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# Dielectric Assist Accelerating (DAA) structures for compact linear accelerators of low energy particles in hadrontherapy treatments.

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Dielectric Assist Accelerating (DAA) structures based on ultralow-loss ceramic are being studied as an alternative to conventional disk-loaded copper cavities. This accelerating structure consists of dielectric disks with irises arranged periodically in metallic structures working under the TM02$-\pi$ mode.
Here, the numerical design of an S-band DAA structure for low beta particles, such as protons or carbon ions used for hadrontherapy treatments, is shown. Four dielectrics with different permittivity and loss tangent are studied as well as different particle velocities depending on the energy range.
Through optimization, most of the RF power is stored in the vacuum space near the beam axis, leading to a significant reduction of power loss on the metallic walls. This allows to fabricate cavities with extremely high quality factor over 100 000 and shunt impedance over 300 M$\Omega$/m at room temperature.
During the numerical study, the design optimization has been improved by adjusting some of the cell parameters in order to both increase the shunt impedance and reduce the peak electric field in certain locations of the cavity, which can lead to instabilities in its normal operation. In addition, first multipactor simulations are being carried out, using several coatings to reduce SEY, which has also been taken into account in the electromagnetic result. Finally, thermal and mechanical analysis has been performed in order to estimate cavity performance and cooling.

**Primary author:** MARTINEZ-REVIRIEGO, Pablo (Instituto de Fisica Corpuscular (IFIC))

**Co-authors:** MENÉNDEZ, Abraham (Instituto de Física Corpuscular (IFIC)); GRUDIEV, Alexej (CERN); BLANCH GUTIERREZ, Cesar (IFIC); ESPERANTE PEREIRA, Daniel (Universidade de Santiago de Compostela, Spain); GONZÁLEZ IGLESIAS, Daniel; MARTÍNEZ, Eduardo (Instituto de Física Corpuscular); BENITO, Gimeno Martinez (University of Valencia); FUSTER VERDU, Juan (IFIC (CSIC-UV)); FUSTER MARTÍNEZ, Nuria (Instituto de Física Corpuscular, IFIC (CSIC-UV)); MARTÍN-LUNA, Pablo

**Presenter:** MARTINEZ-REVIRIEGO, Pablo (Instituto de Fisica Corpuscular (IFIC))

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