FOX Implementation?

Murrough Landon

21 March 2017

- Example modular implementation
  - Connectivity, constraints and modularity
  - Rack layout and ribbon routing
  - Front panel diagrams (innards by Dan)
  - Discussion points?

Connectivity Numbers

- Complex network of interconnections
  - 116 LATOMEs (29 LDPBs) each sending one 48 way ribbon
    - Each LATOME connects to up to 4 eFEX, 3 jFEX and gFEX
  - 32 PPM-TREX each sending one 48 way ribbon
    - Each TREX connects to up to 6 eFEX, 3 jFEX and gFEX
  - 24 eFEX modules each expecting four 48 way ribbons
    - Coming from 12 EM LATOMEs and 12 TREX or 6 TREX + 3 LATOMEs
  - 7 jFEX modules each expecting four 72 way ribbons
    - Coming from 64 EM LATOMEs and 24 TREX or 4 TREX + 9 LATOMEs
  - One gFEX module expecting four 72 way ribbons
    - Coming from all 116 LATOMEs and all 32 TREX
- Connections loop around in phi and across all eta
  - Modular system implies making divisions
  - Tried to optimise the bulk (eFEX)

Mapping Constraints

Constraints mainly coming from the FEXes:

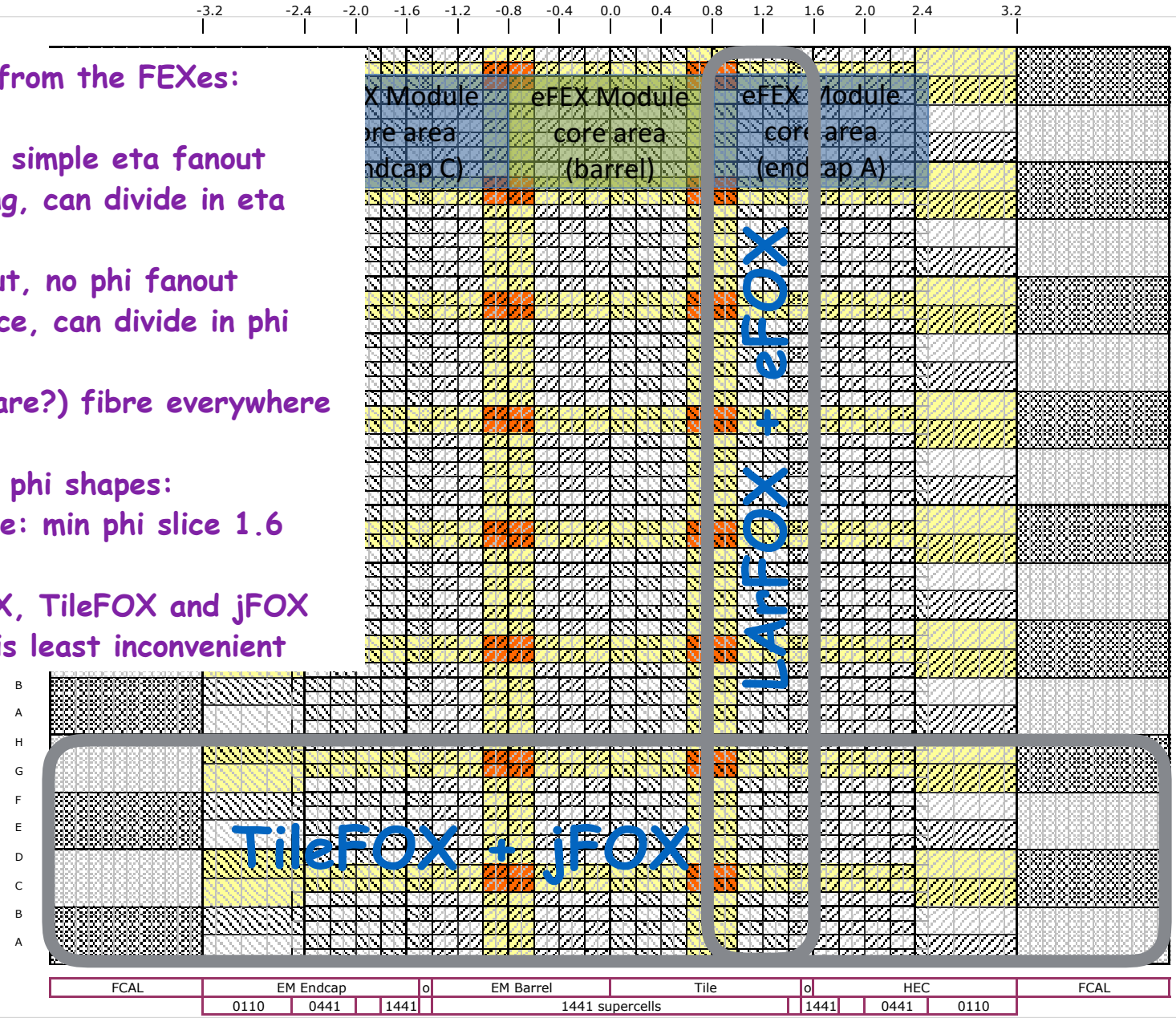
eFEX: complex phi fanout, simple eta fanout
=> eFOX needs full phi ring, can divide in eta

