

Acoustic Imaging Basics & Applications

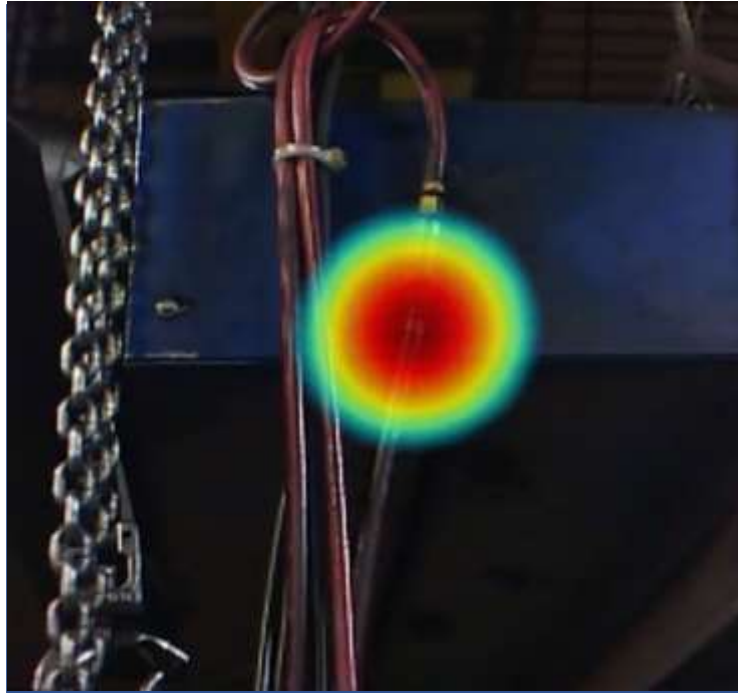


Fluke ii900 Sonic Industrial Imager

The first industrial acoustic camera featuring Fluke SoundSight™ Technology

What is acoustic sound imaging?

What is acoustic sound imaging?



- A technique to create an image of the scene based on the sounds in the scene
- The sound image is then overlaid onto a visible image

Acoustic Imaging vs. Conventional Ultrasonic Tools



Acoustic Imaging vs Conventional Ultrasonic Tools

ULTRASONIC TOOLS 1 leak in 20 minutes

- Listen to identify whether noise is from leaks or not
- Requires experience, training and certifications
- Involves point by point meticulous inspections



Scan point-by-point, listening for potential leaks, using a long-range sensor.



Get close, swap ultrasonic sensors, confirm it is a leak, pinpoint leak source.



Manually tag the leak and write down its location

Acoustic Imaging vs Conventional Ultrasonic Tools

FLUKE ii900 2 leaks in 5 minutes

- Scan large areas at a glance from extended ranges
- Take a picture that pinpoints the leak location
- See multiple leaks on a single image
- Record and share pictures and videos for reporting



Practical considerations in use

Practical considerations

- Reflection
- Diffraction (direction of sound)
- Noise - Frequency selection



Practical considerations

Reflections

Does the sound spot look right?

(For example, is it on a reasonable sound source or a hard floor?)

Does it move when you move?

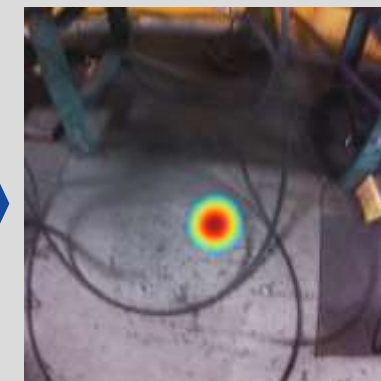
If yes, then it is a reflection.



