



MEASUREMENT REPORT

KOSTOLAC VIMINACIJUM HALFMARATHON

»TRKA LEGIONARA«

by Borut Podgornik
AIMS/IAAF course measurer

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SUMMARY OF MEASUREMENTS KOSTOLAC VIMINACIJUM HALFMARATHON

»TRKA LEGIONARA«

Date of measurement: 23. 3. 2019

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 road is available to runners on the whole course.

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.

Length of course after any adjustment: 21.097,58 m

Difference between longest and shortest measurement: /

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

The final course length of the course was established after bicycle postcalibration and moving the turn 1 for 239,27 m onwards.

OVERVIEW OF THE MEASUREMENT PROCEDURE

Kostolac halfmarathon is a traditional event, organized by Cultural center Kostolac and Association Maraton Tim Požarevac. The date of the event for this year is Saturday, 14th September with start at 10.00 in the morning. The course is run in one lap with 2 turning points with spectacular finish in ancient Roman village Viminacijum.

Approximate number of participants will be around 400, having almost 300 already last year.

I have found an appropriate place for calibration course on pedestrian path along Bože Dimitrijevića street where also the starting straight will take place (see pictures 1 to 4). Unfortunately the straight isn't quite 300m long, as was inappropriate to lengthen this course over the crossing roads full of cars all the time. So I was satisfied with 293,00 m as this was the only solution very close to the city center (and starting place). Bicycle calibration was done before and after the measurement as a standard procedure on this course.

The measurement of the course was very simple. I started at starting line 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). So I made an intermediate (provisional) point 1, where adjustment was possible due to almost traffic free road to village Ostrovo onwards and turned back. Next point was turn 2 which should remain fixed as there was no space to go any further. Then I ride the bike all the way to the finish line in Viminacijum. The distance came out as 20619,04 m, which was way too short, but this was expected as the starting line was moving way forward comparing to previous editions. Then I made a postcalibration of the bike and return to provisional point 1 and measure half of missing distance onwards to get new turn 1 (see pictures 6 and 7) and correct distance for halfmarathon (see data sheet below). I drive nails at this point (as at turn 2 and start) into a road and made all necessary photos (see in an appendix).

The course (see picture 14) is on tarmac road all the way and a bit undulating (see picture 15), the difference between the lowest and the highest point is 26m. Start is at 75m and finish at 67m, the distance between start and finish line in straight line is app. 5,3km.

DETAIL OF THE CALIBRATION COURSE

- 1 Name of event: Kostolac Viminacijum halfmarathon »Trka legionara«
- 2 City/town: Kostolac, Serbia
- 3 Location of calibration course: pedestrian path on the right side in S direction beside main road Bože Dimitrijevića street. Start 0,99 m parallel left from advertising column in front of Sports hall Kostolac, 6,01 m diagonal left from near edge of bus station (see pictures 1 and 2), finish 3,52 m after the last light pole on the right side before crossing with Trudbenička street and 1,02 m before the last short pillar at the edge of the pedestrian path (see pictures 3 and 4).
- 4 Length of calibration course: 293,00m
- 5 Date measured: 23. 3. 2019
- 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 5 + 43m Total length: = 293m



STEEL TAPING DATA SHEET (for measuring a calibration course)

Name of calibration course: pedestrian path beside Bože Dimitrijevića street

City/town and State: Kostolac, Serbia

Date: 23. 3. 2019

Start time: 10.15 **Finish time:** 11.00

Pavement temperature: Start 14°C Finish 14°C Average 14°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.

$$\begin{array}{rcccc} 5 & \times & 50,00\text{m} & + & 43,00 & = & 293,00\text{m} \\ \# \text{ tape} & & \text{distance per} & & \text{partial tape} & & \text{measured} \\ \text{lengths} & & \text{tape length} & & \text{length} & & \text{distance} \end{array}$$

- 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.

$$\begin{array}{rcccc} 5 & \times & 50,00\text{m} & + & 43,0045 & = & 293,0045\text{m} \\ \# \text{ tape} & & \text{distance per} & & \text{partial tape} & & \text{measured} \\ \text{lengths} & & \text{tape length} & & \text{length} & & \text{distance} \end{array}$$

- 3 Average raw (uncorrected) measurement of course: 293,00275m

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

$$\text{Correction factor} = 1.0000000 + (.0000116 \times [14 - 20])$$

$$\text{Correction factor} = 0,9999304$$

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

$$\begin{array}{rcccc} 0,9999304 & \times & 293,00275\text{m} & = & 292,9823570086 \\ \text{correction factor} & & \text{avg. raw measurement} & & \text{corrected measurement} \end{array}$$

- 6 I moved the finish mark for 2,8 cm onwards and drive PK nail into the road.

Final (adjusted) length of calibration course 293,00m

BICYCLE CALIBRATION DATA SHEET

Name of event: Kostolac Viminacijum halfmarathon »Trka legionara«

Date of measurement : 23. 3. 2019

Name of measurer: Borut Podgornik

Length of calibration course: 293,00m

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	00000	03218	3218
2	03218	06436	3218
3	06436	09655	3219
4	09655	12873	3218

Time of day: 11.05

Temperature: 15°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 = 3218,25

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

Working Constant = counts per km x 1.001 = **10.994,7721843**

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	61000	64217	3217
2	64217	67433,5	3216,5
3	67433,5	70649,5	3216
4	70649,5	73866	3216,5

Time of day: 13.15

Temperature: 17°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 = 3216,5

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

Finish Constant = counts per km x 1.001 = **10.988,793515358**

CONSTANT FOR THE DAY = the average of the working constant and the finish constant = **10.991,782849829**

