

Test report

293621-3TRFWL

Date of issue: July 29, 2016

Applicant:

Leggett & Platt Canada Co.

Product:

Helios Wireless Transmitter

Model:

TC

FCC ID:

SFO-8409300

IC Registration number:

9304C-8409300

Specifications:

◆ **Safety Code 6 (2015)**

Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz

◆ **FCC 1.1310**


Radiofrequency radiation exposure limits

◆ **RSS-102 Issue 5**

Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus

Test location

Company name	Nemko Canada Inc.
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City	Ottawa
Province	Ontario
Postal code	K1V 1H2
Country	Canada
Telephone	+1 613 737 9680
Facsimile	+1 613 737 9691
Toll free	+1 800 563 6336
Website	www.nemko.com
Site number	FCC: 176392; IC: 2040A-4 (3 m semi anechoic chamber)

Tested by	Andrey Adelberg, Senior Wireless/EMC Specialist
Reviewed by	Kevin Rose, Wireless/EMC Specialist
Date	July 29, 2016
Signature	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name:	Leggett & Platt Canada Co.
Address:	360 Silvercreek Industrial Dr.
City:	Lakeshore
Province/State:	Ontario
Postal/Zip code:	N8N 4Y3
Country:	Canada

1.2 Test specifications

Safety Code 6 (2015)	Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz
RSS-102, Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
FCC 1.1310	Radiofrequency radiation exposure limits

1.3 Test methods

680106 D01	RF Exposure Wireless Charging Apps v02
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1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.5 Exclusions

None

1.6 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued



Section 2. Summary of test results

2.1 Safety Code 6 test results

Section	Test description	Verdict
2.2.1	Electric and Magnetic Field Strength (3 kHz - 10 MHz)	Pass

2.2 RSS-102 test results

Section	Test description	Verdict
4	RF Exposure limits	Pass

2.3 FCC 1.1310 test results

Section	Test description	Verdict
4(e)	Radiofrequency radiation exposure limits	Pass

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	August 26, 2015
Nemko sample ID number	133-000407

3.2 EUT information

Product name	Helios Wireless Transmitter
Model	TC
Serial number	8409300

3.3 Technical information

Operating band	9 kHz to 30 MHz
Operating frequency	110.9 kHz
Field strength, Units @ distance	73.81 dB μ V/m @ 3 m
Power requirements	12 V _{DC} from car battery
Antenna information	Internal coil antenna

3.4 Product description and theory of operation

EUT is a wireless power transmitter that is used as a wireless charger installed in vehicle.

3.5 EUT exercise details

EUT was powered up. Maximum power transfer was verified with and without the receiver (wirelessly powered Samsung Galaxy Note 5 cellphone with empty battery) placed on the charging surface (rubber mat).

3.6 EUT setup diagram

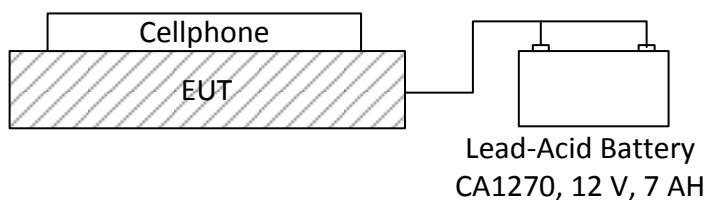


Figure 3.6-1: Setup diagram

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 "Uncertainty in EMC measurements." Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of $K=2$ with 95% certainty.

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Broadband Field Monitor	Narda	ELT-400	FA002728	1 year	Apr 13/2017
Broadband Field Probe	Narda	B field probe 100 cm ²	FA002728	1 year	Apr 13/2017
Starprobe (0.1–6000 MHz)	AR	FL7006	FA002054	1 year	Aug. 27/16

Section 8. Testing data

8.1 Maximum exposure limits

8.1.1 Definitions and limits

Safety Code 6: 2.2.1. Electric and Magnetic Field Strength (3 kHz - 10 MHz)

To ensure compliance with the basic restrictions outlined in Section 2.1, at frequencies between 0.003 MHz and 10 MHz, both the NS- and SAR-based reference levels for electric- and magnetic-field strength must be complied with simultaneously at frequencies where reference levels for both apply.

680106 D01 RF Exposure Wireless Charging Apps v02

For devices designed for typical desktop applications, such as a wireless charging pads, RF exposure evaluation should be conducted assuming a user separation distance of 10 cm. E and H field strength measurements or numerical modeling may be used to demonstrate compliance. Measurements should be made from all sides and the top of the primary/client pair, with the 10 cm measured from the center of the probe(s) to the edge of the device. Emissions between 3 kHz to 10 MHz should be assessed versus the limits Table 4.

FCC §1.1310 Radiofrequency radiation exposure limits.

Limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields for General Population/Uncontrolled Exposure: for frequencies 0.3–1.34 MHz the Electric field strength limit is 614 V/m and Magnetic field strength is 1.63 A/m.

RSS-102, 4 Exposure limits

For the purpose of this standard, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6.

Table 8.1-1: Safety Code 6, Table 3: Electric Field Strength Reference Levels

Frequency (MHz)	Reference level basis	Reference level [rms] for Uncontrolled Environment (V/m)	Reference level [rms] for Controlled Environment (V/m)	Reference Period (min)
0.003–10	NS	83	170	Instantaneous
1.0–10	SAR	$87/f^{0.5}$	$193/f^{0.5}$	6

Note: Frequency, f , is in MHz. The precise frequencies at which SAR-based electric field strength reference levels for Uncontrolled and Controlled Environments begin are 1.10 MHz and 1.29 MHz, respectively.

Table 8.1-2: Safety Code 6, Table 4: Magnetic Field Strength Reference Levels

Frequency (MHz)	Reference level basis	Reference level [rms] for Uncontrolled Environment (A/m)	Reference level [rms] for Controlled Environment (A/m)	Reference Period (min)
0.003–10	NS	90	180	Instantaneous
0.1–10	SAR	$0.73/f$	$1.6/f$	6

Note: Frequency, f , is in MHz.

8.1.2 Test summary

Test date:	July 29, 2016	Temperature:	22 °C
Test engineer:	Andrey Adelberg	Air pressure:	1007 mbar
Verdict:	Pass	Relative humidity:	33 %

8.1.3 Observations, settings and special notes

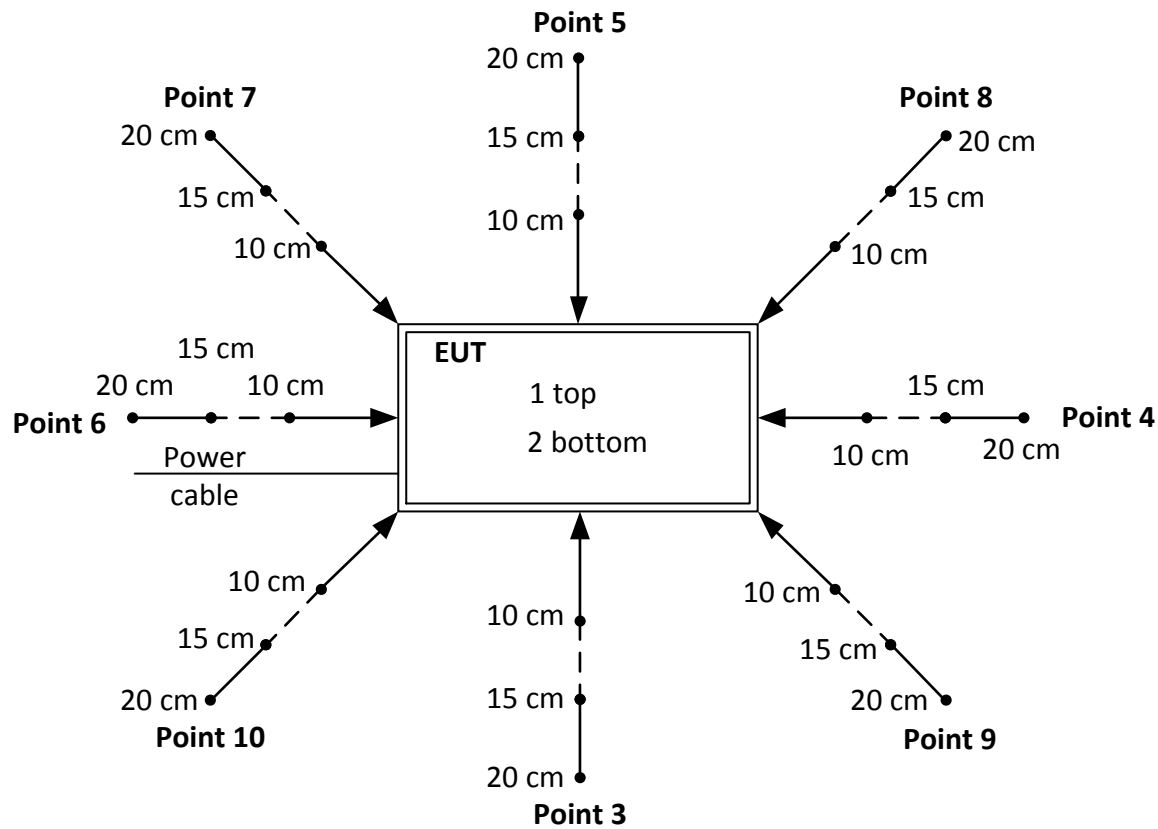


Figure 8.1-1: Test setup diagram

8.1.4 Test results

Table 8.1-3: RF Exposure test results. Electric field measurements, Canadian limits*

