



# Particle therapy masterclass

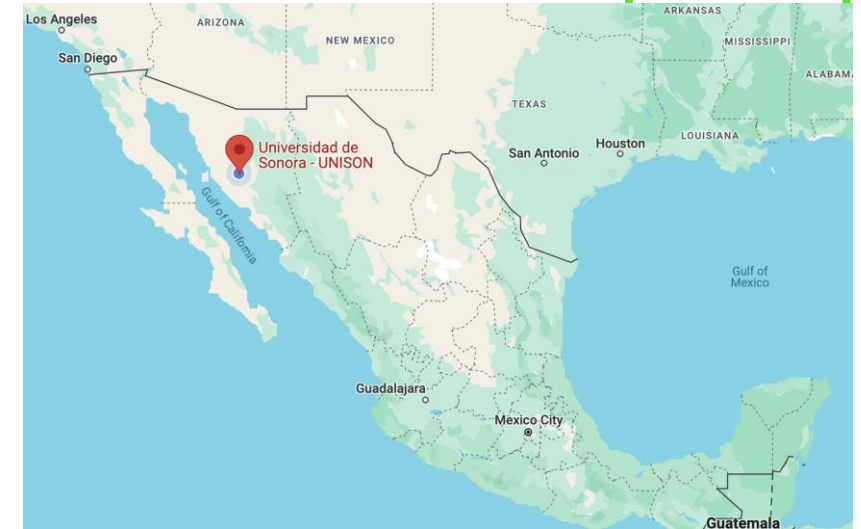
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THERAPY PLANING OF  
UNIVERSITY OF SONORA

ALFREDO CASTANEDA



# HANDS ON SESSION


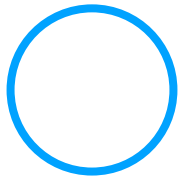


- Participation of around 60 high school students



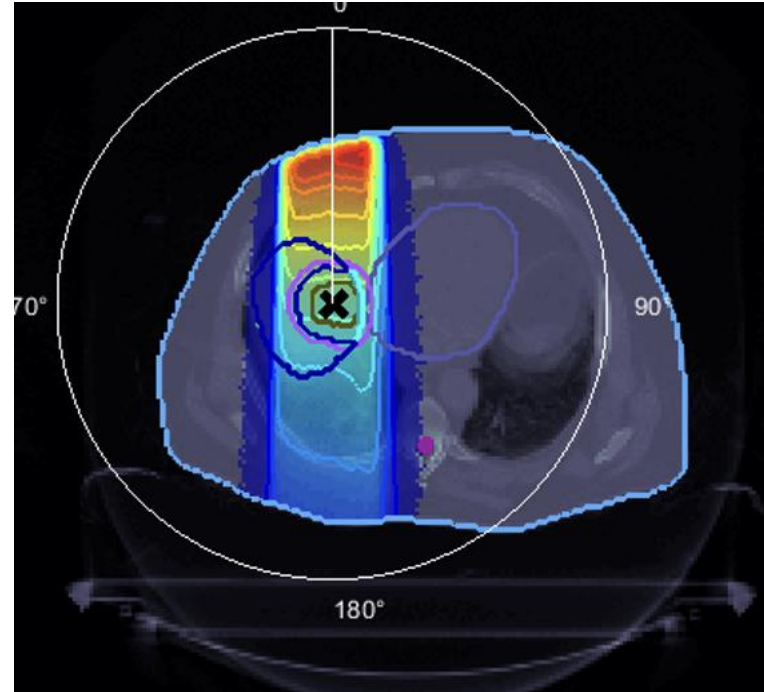


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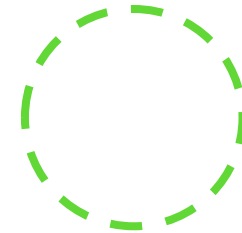
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# ABSTRACT

