Amphenol FiberQuad Performance Data

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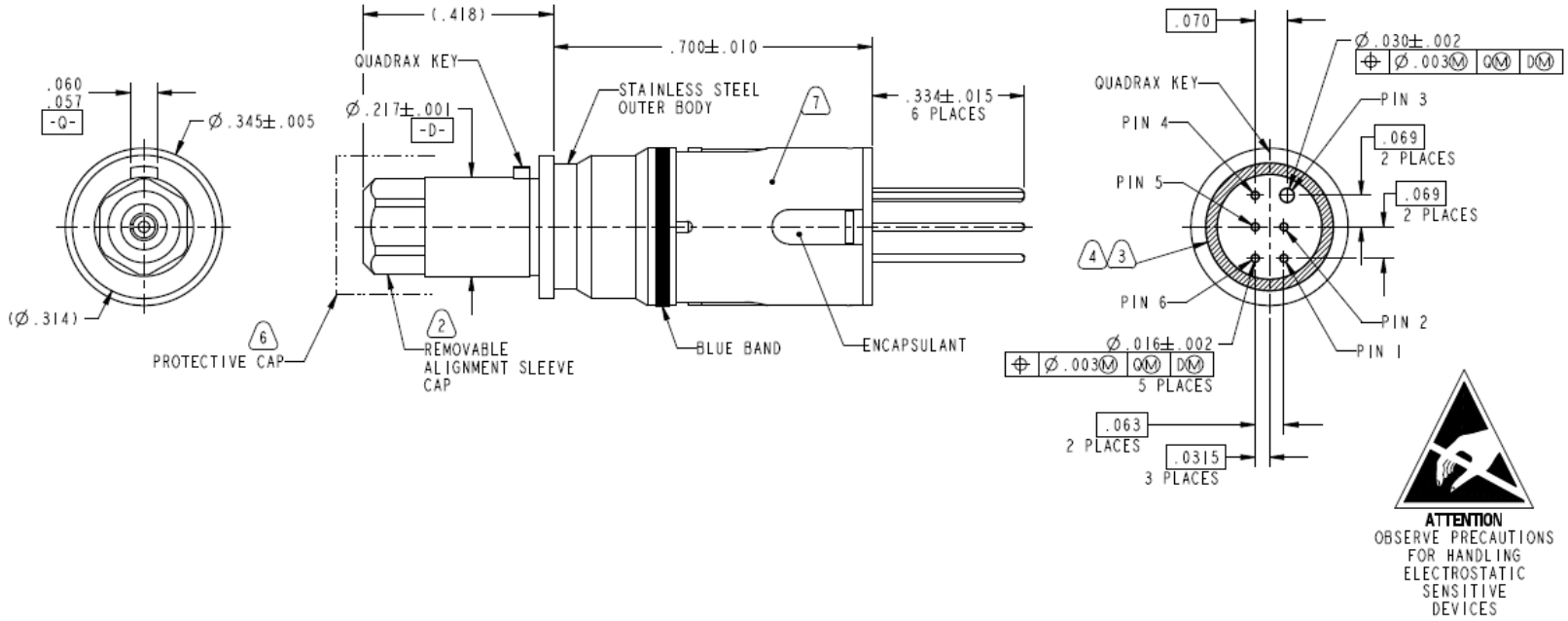
High Speed Solutions

ENABLING THE ELECTRONICS REVOLUTION

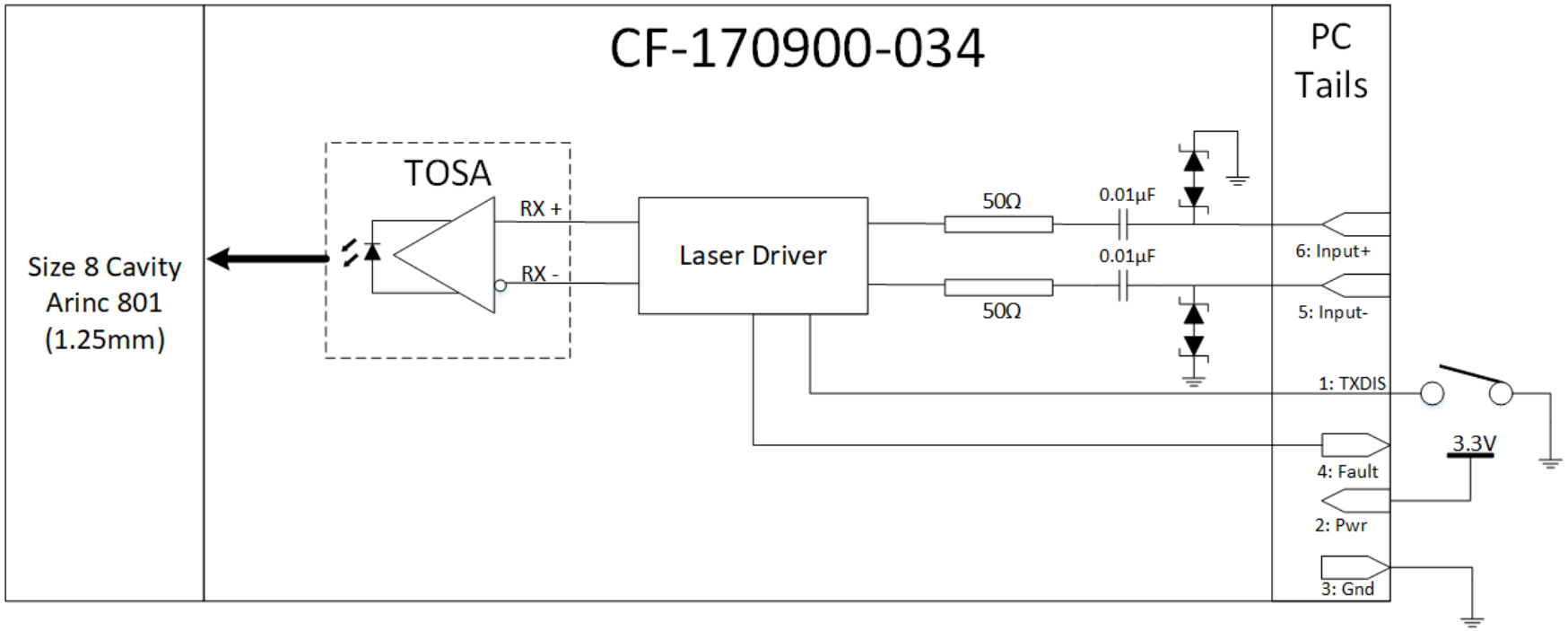
Amphenol FiberQuad Design

CF-170900-034 (Transmitter) Drawing

TOSA CONTACT I/O CHART	
PIN ID	FUNCTION
1	DISABLE
2	3.3VDC
3	GND
4	FAULT
5	INPUT-
6	INPUT+

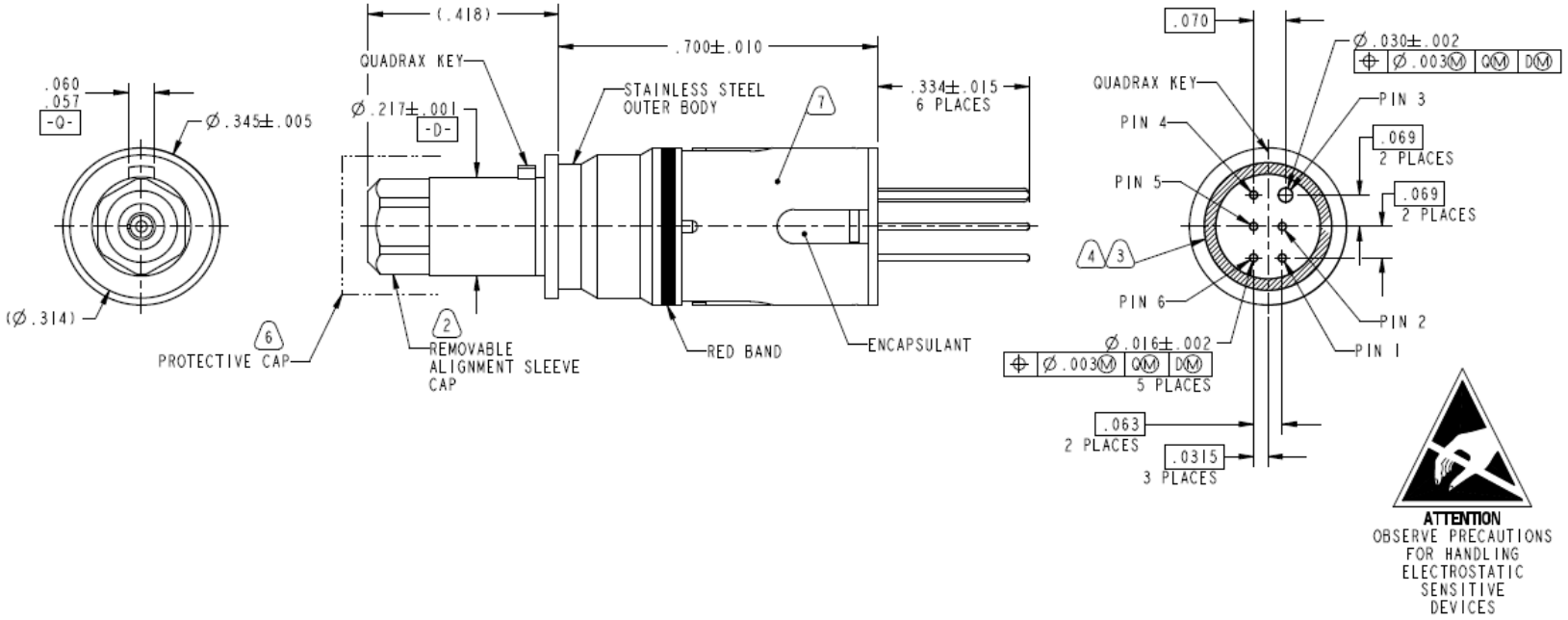


CF-170900-034 (Transmitter) Circuit

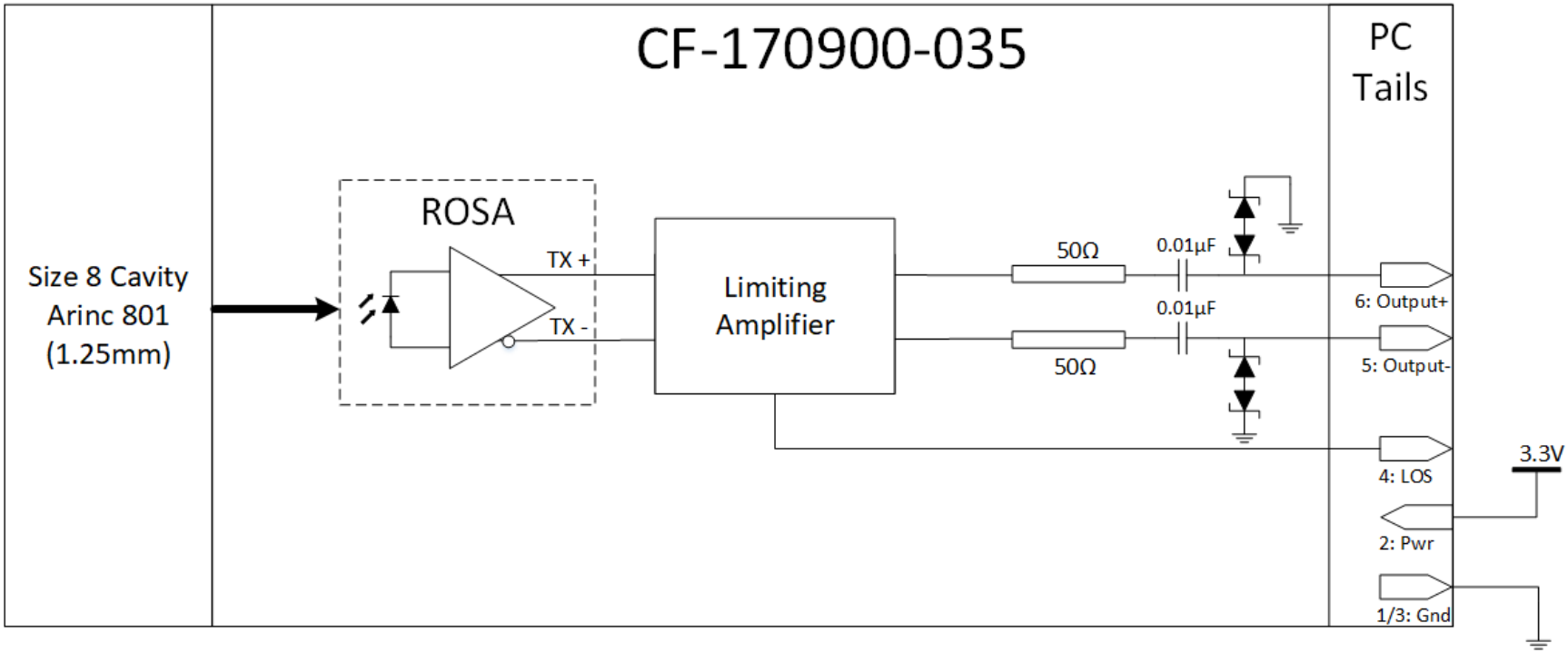


CF-170900-035 (Receiver)

ROSA CONTACT I/O CHART	
PIN ID	FUNCTION
1	GND
2	3.3VDC
3	GND
4	LOS
5	OUTPUT-
6	OUTPUT+



CF-170900-035 (Receiver) Circuit



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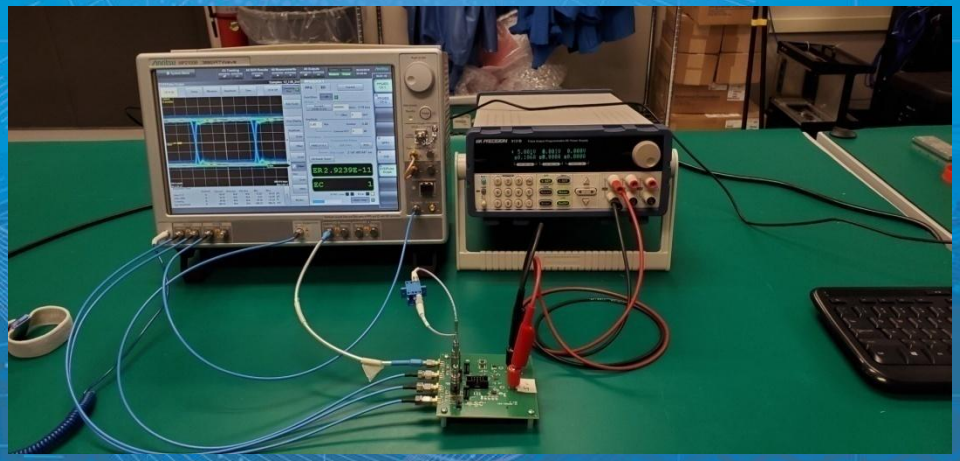
ENABLING THE ELECTRONICS REVOLUTION



FiberQuad Performance Testing
BER and Eye Diagrams

Testing Purpose

- To characterize the performance of Amphenol High Speed Solutions CF-170900-034 and CF-170900-035 FiberQuad contact under a variety of conditions including speed and attenuation
  - Bit error rates and eye diagrams were captured simultaneously
- To test FiberQuad contacts at slower and higher speeds than the components within are rated for
- Validate performance of FiberQuad CF-980062-083 test board
- Validate performance of FiberQuad plug adapters

Ratings of Components within -034/035

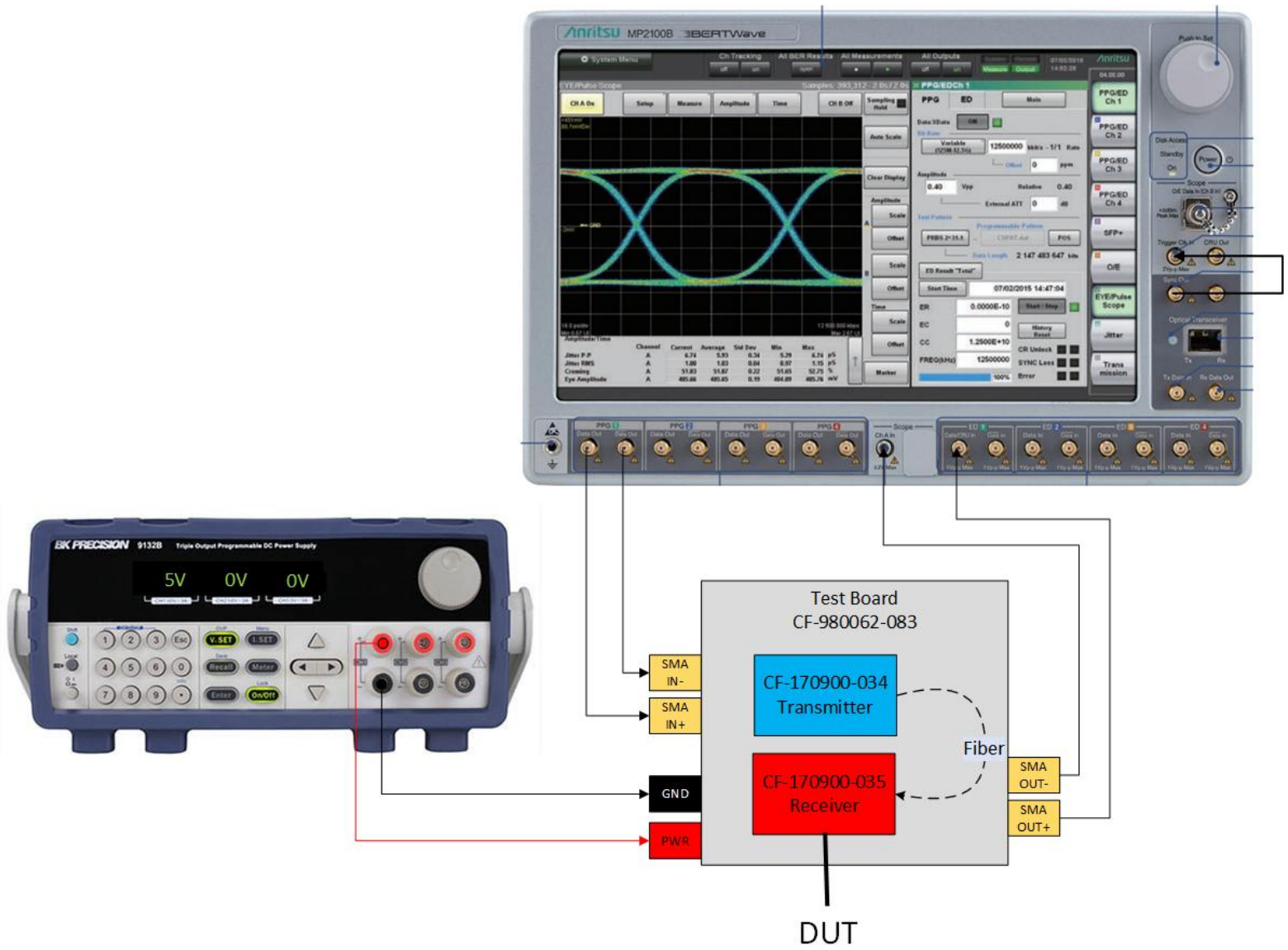
CF-170900-034

- Transmit Optical Subassembly
  - Up to 4.25 Gbps
- Electronics
  - 155Mbps to 4.25 Gbps

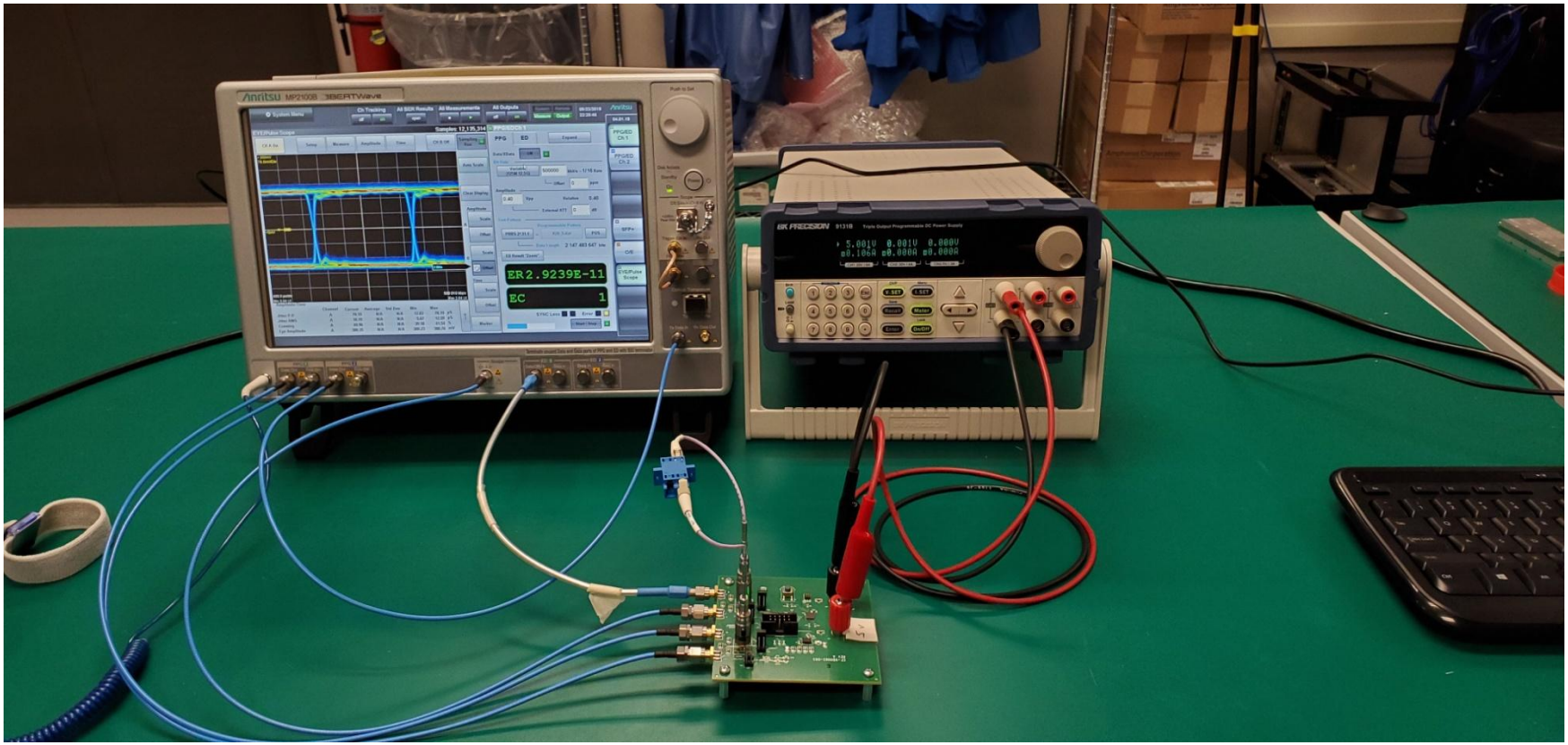
CF-170900-035

- Receive Optical Subassembly
  - 155Mbps to 4.25 Gbps
- Electronics
  - 155Mbps to 4.25 Gbps

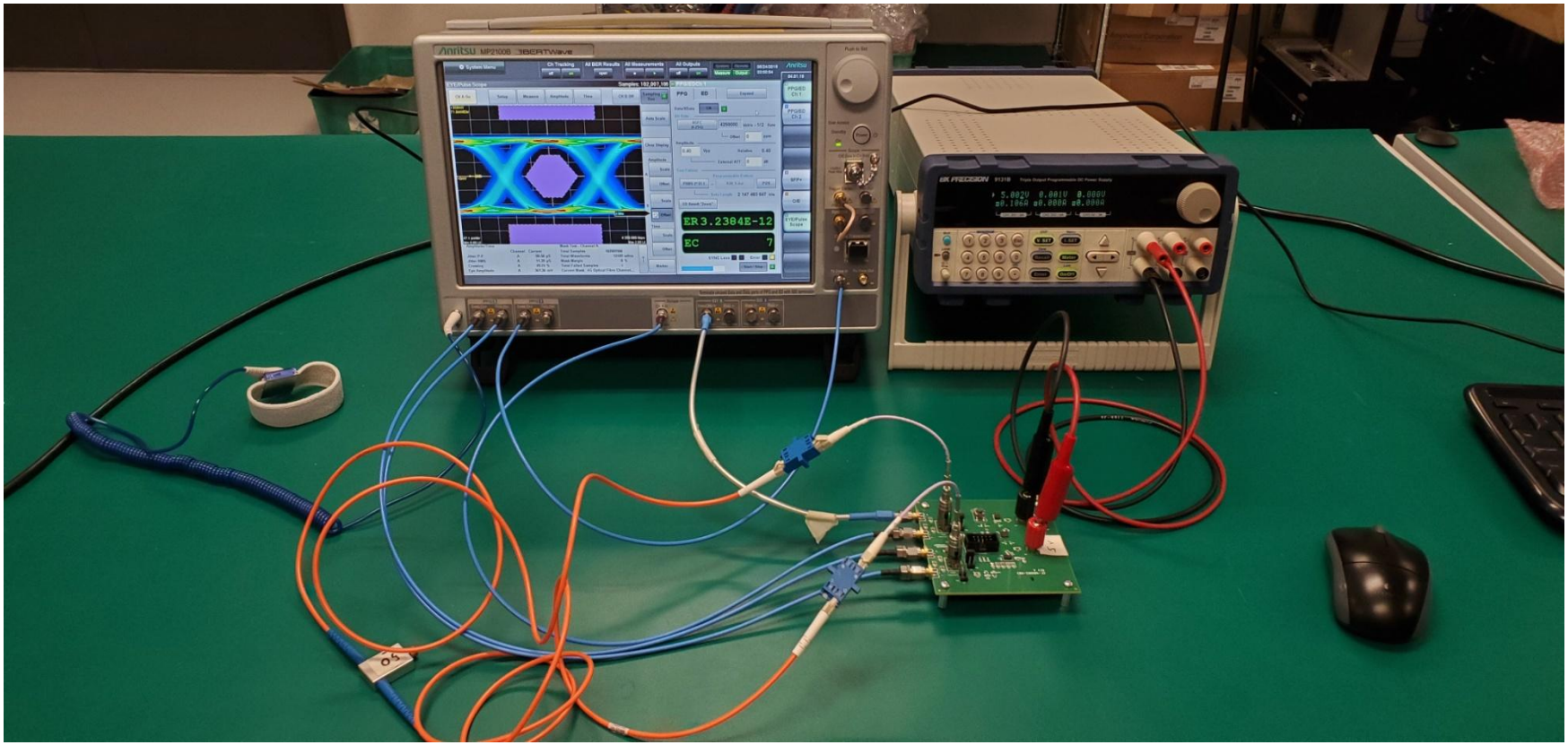
Test Setup Block Diagram



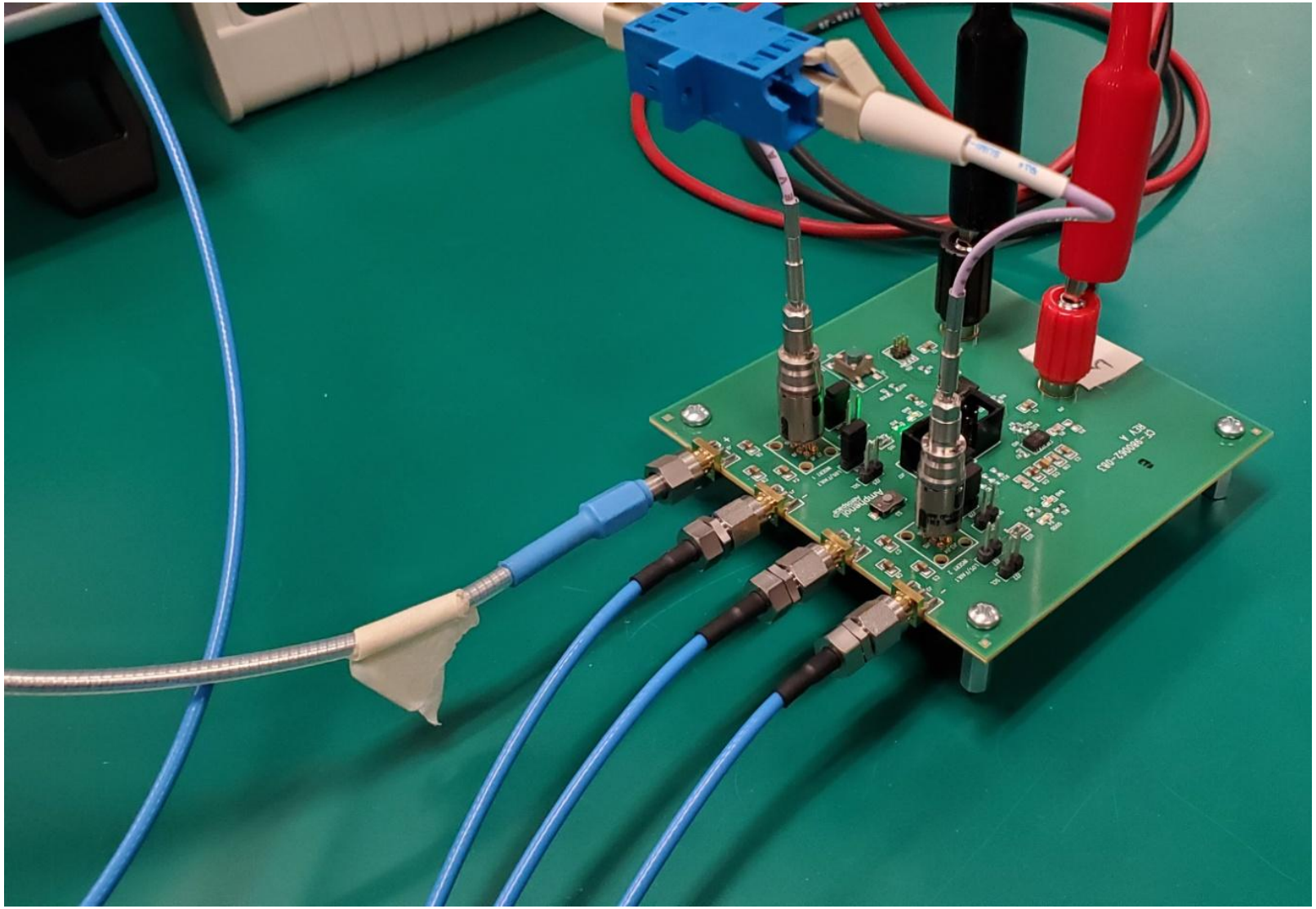
Test Setup (without Attenuator)



Test Setup (with Attenuator)



