

Impact of intra-abdominal pressure variations on the reflection coefficient (S11) of the artificial abdominal wall; The concept behind sub-terahertz reflectometry for non-invasive intra-abdominal pressure measurement

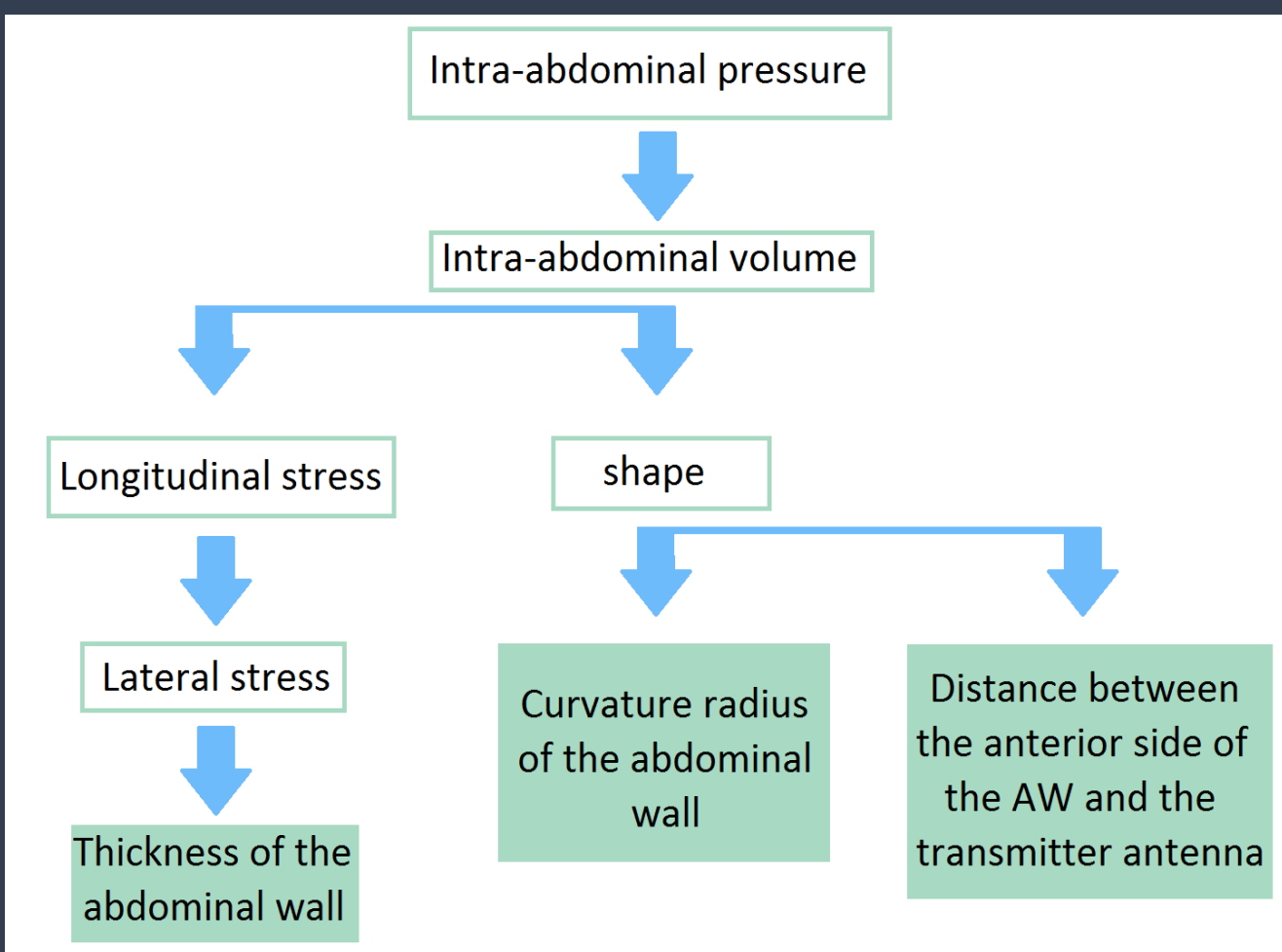
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Introduction:

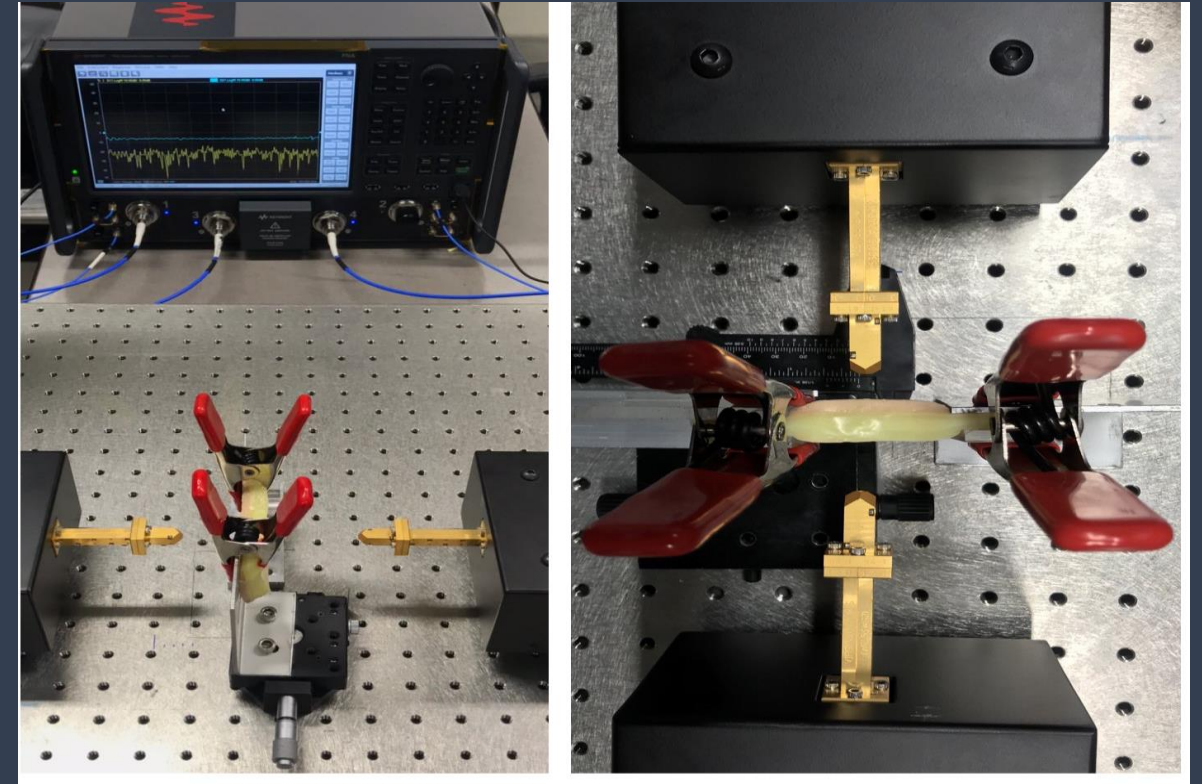
IAH is the sustained abdominal pressure equal to or above 12 mmHg. Based on the defined guidelines of WSACS, IAP monitoring through the bladder with a maximal instillation volume of 25 mL of sterile saline is the reference standard for non-continuous IAP measurement. Erroneous IAP elevation can be detected in patients with hematomas or other intra-pelvic masses¹. Furthermore, it is invasive and not able to monitor IAP continuously. Consequently, there is a demand to improve the IAP monitoring procedure to improve the patient care in the ICU.

Method:

Microwave and sub-terahertz reflectometry is a non-destructive testing method that has already been introduced as a novel measurement technique to be used in the healthcare domain².

