche documentati in tre note interne di ATLAS [PR3, PR4, PR6]. Essi hanno contribuito allo sviluppo del progetto definitivo del rivelatore a pixel [17] e ne ha dimostrato la capacità di fornire le prestazioni richieste anche dopo l'irraggiamento. Ho presentato questi studi in quattro conferenze internazionali [C1, C2, C3, C4].

Successivamente all'installazione del rivelatore in ATLAS, ho analizzato dati di raggi cosmici per verificarne il buon funzionamento, misurando nuovamente l'angolo di Lorentz. Ho inoltre sviluppato il software ufficiale di ATLAS per la ricostruzione delle coordinate dei clusters del rivelatore a pixel.

A partire dal 2016, faccio parte di un gruppo che studia gli effetti dei danni da radiazione, confrontando le predizioni di modelli numerici con i dati raccolti ad LHC. Il modello è stato utilizzato per decidere i parametri operativi del rivelatore a pixel (tensione di svuotamento e soglia) nel 2017 e 2018 ed è in corso di implementazione nel software ufficiale di simulazione del rivelatore di ATLAS. Il modello è anche utilizzato nelle previsioni delle prestazioni del rivelatore a pixel per l'upgrade di alta luminosità.

Esperimento ATLAS : altre attività

Da Ottobre 2017 sono coordinatore delle analisi di fisica e performance di ATLAS Italia, dopo aver svolto il ruolo di vice coordinatore nei dodici mesi precedenti. Il coordinatore delle analisi e' il punto di riferimento della comunità italiana di ATLAS per quanto riguarda l'analisi dati. Il suo ruolo è di promuovere la conoscenza delle attività compiute dai vari gruppi, favorirne l'aggregazione, segnalare situazioni di insufficienza o criticità e suggerire soluzioni per il loro

superamento; armonizzare l'utilizzo delle risorse di calcolo in contatto con il responsabile nazionale ed il responsabile di calcolo; occuparsi dell'assegnazione di presentazioni per conferenze nazionali (quali il congresso SIF e IFAE), della revisione delle presentazioni in questione e dei proceedings; organizzare un workshop annuale sulle analisi di Atlas Italia (l'ultimo si è tenuto a Pavia nell'ottobre 2017); valorizzare le attività nazionali in tutte le sedi opportune (ATLAS, workshops, conferenze, etc.) e svolgere un ruolo di riferimento nei confronti della commissione 1 per le attività di analisi nel loro complesso.

Da Dicembre 2016 sono coordinatore di *FastChain*, un progetto per ridurre la CPU necessaria per la produzione di eventi MonteCarlo di due ordini di grandezza. Il progetto ha un'importanza critica per ATLAS, in quanto le richieste di statistica di eventi Monte Carlo sono in continuo aumento con l'aumentare della luminosità integrata disponibile. Già oggi molte analisi di alto profilo hanno la statistica MonteCarlo tra le principali incertezze sistematiche. Il progetto è molto complesso, e riguarda la simulazione delle interazioni delle particelle con il rivelatore, la simulazione della raccolta del segnale nei vari rivelatori, e la ricostruzione delle traccie in eventi simulati. L'obiettivo è rendere *Fast Chain* il programma di simulazione di default per i campioni simulati prodotti per il run3 di LHC (2021-2023).

Sono stato il direttore del pannello di revisione (*editorial board*) di ATLAS per un articolo di ricerca di supersimmetria [708] e membro del pannello di altri quattro articoli : misura di spin correlation in $t\bar{t}$ [400], sezione d'urto di produzione $t\bar{t}$ in associazione a quark pesanti [266], sezione d'urto di produzione di bosoni W e Z con quark pesanti [90,91].

Attività di ricerca non legate ad ATLAS

MACRO (1997-1999) : Ho lavorato a questo esperimento sotto la supervisione del Prof. G. Giacomelli prima durante la mia tesi di laurea [PR1] e poi con una borsa di studio presso i Laboratori del Gran Sasso, da Aprile 1998 a Marzo 1999. Il rivelatore MACRO si trovava nei laboratori sotterranei del Gran Sasso, e studiava la componente penetrante e di alta energia dei raggi cosmici. Una delle linee principali di ricerca era la ricerca di monopoli magnetici supermassivi ($m \sim 10^{16}$ GeV) prodotti durante i primi istanti di vita dell'universo. Durante la tesi mi sono occupato di calcolare la perdita di energia nella materia di particelle con carica magnetica multipla di quella minima ($\hbar c/2e$) e di particelle con carica magnetica ed elettrica (dioni). Ho calcolato la perdita di energia all'interno della Terra per valutare l'angolo solido di accettanza del rivelatore in funzione della massa e della carica. Il risultato di questo lavoro é stato pubblicato su Astroparticle Physics [1]. Ho poi calcolato la perdita di energia dei monopoli negli scintillatori, nel gas dei tubi a streamer limitato e nel rivelatore nucleare a tracce di MACRO, e la risposta di questi rivelatori, lavoro pubblicato in un secondo articolo [2]. Ho poi effettuato un'analisi dei dati degli scintillatori

di MACRO per la ricerca di monopoli magnetici ed altre particelle fortemente ionizzanti, come i nucleariti [11].

RD50 (2002-2004) : La collaborazione RD50 si è formata per sviluppare rivelatori di vertice maggiormente resistenti alle radiazioni. Tra il 2002 ed il 2004 ho usato il programma di simulazione che avevo scritto per studiare il comportamento di rivelatori a pixel irraggiati per studiare la raccolta del segnale in funzione del materiale utilizzato (silicio Float-Zone standard ed ossigenato, silicio Czochralski ed epitassiale), del tipo di drogaggio (n-on-p, n-on-n, p-on-n), della geometria (spessore del sensore e dimensioni del pixel) e delle condizioni operative (temperatura, campo elettrico). Queste simulazioni consentono di guidare il processo di Ricerca e Sviluppo di nuovi rivelatori. Ho presentato questi studi in due conferenze internazionali [C4, C5].

