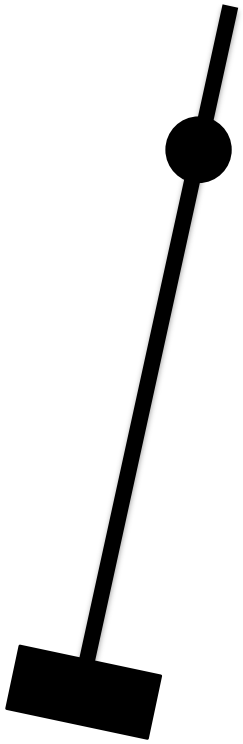
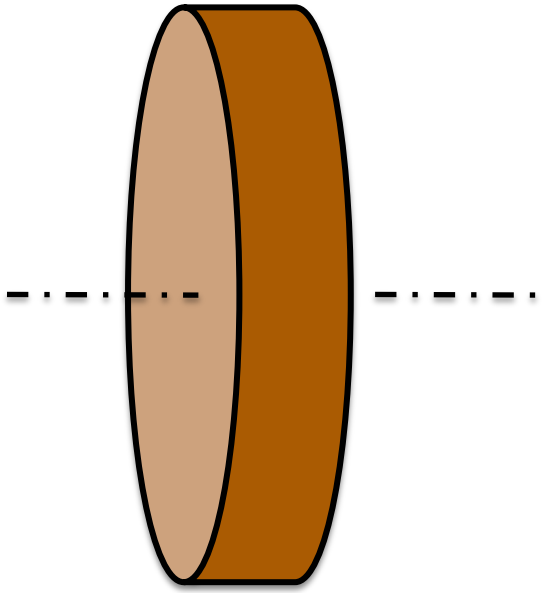
Target studies for the ILC conventional e+ source



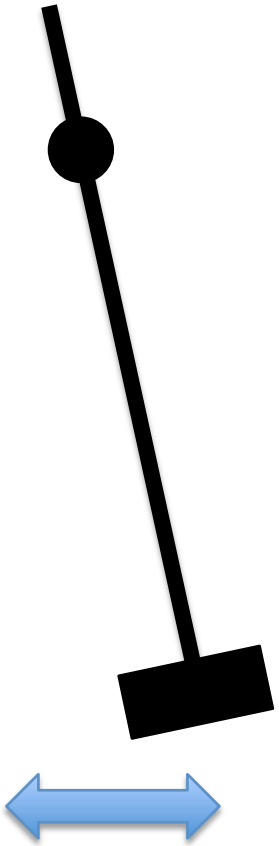


21-May-2013
ILC-CLIC e+ studies
T. Omori

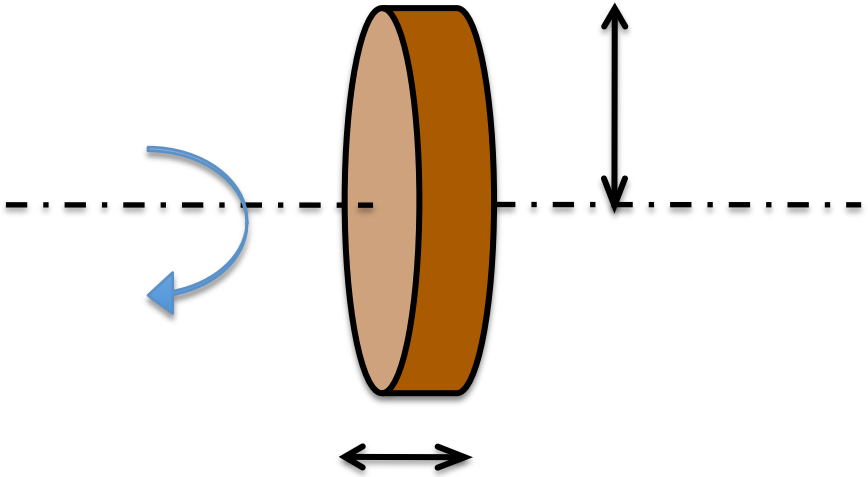
Target study team:
K. Yokoya (KEK), J. Urakawa (KEK), M. Yamanaka (KEK),
T. Takahashi (Hiroshima), M. Kuriki (Hiroshima), and T. Omori (KEK)

