# ATNF InP HBT CIRCUITS SUMMARY

### 1 Digitiser/Demultiplexer

The digitiser/demultiplexer is a 3 level digitiser with integrated 1-4 output demultiplexers. Notable features of the design are the following:

- Operation up to 8 Giga-Samples/s
- Fully differential ECL/CML topology
- On chip matching of RF and clock inputs
- 1 4 Demultiplexers on chip
- Outputs designed to drive 50 ohm terminated lines at ECL levels
- Common mode range 0 -1.3V
- Input level -6 dBm
- Uses mostly smallest 1.5 x 2 um transistors
- 740 transistors, 315 resistors, 3 capacitors 3.2mm x 2.2mm
- Dissipates 1.6W with a 3.5 V supply

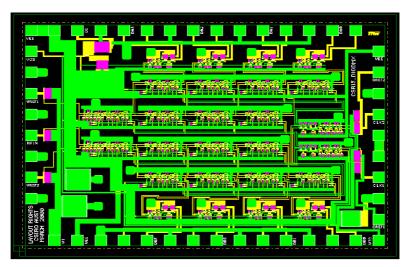


Figure 1. Digitiser/Demultiplexer Layout

#### 2. Digitiser

The Digitiser is a 3 level digitiser without integrated demultiplexer. This design was principly included as a backup in case yields were low causing the more complex Digitiser/Demultiplexer to be unsuccessful. Features of this design are:

- Operation up to 8 GS/s
- Contains no demultiplexer
- 119 transistors, 57 resistors and 3 capacitors
- 350 mW on a 1.6mm x 1.2mm die

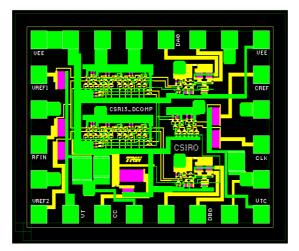


Figure 2. Digitiser Layout.

#### 3. Photonic I/O Digitiser

The Photonic I/O digitiser is a 3 level digitiser with sampling clock supplied photonically and the ability to return the digitised data photonically. Notable features of this design are:

- Sampling clock supplied photonically
- Digital data returned photonically
- On-chip photodiode and transimpedance amplifier
- Current switching output drivers for driving **external** laser diodes or MZMs
- 116 transistors, 59 resistors and 3 capacitors
- 700 mW on a 1.6mm x 1.2mm die

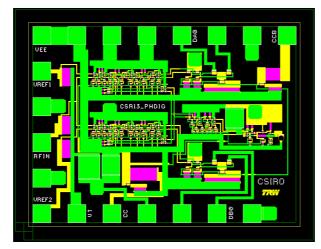


Figure 3. Photonic I/O Digitiser Layout.

## 4 Multiplier

The multiplier is a wideband 4 quadrant Gilbert cell multiplier intended for analogue correlator applications. Features of the design are:

- Optimised for linearity
- Fully DC coupled differential inputs and outputs
- 15 GHz multiplication bandwidth and 11 GHz IF output bandwidth
- 24 transistors, 21 resistors and 2 capacitors
- 110 mW with 1V amd -3V supplies on a 1.2mm x 1.2mm die

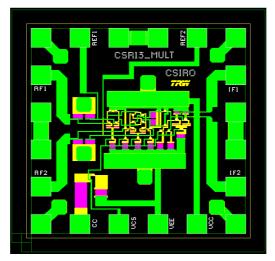


Figure 4. Multiplier Layout.

Further information can be found at <u>http://www.atnf.csiro.au/people/proberts/inp/inp.html</u> or by email from Paul.Roberts@atnf.csiro.au