Discussion on increasing the Schnupp asymmetry

A preliminary document exploring allowable ETM's & ITM's mechanical clearances along the beam center line & the feasibility of cookie cutter 'BLANKS' for the following chambers:
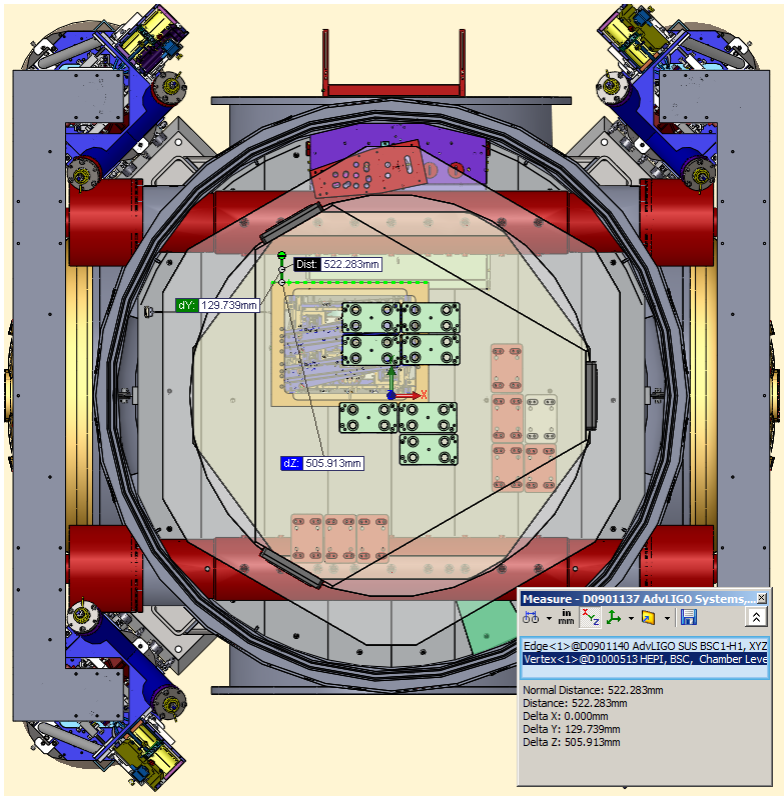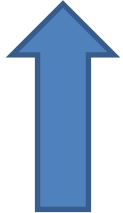(WBSC3, LBSC3)
(WBSC1, LBSC1)
(WBSC9, LBSC4)
(WBSC10, LBSC5)

Discussion on increasing the Schnupp asymmetry

Here are the rough calculations we did for each BSC Chamber about how much an ETM or ITM can be moved along the Beam Center Line.
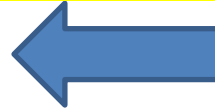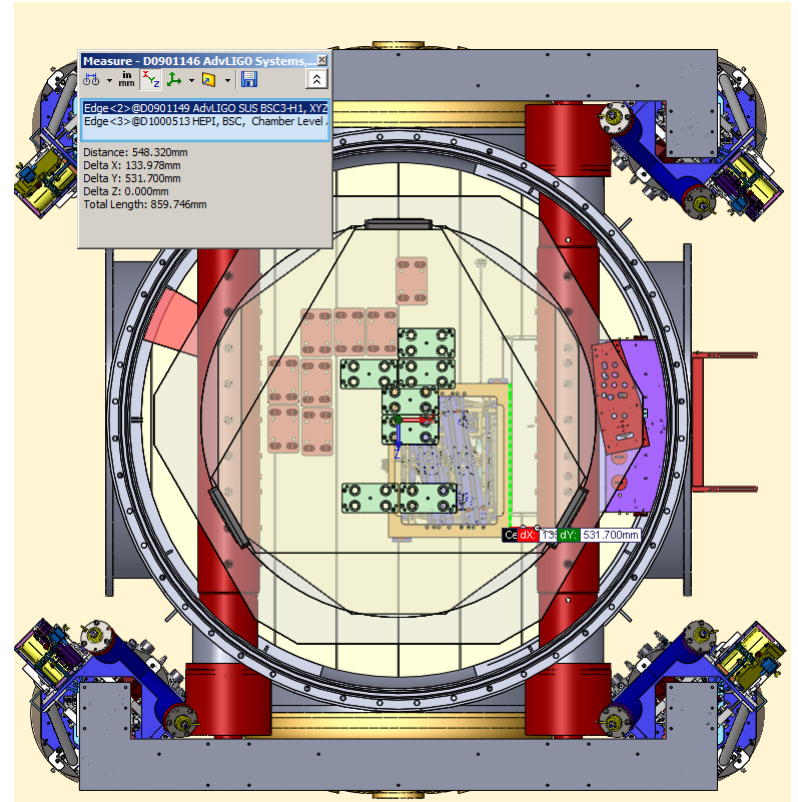
60 mm
Away from Global CS

450 mm
Toward Global CS

60 mm
Away from Global CS

450 mm
Toward Global CS

Dist: 522.283mm

dY: 129.739mm

dZ: 505.913mm

Measure - D0901137 AdvLIGO Systems,

Edge<1>@D0901140 AdvLIGO SUS BSC1-H1, XYZ
Vertex<1>@D1000513 HEPI, BSC, Chamber Leve

Normal Distance: 522.283mm
Distance: 522.283mm
Delta X: 0.000mm
Delta Y: 129.739mm
Delta Z: 505.913mm

Measure - D0901146 AdvLIGO Systems,

Edge<2>@D0901149 AdvLIGO SUS BSC3-H1, XYZ
Edge<3>@D1000513 HEPI, BSC, Chamber Level

Distance: 548.320mm
Delta X: 133.978mm
Delta Y: 531.700mm
Delta Z: 0.000mm
Total Length: 859.746mm

Ce dX: T3: dY: 531.700mm

WBSC1, LBSC1
(ITMy)

WBSC3, LBSC3
(ITMx)

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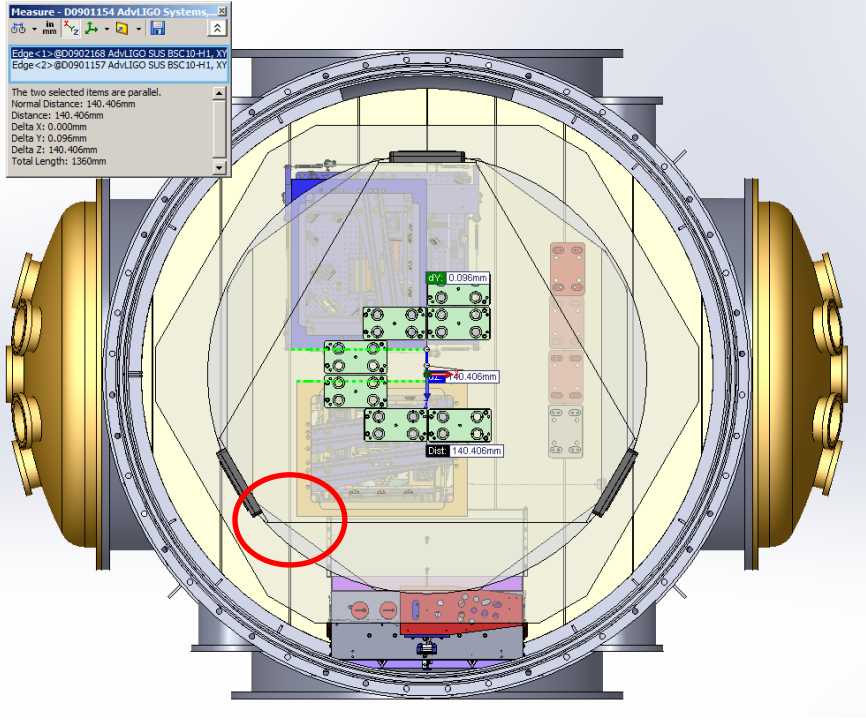
40 mm
Toward Global CS
(Before it hit Stage0 & IF
ACB can be shortened)

10 mm
Away from Global CS,
(Dog Clamps from ETMX
& TMS could collide)
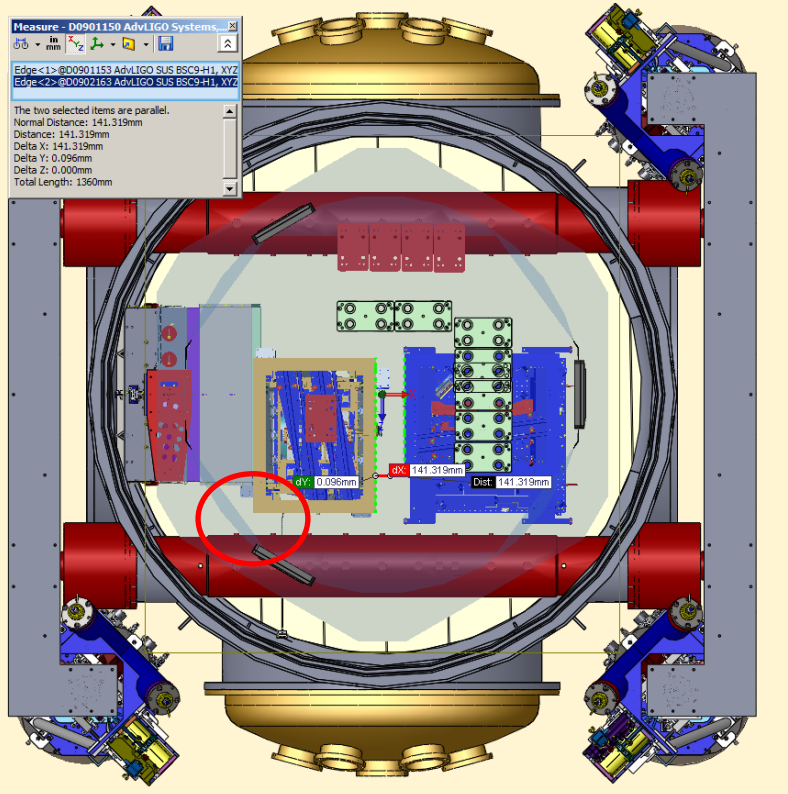
10 mm
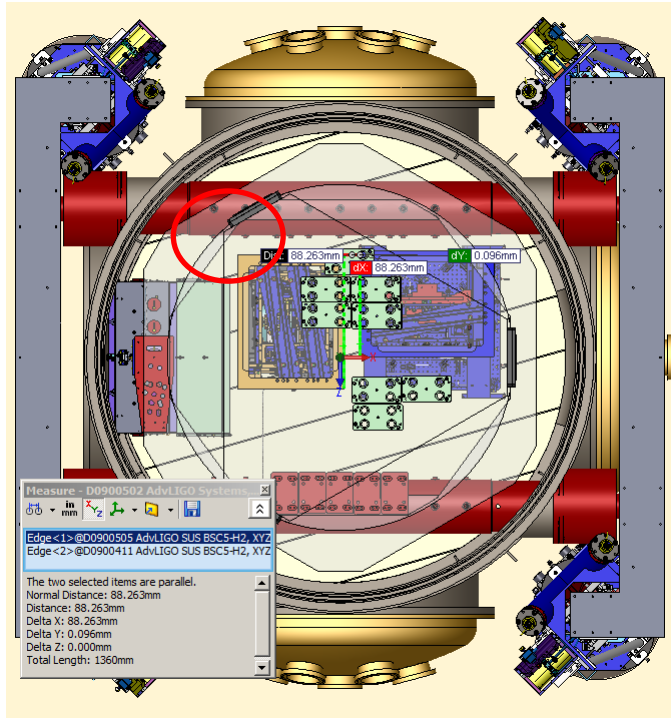Away from Global CS,
(Dog Clamps from ETMX
& TMS could collide)

