mindray
healthcare within reach

Resona 7

New waves in Ultrasound Innovation

Powered by ZST+

Synergy Spark
Premium | Innovative | Evolving

Industrial Milestone
New Waves in Ultrasound Innovation

Revolutionary Sonography

Powered by ZST+

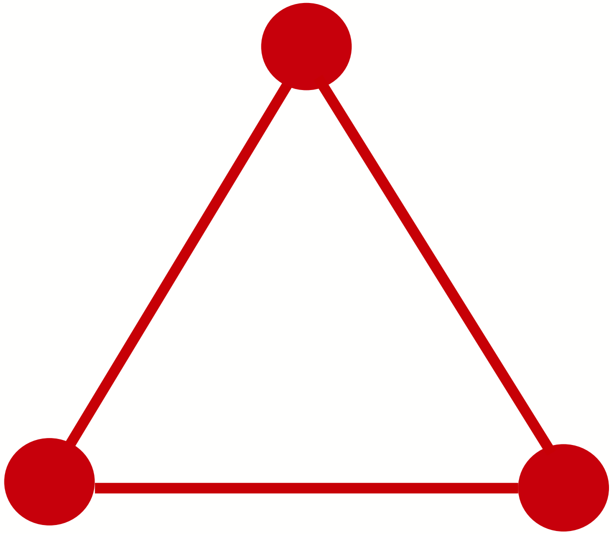
New Waves in Ultrasound Innovation

- New innovation in ultrasound technology
- New capabilities in clinical research and diagnosis
- New image optimization solutions for enhanced diagnostic confidence
- New tools for clinical intelligence
- New user experience for scanning comfort and streamlined workflow

New Innovation in Ultrasound Technology

Why ZONE Sonography®

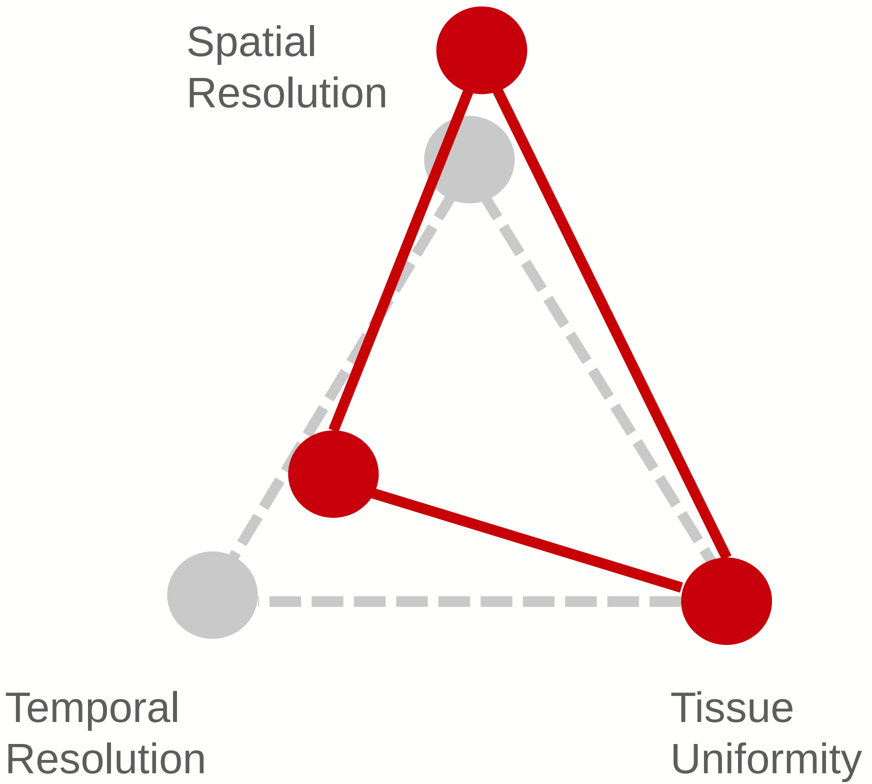
Challenge #1:Trade off between three key ultrasound parameters



The key ultrasound parameters: Spatial resolution, Tissue Uniformity and Temporal Resolution are tightly linked among each other

Why ZONE Sonography®

Challenge #1:Trade off between three key ultrasound parameters



The key ultrasound parameters: Spatial resolution, Tissue Uniformity and Temporal Resolution are tightly linked among each other

Higher Spatial Resolution:
- Increase TX lines
- But decrease temporal resolution

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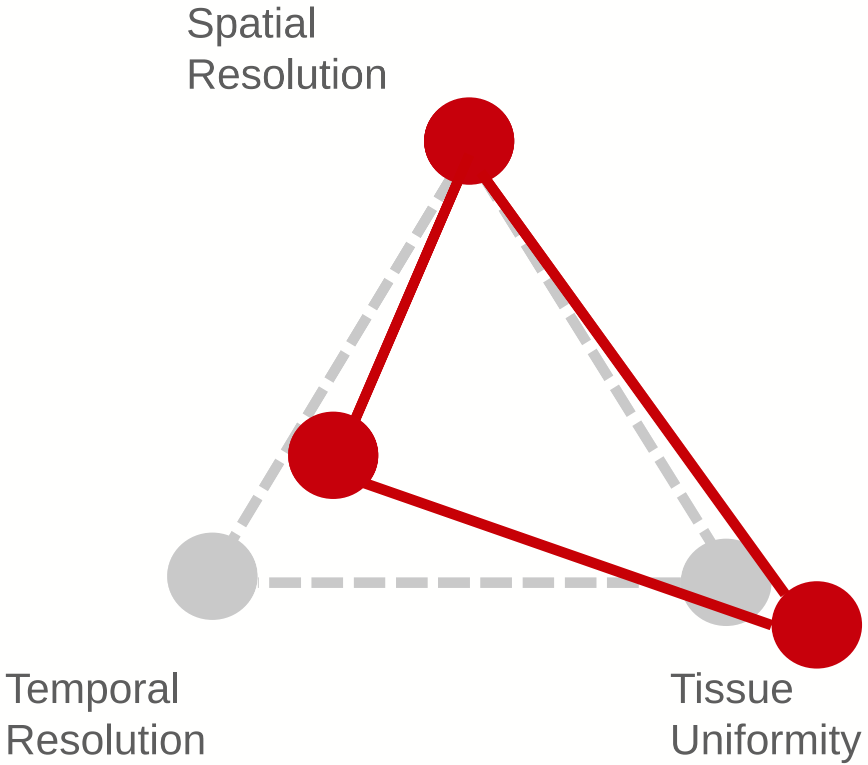
Why ZONE Sonography®

Challenge #1:Trade off between three key ultrasound parameters



The key ultrasound parameters: Spatial resolution, Tissue Uniformity and Temporal Resolution are tightly linked among each other

Higher Spatial Resolution:
- Increase TX lines
- But decrease temporal resolution

Increase Uniformity:
- Multi focuses TX
- But decrease temporal resolution

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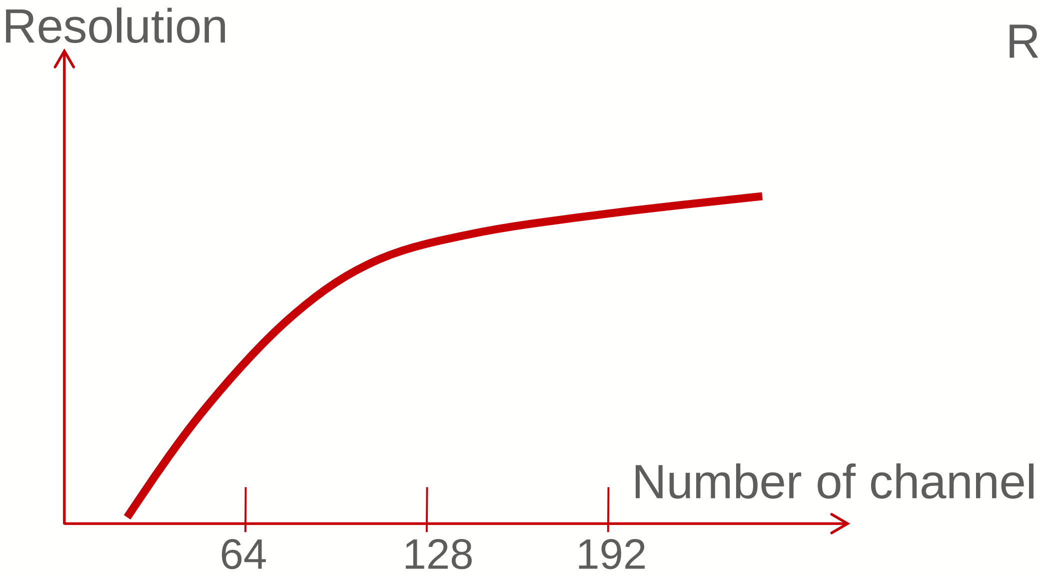
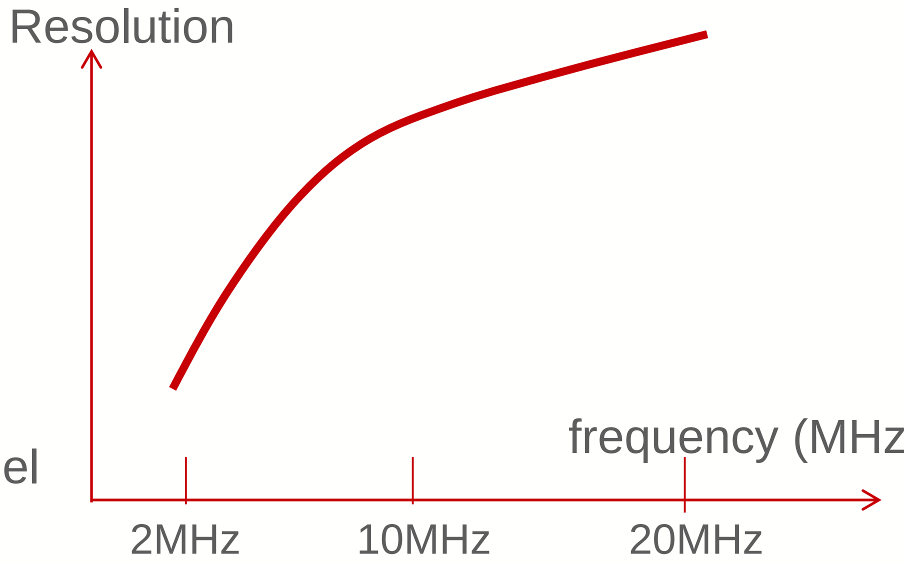
Why ZONE Sonography®

Challenge #2: Bottleneck of Resolution





Optimal resolution is dependent upon number of channels, but conventional architectures do not provide an increase in image quality by increasing channels.

Resolution is dependent on frequency, but trading off with penetration.

