ISSN: 2754-4753

Journal of Physics & Optics Sciences

SCIENTIFIC Research and Community

Review Article

Open Access

New Deeper Mysteries of Double Slit Experiments: Novel Optical Experiments Demanding New Theoretical Interpretation

Hui Peng

James Peng Lab, Fremont, CA, USA

ABSTRACT

We show the following: the characteristics of the interference patterns of the optics slit experiments:
(1). depend on whether the slits are parallel; (2) depend on whether the slits are straight lines or curves; (3) independent on whether there are missing segments at the intersection of, for example, cross-double-slit. The complete interpretation is a challenge and will motivate further development of optics.

***Corresponding author**
Hui Peng, James Peng Lab, Fremont, CA, USA.

Received: April 24, 2026; **Accepted:** May 04, 2026; **Published:** May 10, 2026

Keywords: Double-Slit, Non-Parallel-Double-Slit, Curve-Double-Slit, Curve-Non-Parallel-Double-Slit, Curve Single Slit, Interference Pattern, Hybrid Interference Pattern, Point-Symmetry Interference Pattern, Butterfly-Shape Interference Pattern, Optics-Butterfly-Effect

Introduction

The straight single slit and straight parallel double slit experiments are basic experiments in the optics and physics, and are foundation of the wave-particle duality/quantum theory. In those experiments, the single slit is straight lines and the double-slit is straight line and parallel. Feynman referred to the double slit experiment as the mystery of the optics/quantum mechanics. To study the mystery of the double slit experiments further, in this article, we show more mysteries of new phenomena/experiments of curve-single-slit, single-ring, non-parallel-double slit, curve-parallel-double slit, curve-non-parallel-double slit, and double-ring. We show the following: the characteristics of the interference patterns of the optics slit Experiments depend on: (1) whether the slits are straight-lines or curve-lines; (2) whether slits are parallel or non-parallel; and independent on whether there are missing segments at the intersection of, for example, cross-double-slit.

The straight-parallel-double-slit has no variable; the straight-non-parallel-double-slit has one variable, the angle; the curve-parallel-double-slit has one variable, the curvature; the curve-non-parallel-double-slit has two variables, the angle and curvature.

Regular and Irregular Slit Experiments

Experimental Setup

All of experiments in this Section have the same Experimental setup (Figure 1):

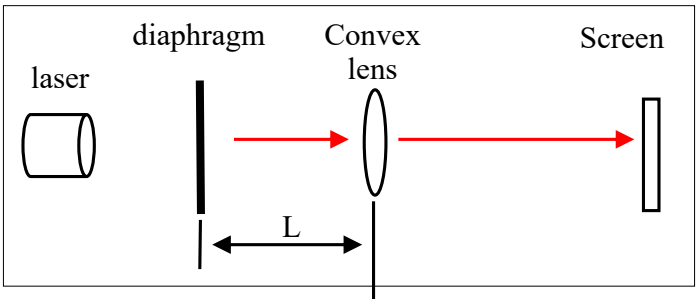


Figure 1: Experimental setup: with lens placed at different positions between diaphragm and detector. **Note:** (1) the diaphragm represents one of slits.
(2) the lens does not change the input pattern, namely, the output pattern is the same as the input pattern.

Straight-Single-Slit vs. Curve-Single-Slit.

The straight-single-slit has no variable. The Curve-single-slit has a variable, i.e., the radian (rad) (Figure 2).

