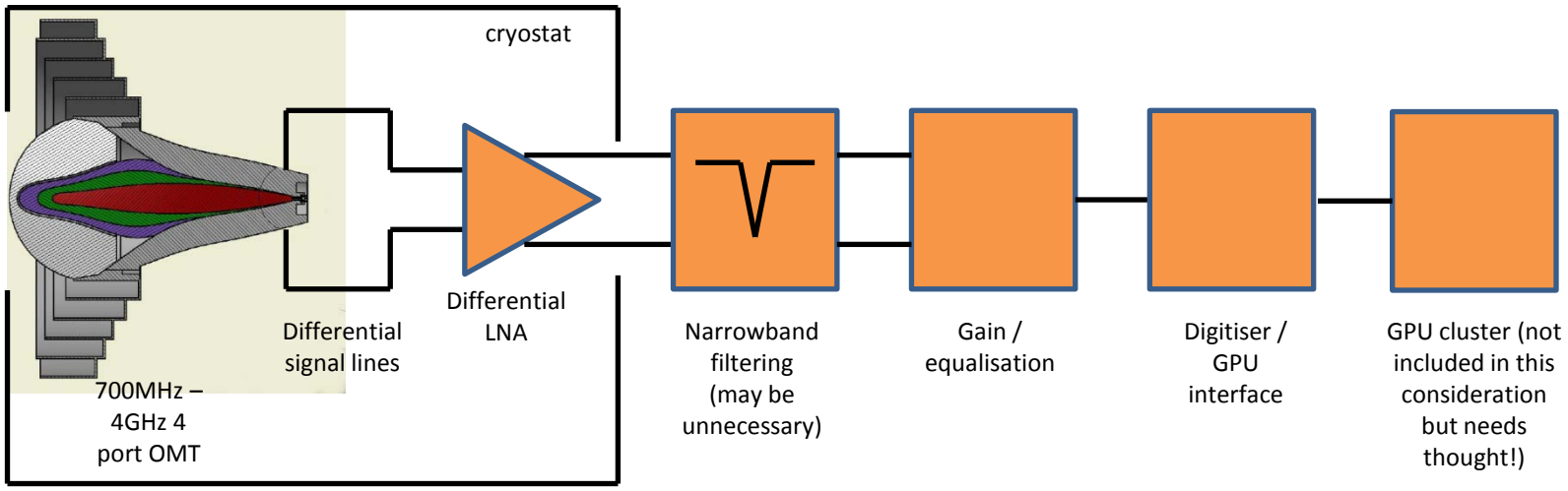
Parkes receiver options

Graeme Carrad
Assistant Director - Engineering
December 2013

Thanks to those who have helped in the face of other work.

