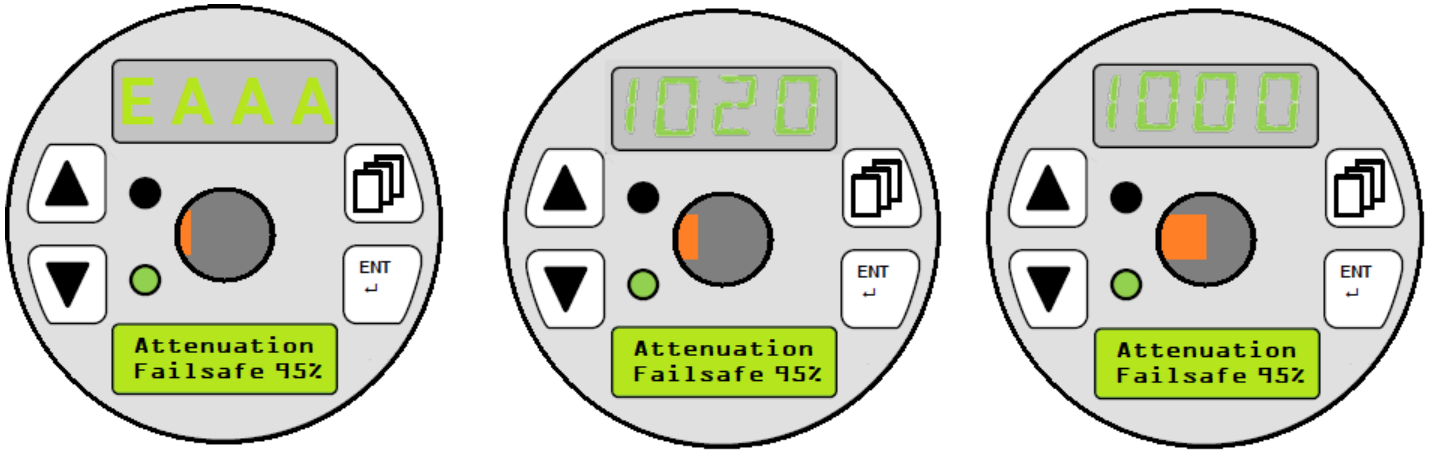
Problem – Temperature Spike E1RL

Endurance ratio (2 color) sensors may experience temperature spikes on the leading and trailing edge of a moving object entering then leaving the sensor field of view

The typical use cases are billets exiting induction furnaces and molten streams where the sensor is scanning from left to right

In billet induction heating processes, certain billet sizes, temperatures and materials may present (to the sensor) on the leading and trailing edges, one curved surface, perpendicularly presented to the sensor) and one flat surface (forward facing surface), at an oblique angle

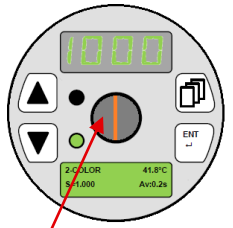
Transition from 0% object in the field of view to a “safe” % of object in the field of view leads to an erroneous reading (temperature spikes)



Problem - Background

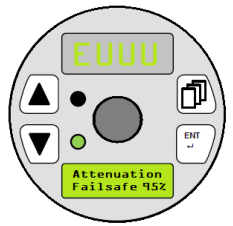
The attenuation failsafe setting was primarily developed as way to determine a dirty sensor window and allow measurements of objects that are smaller than the FOV

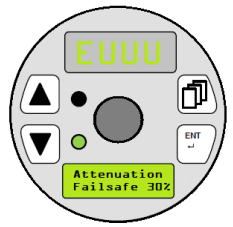
For example, thin wire or molten metal or glass streams from safe distance are ideal situations as the object represents a static situation (aside from the temperature itself). In this steady state situation if typical attenuation values of >50% were necessary, this steady state (in respect of the object size) temperature can be compensated for in the sensor.



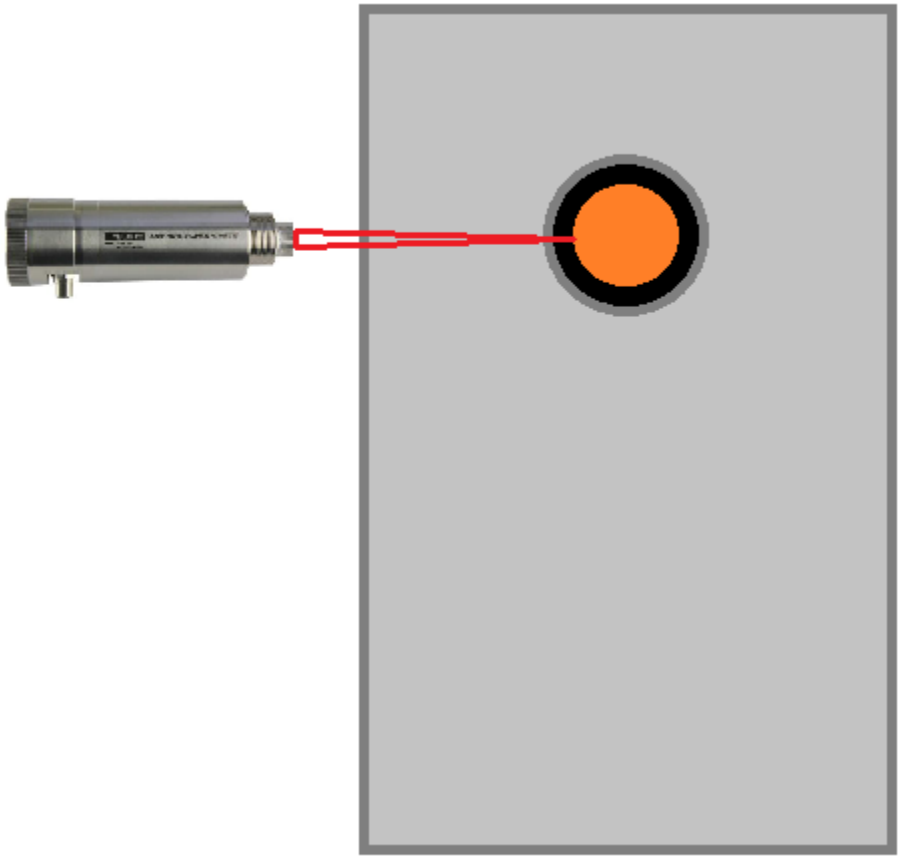
Molten Stream

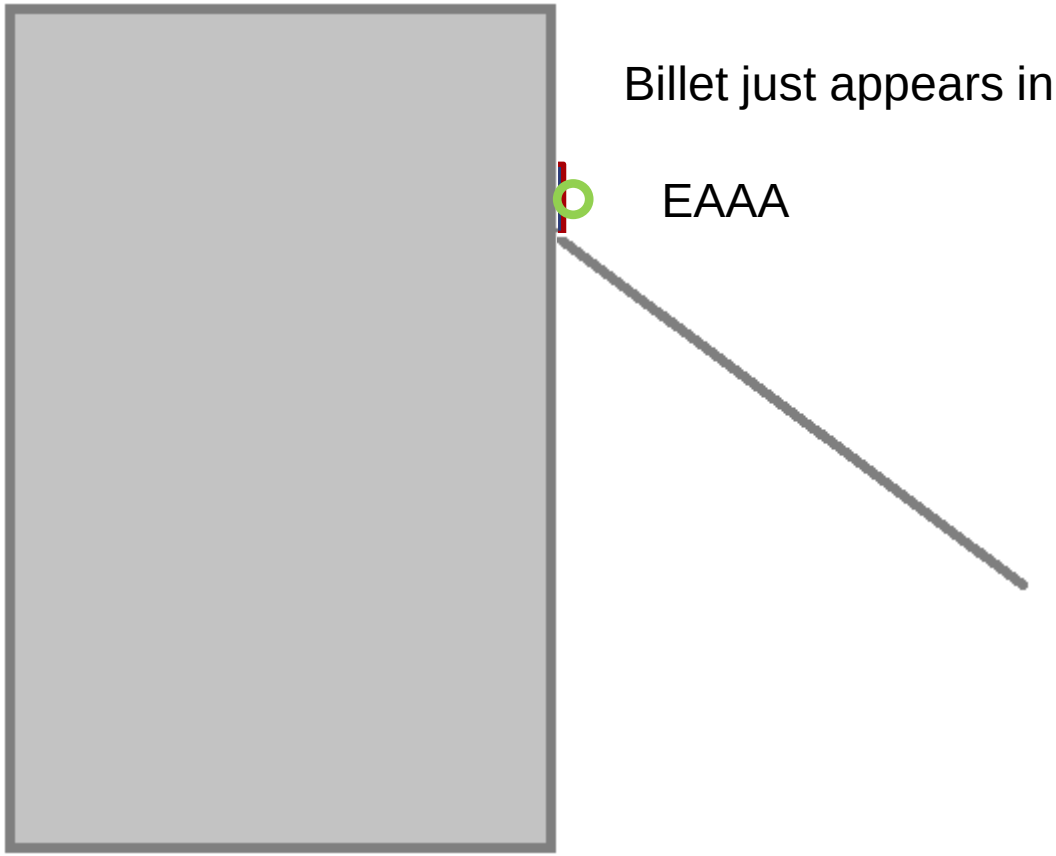
The dynamic situation of an object entering then leaving the field of view cannot be compensated for. In this case we must inhibit the sensor from calculating a temperature until the FOV is almost filled (or ideally completely filled) by setting an appropriate Failsafe Attenuation value



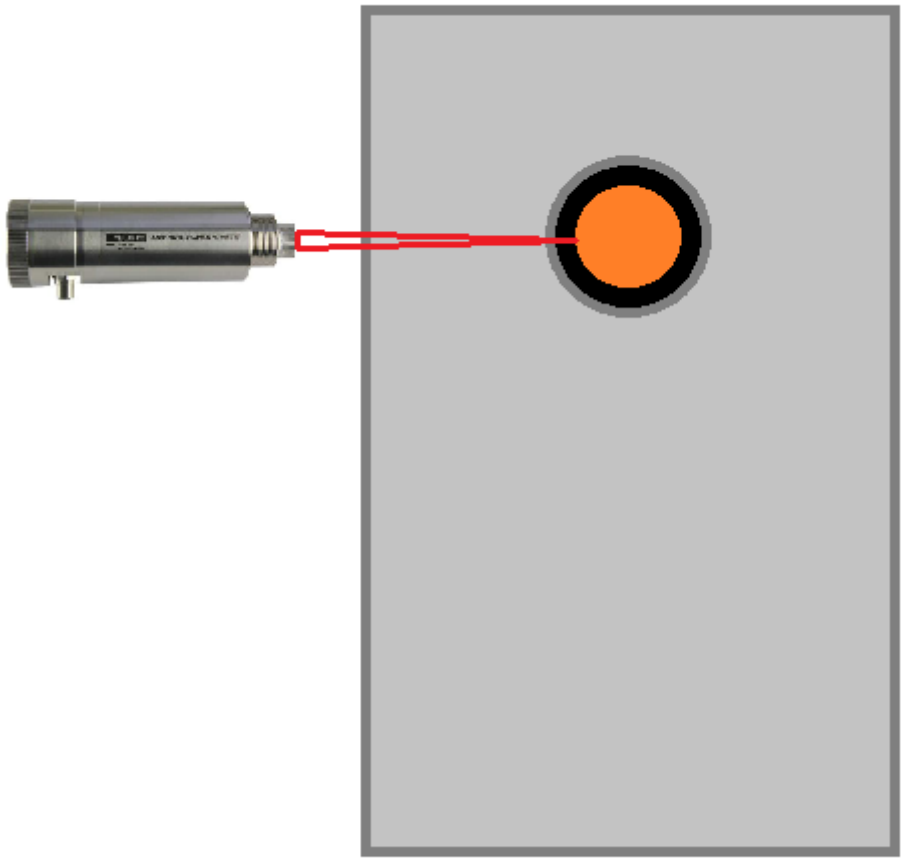


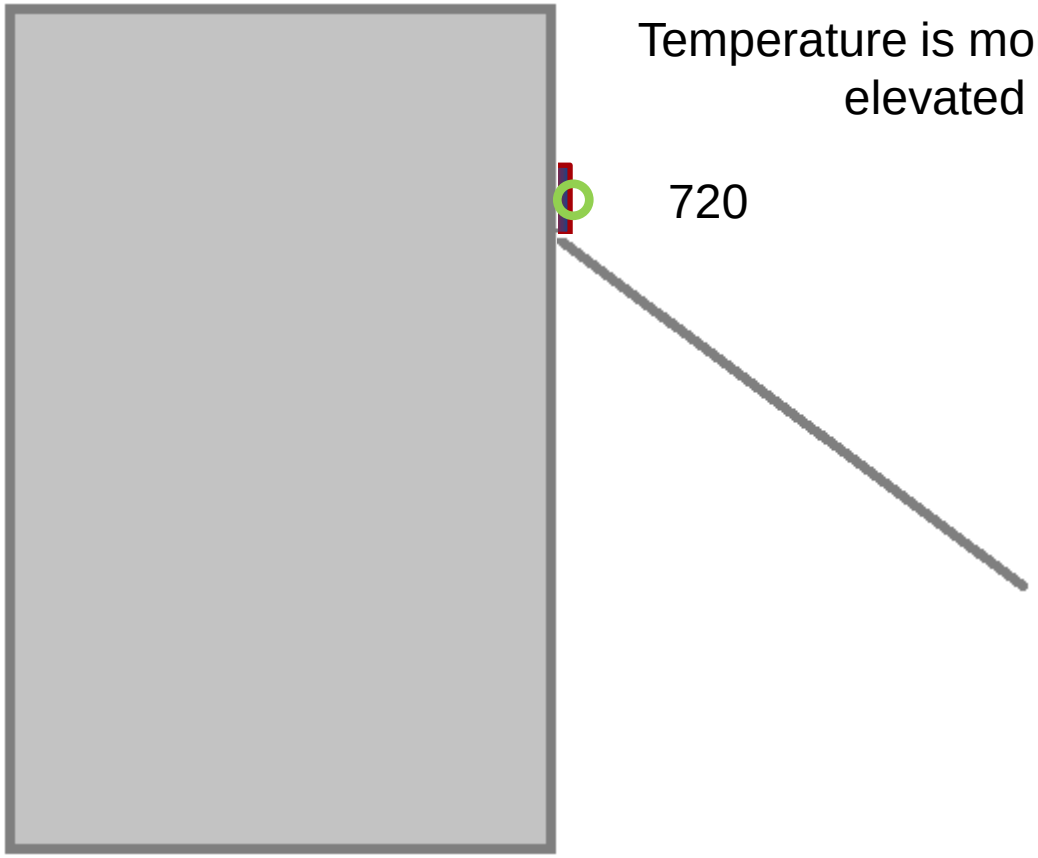
Scenario Original – attenuation failsafe 95%





