POTENTIAL ALIASING IN PYROTECHNIC SHOCK DATA: NUMERICAL EXPERIMENTS

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This tutorial shows that aliasing can cause up to 20 dB error in SRS plots, but that a massive amount of ultra-high-frequency energy is required for this to happen.

Consider a hypothetical shock pulse which satisfies the SRS in Table 1.

Table 1. SRS Q=10

Natural Frequency (Hz)	Peak Accel (G)
100	10
2000	1000
250K	1000

A sample time history which reasonably satisfies this specification is shown in Figure 1. It is composed of damped sinusoids.

The same signal is shown decimated in Figure 2.

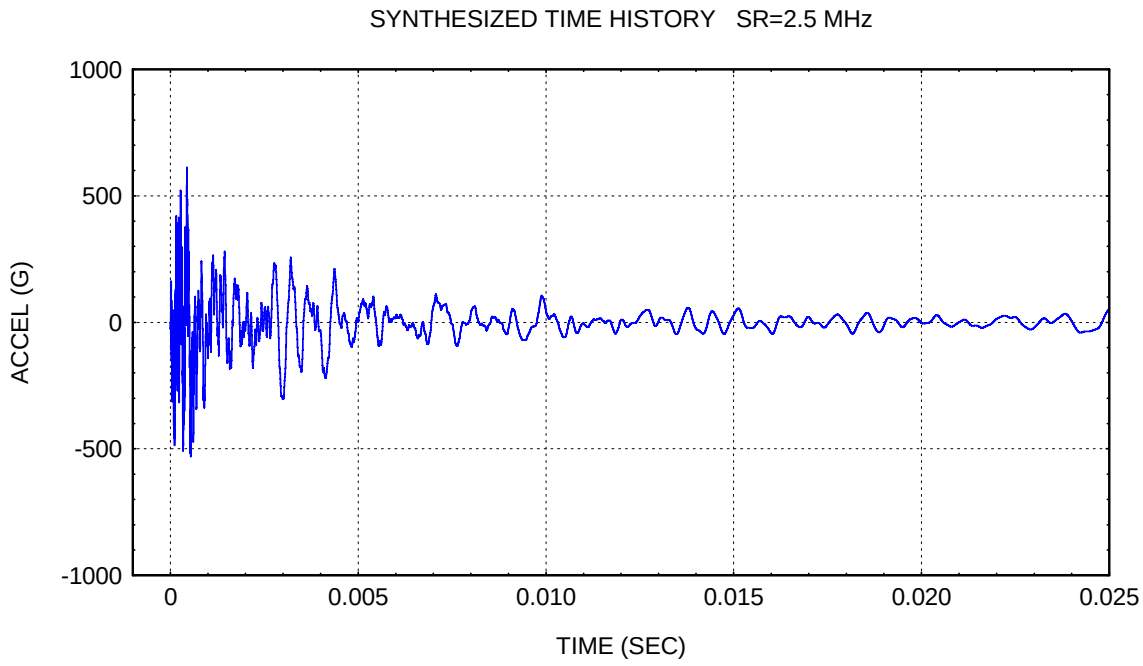

Figure 1.

