Clinical benefits using MapRT for extracranial non-coplanar treatment planning

– implementation in clinical routine and first results

Kirsten Hierholz, senior medical physicist

Gemeinsam fürs Leben.

Disclosures

Department for radiooncology and radiotherapy of Klinikum Darmstadt GmbH has a research agreement with VisionRT

This presentation is honored by VisionRT.

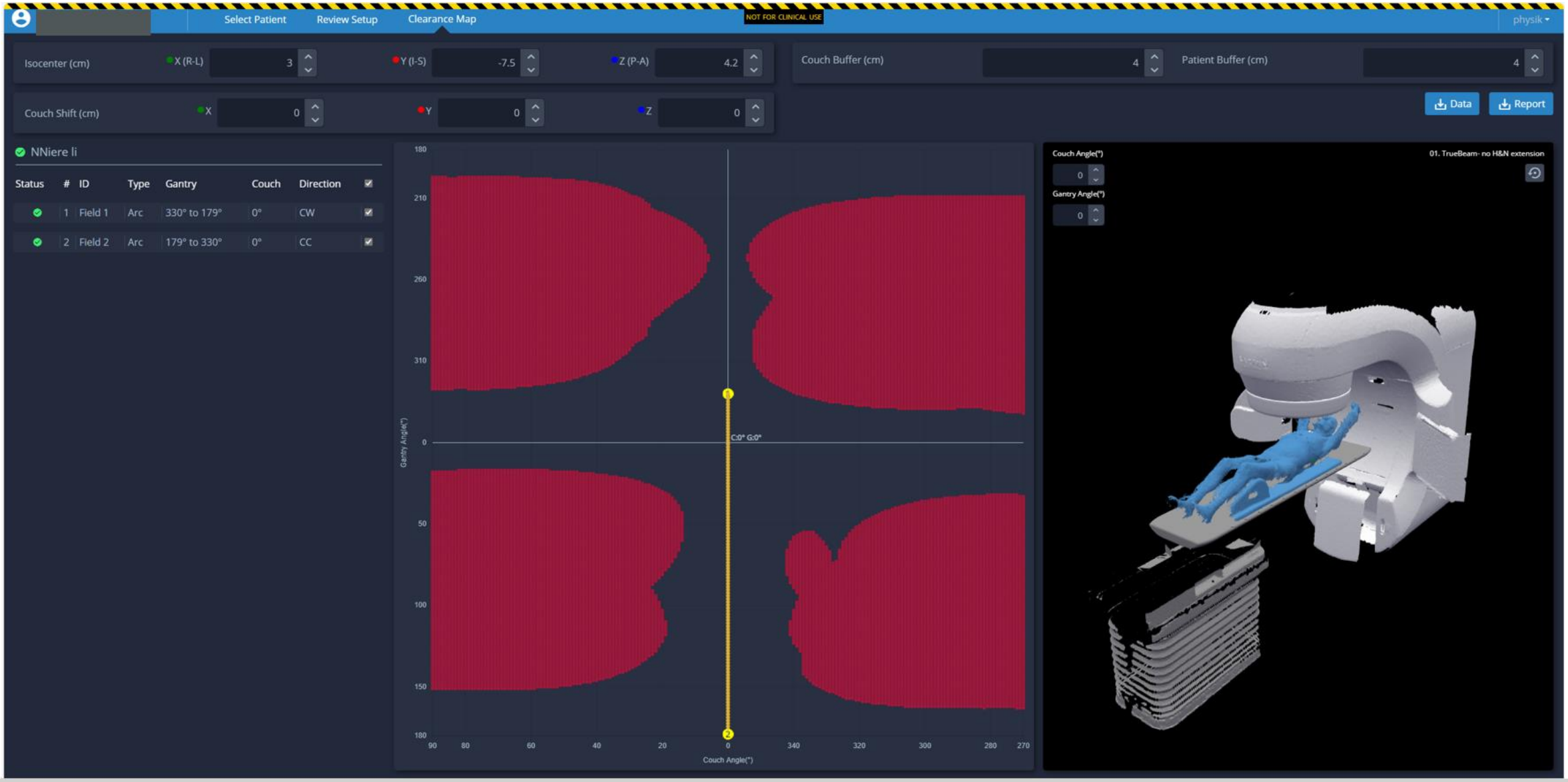
MapRT at Klinikum Darmstadt

Overview:

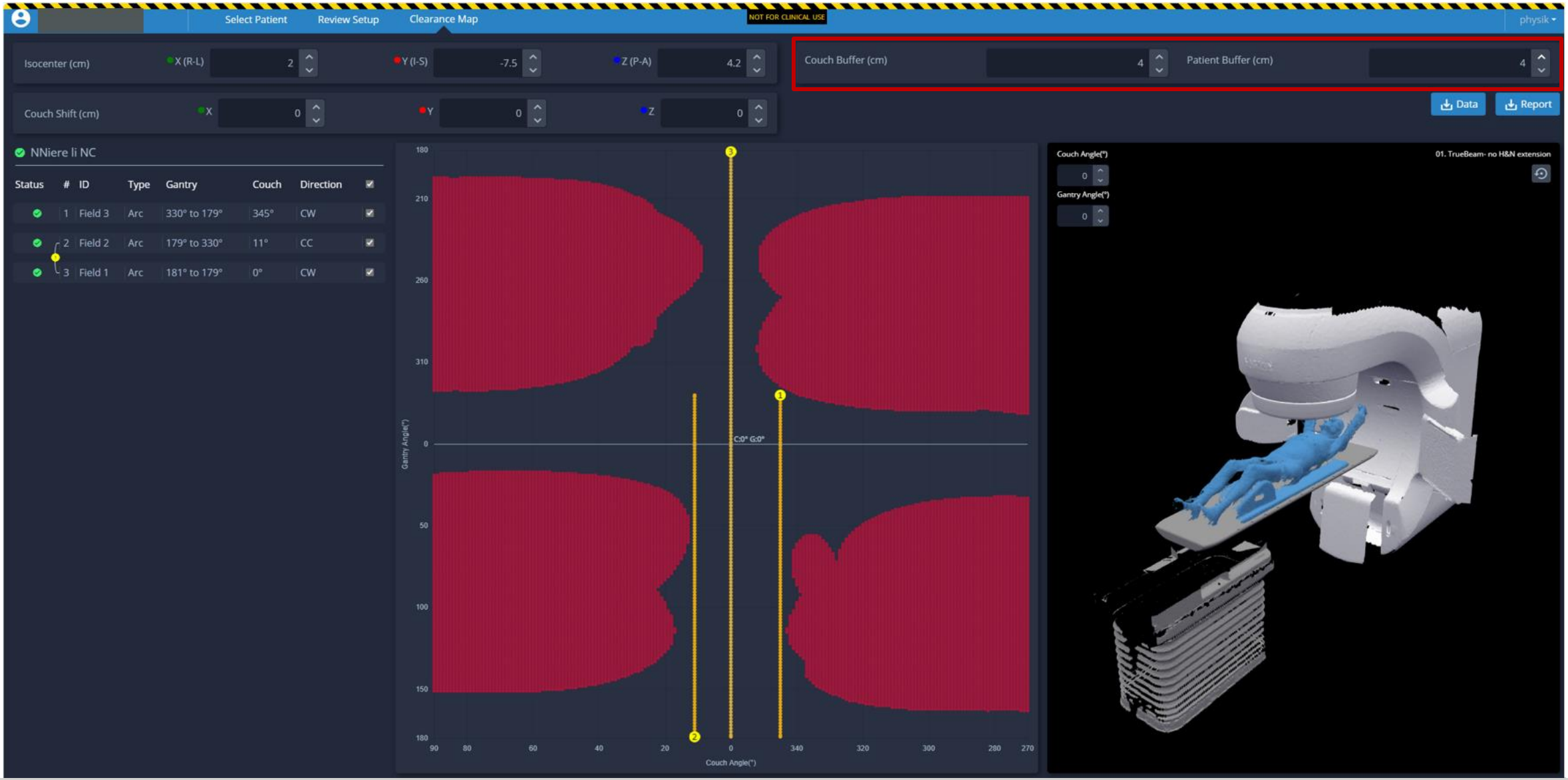
- how MapRT is used in our department
- advantages in dose distribution in non-coplanar treatment with MapRT
- clinical implementation of non coplanar treatment
- summary and next steps

MapRT at Klinikum Darmstadt

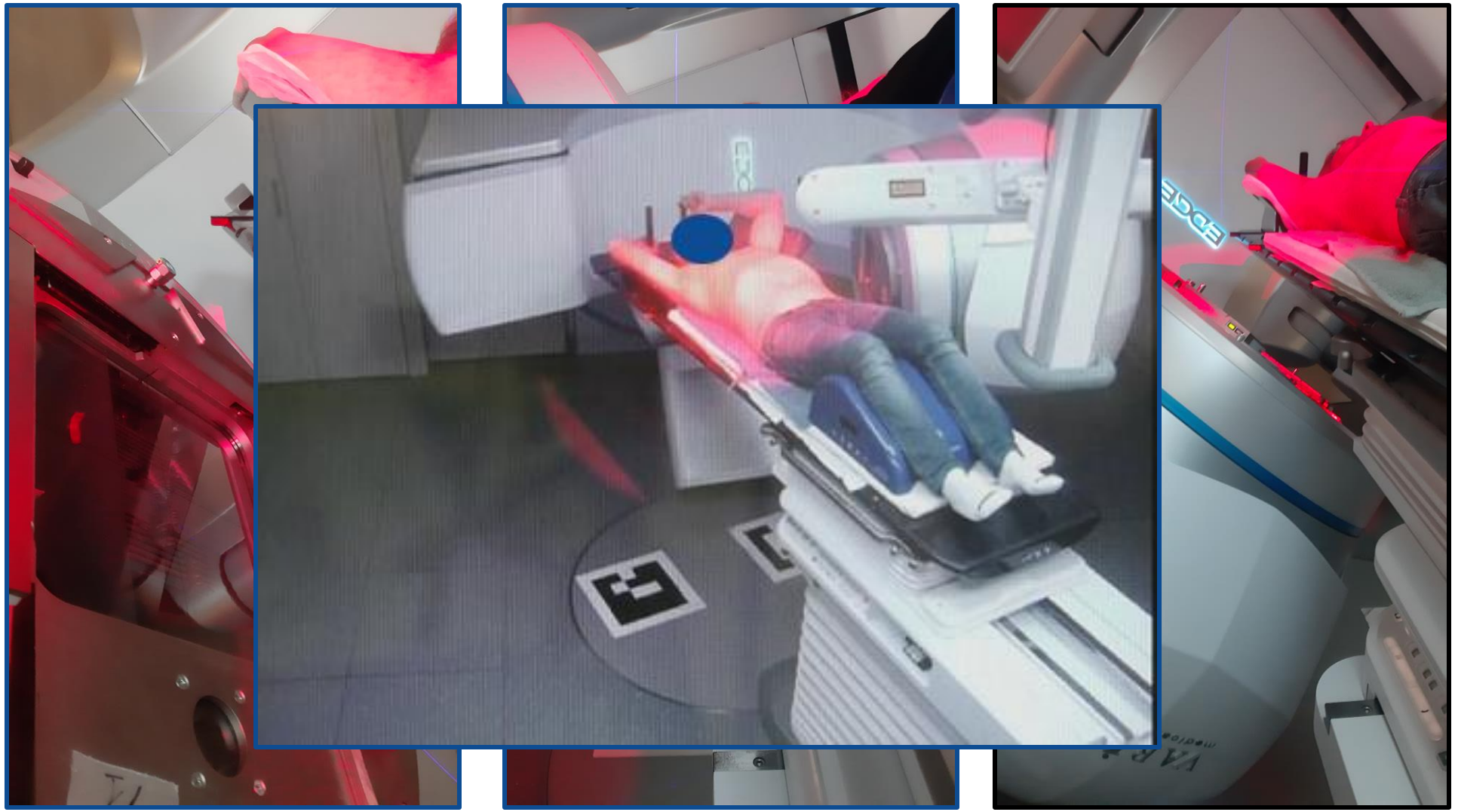
MapRT at Klinikum Darmstadt



MapRT at Klinikum Darmstadt



Influence of couch and patient buffer



MapRT at Klinikum Darmstadt

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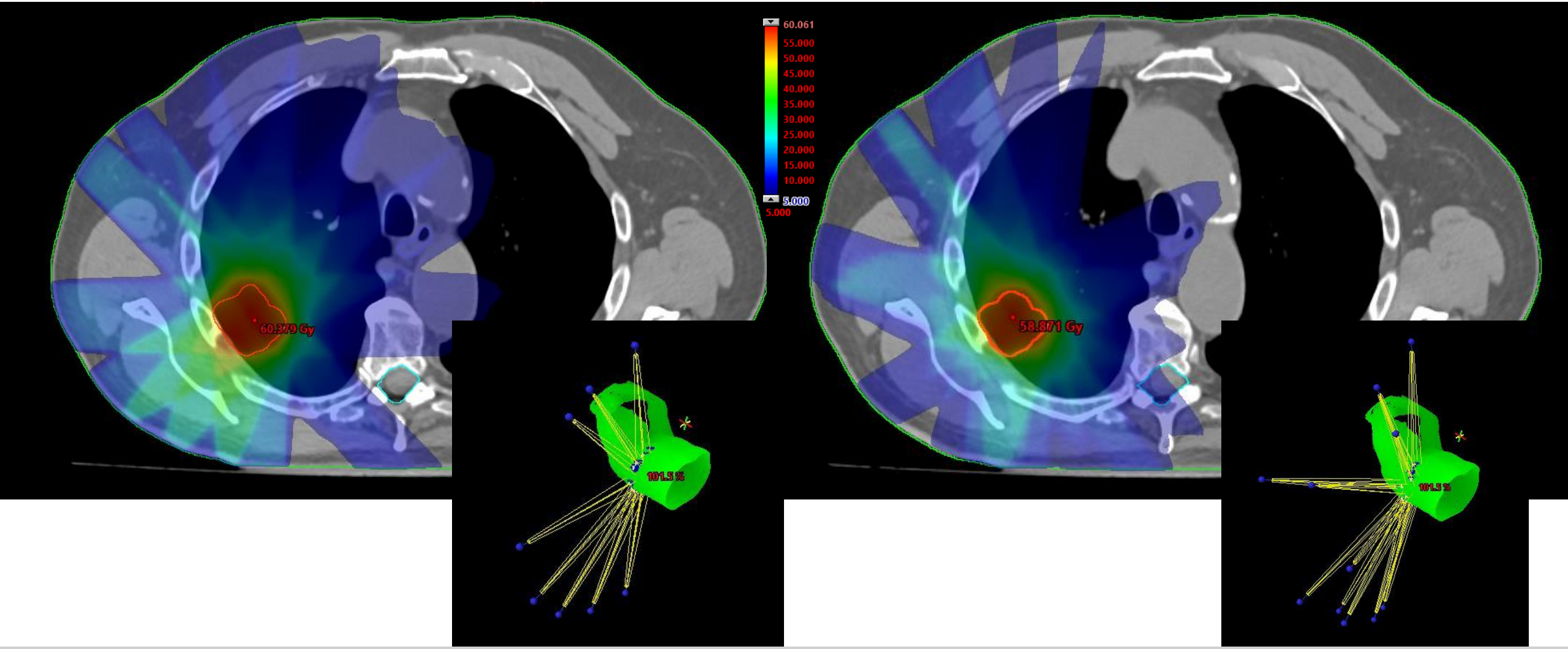
plan optimization using non-coplanar fields – SBRT lung