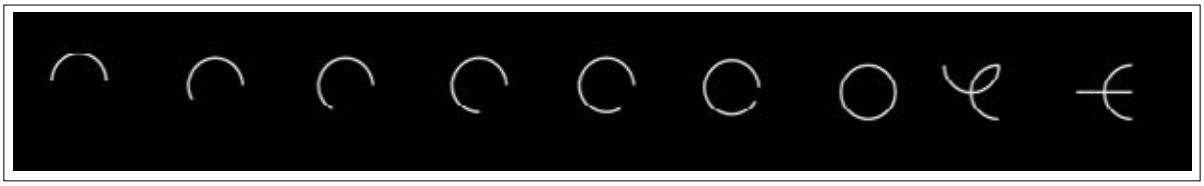


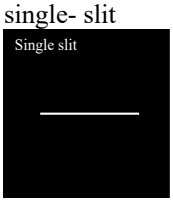
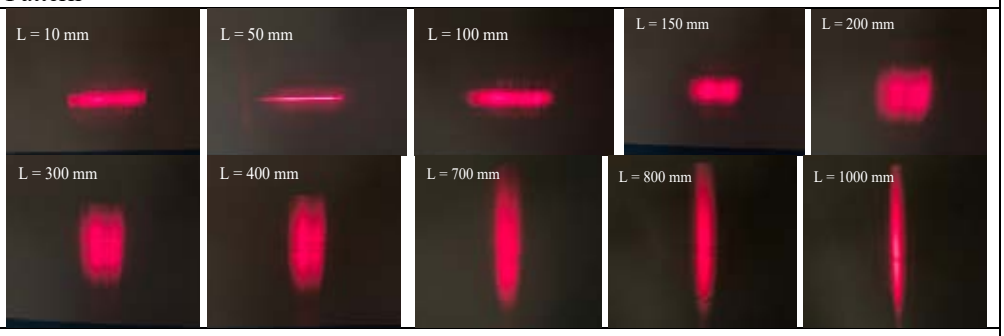
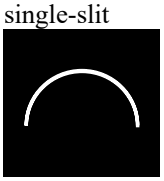
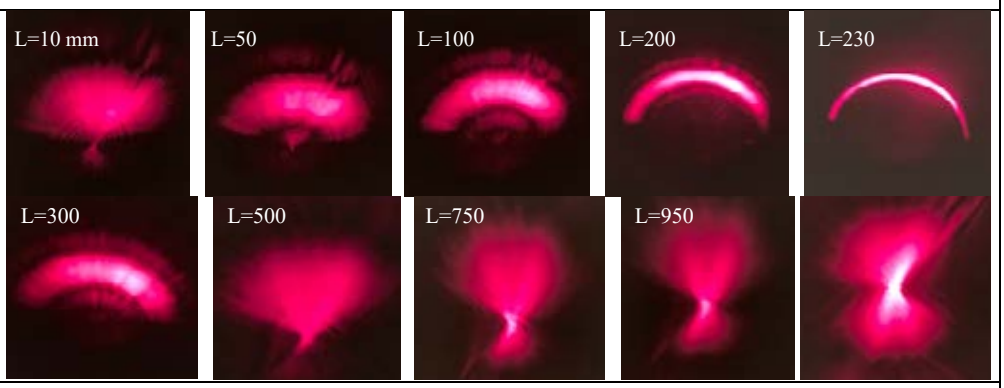
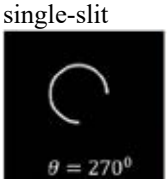
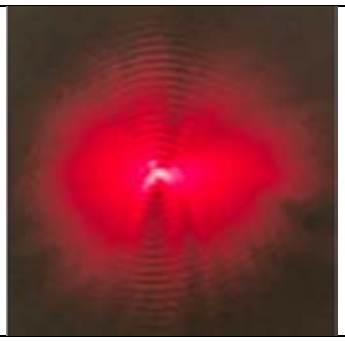
Figure 2: Curve-single-slit with different radians

Note: in this article, we assume that the radius of curves is constant.

Next, we show: (1) the patterns and the pattern evolution of a straight-single-slit; and (2) the pattern evolution and the radian-dependence of the patterns of the curve-single-slits.

Experiment-1: Pattern and pattern evolution of a straight-single-slit and curve-single-slit with different radians.

Table 1: Straight Single Slit and Curve Single Slit

Slit	Pattern
Straight-single- slit 	
180^0 curve-single-slit 	
270^0 curve-single-slit 	

