A Possible Architecture for Wirelessly Integrated RF Nanoystems

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ABSTRACT

Progress to date on nanoelectronics has been significant. Essentially, all devices needed to make the equivalent of a modern digital or analog circuit out of nanotubes and/or nanowires have been demonstrated in prototype experiments, and elementary logic circuits have been demonstrated. However, one of the most important unsolved problems in nanotechnology is how to make electrical contact from nanoelectronic devices to the macroscopic world, without giving up on the potential circuit density achievable with nanoelectronics. All of the nanotube and nanowire devices developed to date have been contacted by lithographically fabricated electrodes. A canonical research theme is to fabricate a nanodevice, contact it with electrodes fabricated with electron-beam lithography, then publish a paper reporting the electrical properties. This is not a scalable technique for massively parallel processing integrated nanosystems. The potential high-density circuitry possible with nanowires and nanotubes will not be realized if each nanowire and nanotube is contacted lithographically. One potential solution to this problem is to use wireless interconnects, which can be densely packed. If each interconnect is connected to a nanotube of a different length (hence different resonant frequency), then the problem of multiplexing input/output signals can be translated from the spatial domain to the frequency domain, hence relaxing the need for high resolution (high cost) lithography for interconnects. This is in contrast to previous approaches which, ultimately, rely on lithography and its inherent limitations to make electrical contact to nanosystems. This idea is indicated schematically in Fig. 1[1].

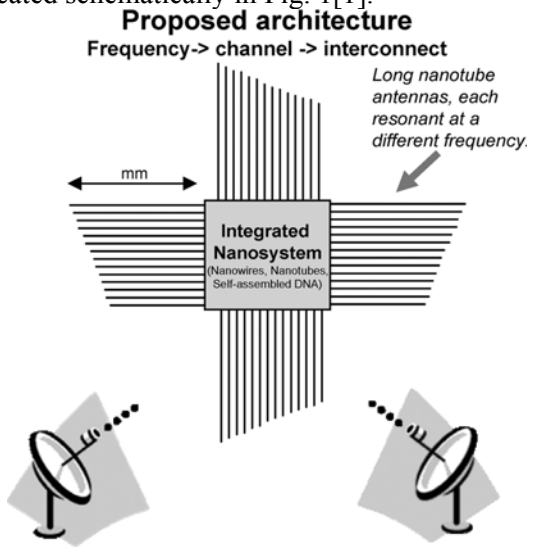

Figure 1. Possible scheme for wireless interconnection to integrated nanosystems.

This talk will discuss challenges in realizing this vision, and if it indeed is at all possible.

REFERENCES

[1.] P. J. Burke, S. D. Li and Z. Yu, "Quantitative Theory of Nanowire and Nanotube Antenna Performance", *IEEE Transactions on Nanotechnology*, **5**, 314-334, (2006).