



## Quad Controls Prototype

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Modifications to Quad Controls Prototype to fix the “d’s”

Advanced LIGO Suspensions

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T050172-00-D

8<sup>th</sup> September 2005

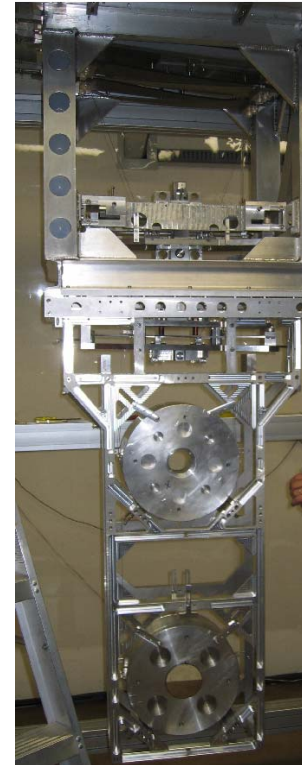
## Flexure Points and d values

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- Originally as per D040183 flexure points were, from the top down, as follows: -
  - » ~~5.07 mm~~            2.25 mm
  - » ~~3.35 mm~~            1.7 mm
  - » ~~3.02 mm~~            1.5 mm
  - » ~~2.19 mm~~            1 mm
  
  - » "d" values still all 1mm from CG!
  
  - » THEREFORE, Wire Jig lengths and position of break offs wrt CG need to be modified!

## Test suspension: “quick fix” to create stable configuration

- 10 mm spacer to modify d1
- 10 mm off length of top wire
- V0 to V2 down on middle blades @ top mass
- Ability to add mass to UI and pen masses
  - » Stable suspension!
  - » Overall height from seismic table to centre of optic 1747 mm cf. 1742 mm!



## Top stage and Blades

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- TOP STAGE

- » Default 106 mm from the “seismic table” to the top of the blade
  - Actual 108mm at thick end of blade!
  - 110 mm at blade tip!
    - SUGGESTION TO SHORTEN TOP WIRE BY 5mm!!

- MIDDLE BLADES

- clamps or blades? Blades!
  - Down by ~ 2mm!
    - » 007 & 006 with V6 instead of V8 (blade tip now lower)
    - » 001 & 004 with V2 instead of V0 (blade tip now lower)

- BOTTOM BLADES

- clamps or blades? Blades!
  - Down by ~ 2mm!
    - » 005, 012, 001 & 008 with V4 instead of V6! (blade tip now lower)

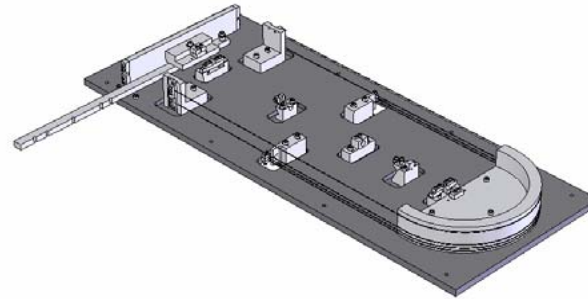
## Wire Jig, REF: T050016

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- TOP WIRE
  - » 455 mm (445 mm + 5 mm FP + 5 mm FP)
    - Now want 450 mm or even 445 mm!
      - Shims were 10 mm at each end, so now use 7.5 mm or 5 mm!
      - Ques: - Can tooling sections handle this change?
  
- FINAL WIRE
  - » 604.2 mm now 602.2 mm (test chain)
  - » 1701.72 mm now 1699.77 mm (reaction chain)
    - Same question as above?

## Wire Jig, REF: T050016

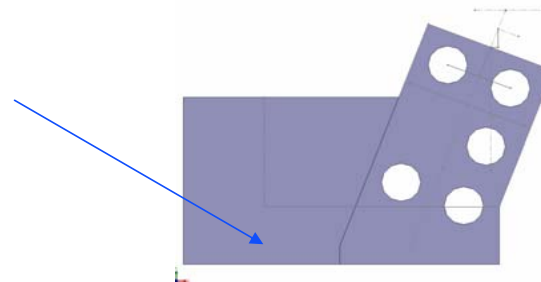
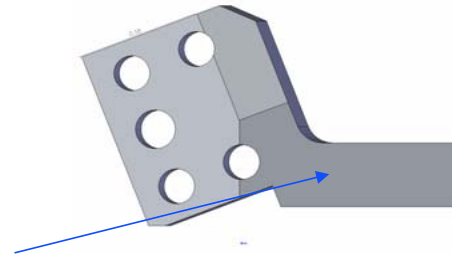
- UI WIRE
  - » 315.2 mm less 3.35 mm = 311.65 mm (both main and reaction chain)
    - Ques: - Can tooling sections handle this change?
- PEN WIRE
  - » 3mm off length on jig! 1181.77 mm becomes 1178.77 mm (both main and reaction chain)
    - Same question as above?



