Advanced Combustion

The Background

In 2015, fires caused more than $14.3 billion in property damage. One structure fire was reported every 63 seconds and an injury was reported every 34 minutes.
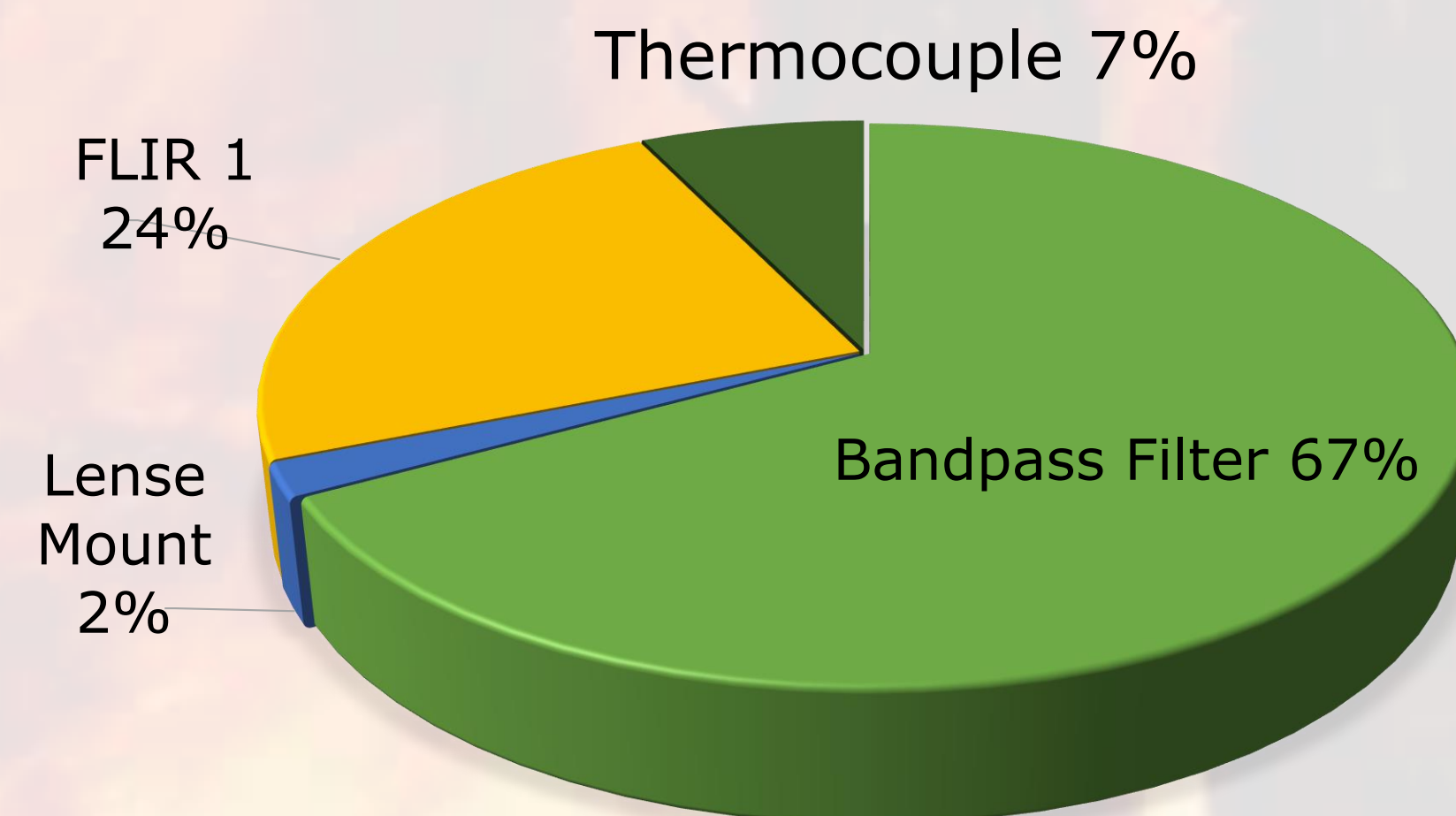
Floating embers are a main factor for how a fire develops and spreads, but little is known about their characteristics.

Our Mission

Create a tool to analyze the probability of fire spotting caused by floating embers.

