Differences between linear and limiting redrivers
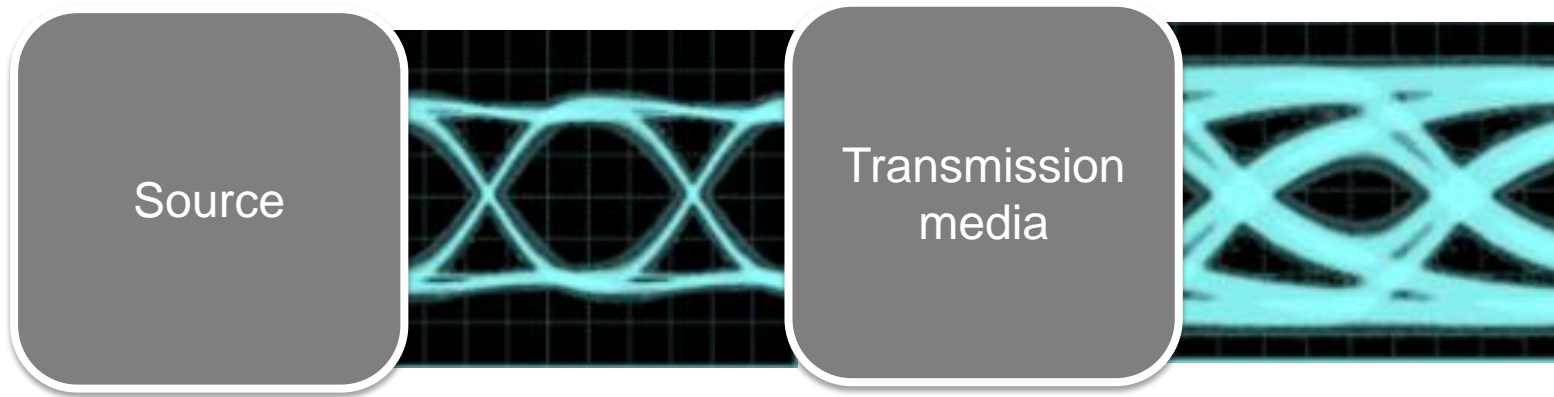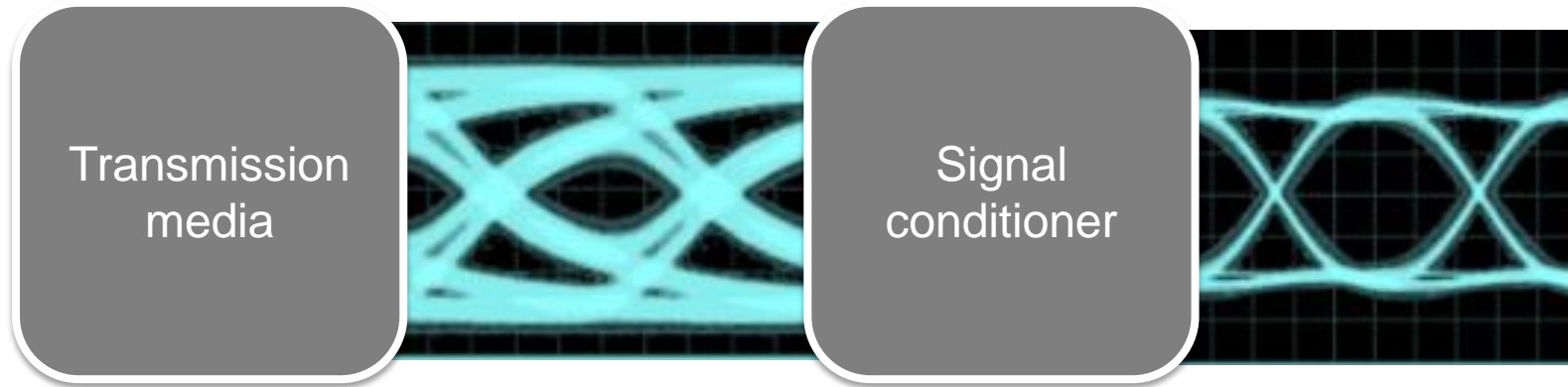
TI Precision Labs – Signal Conditioning

Prepared by David Liu, Malik Barton

TEXAS INSTRUMENTS

What is a signal conditioner?

