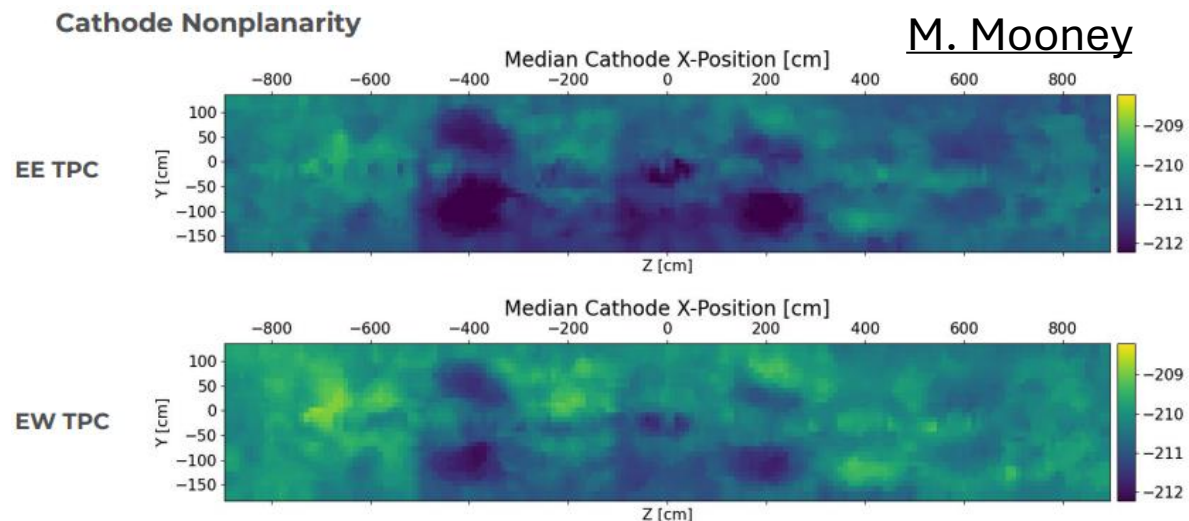


Bent cathode simulation in ICARUS (validation)

Wenqiang Gu, Lane Kashur

Recap



Cathode position as a function of (Y,Z)

More readings: <https://indico.bnl.gov/event/24904/>

Configuration examples

B. Viren

```
local ra = { response: 10*wc.cm, anode: 0 };
// ...
{ type: "Drifter", data: {
  xregions: [
    // "scalar" aka "normal plane" (original)
    ra { cathode: 2*wc.m },
    // "ray" aka "tilted plane"
    ra { cathode: {
      tail: [ /* point on plane */ ],
      head: [ /* from tail to point on normal */ ],
    }},
    // "sampled" arbitrary surface
    ra { cathode: {
      x: [ /* array of x values */ ],
      y: [ /* array of y values */ ],
      z: [ /* array of z values */ ],
    }},
  ]},
// ...
}
```

Extended Xregion geometry, three types of configuration are supported:

- scalar
- one point (surface) + one point (normal)
- sampled arbitrary surface (KD tree)

$X=f(YZ)$ map from Lane

```
x,y,z
211.0054932,-176.9095,-889.9505
211.0054932,-176.9095,-879.9515
210.9715881,-176.9095,-869.952
210.8563004,-176.9095,-859.9525
210.8486481,-176.9095,-849.953
```



CathodeBending_ICA
RUS_WestCryo.csv



```
// cathode-west.jsonnet
```

```
x: [211.0054932, 211.0054932, 210.9715881,  
210.8563004, 210.8486481, ...]
```

```
y: [-176.9095, -176.9095, -176.9095, -176.9095, -  
176.9095, ...]
```

```
z: [-889.9505, -879.9515, -869.952, -859.9525, -  
849.953, ...]
```

Converted JSON format

Configuration

```
local east = import 'pgrapher/experiment/icarus/cathode-east.jsonnet';
```

```
local west = import 'pgrapher/experiment/icarus/cathode-west.jsonnet';
```

```
cathode: {
```

```
  x: if anode < 2 then
```

```
    [v * wc.cm for v in east.x]
```

```
  else
```

```
    [v * wc.cm for v in west.x],
```

```
  y: if anode < 2 then
```

```
    [v * wc.cm for v in east.y]
```

```
  else
```

```
    [v * wc.cm for v in west.y],
```

```
  z: if anode < 2 then
```

```
    [v * wc.cm for v in east.z]
```

```
  else
```

```
    [v * wc.cm for v in west.z],
```

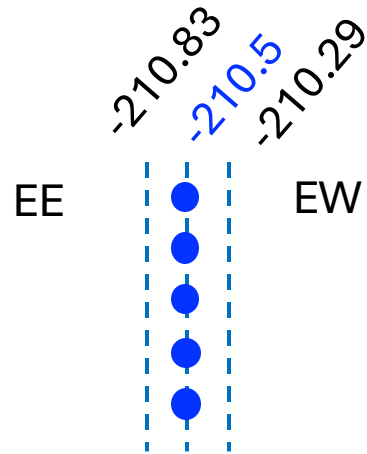
```
},
```

Changes in AnodePlane.cxx

PR [#349](#)

