



Woodruff Scientific Inc

4000 Aurora Ave N,

Suites 5 & 6, Seattle, WA 98103

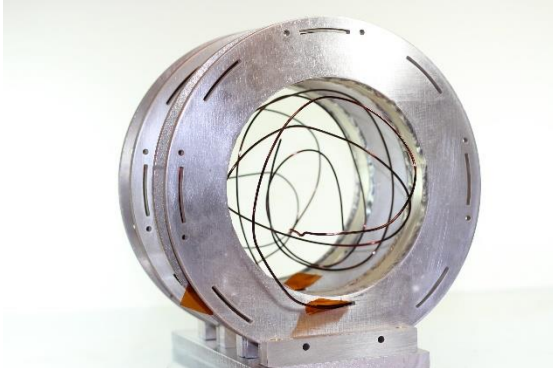
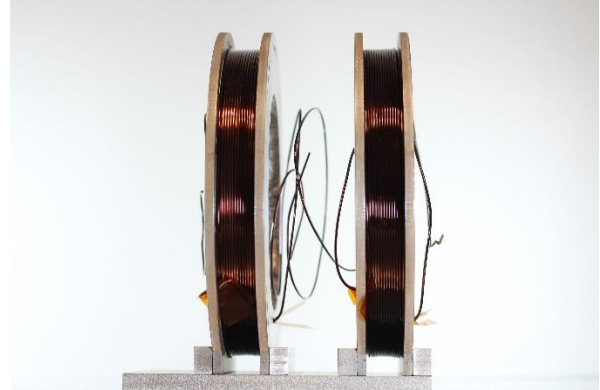
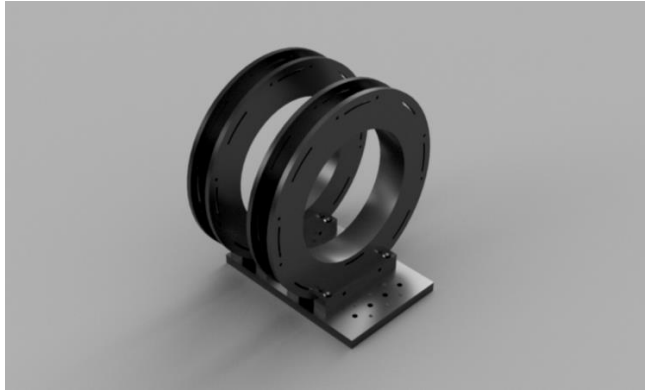
(206) 905 9477 8am to 5pm Pacific

[sales@woodruffscientific.com](mailto:sales@woodruffscientific.com)

<http://www.woodruffscientific.com>

**Model number(s):** HH-AI-Air

**Descriptive name:** Helmholtz Coil set for use in air



**Features:**

- Helmholtz coil pair mounted on 6061 Aluminum form and baseplate
- Designed to be used in air
- Custom sizing and materials based on customer specifications
- Custom harnessing
- Demountable assembly allows for repositioning of coils (variable distances)
- Can be angled 90 degrees on baseplate.
- Water Cooling optional

**Operational ratings:**

Temperature:  $\leq 150\text{C}$  (set by polyimide coating on wires)

Field strength:  $\leq 10\text{ T}$  (set by fuse limit in wire)

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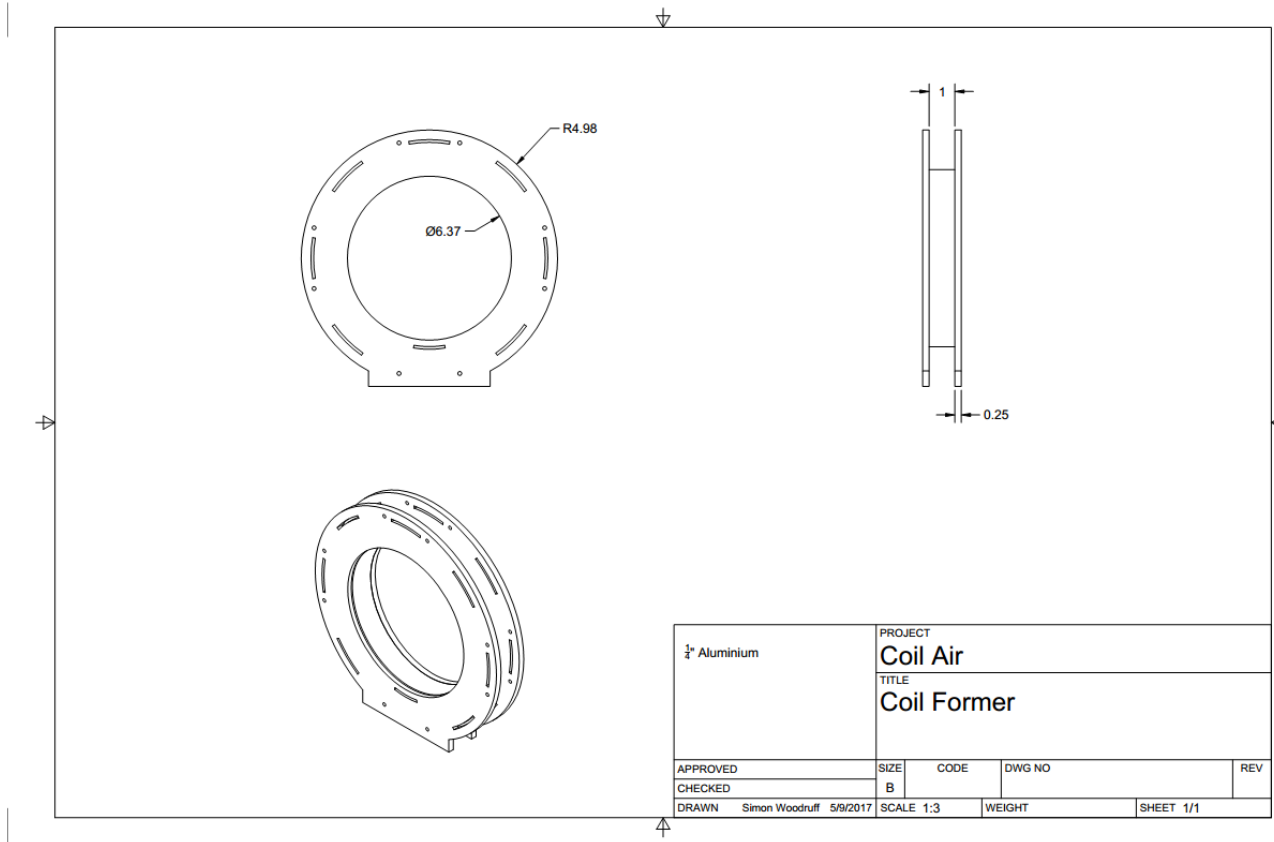
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**Options:**

