

# 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)

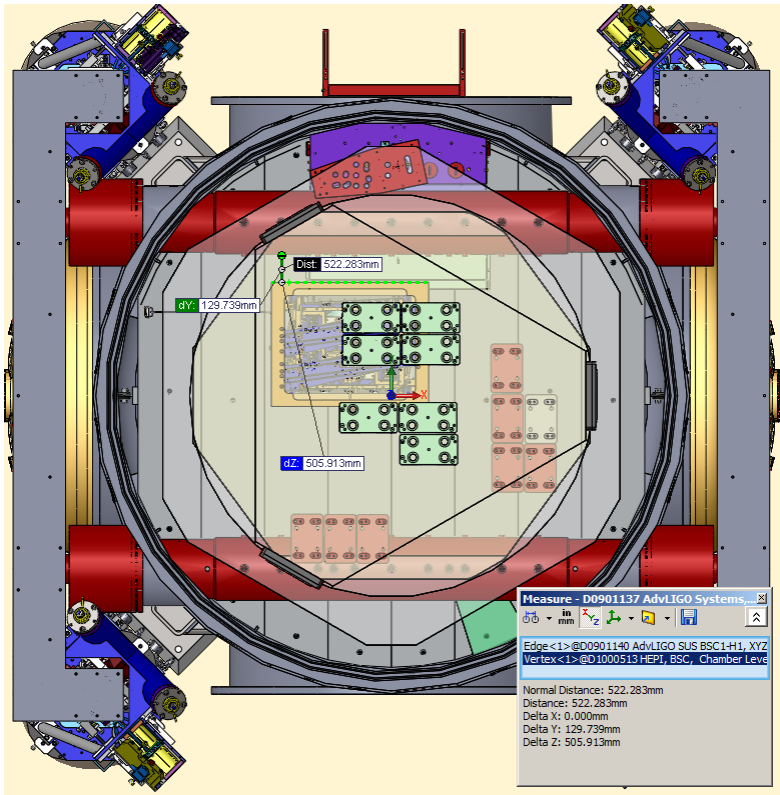
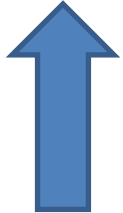
(WBSC9, LBSC4)

(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

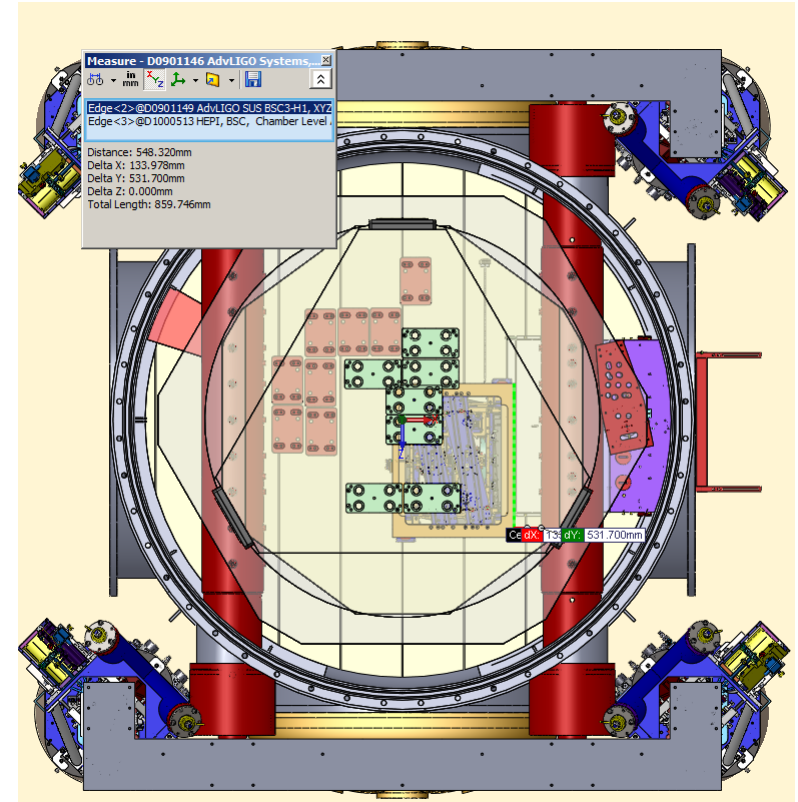
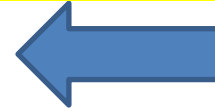


450 mm  
Toward Global CS



WBSC1, LBSC1  
(ITMy)

450 mm  
Toward Global CS



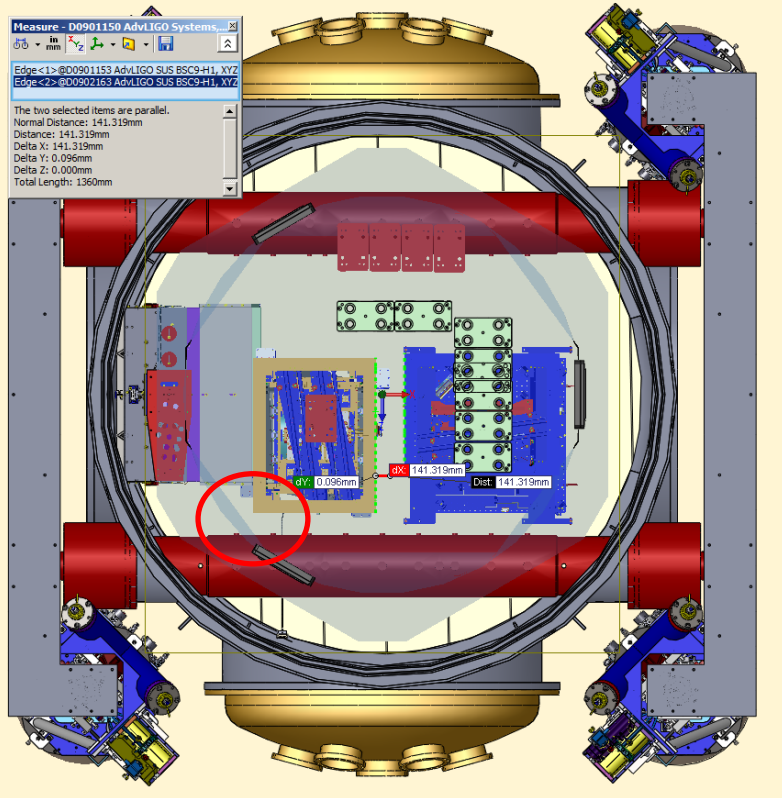
60 mm  
Away from Global CS



WBSC3, LBSC3  
(ITMx)

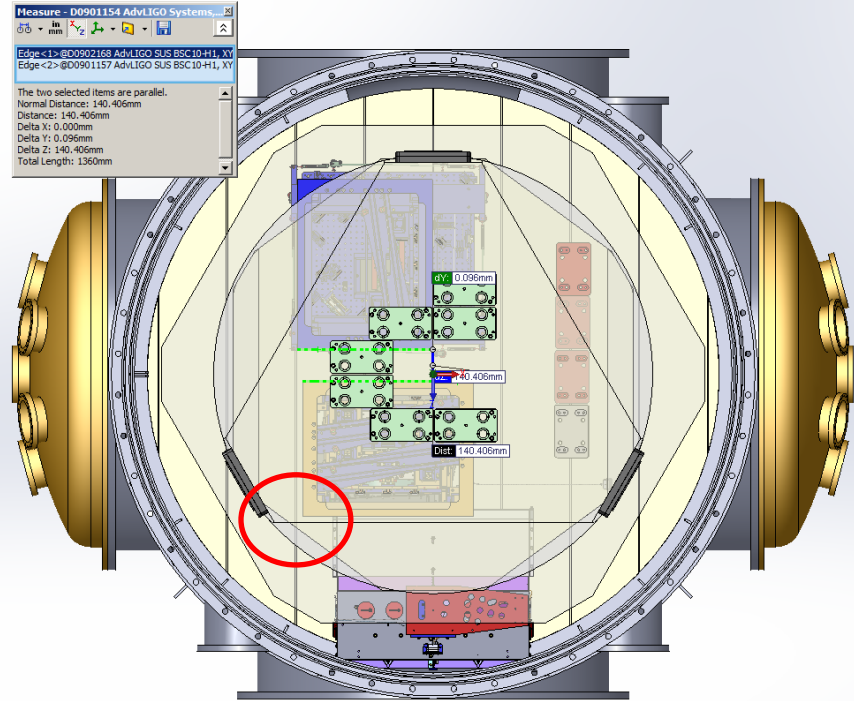
40 mm  
Toward Global CS  
(Before it hit Stage0 & IF  
ACB can be shortened)

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



WBSC9, LBSC4  
(ETM<sub>x</sub>)

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



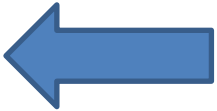
WBSC10, LBSC5  
(ETM<sub>y</sub>)