What is ZONE Sonography®

ZONE Sonography®

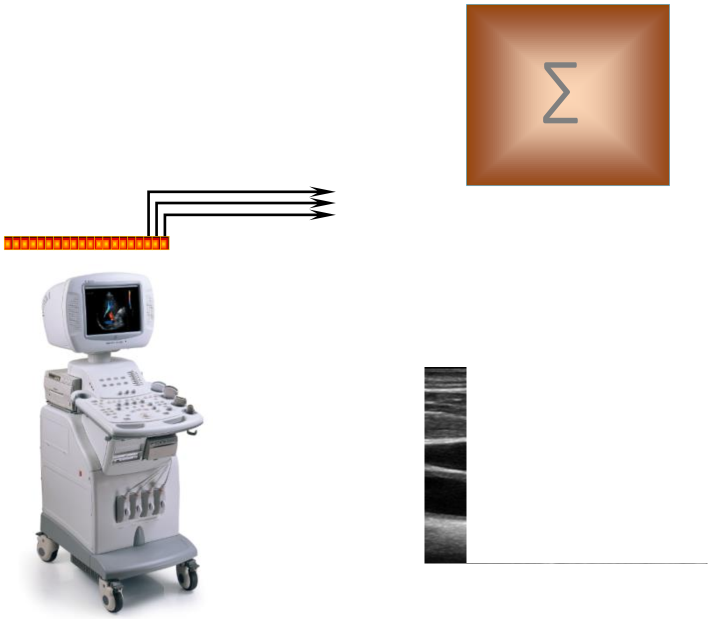
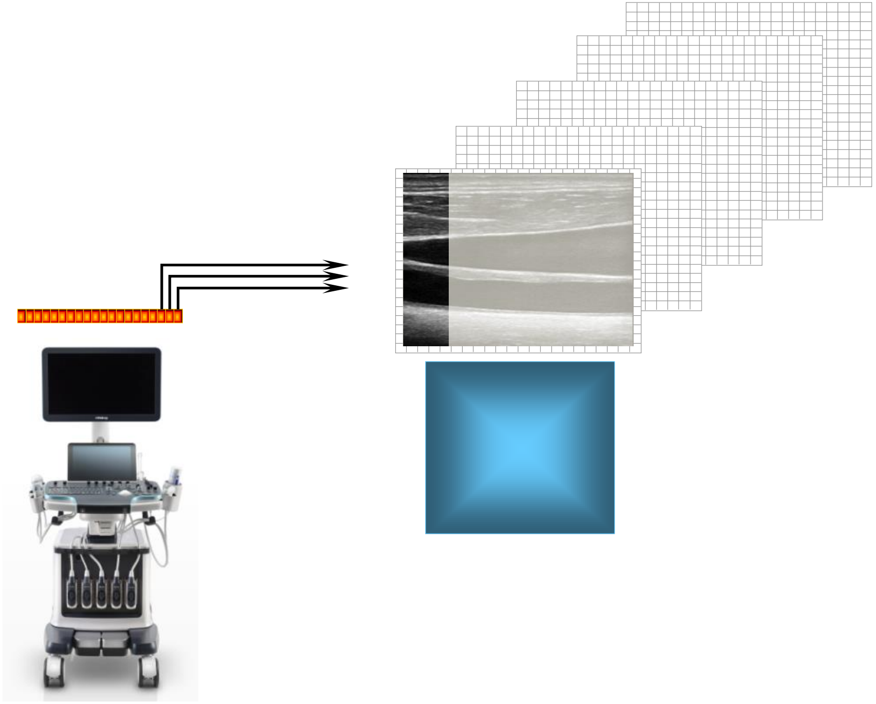
ZONE Sonography® Technology is a revolutionary, software-driven approach to acoustic data acquisition and image formation that breaks the barriers of conventional ultrasound imaging based on innovative channel data processing methods.

“The next industry standard method of generating ultrasound images.

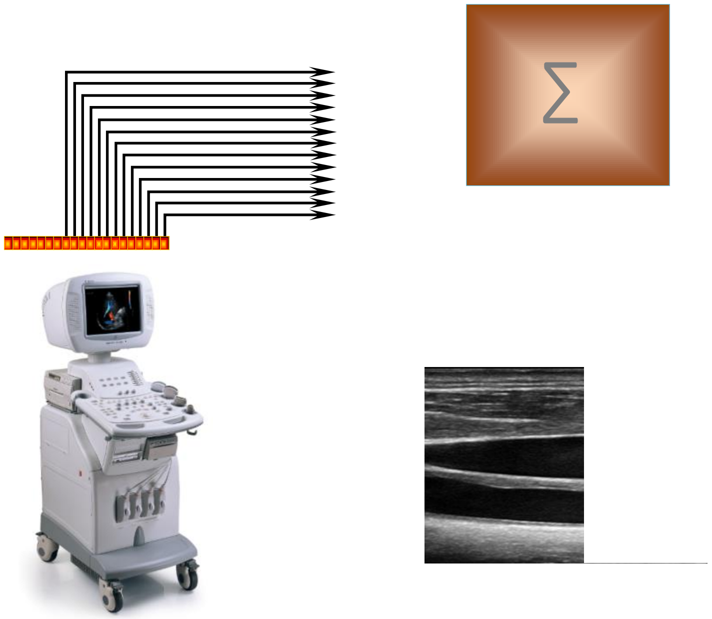
Two generations ahead of traditional digital beam formation technology.”

