How to Setup the Echo Machine ?

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The Beginning ...

Inge Edler and Hellmuth Hertz

Echo Machine from 1954

(photo taken in 1977)

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Increasing Number of Buttons

How to handle them?

Principles

1.) Make yourself comfortable !

Dim the light in the room.

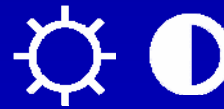**Find your preferred scanning position.**

Adjust the monitor.

Monitor Adjustment

brightness / contrast

use all the
brightness
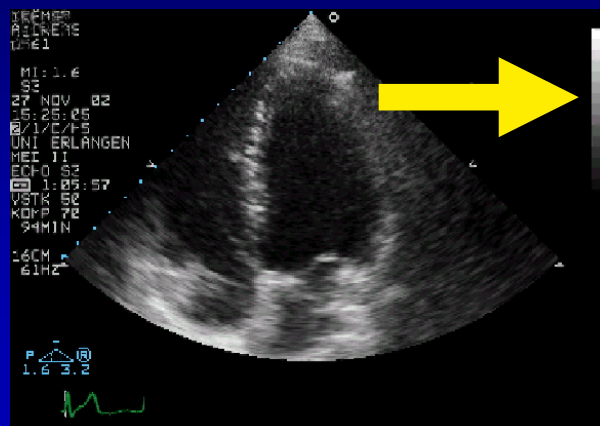range
the monitor
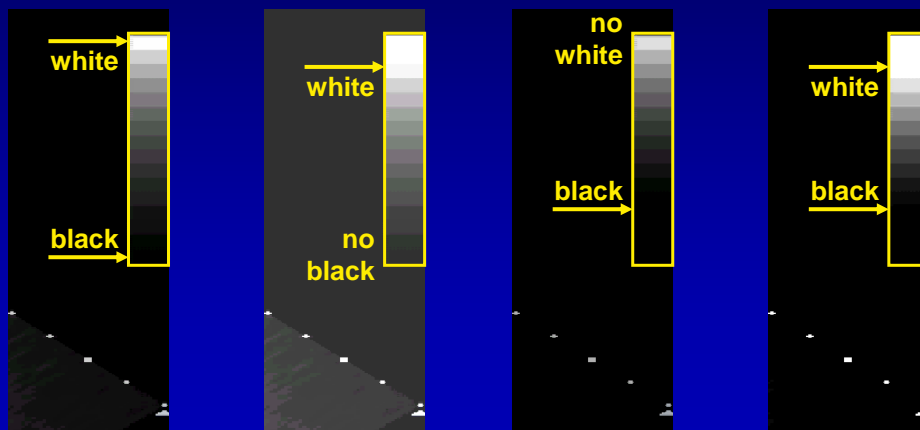can display

Monitor Adjustment

brightness / contrast

Monitor Adjustment

brightness / contrast

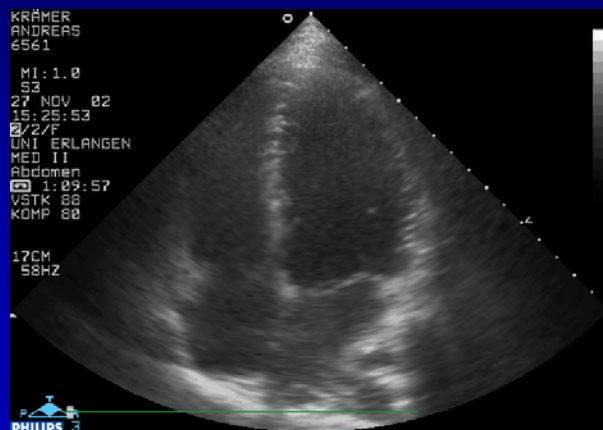# Principles

2.) At best, you can see what is there.

