

TECHNICAL DOCUMENT — ARTICULATED MICRO-SPHERE OPTICAL CABLES

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1. Introduction

The directional photonic cable is a short-distance optical link (up to **300 feet**) designed for internal photonic systems, directional processors, and photonic routers. It uses **articulated micro-spheres**, **double-funnel couplers**, and **directional connectors**, including the **L-shaped gold-plated mirror connector**.

Cable ends rely on a **hybrid male/female multi-cylinder insertion system**, ensuring precise alignment and strong mechanical stability.

2. Internal Structure of the Photonic Cable

2.1 Optical Micro-Spheres

Each micro-sphere contains:

- a central focusing lens,
- an input/output optical channel,
- an internal volume larger than the beam, providing mechanical tolerance,
- a centered beam path that avoids wall contact.

The beam remains smaller than the sphere, ensuring stable propagation.

2.2 Double-Funnel Coupling Tubes

Between spheres, transparent polymer funnels:

- capture the outgoing beam,
- progressively refocus it,
- guide it into the next sphere,
- reduce optical losses.

This creates a continuous and directionally stable optical path.

2.3 Optical Polymer Material

The structure uses optical-grade polymer selected for:

- flexibility,

- friction resistance,
- mechanical resilience,
- low optical absorption.

2.4 Internal Reflective Layer

A reflective inner coating stabilizes directionality and reduces dispersion.

2.5 Outer Sheath & Cut Marks

The outer sheath is flexible and abrasion-resistant. Small printed circular marks indicate safe cut points located between micro-spheres.

3. Directional Behavior

Depending on the number of spheres:

- **Even count** → beam preserved
- **Odd count** → beam inverted

Two cable types exist:

- **Type A: Direction-Preserving**
- **Type B: Direction-Inverting**

4. Maximum Length: 300 Feet

Beyond 300 feet:

- optical losses increase,
- directional coherence decreases.

A **photonic relay** becomes necessary.

5. Photonic Relay

A relay:

- re-emits a clean beam,
- restores coherence,
- launches a new 300-foot segment.

It functions as a directional optical repeater.

6. L-Shaped Photonic Connector (90° Beam Deflection)

6.1 Internal Structure

The L-connector uses a **gold-plated 45° mirror** to deflect the beam by **90°**.

Components include:

- **Input Funnel** guiding the incoming beam,
- **Gold-Plated 45° Mirror** providing precise deflection,
- **Output Funnel** receiving the redirected beam,
- **Optical Polymer Body** ensuring structural transparency and robustness.

6.2 Versions

Two variants exist:

- **Neutral L-Connector** → no inversion
- **Inverting L-Connector** → orientation or phase inversion

6.3 Integration

The connector is installed at designated cut points, enabling **three-dimensional photonic routing**, similar to a printed circuit made of light.

7. Hybrid Male/Female Cable End System

Cable ends use a **hybrid insertion mechanism** based on multiple concentric polymer cylinders.

7.1 Cable Side: 3 Cylinders

Three polymer cylinders form the cable end:

1. **Central Cylinder** — optical alignment
2. **Intermediate Cylinder** — mechanical stabilization
3. **Outer Cylinder** — directional alignment and controlled friction

7.2 Connector Side: 4 Cylinders

The connector includes four receiving cylinders:

1. **Central Receiver Cylinder** — optical channel
2. **Two Stabilization Cylinders** — mechanical fit
3. **Outer Lock Cylinder** — retention and alignment

7.3 Insertion Process

During connection:

- the outer cylinder of the cable fits into the outer receiver,
- the intermediate cylinder aligns with stabilization cylinders,
- the central cylinder enters the optical channel,
- the connector's four cylinders envelop the cable's three cylinders.

This results in:

- precise optical alignment,
- hybrid male/female compatibility,
- strong mechanical stability.

8. External Locking System

A mechanical lock prevents accidental disconnection. Possible mechanisms include:

- rotating ring,
- pressure clip,
- sliding latch.

The lock maintains alignment under vibration and ensures long-term stability.

9. Summary

The complete system includes:

- directional photonic cable with micro-spheres,
- double-funnel couplers,
- reflective inner layer,
- modular cut points,
- photonic relays,
- gold-plated L-connectors (90° deflection),
- hybrid male/female multi-cylinder cable ends,
- external mechanical locking system.

This architecture represents a new generation of internal photonic interconnects: modular, robust, and directionally engineered.