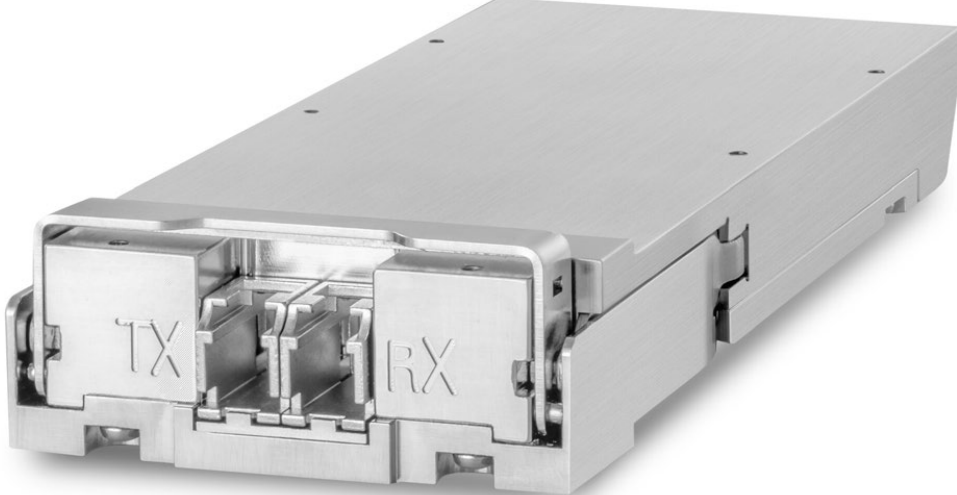
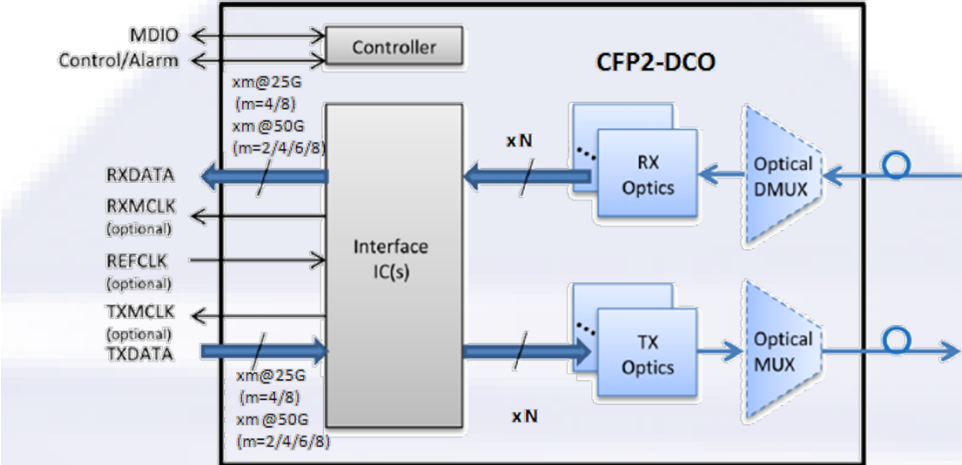


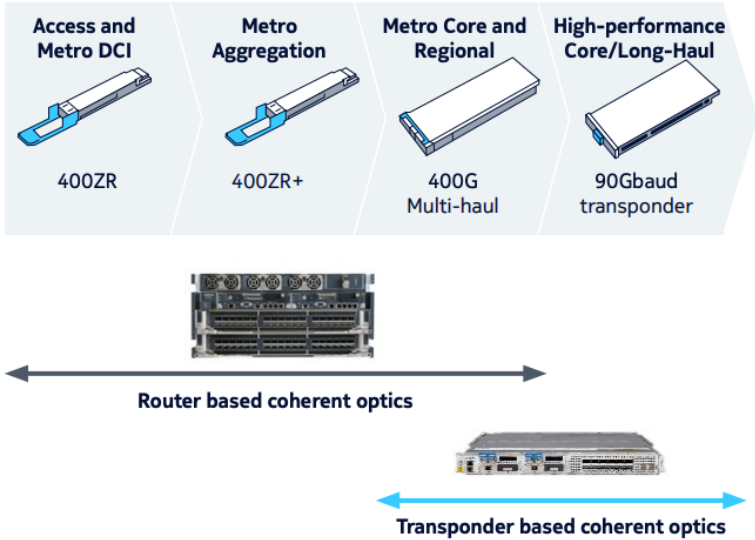
Exhibit N1
U.S. Patent No. 10,771,181
v.
Nokia's DCO Modules¹ ("Exemplary Device")

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
Claim 1	
[pre] A pluggable optical transceiver module comprising of:	The Exemplary Device is a pluggable optical transceiver module. <i>See, e.g.,</i> https://onestore.nokia.com/asset/207647?_ga=2.172896227.172847549.1647280619-441605525.1645903816 (

¹ This chart includes Nokia's 90 GBaud devices.

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	Product description The Nokia CFP2-DCO provides a multi-haul 100G to 400G coherent WDM line interface in a compact, CFP2-DCO pluggable module.); https://cfp-msa.org/wp-content/uploads/2022/10/CFP2_HW-Spec-rev1.0.pdf (This CFP Multi-Source Agreement (MSA) defines the CFP2 form factor of an optical transceiver to support 40Gbit/s and 100Gbit/s interfaces for Ethernet, Telecommunication and other applications. The members of the CFP MSA have authored this document to provide an industry standard form factor for new and emerging high speed communications interfaces. Specifications provided in this document are given as a "delta" to the CFP MSA Hardware Specification Rev. 1.4, June 7, 2010. 1.1 SCOPE This CFP Multi-Source Agreement (MSA) defines the CFP2 form factor of an optical transceiver which can support 10Gbit/s, 40Gbit/s, 100Gbit/s and 400Gbit/s interfaces for Ethernet, ITU-T OTN and other applications. Specifications provided in this document are given as a "delta" to the CFP MSA Hardware Specification Rev. 1.4 [1].); https://www.oiforum.com/wp-content/uploads/2019/01/OIF-CFP2-DCO-01.0.pdf at 8-9 (specification for CFP2-DCO:

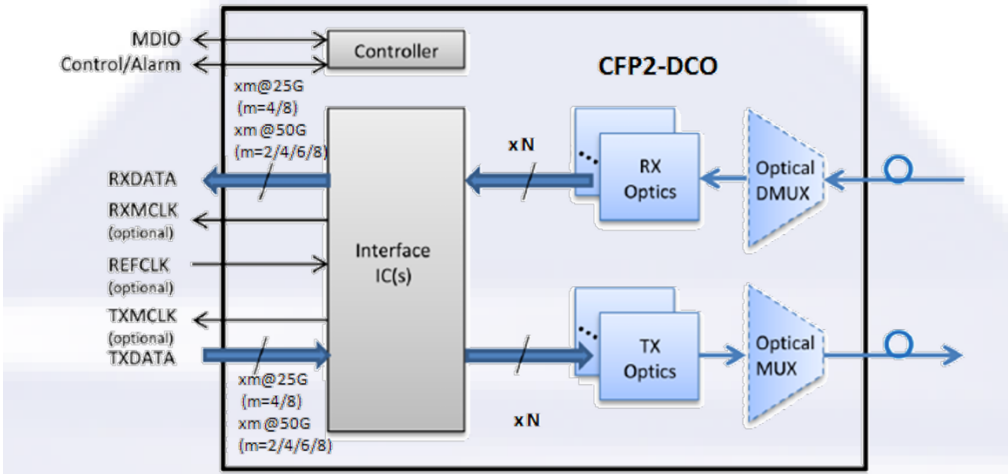
Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	 Figure 1: CFP2-DCO Module Basic Functional Block Diagram), 12 (describing electrical interface), 16 (describing LC connector), 23-25 (Fujitsu, Infinera, and Nokia belonged to OIF); https://cfp-msa.org/wp-content/uploads/2022/10/CFP-MSA_CFP8_HW-Spec-rev1p0.pdf (CFP8 MSA containing similar disclosure for CFP8 devices). On information and belief, Nokia has made and sold DCO transceiver devices in at least the CFP2, CFP8, QSFP and OSFP form factors. <i>E.g.</i>, https://www.gazettabyte.com/home/2021/8/3/nokia-adds-400g-coherent-modules-across-its-platforms.html (article reflecting interview with Serge Melle, “director of product marketing, IP-optical networking at Nokia,” discussing implementation of 400ZR and ZR+ coherent pluggables, including in CFP2, QSFP-DD and OSFP form factors); https://onestore.nokia.com/asset/207464 at 13 (discussing availability of CFP2, QSFP-DD and OSFP pluggables); https://onestore.nokia.com/asset/207220 (White paper for Nokia PSE-VC DSP that “is ideal for pluggable optics with integrated DSP, such as CFP2-based modules...and smaller modules); https://www.nokia.com/blog/roadms-for-the-400g-era-of-ip-optical-networking/ (Nokia article discussing use of DCO pluggables); https://www.nokia.com/blog/silicon-photonics-the-platform-for-the-400g-era-and-beyond/ (similar);

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	https://onestore.nokia.com/asset/210521?_ga=2.210600403.794788348.1664313430-354231912.1664313430 (Solutions Brochure listing products); https://onestore.nokia.com/asset/210434 (similar); https://onestore.nokia.com/asset/210793?_ga=2.90505177.215028192.1664317234-217653640.1664317228 (Application Note for 400ZR and 400ZR+ products); https://www.terabitsystems.com/nokia/routers/7750/7750-service-router (listing two CFP8 modules, 3HE13850AA and 3HE13849AA). In addition, Nokia sells 90 Gbaud transponders. <i>E.g.</i>, https://onestore.nokia.com/asset/210521?_ga=2.210600403.794788348.1664313430-354231912.1664313430 at 6; https://onestore.nokia.com/asset/210434 at 5-6. On information and belief, 90 Gbaud transponders use the CFP2-DCO form factor. <i>E.g.</i>, https://onestore.nokia.com/asset/210434 at 13 (A complete range of 400G coherent optics in routers and transponders ). On Information and belief, because the 90 Gbaud transponders use a CFP-type form factor, the 90 Gbaud transponders infringe for reasons similar to Nokia's other CFP devices.

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	To the extent Nokia made, makes, sells, sold, imports or imported devices compatible the Lambda specifications, such devices also infringe. https://100glambda.com/specifications/summary/2-specifications/11-100g-lr1-20-er1-30-er1-40-technical-specs-rev-1p1 (Nokia and Fujitsu were members of Lambda); 400G FR4 https://100glambda.com/specifications/summary/2-specifications/7-400g-fr4-technical-spec-d2p0; 100G FR LR https://100glambda.com/specifications/summary/2-specifications/9-100g-fr-and-100g-lr-technical-specs-rev2-0; 400G LR4-10 https://100glambda.com/specifications/summary/2-specifications/10-400g-lr4-10-technical-spec-rev1-0; <i>see also</i> https://community.fs.com/blog/100g-single-lambda-offers-cost-effective-100ge-and-400ge-solutions.html (describing 100g Lambda compliant transmitters: “These transceivers take a 4x 25G electrical signal from the host and convert the signal to PAM4 modulation using a DSP, meaning that the entire 100G data stream is transmitted by a single laser.”). Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
[a] an electrical system interface for receiving a first electrical data signal and for transmitting a second electrical data signal;	The Exemplary Device comprises an electrical system interface for receiving a first electrical data signal and for transmitting a second electrical data signal. For example, some forms of the Exemplary Device conform to CFP MSA specifications. https://onestore.nokia.com/asset/207647?_ga=2.172896227.172847549.1647280619-441605525.1645903816 (

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device																														
	Product description The Nokia CFP2-DCO provides a multi-haul 100G to 400G coherent WDM line interface in a compact, CFP2-DCO pluggable module. Technical specifications <table><thead><tr><th>Specifications</th><th>C2DCO4</th><th>C2DCO40</th></tr></thead><tbody><tr><td>Application</td><td colspan="2">WDM coherent pluggable module – metro, LH, DCI, OTN applications</td></tr><tr><td>Line port</td><td colspan="2">1 x CFP2-DCO WDM line port 100G – 400G provisioned (QPSK/8QAM/16QAM) 28 – 67 Gbaud Nokia PSE-Vc DSP</td></tr><tr><td>FEC options</td><td>Nokia SDFEC</td><td>oFEC</td></tr><tr><td>OpenZR+ compliant</td><td>–</td><td>Yes</td></tr><tr><td>OpenROADM compliant</td><td>–</td><td>Yes</td></tr><tr><td>Power consumption</td><td>~27W (typical)</td><td>~24W (typical)</td></tr><tr><td>Operating environment</td><td>Normal Humidity</td><td>-5°C to 70°C (23°F to 158°F) 5% to 90%</td></tr><tr><td>Physical</td><td colspan="2">CFP2</td></tr><tr><td>1830 PSS applications</td><td colspan="2">PSI-M (DD2M4 module) S5AD400H transponder (PSS-8/16ii/32) 2UX500 (PSS-8x/12x OTN interface) 4UC1T (PSS-24x OTN interface)</td></tr></tbody></table>); https://www.terabitsystems.com/nokia/routers/7750/7750-service-router (listing two CFP8 modules, 3HE13850AA and 3HE13849AA). The CFP MSA specifications describe the electrical system interface for electrical data signals that are received and transmitted. https://cfp-msa.org/wp-content/uploads/2022/10/CFP2_HW-Spec-rev1.0.pdf (	Specifications	C2DCO4	C2DCO40	Application	WDM coherent pluggable module – metro, LH, DCI, OTN applications		Line port	1 x CFP2-DCO WDM line port 100G – 400G provisioned (QPSK/8QAM/16QAM) 28 – 67 Gbaud Nokia PSE-Vc DSP		FEC options	Nokia SDFEC	oFEC	OpenZR+ compliant	–	Yes	OpenROADM compliant	–	Yes	Power consumption	~27W (typical)	~24W (typical)	Operating environment	Normal Humidity	-5°C to 70°C (23°F to 158°F) 5% to 90%	Physical	CFP2		1830 PSS applications	PSI-M (DD2M4 module) S5AD400H transponder (PSS-8/16ii/32) 2UX500 (PSS-8x/12x OTN interface) 4UC1T (PSS-24x OTN interface)	
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Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	4.4 HIGH SPEED ELECTRICAL CHARACTERISTICS The CFP2 Module high speed electrical interface supports the following configurations: 1) 4 tx lanes + 4 rx lanes, each at 25 Gbit/s; 2) 8 tx lanes + 8 rx lanes, each at 25 Gbit/s; 3) 10 tx lanes + 10 rx lanes, each at 10 Gbit/s. Following electrical interfaces may be supported in future. 4) 4 tx lanes + 4 rx lanes, each at 50 Gbit/s; 5) 8 tx lanes + 8 rx lanes, each at 50 Gbit/s; Figure 1-1: CFP2 Functional Block Diagram); https://www.oiforum.com/wp-content/uploads/2019/01/OIF-CFP2-DCO-01.0.pdf at 8-9 (specification for CFP2-DCO:

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	 Figure 1: CFP2-DCO Module Basic Functional Block Diagram), 12 (describing electrical interface), 16 (describing LC connector), 23-25 (Fujitsu, Infinera, and Nokia belonged to OIF); https://cfp-msa.org/wp-content/uploads/2022/10/CFP-MSA_CFP8_HW-Spec-rev1p0.pdf (CFP8 MSA containing similar disclosure for CFP8 devices). Other forms of the Exemplary Device conform to the OIF Implementation Agreement 400ZR and/or OpenZR+ MSA Specification. <i>E.g.</i>, https://www.gazettabyte.com/home/2021/8/3/nokia-adds-400g-coherent-modules-across-its-platforms.html (article reflecting interview with Serge Melle, “director of product marketing, IP-optical networking at Nokia,” discussing implementation of 400ZR and ZR+ coherent pluggables, including in CFP2, QSFP-DD and OSFP form factors); https://onestore.nokia.com/asset/207464 at 13 (discussing availability of CFP2, QSFP-DD and OSFP pluggables); https://onestore.nokia.com/asset/212764 (datasheet for Nokia’s 400G QSFP-DD modules, including QDDCO4z-400G and QDDCO4-100-400G). The OIF Implementation Agreement 400ZR and/or OpenZR+ MSA Specification describe the electrical system interface for electrical data signals that are received and transmitted. <i>E.g.</i>, https://www.oiforum.com/wp-content/uploads/OIF-400ZR-01.0_reduced2.pdf at 18-19 (

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	8.1 400G Host Side Interface The 400GbE data enters the transceiver using the 400GBASE-R PMA sublayer, where the electrical interface, for example, may be 400GAUI-8 C2M. The characteristic information of the adapted and mapped 400GBASE-R host interface signal consists of a scrambled sequence of 256b/257b encoded blocks with a nominal bit-rate of 425 000 000 kbit/s, ± 100 ppm. NOTE – 425 000 000 kbit/s is the nominal bit-rate of the aggregate 400GBASE-R PCS signal consisting of 16 PCS lanes with 256b/257b encoding and FEC at the PMA service interface.

8 Host to 400ZR data path

Figure 6 shows the functional blocks in the Tx and Rx data path.

