SUPERHELDEN STUDENTENPROJEKT

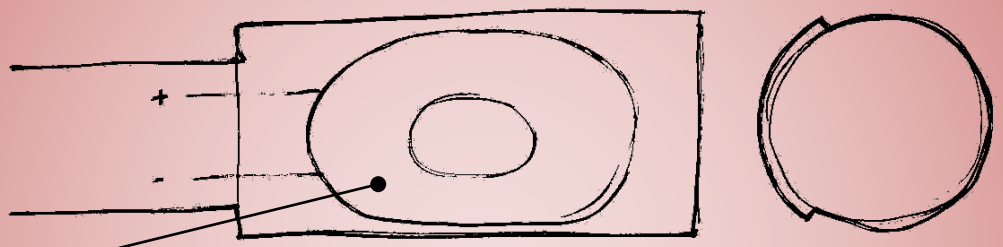
DIE ENTWICKLUNG EINES BEHEIZTEN FAHRRADHELDENHANDSCHUHS
- SIMULATION DES SYSTEMS -

AUFGABEN:
1.AUFBAU 3D CAE MODEL
2.DFSS OPTIMIERUNG
3.DESIGN VORSCHLAGEN

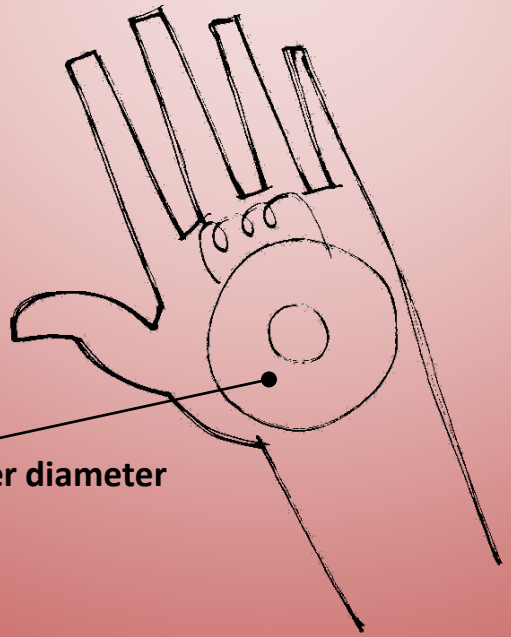
DEIN PROFIL:
1.INNOVATIVER
2.ELEKTROMAGNETISCH- INDUKTIVER
3.CAE EXPERT(IN)

SCOPE:

OPTIMISE MAGNETIC COUPLING



Transmitter, optimise:
- Coil outer and inner diameter
- Number of turns
- Wire diameter
- Frequency
- Grip diameter



Receiver, optimise:
- Coil outer and inner diameter
- Number of turns
- Wire diameter
- Hand diameter

Optimise for Noise factors:
- Axil hand miss-alignment
- Radial hand miss-alignment
- Diameter hand miss-alignment
- Finger on brake
- Ring on finger

