

# CANINE SEIZURE DETECTOR

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# Here's the problem

- ▣ Owners or hospital staff can be unaware of seizure occurrence.



Canine seizures are generally characterized by a contraction of all the body's muscles.

- High frequency movement
- Increase in breathing rate
- Rise in body temperature

# What's the Difference?

- ▣ Generally, the high frequency movements (typically 12-18 Hertz) exist as background noise, but become more pronounced in ictal onset.
- ▣ Rapid breathing such as panting ( $\sim 4$  Hz) is as deep as regular breathing, whereas seizure breathing (higher frequency) is shallow.

# How We Do What We Do



→ Fourier Transform



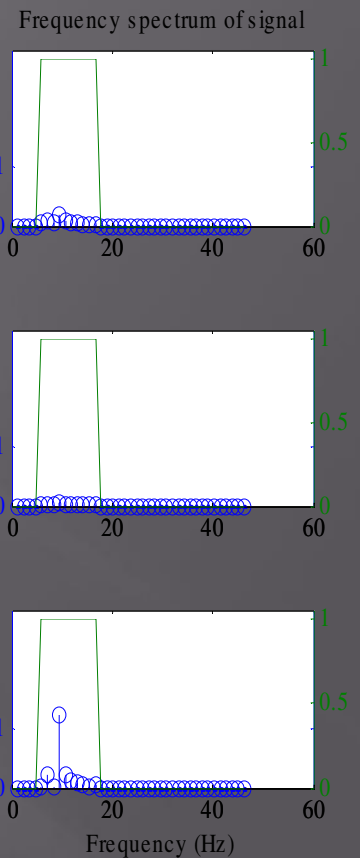
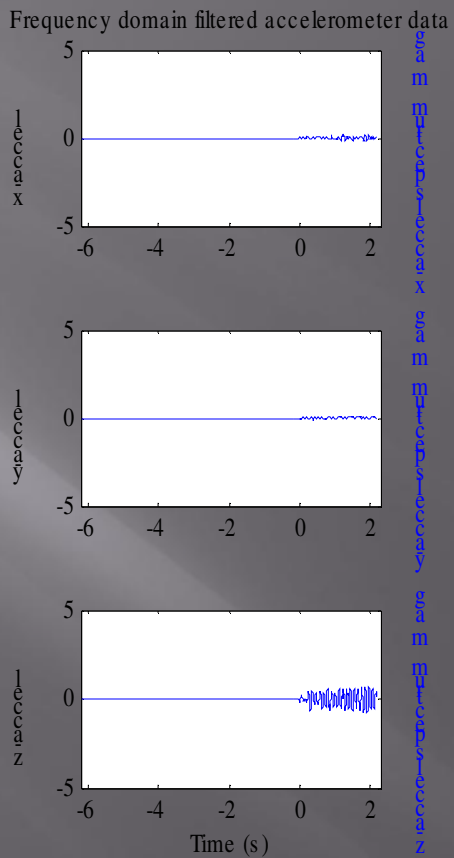
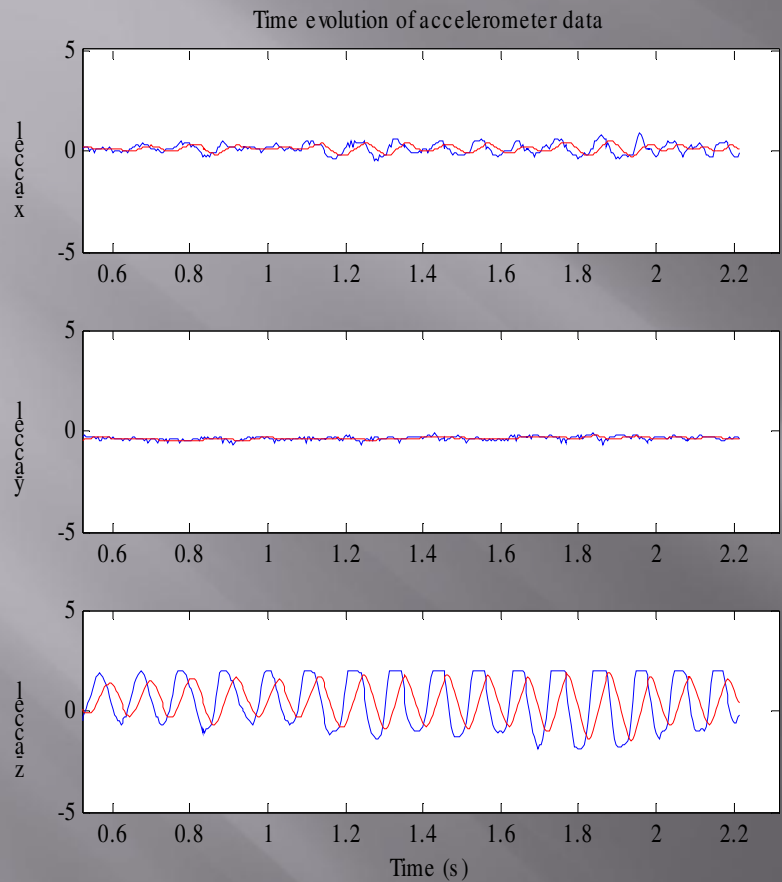
Amplitude Analysis and Threshold Trigger



