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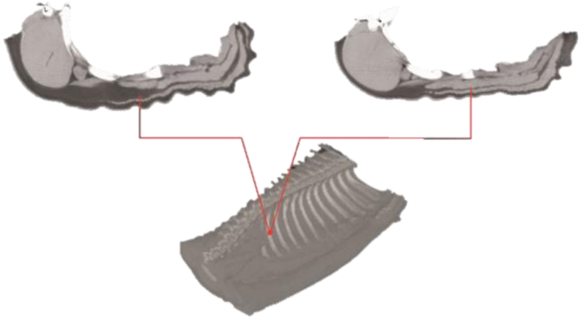
Råvaresortering

RK temadag, November 2018

Lars Bager Christensen

Hvorfor sortering

- Bruge den optimale råvare til hvert slutprodukt
- Standardiserede maskiner og procedurer



Hvordan sortering

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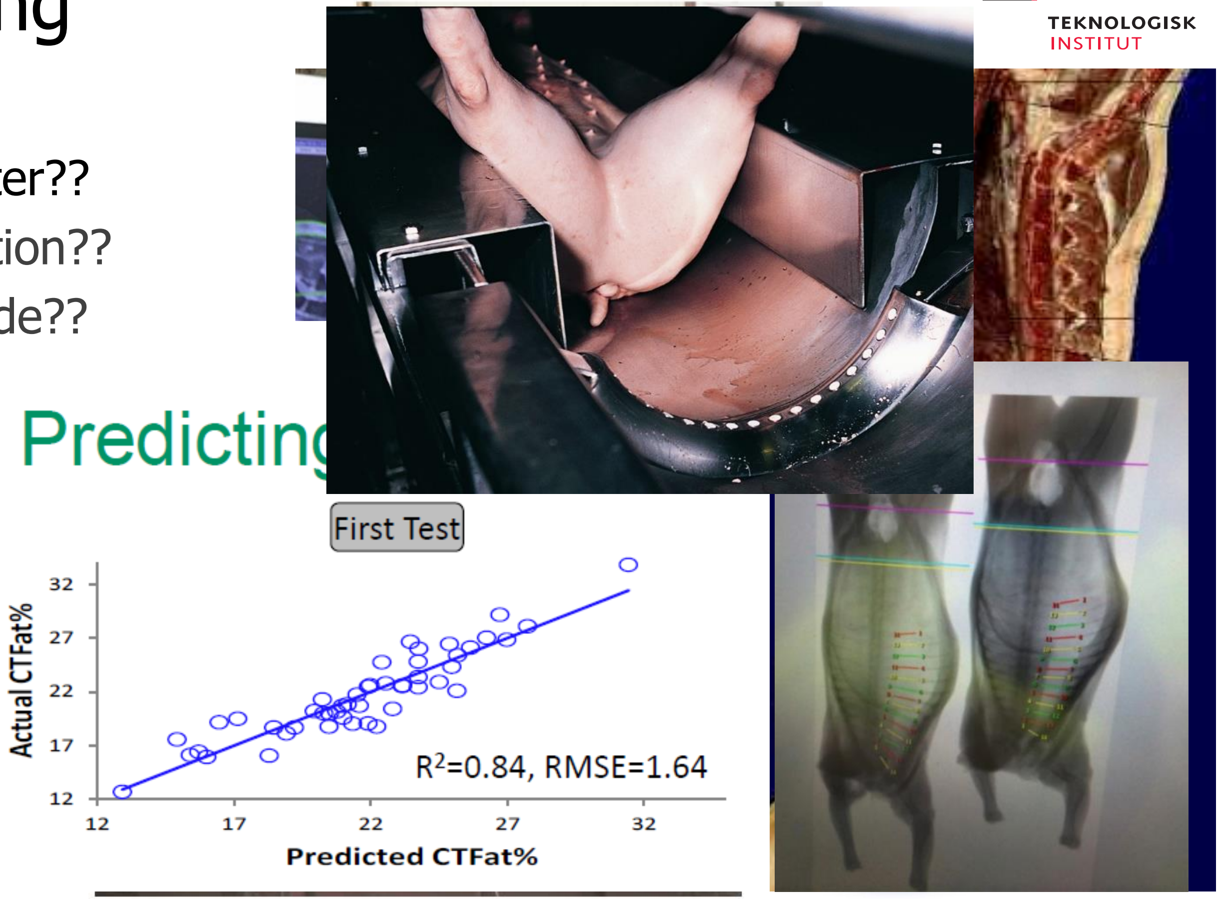
- Sorteringsparameter??
- Måling vs. prædiktion??
- Hvilken målemetode??
  - Ultralyd
  - Vision
  - Radiologi
  - DEXA
  - CT
  - OnlineCT



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CT til råvaresortering

To anvendelser:

- Sortering af midterstykker
- Fedt marmorering

Fremstillet prototype

$$I = I_0 e^{-\mu d}$$

Måleparametre:

- ✓ 3D geometri
- ✓ Vævsdensitet

Volumen analyse: Morphology vs. Density

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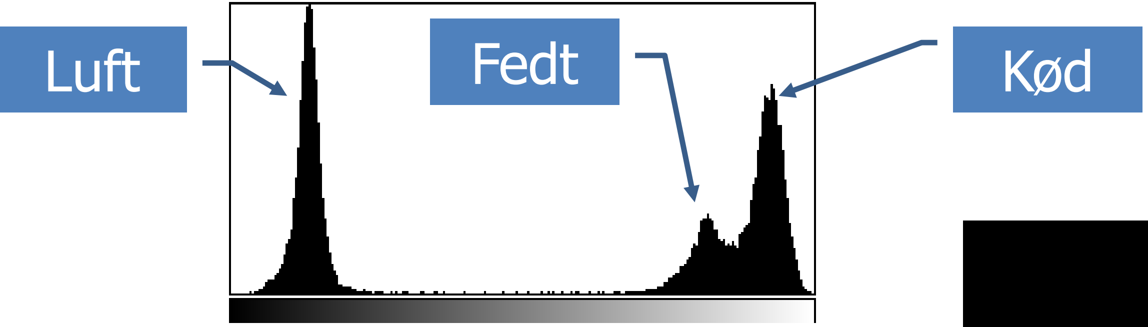
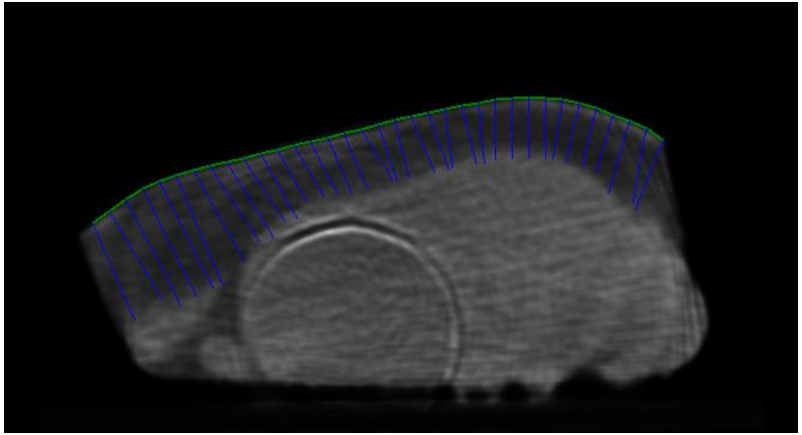


Globale parametre

- Avg. density
- LMP
- Mixed voxels

Lokale parametre

- Form
- Position
- Tykkelse



Manuel sammenligning – to operatører

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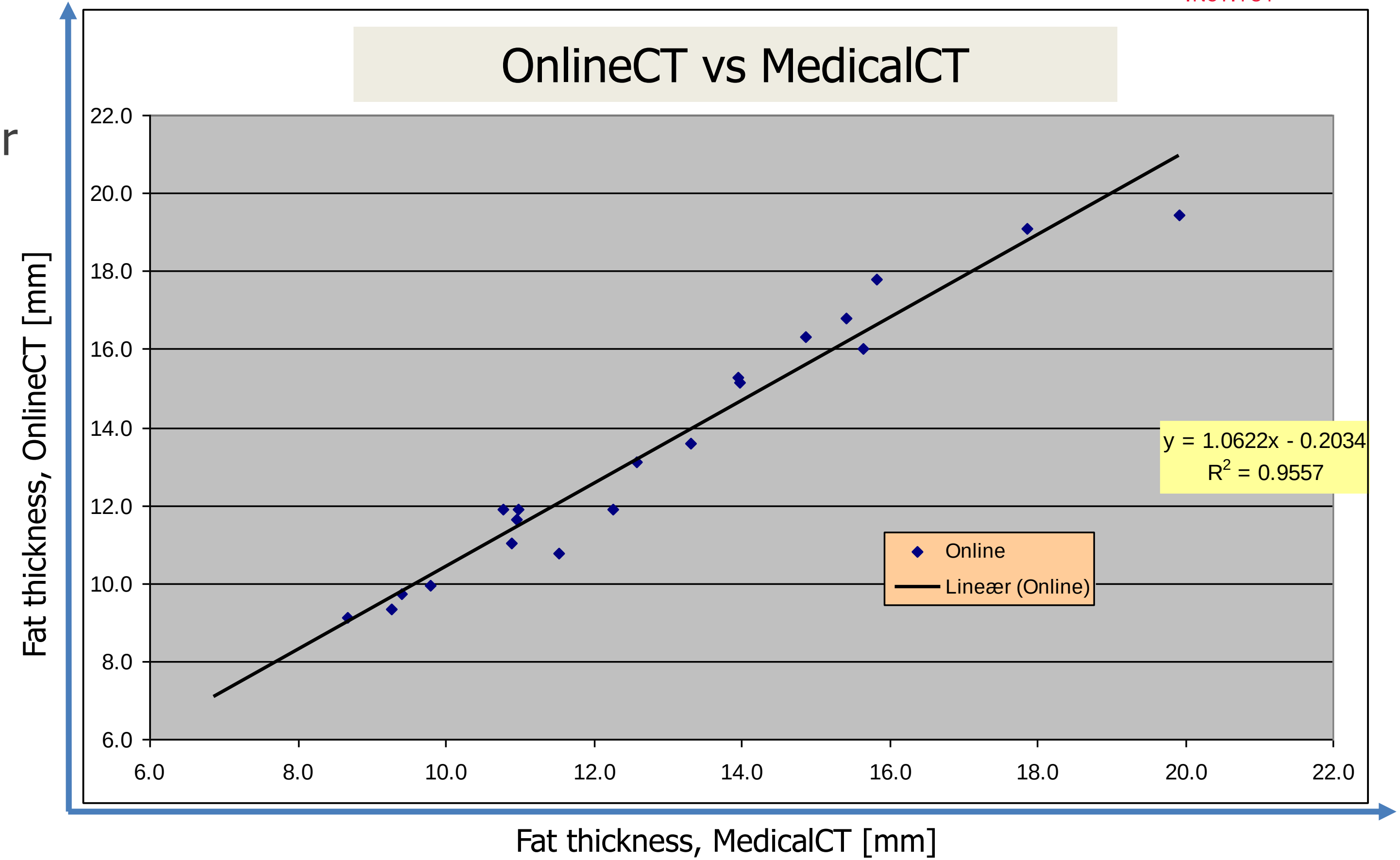
- 19 midterstykker
- MedicalCT [ref]
- To operatører
- Manuelt
- 144m/time

