MOTIVATION FOR HIGH GRAVIMETRIC POWER DENSITY WPT SYSTEM

- Make the on board WPT receiver have high gravimetric power density by reducing weight of on-board components, such as Rx coil, converters etc. to maximize drone flight time.
- With lightweighting as a primary goal, high efficiency of the receiver is desirable only insofar as it allows reduced thermal management.

SYSTEMATIC DESIGN METHOD

- Circuit schematic of the WPT system
- Design space for optimization
- Synchronous buck
- Dc input to rectifier dc output

PROTOTYPE VERIFICATION

- Gravimetric power density estimates
  - Current power density of the entire receiver = 140 W/82 g = 1.71 W/g
  - Achievable power density of the receiver after optimizing the PCB and coil former weight, and with a FC based dc-dc topology = 200 W/43 g = 4.65 W/g

CONCLUSION and FUTURE WORK

- This poster has shown that high gravimetric power density of a receiver for wireless drone charging application can be achieved through a systematic design and optimization method.
- Buck tested up to 140 W. To test up to higher powers, a higher resolution modulator will be implemented to reduce dead time reverse conduction loss.
- Weight modeling of the PCB and passive components will be done to construct a more comprehensive weight model.
- For a 600 W prototype consider topologies such as SC, FCML converters to eliminate or reduce in size the low energy density inductor. Also consider different coil designs, such as a SR Rx coil and uniform-field Tx coil.