MROI instrument

Fringe Tracker
Slow Switchyard Permutations

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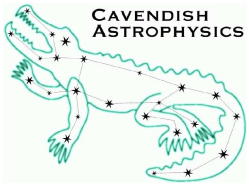

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Preface

The goal of this document is to identify the beam permutations that the slow switchyard feeding the fringe tracker must allow.

Chapter 1

10 Telescopes

1.1 Geometry

The full array is composed of 10 telescopes topologically distributed as presented on Fig. 1.1.

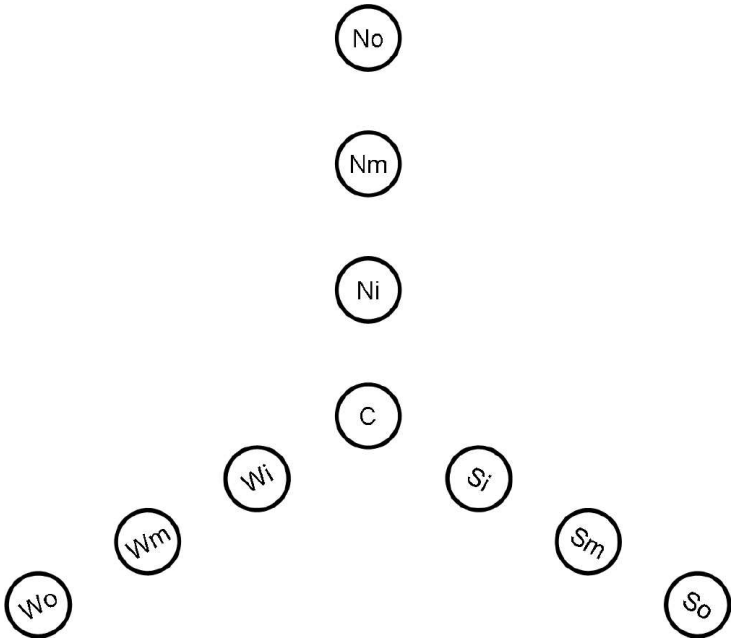

Figure 1.1: The array - 10 telescopes.

Three relay pipes on each arm connect the telescopes to the delay lines (see Fig. 1.2).

The slow switchyard re-organises the beams coming from the delay lines and feeds them to the fringe tracker (see Fig. 1.3).

1.2 Telescope failure

The required permutations in case of a telescope failure are presented below. Each delay line DL xx is represented by 'dxx', and each fringe tracker port yy is represented by 'pyy'. The association of a delay line to a fringe tracker port is noted :=

- No, So, Wo : Nothing to do
- Nm, Sm, Wm : topologically, the outer telescope becomes the middle telescope. Therefore the beam coming from the outer telescope should be fed in the fringe tracker port corres-

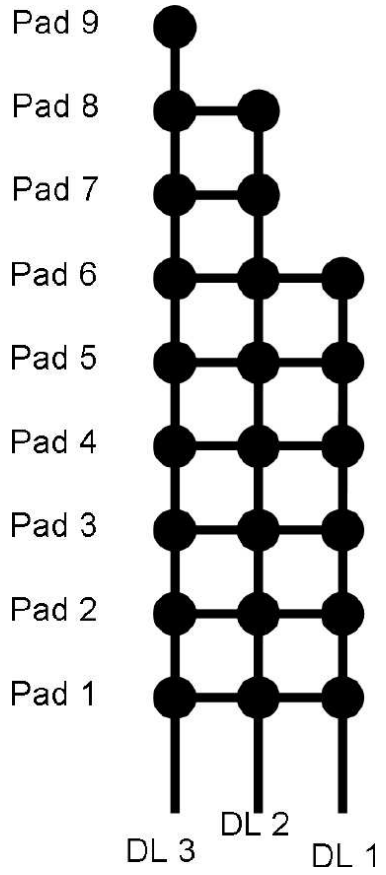

Figure 1.2: The pads (on each arm)

ponding to the (non working) middle telescope to allow fringe tracking on the available baselines on the arm.

d3 := p2

d'3 := p'2

d"3 := p"2

- Ni, Si, Wi : topologically the middle and outer telescopes become the inner and middle telescope on the arm. Therefore the switchyard should re-route the beams from those two telescopes to the fringe tracker port corresponding to the inner and middle telescope.

