



World Congress on CBRNe Science
& Consequence Management



Università di Roma Tor Vergata

INTERNATIONAL CBRNe MASTER COURSES

Chemical, Biological, Radiological, Nuclear and explosive
Department of Industrial Engineering and School of Medicine and Surgery

Education and Training of CBRNe Experts and its Implication in Research Activities

Dr. Colomba Russo, MMSc

Administrative Coorninator

*International Master Courses in
«Protection Against CBRNe events»*

Project Manager for

*International Research Program in
CBRNe safety and security*

**Dept. Of Industrial Engineering
University of Rome «Tor Vergata»**

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+39 0672597201**

**CSCM 2014
Tbilisi (Georgia)**

www.mastercbrn.com

COLOMBA RUSSO, MMSc

05/06/2014



World Congress on CBRNe Science
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TOPICS

- 1. FLUORESCENCE MEASUREMENTS FOR THE IDENTIFICATION OF BIOLOGICAL AGENTS**
- 2. RESEARCH ACTIVITIES on CBRNe SAFETY and SECURITY**
- 3. INTERNATIONAL MASTER COURSES IN PROTECTION AGAINST CBRNe EVENTS**



1. FLUORESCENCE MEASUREMENTS FOR THE IDENTIFICATION OF BIOLOGICAL AGENTS

NEED

NEED IN BIOLOGICAL DETECTION: A FAST ANSWER TO REDUCE THE RISK



**SOLUTION INVESTIGATED FOR RAPID STAND OFF
BIOLOGICAL DETECTION: APPLICATION OF OPTICAL
TECHNIQUES (LIKE THE FLUORESCENCE
MEASUREMENTS)**



1. FLUORESCENCE MEASUREMENTS FOR THE IDENTIFICATION OF BIOLOGICAL AGENTS

Background

- The use of **biological weapons (BW)** represents a great concern from a military and civilian point of view;
- Currently, the pitched identification of biological agents used as weapons (**BWA**) is possible with just few **point-detection** strategies, while some **stand-off** methods are under research;
- The **UV-LIF** (Ultra Violet - Laser Induced Fluorescence) is a promising technique to allow **fast, stand-off detection** and **gross discrimination** between biological agents and background noise, taking advantage of the intrinsic fluorescence of biological molecules.



1. FLUORESCENCE MEASUREMENTS FOR THE IDENTIFICATION OF BIOLOGICAL AGENTS

Purpose of the work

→ In this work was studied the **absorption** and **emission** for different **BWA Simulants**, in **different boundary conditions**:

- Culture media,
- Concentration,
- Excitation wavelength.

→ Results from the preliminary study will allow us to identify the features to implement a **BWA spectra database** and, finally, to define an **algorithm for the stand-off detection** of BWA releases in the atmosphere.



1. FLUORESCENCE MEASUREMENTS FOR THE IDENTIFICATION OF BIOLOGICAL AGENTS

Materials and Methods

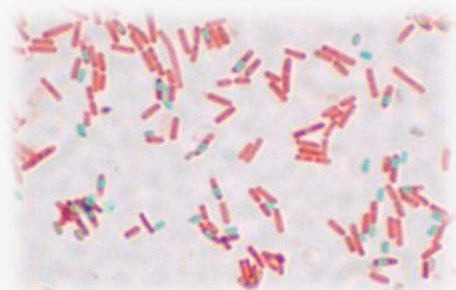
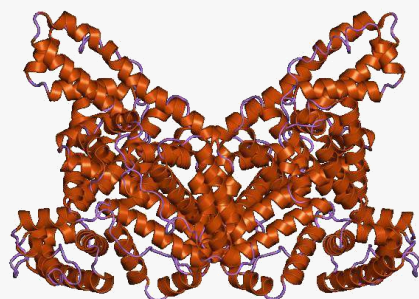
Wavelength source ➡ **Xenon UV Lamp (excitation λ : 266 nm; 355 nm)**

Acquisition system ➡ **and a detector to acquire the Fluorescence signals from the samples used (simulats of biological agents).**



1. FLUORESCENCE MEASUREMENTS FOR THE IDENTIFICATION OF BIOLOGICAL AGENTS

Materials and Methods



SAMPLES

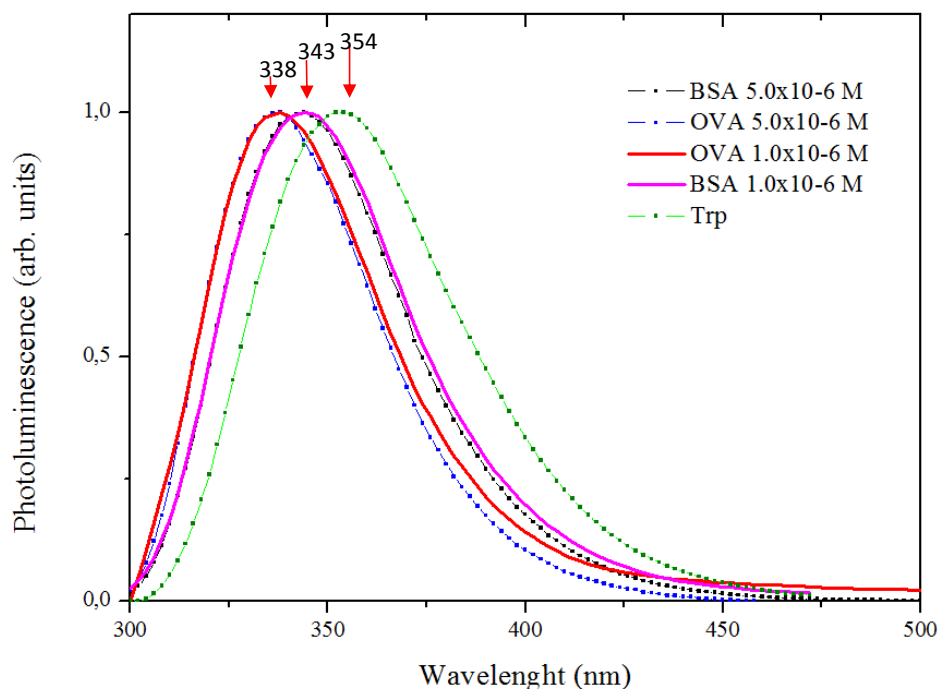
<u>PROTEINS</u>	Ovalbumin	OVA
	Bovine serum albumin	BSA
<u>BACTERIAL SPORES</u>	<i>Bacillus thuringensis</i>	BT
	<i>Bacillus globigii</i>	BG
<u>BACTERIAL VEGETATIVE CELLS</u>	<i>Escherichia coli</i>	coli
	<i>Bacillus subtilis</i>	subtilis



