



**APT/ITU Conformance and  
Interoperability Event 2015**  
7 – 8 September 2015, Bangkok, Thailand



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**07 September 2015**

NTT Electronics, Japan


**COMPONENTS OF BROADBAND ACCESS NETWORK**

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 NEL-C20150907-9040

# Report on components for Broadband Access Networks

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September, 2015

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## Corporate Profile (NEL)

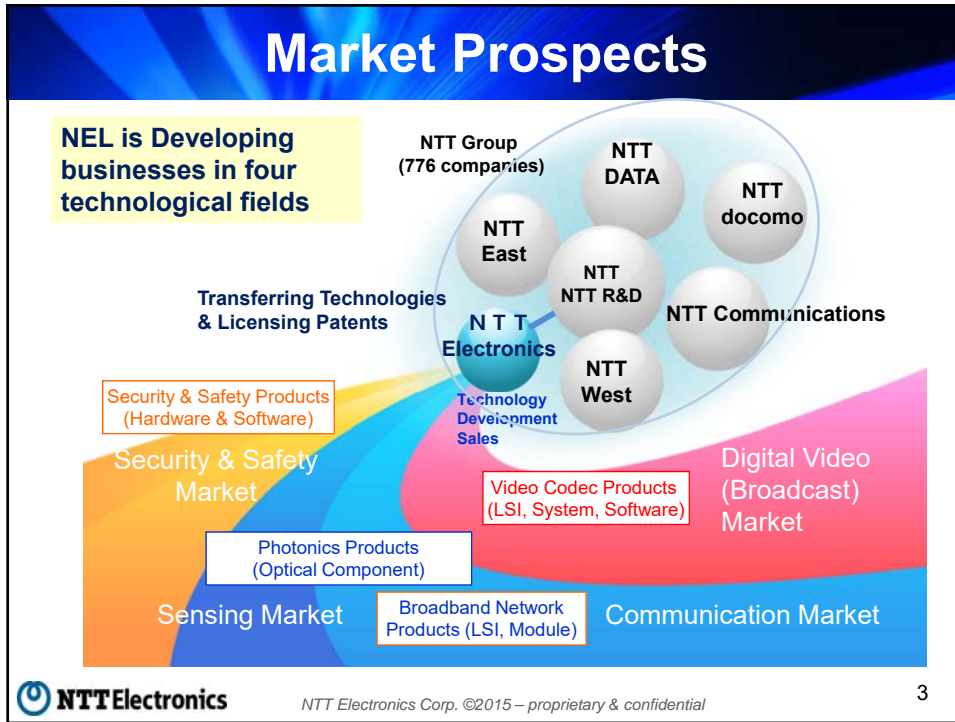
◆ Feature	: Member of NTT Group
◆ Established	: June, 1982
◆ Capital	: 6,577 Million yen (US \$ 65 Million)
◆ President & CEO	: Dr. Kazuo Hagimoto
◆ Business	: Manufacture & Sales of the Key Devices/Modules to contribute to global IT industries
◆ Employees	: 863 (As of April 1, 2015)
◆ Head Office	: Yokohama, Japan



June 20, 2011

<http://www.ntt-electronics.com/>

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## Video Codec

### (1) Codec LSI

- AVC/H.264 Codec LSI : ARQENC, SARADEC2
- MPEG-2 Codec LSI : VASApplus



ARQENC



SARADEC2



VASApplus

### (2) Video Codec System

- AVC/H.264 Codec system : AVC/H.264 Full HD Codec-XVE9310, HVE9210/HVE9230, HVE9110, HVD9130
- IP Codec System : MV5000
- Media Transcoder: HVX750
- Video IP Gateway : NA8000
- Mobile Encoder : WT1000



XVE9310



HVD9130



MV5000



HVX750



NA8000




WT1000

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## LSI for Broadband Network

**(1) Core Network-LSI**

- 100G Digital Coherent Signal Processing LSI ( DSP-LSI)
- 100G OTN Framer LSI ( OTN-LSI ) , 40G OTN Framer LSI
- 40G Linear Amplifier ( TIA-AGC )




100G-DSP-LSI




100G OTN-LSI

**(2) Access & User-LSI**

- Mac-LSI for 10G-EPON OLT/ONU
- 10G-Burst-TIA



10G-EPON MAC-LSI




10G-Burst-TIA


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## Optical Communication Products