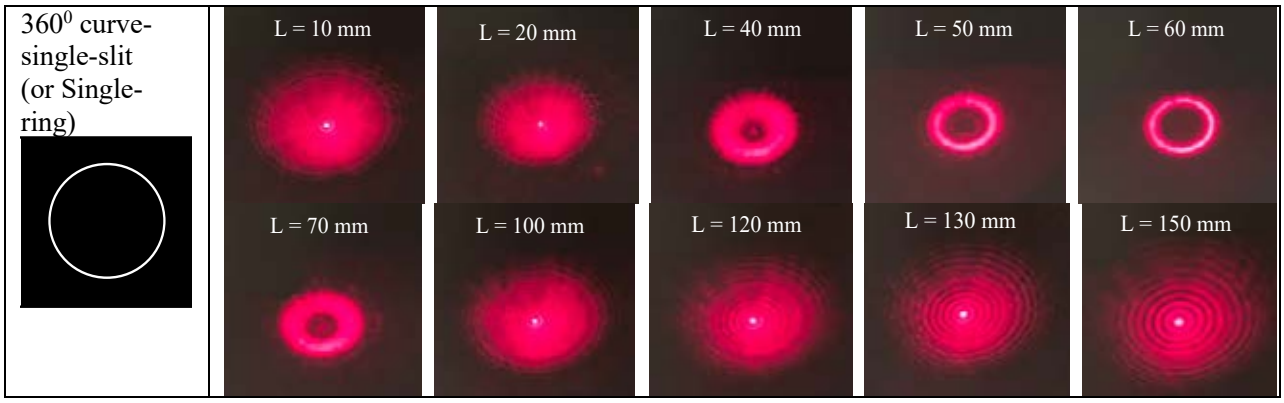


Table 1 shows the patterns and the pattern evolutions of both the straight single slit and the curve single slits. The patterns are profoundly different: the pattern of a straight single slit is one dimension, while the patterns of the curve-single-slits are two dimensions. The patterns are curvature dependent.

