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Two-photon flow cytometer with laser scanning Airy beams YONGDONG WANG, YU DING, CHUNQIANG LI, Univ of Texas, El Paso — Flow cytometry is an important technique in biomedical discovery. In the last ten years in vivo flow cytometers based on one-photon or two-photon excited fluorescence have been developed. One drawback of laser beam scanning two-photon flow cytometer is that two-photon excitation volume is fairly small due to short Rayleigh range of focused Gaussian beam. Hence, the sampling volume is much smaller than one-photon flow cytometer, which makes it challenging to count or detect rare circulating cells in vivo.Non-diffracting beams have narrow intensity profiles with an effective spot size (FWHM) as small as several wavelengths, making them comparable to Gaussian beams. The trade-off of using Airy beams rather than Gaussian beam is the fact that Airy beams have side lobes that contribute to background noise. Two-photon excitation can reduce this noise, as the excitation efficiency is proportional to intensity squared. Therefore, we developed a two-photon flow cytometer using scanned Airy beams to form a light sheet that could be used to intersect the blood vessel. The set up can successfully detect and count flowing micro beads and tumor cells in micro channel. According to our knowledge, this is the first application of Airy beams in flow cytometry.

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