



MEASUREMENT REPORT

APATIN DANUBE HALFMARATHON

(Apatinski Dunavski polumaraton)

(remeasurement)



by Borut Podgornik
AIMS/WA course measurer

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SUMMARY OF MEASUREMENT DANUBE HALFMARATHON

Date of measurement: 12. 8. 2022

How many measurements of the course were made? 1

Name of measurer: Borut Podgornik

How much of the road width is available to runners throughout the length of the road race course?

Entire width of the roads is available to runners on the whole course except at roundabout near Banja Junaković spa, where only right side of the road (when running second part of the race) is available to run (see descriptions with pictures below).

If the route at turns cannot be described as the „shortest possible route“, explain what restrictions will apply, and how these will be enforced?

The course was measured as the shortest possible route on the roads with exceptions above where the measurement was done only to the middle of the road on the right side.

Length of course after any adjustment: 21.097,50 m, 10.000,00 m

Difference between longest and shortest measurement: /

Which measurement was used to establish the final course length and WHY?

The final length of the course was established after bicycle postcalibration and moving the turning point 1 onwards (for halfmarathon) and turning point 2 (for 10km) backwards to the correct length (see data sheet below).

OVERVIEW OF THE MEASUREMENT PROCEDURE

Apatin Danube halfmarathon is a traditional event, this year organized already for 26th time. The organizer is a local Athletic club AK Apatin. The course was already official measured before and had a certificate, but expired this year. Beside halfmarathon there is also a 10km race in program. The date of the event for this year is Sunday, 16th October with start at 11.00 in the morning. There are 2 course distances in the same event as I mentioned before: 10km and halfmarathon with the same start and finish just in front of entrance to Banja Junaković Spa near Apatin, but different turning point on the same course. Approximate number of participants will be around 1000 in both distances.

I found an appropriate road for calibration course on bicycle path along main road heading to Apatin from Banja Junaković Spa (pictures 1 to 5). Bicycle calibration was done before and after the measurement as a standard procedure on this course (see below).

The measurement of the course was very simple. I started at starting point in front of entrance to Banja Junaković Spa (see pictures 6 and 7) and made a ride with a bicycle in running direction on shortest possible route accompanied with a Police car in the front, sometimes on the back (depends on traffic situation) + another car of the organizer. During the measurement I made intermediate stops where I made marks and put down counter readings (provisional B and C - where I turned back over point B again to finish). Next step was another ride around the park (see picture 19) over points D, E and F, where a turning point for halfmarathon is fixed. The way back is the same, except around the roundabout, where the right half of the road is available, so I made another measurement around roundabout between points D and B, which is obvious longer. At the end I calculated all the figures and found out that halfmarathon is for 87,44 m too short, so I moved provisional point C for half of this distance onwards to get the correct distance for halfmarathon. Taking into account this additional extension I calculated also the distance for 10km and found out that the distance is for 42,04 m too long, so I moved provisional point E for half of this distance backwards to get a correct distance. Both distances are now correct.

At all important points (= turns and separation) I also made all necessary photos (see in an appendix) and on pictures below I marked where the organizer should put fences and cones in order to prevent runners to take short cuts.

The course (see pictures 20 and 21) is on tarmac road all the way and flat - pictures 22 and 23, the difference between the lowest and the highest point is 4 m for 10km and 10 m for halfmarathon. Start and finish is at 84 m above sea level.

DETAIL OF THE CALIBRATION COURSE

- 1 Name of event: Danube halfmarathon
- 2 City/town: Apatin, Serbia
- 3 Location of calibration course: on bicycle path beside main road from Banja Junaković Spa to the city of Apatin, in W direction, start parallel to the far edge of electricity box on left side (2,90 m away), 4,41 m diagonal left before near edge of concrete ring around drain cover on the right side (see pictures 1 and 2), finish 28,62 m after far edge of wire fence around gas station on the right side (see pictures 3 to 5).
- 4 Length of calibration course: 300,00m
- 5 Date measured: 11. 8. 2022
- 6 Method used to measure calibration course: 50m steel tape (20°C, 50N)
- 7 How many times did you measure the calibration course? 2x
- 8 Measurement team leader: Borut Podgornik
- 9 Address of team leader: Staneta Severja 14, 2000 Maribor, Slovenia
- 10 Phone contact of team leader: +386 41 664412
- 11 Email address of team leader: borut.podgornik@triera.net
- 12 List names and duties of team members: Helena Javornik, assistant
- 13 Is the calibration course: STRAIGHT? YES PAVED? YES
- 14 How are the start and finish points marked? PK nails
- 15 Are the start and finish points located in the road where a bicycle wheel can touch them? YES
- 16 Number of full tape lengths 6 Total length: 6 x 50m = 300m
- 17 A picture of calibration course:



STEEL TAPING DATA SHEET (for measuring a calibration course)

Name of calibration course: bicycle path Banja Junaković Spa

City/town and State: Apatin, Serbia

Date: 11. 8. 2022

Start time: 18.05 **Finish time:** 19.00

Pavement temperature: Start 27°C Finish 27°C Average 27°C
(thermometer shaded from direct sun)

Measurements and calculations:

- 1 First measurement. This establishes tentative start and finish marks which should not be changed until the final adjustment on line 6 below.

$$\begin{array}{rccccccc} 6 & \times & 50,00\text{m} & + & / & = & 300,00\text{m} \\ \# \text{ tape} & & \text{distance per} & & \text{partial tape} & & \text{measured} \\ \text{lengths} & & \text{tape length} & & \text{length} & & \text{distance} \end{array}$$

- 2 Second measurement. This checks the distance between the SAME tentative start and finish points marked in the first measurement, but use new intermediate taping points.

$$\begin{array}{rccccccc} 6 & \times & 50,00\text{m} & + & 0,001\text{m} & = & 300,001\text{m} \\ \# \text{ tape} & & \text{distance per} & & \text{partial tape} & & \text{measured} \\ \text{lengths} & & \text{tape length} & & \text{length} & & \text{distance} \end{array}$$

- 3 Average raw (uncorrected) measurement of course: 300,0005m

- 4 Temperature correction. Use the average pavement temperature during measurement. Work out answer to at least seven digits beyond the decimal point.

$$\text{Correction factor} = 1.0000000 + (.0000116 \times [27 - 20])$$

$$\text{Correction factor} = 1,0000812$$

NOTE: For temperatures below 20C, factor is less than one

For temperatures above 20C, factor is greater than one

- 5 Multiply the temperature correction factor by the average raw measurement of the course

$$\begin{array}{rccccccc} 1,0000812 & \times & 300,0005\text{m} & = & 300,0248600406 \\ \text{correction factor} & & \text{avg. raw measurement} & & \text{corrected measurement} \end{array}$$

- 6 I moved the finish mark for 2,4 cm backwards and drive PK nail into the road.

Final (adjusted) length of calibration course 300,00m

BICYCLE CALIBRATION DATA SHEET

Name of event: Danube halfmarathon

Date of measurement : 12. 8. 2022

Name of measurer: Borut Podgornik

Length of calibration course: 300,00m

PRE-CALIBRATION - ride the calibration course four times, recording data as follows:

<u>Ride</u>	<u>Start Count</u>	<u>Finish count</u>	<u>Difference</u>
1	44000	47289,5	3289,5
2	47289,5	50580	3290,5
3	50580	53870	3290
4	53870	57160	3290

Time of day: 7.50

Temperature: 17°C

WORKING CONSTANT = number of counts in one kilometre, calculated from the pre-measurement average count, and multiplied by 1.001 – the „short course prevention factor“

Pre-measurement average count = 3290

Counts per km = pre-measurement average count x 1000/length of calibration course in metres

Working Constant = counts per km x 1.001 = **10.977,633333334**

POST-CALIBRATION - ride the calibration course four times, recording data as follows:

<u>Ride</u>	<u>Start Count</u>	<u>Finish count</u>	<u>Difference</u>
1	17000	20285	3285
2	20285	23571	3286
3	23571	26857	3286
4	26857	30143	3286

Time of day: 10.15

Temperature: 23°C

FINISH CONSTANT = number of counts in one kilometre, calculated from the post-measurement average count, and multiplied by 1.001 – the „short course prevention factor“

Post-measurement average count = 3285,75

Counts per km = post-measurement average count x 1000/length of calibration course in metres

Finish Constant = counts per km x 1.001 = **10.963,4525**

CONSTANT FOR THE DAY = the average of the working constant and the finish constant = **10.970,542916667**