WBSC9, LBSC4
(ETMx)
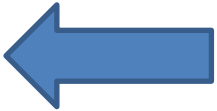
WBSC10, LBSC5
(ETMy)

40 mm
Toward Global CS
(Before it hit Stage0 & IF
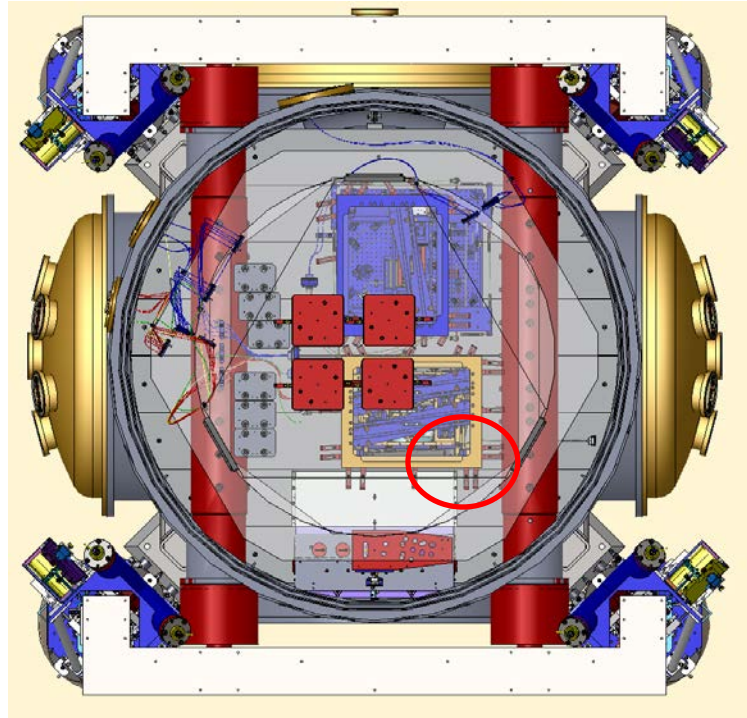ACB can be shortened)

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40 mm
Toward Global CS
(Before it hit Stage0 & IF
ACB can be shortened)

0 mm
Away from Global CS,
(No room for Dog Clamps
from ETMX & TMS)

10 mm
Away from Global CS,
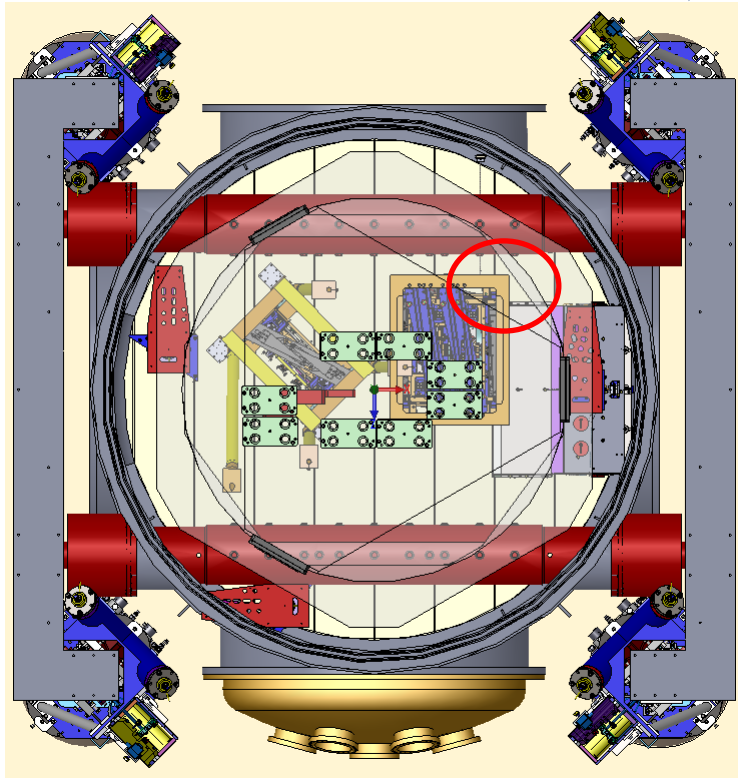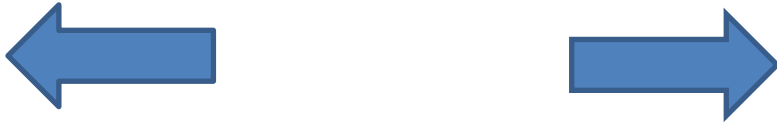(Dog Clamps from ETMX
& TMS could collide)

WBSC5
(ETMx)

WBSC6
(ETMy)

40 mm
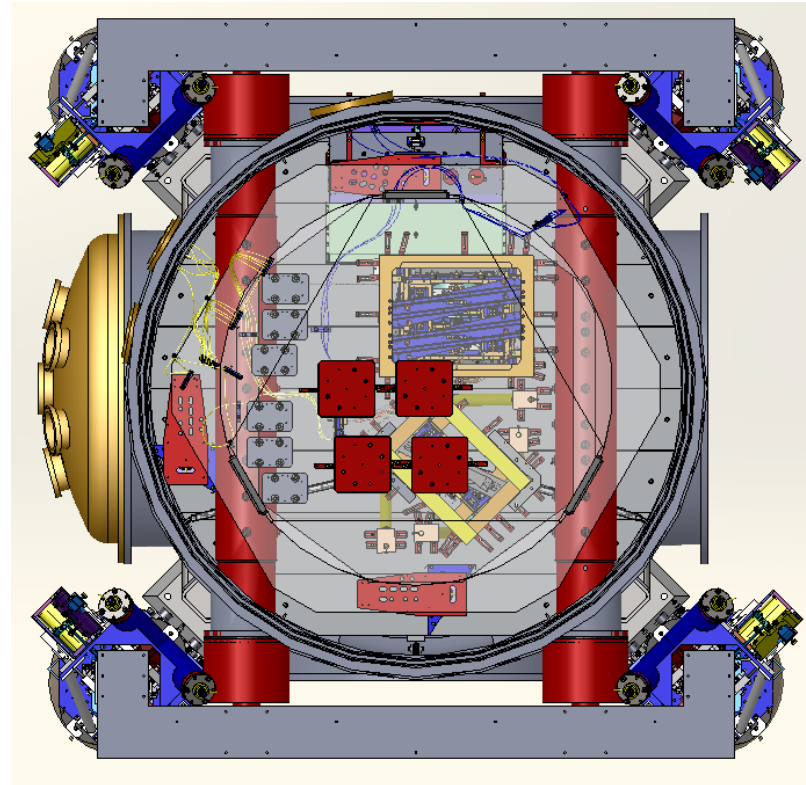Toward Global CS
(Before it hit Stage0 & IF
ACB can be shortened)

30 mm
Toward Global CS
(Dog Clamps from ITMX
& BS FM could collide)

60 mm
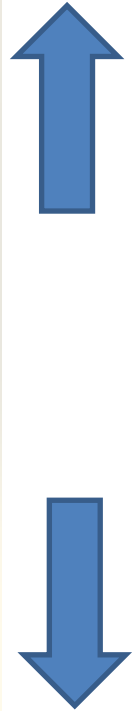Away from Global CS,
(before it collides with edge
On StageO)

60 mm
Away from Global CS,
(before it collides with edge
On StageO)

30 mm
Toward Global CS
(Dog Clamps from ITMX
& BS FM could collide)

WBSC7
(ITMx)

WBSC8
(ITMy)

Discussion on increasing the Schnupp asymmetry

A preliminary document exploring allowable ETM's & ITM's mechanical clearances along the beam center line & the feasibility of cookie cutter 'BLANKS' for the following chambers:

Moving ITMx 15mm in the direction away from global zero (WBSC3, LBSC3)
Moving ITMy 15mm in the direction toward global zero (WBSC1, LBSC1)
Leaving ETMx as is (WBSC9, LBSC4)
Moving ETMy 30mm in the direction toward global zero (WBSC10, LBSC5)

Considerations about increasing the Schnupp Asymmetry on ITMy (WBSC1 & LBSC1) by 15 mm toward the Global CS :

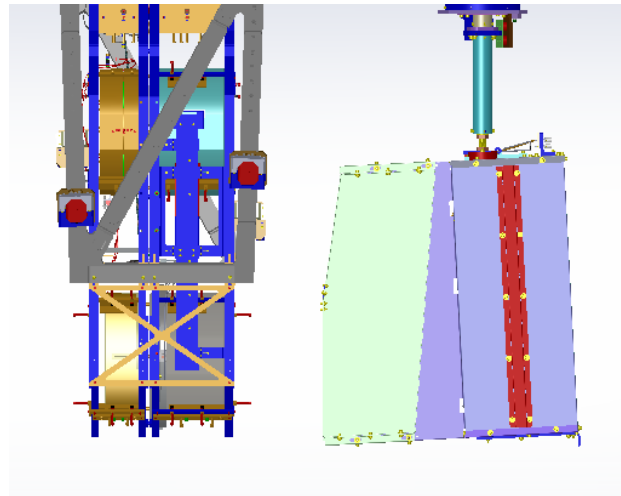1. Balance Masses:
        - There is a very insignificant change in the Y-Direction (2 mm) on the overall CG of the
          table.

