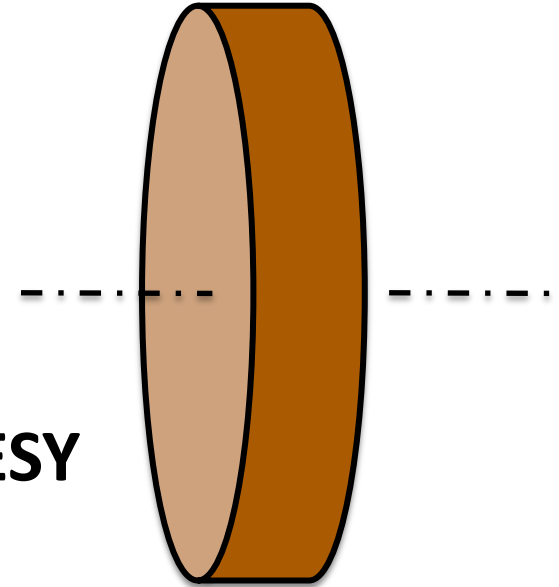


Target studies for the ILC

300 Hz conventional e^+ source



29-May-2013
ECFA LC Workshop at DESY
T. Omori

Target study team:

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T. Takahashi (Hiroshima), M. Kuriki (Hiroshima), and T. Omori (KEK)**

Conventional e+ Source for ILC

Normal Conducting Drive and Booster Linacs in 300 Hz operation

e+ creation

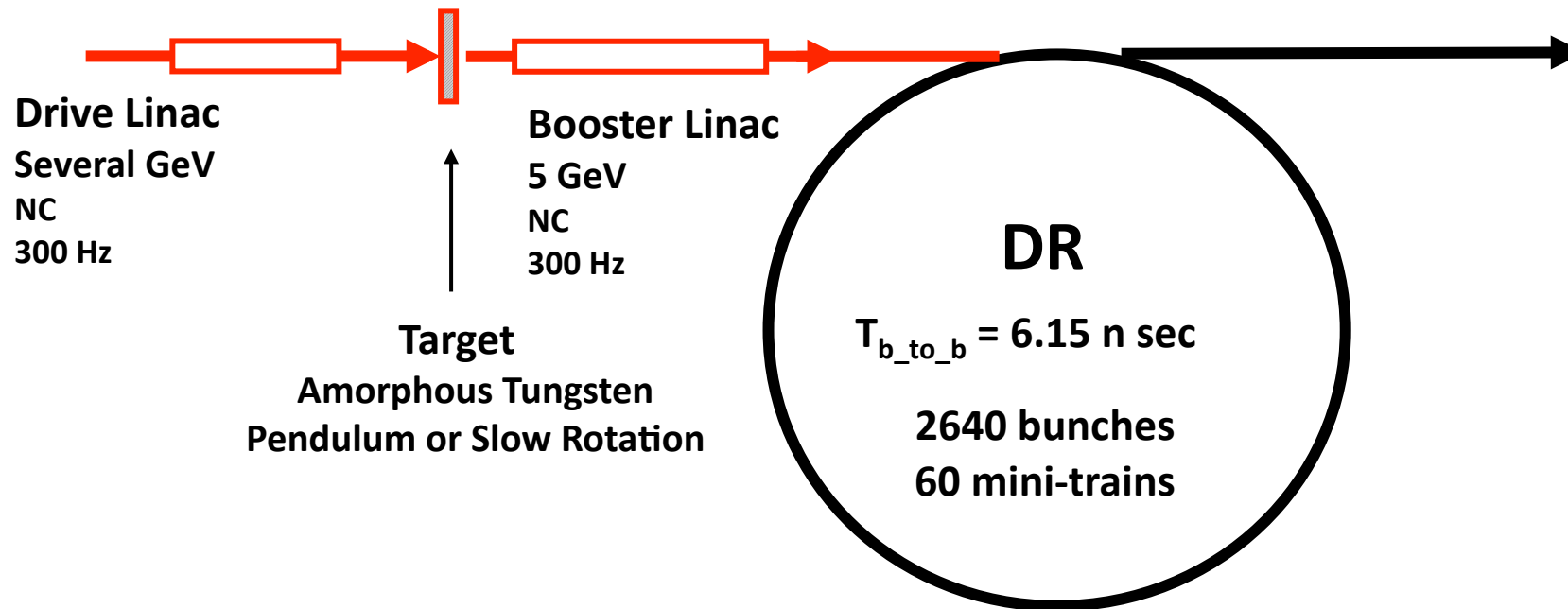
20 triplets, rep. = 300 Hz

- triplet = 3 mini-trains with gaps
- 44 bunches/mini-train, $T_{b_to_b} = 6.15$ n sec