**40G**



DQPSK DLI




DQPSK Rx FE




DQPSK Integrated Rx FE


**Metro Core**




VMUX/ROADM



OCM

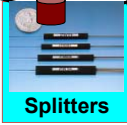


TOSW



TOSA


**Residential**




Splitters

**LH/ULH**


**100G**




DSP-LSI



DP-QPSK Receiver





TLA



A-AWG

• 50GHz AWG  
• WDM-PON  
AWG





10G-EPON LSI

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## NEL key components for Broadband Access networks

The diagram illustrates the key components for Broadband Access networks, categorized into FTTx (Fiber to the x) and MFH/MBH (Multifiber Home/Multifiber Building). FTTx components include Free Banding optical coupler (FB), Optical splitters, 10G-EPON OLT SOC, 10G-EPON burst-mode TIA, and 10G-EPON ONU SOC. MFH/MBH components include Ultra-SFF Athermal AWG, WDM PON Athermal AWG, 10G-EPON WDM-PON, 10G-EPON ONU SOC, 10Gbe, 10G EA-TOSA, and 10G APO-ROSA.

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## Showcasing

Item	Related ITU standard	Product	Sample display	Brochure
1	G.671	Optical PLC Splitter PLC : Planar Lightwave Circuit	Yes	Yes
2	G.9801	EPON OLT/ONU MAC LSI	Yes	Yes
3	G.9801	10G/1G Burst-mode TIA	No	Yes

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## Optical Splitters (G.671)

### Features

- Completely passive, wide wavelength range of 1260 to 1660 nm, wide temperature range of -40 to 85 °C.
- Compact package (ex. 1x4 : 4 mm x 4 mm x 38 mm), suitable for cassette.
- Good performance/High reliability ( based on ITU-T Recommendation G.671 and L.37 )
- NEL has shipped 8 millions of splitters within 10 years all over the world. There is no failure in the field so far.

### Line up

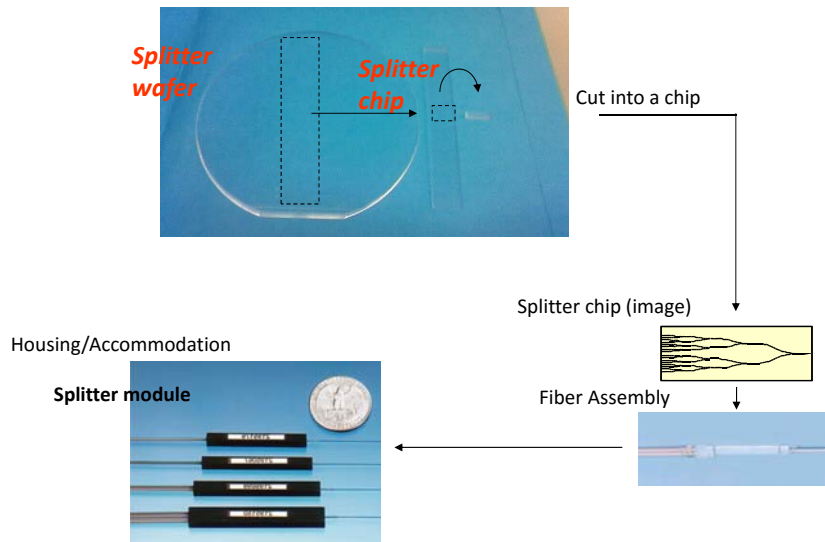
- 1×N Splitters : 1×4, 1×8, 1×16, 1×32, 1×64
- 2×N Splitters : 2×4, 2×8, 2×16, 2×32, 2×64
- (Others: 8 arrayed 2×1 WDM, 8 arrayed 1×4, 2 arrayed 1×16, etc.)



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## Optical PLC Splitters (Photo)

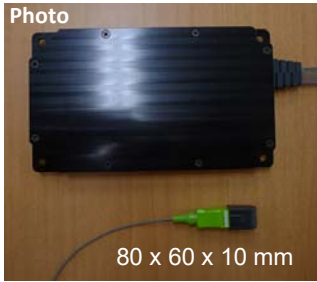


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## WDM-PON AAWG (NG-PON2)

- Wide operation temperature range
- Can be used in both of C-band and L-band with cyclic design
- Water immersion and corrosion resistance tested



	Gaussian	Flat-top
Package size	80 x 60 x 10 mm <sup>3</sup>	120 x 70 x 10 mm <sup>3</sup>
Operating temperature range	- 30 to 70 degree C	
Channel spacing	100 GHz	
Channel number	Up to 40 ch	
Insertion loss(Typ.)	< 4dB	< 6 dB
1dB bandwidth	> 25 GHz	> 40 GHz
3dB bandwidth	> 50 GHz	> 62.5 GHz
AXT	< -25 dB	< -25 dB
NXT	< -30 dB	