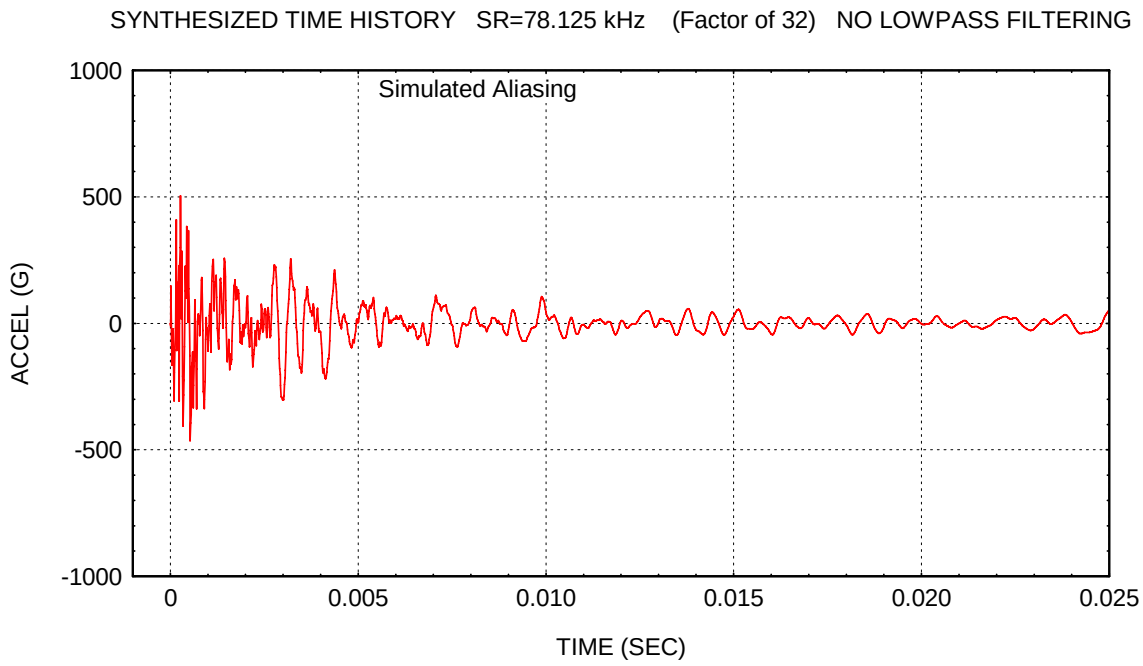

Figure 2.

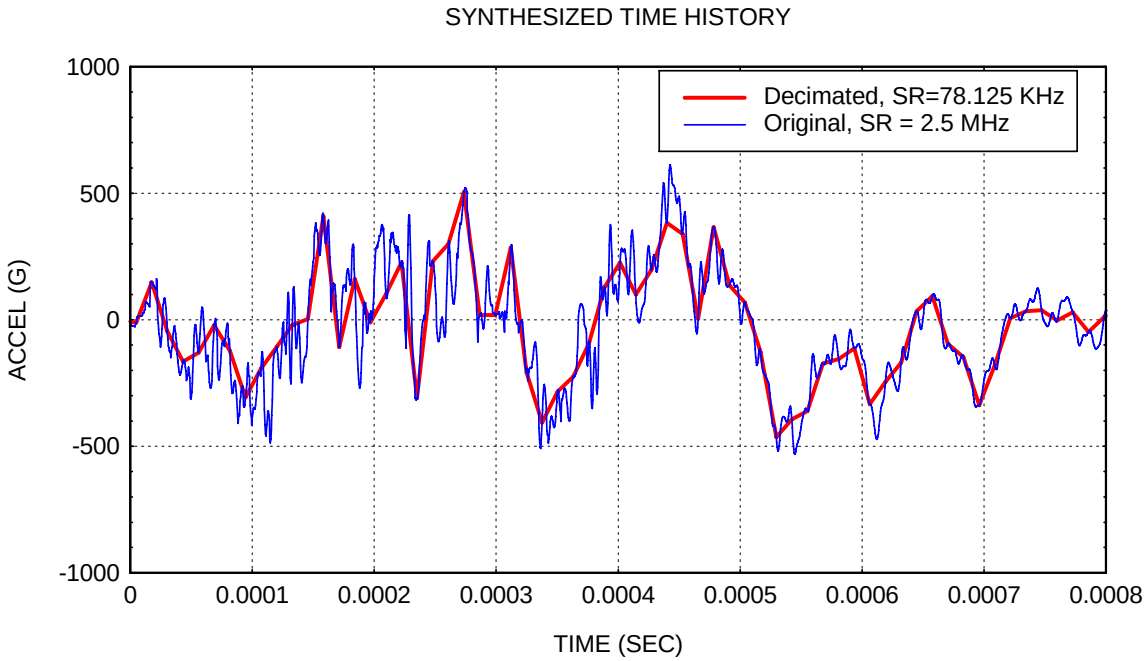

Figure 3.

