



Particle therapy masterclass

THERAPY PLANING OF TG-119, LIVER, HEAD AND NECK

ARISTOTLE UNIVERSITY OF THESSALONIKI (AUTH)

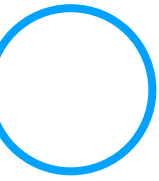
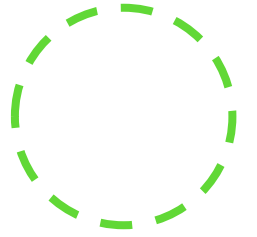
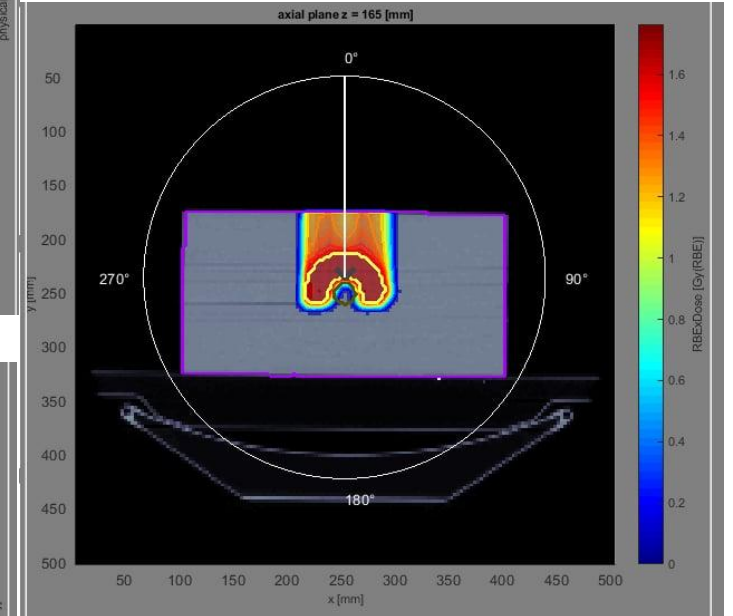
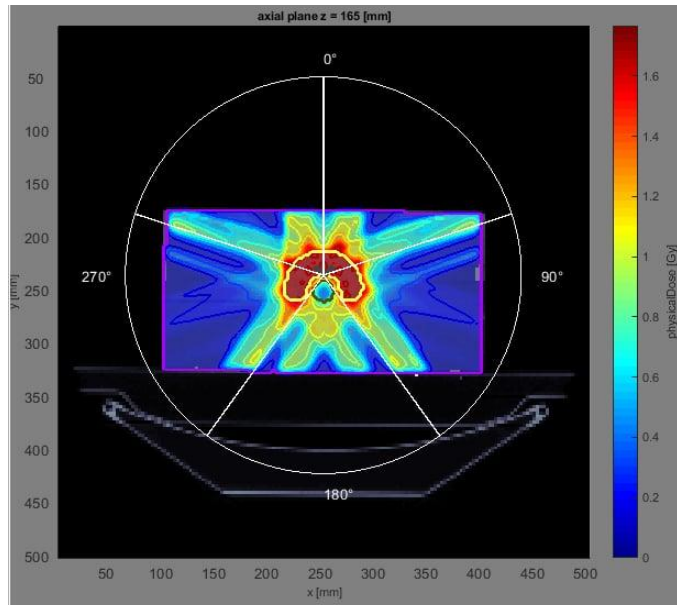
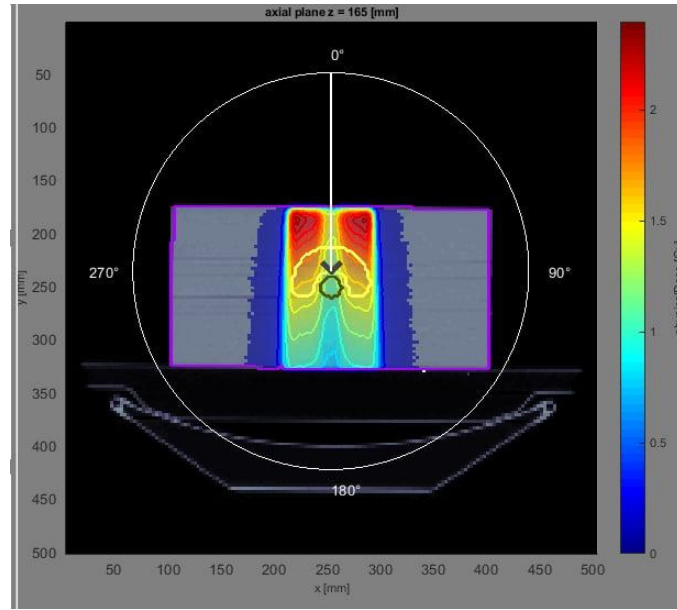
MARIA VAGIANNI, CHRISTINA LITOU, EVDOKIA VLACHOU, DESPOINA GERAKI, EFFROSYNI CHATZIVASILOGLOU, ROGKOTI MARIA AIKATERINI, MARIA ELENI BOZIKA, KORITSIDIS KONSTANTINOS