  (d2, d3) := (p1,p2),

  (d'2, d'3) := (p'1,p'2)

  (d"2, d"3) := (p"1,p"2)

- C : The strategy is to use an inner telescope as the acting centre telescope. The two other telescopes on the arm become the acting inner and middle telescopes. The switchyard must re-organise the beams accordingly.

  (d1, d2, d3) := (pc, p1, p2)

  (d'1, d'2, d'3) := (pc, p'1, p'2)

  (d"1, d"2, d"3) := (pc, p"1, p"2)

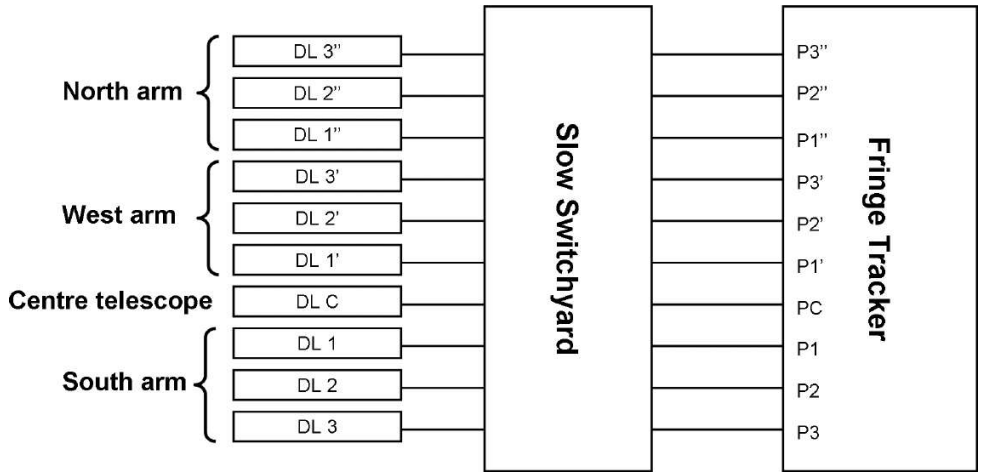

Figure 1.3: Slow switchyard : inputs and outputs.

1.3 Delay line failure

When a delay line fails, one option is to re-route the beam from the telescope to another delay line (through the canisters on the pads). Since there are as many delay lines as telescopes, only 9 telescopes can be used. The telescope normally assigned to the hijacked delay line is not used.

- DL 3, DL 3', DL 3" : Nothing to do
- DL 2, DL 2', DL 2" :

  d3 := p2
  d'3 := p'2
  d"3 := p"2

- DL 1, DL 1', DL 1" :

  (d2, d3) := (p1,p2)
  (d'2, d'3) := (p'1,p'2)
  (d"2, d"3) := (p"1,p"2)

- DL C :

  (d1, d2, d3) := (pc, p1, p2)
  (d'1, d'2, d'3) := (pc, p'1, p'2)
  (d"1, d"2, d"3) := (pc, p"1, p"2)

Chapter 2

6 Telescopes

2.1 Geometry

The 6 telescopes array is presented on Fig. 2.3 : a centre telescope, two telescopes on two arms and a single telescope on the third arm. Without lossing in generality, the single telescope is assumed to be on the South arm.

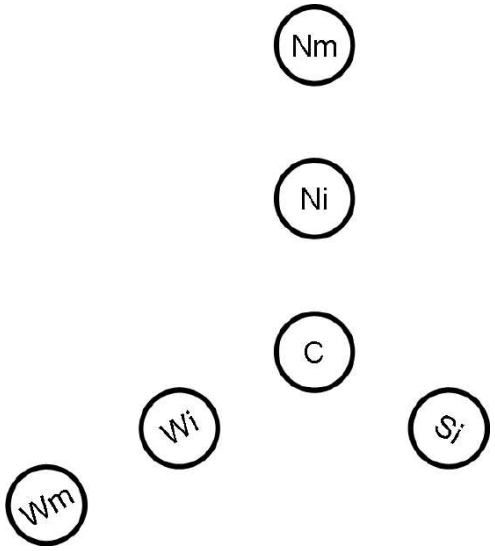

Figure 2.1: The array - 6 telescopes.

A maximum of three relay pipes on each arm connect the telescopes to the delay lines (see Fig. 2.2). With 6 telescopes, only the longest relay pipes are used (and the associated delay lines).