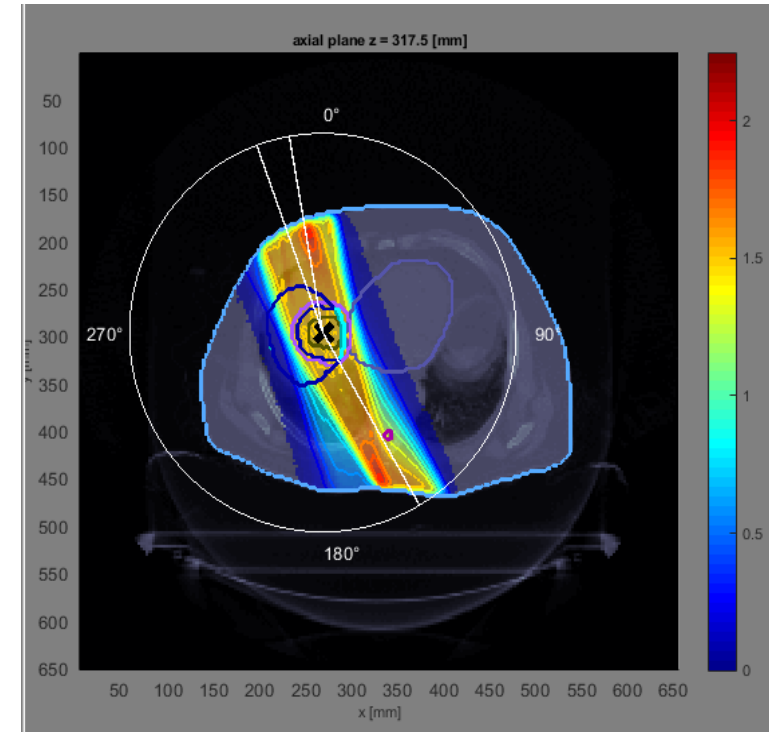
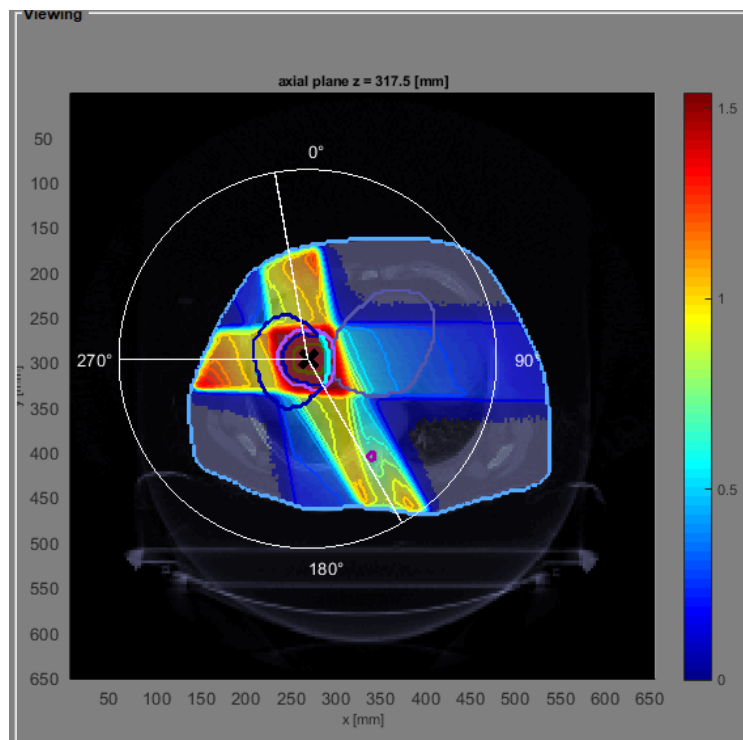
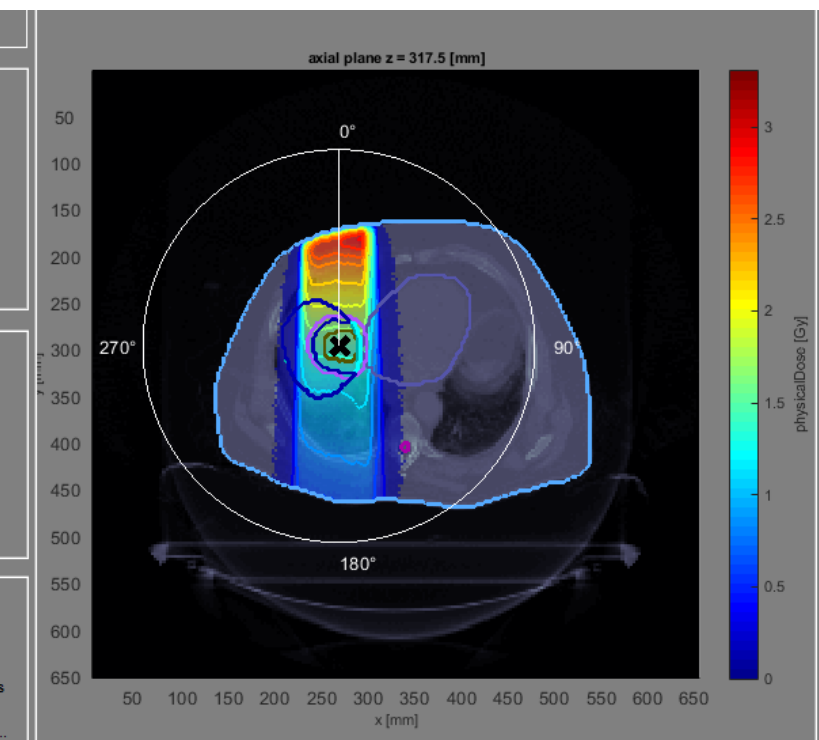
- Running matRad software, using liver phantom
- Three different treatment configuration
  - Photons:
    - 1 angle ( 0 degrees)
    - 3 angles (350,270,150)
    - 3 angles (350,340,150)
  - Protons: 1 angle (0)
  - Carbon Ions: 1 angle (0)

