

## MS-PS4-3 Waves and Their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

- MS-PS4-3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.** [Clarification Statement: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.] [Assessment Boundary: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

### Science and Engineering Practices

#### Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 6-8 builds on K-5 and progresses to evaluating the merit and validity of ideas and methods.

- Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings.

### Disciplinary Core Ideas

#### PS4.C: Information Technologies and Instrumentation

- Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.

### Crosscutting Concepts

#### Structure and Function

- Structures can be designed to serve particular functions.

#### Connections to Engineering, Technology, and Applications of Science

#### Influence of Science, Engineering, and Technology on Society and the Natural World

- Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.

#### Connections to Nature of Science

#### Science is a Human Endeavor

- Advances in technology influence the progress of science and science has influenced advances in technology.

### Observable features of the student performance by the end of the course:

1	Obtaining information											
	a	Given materials from a variety of different types of sources of information (e.g., texts, graphical, video, digital), students gather evidence sufficient to support a claim about a phenomenon that includes the idea that using waves to carry digital signals is a more reliable way to encode and transmit information than using waves to carry analog signals.										
2	Evaluating information											
	a	Students combine the relevant information (from multiple sources) to support the claim by describing*: <table border="1" data-bbox="267 1596 1469 1850"> <tr> <td>i.</td> <td>Specific features that make digital transmission of signals more reliable than analog transmission of signals, including that, when in digitized form, information can be:             <table border="1"> <tr> <td>1.</td> <td>Recorded reliably.</td> </tr> <tr> <td>2.</td> <td>Stored for future recovery.</td> </tr> <tr> <td>3.</td> <td>Transmitted over long distances without significant degradation.</td> </tr> </table> </td> </tr> <tr> <td>ii.</td> <td>At least one technology that uses digital encoding and transmission of information. Students should describe* how the digitization of that technology has advanced science and scientific investigations (e.g., digital probes, including thermometers and pH probes; audio recordings).</td> </tr> </table>	i.	Specific features that make digital transmission of signals more reliable than analog transmission of signals, including that, when in digitized form, information can be: <table border="1"> <tr> <td>1.</td> <td>Recorded reliably.</td> </tr> <tr> <td>2.</td> <td>Stored for future recovery.</td> </tr> <tr> <td>3.</td> <td>Transmitted over long distances without significant degradation.</td> </tr> </table>	1.	Recorded reliably.	2.	Stored for future recovery.	3.	Transmitted over long distances without significant degradation.	ii.	At least one technology that uses digital encoding and transmission of information. Students should describe* how the digitization of that technology has advanced science and scientific investigations (e.g., digital probes, including thermometers and pH probes; audio recordings).
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