The slow switchyard re-organises the beams coming from the delay lines and feed them to the fringe tracker (see Fig. 2.3). Only 6 delay lines and 6 fringe tracker ports are used.

2.2 Always

The delay lines assigned to the outer telescopes on the 10 beams layout are populated first, then the delay lines for the middle telescopes (this allows access to pad 9 on each arm). Therefore the switchyard must re-route the beams from those delay lines to the correct fringe tracker ports.

As before, each delay line DL xx is represented by 'dxx', and each fringe tracker port yy is represented by 'pyy'. The association of a delay line to a fringe tracker port is noted :=

- S :

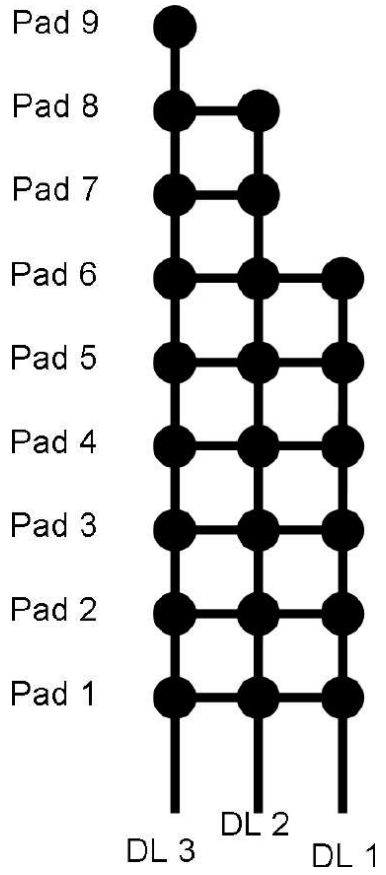

Figure 2.2: The pads (on each arm)

d3 := p1

- N, W :

  (d'2,d'3) := (p'1,p'2)
  (d"2, d"3) := (p"1, p"2)

2.3 Telescope failure

The strategy is basically the same as for 10 beams. The only subtlety is that the permutations outlined in the previous section should also be taken into account :

- Si : Nothing to do
- Nm, Wm : Nothing to do
- Ni, Wi :

  d'3 := p'1
  d"3 := p"1

- C :

  d3 := pC
  (d'2,d'3) := (pC,p'1)
  (d"2,d"3) := (pC,p"1)

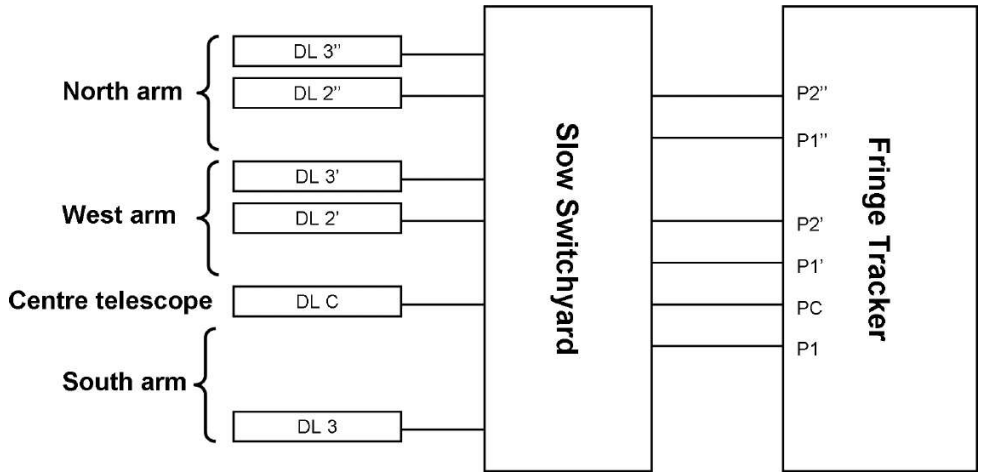

Figure 2.3: Slow switchyard : inputs and outputs.

2.4 Delay line failure

As for the telescope failures, the strategy mimics what has been presented for 10 beams while feeding the correct fringe tracker port (as presented in the before previous section) :

- DL 3 : Nothing to do
- DL 3', DL 3" :

  d'2 := p'1
  d"2 := p"1

- DL 2', DL 2" :

  d'3 := p'1
  d"3 := p"1

- DL C :

  d3 := pC
  (d'2,d'3) := (pC,p'1)
  (d"2,d"3) := (pC,p"1)