A close-up view is shown in Figure 3.

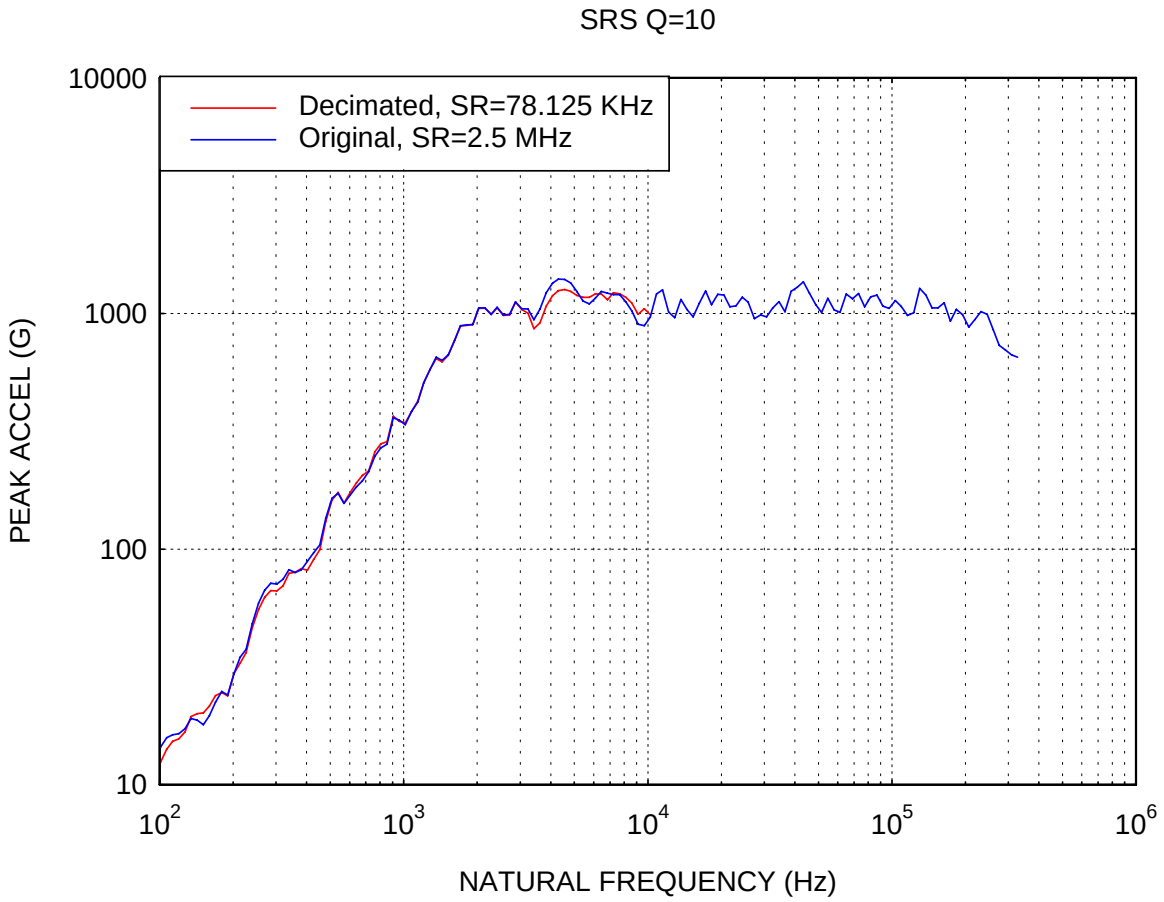

Figure 4.