2. Dog clamps:
        - There are no changes on the Dog clamp layout. ITMy will use the same Dog clamps and
          the same Hole locations.

3. Arm Cavity Baffle:
        - The ITMy will be moved 15 mm in the opposite direction of ACB.
         (However the ACB may need to be enlarged to get closer to the ITMy.)
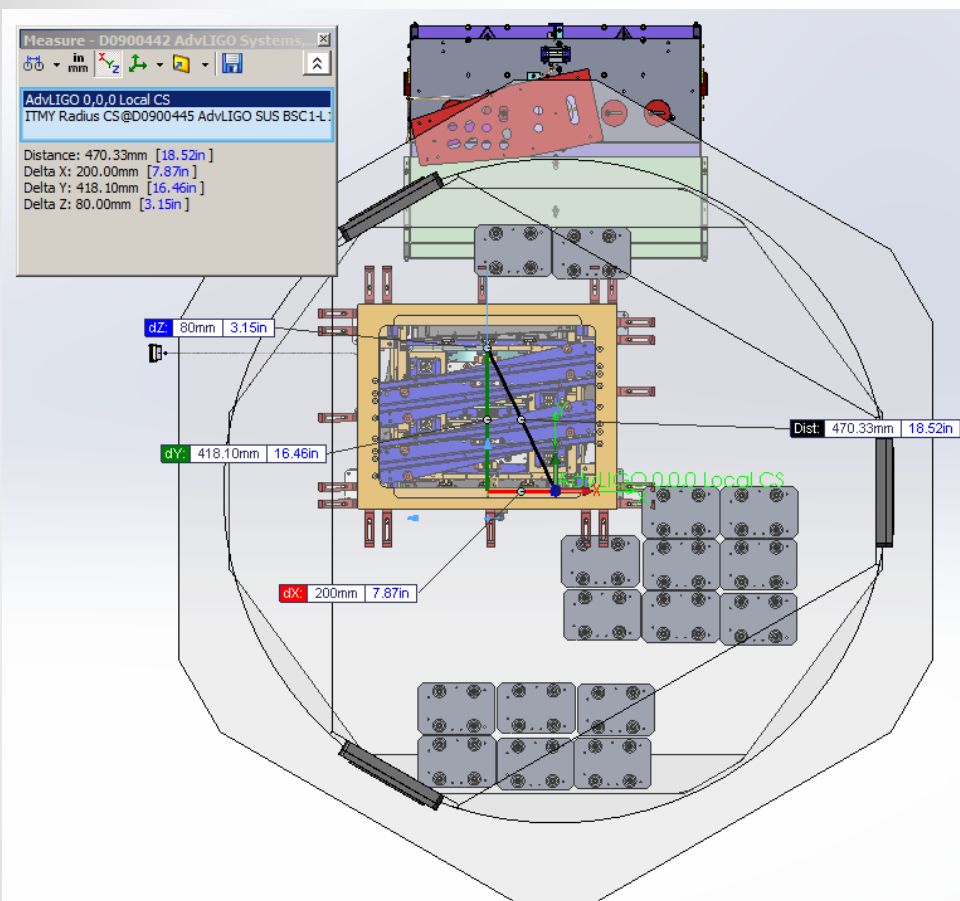

4. TCS CO2P Mirror:
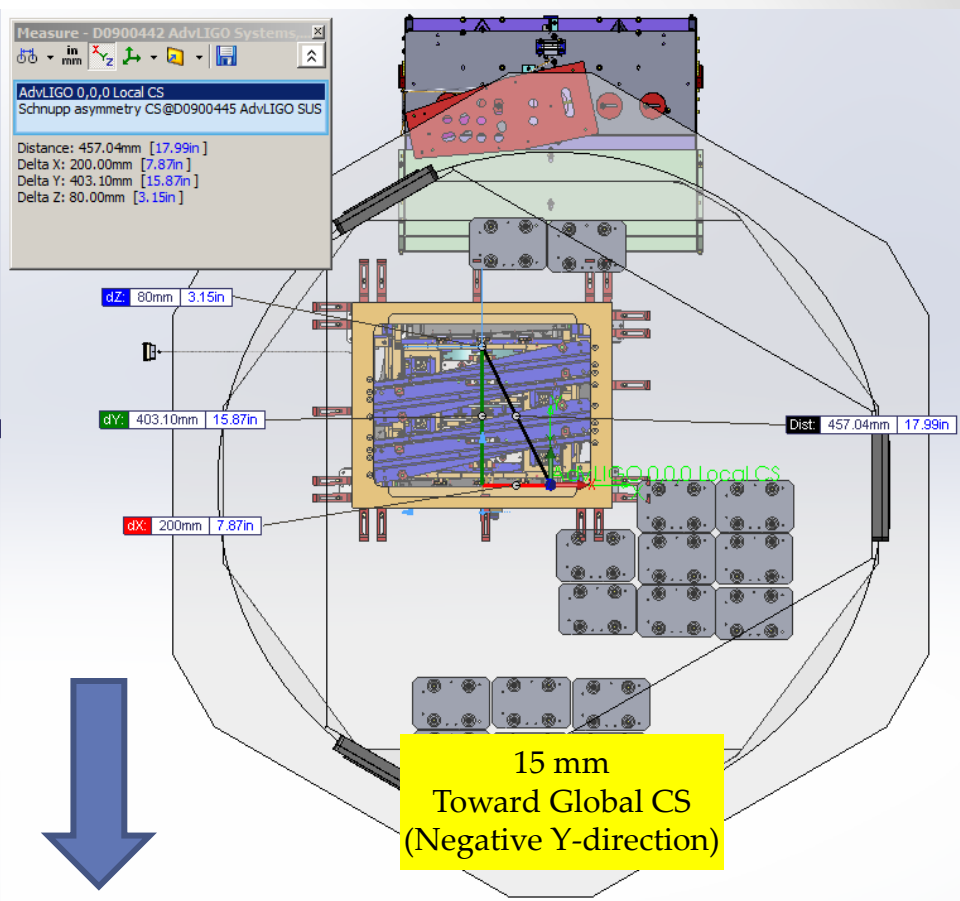   - TCS may need to re-align this mirror to work with the new position of the ITMy.

5. Cables & Cookie Cutters Blanks:
        - There are no significant changes to any of these items.

WBSC1, LBSC1
(ITMy)

Local Coordinates:
X = -200.0 mm
Y = 418.10 mm
Z = -80.0 mm

15 mm
Toward Global CS
(Negative Y-direction)

Local Coordinates:
X = -200.0 mm
Y = 403.10 mm
Z = -80.0 mm

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Considerations about increasing the Schnupp Asymmetry on ITMx (WBSC3 & LBSC3) by 15 mm away from the Global CS :
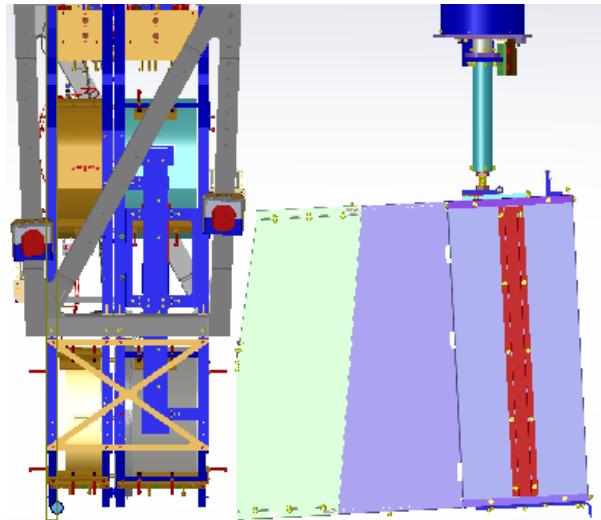
1. Balance Masses:
> - There is a very insignificant change in the X-Direction (2 mm) on the overall CG of the table.

2. Dog clamps:
> - There are no changes on the Dog clamp layout. ITMx will use the same Dog clamps and the same Hole locations.

