



# Doing It Right



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# Doing It Right

What stray electricity do you find on a farm that is served and wired electrically correct?

In November of 2003 I performed a survey of four farms for a farm owner with a total of 11,000 dairy cows being milked three times a day.

One of the farms is served from an investor owned substation along with other utility customers.

The remaining three farms are served by a dedicated substation with three 12 kV feeders, one to each farm.

Distribution lines are 12.47 kV multi-grounded with the neutral grounded at each pole.

Each farm has a 750 or 1000 kVA pad mounted transformer. Transformers are grounded wye primary and grounded wye secondary.

# All farm services are 480 volt three phase.

- ❑ 120/208 volt loads are served by dry type step-down transformers.
- ❑ HID Lighting is 208 volt phase to phase.
- ❑ Watering unit heaters are 120 volt.

All grounding on and off farm is  
to Code and remains connected.

# The first tests performed were Cow Contact Profiles.

A Fluke 189 meter, a 500 ohm resistor and C. Forster's "Many Point" tester were used.

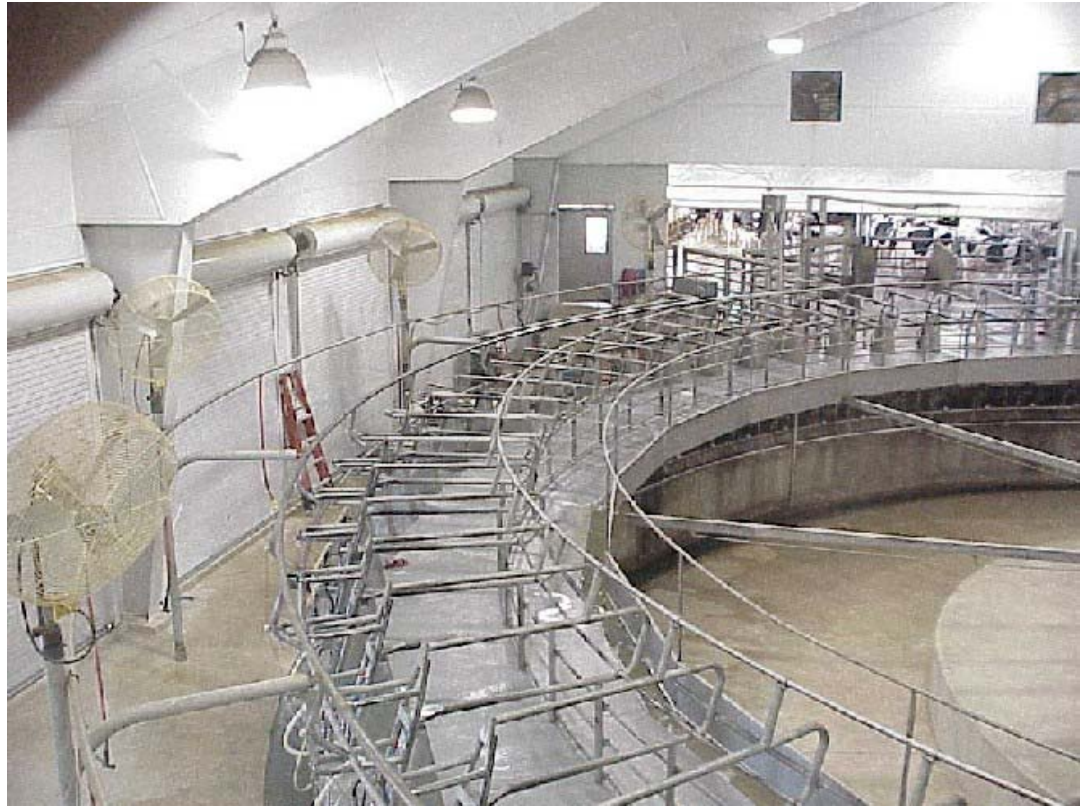
# Measurements were made at each watering unit...

Approximately 180 electric watering units required 4 miles of walking to measure all cow contact points. Points between watering units measured lower CC voltages.

(Weather was warm, heaters were energized but not heating.)

# Four 72 cow rotary units were used for milking.

Measurements were made from “parlor” steel platform to floor and “bump rail” to floor.



# Record your “steady state” measurements

If there is a pattern to the  
measurements, you might investigate  
for “on farm” sources.