1. FLUORESCENCE MEASUREMENTS FOR THE IDENTIFICATION OF BIOLOGICAL AGENTS

Experimental results – Fluorescence emission spectra

Excitation wavelength: 266 nm



TOXIN SIMULANTS

Comparison between different
concentration of two biological simulants
(**OVA** and **BSA**) for toxins.

A **shift of the emission peak** is detectable, using
excitation wavelength = 266 nm, also with respect to the
emission peak of the aminoacid Tryptophan (Trp), the
main responsible for proteins intrinsic fluorescence.

Trp emission spectra is shown for
comparison.

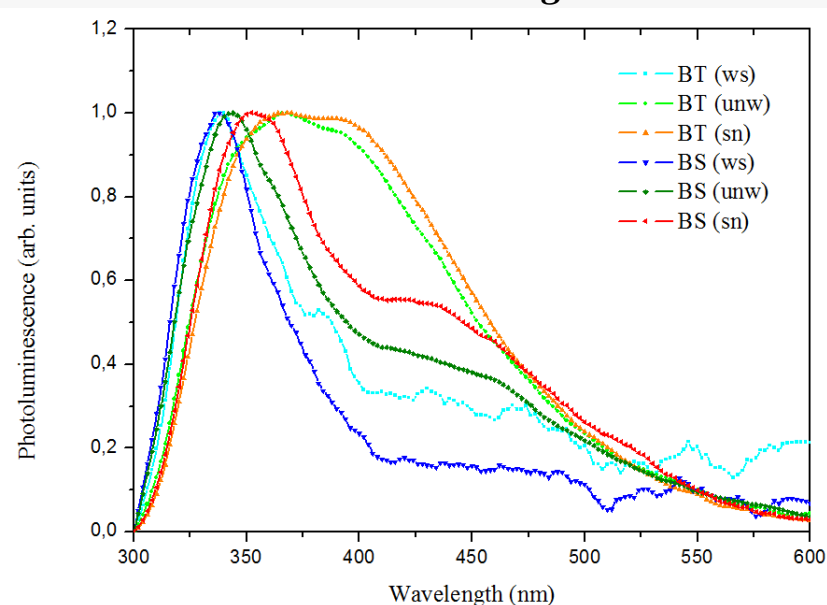
Normalized values



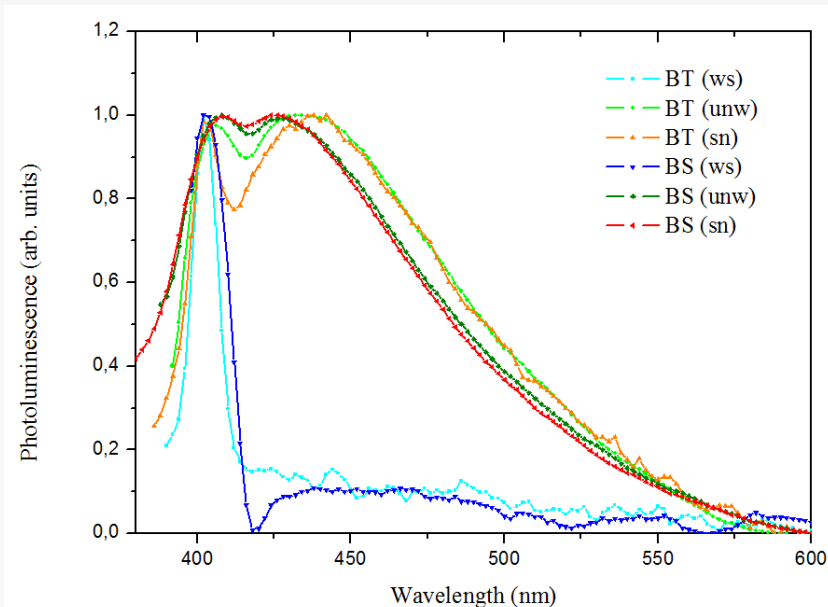
1. FLUORESCENCE MEASUREMENTS FOR THE IDENTIFICATION OF BIOLOGICAL AGENTS

Experimental results – Fluorescence emission spectra

Excitation wavelength: 266 nm



Excitation wavelength: 355 nm



Comparison between washed (**ws**), unwashed (**unw**) and supernatant (**sn**) samples of *Bacillus subtilis* (**BS**) and *Bacillus thuringiensis* (**BT**) **spore** preparations. Spectra were acquired for the two excitation wavelengths: **266 nm** (left graph) and **355 nm** (right graph).