Presets

Power, Gain

TGC

Presets

wrong preset
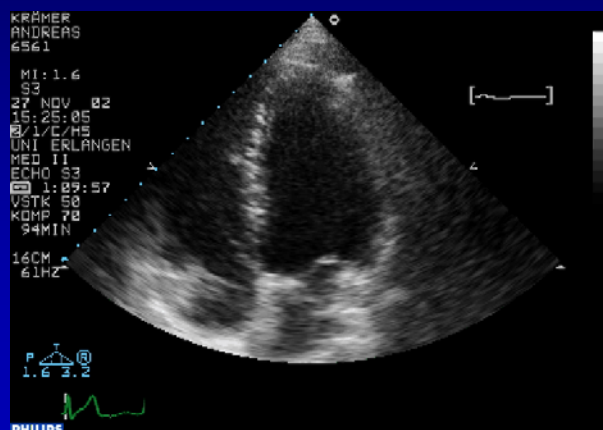

too flat
(compression)

too smooth
(persistence)

abdominal
preset
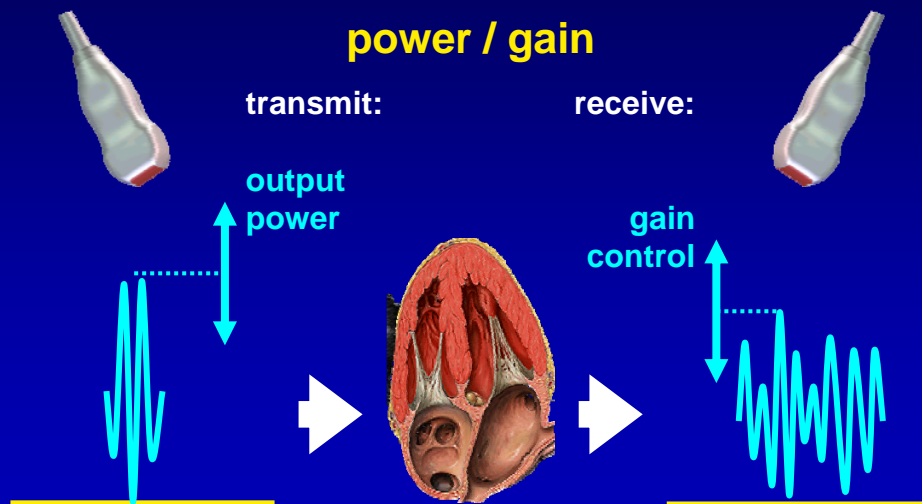
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Presets

right preset

right contrast
setting

no temporal
smoothing

cardiac
preset

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Signal Pathway

power / gain

transmit: receive:

output power

gain control

Signal Pathway

output power

Leistung
0,0 dB

output energy

given in [dB]

highest:
0.0 dB

50% reduction:
-3.0 dB

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Signal Pathway

gain control
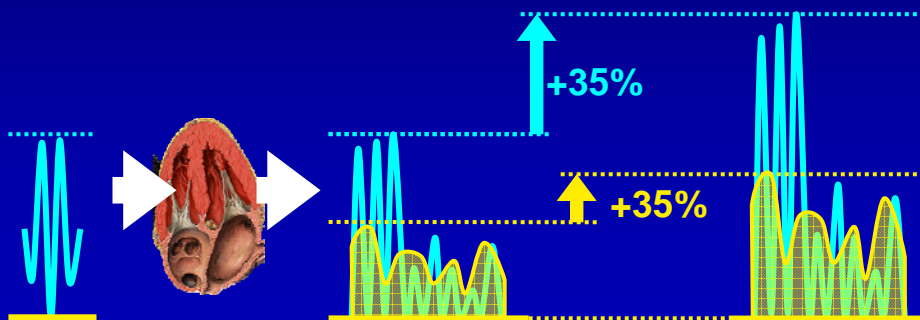

amplification
of the
receive signal

„brightness"

biggest button
on the panel

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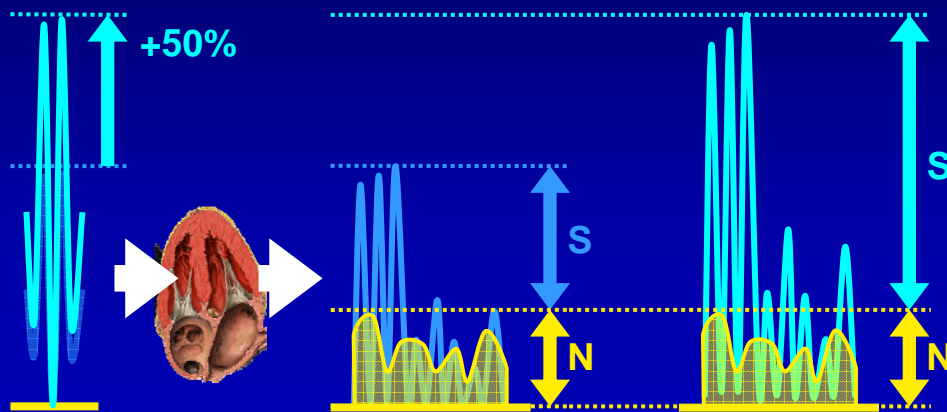

