# Topic: Development of a tool for fast prototyping of pTx sequences for ultra-high-field MRI

Sequence programming for MRI Scanner is a very complex matter. Especially the vendor provided tools can overwhelm even experienced programmers. To make MRI sequences programming more accessible to new programmers, like students, the Pulseq Framework was introduced (Layton et al. 2017). With this it is possible to write a Sequence with only a few lines of code.

Beside the big advantages of Ultra High Field MRI, there are some disadvantages (Peter Ullmann 2007). With increasing field strength, the wavelength decreases. At 7 Tesla the wavelength is short enough to cause artifacts in common field of view sizes. To mitigate these effects, the parallel transmission (pTx) technique was introduced.

The goal of this thesis is to develop an extension for the Pulseq framework, which allows unexperienced MRI programmers to use the pTx option of the new scanner generation. This option should augment the existing tool, without affecting its basis functionality. To evaluate this method some simple pTx methods like TIAMO (Orzada et al. 2010) or MIMOSA (Liebert et al. 2019) will be implemented and tested in model solutions and in vivo.

The proposed work consists of the following parts:

* Development of an extended Pulseq File format, which contain the new pTx information
* Develop an extension to the PyPulseq library (Ravi et al. 2019) to write the new information to the .seq files.
* Enable the Pulseq interpreter for Siemens 3T and 7T Scanner to read the new pulseq files and execute the sequence with the new pTx parameters.
* The whole pipeline should also work with existing Pulseq files without pTx functions
* Implementation of at least two existing methods to evaluate the new frame
* The developed Libraries and interpreter should be made available for further use

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**Start—End:** 01.10.2022 - 31.03.2023

Literature

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