

# LArTPC 50 kT.

## Vertical wires stress and elongation.

### Situation:

#### I. LArTPC without liquid Argon.

- the wires are strain. Temperature- 20°C.
- the "Warm tank" temperature = "Cold tank" temperature=outside temperature [-30°C,+50°C]. Use 20°C.

#### II. LArTPC without liquid Argon.

- the wires are strain and cold (work temperature 87K).
- the "Warm tank" temperature = "Cold tank" temperature=outside temperature [-30°C,+50°C]. Use 20°C.

#### III. LArTPC with liquid Argon.

- the wires are strain and cold (work temperature 87K).
- "Cold tank" temperature 87K
- "Warm tank temperature [-30°C,+50°C]. Use 20°C.

#### IV. LArTPC with liquid Argon.

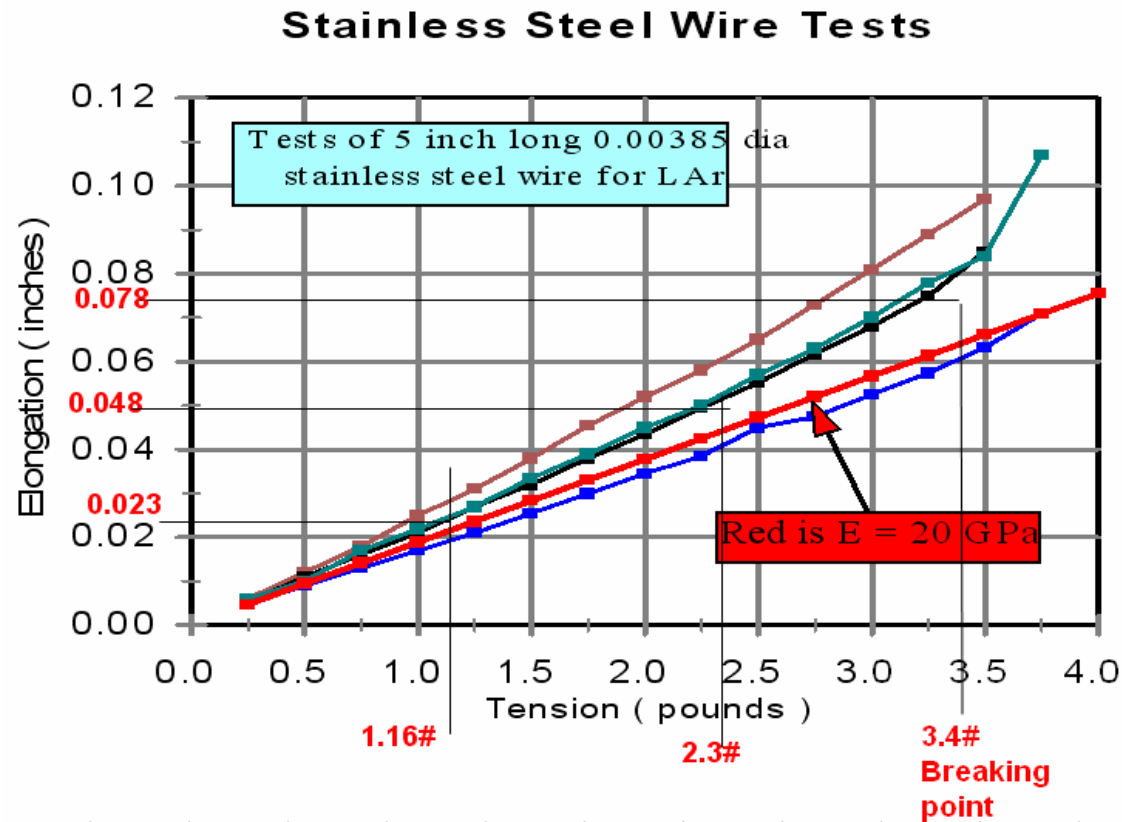
- the wires are strain and cold (work temperature 87K).
- "Cold tank" temperature 87K (but deck not move)
- "Warm tank temperature [-30°C,+50°C]. Height change.

