

Ball Lens Impact

Workshop

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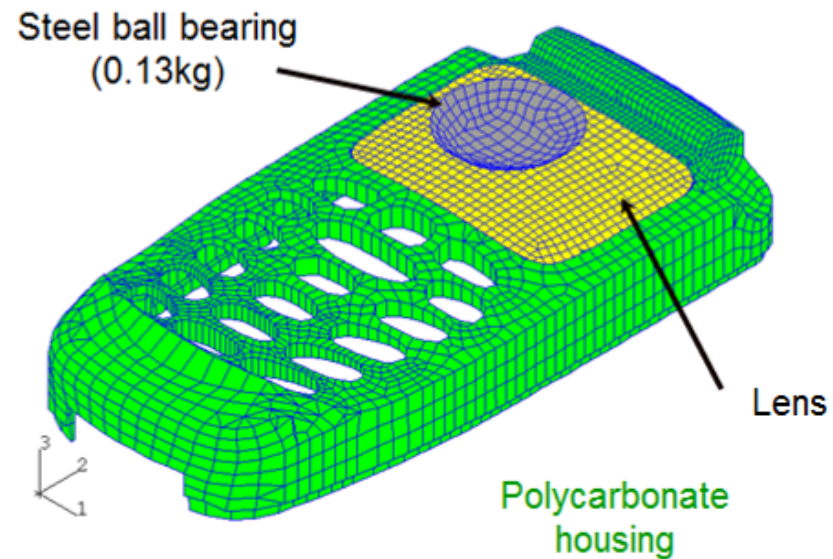
Images:

- Description and Raw Data \Rightarrow Picture of Problem
- Description and Raw Data \Rightarrow Raw Data
- Initial Comparision of Accel
- Data Clean-up and Fourier Assessments of Accel
- After LP Filtering Accel
- Assessing Displacements and Adjusting Stiffness
- Evaluating Shock Response

Ball Impact on a Lens



Accelerometer mounted
bottom-side of lens



This example is based on the following references:

1. Diehl, et. al., "Using Digital Signal Processing (DSP) to Significantly Improve the Interpretation of Abaqus/Explicit Results," *Abaqus Users' Conference*, Chester, United Kingdom, 1999.
2. Diehl, et. al., "Applications of DSP to Explicit Dynamics FEA Simulations of Elastically-Dominated Impact Problems," *Journal of Shock and Vibration*, Vol 7, Number 3, 2000.

Description and Raw Data ⇒ Raw Data

k_varViewer displaying rawExper

=== ADDITIONAL PROPS INFO ===
**.Props.Description
experiment.txt

**.Props.UserData contains stuff but it is NC
Use MATLAB dot syntax on variable to see

	1 Time [msec]	2 Accel [G]
1	-0.8029	-1.2500e+01
2	-0.7989	-1.2500e+01
3	-0.7949	-1.2500e+01
4	-0.7909	-1.2500e+01
5	-0.7869	-1.2500e+01
6	-0.7829	-1.2500e+01
7	-0.7789	-1.2500e+01
8	-0.7749	-1.2500e+01
9	-0.7709	-6.2500e+00
10	-0.7669	-1.2500e+01
11	-0.7629	-1.2500e+01
12	-0.7589	-6.2500e+00
13	-0.7549	-6.2500e+00
14	-0.7509	-6.2500e+00
15	-0.7469	-6.2500e+00
16	-0.7429	-1.2500e+01
17	-0.7389	-6.2500e+00
18	-0.7349	-6.2500e+00
19	-0.7309	-1.2500e+01
20	-0.7269	-6.2500e+00
21	-0.7229	-6.2500e+00