jFEX: three way eta fanout, no phi fanout
=> jFOX needs full eta slice, can divide in phi

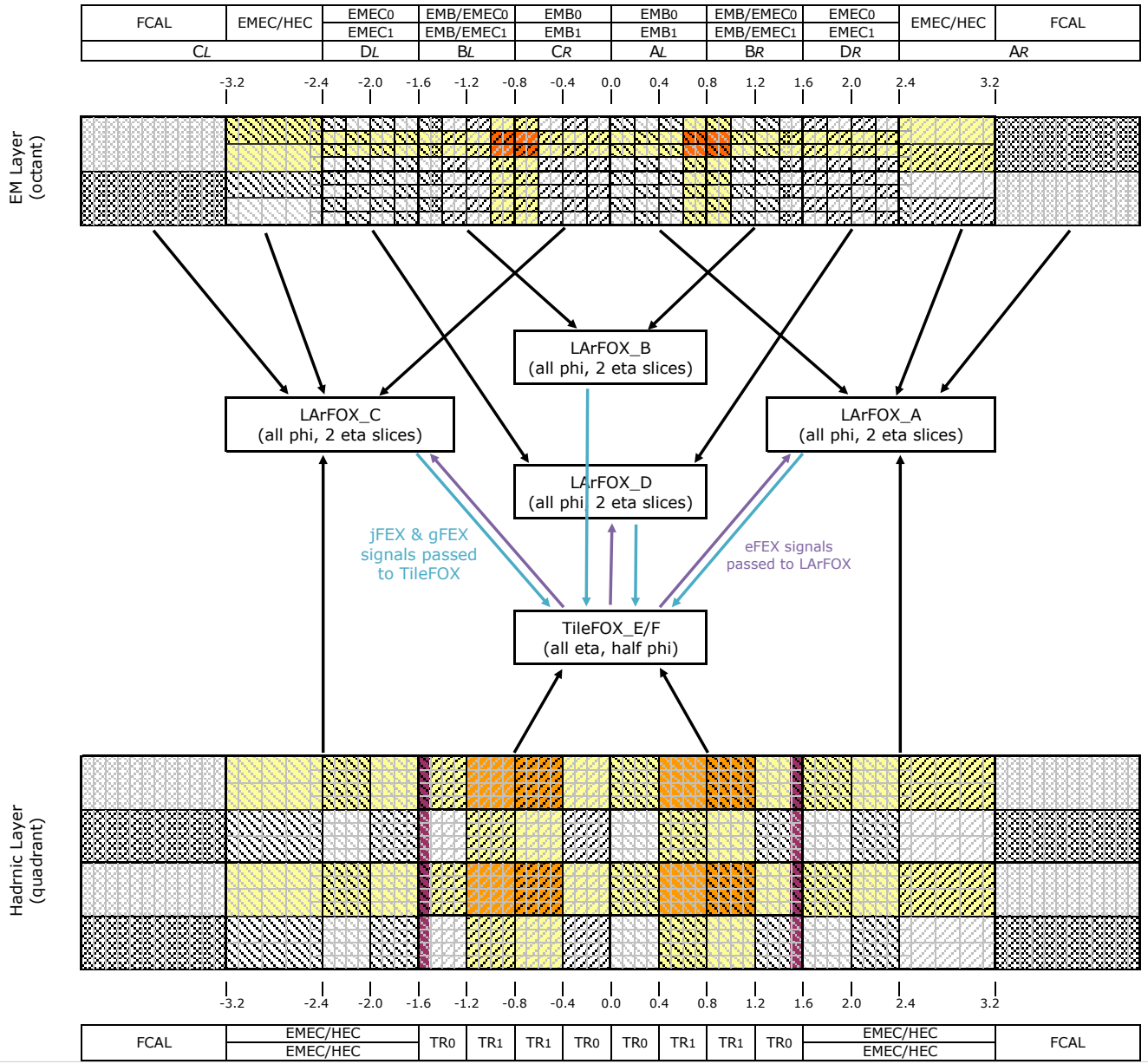
gFEX: "just" needs 1 (+spare?) fibre everywhere