Frost & Sullivan, November 2011
Leaders in Market Research

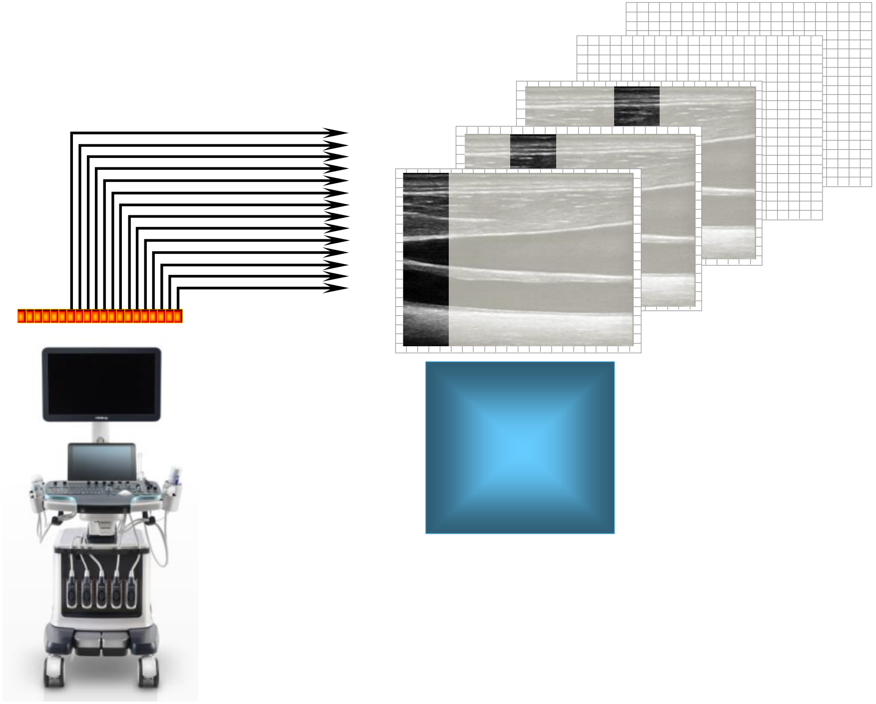
FROST & SULLIVAN

Traditional Beamformer	ZONE Sonography®
	

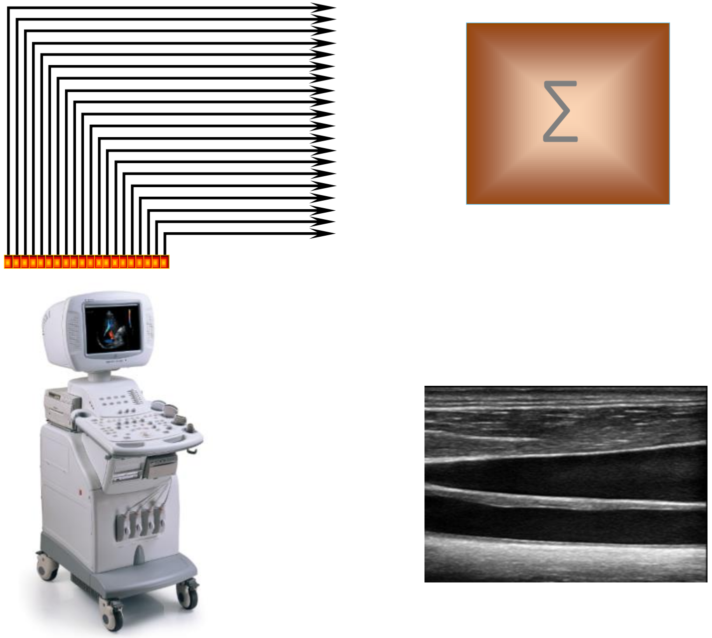
Traditional Beamformer



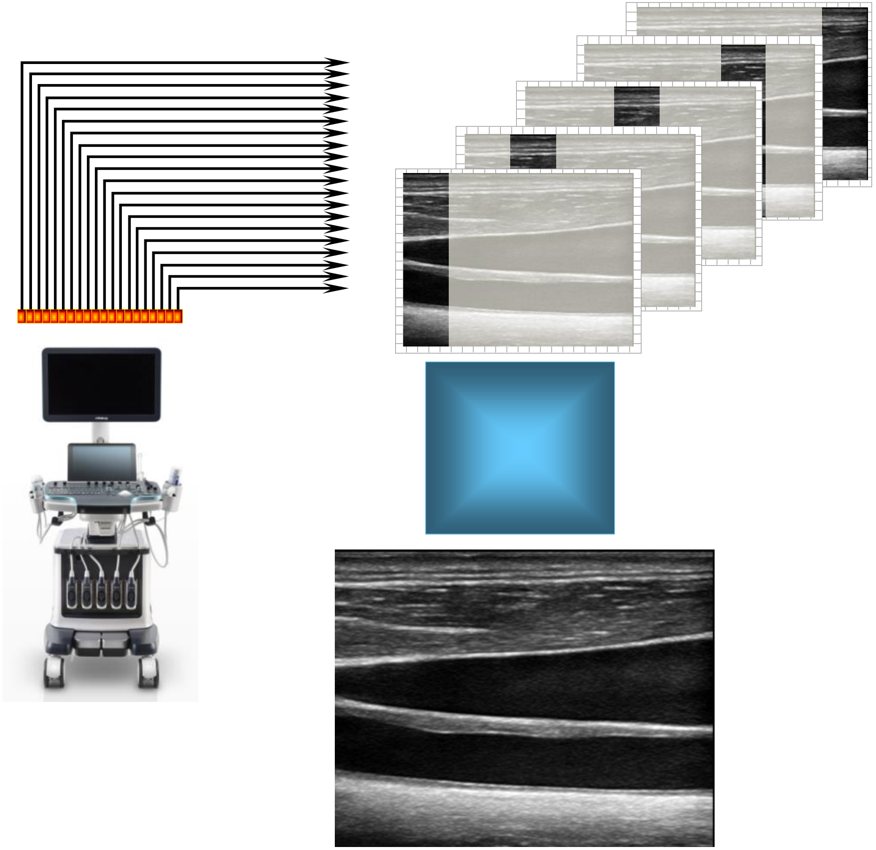
ZONE Sonography®

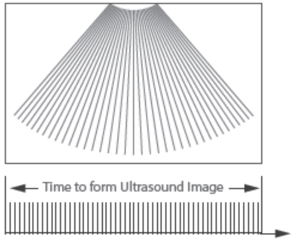


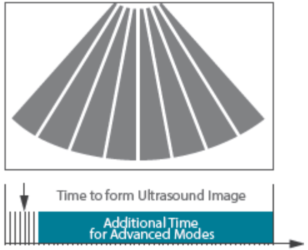
Traditional Beamformer



ZONE Sonography®





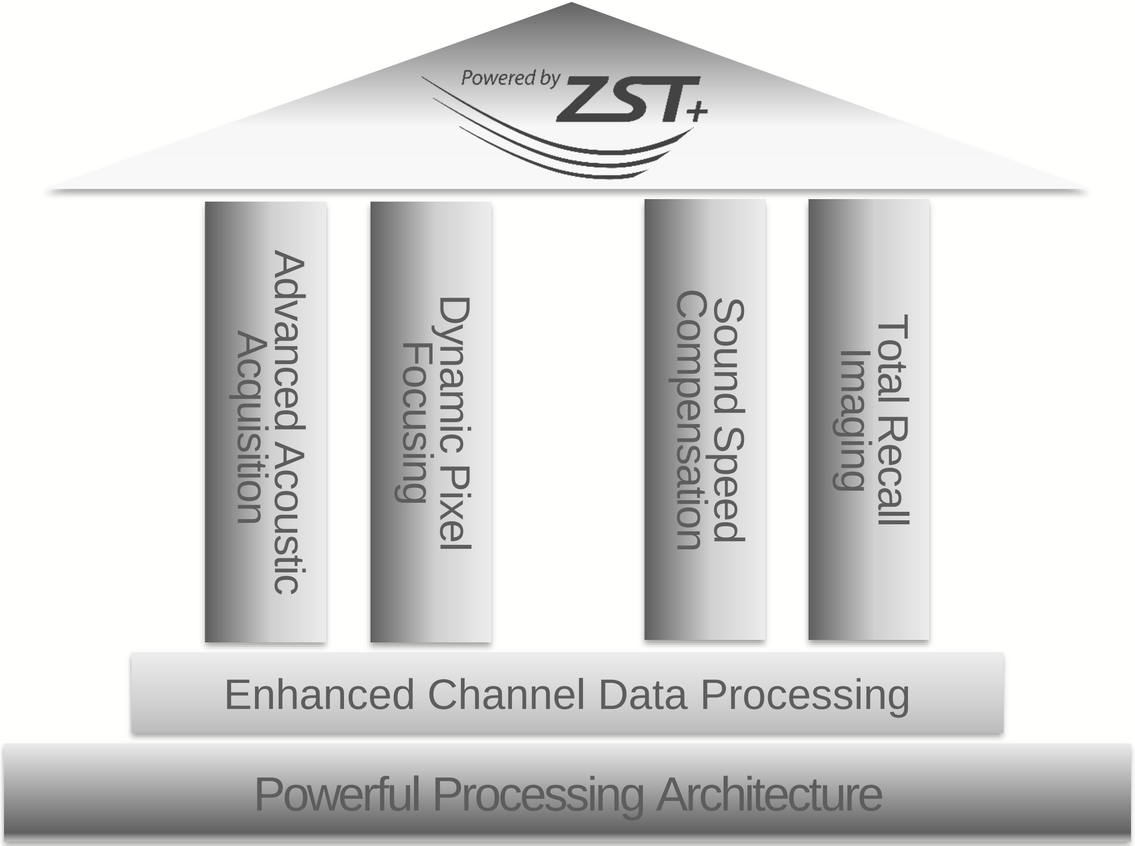


Traditional Beamformer	ZONE Sonography®
Data acquired line by line, limited acoustic acquisition	Data acquired in ZONES, 10x faster acoustic acquisition
Hardware-based Beamformer, limits to upgrade	Software-based Beamformer, easily upgradable
Limited Focal Depth and Number	Full Field of View Focus
Sound speed assumption = 1540 m/sec	One button digital sound speed compensation

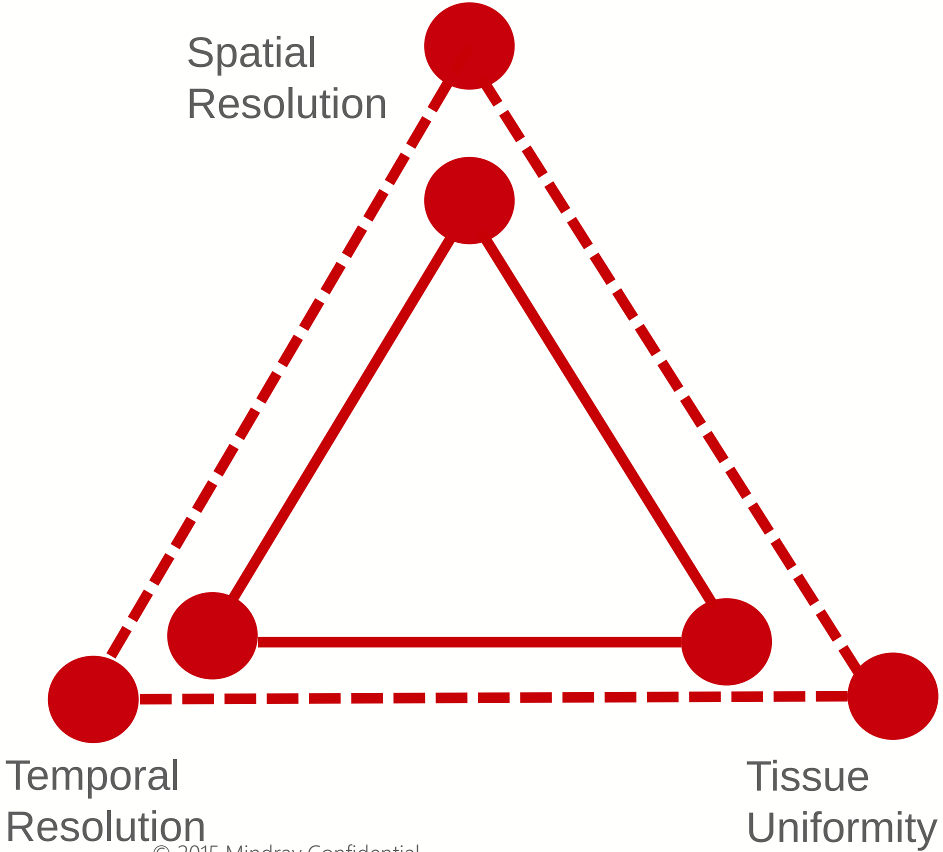
ZONE Sonography® Technology Plus (ZST$^+$)

ZST$^+$ is the most premium and innovative ultrasound platform, it is evolving with powerful processing architecture and enhanced channel data processing based on ZONE Sonography®

Key Pillars of ZST+ Platform



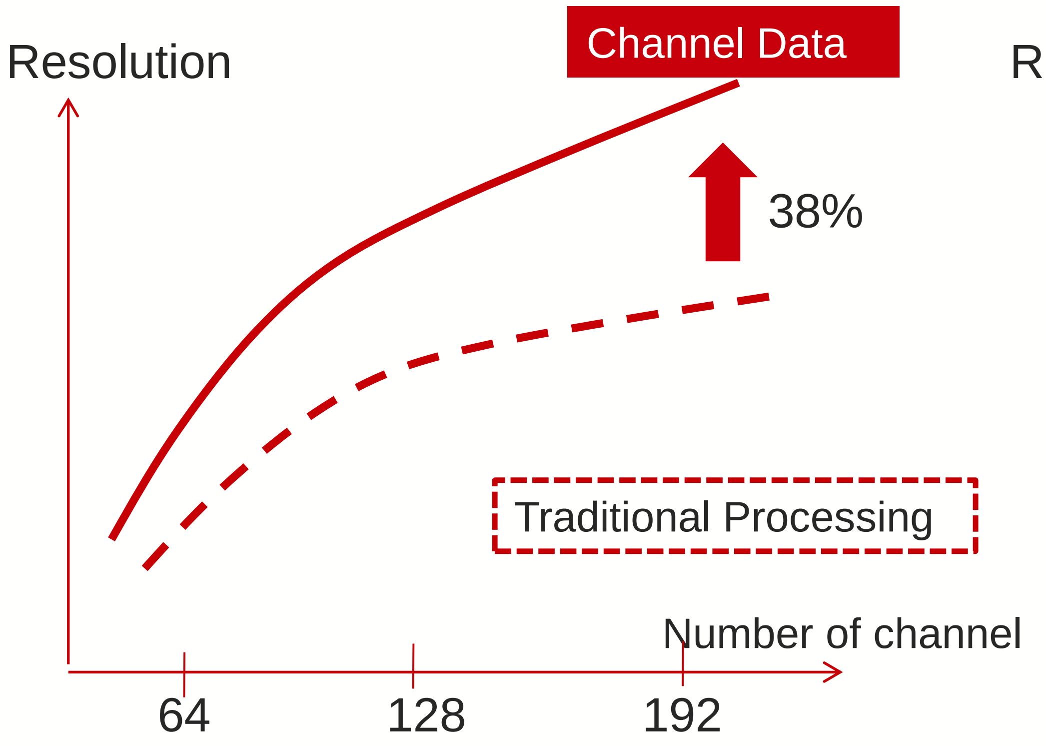
Break Challenge #1

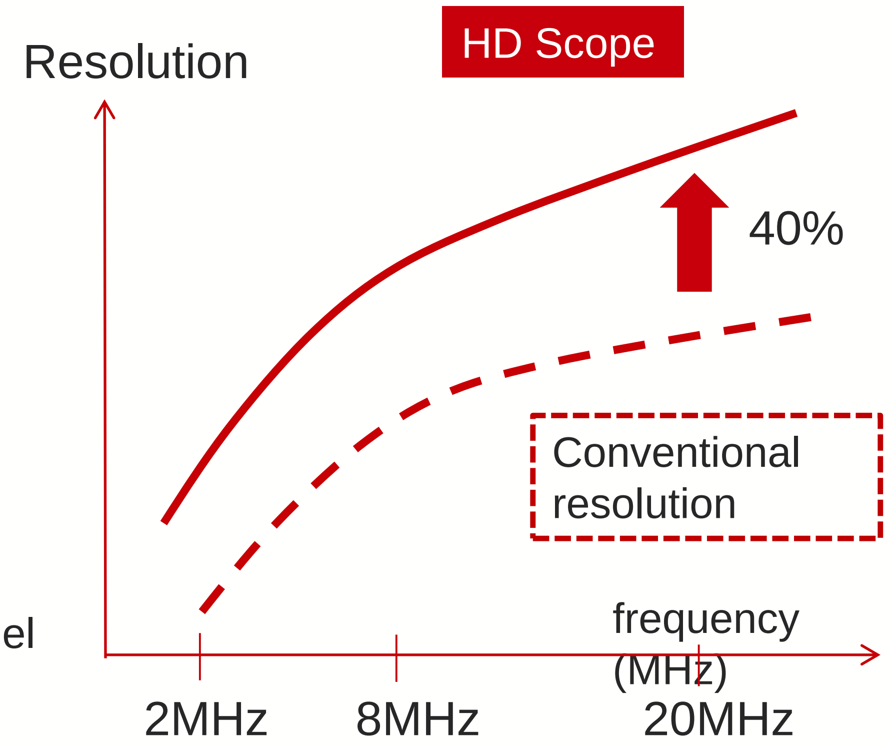


Advanced Acoustic Acquisition

Dynamic Pixel Focusing

Break Challenge #2



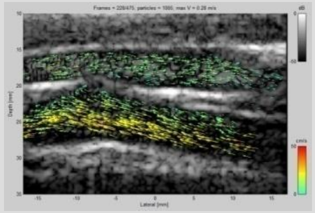


New Capabilities in Clinical Research and Diagnosis

New Capabilities in Clinical Research and Diagnosis

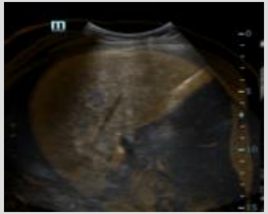
V Flow

- Vivid Vector Flow for visualization of *complex micro-hemodynamics*



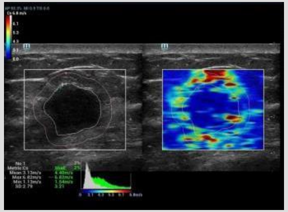
iFusion

- Fusion Imaging with *respiration compensation*



STE

- Shear wave elastography for more *precise quantification of tissue stiffness*



UWN+ Contrast

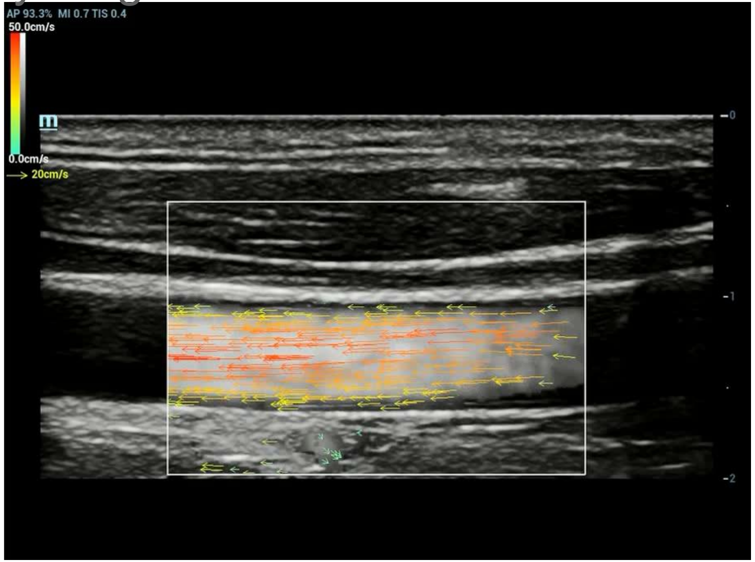
- *Mindray's 2nd generation UWN CEUS*

V Flow

Innovative technology developed by Mindray

An novel approach for vascular hemodynamic analysis, using color coded vector arrows to follow up blood cell's moving velocity magnitude and direction.