We study 2 types of targets

5 Hz pendulum with bellows seal



Slow rotation target with ferromagnetic fluid seal



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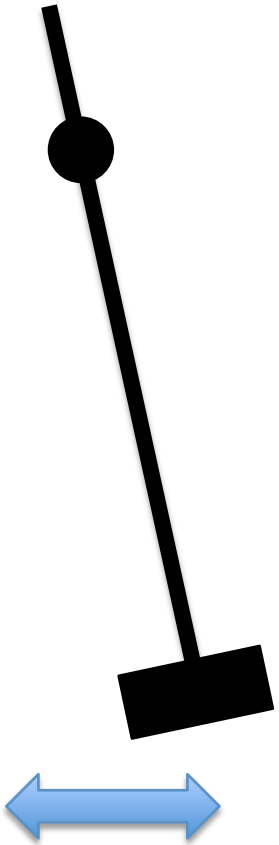
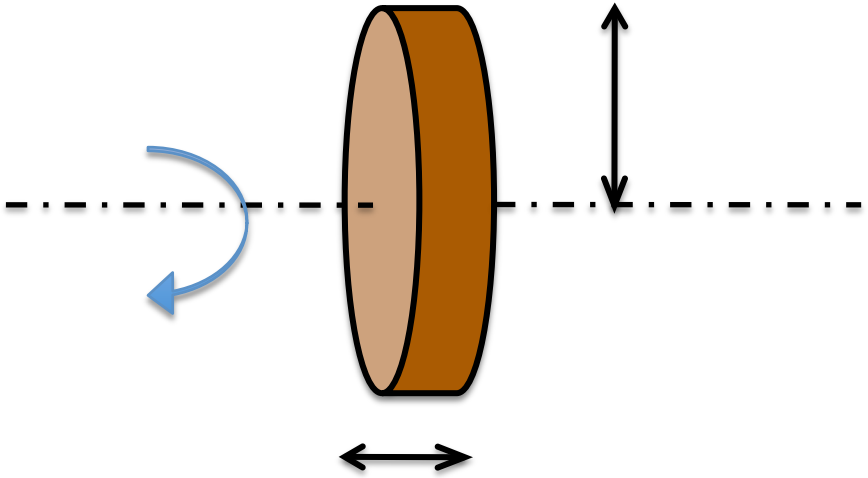


