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# Illicit Drug Analysis by Using Ultra-short Pulses (THz spectroscopy)

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January 26, 2012

## Final Report - Provost's Grants for the Thinkfinity Initiative

- **Title of the Project:**  
Illicit Drug Analysis by Using Ultra-short Pulses (THz spectroscopy)
- **Cornerstone #**  
#3 Interdisciplinary Informatics
- **Principal investigators names along with their School/College:**  
DR. CANAN KARAALIOGLU, DYSON COLLEGE OF ARTS AND SCIENCES, DEPT OF CHEMISTRY AND PHYSICAL SCIENCES
- **Date:**  
The original proposal was submitted on October 4, 2010

To whom it may concern:

My proposed project was conditionally approved on November 2, 2010. I received a letter from the CTLT on the first week of November to clarify certain parts in my proposal. Upon receiving this letter, I submitted a further clarification letter and signed the agreement letter as well on January 27, 2011. The equipment I requested in the grant proposal was a custom made design. It took 5 months for the company to prepare them and all shipped on May 19, 2011. Moreover, in order to perform my experiments, I needed a specially designed table (which was custom made as well) and a laboratory environment to put the table in. My department had given me the room to build my own laboratory, originally assigned as my office space. However, the room itself needed some construction in order to fit this optical table inside and keep the room accident-free, dust free as much as possible. Just to give you an idea about this specific table, it is 5 by 10 ft, has a special construction to perform the experiments as vibration free (otherwise, people moving around would disturb the experiments) and pressurized legs to keep the table leveled at all times (not to interrupt the propagation of the laser beam). Not to mention, it also weighs almost 1500 pounds. I had to wait for an approval from Buildings and Grounds for such construction and had some budgeting issues. Finally, all was approved, but Buildings and Ground wanted to do job during the summer when there were fewer people around and when they were not as busy as usual. Since I was waiting for my equipment, I agreed on waiting until summer. Finally, the room was ready on July 5, 2011. The table was delivered and assembled on July 11, 2011. Finally, I had somebody from Newport on July 25, 2011 to finish the installation of the table in order to adjust the legs. So it was almost August when I opened the boxes received with the Thinkfinity Grant.

**A) Original goals:**

- to build up a THz-TD spectroscopy lab to analyze illicit drugs
- to have collaborations with Stuyvesant High School in the near future and with John Jay College, CUNY later.

**B) What progress have you made towards your original goals on your project to date?**

- The equipment I received with the help of this grant was certainly a great help for me towards my aim of completing the necessary equipment to be able to perform my experiments. But the process of completing/finding/purchasing of the lab equipment is still an ongoing one.
- Collaboration with Stuyvesant High School was a possibility. After they saw the lab, it became a fact and they agreed on working other grant proposals together.

**C) What activities have been completed to contribute to meeting/progressing toward these goals?**

I had a meeting with two people from Stuyvesant High School, who are the Assistant Principle of Supervision for Chemistry and Physics and a physics teacher (who has a PhD in physics as well to be able to teach at Stuyvesant High School, so he too might be involved in the research project). They wanted to see the laboratory I am developing here Pace University. They were satisfied with the progress so far, agreed on sending 2 students per year to work with me as soon as I start running my experiments.

**D) What activities have not been completed? Please indicate why they have not been completed.**

I still could not start running my experiments because of the reasons I explained in the introduction part. Moreover, I need to get more funding to get other lab equipment I need in order to be able to perform my experiments.

**E) Please outline the outcomes you have received as a result.**

It helped me to collaborate with another group from Italy (National Institute for Applied Optics). I contacted them, explained what I have in my lab, what I plan to have and what my research projects are. They were very much interested in my project. Indeed, they are starting a similar research project over there in Italy and I'll do numerical simulations with them until my lab is ready for actual experiments, and then we will start exchanging data and students.

**F) Did you create a Class? If so, is the class running?**

This was never a goal.

**G) Has your project impacted students? If so, how many?**

Not yet, but it certainly will once the lab start working effectively, 2-4 from Pace University (some graduate for their thesis in Forensics Program, some undergraduate level to get a research credit) and 2 from Stuyvesant High School (to get their early college credits), and possibly 1 from Italy as an exchange student.

**H) Has your project impacted other faculty members? If so, how many?**

No, but not intended either in the short term.

**I) Were there any unintended outcomes achieved?**

Yes, indeed. It helped me to collaborate with another group from Italy (National Institute for Applied Optics). I contacted them, explained what I have in my lab, what I plan to have and what my plans are. They were interested in my project. Indeed, they are starting a similar research project over there in Italy and I'll do numerical simulations with them until the lab is ready for actual experiments, and then we will start exchanging data and students.

**J) Did you present at a conference?**

- **If so, which conference?**

No.

**K) Do your outcomes reflect the change or benefit you were hoping to receive?**

I do not have an outcome as of now as an experimental result, but having this specific piece of equipment was crucial for the quality of the data and indeed, it still so, so I will benefit it at least for the next decade.

**L) How has your project furthered the Thinkfinity Cornerstone you selected?**

Not yet, but it will once I start performing my experiments. This analysis will be a combination of physics, forensic science, and chemistry. Not just the analysis, but the set-up itself can be used as interdisciplinary. Instead of using drugs as our samples, when DNA samples are used, the same set-up would be utilized by both physic and biology people.

**M) Describe your future plans for sustaining the program or project.**

As I described previously, my project is an on-going project, so there is no limited time to complete it. In order to progress, I have been seeking for more funding opportunities. I will apply for another Thinkfinity Grant when the next term is available as well as other available grant opportunities to complete the rest of the equipment I need for my experiments.

Without any doubt, when I finally have my data ready to be published, this grant will be acknowledged as well as the other fundings that I will be granted. In the long term, the ultimate aim of my research is to design a patented device to be used at the post offices and/or at security points to detect drugs.

Sincerely,  
Canan Karaalioglu

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