Beam Dwell and Repointing Time Requirements Derived From Memo 128 Considerations

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LWA Memo 128 describes a scheme for using one of the LWA station beams to observe between 99 and 123 sources in a rapidly repeating cycle, in order to provide data on the dynamically-varying ionosphere in support of imaging. LWA Memo 144 indicates that this scheme drives requirements for the *minimum dwell time* and *maximum repointing time* for station beamforming. In this memo, "Minimum dwell time" is defined as the minimum time for which a station beam can be held utterly fixed. "Maximum repointing time" is defined as the maximum time required to re-point the beam, and during which the output of the station electronics is assumed to be invalid and thus not useful for source observation.

Candidate lists of sources to be used in this scheme have been generated, with one list per hour of the day (i.e., 24 source lists). Each source list includes estimates of the minimum required integration time per observation. Using this data with various assumptions for the station beamformer's *minimum dwell time* and *repointing time*, the time required to complete observations of all sources for each source list has been calculated. The time to complete an observation of a source is calculated as the repointing time plus the greater of the *minimum dwell time* and required integration time for that source. The maximum time to complete a cycle is reported in the table below.

Given our best current understanding, total cycle times up to 10 s are acceptable. On that basis, the table indicates that minimum dwell less than 60 ms with maximum repointing time less than 5 ms is acceptable and could be adopted as system requirements. However, we have no actual experience with ionospheric calibration using this data, and it is possible that we will find later that there is compelling reason to reduce this time. Thus, it is recommended that requirements facilitating shorter cycle times be considered "desirable".

Minimum Dwell [ms]	Repointing Time [ms]	Maximum Time Req'd to Complete Cycle [s]
10	0	6.6
10	1	6.7
10	5	7.2
20	0	6.9
20	1	7.0
20	5	7.5
50	0	8.6
50	1	8.7
50	5	9.1
60	0	9.3
60	1	9.4
60	5	9.9