46	50	55	95	20
63	45	48	76	34

18	39	25	41	52
54	127	28	36	35

49	70	47	58	42
44	40	25	32	22

20

5

26

57

12

28

Step potential measurements are from water unit metallic housing to floor. All values are in millivolts (mv) true rms and using a 500 ohm cow resistor. Meter was a Fluke 189 digital voltmeter.

# CC voltages recorded at the watering units in free stall areas:

Minimum CC voltage was 5 millivolts rms.

Average CC voltage was 70 millivolts rms.

Maximum CC voltage was 270 millivolts rms.

(These values are with a 500 ohm cow resistor)

# CC voltages recorded in the milking parlor areas:

Minimum CC voltage was 2 millivolts rms.

Average CC voltage was 25 millivolts rms.

Maximum CC voltage was 83 millivolts rms.

(These values are with a 500 ohm cow resistor)

# Good science would tell us:

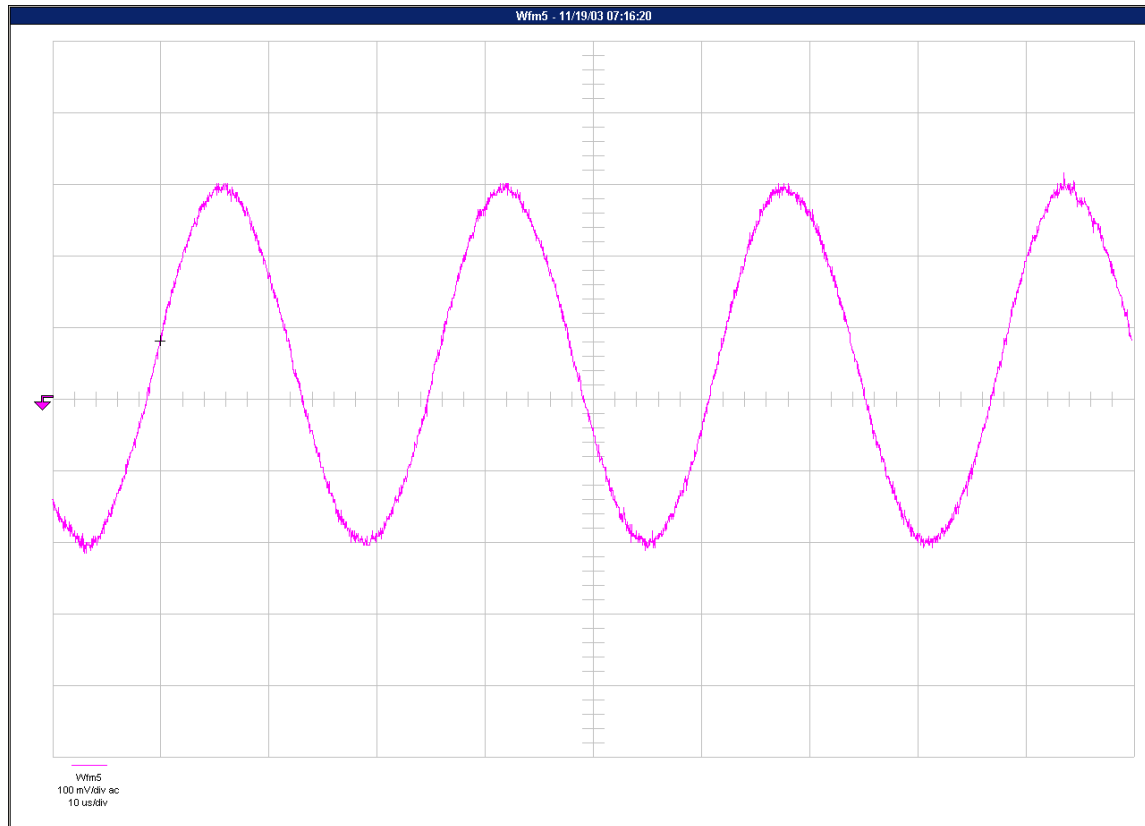
The steady state voltage would have to reach 1,400 millivolts rms (for steady state conditions) to have 5% of the most sensitive cows even detect the presence of stray electricity.

Some SV advisors selling  
solutions might say...

The above voltages would certainly  
prevent good production...

