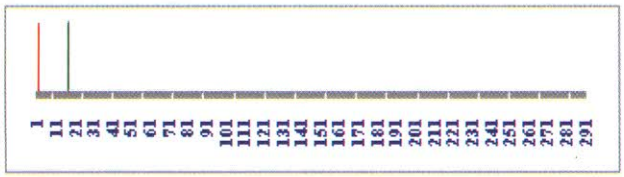
A.2: New bunch filling patterns for Indus-2 ring

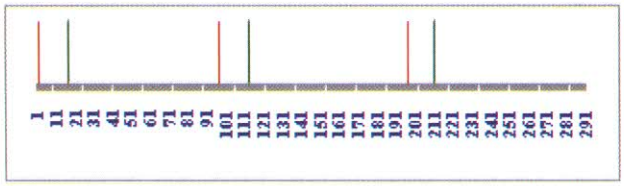
The electron bunch filling pattern in Indus-2 ring is controlled by the Versa Module Eurocard (VME) based Timing Control System. The algorithm is implemented in an OS-9 program running on Motorola 68K CPU board. Indus-2 ring has a total of 291 positions in which bunches can be filled. These are called as Buckets which are about 2 nsec apart. Out of three bunches revolving in booster two bunches get extracted and filled in Indus-2. These two bunches are separated by a distance corresponding to 16 buckets of Indus-2. So if the first bunch is filled at bucket-1 then the second will get filled at bucket-17. The second bunch can be referred as 'Concomitant bunch'.

A sequence of consecutive bunches is called a 'Train'. A train contains main as well as concomitant bunches but without overlapping i.e. a main and a concomitant bunch will not be filled at the same given bucket in a train. Initially there were three bunch filling patterns available to the operator. Recently five more bunch filling patterns have been incorporated in the system. These are required for ion trapping studies and for high current injection trials. This article briefly describes all the eight patterns.

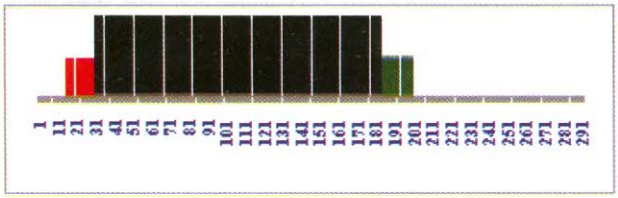
1. Single bunch:
In this mode the operator selects a single bunch number (1 to 291) that has to be filled. Along with the main bunch (red) the concomitant bunch (green) also gets filled.



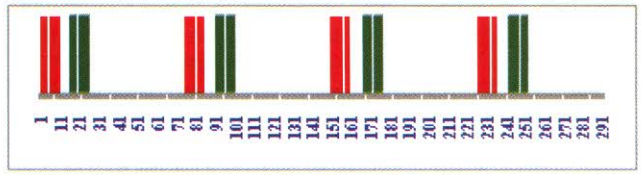
2. Three symmetric bunch:
In this mode bunches at bucket location 1, 97 and 194 are filled along with their corresponding concomitant bunches.



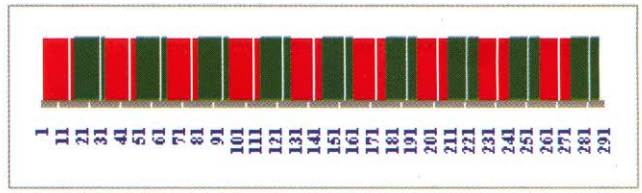
3. Multiple bunch:
In this mode the operator selects the start and end bucket numbers (1 to 291). The buckets between these two values are filled repeatedly with overlapping (black) of main bunches and concomitant bunches.



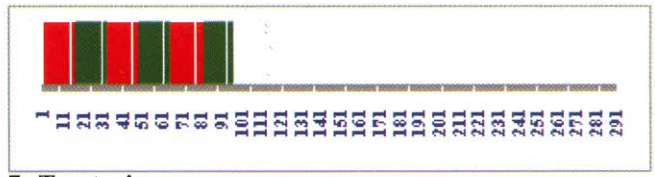
4. Variable width and gap between the trains:
In this mode the operator selects the width of the train (1 to 16) and gap between the trains (0-277). The buckets are then filled without overlapping and the number of trains gets decided as per the amount of gap provided.



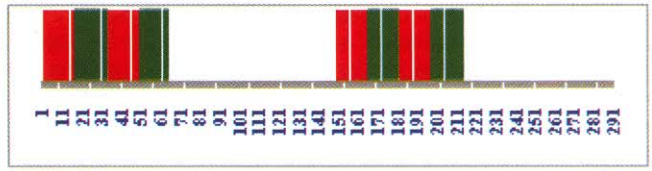
5. Continuous filling without overlapping:
In this mode the buckets from 1 to 288 are filled without any overlap of main and concomitant bunch.



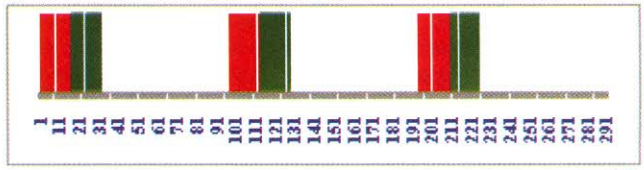
6. Single train:
In this mode a single train is filled without overlapping starting from bucket-1. The operator can choose the width of the train from the values 32, 64, 96, 128, 160, 192, 224, 256 and 288.



7. Two trains:
In this mode two trains are filled without overlapping. Operator can choose width of the train as 32, 64, 96 or 128. First train starts at bucket-1 and starting bucket of second train can be selected between 130 and 160.



8. Three trains:
In this mode three trains are filled without overlapping starting at bucket 1, 97 and 194. The operator can choose the width of the train as either 32 or 64.



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