Signal Pathway

gain control

... does not improve signal to noise ratio !
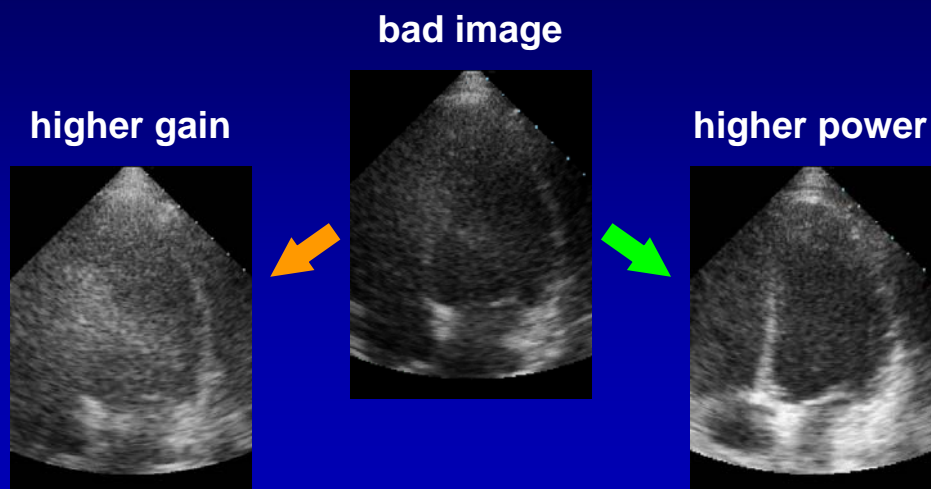

+35%

+35%

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Signal Pathway

... power increase will.

Power and Gain Effects

bad image

higher gain

higher power

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Signal Pathway

time gain compensation

depth dependent gain control

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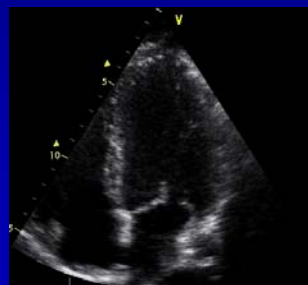

Signal Pathway

time gain compensation

depth dependent gain control

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Image Optimization

automated adjustments

Principles

3.) Nothing in life is for free.

Spatial vs. temporal resolution:
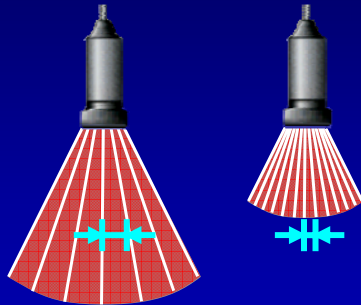
Ultrasound Frequency
Harmonic Imaging
Focus
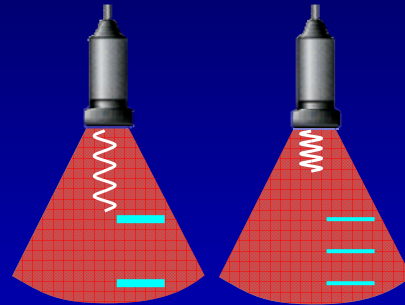**Depth / Sector Width / Frame Rate**

