CIBM Annual Symposium 2022
Campus Biotech, Geneva | 30th November

BigBrain-MR: a new digital phantom at 100-µm resolution for MR methods development

Cristina Sainz Martinez,[1,2] Meritxell Bach Cuadra,[2,3] João Jorge[1]

1. CSEM - Swiss Center for Electronics and Microtechnology, Switzerland; 2. CIBM Center for Biomedical Imaging, Switzerland; 3. Department of Radiology, Centre Hospitalier Universitaire Vaudois (CHUV) and University of Lausanne (UNIL) Switzerland

INTRODUCTION

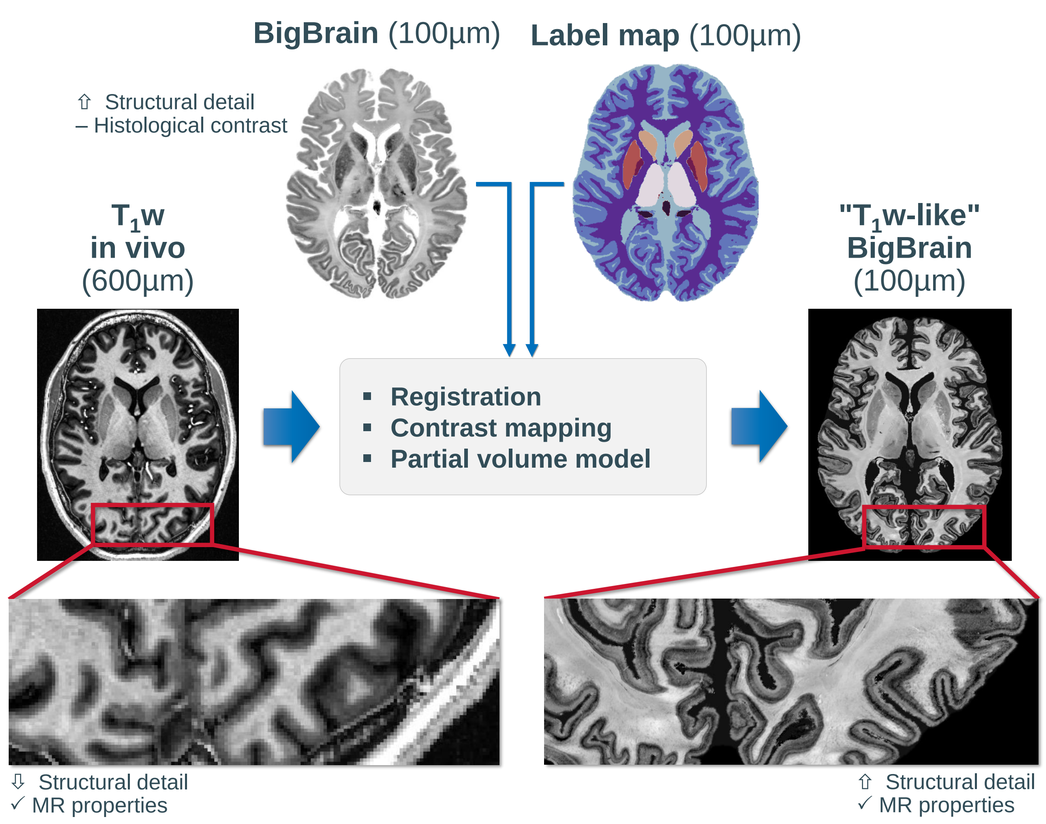
BigBrain-MR is a new computational brain phantom for high-resolution MR imaging methods development [1], with:

- Diverse MR properties (T_1, T_2*, χ) with 100-µm anatomical detail;
- MR coil sensitivity, background field & bias field maps.

