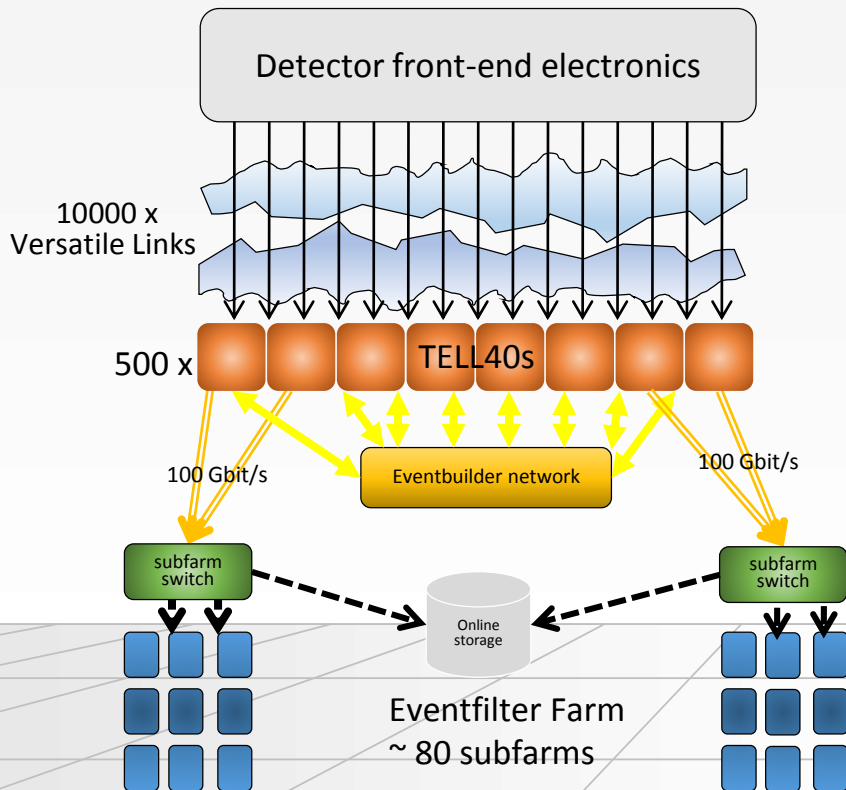


FE Optical Link Validation Setup

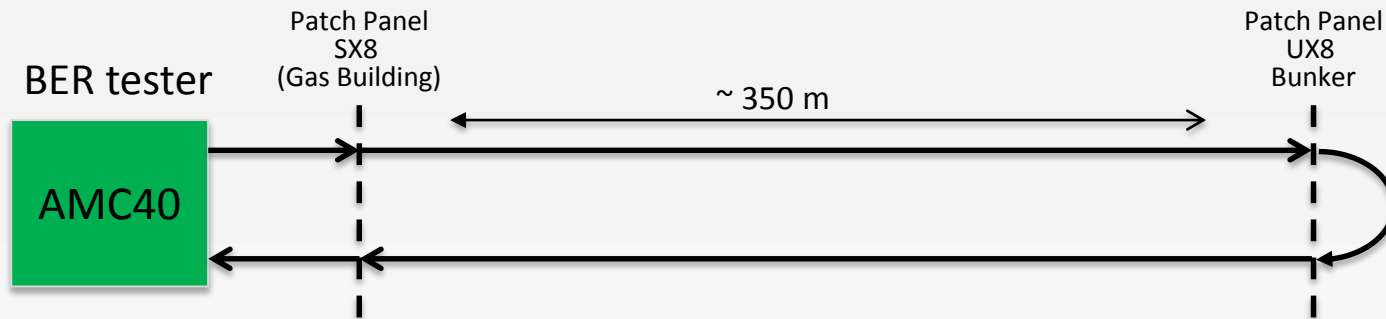
Rainer Schwemmer – LHCb Upgrade Electronics Meeting
13.4.17

Future DAQ Architecture



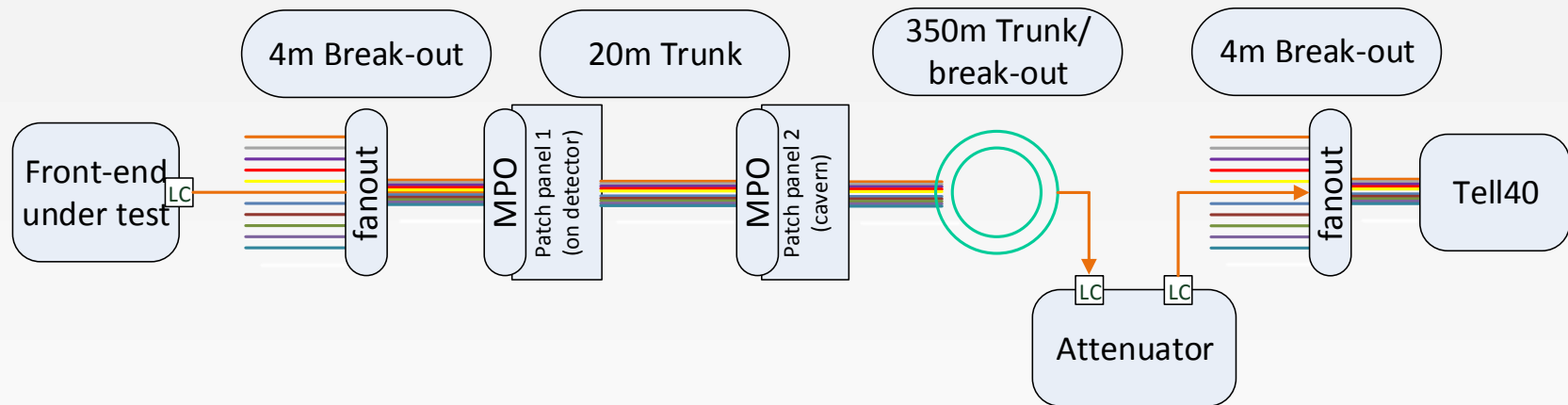
- Current Baseline for Optical Readout
 - $O(10k)$ optical links with $> 300m$ length @ 4.8 GHz
 - Outside the design goal for the Versatile Link (80m)
 - In previous tests we verified that this can work
 - Looking at component specs: this might be a bit on the edge though
 - Never checked with GBT \leftrightarrow Transmitter electrical link
- ➔ Validation needed

