Breedplan RTU Scanning

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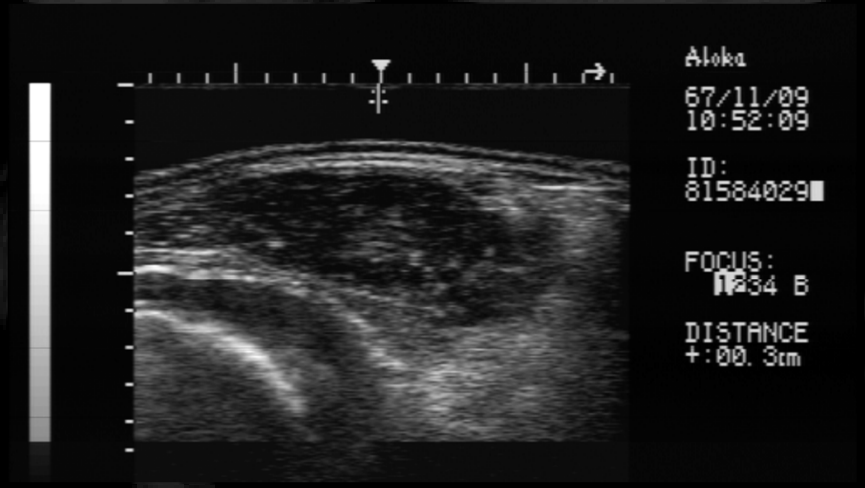

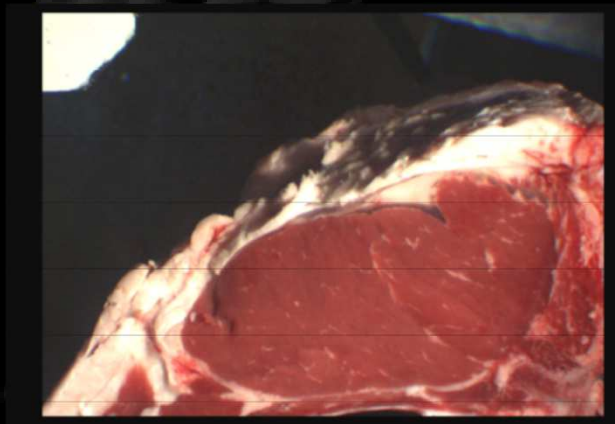

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Breedplan Real-time Ultrasound Measurements

Measures traits which are otherwise only available on the carcase:

- Contribute to BREEDPLAN carcase EBVs
- Dramatically increases the range of animals which can be assessed to generate carcase EBVs
- Allows measurements to be collected while animals are still in analytically useful contemporary groups

Breedplan Real-time Ultrasound Measurements

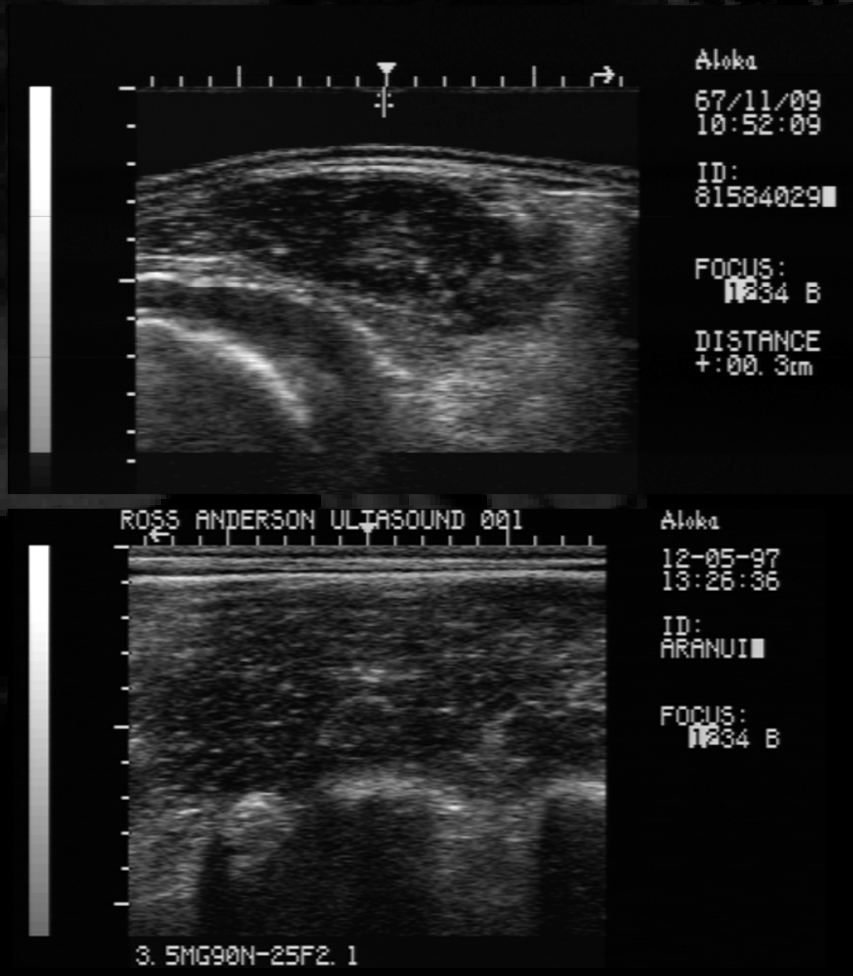
Real Time Ultrasound:

- Transducer acts as a transmitter and receiver
- Ultrasound travels through animal tissue at a constant velocity
- Reflected at tissue boundaries (changes in density)
- Time taken for waves to return to the transducer is proportional to the distance they have traveled
- Interpreted reflections are displayed on a monitor as a real time image of the tissue under examination

Breedplan Real-time Ultrasound Measurements

Breedplan Scanned Traits:

- Fat depth (mm)
  - P8 (Rump)
  - 12/13th Rib
- Eye Muscle Area (cm^2)
- Marbling (% intra-muscular Fat)



