《气象用太阳模拟器校准规范》试验报告

## 试验目的

气象用太阳模拟器（以下简称太阳模拟器）是一种模拟自然太阳光谱和辐照度的光源设备，能够提供具有一定光斑有效口径、稳定、均匀、辐照度可控、光谱匹配自然太阳光的光源输出，主要用于气象辐射仪器如总辐射表和直接辐射表性能参数的室内测试和相关科学试验。

本试验报告旨在验证《气象用太阳模拟器校准规范》中所规定的校准条件、校准方法和校准结果处理等是否能满足实际工作的需要，校准结果的不确定度评定示例是否合理，本校准规范是否能够具有较强的可操作性

## 试验地点及时间

地点：北京市昌平区振兴路2号中国气象科技园2号楼国家气象计量站1楼气象辐射实验室

时间：2018年4月17日 **辐照度不稳定度试验**

时间：2018年4月17日 **辐照度不均匀度试验**

时间：2022年11月24日 **光谱匹配度试验**

## 环境条件

**辐照度不稳定度试验：**温度：（21.5~26.6）℃，湿度：（47%RH~53%RH）

**辐照度不均匀度试验：**温度：（22.3~27.6）℃，湿度：（41%RH~50%RH）

**光谱匹配度试验：**温度：（25.1~27.7）℃，湿度：（31%RH~34%RH）

## 标准器

|  |  |  |
| --- | --- | --- |
| 名称 | 型号规格 | 出厂编号 |
| 光谱仪 | MAYP | 11877 |
| 总辐射表 | CMP22 | 060016 |
| 数字多用表 | 2000-20 | 0910195 |

## 被校仪器

名称：太阳模拟器，型号：YTM200，编号：201101-01

## 校准试验

### 光谱匹配度校准

1. 校准方法依据《气象用太阳模拟器校准规范》7.3.1节
2. 测试数据

测试数据见表1。

表1 光谱辐照度分布

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 波长间隔/nm | 300～400 | 400～700 | 700～1100 | 1100～2500 |
| 不同波段范围内光谱辐照度占300nm～2500nm范围内光谱辐照度的百分比/% | 4.77 | 44.13 | 30.45 | 20.65 |

