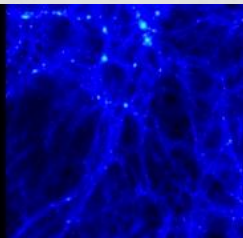


# REPORT ON MD SUMMER STUDENTS AT IFIC\_EXP

J.D. ZORNOZA  
ALCALÁ DE HENARES, NOVEMBER 6<sup>TH</sup> 2013

**MultiDark**

Multimessenger Approach  
for Dark Matter Detection



**IFIC**  
INSTITUT DE FÍSICA  
CORPUSCULAR

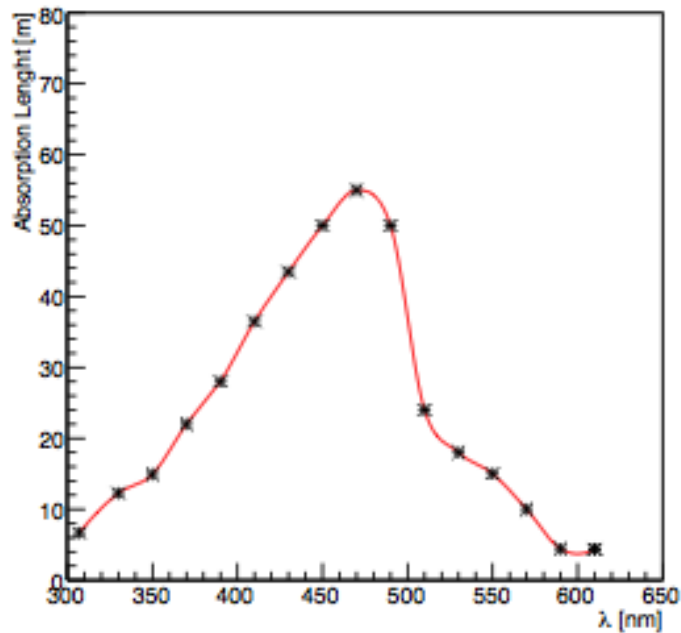
# MD STUDENTS AT IFIC\_EXP

- Ibles Olcina (July)
- Brais Palmeiro (July)
- Pedro Mediano (September)

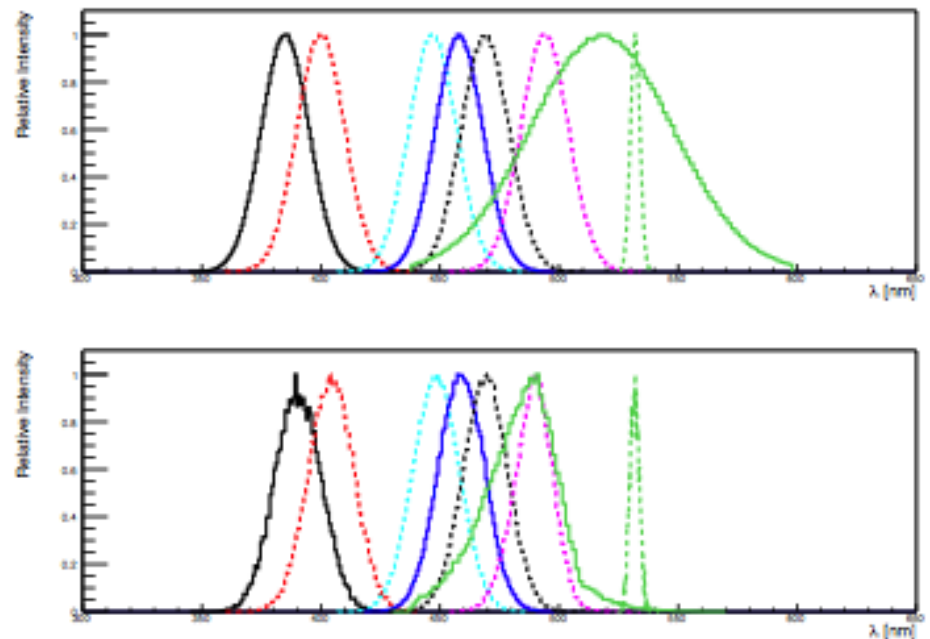
# IBLES OLCINA & BRAIS PALMEIRO

- Bibliography about neutrino astronomy, ANTARES and dark matter
- Some lessons by us about these topics, with discussions
- Introduction to ROOT with some problems (first, generic ones about statistics; later specific for ANTARES topics – LED beacons)
- Tests at laboratory on LED beacons
- Attendance to group meetings
- Attendance to detector shifts
- Talk reviewing the status of the DM field
- Report on the stage

