

## Internship at Sennheiser, Palo Alto California



Sennheiser electronic corporation is a company that manufactures high quality headphones and microphones. Their headquarter is located in Wedemark-Wennebostel, near Hamburg. Sennheiser employs around 2200 people worldwide, and has own production sites in Wennebostel (Germany), Tullamore (Ireland) and Albuquerque (USA). About five years ago, Sennheiser opened a research laboratory in Palo Alto, with focus on digital signal processing, although not exclusively. The location was chosen, because Palo Alto lies in the heart of Silicon Valley, with the Stanford University in close proximity, and many opportunities for cooperation with other companies in the region.

I wanted to do my internship in the USA for several reasons. I wanted to use the opportunity to get to know another country, a new culture and improve my English. Also, since I wanted to do my internship in research, I looked for an internship in Silicon Valley, since the area is well known for being one of the most important technology sites in the world. Although I specialize in medical engineering, I am also very interested in audio and acoustics. Therefore, among the companies I applied to was Sennheiser, where after two successful interviews with the director of research for North America, I could do my internship with.

I had two big projects during my internship. The first project consisted in the development of a new device with several sensors integrated. The first step of that project was to decide what kind of sensors, sliders and buttons could be used. I tested several different sensors like ultrasound distance sensors, capacitive touch sensors, photodiodes, pressure sensors, linear position sensors, and many different switches, buttons and sliders. A microcontroller was used to read the sensor's signals. Sennheiser sent me to the Sensor's Expo in Chicago, to gather ideas

and make contacts to potential sensor providers. There I attended several presentations and spent some time at the exposition hall, testing out the newest technology in sensors there is today.

The second project consisted in researching bone conduction. Bone conduction means, the sound transmitted through the bones to the inner ear. For that project I spent about a month doing a lot of reading into specific literature such as PhD. Thesis, reports and papers on the topic.

In general, my internship was very diverse, since I had to design circuit boards, test sensors and implement them, write code to use with a microcontroller and I even had the chance to do research on a medical topic. I am very grateful for all that I learned during my stay at Sennheiser Palo Alto, and had a wonderful time at work.

On the cultural side there is a lot to do in the two cities San Francisco and San José. I lived in Palo Alto which is almost half way between the cities, where there were also many things to do and visit, with the University of Stanford being in close vicinity. The Caltrain is a good way to travel through Silicon Valley, an alternative to having a car. Whenever I needed to get somewhere the train didn't go, I usually rented a car for the weekend.

As for the landscape, it is worth mentioning that just a short drive away from Palo Alto there are several destinations worth visiting. Just across the mountains to the west, you get to the coast which is very nice, although pretty cold and windy. North of San Francisco lies the wine region (Napa and Sonoma), which offers great wines and hiking possibilities. And a couple of hours drive away there is breathtaking Yosemite National Park, a must see if you are in the region.

One last thing to mention: It is very pricy to live in California compared to Germany. I payed \$720 Dollars just for a furnished room. On the other hand you get payed well, so you can afford that and even have some money left for some traveling around. And keep in mind that there are many German companies in the region like Bosch, Mercedes, VW, Siemens... that have mostly research facilities there, where you could apply for an internship as well.

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