1. INTRODUCTION

In AGS [1], the names of the elements are simply copied from input to output, but they are not used in any way. Therefore, no rules are imposed by AGS on how they are constructed. In some of the other orbit dynamics programs, however, element names are used for specific purposes, and, therefore, must obey rules. In order to facilitate the automatic translation of AGS output for subsequent programs it is suggested that these rules are observed in naming elements in AGS data. In addition to rules about the naming of elements, there are some extra rules and limitations which will also be mentioned below.

In order to facilitate the understanding of the rules, the methods used by the various programs for defining the elements and their sequence is described first. In this note, an element is either a magnetic element or a straight section.

2. RULES FOR HANDLING NAMES IN OTHER PROGRAMS

2.1. HARMON

The HARMON program [2] calculates and minimises chromatic effects for a given linear lattice and layout of sextupoles. HARMON maintains zero chromaticity during the minimisation by incrementing the strengths of the participating sextupole families appropriately. The
parameters and sequence of elements are described by BCD data having 5 card images for each element. A translation program HRMAGS [3] automatically constructs these data from TAPE3 output of AGS. A second translation program AGS2HRM [4] automatically constructs an entire HARMON job. Only the sextupole names must follow rules:

1. Sextupole names must be left justified and start with an S.
2. Sextupoles belonging to the same family, i.e. having the same strength, must have the same name.
3. Sextupoles with names SD or SF are varied to maintain zero chromaticity. Sextupoles whose names start with SD or SF are variables in the minimisation and also varied to maintain zero chromaticity. Sextupoles whose names start with SS are only used in the minimisation. Sextupoles with all other names, all starting with S, are fixed.
4. There must not be more than 20 sextupole names.

2.2. PATRICIA

The PATRICIA program [5] is mostly used here as a tracking program. The sequence of elements is read in three stages. PATRICIA considers a magnetic element and the straight section preceding it as one unit. A parameter list of different magnetic elements is given first. Different elements must have different names. In order to keep the parameter list short, equal elements should have equal names. The sequence of elements is then defined by just giving an ordered list of their names. Finally the sequence of straight sections is given. A translation program AGSTOPAT [6] generates the PATRICIA data from TAPE3 output of AGS Version 2. The element names must obey the following rules:

1. The magnetic elements must not be called CELL or END.
2. There must be at least 2 families of sextupoles, possibly each with just one member, whose names are SD and SF, left justified. Their strength is adjusted to obtain the desired chromaticity.

3. The strengths of the sextupoles with all other names are held constant. Strictly speaking, all names except CELL, END, SD and SF are permitted.

4. Since PATRICIA considers a magnetic element and the straight section preceding it as one unit, (almost all) straight sections should have no names, and there must not be an even number of unnamed neighbouring straight sections. An odd number of unnamed straight sections is permitted by AGSTOPAT, but not recommended.

2.3. **TRANSPORT and TURTLE**

In TRANSPORT [7] and TURTLE [8] the element types are defined by numerical type codes, and their names are simply copied to output. Hence, they need not follow any rules. A translation program [9] generates TRANSPORT and TURTLE data from TAPE3 output of AGS version 2.

2.4. **PETROS**

The PETROS program [10] is mostly used here to study the effects of alignment and excitation errors on the beam dynamics. The lattice layout is read in two stages. The parameters of the different magnetic elements are defined first. Their type is defined by the first character of their name. The sequence is then determined by giving the positions of the front faces of these elements. A translation program AGSPET [11] generates these data from TAPE3 output of AGS version 2. All element names must obey rules:

1. The first character of the name defines the type of magnetic
element: D for drift spaces, B for dipoles, Q for quadrupoles, S for sextupoles, O for octupoles. Several other characters are reserved for element types outside the scope of AGS, namely C for orbit correctors, I for intersection points, M for orbit monitors, R for RF cavities and X for solenoids. All other type codes are not recognized by PETROS.

2. Straight sections are just the gaps between magnetic elements and therefore, as a rule, should not have names.

3. PROPOSED RULES FOR NAMING ELEMENTS

From the above discussion the following set of rules emerges which should permit automatic translation of AGS output to input for the other programs, and ensure that they execute correctly. This list may not be exhaustive. If somebody finds more rules which have escaped so far, I would like to know about them. One unresolved sextupole naming conflict remains between HARMON and PATRICIA. It concerns the names SD and SF.

1. Magnetic elements have names of one to four characters, left justified. The first character is determined by the type of the element, B for bending magnets, Q for quadrupoles, S for sextupoles and O for octupoles. This rule is imposed by PETROS.

2. Different magnetic elements have different names, and equal magnetic elements have equal names. The former is a must for the name-oriented programs PATRICIA and PETROS, the latter is desirable since it keeps the list of different elements short. The maximum length of this list, including the named straight sections (Rule 4), is 96 for the largest version of PATRICIA and 60 for PETROS.

3. Most straight sections have no names (PATRICIA, PETROS).
4. The names of the few named straight sections start with a D (PETROS).

5. There are no neighbouring unnamed straight sections (PATRICIA).

6. If there is a crossing point in the data, it must be at the entrance of the first element. If there is a second crossing point in the data, it must be at the end of the last element (HARMON).

7. The total number of elements does not exceed 600 for HARMON, 3000 for PATRICIA and 4744 for PETROS.

8. PATRICIA requires that there are at least two sextupoles, with names SD and SF. These are special names in HARMON (cf. 2.1). This conflict cannot be resolved without changing at least one program.

9. The number of sextupole families does not exceed 20 for HARMON. The total number of sextupoles and octupoles does not exceed 600 for PATRICIA.

References