Spatial and Temporal Resolution

depth dependence

frequency dependence

lateral resolution

less depth - more beams

radial resolution

higher frequency - shorter pulses

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Radial Resolution

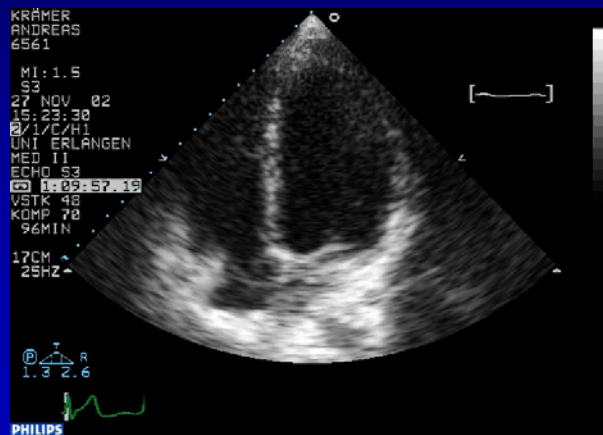**ultrasound frequency**

penetration depth

radial resolution

low frequency

high frequency

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Radial Resolution

ultrasound frequency

low frequency

good penetration:

obese patients

deep structures

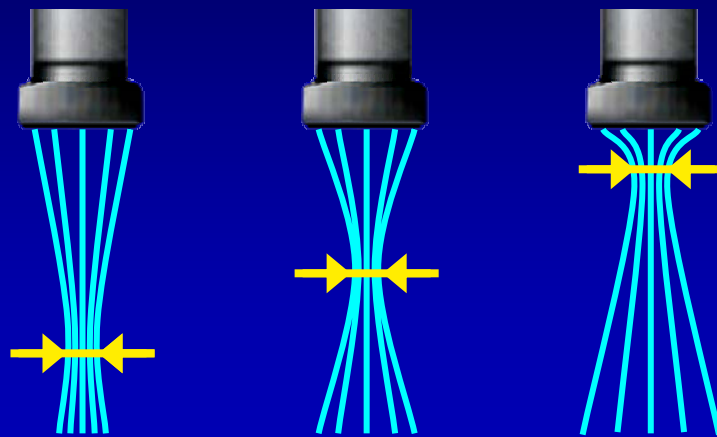**Radial Resolution**

ultrasound frequency
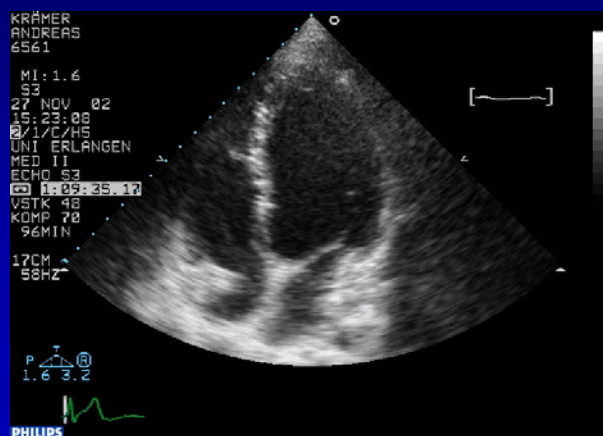
high frequency

high resolution

normal patients

children

apical structures

Resolution

focal zone

Resolution
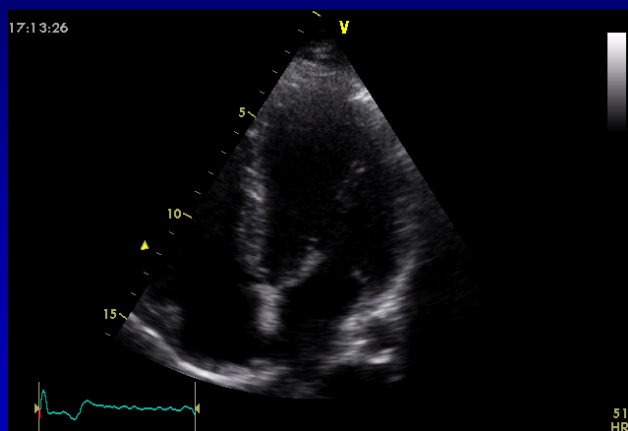
focal zone

focus = 12 cm

apex blurred

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Resolution
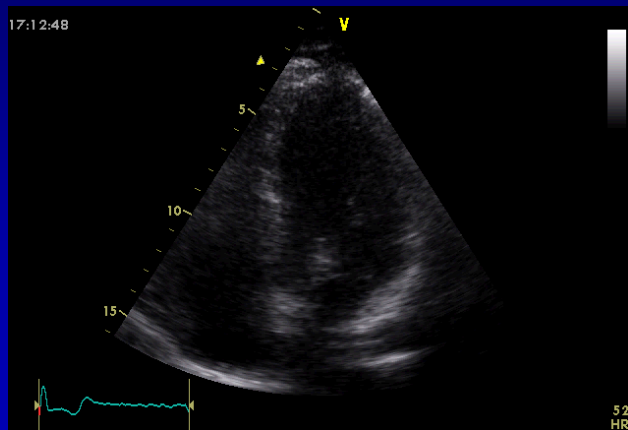
focal zone

