MatRad with Fine Sampling Beam

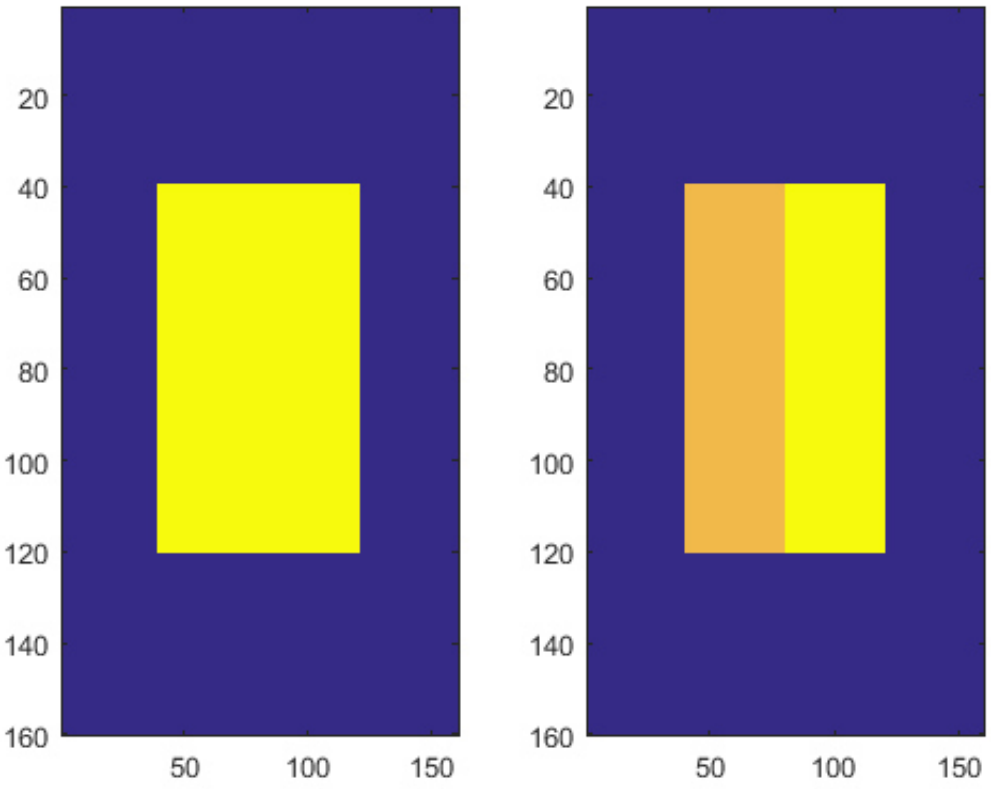
In this document we will provide some examples on the results of MatRad implemented with Fine Sampling Beam Algorithm and some comparison with the previous version of MatRad.

Contents

Phantoms

Here we show the phantoms on which we made our tests. The second one has a region of inhomogeneity in the center.

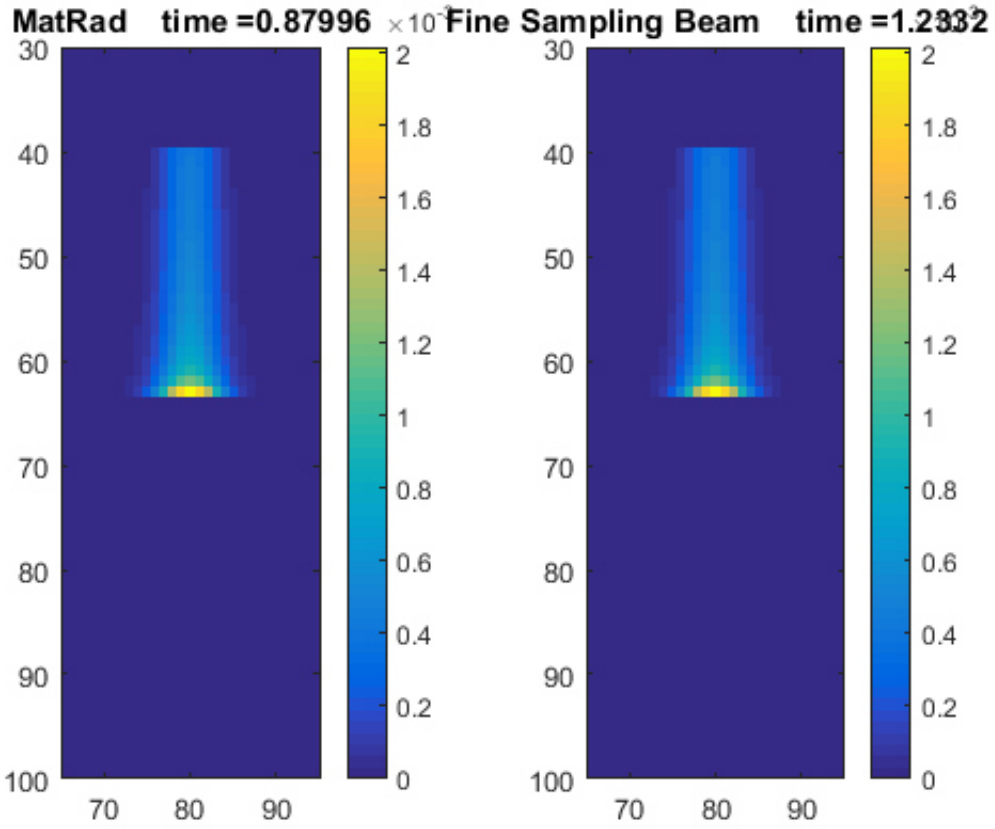
```
addpath('tools')
load('BoxTest3_0_0.mat')
figure
subplot(1,2,1)
imagesc(ct2.cube{1}(:,:,80))
subplot(1,2,2)
imagesc(ct.cube{1}(:,:,80))
```

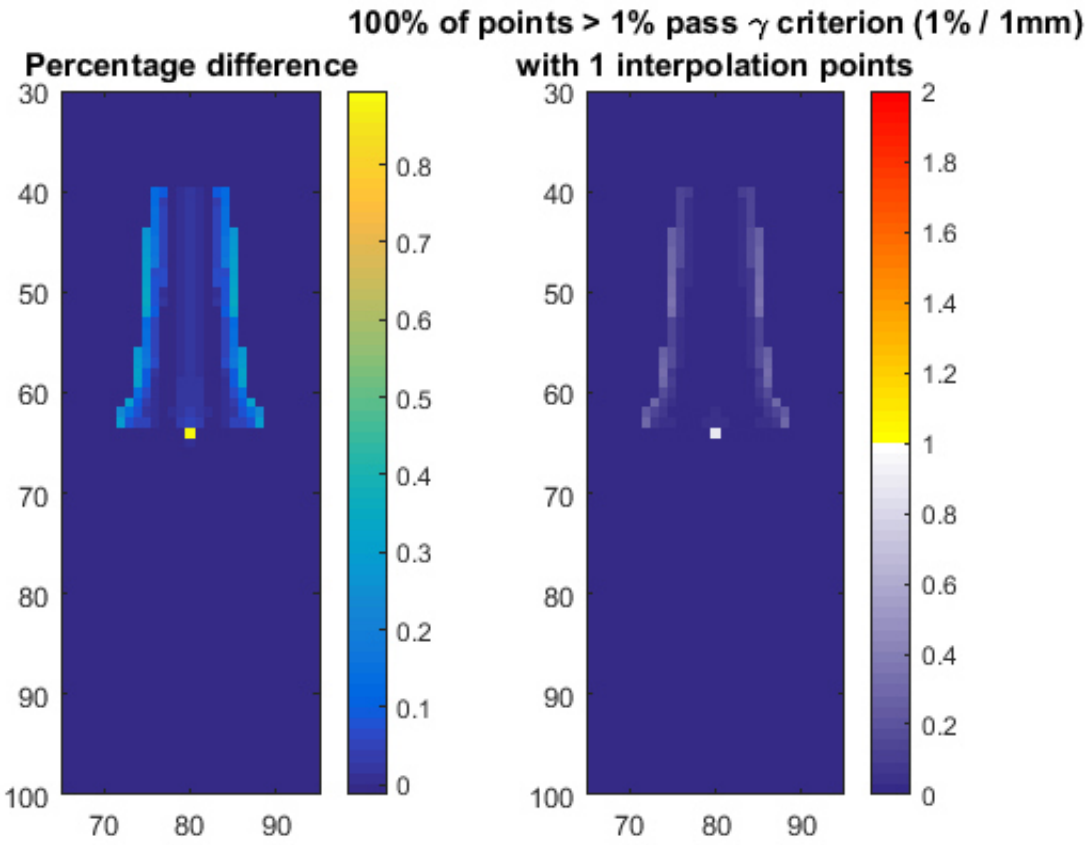


Results with homogeneous Phantom

Shown after are the results for comparison between the algorithms in a homogeneous phantom for a single Ray and a single sampling beam

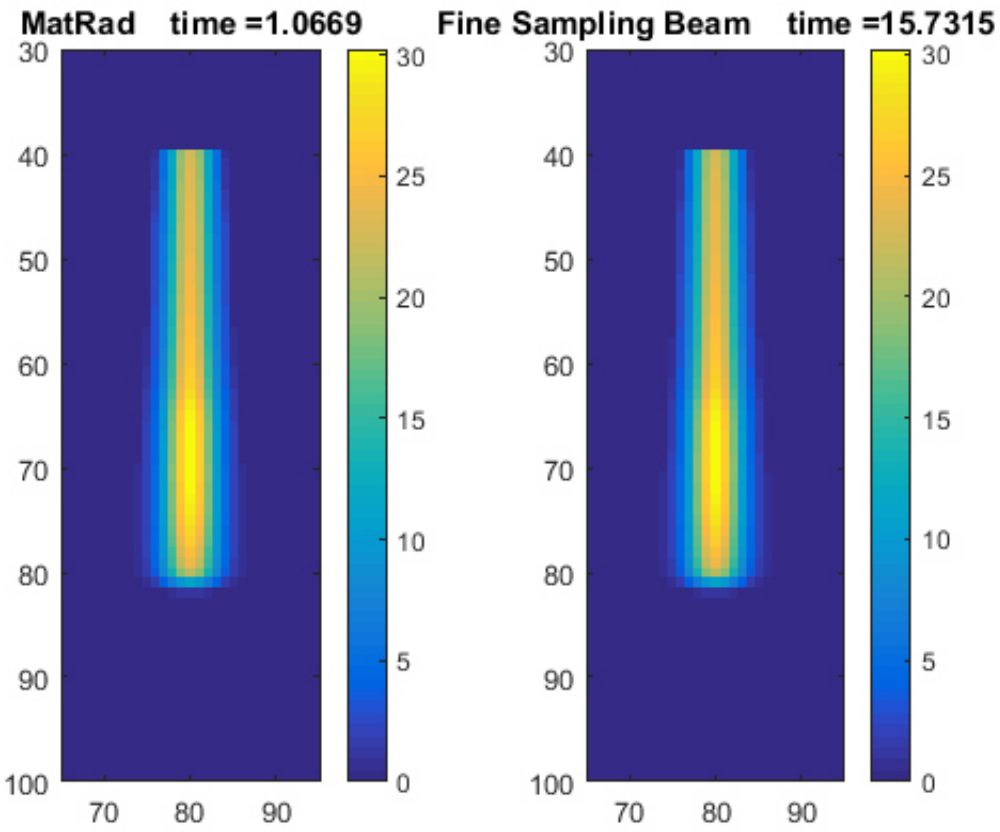
```
tic
matRad_calc_00 = matRad_calcDoseDirect_old(ct2,stf4,pln,cst,resultGUI2.w);
t1 = toc
tic
matRadFS_calc_00 = matRad_calcDoseDirect(ct2,stf4,pln,cst,resultGUI2.w);
t2 = toc
figure
subplot(1,2,1)
imagesc(matRad_calc_00.physicalDose(:,:,80))
title(strcat('MatRad    time = ', num2str(t1)))
axis([65 95 30 100])
colorbar
subplot(1,2,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,80))
title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
axis([65 95 30 100])
colorbar
figure
subplot(1,2,1)
imagesc((matRad_calc_00.physicalDose(:,:,80)-matRadFS_calc_00.physicalDose(:,:,80)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
title('Percentage difference')
axis([65 95 30 100])
colorbar
subplot(1,2,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],80,1,'global
',cst);
axis([65 95 30 100])
colorbar
```