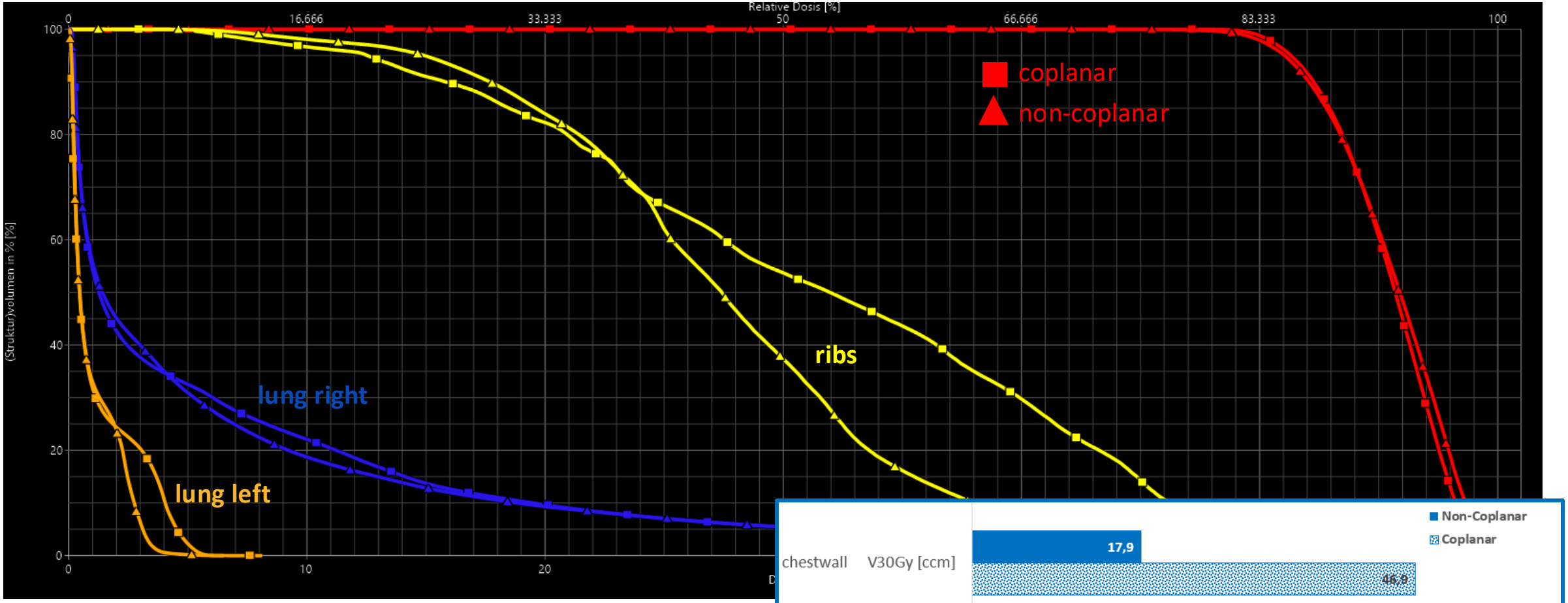
8 fixed fields coplanar

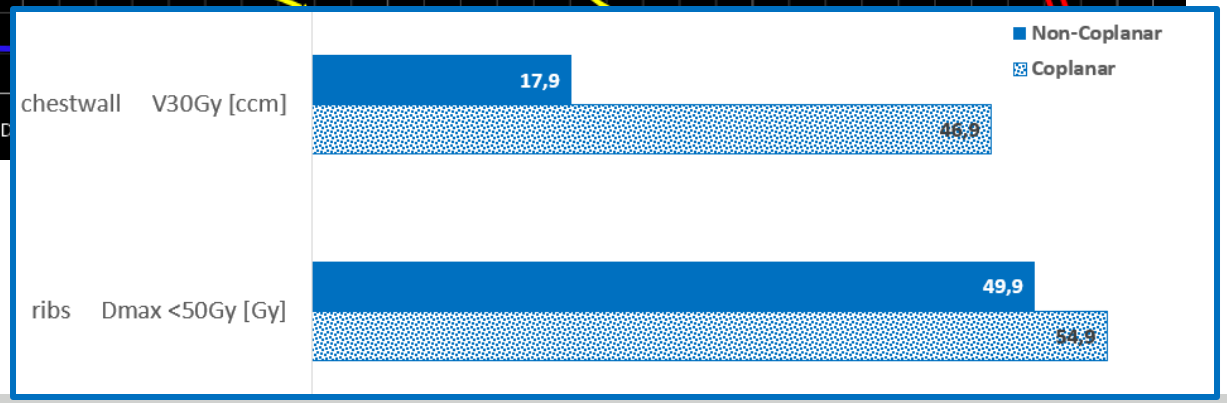
prescription: 4*12Gy [80%)

12 fixed fields - 7 non-coplanar



plan optimization using non-coplanar fields – SBRT lung



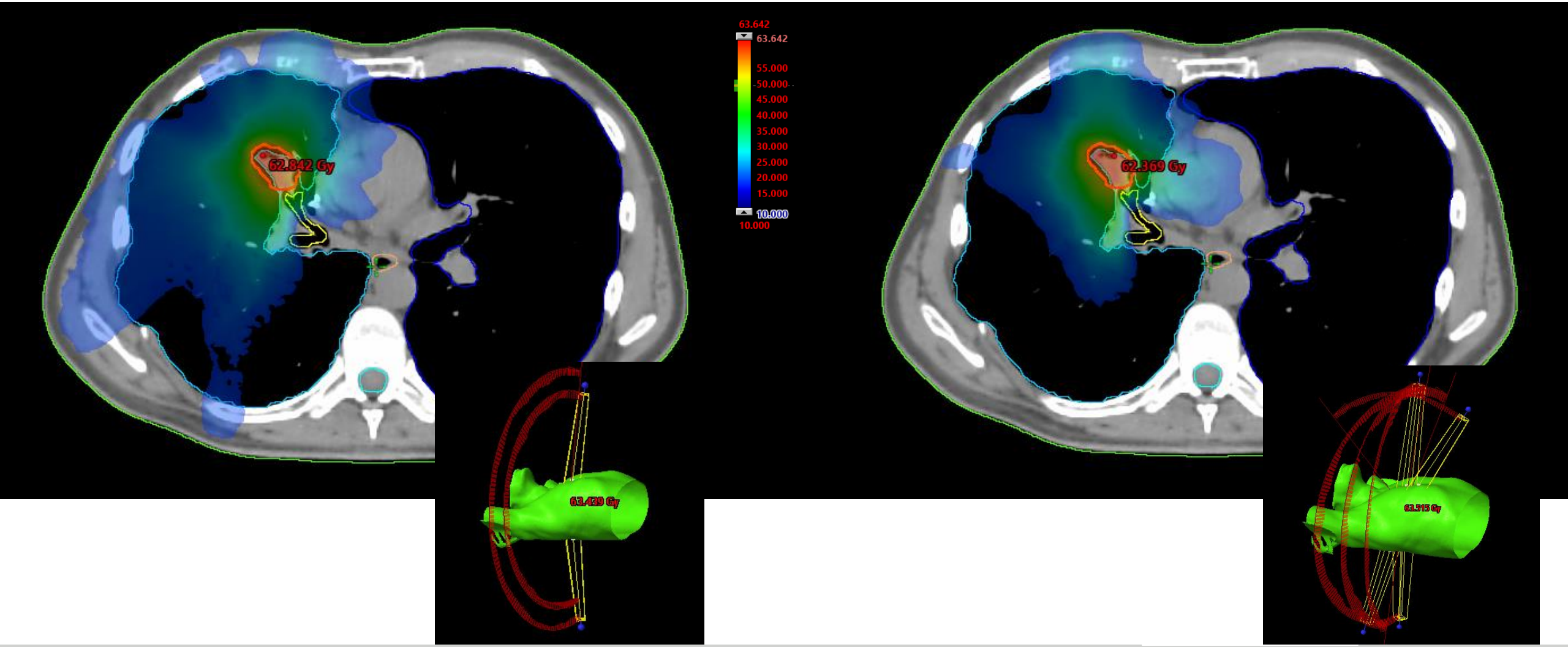


plan optimization using non-coplanar fields – SBRT lung

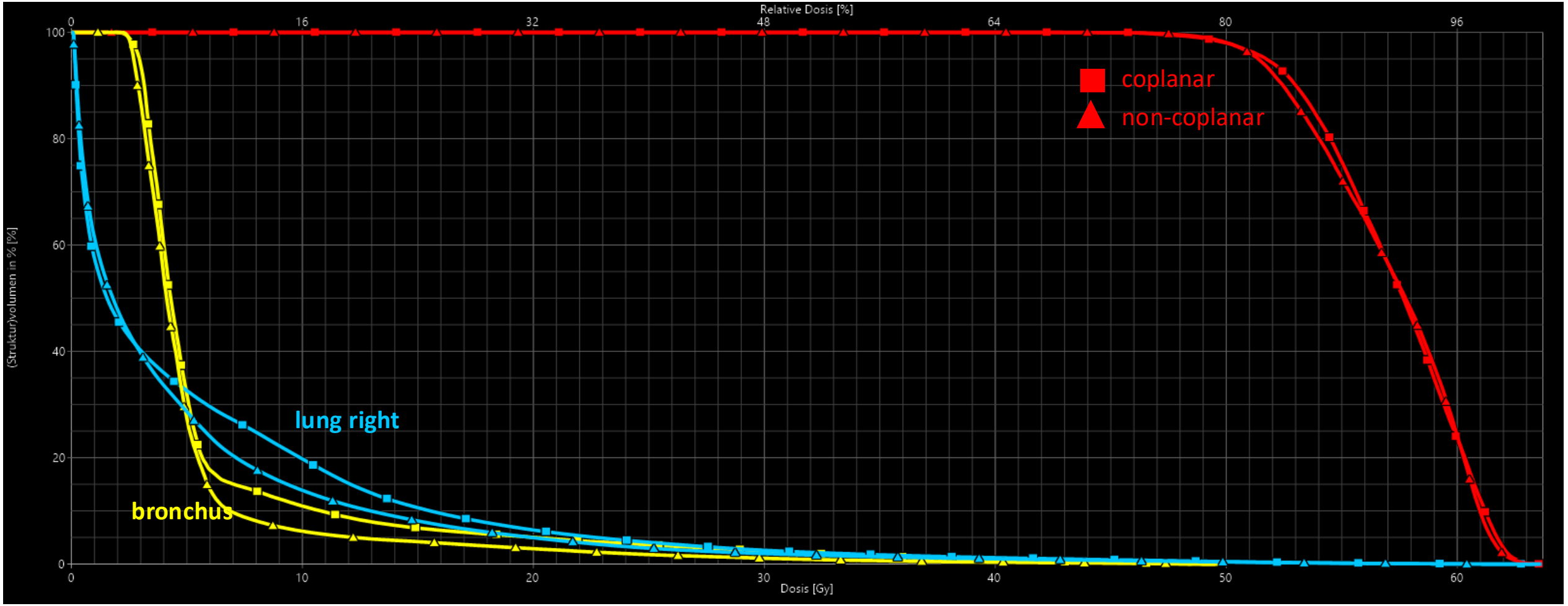
2 VMAT fields– coplanar

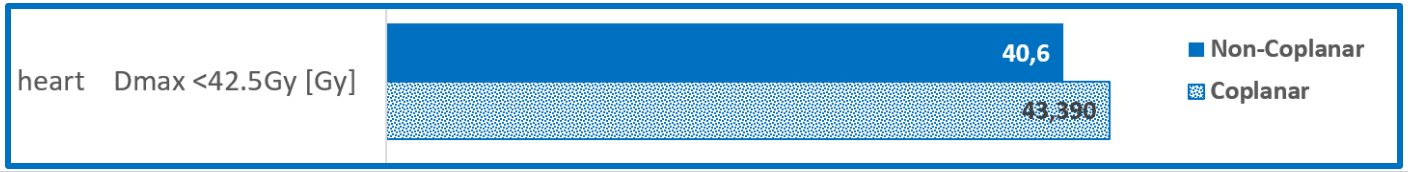
prescription: 10*5,0Gy (80%)