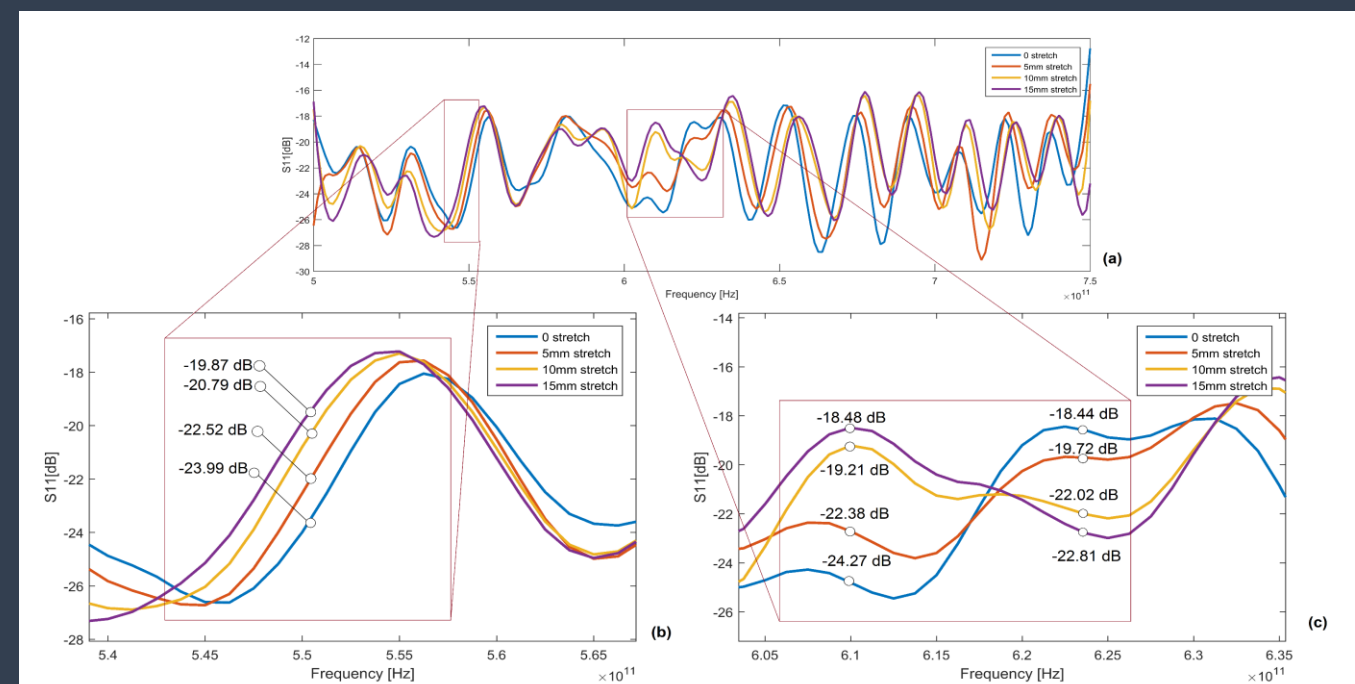


In general, reflectometry is a measurement technique that can be used to extract the electromagnetic and geometric properties of materials under investigation. Since IAP fluctuations influence some geometric and electromagnetic parameters of the abdominal wall, we can potentially use this novel monitoring method for IAP measurement.

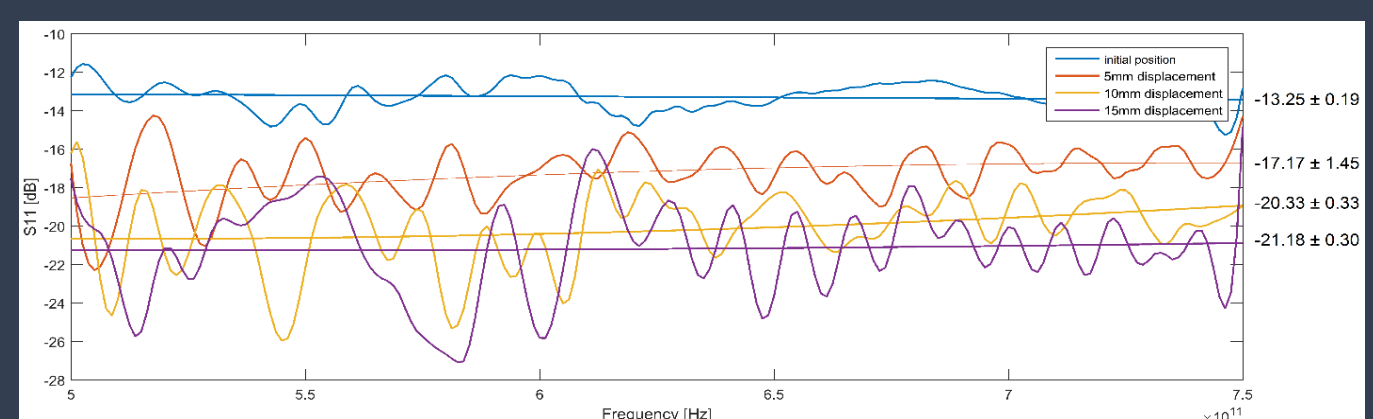


Result:

As illustrated, at the frequency of 550 GHz, On average, each 5 mm stretch increased the reflection response of the AW for 1.373 ± 0.468 dB with 0.95 confidence interval.



Based on the achieved result, the average amplitude of S11 at the distance of 2, 2.5, 3, and 3.5 cm to the transmitter antenna was -13.25 ± 0.19 , -17.17 ± 1.45 , -20.33 ± 0.33 , and -21.18 ± 0.30 dB, respectively.



References:

- De Waele JJ et al., Acta Clin Belg.
- Tayebi S et al., J Clin Monit Comput.