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(54) **Title:** MODULATED MULTI-FREQUENCY PROCESSING METHOD

(57) **Abstract:** A method is provided for operating a processing system having a space therein arranged to receive a gas and an electromagnetic field generating portion operable to generate an electromagnetic field within the space. The method includes providing a gas into the space, and operating the electromagnetic field generating portion with a driving potential to generate an electromagnetic field within the space to transform at least a portion of the gas into plasma. The driving potential as a function of time is based on a first potential function portion and a second potential function portion. The first potential function portion comprises a first continuous periodic portion having a first amplitude and a first frequency. The second potential function portion comprises a second periodic portion having a maximum amplitude portion, and minimum amplitude portion and a duty cycle. The maximum amplitude portion is a higher amplitude than the minimum amplitude portion. The duty cycle is the ratio of a duration of the maximum amplitude portion to the sum of the duration of the maximum amplitude portion and the duration of the minimum amplitude portion. The second periodic portion additionally has a second frequency during the maximum amplitude portion. An amplitude modulation of the second periodic portion is phase locked to the first continuous periodic portion.

