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EENG 4097 Course Proposal

Spatium Wafer Level and Blade Level Phase Data Analysis

Scope:
The scope of this document is to outline the proposed internship project. The internship will provide three hours of academic credit while benefiting Qorvo by increasing production efficiency of its Spatium RF solid-state power amplifiers (SSPA). The project proposed is to correlate phase data on a wafer level to the phase data of completed blades. If a correlation is found, this data can be used to better select wafer dies that result in Spatium blades that lie within the optimal phase window resulting in a final product that meets an acceptable level of performance.

Preliminary Information:
The project is intended for Lee Baca and is not retroactive, nor does Mr. Baca have any functional experience in the technical area of this project. All work will be completed according to the schedule in this report for credit during the summer of 2020. Mr. Baca is currently employed in the assembly process engineering department at Qorvo. Mr. Baca's engineering supervisor is Paul Young and he will be guiding and directing Mr. Baca throughout the proposed internship. Dr. Joshua Parthpeen is the academic advisor for the course credit through West Texas A&M University and consultation throughout this project.

Project Introduction:
One of Qorvo's products, the Spatium line of RF SSPA's, contains sixteen individual components referred to as blades. These blades are arranged radially, and each contain a High Power Amplifier MMIC. Due to many variables, in every production batch there are variances in the phase shift with each individual blade. The current practice is to use the sixteen blades that are most closely grouped by phase to assemble a single Spatium amplifier. This leaves the blades that are outside of this phase window unused until another set of blades from later production batches can be matched. This is inefficient and costly. This project aims to increase the efficiency of Spatium production by identifying correlations between the phase shifts at wafer level of production and the phase shifts of completed blades. This will allow an appropriate set of wafer dies to be selected to produce a final blade set that are within the accepted phase window

Project Learning Objectives:

1. RF and Phase Analysis of Complex Systems
   a. Student will gain a general understanding of RF theory.
   b. Student will gain in-depth experience in complex RF and phase analysis.
   c. Student should gain a general understanding of RF design considerations.

2. Semiconductor Fabrication
   a. Student will gain a general understanding of wafer production.
   b. Student will gain a general understanding of metrology and wafer level testing methods.
   c. Student should gain in-depth experience in analyzing wafer die characteristics.

3. Simulation and Testing of RF Systems
   a. Student will gain in-depth experience in using RF modeling software.
   b. Student will develop an ability to apply models and simulations in developing theories.
   c. Student shall gain skills in developing testing programs and procedures.

4. Presentation and Final Report (End of Course Report)
   a. Student will gain experience with professional report writing.
   b. Student will gain experience in taking engineering test data and applying it in a method that is understood and received by others who were not directly involved in said project.
   c. Student will gain experience in presenting a project to both peers and those in management positions.

To ensure that the learning objectives are being met by the student, intermediate reports will be required throughout the duration of this project. A weekly brief (email updates) will be requested before the close of business on each Friday to ensure that the student and project remains on track and is delivered on time and in full.

On Site Visit

The academic advisor and/or any other University representative are welcome to perform a site visit at Qorvo before, during, or after the completion of this internship. It is required that Qorvo receives at least 14 business days of notice to ensure the appropriate personnel will be on-site for the visit and the necessary arraignments with Qorvo's security department.

Evaluations

Qorvo agrees to fill out the appropriate evaluation sheet and submit it to West Texas A&M's Career Services.

Project Schedule and Tasks:

	Task	Start	Finish
	Spatium Project Timeline		
	Phase Data Internship Project	Mon 6/15/2020	Fri 8/21/2020
1.0	**Project Initiation**	Mon 6/15/2020	Mon 6/15/2020
2.0	**Wafer and Die Level Data Overview**	Mon 6/15/2020	Fri 6/19/2020
2.1	Introduction to Wafer Production	Mon 6/15/2020	Tues 6/16/2020
2.2	Introduction to Wafer/Die Data	Wed 6/17/2020	Fri 6/19/2020
3.0	*Intermediate Report #1 - 6/22/2020*		
4.0	**Wafer Level Phase Data Analysis**	Mon 6/22/2020	Wed 7/1/2020
4.1	Die Phase Data Analysis	Mon 6/22/2020	Wed 7/1/2020
5.0	**Blade Level Phase Data Analysis**	Thurs 7/2/2020	Fri 7/17/2020
5.1	Blade Build	Thurs 7/2/2020	Friday 7/10/2020
5.2	Blade Charateristic Testing	Mon 7/13/2020	Fri 7/17/2020
5.3	Blade Phase Data Analysis	Mon 7/20/2020	Fri 7/24/2020
6.0	*Intermediate Report #2 - 7/20/2020*		
7.0	**Die and Blade Phase Data Correlation**	Mon 7/27/2020	Tues 8/4/2020
7.1	Data Correlation		
8.0	*Intermediate Report #3 - 8/10/2020*		
9.0	**Presentation and Final Reporting**	Wed 8/5/2020	Thu 8/20/2020
9.1	Final Report Development	Wed 8/5/2020	Tues 8/11/2020
9.2	Presentation Development	Wed 8/12/2020	8/20/2020
10.0	**Project Report and Presentation**	TBD	