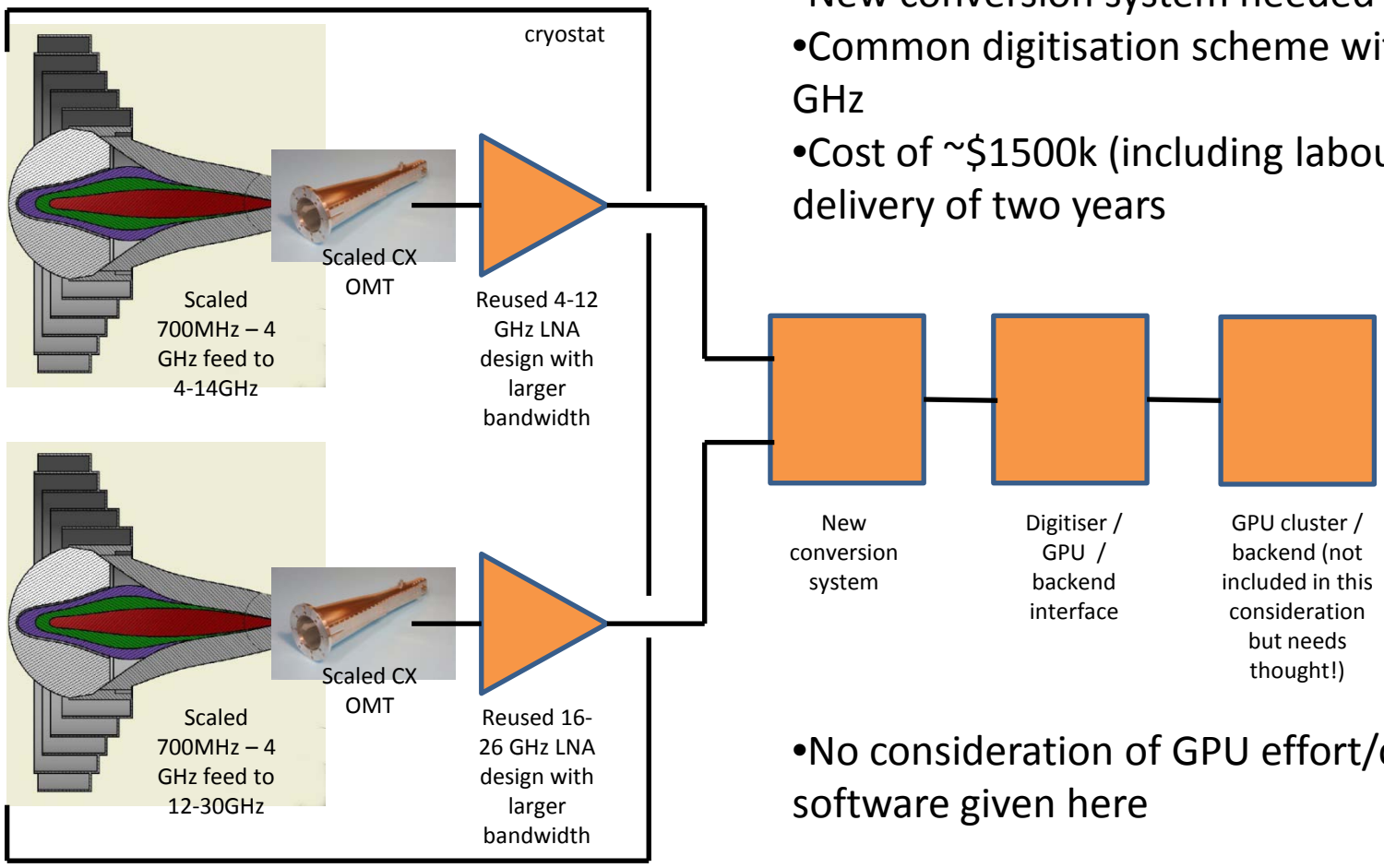
700 MHz – 4 GHz receiver



- Wideband feed/OMT of novel design. Designed but is it manufacturable?
- Cooling possibly requires a novel approach but a feed/OMT gap is possible/designed.
- Balanced outputs so differential amplifiers required. Not done before but doable…or buy
- Calibration input to LNA or on dish radiator scheme.
- Filtering of major RFI contributors likely to be unnecessary through system design using appropriate components
- A MMIC LNA is seen as the best option
- Wideband digitisation system needed in cabin. Doable but needs demonstration
- Cost of ~$1500k (includes labour) with a time of delivery of two years
- No consideration of GPU effort/observing software given here

