

**ANALISA PERBANDINGAN HASIL PENGUKURAN KOORDINAT DAN
ELEVASI DENGAN ALAT TOTAL STATION DAN GPS GEODETIC DI
FOLDER SANGATTA KAB. KUTAI TIMUR**

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ABSTRACT

Measurement of the position of the dots by using a method ekstraterrestrial GPS receivers are now widely used. This is supported by advances in technology so that the results have a high accuracy with a relatively short time. This study aims to assess the extent to which comparisons coordinates and elevation measurements obtained from the measurement results using Total Station Spectra focus 8 "and SP80 Geodetic GPS.

From the results of measurement and data processing in which the result of the difference in the coordinates of Total Station spectra focus 8 "with geodetic GPS sp80 spectra of 0.009 meters, while the result of the difference in elevation of Total Station spectra focus 8" with geodetic GPS sp80 at 0,011 meters

Keywords : Total Station Spectra Fokus 8", GPS Geodetic Spectra SP8, Land surveying

PENGANTAR

Saat ini metode penentuan posisi suatu titik di permukaan bumi mengalami kemajuan yang demikian pesat. Hal tersebut ditandai dengan ketersediaan peralatan ukur yang dilengkapi dengan teknologi digital terkini. Metode penentuan posisi suatu titik di permukaan bumi dapat dibedakan menjadi dua bagian, yaitu : metode pengukuran secara *terrestrial* dan *ekstraterrestrial*.

Pada pengukuran dengan cara *terrestrial*, penggunaan alat ukur TS (Total Station) saat ini sudah umum digunakan. Sebagaimana diketahui bahwa TS merupakan gabungan antara alat ukur jarak eltronik dan teodolit digital sehingga dari pengukuran lapangan didapat koordinat titik-titik dengan ketelitian yang tinggi. Penggunaan *receiver* GPS pada metode *ekstraterrestrial* untuk penentuan posisi titik saat ini sudah banyak digunakan. Hal tersebut disebabkan karena penggunaan metode tersebut memungkinkan untuk mendapatkan posisi titik yang teliti dengan waktu yang relatif singkat.

Berdasarkan latar belakang di atas, Dari hasil pengukuran kedua alat tersebut akan didapat koordinat berupa angka-angka yang berbeda, sehingga kita dapat menganalisa seberapa besar perbedaan masing-masing alat yang digunakan kemudian bisa kita simpulkan bahwa penggunaan alat yang tepat pada kondisi tertentu dapat memaksimalkan waktu, tenaga bahkan biaya.

Adapun maksud dalam penelitian, adalah untuk menganalisa ketelitian alat dan mengkaji sampai sejauh mana ketelitian posisi titik atau koordinat dan elevasi yang diperoleh dari hasil pengukuran menggunakan *Total Station* dan *GPS Geodetic*.

Untuk membatasi luasnya ruang lingkup pembahasan dalam suatu penelitian, maka dalam penelitian ini lebih difokuskan kepada analisa Koordinat dan Elevasi antara alat Total Station Fokus 8 merk *SPECTRA™ PRECISION* dan *GPS GEODETIC REICEIVER SP 80 merk SPECTRA™ PRECISION*.

CARA PENELITIAN DAN PEMBAHASAN

Lokasi penelitian berada di Folder Sangatta jalan Ilham Maulana Kec. Sangatta Utara Kab. Kutai Timur. Pengambilan data koordinat dan elevasi sebanyak 198 titik dengan alat Total Station dan 198 titik dengan alat GPS Geodetic, pengambilan titik koordinat dan elevasi dilakukan pada titik yang sama.

Dari hasil pengukuran dilapangan kemudian didapat hasil-hasil seerti disajikan dalam tabel berikut ini :

Tabel 1. Hasil Pengukuran Koordinat dan Elevasi Alat *Total Station*

Hasil Pengukuran Koordinat dan Elevasi dengan Alat Totat Station			
Poin	X	Y	Z
1	560,330,206	57,570,538	6,510
2	560,337,517	57,572,847	6,554
3	560,335,272	57,574,515	6,564
4	560,329,155	57,577,720	6,520
5	560,325,879	57,582,192	6,543
6	560,329,731	57,584,924	6,623
7	560,322,848	57,595,360	6,608
8	560,319,097	57,597,246	6,528
9	560,314,133	57,603,354	6,548
10	560,317,398	57,605,952	6,558
11	560,306,585	57,612,179	6,569
12	560,309,305	57,615,403	6,576
13	560,296,035	57,619,097	6,583
14	560,284,237	57,628,573	6,655
15	560,282,275	57,624,700	6,557
16	560,275,888	57,632,425	6,595
17	560,273,685	57,628,792	6,570
18	560,260,630	57,635,717	6,538
19	560,263,032	57,639,373	6,563
20	560,255,487	57,639,548	6,541
21	560,257,944	57,642,926	6,543
22	560,248,655	57,646,209	6,547
23	560,251,754	57,649,042	6,510

