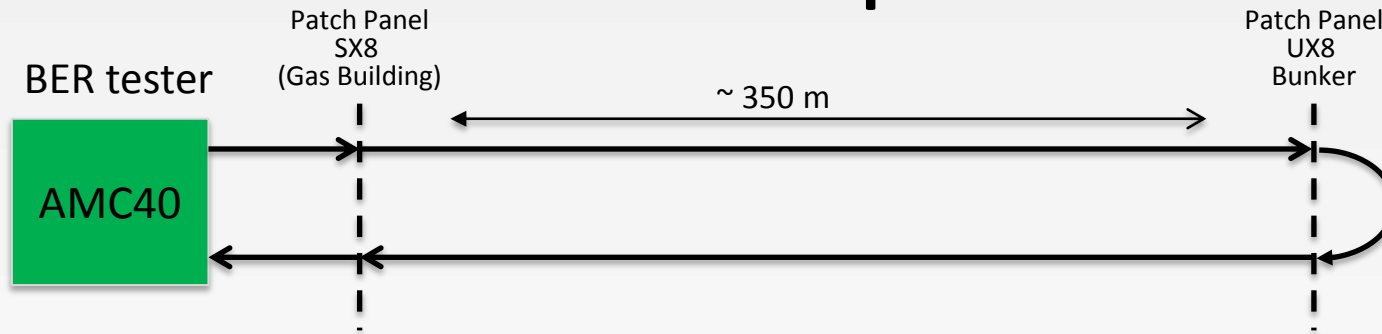# Optical fibre test update

P8 test installation

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Setup

- Review of TDR suggested a test installation at P8 to ensure the viability of the long distance read-out
- Installed 3 Trunk cables with 144 fibers each from different providers at P8
  - 1 x 144 Fibers from Fibernet, pre-connectorized
  - 1 x 144 Fibers from CERN, pre-connectorized
  - 1 x 144 Fibers from CERN, spliced
- All 432 Fibers have been tested and have expected Attenuation
- Currently Measuring the spliced fibers
  - Worst case scenario due to additional attenuation of splice point
- Testing on loop with 2 x 350m
  - Higher attenuation than in final setup
  - AMC40 transmitter has more optical power though
  - Longer fiber just about compensates for the stronger transmitter

Result so far

- Setup has been running for approx. 65 days now
- 3.27×10^{17} bits tested so far
- 0 Errors
- However BER $< 1 / 3.27 \times 10^{17}$ only with 63% confidence

$$CL = 1 - e^{-N \times BER_s} \times \sum_{k=0}^{E} \frac{(N \times BER_s)^k}{k!}$$

CL = Confidence Level
N = Number of bits tested
E = Errors
BER_s = Specific Error Rate

Confidence	63%	74%	95%
Aggregated BER	$< 3.1 \times 10^{-18}$	$< 4 \times 10^{-18}$	$< 9 \times 10^{-18}$
Error rate for 12k fibers	< 16 / day	< 20 / day	< 45 / day

Outlook

- At the current rate we need to test for 2925 more days to ensure < 1 error per day (2×10^{-19}) with 95% confidence
- If we used all installed links we needed 82 more days
  - Would need 11 more AMC40s though

- What is an acceptable error rate?
- Bit Errors in Data only contribute to noise
- Bit Errors in Headers → De-synchronization
  - TODO: What is the estimated rate for this happening and is it acceptable?