3. Arm Cavity Baffle:
> - The ITMy will be moved 15 mm away from Global CS (toward ACB)
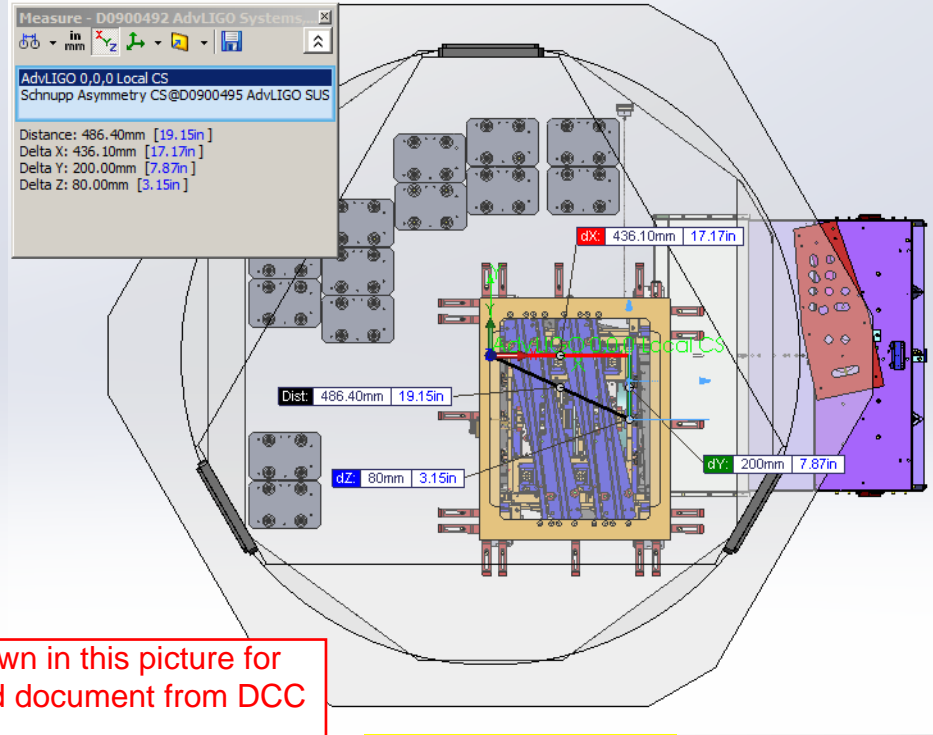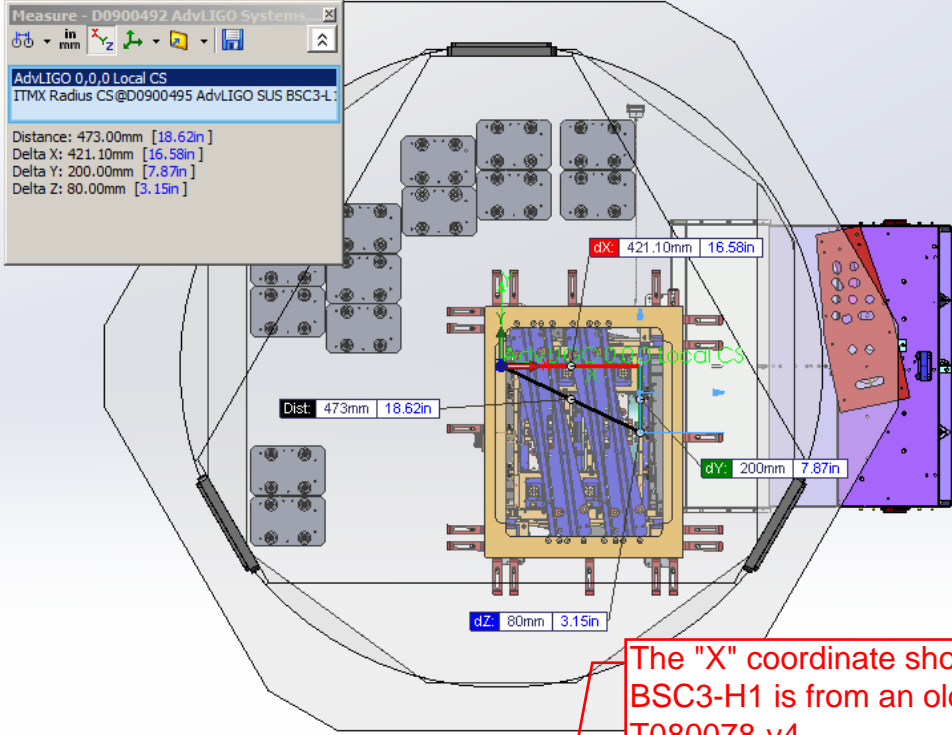> (ACB may need to be shortened by 15 mm, to keep same gap with ITMx).

4. TCS CO2P Mirror:
> - TCS may need to re-align this mirror to work with the new position of the ITMx.

5. Cables & Cookie Cutters Blanks:
> - There are no significant changes to any of these items.

The "X" coordinate shown in this picture for BSC3-H1 is from an old document from DCC T080078-v4.
The actual/correct value for the "X" coordinate should be from document E1101147-v2 and it should be X = 418.0 mm

15 mm
Away from Global CS
(Positive X-Direction)

Local Coordinates:
X = 421.0 mm
Y = -200.0 mm
Z = -80.0 mm

Local Coordinates:
X = 436.0 mm
Y = -200.0 mm
Z = -80.0 mm
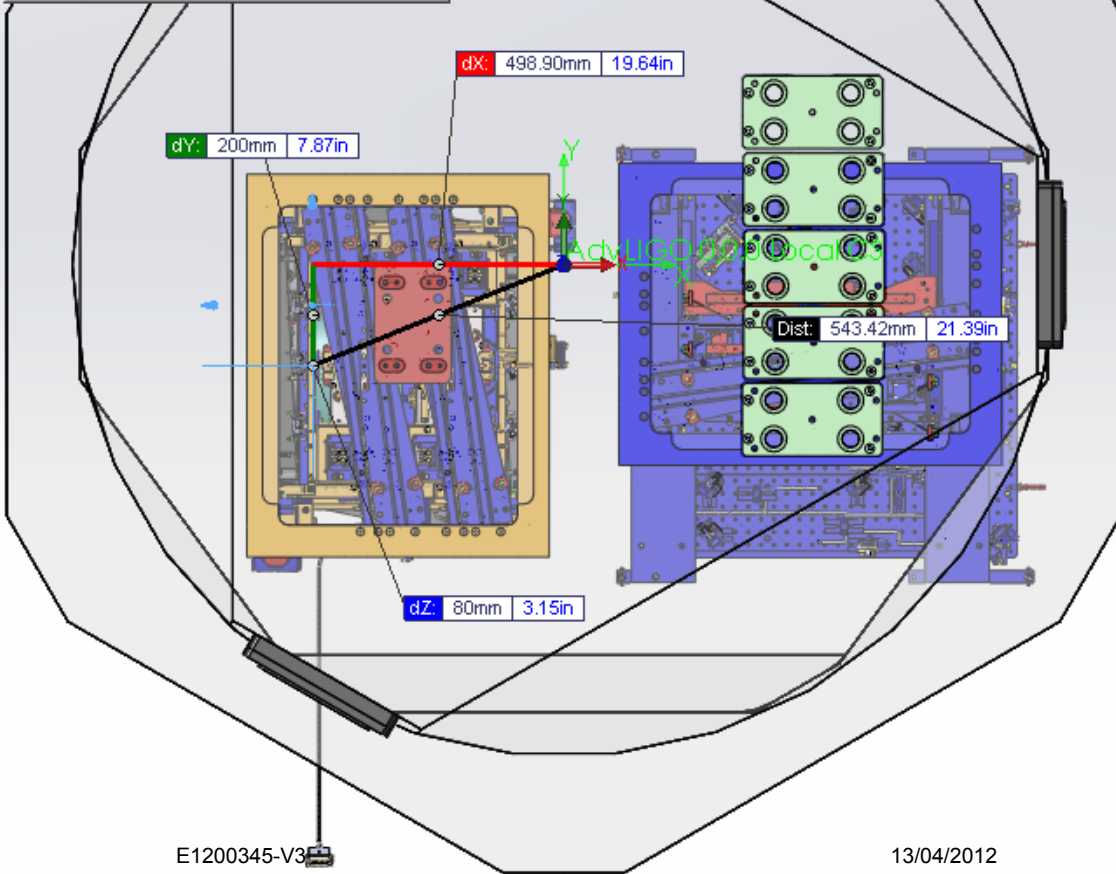
NO CHANGE

Measure - D0900471 AdvLIGO Systems,...

AdvLIGO 0,0,0 Local CS
ETMX Radius CS@D0900478 AdvLIGO SUS BSC4-L

Distance: 543.42mm [21.39in]
Delta X: 498.90mm [19.64in]
Delta Y: 200.00mm [7.87in]
Delta Z: 80.00mm [3.15in]

dX: 498.90mm 19.64in

dY: 200mm 7.87in

AdvLIGO 0,0,0 Local CS

Dist: 543.42mm 21.39in

dZ: 80mm 3.15in

Local Coordinates:
X = -498.9 mm
Y = -200.0 mm
Z = -80.0 mm

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Considerations about increasing the Schnupp Asymmetry on ETMy (WBSC10 & LBSC5) by 30 mm toward the Global CS :