Sources only constrain eta phi shapes:
LAr: min eta slice 0.8; Tile: min phi slice 1.6

Combine LArFOX and eFOX, TileFOX and jFOX
Handle gFOX wherever it is least inconvenient



Connectivity Sketch

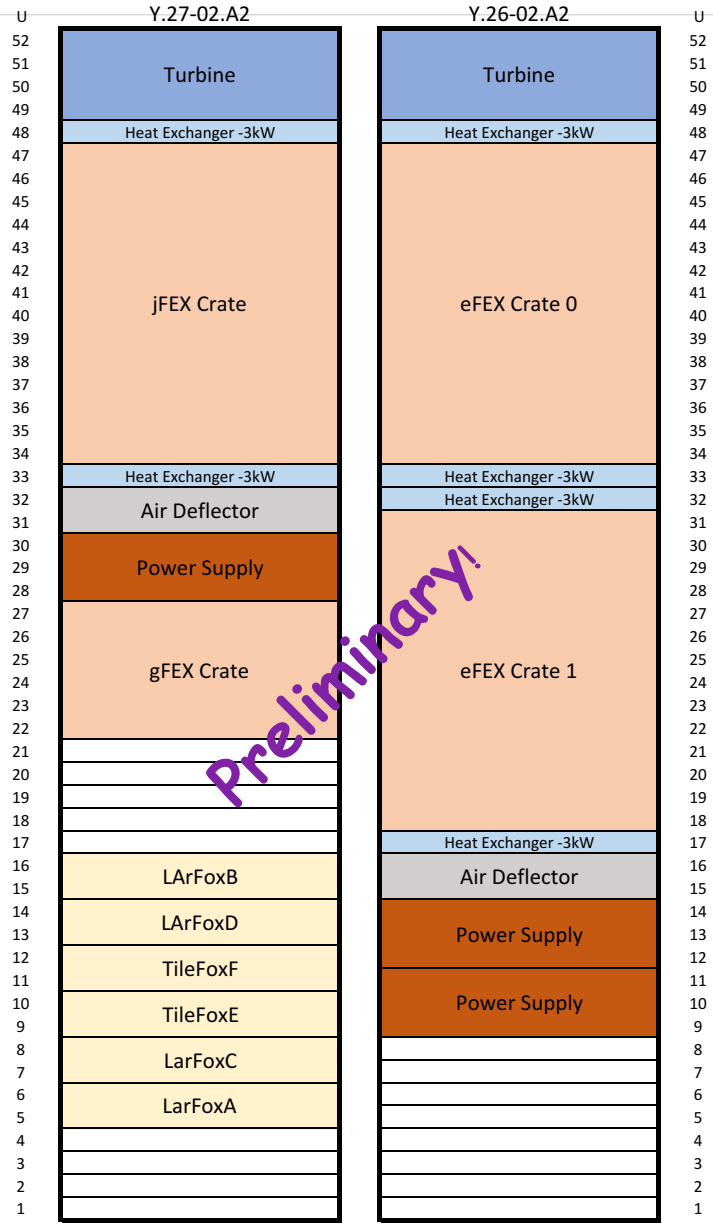


Modular Choices

- For Run 3 latency will still be critical
  - Best to have the FOX on the minimal real time path
    - Installation at the end of the row of racks adds ~ 1 BC?
    - May have space for ~12 U installation below gFEX crate
- How will we put the FOX together and test in situ?
  - Each input goes to many destinations - would testing the complete FOX involve too many (re)connections?
  - If we discover an internal misconnection, fixing it involves lots of disconnections and reconnections => further risk
  - Balance between monolithic and fiddly?
- Sketch design with six ~2U boxes
  - Aim for mapping with multiconnector ribbons
  - Still need quite a lot of interconnections between boxes…
    - Can we avoid having extra connectors at both ends?