Test Setup – Test Board

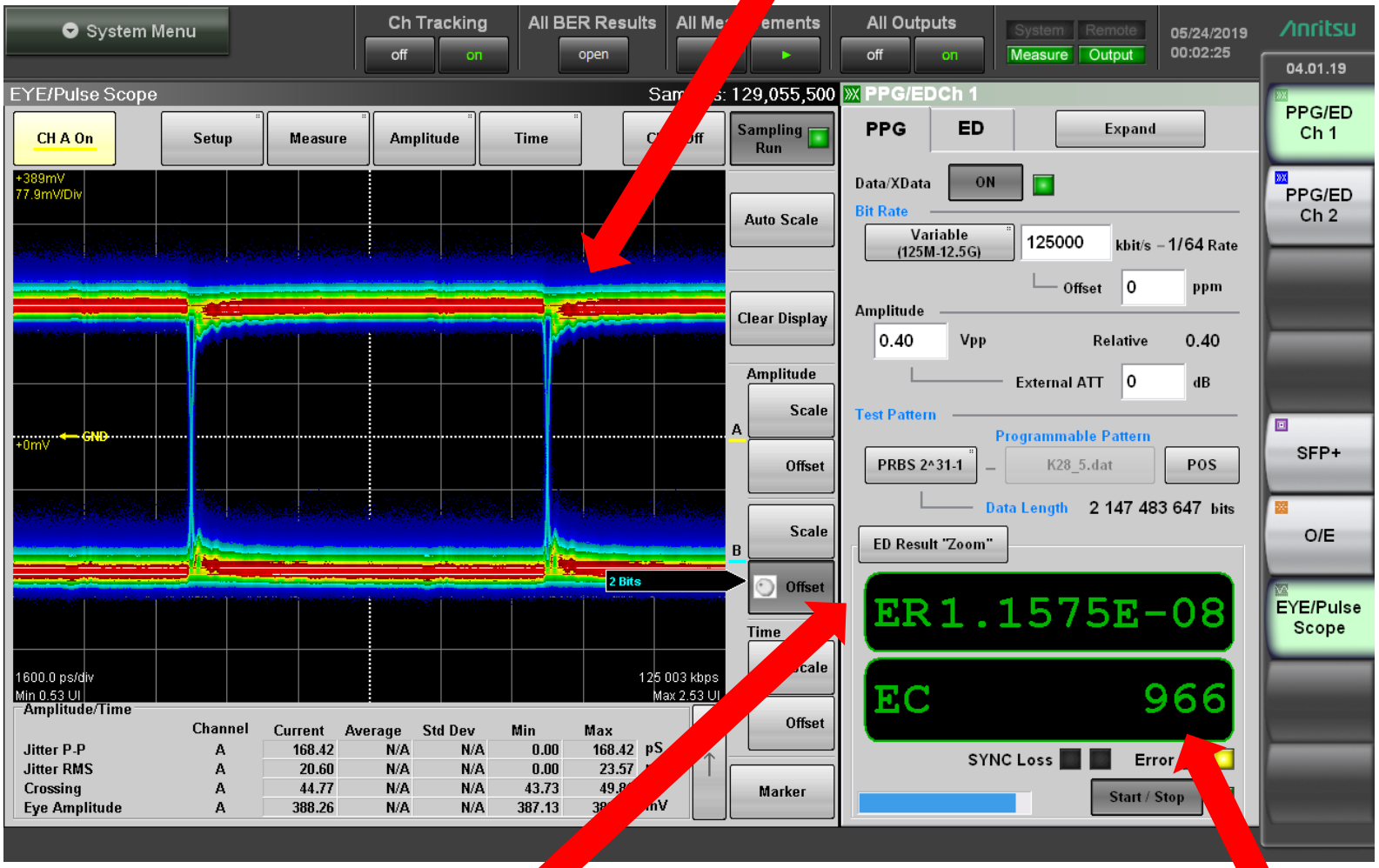


Test Setup/Conditions

- Ambient temperature 23°C
- PRBS 2^31 -1 Pattern
- With and without optical attenuation using the following data rates:
  - 125 Mbps
  - 500 Mbps
  - 1.25 Gbps (using a GbE mask)
  - 4.25 Gbps (using a FibreChannel mask)
  - 6.00 Gbps
  - 8.50 Gbps (using a FibreChannel mask)
- The optical attenuator was set such that the receiver received -15dBm of optical power from the transmitter
- Duration of each test was roughly 10 minutes
- For every test performed one error was purposely injected in order to have a BER

