Receive-Only Array Insert Influence on Spin Excitation and Specific Absorption Rate (SAR) on a 7T Tesla Transmit-Only Head Coil:

Currents induced in receive-only inserts can distort the transmit field and cause changes in electric and magnetic fields. In this work we evaluate the effect of a wide variety of receive-only insert geometry including cylinders and helmets with different trace widths on spin excitation field and SAR of a 7T TEM transmit coil.

Results and Discussion

Local SAR peak increased by 15% for the close fitting array, and 6-8% for the 8-loop array and 0-2% for the 16-loop array. The global SAR increased 0-2% for the 8-loop array and decreased by 4-6% for 16-loop and close fitting arrays. While the absorbed power and mean $B_1^+$ in brain increased in the presence of receive inserts, the mean $B_1^+$ in brain per Watt of absorbed power increased marginally by 3% for the 16-loop array for head2 but decreased by 20-25% for head3. The close fitting array did not degrade the mean $B_1^+$ field. Changes in copper width for the 8 and 16-loop arrays from 0.125” to 0.25” did not alter SAR and $B_1^+$ appreciably. Thus, while the peak local SAR increased with increasing number of parallel receive channels, the global mean SAR decreased for the 16-loop and close fitting arrays. The mean $B_1^+$ in the brain per Watt of absorbed power was both geometry and subject dependent, all these changes to magnetic and electric fields were found even when the transmit coil tuning did not shift appreciably.