Today

Slow rotation target with ferromagnetic fluid seal

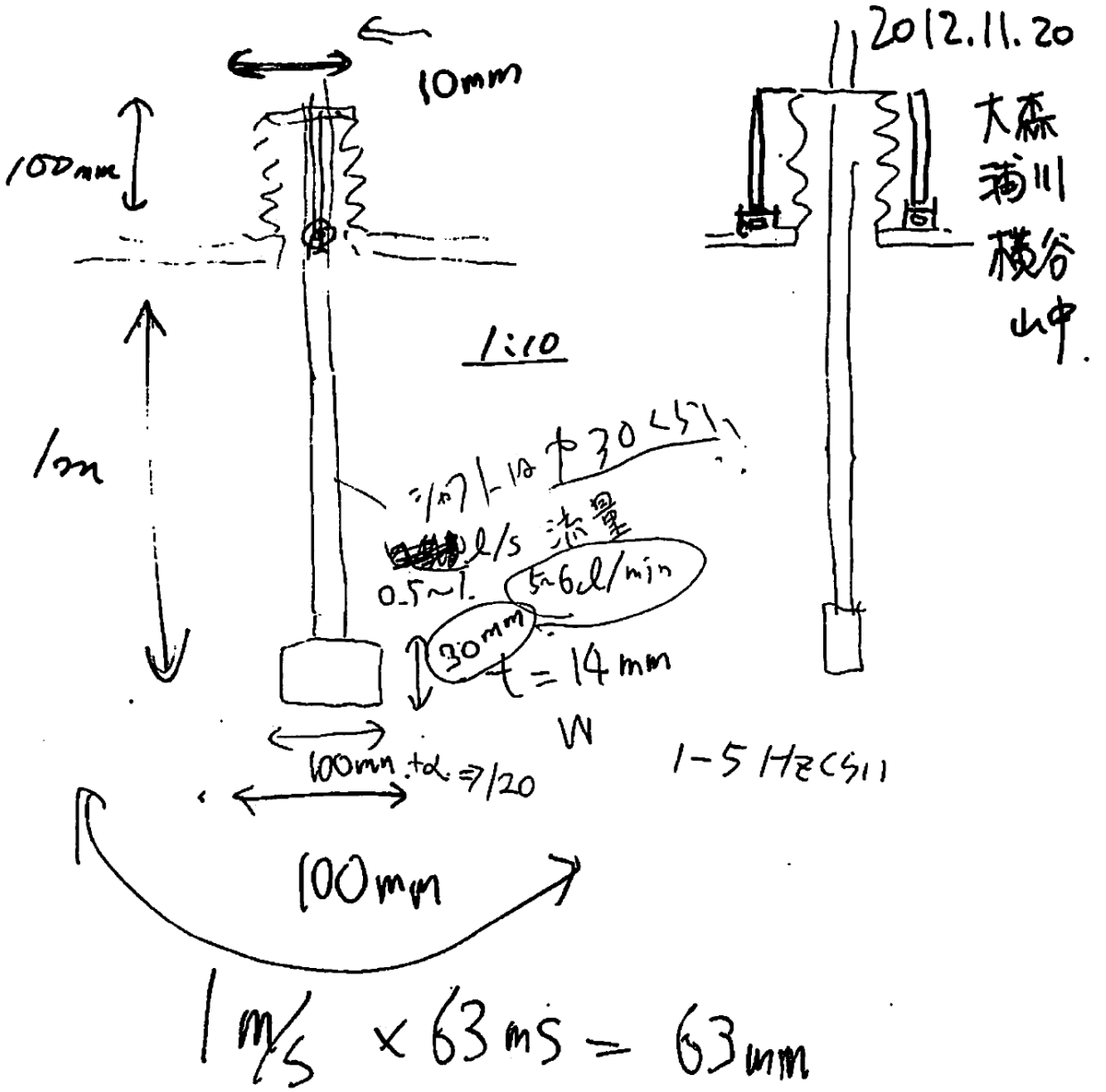


Plan of test: 5 Hz pendulum with bellows seal

タングステンターゲットの振り子
接続するベローズの耐久テストベンチについて

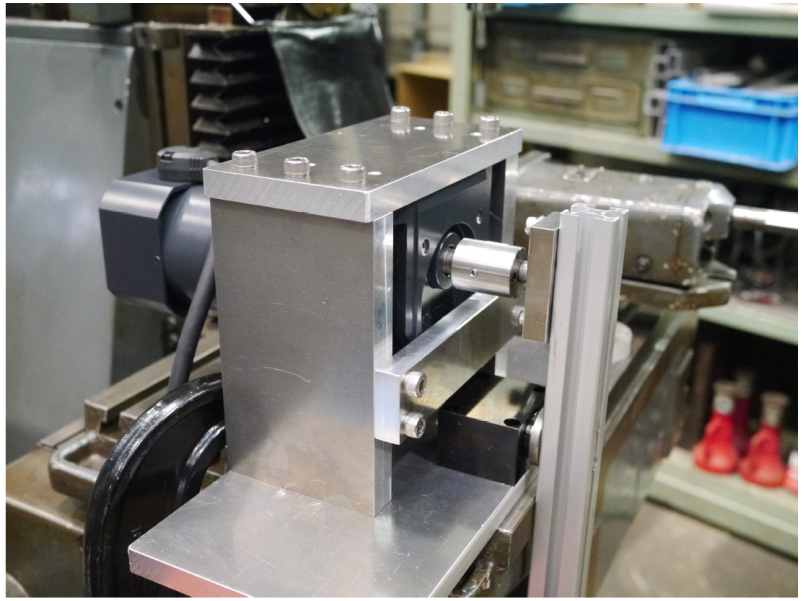
5Hzでストローク100で振れるか？

半年くらいの耐久テスト

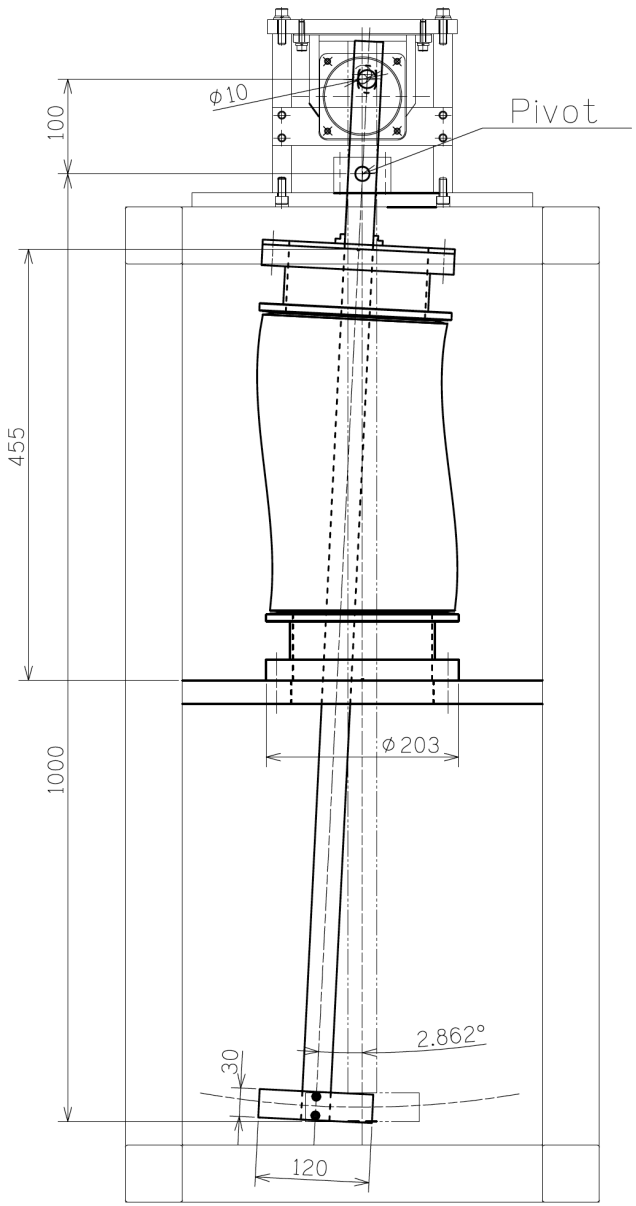


