**Supplementary Figure and Legend**

Supplymentary Figure 1. Positive rate of CTC sample test.

**Supplymentary Figure 2. Flow analysis of CTC sample detection.**
Supplementary Table 1. The number of CTCs for each enrolled patient.

| NO  | CTC number per 4ml PB | CT (diameter mm) | Density     | Type       |
|-----|-----------------------|------------------|-------------|------------|
| 1   | 1                     | 0.9              | Solid nodule| Malignant  |
| 2   | 4                     | 2                | Subsolid nodule | Malignant  |
| 3   | 11                    | 0.8              | Subsolid nodule | Malignant  |
| 4   | 7                     | 0.6              | Subsolid nodule | Malignant  |
| 5   | 20                    | 1.1              | Solid nodule  | Malignant  |
| 6   | 6                     | 1.7              | Subsolid nodule | Malignant  |
| 7   | 14                    | 1.3              | Subsolid nodule | Malignant  |
| 8   | 6                     | 1.2              | Solid nodule  | Malignant  |
| 9   | 10                    | 0.6              | Subsolid nodule | Malignant  |
| 10  | 1                     | 2                | Subsolid nodule | Malignant  |
| 11  | 8                     | 2                | Solid nodule  | Malignant  |
| 12  | 2                     | 2                | Solid nodule  | Malignant  |
| 13  | 3                     | 1                | Solid nodule  | Malignant  |
| 14  | 4                     | 2                | Solid nodule  | Malignant  |
| 15  | 8                     | 1.5              | Subsolid nodule | Malignant  |
| 16  | 4                     | 1.9              | Solid nodule  | Malignant  |
| 17  | 6                     | 0.6              | Subsolid nodule | Malignant  |
| No. | Diameter | Subsolidity | Type       | Status  |
|-----|----------|-------------|------------|---------|
| 18  | 1.6      | Subsolid    | Nodule     | Malignant |
| 19  | 1.5      | Subsolid    | Nodule     | Malignant |
| 20  | 1.0      | Solid       | Nodule     | Malignant |
| 21  | 2.0      | Solid       | Nodule     | Malignant |
| 22  | 1.1      | Solid       | Nodule     | Malignant |
| 23  | 1.9      | Subsolid    | Nodule     | Malignant |
| 24  | 1.8      | Subsolid    | Nodule     | Malignant |
| 25  | 1.0      | Subsolid    | Nodule     | Malignant |
| 26  | 0.8      | Subsolid    | Nodule     | Malignant |
| 27  | 1.5      | Subsolid    | Nodule     | Malignant |
| 28  | 1.3      | Subsolid    | Nodule     | Malignant |
| 29  | 1.3      | Subsolid    | Nodule     | Malignant |
| 30  | 1.2      | Solid       | Nodule     | Malignant |
| 31  | 1.5      | Subsolid    | Nodule     | Malignant |
| 32  | 1.1      | Subsolid    | Nodule     | Malignant |
| 33  | 1.5      | Subsolid    | Nodule     | Malignant |
| 34  | 1.6      | Subsolid    | Nodule     | Malignant |
| 35  | 1.0      | Subsolid    | Nodule     | Malignant |
| 36  | 1.4      | Solid       | Nodule     | Malignant |
| 37  | 0.8      | Subsolid    | Nodule     | Malignant |
| 38  | 1.3      | Solid       | Nodule     | Malignant |
| 39  | 1.4      | Solid       | Nodule     | Malignant |
| 40  | 0.5      | Subsolid    | Nodule     | Malignant |
| 41  | 0.9      | Subsolid    | Nodule     | Malignant |
| 42  | 1.2      | Solid       | Nodule     | Malignant |
| 43  | 1.9      | Solid       | Nodule     | Malignant |
| 44  | 1.9      | Subsolid    | Nodule     | Malignant |
| 45  | 1.3      | Solid       | Nodule     | Malignant |
| 46  | 1.3      | Subsolid    | Nodule     | Malignant |