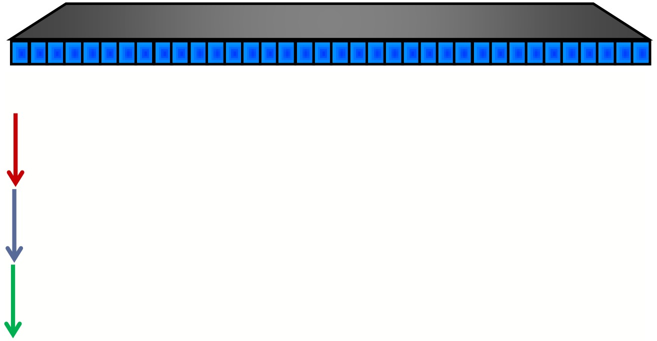
- Qualitative analysis tool:
  - Grayscale: flow distribution
- Quantitative analysis tool:
  - Arrow color: flow velocity
  - Arrow direction: flow direction
  - Arrow length: flow velocity
  - Cursor on arrow: Instant flow velocity and angle number at any single point



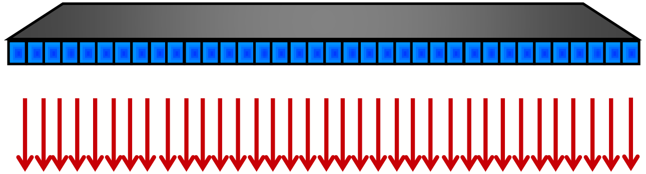
V Flow

Innovative technology developed by Mindray

Traditional Color Flow



V Flow



Line-by-line acquisition:

1. Low frame rate (two digital FPS)
2. Angle dependent
3. Roughly display of blood velocity by color
4. Roughly display flow hemodynamics

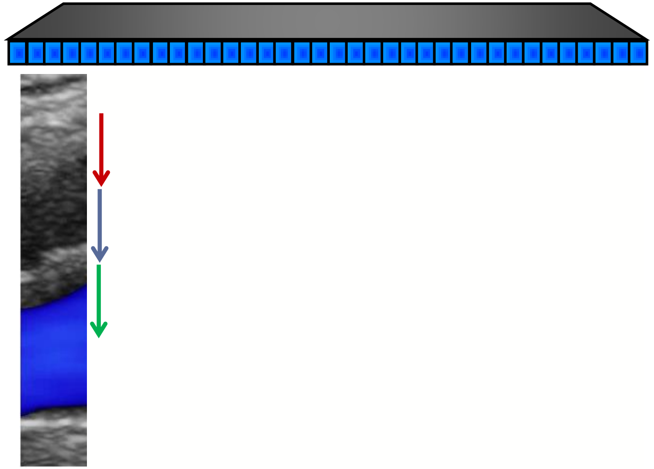
Multiple lines (Plane Wave) acquisition:

1. Extremely high frame rate (over 300 FPS)
2. No Angle dependent
3. Precise display of blood velocity
4. Precise display of hemodynamics

V Flow

Innovative technology developed by Mindray

Traditional Color Flow



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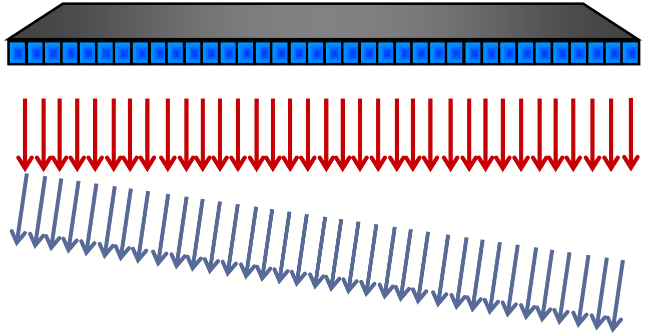

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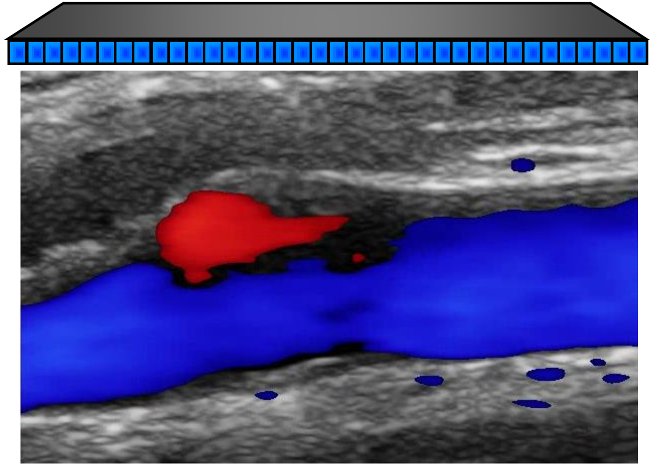

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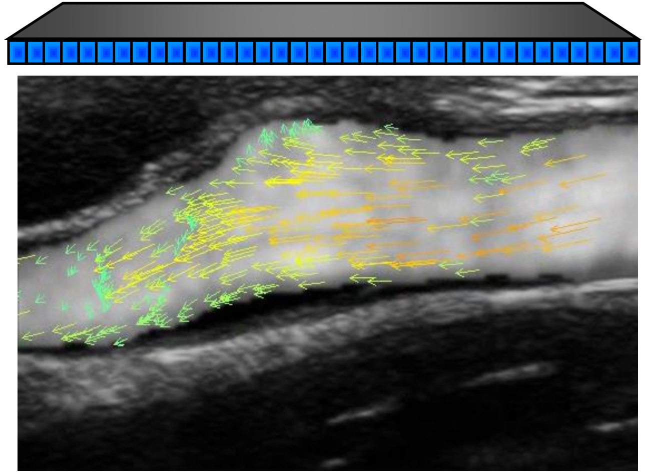

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V Flow

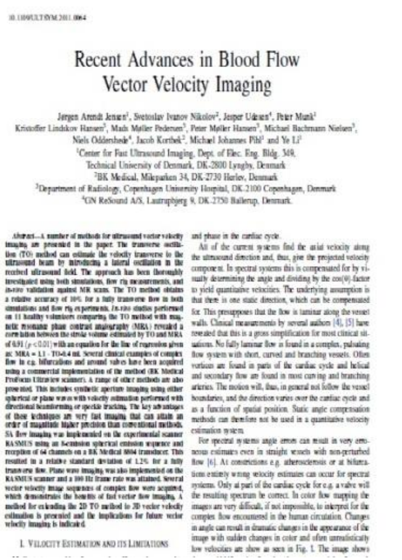
Innovative technology developed by Mindray

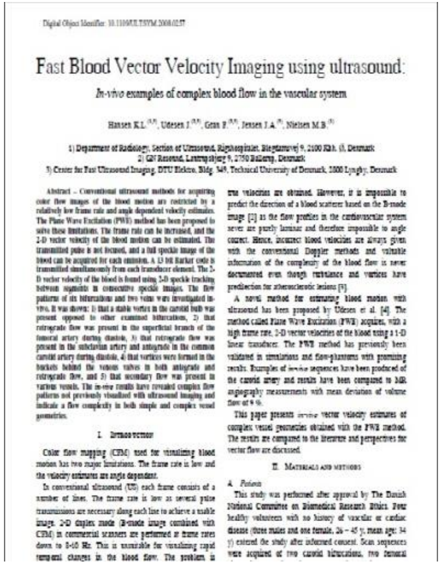
Jugular Vein and CCA

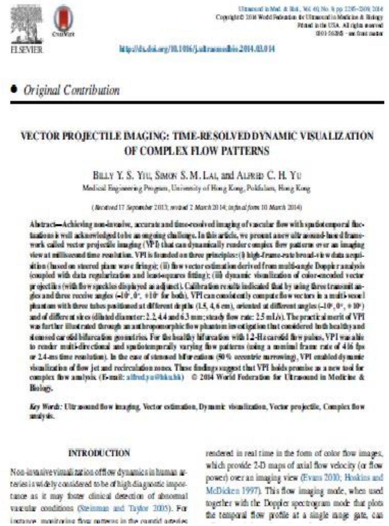
Vortex Flow

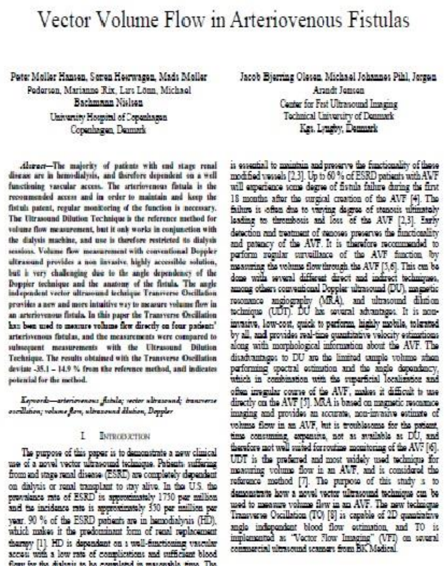
Proven V Flow Clinical Benefits

- **True hemodynamic changes** in the vessels, not only in laminar flow, but well identified in turbulent and vortex flow and elevates diagnostic value.
- **More accurate in velocity**, easily compare and analyze velocity in different time of a single cardiac cycle from different points.

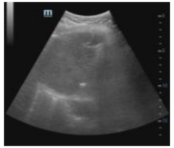








iFusion

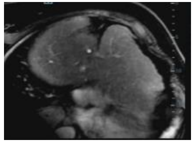


Ultrasound

Real time imaging

On-imaging procedure

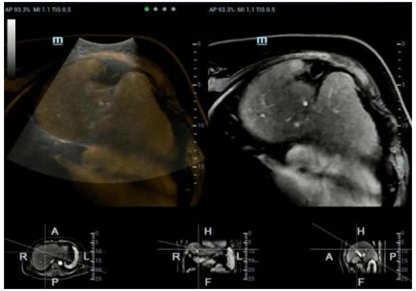
CT/MRI



High-resolution imaging

Accurate localization of lesion

Fusion Imaging



Pathology diagnosis
Intervention procedure
Treatment evaluation

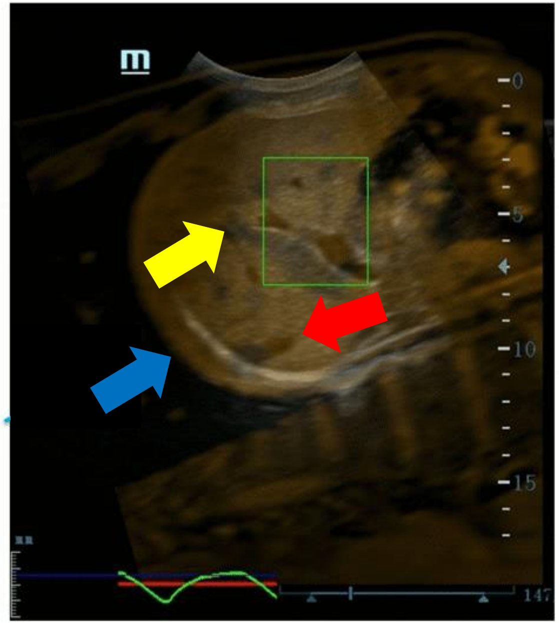
iFusion

with Innovative Respiration Compensation

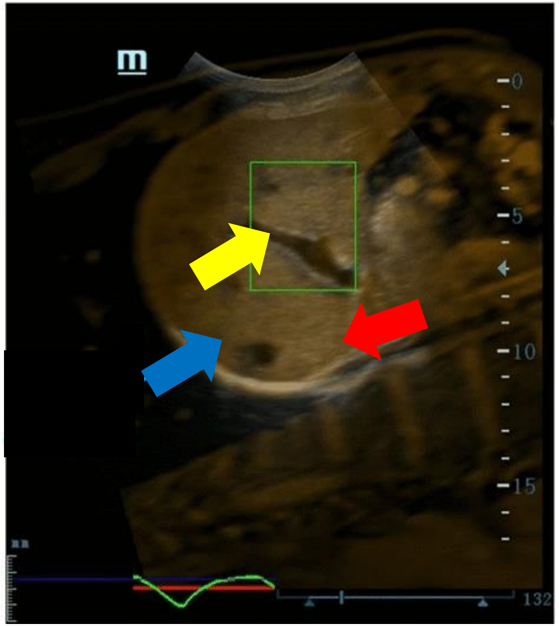
- Mindray's exclusive technology to minimize the limitations in fusion imaging:
  - *More Sensitive*: magnetic motion sensor with millimeter accuracy
  - *More precise*: effectively eliminates the matching distortion caused by unavoidable patient respiration
  - *More confidence* for tumor diagnosis and interventional procedure

