Supplemental material

Chaotic resonance modes in dielectric cavities: Product of conditionally invariant measure and universal fluctuations

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Gallery of modes

We present a gallery of individual modes in position space for the limaçon shaped cavity studied in the manuscript. The modes are shown in six sets ordered from short-lived to long-lived modes. The values of $\mathrm{Im}(kR)$ and $\mathrm{Re}(kR)$ in Figs. S1 to S5 correspond to Fig. 4 of the manuscript and in Fig. S6 correspond to Fig. 5 of the manuscript for modes with longest lifetime.

The intensity $|\psi(\boldsymbol{r})|^2$ is presented on a 500×560 grid, such that the grid spacing is about 7.2 wavelengths in Figs. S1 to S5 and about 2.3 wavelengths in Fig. S6. In all figures the average intensity in position space within the cavity is scaled to one and intensities greater than the maximal value of the colorbar are shown with darkest color.

This gallery supports the observation that modes with similar $\mathrm{Im}(kR)$ have very similar coarse-grained structure. Furthermore it shows their individuality due to universal fluctuations and their scarring along varying segments of rays, which is particularly strong in Figs. S1 to S3 and S6.

High resolution mode

Ray-segment scarring is best seen when the mode is shown with a resolution at least on the scale of the wavelength. Figure S7 shows the mode in the middle of Fig. 1(b), also shown at top left in Fig. S3, with a 10 times higher resolution on a 5000×5600 grid, such that the grid spacing is about 0.72 wavelengths.