| 47  | 2.0      | Subsolid    | Nodule     | Malignant |
| 48  | 2.0      | Subsolid    | Nodule     | Malignant |
| 49  | 0.7      | Subsolid    | Nodule     | Malignant |
| 50  | 1.3      | Solid       | Nodule     | Malignant |
|   |   |   |                  |     |
|---|---|---|------------------|-----|
| 51| 5 | 1.4| Subsolid nodule  | Malignant |
| 52| 2 | 2  | Subsolid nodule  | Malignant |
| 53| 0 | 1  | Subsolid nodule  | Malignant |
| 54| 3 | 2  | Solid nodule     | Malignant |
| 55| 6 | 1.8| Solid nodule     | Malignant |
| 56| 0 | 1.3| Solid nodule     | Malignant |
| 57| 2 | 1.9| Solid nodule     | Malignant |
| 58| 2 | 1.9| Solid nodule     | Malignant |
| 59| 40| 1.5| Solid nodule     | Malignant |
| 60| 3 | 1.7| Solid nodule     | Malignant |
| 61| 6 | 1  | Solid nodule     | Malignant |
| 62| 9 | 1.9| Subsolid nodule  | Malignant |
| 63| 10| 1.8| Solid nodule     | Malignant |
| 64| 14| 1.1| Subsolid nodule  | Malignant |
| 65| 4 | 1  | Solid nodule     | Malignant |
| 66| 0 | 2  | Solid nodule     | Malignant |
| 67| 6 | 1.2| Solid nodule     | Malignant |
| 68| 2 | 1.5| Subsolid nodule  | Malignant |
| 69| 2 | 1.9| Solid nodule     | Malignant |
| 70| 2 | 1.5| Solid nodule     | Malignant |
| 71| 7 | 1.8| Solid nodule     | Malignant |
| 72| 47| 2  | Solid nodule     | Malignant |
| 73| 1 | 1.8| Solid nodule     | Malignant |
| 74| 8 | 1.7| Solid nodule     | Malignant |
| 75| 2 | 1.6| Subsolid nodule  | Malignant |
| 76| 4 | 1.3| Subsolid nodule  | Malignant |
| 77| 1 | 1.1| Subsolid nodule  | Malignant |
| 78| 11| 1  | Solid nodule     | Malignant |
| 79| 7 | 0.8| Subsolid nodule  | Malignant |
| 80| 3 | 1.2| Subsolid nodule  | Malignant |
| 81| 0 | 1  | Subsolid nodule  | Malignant |
| 82| 2 | 1  | Subsolid nodule  | Malignant |
| 83| 40| 1  | Subsolid nodule  | Malignant |
|    | #   | DIA |    |       |     |
|----|-----|-----|----|-------|-----|
| 84 | 3   | 1.5 | Solid nodule | Malignant |
| 85 | 5   | 1.6 | Subsolid nodule | Malignant |
| 86 | 7   | 1.2 | Subsolid nodule | Malignant |
| 87 | 6   | 1.6 | Solid nodule | Malignant |
| 88 | 6   | 1.2 | Subsolid nodule | Malignant |
| 89 | 4   | 2   | Subsolid nodule | Malignant |
| 90 | 1   | 1   | Solid nodule | Benign |
| 91 | 0   | 1.6 | Solid nodule | Benign |
| 92 | 1   | 1.2 | Solid nodule | Benign |
| 93 | 0   | 1.4 | Solid nodule | Benign |
| 94 | 0   | 2   | Solid nodule | Benign |
| 95 | 0   | 2   | Solid nodule | Benign |
| 96 | 1   | 0.7 | Solid nodule | Benign |
| 97 | 1   | 0.8 | Subsolid nodule | Benign |
| 98 | 0   | 1.1 | Solid nodule | Benign |
| 99 | 3   | 0.4 | Solid nodule | Benign |
| 100| 0   | 1.6 | Solid nodule | Benign |
| 101| 3   | 0.8 | Subsolid nodule | Benign |
| 102| 1   | 1   | Solid nodule | Benign |
| 103| 0   | 0.6 | Solid nodule | Benign |
| 104| 0   | 2   | Solid nodule | Benign |
| 105| 0   | 0.8 | Solid nodule | Benign |
| 106| 12  | 1.5 | Solid nodule | Benign |
| 107| 1   | 2   | Solid nodule | Benign |
| 108| 1   | 1.8 | Solid nodule | Benign |
| 109| 1   | 1.1 | Subsolid nodule | Benign |
| 110| 1   | 1.1 | Subsolid nodule | Benign |
| 111| 0   | 0.6 | Subsolid nodule | Benign |
| 112| 6   | 1.5 | Subsolid nodule | Benign |
| 113| 0   | 1.5 | Solid nodule | Benign |
| 114| 1   | 2   | Solid nodule | Benign |
| 115| 0   | 1.4 | Solid nodule | Benign |
| 116| 3   | 1.1 | Solid nodule | Benign |
|   |   |   |   |
|---|---|---|---|
| 117 | 1 | 1.4 | Subsolid nodule |
| 118 | 1 | 1.9 | Solid nodule |
| 119 | 1 | 1.1 | Solid nodule |
| 120 | 0 | 2 | Solid nodule |

