

Apr 15th, 2024

Proto-0 Wire Grid Tension Measurement

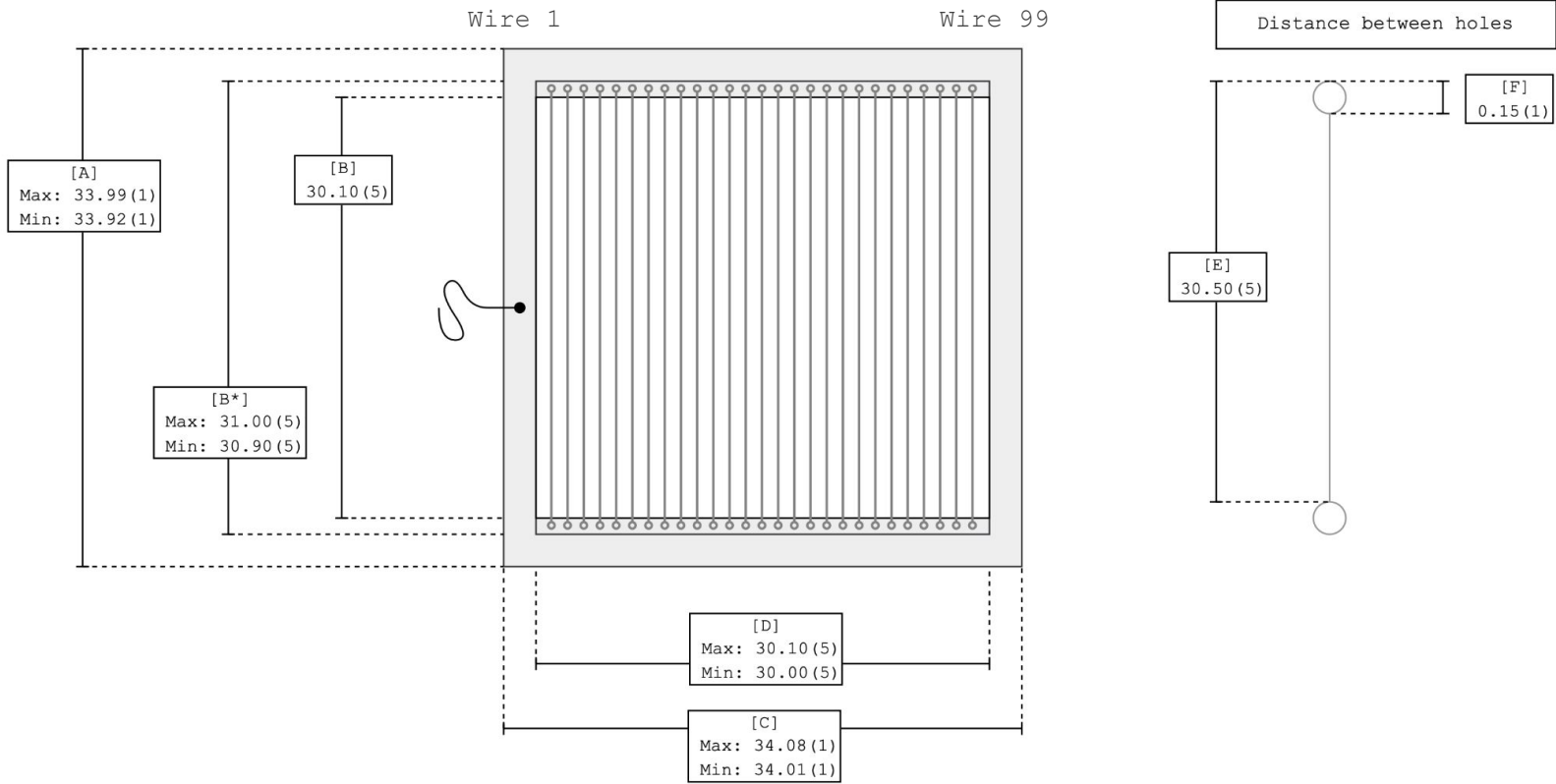
DarkSide-20k - Proto-0 Weekly Meeting

Giuseppe Matteucci

Proto-0 Wire Grid Status

- Wire grid is composed of 99 wires with width 200 μm and spacing of 3 mm
- Wire n.23 is broken
- Daniel Huff shipped replacements to Naples, but they were too long
- We then measured the grid dimension and there is a ~ 1 mm difference between Naples' and Houston's hole-hole length (next slides)
- DH will ship new replacement wires with the correct length
- I measured the average tension of grid wires by measuring the frequency of the first vibrational mode