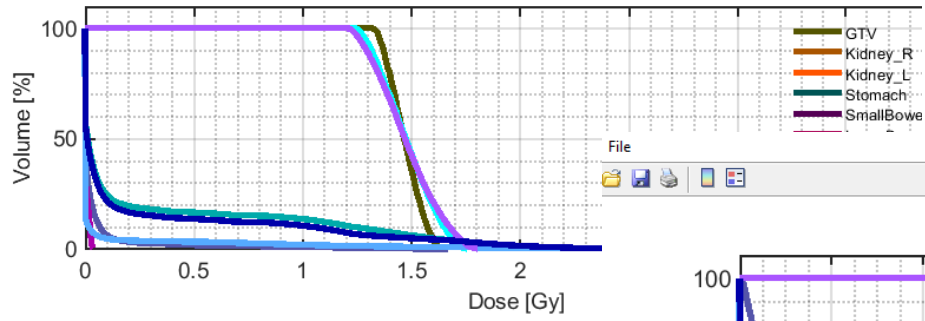


# PHOTON TREATMENT (DIFFERENT ANGLE)

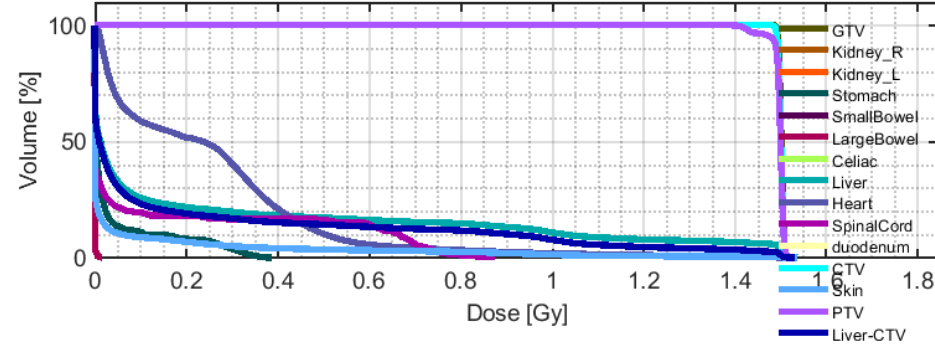


- Different angle were used for photon treatment
- The idea was to optimize the treatment to minimize the radiation doses nearby the heart
- The one in the middle seems to deliver the best radiation doses for the tumor, however the heart is also irradiated considerably