Scenario Original – attenuation failsafe 95%

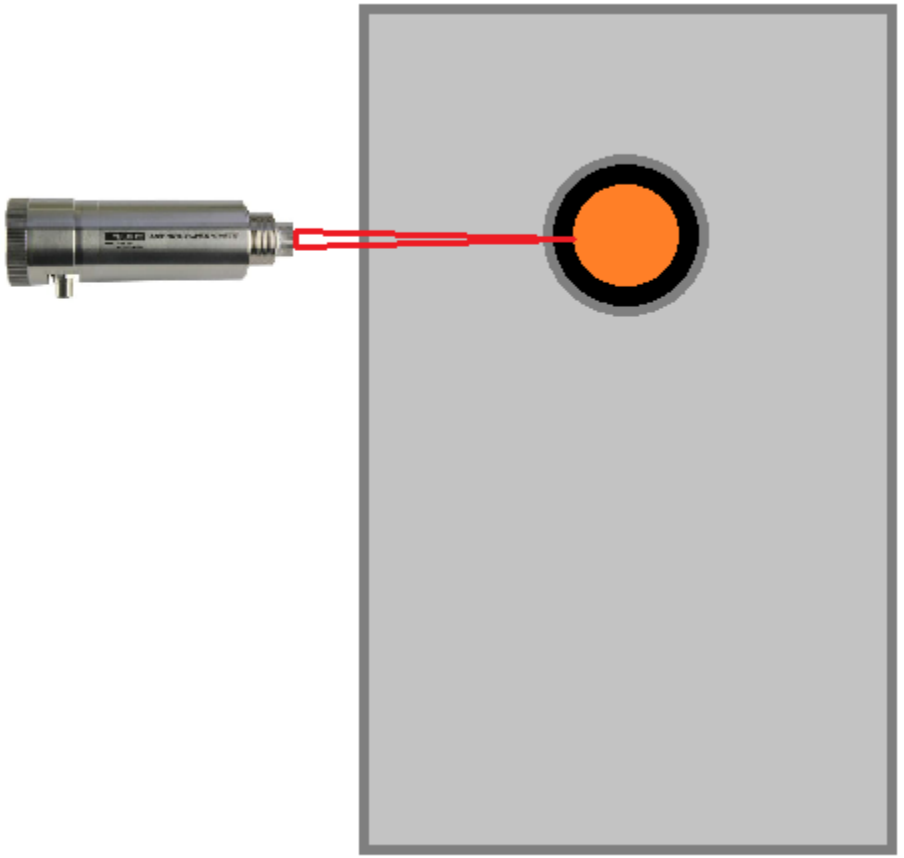


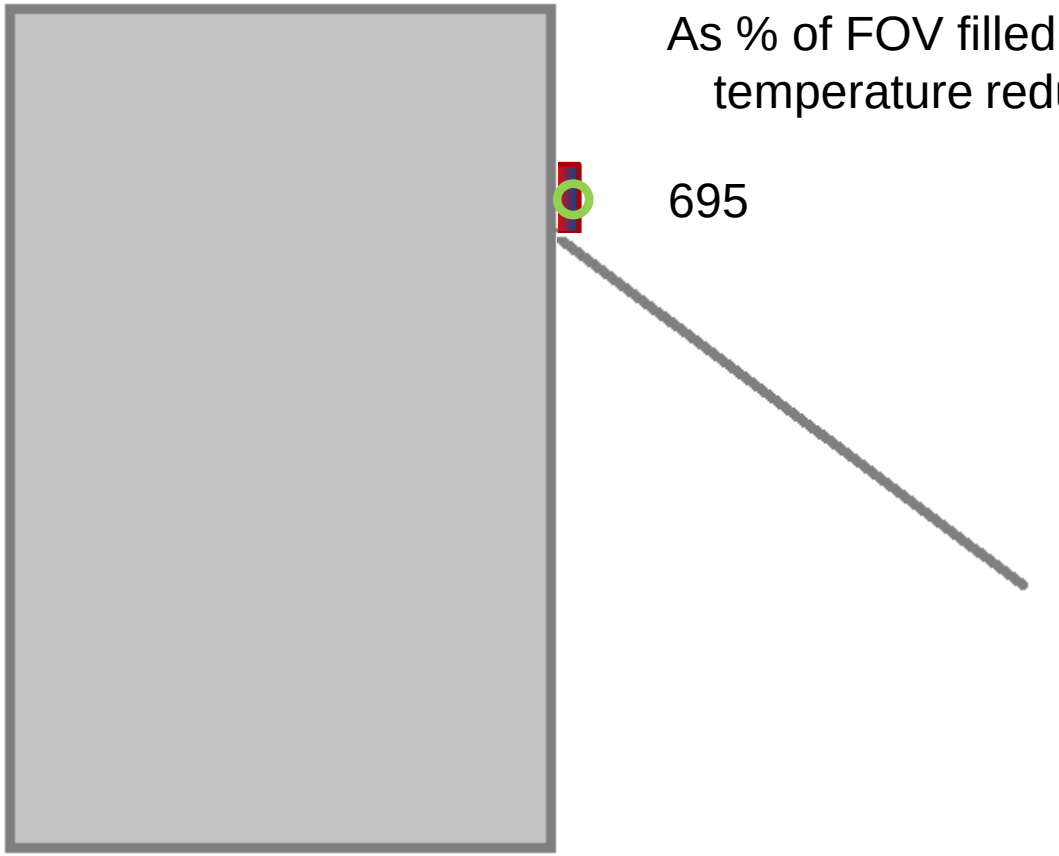


As % of FOV increases Temperature is momentarily elevated

720

Scenario Original – attenuation failsafe 95%

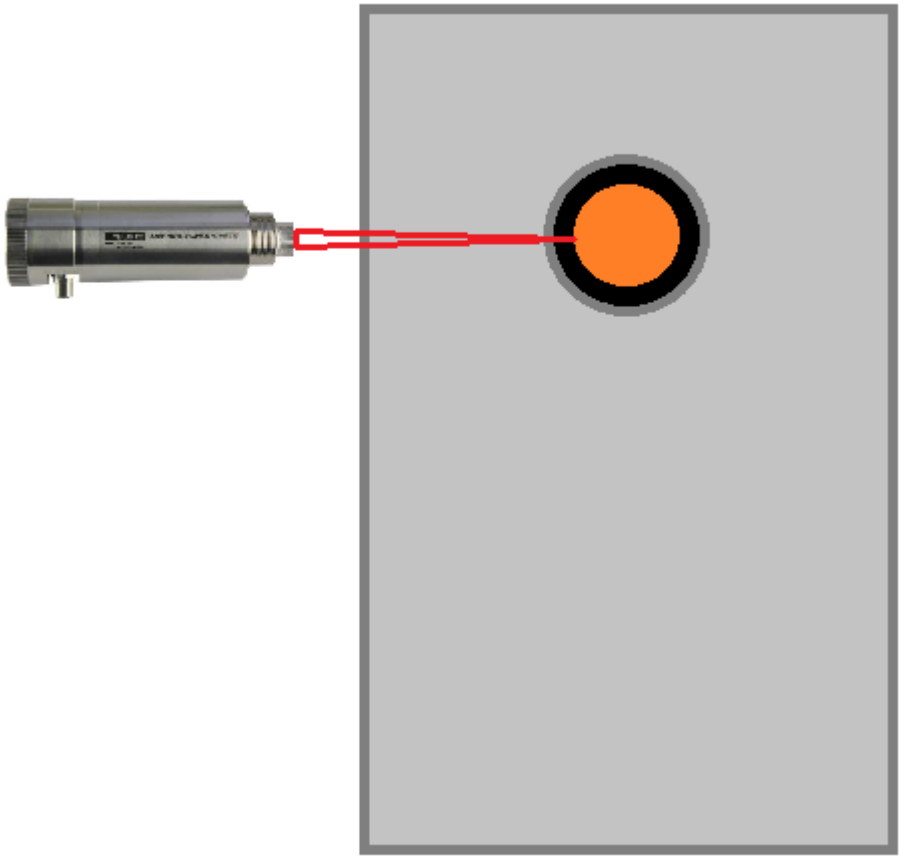


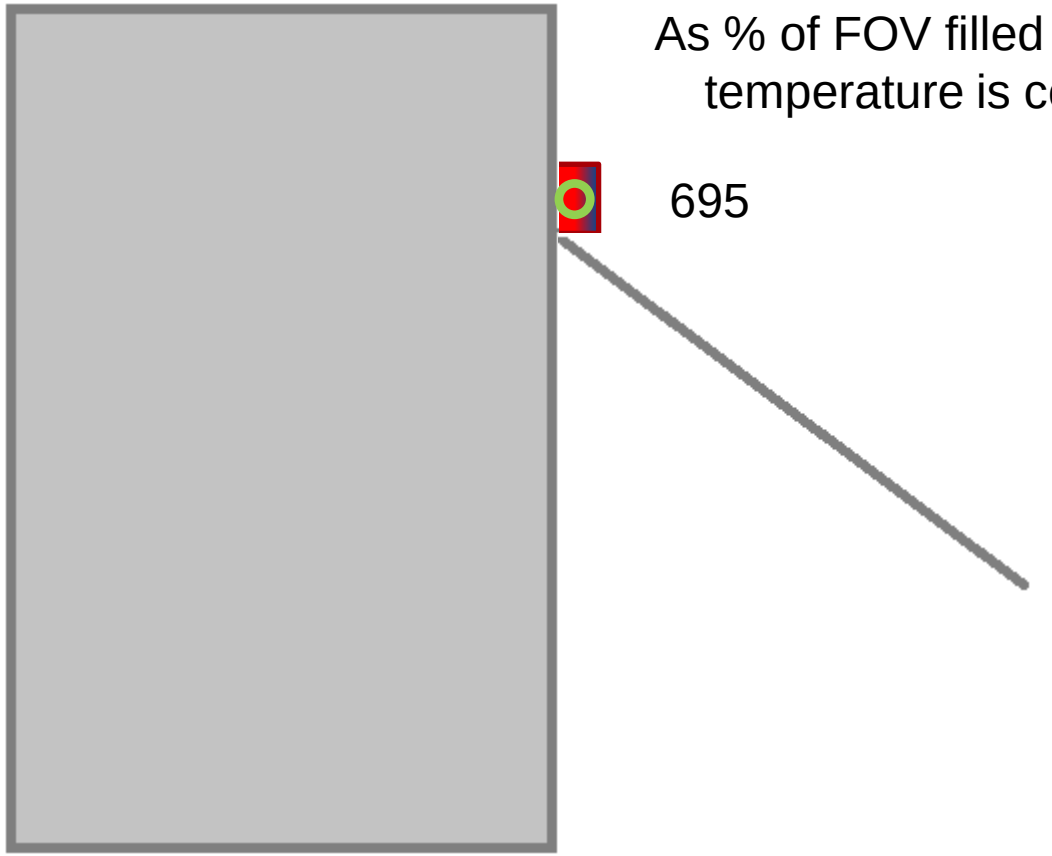


As % of FOV filled >50%, temperature reduced

695

Scenario Original – attenuation failsafe 95%

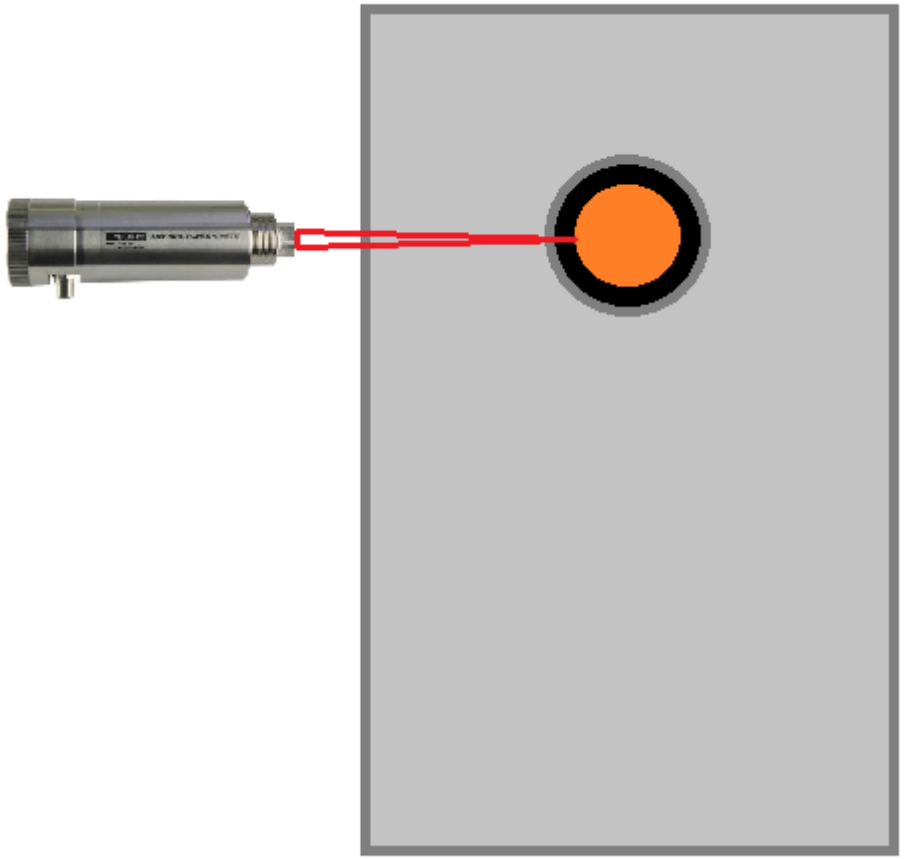