Proto-0 Grid Measurements
Giuseppe Matteucci
Apr. 9th, 2024





Measuring the tension of a guitar string

- Wires of the grid are analogous to guitar strings
- When perturbed, they vibrate with harmonics of a fundamental frequency

$$T = \pi L_0^2 f_0^2 d^2 \rho$$

T = Tension

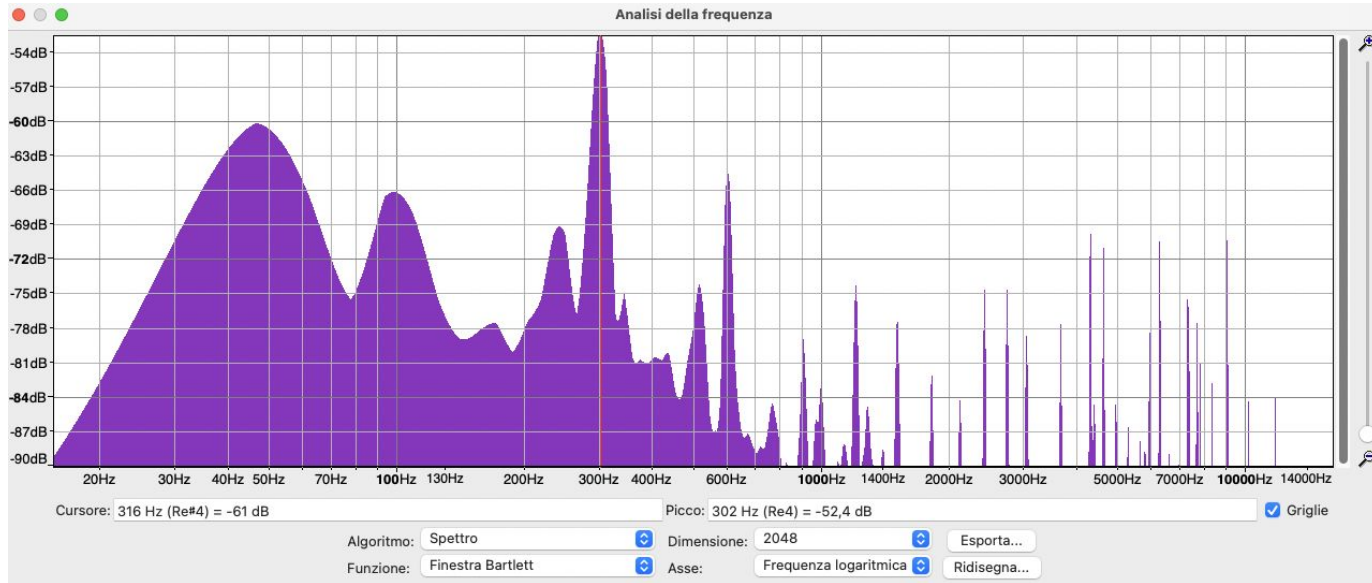
L0 = Length of Wire

f0 = Frequency of first harmonic

d = Wire diameter

rho = density of material (7.97 g/cm³ by the SS wire manufacturer)

Let's play some music



Results

Average	7.5 N
StdDev	2.4 N
MinMax	6.4 N

Much higher than Mockup and more variable
(DH reports 3.0 N wires with .25 N variability)

I propose to measure all wires, identify outliers
and substitute them

Parameters	
wire diameter	0.2 mm
wire length	0.3 m
density (SS)	7970 kg/m ³

Wire ID	First Harm. Freq [Hz]	Tension [N]
1	300	8.1
2	240	5.2
3	300	8.1
4	239	5.1
5	229	4.7
22	236	5.0
24	244	5.4
99	351	11.1
98	322	9.3
97	272	6.7
96	343	10.6
95	341	10.5