

TIMBER MEASUREMENTS SOCIETY
CENTRAL MEETING

Comparison of log scaling under different national standards in Europe

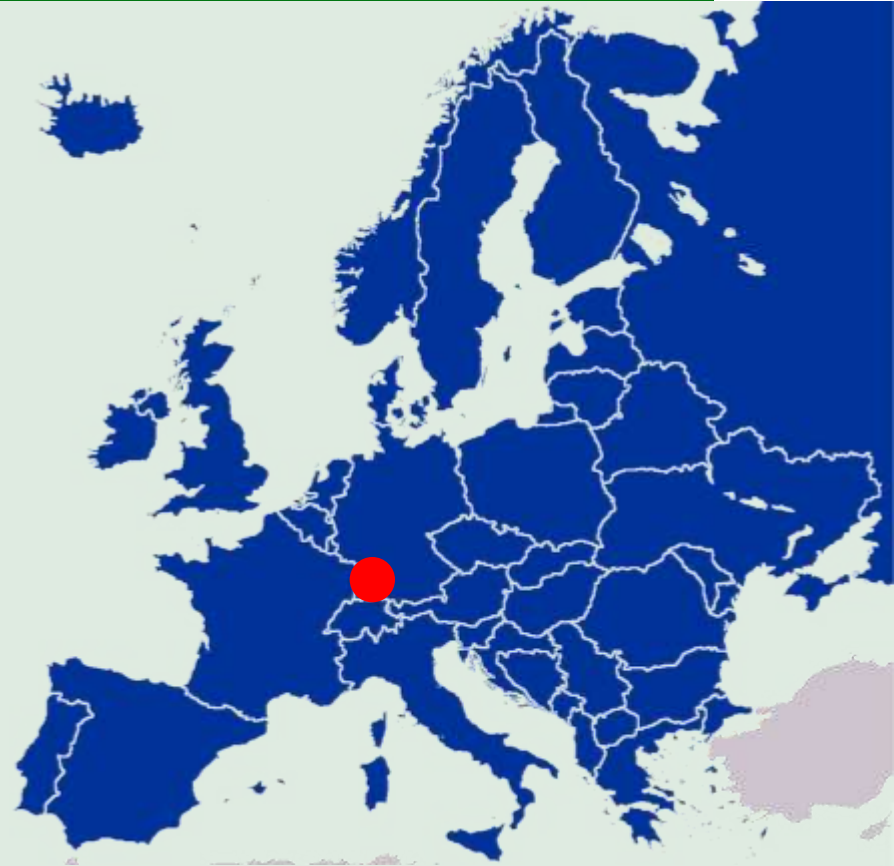
Udo Hans Sauter
Jörg Staudenmaier

Department of Forest Utilisation

Forest Research Institute of
Baden-Wuerttemberg

Forest Research Institute of Baden-Wuerttemberg (FVA)

- Located in Freiburg (Black Forest)
- Research institute of the forest administration
- Regional, national and international research and consulting tasks and projects



FVA - Department of Forest Utilisation

Harvesting,
logistics

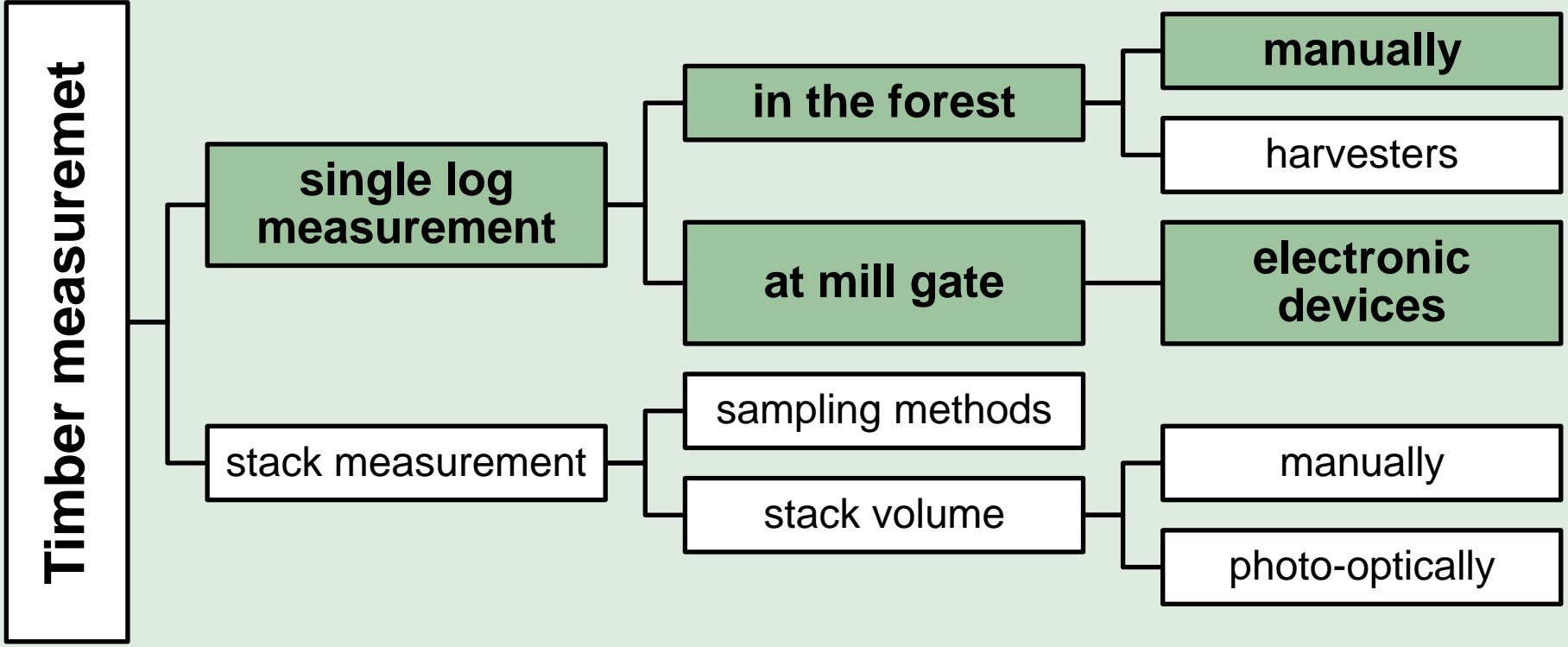


Roundwood
measurement,
grading

Applied
wood
science



Bioenergy from
forests
short rotation
agroforestry



Manual measurement in the forest (1)

Single log measurement:

- Long tradition
- Carried out by forest workers
- Using mechanical calliper and tape
- Measuring unit: m³
(in Germany since 1875)