BACTERIAL SPORE SIMULANTS

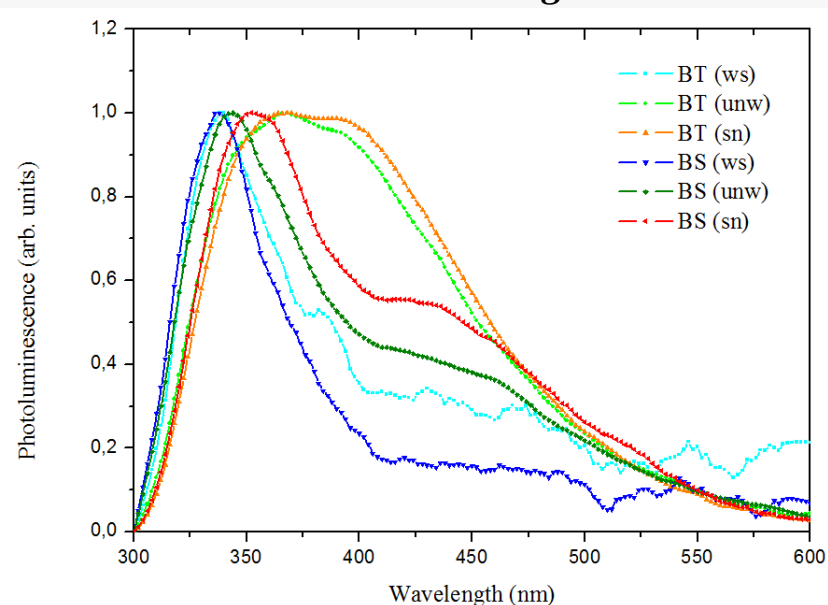
Normalized values



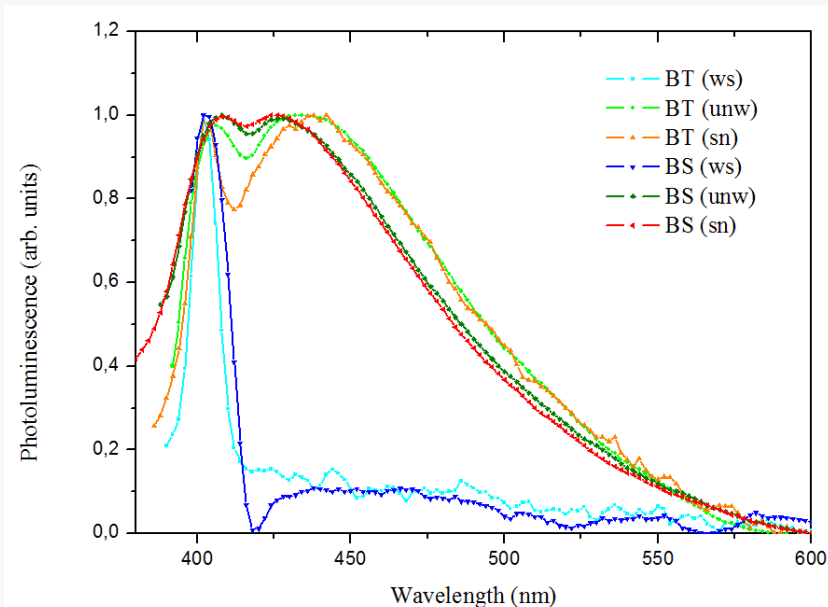
1. FLUORESCENCE MEASUREMENTS FOR THE IDENTIFICATION OF BIOLOGICAL AGENTS

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BACTERIAL SPORE

Normalized values



1. FLUORESCENCE MEASUREMENTS FOR THE IDENTIFICATION OF BIOLOGICAL AGENTS

CONCLUSION

→ In this first section was conducted a preliminary analysis to identify critical issues related to the **selection** of the biological simulants, showing that differences in the **spectral signature** may be the result of the **sample preparation method** and not of intrinsic structural and molecular differences.

→ For this reason, **further analysis should be conducted** in order to identify best practices to implement **spectral signature databases** and exploit the potential of **UV-LIF** and other optical techniques, as tools for the early stand-off warning and detection of BWAs.



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2. RESEARCH ACTIVITIES ON CBRNE SAFETY AND SECURITY

WE STRESS the PRESENTATION on BIOLOGICAL
DETECTION: because it is a BIOLOGICAL SESSION

BUT

WE HAVE MANY RESEARCH PROJECTS ON CBRNe SAFETY
AND SECURITY like:



2. RESEARCH ACTIVITIES ON CBRNE SAFETY AND SECURITY

LASER MONITORING

- SAI - LIDAR system (fire detection at long distance with low amount of smoke)
- TELEMACO (CWA (Chemical Warfare agents) analysis with laser in air at long distance)
- SNIFF – LIDAR & DIAL systems (environmental pollutants source and diffusion control)

MATERIAL SCIENCE

- Material characterization (SEM, XRD, X-ray and Optical Spectroscopy)
- New structure growth and possible applications (new detectors, specific material properties, etc...)