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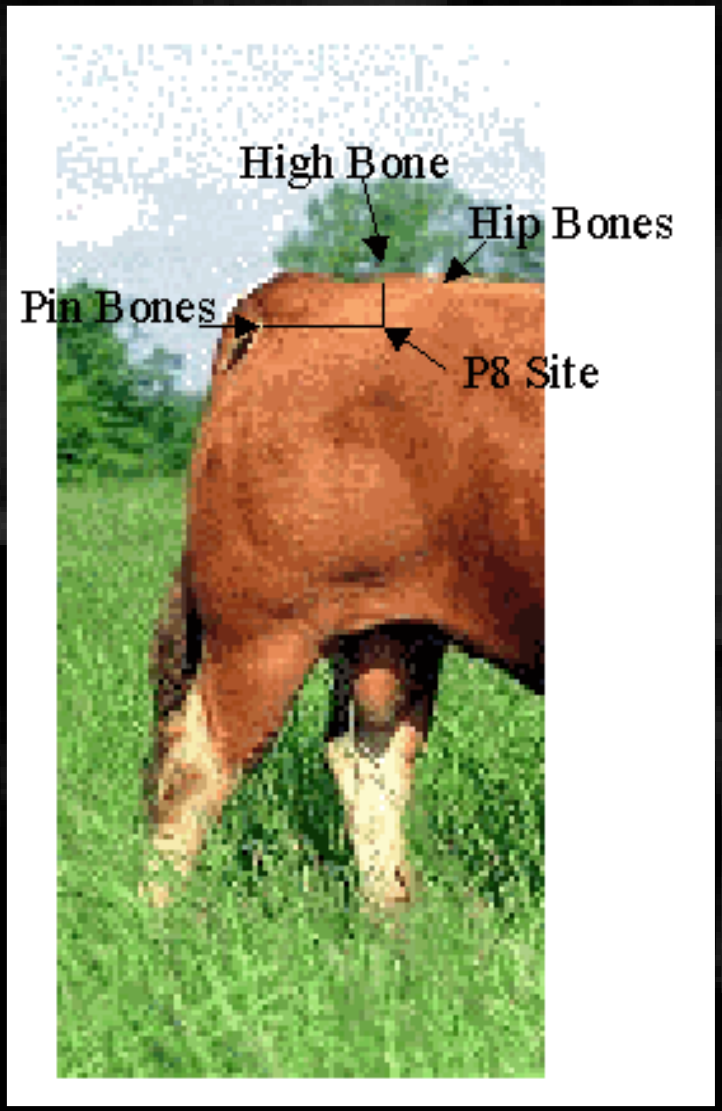
Breedplan Real Time Ultrasound Measurements

Fat Depth Measurement Sites

1. P8 site

- Located at the junction of a ‘vertical’ line, centered on the 3rd sacral vertebrae (high bone), and a ‘horizontal’ line parallel to the back bone, centered on the pin bone.



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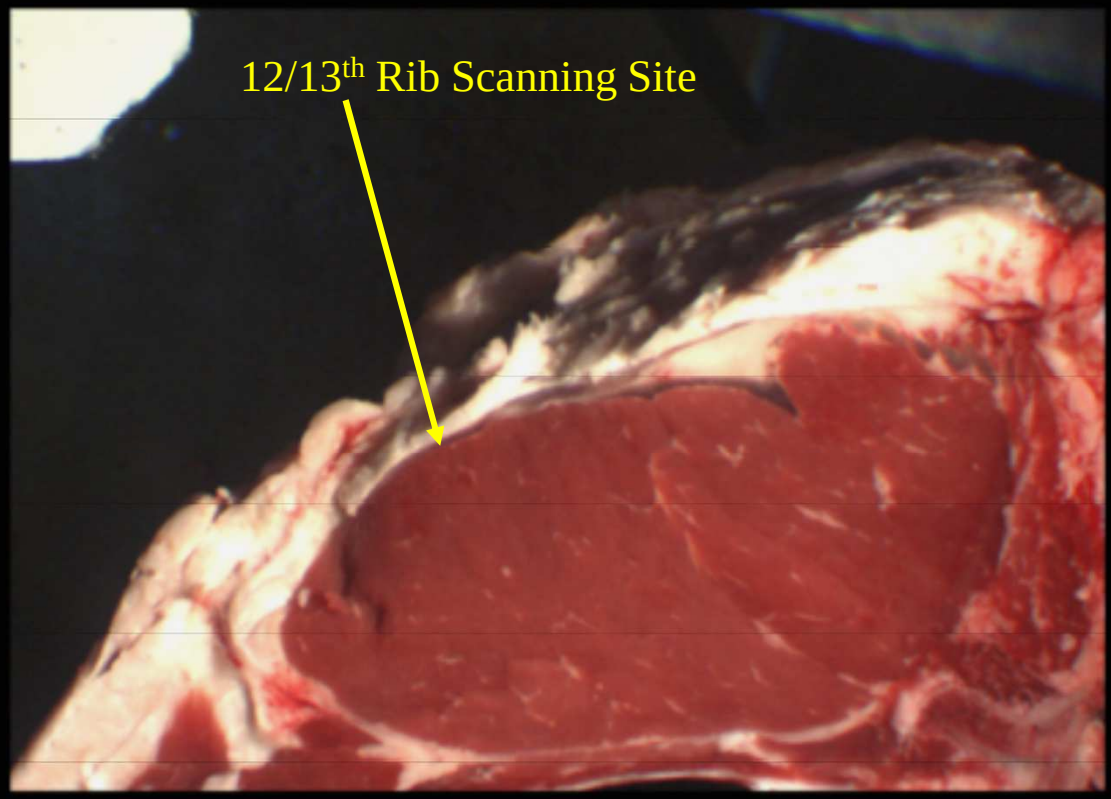
Breedplan Real Time Ultrasound Measurements

Fat depth Measurement Sites

2. 12/13th Rib

•Located ¾ of the way ‘down’ the eye muscle, from it’s dorsal (back-bone) margin



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Breedplan Real-time Ultrasound Measurements

Fat depth (P8 and 12 / 13th Rib)

- Locate scanning site accurately
- Be consistent with transducer pressure
- Use appropriate gain setting for “near field” measurements
- Be conscious of fat layering in fatter / older animals
- Take a number of measurements and average

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Breedplan Real-time Ultrasound Measurements

Eye Muscle Area: Measured between the 12th and 13th Ribs

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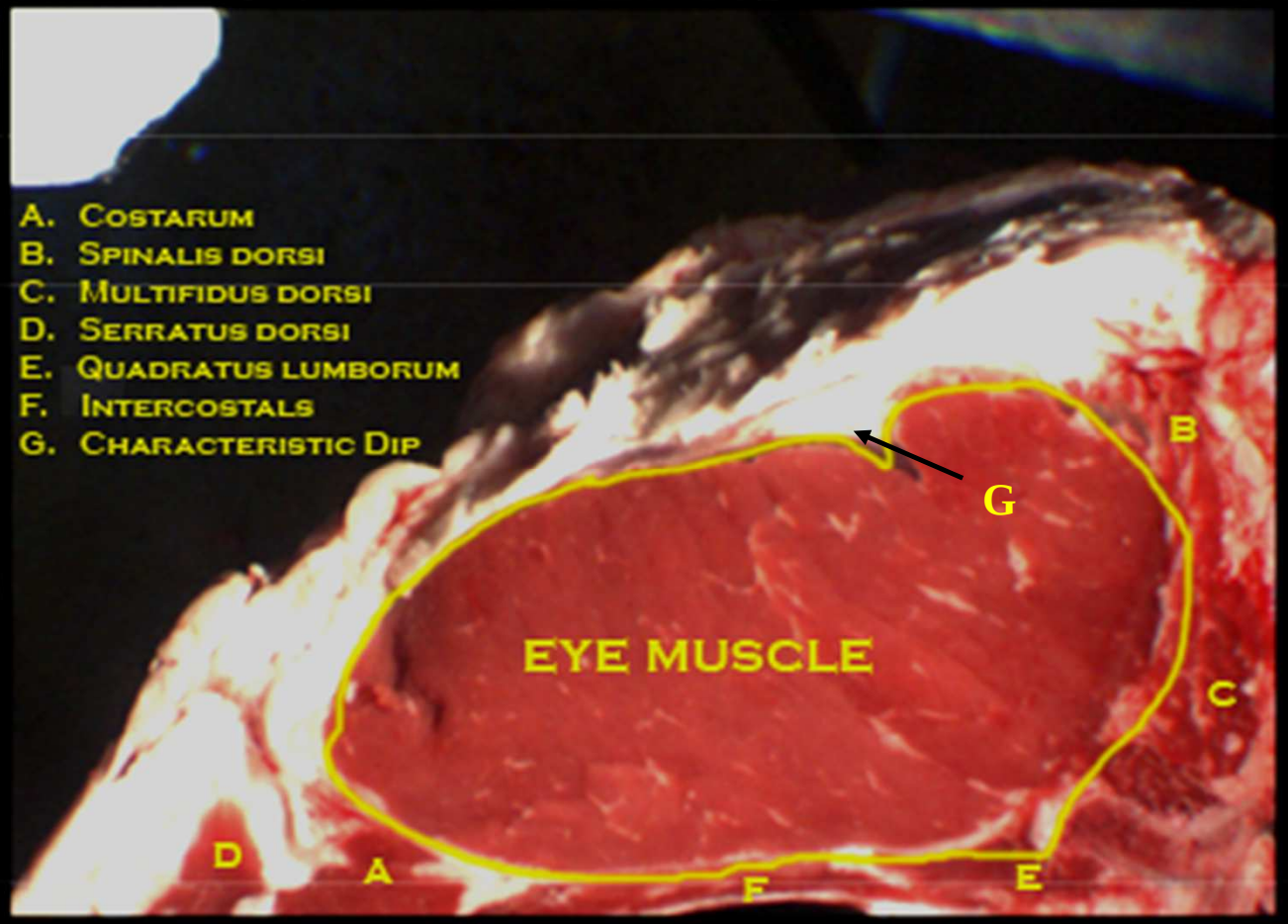
Breedplan Real-time Ultrasound Measurements