Manual measurement in the forest (2)

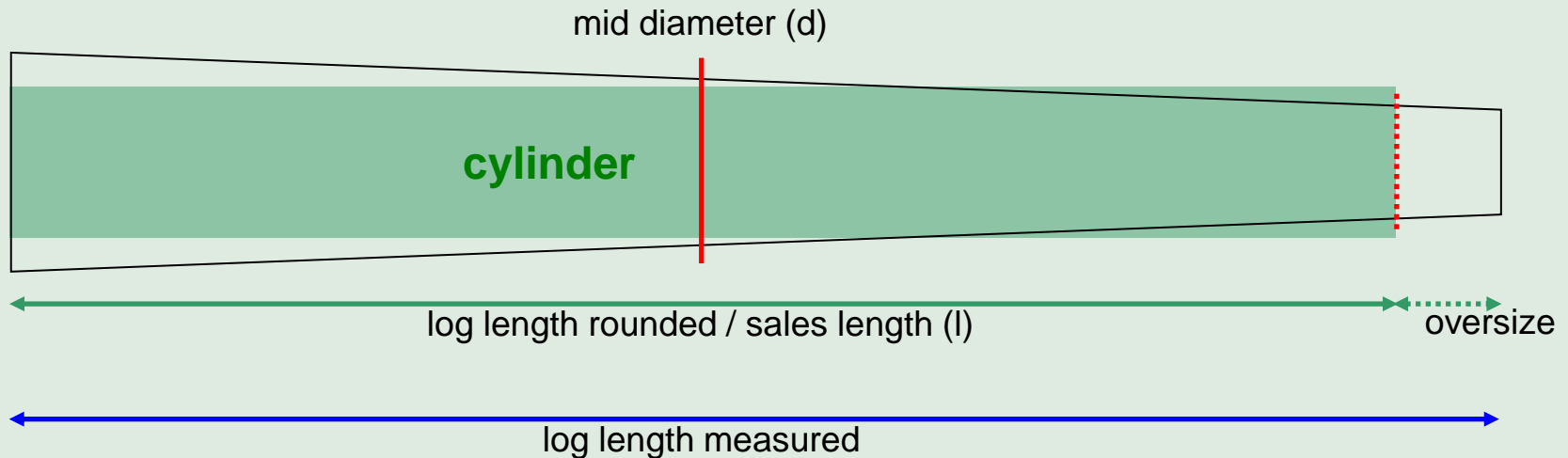
Single log measurement:

- Mid diameter:
 - two perpendicular measurements (minimum and maximum)
 - taken in the middle of the log length
 - Truncation to full centimeters
- Log length:
 - Truncation to agreed steps (e.g. 10 cm, 50 cm)



Calculating the volume

- Basis: cylinder volume



$$\text{Huber's formula: } V = \frac{\pi}{4} * d^2 * l$$

→ Standard for all types of wood

Considering legal requirements

- 1969: EU directive (68/89) for the intra-European approximation of laws in terms of roundwood scaling and grading was transferred into a national law (Forst-HKL, Forst-HKS).
 - For more than 40 years this law formed the main basis for scaling and grading of roundwood in Germany.
 - 31.12.2008: Suspension of the EU directive (68/89)
- Since 01.01.2015: „Rahmenvereinbarung für den Rohholzhandel in Deutschland“ (RVR) as a framework agreement on a private basis
- www.rvr-deutschland.de

Raw material

- Only softwood:
 - Spruce
 - Pine
 - Fir
 - Douglas fir
 - Larch
- Short logs (< 6 m)
- Long logs (6 – 20 m)



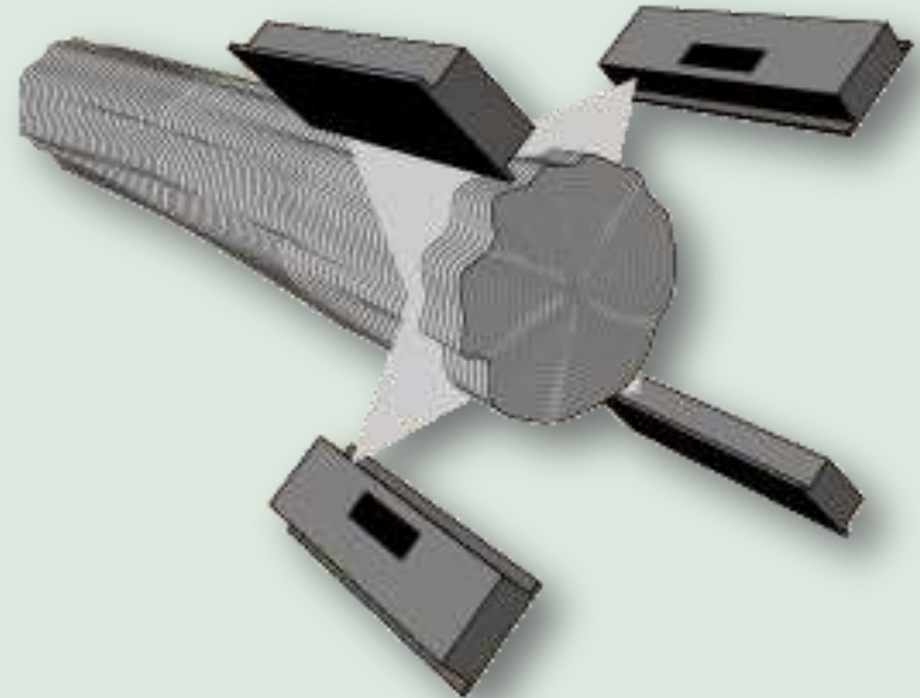
Technology

- 2D Measurement Systems
 - infrared or / and ultrasound
 - normally 2 perpendicular diameters
 - fixed measuring directions (geometry of the system)



