APEX Target Status

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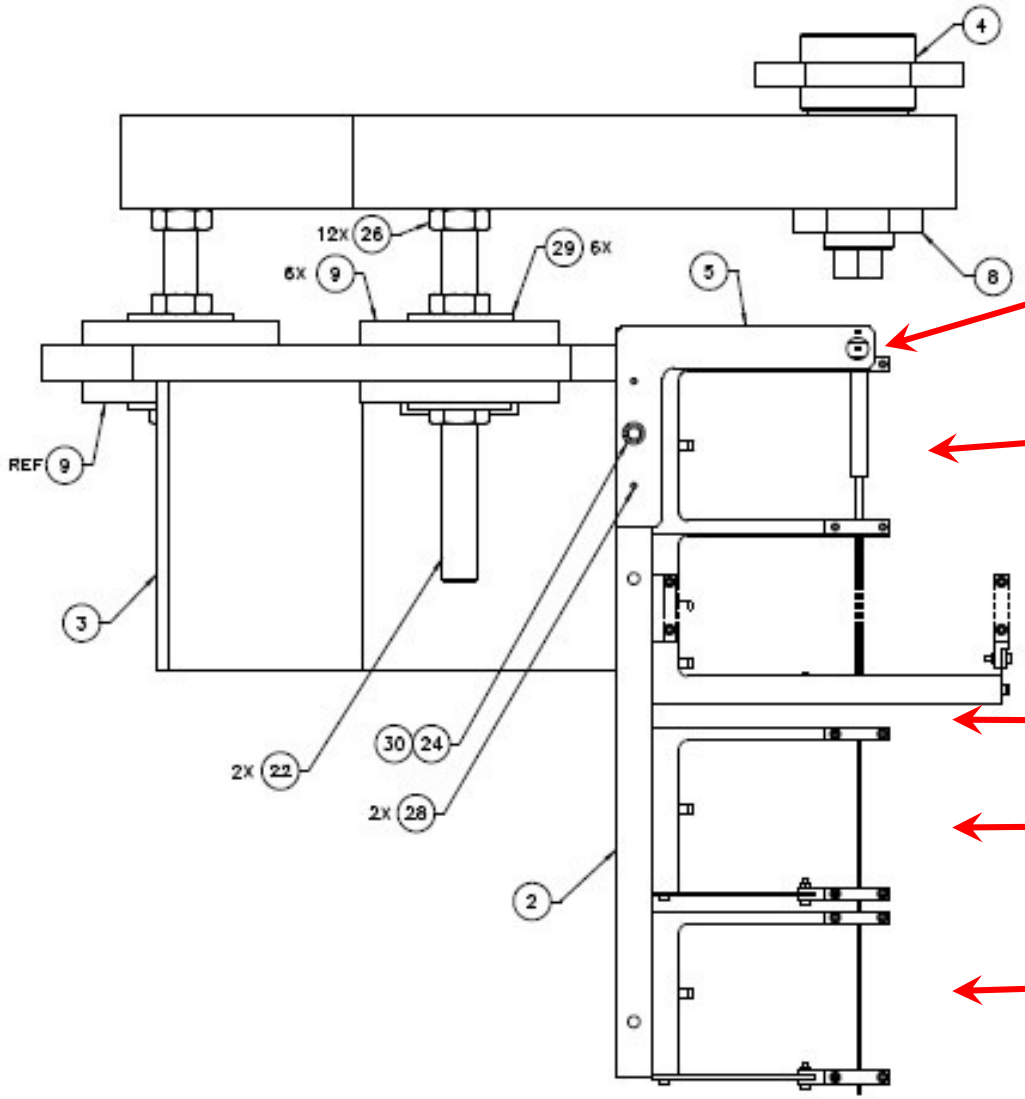
Target Thermal Assessment Summary

- A 10 W laser thermal assessment stand was built and operated in Lab 6 at FEL to address concerns from the APEX-ERR
- We tested under vacuum and with no active cooling 2 tungsten foils (18.5 microns thick each) in their APEX Al frames with surface heating power densities 2 to 5 times the expected heating power density from the electron beam with the nominal raster area
- Measured the temperature distribution in the W foils and in the Al frames, the laser power loss, the displacement of the W foil when heated, the endurance of a W foil with power ON and the endurance of a foil under thermal cycling similar to electron beam trips and ramps
- Predictions with CFD simulations have been confirmed by measurements
- Conclusions:
  - The W foils tested can stand the max temperature expected from the electron beam
  - The W foils tested can stand more than 4000 thermal cycles from beam ON/OFF trips and ramps
  - There is no need for actively cooling the Al frame, which dramatically simplifies the target manufacturing, installation, operation and decommissioning
- Thanks for Sandesh Gopinath for bringing these tests to fruition

