

## Article

# Dynamic Measurement of a Cancer Biomarker: Towards In Situ Application of a Fiber-Optic Ball Resonator Biosensor in CD44 Protein Detection

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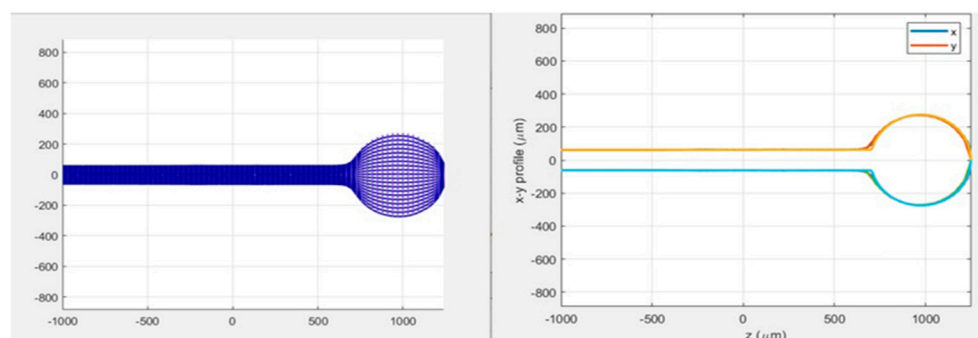
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**Figure S1.** The geometrical 2D profile of a ball resonator 492–485  $\mu\text{m}$  fabricated by Fujikura LZM-100.

**Table S1.** Optical fiber ball resonator data.

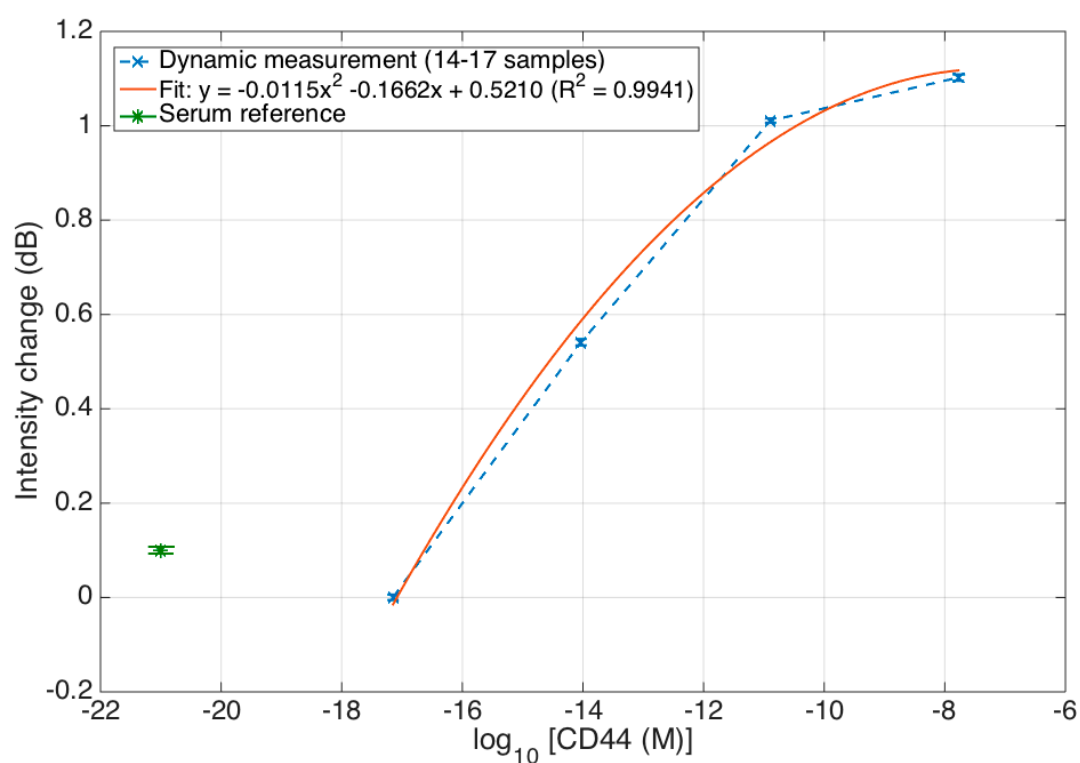
	Sensor	Reflection dB/mm	Sensitivity (dB/RIU)	R <sup>2</sup>	Purpose
1	489 µm	air: 35 water: 47	-96	1.00	Gamma globulin detection
2	491 µm	air: 35 water: 48	-90	0.96	CD44 detection
3	492 µm	air: 37 water: 47	-98	0.95	CD44 detection
4	496 µm	air: 35 water: 45	-83	0.99	CD44 detection
5	497 µm	air: 35 water: 50	-98	0.95	CD44 detection
6	499 µm	air: 36 water: 48	-85	0.97	CD44 detection
7	521 µm	air: 37 water: 49	-128.37	0.98	CD44 detection
8	533 µm	air: 36 water: 46	-105	0.97	CD44 detection
9	485 µm	air: 37 water: 50	-83	0.98	Thrombin detection
10	518 µm	air: 44 water: 54	-105	0.95	Thrombin detection
11	499 µm	air: 36 water: 48	-84	0.97	Pressure measurement

**Table S2.** Splice parameters for ball resonators; recipe for Fujikura LZM-100 splicer.

Parameter	Settings
Pre-heat	1
Absolute power	342
Relative power	150
Feeding speed	0.2 mm/s
Rotator speed	150 deg/s
Diameter adjustment	10 $\mu$ m

**Table S3.** Mean height and root-mean-square (RMS) roughness of the sensor's surface determined from the obtained AFM height images ( $n \geq 40$ ).

Treatment	Piranha	APTMS	Heat	GA	AB	mPEG	Ball resonator
Height (nm)	4.05 $\pm$ 0.34	11.56 $\pm$ 4.1.05	12.77 $\pm$ 0.91	11.51 $\pm$ 0.95	8.55 $\pm$ 0.76	17.36 $\pm$ 0.95	11.0 $\pm$ 1.05
RMS roughness (nm)	1.53 $\pm$ 0.12	7.22 $\pm$ 0.62	8.45 $\pm$ 0.50	6.77 $\pm$ 0.51	4.70 $\pm$ 0.35	7.82 $\pm$ 1.03	6.19 $\pm$ 0.56



**Figure S2.** Output of the CD44 biosensor, reporting the intensity change for each concentration, and the blank sample. The sensitivity is obtained by log-quadratic fit. The estimated limit of detection is 2.93 fM, using the analytical method  $\text{LoD} = f^{-1}(x_{\text{blank}} + 3\sigma_{\text{max}})$ , where:  $f(x)$  is the log-quadratic fit,  $x_{\text{blank}}$  is the blank sample,  $\sigma_{\text{max}}$  is the maximum of the standard deviation for each concentration.

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