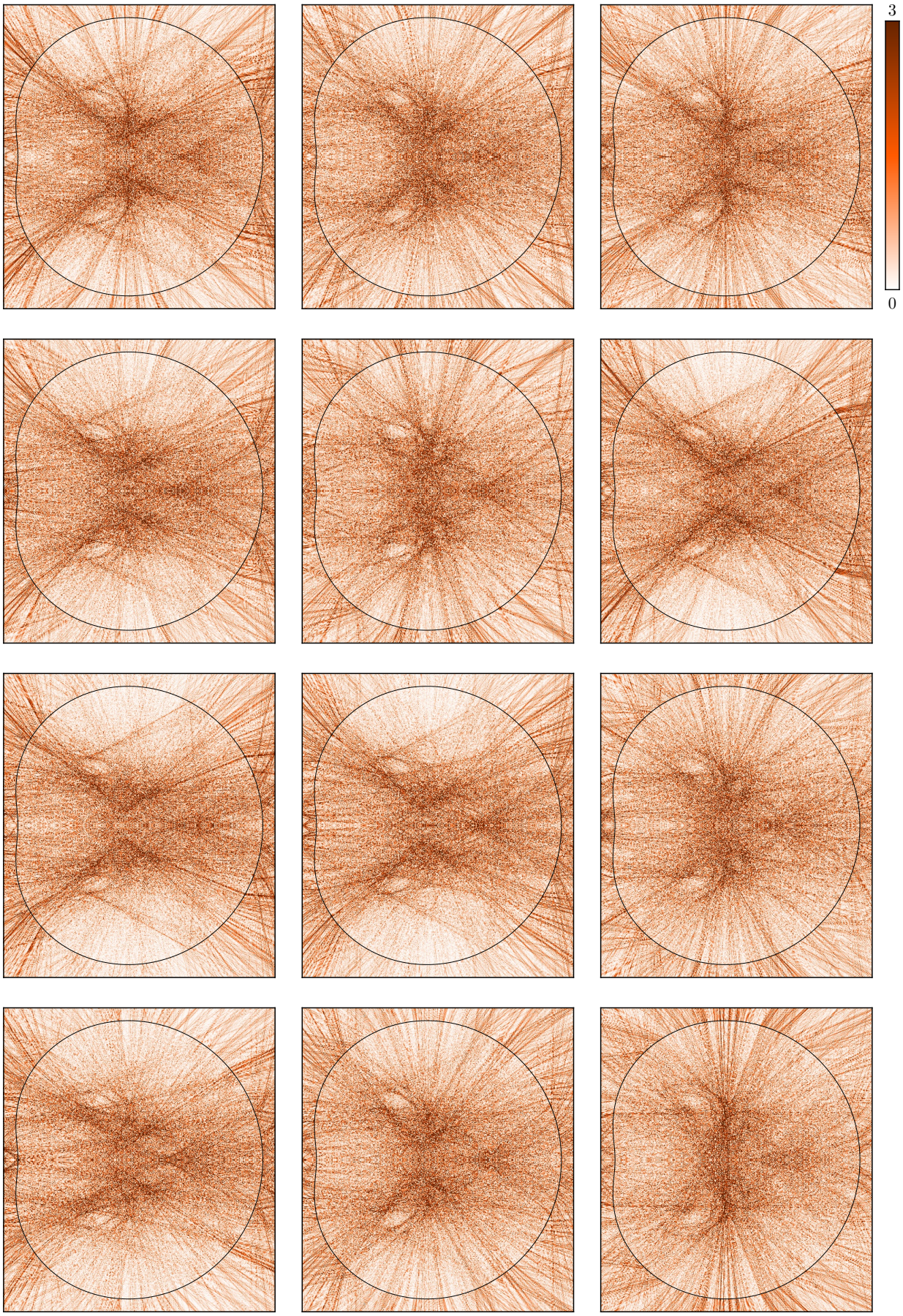

FIG. S1. Intensity in position space for 12 modes nearest to $\mathrm{Im}(kR) = -0.0611$ with $\mathrm{Re}(kR) \in [3100, 3101]$.