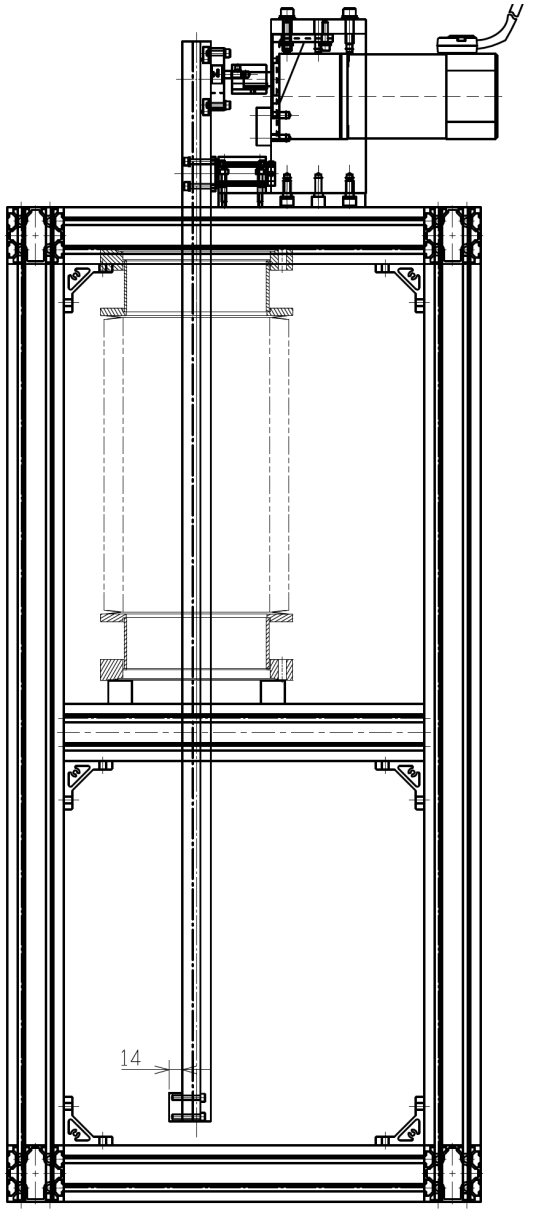
1 m/s × 63 ms = 63 mm

Toy model: 5 Hz pendulum (no bellows)



New: Drawing of the model with bellows (in air)





機械工学
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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.
   Now he have the drawing of the model with bellows.

