



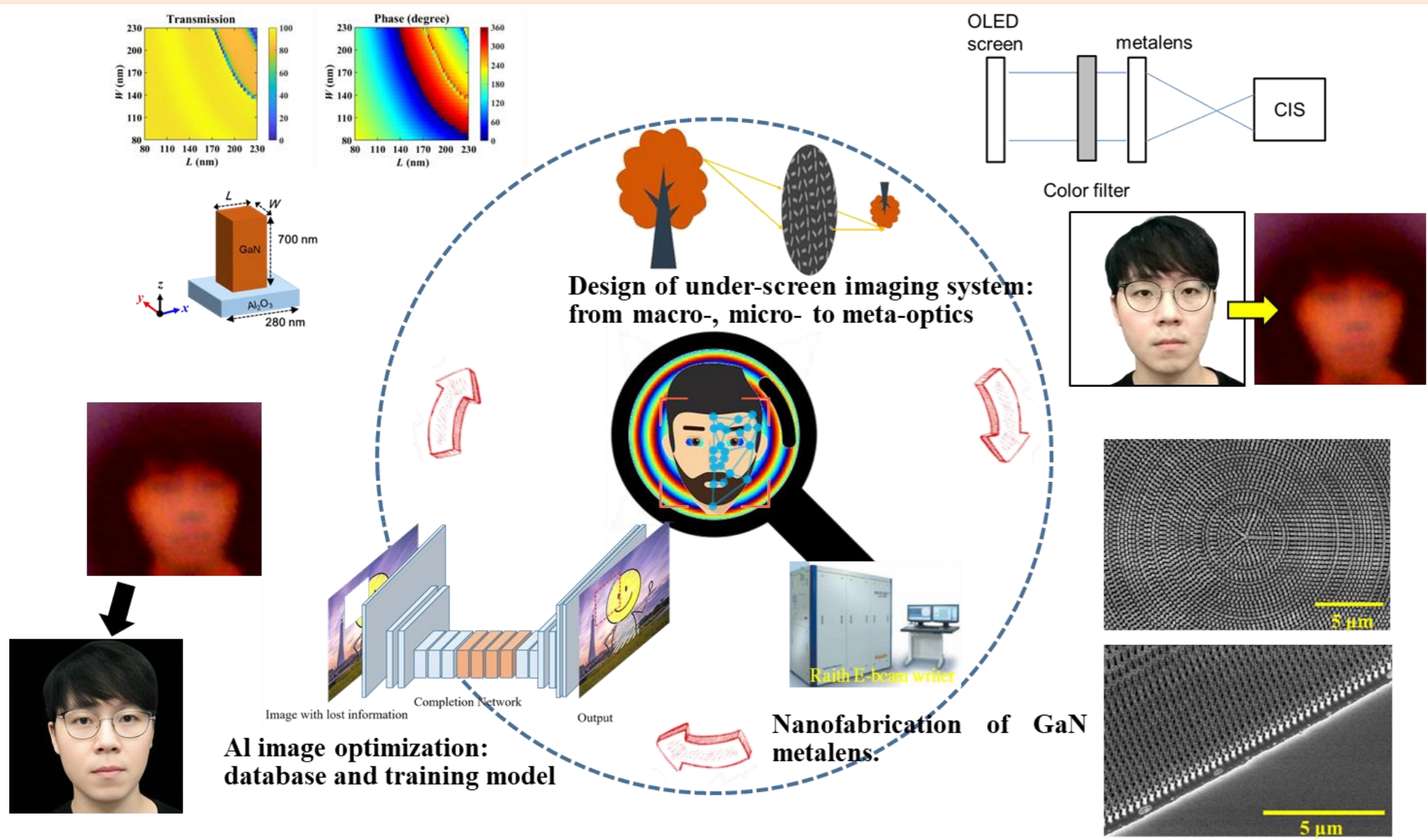
# 人工智慧影像優化之屏下顯示超穎光學系統 III

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## 【Target and progress】



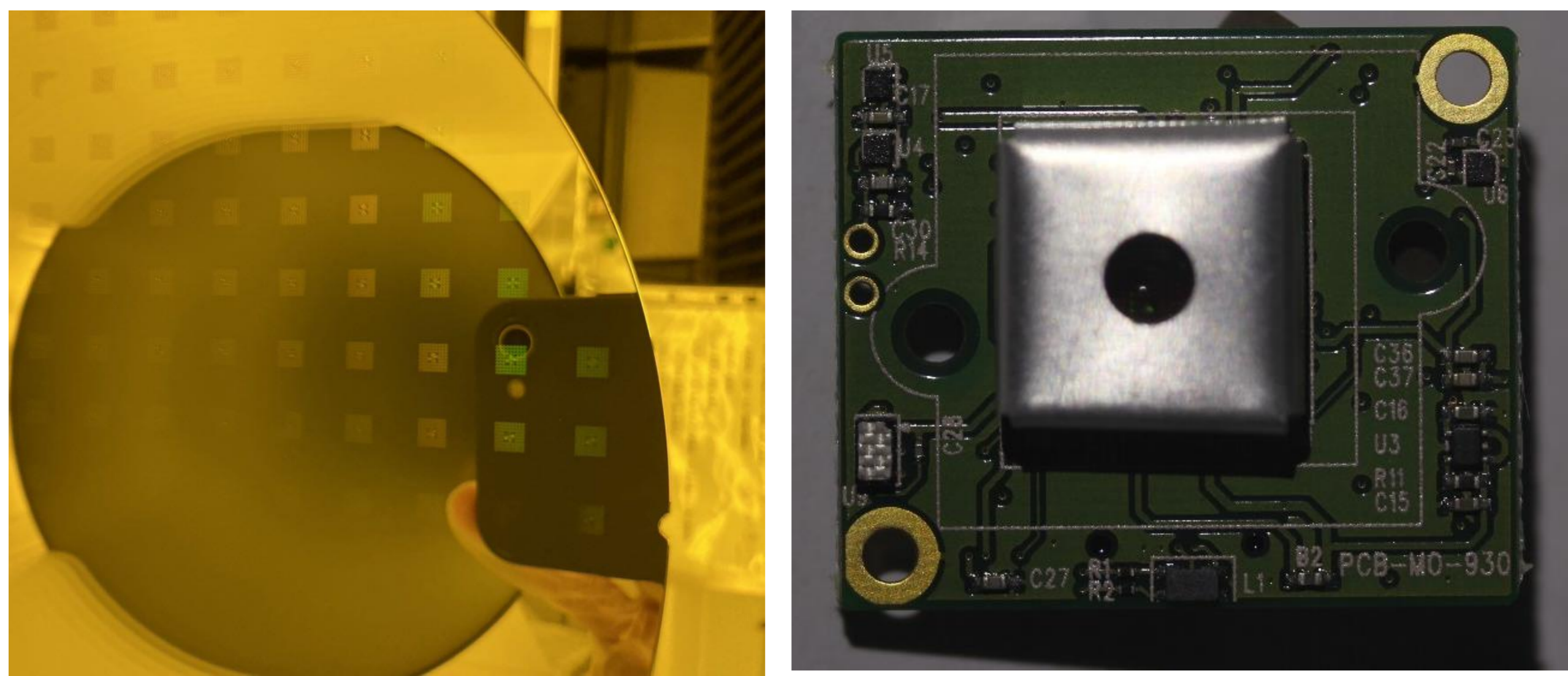
| TR    | L | Work Item*  | Year & Month |     |      |      |     |
|-------|---|---|--------------|-----|------|------|-----|
|       |   |   | 2-4          | 5-7 | 8-10 | 11-1 | 2-4 |
| TR1.1 |   | Item A: Design of under-screen imaging system: from macro-, micro- to meta-optics                                   |              |     |      |      |     |
| TR1.2 |   | A1: Phase segment design of diffraction-limited metalens: diffraction limited. Working distance < 2 mm. N.A. > 0.45 |              |     |      |      |     |
| TR1.3 |   | A2: Unit cell design: transmission efficiency > 85%, uniformity of phase modulation +/- 5%                          |              |     |      |      |     |
| TR1.4 |   | A3: EM wave analysis of diffraction-limited metalens  |              |     |      |      |     |
| TR1.5 |   | A4: Large FOV metalens: FOV > 45°   |              |     |      |      |     |
| TR1.6 |   | A5: Wave-optics-based stray light analysis of meta-optics system  |              |     |      |      |     |
| TR1.7 |   | A6: system evaluation of under-screen imaging module: measurement system  |              |     |      |      |     |
| TR2.1 |   | Item B: Nanofabrication of low-cost nitride-based metalens on glass   |              |     |      |      |     |
| TR2.2 |   | B1: Fabrication of silicon mold for metalens: Aspect ratio > 10:1, linewidth < 100 nm                               |              |     |      |      |     |