PROJEKT PLAN

1.Einlesen: Grundlagen und Vorarbeit verstehen

2.Überprüfung der verwendeten Methodik zur Ermittlung des Wirkungsgrades

3.Erstellung und Vernetzung von 3D Modellen der Griffe und Handschuhe

4.DFSS oder DOE matrix definieren

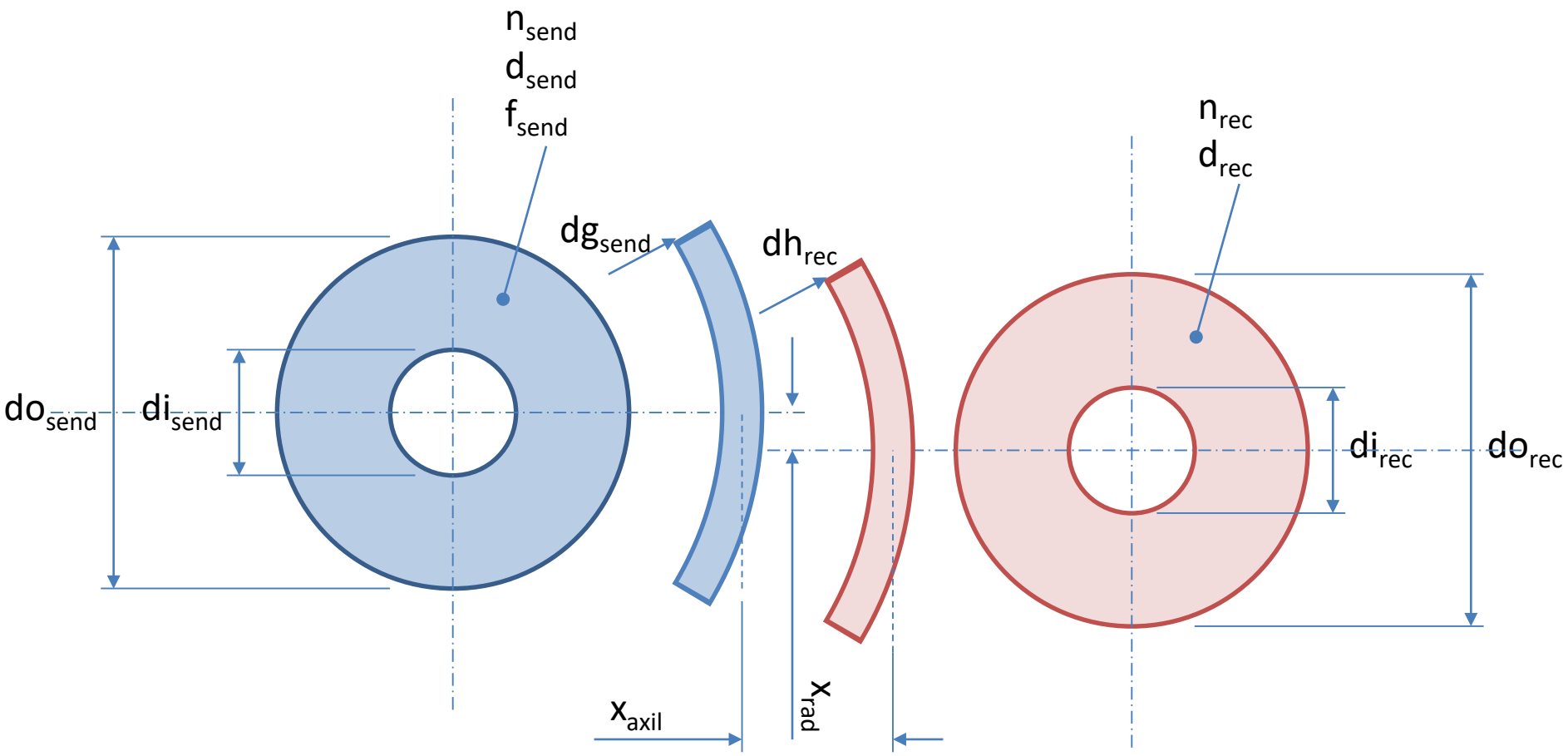
5.Simulationen durchführen, Ergebnisse interpretieren