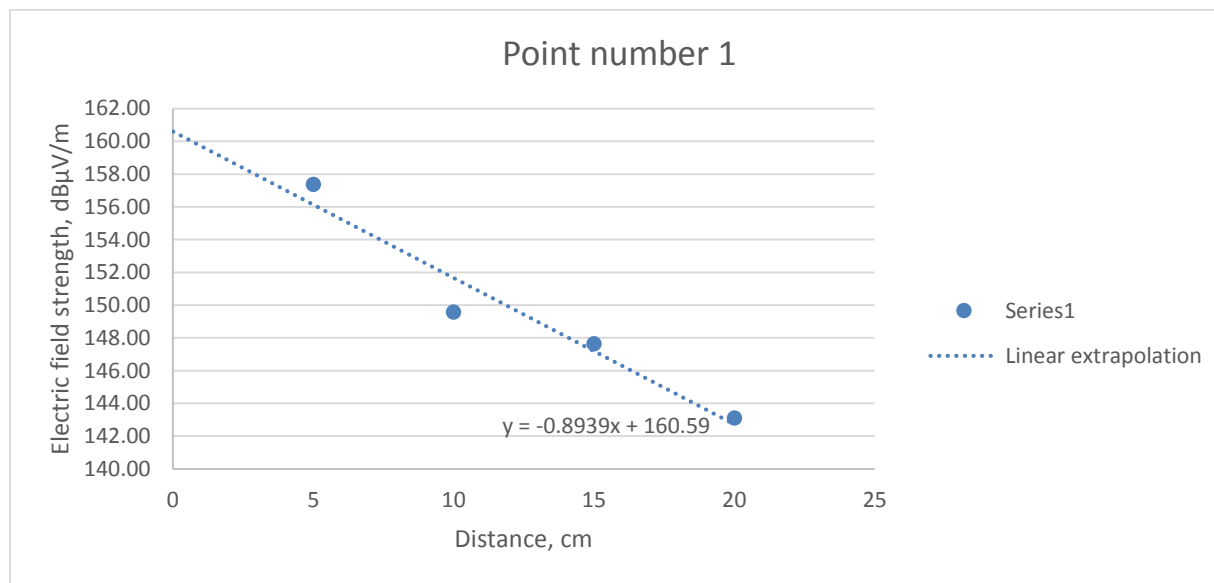
Point number	Electric Field Strength @ 0 cm**, dBμV/m	Electric Field Strength @ 5 cm, dBμV/m	Electric Field Strength @ 10 cm, dBμV/m	Electric Field Strength @ 15 cm, dBμV/m	Electric Field Strength @ 20 cm, dBμV/m	Maximum Field Strength, dBμV/m	Limit, dBμV/m
1	160.59	157.36	149.57	147.64	143.11	160.59	158.38
2	150.75	149.71	130.37	128.94	128.30	150.75	158.38
3	151.08	144.45	136.78	128.94	123.52	151.08	158.38
4	145.87	140.51	134.81	127.96	124.08	145.87	158.38
5	148.50	142.80	134.32	128.30	122.92	148.50	158.38
6	148.16	142.14	132.87	125.11	120.83	148.16	158.38
7	148.67	141.51	134.32	126.85	120.00	148.67	158.38
8	146.59	140.67	134.65	126.44	122.92	146.59	158.38
9	147.38	142.67	136.65	128.94	127.23	147.38	158.38
10	146.97	140.83	131.36	126.02	119.08	146.97	158.38

Note: * As per Notice 2015-DRS001 Industry Canada is notifying the industry that the NS requirements are not in force until further notice. Limit in the table above is for future reference and for the information purposes only. In order to present values in dBμV/m the following was used: $E_f [dBμV/m] = 120 + 20 \times \log_{10} (E_f [V/m])$. So the limit of 83 V/m is 158.38 dBμV/m.

** Electric field strength at 0 cm was linearly extrapolated from the trend line built from the 5, 10 15 and 20 cm measurement points.

Example of Electric Field Strength calculation at 0 cm distance for 'Point number 1'

Distance, cm	5	10	15	20
Electric field, dBμV/m	157.36	149.57	147.64	143.11



In order to calculate the value of the field strength 'y' at 0 cm distance, 0 was substituted instead of 'x'.

Minimum distance to compliance for Point number 1 was calculated as follows: $(158.38 - 160.59) / (-0.8939) = 2.47$ cm. The rest of measurement points comply at 0 cm distance.

Table 8.1-4: RF Exposure test results. Electric field measurements, FCC limits*

Point number	Electric Field Strength @ 0 cm, dBμV/m	Electric Field Strength @ 5 cm, dBμV/m	Electric Field Strength @ 10 cm, dBμV/m	Electric Field Strength @ 15 cm, dBμV/m	Electric Field Strength @ 20 cm, dBμV/m	Maximum Field Strength, dBμV/m	Limit, dBμV/m
1	160.59	157.36	149.57	147.64	143.11	160.59	175.76
2	150.75	149.71	130.37	128.94	128.30	150.75	175.76
3	151.08	144.45	136.78	128.94	123.52	151.08	175.76
4	145.87	140.51	134.81	127.96	124.08	145.87	175.76
5	148.50	142.80	134.32	128.30	122.92	148.50	175.76
6	148.16	142.14	132.87	125.11	120.83	148.16	175.76
7	148.67	141.51	134.32	126.85	120.00	148.67	175.76
8	146.59	140.67	134.65	126.44	122.92	146.59	175.76
9	147.38	142.67	136.65	128.94	127.23	147.38	175.76
10	146.97	140.83	131.36	126.02	119.08	146.97	175.76

Note: * Since the EUT operates at the frequency range that is outside the coverage of the requirement, the closest limit was applied. In order to present values in dBμV/m the following was used: $E_f [dBμV/m] = 120 + 20 \times \log_{10} (E_f [V/m])$. So the limit of 614 V/m is 175.76 dBμV/m.

Table 8.1-5: RF Exposure test results. Magnetic field measurements, Canadian limits

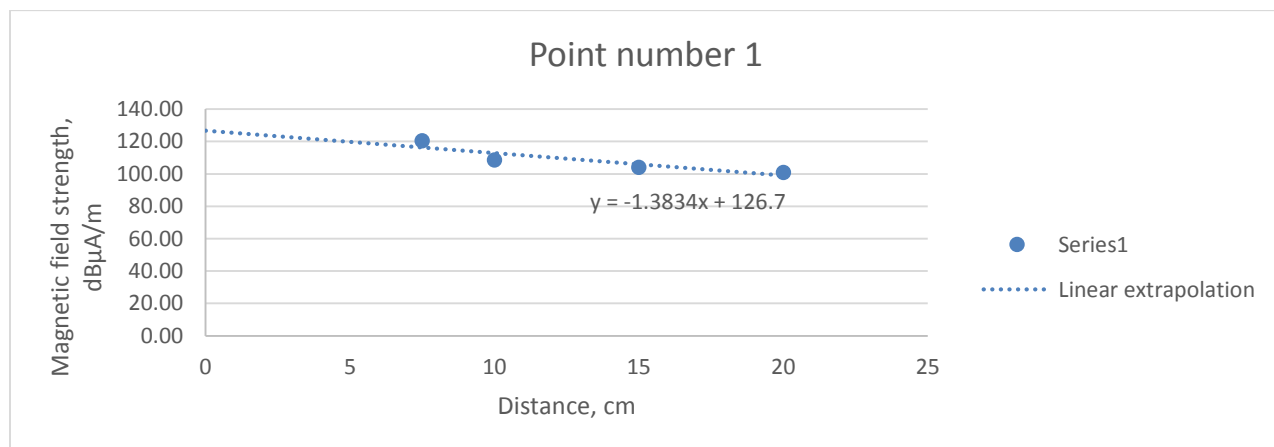
Point number	Magnetic Field Strength, μT					Magnetic Field Strength, dBμA/m				Maximum Field Strength, dBμA/m	Limit, dBμA/m
	@ 7.5 cm	@ 10 cm	@ 15 cm	@ 20 cm	@ 0 cm**	@ 7.5 cm	@ 10 cm	@ 15 cm	@ 20 cm		
1	1.31	0.34	0.20	0.14	126.70	120.41	108.69	104.08	100.98	126.70	136.35
2	1.22	0.38	0.23	0.18	125.11	119.79	109.66	105.30	103.17	125.11	136.35
3	0.88	0.42	0.26	0.18	122.71	116.95	110.53	106.36	103.17	122.71	136.35
4	0.93	0.55	0.32	0.23	123.26	117.43	112.87	108.16	105.30	123.26	136.35
5	0.91	0.56	0.28	0.21	123.77	117.24	113.03	107.00	104.51	123.77	136.35
6	0.70	0.40	0.26	0.20	119.66	114.96	110.10	106.36	104.08	119.66	136.35
7	0.59	0.29	0.22	0.17	117.21	113.48	107.31	104.91	102.67	117.21	136.35
8	0.49	0.27	0.18	0.14	116.35	111.87	106.69	103.17	100.98	116.35	136.35
9	0.60	0.26	0.19	0.16	117.11	113.62	106.36	103.64	102.14	117.11	136.35
10	0.58	0.35	0.26	0.19	117.46	113.33	108.94	106.36	103.64	117.46	136.35

Note: Magnetic field strength in A/m units was calculated as follows: $A/m = \mu T \div 1.25$. The limit for SAR was calculated as follows: $0.73 \div f = 0.73 / 0.111 = 6.57 A/m$. In order to present values in dBμA/m the following was used: $H_f [dBμA/m] = 120 + 20 \times \log_{10} (H_f [A/m])$

** Magnetic field strength at 0 cm was linearly extrapolated from the trend line built from the 7.5, 10 15 and 20 cm measurement points.