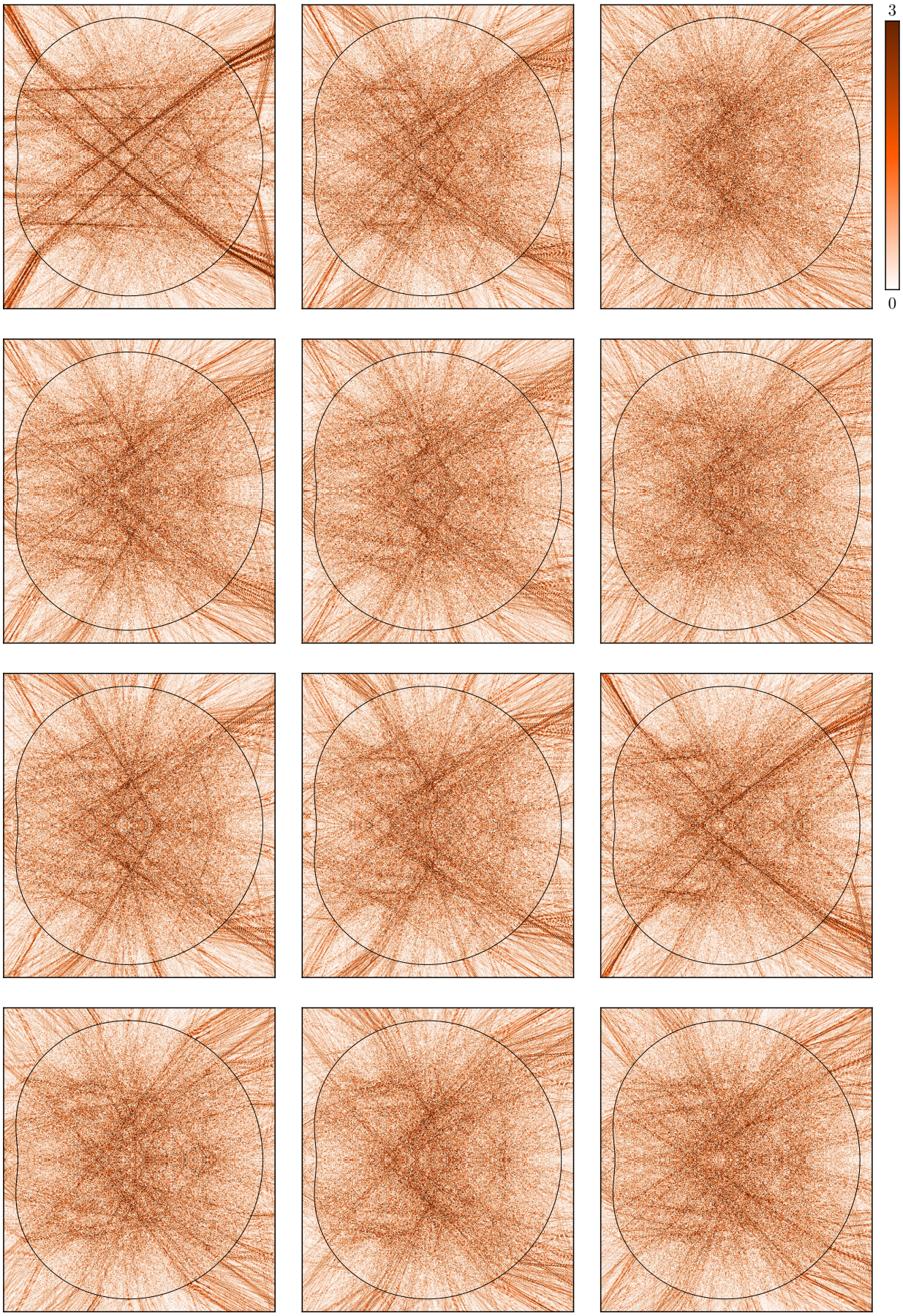

FIG. S2. Intensity in position space for 12 modes nearest to $\mathrm{Im}(kR) = -0.045$ with $\mathrm{Re}(kR) \in [3100, 3101]$.

