‘POF – Crossing the Chasm of Market Adoption’
Step Index-POF Basics

- Core diameter: 1 mm
- NA: 0.5
- Attenuation: 180 dB/km at 650 nm (Visible)
- Dispersion: 40 Mhz.50 m
- NRZ Transceivers 125 Mbps-100m
- Minimum Bend Radius ~10 mm
- Terminated with a simple cutter: bare fibre interfaces
- Standard: IEC 60793240 A4a.2
POF Technology from Car to Home

• Automotive
  – Entertainment POF network
  – 15 million nodes annually
  – 55 Car models
  – 25 – 150 Mbps
  – Excellent EMI Immunity
  – High Reliability
  – Low Cost

• Consumer
  – Entertainment home-networks
  – IPTV Services delivered by Operators
  – Early Adoption by Innovators
Consumer Leverage of Auto

Auto

- Performance
- Quality
- Reliability
- Manufacturing
- Standards
- Confidence

POF

Shielding

Plastic Housing

Header

Tx and Rx Fibre Optic Transceivers
Technology Maturity Curve

Technology is “good enough”. User Experience dominates.

Unfilled Need

Product Performance

Level of Performance Required by average users

Auto

Excess Quality. Most customers uninterested

Technology is “good enough”. User Experience dominates

Time

Consumer

High technology
Consumers want more technology, better performance

Transition Point
where technology delivers basic need

Consumer Commodity
Consumers want convenience, reliability, low cost...

[Source: Christensen]
IPTV In-Home Connection Requirements

Access Gateway (Modem) → ? → Set-Top-Box

• **Criteria**
  – Quality of Service
  – Future Proof
    • Multiple HDTV channels
    • Multi-room scenario
  – Ease of Use
  – Self Installation Option
    • Increases adoption rate
    • Reduces operator costs
    • Reduces customer cost
  – Low Cost
In-Home Connection Options

- **No Wires / No New Wires**
  - MOCA, HPNA
    - Variable install times
  - 802.11b/g/n, MIMO
  - HomePlug/AV, PLC, HDPLC
    - Ideal for low speed SDTV
    - Construction dependent
    - Net throughput & Interference
    - Uncontrollable install time
    - Self-Install Options: (PLC, Wireless)
    - Not a home backbone technology

- **Clean Wire**
  - Cat5/5e/6
    - Ideal if already wired
    - Long installs for retro-fits
  - PLASTIC OPTICAL FIBRE (POF)
    - Guaranteed bandwidth (125 Mbps)
    - Future Gbps capability
    - Dedicated medium
    - Fast & Controlled installation time for retro-fits
    - Self-Install Option
Early Adopter Solution

Aufbau und Gerätebezeichnungen

* Im Lieferumfang enthalten
Crossing the Adoption Chasm

[Source: Geoffrey Moore]
Path to Adoption Growth

**Early Adoption Phase**
- Kits
- Costs Telco
- Approx $40

**Integration Phase**
- Optical Port ‘In-The-Box’
- Costs Telco
- Approx $2.50/per port

**Multi-Room Scenario**
- Widespread adoption
- Multiple Networking Options
STB with Embedded POF Port
STB with Embedded POF Converter
Home Gateway with Embedded POF Port
Tomorrow’s Bandwidth Requirements?

- FTTH Gbps services
- High Speed Wireless
- Super Hi-Vision (SHV) video system developed by NHK
  - Screen definition of 7680 x 4320 (aspect ratio of 16:9) and carries 24 audio channels for full spatial sound effects.
  - 180 – 600 Mbps depending upon coding
  - Expected to be broadcasted in Japan by 2025.
- 3D TV already broadcasted in Japan as of April 2008
  - 3D TV are commercially available
  - 62.5 to 300 Mbps depending on coding
Optical OFDM: The Experimental Setup

Transmitter (Tx)
VCSEL (1) or RCLED (2)

Bias-T

Receiver (Rx)
Si pin (700 μm) + 400 MHz -3dB

Digital Sampling Oscilloscope (DSO)
2 GS/s

Arbitrary Waveform Generator 1GS/s (AWG)

OptoLock®

512 Symbols Continuous loop

Calculates EVM, applies bit loading algorithm Derives SNR and BER

OptoLock®

Bias Voltage

512 Symbols Continuous loop

Mitsubishi Eska Premier 40 Mhz-50m

Bias Voltage

OptoLock®

1010001101

FP7-ICT-2007-2 – STREP project n. 224521 – POF-PLUS
Plastic Optical Fibre for Pervasive Low-cost Ultra-high capacity Systems
RCLED Results

- 50m SI-POF
- Symbol Duration 2.05 μs
- 950 Mbps achieved for a target bit error rate of $10^{-5}$
- Modulations from 64QAM to BPSK
- Channels used up to 512 (250MHz)
Conclusions

• POF has proved to be a robust low-cost solution for automotive applications
• POF is now being used by early adopters for consumer IPTV applications
• Embedded POF port solutions are now appearing from a number of STB and Gateway manufacturers
• POF has the potential to become a robust, low-cost optical back-bone with Gbps capacity