4 VMAT fields – 3 non-coplanar



plan optimization using non-coplanar fields – SBRT lung



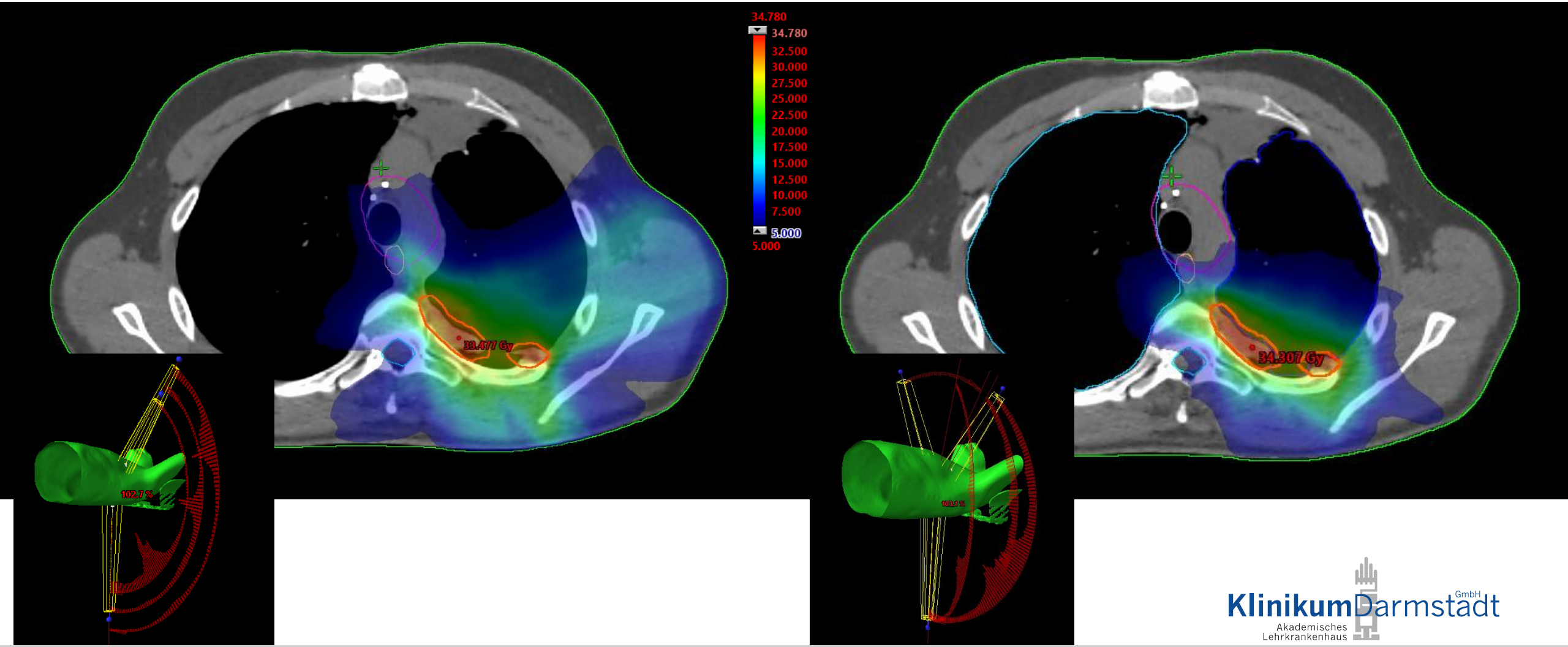


plan optimization using non-coplanar fields – metastasis of a thymoma

3 VMAT fields– coplanar

prescription: 3*9,0Gy (80%)

4 VMAT fields – 3 non-coplanar



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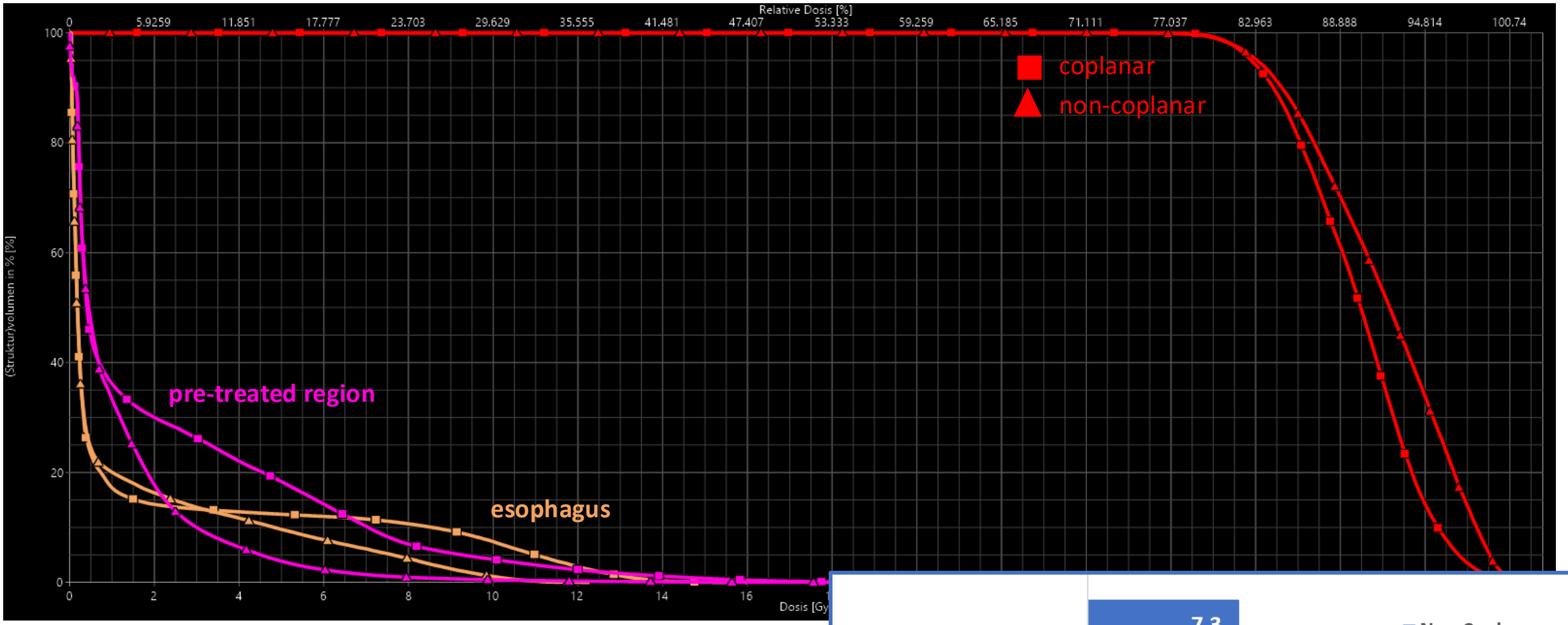
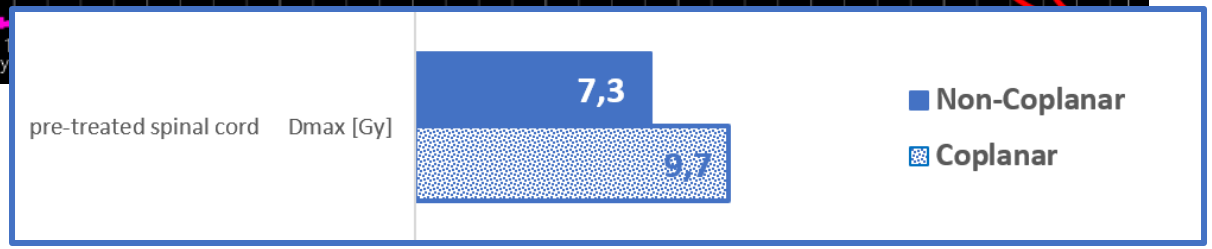
plan optimization using non-coplanar fields – metastasis of a thymoma