Eye Muscle Area: Carcase VIA Image



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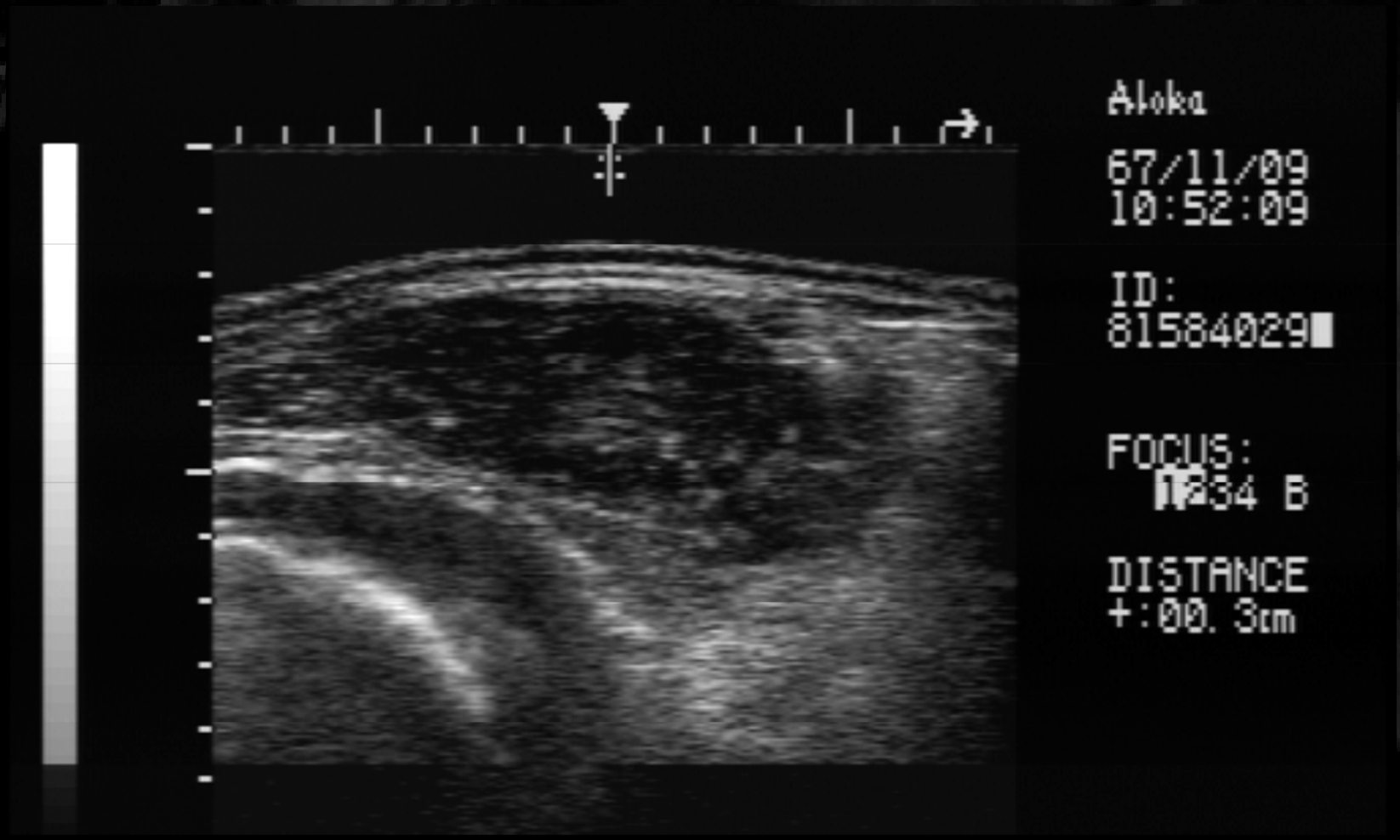
Breedplan Real-time Ultrasound Measurements

