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Title: In vivo brain imaging with entangled photons

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Abstract: Multi-photon imaging provides excellent spatial resolution and penetration depth using non-ionizing radiation, and therefore is highly suited for in vivo deep brain imaging at cellular level. However, major problems with current state-of-the-art multi-photon apparatus are: 1) The subject must be head-fixed within the complex optics assembly used for galvano-scanning and detection. 2) An ultrafast pulsed laser is required, which itself is bulky, costly, can damage tissue, and requires specialized training. Entangled photons allow for the benefits of classical two-photon imaging but at a much lower laser power, which avoids damaging the sample as often seen in classical two-photon imaging. This also means that CW diode lasers could replace bulky pulsed lasers, resulting in ease of operation and more freedom in the test subject. We outline here the experimental approach for entangled multiphoton brain imaging.