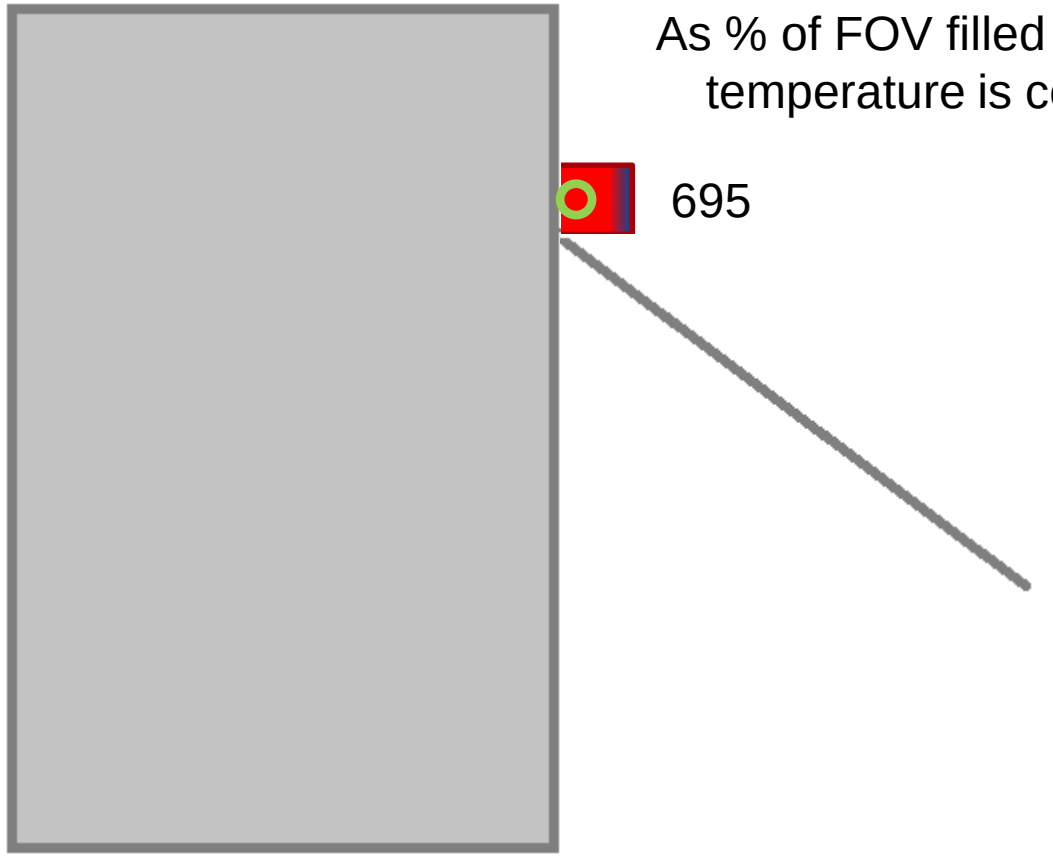


As % of FOV filled =100%, temperature is correct

695

Scenario Original – attenuation failsafe 95%

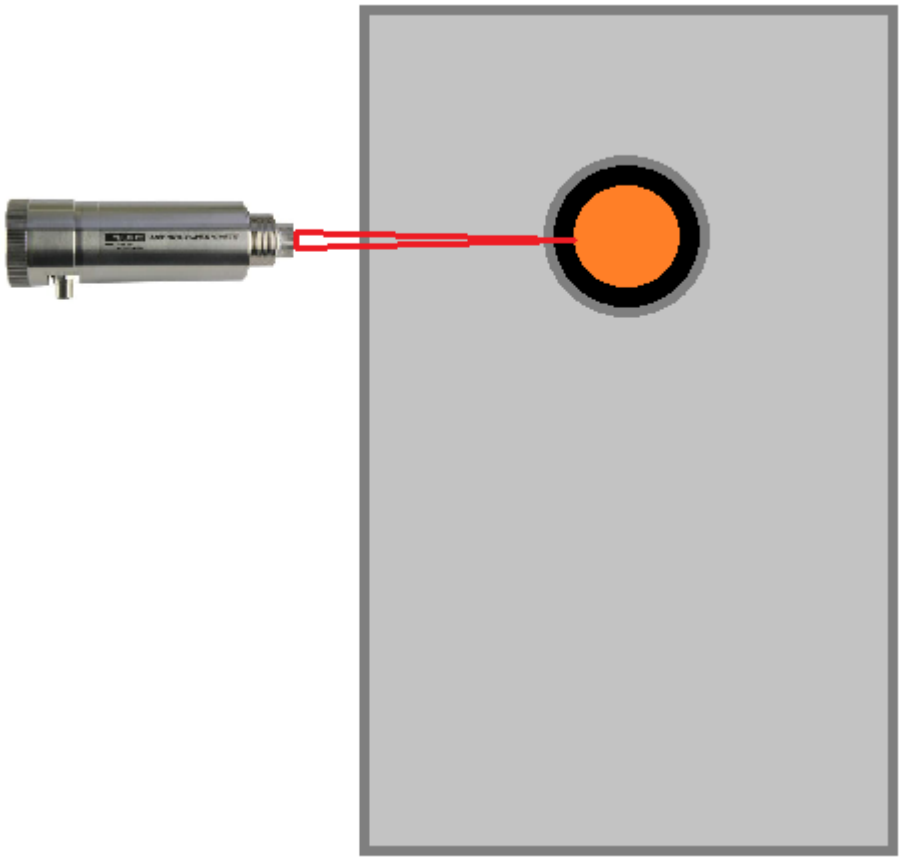


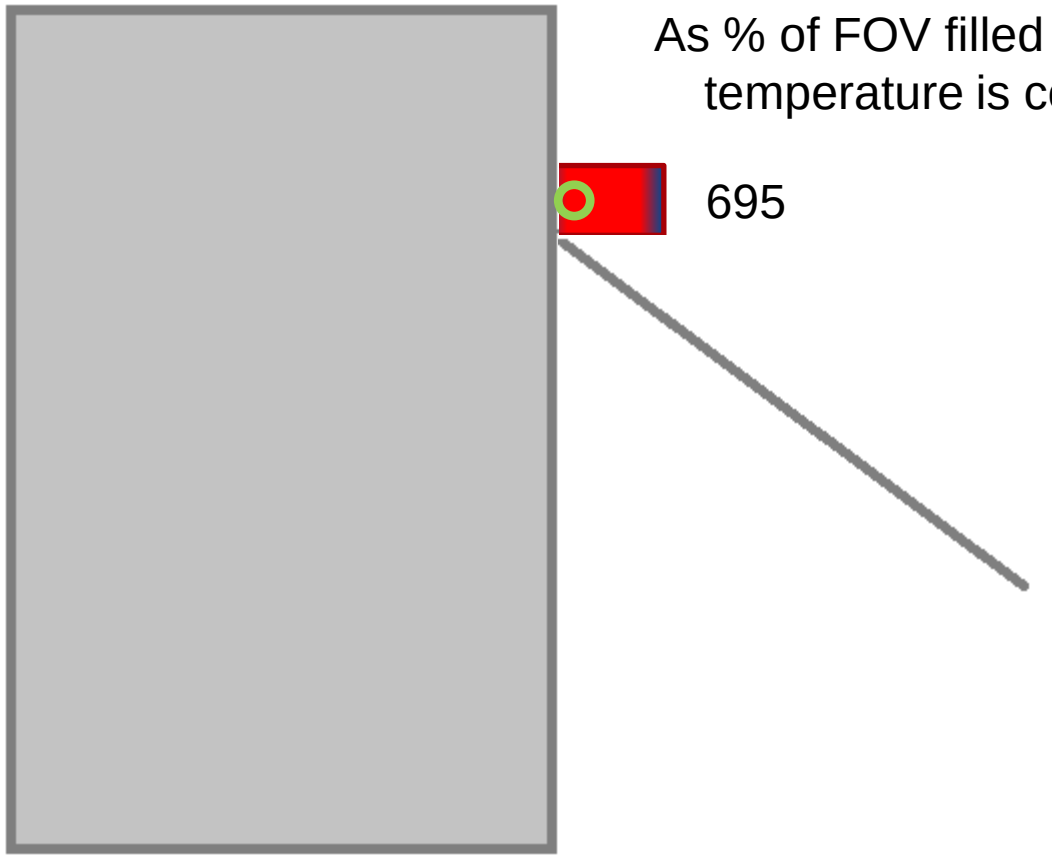


As % of FOV filled >100%, temperature is correct

695

Scenario Original – attenuation failsafe 95%

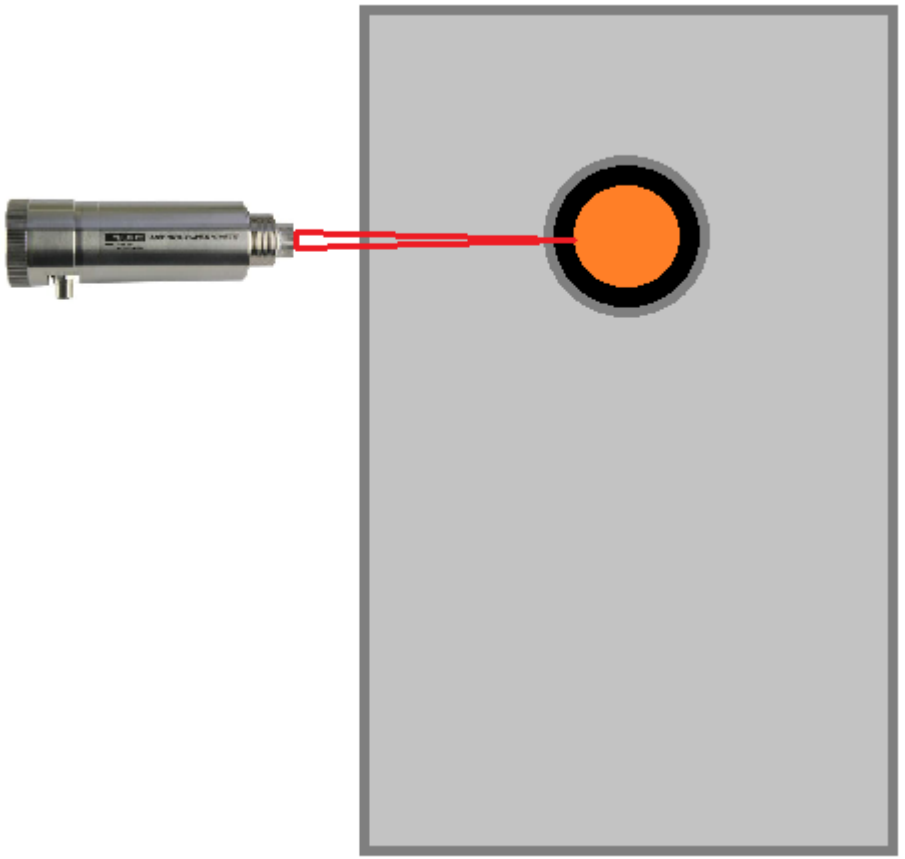


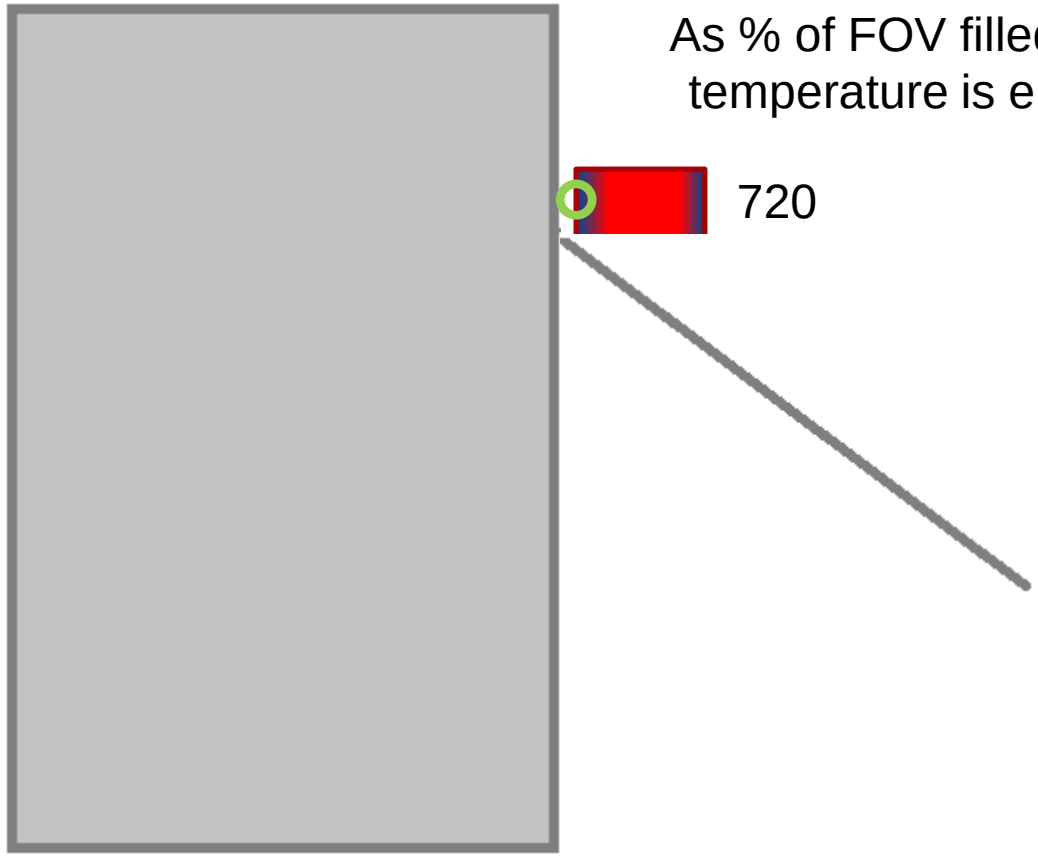


As % of FOV filled =100%, temperature is correct

695