Example of Electric Field Strength calculation at 0 cm distance for 'Point number 1'

Distance, cm	7.5	10	15	20
Magnetic field, dBμA/m	120.41	108.69	104.08	100.98



In order to calculate the value of the field strength 'y' at 0 cm distance, 0 was substituted instead of 'x'.

Table 8.1-6: RF Exposure test results. Magnetic field measurements, FCC limits*

Point number	Magnetic Field Strength, μT					Magnetic Field Strength, $\text{dB}\mu\text{A/m}$				Maximum Field Strength, $\text{dB}\mu\text{A/m}$	Limit, $\text{dB}\mu\text{A/m}$
	@ 7.5 cm	@ 10 cm	@ 15 cm	@ 20 cm	@ 0 cm	@ 7.5 cm	@ 10 cm	@ 15 cm	@ 20 cm		
1	1.31	0.34	0.20	0.14	126.70	120.41	108.69	104.08	100.98	126.70	124.24
2	1.22	0.38	0.23	0.18	125.11	119.79	109.66	105.30	103.17	125.11	124.24
3	0.88	0.42	0.26	0.18	122.71	116.95	110.53	106.36	103.17	122.71	124.24
4	0.93	0.55	0.32	0.23	123.26	117.43	112.87	108.16	105.30	123.26	124.24
5	0.91	0.56	0.28	0.21	123.77	117.24	113.03	107.00	104.51	123.77	124.24
6	0.70	0.40	0.26	0.20	119.66	114.96	110.10	106.36	104.08	119.66	124.24
7	0.59	0.29	0.22	0.17	117.21	113.48	107.31	104.91	102.67	117.21	124.24
8	0.49	0.27	0.18	0.14	116.35	111.87	106.69	103.17	100.98	116.35	124.24
9	0.60	0.26	0.19	0.16	117.11	113.62	106.36	103.64	102.14	117.11	124.24
10	0.58	0.35	0.26	0.19	117.46	113.33	108.94	106.36	103.64	117.46	124.24

Note: Magnetic field strength in A/m units was calculated as follows: $\text{A/m} = \mu\text{T} \div 1.25$. In order to present values in $\text{dB}\mu\text{A/m}$ the following was used: $\text{Hf} [\text{dB}\mu\text{A/m}] = 120 + 20 \times \text{Log}_{10} (\text{Hf} [\text{A/m}])$

* Since the EUT operates at the frequency range that is outside the coverage of the requirement, the closest limit was applied.

Minimum distance to compliance for Point number 1 was calculated as follows: $(124.24 - 126.70) / (-1.3834) = 1.78 \text{ cm}$.

Minimum distance to compliance for Point number 2 was calculated as follows: $(124.24 - 125.11) / (-1.1909) = 0.73 \text{ cm}$.

The rest of measurement points comply at 0 cm distance.