1. Balance Masses:
> - There is a very insignificant change in the Y-Direction (4 mm) on the overall CG of the table.

2. Dog clamps:
> - There will be minor changes on the Dog clamp layout. ETMy will use the same Dog clamps but they will use some other available Hole locations for clamping.
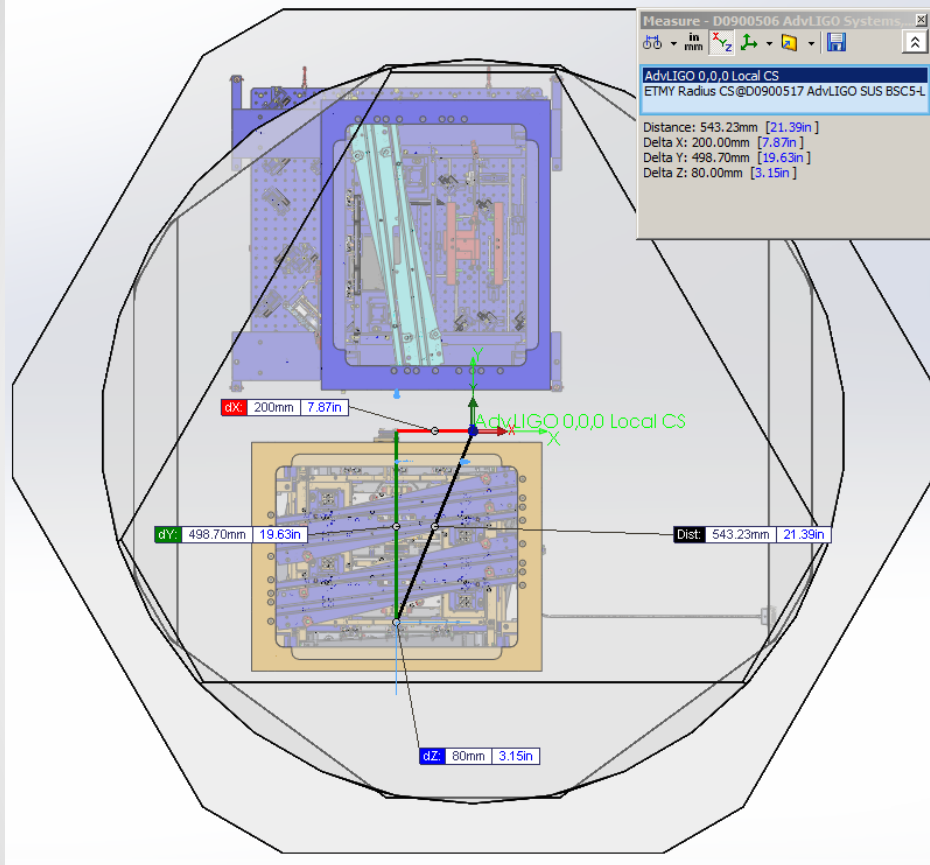
3. TMS:
> - The ETMy will be moved 30 mm toward the Global CS (away from TMS). TMS may need to be moved to keep same gap with ETMy
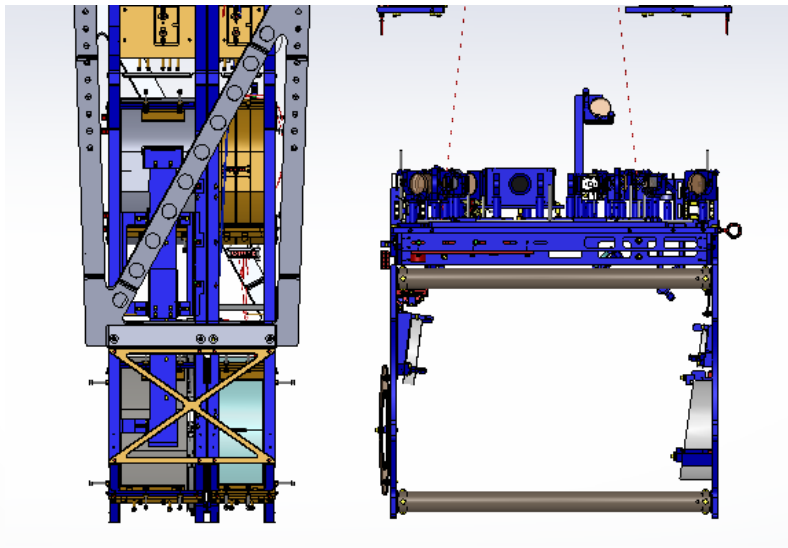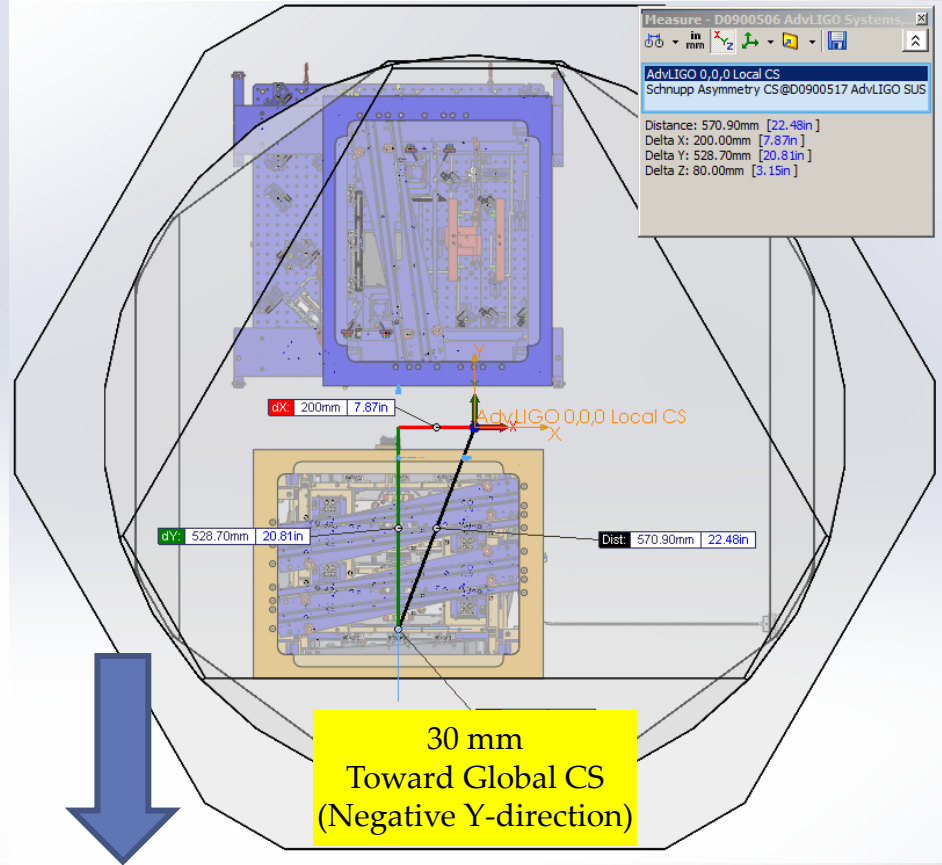

4. Cables & Cookie Cutters Blanks:
> - There are no significant changes to any of these items.

WBSC10, LBSC5
(ETMy)

Local Coordinates:
X = -200.0 mm
Y = -498.70 mm
Z = -80.0 mm

30 mm
Toward Global CS
(Negative Y-direction)
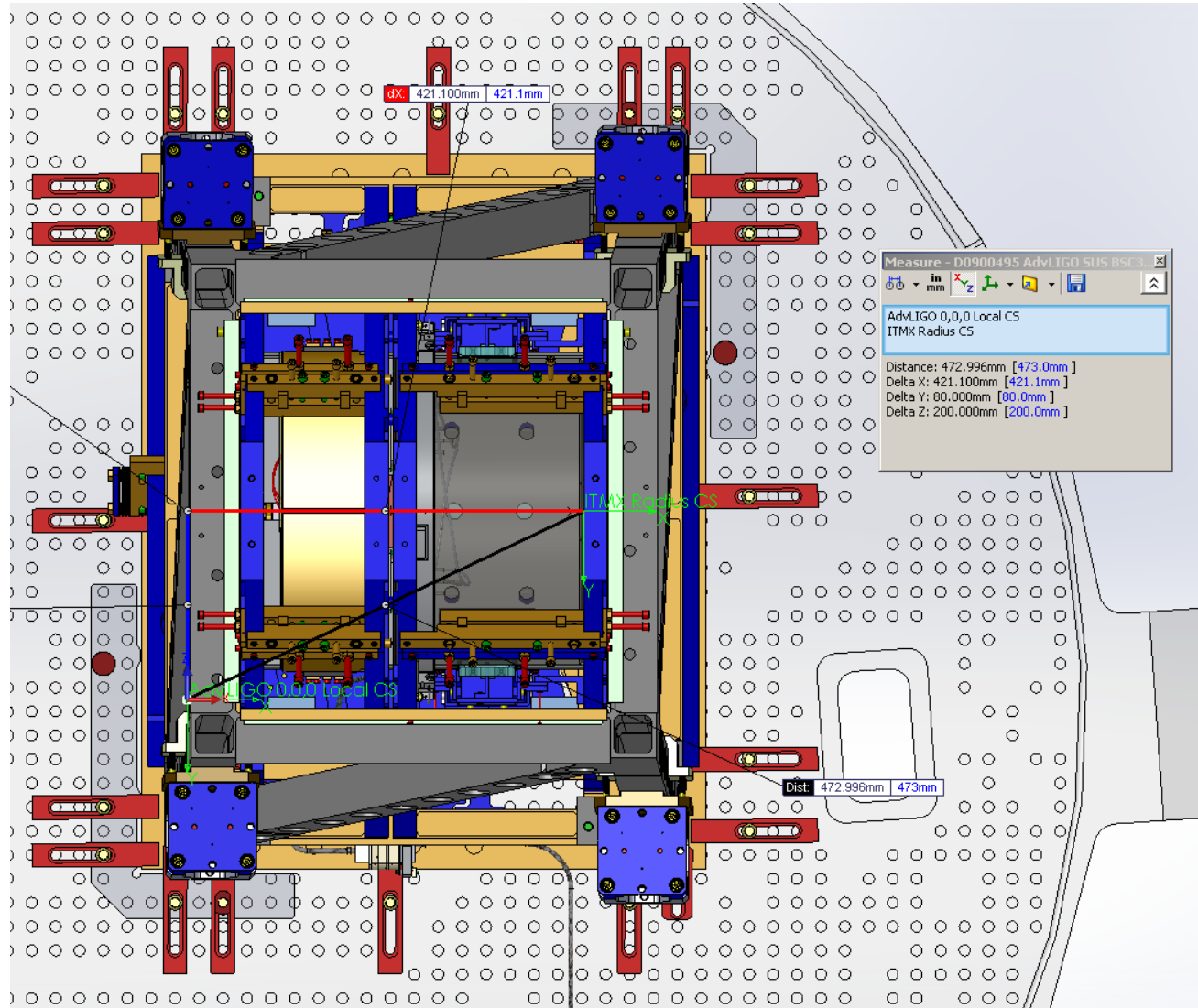
Local Coordinates:
X = -200.0 mm
Y = -528.70 mm
Z = -80.0 mm

