

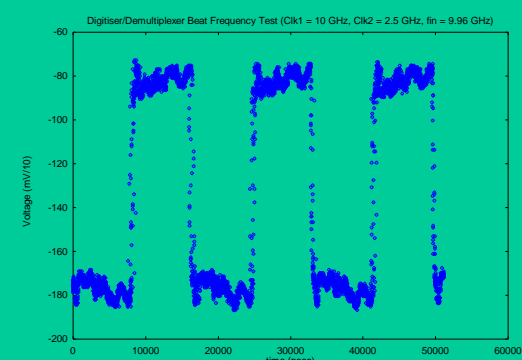
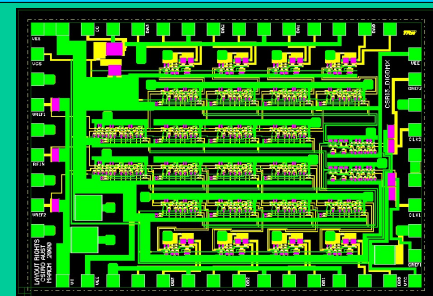
# High Speed Digitisers for Radio-Astronomy using InP HBTs

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Indium Phosphide Heterojunction Bipolar Transistor (InP HBT) technology offers transistors with an intrinsic cutoff frequency of 70 GHz combined with good across-chip device matching and modest levels of integration. This combination of properties makes them well suited for realising medium complexity circuits such as high speed digitisers. The ATNF has successfully designed and tested a range of three-level quantisation digitiser integrated circuits using InP HBTs. On wafer testing showed correct large signal operation of the devices to at least 10 GHz clock rate. Our current correlator allows us to use the devices in-system to a maximum clock rate of 4 GHz.

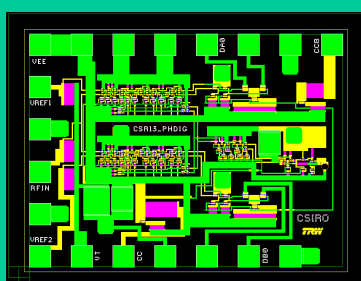
## Digitiser with Demultiplexer

- 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



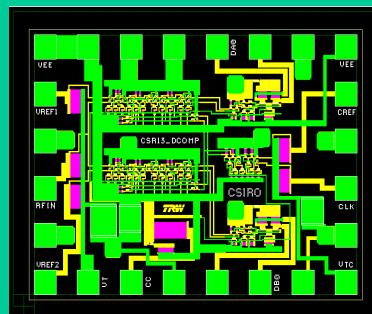
## Photonic I/O Digitiser

- Sampling clock supplied photonicly
- Digital data returned photonicly
- 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

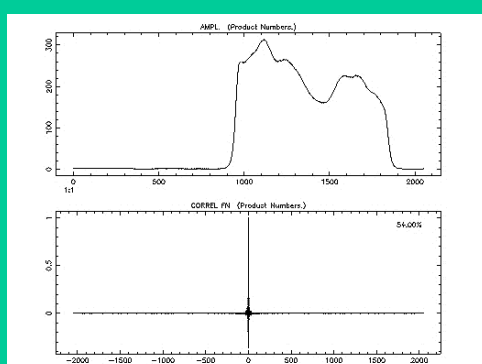
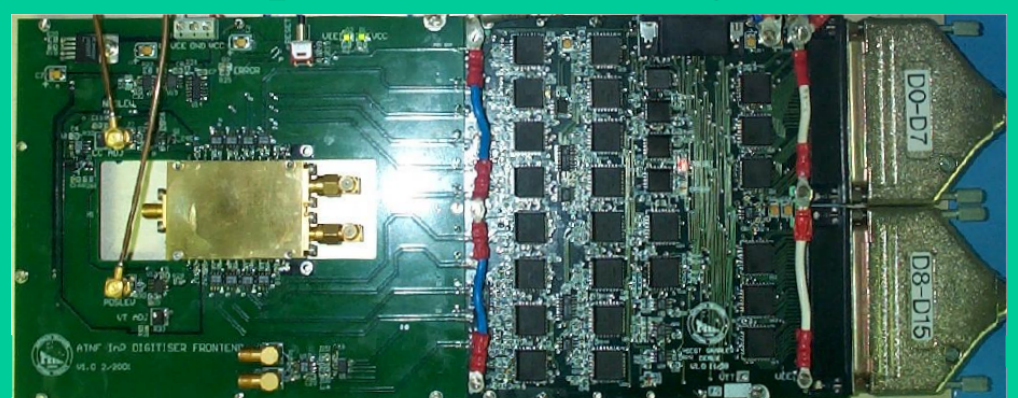


## Digitiser

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



## Complete 4 GS/s Digitiser



2 GHz Spectrum  
2048 Channels

Digitiser Package