Characterize important aspects of floating embers such as temperature, energy, and the velocity profile. A cell phone application will be developed using this data to examine the risk of combustion to the surrounding area.
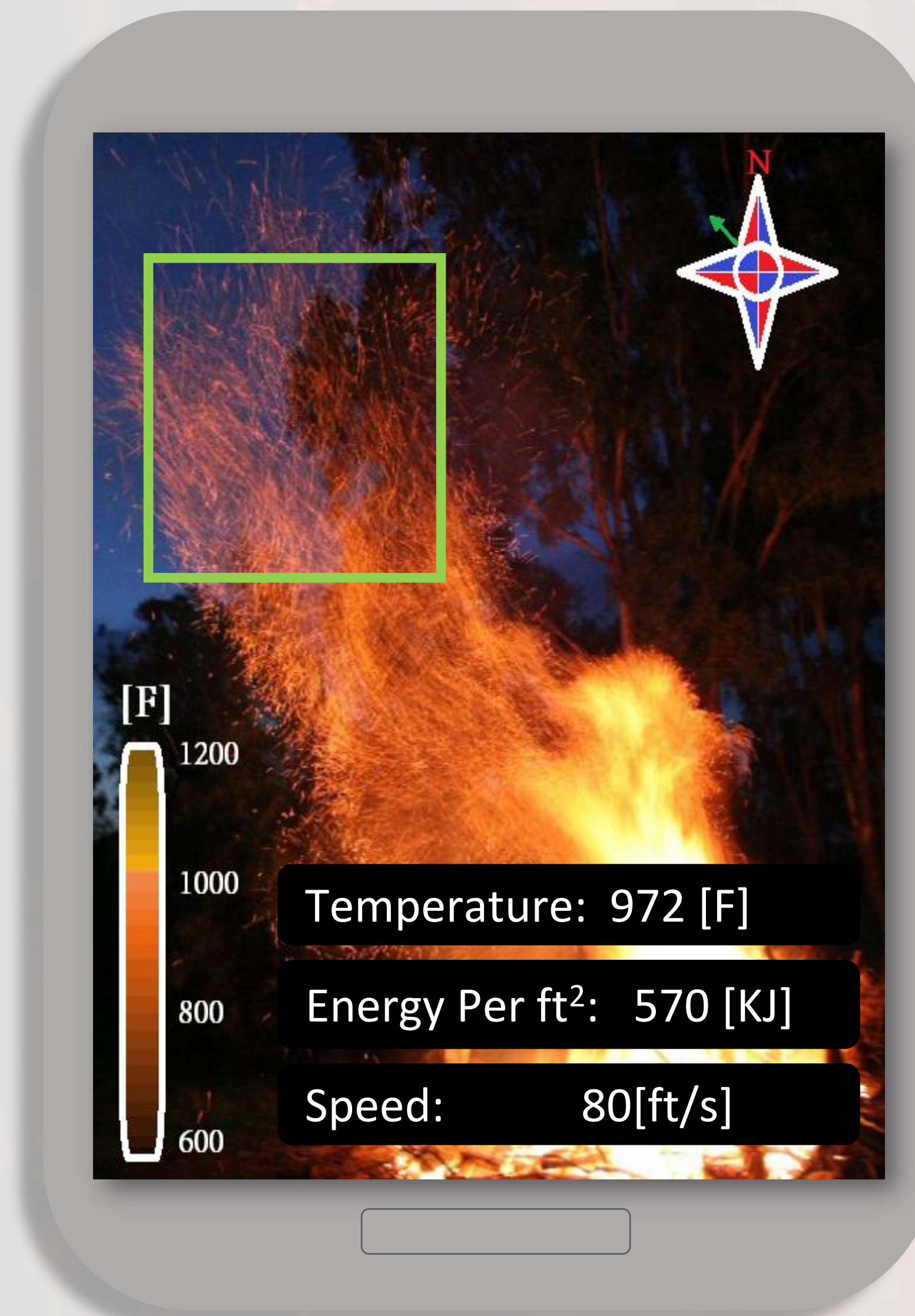
Total Cost: $975

- Thermocouple 7%
- FLIR 1 24%
- Lense Mount 2%
- Bandpass Filter 67%

Temperature: 972 [F]

Energy Per ft^2: 570 [KJ]

Speed: 80[ft/s]

[F] 1200 1000 800 600

Multi-Color Pyrometry

Surface Temperature will be determined by comparing ratios of the intensities of at least three different wavelengths in the visible spectrum.