go to main linac

2640 bunches/train, rep. = 5 Hz

- $T_{b_to_b} = 369$ n sec



Time remaining for damping = 137 m sec

We create 2640 bunches
in 63 m sec

← Stretching

Assumptions

drive electrons

2×10^{10} /bunch



a triplet: 132 bunches 992ns



3.3ms

a train: 20 triplet

= 2640 bunches 63ms

132 bunches

make a shock wave

heat same position on the target



each triplet hits

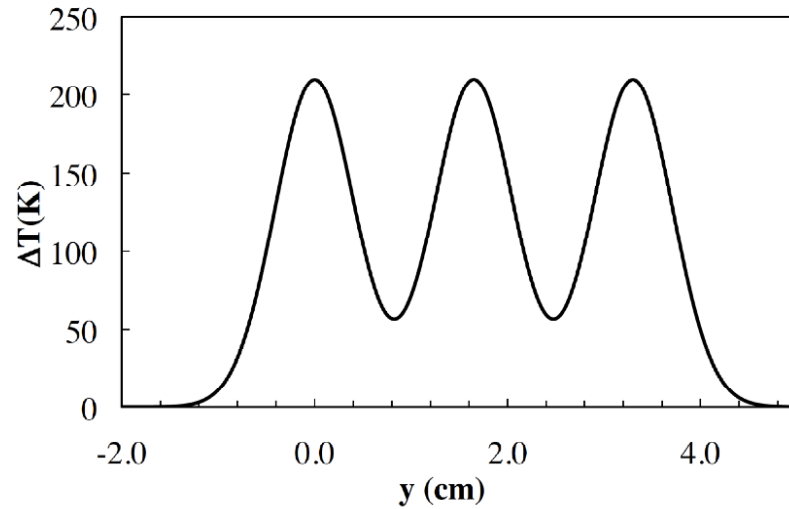
different position on the target



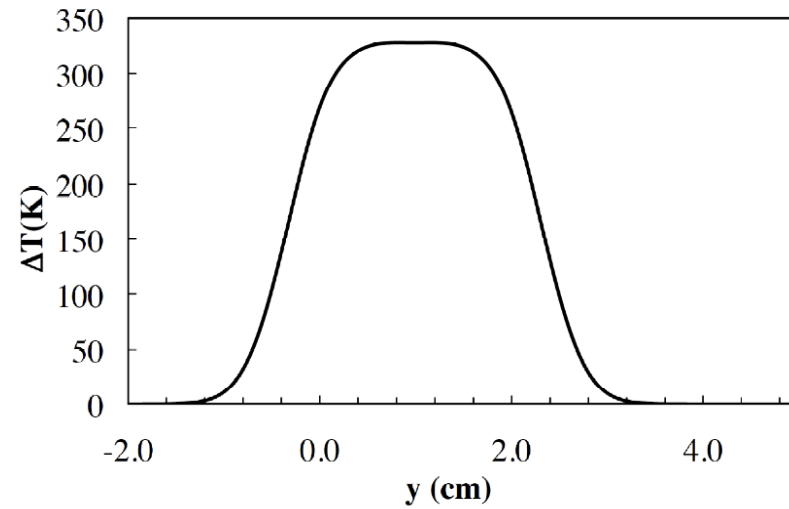
slow rotation target

Target Heat Simulation (Warming)