Scanned Eye Muscle Area Image



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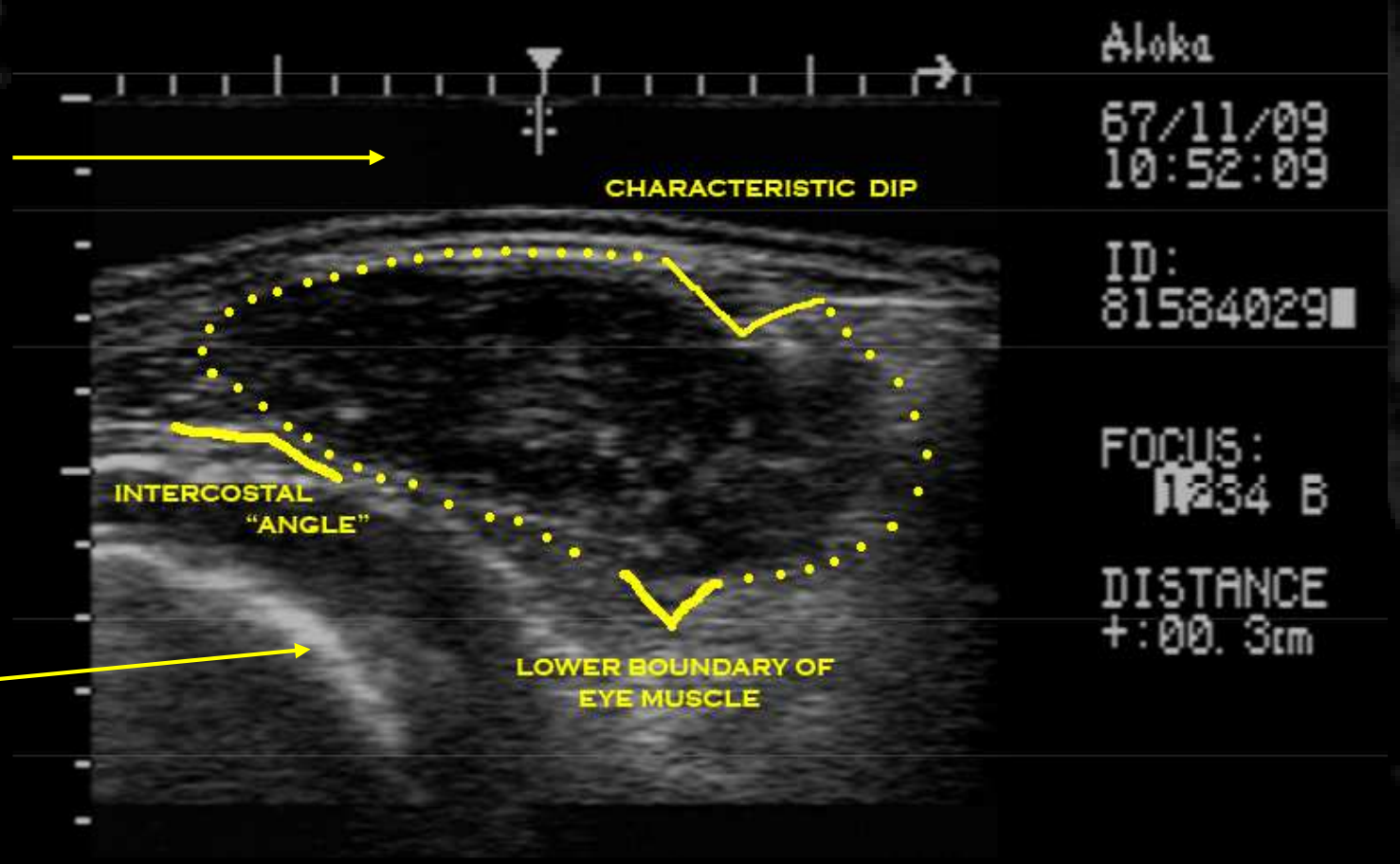
Breedplan Real-time Ultrasound Measurements

Scanned Eye Muscle Area Image



Scanning Guide

Diaphragm

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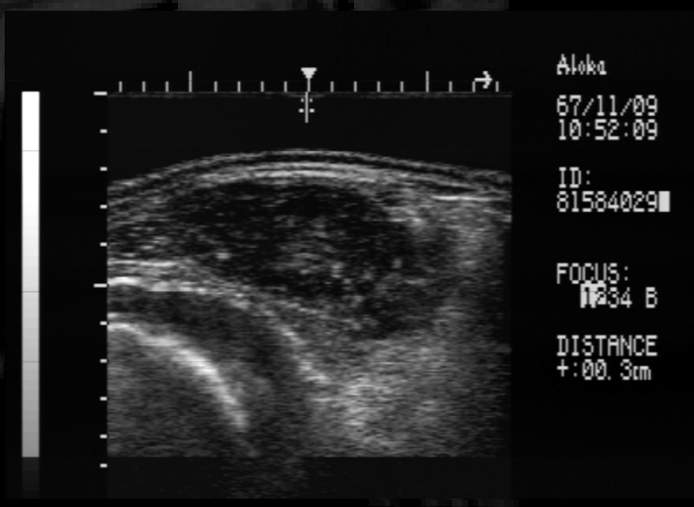
Breedplan Real-time Ultrasound Measurements

Eye Muscle area

- Measured **between** the 12th and 13th ribs
- Scan at an acute angel to the backbone, towards the tail
- Include only the *eye muscle* in EMA measurements
- Use a scanning guide to improve image accuracy



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Breedplan Real-time Ultrasound Measurements

Marbling

- Marbling is fat present inside the muscle boundaries
- Marbling analysis software returns a result of %IMF
- Measurement site located parallel to backbone, centered on 12/13th rib
- Scanned IMF% is the least accurate of the scanned carcass measurements
  - Collect multiple measurements and average

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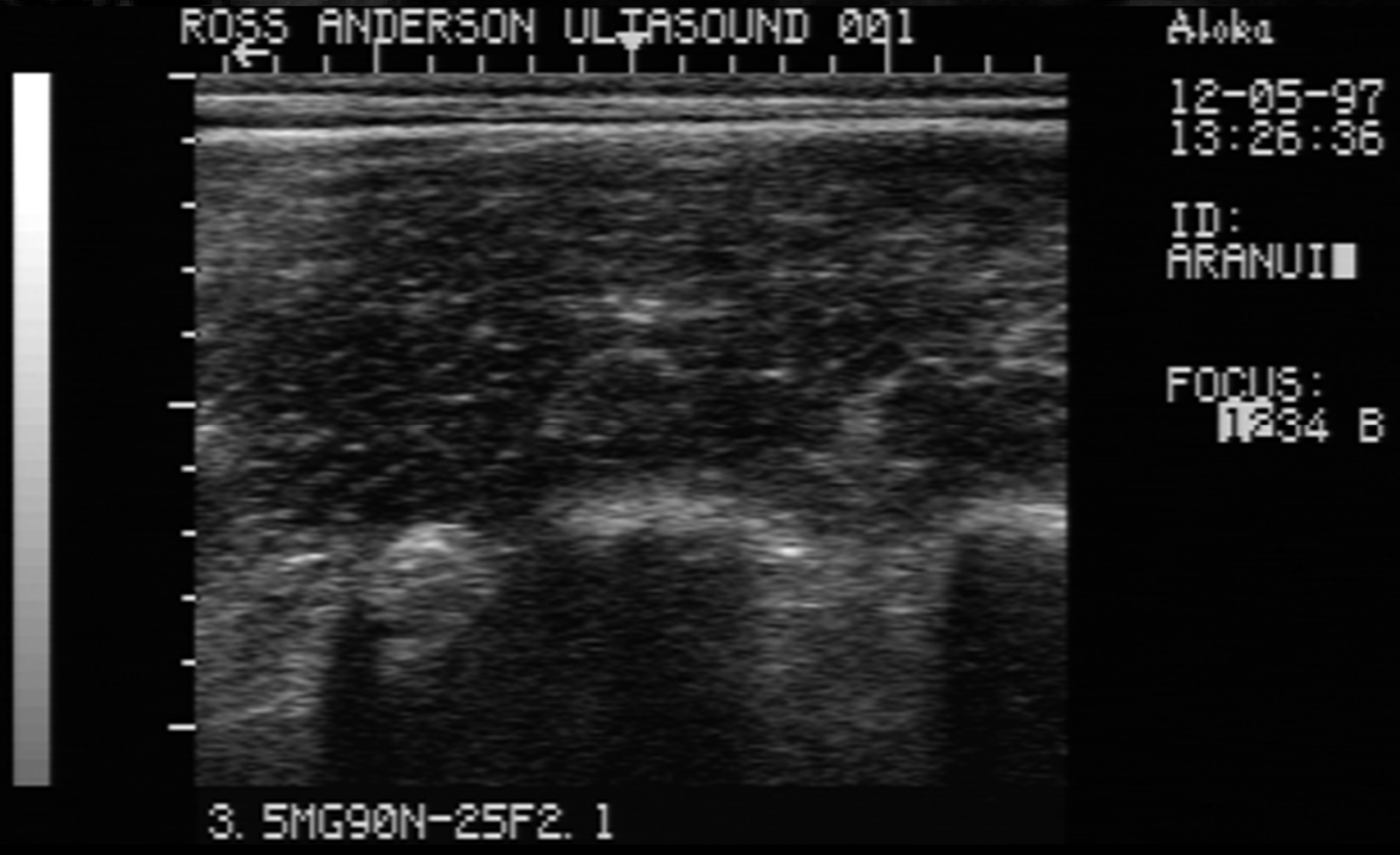
Breedplan Real-time Ultrasound Measurements