SD=0.7mm



Automatisk billedanalyse – tilpasses applikationen

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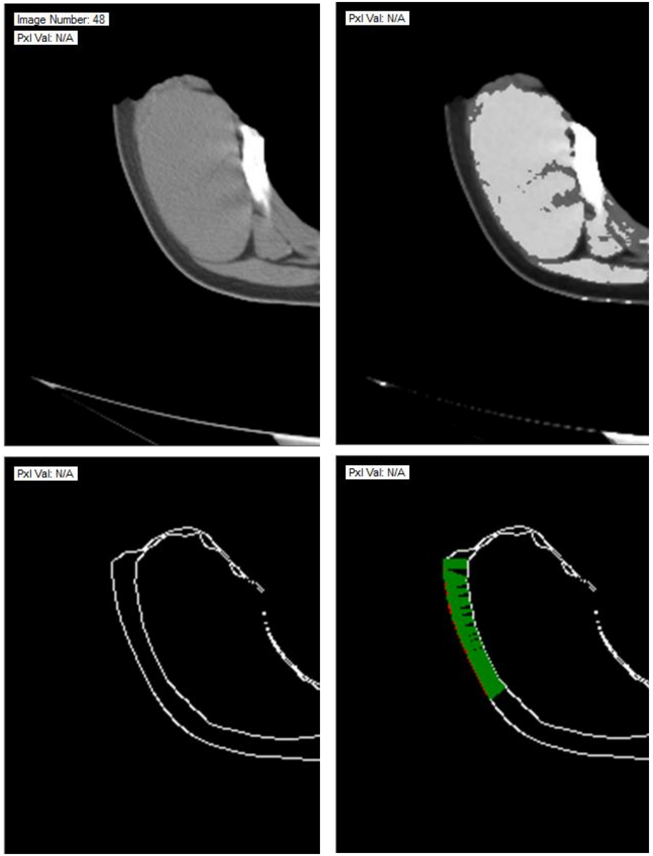

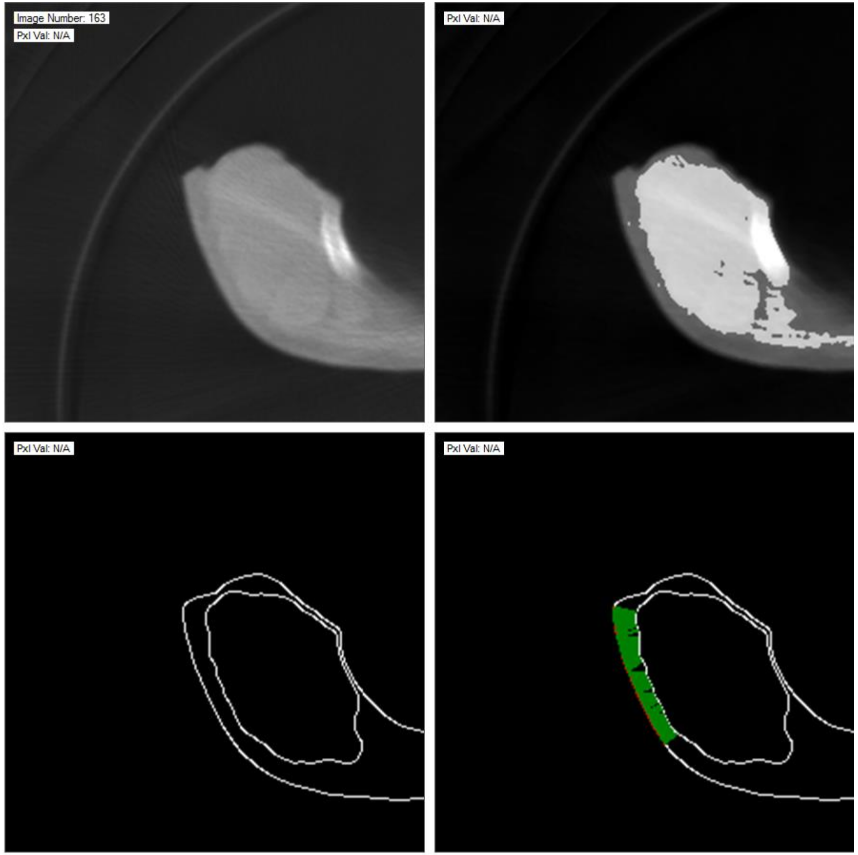

Anatomiske fixpunkter

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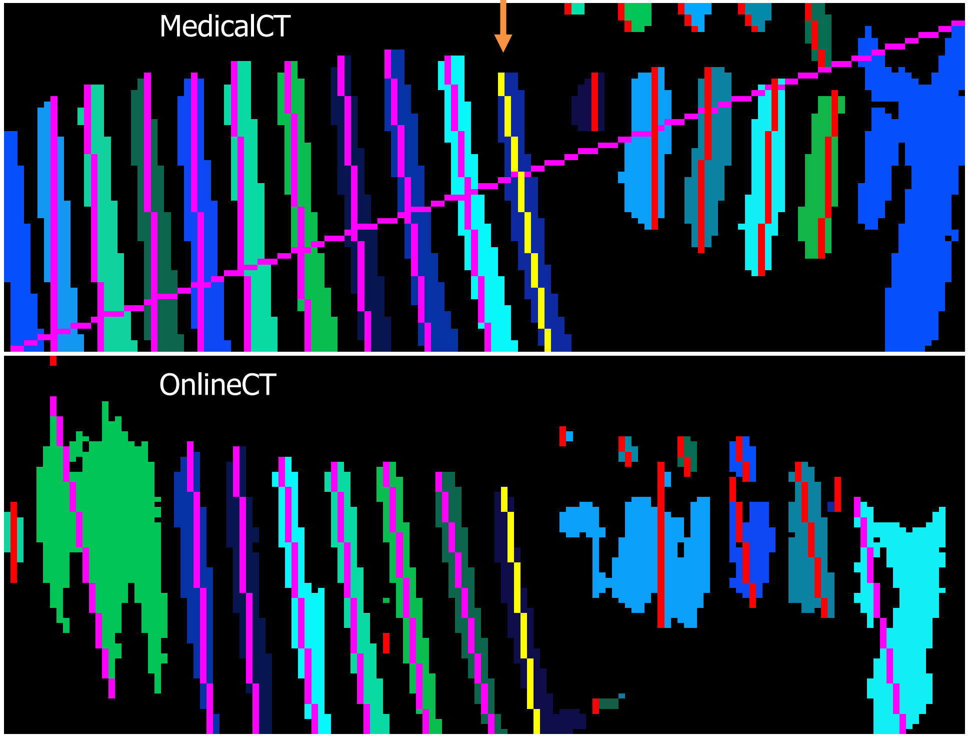
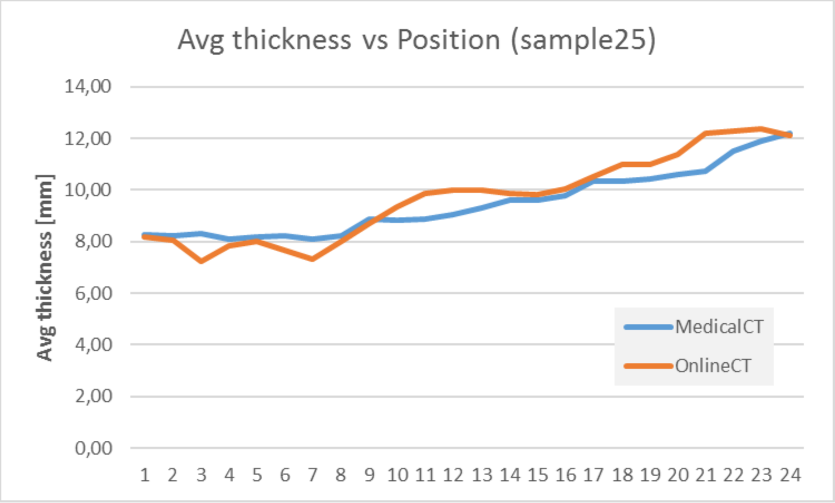
P0