iFusion

with Innovative Respiration Compensation



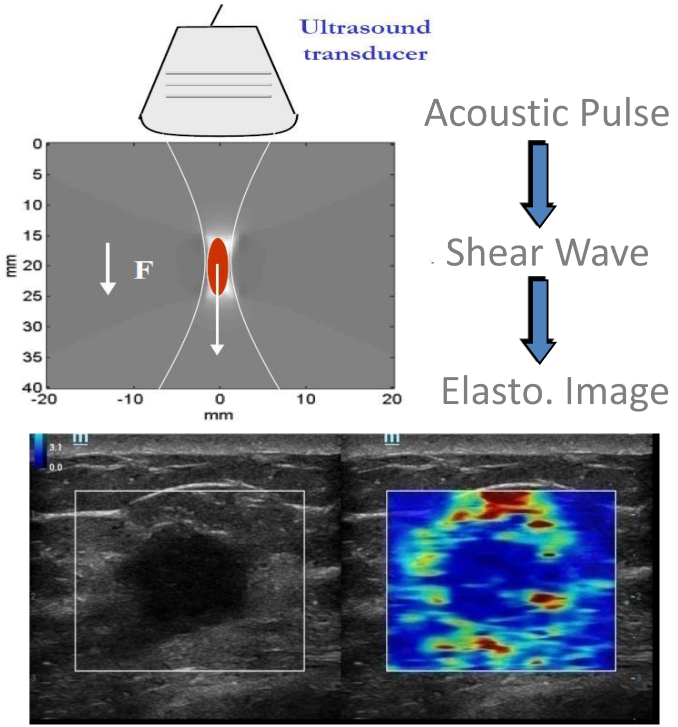
Before respiration compensation



After respiration compensation

Sound Touch Elastography(STE)

- Shear wave elastography with Mindray exclusive Ultra Wide Beam Tracking for faster and more precise imaging with higher penetration:
  - *Unique Shell Analysis:* for assessment of infiltratrion area
  - *Real time imaging:* for more diagnostic information
  - *HQE mode (one-frame):* for higher image quality and better penetration
  - *More comprehensive evaluation:* with different elasticity metrics, and multiple quantification tools



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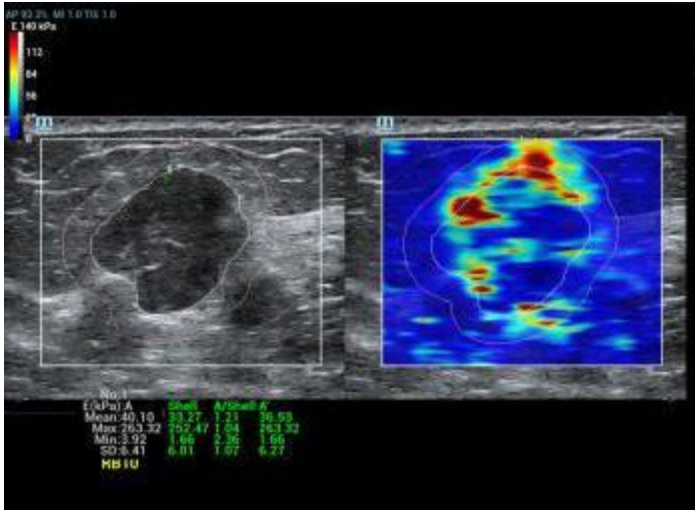
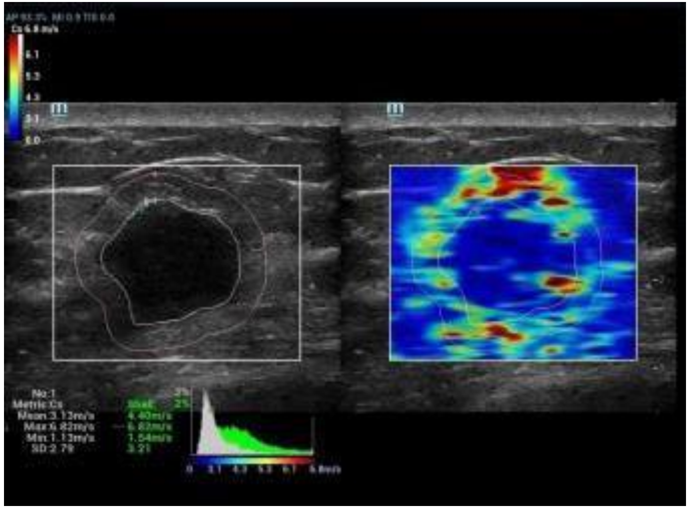
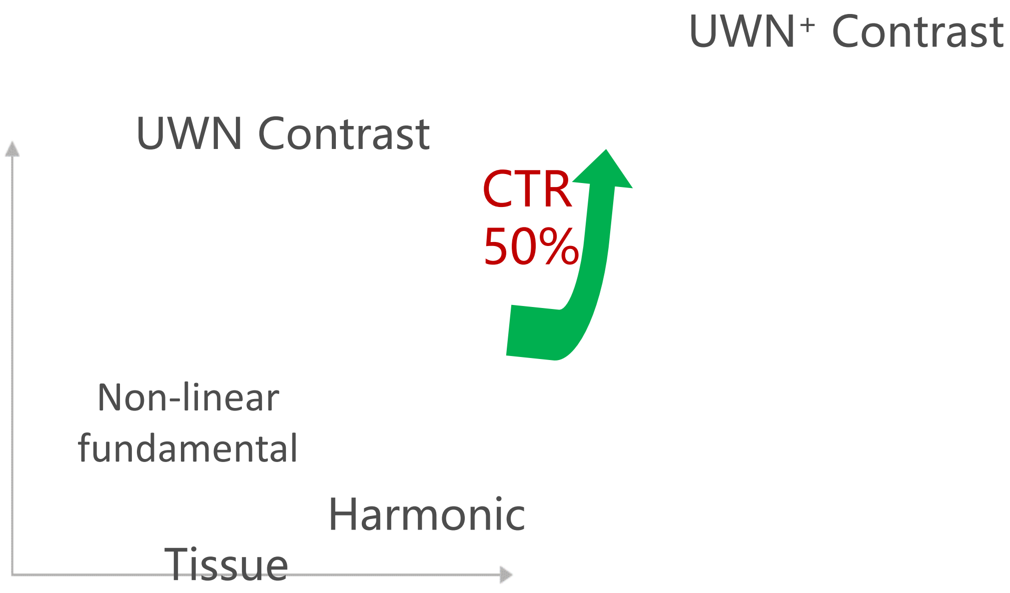




The shell area shows higher stiffness on malignant tumors

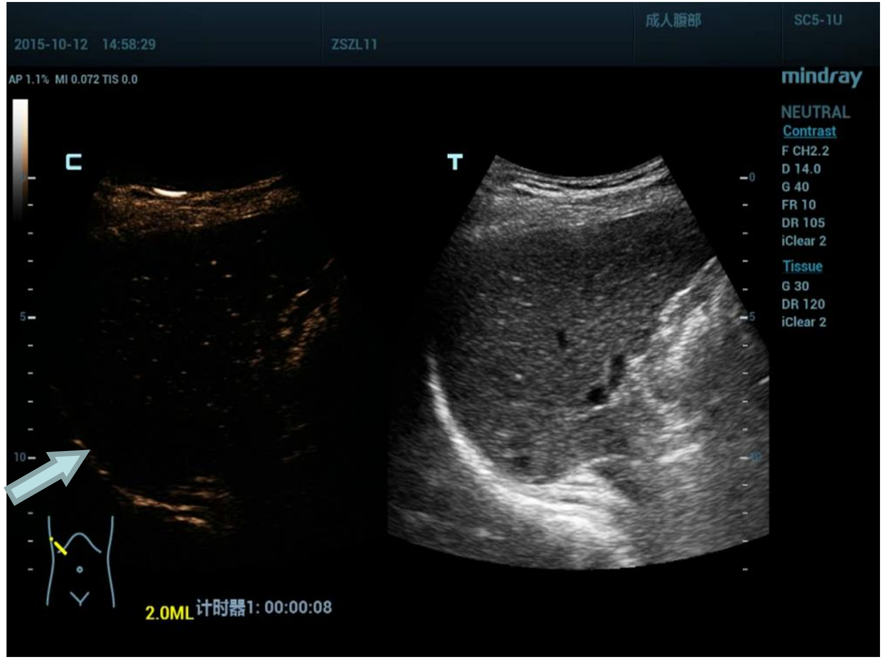
UWN$^+$ Contrast Imaging



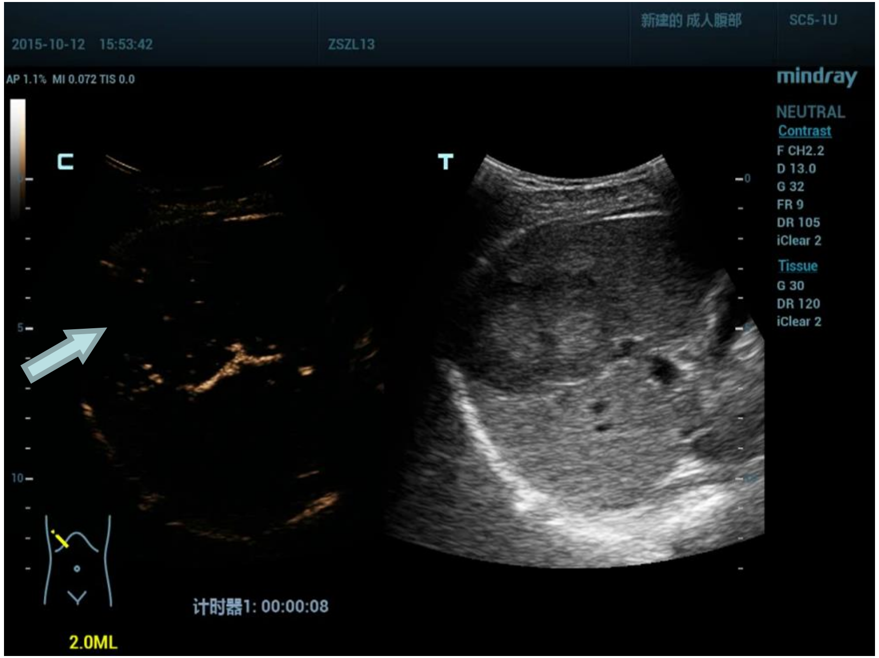
- Excellent contrast agent sensitivity
- Improved contrast imaging penetration
- Longer CEUS perfusion time with lower MI setting
- ZST$^+$ improves the temporal resolution and delivers higher uniformity

UWN+
with higher contrast/tissue ratio
few contrast dose

ZST+
improves the temporal resolution
delivers higher uniformity



Case 1, HCC after treatment



Case 2, Metastatic hepatic carcinoma

New Image Optimization Solutions for Enhanced Diagnostic Confidence

New Image Optimization Solutions for Enhanced Diagnostic Confidence

SSC

- Sound Speed Compensation for tissue-specific image optimization
- Better lateral resolution with a more precise sound propagation

HD Scope

- Optimize the image quality within ROI in real time
- Higher definition in micro-level for more precise detection