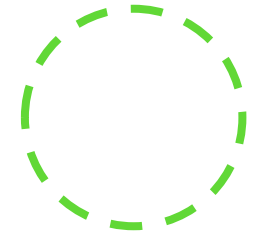
C PHANTOM

A “phantom” is a medical physical object that mimics biological tissues and its properties.

It is used as a “stand – in” of a living subject and it can be used to evaluate, analyze and fine – tune the performance of various imaging devices.

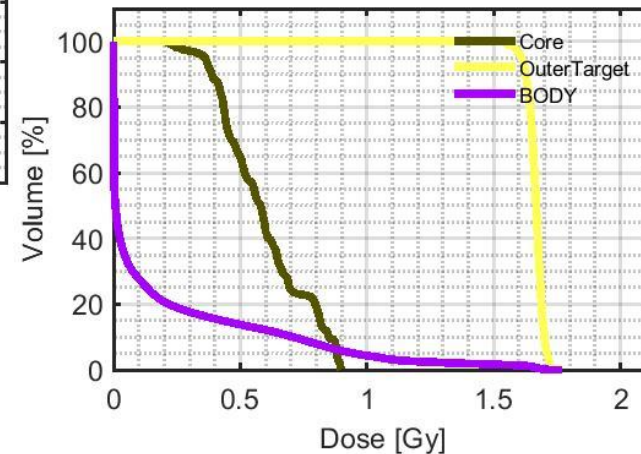
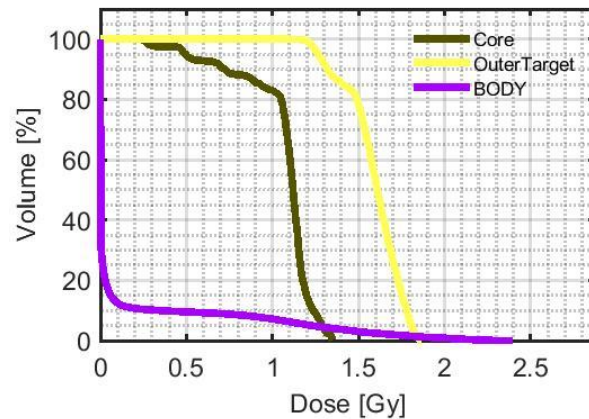


COMPARISON FOR PHOTON AND PROTON THERAPY FOR TG-119



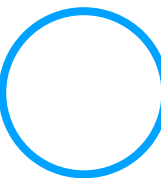
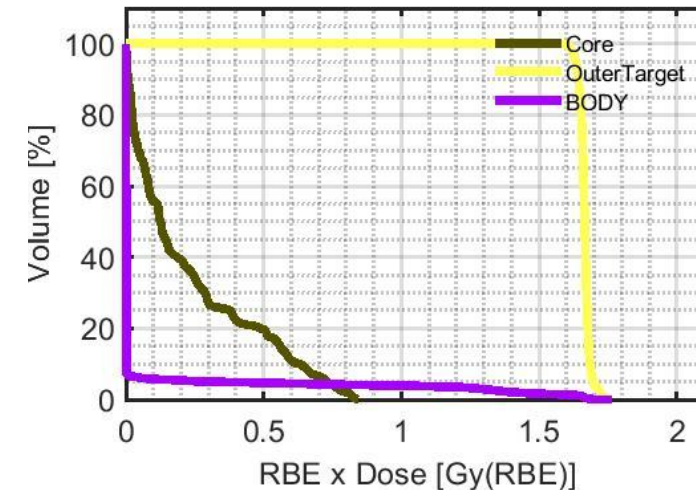
PHOTON THERAPY

We compared the diagrams created by irradiating with 1 photon beam and with 5 photon beams. In irradiation with five photon beams, improvement of results is observed along with increased energy deposition in the cancerous tumor.