Source

Transmission media

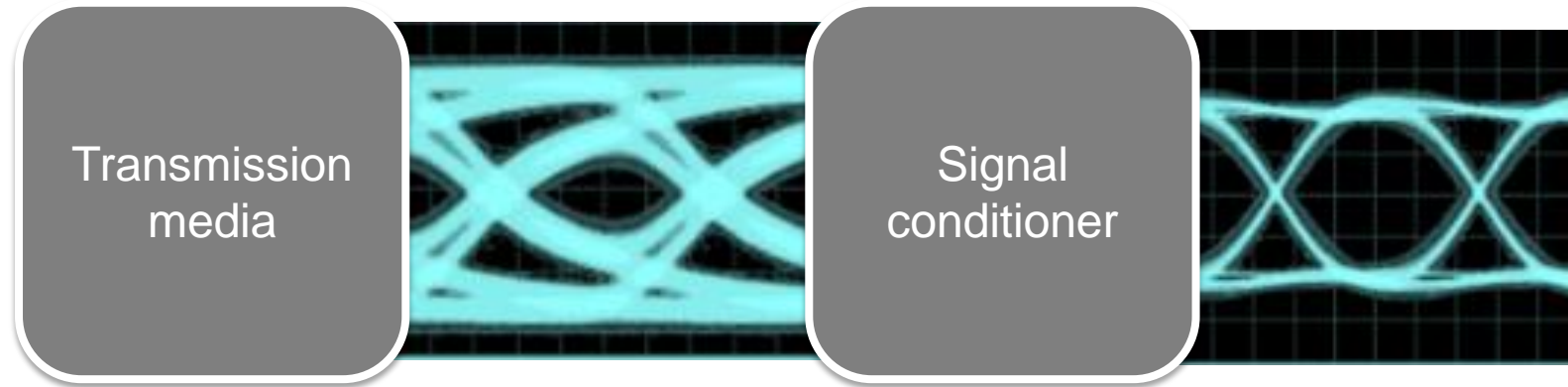TEXAS INSTRUMENTS

What is a signal conditioner?

Transmission media

Signal conditioner

A signal conditioner, in the form of a redriver or retimer, is used to correct signal integrity issues that produce less than desired bit error rate (BER).
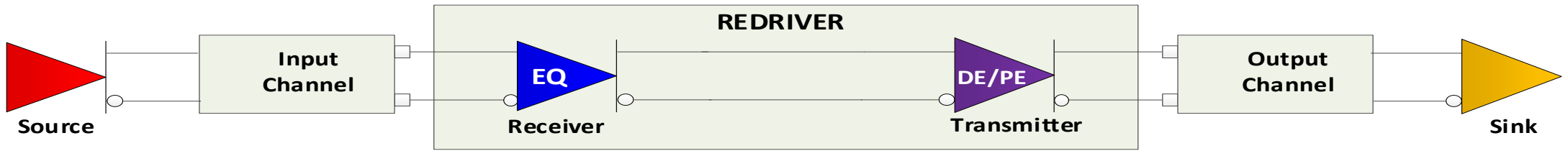
TEXAS INSTRUMENTS

What is a signal conditioner?

Use cases:
- Extending a device's operating range to meet system form-factor requirements.
- Correct a device's short-comings.

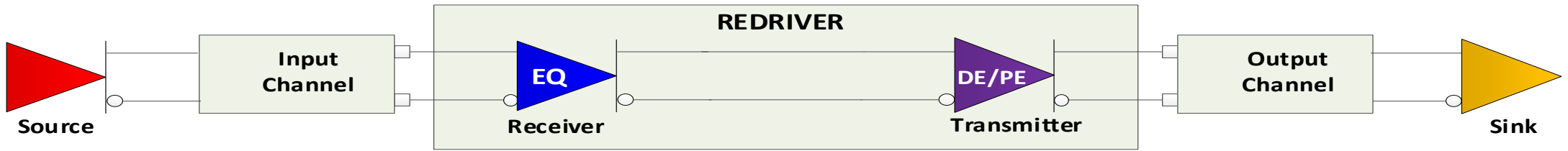**TEXAS INSTRUMENTS**

What is a redriver?

A redriver is a protocol agnostic analog component that provides a compensation of an attenuated signal using an equalizer function on its receiver side.