# EXAMPLES



(a)

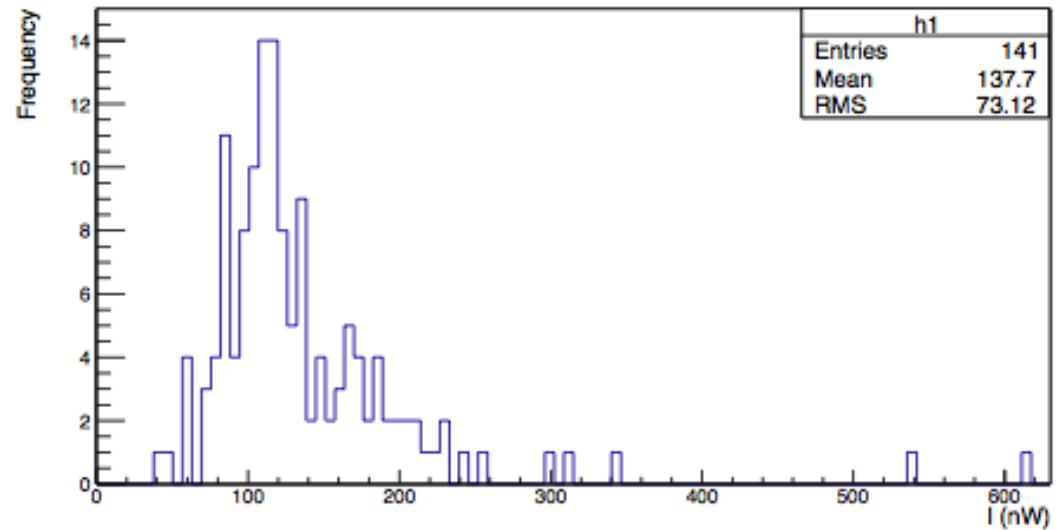
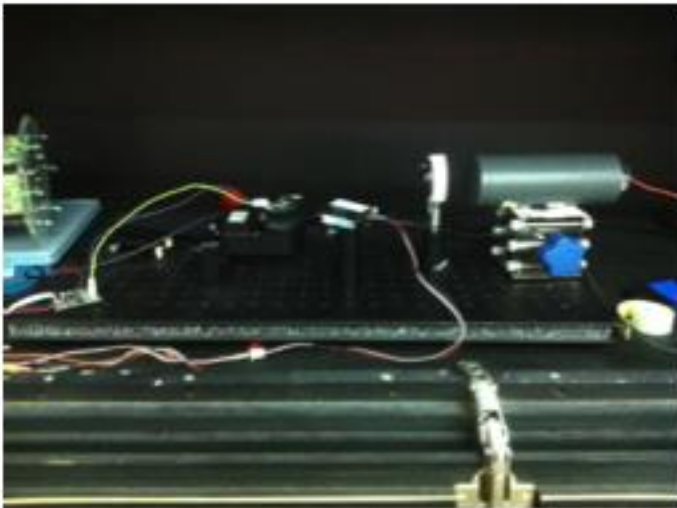


(b)

**Figure 9:** (a) Real data of the absorption length spectra in sea water. (b) On top, we can see the wavelength spectra of the light sources with the highest value set equal to one. In the bottom, for each curve I take one measure, calculate its Absorption Length by interpolation and then I calculate the distance that the photon with such wavelength is supposed to travel. If such distance is lower than 120 m that measure won't be in this second histogram. As a result we can observe how the wavelength spectra of the extremes have been modified appreciably while those in the middle remain almost equal.

# EXAMPLES

Measurements carried out in the laboratory on the light intensities of several LED units



**Figure 10:** Histogram of the intensities of all the LEDs measured.

# PEDRO MEDIANO

- Bibliography about neutrino astronomy, ANTARES and dark matter
- Some “lessons” by us about these topics, with discussions
- Introduction to ROOT with some problems (first, generic ones about statistics; later specific for ANTARES topics –LED beacons)
- Scanning of allowed DM models with DarkSUSY
- Attendance to group meetings
- Report on the stage (on going)

# EXAMPLES

Using Guillaume's software and under the supervision of C. Tönnis, several models of SUSY were scanned with DarkSUSY, to be compared with ANTARES limits