A



B



C



D



E



F

Always move to confirm location of sound source

Practical considerations



Reflections

Confirming sound source

Echoes / Reflections

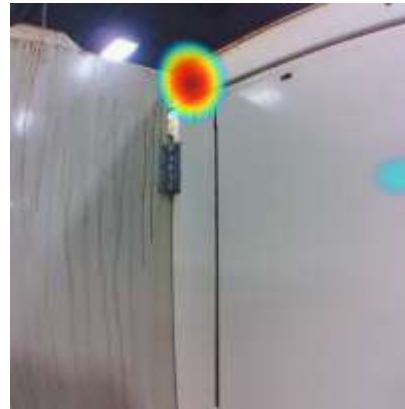
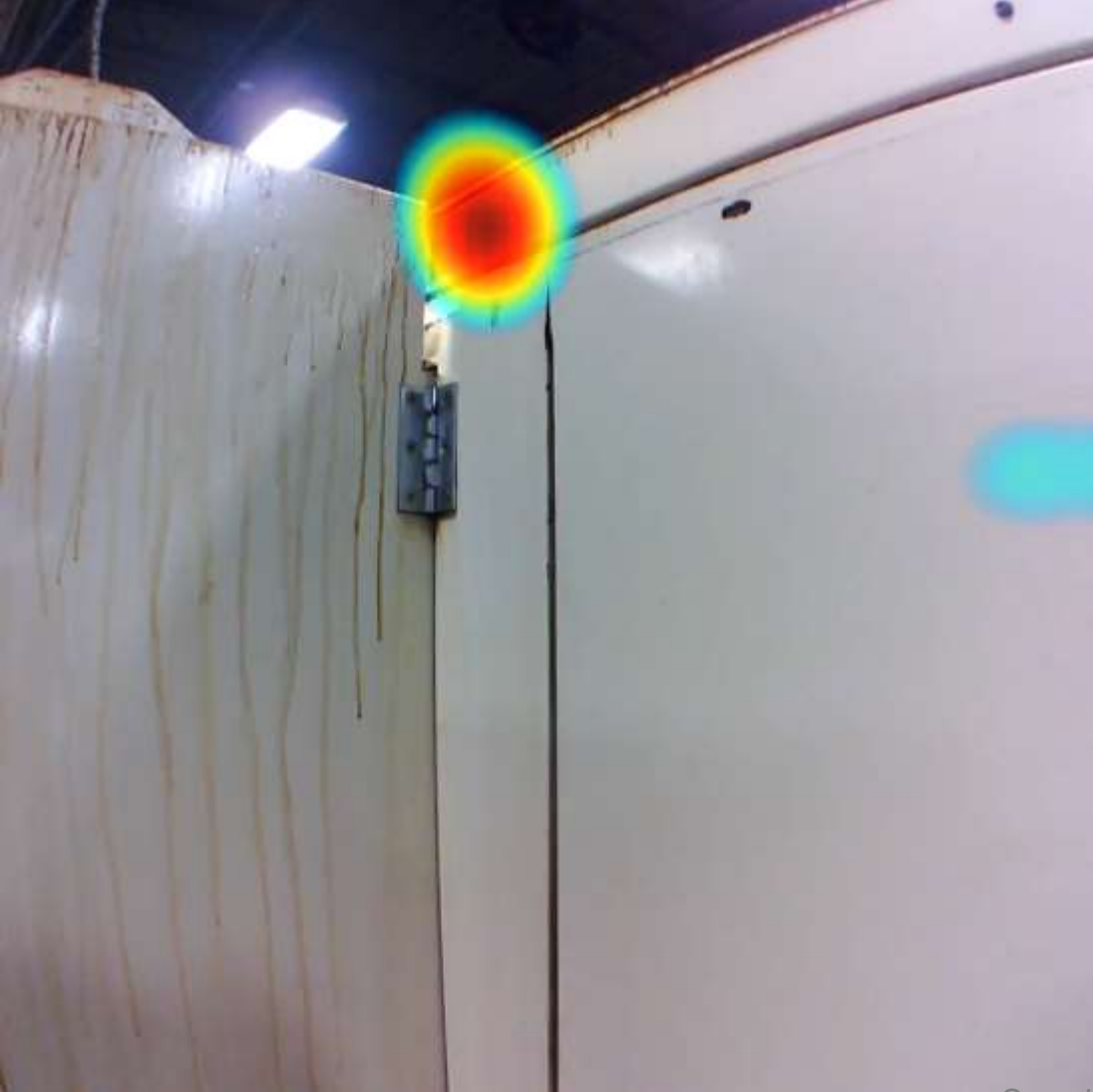
FLUKE®



Practical considerations

Direction

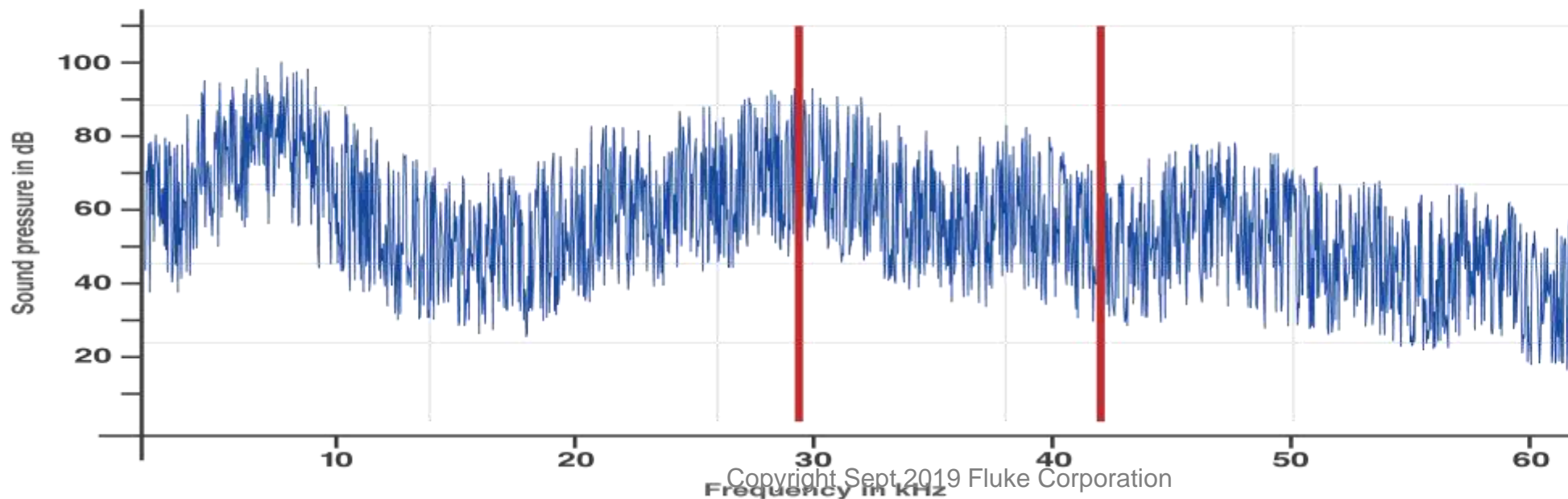
Always move to confirm location of sound source



