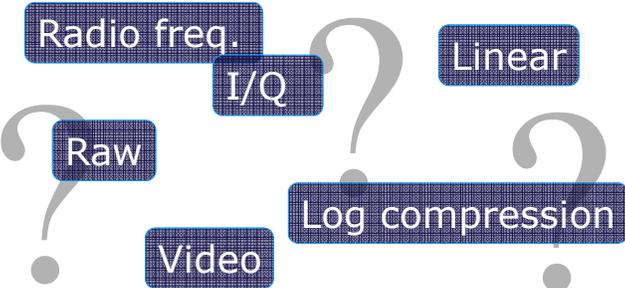# Measures with Contrast Agents
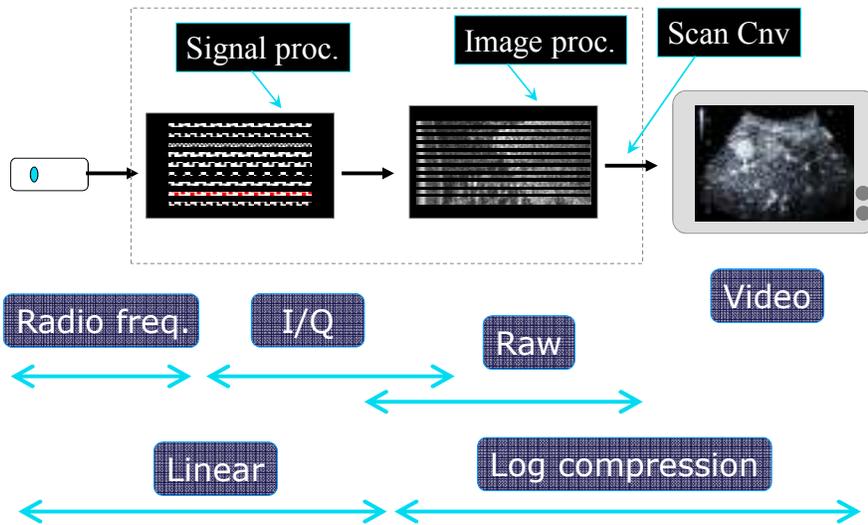
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TOSHIBA
Leading Innovation >>>

Data Type "à foison"

> Which data type to use for adequate perfusion quantification?

Radio freq.

I/Q

Linear

Raw

Log compression

Video

Processing Path

Signal proc. → Image proc. → Scan Cnv

Radio freq. I/Q Raw Video

Linear Log compression

Data Type

Radio freq.
- ✓ Very native
- ✓ Linear
- ✓ Phase information

I/Q
- ✓ Rx-freq. decided
- ✓ Linear
- ✓ Phase information

Suitable for analyses necessitating phase information
(Frequency analysis, Doppler velocity, Elasticity…)

Data Type

Raw

✓ Highly log-compressed
✓ Low post-processed
✓ Wide dynamic range
✓ Header information

Convenient to measure INTENSITY.
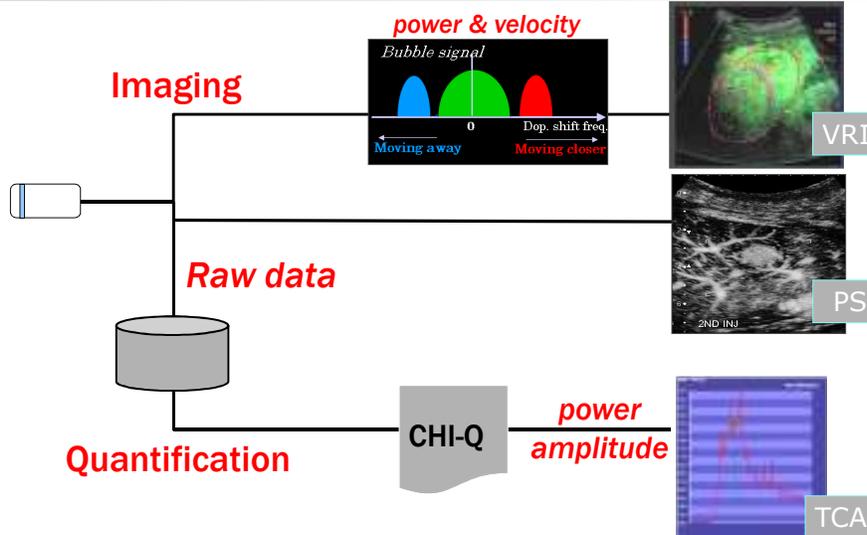**"Log-compressed" NOT a demerit. Header recovers.**

Data Type

Video

✓ User defined log-compression
✓ 0–255 gray level intensity
✓ Narrow dynamic range
✓ Non-linear luminance (colormap)

RISKY
(possible loss of information)

Solution

power & velocity

Imaging

Bubble signal

0   Dop. shift freq.
Moving away   Moving closer

VRI

Raw data

PS

2ND INJ

Quantification CHI-Q *power amplitude*

TCA

Quantification

> **Example of perfusion modeling**
>> Local Density Random Walk function[1,2]

$$f(t) = o + \alpha \left(\frac{e^{\lambda}}{\tau}\right)\left(\frac{\lambda}{2\pi}\right)^{1/2}\left(\frac{\tau}{t}\right)^{1/2} e^{-\frac{1}{2}\lambda\left(\frac{\tau}{t}+\frac{t}{\tau}\right)}$$
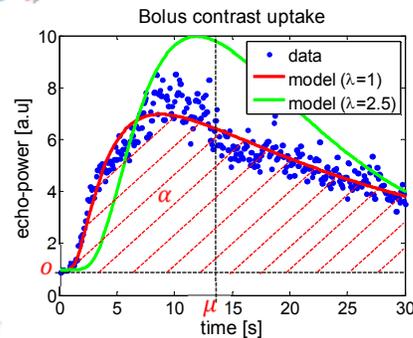
with

f : perfusion model

t : time variable

o : baseline

α : area under the curve

λ : skewness

τ : transit time

$\phi = \alpha/\tau$: correlated to blood flow

Bolus contrast uptake

echo-power [a.u]

- data
- model (λ=1)
- model (λ=2.5)

α

o

μ

time [s]

1. Bogaard JM, Jansen JR, von Reth EA, Versprille A, Wise ME., *Random walk type models for indicator-dilution studies: comparison of a local density random walk and a first passage times distribution*, Cardiovasc Res., 20(11):789-96, 1986.
2. Wise ME, *Tracer dilution curves in cardiology and random walk and lognormal distributions*, Acta Physiol. Pharmacol. Neerl., 14:175–204, 1966