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Titanium coating of ceramics for vacuum chambers for PSB RF system

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In the framework of the Large Hadron Collider Injectors Upgrade (LIU), CERN is replacing the RF cavities of the Proton Synchrotron Booster (PSB). The vacuum chambers of the RF system are composed of stacks of 6 ceramic rings, separated by stainless steel tubes, for a total length of about 1 meter. In order to prevent charge build-up on the inner walls of the ceramics during operation and to reduce electron multipacting, a high resistivity titanium thin film is needed on the internal surface of the ceramic rings.
A two-step coating process was developed. First, before brazing the stainless steel tubes to the ceramic rings, a low resistivity Ti coating (in the range of 50-100 Ohm) is applied to the chamfered extremities of the ceramic rings by planar magnetron sputtering. The role of this first coating is to ensure a good electrical contact between the stainless steel tubes and the high resistivity film (10 MOhm / square) to be deposited in the second step, once the mechanical assembly of the chambers is finished. In this second step, each ceramic ring is coated individually by a movable cylindrical post magnetron-sputtering source to guarantee the specified electrical resistivity.
In this work, we describe the two-step coating process, the coating system and the status of the production of 28 PSB RF vacuum chambers.

Keywords
magnetron deposition
particle accelerator
cylindrical configuration