

Subject: BMW Balancing Motorcycle Concept
To: Dan Kim
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Summary and Conclusions

BMW's self-balancing concept reveal does not provide enough evidence to conclude that it has a substantial self-balancing bike. From their demonstration, it appears that their bike has just enough torque to maintain balance once the bike is in an equilibrium position.

Observations

(The Demonstration Begins at minute 10:15)

<https://youtu.be/J18a56nXF0s?t=10m15s>

The two major observations are first that the rider appears very careful to maintain symmetrical movements likely so as not to disturb the bike from its unstable equilibrium position. Anything that is balanced is at an unstable equilibrium position. The key is how far from the equilibrium position can the bike be moved and still recover. If there is not enough torque to recover the rider from an unbalanced equilibrium state, it would suggest that if the bike were to be parked using a kickstand and the control was turned on that there isn't enough torque to bring it to an upright position.

The second observation is that the bike was turned on a turntable, enabling it to exit the auditorium without turning. This may not have been a showman extra, but a requirement to turn the bike around. A low speed turn could have demonstrated the inability of the balancing actuator to maintain balance, due to insufficient torque.

A more thorough demonstration is needed to determine whether BMW's concept is a substantially self-balancing bike, including turning the vehicle at a low speed, moving it substantially from an equilibrium state by applying weight to one side, and having the vehicle pick itself up from its kickstand.