P0 hvor bagerste ribben møder rygsøjlen



30mm

120mm

200 midterstykker – slab vs. to skiver

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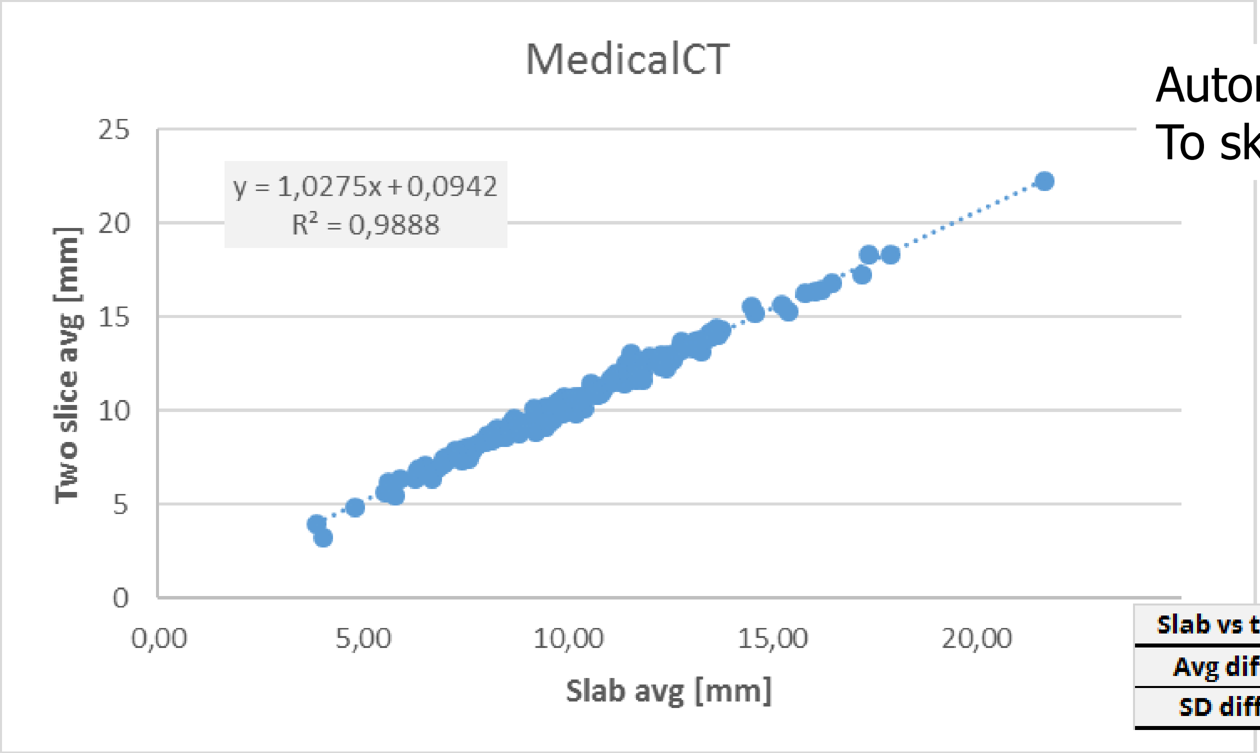

Automatisk billedanalyse
To skiver vs udsnit (slab)

Slab vs two slice diff	
Avg diff	-0,19
SD diff	0,285183

Første halvdel

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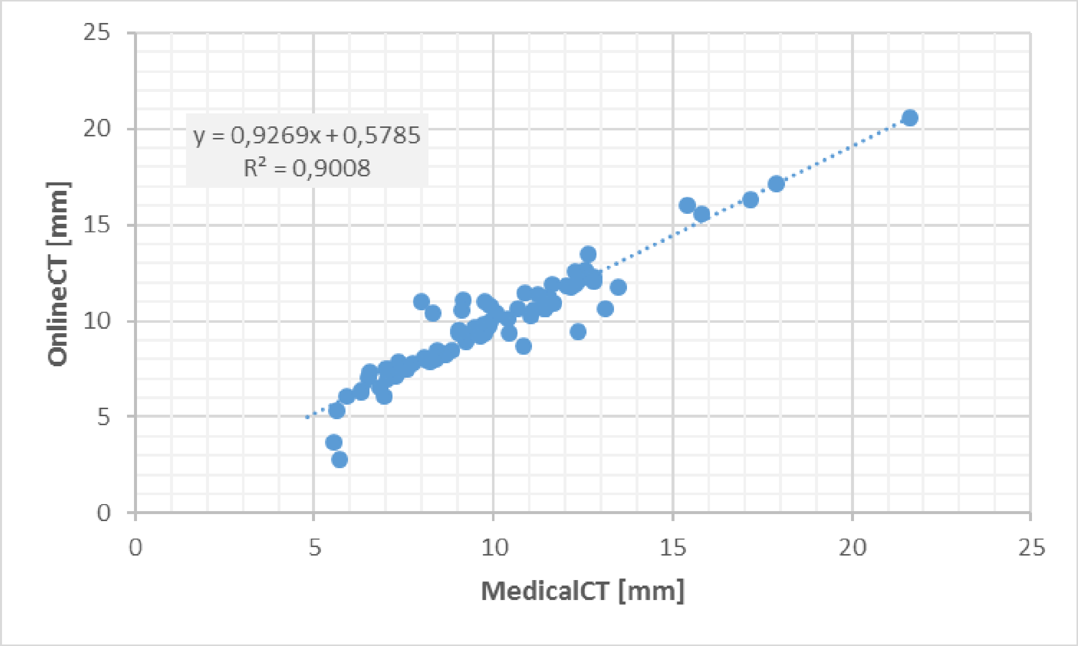

