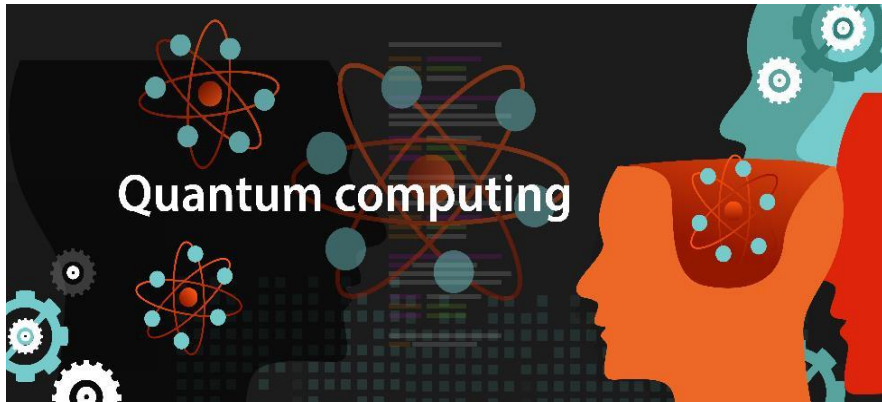


Quantum Computing Patents



Quantum Computing Patents

Industry 4.0 Research (division of **HSRC**) is an international market and technology research publisher specializing in premium Industry 4.0 and Quantum Technologies market. With an extensive portfolio of Industry 4.0 and Quantum Computing reports, **Industry 4.0 Research** has been recognized as the global leader in the Fourth Industrial Revolution market research.

601 Pennsylvania Ave., NW Suite 900. Washington DC 20004
Tel: (202) 740-960, info@i40research.com

Table of Contents

1	Key Quantum Computing Patents	4
1.1	Key Patents	4
2	Disclaimer & Copyright.....	11

1 Key Quantum Computing Patents

1.1 Key Patents

Patent #	Title
1 9,537,953	Methods and systems for quantum ready computations on the cloud
2 9,530,873	Semiconductor adiabatic qubits
3 9,524,470	Modular array of vertically integrated superconducting qubit devices for scalable quantum computing
4 9,471,880	Systems and methods for interacting with a quantum computing system
5 9,460,397	Quantum computing device spin transfer torque magnetic memory
6 9,400,499	Systems and methods for real-time quantum computer-based control of mobile systems
7 9,311,606	Quantum computer and quantum memory
8 9,256,834	Quantum computers having partial interferometric quantum gates
9 9,246,675	Cryptographic systems using pairing with errors
10 9,224,099	Quantum computer
11 9,208,445	System and method of quantum computing using three-state representation of a qubit
12 9,207,672	Systems and methods for real-time quantum computer-based control of mobile systems
13 9,152,922	Methods, apparatus, and computer program products for quantum searching for multiple search targets
14 9,152,746	Quantum annealing simulator
15 9,130,116	System and method for providing multi-conductive layer metallic interconnects for superconducting integrated circuits
16 9,049,010	Portable data encryption device with configurable security functionality and method for file encryption
17 8,995,797	Periodic probabilistic two-dimensional cluster state generator with arbitrary interconnections
18 8,897,449	Quantum computing on encrypted data
19 8,816,325	Scalable quantum computer architecture with coupled donor-quantum dot qubits

Patent #	Title
20 8,745,850	Method of manufacturing superconducting low pass filter for quantum computing
21 8,612,499	Method for evaluating quantum operator averages
22 8,543,627	Method for sampling probability distributions using a quantum computer
23 8,527,437	Method for driving starting quantum state to target one
24 8,504,497	Methods of adiabatic quantum computation
25 8,437,818	System and method for providing multi-conductive layer metallic interconnects for superconducting integrated circuits
26 8,437,168	Josephson quantum computing device and integrated circuit using such devices
27 8,423,297	Device and method for responding to influences of mind
28 RE44,097	Device and method for responding to influences of mind
29 8,374,994	System and method of quantum computing using three-state representation of a qubit
30 8,355,765	Magnetic vacuum systems and devices for use with superconducting-based computing systems
31 8,301,214	System and method for providing multi-conductive layer metallic interconnects for superconducting integrated circuits
32 8,294,967	Coherent photonic frequency conversion (CPFC) for quantum computing using pumped four-wave mixing processes
33 8,284,585	Josephson quantum computing device and integrated circuit using such devices
34 8,247,799	Superconducting shielding for use with an integrated circuit for quantum computing
35 8,244,650	Systems, methods, and apparatus for recursive quantum computing algorithms
36 8,217,202	Single carbon precursor synthons
37 8,190,553	Methods and systems for quantum search, computation and memory
38 8,178,165	Method for fabricating a long-range ordered periodic array of nano-features, and articles comprising same
39 8,164,082	Spin-bus for information transfer in quantum computing
40 8,148,715	Solid state charge qubit device
41 8,073,631	Device and method for responding to influences of mind

