

# Analysis of the Length of Optical Fiber Cables from the Detector to the DAQ Room

By Howard Matis  
Lawrence Berkeley Laboratory  
January 5, 1999  
STAR Note #369A

**Abstract:** Optical signals need to be sent from the detector to the DAQ room. This document provides information to calculate the length of hoses to order. As cable routing is quite complex, the STAR cable Czar should be consulted before ordering any cable.

Original: October 1, 1998

Version A: January 5, 1999—Due to length calculated in the original version, it was felt that the path should be shortened. Therefore, the position of the festoon was moved closer to the detector. This document reflects the new design.

## Introduction

For simplicity and cost, all fiber runs from the detector to the patch panels on the DAQ racks will be with one continuous fiber. Each optical cable will be routed from the detector over the following paths:

1. From the radial trays which are aligned with each TPC sector, to
2. The radial and cylindrical cable trays on the TPC face, to
3. Trays under the second floor of the South Platform (for the lower 6 sectors) and trays under the third floor of the South Platform (for the upper 6 sectors), to
4. Vertical trays for the cables under the second floor to go to the third floor, to
5. Horizontal tray under the third floor (for cables on the East side to go the West side), to a
6. Festoon which takes the cables to the entrance of the cable walkway on the West wall), to
7. Cable walkway to the computer floor of the DAQ room, to
8. Cable trays under the computer floor on the DAQ room, to
9. A patch panel in the center of a rack.

As one can see, the path of any optical cable is complicated. Therefore, before any cable is ordered and cut, the STAR Cable Czar should be consulted to make sure this document is interpreted correctly. At the time this note is written, Howard Matis is the current Cable Czar.

## Longest Cable

The longest optical cable goes from the SVT electronic boxes along cable tray spoke number 15 (East Side).<sup>1</sup> A spoke is labeled by the TPC sector that feeds it. The 12 o'clock sector feeds a spoke on its clockwise side. That means, when looking at the 12 o'clock sector it feeds a spoke on the right. Therefore, sector 15 cables feed down and

---

<sup>1</sup> See Controlled STAR Note CSN0229 for a discussion on STAR geometry.

under the TPC. The longest cables comes from sector 15 and feeds under the second floor of the platform and then across the length of the south platform to the festoon. The end of the cable is the highest patch panel in DAQ rack DA16.<sup>2</sup> We choose that rack so that any cable in the DAQ room can be patched to any DAQ rack.

The length of this cable can be calculated from Table 1. Cable errors are added cumulatively. This table demonstrates that a 342 foot cable can be used for all paths. However, for reasons of cost and the need to store excess cable, it might be possible to reduce the cable length. Excess cable length is stored under the DAQ computer floor and

Length (feet)	Max positive error (feet)	Cable Section	Comments on Length	Comments on Error
9.4	1.0	Distance from SVT Boxes to Face of magnet	From Model	
82.0	10.0	To rack 2B9 (Take lower east cable run as upper does not need to go to second level.) This number includes 6.7' to top of rack. This is the approximate distance to festoon from the bottom of the rack.	From sum of measurements on actual detector	Pretty conservative
9.7	0.5	To third floor tray	From measurement	
170.0	5.0	To SOUTH end of the eastern set of racks (DC1)	Revised number from e-mail of Bill Edwards	Longest quoted error
52.0	1.0	To furthestmost DAQ Rack DA16 and then to upper patch panel	Measurement on floor	
323.1	17.5	Total Length		

**Table 1—Calculation of the maximum fiber cable**

it is important to minimize this surplus. It could be possible to order several different cable lengths.

### Going to a Different Sub-System

The longest cable length is for a cable from the SVT box on the TPC wheel. The length to the outer ring of the TPC is 4.4 feet shorter while the length to the CTB tray is 4.8 feet shorter than a cable to the SVT.

<sup>2</sup> Controlled STAR Note CSN0273 discusses the rack assignments and the labels for the racks.

Length (feet)	Max positive error (feet)	Cable Section	Comments on Length	Comments on Error
9.4	1.0	Distance from SVT Boxes to Face of magnet	From Model	
66	10.0	Sector 17 To rack 2B9 (Take lower east cable run as upper does not need to go to second level.) This number includes 6.7' to top of rack. This is the approximate distance to festoon from the bottom of the rack	From sum of measurements on actual detector	Pretty conservative
9.7	0.5	To third floor tray	From measurement	
170.0	5.0	To SOUTH end of the eastern set of racks (DC1)	From e-mail of Bill Edwards	Longest quoted error
52.0	1.0	To furthest DAQ Rack DA16 and then to upper patch panel	Measurement on floor	
307.1	17.5	Total Length		

**Table 2—Calculation of the fiber cable to sector 17.**

### Using a Different Cable Spokes

Some detectors need only one cable per end. These detectors could route their cable along a different TPC sector and reduce the cable length. Table 2 provides the length saved by using a closer sector.

### Sorting Cables by East or West Side

All cables from the East Side must be routed along the width of the south platform. Consequently, cables on the West Side can be made 25 feet shorter.

Sector #	Difference Saved (feet)
15, 14, 9, 8	0
16, 13, 10, 7	9.6
17, 24, 11, 6	16.2
18, 23, 12, 5	23.3
19, 22, 1, 4	30.8
20, 21, 2, 3	35.3

**Table 2—Different Lengths to TPC Sectors**

## **Sorting Cables by Up and Down**

Cables from sectors on the upper half of the detector are 9.7 feet closer to the DAQ room. This length can be used to minimize cables coming from the upper sectors.

## **Conclusion**

A length of 342 feet (104 meters) is sufficient to connect all detector elements on the TPC wheel to any DAQ rack. This length can be shortened for some optical cables when cables are sorted by length or a cable does not need to go to the farthest sector. However, the length that can be shortened is still small compared to the total length of the cable. Great care should be used if this method is used. In addition to the length requirement for a cable, it is important to check that the cable meets applicable flammability requirements. Consequently, any order for cables should be checked with the STAR cable czar before ordering.