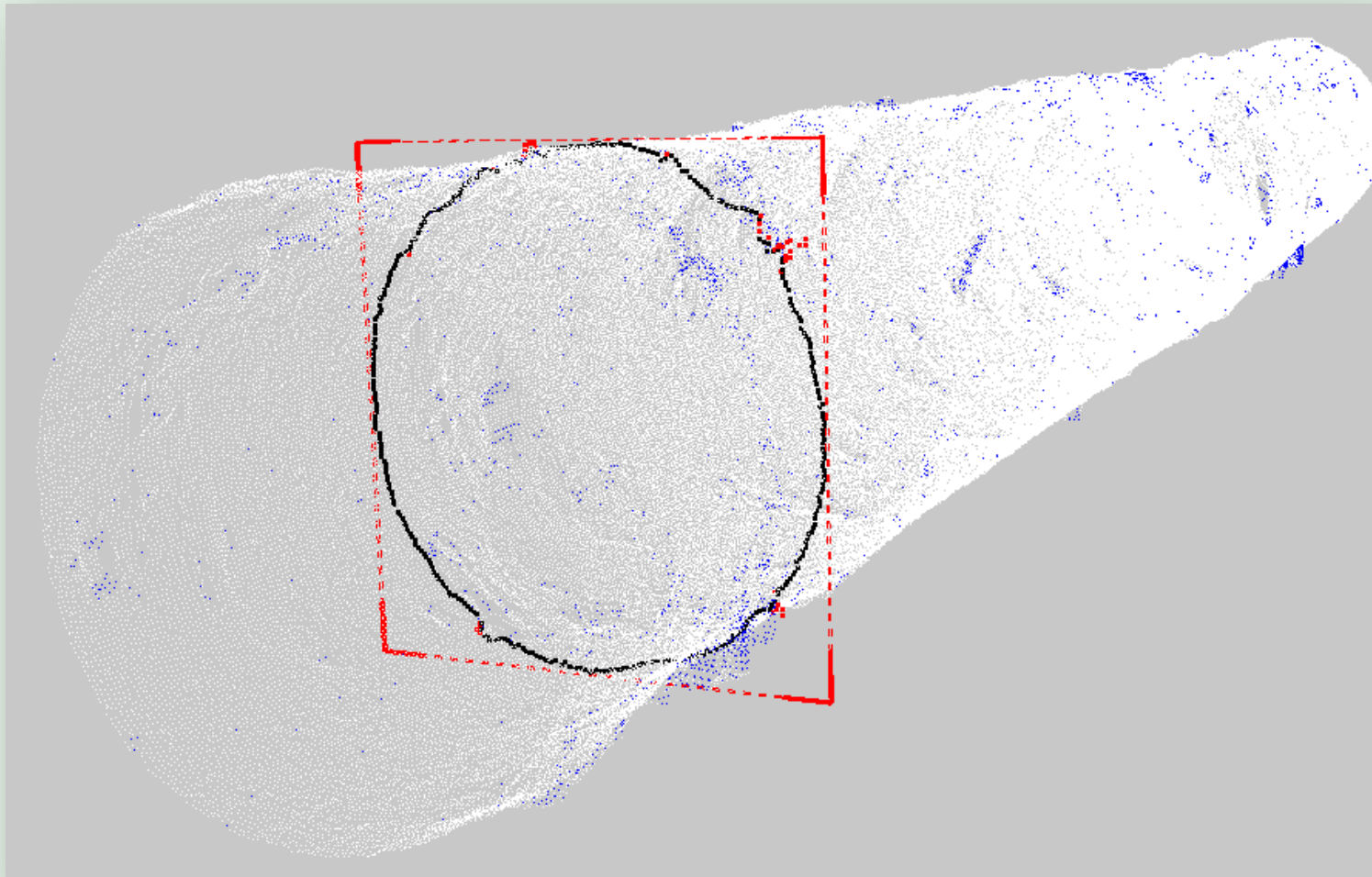
Technology

- 3D Measurement Systems (Laser-Triangulation)
 - Normally 4 laser sources / sensor devices
 - Full contour scan

