

ELECTROIMPEDANCE MAMMOGRAPHY



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ONKO•CET

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History of mammography



EIM 003 "KORVET"



Model 3

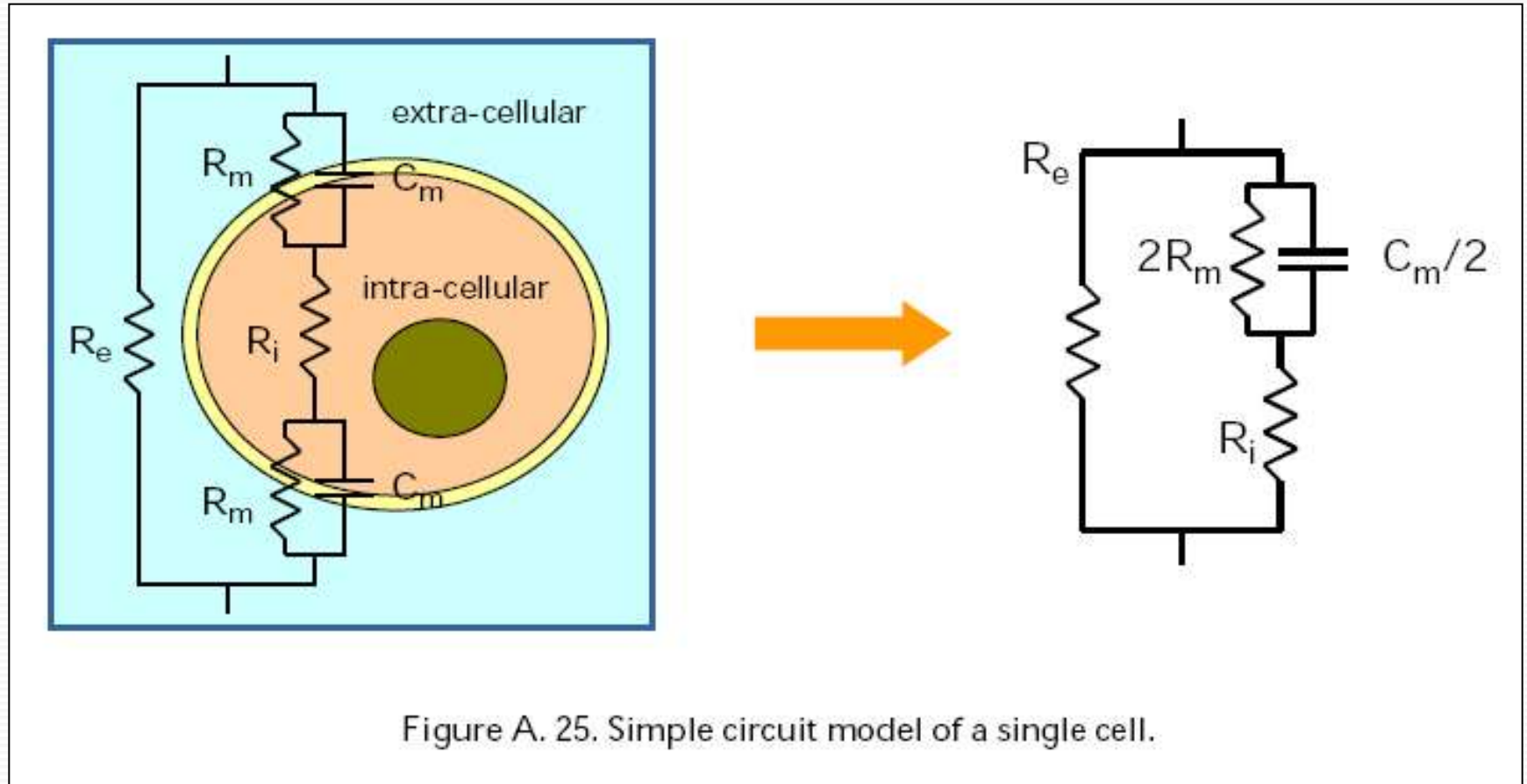


Model 5

The first version of diagnostic instrument was called "electro-impedance computer mammogram EIM 003 KORVET"

Patents RF for the invention № 2153285 and № 2127075 and patents of the USA № 6,167,300 and № 6,236,886

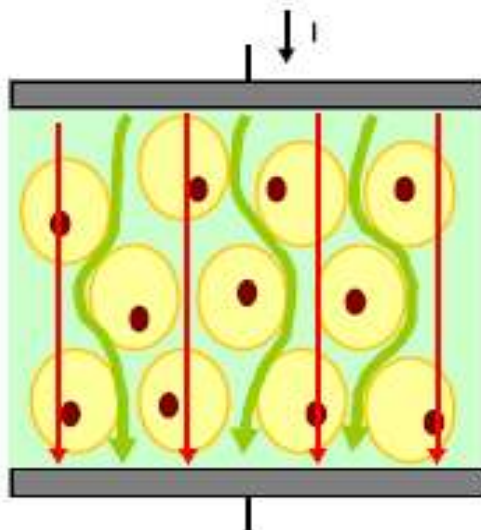
Simple electrical model of a cell



Electrical characterisation of the materials

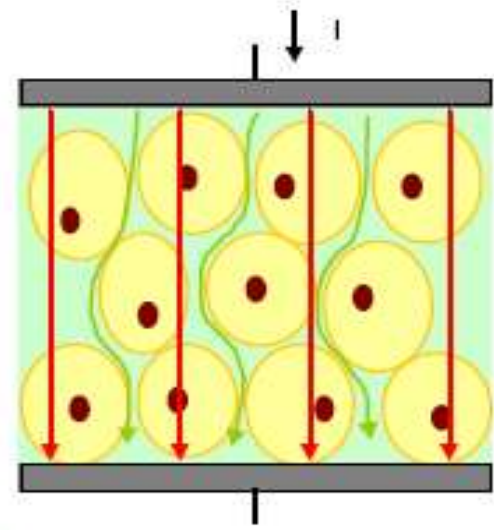
Dielectric properties

Parameter	Symbols	Units	Equations
conductivity	σ, κ	S/cm	$Y = G + jB = K(\sigma + j\omega\epsilon); \quad \sigma = G/K$
permittivity	ϵ	F/cm	$Y = G + jB = K(\sigma + j\omega\epsilon); \quad \epsilon = B/(\omega K)$
relative permittivity	ϵ_r	no units	$\epsilon_r = \epsilon/\epsilon_0$
resistivity	ρ	$\Omega \cdot \text{cm}$	$Z = 1/Y = (R + jX); \quad R = (1/K) \cdot \rho; \quad \rho \neq 1/\sigma$



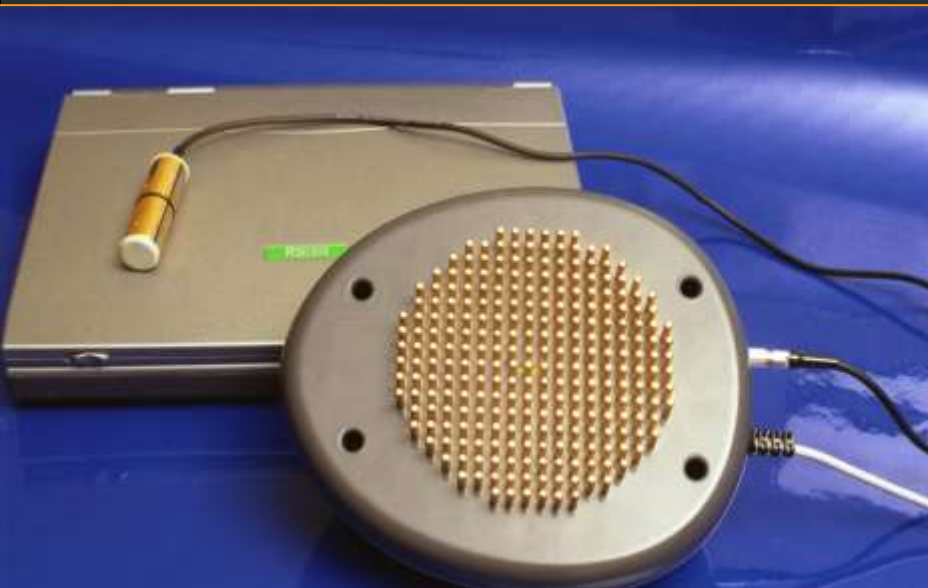
low frequency (< 1 kHz)

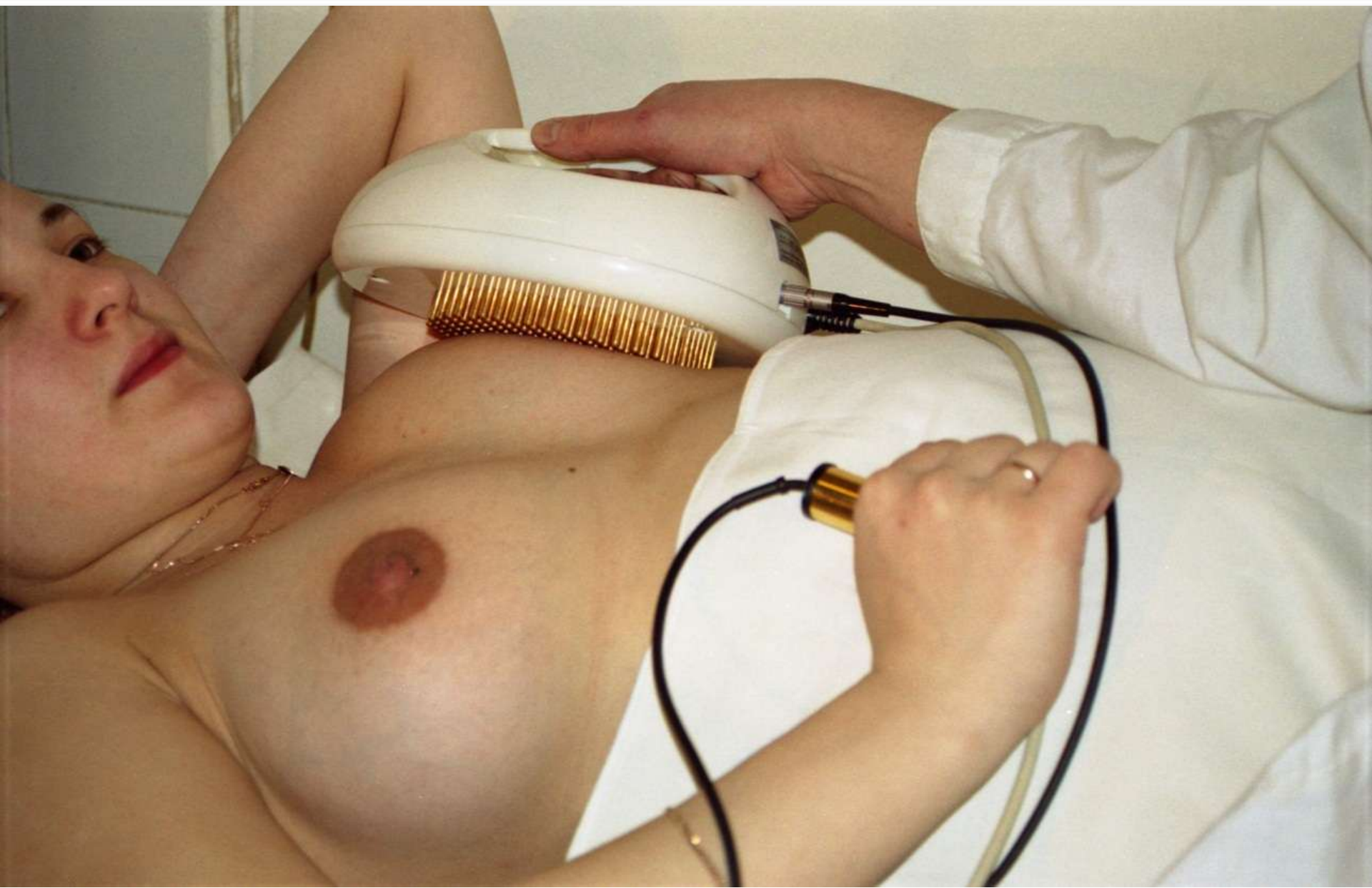
high frequency (> 10 kHz)



[illegible]

Diagnostic set





Operating characteristics

- sensitivity - 92%
- specificity - 99%
- the prognostic value of positive result - 73%
- the prognostic value of negative result - 99%



Usage Time Features

- Duration of the procedure: scanning is accomplished in 35 seconds.
- The process of diagnostic inspection, from the moment of the collection of anamnesis to the delivery of conclusion, takes in average up to 15 minutes.
- Inspection with the screening takes 3-5 min.