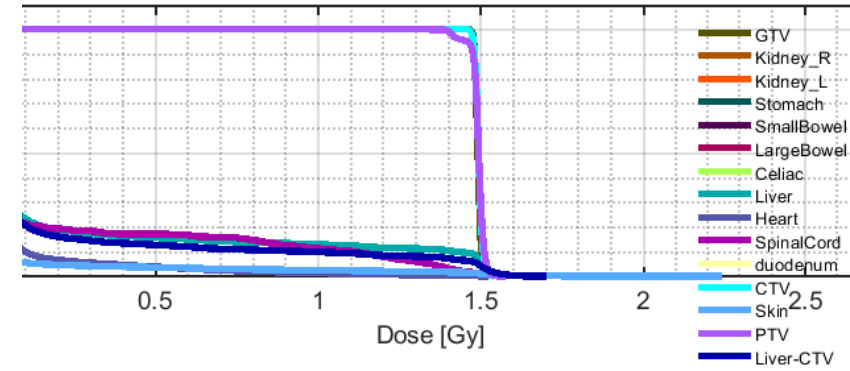




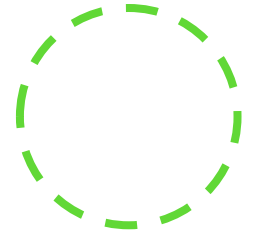
	max	min	mean	std
GTV	1.6406	1.3221	1.4716	0.0744
Kidney_R	0	0	0	0
Kidney_L	0	0	0	0
Stomach	0	0	0	0
SmallBowel	0	0	0	0
LargeBowel	0	0	0	0
Celiac	0	0	0	0
Liver	2.6562	0	0.2549	0.5303
Heart	1.6725	0	0.0371	0.1443
SpinalCord	0.0383	0	0.0054	0.0096



	max	min	mean	std
GTV	1.5149	1.4843	1.5008	0.0046
Kidney_R	0	0	0	0
Kidney_L	0	0	0	0
Stomach	0.3867	0	0.0352	0.0831
SmallBowel	0	0	0	0
LargeBowel	0.0163	0	1.9683e-04	0.0012
Celiac	0	0	0	0
Liver	1.5304	0	0.2291	0.4471
Heart	1.5074	0.0019	0.2472	0.2434
SpinalCord	0.8764	0	0.1215	0.2515



	max	min	mean	std
GTV	1.5229	1.4672	1.4929	0.0083
Kidney_R	0	0	0	0
Kidney_L	0	0	0	0
Stomach	0.0054	0	6.2601e-06	1.2065e-04
SmallBowel	0	0	0	0
LargeBowel	0	0	0	0
Celiac	0	0	0	0
Liver	1.7034	0	0.2344	0.4876
Heart	1.5290	0	0.0592	0.1857
SpinalCord	1.6283	0	0.2092	0.4382






# LIVER

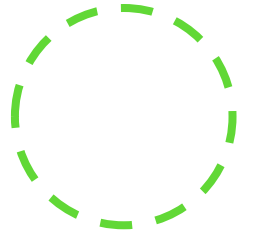


**Here you will list all the organs that are present in your case and list them as organs at risk (OAR), PTV, CTV, etc.) eg. prostate**

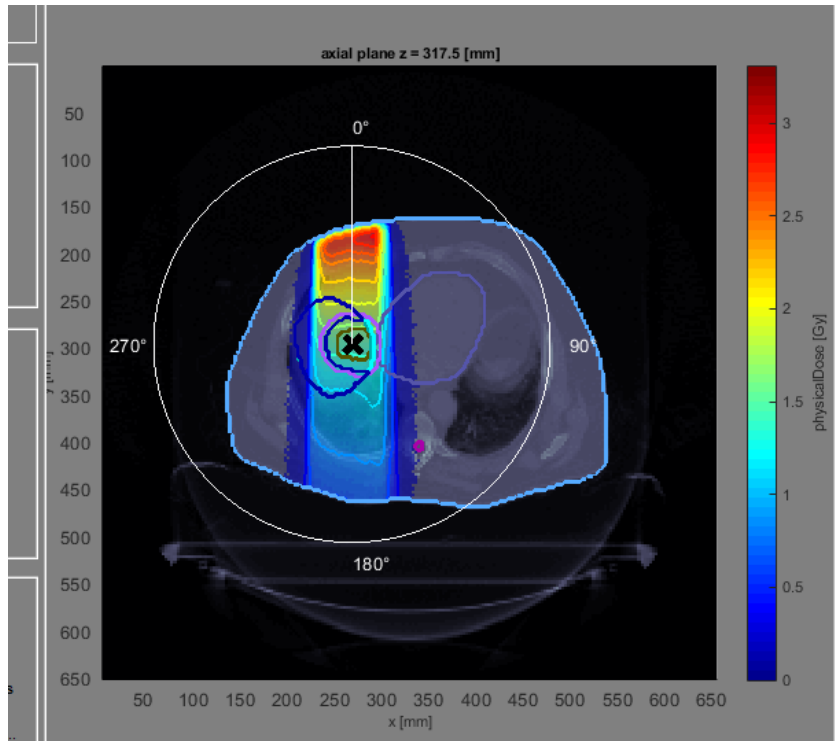
GTV	
Stomach	
SmallBowel	
LargeBowel	
Liver	OAR
Heart	OAR
SpinalCord	OAR



