



COT+ services for LEO satellites and silicon photonics

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STMicroelectronics



Silicon photonics and space solutions

Optical Module



Wireless Infra.



Fixed Wireless Access



Other (test & measurements, radar, geolocation...)



Smartphone FEM



Wi-Fi FEM



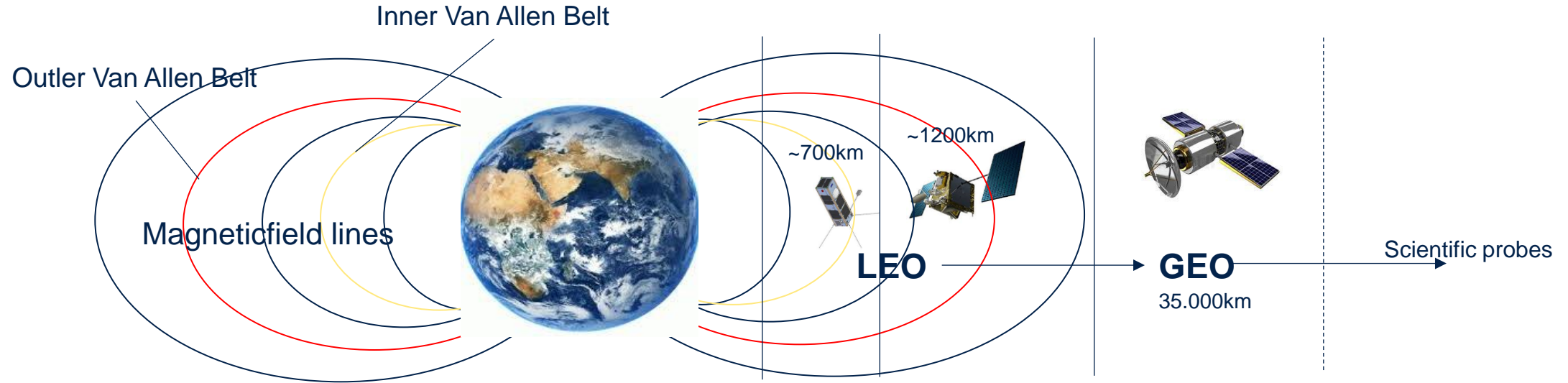
LEO satellite



ST for LEO satellites



System solution enabler through products offer



GEO & more

Low Orbit

- Focus on relentless innovation for functional and electric performance staying best-in-class for radiation hardness
- New products and solutions including re-use of existing IPs
- Ready to support market demand: New Space, same leadership!

ST Rennes – Space qualified assembly site

40+ years committed to Space Business



CNES/ESA/CSG Service Optique



1st DSCC Qualification
 QML-V (Integrated Circuits
 with Radiation Hardness
 Assurance)



Assy Clean Room
 FLIP-CHIP ASICs



Rennes
 ISO 45001
 Transition



Rennes
 ISO 50001
 Certification



1st ESA qualification
 for ST Rennes
 Dec 24th,
 1st Ariane launch

ST as 1st
 manufacturer
 qualified by
 ESA ;
 ESA Certificate
 #001



Rennes belongs to
 the new Group
 STMicroelectronics



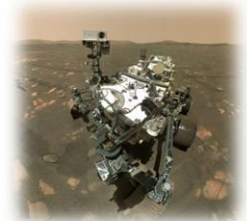
Rennes
 ISO 9001
 Quality
 Certification



Assy
 Clean Room

2018

2019



Perseverance Rover



Site refurbish
 (offices)

1977

1979

1987

1997

2000

2007

2011

2016



Rennes
 ISO 14001
 OHSAS 18001
 Certification



Rennes
 ISO 22301
 Business
 Continuity
 Certification



Curiosity Rover



Rennes belongs to the new
 Group SGS-THOMSON
 Microelectronics

LEO satellite communication technology

With many years of experience in the LEO satellite domain, ST has developed best-in-class technology to provide leading-edge LEO satellite products.