125Mbps No Attenuation

Eye Diagram

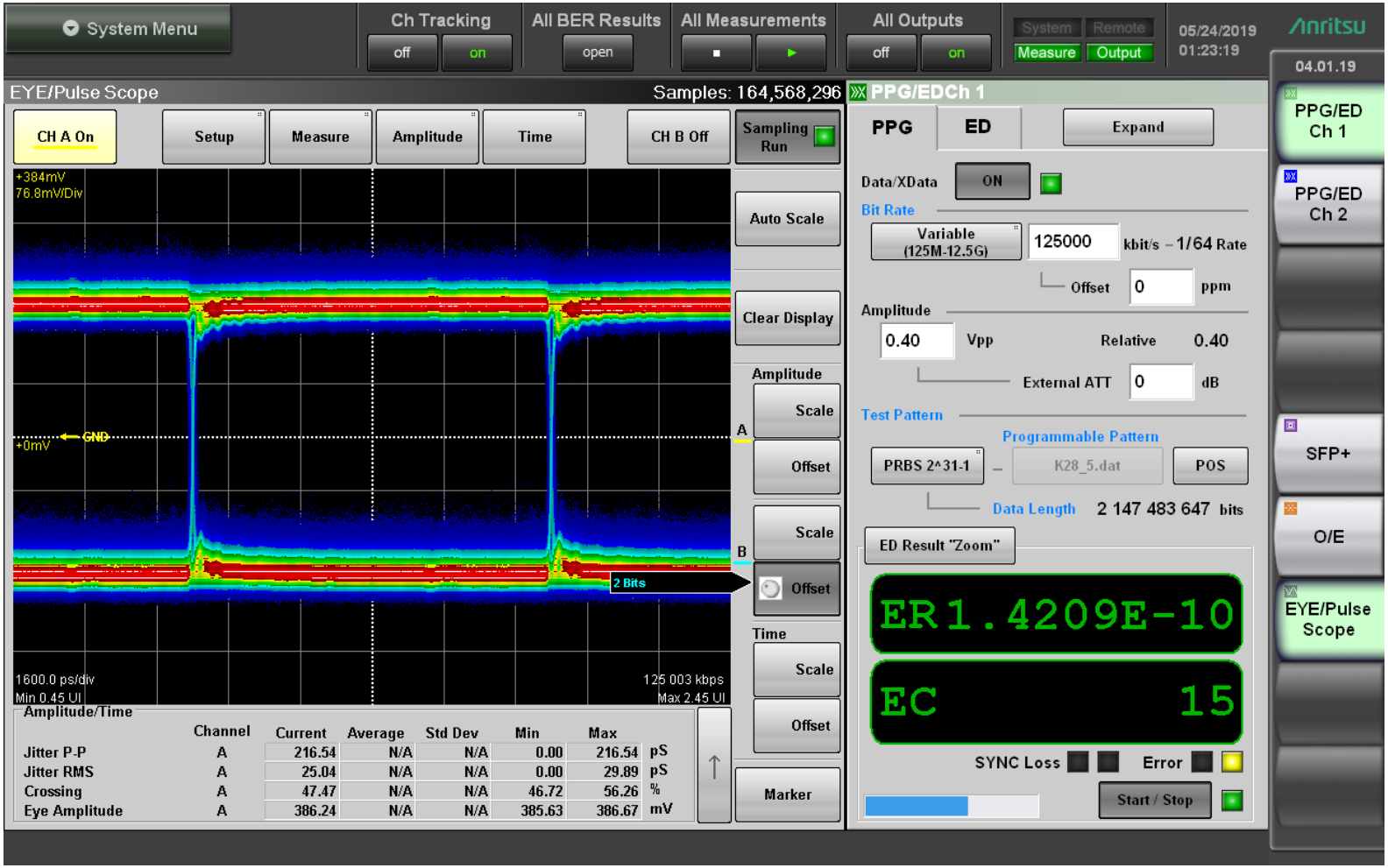


Bit Error Rate

Bit Error Count

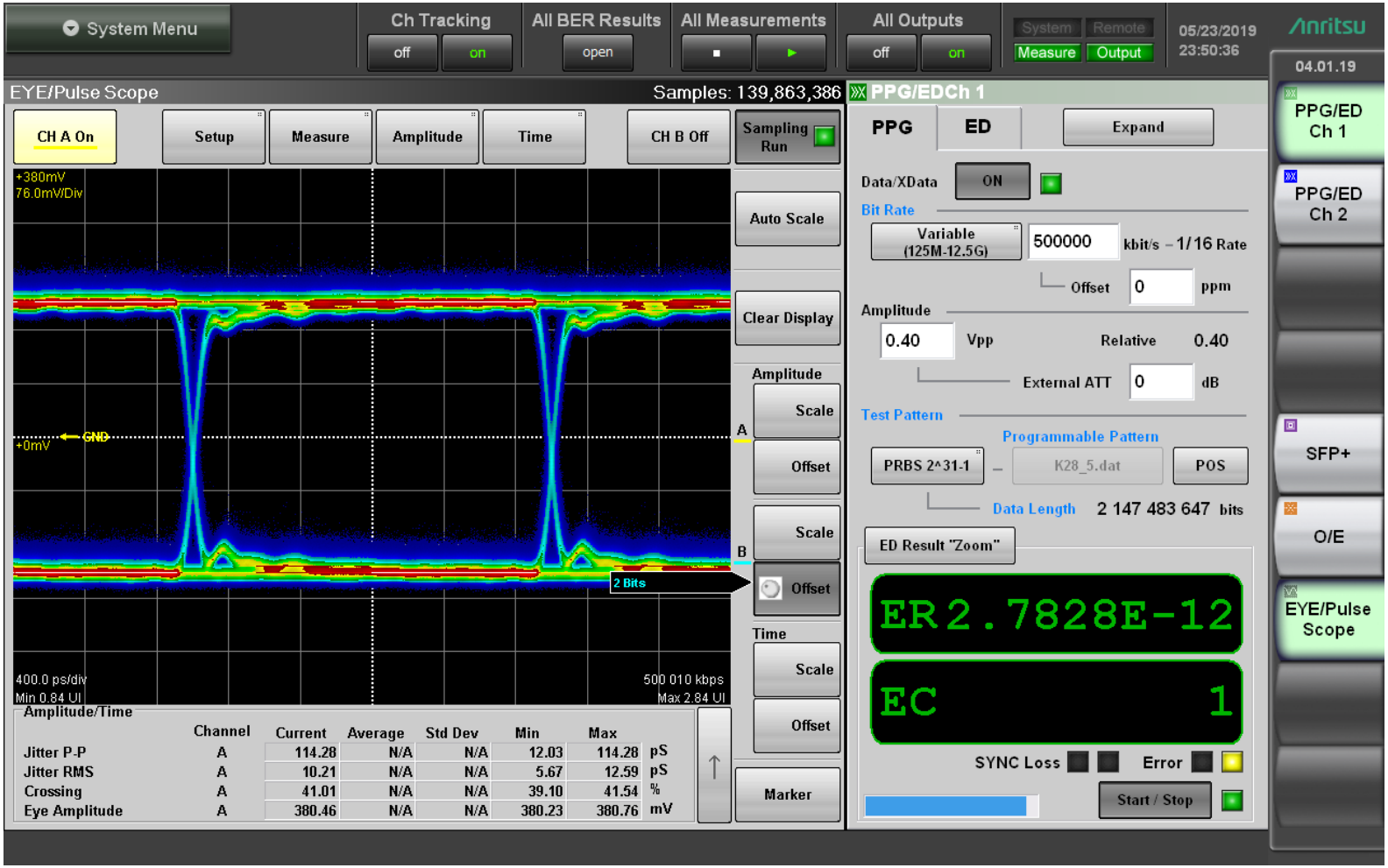
23°C

125Mbps with Optical Attenuation



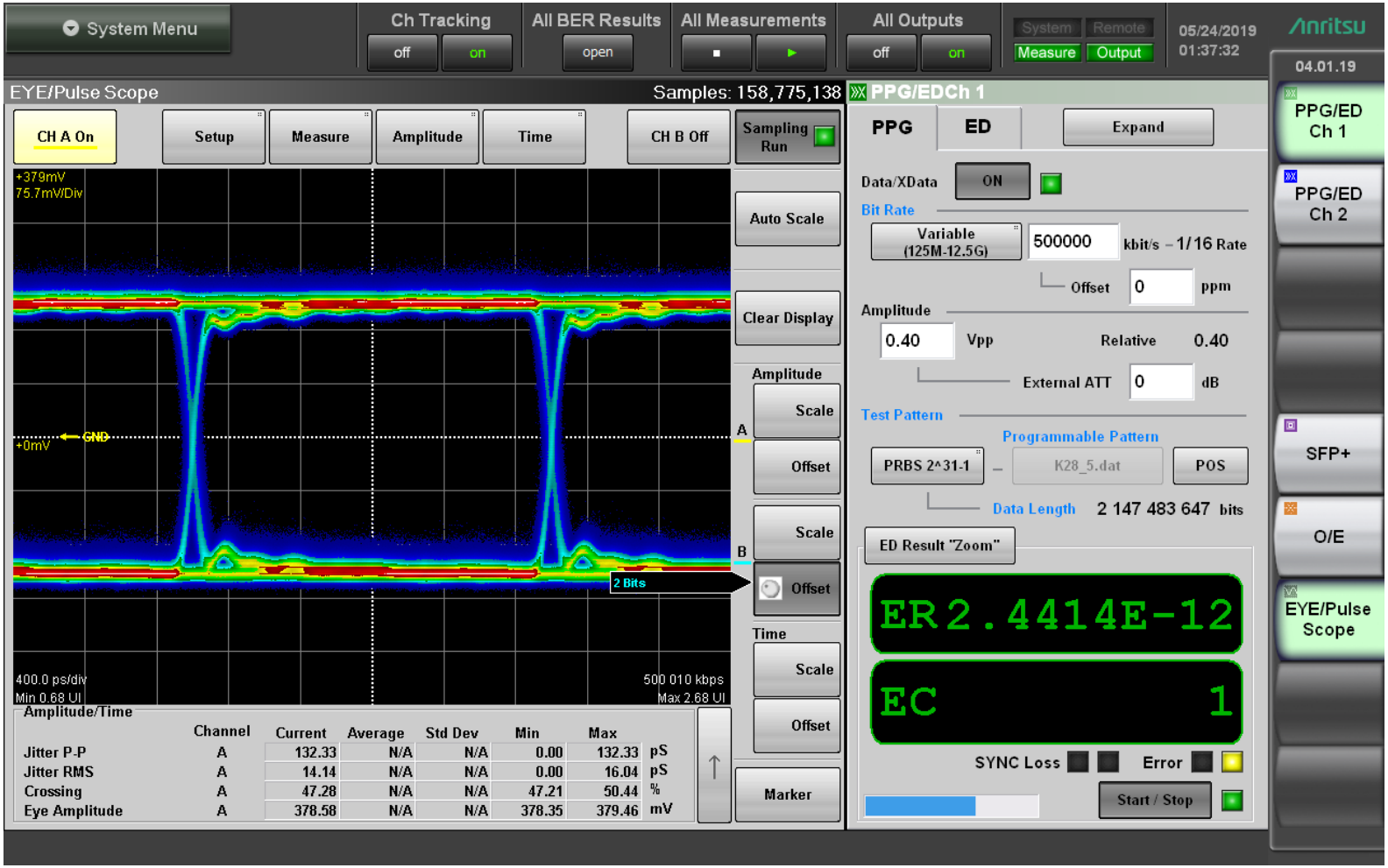
23°C

500Mbps No Attenuation



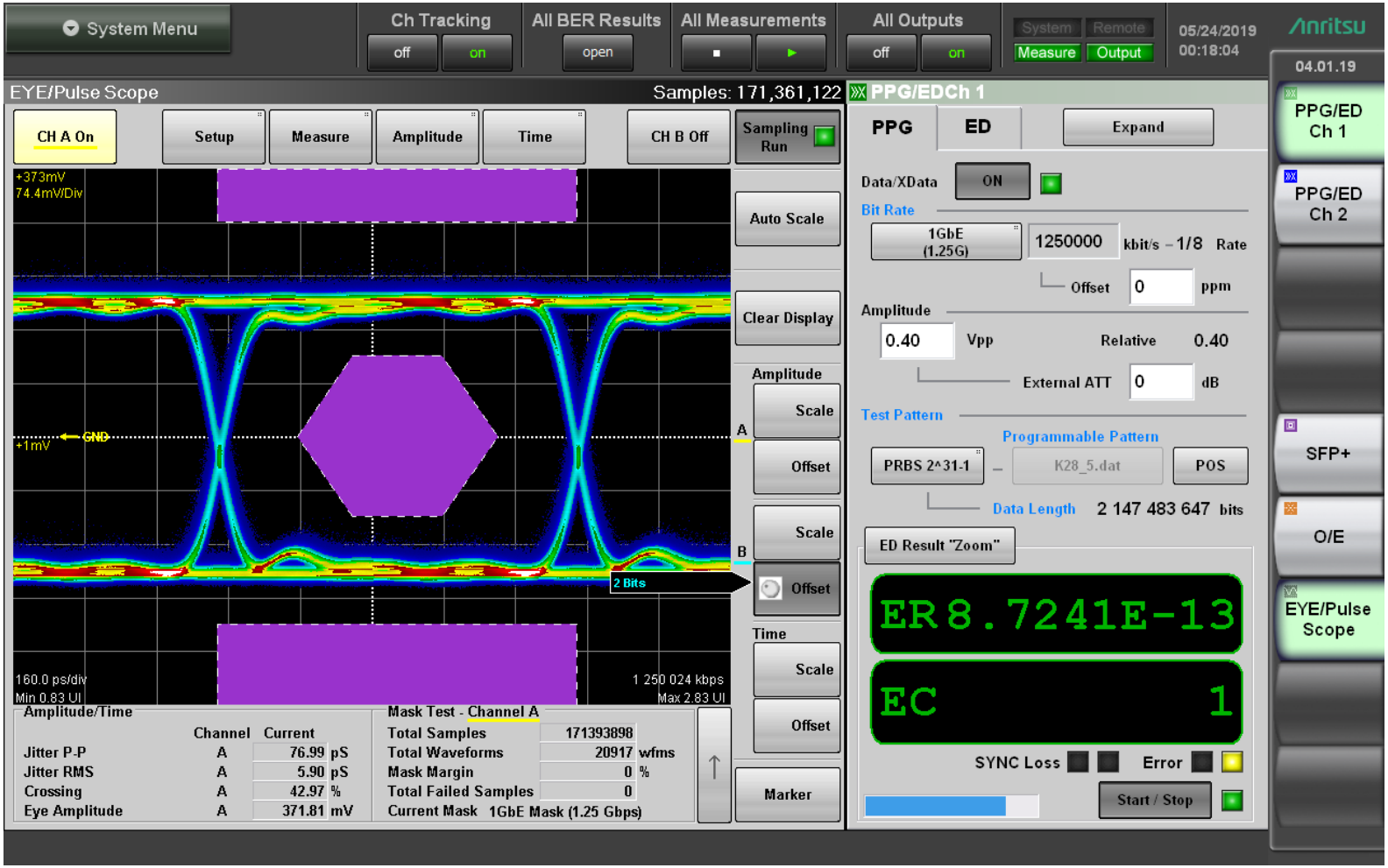
23°C

500Mbps with Optical Attenuation



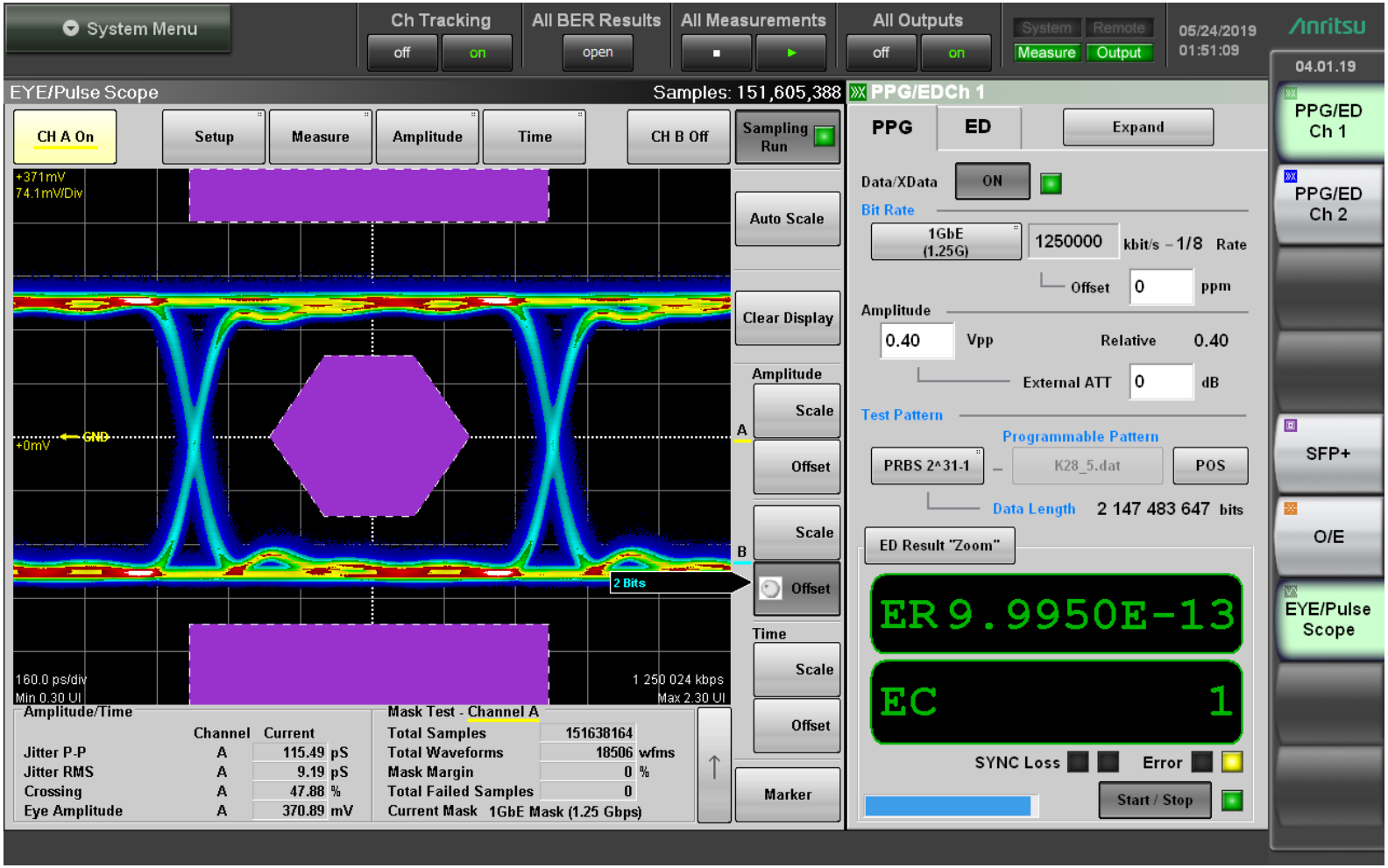
23°C

1.25Gbps No Attenuation



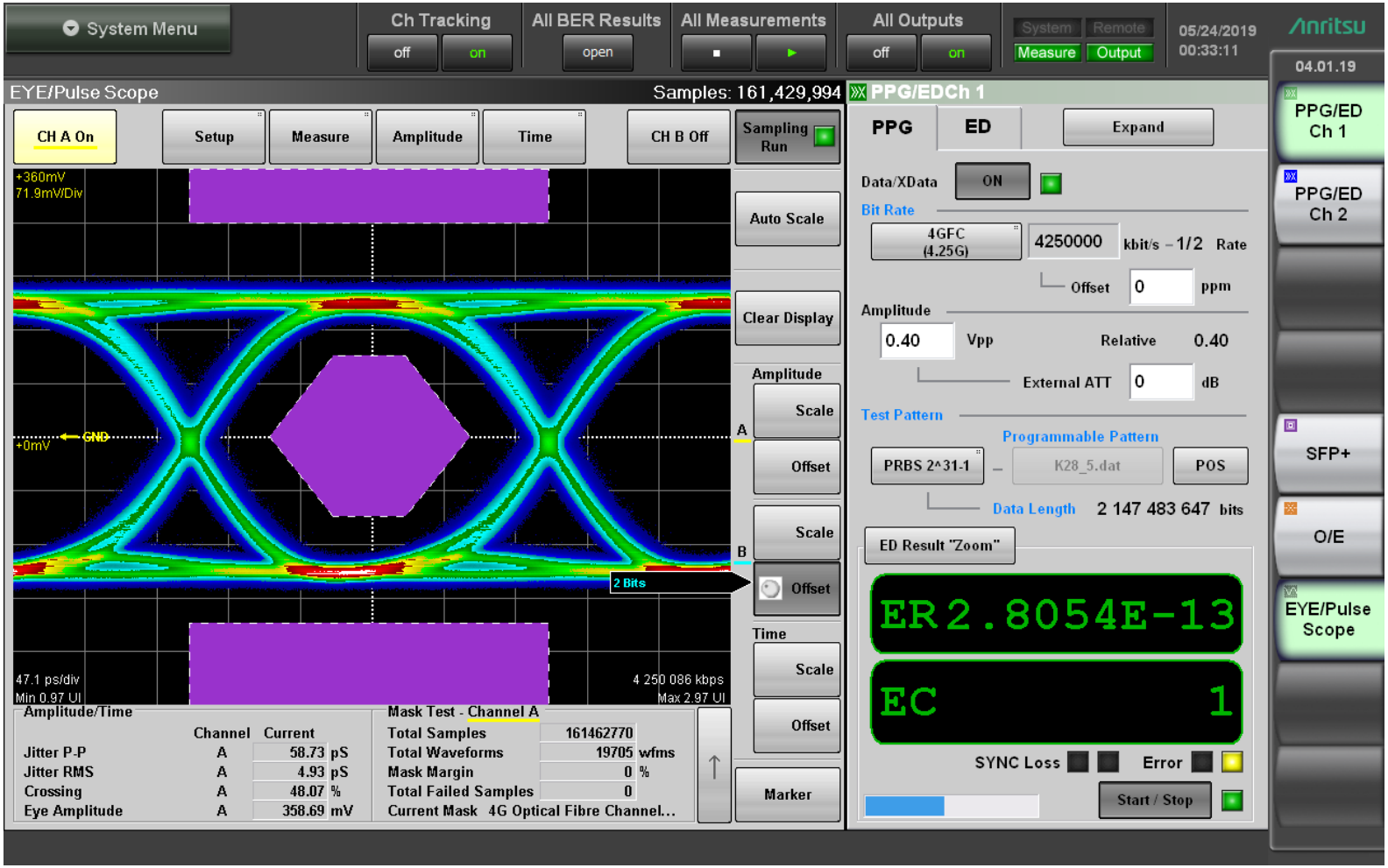
23°C

1.25Gbps with Optical Attenuation



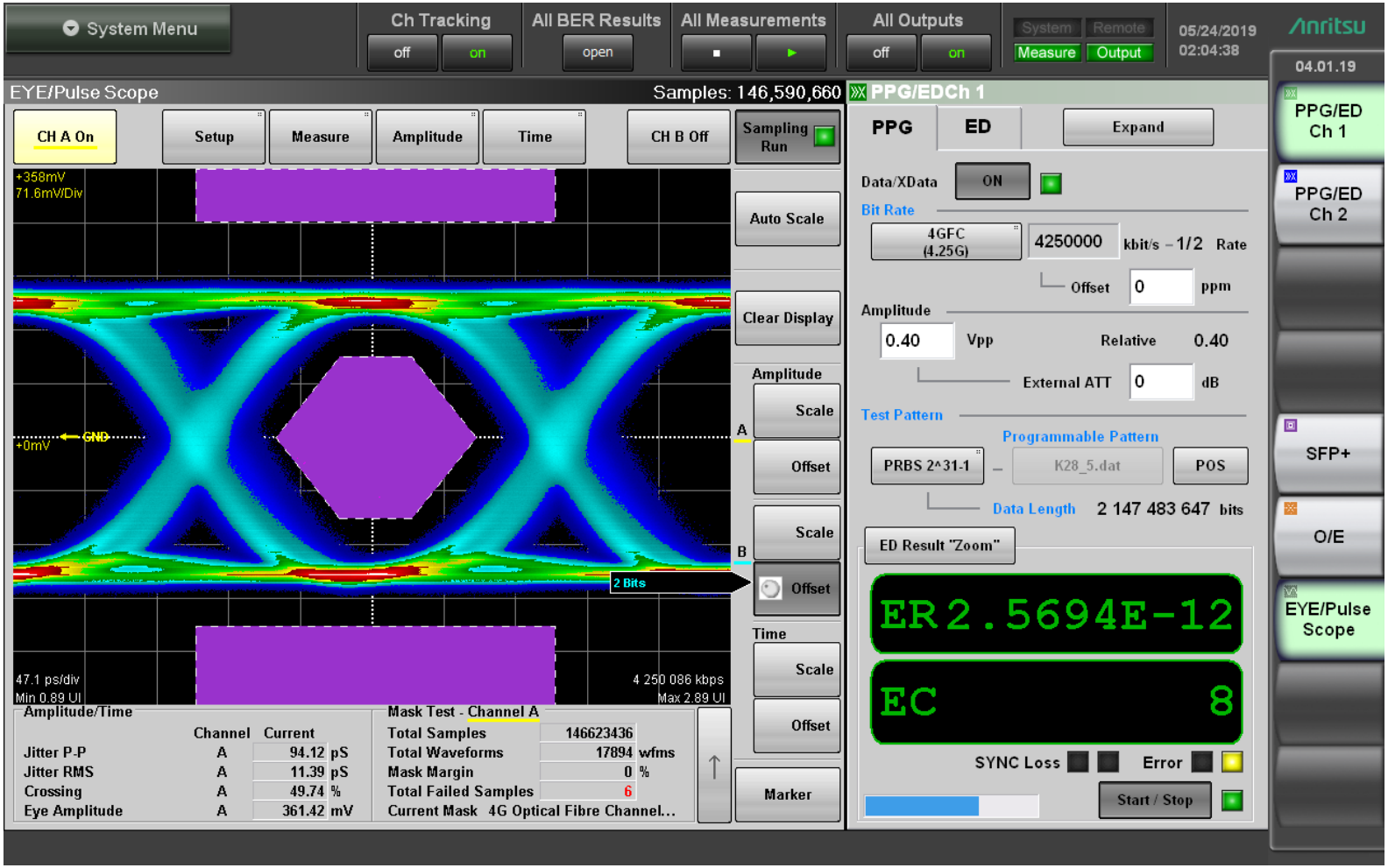
23°C

4.25Gbps No Attenuation



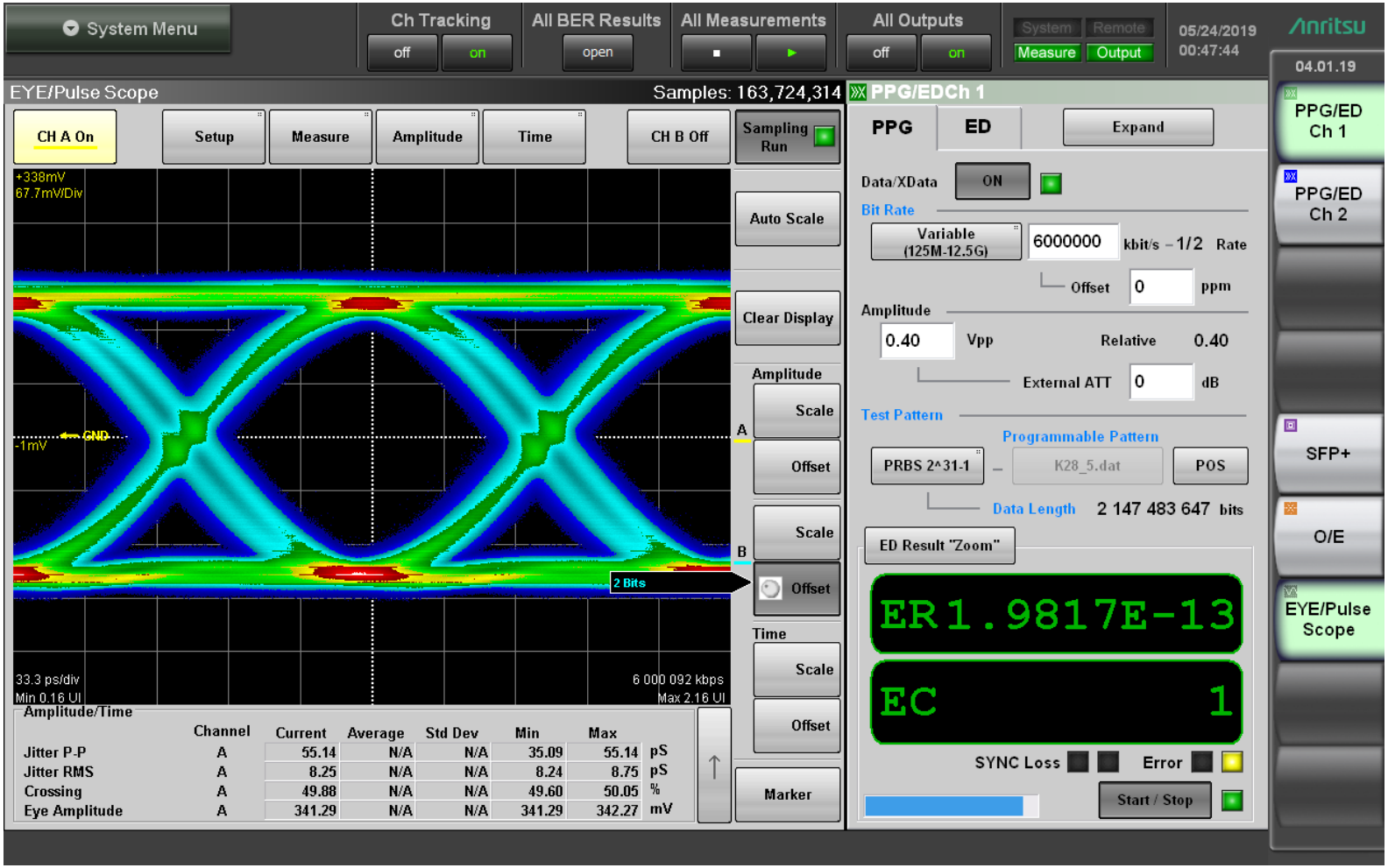
23°C

4.25Gbps with Optical Attenuation



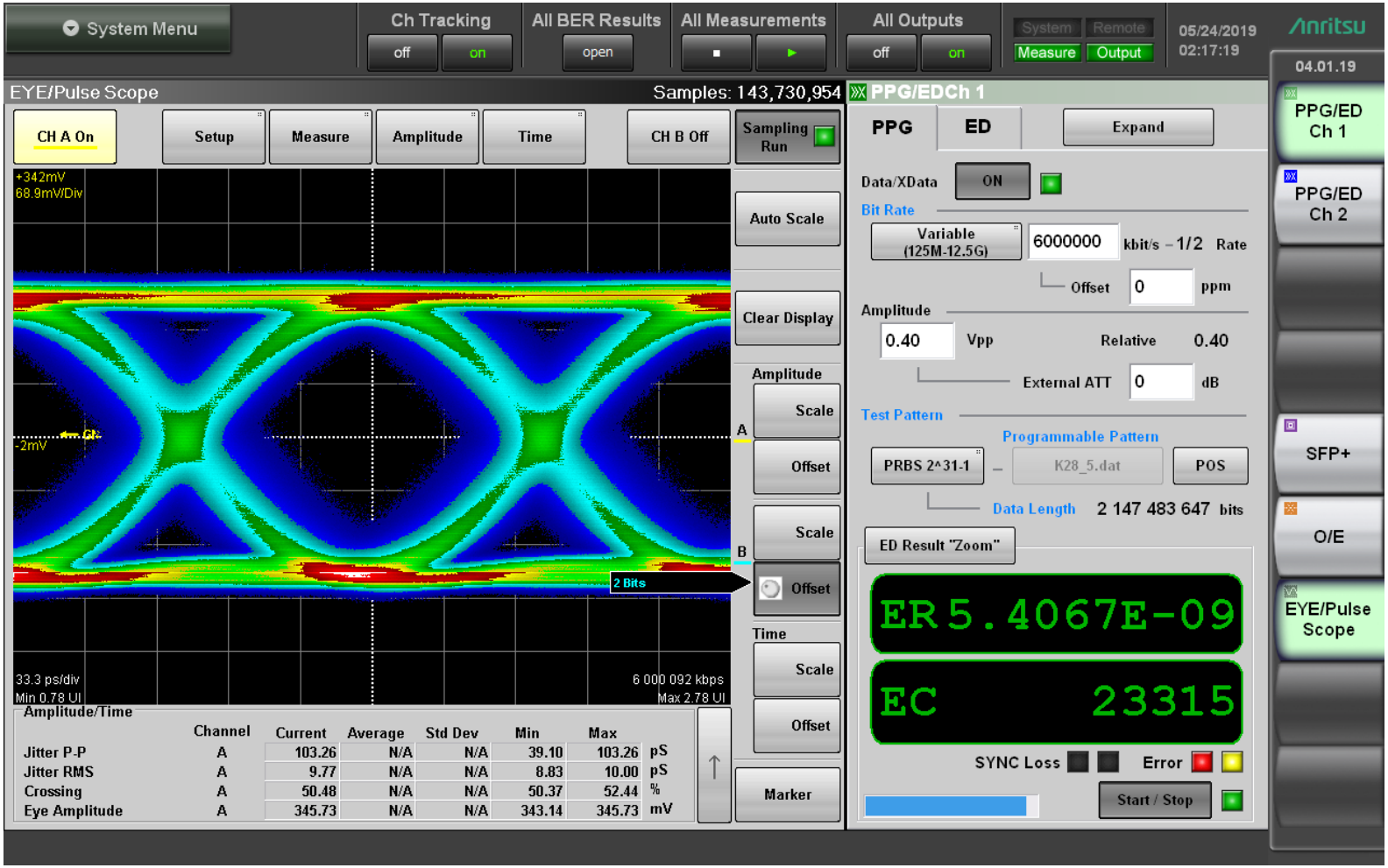
23°C

6Gbps No Attenuation



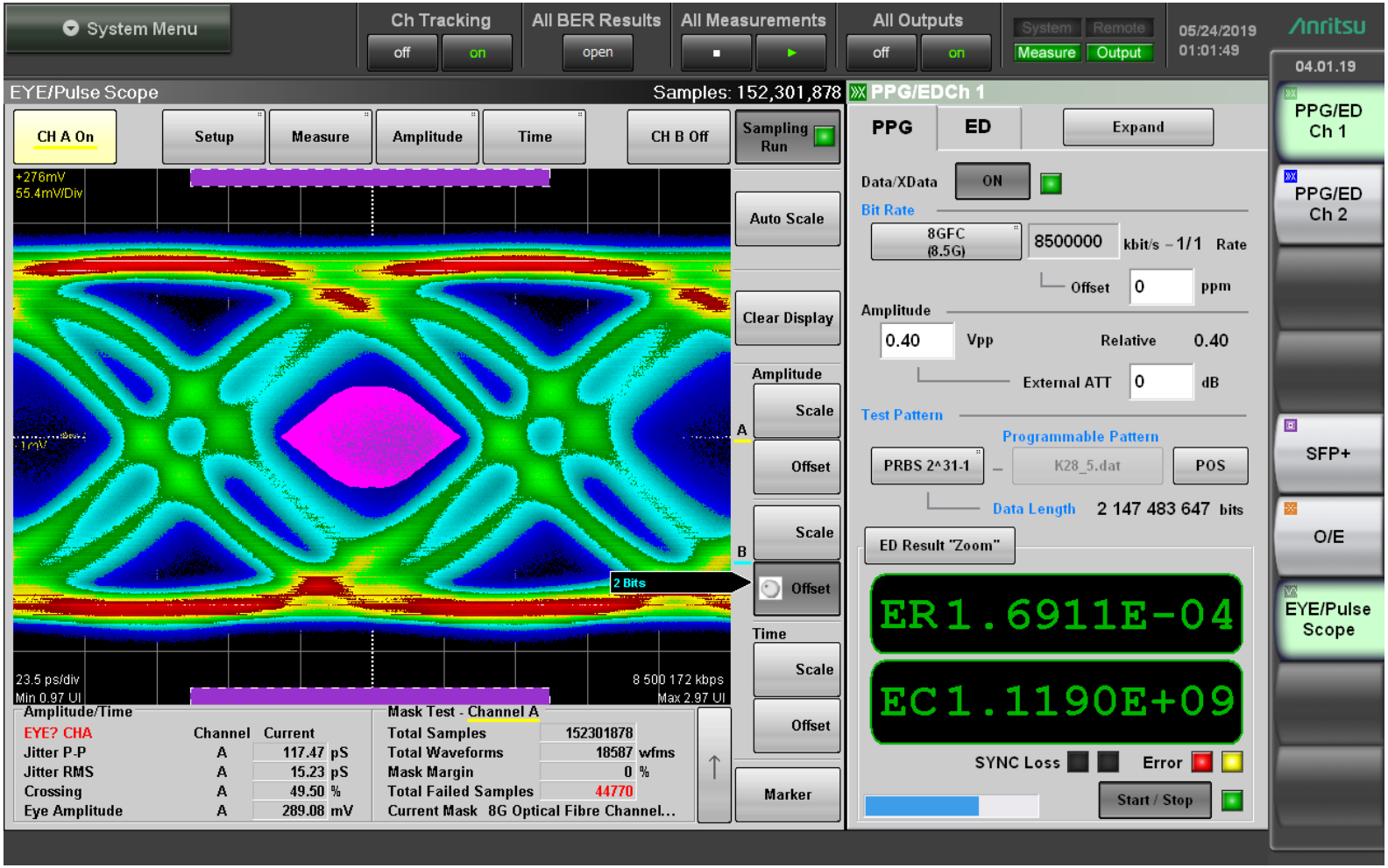
23°C

6Gbps with Optical Attenuation



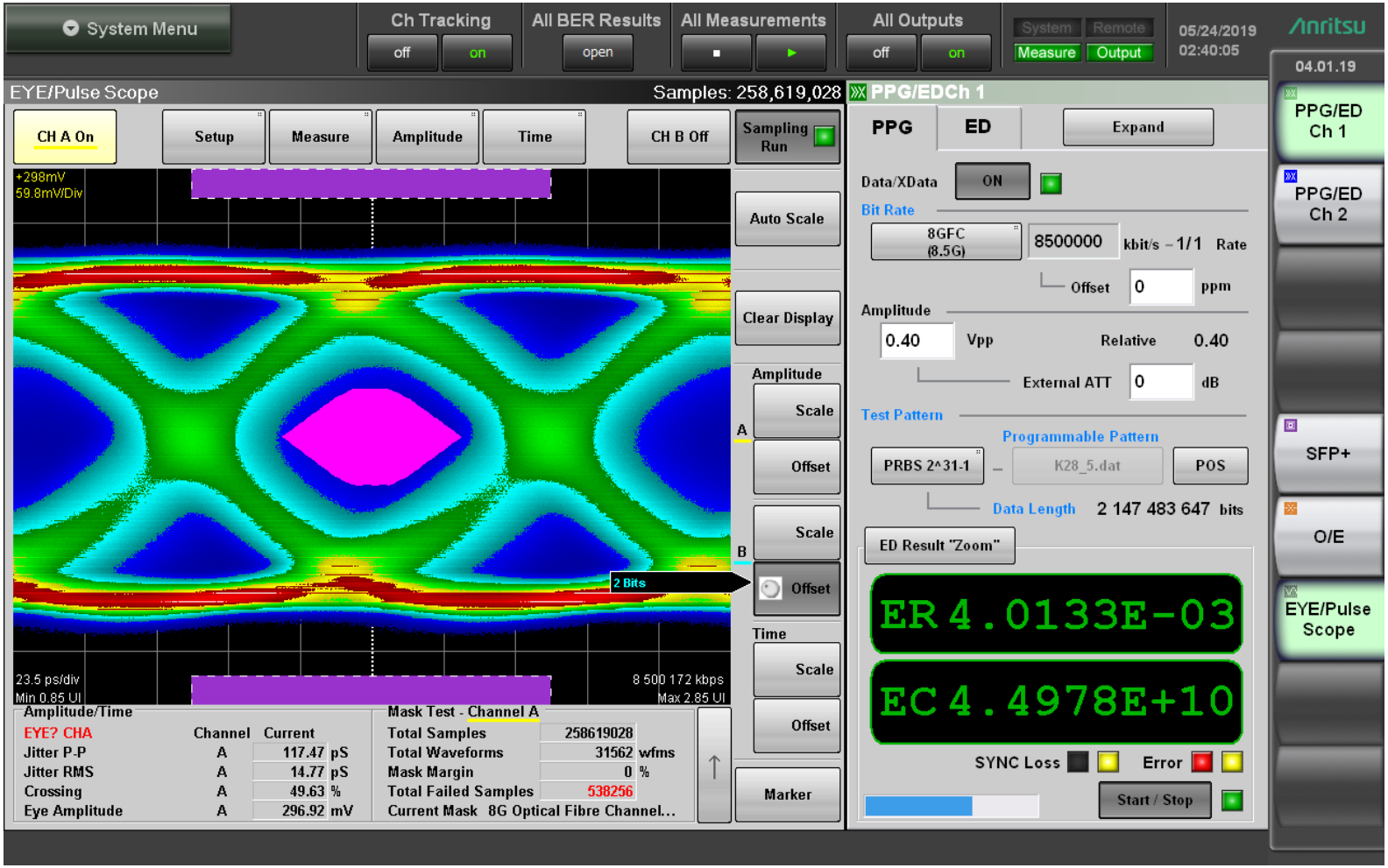
23°C

8.5Gbps No Attenuation



23°C

8.5Gbps with Optical Attenuation



23°C

Bit Error Rate Summary (23°C)

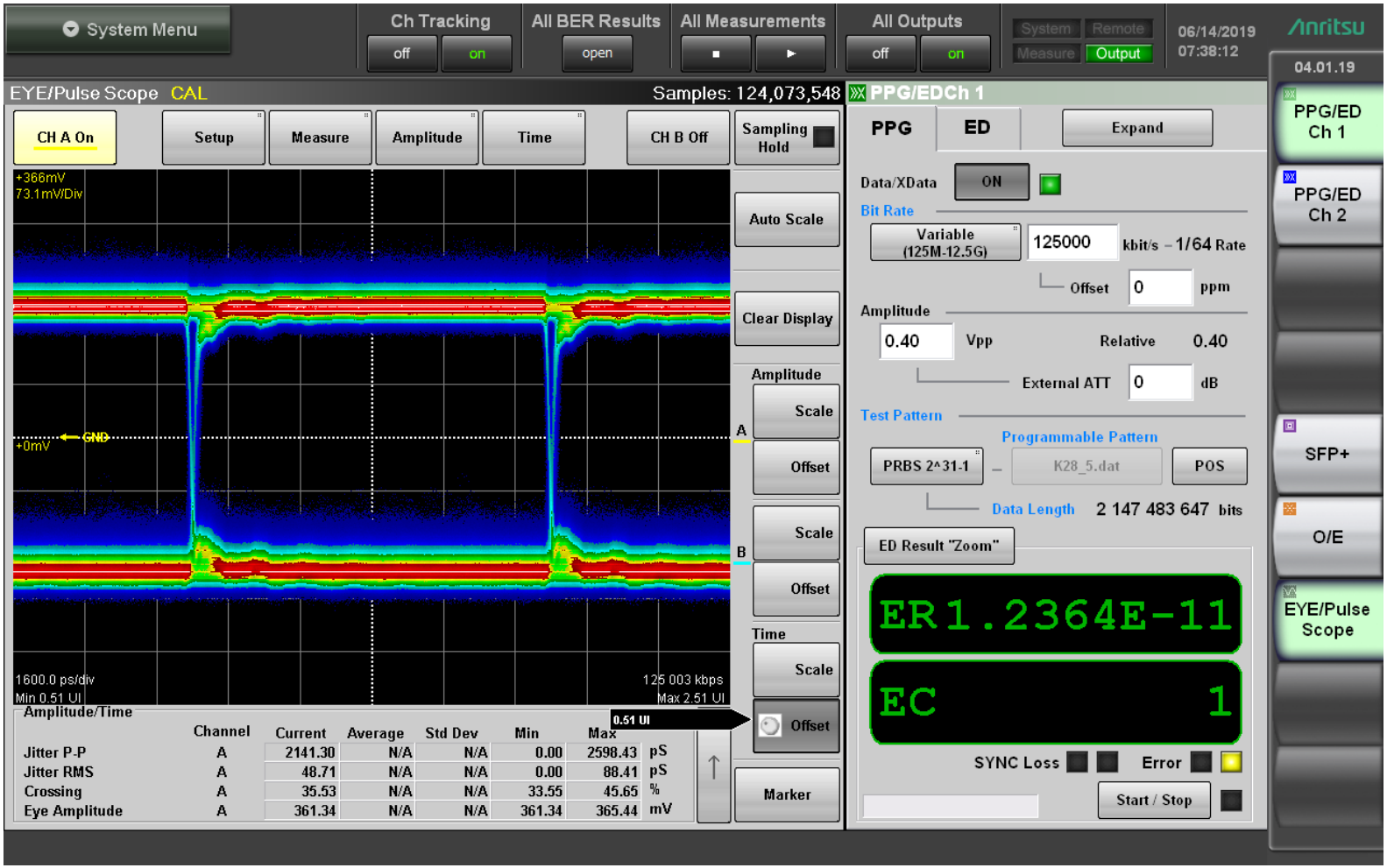
Data Rate	Attenuation	BER (1 error injected manually)
125 Mbps	No	01.16E-08
125 Mbps	Yes	01.42E-10
500 Mbps	No	02.78E-12
500 Mbps	Yes	02.44E-12
1.25 Gbps	No	08.72E-13
1.25 Gbps	Yes	10.00E-13
4.25 Gbps	No	02.10E-13
4.25 Gbps	Yes	02.57E-12
6.00 Gbps	No	01.98E-13
6.00 Gbps	Yes	05.40E-09
8.50 Gbps	No	01.67E-04
8.50 Gbps	Yes	04.01E-03

CF-170300-034/035 Components are Rated from 155.00Mbps to 4.25Gbps but have Reasonable BER at up to 6Gbps

Temperature Performance Testing

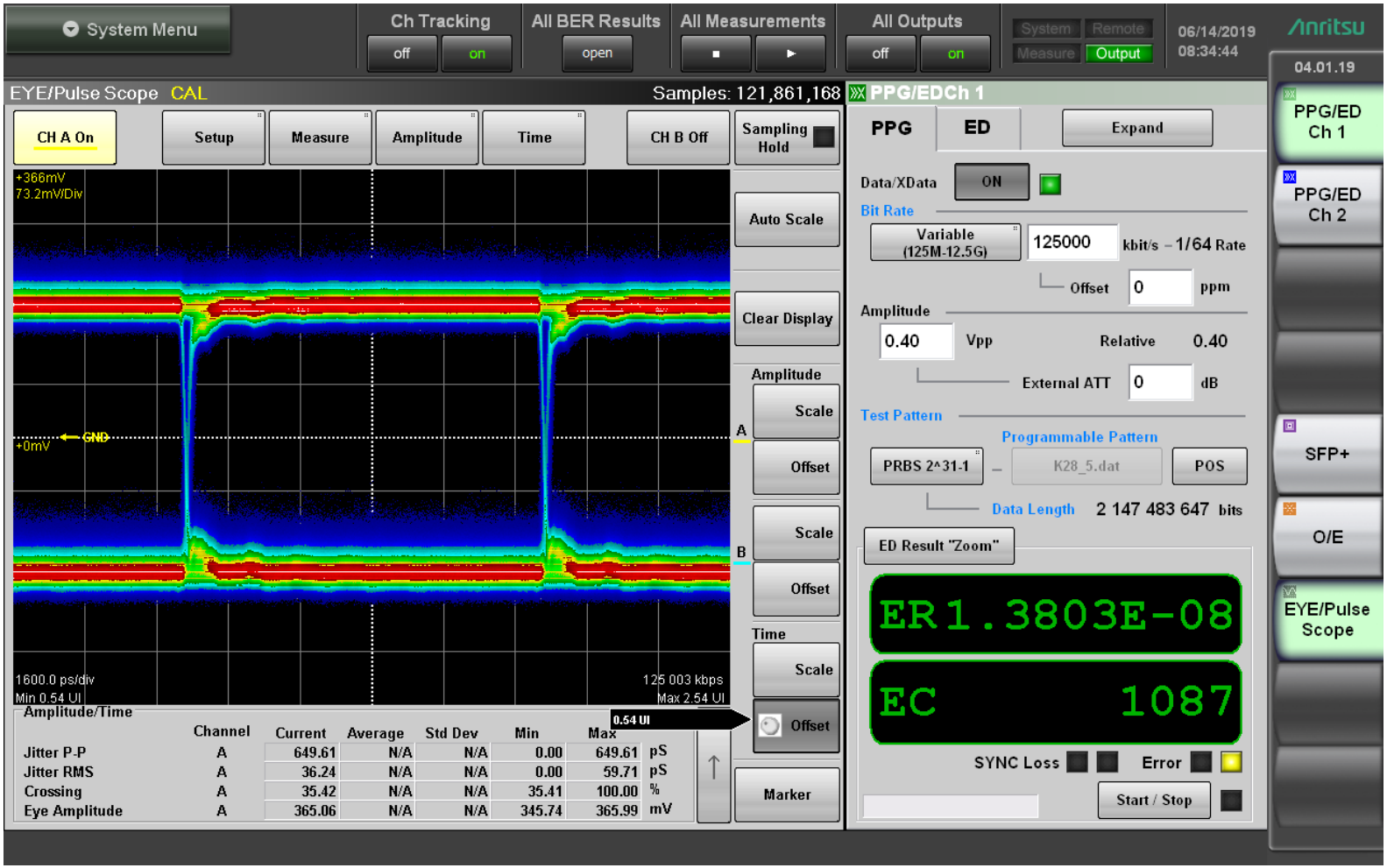
- Tested at temperatures of 100, 85, -40, and -55 °C
- PRBS 2^31 -1 Pattern
- With and without optical attenuation using the following data rates:
  - 125 Mbps
  - 500 Mbps
  - 1.25 Gbps (using a GbE mask)
  - 4.25 Gbps (using a FibreChannel mask)
  - 6.00 Gbps
- The optical attenuator was set such that the receiver received -15dBm of optical power from the transmitter
- Duration of each test was roughly 10 minutes
- For every test performed one error was purposely injected in order to have a BER

