## Cavity Design tutorial part 3

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## Task 3: Cavity frequency and field calculations

- Pill box vs half wave resonator (HWR)
  - 1 a) Assume a pill box of diameter=0.6 m What are the frequencies and wavelengths of the two lowest accelerating modes.
  - 1 b) What is the height of the HWR that would have the same fundamental frequency as the pill box in 1a.
  - 1 c) Assuming the HWR cavity in 1b operating in the fundamental mode with characteristic parameters a=3cm and b=9cm and a maximum inner conductor voltage of 500 kV – what are the peak electric field and peak magnetic field on the cavity surface

## Task 4: RF cavity type

- Room temperature vs superconducting
  - a. A 400MHz Cu cavity at room temperature has a Geometry factor of G=100  $\Omega$  and Ra/Q = 250  $\Omega$  with  $\sigma$  = 58 x 106 S/m
    - i. Calculate the skin depth and rf surface resistance and the Q
    - ii. Calculate the power absorbed in the cavity for Veff = 1MV
  - b. An identical 400MHz cavity but made from Niobium is cooled to 4.2K
    - i. Calculate the total rf surface resistance assuming that R0 = 10 n $\Omega$  and the Q
    - ii. Calculate the power absorbed in the cavity for Veff = 1MV