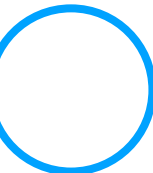
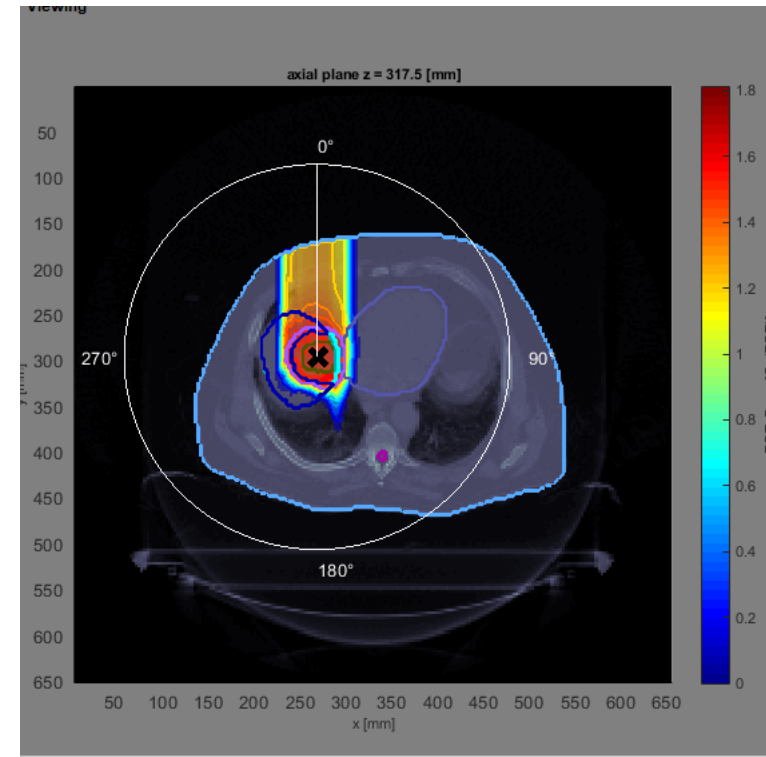
# COMPARISON FOR PHOTON AND PROTON THERAPY FOR LIVER