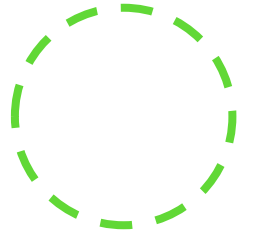


PROTON THERAPY

Protons reserve and release most of their energy at a certain depth where the tumor is located, which reduces the dose on surrounded organs. As a result, damage of healthy tissues is minimized.

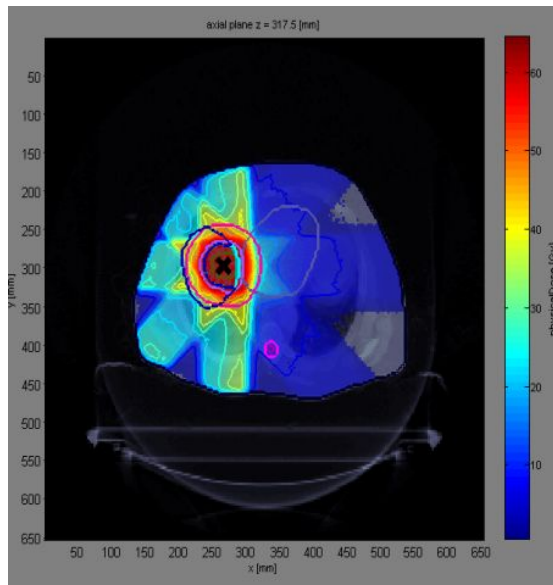


COMPARISON FOR PHOTON AND PROTON THERAPY FOR LIVER



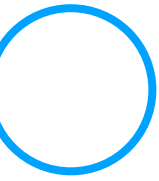
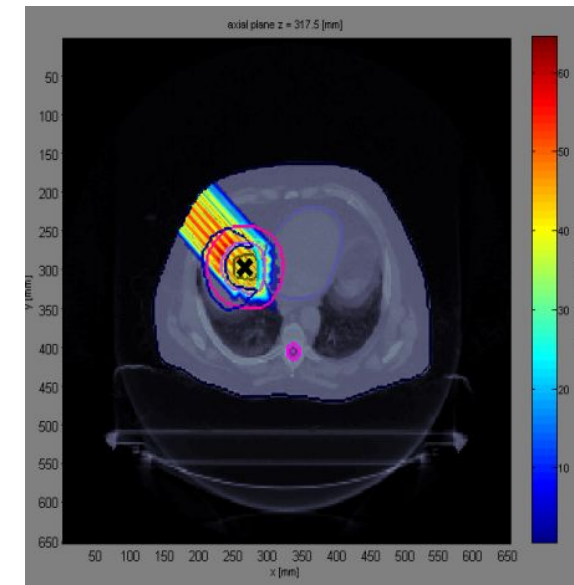
PHOTON THERAPY

As of using 5 beams uniformity of the dose distribution is equal to all of the beams but the intensity of the beam is not minimal in areas before and after the target



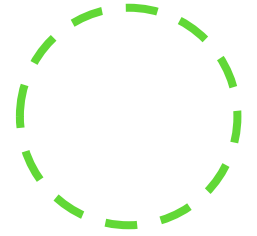
PROTON THERAPY/ CARBON ION

Beacuse of using only 1 beam dose distribution is high before and in the target volume but in the space after the target there is no dose