125 Mbps No Attenuation



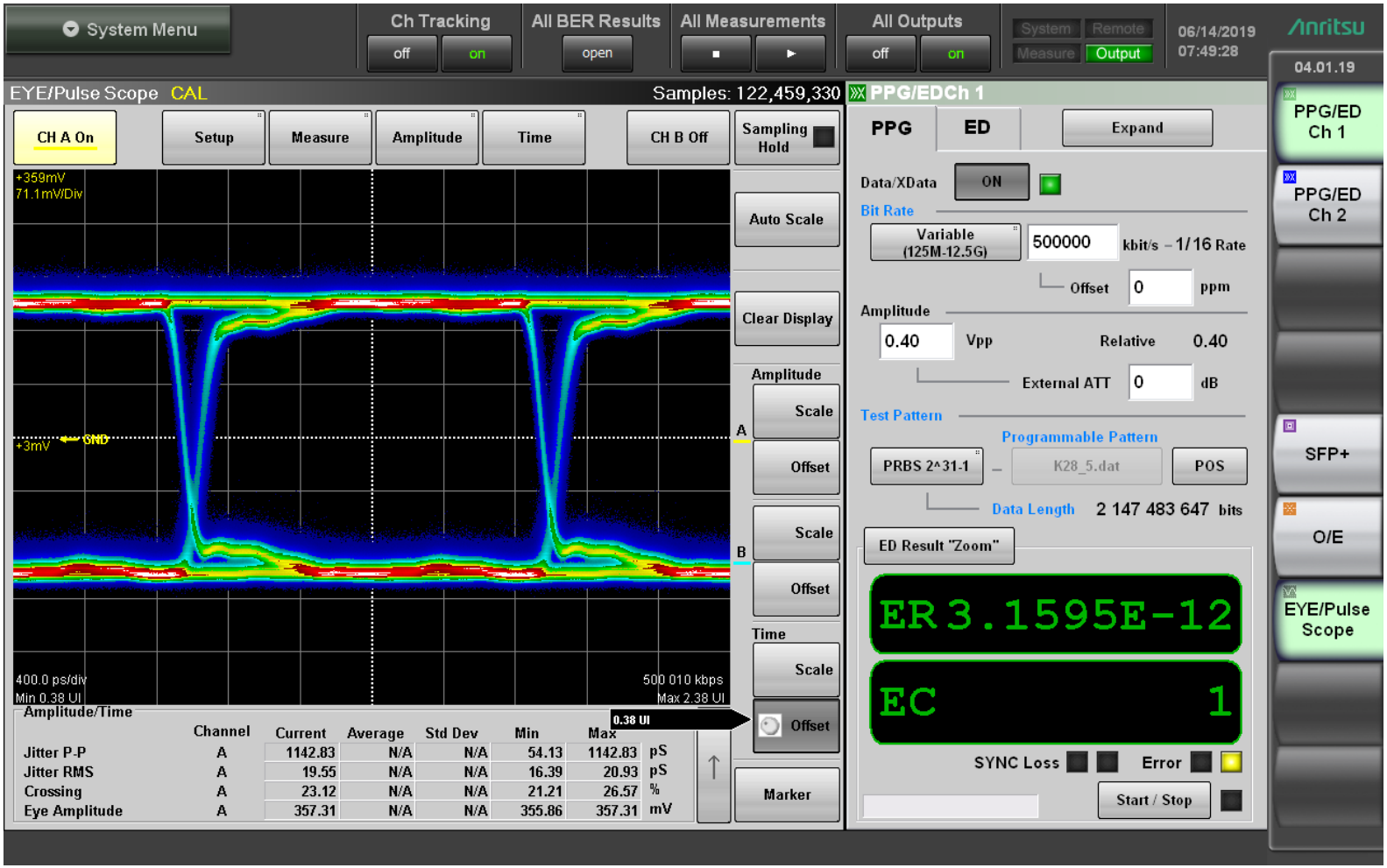
100°C

125 Mbps with Optical Attenuation



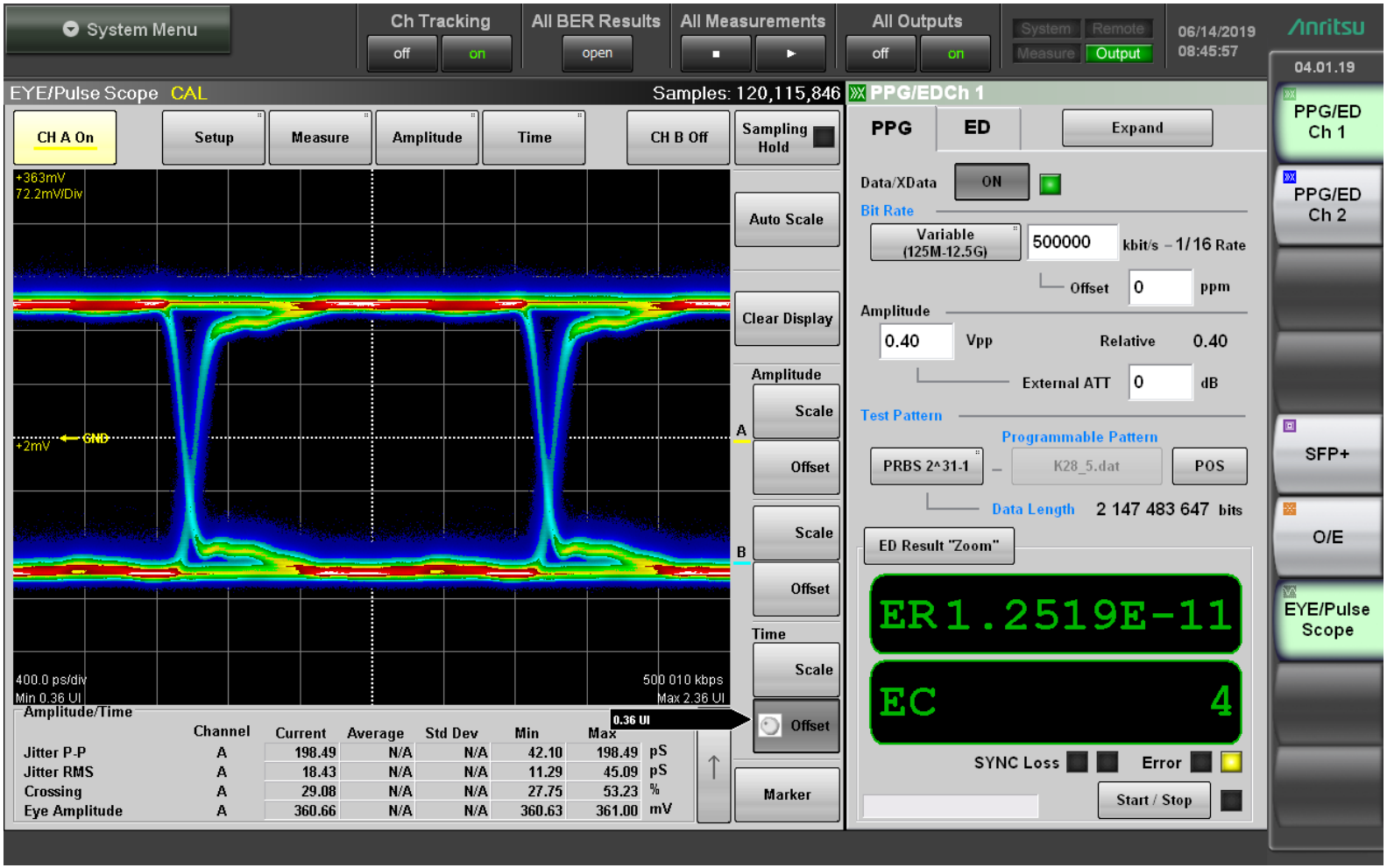
100°C

500 Mbps No Attenuation



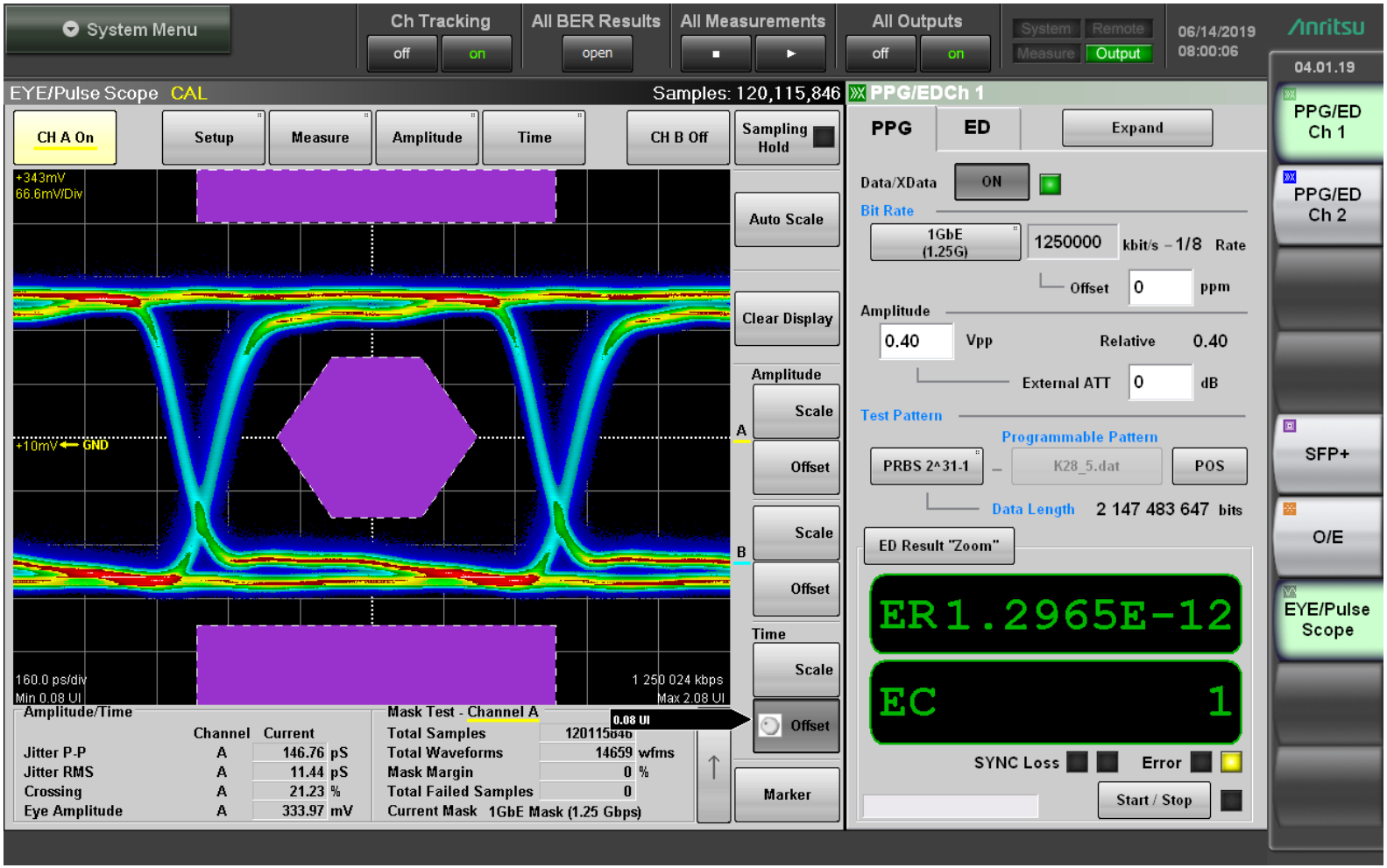
100°C

500 Mbp with Optical Attenuation



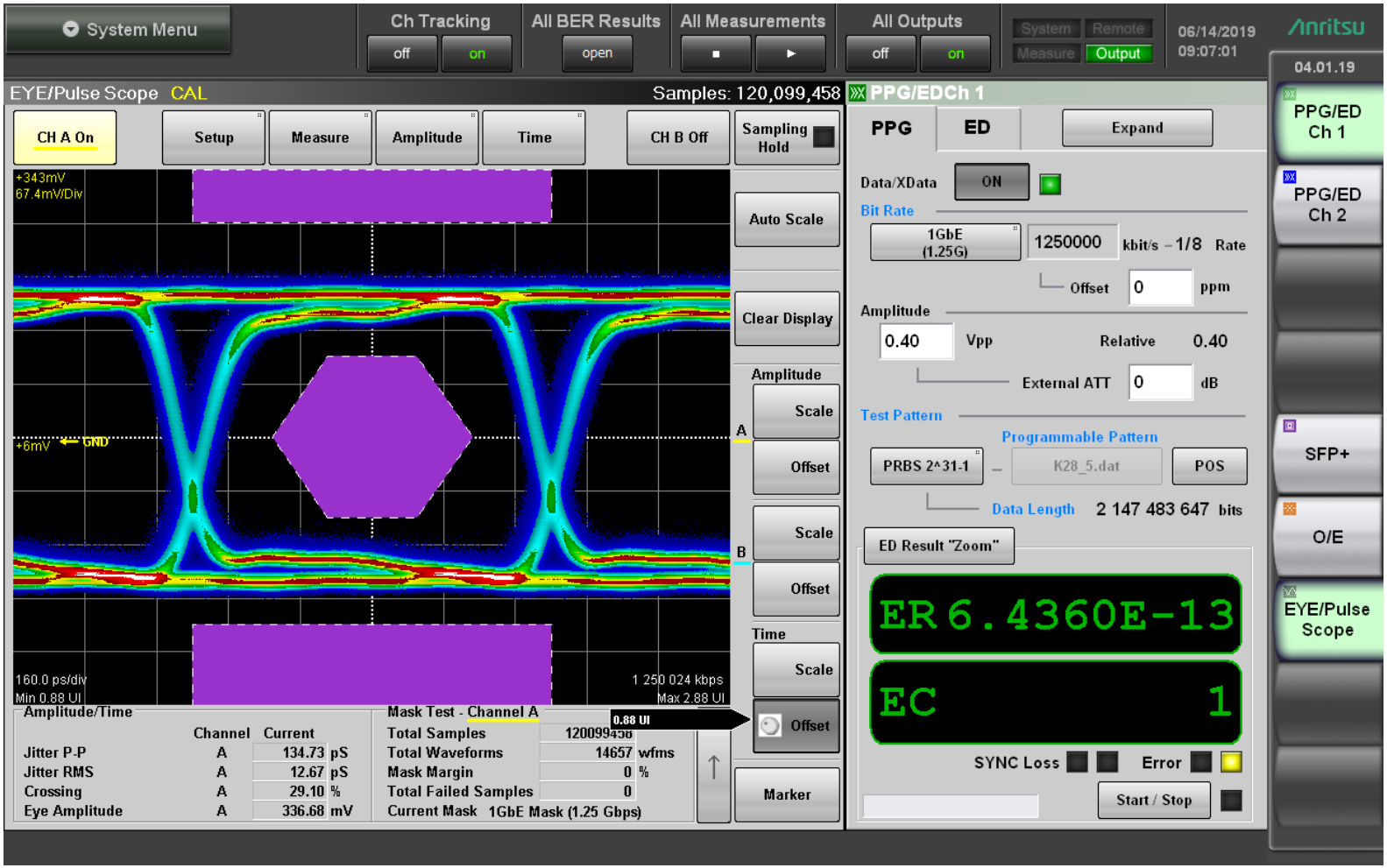
100°C

1.25 Gbps No Attenuation



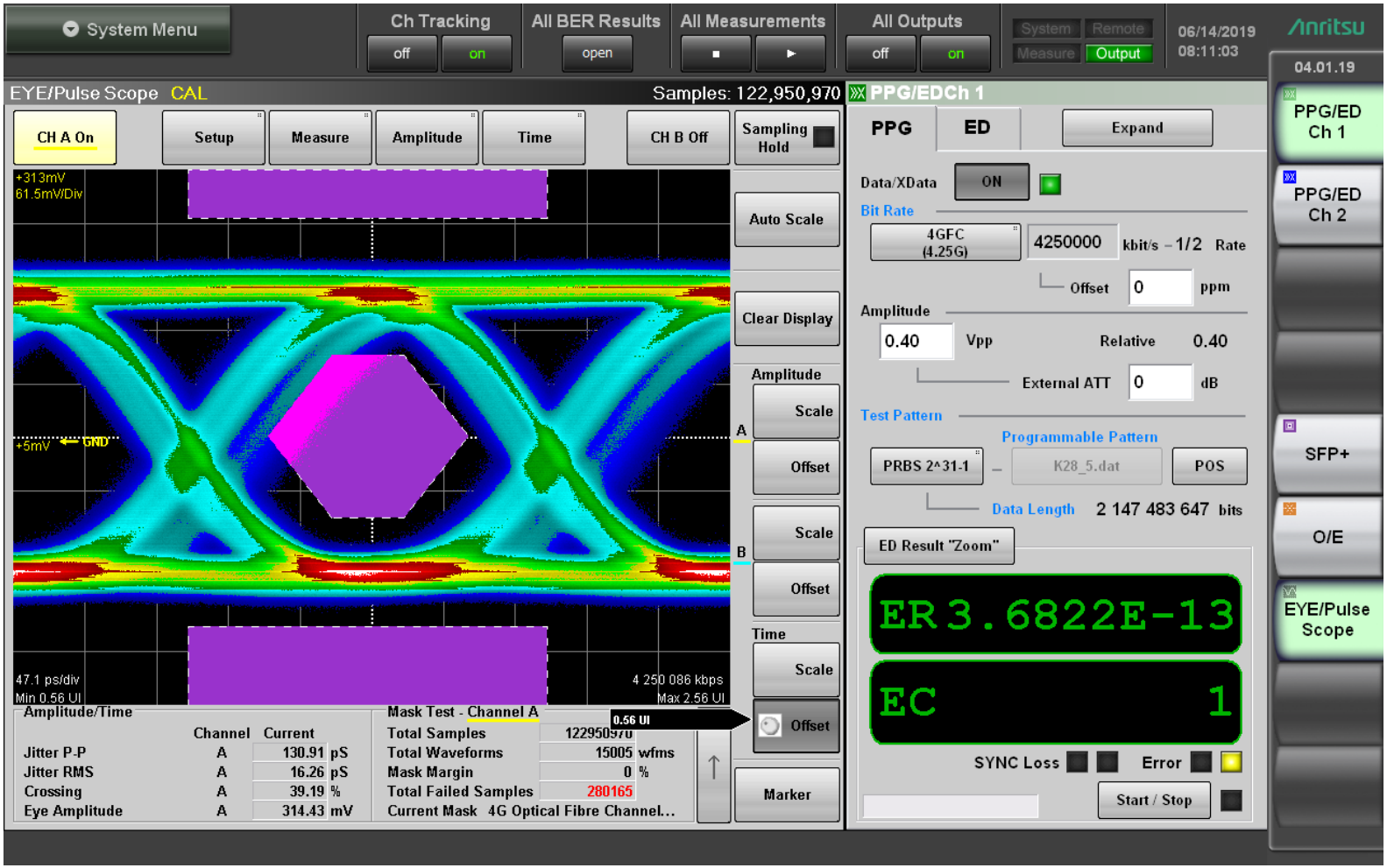
100°C

1.25 Gbps with Optical Attenuation



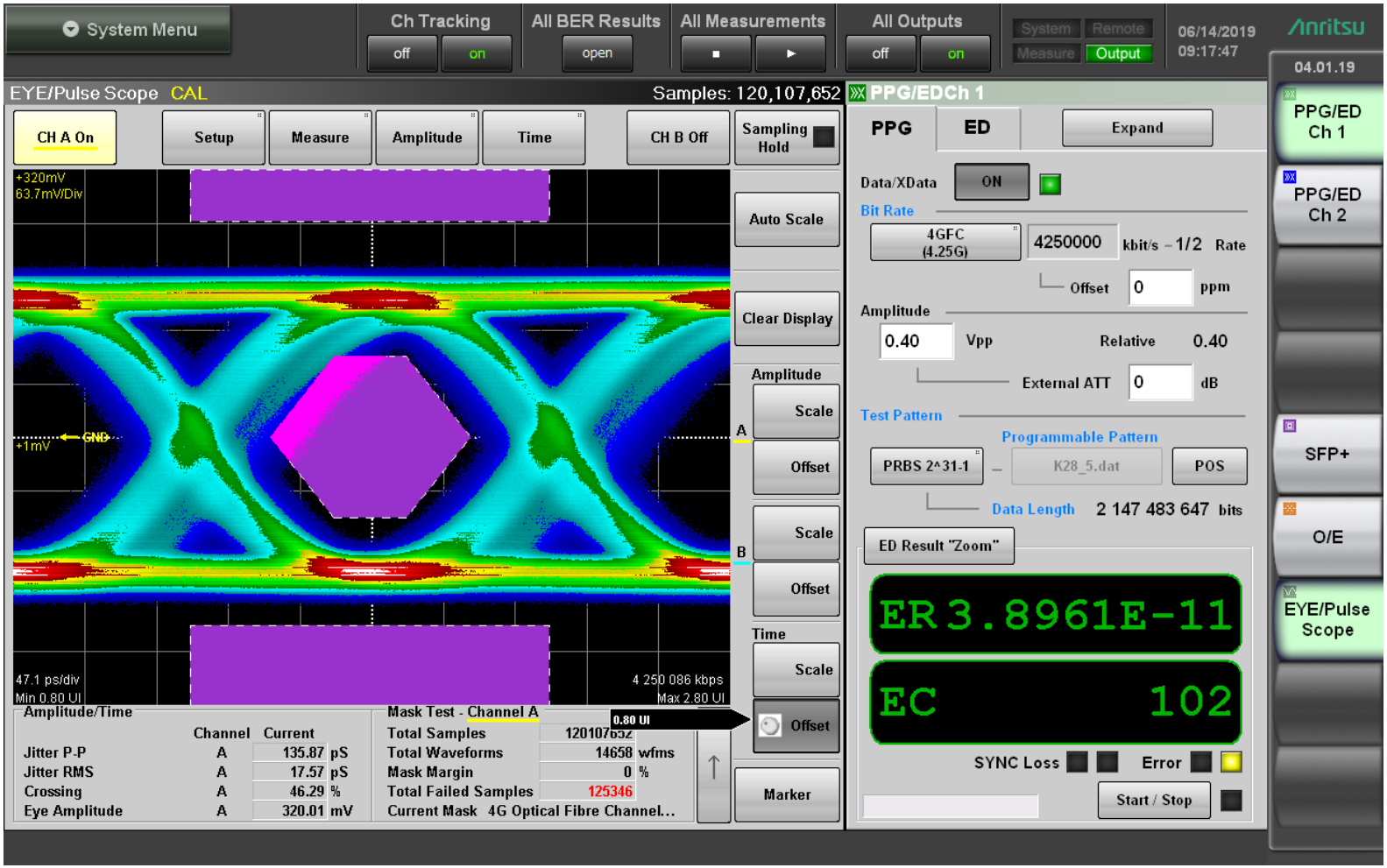
100°C

4.25 Gbps No Attenuation



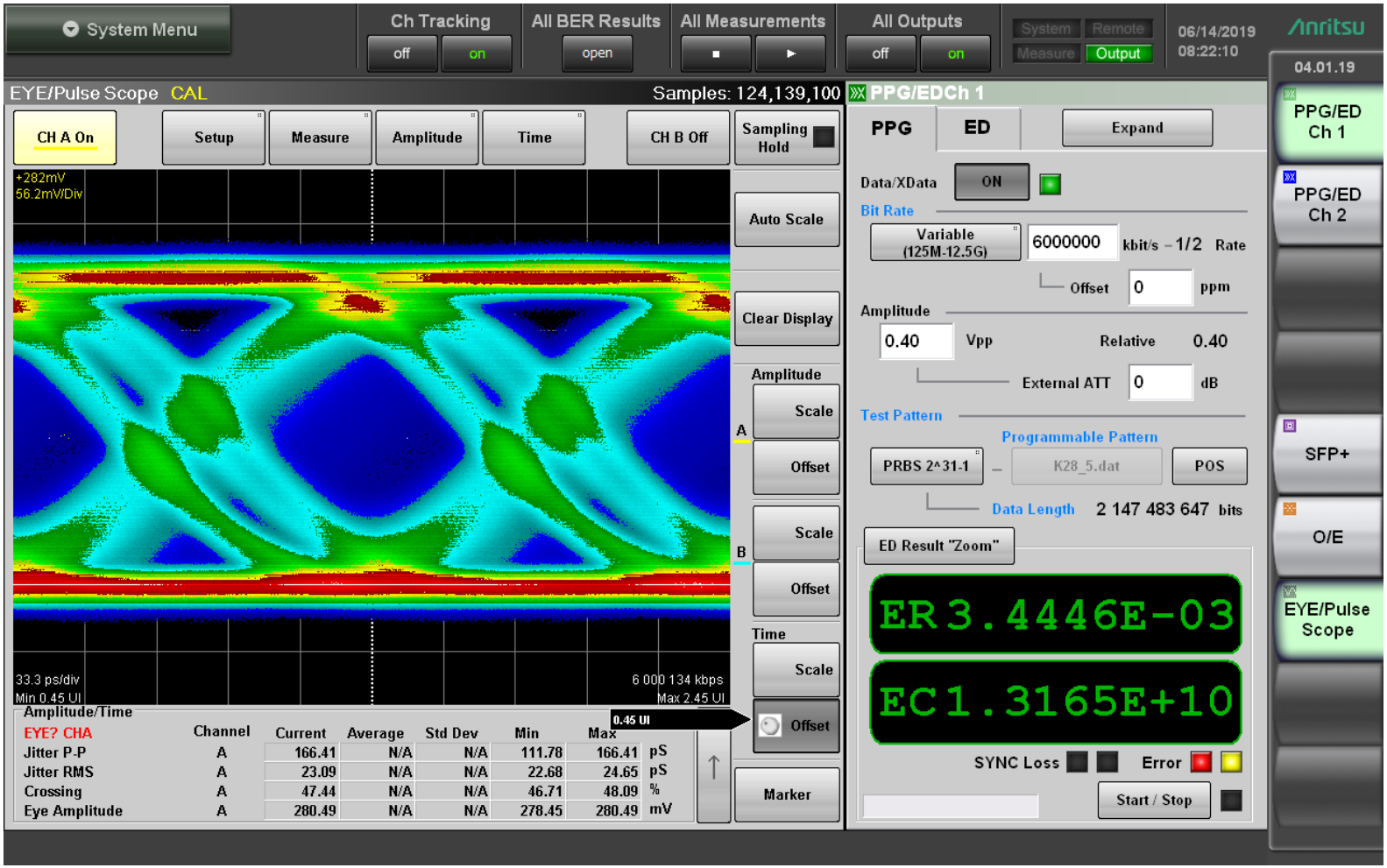
100°C

4.25 Gbps with Optical Attenuation



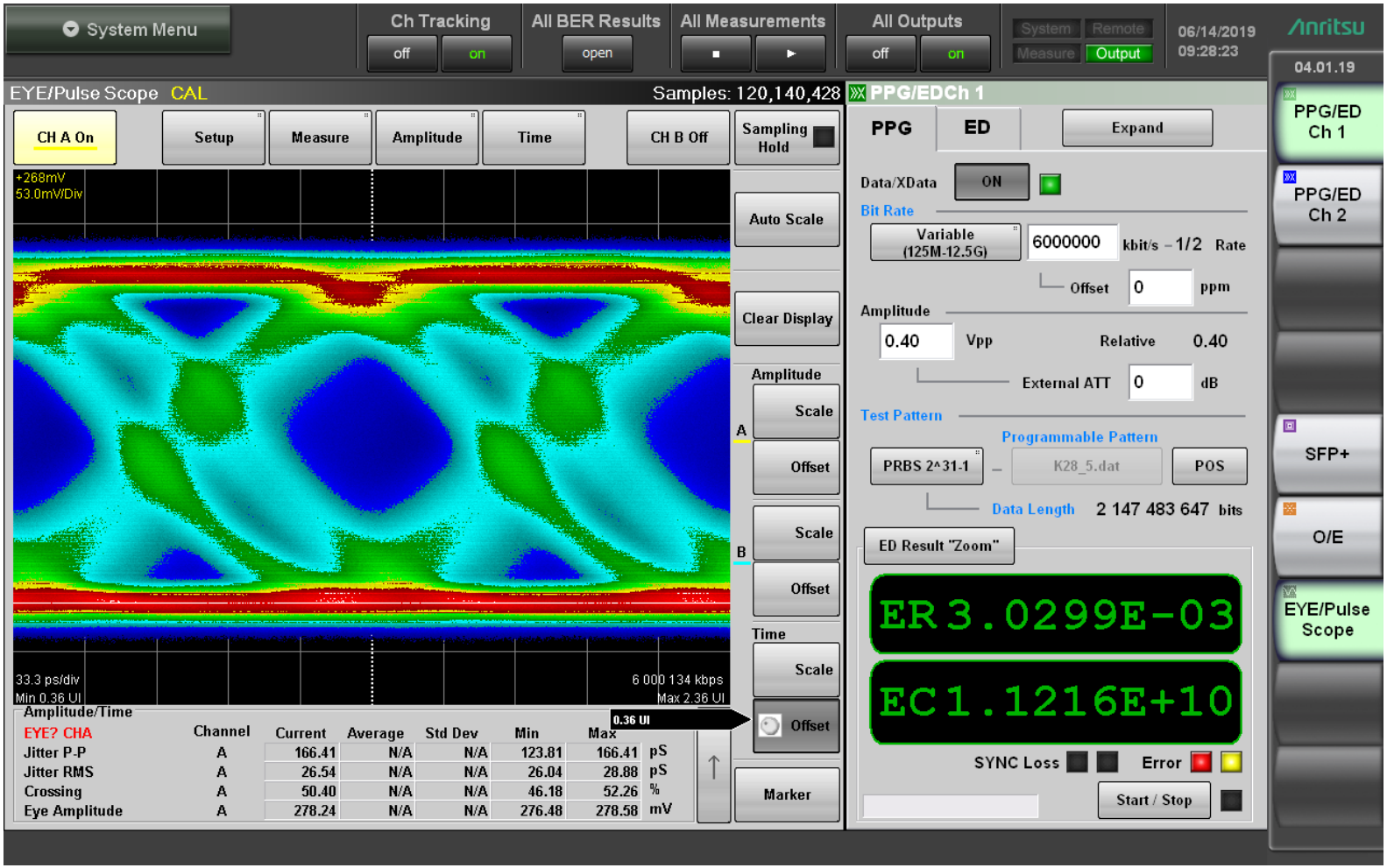
100°C

6 Gbps No Attenuation



100°C

6 Gbps with Optical Attenuation



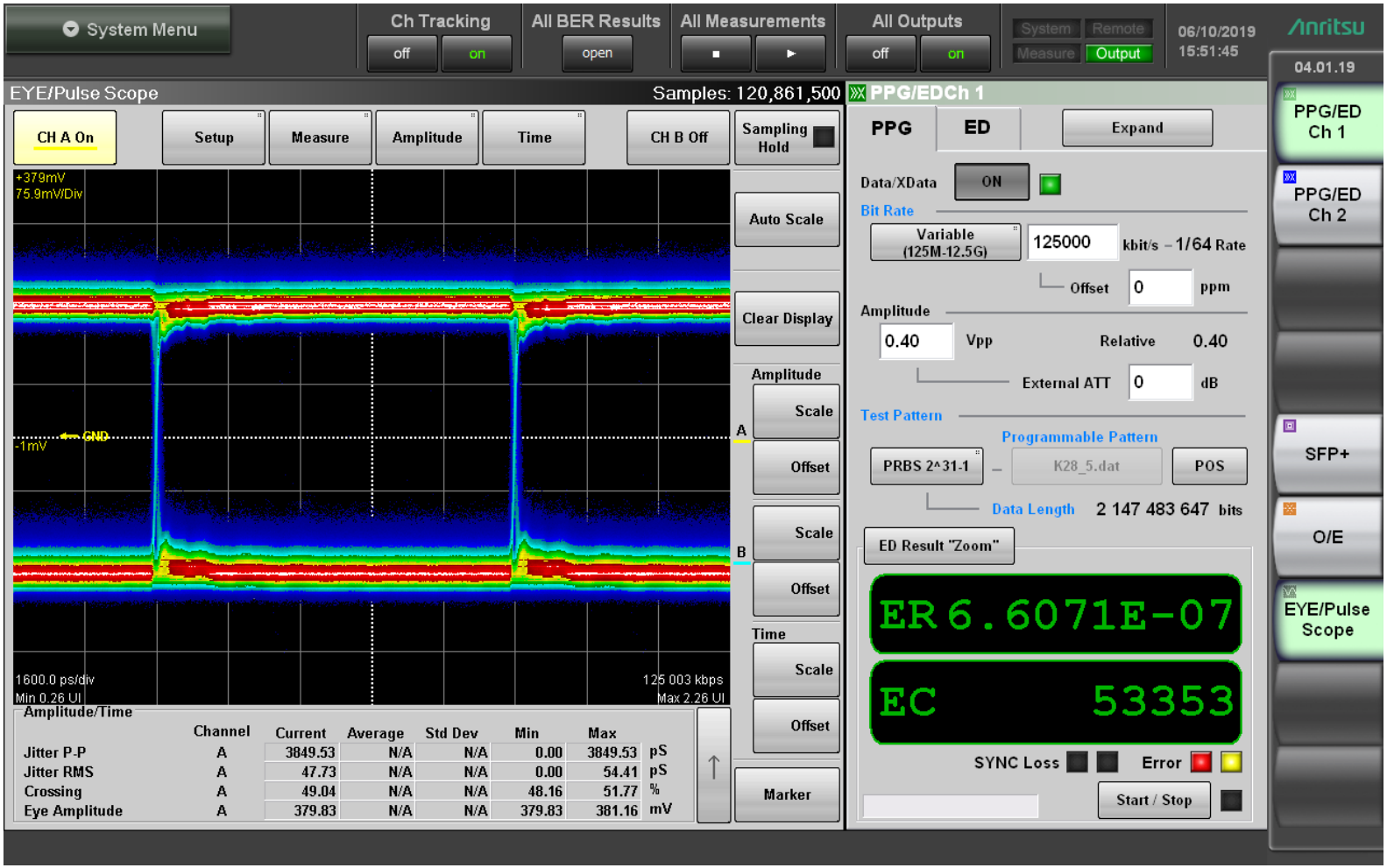
100°C

Bit Error Rate Summary (100°C)

Data Rate	Attenuation	BER (1 error injected manually)
125 Mbps	No	1.23E-11
125 Mbps	Yes	1.38E-08
500 Mbps	No	3.16E-12
500 Mbps	Yes	1.25E-11
1.25 Gbps	No	1.30E-12
1.25 Gbps	Yes	6.44E-13
4.25 Gbps	No	3.68E-13
4.25 Gbps	Yes	3.90E-11
6.00 Gbps	No	3.44E-03
6.00 Gbps	Yes	3.03E-03

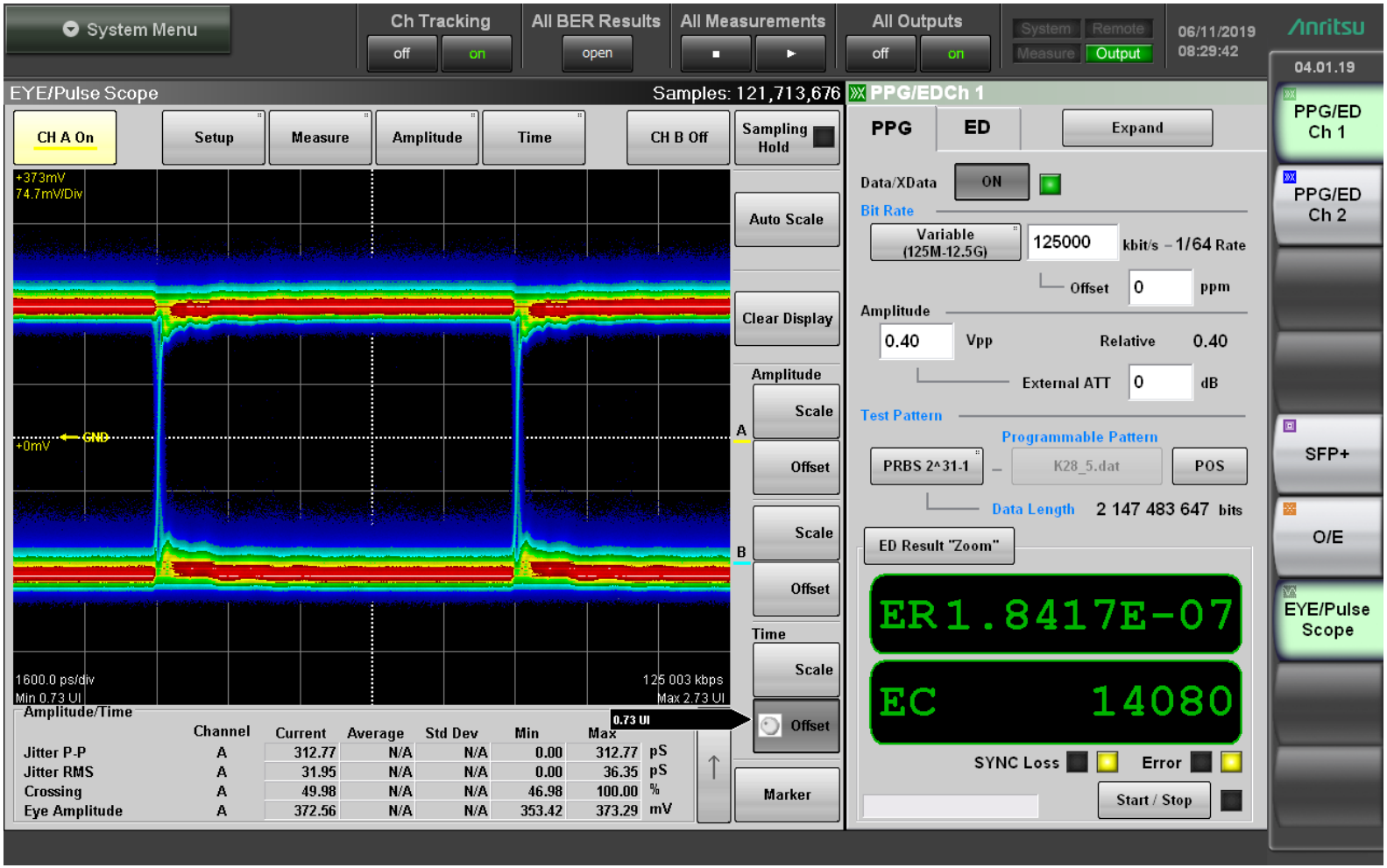
CF-170300-034/035 Components are Rated from 155.00Mbps to 4.25Gbps but have Reasonable BER at up to 6Gbps