Cross-Straight-Single-Slit vs Cross-Curve-Single-Slit

Next, let us compare a cross-straight-single-slit and a cross-curve-single-slit.

Experiment-2 (Table 2). Pattern and pattern evolution of a cross-straight-single-slit and cross-curve-single-slit.

Table 2: Cross-Straight-Single-Slit and Cross-Curve-Single-Slit

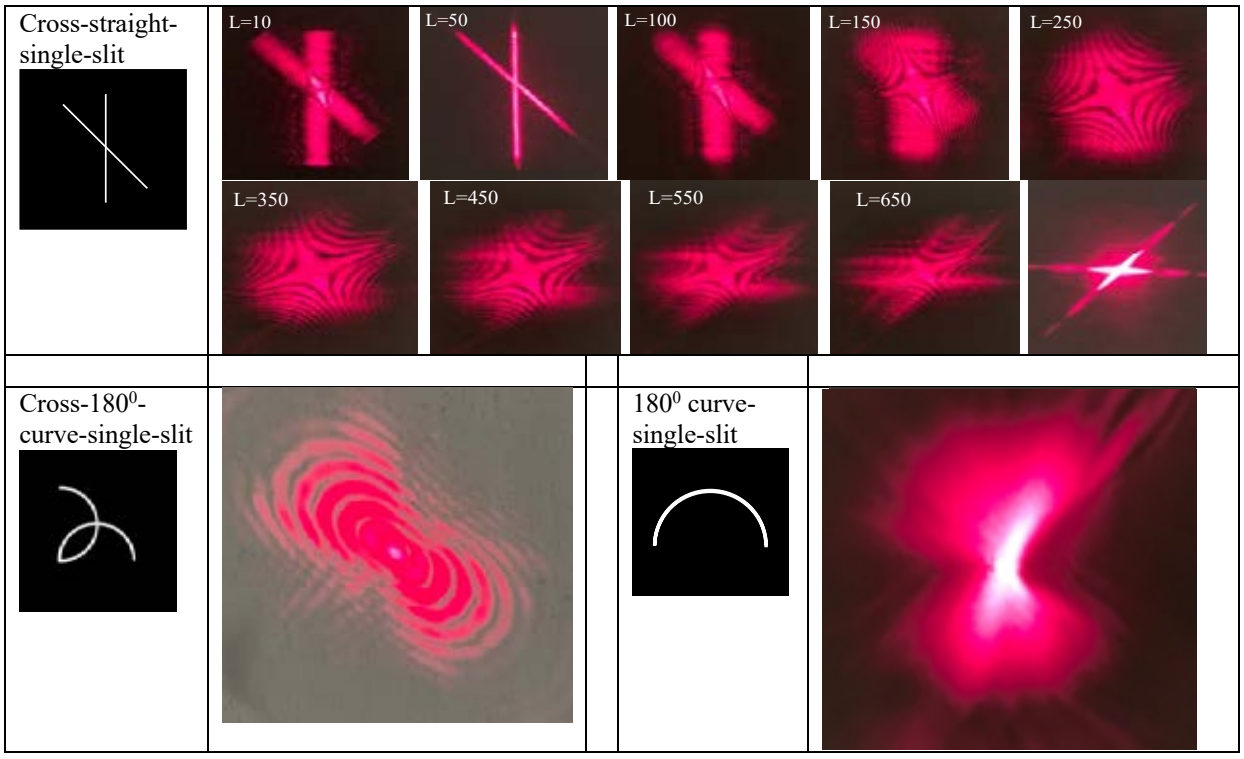
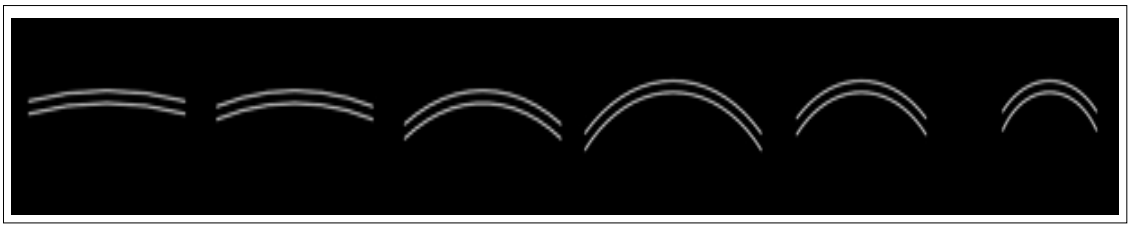