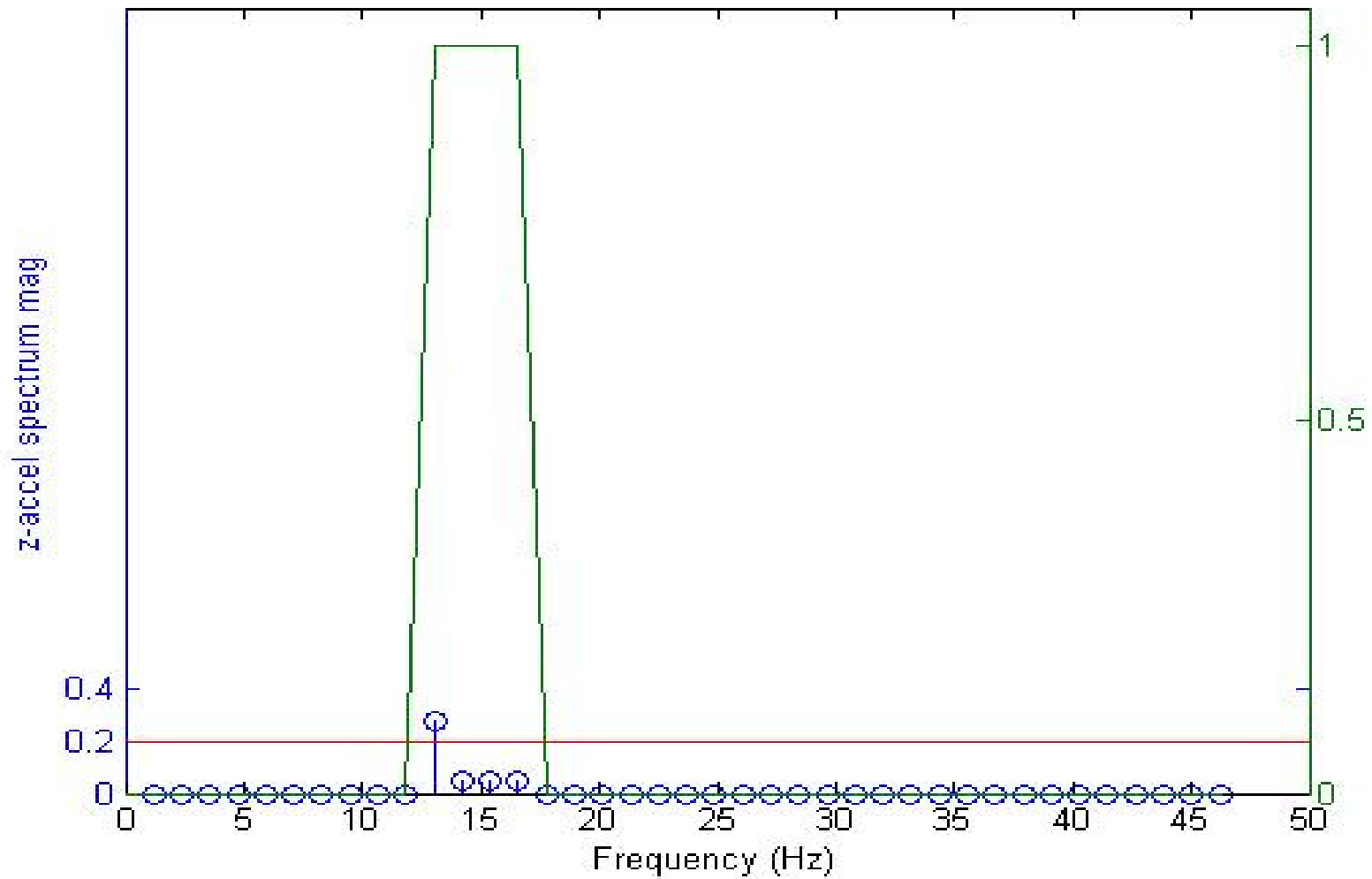
Humidity Level and Frequency



Threshold Trigger

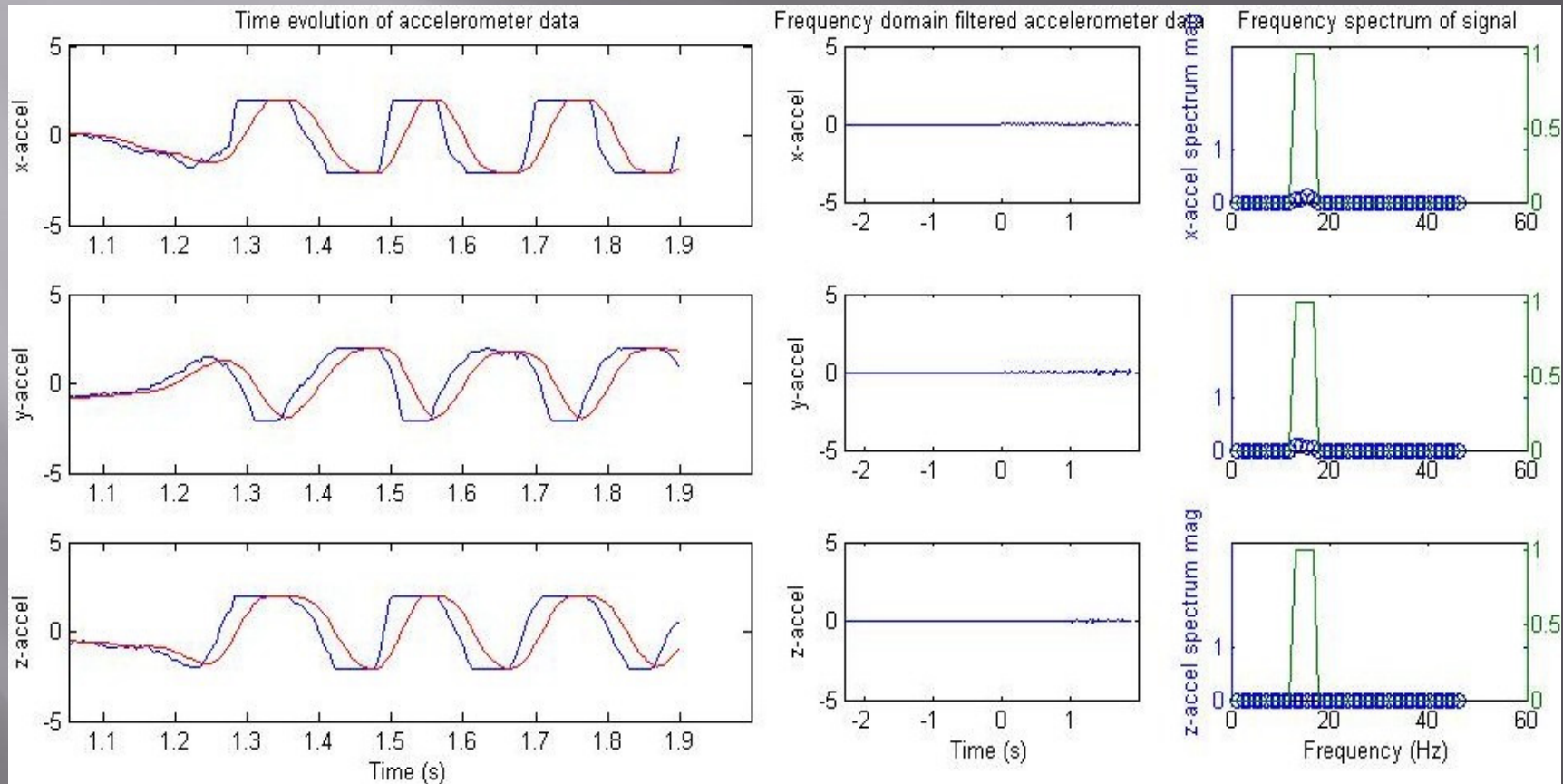


Movement tends to occur mostly along the axis of articulation of the limb.  
 One or two axis accelerometer may be sufficient to accomplish the task, driving down cost.