## PHOTON THERAPY



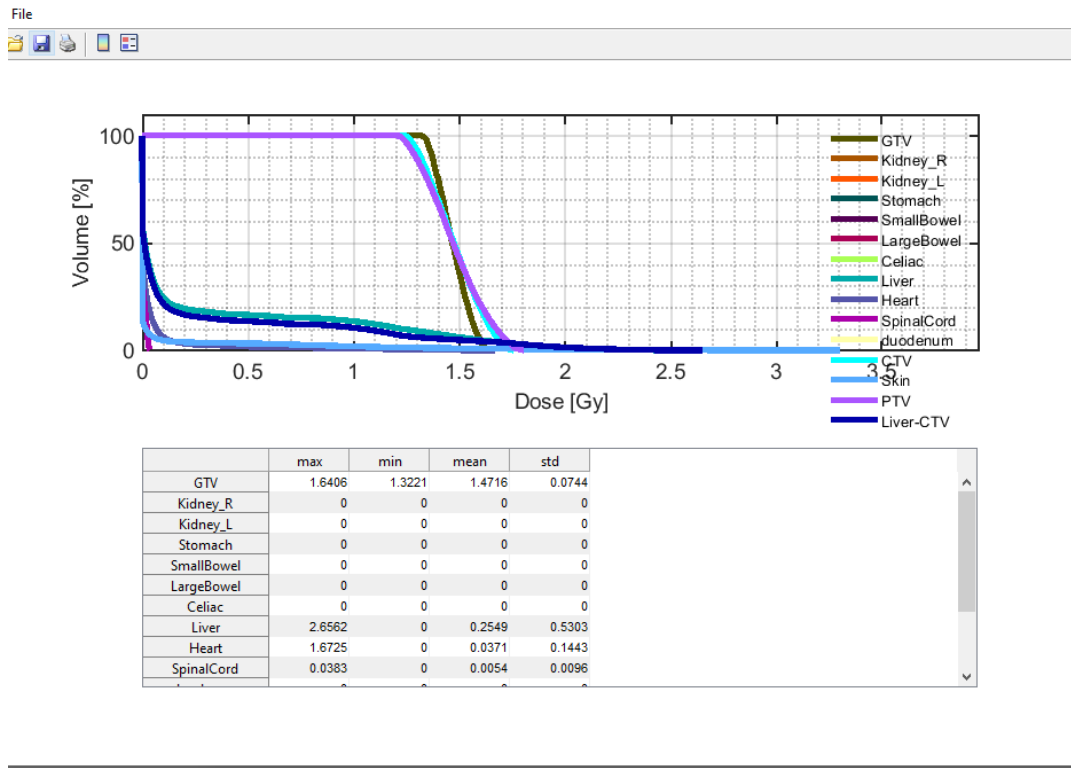
## PROTON THERAPY



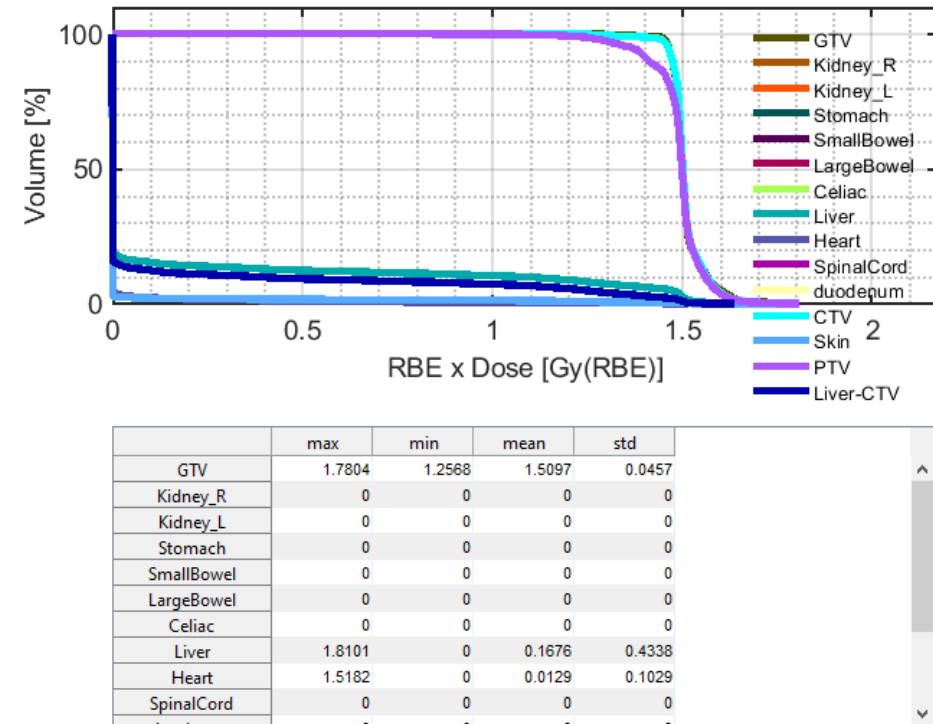


# COMPARISON FOR PHOTON AND PROTON THERAPY FOR LIVER

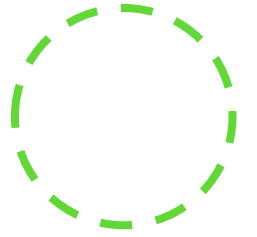