Depth VR

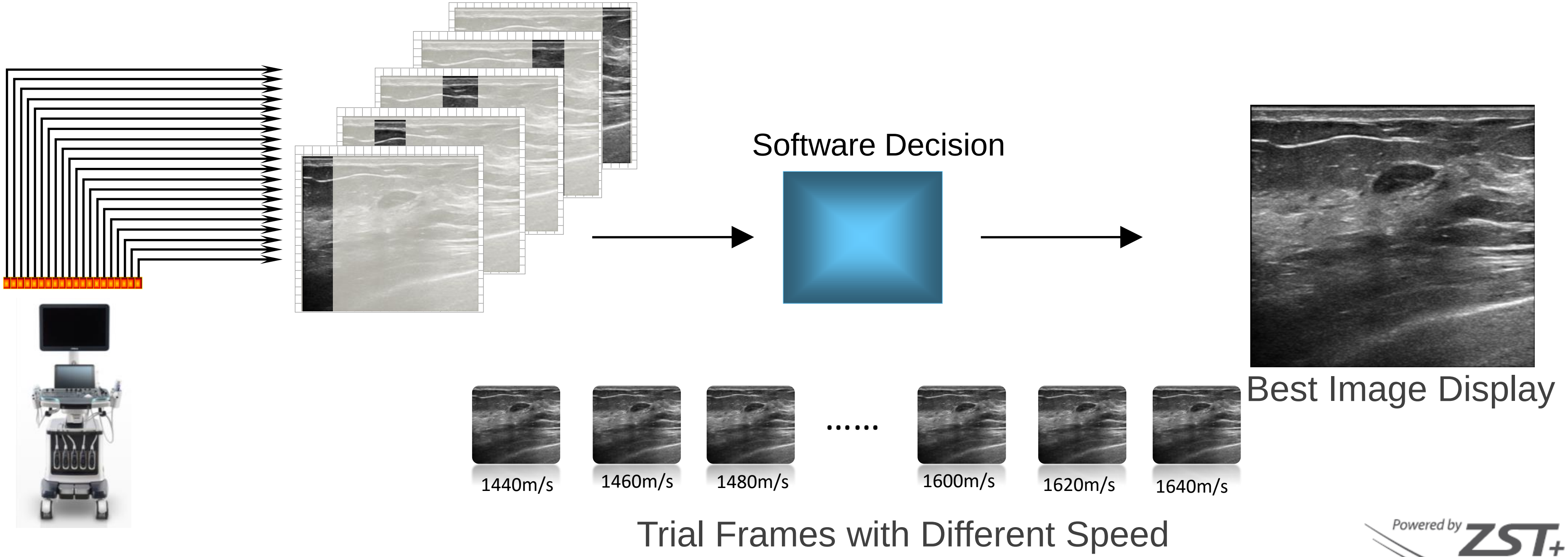
- Innovative volume-rendering technology
- more vivid and realistic 3D/4D visualization of subtle anatomic structures

3D iClear

- 3D/4D speckle noise-reduction imaging
- Higher image quality with an enhanced smoothing effect
- Improved contrast and edge definition

Sound Speed Compensation (SSC)

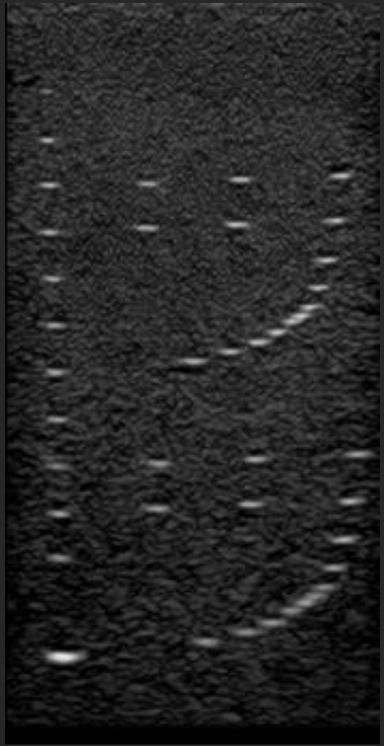
Sound Speed Compensation retrospectively processes channel data with various sound speed, and acquires the optimal tissue-specific image adaptively



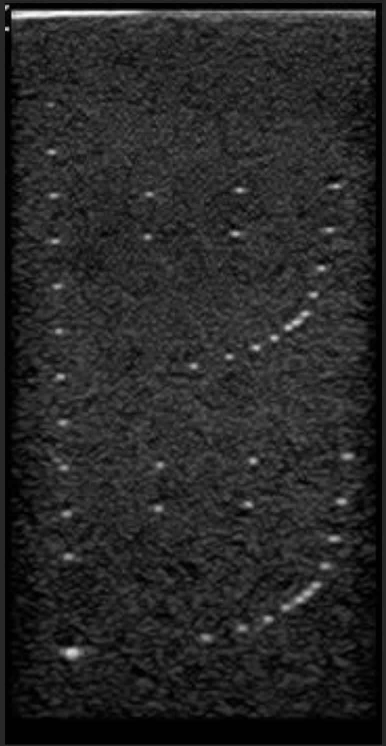
Powered by ZST+

Sound Speed Compensation (SSC)

Imaged at 1540 m/s

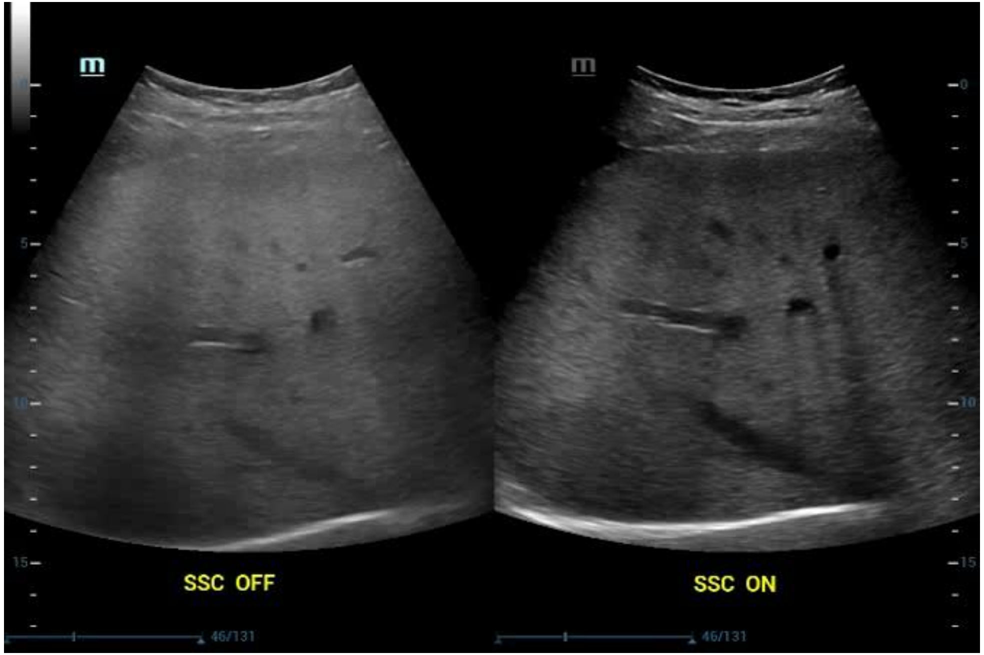


Imaged at 1480 m/s



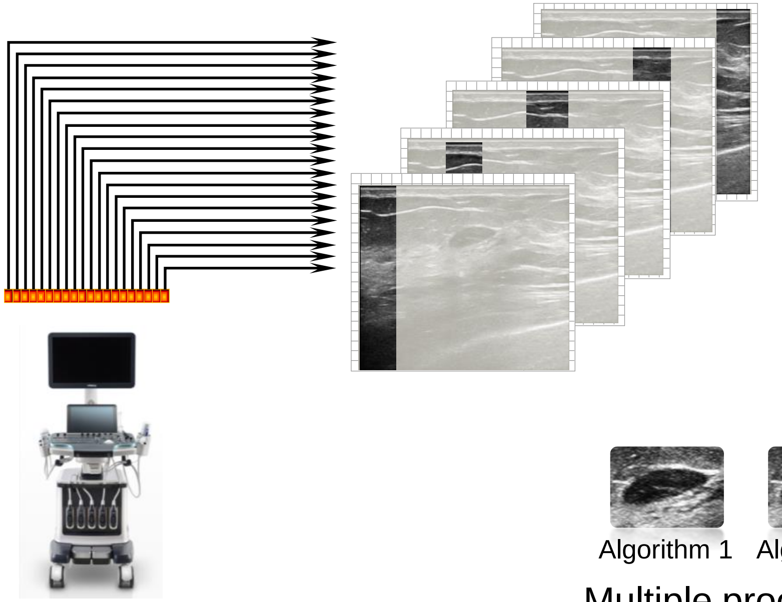
Phantom speed 1480m/s

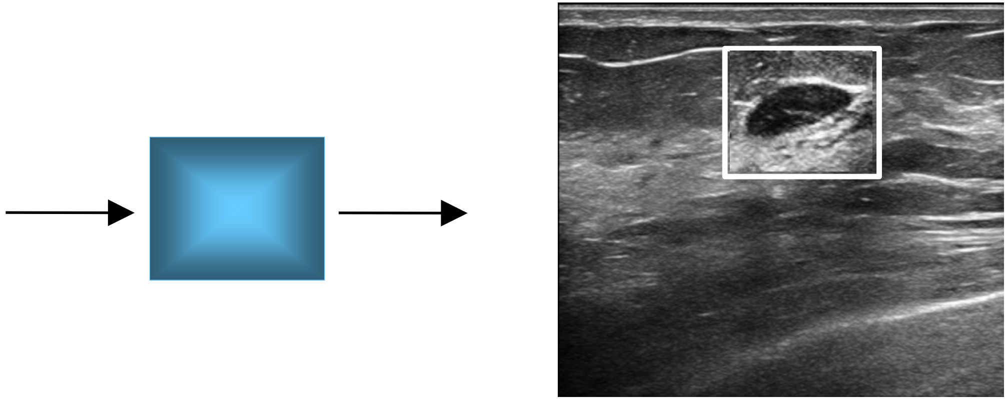
- Clinical Value
  - Improve the penetration of fatty liver
  - Better lateral resolution with a more precise sound propagation
  - Tissue-specific imaging



HD Scope

HD Scope: By processing channel data multiply and retrospectively, HD Scope can improve the detail information and image contrast on specific area maximally

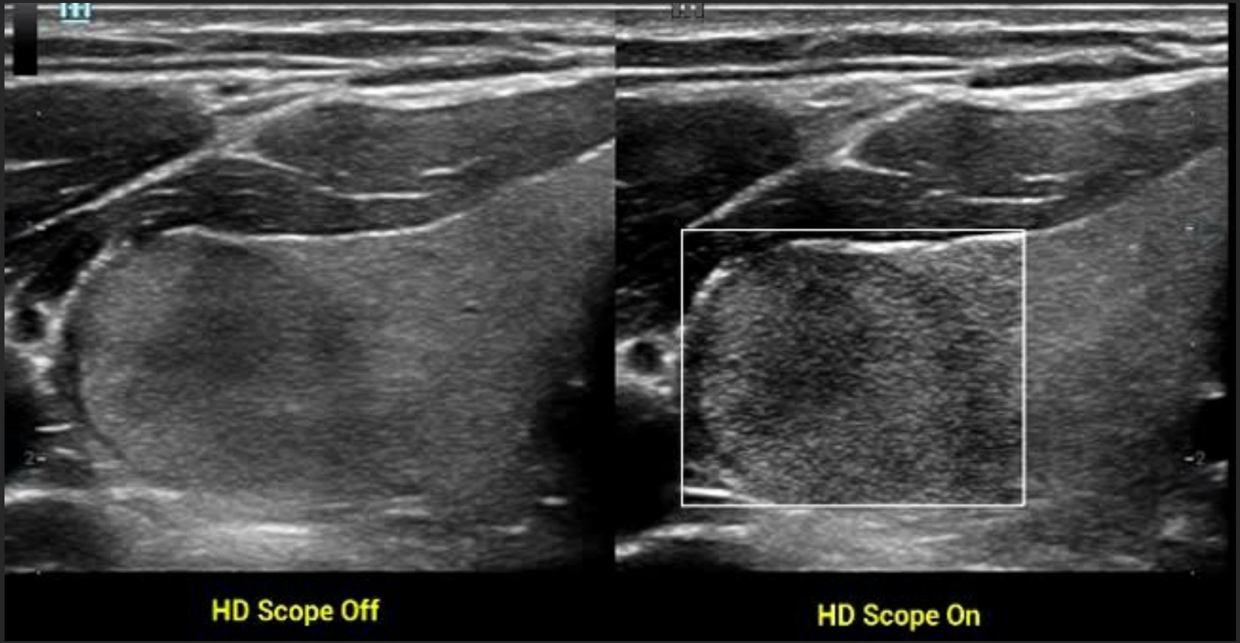




Multiple processing of channel data for enhancement

Powered by ZST+

HD Scope



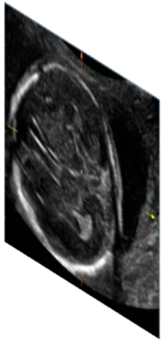
- Clinical Value
  - Unmatched spatial and contrast resolution can improve diagnostic confidence for complex structure, such as mass or other lesions