4-24GHz receiver…
Prefer 4-14 and 12-30 GHz

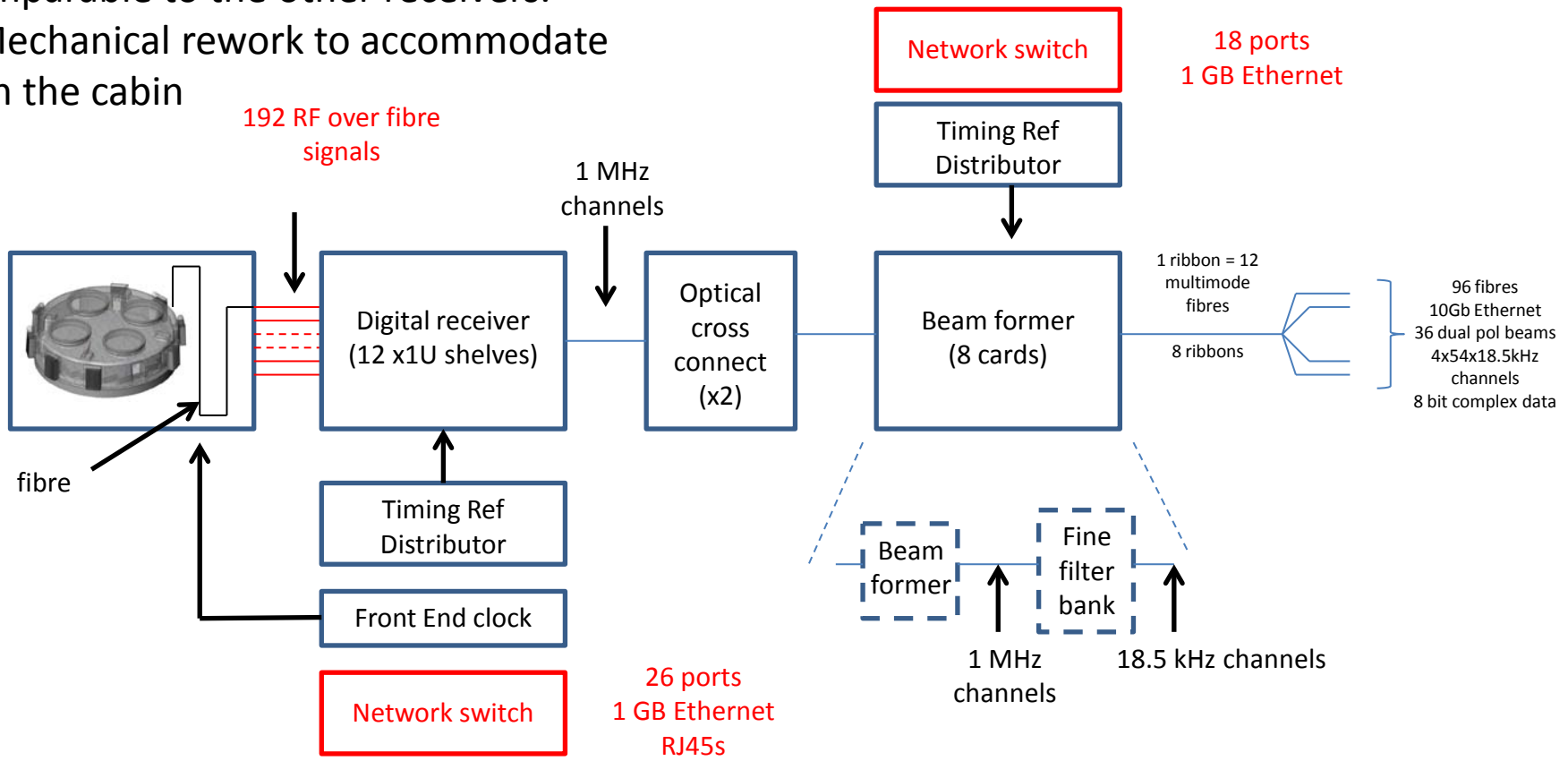
- Scaled 700MHz – 4 GHz feed design to cover 4-24GHz may not be manufacturable. Prefer two bands. 4-14GHz and 12 – 30 GHz. Feed needs designing. ***NOT 6:1 bandwidth*** so ostensibly simpler. ***Maybe three bands (3.?-8/8-16/16-30)***
- Use of existing CX OMT and CX and K band LNA design. Single output from OMT and well known.
- New conversion system needed
- Common digitisation scheme with 700MHz – 4 GHz
- Cost of ~$1500k (including labour) with a time of delivery of two years



- No consideration of GPU effort/observing software given here

PAF – what we know used on Parkes

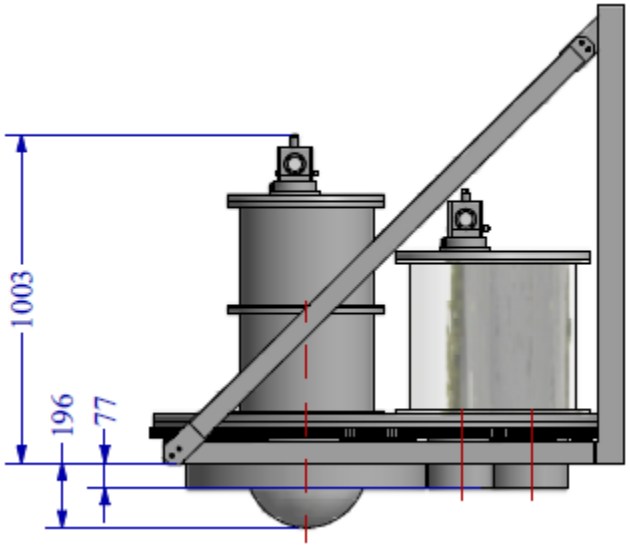
- $650k cost to make (including labour) if done as a batch job. Twice as much for a 'special'
- Significant work needed to ensure a usable system both on the PAF receiver itself and the telescope (LNAs, filters, mechanical, firmware for receiver and signal processing, control computer)
- 4 FTEs needed for a year to achieve good performance so the total cost is comparable to the other receivers.
- Mechanical rework to accommodate it in the cabin

