

Gunn Diode Oscillator Minutes

David Headland

2004-02-19 10:00

Attendance

- Fourth year students:
 - AJ Nelms.
 - JM Higginbotham.
 - MP Gaskill.
 - DP Headland.
 - RE Irwin.
- UMIST Staff
 - WS Truscott from 11:07.

Apologies

- R Wan.

Approvals

- The minutes from the previous meeting were approved.

Power Supply

- AJ Nelms and R Wan are meeting this afternoon to progress here.
- Plans for the power supply have been produced.
- Designs are suitable for 1.5 A current per channel.
- PCB design is preferred for the finished design.
- The design eliminates the need for a voltage limiter as it is set digitally.
- A 6 A, 10 V PSU was suggested for the main supply.
- WS Truscott suggested capacitors between the output and ground. Ones at the device will also be required because of the inductance of supply leads.
- Using a pre-regulated voltage was suggested.
- Check for a PSU brick with the required voltage and current.
- Check with Ian regarding voltage regulation.
- Regulating each channel individually may be cheaper and easier.
- Four 2 A PSUs may be cheaper than a single 8 A PSU.

Simulation

- All was going well simulation the radial line transformer until rejection at the second harmonic was checked.
- Dimensions were altered to try give give >5 dB rejection.
- JM Higginbotham will talk to R Sloan and WS Truscott to try to find a solution.
- This needs to be sorted out quickly.
- WS Truscott recommends spending a lot of time on simulations.
- It was suggested that difficult problems are set going to be calculated over the weekends.

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- More stages may be required on the radial line transformer to produce a more complex transformer.
 - Model an existing filter and see how that works.
 - Another person may need assigning to simulation.

Waveguide design

- Drawings have been changed by R Wan and JM Higginbotham.
- Designs have been submitted to e2v Technologies.
- The backshort is now circular to allow for greater tuning of the second harmonic.
- Individual Q factors have been calculated, but need to be combined.
- The losses in each section have been calculated.
- It has been suggested that the waveguide be simulated as a transmission line.
- The power combining waveguide was measured.
 - The device has similar length:width ratios to ours.
 - The device is designed to operate at a slightly higher frequency.

Progress with e2v

- MP Gaskill has spoken to P Norton.
- e2v Technologies are currently in the process of building the device.
- A long section is being made and will be cut into the required lengths.
- Liaise with R Irwin to limit calls to e2v to ≤ 2 per week.

Carrier energy raising

- Hot electron injection was discussed.
 - Papers were shown.
 - The summary was presented and explained.
- Graded gaps were discussed.

Interim report feedback

- Comments from the markers were copied and distributed.
- There were problems deciding what level to write at.
- We have to show that we're working professionally at a challenging project, yet we are managing to succeed.
- Use comments here to influence the final report.
- Make brief references to things that are well known.
- Start with a brief history of Gunn diode developments.
- To make the biggest improvements:
 - Alter the weighting of certain areas.
 - Change the writing style.
- WS Truscott will try to find an example report written in a good style.
- Getting facts right is very important in the final report.
- Good project reports state the final result. Bad ones describe a journey with many problems.
- Persuade the readers that the project is cutting edge:
 - The most relevant paper was written in 1981.
 - Power combining was dropped because InP was seen as better.
 - Research in 1982–2003 concentrated on InP, which has since been determined to be commercially infeasible.
 - We can improve on Barth's design with new simulation tools.

Marks assignment

- Individual mark assignments were discussed.
- Marks have not been decided upon yet.
- WS Truscott will discuss with R Sloan to come to an agreement.
- The individual mark adjustment value does not have to be an integer.

Forthcoming events

- There is a postgraduate open day on 3 March.
- There is a terahertz programme meeting in Cambridge on 2004-03-31.
- We may want to prepare a poster for this event.
- The poster could be used as a basis for the one in the demonstration.

Proposed actions

DP Headland	Post research on hot electron injection to the web site.
MP Gaskill	Call N Priestley to check the build status.
JM Higginbotham	Talk to R Sloan and WS Truscott regarding radial line transformer problems at the second harmonic.
AJN, RW	Meet to continue PSU design.
DP Headland	Research Gunn diode history and produce document.
AJ Nelms	Send a copy of the circuit diagram to DP Headland.
RE Irwin	Measure the radial line transformer and its cavity.
DP Headland	Reclaim the cost of binding the report from UMIST.

Next meeting

Time Thursday 26 February 2004, 10:00.

Place D floor coffee room.

Meeting adjourned, 12:42.