Hasil Pengukuran Koordinat dan Elevasi dengan Alat Totat Station			
Poin	X	y	Z
24	560,241,354	57,656,619	6,541
25	560,245,016	57,658,850	6,555
26	560,236,993	57,665,044	6,544
27	560,241,066	57,666,427	6,599
28	560,232,757	57,675,679	6,543
29	560,236,712	57,677,233	6,631
30	560,230,259	57,684,911	6,517
31	560,234,441	57,685,686	6,662
32	560,228,801	57,694,183	6,514
33	560,233,074	57,695,000	6,636
34	560,227,843	57,704,593	6,522
35	560,231,968	57,704,949	6,627
36	560,227,494	57,719,325	6,487
37	560,231,745	57,719,341	6,545
38	560,227,227	57,730,819	6,520
39	560,231,609	57,730,410	6,601
40	560,227,109	57,743,302	6,519
41	560,231,403	57,743,629	6,624
42	560,227,028	57,755,891	6,519
43	560,231,164	57,756,535	6,665
44	560,226,857	57,767,418	6,550
45	560,230,970	57,767,578	6,636
46	560,226,380	57,789,570	6,531
47	560,230,592	57,789,769	6,659
48	560,225,083	57,815,887	6,563
49	560,229,379	57,815,771	6,622
50	560,223,528	57,841,173	6,571
51	560,227,810	57,841,664	6,636
52	560,222,026	57,861,671	6,540
53	560,226,281	57,862,167	6,563
54	560,220,198	57,882,911	6,513
55	560,224,413	57,884,177	6,577
56	560,218,273	57,903,182	6,556
57	560,222,379	57,904,227	6,612
58	560,216,009	57,923,212	6,528
59	560,220,212	57,924,226	6,541
60	560,212,026	57,946,891	6,557
61	560,216,144	57,948,025	6,586

Hasil Pengukuran Koordinat dan Elevasi dengan Alat Totat Station			
Poin	X	y	Z
62	560,205,795	57,964,584	6,536
63	560,209,547	57,966,633	6,618
64	560,197,252	57,978,898	6,544
65	560,200,437	57,981,849	6,684
66	560,190,959	57,985,771	6,562
67	560,193,764	57,989,056	6,605
68	560,181,872	57,992,912	6,530
69	560,183,374	57,997,101	6,580
70	560,170,724	57,998,547	6,464
71	560,172,159	58,002,533	6,585
72	560,158,705	58,002,894	6,549
73	560,159,958	58,006,992	6,611
74	560,143,410	58,006,316	6,496
75	560,144,017	58,010,554	6,674
76	560,113,131	58,009,475	6,511
77	560,113,626	58,013,758	6,693
78	560,083,907	58,010,836	6,520
79	560,082,882	58,015,193	6,614
80	560,064,028	58,011,606	6,500
81	560,063,045	58,015,959	6,589
82	560,042,960	58,010,926	6,515
83	560,042,459	58,015,272	6,596
84	560,028,942	58,006,068	6,512
85	560,027,095	58,009,910	6,642
86	560,016,648	58,000,070	6,555
87	560,013,908	58,003,342	6,702
88	560,006,598	57,988,171	6,542
89	560,002,610	57,989,839	6,584
90	560,002,189	57,973,863	6,470
91	559,998,103	57,975,310	6,596
92	559,997,171	57,957,528	6,528
93	559,993,272	57,959,394	6,606
94	559,993,416	57,948,506	6,526
95	559,989,526	57,950,426	6,638
96	559,984,647	57,932,931	6,525
97	559,980,925	57,935,251	6,731
98	559,964,161	57,913,199	6,511
99	559,961,323	57,916,373	6,644