Sviluppo di rivelatori a pixel di diamante (2002) : Durante il periodo trascorso a Bonn ho analizzato dati di test beam presi con rivelatori a pixel che usavano diamante come materiale sensibile. Tali rivelatori sono promettenti per la loro maggiore resistenza ai danni da radiazione, ma presentano ancora dei problemi di omogeneità e raccolta di carica in quanto utilizzano materiale policristallino. Analizzando questi dati e sfruttando l'elevata granularità dei rivelatori a pixel di ATLAS ho messo in luce per la prima volta come la ricostruzione della posizione sia influenzata dalla struttura policristallina del materiale, che provocava variazioni locali (al livello del singolo cristallo) dell'ordine di 20 micrometri nella posizione in cui veniva raccolta la carica rispetto alla posizione di passaggio della particella. Ho poi scritto un programma di simulazione per descrivere la raccolta di carica e la risposta di questi rivelatori a particelle ionizzanti, che ha permesso di spiegare il comportamento osservato nei dati come derivante dai campi elettrici di polarizzazione creati dalle cariche intrappolate nella regione di confine tra diversi cristalli. L'analisi e la simulazione dei dati presi con rivelatori al diamante è stata oggetto di una pubblicazione di cui io sono primo autore [4].

Attività didattica

Ho svolto attività didattica come assistente per i seguenti laboratori:

- Corso di Laboratorio di Fisica per Scienze Biologiche, Anno Accademico 1999/2000, Università degli Studi di Milano. Durante il corso venivano insegnati agli studenti i fondamenti del trattamento statistico delle misure e degli errori associati. L'esperimento di laboratorio consisteva nella misura della costante di Faraday utilizzando l'elettrolisi di una soluzione di $CuSO_4$.

- Corso di Laboratorio di Programmazione 2, Anno Accademico 2003/04, Università degli Studi di Milano. Durante il corso si insegnava agli studenti la programmazione in linguaggio C. Veniva proposto un esercitazione a scelta tra la simulazione di un esperimento (misura della relazione tra indice di rifrazione e lunghezza d'onda con uno spettrometro a prisma) e lo sviluppo di un programma per acquisire la funzione d'onda misurata da un'oscilloscopio e caratterizzare un circuito RLC.

A partire dall'anno accademico 2014-2015 alla data presente, sono membro del Collegio dei Docenti del corso di Dottorato in Fisica dell'Università di Milano.

Partecipazione a scuole e corsi di formazione

- Corso di formazione INFN *Corso di formazione manageriale per ricercatori e tecnologi INFN*, Legnaro, Ottobre 2017
- Corso di formazione INFN *Corso di comunicazione scientifica*, Milano, Maggio 2017
- XIII seminario di Fisica Nucleare e Subnucleare, Otranto, 21-27 Settembre 2000
- Giornate di Studio sui rivelatori, Torino 27 febbraio - 1 marzo 2001.
- Lezioni su software e calcolo Moderno, Torino 1-2 marzo 2001.
- IX corso specialistico su *linguaggio c++ ed analisi e disegno nella programmazione ad oggetti*, bologna, 26-30 marzo 2001.
- Scottish University Summer School in Physics on heavy flavour physics, St. Andrews (Scotland) 7-23 agosto 2001.

Lavori a stampa

Per le pubblicazioni su rivista, si veda l'elenco allegato alla domanda.

Tesi

- **PR1** T. Lari, Ricerca di monopoli magnetici con il rivelatore MACRO al Gran Sasso, **diploma thesis**, Bologna 1998.
- **PR2** T. Lari, Study of silicon pixel sensors for the ATLAS detector, **PhD thesis**, CERN-THESIS-2001-028, Milano 2001.

Note della collaborazione ATLAS

- **PR3** T. Lari, Alignment of irradiated and not irradiated pixel sensors in test-beam operation, ATL-INDET-2001-002.
- **PR4** T. Lari, *Lorentz angle variation with electric field for ATLAS silicon detectors*, ATL-INDET-2001-004.
- **PR5** A. Andreazza et al., H8 ATLAS Pixel test beam analysis program - User Guide, ATL-INDET-2003-009.
- **PR6** G. Alimonti et al., A study of charge trapping in irradiated silicon with test beam data, ATL-INDET-2003-014.
- **PR7** T. Lari, A Geant4 simulation of not irradiated and irradiated pixel detectors, ATL-INDET-2003-015.
- **PR8** T. Lari and G. Polesello, A study on the detection of a light stop quark with the ATLAS detector at LHC, ATL-PHYS-CONF-2006-001.
- **PR9** J. Abdallah et al., Prospects for SUSY discovery based on inclusive searches with the ATLAS detector at the LHC, ATL-COM-PHYS-2009-261.
- **PR10** B. Acharya et al., Prospects for measuring the Top Quark Pair Production Cross-section in the Single Lepton Channel at ATLAS in 10 TeV p-p Collisions, ATL-PHYS-INT-2009-071.
- **PR11** A. Barr et al, Details on Early supersymmetry searches with jets, missing transverse momentum and one or more leptons with the ATLAS Detector, ATL-PHYS-INT-2010-083.
- **PR12** M. Arrouche et al., Wenu and Zee observations supporting note, ATL-PHYS-INT-2010-109.
- **PR13** M. Arrouche et al., $W \to e\nu$ and $Z \to ee$ cross-section measurements in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS Detector : Support note to publication, ATL-PHYS-INT-2010-130.
- **PR14** B. Acharya et al., Estimation of the W+Jets Background for Top Quark Re-Discovery in the Single Lepton+Jets Channel, ATL-PHYS-INT-2010-136.
- **PR15** B. Abi et al., Mis-identified lepton backgrounds to top quark pair production : Supporting note 5, ATL-PHYS-INT-2010-139.
- **PR16** B. Acharya et al., Cut-and-count measurement of the top quark pair production in the semileptonic decay channel at $\sqrt{s} = 7$ TeV with the ATLAS detector, ATL-PHYS-INT-2011-048.

