SUPPLEMENTAL ITEMS

Movie S1. Long-term imaging allows access to cell fate heterogeneity in response to γ-irradiation for several days after damage. (Related to main text Fig. 1)

Representative time-lapse data of cells exposed to 4Gy γ-irradiation and imaged in the course of one week every 30min. Each cell is identified with fluorescence signal from a nuclear marker. Tracking output is shown in the form of fading lines. Two representative tracks are shown: the blue line follows a cell that does not divide for the entire duration of the experiment; the orange lines follow a set of cells that divide multiple times.

Movie S2. Damaged cells show persistent pulsatile activation of p53, which translate into accumulation of p21. (Related to main text Fig. 3)

Representative behavior of p53-mNeonGreen and p21-mKate2 in a single cell tracked for 5 days after 10Gy γ-irradiation. Tracking data was used to *in silico* maintain cell in the center for ease of visualization. Quantification of fluorescence intensity over time is shown in the right.

Movie S3. Escape events are characterized by a switch in the level of p21 and CDK2 activity.

(Related to main text Fig. 4)

Representative behavior of p21-mKate2 and DHB-mVenus in a single escaper cell tracked for 5 days after 10Gy γ-irradiation. Tracking data was used to *in silico* maintain cell in the center for ease of visualization. Note that p21 degradation is tightly correlated with a switch in the cytoplasmic-nuclear ratio of DHB-mVenus (quantified in main text, Fig 3).