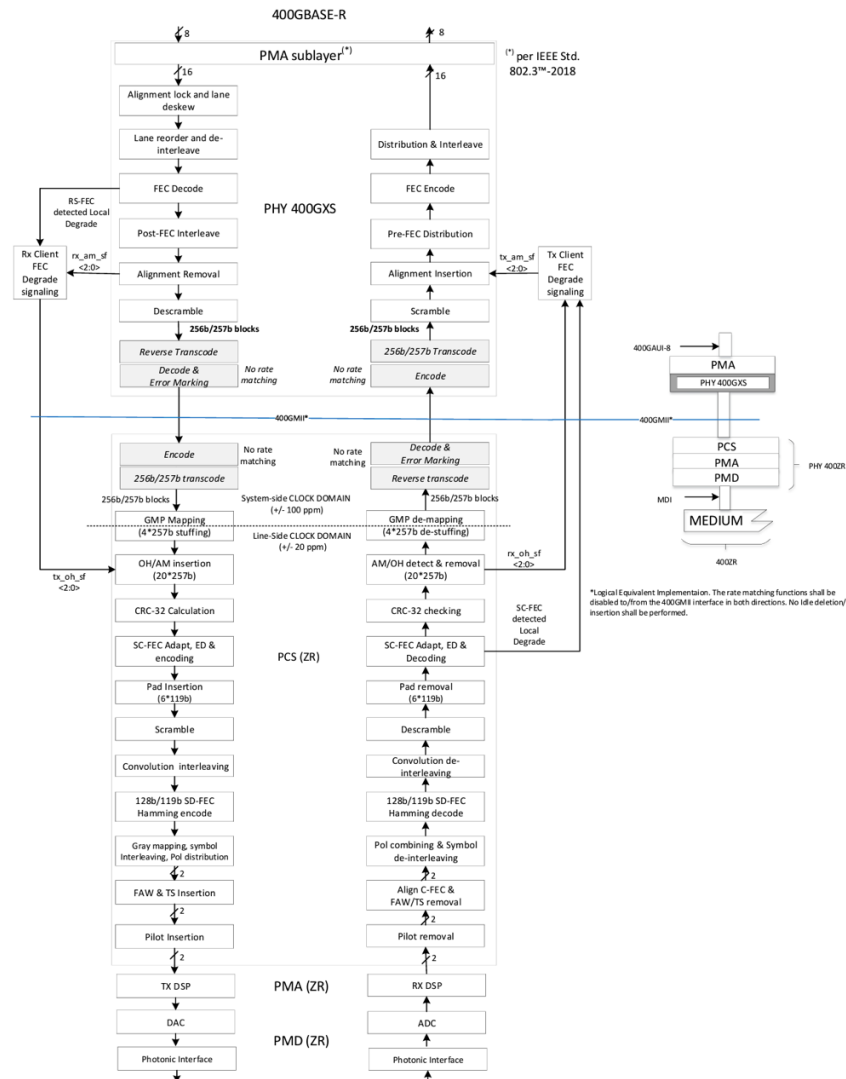
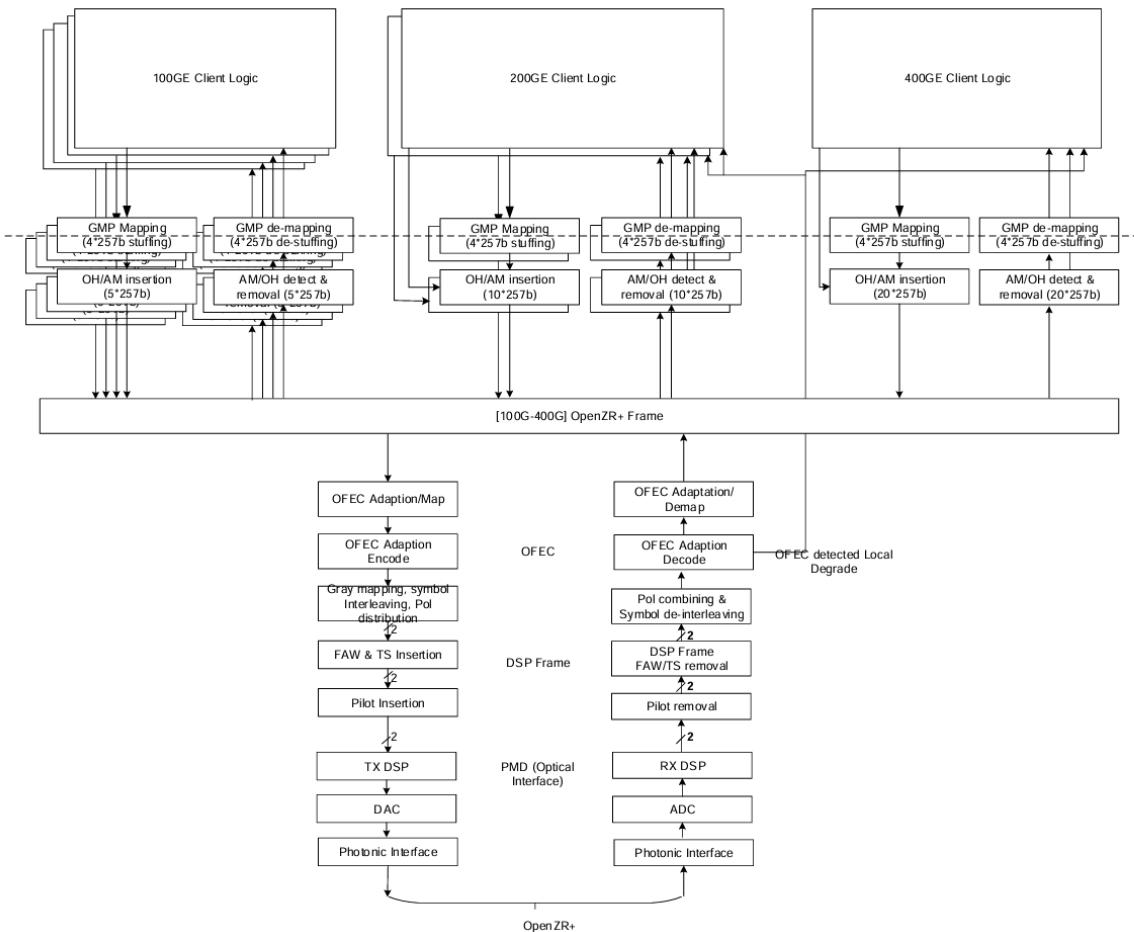
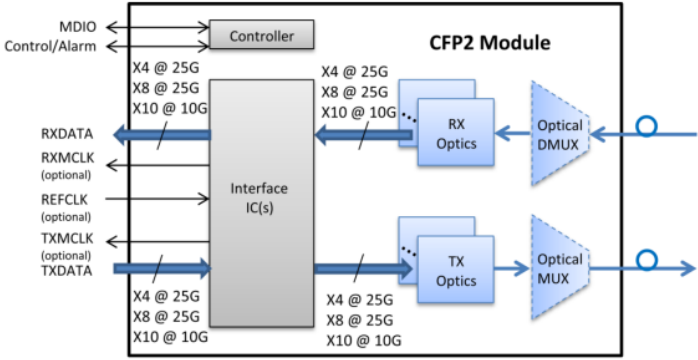


Figure 6: Data path detail

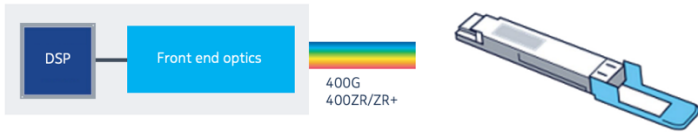
Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	); https://openzrplus.org/site/assets/files/1091/openzrplus_2p0.pdf at 9, 16 (2 OpenZR+ Block Diagram  Figure 2-1 OpenZR+ Block Diagram

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	Figure 4-1: Digital port functions for a single ZRx-OFEC-mQAM signal). The Lambda specifications include similar functionality. https://100glambda.com/specifications/summary/2-specifications/11-100g-lr1-20-er1-30-er1-40-technical-specs-rev-1p1; 400G FR4 https://100glambda.com/specifications/summary/2-specifications/7-400g-fr4-technical-spec-d2p0; 100G FR LR https://100glambda.com/specifications/summary/2-specifications/9-100g-fr-and-100g-lr-technical-specs-rev2-0; 400G LR4-10 https://100glambda.com/specifications/summary/2-specifications/10-400g-lr4-10-technical-spec-rev1-0; <i>see also</i> https://community.fs.com/blog/100g-single-lambda-offers-cost-effective-100ge-and-400ge-solutions.html (describing 100g Lambda compliant transmitters: “These transceivers take a 4x 25G electrical signal from the host and convert the signal to PAM4 modulation using a DSP, meaning that the entire 100G data stream is transmitted by a single laser.”).

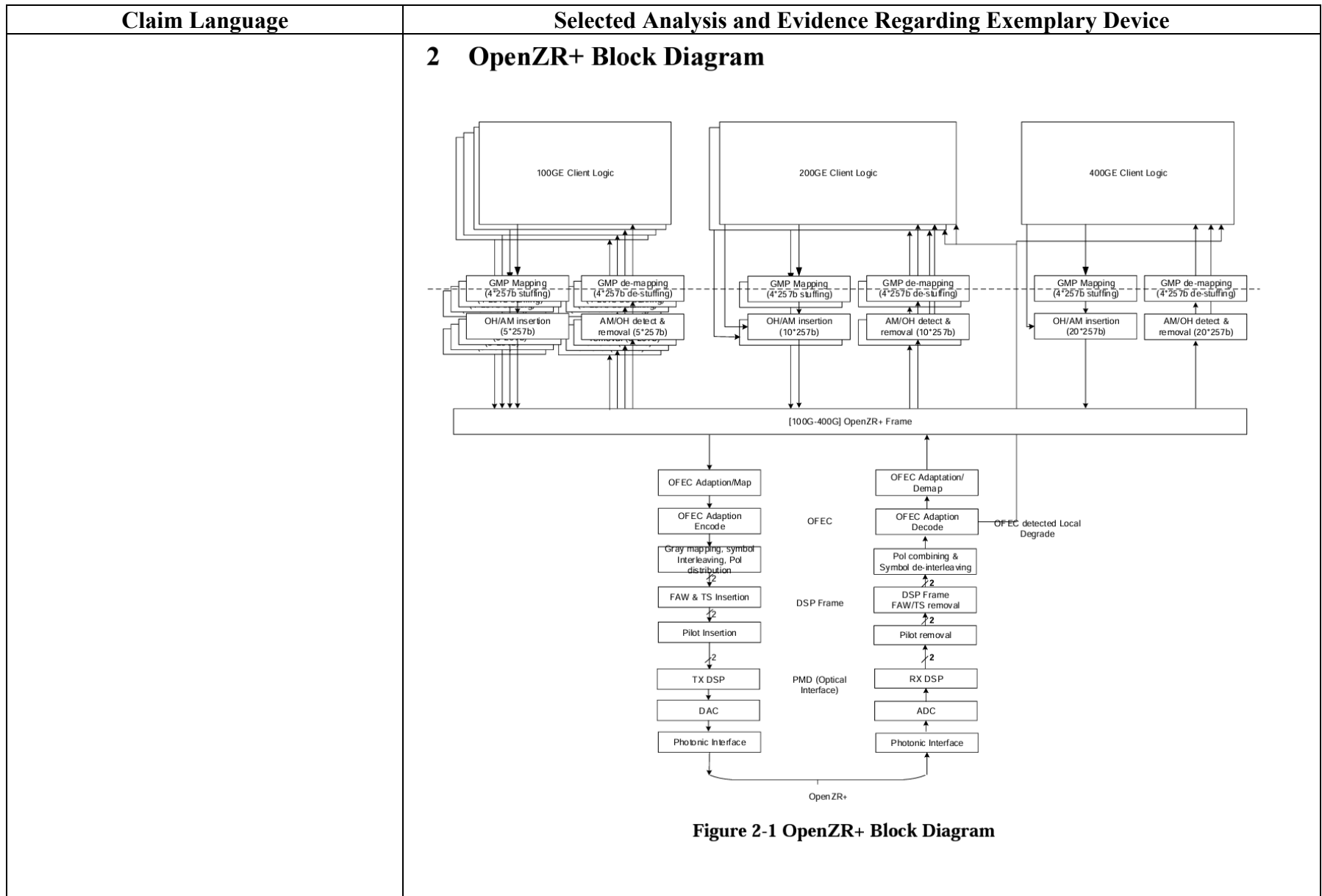
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[b] an m-ary modulator for increasing the number of bits per symbol in the first electrical data signal to produce a first m-ary modulation signal;	The Exemplary Device comprises an m-ary modulator for increasing the number of bits per symbol in the first electrical data signal to produce a first m-ary modulation signal. For example, the Exemplary Device supports the 16QAM modulation format. <i>E.g.</i>, https://onestore.nokia.com/asset/207647?_ga=2.172896227.172847549.1647280619-441605525.1645903816 (Technical specifications <table><tr><th>Specifications</th><th>C2DCO4</th><th>C2DCO40</th></tr><tr><td>Application</td><td colspan="2">WDM coherent pluggable module – metro, LH, DCI, OTN applications</td></tr><tr><td>Line port</td><td colspan="2">1 x CFP2-DCO WDM line port 100G – 400G provisioned (QPSK/8QAM/16QAM) 28 – 67 Gbaud Nokia PSE-Vc DSP</td></tr><tr><td>FEC options</td><td>Nokia SDFEC</td><td>oFEC</td></tr><tr><td>OpenZR+ compliant</td><td>–</td><td>Yes</td></tr><tr><td>OpenROADM compliant</td><td>–</td><td>Yes</td></tr><tr><td>Power consumption</td><td>~27W (typical)</td><td>~24W (typical)</td></tr><tr><td>Operating environment</td><td>Normal Humidity</td><td>-5°C to 70°C (23°F to 158°F) 5% to 90%</td></tr><tr><td>Physical</td><td colspan="2">CFP2</td></tr><tr><td>1830 PSS applications</td><td colspan="2">PSI-M (DD2M4 module) S5AD400H transponder (PSS-8/16ii/32) 2UX500 (PSS-8x/12x OTN interface) 4UC1T (PSS-24x OTN interface)</td></tr></table>	Specifications	C2DCO4	C2DCO40	Application	WDM coherent pluggable module – metro, LH, DCI, OTN applications		Line port	1 x CFP2-DCO WDM line port 100G – 400G provisioned (QPSK/8QAM/16QAM) 28 – 67 Gbaud Nokia PSE-Vc DSP		FEC options	Nokia SDFEC	oFEC	OpenZR+ compliant	–	Yes	OpenROADM compliant	–	Yes	Power consumption	~27W (typical)	~24W (typical)	Operating environment	Normal Humidity	-5°C to 70°C (23°F to 158°F) 5% to 90%	Physical	CFP2		1830 PSS applications	PSI-M (DD2M4 module) S5AD400H transponder (PSS-8/16ii/32) 2UX500 (PSS-8x/12x OTN interface) 4UC1T (PSS-24x OTN interface)	
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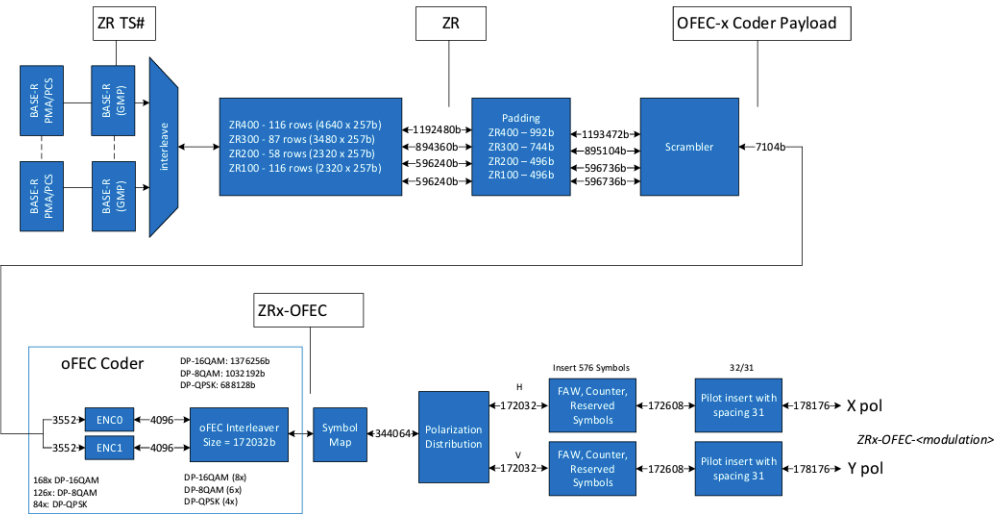
Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	Figure 1. Nokia CFP2-DCO module ); https://www.oiforum.com/wp-content/uploads/OIF-400ZR-01.0_reduced2.pdf at 48-49 (section entitled “DP-16QAM Symbol mapping and polarization distribution”). The 16QAM modulation format is an m-ary modulation method. <i>See</i> ’181 patent at 10:20-31. M-ary is used “[t]o increase the number of bits per symbol transmitted” in optical systems. Additionally, on information and belief, the “Interface IC(s)” defined in the CFP MSA specification includes an m-ary modulator, or its equivalent, or, on information and belief, the DSP defined in the OIF Implementation Agreement 400ZR and/or OpenZR+ MSA Specification includes an m-ary modulator, or its equivalent. https://cfp-msa.org/wp-content/uploads/2022/10/CFP2_HW-Spec-rev1.0.pdf ( Figure 1-1: CFP2 Functional Block Diagram); https://www.oiforum.com/wp-content/uploads/2019/01/OIF-CFP2-DCO-01.0.pdf at 8-9 (specification for CFP2-DCO:

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
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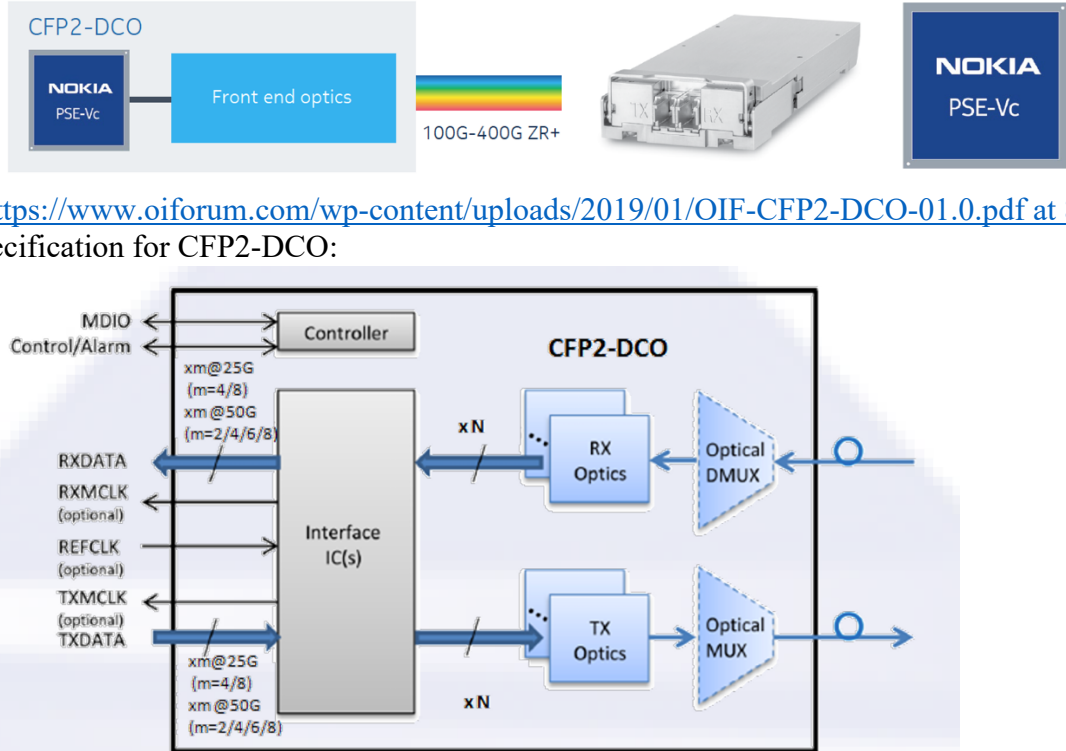
Claim Language	Selected Analysis and Evidence Regarding Exemplary Device									
	Product description The Nokia 400ZR/ZR+ modules provide 400G (400ZR) and 100G to 400G (400ZR+) coherent WDM line interfaces in a compact, QSFP-DD pluggable module. Incorporating the latest generation Nokia optical technology, the 400ZR/ZR+ modules provide plug-and-play options supporting coherent WDM line optics router and switch interface cards Integration of coherent digital signal processors (DSPs) into optical modules has long been an industry objective, but only recently become viable with the introduction of low-power 7nm CMOS technology. The small size and lower power consumption of 400ZR modules enable a wide array of applications, including coherent router DCI applications. Coupling with Nokia 1830 WDM line systems and ILA nodes provides an efficient, seamless network, all managed by Nokia WaveSuite network management and controller platforms. The Nokia QDDCO4Z 400G ZR module supports 400G applications up to 120 Km, compliant to Optical Interworking Forum (OIF) 400ZR standards. The QDDCO4 400G ZR+ module can be provisioned for 100G to 400G capacities using QPSK, 8QAM, or 16QAM modulation formats and is compliant to industry OpenZR+ standards The provisioning flexibility ensures the QDDCO4 supports optimum capacity over any metro, regional, or long-haul route. The Nokia 400ZR/ZR+ modules are ideal for DCI applications using router integrated coherent optics. They support direct 400 GbE clients as well as aggregation of 1n x 100 GbE clients. Figure 1. Nokia QDDCO4Z/QDDCO4 module  <table><tr><th>400ZR/ZR+</th><th>Part number</th><th>Description</th></tr><tr><td>QDDCO4Z-400G</td><td>3AL82199AA</td><td>400ZR QSFP-DD module, 400G</td></tr><tr><td>QDDCO4-100-400G</td><td>3AL82213AA</td><td>400ZR+ QSFP-DD module, 100G – 400G</td></tr></table>	400ZR/ZR+	Part number	Description	QDDCO4Z-400G	3AL82199AA	400ZR QSFP-DD module, 400G	QDDCO4-100-400G	3AL82213AA	400ZR+ QSFP-DD module, 100G – 400G
400ZR/ZR+	Part number	Description								
QDDCO4Z-400G	3AL82199AA	400ZR QSFP-DD module, 400G								
QDDCO4-100-400G	3AL82213AA	400ZR+ QSFP-DD module, 100G – 400G								

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device																																		
	Technical specifications <table> <tr> <th>Specifications</th><th>QDDCO4Z</th><th>QDDCO4-100G-400G</th></tr> <tr> <td>Application</td><td>400ZR</td><td>400ZR+</td></tr> <tr> <td>Line port</td><td>1 x QSFP-DD WDM line port 400G 16QAM 60 Gbaud</td><td>1 x QSFP-DD WDM line port 100G - 400G provisioned QPSK/8QAM/16QAM 60 Gbaud (200G - 400G) 30 Gbaud (100G)</td></tr> <tr> <td>Supported clients</td><td>400 GbE 4x100 GbE</td><td>400 GbE 4x100 GbE</td></tr> <tr> <td>FEC options</td><td>cFEC</td><td>oFEC</td></tr> <tr> <td>OIF 400ZR compliant</td><td>Yes</td><td>–</td></tr> <tr> <td>OpenZR+ compliant</td><td>–</td><td>Yes</td></tr> <tr> <td>Power consumption</td><td>18.9W</td><td>23W</td></tr> <tr> <td>Case temp</td><td>Normal</td><td>Normal</td></tr> <tr> <td>Humidity</td><td>5% to 85%</td><td>5% to 85%</td></tr> <tr> <td>Size</td><td>QSFP-DD</td><td>QSFP-DD</td></tr> </table>); https://openzrplus.org/site/assets/files/1091/openzrplus_2p0.pdf at 9, 16 (		Specifications	QDDCO4Z	QDDCO4-100G-400G	Application	400ZR	400ZR+	Line port	1 x QSFP-DD WDM line port 400G 16QAM 60 Gbaud	1 x QSFP-DD WDM line port 100G - 400G provisioned QPSK/8QAM/16QAM 60 Gbaud (200G - 400G) 30 Gbaud (100G)	Supported clients	400 GbE 4x100 GbE	400 GbE 4x100 GbE	FEC options	cFEC	oFEC	OIF 400ZR compliant	Yes	–	OpenZR+ compliant	–	Yes	Power consumption	18.9W	23W	Case temp	Normal	Normal	Humidity	5% to 85%	5% to 85%	Size	QSFP-DD	QSFP-DD
Specifications	QDDCO4Z	QDDCO4-100G-400G																																	
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Supported clients	400 GbE 4x100 GbE	400 GbE 4x100 GbE																																	
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Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	 Figure 4-1: Digital port functions for a single ZRx-OFEC-mQAM signal). The Lambda specifications include similar functionality. https://100glambda.com/specifications/summary/2-specifications/11-100g-lr1-20-er1-30-er1-40-technical-specs-rev-1p1; 400G FR4 https://100glambda.com/specifications/summary/2-specifications/7-400g-fr4-technical-spec-d2p0; 100G FR LR https://100glambda.com/specifications/summary/2-specifications/9-100g-fr-and-100g-lr-technical-specs-rev2-0; 400G LR4-10 https://100glambda.com/specifications/summary/2-specifications/10-400g-lr4-10-technical-spec-rev1-0; <i>see also</i> https://community.fs.com/blog/100g-single-lambda-offers-cost-effective-100ge-and-400ge-solutions.html (describing 100g Lambda compliant transmitters: “These transceivers take a 4x 25G electrical signal from the host and convert the signal to PAM4 modulation using a DSP, meaning that the entire 100G data stream is transmitted by a single laser.”). In addition, on information and belief, a first m-ary modulation signal is created by the DSP, digital-to-analog converter, or equivalent hardware used in the Exemplary Device.

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[c] a digital to analog converter for converting the first m-ary modulation signal to a first electrical m-ary analog modulation signal;	The Exemplary Device comprises a digital to analog converter for converting the first m-ary modulation signal to a first electrical m-ary analog modulation signal. For example, the Exemplary Device includes functionality that converts the m-ary modulated signal to an electrical m-ary analog modulation signal (for example, along the optical connection). <i>E.g.</i>, https://onestore.nokia.com/asset/207647?_ga=2.172896227.172847549.1647280619-441605525.1645903816 (Technical specifications <table><tr><th>Specifications</th><th>C2DCO4</th><th>C2DCO4O</th></tr><tr><td>Application</td><td colspan="2">WDM coherent pluggable module – metro, LH, DCI, OTN applications</td></tr><tr><td>Line port</td><td colspan="2">1 x CFP2-DCO WDM line port 100G – 400G provisioned (QPSK/8QAM/16QAM) 28 – 67 Gbaud Nokia PSE-Vc DSP</td></tr><tr><td>FEC options</td><td>Nokia SDFEC</td><td>oFEC</td></tr><tr><td>OpenZR+ compliant</td><td>–</td><td>Yes</td></tr><tr><td>OpenROADM compliant</td><td>–</td><td>Yes</td></tr><tr><td>Power consumption</td><td>~27W (typical)</td><td>~24W (typical)</td></tr><tr><td>Operating environment</td><td>Normal Humidity</td><td>-5°C to 70°C (23°F to 158°F) 5% to 90%</td></tr><tr><td>Physical</td><td colspan="2">CFP2</td></tr><tr><td>1830 PSS applications</td><td colspan="2">PSI-M (DD2M4 module) S5AD400H transponder (PSS-8/16ii/32) 2UX500 (PSS-8x/12x OTN interface) 4UC1T (PSS-24x OTN interface)</td></tr></table>	Specifications	C2DCO4	C2DCO4O	Application	WDM coherent pluggable module – metro, LH, DCI, OTN applications		Line port	1 x CFP2-DCO WDM line port 100G – 400G provisioned (QPSK/8QAM/16QAM) 28 – 67 Gbaud Nokia PSE-Vc DSP		FEC options	Nokia SDFEC	oFEC	OpenZR+ compliant	–	Yes	OpenROADM compliant	–	Yes	Power consumption	~27W (typical)	~24W (typical)	Operating environment	Normal Humidity	-5°C to 70°C (23°F to 158°F) 5% to 90%	Physical	CFP2		1830 PSS applications	PSI-M (DD2M4 module) S5AD400H transponder (PSS-8/16ii/32) 2UX500 (PSS-8x/12x OTN interface) 4UC1T (PSS-24x OTN interface)	
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	Figure 1. Nokia CFP2-DCO module ); https://www.oiforum.com/wp-content/uploads/2019/01/OIF-CFP2-DCO-01.0.pdf at 8-9 (specification for CFP2-DCO: Figure 1: CFP2-DCO Module Basic Functional Block Diagram), 12 (describing electrical interface), 16 (describing LC connector), 23-25 (Fujitsu, Infinera, and Nokia belonged to OIF); https://cfp-msa.org/wp-content/uploads/2022/10/CFP-MSA_CFP8_HW-Spec-rev1p0.pdf (CFP8 MSA containing similar disclosure for CFP8 devices); https://www.oiforum.com/wp-content/uploads/OIF-400ZR-01.0_reduced2.pdf at 18 (

8 Host to 400ZR data path

Figure 6 shows the functional blocks in the Tx and Rx data path.

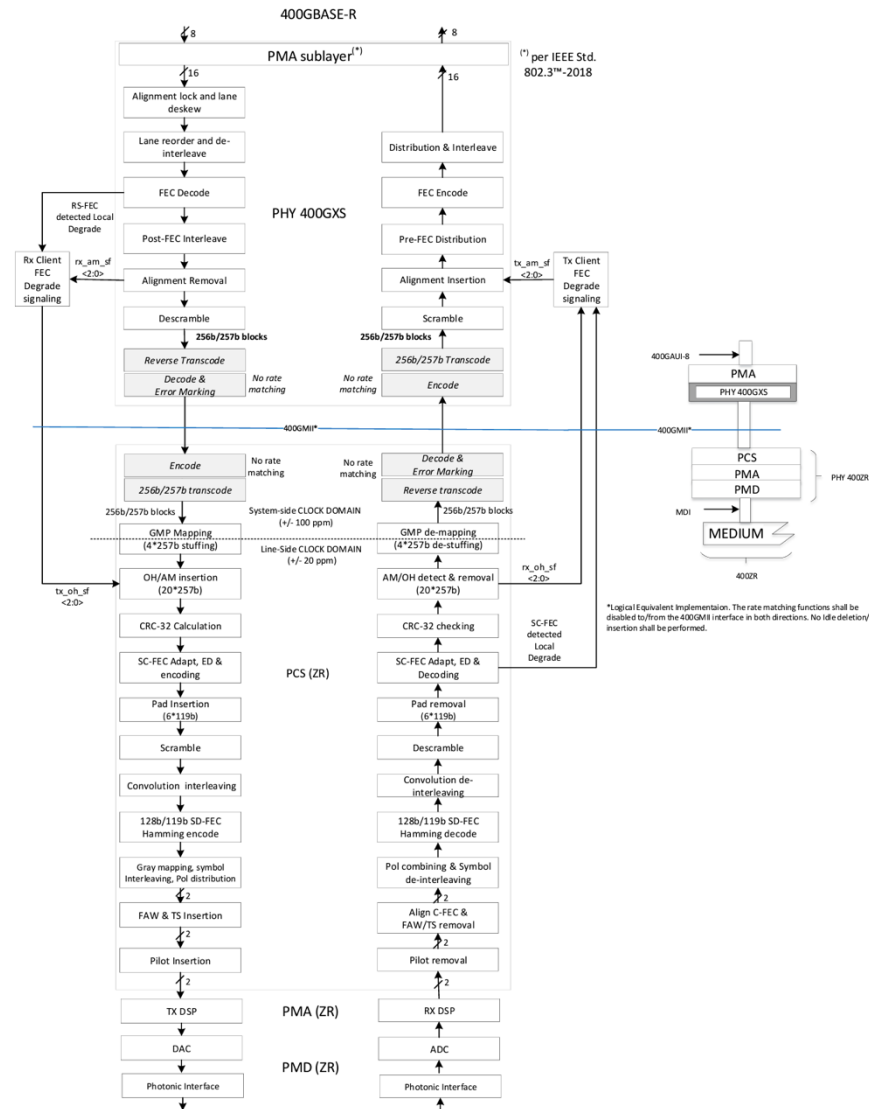
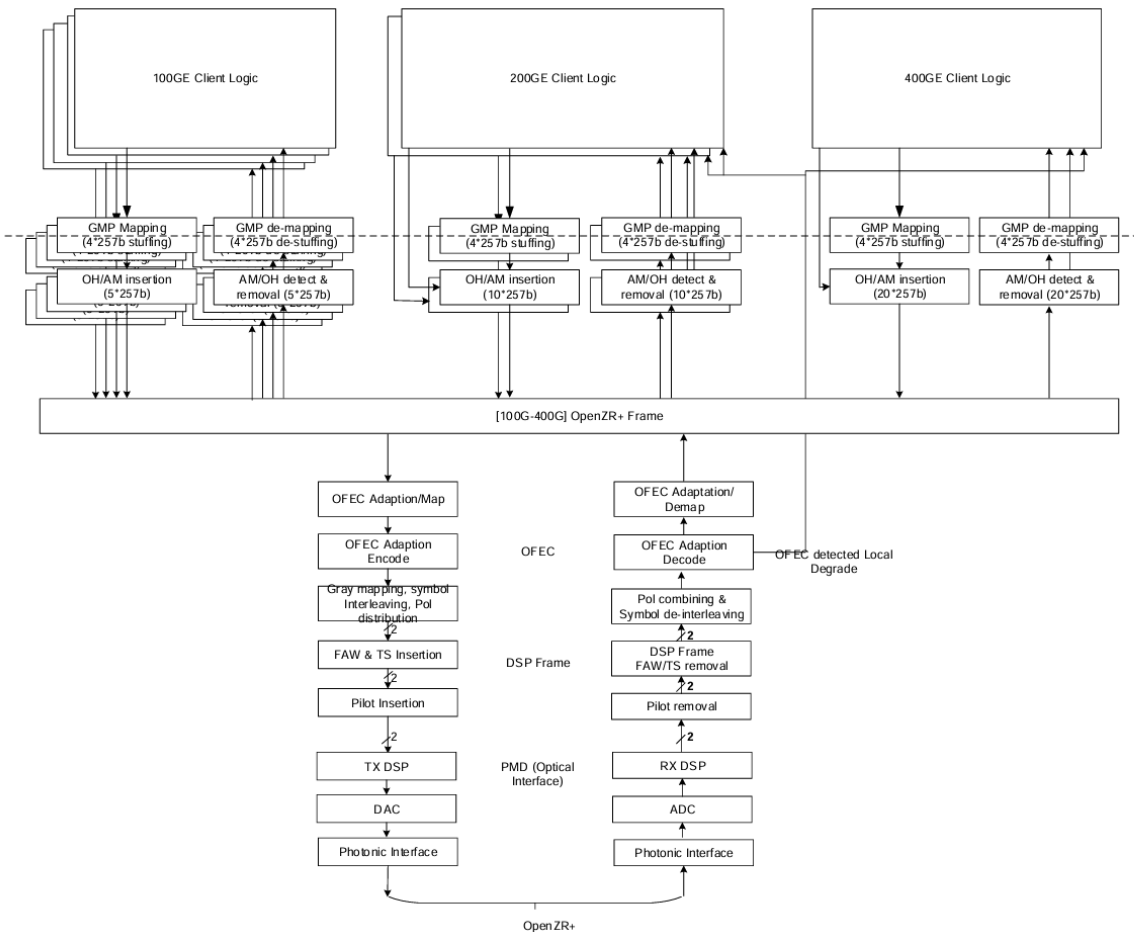
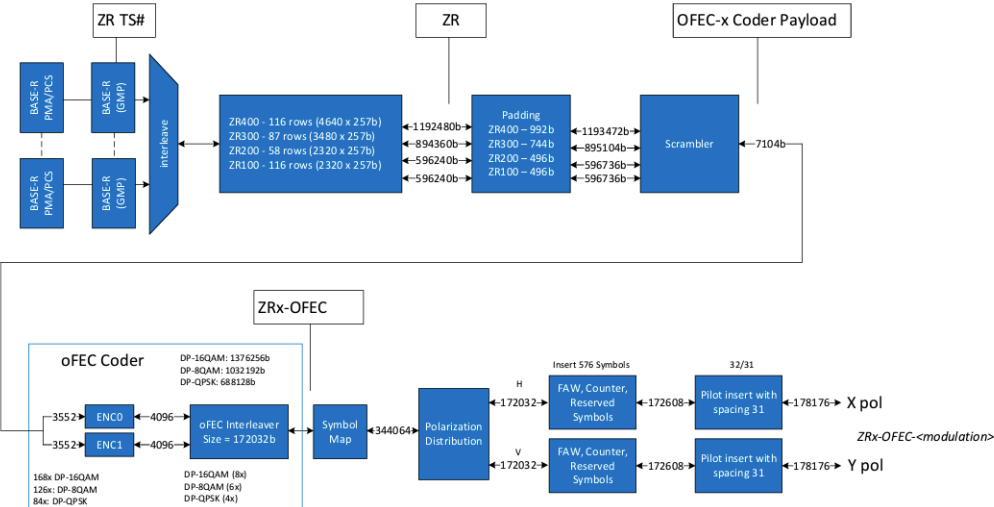
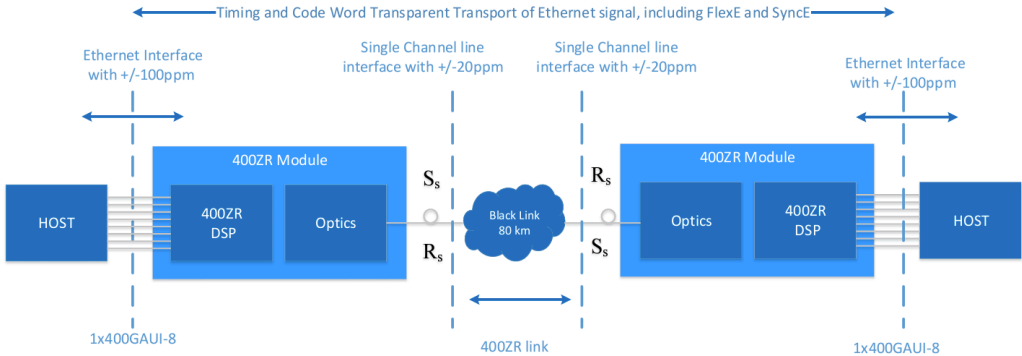