The agreement is very good despite the aliasing present in the decimated data.

APPENDIX A

Repeat the previous example but with significantly higher amplitude at the last breakpoint.

Table A-1. SRS Q=10	
Natural Frequency (Hz)	Peak Accel (G)
100	10
2000	1000
250K	50000

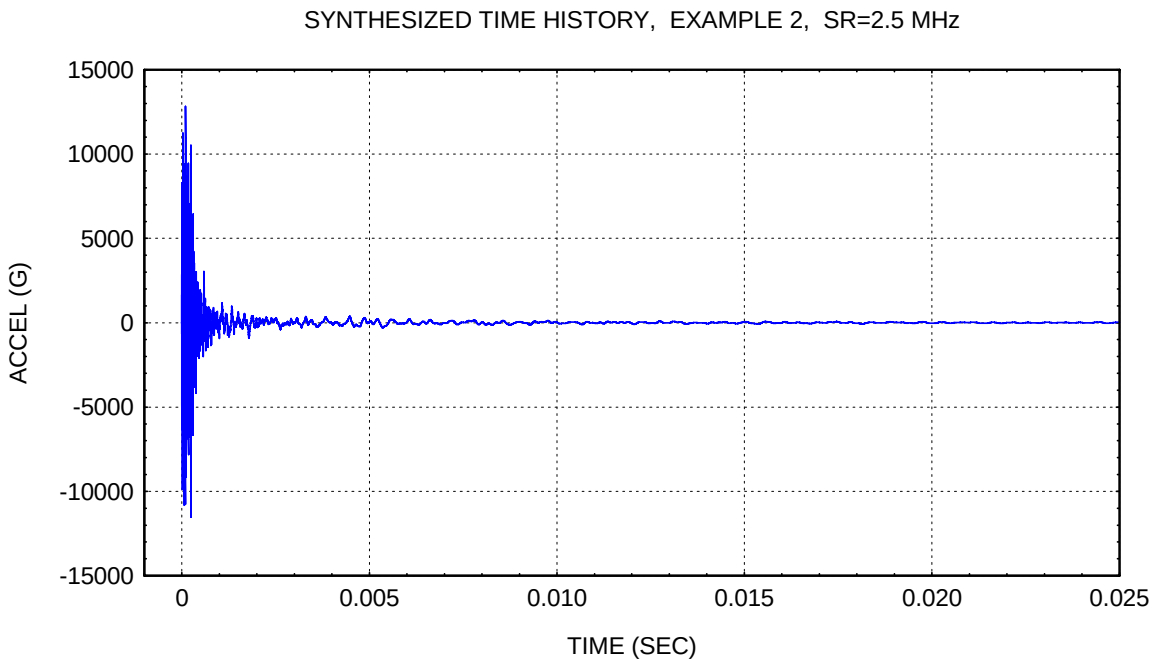

Figure A-1.

