

A. Clutter Filter Characteristics

The RVP7 is shipped with a preprogrammed set of digital IIR (Infinite Impulse Response) high-pass clutter filters. There are eight filters available. The filters are fourth-order Chebyshev, and provide 40dB and 50dB stop band attenuation in seven different widths ranging from approximately 2% to 14% of the Nyquist interval. Filter #0 is an all-pass filter, so that clutter rejection can effectively be switched off.

The correct choice of filter for observing different weather conditions must be determined by experiment. The filter with the highest rejection is not always the best choice, since the group delay of signals in the transition band is greater for deeper filters. This effect introduces dispersion in the Velocity/Time profile of the incoming signal. In general, try to use the shallowest filter with the shortest impulse response that will do the job for the types of weather and clutter that are typical at the radar site.

The processing algorithm for the IIR clutter filter is described in Chapter 5, as follows:

$$A'_n = B_0A_n + B_1A_{n-1} + B_2A_{n-2} + B_3A_{n-3} + B_4A_{n-4} - C_1A'_{n-1} - C_2A'_{n-2} - C_3A'_{n-3} - C_4A'_{n-4}$$

In this algorithm, the input time series A_n is processed to form a filtered output time series A'_n , and the B's and C's are filter coefficients. This appendix shows the magnitude response plots for the set of filters supplied with the RVP7. The Doppler 40dB and 50dB clutter filter coefficients are given in Tables A-1 and A-2.

Table A-1: Doppler 40dB Clutter Filter Coefficients

B_4	$-C_4$	B_3	$-C_3$	B_2	$-C_2$	B_1	$-C_1$	B_0
0.88524580	-0.78366012	-3.53845834	3.32323517	5.30642599	-5.29330203	-3.53845834	3.75363693	0.88524580
0.80657571	-0.65056438	-3.21913964	2.87521021	4.82513582	-4.78811692	-3.21913964	3.56267500	0.80657571
0.71441318	-0.51038627	-2.84208420	2.37084266	4.25538455	-4.17592962	-2.84208420	3.31122076	0.71441318
0.62870255	-0.39526762	-2.48861663	1.92570662	3.71996530	-3.58889047	-2.48861663	3.04473893	0.62870255
0.54606519	-0.29819195	-2.14537980	1.52275259	3.19897838	-3.01019977	-2.14537980	2.75072405	0.54606519
0.45879351	-0.21051814	-1.78052007	1.13050566	2.64427921	-2.39223952	-1.78052007	2.38964305	0.45879351
0.37359302	-0.13969494	-1.42239330	0.78656442	2.09937656	-1.79477930	-1.42239330	1.97031054	0.37359302

Table A–2: Doppler 50dB Clutter Filter Coefficients

B_4	$-C_4$	B_3	$-C_3$	B_2	$-C_2$	B_1	$-C_1$	B_0
0.84542846	-0.71474928	-3.37930255	3.09659463	5.06774905	-5.04399223	-3.37930255	3.66187494	0.84542846
0.74382306	-0.55327276	-2.96868634	2.53400299	4.44973390	-4.38526438	-2.96868634	3.40221256	0.74382306
0.62973136	-0.39656213	-2.50520230	1.93990255	3.75097936	-3.61978794	-2.50520230	3.06459405	0.62973136
0.52882407	-0.27966010	-2.09326396	1.45511086	3.12899512	-2.92516254	-2.09326396	2.71323771	0.52882407
0.43670149	-0.19073865	-1.71571192	1.05300155	2.55830009	-2.28497406	-1.71571192	2.33441266	0.43670149
0.34541284	-0.11946113	-1.34050390	0.69988946	1.99080407	-1.66019496	-1.34050390	1.88309201	0.34541284
0.26278690	-0.06966656	-1.00051743	0.42488088	1.47671031	-1.12951524	-1.00051743	1.37925631	0.26278690

The filter responses are plotted on the following pages. Note that the plots cover only 50% of the width of the full Nyquist interval, so the pass band of the filters actually extends another full plot width off the right edge of the diagrams. In other words, a normalized velocity of 1.0 corresponds to the “fold” velocity of a target. The higher numbered filters are the wider ones on the plots.