Process Technology

Best-in-class BiCMOS technology for UT RF IC

- 4th generation HBT architecture
- Best-in-class noise figure

28FDSOI providing features optimized for beamformer performances

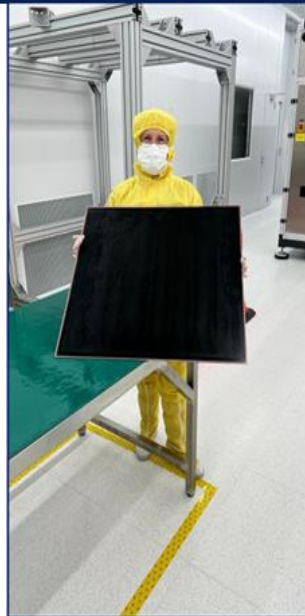
Testing

RF options or mmW cards on ATE
Optimization of test time for RF devices

All RF functionalities pre-characterized till prod. ramp-up
Test in volume optimized with RF to DC correlations
Test in volume leverages synergies with internal ST package lines

PLP - Panel level Package

Ultra large capacity to support high volume UT
Low-cost package technology
no wafer BSM, no bumping, no die attach



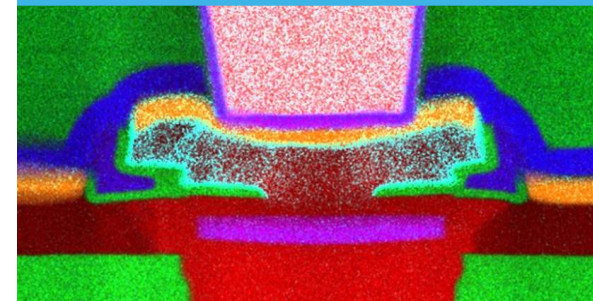
Business models & technologies

Diverse business models

	ASSP	CSSP	ASIC	COT
System & Product specification	ST	Customer	Customer	Customer
RF, analog & digital design		ST		
IP & Physical Implementation			ST	
Wafer manufacturing		ST		
Packaging, test & supply-chain				

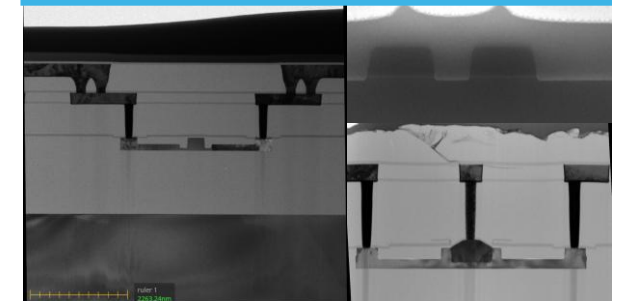
Technologies

BiCMOS



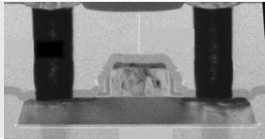
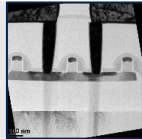
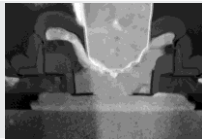
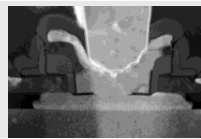
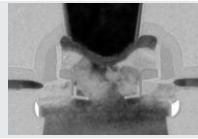
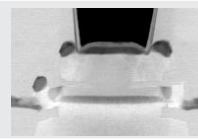
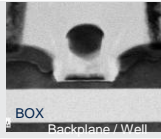
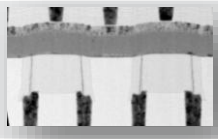
- Best BiCMOS roadmap in the industry
- Very high volume 8" **B9MW** and most advanced 12" **B55X**
- Best **NF** for Rx and best **Tx linearity** at higher gain
- Perfectly tailored for **RF FEM** & **Optical** drivers IC

SiPho



- PIC100 is the only Silicon only technology able to support 100GBaud/s
- 12" using advanced lithography for best yield
- Ideal for **new 1.6Tbps pluggable transceivers and Optical IOs for AI**

