A locally modulated static magnetic field for reduction of the SEY and also mitigation for multipactoring - a proposal

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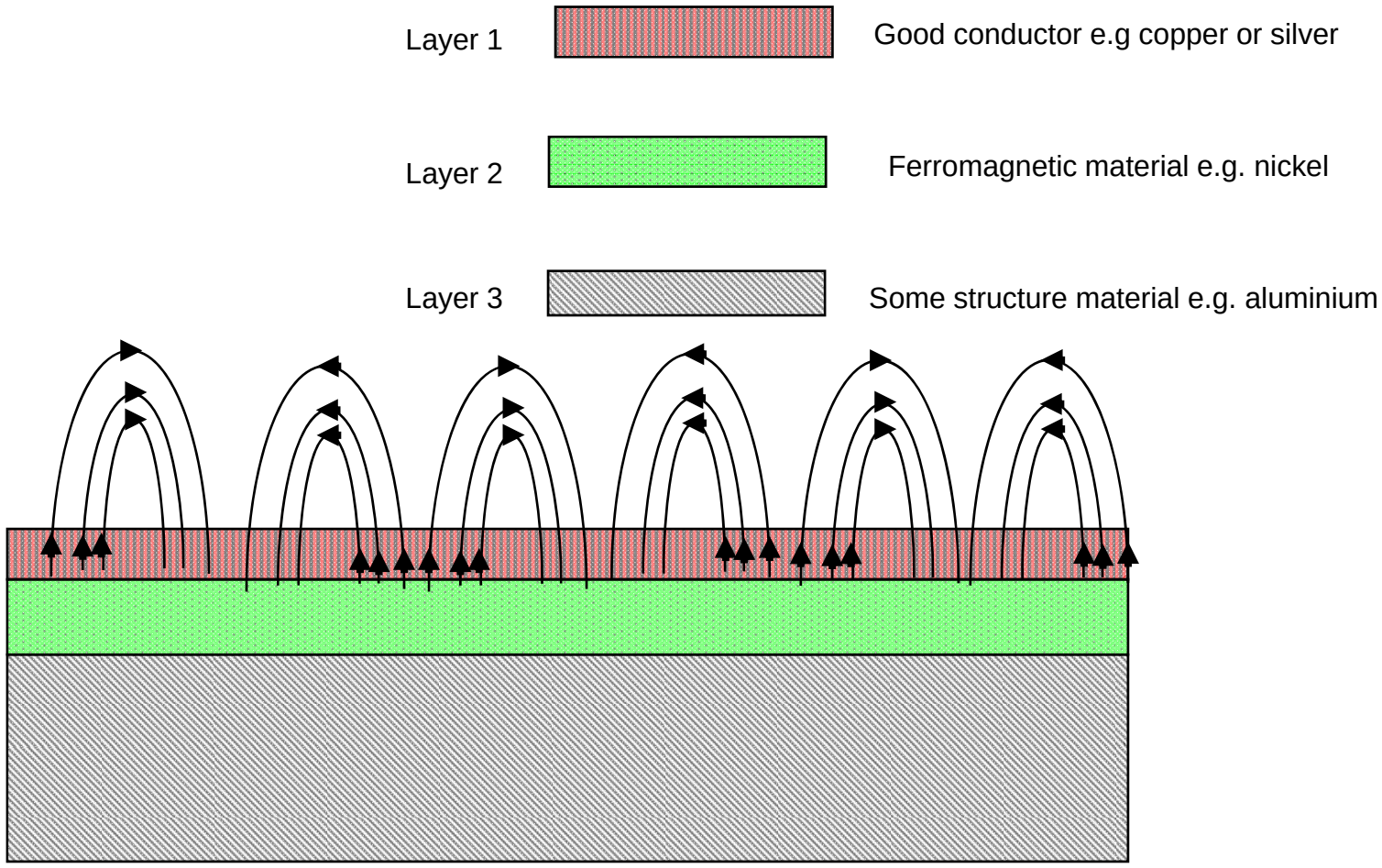
Introduction

- We know that surface roughening and or preparation of grooves can significantly reduce the SEY (secondary electron yield)
- But grooves or rough surfaces deteriorate the RF performace (skin effect losses)
- We know that multipactoring problems can be mitigated by static electric and/or magnetic fields (example: electric bias of couplers in certain cavities)
- Global static and magnetic fields are in may cases not applicable (i.e.waveguide filter structures in satellites)
- We had the „nickel syndrom“ at CERN with LEP where on the aluminium body of the vaccum chamber for reasons of electrochemical plating a thin (micron) nickel layer was applied. This nickel layer has led to significant pertubations of the magnetic field homogeneity field in the machine
- Such nickel layers are often also used for the same reason (electrochemical process) in satellite filter structures (aluminium body). Note that there exist also nonmagnetic nickel „alloys“ by adding 18% of phosphor.

The idea: (born at Mulcopim 2008 in Valencia Sept 2008)



Just magnetise the the anyway existing nickel layer with a magnetisation pattern similar to that of a magetic tape to create a magnetic surface roughness

The application (if it works)

- So far this was just an idea, essentially based on intuition
- But we need some evidence, thus simulations are underway and also preparations for experimental tests (prelim sim. results coming in)
- If it can be shown that the concepts works it should be applicable in

Satellite filters
normal conducting RF cavities and couplers
field free beampipe regions (drift space)
perhaps certain high power electron tubes

One may consider to apply the concept also the beampipe regions with static bending or quad fields, but then we need a modification. We could apply a ferromagentic layer a tiny patches (10 micron size) which form local magnetic dipoles in an external field and thus produce a very local „magnetic roughness“ with very small impact on the field seen by the beam