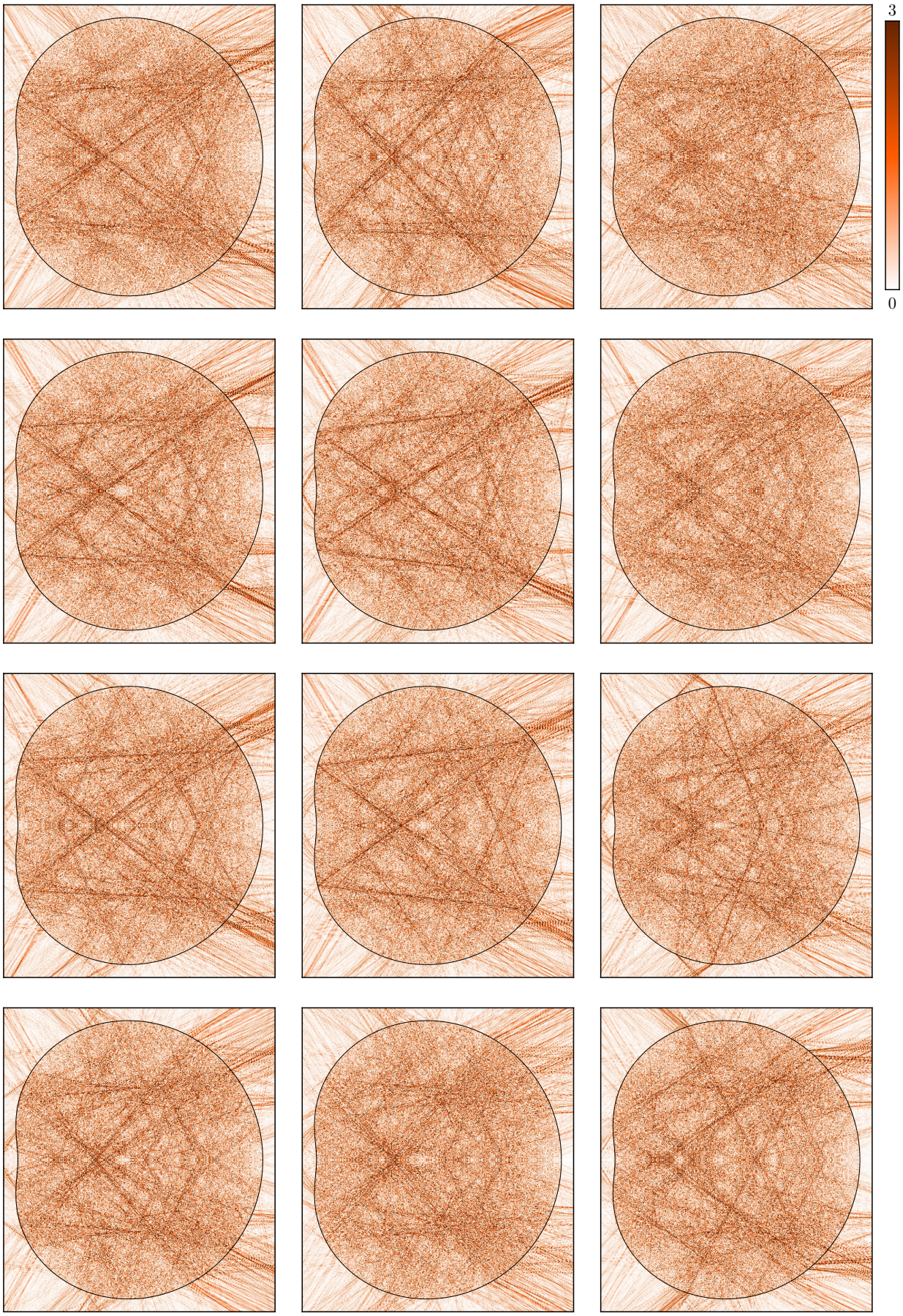

FIG. S3. Intensity in position space for 12 modes nearest to $\mathrm{Im}(kR) = -0.0267$ with $\mathrm{Re}(kR) \in [3100, 3101]$.

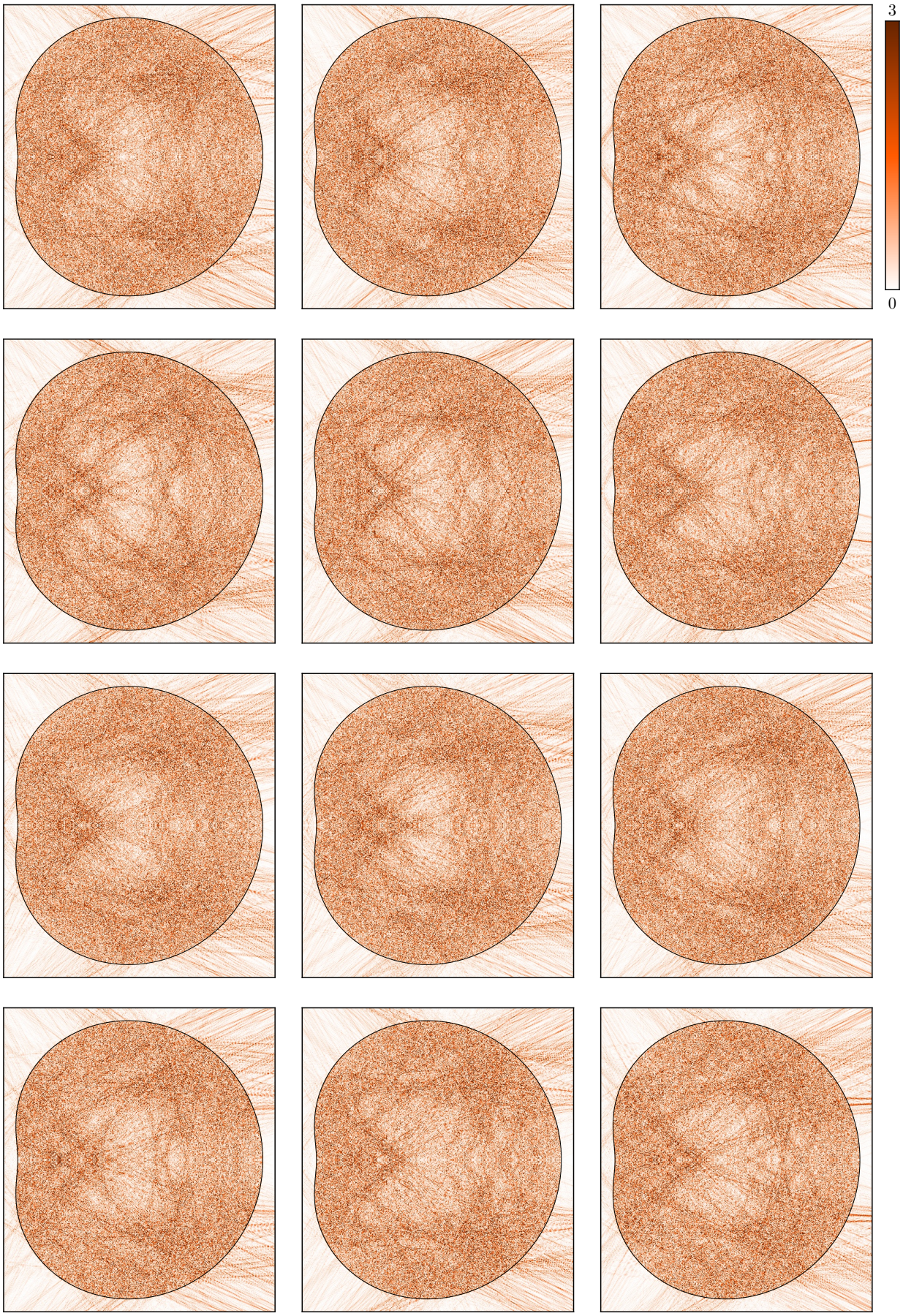

FIG. S4. Intensity in position space for 12 modes nearest to $\mathrm{Im}(kR) = -0.015$ with $\mathrm{Re}(kR) \in [3100, 3101]$.

