THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY
12000 Jefferson Avenue
Newport News, VA 23606

HALL D PROCEDURE NO.:
D00000-01-05-P0000 Rev -

TITLE: TOF ASSEMBLY PROCEDURE

DATE: 05/10/2013

BY: C HUTTON

APP: _____
PRINT: _____

CHK:_____
PRINT: _____

APP: _____
PRINT:_____

REV.	DESCRIPTION	BY	CHK.	APP.	APP.	DATE

PREPERATION

Safety Equipment Required:	
# of Technicians Required: **2**	**Work Station:**
Material Required:	

Procedure

1. Setup saw horses approxiamtely as shown. Saw horses marked C & D will be 1.00” higher than A & B.

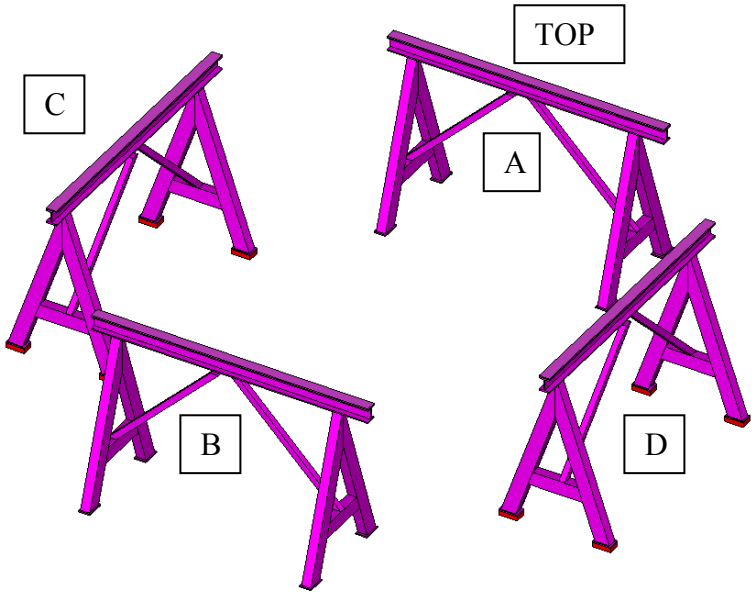

Figure 1

2. Layout MC Channel 1 (D00000-01-05-2000),MC Channel 2 (D00000-01-05-2001), MC Channel 4 (D00000-01-05-2003 & MC Channel 5 (D00000-01-05-2036 roughly as shown below in Fig.2.

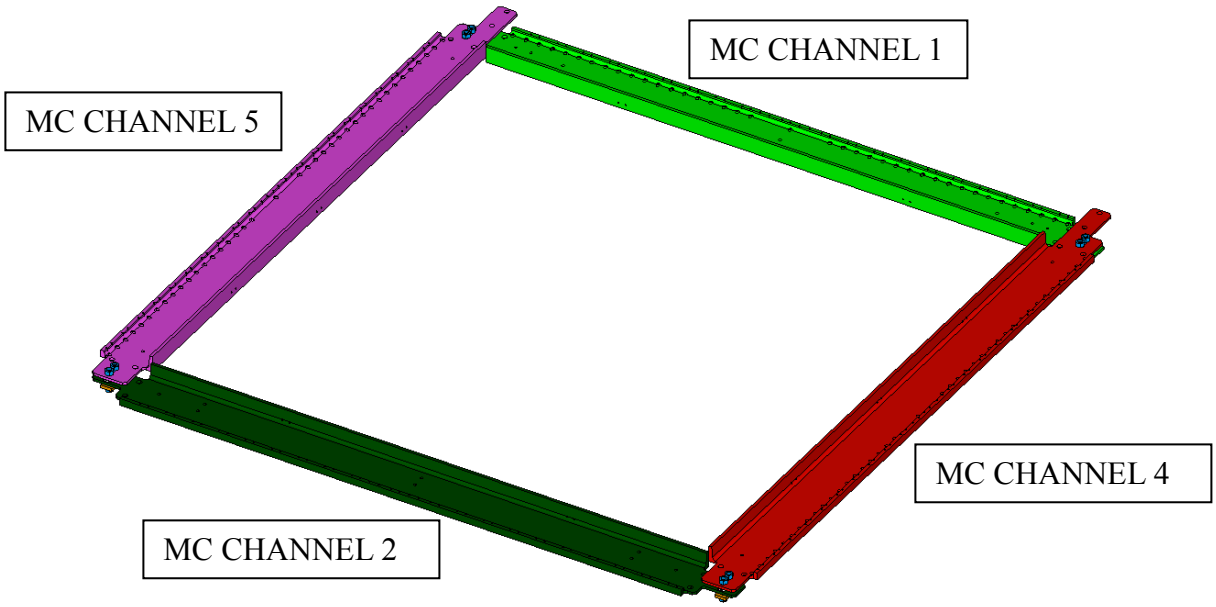

Figure 2

3. Attach MC Channels shown in Fig.2 loosely using hardware shown in Fig.3. Use a quantity of 2, ¾-10 UNC X 3.0 lg hex bolts, ¾ flat washers, ¾-10 UNC nuts along with 1 Friction Plate (D00000-01-05-2026) and 2 MC Spacers (D00000-01-05-2041) per corner.

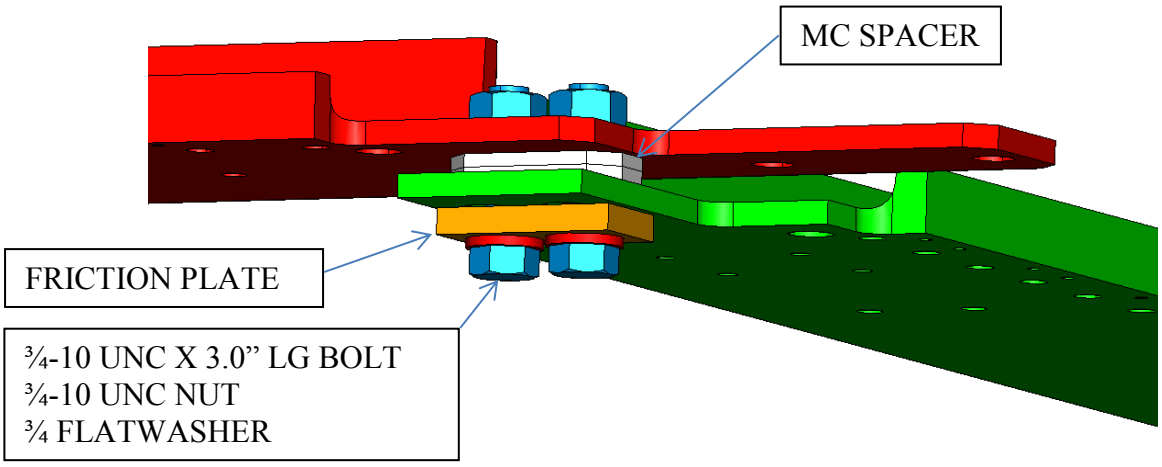

Figure 3

4. Lift attached MC Channels and lay onto previously arranged saw horses (Fig.1) making sure that MC Channel 1 matches the sawhorse labeled TOP in Fig.1. The distance between channels ~100".

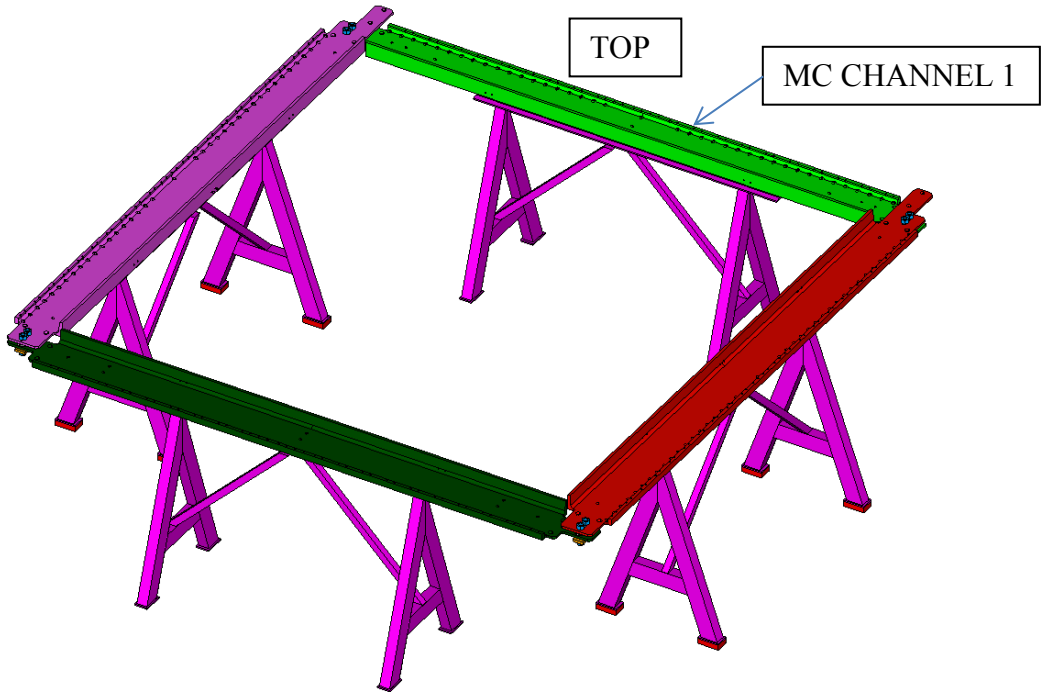

Figure 4

5. Saw horses should be centered on bottom faces of MC Channels as shown in Fig.5

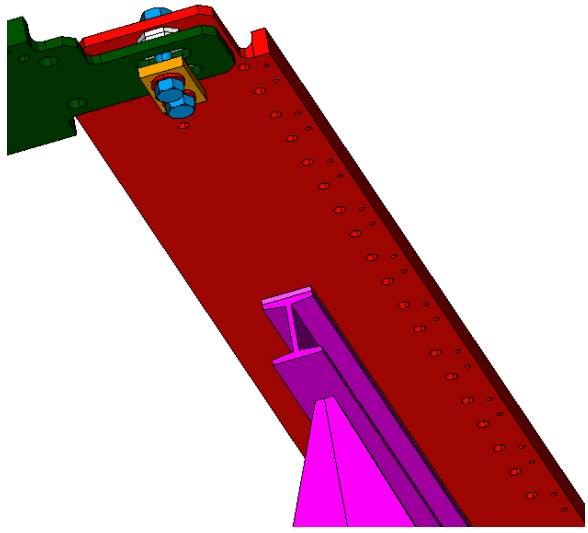

Figure 5

6. Attach Scint bar/center support weldment (D00000-01-05-2031) to MC Channel 4 and MC channel 5 using a quantity of 4, ¼-20 UNC X .75 lg SHCS as shown in Fig 6. Final height will be determined later in assembly. Leave screws finger tight.

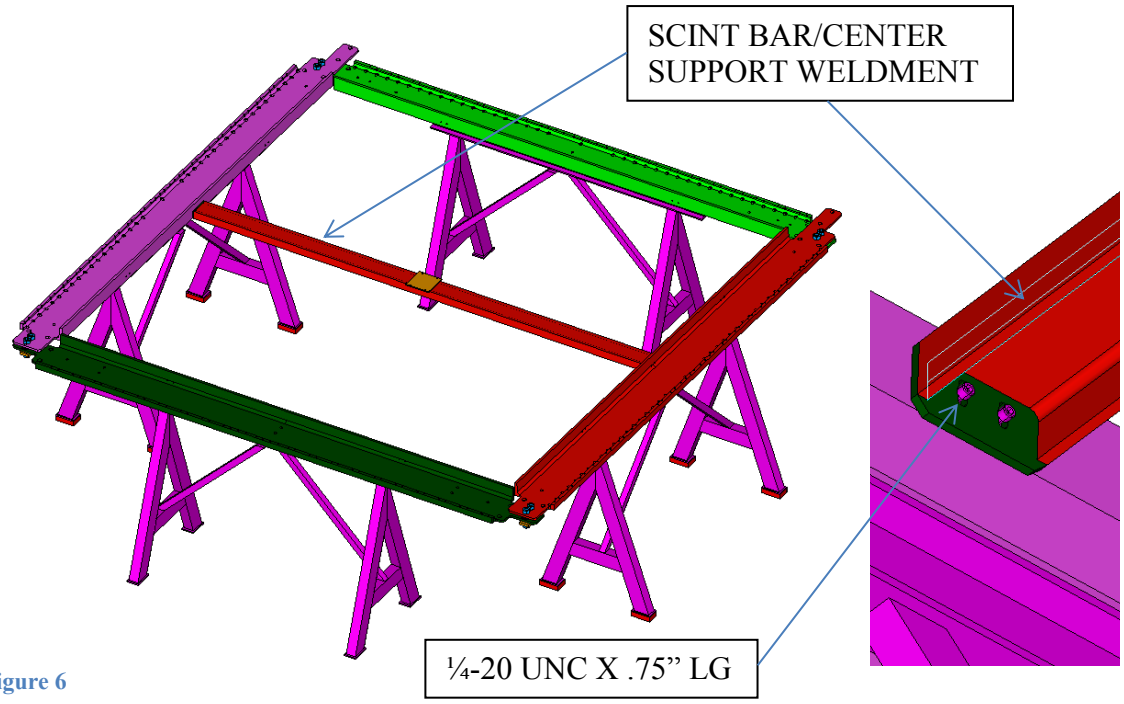

Figure 6

7. Attach the Center support assembly (D00000-01-05-1003) to the Scint bar/center support weldment (D00000-01-05-2031) using the existing fasteners. It is important that the 4.99" edge of the center support assembly be installed parrallel with support weldment. A quantitiy of 4, #6 screws will be removed from the center support assembly and then reinstalled to attach.

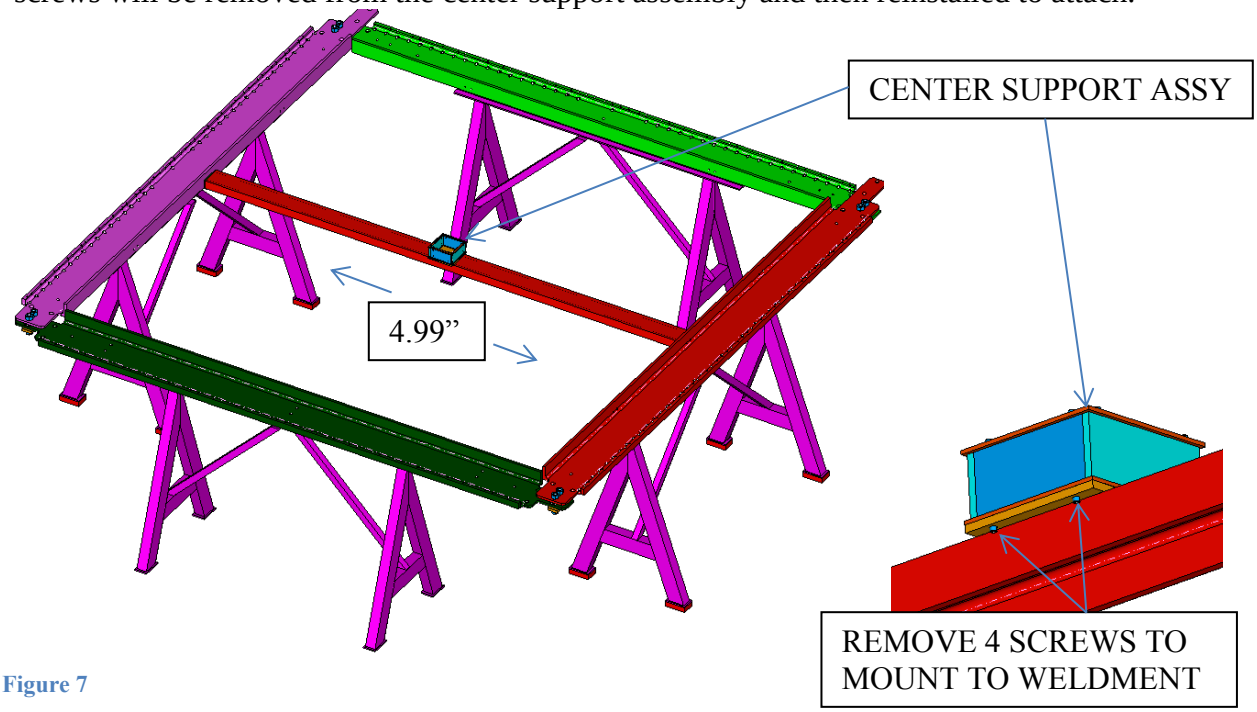

Figure 7

8. Attach the MC Channel rubber lip (D00000-01-05-2040) to the MC channels 1, 2, 4 & 5 as shown. Add 39 MC Channel standoffs (D00000-01-05-2014) per MC Channel along with .50-13 unc nuts (outer and inner) to all of the MC Channels as shown in figure below leaving about .7" of thread out of the bottom of the MC channels.

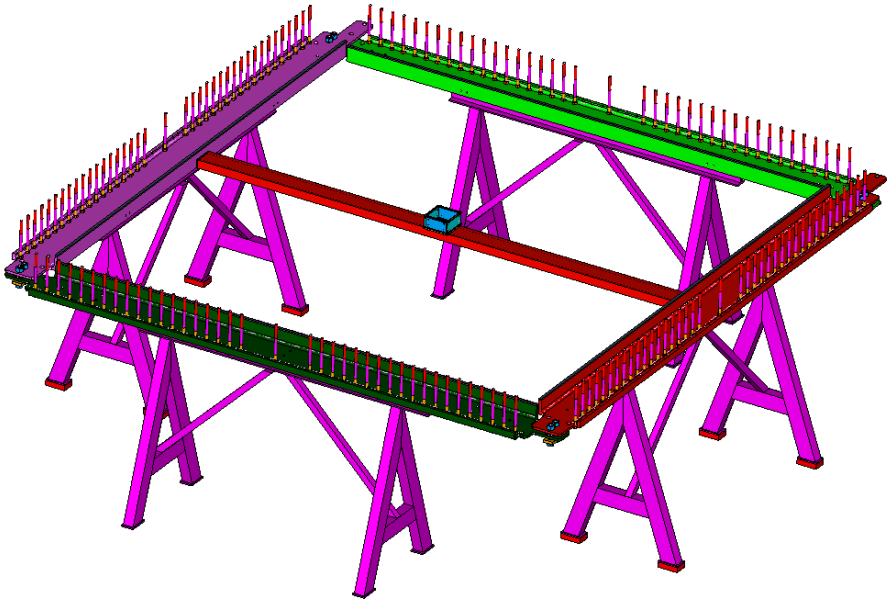

Figure 8a

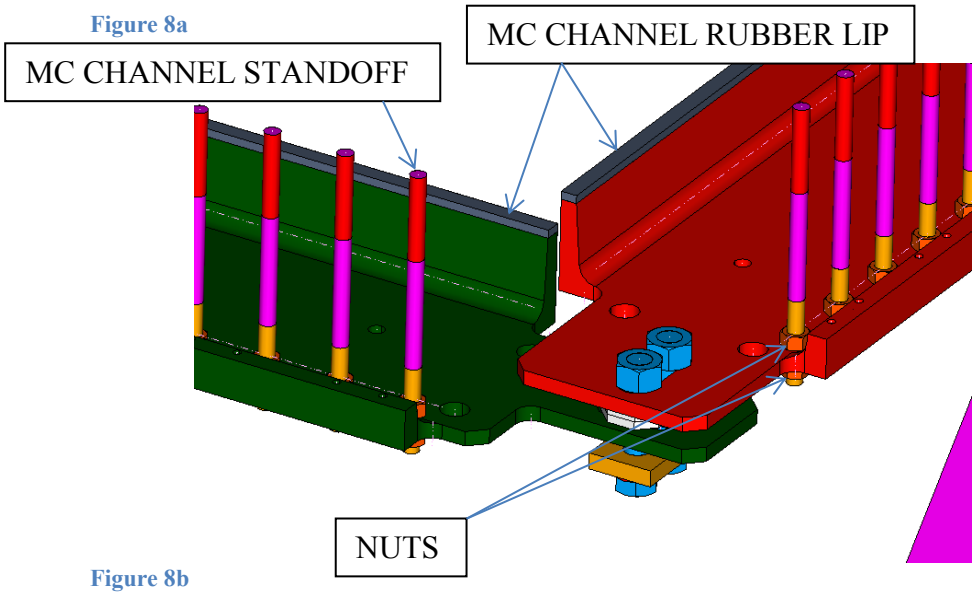

Figure 8b

9. Install next set of nuts on all MC channel standoffs leaving approximately .28” gap between previously installed MC channel inner nuts.

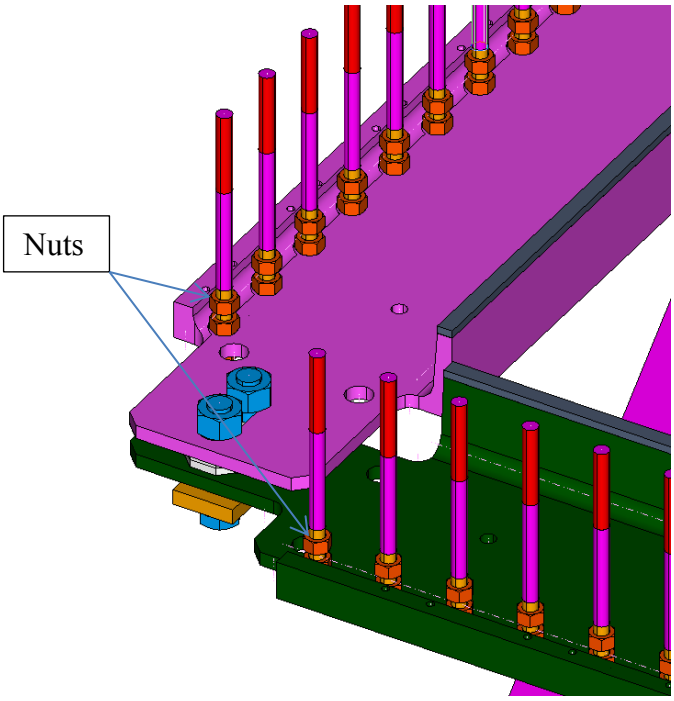

Figure 9

10. Slide Light guide center holder (D00000-10-05-2020), two light guide holder plate 2 (D00000-01-05-2022) and two light guide holder plate 4 (D00000-01-05-2045) over the MC channel 1 standoffs.