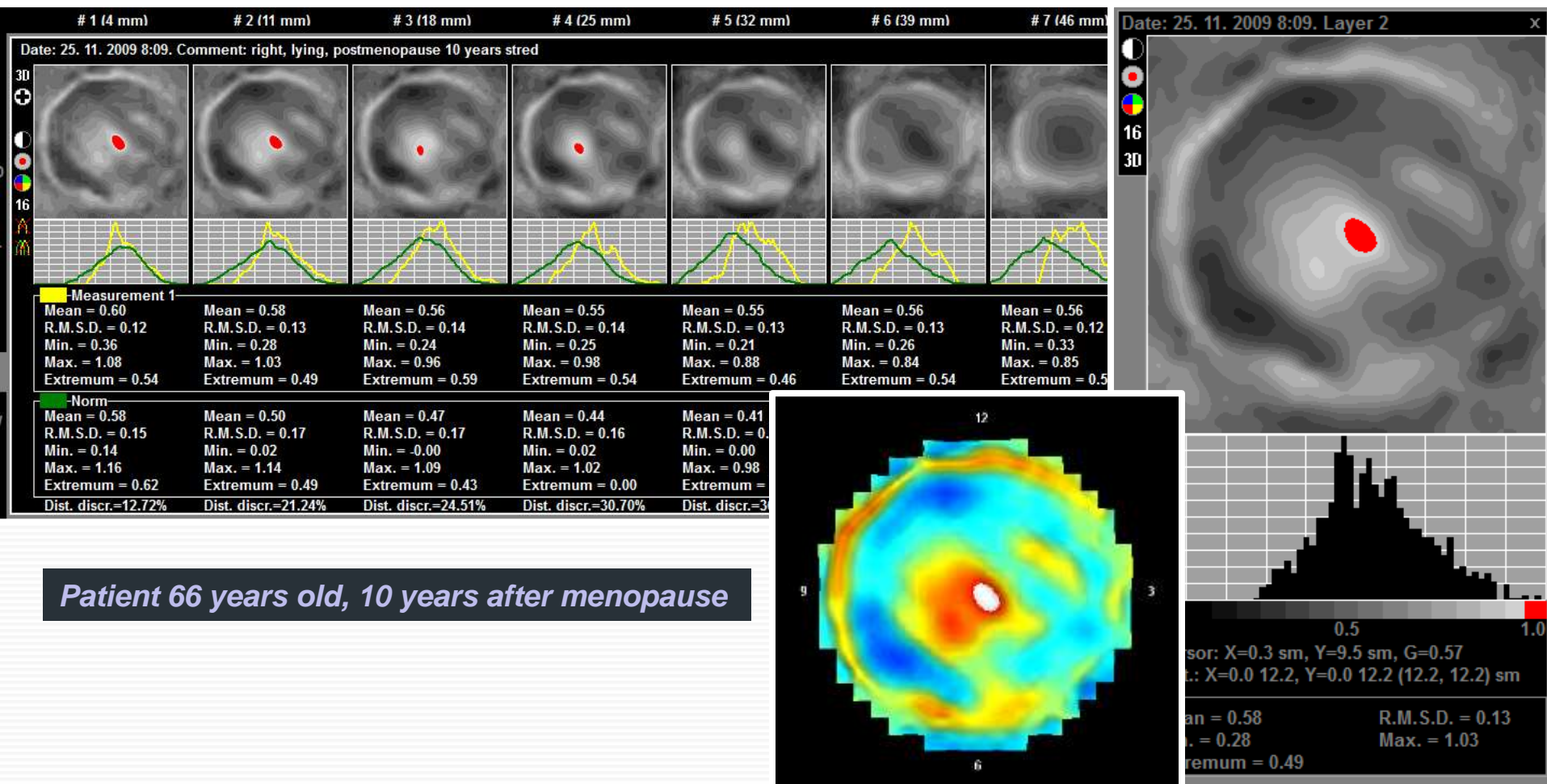
Identification of pathologies using EI mammograph



- **Cancer**
- **Cyst**
- **Fibroadenoma**
- **Calcificate**
- **Scar**
- **Inflammation**

Breast cancer; type I.a

Visual and quantitative assessment data of the electroimpedance image of the patients' mammary glands

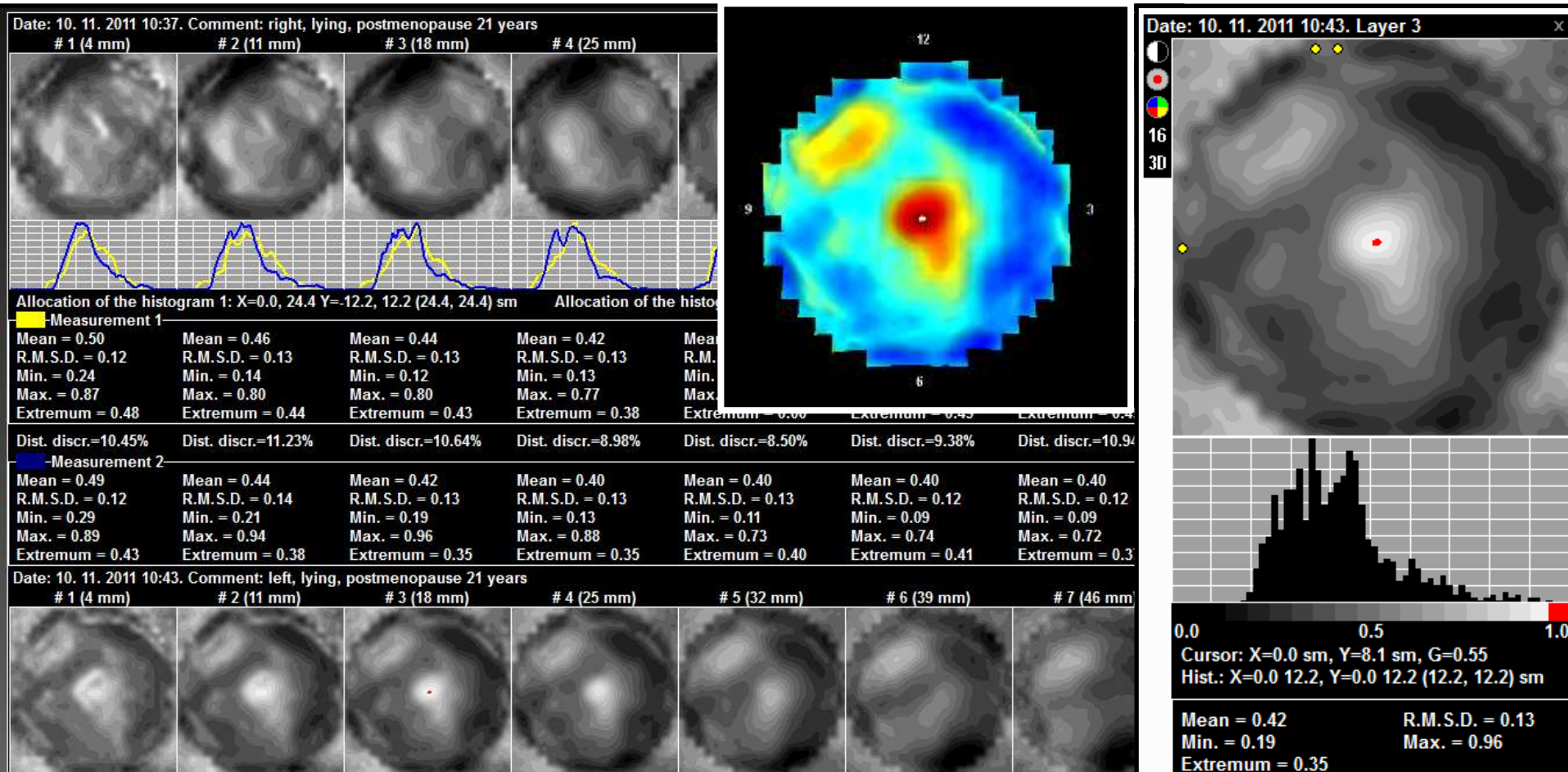


Patient 66 years old, 10 years after menopause

Breast cancer; type I.a

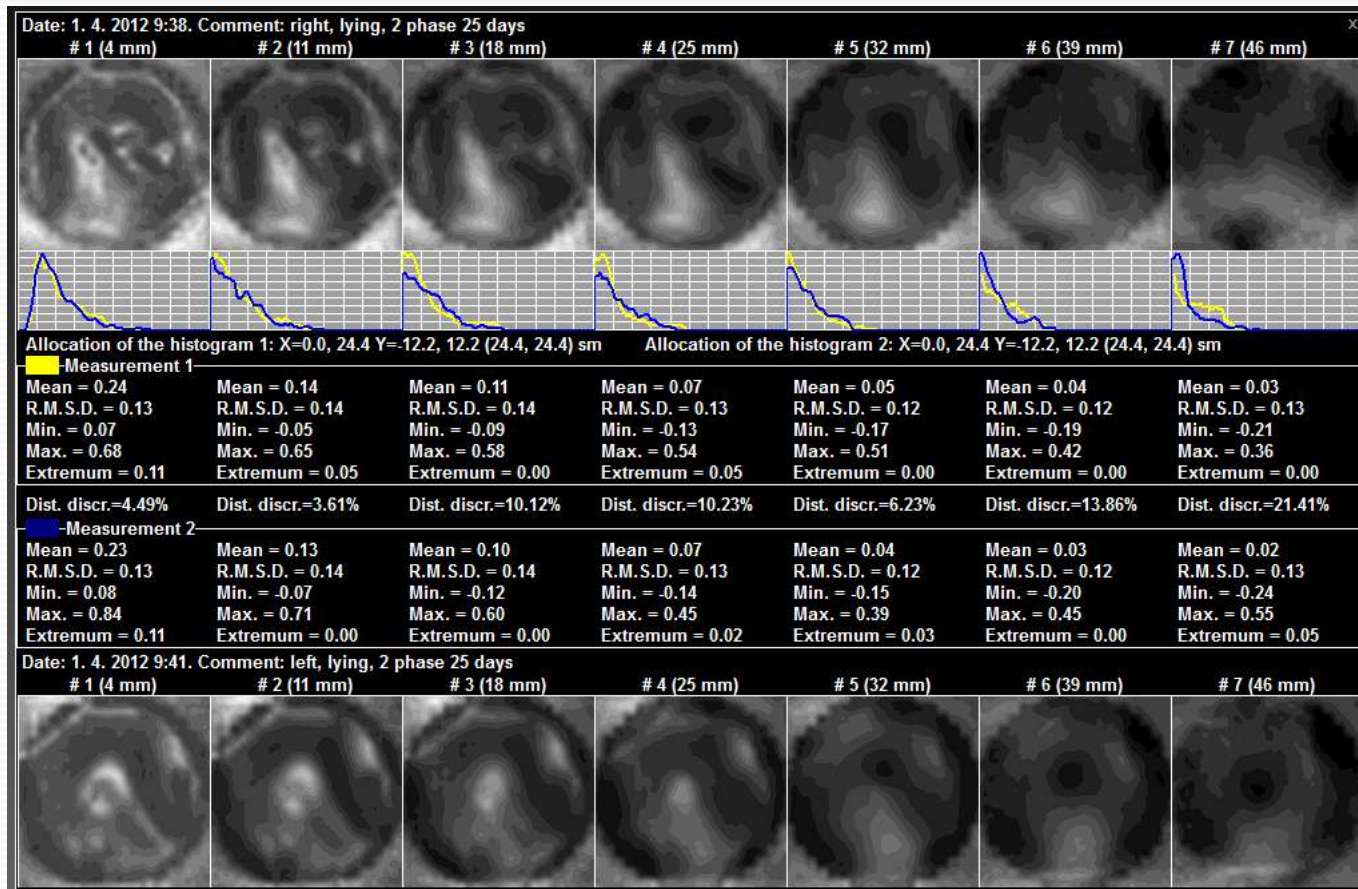
Visual and quantitative assessment data of the electroimpedance image of the patients' mammary glands