TEXAS INSTRUMENTS
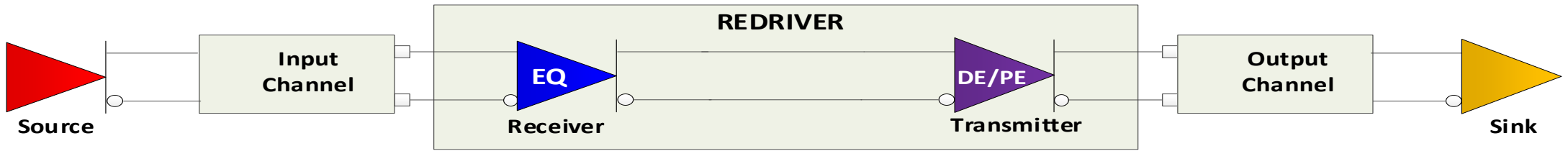
What is a redriver?

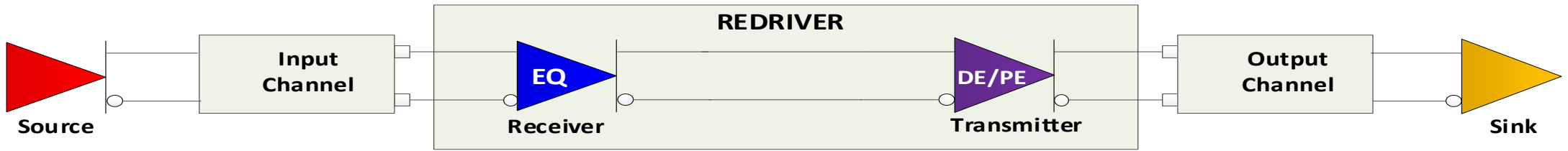The transmitter drives the equalized signal.

TEXAS INSTRUMENTS

What is a redriver?

A redriver cleans up ISI-related deterministic jitter with the proper equalization.
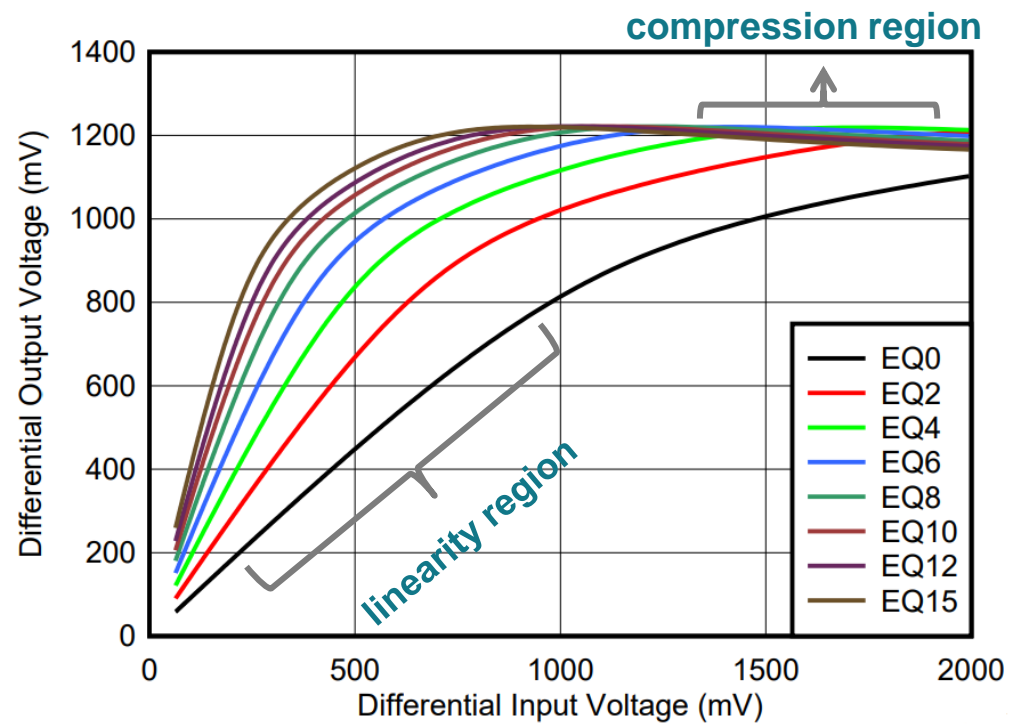
Random and non-ISI related deterministic jitter will pass from the redriver input to the output.

TEXAS INSTRUMENTS

What is a redriver?

A redriver can be "linear" or "non-linear (limited)".

TEXAS INSTRUMENTS

What is a linear redriver?

