

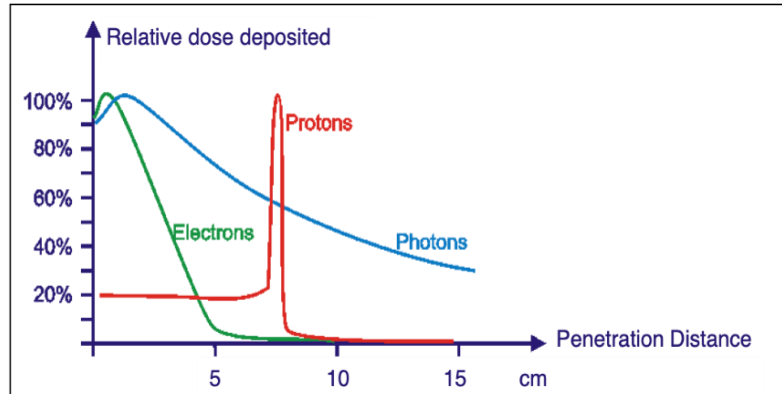
Option: Medical Applications

Goal: Learn how e-beams are used in medical applications and in society.

1. Choose the correct “beam” to use.




Beyond being able to target specific areas, there are differences in how radiation is deposited in the body, depending on the particles used.

As can be seen in the graph, protons, electrons and photons (often x-rays) deposit their dose (or energy) at different penetration distances (how deep beam gets into the body).



Prediction

Which beam do you recommend using for treating different areas? Note down your individual recommendations by filling in the table in your worksheet!

Therapy for skin condition 	Therapy for deep tissue tumor 	Whole body therapy 
Electron beam <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Proton beam <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Photon beam (X-rays) <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Now check your answers with a guide.
- Discuss what other factors might have a role to play when it comes to radiation treatment.

2. Explore how an e-beam can be used to make X-rays.

In this machine, electrons are produced the same way as in the electron tube through thermionic emission and a vertical electric field accelerates the electrons upward. They are made to impact on a slanted piece of metal and some of the kinetic energy of the electrons is converted into X-rays through a process known as breaking radiation or 'Bremsstrahlung'.

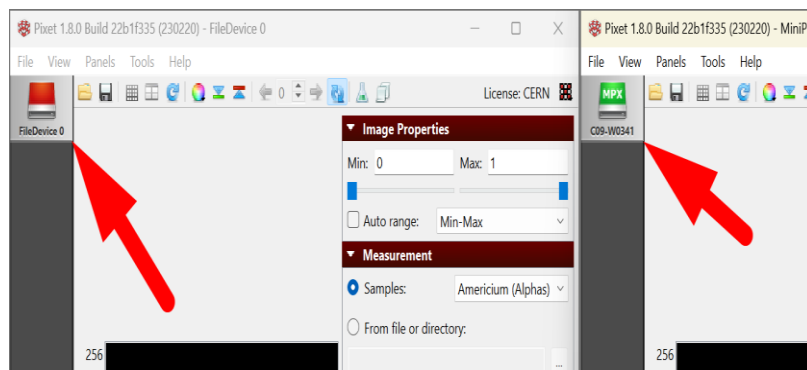
Your task will be to visualise the x-rays produced by this machine using a MiniPix pixel detector.



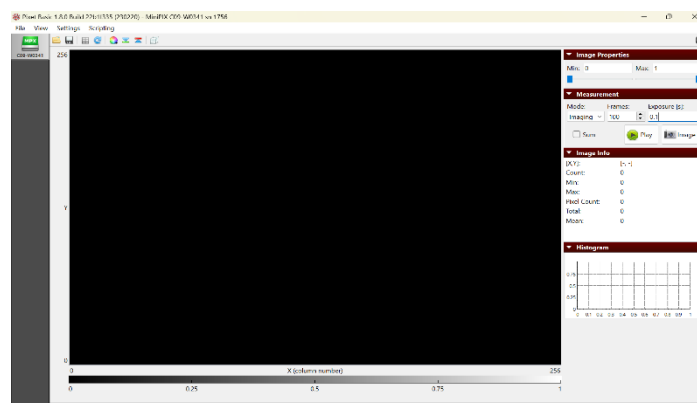
Task

Set up the Pixel detector ready for measurement.

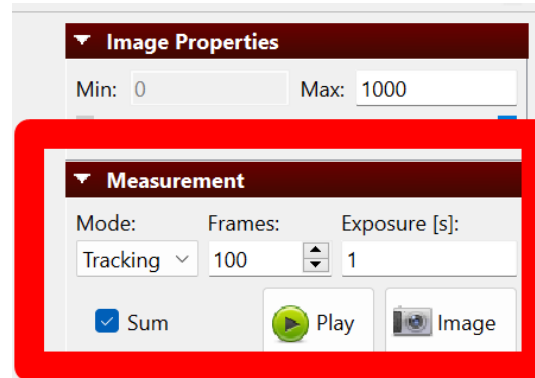
- Open PixetPro software.
- Check Detector Connection.
- In the top-left corner, ensure that the status indicator is green (e.g., C09-W0341). If it appears red and says 'FileDevice 0,' it means the software doesn't recognise the detector. Try reloading the software or reconnecting the detector. Should be like this:



- Go to Tools -> Pixel Basic. Your screen should look like this:



- In the Measurement tab on the right, set:
 - Mode to "Tracking".
 - Frames to 1000.
 - Exposure to 0.00005 s.



- Press play.
- Explore the software by changing some settings.



Task **Turn on the x-rays.**

- Connect power cable ensuring switch at back is off.
- Turn on machine at the back using On/Off switch. Wait about 1 minute for screen to load.
- Open the door.
- Close the door.
- Press lock button.
- Ensure Pixel detector is measuring (Press Play.)
- Press radiation button.
- Observe.

