Lecture 4.1b Unclear Points:

I think the word ionization is confusing me. What do you mean between ionization chamber and ionization charge?

Ionization charge is produced when ionization takes place. It is the total charge of one sign or the other as a result of the radiation interaction. The ionization chamber is the entity that collects the charge.

What is the relation between two coefficients: "small d" and "large D"?

Small d pertains to dimensions at the point of measurement inside the collection volume, while large D pertains to dimensions at the entrance diaphragm. It’s easy to measure $A_0$ but not $A_d$. But to know the size of the collection volume we need $A_d$.

I understand that the guard electrodes provide straight electric lines of force but how do the guard electrodes define the borders of the collection volume? I might have missed that point.

Electrons produced outside the guard electrodes reach the guard electrodes, but are not measured.

When do we know we don't have dry air? Basically, when do we account for humidity in the air? (Houston is almost always humid whereas Dallas not as much.)

Generally, thanks to air conditioning, we don’t make a humidity correction. The correction is not significant for clinical purposes. But the standards labs do.

You are talking about inverse square law on slides 18 and 19. I understand that inverse square means 1 over quantity squared but how did we get the relation $(S_2/S_1)^2$ on slide 18 for example?

Area at the diaphragm is related to area at the measurement point via inverse square relationship.

For Q2 of pretest, you have some answer choices mentioning "collection volume." I assume collection volume is not a factor to consider when measuring any kind of kerma—whether it be collision kerma or just kerma. Is this right?

Right.

I just don't really understand the geometry and their consequences of the free-air ionization chamber on pg. 11. Can we go over this in class?

How does the guard electrode force the electric lines of force to remain straight?

If there were no guard electrodes, the electric lines of force would curve outward.

When we place a "wall" as mentioned in pg.21, where is the wall physically inside the chamber?
Yes

Regarding the equations on p. 18 and p. 19--is the eq for $X_D$ on p.18 the result of the assuming the relationship on pg.19, or is it something new?

Yes, nothing new.

I was a little confused trying to understand how the appropriate wall thickness was determined for solid air wall chambers.

Purpose of wall is to ensure electronic equilibrium so wall thickness must be at least range of secondary electrons. If wall is too thick, there will be photon attenuation.

Could you go over the question for the Bragg-Gray Theory

Bragg-Gray related ionizations in a cavity to dose delivered to a medium.

You said that both the area and the shape of the diaphragm are important, but only the area goes into the calculation of exposure. Why is the shape important?

Just need to be careful about the shape so the area can be accurately determined.

When talking about the $A_{eq}$ factor necessary for higher energy photon beams, what are higher energy photon beams?

Typically 1 MeV or higher.

Does $A_{eq}$ vary according to the ionization chamber or is there a general rule of thumb for the energies where we must consider $A_{eq}$?

$A_{eq}$ is dependent on the energy of the photons.

Also, what exactly is 3% for Co-60? Is it the error in dose from not accounting for this $A_{eq}$ factor?

$A_{eq}$ is used when the measurement is in air and represents the attenuation of the beam in the wall.

Can you explain the concept of an air wall?

Needed to achieve electronic equilibrium.

Why are free air ionization chambers not easily moved?

Size, mainly.