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

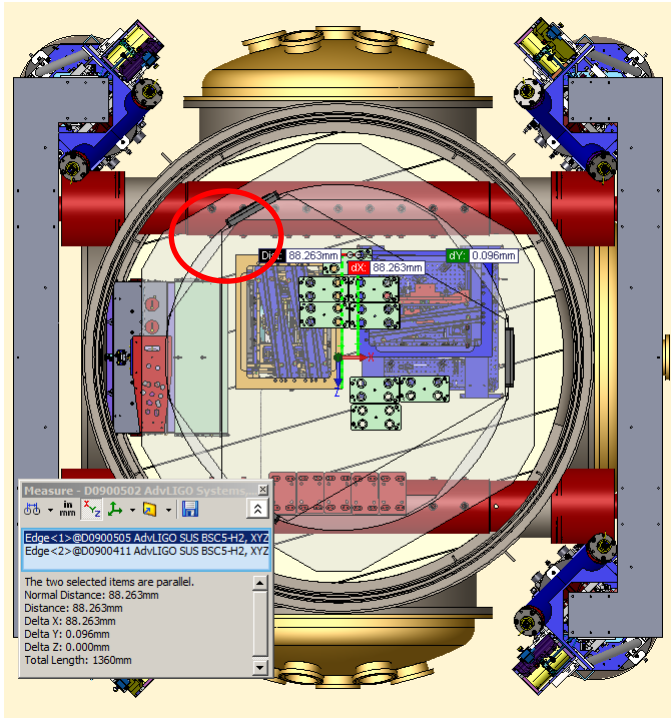


40 mm  
Toward Global CS  
(Before it hit Stage0 & IF  
ACB can be shortened)

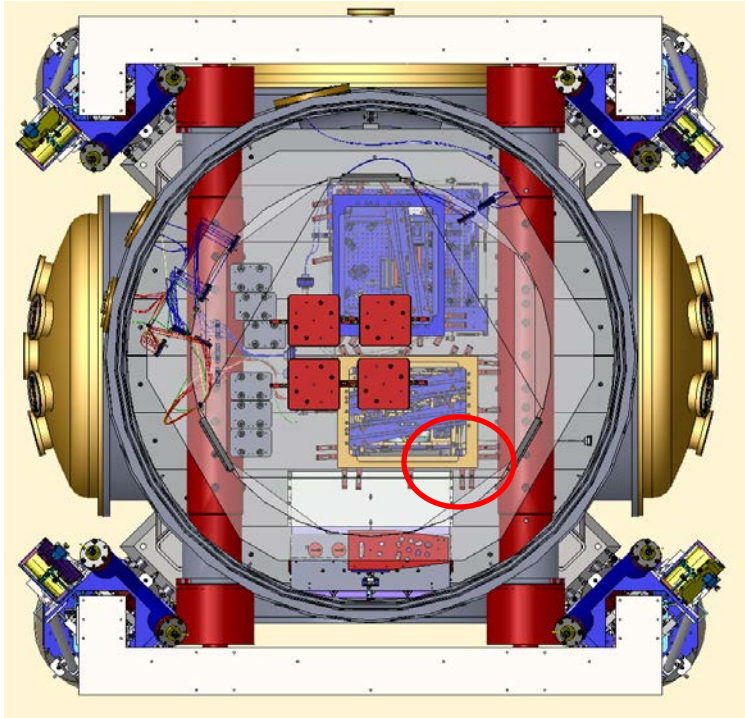
0 mm  
Away from Global CS,  
(No room for Dog Clamps  
from ETMX & TMS )



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



WBSC5  
(ETM<sub>x</sub>)



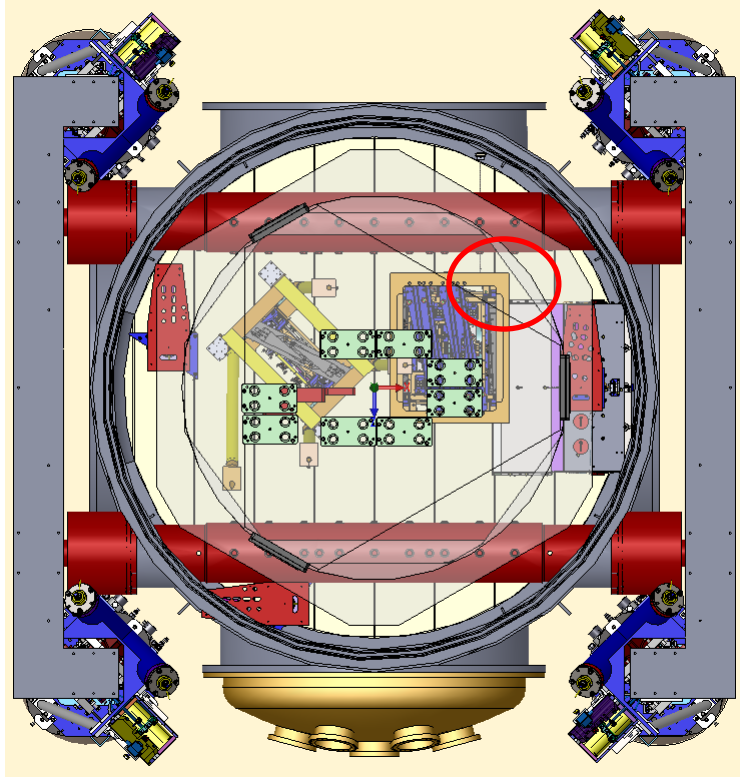
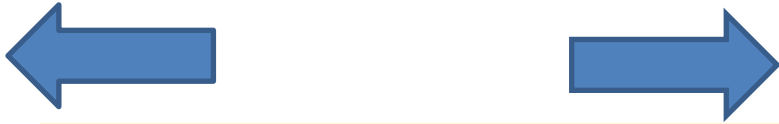
WBSC6  
(ETM<sub>y</sub>)

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



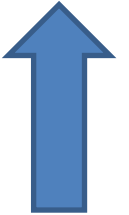
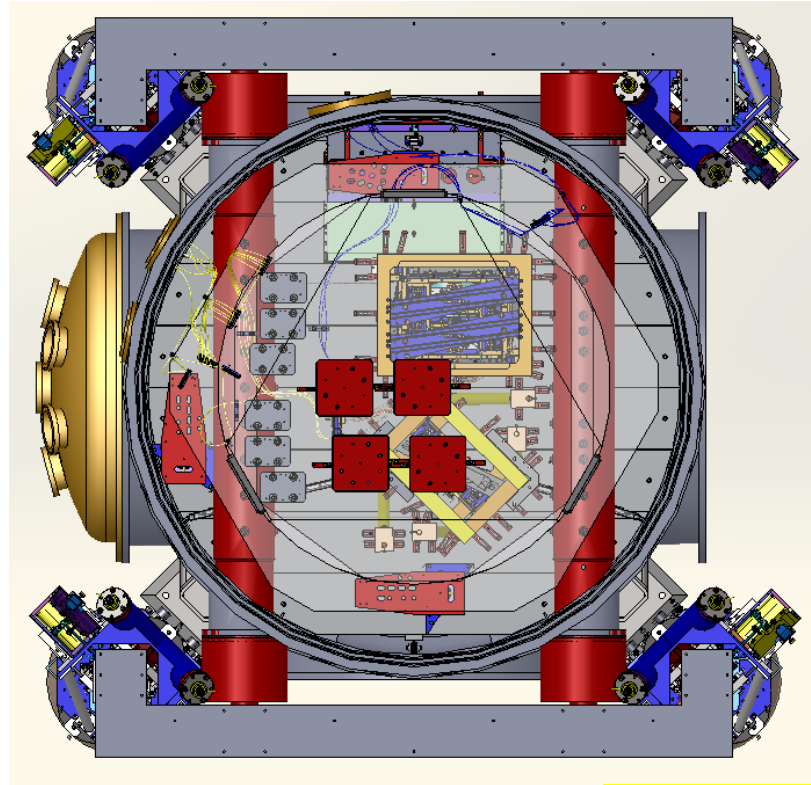
30 mm  
Toward Global CS  
(Dog Clamps from ITMX  
& BS FM could collide)

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



WBSC7  
(ITMx)

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



WBSC8  
(ITMy)

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

# 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:

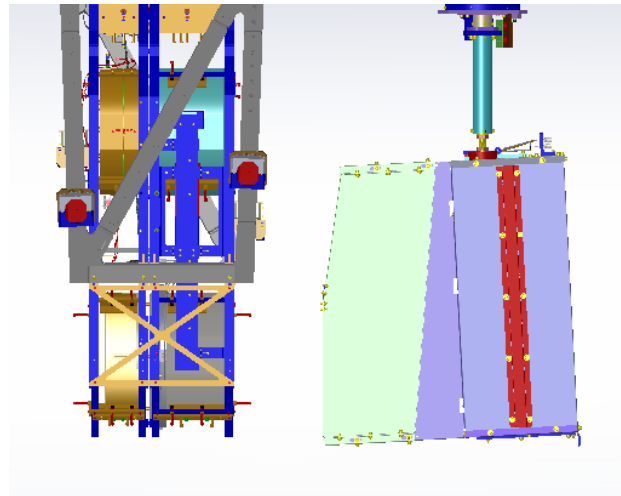
- There is a very insignificant change in the Y-Direction (2 mm) on the overall CG of the table.