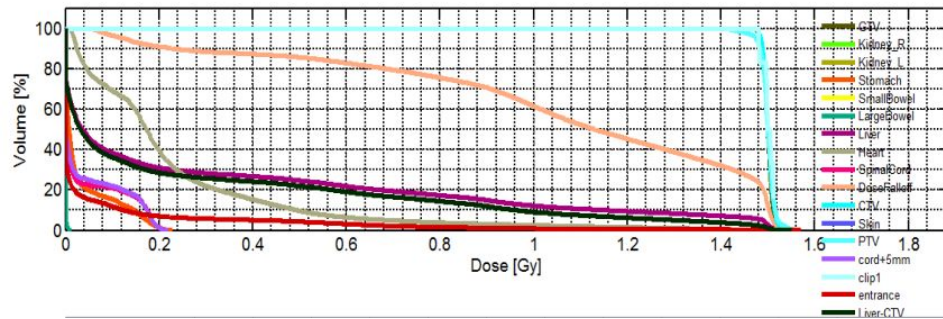


COMPARISON FOR PHOTON AND PROTON THERAPY FOR LIVER



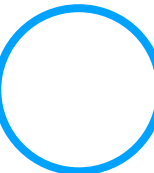
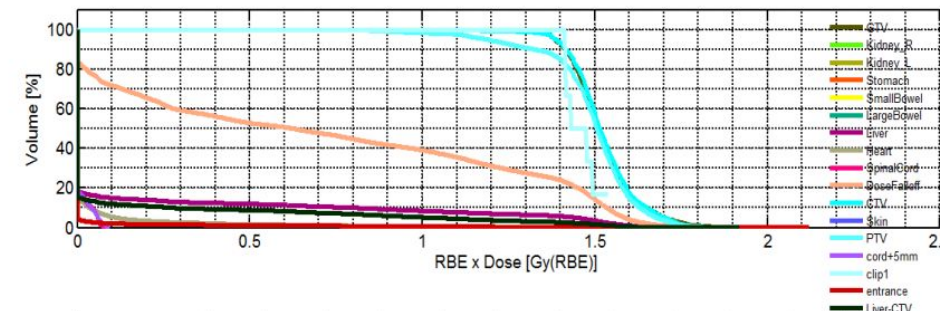
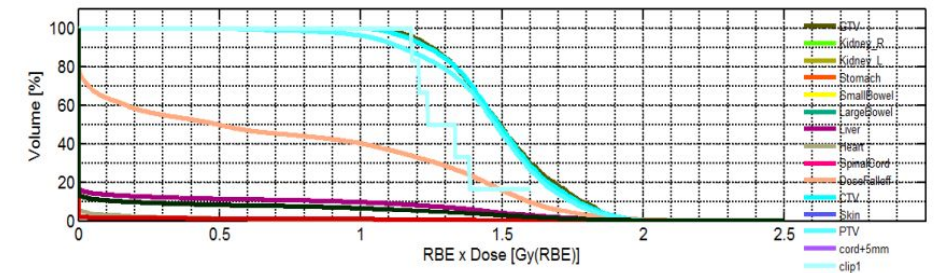
PHOTON THERAPY

Dose in the target volume has reached its required high but the dose in other organs which are not marked as a target is higher for photons than for protons



PROTON THERAPY/ CARBON ION

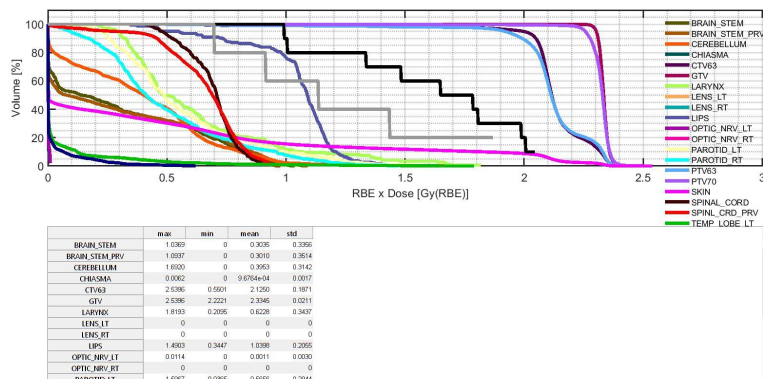
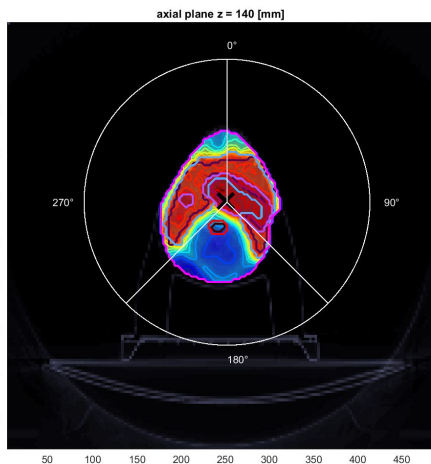
Dose for the target volume is higher than photon beams and the dose has fallen off much faster. Other organs which are not marked as targets have received much lower doses than with photons. Target volume has received the maximum dose but in the case for carbon ion therapy we can see that the dose dropoff is sharper than in the case for protons. Non targets have received the similar doses as with protons