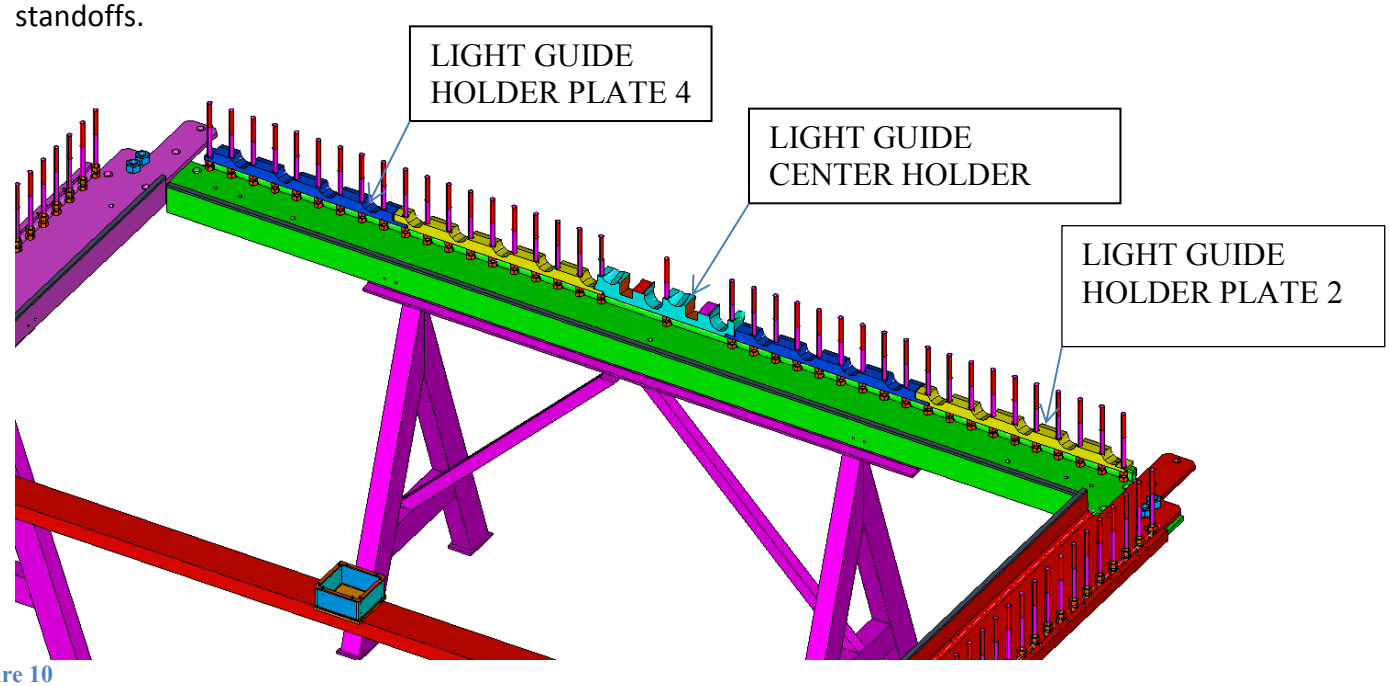

Figure 10

11. Slide Light guide center holder reverse (D00000-10-05-2023), Light guide holder plate 2 reverse (D00000-01-05-2024) and Light guide holder plate 4 reverse (D00000-01-05-2047) over MC channel 2 standoffs.

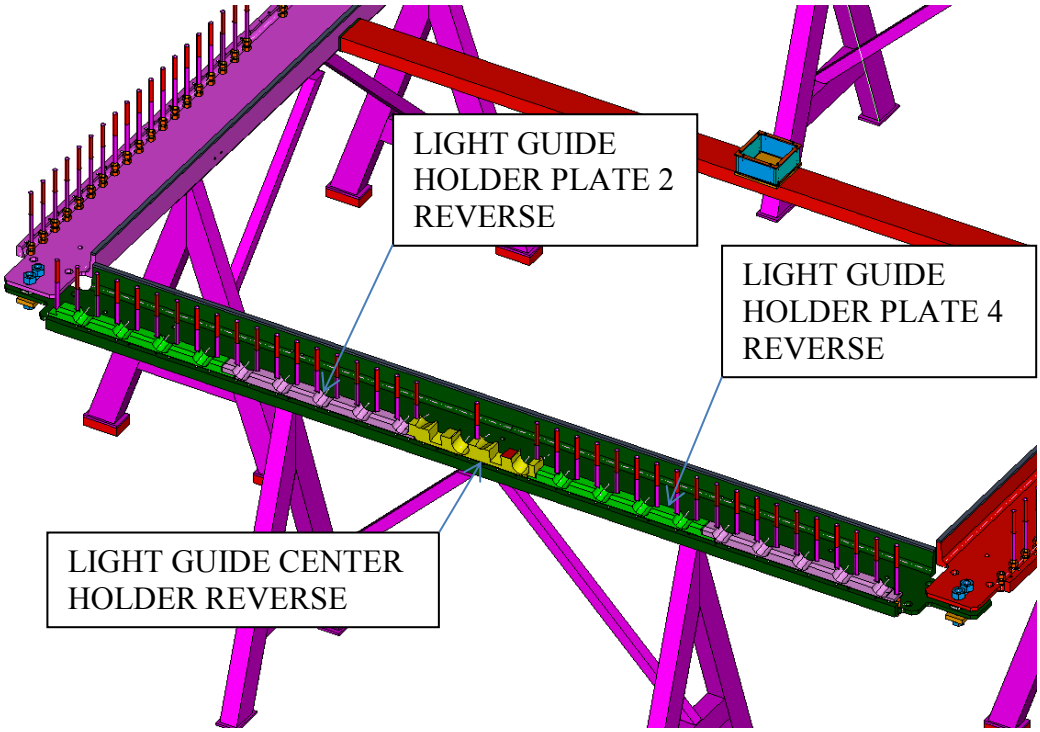

Figure 11

12. *Slide Light guide center holder (D00000-10-05-2020), two light guide holder plate 2 (D00000-01-05-2022) and two light guide holder plate 4 (D00000-01-05-2045) over the MC channel standoffs.*

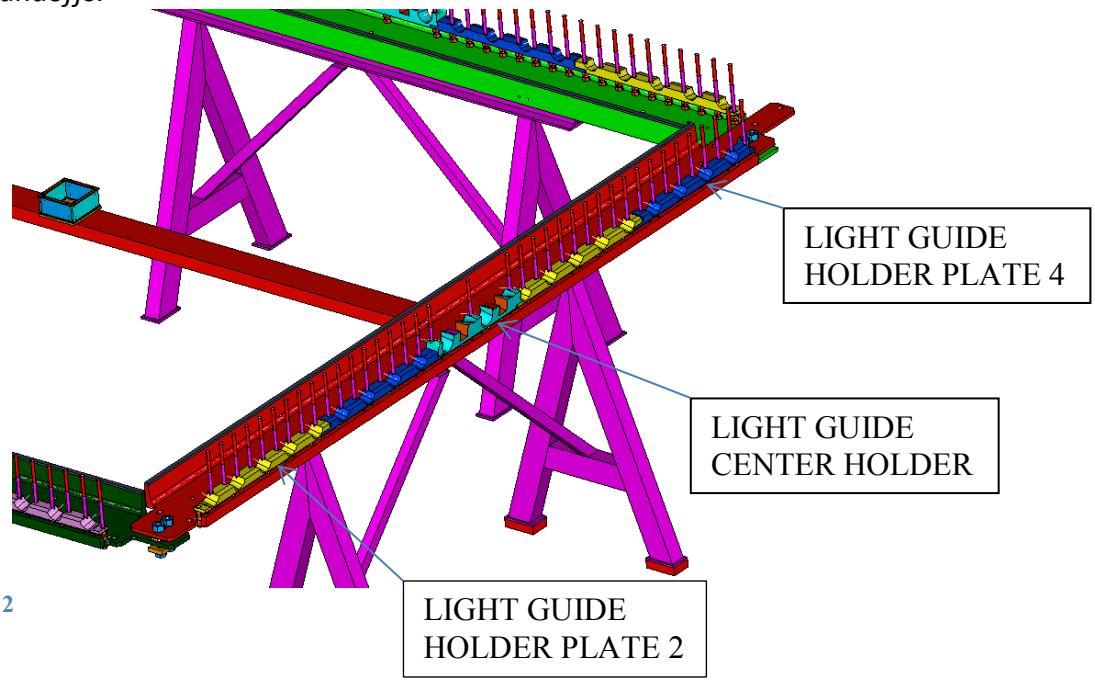

Figure 12

13. Slide Light guide center holder reverse (D00000-10-05-2023), Light guide holder plate 2 reverse (D00000-01-05-2024) and Light guide holder plate 4 reverse (D00000-01-05-2047) over MC channel 2 standoffs.

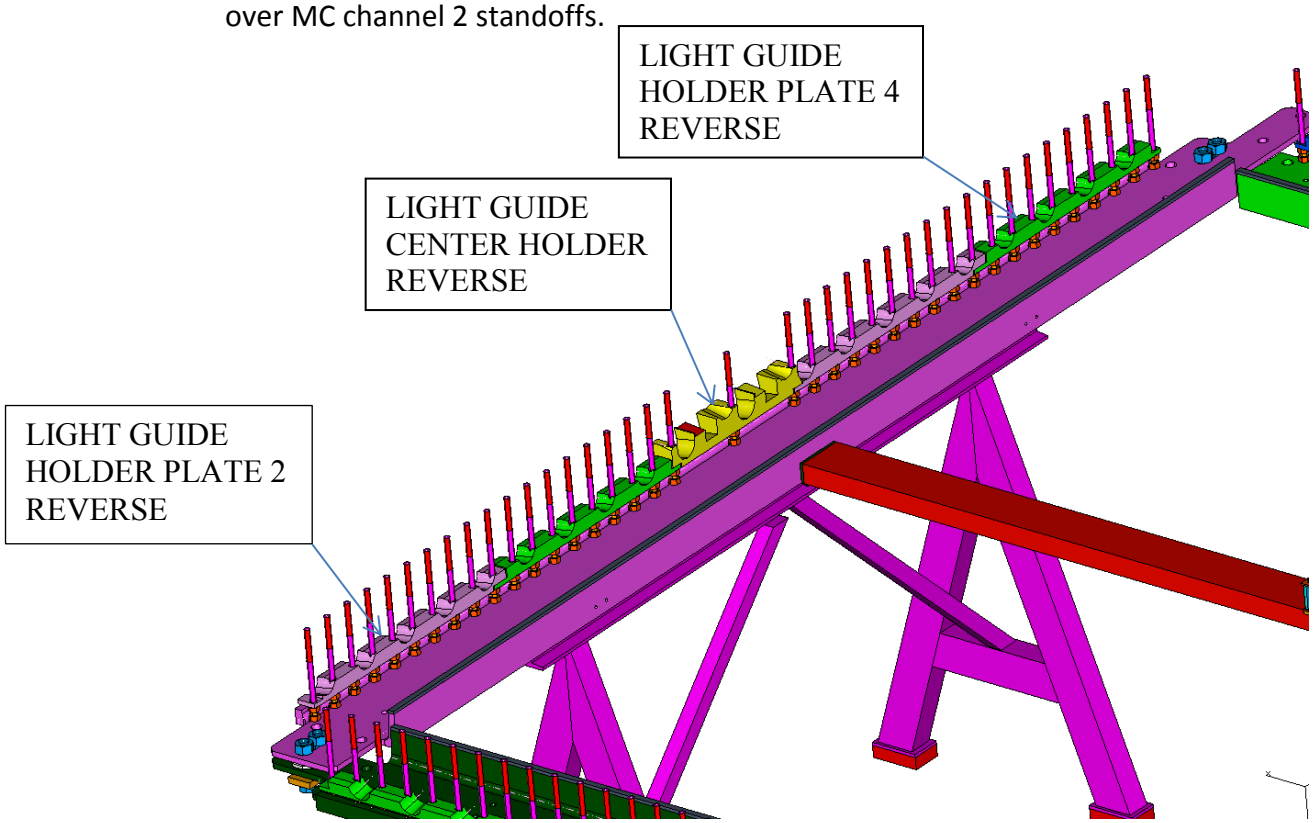

Figure 13

14. Insert the 1/8" thick liner in between the cutout surfaces of the center light guide holder (on MC Channel 1) and the light guides themselves to help protect them from any contact that may damage the wrapping. Finish the installation of the wrapping by attaching the wrap all the way around the light guide after laying in 2 Short bar assy's (6cm) (D00000-01-05-1001) onto the Center support assy and the center light guide holder on MC 1 as shown below.

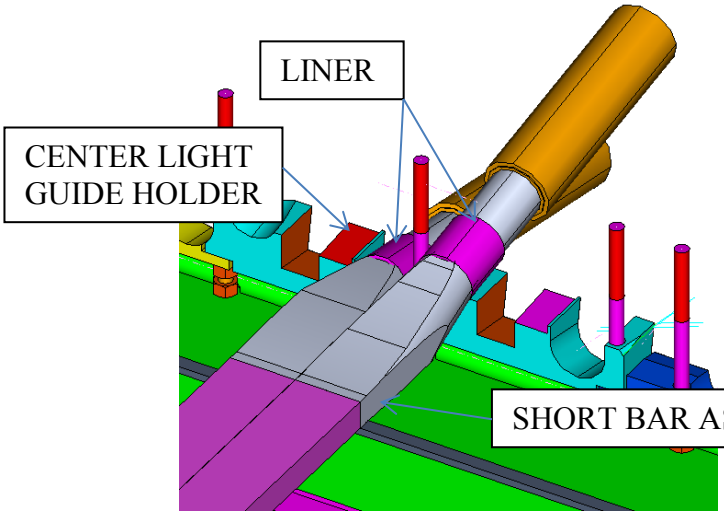

Figure 14a

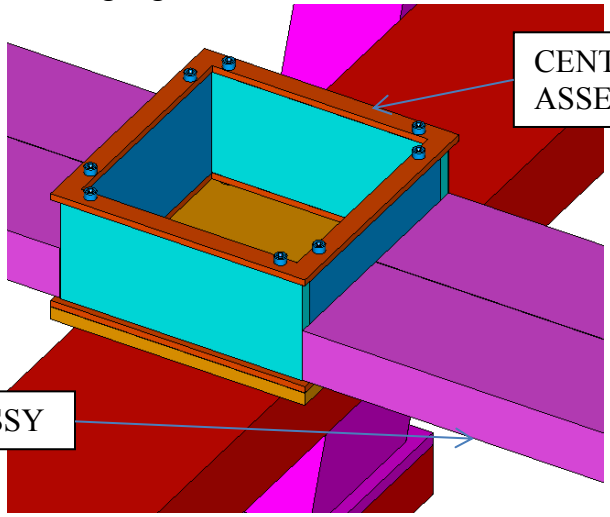

Figure 15b

15. Loosen screws holding the Center support assy and vertically adjust the Scint bar/center support weldment to ensure that the newly installed short bar assy's are parallel with the MC channels.

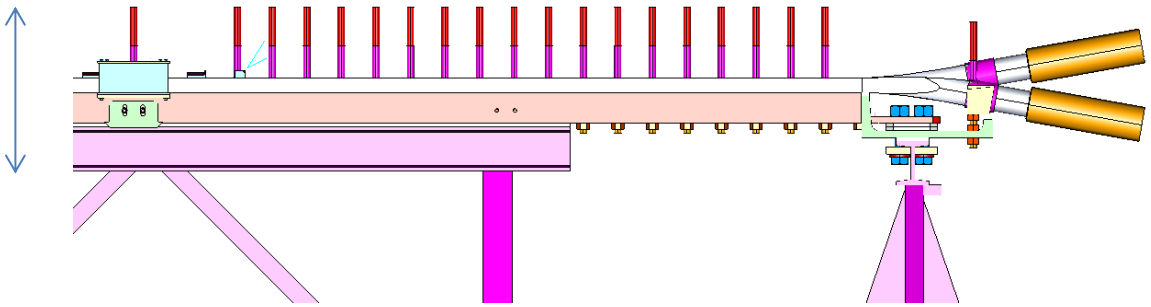

Figure 15

16. Insert the 1/8" thick liner in between the cutout surfaces of the center light guide holder reverse (on MC Channel 2) and the light guides themselves to help protect them from any contact that may damage the wrapping. Finish the installation of the wrapping by attaching the wrap all the way around the light guide after laying in 2 Short bar assy's (6cm) (D00000-01-05-1001) onto the Center support assy and the center light guide holder reverse on MC 2 as shown below.

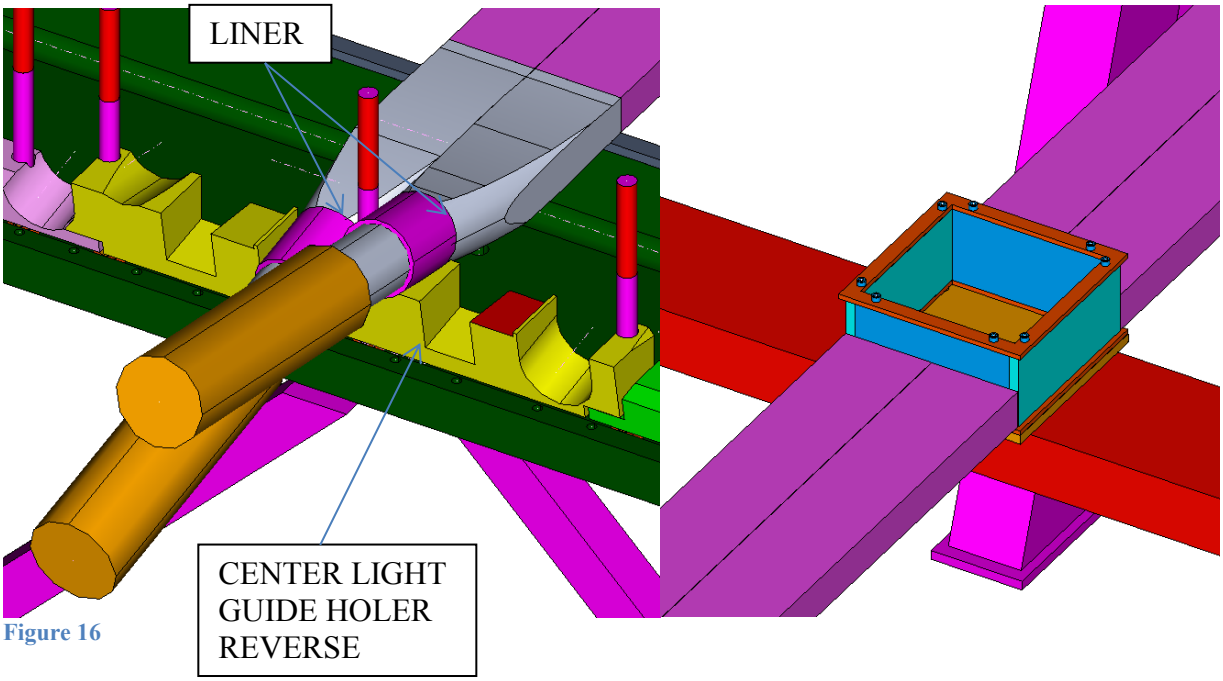

Figure 16

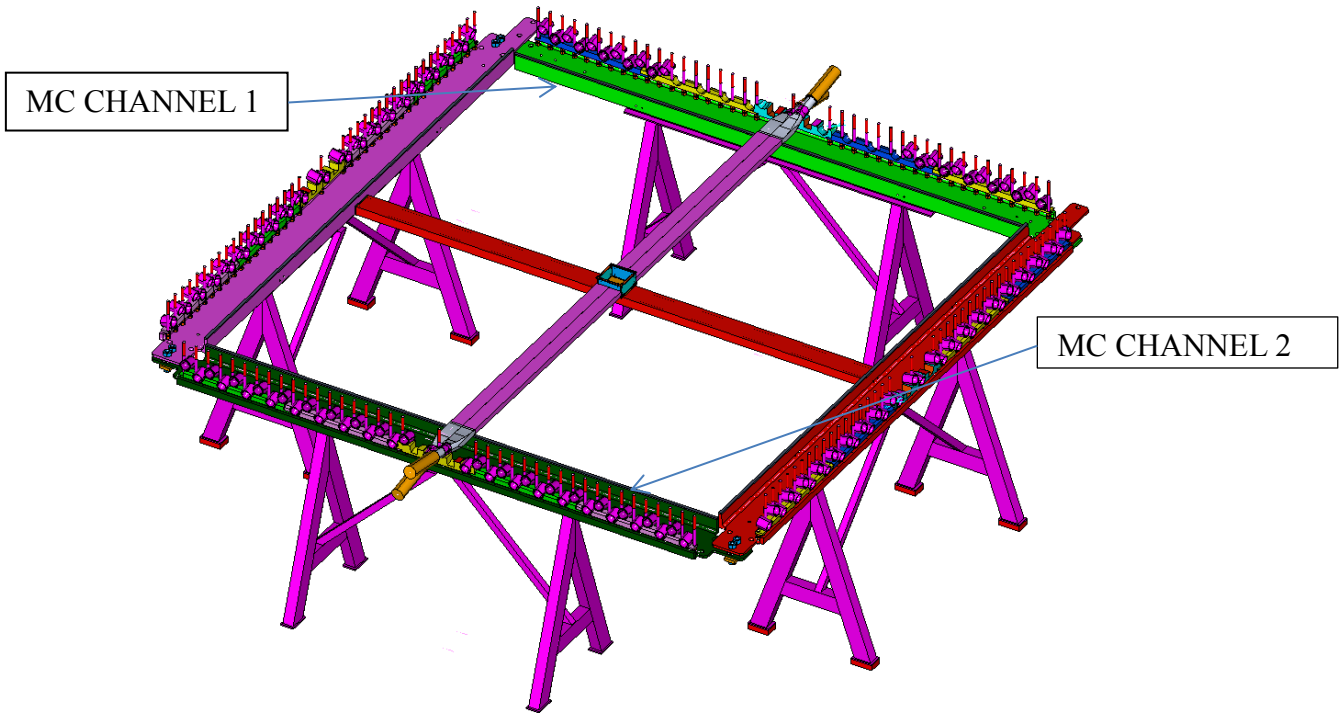

Figure 16b

17. Attach the 2 Scint bar support weldments (D00000-01-05-2030) using a quantitiy of 8, ¼-20 UNC X .75 lg SHCS as shown. 6. Final height will match the underside of installed light guides.