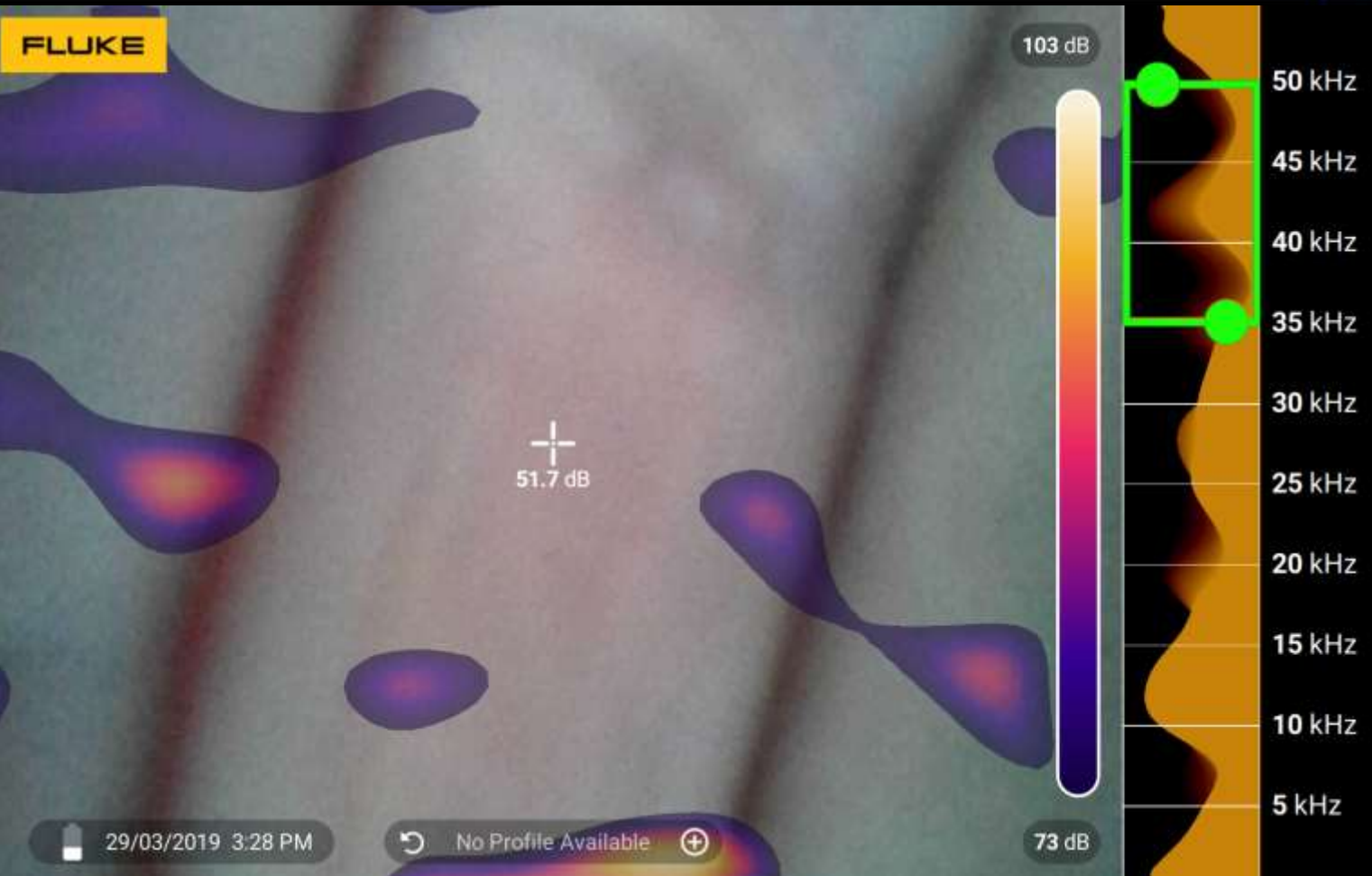
Practical considerations

Noise

- In the ii900 the signal or sound of interest to us is very often in the high frequency range.
- A high pressure leak will have a wide frequency spectrum. In a noisy factory there is likely to be a lot of low frequency sounds. We use the fact that a high pressure leak has sound in the 30-35KHz band.