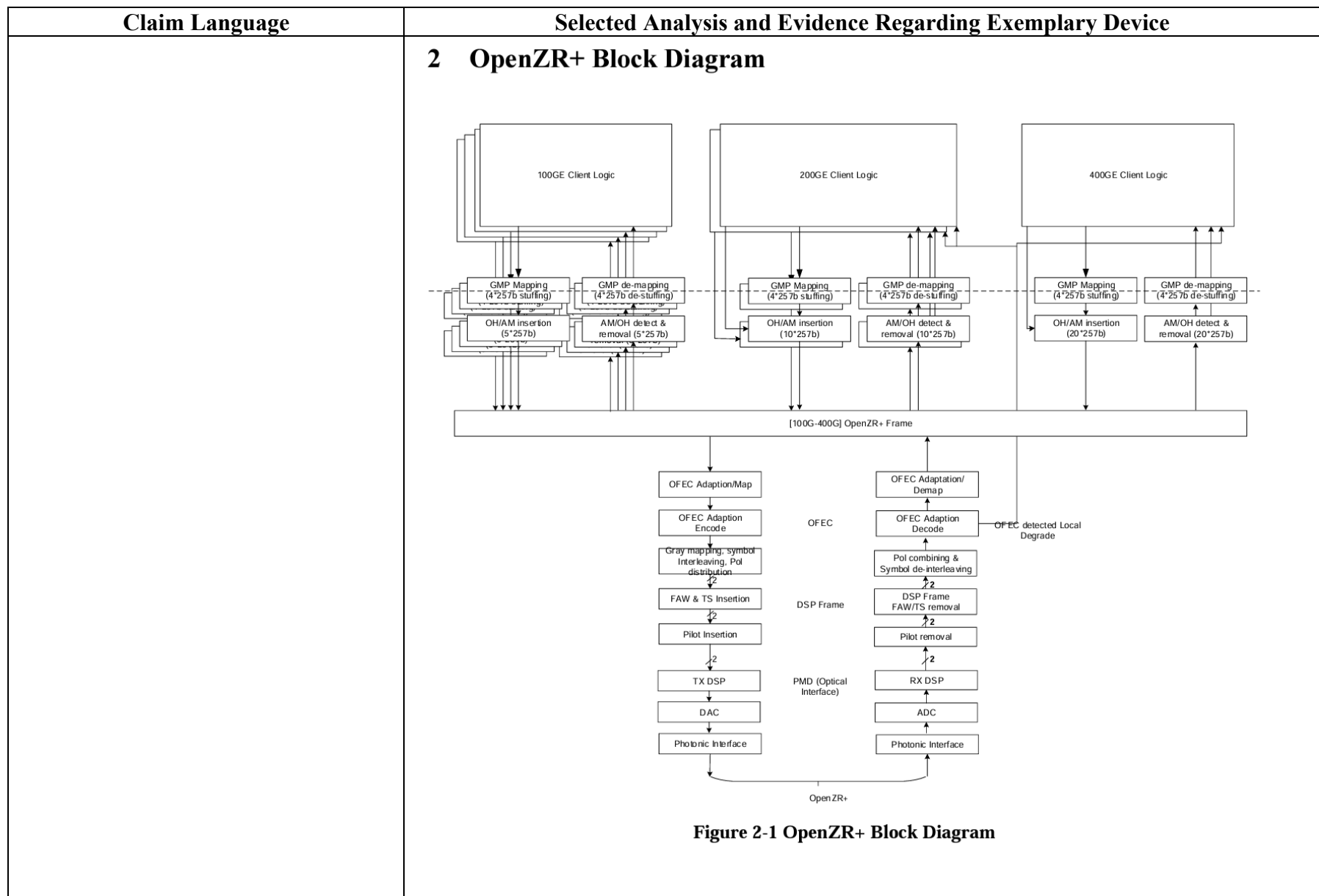
Figure 6: Data path detail

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	); https://openzrplus.org/site/assets/files/1091/openzrplus_2p0.pdf at 9, 16 (2 OpenZR+ Block Diagram  Figure 2-1 OpenZR+ Block Diagram

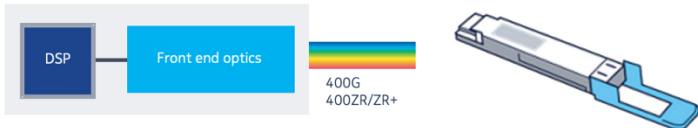
Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	 Figure 4-1: Digital port functions for a single ZRx-OFEC-mQAM signal On information and belief, the digital to analog converter, or its equivalent, can found in the PSE-Vc DSP, and/or the “Interface IC(s)” or “TX Optics” defined in the CFP MSA specification or in the DSP or Optics defined in the OIF Implementation Agreement 400ZR and/or OpenZR+ MSA Specification. https://cfp-msa.org/wp-content/uploads/2022/10/CFP2_HW-Spec-rev1.0.pdf (

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Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	MSA_CFP8_HW-Spec-rev1p0.pdf (CFP8 MSA containing similar disclosure for CFP8 devices); https://www.oiforum.com/wp-content/uploads/OIF-400ZR-01.0_reduced2.pdf at 14 ( Figure 1: 400ZR reference diagram); https://openzrplus.org/site/assets/files/1091/openzrplus_2p0.pdf at 9, 16 (

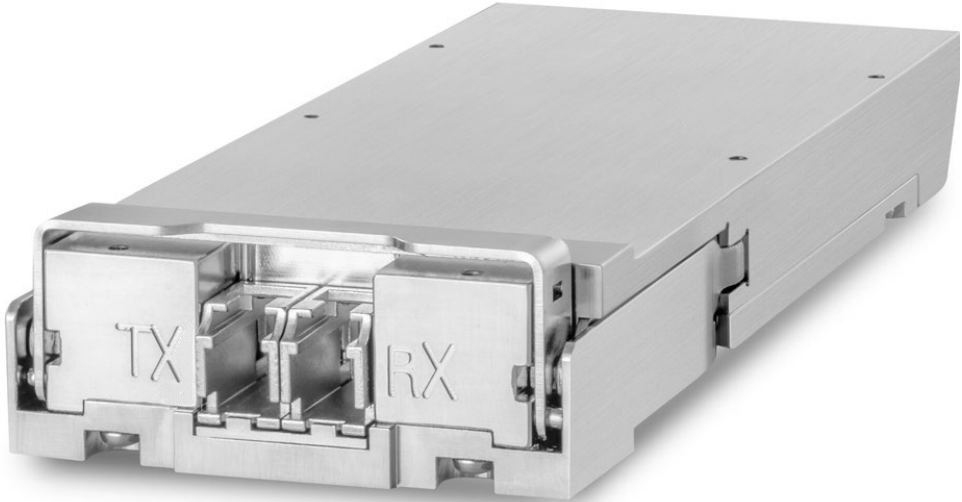


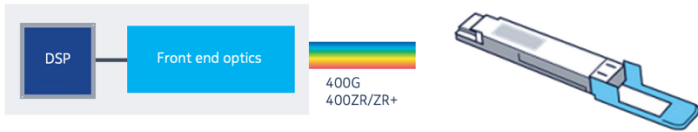
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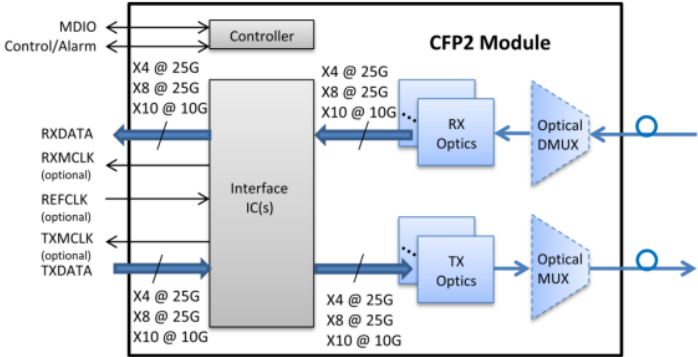
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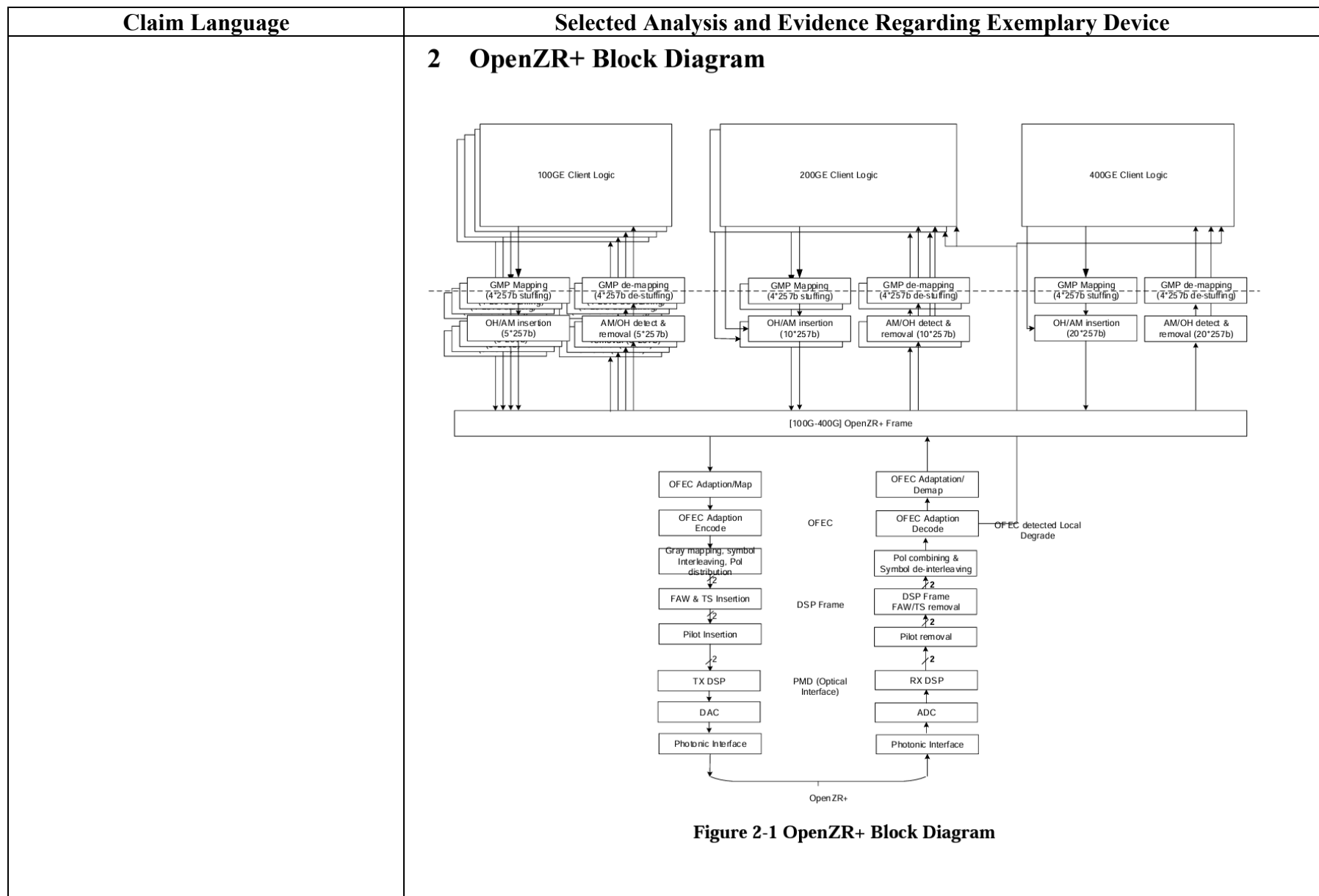
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	Technical specifications <table> <tr> <th>Specifications</th><th>QDDCO4Z</th><th>QDDCO4-100G-400G</th></tr> <tr> <td>Application</td><td>400ZR</td><td>400ZR+</td></tr> <tr> <td>Line port</td><td>1 x QSFP-DD WDM line port 400G 16QAM 60 Gbaud</td><td>1 x QSFP-DD WDM line port 100G - 400G provisioned QPSK/8QAM/16QAM 60 Gbaud (200G - 400G) 30 Gbaud (100G)</td></tr> <tr> <td>Supported clients</td><td>400 GbE 4x100 GbE</td><td>400 GbE 4x100 GbE</td></tr> <tr> <td>FEC options</td><td>cFEC</td><td>oFEC</td></tr> <tr> <td>OIF 400ZR compliant</td><td>Yes</td><td>-</td></tr> <tr> <td>OpenZR+ compliant</td><td>-</td><td>Yes</td></tr> <tr> <td>Power consumption</td><td>18.9W</td><td>23W</td></tr> <tr> <td>Case temp</td><td>Normal</td><td>Normal</td></tr> <tr> <td>Humidity</td><td>-5°C to 75°C (23°F to 167°F) 5% to 85%</td><td>-5°C to 75°C (23°F to 167°F) 5% to 85%</td></tr> <tr> <td>Size</td><td>QSFP-DD</td><td>QSFP-DD</td></tr> </table>); https://openzrplus.org/site/assets/files/1091/openzrplus_2p0.pdf at 58-63. The optical transmitter uses a driver amplifier to optimize the level of the modulation signal driven by the optical transmitter. On information and belief, the driver for the transmitter, or its equivalent, is contained within the interface IC(s) or TX Optics shown in the CFP specification functional block diagram, or, on information and belief, within the DSP or Optics defined in the OIF Implementation Agreement 400ZR and/or OpenZR+ MSA Specification. https://cfp-msa.org/wp-content/uploads/2022/10/CFP2_HW-Spec-rev1.0.pdf (		Specifications	QDDCO4Z	QDDCO4-100G-400G	Application	400ZR	400ZR+	Line port	1 x QSFP-DD WDM line port 400G 16QAM 60 Gbaud	1 x QSFP-DD WDM line port 100G - 400G provisioned QPSK/8QAM/16QAM 60 Gbaud (200G - 400G) 30 Gbaud (100G)	Supported clients	400 GbE 4x100 GbE	400 GbE 4x100 GbE	FEC options	cFEC	oFEC	OIF 400ZR compliant	Yes	-	OpenZR+ compliant	-	Yes	Power consumption	18.9W	23W	Case temp	Normal	Normal	Humidity	-5°C to 75°C (23°F to 167°F) 5% to 85%	-5°C to 75°C (23°F to 167°F) 5% to 85%	Size	QSFP-DD	QSFP-DD
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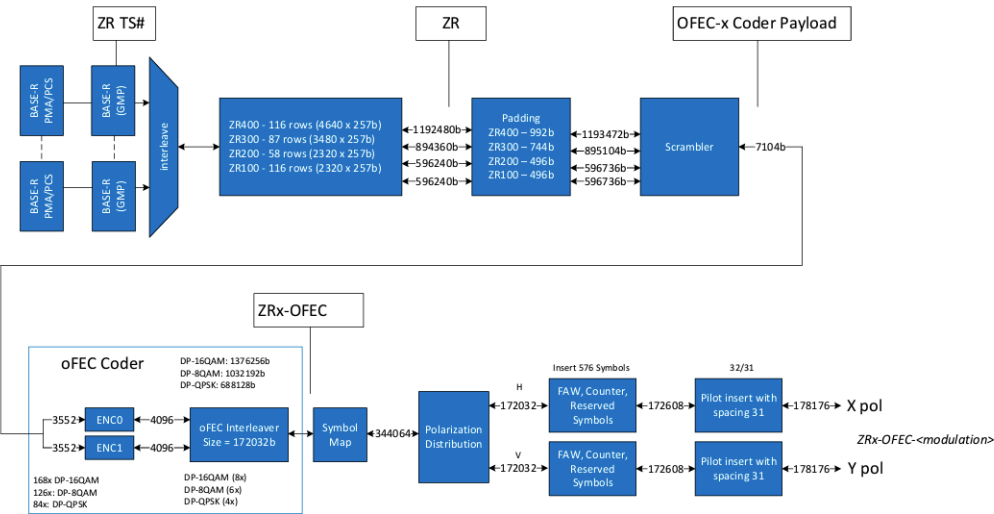
Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	Figure 1-1: CFP2 Functional Block Diagram); https://www.oiforum.com/wp-content/uploads/2019/01/OIF-CFP2-DCO-01.0.pdf at 8-9 (specification for CFP2-DCO: Figure 1: CFP2-DCO Module Basic Functional Block Diagram), 12 (describing electrical interface), 16 (describing LC connector), 23-25 (Fujitsu, Infinera, and Nokia belonged to OIF); https://cfp-msa.org/wp-content/uploads/2022/10/CFP-MSA_CFP8_HW-Spec-rev1p0.pdf (CFP8 MSA containing similar disclosure for CFP8