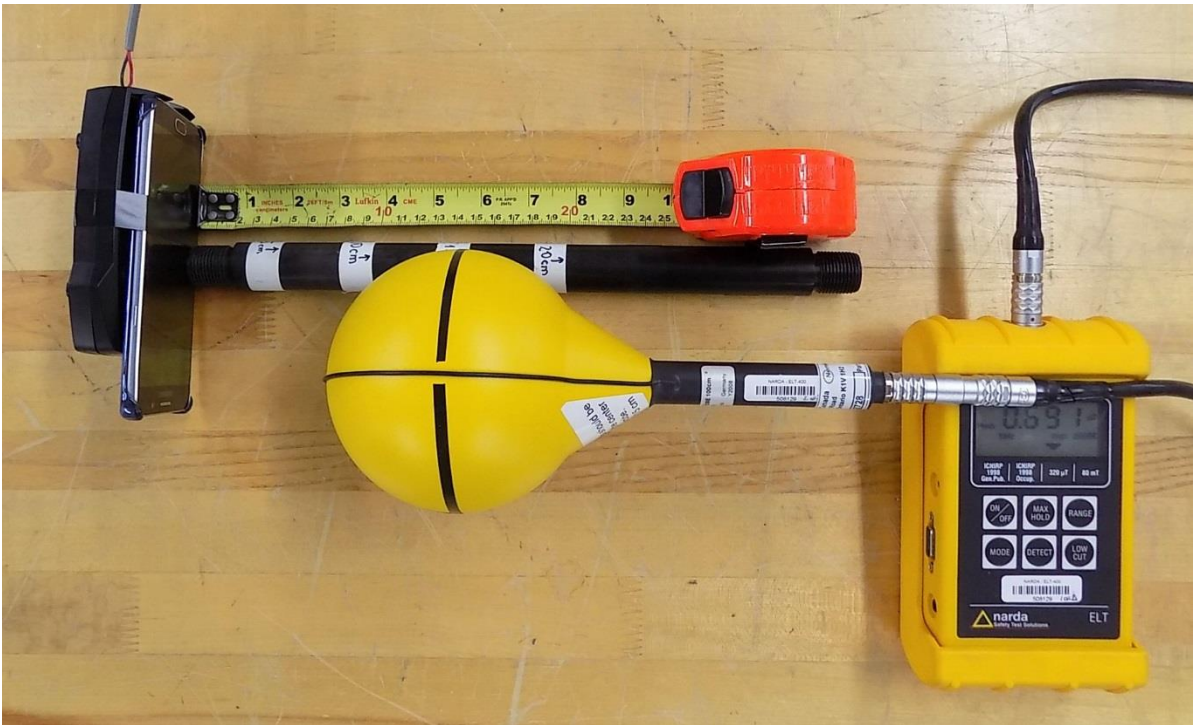


Figure 8.1-2: Test setup photograph, Magnetic field, point 1

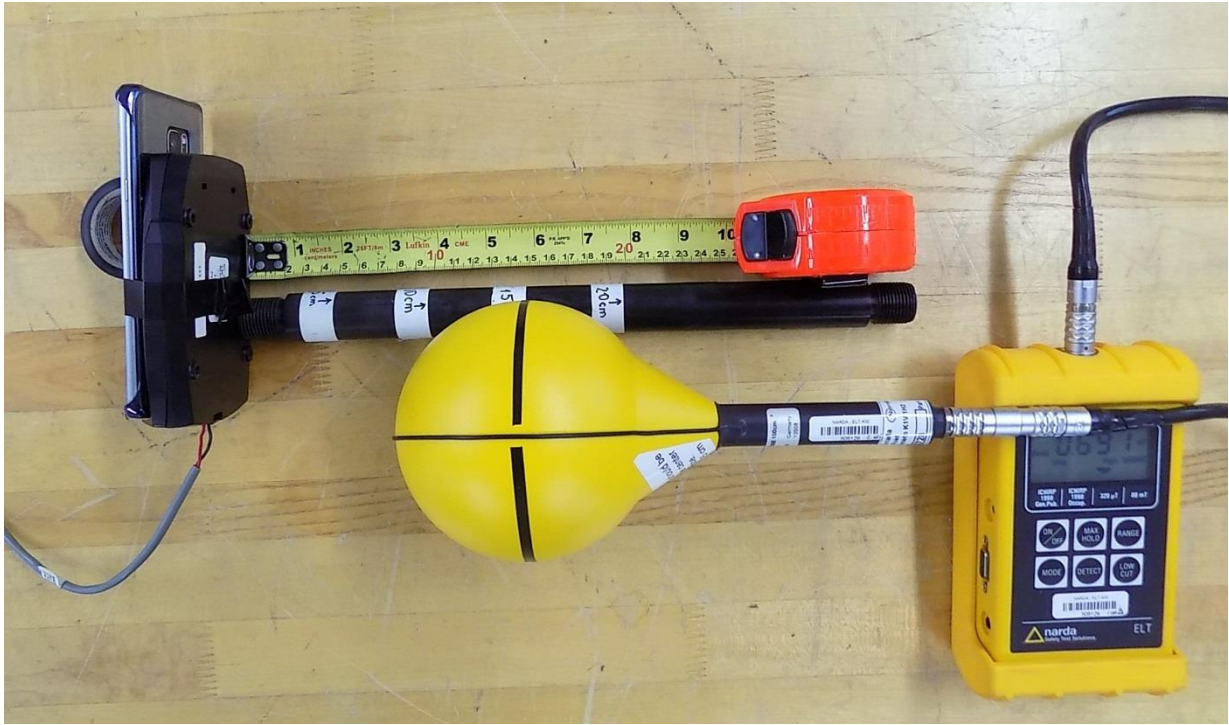


Figure 8.1-3: Test setup photograph, Magnetic field, point 2

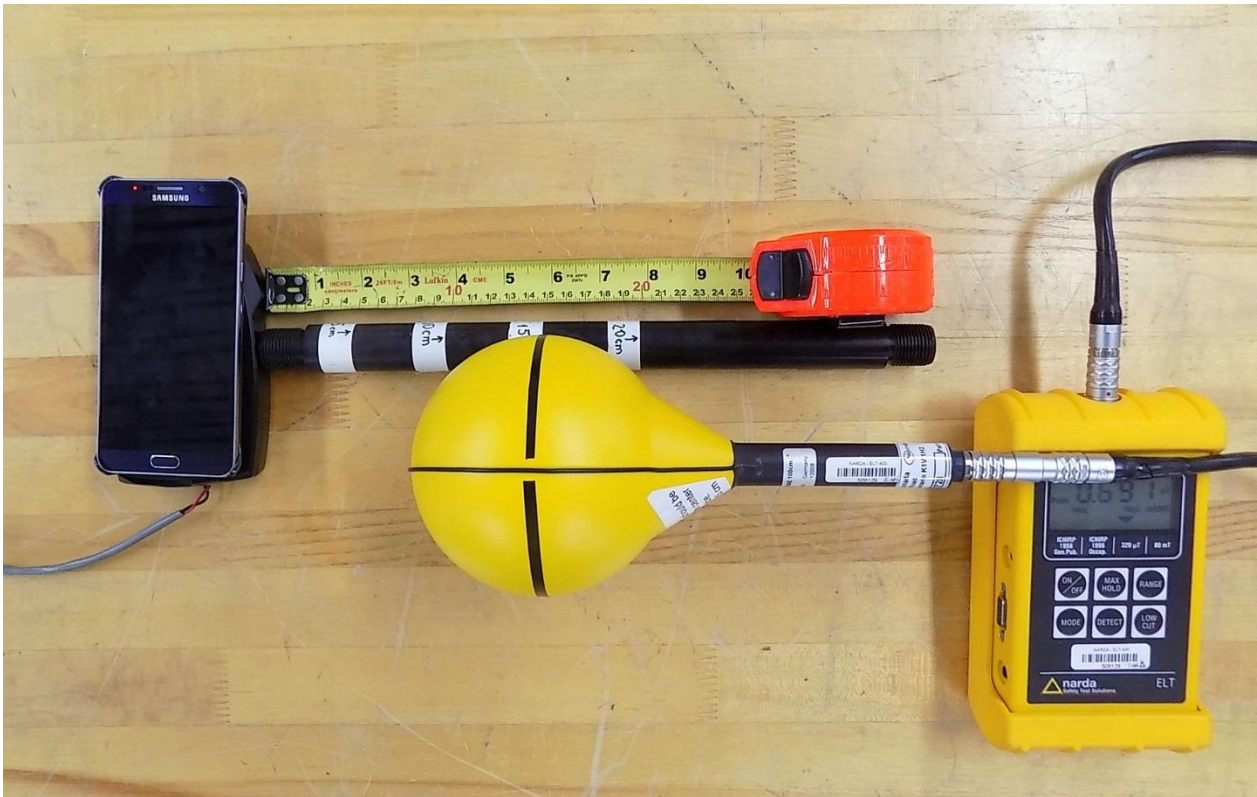


Figure 8.1-4: Test setup photograph, Magnetic field, point 3

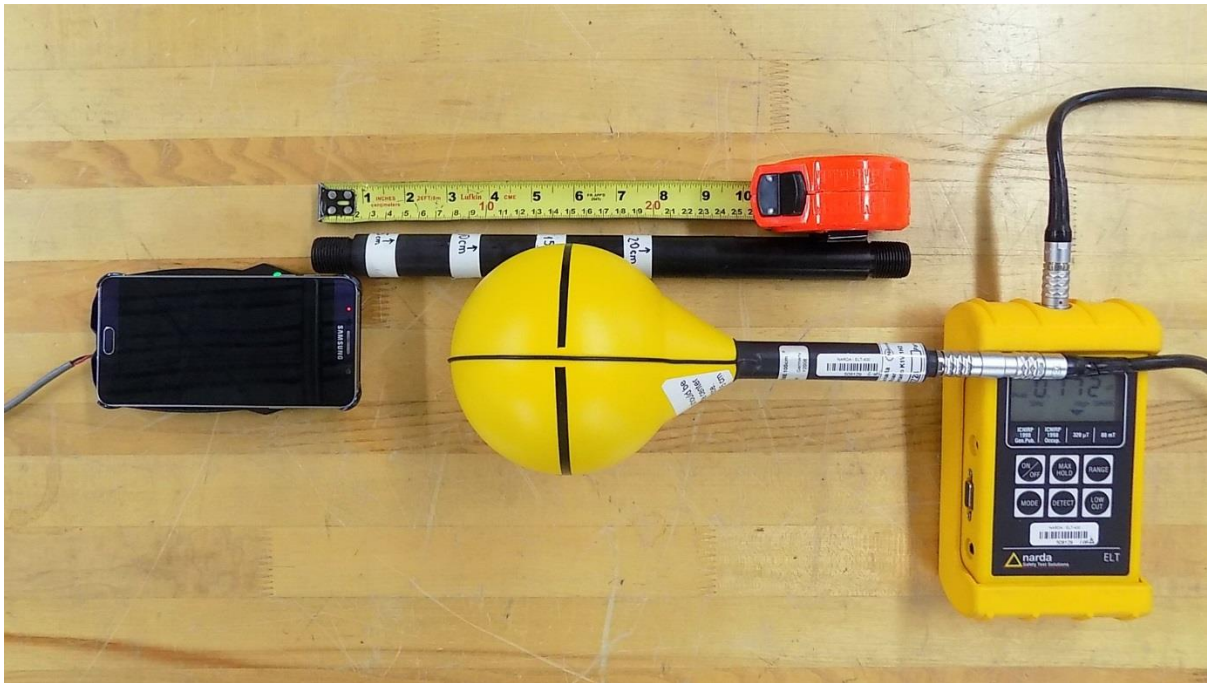


Figure 8.1-5: Test setup photograph, Magnetic field, point 4

