Electronic Supplementary Material (ESI) for Lab on a Chip.

Supplementary Information for

A Robust Tissue Laser Platform for Analysis of Formalin-Fixed Paraffin-Embedded Biopsies

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1. Characteristics and profile of the designed FP cavity with SU8 spacer

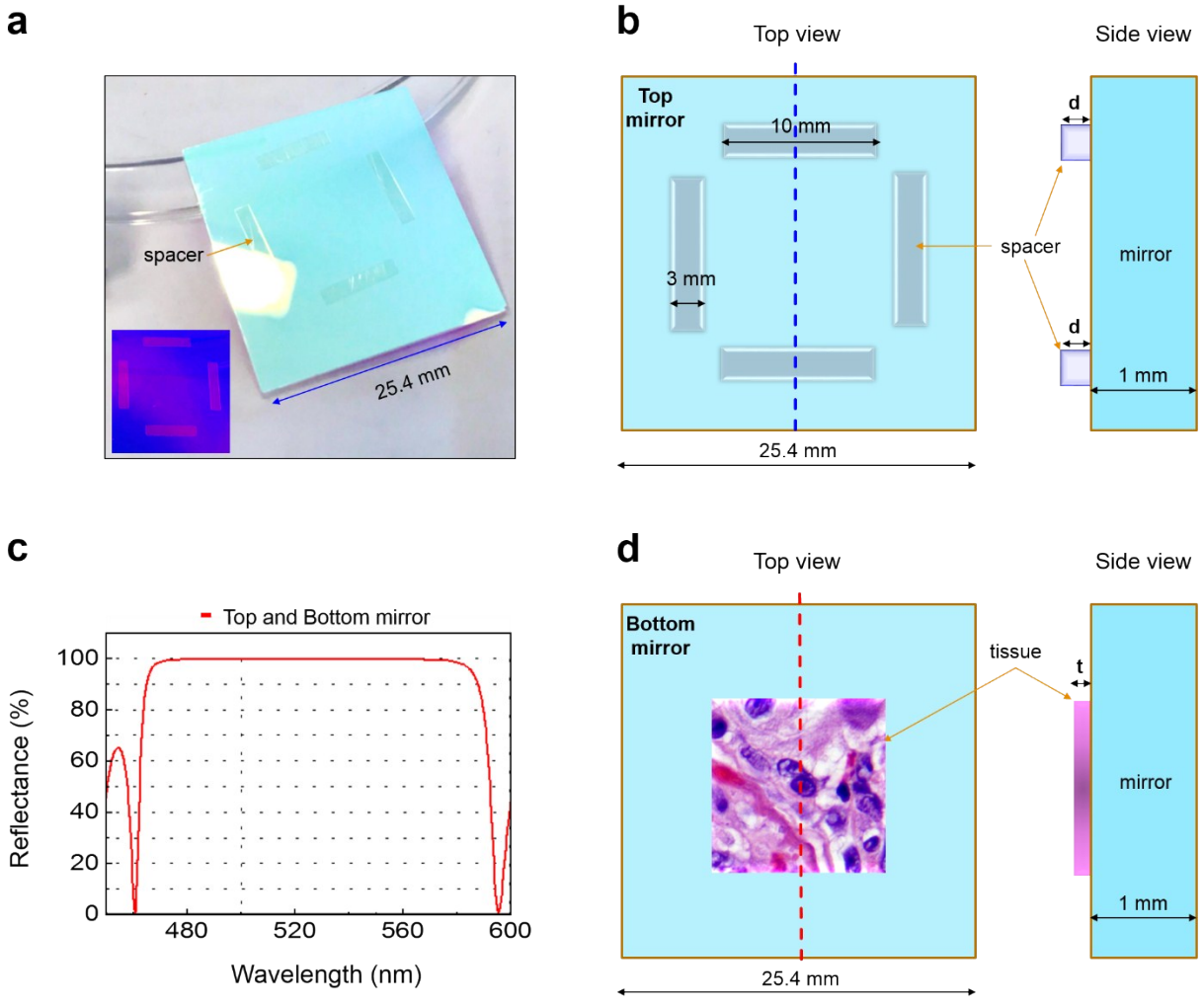

Figure S1. a, Bright field photos of the top mirror with spacers taken from the side and the top (inset). The arrow shows the transparent spacer on the top mirror. **b,** Detailed parameters of the top mirror, including the sketch from the top view (left image) and the side view (right image) taken from the blue dashed line of the top view. The spacers are nearly transparent. Their height, d, can be predetermined. **c,** The reflectance spectra of the top mirror and the bottom mirror. **d,** Detailed parameters of the bottom mirror, including the sketch from the top view (left image) and the side view (right image) taken from the red dashed line of the top view. The sliced tissue is mounted on the surface of the bottom mirror. The thickness of the tissue, t, is always smaller than the height of the spacer, d.