Patient 74 years old, 21 years after menopause

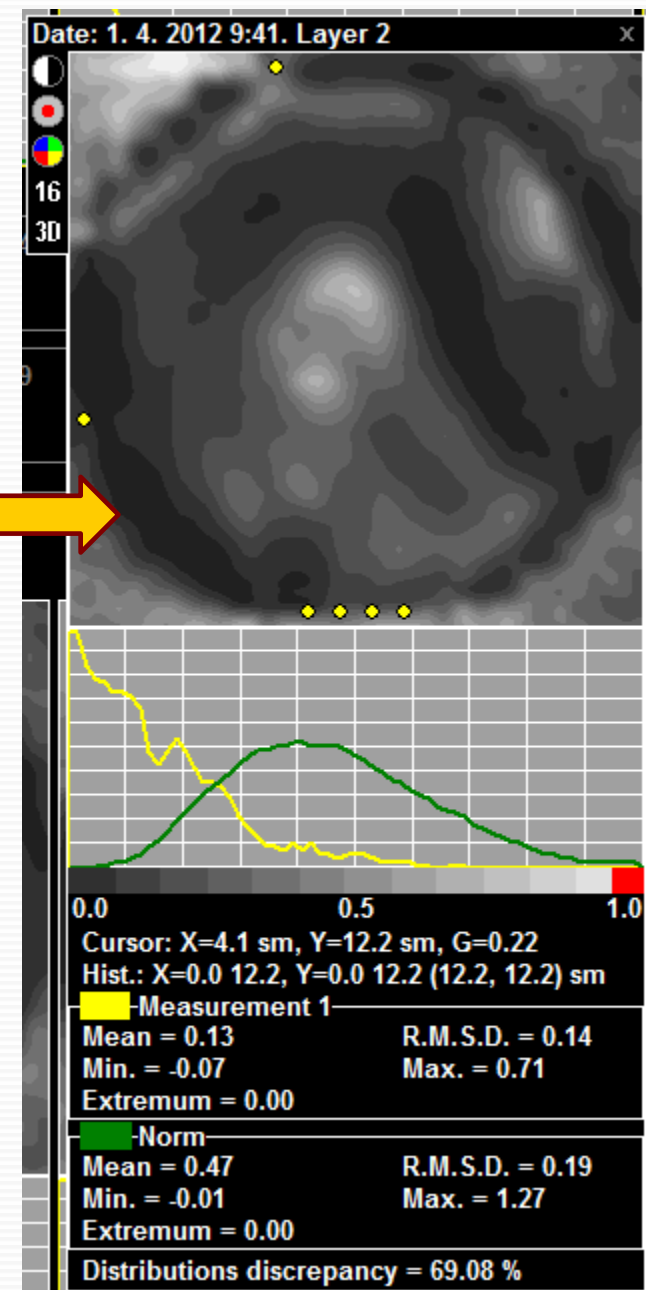
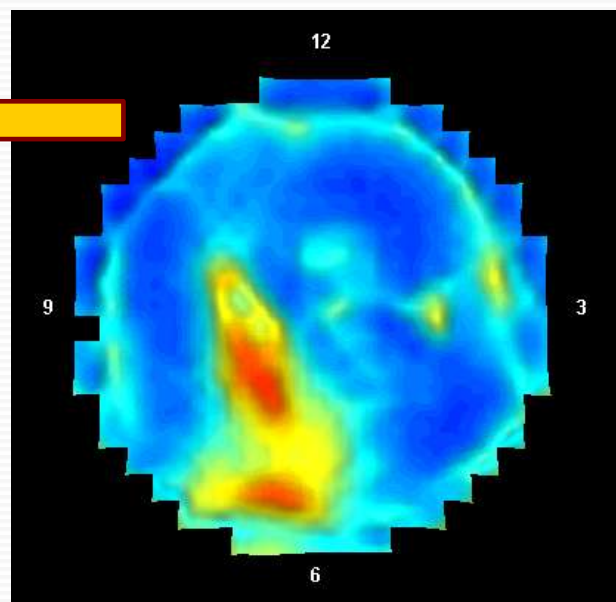
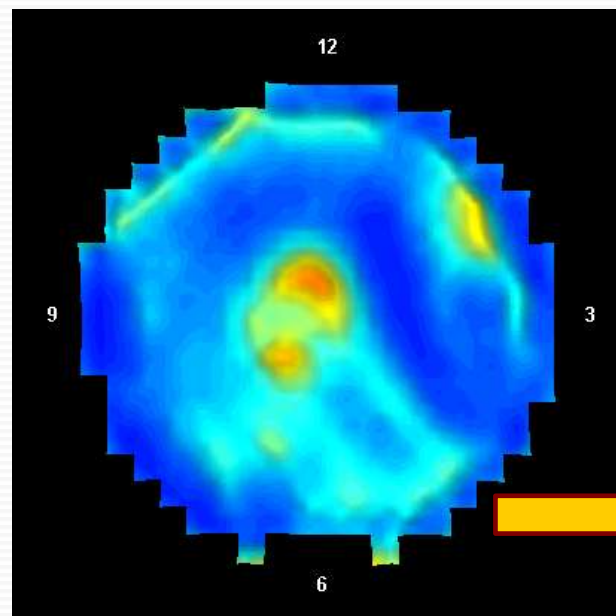
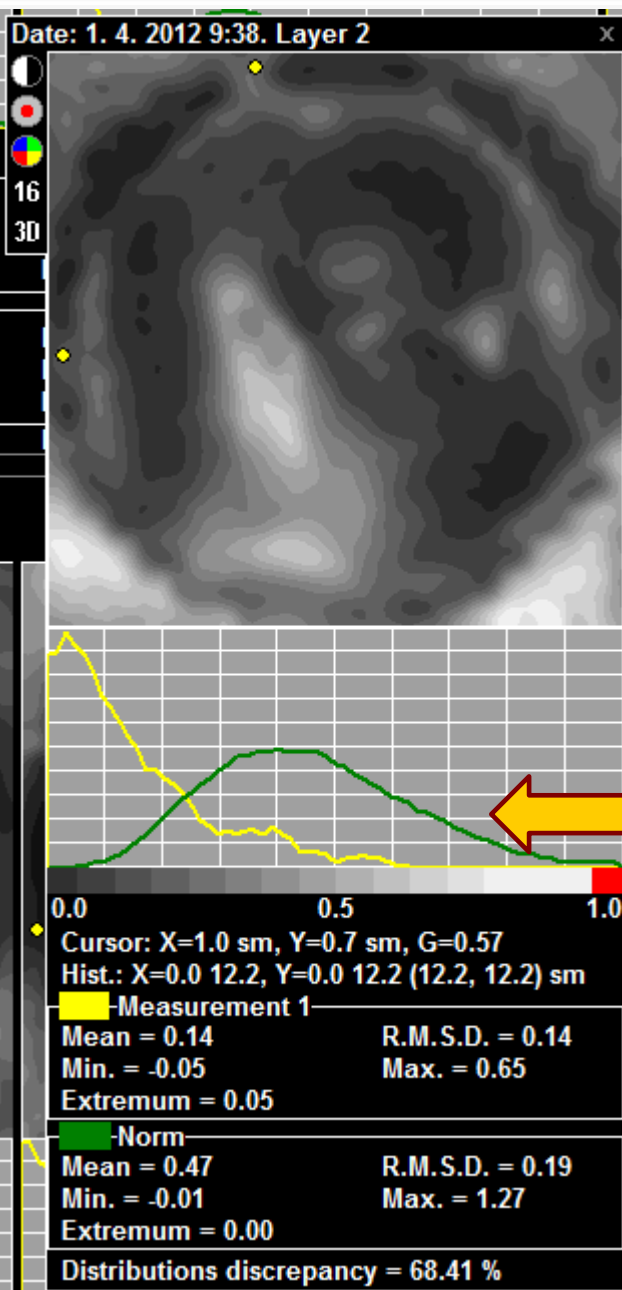


Breast cancer; type I.b

Visual and quantitative assessment data of the electroimpedance image of the patients' mammary glands



Patient 45 years old, histology $T_2 N_0 M_0$



Breast cancer; type I.b



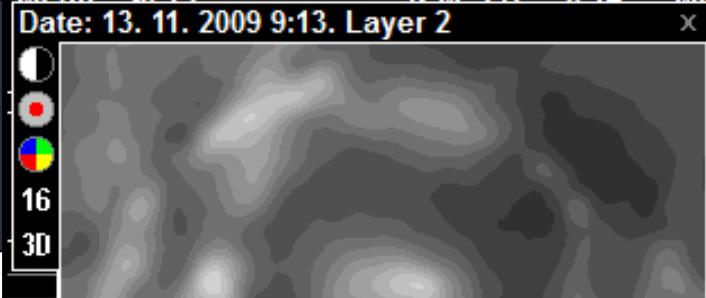
Before surgery



After surgery

Histogy: Invasive ductal CA with modular features G3, pT2pN0MX

Breast cancer; type Ic.



1 (4 mm)

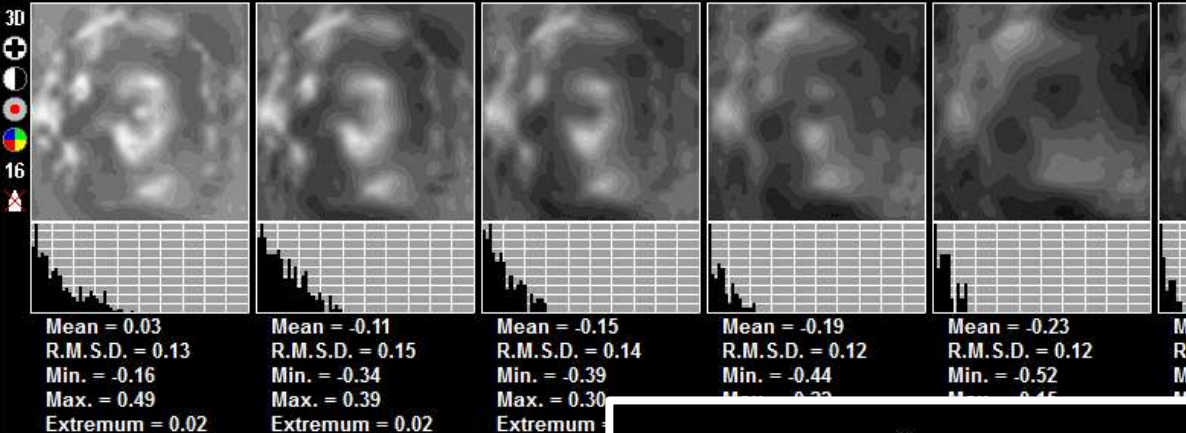
2 (11 mm)

3 (18 mm)

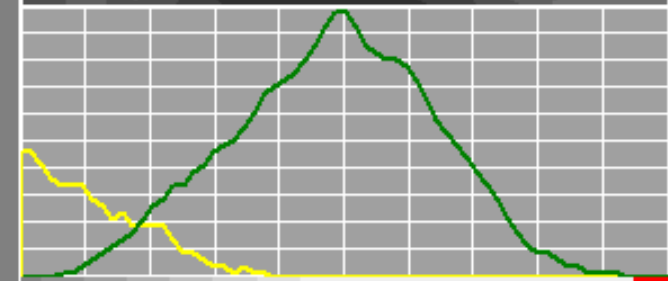
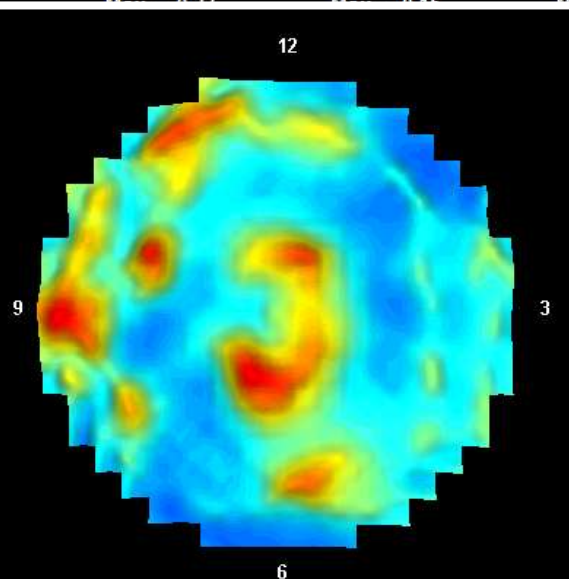
4 (25 mm)

5 (32 mm)

Date: 13. 11. 2009 9:13. Comment: right, lying, postmenopause 20 years stred



Patient 65 years old



0.0 0.5 1.0

Cursor: X=0.0 sm, Y=7.5 sm, G=-0.03
Hist.: X=0.0 12.2, Y=0.0 12.2 (12.2, 12.2) sm

