2181 磁阻传感器与磁场测量

四、数据记录和处理

1. 磁阻传感特性测量

(1)测量磁阻传感器的磁电转换特性

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 线圈电流 | #1\_1\_I1# | #1\_1\_I2# | #1\_1\_I3# | #1\_1\_I4# | #1\_1\_I5# | #1\_1\_I6# | #1\_1\_I7# | #1\_1\_I8# | #1\_1\_I9# | #1\_1\_I10# | #1\_1\_I11# | #1\_1\_I12# | #1\_1\_I13# |
| 磁感应强度(高斯) | #1\_1\_B1# | #1\_1\_B2# | #1\_1\_B3# | #1\_1\_B4# | #1\_1\_B5# | #1\_1\_B6# | #1\_1\_B7# | #1\_1\_B8# | #1\_1\_B9# | #1\_1\_B10# | #1\_1\_B11# | #1\_1\_B12# | #1\_1\_B13# |
| 输出电压(V) | #1\_1\_V1# | #1\_1\_V2# | #1\_1\_V3# | #1\_1\_V4# | #1\_1\_V5# | #1\_1\_V6# | #1\_1\_V7# | #1\_1\_V8# | #1\_1\_V9# | #1\_1\_V10# | #1\_1\_V11# | #1\_1\_V12# | #1\_1\_V13# |

作图，以磁感应强度为横坐标，以输出电压为纵坐标

#Graph-1-1#

由表格和数据可知，传感器线性工作范围

灵敏度约为： #1\_1\_sen#

(2) 测量磁阻传感器的各方异性特性

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 夹角(°) | #1\_2\_a1# | #1\_2\_a2# | #1\_2\_a3# | #1\_2\_a4# | #1\_2\_a5# | #1\_2\_a6# | #1\_2\_a7# | #1\_2\_a8# | #1\_2\_a9# | #1\_2\_a10# |
| 输出电压(V) | #1\_2\_v1# | #1\_2\_v2# | #1\_2\_v3# | #1\_2\_v4# | #1\_2\_v5# | #1\_2\_v6# | #1\_2\_v7# | #1\_2\_v8# | #1\_2\_v9# | #1\_2\_v10# |

作图：以夹角x为横坐标，以输出电压为纵坐标

#Graph-1-2#

曲线规律：随夹角增大，斜率的绝对值也在不断变大，即曲线变陡，且在象限内为凸函数，符合余弦规律。

模拟方程为：

2. 赫姆霍兹线圈的磁场分布测量

(1)线圈轴线上的磁场分布测量

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 位置x | -0.5R | -0.4R | -0.3R | -0.2R | -0.1R | 0 | 0.1R | 0.2R | 0.3R | 0.4R | 0.5R |
| B(x)/B(0) 计算值 | #2\_1\_x1# | #2\_1\_x2# | #2\_1\_x3# | #2\_1\_x4# | #2\_1\_x5# | #2\_1\_x6# | #2\_1\_x7# | #2\_1\_x8# | #2\_1\_x9# | #2\_1\_x10# | #2\_1\_x11# |
| B(x)测量值/V | #2\_1\_v1# | #2\_1\_v2# | #2\_1\_v3# | #2\_1\_v4# | #2\_1\_v5# | #2\_1\_v6# | #2\_1\_v7# | #2\_1\_v8# | #2\_1\_v9# | #2\_1\_v10# | #2\_1\_v11# |
| B(x)测量值(高斯) | #2\_1\_g1# | #2\_1\_g2# | #2\_1\_g3# | #2\_1\_g4# | #2\_1\_g5# | #2\_1\_g6# | #2\_1\_g7# | #2\_1\_g8# | #2\_1\_g9# | #2\_1\_g10# | #2\_1\_g11# |

作图：以位置为横坐标，B(x)测量值(Gauss)为纵坐标

#Graph-2-1#

(2)赫姆霍兹线圈间磁场分布的测量

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Y/Vx/x | 0 | 0.05R | 0.1R | 0.15R | 0.2R | 0.25R | 0.3R |
| 0 | #2\_2\_11# | #2\_2\_12# | #2\_2\_13# | #2\_2\_14# | #2\_2\_15# | #2\_2\_16# | #2\_2\_17# |
| 0.05R | #2\_2\_21# | #2\_2\_22# | #2\_2\_23# | #2\_2\_24# | #2\_2\_25# | #2\_2\_26# | #2\_2\_27# |
| 0.1R | #2\_2\_31# | #2\_2\_32# | #2\_2\_33# | #2\_2\_34# | #2\_2\_35# | #2\_2\_36# | #2\_2\_37# |
| 0.15R | #2\_2\_41# | #2\_2\_42# | #2\_2\_43# | #2\_2\_44# | #2\_2\_45# | #2\_2\_46# | #2\_2\_47# |
| 0.2R | #2\_2\_51# | #2\_2\_52# | #2\_2\_53# | #2\_2\_54# | #2\_2\_55# | #2\_2\_56# | #2\_2\_57# |
| 0.25R | #2\_2\_61# | #2\_2\_62# | #2\_2\_63# | #2\_2\_64# | #2\_2\_65# | #2\_2\_66# | #2\_2\_67# |
| 0.3R | #2\_2\_71# | #2\_2\_72# | #2\_2\_73# | #2\_2\_74# | #2\_2\_75# | #2\_2\_76# | #2\_2\_77# |

空间分布特点：

X方向上变化规律：随着y的变大，x方向上的磁场强度变化呈现先增大后减小再一直增大；y方向上变化规律：随x变大在0-0.2R内，在y上0-0.3R上减小，在0.2-0.3R内，y呈现增大的变化规律。

3. 地磁场的测量

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 磁倾角(°) | 磁感应强度 | | | |
|  |  | /V |  |
| 60 | #3\_u1# | #3\_u2# | #3\_u# | #3\_B# |

实验室内测量地磁场时，建筑物的钢筋分布，同学携带的铁磁物质均可影响到实验结果。