125 Mbps No Attenuation



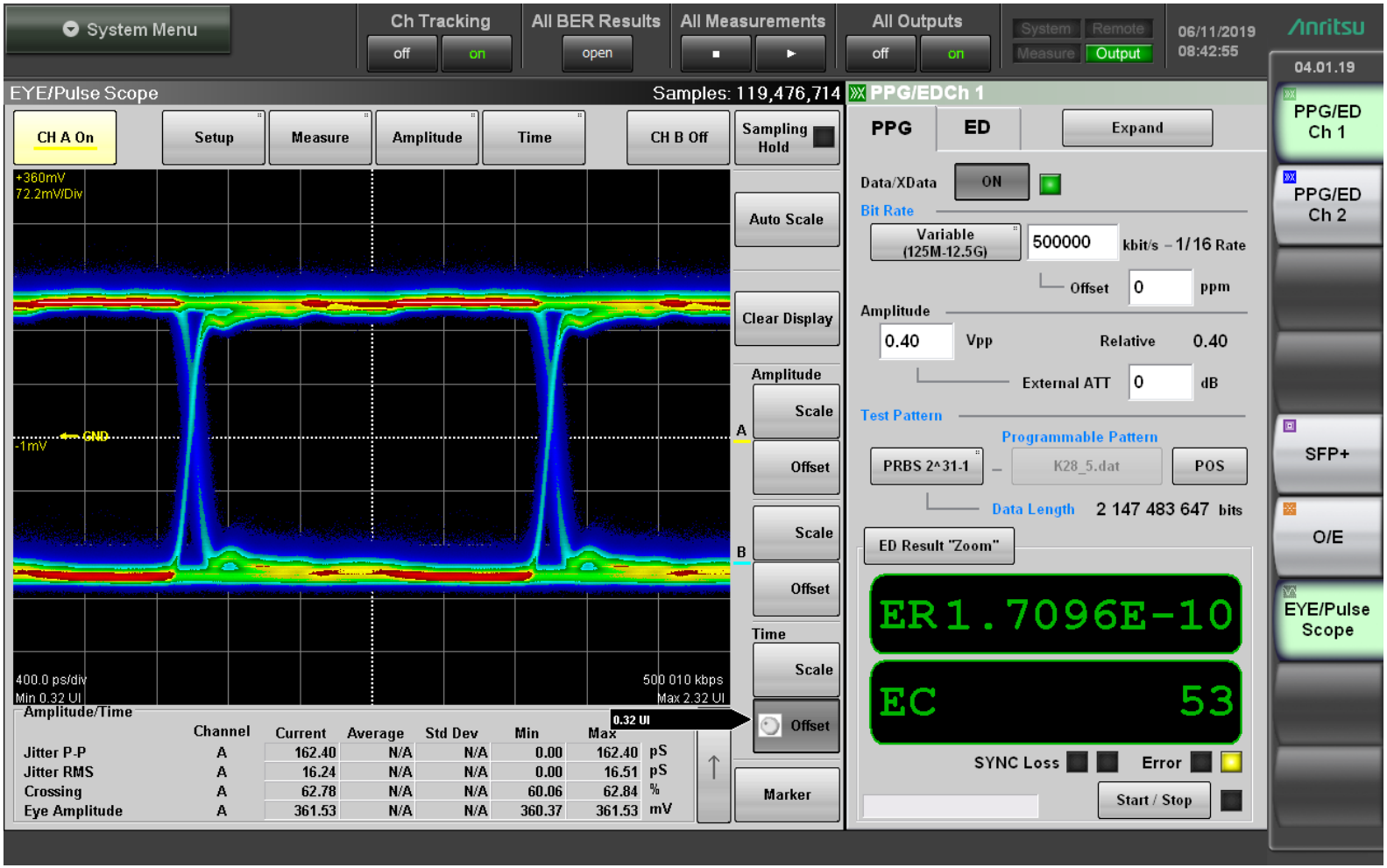
85°C

125 Mbps with Optical Attenuation



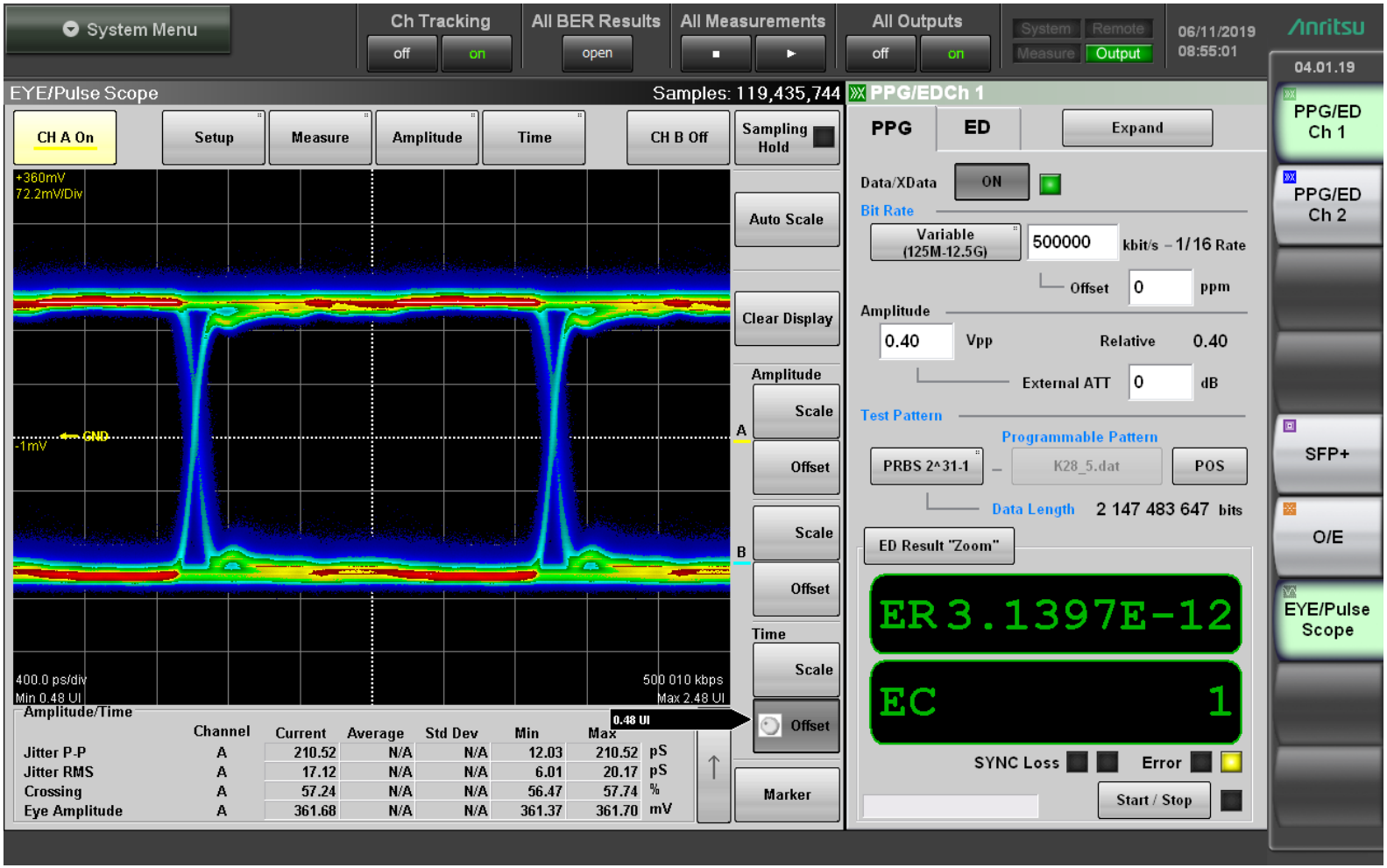
85°C

500 Mbps No Attenuation



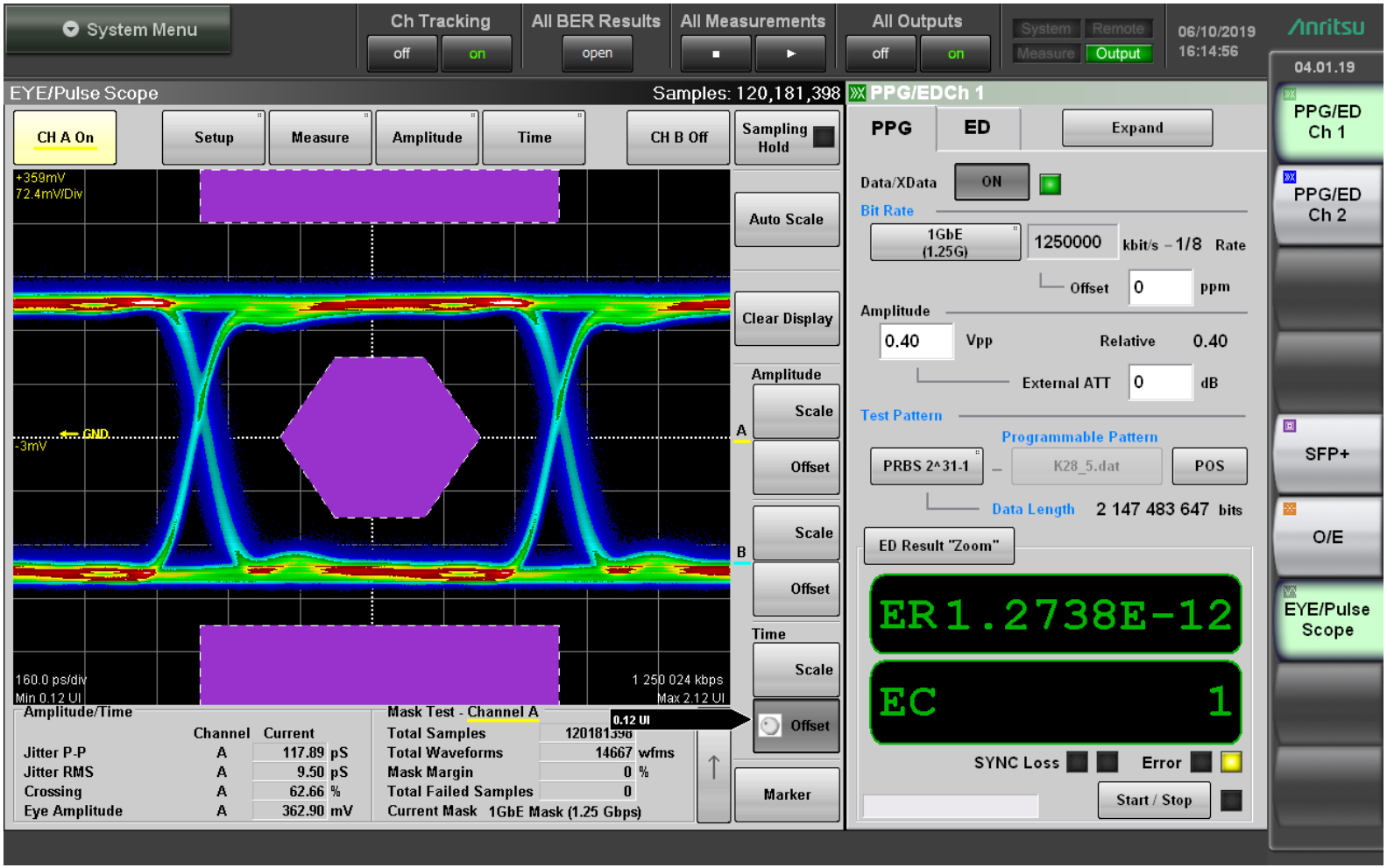
85°C

500 Mbps with Optical Attenuation



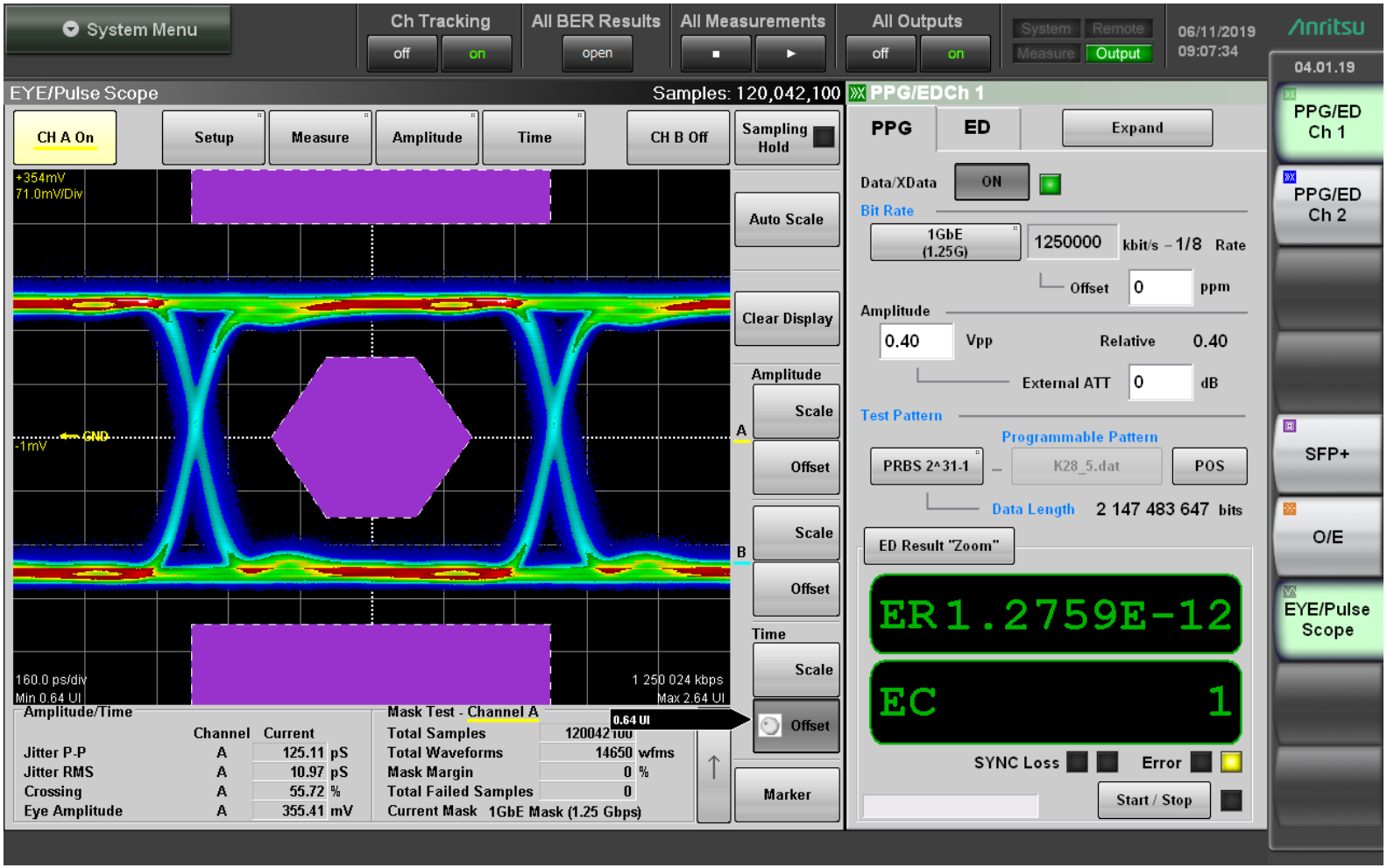
85°C

1.25 Gbps No Attenuation



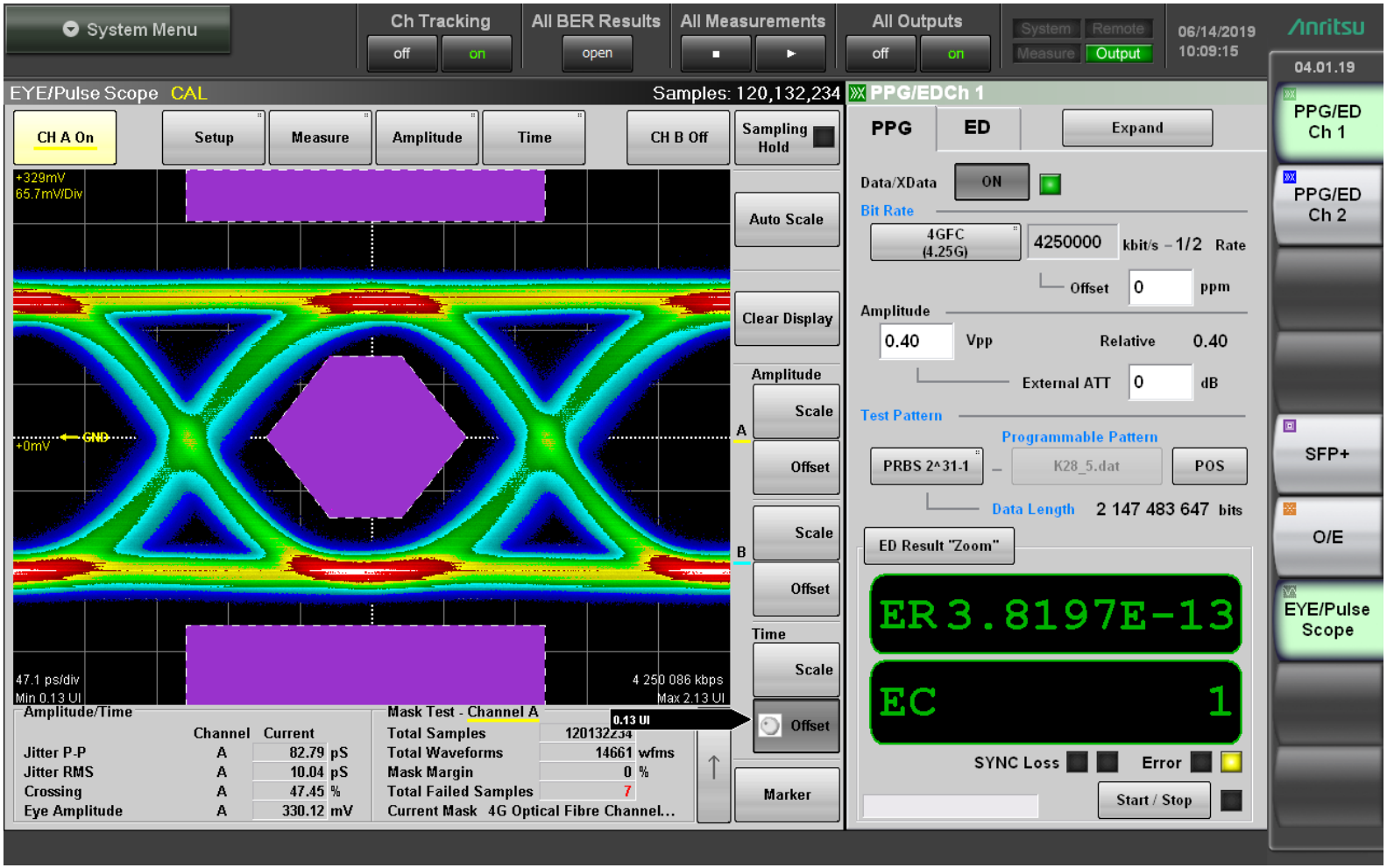
85°C

1.25 Gbps with Optical Attenuation



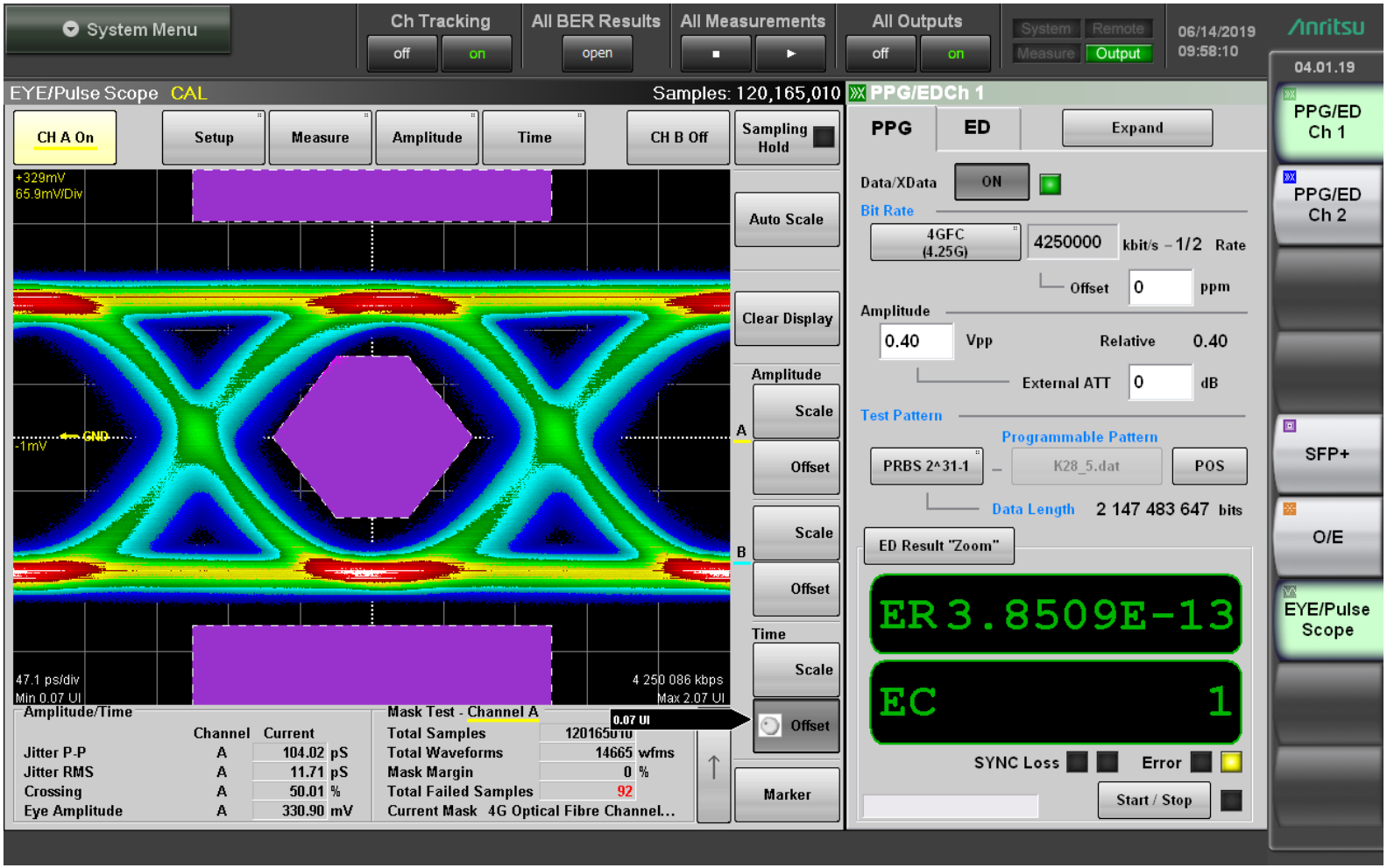
85°C

4.25 Gbps No Attenuation



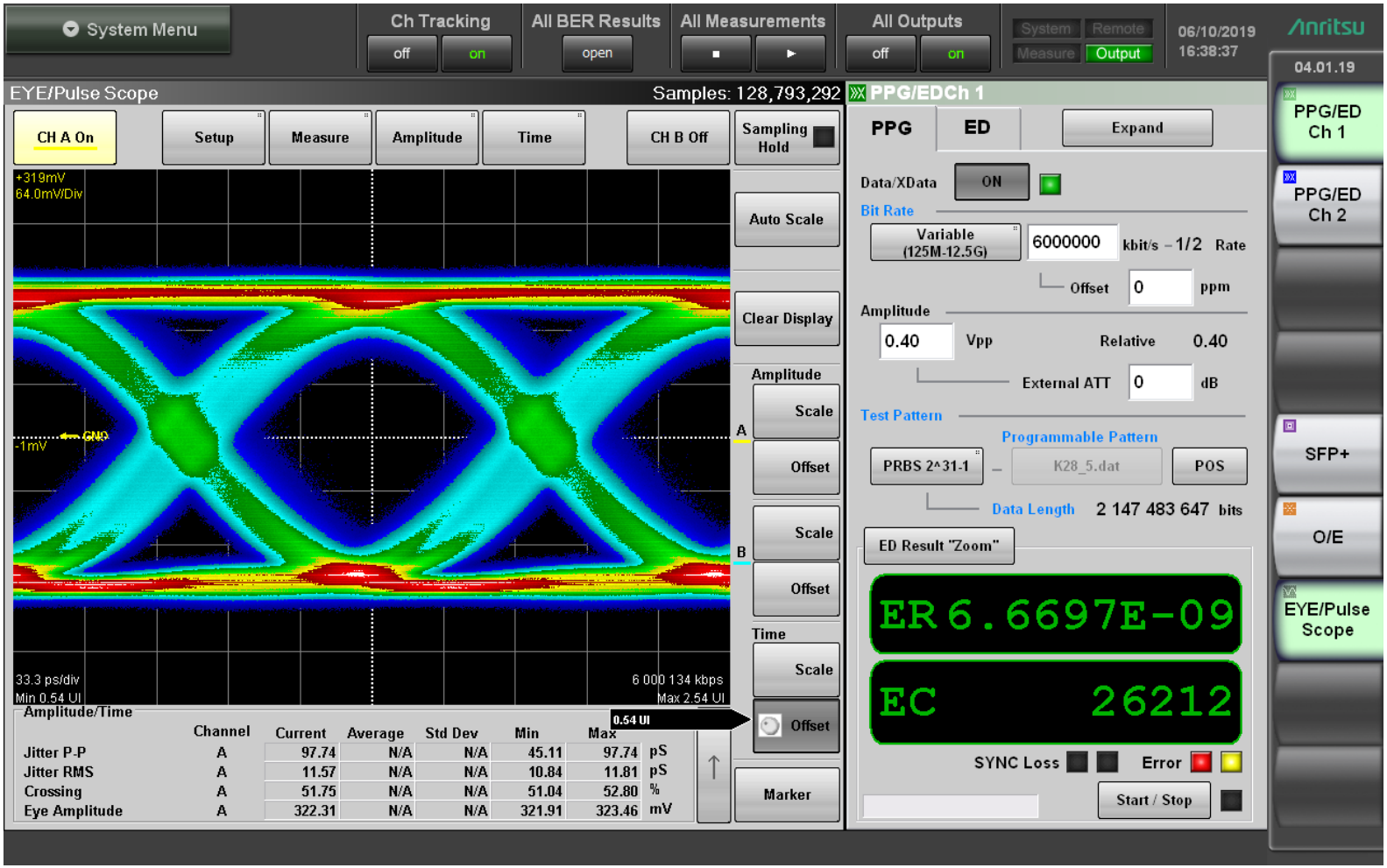
85°C

4.25 Gbps with Optical Attenuation



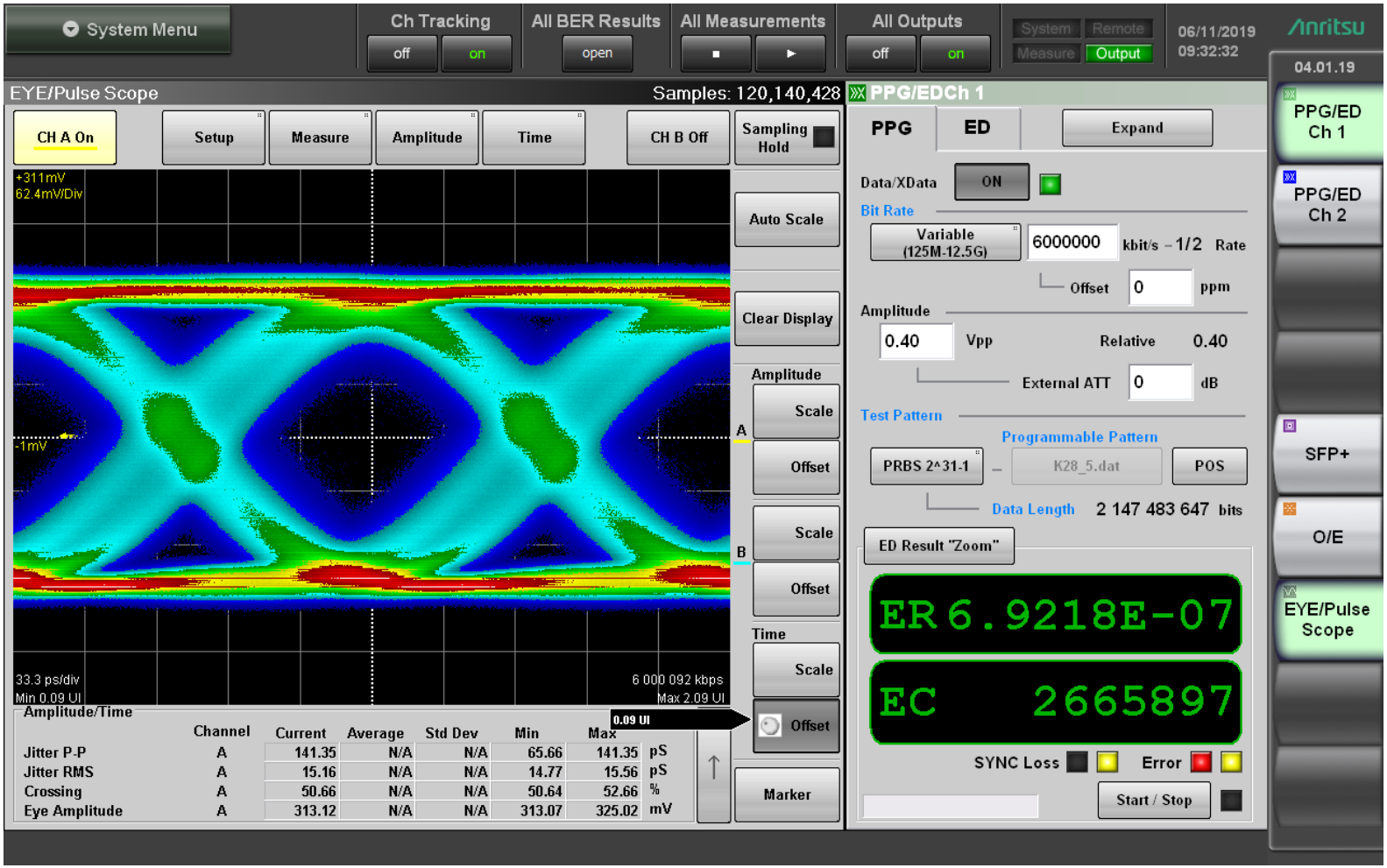
85°C

6 Gbps No Attenuation



85°C

6 Gbps with Optical Attenuation



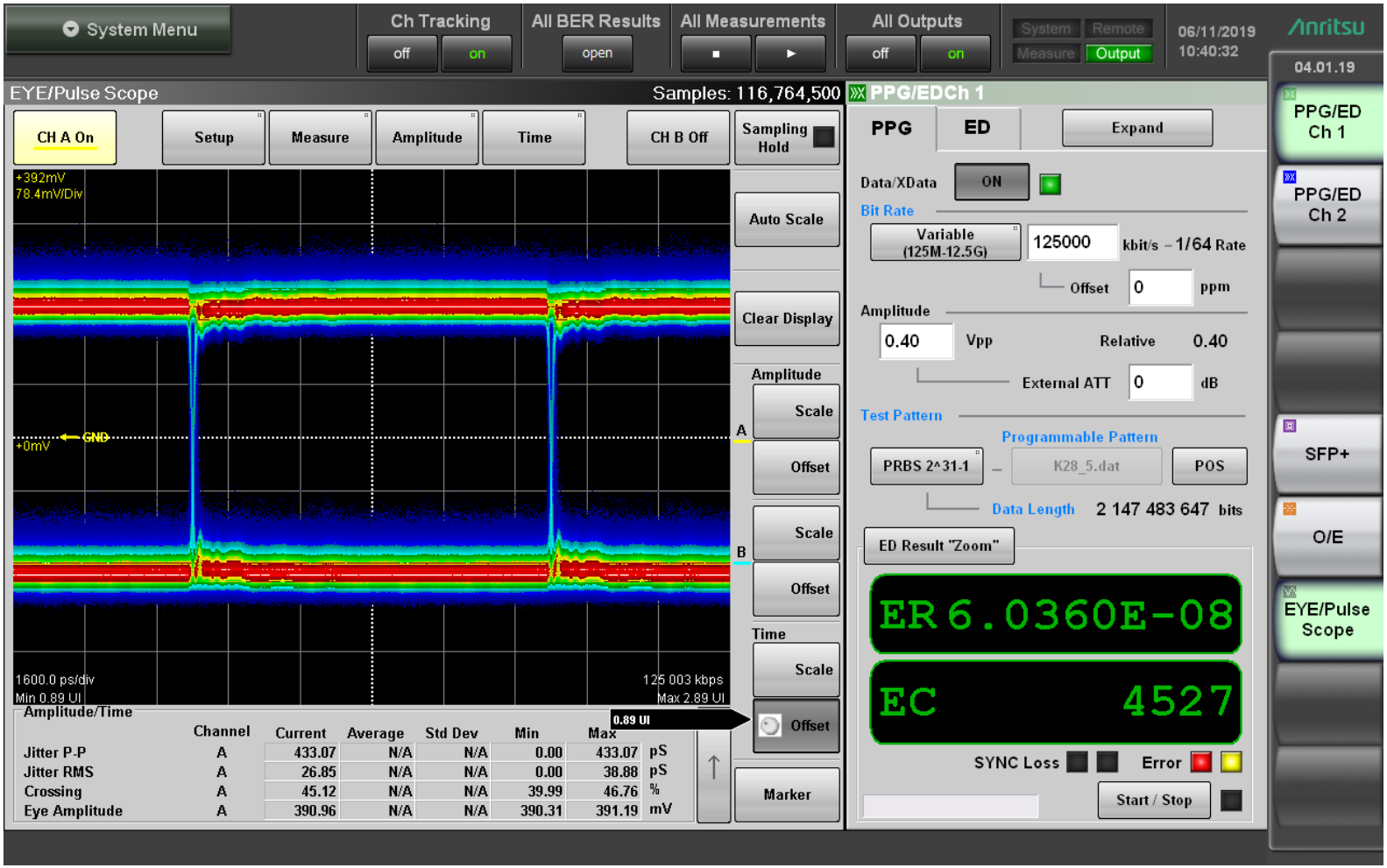
85°C

Bit Error Rate Summary (85°C)