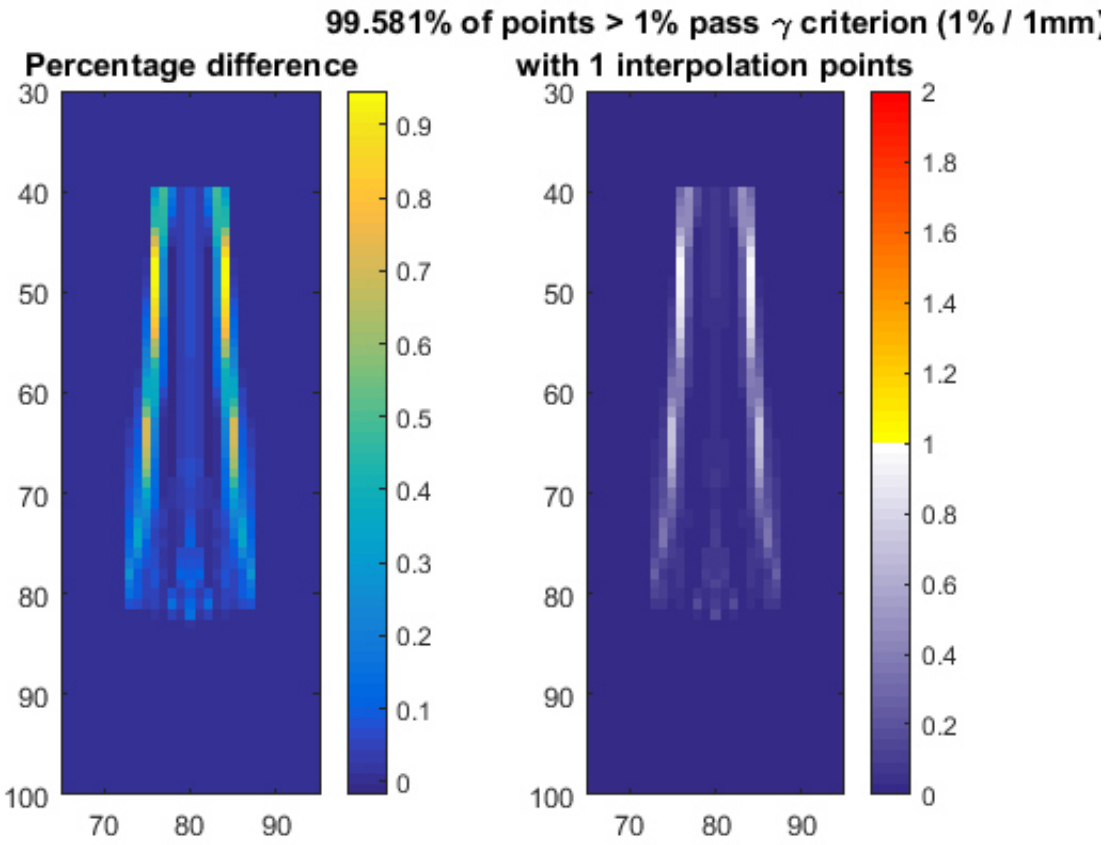





```
tic
matRad_calc_00 = matRad_calcDoseDirect_old(ct2,stf3,pln,cst,resultGUI.w);
t1 = toc
tic
matRadFS_calc_00 = matRad_calcDoseDirect(ct2,stf3,pln,cst,resultGUI.w);
```

```
t2 = toc
figure
subplot(1,2,1)
imagesc(matRad_calc_00.physicalDose(:,:,80))
title(strcat('MatRad    time = ', num2str(t1)))
axis([65 95 30 100])
colorbar
subplot(1,2,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,80))
title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
axis([65 95 30 100])
colorbar
figure
subplot(1,2,1)
imagesc((matRad_calc_00.physicalDose(:,:,80)-matRadFS_calc_00.physicalDose(:,:,80)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
title('Percentage difference')
axis([65 95 30 100])
colorbar
subplot(1,2,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],80,1,'global
',cst);
axis([65 95 30 100])
colorbar
```



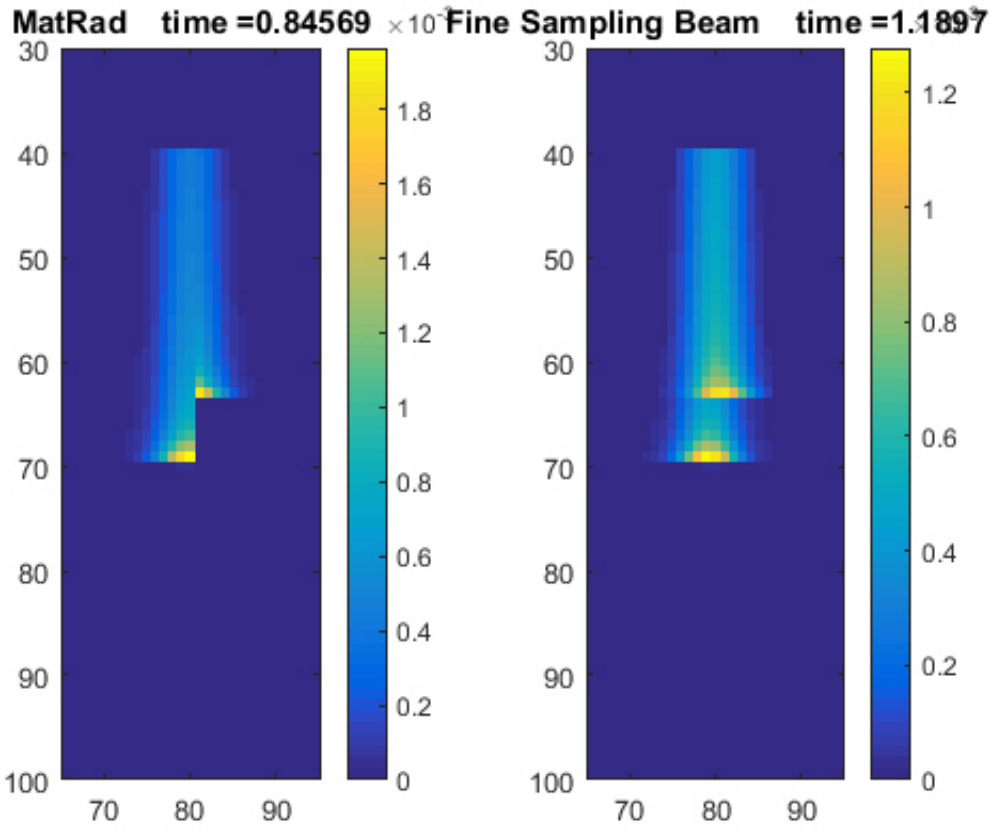


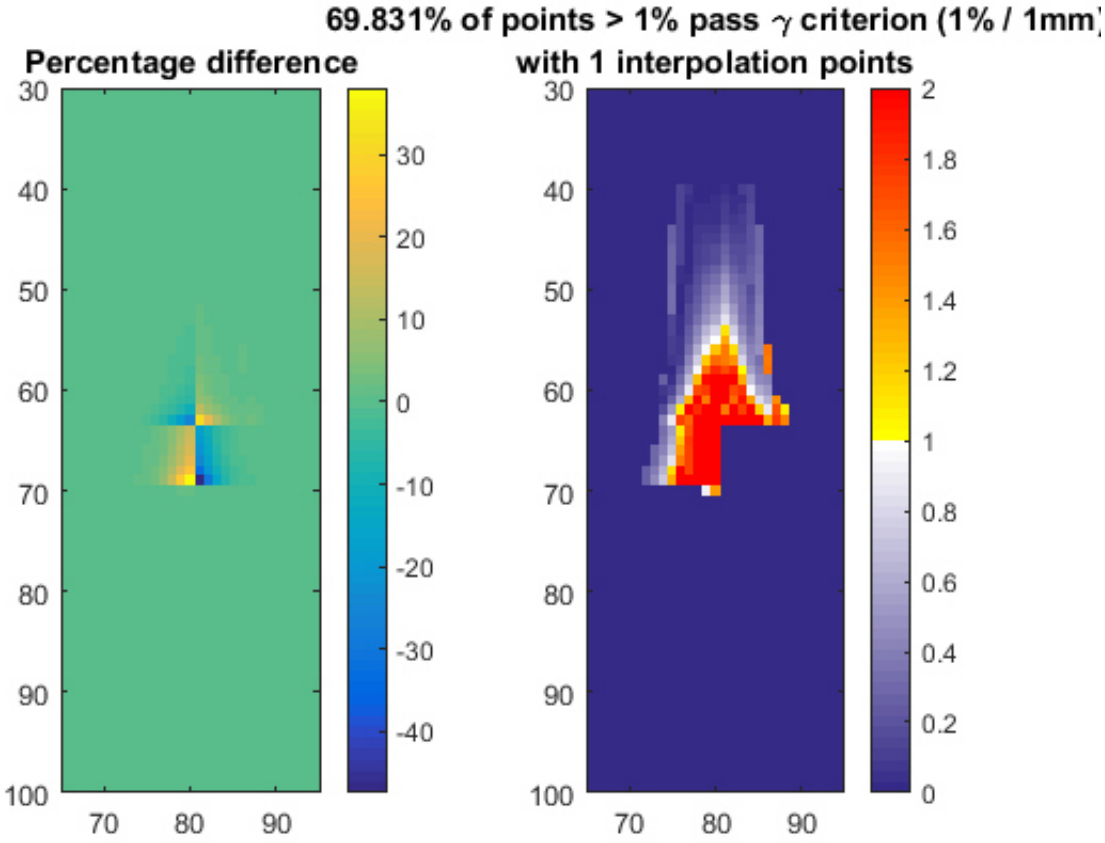
Results with inhomogeneous Phantom

Shown after are the results for comparison between the algorithms in an inhomogeneous phantom for a single Ray and a single sampling beam

```
tic
matRad_calc_00 = matRad_calcDoseDirect_old(ct,stf4,pln,cst,resultGUI2.w);
t1 = toc
tic
matRadFS_calc_00 = matRad_calcDoseDirect(ct,stf4,pln,cst,resultGUI2.w);
t2 = toc
figure
subplot(1,2,1)
imagesc(matRad_calc_00.physicalDose(:,:,80))
title(strcat('MatRad    time = ', num2str(t1)))
axis([65 95 30 100])
colorbar
subplot(1,2,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,80))
title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
axis([65 95 30 100])
colorbar
figure
subplot(1,2,1)
imagesc((matRad_calc_00.physicalDose(:,:,80)-matRadFS_calc_00.physicalDose(:,:,80)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
title('Percentage difference')
axis([65 95 30 100])
colorbar
subplot(1,2,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],80,1,'global
',cst);
```

