



Industrial Consultancy & Sponsored Research (IC&SR)

Apparatus for varying resonant frequency in a multi-frequency radio frequency (RF) Micro-Electro-Mechanical System (MEMS) switch IITM Technology Available for Licensing

Problem Statement

□ The problem statement discussed in the present invention is **how to vary resonant frequency in a radio frequency (RF) MEMS capacitive switch**.

□ Hence, subject invention addresses the issue.

Technology Category/ Market

Technology:; Apparatus for varying resonant frequency in a multi-frequency RF Micro-Electro-Mechanical System (MEMS) switch

Industry/Application: RF MEMS Switch, ESDM;

Market: The global RF MEMS market is projected to reach at a **CAGR** of **13.08%** during the period **(2024-32)**.

Technology

□ Present patent describes an **apparatus** for **varying resonant frequency** in a multi-frequency radio frequency (RF) Micro-Electro-Mechanical System (MEMS) capacitive switch. (Refer Fig.1 & Fig. 2)

□ The apparatus includes a multi-frequency RF MEMS capacitive switch, a plurality of floating metals **spaced uniformly** in the multi frequency RF MEMS capacitive switch, a lateral thermal actuator, a push-pull beam with a contact arm and a plane tip or a T-shaped tip and a buckling actuator.

□ The buckling actuator, the push-pull beam and the lateral thermal actuator are in the **same horizontal plane** in the initial state (**ON –state of the switch**).

□ Further, a first (1st) direct current (DC) voltage is applied to the **lateral thermal actuator** and a second (2nd) DC voltage is applied to the **buckling actuator**.

□ The buckling actuator buckles upward from a first (1st) position to a 2nd position when the second (2nd) DC voltage is applied to the buckling actuator.

□ The **push-pull beam** is pushed laterally by the lateral thermal actuator towards the plurality of floating metals when the 1st DC voltage is applied to the lateral thermal actuator.

□ The **voltages** can be applied to the buckling actuator and the lateral thermal actuator at the **same time or at different times**.

□ The **former** case, the distance of separation between the buckling actuator and the push-pull beam and the 1st & 2nd voltages to be applied on them are optimized so as to assure that the buckling actuator has moved **upward displacing itself** from the path of the push-pull beam.

□ The **latter** case, the distance of separation and the voltages are not time-dependent, unlike the former case.

□ Moreover, each of the floating metal is segmented.

TRL (Technology Readiness Level)

TRL-4, Technology validated in Lab;

Intellectual Property

IITM IDF Ref. 1339; Patent No. 363823

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Images

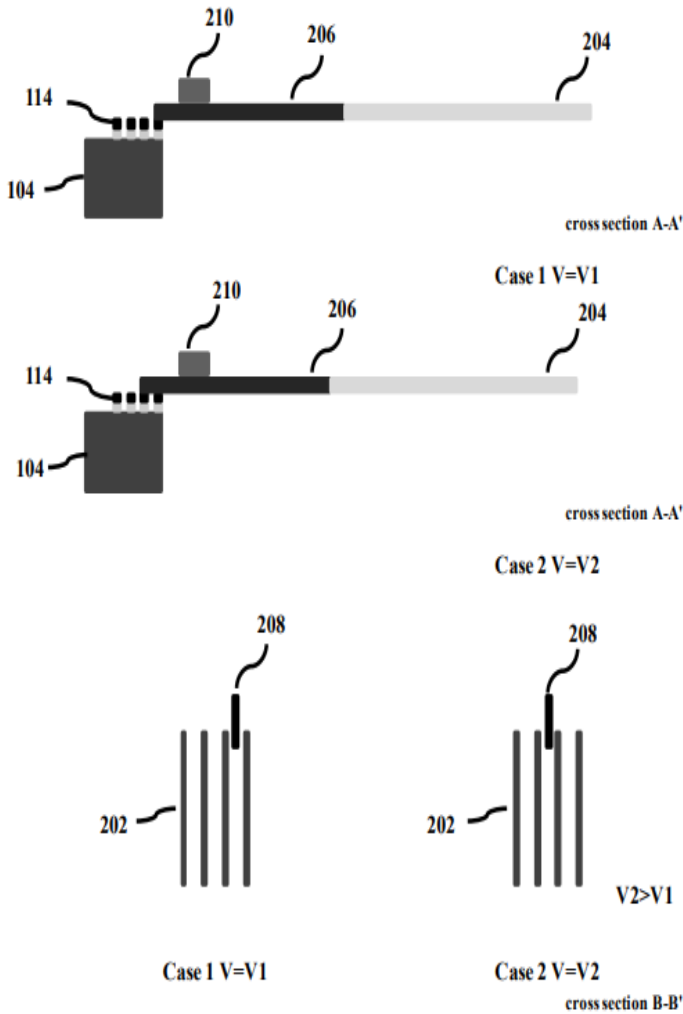
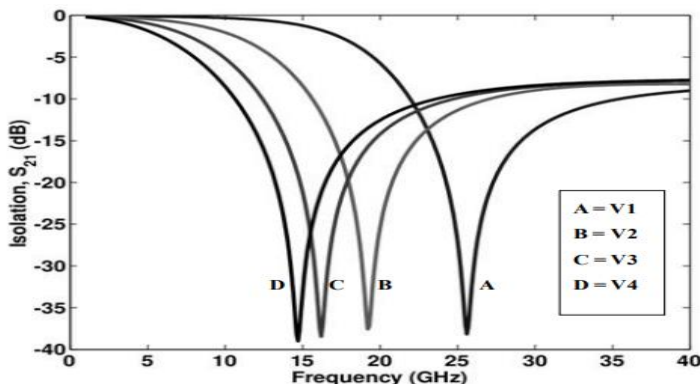
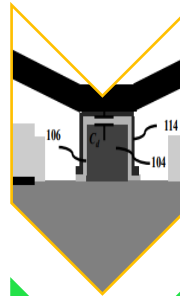


Fig.1 depicts a buckling actuator on a push-pull beam as claimed in the subject invention.



Key Features / Value Proposition



The proposed method facilitates a plurality of floating metals spaced uniformly in the multi-frequency RF MEMS capacitive switch.



Provide the RF MEMS capacitive switch with a lateral thermal actuator, a push-pull beam with a contact arm and a buckling actuator to vary the resonant frequency of the RF MEMS capacitive switch.



Based on a position of the push-pull beam over the plurality of floating metals, the resonant frequency of RF MEMS capacitive switch is varying,



Position of the push pull beam over the plurality of floating metals is varied by varying said first DC voltage applied to the lateral thermal actuator



Applications : Stationary Dielectric on metal (DOM), ESDM,

Fig.3 (left) shows **variation of isolation with frequency** for various values of lateral displacement of the beam.

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