- Signal outputs are a linear function of the input

- Linearity persists up to a certain input amplitude

- Pass through all electrical characteristics of a source signal

What is a limited redriver?
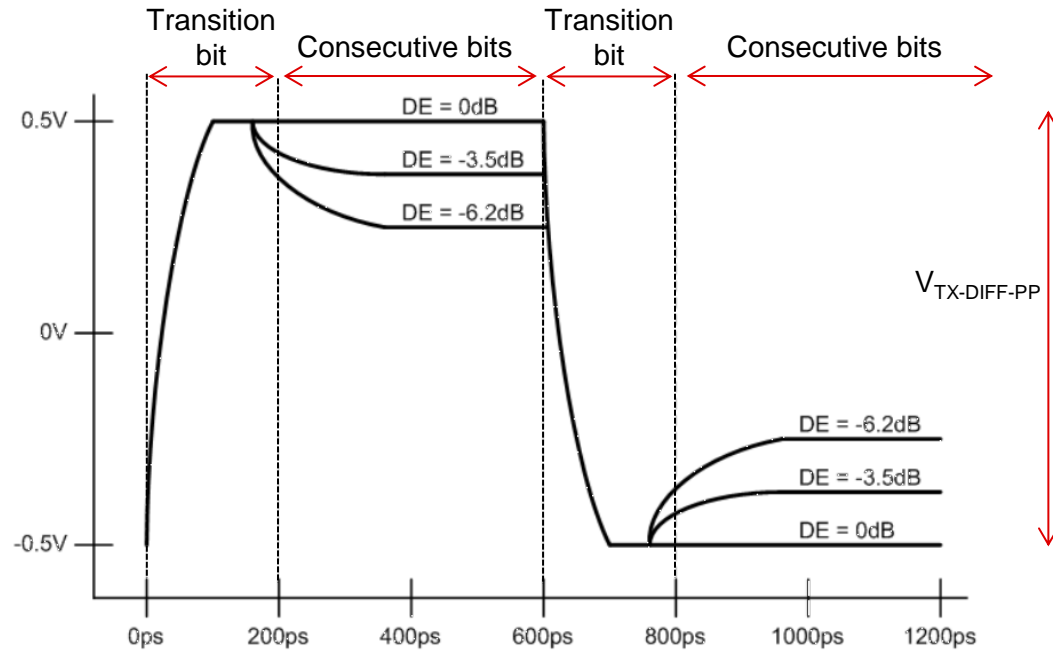
- Signal outputs are not a linear function of the input

- Output swing control or output de-emphasis or pre-emphasis

- Reflection and crosstalk are converted into deterministic jitter

TEXAS INSTRUMENTS

What are the different advantages of redriver types?

Feature	Linear	Limiting
Does not break or interfere with DP link training solving a long standing issue in the DP eco-system	Yes	No
USB receive channel EQ flexibility between long and short RX channel	Yes	No
Adjustable transmit voltage swing	No	Yes
Adjustable transmit de-emphasis or pre-emphasis	No	Yes
Make non-compliant TX swing VOD or de-emphasis/pre-emphasis level compliant	No	Yes

TEXAS INSTRUMENTS

Short quiz

- True or False: Redriver can clean up random jitter

- True or False: Linear redrivers have signal outputs that are a linear function of the input

- True or False: A redriver is the same as a retimer

- True or False: A limited redriver has TX SWING VOD and De-emphasis/Pre-emphasis control

TEXAS INSTRUMENTS

Short quiz

- True or False: Redriver can clean up random jitter
  - -False

- True or False: Linear redrivers have signal outputs that are a linear function of the input

- True or False: A redriver is the same as a retimer

- True or False: A limited redriver has TX SWING VOD and De-emphasis/Pre-emphasis control

TEXAS INSTRUMENTS

Short quiz

- True or False: Redriver can clean up random jitter
    - -False

- True or False: Linear redrivers have signal outputs that are a linear function of the input
    - -True

- True or False: A redriver is the same as a retimer

- True or False: A limited redriver has TX SWING VOD and De-emphasis/Pre-emphasis control

TEXAS INSTRUMENTS

Short quiz

- True or False: Redriver can clean up random jitter

    -False

- True or False: Linear redrivers have signal outputs that are a linear function of the input

    -True

- True or False: A redriver is the same as a retimer

    – False

- True or False: A limited redriver has TX SWING VOD and De-emphasis/Pre-emphasis control

TEXAS INSTRUMENTS

Short quiz

- True or False: Redriver can clean up random jitter
  - -False

- True or False: Linear redrivers have signal outputs that are a linear function of the input
  - -True

- True or False: A redriver is the same as a retimer
  – False

- True or False: A limited redriver has TX SWING VOD and De-emphasis/Pre-emphasis control
  – True

TEXAS INSTRUMENTS

Thank you

TEXAS INSTRUMENTS