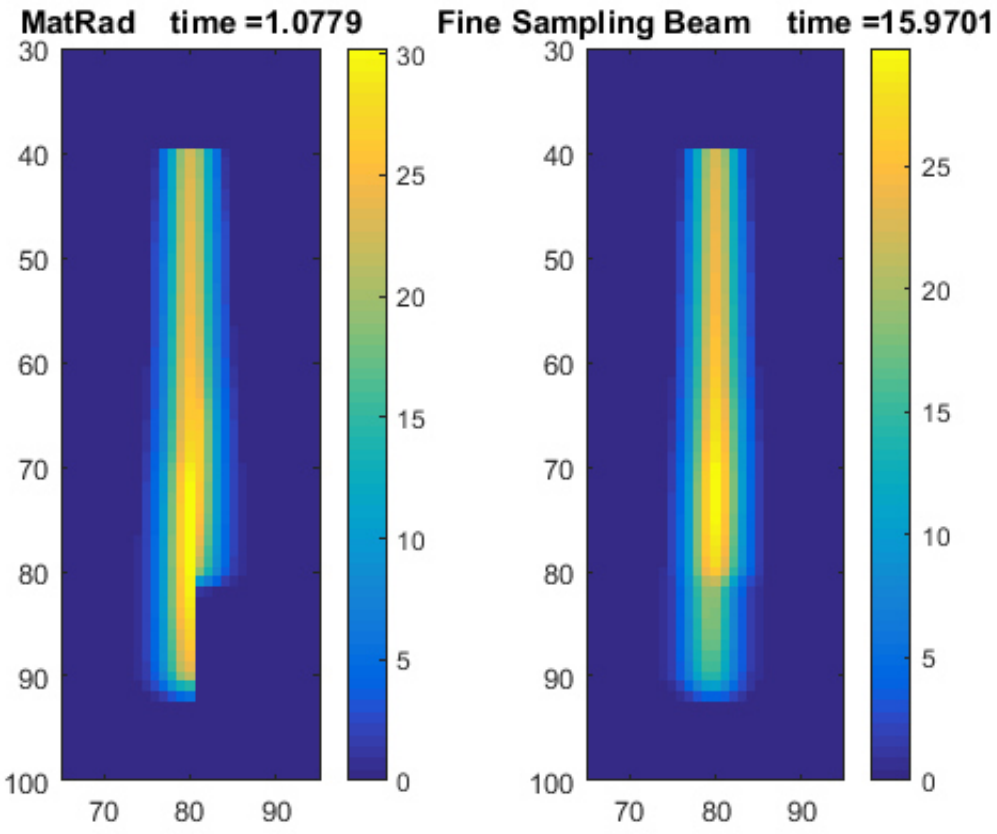
```
axis([65 95 30 100])
colorbar
```

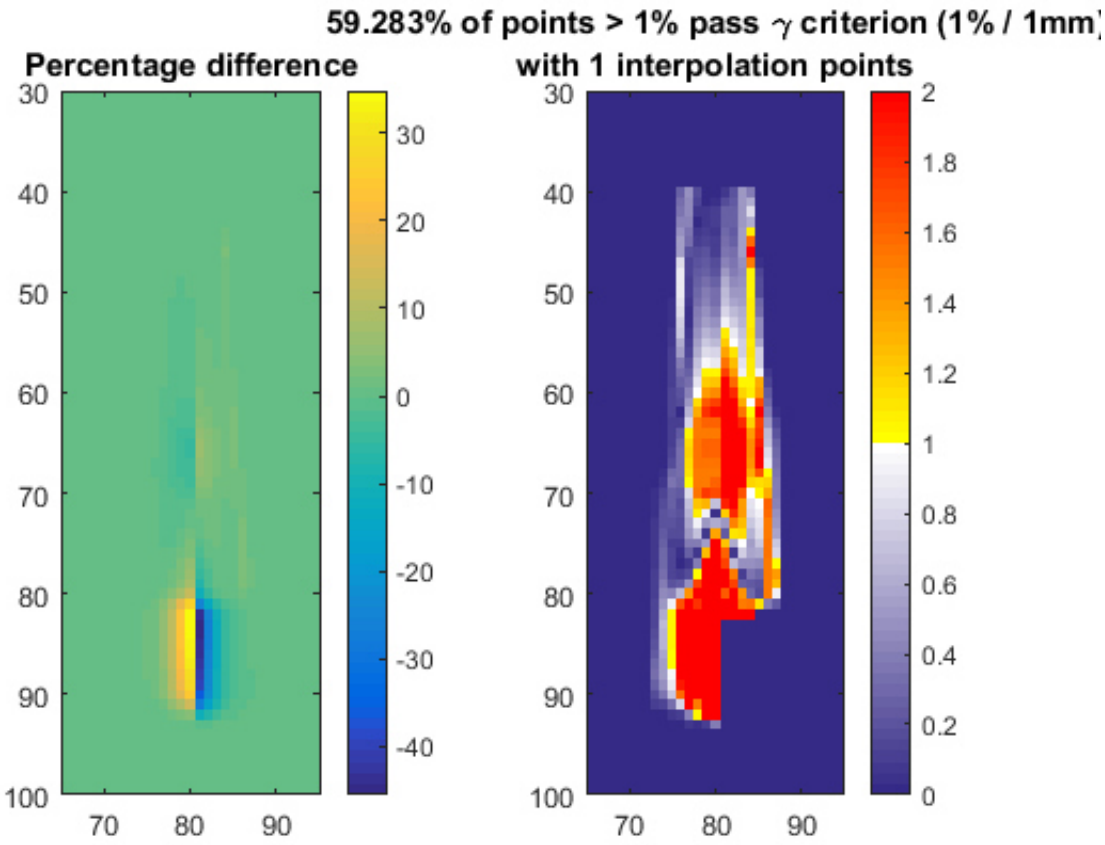





```
tic
```

```
matRad_calc_00 = matRad_calcDoseDirect_old(ct,stf3,pln,cst,resultGUI.w);
t1 = toc
tic
matRadFS_calc_00 = matRad_calcDoseDirect(ct,stf3,pln,cst,resultGUI.w);
t2 = toc
figure
subplot(1,2,1)
imagesc(matRad_calc_00.physicalDose(:,:,80))
title(strcat('MatRad    time = ', num2str(t1)))
axis([65 95 30 100])
colorbar
subplot(1,2,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,80))
title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
axis([65 95 30 100])
colorbar
figure
subplot(1,2,1)
imagesc((matRad_calc_00.physicalDose(:,:,80)-matRadFS_calc_00.physicalDose(:,:,80)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
title('Percentage difference')
axis([65 95 30 100])
colorbar
subplot(1,2,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],80,1,'global
',cst);
axis([65 95 30 100])
colorbar
```