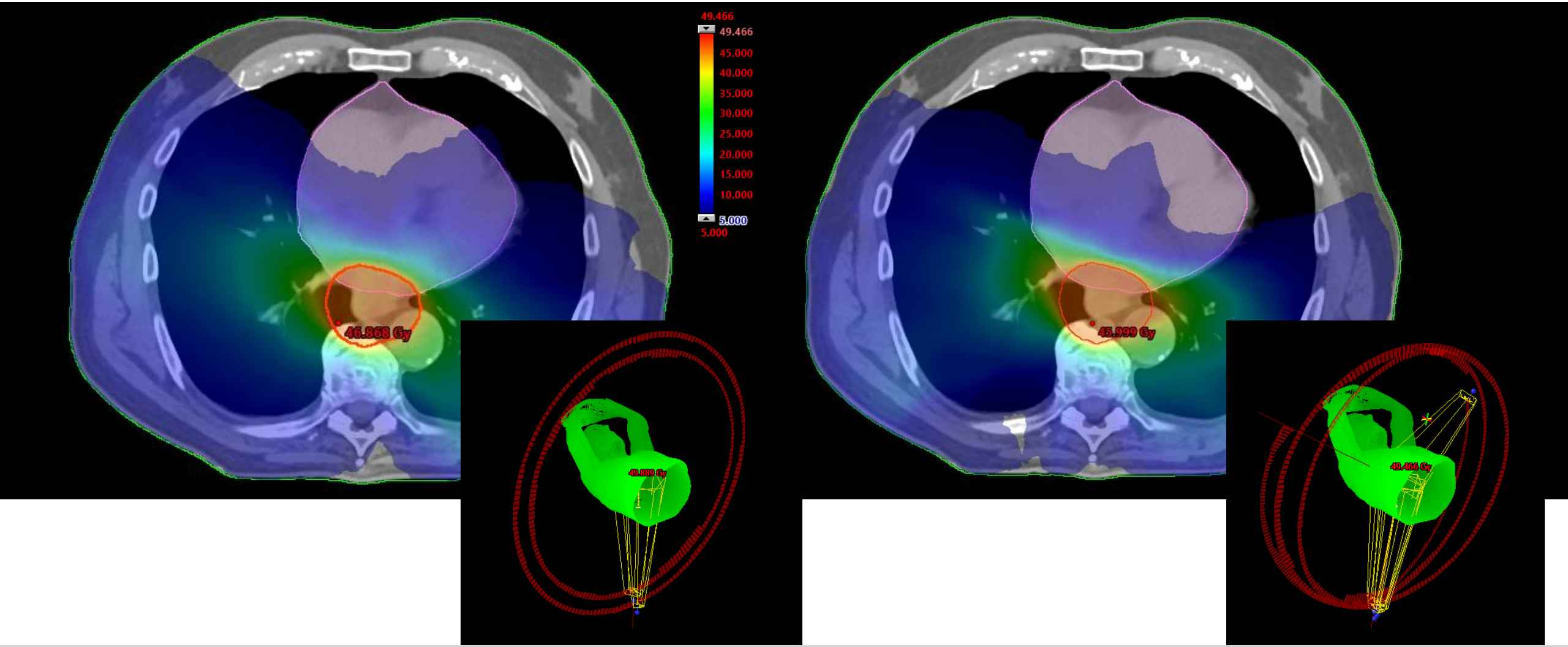


plan optimization using non-coplanar fields – esophagus

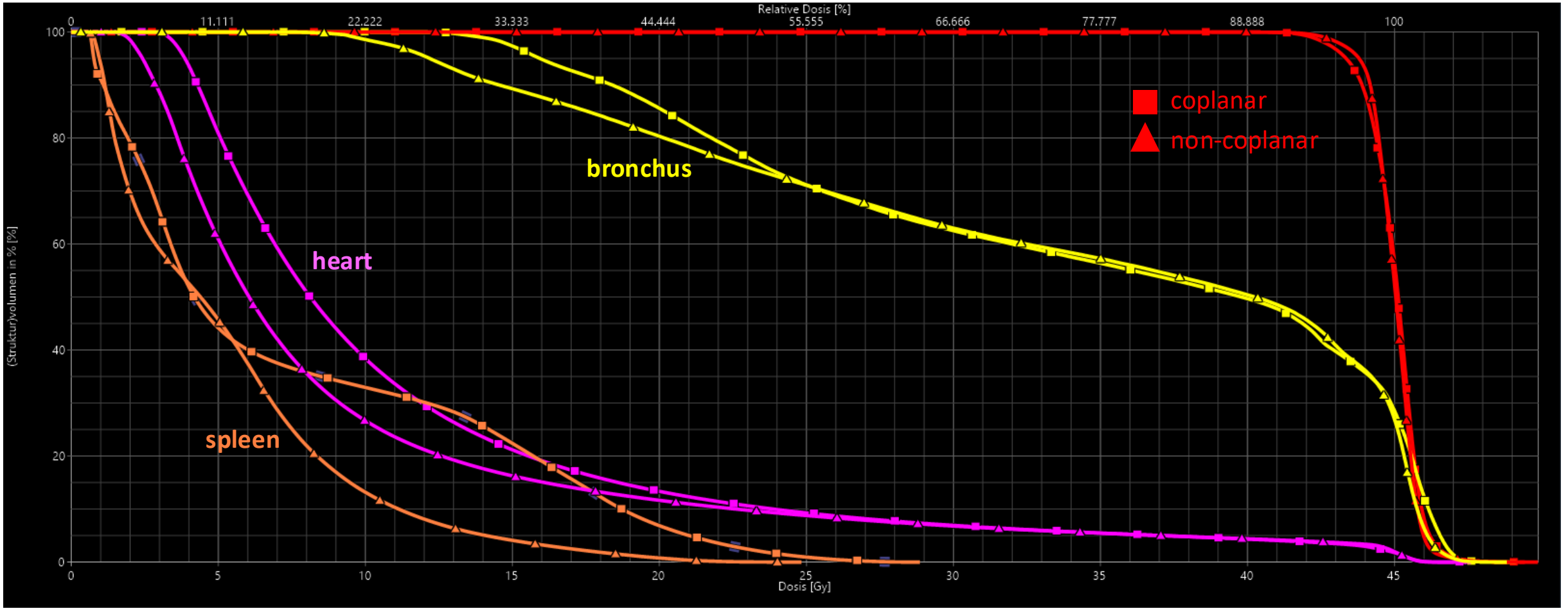
2 VMAT fields – coplanar

prescription: 25*1,8Gy

4 VMAT fields – 4 non-coplanar



plan optimization using non-coplanar fields – esophagus

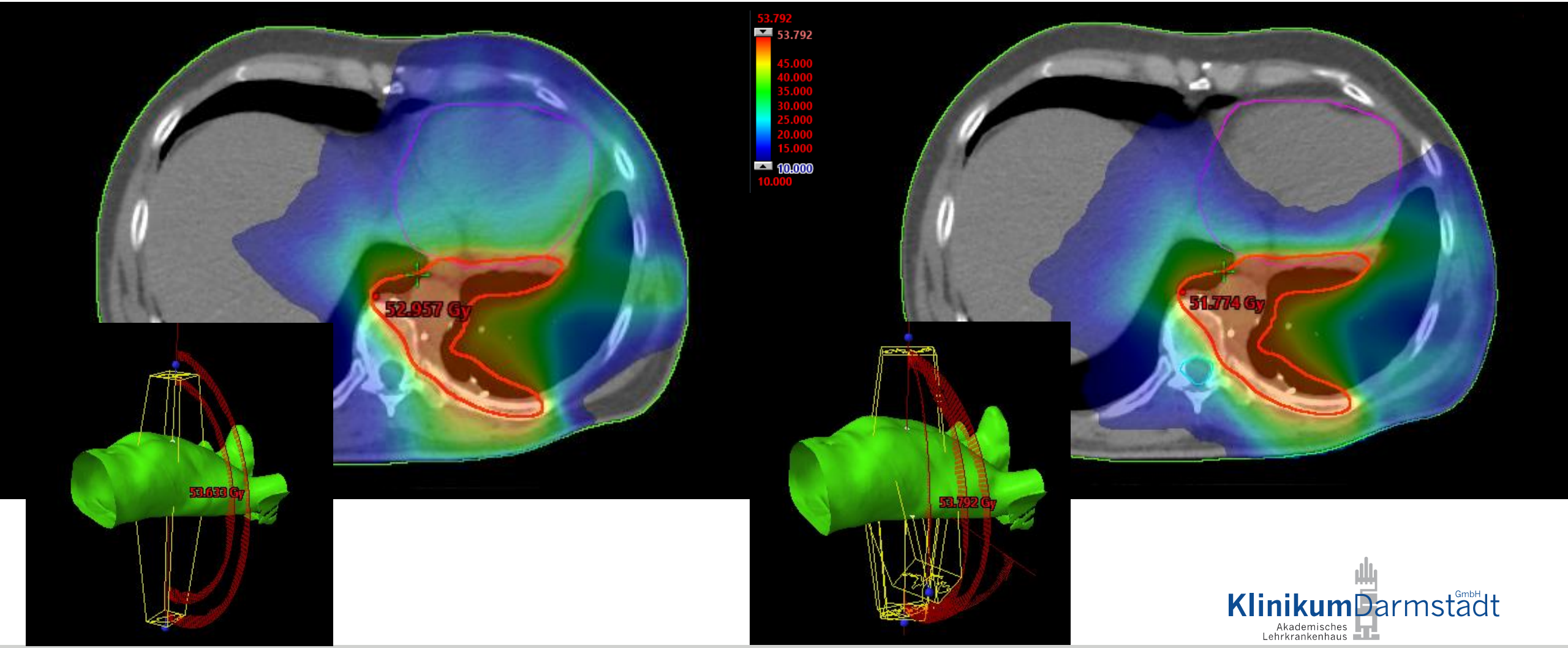


plan optimization using non-coplanar fields – desmoid

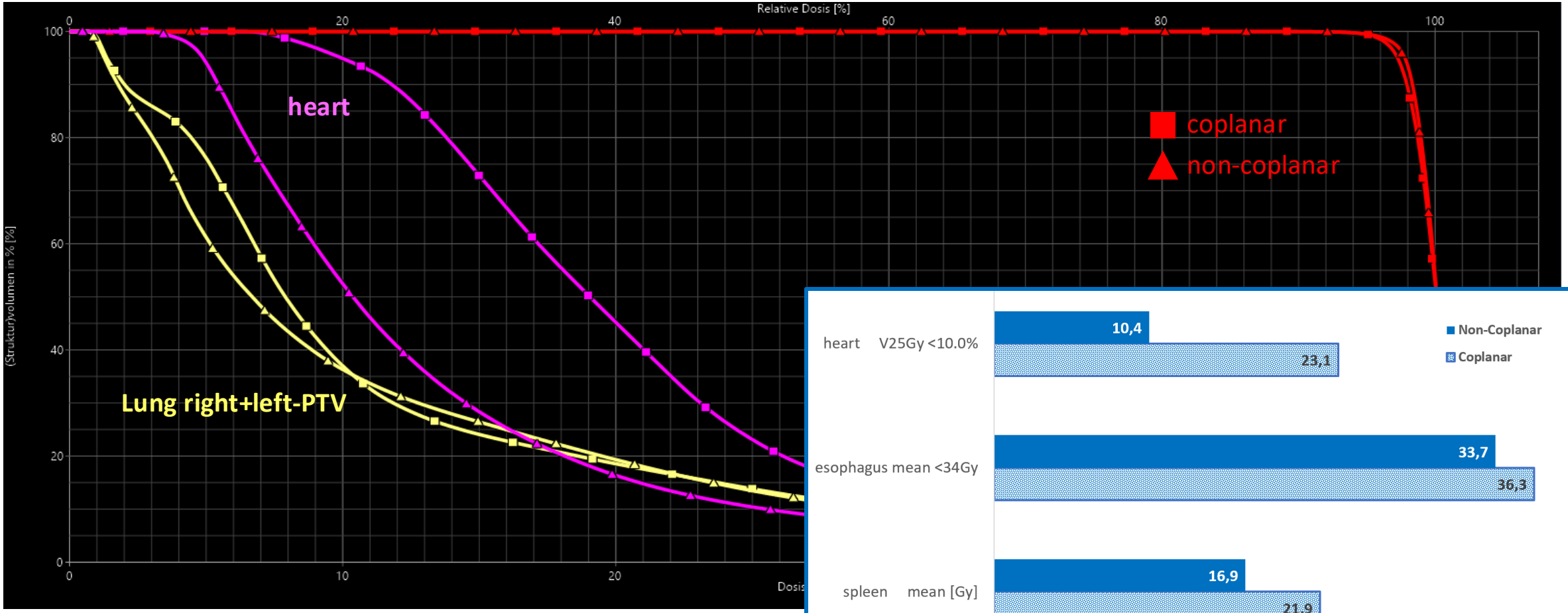
2 VMAT fields– coplanar

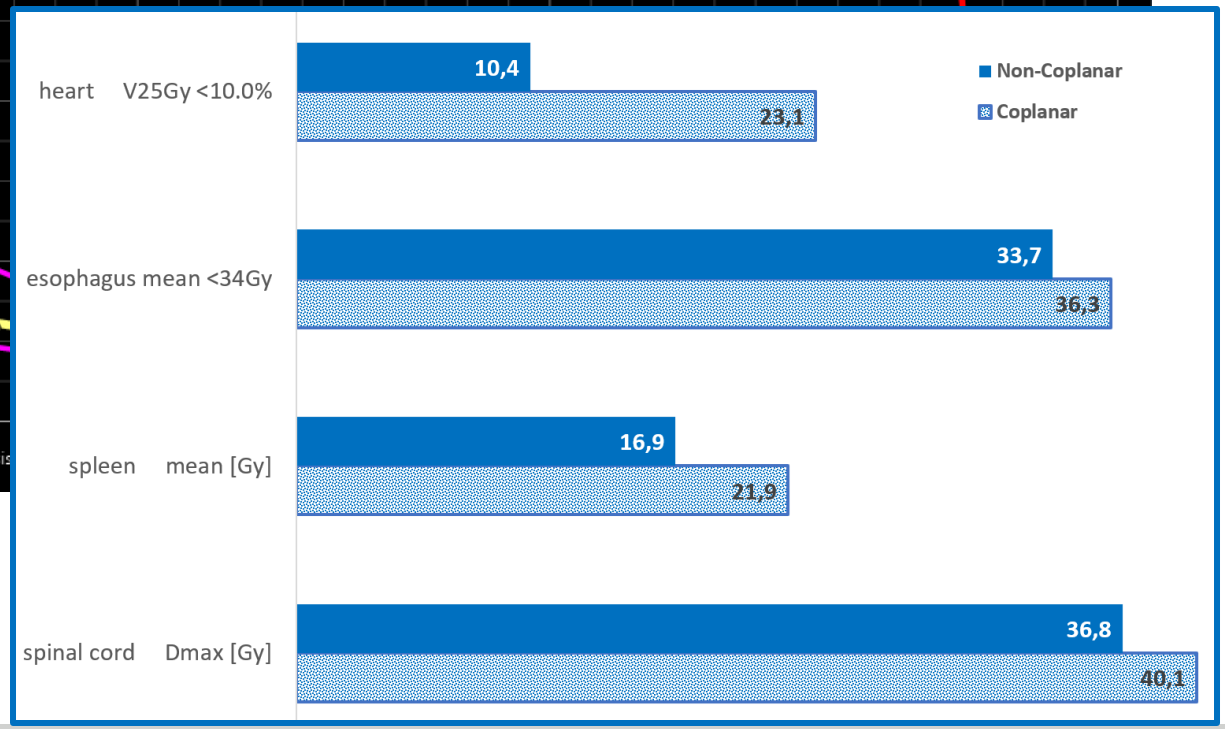
prescription: 25*2Gy

4 VMAT fields – 3 non-coplanar



plan optimization using non-coplanar fields – desmoid



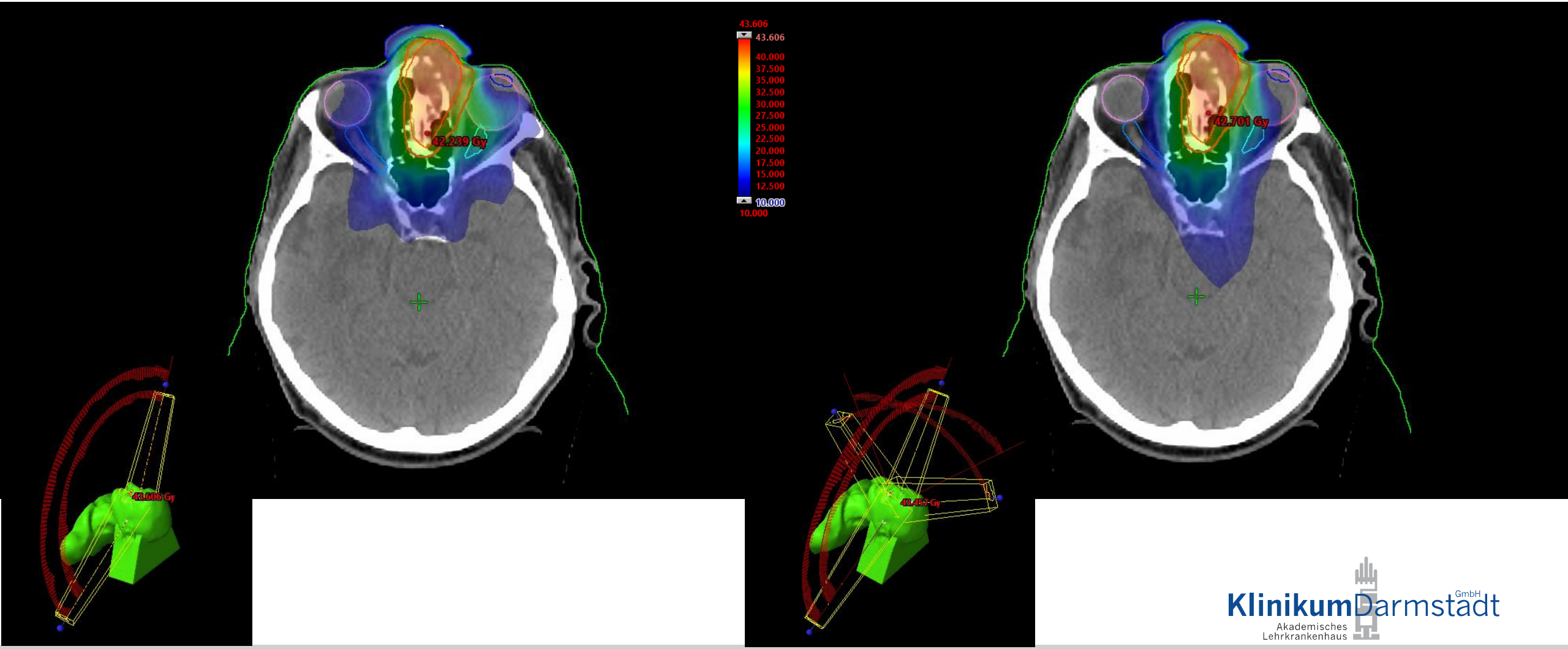


plan optimization using non-coplanar fields – nose