k_varViewer displaying rawFea

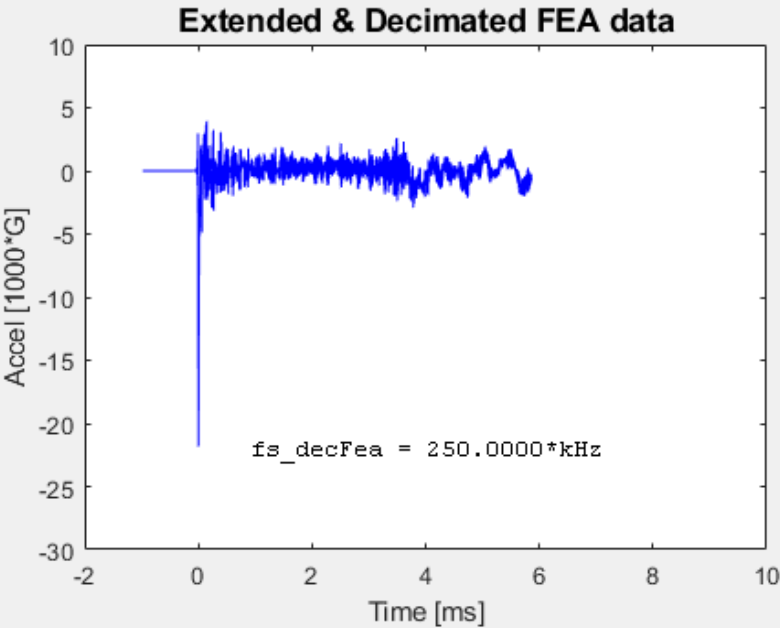
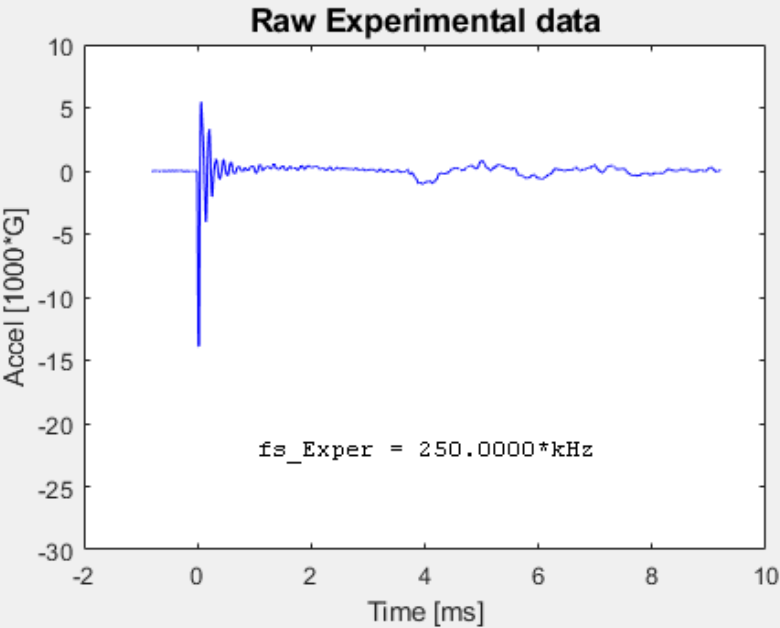
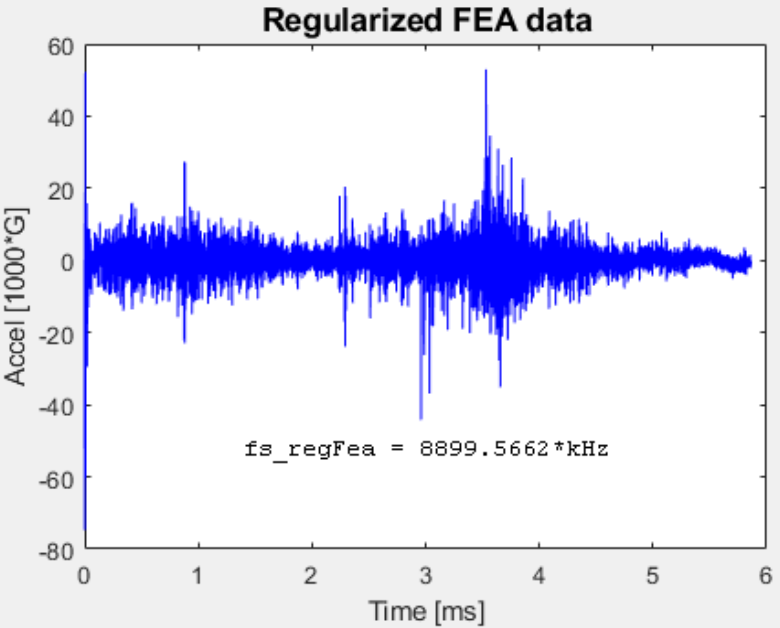
=== ADDITIONAL PROPS INFO ===
**.Props.Description
fea.txt