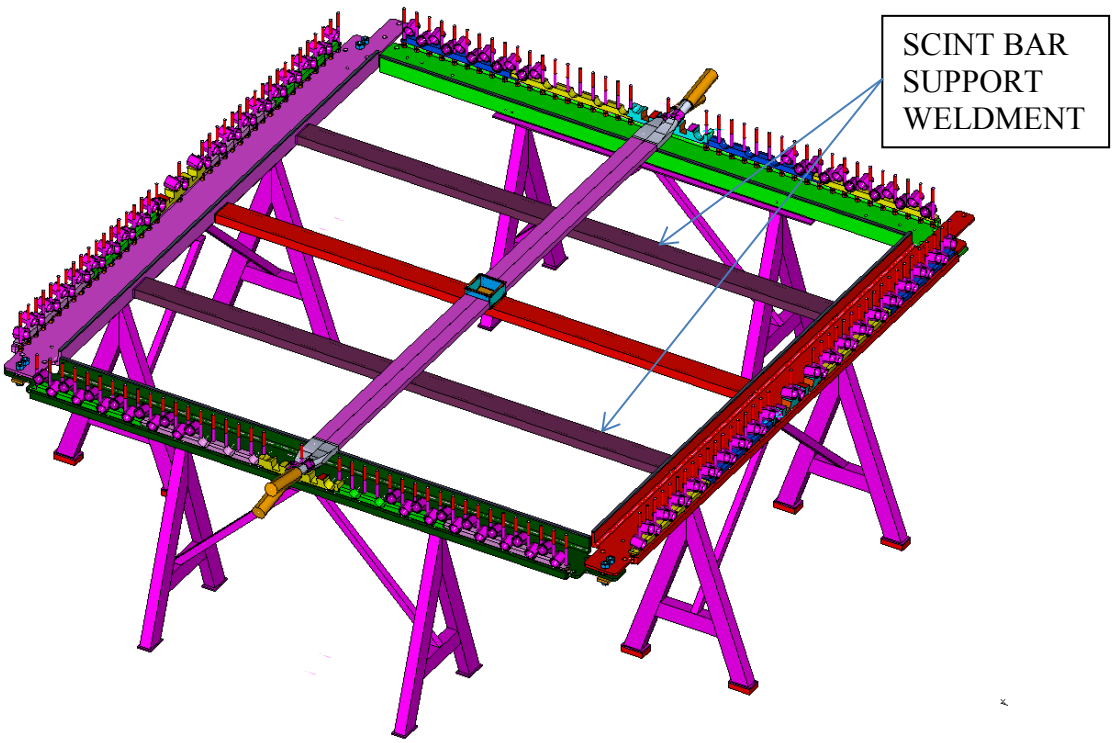

Figure 17

18. Insert the 1/8” thick liner in between the cutout surfaces of the center light guide holder (on MC Channel 1) or center light guide holder reverse (on MC Channel 2) and the light guides themselves to help protect them from any contact that may damage the wrapping. Finish the installation of the wrapping by attaching the wrap all the way around the light guide after laying in the 4 Split long bar assy’s (3cm) (D00000-01-05-1002) onto the Center light guide holder (MC 1) and the Center light guide holder reverse (MC 2).

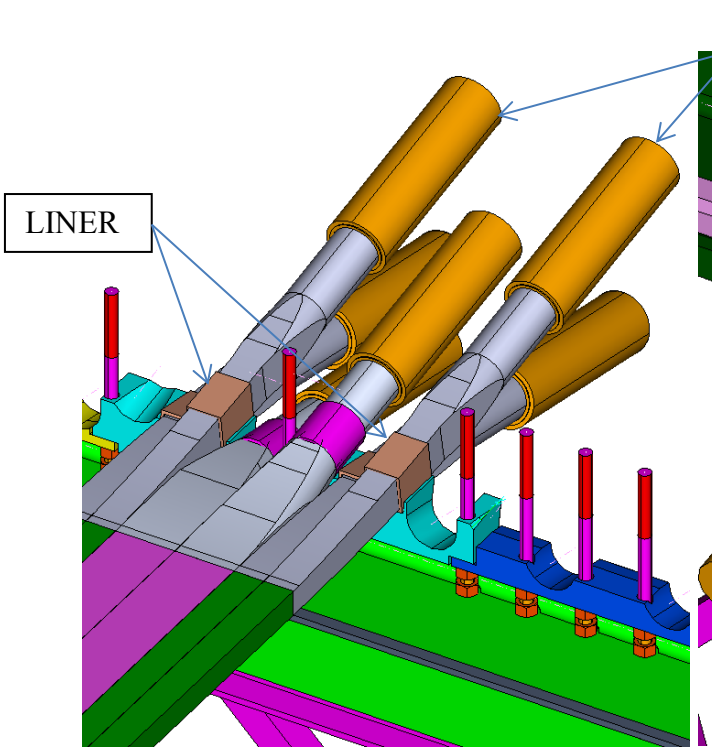

Figure 18a

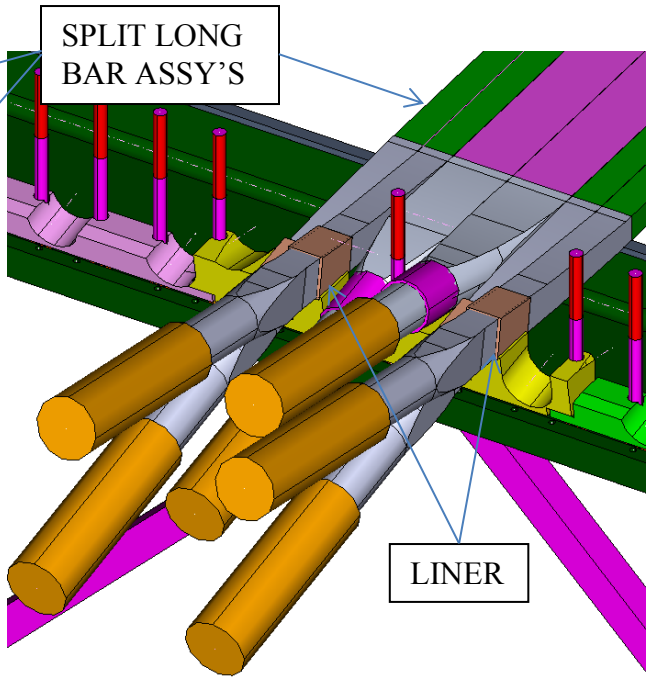

Figure 18b

19. Insert the 1/8” thick liners in between the cutout surfaces of the Light guide holder plate 2 and 4 (on MC Channel 1) and Light guide holder plate reverse 2 and 4 (on MC Channel 2) and the light guides themselves to help protect them from any contact that may damage the wrapping. Finish the installation of the wrapping by attaching the wrap all the way around the light guide after laying the 19 downward facing Long bar assy’s (6cm) (D00000-01-05-1000) onto the Light guide holder plates 2 &4 (MC 1) and the Light guide holder plates 2 & 4 reverse (MC 2).

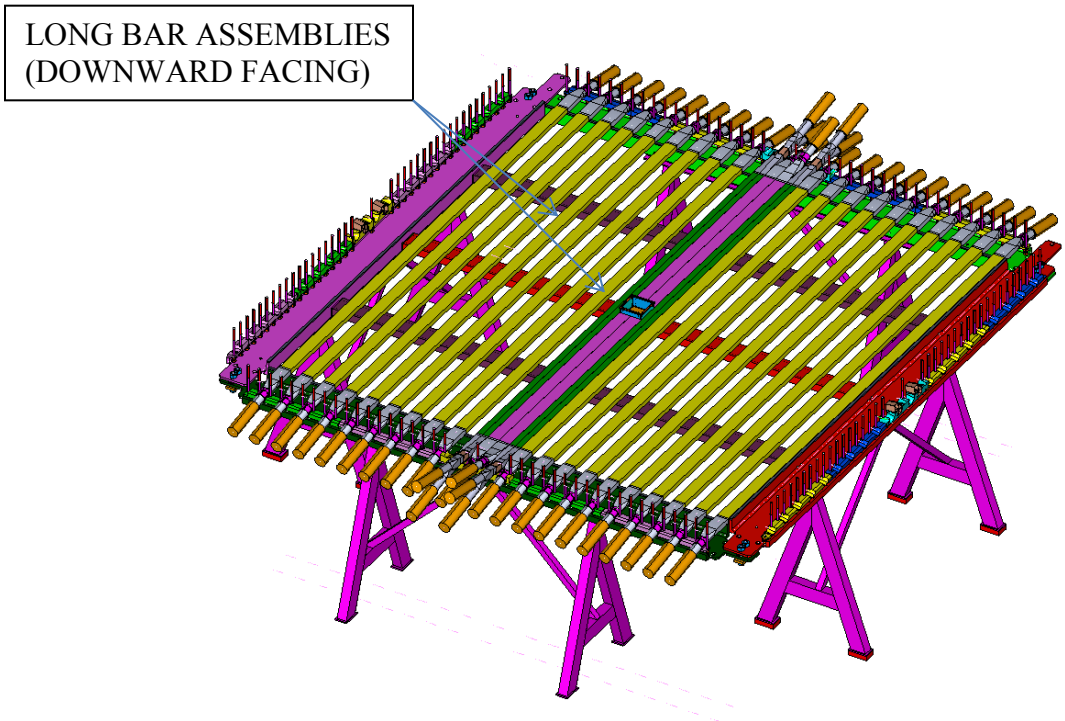

Figure 19

20. Slide Light guide holder plate 3's (D00000-10-05-2044) and Light guide holder plate 1's (D00000-01-05-2021) over MC channel 1 standoffs as shown. Check that liners previously installed in step 19 properly fits in mating holes of these pieces.

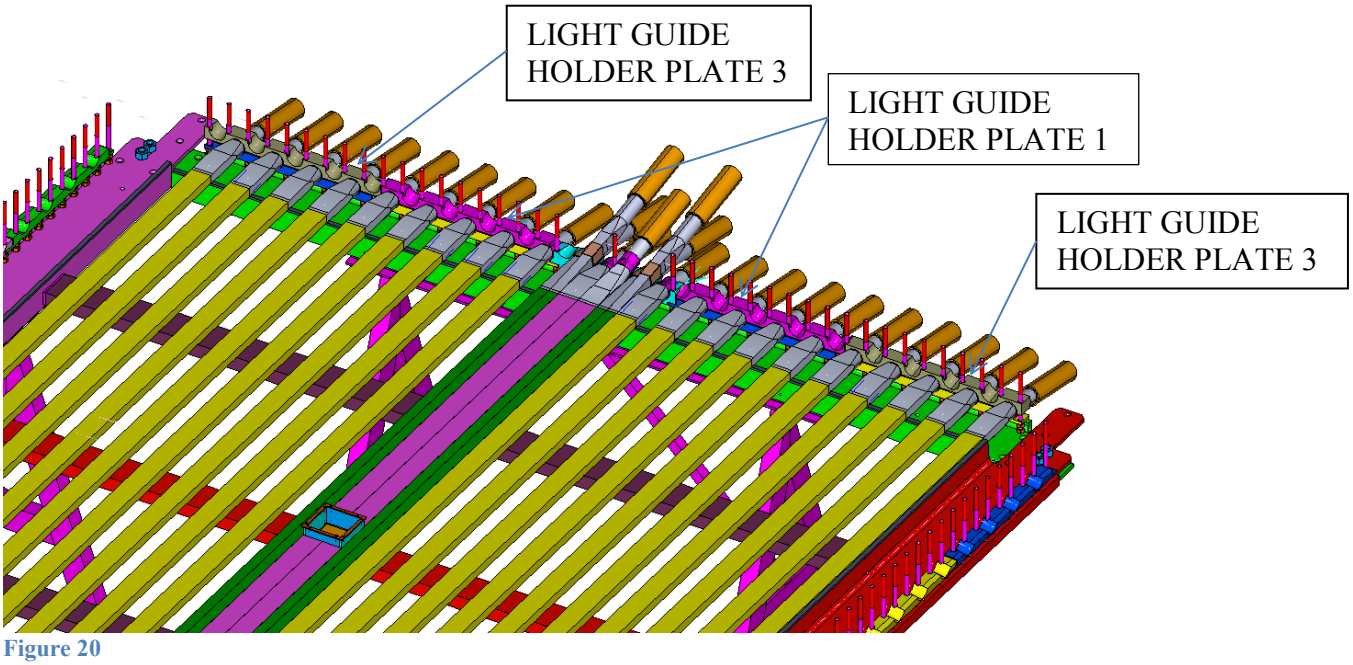

Figure 20

21. Slide Light guide holder plate 3 reverse (D00000-10-05-2046) and Light guide holder plate 1 reverse (D00000-01-05-2024) over MC channel 2 standoffs as shown. Check that liners previously installed in step 19 properly fits in mating holes of these pieces.

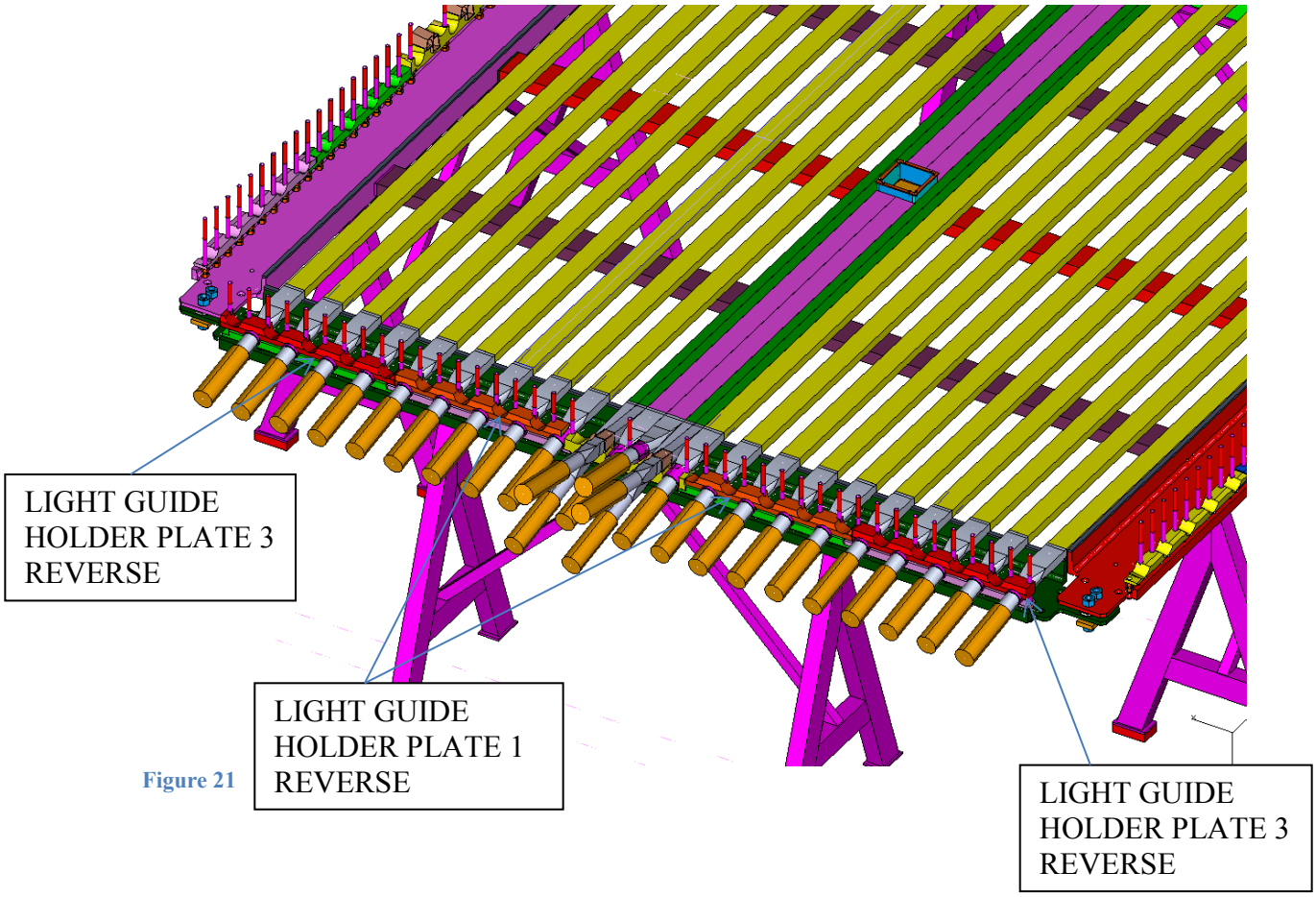

Figure 21

22. Insert the 1/8" thick liners in between the cutout surfaces of the Light guide holder plate 1 and 3 (on MC Channel 1) and Light guide holder plate reverse 1 and 3 (on MC Channel 2) and the light guides themselves to help protect them from any contact that may damage the wrapping. Finish the installation of the wrapping by attaching the wrap all the way around the light guide after laying the remaining 19 upward facing Long bar assy's (6cm) (D00000-01-05-1000) onto the Light guide holder plates 1 & 3 (MC 1) and the Light guide holder plates 1 & 3 reverse (MC 2).

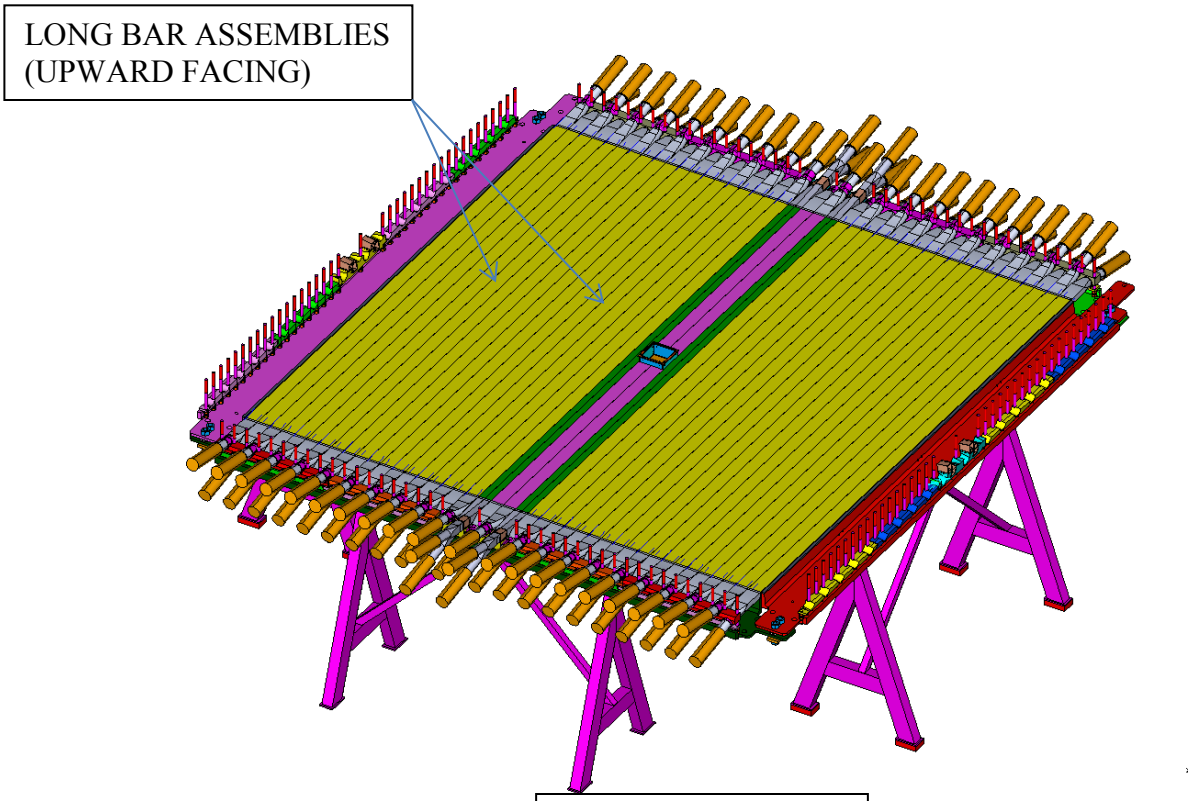

Figure 22a

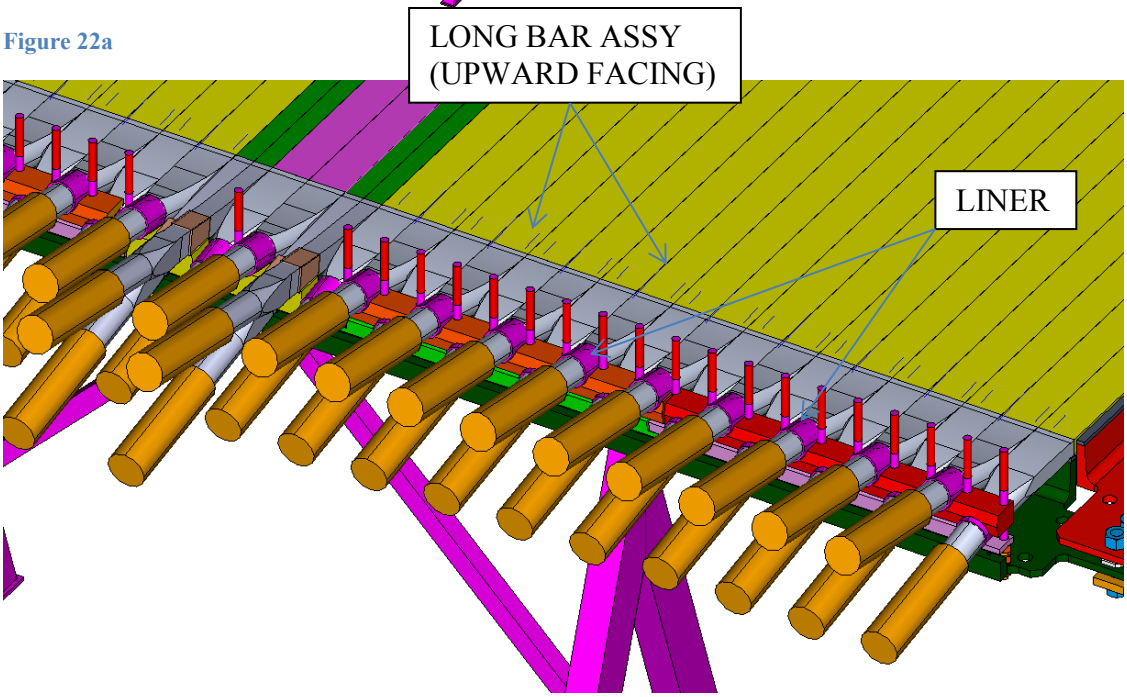

Figure 22b

23. After installation of Upward facing Long bar assemblies, squeeze MC channels 4 & 5 together to make sure that any spaces between vertical layer of scintillators will be minimized. Make sure that MC channels 1 & 2 are parallel to each other, and perpendicular to MC channels 4 & 5. (Reminder: the rubber tips previously installed on the MC Channels are not to be touching scintillator material location of scintillator bar assemblies.) Tighten existing corner hardware to maintain squeeze.