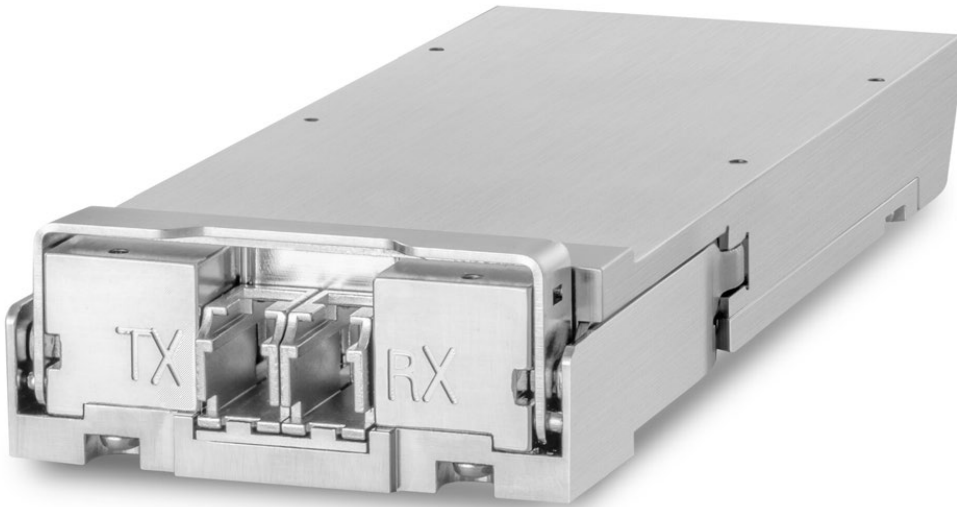
Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	devices). Moreover, on information and belief, the functionality of the QSFP and OSFP DCO devices is similar to that of the CFP2-DCO devices. <i>E.g.</i>, https://www.gazettabyte.com/home/2021/8/3/nokia-adds-400g-coherent-modules-across-its-platforms.html (article reflecting interview with Serge Melle, “director of product marketing, IP-optical networking at Nokia,” discussing implementation of 400ZR and ZR+ coherent pluggables, including in CFP2, QSFP-DD and OSFP form factors); https://onestore.nokia.com/asset/207464 at 13 (discussing availability of CFP2, QSFP-DD and OSFP pluggables); https://onestore.nokia.com/asset/207220 (White paper for Nokia PSE-VC DSP that “is ideal for pluggable optics with integrated DSP, such as CFP2-based modules...and smaller modules); https://www.nokia.com/blog/roadms-for-the-400g-era-of-ip-optical-networking/ (Nokia article discussing use of DCO pluggables); https://www.nokia.com/blog/silicon-photonics-the-platform-for-the-400g-era-and-beyond/ (similar). The Lambda specifications include similar functionality. https://100glambda.com/specifications/summary/2-specifications/11-100g-lr1-20-er1-30-er1-40-technical-specs-rev-1p1; 400G FR4 https://100glambda.com/specifications/summary/2-specifications/7-400g-fr4-technical-spec-d2p0; 100G FR LR https://100glambda.com/specifications/summary/2-specifications/9-100g-fr-and-100g-lr-technical-specs-rev2-0; 400G LR4-10 https://100glambda.com/specifications/summary/2-specifications/10-400g-lr4-10-technical-spec-rev1-0; <i>see also</i> https://community.fs.com/blog/100g-single-lambda-offers-cost-effective-100ge-and-400ge-solutions.html (describing 100g Lambda compliant transmitters: “These transceivers take a 4x 25G electrical signal from the host and convert the signal to PAM4 modulation using a DSP, meaning that the entire 100G data stream is transmitted by a single laser.”). Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
[e] the optical transmitter for emitting a first optical signal on a first wavelength responsive to and representative of the amplified first electrical m-ary analog modulation signal from the driver;	The Exemplary Device comprises the optical transmitter for emitting a first optical signal on a first wavelength responsive to and representative of the amplified first electrical m-ary analog modulation signal from the driver. For example, the Exemplary Device includes transmitter functionalities as described above in claim elements 1[a]-[d]. On information and belief, the optical transmitter, or its equivalent, is contained within the interface IC(s) or TX Optics shown in the CFP specification functional block diagram, or, on information and belief, the DSP or Optics defined in the OIF Implementation Agreement 400ZR and/or OpenZR+ MSA Specification. https://cfp-msa.org/wp-content/uploads/2022/10/CFP2_HW-Spec-rev1.0.pdf ( Figure 1-1: CFP2 Functional Block Diagram); https://www.oiforum.com/wp-content/uploads/2019/01/OIF-CFP2-DCO-01.0.pdf at 8-9 (specification for CFP2-DCO:

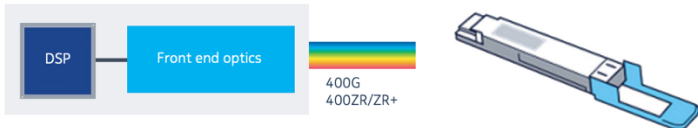
Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	Figure 1: CFP2-DCO Module Basic Functional Block Diagram), 12 (describing electrical interface), 16 (describing LC connector), 23-25 (Fujitsu, Infinera, and Nokia belonged to OIF); https://cfp-msa.org/wp-content/uploads/2022/10/CFP-MSA_CFP8_HW-Spec-rev1p0.pdf (CFP8 MSA containing similar disclosure for CFP8 devices); https://www.oiforum.com/wp-content/uploads/OIF-400ZR-01.0_reduced2.pdf at 14 (Figure 1: 400ZR reference diagram); https://openzrplus.org/site/assets/files/1091/openzrplus_2p0.pdf at 9, 16 (



Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	 Figure 4-1: Digital port functions for a single ZRx-OFEC-mQAM signal); see also https://onestore.nokia.com/asset/207647?_ga=2.172896227.172847549.1647280619-441605525.1645903816 (

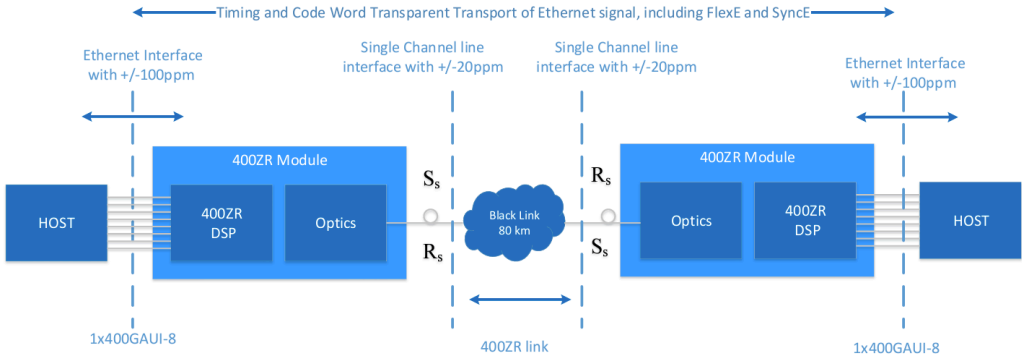
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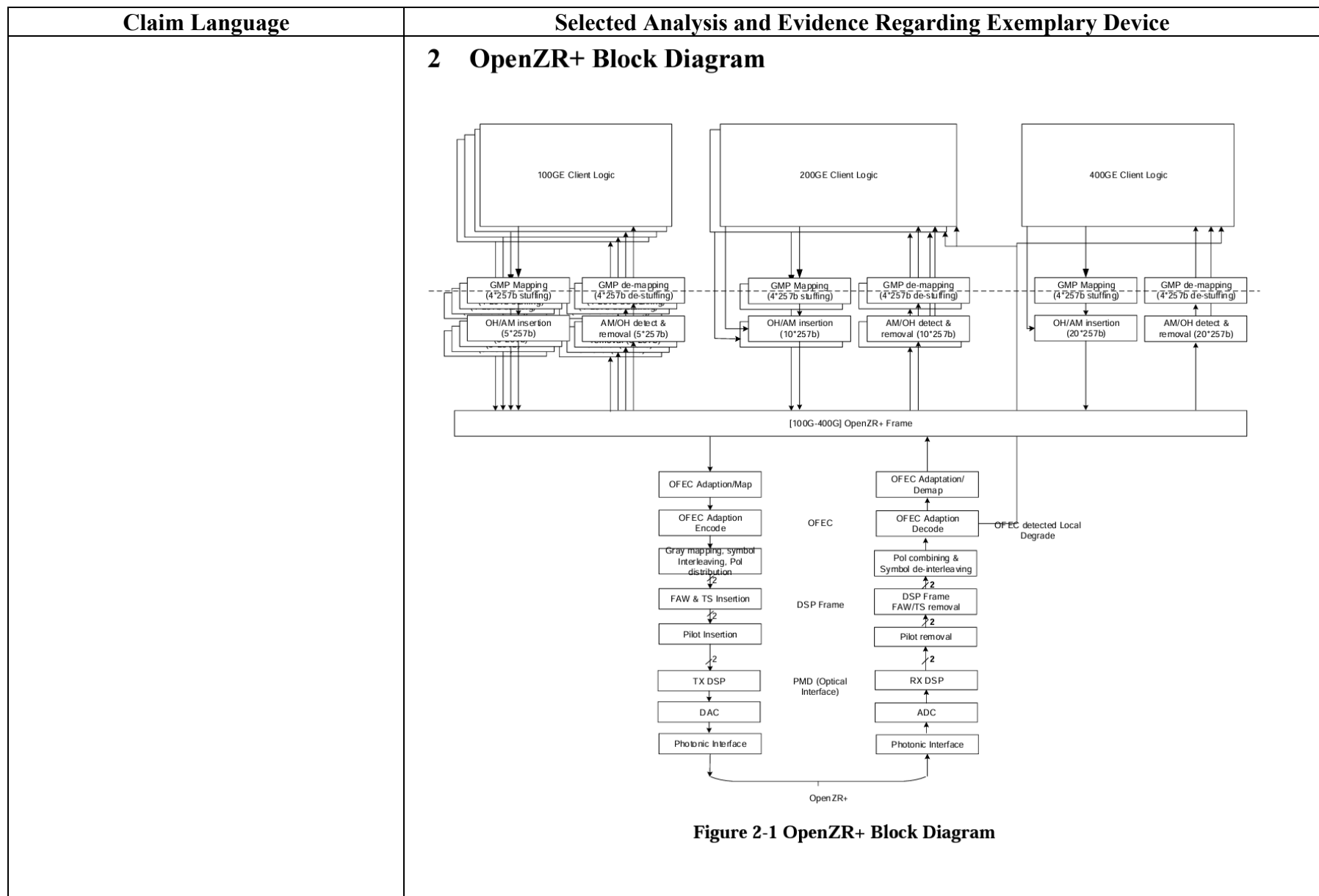
Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	IP-optical networking at Nokia,” discussing implementation of 400ZR and ZR+ coherent pluggables, including in CFP2, QSFP-DD and OSFP form factors); https://onestore.nokia.com/asset/207464 at 13 (discussing availability of CFP2, QSFP-DD and OSFP pluggables); https://onestore.nokia.com/asset/207220 (White paper for Nokia PSE-VC DSP that “is ideal for pluggable optics with integrated DSP, such as CFP2-based modules...and smaller modules); https://www.nokia.com/blog/roadms-for-the-400g-era-of-ip-optical-networking/ (Nokia article discussing use of DCO pluggables); https://www.nokia.com/blog/silicon-photonics-the-platform-for-the-400g-era-and-beyond/ (similar); https://onestore.nokia.com/asset/212764 (Product description The Nokia 400ZR/ZR+ modules provide 400G (400ZR) and 100G to 400G (400ZR+) coherent WDM line interfaces in a compact, QSFP-DD pluggable module. Incorporating the latest generation Nokia optical technology, the 400ZR/ZR+ modules provide plug-and-play options supporting coherent WDM line optics router and switch interface cards Integration of coherent digital signal processors (DSPs) into optical modules has long been an industry objective, but only recently become viable with the introduction of low-power 7nm CMOS technology. The small size and lower power consumption of 400ZR modules enable a wide array of applications, including coherent router DCI applications. Coupling with Nokia 1830 WDM line systems and ILA nodes provides an efficient, seamless network, all managed by Nokia WaveSuite network management and controller platforms. The Nokia QDDCO4Z 400G ZR module supports 400G applications up to 120 Km, compliant to Optical Interworking Forum (OIF) 400ZR standards. The QDDCO4 400G ZR+ module can be provisioned for 100G to 400G capacities using QPSK, 8QAM, or 16QAM modulation formats and is compliant to industry OpenZR+ standards The provisioning flexibility ensures the QDDCO4 supports optimum capacity over any metro, regional, or long-haul route. The Nokia 400ZR/ZR+ modules are ideal for DCI applications using router integrated coherent optics. They support direct 400 GbE clients as well as aggregation of 1n x 100 GbE clients.

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	Figure 1. Nokia QDDCO4Z/QDDCO4 module  <table><tr><th>400ZR/ZR+</th><th>Part number</th><th>Description</th></tr><tr><td>QDDCO4Z-400G</td><td>3AL82199AA</td><td>400ZR QSFP-DD module, 400G</td></tr><tr><td>QDDCO4-100-400G</td><td>3AL82213AA</td><td>400ZR+ QSFP-DD module, 100G – 400G</td></tr></table> Technical specifications <table><tr><th>Specifications</th><th>QDDCO4Z</th><th>QDDCO4-100G-400G</th></tr><tr><td>Application</td><td>400ZR</td><td>400ZR+</td></tr><tr><td>Line port</td><td>1 x QSFP-DD WDM line port 400G 16QAM 60 Gbaud</td><td>1 x QSFP-DD WDM line port 100G - 400G provisioned QPSK/8QAM/16QAM 60 Gbaud (200G - 400G) 30 Gbaud (100G)</td></tr><tr><td>Supported clients</td><td>400 GbE 4x100 GbE</td><td>400 GbE 4x100 GbE</td></tr><tr><td>FEC options</td><td>cFEC</td><td>oFEC</td></tr><tr><td>OIF 400ZR compliant</td><td>Yes</td><td>-</td></tr><tr><td>OpenZR+ compliant</td><td>-</td><td>Yes</td></tr><tr><td>Power consumption</td><td>18.9W</td><td>23W</td></tr><tr><td>Case temp</td><td>Normal Humidity 5% to 85%</td><td>Normal Humidity 5% to 85%</td></tr><tr><td>Size</td><td>QSFP-DD</td><td>QSFP-DD</td></tr></table>). The Lambda specifications include similar functionality. https://100glambda.com/specifications/summary/2-specifications/11-100g-lr1-20-er1-30-er1-40-technical-specs-rev-1p1; 400G FR4 https://100glambda.com/specifications/summary/2-specifications/7-400g-fr4-technical-spec-d2p0; 100G FR LR https://100glambda.com/specifications/summary/2-specifications/9-100g-fr-and-100g-lr-technical-specs-rev2-0; 400G LR4-10 https://100glambda.com/specifications/summary/2-specifications/10-400g-lr4-10-technical-spec-d2p0	400ZR/ZR+	Part number	Description	QDDCO4Z-400G	3AL82199AA	400ZR QSFP-DD module, 400G	QDDCO4-100-400G	3AL82213AA	400ZR+ QSFP-DD module, 100G – 400G	Specifications	QDDCO4Z	QDDCO4-100G-400G	Application	400ZR	400ZR+	Line port	1 x QSFP-DD WDM line port 400G 16QAM 60 Gbaud	1 x QSFP-DD WDM line port 100G - 400G provisioned QPSK/8QAM/16QAM 60 Gbaud (200G - 400G) 30 Gbaud (100G)	Supported clients	400 GbE 4x100 GbE	400 GbE 4x100 GbE	FEC options	cFEC	oFEC	OIF 400ZR compliant	Yes	-	OpenZR+ compliant	-	Yes	Power consumption	18.9W	23W	Case temp	Normal Humidity 5% to 85%	Normal Humidity 5% to 85%	Size	QSFP-DD	QSFP-DD
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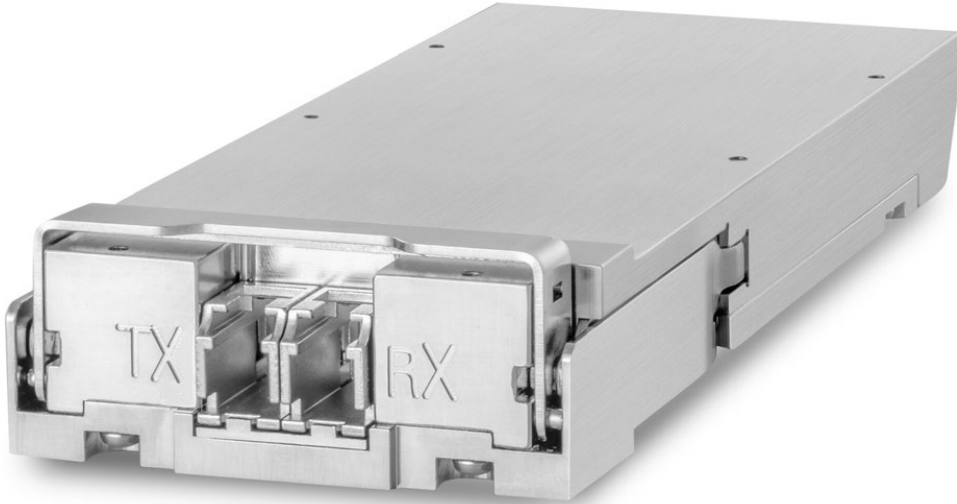
Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	specifications/10-400g-lr4-10-technical-spec-rev1-0; <i>see also</i> https://community.fs.com/blog/100g-single-lambda-offers-cost-effective-100ge-and-400ge-solutions.html (describing 100g Lambda compliant transmitters: “These transceivers take a 4x 25G electrical signal from the host and convert the signal to PAM4 modulation using a DSP, meaning that the entire 100G data stream is transmitted by a single laser.”). Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
[f] an optical detector for receiving a second optical signal on a second wavelength to produce an electrical analog signal;	The Exemplary Device comprises an optical detector for receiving a second optical signal on a second wavelength to produce an electrical analog signal. For example, the Exemplary Device includes transmitter functionalities as described above in claim elements 1[a]-[e]. On information and belief, the optical detector, or its equivalent, is contained within the interface IC(s) or RX Optics shown in the CFP specification functional block diagram, or the DSP or Optics defined in the OIF Implementation Agreement 400ZR and/or OpenZR+ MSA Specification. https://cfp-msa.org/wp-content/uploads/2022/10/CFP2_HW-Spec-rev1.0.pdf (

