	<b>Lawrence Berkeley National Laboratory</b>	Cat Code <b>SU3322</b>	<b>TECHNICAL NOTE</b>	LBNL Technical Note # SU-1011-5149	Rev A	Page 1 of 2
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Title LARP QXF LQXF - MAGNET Stress Analysis for the MQXFA04 shell divot found in #003 short shell						

## I. Introduction

One of the MQXFA04 short shells was found to have a gouge upon its arrival and subsequent inspection. The part affected is a short shell (SU-1011-1072), S/N 003. Figure 1 shows an image of the gouge (appears to be an errant cut), which is located at the 6 o' clock position if 12 o' clock is defined by the location of the serial number. The deepest gouge was measured to be 0.006" deep (150  $\mu$ m) max, and approximately 1/4" long. This note contains an analysis that models the gouge on the shell edge, confirming whether or not this divot is cause for concern.

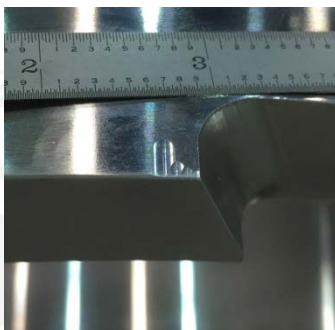


Figure 1 Gouges in the shell of MQXFA04, located approximately 6 o'clock position from the S/N engraving.

## II. Analysis model

The gouge is located at a low stress area, and it is very shallow, but in order to verify the impact of the gouge on the shell stress distribution, a sub-model analysis with the gouge modelled was performed. The gouge size in the model is 0.006" (150 $\mu$ m) deep, 0.125" (3.175 mm) wide, and 0.25" (6.35 mm) long.

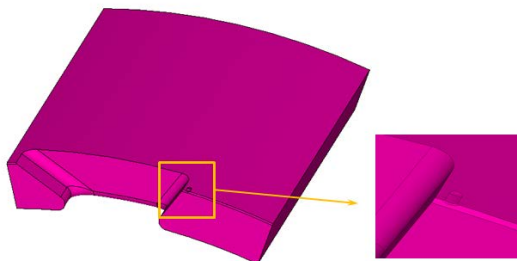


Figure 2 Sub-model of the shell with gouge

The sub-model used for this analysis is same as that used for the shell cut-out optimizations [1].

### III. Stress results around the gouge

The stress on the shell is not significantly impacted by the gouge. Figure 3 shows the Von Mises stress of the shell in the cases that with and without the gouge. From the results, the peak stresses at the corner are not changed; the stress distribution around the gouge area is also virtually unchanged as well.

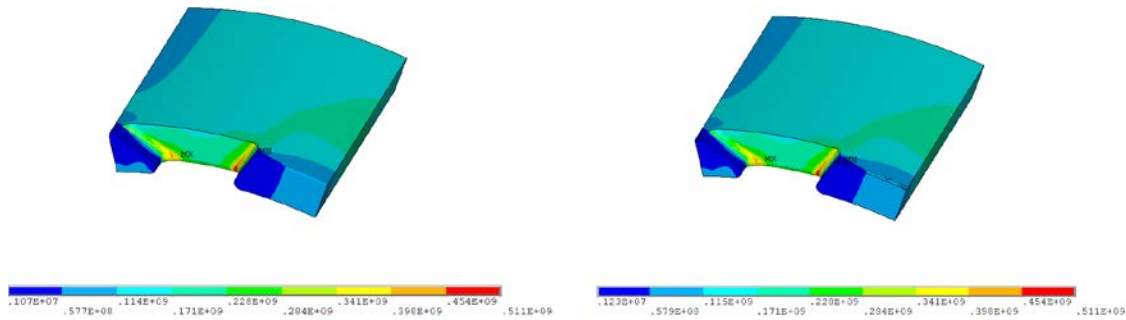


Figure 3 Von Mises stress on the shell (Pa) (L) without the gouge; and (R) with the gouge.

### IV. Conclusion

The stress on the shell is not significantly impacted by the gouge. The results of the FEA model, with and without the gouge, are virtually identical. Therefore, based on these results it is determined that this shell may be used in the MQXFA04 magnet safely.