Scenario Original – attenuation failsafe 95%

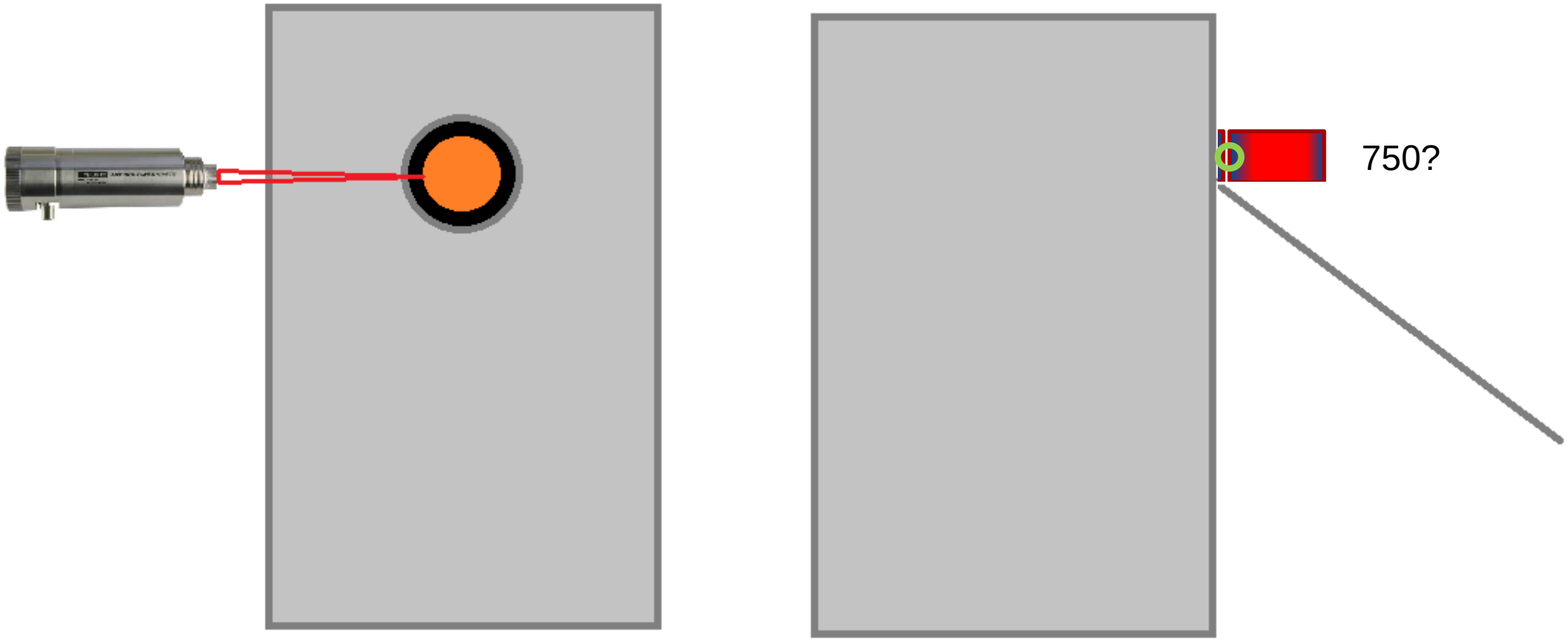




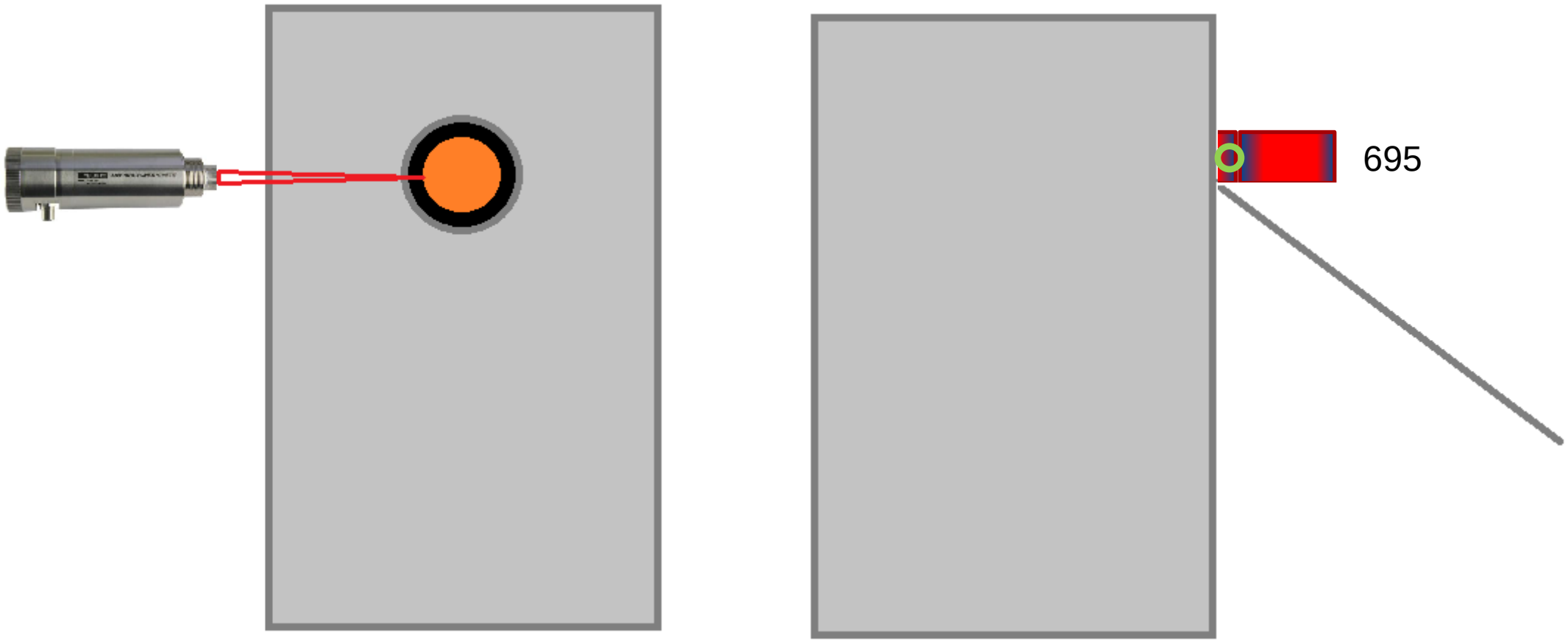
As % of FOV filled <50%, temperature is elevated

720

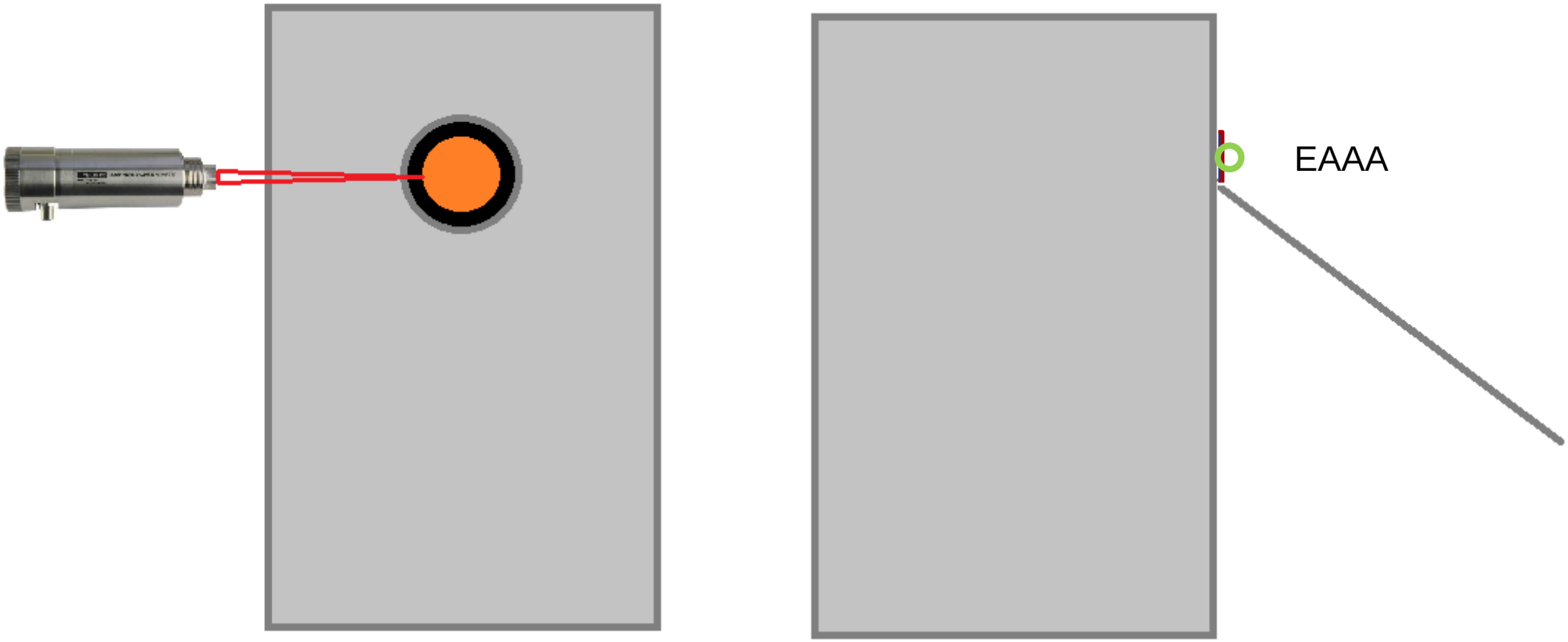
Scenario Original – attenuation failsafe 95%



Scenario Original – attenuation failsafe 95%



Scenario 1 – large gap between billets – attenuation failsafe 30%



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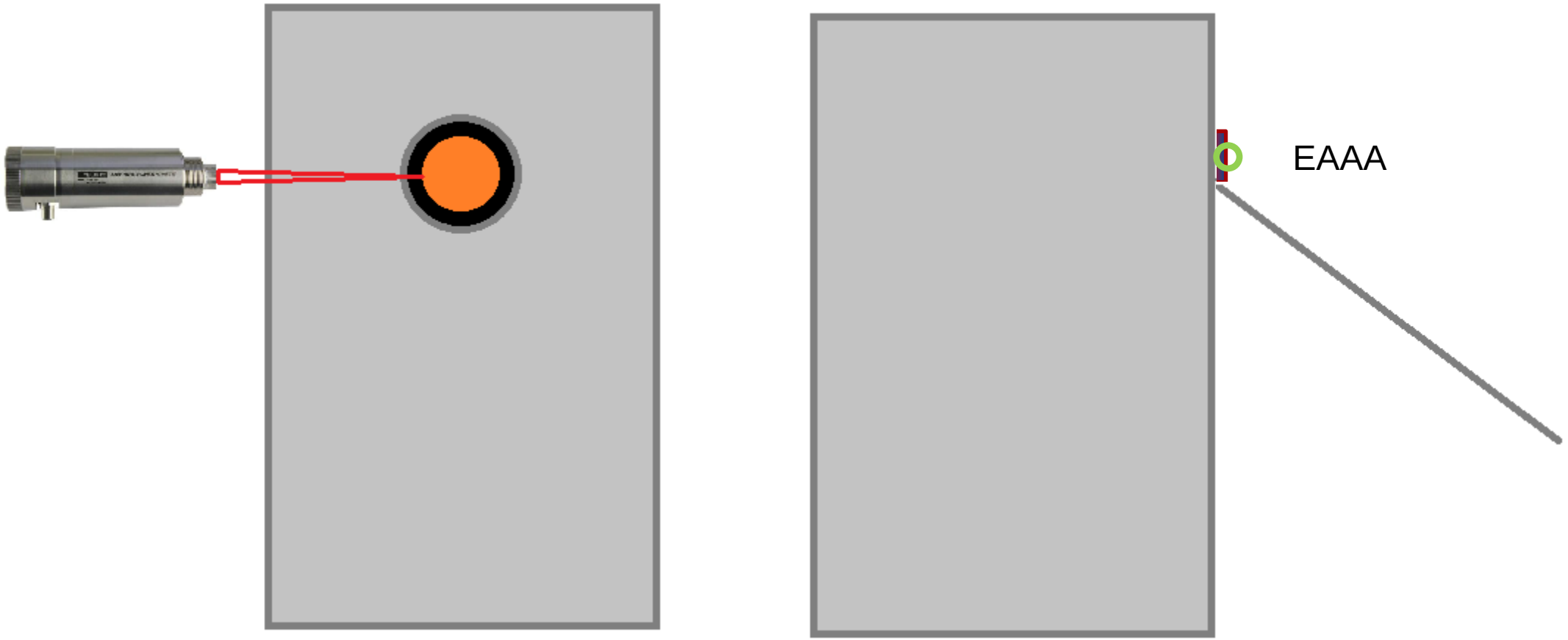

