Report on the Medical Physics Degrees

Faculty Affairs Committee
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1. Introduction
This report discusses the new *TTU Professional PhD program* in Medical Physics (MP) originally proposed by Lynn Hatfield. We have studied the documentation on file at the Physics department, the American Board of Radiology (ABR) exam requirements from the ABR website, and the list of accredited MP graduate programs provided by the Commission on Accreditation of MP Educational Programs (CAMPEP) from the CAMPEP website. A summary of all that information can be downloaded in a single file (MP.pdf) and a single webpage.

http://www.phys.ttu.edu/~kcheng/MP.pdf
http://www.phys.ttu.edu/~kcheng/summary.htm

The background information is as follows.

The ‘end product’ of the proposed *TTU Professional PhD program* is an ABR certified medical physicist. Note that the minimum graduate degree requirement for getting ABR board certified in MP is a MS degree in medical physics or relevant field plus 3 years of on-the-job clinical training. A PhD degree is not required. Usually, a PhD degree is needed for a medical physicist to work in an academic and/or research setting in the field of MP.

The CAMPEP website currently lists 15 approved graduate degree programs in MP. Among them, 6 are hosted by Physics departments, 1 by an Engineering department, and the rest by Medical Schools or Health Sciences Centers (HSC) in different institutions.

An analysis of the proposed *TTU Professional PhD program*, when compared with the existing CAMPEP approved programs, is detailed below. The focus is on five areas, Degree, Pre-requisite, Core courses, Faculty and Thesis.

(1) Degree (MS or PhD)
The proposed structure of the *TTU Professional PhD program* is along the line of a terminal MS (non-thesis option) graduate program as found in the CAMPEP approved programs. As mentioned in the *TTU Professional PhD program* proposal, the new feature of 1st year Medical school and the additional 2-3 years on the job training will produce a better Practitioner in Medical Physics than do the other MS programs in medical physics. However there are questions.

How do we make the judgment that the quality of the clinical training is equivalent to a PhD level training in Physics without qualifying exam or final exam, usually in the form of research dissertation? Currently, we do not have any physics faculty in the MP field to make that judgment. The professional exam, ABR certification, only requires a minimum of a MS degree plus 3 years of clinical training. In contrast, Medical Board certification in Cardiology, Oncology, or other requires the completion of a 4-years MD degree (2 years of course work in Medical School plus 2 years of internship involving clinical rotations), plus several years of fellowship (residency training) in a sub-specialty. That takes at least 7 years.

What is the difference between the *TTU Professional PhD program* and the other existing MS-terminal programs in MP? The major difference is the extra 1st year Medical School courses plus 2 to 3 years clinical training. Does this difference qualify for a PhD in Physics?

(2) Pre-requisites
All CAMPEP-approved programs in MP require a strong physical science BS training (BS in Physics is preferred in most cases) for those programs hosted by the Physics departments. For those in the HSC, strong Physics, computer science and math background is clearly spelled out. However, none requires Pre-Med courses. The *TTU Professional PhD program* requires Pre-Med courses, or else the students will not be admitted to the 1st year program (1st year Med
school). Basically, this program targets Biological Science students as opposed to Physical Science students found in all the programs approved by CAMPEP. Should we train Biological Science majors without asking them to take remedial Physics, Math or Computer Science courses?

(3) PhD Core courses requirement
Except for the University of Alberta's program that only requires one graduate EM or QM2 physics course, all CAMPEP accredited PhD programs hosted by Physics departments require Physics core courses. Do we have to modify the Physics core courses requirements? Roger suggests substituting CM with Nuclear Physics. At TTU and TTUHSC, the MP graduate courses do not exist. Who is going to teach the graduate MP core courses? The graduate MP courses in the CAMPEP approved MS or PhD programs are well diversified in Diagnostic Imaging, Therapeutic and Nuclear Medicine. Our program appears to be biased towards Therapeutic since the clinical people at UMC and TTUHSC are in the Therapeutic area. I believe that a good quality PhD program in medical physics should have a diversified training in MP, not just Therapeutic.

(4) Graduate Faculty in MP
So far none exists at TTUHSC (academic departments) and none of us at TTU can teach graduate level MP courses. We will need at least two new faculty members in MP to establish a good quality PhD level program in MP.

(5) PhD dissertation or not
The TTU Professional PhD program does not mention a dissertation requirement. There are a couple of options to implement the program: (A) PhD dissertation (hypothesis driven and publishable), (B) substitute this by an Internship Report, or (C) substitute the dissertation by the ABR exam. The last option is problematic since the minimum requirement for taking the ABR exam is only a MS degree.

Should the TTU Professional PhD program require a dissertation, one has to consider the absence of research infrastructure in MP at TTU and TTUHSC. No PhD level research infrastructure in MP currently exists at TTUHSC. So far, the only physics faculty at TTU who has some experience in MP-related area is Kelvin Cheng. He has graduated one PhD student (Richard Cardenas, 2003) in the area of radiation dosimetry and one MS (non-thesis option) student (Melissa Hernandez, 1991) in the area of MRI. Both MS and PhD projects resulted in publications in peer-reviewed journals. Both involved research cooperation and agreement with the Radiology Department of TTUHSC and UMC-MRI center. Note that these students passed the physics PhD qualifying exam in our department. This suggest that we can have research in MP at both the MS and PhD level within the infrastructure of our existing MS or PhD program without creating a new degree plan.

2. Recommendations
Based on the problems highlighted above, we should not pursue the proposed TTU Professional PhD program in Medical Physics at this time. We recommend the following steps.

(1) Creation of a new MSI-Medical Physics.
It is possible to modify the current TTU Professional PhD program into a MSI that targets the Medical Physics profession in health care industry using the framework of our existing MSI
(which targets the semiconductor industry). Lubbock has two major medical centers, UMC and Covenant, and one private cancer center, Lubbock Cancer Center. They all have updated diagnostic and therapeutic facilities for patient care and all need Medical Physicists. All three are in close proximity, which is a big advantage for student internship. We believe that we can create a MSI-Medical Physics degree program as a new pilot program that involves both education component (TTU and TTUHSC) and health care partners (UMC, Covenant and Lubbock Cancer Center). This new MSI program requires careful planning.

(2) **Creation of new research projects in MP within our MS and PhD programs.**

We still can pursue MP research projects within our existing framework of PhD and MS programs. Our department had projects in that area before. The establishment of a new MSI-MP will create new opportunities and fuel the expansion of the MP-related research. The existing biophysics, condensed matter and HEP groups may benefit from the strong ties with the local medical facilities through the MSI-MP connection.

(3) **Creation of a new PhD degree plan in MP.**

Once the MSI-MP program is on track and we learn more about the existing MP facilities (locally and within Texas), it might become possible to create a new PhD degree program in MP. However, we must secure the participation of the Radiology and Radiation Oncology departments from TTUHSC and add new physics faculty in areas related to MP research.

We suggest that the pursuit of the *TTU Professional PhD program* in MP be abandoned at this time, and that we move forward with the development a new MSI-MP program. We will reconsider the possibility of creating a new PhD degree plan in MP if we develop a sufficient research and education infrastructure in the field, and the full participation of TTUHSC, UMC, and private health care industry related to MP.