Thoughts on the switch-table for a General Single-dish Spectral-line data format

1 INTRODUCTION

It is desirable that any single-dish data format should include a facility for storing separately the data values associated with individual "phases" of a general switching sequence. Since there are essentially an infinite number of possible switch sequences (such things as position, frequency, focus, polarization and beam switching, singly or in combination, with arbitrary numbers of states for each switched variable) it does not appear to be practicable to allocate in advance unique codes for each of these. We conclude that the only way of describing the sequence is by means of a table containing entries for the value of each switchable parameter for each phase of the switch cycle. Probably this table should also include the percentage of the whole cycle spent in a given phase.

2 A SUGGESTED FORMAT

We can predict in advance that the parameters which will be switched most often are:

1. Position (of the whole telescope)
2. Beam (by means of chopper-wheel, secondary mirror etc)
3. Frequency
4. Polarization
5. Focus

However it is also possible to imagine that a number of other parameters may also be switched, although we don't know yet what they are. We propose the names "Device_1", "Device_2", etc for these unknown parameters. If we allow up to three such unknown devices then our table has 9 columns (1 each for the switched devices, plus one for percentage time allocated to the phase) and one row per phase. The entries in the table may be either real numbers (e.g. frequencies) or logical variables (The states of a chopper etc.) We tentatively suggest that there be a maximum of 16 possible phases, although if anyone feels this should be increased then I have no objections.

3 INTERPRETING THE FORMAT

The table itself contains no information about the way in which the individual phases are to be used to reconstruct the desired spectra. It is possible to find a number of (not very contrived) examples in which there is more than one output from a given data set (say two different polarizations) and it appears to be difficult to describe this process in the data header. In fact, it also seems to be inappropriate. The table, however, is probably not very informative

in a conceptual sense (it tells you what frequencies were used in the switching pattern, but not why). We therefore propose that we include a mode word in the header. We might define values for some of the more common modes (such as pure position switching, 50% of the time on and 50% off), but it appears that most of the values will have very site-specific meanings. I suggest that we reserve values in the range 1-32 for "standard" cycles (as above), with all values greater than this available for individual sites. Our format makes it possible to transport the data, plus a full description of what they <u>are</u>, but extra information may be required to interpret what they <u>mean</u>.

4 MULTIPLE RECEIVERS

The proposed header allows for an undefined number of receivers to be associated with a given header. I propose however that we have only one state table per header. It therefore needs entries for the maximum number of phases (or states) applied to any receiver. It seems safe to assume that multiple receivers are sampled either synchronously or at a sub-harmonic of the overall cycle. If we actually carry through the maximum number of phases for all receivers then, for receivers which use some fraction of these only, there will be state transitions which do not cause a change in output. I suggest that we just duplicate the data values here so that the percentage of time in a given state for such a system can be found by adding up the numbers in the appropriate rows of the state table.

If an observation cannot be fitted into this descriptive framework then it will require more than one "spectrum " (=header+data) - most probably this will correspond to putting multiple receivers in separate spectra.

A final note: Since we are allowing for different numbers of states for different receivers (e.g. an AOS and correlator looking at the same I.F.) we require a different mode word for each receiver.

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