光谱图如图1所示。

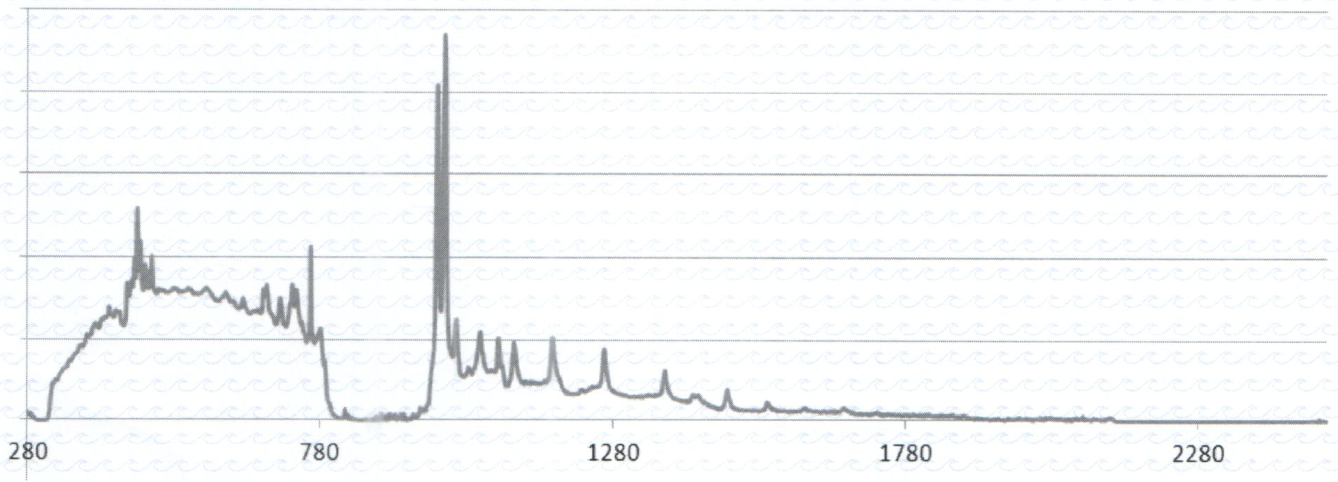


图1 光谱图

（3）标准数据

AM1.5 A级标准光谱分布数据根据ISO 9845-1: 2022计算得到。按100nm间隔计算AM 1.5A级光谱辐射分布见表2所示。按300nm～400nm，400nm～700nm，700nm～1100nm，1100nm～2500nm计算AM 1.5A级光谱辐射分布见表3所示，其中2500nm～3000nm之间的光谱辐射能量很小，此处忽略不计。

表 按100nm间隔计算AM 1.5A级光谱辐射分布

|  |  |
| --- | --- |
| 波段 | 不同波段范围内光谱辐照度占300nm～2500nm范围内光谱辐照度的百分比/% |
| 300nm-400nm | 4.8% |
| 400nm-500nm | 14.1% |
| 500nm-600nm | 15.2% |
| 600nm-700nm | 14.0% |
| 700nm-800nm | 11.4% |
| 800nm-900nm | 9.5% |
| 900nm-1000nm | 5.7% |
| 1000nm-1100nm | 6.5% |
| 1100nm-1200nm | 3.2% |
| 1200nm-1300nm | 4.3% |
| 1300nm-1400nm | 1.2% |
| 1400nm-1500nm | 0.7% |
| 1500nm-1600nm | 2.6% |
| 1600nm-1700nm | 2.2% |
| 1700nm-1800nm | 1.4% |
| 1800nm-1900nm | 0.0% |
| 1900nm-2000nm | 0.3% |
| 2000nm-2100nm | 0.7% |
| 2100nm-2200nm | 0.8% |
| 2200nm-2300nm | 0.7% |
| 2300nm-2400nm | 0.5% |
| 2400nm-2500nm | 0.2% |
| 2500nm-2600nm | 0.002% |
| 2600nm-2700nm | 0.000% |
| 2700nm-2800nm | 0.000% |
| 2800nm-2900nm | 0.003% |
| 2900nm-3000nm | 0.038% |

表2 按300nm～400nm，400nm～700nm，700nm～1100nm，1100nm～2500nm计算AM 1.5 A级光谱辐射分布

|  |  |
| --- | --- |
| 波段 | 不同波段范围内光谱辐照度占300nm～2500nm范围内光谱辐照度的百分比/% |
| 300nm-400nm | 4.8% |
| 400nm-700nm | 43.3% |
| 700nm-1100nm | 33.0% |
| 1100nm-2500nm | 18.9% |
| 2500nm-3000nm | 0.0% |

对比表1和表3，可以计算太阳模拟器光谱匹配度，见表4。

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 序号 | 波长间隔/nm | AM1.5条件下不同波段范围内光谱辐照度占300nm～2500nm范围内光谱辐照度的百分比/% | 太阳模拟器不同波段范围内光谱辐照度占300nm～2500nm范围内光谱辐照度的百分比/% | 光谱匹配度 |
| 1 | 300～400 | 4.8 | 4.77 | 0.99 |
| 2 | 400～700 | 43.3 | 44.13 | 1.02 |
| 3 | 700～1100 | 33.0 | 30.45 | 0.92 |
| 4 | 1100～2500 | 18.9 | 20.65 | 1.09 |