Practical considerations



Noise

By filtering all other frequencies we can benefit from:

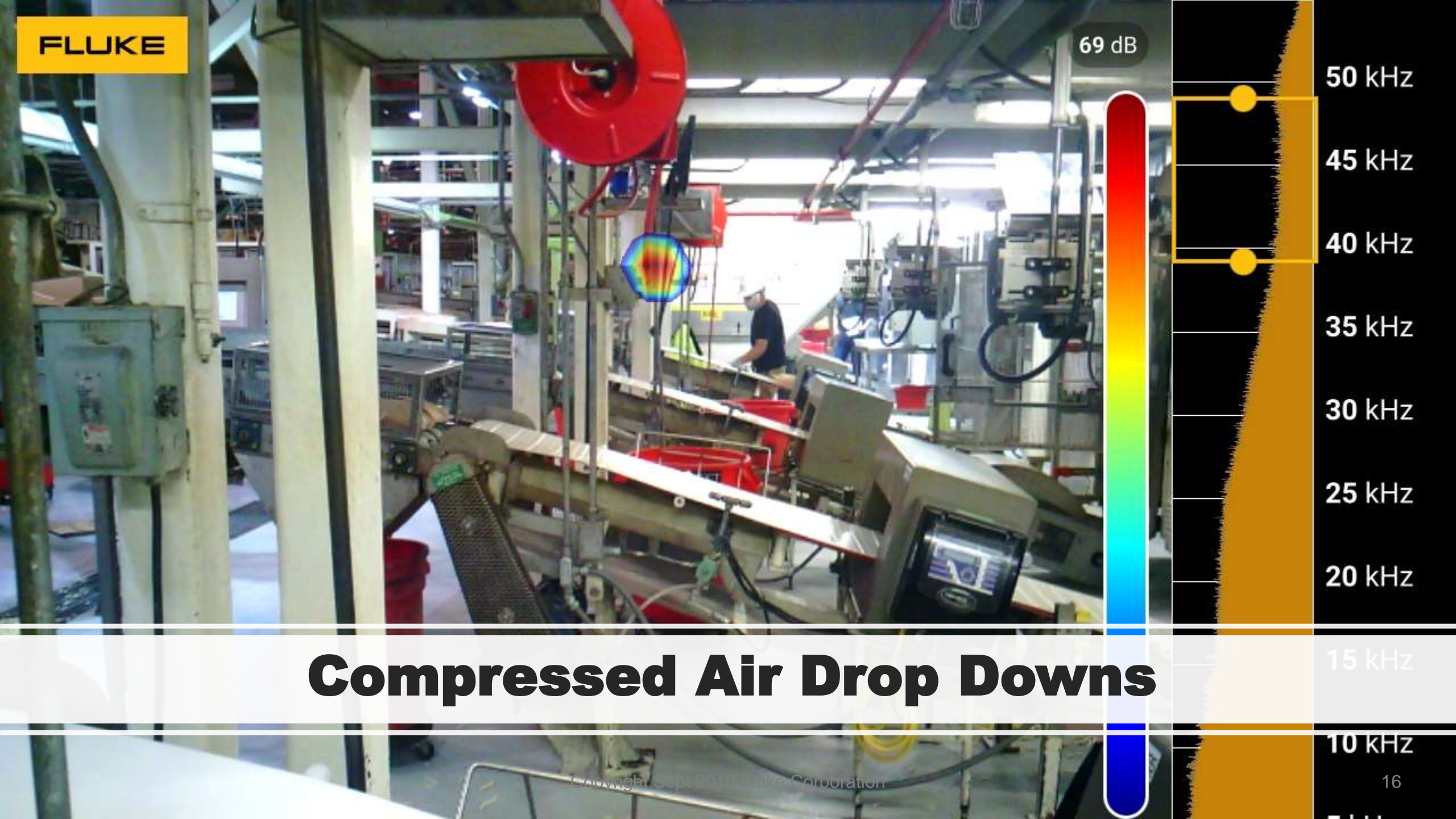
- Removing the interference from other background noise.
- Ability to pick up the leak at greater distances, as using higher frequencies will require being much closer to the leak.

Select an appropriate frequency band to maximize the signal from the leak.