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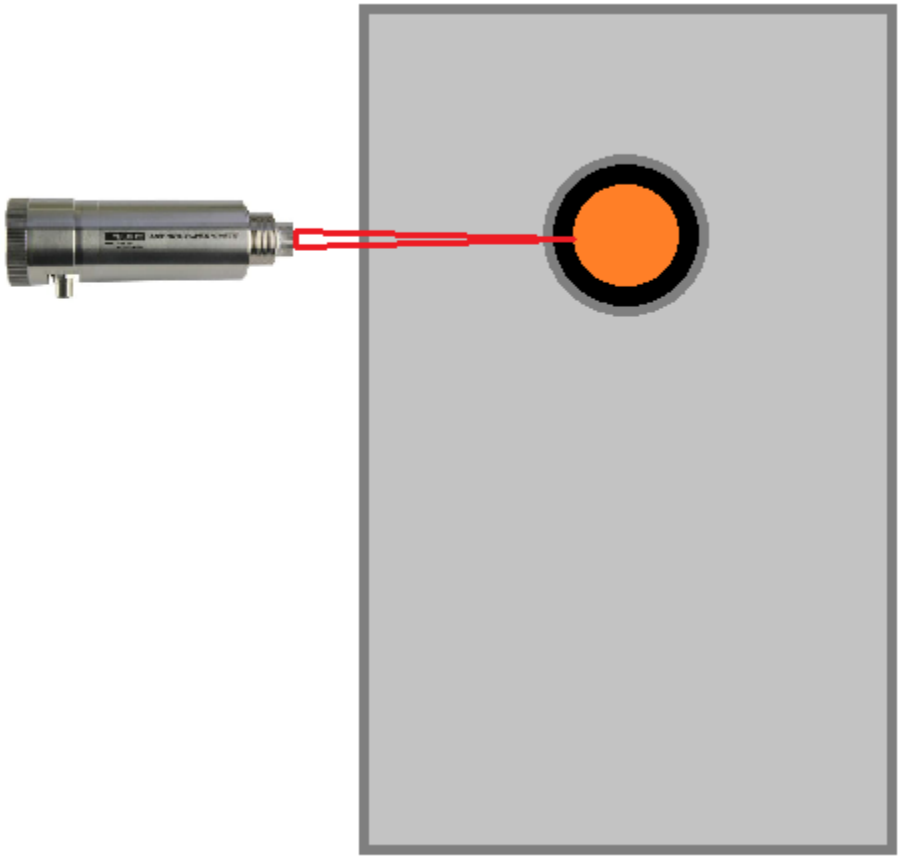

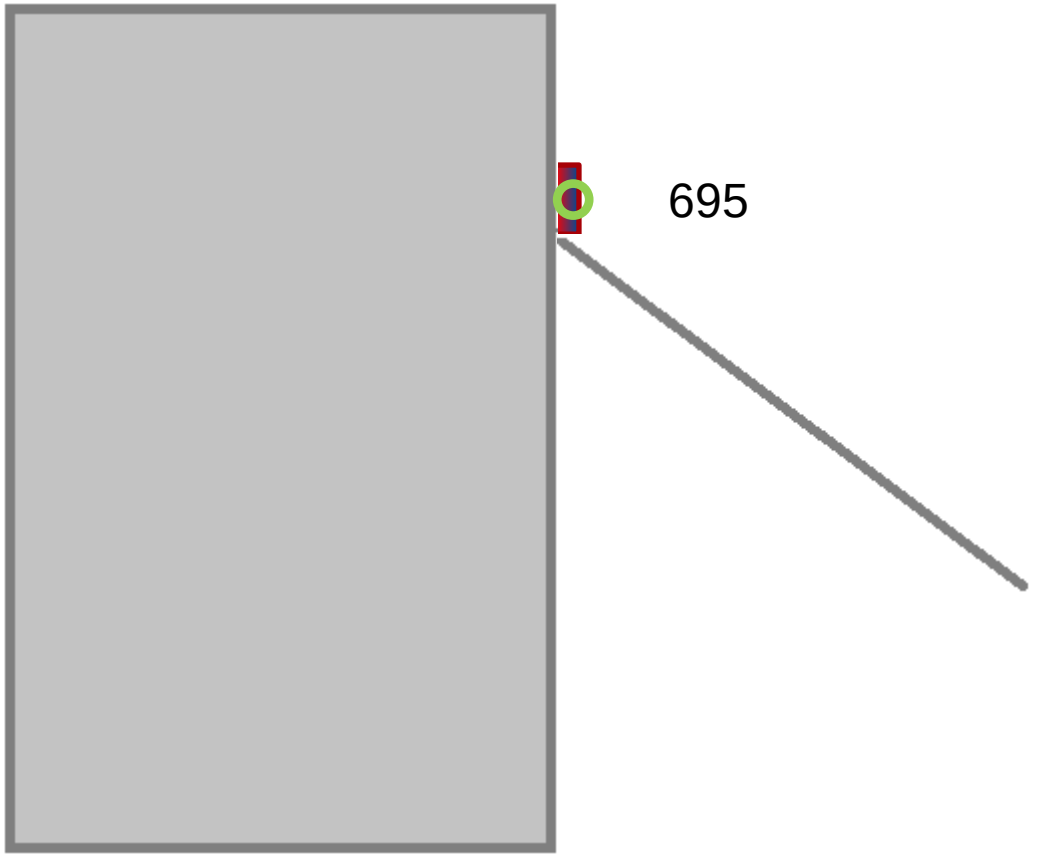

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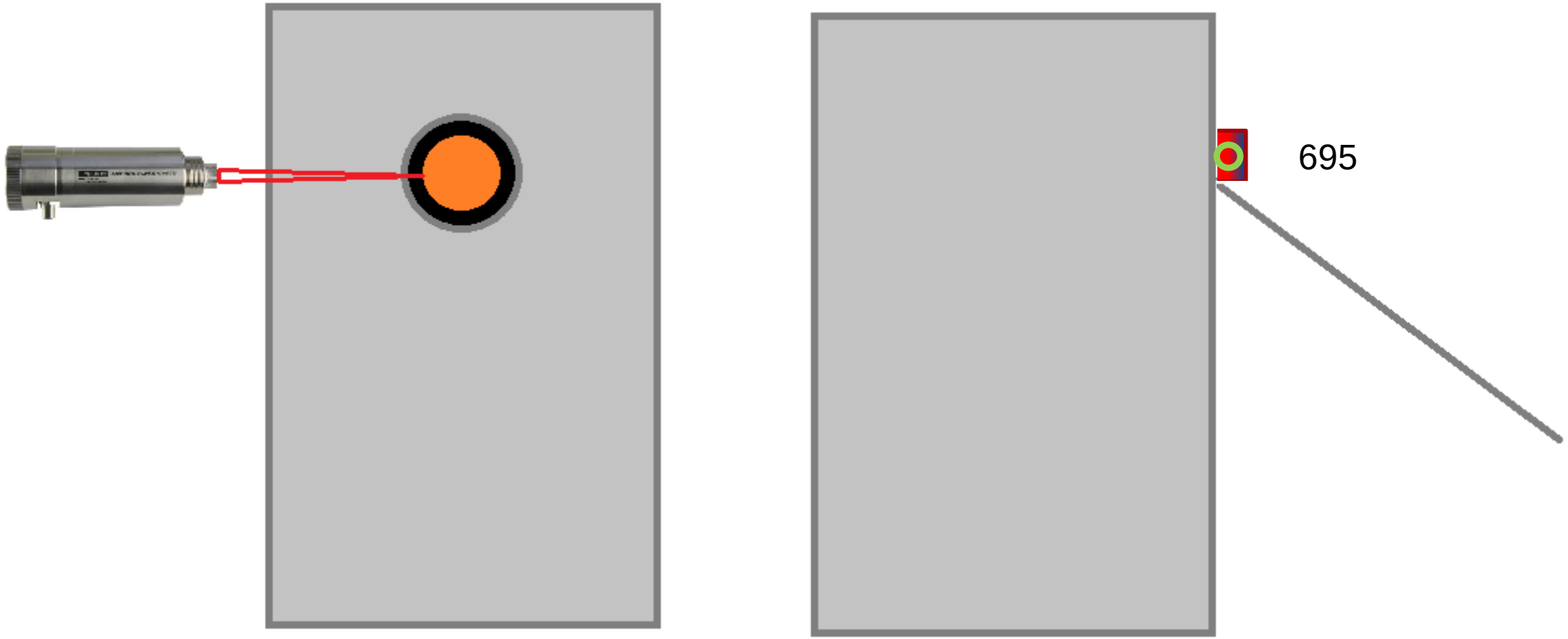

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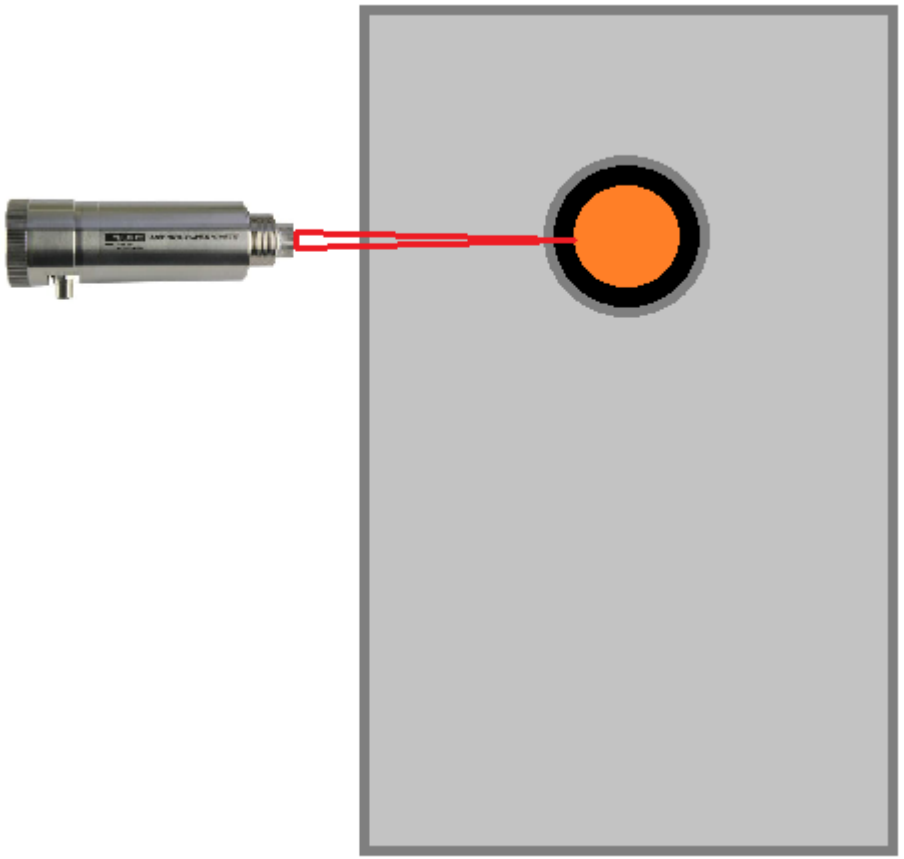