Discussion on increasing the Schnupp asymmetry

Summary

1. Moving ITMx 15mm in the direction away from global zero (WBSC3, LBSC3)

2. Moving ITMy 15mm in the direction toward global zero (WBSC1, LBSC1)

3. Leaving ETMx as is (WBSC9, LBSC4)

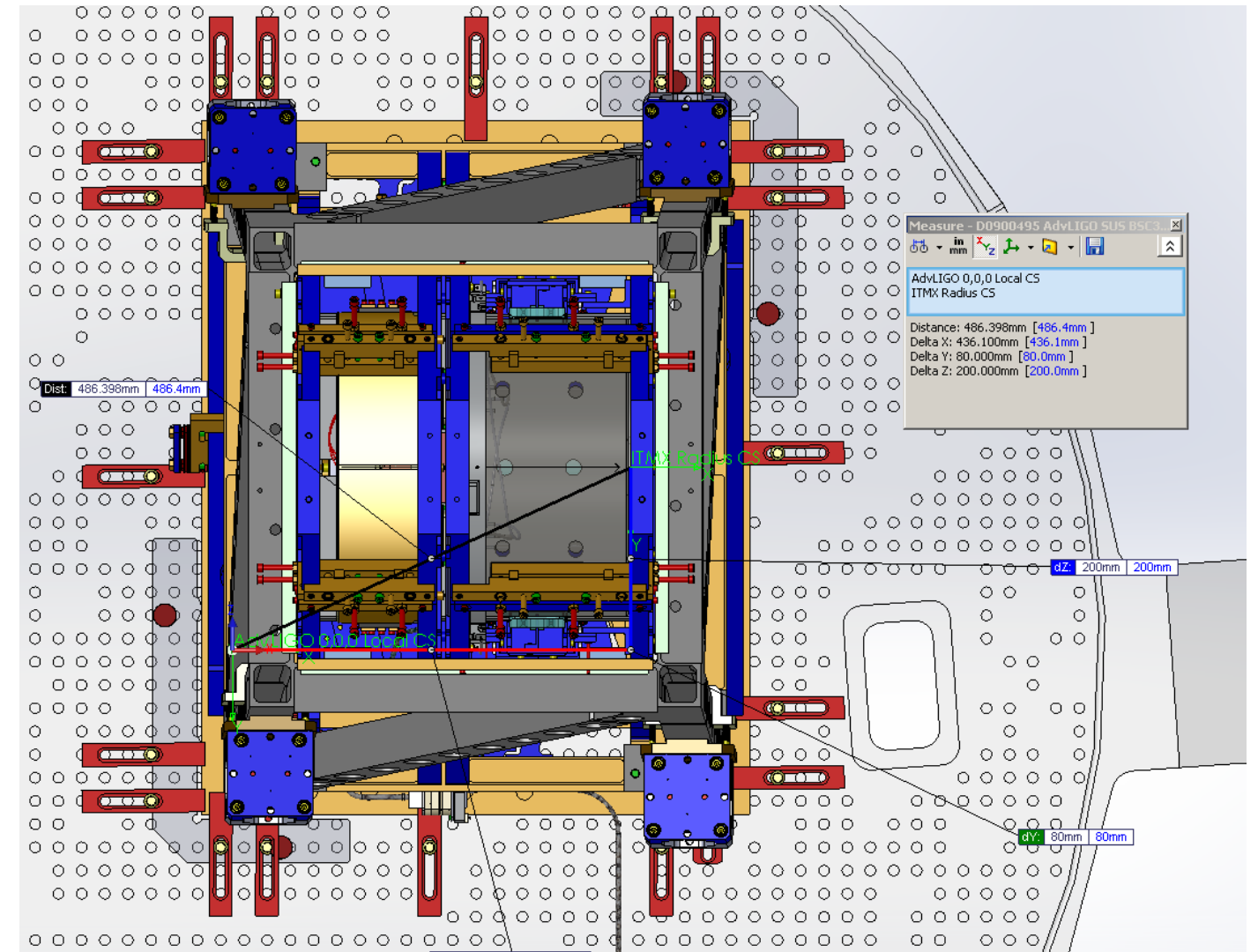4. Moving ETMy 30mm in the direction toward global zero (WBSC10, LBSC5)

BSC3-L1 (ITMX)
CURRENT:

LOCAL
Distance: 472.996mm [473.0mm]

Delta X: 421.100mm [421.1mm]

Delta Y: 80.000mm [80.0mm]

Delta Z: 200.000mm [200.0mm]

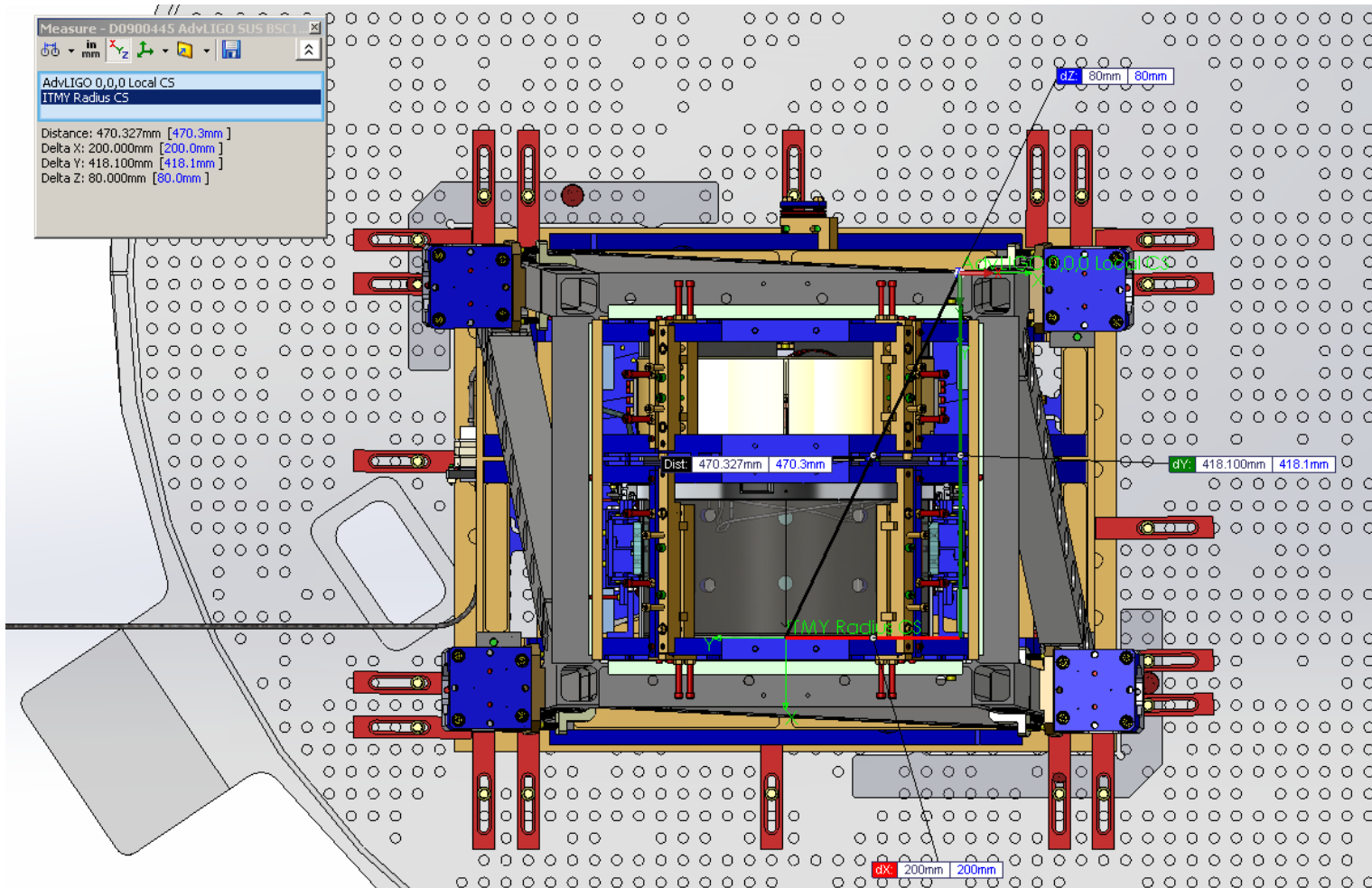## BSC3-L1 (ITMX)
Schnupp Effect:
15mm AWAY FROM GLOBAL 0

LOCAL
Distance: 486.398mm [486.4mm]

Delta X: 436.100mm [436.1mm]