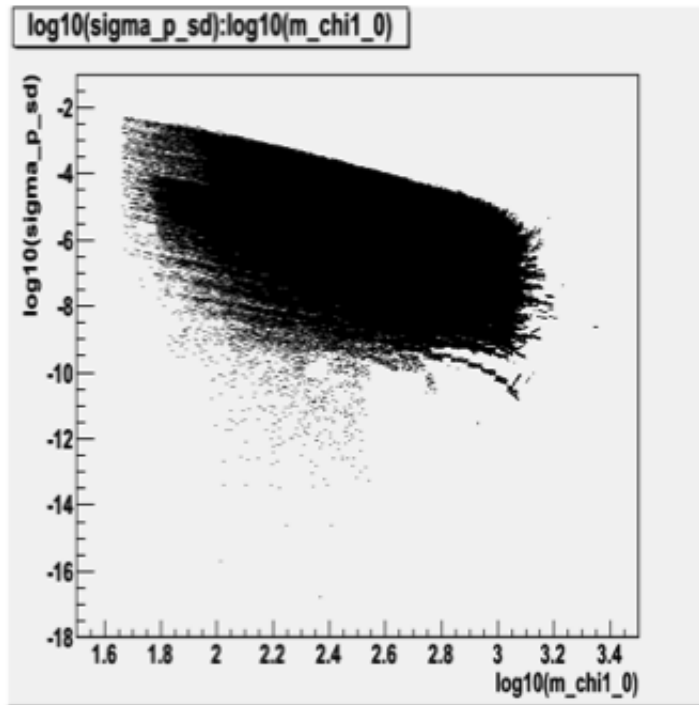


Figure : Output for MSSM7

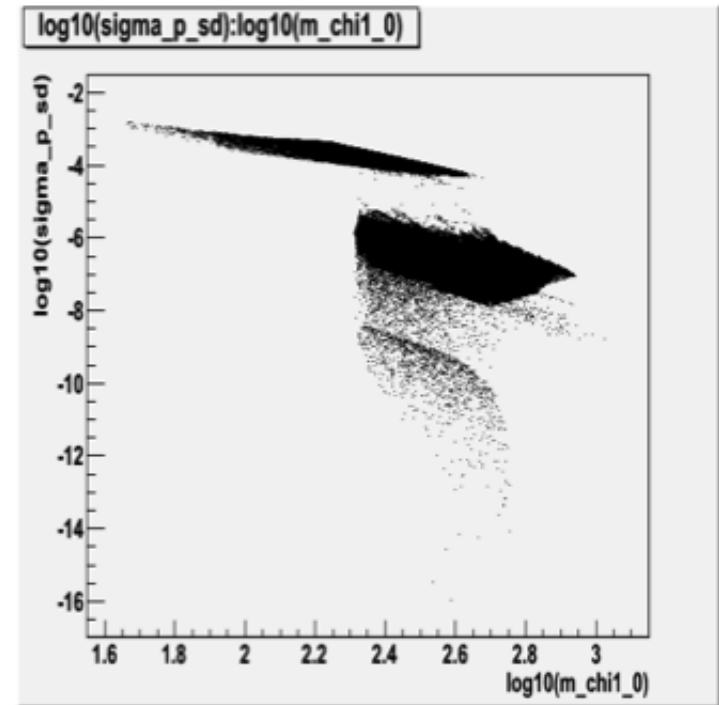


Figure : Output for mSUGRA

# OUR EXPERIENCE

- Too short to really “gain” too much FROM the students, but this is not the goal of these stages
- If in the future we “recover” any of them for a thesis, it will be a clear net gain
- For the students, our feeling is that it was a quite profitable experience
- We have adapted the assigned tasks to the background and preferences of the students
- Their opinion after the stage is quite favorable

Nevertheless, I am very grateful of what I have learnt and the people I have met. I would strongly recommend the experimental group of the IFIC to future students.

Pese a esto, y reiterando lo ya dicho, mi opinión no podría ser más que positiva, y repetiría y recomendaría encarecidamente la experiencia.



# FEEDBACK

- Room for improvement, according to the students:
  - Stage a bit too short. The feeling is that they had to leave just when they were felt more able to help
  - Notification too late: a lot of things to organize in a short time

La nota negativa de la estancia es la duración, ya que al ser un mes, no da tiempo a profundizar en serio en el trabajo del grupo, y todo se ha tenido que hacer por encima, intentando hacer lo máximo posible en la mayor amplitud de campos posible.

Si he de poner otra pega, sería lo tardío de la resolución, ya que esta se produjo el 12 de junio y el 14 se me comunicó la fecha de inicio (el 1 de julio), teniendo que arreglar todo el papeleo, arreglar todos los asuntos en mi universidad de origen y buscar residencia en quince días.

For possible future programs, I would suggest extending the period of the grant. I say that because it wasn't until the end of the month that I started to feel more confident and all the information that had given to me started to make sense in my head. So, if I had had more time I suppose that I could have begun bigger projects.