Horn 2 Relocation to ME Stripline Extension

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David Tinsley, FNAL

ANU Target Hall Infrastructure, WBS X.0.3.3.2.1

CD-2/3a Director's Review Breakout

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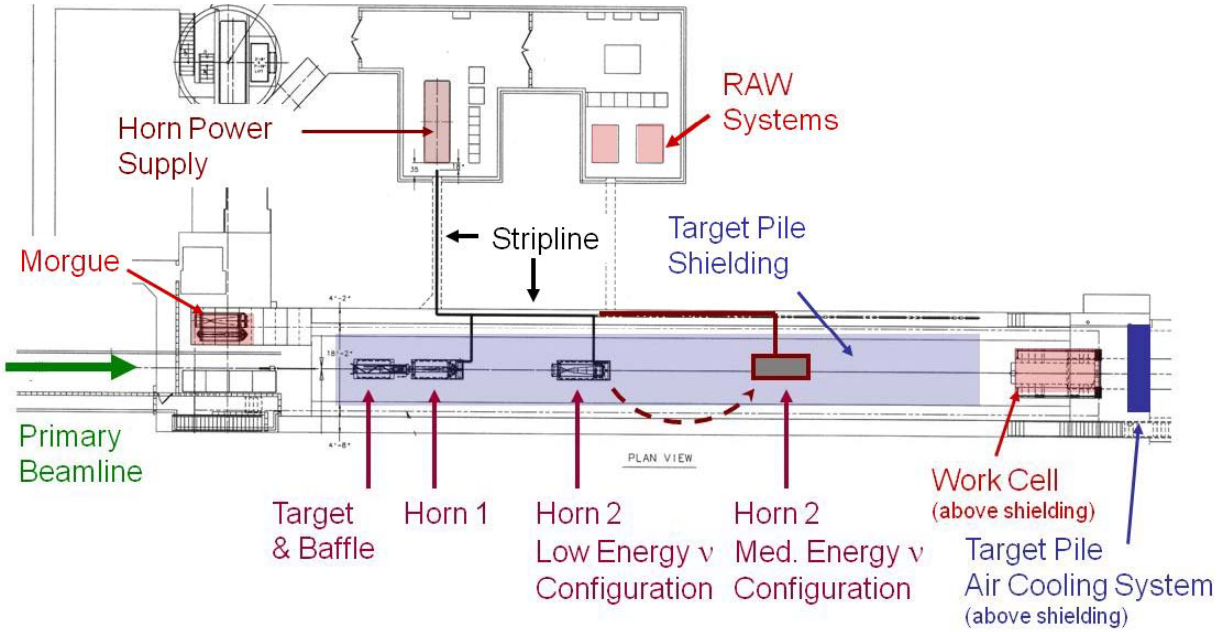
Description of Stripline Circuit

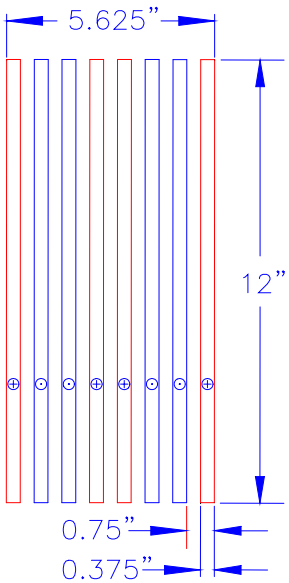
- The stripline is the electrical connection between the 240 kA pulse power supply and the two series connected horns.
- The power supply is a 0.225 F capacitor bank that operates up to about 1.3 kV.
- The power supply output is presently set to 200 kA at 680 V for NuMI.
- The two focusing horns, each a single turn air core magnet is constructed in a co-axial configuration.