focus = 3 cm

apex sharp

basal image
sub-optimal

17:12:48

52
HR

Resolution

focal zone

17:11:55

50
HR

14
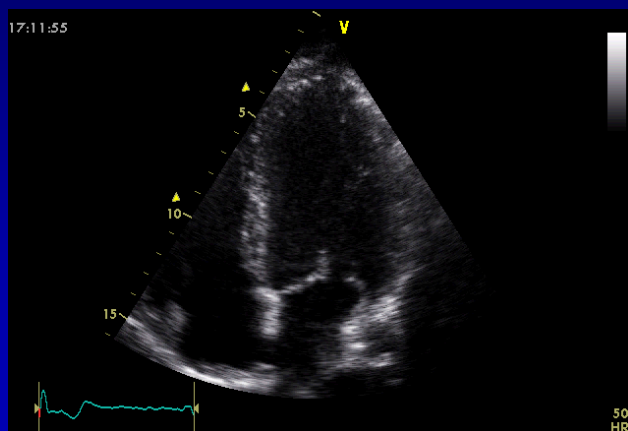
Resolution

focal zone
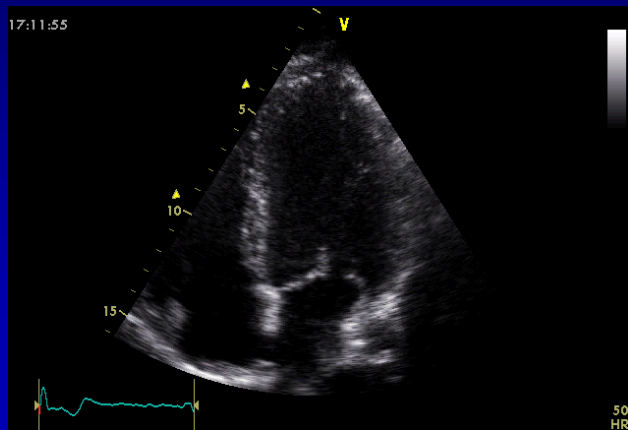
dual focus:

$focus_1 = 4$ cm
$focus_2 = 10$ cm

trade-off:

frame rate
(78 fps vs. 37 fps)

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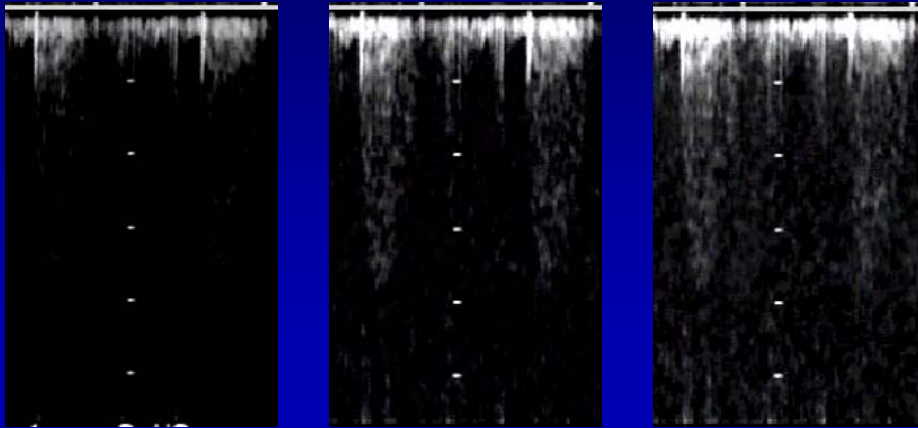

Principles

4.) Doppler Ultrasound.