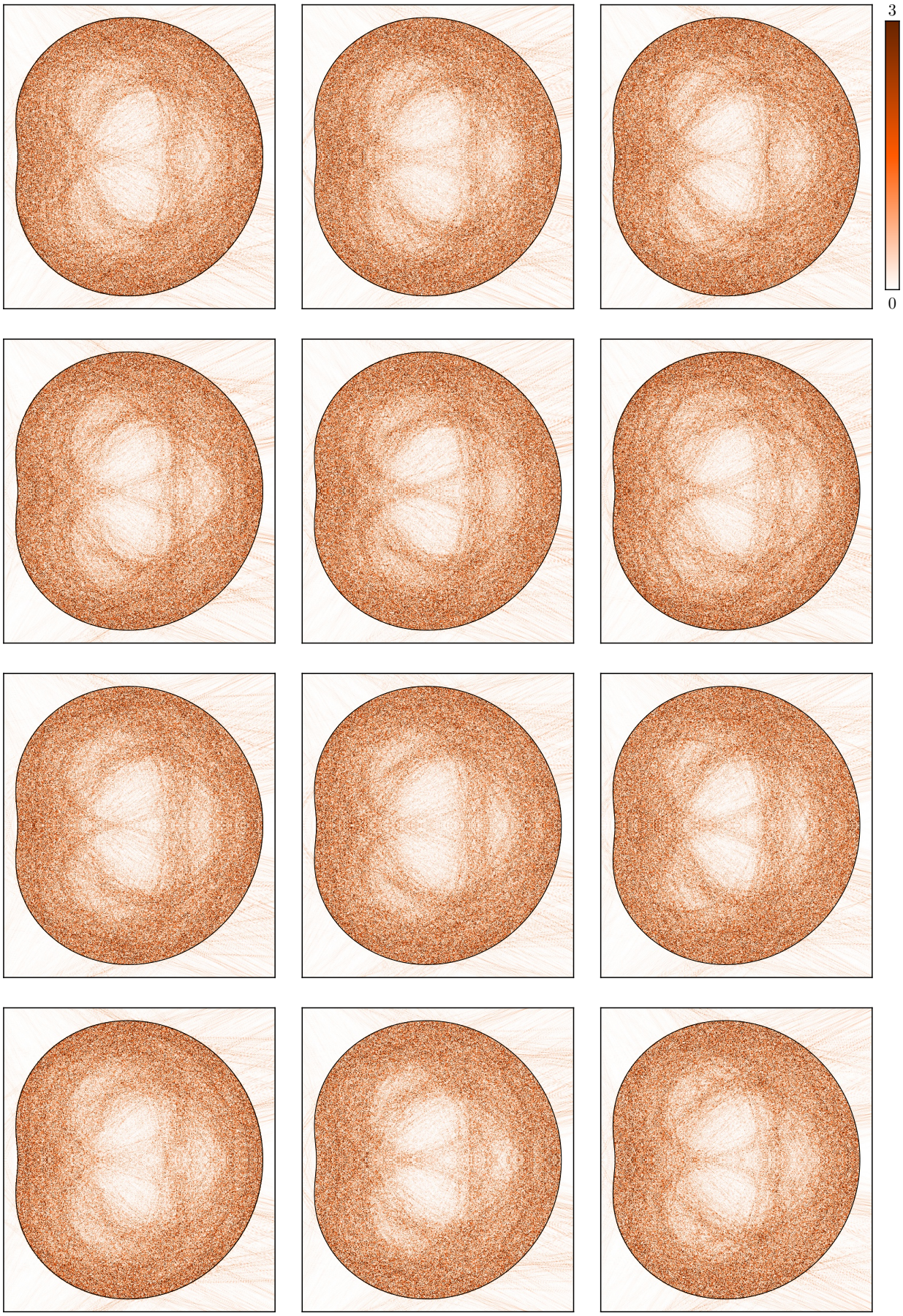

FIG. S5. Intensity in position space for 12 modes nearest to $\mathrm{Im}(kR) = -0.0053$ with $\mathrm{Re}(kR) \in [3100, 3101]$.

