Separatingactivityfrom cortical columns and cortical layersusingsub-millimetrefMRIat 7 and 9.4 Tesla: Exciting new possibilities for human cognitive neuroscience

Rainer Goebel
MaastrichtUniversity, The Netherlands

Ultra-highmagneticfield (UHF) fMRIat 7 Tesla and higherenablesmeasurement of humanbrainactivitywithsub-millimeter spatial resolutionallowing to differentiatebrain activation at the mesoscopiclevel of cortical layers and columnar-likefeature clusters. Recentexperiments show thatitis possible to mapknowncolumnar-levelfeaturerepresentations in specialisedbrain areas (e.g. V1-V3, A1, hMT, STS/STG) whenusing UHF fMRIwithoptimizedcoils and MR pulse sequences. Furthermore, the separation of activityfromupper, middle and lower cortical layer compartmentsprovides the possibility to separatebottom-up from top-down information flow. Wewillpresentseveralexamples of thisemerging new field of human "mesoscopic" neuroscience includingread out the content of conscious perception whenperceivingambiguousmoving stimuli and top-down effectsduringauditory attention.