- **PR17** A. Alonso et al., Searching for Supersymmetry with two leptons and missing transverse momentum at $\sqrt{s} = 7$ TeV, ATL-PHYS-INT-2011-091.
- **PR18** B. Acharya et al., Measurement of the Top Quark Pair Production Cross-section in ATLAS in the Single Lepton plus Jets Channel, ATL-COM-PHYS-2011-666.
- **PR19** S. Asai et al., Search for Supersymmetry with jets and missing transverse momentum and one lepton at $\sqrt{s} = 7$ TeV, ATL-PHYSINT-2011-082.
- **PR20** B. Acharya et al., Measurement of the top quark charge asymmetry in pp collisions data at $\sqrt{s} = 7$ TeV using the ATLAS detector, ATL-PHYS-INT-2011-063
- **PR21** A. Alonso et al., Constraining the gauge-mediated Supersymmetry breaking model in final states with two leptons, jets and missing transverse momentum with the ATLAS experiment at $\sqrt{(s)} = 7$ TeV, ATL-PHYS-INT-2011-096.
- **PR22** M. Bianco et al., Search for an heavy top partner in final states with two leptons, ATL-PHYS-INT-2012-077.
- **PR23** M.I. Besana et al., Search for a scalar top decaying to a chargino and a b-quark in final states with two leptons, ATL-PHYS-INT-2012-102.
- **PR24** M.I. Besana et al., Search for a scalar top decaying to a chargino and a b-quark in final states with two leptons, ATL-PHYS-INT-2013-022.
- **PR25** M.I. Besana and T. Lari, Search for a scalar top decaying to tau-sleptons, b-jets and neutrinos in final states with two leptons, ATL-PHYS-INT-2014-010.
- **PR26** M. Besana et al., Search for a scalar top in final states with two leptons and intermediate values of m_{T2}, ATL-COM-PHYS-2014-754
- **PR27** A. Barr et al., Summary of the ATLAS experiment's sensitivity to supersymmetry after LHC Run 1 - interpreted in the phenomenological MSSM, ATL-COM-PHYS-2014-952.
- **PR28** M. Aliev et al. Search for direct top squark pair production in final states with two leptons in $\sqrt{s} = 13$ TeV pp collisions using 3.2 fb^{-1} of ATLAS data, ATL-COM-PHYS-2016-113.
- **PR29** S. Carra et al., Search for top squark pair production in final states with two leptons and two b-jets (hadronic MT2 analysis), ATL-COM-PHYS-2016-507
- **PR30** M. Aliev et al., Search for top squark pair production with $\tilde{t} \to bff'\chi_1^0$ in final states with two leptons in pp collisions at $\sqrt{s} = 13$ TeV, ATL-COM-PHYS-2016-1627

- **PR31** M. Aliev et al., Search for top squark pair production in final states with two leptons with 36.5 fb1 of pp collision at s$\sqrt{s}$ = 13 TeV (leptonic m_{T2} analysis), ATL-COM-PHYS-2016-1630
- **PR32a** S.C. Itzebelt et al., Search for supersymmetry with two and three leptons and missing transverse momentum in the final state at $\sqrt{s}$ = 13 TeV with the ATLAS detector, ATL-COM-PHYS-2016-1673 (ATLAS Internal note).
- **PR32b** ATLAS Collaboration, Search for supersymmetry with two and three leptons and missing transverse momentum in the final state at $\sqrt{s}$ = 13 TeV with the ATLAS detector, arXiv:1803.02762 (public document, submitted to the European Physics Journal)
- **PR33** M. Hance et al., Searches for Weak Production of Compressed Supersymmetry in pp Collisions at $\sqrt{s}$ = 13 TeV with the ATLAS Detector, ATL-COM-PHYS-2016-1708.
- **PR34a** A. H. Pacey et al., Search for direct chargino pair production with W -boson mediated decays in events with two leptons and missing transverse momentum in the final state at $\sqrt{s}$ = 13 TeV with the ATLAS detector, ATL-COM-PHYS-2018-256 (ATLAS Internal note)
- **PR34b** The ATLAS Collaboration, Search for direct chargino pair production with W -boson mediated decays in events with two leptons and missing transverse momentum at $\sqrt{s}$ = 13 TeV with the ATLAS detector, ATLAS-CONF-2018-18 (public document).

Altri lavori non pubblicati su rivista

- **PR35** T. Lari, Test Beam results of ATLAS Pixel sensors, proceedings di Pixel 2002, arxiv:hep-ex/0210045 and SLAC e-conf C020909
- **PR36** B. C. Allanach et al., Les Houches "Physics at TeV Colliders 2005" Beyond the Standard Model working group: summary report, arxiv:hep-ph/0602198

Articoli di outreach

- **PR37** Narrowing down the stop gap with ATLAS, CERN Courier 55, p 9, https://cds.cern.ch/record/2215934

1 Tesi di cui sono stato correlatore o relatore esterno

Tesi triennali :

- **T1** F.C. Ungaro, Misura della sezione d'urto e stima del fondo nella produzione del bosone vettoriale Z in collisione protone-protone, Milano 2008.

- **T2** C. Giuliani, Ricerche di Supersimmetria con il rivelatore ATLAS ad LHC, Milano 2009.
- **T3** C. Merlassino, Ottimizzazione della risoluzione spaziale del rivelatore a pixel di ATLAS per high luminosity LHC, Milano 2013.
- **T4** L. Rossini, Ricerche di top scalare con il rivelatore ATLAS in stati finali con due leptoni, Milano 2014.

Tesi magistrali :

- **T6** U. De Sanctis, *Ricerca di Particelle Supersimmetriche con il rivelatore ATLAS ad LHC*, Milano 2005.
- **T7** S. Montesano, Ricerca di particelle supersimmetriche nell'ambito dell'esperimento ATLAS, Milano 2006
- **T8** A.A. Maffioli, Studio di un algorito lineare di ricostruzione analogica della posizione per il rivelatore a Pixel di ATLAS, Milano 2007
- **T9** M. Uslenghi, Ricerche di Supersimmetria col rivelatore ATLAS, Milano 2008.
- **T10** F. Meloni, Estimate of the QCD background with misidentified electrons in W+jets measurements with the ATLAS detector, Milano 2010
- **T11** R. Simoniello, Study of the performance of missing transverse energy in ATLAS and its application in a supersymmetry search, Milano 2010.
- **T12** F. C. Ungaro, Searches for Supersymmetric particles in events with opposite sign lepton pairs and large missing transverse momentum in $\sqrt{s} =$ 7 TeV proton-proton collisions at the ATLAS experiment, Milano 2011.
- **T13** C. Giuliani, Searches for Supersymmetry with two leptons and missing transverse momentum at $\sqrt{s} = 7$ TeV at the ATLAS detector, Milano 2011.
- **T14** C. Rizzi, Search for scalar top in final states with missing transverse momentum and two tau leptons at in 8 TeV p-p collisions collected by the ATLAS detector, Milano 2014.
- **T15** G. Lerner, Search for scalar top and boottom in final states with one lepton and missing transverse momentum, using 8 TeV p-p collisions recorded by the ATLAS detector, Milano 2014.
- **T16** C. Merlassino, Estimate of the QCD background in a search for top squarks in final states with two leptons with ATLAS in $\sqrt{s} = 13$ TeV pp collisions, Milano 2016.
- **T17** A. G. Zecchinelli, Search for Supersymmetry in the di-photon plus missing transverse momentum final state with the ATLAS detector in sqrts = 13 TeV pp collisions, Milano 2016.