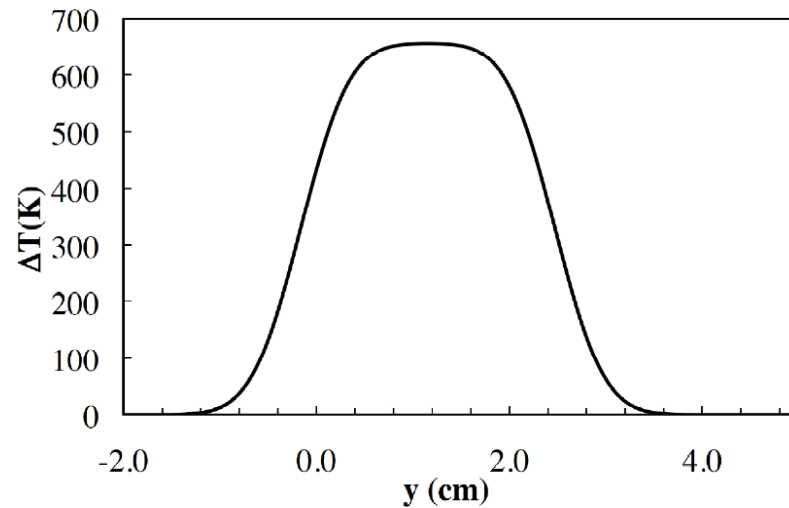
(a) 5 m/s, after 3 triplets



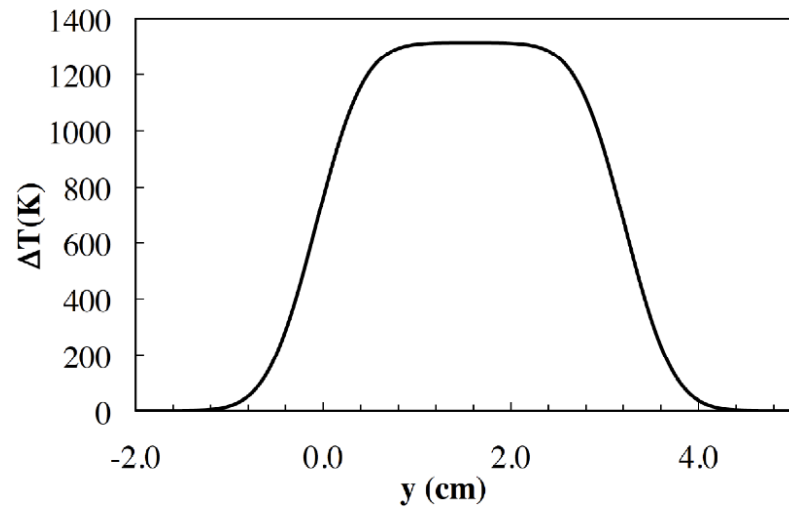
(b) 2 m/s, after 4 triplets



(c) 1 m/s, after 8 triplets

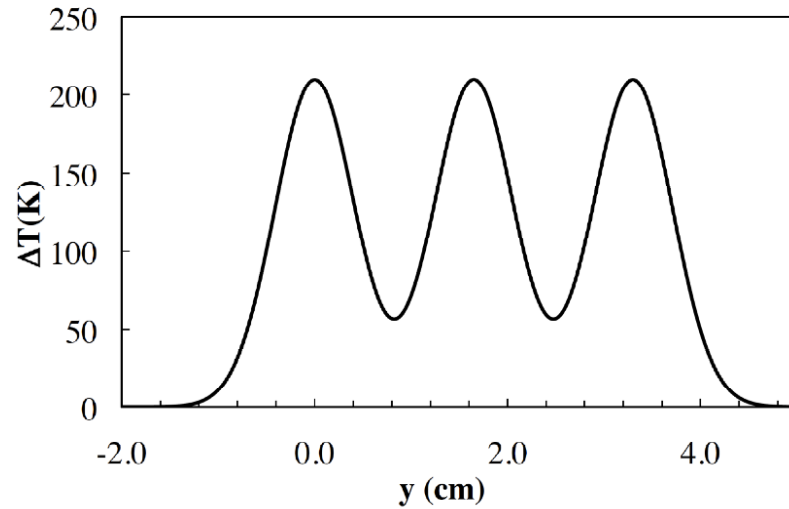


(d) 0.5 m/s, after 20 triplets

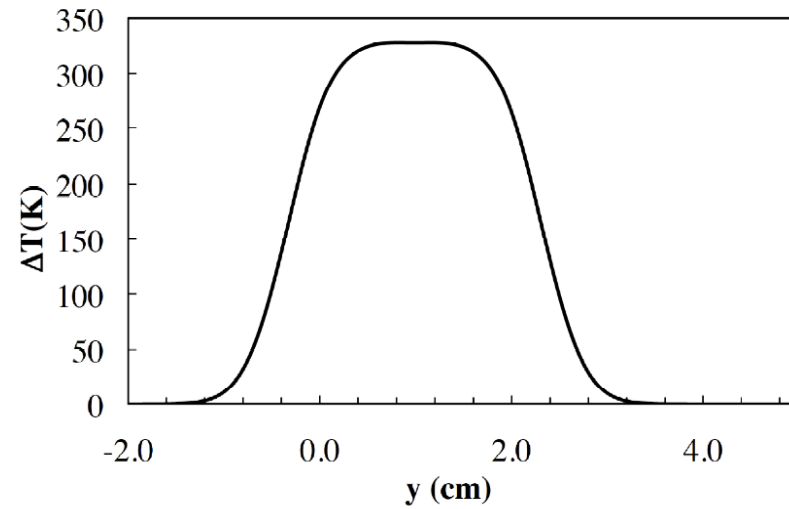


Target Heat Simulation (Warming)