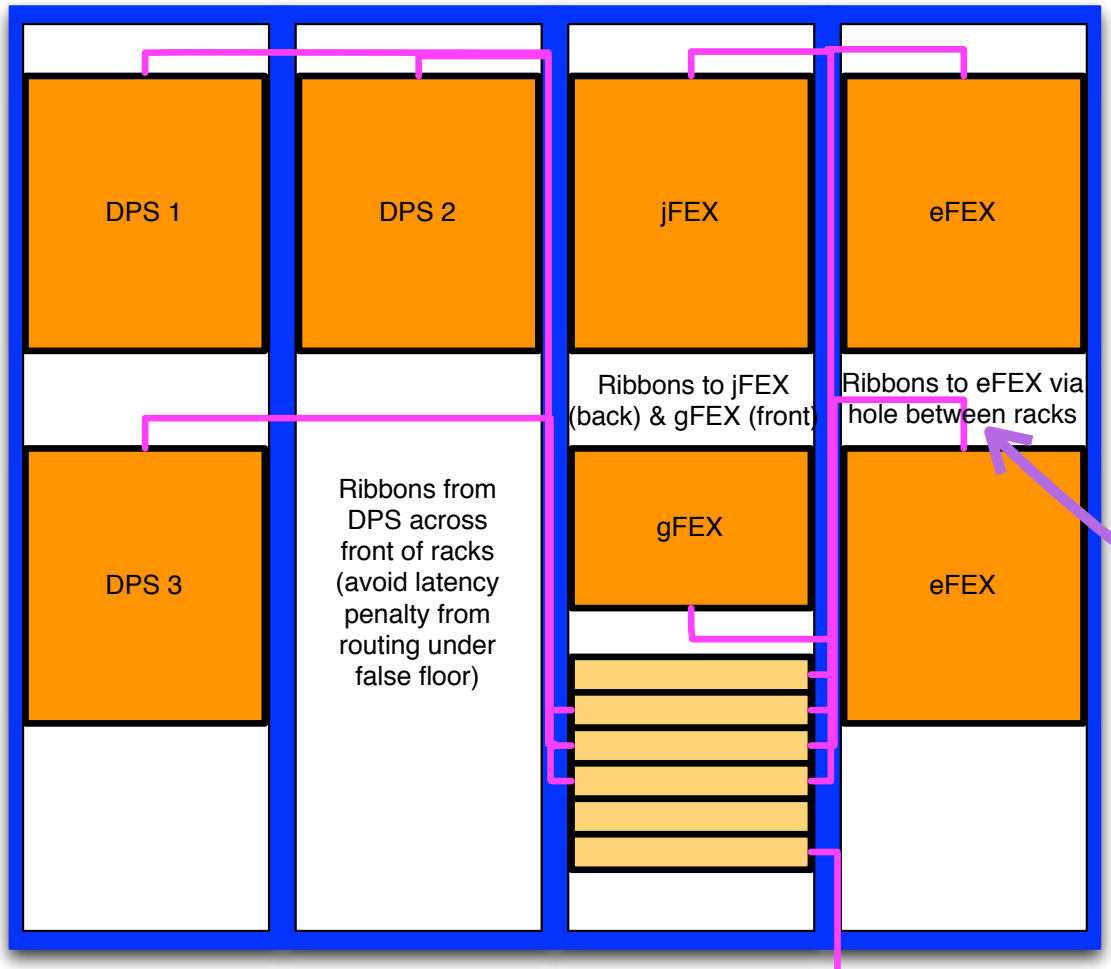
Draft Rack Layout

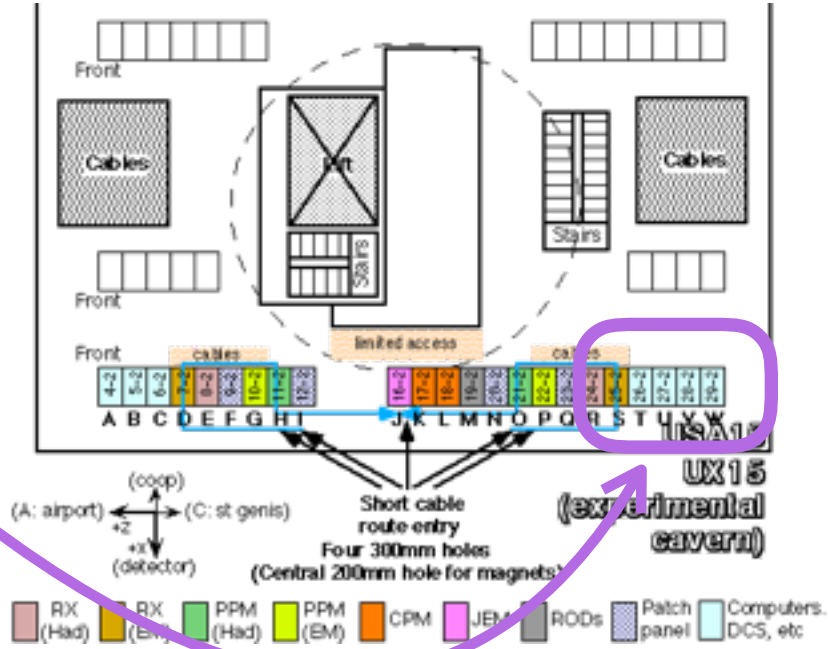
- Possible space for FOX
  - NB still not sure if eFEX will need an extra crate
  - If so, things get very tight
  - Also I may have forgotten something crucial!