- **T18** L. Rossini, Search for top squarks in final states with two leptons with ATLAS in $\sqrt{s} = 13$ TeV pp collisions, Milano 2016.

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- **T19** F. Meloni, Search for direct top squark pair production in final states with two leptons with ATLAS in $\sqrt{s} = 7$ TeV and $\sqrt{s} = 8$ TeV pp collisions, XXVI ciclo, Milano 2013.
- **T20** S. Carrà, Search for electroweak production of supersymmetric particles at the LHC with the ATLAS detector (in corso, XXXI ciclo)
- **T21** L. Rossini, Search for supersymmetric particles with compressed mass spectra with ATLAS in $\sqrt{s} = 13$ TeV pp collisions (in corso, XXXII ciclo)

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1. J. Derkaoui et al., *Energy losses of magnetic monopoles and dyons in the earth*, Astroparticle Physics 9 (1998) 173.
2. J. Derkaoui et al., *Energy losses of magnetic monopoles and dyons in scintillator, streamer tubes and nuclear track detectors*, Astroparticle Physics 10 (1999) 339.
3. J. Treis et al., *A modular PC based silicon microstrip beam telescope with high speed data acquisition*, Nucl. Instr. and Meth. A490 (2002) 112.
4. T. Lari et al., *Characterization and modeling of non-uniform charge collection in CVD diamond pixel detectors*, Nucl. Instr. and Meth. A537 (2005) 581.
5. A. Airoldi et al., *A chip removal facility for indium bump bonded pixel detectors*, Nucl. Instr. and Meth. A540 (2005) 259.
6. U. De Sanctis, T. Lari, S. Montesano e C. Troncon, *Perspectives for the detection and measurement of supersymmetry in the focus point region of mSUGRA models with the ATLAS detector at LHC*, Eur. Phys. J. C52 (2007) 743.
7. T. Lari et al., *Collider aspects of flavor physics at high Q*, Eur. Phys. J. C57 (2008) 183, [DOI https://doi-org.ezproxy.cern.ch/10.1140/epjc/s10052-008-0713-4]

8. E. Moulin et al., *Complementary of gamma-ray and CERN LHC searches for neutralino Dark Matter in the Focus Point region*, Phys. Rev. D77 (2008) 055014.

Papers published with the MACRO collaboration

9. M. Ambrosio et al., *Limits on dark matter WIMPs using upward-going muons in the MACRO detector*, Phys. Rev. D60 (1999) 082002/1.

10. M. Ambrosio et al., *High statistics measurement of the underground muon pair separation at Gran Sasso*, Phys. Rev. D60 (1999) 032001/1.

11. M. Ambrosio et al., *Nuclearite search with the MACRO detector at Gran Sasso*, Eur. Phys. J. C13 (2000) 453.

Papers published with the RD50 Collaboration

12. M. Bruzzi et al., *Radiation-hard semiconductor detectors for SuperLHC*, Nucl. Instr. and Meth. A541 (2005) 189.

ATLAS combined test beam papers

13. A. Ahmad et al., *Alignment of the Pixel and SCT Modules for the 2004 ATLAS Combined Test Beam*, J. Instrum. 3 (2008) P09004.

14. E. Abat et al., *A Layer Correlation technique for pion energy calibration at the 2004 ATLAS Combined Beam Test*, J. Instrum. 6 (2011) P06001.

15. E. Abat et al., *Combined performance studies for electrons at the 2004 ATLAS combined test-beam*, J. Instrum. 5 (2010) P11006.

16. S. Wheeler et al., *Photon reconstruction in the ATLAS Inner Detector and Liquid Argon Barrel Calorimeter at the 2004 Combined Test Beam*, J. Instrum. 6 (2011) P04001.

Papers published with the ATLAS Pixel Collaboration

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Alberto Santambrogio: **Curriculum Vitae**

Present Position: Researcher at INFN - Sezione di Milano.

Education and Qualifications

- **May 1993**: *Laurea (Degree)* in Theoretical Physics at the University of Milano with full marks and honors (110/110 cum laude)

  Supervisor: Prof. Daniela Zanon (University of Milano)

  Title of the Thesis: *Study of the quantum properties of supersymmetric Toda theories*

- **November 1994** (after one year of compulsory military service): he won the entrance examination for the Ph.D. course at the University of Milano and he started his research activity under the supervision of Prof. Daniela Zanon

- **May 1998**: final discussion of the Ph.D. Thesis

  Title of the Thesis : *Quantum aspects in perturbative and non-perturbative strings*

- **01/10/1998 – 31/08/2000**: Post-Doctoral position at KULeuven, Belgium in the context of the EC contract TMR ERBFMRXCT96-0045

- **01/11/2000 – 31/10/2004**: Post-Doctoral position ("Assegno di Ricerca") at University of Milano

- **01/11/2004 – 31/10/2005**: Post-Doctoral position ("Assegno di Ricerca") at University of Milano - Bicocca

- from **28/12/2005**: Researcher at INFN - Sezione di Milano

Scientific techniques and skills acquired

- *Scientific background:* it is mainly founded on general relativity, quantum field theory, string theory, supersymmetry and group theory.

- *Skills acquired:* renormalization techniques in quantum field theory, superspace methods in supersymmetric quantum field theories, with particular emphasis to *supergraph* techniques, representation group theory and geometrical techniques in general relativity.