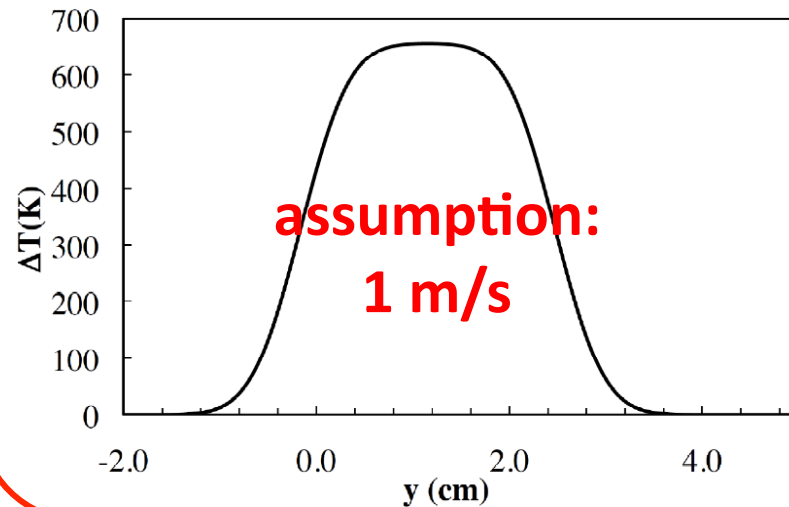
(a) 5 m/s, after 3 triplets



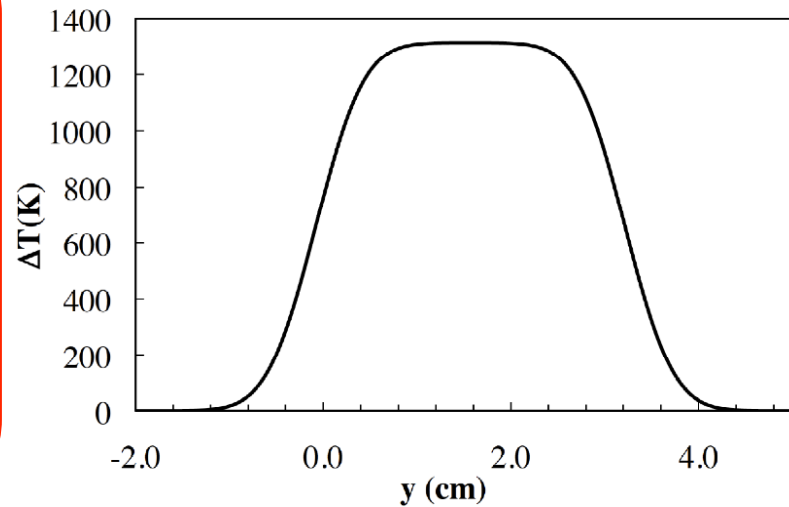
(b) 2 m/s, after 4 triplets



(c) 1 m/s, after 8 triplets



(d) 0.5 m/s, after 20 triplets



Requirements

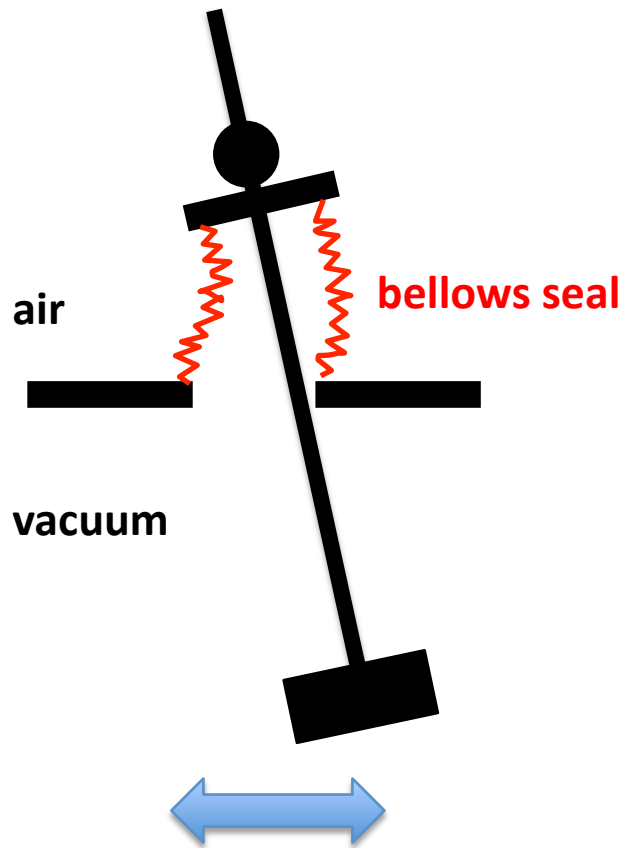
Tangential speed : 1 m/s

Good vacuum, No contamination

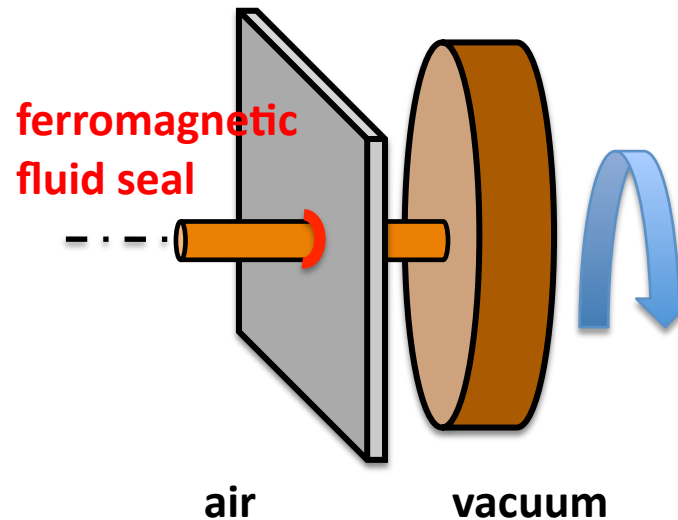
Life Time (Mean Time Between Failure)

We study 2 types of targets

5 Hz pendulum
with bellows seal



Slow rotation target
with ferromagnetic
fluid seal



What are potential issues?

5 Hz pendulum
with bellows seal

Slow rotation target
with ferromagnetic
fluid seal

Issue?

Tangential speed

NOT issue

NOT issue

Good vacuum,
No contamination

Issue
(ferromagnetic fluid)

