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RF kicker at the Cyrcé facility in Strasbourg

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The Cyrcé facility of IPHC in Strasbourg operates a TR24 cyclotron to produce medical isotopes, lead radiobiology programs and test detectors.
A RF kicker has been developed in order to discard one beam bunch over two to get a rate close to 40MHz. An RF voltage at a quarter of the cyclotron frequency applied to a deflector in the injection line allows to reach that goal. The 30keV DC beam from the ion source is discarded except at the zero crossing of the RF. With a proper phase difference between the two RF, only one accelerating phase of the cyclotron over two is populated resulting in a bunch rate of 42.5MHz.
A second need for radiobiology is to switch the beam on and off with the highest raise and fall times. This is done by adjusting the phase of the kicker to block the beam.
The kicker is made of a collimator (diam. 8 mm), followed by 2 deflectors (55 mm long, 50 mm wide) spaced by 40 mm and a second collimators (diam. 6mm) at 160 mm downstream the deflectors, also used as a beam dump for the deflected ions.
The high voltage is achieved by a resonant circuit consisting of a coil and the deflector, excited by a second coil. A second variable capacitor is added for tuning. The excitation coil position allows to adjust the matching. Scintillators associated with fast electronics has shown that the bunche rate was half the cyclotron frequency as expected. The beam rejection was measured to values up to 10-5.
The raising and falling times of the beam was measured to 10µs.

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Footnotes

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Yes

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