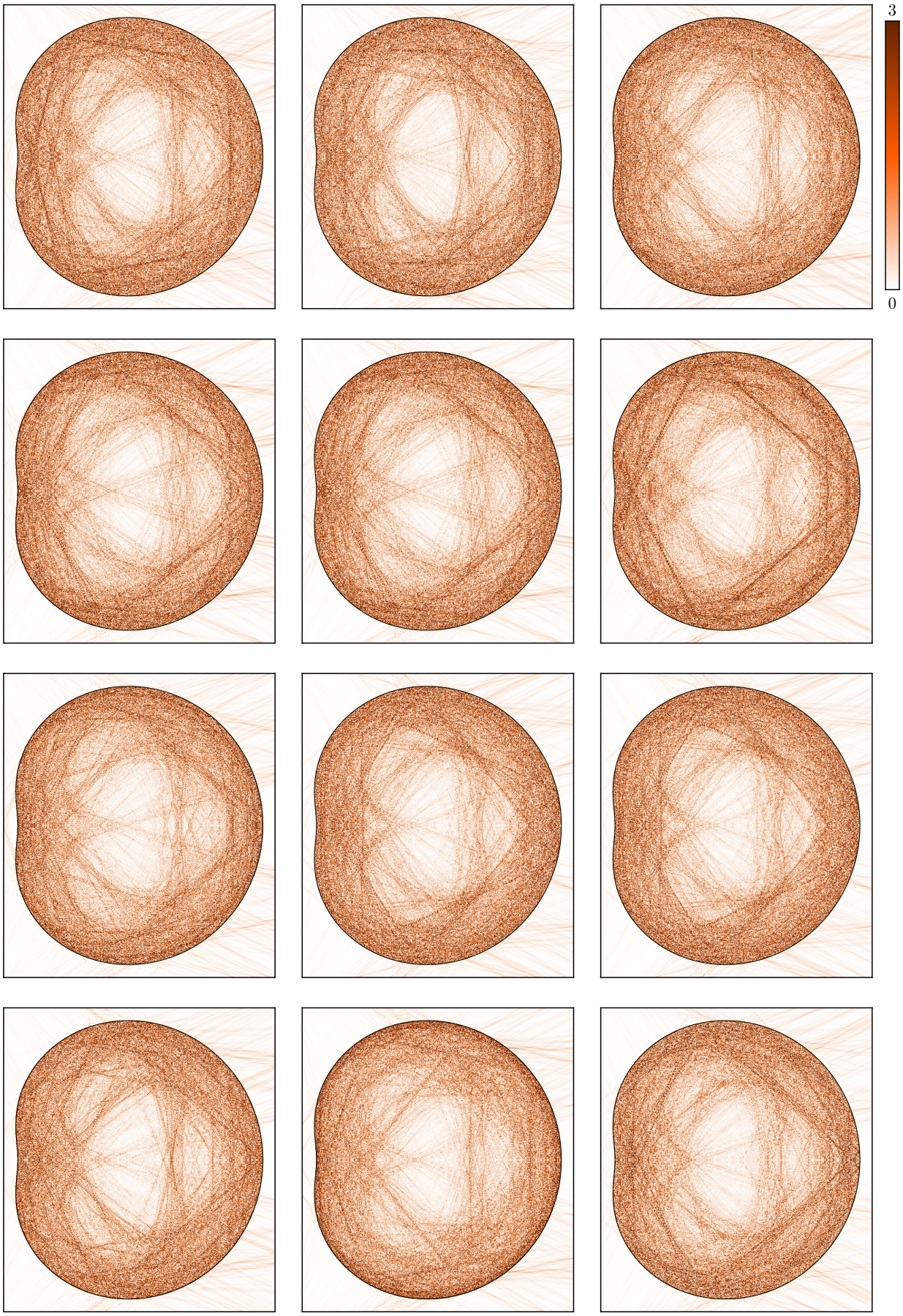

FIG. S6. Intensity in position space for 12 modes nearest to $\mathrm{Im}(kR) = -0.004$ with $\mathrm{Re}(kR) \in [1000, 1010]$.

