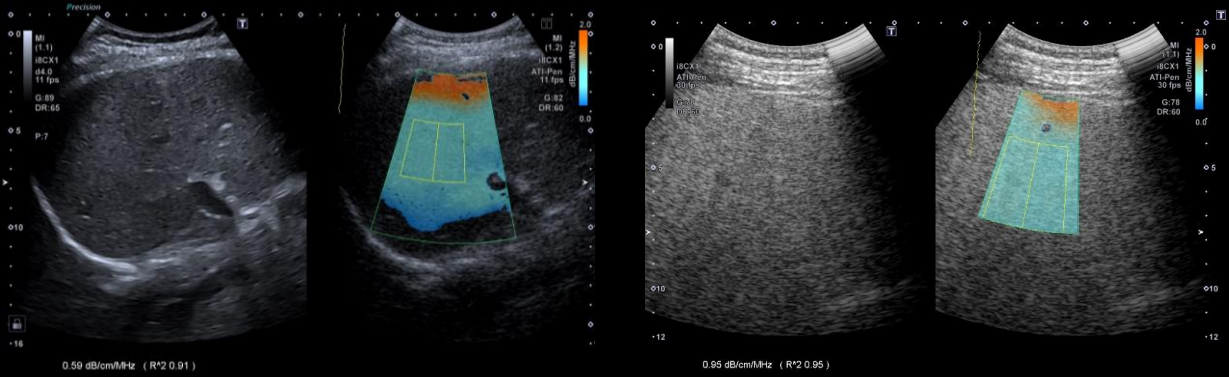


Attenuation Imaging (ATI)



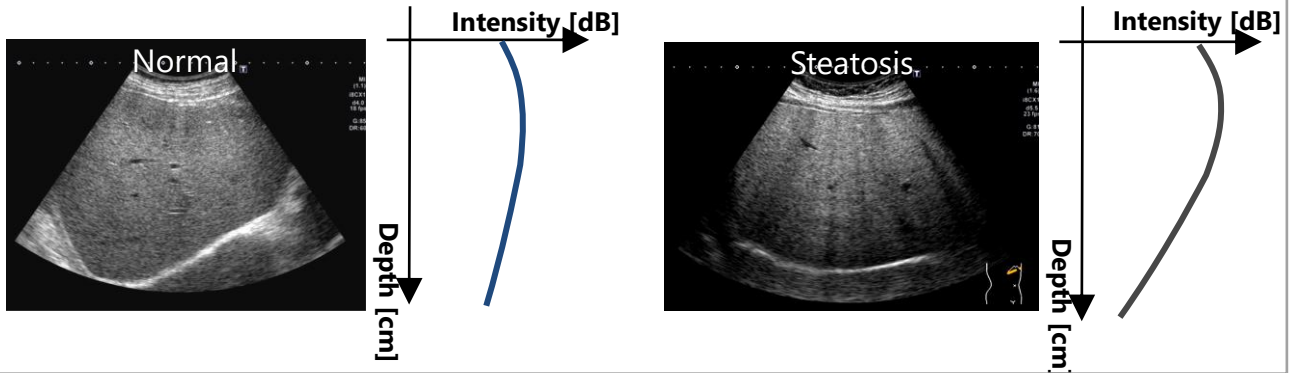
In ATI mode, the image represents the ultrasound-frequency-dependent attenuation coefficient that is generated within tissue. A ROI can be set in the relevant area, and the attenuation coefficient within the ROI can be calculated.

* The available functions vary depending on machine version or setting.
 * Supported transducers : PVT-475BX, PVT-475BT, PVT-375BT, PVT-375SC with Attenuation Imaging kit