**.Props.UserData contains stuff but it is NOT shown here.
Use MATLAB dot syntax on variable to see the ".Props.UserData" content:

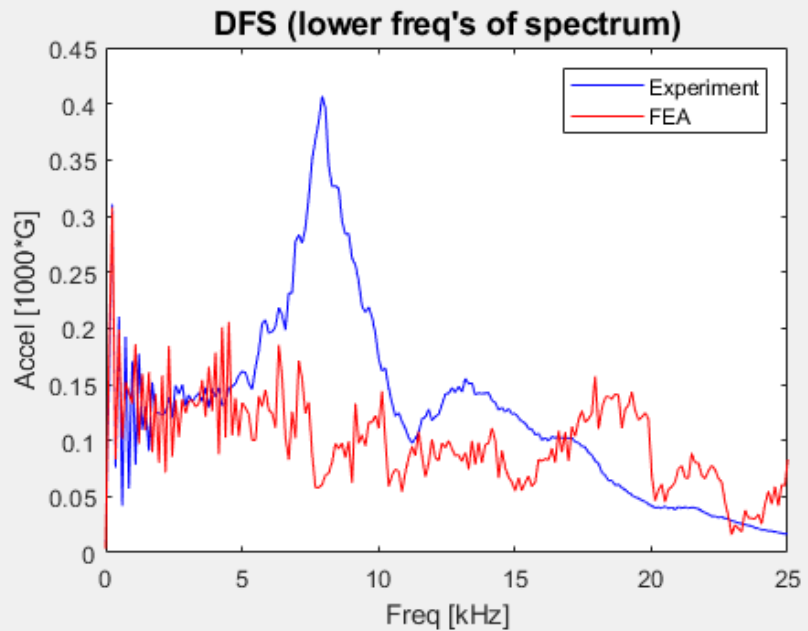
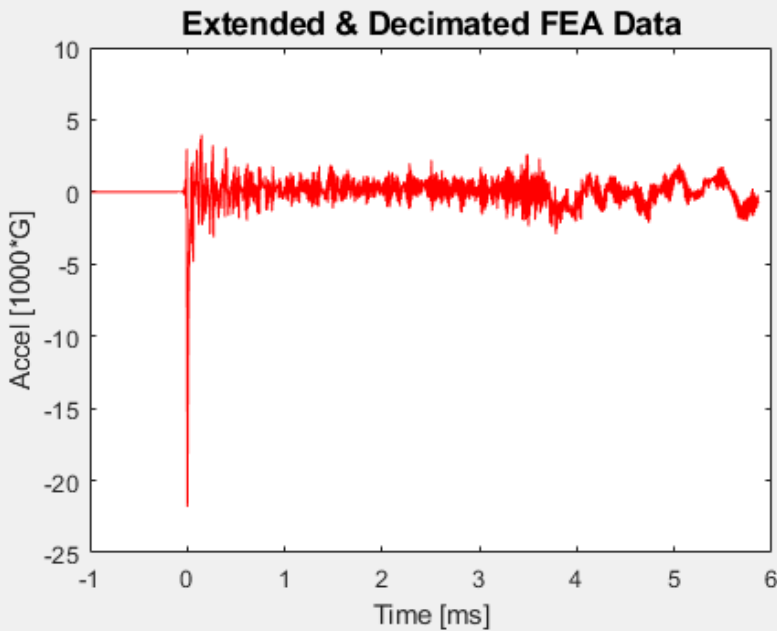
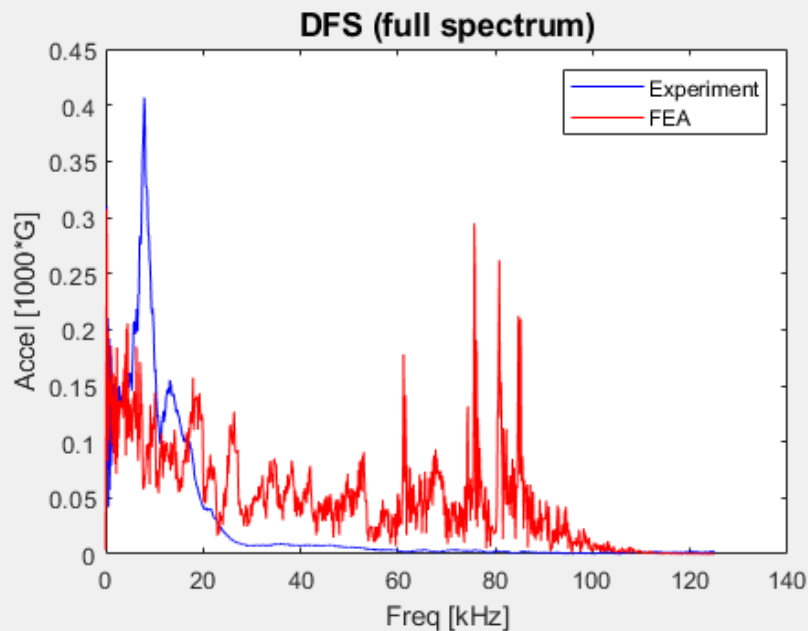
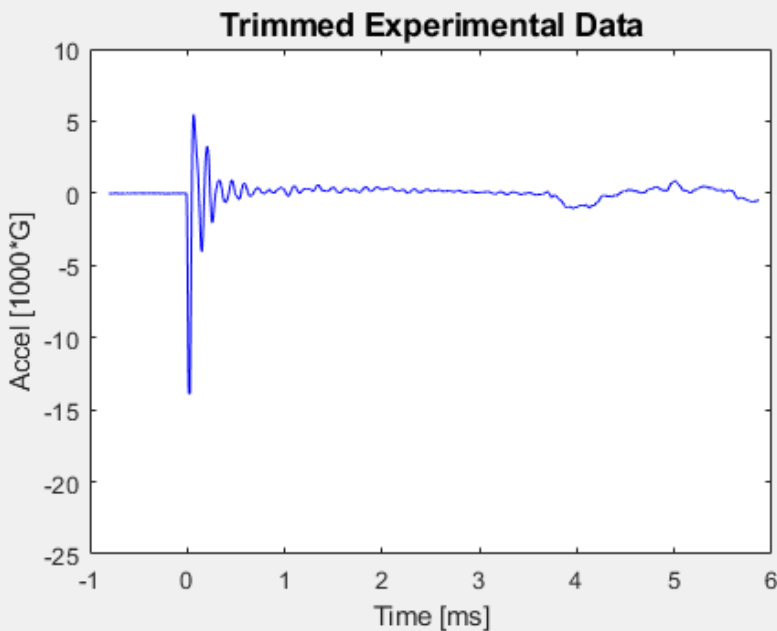
	1 Time [sec]	2 Accel [mm/sec^2]	3 Disp [mm]	4 Strain [m/m]
1	0	0	0	0
2	1.1223e-07	-6.5188e+05	0	0
3	2.2443e-07	-4.3843e+06	-8.2088e-09	5.1468e-10
4	3.3666e-07	-1.5382e+07	-7.1627e-08	4.4873e-09
5	4.4887e-07	-3.8928e+07	-3.2875e-07	2.0747e-08
6	5.6110e-07	-8.0164e+07	-1.0761e-06	6.8754e-08
7	6.7329e-07	-142552124	-2.8329e-06	1.8396e-07
8	7.8551e-07	-226430206	-6.3848e-06	4.2283e-07
9	8.9774e-07	-328046631	-1.2788e-05	8.6633e-07
10	1.0099e-06	-439310150	-2.3322e-05	1.6211e-06
11	1.1222e-06	-548669861	-3.9388e-05	2.8172e-06
12	1.2344e-06	-642564880	-6.2363e-05	4.6030e-06
13	1.3466e-06	-707587891	-9.3430e-05	7.1363e-06
14	1.4588e-06	-732835327	-1.3341e-04	1.0574e-05
15	1.5710e-06	-712009766	-1.8261e-04	1.5059e-05
16	1.6832e-06	-644931458	-2.4078e-04	2.0712e-05
17	1.7955e-06	-538042419	-3.0708e-04	2.7615e-05
18	1.9077e-06	-403543243	-3.8014e-04	3.5811e-05
19	2.0199e-06	-257919647	-4.5829e-04	4.5300e-05
20	2.1321e-06	-118931908	-5.3969e-04	5.6039e-05
21	2.2443e-06	-3.9486e+06	-6.2259e-04	6.7948e-05