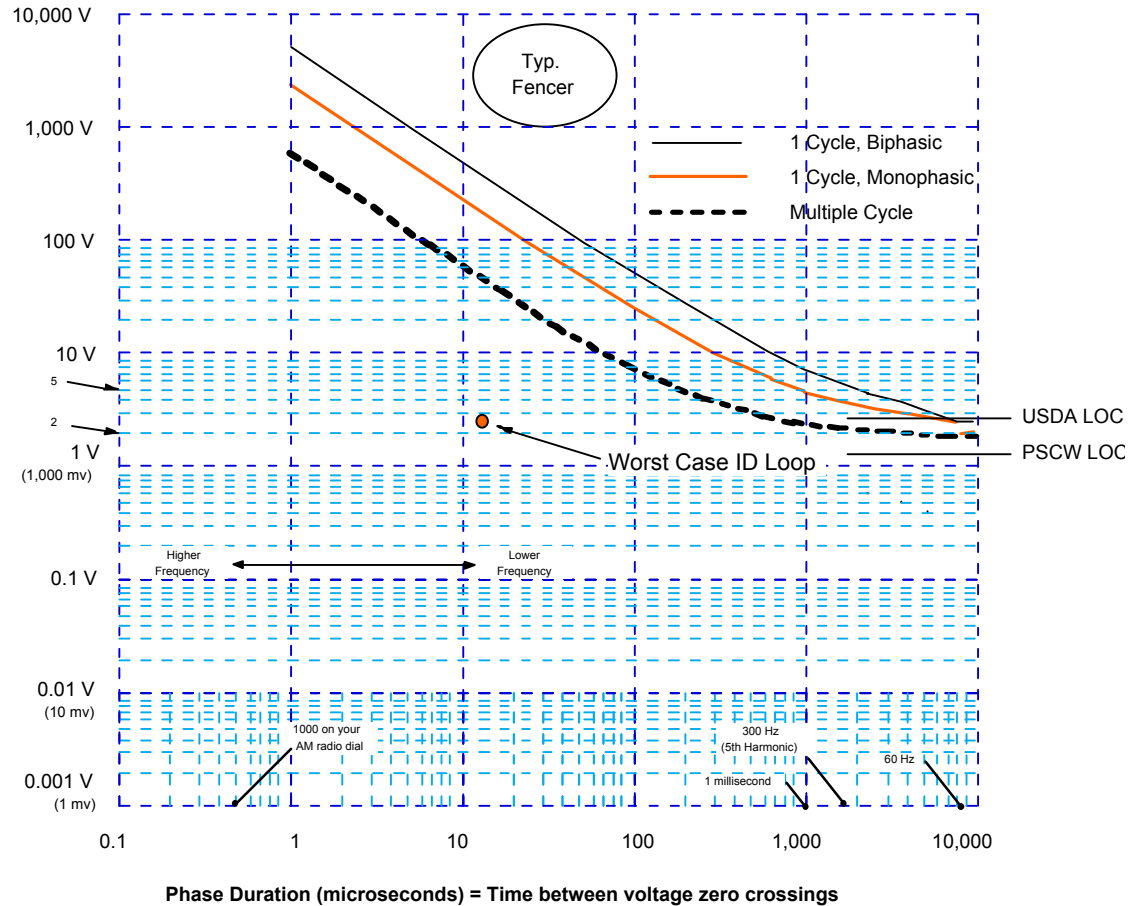
You may want to check for fencer, cow trainer, ID system or VFD on farm source influence in the cow contact area.