Marbling (IMF%)



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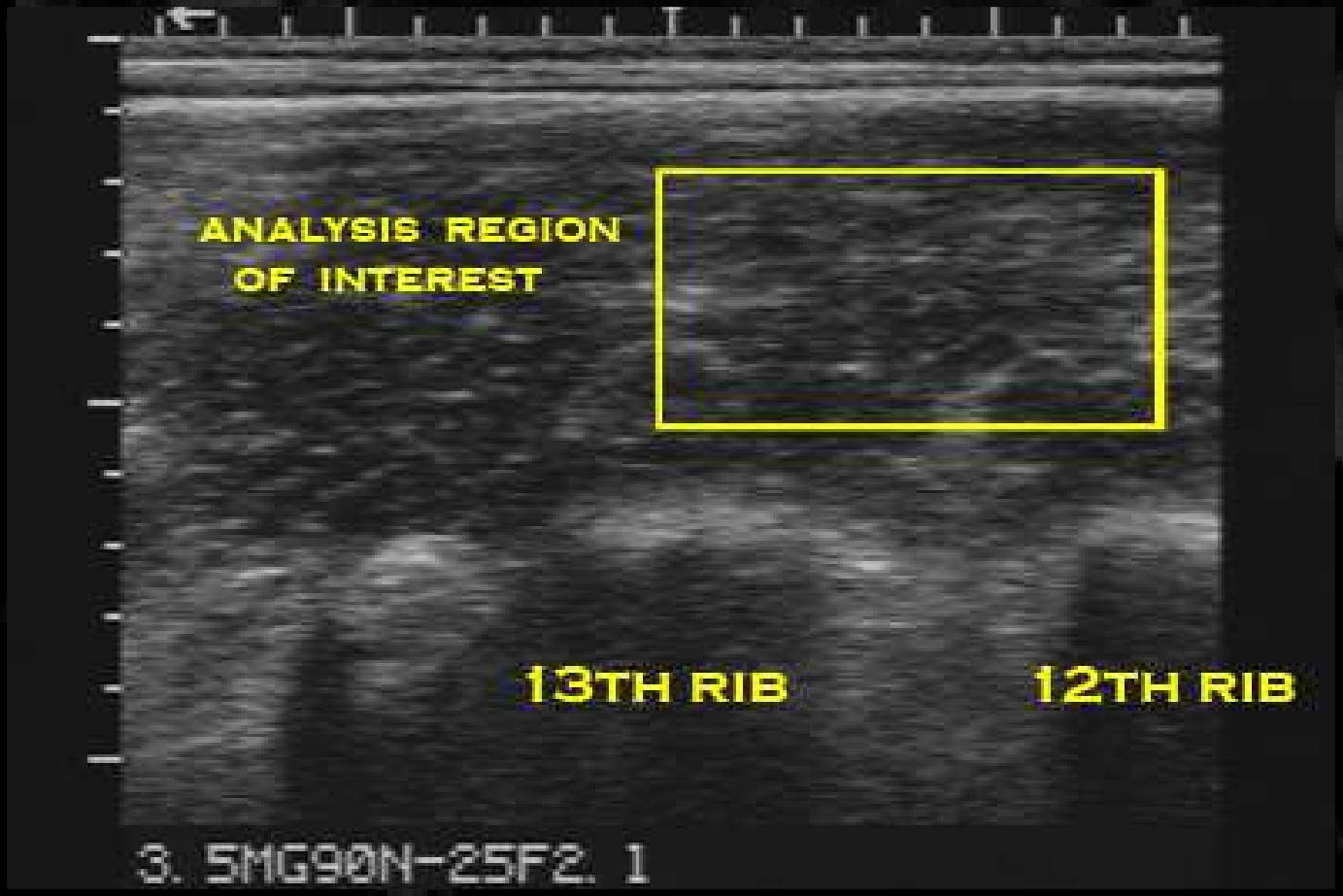
Breedplan Real-time Ultrasound Measurements

Marbling (IMF%)



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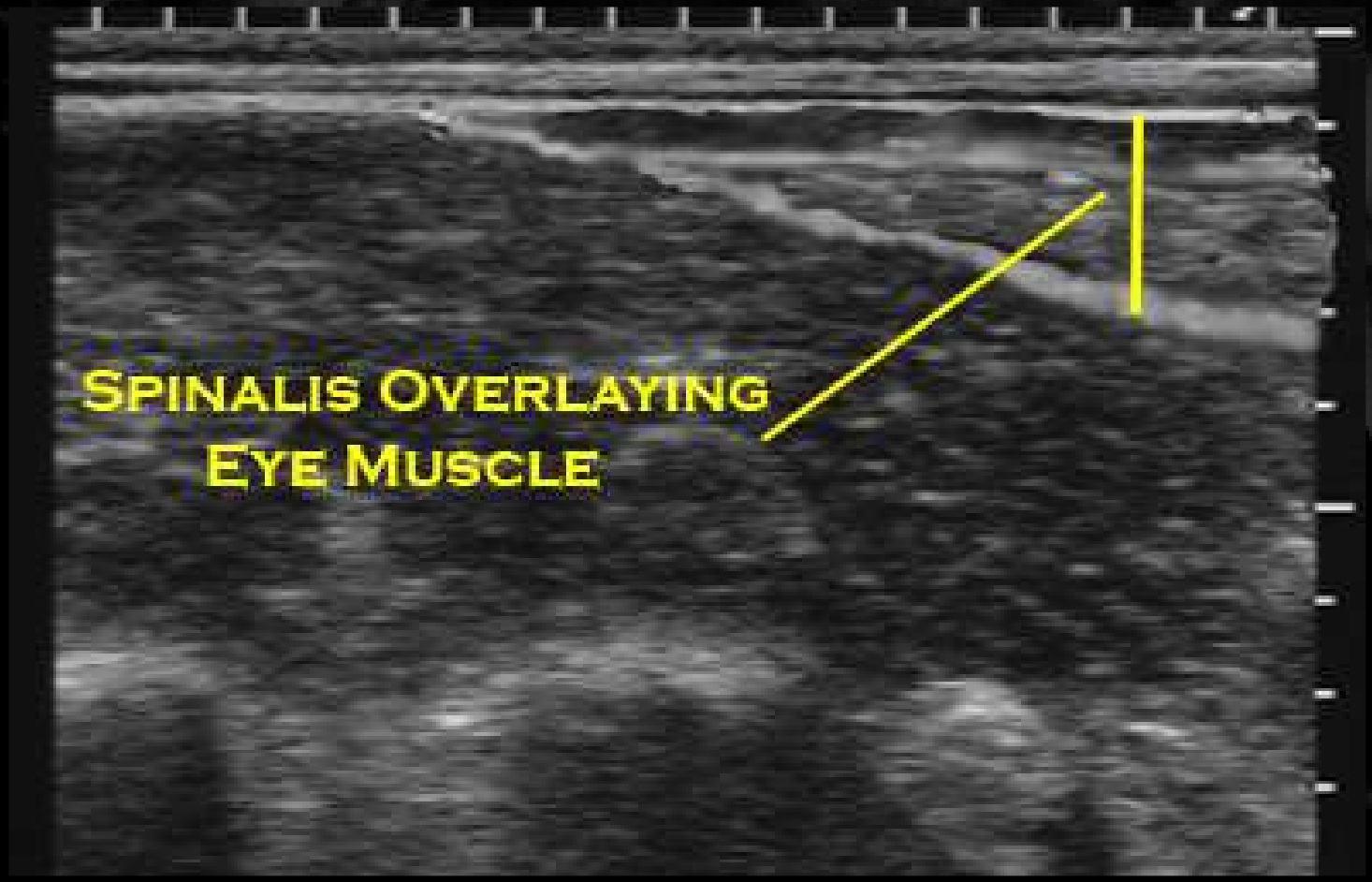
Breedplan Real-time Ultrasound Measurements