Spectral Doppler (PW, CW).
Colour Doppler

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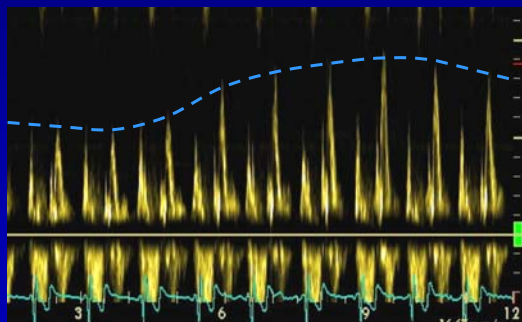
Spectral - Doppler

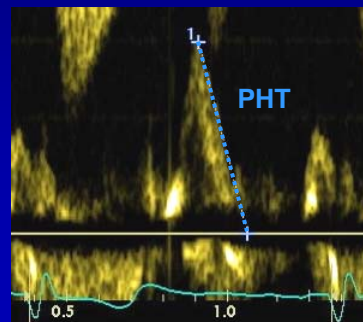**spectrum display: gain settings**

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Spectral - Doppler

spectrum display: time scale
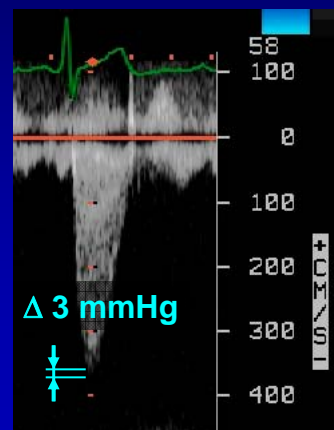
peak only measurements   **time dependent measurements**
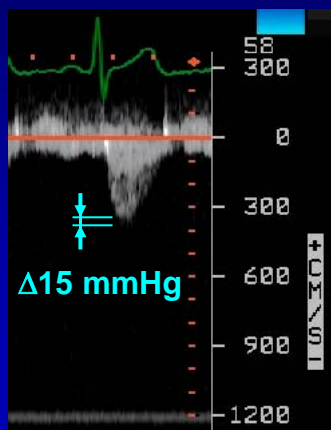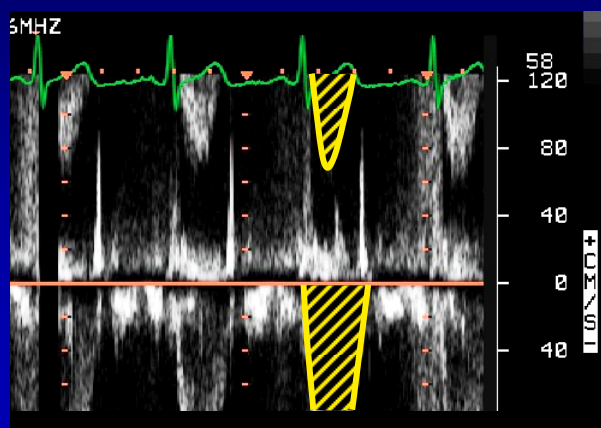

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Spectral - Doppler

spectrum display: velocity range

Δ15 mmHg

Δ 3 mmHg

Spectral - Doppler

pulsed wave Doppler: velocity range

**limited
velocity range
or
limited depth**
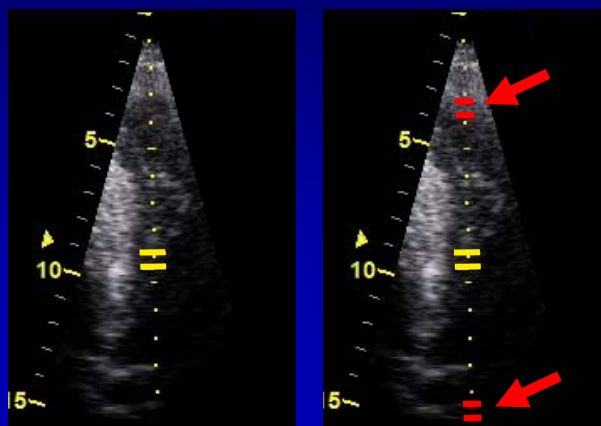
aliasing

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Spectral - Doppler

pulsed wave Doppler: velocity range
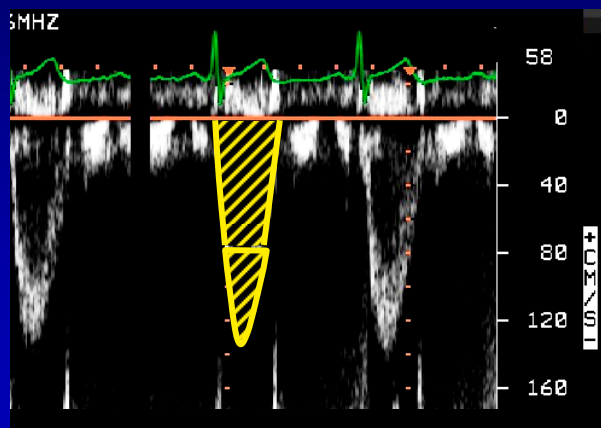
adjust:

base line

velocity range
(PRF)

Spectral - Doppler

pulsed wave Doppler: high PRF mode

HPRF - mode

advantage:
higher velocities

drawback:
multiple
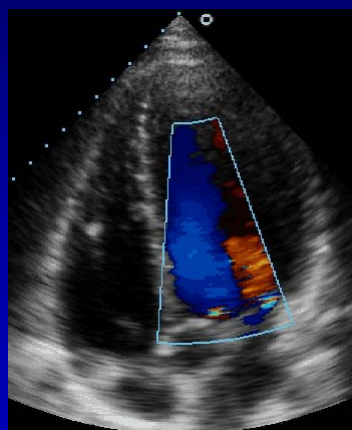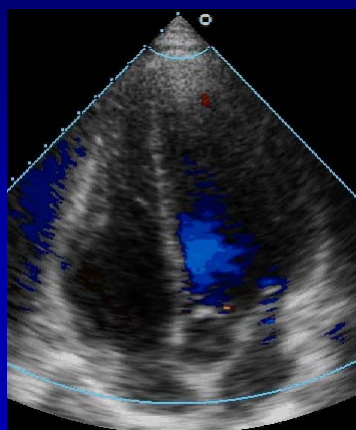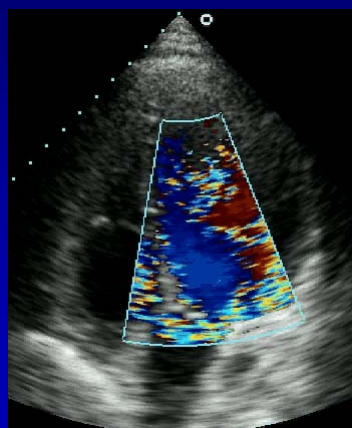sample volumes

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Colour - Doppler

colour box size

Colour - Doppler

gain setting
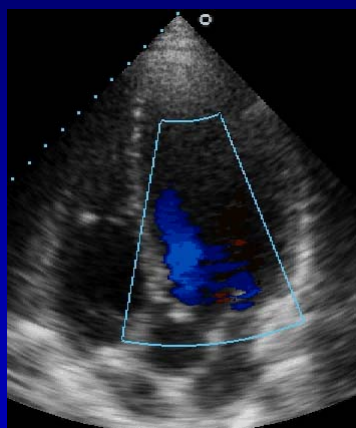
Colour - Doppler

velocity range (PRF)
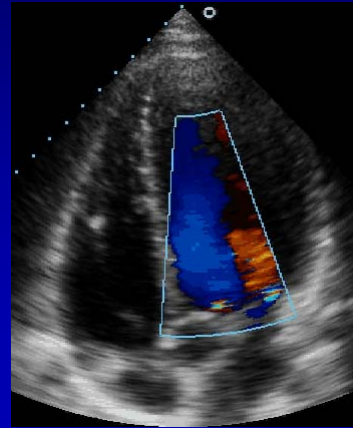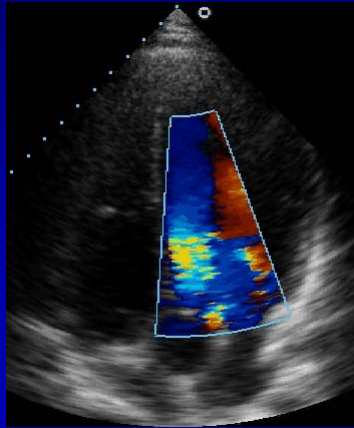
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Principles

5.) In case of problems,
don't call the technical service.
First of all, think !

Requirements:

Know what you want to see.
Know something about ultrasound.
Recognize what's wrong.

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