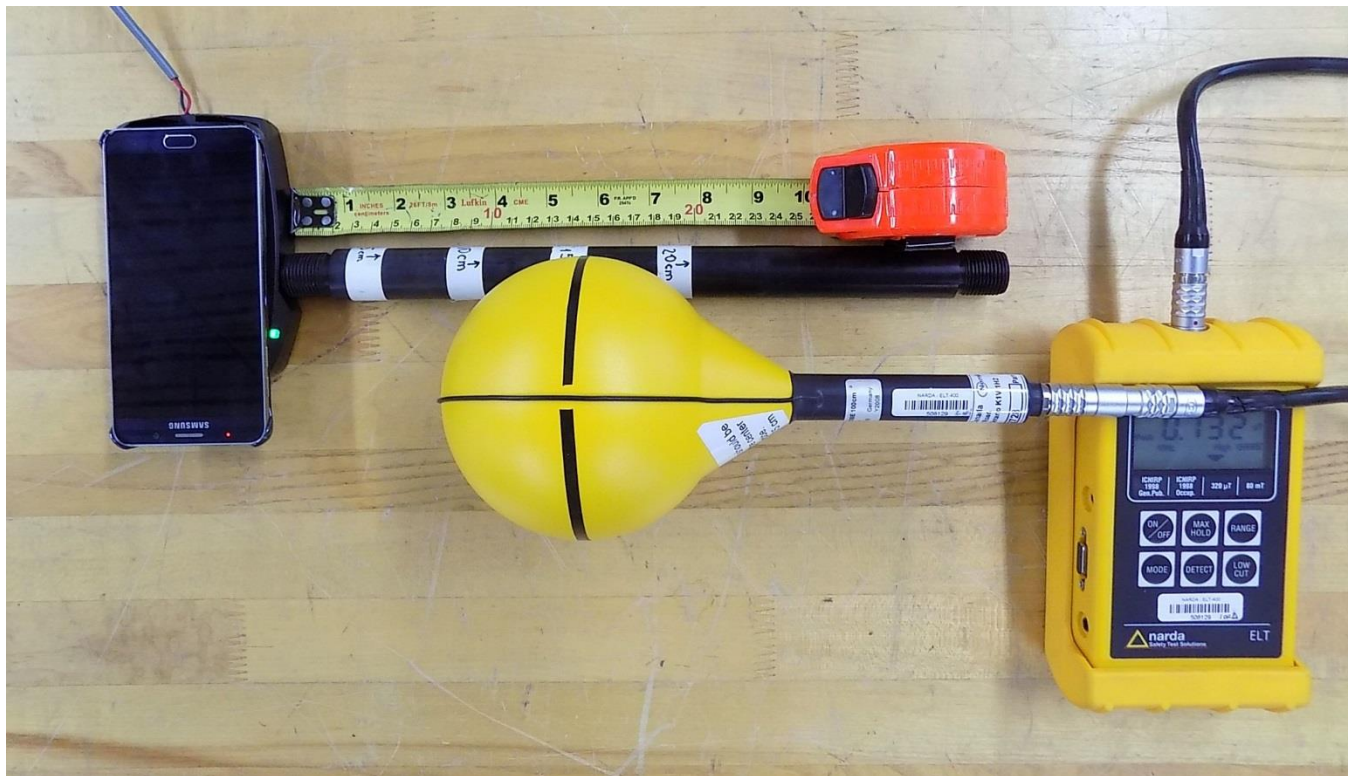


Figure 8.1-6: Test setup photograph, Magnetic field, point 5

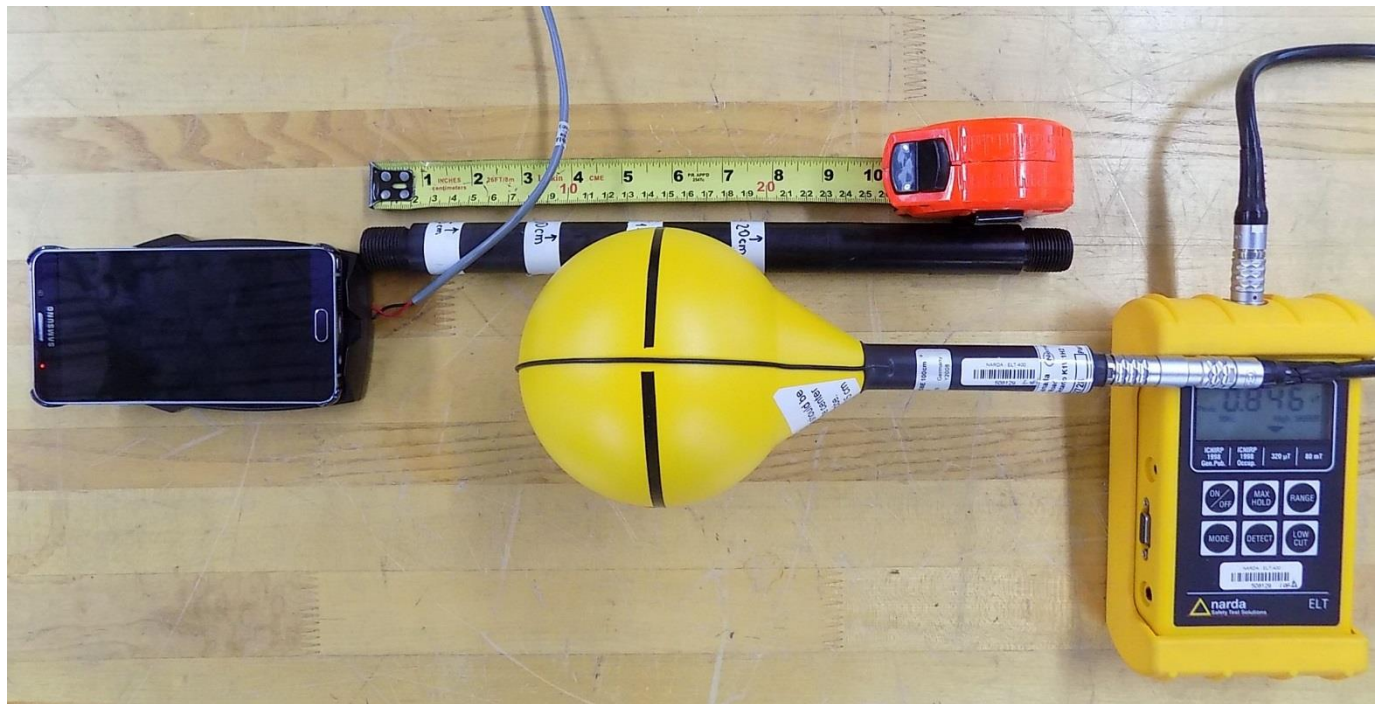


Figure 8.1-7: Test setup photograph, Magnetic field, point 6

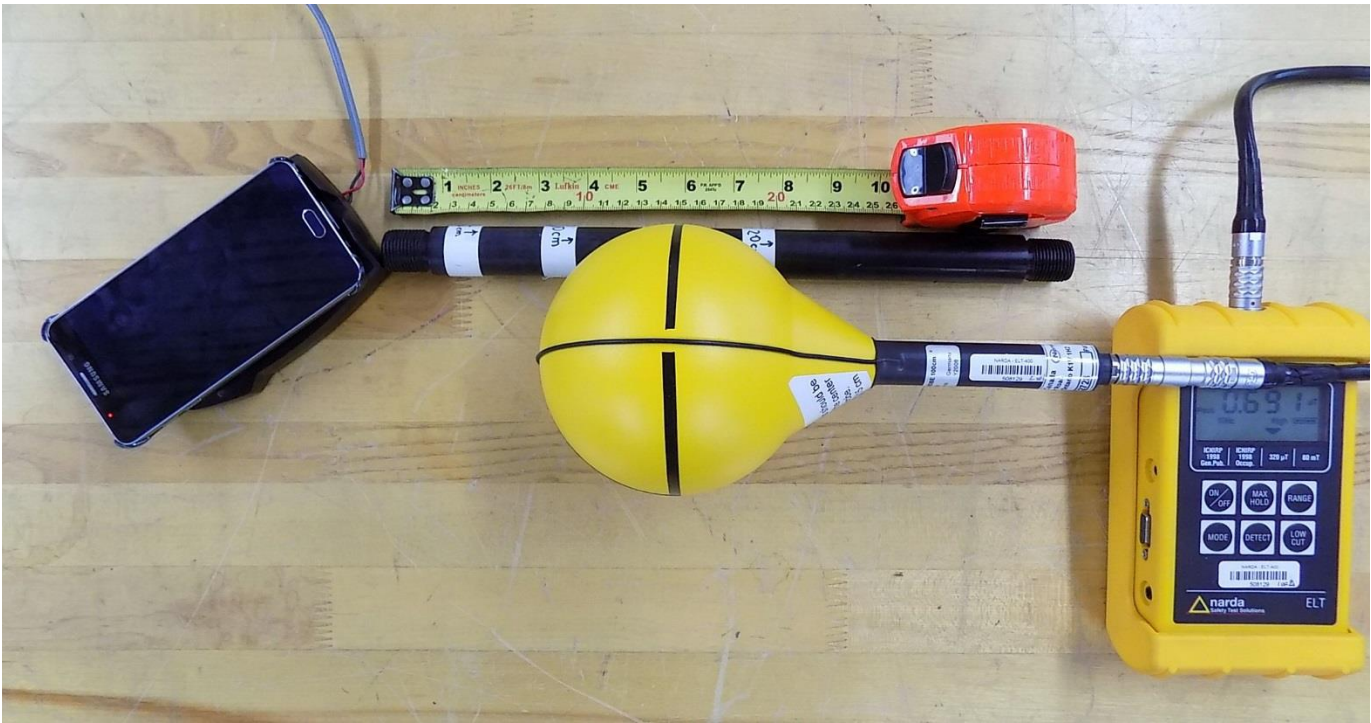


Figure 8.1-8: Test setup photograph, Magnetic field, point 7

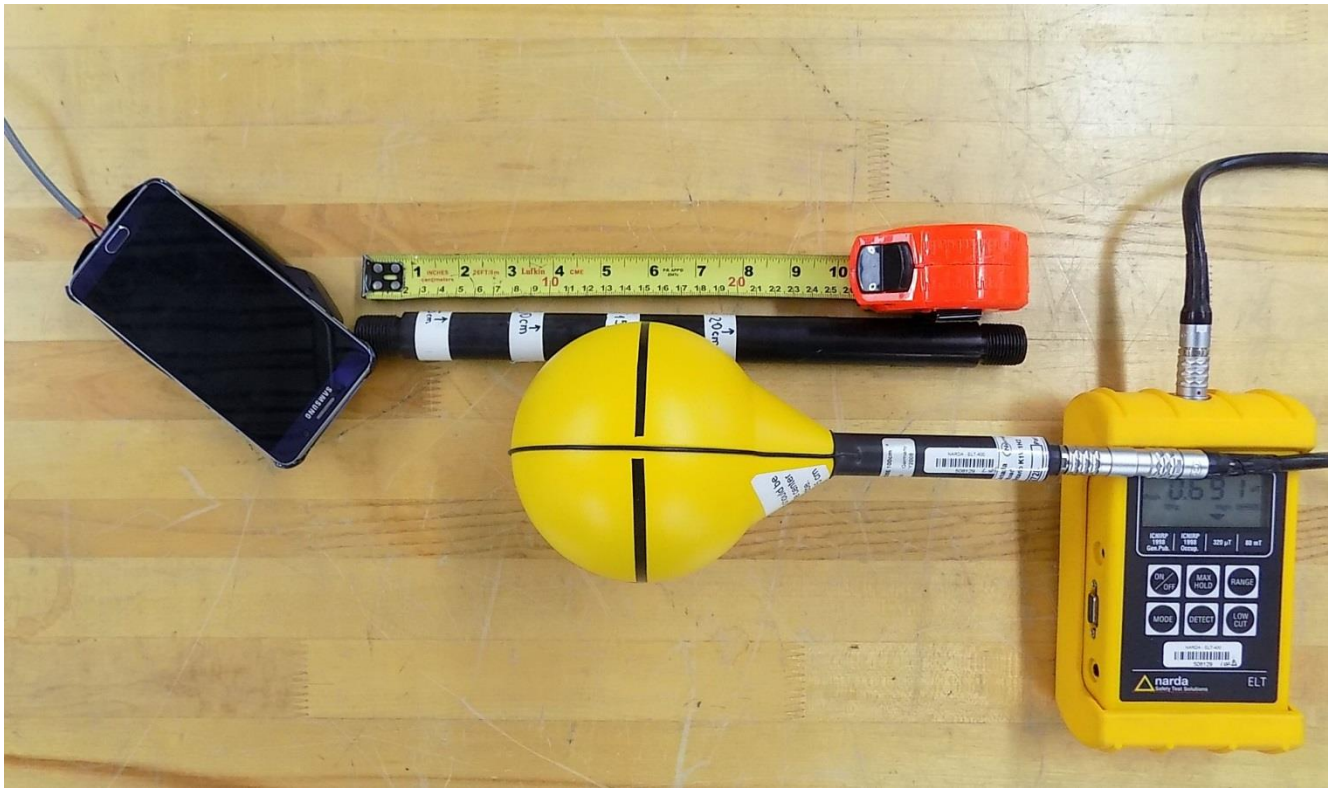


Figure 8.1-9: Test setup photograph, Magnetic field, point 8

