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VLA ELECTRONICS MEMO 229

WIDEBAND (ABOUT 80 MHz/IF) ANALOG SUM FOR THE VLA

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We are working on increasing the VLA bandwidth from 50 MHz/IF to about 80 MHz/IF for continuum observations (VLA Electronics Memo. 227; VLA Test Memo. 205). This will allow to use upto about 80 MHz of bandwidth per IF for single dish VLBI. Then the question arises: can we some way obtain analog sum with 80 MHz bandwidth without aliasing. This will allow to produce two 80 MHz bandwidth phased array signals for VLBI and pulsar type observations instead of being limited to two 50 MHz bandwidth phased array signals at present. This question is addressed below.

The sampling theorem for complex signals requires that they must be sampled only at the bandwidth, and not at twice the bandwidth rate. The VLA samplers produce both sine and cosine of the input signals which are then sampled at 100 MHz rate. This is a complex signal sampled at 100 MHz rate. Using a quadrature network one can combine the two outputs from a sampler to represent a signal of upto 100 MHz bandwidth witout aliasing. Similarly if we have analog sums for both sine and cosine outputs, then they can be combined using a quadrature network to provide analog sum of upto 100 MHz bandwidth from the array.

The analog sum for the array is produced at present for only sine signals from various antennas. If we also produce analog sum for the cosine signals, then the two analog sums can be combined using a quadrature network to produce wideband (about 80 MHz) analog sum for the whole array, bandwidth being limited to about 80 MHz by the IF and baseband electronics. A suggested block diagram for a wideband analog sum for the array is shown in Fig. 1.

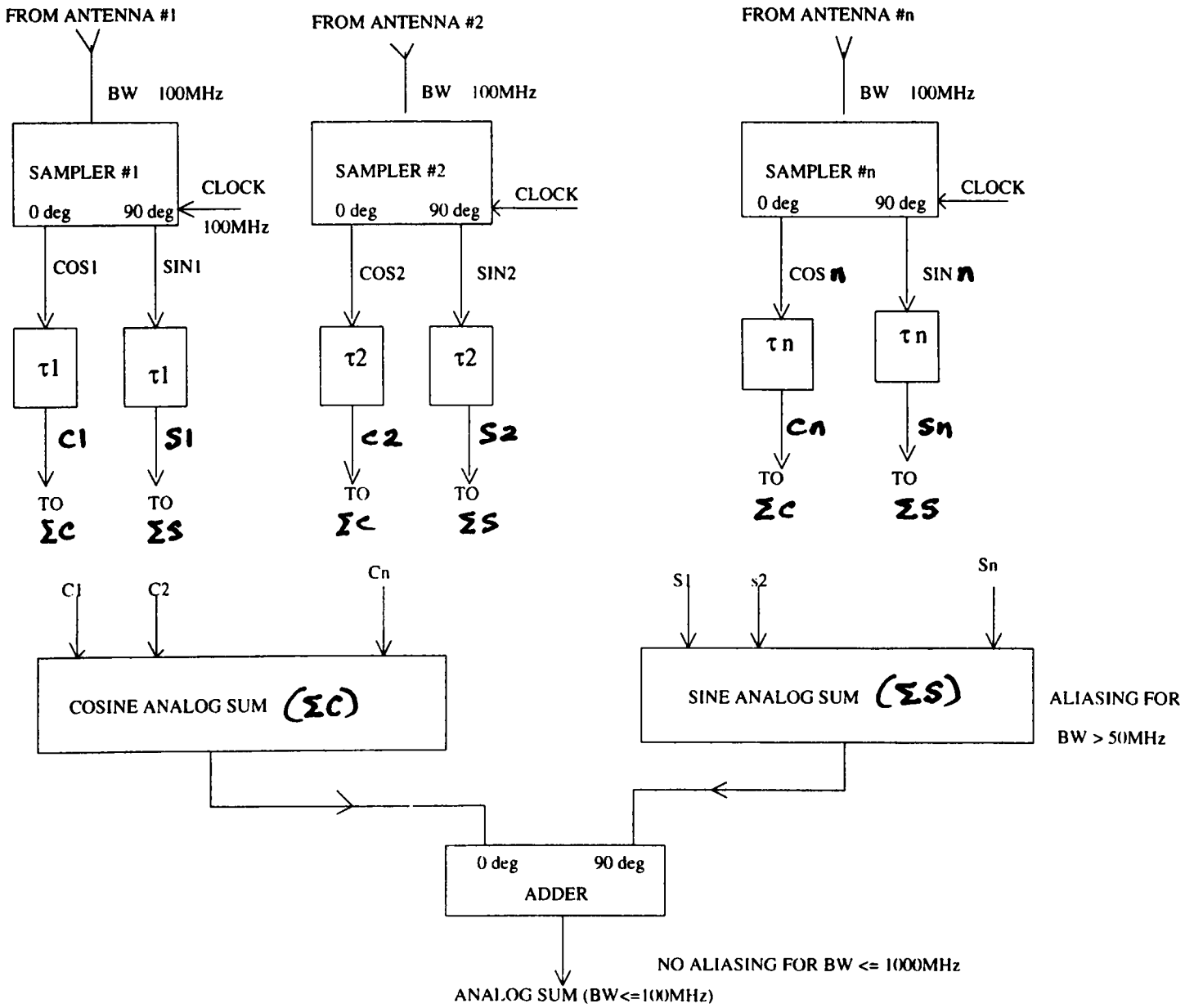

FIG. 1 WIDEBAND ANALOG SUM FOR THE VLA