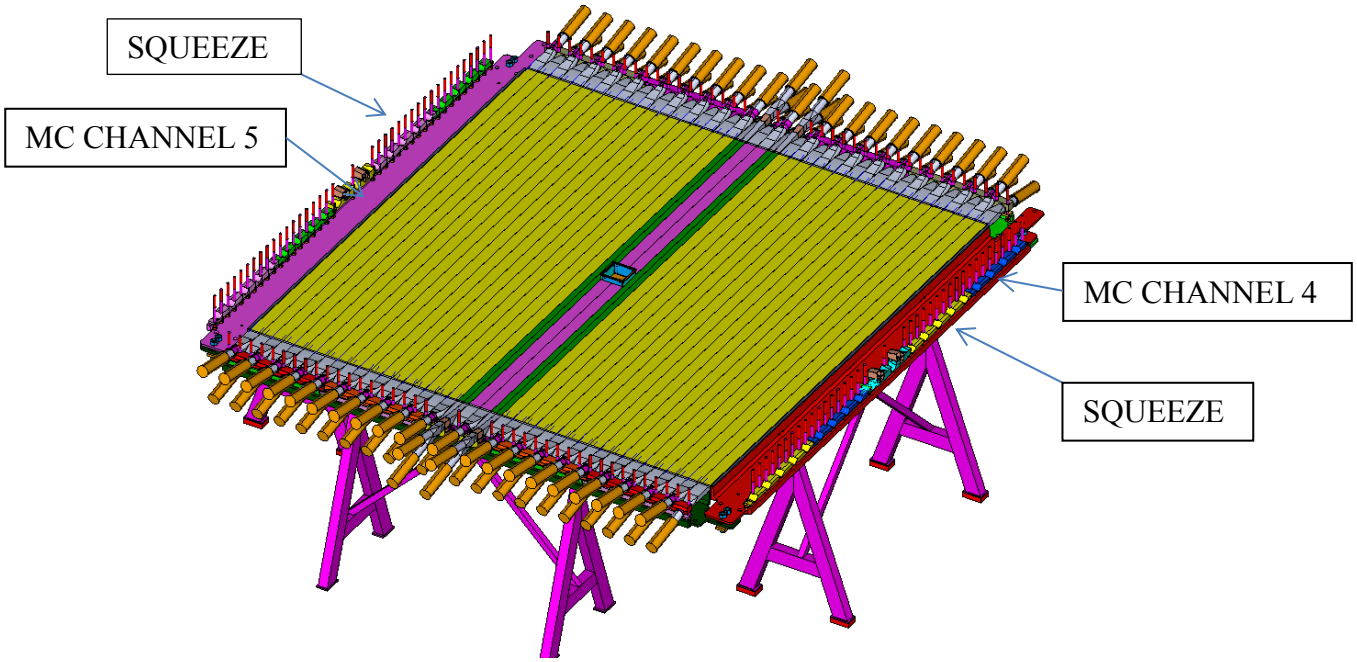

Figure 23

24. Slide Light guide holder plate 2's (D00000-10-05-2022) and Light guide holder plate 4's (D00000-01-05-2045) over MC channel 1 standoffs as shown. Check that liners previously installed in step 19 properly fits in mating holes of these pieces. Install .50-13 UNC nuts on MC channel 1 stand offs and tighten to hold scintillator bar assemblies. Install next set of nuts on all MC1 channel standoffs leaving approximately .28" gap between previously installed MC channel nuts.

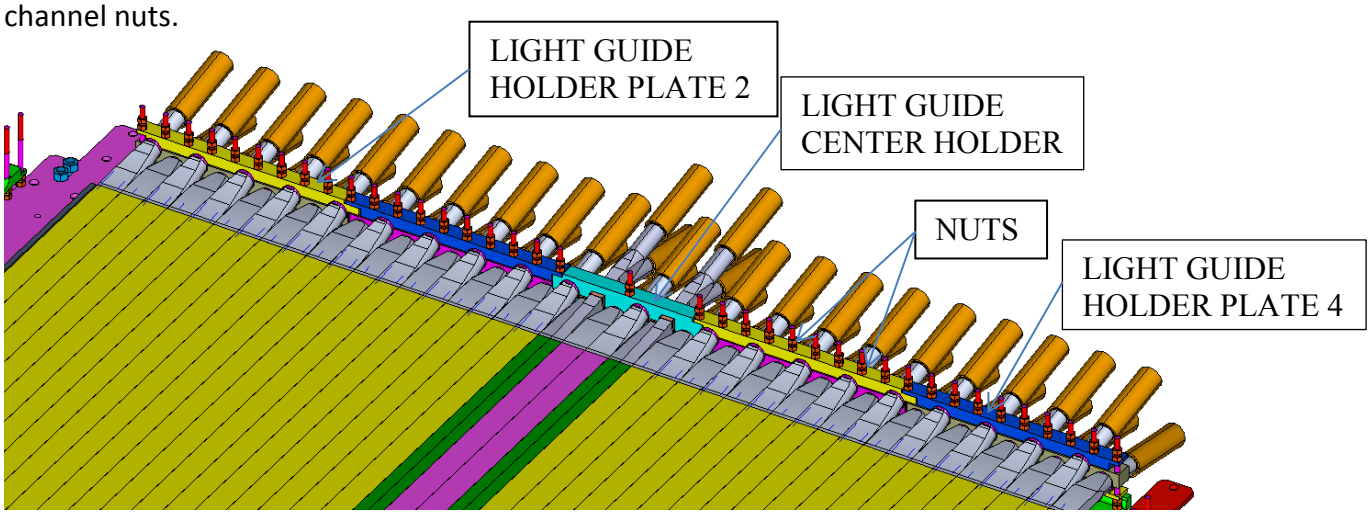

Figure 24

25. Slide Light guide holder plate 2 reverses (D00000-10-05-2025) and Light guide holder plate 4 reverses (D00000-01-05-2047) over MC channel 2 standoffs as shown. Check that liners previously installed in step 19 properly fits in mating holes of these pieces. Install .50-13 UNC nuts on MC channel 2 stand offs and tighten to hold scintillator bar assemblies. Install next set of nuts on all MC channel standoffs leaving approximately .28" gap between previously installed MC channel inner nuts.

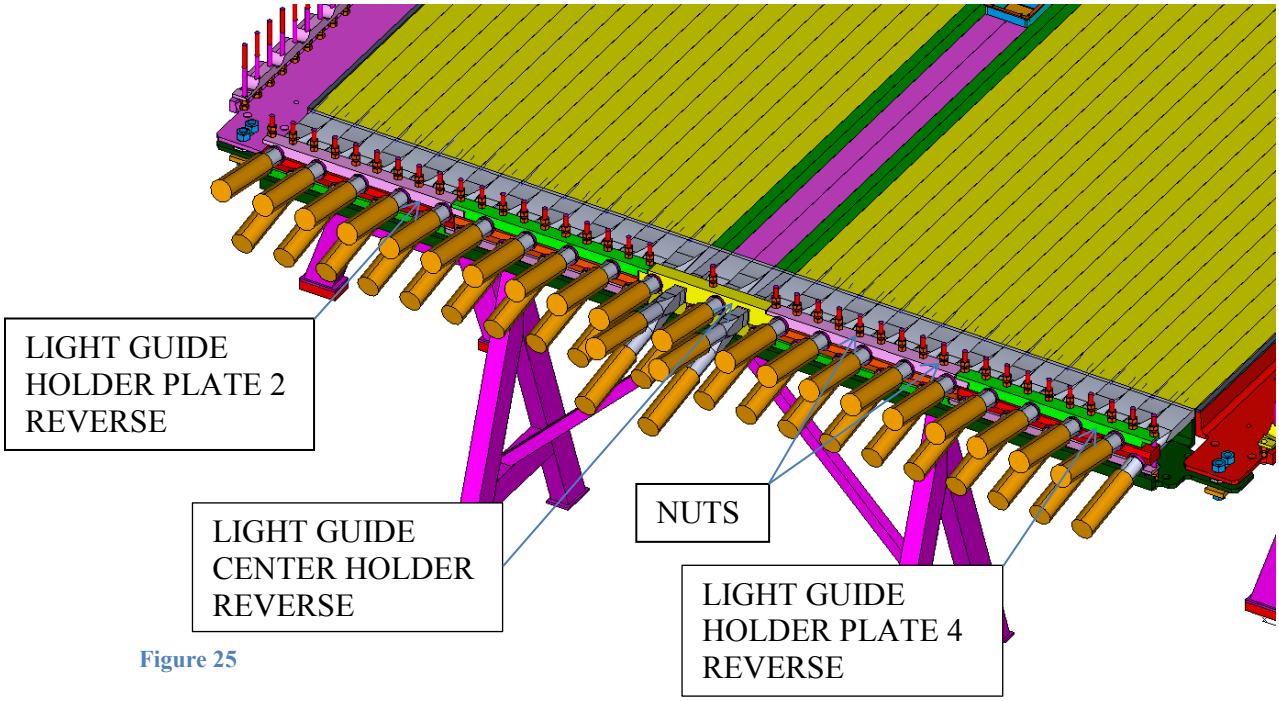

Figure 25

26. Attach the MC Channel rubber lip (D00000-01-05-2040) to the MC channel 1 as shown in step 8. With rubber lip attached, slide the MC channel 1 (rubber lip side down) over the MC Channel standoffs and use .50-13 unc nuts to capture with corresponding MC channel.

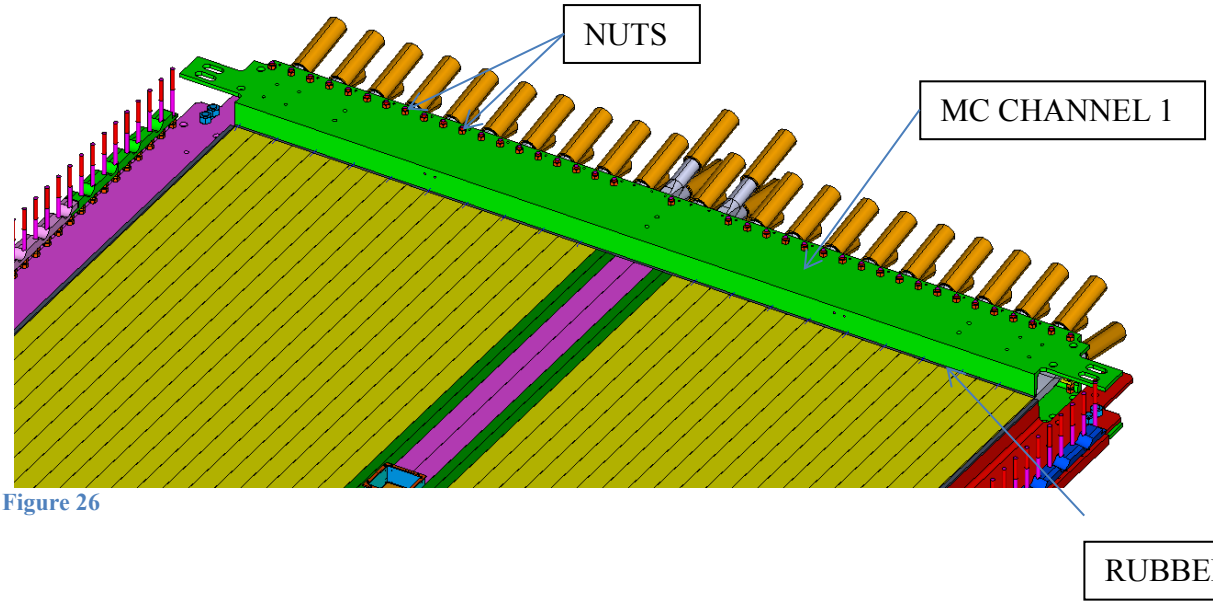

Figure 26

27. Attach the MC Channel rubber lip (D00000-01-05-2040) to the MC channel 2 as shown in step 8. With rubber lip attached, slide the MC channel 2 (rubber lip side down) over the MC Channel standoffs and use .50-13 unc nuts to capture with corresponding MC channel.

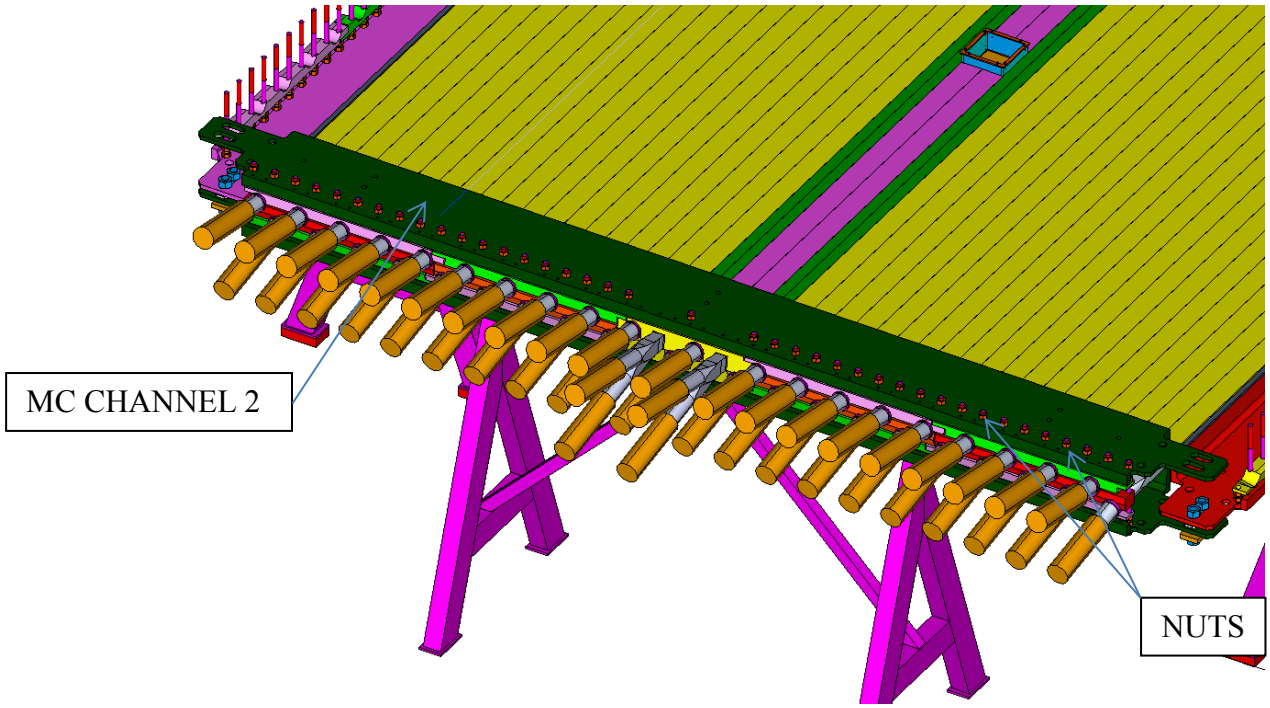

Figure 27

28. Attach mating MC channel 1's and 2's with a set of two, ¾"-10 unc x 9.0" long hex head bolts, 3/4-10 unc nuts and flat washers per end as shown. The outer faces of the MC channels should be parallel without compromising the squeeze on the scintillator bar assemblies.

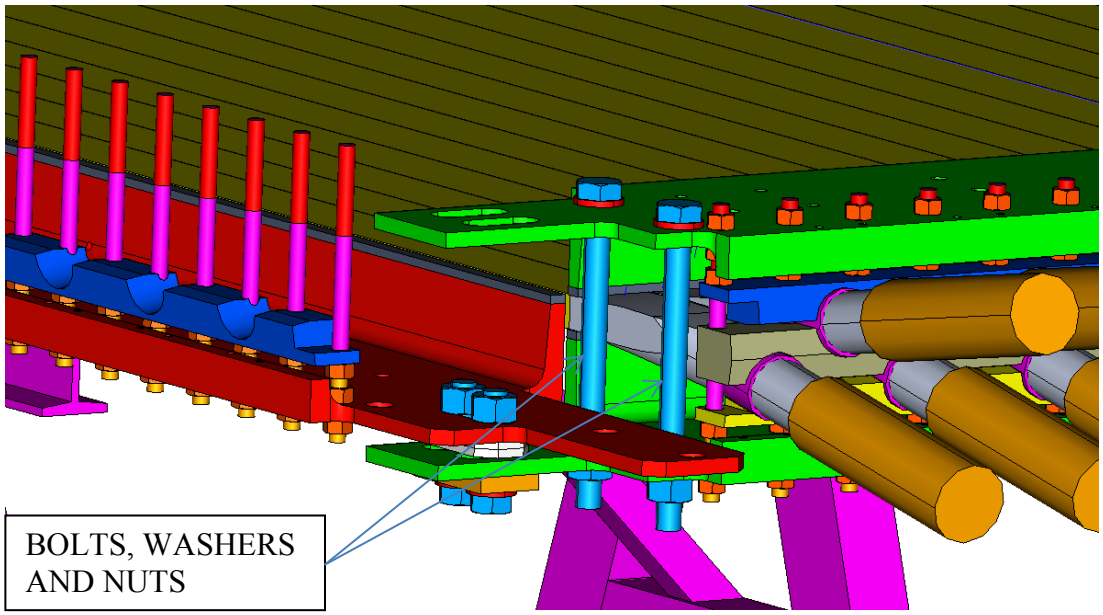

Figure 28

29. Insert the 1/8” thick liner in between the cutout surfaces of the center light guide holder (on MC Channel 4) and the light guides themselves to help protect them from any contact that may damage the wrapping. Finish the installation of the wrapping by attaching the wrap all the way around the light guide after laying in 2 Short bar assy’s (6cm) (D00000-01-05-1001) into the Center support assy and the center light guide holder on MC channel 4 as shown below.

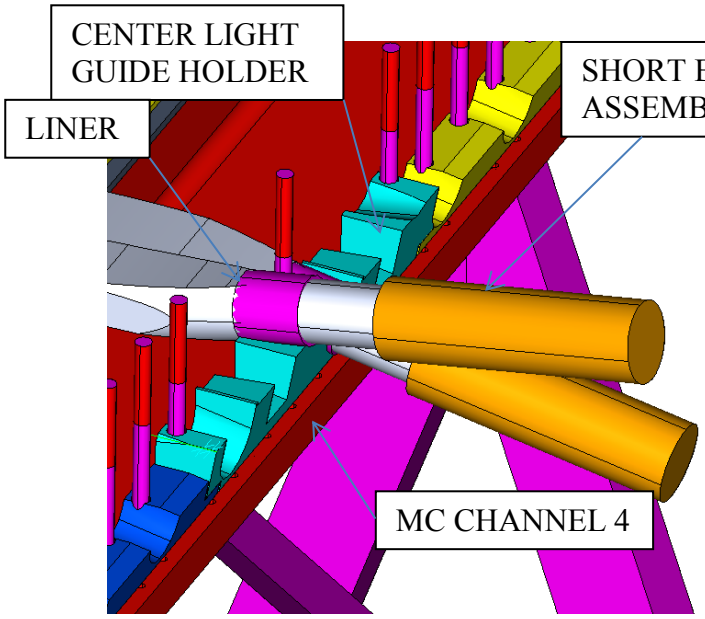

Figure 29a

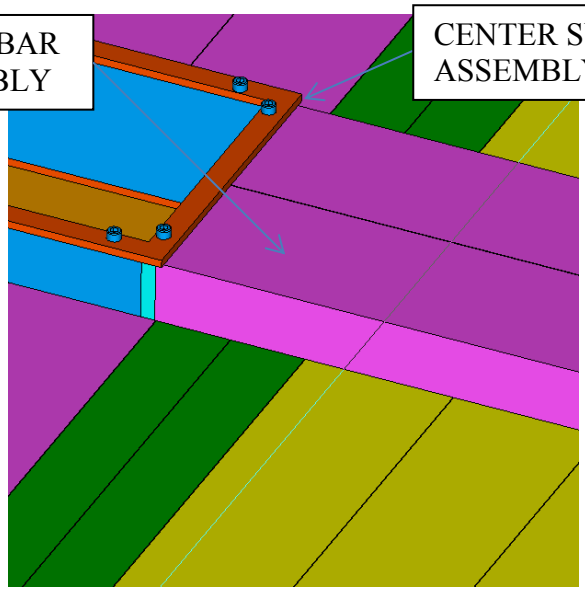

Figure 29b

30. Insert the 1/8” thick liner in between the cutout surfaces of the center light guide holder reverse (on MC Channel 5) and the light guides themselves to help protect them from any contact that may damage the wrapping. Finish the installation of the wrapping by attaching the wrap all the way around the light guide after laying in 2 Short bar assy’s (6cm) (D00000-01-05-1001) onto the Center support assy and the center light guide holder reverse on MC channel 5 as shown below.

