



Bounce and Court Pace

What each surface keeps and gives back, from friction and restitution.

The impulse model of a bouncing ball with spin, including the transition from sliding to rolling, and the ITF court pace rating that follows from it.

SPORT

Tennis

FAMILY

Sports physics

LICENCE

£249

one-off, perpetual

RUNNING IN THE PLATFORM

https://edgewortharena.com/arena/api/gear/bounce?serve_kmh=200&spin_rpm=1500

Inputs

NAME	TYPE	UNITS	WHERE IT COMES FROM
incoming velocity	(vx, vy)	m/s	your flight solver or a radar
spin	float	rpm	
surface	string or (mu, e)	-	the catalogue, or your own measurements

Outputs

NAME	TYPE	UNITS	NOTES
outgoing velocity and spin	floats	m/s, rpm	
speed_kept	float	fraction	
regime	string	-	slid or rolled
cpr	float	-	the ITF court pace rating

Method

- 1 Assume the vertical impulse returns e times the incoming vertical speed.

THIS IS THE SAMPLE

The method runs to 4 steps; one is shown. The assumptions, the limits, the module layout and the reference implementation come with the licence. Everything on the page below this -- what the model was measured at -- is the same in both versions, because that is the part you should not have to take on trust.



What it was measured at

Computed now, for a 200 km/h serve with 1,500 rpm of topspin.

MEASURE	RESULT	READING
Surfaces in the catalogue	5	
Grass	keeps 90.1%	bounce 0.44 m, CPR 48
Clay	keeps 85.0%	bounce 0.59 m, CPR 24
Difference in the receiver's time	11 ms	which is the return

Assumptions

What has to be true for the numbers to mean what they say.

- A rigid court, a thin-shelled ball, and a contact short enough to treat as an impulse.

Limits

Where it is known to be wrong. Published because a model without stated limits is one nobody has pushed on.

- Clay moves under the ball and grass is worn by the second week; μ and e are surface averages, not a given court on a given day.

LICENCE

Issued to Evaluation copy. One perpetual licence to use and modify this model inside your own organisation. Redistribution of the specification or the reference implementation is not included. No warranty is given: the validation above is the whole of the claim being made.