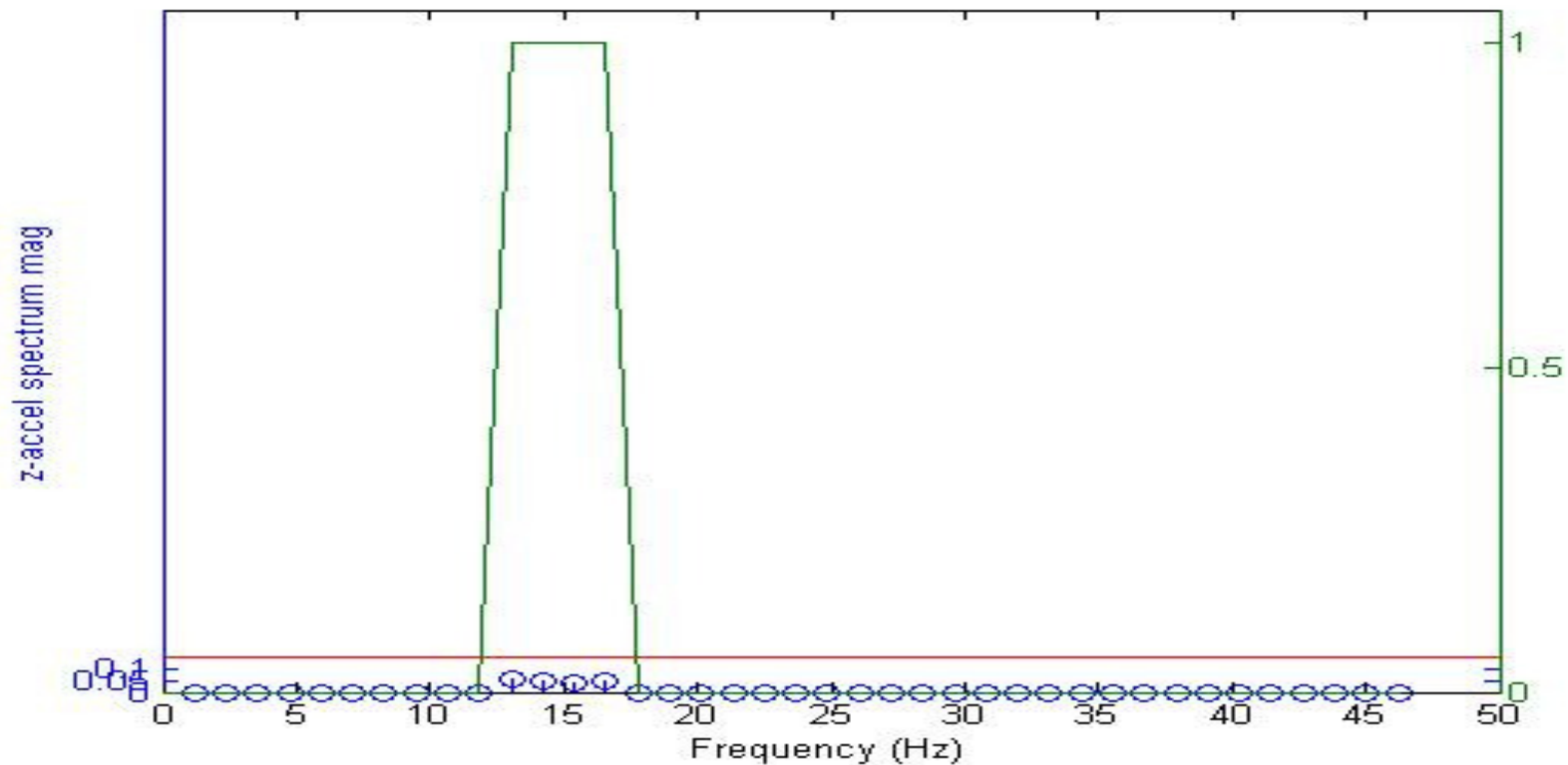


When a seizure occurs, the threshold is surpassed, and the alarm is sounded.