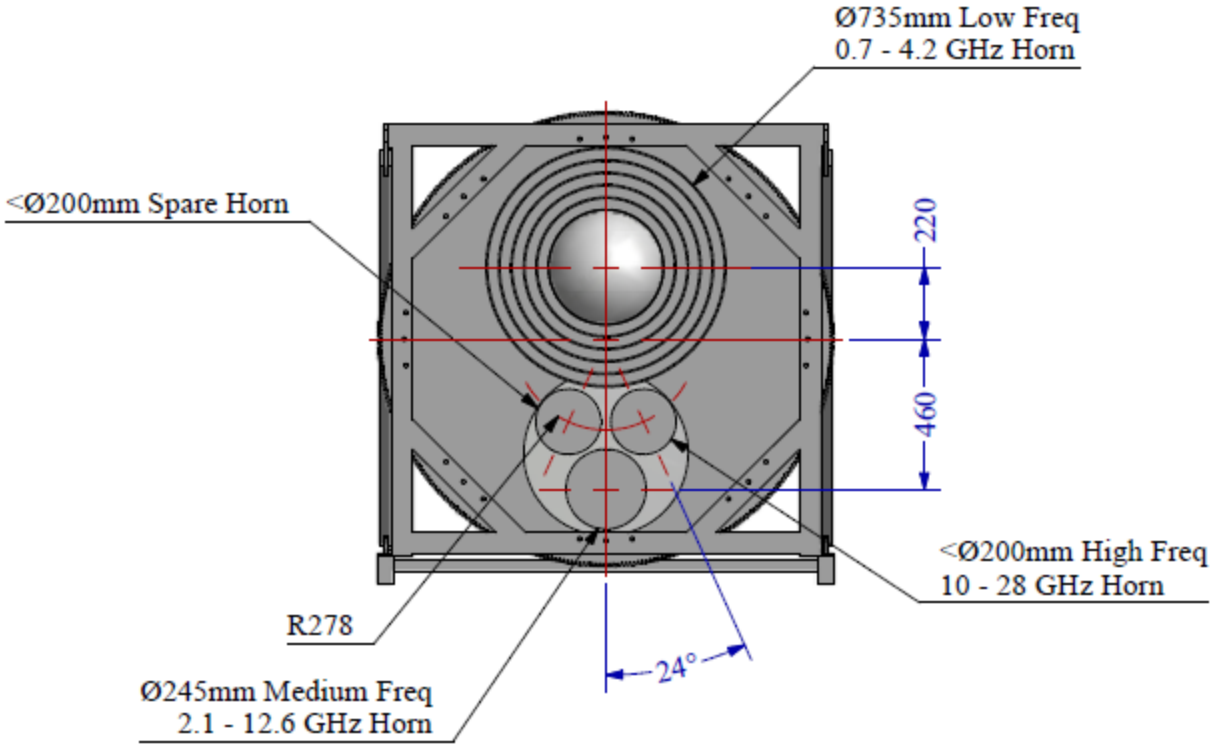


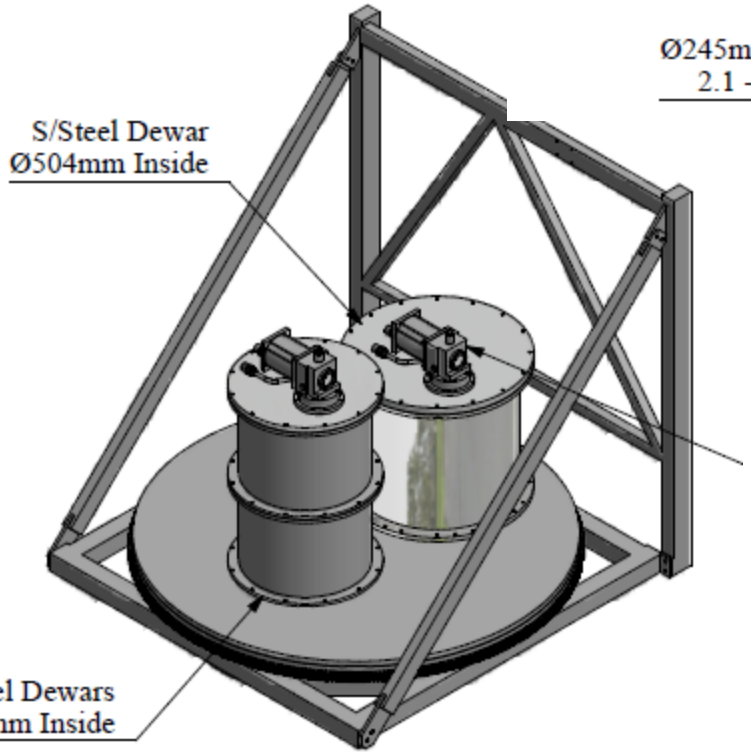
Other considerations

- 700MHz – 4 GHz, 4-14GHz and 12 – 26 GHz receivers need to be considered as a suite.
- Preliminary design work indicates that it should be possible to accommodate all three receiver(s) on the one rotator.
- Possible options:
  - Three separate cryostats as part of an integrated receiver package, or
  - Single cryostat incorporating all three bands.
  - cryostat for LF and separate one for the two HF receivers.
- An option is to progress preliminary feed designs for all three bands then implement the individual bands one at a time.

Cryostat configurations







All in one is an option.