Measurement 1

Mean = -0.11	R.M.S.D. = 0.15
Min. = -0.34	Max. = 0.39
Extremum = 0.02	

Norm

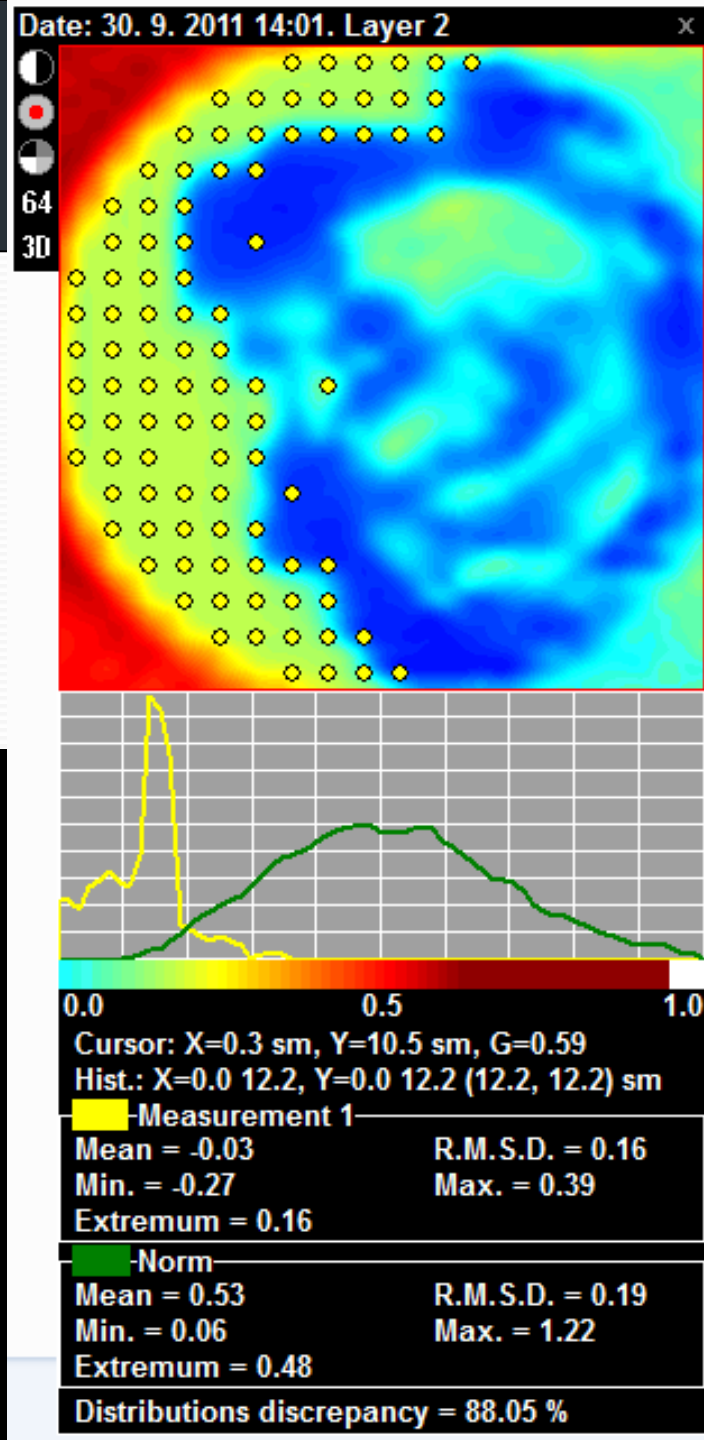
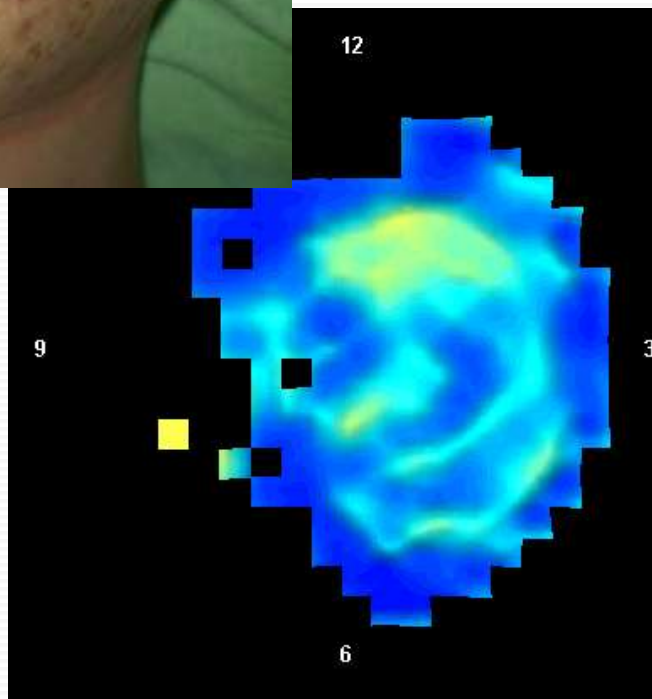
Mean = 0.50	R.M.S.D. = 0.17
Min. = 0.02	Max. = 1.14
Extremum = 0.49	

Distributions discrepancy = 82.03 %

Breast cancer; type Ic.

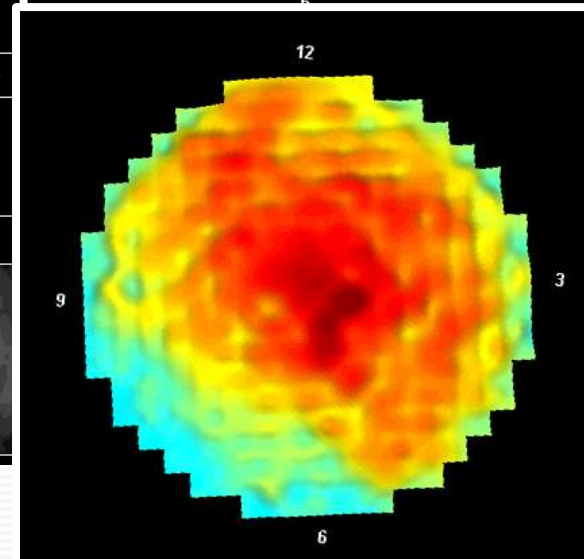
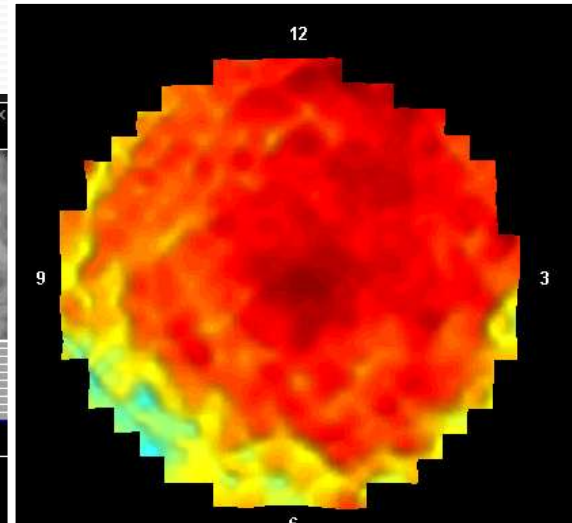
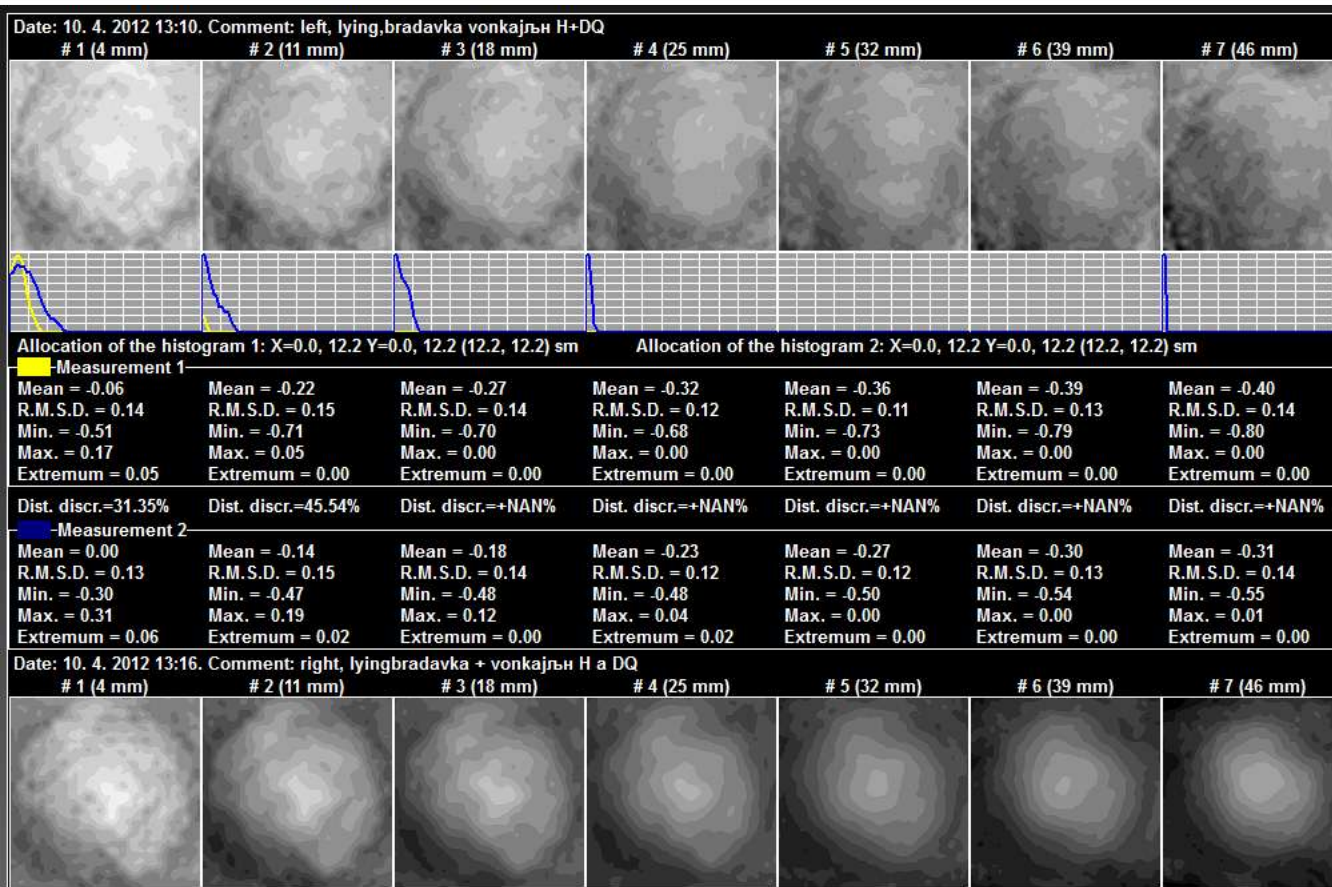