Table 2 show the following: the pattern of the cross-curve-single-slit is a complicated interference pattern, and complicate than both the patterns of the cross-straight-single-slit, and the patterns of the curve-single-slit. Three patterns are completely different.

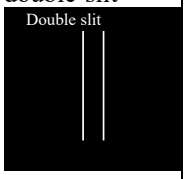
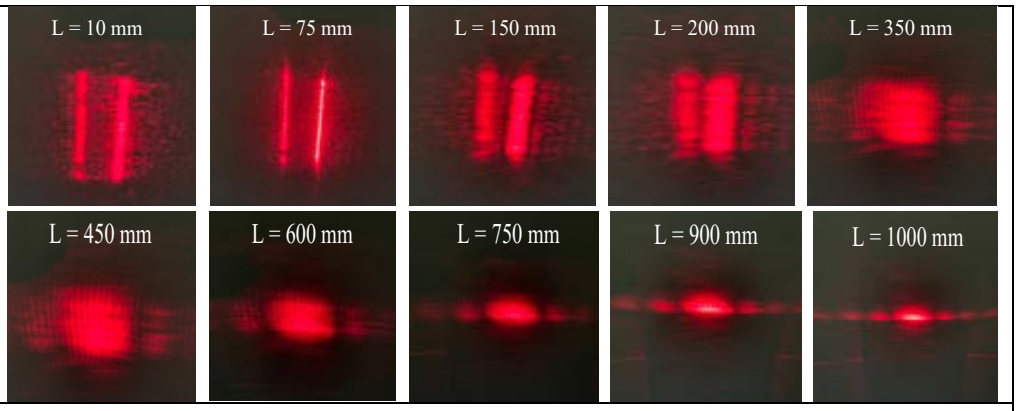
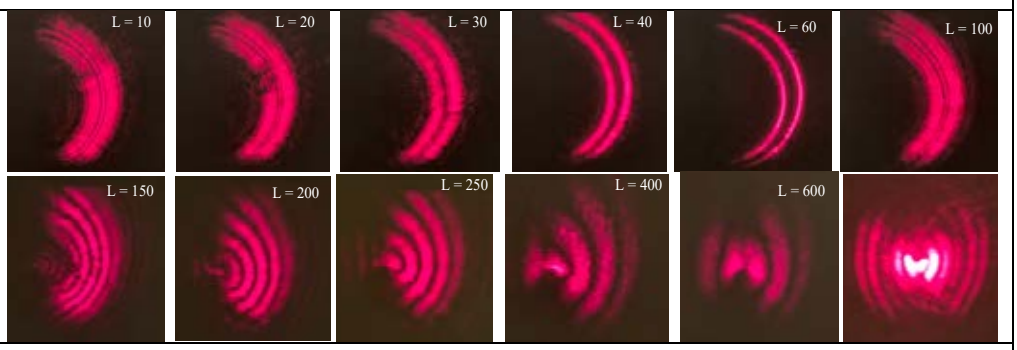
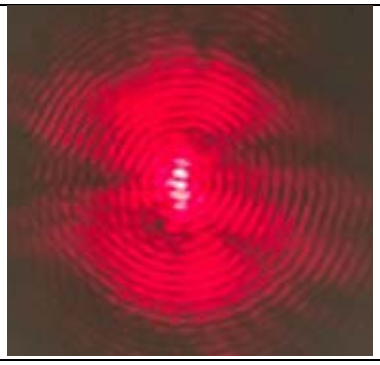
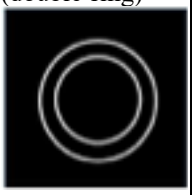
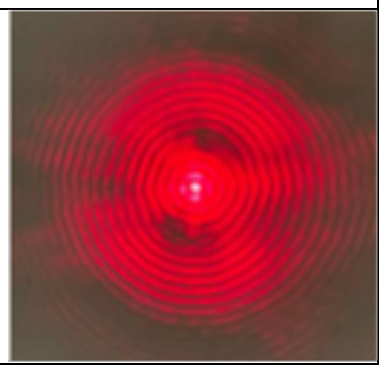
Straight-Parallel-Double-Slit vs. Curve-Parallel-Double-Slit

