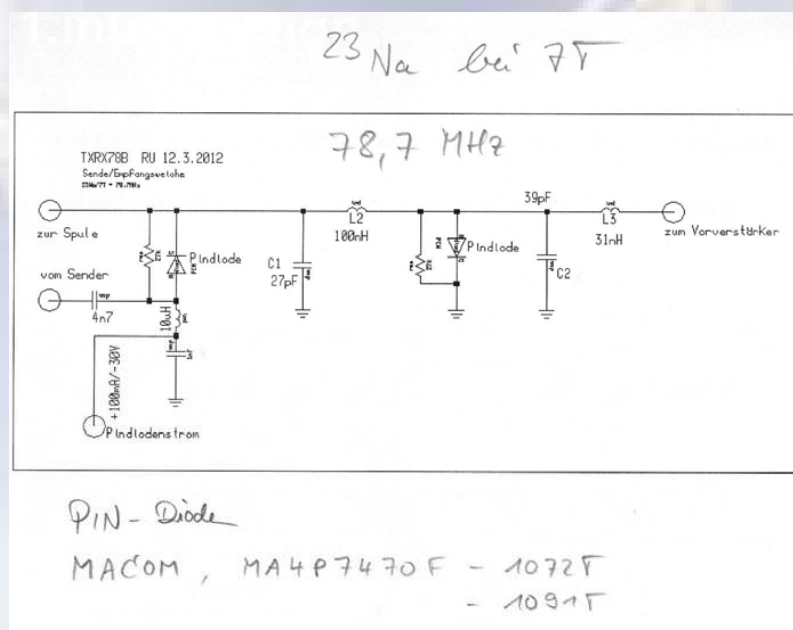


Projektarbeit

Transmit/Receive Switch for ^{23}Na Coils in a 7-Tesla Magnetic Resonance Imaging System (MRI)

In a research project in cooperation with the Erwin L. Hahn Institute for Magnetic Resonance Imaging, a coil has been developed for functional imaging of ^{23}Na in a 7-Tesla MRI system.



In order to allow the use of the coil in receive and transmit, a transmit/receive switch has to be inserted between the high-power transmitter and the receiver lownoise amplifier. A suitable switch design has been prepared as shown below, which employs PIN diodes as electronic switches which are embedded in a RF circuit. The diodes are biased in reverse (-30V) and forward (+100 mA) to act as open or closed switch.

Project Task

The task of the project is to examine this design by simulation and to build the circuit for testing in our 7 Tesla MRI at the Erwin L. Hahn Institute (Essen). In particular the task is to

- Set-up an RF-simulation of the circuit in QUCS or Advanced Design System (ADS), both microwave circuit analysis tools, and verify the function of the switch
- Check the component values for the low-loss capacitors and inductors in the band-pass filter circuit and optimize
- lay-out a microstrip (or grounded coplanar) circuit realization on Rogers RO4003 laminate
- prepare the data files for production of the printed circuit board for production of the board at our in-house PCB workshop
- after production of the PCB, assemble and test the circuit (impedance/reflection coefficients, insertion loss, insertion phase) using a small-signal vector network analyzer
- tune the circuit for correct pass-band frequency by modifications in the wire wound inductors
- perform a high-power test to verify the power handling capabilities of the switch

At the end of the work, a public presentation of results is to be given.