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## EPON SoCs (G.9801)

- IEEE802.3av compliant(10G-EPON), IEEE802.3ah compliant(EPON)
- 10G-EPON SoCs achieve low cost high-speed access with 1G/10G/1G&10G connection
- EPON SoC realizes low-power ONU equipment with lower cost

10G-EPON OLT SoC



31 x 31 mm

10G-EPON ONU SoC



27 x 27 mm

EPON ONU SoC



17 x 17 mm

SoC	Specifications
10G-EPON	<ul style="list-style-type: none"> <li>- 1G/10G dual-rate connection supported</li> <li>- IEEE802.3av compliant MPCP</li> <li>- IEEE802.3-2005 compliant OAM</li> <li>- IEEE802.1p compliant priority control</li> <li>- IEEE802.1q compliant VLAN control</li> <li>- IEEE802.1AE encryption and FEC supported</li> <li>- 128 ONUs connection(OLT)</li> <li>- IEEE802.3az power save supported(ONU)</li> </ul>
EPON ONU	<ul style="list-style-type: none"> <li>- IEEE802.1D bridge, IEEE802.1q VLAN</li> <li>- MAC address filter for multicast</li> <li>- Built-in SERDES, large packet buffer</li> <li>- ARM processor</li> </ul>



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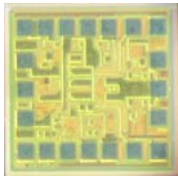
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## 10G/1G Burst-mode TIA (G.9801)

- 1G/10G burst-mode trans-impedance amplifier (TIA) for 1G/10G EPON OLT fully conforming to both IEEE802.3ah and IEEE802.3av.
- High sensitivity and fast response are achieved in small-size PKG.
- ES: 2015 September, CP: 2015 November


NLY3016EXX



1.02 x 0.97 mm

Application	1G/10G Dual-rate, 10G Symmetric, 10G/1G Asymmetric, 1G Symmetric
Sensitivity 10G	-31.9dBm@BER 10 <sup>-3</sup>
Sensitivity 1G	-34.5dBm@BER 10 <sup>-12</sup>
2R Response 10G	400 ns (w/o Guard time)
2R Response 1G	200 ns (w/o Guard time)

\* Design results

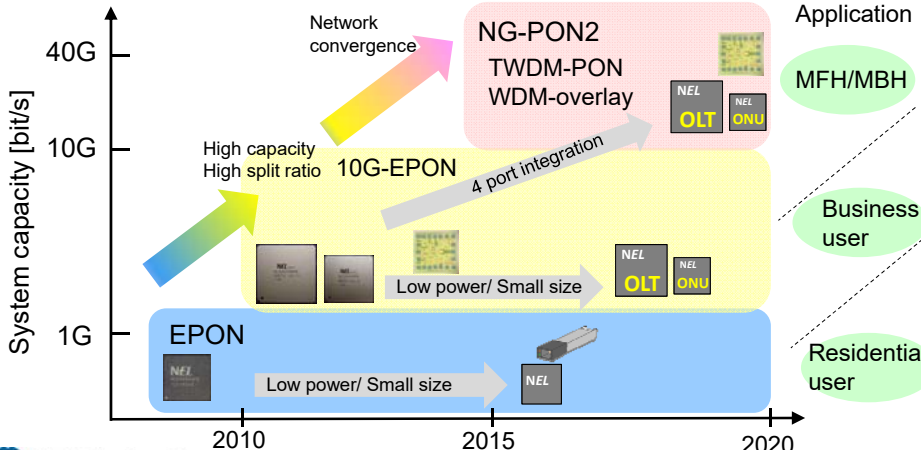


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## Roadmap of EPON SoCs and TIA

- Next version of PON SoCs is low power consumption and small size type and will evolve for NG-PON2 use.
- B-TIA is under testing for NG-PON2 use.




Application

MFH/MBH

Business user

Residential user



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## Summary

- NTT Electronics (NEL) is a member of NTT group. Most of our service and our key devices are provided by using NTT Laboratories advanced technologies.
- Optical power splitters are used in world wide more than 10 years, more than 8M units. PLC technology is proved with long term reliability. NEL believes that we can contribute to deploy splitters in Asia pacific region.
- Furthermore, MAC SoCs and Burst-mode TIA are developed for next generation 10G-EPON as key components. NEL can provide them.

# Thank you