Teaching Activities

- Assistant at the undergraduate course *Esperimentazioni di Fisica I* and at the relative examinations at the University of Milano for the academic year 1997/1998

- Tutor of the course on *Constrained Dynamics* for the Ph.D. Course at the Institute of Theoretical Physics of K.U.Leuven for the academic year 1999/2000

- Titular of the course *Introduction to Supersymmetry* for the Ph.D. Course at the University of Milano for the academic year 2000/2001

- Titular of the course *Quantum properties of supersymmetric theories* for the Ph.D. Course at the University of Milano for the academic year 2002/2003

- Assistant at the undergraduate course *Structure of the Matter II* and at the relative examinations at University of Milano-Bicocca for the academic years 2003/2004

- Titular of the course *Group Theory and Applications to the Structure of the Matter*, in the framework of the undergraduate course "Structure of the Matter II" at the University of Milano-Bicocca for the academic years 2004/2005, 2005/2006 and 2006/2007

- Titular of the undergraduate course *Theoretical Physics II* (on quantum gauge theories) at "Università Cattolica" of Brescia for the academic years 2004/2005 and 2005/2006
- Lectures on *Supersymmetry* for the undergraduate course *Gravity and Superstrings - 1st module'* at the University of Milano for the academic years 2004/2005, 2005/2006, 2006/2007, 2007/2008
- Titular of the undergraduate course *Gravity and Superstrings - 1st module* at the University of Milano from the academic year 2008/2009 to the academic year 2012/2013
- Titular of the undergraduate course *Gravity and Superstrings - 2nd module* at the University of Milano from the academic year 2014/2015 to the academic year 2017/2018
- Titular of the undergraduate course *Mathematical Methods for Physics - Geometry and Groups* at the University of Milano from the academic year 2009/2010 to the academic year 2017/2018
- Relator and Co-relator of many degree thesis and Tutor of 6 Ph.D. students at the Department of Physics of the University of Milano

List of Scientific Publications

1. *Renormalization group flows in σ-models coupled to two-dimensional dynamical gravity*
   S. Penati, A. Santambrogio and D. Zanon
   Nucl. Phys. B483 (1997) 495-513
2. *Gravitational dressing of sigma-model beta-functions*
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A. Mauri, S. Penati, M. Pirrone, A. Santambrogio and D. Zanon
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29. *Anomalous dimension with wrapping at four loops in $\mathcal{N} = 4$ SYM*
F. Fiamberti, A. Santambrogio, C. Sieg and D. Zanon
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30. *Finite-size effects in the superconformal beta-deformed $\mathcal{N} = 4$ SYM*
F. Fiamberti, A. Santambrogio, C. Sieg and D. Zanon
JHEP 0808 (2008) 057

31. *Wrapping interactions in standard and β-deformed $\mathcal{N} = 4$ SYM*
F. Fiamberti, A. Santambrogio, C. Sieg and D. Zanon
Fortsch. Phys. 57 (2009), 552

32. *Single impurity operators at critical wrapping order in the beta-deformed $\mathcal{N} = 4$ SYM*
F. Fiamberti, A. Santambrogio, C. Sieg and D. Zanon
JHEP 0908 (2009) 034

33. *Five-loop anomalous dimension at critical wrapping order in $\mathcal{N} = 4$ SYM*
F. Fiamberti, A. Santambrogio and C. Sieg
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34. *Wrapping at four loops in $\mathcal{N} = 4$ SYM theory*
F. Fiamberti, A. Santambrogio, C. Sieg and D. Zanon
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F. Fiamberti, A. Santambrogio and C. Sieg
e-print: arXiv:1006.3475

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M. Leoni, A. Mauri, J.A. Minahan, O. Ohlsson Sax, A. Santambrogio, C. Sieg and G. Tartaglino-Mazzucchelli
JHEP 1012 (2010) 074

37. *From Correlators to Wilson Loops in Chern-Simons Matter Theories*
M.S. Bianchi, M. Leoni, A. Mauri, S. Penati, C.A. Ratti and A. Santambrogio
JHEP 1106 (2011) 118

38. *Scattering Amplitudes/Wilson Loop Duality In ABJM Theory*
M.S. Bianchi, M. Leoni, A. Mauri, S. Penati and A. Santambrogio
JHEP 1201 (2012) 056

39. *Scattering in ABJ theories*
M.S. Bianchi, M. Leoni, A. Mauri, S. Penati and A. Santambrogio
JHEP 1112 (2011) 073

40. *Four-points two-loop scattering amplitude in ABJM theory*
M.S. Bianchi, M. Leoni, A. Mauri, S. Penati and A. Santambrogio
Fortsch. Phys. 60 (2012) 921-927

41. *One Loop Amplitudes In ABJM*
M.S. Bianchi, M. Leoni, A. Mauri, S. Penati and A. Santambrogio
JHEP 1207 (2012) 029

42. *ABJM amplitudes and WL at finite N*
M.S. Bianchi, M. Leoni, M. Leoni, A. Mauri, S. Penati and A. Santambrogio
JHEP 1309 (2013) 114

43. *The Leading Order Dressing Phase in ABJM Theory*
A. Mauri, A. Santambrogio and S. Scoleri
JHEP 1304 (2013) 146

44. *Four-point amplitudes in N=2 SCQCD*
M. Leoni, A. Mauri and A. Santambrogio
JHEP 1409 (2014) 017; JHEP 1502 (2015) 022

45. *On the amplitude/Wilson loop duality in N=2 SCQCD*
M. Leoni, A. Mauri and A. Santambrogio
Phys. Lett. B747 (2015) 325

CURRICULUM VITAE OF ANGELA BRACCO

Personal data

Angela Bracco
born 24-09-1955 in Lecco (Italy).
Present work address: Dipartimento di Fisica, Università di Milano, via Celoria,16, 20133 Milano, e-mail: Angela.Bracco@mi.infn.it

Education

Laurea (Master) in Physics (1979, Università degli Studi di Milano)
Ph.D. in Physics (1983, Canada, TRIUMF laboratory at UBC Vancouver and U.of. Manitoba)

Current accademic position

Full professor of Physics (Experimental Physics) at the University of Milano (since 2002).
Previously assistant (from 1983) and associate (from 1998) professor in Milano.

Teaching Activity

1983-1998 General Physics - Electromagnetism and optics for Physics students
1992-1994 "Experimental techniques in gamma spectroscopy" Course for Graduate School
2000-2001 General Physics - Electromagnetism and optics for Chemistry students
1994-present Laboratory of gamma spectroscopy for Physics students
2004-present Introductory Nuclear and Particle physics
2003-present Member of the board of Graduate School in Physics
2002-present Responsible of the second level degree with specialization in Nuclear Physics

Supervisor for undergraduate theses for the first level degree : 22 theses
Supervisor for undergraduate theses for the second level degree (Master): 33 theses
Supervisor for graduate theses (Ph.D): 13 theses

Member and chair of several committees for Ph. D graduation in Milano and in other Universities in Italy and abroad.