6.Ergebnis der Parameterstudie verstehen und zusammenfassen

7.Design Vorschlag machen

8.Bericht schreiben

Design 2 Model

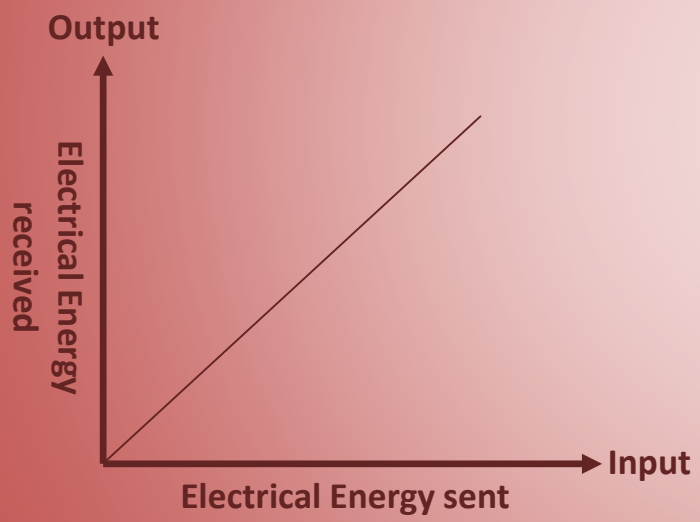


Design Parameter		Values		
do_{send}	Send coil outer dia.	20 mm	50 mm	80 mm
di_{send}	Send coil inner dia.	5 mm	10 mm	15 mm
n_{send}	Send coil number of turns	4	25	50
d_{send}	Send coil wire diameter	0,5 mm	2 mm	5 mm
$n_{sendcoil}$	Number of sending coils	1		
f_{send}	Frequency	100 kHz	500 kHz	5 MHz
dg_{send}	Grip diameter	40 mm	75 mm	∞
do_{rec}	Receive coil outer dia.	20 mm	50 mm	80 mm
di_{rec}	Receive coil inner dia.	5 mm	10 mm	15 mm
n_{rec}	Receive coil nr. turns	4	25	50
d_{rec}	Receive coil wire dia,	0,5 mm	2 mm	5 mm

Signal		5 W Low Power	10 W High Power
x_{axil}	Axil hand miss-alignment	1 mm	5 mm
x_{rad}	Radial hand miss-alignment	0 mm	30 mm
dh_{rec}	Hand diameter	dg_{send}	dg_{send} + 30 mm
-	Finger on brake		
-	Ring on finger		

BACKUP

IDEAL FUNCTION



Signal	5 W Low Power	10 W High Power
Noise	Axil hand miss-alignment	
	Radial hand miss-alignment	
	Diameter hand miss-alignment	
	Finger on brake	
	Ring on finger	

CONTROL FACTORS

Design 1	
5,1	Number of coil turns
5,2	Wire diameter
5,3	Frequency
5,4	Mesh material
5,5	Mesh density
5,6	Mesh diameter

Design 2	
5,1	Send coil diameter
5,2	Send coil number of turns
5,3	Send coil wire diameter
5,4	Number of sending coils
5,5	Frequency
5,6	Receiver coil diameter
5,7	Receiver coil number of turns
5,8	Receiver coil wire diameter

ORTHOGANAL ARRAY

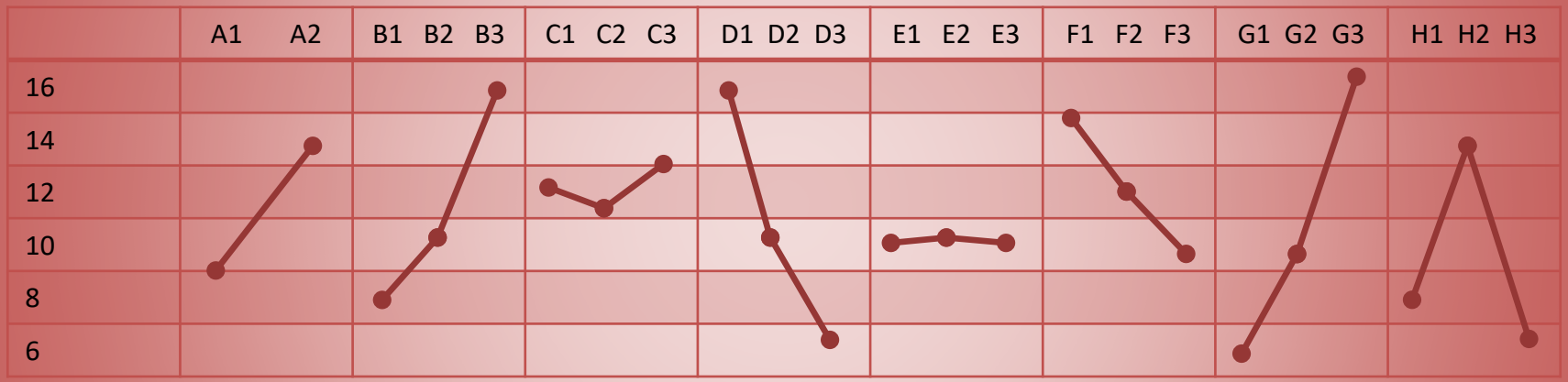
	Control Factors								M1		M2	
Run	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**N1**	**N2**	**N1**	**N2**
1	1	1	1	1	1	1	1	1	y1	y2	y3	y4
2	1	1	2	2	2	2	2	2	y1	y2	y3	y4
3	1	1	3	3	3	3	3	3	y1	y2	y3	y4
4	1	2	1	1	2	2	3	3	y1	y2	y3	y4
…												
18	2	3	3	3	3	3	3	3	y1	y2	y3	y4