UNCERTAINTIES ON HEAD AND NECK CASE

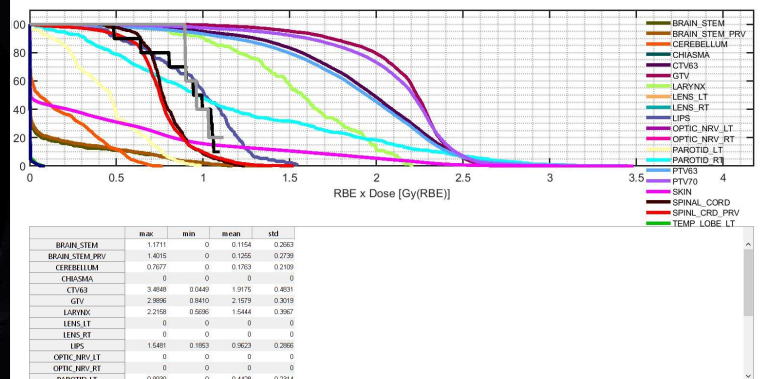
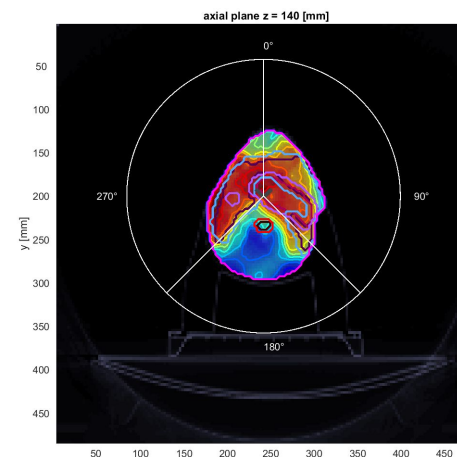
AUTO ISOCENTER [ISO : 250.4, 205.3, 138.5]

We inserted three beams coming from three different angles (0, 135, 225) and by looking at the DVH chart, we observed that we had a very good dose distribution.



NON-AUTO ISOCENTER [ISO : 240, 215, 135]

As we wanted to add an uncertainty to our plan, we unchecked the auto isocenter box and proceeded to slightly change the isocenter coordinates. By observing the new DVH chart, we saw that the Bragg peaks were ruined and there was no good OAR coverage.



CONCLUSION : In conclusion, we have to be very careful with our plan and although the uncertainties that may occur, we need to encounter them at the best possible way.




CONCLUSION

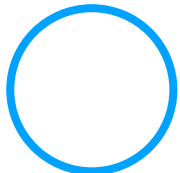
As stated before, we will discuss here the differences amongst photon, proton and carbon ion therapy

For photon therapy we have seen that even when using multiple beams we have still had results which are not as good as the results for proton therapy because of the dose falloff and the dose on surrounding organs

Regarding the differences between the carbon ion therapy and proton therapy we can see that the carbon ion therapy has a much sharper dropoff in doses for target organs, but for the case of one beam the results are very similar



In the conclusion we can say that the carbon ion therapy has the best results while the proton therapy follows closely behind and the photon therapy can be graded as the third best of the presented ones



A decorative graphic featuring two large, overlapping pink arcs that frame the central text. On the left, a dashed orange circle is partially visible at the top, and a small yellow dot is located near the bottom. On the right, a dashed green circle is at the top, a solid cyan dot is on the pink arc, and a solid blue circle is at the bottom.

Thank you
for your
attention