光谱匹配度都介于[0.8，1.2]之间，太阳模拟器光谱匹配度满足AM 1.5A级光谱辐射分布。

### 辐照度不均匀度

1. 校准方法依据《气象用太阳模拟器校准规范》7.3.2节
2. 测试数据

φ60 mm辐照度不均匀度测试数据见表5，φ160 mm辐照度不均匀度测试数据见表6，测试以1100 W/m2测试点为例。

表5 φ60 mm辐照度不均匀度测试数据



表6 φ160 mm辐照度不均匀度测试数据



按照计算，，。

### 辐照度不稳定度

1. 校准方法依据《气象用太阳模拟器校准规范》7.3.3节
2. 测试数据

调节太阳模拟器输出约为975W/m2左右，测试时间约为1h，记录数据见表7。

表7 辐照度不稳定度校准测试数据

| 序号 | 时间戳 | 电压 | 辐照度 | 序号 | 时间戳 | 电压 | 辐照度 |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 17:02:46 | 0.008729 | 975.27 | 181 | 17:32:46 | 0.008696 | 971.64 |
| 2 | 17:02:56 | 0.008744 | 976.98 | 182 | 17:32:56 | 0.008717 | 973.98 |
| 3 | 17:03:06 | 0.008728 | 975.20 | 183 | 17:33:06 | 0.008713 | 973.55 |
| 4 | 17:03:16 | 0.008727 | 975.10 | 184 | 17:33:16 | 0.008705 | 972.64 |
| 5 | 17:03:26 | 0.008736 | 976.07 | 185 | 17:33:26 | 0.008711 | 973.29 |
| 6 | 17:03:36 | 0.008736 | 976.12 | 186 | 17:33:36 | 0.008712 | 973.36 |
| 7 | 17:03:46 | 0.008732 | 975.70 | 187 | 17:33:46 | 0.008718 | 974.09 |
| 8 | 17:03:56 | 0.008738 | 976.27 | 188 | 17:33:56 | 0.008733 | 975.75 |
| 9 | 17:04:06 | 0.008738 | 976.37 | 189 | 17:34:06 | 0.008713 | 973.53 |
| 10 | 17:04:16 | 0.008741 | 976.65 | 190 | 17:34:16 | 0.008711 | 973.31 |
| 11 | 17:04:26 | 0.008735 | 975.97 | 191 | 17:34:26 | 0.008727 | 975.06 |
| 12 | 17:04:36 | 0.008728 | 975.16 | 192 | 17:34:36 | 0.008722 | 974.49 |
| 13 | 17:04:46 | 0.008715 | 973.76 | 193 | 17:34:46 | 0.008731 | 975.58 |
| 14 | 17:04:56 | 0.008756 | 978.31 | 194 | 17:34:56 | 0.008712 | 973.39 |
| 15 | 17:05:06 | 0.008740 | 976.48 | 195 | 17:35:06 | 0.008714 | 973.60 |
| 16 | 17:05:16 | 0.008734 | 975.85 | 196 | 17:35:16 | 0.008720 | 974.25 |
| 17 | 17:05:26 | 0.008715 | 973.77 | 197 | 17:35:26 | 0.008721 | 974.40 |
| 18 | 17:05:36 | 0.008740 | 976.48 | 198 | 17:35:36 | 0.008718 | 974.04 |
| 19 | 17:05:46 | 0.008738 | 976.36 | 199 | 17:35:46 | 0.008722 | 974.49 |
| 20 | 17:05:56 | 0.008743 | 976.84 | 200 | 17:35:56 | 0.008719 | 974.15 |
| 21 | 17:06:06 | 0.008761 | 978.90 | 201 | 17:36:06 | 0.008738 | 976.32 |
| 22 | 17:06:16 | 0.008779 | 980.92 | 202 | 17:36:16 | 0.008730 | 975.39 |
| 23 | 17:06:26 | 0.008776 | 980.51 | 203 | 17:36:26 | 0.008731 | 975.49 |
| 24 | 17:06:36 | 0.008787 | 981.80 | 204 | 17:36:36 | 0.008707 | 972.83 |
| 25 | 17:06:46 | 0.008786 | 981.69 | 205 | 17:36:46 | 0.008721 | 974.38 |
| 26 | 17:06:56 | 0.008783 | 981.30 | 206 | 17:36:56 | 0.008711 | 973.31 |