# The Scratch Frequency

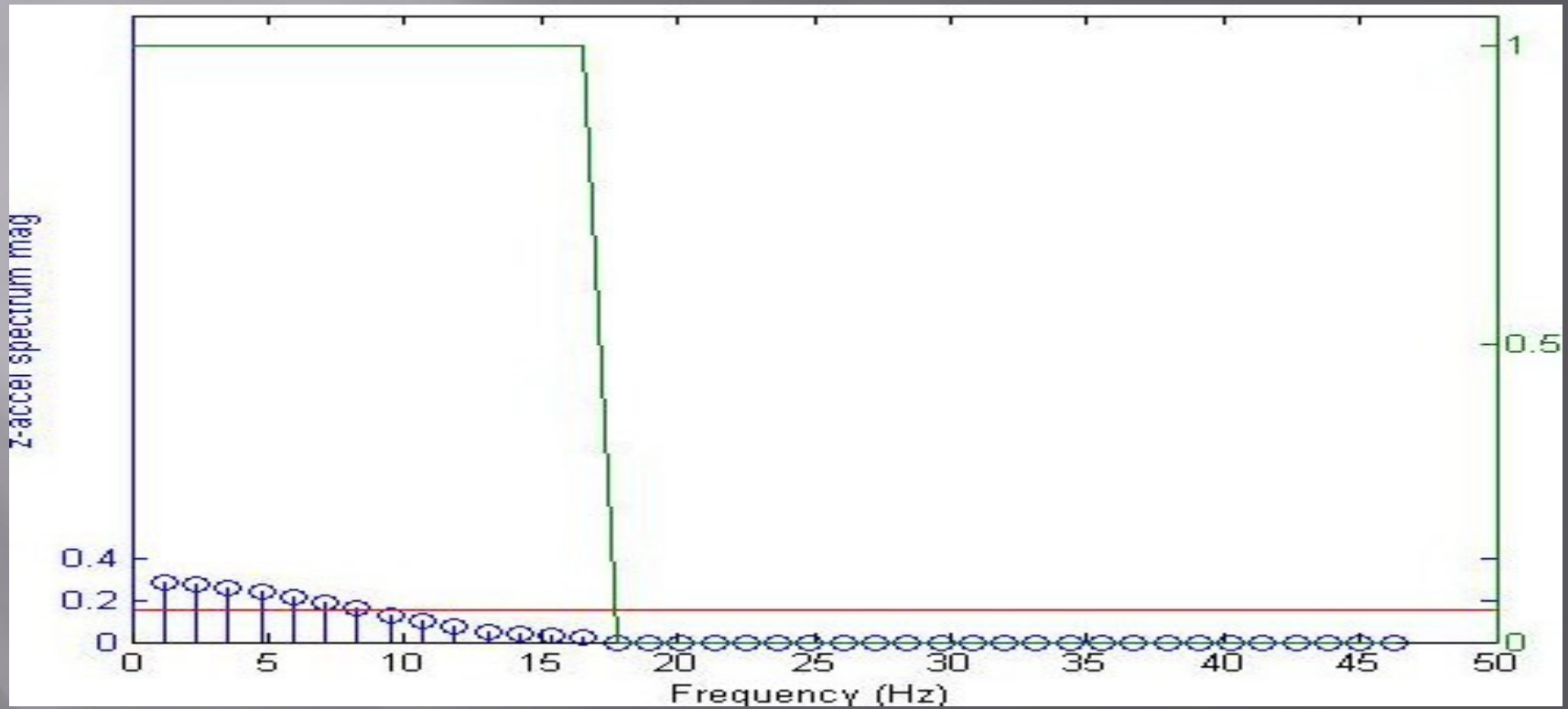


# Scratch Frequency