Supplementary Table 2. ROC analysis of CTCs in the pulmonary nodule patients with different diameter.

|                      | All patients | ≤1cm nodule | 1-2 cm nodule |
|----------------------|--------------|-------------|--------------|
| AUC                  | 0.843        | 0.798       | 0.858        |
| 95%Cl                | 0.759-0.927  | 0.644-0.952 | 0.753-0.963  |
| Best Cut-off Value   | 1.5          | 1.5         | 1.5          |
| Sensitivity          | 0.8539       | 0.7727      | 0.8806       |
| Specificity          | 0.8387       | 0.7778      | 0.8636       |
| Negative Predictive Value | 0.6667    | 0.5833      | 0.7037       |
| Positive Predictive Value | 0.9383    | 0.8947      | 0.9516       |
| True Positive Rate   | 0.8539       | 0.7727      | 0.8806       |
| False Positive Rate  | 0.1613       | 0.2222      | 0.1364       |
| True Negative Rate   | 0.8387       | 0.7778      | 0.8636       |
| False Negative Rate  | 0.1461       | 0.22723     | 0.1194       |
| False Discovery Rate | 0.0617       | 0.1053      | 0.0484       |
| Accuracy             | 0.85         | 0.7742      | 0.8764       |
| Precision            | 0.9383       | 0.8947      | 0.9516       |
| Youden Index         | 1.6926       | 1.5505      | 1.7442       |

Supplementary Table 3. Correlations between CTCs and tumor biomarkers.

|                      | CTC correlation |
|----------------------|-----------------|
|                      | Pearson r | 95% CI          | p      |
| CEA (n=86)           | 0.11       | -0.108 to 0.312 | 0.33   |
| NSE (n=89)           | 0.08       | -0.127 to 0.287 | 0.44   |
| pro-GRP (n=88)       | -0.08      | -0.282 to 0.135 | 0.48   |
| CYRFA21-1 (n=89)     | -0.03      | -0.234 to 0.182 | 0.80   |
| Diameter (n=89)      | -0.02      | -0.224 to 0.1193| 0.88   |
Supplementary Table 4. ROC analysis of the number of CTCs, the expression levels of CEA, NSE, pro-GRP, and CYFRA21-1 in the pulmonary nodule patients enrolled.

|               | AUC    | 95% CI   | Accuracy | Precision | Youden Index | p      |
|---------------|--------|----------|----------|-----------|--------------|--------|
| CTCs          | 0.843  | 0.759-0.927 | 0.85     | 0.9383    | 1.6926       | /      |
| CEA           | 0.524  | 0.412-0.637 | 0.4417   | 0.8929    | 1.1841       | <0.0001|
| NSE           | 0.530  | 0.414-0.646 | 0.5      | 0.8537    | 1.1997       | <0.0001|
| pro-GRP       | 0.502  | 0.375-0.629 | 0.7083   | 0.77      | 1.1232       | <0.0001|
| CYFRA21-1     | 0.559  | 0.445-0.673 | 0.4333   | 0.8621    | 1.1519       | 0.0001 |