confused w/ decoherence

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- *From*: mahdiarnt <mahdiarnt@xxxxxxxxx>
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Hi

In the density matrix formalism, it's said that after a measurement of
an observable
A = Sum (a_i P_i),
with P_i projection operators and a_i eigenvalues of A, a system which
was originally described by a density matrix rho is now described by
rho' = Sum P_i rho P_i.
This states, among many things, that a pure state can become a mixed
state by means of a measurement. What I don't understand is as
follows:

Before the measurement, the ensemble average of A is given by
Exp(A) = Tr (rho A).
After the measurement,
Exp(A) = Tr (rho' A) = Tr (rho A),
by a straightforward calculation. Thus the average value of A is
unchanged before and after the measurement. Again this is reasonable
for an ensemble.

But what about a single particle? The density matrix is equally well
used for an ensemble and a for part of a big system (when the system
has a state vector but the part doesn't). For a single particle,
traditional experiments (double slit, etc.) indicated that the
successive experiments' results depend on the previous ones'.
Nevertheless, it seems to me that the decoherence approach (devised to
get rid of the wave function reduction) states that a measurement
(even on a single particle, not an ensemble) is just the interaction
of the system with the environment in such a way to convert a pure
state to a mixed one as above. So how can then the result of a further
measurement depend on the outcome of the previous one?

Any explanation is appreciated.

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