2. RESEARCH ACTIVITIES ON CBRNE SAFETY AND SECURITY

NUCLEAR FUSION – Magnetic Confinement

- Material studies (Fast particle production and radioprotection)
- Safety studies (Loss of Vacuum Accident) with STARDUST facility
- Develop of genetic code to process database to find connection and physics law (computational work) (USEFUL ALSO FOR CBRNe database)

NUCLEAR FUSION – Inertial Confinement

- Controlled nuclear explosions for energy production
- Material studies (Fast particle production and radioprotection)
- Development in diagnostic and detectors (operation in extreme regime)
- Hydrodynamic simulations



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2. RESEARCH ACTIVITIES ON CBRNE SAFETY AND SECURITY

AND

WE ARE ALSO INVOLVEND IN MANY RESEARCH
FINANCING PROGRAMMES like:



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2. RESEARCH ACTIVITIES ON CBRNE SAFETY AND SECURITY

UNIVERSITY TOR VERGATA (Dpt.Ind.Eng) and Italian Army
TELEMACO Project : A LIDAR/DIAL SYSTEM for CWA EARLY DETECTION



UNIVERSITY TOR VERGATA (Dpt.Ind.Eng) , SCUOLA SUPERIORE S.ANNA and ITALIAN FIRE BRIGADES
CBRN – Integrated Response Italy (<http://cbrn.netseven.it/>)



UNIVERSITY TOR VERGATA (Dpt.Ind.Eng) , CNR and VITROCISSET
SNIFF – A LIDAR/DIAL SYSTEM for TIC and TIM Detection



FIRE BRIGADES & COMPANIES
SOFTWARE REALIZATION FOR EARLY HOT SPOT ZONE IDENTIFICATION AND MAPPING in CASE OF RADIOLOGICAL DIFFUSION

COMPANIES & MINISTRY of INTERIOR, MINISTRY of DEFENCE & MINISTRY OF HEALTH
HARDWARE AND SOFTWARE DEVELOPMENT AND/OR IMPROVE TO FACE CBRNe EMERGENCIES

ACADEMIA & MILITARY ENTITIES & PUBLIC ENTITIES & COMPANIES
SCIENTIFIC PUBLICATION, PATENTS, PROPOSALS FOR NEW REQUEST FOUNING (AS H2020)



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3. INTERNATIONAL MASTER COURSES IN PROTECTION AGAINST CBRNE EVENTS

IT IS POSSIBLE THANKS TO



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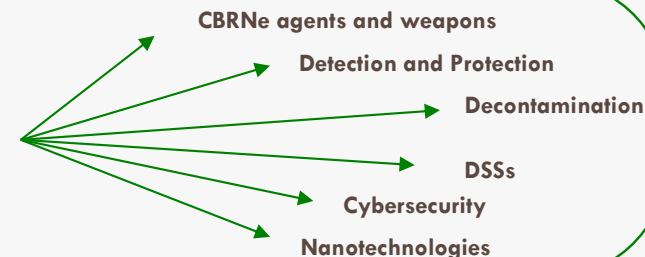


3. INTERNATIONAL MASTER COURSES IN PROTECTION AGAINST CBRNE EVENTS

1) IT IS IMPORTANT TO HAVE EXPERTS THAT LOOK AT...



Products and New Technologies



2) .. AND ALSO EXPERTS THAT LOOK AT...

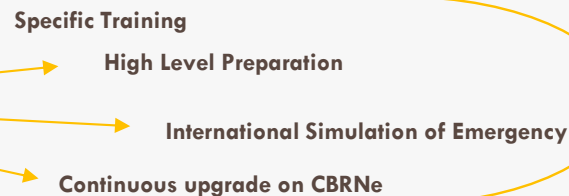
3) ..AND EXPERTS THAT ARE ABLE TO FACE THE..



Old Risk
and
New Risks



First Response





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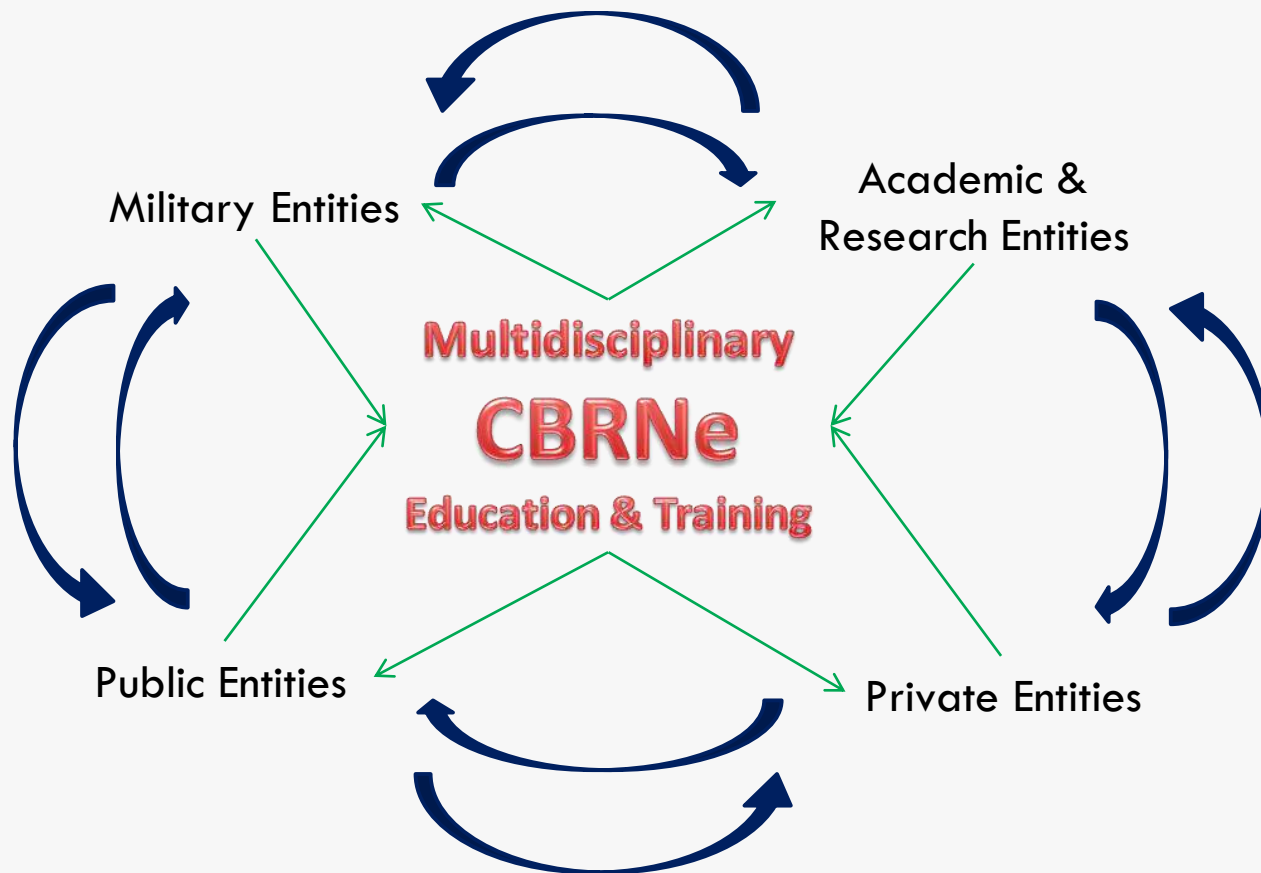
3. INTERNATIONAL MASTER COURSES IN PROTECTION AGAINST CBRNE EVENTS

