

MSC. THESIS SUBJECT PROPOSAL

Title: *Analysis and optimisation of the cooling performance of a high power amplifier*

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Keywords: *Thermal resistance; heatsink design; heat transfer; high-power amplifier (HPA)*

Company profile

As a former production plant of the Airbus group, Advionics has a long-standing history of manufacturing high-tech RF(Radio Frequency)-based electronics products for the defence and aviation industry, involving frequencies from DC to 20 GHz.

Today, the company has evolved into a 100% independent 'one-stop-shop' partner that is able to cover the entire life cycle of a product from concept definition to its eventual installation in the field.

Some examples of recent developed products include - but are not limited to - T/R(Transmit/Receive)-modules for secondary radar systems, solid state high-power amplifiers for scientific research installations and specific tailored embedded hardware solutions for general industrial applications.

Problem statement

In the framework of a past project Advionics has developed a working prototype of a solid state power amplifier (SSPA) that is used in a larger RF cavity combining system in order to provide a particle accelerator of the necessary power levels.

The main purpose of the SSPA is to amplify a sinusoidal RF input signal to a specific RF output power level that can reach values around 1kW. The power lost results in waste heat that has to be removed as fast as possible. This is commonly done by means of a closed-loop liquid-based cooling system that runs through an embedded channel circuit of the mechanical housing of the module (see figure).

Although this method is currently effective, possible means are being investigated to quantify the overall cooling performance of the existing module and use this quantification to come up with a more generic heatsink methodology that can be used for future amplifier designs, improving its value on the market.

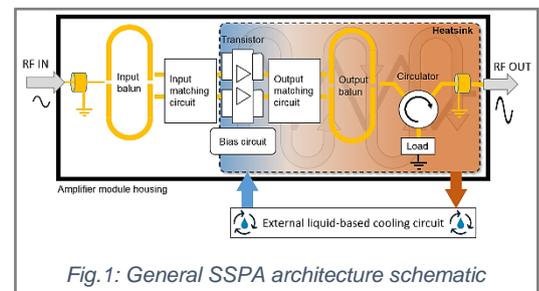


Fig.1: General SSPA architecture schematic

Thesis objectives

The main goal of this thesis is to make an effective evaluation of the cooling performance of the above described device, so that a more sustainable product can be achieved for future applications.

From this point of view the thesis can be approached in several ways: a more theoretical one (e.g. based on simulations), a more practical one (design, build and test) or a hybrid mix of both (Phase 2 ↔ Phase 3).

	Theoretical approach	More applied approach
Phase 1	Literature study and review	Literature study and review
Phase 2	Mathematic modelling of the module's overall (or local) thermal resistance	New CAD-design of the module's housing heatsink based on study in phase 1
Phase 3	Validation of model by simulation (e.g. CFD)	Performing tests to validate new design

A more detailed outline of the proposed thesis topic will be further defined in collaboration with the candidate student(s) and academic supervisor(s), in order to obtain an optimal match between the company's core activities and the student's interests and skills.

Student profile

- MSc. Student in Electromechanical Engineering.
- Strongly motivated to conduct research within an industrial environment.
- Possible candidates should possess good analytical skills, have a hands-on mentality and are able to work independently.