Let us consider the pattern and pattern evolution of Curve-Parallel-Double-Slit (Figure 3)

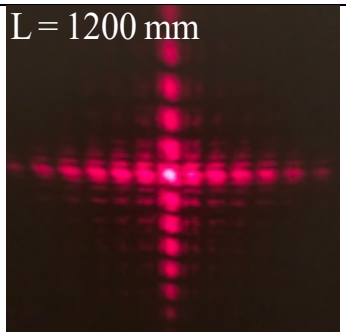
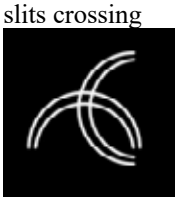


Experiment-3: Straight-double slit experiment and Curve-double-slit Experiments

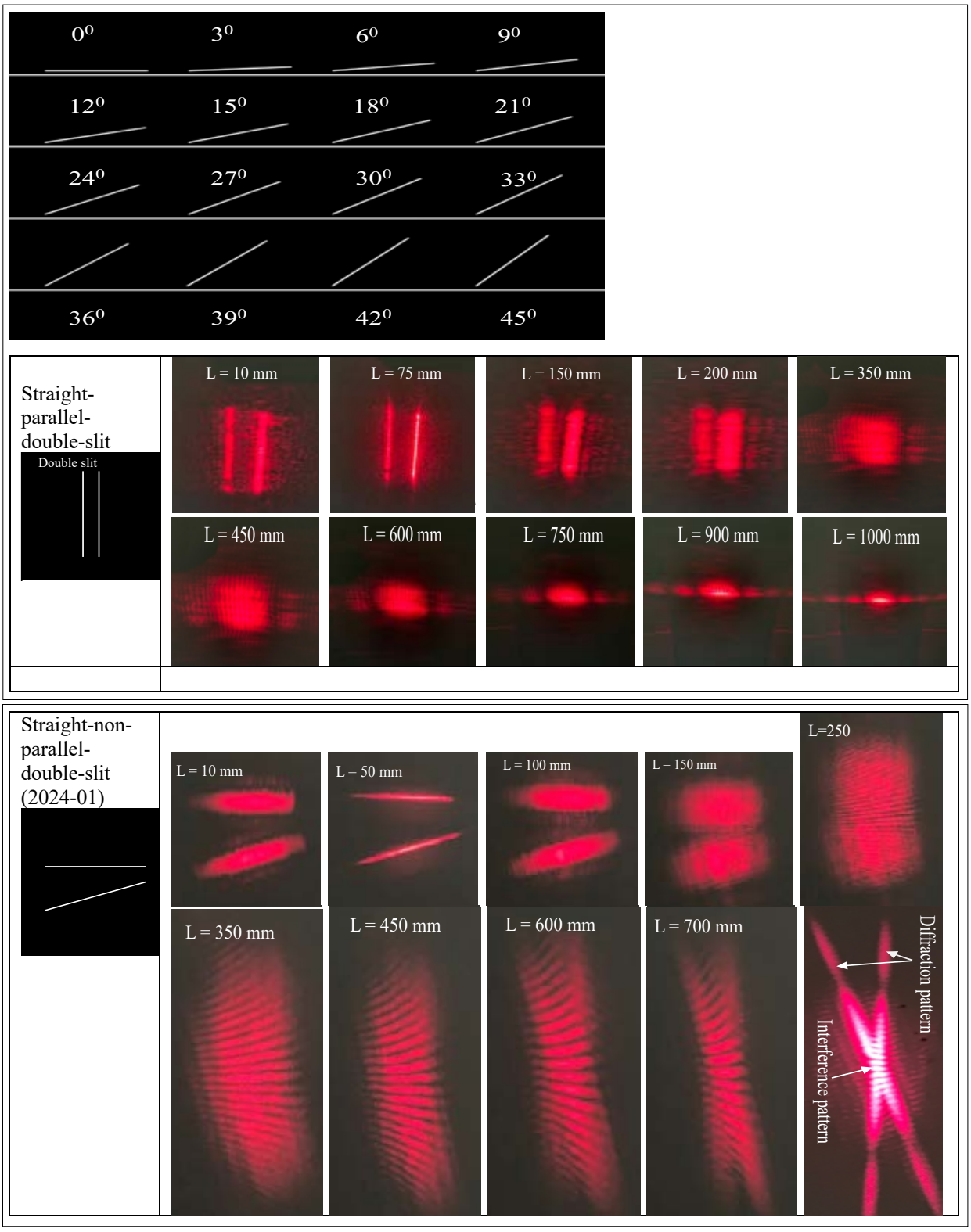
Table 3: Pattern and Pattern-Evolution of Curve-parallel-double-slit

Straight-parallel-double-slit 	
Curve-parallel-double-slit 90^0 	
Curve-parallel-double-slit 270^0 	
Curve-parallel-double-slit 360^0 (double-ring) 	

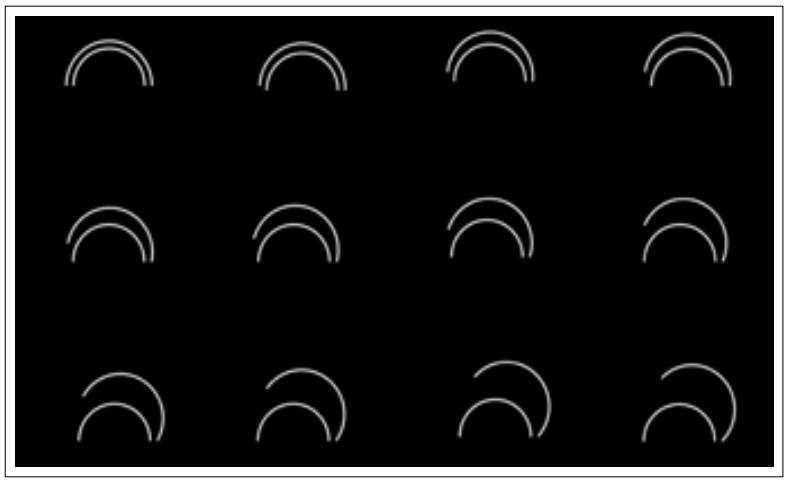
Cross-Straight-Parallel-Double-Slit vs Cross-Curve-Parallel-Double-Slit