Analysis

Energy per unit area; Temperature; Trajectory; Risk Factors.

Software

Analysis will take place within the camera, be connected to mapping software, and information will be easily saved and forwarded.

Fall
- Develop a calibration system and gather data
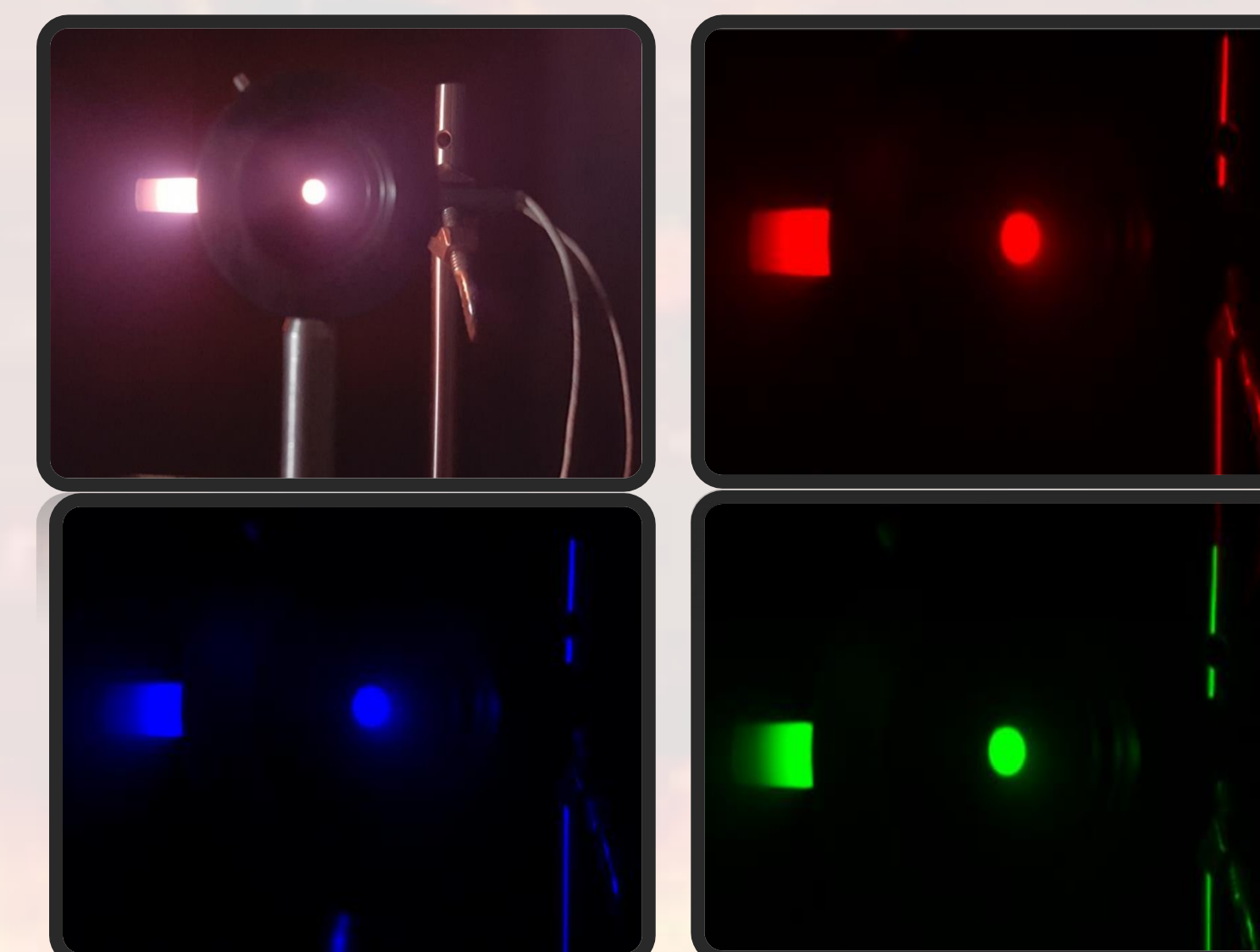- Organize, characterize and analyze data