Patent #	Title
42 8,054,072	Quantum computer and quantum computing method
43 7,985,965	Quantum computing device and method including qubit arrays of entangled states using negative refractive index lenses
44 7,930,152	Method for signal and image processing with lattice gas processes
45 7,876,145	Control system architecture for qubits
46 7,875,876	Scalable quantum computer
47 7,847,615	Quantum bit variable coupling method, quantum computing circuit using the method, and variable coupler
48 7,830,695	Capacitive arrangement for qubit operations
49 RE41,900	Compiler for a quantum computer
50 7,805,031	Methods for fabricating color-center-based quantum computer architectures
52 7,781,754	Fermionic bell-state analyzer and quantum computer using same
53 7,747,546	Information register using endohedral fullerenes in nanotube
54 7,737,432	Voltage controlled computing element for quantum computer
55 7,732,804	Solid state charge qubit device
56 7,688,973	Encryption apparatus, decryption apparatus, key generation apparatus, program, and method
57 7,687,938	Superconducting shielding for use with an integrated circuit for quantum computing
58 7,660,533	Quantum Fourier transform based information transmission system and method
59 7,620,672	Method for performing classical Bayesian net calculations using a quantum computer
60 7,598,514	Quasi-particle interferometry for logical gates
61 7,596,318	Addressing method of quanta network and quanta network router
62 7,590,607	Non-unitary probabilistic quantum computing circuit and method
63 7,583,438	Quantum circuit and quantum computer
64 7,566,896	Lattice platforms for performing quantum computations
65 7,546,000	Scalable and defect-tolerant color-center-based quantum computer architectures and methods for fabricating color-center-based quantum

Patent #	Title
	<u>computer architectures</u>
66 <u>7,529,717</u>	<u>Universal quantum computing</u>
67 <u>7,529,437</u>	<u>Scalable and defect-tolerant quantum-dot-based quantum computer architectures and methods for fabricating quantum dots in quantum computer architectures</u>
68 <u>7,518,138</u>	<u>Systems and methods for quantum braiding</u>
69 <u>7,492,494</u>	<u>Quantum computer and quantum computing method</u>
70 <u>7,466,725</u>	<u>Quantum computer apparatus</u>
71 <u>7,451,292</u>	<u>Methods for transmitting data across quantum interfaces and quantum gates using same</u>
72 <u>7,436,175</u>	<u>Practical pulse synthesis via the discrete inverse scattering transform</u>
73 <u>7,427,771</u>	<u>Universal gates for ising TQFT via time-tilted interferometry</u>
74 <u>7,423,427</u>	<u>Arbitrarily accurate composite pulse sequences</u>
75 <u>7,418,283</u>	<u>Adiabatic quantum computation with superconducting qubits</u>
76 <u>7,394,092</u>	<u>Quasi-particle interferometry for logical gates</u>
77 <u>7,385,262</u>	<u>Band-structure modulation of nano-structures in an electric field</u>
78 <u>7,376,547</u>	<u>Systems and methods that facilitate quantum computer simulation</u>
79 <u>7,364,923</u>	<u>Dressed qubits</u>
80 <u>7,353,148</u>	<u>Generation of displays of solutions to physics problems represented by complex mathematical equations using quantum computations or simulation of quantum computations on classic computers</u>
81 <u>7,335,909</u>	<u>Superconducting phase-charge qubits</u>
82 <u>7,321,131</u>	<u>Universal gates for ising TQFT via time-tilted interferometry</u>
83 <u>7,307,275</u>	<u>Encoding and error suppression for superconducting quantum computers</u>
84 <u>7,277,872</u>	<u>Method for quantum computing</u>
85 <u>7,250,624</u>	<u>Quasi-particle interferometry for logical gates</u>
86 <u>7,176,066</u>	<u>Fabrication of nanoelectronic circuits</u>
87 <u>7,173,272</u>	<u>Quantum optical CNOT gate</u>

Patent #	Title
88 7,133,888	Method and programmable apparatus for quantum computing
89 7,126,106	Quantum computer and quantum computation method
90 7,113,967	Efficient quantum computing operations
91 7,097,708	Substituted donor atoms in silicon crystal for quantum computer
92 7,061,008	Single molecule array on silicon substrate for quantum computer
93 7,042,005	Extra-substrate control system
94 7,038,452	Practical pulse synthesis via the discrete inverse scattering transform
95 7,015,499	Permanent readout superconducting qubit
96 7,002,166	Method and system for single ion implantation
97 6,988,058	Quantum computation with quantum dots and terahertz cavity quantum electrodynamics
98 6,987,282	Quantum bit with a multi-terminal junction and loop with a phase shift
99 6,943,368	Quantum logic using three energy levels
100 6,919,579	Quantum bit with a multi-terminal junction and loop with a phase shift
101 6,911,664	Extra-substrate control system
102 6,842,047	Electrical parallel processing frequency coded logic
103 6,819,474	Quantum switches and circuits
104 6,787,794	Quantum computer
105 6,728,281	Quantum-dot photon turnstile device
106 6,728,131	Fluxon injection into annular Josephson junctions
107 6,678,450	Optical method for quantum computing
108 6,675,154	Method and system for the quantum mechanical representation and processing of fuzzy information
109 6,635,898	Quantum computer
110 6,633,053	Method and apparatus for creating at least one qubit in a quantum computing device
111 6,605,822	Quantum phase-charge coupled device