HOW CAN WE FACE THESE NEEDS?



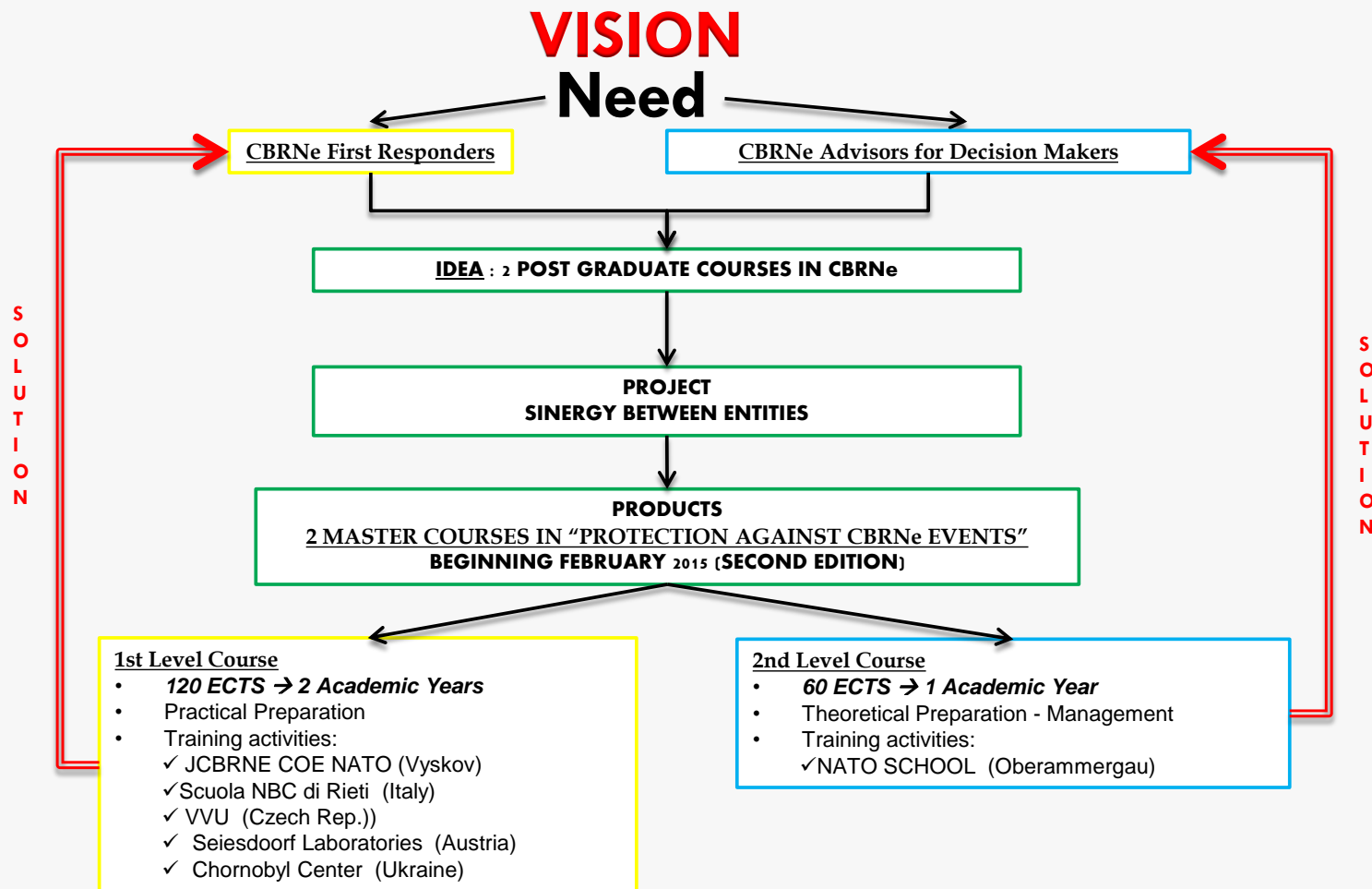
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MISSION





