

# # Wavelength-Native Signaling Protocol (WNSP) v1.0

## ## 1. Overview

The Wavelength-Native Signaling Protocol (WNSP) is a lightweight optical signaling standard for MesgNexusOS.

It encodes textual messages into a sequence of **wavelength\_nm** values across the visible spectrum and packages them into discrete **frames**. These frames can be rendered as flashes of light (screen, LED, etc.) and decoded via camera or photodiode, then reconstructed back into text.

WNSP is designed to be:

- **Physics-based**: The core symbol is wavelength\_nm, not perceived color.
- **Device-agnostic**: Independent of screen brand, gamma, or white balance.
- **Accessible**: Works for color-blind users; humans do not need to see the color.
- **Mesh-ready**: Suitable as a signaling layer for offline, optical mesh networking.
- **Extensible**: Can evolve to support smart cities, IoT, and civilizational signaling.

---

## ## 2. Alphabet and Wavelength Mapping

WNSP v1.0 defines a base alphabet of \*\*26 letters\*\* (A–Z):

- Each letter has:
  - A \*\*hex color\*\* (for basic visualization and UI).
  - A \*\*wavelength\_nm\*\* value, evenly spaced across the visible spectrum from ~380 nm to ~740 nm.

The exact mapping is defined in `/src/protocol/wavelengthMap.ts`.

Example (conceptual):

- A → 380 nm (violet)
- M → ~567–582 nm (greenish-yellow)
- Z → 740 nm (deep red)

The \*\*wavelength\_nm\*\* is the canonical representation; the hex color is illustrative.

---

## ## 3. Frames

The core unit of transmission is the \*\*WNSP Frame\*\*:

```
```ts
type WnspFrame = {
    sync: number;          // sync pattern identifier
    wavelengthNm: number; // encoded symbol wavelength
```

```
intensityLevel: number; // discrete level, e.g. 0–7
checksum: number; // simple checksum for error
detection
payloadBit: 0 | 1; // a single bit carried in this frame
timestampMs: number; // local timestamp when frame
was created
};
```