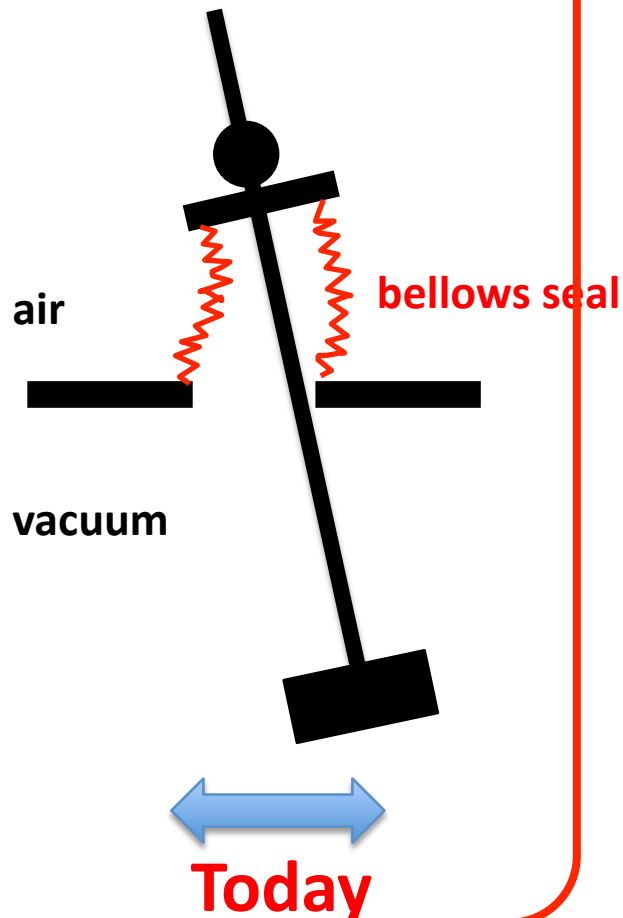
Issue
(bellows)

Life Time

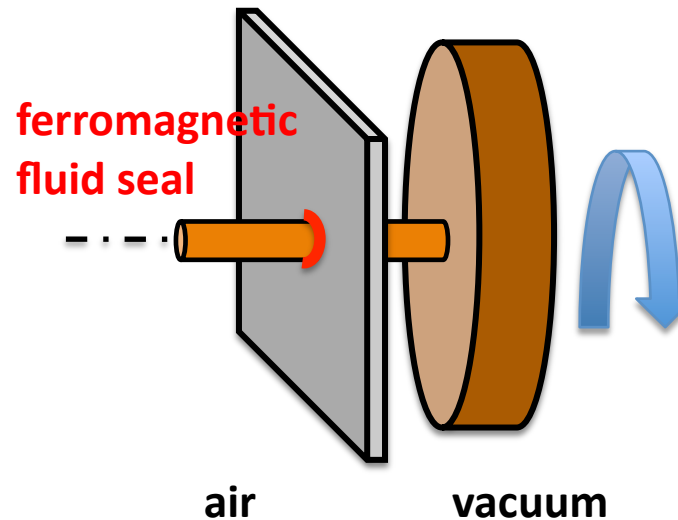
Issue?