Patient 45 years old

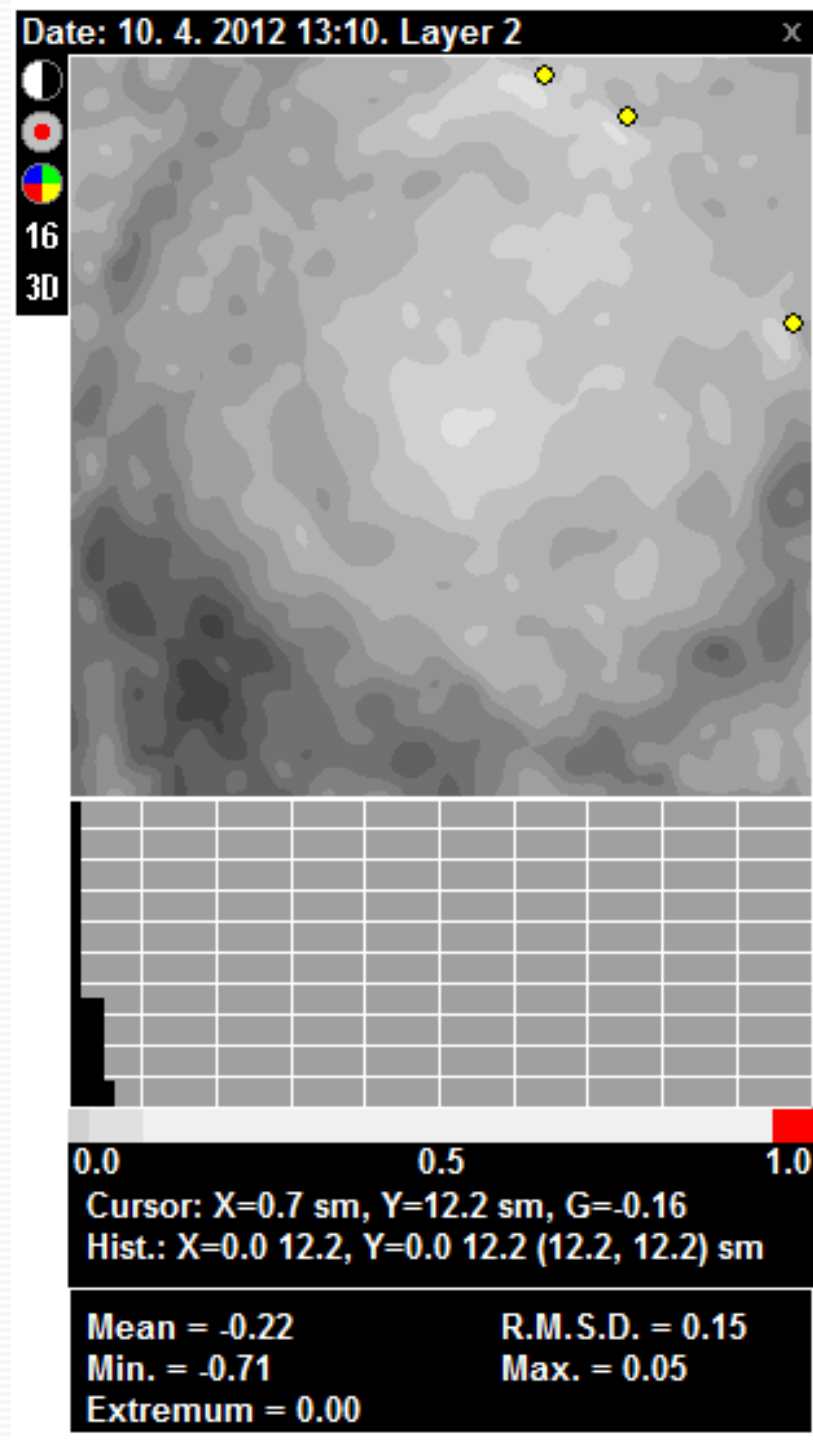
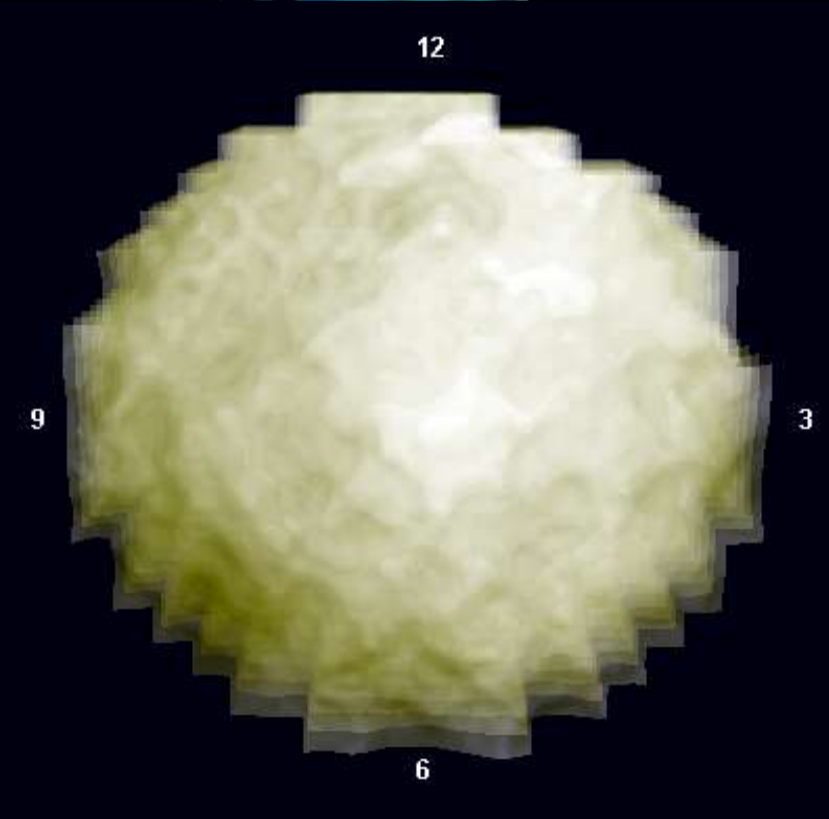
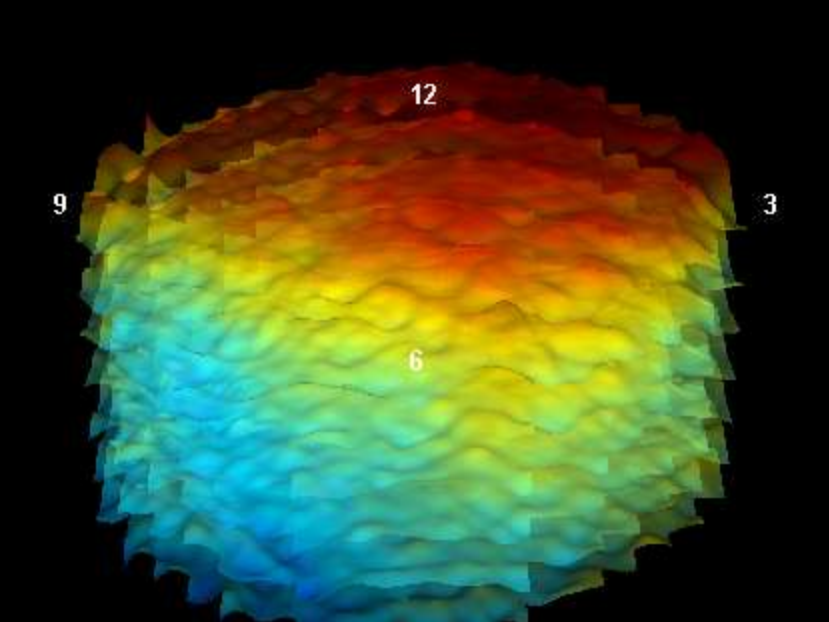


Atypical breast cancer - haemangioma

A cancerous tumor which is hard, translucent, of a gray or bluish color, and emits a creaking sound when incised.

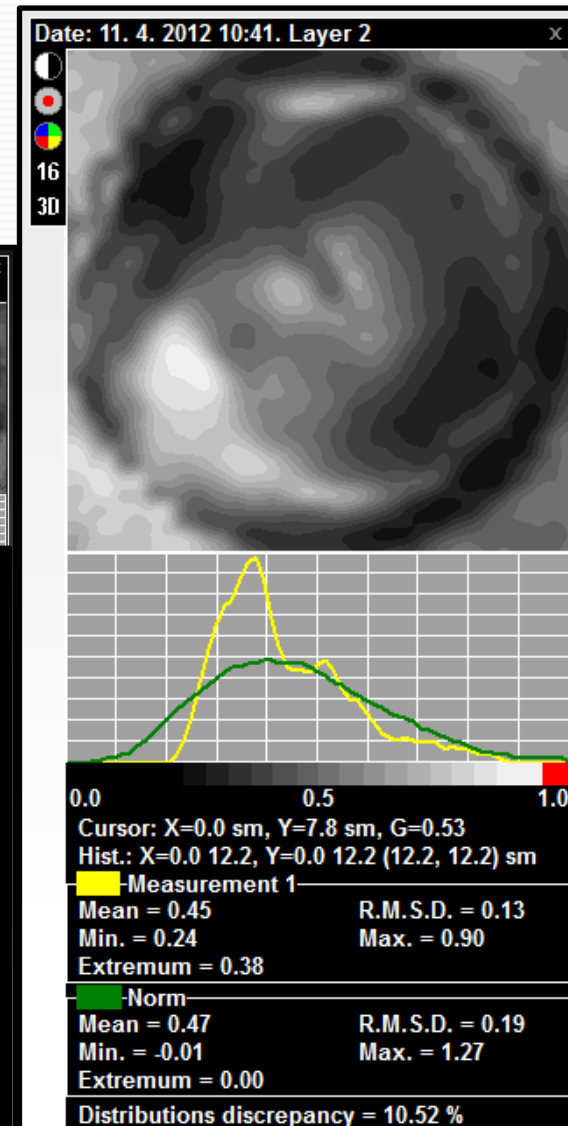
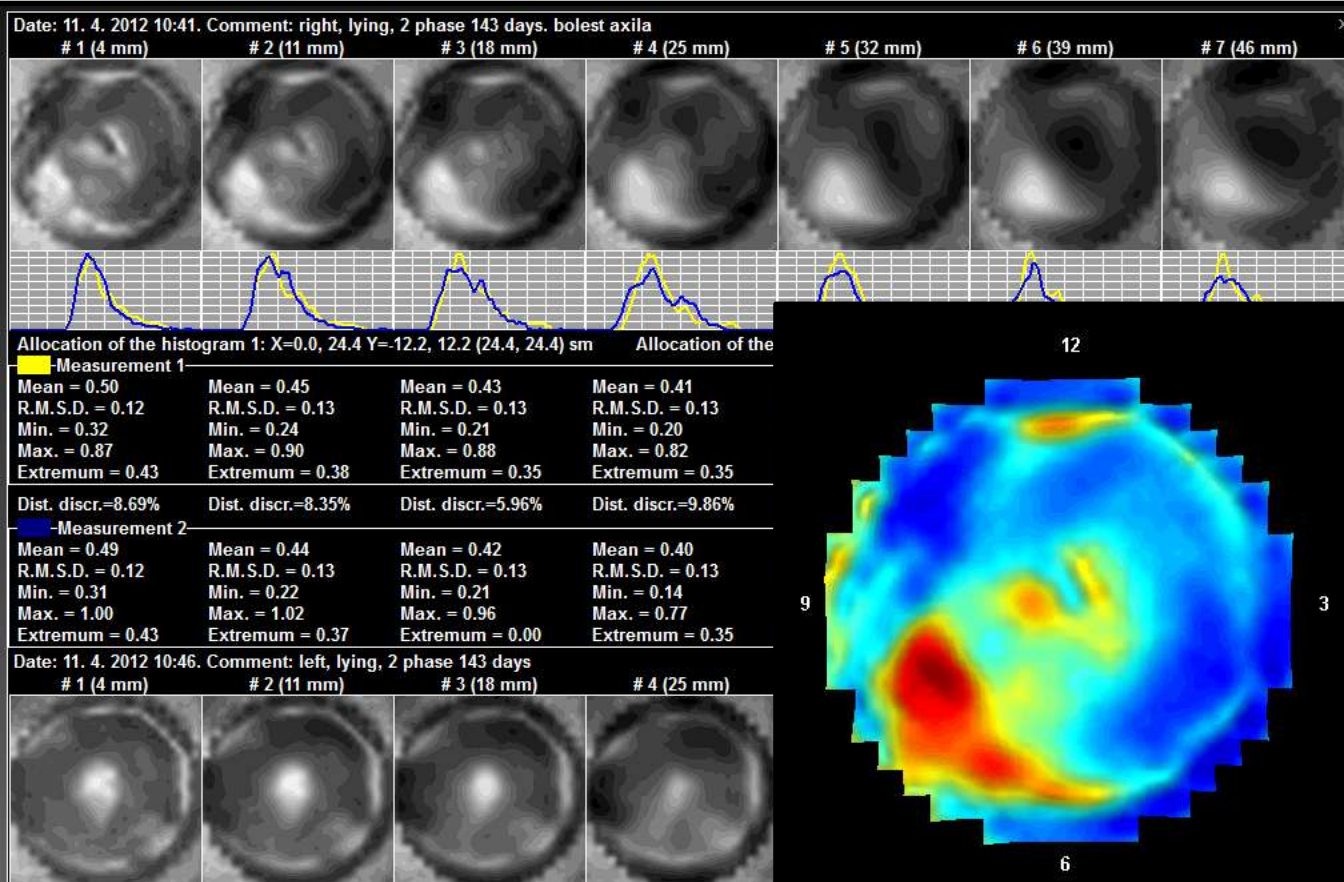


