



## Scientists Learn to Switch Donut-Shaped Light for Future Wireless Signals | Stable Donut-Shaped Light Could Change the Future of Wireless Communication

### Description

Researchers have created a device that switches stable donut-shaped light patterns called skyrmions. The breakthrough could improve future wireless and terahertz communication systems.

### How Donut-Shaped Light Could Carry Data More Safely

#### Key Highlights (Quick Look)

- Scientists created a new device that **controls light in a brand-new way**
- The light forms **stable, donut-shaped patterns** called *skyrmions*
- These light patterns can be **switched on command**
- The discovery could improve **future wireless and internet technology**
- It may help build **faster, stronger, and more reliable communication systems**

## What If Light Could Be Twisted Like a Donut? ©

When you think of light, you probably imagine:

- Straight beams
- Flashlights
- Sunlight traveling in lines

But scientists have discovered that light can also be **twisted into swirling shapes**—almost like glowing donuts floating through space!

And now, researchers have learned how to **control and switch** these special light shapes, opening the door to **better wireless technology**.

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This exciting research was reported in **Optica**, a leading science journal about light.

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## Meet Skyrmions: Light That Refuses to Break ð???

The donut-shaped light patterns are called **skyrmions**.

Letâ??s make that simple:

ð??? Imagine a spinning whirlpool in water

ð??© Now imagine the whirlpool is made of light

ð??ª Even if something bumps into it, it keeps its shape

Thatâ??s a **light skyrmion**!

Scientists love skyrmions because they are:

- Extremely **stable**
- Hard to disturb
- Perfect for **carrying information**

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## Why Stability Matters for Wireless Signals ð???

Wireless signals (like Wi-Fi and 5G) often face problems:

- Interference
- Noise
- Obstacles like buildings

If a signal loses its shape, **information can be lost**.

But skyrmions are different.

ð??? They hold their structure even when disturbed

ð??? That makes them great for **reliable data transmission**

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## The Big Breakthrough: Switching Light Modes ð???

Scientists didnâ??t just create skyrmions.

They learned how to **switch between two types**:

- â?¡ **Electric-mode skyrmions**
- ð??² **Magnetic-mode skyrmions**

Think of it like:

Pressing one button to send a text,  
another button to send a videoâ??  
using the *same device*.

This control is crucial for real-world technology.

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## How Did Scientists Do This? ð?§<sup>a</sup>ð??-

Researchers from **Tianjin University** and **Nanyang Technological University** built a tiny but powerful device.

### The secret ingredient?

A **metasurface**.

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## What Is a Metasurface? ð?§

A **metasurface** is:

- Extremely thin
- Made of tiny patterns smaller than a grain of dust
- Designed to **bend and shape light** in unusual ways

Normal lenses canâ??t do what metasurfaces do.

When special laser pulses hit the metasurface:

- Light is reshaped into donut-like vortices
- Changing the laserâ??s â??twistâ?? switches the skyrmion type

Itâ??s like using different keys to unlock different light patterns ð????â??"

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## Super-Fast Light: Terahertz Waves â??j

The skyrmions live in **terahertz light**.

Terahertz waves:

- Sit between microwaves and infrared light
  - Are super fast
  - Could be used for **future internet, imaging, and sensors**
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Scientists believe terahertz communication could one day be **much faster than today's wireless networks**.

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## How Did Scientists Test It? ¶¶¶

To be sure the light behaved correctly, the team:

- Tracked the light as it moved through space
- Measured it at many positions and times
- Confirmed clean switching between modes

The results showed **high accuracy and reliability**, which is essential for technology use.

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## Why This Matters for the Future ¶¶¶

This discovery could help build:

- ¶¶¶ Stronger wireless communication
- ¶¶¶ Faster future internet
- ¶¶¶ Light-based circuits that route signals
- ¶¶¶ New ways to encode information

Instead of fragile signals, future networks could use **tough, twisty light** that keeps working even in noisy environments.

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## ¶¶¶ Big Takeaway

By learning how to twist and switch light into stable donut-shaped patterns, scientists have taken a big step toward **smarter and more reliable wireless technology**.

¶¶¶ **Sometimes, changing the shape of light can change the future.**

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## ¶¶¶ Quick Quiz: Light & Technology

1. What shape do light skyrmions have?

- A) Straight lines
- B) Squares
- C) Donuts
- D) Triangles

2. Why are skyrmions useful for communication?

- A) They are colorful
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- B) They move slowly
- C) They stay stable even when disturbed
- D) They make heat

**3. What thin material helps control the light?**

- A) Plastic sheet
- B) Metasurface
- C) Glass lens
- D) Mirror

**4. What kind of light is used in this research?**

- A) Visible light
- B) X-rays
- C) Terahertz light
- D) Ultraviolet

**5. What can switching light modes help with?**

- A) Making brighter lamps
- B) Encoding information
- C) Cooking food
- D) Charging batteries

**Answers:**

1-C, 2-C, 3-B, 4-C, 5-B

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**Think About This!**

If light can carry information in different shapes, what other hidden "tricks" of nature might help build the technology of tomorrow?

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1. KIDS SCIENCE NEWS

**Tags**

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