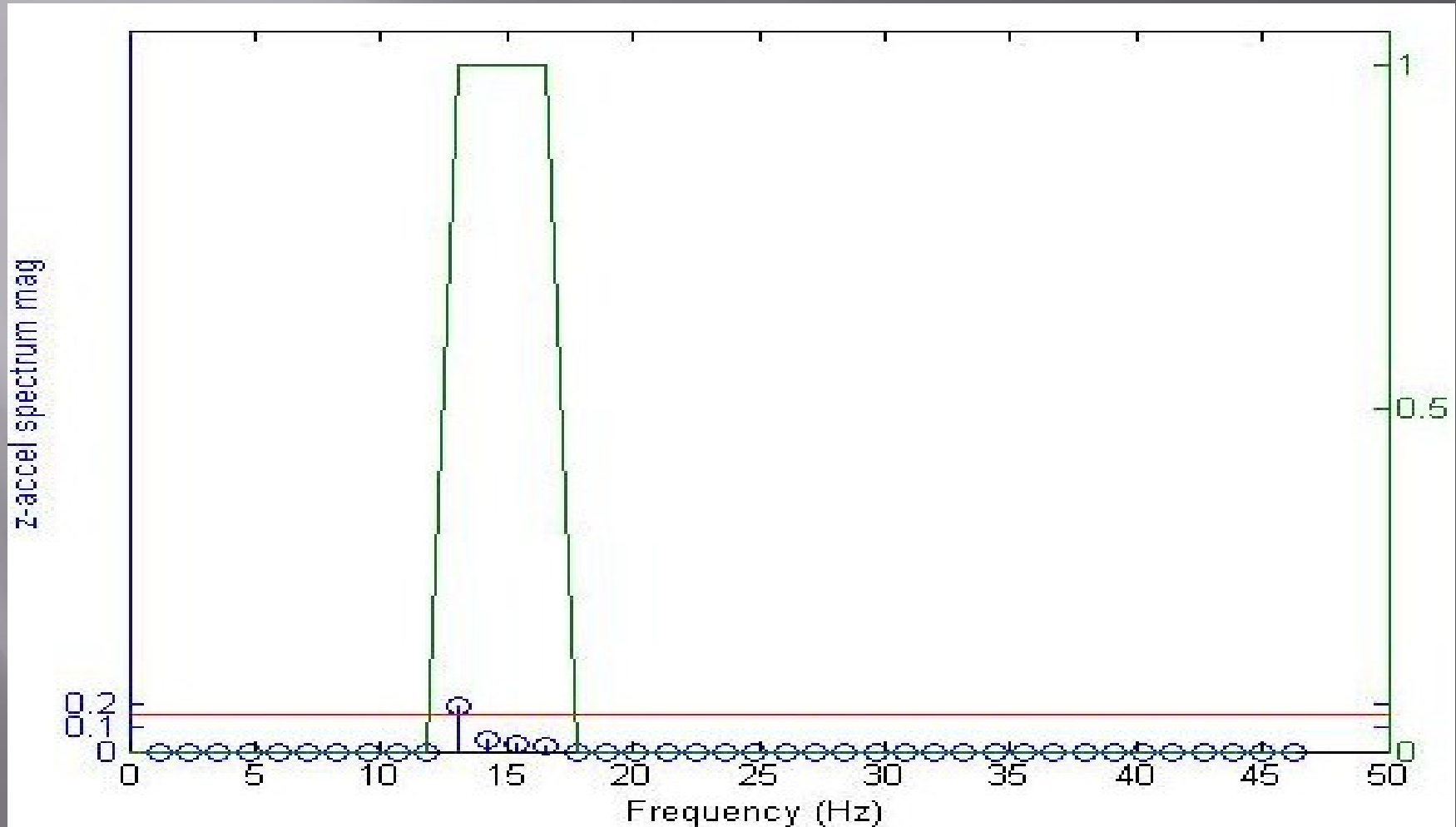
This graph shows the key frequencies remaining below threshold while scratching occurs.