Automatisk billedanalyse
290m/time OnlineCT

Subsample I	
AVG diff	0,144405
SD diff	0,901589

Målinger på oksekød

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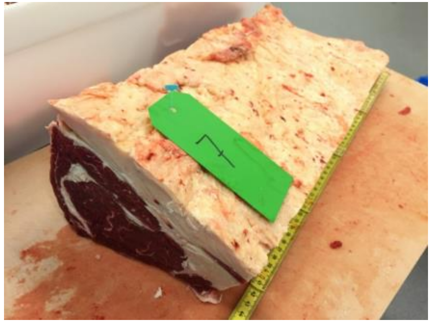
Målt på 7 danske samples
2 med ben (ca. 2% hhv. ca. 14% CL)
Scannerborg (2 og 10mm)
OnlineCT (144m/h)
Subjektiv bedømmelse
Kemisk fedtindhold (CL)



Submission id: 100032959

Lims nummer / kundens reference	FEDTBESTEMMELSE FEDE PRØVER, SM 004-14 (Fedt)	FEDTBESTEMMELSE MAGRE PRØVER, SM 004-14 (Fedt)
200388200 / 1-1	13.5 g/100g	
200388201 / 1-13	16.8 g/100g	
200388202 / 1-24	13.5 g/100g	
200388203 / 2-1		2 g/100g
200388204 / 2-11		.9 g/100g
200388205 / 2-22		1.9 g/100g
200388206 / 3-1	4.1 g/100g	
200388207 / 3-10	3.5 g/100g	
200388208 / 4-2	3.3 g/100g	
200388209 / 4-13	4.1 g/100g	
200388210 / 5-1	4.3 g/100g	
200388211 / 5-12	2.9 g/100g	
200388212 / 6-1	9.3 g/100g	
200388213 / 6-10	6.6 g/100g	
200388214 / 7-1	6.2 g/100g	
200388215 / 7-13	6.8 g/100g	

Subjektiv vurdering med medical CT

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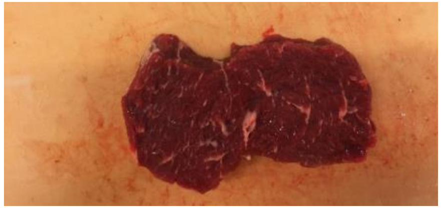
7 danske højreb

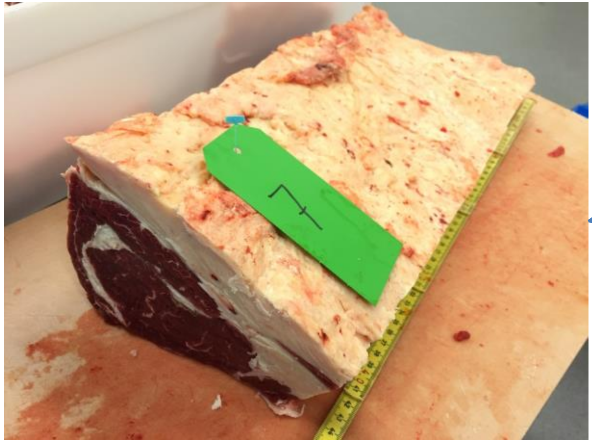
<u>Subjektiv</u> bedømmelse af US marbling

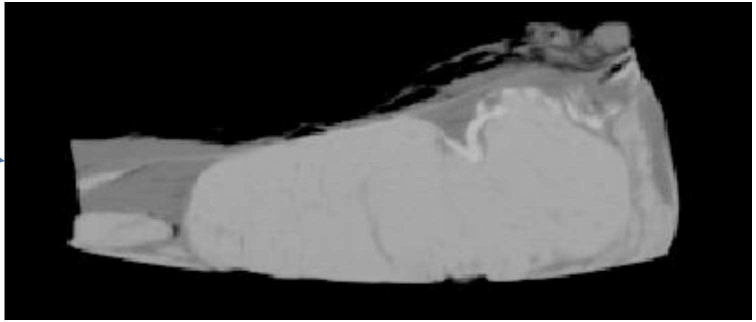
fra (N_1) trimmede 30mm steaks (ref)