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
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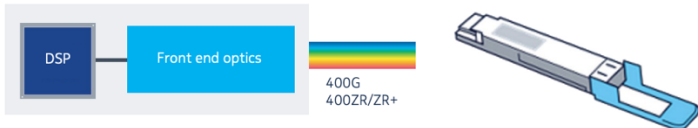
Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	MSA_CFP8_HW-Spec-rev1p0.pdf (CFP8 MSA containing similar disclosure for CFP8 devices); https://www.oiforum.com/wp-content/uploads/OIF-400ZR-01.0_reduced2.pdf at 14 ( Figure 1: 400ZR reference diagram); https://openzrplus.org/site/assets/files/1091/openzrplus_2p0.pdf at 9, 16 (



Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	The diagram illustrates the digital port functions for a single ZRx-OFEC-mQAM signal. It shows the flow of data from input sources (ZR TS#, ZR, OFEC-x Coder Payload) through various processing blocks. The ZR TS# input goes through BASE-R PM/PCS and BASE-R (GMP) blocks. The ZR input goes through a series of blocks including ZR400 - 116 rows (4640 x 257b), ZR300 - 87 rows (3480 x 257b), ZR200 - 58 rows (2320 x 257b), and ZR100 - 116 rows (2320 x 257b). These are followed by a Padding block (ZR400 - 992b, ZR300 - 744b, ZR200 - 496b, ZR100 - 496b) and an OFEC-x Coder Payload block. The data then passes through a Scrambler block. The output of the Scrambler is then processed by the ZRx-OFEC block, which includes an oFEC Coder (DP-16QAM: 1376256b, DP-8QAM: 1032192b, DP-QPSK: 688128b) and a Symbol Map block. The Symbol Map block outputs are then processed by a Polarization Distribution block, which outputs H and V signals. These signals are then processed by FAW Counter, Reserved Symbols blocks, and Pilot insert blocks (Pilot insert with spacing 31). The final outputs are X pol and Y pol signals, labeled as ZRx-OFEC-<modulation>. Figure 4-1: Digital port functions for a single ZRx-OFEC-mQAM signal); see also https://onestore.nokia.com/asset/207647?_ga=2.172896227.172847549.1647280619-441605525.1645903816 (

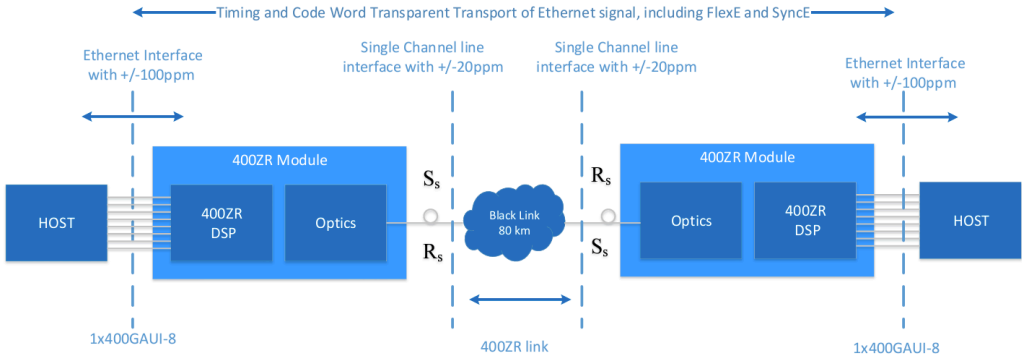
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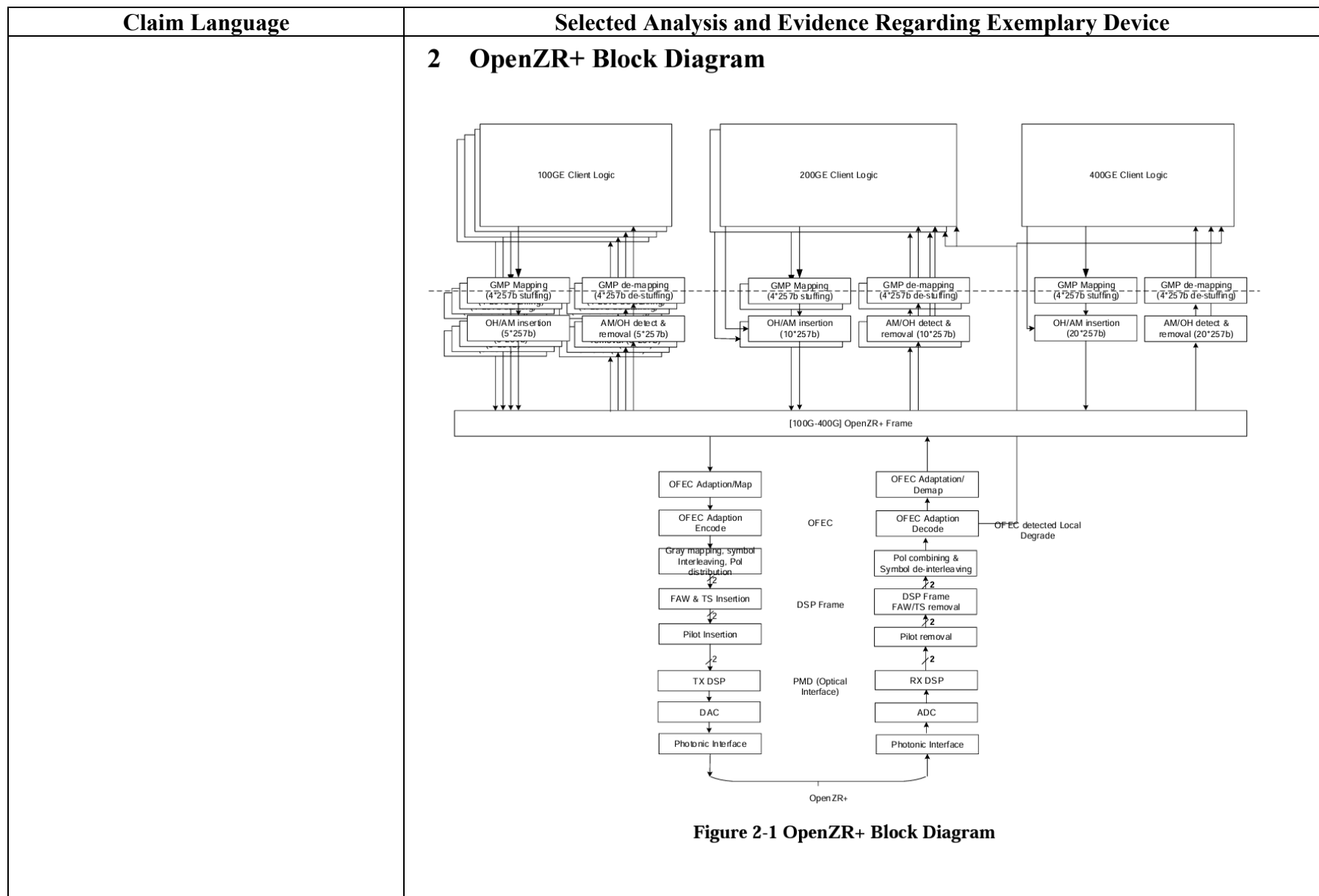
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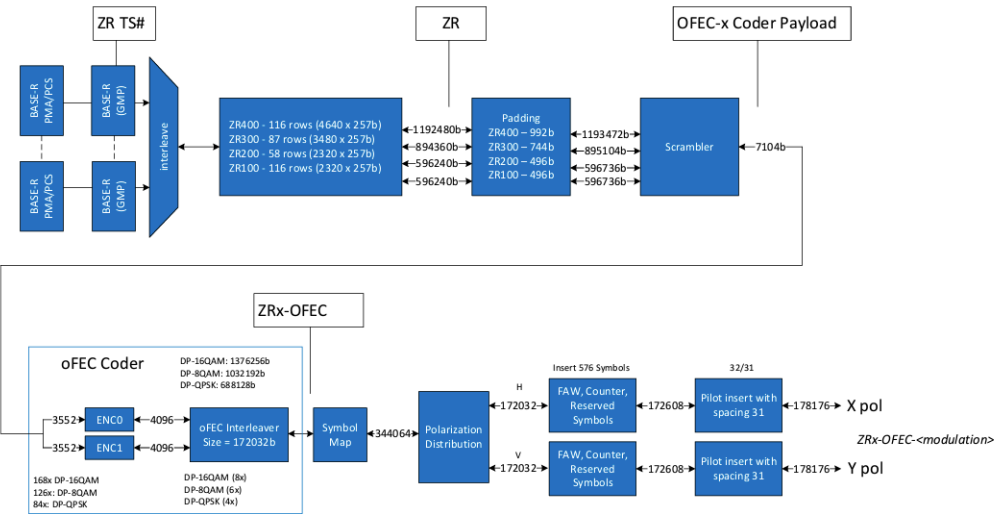
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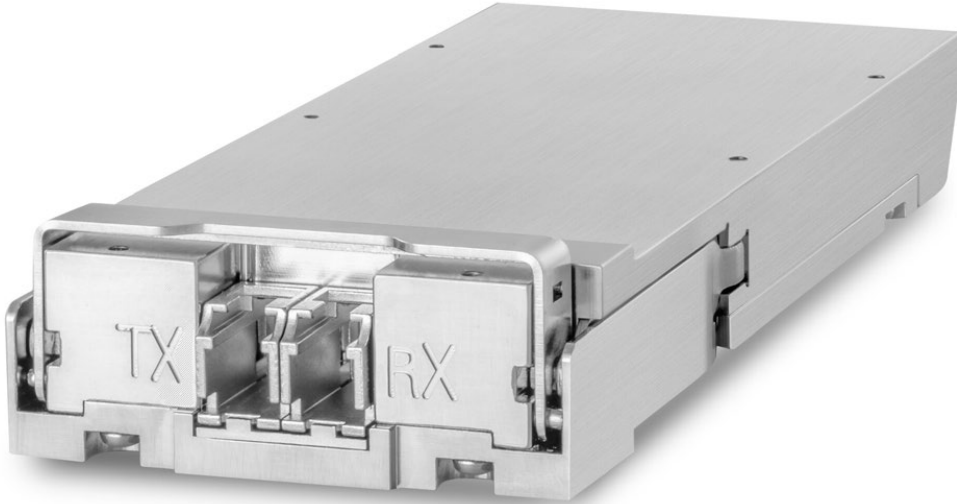
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[g] an amplifier for amplifying the electrical analog signal to an amplified electrical analog signal;	The Exemplary Device comprises an amplifier for amplifying the electrical analog signal to an amplified electrical analog signal. For example, the Exemplary Device includes transmitter functionalities as described above in claim elements 1[a]-[f]. On information and belief, an amplifier, or its equivalent, is contained within the interface IC(s) or RX Optics shown in the CFP specification functional block diagram, or the DSP or Optics defined in the OIF Implementation Agreement 400ZR and/or OpenZR+ MSA Specification. https://cfp-msa.org/wp-content/uploads/2022/10/CFP2_HW-Spec-rev1.0.pdf (

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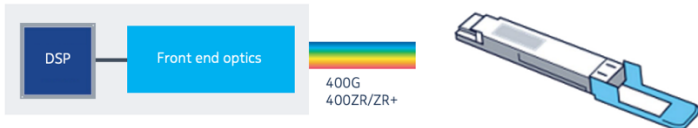
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	MSA_CFP8_HW-Spec-rev1p0.pdf (CFP8 MSA containing similar disclosure for CFP8 devices); https://www.oiforum.com/wp-content/uploads/OIF-400ZR-01.0_reduced2.pdf at 14 ( Figure 1: 400ZR reference diagram); https://openzrplus.org/site/assets/files/1091/openzrplus_2p0.pdf at 9, 16 (



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	 Figure 4-1: Digital port functions for a single ZRx-OFEC-mQAM signal); see also https://onestore.nokia.com/asset/207647?_ga=2.172896227.172847549.1647280619-441605525.1645903816 (

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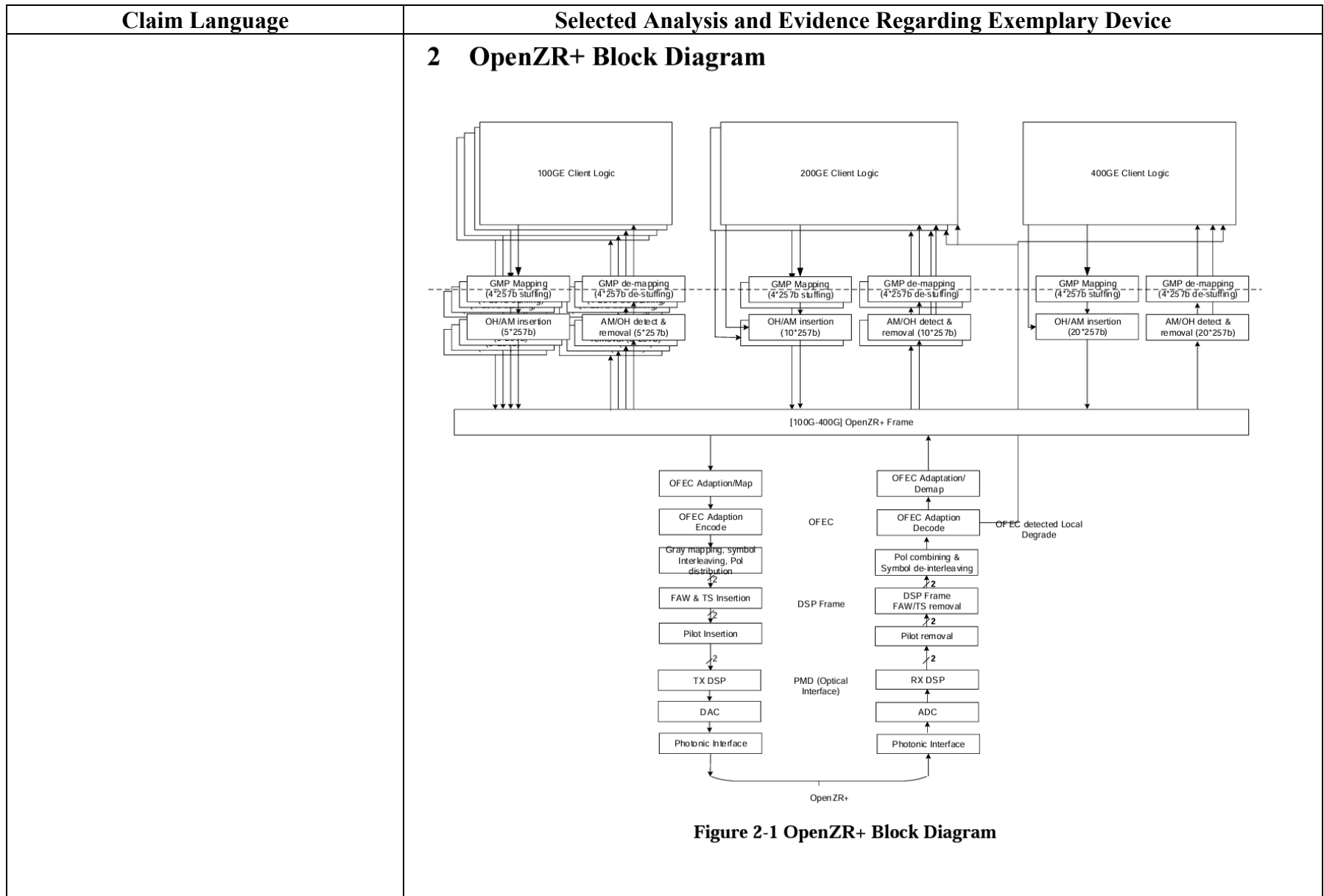
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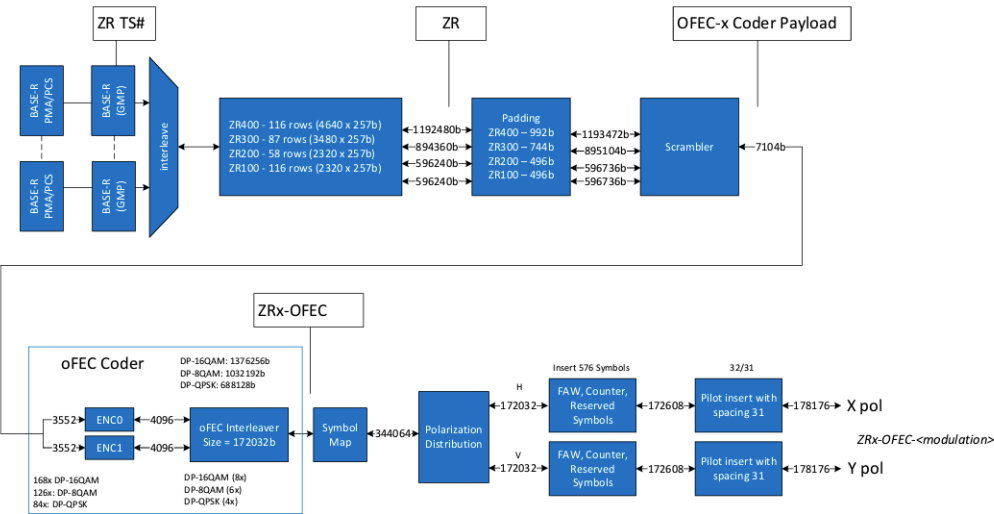
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[h] a clock data recovery unit for recovering clock and data information to produce a second m-ary modulation signal from the amplified electrical analog signal;	The Exemplary Device comprises a clock data recovery unit for recovering clock and data information to produce a second m-ary modulation signal from the amplified electrical analog signal. For example, the Exemplary Device includes transmitter functionalities as described above in claim elements 1[a]-[g]. The clock-and-data recovery (“CDR”) functionality is used for coherent digital signal recovery/reception. On information and belief, the clock data recovery unit, or its equivalent, is contained within the interface IC(s) in the CFP MSA specification functional block diagram, or the DSP defined in the OIF Implementation Agreement 400ZR and/or OpenZR+ MSA Specification. https://cfp-msa.org/wp-content/uploads/2022/10/CFP2_HW-Spec-rev1.0.pdf (