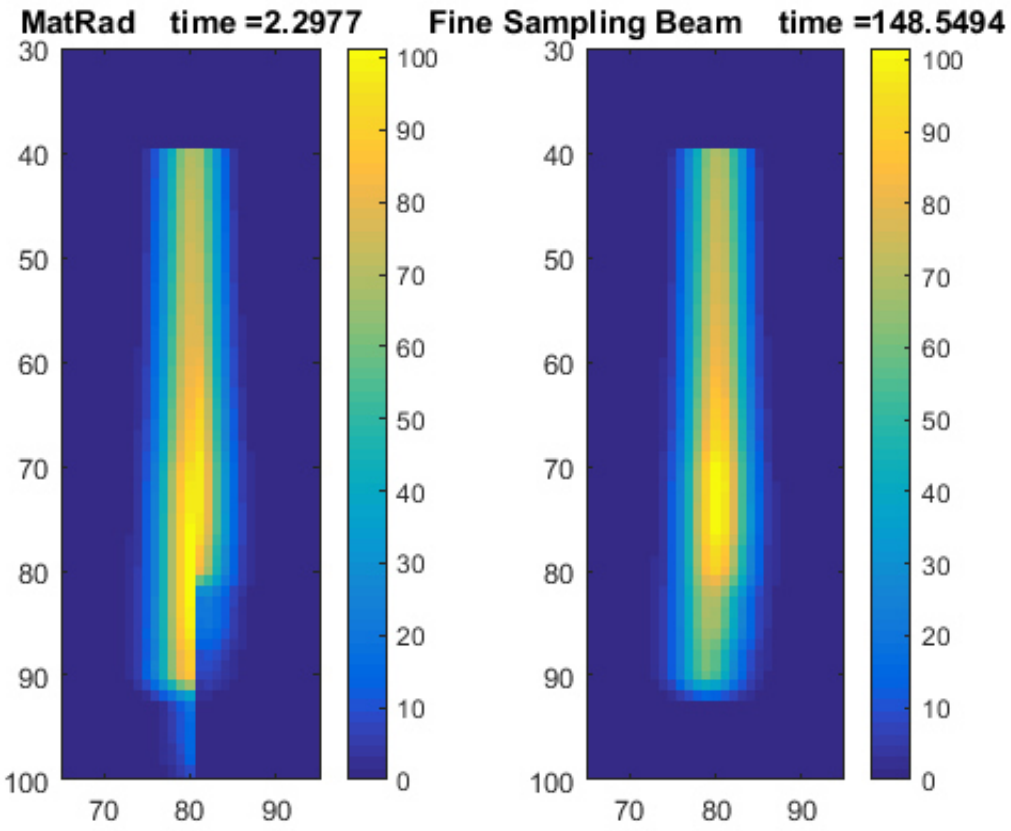


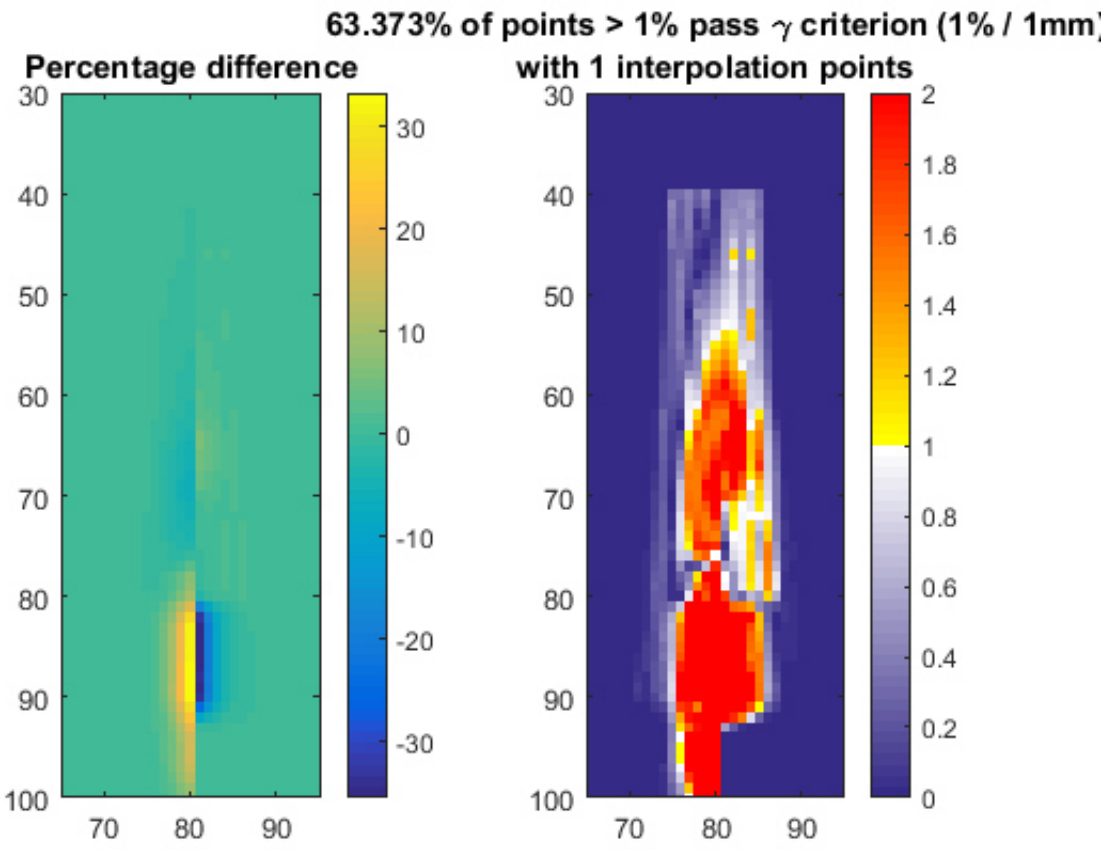
Results with inhomogeneous Phantom

Shown after are the results for comparison between the algorithms in an inhomogeneous phantom for nine rays with square simmetry with central ray positioned on inhomogeneity position

```
tic
matRad_calc_00 = matRad_calcDoseDirect_old(ct,stf2,pln,cst,resultGUI.w);
t1 = toc
tic
matRadFS_calc_00 = matRad_calcDoseDirect(ct,stf2,pln,cst,resultGUI.w);
t2 = toc
figure
subplot(1,2,1)
imagesc(matRad_calc_00.physicalDose(:,:,80))
title(strcat('MatRad    time = ', num2str(t1)))
axis([65 95 30 100])
colorbar
subplot(1,2,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,80))
title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
axis([65 95 30 100])
colorbar
figure
subplot(1,2,1)
imagesc((matRad_calc_00.physicalDose(:,:,80)-matRadFS_calc_00.physicalDose(:,:,80)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
title('Percentage difference')
axis([65 95 30 100])
colorbar
subplot(1,2,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],80,1,'global
',cst);
```

```
axis([65 95 30 100])
colorbar
```

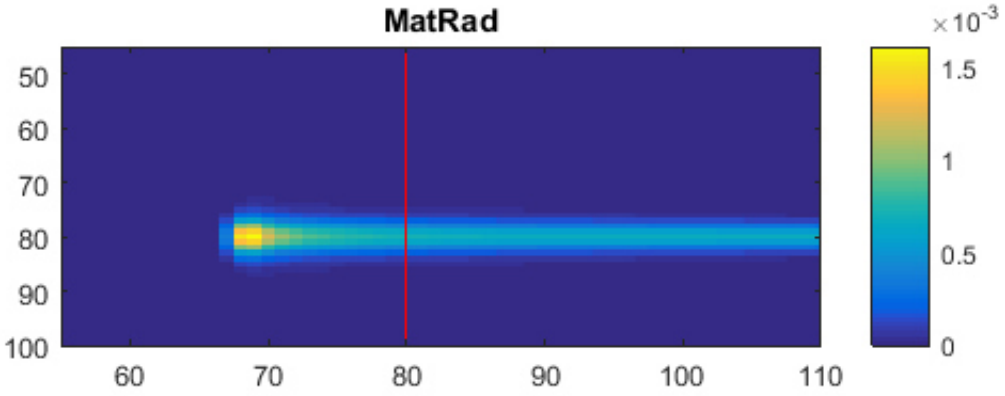


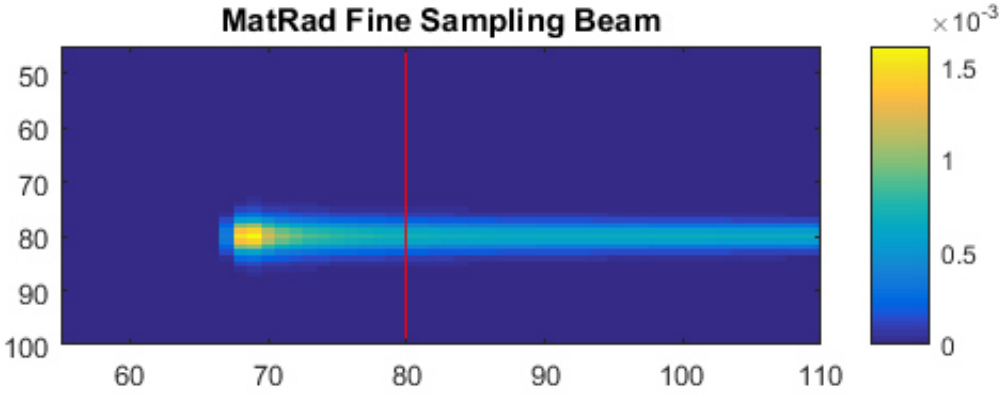


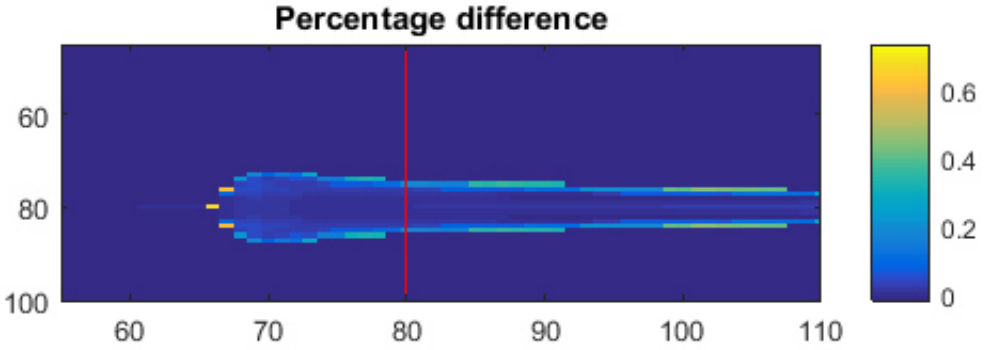
Results with inhomogeneous Phantom at [90 0]

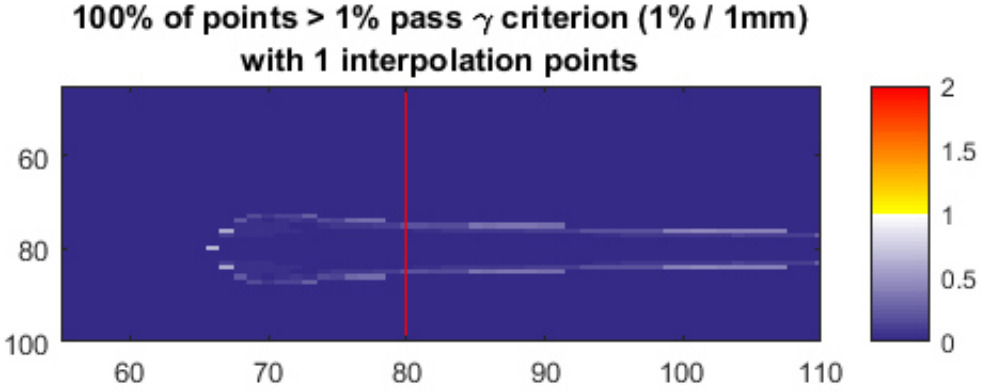
Here we show the result for a beam (1 ray and 9 rays) entering the area with couch angle of 0 degrees and a gantry angle of 90 degrees in the previous seen phantom. The red line represents the beginning of the inhomogeneity.

```
load('BoxTest3_90_0.mat')

matRad_calc_00 = matRad_calcDoseDirect_old(ct,stf4,pln,cst,resultGUI2.w);
matRadFS_calc_00 = matRad_calcDoseDirect(ct,stf4,pln,cst,resultGUI2.w);
figure
subplot(2,1,1)
imagesc(matRad_calc_00.physicalDose(:,:,80))
line([80 80],[20 120],'Color','r')
title('MatRad')
axis([55 110 45 100])
colorbar
subplot(2,1,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,80))
title('MatRad Fine Sampling Beam')
line([80 80],[20 120],'Color','r')
axis([55 110 45 100])
colorbar
figure
subplot(2,1,1)
imagesc((matRad_calc_00.physicalDose(:,:,80)-matRadFS_calc_00.physicalDose(:,:,80)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
line([80 80],[20 120],'Color','r')
title('Percentage difference')
axis([55 110 45 100])
colorbar
subplot(2,1,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],80,1,'global
',cst);
line([80 80],[20 120],'Color','r')
axis([55 110 45 100])
colorbar
```