Research Topics

Most of the activity is in experimental Nuclear Physics, in particular nuclear structure studied with gamma spectroscopy. I was engaged in developments of detection systems for large arrays employed for gamma spectroscopy using heavy ion reactions (at energies from few MeV/A to 600 MeV/A). The research was conducted, in large fraction, at the LNL-INFN laboratory and in several laboratories in Europe, USA and Japan (see below the short description of the reaserach activity). I contributed in developments of analysis techniques to study the spectroscopy in the contininuum, in particular giant resonances for nuclear structure at finite temperature.

Experience in managing Research: Funding and personnel

In connection with my experience in managing research funding and personnel I had the chance to be in committees and panels dealing with several different activities: astrophysics, astroparticle, particle, nuclear and accelerator physics, new technical developments and applications.

- MIUR (Ministry of Research and University) representative member in the *Board of directors of INFN* (from August 2011-to August 2015)

- Chair of the Nuclear Physics Board of INFN (CSN3) from April 2005 to September 2011- This responsibility position implied extensive work to organize the funding of many different projects in Nuclear Physics in the Italian laboratories LNL, LNS (and partly in LNGS and LNF), at CERN, and at several foreigner laboratories such as GSI, GANIL, JLAB, and few others. The activity included also the preparation of road map and triennial plans, annual reports of the results and future planning to be presented to the international evaluation committee of INFN.

- Member of several selection committees for INFN and University personnel. In particular, I was chair of an INFN Committee for selection at national level for Advanced researchers (more than 200 participants) and chair of a committee for selection at national level of first level researchers of INFN. Member of several university committees for selection for positions of different levels at several Universities in Italy and in Europe (Leuvain and Darmstadt)

- Member of the governing board of the EU project NupNet (ERANET for Nuclear Physics in FP7) and responsible of one working package -from 2008-2011. I particular I worked in the preparation of calls for projects to be funded jointly by several funding agencies in Europe.
- Responsible of a PRIN MIUR project (competitive funding) on instrumentation for Radioactive beams (2013-2015)

Responsabilities and participation in Scientific boards

- ***Chair of NuPECC*** - the nuclear Physics expert committee of the European Science Foundation, from January 2012- . *(Among the activities made for NuPECC is the volume " Nuclear Physics for Medicine"; now we have started the process for "The long Range Plan in Nuclear Physics")*- Invited (in 2014-2015) to contribute in several meetings of ESFRI for the European Landscape for Physics.
- Member of WG9 (nuclear physics) of IUPAP.
- Member of the Executive Board of the European Physical Society (from 2014-).

Scientific committees of Laboratories and Institutes

- Chair of the International Program Advisory Committee of Nishina Center RIKEN (2017-)
- Chair of the International Scientific Committee of the project HE-ISOLDE at CERN (2011-)
- Chair of the International Scientific Council of the institute IRFU/CEA (France) (2013-) This council deals with all activities of the institute: astrophysics, astroparticle, particle, nuclear and accelerator physics, new technical developments and applications.
- Member of the Scientific Committee of French Institute IN2P3(CNRS Institute for Nuclear, Particle and astroparticle Physics)(2011- 2014) and member of the Scientific Committee of Nuclear Physics Institute at Orsay (IPNO) (2012-2016).
- Member of the Scientific Committee of the german Laboratory GSI (Darmstadt, Germany) (2009-2015) and of the Scientific Committee of the center of the Helmholtz Istititute at Mainz (Germany) for Nuclear Physics (2009-2015).
- Member of the Scientific Council of the ELI Facility (the part in Bucarest).
- Member of the Scientific Committee of Nishina Center at the research institute RIKEN (Tokyo, Japan) (from 2008-2012). Member of the Program Advisory Committee of the RIKEN Nishina Center (2015-2016).
- Member of the Scientific committee of the cyclotron laboratory at IFJ in Cracow.

Other Past responsabilities and participation in Scientific committees of Laboratories, Institutes and Funding agencies

- Member of the 'Working Group of OECD (Global Science Forum Organization for Economic Cooperation and development) on Nuclear Physics (2006-2007)
- Member of the Scientific Committee of the laboratory GANIL (France (from 2007-2010)
- Member of the Scientific Review International Committee of the INFN LNL and LNS laboratories (2004- March 2008)
- Member of the scientific Advisory Committee (SAC) of the Facility SPIRAL2 (in the ESFRI list) from 2003 to 2005.
- Member of the Program Advisory Committee of the Laboratory " National Accel.Center of Cape Town " (from 2000 to 2002) and Member of the Program Advisory Committee of the CNRS Laboratory IRES in Strasburg (from 1998 to 2002).

Evaluation activity in International Review Committees and EU review panels

- ***Member of several panels for the EU commission in different calls and framework programs.***
  Member of the ERC panel for evaluation and selection of physics projects with meetings in Bruxelles *(section PE* in ***HORIZON2020***) for the Starting grants (in 2014).
  Panel member (evaluation and selection) for calls within the ***FP6 and FP7*** *programs.* Evaluation panels in Bruxelles for proposals of the type "Integrated Activities" and "Design Studies" (2002, 2003 and 2004) and in 2005 for "Research and Training Networks , Marie Curie fellows".

- ***Member of the Physics Expert Panel*** (called GEV) of ***ANVUR*** for the evaluation of the Italian Research from 2011 up to May 2013. I was the coordinator of the sub-panel for nuclear, particle and astroparticle physics. Invited to be GEV member also for the second evaluation in 2015-2016.
- Responsible for the Nuclear and particle physics evaluation of several Greek institutes (February 2014), nominated by the Greek Ministry of Research.
- Member of the Review panel of the Helmholtz Programme "Physics of Hadrons and Nuclei" (GSI, February 2009)
- Member of the Review Panel of the Helmholtz Institute Mainz"Structure, Symmetry and Stability of Matter and Antimatter" (Mainz, April 2009)
- Member of an evaluation panel for the French activity P2I (Physique des deux infinis) held in April 2010.
- Member of the Evaluation panel for excellence Initiative for *"Graduate Schools"* for the German Research Foundation DFG (November 2011)
- Evaluation of proposals for the English "Engineering and Phys. Sciences Research Council ".