| 27 | 17:07:06 | 0.008799 | 983.07 | 207 | 17:37:06 | 0.008728 | 975.23 |
| 28 | 17:07:16 | 0.008788 | 981.88 | 208 | 17:37:16 | 0.008704 | 972.46 |
| 29 | 17:07:26 | 0.008780 | 981.02 | 209 | 17:37:26 | 0.008715 | 973.78 |
| 30 | 17:07:36 | 0.008775 | 980.42 | 210 | 17:37:36 | 0.008706 | 972.75 |
| 31 | 17:07:46 | 0.008751 | 977.80 | 211 | 17:37:46 | 0.008723 | 974.64 |
| 32 | 17:07:56 | 0.008754 | 978.09 | 212 | 17:37:56 | 0.008712 | 973.42 |
| 33 | 17:08:06 | 0.008766 | 979.48 | 213 | 17:38:06 | 0.008724 | 974.74 |
| 34 | 17:08:16 | 0.008741 | 976.59 | 214 | 17:38:16 | 0.008729 | 975.31 |
| 35 | 17:08:26 | 0.008752 | 977.88 | 215 | 17:38:26 | 0.008714 | 973.67 |
| 36 | 17:08:36 | 0.008737 | 976.23 | 216 | 17:38:36 | 0.008719 | 974.24 |
| 37 | 17:08:46 | 0.008731 | 975.57 | 217 | 17:38:46 | 0.008713 | 973.52 |
| 38 | 17:08:56 | 0.008741 | 976.64 | 218 | 17:38:56 | 0.008728 | 975.19 |
| 39 | 17:09:06 | 0.008742 | 976.80 | 219 | 17:39:06 | 0.008705 | 972.66 |
| 40 | 17:09:16 | 0.008735 | 975.95 | 220 | 17:39:16 | 0.008731 | 975.57 |
| 41 | 17:09:26 | 0.008734 | 975.87 | 221 | 17:39:26 | 0.008718 | 974.04 |
| 42 | 17:09:36 | 0.008748 | 977.40 | 222 | 17:39:36 | 0.008731 | 975.56 |
| 43 | 17:09:46 | 0.008740 | 976.54 | 223 | 17:39:46 | 0.008711 | 973.24 |
| 44 | 17:09:56 | 0.008738 | 976.32 | 224 | 17:39:56 | 0.008718 | 974.06 |
| 45 | 17:10:06 | 0.008739 | 976.42 | 225 | 17:40:06 | 0.008714 | 973.64 |
| 46 | 17:10:16 | 0.008744 | 976.93 | 226 | 17:40:16 | 0.008711 | 973.26 |
| 47 | 17:10:26 | 0.008726 | 974.98 | 227 | 17:40:26 | 0.008717 | 973.95 |
| 48 | 17:10:36 | 0.008723 | 974.61 | 228 | 17:40:36 | 0.008717 | 974.01 |
| 49 | 17:10:46 | 0.008723 | 974.60 | 229 | 17:40:46 | 0.008723 | 974.68 |
| 50 | 17:10:56 | 0.008722 | 974.48 | 230 | 17:40:56 | 0.008714 | 973.66 |
| 51 | 17:11:06 | 0.008738 | 976.31 | 231 | 17:41:06 | 0.008718 | 974.07 |
| 52 | 17:11:16 | 0.008722 | 974.53 | 232 | 17:41:16 | 0.008701 | 972.18 |
| 53 | 17:11:26 | 0.008700 | 972.04 | 233 | 17:41:26 | 0.008719 | 974.15 |
| 54 | 17:11:36 | 0.008721 | 974.43 | 234 | 17:41:36 | 0.008734 | 975.86 |
| 55 | 17:11:46 | 0.008726 | 974.93 | 235 | 17:41:46 | 0.008720 | 974.28 |
| 56 | 17:11:56 | 0.008735 | 976.03 | 236 | 17:41:56 | 0.008726 | 974.99 |
| 57 | 17:12:06 | 0.008727 | 975.09 | 237 | 17:42:06 | 0.008725 | 974.91 |