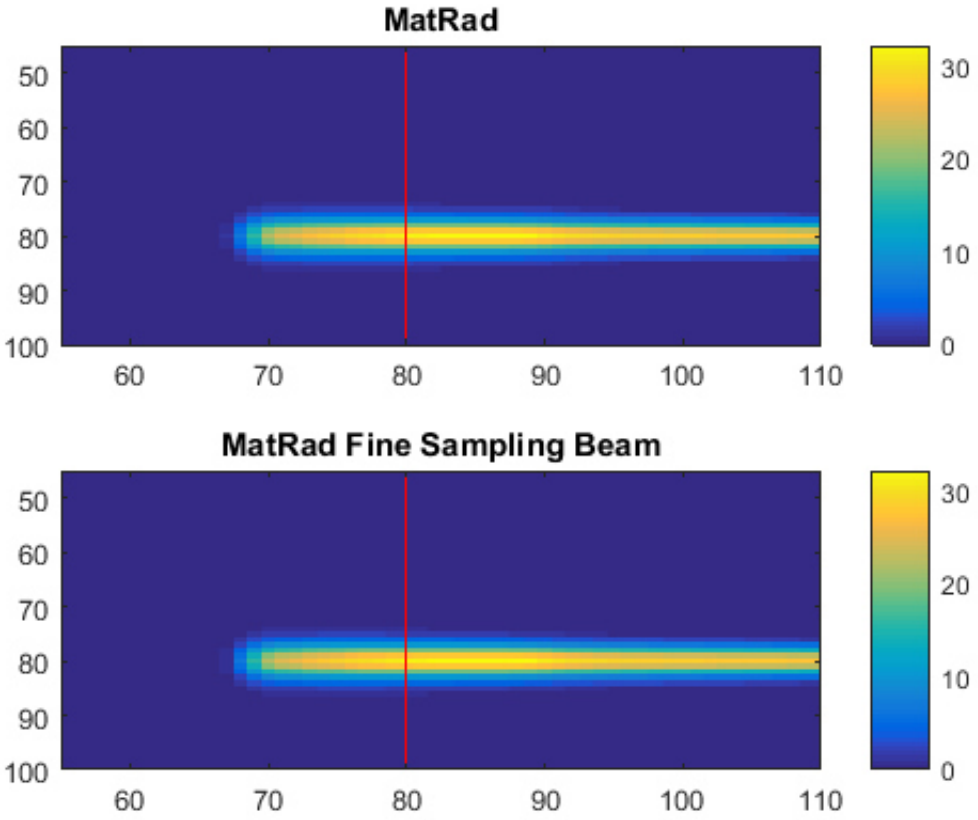


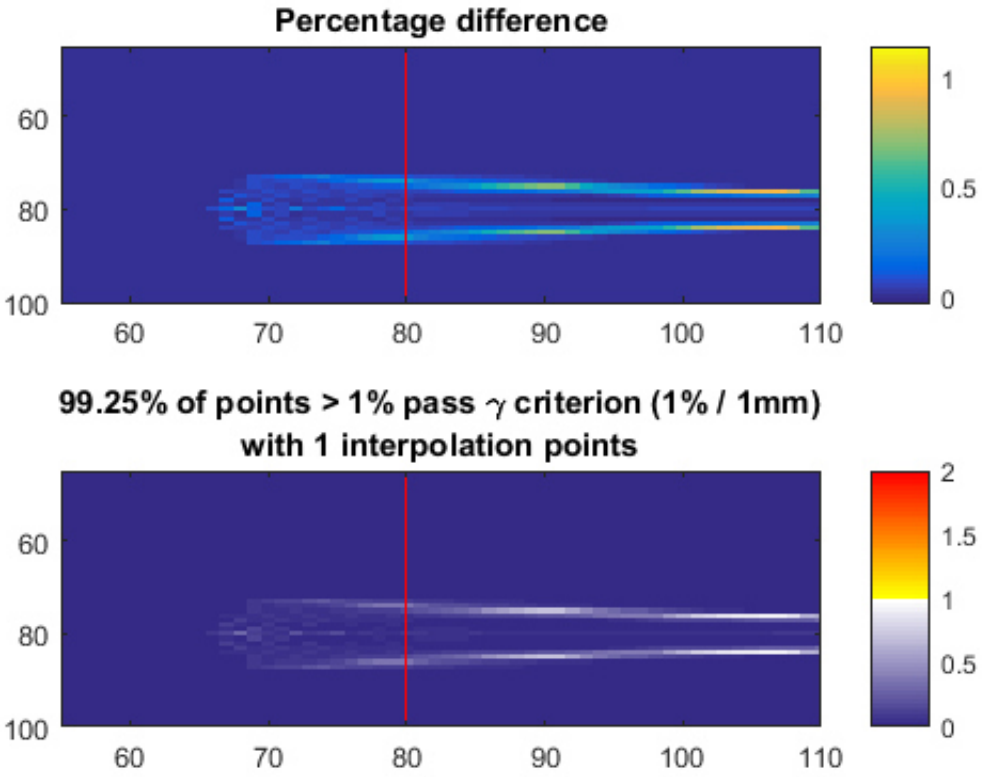





```
matRad_calc_00 = matRad_calcDoseDirect_old(ct,stf3,pln,cst,resultGUI.w);
matRadFS_calc_00 = matRad_calcDoseDirect(ct,stf3,pln,cst,resultGUI.w);
figure
subplot(2,1,1)
imagesc(matRad_calc_00.physicalDose(:,:,80))
```

```
line([80 80],[20 120],'Color','r')
title('MatRad')
axis([55 110 45 100])
colorbar
subplot(2,1,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,80))
title('MatRad Fine Sampling Beam')
line([80 80],[20 120],'Color','r')
axis([55 110 45 100])
colorbar
figure
subplot(2,1,1)
imagesc((matRad_calc_00.physicalDose(:,:,80)-matRadFS_calc_00.physicalDose(:,:,80)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
line([80 80],[20 120],'Color','r')
title('Percentage difference')
axis([55 110 45 100])
colorbar
subplot(2,1,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],80,1,'global
',cst);
line([80 80],[20 120],'Color','r')
axis([55 110 45 100])
colorbar
```



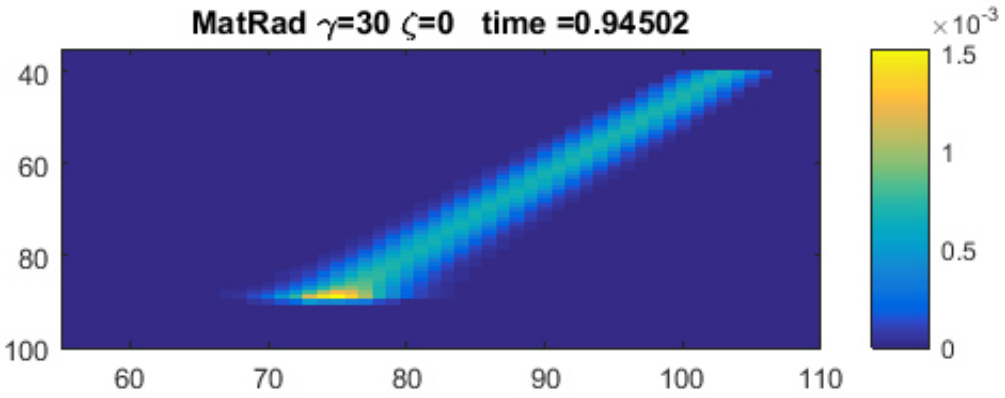


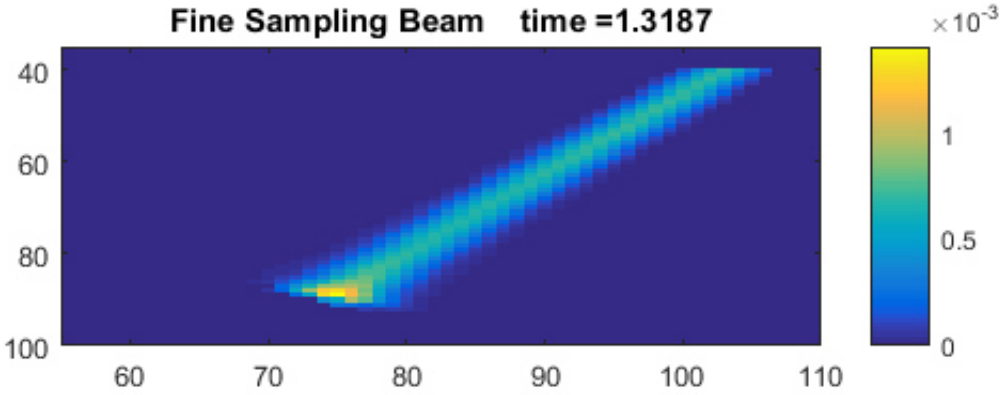
Results with inhomogeneous Phantom at different angles

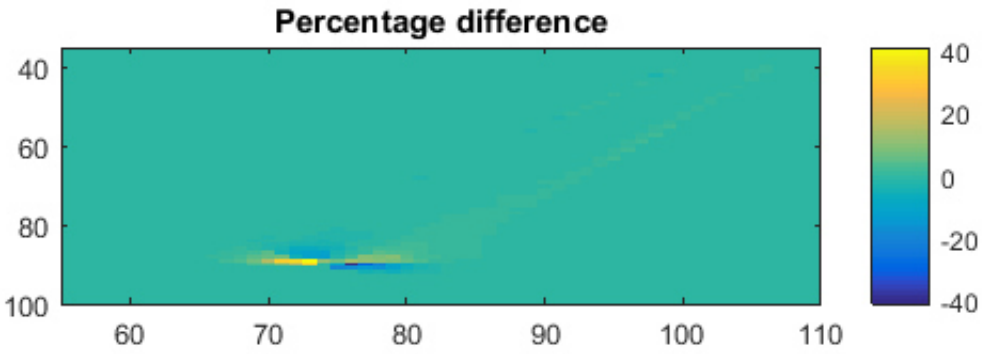
Here we show the result for a beam (1 ray) entering the area with certain couch angle (indicated with "\zeta") and gantry angle (indicated with "\gamma") in the previous seen phantoms. Without inhomogeneities.

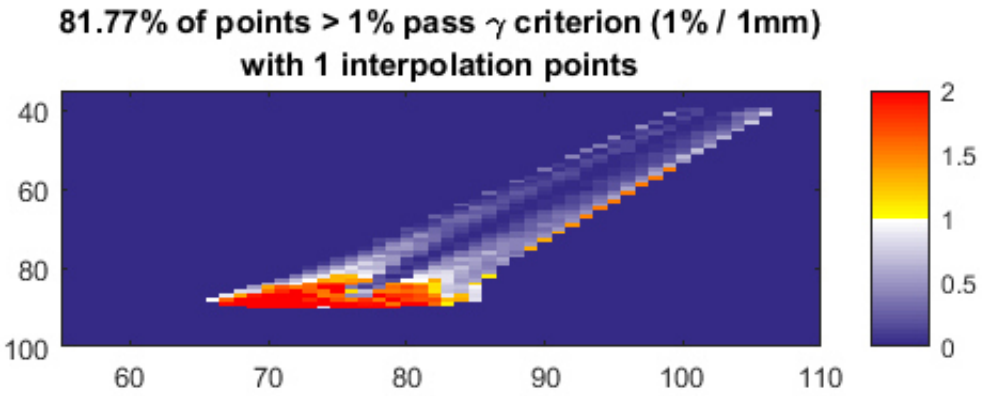
```
load('BoxTest3_30_0.mat')

tic
matRad_calc_00 = matRad_calcDoseDirect_old(ct2,stf2,pln,cst,resultGUI2.w);
t1 = toc
tic
matRadFS_calc_00 = matRad_calcDoseDirect(ct2,stf2,pln,cst,resultGUI2.w);
t2 = toc
figure
subplot(2,1,1)
imagesc(matRad_calc_00.physicalDose(:,:,80))
title(strcat('MatRad \gamma=30 \zeta=0   time = ', num2str(t1)))
axis([55 110 35 100])
colorbar
subplot(2,1,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,80))
title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
axis([55 110 35 100])
colorbar
figure
subplot(2,1,1)
imagesc((matRad_calc_00.physicalDose(:,:,80)-matRadFS_calc_00.physicalDose(:,:,80)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
title('Percentage difference')
axis([55 110 35 100])
colorbar
subplot(2,1,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
```

```
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],80,1,'global
',cst);
axis([55 110 35 100])
colorbar
```