ST RF & mmW technologies

	RF-SOI		BiCMOS				FDSOI	
	H9SOIFEM	C65SOIFEM	B9MW	B9MW HR	BiCMOS55	B55X	28FDSOI	P18
Device Cross-section								
Applications	<ul style="list-style-type: none"> • 4G & 5G sub-6GHz handsets • BTS RF FEM • IoT FEM • Wi-Fi RF FEM 	<ul style="list-style-type: none"> • 5G sub-6GHz handsets RF FEM 	<ul style="list-style-type: none"> • Wi-Fi 6 & WiGig RF PA, LNA • IoT PA, LNA • 5G sub-6 GHz PA, LNA • 5G/SAT mmW RF PA, LNA & TRX 	<ul style="list-style-type: none"> • Wi-Fi 6 & WiGig RF FEM • IoT FEM • 5G sub-6 GHz FEM • 5G mmW RF FEM & TRX 	<ul style="list-style-type: none"> • 5G mmW BTS RF FEM & Transceiver • mmWave PhaseArrayAnt • Optical transceivers 	<ul style="list-style-type: none"> • 5G mmW RF FEM & Transceiver • mmWave PhaseArrayAnt (5G and SAT) 	<ul style="list-style-type: none"> • High-speed AD/DA and I/O • 5G BTS RF Transceiver • Analog/digital Beamforming 	<ul style="list-style-type: none"> • Enhanced MCU perf. • Connectivity application
Process litho	130 nm	65 nm	130 nm	130 nm	55 nm	55 nm	28 nm	18 nm
Wafer size	8"	12"	8"	8"	12"	12"	12"	12"
Techno node	PD-SOI	PD-SOI	SiGe	SiGe	SiGe	SiGe	FD-SOI	FD-SOI
Key benefits	High performance analog RF dedicated processes for RF Switches, LNA, PA & RF FEM integration capability		Analog RF for infrastructure (based on high-performance HBT), including high-end applications, & digital integration capability. Best possible NF				Mixed signal RF & Digital Integration	PCM, ULP RF
FoM	<i>RonCoff</i> 115fs <i>BV</i> 4V $f_T/f_{MAX} = 70/140$ GHz	$f_T = 170$ GHz $f_{MAX} = 260$ GHz	$f_T = 220$ GHz $f_{MAX} = 280$ GHz	$f_T = 220$ GHz $f_{MAX} = 280$ GHz	$f_T = 320$ GHz $f_{MAX} = 370$ GHz	$f_T > 400$ GHz $f_{MAX} > 500$ GHz	$f_T = 290$ GHz $f_{MAX} = 390$ GHz	ePCM 0,038um2
Ready for risk production	Now	Now	Now	Now	Now	2H 2024	Now	2025

ST silicon photonics



STARLight consortium

STARLight consortium

driven by ST, more than 20 top tech companies and universities unite to pioneer next-gen silicon photonics on 300 mm wafers



The STARLight project brings together a consortium of leading industrial and academic partners to position Europe as a technology leader in 300mm silicon photonics (SiPho) technology by establishing a high-volume manufacturing line, developing leading-edge optical modules, and fostering a complete value chain.

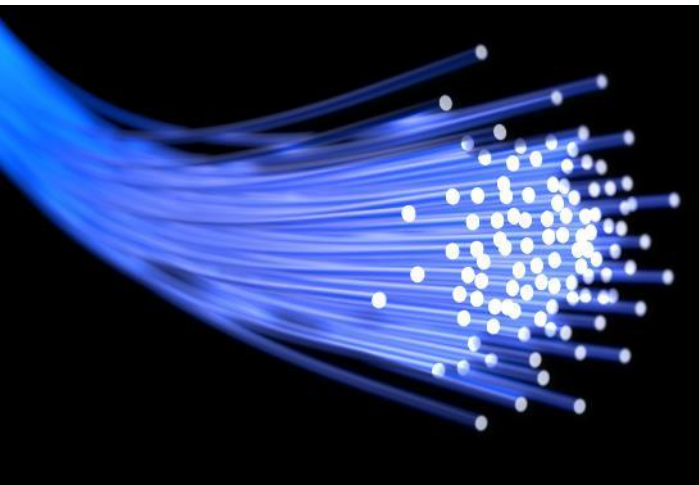
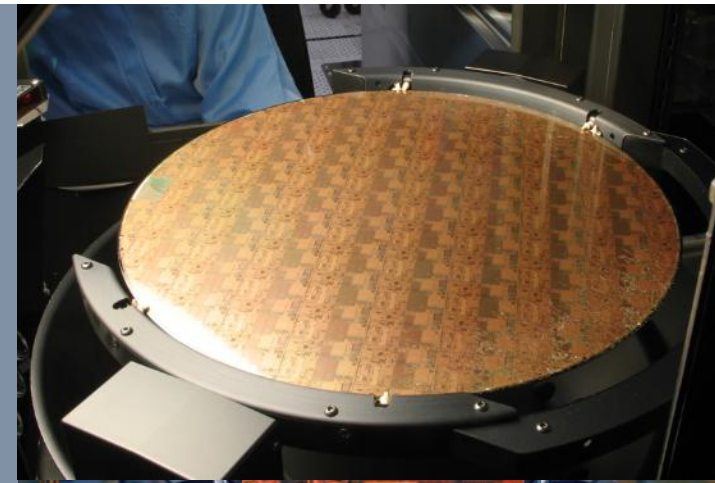
Led by STMicroelectronics (NYSE: STM), a global semiconductor leader serving customers across the spectrum of electronics applications, the STARLight consortium has been selected by the European Commission under the EU CHIPS Joint Undertaking initiative.