2 VMAT fields– coplanar

prescription: 10*4,0/3,0Gy

4 VMAT fields – 2 non-coplanar



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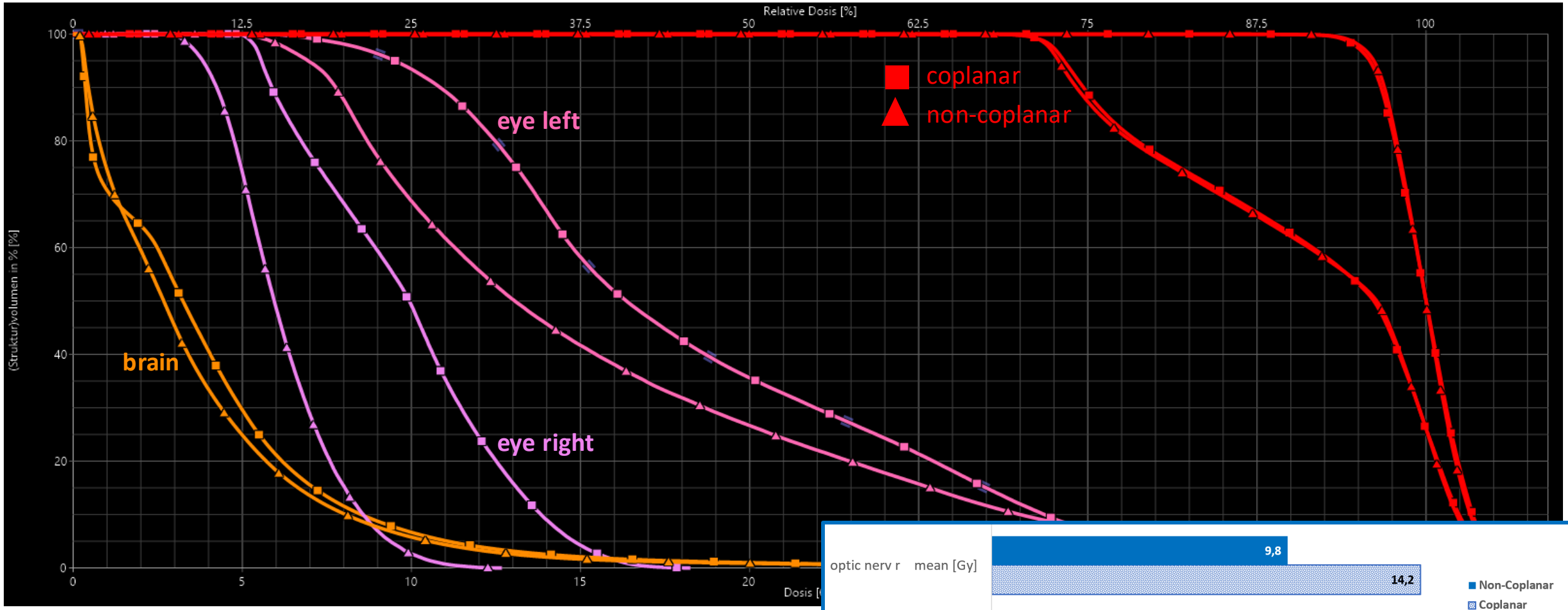
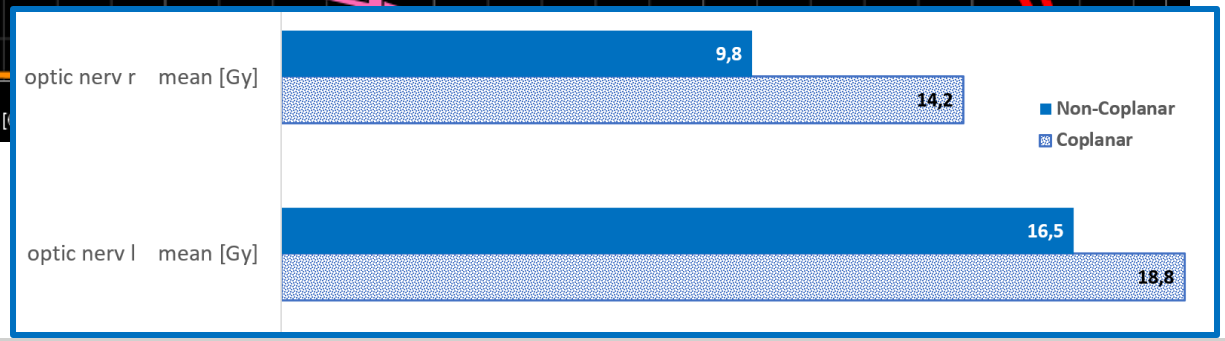
plan optimization using non-coplanar fields – nose



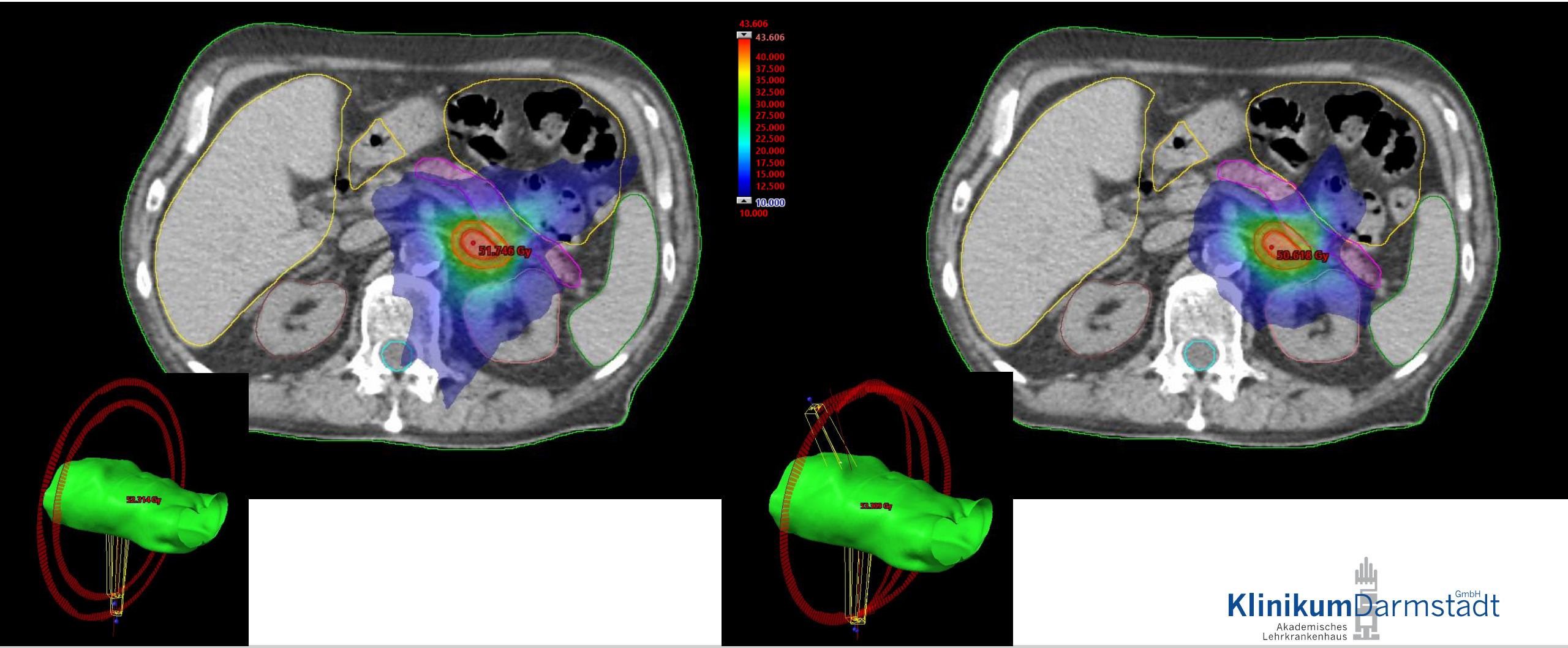


plan optimization using non-coplanar fields – adrenal gland

2 VMAT fields– coplanar

prescription: 10*5,0/4,0Gy

3 VMAT fields – 2 non-coplanar



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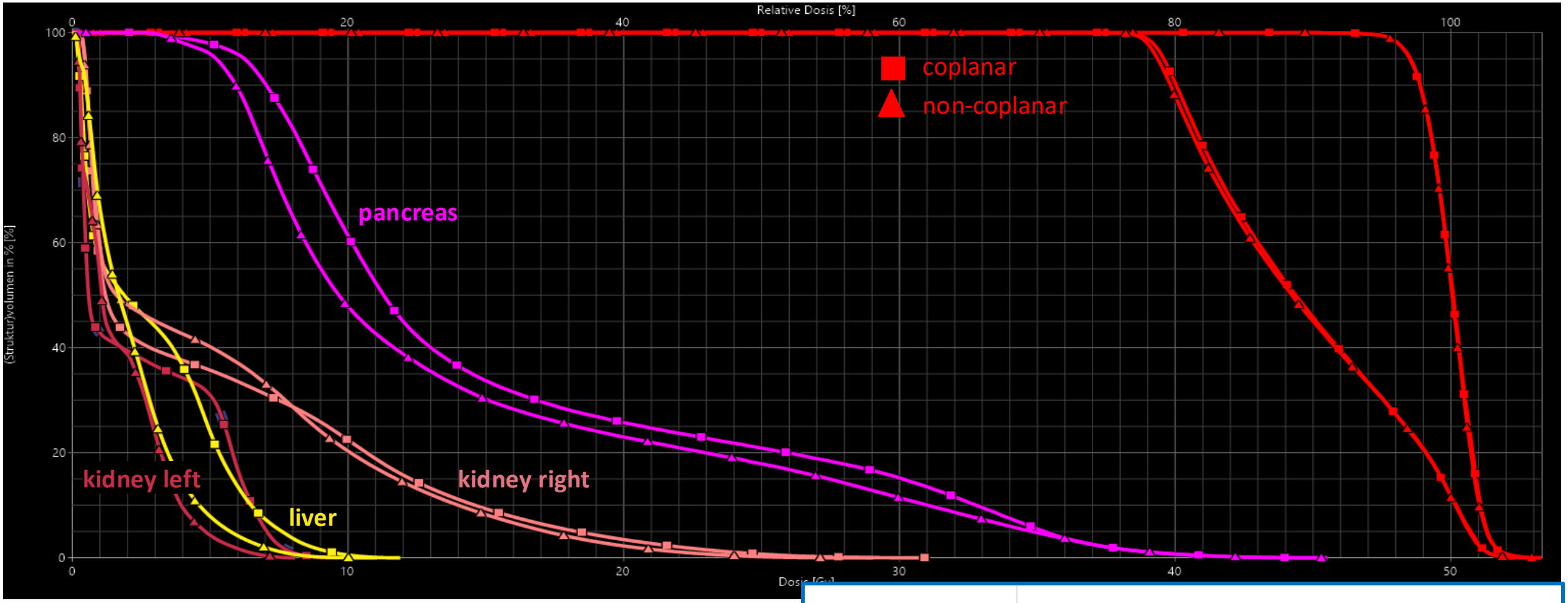
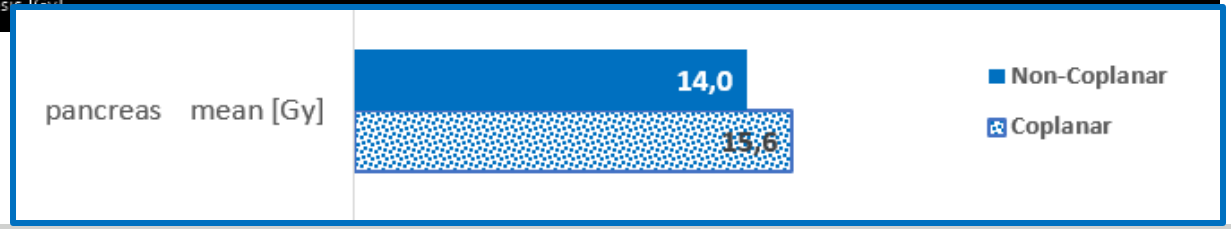
plan optimization using non-coplanar fields – adrenal gland



