PCB Calculations

For the battery holder PCB section a directional coupler is needed. There for coupled lines are needed. After these lines, a 50 ohm termination resistor is needed. (see picture of today that Chris has drawn in the tutor meeting)

# Coupled line:

## Design equations:

With

Both characteristic impedances can be computed by the reference impedance of 50Ω.

## Applying the design equations:

Computing the even and odd impedances:

## Calculator tool results:

Afbeelding met tekst, schermopname, nummer, Lettertype

Automatisch gegenereerde beschrijving

|  |  |
| --- | --- |
| Width | 2.6mm |
| Spacing | 0.303318mm |
| Length | 9.43061mm |

**Source:**

<https://sourceforge.net/projects/qucs/>

<https://qucs.sourceforge.net/docs/tutorial/coupler.pdf>

# Wilkinsons power splitter

For the Randle circuits a power splitter is needed. Therefore these calculations and dimensions are needed.

**Calculations of the transmission line of the power divider.**

Length for 1GHz, other parameters taken from example.

Afbeelding met tekst, schermopname, nummer, software

Automatisch gegenereerde beschrijving

Result for a width of roughly 3.07661mm is a transmission line length of 9.24587mm.

|  |  |  |
| --- | --- | --- |
| Section number | Section width | Section length |
| 1 | 3.07661mm | 9.24587mm |
| 2 | 1.62mm | 46.0721mm |
| 3 | 1.62mm | 46.0721mm |
| 4 | 3.07661mm | 9.24587mm |
| 5 | 3.07661mm | 9.24587mm |

**Calculations for section 2 and 3 based on quarter wavelength:**

The cfrequency is 1GHz, which results in the following free space wavelength, taking the speed of light (3\*10^8 m/s) into account.

This needs to be converted to the wavelength in the substrate, taking the dielectric constant of 4.3 into account. The dielectric constant first needs to be converted to the effective dielectric constant with the following formula:

With this effective dielectric constant the effective wavelength can be calculated, and afterwards this effective wavelength can be divided by 4, because the strip length is a quarter effective wavelength. **Afbeelding met tekst, schermopname, nummer, software

Automatisch gegenereerde beschrijving**

**Afbeelding met schets, tekening, lijn, diagram

Automatisch gegenereerde beschrijving**