

NANOSECOND TRUE RANDOM BIT GENERATOR

A single nanodevice is capable of generating a constant stream of random bits, with each bit being generated approximately every 10 nanoseconds.

+ Features

Individual devices with ~100 nm diameter
 Possibility of scalability

+ Suggested applications

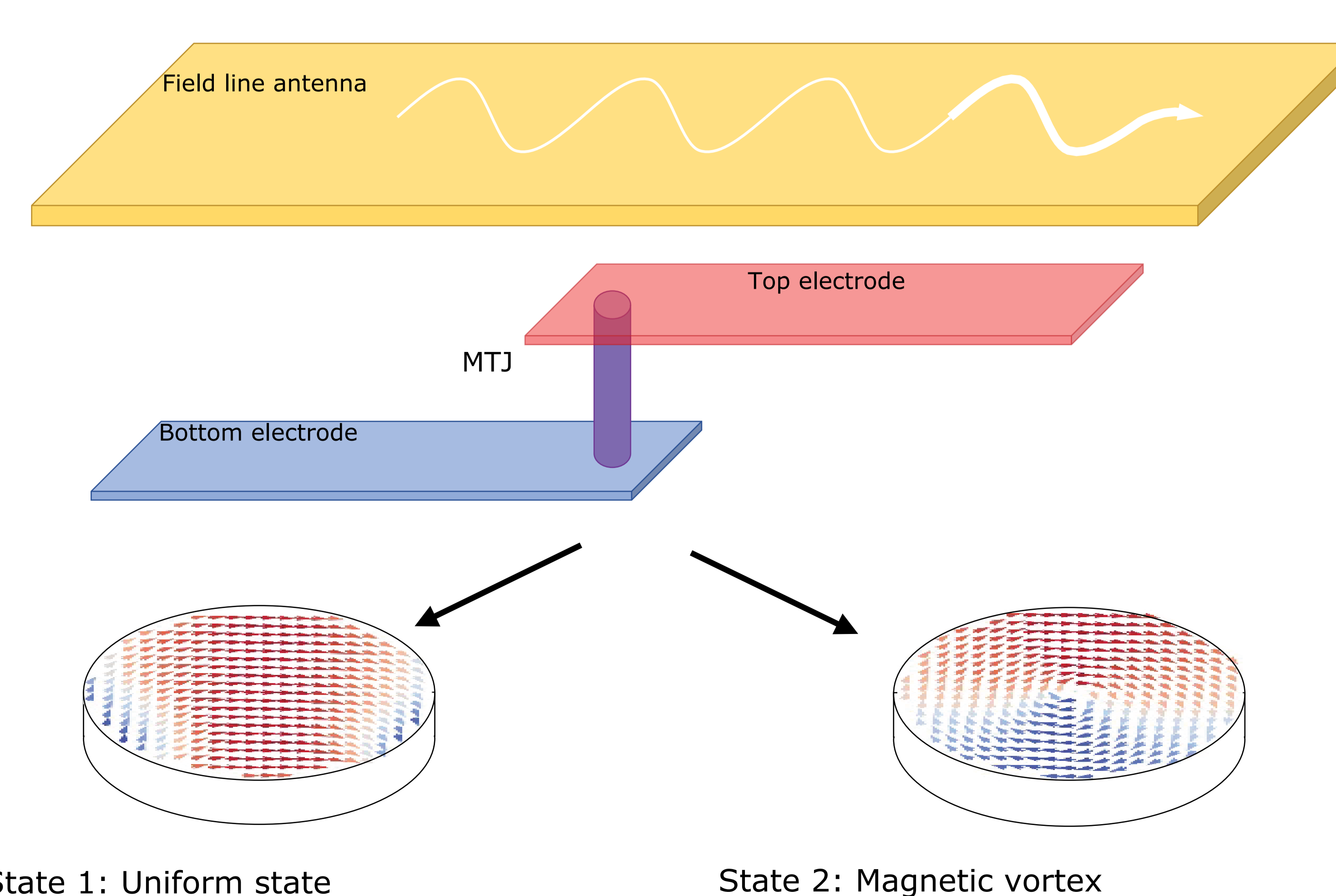
Cryptography
 Security systems
 Defense

The 'nanosecond random bit generator' (nRBG) is a nanoscale solution based on magnetic tunnel junction (MTJ) for the fast generation of a large number of random bits. nRBGs have the potential for diverse applications such as cryptography, security and defense.

