

Re: Rasetti: Quantum Computers based on TQFT

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From: Ralph Hartley (hartley_at_aic.nrl.navy.mil)

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> *So the idea is that there may be more types of quantum computers than
> currently considered in the standard literature. In particular, so
> Rasetti's idea, using systems that have to be described by quantum
> *field* theory one might be able to (in principle) construct
> new and more powerful types of quantum computers.*

A quick and inadequate search didn't find anything by Rasetti saying that, so there is no way to address what he said in a talk.

> *This idea apparently goes back to Michael Friedman, who first proposed
> that non-abelian topological quantum field theories might exhibit
> features necessary so support a model of computation capable of
> solving not-P problems in polynomial time?*

It did find two papers from 1998:

http://research.microsoft.com/theory/freedman/P_NP.pdf and

<http://research.microsoft.com/research/theory/freedman/Topological%20Views.pdf>

I did not find them convincing.

Here is a latter paper by Freedman, Kitaev, and Wang:

"Simulation of topological field theories by quantum computers"

<http://arxiv.org/abs/quant-ph/0001071>

I haven't checked it thoroughly, but if correct, it would prove the conjecture in the earlier papers – that TQFT is stronger than Quantum Computation – false.

A proof that BQP is as strong as #P would have to be spelled out very well, since there is reason to believe such a proof would be very difficult, even if it were true, which it probably isn't. A handwavy argument wouldn't do at all.

That TQFTs could provide an improved (in some respects) *description* or potential implementation of Quantum computation cannot be ruled out.

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Ralph Hartley