Why our optical interconnect is a game changer



The need
AI driving demand for
faster data transfer

Pioneering tech
Silicon Photonics &
BiCMOS overcoming
current limitations



Strong interest
AWS and optical
module providers
on-board

Large volume
Independency
Made in Crolles
(France)

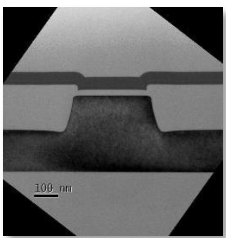


ST's long-lasting history in silicon photonics

$\lambda = 1.31\mu\text{m}$

100G- PIC25G

- 300mm / 12"
- NRZ signal
- 20GHz Ge PD
- PN Modulator
- Rib Si-waveguides

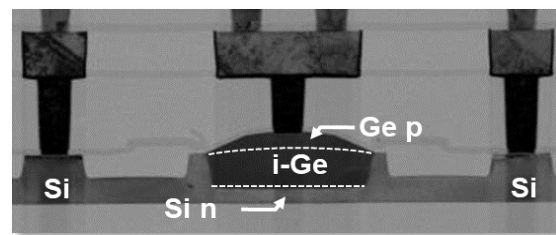


F.Boeuf et al. IEDM 2013



400G-PIC25GP3

- PAM-4 signal
50Gbd/s
- 67 GHz Ge PD
- PN modulator Gen2
- Thick-Cu Metallization
- DR4 applications

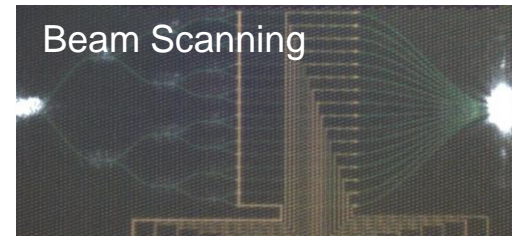


F.Boeuf et al. IEDM 2019

$\lambda = 1.31\mu\text{m}, 1.55\mu\text{m}$

PIC50

- PN PS Gen3
- Si PD (905nm)
- Si/SiN waveguides
- Low loss Si-waveguides
- Sensing applications



F. Boeuf et al. IEDM 2021

PIC100/200

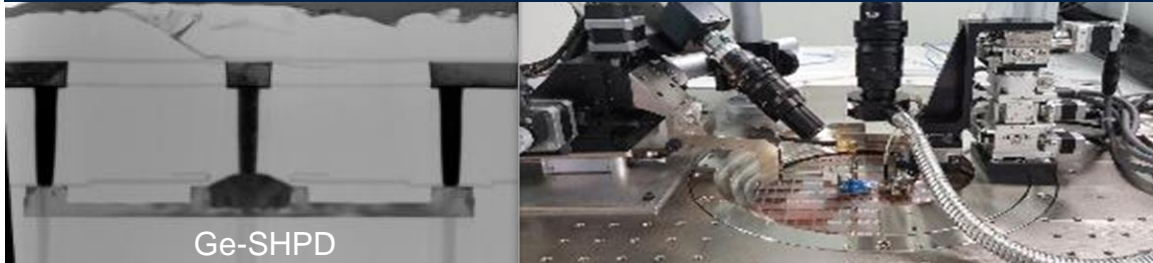
- PAM4 & QAM-16
- 113 Gbaud/s (200G/lane)
- 800G/1.6T/Coherent
- O&C-band Low loss SiN
- Faster/denser modulators
- HS Photo Diodes
- Edge & Grating couplers

