Gunn Diode Oscillator Minutes

David Headland

2004-02-05 11:00

Attendance

- Fourth year students:
  - R Wan.
  - JM Higginbotham.
  - MP Gaskill.
  - DP Headland.
  - RE Irwin.
- e2v Technologies staff
  - N Priestley

Apologies

- AJ Nelms.

Approvals

- The minutes from the previous meeting were approved.

Thermal considerations

- With four diodes using so much power, a lot of heat is produced.
- This could cause the diodes to drift.
- Maximum junction temperature is about 250°C.
- Aluminium heatsink suggested in combination with a fan.
- Water cooling was discussed — scaling could be a problem and the idea was discouraged.
- Without heatsinking, thermal drift could cause major problems.

Power combining

- Jon Andrea worked for e2v in the 1980s.
- He designed a waveguide for combining power from four oscillators.
- N Priestley has left the waveguide with us to show how waveguide sections can be joined together.
- Our injection locking methods were discussed.
- We may not need to individually bias the diodes.
- Locking may occur naturally, we will have to experiment.

Hot electron injection

- Jon was also working on GaAs oscillators operating at 90 GHz at the fundamental using hot electron injection.
- Hot electron injection can virtually remove the dead zone.
- This should at least be investigated as an alternative.
- Dale, Kelley and Kealey developed hot electron injection methods.
- With this, electrons are injected at the second energy valley.

- e2v are still looking for a second harmonic system, but in theory we could use a fundamental system.
- Hot electron injection systems are manufactured at UMIST.

Waveguide manufacture

- The drawings submitted to e2v Technologies were discussed.
- Drawing G has missing dimensions.
- The dimensions in drawing C were questioned.
- MP Gaskill will contact P Norton to discuss these dimensions.
- e2v are happy to manufacture the waveguide once dimensions are confirmed.

Power supply

- Currently a PSU with a current limiter and variable voltage is planned.
- An emitter follower will be used between the PSU and the oscillator.

Radial line transformer

- We are doing pioneering work modelling the transformer in HFSS.
- Design of transformers started long before simulation software.
- "Old school" designers will not use simulation tools.
- e2v will see if anyone in the company has any experience.
- Keith Newson has tried simulation planar oscillators.
- JM Higginbotham will send an HFSS file of the transformer simulation to e2v Technologies.
- e2v use the Ansoft version of HFSS.

Miscellaneous

- For frequency multiplying, additional power is lost.
- e2v Technologies would like a copy of the new time plan.
- A copy of the interim report was given to N Priestley.
- N Priestley and P Norton would like to attend the formal demonstration.

Proposed actions

All	Complete self appraisal 1.
MP Gaskill	Confirm the waveguide dimensions with P Norton.
All	Look for papers by Andrea, Dale, Kelley and Kealey on hot electron injection.
JM Higginbotham	Send HFSS radial line transformer simulation to e2v.

Next meeting

Time	Thursday 12 February 2004, 10:00.
Place	D floor coffee room.

Meeting adjourned, 12:00.