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:

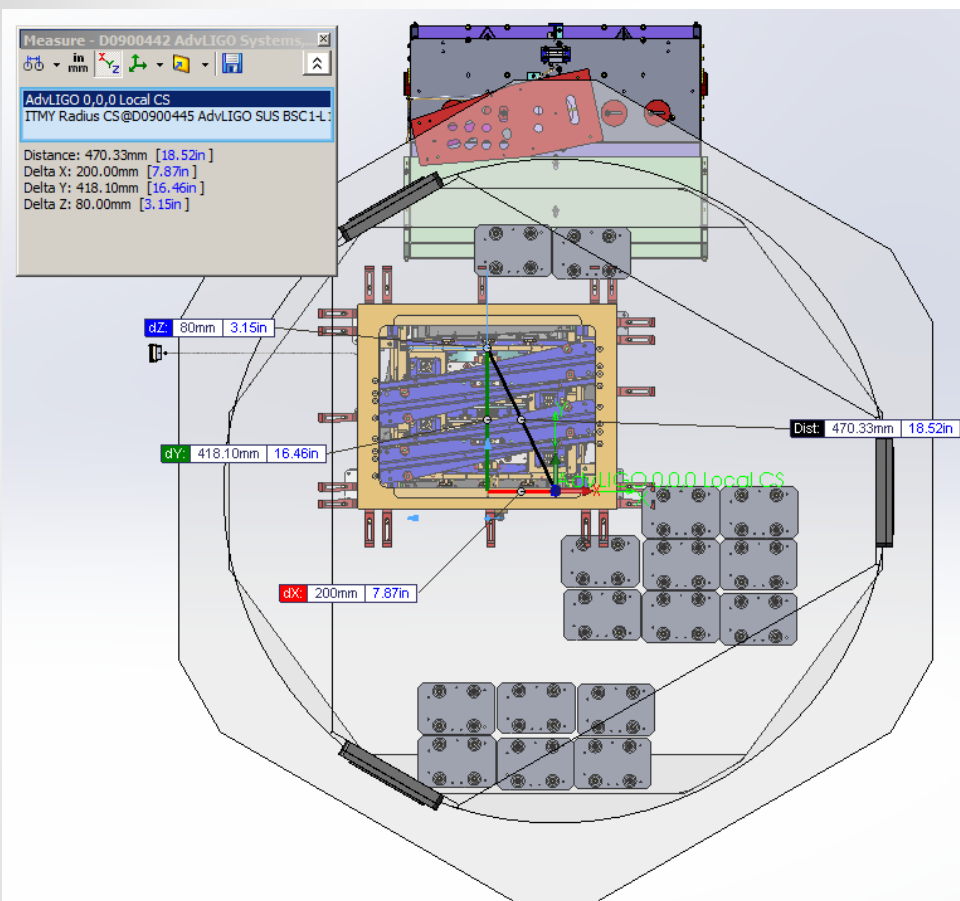
- TCS may need to re-align this mirror to work with the new position of the ITMy.

5. Cables & Cookie Cutters Blanks:

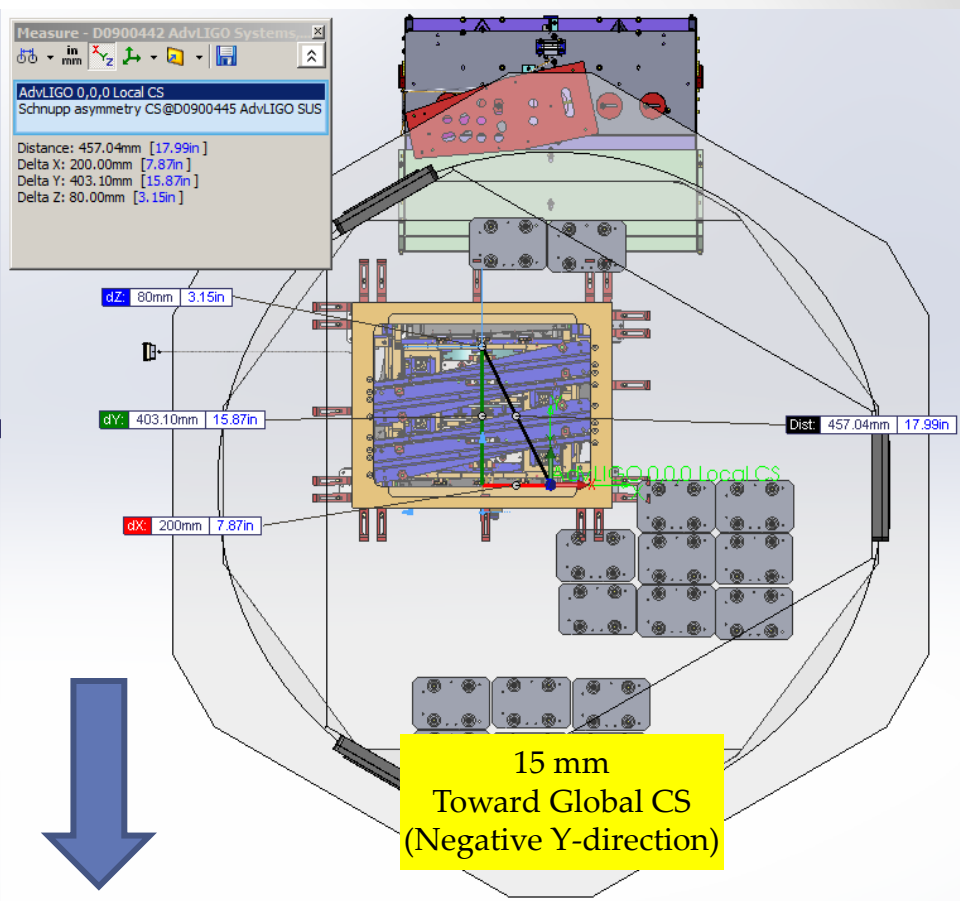
- There are no significant changes to any of these items.



# WBSC1, LBSC1 (ITMy)



Local Coordinates:  
 $X = -200.0 \text{ mm}$   
 $Y = 418.10 \text{ mm}$   
 $Z = -80.0 \text{ mm}$



Local Coordinates:  
 $X = -200.0 \text{ mm}$   
 $Y = 403.10 \text{ mm}$   
 $Z = -80.0 \text{ mm}$

Considerations about increasing the Schnupp Asymmetry on ITMx (WBSC3 & LBSC3) by 15 mm away from the Global CS :

1. Balance Masses:

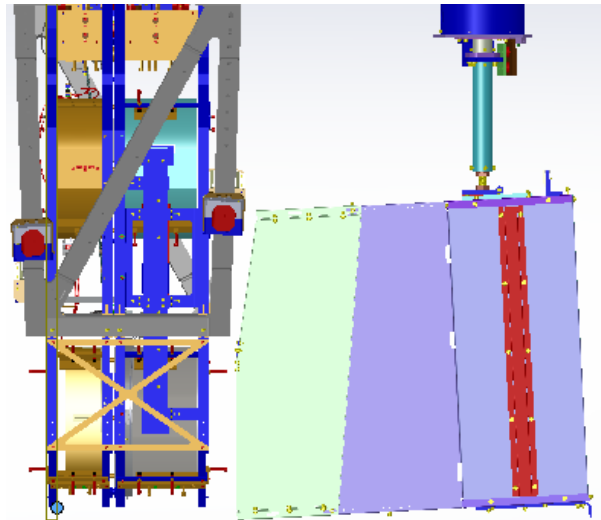
- There is a very insignificant change in the X-Direction (2 mm) on the overall CG of the table.

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).