# Cow ID System Influence



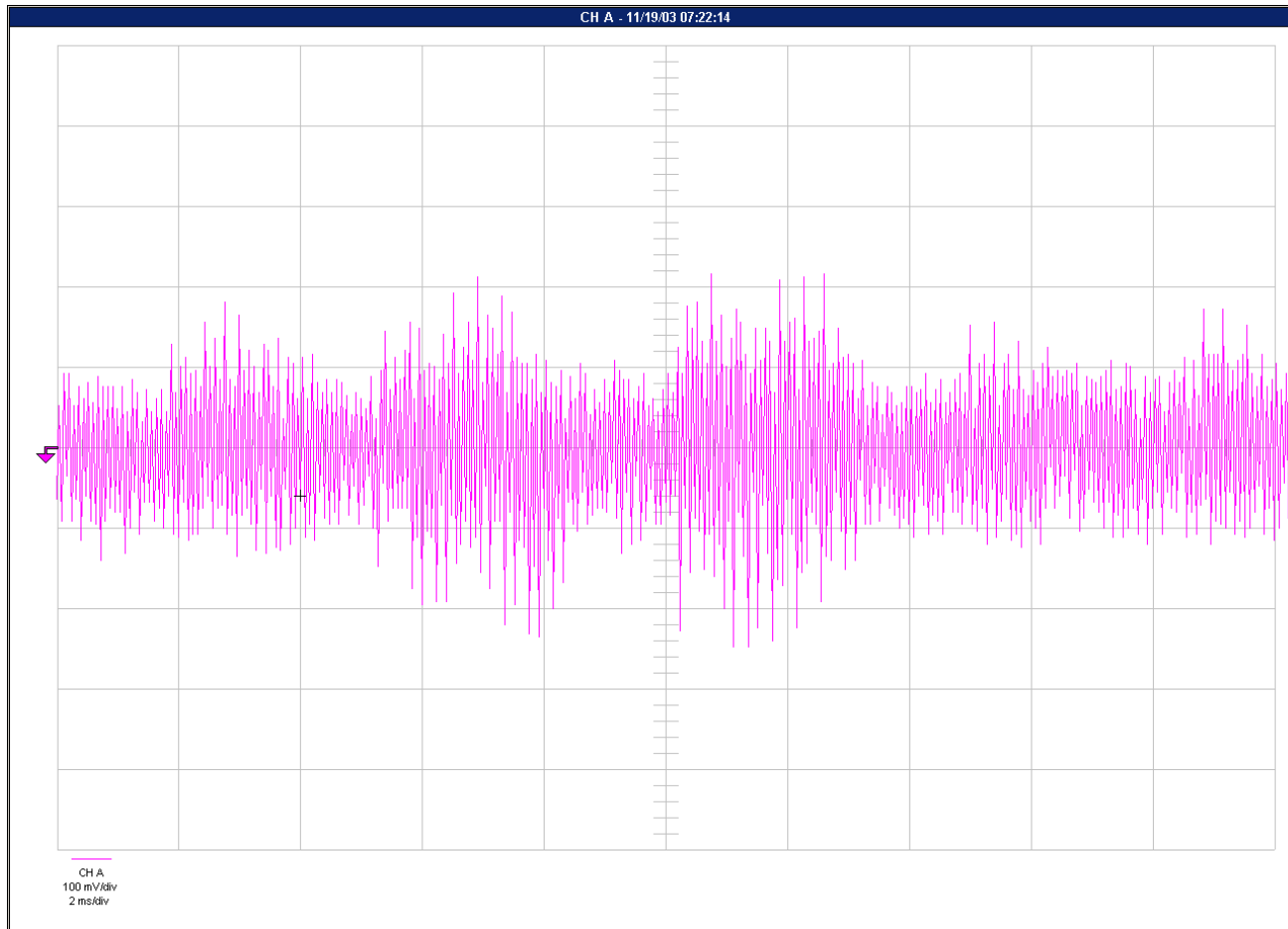
# Is it significant???