Stripline Power Supply- 22,000 Pounds
Bank of 120 7.5mF Capacitors

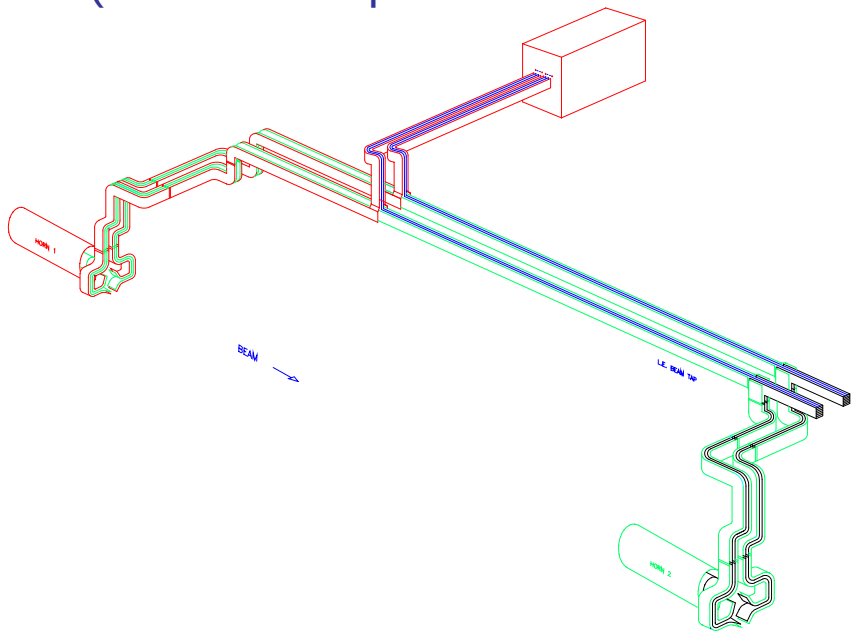
Stripline Design

- The stripline consists of 8 layers of high conductivity 6101-T61 aluminum bus bars which are 12 inches wide by .375 inches thick.
- The bus bars are held together with aluminum clamps with fiberglass insulators in low radiation areas.
- The bus bars are held together with titanium fasteners and zirconia PSA ceramics insulators in high radiation areas.



Types of Striplines

- The stripline consists of 6 major segments:
  - Penetration Stripline (from the power supply to the target hall)
  - Walkway Stripline (runs down the west side of the target hall)
  - Chase Stripline (from the “Walkway” to under the R-blocks)
  - Module Stripline (from the “Chase” to the “Shielding Block”)
  - Shielding Block Stripline (runs down to the remote clamp)
  - Horn Stripline (remote clamp to the downstream end of the horn)