Depth VR

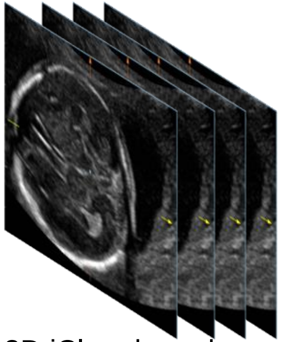
- Interactive lighting effect to generate more vivid rendering results
- Innovative new algorithm with depth information, to provide a better 3D effect
- Multiple depth tint for user's preference

3D iClear

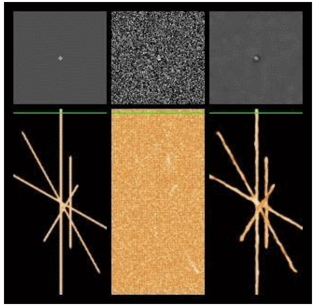
- Fully utilizes volume data information on X, Y, Z dimensional axes for 3D/4D speckle noise-reduction imaging
- Higher image quality with an enhanced smoothing effect on MPR and VR images
- Improved contrast and edge definition without compromising detail resolution



2D iClear based on single frame



3D iClear based on several frames



Principle of 3D iClear

3D iClear


Original
2D iClear
3D iClear


mindray
mindray
mindray
Original
2D iClear
3D iClear

New Tools for Clinical Intelligence

New Tools for Clinical Intelligence

- Smart Acquisition
  - Smart Planes: Mindray's exclusive technolgy for fetal CNS study
- Smart detection and calculation
  - RIMT: RF-Data IMT measurement
  - Smart FLC: Automatic follicle detection and calculation
  - Smart OB: Auto measurement of OB biometrics
  - Smart NT: Auto NT detection and evaluation

Smart Aquisition

Smart Planes™

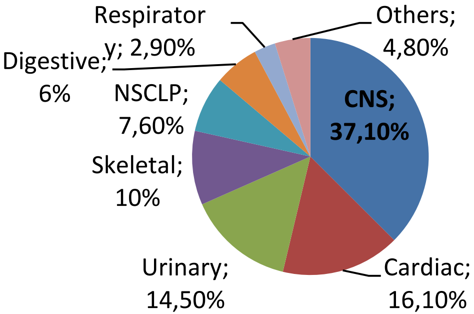
- Mindray's exclusive technolgy for fetal CNS study
- 5000 cases: self-trained with artificial intelligence
- 4 CNS planes and 6 measurements: accurate detection
- 1 second: fully automatic

Smart Planes

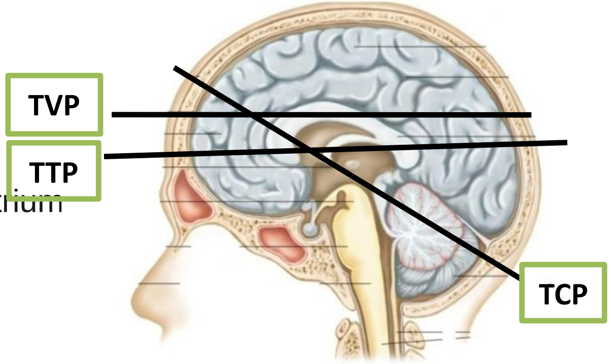
Mindray's exclusive technolgy for fetal CNS study

- **CNS (Central Nervous System) malformations：**
  - The highest incidence of fetal malformation;
  - Encountering in about 1% of all births.

（From：The ISUOG Education Committee, Guidelines, Sonographic examination of the fetal central nervous system: guidelines for performing the 'basic examination' and the 'fetal neurosonogram', Ultrasound Obstet Gynecol, 2007.）

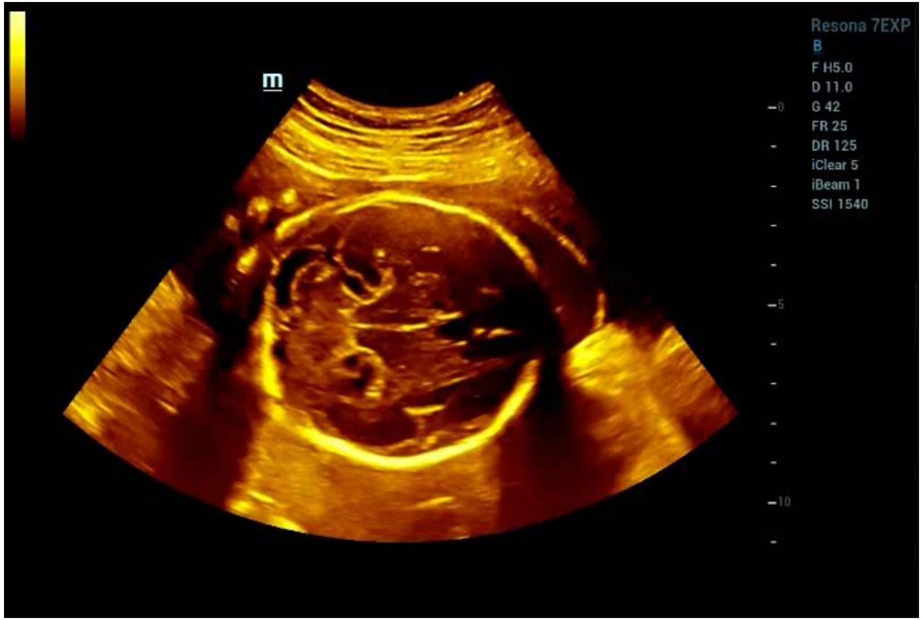


- **Important inspection planes in fetal CNS**：
  - TCP(Trans Cerebella Plane): cerebellum and cisterna magna
  - TTP(Trans Thalamic Plane): thalami and hippocampal gyruses
  - TVP(Trans Ventricular Plane): CSP, frontal horn, choroid plexus and atrium
  - MSP (Middle Sagittal Plane) : corpus callosum and cerebellar vermis



Smart Planes

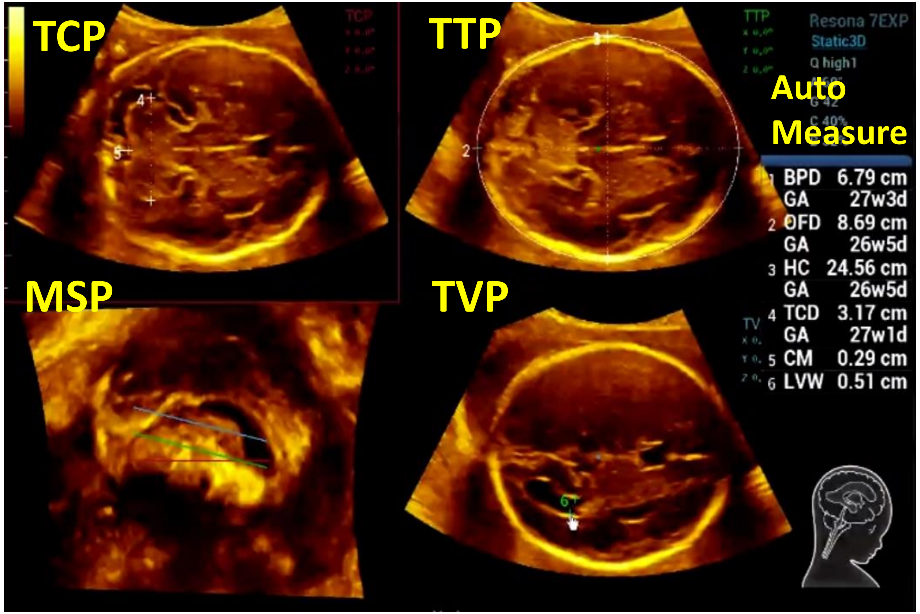
Mindray's exclusive technolgy for fetal CNS study



- **Step 1:** Acquire 3D fetal head dataset from the BPD view
- **Step 2:** Press the **Smart Planes** tab on the Touch Panel
- **Step 3:** Detect and display the TCP/TTP/MSP/TVP automatically.
- **Step 4:** Press the **Auto Measure** button on the Touch Panel and the system will automatically measure the BPD/OFD/HC/TCD/CM/LVW

Smart Planes

Mindray's exclusive technolgy for fetal CNS study



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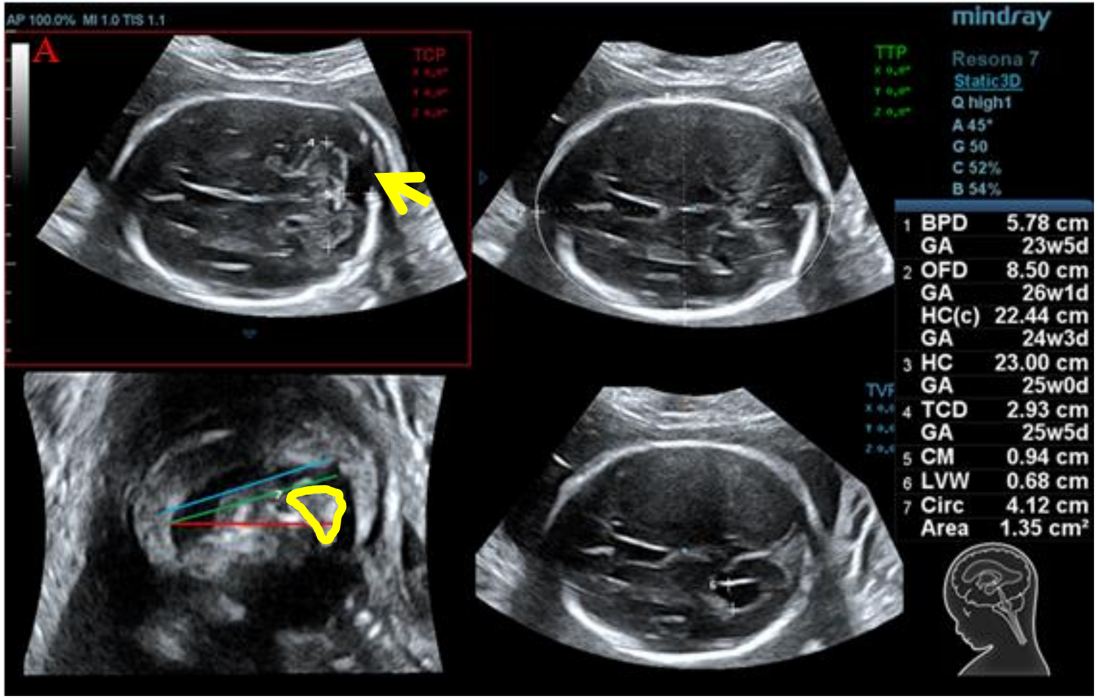


Clinical case:

- GA: 24w2d
- Misdiagnosis as Dandy-Walker syndrome in 2D but correct diagnosis from Smart Planes

Smart Planes

Mindray's exclusive technolgy for fetal CNS study

Intelligent: improve clinical efficiency and saving time

Confidence: Improve MSP acquiring rate and improve diagnosis confidence of CNS

Accurate: Improve accuracy of CNS anatomy

Automatic: Reduce operator’s dependence

Smart Detection and Calculation

RIMT
RF-Data IMT measurement

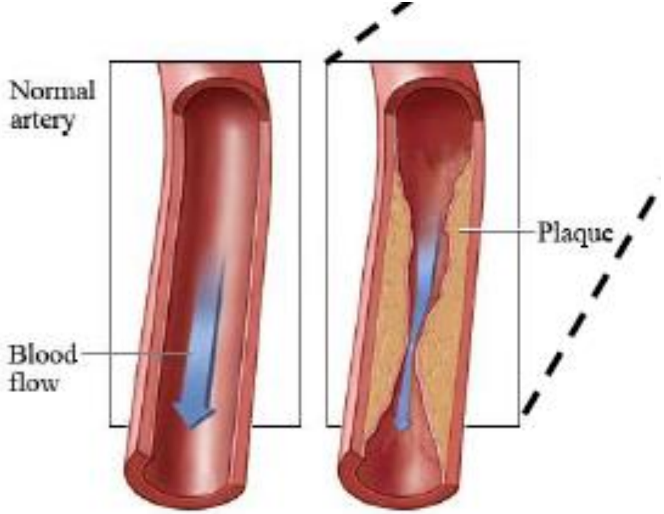
Smart FLC
Automatic follicle detection and calculation