Patient 44 years old



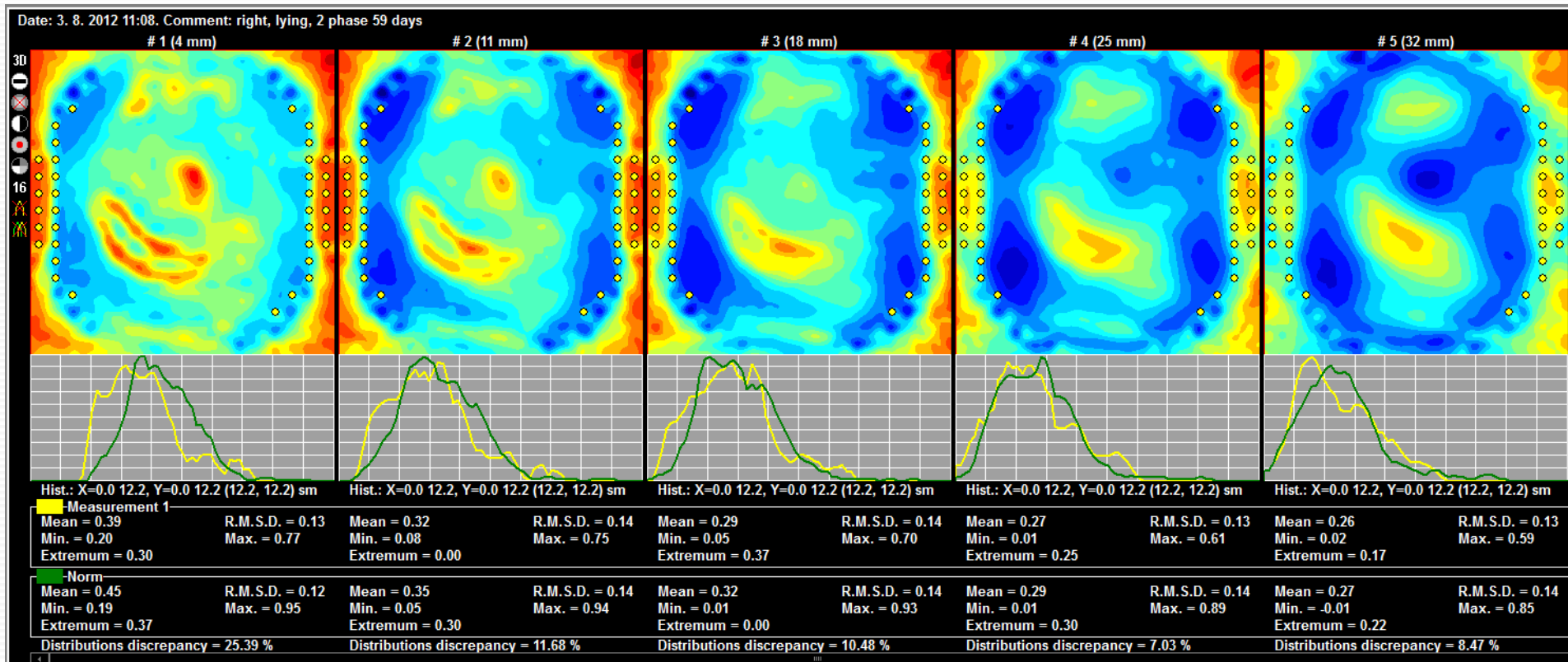
Mammary gland visualization - cysts

Patient 48 years old



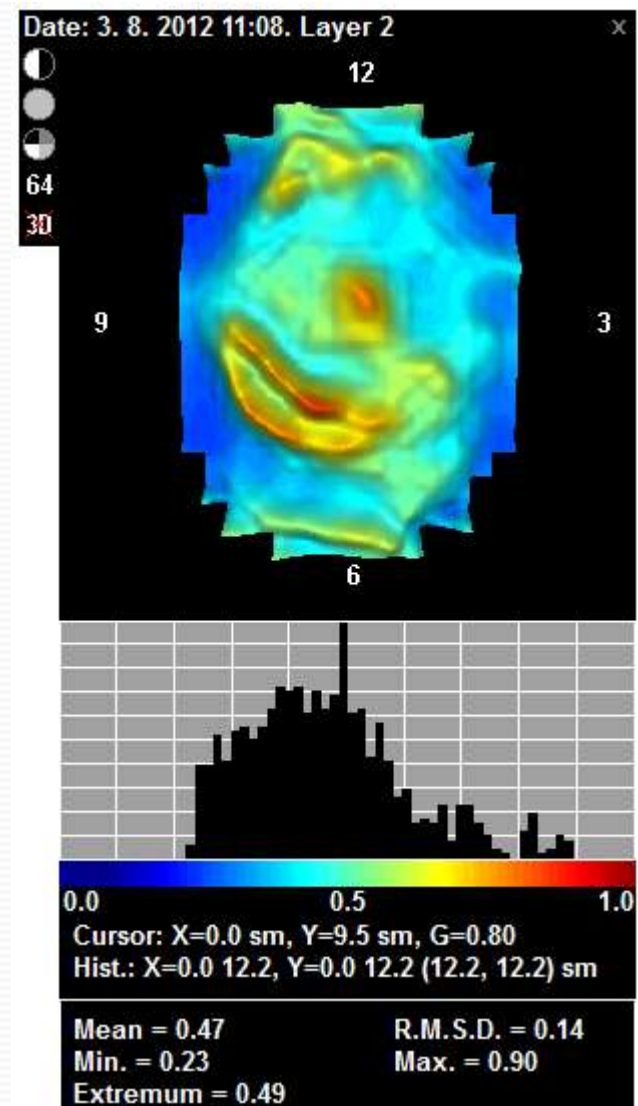
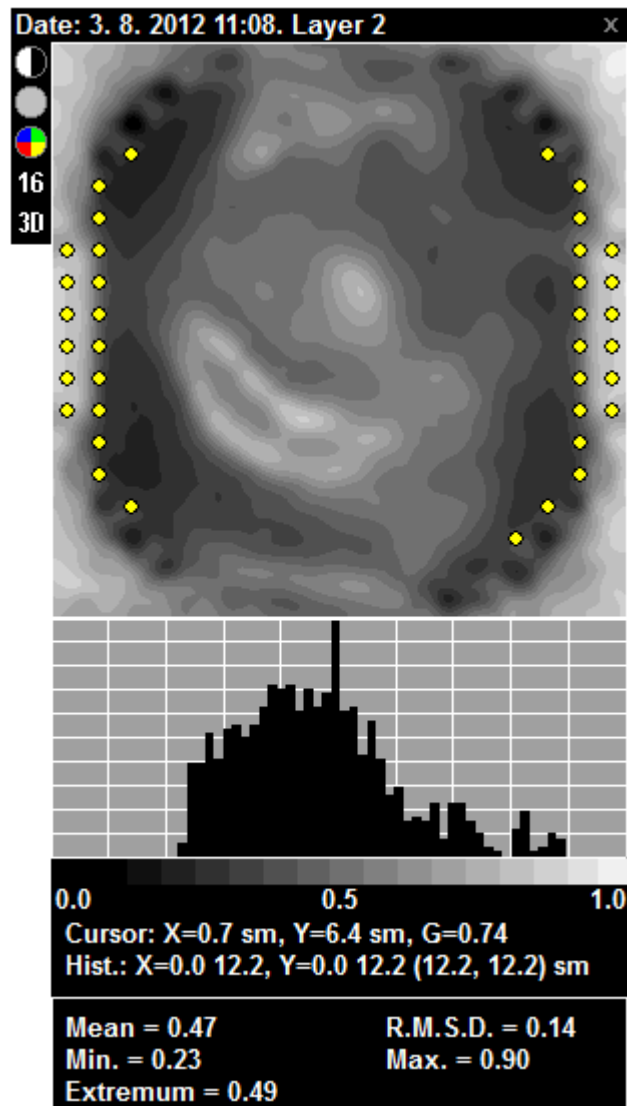
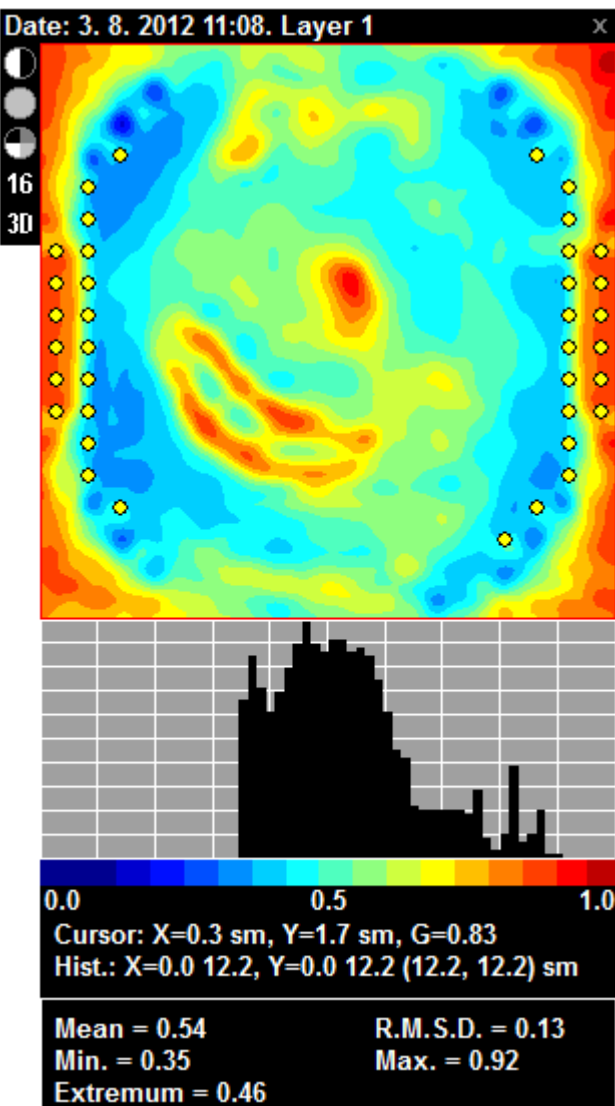
Mammary gland visualization - cysts