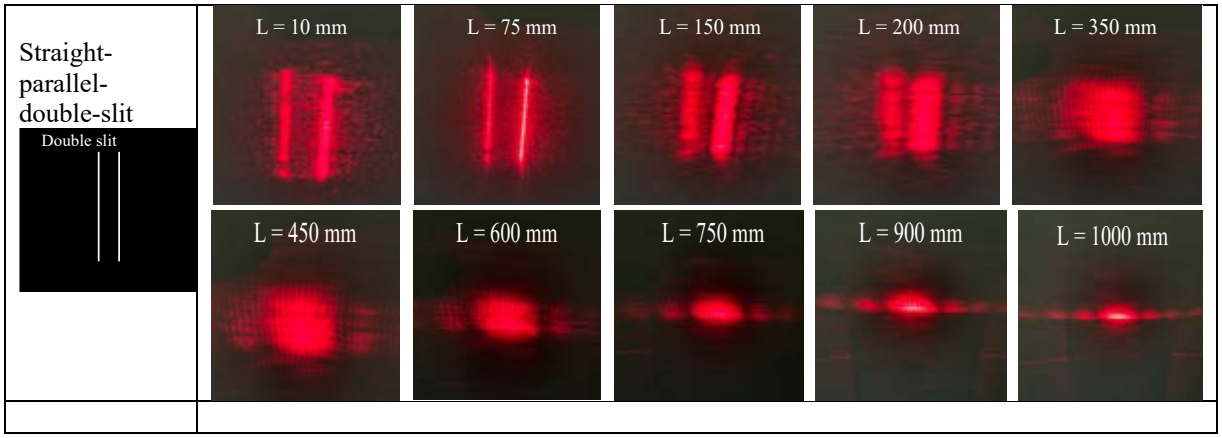
Two straight-parallel-double-slits crossing 	
Two curve-parallel-double-slits crossing 	

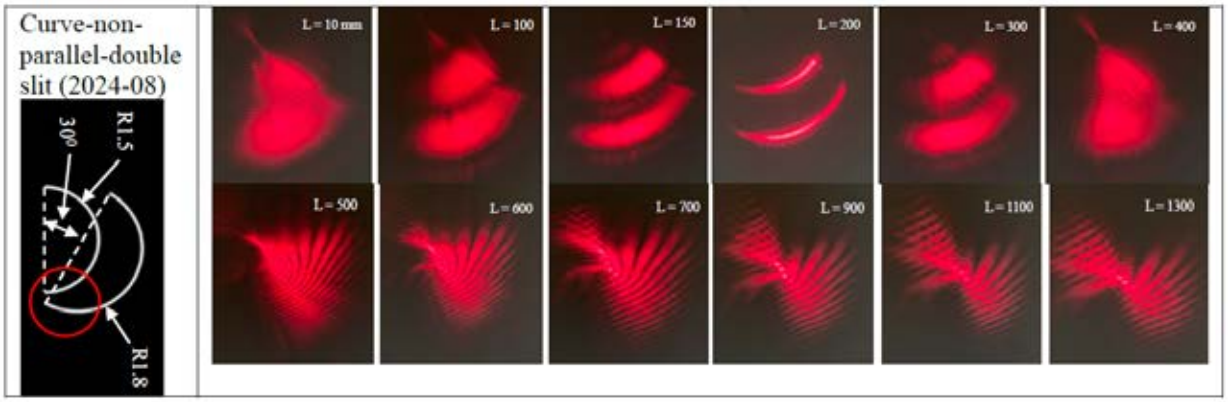
Straight-Parallel-Double-Slit vs. Straight-Non-Parallel-Double-Slit