2. Fluorescence and laser emission spectra of YOPRO

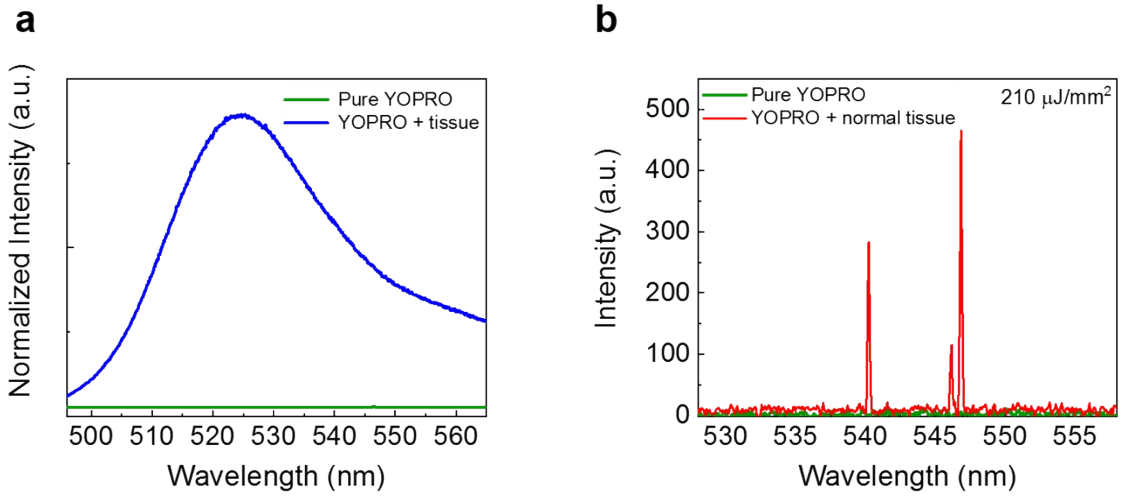

Figure S2. a, Fluorescence emission spectrum of pure YOPRO in water (green curve) and in tissue (blue curve). **b,** Fluorescence emission spectrum of pure YOPRO in water (green curve) and lasing emission spectrum of YOPRO in in normal lung tissue (red curve) under a very high pump energy density of 210 μJ/mm^2.