Data Rate	Attenuation	BER (1 error injected manually)
125 Mbps	No	6.61E-07
125 Mbps	Yes	1.84E-07
500 Mbps	No	1.71E-10
500 Mbps	Yes	3.14E-12
1.25 Gbps	No	1.27E-12
1.25 Gbps	Yes	1.28E-12
4.25 Gbps	No	3.82E-13
4.25 Gbps	Yes	3.85E-13
6.00 Gbps	No	6.67E-07
6.00 Gbps	Yes	6.92E-09

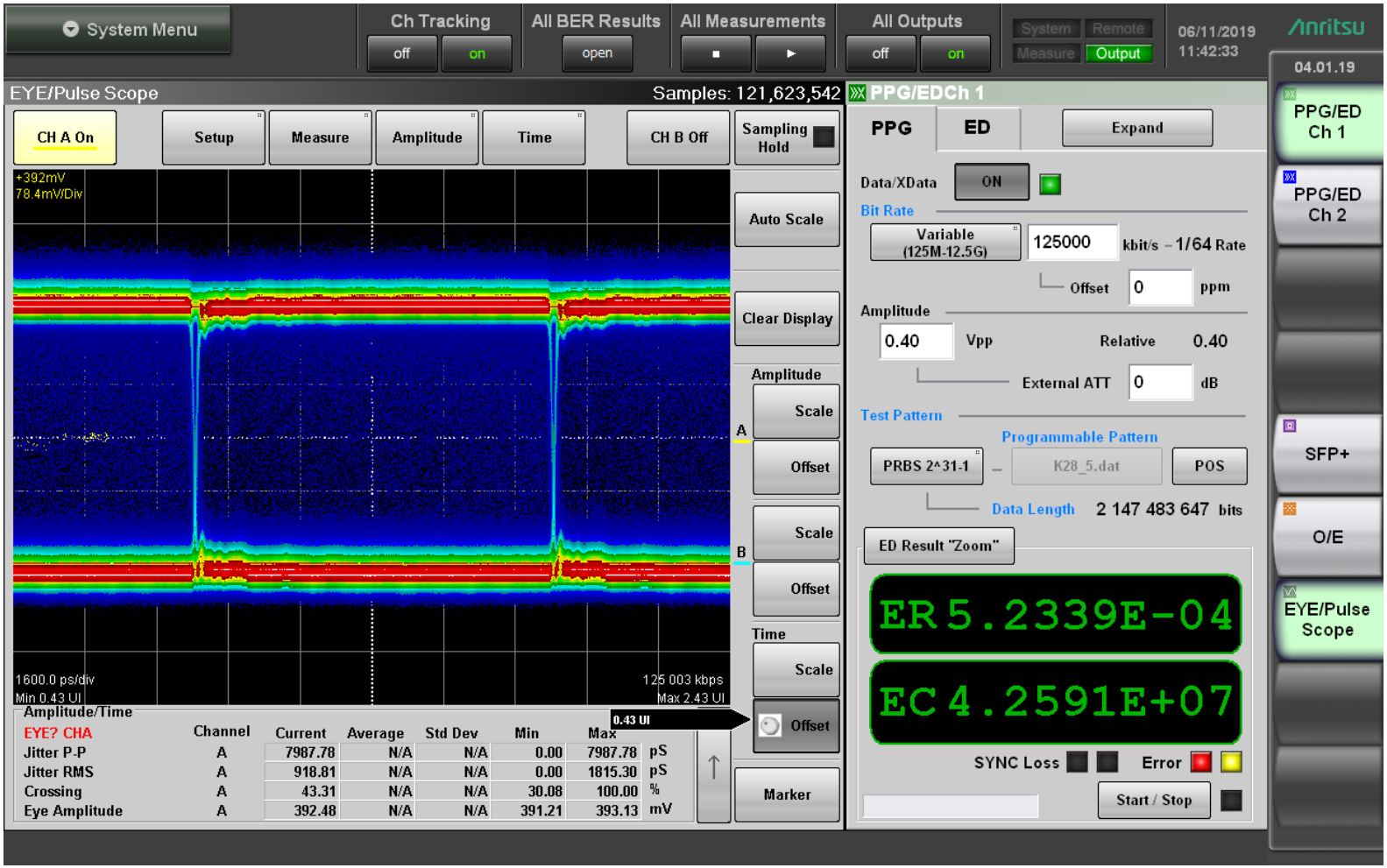
CF-170300-034/035 Components are Rated from 155.00Mbps to 4.25Gbps but have Reasonable BER at up to 6Gbps