Routing Ribbons

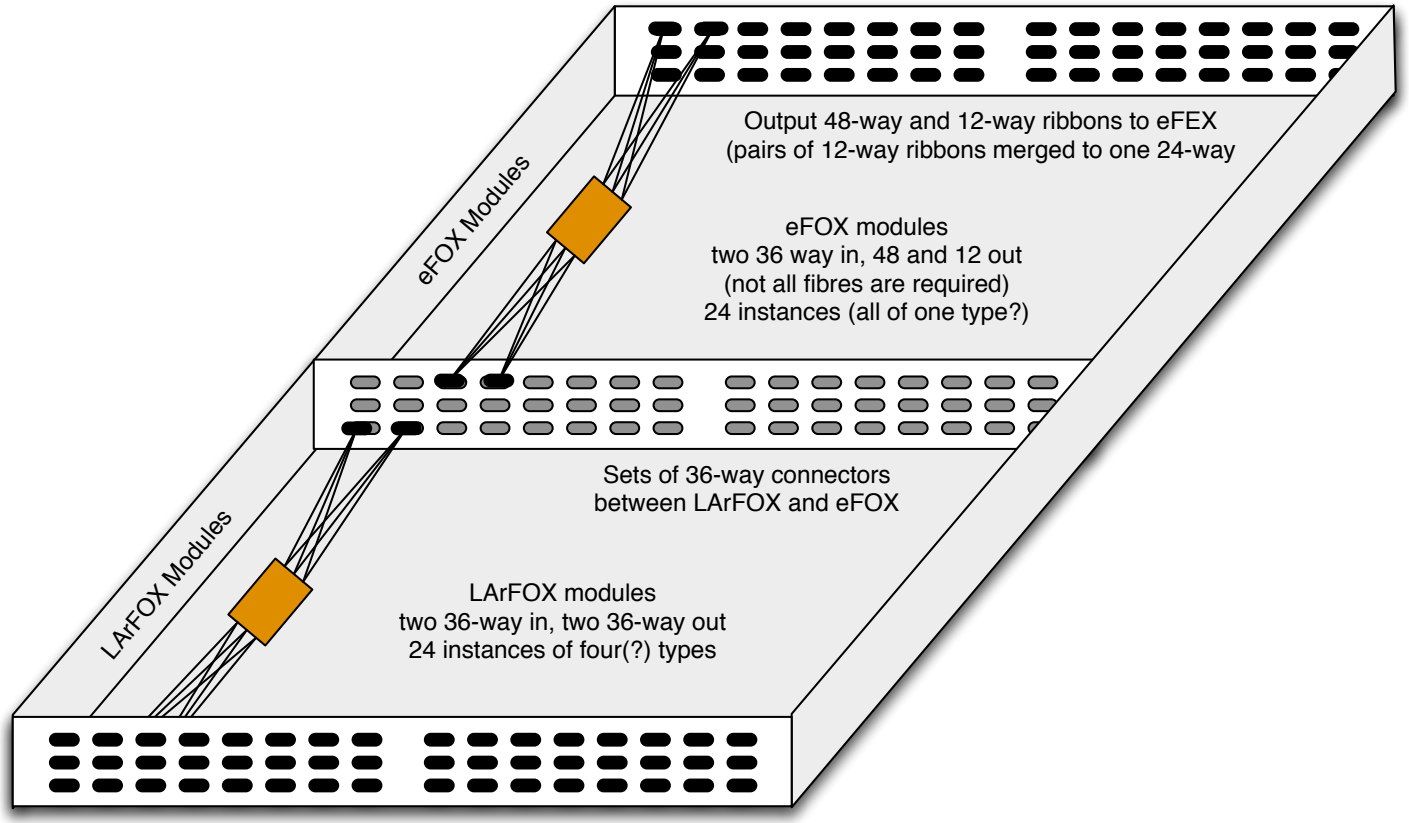
- Minimal latency path: across racks from DPS and to gFEX, via back to jFEX and via hole between racks to back of eFEX