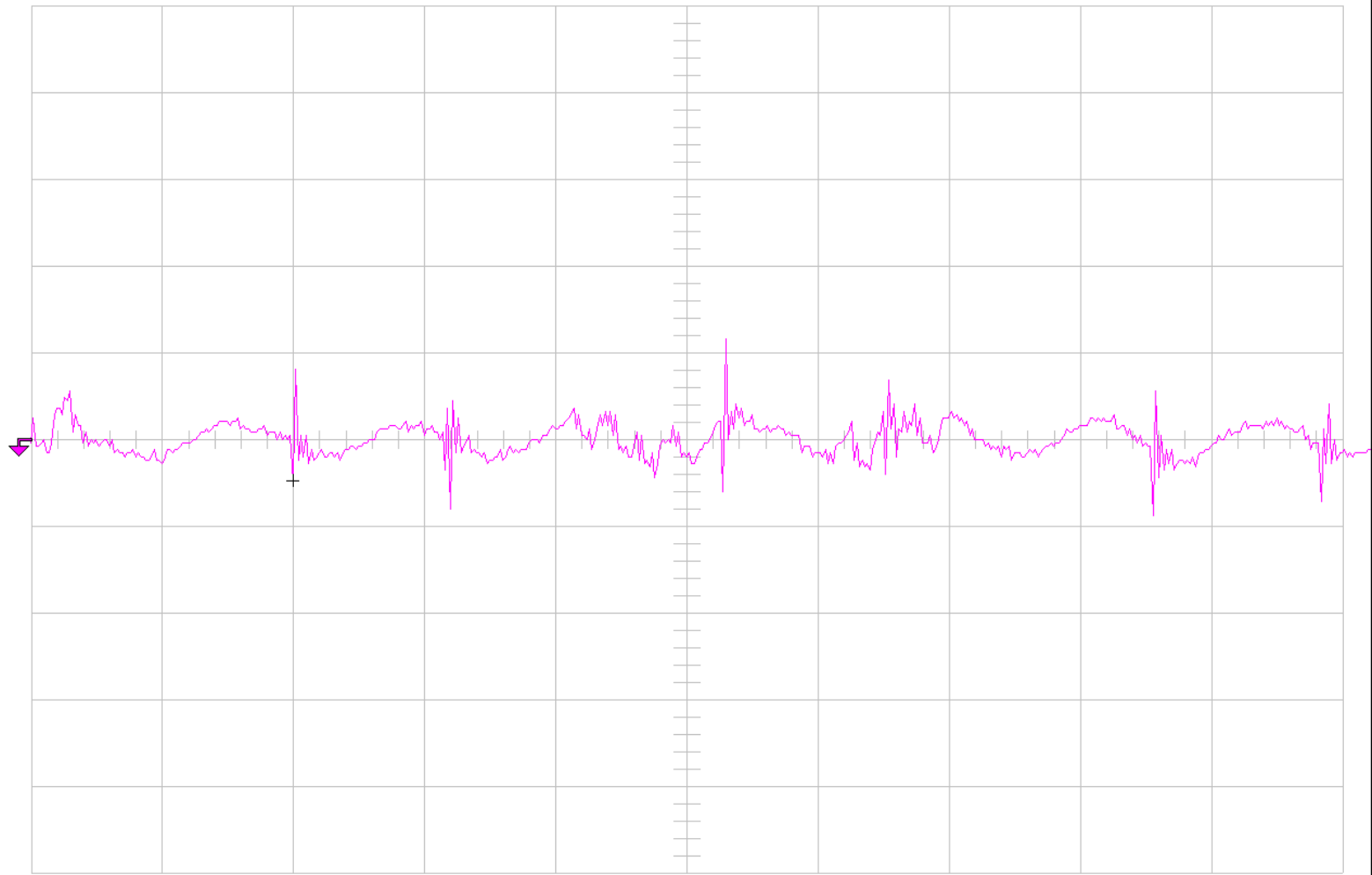
Behavioral response for 5% of the most sensitive cows using sine waves from muzzle to hooves exposure