PICTORIAL REPRESENTATION OF HORNS AND STRIPLINE

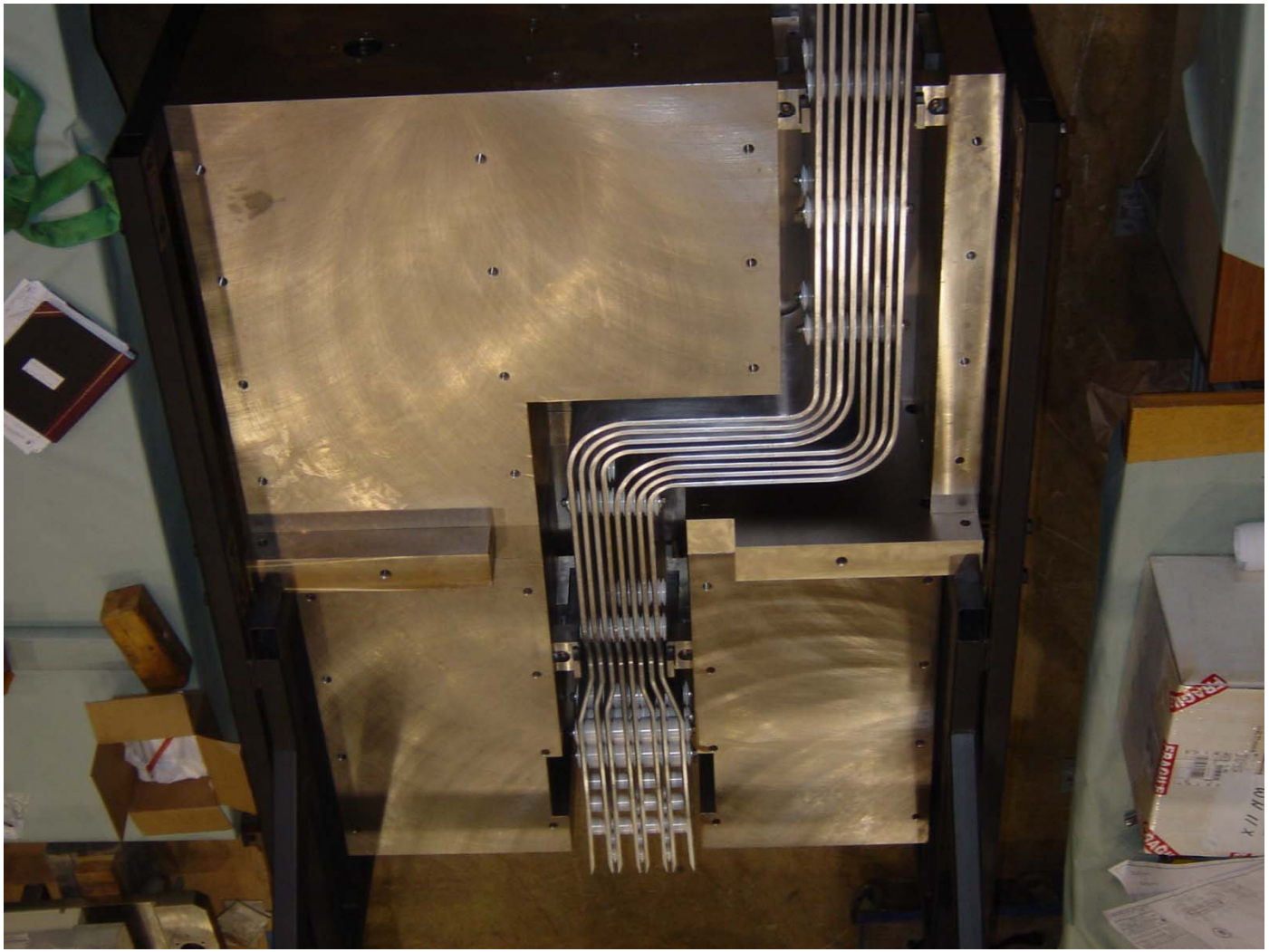
Penetration Stripline
(goes through the rock wall)

Striplines in Target Hall (Walkway, Chase & Module)

Horn 1 Striplines: Walkway, Chase, Module & Shielding Block

Horn 2 Striplines: Walkway, Chase, Module & Shielding Block

Shielding Block Stripline (shown with cover removed)



Walkway Stripline Extension

- The horn 2 medium energy walkway stripline extension would be designed by duplicating the existing walkway stripline and support structure.
- The walkway stripline extension will be pre-assembled in a building above ground and then be moved to and installed in the target hall.
- The walkway stripline extension will be plugged into the silver plated contacts at the downstream end of the existing walkway stripline.