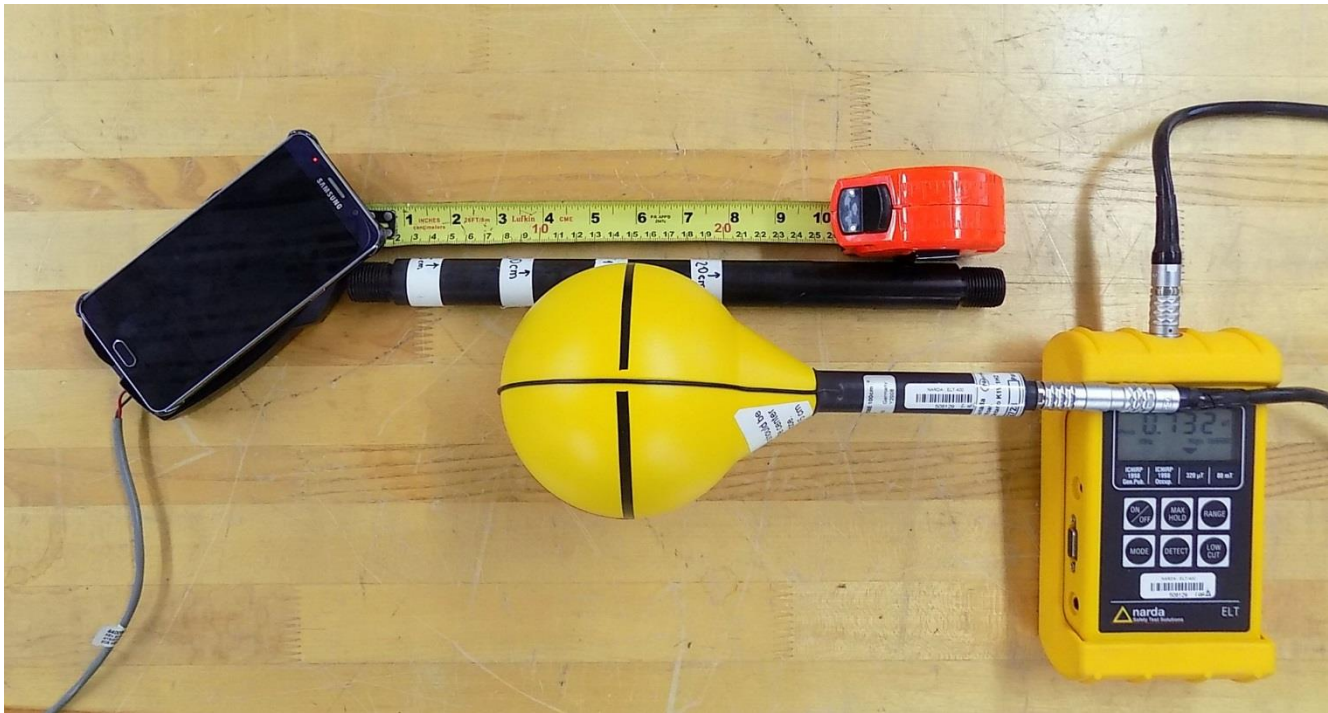


Figure 8.1-10: Test setup photograph, Magnetic field, point 9

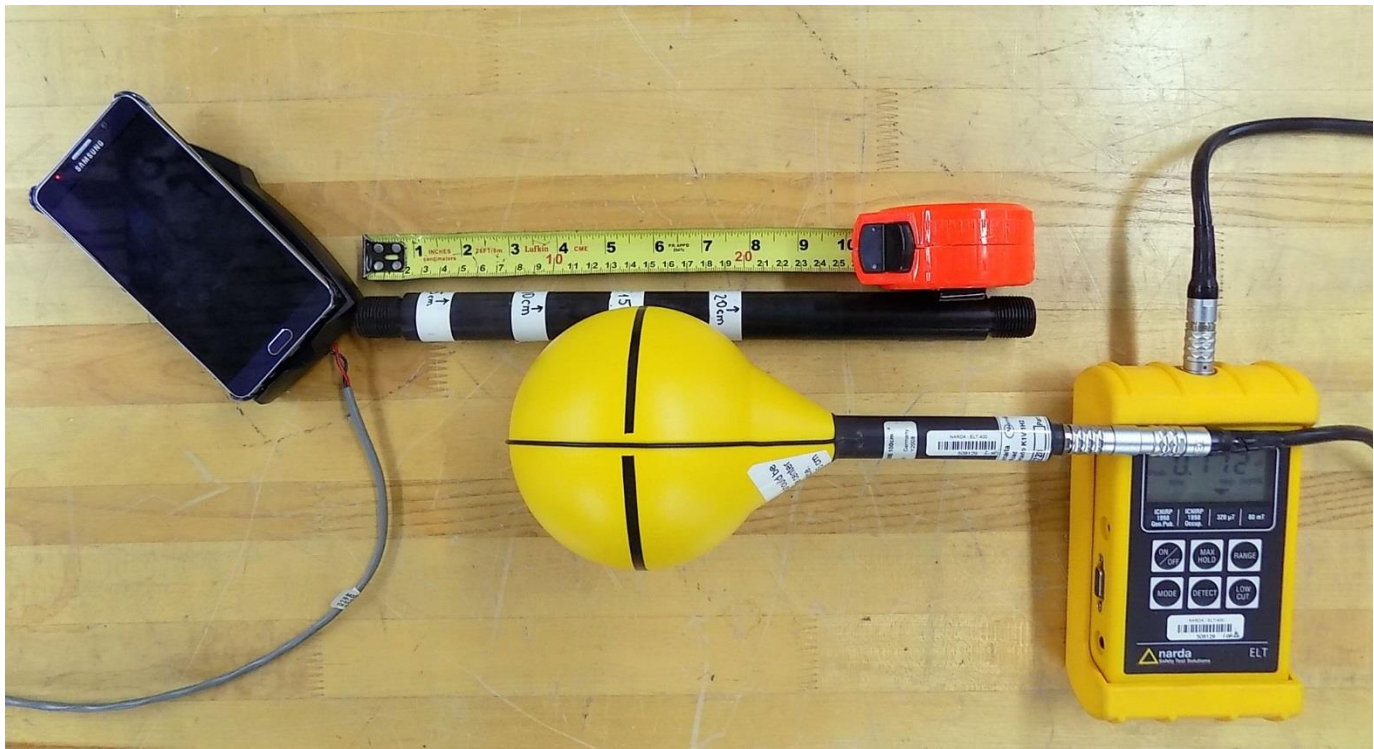


Figure 8.1-11: Test setup photograph, Magnetic field, point 10

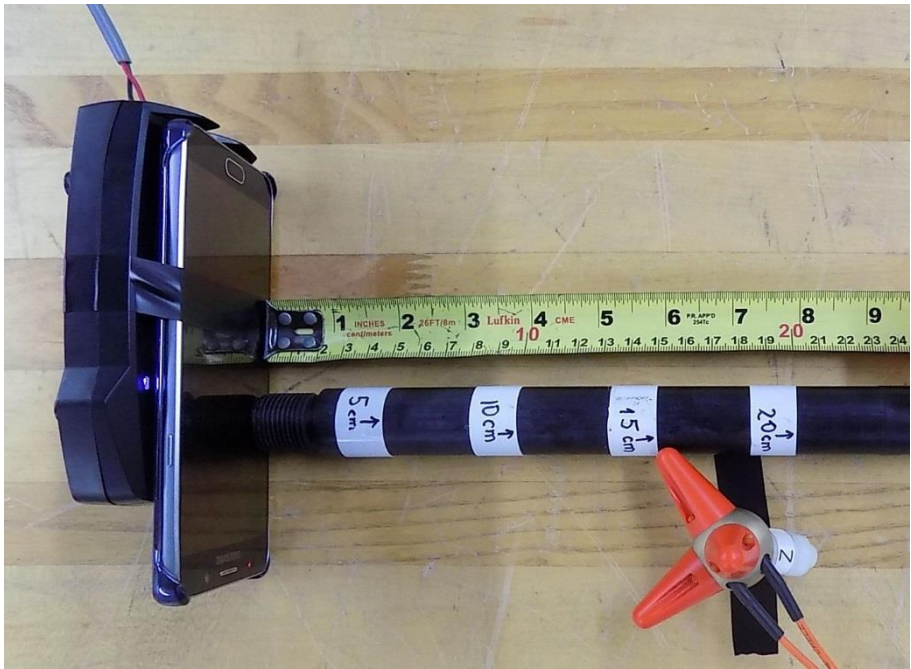


Figure 8.1-12: Test setup photograph, Electric field, point 1

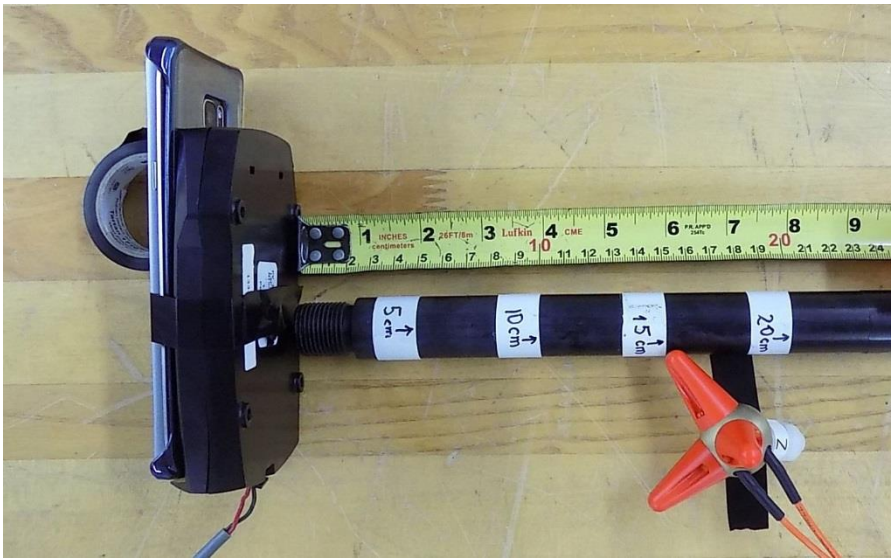


Figure 8.1-13: Test setup photograph, Electric field, point 2

