VLB ARRAY MEMO No. 662

VLBA Correlator Memo No. 96

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National Radio Astronomy Observatory
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To: (see Distribution)

From: J. D. Romney

Subject: VLBA Correlator Operations Layout

The physical layout of the VLBA correlator and its playback system in the Array Operations Center was discussed as early as the VLBA's "design year". In the first edition of the VLBA Project Book, section 10.2.9, Martin Ewing described seven distinct correlator environments, each having its own requirements with respect to temperature, humidity, noise, traffic, *etc.* Correlator requirements were taken into account in designing the AOC, but it was concluded that these all could be accommodated within the large "computer floor" area on the second level of the building, with more detailed specification deferred. Final layout of the correlator/operations area is now necessary to meet the scheduled delivery of the correlator subset to the AOC. This memorandum summarizes current concepts governing this layout, presents a specific preferred configuration, and mentions some alternatives and their disadvantages.

Ewing's environmental classification is still germane to this discussion. In the following summary table, I have interpolated some additional considerations, in particular some relaxed requirements arising from current knowledge of tape behavior.

	Temperature and Humidity	Drafts and Noise	Access and Traffic
Correlator equipment	Heavy cooling	Significant	Minimal
Computer equipment	Moderate cooling	Significant	Moderate
Tape transports	Heavy cooling *and* Precise control	Moderate	to Operations
Tape staging	Precise control	None	Heavy
Tape storage	Moderate control	None	to Operations
Tape shipping	None	None	to Loading dock
Operations	Moderate control	Minimal	Moderate

Entries are variously operational requirements, desiderata, or physical realities; nevertheless, I hope the table is largely self-explanatory. Obvious generalizations are (1) equipment environments require heavy cooling capacity, and thus are unavoidably noisy and drafty; (2) VLBA data tapes require precise temperature and humidity control during and shortly before playback; and (3) operators require a quiet, still environment.

Modern plans, accepting some compromises, have condensed these environments into two basic "rooms". Correlator and computer equipment can share the AOC's general computer room with the VLBA/VLA control and post-processing computers. Tape staging, storage, and even the relatively dirty tape shipping can share the large operations room. This may require more precise regulation of temperature and humidity than usual in an operations environment, but can be done without massive air flows since no heat is dissipated.

Incompatible with this convenient dichotomy, however, are the 24 tape transports — playback drives or PBDs in current VLBA jargon — which consume nearly a kilowatt of electric power each, in direct proximity to the tape mounted thereon. The dilemma is resolved by The Wall, as it seems to have become

known. Observing that the dissipated heat is vented through the top of the drive, while the tape is mounted on the front surface, we can build a line of playback drives into the wall separating the two rooms, such that their volumes are within the computer room, while the front surfaces protrude slightly into the operations room. Such a wall has functioned quite effectively for many years at the Mark 3 correlator in Bonn.

(In earlier discussions of this scheme, the misapprehension has somehow taken root that its primary purpose is sound isolation. Although recognizing the futility of trying to controvert this fallacy, I will do so once again here. My original proposal for the Bonn version, in fact, arose from operator complaints about drafts, more than noise. And for the VLBA playback drives, the new vacuum motors are already quiet enough that noise is comparatively a minor consideration.)

Figure 1 shows a preferred layout for the north end of the AOC building's large computer-floor area, incorporating all the design considerations discussed above. The correlator proper (hatched) and its computer systems (dot-hatched) are within the computer room, which extends southwards toward the main building entrance. The 24 PBDs (shaded) are also in the computer room but front through The Wall into the operations room, aligned with the structural pillars supporting the roof in order to conserve open space.

These pillars, spaced on 6.1-meter (20') centers, span 5.6-meter (18' 4") clear spaces. Each PBD is 56 cm (22") wide, allowing eight PBDs and a 112-cm (44") doorway between pairs of pillars, as shown. This arrangement in turn both facilitates access for maintenance purposes, and provides the operators with visual cues to the four-groups-of-six organization which the correlator imposes on the PBDs.

Tape staging/storage/shipping areas are not shown explicitly in the operations room, but should be concentrated toward the east end, near the doors to the elevator. The figure does show the location of the existing temporary walls — including one section associated with permanent fixtures requiring conduits embedded in the concrete sub-floor. Finally, a suggested division of the unused space on the west side of the building is indicated.

The correlator and computer equipment are centered along the line of PBDs mainly for aesthetic reasons. On a recent trip to Socorro I noted some fire sensors and a cooling unit that may interfere with the specific placement shown; these racks could in fact be located nearly anywhere along The Wall, subject to a nominal maximum separation of 15 meters (50') between a PBD and its PBI within the correlator racks. The separation of 2 meters (6') between the rows should be maintained, of course.