- Check assembly, LIGO-D050075 for required modifications?

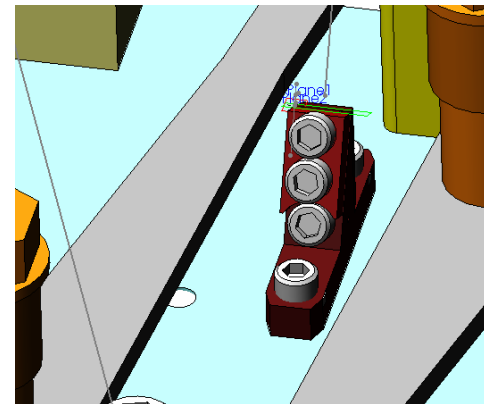
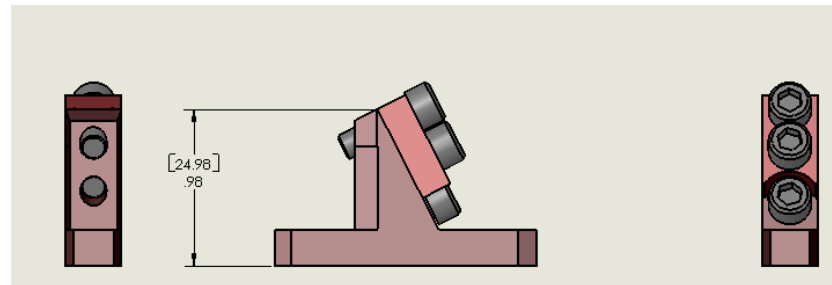
## Top Wire

- Top blade to top mass
  - » F.P. from 5 mm to 2.5 mm
    - Removed 2.3 mm off top blade wire clamp, to keep FP at CG of blade
    - Added 2.3 mm to top wire clamp at top mass



## UI Wire

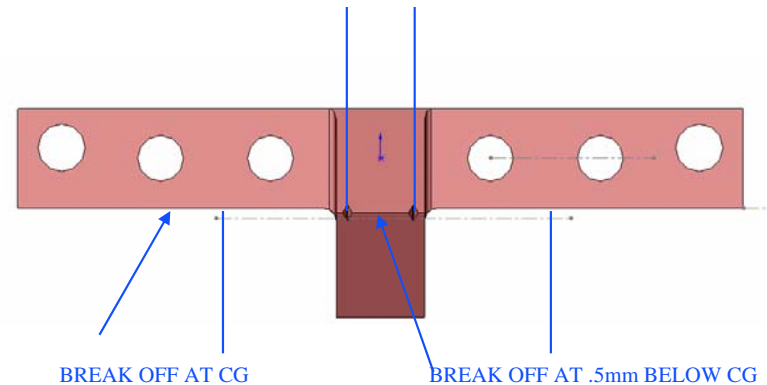
- Middle Blades to UI mass
  - » 'd' value still 1mm above CG but flexure point now only 1.7 mm instead of 3.35mm. Therefore, break off needs to move up 1.7mm or clamp needs to get 1.5 mm taller in vertical Z (after resolving)
  - » Also chose to make thinner clamp to ease interference with blades!
- Blades, ref slide 4





## Penultimate Wire

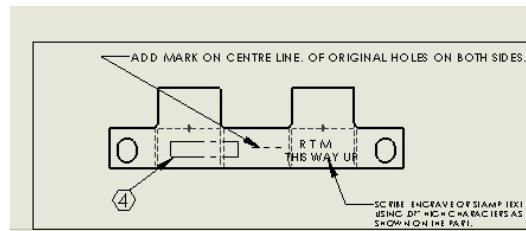
- Bottom blade to pen mass
  - NEW PEN WIRE CLAMP
    - Final wire break off at CG
    - Pen wire break off 0.5mm below CG so “d” value at FP 1mm above CG (FP now ~ 1.5 mm)
- Blades, ref slide 8



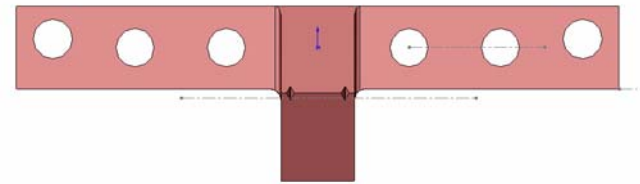
## Final Wire

- Pen mass to test mass
  - » FP reduced from 2 mm to 1 mm.
  - » “d” vaule still 1mm above CG.
  - » Therefore clamp re-designed to have slots so as break off can be positioned at CG!

### MODIFIED REACTION MASS CLAMP



LIGO-G9900XX-00-M



### NEW PEN WIRE CLAMP