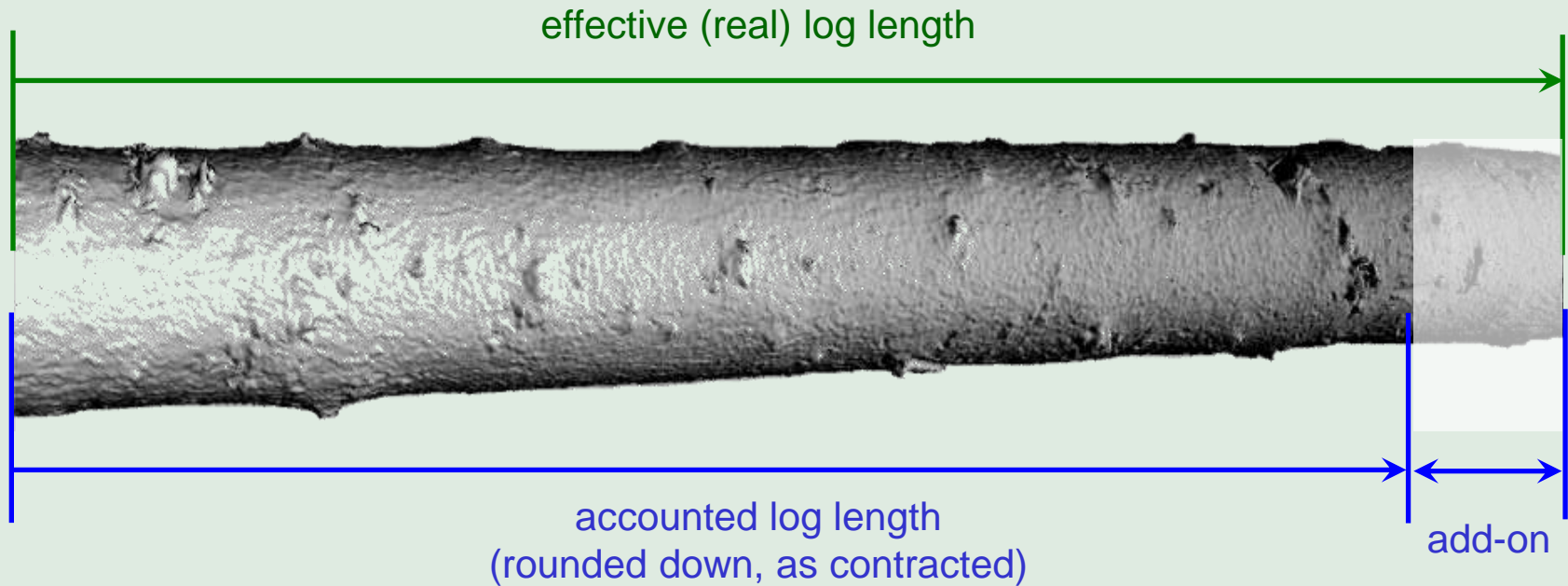




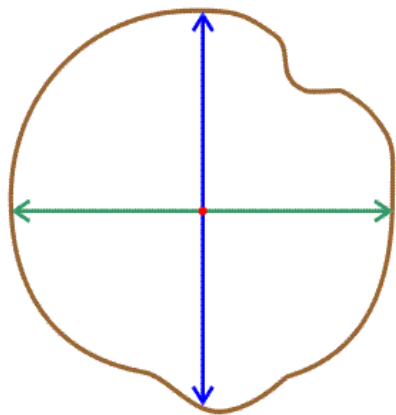
MICROTEC (c) 2010



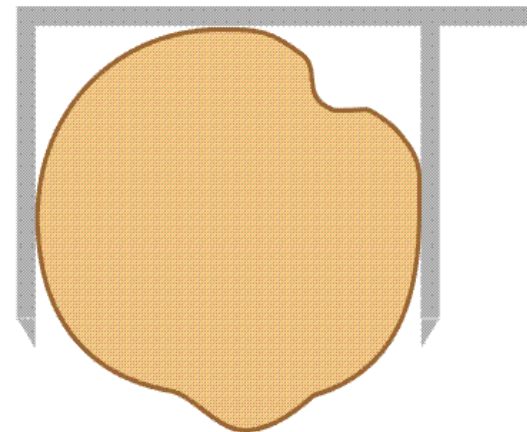
Log length



Diameter: Different approaches



Determining the
real contour

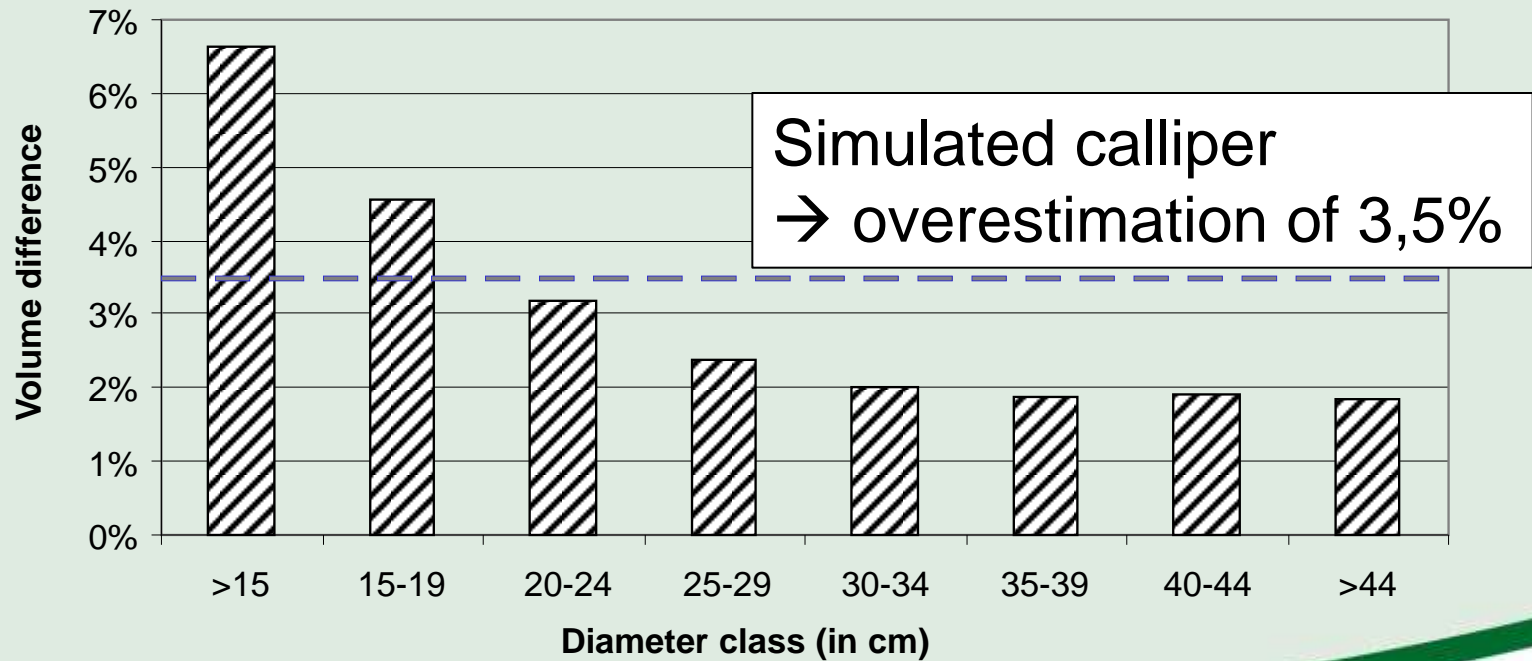


Simulating a
mechanical calliper

Diameter: Different approaches

Volume differences: simulated calliper – real contour

(2 perpendicular mid diameters, no roundings, fixed measurement planes,
n = 139.662, mean = 3,5%)



Different standards in Central Europe

	Austria	Germany
Standard	National standard (ÖNorm L1021)	Framework agreement (Rahmenvereinbarung Werksvermessung)

Different standards in Central Europe

	Austria	Germany
Standard	National standard (ÖNorm L1021)	Framework agreement (Rahmenvereinbarung Werksvermessung)
Mid diameter position	Middle of the <u>effective</u> log length	Middle of the <u>accounted</u> log length

Different standards in Central Europe

	Austria	Germany
Standard	National standard (ÖNorm L1021)	Framework agreement (Rahmenvereinbarung Werksvermessung)
Mid diameter position	Middle of the <u>effective</u> log length	Middle of the <u>accounted</u> log length
Diameter measurement planes	2 perpendicular, <u>variable</u> planes	2 perpendicular, <u>fixed</u> planes (e.g. vertical / horizontal)

Different standards in Central Europe

	Austria	Germany
Standard	National standard (ÖNorm L1021)	Framework agreement (Rahmenvereinbarung Werksvermessung)
Mid diameter position	Middle of the <u>effective</u> log length	Middle of the <u>accounted</u> log length
Diameter measurement planes	2 perpendicular, <u>variable</u> planes	2 perpendicular, <u>fixed</u> planes (e.g. vertical / horizontal)
Rounding of diameters	Double truncation (to whole centimeters)	Single or double truncation (to whole centimeters)