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How does it work?

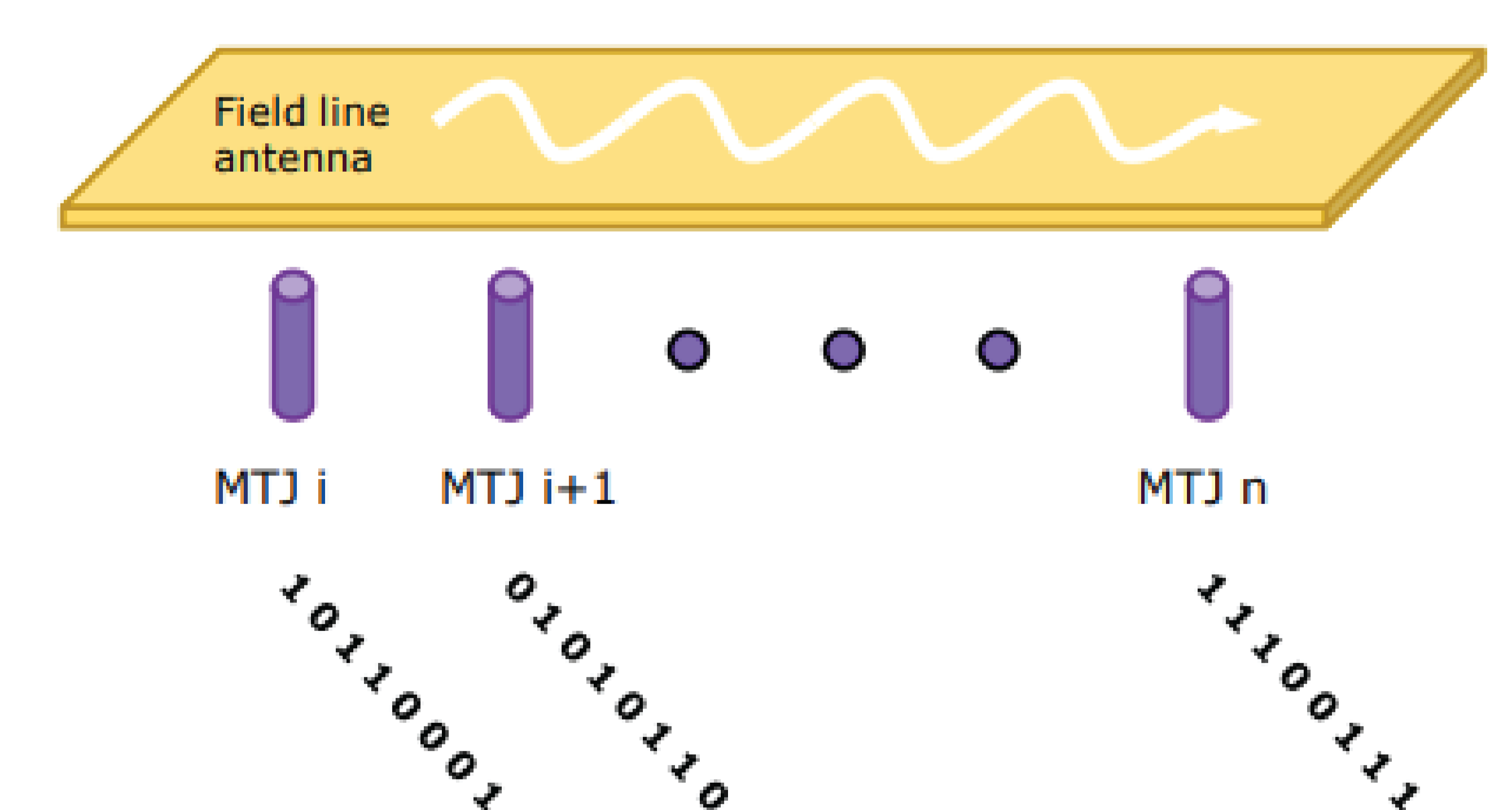
When a high frequency magnetic current passes across an adjacent field line antenna, a corresponding high frequency magnetic field is generated at the MTJ, which causes the free layer to switch back and forth between two states. Due to the tunneling magnetoresistance of the MTJ, the two magnetic states will have differing resistance.