- Orientations: Parallel / Anti-parallel  
 Usual orientation for the HH configuration is parallel, but coils can be connected anti-parallel to provide a field null between them.
- Electronics: Static / time-varying  
 Power supplies can be provided to program waveforms of almost arbitrary functions, from continuous operation to low duty-cycle operations. Computer control can be provided as well as thermal monitoring.

**Engineering drawing:**





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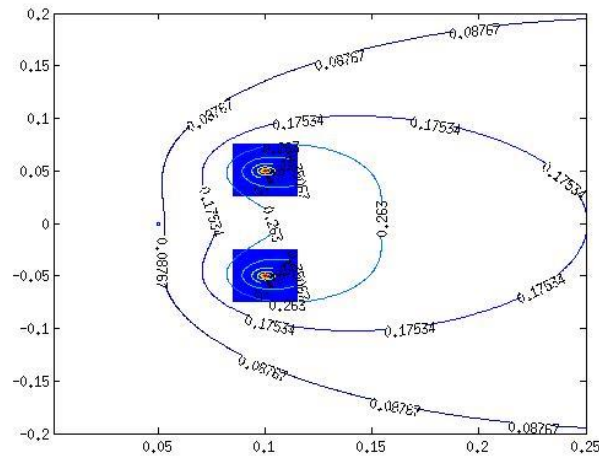
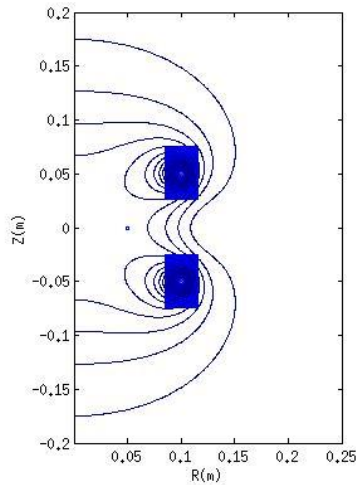
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### Flux plots





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## Thermal analysis

### Single Pulse HH

Coil current,	$I = 12.50 \text{ A}$
Coil radius,	$r = 0.10 \text{ m}$
Turns per coil,	$n = 225.00$
Max B,	$B = 0.02 \text{ T}$
Max B,	$B = 241.50 \text{ G}$
Radius of wire,	$r_w = 0.08 \text{ cm}$
Time,	$t = 3.60\text{e}+03 \text{ s}$
Length of wire,	$L_w = 282.69 \text{ m}$
Resistance,	$R = 2.34 \text{ Ohms}$
Ohmic heating,	$E = 1316628.68 \text{ J}$
Volume of Wire,	$V_w = 568.38 \text{ cm}^3$
Mass of Wire,	$M_w = 4888.08 \text{ g}$
Temp. change,	$dT = 699.62 \text{ C}$

### Multi-Pulse HH

Duty cycle,	$\text{duty} = 1.00\text{e}+00$
Cooling power,	$P*\text{duty} = 365.73 \text{ W}$

Table 1. Thermal analysis (assuming no heat conduction).

## Customization:

In addition to the options listed previously, the air HH coil can be customized in many different ways. For example, if the application is for pulsed operation with timescales short relative to the resistive diffusion time through the coil form, then an insulating break can be provided in the coil form itself. Other customizations can include form materials selection, wire selection, harnessing, shroud, orientation (two axis systems), water cooling, and so forth.