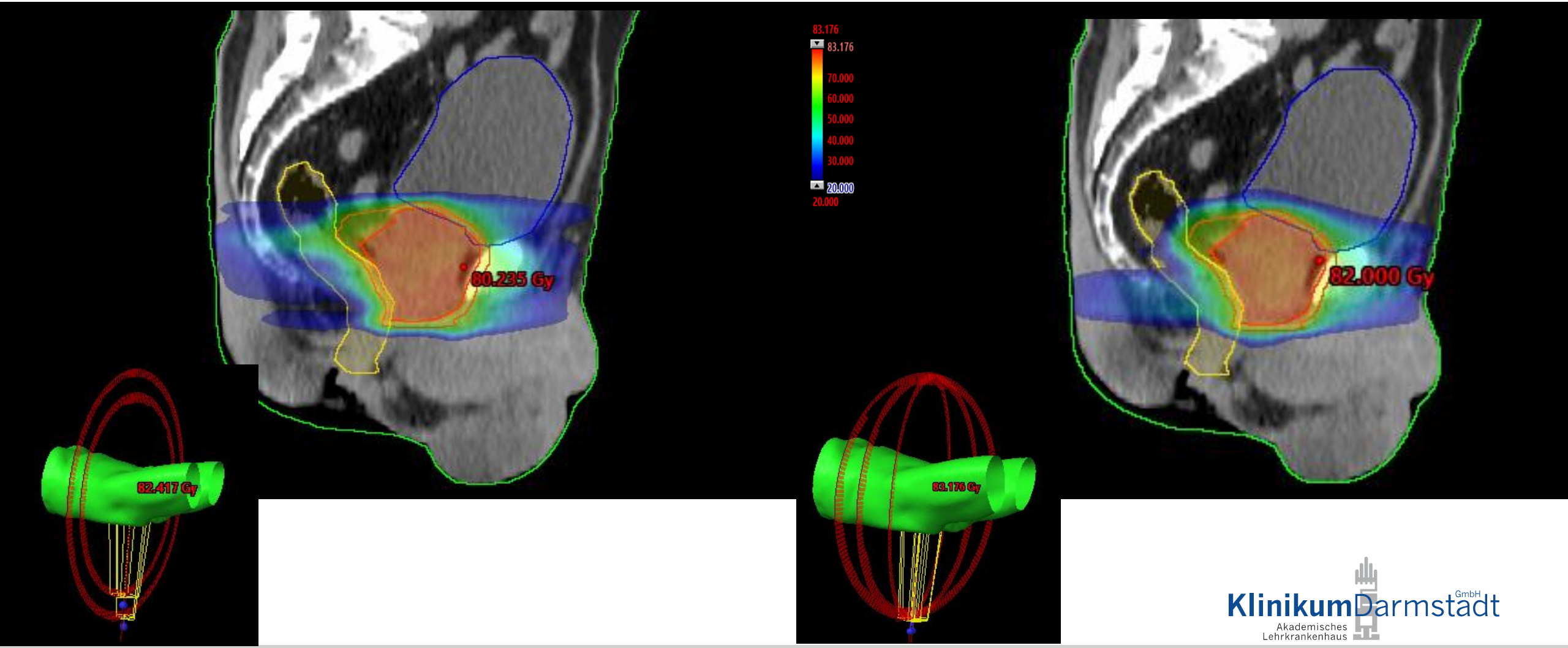


plan optimization using non-coplanar fields – prostate

2 VMAT fields– coplanar

prescription: 36*2,15/1,8Gy

3 VMAT fields – 3 non-coplanar



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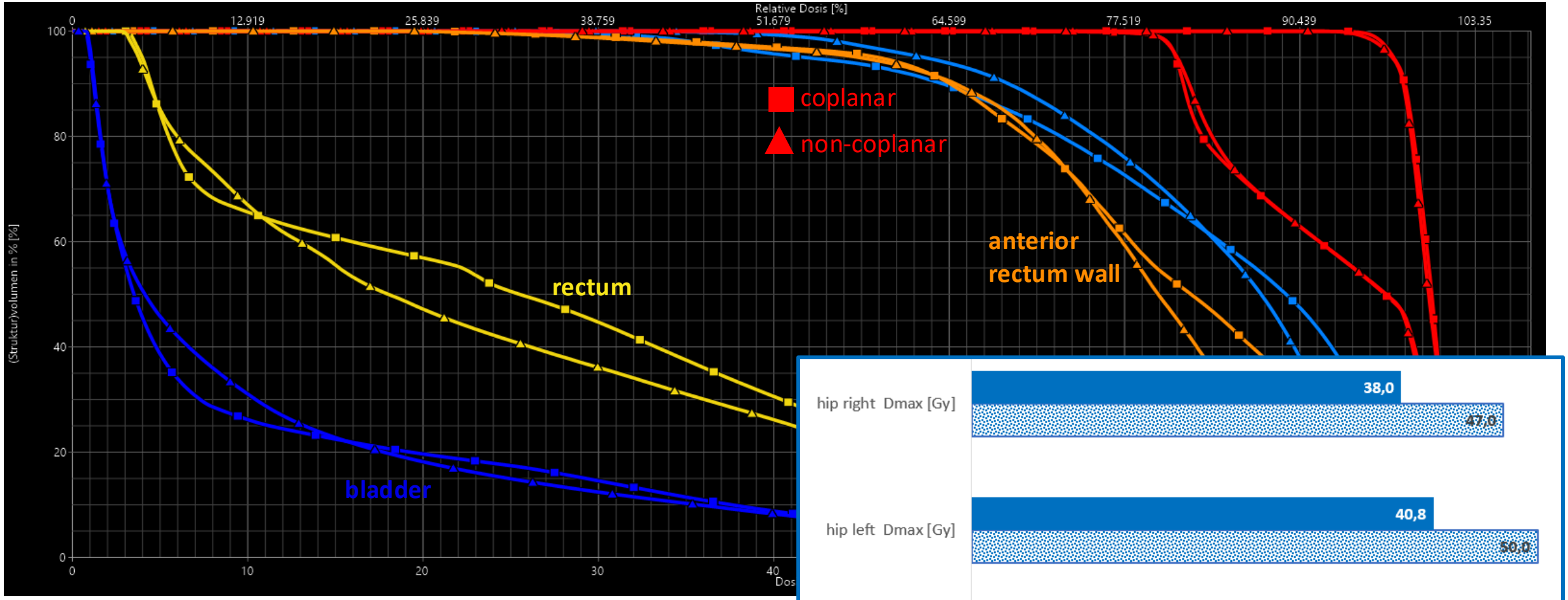
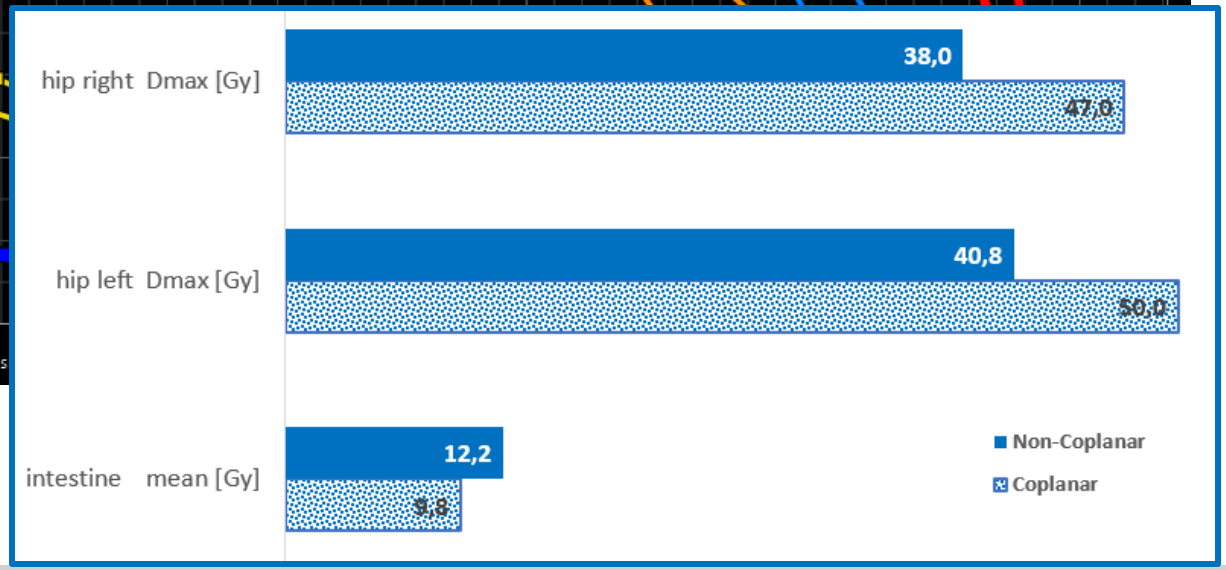
plan optimization using non-coplanar fields – prostate

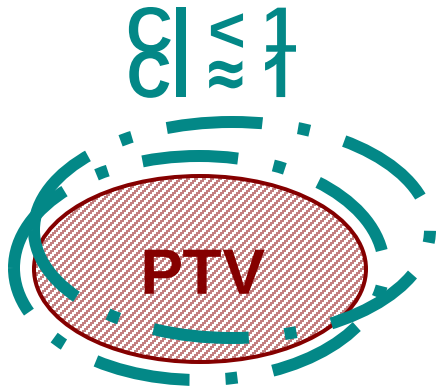




change in Conformity Index CI in lung SBRT Cases

coplanar

non-coplanar



reference isodose

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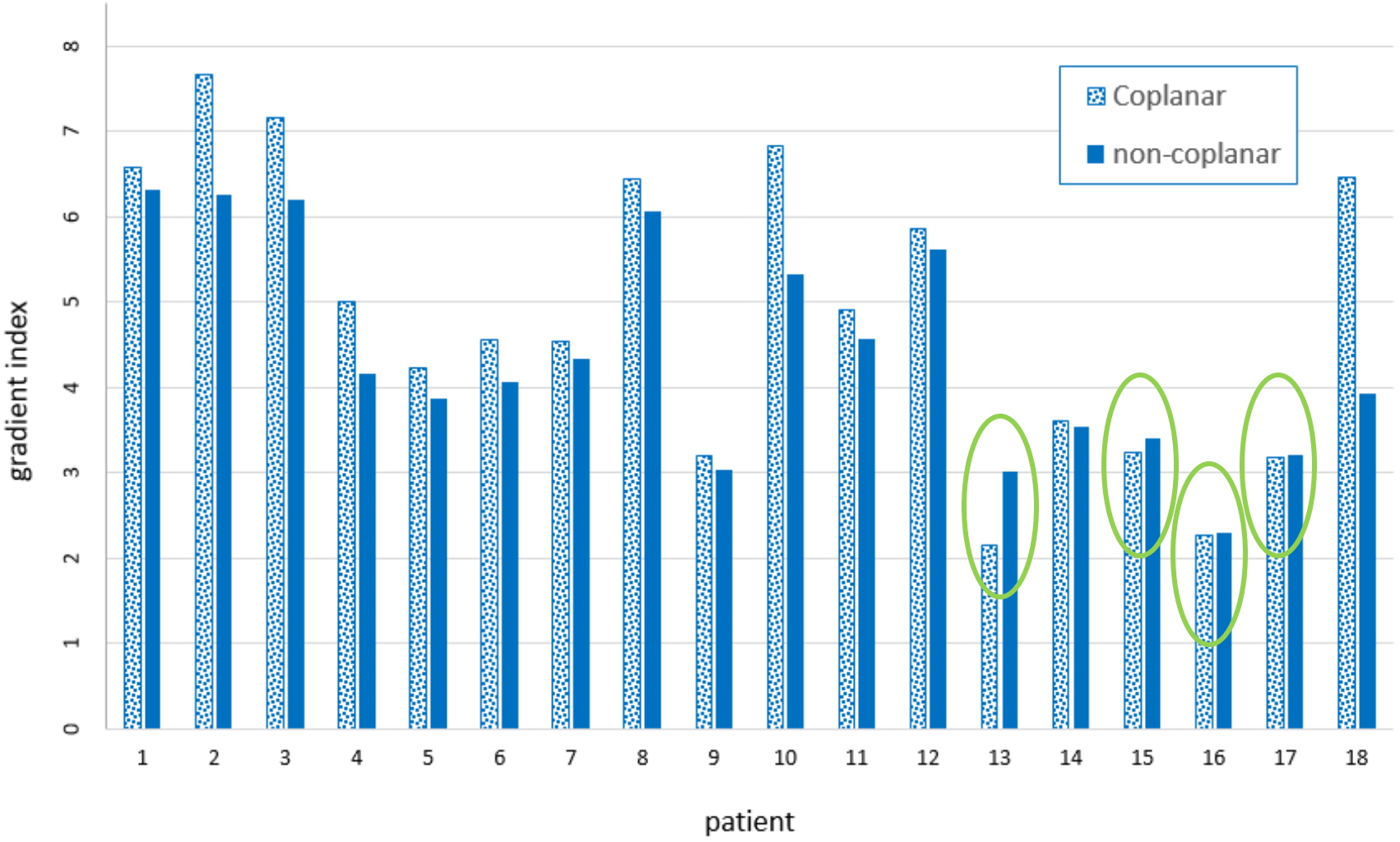
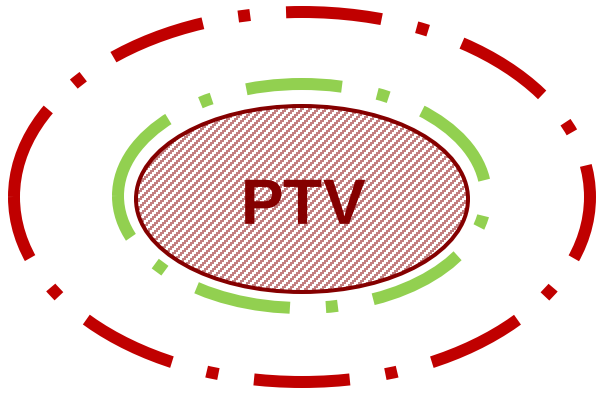
change in Gradient Index GI in lung SBRT Cases