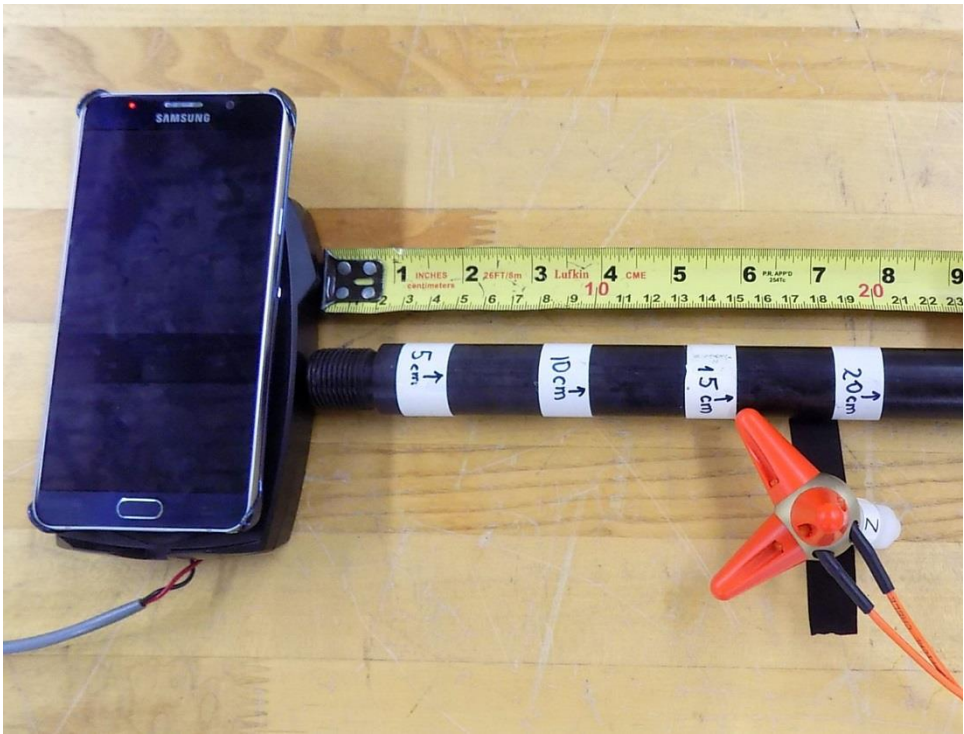


Figure 8.1-14: Test setup photograph, Electric field, point 3

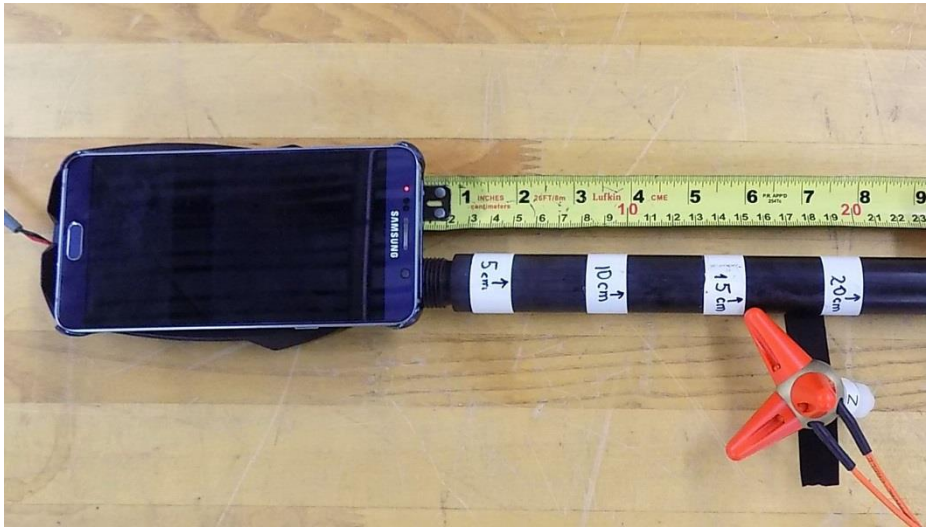


Figure 8.1-15: Test setup photograph, Electric field, point 4

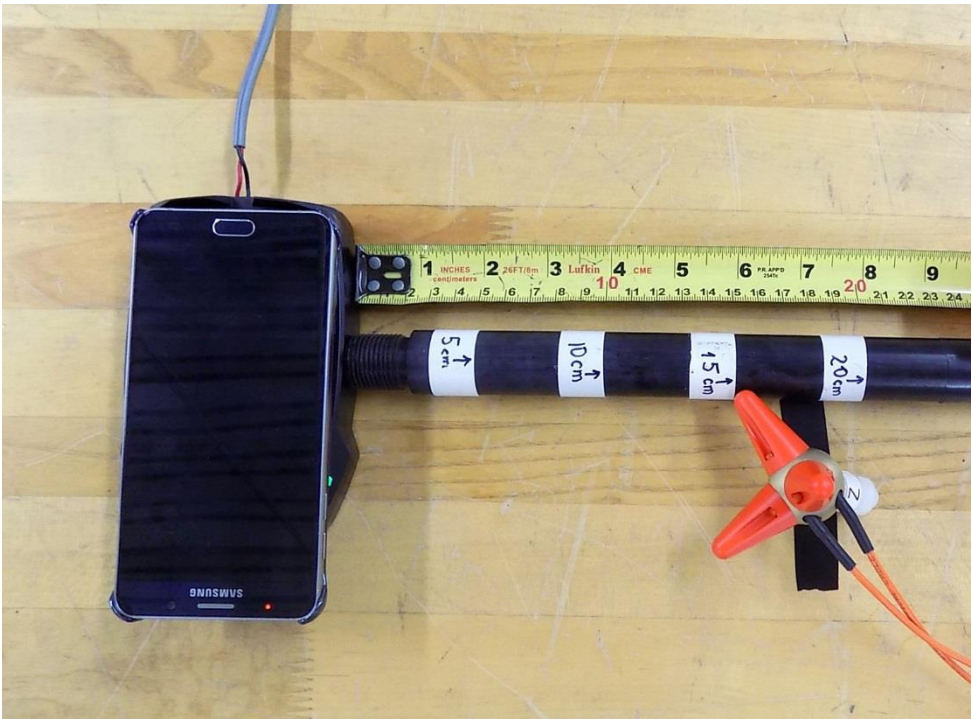


Figure 8.1-16: Test setup photograph, Electric field, point 5

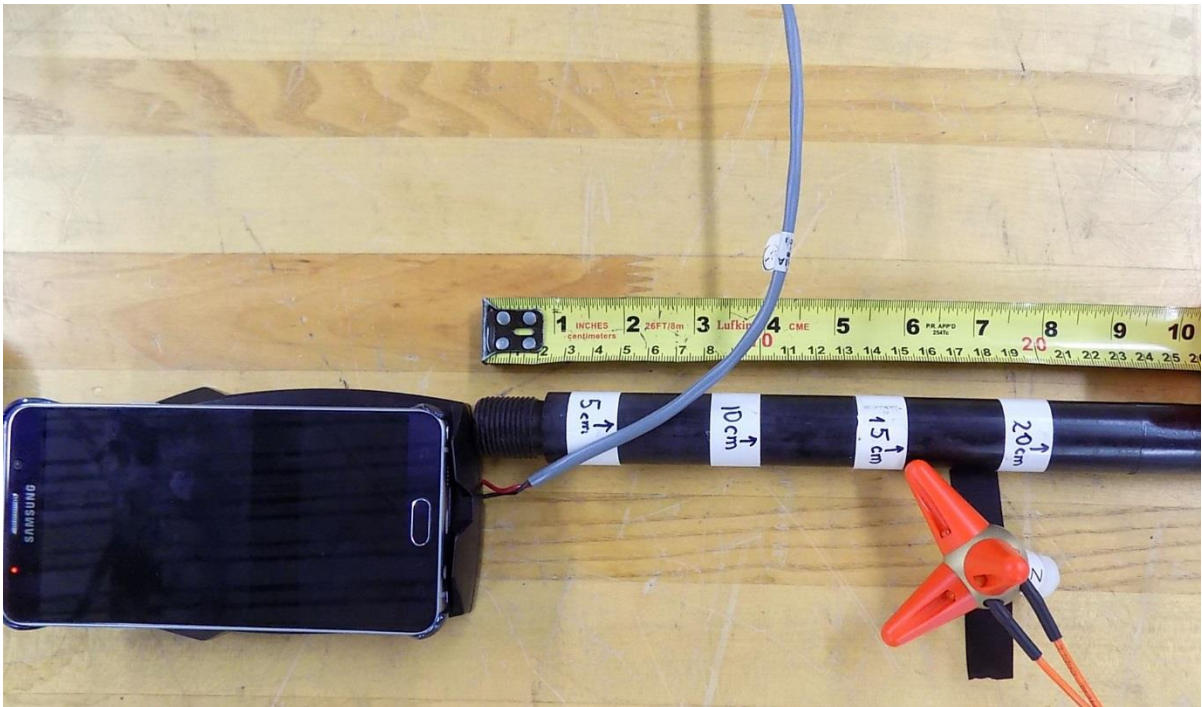


