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## Expansion of the $\mu$ TCA based direct sampling LLRF at MedAustron for hadron synchrotron applications

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The MedAustron Ion Therapy Centre is a synchrotron-based particle therapy facility, which delivers proton and carbon beams for clinical treatments. Currently, the facility treats 40 patients per day and is improving its systems and workflows to further increase this number. Although MedAustron is a young and modern center, the life-cycle of certain crucial control electronics is near end-of-life and needs to be addressed. This paper covers the expansion of the direct sampling  $\mu$ TCA based LLRF system presented in posters at Linac2022 and IBIC2022\*. These extensions are particle beam-based regulation loops, which allow regulation of the heavy ion beams in the synchrotron. At the moment a phase regulation loop, to align cavity phases to beam phases, and a radial position regulation loop, to keep the beam orbit centered in the beam pipe are realized. Both of these additions rely on the already implemented real time configurable NCOs, the cavity regulation and the position measurement already presented in the posters mentioned above. The regulation can act on the base frequency of the NCO or the requested cavity phase to attain the requested setpoint.

### Funding Agency

### Footnotes

- Linac 2022 Proceedings THPOPA12 \*\* IBIC 2022 Proceedings TUP10

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Yes

**Primary author:** WOLF, Markus (EBG MedAustron GmbH)

**Co-authors:** BARDORFER, Ales (Instrumentation Technologies); BARICEVIC, Borut (Instrumentation Technologies); KURFUERST, Christoph (EBG MedAustron GmbH); SCHMITZER, Claus (EBG MedAustron GmbH); REPOVZ, Matjaz (EBG MedAustron GmbH); SKABAR, Matjaz (Instrumentation Technologies); CERV, Miha (CIVIDEC Instrumentation); PAGLOVEC, Peter (Instrumentation Technologies); MYALSKI, Szymon (EBG MedAustron GmbH)

**Presenter:** WOLF, Markus (EBG MedAustron GmbH)

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