Performance Specifications

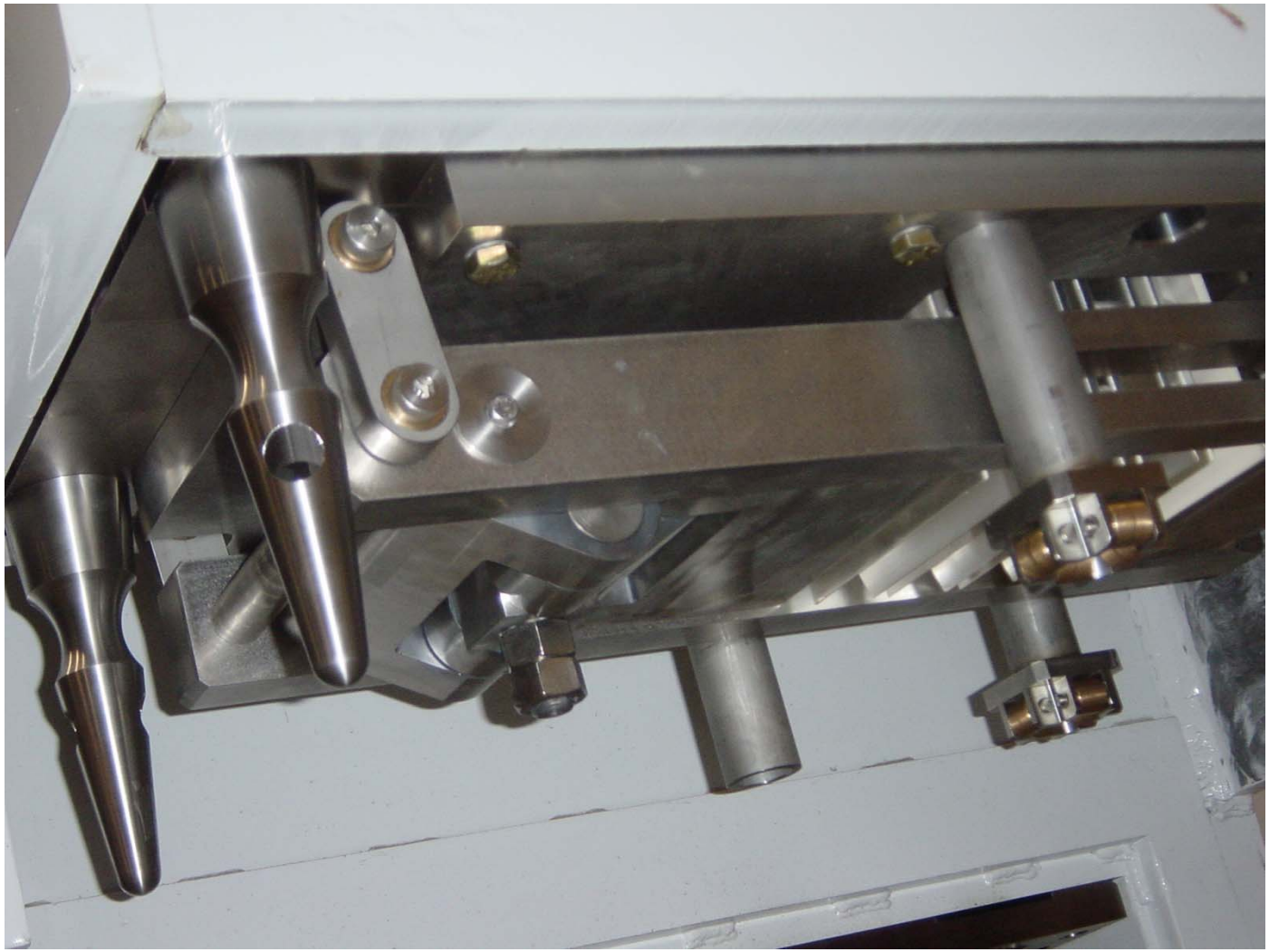
- Addition of 10 meters of stripline will increase the inductance of the system by 160 nH
- The power supply voltage will have to be increased from 680 V to about 787 V to maintain the 200 kA output.
- Power supply is capable of about 1.3 kV so no upgrades are needed for the power supply.
- Even though there is an increase in power supply output the electrical heating of the stripline will increase only slightly due to 10 extra meters of stripline to dissipate the heat.
- The stripline was originally designed with the high heat load of a 5.2 ms pulse width so no modifications are necessary with a 2.6 ms pulse width at 1.33 second repetition rate that NOvA will use