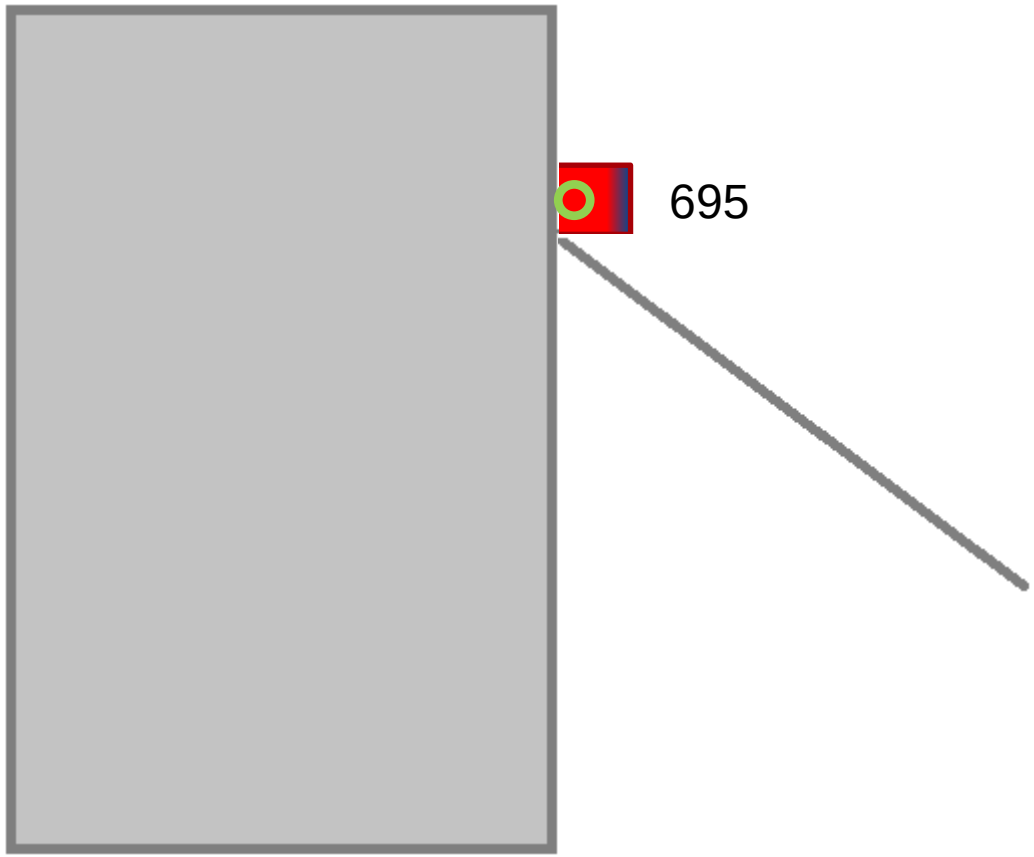

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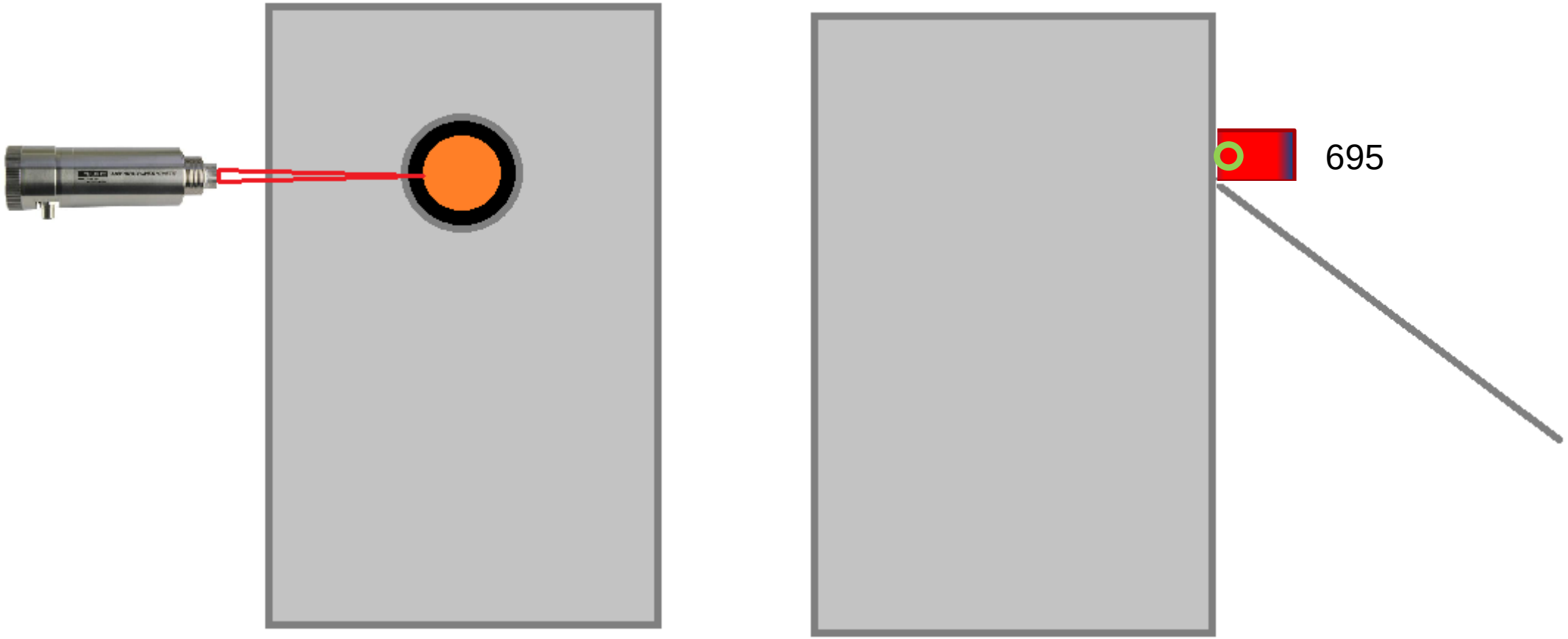

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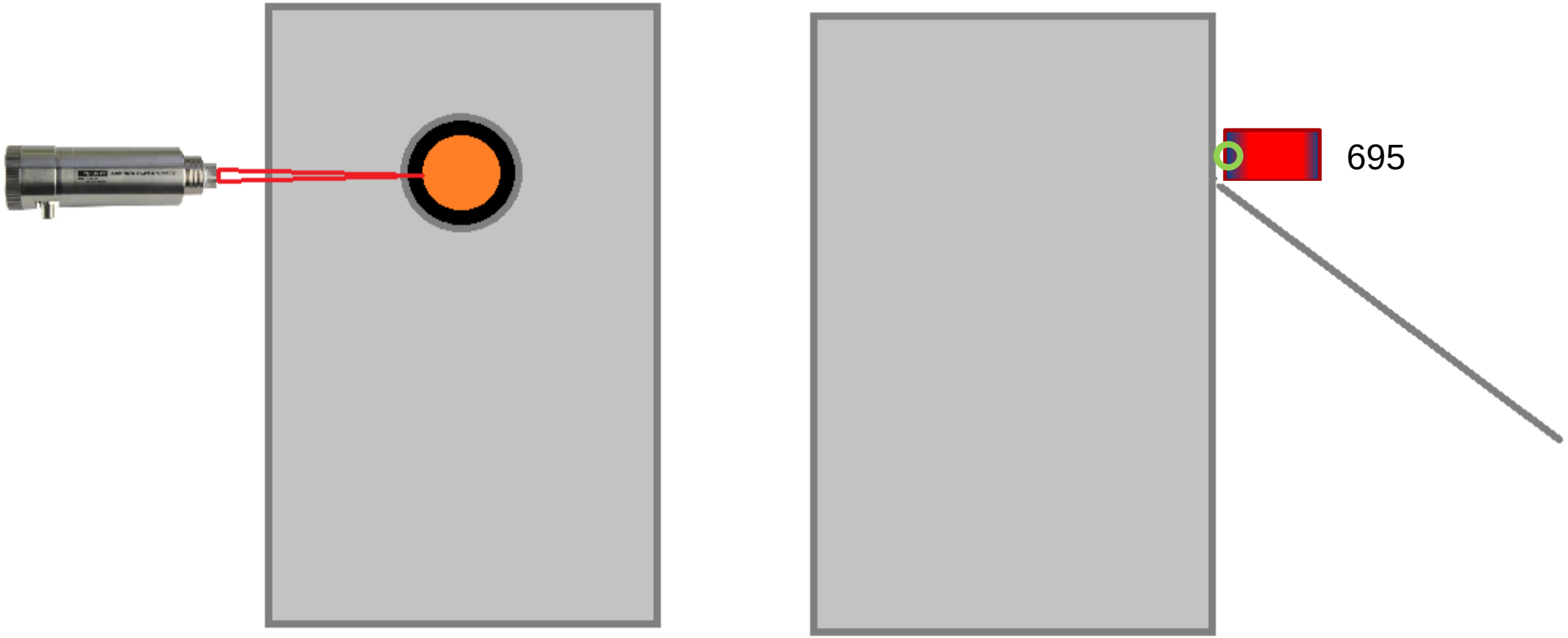

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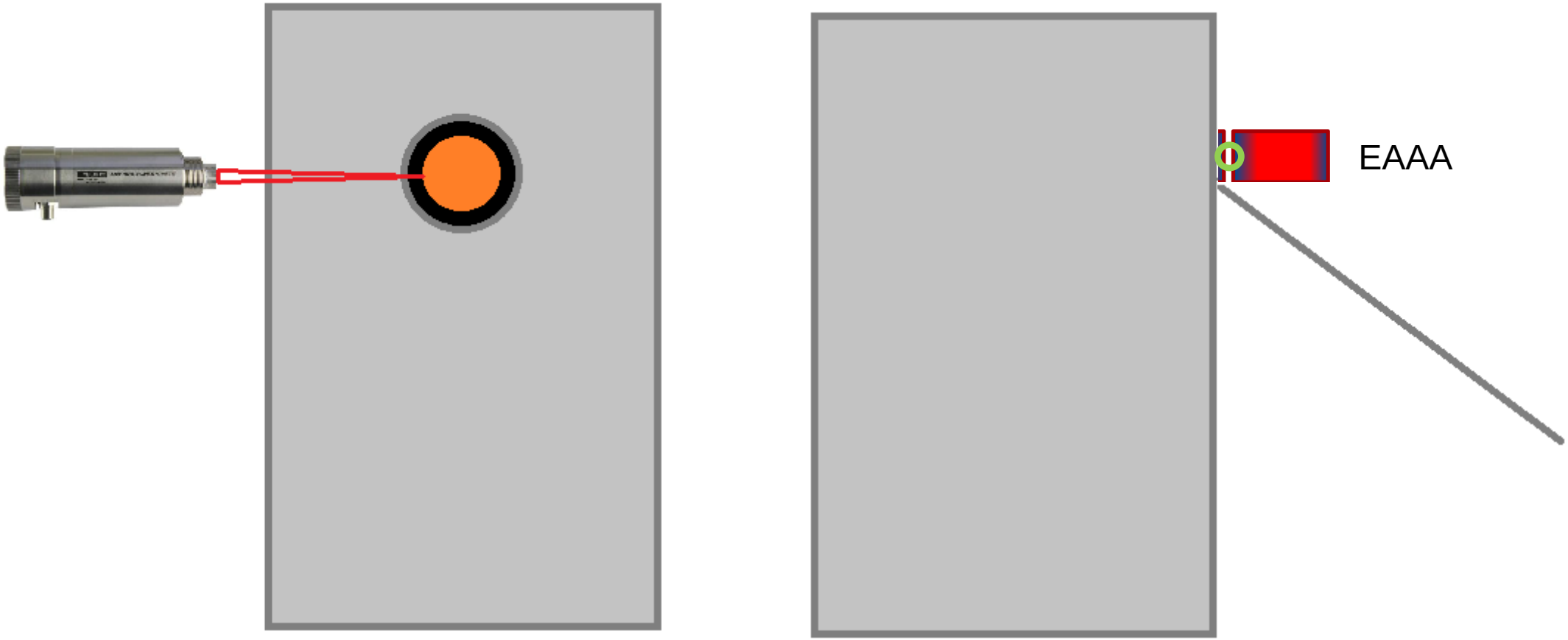