| 58 | 17:12:16 | 0.008716 | 973.83 | 238 | 17:42:16 | 0.008720 | 974.29 |
| 59 | 17:12:26 | 0.008706 | 972.78 | 239 | 17:42:26 | 0.008721 | 974.42 |
| 60 | 17:12:36 | 0.008721 | 974.44 | 240 | 17:42:36 | 0.008717 | 973.98 |
| 61 | 17:12:46 | 0.008724 | 974.80 | 241 | 17:42:46 | 0.008721 | 974.36 |
| 62 | 17:12:56 | 0.008727 | 975.07 | 242 | 17:42:56 | 0.008708 | 973.01 |
| 63 | 17:13:06 | 0.008712 | 973.39 | 243 | 17:43:06 | 0.008707 | 972.90 |
| 64 | 17:13:16 | 0.008714 | 973.66 | 244 | 17:43:16 | 0.008720 | 974.27 |
| 65 | 17:13:26 | 0.008710 | 973.22 | 245 | 17:43:26 | 0.008733 | 975.75 |
| 66 | 17:13:36 | 0.008706 | 972.70 | 246 | 17:43:36 | 0.008719 | 974.23 |
| 67 | 17:13:46 | 0.008704 | 972.55 | 247 | 17:43:46 | 0.008712 | 973.38 |
| 68 | 17:13:56 | 0.008716 | 973.84 | 248 | 17:43:56 | 0.008718 | 974.06 |
| 69 | 17:14:06 | 0.008704 | 972.55 | 249 | 17:44:06 | 0.008715 | 973.73 |
| 70 | 17:14:16 | 0.008709 | 973.09 | 250 | 17:44:16 | 0.008722 | 974.55 |
| 71 | 17:14:26 | 0.008720 | 974.26 | 251 | 17:44:26 | 0.008724 | 974.76 |
| 72 | 17:14:36 | 0.008708 | 972.97 | 252 | 17:44:36 | 0.008739 | 976.39 |
| 73 | 17:14:46 | 0.008713 | 973.50 | 253 | 17:44:46 | 0.008745 | 977.08 |
| 74 | 17:14:56 | 0.008727 | 975.13 | 254 | 17:44:56 | 0.008734 | 975.91 |
| 75 | 17:15:06 | 0.008714 | 973.58 | 255 | 17:45:06 | 0.008752 | 977.92 |
| 76 | 17:15:16 | 0.008709 | 973.11 | 256 | 17:45:16 | 0.008768 | 979.65 |
| 77 | 17:15:26 | 0.008721 | 974.39 | 257 | 17:45:26 | 0.008756 | 978.28 |
| 78 | 17:15:36 | 0.008722 | 974.51 | 258 | 17:45:36 | 0.008758 | 978.60 |
| 79 | 17:15:46 | 0.008719 | 974.15 | 259 | 17:45:46 | 0.008733 | 975.73 |
| 80 | 17:15:56 | 0.008716 | 973.89 | 260 | 17:45:56 | 0.008744 | 976.93 |
| 81 | 17:16:06 | 0.008715 | 973.75 | 261 | 17:46:06 | 0.008737 | 976.23 |
| 82 | 17:16:16 | 0.008732 | 975.69 | 262 | 17:46:16 | 0.008751 | 977.81 |
| 83 | 17:16:26 | 0.008712 | 973.43 | 263 | 17:46:26 | 0.008739 | 976.46 |
| 84 | 17:16:36 | 0.008714 | 973.59 | 264 | 17:46:36 | 0.008743 | 976.92 |
| 85 | 17:16:46 | 0.008714 | 973.59 | 265 | 17:46:46 | 0.008728 | 975.18 |
| 86 | 17:16:56 | 0.008710 | 973.18 | 266 | 17:46:56 | 0.008743 | 976.86 |
| 87 | 17:17:06 | 0.008714 | 973.58 | 267 | 17:47:06 | 0.008742 | 976.76 |
| 88 | 17:17:16 | 0.008692 | 971.18 | 268 | 17:47:16 | 0.008753 | 978.01 |
