Supporting information

DNAzyme catalyzed tyramide depositing reaction for in situ imaging of protein status on the cell surface

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Table S1. The sequences of oligonucleotides used in this work.

Name	Sequence (5' – 3')
Apt2-g4 (spacer 0)	GTGGGT**GGTGCACAGTCTAACGCAACAGAAAGCCAGCACCAACGCC**
Apt2-g8 (spacer 0)	**CCGCAACCACGACCGAAAGACAACGCAATCTGACACGTGG**GGGTGGGTGG
Apt2-g4 (spacer 4)	GTGGGTTTTT**GGTGCACAGTCTAACGCAACAGAAAGCCAGCACCAACGCC**
Apt2-g8 (spacer 4)	**CCGCAACCACGACCGAAAGACAACGCAATCTGACACGTGG**TTTTGGGTGGGTGG
Apt2-G4 (spacer 8)	**CCGCAACCACGACCGAAAGACAACGCAATCTGACACGTGG**TTTTTTTTGGGTGGGTGGGTGGGT
Apt2-g4 (spacer 8)	GTGGGTTTTTTTTT**GGTGCACAGTCTAACGCAACAGAAAGCCAGCACCAACGCC**
Apt2-g8 (spacer 8)	**CCGCAACCACGACCGAAAGACAACGCAATCTGACACGTGG**TTTTTTTTGGGTGGGTGG
Apt2-g4 (spacer 12)	GTGGGTTTTTTTTTTTTT**GGTGCACAGTCTAACGCAACAGAAAGCCAGCACCAACGCC**
Apt2-g8 (spacer 12)	**CCGCAACCACGACCGAAAGACAACGCAATCTGACACGTGG**TTTTTTTTTTTTGGGTGGGTGG
Random-G4	TCCCTACGGCGCTAACCTCCCAACCGCTCCACCCTGCCTCCGTTTTTTTTGGGTGGGTGGG
FITC-Apt2	**FITC-CCGCAACCACGACCGAAAGACAACGCAATCTGACACGTGG**
FITC-Apt2-g4 (spacer 8)	FITC-GTGGGTTTTTTTTT**GGTGCACAGTCTAACGCAACAGAAAGCCAGCACCAACGCC**
TAMRA-Apt2-g8(spacer 8)	**CCGCAACCACGACCGAAAGACAACGCAATCTGACACGTGG**TTTTTTTTGGGTGGGTGG-TAMRA
Apt3-g8 (spacer 8)	**CGGACGAATGCTTTGATGTTGTGCTGGATCCAGCGTTCATTCTCA**TTTTTTTTGGGTGGGTGG

Notes: Aptamer sequence was shown in bold. The intact G-quadruplex sequence and split G-quadruplex sequence were indicated by underline.

Table S2. The comparison of immunohistochemistry and this method.

Method	Materials	Time (hours)	Cost (dollar/test)	Application
IHC	Antibody, HRP Polymer and DAB Plus Chromogen	>12	≈4	Protein
DCTDR	DNA Probes and tyramide reagent	< 6	≈1.3	Protein and dimer

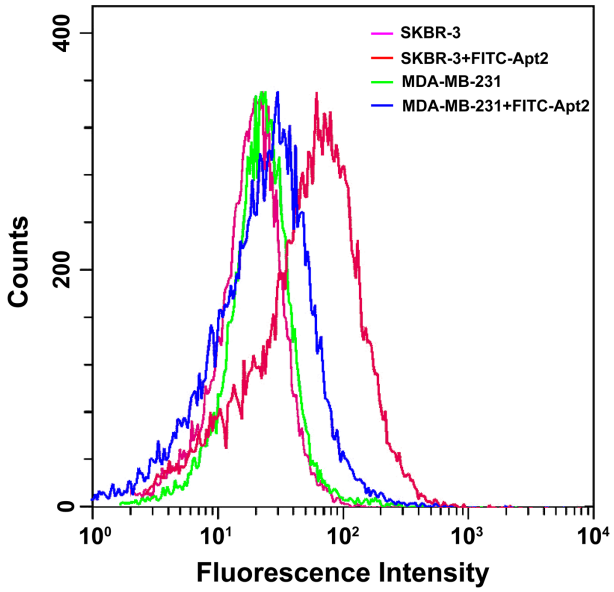

Figure S1. The flow cytometry analysis the specific binding of aptamer by using the FITC-labeled HER2 aptamer.