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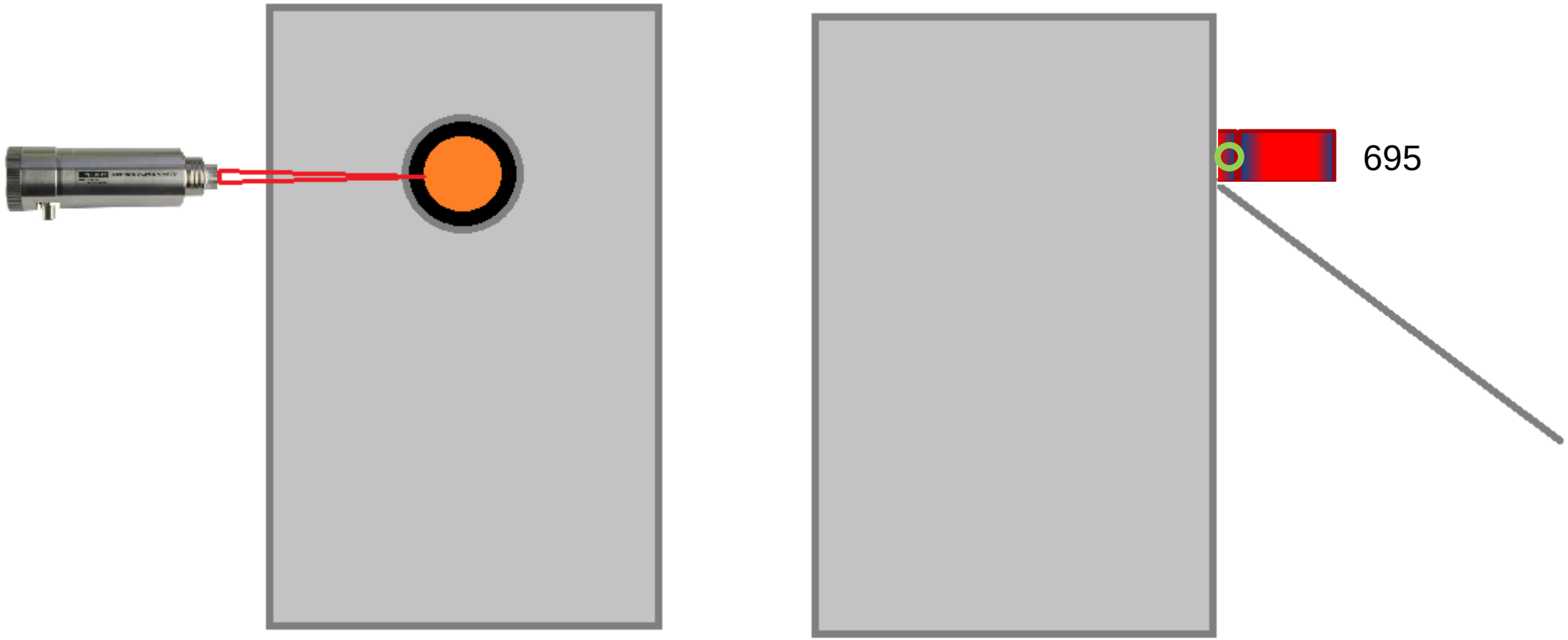
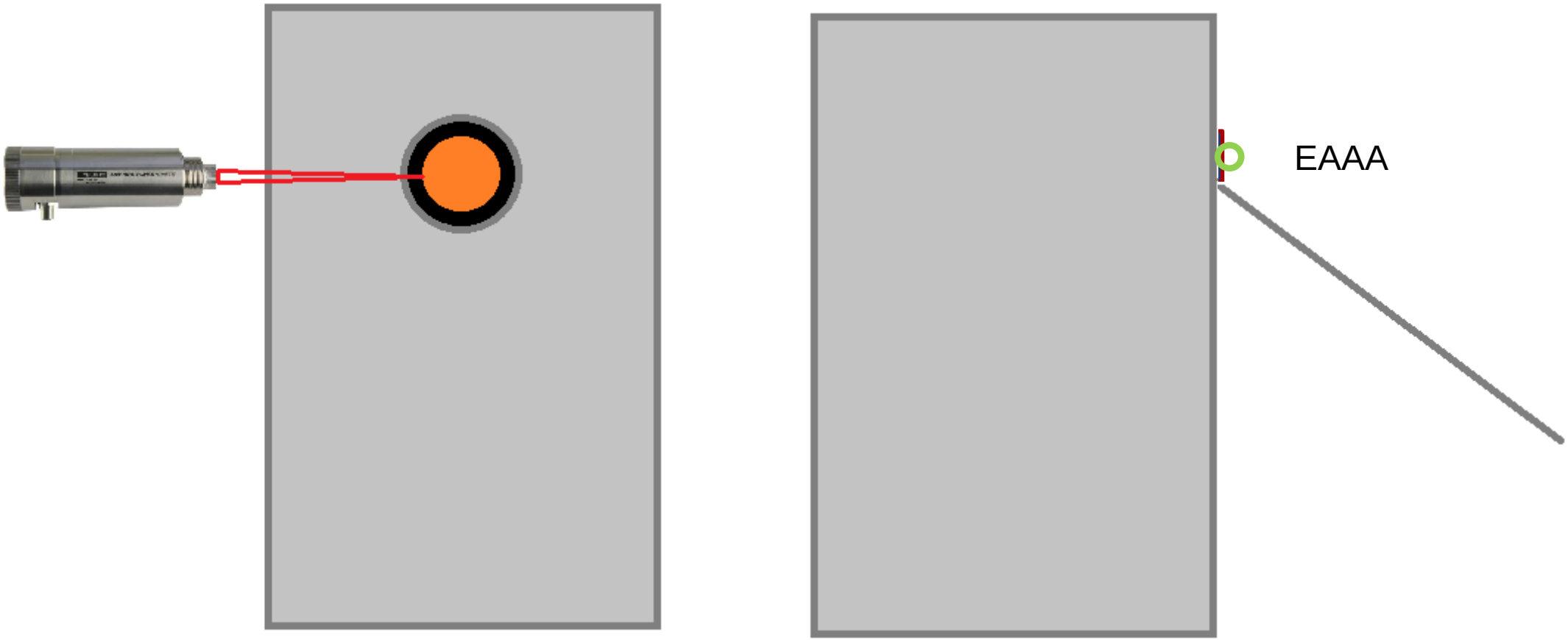
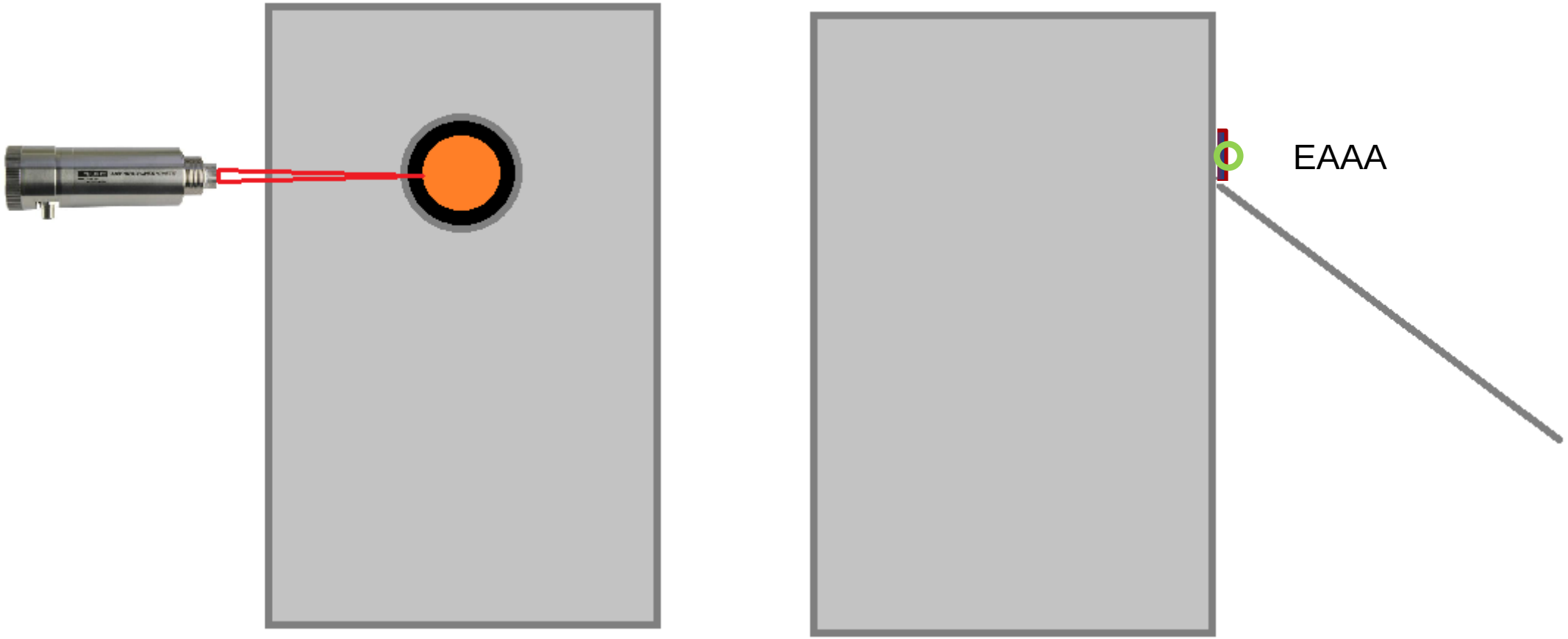


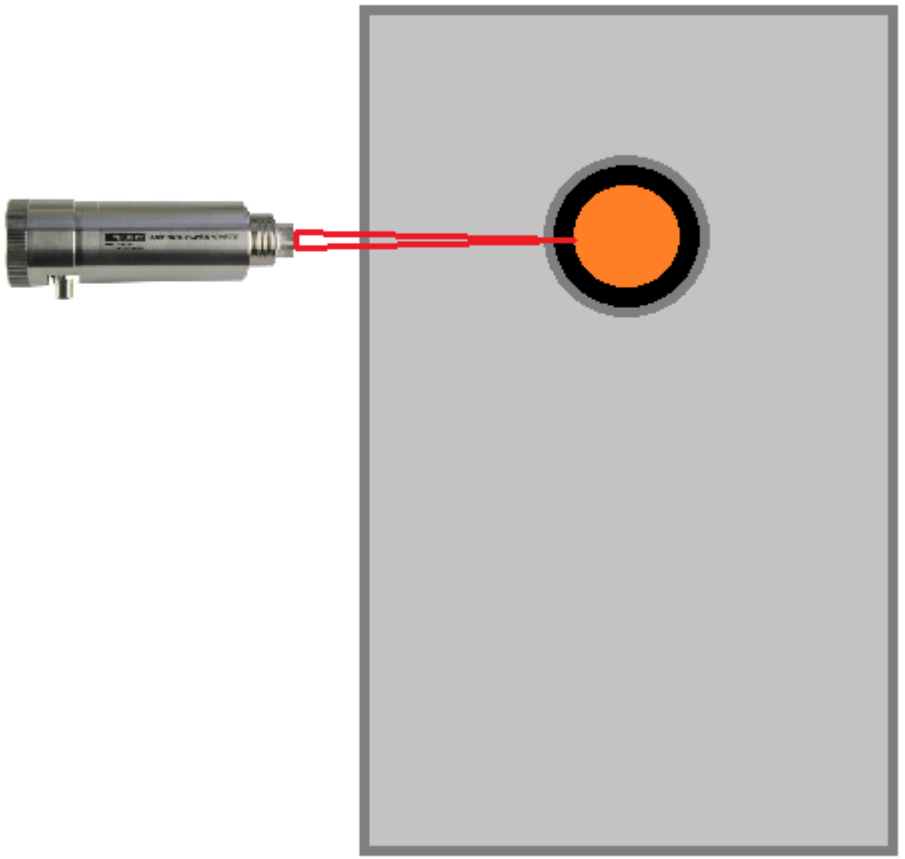
Scenario 2 – very small gap between billets – attenuation failsafe 30%



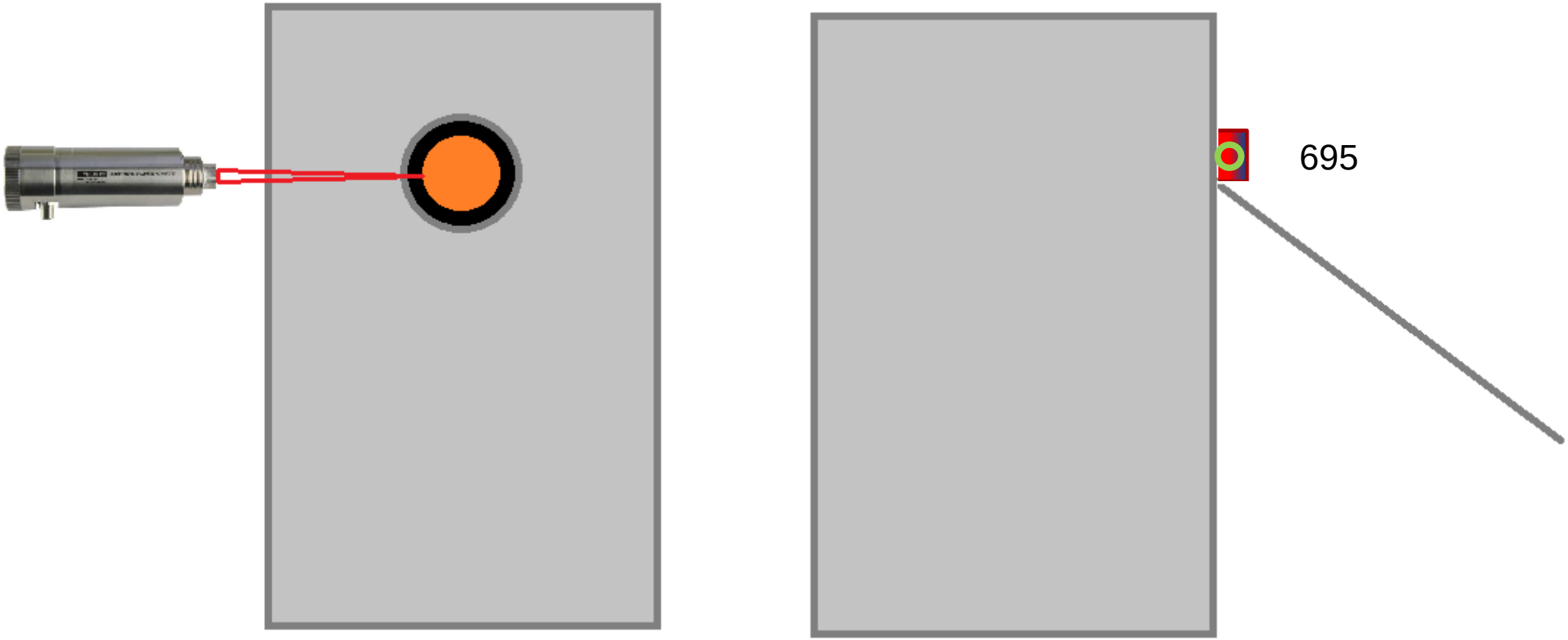
Scenario 2 – very small gap between billets – attenuation failsafe 30%



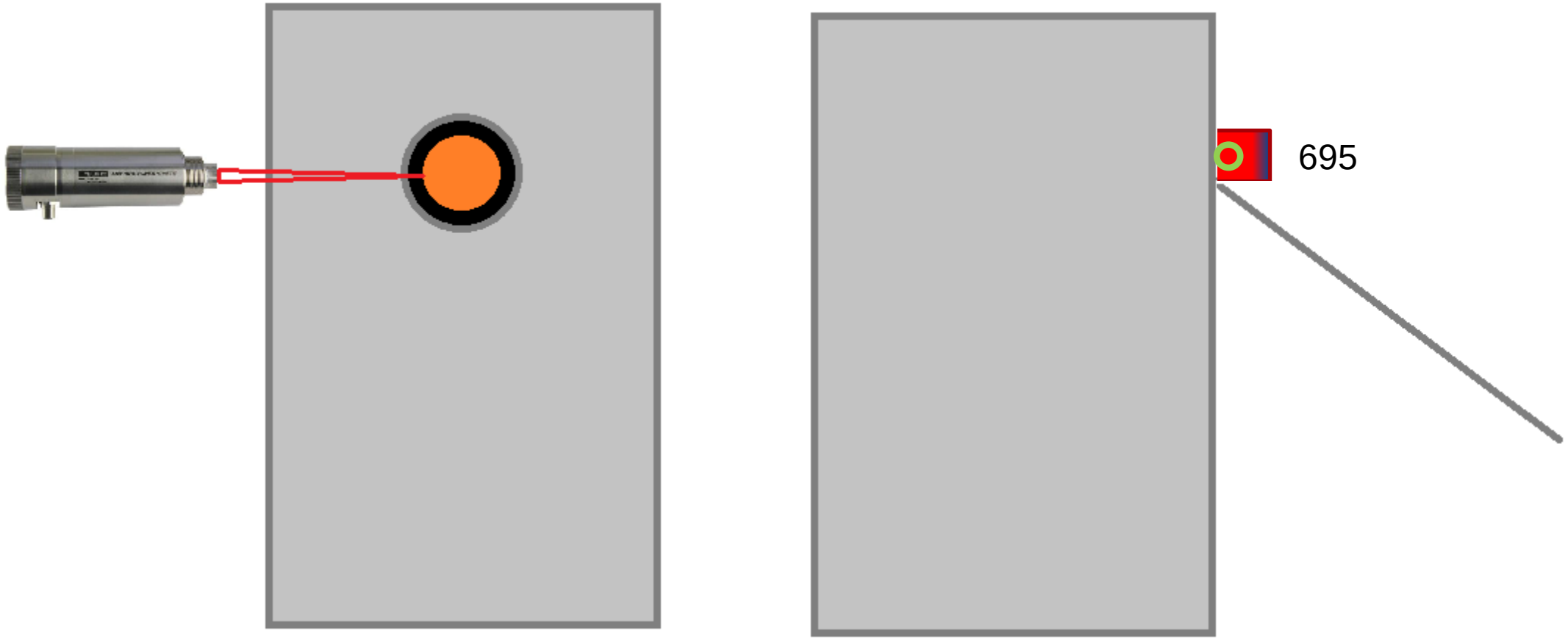
Scenario 2 – very small gap between billets – attenuation failsafe 30%



