

### **Descriptions of additional Supplementary files**

**Supplementary Movie 1. mDia1-nucleated F-actin network growth.** 83 nM mDia1-nucleated F-actin network growth on the lipid bilayer. Scale bar is 10  $\mu\text{m}$ .

**Supplementary Movie 2. Arp2/3-nucleated F-actin network growth.** 7.4nM Arp2/3-nucleated F-actin network on the lipid bilayer. Scale bar is 25  $\mu\text{m}$ .

**Supplementary Movie 3. mDia1-nucleated F-actin network contraction actin channel.** 83 nM mDia1-nucleated F-actin network contraction actin channel. Scale bar is 10  $\mu\text{m}$ .

**Supplementary Movie 4. mDia1-nucleated F-actin network contraction myosin channel.** 83 nM mDia1-nucleated F-actin network contraction myosin channel. Scale bar is 10  $\mu\text{m}$ .

**Supplementary Movie 5. Photoactivation of Myosin II thick filaments in mDia1-nucleated F-actin network.** 83 nM mDia1-nucleated F-actin and Skeletal Muscle Myosin II thick filaments with Blebbistatin contract when exposed under 405nm laser. Scale bar is 10  $\mu\text{m}$ .

**Supplementary Movie 6. Photoactivation of Myosin II thick filaments in Arp 2/3-nucleated F-actin network.** 74nM Arp 2/3-nucleated F-actin and Skeletal Muscle Myosin II thick filaments with Blebbistatin do not contract when exposed under 405nm laser. Scale bar is 10  $\mu\text{m}$ .

**Supplementary Movie 7. HMM on mDia1-nucleated F-actin network.** Fluorescently labeled HMM (Myosin II) in 83 nM mDia1-nucleated F-actin. Scale bar is 10  $\mu\text{m}$ .

**Supplementary Movie 8. HMM on Arp 2/3-nucleated F-actin network.** Fluorescently labeled HMM (Myosin II) in 0.74nM Arp 2/3-nucleated F-actin. Scale bar is 10  $\mu\text{m}$ .

**Supplementary Movie 9. Laser Ablation on mDia1-nucleated F-actin network actin channel.** 83 nM mDia1-nucleated F-actin aster ablation and retraction. Scale bar is 10  $\mu\text{m}$ .

**Supplementary Movie 10. Laser Ablation on mDia1-nucleated F-actin network myosin channel.** Myosin channel of 83 nM mDia1-nucleated F-actin aster ablation and retraction. Scale bar is 10  $\mu\text{m}$ .

**Supplementary Movie 11. Actomyosin overlay to demonstrate force transmission.** 83 nM mDia1-nucleated F-actin network overlay with Myosin thick filaments. The Myosin thick filaments transmit force through actin filaments. Scale bar is 10  $\mu\text{m}$ .

**Supplementary Movie 12. Myosin motion for Arp 2/3 and mDia1-nucleated F-actin networks.** The motion of Myosin thick filaments on 74 nM Arp 2/3 (left) and 830 nM mDia1-nucleated F-actin. Scale bar is 10  $\mu\text{m}$ .