The $J/\psi$ meson flows! \textit{ALICE, PRL 119 (2017) 242301}

A positive $J/\psi$ elliptic flow was measured in Pb-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV with a significance of 6$\sigma$.
This favours transport models including charm thermalization.
Lower energy measurements do not exhibit a sizable $v_2$.
At high $p_T$ its origin is not quantitatively understood.

Heavy quarks in Pb-Pb collisions at the LHC
- early production ($t_c \sim 0.08$ fm/$c$, $t_\tau \sim 0.02$ fm/$c$ vs. $t_{QGP} \sim 0.3$ fm/$c$)
- experience the full system evolution
- interact with the QGP: sensitive to the medium properties
- same number per binary collision produced in Pb-Pb and in pp
- Quarkonium in Pb-Pb collisions: hard probes of the QGP

Two antagonist mechanisms are required to reproduce experimental observations

Run 2 (2015-2016): Pb-Pb at $\sqrt{s_{NN}}=5.02$ TeV

The $J/\psi$ study with the muon spectrometer:
- forward rapidity: $2.5 < y < 4$
- down to $p_T = 0$

The $J/\psi$ study with the TPC:
- mid-rapidity: $|y| < 0.9$
- down to $p_T = 0$

Results and interpretation
- Significant $v_2$ is observed
  - in 2 rapidity regions
  - and for different centrality ranges
- Clear indication of charm quark (re)combination
- Comparison to D mesons: strong hint of charm thermalisation
- Transport models do not reproduce the $p_T$ dependence...

...and in p-Pb collisions a similar $v_2$ is observed at high $p_T$, suggesting a common missing mechanism.

Thermal charm quark might not be the only source of $J/\psi$ flow
- path-length dependence, strong magnetic field, other?

**References**
- Phys. Rev. D 64 (2001) 094015