Scenario 2 – very small gap between billets – attenuation failsafe 30%



Scenario 2 – very small gap between billets – attenuation failsafe 30%



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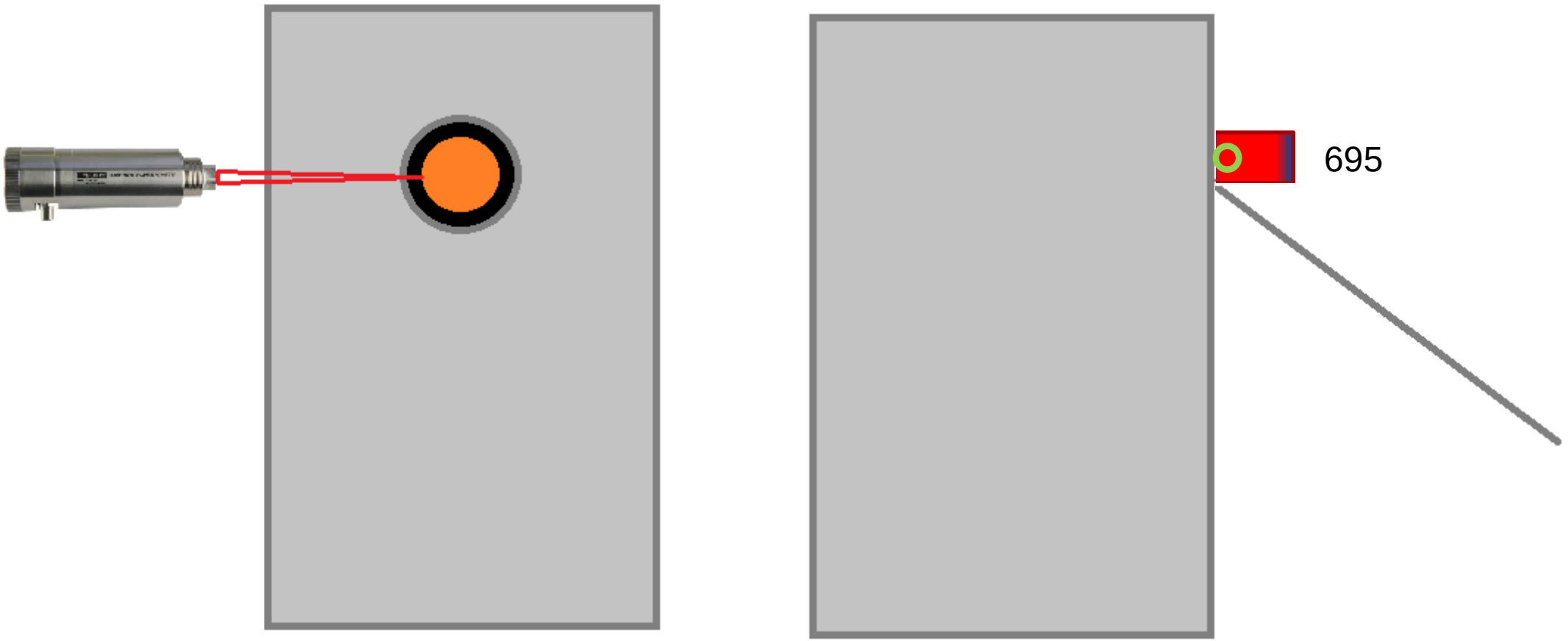

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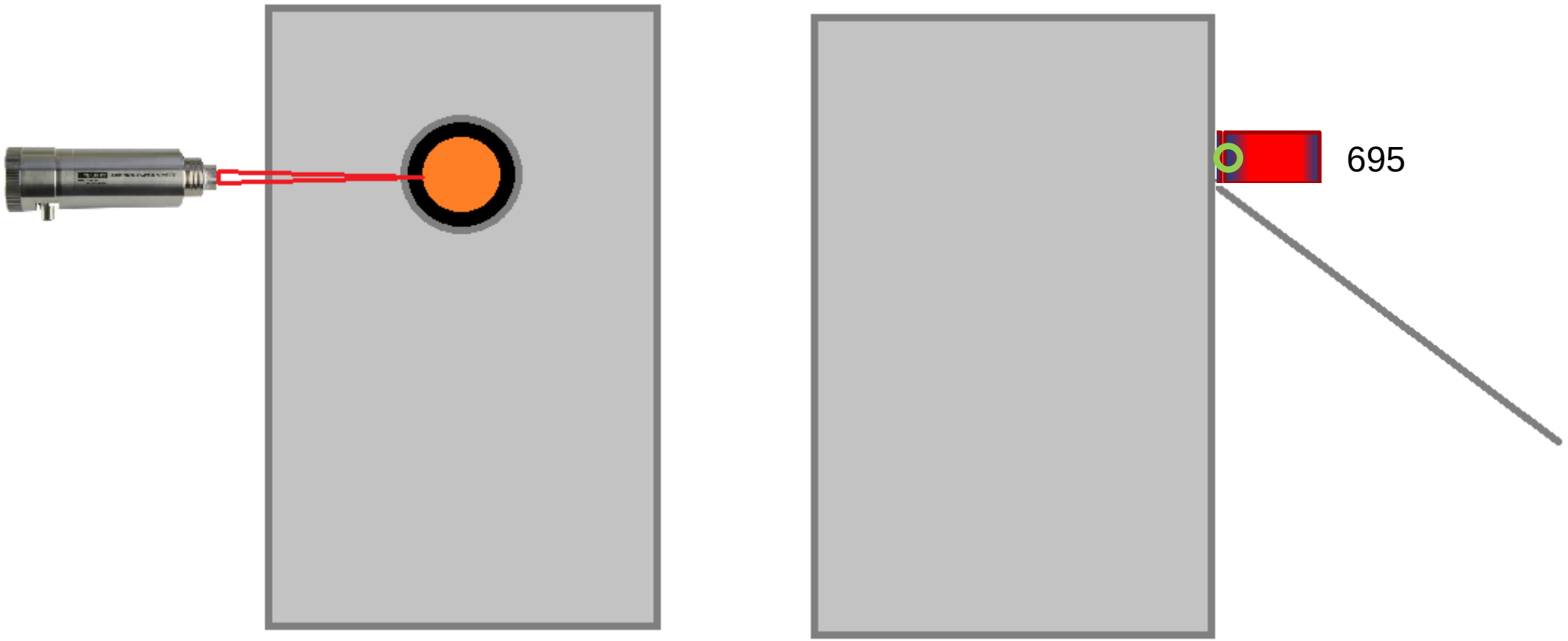
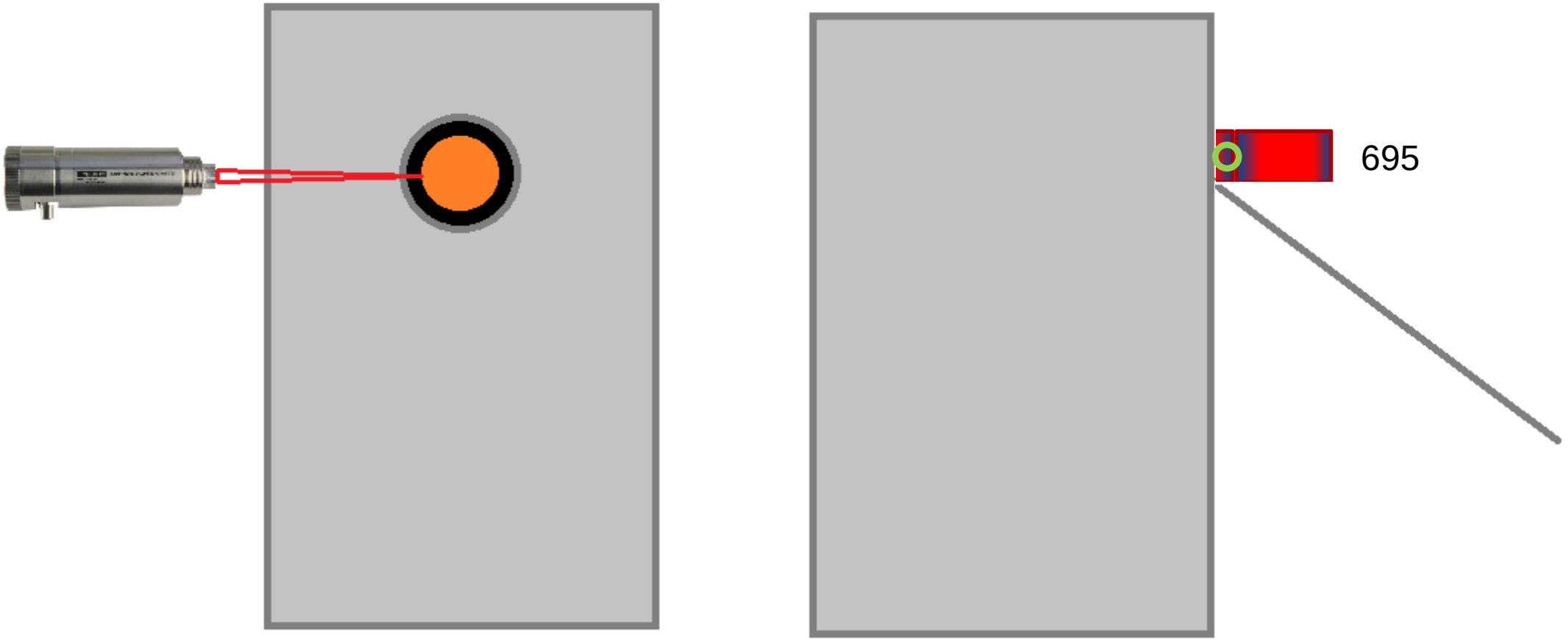


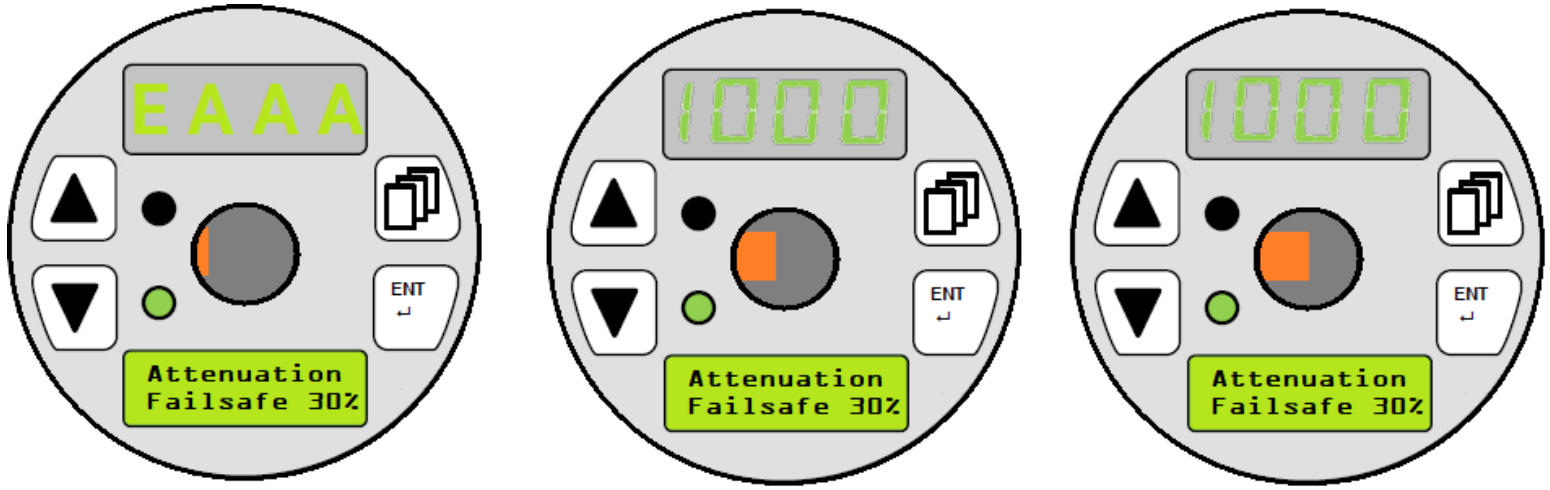
Scenario 2 – very small gap between billets – attenuation failsafe 30%



Conclusion & Solution

Reduce attenuation failsafe value from 95% (default value) to 30% (exact value depends on % FOV filled and emissivity of object)

Note the attenuation value when the field of view is completely filled and use that as the attenuation failsafe value



This will reduce or remove temperature spikes on the leading or trailing edge of the billet as it moves into, then out of the field of view

If post processing is used (peak hold) it will be necessary to use the ASC=1 parameter to convert the EAAA value to EUUU allowing peak hold to function correctly