International Panels of Research Funding Agencies *(abroad)*

- Member of the expert panel for Nuclear and Particle physics of the Belgian Funding Agency FWO (from 2010-)
- Member of the expert panel of Academy of Finland Centre of Excellence Programme - Nuclear and Accelerator Based Physics (October 2010- September 2012)
- Member of the committee for MICINN (Spanish ministry of Science and Innovation) for " evaluación de proyectos de investigación 2011 del Plan Nacional" (Madrid May 2011).
- Member of the Nuclear Physics Grants Panel of the Science and Technology Facilities Council in the UK (October 2010-June 2011, 2013-2015, 2016-2018)

Research collaborations

- Member of the Steering Committee of the AGATA European collaboration for nuclear spectroscopy with gamma-rays (from 2009-...)
- Member of the Steering Committee of the RISING collaboration at GSI from 2002 to 2005 (gamma spectroscopy with radioactive beams at GSI).
- Member of the Steering Committee of EUROBALL (Large European Collaboration for gamma spectroscopy) (from 1996 to 1999)
- National responsible of INFN Nuclear Physics experiments (named HECTOR, PRIAMO, PARIDE from 1992-1998 dealing with the study of giant resonances) and responsible for Milano of the INFN experiments named EUROBALL and AGATA (1999-2005)
- Scientific Responsible of the project SPES (2001-2005). In 2005 I left the responsibility because in conflict with the chairship of the scientific committee of Nuclear Physics of INFN (CSN3).

Visitor Scientist at TRIUMF (1984); at Oak Ridge National Laboratory (in 1985 and in 1986); at the Niels Bohr Institute (Copenhagen) for several periods of 2 to 3 months from 1987 to 2005.

Relation with industry and technology transfer

During the time I was chair of the Nuclear Physics Board of INFN I had the chance to interact directly or indirectly with industries and companies involved in the construction of our detection systems.
In addition with my group in Milano we are developing detectors and related electronics (particularly scintillators) for nuclear spectroscopy in basic science and applications. In this context we have had for several years contacts and collaborations with companies and industries.
Recently, the company CAEN showed much interest in developing together with our group a commercial version of an electronics module for scintillators, whose main structure was designed at the Milano INFN section for our applications.
This resulted in *the funding by CAEN of a post-doctoral fellowship and in a technology transfer* agreement (with royalties for INFN) for the electronics module.

Publications and presentations at international conferences

- Co-author of 200 research papers on scientific journals (including 27 PRL+28 PLB, a Phys. Report and a Report in Progress Physics) plus approximately 160 papers on proceeding volumes (many in special volumes of scientific journals), (5772 citations and h factor 38).
  The number of coautors varies from 10 to around 50 which is typical for the field in which I carry out my research.
- Presentation of 72 invited talks at international workshops and conferences (2 summary talks, and two keynote talk at 4 large conferences, EMIS2012, ARIS2014 and NN2015 and Zakopane2016) plus 25 seminars given at Universities or Laboratories. One "relazione generale" at SIF.
- Author (with two other collegues) of a book "GiantResonances: Nuclear structure at finite temperature" belonging to the series "Contemporary Concepts in Physics"
- *Co-editor of European Physics Letters (EPS journal) (2015-) and Member of the editorial board* of the international scientific journal Nuclear Physics A (Elsevier) (2009-)
- Editor for 4 volumes of Conference Proceedings, one volume being lectures of the Enrico- Fermi School in Varenna of the Italian Physical Society.
- Referee of several papers in different scientific journals.
- Contributor to more general journals such as Nuclear Physics News, Asimmetrie of INFN, Notiziario Università di Milano. Member of scientific committee of Energy-Lab in Lombardia.

Activity for Conferences and workshops

- I have organized 6 international conferences including one Enrico Fermi School in 2010 (Varenna) I have also organized meetings for the EU-Eranet NuPNET project and several other collaboration meetings. Organization in Milano of the Simposium Italy-RIKEN in 2012.
- I was member of the International Advisory Committees of several (26) International Conferences.
- Chair of the Program Committee of the international Nuclear Physics Conference INPC2013 (this is the largest conference in the field, covering all topics of modern Nuclear Physics, some at the boundary with particle and astroparticle physics).
- Responsible in 2014 of the section on " Nuclear and Particle Physics" for the annual meeting of SIF (Società Italiana di Fisica).

Research Activity: topics and contributions

The research activity starting from 1985 is in experimental nuclear physics with focus in the field of Nuclear Structure and reaction dynamics. Before, and in particular during the PH.D work, research was made to study the nucleon force and the nucleon few-body problem with reactions induced by intermediate energy protons (at the laboratory TRIUMF, Vancouver Canada).
Most of the experimental work of my research activity was made employing heavy ions reactions and gamma spectroscopy. In this connection the research was and is being carried out as a member of several European collaborations around large detector arrays for gamma-ray spectroscopy. The most recent collaboration is AGATA, an array for gamma-ray spectroscopy based on a novel tracking technique. The first phase of the AGATA array, called demonstrator, was constructed and pilot experiments were carried out in LNL-INFN, GSI and GANIL. I am presently involved in experiments for the study of Giant Resonances in RIKEN and Osaka, Japan.
In the past years I was member of the international collaborations NORBALL and HECTOR (Niels Bohr Institute, Copenhagen) and GASP (LNL-INFN, Legnaro-Padova) and of the much larger European collaboration EUROBALL (operating during 1996-2002 at LNL-INFN and Strasbourg).
After 2002, using a large fraction of the EUROBALL equipment, two new experimental set ups were constructed, RISING(GSI) and PRISMA-CLARA (at LNL). The RISING collaboration has conducted very new studies of unstable nuclei with radioactive beams at the laboratory GSI (Darmstadt-Germany).
Personal contributions of some relevance were given in the experimental data taking and they concern the study of the properties of collective nuclear excitations at the extreme conditions of thermal excitation, angular momentum and isospin. Indeed a number of experiments dedicated to the study of the gamma decay of the giant dipole resonances were performed under the Milano responsibility.
Interesting results on nuclear structure at finite temperature were obtained using the above large arrays and including additional detectors for high energy gamma-rays, developed and constructed with my group in Milano.