Application Examples



69 dB



Compressed Air Drop Downs



Air Compressor Connections

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05/22/2019 7:46 AM

57 dB

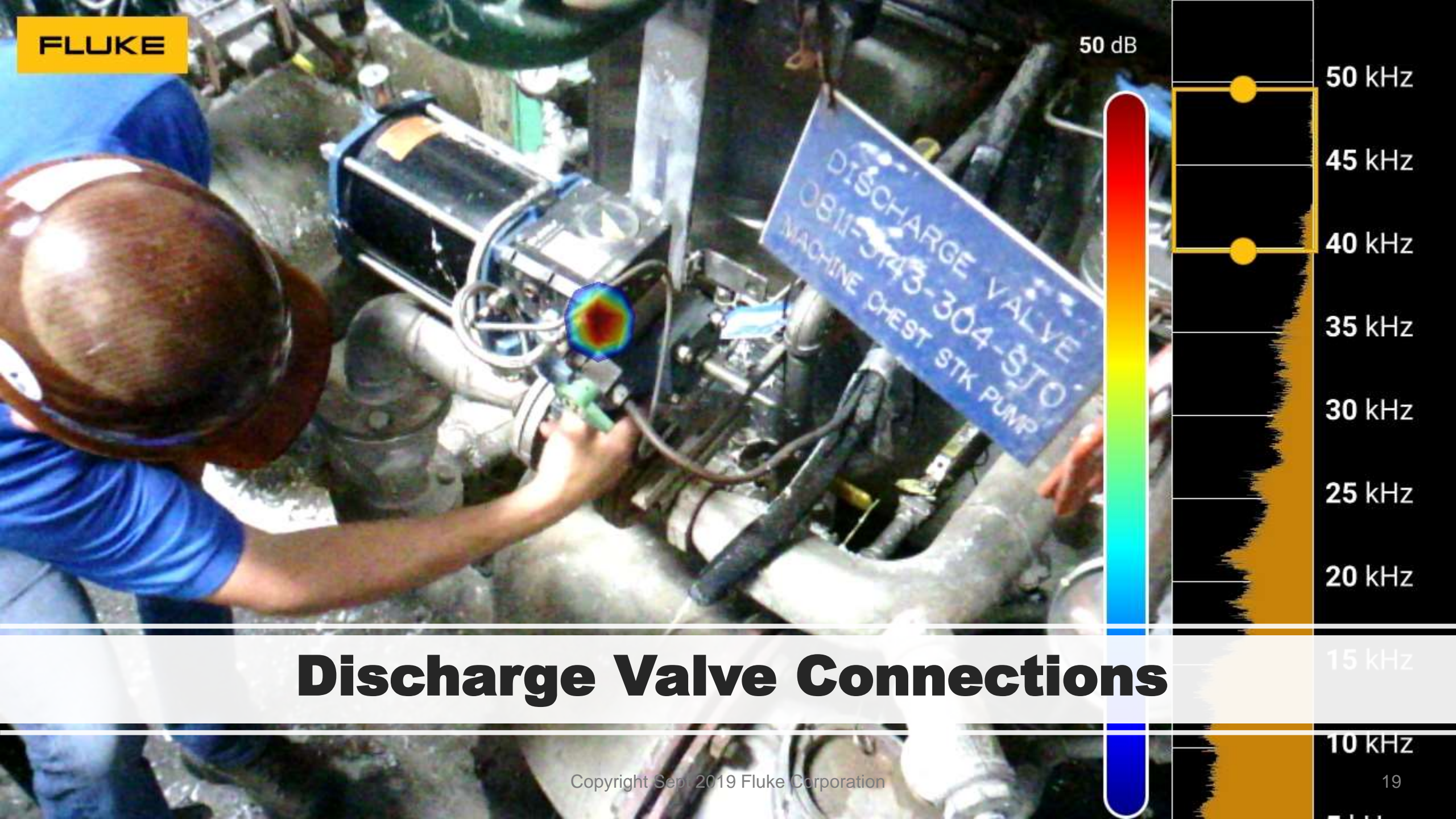
5 kHz



Air Regulators

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05/22/2019 7:41 AM



50 dB

50 kHz

45 kHz

40 kHz

35 kHz

30 kHz

25 kHz

20 kHz