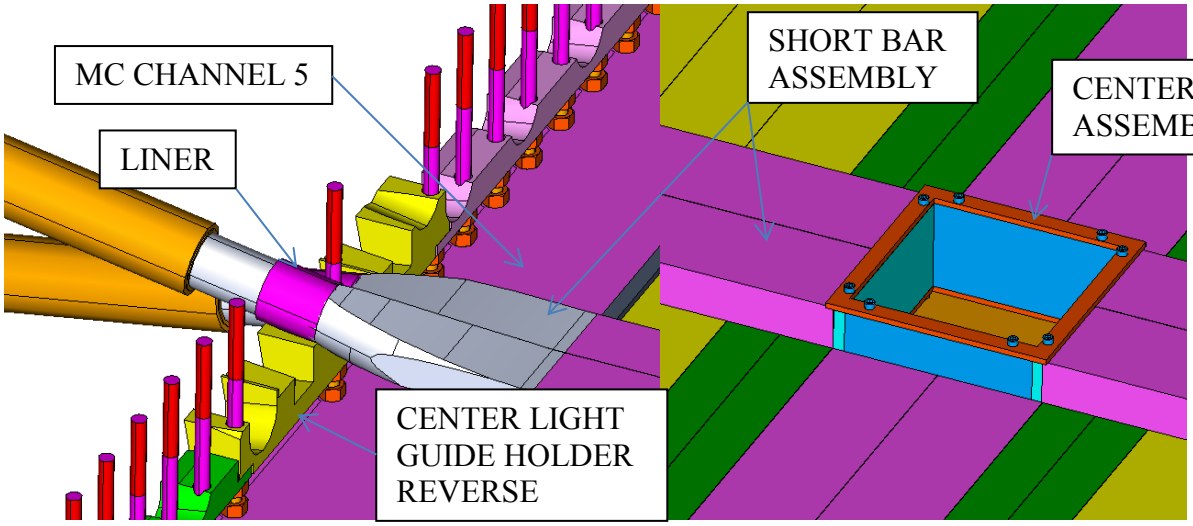

Figure 30a

Figure 30b

31. Insert the 1/8" thick liner in between the cutout surfaces of the center light guide holder (on MC Channel 4) and the center light guide holder reverse (on MC Channel 5) and the light guides themselves to help protect them from any contact that may damage the wrapping. Finish the installation of the wrapping by attaching the wrap all the way around the light guide after laying in the 4 Split long bar assy's (3cm) (D00000-01-05-1002) onto the Center light guide holder (MC 4) and the Center light guide holder reverse (MC 5).

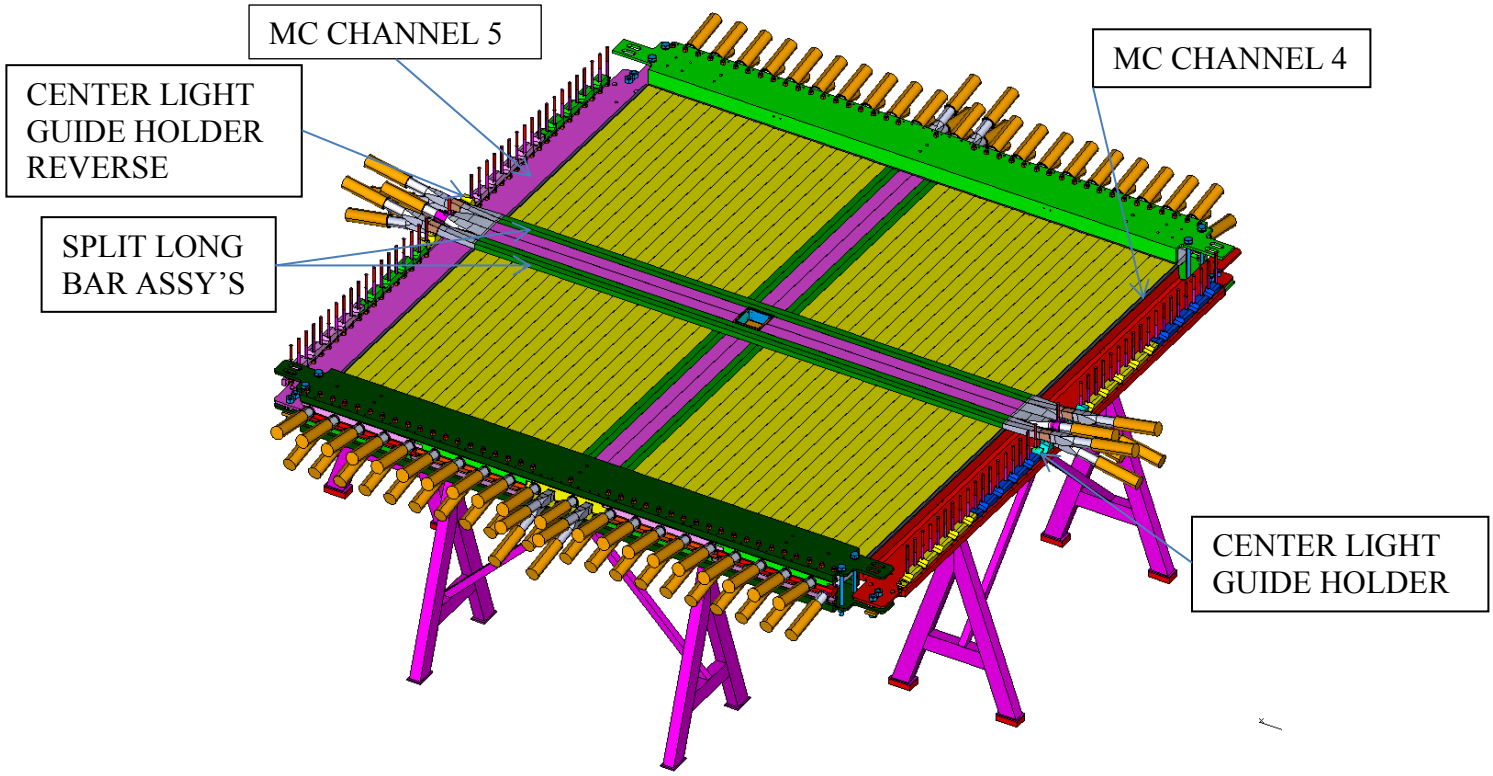

Figure 31

32. Insert the 1/8” thick liners in between the cutout surfaces of the Light guide holder plate 2 and 4 (on MC Channel 4) and Light guide holder plate reverse 2 and 4 (on MC Channel 5) and the light guides themselves to help protect them from any contact that may damage the wrapping. Finish the installation of the wrapping by attaching the wrap all the way around the light guide after laying the 19 downward facing Long bar assy’s (6cm) (D00000-01-05-1000) onto the Light guide holder plates 2 &4 (MC 4) and the Light guide holder plates 2 & 4 reverse (MC 5).

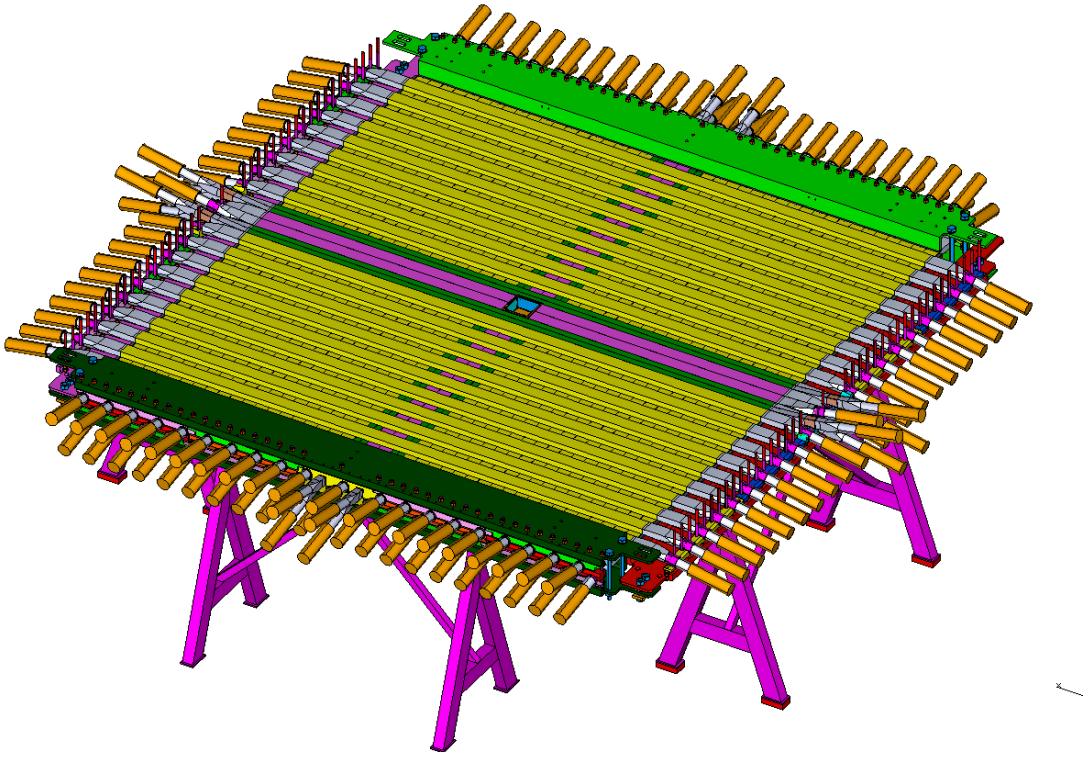

Figure 32

33. Slide Light guide holder plate 3’s (D00000-10-05-2044) and Light guide holder plate 1’s (D00000-01-05-2021) over MC channel 4 standoffs as shown. Check that liners previously installed in step 32 properly fits in mating holes of these pieces.

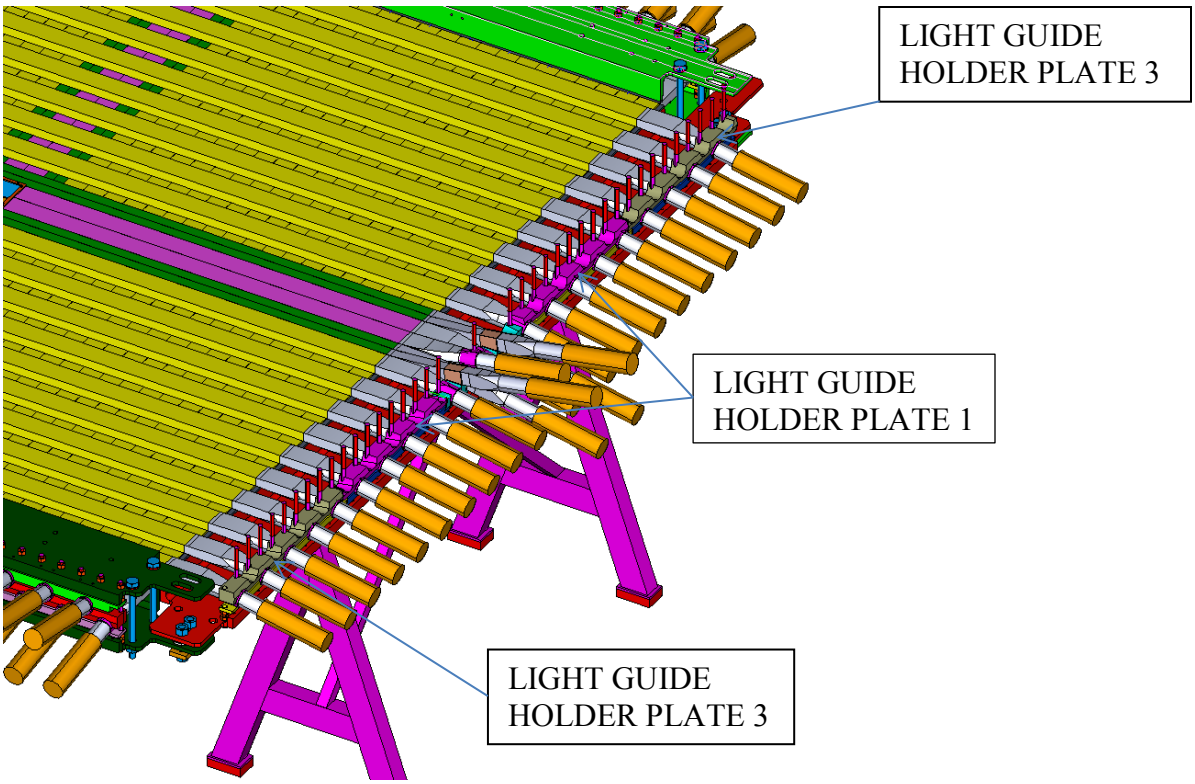

Figure 33

34. Slide Light guide holder plate 3 reverse (D00000-10-05-2046) and Light guide holder plate 1 reverse (D00000-01-05-2024) over MC channel 5 standoffs as shown. Check that liners previously installed in step 19 properly fits in mating holes of these pieces.

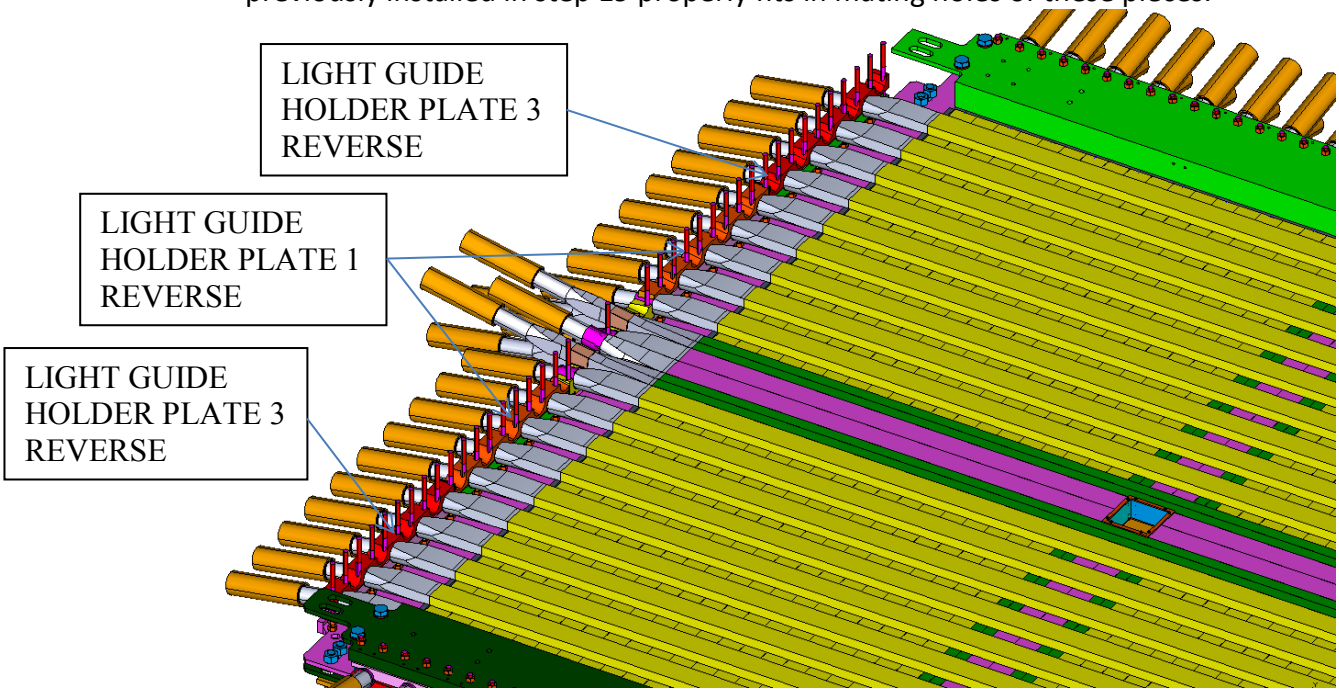

Figure 34

35. Insert the 1/8” thick liners in between the cutout surfaces of the Light guide holder plate 1 and 3 (on MC Channel 4) and Light guide holder plate reverse 1 and 3 (on MC Channel 5) and the light guides themselves to help protect them from any contact that may damage the wrapping. Finish the installation of the wrapping by attaching the wrap all the way around the light guide after laying the remaining 19 upward facing Long bar assy’s (6cm) (D00000-01-05-1000) onto the Light guide holder plates 1 & 3 (MC 4) and the Light guide holder plates 1 & 3 reverse (MC 5).

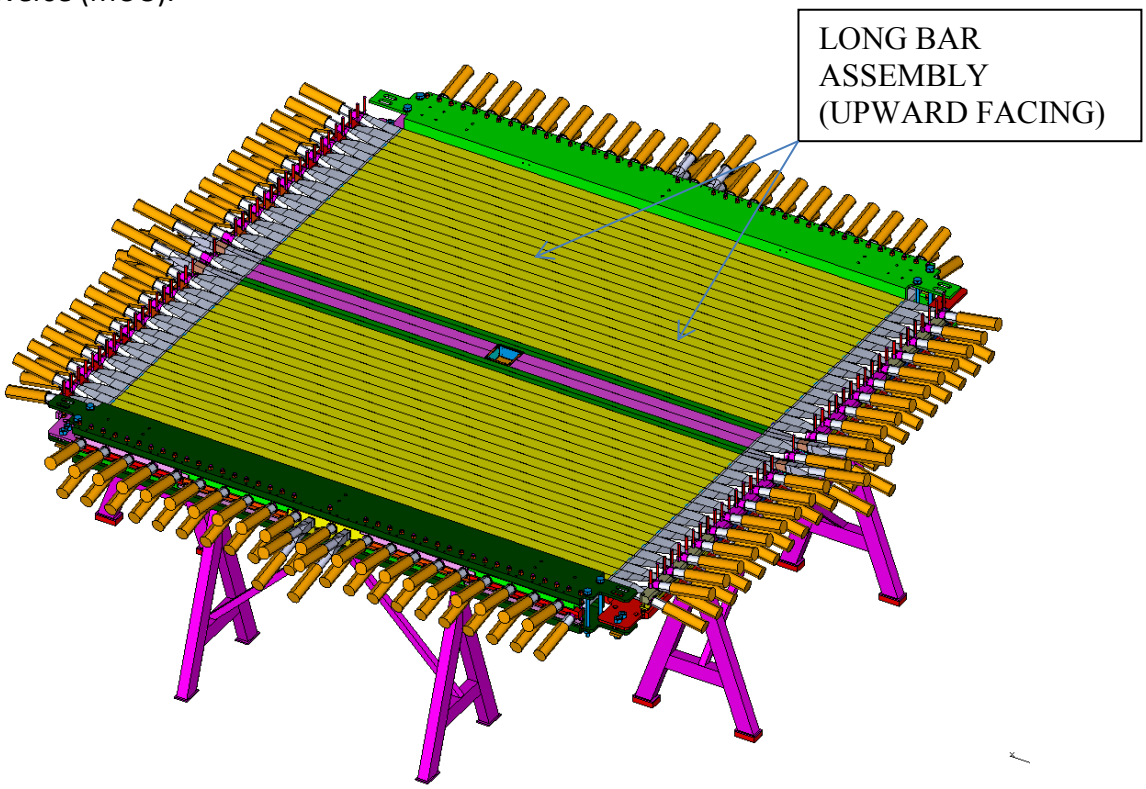

Figure 35a

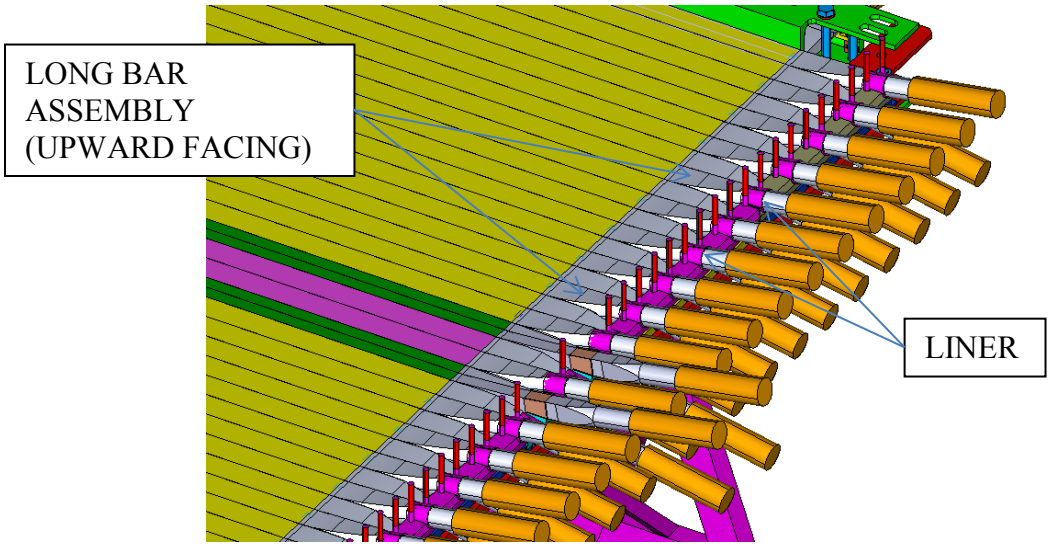

Figure 35b

36. Slide Light guide holder plate 2's (D00000-10-05-2022), Light guide holder plate 4's (D00000-01-05-2045) and over MC channel 4 standoffs as shown. Check that liners previously installed in step 19 properly fits in mating holes of these pieces. Install .50-13 UNC nuts on MC channel 4 stand offs and tighten to hold scintillator bar assemblies. Install next set of nuts on all MC4 channel standoffs leaving approximately .28" gap between previously installed MC channel nuts.

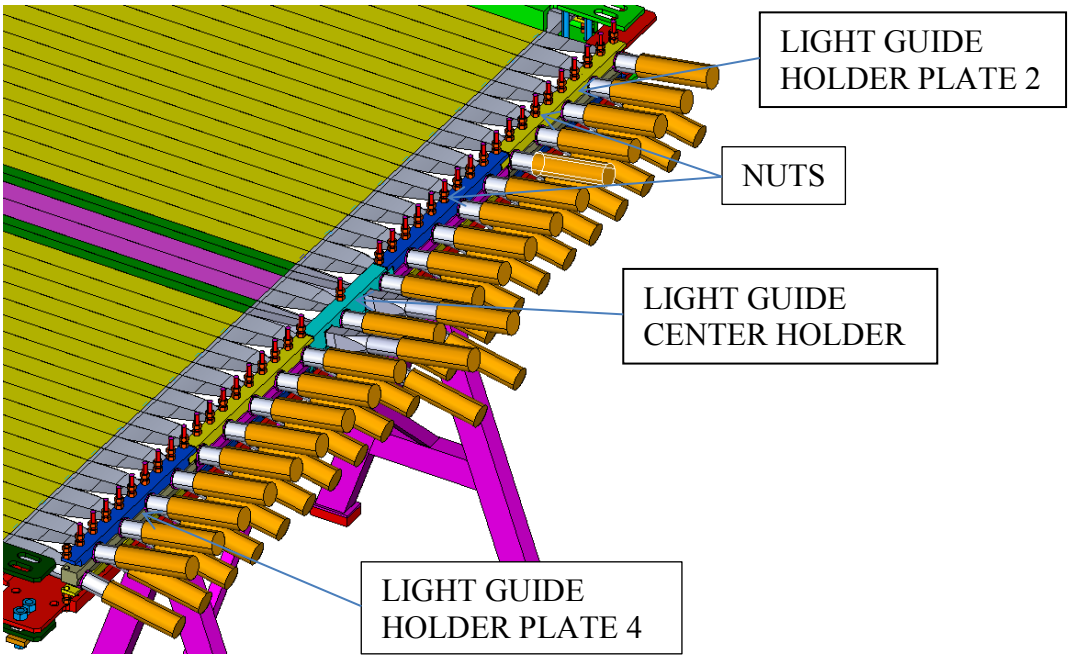

Figure36

37. Slide Light guide holder plate 2 reverses (D00000-10-05-2025), Light guide holder plate 4 reverses (D00000-01-05-2047) and Light guide center holder reverse over MC channel 5 standoffs as shown. Check that liners previously installed in step 19 properly fits in mating holes of these pieces. Install .50-13 UNC nuts on MC channel 5 stand offs and tighten to hold scintillator bar assemblies. Install next set of nuts on all MC channel 5 standoffs leaving approximately .28" gap between previously installed MC channel nuts.