Hasil Pengukuran Koordinat dan Elevasi dengan Alat Totat Station			
Poin	X	Y	Z
100	559,940,888	57,896,013	6,465
101	559,938,122	57,899,348	6,576
102	559,934,279	57,888,282	6,533
103	559,930,497	57,890,270	6,662
104	559,929,794	57,876,239	6,636
105	559,925,550	57,876,503	6,764
106	559,931,661	57,860,483	6,634
107	559,927,639	57,858,961	6,667
108	559,941,096	57,835,784	6,521
109	559,937,468	57,833,587	6,681
110	559,955,393	57,812,810	6,605
111	559,951,898	57,810,465	6,725
112	559,974,681	57,782,657	6,485
113	559,971,304	57,779,876	6,589
114	559,980,113	57,770,015	6,523
115	559,976,167	57,768,827	6,550
116	559,980,593	57,759,595	6,540
117	559,976,337	57,760,107	6,584
118	559,974,174	57,744,171	6,472
119	559,970,376	57,746,101	6,548
120	559,970,349	57,746,103	6,544
121	559,955,076	57,721,785	6,527
122	559,951,318	57,723,915	6,541
123	559,945,283	57,710,856	6,538
124	559,941,637	57,713,308	6,589
125	559,934,179	57,700,979	6,519
126	559,931,704	57,704,442	6,606
127	559,921,807	57,689,769	6,545
128	559,918,280	57,692,206	6,681
129	559,911,802	57,667,584	6,543
130	559,907,615	57,668,452	6,665
131	559,905,351	57,644,174	6,539
132	559,901,274	57,645,513	6,691
133	559,903,974	57,629,365	6,611
134	559,899,720	57,628,916	6,732
135	559,911,346	57,609,946	6,707
136	559,908,242	57,607,032	6,831
137	559,928,364	57,595,567	6,731

Hasil Pengukuran Koordinat dan Elevasi dengan Alat Totat Station			
Poin	X	y	Z
138	559,926,075	57,591,979	6,836
139	559,956,093	57,582,237	6,520
140	559,953,570	57,578,802	6,698
141	559,972,674	57,567,451	6,506
142	559,969,312	57,564,668	6,685
143	559,985,948	57,553,654	6,514
144	559,983,455	57,550,151	6,672
145	559,998,251	57,543,231	6,522
146	559,995,544	57,539,997	6,583
147	560,004,587	57,539,353	6,510
148	560,003,059	57,535,187	6,635
149	560,014,431	57,534,710	6,512
150	560,013,242	57,530,656	6,599
151	560,026,609	57,532,020	6,508
152	560,026,167	57,527,820	6,574
153	560,039,596	57,527,297	6,586
154	560,039,165	57,531,520	6,514
155	560,052,981	57,532,299	6,499
156	560,053,718	57,528,044	6,635
157	560,072,931	57,534,543	6,519
158	560,073,899	57,530,376	6,666
159	560,097,262	57,537,044	6,482
160	560,098,288	57,532,790	6,673
161	560,107,946	57,536,896	6,493
162	560,107,194	57,532,631	6,685
163	560,119,986	57,532,941	6,486
164	560,118,535	57,528,815	6,758
165	560,138,556	57,522,618	6,499
166	560,136,181	57,519,055	6,678
167	560,156,000	57,512,328	6,447
168	560,154,508	57,508,311	6,628
169	560,176,984	57,500,137	6,493
170	560,174,542	57,496,631	6,678
171	560,195,134	57,490,657	6,498
172	560,193,521	57,486,683	6,606
173	560,210,617	57,483,271	6,538
174	560,209,644	57,479,049	6,644
175	560,220,482	57,479,230	6,518

Hasil Pengukuran Koordinat dan Elevasi dengan Alat Totat Station			
Poin	X	Y	Z
176	560,218,851	57,475,287	6,667
177	560,230,441	57,475,462	6,517
178	560,228,975	57,471,423	6,653
179	560,242,621	57,471,708	6,526
180	560,241,467	57,467,570	6,638
181	560,252,875	57,468,937	6,545
182	560,252,140	57,464,711	6,676
183	560,265,353	57,466,589	6,527
184	560,264,475	57,462,442	6,655
185	560,278,948	57,465,036	6,513
186	560,278,574	57,460,770	6,669
187	560,288,574	57,465,331	6,543
188	560,289,403	57,461,104	6,613
189	560,299,506	57,467,607	6,542
190	560,300,604	57,463,351	6,610
191	560,307,400	57,470,605	6,524
192	560,309,105	57,466,600	6,623
193	560,320,163	57,478,614	6,527
194	560,322,828	57,475,220	6,581
195	560,332,400	57,492,910	6,433
196	560,346,528	57,493,828	6,410
197	560,332,101	57,526,521	6,524
198	560,344,641	57,526,393	6,522