15 kHz

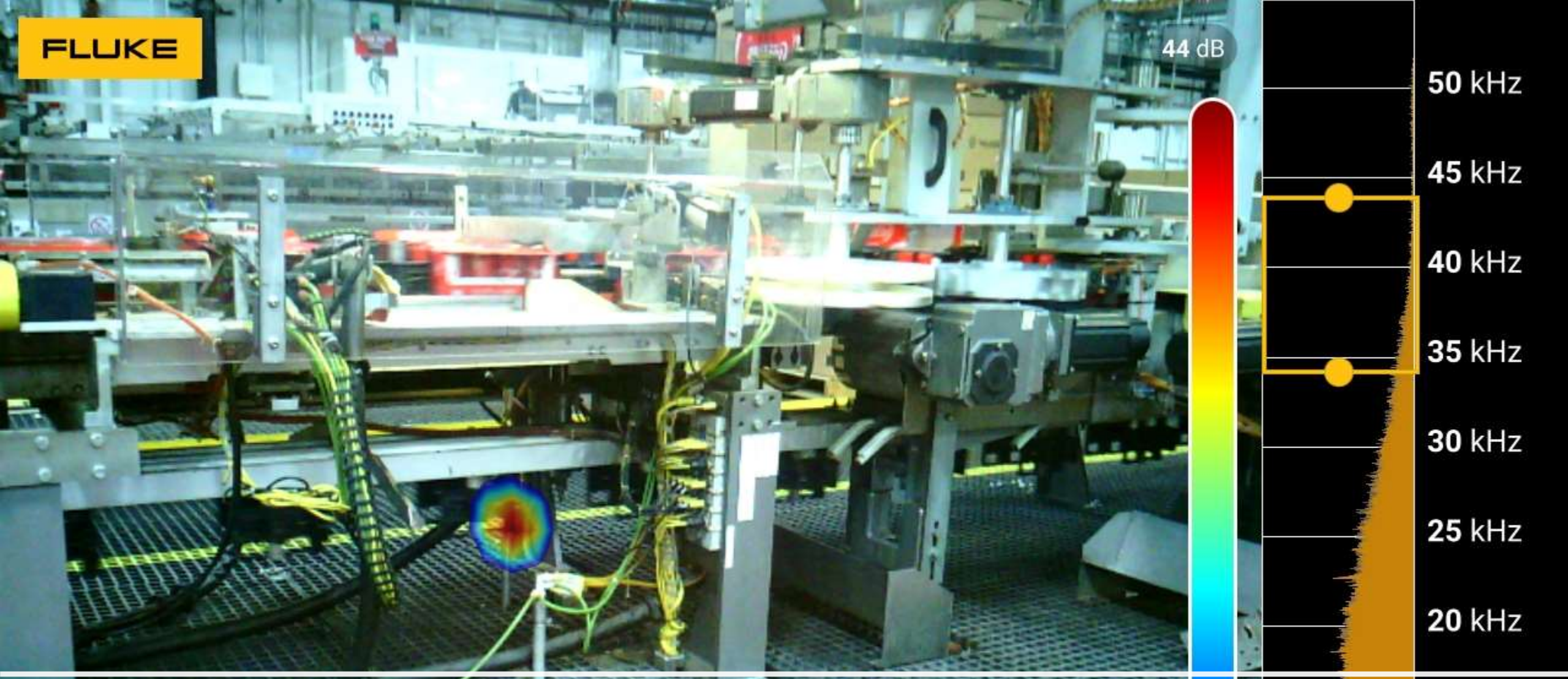
10 kHz

19

Discharge Valve Connections

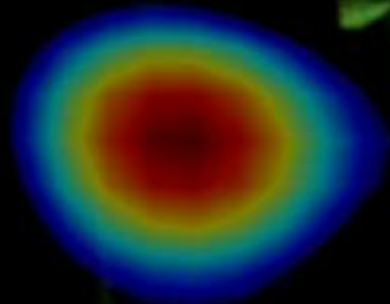
FLUKE

44 dB



Production Line @ a Food & Beverage Facility

54 dB



Boiler Tubes



Natural Gas Line @ a Steel Mill



04/18/2019 1:11 PM

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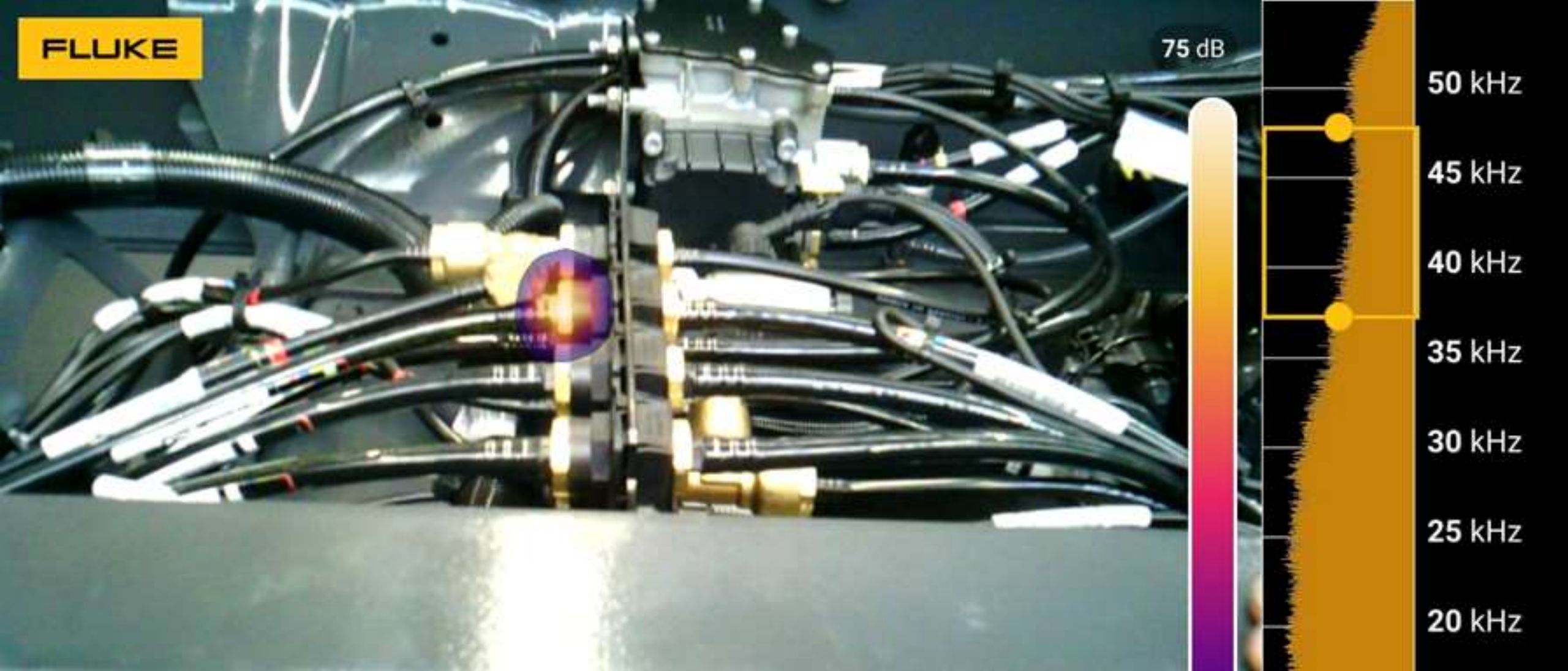
42 dB