| 89 | 17:17:26 | 0.008729 | 975.27 | 269 | 17:47:26 | 0.008726 | 974.96 |
| 90 | 17:17:36 | 0.008708 | 972.99 | 270 | 17:47:36 | 0.008737 | 976.26 |
| 91 | 17:17:46 | 0.008723 | 974.61 | 271 | 17:47:46 | 0.008723 | 974.68 |
| 92 | 17:17:56 | 0.008719 | 974.14 | 272 | 17:47:56 | 0.008727 | 975.07 |
| 93 | 17:18:06 | 0.008716 | 973.86 | 273 | 17:48:06 | 0.008735 | 975.94 |
| 94 | 17:18:16 | 0.008708 | 972.98 | 274 | 17:48:16 | 0.008749 | 977.54 |
| 95 | 17:18:26 | 0.008707 | 972.88 | 275 | 17:48:26 | 0.008726 | 974.99 |
| 96 | 17:18:36 | 0.008717 | 973.97 | 276 | 17:48:36 | 0.008726 | 974.94 |
| 97 | 17:18:46 | 0.008697 | 971.68 | 277 | 17:48:46 | 0.008740 | 976.54 |
| 98 | 17:18:56 | 0.008702 | 972.31 | 278 | 17:48:56 | 0.008723 | 974.64 |
| 99 | 17:19:06 | 0.008709 | 973.05 | 279 | 17:49:06 | 0.008729 | 975.29 |
| 100 | 17:19:16 | 0.008699 | 971.96 | 280 | 17:49:16 | 0.008741 | 976.66 |
| 101 | 17:19:26 | 0.008710 | 973.15 | 281 | 17:49:26 | 0.008732 | 975.66 |
| 102 | 17:19:36 | 0.008724 | 974.70 | 282 | 17:49:36 | 0.008737 | 976.25 |
| 103 | 17:19:46 | 0.008716 | 973.80 | 283 | 17:49:46 | 0.008745 | 977.14 |
| 104 | 17:19:56 | 0.008732 | 975.67 | 284 | 17:49:56 | 0.008731 | 975.56 |
| 105 | 17:20:06 | 0.008722 | 974.56 | 285 | 17:50:06 | 0.008725 | 974.89 |
| 106 | 17:20:16 | 0.008733 | 975.76 | 286 | 17:50:16 | 0.008743 | 976.89 |
| 107 | 17:20:26 | 0.008724 | 974.74 | 287 | 17:50:26 | 0.008747 | 977.30 |
| 108 | 17:20:36 | 0.008712 | 973.45 | 288 | 17:50:36 | 0.008733 | 975.76 |
| 109 | 17:20:46 | 0.008699 | 971.97 | 289 | 17:50:46 | 0.008755 | 978.21 |
| 110 | 17:20:56 | 0.008724 | 974.71 | 290 | 17:50:56 | 0.008731 | 975.53 |
| 111 | 17:21:06 | 0.008716 | 973.86 | 291 | 17:51:06 | 0.008757 | 978.42 |
| 112 | 17:21:16 | 0.008720 | 974.31 | 292 | 17:51:16 | 0.008741 | 976.62 |
| 113 | 17:21:26 | 0.008733 | 975.70 | 293 | 17:51:26 | 0.008743 | 976.82 |
| 114 | 17:21:36 | 0.008706 | 972.74 | 294 | 17:51:36 | 0.008731 | 975.54 |
| 115 | 17:21:46 | 0.008706 | 972.71 | 295 | 17:51:46 | 0.008764 | 979.25 |
| 116 | 17:21:56 | 0.008718 | 974.03 | 296 | 17:51:56 | 0.008760 | 978.75 |
| 117 | 17:22:06 | 0.008729 | 975.30 | 297 | 17:52:06 | 0.008759 | 978.62 |
| 118 | 17:22:16 | 0.008726 | 974.92 | 298 | 17:52:16 | 0.008758 | 978.59 |
| 119 | 17:22:26 | 0.008718 | 974.04 | 299 | 17:52:26 | 0.008769 | 979.83 |