New value proposal

ST foundry value proposal

SiPho PIC100

The only Silicon-only 300mm technology able to support 200Gbps per lane (100GBaud PAM4)



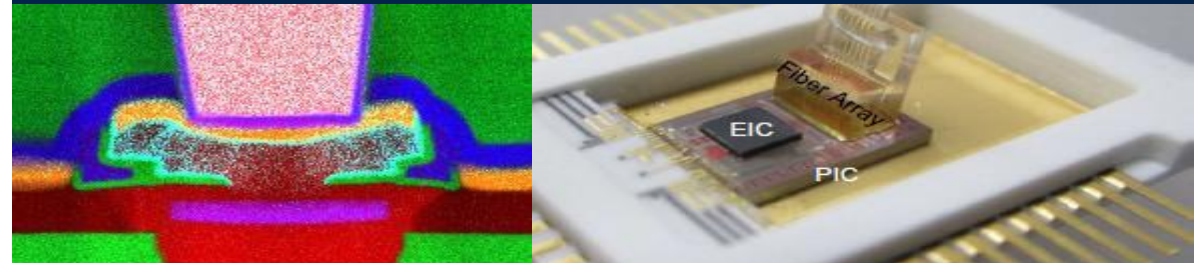
- **Yield 300mm** High yield, best-in-class vs 200mm foundries
- **System on Chip** High-performing RX/TX compact integration
- **Performance** Innovative stack to achieve best-in-class pure-silicon MZM modulators 50GHz BW suitable for 200Gbps/lane.

Enable **Edge coupling** thanks to a patented technology stack

200Gbps Silicon-only based, ramp H2'25

BiCMOS

300mm wafer for in volume production of B55
300mm wafer for leading-edge B55X



- mmW Frequencies** Ultra high-speed data transmission for AI
- Low power** -15% (vs existing technologies)
- BiCMOS SiPho Combo** Recognized as Best-in-class (vs all-in-one technology)

B55 in volume production at major component suppliers
Major B55X product ramp-up in 2025

B55(X) enables high-throughput for AI

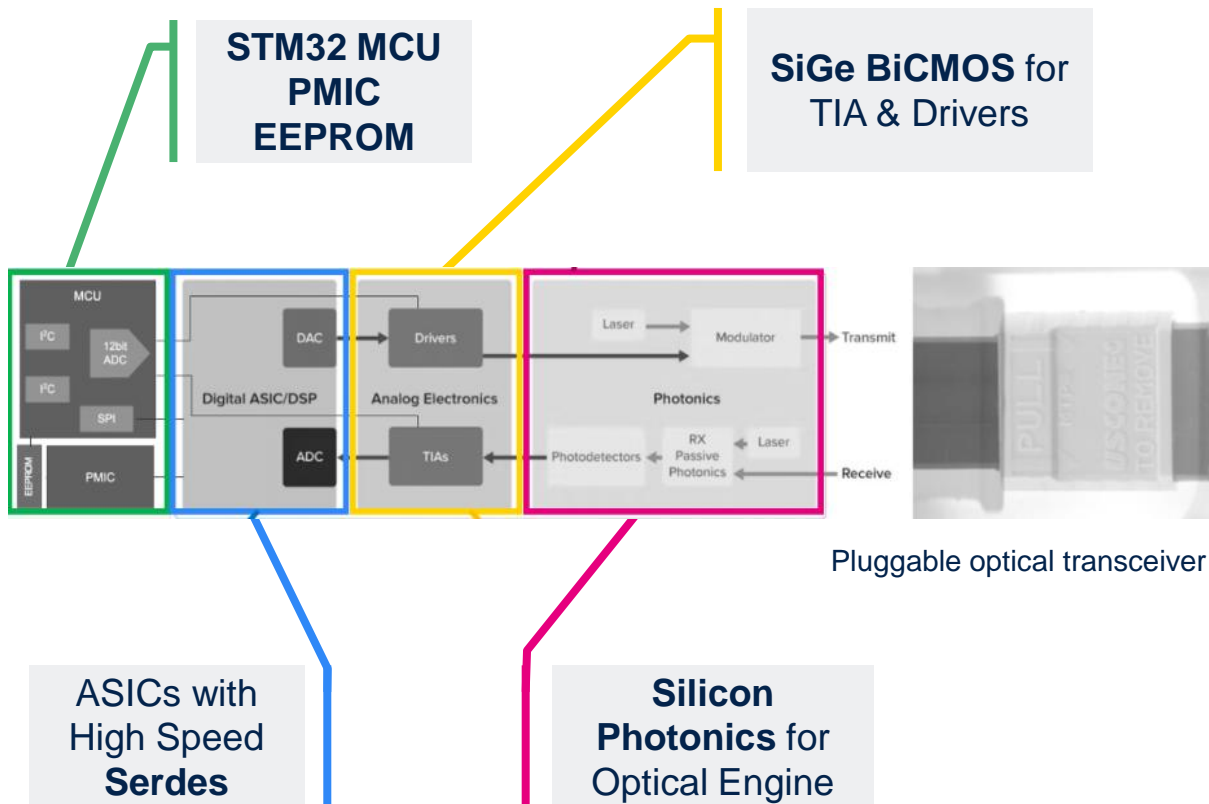
Optical Engine post-silicon assembly roadmap (micro-bumping, TSV)