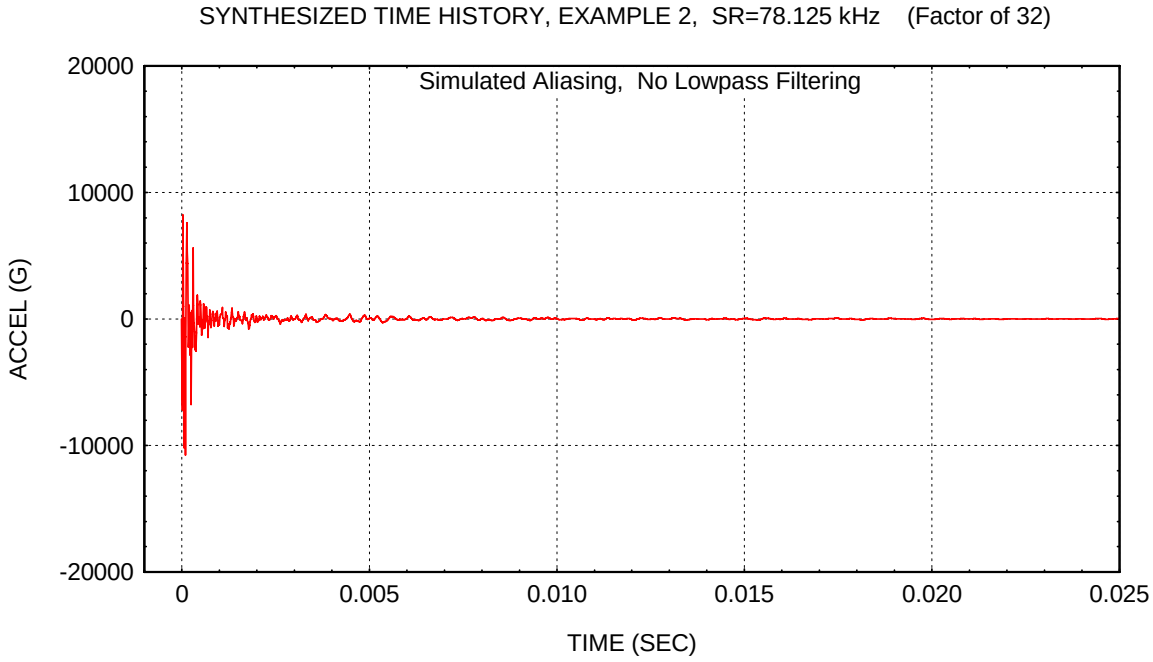

Figure A-2.

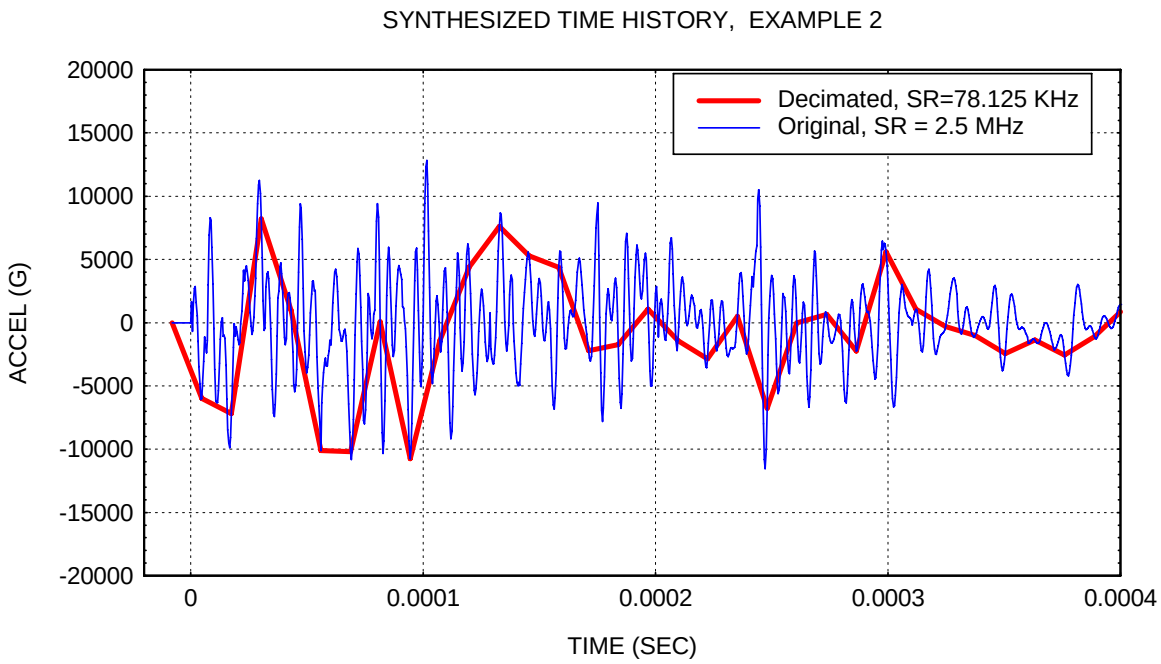

Figure A-3.