【計畫甘特圖】

| TR    | L | Work Item*   | Year & Month |     |      |      |     |
|-------|---|--|--------------|-----|------|------|-----|
|       |   |  | 2-4          | 5-7 | 8-10 | 11-1 | 2-4 |
| TR3.1 |   | Item B: Nanofabrication of low-cost nitride-based metalens on glass                                    |              |     |      |      |     |
| TR3.2 |   | B2: Pattern transferring: glass-based mold for low-temperature deposition of GaN                       |              |     |      |      |     |
| TR3.3 |   | B3: Low-temperature sputtered GaN: mirror-like, deposition temperature < 400 oC. RMS roughness < 10 nm |              |     |      |      |     |
| TR4.1 |   | Item C: AI image optimization: database and training model   |              |     |      |      |     |
| TR4.2 |   | C1: Establish of training database: number of training images > 1000 pcs.                              |              |     |      |      |     |
| TR4.3 |   | C2: GANs-free CNN Training model: Image repair   |              |     |      |      |     |

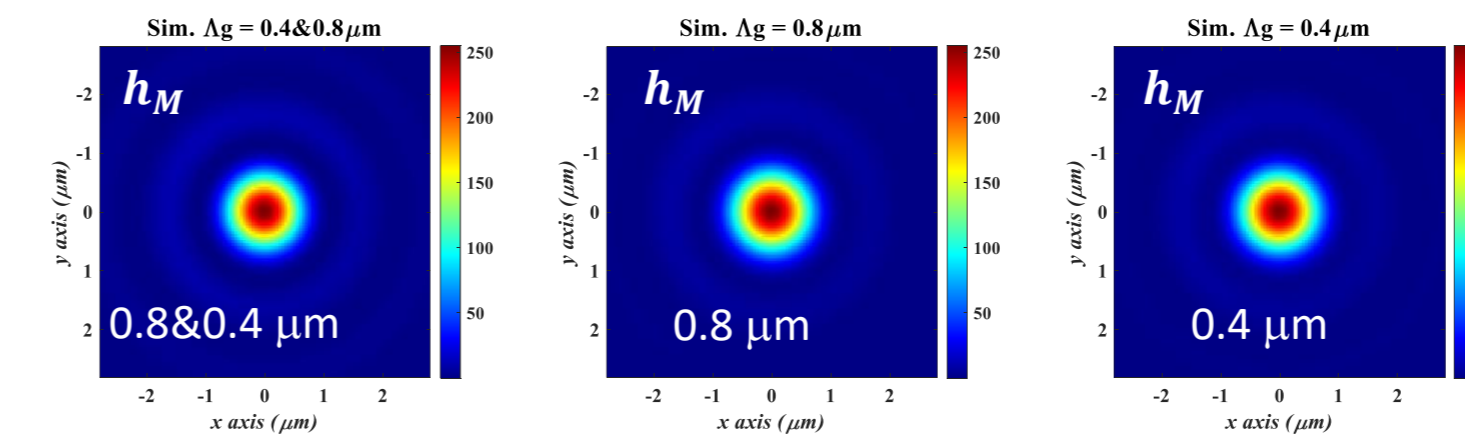
## 【Low cost wafer level metalens】

### ▶ Wafer level metalens & metalens module

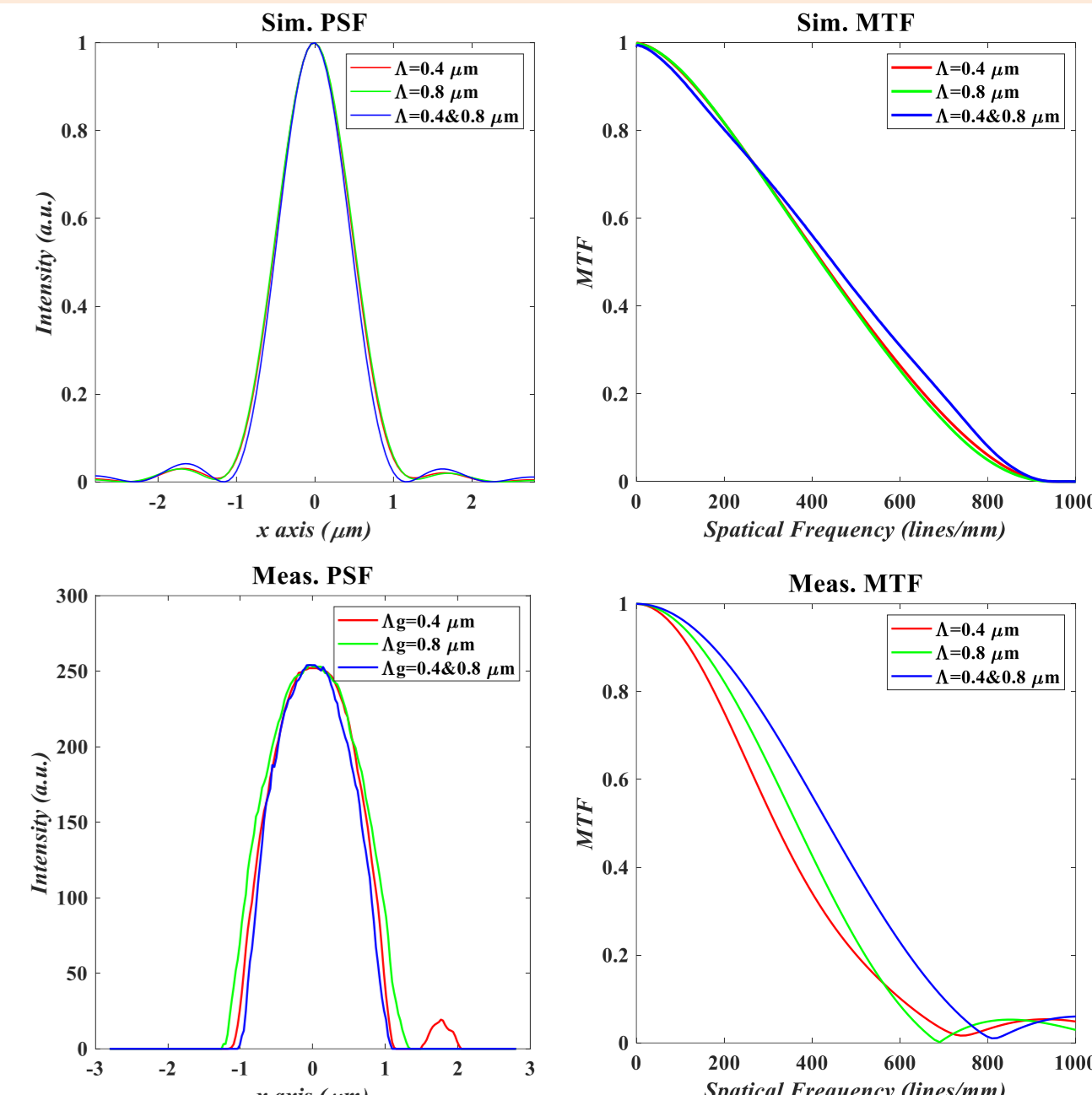
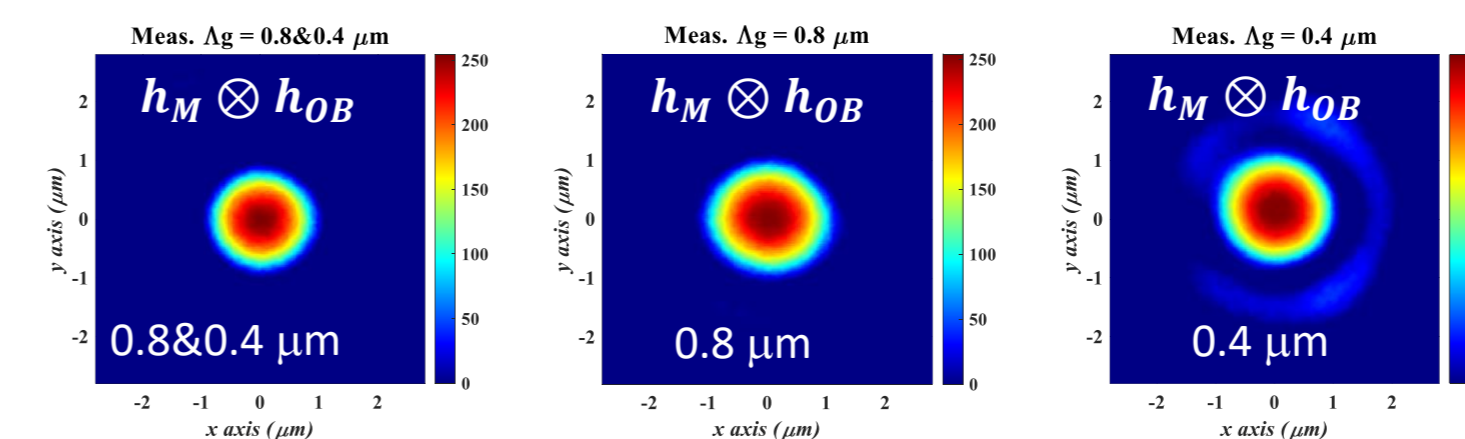


