

CLAIMS

1. A microwave amplifier for amplifying electromagnetic (EM) signals at a fundamental frequency, the amplifier comprising:
- 5 a transistor configured to provide an amplified microwave signal at an output thereof; and
- a load network coupled to the output for shaping a waveform of the amplified microwave signal,
- 10 wherein the load network comprises:
- a fundamental matching network that is tunable to provide impedance matching at the fundamental frequency;
- a half-wave transmission line for a second harmonic frequency of the amplified microwave signal, the half-wave transmission line being disposed between the output and the
- 15 fundamental matching network;
- a quarter-wave stub and a five-quarter-wave stub for a third harmonic frequency of the amplified microwave signal arranged on the half-wave transmission line to provide an open circuit condition at the third harmonic frequency; and
- 20 a quarter-wave stub for the second harmonic frequency and a quarter-wave stub for the fundamental frequency, arranged on the half-wave transmission line to provide a short circuit condition at the second harmonic frequency.
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2. A microwave amplifier according to claim 1, wherein the quarter-wave stub and the five-quarter wave stub for the third harmonic frequency are arranged to oppose each other at
- 30 a distance along the half-wave transmission line equal to a quarter-wave for a third harmonic frequency.
3. A microwave amplifier according to claim 1 or claim 2, wherein the quarter-wave stub for the second harmonic frequency and the quarter-wave stub for the fundamental frequency are arranged to oppose each other at an output of the half-wave transmission line.
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4. A microwave amplifier according to any preceding claim, wherein a bias voltage is applied to the transistor
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through the quarter-wave stub for the fundamental frequency.

5           5.     A microwave amplifier according to claim 4, further comprising a capacitor arranged between the bias voltage input and the quarter-wave stub for the fundamental frequency.

10           6.     A microwave amplifier according to any one of the preceding claims, wherein the half-wave transmission line for the second harmonic frequency comprises a quarter-wave transmission line for a third harmonic frequency, the quarter-wave stub and five-quarter-wave stub for the third harmonic frequency being arranged to oppose each other at the output of the quarter-wave transmission line for the third harmonic frequency.

15           7.     A microwave amplifier according to any one of the preceding claims, wherein the transistor is a GaN-based HEMT.

20           8.     A microwave signal generator for generating high power microwave electromagnetic (EM) radiation, the generator comprising:

          a microwave source arranged to generate microwave EM radiation at a first power, and

25           a microwave amplifier according to any one of claims 1 to 7, wherein the microwave amplifier is arranged to amplify the microwave EM radiation from the first power to a second power that is higher than the first power.

30           9.     A microwave signal generator according to claim 8, further comprising a direct current (DC) power source for supply DC energy.

          10.    An electrosurgical apparatus for performing electrosurgery, the apparatus comprising:

35           a microwave source arranged to generate microwave electromagnetic (EM) radiation at a first power;

          a microwave amplifier according to any one of claims 1 to 7, arranged to amplify the microwave EM radiation from a first power to a second power that is higher than the first power;

a probe arranged to deliver the microwave EM radiation at the second power from a distal end thereof for treating biological tissue; and

5 a feed structure for conveying microwave EM energy from the microwave generator to the microwave amplifier and to the probe,

wherein the probe is arranged at a distal end of the feed structure.

10 11. An electrosurgical apparatus according to claim 10, further comprising a direct current (DC) power source for supplying DC energy to the microwave signal generator, wherein the DC power source is integrated with the probe.

15 12. An electrosurgical apparatus according to any one of claims 10 or 11, wherein the microwave amplifier is mounted in the probe.

20 13. An electrosurgical apparatus according to any one of claims 10 to 12, wherein the microwave signal generator is mounted in the probe.

25 14. An electrosurgical apparatus according to any one of claims 10 to 13, wherein the apparatus further comprises a scoping device having a body and an instrument cord, wherein an instrument channel extends through the instrument cord, and wherein the probe is insertable through the instrument channel.

30 15. An electrosurgical apparatus according to any one of claims 10 to 14, wherein the apparatus further comprises a handle connected to the probe via a flexible shaft.