3. Exemplary H&E Images used in Fig. 4

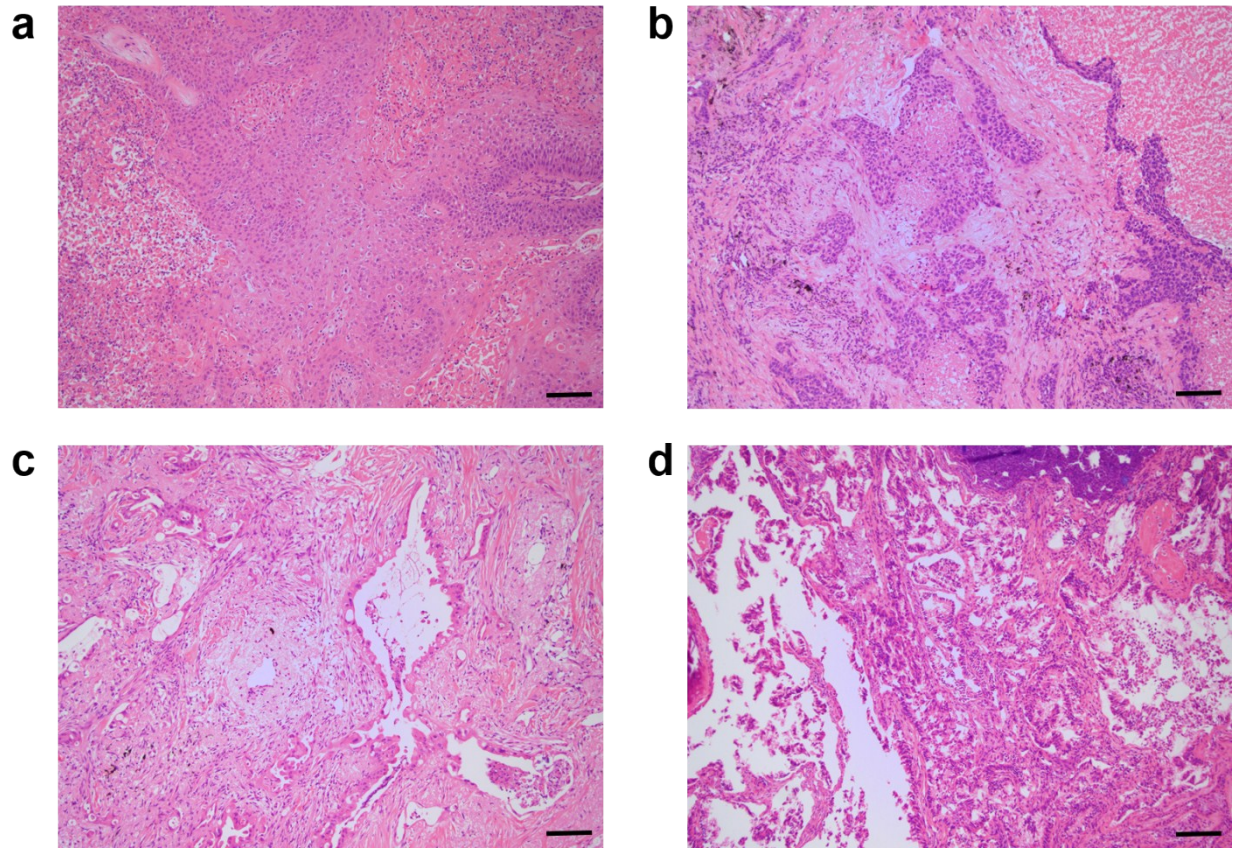

Figure S3. a-b, H&E images of (a) moderately differentiated (T4) and (b) poorly differentiated squamous cell carcinoma (T6) tissue. **c-d,** H&E images of (c) moderately differentiated (T7) and (d) poorly differentiated adenocarcinoma (T9) tissue. All human lung tissues were examined and diagnosed by pathologists. Scale bars, 100 μm.

4. Receiver Operating Characteristics based on Fig. 6

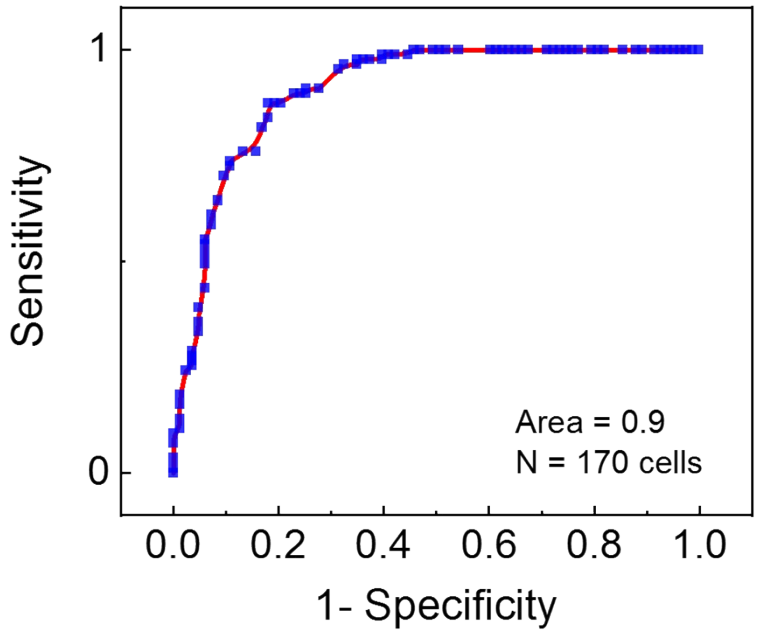

Figure S4. Receiver Operating Characteristics (ROC) curve based on the 170 cells. The ROC curve is plotted by using the excitations (denoted by the numbers by the dots in units of μJ/mm^2) as the cut-off criterion. The area under the fitted red curve is 0.90. The sensitivity of 97.7% is obtained based on the criterion of 80 μJ/mm^2.

5. Lasing threshold statistics for lung cancer tissue from China

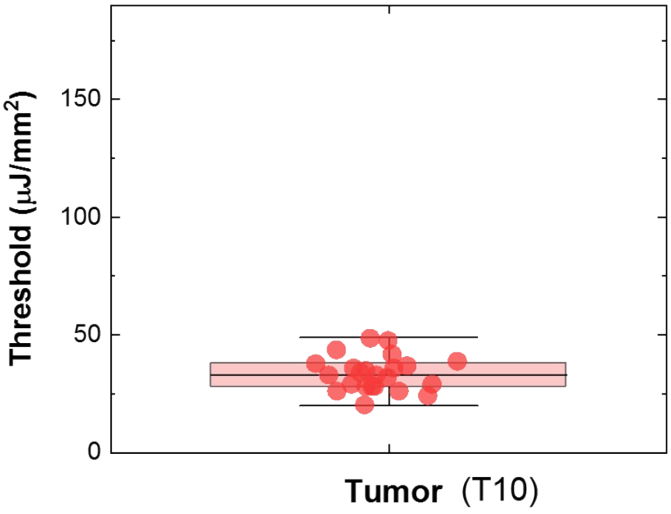

Figure S5. Statistics of the lasing threshold from 25 cells in the cancer lung tissues from China.

