

Question 11**(7 marks)**

Chloe is piloting the spaceship *Antilles*. It is 1.10 km long and travelling at $0.80c$ past a spaceport controlled by Zhang. Zhang needs to measure the speed of passing spaceships. Chloe steers the spaceship between two beacons 1000 m apart as measured by Zhang. The beacons are placed parallel to the *Antilles*' path. Both Chloe and Zhang start their timers when the front of the *Antilles* reaches the first beacon.

- (a) Calculate the time elapsed on Zhang's clock (as observed by Zhang) when the front of *Antilles* reaches the second beacon. (1 mark)

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- (b) Calculate the distance Chloe observes between the beacons before she passes the first beacon. (2 marks)

_____ m

- (c) At one stage, Zhang observes *Antilles* fits completely between the two beacons. Chloe says that at no time did the spaceship completely fit between the beacons. Explain how they can both be correct, and why. (4 marks)