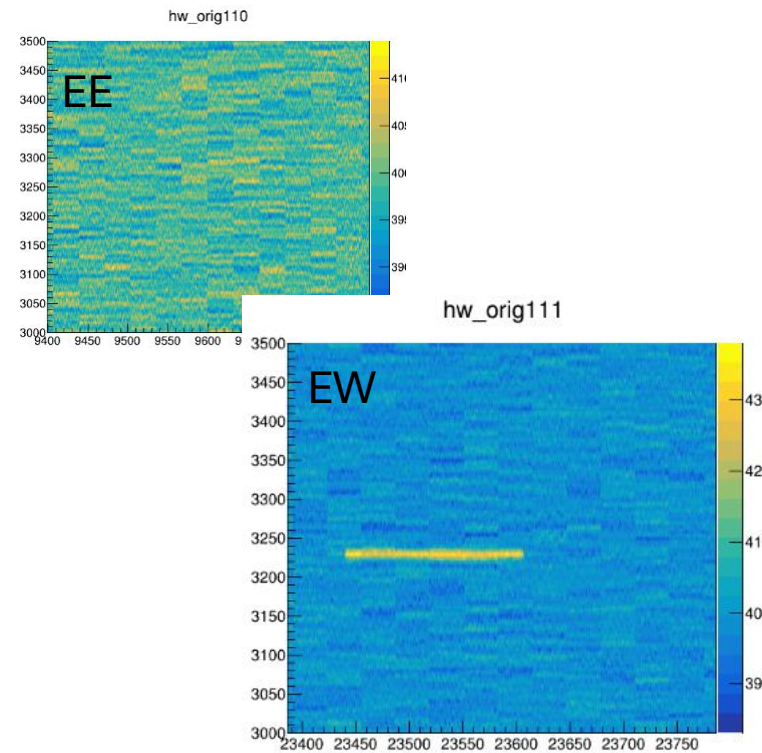
```
// const double cathode_x = jface["cathode"].asDouble();
double cathode_xref;
if (jface["cathode"].isNumeric()) {
    cathode_xref = jface["cathode"].asDouble();
}
else if (jface["cathode"].isMember("x")) {
    auto xvec = get<std::vector<double>>(jface["cathode"], "x");
    const auto [vmin, vmax] = std::minmax_element(xvec.begin(), xvec.end());
    cathode_xref = *vmin < response_x ? *vmin : *vmax;
}
const double cathode_x = cathode_xref;
```

Simulation Validation

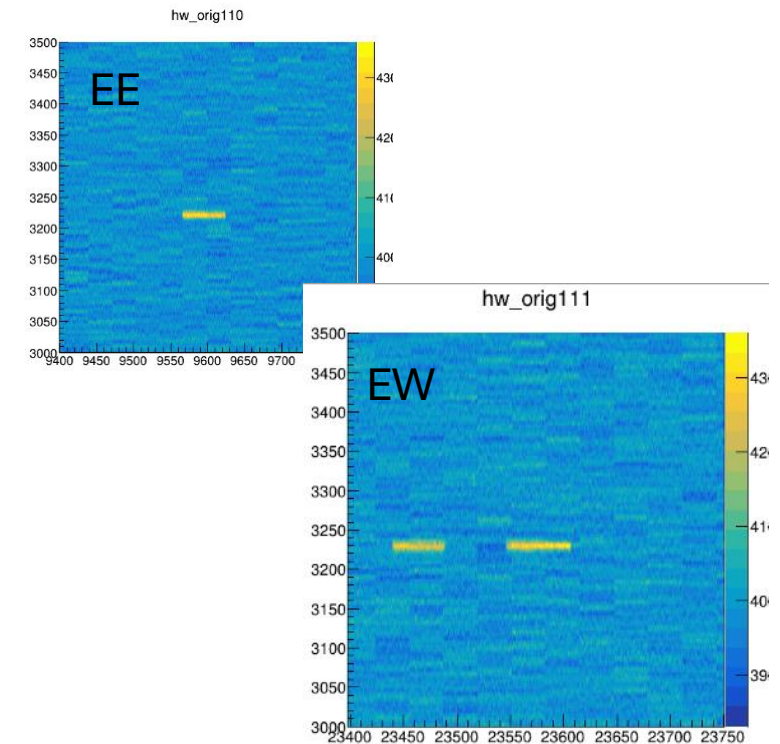


- Line charge at the boundary of East Cryostat:
 $(-210.5, -50, -450) \text{ cm} \rightarrow (-210.5, 50, -450) \text{ cm}$

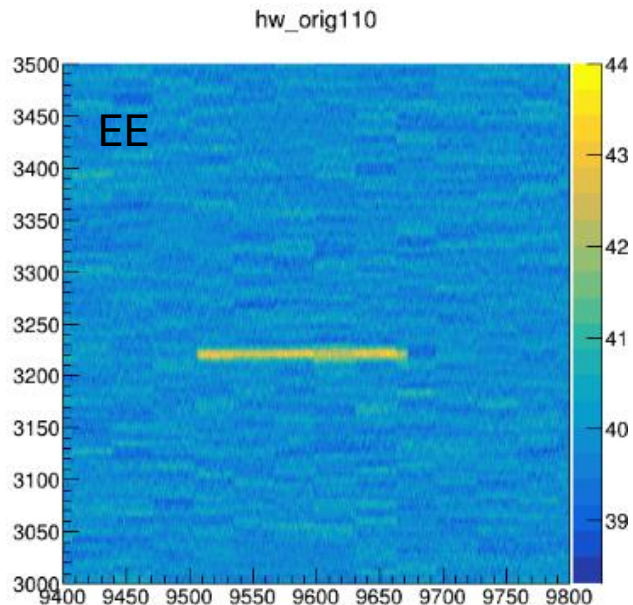
East cathode: -210.83 *cm



**East cathode: specified in array,
mean value -210.56 *cm**



East Cathode: -210.29 *cm



About the WCT release

- In case ICARUS requires a minimal change in WCT release for their production, this new function requires PR [#336](#) and [#349](#)