Aliasing occurs in the Decimated time history.

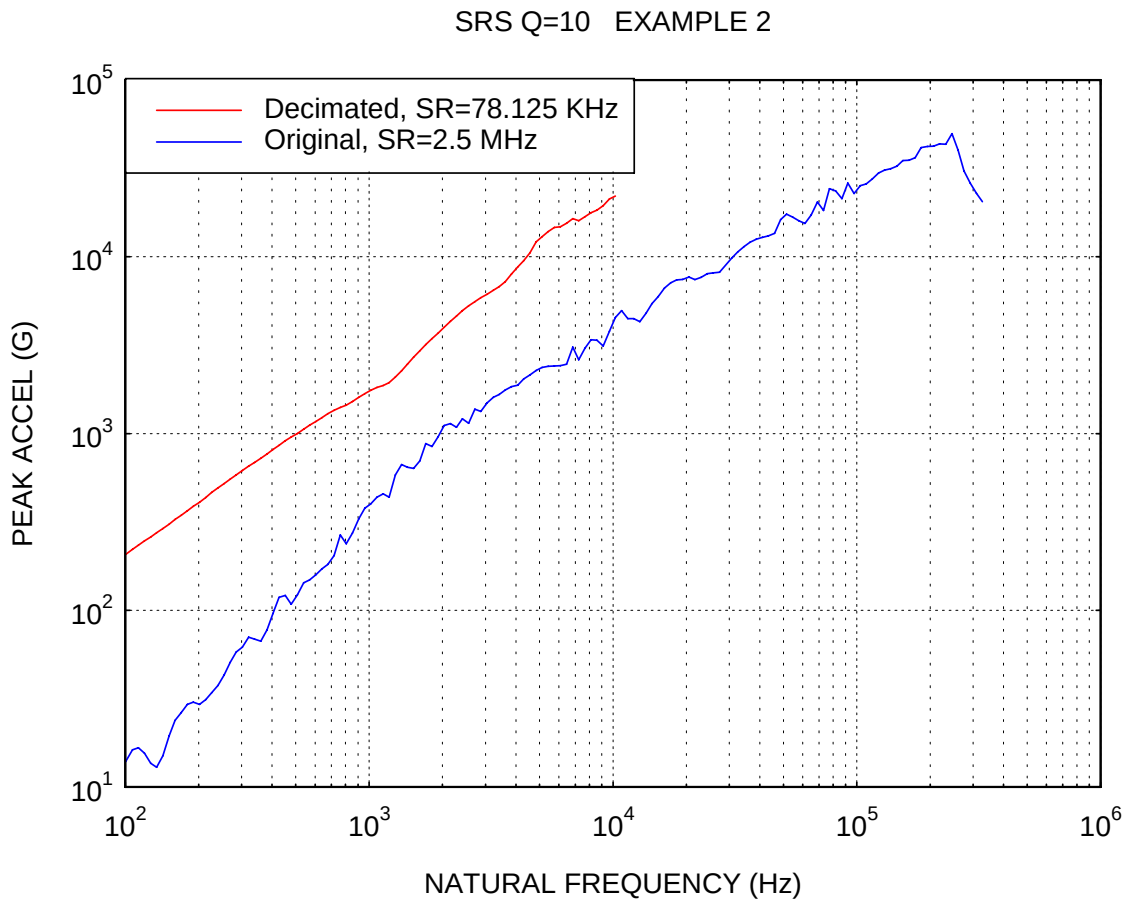

Figure A-4.

The Decimated SRS is approximately 10 to 20 dB higher than the Original SRS. The source of the error is aliasing.