# The Hand Scratch

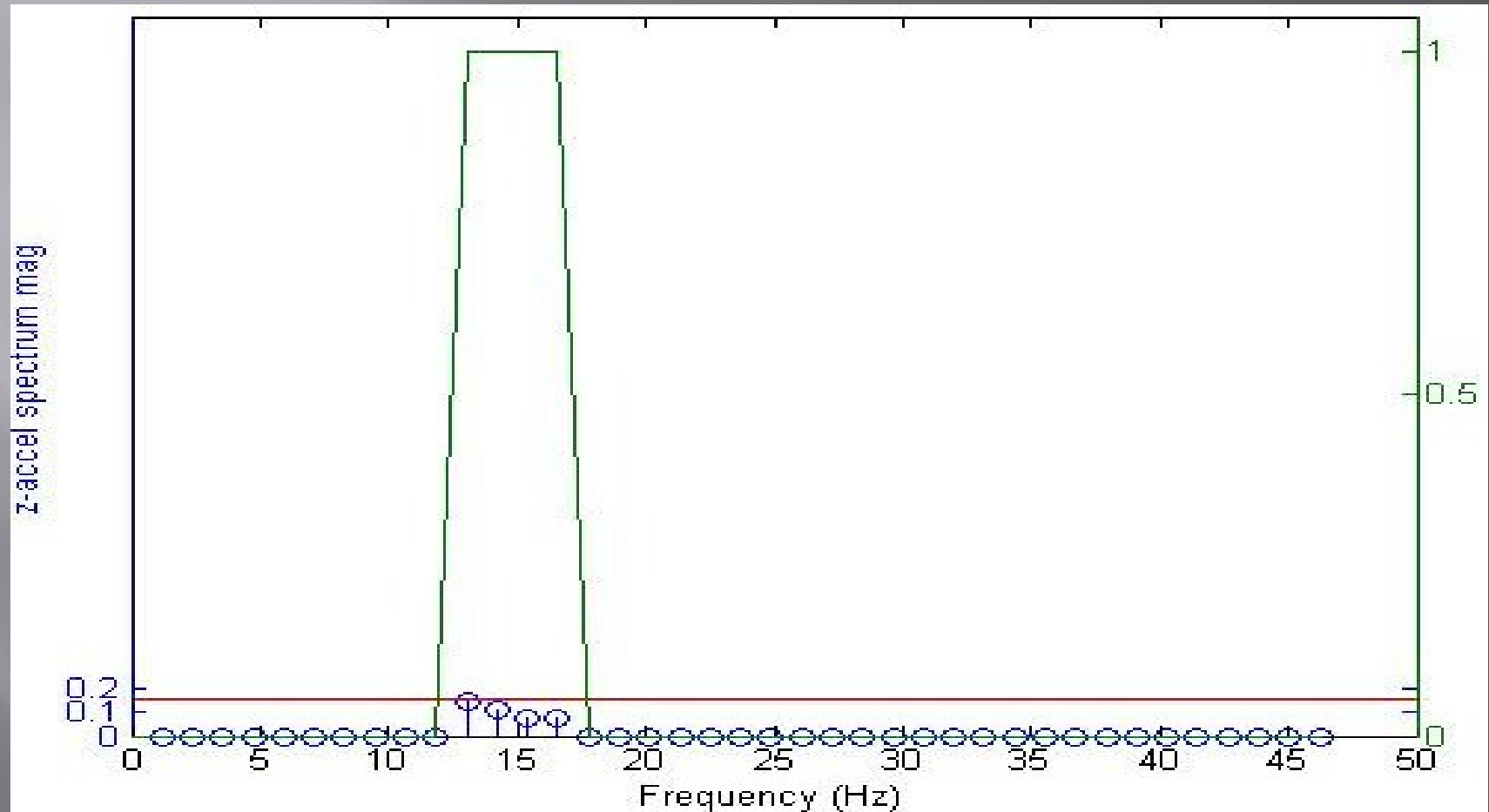


Here, typical scratch frequencies are seen with a lowpass filter.