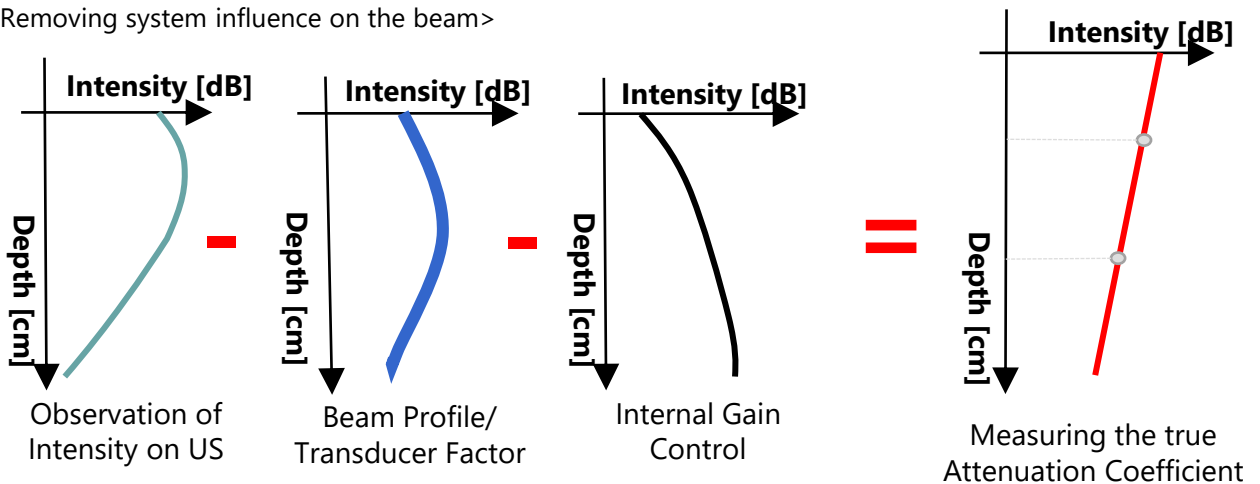
ATI principle

Ultrasound waves travelling in the body are attenuated by acoustic scattering, reflection and absorption (heat). ATI removes any system influence on the beam (Beam Profile / Transducer Factor / Internal Gain Control) and then quantifies attenuation by measuring Attenuation Coefficient (dB/cm/MHz).

<Difference in the signal between normal and steatosis>



<Removing system influence on the beam>



Basic operation

1. Start an abdominal examination or select an abdomen user preset..
2. Scan according to the following acquisition protocol.

Acquisition Protocol:

- Patient in the supine position
- Right liver intercostal approach (predominantly segment VII / VIII)
- Probe perpendicular to the liver surface
- Liver surface (capsule) displayed horizontally
- High quality B-mode image free of vessels or any shadowing / reverberation artifact



Image quality 2D horizontal capsule

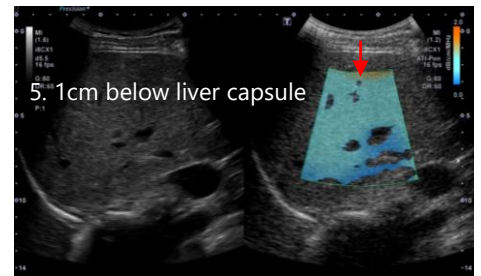
3. Press and on TCS. * TSC : Touch Command Screen



4. Press and adjust the ATI ROI size with the trackball.

5. Place the ATI ROI about 1 cm below the liver capsule.

6. Regulate patient breathing, and press



7. After freezing, the measurement ROI is automatically displayed.



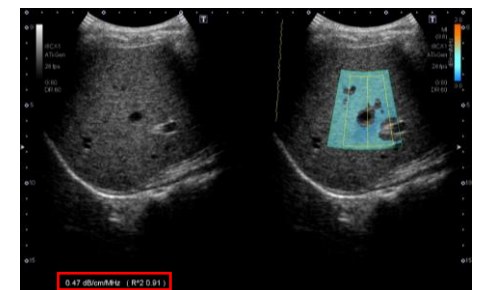
If the measurement ROI is not displayed automatically, press on TSC.



8. Move the measurement ROI and press at the position where the measured value is shown in **white** or **yellow**.

Measurement points:

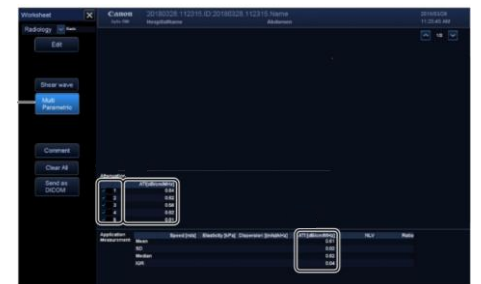
- Measurement ROI size can be changed as needed, in the same way as the ATI ROI.
- Avoid any orange area, which may be present in the upper part of the ATI ROI.
- Avoid a dark blue areas posterior to blood vessels or at the bottom of the ATI ROI.



9. Press to store image and unfreeze.

10. Repeat **step 6.** ~ **step 9.** 5 times in the same position.

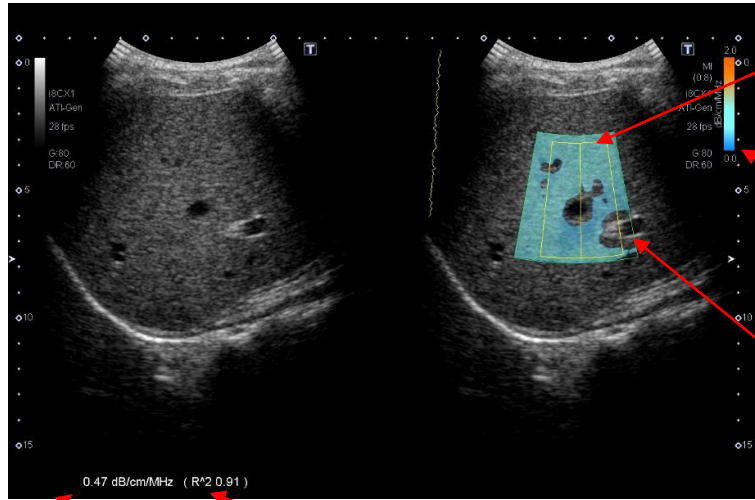
11. After 5 measurements, press



The measurement results will be displayed on the worksheet.