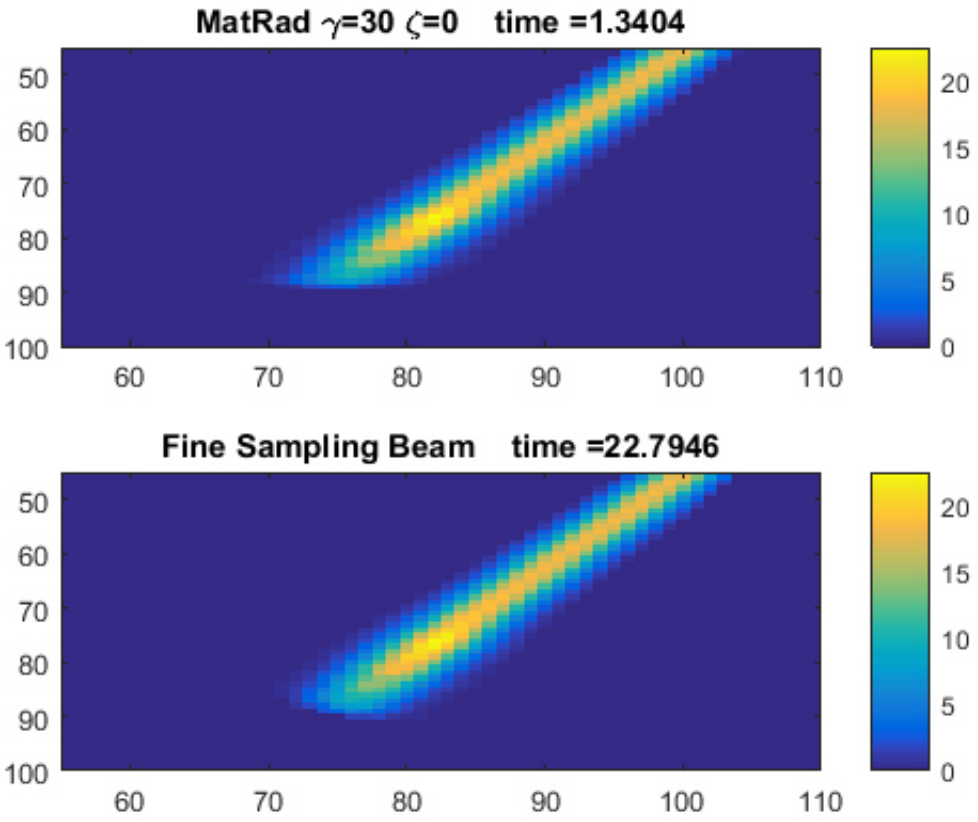


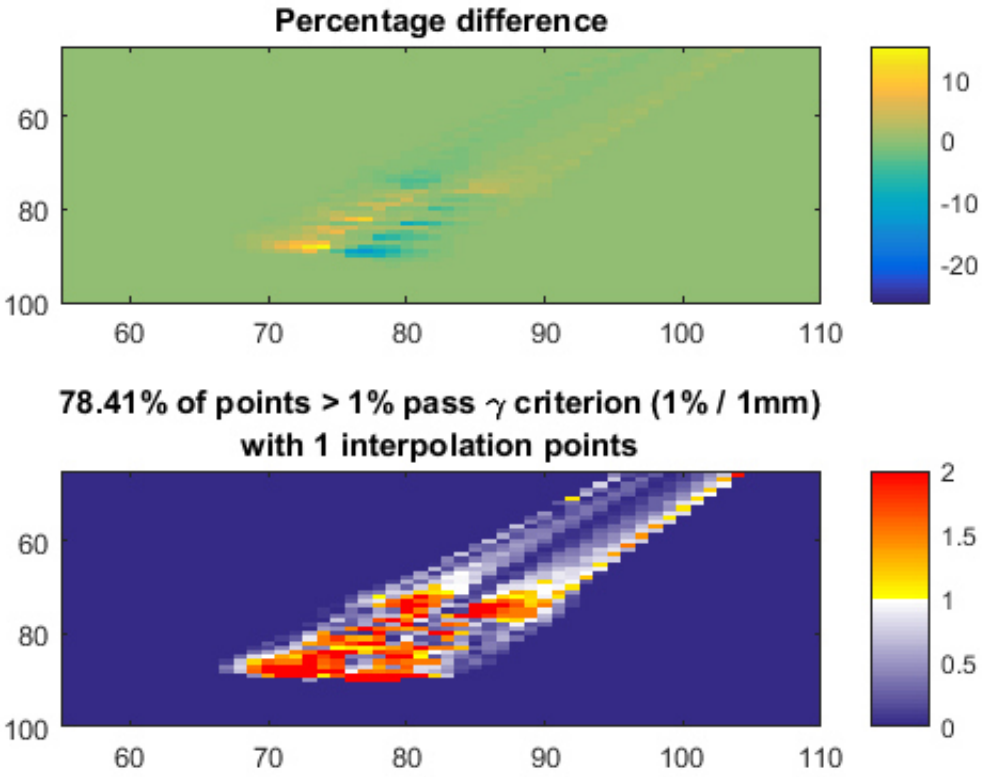






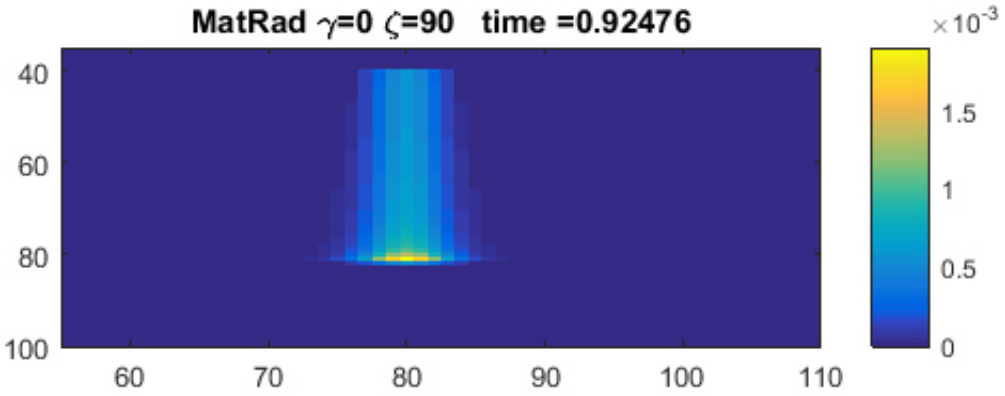
```
tic
matRad_calc_00 = matRad_calcDoseDirect_old(ct2,stf3,pln,cst,resultGUI3.w);
t1 = toc
tic
matRadFS_calc_00 = matRad_calcDoseDirect(ct2,stf3,pln,cst,resultGUI3.w);
t2 = toc
figure
subplot(2,1,1)
imagesc(matRad_calc_00.physicalDose(:,:,80))
title(strcat('MatRad \gamma=30 \zeta=0    time = ', num2str(t1)))
axis([55 110 45 100])
colorbar
subplot(2,1,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,80))
title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
axis([55 110 45 100])
colorbar
figure
subplot(2,1,1)
imagesc((matRad_calc_00.physicalDose(:,:,80)-matRadFS_calc_00.physicalDose(:,:,80)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
title('Percentage difference')
axis([55 110 45 100])
colorbar
subplot(2,1,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],80,1,'global
',cst);
axis([55 110 45 100])
colorbar
```

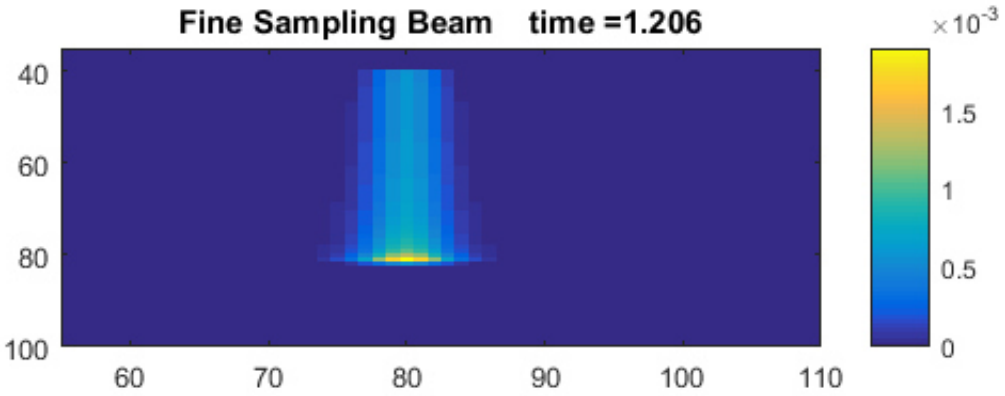


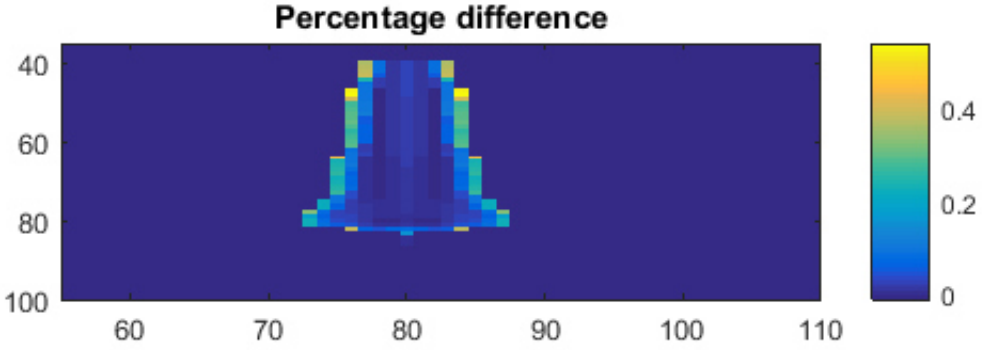


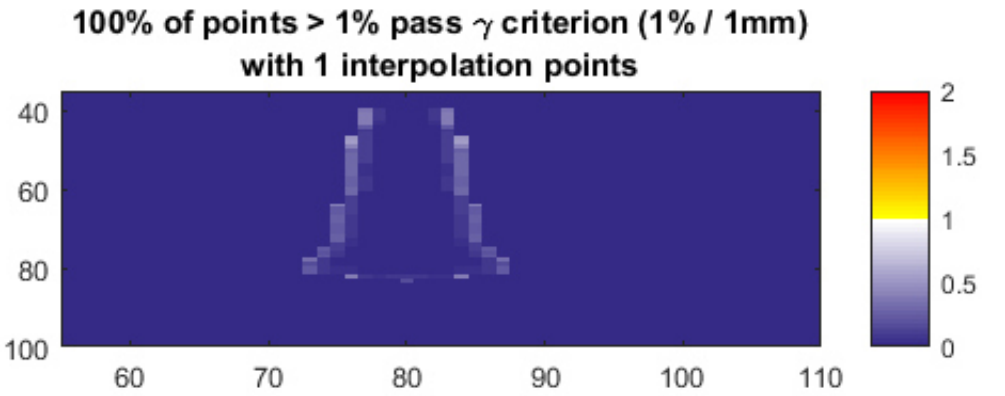

```
load('BoxTest3_0_90.mat')

tic
matRad_calc_00 = matRad_calcDoseDirect_old(ct2,stf2,pln,cst,resultGUI2.w);
t1 = toc
tic
matRadFS_calc_00 = matRad_calcDoseDirect(ct2,stf2,pln,cst,resultGUI2.w);
t2 = toc
[x0,y0,z0] = ind2sub(ct.cubeDim, find(matRad_calc_00.physicalDose == max(max(max(matRad_ca
lc_00.physicalDose)))));
figure
subplot(2,1,1)
imagesc(matRad_calc_00.physicalDose(:,:,z0))
title(strcat('MatRad \gamma=0 \zeta=90   time = ', num2str(t1)))
axis([55 110 35 100])
colorbar
subplot(2,1,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,z0))
title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
axis([55 110 35 100])
colorbar
figure
subplot(2,1,1)
imagesc((matRad_calc_00.physicalDose(:,:,z0)-matRadFS_calc_00.physicalDose(:,:,z0)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
title('Percentage difference')
axis([55 110 35 100])
colorbar
subplot(2,1,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],z0,1,'global
',cst);
axis([55 110 35 100])
```

```
colorbar
```