Smart OB
Auto measurement of OB biometrics

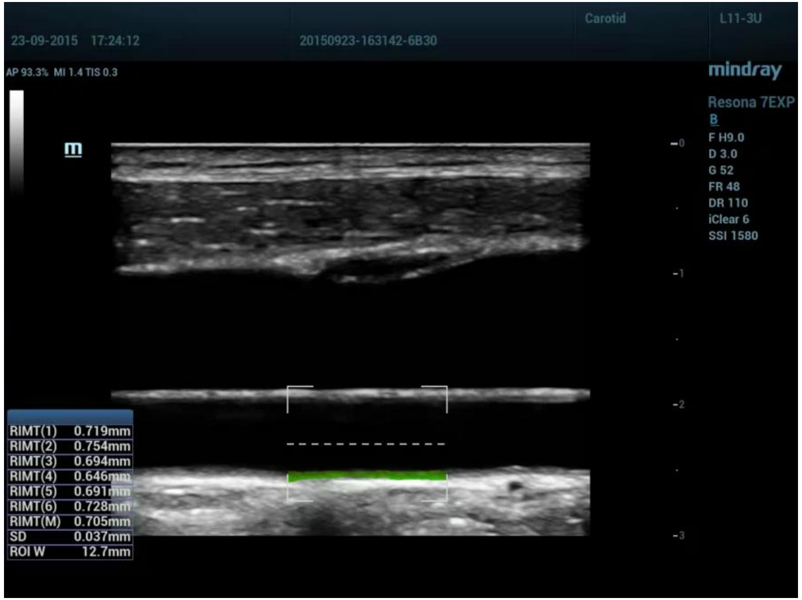
Smart NT
Auto NT detection and evaluation

RIMT (RF-Data IMT)

- The IMT average growth is about 10 micrometres per year (ARIC study)
- The traditional IMT measurement is not accurate enough to detect the minimal changes during follow up procedure



RIMT (RF-Data IMT)

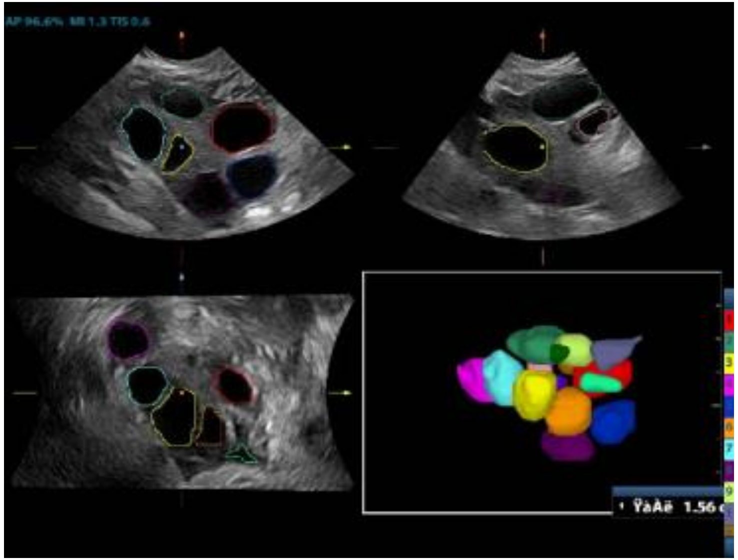


Traditional Auto IMT	RIMT	Clinical Value of RIMT
Accuracy: 80µm	Accuracy: 5µm	More accurate measurements to detect even minimal changes during follow up procedures
Processed data of stored image	RF data based	More accuracy, less dependence on image quality
quantification on one static image	Real time with quantification of 6 heart cycles	More information for Improved diagnostic confidence

Smart FLC

Automatically detect the number and calculate the volume of follicles from a 3D volume image

- Accurate assessment of the size of follicles
- Follicles are automatically sorted by sizes with color code
- Easy reporting with colorful graphic designed for follicle study

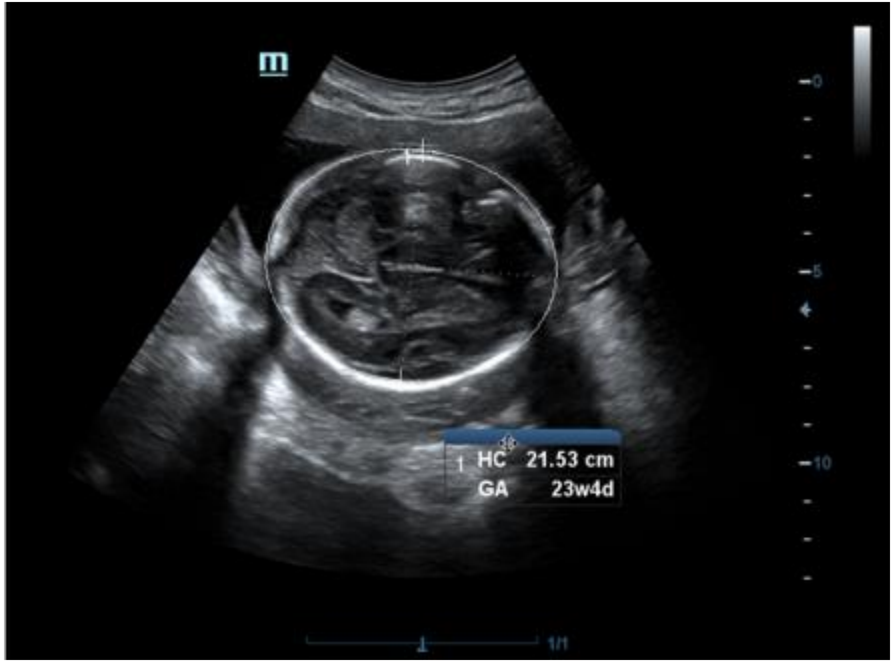


Follicle Rendering

Smart OB

Accurate auto measurements of most frequently examined OB parameters:

- BPD/HC/FL/AC/OFD
- Efficient and accurate
- Greatly reduces repetitive key strokes and streamlines workflow

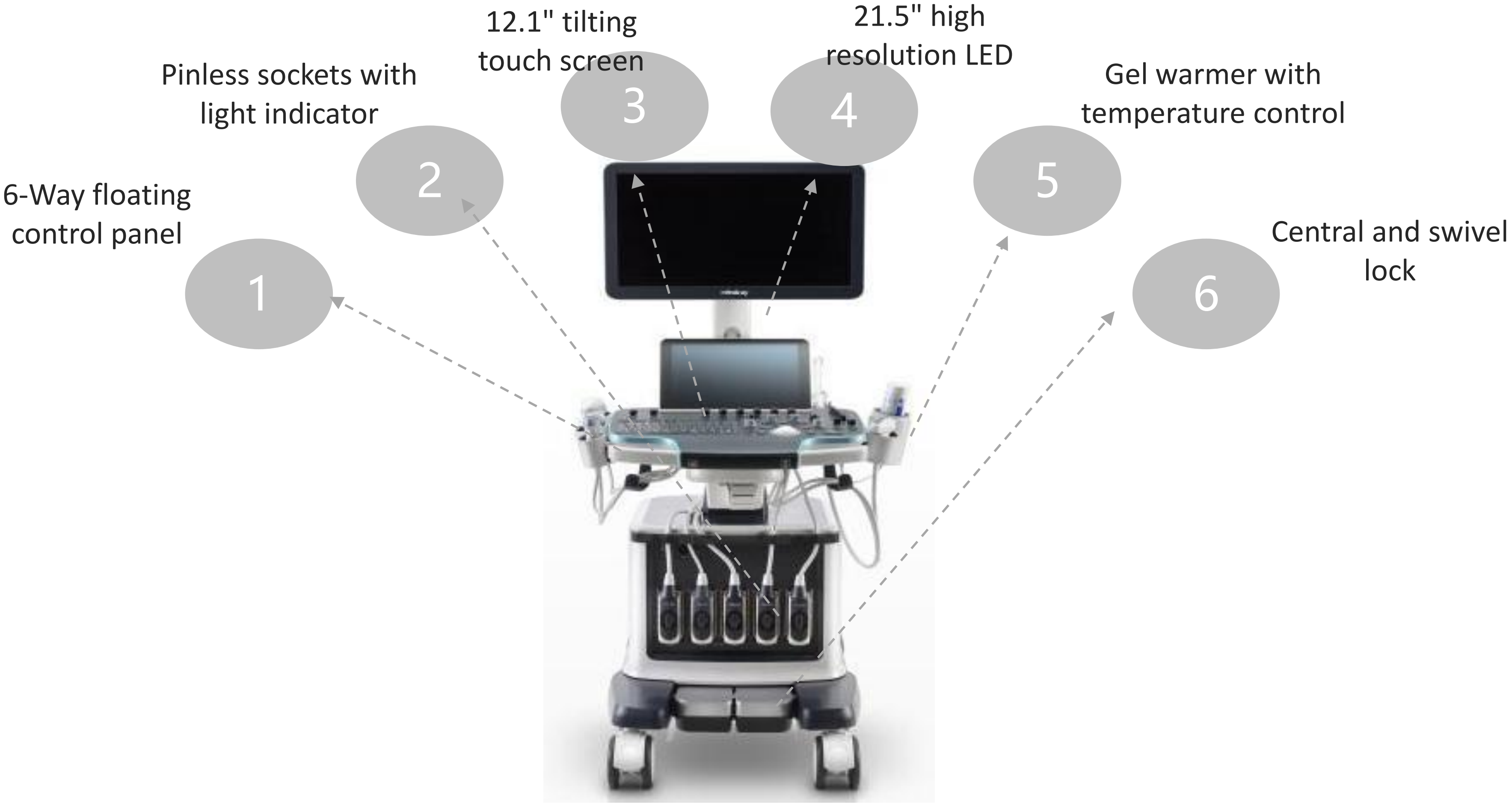


Smart NT

- Automatically traces the NT tube cavity edge and display max NT result by industry standard method of “In to In”
- Greatly simplifies NT measurements with ease of use and accuracy

New User Experience for Scanning Comfort and Streamlined Workflow

New User Experience for Scanning Comfort



Clinical Research and Diagnosis | New Image Optimization Solutions | New Tools for Clinical Intelligence | **New User Experience for Scanning Comfort**

Floating control panel

Electronic height adjustment

Tilting gesture-powered touch screen

Gesture Powered Operation

Following functions can be performed by gestures

Image adjustment
- Slide parameter page up/down
- Shift image to touch screen
- Zoom in/out
- 3D/4D rotate&erase
- …

Measure on screen
- 2D Caliper & trace
- Manual spectrum trace
- Auto LV, IMT, Smart NT
- …

Image review
- Image review
- Cine review frame by frame
- …

User defined gestures to realize more functions with one swipe

- Initiate special functions: UWN+ CEUS, Elastography, iFusion, V Flow, iScape…
- iZoom, iTouch, measure, freeze, save, print…

Adjust menu layout on touch screen

Resona 7

is now ready

To Lead New Waves in Ultrasound Innovation

- New innovation in ultrasound technology
  - The most advanced image processing empowered by channel data
  - ZST^{+} breaks the bottlenecks of traditional ultrasound imaging
- New capabilities in clinical research and diagnosis
  - V Flow for visualization of complex micro-hemodynamics
  - iFusion with respiration compensation for more accuracy
  - Sound Touch Elastography with unique shell analysis
- New tools for clinical intelligence
  - Smart Planes provides fully automatic and accurate detection of the standard fetal CNS scanning planes
- New user experience for scanning comfort and streamlined workflow
  - Gesture powered operation allows more intuitive and effective workflow

Technology in Resonance with Healthcare