Initial Comparison of Accel

No experimental data available that is comparable to high sampling rate FEA data

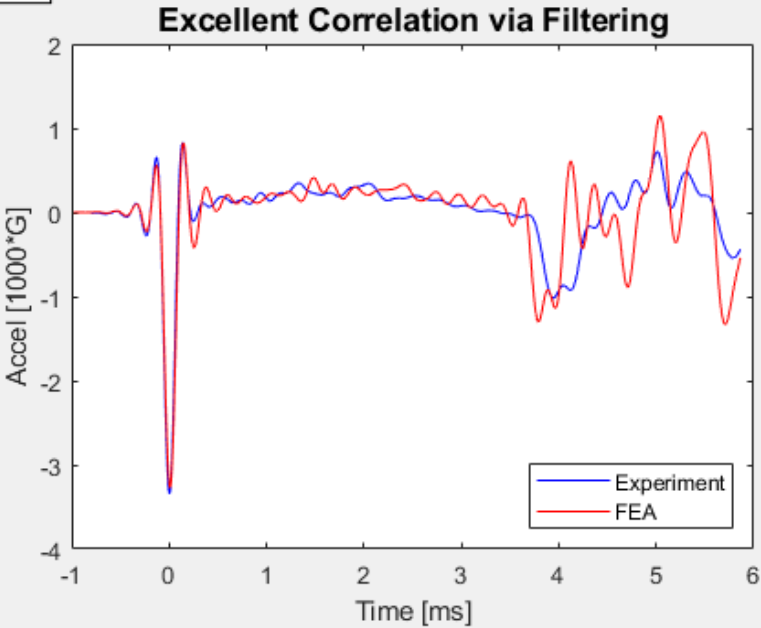
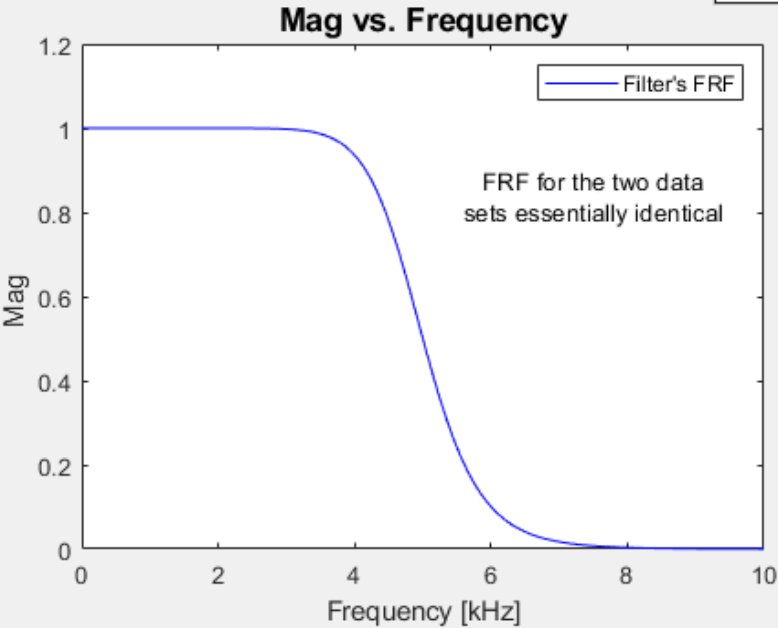