5. Discussion with Rigaku is underway for slow rotation target.

Backups

Conventional e+ Source for ILC

Normal Conducting Drive and Booster Linacs in 300 Hz operation

e+ creation

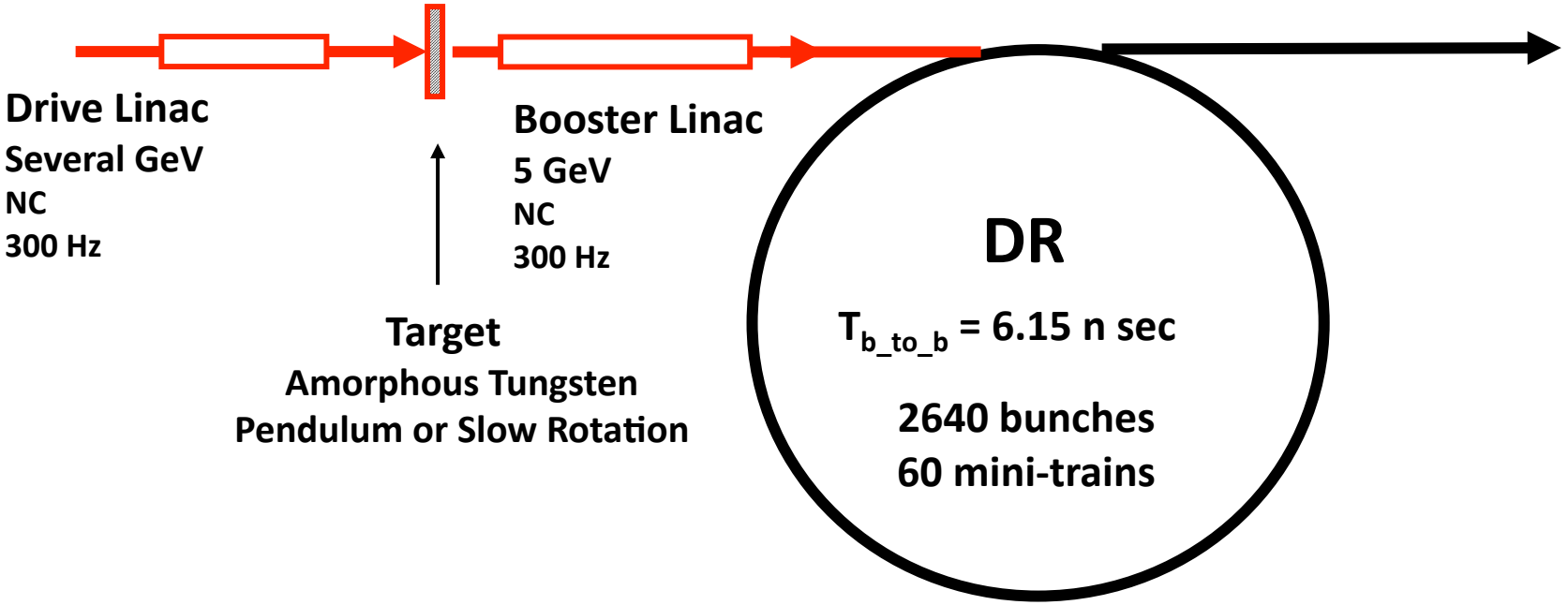
20 triplets, rep. = 300 Hz

- 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

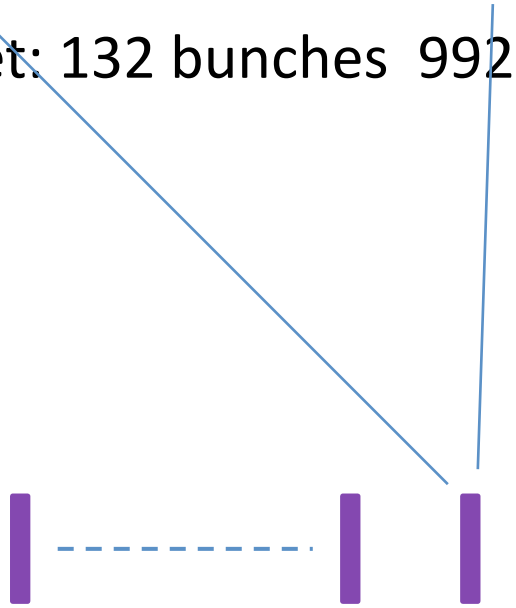
We create 2640 bunches in 63 m sec ← Stretching

