CLAIMS

1. A quantum circuit, comprising:

a plurality of Josephson junctions coupled together in series and in parallel, such that at least two of the Josephson junctions are coupled together in series and at least two of the Josephson junctions are coupled together in parallel,

wherein the quantum circuit is configured to receive a plurality of pump signal components, each pump signal component parametrically adjusting a Josephson junction gain in such a manner that the quantum circuit acts as an amplifier.

2. The quantum circuit of claim 12, wherein the non-linear circuit elements are Josephson junctions.

3. The quantum circuit of claim 1, wherein N of the Josephson junctions are coupled together in series within a sub-circuit of the quantum circuit, and wherein a plurality of said sub-circuits are coupled together in parallel M times within the quantum circuit.

4. The quantum circuit of claim 3, wherein N is at least 3 and M is at least 3.

5. The quantum circuit of claim 3, further comprising a first capacitor within each of the plurality of sub-circuits.

6. The quantum circuit of claim 3, further comprising at least one inductor within each of the plurality of sub-circuits.

7. The quantum circuit of claim 3, further comprising a plurality of second capacitors each coupled between neighboring pairs of the sub-circuits.

8. The quantum circuit of claim 12, wherein the plurality of non-linear circuit elements are substantially identical to one another.

9. The quantum circuit of claim 1, wherein the quantum circuit is configured to operate the plurality of circuit elements in a hybrid common mode.

10. The quantum circuit of claim 1, wherein the quantum circuit is configured to receive an input signal component and to amplify said input signal component.

11. The quantum circuit of claim 10, wherein the quantum circuit is configured to receive a current source, and wherein the input signal component and the plurality of pump signal components are components of the current source.

12. A quantum circuit, comprising:

a network of a plurality of sub-circuits coupled in parallel, wherein each sub-circuit includes a plurality of non-linear circuit elements coupled in series,

wherein the network is configured to receive an input, across the plurality of sub-circuits, the input comprising a signal to be amplified and a plurality of pump signal components, each pump signal component parametrically adjusting a non-linear circuit element gain in such a manner that the network acts as an amplifier.

13. The quantum circuit of claim 12, wherein N of the non-linear circuit elements are coupled in series within each sub-circuit of the quantum circuit, wherein the network comprises M sub-circuits coupled in parallel, and wherein N is at least 3 and M is at least 3.

14. The quantum circuit of claim 12, further comprising a first capacitor within each of the plurality of sub-circuits.

15. The quantum circuit of claim 12, further comprising at least one inductor within each of the plurality of sub-circuits.

16. The quantum circuit of claim 15, wherein the at least one inductor includes one or more inductors distinct from the one or more circuit elements.

17. The quantum circuit of claim 12, further comprising a plurality of second capacitors each coupled between neighboring pairs of the sub-circuits.