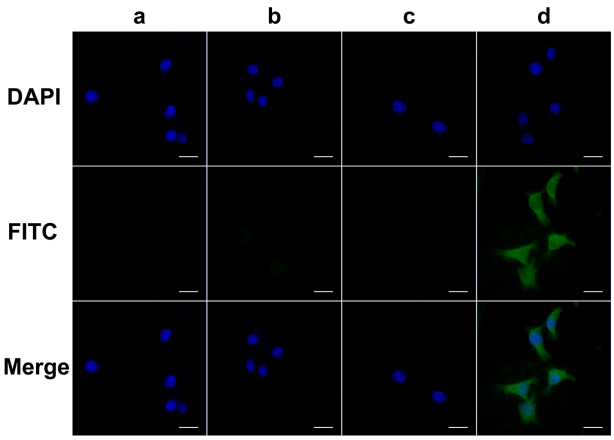

Figure S2. Feasibility of DCTDR on SKBR-3 cells surface. DCTDR system without Apt2-G4 probes (a) or without hemin (b), and complete DCTDR system with random sequence-G4 probes (c) or with Apt2-G4 probes (d). Scale bar: 25 μm.

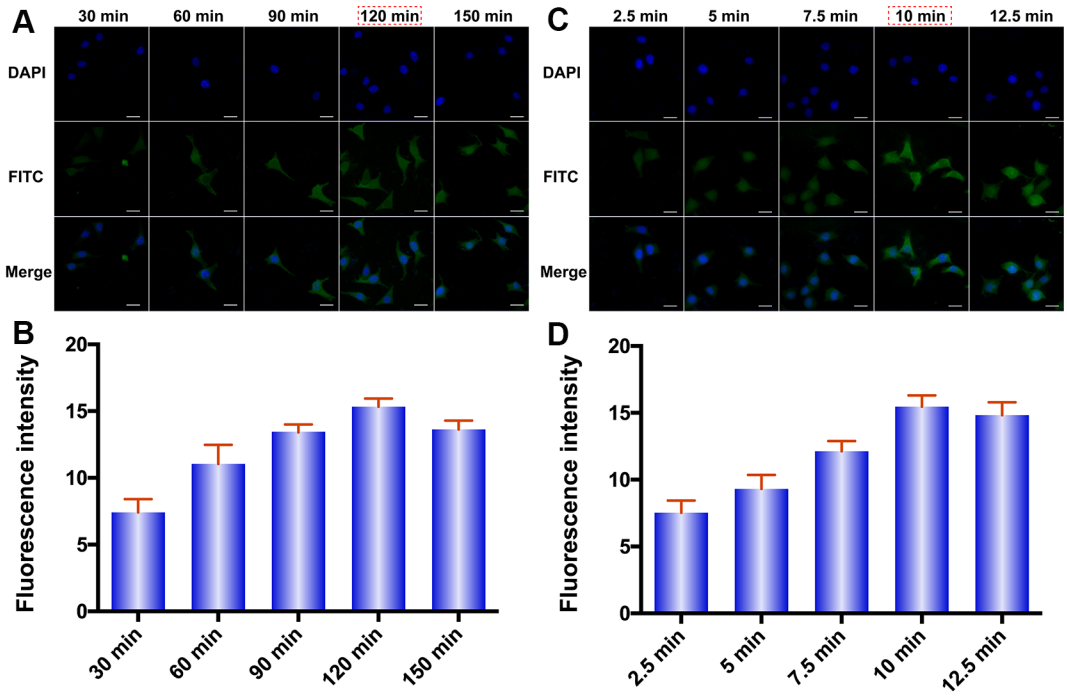

Figure S3. Dependences of DCTDR-based imaging (A, C) and fluorescence intensity analysis (B, D) of SKBR-3 cells on the incubation time of Apt2-G4 probes

(A, B) and the reaction time of DNAzyme catalyzed tyramide deposition (C, D). Scale bar: 25 μm.

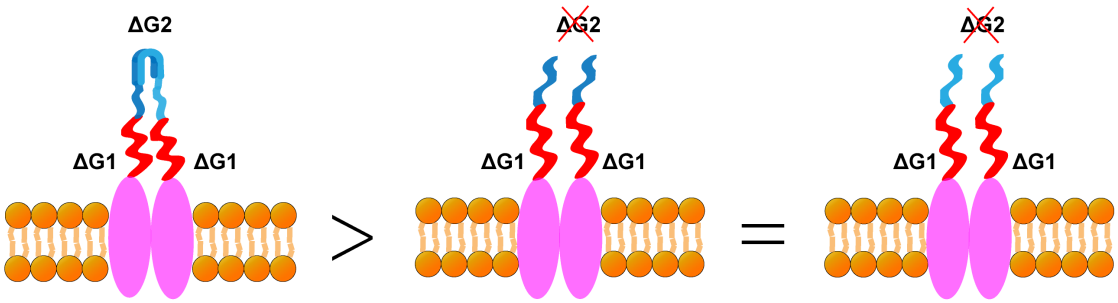

Figure S4. Schematic diagram of the fromanton of three proximity complexes in our proximity-induced DCTDR system.