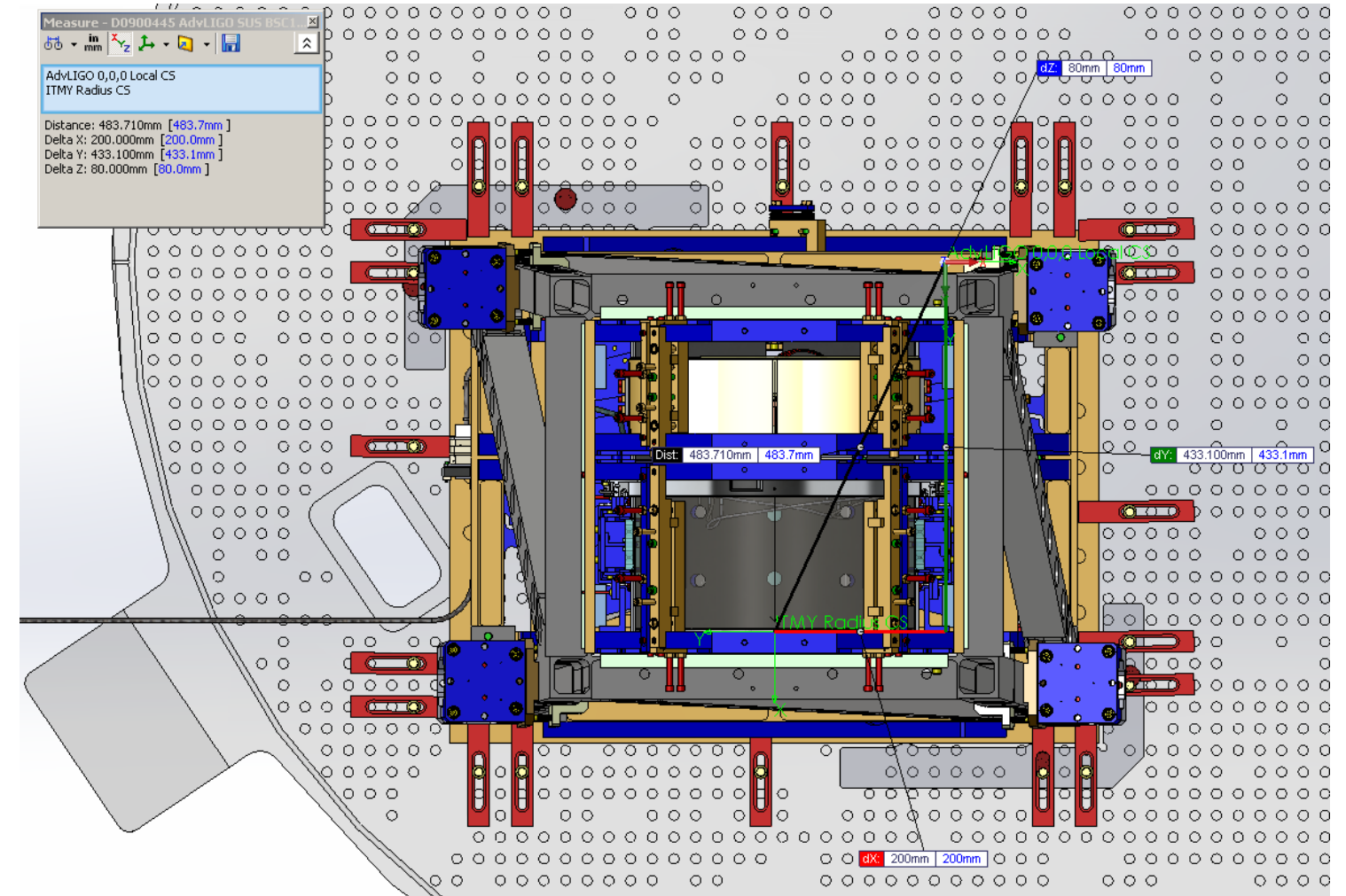Delta Y: 80.000mm [80.0mm]

Delta Z: 200.000mm [200.0mm]

BSC1-L1 (ITMY)
CURRENT:

LOCAL
Distance: 470.327mm [470.3mm]

Delta X: 200.000mm [200.0mm]

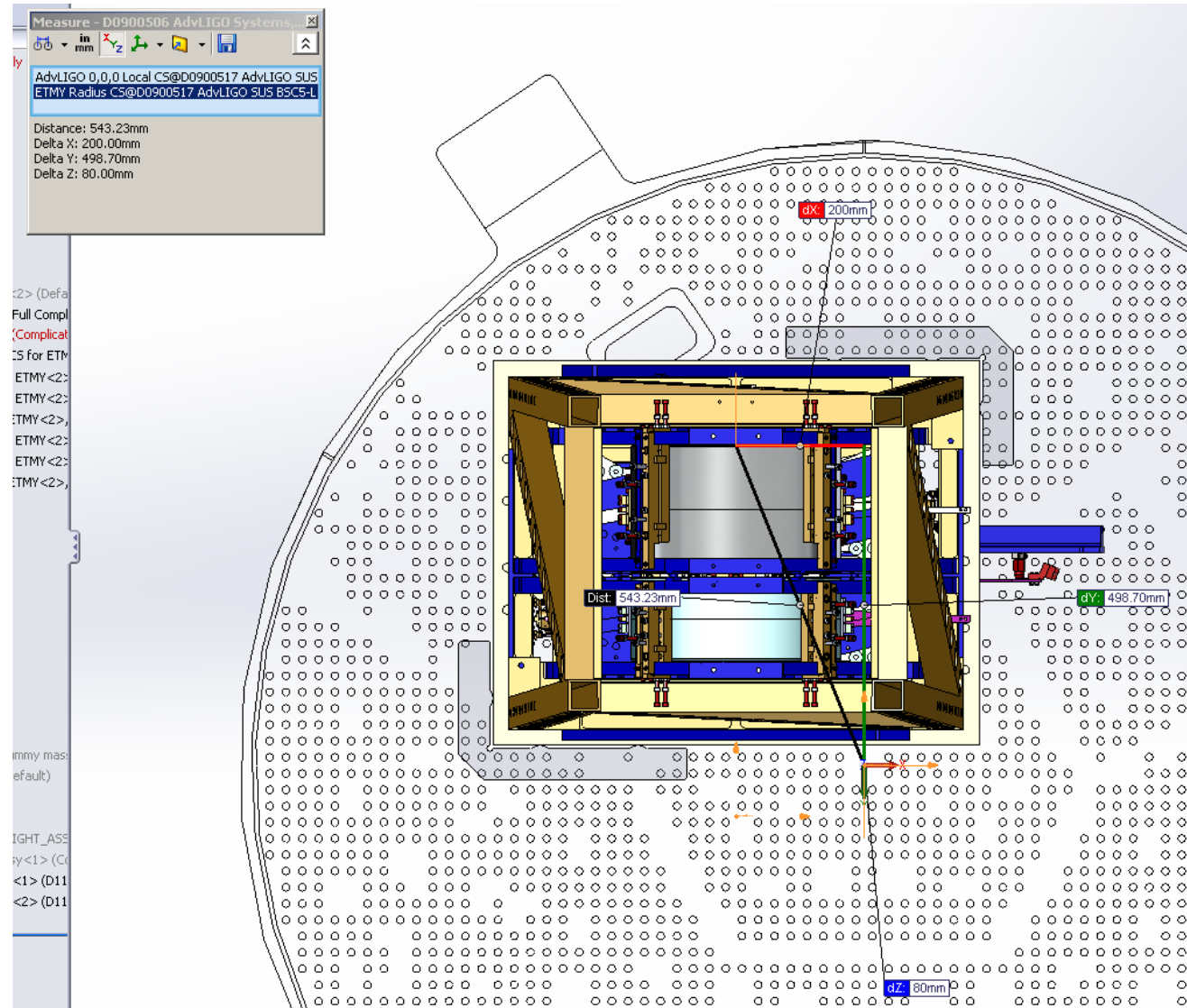Delta Y: 418.100mm [418.1mm]

Delta Z: 80.000mm [80.0mm]

BSC1-L1 (ITMY)
Schnupp Effect:
15mm Toward GLOBAL 0

LOCAL
Distance: 483.710mm [483.7mm]

Delta X: 200.000mm [200.0mm]

Delta Y: 433.100mm [433.1mm]
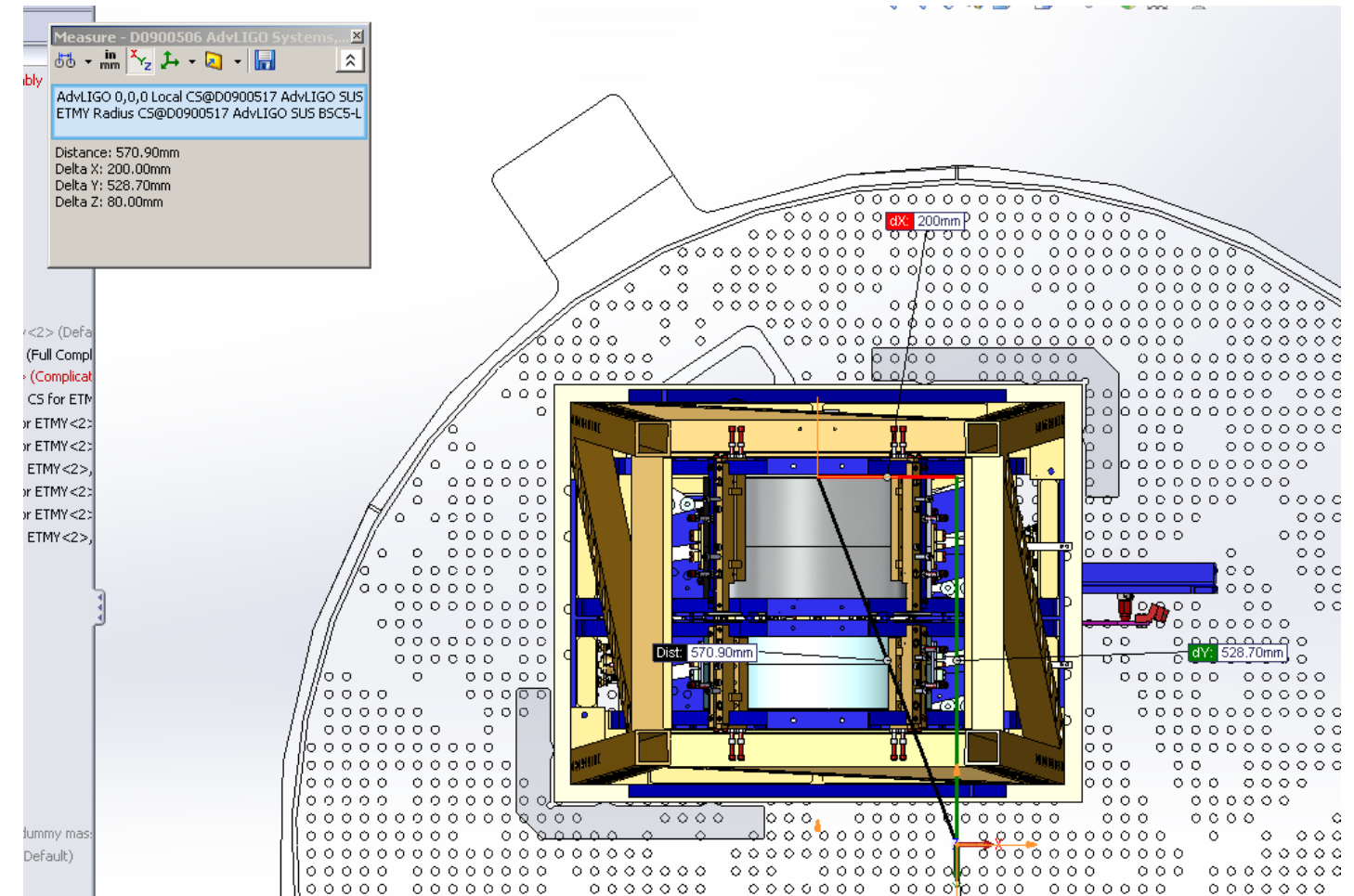
Delta Z: 80.000mm [80.0mm]