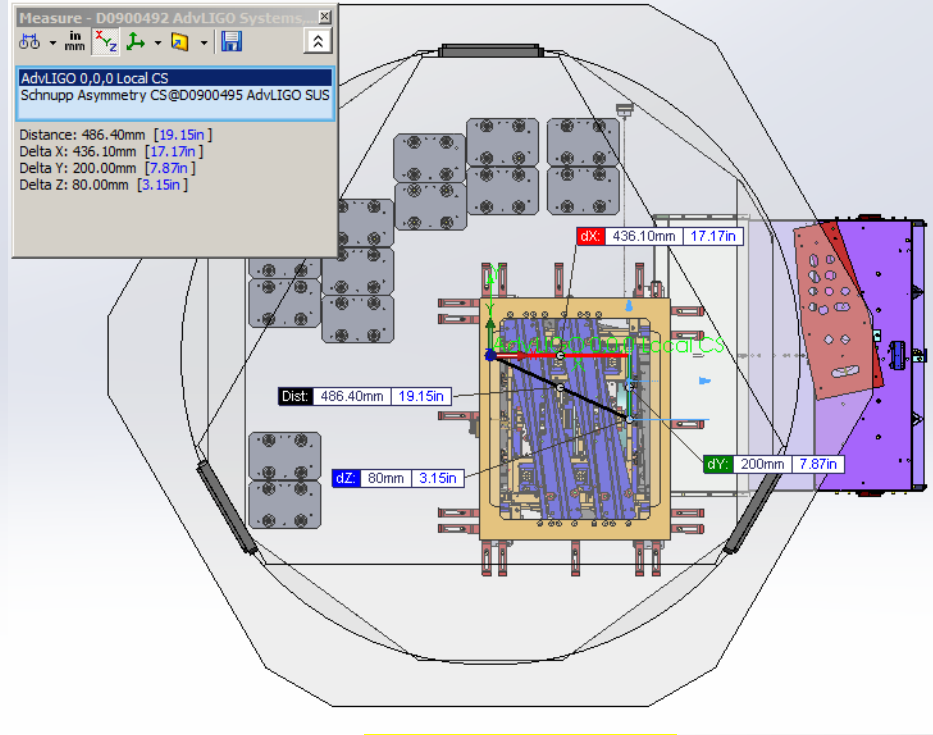
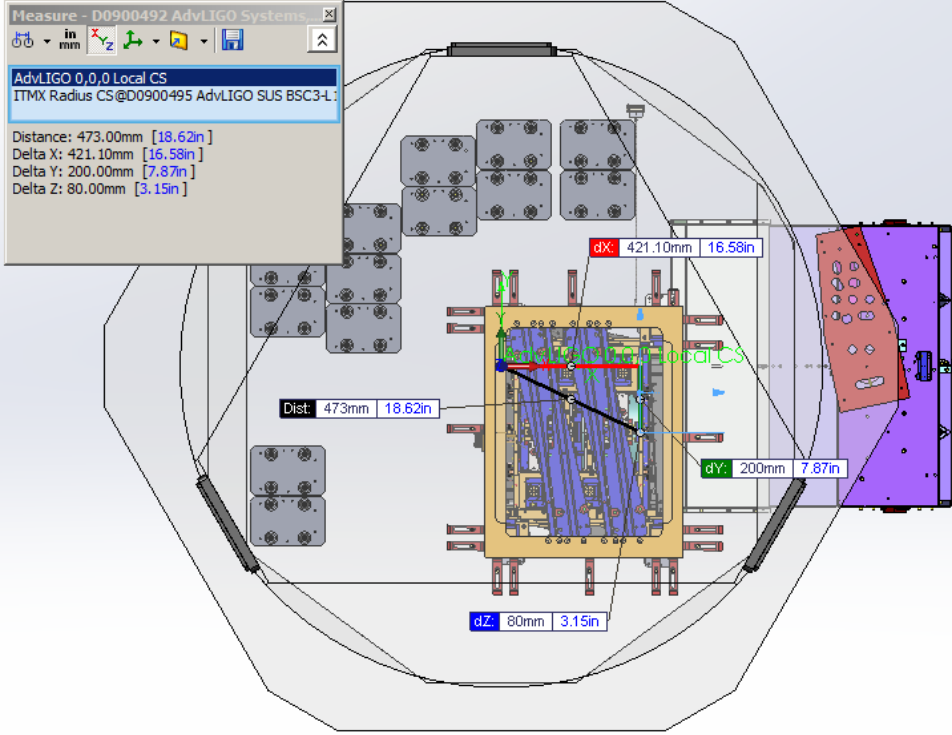
4. TCS CO2P Mirror:

- 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.

# WBSC3, LBSC3 (ITMx)



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

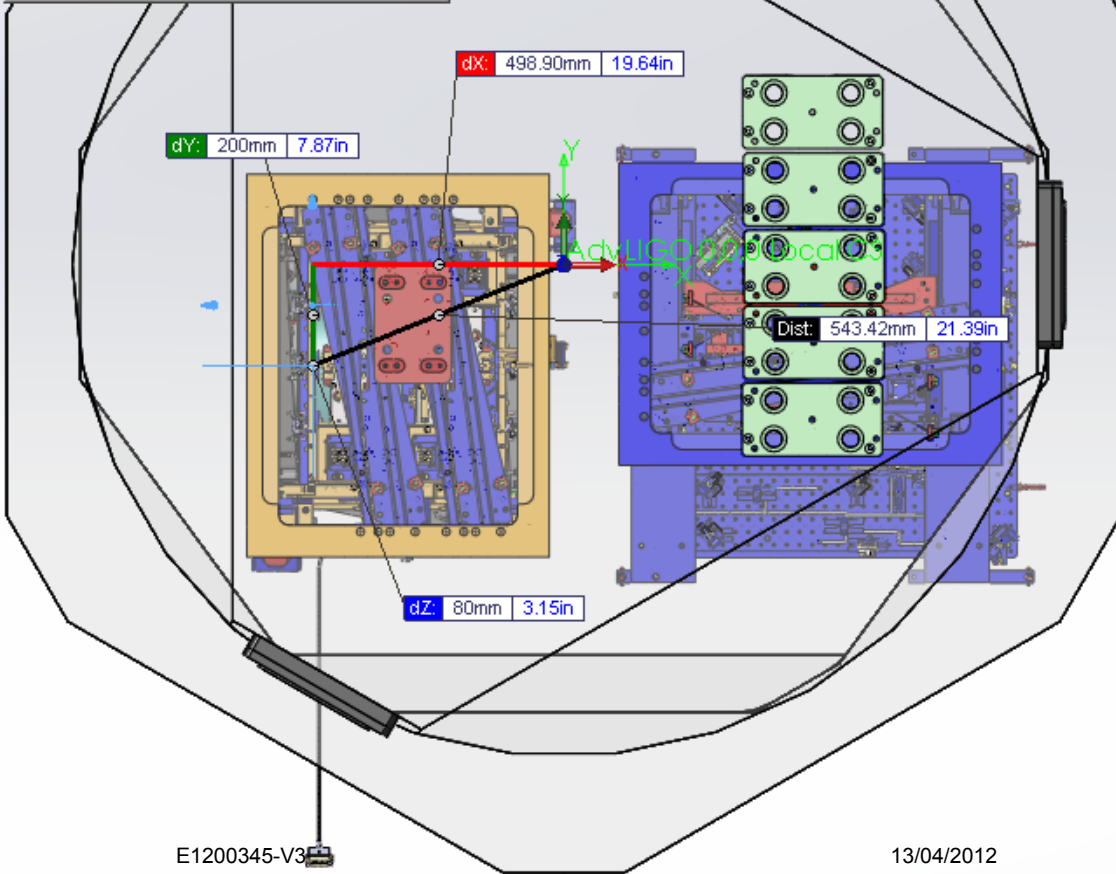
# WBSC9, LBSC4 (ETM<sub>x</sub>)

# 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]



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

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

1. Balance Masses:

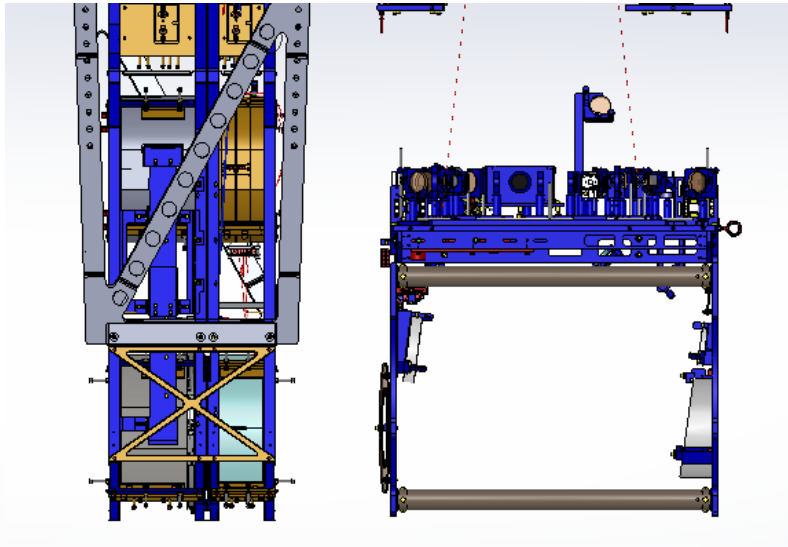
- There is a very insignificant change in the Y-Direction (4 mm) on the overall CG of the table.