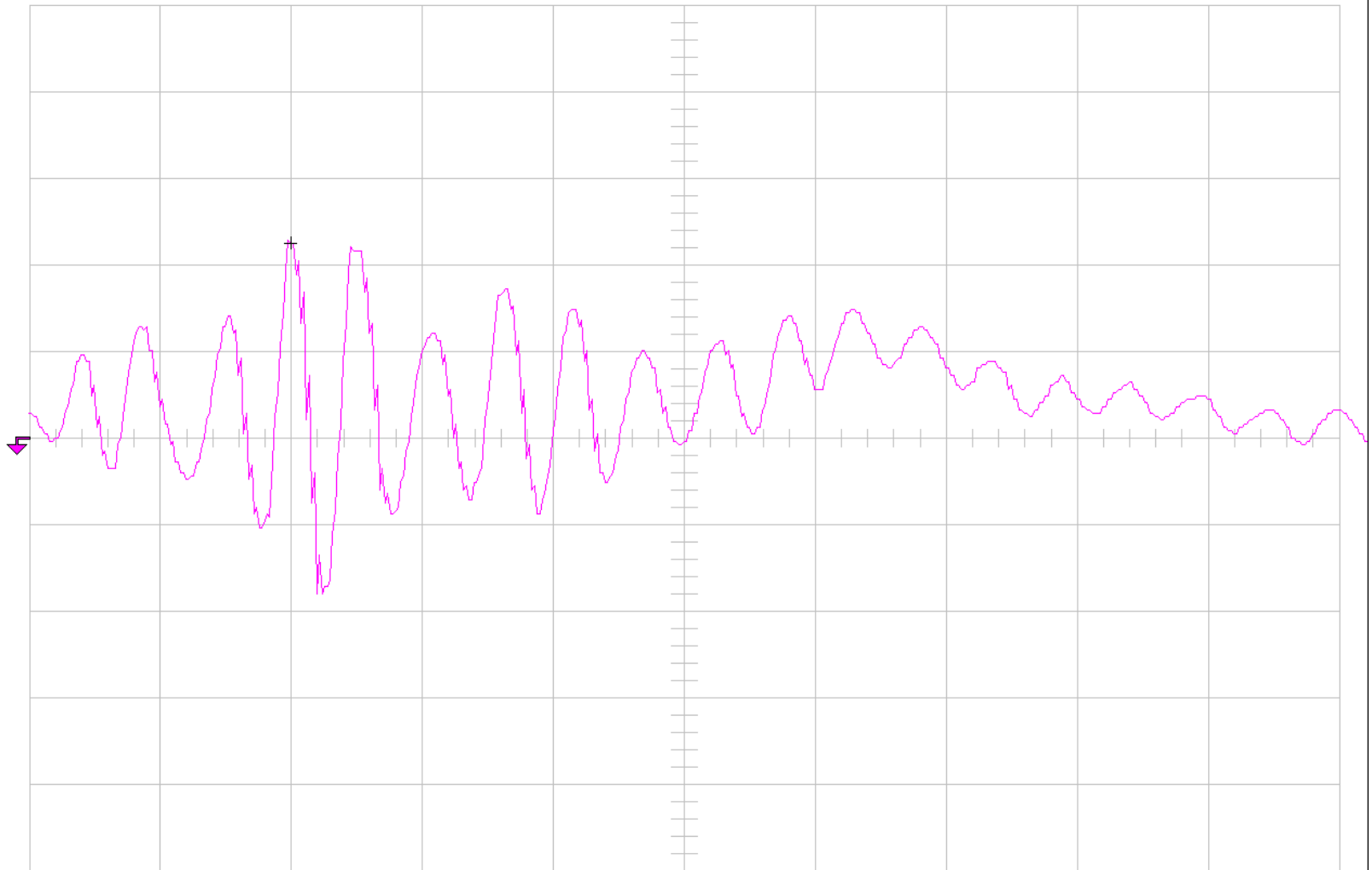
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# VFD System Influence