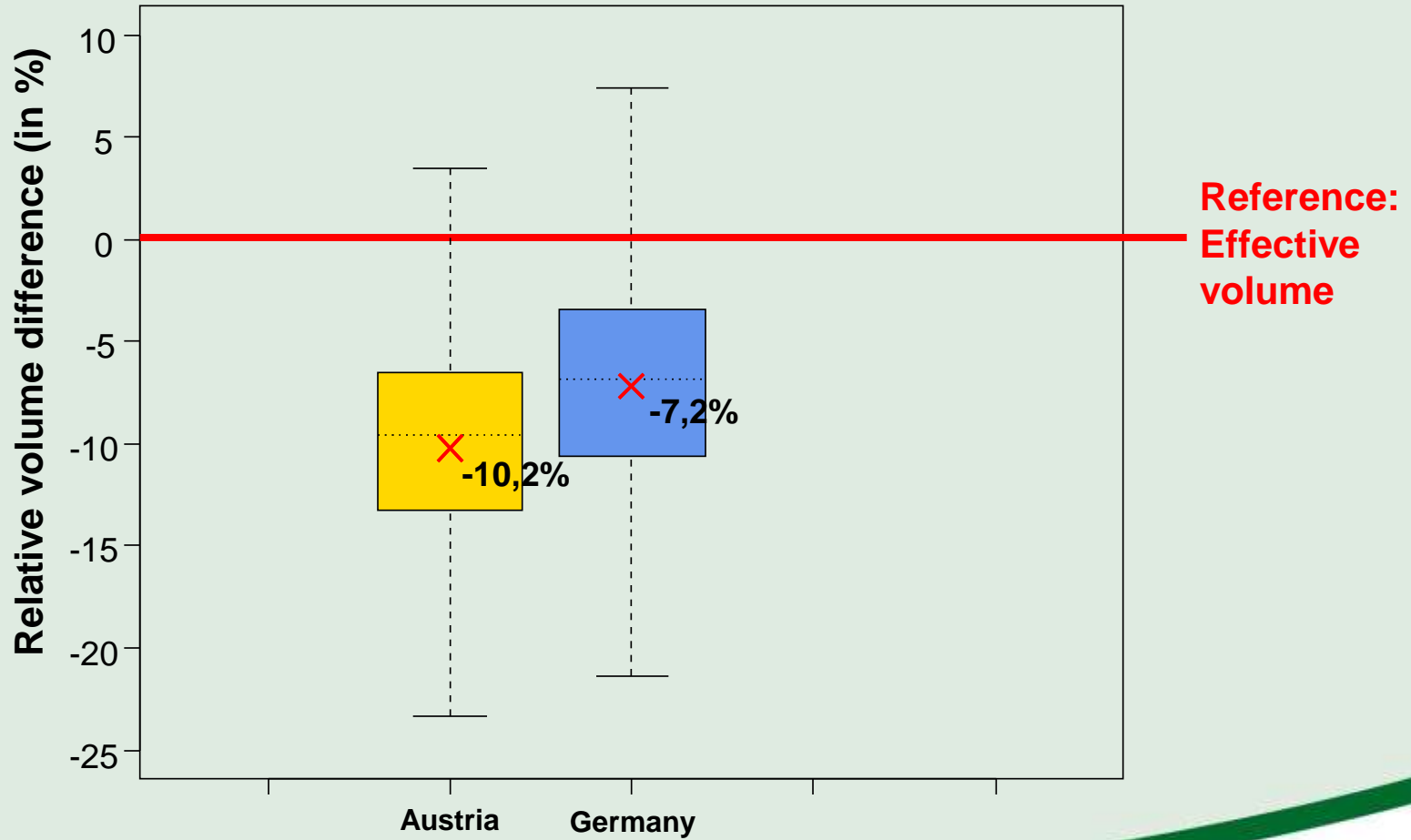
Different standards in Central Europe

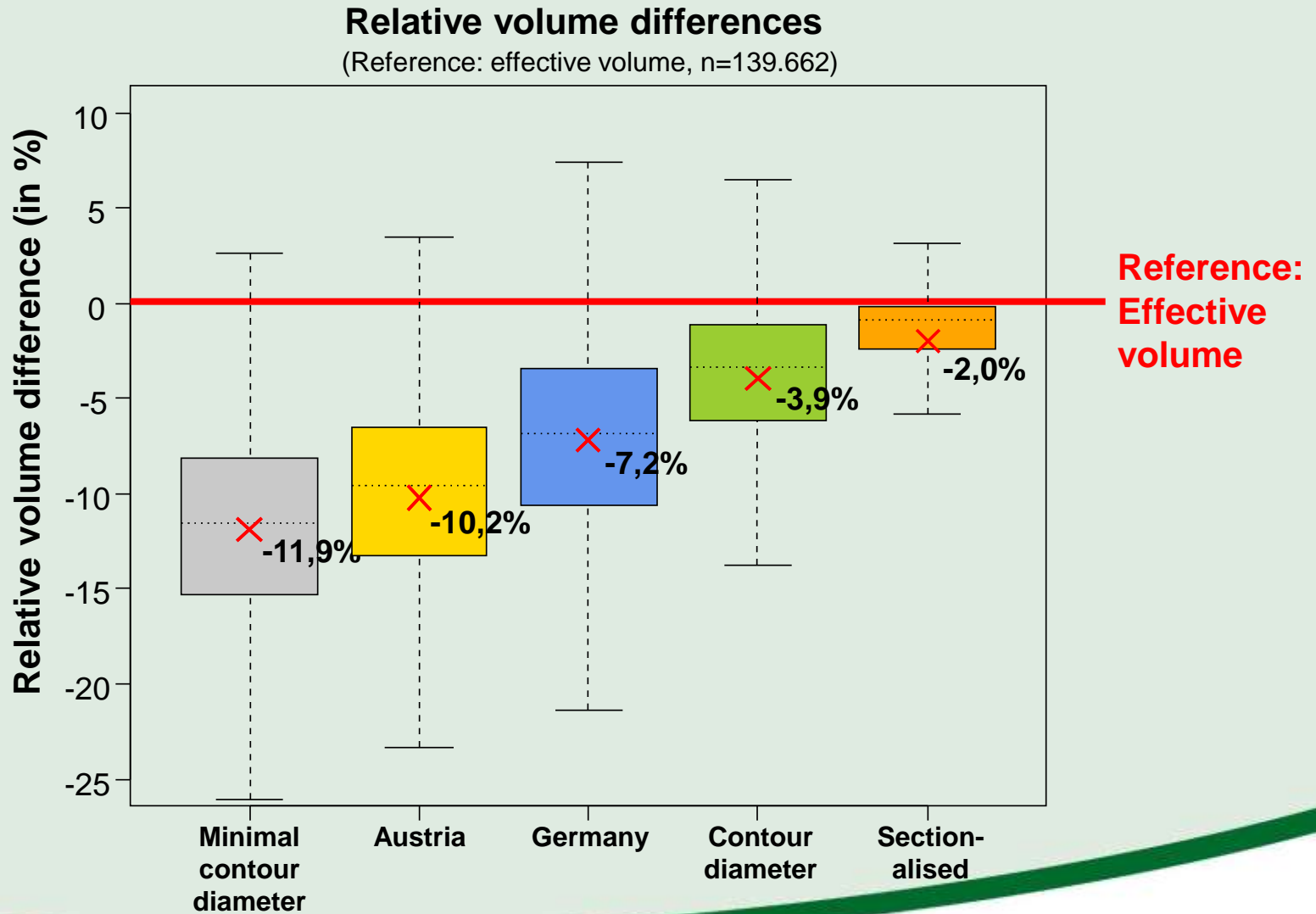
	Austria	Germany
Standard		
Mid diameter position	German standard: France, Switzerland and Belgium	
Diameter measurement planes	Austrian standard: e.g. Eastern Europe	
Rounding of diameters	Double truncation (to whole centimeters)	Single or double truncation (to whole centimeters)

Both national standards are also applied abroad.

