Achievement Standard

Subject Reference	Physics 3.3				
Title	Demonstrate understanding of wave systems				
Level	3	**Credits**	4	**Assessment**	External
Subfield	Science				
Domain	Physics				
Status	Registered	**Status date**	4 December 2012		
Planned review date	31 December 2019	**Date version published**	17 November 2016		

This achievement standard involves demonstrating understanding of wave systems.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of wave systems.	• Demonstrate in-depth understanding of wave systems.	• Demonstrate comprehensive understanding of wave systems.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 8. The standard is aligned to Physical inquiry and physics concepts in the Physical World strand and Communicating in science in the Nature of Science strand, and is related to the material in the *Teaching and Learning Guide for Physics*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

This standard is also derived from *Te Marautanga o Aotearoa*. For details of *Te Marautanga o Aotearoa* achievement objectives to which this standard relates, see the Papa Whakaako for the relevant learning area.

2 *Demonstrate understanding* involves showing an awareness of how simple facets of phenomena, concepts, or principles relate to a given situation.

Demonstrate in-depth understanding involves giving explanations for phenomena, concepts, or principles that relate to a given situation.

Demonstrate comprehensive understanding involves connecting concepts or principles that relate to a given situation.

3 *Wave systems* include mathematical solutions and/or written descriptions. Written descriptions may include graphs or diagrams.

4 Assessment is limited to a selection from the following:

Interference (quantitative) of electromagnetic and sound waves, including multi-slit interference and diffraction gratings; standing waves in strings and pipes; harmonics; resonance; beats; Doppler Effect (stationary observer for mechanical waves).

Relationships:

$d \sin\theta = n\lambda$ $\quad\quad$ $n\lambda = \frac{dx}{L}$

$f' = f \frac{v_w}{v_w \pm v_s}$

5 Assessment Specifications for this achievement standard can be accessed through the Physics Resources page found at http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/.

Replacement Information
This achievement standard replaced unit standard 6391 and AS90520.

Quality Assurance

1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.

2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference 0233