Marbling (IMF%)



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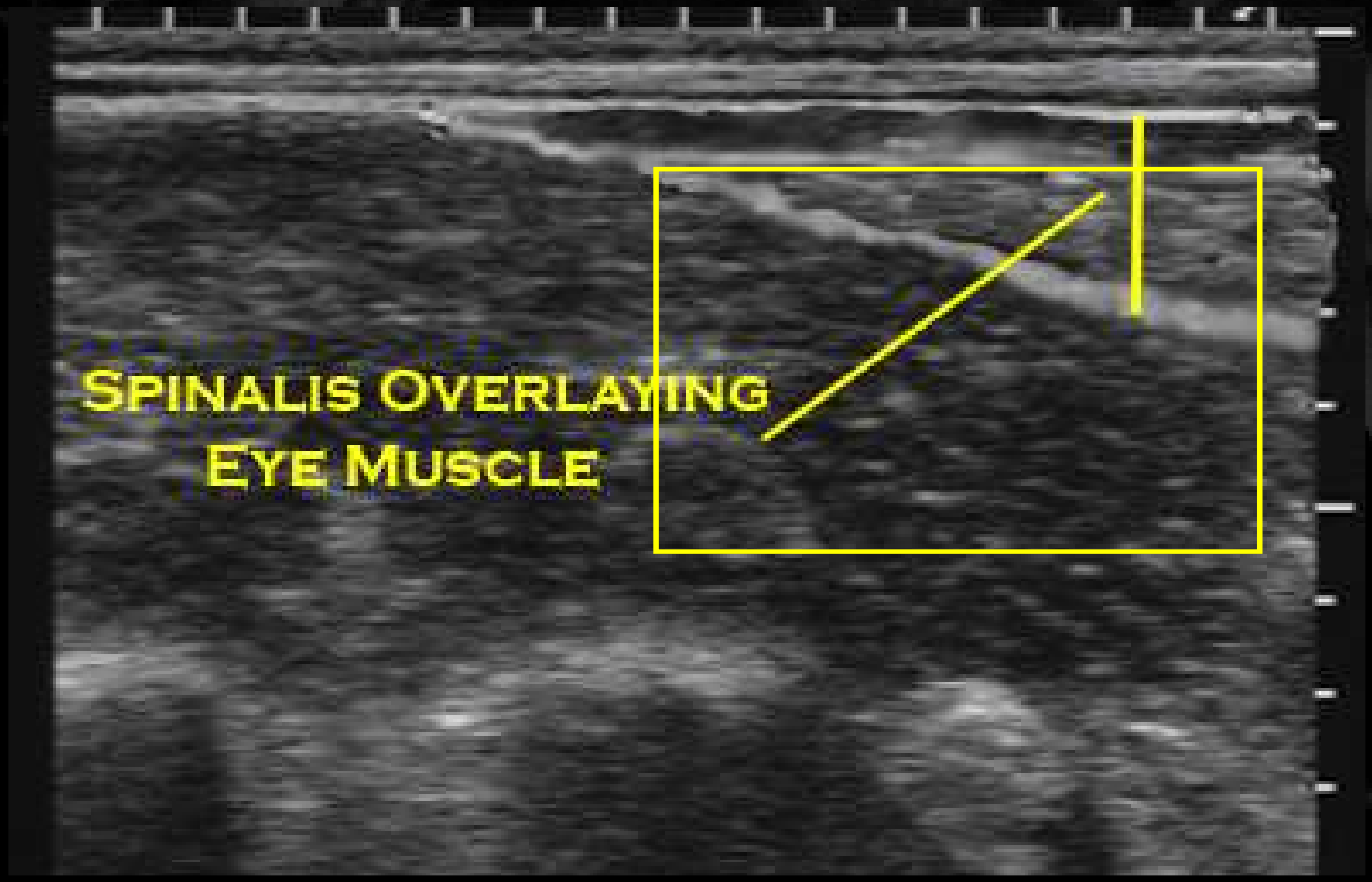
Breedplan Real-time Ultrasound Measurements

Marbling (IMF%)



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Breedplan Real-time Ultrasound Measurements

Marbling

- Locate scanning site accurately
- Be conscious of animal posture
- Thoroughly prepare the scanning site
- Only measure IMF for groups of animals with sufficient variation
    - Average P8 FD of 5mm or more
- Take a number of measurements and average

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Breedplan Real-time Ultrasound Scanning Equipment

Cattle carcass ultrasound equipment

- Large (17-18cm) transducer
- 3.5MHz transducer
- Software to analyze
  - Eye muscle area
  - Marbling (IMF%)
- Manufactured for farm conditions

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Breedplan Real-time Ultrasound Scanning Equipment

PIE ® 200 “Aquilla”

Aloka ® 500 - V

PIE ® 100 “Falco”

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Breedplan Real-time Ultrasound Measurements

Marbling Analysis

- **Grey scale analysis:**
  - **Examines the light vs. dark pixels within a pre-set region of interest**
  - **Analyses > 100 parameter to estimate %IMF**
- **Transmission contrast analysis:**
  - **Analyses user defined areas at the top and bottom of the muscle**
  - **Examines similar parameters to GSA in these locations**
  - **Relates the variation between parameters to IMF%**
    - **↑ [*(Transmission index top)–(Transmission index bottom)*] ⇒ ↑ *IMF%*.**

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Breedplan Real-time Ultrasound Scanning Equipment

Aloka 500 - V:

- Grey scale analysis
- IMF Software made available to users on a $ / image analysed basis
- Requires storage of EMA and IMF images for later analysis

PIE Aquila and Falco:

- Transmission contrast analysis
- Can perform all analysis on the spot
- IMF software packaged with the machine with no on-going fee to the user.