# LArTPC 50 kT. Vertical wire parameters.

1				
2				
3	Wires	SS304		
4	Dia	3.85E-03 in	9.78E-05 m	
5	Wire area	1.16E-05 in <sup>2</sup>		
6	Wire Length	5 in		
7				
8	tension (Hans)	1.16 #	1.00E+05 psi	
9	Tension is noted	2.30 #	1.98E+05 psi	
10	Yield point is noted	3.20 #		
11	Breaking point is noted	3.40 #		
12				
13				
14	Yield stress	2.75E+05 psi		
15	Breaking stress	2.92E+05 psi		
16				
17	Elongation (1.16 #)	0.023 in	0.46 %	
18	Elongation (2.3 #)	0.048 in	0.96 %	
19	Elongation (3.4 #)	0.078 in	1.56 %	
20				
21	<b><i>Hans use:</i></b>			
22				
23	Wires	SS304		
24	Dia	3.94E-03 in	0.0001 m	
25	Wire area	1.22E-05 in <sup>2</sup>		
26	Wire force	1.22 #		
27				
28	Tension	1.00E+05 psi		

Date from "Some Notes on the 4 mill LArTPC wire December 9, 2005"  
by Doug Jensen

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Plot from "Some  
Notes on the 4 mill  
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46			
47			
48		wire tension, psi	
49		1.00E+05	1.98E+05
50	<b>I.LArTPC without Liquid Argon.</b>		
51			
52	30 m wire straine elongation, in	5.43	11.34
53	Wire Stress, psi	1.00E+05	1.98E+05
54	wire tension force	1.16	2.30
55	% to Yield force	36.38	71.88
56			
57			
58	<b>II.LArTPC without Liquid Argon.</b>		
59	(wire straine+temperature elongation)		
60			
61	30 m wire straine elongation (F), in	5.43	11.34
62	30 m wire temperature (87K)elongation (T), in	3.21	3.21
63	30 m wire total (F+T) elongation, in	8.65	14.55
64	5" wire elongation, in	<b>0.0366</b>	<b>0.0616</b>
65	wire tension force,# (using lab 8 plot)	<b>1.85</b>	<b>2.85</b>
66	% to Yield force	57.81	89.06
67			

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## Vertical wire stress and elongation. CONTINUE.

68			
69	<b>III.LArTPC with Liquid Argon.</b>		
70	(wire straine+temperature elongation-Cold tank shrinkage)		
71			
72	30 m wire straine elongation (F), in	5.43	11.34
73	30 m wire temperature (87K)elongation (T), in	3.21	3.21
74	cold tank(87K) height shrinkage (H), in	2.32	2.32
75	30 m wire total (F+T-H) elongation, in	6.33	12.24
76	5" wire elongation, in	<b>0.0268</b>	<b>0.0518</b>
77	wire tension force,# (using lab 8 plot)	<b>1.35</b>	<b>2.37</b>
78	% to Yield force	42.19	74.06
79			
80			
81	<b>IV.LArTPC with Liquid Argon.</b>		
82	(wire straine+temperature elongation+Warm atm.tenp [-30°C,+50°C] tank height change)		
83			
84	30 m wire straine elongation (F), in	5.43	11.34
85	30 m wire temperature (87K)elongation (T), in	3.21	3.21
86	Warm tank(atmospheric t) height change (H1)	1.56	1.56
87	30 m wire total (F+T+H1) elongation, in	10.21	16.11
88	5" wire elongation, in	<b>0.0432</b>	<b>0.0682</b>
89	wire tension force,# (using lab 8 plot)	<b>2.18</b>	<b>3.08</b>
90	% to Yield force	68.13	96.25
91			

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## Vertical wire stress and elongation. CONTINUE.

