Invitation to the 2020 Christmas Tree Fire Size Prediction Competition

On Tuesday, December 22, at 12:00 pm (EST) the Department of Fire Protection Engineering at the University of Maryland will host its *seventh annual* competition to predict the burning behavior (heat release rate, HRR) of a Christmas tree. This is a friendly competition to bring together members of the fire safety science community that hopefully provides an opportunity to explore and develop collaborations in the future. The event also serves to share a positive fire safety message, mainly: "If you have a natural Christmas Tree this season, please keep it well-watered."

We would like to invite you to join us by submitting predictions to this year's competition. For the 2019 Competition, we received 96 unique predictions (several of which were group predictions prepared by multiple individuals) from 29 unique institutions across 8 countries (including 6 different states in the US). The video of the 2019 Christmas Tree Burn can be viewed here: https://youtu.be/9SwgApd0364?t=229. The 2020 event will be livestreamed; details regarding how to watch the event will be provided to all groups who submit a prediction.

Our current reigning champions (three years in a row!) are the members of University of Queensland Fire Safety Science and Engineering Program. Hopefully someone new can dethrone them and earn the Golden Pinecone this year (teams of at least 3 individuals from the same University or Research Institution are needed for a chance to win best team prediction). This year, a Silver Pinecone will also be awarded to our second-place team.

2020 has been… a year. Come take a break with us for a moment when we can come together as a community just for fun (and to share an important fire safety message).

Good luck!

Submitting Predictions

Visit https://pages.nist.gov/christmas_tree_fire_safety/ to use a custom-made app that allows you to 'build' (and submit) your own fire by adjusting four parameters:

Fire Growth Rate
Peak Heat Release Rate (Peak HRR)
Duration of Steady Burning
Fire Decay

In this app, after you click submit, an email will be generated that contains the parameters defining your HRR curve. Please remember to add your name, email, and lab affiliation if you wish to receive credit (and to hear future updates/receive the event livestream link) and to CLICK SEND so that the submission actually comes our way.

Competition information

This year's competition will be organized and scored a bit differently from previous years. After a conversation with colleagues at NIST, we have decided to make a first order attempt at using this competition to contextualize model-predictions vs. experimental uncertainty. In short, this means that tests will be repeated in triplicate and your predictions will be scored with respect to the average and standard deviations (with explicit considerations for measurement uncertainty) of experimentally measured burning behavior (i.e., peak HRR, time to peak, fire growth time and duration, and total energy release).

This year's competition trees are all Balsam Firs, each approximately 185 cm +/- 2.5 cm tall (as shown in Fig. 1). Tree masses (obtained on December 4, 2020) were between 9.8 and 11.1 kg. The trees will be held in laboratory storage (relative humidity = 50 %; temperature = 22 °C) without water for 18 days prior to burning.

For ignition, a 7.5 cm diameter pan filled with 40 mL of heptane will be placed below the lowest branches of the tree. Ignition (time, $t = 0$ s) will be defined as the earliest time at which measured HRR exceeds 50 kW. Note: last year's tree, a Balsam Fir, was larger than the three trees to be burned this year. Experimental results and the best predicted HRR curves (from the 2019 competition) are shown in Fig. 2.

Christmas tree mass loss rate will be measured continuously at 1 Hz using a Mettler Toledo mass balance with a 0.1 g precision. If possible, cone calorimeter measurements will be performed to determine a representative heat of combustion, ΔH_c, for each tree. If not, a constant value will be assumed – $\Delta H_c = 17.7$ kJ/g [Mell et al. 2009] – to convert this to HRR.

Additional information

Rules, scoring guidelines, and some reference materials can be found at: https://fpe.umd.edu/events/christmas-fire-safety-demo (scroll *all* the way down)

Figure 1. This year's **three** competition trees (Balsam Firs, each ~1.85 m tall).

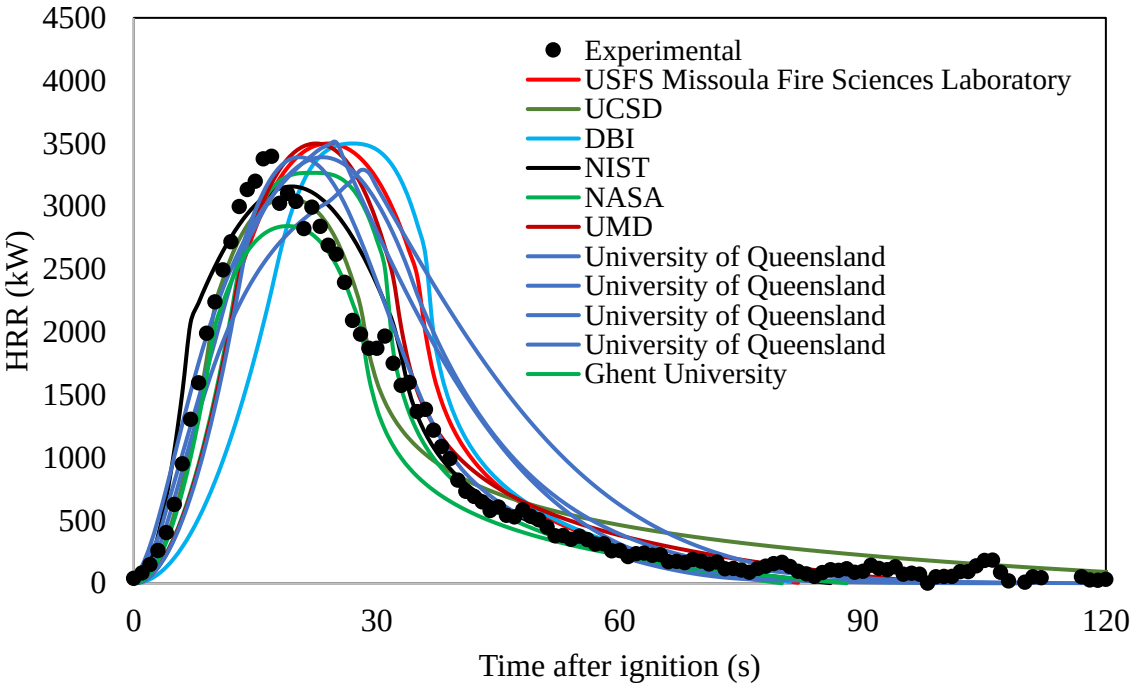

Figure 2. Results from the 2019 Christmas Tree HRR Prediction Competition