125 Mbps No Attenuation



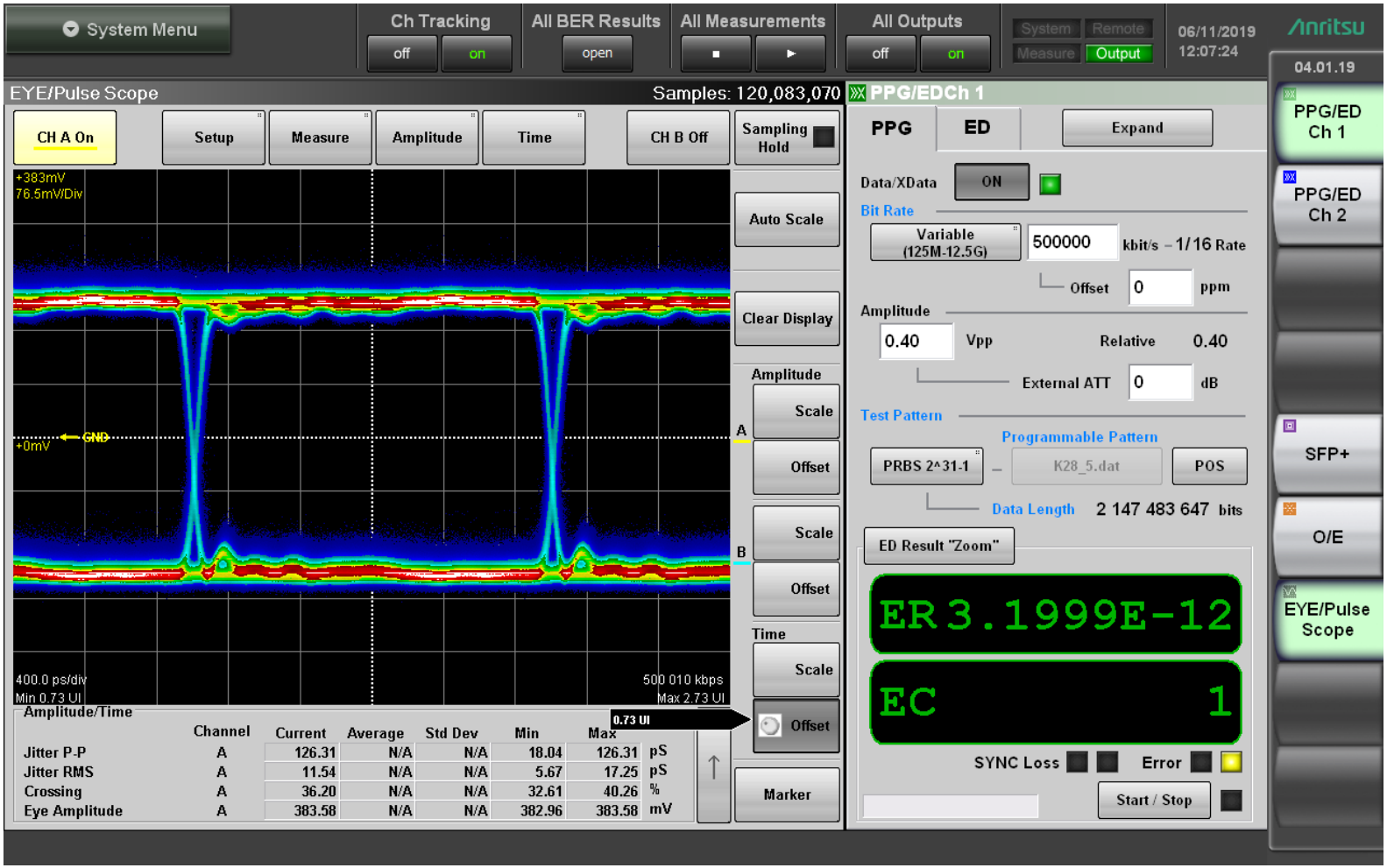
-40°C

125 Mbps with Optical Attenuation



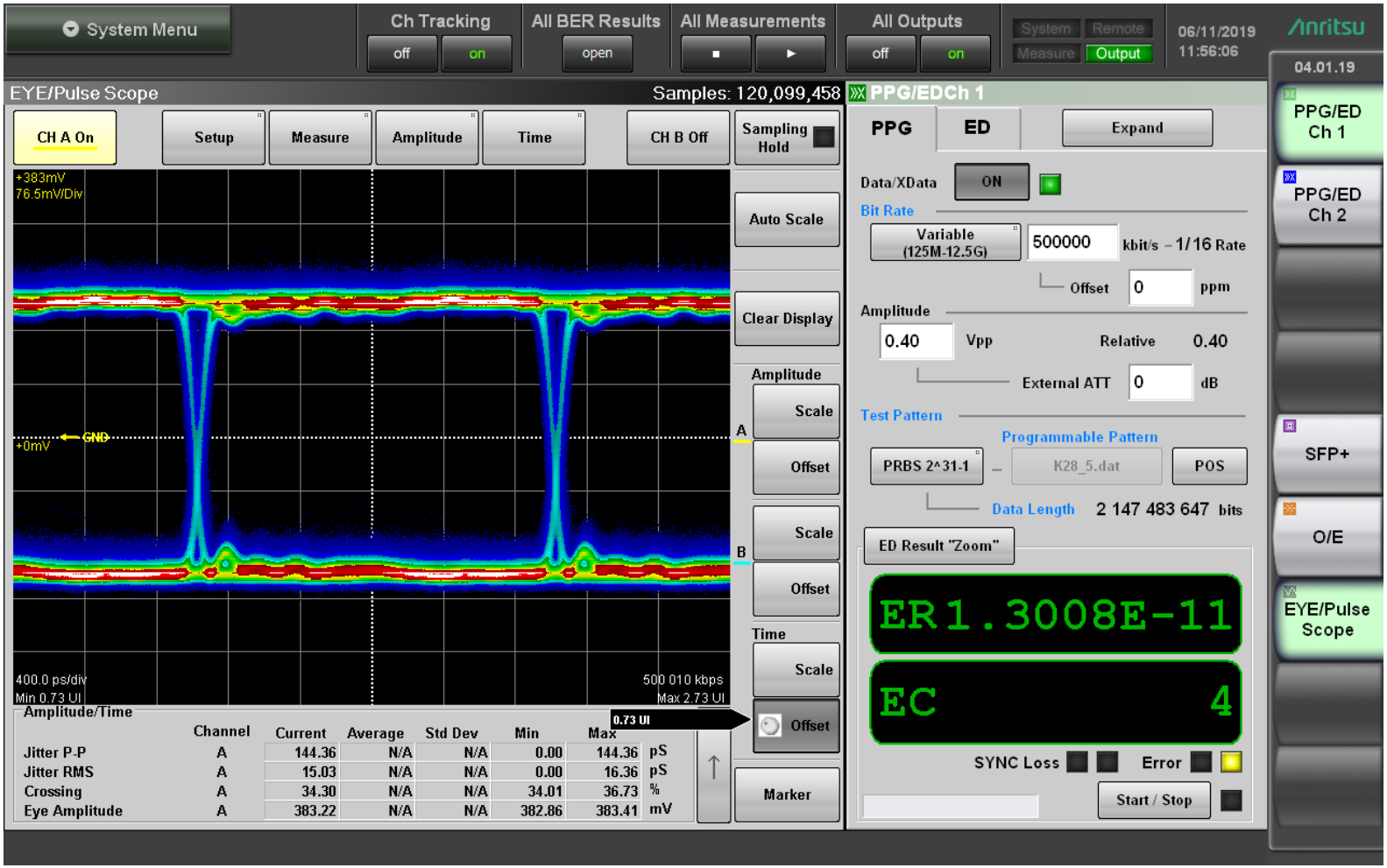
-40°C

500 Mbps No Attenuation



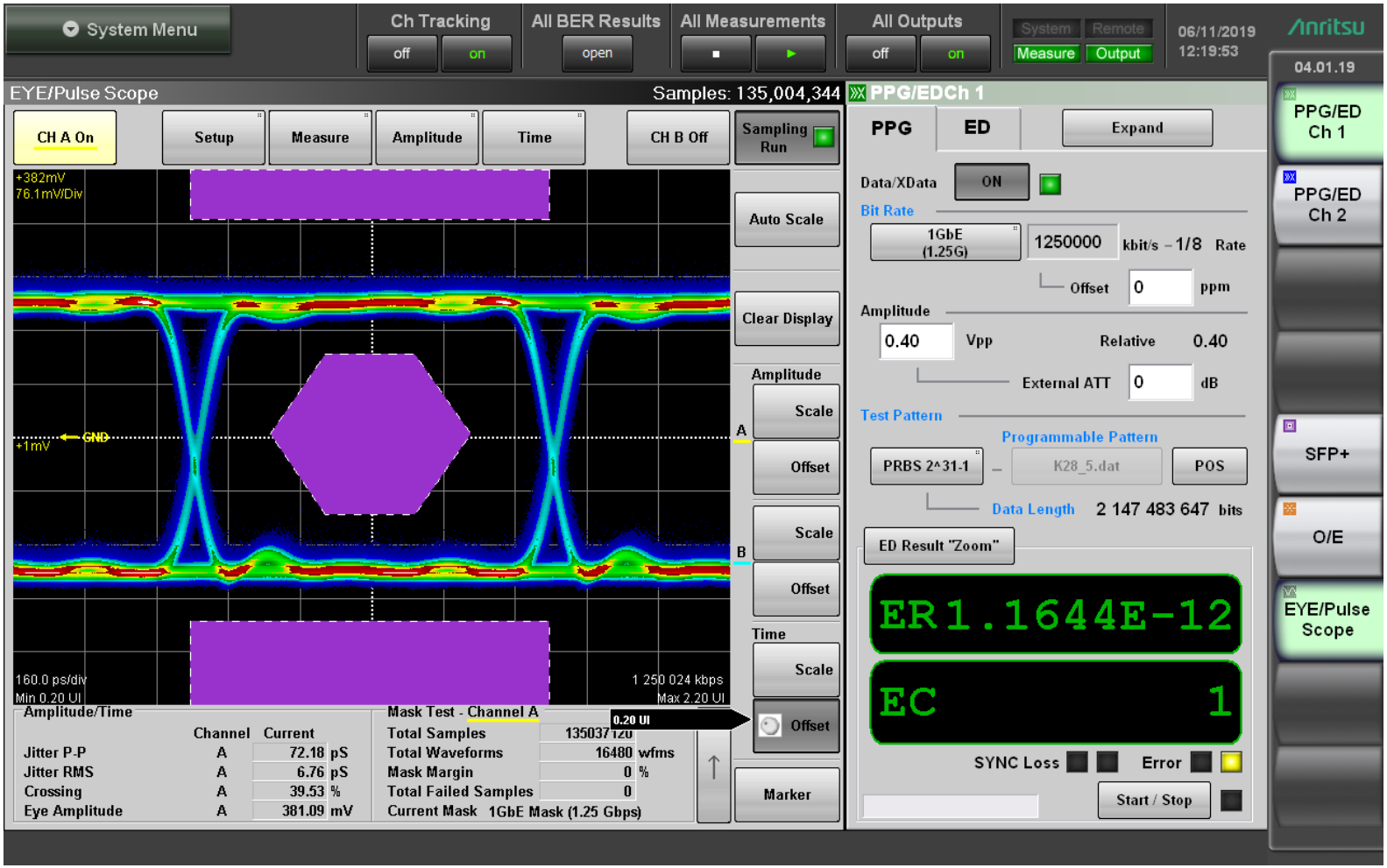
-40°C

500 Mbps with Optical Attenuation



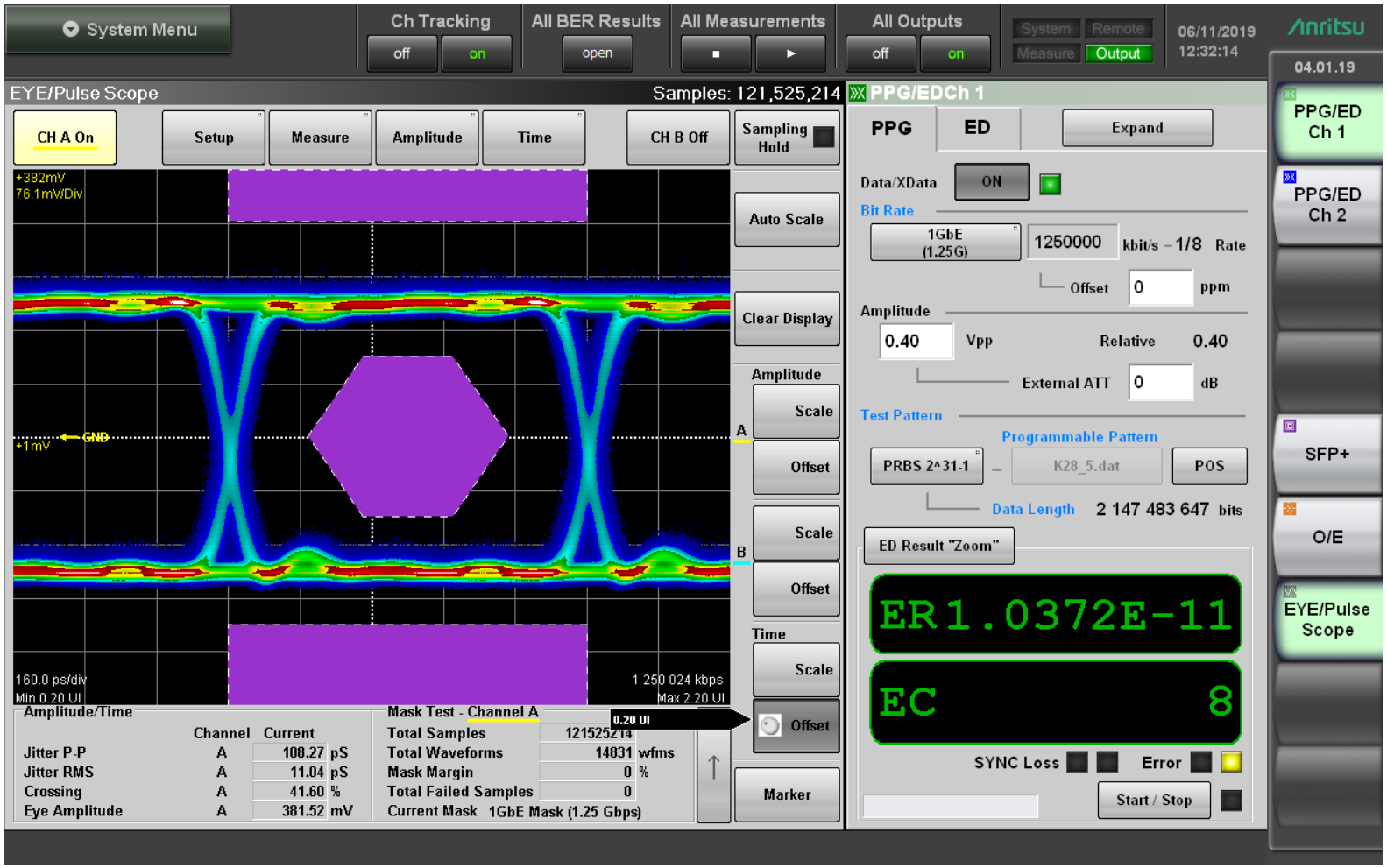
-40°C

1.25 Gbps No Attenuation



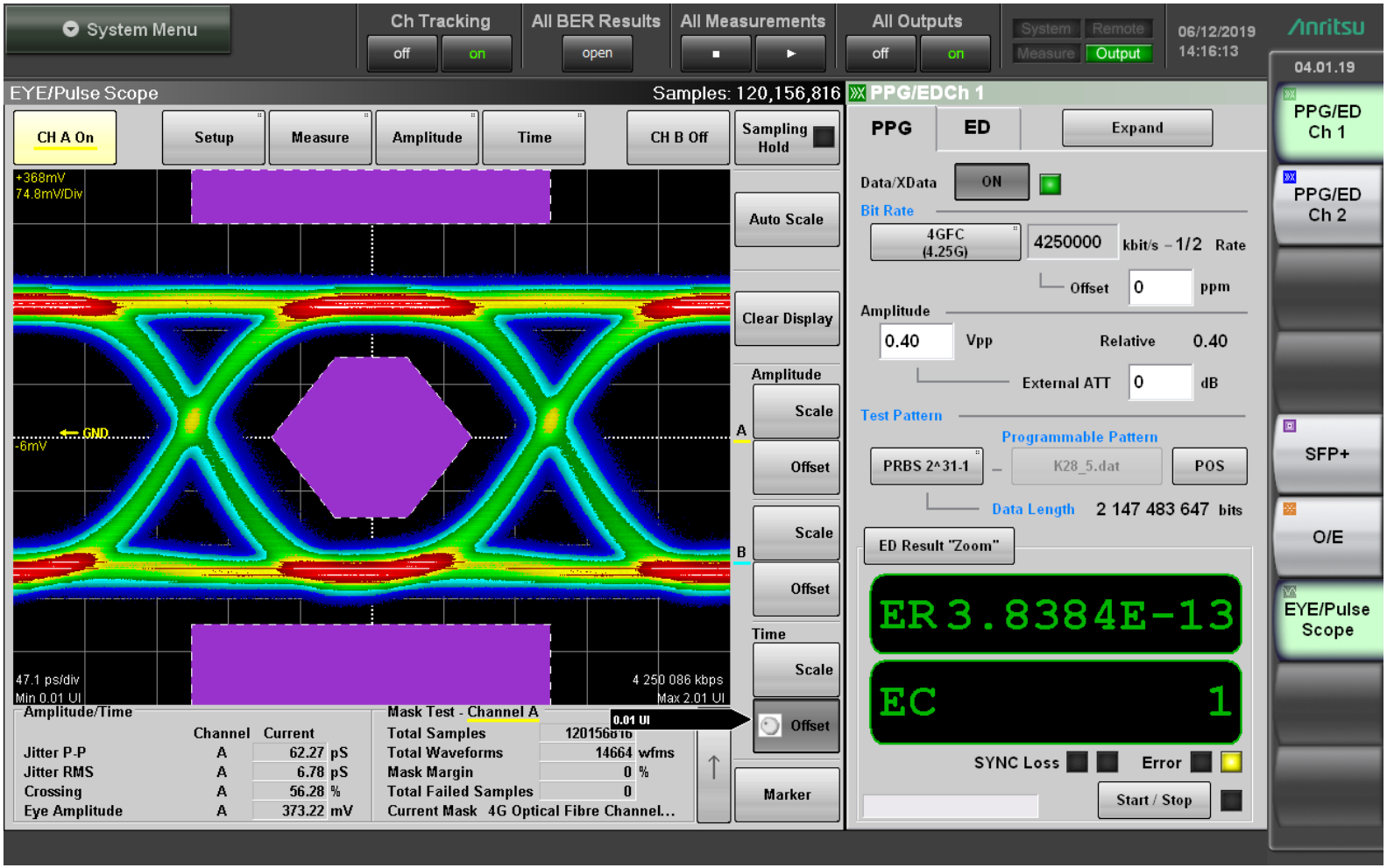
-40°C

1.25 Gbps with Optical Attenuation



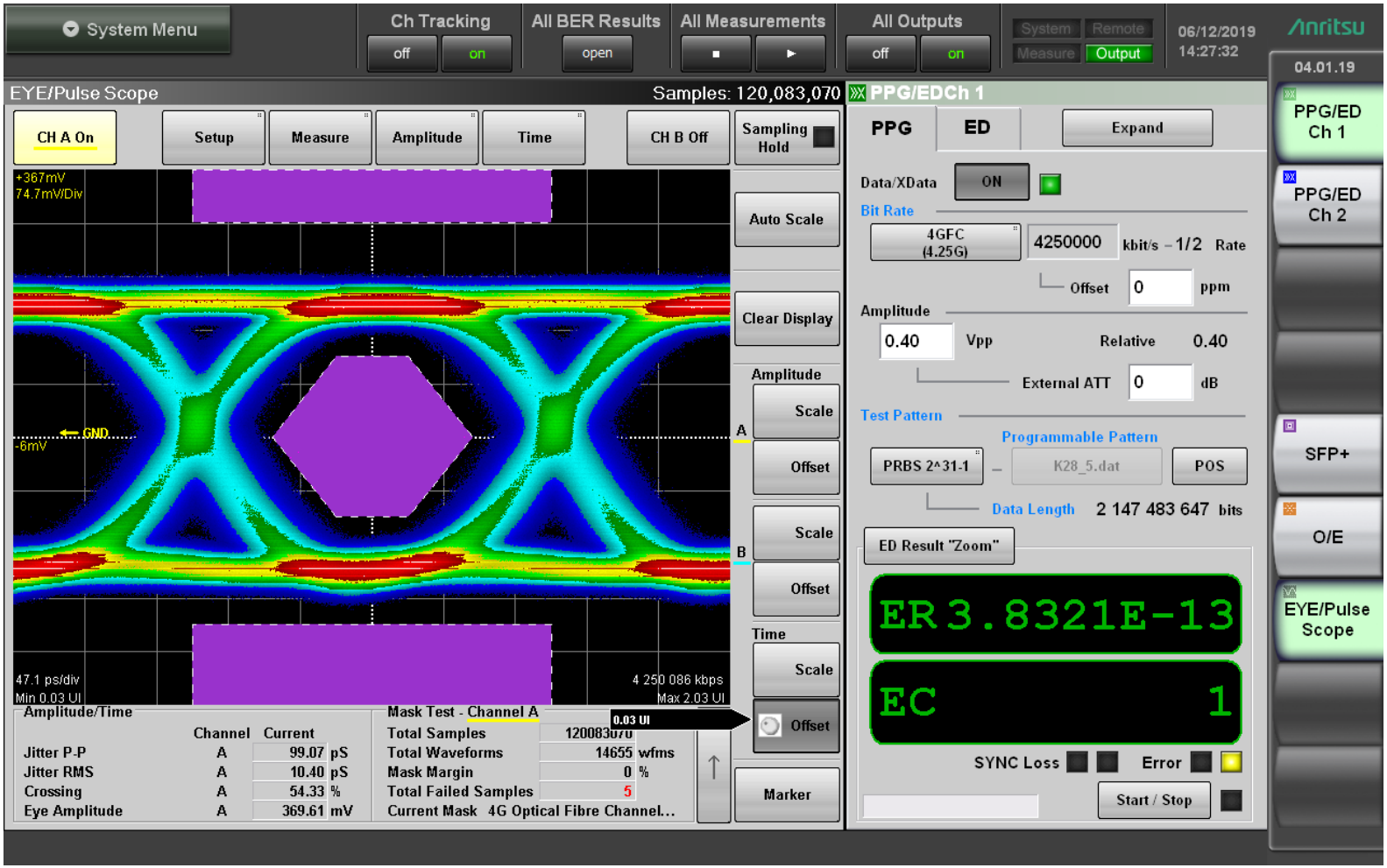
-40°C

4.25 Gbps No Attenuation



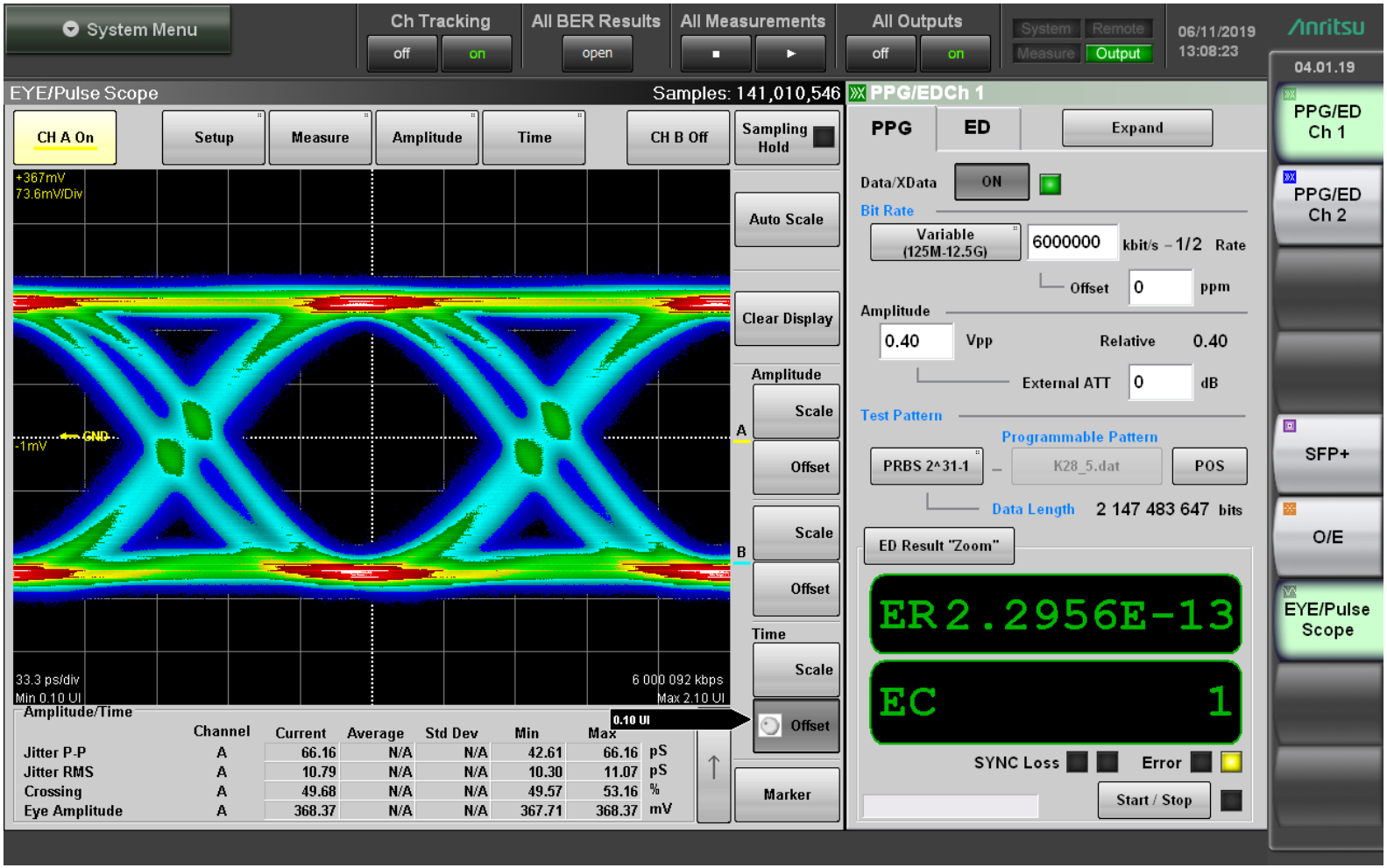
-40°C

4.25 Gbps with Optical Attenuation



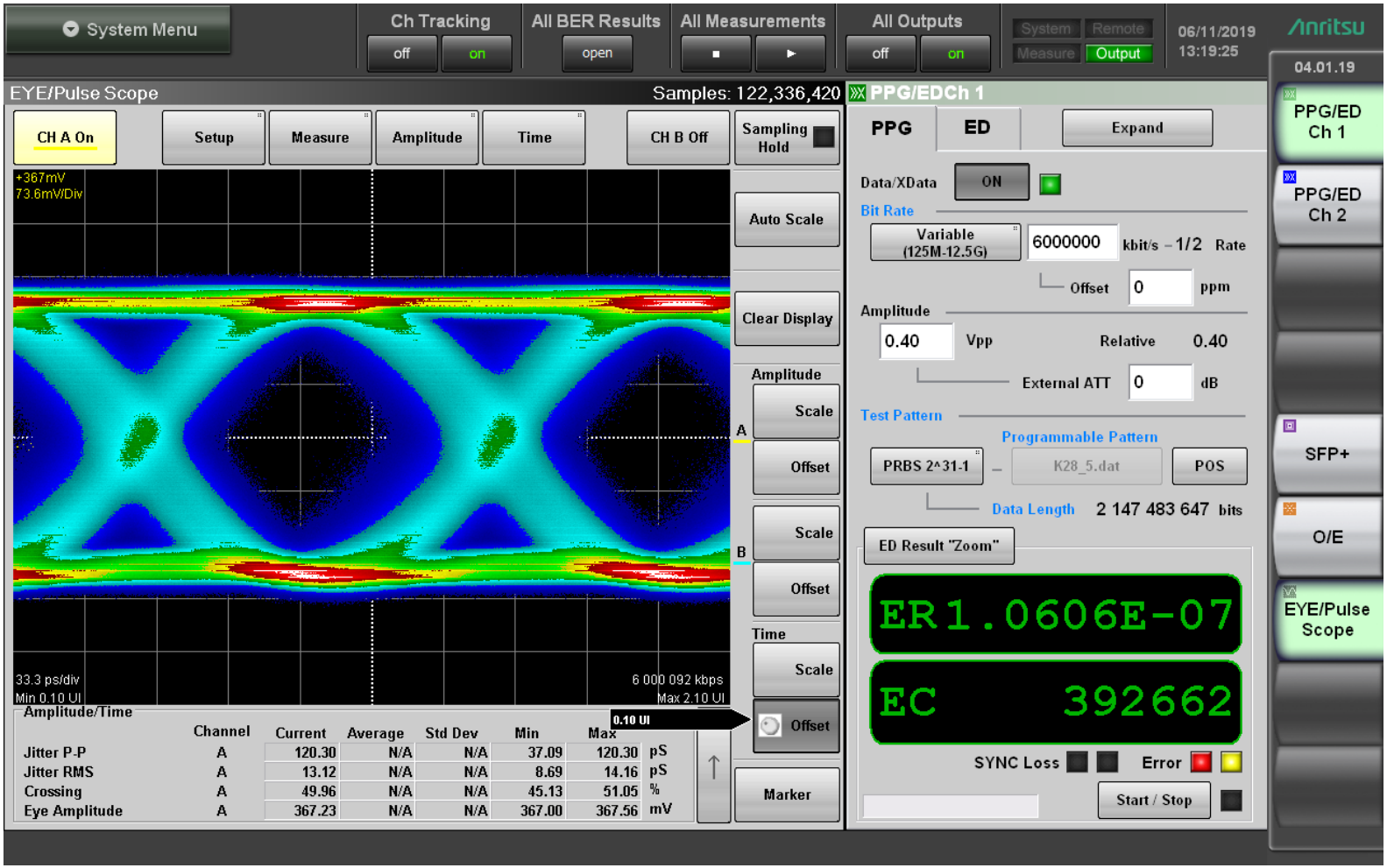
-40°C

6 Gbps No Attenuation



-40°C

6 Gbps with Optical Attenuation



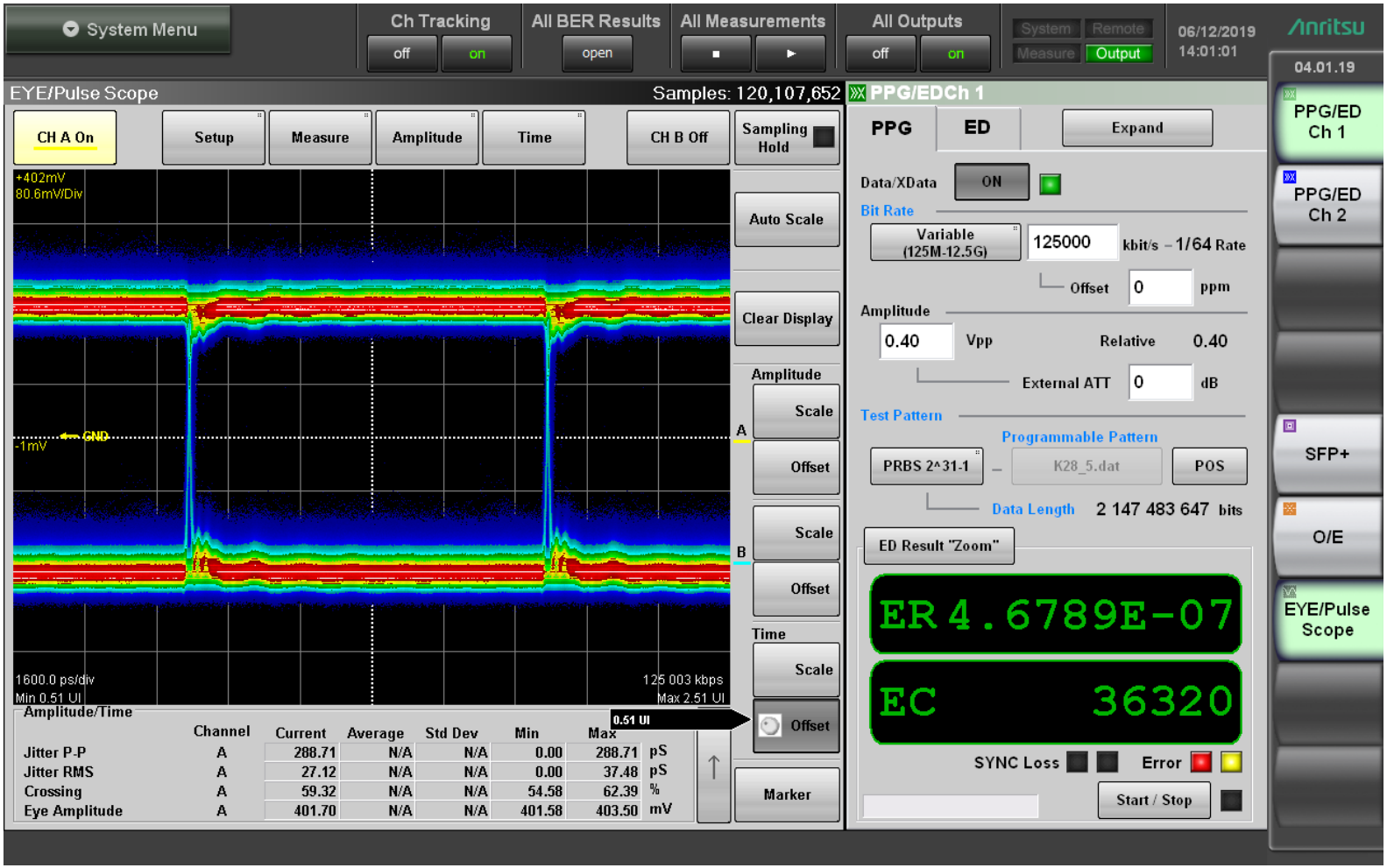
-40°C

Bit Error Rate Summary (-40°C)

Data Rate	Attenuation	BER (1 error injected manually)
125 Mbps	No	6.04E-08
125 Mbps	Yes	5.23E-04
500 Mbps	No	3.20E-12
500 Mbps	Yes	1.30E-11
1.25 Gbps	No	1.16E-12
1.25 Gbps	Yes	1.04E-11
4.25 Gbps	No	3.84E-13
4.25 Gbps	Yes	5.89E-12
6.00 Gbps	No	2.30E-13
6.00 Gbps	Yes	1.06E-07

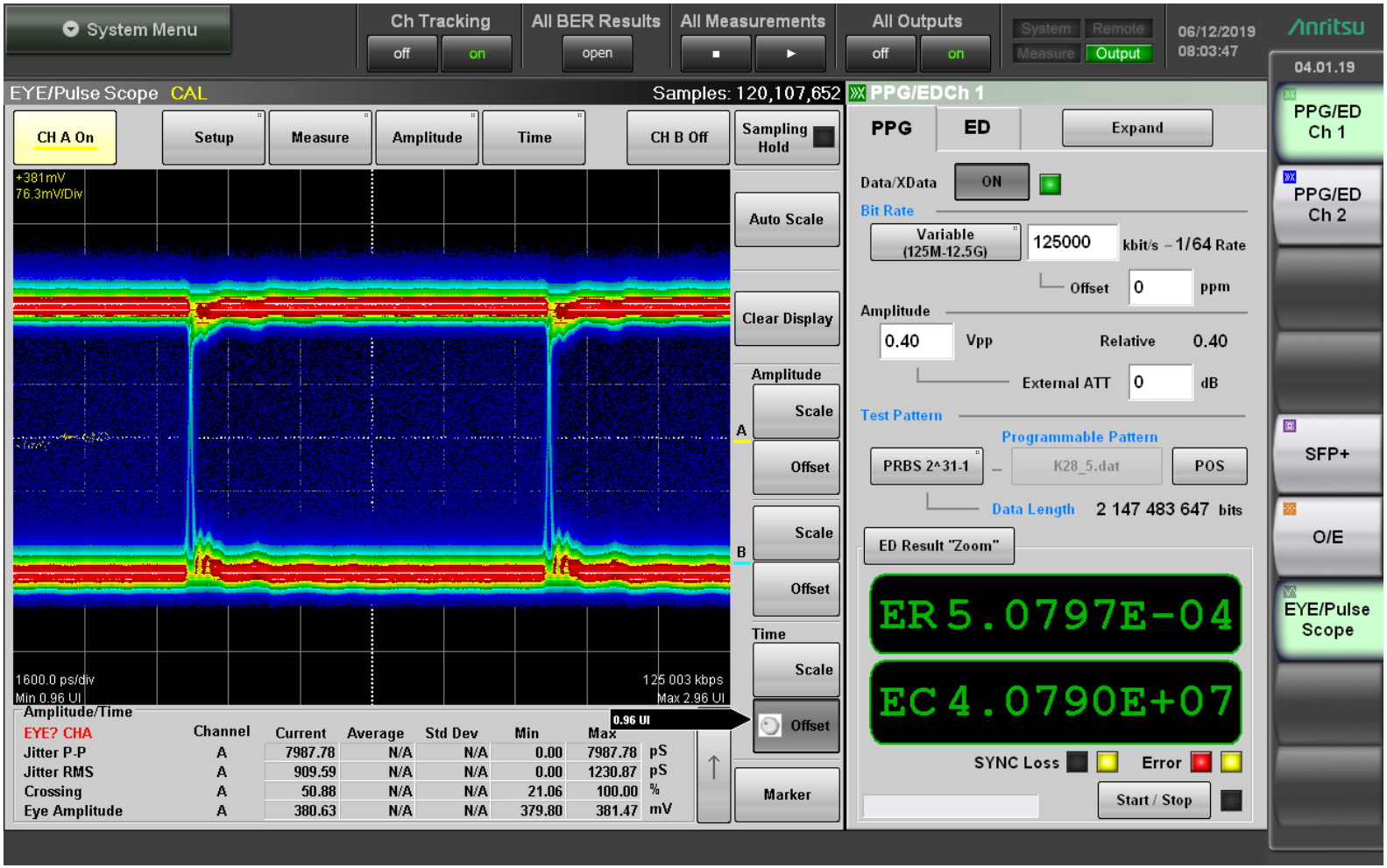
CF-170300-034/035 Components are Rated from 155.00Mbps to 4.25Gbps but have Reasonable BER at up to 6Gbps