Assumptions

drive electrons

2×10^{10}/bunch

a triplet: 132 bunches 992ns



3.3ms

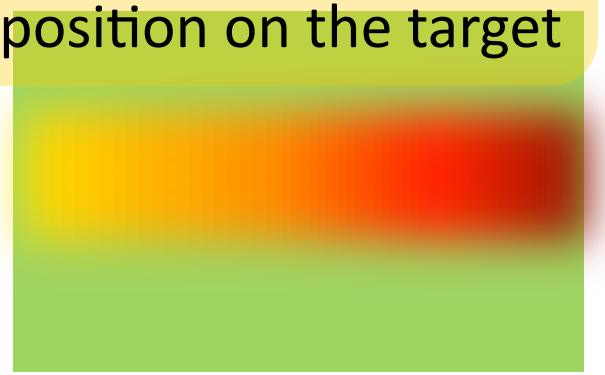
a train: 20 triplet

= 2640 bunches 63ms

132 bunches

make a shock wave

heat same position on the target



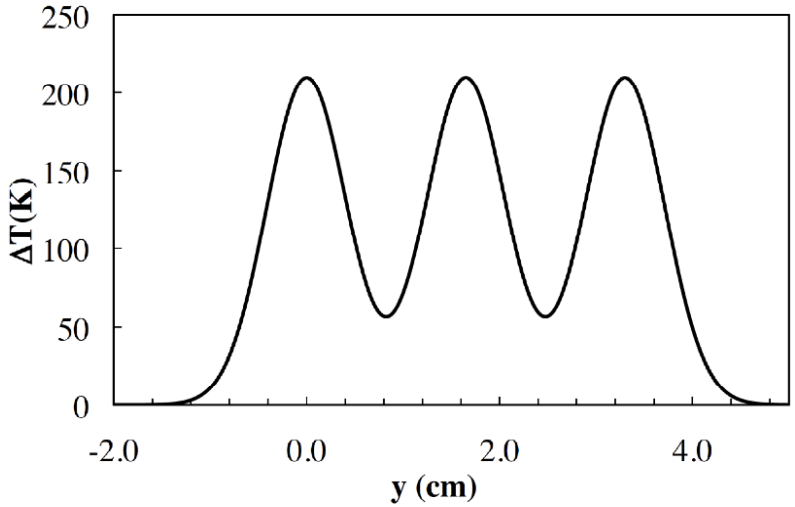
each triplet hits

different position on the target

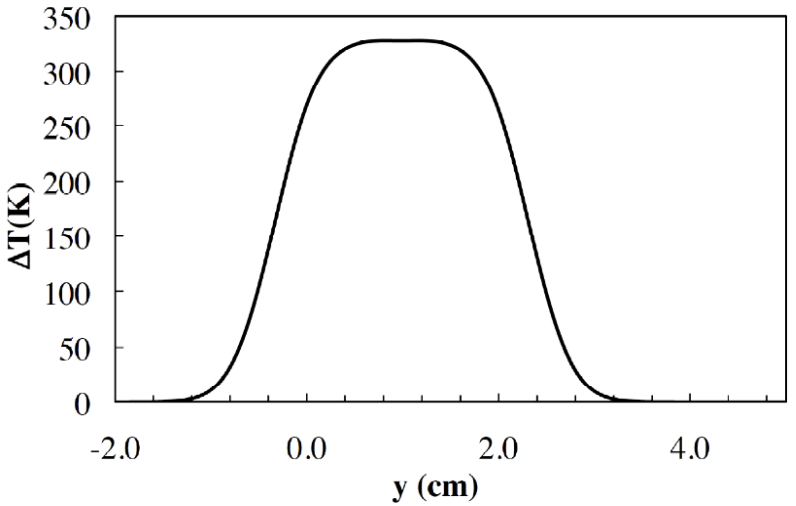
slow rotation target

Target Heat Simulation (Wanming)

