Summary Master Thesis

Author: Luca Belloi
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Title: Design of a flexible eight channels body coil array for neonatal patients

While the research and development of MRI coils for adults are well established, this is not equally true when it comes to neonatal patients. As of today, it is still common practice to use coils for adults when examining newborn patients. High flexibility and reduced overall dimensions are the key requirements to be considered during the design. In neonatal coils, a heavy miniaturization is needed to achieve the required dimensions. However, as well known in the literature, this leads to the creation of undesired parasitic coupling among the components and/or between the input and output of the coil itself. Consequently, the instabilities of the coil might be triggered and heavy artifacts on the clinical image are present. Common solutions are the lowering of the preamplifier gain to stabilize the system or the introduction of shielding solutions to avoid parasitic coupling among the components. However, both solutions are not optimal as the first degrades the overall signal-to-ratio (SNR) and the second implies higher manufacturing cost and it is not always effective. This thesis presents the design and development of a flexible 8-channel surface array coil for neonatal patients. The surface array coil was developed as a flexible PCB to ensure flexibility and adaptability, while the instabilities of the coil are dealt with through the analysis of the Rollett factor. The study implements the Rollett's method to overcome the instabilities of the coil by designing the LNA as an unconditionally stable element. In this way, the design can focus only on the proprieties of the LNA itself and avoid the difficult task of determining the parasitic coupling of the channel/s or its closed-loop response. In conclusion, the simulations and measurements carried out demonstrates how it is possible to design and develop an neonatal coil without compromising in flexibility and overall signal to noise ratio.