

# README

---

*For Light coupling to photonic integrated circuits using optimized lensed fibers*

## FIGURE 3


---

- Folder: `./Figure3`


### Code&Data

---


#### 1. `all_exp_data.mat`

- **Description:**  Data for the coupling efficiency experimental result.
  - **Parameters:**
    - *Chip*: chip ID;
    - *process*: process of the taper
    - $(D, w, h)$ : in the same meaning as the manuscript;
    - $(\eta_{TE}, \eta_{TM})$ :  $\eta$  tested in TE and TM polarization.
  - **Generated by:** Experimental result using methods described in Appendix F.
  - **Usage:** Used for plotting Figure 3a, 3d, and Table I.

#### 2. `gpr_data.mat`


- **Description:**  Data for the Gaussian process regression fitting model.
  - **Parameters:**
    - *process*: process of the taper
    - $(D, h)$ : in the same meaning as the manuscript;
    - *pol*: polarization;
    - *gpr*: fitting model result;
    - *projector*: parameter that converts design width to width measured by SEM.
  - **Generated by:** the Gaussian process regression method in MATLAB.
  - **Usage:** Used for plotting Figure 3a and 3d.

#### 3. `RM_recorder.mat`


- **Description:**  Data for the transmission simulation of taper.
  - **Parameters:**
    - *process*: process of the taper
    - $(D, h)$ : in the same meaning as the manuscript;

- *pol*: polarization;
  - *result\_matrix*:  $\zeta_{\text{fun}}$  described in the manuscript;
  - *w\_list*:  $w$  related to the row of *result\_matrix*;
  - *D\_lit*:  $D$  related to the column of *result\_matrix*.
- **Generated by:** The methods described in Appendix D.
- **Usage:** Used for plotting Figure 3a and 3d, and Table I .


#### 4. `T_f_data.mat`

- **Description:**  Data for the simulated transmission from fiber to the air.
  - **Parameters:**
    - *D\_list*:  $D$  related tot *T\_f\_list*;
    - *T\_f\_list*: transmission from fiber to the air with  $D$  in *D\_list*.
- **Generated by:** The methods described in Appendix D.
- **Usage:** Used for plotting Figure 3a and 3d, and Table I .

#### 5. `Trans_D2_h320.mat`

- **Description:**  Data for the transmission experiment of 320 nm subtractive taper with various  $w$ .
  - **Parameters:**
    - *w%d*: transmission expermental data with  $w = \%d = 300, 380, \text{ or } 440$  (nm);
    - *w%d.freq*: transmission frequency;
    - *w%d.CE*: transmission for each frequency.
- **Generated by:** Experimental result using methods described in Appendix F.
- **Usage:** Used for plotting Figure 3c.

#### 6. `Plot_eta.m`

- **Description:**  Code for plotting the simulated and experimental  $\eta$  distribution of different  $D$  values and tapers with varying  $w$ .
- **Input:** `all_exp_data.mat`, `RM_recorder.mat`, `gpr_data.mat`, `T_f_data.mat` and  $(D, h, process, pol)$ .
- **Usage:** Used for plotting Figure 3a and 3d.

## Notes

1. Run the `.m` scripts in MATLAB with the corresponding `.mat` files.
2. The MATLAB version is suggested to be higher than R2022b with the superclass CompactRegressionGP.