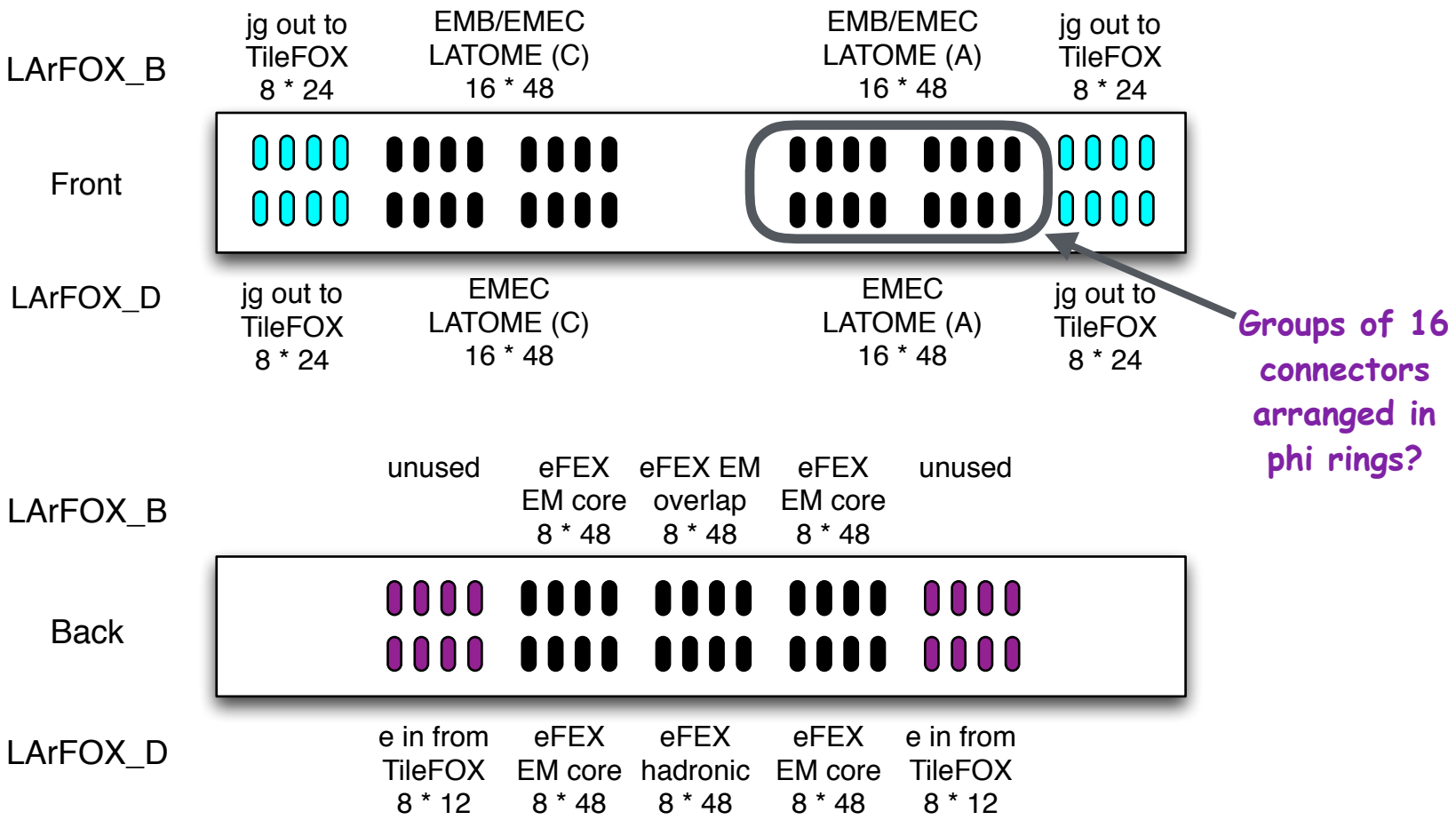
Rack Mounted Boxes

- An early overambitious sketch from a year or two ago
  - 1U is probably too little for that many connectors
  - 2U should be plenty - but more compact would be better!