We study 2 types of targets

5 Hz pendulum
with bellows seal



Slow rotation target
with ferromagnetic
fluid seal

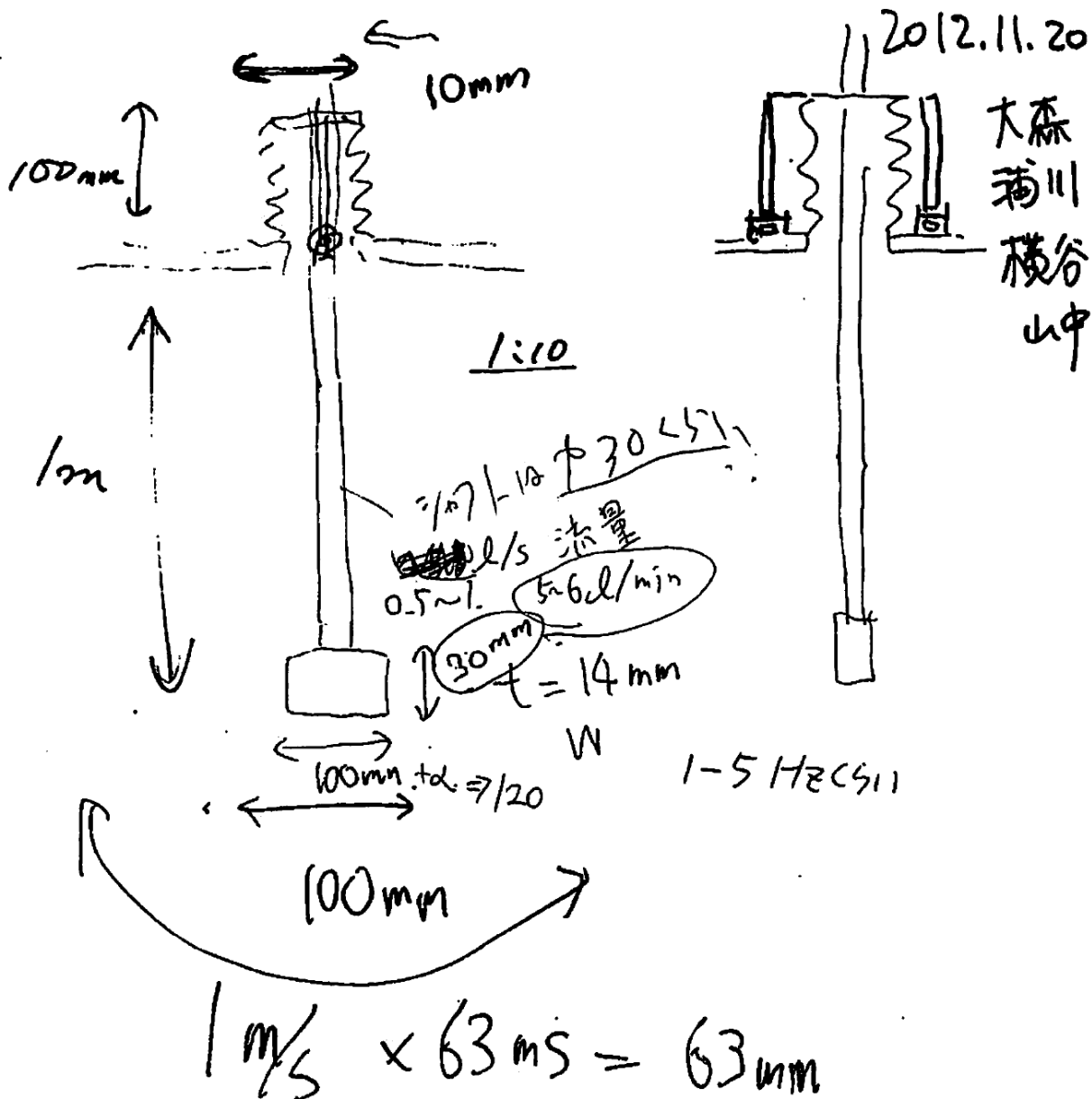


Plan of test: 5 Hz pendulum with bellows seal

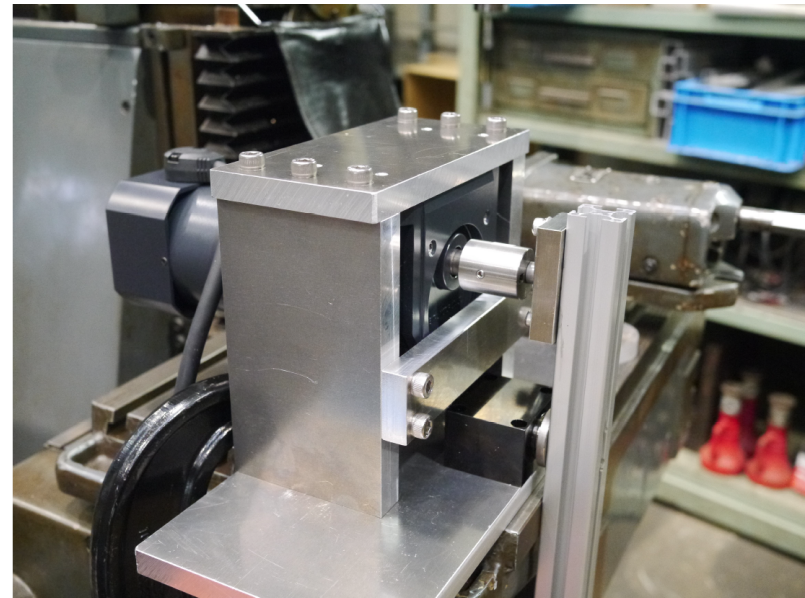
タングステンターゲット
の振子
接続するバローズ
の耐久テストベンチ
1-7112