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BREEDPLAN Scanning Accreditation

- Breedplan requires scanners to be accredited before their measurements are accepted for analysis

- Accreditation tests operators on the basis of :
  - Accuracy (relationship with carcass measurements)
  - Repeatability (relationship between repeated measurements)

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BREEDPLAN Scanning Accreditation

Breedplan Accreditation Standards

Criteria	P8 FD	Rib FD	EMA	IMF
Repeatability				
Correlation	0.90	0.90	0.80	0.70
Standard Error	1.5mm	1.0mm	5.5cm^2	1.0%
Accuracy				
Correlation	0.90	0.90	0.80	0.70
Standard Error	1.5mm	1.0mm	5.5cm^2	1.0%

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BREEDPLAN Scanning Accreditation

Accreditation: Results Example 2002 Test

Average results for Scanners in 2002 Test who passed for all traits

Criteria	P8 FD	Rib FD	EMA	IMF
Repeatability				
Correlation	0.97	0.93	0.88	0.77
Standard Error	0.99mm	0.87mm	4.27cm^2	0.83%
Accuracy				
Correlation	0.95	0.90	0.89	0.74
Standard Error	1.39mm	***1.38mm***	4.44cm^2	0.93%

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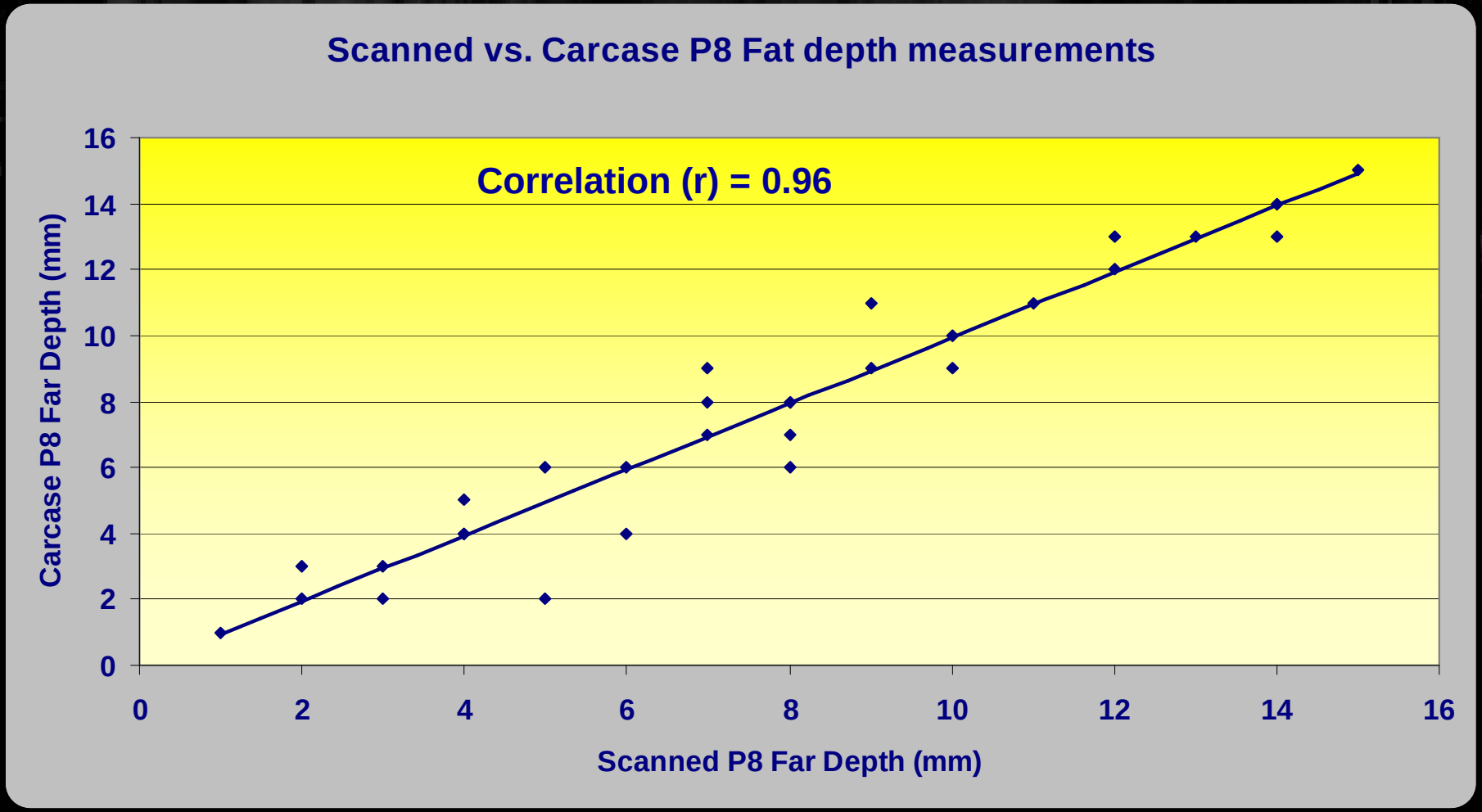
BREEDPLAN Scanning Accreditation

Correlations (R^2): The ability to predict carcase traits from scanned measurements



