The "Collapse" of the Wave Function

If E_2 is observed, what is the state of the particle after the measurement?

We start out with this wave function:

$$\Psi(x,t) = 0.5\Psi_2(x,t) + 0.866\Psi_4(x,t)$$

Before we make the measurement, we can't predict the result of an energy measurement with certainty.

However, after the measurement, we know with certainty that E = E_2.
To be specific: We know that a second measurement will yield E_2. (Why?)

Therefore, after obtaining E_2, the wave function must now be:

$$\Psi(x,t) = \Psi_2(x,t)$$

That is, the wave function has "collapsed" to the state that corresponds with the result we obtained.

This is one of the weirder features of QM, and is the principal reason that Einstein never accepted QM as a complete theory.

("God does not place dice!")