## Instructions for Matlab scripts

You should do 5.1–5.3 in the exercise book. There are three Matlab scripts that are to be written.

The first is to find the retarded time $t_\mathrm{r}$ for a given field point $\boldsymbol{r}$ and prescribed curve $\boldsymbol{w}(t)$ for the charged particle. It is best to write the script as a function and let the prescribed curve also be in a function. In that way the script can be used for different curves.

Solve the equation $t_\mathrm{r} = t - \dfrac{|\boldsymbol{r} - \boldsymbol{w}(t_\mathrm{r}|}{c}$ by iteration. The time $t$ is then a vector with $N$ time values. You can for instance write that as

t=tstart+(0:N-1)/N*Deltat

where tstart is the startvalue for time and Deltat the time step.

I used an iteration scheme to find $t_\mathrm{r}$. The zeroth iteration is $t_\mathrm{r} = t$. At every iteration $w(t_\mathrm{r})$ is evaluated and then the new value of $t_\mathrm{r}$ is evaluated from $t_\mathrm{r} = t - \dfrac{|\boldsymbol{r} - \boldsymbol{w}(t_\mathrm{r}|}{c}$. It is best to use the while function in Matlab. The criteria can be that the difference between two iterations of $t_\mathrm{r}$ should be less than a certain value.

The rest of the scripts in 5.1 and 5.2 are quite straightforward. Notice that you need 5.1 in 5.2. In 5.3 you should find the spectrum of the pulses from an accelerating charge. This is done by the FFT-routine in Matlab. There is an example in the reference page for fft that you can copy. The script in 5.3 can be placed after the script in 5.2. Once you have a script you can check the spectrum you obtain with Anders.