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AISHa, NEW ION BEAMS FOR HADRONTHERAPY AND RESEARCH

At the end of 2016, AISHa (Advanced Ion Source for Hadron Therapy) produced its first ion beam. Designed at the INFN Southern National Laboratories, AISHa is an innovative source of ions for hadrontherapy, a technique for the treatment of tumours in which protons or ions beams, accelerated in cyclotrons or synchrotrons, are directed against tumour cells.

AISHa was designed with the objective of creating a source of high-performance ions suitable for installation and use in hospital environments. It must therefore be easy to use and maintain, consume little energy and produce particle beams with high reliability, intensity, charge and brilliance. The recent launch of the source with production of the first beam has shown that AISHa's operating parameters meet these requirements and that it is therefore now possible to start the source characterisation phase, which will continue throughout 2017. AISHa also presents technological innovations that will allow it to compete with the best ion sources currently available.

AISHa is the result of the work of a team of over twenty researchers and technicians, engaged on the project since 2013. In February last year, the core of the source was produced and, after being completed over the year with the mechanical part, it produced the first ion beam.

Compared to other ion sources currently used in hadrontherapy, AISHa envisages a more intense and flexible magnetic field, thanks to the use of 4 superconducting coils brought to an operating temperature of 4 Kelvin. The source is also characterised by an innovative plasma heating system - a key element of the source itself - that increases the probability of producing ions with the desired state of charge.

A further peculiarity of AISHa lies in the fact that the source is not limited to the production of protons or carbon ions, it is additionally able to produce a wide variety of ionic species, from lithium to heavier metal ions, a characteristic for which it could also be useful in basic research. Moreover, the new source was designed to be compact, despite its high performance. It will therefore be suitable to be

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used in Italian hadrontherapy centres, as well as in basic nuclear physics research internationally. The AISHa project was funded also thanks to the regional development fund dedicated to small and medium enterprises integrated with research institutes, the ROP Sicily ERDF fund, in the context of which the Region has earmarked around four million euros for the project. The INFN partners in this context are HITEC2000 srl, UNICO srl and C3SL. ■