COURSE MEASUREMENT DATA SHEET

Name of event: Kostolac Viminacijum halfmarathon »Trka legionara«

Name of measurer: Borut Podgornik

Date of measurement: 23. 3. 2019

Start time: 11.20 Temperature: 16°C

Finish time: 13.30 Temperature: 17°C

Constant for the Day: 10.991,782849829 counts/km

MEASUREMENT DATA

Measured point	Counter reading	Cumulative counts	Cumulative distance in m	Adjustment in m
Start – on Bože Dimitrijevića street in city center, parallel to the start of calibration course, just 1,25 m left – see picture 5	12000	00000	0,00	/
Point 1 – provisional (on the road to Ostrovo village)	57330	45330	4123,99	+ 239,27
Turn 2 – in front of Motel »Dragulj« just before the Danube river, 4,35m right from 2nd to last light pole on the left side, 11,05 m before right pillar in the gate to the motel – see pictures 8 and 9	132550	120550	10967,28	+ 478,54
Finish – in the Ancient Roman village Viminacijum, far edge of main gate into an atrium – see pictures 10 and 11	238640	226640	20619,04	+478,54
Point 1 – provisional (on the road to Ostrovo village)	75000	00000	0,00	/
Turn 1 – 25,24 m before traffic sign »right turn« on the no name road (towards Ostrovo village – see pictures 6 and 7	77630	2630	239,27	/

RECAPITULATION OF MEASUREMENT

Measurement:

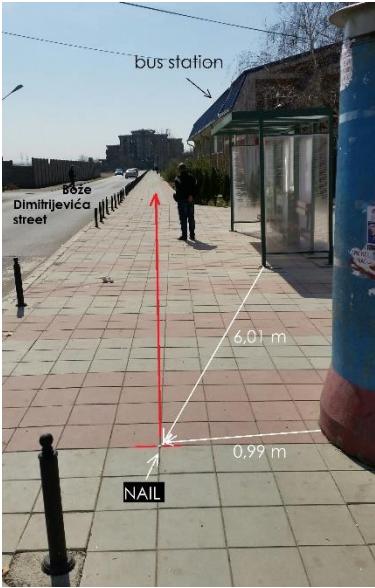
desired length of the course: 21.097,50 m

measured course: 20.619,04 m (= 478,46 m too short)

missing distance: 478,46 m : 2 = moving provisional point 1 for 239,23 m onwards to get correct Turn 1

Halfmarathon length: **21.097,58 m** (= 8 cm too long)

CALIBRATION COURSE START – (picture 1)



CALIBRATION COURSE START – (picture 2)



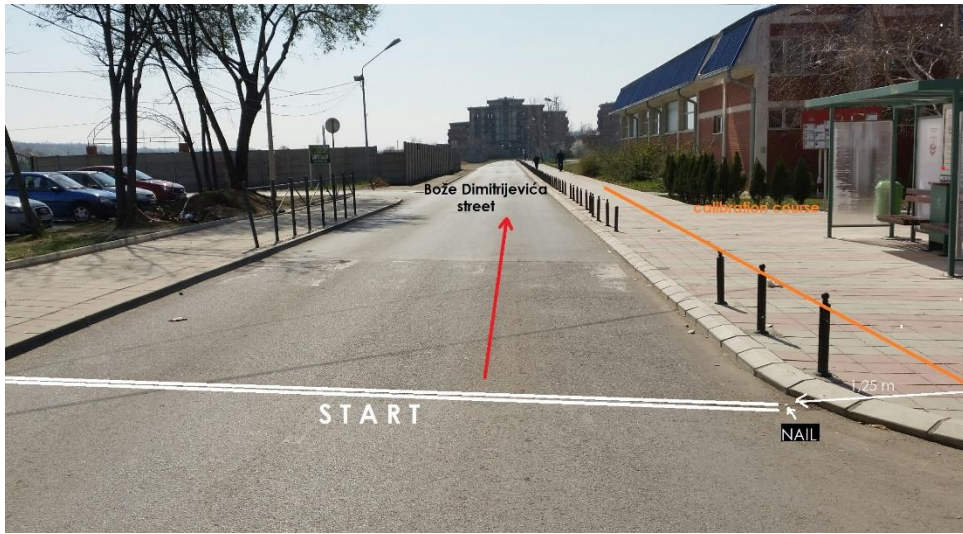
CALIBRATION COURSE FINISH – (picture 3)



CALIBRATION COURSE FINISH – (picture 4)



START - (picture 5)



TURN 1 – (picture 6)



TURN 1 backwards – (picture 7)



TURN 2 – (picture 8)



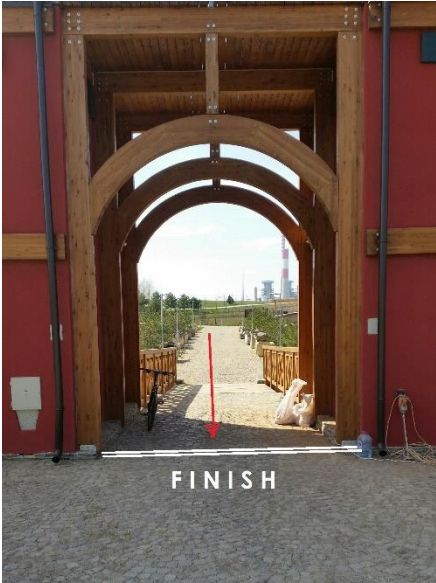
TURN 2 backwards – (picture 9)



FINISH – (picture 10)



FINISH backwards – (picture 11)



TOWARDS FINISH – (picture 12)



TOWARDS FINISH – (picture 13)



THE COURSE - (picture 14)



ELEVATION PROFILE – (picture 15)



Maribor, 28th March 2019

Report prepared by: Borut Podgornik
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