Supplementary Data Legends

Supplementary Movie S1. Effective cytotoxic killing.
Holotomography-based live microscopy showing NALM-6 cell blebbing after 20min and subsequent nuclear condensation over 1h as signs of effective killing by a CAR T cell (60x magnification, 1 frame every 2 min, 2 frames/s display rate).

Supplementary Movie S2. "Scanning interaction".
Holotomography-based live microscopy showing sustained contact between a NALM-6 cell and a CAR T cell for 2h without signs of cytotoxic activity (60x magnification, 1 frame every 2 min, 2 frames/s display rate).

Supplementary Movie S3. "Escape interaction".
Holotomography-based live microscopy showing escape of a NALM-6 cell interacting with a CAR T cell after 16min (60x magnification, 1 frame every 2 min, 2 frames/s display rate).

Supplementary Movie S4. CD19 internalization upon productive interaction with CAR T cell.
Time-lapse fluorescence microscopy shows CD19 internalization in a NALM-6 cell interacting with a CAR T cell (NALM-6 cells stained with anti-CD19 AF647, 20x magnification, 1 frame every 2min, 2 frames/s display rate).

Supplementary Movie S5. Stable CD19 distribution upon interaction with uninfected control T cell.
Time-lapse fluorescence microscopy shows no change of CD19 distribution of a NALM-6 cell interacting with an uninfected T cell (NALM-6 cells stained with anti-CD19 AF647 antibody, 20x magnification, 1 frame every 2min, 2 frames/s display rate).

Supplementary Image File S1. Four dimensional hyperstack (x-, y-, z- and time axis) showing CD19 internalization (related to Supplementary Movie 4).
Time-lapse fluorescence microscopy of a NALM-6 cell interacting with a CAR T-cell (NALM-6 cells stained with anti-CD19 AF647 antibody, 20x magnification, 1 frame every 2min) including Z-stack images with 2µm distance (see methods) demonstrating CD19 internalization (Top bar, timelapse; bottom bar, Z-stack over time; requires ImageJ for proper viewing, if viewing in other applications Z-stacks will be presented consecutively).