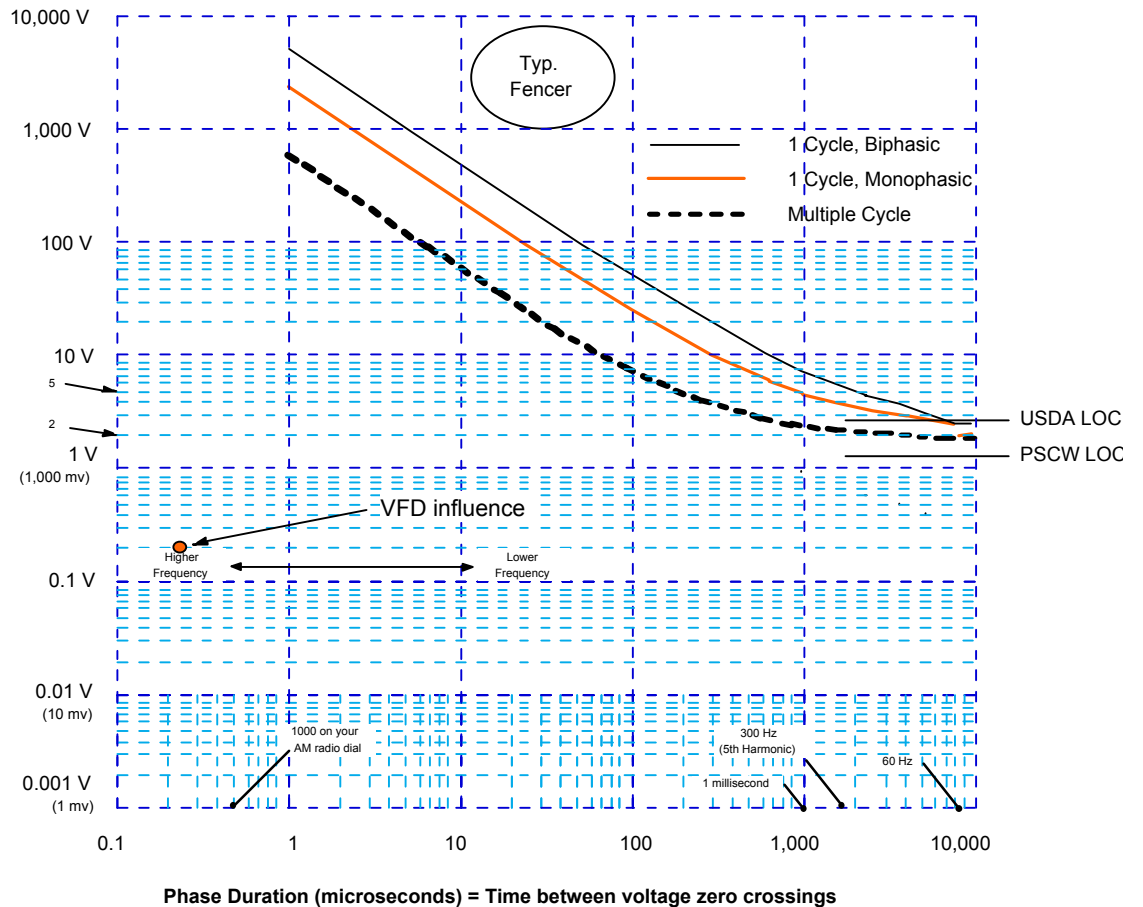
CH A  
100 mV/div  
20 us/div



CH A  
100 mV/div  
100 ns/div

# Significant?

Behavioral response for 5% of the most sensitive cows using sine waves from muzzle to hooves exposure



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# So, what myths have been debunked?

Myth #1 - You cannot use a multi-grounded distribution system to serve farms.

# More myths..

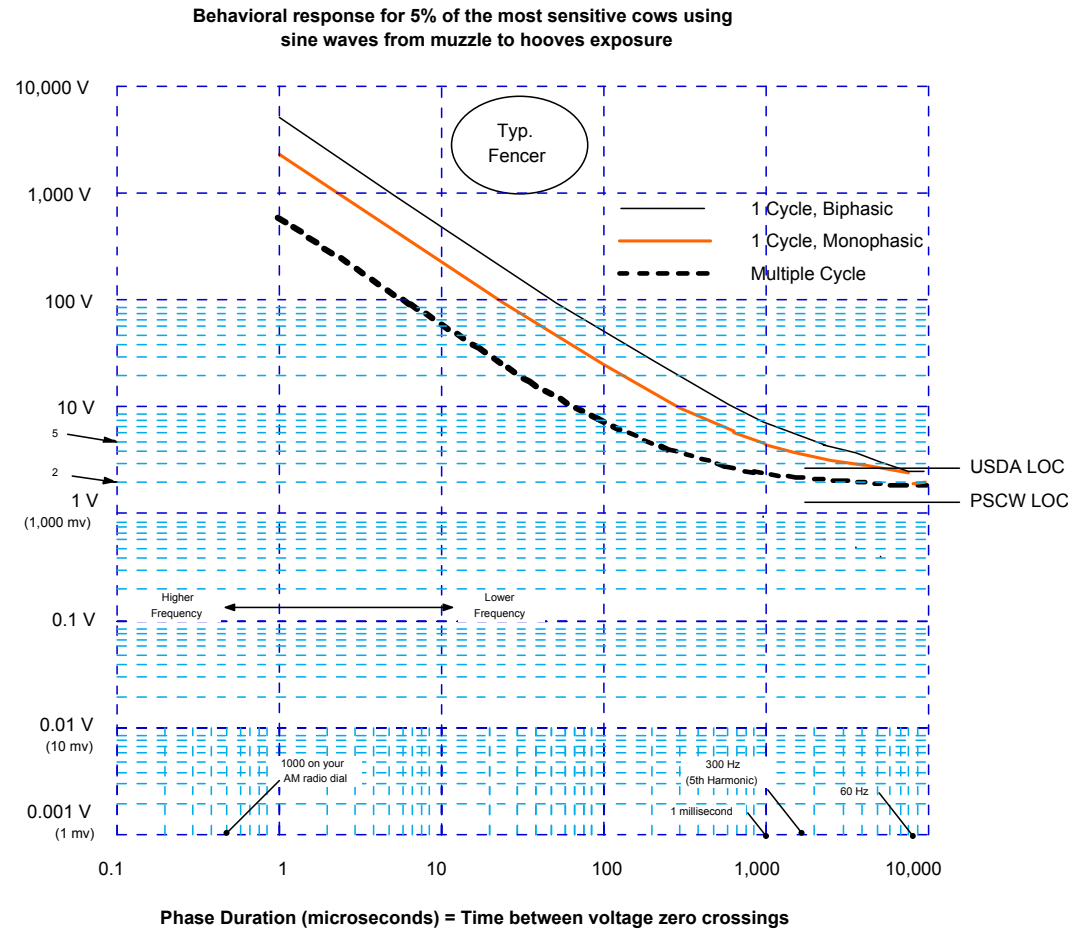
Myth #2 - Grounding the neutral creates too many earth currents.