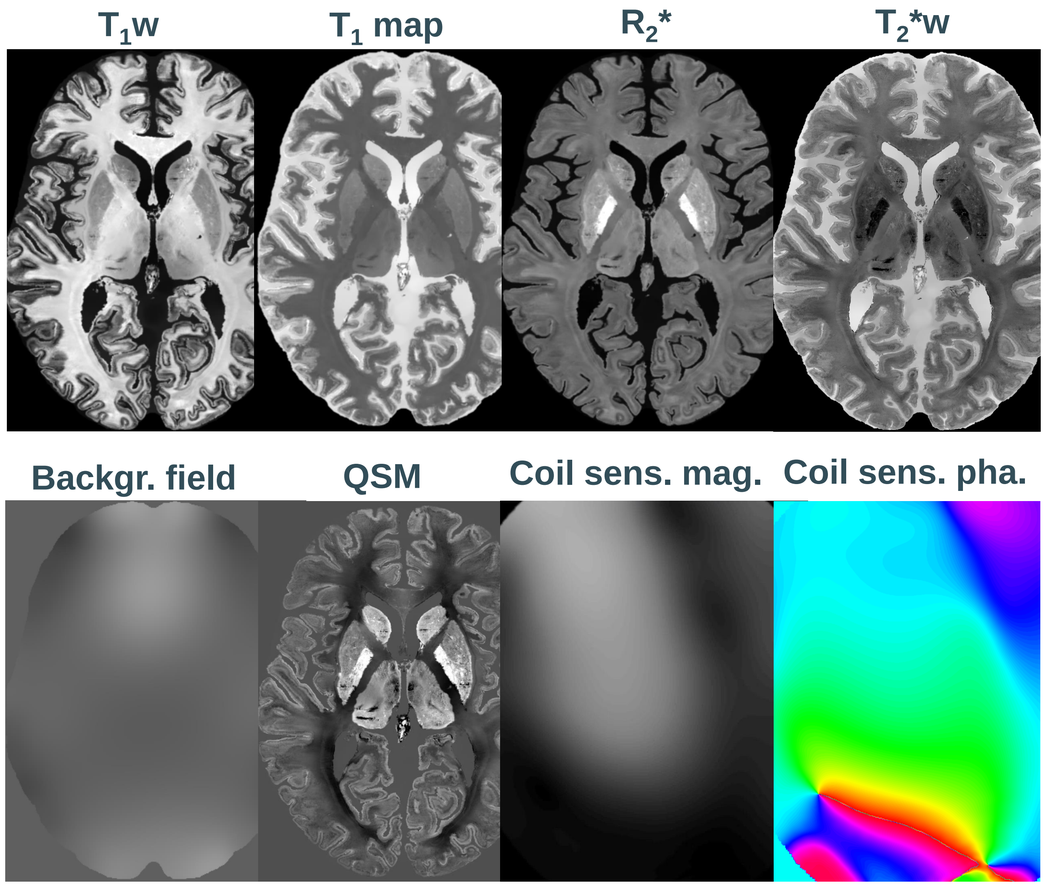
IN THIS WORK

- We present **BigBrain-MR's framework** for creating 100µm maps based on lower-resolution in-vivo MR data and the publicly-available BigBrain dataset [2];
- We evaluate **BigBrain-MR's validity** as a simulation platform in two applications: super-resolution imaging & parallel imaging reconstruction.