5 kHz

22

FLUKE

75 dB



Air Lines on Semi-Trucks



Nitrogen Leak

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05/20/2019 2:15 PM

25.18

5 kHz

10 kHz

15 kHz

20 kHz

25 kHz

30 kHz

35 kHz

40 kHz

45 kHz

50 kHz

FLOUKE

51 dB



Ammonia Compressor Leak

FLUKE

35 dB



Argon Tank Leak




Duct Leak @ a Coal Plant

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05/14/2019 3:26 PM

59 dB

5 kHz₂₇

A technician wearing safety glasses and a dark t-shirt is holding a large, yellow, handheld electronic device in a workshop. In the background, another person is welding, creating a bright spark. The workshop is filled with various tools and equipment.

Operation of instrument

Instrument operation

Buttons



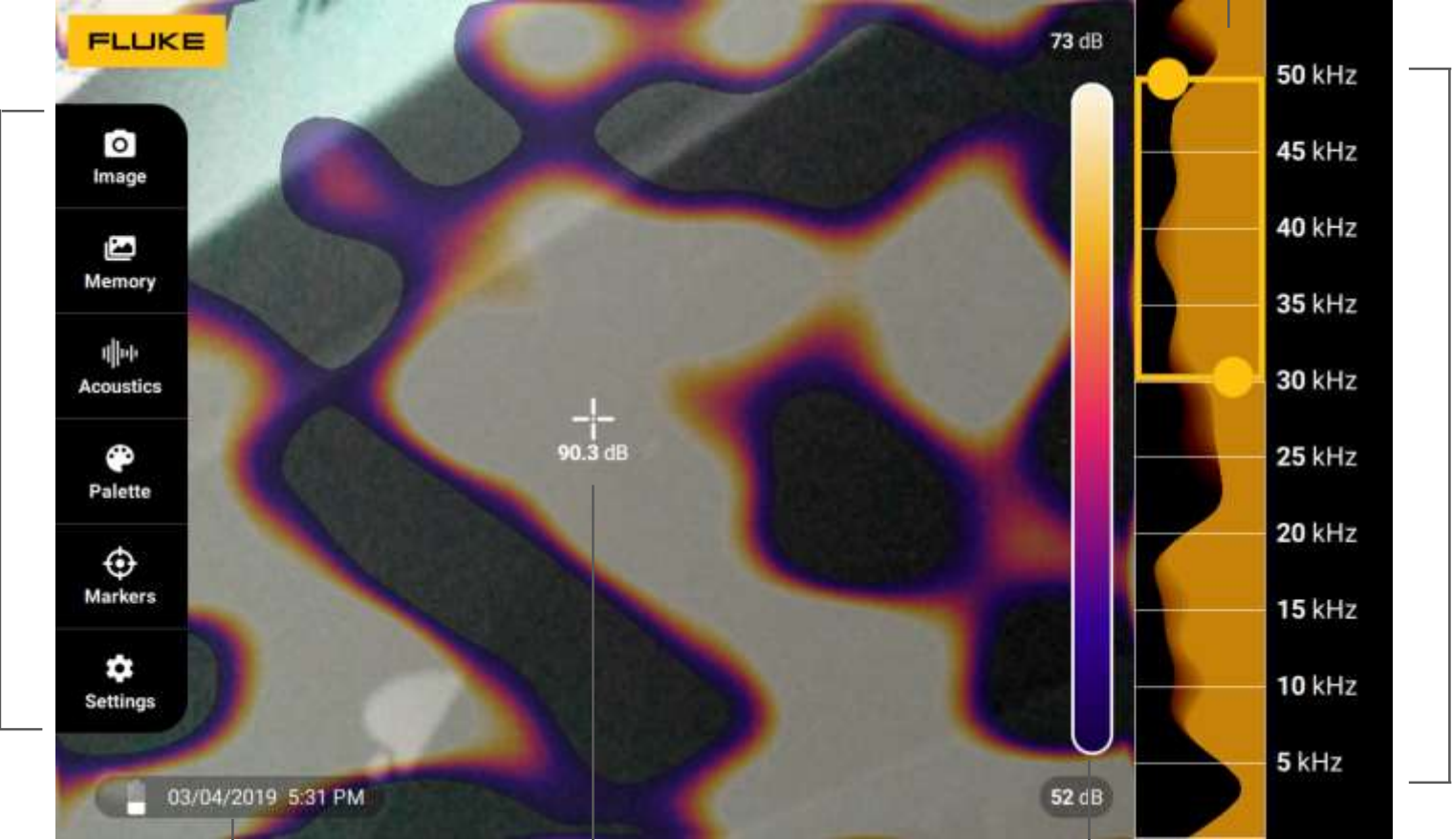
Instrument operation

Screen

Amplitude spectrum

Menu

Appears when you touch the screen on the right