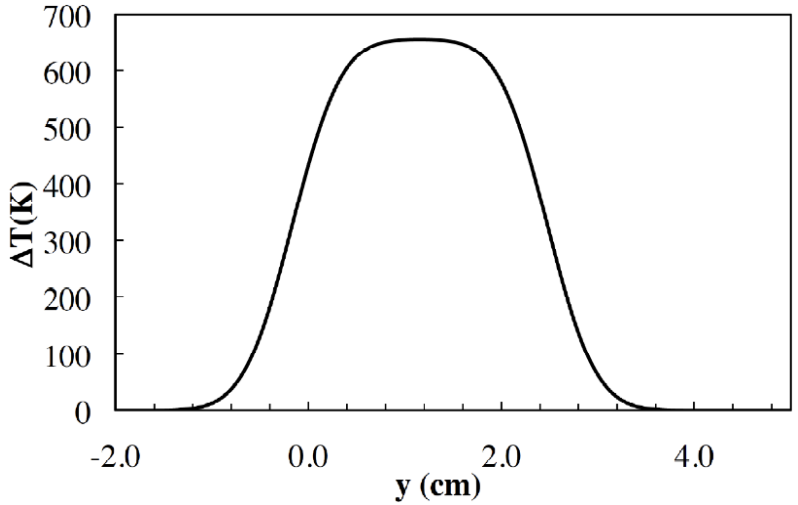
(a) 5 m/s, after 3 triplets



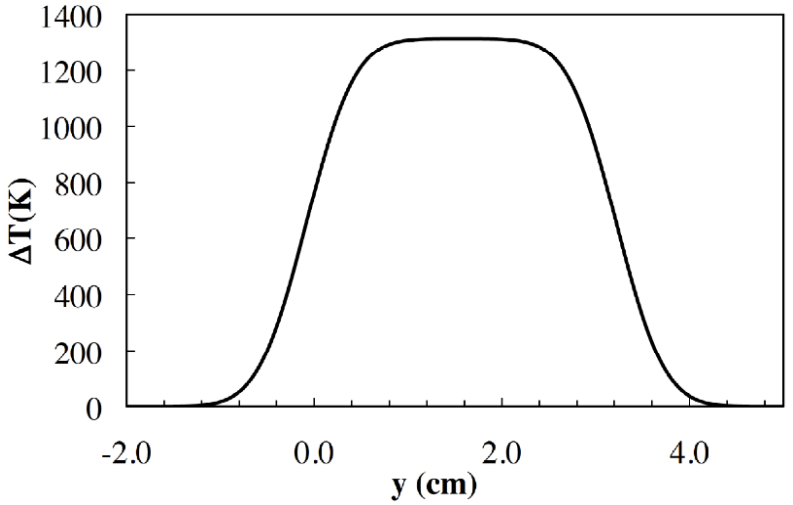
(b) 2 m/s, after 4 triplets



(c) 1 m/s, after 8 triplets



(d) 0.5 m/s, after 20 triplets



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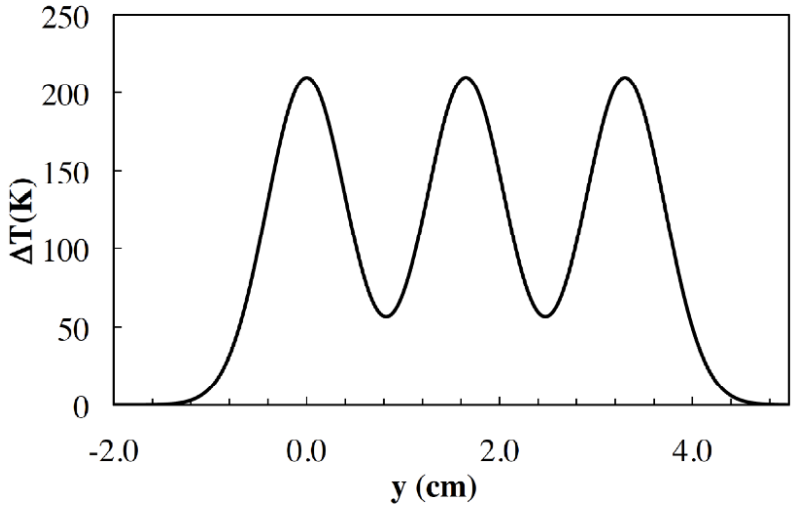

