VLBA ACQUISITION MEMO #306

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To: VLBA Data Acquisition Group

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Subject: Differences in the VLBA, MkIII, and MkIV IF to Baseband Conversion

The following parameters define the VLBI bandpasses:

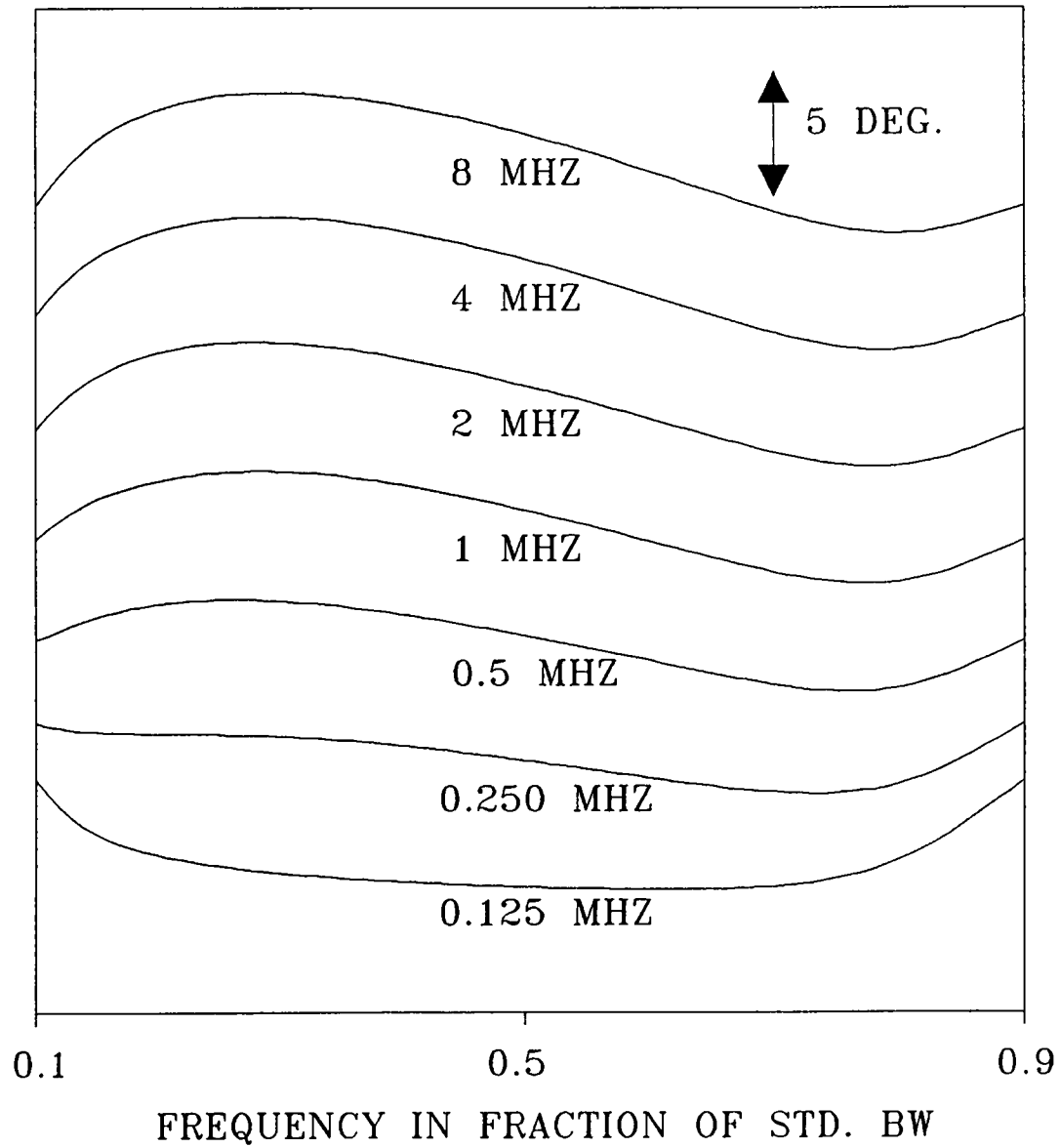
	MkIII	VLBA	MkIV
Low-pass filters:	7-pole	8-pole	7-pole
Type:	Butterworth	Butterworth	Butterworth
3-dB point:	90% BW	90% BW	90% BW
Standard BWs:	ext,4,2,1,0.5, 0.250,0.125	16,8,4,2,1,0.5, 0.25,0.125,0.0625	(*16),8,4,2,0.5, 0.25,0.125
All pass pole-zero Locations	0.57,11,155, 2236,2.9,41, 584,11239 KHz	4.7,66,628, 6145,20.8,204, 1936,27040 KHz	

Also see VLBA Acquisition Memo #101

*MkIV - The addition of 16 MHz to MkIV is under consideration for increased compatibility with the VLBA. In this case, the all-pass pole-zero locations would be changed to match the VLBA. Note the 1 MHz bandwidth has been dropped to add 8 MHz. Another bandwidth would have to be dropped to add 16 MHz.

While the differences between MkIII and VLBA bandpasses are small and produce a negligible loss of correlation on a single frequency channel. However, if upper and lower sidebands are combined (as in MkIII modes A and B) there will be an instrumental phase difference between upper and lower sidebands on baselines between MkIII and VLBA systems.

Figure 1 shows the calculated differences between the VLBA and MkIII bandpass response. Figure 1 also lists the calculated group and phase delay differences (VLBA - MkIII). The difference between upper and lower sideband channels on VLBA to MkIII baselines is twice the phase delay difference. (When sidebands are added in the MkIII FRNGE program, the correction is entered using the keyword VLBACR - currently using empirically determined values of 130 and 150 deg for 2 and 4 MHz bandwidths respectively.)



BW MHZ	DP DEG	UL DEG	DELAY NS
8	-92	177	32
4	-101	159	62
2	-109	142	120
1	-116	128	229
0.5	-122	116	435
0.25	-126	108	793
0.125	-126	107	1352

BW = STANDARD BANDWIDTH
DP = PHASE DELAY DIFFERENCE
VLBA -MKIII
UL = PHASE DELAY DIFFERENCE
UPPER - LOWER
VLBA -MKII
DELAY = GROUP DELAY
VLBA -MKIII

Figure 1. Bandpass differences VLBA-MKIII