8 Control Factors (1 two level, 7 three level)

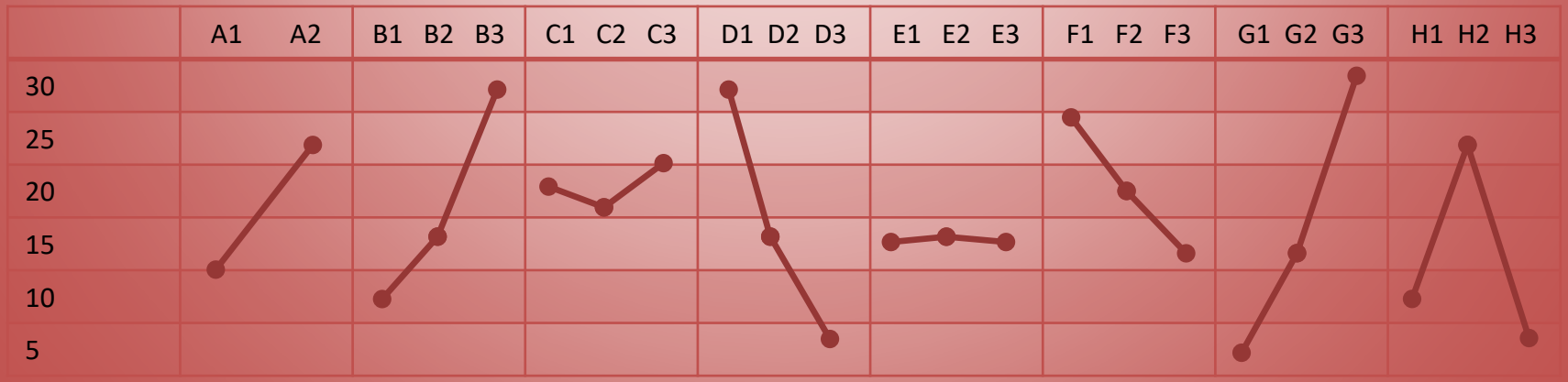
L_{18} (2^1 x 3^7)