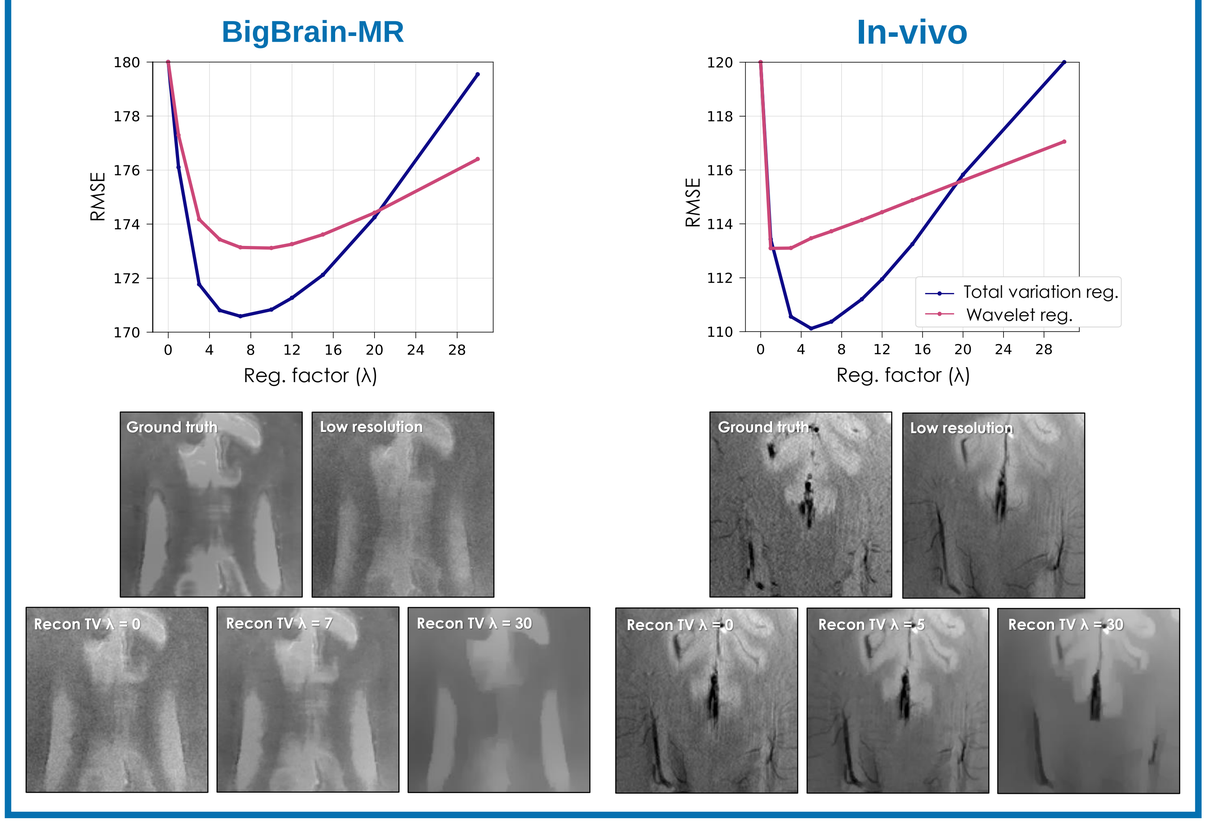
FRAMEWORK



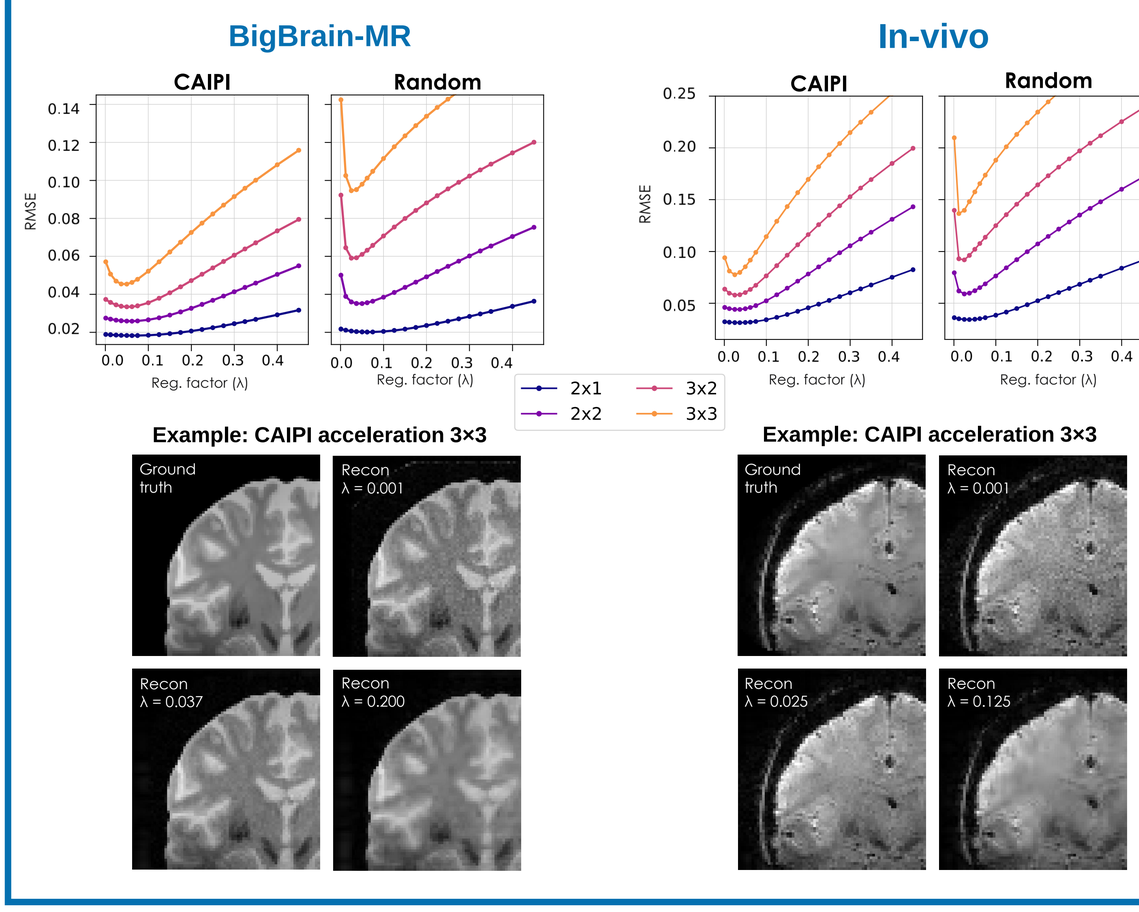
Generated contrasts & maps



VALIDATION 1: super-resolution imaging



VALIDATION 2: parallel imaging reconstruction



CONCLUSION

- BigBrain-MR provides realistic MR contrasts with fine structural detail;
- The validation tests indicate that the phantom compares well against real in-vivo data – thus it is a valid simulation tool to aid the development of high-resolution imaging methods.

References: [1] Sainz Martinez et al., ISMRM 2021; [2] Amunts K et al., Science 2013

Financial support: Swiss National Science Foundation through grant 185909, CSEM, CIBM Center for Biomedical Imaging