Patent #	Title
112 6,580,102	Four-terminal system for reading the state of a phase qubit
113 6,578,018	System and method for control using quantum soft computing
114 6,576,951	Four-terminal system for reading the state of a phase qubit
115 6,573,202	Four-terminal system for reading the state of a phase qubit
116 6,563,311	Quantum computing method using magnetic flux states at a josephson junction
117 6,563,310	Quantum computing method using Josephson junctions between s-wave and d-wave superconductors
118 6,504,172	Superconducting dot/anti-dot flux qubit based on time-reversal symmetry breaking effects
119 6,472,681	Quantum computer
120 6,459,097	Qubit using a Josephson junction between s-wave and d-wave superconductors
121 6,456,994	Computer for a quantum computer
122 6,437,413	Crystal lattice quantum computer
123 6,218,832	Nuclear magnetic resonance quantum computing method with improved solvents
124 5,793,091	Parallel architecture for quantum computers using ion trap arrays
125 5,530,263	Three dot computing elements
101 6,911,664	Extra-substrate control system
102 6,842,047	Electrical parallel processing frequency coded logic
103 6,819,474	Quantum switches and circuits
104 6,787,794	Quantum computer
105 6,728,281	Quantum-dot photon turnstile device
106 6,728,131	Fluxon injection into annular Josephson junctions
107 6,678,450	Optical method for quantum computing
108 6,675,154	Method and system for the quantum mechanical representation and processing of fuzzy information
109 6,635,898	Quantum computer

Patent #	Title
110 6,633,053	Method and apparatus for creating at least one qubit in a quantum computing device
111 6,605,822	Quantum phase-charge coupled device
112 6,580,102	Four-terminal system for reading the state of a phase qubit
113 6,578,018	System and method for control using quantum soft computing
114 6,576,951	Four-terminal system for reading the state of a phase qubit
115 6,573,202	Four-terminal system for reading the state of a phase qubit
116 6,563,311	Quantum computing method using magnetic flux states at a josephson junction
117 6,563,310	Quantum computing method using Josephson junctions between s-wave and d-wave superconductors
118 6,504,172	Superconducting dot/anti-dot flux qubit based on time-reversal symmetry breaking effects
119 6,472,681	Quantum computer
120 6,459,097	Qubit using a Josephson junction between s-wave and d-wave superconductors
121 6,456,994	Computer for a quantum computer
122 6,437,413	Crystal lattice quantum computer
123 6,218,832	Nuclear magnetic resonance quantum computing method with improved solvents
124 5,793,091	Parallel architecture for quantum computers using ion trap arrays
125 5,530,263	Three dot computing elements

2 Disclaimer & Copyright

HSRC Information and Data

Internal Documents and Presentations – Quoting individual sentences and paragraphs for use in your company’s internal communications do not require permission from HSRC. The use of large portions or the reproduction of any HSRC document in its entirety does require prior written approval and may involve some financial consideration.

External Publication – Any HSRC information that is to be used in advertising, press releases, or promotional materials requires prior written approval from the appropriate HSRC President or Country Manager. A Draft of the proposed document should accompany any such request. HSRC reserves the rights to deny approval of external usage for any reason.

Note: This is a Single User License Copy – unless otherwise stipulated in the purchase agreement

Exclusion of Warranties and Liabilities

HSRC used its reasonable endeavor to provide information that is accurate. However, HSRC makes no representation or warranty as to the accuracy or completeness of any information provided. HSRC also expressly disclaims any representation or warranties that may be implied under applicable law, including, without limitation, any warranty of merchantability or fitness for a particular use.

HSRC is not liable for any loss or damage claimed to have resulted from the use by, or on behalf of, the client of any information or material furnished by HSRC, regardless of the circumstances or cause of action (including negligence), and the client shall hold HSRC harmless from, and indemnify it for, any loss, cost, or expense including reasonable attorneys' fees, suffered or incurred as a result of, or in connection with, any claim, suit, or action by the client or any third party relating to that use. In no event (including negligence) will HSRC be liable for any indirect, special, consequential, or exemplary damages, even if HSRC was advised of the possibility of such damages, or for any damages in excess of the amount actually received by HSRC under this Agreement as of the date when the cause of action occur.

Copyrighted © 2017, HSRC. All Rights Reserved.

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form, by any means, electronic, mechanical, or by photocopying, recording, or otherwise, without prior written permission of Homeland Security Research Corporation.