Relative volume differences

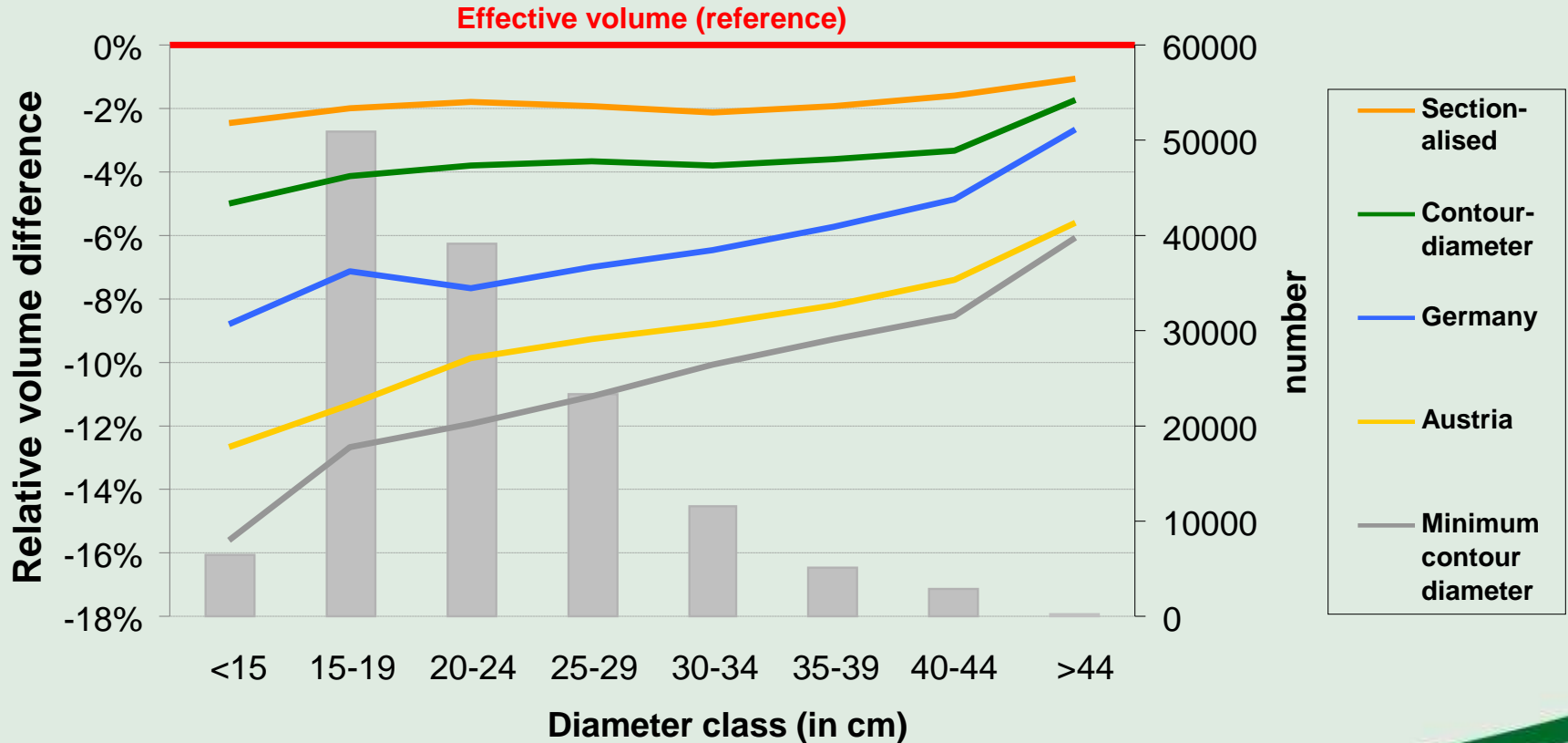
(Reference: effective volume, n=139.662)





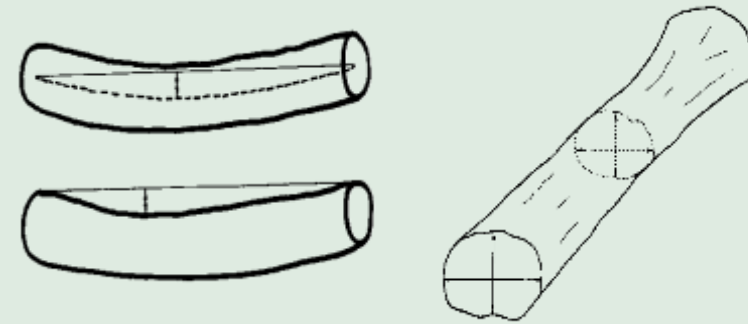
Relative volume differences by diameter classes

(Reference: effective volume, n=139.662)



Automated determination of log quality

- measurable quality parameters can be used for automatic grading:
 - sweep, taper (and ovality)