COURSE MEASUREMENT DATA SHEET

Name of event: Danube halfmarathon

Name of measurer: Borut Podgornik

Date of measurement: 12. 8. 2022

Start time: 8.15 Temperature: 18°C

Finish time: 11.00 Temperature: 23°C

Constant for the Day: 10.970,542916667 counts/km

MEASUREMENT DATA

Measured point	Counter reading	Cumulative counts	Cumulative distance in m	Adjustment in m
Start – between 2 concrete pillars in front of entrance into Banja Junaković Spa – see pictures 6 and 7	71000	00000	0,00	/
Point B (provisional) on the road from Banja Junaković Spa to the roundabout on main road - see picture 8	77323	6323	576,36	/
Point C (provisional) = turn 1 on the main road to village Prigrevica – see pictures 9 and 10	99974	28974	2.641,07	+ 43,72
Finish – between 2 concrete pillars in front of entrance into Banja Junaković Spa – see picture 11	128948	57948	5282,14	+ 87,44
Finish – between 2 concrete pillars in front of entrance into Banja Junaković Spa – see picture 11	29000	00000	0.00	/
Point B (provisional) on the road from Banja Junaković Spa to the roundabout on main road - see picture 8	36586	7586	691,48	/
Point D (provisional) on main road to Apatin - see picture 8	41240	12240	1115,71	/
Point E (provisional) = Turn for 10km – on Main road to Apatin, near entrance to MBP gas station on the right side – see pictures 12 to 15	55035	26035	2373,17	-21,04
Point F = Turn 2 for halfmarathon, just before the access road to Town beach, 8,62 m diagonal right from signpost »Town	115677	86677	7900,88	/

beach« in the middle of the road – see pictures 16 and 17				
Point D (provisional) on main road to Apatin - see picture 8	60000	00000	0,00	/
Point B (provisional) on the road from Banja Junaković Spa to the roundabout on main road - see picture 8	65107	5107	465,51	/

RECAPITULATION OF MEASUREMENT

I. halfmarathon

desired length of the course: 21.097,50 m

measured course: (Start – Finish) + (Finish – F) + (F – D – B – Finish) = 5282,14 m + 7900,88 m + 7827,04 m = 21.010,06 m (87,44 m missing)

moving provisional point C for half of this distance onwards = 43,72 m, which makes a total distance: **21.097,50 m (correct distance!)** - see pictures 9 and 10

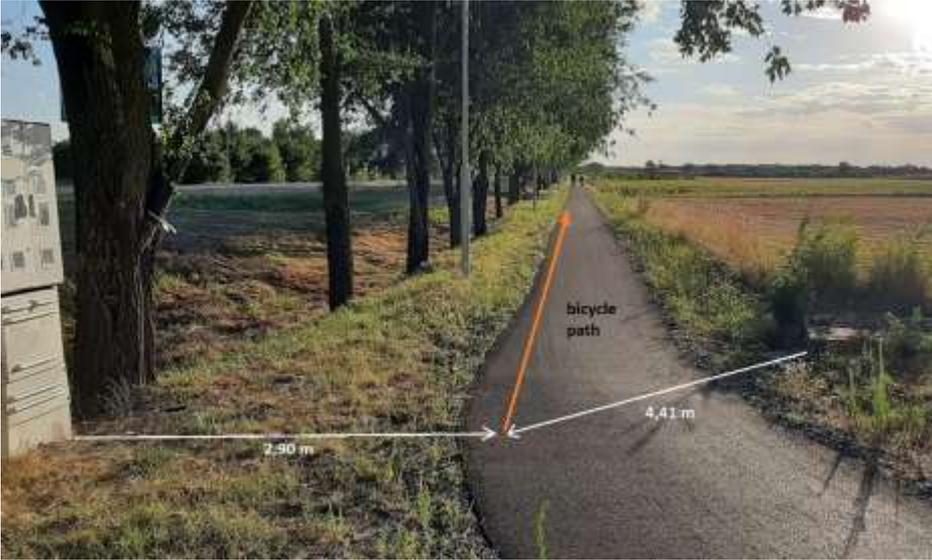
II. 10km

desired length of the course: 10.000,00 m

measured course: (Start – Finish) + (Finish – E) + (E – D – B – Finish) = 5369,58 m + 2373,17 m + 2299,33 m = 10.042,08 m (42,08 m too long)