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:

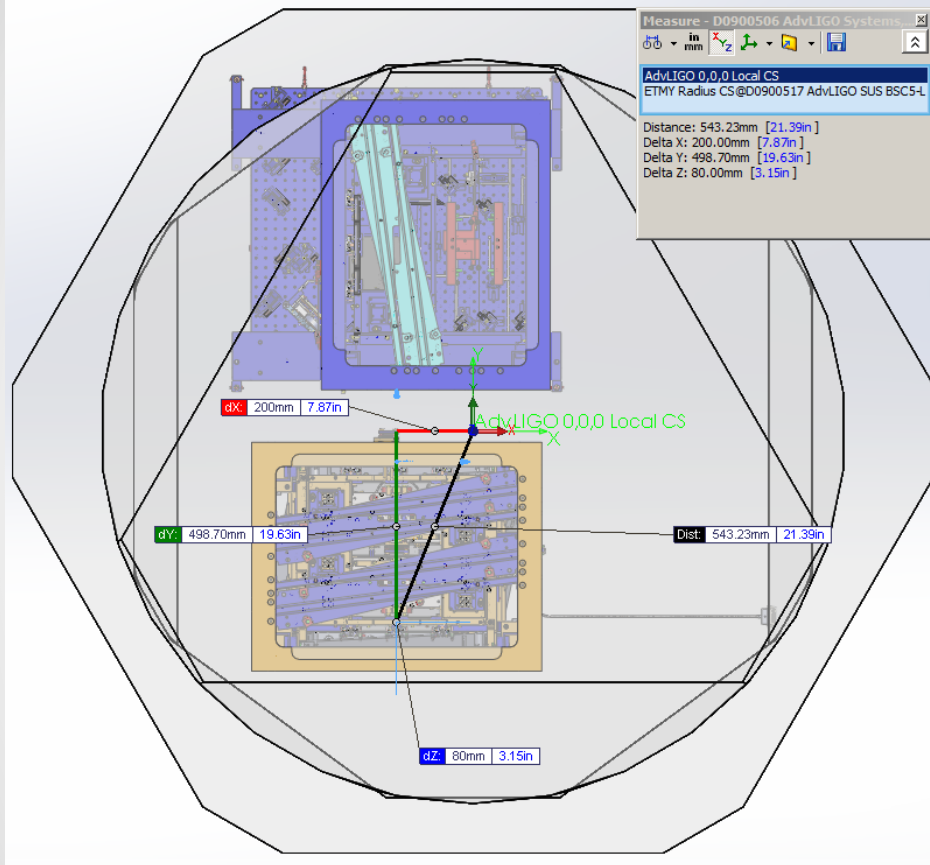
- The ETMy will be moved 30 mm toward the Global CS (away from TMS). TMS may need to be moved to keep same gap with ETMy



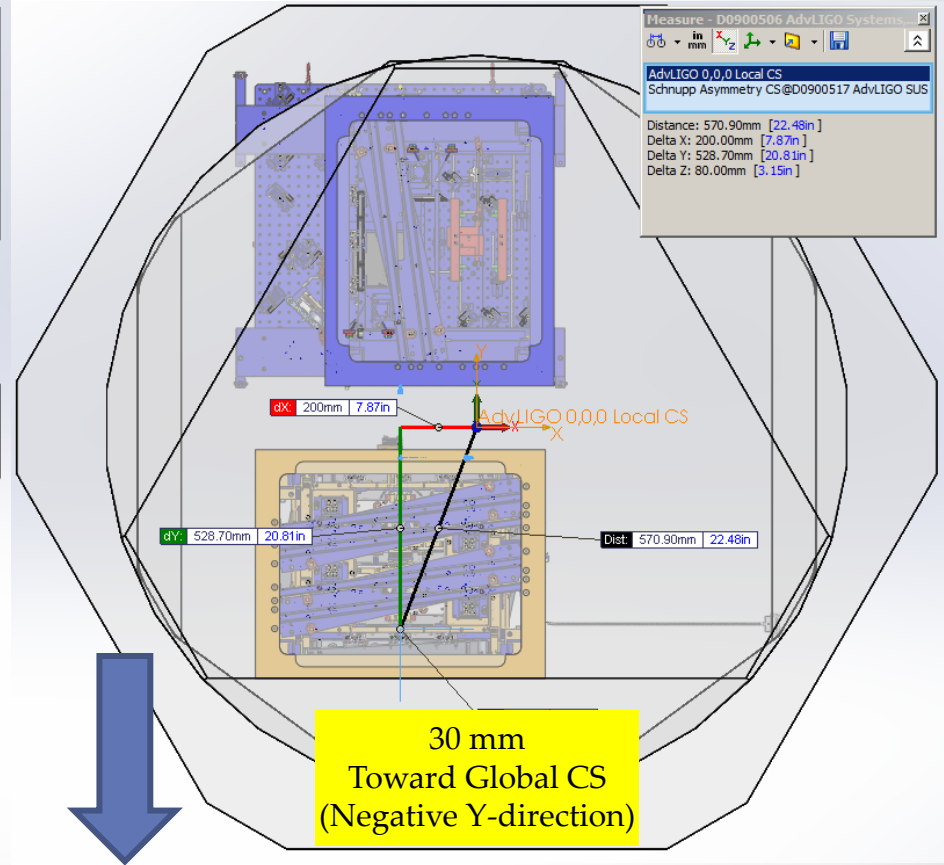
4. Cables & Cookie Cutters Blanks:

- There are no significant changes to any of these items.

# WBSC10, LBSC5 (ETMy)



Local Coordinates:  
 $X = -200.0 \text{ mm}$   
 $Y = -498.70 \text{ mm}$   
 $Z = -80.0 \text{ mm}$



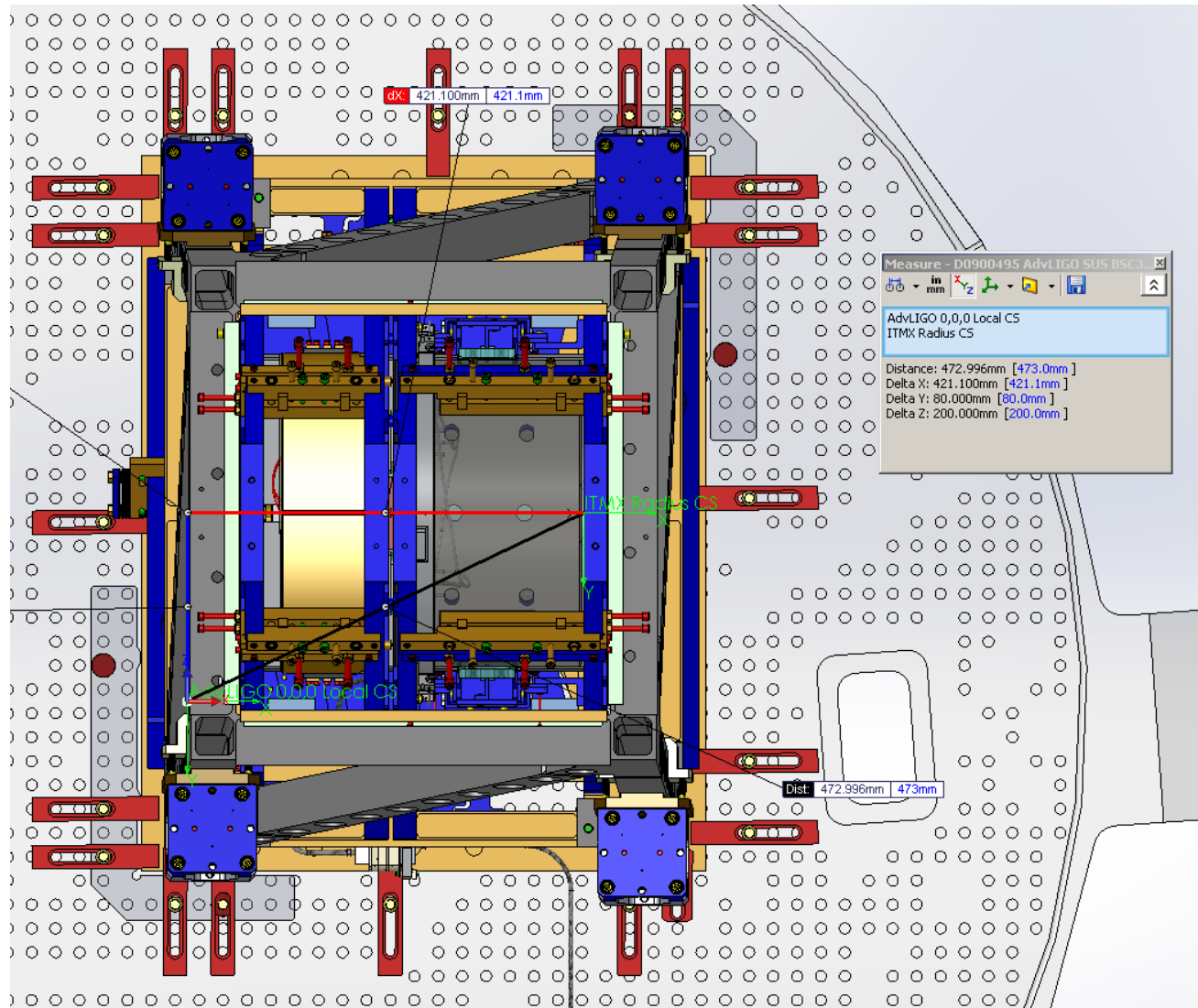
Local Coordinates:  
 $X = -200.0 \text{ mm}$   
 $Y = -528.70 \text{ mm}$   
 $Z = -80.0 \text{ mm}$