3. INTERNATIONAL MASTER COURSES IN PROTECTION AGAINST CBRNE EVENTS





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To prepare highly specialized **FIRST RESPONDERS** &
CBRNe ADVISORS for Decision Makers

**Faculty
of
MEDICINE
and
SURGERY**



**Department
of
INDUSTRIAL
ENGINEERING**



3. INTERNATIONAL MASTER COURSES IN PROTECTION AGAINST CBRNE EVENTS

The Courses are organised in cooperation with the following International Entities,
that have signed formal Agreements with the University

Italian Public Entities

- Prime Minister's Office

- Ministry of Defence:

- ✓ Italian Army
- ✓ Italian Navy
- ✓ Italian Air Force
- ✓ Carabinieri

- Ministry of Interior:

- ✓ Fire Brigades
- ✓ Police

- ENEA

- INGV

- ISS

- COPIT

- CRATI

- MARIS

- SCIRE

International Entities:

- OPCW
- JCBRNe COE NATO (Czech Republic)
- NATO SCHOOL of Oberammergau (DE)
- HotZone Solutions (Holland)
- VVU-026 Sternberk (Czech Republic)
- Seibersdorf Labor GmbH (Austria)
- Chornobyl Centre (Ukraine)

Sponsors & Partners

- | | |
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| <input type="checkbox"/> SELEX SE | <input type="checkbox"/> NBC SYSTEM SRL |
| <input type="checkbox"/> THALES GROUP | <input type="checkbox"/> BMA SRL |
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| <input type="checkbox"/> INTERGRAPH LLC | <input type="checkbox"/> PETROLTECNICA SRL |
| <input type="checkbox"/> CRISTANINI SPA | <input type="checkbox"/> OTOMELARA |
| <input type="checkbox"/> AEROSEKUR SPA | <input type="checkbox"/> DRAEGER |
| <input type="checkbox"/> BMD SPA | <input type="checkbox"/> PRINCIPIUM SRL |
| <input type="checkbox"/> PAX LUDENS | <input type="checkbox"/> SERVIZI PI |
| | <input type="checkbox"/> RA.SE.T SRL |
| | <input type="checkbox"/> DPI SEKUR |



3. INTERNATIONAL MASTER COURSES IN PROTECTION AGAINST CBRNE EVENTS

Both Master Courses have been granted the **NATO SELECTED** status by the **NATO HQ SACT** (Supreme Allied Commander Transformation – Norfolk, Virginia, USA).

The Tor Vergata University has signed a **Cooperation Agreement** with the **OPCW** (Organization for the prohibition of Chemical Weapons), which will support the **Master Courses**.

As it is stated in the **OPCW Press Release**,

“It is the first such agreement the OPCW has made with a university in this field”

(https://www.opcw.org/index.php?id=242&tx_ttnews%5Btt_news%5D=1719&cHash=a51e455b9203696a4d17771ae5282b11)



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**MORE THAN 80 STUDENTS
OF THE
FIRST 4 ITALIAN EDITIONS
OF THE COURSES
(2009-2013)**

95% WITH A JOB TODAY!

TODAY

ISCRPTION FOR 2014 CLOSED 31 January 2014

1st Level Course

- **120 ECTS → 2 Academic Years**
- Practical Preparation
- Training activities:
 - ✓ Scuola NBC di Rieti (Italy)
 - ✓ VVU (Czech Rep.)
 - ✓ Seiesdoorf Laboratories (Austria)
 - ✓ Chornobyl Center (Ukraine)

12 students

2nd Level Course

- **60 ECTS → 1 Academic Year**
- Theoretical Preparation - Management
- Training activities:
 - ✓ JCBRNE COE NATO (Vyskov)
 - ✓ NATO SCHOOL (Oberammergau)

25 students

**Enrollments from
EUROPE-ASIA-AFRICA**

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II LEVEL MASTER COURSE IN PROTECTION AGAINST CBRNe EVENTS. 2013-2014 (60 ECTS)

MODULE 0 - CBRNe International Safety and Security Policy (24-28 March 2014) - Rome (Italy)

MODULE 1 - CBRNe Agents - (21-25 April 2014) Rome (Italy)

MODULE 2 - CBRNe Protection and Decontamination - (26-30 May 2014) Rome (Italy)

MODULE 3 - DSS for ADVISORS - (21-25 July 2014) Rome (Italy)

MODULE 4 - NATO SCHOOL (23-27 June 2014)- Germany - OBBERAMMERGAU

MODULE 5 - DIFFERENT WAY TO MANAGE A CBRNE events in DIFFERENT CONTINENTS - (22-26 September 2014) Rome (Italy)

MODULE 6 - MEDICAL MANAGMENT OF A CBRNe MAXI-EMERGENCY - (20-24 October 2014)-Rome (Italy)

MODULE 7 - INVESTIGATION AND INFORMATION IN CASE OF CBRNe EVENTS (15-19 December 2014) Rome (Italy)

MODULE COMPANIES (17-21 November 2014)- Rome (Italy)

REMEDIAL SESSION - 13-16 January 2014 Rome (Italy)

STAGE - (September to December 2014)

FINAL ACTIVITY - The final thesis will be finished before the 30th of January, the students together with the final thesis delivery will have a 2-3 days Table Top Exercise that together with the thesis and the marks of the exams will give a final evaluation for each of them

It is possible to attend
SINGLE MODULES
and achieve ECTS
of single modules

Official Course
Language
ENGLISH



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I LEVEL MASTER COURSE IN PROTECTION AGAINST CBRNe EVENTS. 2013-2015 (120 ECTS)