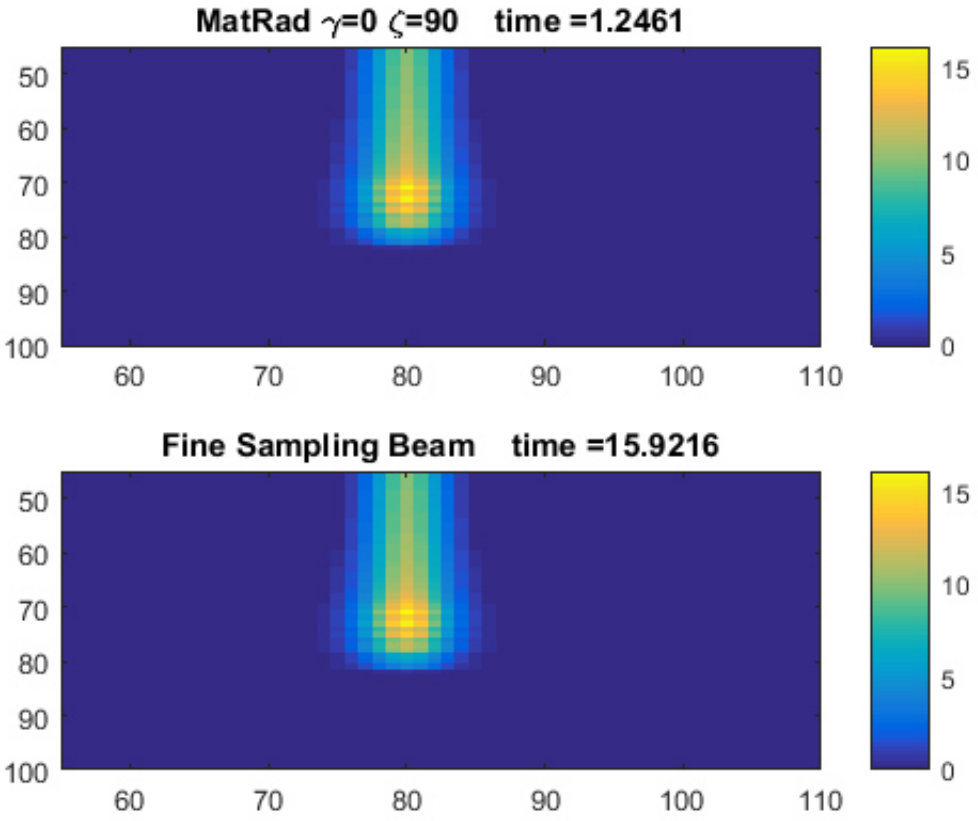


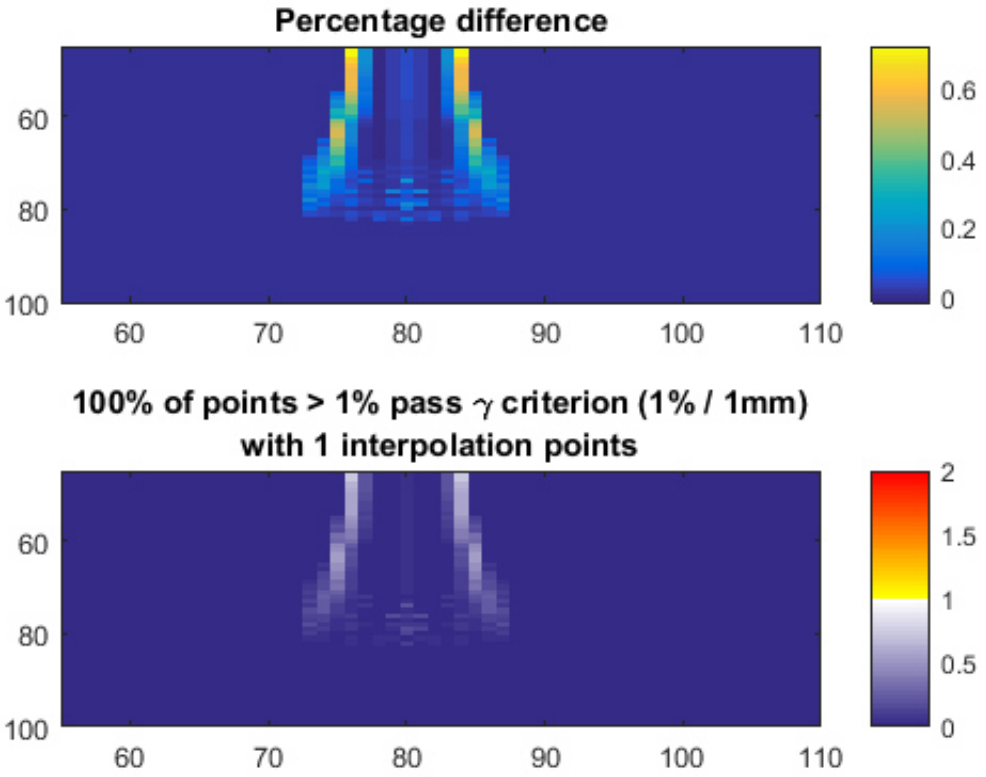




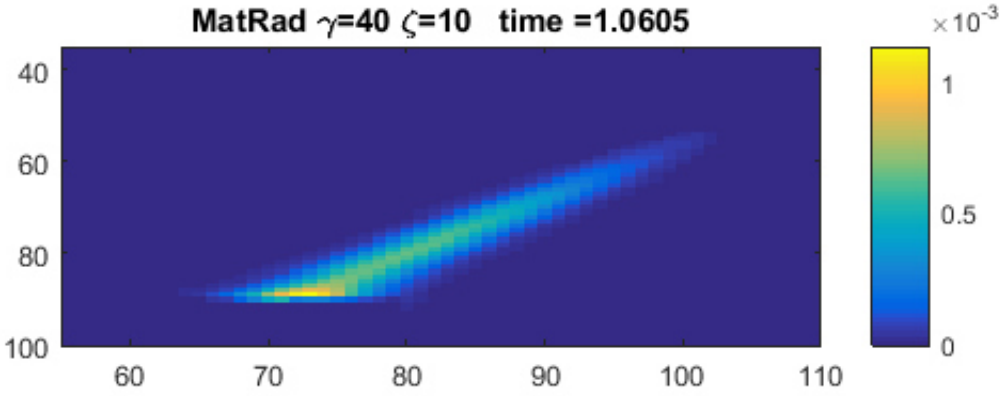

```
tic
matRad_calc_00 = matRad_calcDoseDirect_old(ct2,stf3,pln,cst,resultGUI3.w);
```

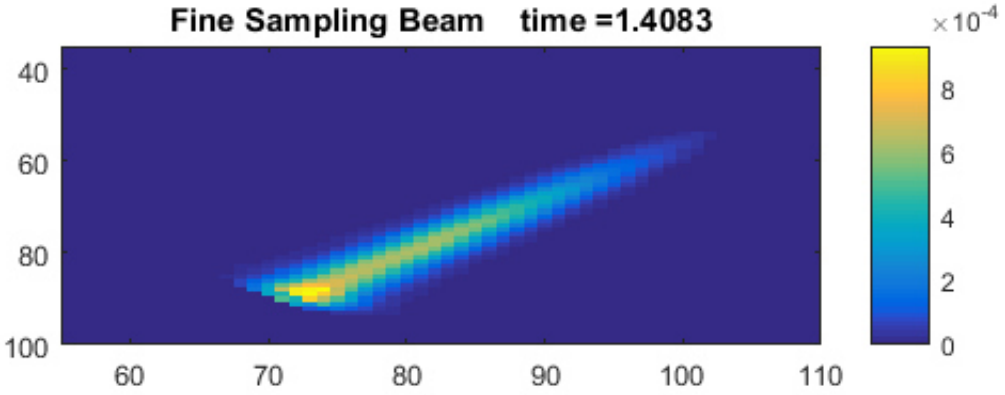
```
t1 = toc
tic
matRadFS_calc_00 = matRad_calcDoseDirect(ct2,stf3,pln,cst,resultGUI3.w);
t2 = toc
[x0,y0,z0] = ind2sub(ct.cubeDim, find(matRad_calc_00.physicalDose == max(max(max(matRad_ca
lc_00.physicalDose)))));
figure
subplot(2,1,1)
imagesc(matRad_calc_00.physicalDose(:,:,z0))
title(strcat('MatRad \gamma=0 \zeta=90    time = ', num2str(t1)))
axis([55 110 45 100])
colorbar
subplot(2,1,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,z0))
title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
axis([55 110 45 100])
colorbar
figure
subplot(2,1,1)
imagesc((matRad_calc_00.physicalDose(:,:,z0)-matRadFS_calc_00.physicalDose(:,:,z0)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
title('Percentage difference')
axis([55 110 45 100])
colorbar
subplot(2,1,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],z0,1,'global
',cst);
axis([55 110 45 100])
colorbar
```

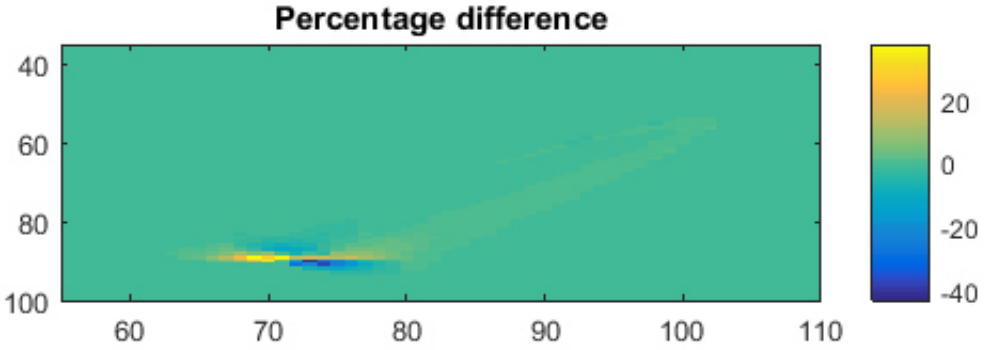


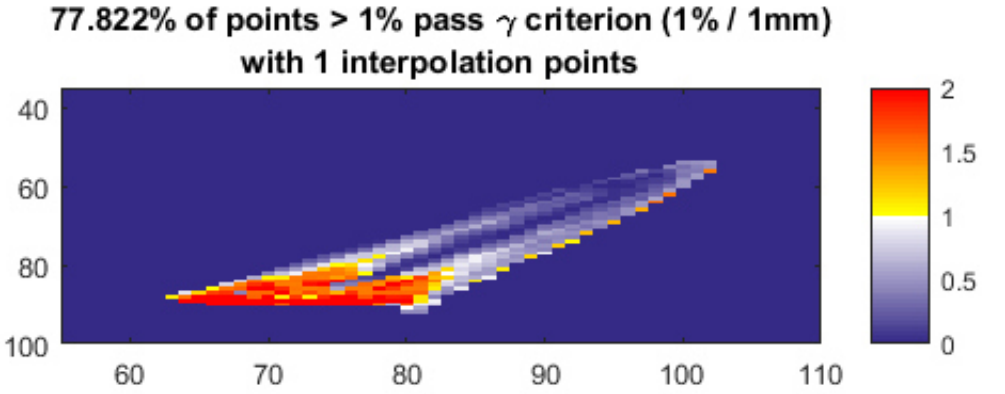



```
load('BoxTest3.mat')

tic
matRad_calc_00 = matRad_calcDoseDirect_old(ct2,stf5,pln,cst,resultGUI2.w);
t1 = toc
tic
matRadFS_calc_00 = matRad_calcDoseDirect(ct2,stf5,pln,cst,resultGUI2.w);
t2 = toc
figure
subplot(2,1,1)
imagesc(matRad_calc_00.physicalDose(:,:,80))
title(strcat('MatRad \gamma=40 \zeta=10   time = ', num2str(t1)))
axis([55 110 35 100])
colorbar
subplot(2,1,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,80))
title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
axis([55 110 35 100])
colorbar
figure
subplot(2,1,1)
imagesc((matRad_calc_00.physicalDose(:,:,80)-matRadFS_calc_00.physicalDose(:,:,80)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
title('Percentage difference')
axis([55 110 35 100])
colorbar
subplot(2,1,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],80,1,'global
',cst);
axis([55 110 35 100])
colorbar
```