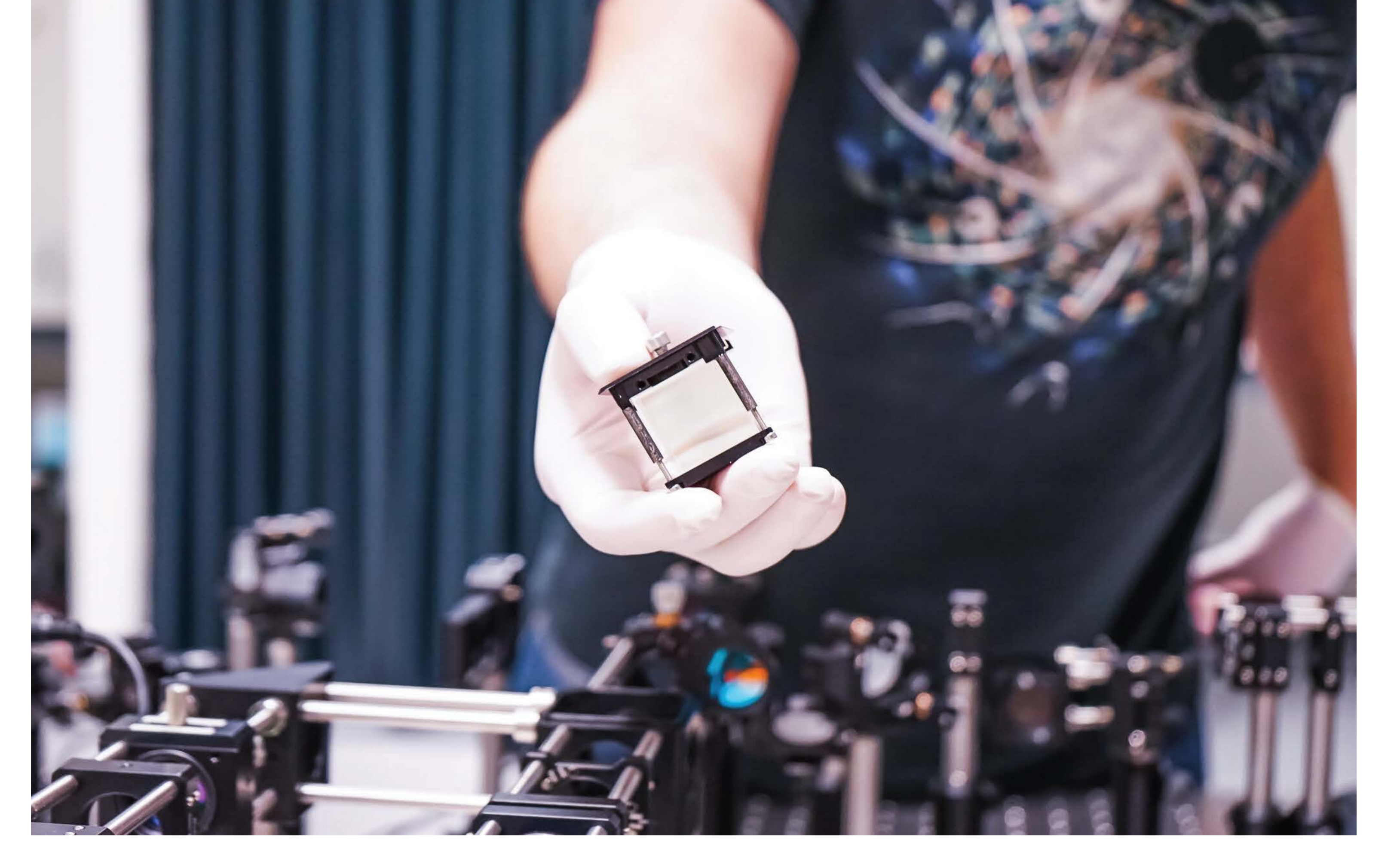
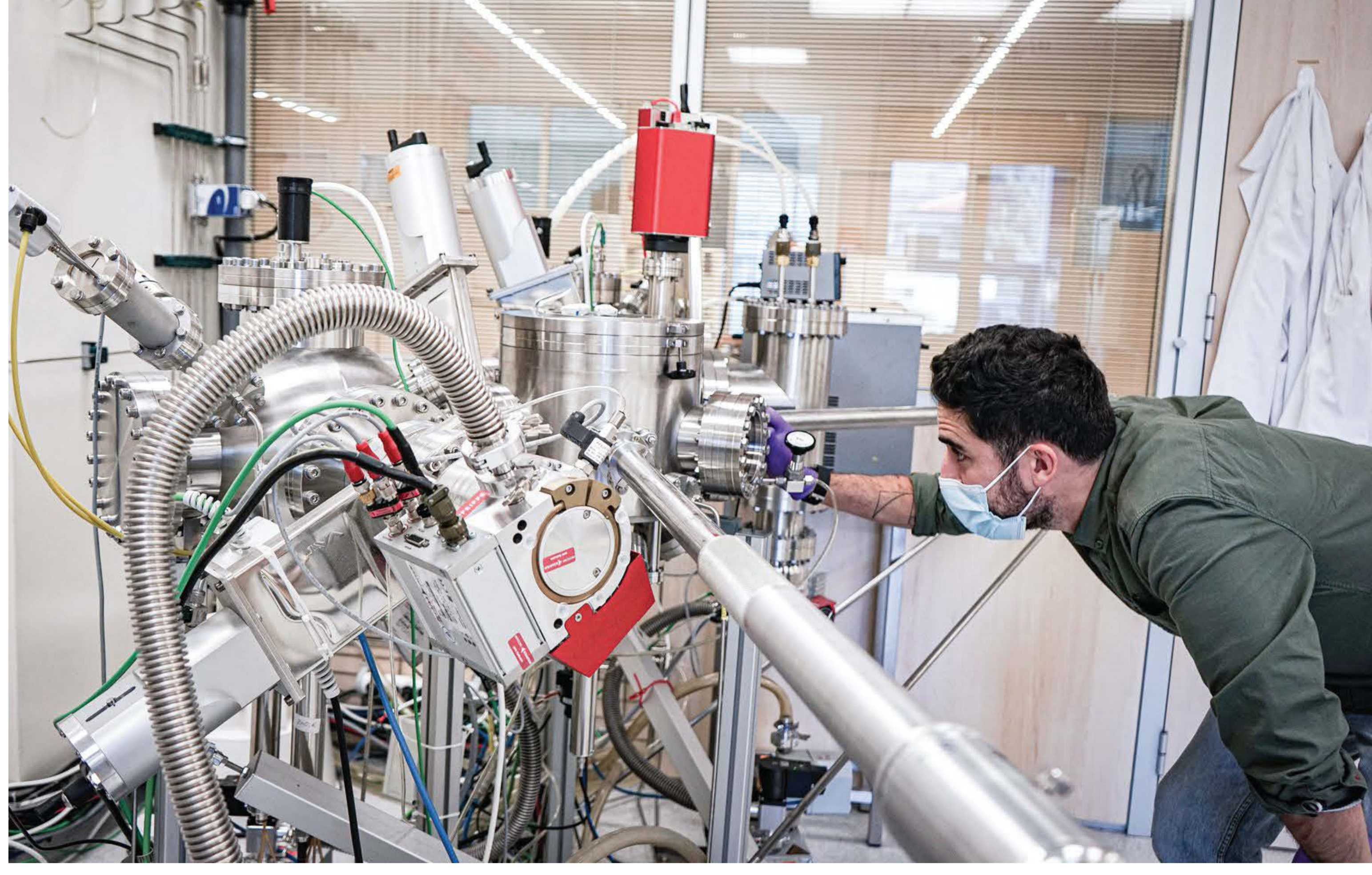
The amount of time that the free layer spends in either state is proportional to the frequency of the driving magnetic field and will have two discrete values, which can be identified as being a 0 or 1.

Perspectives

The random bits were subjected to 10 NIST tests for randomness and were found to pass all of them, only at a single frequency. This allows the design of 'biased dice', where the probability can be controlled by simply modulating the frequency applied to the field line antenna.



Due to the nanosize of the individual devices (~100 nm device diameter), there is a clear possibility for scalability, with multiple devices being connected to a single field line antenna producing synchronised but uncoupled random bits.



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