$$GI = \frac{\text{50\% isodose}}{\text{reference isodose}}$$



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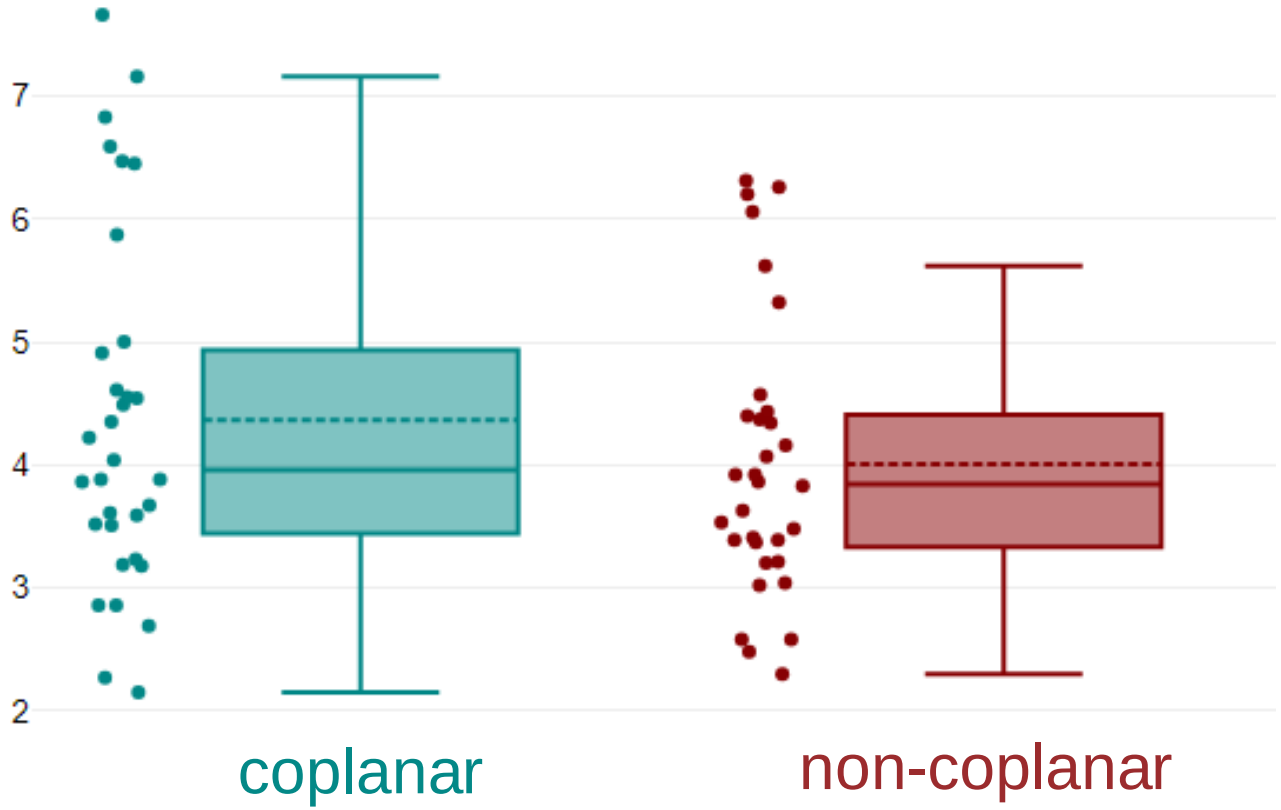
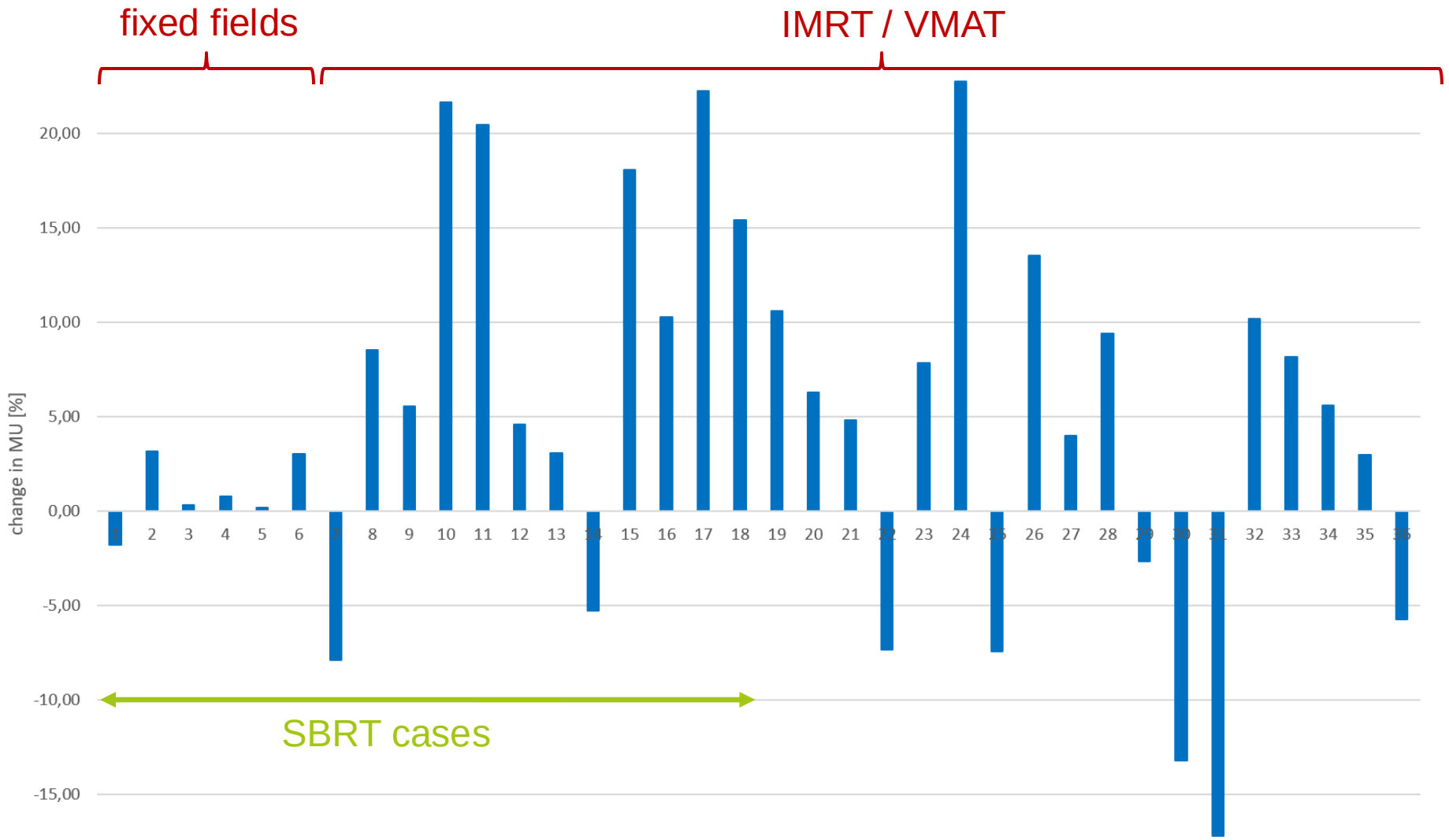
change in Gradient Index GI in all cases



change of Monitor Units from coplanar to non-coplanar technique



MapRT at Klinikum Darmstadt

Overview:

- how MapRT is used in our department
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starting patient treatment using non-coplanar fields

Non coplanare Bestrahlung
Planung und EE

KlinikumDarmstadt GmbH
Akademisches Lehrkrankenhaus

ID: _____ **Patientenname:** _____

CT-Planung: Zielvolumen: _____

Lagerungshilfsmittel: Position craniale Bar: _____

Armhalterung: Stifte: _____ Position: _____ Keil: _____

Prostep: Position: _____

Maskenhalterung: Stufenhalter Pos: _____ Keil: _____

Handgriffe: _____

Bestrahlungsplanung: Planung durchgeführt von: _____

Planname: _____ Buffer Couch: _____ cm

Buffer Gantry: _____

Planfreigabe: Endgültiger Plan in A_____

Ersteinstellung: EE_____

AlignRT ROI OK? Ja ☐ Nein ☐

Zuständige MTRA: _____

MTRA-Einweisung: Durchgeführt: ☐ Nein (sind bereits eingewiesen) ☐

Dry Run: Ja Nein

Feld1: Gantry: _____ Couch_____ Dry run OK? ☐ ☐

Feld2: Gantry: _____ Couch_____ Dry run OK? ☐ ☐

Feld3: Gantry: _____ Couch_____ Dry run OK? ☐ ☐

Feld4: Gantry: _____ Couch_____ Dry run OK? ☐ ☐

Feld5: Gantry: _____ Couch_____ Dry run OK? ☐ ☐

Abweichungen bei Bildgebung:

> 1cm; 1° Nein ☐ Ja ☐ -> erneuten Dry Run durchführen

> 0,5cm vrt /lat oder 0,5° rot Nein ☐ Ja ☐ -> erneuten Dry Run für kritischste Felder durchführen

DokuID: Formular_Planung_EE_240429.doc | Stand: 29.04.2024 Die aktuell gültige Version dieses Formulars ist im Intranet verfügbar. | Abteilung: Hie Ersteller: Hie 1 von 1

first treatment

Non coplanare Bestrahlung
Vorgehen bei jeder Fraktion

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Akademisches Lehrkrankenhaus

ID: _____ **Patientenname:** _____

Diese Schritte bei jeder Fraktion durchführen:

1. Patientenlagerung mittels AlignRT
2. Trockenlauf durchführen für folgende Felder:
   - Couch: _____ Gantry rotieren von _____bis_____ Wenn ok, Gantry auf _____
   - Couch: _____ Gantry rotieren von _____bis_____ Wenn ok, Gantry auf _____
   - Couch: _____ Gantry rotieren von _____bis_____ Wenn ok, Gantry auf _____
   - Couch: _____ Gantry rotieren von _____bis_____ We___ntry auf _____
3. Couch wieder auf 0°
4. Bestrahlungsraum verlassen
5. Bildgebung geplant? Ja → Punkt___
6. CBCT (ggfs. mit Tischze___
7. Ergebnis des ___ V___ od___ Rota___ größer 2°? Ja → Punkt 8
   Nein → Punkt 12
8. In den Bestrahlungsraum gehen
9. Erneuter Trockenlauf für das kritischste Feld:
   Couch: _____ Gantry rotieren von _____bis_____ Wenn ok, Gantry auf _____
   Bei Kollisionsgefahr bitte Physik rufen !
10. Couch wieder auf 0°
11. Bestrahlungsraum verlassen
12. Bestrahlung **in der vorgegebenen Reihenfolge** starten. Auf keinen Fall ändern!
13. Bestrahlungsfelder mit Couch-Drehung:
    In den Raum gehen: 1. Couch auf vorgegebene Position
    2. Gantry auf vorgegebene Position
14. Raum verlassen und Feld bestrahlen

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subsequent factions

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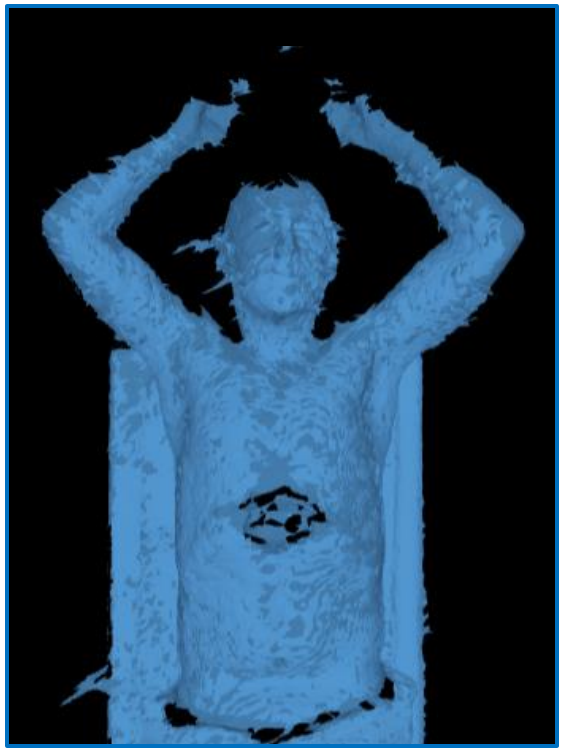
Results 1:
Influence of patient positioning