| 120 | 17:22:36 | 0.008710 | 973.19 | 300 | 17:52:36 | 0.008733 | 975.77 |
| 121 | 17:22:46 | 0.008719 | 974.24 | 301 | 17:52:46 | 0.008762 | 979.04 |
| 122 | 17:22:56 | 0.008728 | 975.16 | 302 | 17:52:56 | 0.008746 | 977.16 |
| 123 | 17:23:06 | 0.008719 | 974.15 | 303 | 17:53:06 | 0.008776 | 980.53 |
| 124 | 17:23:16 | 0.008723 | 974.60 | 304 | 17:53:16 | 0.008748 | 977.42 |
| 125 | 17:23:26 | 0.008731 | 975.55 | 305 | 17:53:26 | 0.008758 | 978.49 |
| 126 | 17:23:36 | 0.008733 | 975.79 | 306 | 17:53:36 | 0.008766 | 979.48 |
| 127 | 17:23:46 | 0.008722 | 974.54 | 307 | 17:53:46 | 0.008734 | 975.89 |
| 128 | 17:23:56 | 0.008724 | 974.74 | 308 | 17:53:56 | 0.008751 | 977.78 |
| 129 | 17:24:06 | 0.008746 | 977.26 | 309 | 17:54:06 | 0.008736 | 976.10 |
| 130 | 17:24:16 | 0.008717 | 973.94 | 310 | 17:54:16 | 0.008745 | 977.10 |
| 131 | 17:24:26 | 0.008709 | 973.05 | 311 | 17:54:26 | 0.008760 | 978.75 |
| 132 | 17:24:36 | 0.008736 | 976.03 | 312 | 17:54:36 | 0.008753 | 977.93 |
| 133 | 17:24:46 | 0.008714 | 973.59 | 313 | 17:54:46 | 0.008771 | 980.04 |
| 134 | 17:24:56 | 0.008705 | 972.64 | 314 | 17:54:56 | 0.008764 | 979.20 |
| 135 | 17:25:06 | 0.008731 | 975.52 | 315 | 17:55:06 | 0.008750 | 977.67 |
| 136 | 17:25:16 | 0.008721 | 974.41 | 316 | 17:55:16 | 0.008772 | 980.08 |
| 137 | 17:25:26 | 0.008742 | 976.79 | 317 | 17:55:26 | 0.008747 | 977.30 |
| 138 | 17:25:36 | 0.008733 | 975.78 | 318 | 17:55:36 | 0.008735 | 975.96 |
| 139 | 17:25:46 | 0.008730 | 975.42 | 319 | 17:55:46 | 0.008751 | 977.80 |
| 140 | 17:25:56 | 0.008746 | 977.21 | 320 | 17:55:56 | 0.008733 | 975.75 |
| 141 | 17:26:06 | 0.008744 | 976.99 | 321 | 17:56:06 | 0.008732 | 975.70 |
| 142 | 17:26:16 | 0.008745 | 977.07 | 322 | 17:56:16 | 0.008737 | 976.16 |
| 143 | 17:26:26 | 0.008724 | 974.78 | 323 | 17:56:26 | 0.008760 | 978.73 |
| 144 | 17:26:36 | 0.008731 | 975.49 | 324 | 17:56:36 | 0.008762 | 979.03 |
| 145 | 17:26:46 | 0.008717 | 973.91 | 325 | 17:56:46 | 0.008756 | 978.28 |
| 146 | 17:26:56 | 0.008732 | 975.62 | 326 | 17:56:56 | 0.008731 | 975.52 |
| 147 | 17:27:06 | 0.008734 | 975.83 | 327 | 17:57:06 | 0.008755 | 978.19 |
| 148 | 17:27:16 | 0.008725 | 974.91 | 328 | 17:57:16 | 0.008757 | 978.47 |
| 149 | 17:27:26 | 0.008726 | 974.96 | 329 | 17:57:26 | 0.008744 | 976.98 |
| 150 | 17:27:36 | 0.008720 | 974.35 | 330 | 17:57:36 | 0.008747 | 977.28 |