Moving provisional point E for half of this distance backwards = 21,04 m, which makes a total distance: **10.000,00 m (correct distance!)** - see pictures 12 to 15

CALIBRATION COURSE START onwards – (picture 1)



CALIBRATION COURSE START side view – (picture 2)



CALIBRATION COURSE FINISH backwards – (picture 3)



CALIBRATION COURSE FINISH side view – (picture 4)



CALIBRATION COURSE BEFORE FINISH onwards – (picture 5)



START onwards - (picture 6)



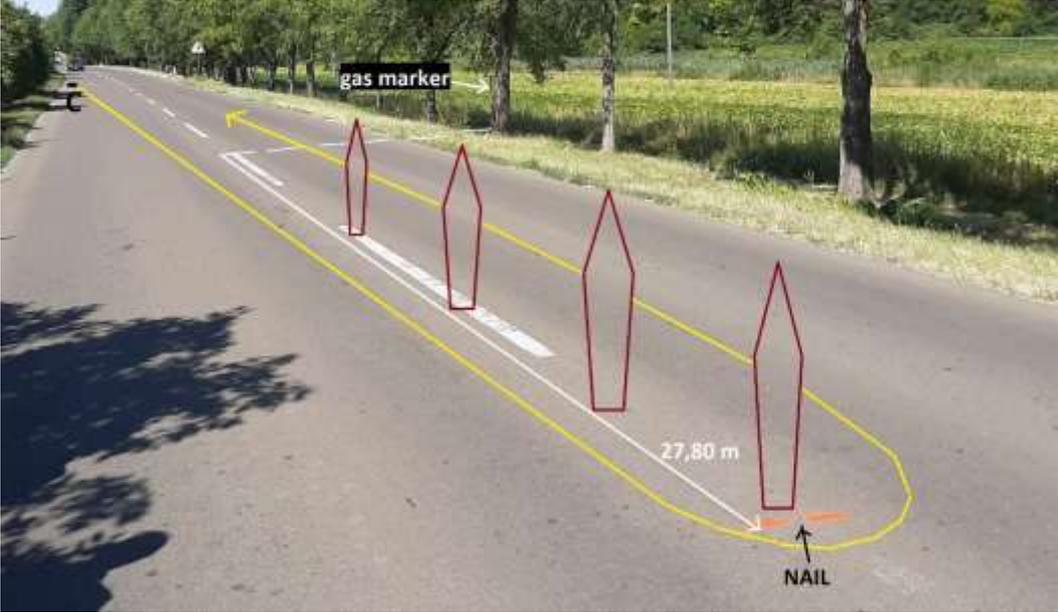
START side view – (picture 7)



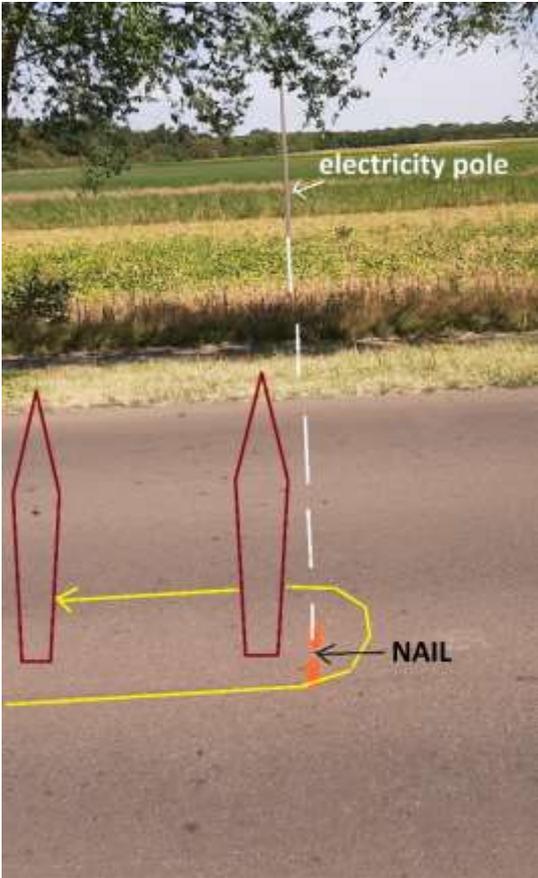
POINTS B and D – (picture 8)



POINT C and Turn 1 – (picture 9)



TURN 1 side view – (picture 10)