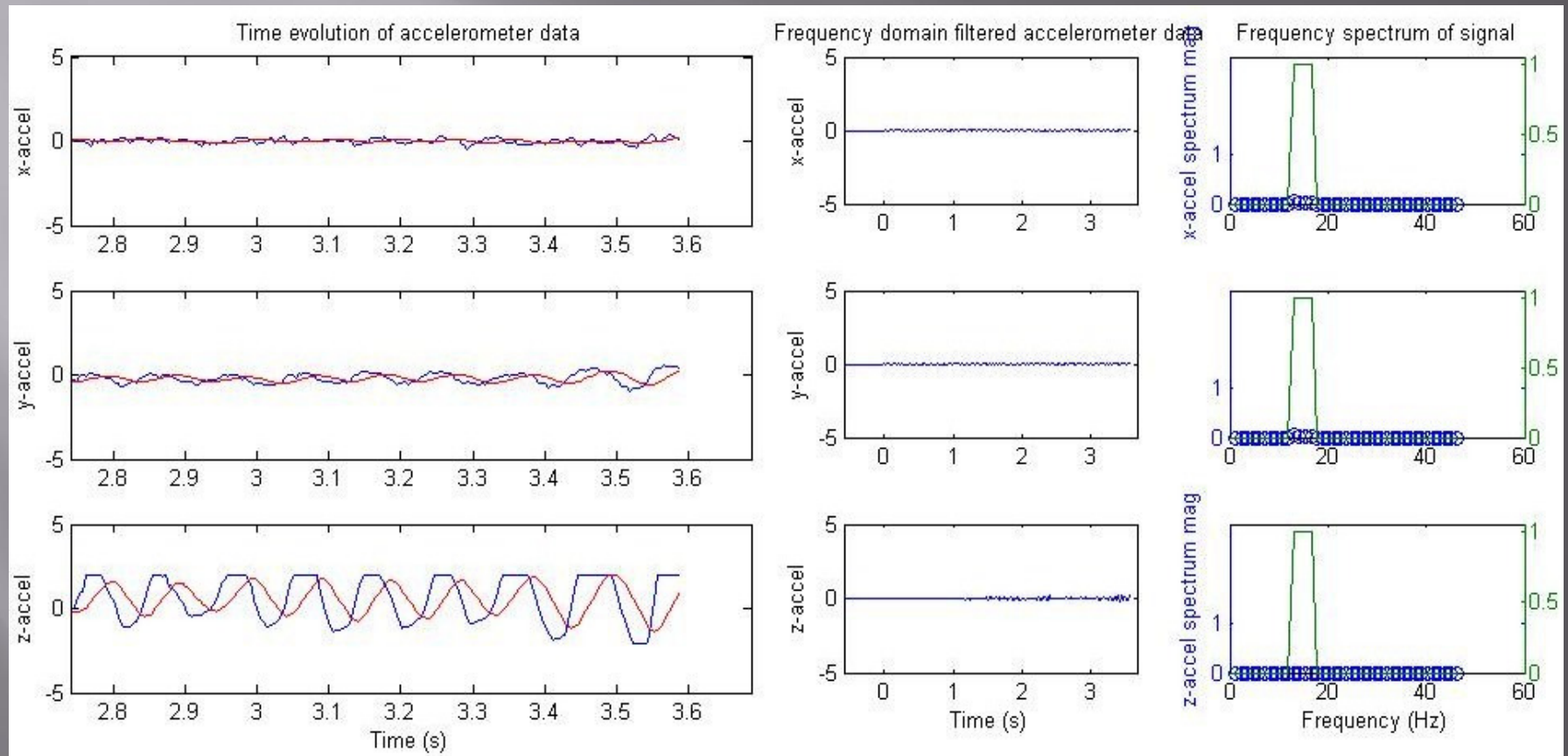
# Cisco's Seizure



# Duke's Seizure



# Duke's Seizure in Real Time



The severity of Duke's seizure with real time waves clipping.

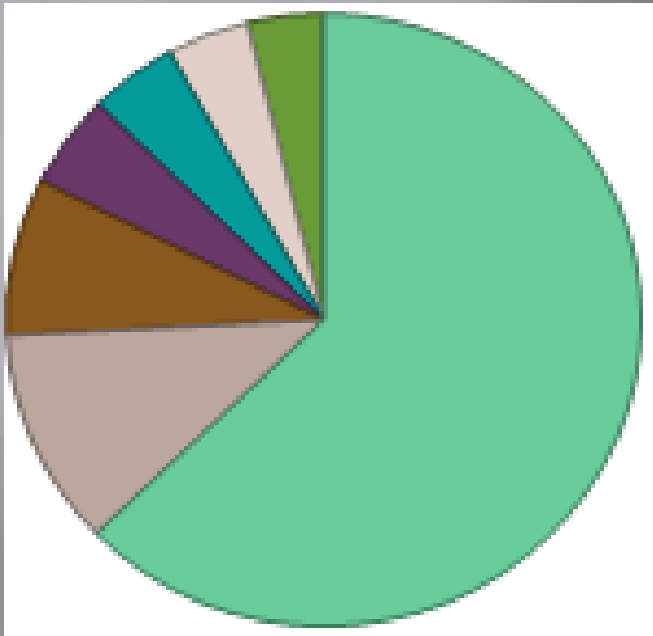
# Additionally...

- ▣ Added EKG monitoring
- ▣ Real time seizure recording
- ▣ Possible venture into larger animal practice

# Opportunity

- ▣ Medical Device Market: \$85.6 billion
- ▣ Existing demand

# Veterinary Medicine



Small Animal Medicine

Veterinary Medicine: Expected to grow due to aging population (IBISWorld)  
As seen here, the bulk of veterinary medicine is concentrated in the service industry sector of small animal practice, which is our market.

# Pet Ownership in the US

	Dogs	Cats
Percent of households owning	37.2%	32.4%
Number of households owning	43,021,000	37,460,000
Average number owned per household	1.7	2.2
Total number in United States	72,114,000	81,721,000
Veterinary visits per household per year (mean)	2.6	1.7
Veterinary expenditure per household per year (mean)	\$356	\$190
Veterinary expenditure per animal (mean)	\$200	\$81

# Key Statistics for the Veterinary Industry

▣ Industry Revenue	28,710.3\$Mil
▣ Revenue Growth	1%
▣ Industry Gross Product	18,231.1\$Mil
▣ Number of Establishments	44,928Units
▣ Number of Enterprises	43,352Units
▣ Employment	314,312Units
▣ Total Wages	9,560.5\$Mil

# Why a Seizure Detector?

- ▣ Avoid lawsuits due to negligence – There has been a rise in malpractice lawsuits directed at veterinary doctors.
- ▣ Appease worried owners with the presence of the detector in the clinic

# Additional Reasons

- ▣ Avoid the wrath of whistle blowers who crusade against malpractice.
- ▣ Owners of practice always benefit from keeping their establishment technologically competent.