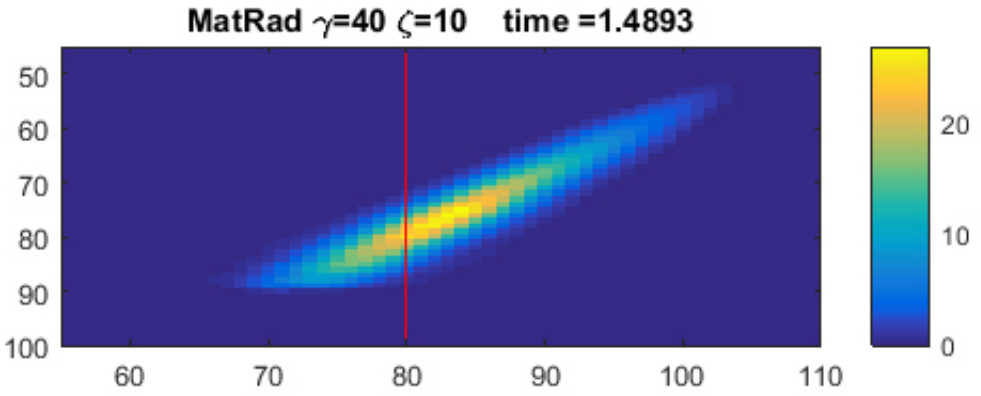


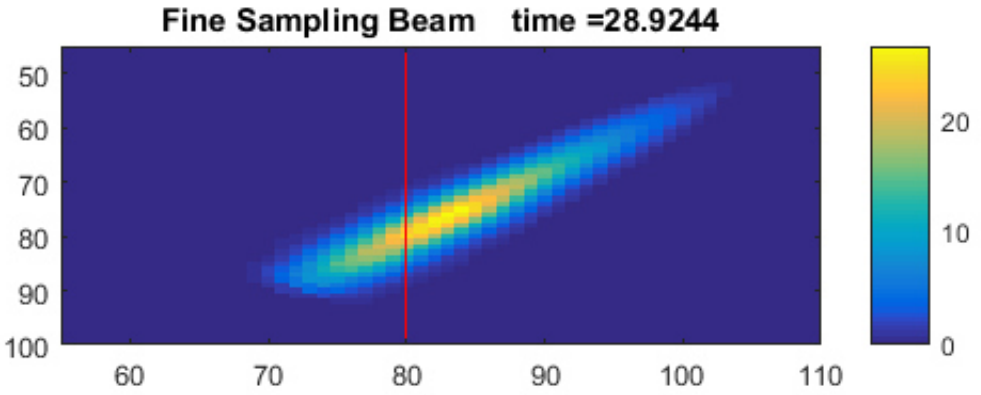

```
tic
matRad_calc_00 = matRad_calcDoseDirect_old(ct2,stf4,pln,cst,resultGUI.w);
t1 = toc
tic
matRadFS_calc_00 = matRad_calcDoseDirect(ct2,stf4,pln,cst,resultGUI.w);
```

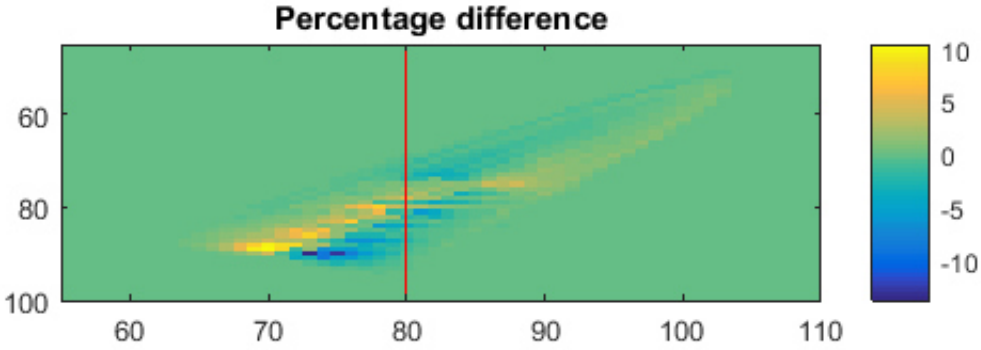
```
t2 = toc
figure
subplot(2,1,1)
imagesc(matRad_calc_00.physicalDose(:,:,80))
line([80 80],[20 120],'Color','r')
title(strcat('MatRad \gamma=40 \zeta=10    time = ', num2str(t1)))
axis([55 110 45 100])
colorbar
subplot(2,1,2)
imagesc(matRadFS_calc_00.physicalDose(:,:,80))
title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
line([80 80],[20 120],'Color','r')
axis([55 110 45 100])
colorbar
figure
subplot(2,1,1)
imagesc((matRad_calc_00.physicalDose(:,:,80)-matRadFS_calc_00.physicalDose(:,:,80)) ./max(
max(max(matRad_calc_00.physicalDose))).*100)
line([80 80],[20 120],'Color','r')
title('Percentage difference')
axis([55 110 45 100])
colorbar
subplot(2,1,2)
[gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_00.physicalDose,matRadFS
_calc_00.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],80,1,'global
',cst);
line([80 80],[20 120],'Color','r')
axis([55 110 45 100])
colorbar



% %% Double wedges Phantom
% % Here we have a figure representing the double wedges phantom on witch the
% % experiment was run.
%
% addpath('E:\Pezzano\MATLAB\Pezz\HIT Data\')
% load('HITpoint_workspace.mat')
% figure
% imagesc(ct.cube{1}(:,:,round(pln.isoCenter(3)/10)))
% text(50,250,'Water (1)','Color','k','FontSize',16)
% text(200,150,'PMMA (1.165)','Color','k','FontSize',16)
% text(400,400,'Air (0)','Color','w','FontSize',16)
% arrow([450 250], [350 250], 'Beam')
%
% %% Test on HIT double wedges Phantom for one sampling beam
% % Here we compare the results for the simulation, made with MatRad, Syngo
% % and the new Fine Sampling Beam method, on the double wedges
% % phantom for one sampling beam.
%
% tic
% matRad_calc_dw_p = matRad_calcDoseDirect_old(ct,stf,pln,cst,resultGUI.w);
% t1 = toc
% tic
% matRadFS_calc_dw_p = matRad_calcDoseDirect(ct,stf,pln,cst,resultGUI.w);
% t2 = toc
% figure
% subplot(3,1,1)
% imagesc(matRad_calc_dw_p.physicalDose(:,:,round(pln.isoCenter(3)/10)))
% title(strcat('MatRad    time = ', num2str(t1)))
% axis([50 260 190 300])
```

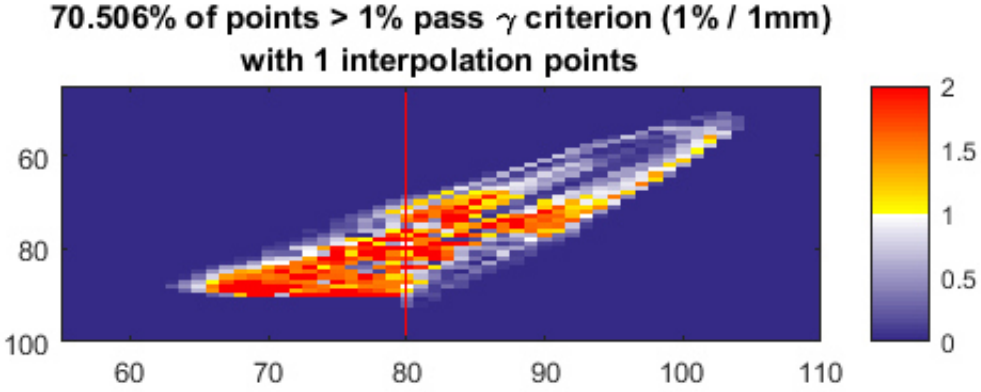
```
% colorbar
% subplot(3,1,2)
% imagesc(matRadFS_calc_dw_p.physicalDose(:,:,round(pln.isoCenter(3)/10)))
% title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
% axis([50 260 190 300])
% colorbar
% subplot(3,1,3)
% imagesc(resultGUI.physicalDose(:,:,round(pln.isoCenter(3)/10)))
% title('Syngo')
% axis([50 260 190 300])
% colorbar
% figure
% subplot(2,1,1)
% imagesc((matRad_calc_dw_p.physicalDose(:,:,round(pln.isoCenter(3)/10))-resultGUI.physica
lDose(:,:,round(pln.isoCenter(3)/10))) ./max(max(max(matRad_calc_dw_p.physicalDose))).*100
)
% title('Percentage difference between MatRad and Syngo')
% axis([50 260 190 300])
% colorbar
% subplot(2,1,2)
% [gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_dw_p.physicalDose,resu
ltGUI.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],round(pln.isoCe
nter(3)/10),1,'global',cst);
% axis([50 260 190 300])
% colorbar
% figure
% subplot(2,1,1)
% imagesc((matRad_calc_dw_p.physicalDose(:,:,round(pln.isoCenter(3)/10))-matRadFS_calc_dw_
p.physicalDose(:,:,round(pln.isoCenter(3)/10))) ./max(max(max(matRad_calc_dw_p.physicalDos
e))).*100)
% title('Percentage difference between MatRad and FSB')
% axis([50 260 190 300])
% colorbar
% subplot(2,1,2)
% [gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_dw_p.physicalDose,matR
adFS_calc_dw_p.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],round(
pln.isoCenter(3)/10),1,'global',cst);
% axis([50 260 190 300])
% colorbar
%
%
% % save('HIT_dw_test1_point','matRad_calc_dw_p','matRadFS_calc_dw_p')
%
% %% Test on HIT double wedges Phantom
% % Here we compare the full simulation made with MatRad and the simulation made
% % with the Fine Sampling Algorithm for the double wedges phantom.
%
% load('HITcube_workspace.mat')
% load('HIT_dw_test1.mat')
%
% % tic
% % matRad_calc_dw = matRad_calcDoseDirect_old(ct,stf,pln,cst,resultGUI.w);
% % t1 = toc
% % tic
% % matRadFS_calc_dw = matRad_calcDoseDirect(ct,stf,pln,cst,resultGUI.w);
% % t2 = toc
% figure
% subplot(3,1,1)
% imagesc(matRad_calc_dw.physicalDose(:,:,round(pln.isoCenter(3)/10)))
% title(strcat('MatRad    time = ', num2str(t1)))
% axis([50 260 190 300])
```

```
% colorbar
% subplot(3,1,2)
% imagesc(matRadFS_calc_dw.physicalDose(:,:,round(pln.isoCenter(3)/10)))
% title(strcat('Fine Sampling Beam    time = ', num2str(t2)))
% axis([50 260 190 300])
% colorbar
% subplot(3,1,3)
% imagesc(resultGUI.physicalDose(:,:,round(pln.isoCenter(3)/10)))
% title('Syngo')
% axis([50 260 190 300])
% colorbar
% figure
% subplot(2,1,1)
% imagesc((matRad_calc_dw.physicalDose(:,:,round(pln.isoCenter(3)/10))-resultGUI.physicalD
ose(:,:,round(pln.isoCenter(3)/10))) ./max(max(max(matRad_calc_dw.physicalDose))).*100)
% title('Percentage difference between MR and Syngo')
% axis([50 260 190 300])
% colorbar
% subplot(2,1,2)
% [gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_dw.physicalDose,result
GUI.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],round(pln.isoCent
er(3)/10),1,'global',cst);
% axis([50 260 190 300])
% colorbar
% figure
% subplot(2,1,1)
% imagesc((matRad_calc_dw.physicalDose(:,:,round(pln.isoCenter(3)/10))-matRadFS_calc_dw.ph
ysicalDose(:,:,round(pln.isoCenter(3)/10))) ./max(max(max(matRad_calc_dw.physicalDose))).*
100)
% title('Percentage difference between MR and FSB')
% axis([50 260 190 300])
% colorbar
% subplot(2,1,2)
% [gammaCube,gammaPassRateCell] = matRad_gammaIndex_NEW(matRad_calc_dw.physicalDose,matRad
FS_calc_dw.physicalDose,[ct.resolution.x ct.resolution.y ct.resolution.z],[1 1],round(pln.
isoCenter(3)/10),1,'global',cst);
% axis([50 260 190 300])
% colorbar
%
% % save('HIT_dw_test1','matRad_calc_dw','matRadFS_calc_dw')
%
%
% %%
% % to be continued...
```









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