BSC5-L1 (ETMY)
CURRENT:

LOCAL
Distance: 543.23mm
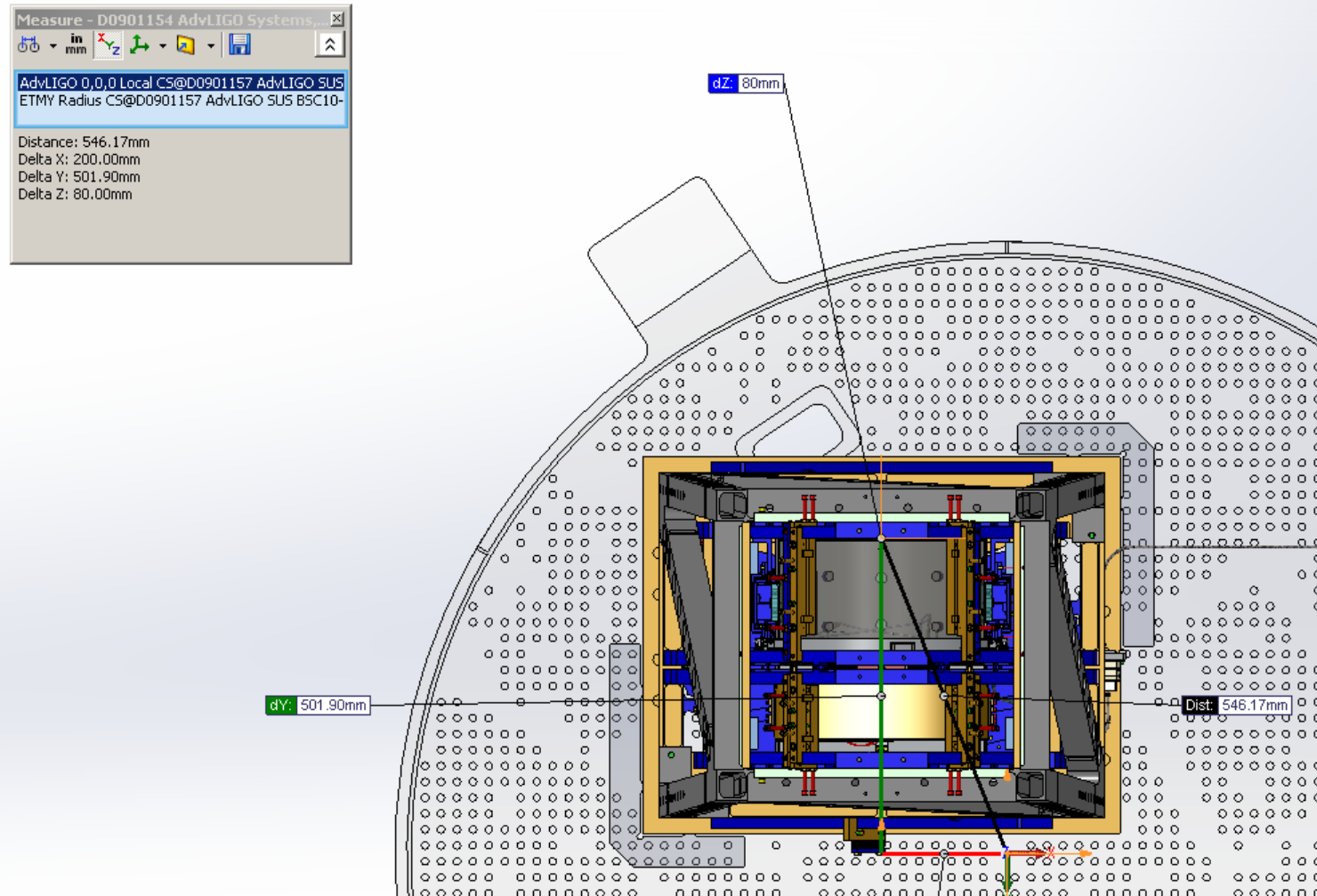
Delta X: 200.00mm

Delta Y: 498.70mm

Delta Z: 80.00mm

BSC5-L1 (ETMY)
Schnupp Effect:
30mm Toward GLOBAL 0

LOCAL
Distance: 570.90mm
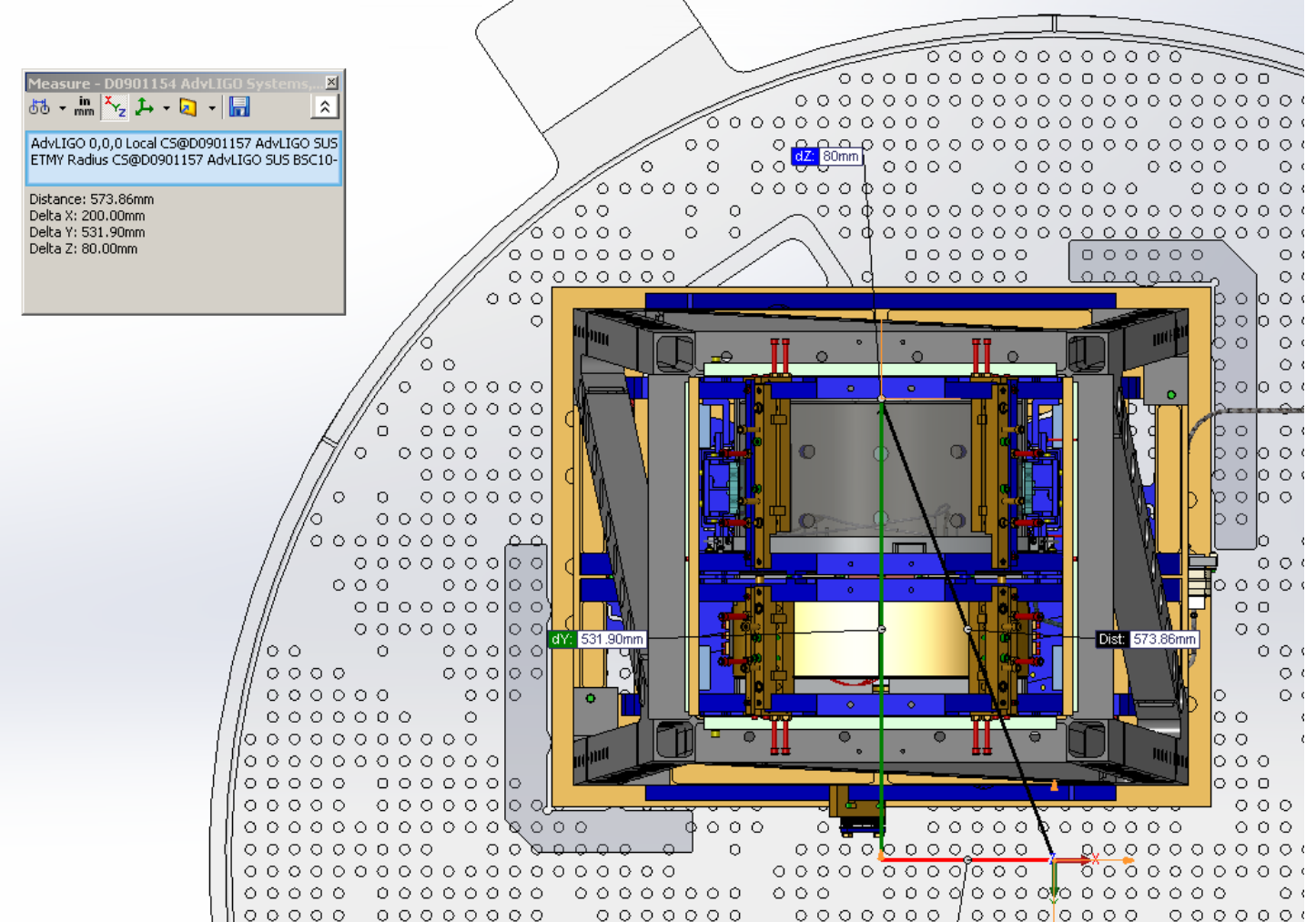
Delta X: 200.00mm

Delta Y: 528.70mm

Delta Z: 80.00mm

BSC10-H1 (ETMY)
CURRENT:

LOCAL
Distance: 546.17mm
Delta X: 200.00mm
Delta Y: 501.90mm
Delta Z: 80.00mm

BSC10-H1 (ETMY)
Schnupp Effect:
30mm Toward GLOBAL 0

LOCAL
Distance: 573.86mm
Delta X: 200.00mm
Delta Y: 531.90mm
Delta Z: 80.00mm