The ATI value is the median value of five measurements.

Image display



ROI (yellow) for measurement

Attenuation:
Orange : Higher
Blue : Lower

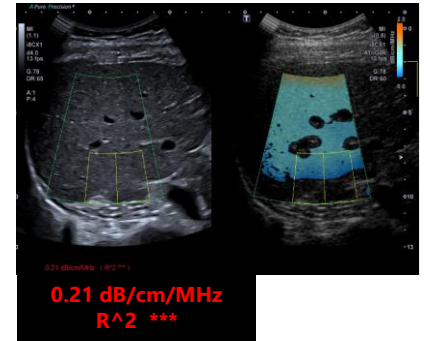
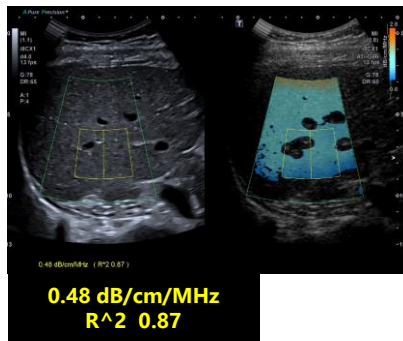
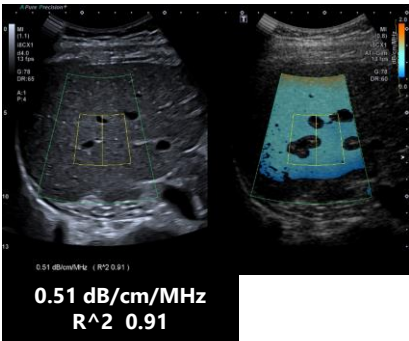
Intensity inhomogeneity (variance) results in no attenuation data e.g.. vessel

Mean attenuation coefficient of ROI
Unit: **dB/cm/MHz**

R²: Coefficient of determination

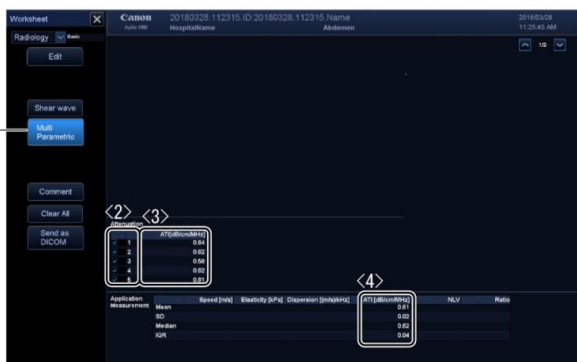
90-100%: Excellent
80-89%: Good
0-79%: Fair

<Reliability of measurement>



Choose the position where the measured value is shown in **white** or **yellow**.

Worksheet



*The ATI value is the median value of five measurements.

No.	Description
1	Displays measurement values and statistical values for ATI measurement.
2	The calculation range for statistical values is set using checkmarks for each measurement result.
3	Displays measurement values and statistical values for ATI measurement.
4	Displays statistical values calculated based on the measurement value. <ul style="list-style-type: none"> • Mean : Mean value • SD : Standard deviation • Median : Median value • IQR : Interquartile range

Clinical evidence

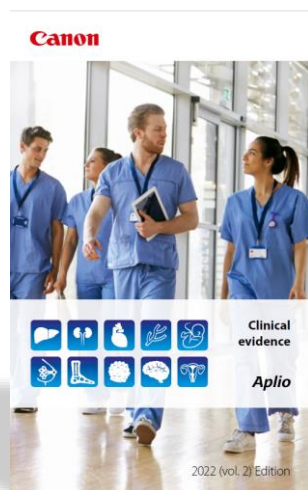
Quantification of Liver Fat Content with Ultrasound: A WFUMB Position Paper

Ferraioli G, Berzigotti A, Barr RG, Choi BI, Cui XW, Dong Y, Gilja OH, Lee JY, Lee DH, Moriyasu F, Piscaglia F, Sugimoto K, Wong GL, Wong VW, Dietrich CF
***Ultrasound Med Biol.* 2021;47(10):2803-2820.**

< List of cut off values for studies using liver biopsy as a reference > from Table 2 on page 2812

Study	Etiology (No. of patients)	S0 vs. S1–S3 (dB/cm/MHz)	S0–S1 vs. S2–S3 (dB/cm/MHz)	S0–S2 vs. S3 (dB/cm/MHz)
Bae et al., 2020	Mixed etiologies (108)	0.63	0.70	0.74
Dioguardi Burgio et al., 2020	Mixed etiologies (101)	0.69	0.72	-
Lee et al., 2021	Suspect NAFLD (102)	0.64	0.70	0.73
Sugimoto et al., 2020	Suspect NAFLD (120)	0.67	0.72	0.86
Tada et al., 2019a	Mixed etiologies (148)	0.66	0.67	0.68

* Please see the original paper for AUROC and other information.



There are many other papers/references in addition to the above paper.
 Please see the **Clinical Evidence Brochure** for more details.

Memo