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	Figure 1-1: CFP2 Functional Block Diagram Figure 4-3: Example of clocking for 4 x 25 Gbit/s CFP2 applications); https://www.oiforum.com/wp-content/uploads/2019/01/OIF-CFP2-DCO-01.0.pdf at 8-9 (specification for CFP2-DCO:

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	Figure 1: CFP2-DCO Module Basic Functional Block Diagram), 12 (describing electrical interface), 16 (describing LC connector), 23-25 (Fujitsu, Infinera, and Nokia belonged to OIF); https://cfp-msa.org/wp-content/uploads/2022/10/CFP-MSA_CFP8_HW-Spec-rev1p0.pdf (CFP8 MSA containing similar disclosure for CFP8 devices); https://www.oiforum.com/wp-content/uploads/OIF-400ZR-01.0_reduced2.pdf at 14, 15 (Figure 1: 400ZR reference diagram

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device		
	Host protocol support	Sublayer	Capabilities
	IEEE Std 802.3™-2018 400GBASE-R	PCS	FEC coding RS(544,514), lane distribution, AM lock and deskew, per clause 119.1, Extender sublayer.
		PMA	Mux'ing, clock and data recovery, clock generation, modulation.
		AUI	Optionally physically instantiated as 400GAUI-8 C2M; 8 x CEI-56G-VSR PAM-4.
	Table 2: 400ZR host interface		
); https://openzrplus.org/site/assets/files/1091/openzrplus_2p0.pdf at 9, 16 (			



Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	 Figure 4-1: Digital port functions for a single ZRx-OFEC-mQAM signal Figure 4-1 illustrates the digital port functions for a single ZRx-OFEC-mQAM signal. The process begins with the ZR TS# and ZR inputs, which feed into the BASE-R PMA/FCS and BASE-R GMP blocks. These outputs are then processed by the Interleave block. The resulting data is organized into rows: ZR400 (116 rows, 4640 x 257b), ZR300 (87 rows, 3480 x 257b), ZR200 (58 rows, 2320 x 257b), and ZR100 (116 rows, 2320 x 257b). These rows are then processed by the Padding block, which outputs ZR400 (992b), ZR300 (744b), ZR200 (496b), and ZR100 (496b). The OFEC-x Coder Payload is then processed by the Scrambler, which outputs 7104b. This output is then processed by the ZRx-OFEC block, which includes the oFEC Coder, Symbol Map, Polarization Distribution, FAW Counter/Reserved Symbols, Pilot insert, and finally the X pol and Y pol outputs. The ZRx-OFEC block also includes a 32/31 Pilot insert with spacing 31. Figure 4-1: Digital port functions for a single ZRx-OFEC-mQAM signal Figure 4-1 illustrates the digital port functions for a single ZRx-OFEC-mQAM signal. The process begins with the ZR TS# and ZR inputs, which feed into the BASE-R PMA/FCS and BASE-R GMP blocks. These outputs are then processed by the Interleave block. The resulting data is organized into rows: ZR400 (116 rows, 4640 x 257b), ZR300 (87 rows, 3480 x 257b), ZR200 (58 rows, 2320 x 257b), and ZR100 (116 rows, 2320 x 257b). These rows are then processed by the Padding block, which outputs ZR400 (992b), ZR300 (744b), ZR200 (496b), and ZR100 (496b). The OFEC-x Coder Payload is then processed by the Scrambler, which outputs 7104b. This output is then processed by the ZRx-OFEC block, which includes the oFEC Coder, Symbol Map, Polarization Distribution, FAW Counter/Reserved Symbols, Pilot insert, and finally the X pol and Y pol outputs. The ZRx-OFEC block also includes a 32/31 Pilot insert with spacing 31.

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
[i] an equalizer for performing equalization on the second m-ary modulation signal to remove noise; and	The Exemplary Device comprises an equalizer for performing equalization on the second m-ary modulation signal to remove noise. For example, equalization is used for coherent digital signal reception/recovery to compensate for group velocity dispersion and polarization mode dispersion effects. On information and belief, the equalizer, or its equivalent, is contained within the interface IC(s) in the CFP specification functional block diagram, or the DSP defined in the OIF Implementation Agreement 400ZR and/or OpenZR+ MSA Specification. https://cfp-msa.org/wp-content/uploads/2022/10/CFP2_HW-Spec-rev1.0.pdf (Figure 1-1: CFP2 Functional Block Diagram); https://www.oiforum.com/wp-content/uploads/2019/01/OIF-CFP2-DCO-01.0.pdf at 8-9 (specification for CFP2-DCO:

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
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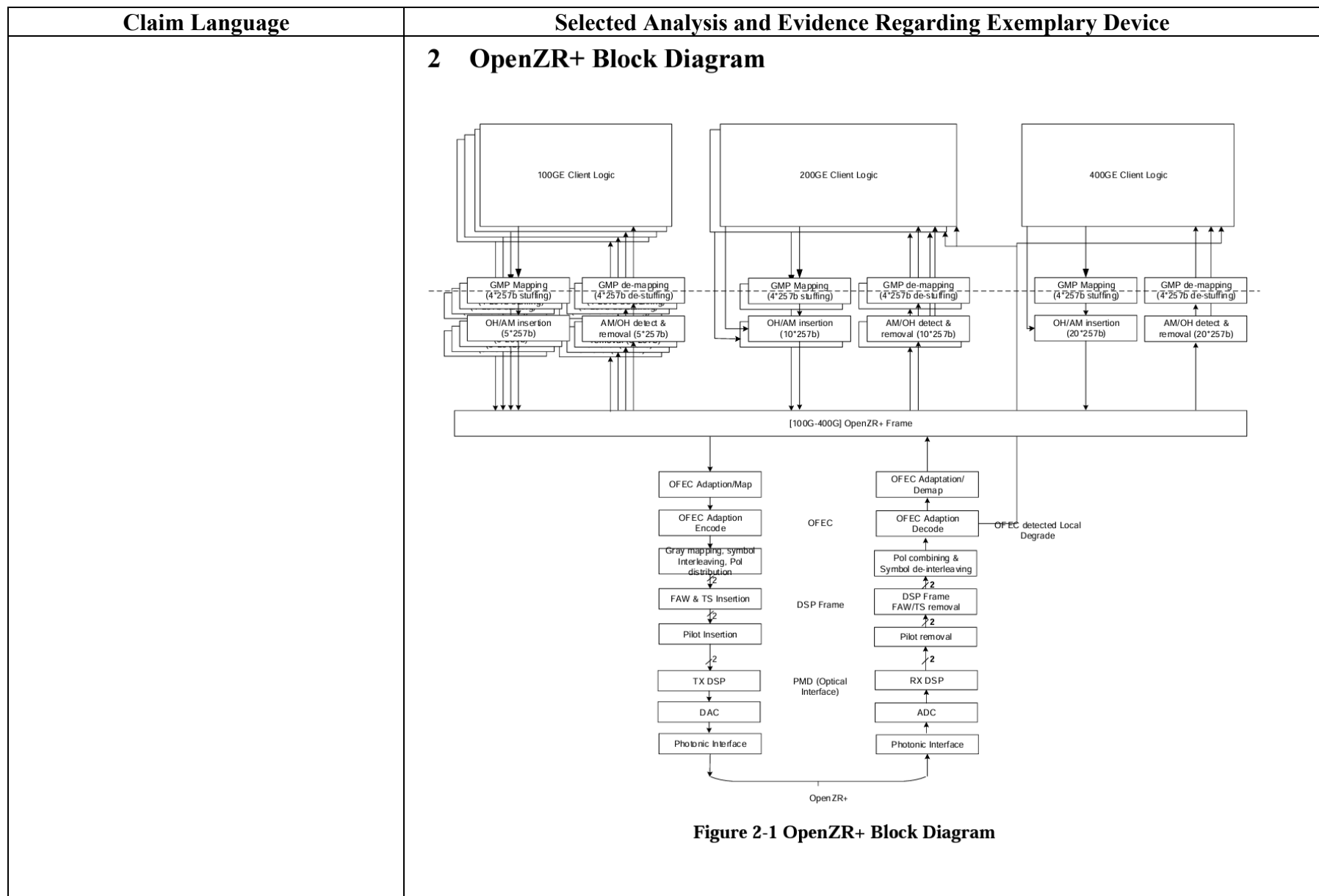
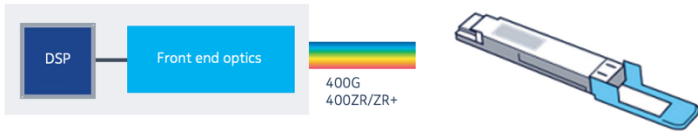


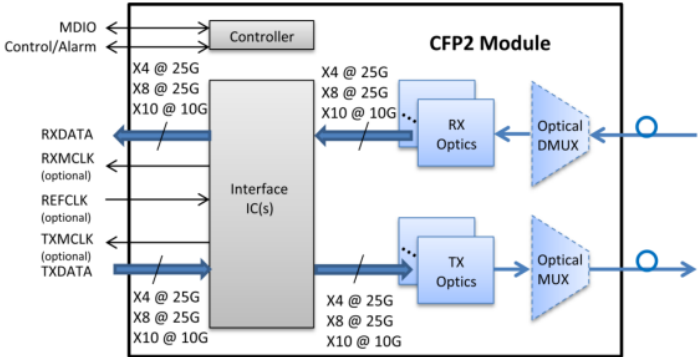
Figure 2-1 OpenZR+ Block Diagram

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	Figure 4-1: Digital port functions for a single ZRx-OFEC-mQAM signal); https://onestore.nokia.com/asset/212764 (

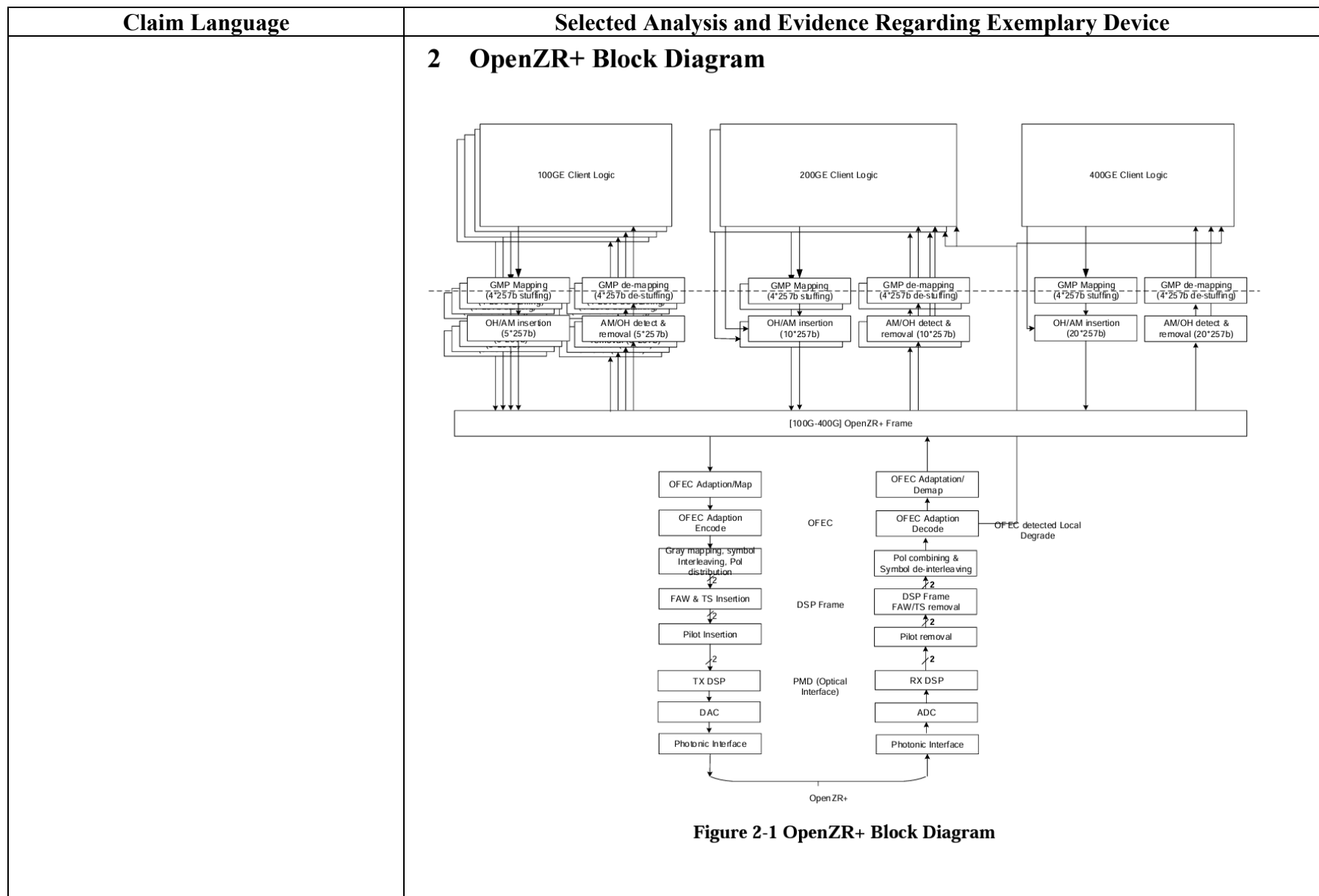
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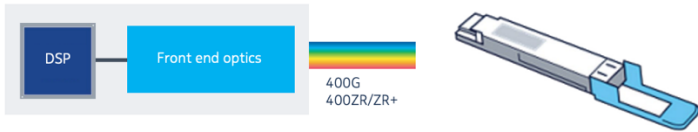
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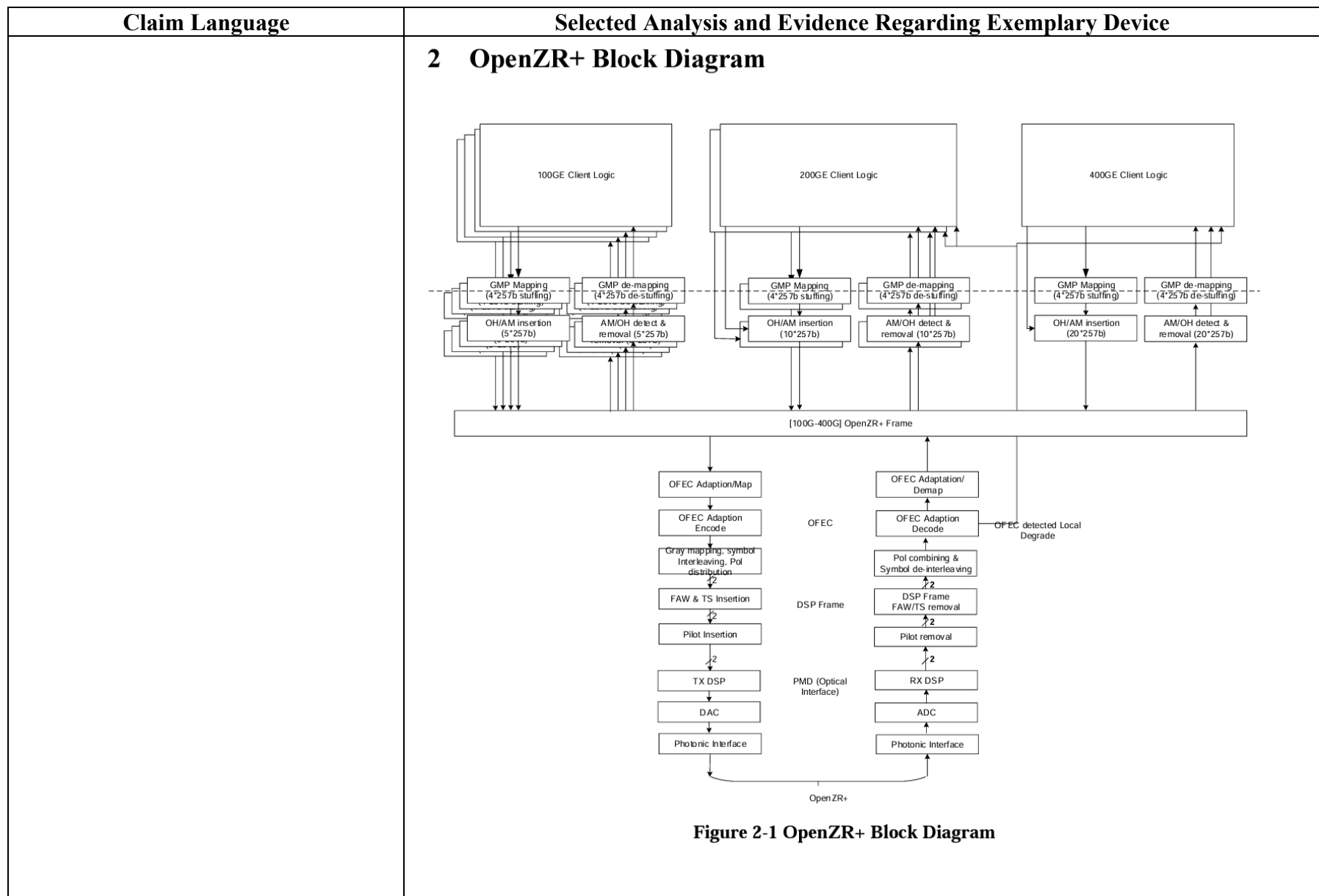


