RESEARCH STATEMENT

My research subjects are mainly concerned with radiation physics topics especially radiation effects in different materials and radiation detection and measurements since it was started on 1996 where the start of my M.Sc. as a member in a metrology institute I have trained for the use of international protocols for radiation dose and evaluation using different techniques especially the ionization chamber, TLD’s, and EPR dosimetry in addition to providing and organizing workshops on radiation protection. I was able since that date to evaluate uncertainties associated to the evaluated radiation doses and employing different physical principles in studying radiation effects in materials or dosimeters.

Following master and after completing the thesis of the master I started my Ph.D. thesis in Cairo University with shared supervision of Dr. Marc Desrosiers from NIST, MD, at the start of my Ph.D. work which aims to investigate new radiation dosimetry systems based on organic compounds using the electron paramagnetic resonance spectroscopy (EPR). Working on the P.D. thesis started with setting-up the spectrometer and adjusting its parameters followed by the characterization of the beams used in the study these beams are high energy photons from Co-60 and Cs-137 in addition to the evaluation of beam qualities using different beam quality indices and the evaluation of uncertainties associated to the radiation quantities used throughout the study. Characterization of some organic compounds was performed resulting in a suggestion of new dosimetry systems.

Post-doctoral research scope was wider where the effect of radiation on the hemoglobin molecules of bovine samples was investigated using some spectroscopic techniques revealing the target site inside the bovine hemoglobin to be affected by irradiation, similar research was performed using chitosan molecules and similarly spectroscopic investigations of possible molecular changes were performed. Also the impact of irradiation of crabs and dose evaluation using different body parts was assessed. Other research papers about investigating two new dosimetry systems based on sulfamic and sulphanilic acids were published. Research on the new sensitive dosimeter based on sulfamic acid was performed during the post-doctoral position at PTB in Braunsweig in Germany where the primary standard beam was used for irradiation of samples.

Rando phantom was used to estimate eye lens, skin, and deep doses using TLD cards provided by Harshaw. Also other papers were focusing on the evaluation of collection efficiencies in ionization chambers and those factors affecting such evaluation in addition to presenting new theoretical possibility of evaluating important parameters of some types of chambers. In addition to this, other studies on the use of EPR for estimation of delivered radiation doses in teeth enamel of irradiated monkies were erformed within the EPR center of viable systems with Prof. Harold Swartz in Dartmouth college, NH.

After promoting to the associate professor degree, other research topics were added: investigating radiation effects on dental enamel of experimental rats, also investigating
radiation-induced radicals in camel molars using EPR spectroscopy. Reconstruction of radiation doses in cases of accidental radiation exposure is one of hot topics in emergency dosimetry, Aspartame based sweetener tablets were suggested to be used reconstruction of delivered radiation doses to public after massive exposure.

Investigating new dosimeters continued where taurine and homotaurine dosimeters were proposed as new detectors for gamma radiation using EPR spectrometers. Taurine was found to be sensitive in addition to its tissue equivalency; hence further work was performed leading to the production of a prototype of taurine-EVA copolymer dosimeters followed by a comparative study including all newly investigated EPR dosimeters.

Numerical manipulation of EPR spectra was considered in some papers where the DSP processing of obtained signals such signal averaging technique was evaluated from the point of view of associated uncertainties and signal/noise ratio, also moving average filter is considered and optimum filtering windows were evaluated.

Other dosimetry technique which is the thermoluminescence dosimetry was considered in several papers where the impacts of heat treatment methods on the registered glow curves of TLD-100, TLD-600, and TLD-700 were studied deeply revealing individual changes in peak positions and peak intensities. Same was repeated for other work using TLD-300 and other sensitized TLD-600, and TLD-700.

On the level of radioactivity, I participated in evaluating Radon gas levels and estimating the expected risk within the population of one important city in Saudi Arabia which is ‘Alkharj’, SSNTD’s were used in this study.

In general, research interests focus on the use of different physical techniques for evaluation of radiation doses accurately and reproducibly, either on the level of radiation therapy for use in quality assurance purposes or as transfer dosimeters, or on the level of dose reconstruction in cases of radiation massive accidental exposure, in addition to this, other effects of ionizing radiation on different important materials (especially biological materials) also is of interest.