05.04.2024



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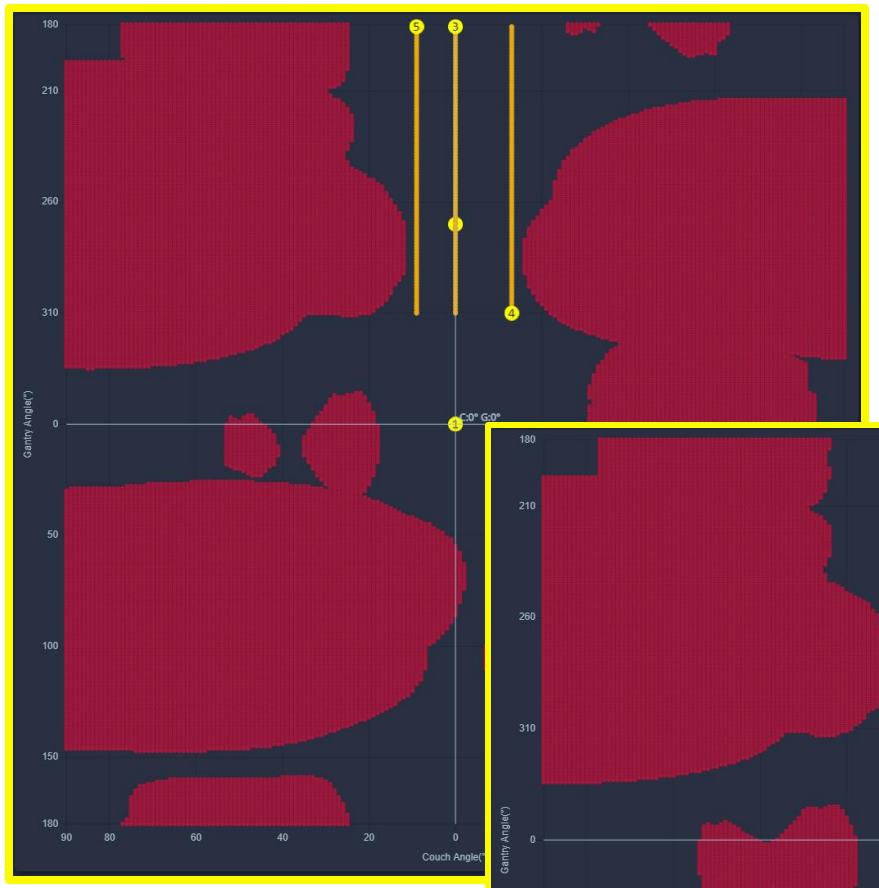
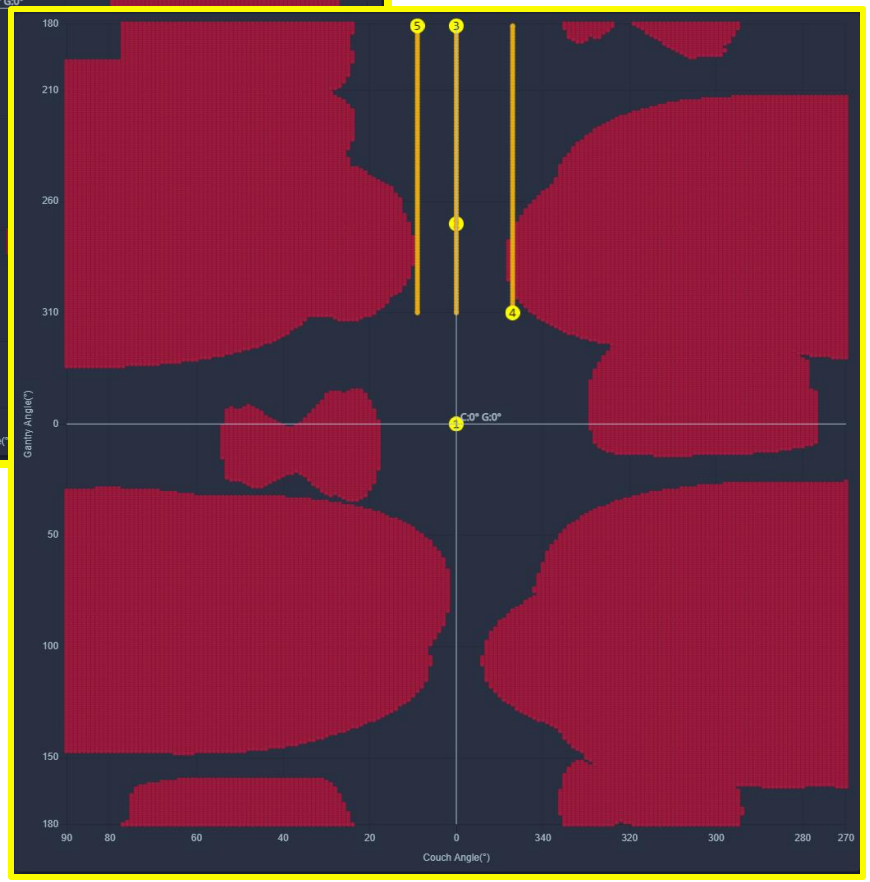
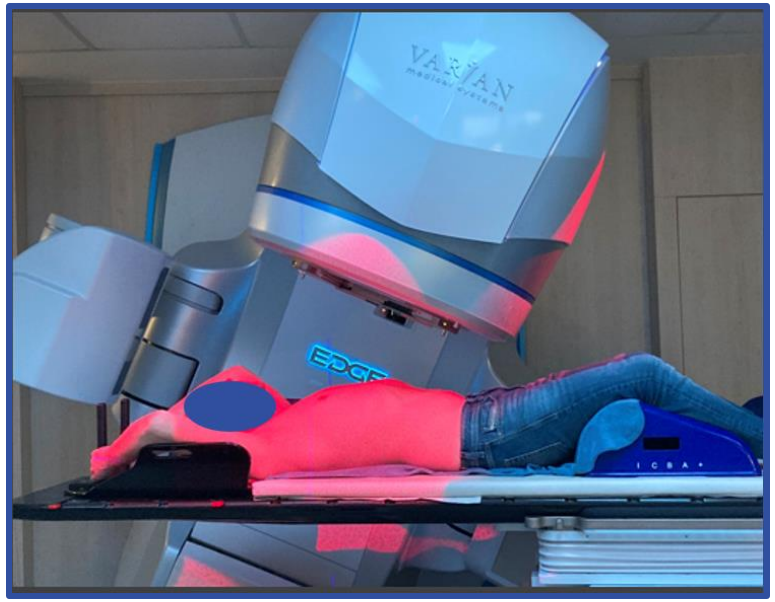
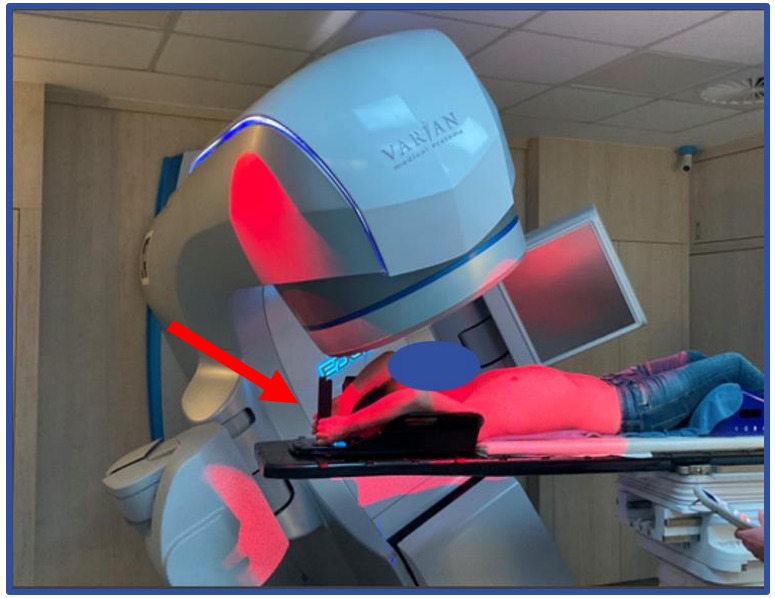
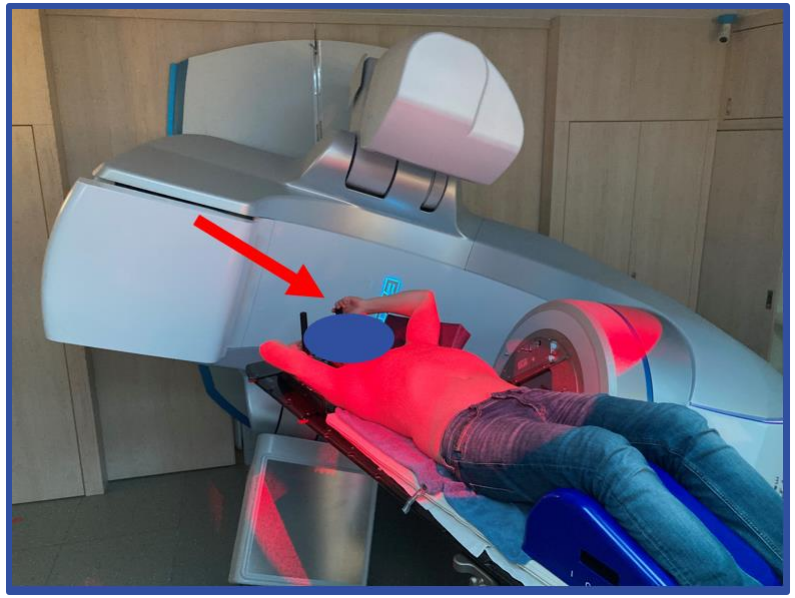




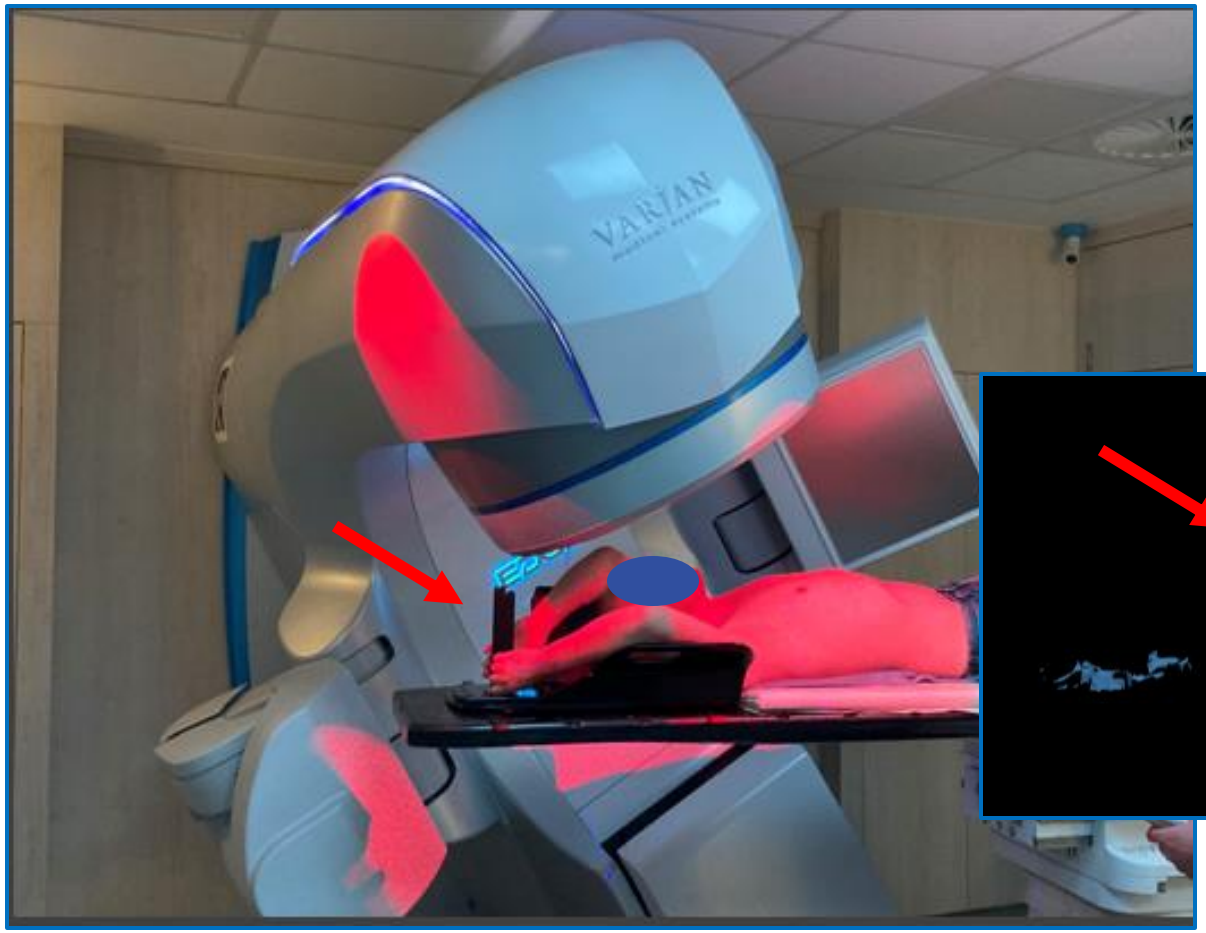
Results 2:
Influence of patient positioning

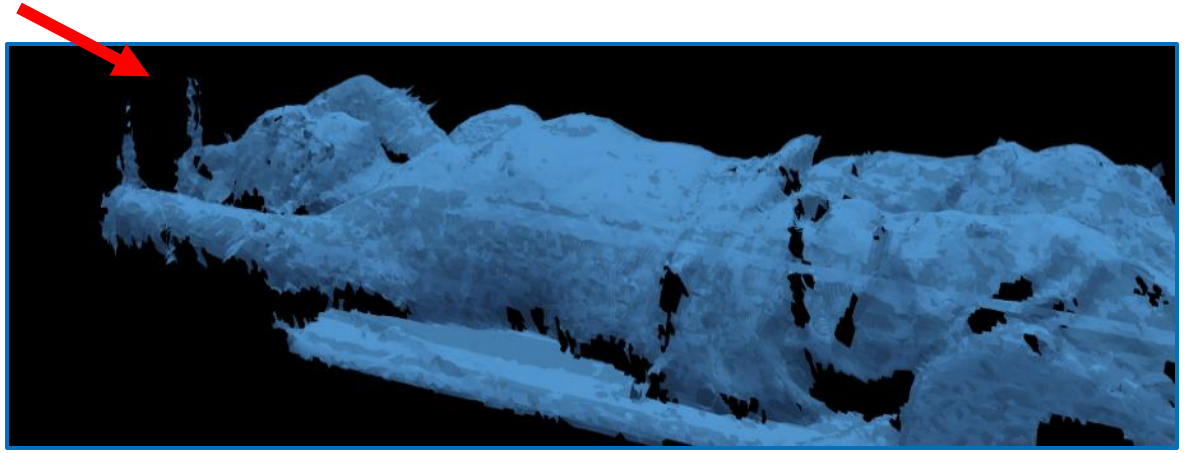




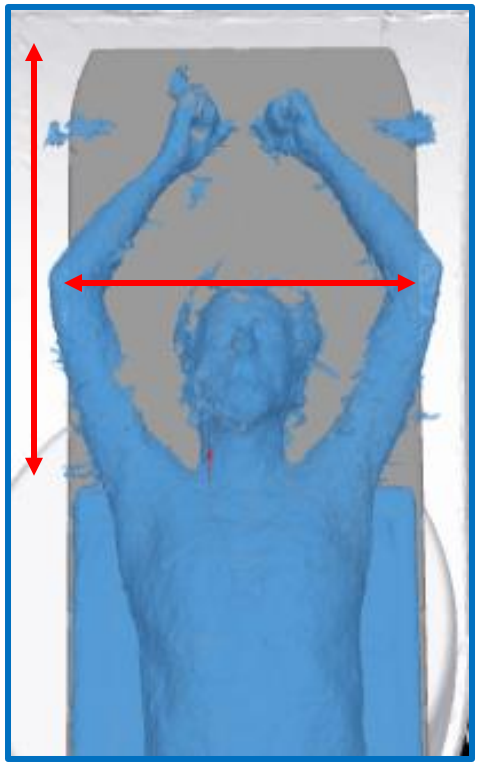


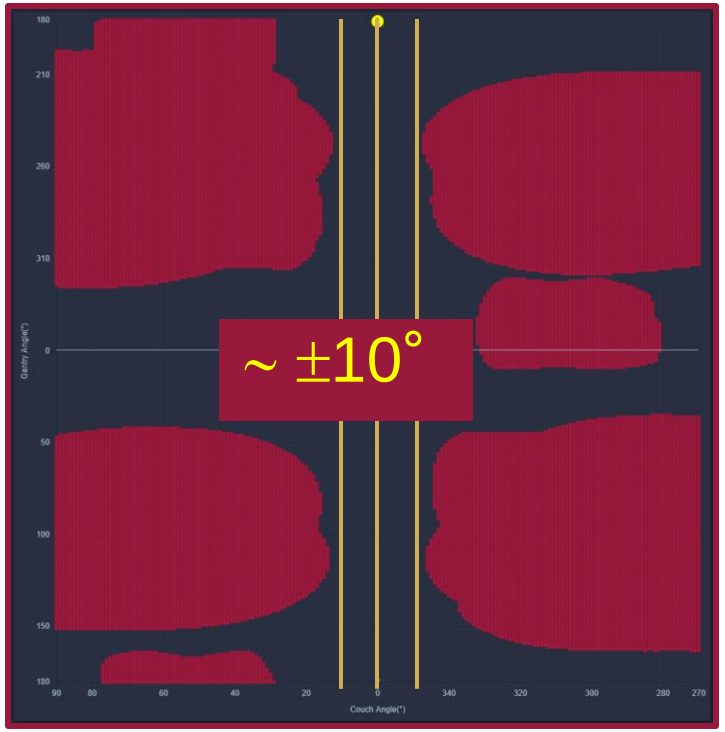
Results 3:
Influence of positioning aid





Results 4:
Influence of positioning aid





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Summary

- better results in less time in plan calculation
- increased safety during treatment of non-coplanar fields
- treatment time is only slightly longer
- positioning of the patients and used positioning aid influence the possible couch deflection

„More freedom, better plans……..better outcome, less side effects“

Next steps

- allow couch movements from outside
- reduce couch and patient buffer from 4cm to 3cm

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Thank you for your interest ….

….and many thanks to my team:

Jana Kouptsidis
Iliyana Nikolova-Rezaie
Stephan Böck, Noel Goethals, Agnieszka Jasko, Eugen Kara
Stefanie Trappen, Franziska Leist, Dr. Martin Silber, Martin Brauns