MODULE 0 - INTRODUCTION TO CBRNE RISKS-THE POINT OF VIEW OF A FIRST RESPONDER (17-21 March 2014) - Rome (Italy)

MODULE 1 - BIOLOGICAL EVENTS (14-18 April 2014)- Rome (Italy)

MODULE 2 - RADIOLOGICAL-NUCLEAR EVENTS (19-23 May 2014)- Rome (Italy)

MODULE 4 - NBC SCHOOL OF RIETI (16-20 June 2014)- Rieti (Italy)

MODULE 3 - CHEMICAL EVENTS and eXPLOSIVE EVENTS (14-18 July 2014)- Rome (Italy)

MODULE 5 - JCBRNE COE - (15-19 September 2014) Vyskov (Czech Republic)

MODULE 6 - VVU + SEIBERSDORF - (13-17 October 2014) Vyskov (Czech Republic) + Vienna (Austria)

MODULE COMPANIES - (17-21 November 2014) Rome (Italy)

MODULE 9 - MEDICAL FIRST AID AND EMERGENCY PLANNING - (19-23 January 2015) Rome (Italy)

MODULE 10 - SOFTWARE AND DSS - (16-20 February 2015)-Rome (Italy)

MODULE 11 - INVESTIGATION and COMUNICATION (16-20 March 2015) Rome (Italy)

MODULE 8 - CHORNOBYL CENTRE - (13-19 April 2015) Chernobyl (Ukraine)

REMEDIAL SESSION (11-15 May 2015)- Rome (Italy)

STAGE - (May - November 2015)

FINAL THESIS - (December 2015)

It is possible to attend
SINGLE MODULES
and achieve ECTS
of single modules

Official Course
Language
ENGLISH



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Requirements: Bachelor Degree or Equivalent title in Engineering, Science, Medicine, Biology, Chemistry, Physics, Law, Politic Science, Strategic Science, Journalism or similar (contact: info@mastercbrn.it)

1st Level Course

120 ECTS – 2 YEARS

(European Credit Transfer System)

OFFICIAL ACADEMIC TITLE
RECOGNIZED BY
“BOLOGNA PROCESS”

ALLOWED ACCES to 2nd Level
Course

Requirements: Master Degree or Equivalent title in Engineering, Science, Medicine, Biology, Chemistry, Physics, Law, Politic Science, Strategic Science, Journalism or similar (contact: info@mastercbrn.it)

2nd Level Course

60 ECTS – 1 YEAR

(European Credit Transfer System)

OFFICIAL ACADEMIC TITLE
RECOGNIZED BY
“BOLOGNA PROCESS”

ALLOWED ACCES to PhD
Programs in Safety & Security



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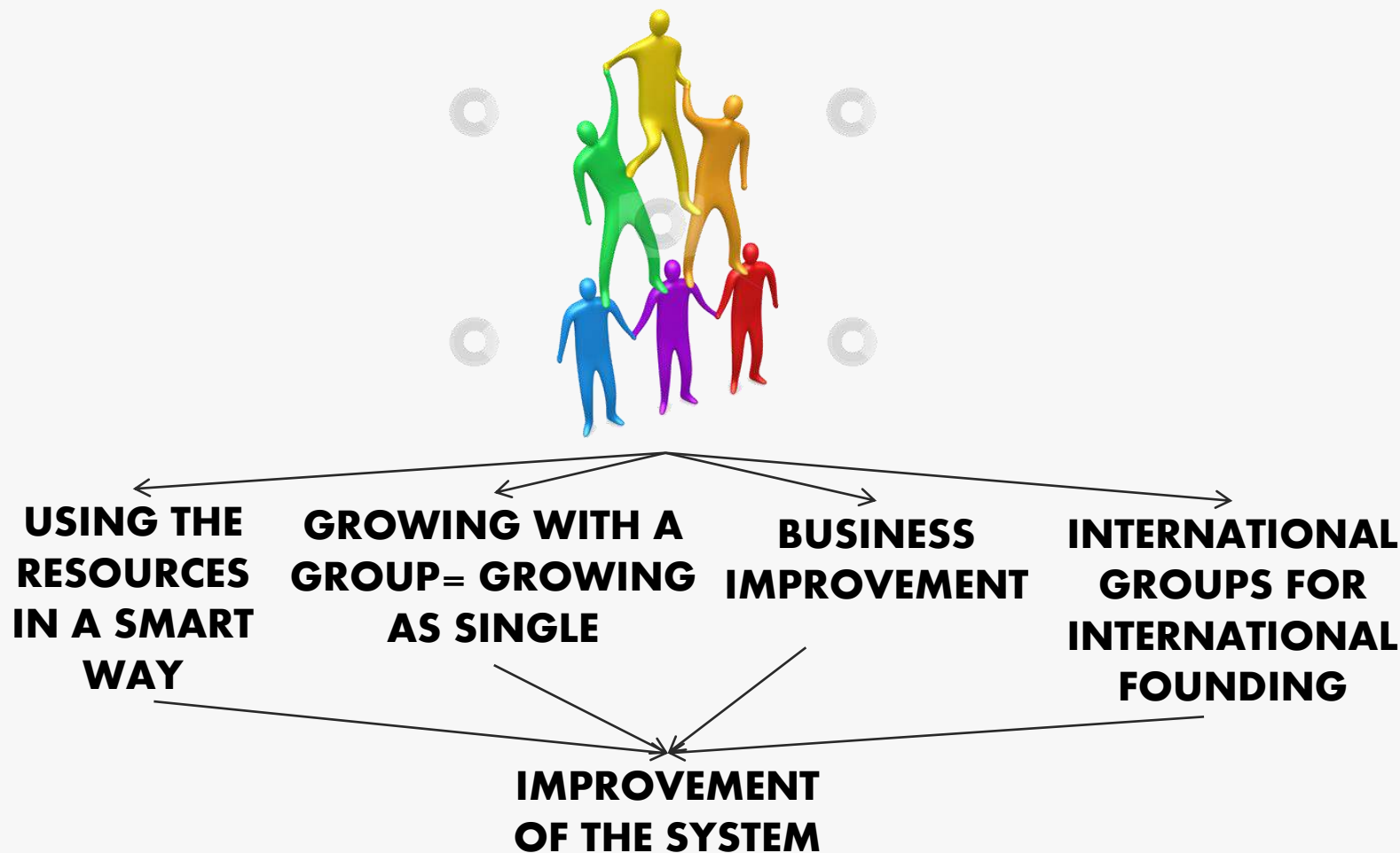