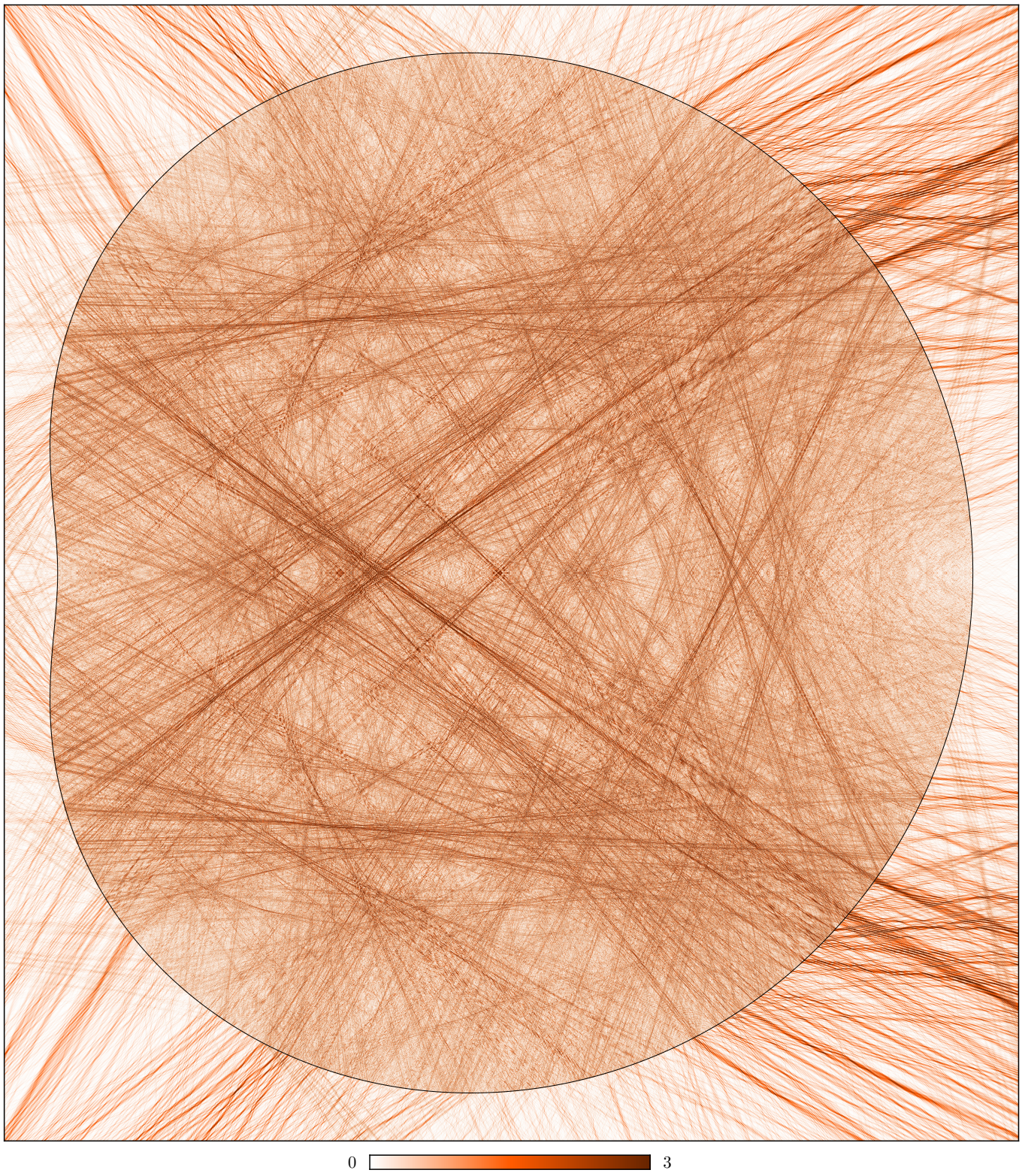

FIG. S7. Intensity in position space for mode $\mathrm{Im}(kR) = -0.026704$ and $\mathrm{Re}(kR) = 3100.321763$. This is the mode in the middle of Fig. 1(b) and at the top left in Fig. S3. Here it is shown on a 5000×5600 grid, such that the grid spacing is about 0.72 wavelengths.