125 Mbps No Attenuation



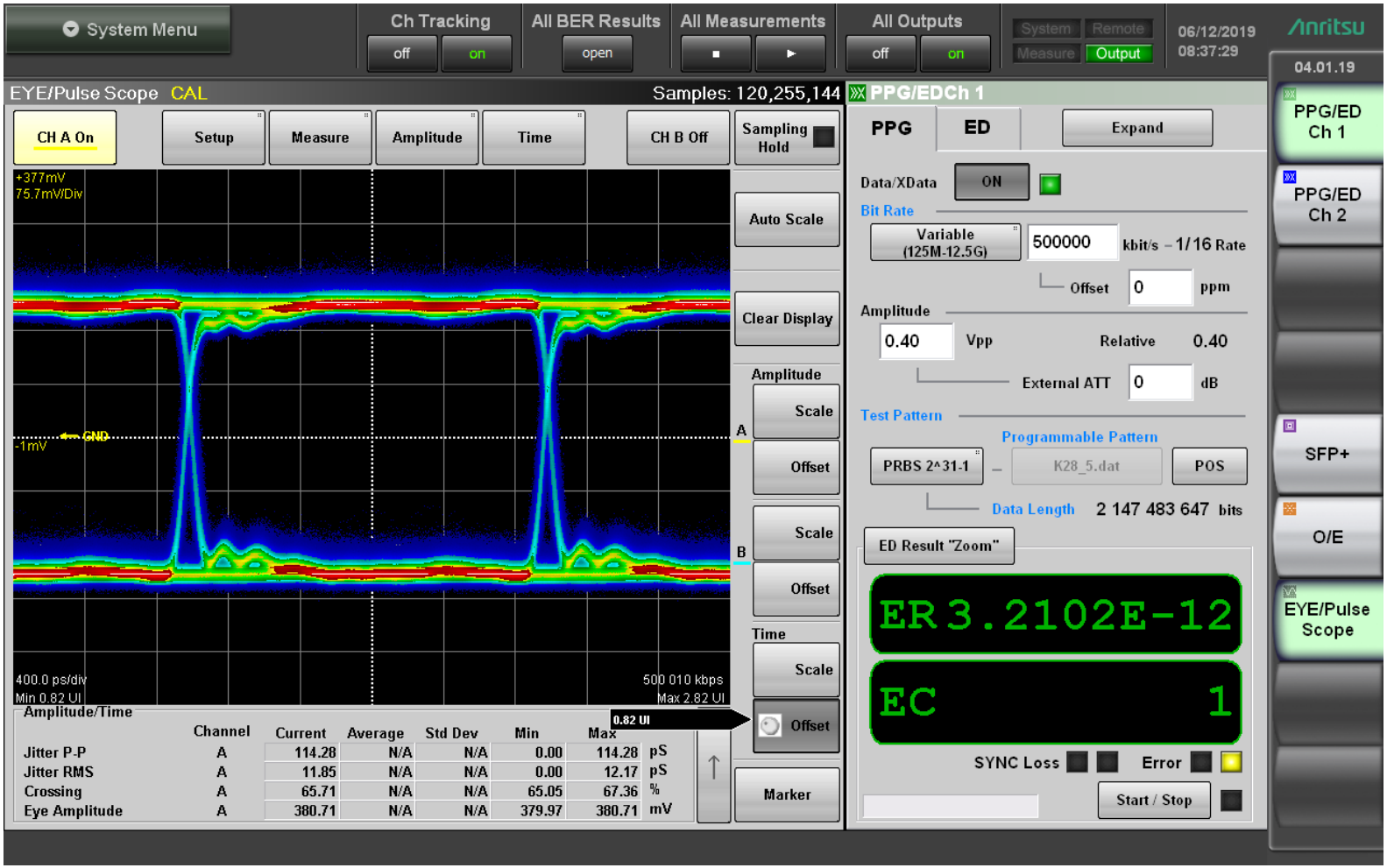
-55°C

125 Mbps with Optical Attenuation



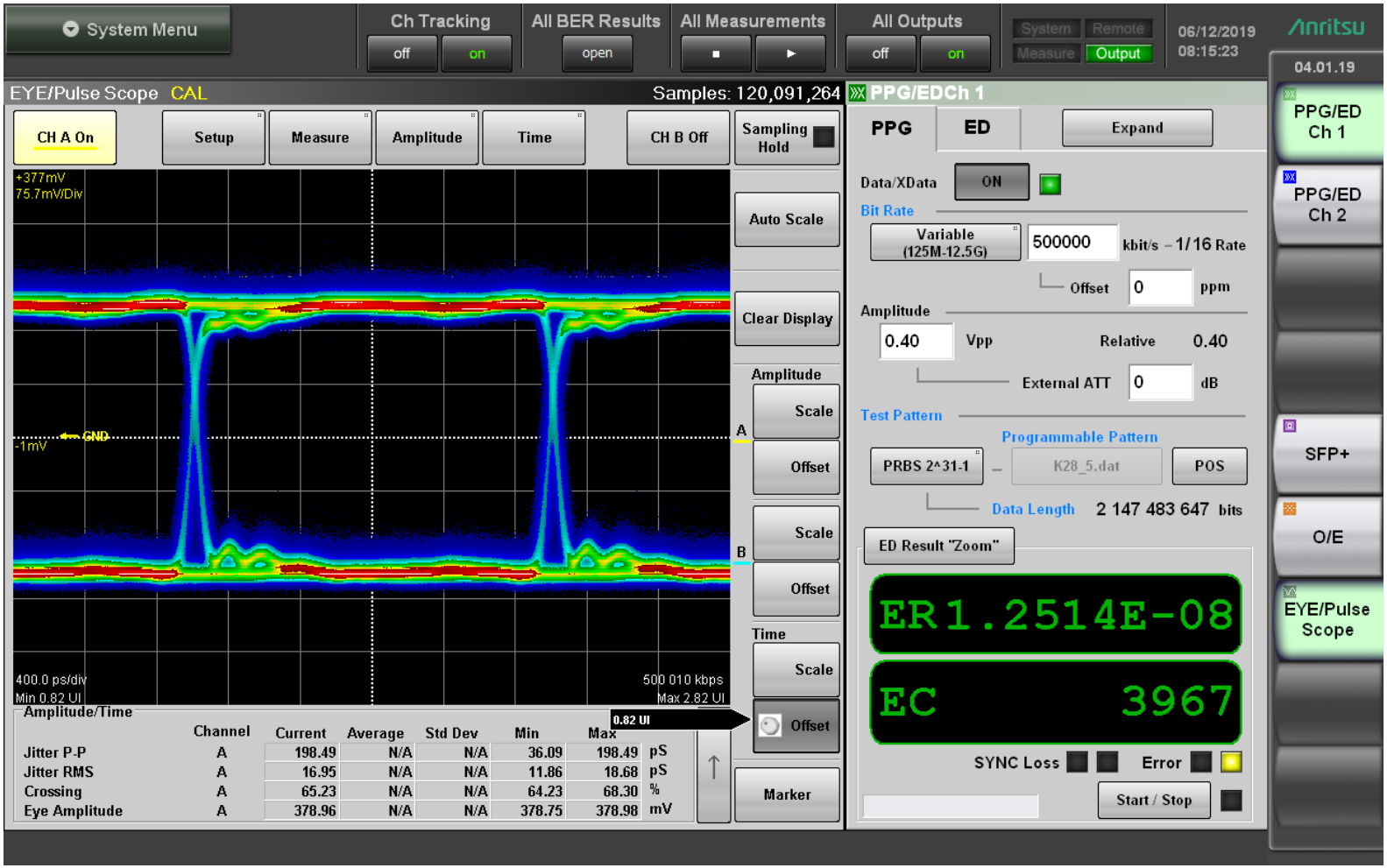
-55°C

500 Mbps No Attenuation



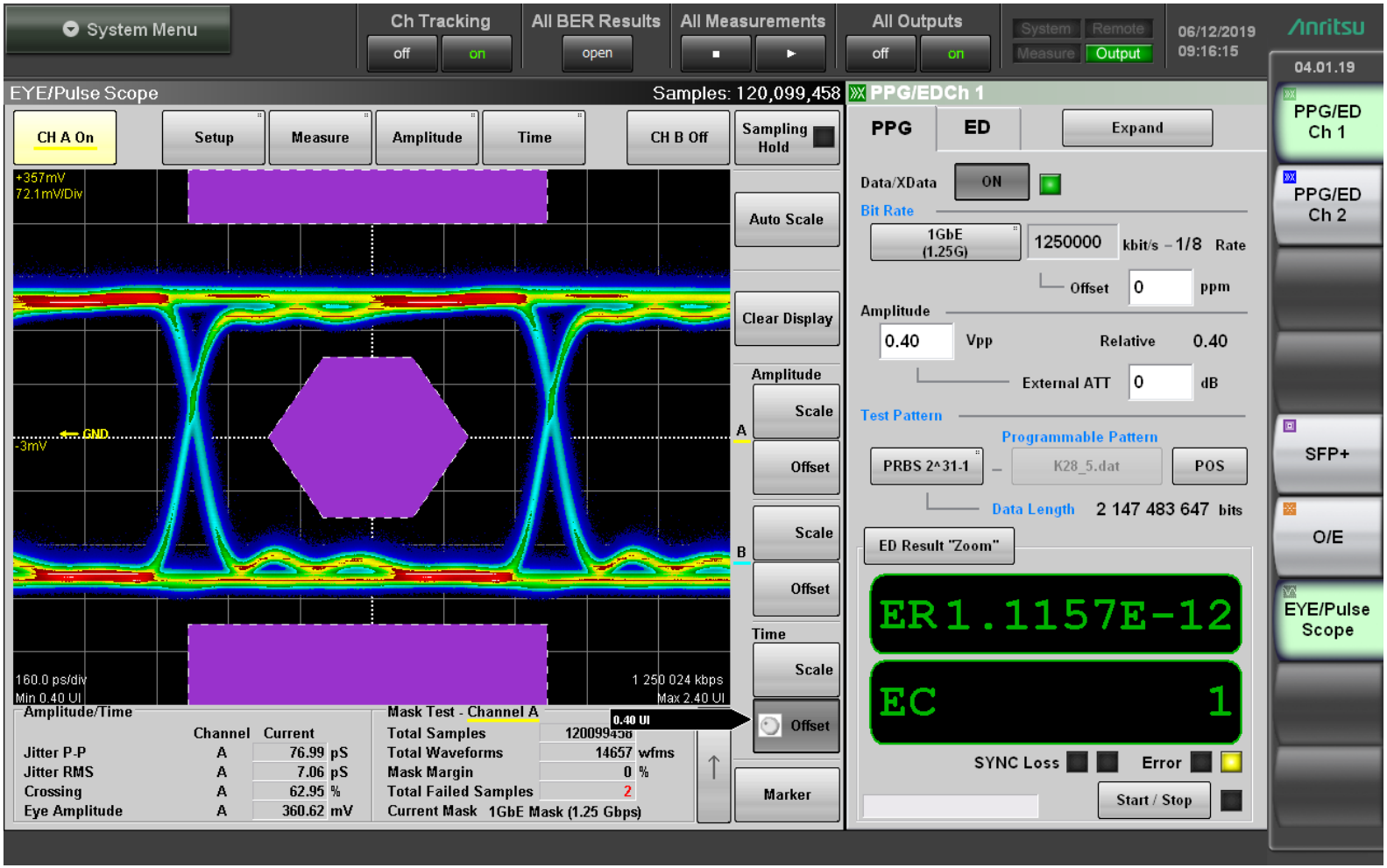
-55°C

500 Mbps with Optical Attenuation



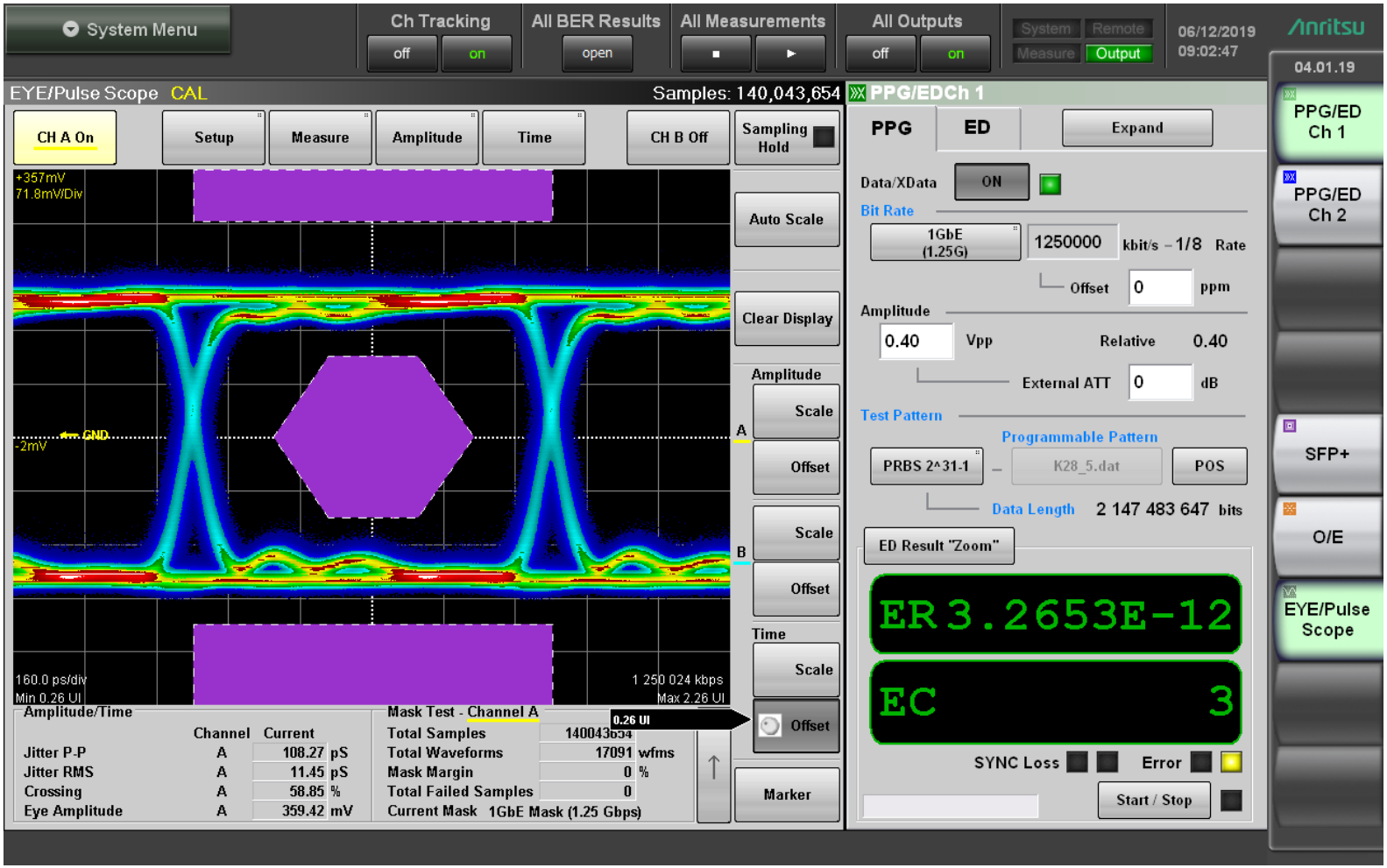
-55°C

1.25 Gbps No Attenuation



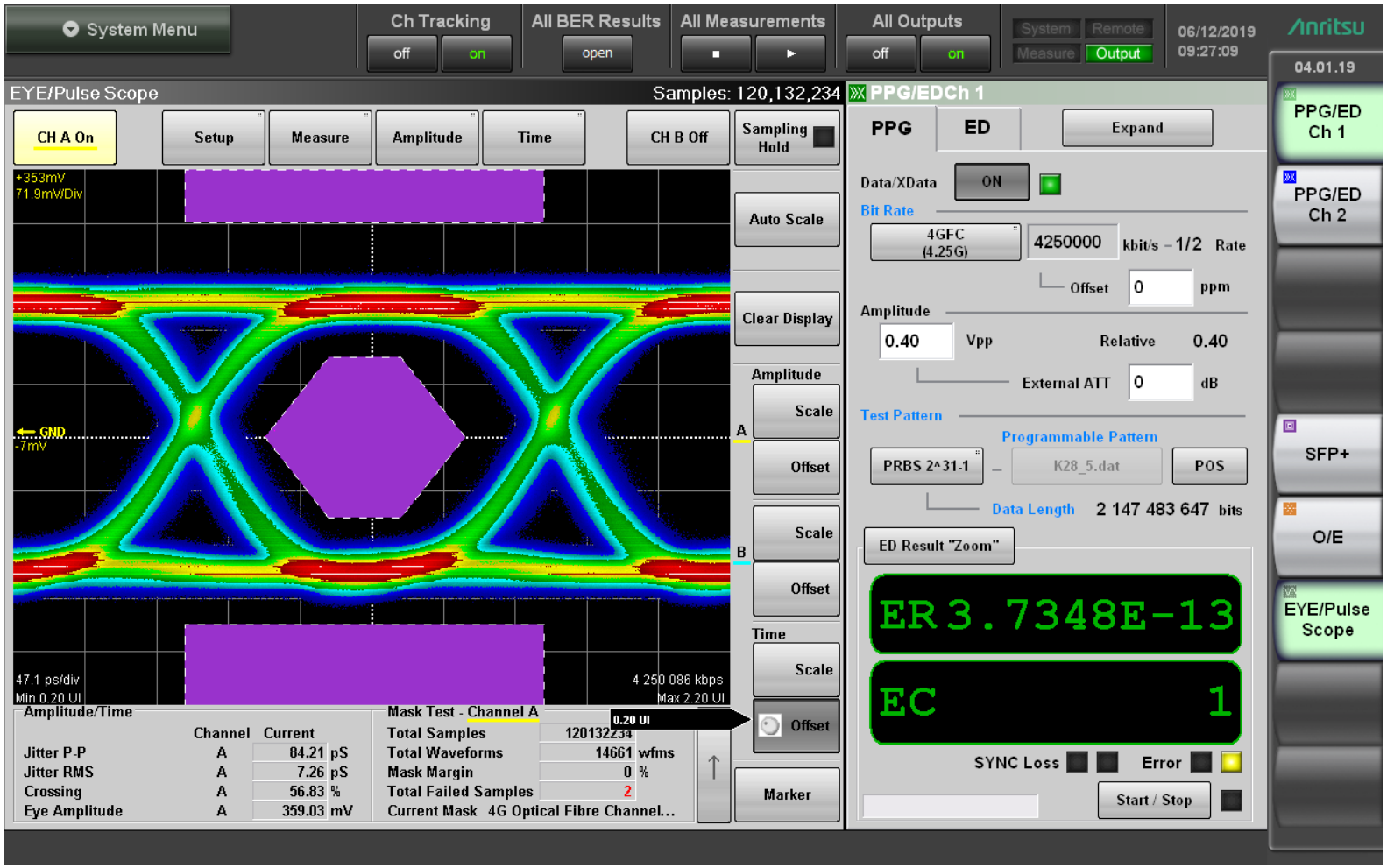
-55°C

1.25 Gbps with Optical Attenuation



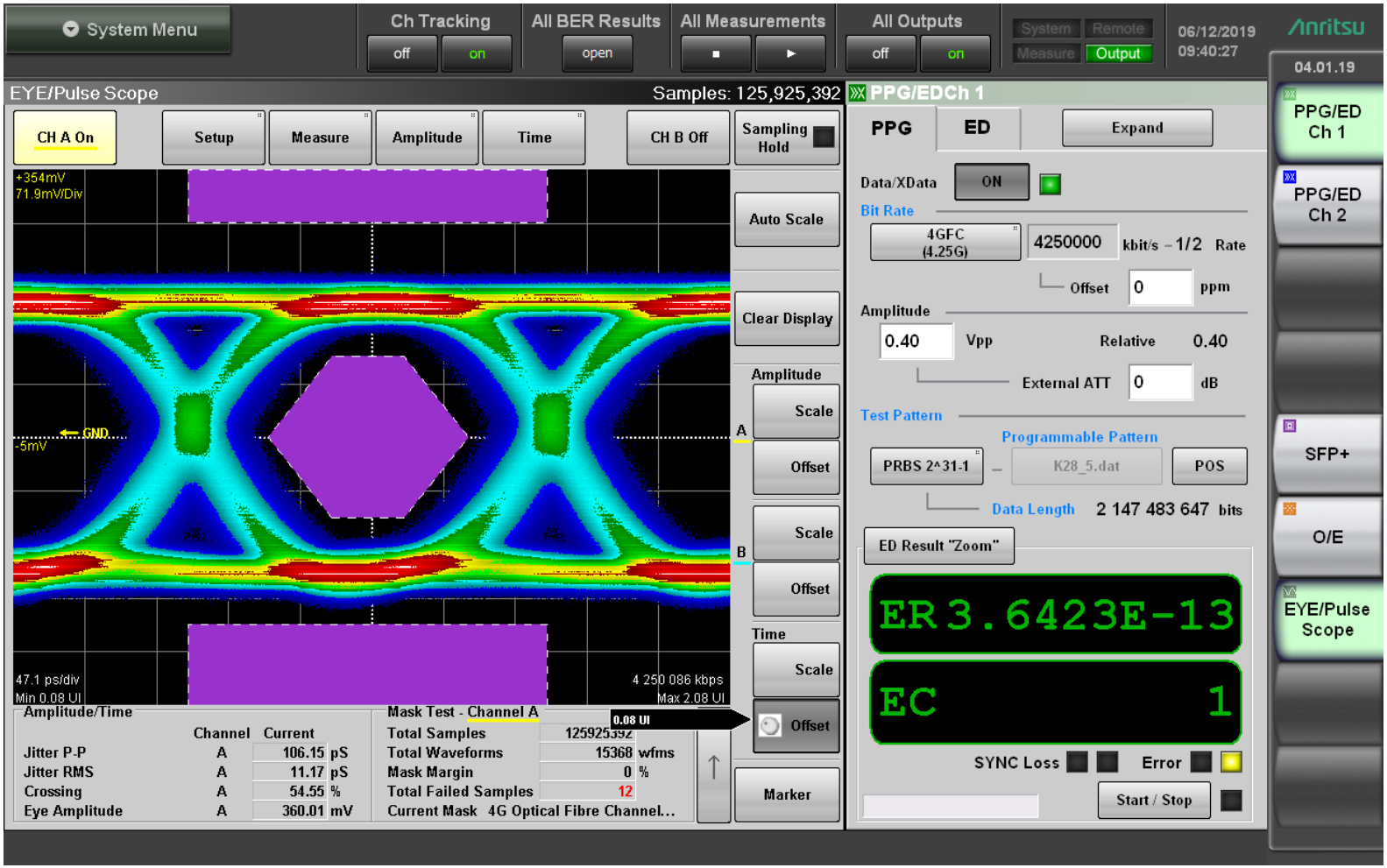
-55°C

4.25 Gbps No Attenuation



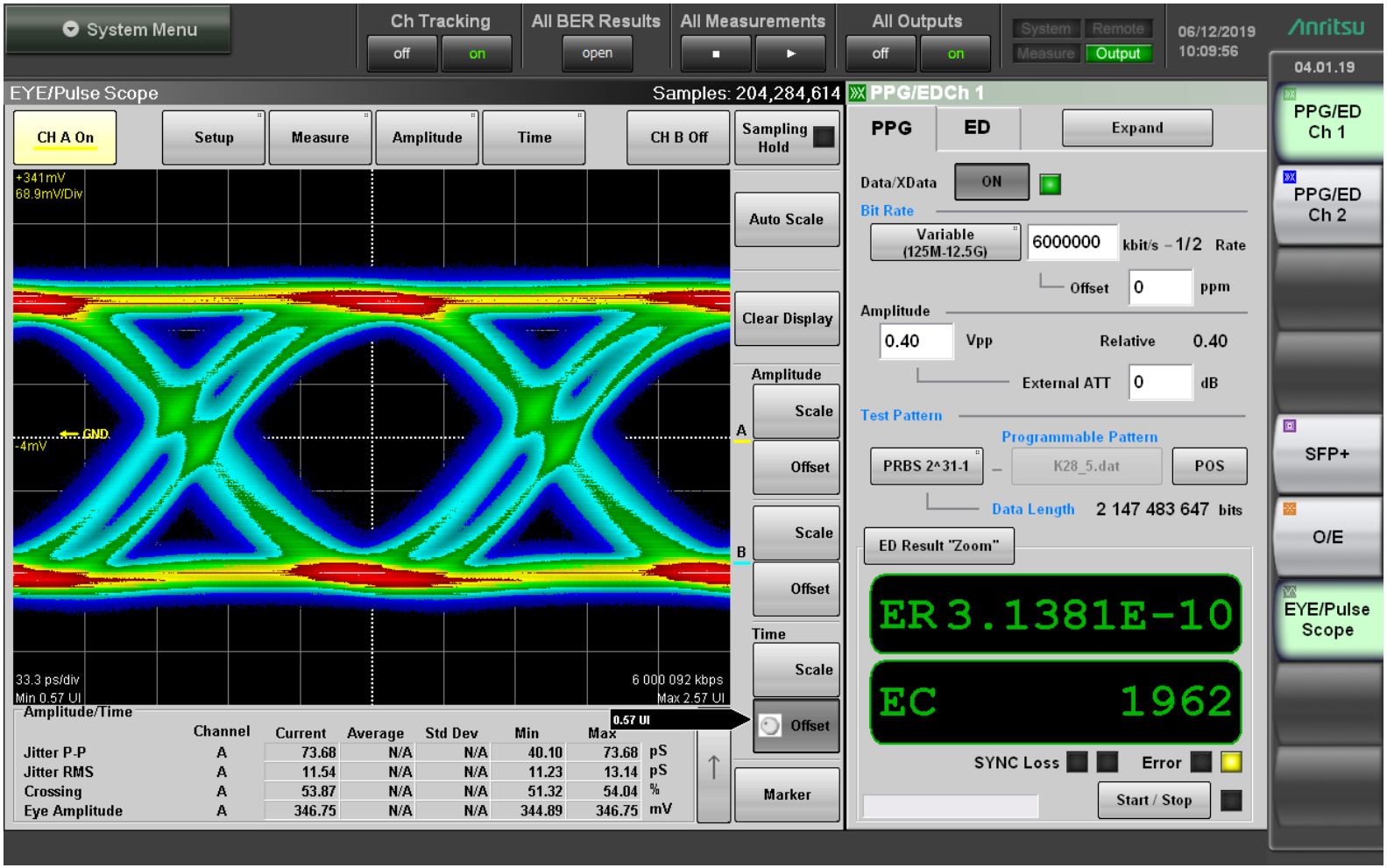
-55°C

4.25 Gbps with Optical Attenuation



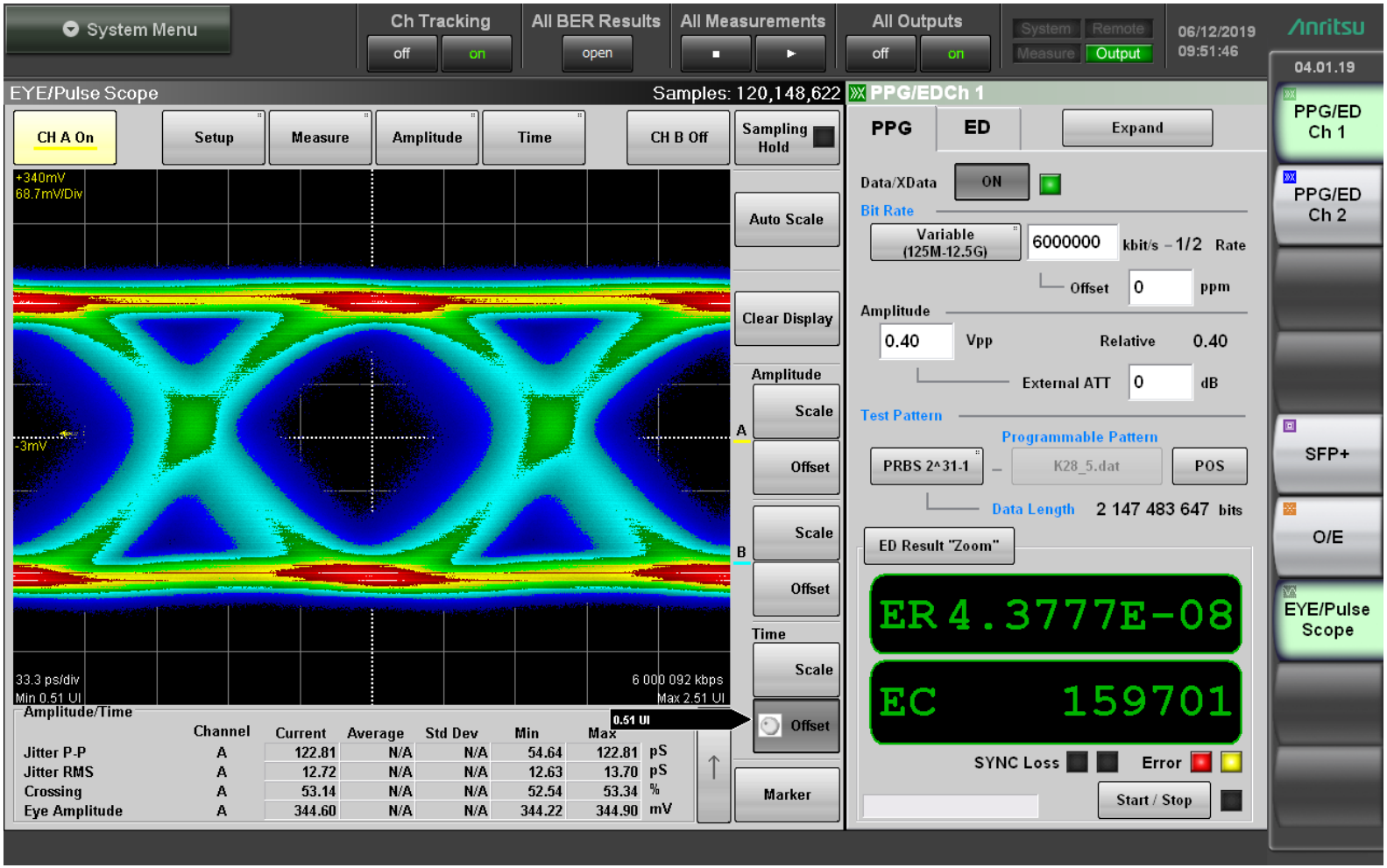
-55°C

6 Gbps No Attenuation



-55°C

6 Gbps with Optical Attenuation



-55°C

Bit Error Rate Summary (-55°C)

Data Rate	Attenuation	BER (1 error injected manually)
125 Mbps	No	4.47E-07
125 Mbps	Yes	5.08E-04
500 Mbps	No	3.21E-12
500 Mbps	Yes	1.25E-08
1.25 Gbps	No	1.12E-12
1.25 Gbps	Yes	3.27E-12
4.25 Gbps	No	3.73E-13
4.25 Gbps	Yes	3.64E-13
6.00 Gbps	No	3.14E-10
6.00 Gbps	Yes	4.38E-08

CF-170300-034/035 Components are Rated from 155.00Mbps to 4.25Gbps but have Reasonable BER at up to 6Gbps

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FiberQuad BER Summary Across Temperature

BER Summary No Attenuation

Temperature (in °C)	Data Rate	Attenuation	BER (1 error injected manually)
100	125 Mbps	No	1.23E-11
	500 Mbps	No	3.16E-12
	1.25 Gbps	No	1.30E-12
	4.25 Gbps	No	3.68E-13
	6.00 Gbps	No	3.44E-03
85	125 Mbps	No	6.61E-07
	500 Mbps	No	1.71E-10
	1.25 Gbps	No	1.27E-12
	4.25 Gbps	No	3.82E-13
	6.00 Gbps	No	6.67E-07
23	125 Mbps	No	1.16E-08
	500 Mbps	No	2.78E-12
	1.25 Gbps	No	8.72E-13
	4.25 Gbps	No	2.10E-13
	6.00 Gbps	No	1.98E-13
-40	125 Mbps	No	6.04E-08
	500 Mbps	No	3.20E-12
	1.25 Gbps	No	1.16E-12
	4.25 Gbps	No	3.84E-13
	6.00 Gbps	No	2.30E-13
-55	125 Mbps	No	4.47E-07
	500 Mbps	No	3.21E-12
	1.25 Gbps	No	1.12E-12
	4.25 Gbps	No	3.73E-13
	6.00 Gbps	No	3.14E-10

BER Summary With Attenuation

Temperature (in °C)	Data Rate	Attenuation	BER (1 error injected manually)
100	125 Mbps	Yes	1.38E-08
	500 Mbps	Yes	1.25E-11
	1.25 Gbps	Yes	6.44E-13
	4.25 Gbps	Yes	3.90E-11
	6.00 Gbps	Yes	3.03E-03
85	125 Mbps	Yes	1.84E-07
	500 Mbps	Yes	3.14E-12
	1.25 Gbps	Yes	1.28E-12
	4.25 Gbps	Yes	3.85E-13
	6.00 Gbps	Yes	6.92E-09
23	125 Mbps	Yes	1.42E-10
	500 Mbps	Yes	2.44E-12
	1.25 Gbps	Yes	1.00E-12
	4.25 Gbps	Yes	2.57E-12
	6.00 Gbps	Yes	5.40E-09
-40	125 Mbps	Yes	5.23E-04
	500 Mbps	Yes	1.30E-11
	1.25 Gbps	Yes	1.04E-11
	4.25 Gbps	Yes	5.89E-12
	6.00 Gbps	Yes	1.06E-07
-55	125 Mbps	Yes	5.08E-04
	500 Mbps	Yes	1.25E-08
	1.25 Gbps	Yes	3.27E-12
	4.25 Gbps	Yes	3.64E-13
	6.00 Gbps	Yes	4.38E-08

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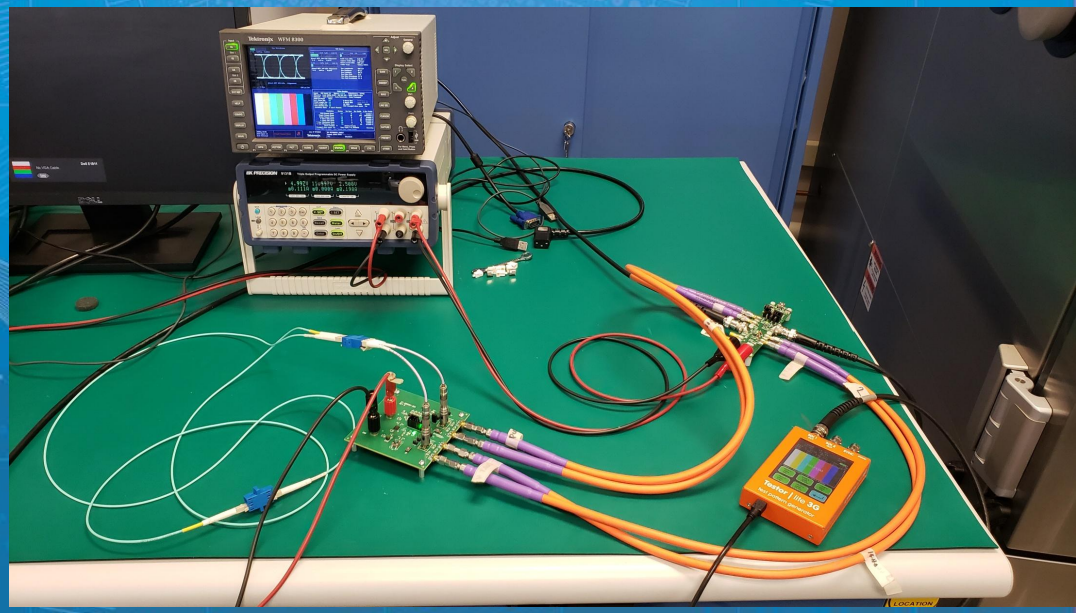
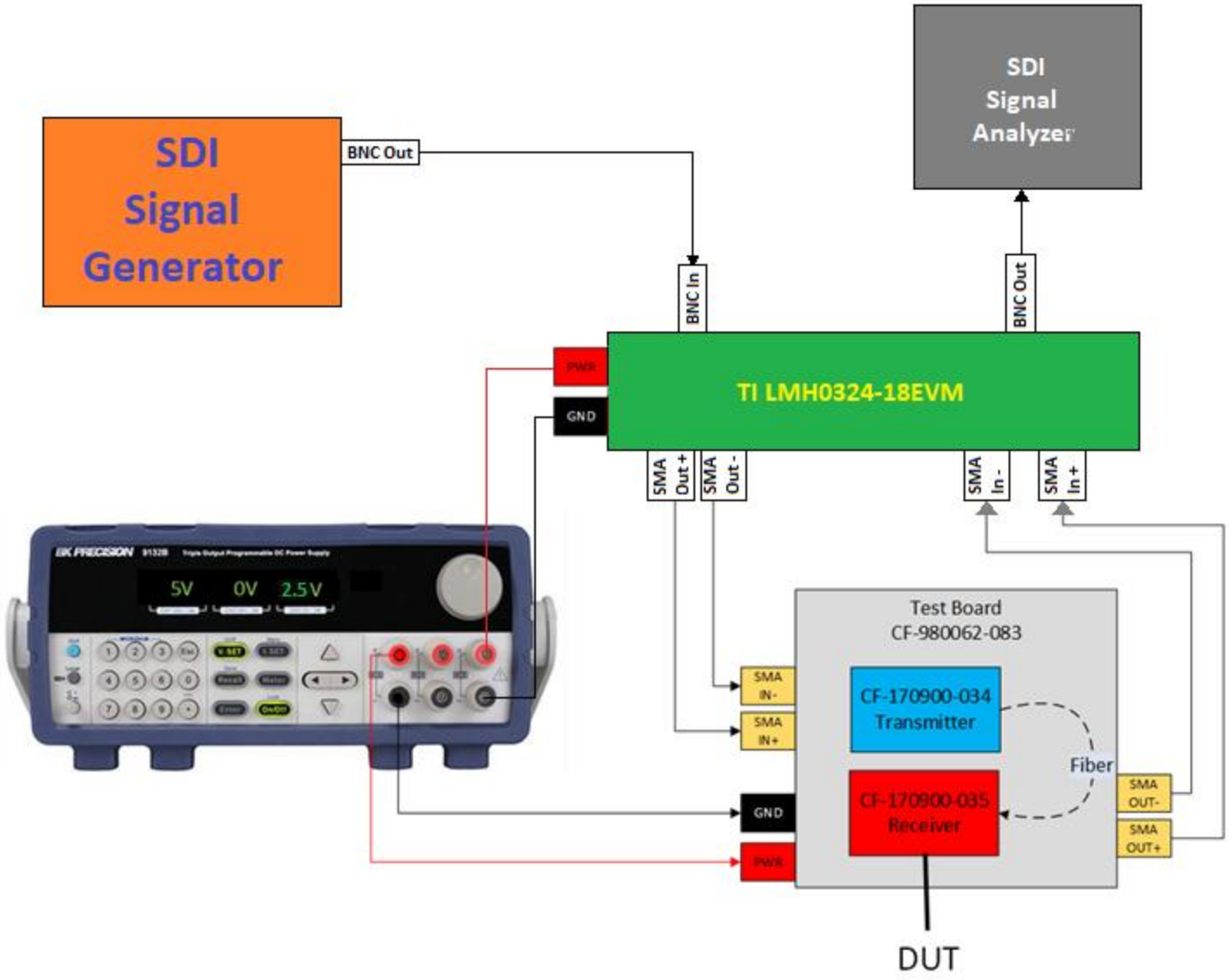


FiberQuad SDI Video Testing

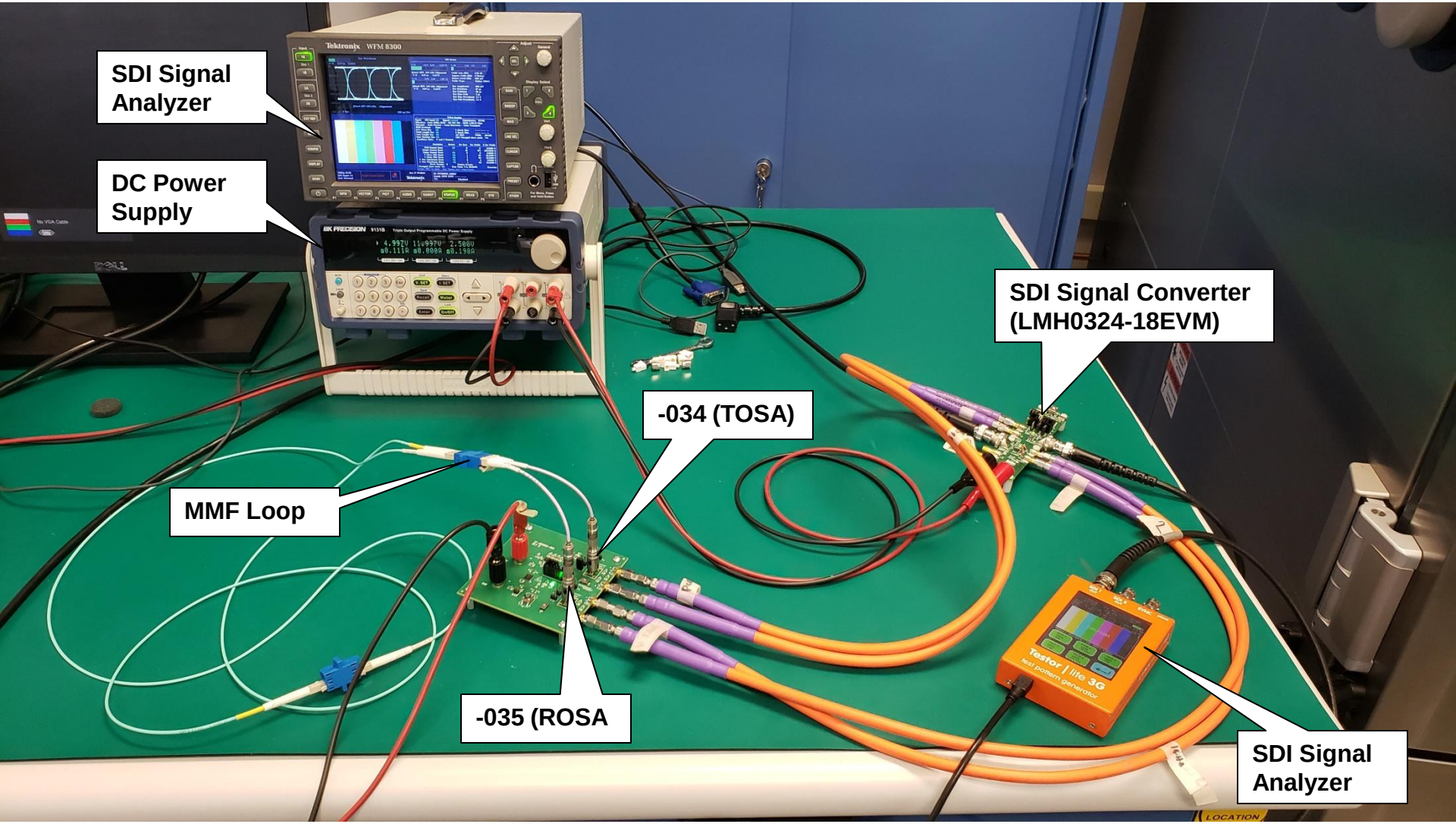
Video Performance Testing

- Tested at temperatures of 100, 85, -40, and -55 °C
- Tested SDI at 3 different resolutions:
  - 3G-SDI : 1920x1080 @ 60Hz (2.97 Gbps)
  - HD-SDI : 1920x1080 @ 30Hz (1.485 Gbps)
  - SD-SDI : 720x480 @ 59.94Hz (270 Mbps)
- Tested without optical attenuation, attenuated to -9 dBm of optical power, and attenuated to -15 dBm of optical power
- Duration of each test was roughly 10 minutes

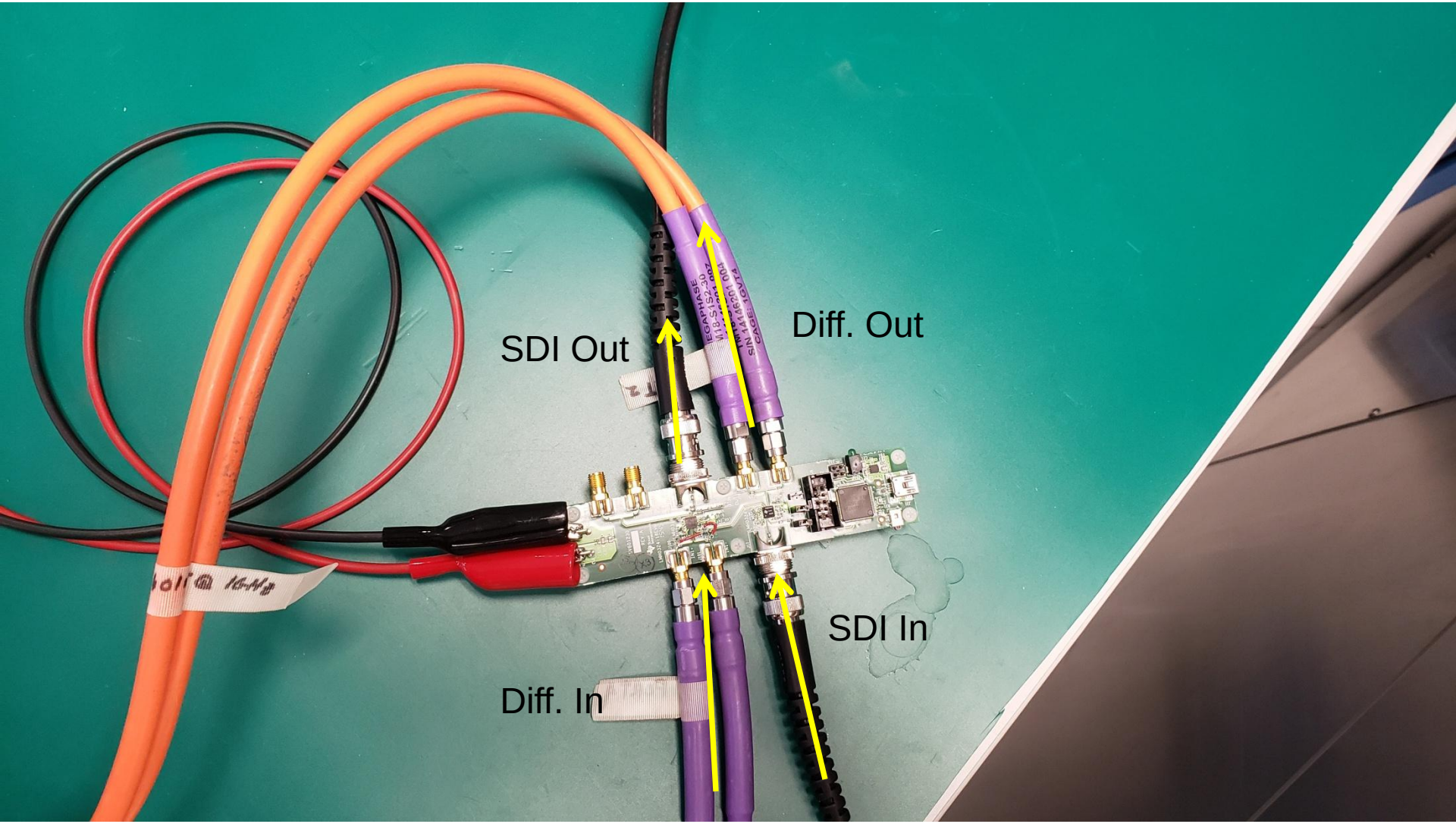
Test Setup Block Diagram (Video)



Video Performance Test Setup



Video Performance Test Setup



3G-SDI No Attenuation

100°C

3G-SDI @ -9 dBm

100°C

3G-SDI @ -15 dBm

100°C

HD-SDI No Attenuation

100°C

HD-SDI @ -9 dBm

100°C

HD-SDI @ -15 dBm

100°C

SD-SDI No Attenuation

100°C

SD-SDI @ -9 dBm

100°C

SD-SDI @ -15 dBm

100°C

3G-SDI No Attenuation

85°C

3G-SDI @ -9 dBm

85°C

3G-SDI @ -15 dBm

85°C

HD-SDI No Attenuation

85°C

HD-SDI @ -9 dBm

85°C

HD-SDI @ -15 dBm

85°C

SD-SDI No Attenuation

85°C

SD-SDI @ -9 dBm

85°C

SD-SDI @ -15 dBm

85°C

3G-SDI No Attenuation

23°C

3G-SDI @ -9 dBm

23°C

3G-SDI @ -15 dBm

23°C

HD-SDI No Attenuation

23°C

HD-SDI @ -9 dBm

23°C

HD-SDI @ -15 dBm

23°C

SD-SDI No Attenuation

23°C

SD-SDI @ -9 dBm

23°C

SD-SDI @ -15 dBm

23°C

3G-SDI No Attenuation

-40°C

3G-SDI @ -9 dBm

-40°C

3G-SDI @ -15 dBm

-40°C

HD-SDI No Attenuation

-40°C

HD-SDI @ -9 dBm

-40°C

HD-SDI @ -15 dBm

-40°C

SD-SDI No Attenuation

-40°C

SD-SDI @ -9 dBm

-40°C

SD-SDI @ -15 dBm

-40°C

3G-SDI No Attenuation

-55°C

3G-SDI @ -9 dBm

-55°C

3G-SDI @ -15 dBm

-55°C

HD-SDI No Attenuation

-55°C

HD-SDI @ -9 dBm

-55°C

HD-SDI @ -15 dBm

-55°C

SD-SDI No Attenuation

-55°C

SD-SDI @ -9 dBm

-55°C

SD-SDI @ -15 dBm

-55°C

SDI CRC Errors

	3G-SDI			HD-SDI			SD-SDI		
Signal Strength (dBm)	0	-9	-15	0	-9	-15	0	-9	-15
100°C	0	0	0	0	0	0	0	0	0
85°C	0	0	0	0	0	0	0	0	0
23°C	0	0	0	0	0	0	0	0	54
-40°C	0	0	0	0	0	0	0	0	1027
-55°C	0	0	2	0	0	82	0	0	615

Each test was performed for at least 10 minutes.

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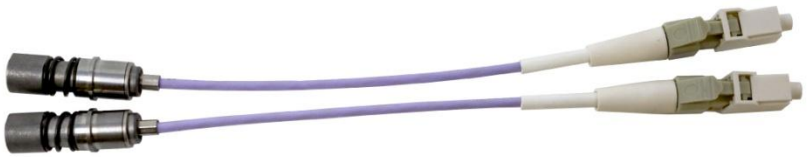
Contact Us

Questions / Comments



Contact Information

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  - jsibrava@amphenol-aao.com
- **Joseph Rothrock**
  - 607-643-8009
  - jrothrock@amphenol-aao.com

Datasheet

- https://www.amphenol-aerospace.com/pdf/pds/FiberQuad.pdf

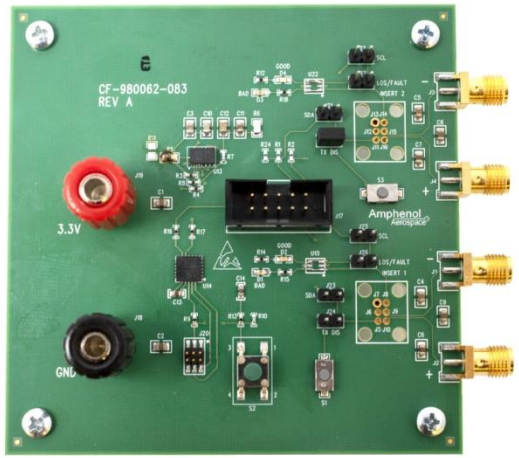
Sample Kits

- To include a kit of the transmitter, receiver, test board, and fiber cables provided upon request

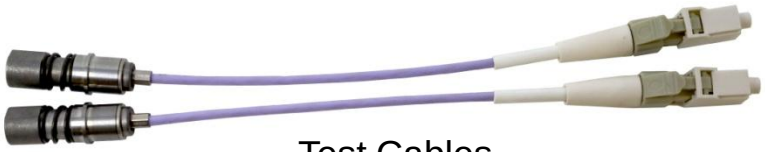
Sample Kit Contents

Transmitter

Receiver



Test Board



Test Cables