Myth #3 - All farms must be isolated.

Myth #4 - All farms should be wired with an ungrounded electrical system.

# More myths..

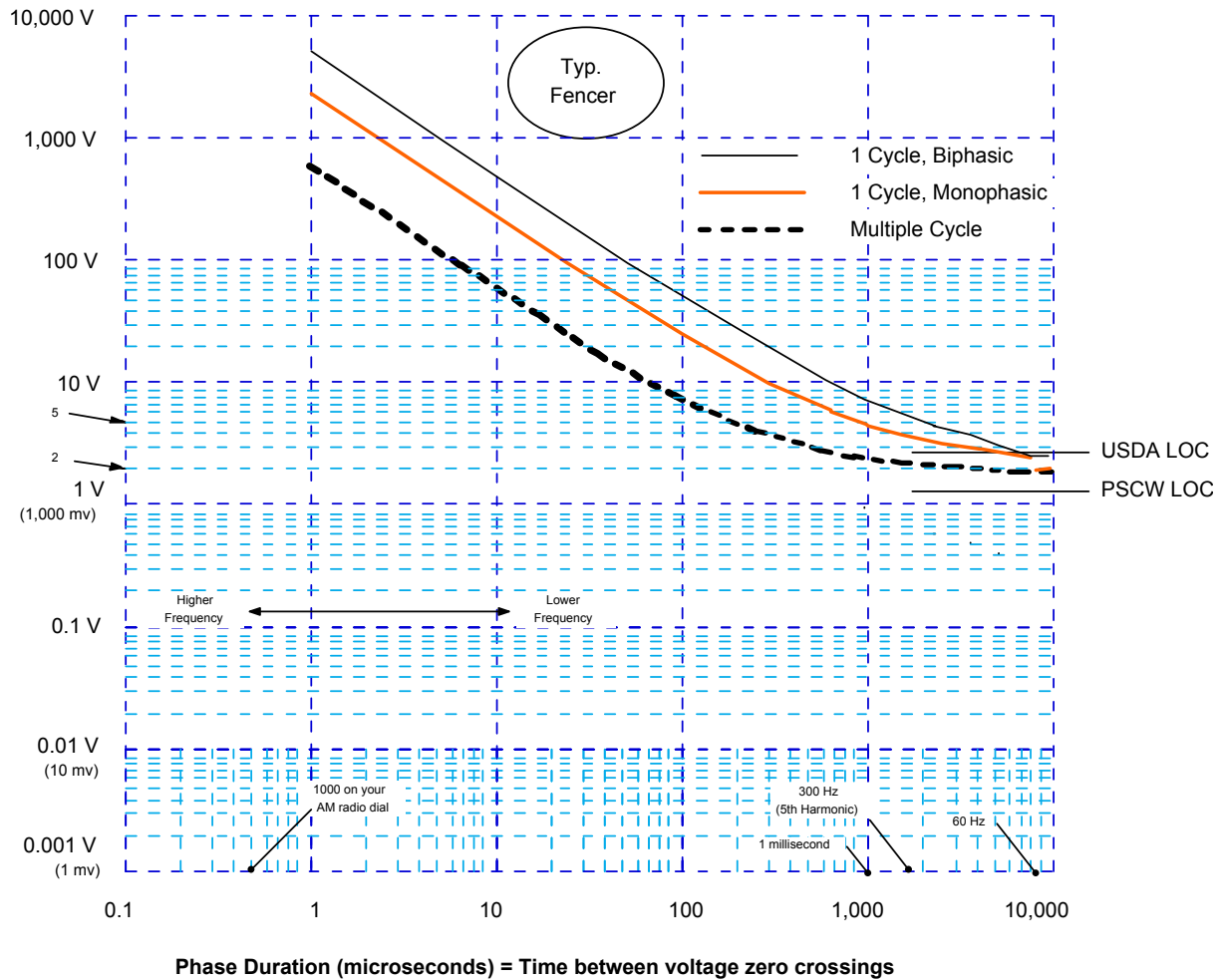
Myth #5 - Voltage levels below the sensitivity curve for the most sensitive cows will affect milk production.



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Vertical scale is in volts (Zero to Peak) across a 500 ohm "Cow" resistor

**Behavioral response for 5% of the most sensitive cows using  
sine waves from muzzle to hooves exposure**



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**Vertical scale is in volts (Zero to Peak) across a 500 ohm "Cow" resistor**

Just do it right!

-End-