BER considerations



- Test setup at P8
- 36 links for 8 Months
- $BER < 1.3 \times 10^{-18}$ @ 95% CL
- Ramifications (example):
 - Expected error rates DAQ @ $BER 1.0 \times 10^{-18}$
 - 10k links \rightarrow 4 Errors per day
 - 8 bit header (120 bit frames) \rightarrow 4 days between errors in header which can potentially upset DAQ (desynchronization)
 - Rest is bit flips in detector channel data (detector noise)
- Problem rate increases proportional with error rate

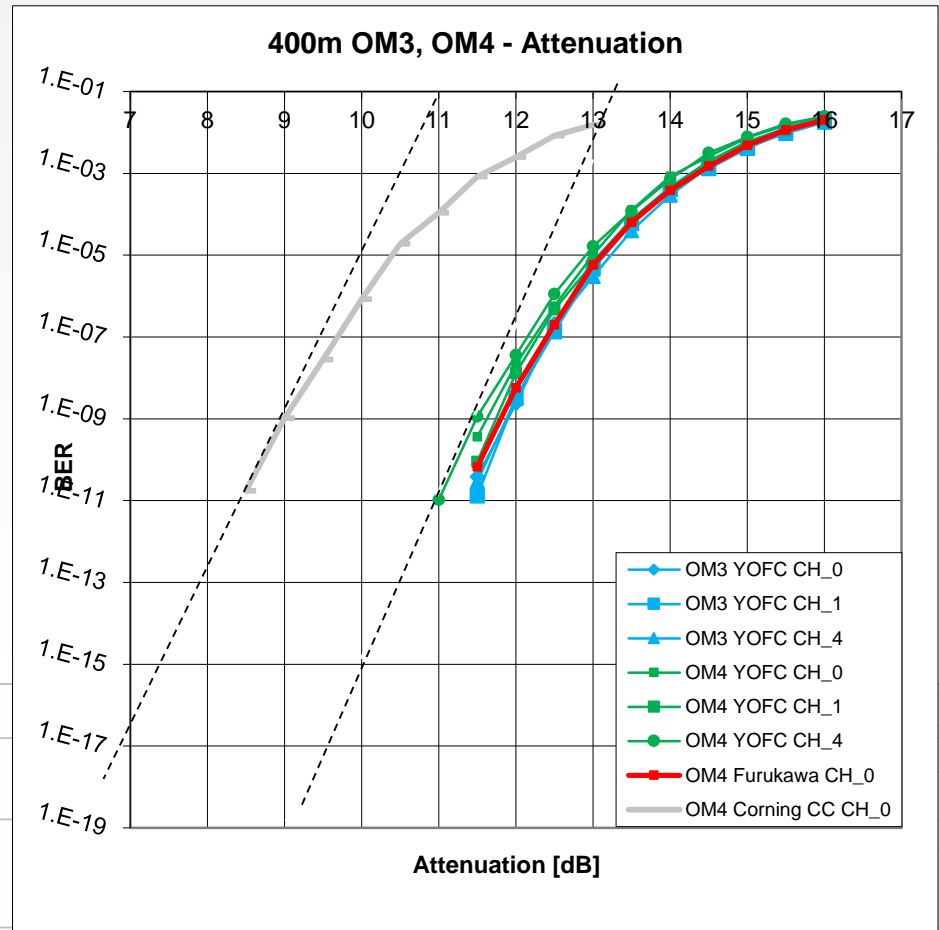
Proposed setup for validation



- In the process of acquiring all the pieces which are the current baseline for the final system
 - 350m x 144 Trunk cable → already delivered
 - Fan-outs → ordered
 - Patch panels → ordered
 - Attenuators → Supplier found, order after Easter
 - Tell40s → already delivered
- Enough cables to fully populate 2 Tell40s
- Hoping that we can have the hardware setup ready and debugged by mid May

Validation procedure/goals

- GBT on FE produces test pattern
 - Preferably PRBS
- Tell40 measures error rate of transmission
- Use set of attenuators to dampen signal to obtain coarse BER curve
- Use previous lab measurements to extrapolate error rate at 0 dB attenuation
- Suggested target values (assuming similar behavior as previous tests):
 - 3.5dB safety margin for aging, installation issues, variance
 - $BER < 1.0 \times 10^{-18}$
 - $< 10^{-8}$ @ 6 dB O(seconds)
 - $< 10^{-12}$ @ 5 dB O(10 min)
- Goals
 - Validate optical components (again)
 - Validate electrical path on FEs
 - Check all FE designs by end of Year



Discussion/Questions