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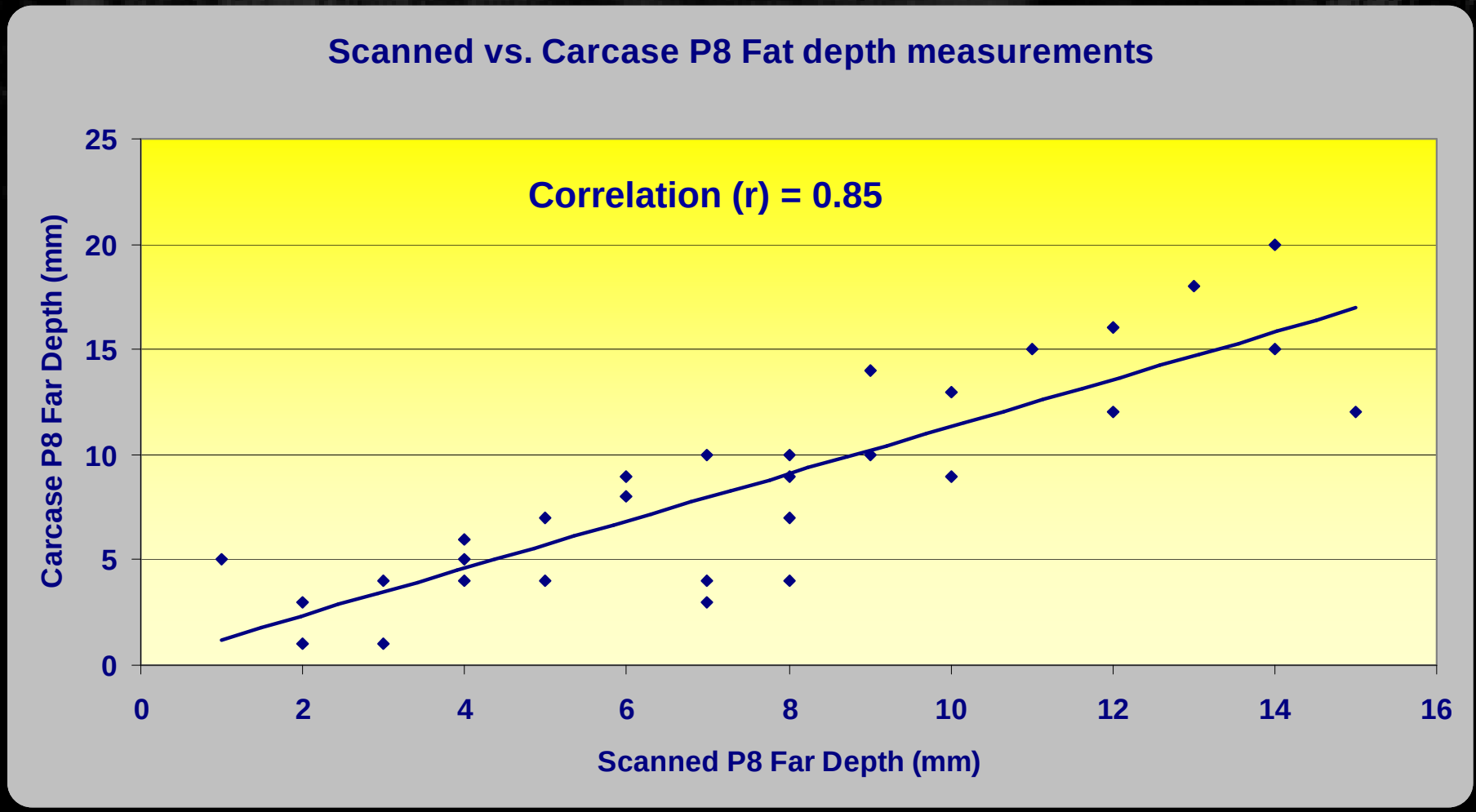
BREEDPLAN Scanning Accreditation

Correlations (R^2): The ability to predict carcase traits from scanned measurements



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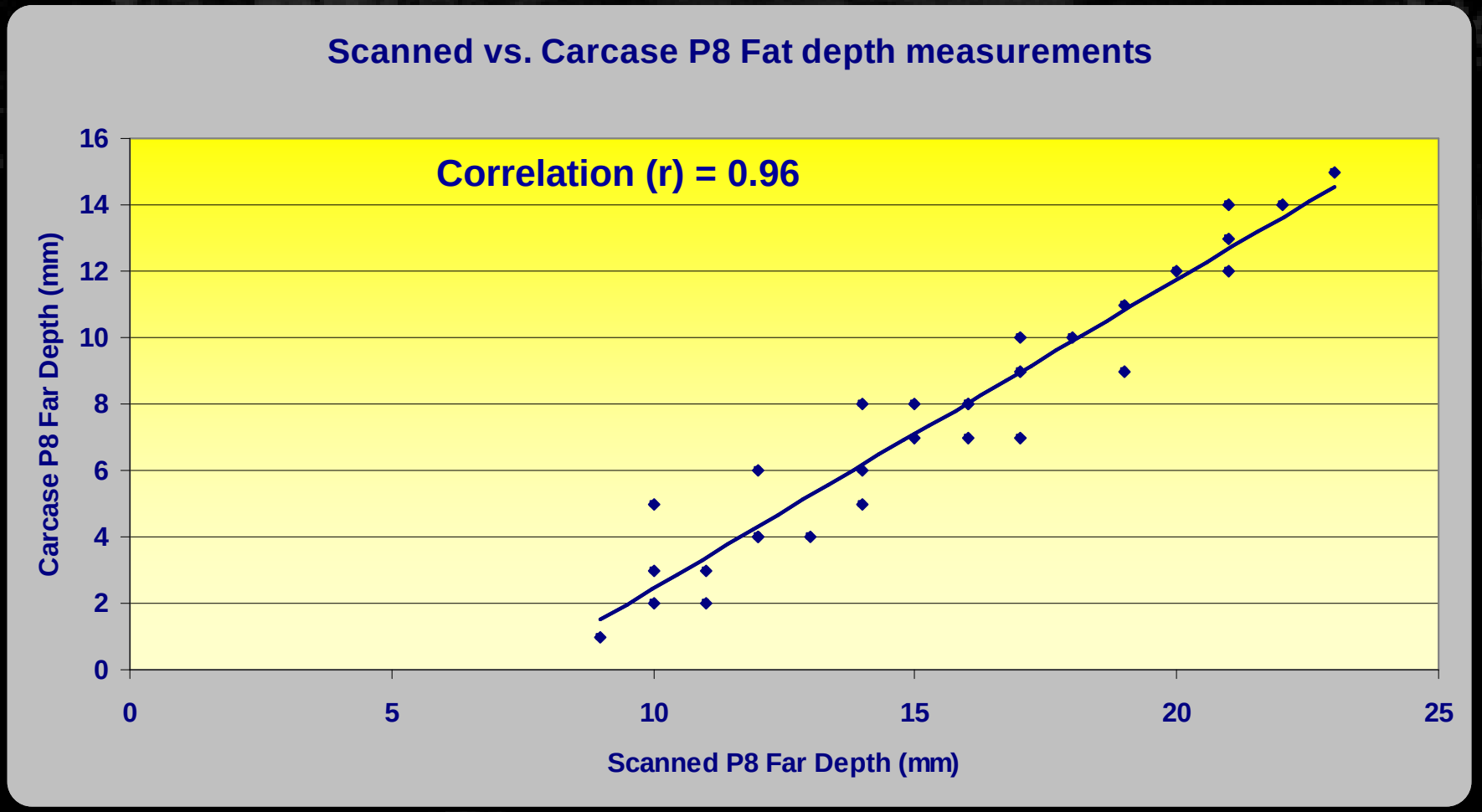
BREEDPLAN Scanning Accreditation

Bias: A constant, predictable error in an operators measurements



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BREEDPLAN Scanning Accreditation

Standard Error

- $SE = \sqrt{(16^2 + 1^2 + -1^2 \ldots\ldots) / 15}$

$SE = \sqrt{8.27}$

$= 2.88$

Bias

- Average Scanned P8 – Average Carcase P8

Bias = 9.1 – 7.3

= +1.8

Carcase P8	Scanned P8	Residual	(Residual)^2
1	5	4	16
2	1	1	1
2	3	1	1
3	4	1	1
3	1	2	4
4	6	2	4
4	5	1	1
6	9	3	9
10	13	3	9
11	15	4	16
12	16	4	16
12	12	0	0
14	20	6	36
14	15	1	1
15	12	3	9
7.3	9.1	2.3	8.27

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BREEDPLAN Carcase Scanning

- Provides an estimate of carcase characteristics without the need to slaughter the animal
- Measures meat quality traits of importance to many markets
- Allows large groups of animals to be tested economically and quickly
- Requires experienced, accredited operators to maintain data quality