fra (N_2) 2mm medicalCT images







Subjektiv vurdering ud fra MedicalCT

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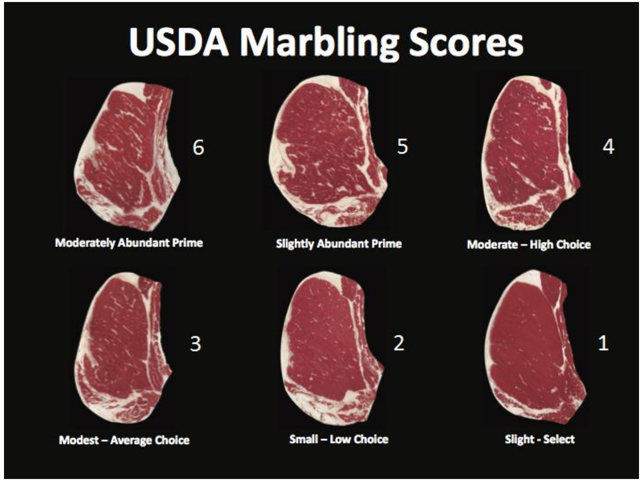
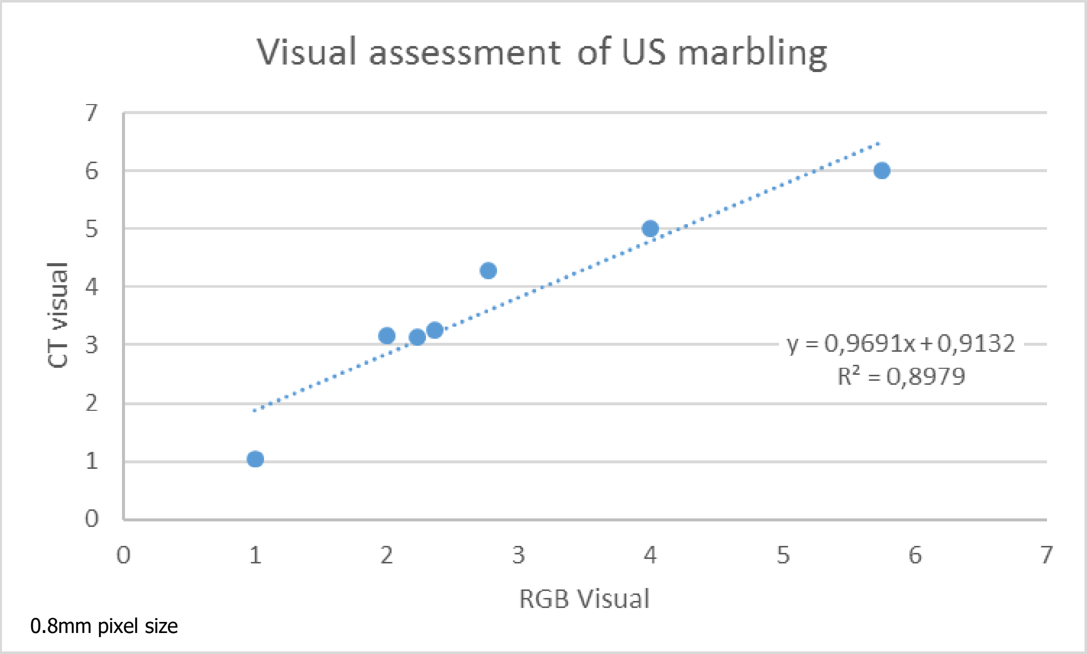
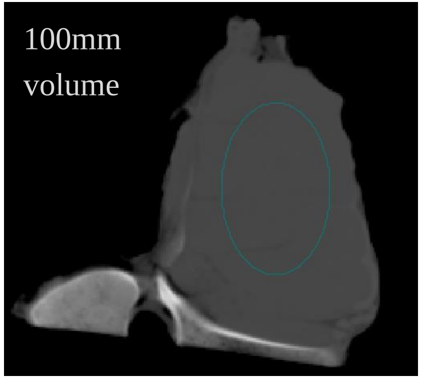
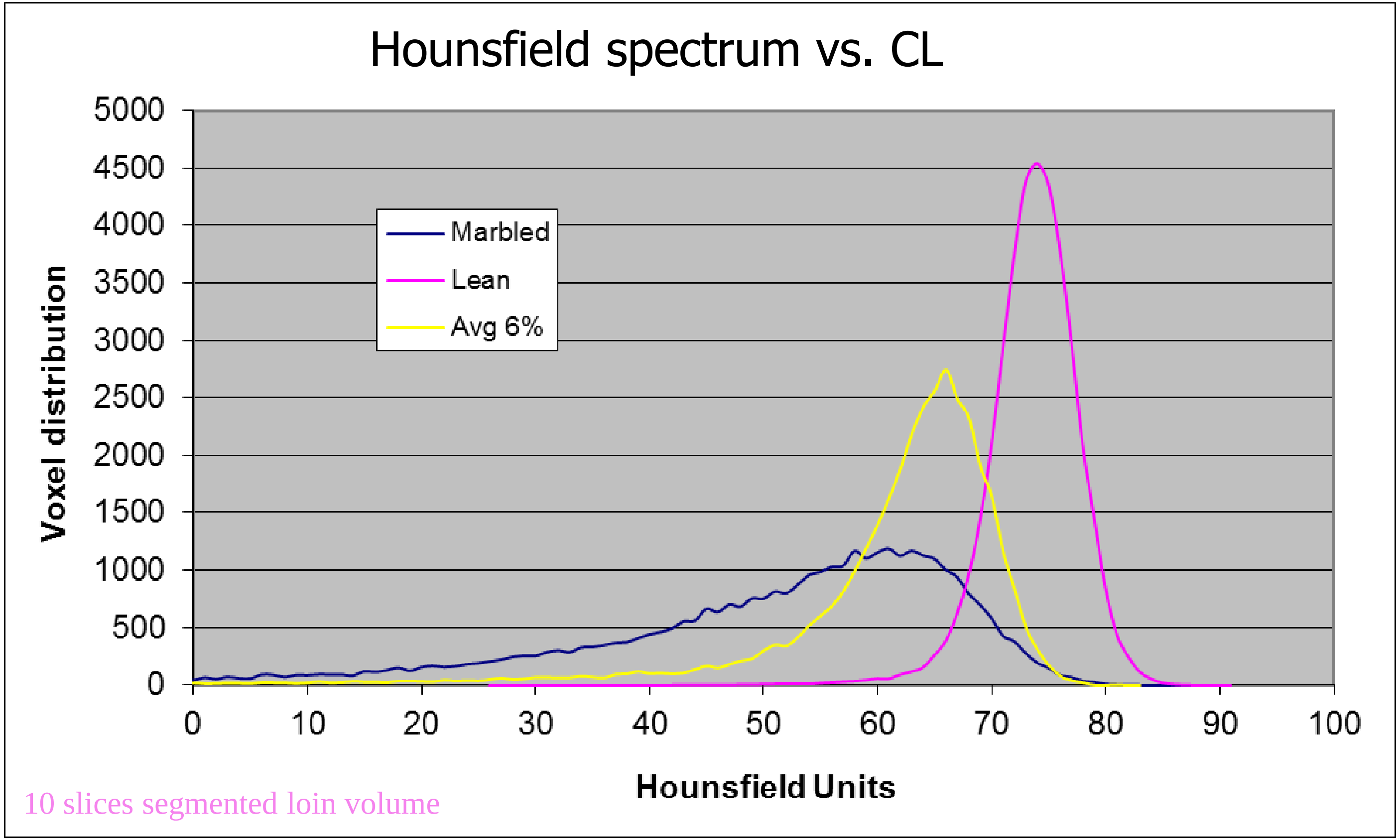




