# VLBA ACQUISITION MEMO #281

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To: VLBA Data Recording Group

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Subject: Possible variations on the vacuum loop

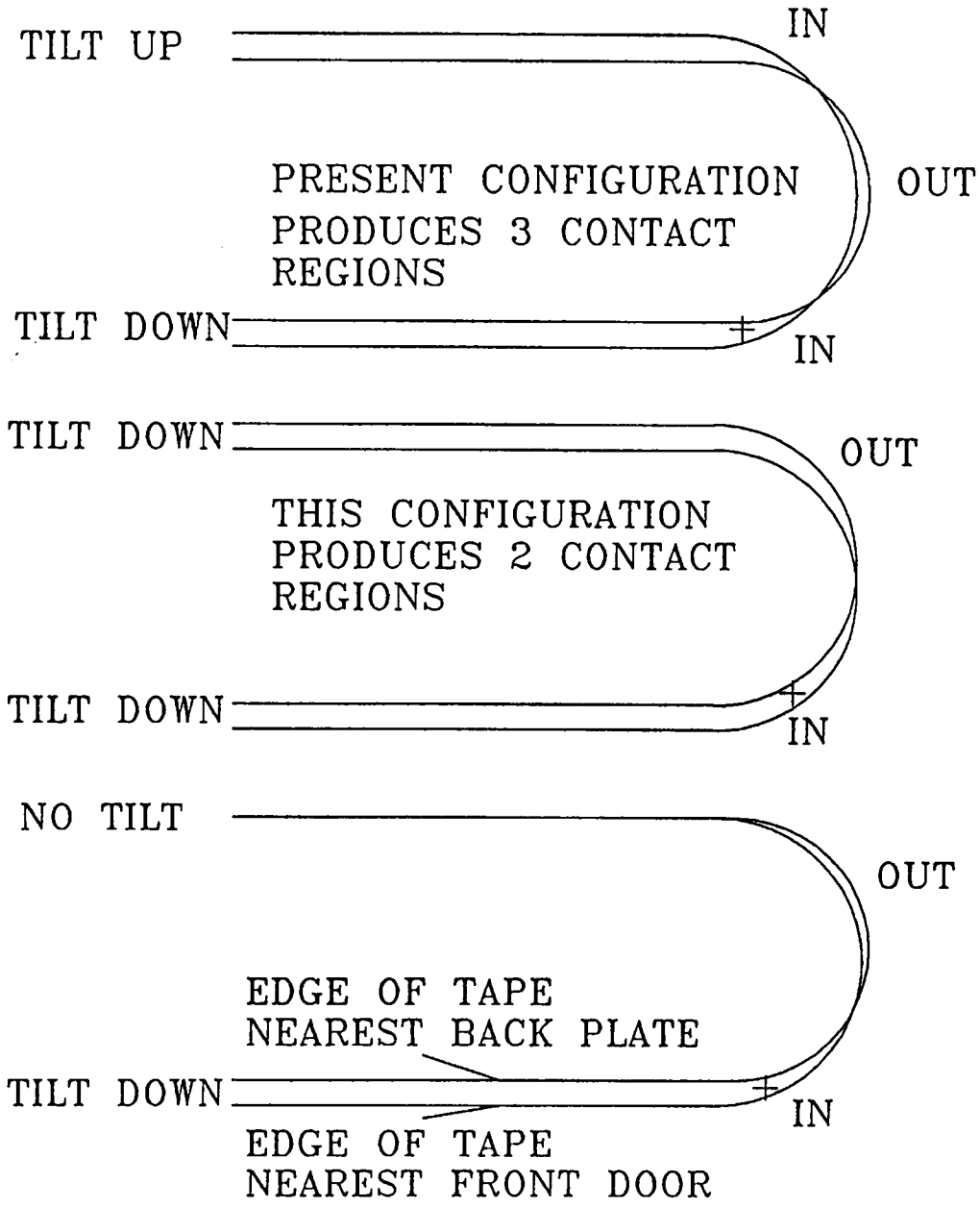
The theory of the vacuum loop was given in VLBA Acquisition Memo #124. The 3° slope on the vacuum column (so called "E" casting) walls provides the edge guiding by pressing the tape edge at the start of the turn-around loop so that it maintains contact with the "precision" back plate. The current design has both walls tilted in a symmetrical manner producing three edge contact regions for each loop, in the middle against the front door and at the start and end of the loop against the back plate. The following alternate arrangements are worth investigating:

1. Tilting the walls near the I/O rollers in the opposite direction - suggested by Hans.
2. Removing the tilt on the walls near the I/O rollers.

Figure 1 shows the variations of loop configuration. In the case of constant circular sections the deviation from perpendicular are (using the notation and parameters in VLBA Acquisition Memo #124) are:

| Case | Deviation from Perpendicular | Perpendicular at | Pressure Force $P\epsilon$ |
|---|---|---|---|
| 1 | $\epsilon\,(1 - \pi/2 \sin\phi)$ | 39.54° | 0.43 |
| 2 | $\epsilon \cos\phi$ | 90° | 1.3 |
| 3 | $\epsilon\,(1 - \pi/2 \sin\phi + \cos\phi)/2$ | 65° | 0.74 |

A torque about the $x$-axis (notation of Memo #124) cannot be transmitted as the tape is free to twist and the remaining boundary conditions are set by the loop geometry. The general trend with the alternate geometries is to move the center of pressure for the edge guiding region out away from the "E" casting wall while increasing the force. The bias torque of 0.08 $P\epsilon$ (see Memo #124) from the wall tilt is the same (on the leg to the capstan) in all three cases. Bias torque contributions from the perpendicular contact and vacuum forces depend on the tape angle (which moves the contact region) and front door. These torques are expected to be small for all three configurations. Simple tests made of the alternate configurations confirm that there are no major changes in the edge guiding and wear patterns for the leg going to the capstan. In my opinion there is no reason to change configuration.




NOTES:
"IN" = AREAS PUSHED IN TOWARDS THE BACK PLATE

"OUT" = AREAS PUSHED OUT TOWARDS THE FRONT DOOR

+ = APPROXIMATE CENTER OF PRESSURE FOR EDGE GUIDING

TILT IS AS VIEWED FROM FRONT OF TRANSPORT

FIGURE 1. VARIATIONS ON THE LOOP CONFIGURATION