# 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:



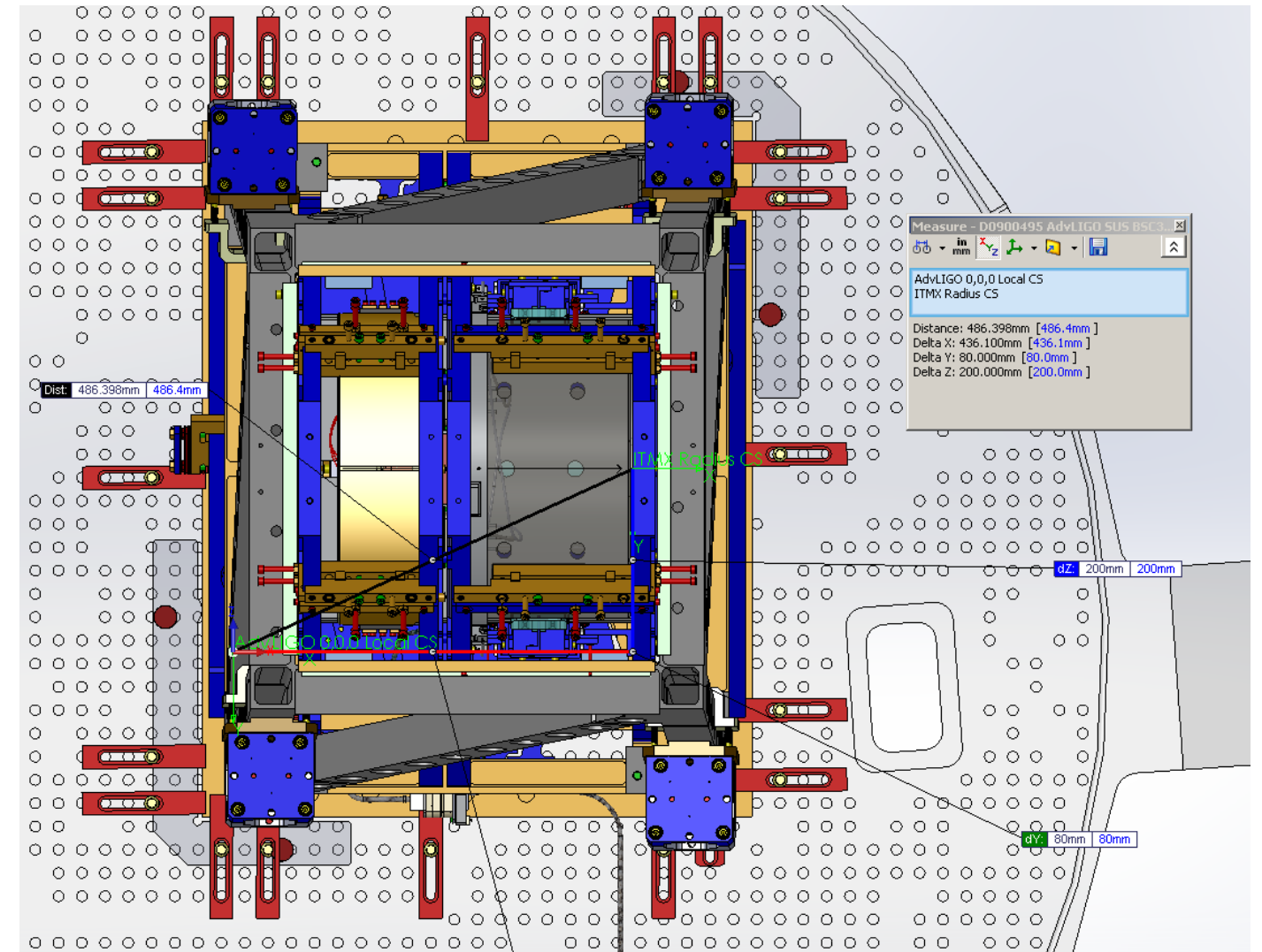
### LOCAL

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

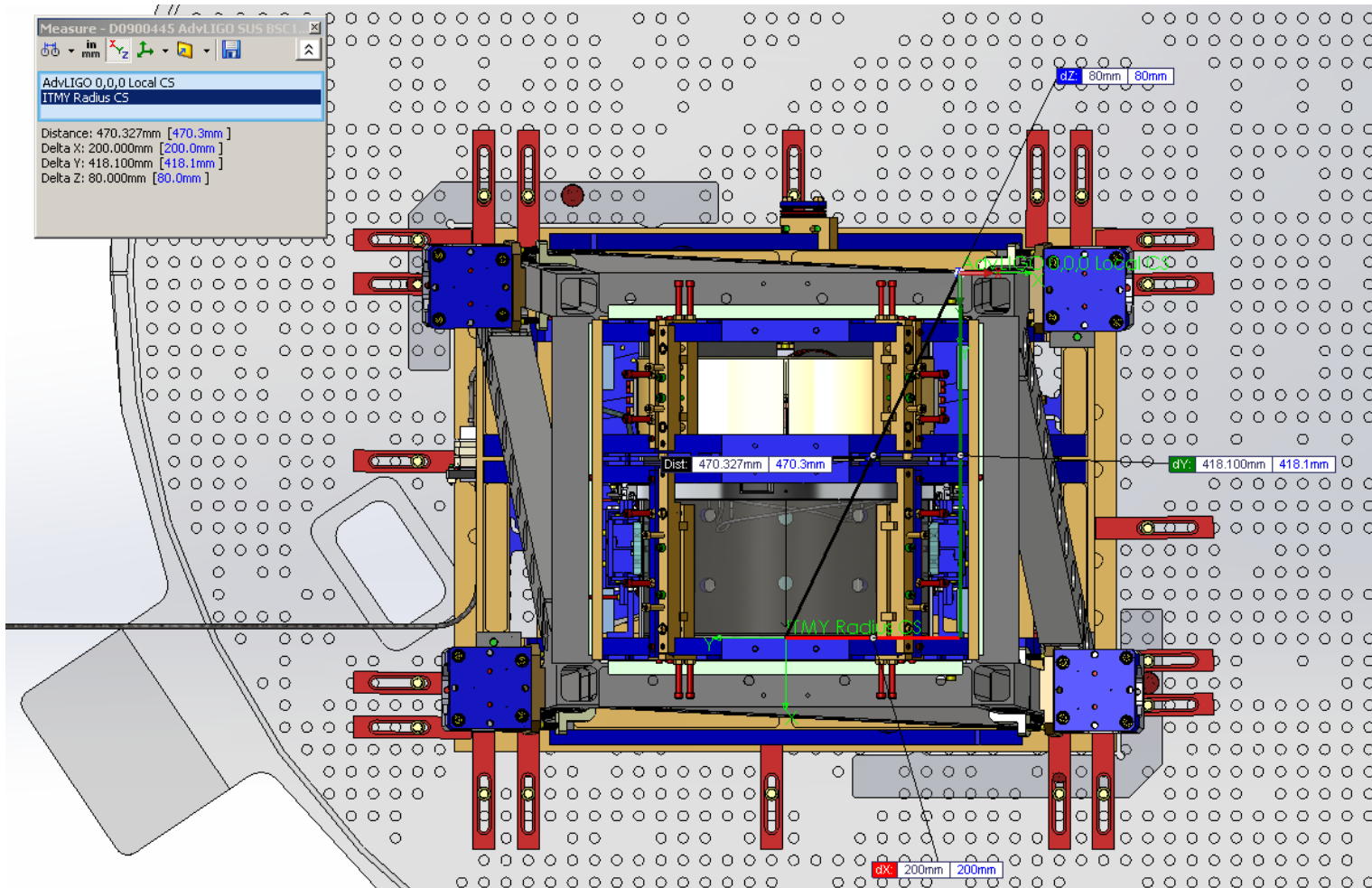


### LOCAL

Distance: 486.398mm [486.4mm]  
 Delta X: 436.100mm [436.1mm]  
 Delta Y: 80.000mm [80.0mm]  
 Delta Z: 200.000mm [200.0mm]



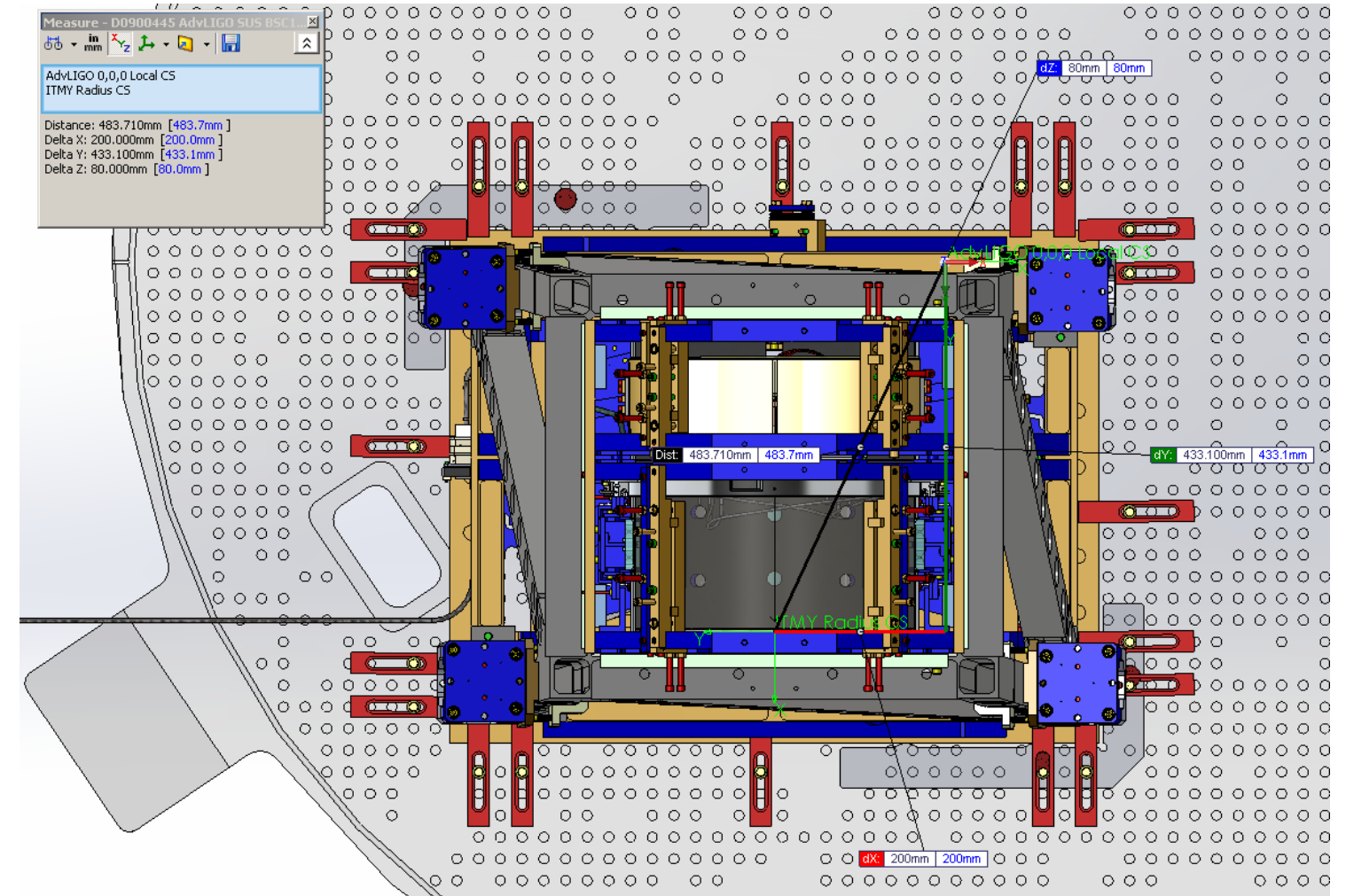
# BSC1-L1 (ITMY) CURRENT:



## LOCAL

Distance: 470.327mm [470.3mm]  
Delta X: 200.000mm [200.0mm]  
Delta Y: 418.100mm [418.1mm]  
Delta Z: 80.000mm [80.0mm]

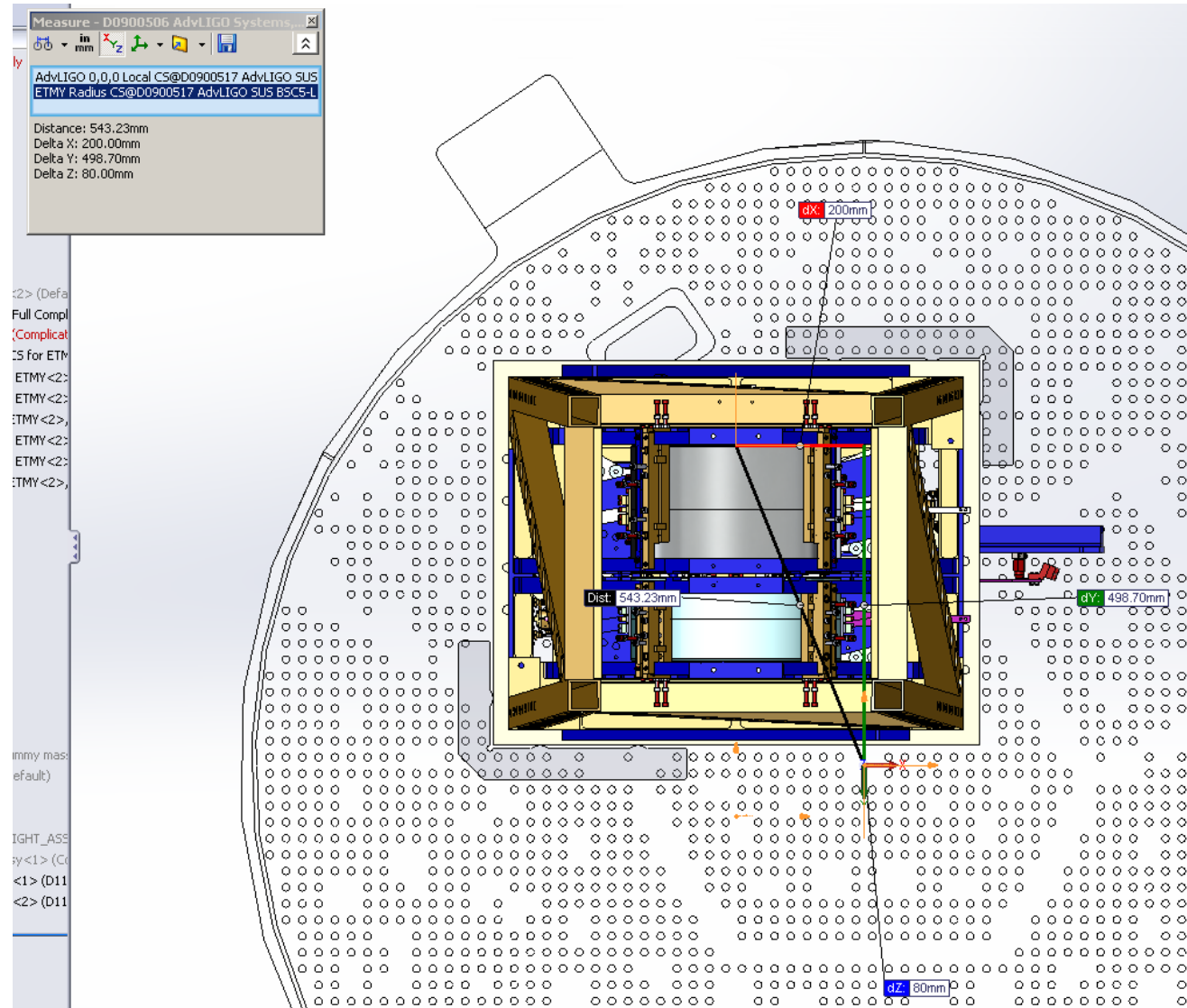
# BSC1-L1 (ITMY) Schnupp Effect: 15mm Toward GLOBAL 0



## LOCAL

Distance: 483.710mm [483.7mm]  
Delta X: 200.000mm [200.0mm]  
Delta Y: 433.100mm [433.1mm]  
Delta Z: 80.000mm [80.0mm]

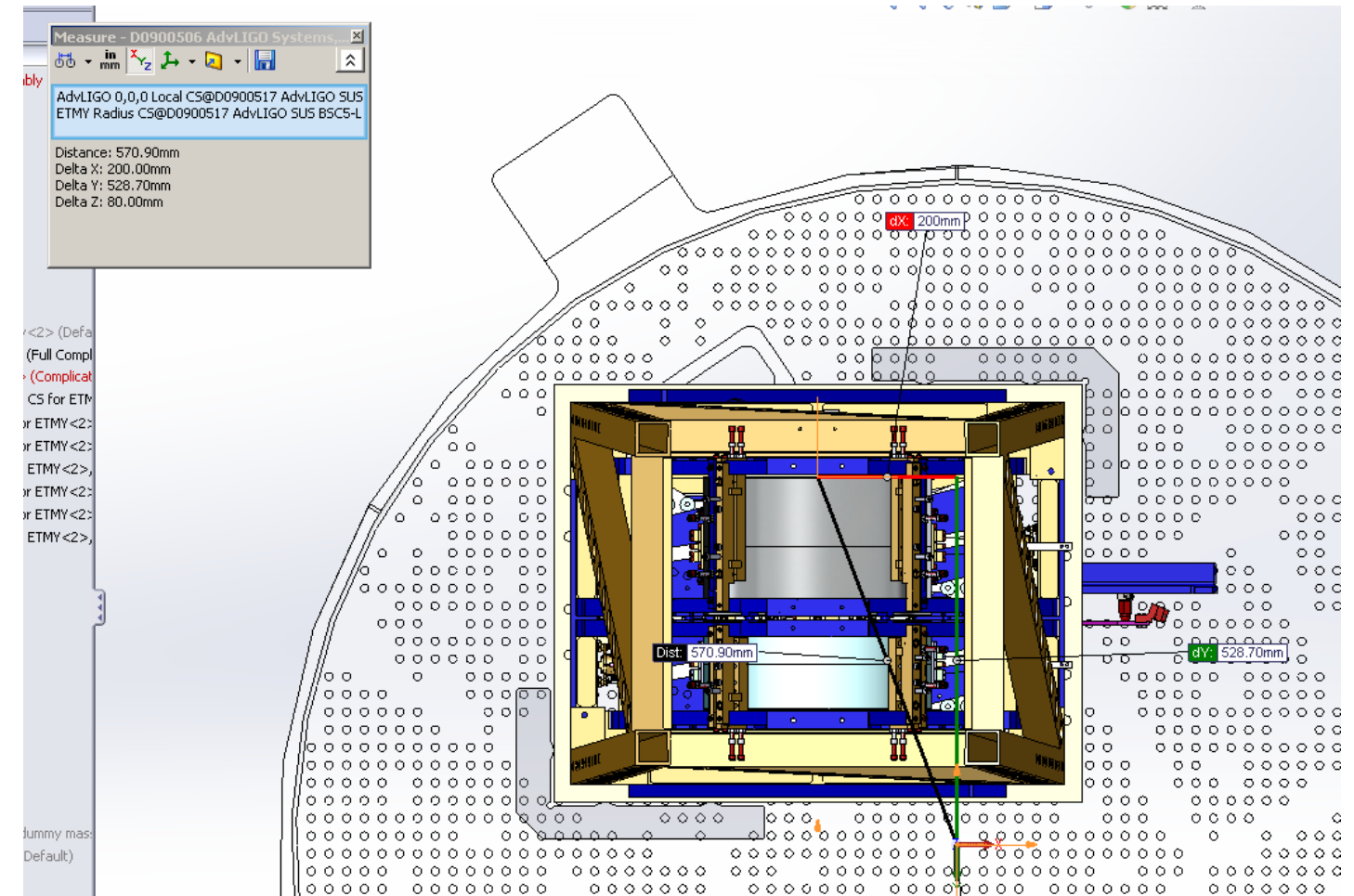
# BSC5-L1 (ETMY) CURRENT:



## LOCAL

Distance: 543.23mm  
Delta X: 200.00mm  
Delta Y: 498.70mm  
Delta Z: 80.00mm

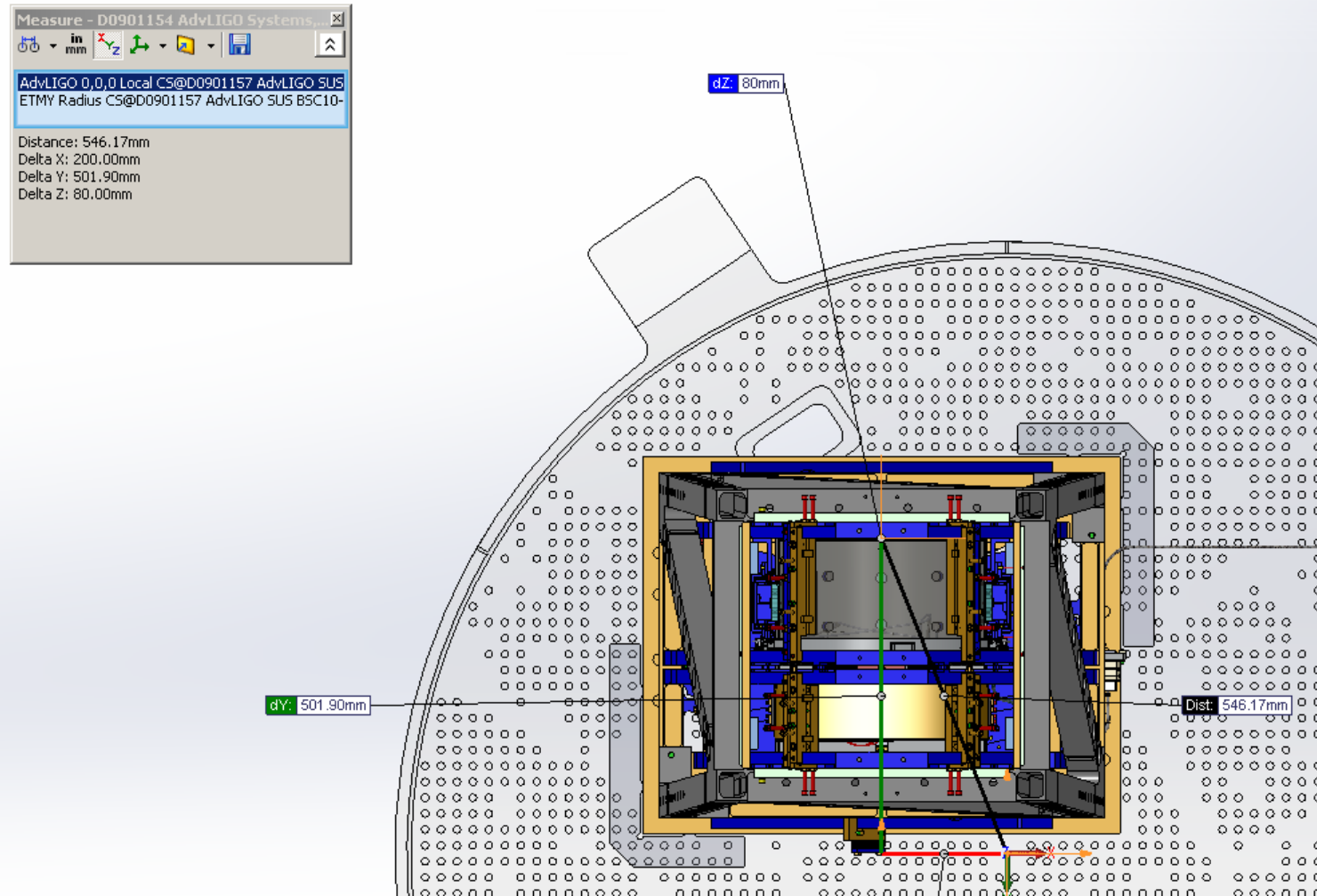
# BSC5-L1 (ETMY) Schnupp Effect: 30mm Toward GLOBAL 0



## LOCAL

Distance: 570.90mm  
Delta X: 200.00mm  
Delta Y: 528.70mm  
Delta Z: 80.00mm

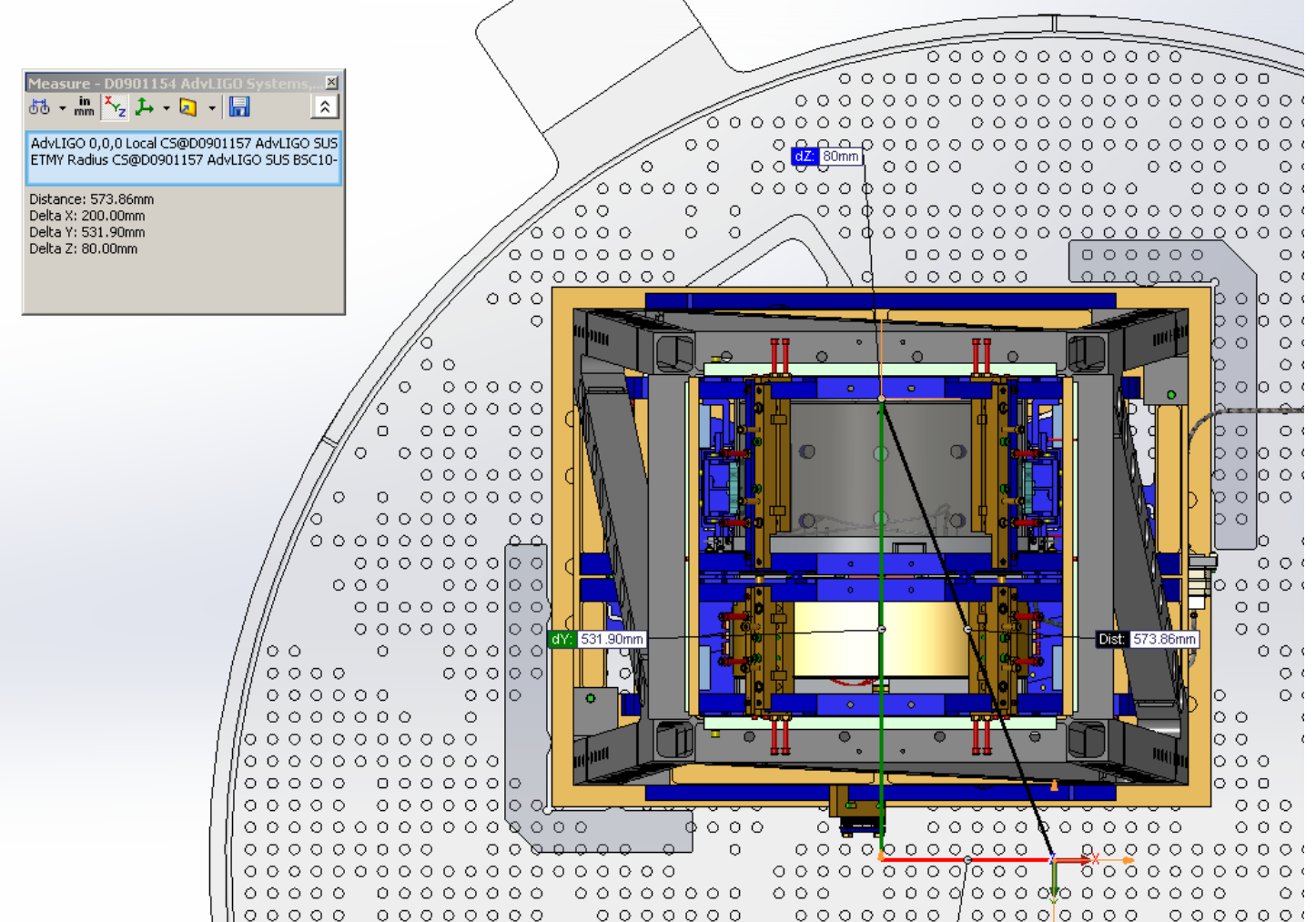
# BSC10-H1 (ETMY) CURRENT:



## 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