Design Issues

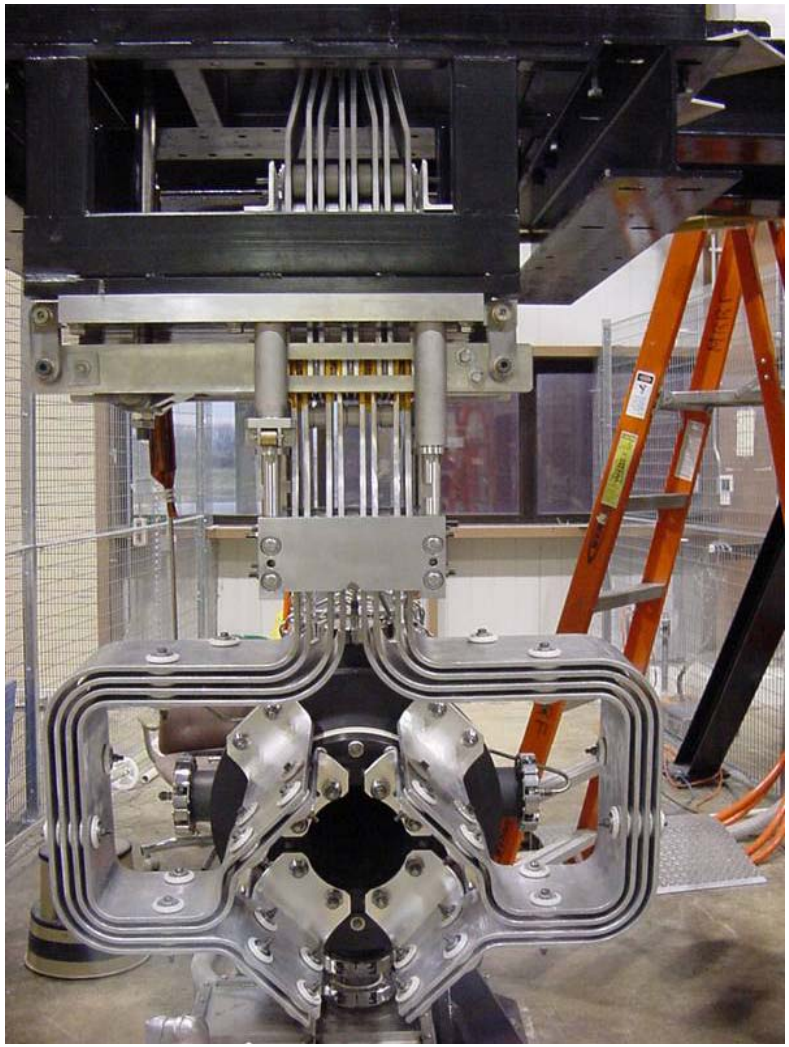
- Stripline shielding blocks and the remote clamp need to be evaluated for thermal beam heating. RAW cooling may be needed.
- The stripline attached directly to the horn needs to be evaluated for thermal beam heating. Additional air cooling may be needed.
- Thermal expansion of the extra 10 meters of stripline should be evaluated. No problems are expected.

Shielding Block Stripline (Remote Clamp Contacts)

Stripline Remote Clamp (bottom of the shielding blocks)



Horn Stripline
(shown on horn testing stand)



Value Engineering/Management

Value Engineering/Management:

- The original design concept was to have horn 2 capable of being moved into three discrete locations. Provisions were made to add additional stripline.
- The horn 2 chase and module striplines along with all their supports will be moved and re-used in the new horn 2 position.
- Shunts will be placed in the low energy tap location to bypass the current to the medium energy position.
- High voltage tap will be incorporated at the downstream end of the walkway stripline to provide for a future high energy position.

Conclusions

- Status of Design
  - The stripline extension is a duplication of existing design
  - Reconfiguring horn 2 to medium energy will be re-using existing chase and module striplines
  - Chase and module striplines will mount on to supports that will be moved from the low energy to the medium energy positions
  - Need to analyze higher heating loads in the stripline remote clamp area
  - Horn stripline shielding block assembly will be modified with improvements to increase cooling in the remote clamp area