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TODAY

we are looking for new collaboration to improve

**TRAINING
ACTIVITIES**

**IMPROVE THE
NETWORK**

**IMPROVE ENROLLMENTS
&
MEDIA ACTIVITIES**



**IMPROVE
DIDACTICAL
BOARD**

(Today from:
EUROPE, AMERICA, ASIA, AFRICA)



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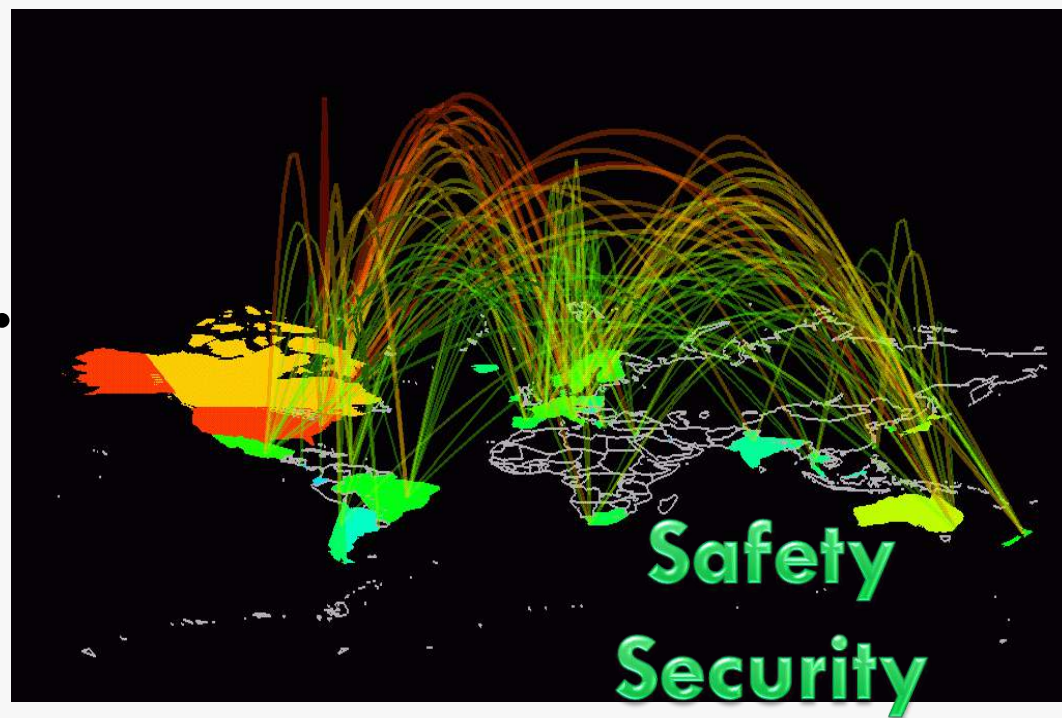
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TOMORROW.....

This is our **Dream...**
This is **ONE** of our...
HORIZONs..
for **2020...**





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**DO YOU KNOW THE
REAL SECRET OF
OUR SUCCESS
??????????**



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YOU!!!!!!!



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감사합니다 Natick
Danke Ευχαριστίες Dalu
Grazie Thank You Köszönöm
Спасибо Dank Gracias
谢谢 Merci Seé
ありがとう oborigado



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Master Staff

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HEAD OF DEP. OF INDUSTRIAL ENGINEERING: **PROF. MARCO GAMBINI**

DIRECTOR : **PROF. LEONARDO PALOMBI**

COORDINATOR : **DR. PASQUALE GAUDIO**

PRESIDENT OF SCIENTIFIC BOARD : **PROF. CARLO BELLECCI**

Coordination of Didactical Activities : **Dr. Andrea Malizia, Dr. Fabrizio D'Amico, Dr. Dieter Rothbacher**

Communications with attendees: **Dr. Mariachiara Carestia, Dr. Daniele Di Giovanni**

Support to didactic activities: **Dr. Orlando Cenciarelli**

Project Manager: **Dr. Colomba Russo**

Administration : **Dr. Patrizia Vannicelli, Daniela Pinto, Anna Mezzanotte, Germana Paolucci**

Web Master : **Carlo Perrimezzi**

Quantum Electronics and Plasma Physics Research Group

PROFESSOR AND SENIOR RESEARCHER : **P. Gaudio, R. Pizzoferrato, A. Malizia, M. Gelfusa, M. Richetta**

PhD students: **Emmanuele Peluso, Francesco Barbato, Mariachiara Carestia, Daniele Di Giovanni, Stefano Parracino, Maria Del Vecchio, Fabrizio D'Amico, Orlando Cenciarelli, Alessandro Sassolini, Fabiana Conetta.**



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