Winter
- Define parameters to calibrate a cell phone camera for temperature measurement
- Test and finalize code for prototype
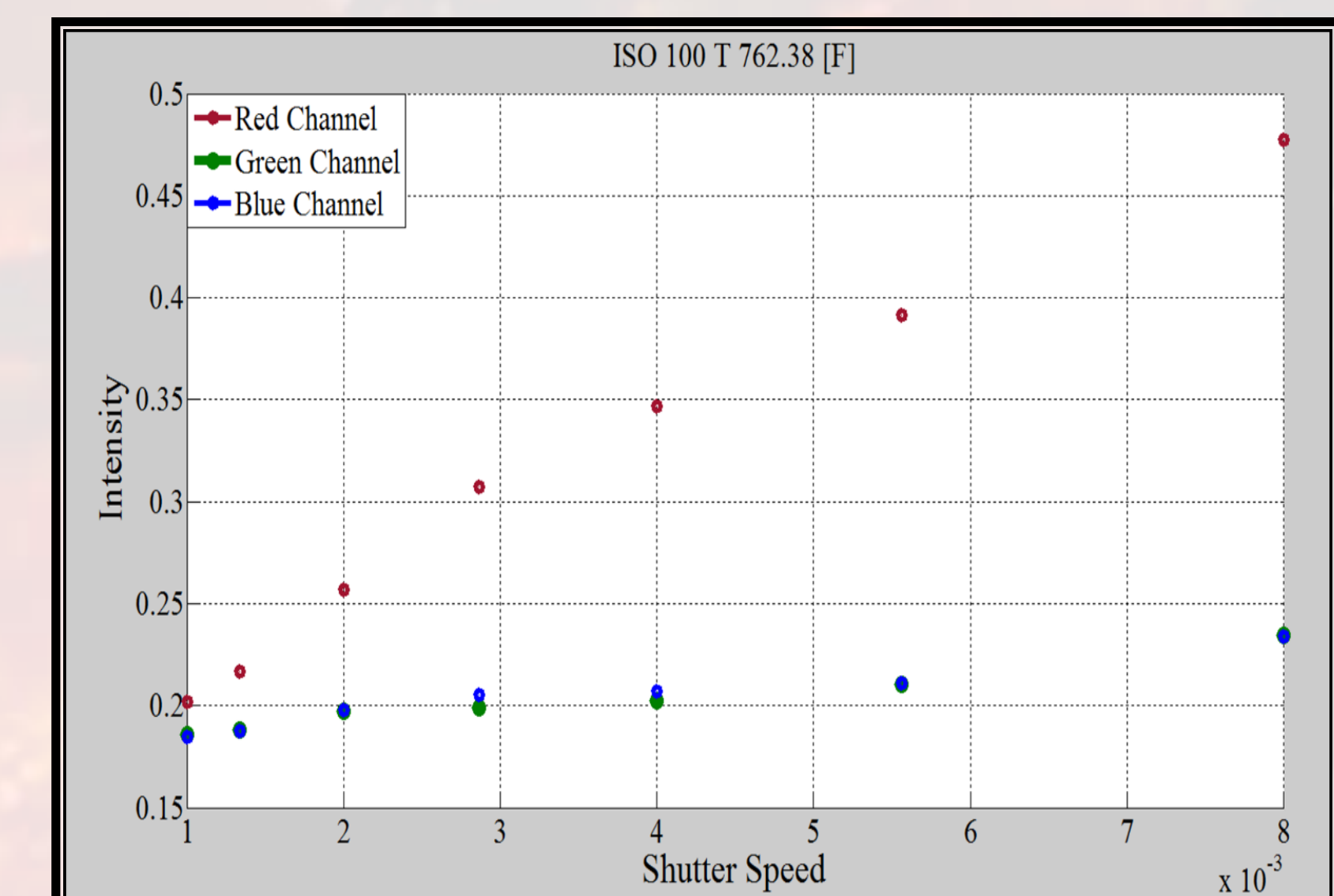
Spring
- Develop a setting to field test product
- Field testing and revising

Experiment set up for the camera's capabilities study

Separation of red, green, and blue (RGB) channel from the raw image

ISO 100 T 762.38 [F]
- Red Channel
- Green Channel
- Blue Channel

Intensity

Shutter Speed

Sensitivity of the camera's CCD

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