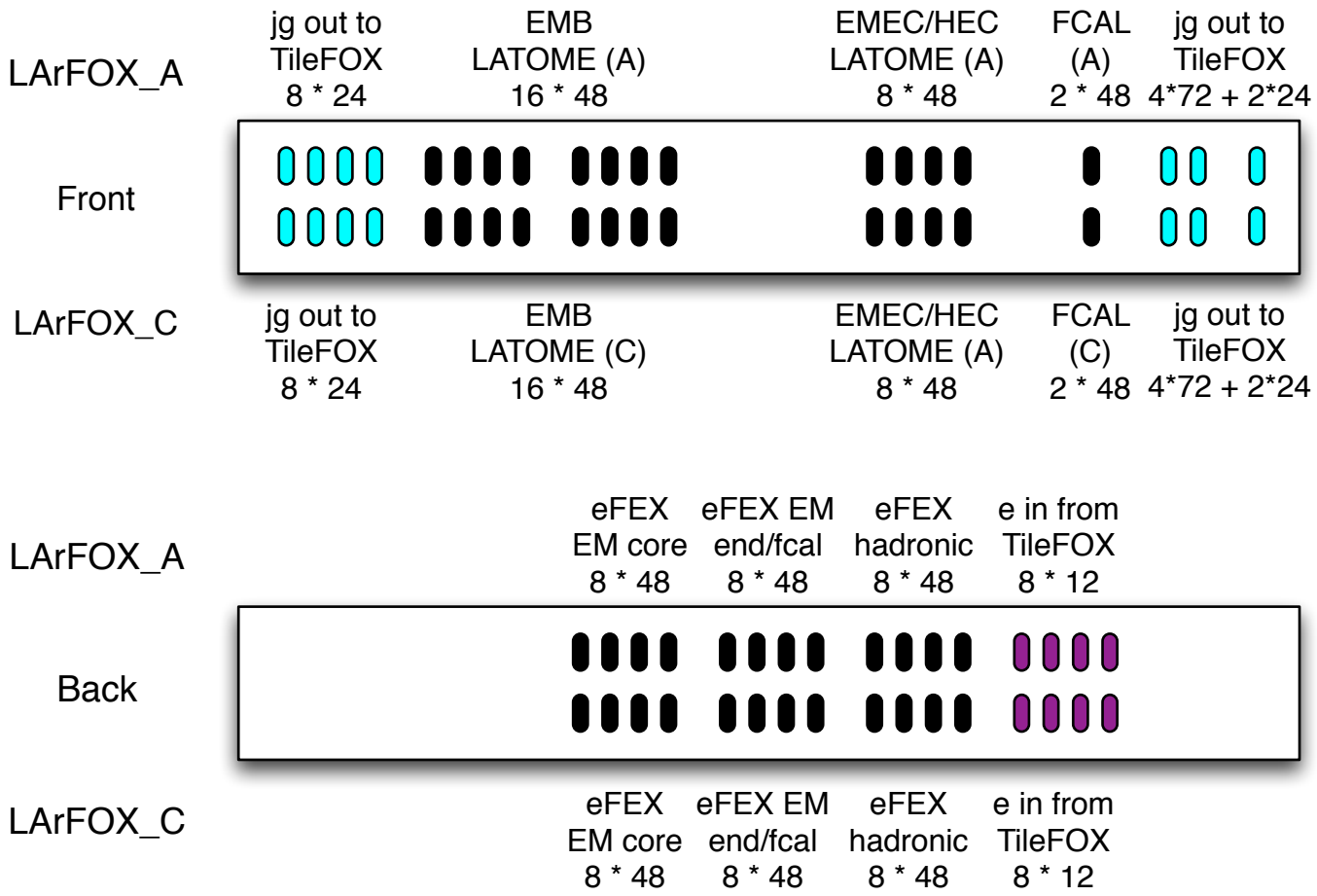
Front and Back Panels (1)