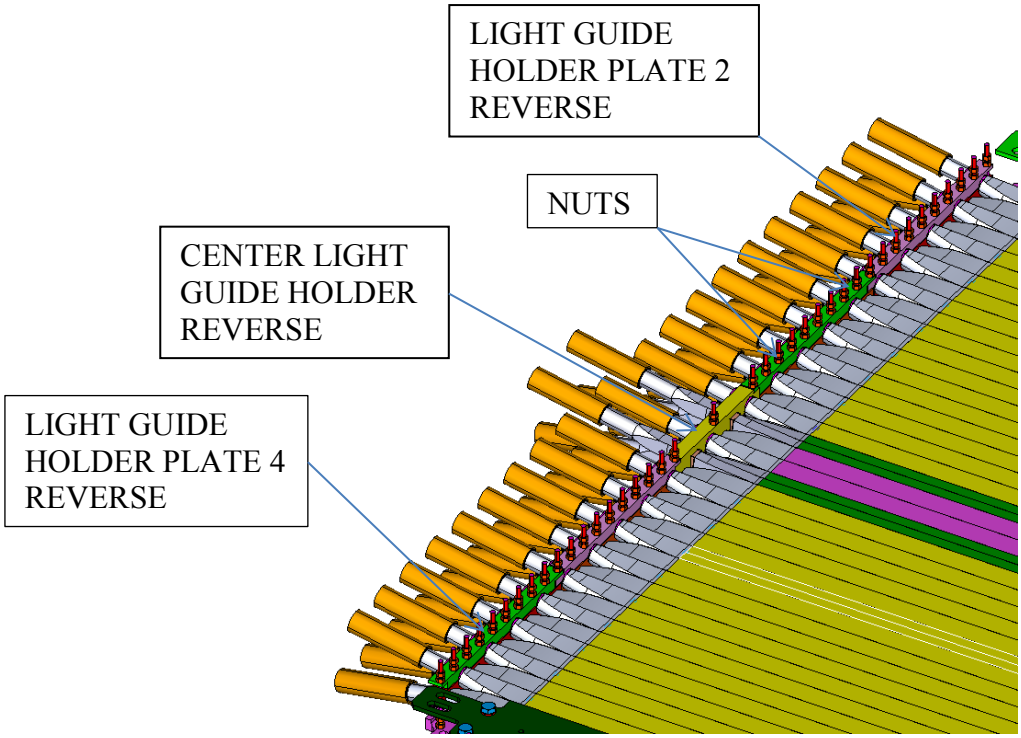

Figure37

38. Attach the MC Channel rubber lip (D00000-01-05-2040) to the MC channel 3 as shown in step 8. With rubber lip attached, slide the MC channel 3 (rubber lip side down) over the MC Channel standoffs and use .50-13 unc nuts to capture with corresponding MC channel.

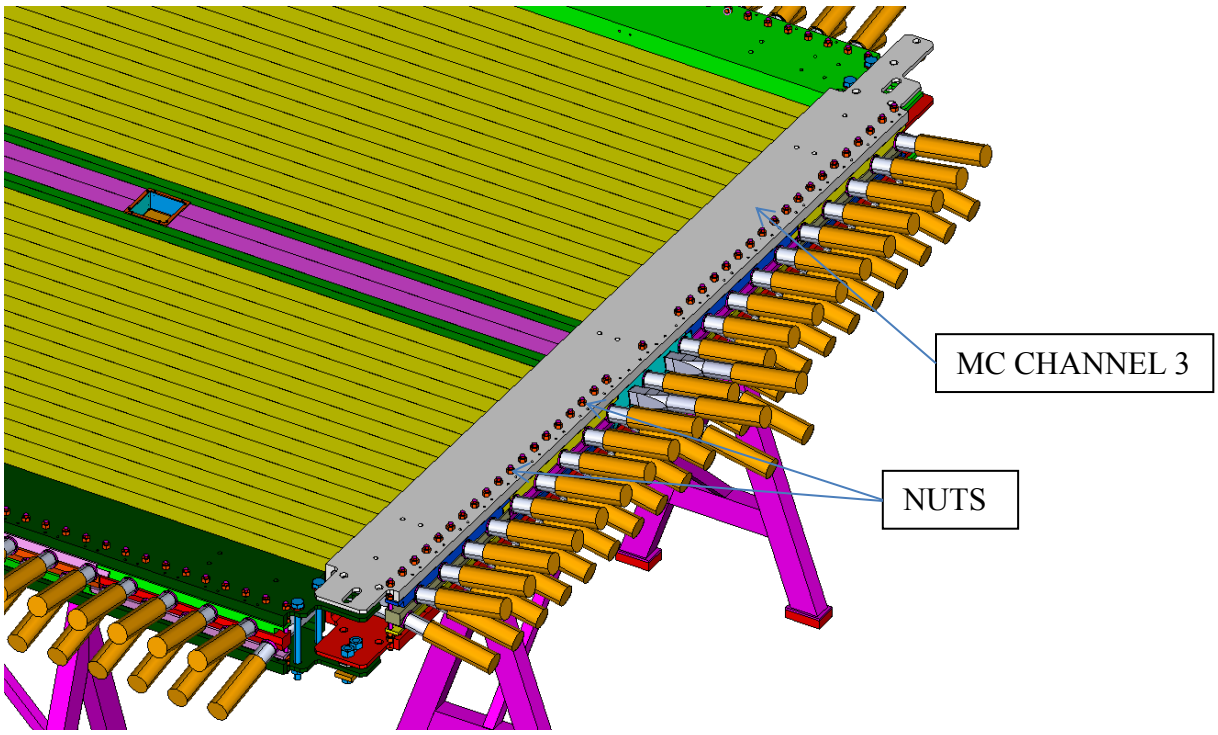

Figure 38

39. Attach the MC Channel rubber lip (D00000-01-05-2040) to the MC channel 6 as shown in step 8. With rubber lip attached, slide the MC channel 6 (rubber lip side down) over the MC Channel standoffs and use .50-13 unc nuts to capture with corresponding MC channel.

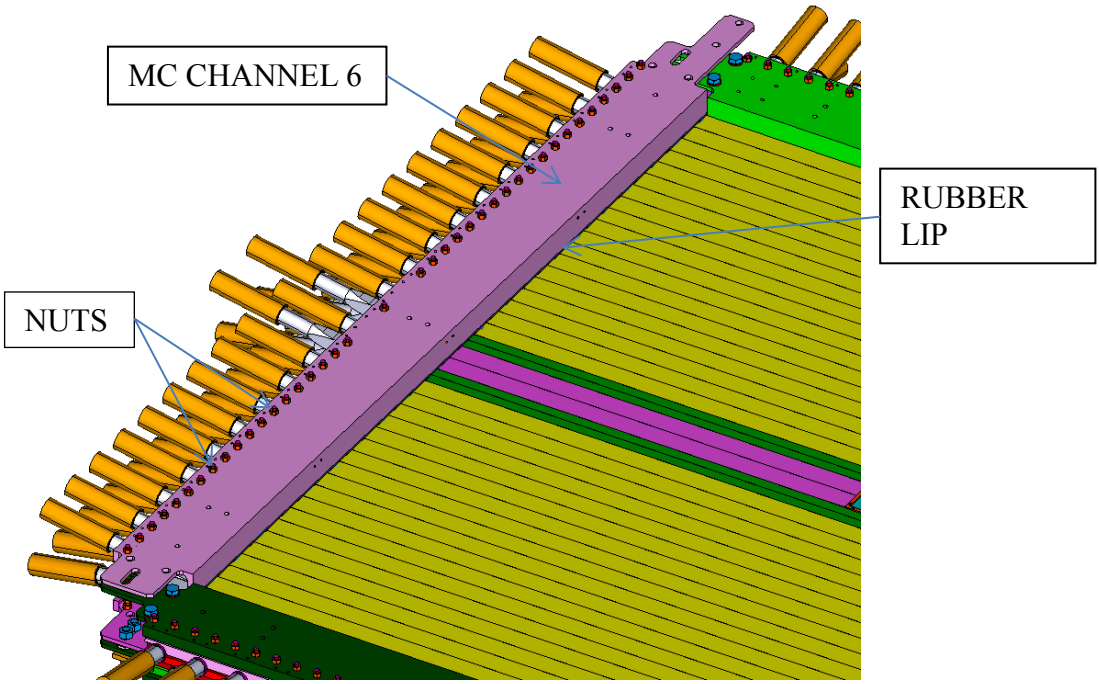

Figure 39

40. Attach mating MC channel's 3 and 4 with a set of two, ¾"-10 unc x 9.0" long hex head bolts, 3/4-10 unc nuts and flat washers per end as shown. The outer faces of the MC channels should be parallel without compromising the squeeze on the scintillator bar assemblies. Then attach MC channel's 5 and 6 the same.

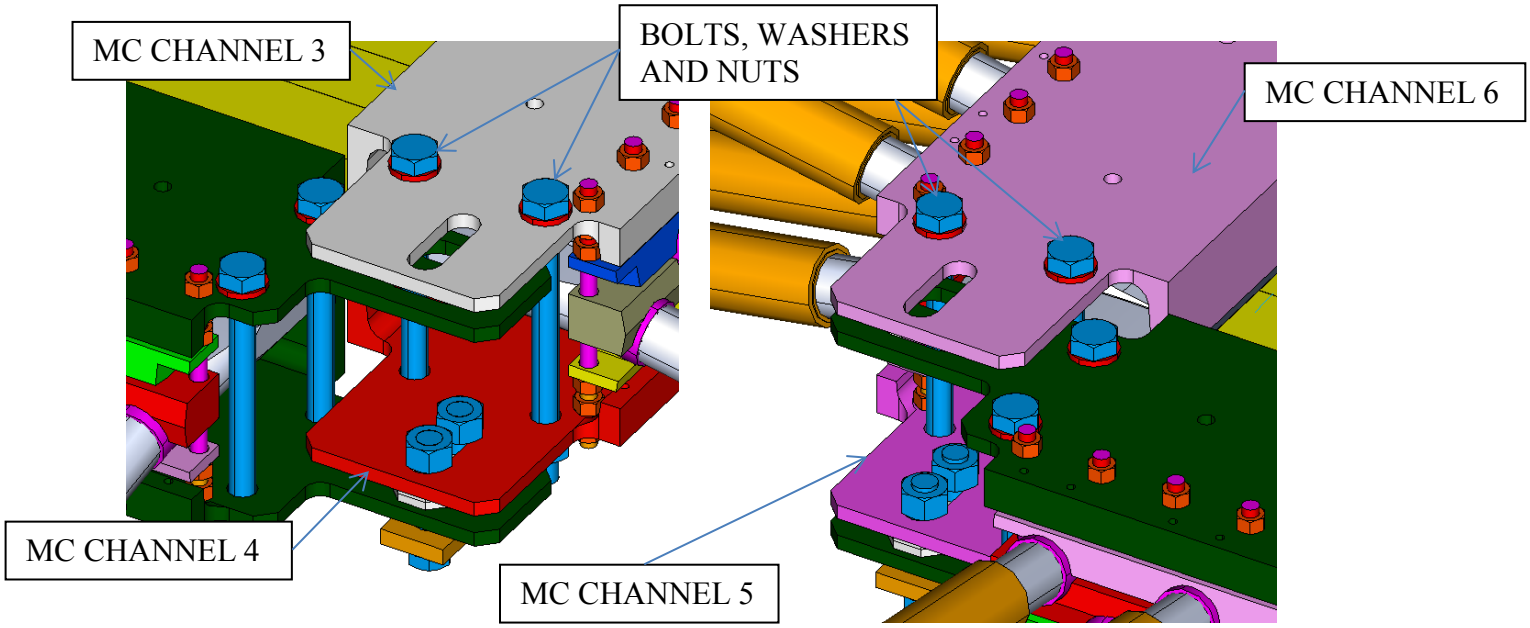

Figure 40a

Figure 40b17

41. Remove hardware previously installed in step 3 except for MC spacers on bottom channels only. Remove, ¾-10 UNC X 3.0 lg hex bolts, ¾ flat washers, ¾-10 UNC nuts along with 1 Friction Plate (D00000-01-05-2026) per corner.

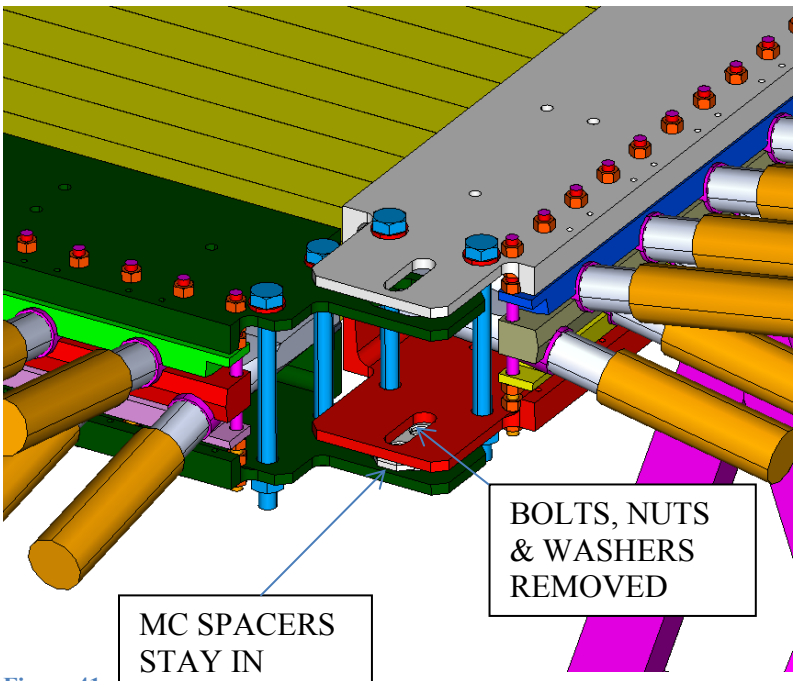

Figure 41

42. Attach Lower bracket weldment 1 (D00000-01-05-2038) and Lower bracket weldment 2 (D00000-01-05-2039) using steps 43 and 44.

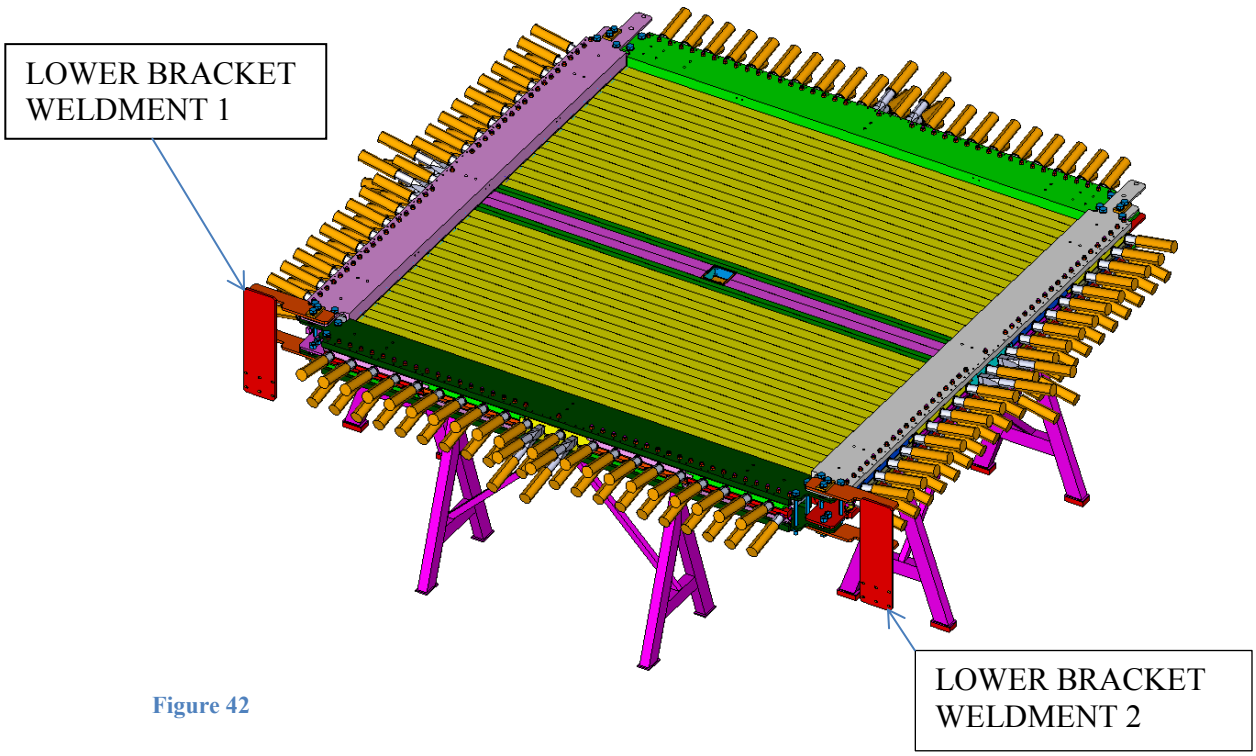

Figure 42

43. Attach Lower bracket weldment 1 (D00000-01-05-2038) using two, ¾-10 UNC X 3.50 long hex bolts, ¾ flat washers, ¾-10 UNC nuts along with 1 Friction Plate (D00000-01-05-2026) per side. Prior to tightening fill gap with MC spacers.

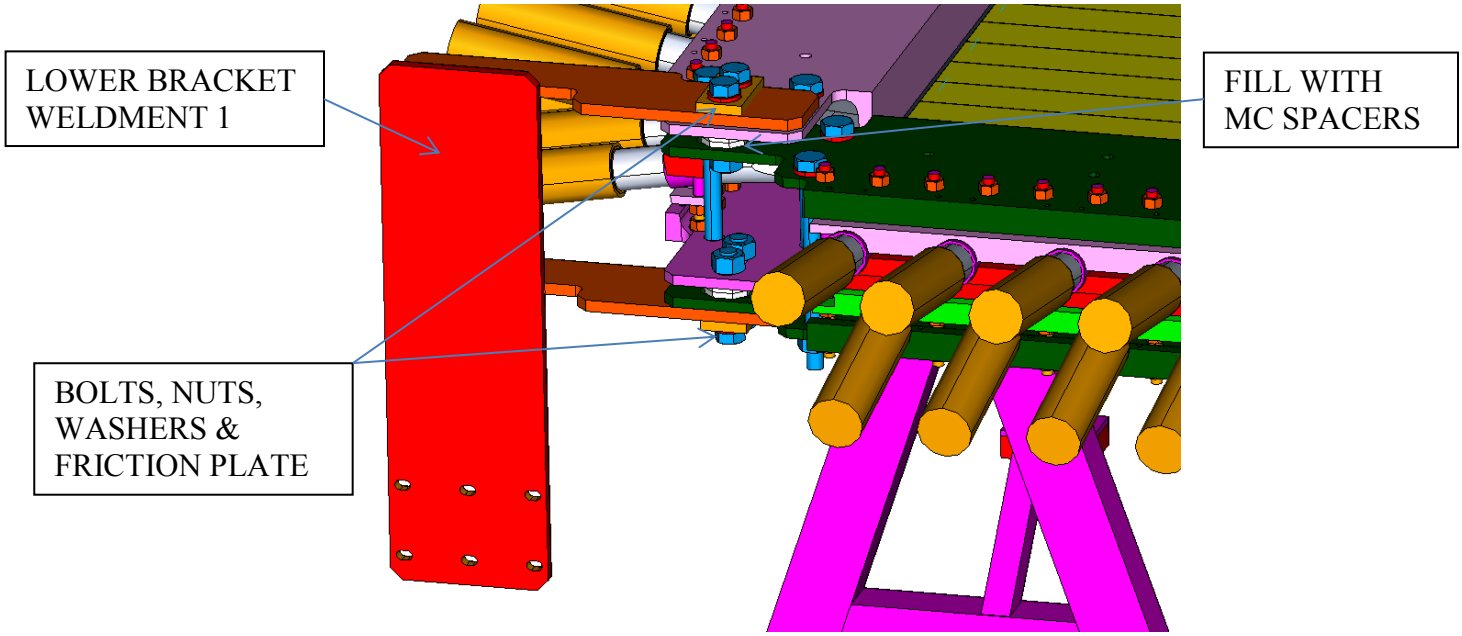

Figure 43

44. Attach Lower bracket weldment 2 (D00000-01-05-2039) using two, ¾-10 UNC X 3.5 lg hex bolts, ¾ flat washers, ¾-10 UNC nuts along with 1 Friction Plate (D00000-01-05-2026) per side. Prior to tightening fill gap with MC spacers.