## PHOTON THERAPY



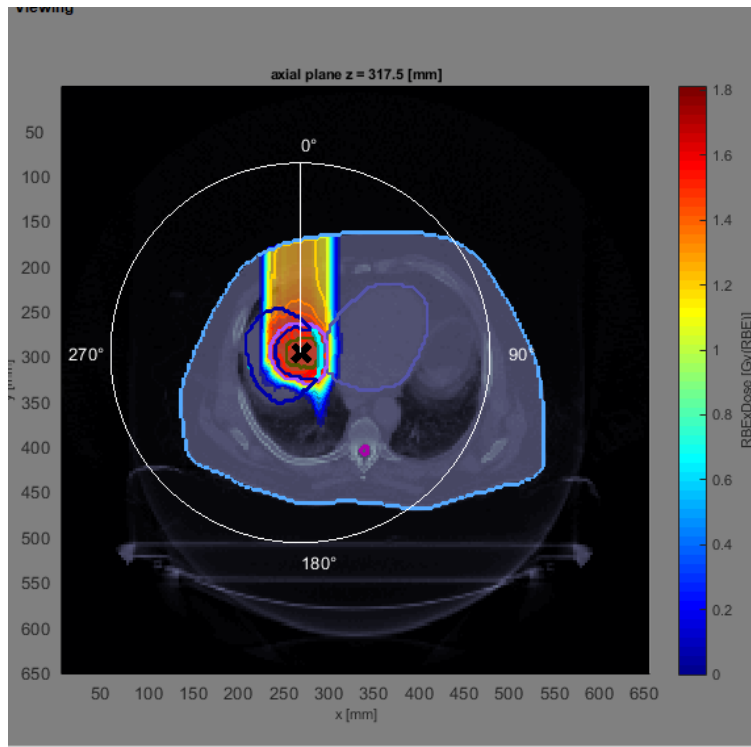
## PROTON THERAPY



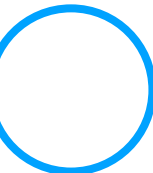
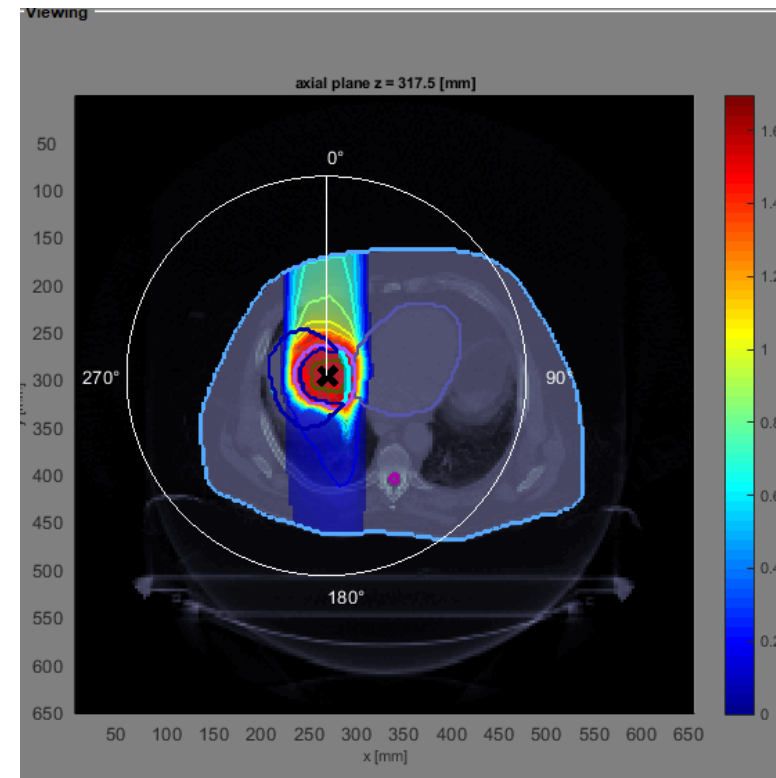
# COMPARISON FOR PROTON AND CARBON ION THERAPY FOR LIVER