Target Status

- Redesigned to accommodate the new run plan - completed May 2018 (Joyce Miller)
- Clean-up naming correspondence between 3D CAD model and jlab's NX database (Sandesh Gopinath – July 2018)
- Sandesh Gopinath (mechanical engineer) will help (part time) with QA for the remaining target parts
- We'll (re)use the W wires and optics targets from the SLAC target, we'll use a new target mounting plate, new alignment mechanism, new vacuum bellows assembly and new motion system
- Submitted updated manufacturing drawings packages for bids for all remaining parts, except the motion mechanism; received one bid already
- We'll buy a new target motion motor and controller and the coupling of the motor with the target will be manufactured in house
- We'll order spare 10 microns W foils and graphite foils



Alignment holes, upstream and downstream

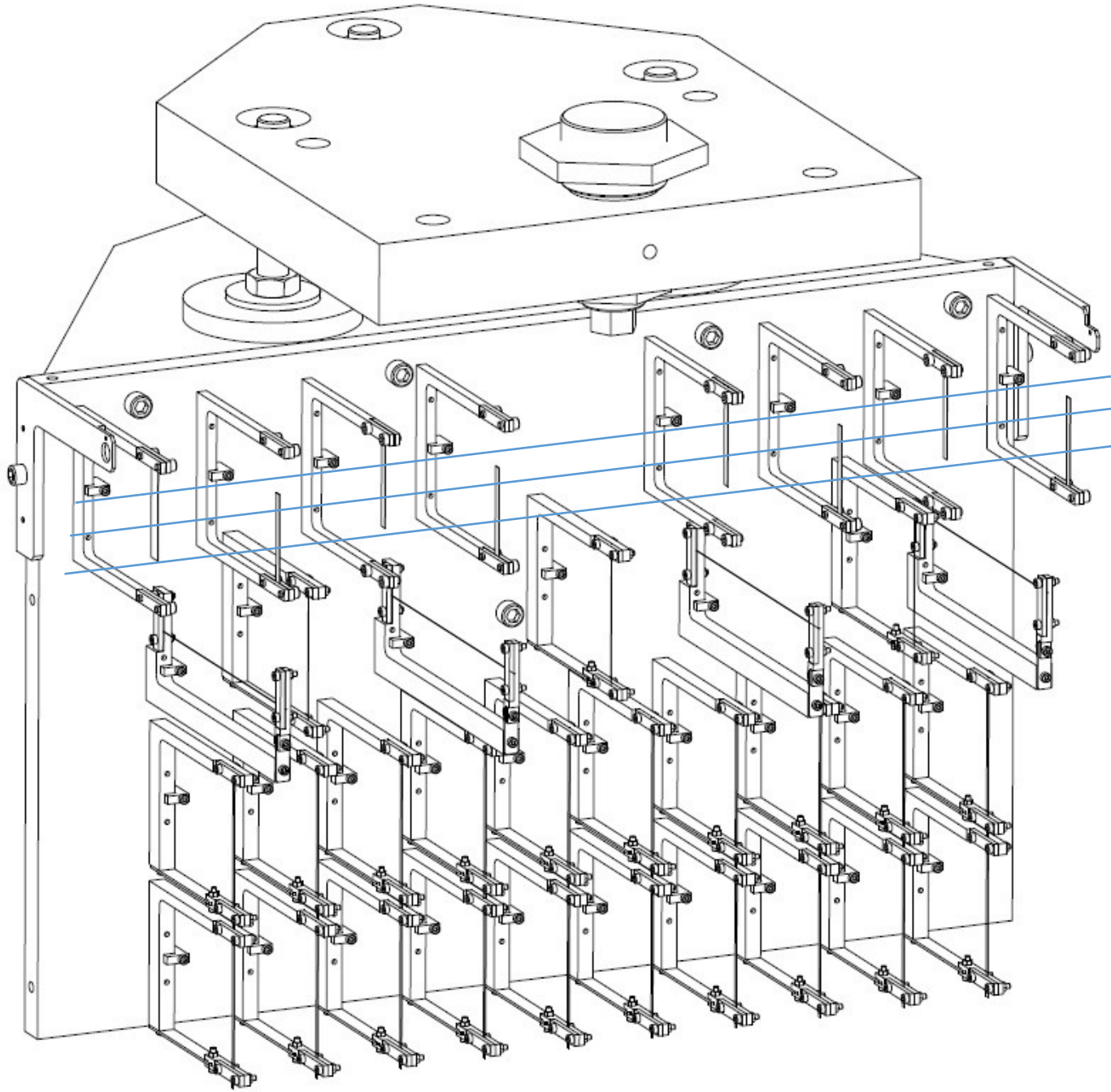
Optics, 3 positions vertically

Tungsten wires

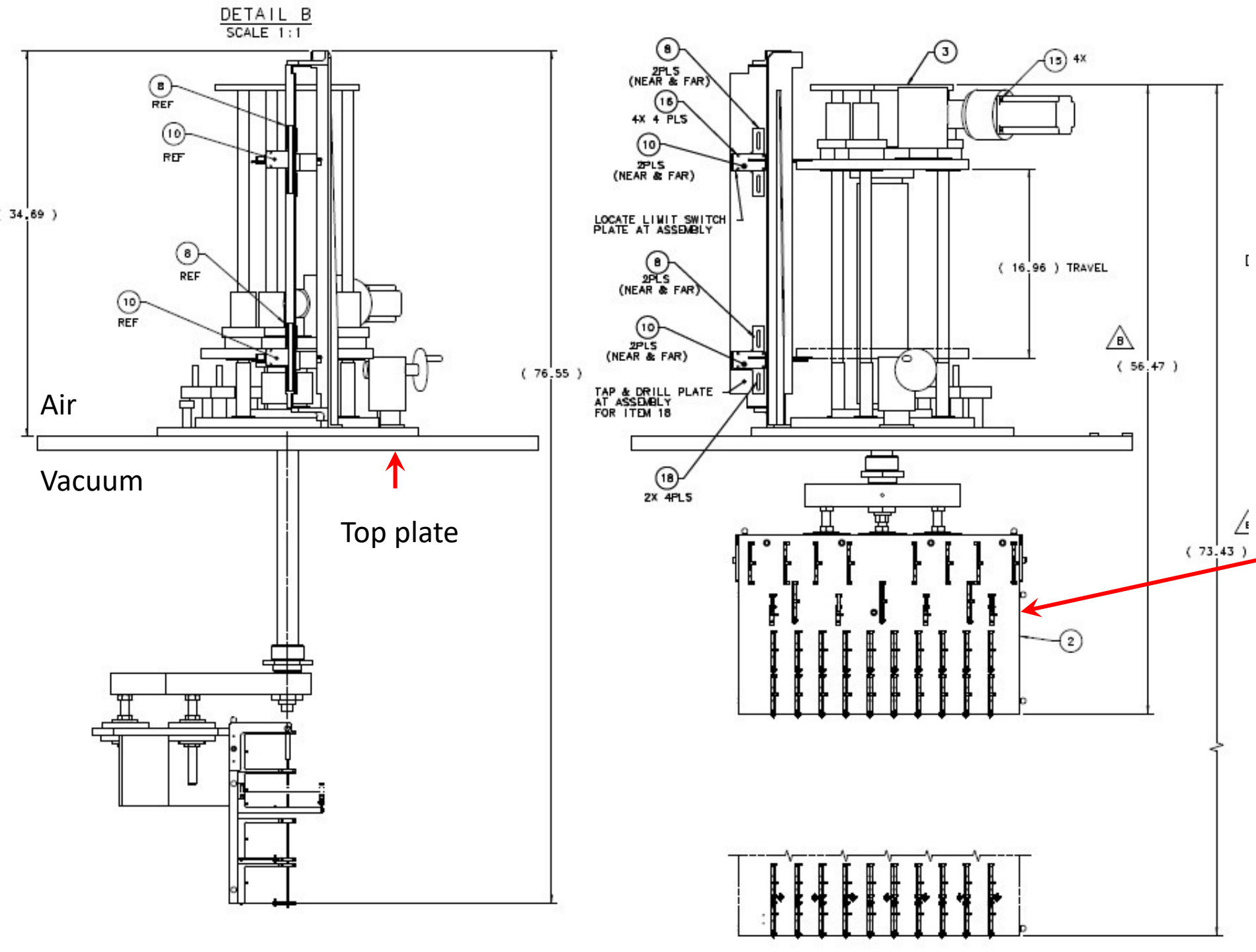
No target

10 Graphite foils production target, 0.07%RL, 0.2989 g/cm^2

10 tungsten foils production target, 2.8%RL, one foil is 10 microns thick



Optics1 – hits 4 graphite foils – top only
Optics2 – hits 8 graphite foils – top+bottom
Optics3 – hits 4 graphite foils – bottom only



Target assembly details, beam view and perpendicular to beam axis

Al mounting plate (new)

Target Schedule

- Have all parts manufactured by the end of Sep 2018
- Test the target motion mechanism with a new motor+controller by the end of Aug 2018 (SCD+SG)
- Target assembly test on the Al mounting plate by the end of Sep 2018 (SCD+SG)
- Need to schedule two sessions with the Alignment and Survey Group: first to survey the target outside its chamber (Sep-Oct 2018) and second do an alignment and survey in-situ (during APEX installation, after Thanksgiving 2018)
- Target monitoring will include a few temperature sensors on the Al frames (4-6), target motion control and target chamber vacuum: GUIs will have to be written for these (SCD+SW)
- We won't need a dedicated TO, target ops will involve moving the target, addressing target related alarms and monitoring temperatures and vacuum
- Target installation will be handled by Jessie&Co.
- Target decommissioning done by RCG
- I propose that we make Sandesh a member of the APEX collaboration

SG = Sandesh; SW = Sue Witherspoon; SDC = Silviu