Bandwidth Property of GI-POF

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This contribution is intended to provide:

\(\text{min}EMB_c\) for 40 m and 15m GI-POF link length, and

the bandwidth – length relationship for short length of GI-POF

to improve the validity of link budget calculation. (Ref.[1] p.3)
Experimental Setup for DMD Measurement

- Pulse light source (OPG-3300)
- Automatic Stage
- SMF4m
- Sampling oscilloscope (C8188)
- Test Fiber L=100m

$D(\lambda) = 115 \text{ ps/mm} \cdot \text{km}$

- Spectral width $\Delta \lambda_{\text{rms}} = 1.72 \text{ nm}$
- Normalized Intensity
- Wavelength (nm)
- MFD: $5.35 \mu \text{m}$

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DMD Measurement Results of 100 m long GI-POF

\[ DMD = (T_{\text{slow}} - T_{\text{fast}}) - \Delta T_{\text{REF}} \]

\[ = 221 \text{ psec.} @ L = 100 \text{ m} \]

\[ (0 \leq r \leq 25 \mu m) \]
Calculated EMB Results of 100 m long GI-POF

\[ \text{minEMB}_c = 2.97 \text{ GHz} \]
Transmission Bandwidth of GI-POF as a Function of Fiber Length with Mode Conditioner

\[ B \propto L^{-\gamma} \]
\[ \gamma = 0.8 \]

Light Component Analyzer (N5242A, N4376B)

Wavelength spectra of LCA

\[ \text{Normalized Intensity: } I_{\text{norm}}(\lambda) \]

\[ \Delta \lambda_{\text{rms}} = 0.03 \text{nm} \]

OUT

IN

Mode

conditioner

Test Fiber

Bandwidth (GHz)

Fiber length (m)
**minEMB\(_c\) for 40m and 15m of GI-POF**

Based on the length bandwidth product relationship, \( B \propto L^{-\gamma} \)

and \( \text{minEMB}_c \) at 100 m length result (2.97 GHz),

\( \text{minEMB}_c \) for 40 m and 15 m of GI-POF is calculated as follows;

<table>
<thead>
<tr>
<th>Length (m)</th>
<th>Bandwidth (GHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 m</td>
<td>6.13</td>
</tr>
<tr>
<td>15 m</td>
<td>13.3</td>
</tr>
</tbody>
</table>
Summary

➢ From the DMD measurement results for 100 m GI-POF, the \textit{minEMBc} of 2.97 GHz is obtained.

➢ The \textit{minEMBc} of short length GI-POF is calculated based on the bandwidth (B) – length (L) relationship, $B \propto L^{-\gamma}$, below 100 m and the \textit{minEMBc} of 2.97 GHz at 100 m.
References

Thank you for your kind attention!