Patient 53 years old, mammary gland 3 years after aspiration of a cyst



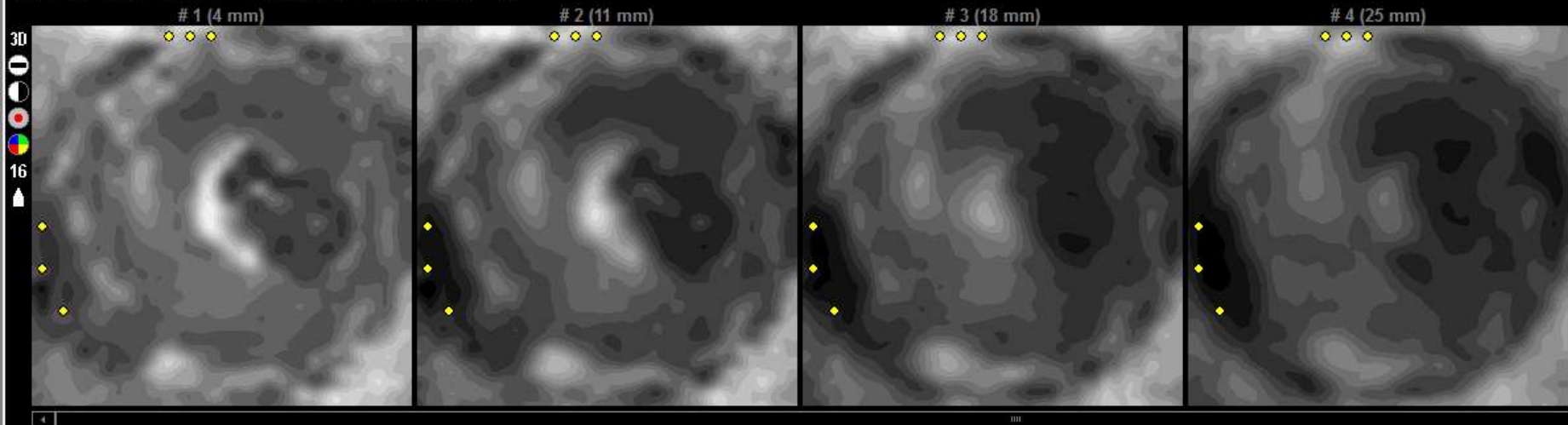
Mammary gland visualization - cysts

Patient 53 years old, mammary gland 3 years after aspiration of a cyst

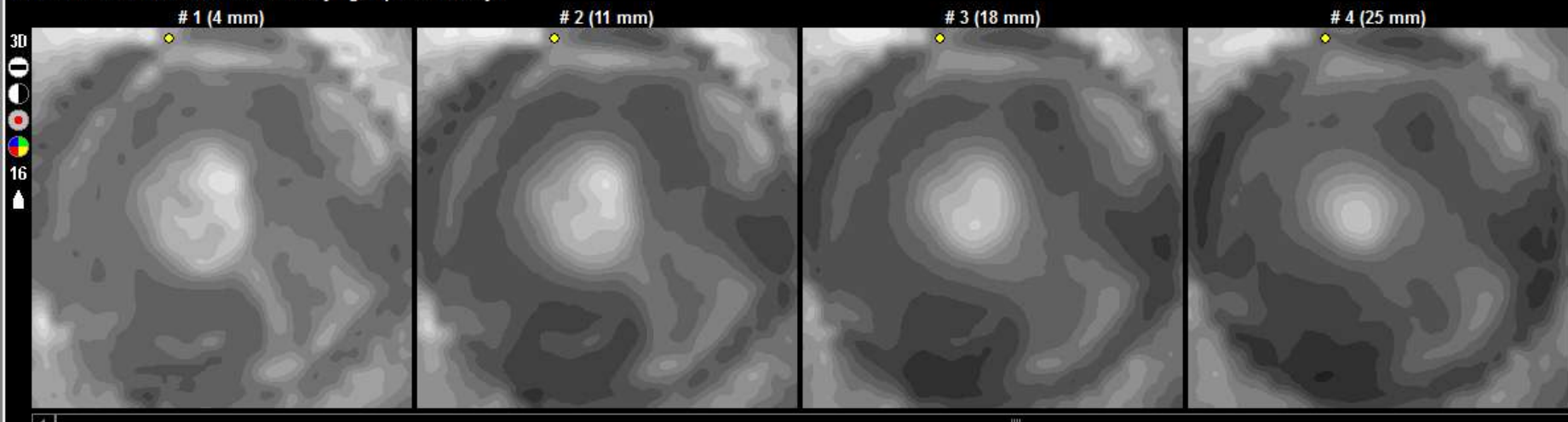


Fibroadenoma

Date: 3. 2. 2012 8:42. Comment: right, lying, 2 phase 14 days



Date: 3. 2. 2012 8:45. Comment: left, lying, 2 phase 14 days

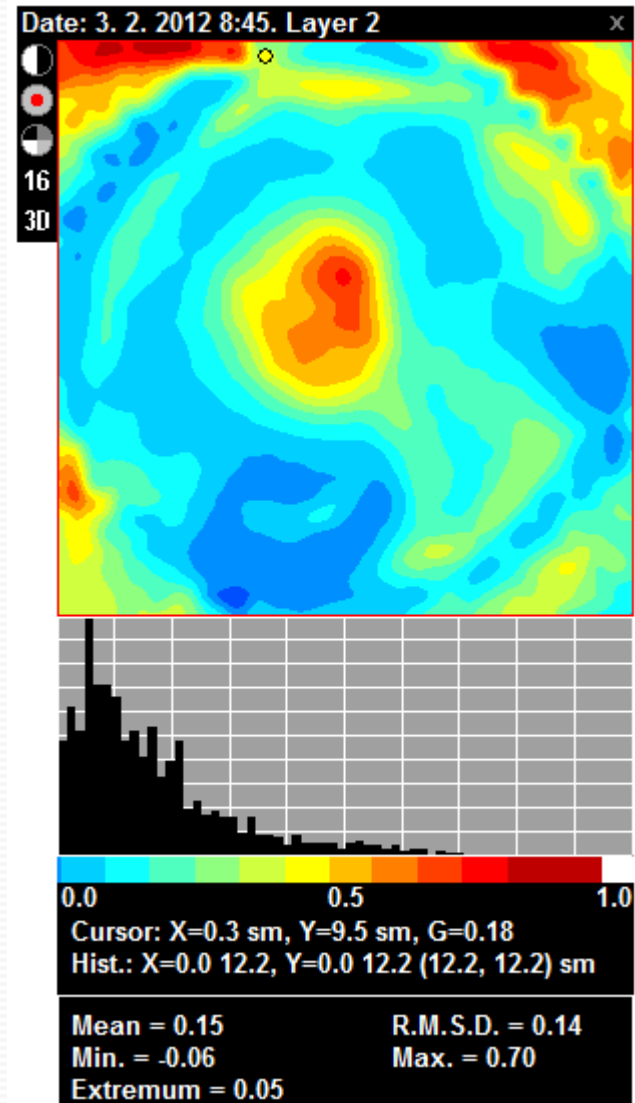
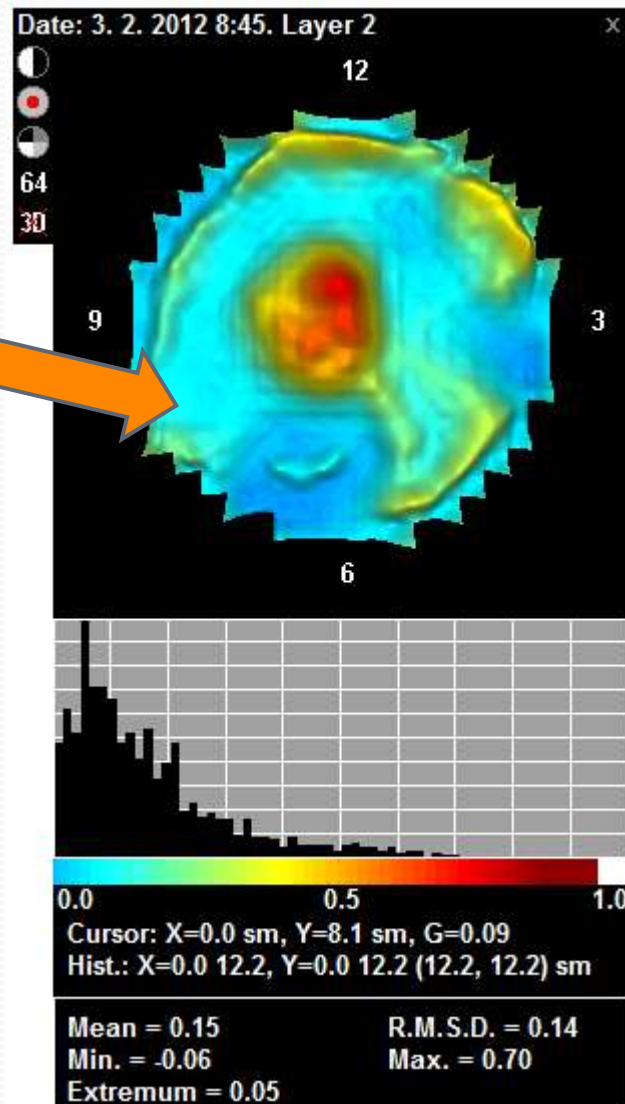


44 years old patient; Fibroadenoma bilat., lumpectomia bilat.

Fibroadenoma

Left breast:
fibroadenoma mammae l.
sin., extirpated 35 x 25 x
20 mm non capsulated
lobular lesion,

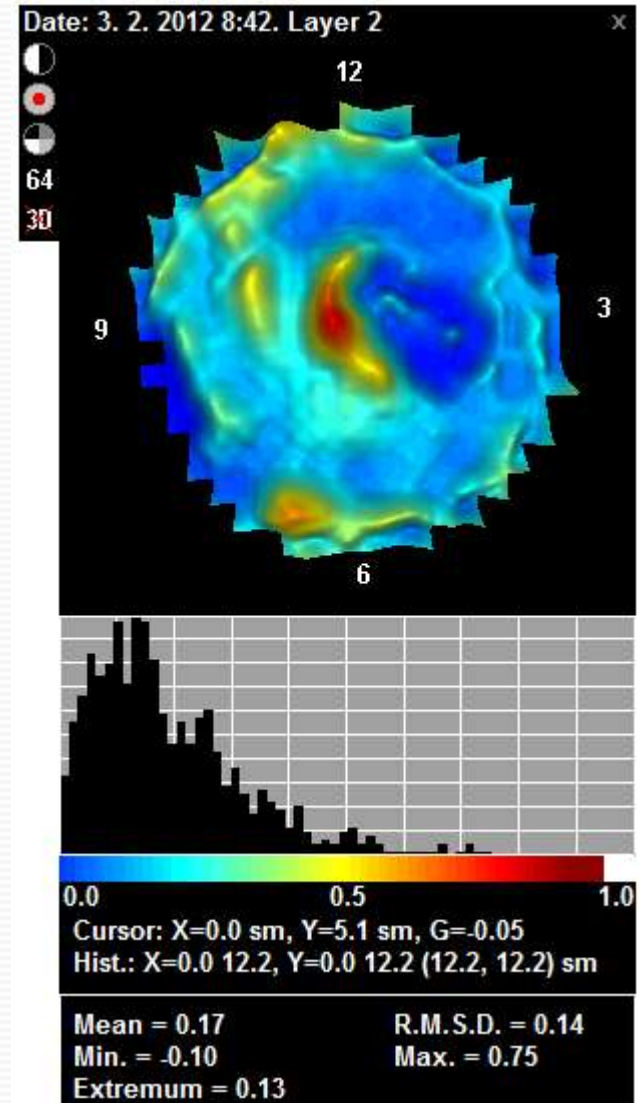
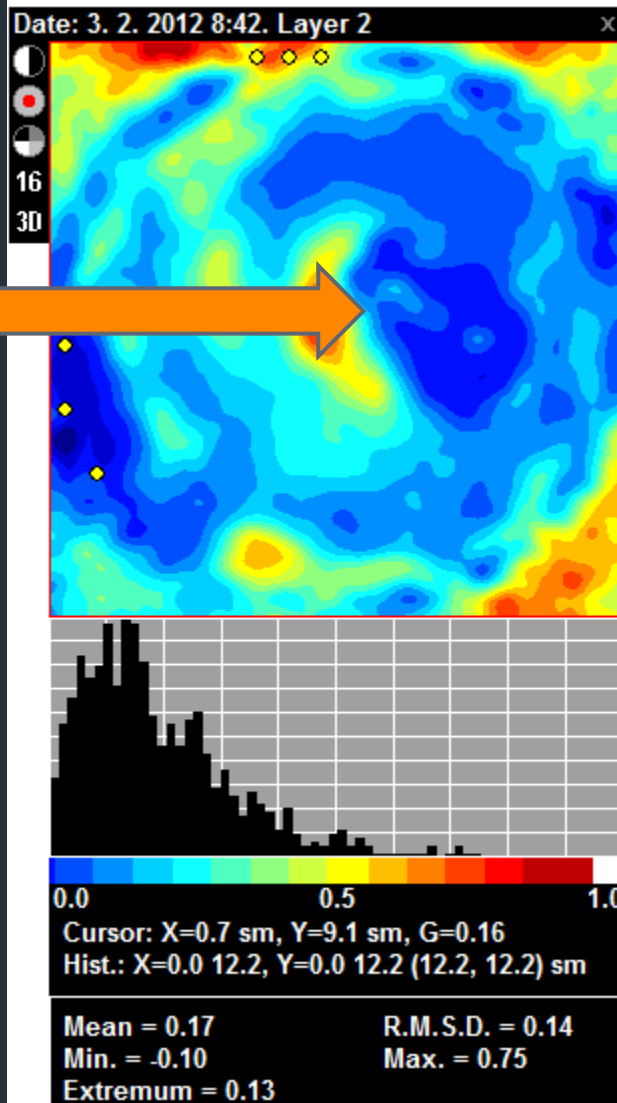
**Histopathologically
demonstrated:**
Phylloides tumor (PT),
(cystosarcoma phyllodes,
sometimes called „giant
fibroadenomas)