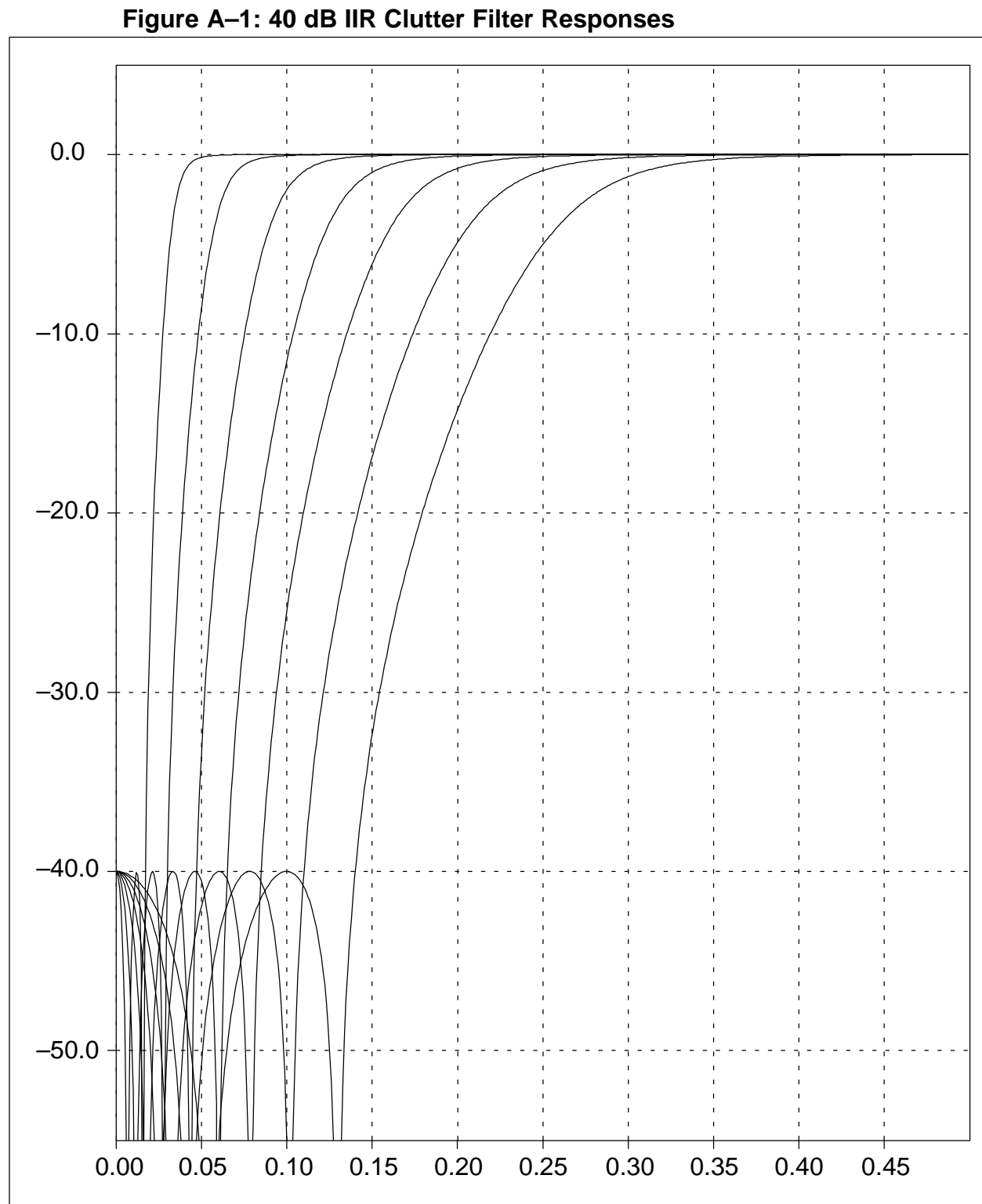


Figure A-2: 50 dB IIR Clutter Filters Responses