Straight-Parallel-Double-Slit vs. Curve-Non-Parallel-Double-Slit

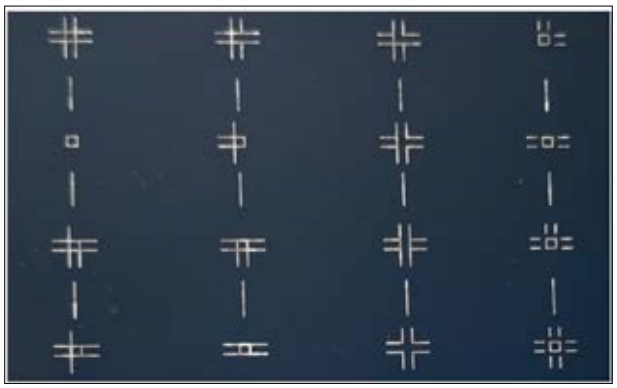






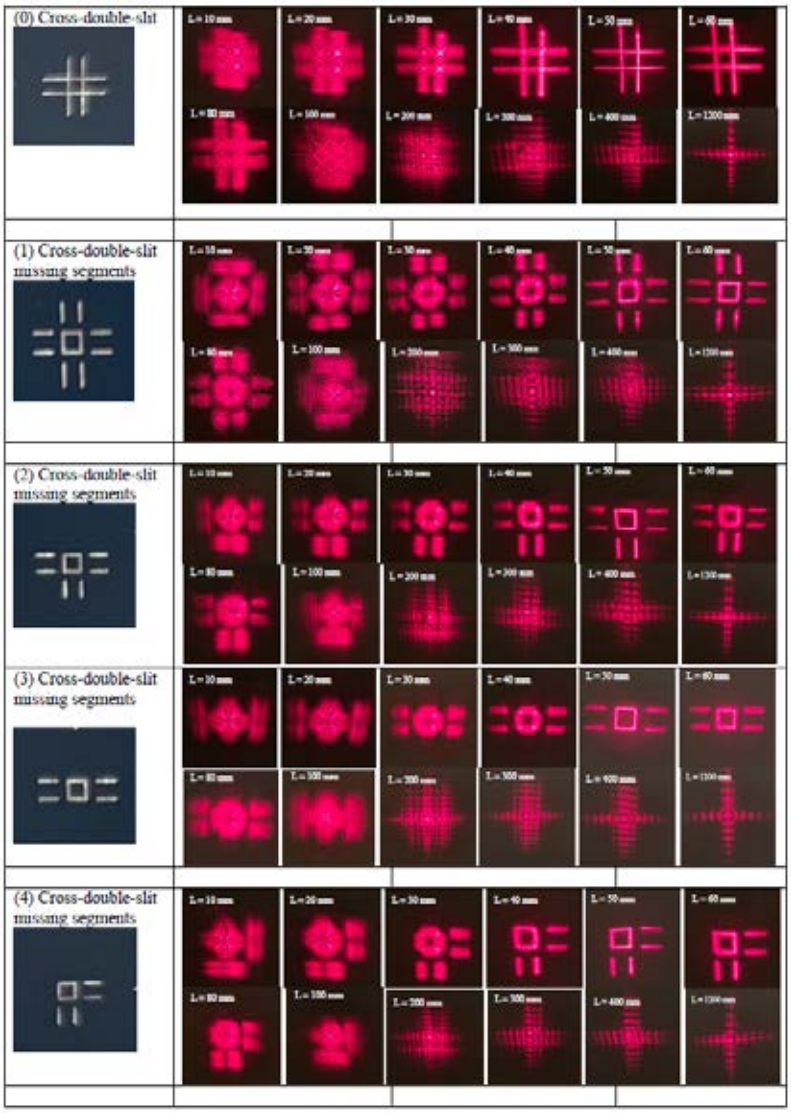
Missing Segments of Each Slit Do Not Affect Final Interference Patterns at Far-Detector

In this Section, utilize the fact that each slit of the cross double slit (a double slit crossing a double slit) is divided into three segments by other two slits crossing.



We experimentally show the function of each segment of each slit in producing both non-interference patterns (including Pre-Particle patterns, Particle patterns and Transition Patterns) and the Interference patterns by eliminate the segment respectively and then, compare with the patterns of the standard cross double slit experiment. Although the non-interference patterns of the different modified cross double slits are obviously different, the final interference patterns are surprisingly similar. This phenomenon is a new mystery and needs a consistent theoretical interpretation. In the case of applying the interference patterns of the cross-double-slit diaphragms, this phenomenon allows a bigger tolerance on the defect of making the cross-double-slit diaphragm.

Table 2: Function of each segment of a slit in producing patterns




(5) Cross-double-slit missing segments
(6) Cross-double-slit missing segments
(7) Cross double slit missing segments
(8) Cross-double-slit missing segments
(9) Cross-double-slit missing segments