Spektralmåling af Chemical Lean i MedicalCT



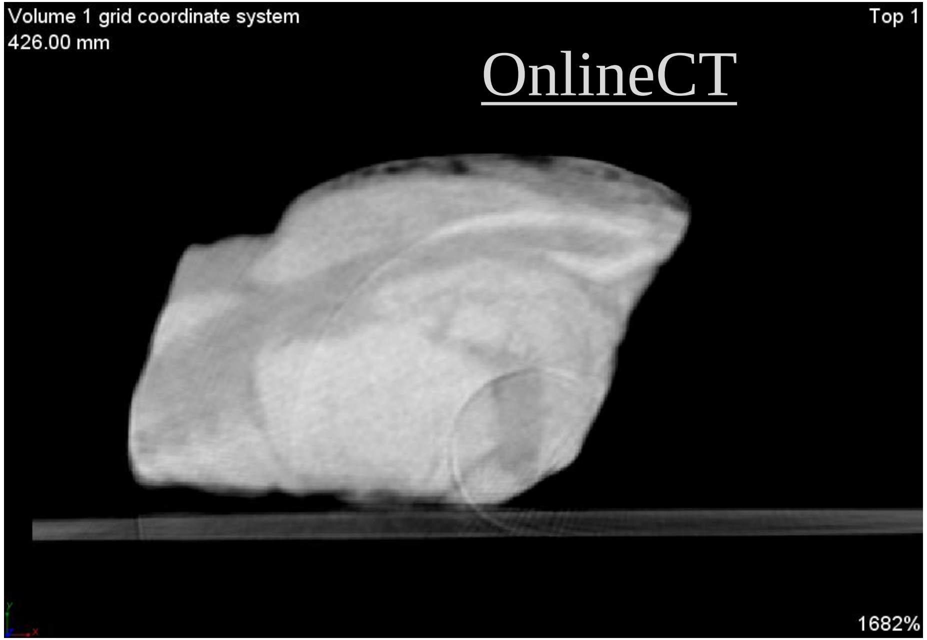


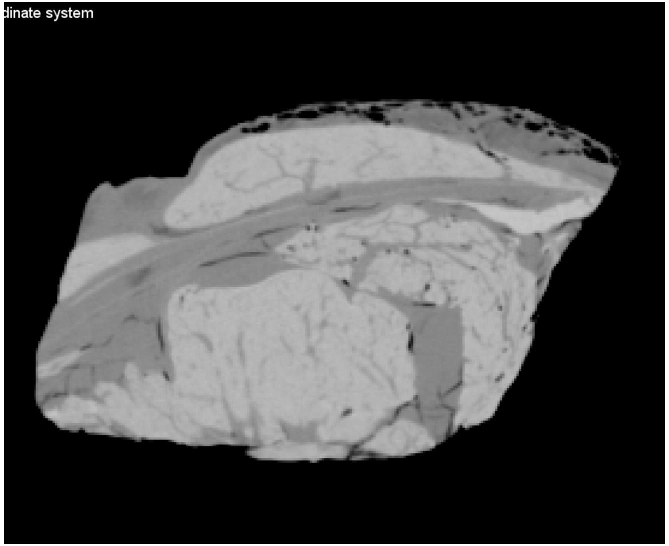
$\approx \Delta 1HU/CL$

Måling på højreb i MedicalCT

10mm slices

2mm slices





OnlineCT måling af steak potentiale

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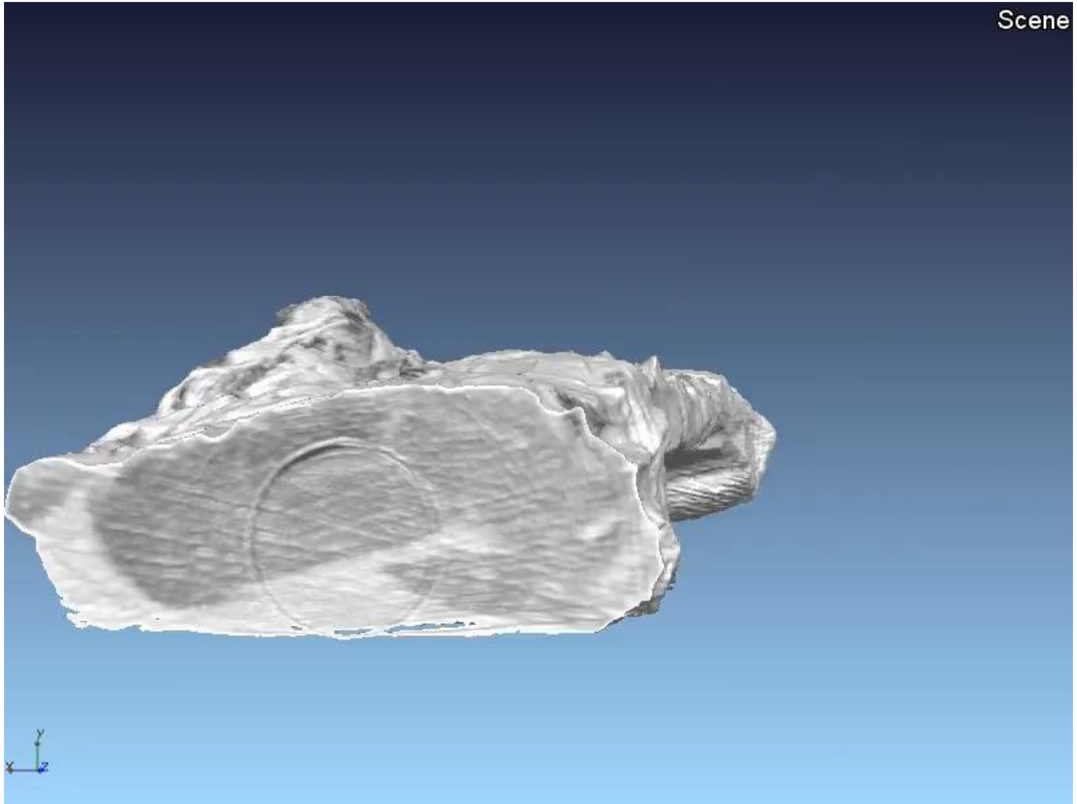
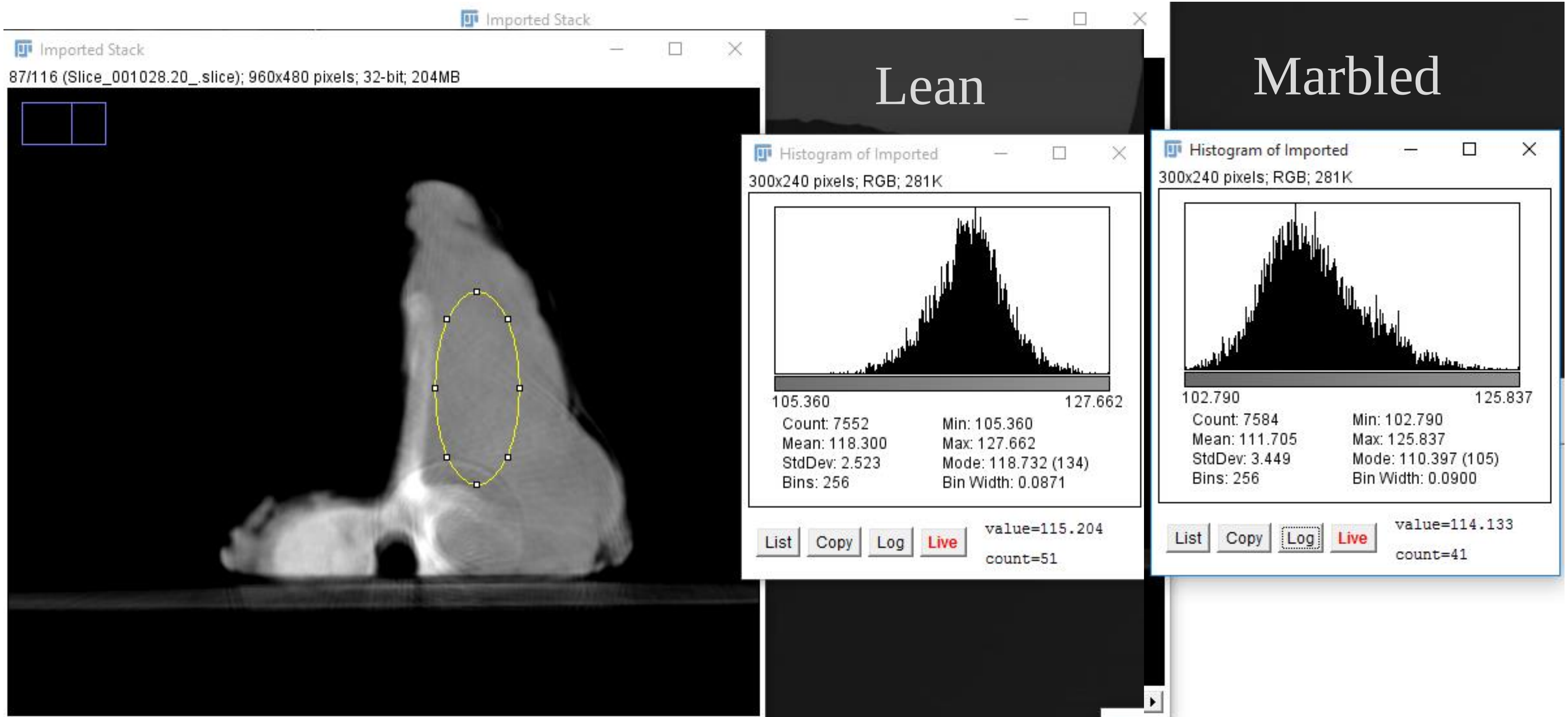


Korrigeret gråtoneskala
200 prod/hour
Manuelle snit