| 151 | 17:27:46 | 0.008705 | 972.58 | 331 | 17:57:46 | 0.008741 | 976.68 |
| 152 | 17:27:56 | 0.008736 | 976.07 | 332 | 17:57:56 | 0.008743 | 976.84 |
| 153 | 17:28:06 | 0.008731 | 975.54 | 333 | 17:58:06 | 0.008738 | 976.29 |
| 154 | 17:28:16 | 0.008720 | 974.31 | 334 | 17:58:16 | 0.008739 | 976.45 |
| 155 | 17:28:26 | 0.008717 | 973.95 | 335 | 17:58:26 | 0.008745 | 977.07 |
| 156 | 17:28:36 | 0.008727 | 975.12 | 336 | 17:58:36 | 0.008733 | 975.75 |
| 157 | 17:28:46 | 0.008730 | 975.46 | 337 | 17:58:46 | 0.008719 | 974.15 |
| 158 | 17:28:56 | 0.008720 | 974.30 | 338 | 17:58:56 | 0.008743 | 976.84 |
| 159 | 17:29:06 | 0.008708 | 972.92 | 339 | 17:59:06 | 0.008729 | 975.33 |
| 160 | 17:29:16 | 0.008714 | 973.60 | 340 | 17:59:16 | 0.008733 | 975.73 |
| 161 | 17:29:26 | 0.008717 | 973.92 | 341 | 17:59:26 | 0.008738 | 976.35 |
| 162 | 17:29:36 | 0.008718 | 974.04 | 342 | 17:59:36 | 0.008729 | 975.27 |
| 163 | 17:29:46 | 0.008716 | 973.91 | 343 | 17:59:46 | 0.008726 | 974.96 |
| 164 | 17:29:56 | 0.008733 | 975.78 | 344 | 17:59:56 | 0.008718 | 974.07 |
| 165 | 17:30:06 | 0.008716 | 973.90 | 345 | 18:00:06 | 0.008732 | 975.60 |
| 166 | 17:30:16 | 0.008711 | 973.31 | 346 | 18:00:16 | 0.008733 | 975.80 |
| 167 | 17:30:26 | 0.008738 | 976.33 | 347 | 18:00:26 | 0.008751 | 977.78 |
| 168 | 17:30:36 | 0.008711 | 973.28 | 348 | 18:00:36 | 0.008745 | 977.12 |
| 169 | 17:30:46 | 0.008726 | 974.98 | 349 | 18:00:46 | 0.008730 | 975.37 |
| 170 | 17:30:56 | 0.008713 | 973.57 | 350 | 18:00:56 | 0.008737 | 976.15 |
| 171 | 17:31:06 | 0.008728 | 975.17 | 351 | 18:01:06 | 0.008735 | 975.93 |
| 172 | 17:31:16 | 0.008725 | 974.81 | 352 | 18:01:16 | 0.008755 | 978.24 |
| 173 | 17:31:26 | 0.008712 | 973.45 | 353 | 18:01:26 | 0.008735 | 975.99 |
| 174 | 17:31:36 | 0.008698 | 971.87 | 354 | 18:01:36 | 0.008749 | 977.60 |
| 175 | 17:31:46 | 0.008727 | 975.07 | 355 | 18:01:46 | 0.008718 | 974.13 |
| 176 | 17:31:56 | 0.008723 | 974.63 | 356 | 18:01:56 | 0.008736 | 976.08 |
| 177 | 17:32:06 | 0.008718 | 974.11 | 357 | 18:02:06 | 0.008733 | 975.78 |
| 178 | 17:32:16 | 0.008724 | 974.71 | 358 | 18:02:16 | 0.008721 | 974.45 |
| 179 | 17:32:26 | 0.008705 | 972.62 | 359 | 18:02:26 | 0.008727 | 975.11 |
| 180 | 17:32:36 | 0.008707 | 972.85 | 360 | 18:02:36 | 0.008735 | 976.00 |

按照，计算得到。

## 试验结论

通过实验验证，表明《气象用太阳模拟器校准规范》校准项目与校准方法设置合理，可操作性强，可较全面的评价气象用太阳模拟器的计量性能，具有可行性。