### ▶ Optical property of metalens for 940 nm application 采鈺科技產學案

#### ● Simulation of focal spot

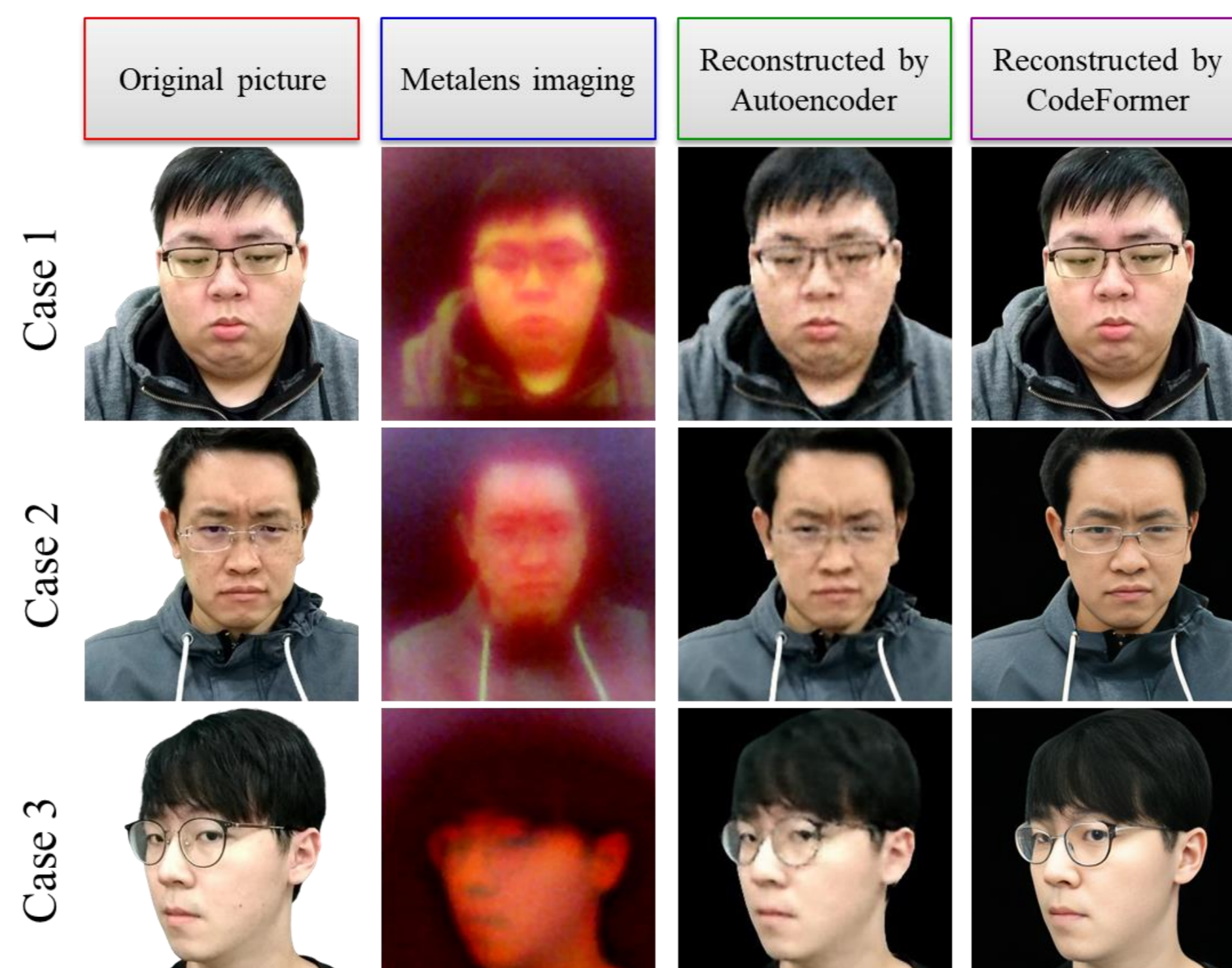
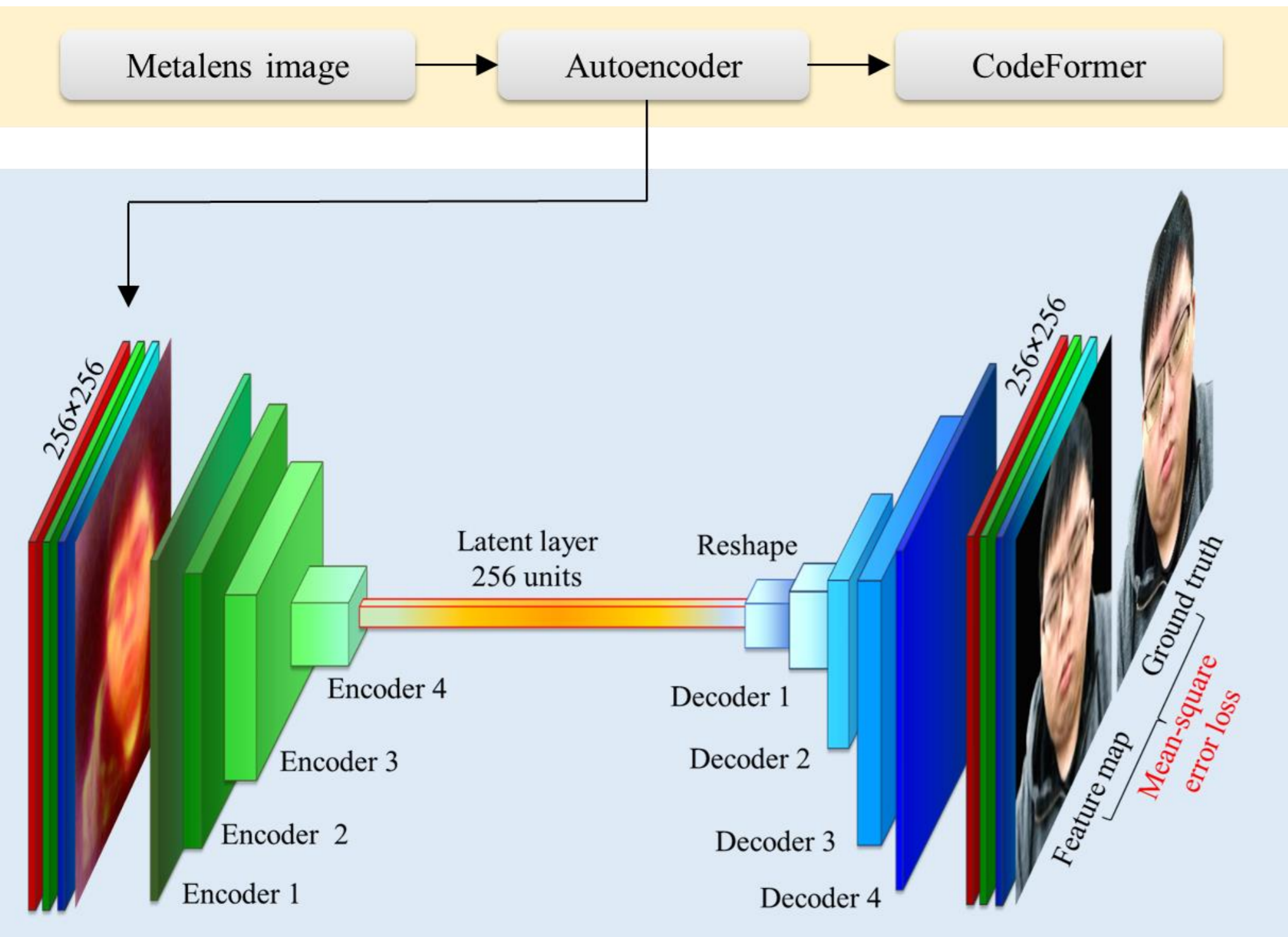