## PROTON THERAPY



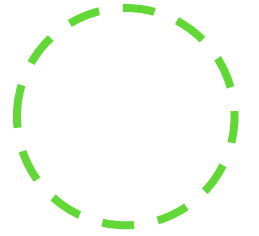
## CARBON ION THERAPY



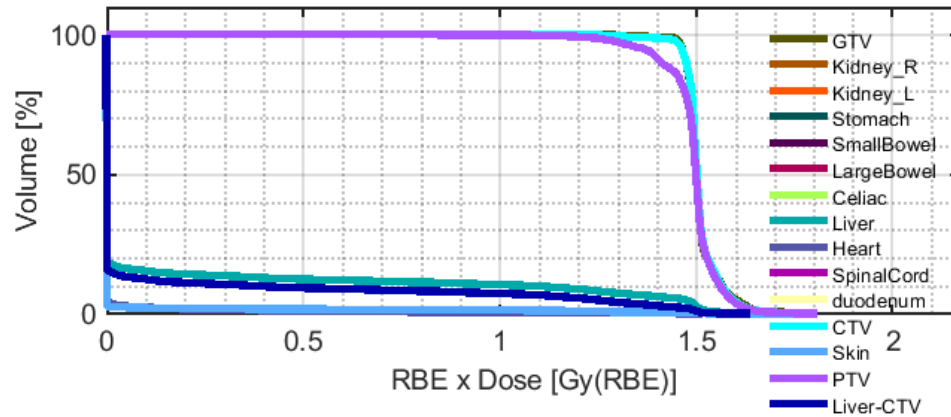


# COMPARISON FOR PROTON AND CARBON ION THERAPY FOR \*HERE\*

(TYPE THE ORGAN)

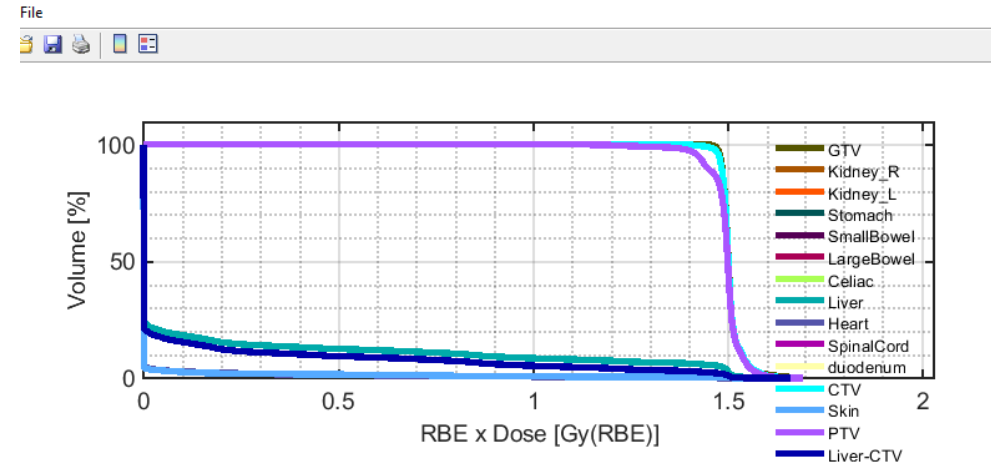


## PROTON THERAPY

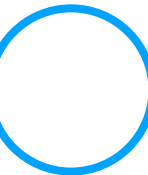


	max	min	mean	std
GTV	1.7804	1.2568	1.5097	0.0457
Kidney_R	0	0	0	0
Kidney_L	0	0	0	0
Stomach	0	0	0	0
SmallBowel	0	0	0	0
LargeBowel	0	0	0	0
Celiac	0	0	0	0
Liver	1.8101	0	0.1676	0.4338
Heart	1.5182	0	0.0129	0.1029
SpinalCord	0	0	0	0

## CARBON ION THERAPY



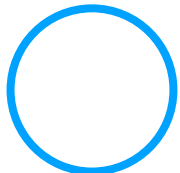

	max	min	mean	std
GTV	1.6657	1.4403	1.5064	0.0259
Kidney_R	0	0	0	0
Kidney_L	0	0	0	0
Stomach	0	0	0	0
SmallBowel	0	0	0	0
LargeBowel	0	0	0	0
Celiac	0	0	0	0
Liver	1.6937	0	0.1672	0.4164
Heart	1.5188	0	0.0175	0.1223
SpinalCord	0	0	0	0





# CONCLUSION

We conclude that the best treatment for liver cancer is using proton and carbon ion beams, the radiation is focused on the cancer cells while reducing the impact on nearby organs (particularly the heart)



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

Thank you  
for your  
attention