Figure 8.1-17: Test setup photograph, Electric field, point 6

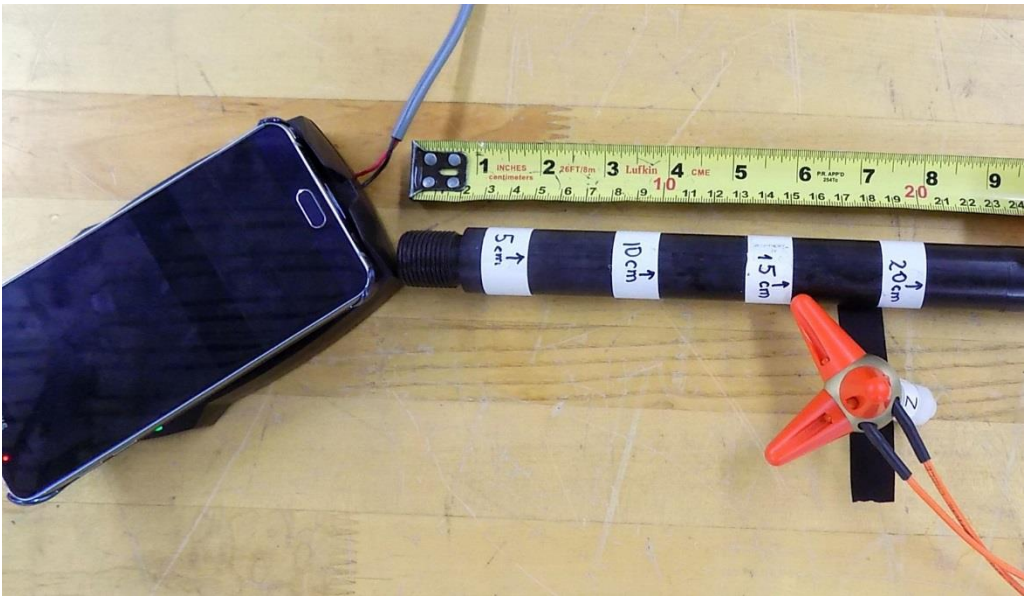


Figure 8.1-18: Test setup photograph, Electric field, point 7



Figure 8.1-19: Test setup photograph, Electric field, point 8

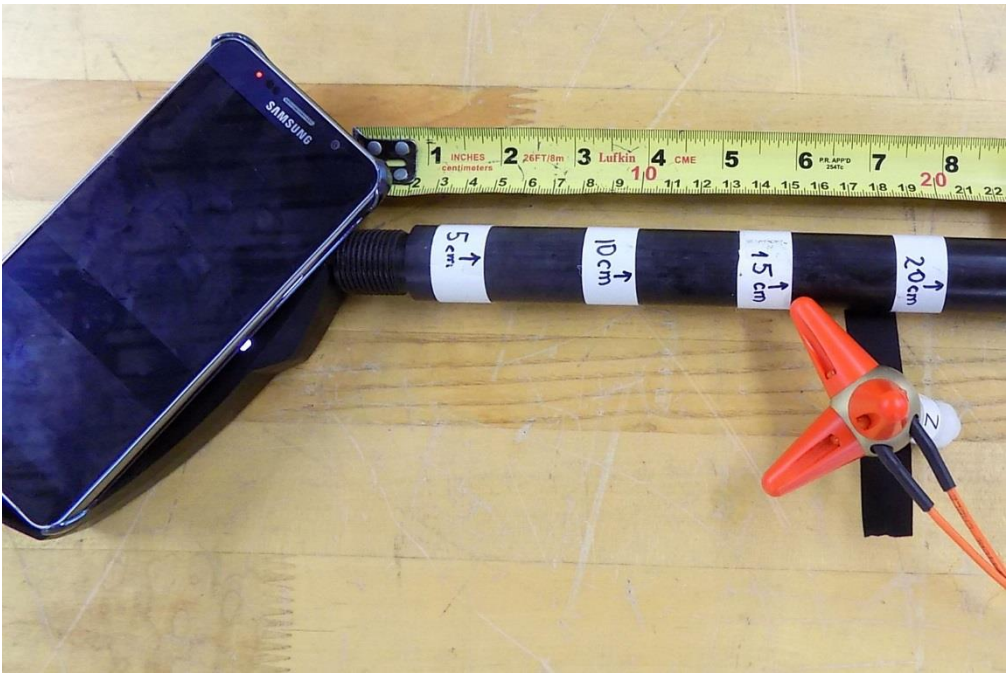


Figure 8.1-20: Test setup photograph, Electric field, point 9

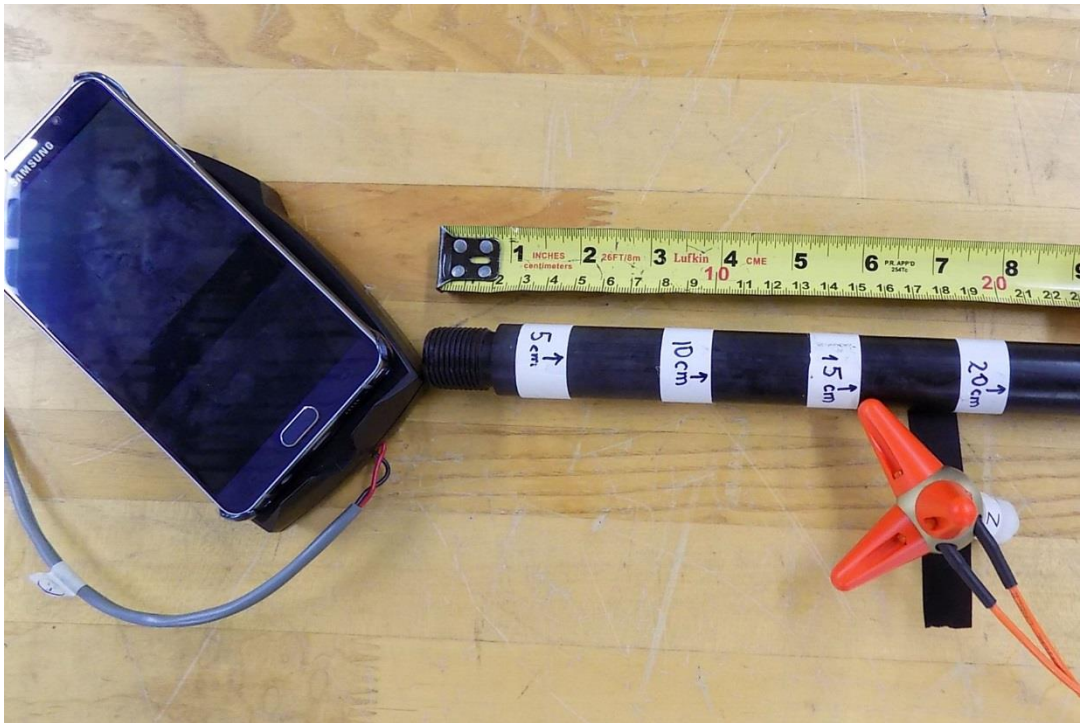


Figure 8.1-21: Test setup photograph, Electric field, point 10