#### ● Measurement of focal spot

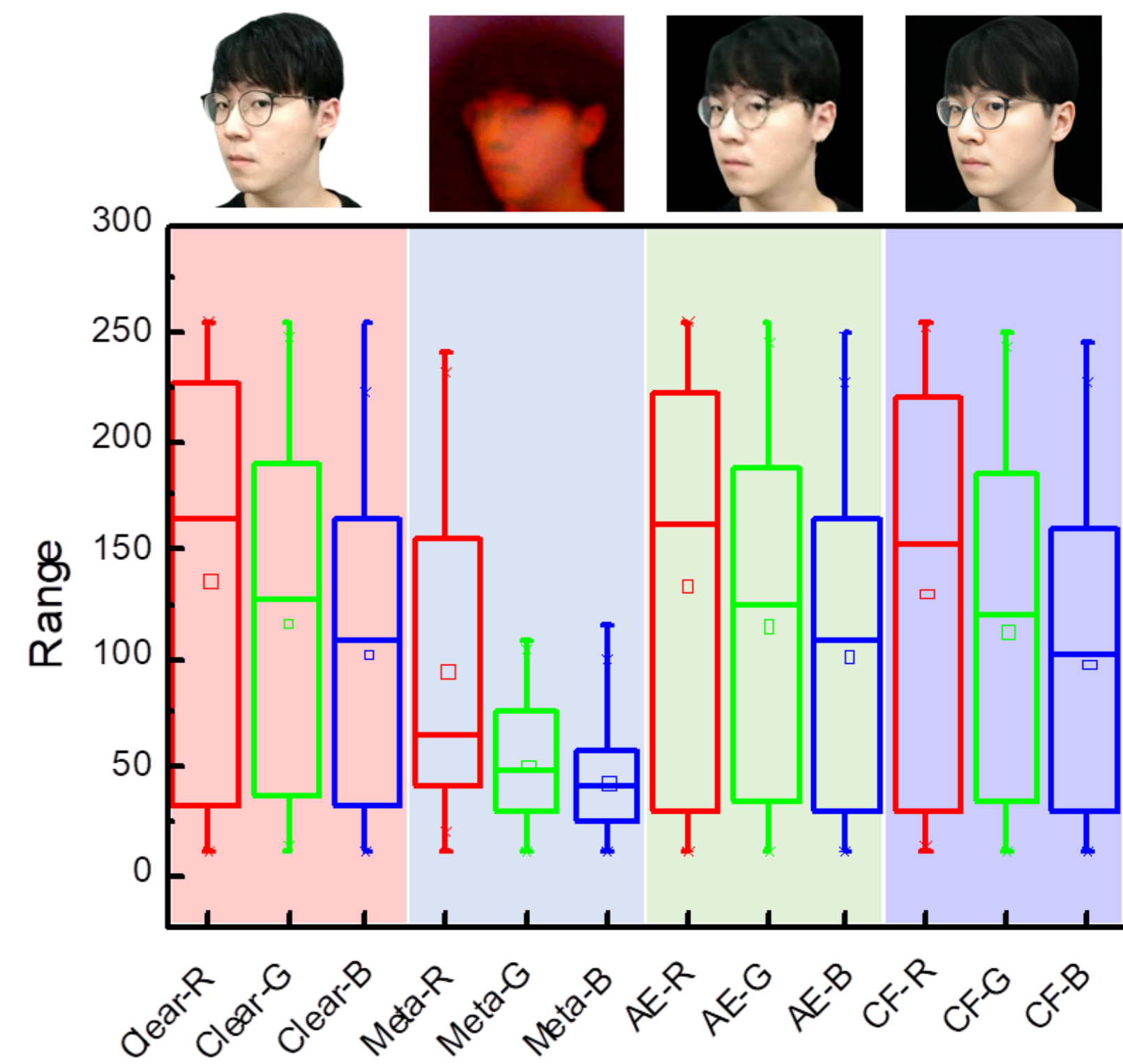


## 【Sequential AI model-empowered metalens imaging.】

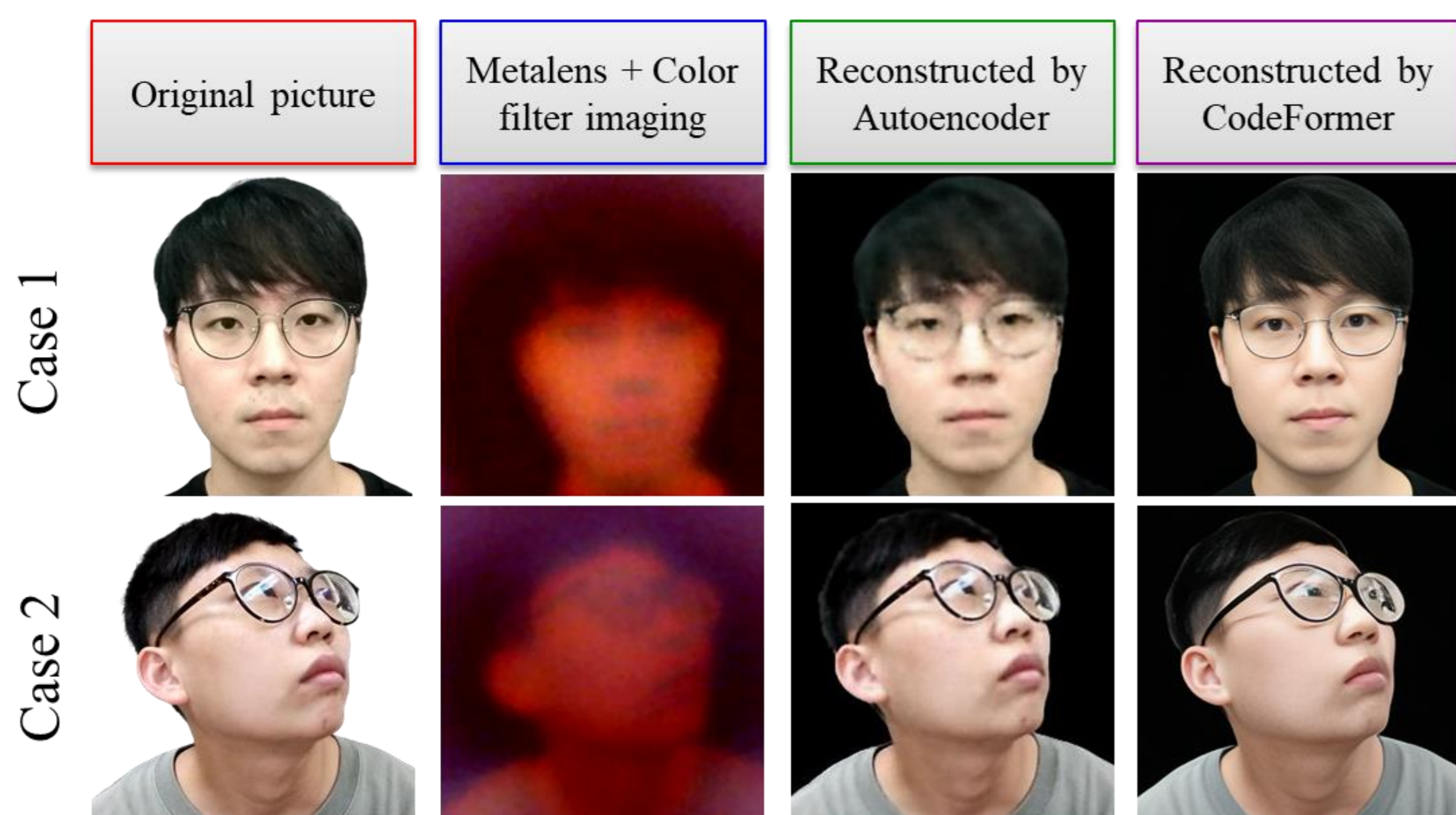
### ▶ Sequential AI models restore images capture by metalens



### ▶ Boxchart of the R, G, and B pixel value distributions



## 【Under screen imaging demonstration】



## 【Commercialization of thermal metalens】

獲得國科會萌芽計畫補助

六吋基板上的熱影像超穎透鏡