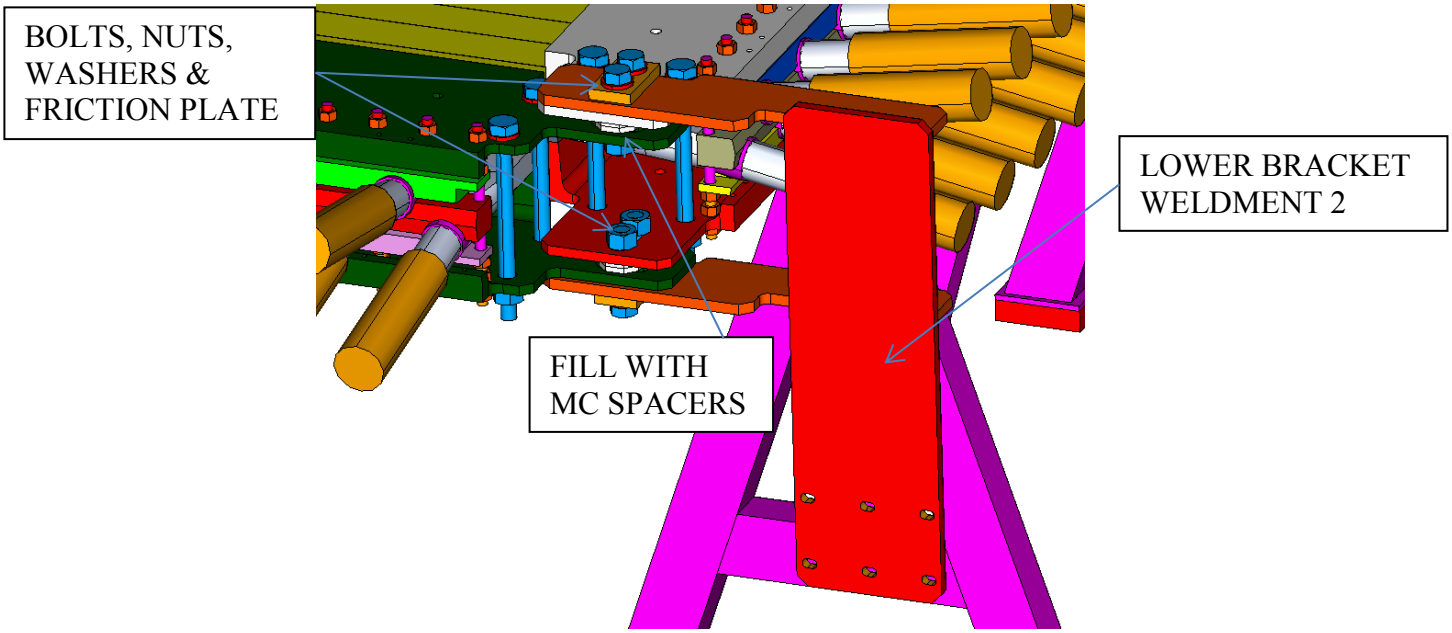

Figure 44

45. Attach MC Channels at top of TOF using a quantity of 2, ¾-10 UNC X 3.0 lg hex bolts, ¾ flat washers, ¾-10 UNC, Friction Plate (D00000-01-05-2026) and 2 MC Spacers (D00000-01-05-2041) per corner. Prior to tightening fill gap with MC spacers.

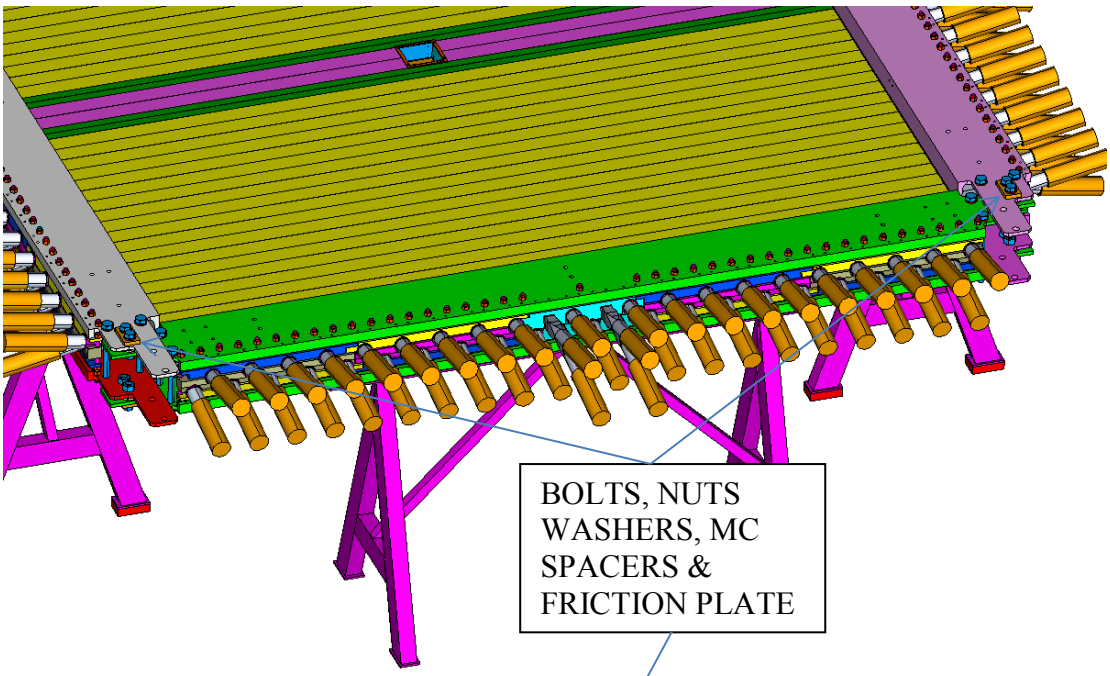

Figure 45a

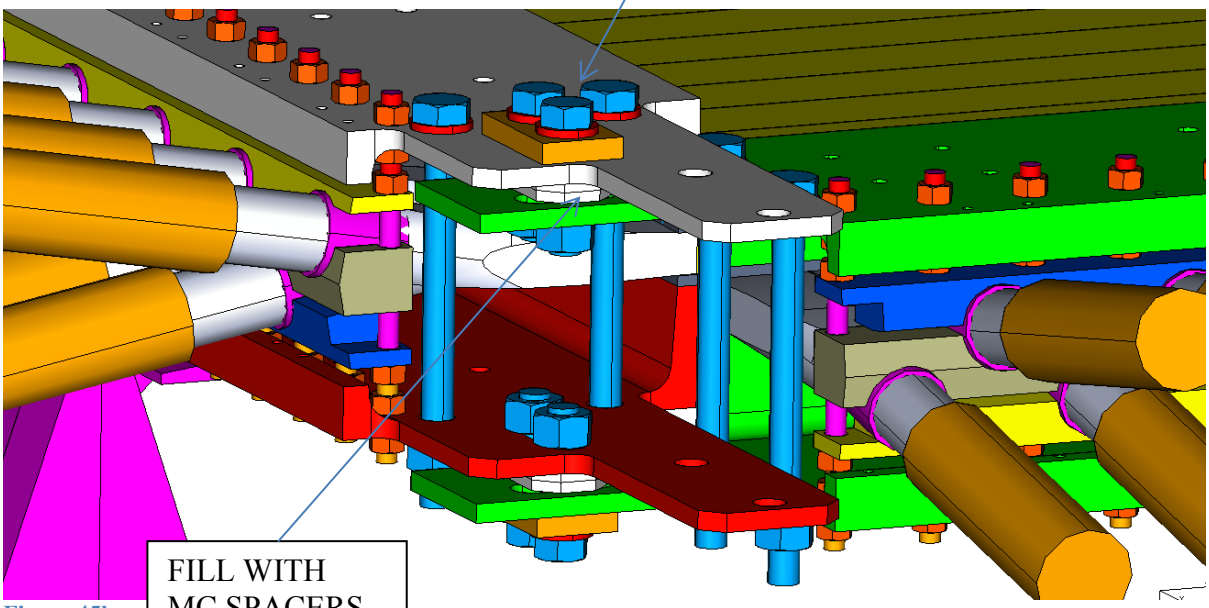

Figure 45b

46. Install Bent shield holder assemblies (D00000-01-05-1004) on all MC Channels as shown below in Fig 46a & b. Use .25-20 unc x .50 long SHCS to attach shield holders to MC Channels.

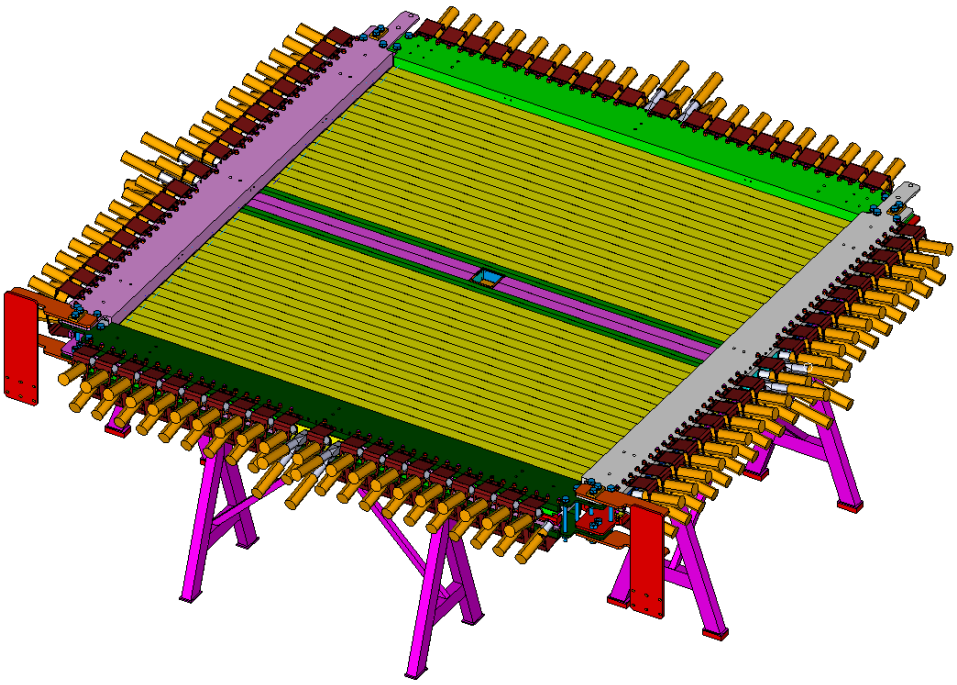

Figure 46a

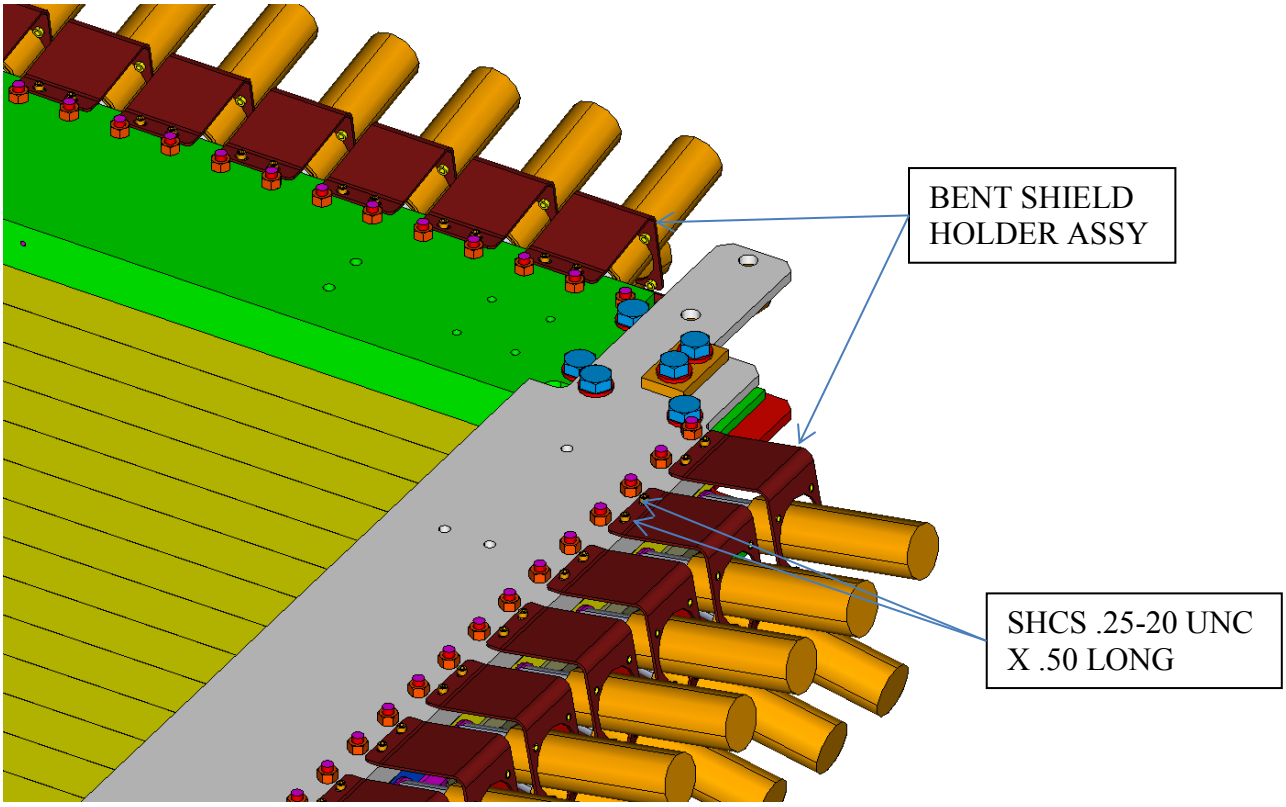

Figure 46b

47. Install eight Bent long shield holder 1 assy's (D00000-01-05-2012) and eight Bent long shield holder 2 assy's (D00000-01-05-2013) on all MC Channels as shown below in Fig 47a & b. Use .25-20 unc x .50 long SHCS to attach shield holders to MC Channels.

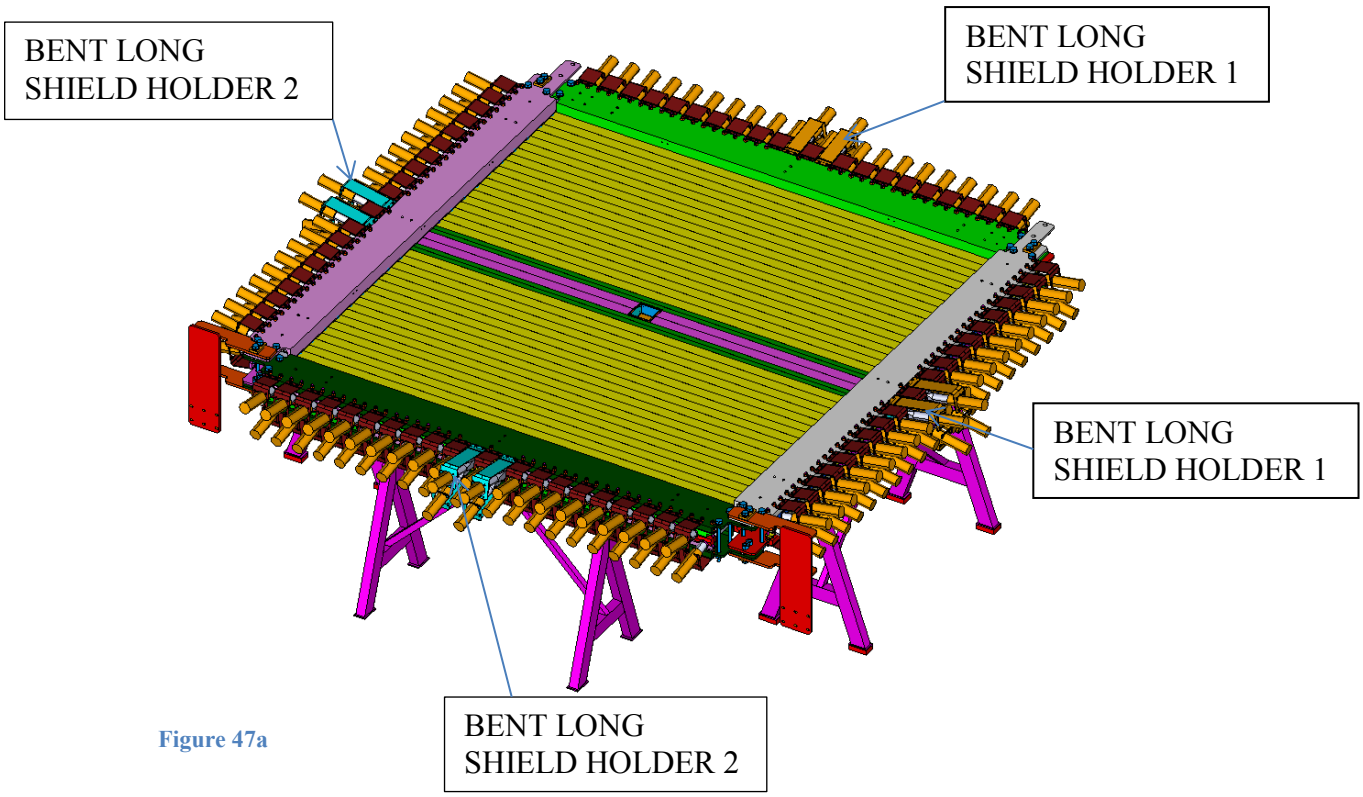

Figure 47a

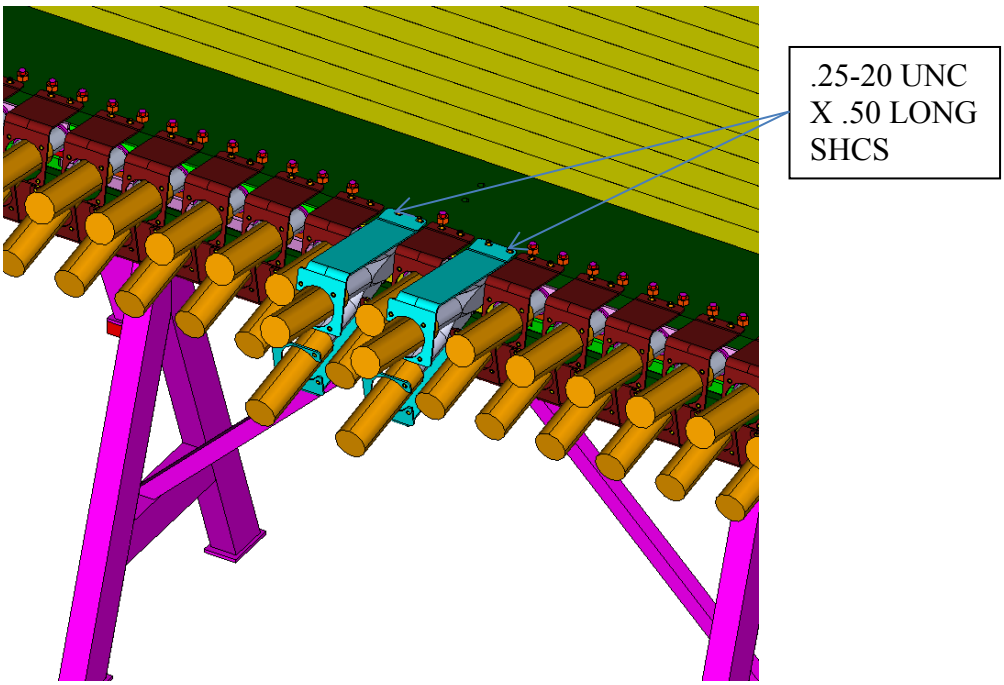

Figure 47b

48. Loosely install TOF Shield holders (D00000-01-05-2015) on all Bent shield holder assemblies using four .25-20 unc x .75 lg SHCS and three #10-32 x .50 lg hex socket oval point set screws per holder as shown in Fig 48a and 48b. Insert PMT Shields (D00000-01-05-2006). Slide PMT Shield through Bent shield holder assemblies and TOF shield holder. Gently tighten the four .25-20 unc x .50 long Square head setscrews per holder.