5 Hzでストローク 100mm
検証する?

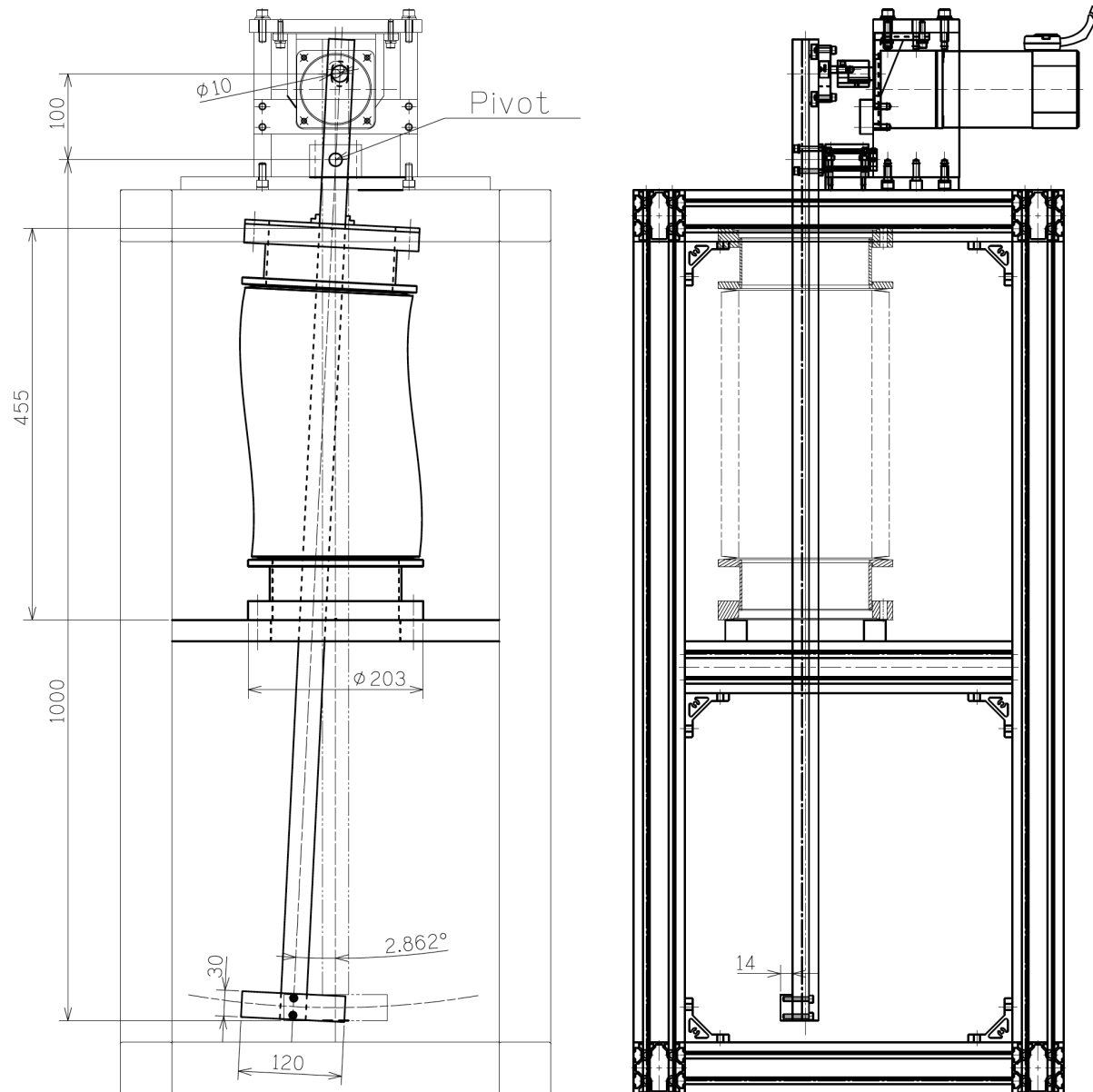
半年くらいの耐久テスト



Toy model: 5 Hz pendulum (no bellows)



Drawing of the model with bellows (in air)



Summary

1. We make tests of the target for ILC conventional e+ source.
2. We plan to test two types of targets.
 - * 5 Hz pendulum target with bellows seal
 - * Slow rotation target with ferromagnetic fluid seal
3. We made a toy model of the 5 Hz pendulum target.
No mechanical difficulty to made 5 Hz motion with 100 mm stroke (with no bellows).
4. Next step for pendulum target is long term test with bellows. --> We see the life time of the bellows.
5. Discussion with Rigaku is underway for slow rotation target.
It seems that Rigaku thinks 1 m/s can be achievable.
We need to make a prototype to test leak rate and the effect of vaporization of the fluid.