6. H&E images for normal/cancer tissues used in Fig. 7

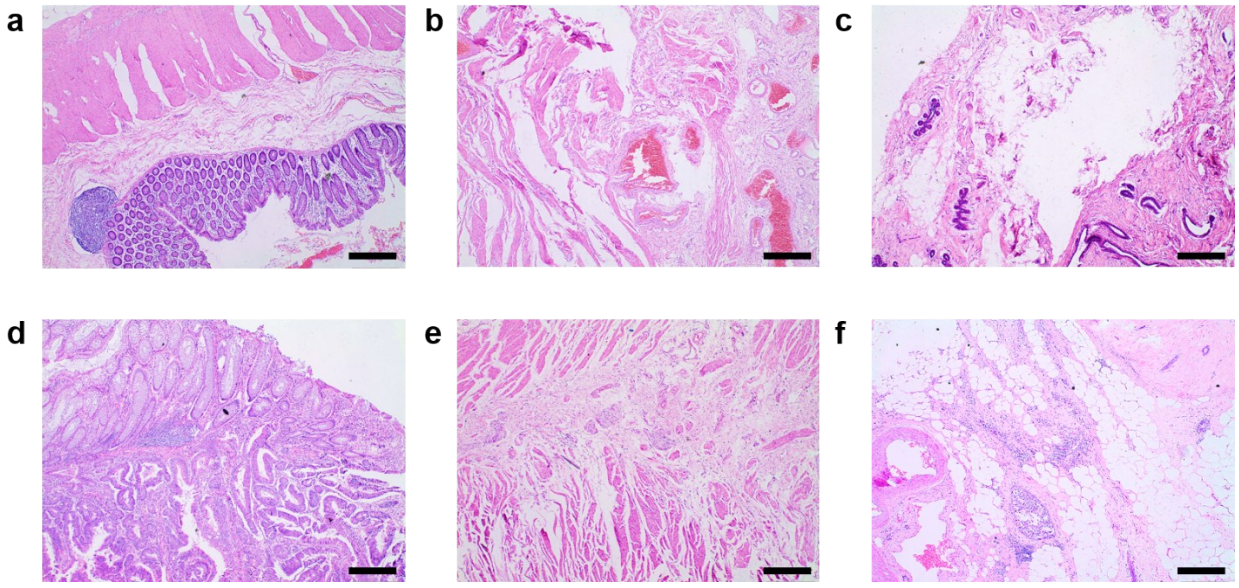

Figure S6. a-c, H&E images of normal (a) colon, (b) stomach, and (c) breast ductal tissue. **d-f,** H&E images of cancer (d) colon, (e) stomach, and (f) breast tissue. All scale bars, 200 μm.

7. Lasing threshold plots for different cancer tissues in Fig. 7

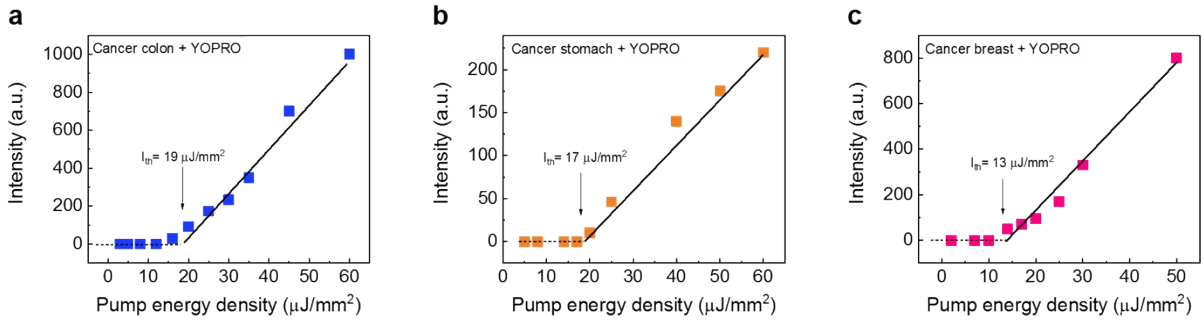

Figure S7. a-c, Spectrally integrated laser output as a function of pump energy density for a representative (a) colon cancer, (b) stomach cancer, and (c) breast ductal cancer tissue, respectively. Solid lines show the linear fit above the threshold. Excitation wavelength = 470 nm. [YOPRO]= 0.1 mM. Tissue thickness= 5 μm.