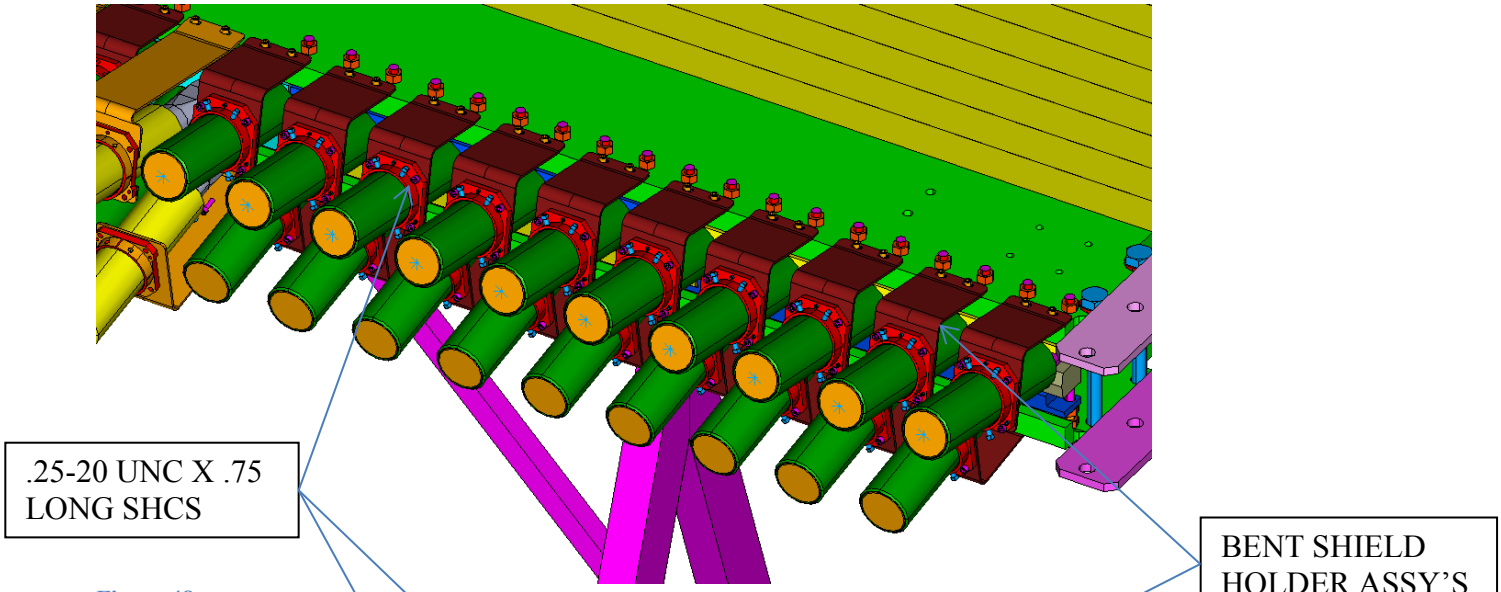

Figure 48a

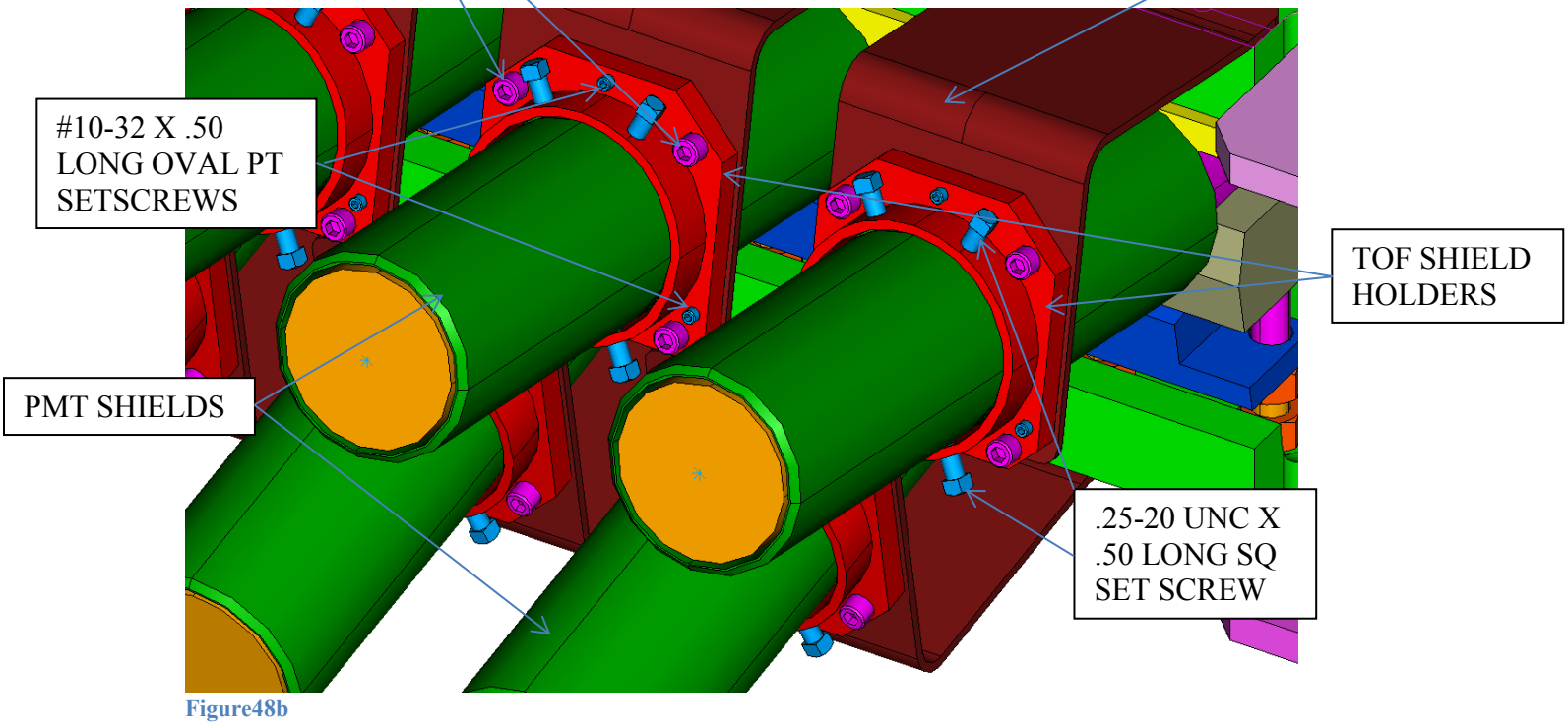

Figure48b

49. Loosely install TOF Shield holders (3cm) (D00000-01-05-2016) on all Long bent shield holder 1 and 2 assemblies using four .25-20 unc x .75 lg SHCS and three #10-32 x .50 lg hex socket oval point set screws per holder as shown in Fig 49a and 49b. Insert PMT Shields (3cm) (D00000-01-05-2007). Slide PMT Shield (3cm) through Long bent shield holder assemblies and TOF shield holder (3cm). Gently tighten the four .25-20 unc x .50 long Square head setscrews per holder.

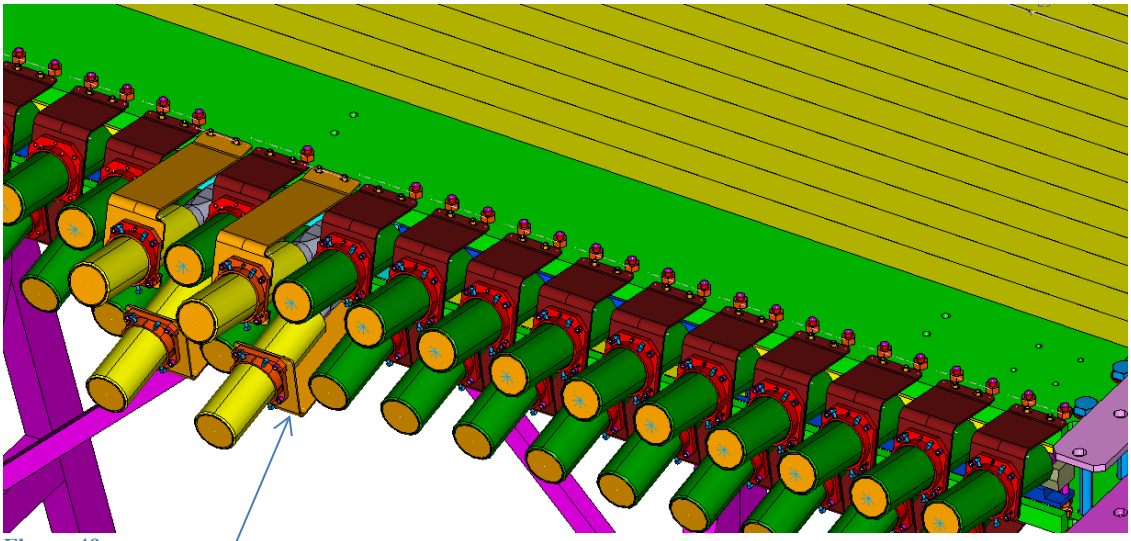

Figure 49a

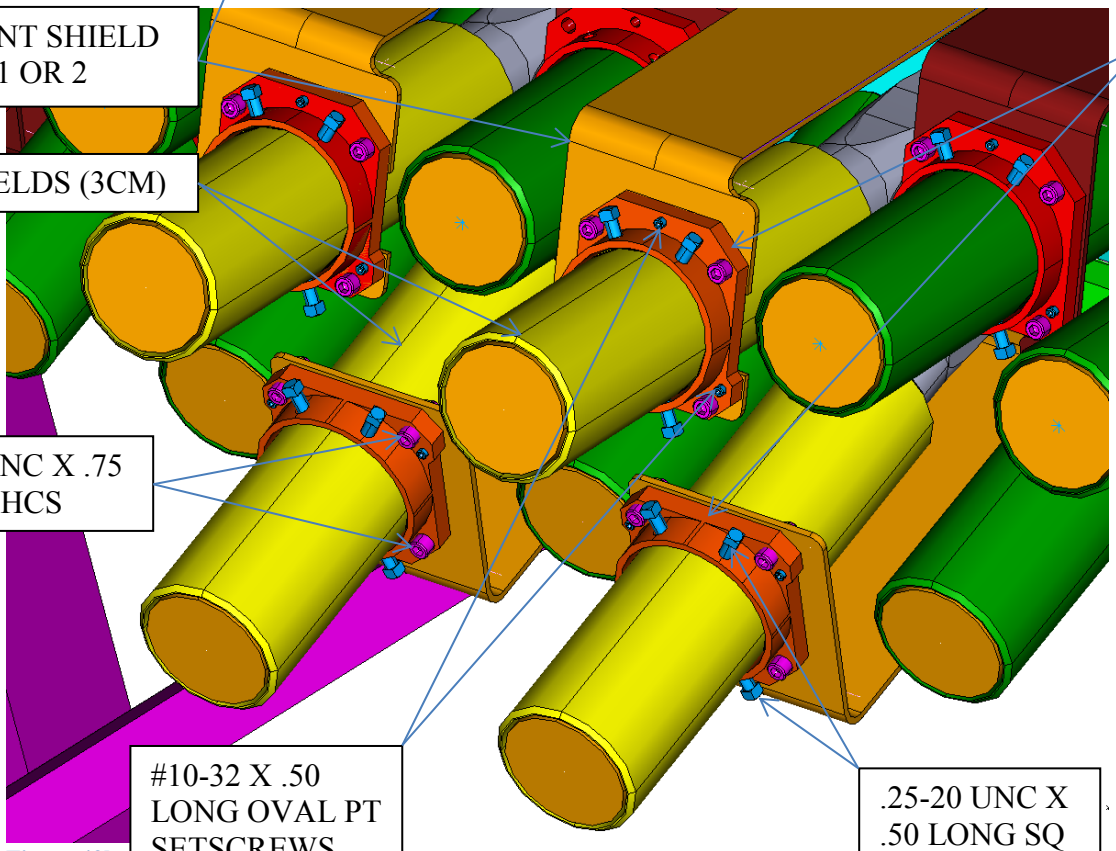

Figure 49b

50. Attach the 2 Scint bar support weldments (D00000-01-05-2030) between MC channel 1 and MC channel 2 using a quantitiy of 8, ¼-20 UNC X .75 lg SHCS as shown in Fig 50.

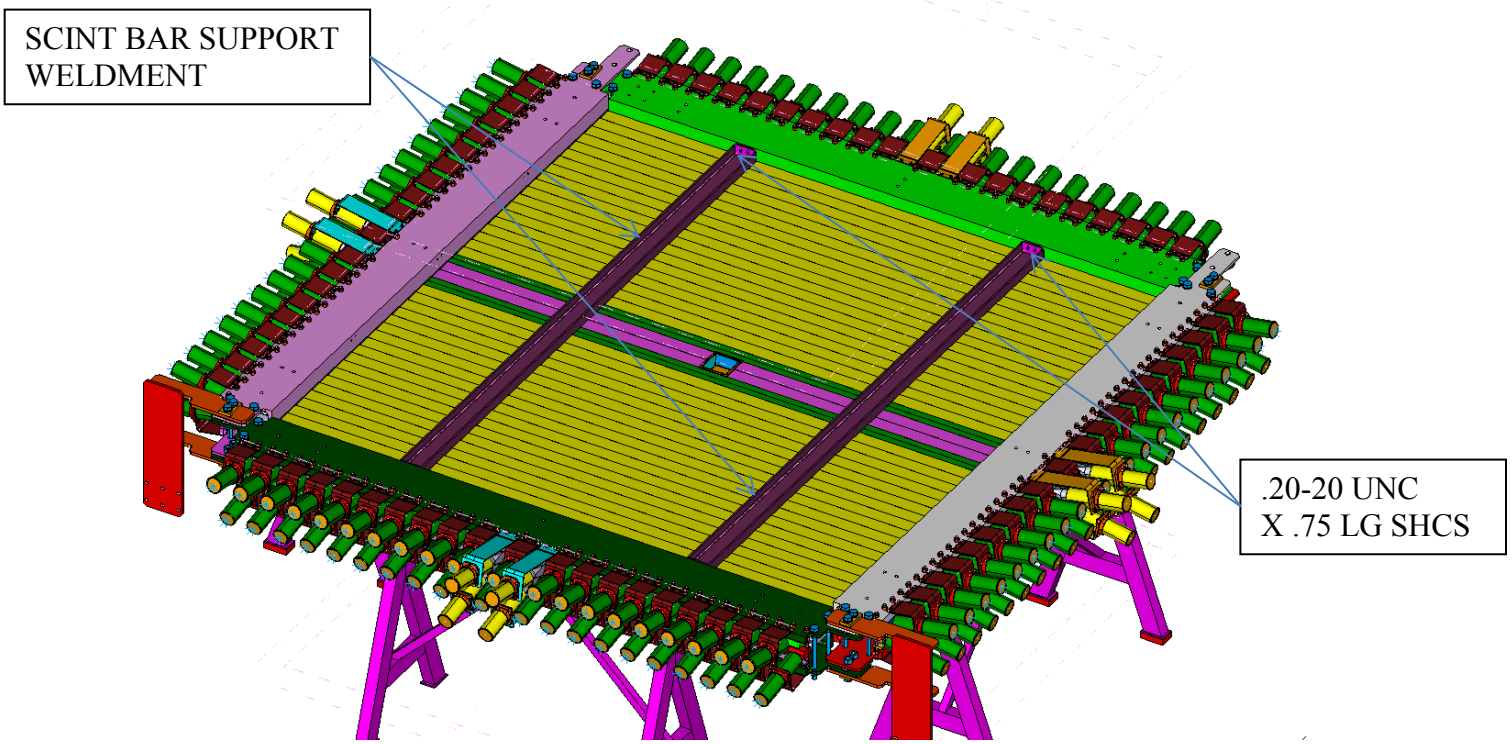

Figure 50

51. Attach the 4 Channel stiffeners (D00000-01-05-2042 to each of the upper MC channels as shown in Fig. 51using quantitiy of six, 1/2-13 UNC X .75 lg Hex hd bolts as shown in Fig 51.

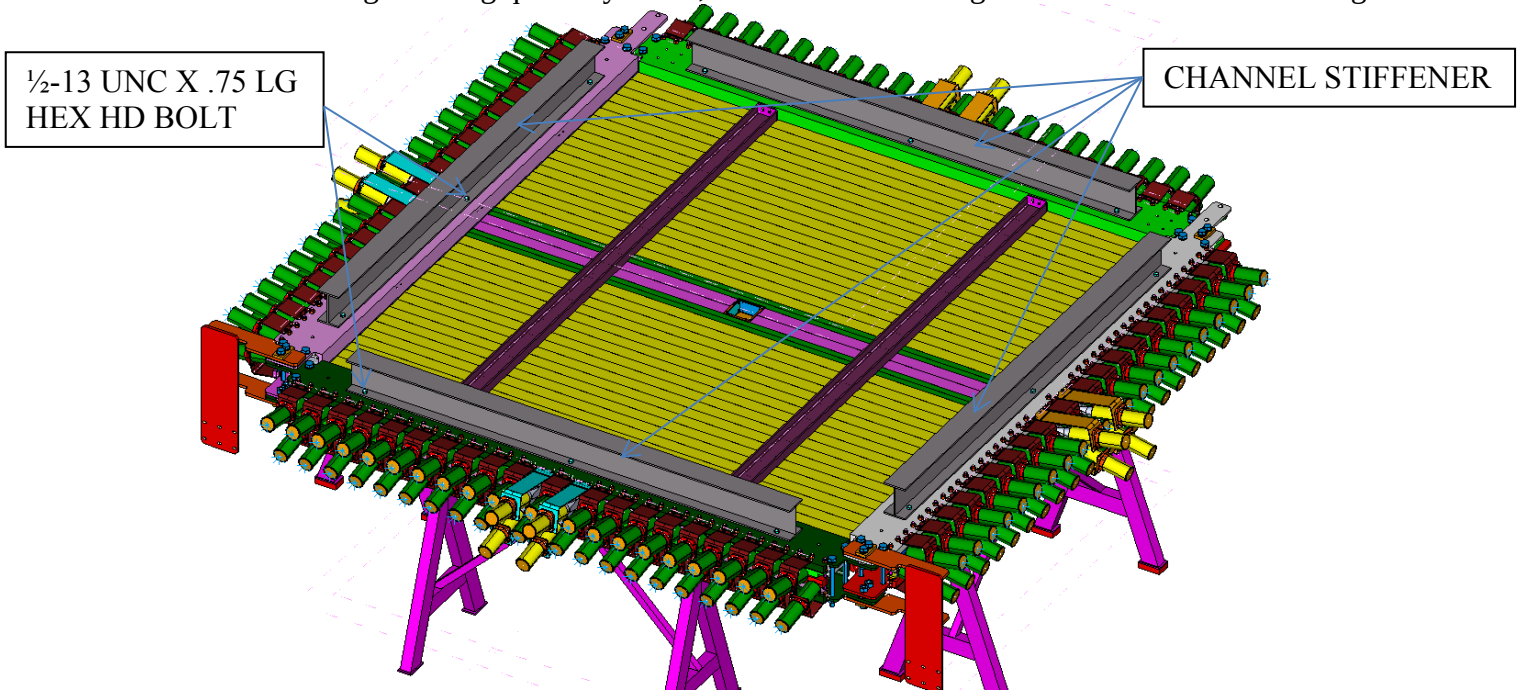

Figure 51

52. attach hoist ring standoff (D00000-01-05-2043) to MC Channel 1 as shown below using four, 3/8-16 unc x 2.0 long socket head cap screws per hoist ring.

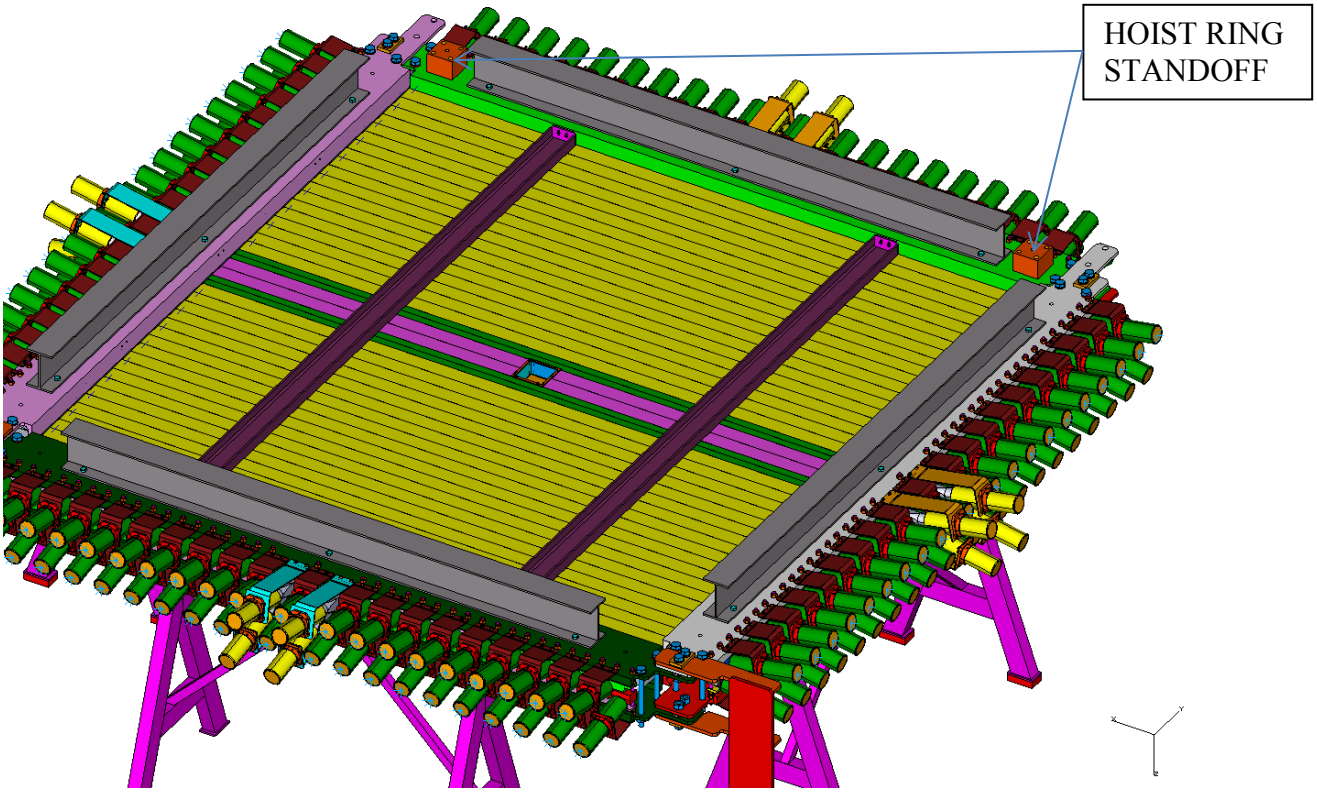

Figure 52

53. Install hoist rings as shown in Fig. 53.

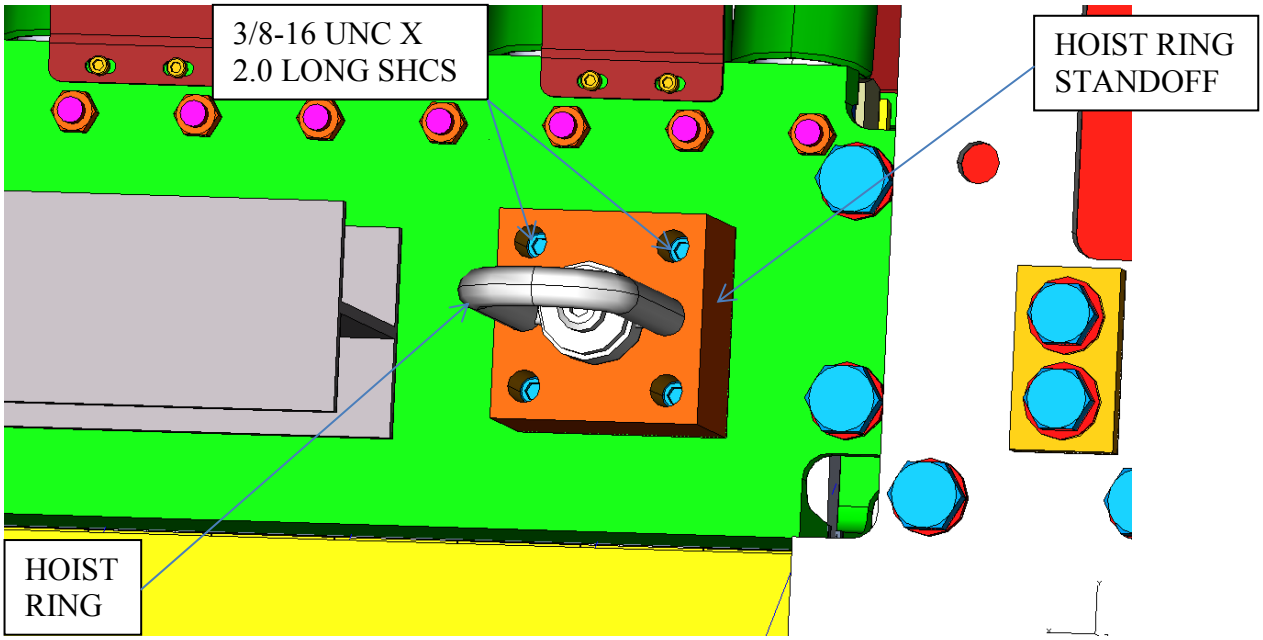

Figure 53