Presently within the AGATA international collaboration, I am committed in the realization of new ancillary detectors to study nuclear degrees of freedom identified with high-energy gamma-ray emission. These studies are relevant to understand the response for high frequency small amplitude vibrations in the region around the nucleon binding energy. They are also important for the description of the nucleosynthesis of elements following explosions of super-novae.
Additional experimental work, still in the field of nuclear structure with gamma spectroscopy, was made during the years at ANL(Chicago,USA) with the array Gammasphere and GANIL(Caen, France) with the array EXOGAM.
With all these activities the group of Milano, that I have been coordinating for the last 25 years, has gained a well recognized expertise in the field of nuclear structure at finite temperature. The expertise is also in the development of experimental and analysis techniques necessary to study continuum spectra emitted from nuclear rotations and vibrations. The experimental activities planned for the future are in international collaborations and concern the investigation of collective modes in nuclei far from stability, which are mostly created using radioactive beams (from SPES_INFN, CERN-ISOLDE and GANIL-SPIRAL2).

The construction phases of the complex detector arrays, mentioned above, required relations and common developments with companies dealing with detectors, mechanics, electronics and computers.

In this research field she supervised the activity of 10 post-doctoral fellows. One fellowship was obtained from funding from industry (from CAEN)
A good fraction of the master and Ph.D supervised students, with research projects within the above collaboration, have now positions at the University of Milano, at INFN , in foreigner research institutions, and as managers in companies performing research.

Honorary membership

Member of Academia Europaea

Annexes

Short List of selected Publications (below).
The Full list of Publications can be asked as a separate file.

Selected publications of Angela Bracco (out of >200 co-authored in refereed journals)

1) *Isospin Mixing in Zr-80: From Finite to Zero Temperature,*Ceruti, S.; Camera, F.; Bracco, A.; et al.
PHYSICAL REVIEW LETTERS 115 (2015) 222502.

2) *Gamma decay of pygmy states from inelastic scattering of ions,* Bracco, A.; Crespi, F. C. L.; Lanza, E. G.
EPJA 51(2015)99.

3) *Pygmy dipole resonance in Sn-124 populated by inelastic scattering of O-17,* Pellegri, L.; Bracco, A.; Crespi, F. C. L.; et al.
PHYSICS LETTERS B (2014) Volume: 738 Pages: 519-523

4) Isospin Character of Low-Lying Pygmy Dipole States in Pb-208 via Inelastic Scattering of O-17 Ions, Crespi, F. C. L.; Bracco, A.; Nicolini, R.; et al.
PHYSICAL REVIEW LETTERS (2014)Volume: 113 Issue: 1 Article Number: 012501

5) Concluding remarks on the EMIS2012 conference, Bracco, Angela NIM 317 (2013) 317, 810.

6) Evidence for the Dipole Nature of the Low-Energy gamma Enhancement in Fe-56, Larsen, A. C.; Blasi, N.; Bracco, A.; et al.
PHYSICAL REVIEW LETTERS111(2013), 242504 .

7)*"The Pygmy Dipole Resonance in 68Ni and the neutron skin",* O. Wieland and A. Bracco, Progress in Particle and Nuclear Physics Vol. 66(2011)374

8) *"Constraints on the symmetry energy and neutron skins from pygmy resonances in ^{68}Ni and ^{132}Sn"* A.Carbone, G. Colo, A. Bracco, L. Cao, P. F. Bortignon, F. Camera and O. Wieland , Phys. Rev. C 81 (2010) 041301(R)

9) *"Probing the nature of particle-core couplings in 49Ca with γ spectroscopy and heavy-ion transfer reactions*", D.Montanari, S.Leoni, D.Mengoni, G.Benzoni, N.Blasi, G.Bocchi, P.F.Bortignon, A.Bracco, F.Camera, G.Colo, A.Corsi, F.C.L.Crespi, B.Million, R.Nicolini, O.Wieland, J.J.Valiente-Dobon, L.Corradi, G.de Angelis, F.Della Vedova, E.Fioretto, A.Gadea, D.R.Napoli, R.Orlandi, F.Recchia, E.Sahin, R.Silvestri, A.M.Stefanini, R.P.Singh, S.Szilner, D.Bazzacco, E.Farnea, R.Menegazzo, A.Gottardo, S.M.Lenzi, S.Lunardi, G.Montagnoli, F.Scarlassara, C.Ur, G.Lo Bianco, A.Zucchiatti, M.Kmiecik, A.Maj, W.Meczynski, A.Dewald, Th.Pissulla, G.Pollarolo, Phys.Lett. B 697, 288 (2011)

10) "*Search for the Pygmy Dipole Resonance in Ni-68 at 600 MeV/nucleon"* , Wieland, O; Bracco, A; Camera, F; Benzoni, G; Blasi, N; Brambilla, S; Crespi, FCL; Leoni, S; Million, B; Nicolini, R; Maj, A; Bednarczyk, P; Grebosz, J; Kmiecik, M; Meczynski, W; Styczen, J; Aumann, T; Banu, A; Beck, T; Becker, F; Caceres, L; Doornenbal, P; Emling, H; Gerl, J; Geissel, H; Gorska, M; Kavatsyuk, O; Kavatsyuk, M; Kojouharov, I; Kurz, N; Lozeva, R; Saito, N; Saito, T; Schaffner, H; Wollersheim, HJ; Jolie, J; Reiter, P; Warr, N; deAngelis, G; Gadea, A; Napoli, D; Lenzi, S; Lunardi, S; Balabanski, D; LoBianco, G; Petrache, C; Saltarelli, A; Castoldi, M; Zucchiatti, A; Walker, J; Burger, A, PHYS REV LETT(2009)51

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In seguito ha lavorato alla fisica dei raggi cosmici e alla fisica del neutrino con l'esperimento MACRO ai Laboratori del Gran Sasso.
Si è trasferito alla sezione INFN di Milano nel 1990, dove si è unito all'attività di ricerca e sviluppo in vista degli esperimenti LHC al CERN per poi contribuire alla realizzazione dell'esperimento ATLAS. Dal 2001 al 2006 ha anche partecipato all'esperimento ICARUS. Nell'ambito di queste attività ha iniziato anche a dedicarsi allo sviluppo delle simulazioni di Montecarlo e la loro applicazione alla ricerca spaziale e alla medicina. Dal 2006 lavora principalmente nell'applicazione della fisica delle particelle e del nucleo alla medicina, contribuendo alla ricerca in adroterapia. In particolare attualmente è coinvolto nello studio sperimentale di processi nucleari rilevanti per la terapia con particelle e nello sviluppo di tecniche per il monitoraggio in-vivo in adroterapia. A tal fine collabora con i centri di adroterapia di Pavia (CNAO) e Trento.
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