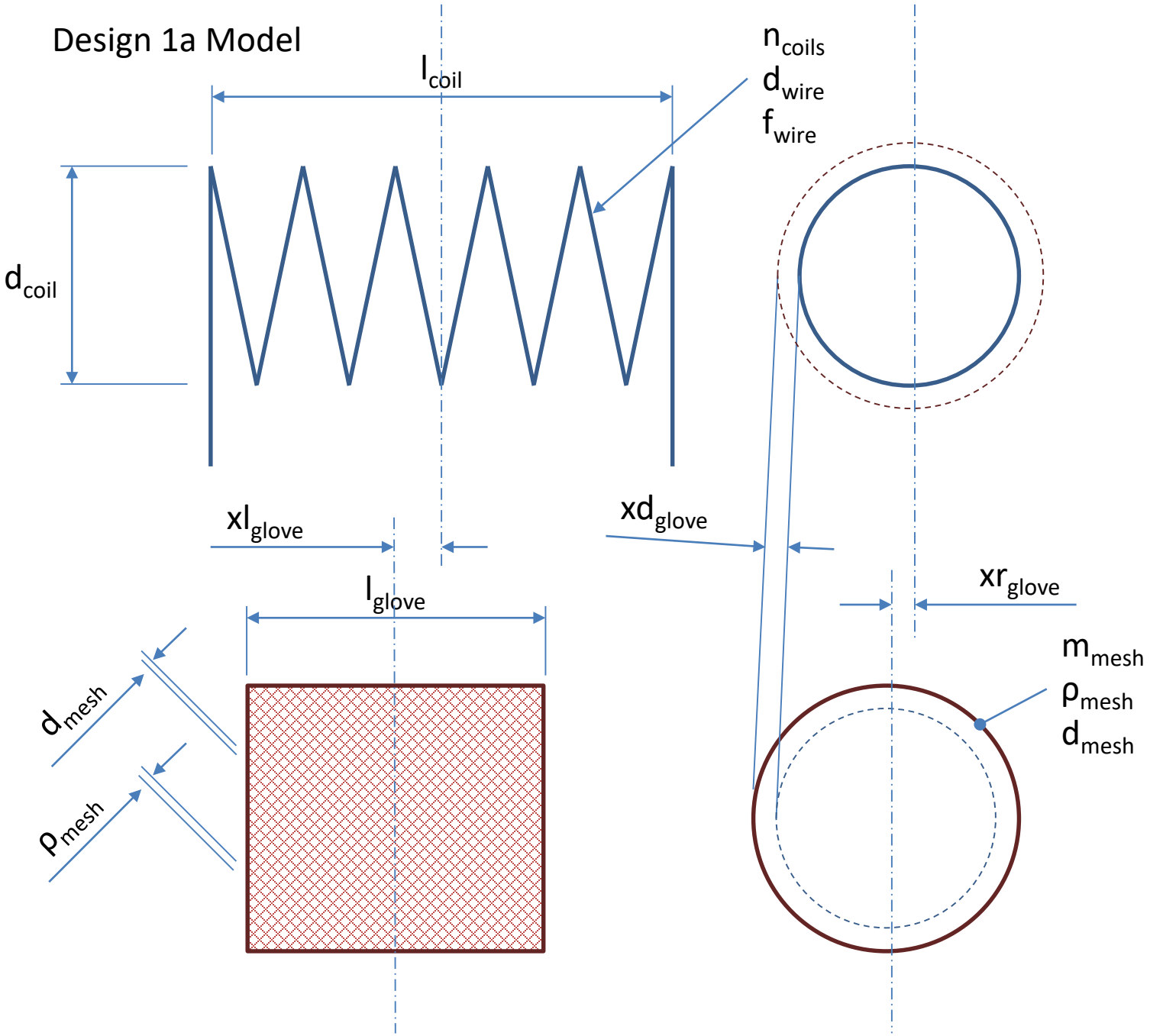
PARAMETER STUDIE

S/N



β




Design 1a Model
l_{coil}
d_{coil}
n_{coils}
d_{wire}
f_{wire}
xl_{glove}
xd_{glove}
l_{glove}
xr_{glove}
d_{mesh}
ρ_{mesh}
m_{mesh}
ρ_{mesh}
d_{mesh}

Design 1a Model

Design Parameter		Values		
l_{coil}	Length of coil	80 mm	100 mm	120 mm
d_{coil}	Diameter of coil	30 mm	45 mm	60 mm
n_{coils}	Number of coil turns	4	25	50
d_{wire}	Wire diameter	0,5 mm	2 mm	5 mm
f_{wire}	Frequency	100 kHz	500 kHz	5 MHz
l_{glove}	Length of glove	40 mm	60 mm	80 mm
m_{mesh}	Mesh material	iron	Steel	
ρ_{mesh}	Mesh density	1 mm	4 mm	7 mm
d_{mesh}	Mesh diameter	0,25 mm	0,5 mm	1 mm

Signal		5 W Low Power	10 W High Power
xl_{glove}	Axil hand miss-alignment	0 mm	30 mm
xr_{glove}	Radial hand miss-alignment	0 mm	3 mm
xd_{glove}	Diameter hand miss-alignment	0 mm	5 mm
-	Finger on brake		
-	Ring on finger		