FINISH – (picture 11)



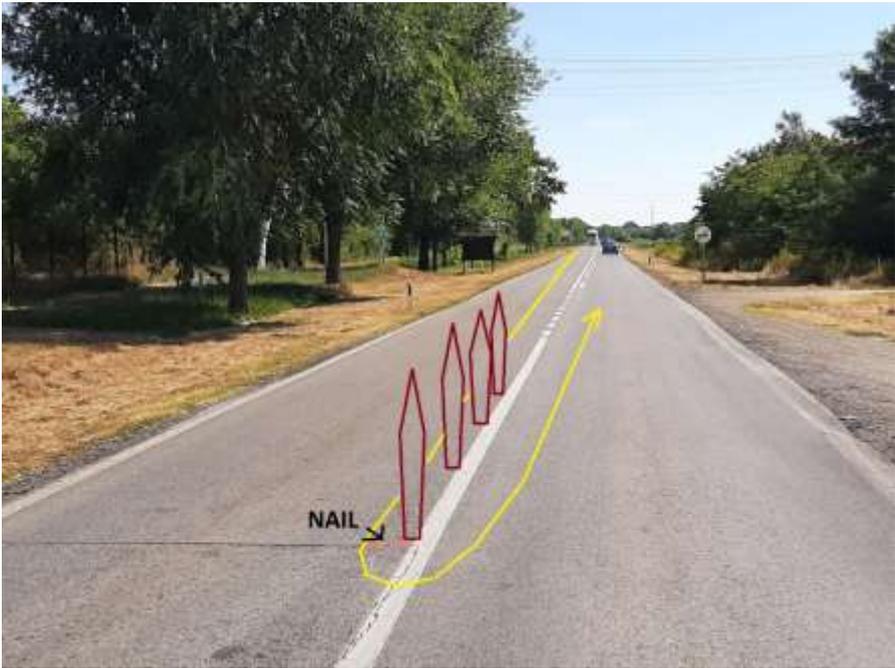
POINT E – (picture 12)



TURN 10km onwards – (picture 13)



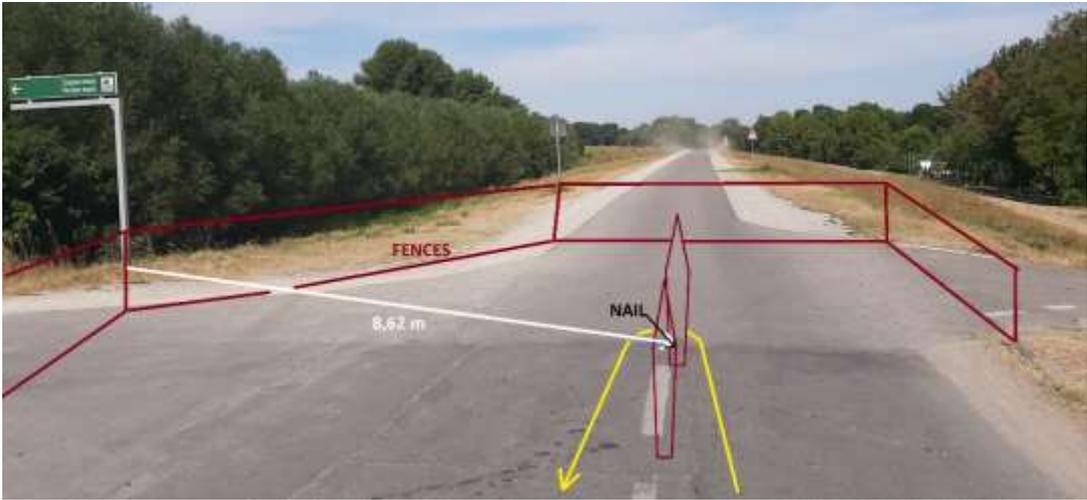
TURN 10km backwards – (picture 14)



TURN 10km side view – (picture 15)



POINT F = TURN halfmarathon onwards – (picture 16)



POINT F = TURN halfmarathon backwards – (picture 17)



SITUATION ROUNDABOUT – (picture 18)



SITUATION START/FINISH – (picture 19)



COURSE halfmarathon – (picture 20)



COURSE 10km – (picture 21)



ELEVATION PROFILE halfmarathon – (picture 22)



ELEVATION PROFILE 10km – (picture 23)



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