8. ROC curve for different cancer tissues in Fig. 7

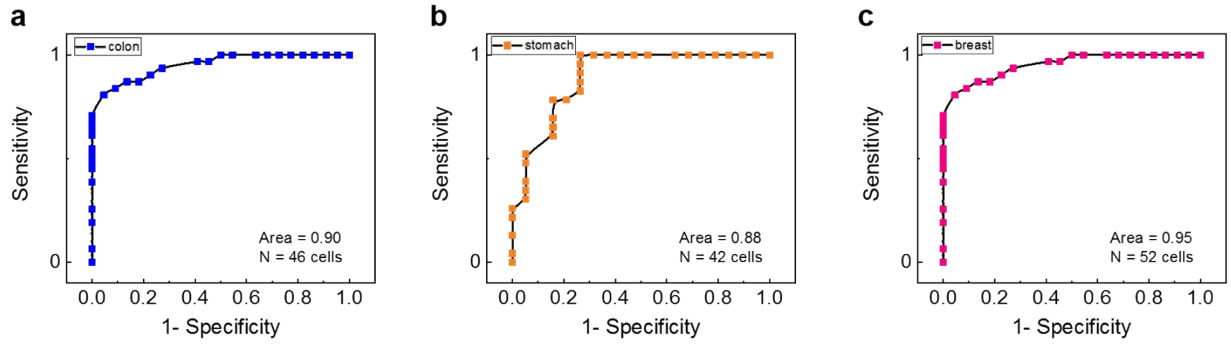

Figure S8. a-c, Receiver Operating Characteristics (ROC) curve for (a) colon, (b) stomach, and (c) breast ductal tissue based on Figs. 7d-f.

Supplementary Table 1

No.	Tissue origin	Patient No.	Thickness	Tissue information
N1	Lung (normal)	Patient A (U.S.)	10 μm, 5 μm	N/A
N2	Lung (normal)	Patient B (U.S.)	10 μm, 5 μm	N/A
N3	Lung (normal)	Patient C (U.S.)	10 μm, 5 μm	N/A
N4	Lung (normal)	Patient D (U.S.)	10 μm, 5 μm	N/A
N5	Lung (normal)	Patient E (U.S.)	10 μm, 5 μm	N/A
N6	Lung (normal)	Patient F (U.S.)	10 μm	N/A
N7	Lung (normal)	Patient G (U.S.)	10 μm, 5 μm	N/A
T1	Lung (cancer)	Patient A (U.S.)	10 μm, 5 μm	unspecified
T2	Lung (cancer)	Patient B (U.S.)	10 μm, 5 μm	squamous cell carcinoma
T3	Lung (cancer)	Patient C (U.S.)	10 μm, 5 μm	adenocarcinoma
T4	Lung (cancer)	Patient H (U.S.)	10 μm, 5 μm	squamous cell carcinoma
T5	Lung (cancer)	Patient I (U.S.)	10 μm	squamous cell carcinoma
T6	Lung (cancer)	Patient J (U.S.)	10 μm, 5 μm	squamous cell carcinoma
T7	Lung (cancer)	Patient K (U.S.)	10 μm, 5 μm	adenocarcinoma
T8	Lung (cancer)	Patient L (U.S.)	10 μm	adenocarcinoma
T9	Lung (cancer)	Patient M (U.S.)	10 μm	adenocarcinoma
T10	Lung (cancer)	Patient N (China)	5 μm	needle biopsy
CN1	Colon (normal)	Patient O (China)	5 μm	N/A
CN2	Colon (normal)	Patient P (China)	5 μm	N/A
CT1	Colon (cancer)	Patient O (China)	5 μm	adenocarcinoma
CT2	Colon (cancer)	Patient P (China)	5 μm	adenocarcinoma
SN1	Stomach (normal)	Patient Q (China)	5 μm	N/A
SN2	Stomach (normal)	Patient R (China)	5 μm	N/A
ST1	Stomach (cancer)	Patient Q (China)	5 μm	unspecified
ST2	Stomach (cancer)	Patient R (China)	5 μm	unspecified
BN1	Breast (normal)	Patient S (China)	5 μm	N/A
BN2	Breast (normal)	Patient T (China)	5 μm	N/A
BT1	Breast (cancer)	Patient S (China)	5 μm	ductal carcinoma
BT2	Breast (cancer)	Patient T (China)	5 μm	ductal carcinoma