Claims

1. Mass spectrometer comprising:
an ion trap (2), comprising:
a first ring-shaped end cap electrode (4a) and a second ring-shaped end cap electrode (4b), between which is formed a ring-shaped ion storage cell (5), the first end cap electrode (4a) and the second end cap electrode (4b) being divided into at least two ring-shaped segments (Q1, Q2, Q3, Q4) in the circumferential direction,

a plurality (N) of radially inner disk-shaped ring electrodes (E1,i) and a plurality (N) of radially outer disk-shaped ring electrodes (E2,i) that delimit the ring-shaped ion storage cell (5), and
a control device (3) that is designed to actuate the disk-shaped ring electrodes ($E_{1,i}$, $E_{2,i}$) and the end cap electrodes (4a, 4b) for the storage, selection, excitation and/or detection of ions (6) in the ring-shaped ion storage cell (5), characterised in that the control device (3) is designed, on the basis of ion signals (S1, S2) recorded at different segments (Q1, Q2, Q3, Q4) of the end cap electrodes (4a, 4b), to determine a time-related dispersion of the ions (6) that are injected in a pulsed manner into the ion storage cell (5).

2. Mass spectrometer according to claim 1, in which the inner ring electrodes (E1,i) and the outer ring electrodes (E2,i) are arranged at a constant radial distance (2 r0) from one another.

3. Mass spectrometer according to claim 1 or 2, in which a radial distance ($2\ r_0$) between the inner ring electrodes ($E_{1,i}$) and the outer ring electrodes ($E_{2,i}$) is smaller than a radius (R) of the ring-shaped end cap electrodes (4a, 4b).

4. Mass spectrometer according to one of the preceding claims, in which in each case an inner ring electrode ($E_{1,i}$) and an outer ring electrode ($E_{2,i}$) are arranged on a common plane (X, Y) perpendicular to an axial direction (Z).

5. Mass spectrometer according to one of the preceding claims, in which in each case an inner ring electrode ($E_{1,i}$) and an outer ring electrode ($E_{2,i}$) are connected to one another in an electrically conductive manner.

6. Mass spectrometer according to claim 4, in which for a width b of a respective disk-shaped ring electrode ($E_{1,i}$, $E_{2,i}$) and a distance d in the axial direction (Z) between, respectively, two adjacent disk-shaped ring electrodes ($E_{1,i}$, $E_{1,i+1}$; $E_{2,i}$, $E_{2,i+1}$), the following applies: $d / b < 1 / 4$.

7. Mass spectrometer according to one of the preceding claims, which has a number N of radially inner ring electrodes ($E_{1,i}$) and a number N of radially outer ring electrodes ($E_{2,i}$), for which the following applies: $10 < N < 200$.

8. Mass spectrometer according to one of the preceding claims, further comprising: at least one injection device (9) for the injection of ions (6) and/or of an electron beam (10) into the ring-shaped ion storage cell (5).

9. Mass spectrometer according to any one of the preceding claims, in which the control device (3) is arranged at least partially within a volume area (7) that is surrounded by the ring-shaped ion storage cell (5).

10. Mass spectrometer according to any one of the preceding claims, in which the control device (3) is designed to actuate the disk-shaped ring electrodes ($E_{1,i}$, $E_{2,i}$) to produce a respective HF storage voltage ($V_{RF,i}$) to store ions (6) in the ion storage cell (5).

11. Mass spectrometer according to one of the claim 8, in which the control device (3) is designed to divert the electron beam (10) injected tangentially into the ring-shaped ion storage cell (5) along a circular trajectory (11).