

CHAPTER VI

Discussion and Conclusion:

This work demonstrates that the hybrid spiral 3D TRF pulse can be implemented in the excitation domain to reduce 3D pulse length. Reduction of pulse width approximately 34% is possible, with a minor error in the desired slice profile. The result shows a reduction of excitation FOV in xy plane (12 cm.) and excitation slab thickness (10 cm.) along z direction. Reducing the FOV with reducing the number of required k-space lines is possible, enabling the acquisition of higher resolution images with a reasonable scan time. Echo time (TE) which is referred to as the time period from the center (or equivalent center) of an excitation pulse to the data acquisition at the center of k-space [28] is potentially shorter when the hybrid spiral 3D TRF pulse is applied because the time between the peak of hybrid pulse is approximately 50% of the conventional full pulses.

In general, long duration RF excitation is not practical because it prolongs TE, resulting in loss of the signal from T2 or T2* decay. Even though the new 3D pulse design shows only slightly reduced pulse duration compared to that of the “skip k-z” method, it provides approximately 50% shorter TE by the property of the Half-pulse designed. Short TE offers many advantages such as susceptibility reduction, strong T1-weighted image, and reduce flow dephasing in Magnetic Resonance Angiography (MRA) [20]. Our 3D RF pulse applies window-Sinc pulse which provides sharper profile compare to the Gaussian pulse used in typical 3D pulse designs [22].

Conclusion: This work demonstrates that the spiral 3D RF pulses which combine multi-shot and half-pulse potentially reduce pulse length by a factor of approximately 0.34 compared to that of the conventional multi-shot 3D pulse. Furthermore, the new designed pulse is potentially able to reduce volume of excitation and provides shorter TE along with relatively smaller side lobes.

LIMITATION:

The limitation of this design is that breaking up excitations may introduce artifacts caused by discrepancy due to physiological motion of the two separate half pulses. The pulse width of 13.8 ms. may cause phase dispersion along the slice profile.

Future Work:

The optimum pulse will be uploaded to the 1.5 T MRI scanner (Achieva, Philips Medical system) via Pulse Programming Environment (PPE) and will be scan in phantom and human study.