- LArFOX_B and LArFOX_D



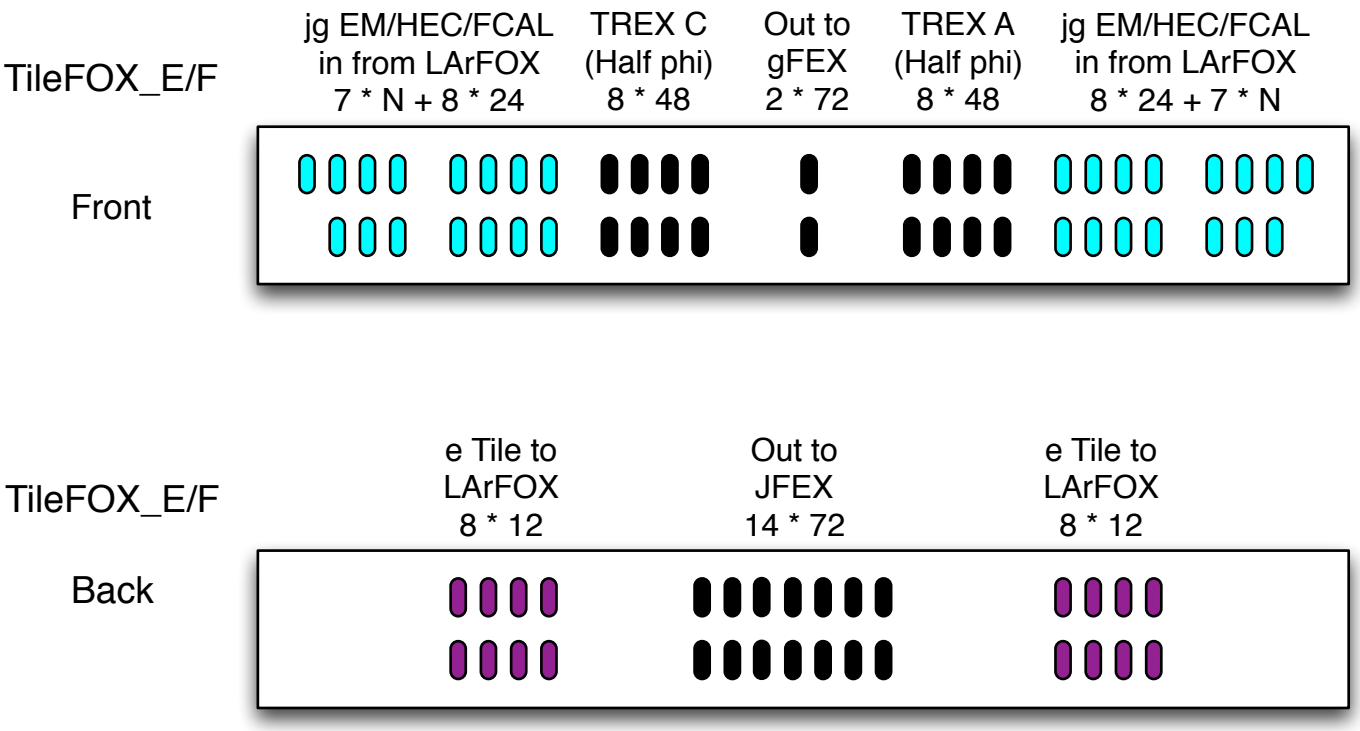
Front and Back Panels (2)

- LArFOX_A and LArFOX_C



Front and Back Panels (3)

- TileFOX_E and TileFOX_F



Number of Connectors

FOX Box	Front Total (Interconnect)	Back Total (Interconnect)	From LATOME/ TREX	To e/j/gFEX	Inter-connect
LArFOX_A	40 (14)	32 (8)	26 / 0	24/0/0	22
LArFOX_B	48 (16)	24 (0)	32 / 0	24/0/0	16
LArFOX_C	40 (14)	32 (8)	26 / 0	24/0/0	22
LArFOX_D	48 (16)	40 (16)	32 / 0	24/0/0	32
TileFOX_E	48 (30)	30 (16)	0 / 16	0/14/2	46
TileFOX_F	48 (30)	30 (16)	0 / 16	0/14/2	46
Total	**272 (120)**	**188 (64)**	**116 / 32**	**96/28/4 = 128**	**184**

- NB details of FCAL and other difficult regions to be done
  - May be more fiddly, needing more connectors than my guesses above

Discussion Points

- Testing complete FOX boxes
  - How many connections before connectors damaged?
- Mechanical design considerations
  - Cable/ribbon management
  - Way of securing interconnections if box removed from rack
- Maximum number of optical connections?
  - Dangling ribbons between boxes to avoid extra connectors?
  - Might need lots of single fibre connections if ribbon approach ends up with too many connections to regroup everything
  - Current jFEX tests - all links work fine with two FOX boxes:
    - FTM - FOX1 - FOX2 - jFEX
    - (Minipod - MTP) - (MTP - MTP) - (LC - MTP) - (MTP - Minipod) [I think]
    - One or two more optical connections than we are hoping for…