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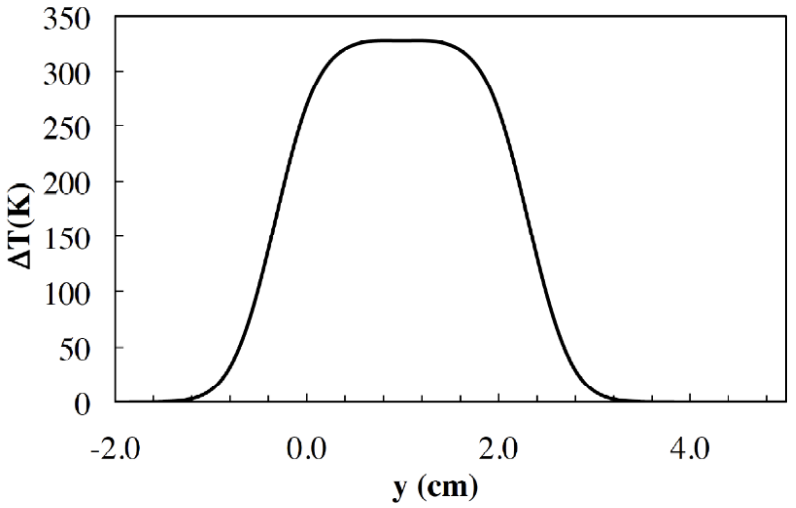

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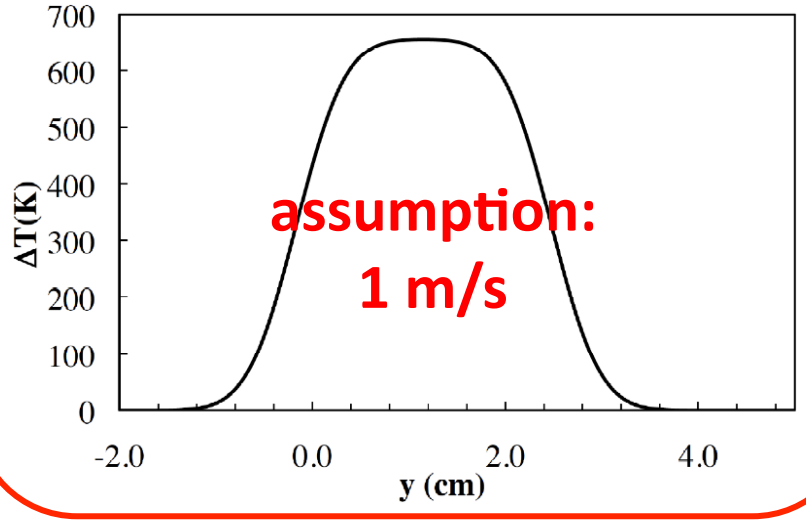
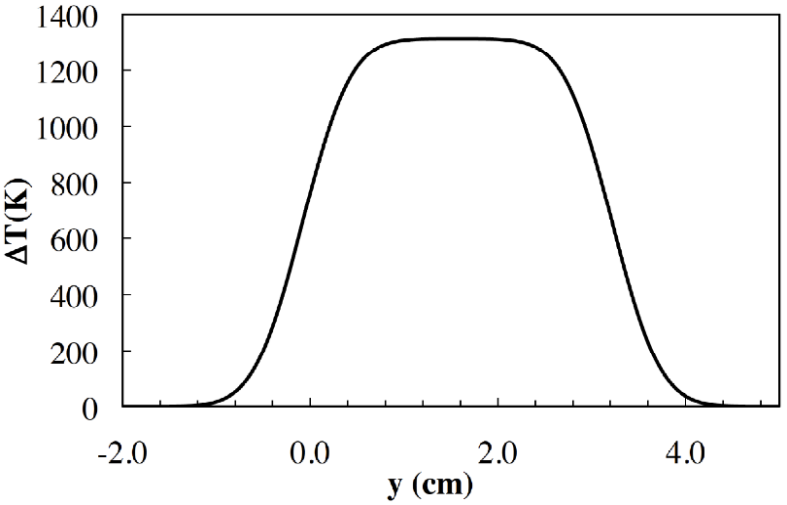


assumption: 1 m/s

(d) 0.5 m/s, after 20 triplets



Requirements

Tangential speed : 1 m/s

Good vacuum, No contamination

Life Time (Mean Time Between Failure)

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?

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