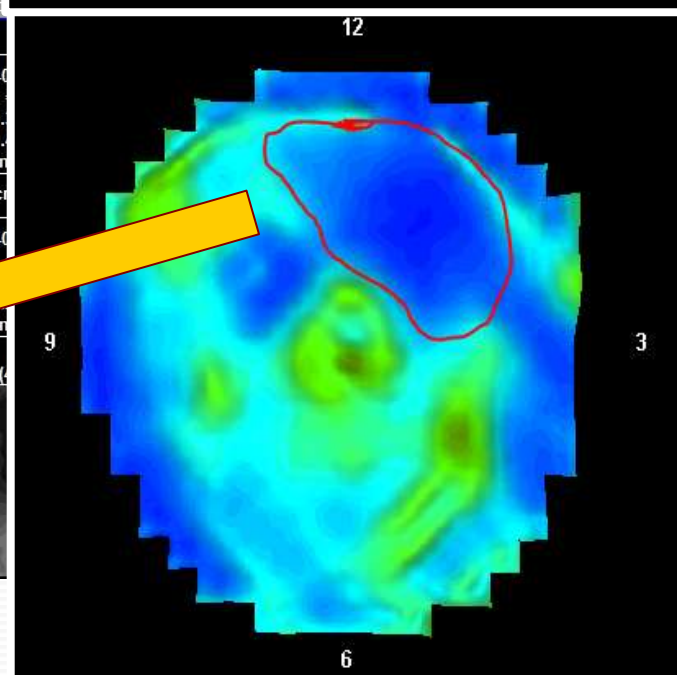
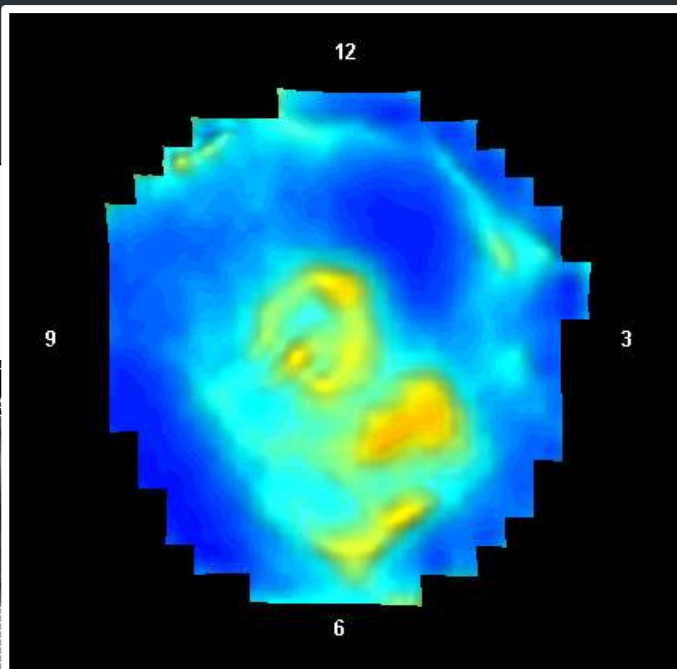
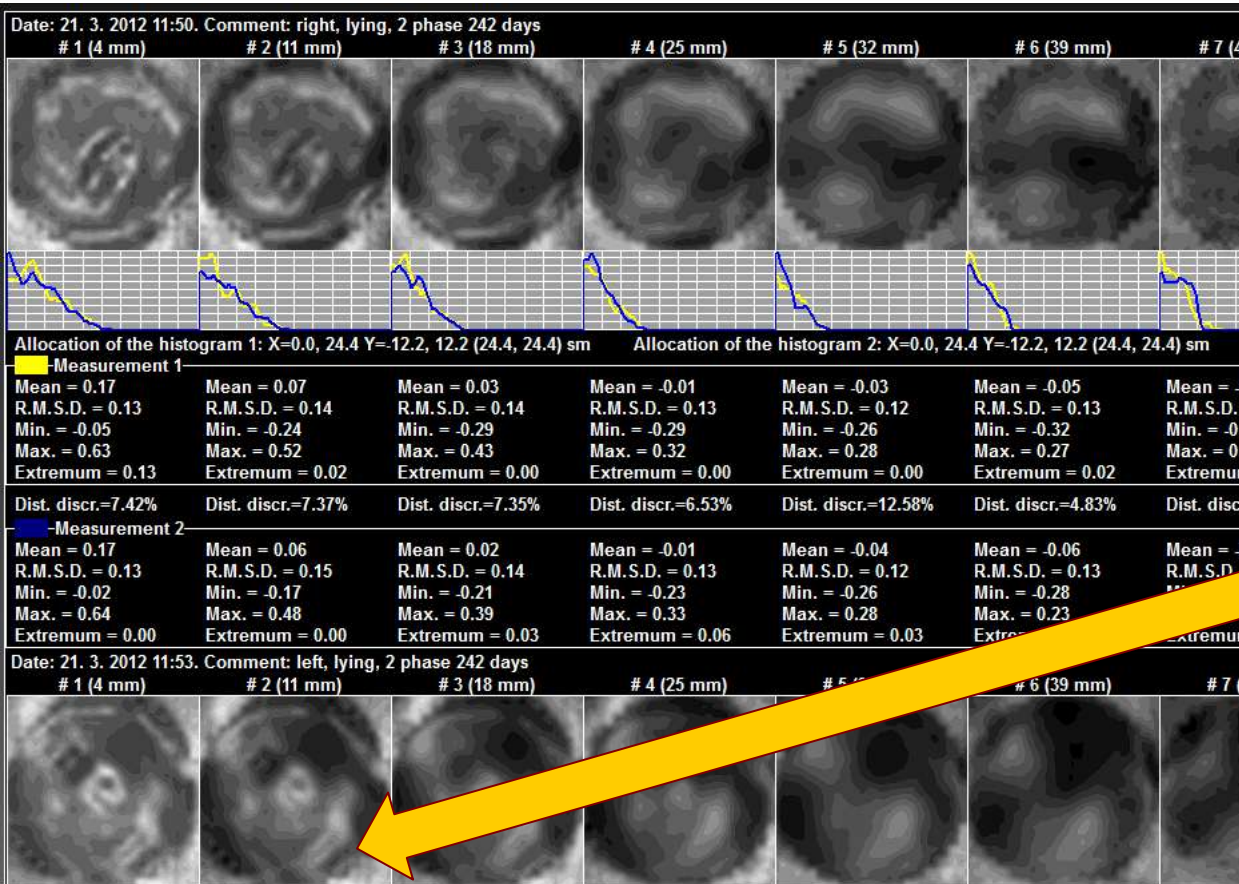
Fibroadenoma

Right breast:
fibroadenoma mammae l.
dx. extirpated 40 x 35 x
30 mm adipose tissue
fibrosis

**Histopathologically
demonstrated:**
fibrocystic parenchyma of
right breast



Mammary gland visualization - mastitis



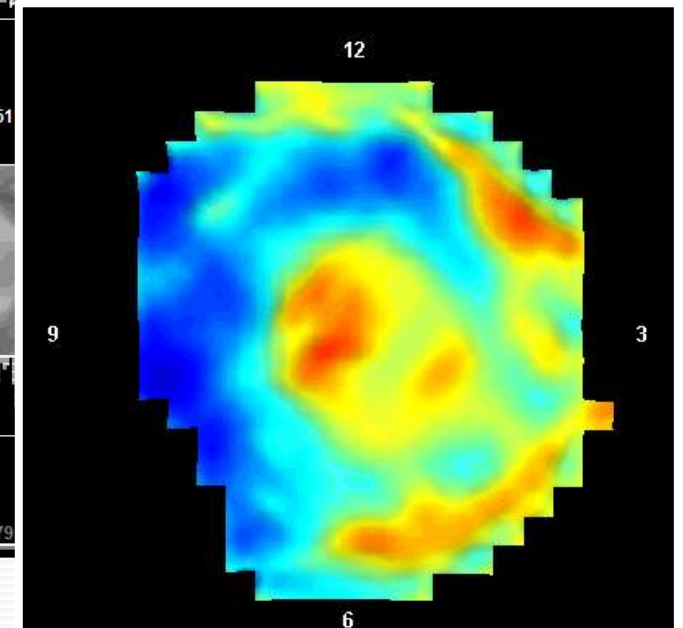
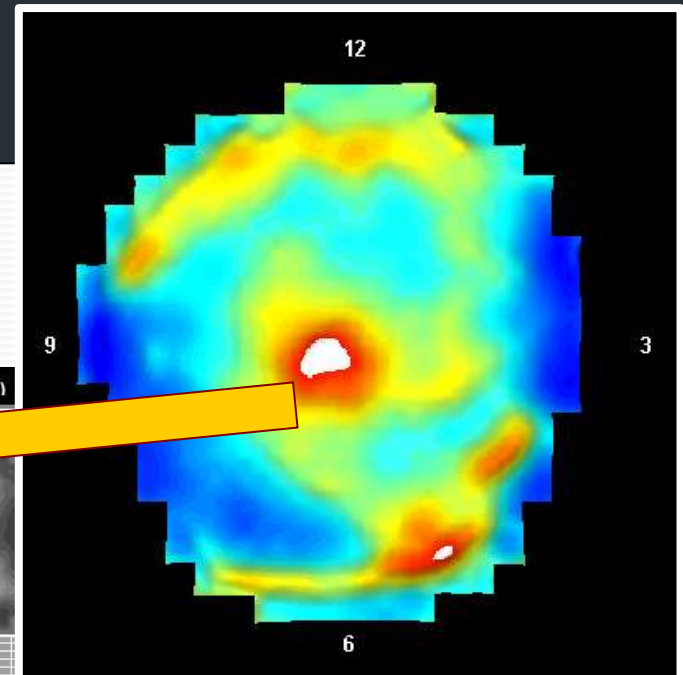
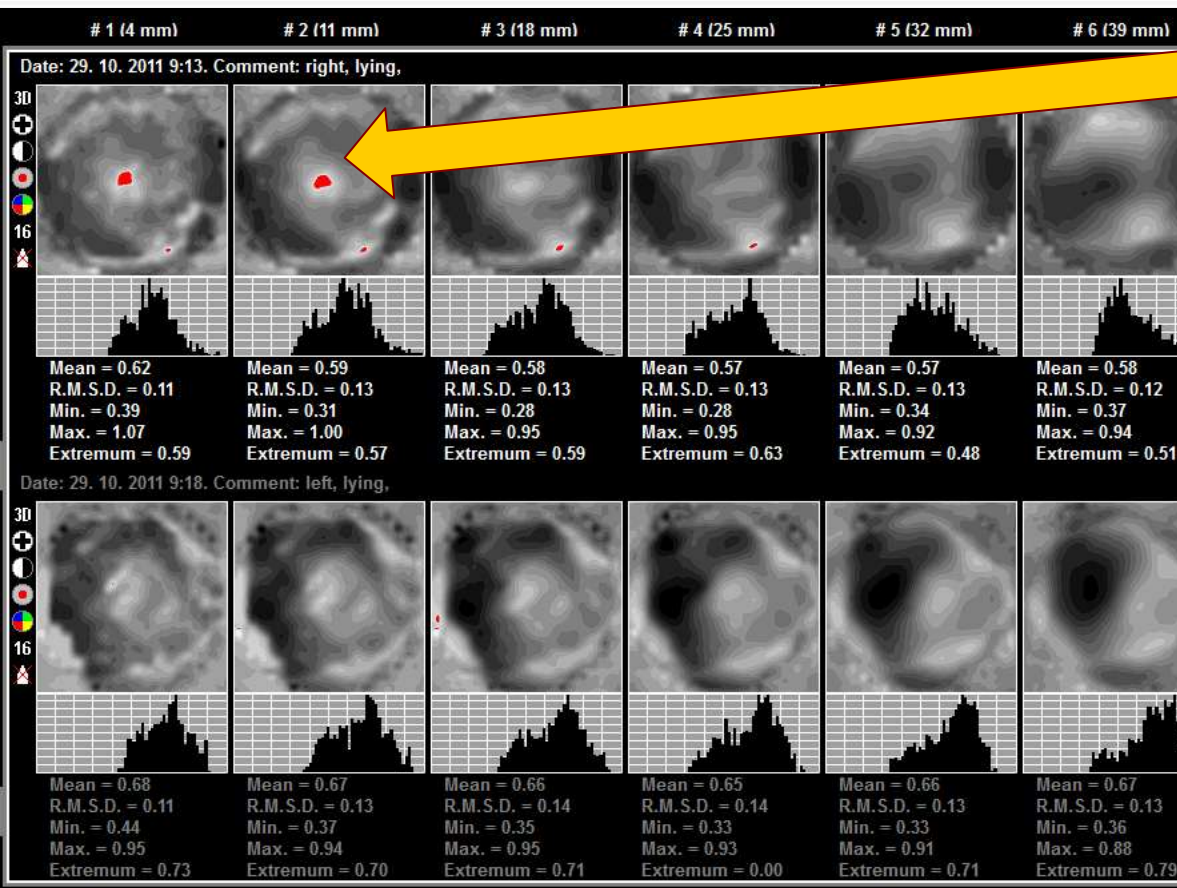
Mammary gland visualization - mastitis



**Pregnant woman
with mastitis**

Diagnostics of men for breast cancer

Patient 45 years old



Diagnostics of men for breast cancer



Patient 45 years old

EIM vs. ACR

EIM	ACR
<i>Common scale</i>	<i>BI-RADS categories</i>
no score	BI-RADS 0 poor image
0-1	BI-RADS 1 lesion is not defined
2-3	BI-RADS 2 benign tumours – routine mammography
4	BI-RADS 3 probably benign findings
5-7	BI-RADS 4 suspicious abnormality - biopsy
8-10	BI-RADS 5 highly suggestive of malignancy – treatment/biopsy

ACR - American college of radiology