All the obvious alternatives to the layout of Figure 1 have moderately serious drawbacks. One could translate the entire arrangement by one pillar span parallel to The Wall. Beginning the PBDs right at the east end of the operations room (which is how I had originally conceived this layout) concentrates too much activity right at the doors, and also would require relocating the fire alarm panel and power meter connections from the "temporary" wall, which I am told may be extremely expensive. A westward translation, on the other hand, leaves the end of the line too far from the doors and/or tape storage area, and extends the operations room beyond what probably will be necessary.

Alternatives involving 'L'-shaped PBD layouts may save a few operator steps, but have similar liabilities. With their more compact configuration, they either shorten the operations room unreasonably, or push the PBDs too far from the tape storage. They also reduce the flexibility with which the correlator and computer equipment can be located, and may make proper cooling of the northernmost PBDs difficult.

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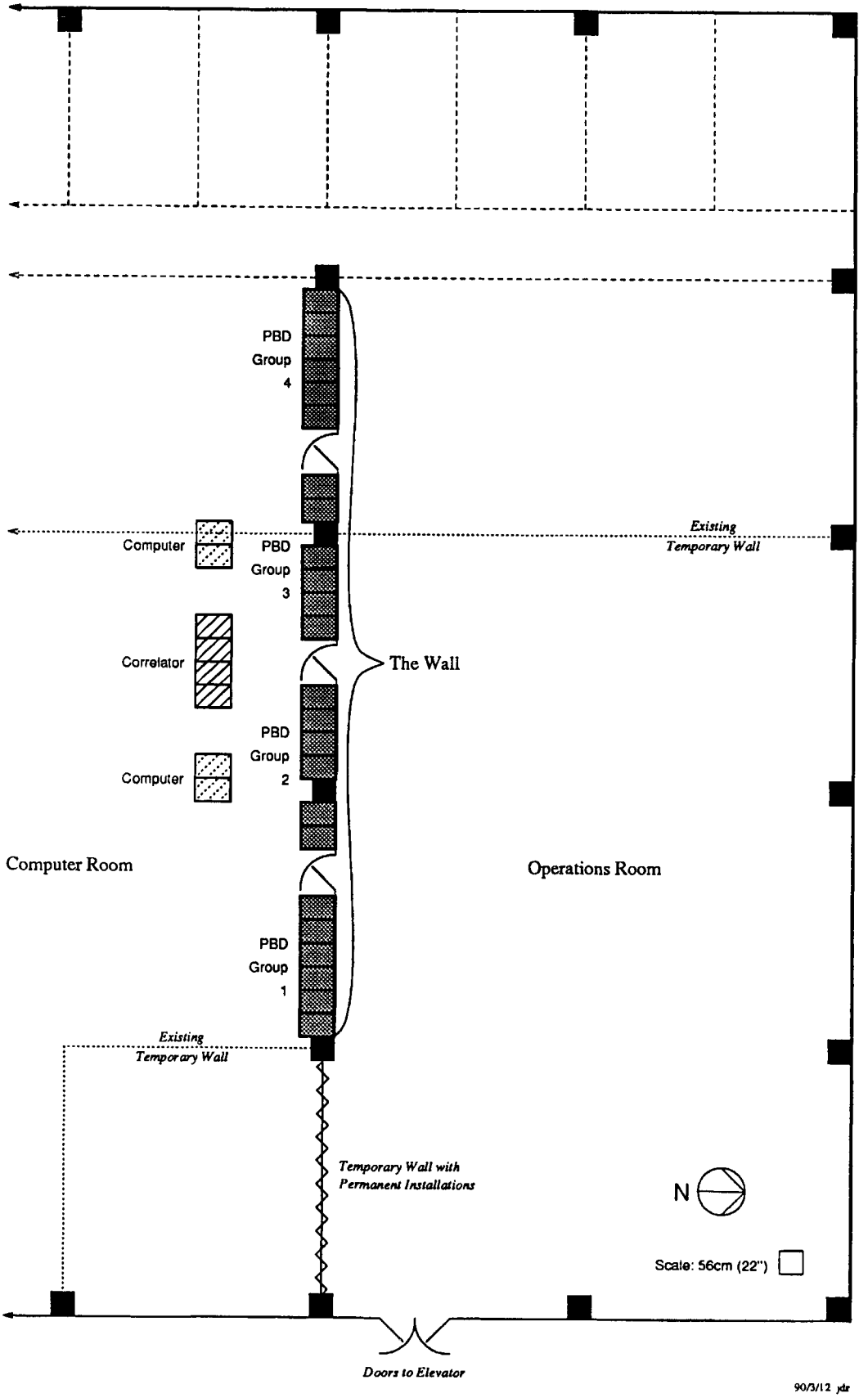

Figure 1. Preferred correlator / operations layout