WHAT IS CLAIMED IS:

1. A system, comprising:

a first superconducting terminal,

a second superconducting terminal,

a graphene channel comprising a portion of a graphene sheet, and

a conductive gate,

the first superconducting terminal, the second superconducting terminal, and the graphene channel together forming a Josephson junction having an oscillation frequency, and

the conductive gate being configured, upon application of a voltage across the conductive gate and the graphene channel, to modify the oscillation frequency by changing a resistance of the graphene channel.

2. The system of claim 1, wherein a gap between the first superconducting terminal and the second superconducting terminal has a length greater than 100 nm and less than 1000 nm.

3. The system of claim 2, wherein the gap has a width greater than 0.5 microns and less than 10 microns.

4. The system of any of claims 1-3, further comprising a first bias circuit connected to the first superconducting terminal and the second superconducting terminal and configured to drive a bias current through the Josephson junction.

5. The system of claim 4, wherein the Josephson junction has a critical current, and the bias current is greater than the critical current and less than 1.2 times the critical current.

6. The system of any of claims 1-5, further comprising a second bias circuit connected to the conductive gate and configured to apply a voltage to the conductive gate.

7. The system of any of claims 1-6, further comprising a graphene sandwich comprising:

a first layer of hexagonal boron nitride immediately adjacent a first surface of the graphene sheet,

the graphene sheet, and

a second layer of hexagonal boron nitride immediately adjacent a second surface of the graphene sheet.

8. The system of claim 7, wherein the conductive gate is directly on the graphene sandwich.

9. The system of claim 7, further comprising a gate insulating layer directly on the graphene sandwich, the conductive gate being directly on the gate insulating layer.

10. The system of claim 9, wherein the gate insulating layer is composed of aluminum oxide.

11. The system of claim 7, further comprising a substrate, wherein the first superconducting terminal, the second superconducting terminal, and the graphene sandwich are on the substrate.

12. The system of claim 11, wherein the substrate is a silicon substrate.

13. The system of any of claims 1-12, wherein the graphene sheet consists of a single atomic layer of graphene.

14. The system of any of claims 1-12, wherein the graphene sheet comprises two atomic layers of graphene.

15. The system of any of claims 1-14, wherein the first superconducting terminal and the second superconducting terminal are composed of a material selected from the group consisting of niobium nitride, niobium titanium nitride, niobium diselenide, aluminum, niobium, niobium titanium, and lead.

16. The system of any of claims 1-15, further comprising a refrigerator configured to cool the graphene sheet to a temperature below 4 K.

17. The system of claim 16, wherein the refrigerator is a pulse tube refrigerator.

18. The system of any of claims 1-17, further comprising an antenna comprising a first conductor, and a second conductor,

wherein:

the first superconducting terminal is connected to the first conductor of the antenna, and

the second superconducting terminal is connected to the second conductor of the antenna.

19. The system of any of claims 1-18, further comprising a quarter-wave open stub, connected to the first superconducting terminal.

20. The system of claim 19, further comprising a quarter-wave section of transmission line, connected to the second superconducting terminal.