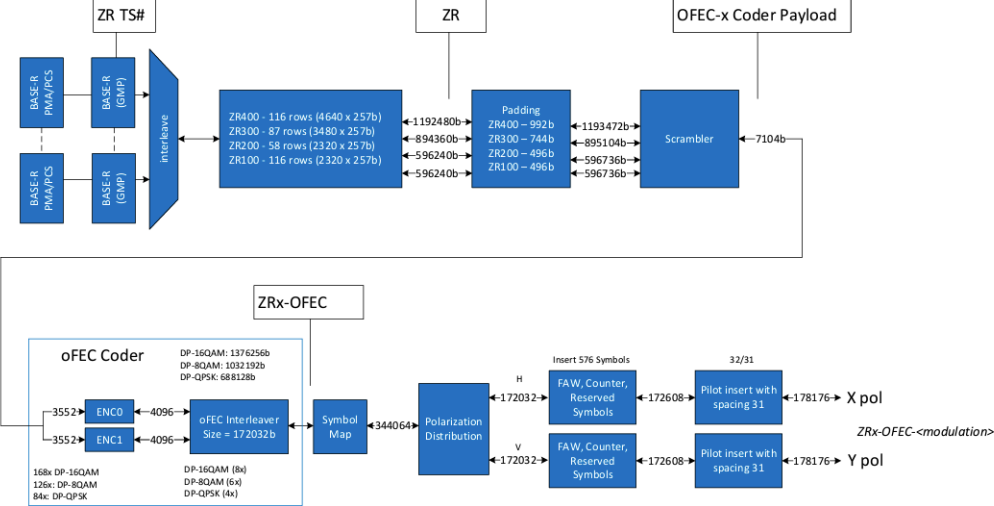
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Size	QSFP-DD	QSFP-DD																																	

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 2	
2. The pluggable optical transceiver module of claim 1, wherein the form factor of the pluggable optical transceiver module is a pluggable form factor standard.	The form factor of the Exemplary Device, which is pluggable optical transceiver module, is a pluggable form factor standard. For example, as discussed in claim 1, the Exemplary Device uses a CFP, CFP2 or CFP8 form factor, or a QSFP or OSFP form factor implementing OIF Implementation Agreement 400ZR, OpenZR+ MSA Specification, and/or Lambda specifications, all of which are based on standards. Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 3	
3. The pluggable optical transceiver module of claim 2, wherein the pluggable form factor standard of the pluggable optical transceiver module is a small form factor pluggable (SFP) or SFP+ form factor standard.	The Exemplary Device is a pluggable optical transceiver module wherein the pluggable form factor standard of the pluggable optical transceiver module is a small form factor pluggable (SFP) or SFP+ form factor standard. For example, QSFP and OSFP are forms of a small form factor pluggable standard. <i>See</i> claim 1. Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
Claim 5	
5. The pluggable optical transceiver module of claim 1, wherein the m-ary modulator and the m-ary demodulator perform m-ary quadrature amplitude modulation and demodulation, respectively, that uses two or more bits per symbol.	The Exemplary Device includes an m-ary modulator and an m-ary demodulator that perform m-ary quadrature amplitude modulation and demodulation, respectively, that uses two or more bits per symbol. For example, <i>see</i> Claim 1[b] and [j]. Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 6	
6. The pluggable optical transceiver module of claim 1, wherein the m-ary modulator and the m-ary demodulator perform m-ary quadrature phase shift keying modulation and de-modulation, respectively, that uses two or more bits per symbol.	The Exemplary Device includes an m-ary modulator and an m-ary demodulator perform m-ary quadrature phase shift keying modulation and de-modulation, respectively, that uses two or more bits per symbol. For example, <i>see</i> Claim 1[b] and [j]; https://www.oiforum.com/wp-content/uploads/OIF-400ZR-01.0_reduced2.pdf at 50-52 (referring to use of QPSK); https://openzrplus.org/site/assets/files/1091/openzrplus_2p0.pdf at 9, 16 (



Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	 Figure 4-1: Digital port functions for a single ZRx-OFEC-mQAM signal). Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 8	
8. The pluggable optical transceiver module of claim 1, wherein the electrical system interface includes parallel signals.	The electrical system interface in the Exemplary Device includes parallel signals. <i>See</i> claim 1. Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 10	
10. The pluggable optical transceiver module of claim 1, wherein the first electrical data signal and second electrical data signal includes parallel electrical data signals.	The first electrical data signal and second electrical data signal in the Exemplary Device include parallel electrical data signals. <i>See</i> claim 1. Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 11	
11. The pluggable optical transceiver module of claim 1, wherein the electrical system interface includes an attachment unit interface (AUI) based interface.	The electrical system interface in the Exemplary Device includes an attachment unit interface (AUI) based interface. <i>See, e.g.,</i> https://www.oiforum.com/wp-content/uploads/2019/01/OIF-CFP2-DCO-01.0.pdf at 8 (CFP2-DCO specification requiring use of AUI interfaces such as “CAUI-4 [7], 200GAUI-8 [13], 400GAUI-16 [13], 25GAUI [14], LAUI2 [15], 50GAUI-2 [16], or 100GAUI-4 [16].”
Claim 12	
12. The pluggable optical transceiver module of claim 1, wherein the first optical signal on a first wavelength is configured to emit into a first optical fiber and the second optical signal on a second wavelength is configured to be received from the first optical fiber.	In the Exemplary Device, the first optical signal on a first wavelength is configured to emit into a first optical fiber and the second optical signal on a second wavelength is configured to be received from the first optical fiber. <i>See</i> claim 1. Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
Claim 13	
13. The pluggable optical transceiver module of claim 1, wherein the first optical signal on a first wavelength is configured to emit into a first optical fiber and the second optical signal on a second wavelength is configured to be received from a second optical fiber.	In the Exemplary Device, the first optical signal on a first wavelength is configured to emit into a first optical fiber and the second optical signal on a second wavelength is configured to be received from a second optical fiber. <i>See</i> claim 1. Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 14	
14. The pluggable optical transceiver module of claim 1, wherein the noise removed by the equalizer includes inter-symbol interference (ISI).	On information and belief, in the Exemplary Device, the noise removed by the equalizer includes inter-symbol interference (ISI). <i>See</i> https://en.wikipedia.org/wiki/Intersymbol_interference (equalizer is used to remove ISI). Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 15	
15. The pluggable optical transceiver module of claim 1, wherein the equalizer performs decision directed	On information and belief, the equalizer in the Exemplary Device performs decision directed equalization on the second m-ary modulation signal to remove noise. <i>See</i> Claim 1[i]. This type of operation is performed by optical transceivers such as the Exemplary Device. <i>E.g.</i>, https://www.researchgate.net/publication/236606066_Frequency_Domain_Blind_Equalization

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
equalization on the second m-ary modulation signal to remove noise.	for Long-Haul Coherent Pol-Mux 16-QAM System with CD Prediction and Dual-Mode Adaptive Algorithm. On information and belief, the Exemplary Device also performs this operation. Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 16	
16. The pluggable optical transceiver module of claim 1, wherein the equalizer performs blind equalization on the second m-ary modulation signal to remove noise.	On information and belief, the equalizer in the Exemplary Device performs blind equalization on the second m-ary modulation signal to remove noise. <i>See</i> Claim 1[i]. This type of operation is performed by optical transceivers such as the Exemplary Device. <i>E.g.</i>, https://www.researchgate.net/publication/236606066_Frequency_Domain_Blind_Equalization_for_Long-Haul_Coherent_Pol-Mux_16-QAM_System_with_CD_Prediction_and_Dual-Mode_Adaptive_Algorithm. On information and belief, the Exemplary Device also performs this operation. Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 17	
17. The pluggable optical transceiver module of claim 1, wherein the digital to analog converter is configured to shape, condition, or emphasize the first	On information and belief, the digital to analog converter in the Exemplary Device is configured to shape, condition, or emphasize the first electrical m-ary analog modulation signal for improved transmission performance. <i>See</i> Claim 1[c]. For example, on information

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
electrical m-ary analog modulation signal for improved transmission performance.	and belief, the Exemplary Device may use techniques such as constellation shaping for improved transmission performance. Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 22	
[pre] A pluggable optical transceiver module comprising of:	The Exemplary Device is a pluggable optical transceiver module. <i>See</i> claim 1[pre].
[a] an electrical system interface for receiving a first electrical data signal and for transmitting a second electrical data signal;	The Exemplary Device comprises an electrical system interface for receiving a first electrical data signal and for transmitting a second electrical data signal. <i>See</i> claim 1[a].
[b] an m-ary modulator for increasing the number of bits per symbol in the first electrical data signal to produce a first m-ary modulation signal;	The Exemplary Device comprises an m-ary modulator for increasing the number of bits per symbol in the first electrical data signal to produce a first m-ary modulation signal. <i>See</i> claim 1[b].
[c] a digital to analog converter for converting the first m-ary modulation signal to a first electrical m-ary analog modulation signal;	The Exemplary Device comprises a digital to analog converter for converting the first m-ary modulation signal to a first electrical m-ary analog modulation signal. <i>See</i> claim 1[c].
[d] a driver for amplifying the first electrical m-ary analog modulation signal to an amplified first electrical m-ary analog modulation signal to drive an optical transmitter;	The Exemplary Device comprises a driver for amplifying the first electrical m-ary analog modulation signal to an amplified first electrical m-ary analog modulation signal to drive an optical transmitter. <i>See</i> claim 1[d].

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
[e] the optical transmitter for emitting a first optical signal on a first wavelength responsive to and representative of the amplified first electrical m-ary analog modulation signal from the driver;	The Exemplary Device comprises the optical transmitter for emitting a first optical signal on a first wavelength responsive to and representative of the amplified first electrical m-ary analog modulation signal from the driver. <i>See</i> claim 1[e].
[f] an optical detector for receiving a second optical signal on a second wavelength to produce an electrical analog signal;	The Exemplary Device comprises an optical detector for receiving a second optical signal on a second wavelength to produce an electrical analog signal. <i>See</i> claim 1[f].
[g] an amplifier for amplifying the electrical analog signal to an amplified electrical analog signal;	The Exemplary Device comprises an amplifier for amplifying the electrical analog signal to an amplified electrical analog signal. <i>See</i> claim 1[g].
[h] a clock data recovery unit for recovering clock and data information to produce a second m-ary modulation signal from the amplified electrical analog signal;	The Exemplary Device comprises a clock data recovery unit for recovering clock and data information to produce a second m-ary modulation signal from the amplified electrical analog signal. <i>See</i> claim 1[h].
[i] an equalizer for performing equalization on the second m-ary modulation signal to remove noise; and	The Exemplary Device comprises an equalizer for performing equalization on the second m-ary modulation signal to remove noise. <i>See</i> claim 1[i].
[j] an m-ary demodulator for decreasing the number of bits per symbol in the equalized second m-ary modulation signal to produce the second electrical data signal.	The Exemplary Device comprises an m-ary demodulator for decreasing the number of bits per symbol in the equalized second m-ary modulation signal to produce the second electrical data signal. <i>See</i> claim 1[j].
[k] wherein the m-ary modulator and the m-ary demodulator perform m-ary pulse amplitude modulation and demodulation, respectively, that uses two or more bits per symbol.	On information and belief, the Exemplary Device includes an m-ary modulator and m-ary demodulator that performs m-ary pulse amplitude modulation and demodulation, respectively, that uses two or more bits per symbol. <i>See, e.g.,</i> https://www.henanliyuan.com/en/product/Nokia-3HE15212AA.html ; <i>see also</i> https://www.prolabs.com/products/transceivers/alcatel-lucent-nokia/qsf28/100gbase/3he16557aa-c (referencing Nokia part number 3HE16557AA); https://www.addonnetworks.com/products/transceivers/alcatel-lucent-

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
	nokia/qsf28/100gbase/3he16557aa-ao (same); https://www.terabitsystems.com/nokia/routers/7750/7750-service-router (listing 3HE13850AA and 3HE13849AA); https://100glambda.com/specifications/summary/2-specifications/11-100g-lr1-20-er1-30-er1-40-technical-specs-rev-1p1; 400G FR4 https://100glambda.com/specifications/summary/2-specifications/7-400g-fr4-technical-spec-d2p0; 100G FR LR https://100glambda.com/specifications/summary/2-specifications/9-100g-fr-and-100g-lr-technical-specs-rev2-0; 400G LR4-10 https://100glambda.com/specifications/summary/2-specifications/10-400g-lr4-10-technical-spec-rev1-0; <i>see also</i> https://community.fs.com/blog/100g-single-lambda-offers-cost-effective-100ge-and-400ge-solutions.html (describing 100g Lambda compliant transmitters: “These transceivers take a 4x 25G electrical signal from the host and convert the signal to PAM4 modulation using a DSP, meaning that the entire 100G data stream is transmitted by a single laser.”). Investigation of both the patent and the Exemplary Device (and other potentially infringing products) is ongoing. This chart is based on evidence and analysis reasonably accessible at this time. NextGen reserves the right to update and amend its contentions, including adding additional claims, evidence and accused devices, as the litigation progresses and discovery is provided by the defendant.
Claim 23	
[pre] A pluggable optical transceiver module comprising of:	The Exemplary Device is a pluggable optical transceiver module. <i>See</i> claim 1 [pre].
[a] an electrical system interface for receiving a first electrical data signal and for transmitting a second electrical data signal;	The Exemplary Device comprises an electrical system interface for receiving a first electrical data signal and for transmitting a second electrical data signal. <i>See</i> claim 1 [a].
[b] an m-ary modulator for increasing the number of bits per symbol in the	The Exemplary Device comprises an m-ary modulator for increasing the number of bits per symbol in the first electrical data signal to produce a first m-ary modulation signal. <i>See</i> claim 1 [b].

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
first electrical data signal to produce a first m-ary modulation signal;	
[c] a digital to analog converter for converting the first m-ary modulation signal to a first electrical m-ary analog modulation signal;	The Exemplary Device comprises a digital to analog converter for converting the first m-ary modulation signal to a first electrical m-ary analog modulation signal. <i>See</i> claim 1[c].
[d] a driver for amplifying the first electrical m-ary analog modulation signal to an amplified first electrical m-ary analog modulation signal to drive an optical transmitter;	The Exemplary Device comprises a driver for amplifying the first electrical m-ary analog modulation signal to an amplified first electrical m-ary analog modulation signal to drive an optical transmitter. <i>See</i> claim 1[d].
[e] the optical transmitter for emitting a first optical signal on a first wavelength responsive to and representative of the amplified first electrical m-ary analog modulation signal from the driver;	The Exemplary Device comprises the optical transmitter for emitting a first optical signal on a first wavelength responsive to and representative of the amplified first electrical m-ary analog modulation signal from the driver. <i>See</i> claim 1[e].
[f] an optical detector for receiving a second optical signal on a second wavelength to produce an electrical analog signal;	The Exemplary Device comprises an optical detector for receiving a second optical signal on a second wavelength to produce an electrical analog signal. <i>See</i> claim 1[f].
[g] an amplifier for amplifying the electrical analog signal to an amplified electrical analog signal;	The Exemplary Device comprises an amplifier for amplifying the electrical analog signal to an amplified electrical analog signal. <i>See</i> claim 1[g].
[h] a clock data recovery unit for recovering clock and data information to produce a second m-ary modulation signal from the amplified electrical analog signal;	The Exemplary Device comprises a clock data recovery unit for recovering clock and data information to produce a second m-ary modulation signal from the amplified electrical analog signal. <i>See</i> claim 1[h].
[i] an equalizer for performing equalization on the second m-ary modulation signal to remove noise; and	The Exemplary Device comprises an equalizer for performing equalization on the second m-ary modulation signal to remove noise. <i>See</i> claim 1[i].

Claim Language	Selected Analysis and Evidence Regarding Exemplary Device
[j] an m-ary demodulator for decreasing the number of bits per symbol in the equalized second m-ary modulation signal to produce the second electrical data signal.	The Exemplary Device comprises an m-ary demodulator for decreasing the number of bits per symbol in the equalized second m-ary modulation signal to produce the second electrical data signal. <i>See</i> claim 1[j].
[k] wherein the equalizer includes coefficients or weights configured to remove noise from the second m-ary modulation signal.	The Exemplary Device includes an equalizer that includes coefficients or weights configured to remove noise from the second m-ary modulation signal. <i>See</i> claims 1[i], 14.