Vurdering af steak potentiale

OnlineCT måling på højreb med ben

Segmenteret et "rent" 1cm stykke Loin muscle fra 1 og 2



Røntgen i et produktions miljø

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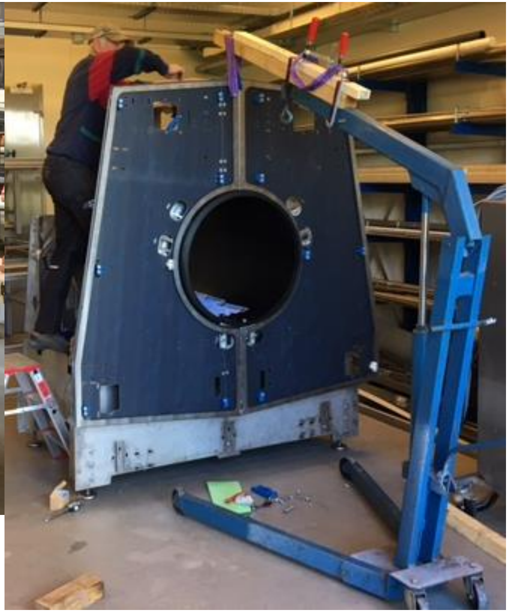
Udfordringer: Installation
Vedligehold

Løsning: Kontinuert køling
Lukket røntgenskab
< 5μSv/h
2 års forventet levetid af rør



Afslutning og spørgsmål

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