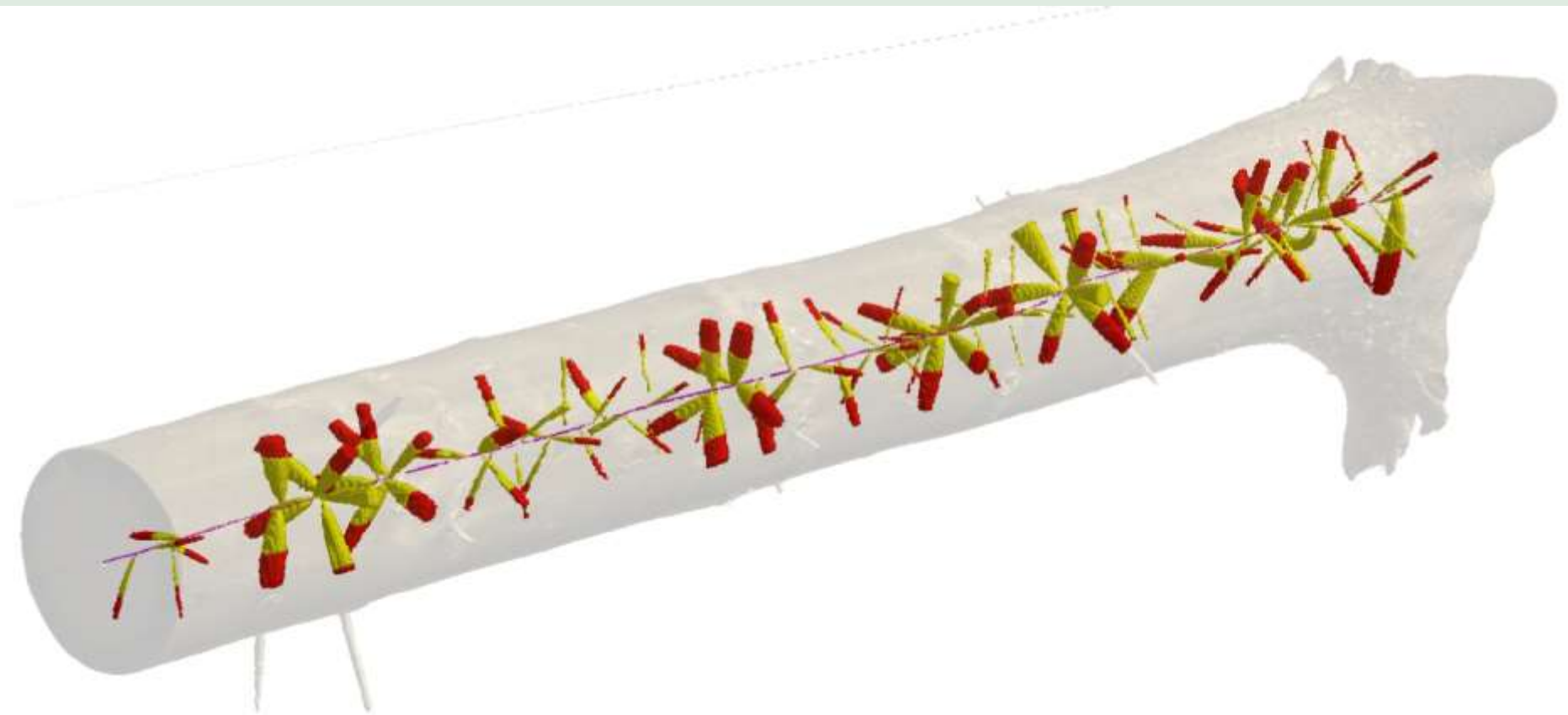


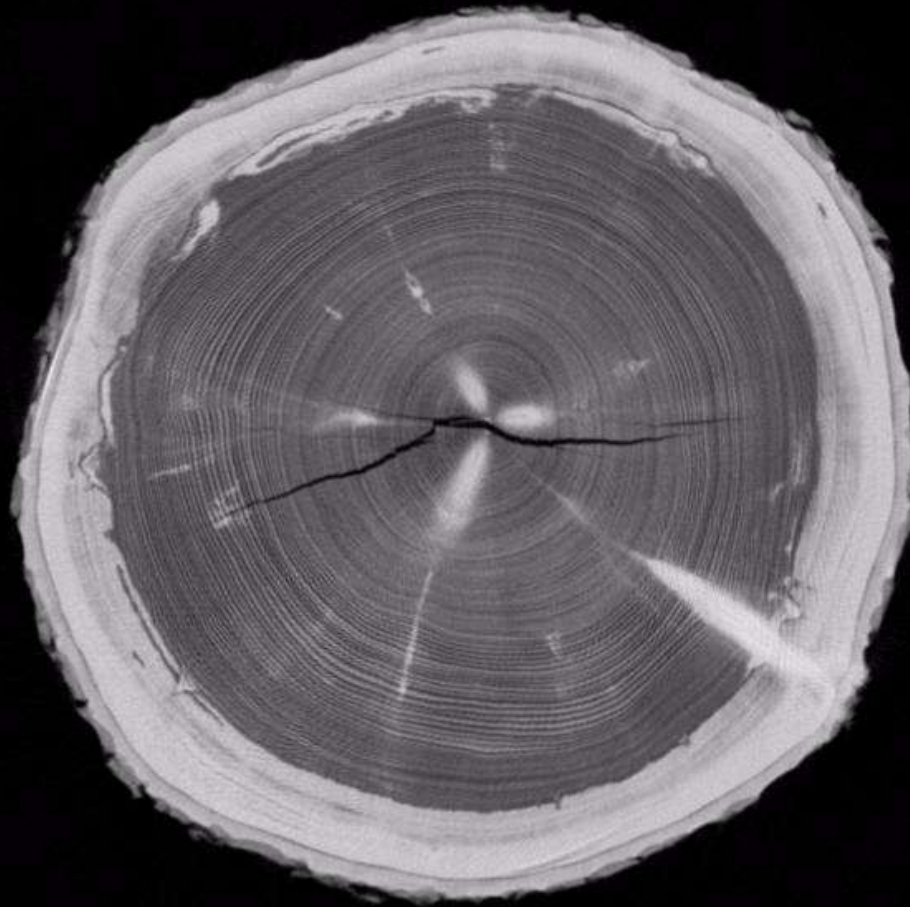
Non-measurable quality parameters

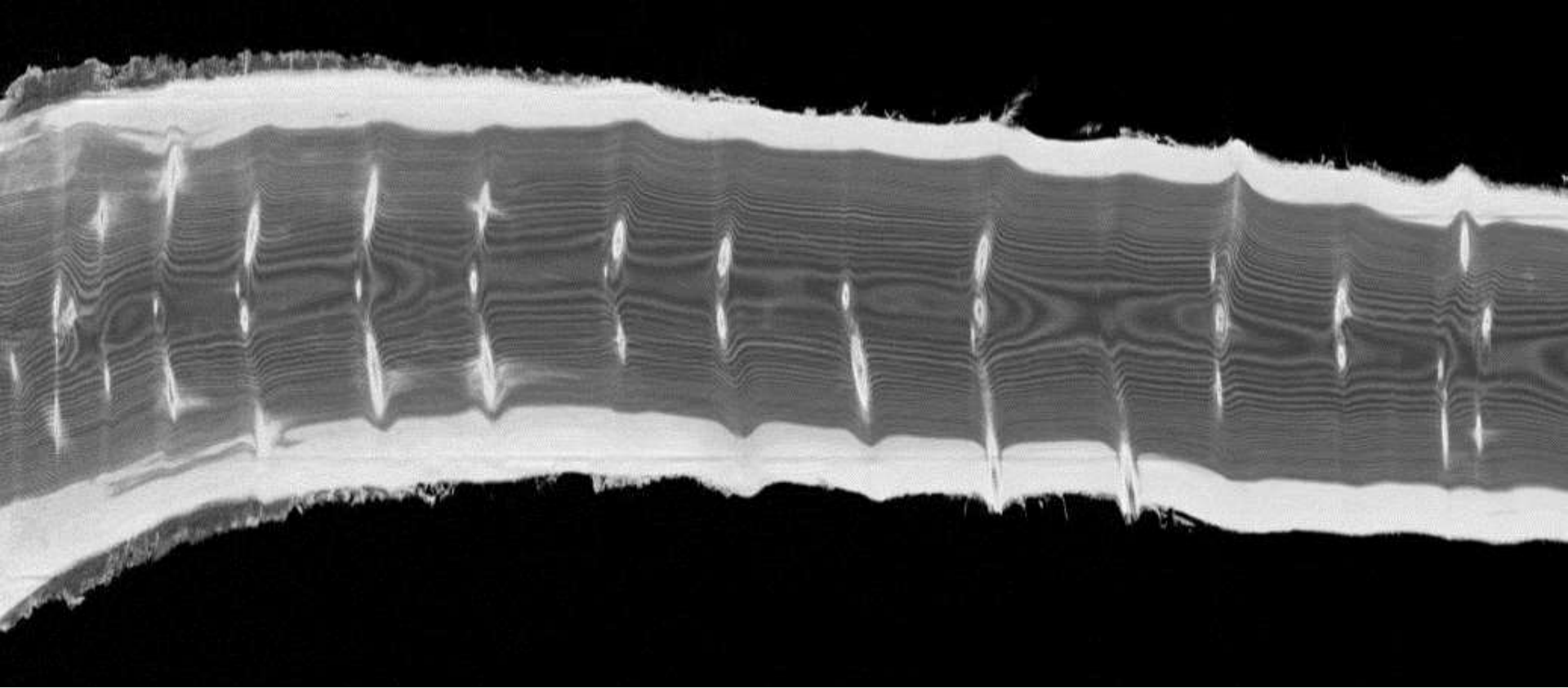
- parameters which can not yet be measured automatically
- can be used for grading if there is a photo-optical documentation system (e.g. knots, rot, insects)

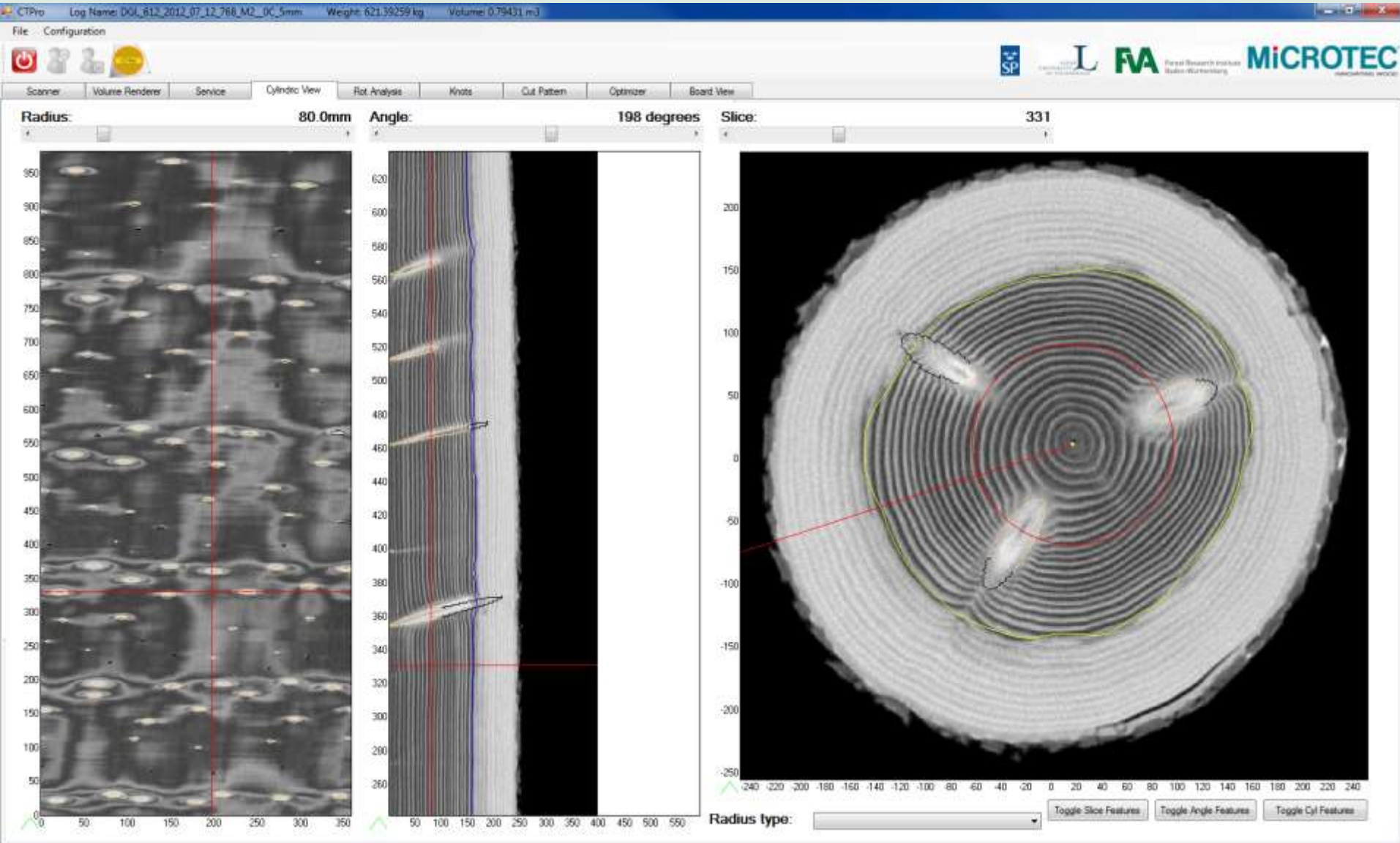












Thank you!

Dr. Udo Hans Sauter
udo.sauter@forst.bwl.de

Dr. Jörg Staudenmaier
joerg.staudenmaier@forst.bwl.de

Department of Forest Utilisation
Forest Research Institute of
Baden-Wuerttemberg
Wonnhaldestrasse 4
D-79100 Freiburg

www.fva-bw.de



Approaches for determining the log volume

Contour diameter

- Mid diameter: mean of 180 single measurements
- No roundings

Minimal contour diameter

- Mid diameter: 2 perpendicular contour diameters, one is the minimum diameter out of 180 contour diameters
- Rounding down to full centimeters

Sectionalised volume

- Dividing the log into sections of 50 cm
- 2 perpendicular contour diameters per section
- Calculation the volume for each section
- No rounding
- Log volume = sum of all section volumes