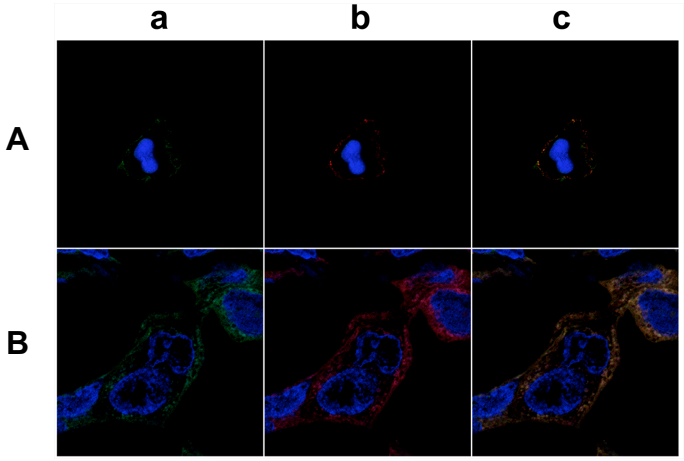

Figure S5. Confocal microscopy imaging of SKBR-3 cell with ×400 magnification (A) and HER2 over-expressed breast cancer tissue with ×1260 magnification (B) by using the FITC-labeled Apt2-g4 and TAMRA-labeled Apt2-g8 probes to analyze. FITC+DAPI (a), TAMRA+DAPI(b), FITC+ TAMRA+DAPI (c).

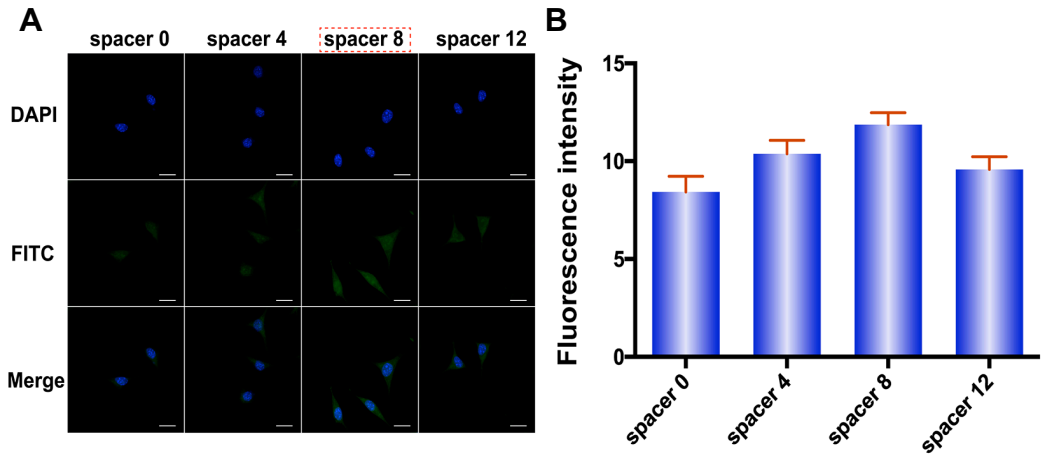

Figure S6. Proximity-induced DCTDR imaging (A) and fluorescence intensity analysis (B) of SKBR-3 cells with different spacer lengths between split G4 and aptamer sequence. Scale bar: 25 μm.

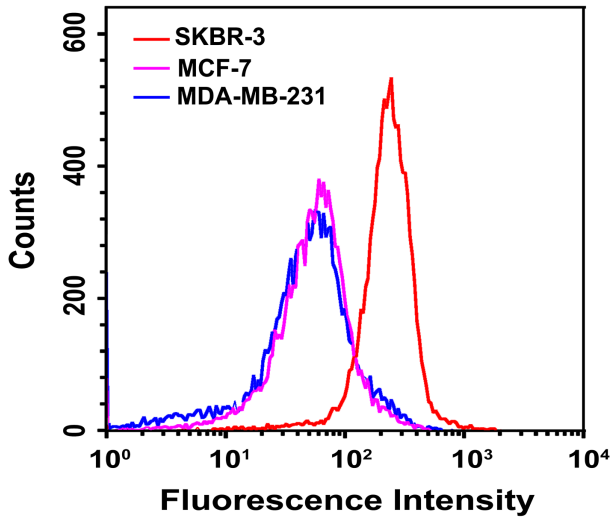

Figure S7. The flow cytometry analysis HER2 homodimer of SKBR-3, MCF-7 and MDA-MB-231 cells based on proximity-induced DCTDR.