Frequency scale

General info

Battery, date, time

Center reading

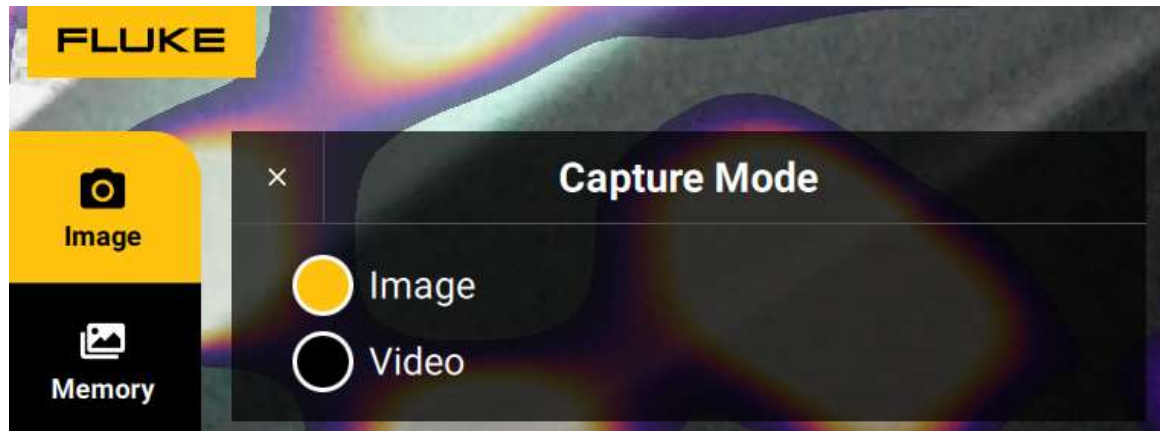
Can be turned off

dB scale color palette

Can be turned off

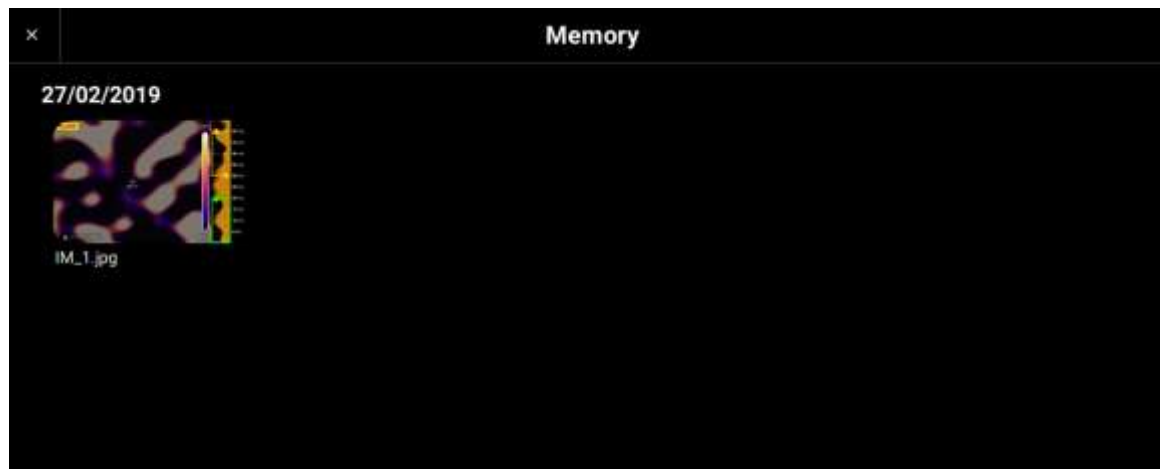
Instrument operation

Menu



Image

Select to save image or video



Memory

Shows saved images and video

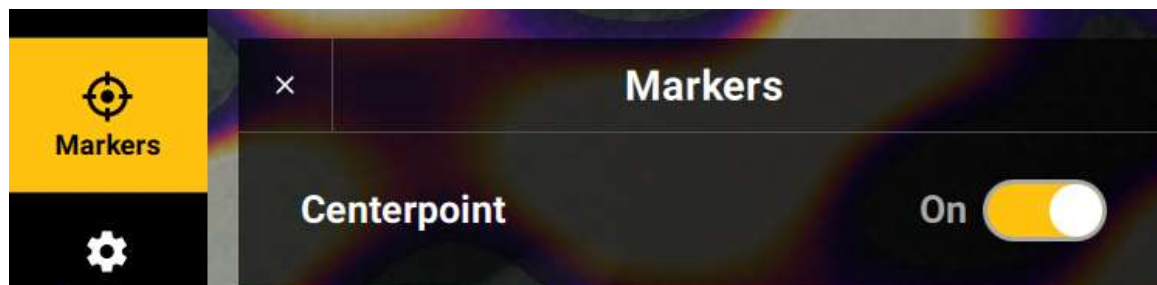
Instrument operation

Menu



Palette

Choose from 3 different color palettes.
Default is Red-Blue



Markers

Choose to display center marker or turn it off

FAQ's

- **Leaks can be detected as far as 164 ft.**
- **You can store up-to 999 images on the device**
- **The battery life is 6 hours**
- **The ii900 can visualize more than just compressed air leaks**
- **We cannot quantify leaks...yet**
- **The camera does visualize vacuum leaks**
- **This version of the camera is not ideal for corona discharge**