Long-term roadmap suitable for
800G/1.6T plugables and Optical chip-to-chip interconnects.



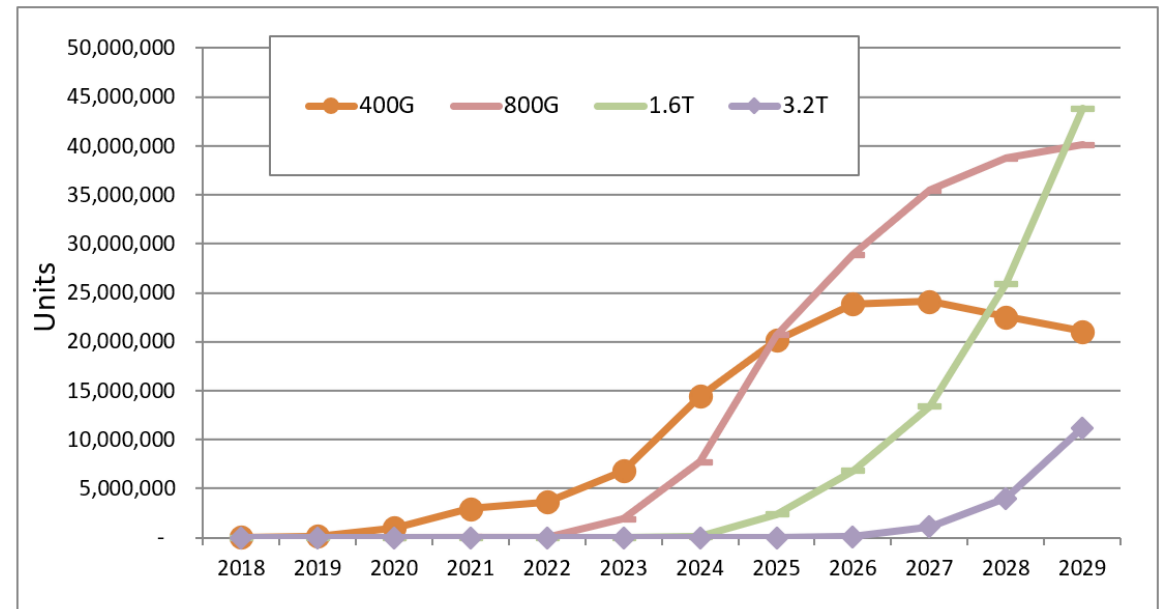
Addressing the pluggable optical transceiver market

Broad product portfolio to address optical transceivers



Pluggable optical transceiver

Optical transceiver speed adoption accelerating



Optical Ethernet Transceivers TAM. Source: LC Oct'24

B55/X + PIC100
• 100/200Gbps/lane

B55X + PIC100
• 200/400Gbps/lane

B55X/U + PIC200
• 400Gbps/lane

Production Ready

Development

Process roadmap aligned with market (up to 400Gbps/lane)

Our technology starts with You



Find out more at www.st.com

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