



**Figure S1** Simulated  $B_{1+}$  and  $B_{1-}$  maps in CP mode without local coils (**A** and **B**) and with a local transverse dipole (**C** and **D**). The ratio between  $B_{1+}$  and  $B_{1-}$  in CP mode increases locally (white box) when loaded with a local transverse dipole, which might also contribute to transmit efficiency improvement.