Data Clean-up and Fourier Assessments of Accel



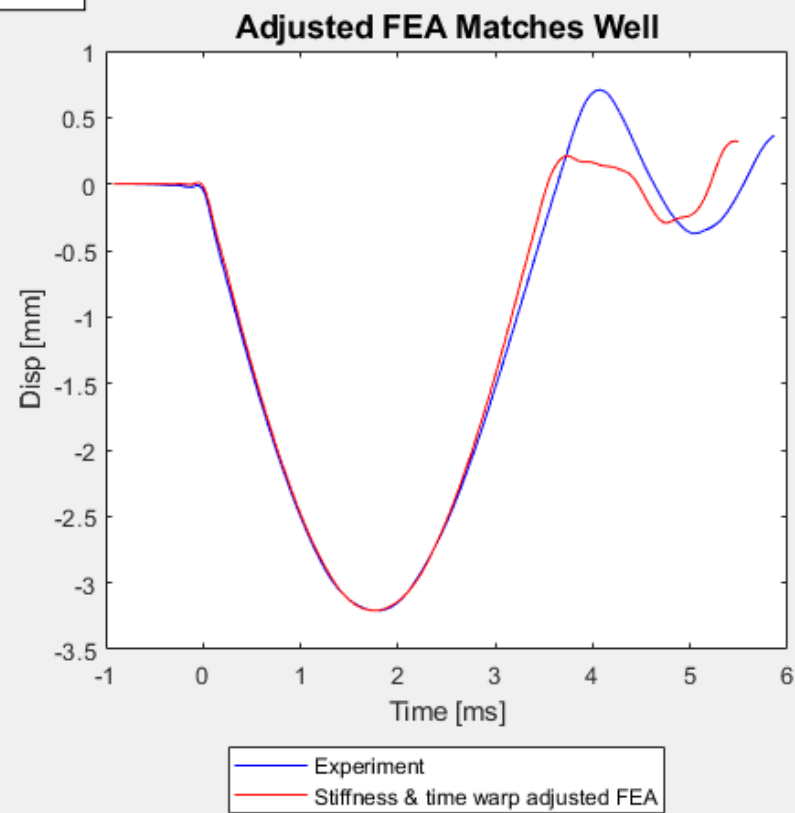
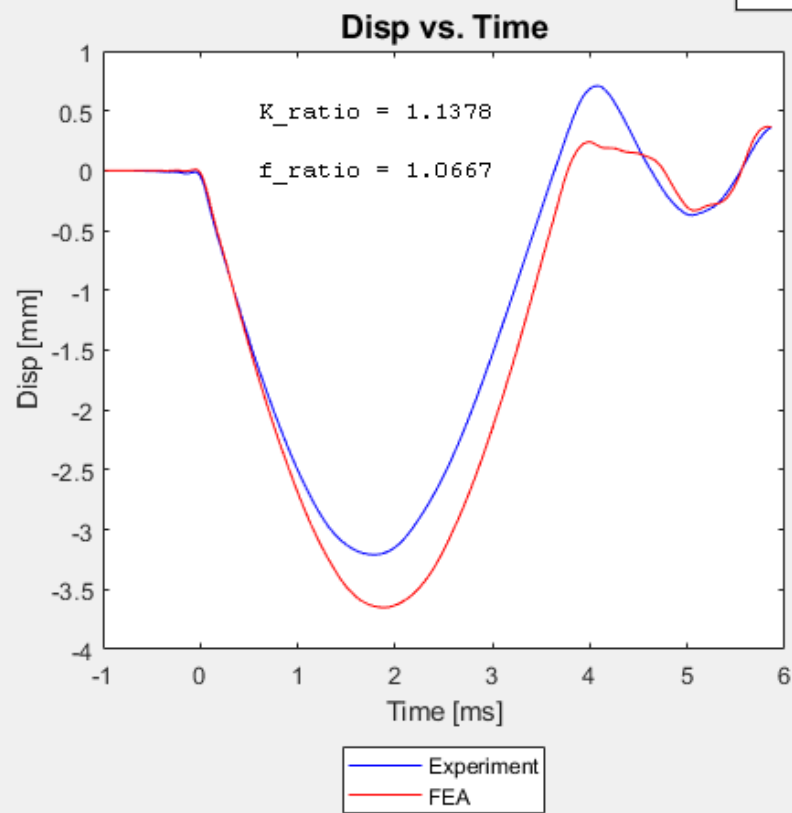
After LP Filtering Accel

$f_c = 5.0000 \text{ kHz}$



Assessing Displacements and Adjusting Stiffness

fc = 5.0000*kHz



The excellent match suggests the FEA model's material law needs to be stiffened by K_ratio = 1.138.

Evaluating Shock Response

fc = 5.0000*kHz