Tabel 2. Hasil Pengukuran Koordinat dan Elevasi Alat *GPS Geodetic*

Hasil Pengukuran Koordinat dan Elevasi dengan Alat GPS Geodetic			
Poin	X	y	Z
1	560,330,213	57,570,533	6,523
2	560,337,524	57,572,846	6,563
3	560,335,264	57,574,515	6,572
4	560,329,145	57,577,718	6,530
5	560,325,872	57,582,197	6,554
6	560,329,724	57,584,929	6,632
7	560,322,856	57,595,361	6,622
8	560,319,090	57,597,248	6,536
9	560,314,126	57,603,356	6,561
10	560,317,408	57,605,942	6,567
11	560,306,593	57,612,181	6,577
12	560,309,315	57,615,405	6,587
13	560,296,043	57,619,099	6,591
14	560,284,230	57,628,578	6,664
15	560,282,283	57,624,702	6,570
16	560,275,878	57,632,420	6,609
17	560,273,678	57,628,791	6,578
18	560,260,623	57,635,720	6,547
19	560,263,040	57,639,375	6,577
20	560,255,497	57,639,549	6,553
21	560,257,937	57,642,931	6,552
22	560,248,648	57,646,214	6,556
23	560,251,762	57,649,044	6,523
24	560,241,364	57,656,620	6,550
25	560,245,009	57,658,854	6,568
26	560,236,986	57,665,048	6,554

Hasil Pengukuran Koordinat dan Elevasi dengan Alat GPS Geodetic			
Poin	X	Y	Z
27	560,241,074	57,666,432	6,608
28	560,232,767	57,675,684	6,557
29	560,236,705	57,677,242	6,642
30	560,230,252	57,684,918	6,530
31	560,234,449	57,685,688	6,671
32	560,228,794	57,694,190	6,523
33	560,233,067	57,695,009	6,652
34	560,227,851	57,704,595	6,530
35	560,231,978	57,704,954	6,640
36	560,227,487	57,719,330	6,496
37	560,231,738	57,719,343	6,555
38	560,227,235	57,730,820	6,534
39	560,231,619	57,730,414	6,612
40	560,227,102	57,743,306	6,528
41	560,231,396	57,743,634	6,635
42	560,227,036	57,755,896	6,532
43	560,231,157	57,756,544	6,678
44	560,226,850	57,767,425	6,559
45	560,230,978	57,767,580	6,649
46	560,226,391	57,789,577	6,543
47	560,230,600	57,789,778	6,668
48	560,225,094	57,815,892	6,572
49	560,229,387	57,815,776	6,634
50	560,223,537	57,841,175	6,584
51	560,227,818	57,841,665	6,649
52	560,222,026	57,861,675	6,550
53	560,226,281	57,862,171	6,575
54	560,220,206	57,882,916	6,524
55	560,224,413	57,884,182	6,588
56	560,218,273	57,903,191	6,569
57	560,222,379	57,904,234	6,623
58	560,216,017	57,923,214	6,543
59	560,220,212	57,924,233	6,554
60	560,212,026	57,946,900	6,568
61	560,216,152	57,948,027	6,595
62	560,205,795	57,964,589	6,544
63	560,209,555	57,966,638	6,631
64	560,197,252	57,978,900	6,553

Hasil Pengukuran Koordinat dan Elevasi dengan Alat GPS Geodetic			
Poin	X	Y	Z
65	560,200,445	57,981,850	6,693
66	560,190,959	57,985,775	6,572
67	560,193,772	57,989,060	6,617
68	560,181,872	57,992,917	6,541
69	560,183,374	57,997,106	6,589
70	560,170,732	57,998,556	6,473
71	560,172,159	58,002,540	6,597
72	560,158,705	58,002,896	6,563
73	560,159,969	58,006,999	6,620
74	560,143,410	58,006,325	6,509
75	560,144,025	58,010,559	6,688
76	560,113,131	58,009,480	6,520
77	560,113,634	58,013,760	6,706
78	560,083,907	58,010,837	6,528
79	560,082,882	58,015,197	6,625
80	560,064,036	58,011,610	6,510
81	560,063,045	58,015,964	6,602
82	560,042,960	58,010,931	6,524
83	560,042,459	58,015,281	6,605
84	560,028,950	58,006,075	6,524
85	560,027,095	58,009,912	6,653
86	560,016,648	58,000,077	6,566
87	560,013,916	58,003,351	6,717
88	560,006,598	57,988,176	6,553
89	560,002,610	57,989,844	6,593
90	560,002,189	57,973,865	6,483
91	559,998,111	57,975,311	6,605
92	559,997,171	57,957,532	6,537
93	559,993,280	57,959,398	6,617
94	559,993,416	57,948,511	6,539
95	559,989,526	57,950,431	6,647
96	559,984,655	57,932,940	6,534
97	559,980,933	57,935,258	6,743
98	559,964,169	57,913,201	6,526
99	559,961,334	57,916,380	6,653
100	559,940,896	57,896,022	6,474
101	559,938,130	57,899,353	6,587
102	559,934,279	57,888,287	6,544

Hasil Pengukuran Koordinat dan Elevasi dengan Alat GPS Geodetic			
Poin	X	Y	Z
103	559,930,497	57,890,272	6,671
104	559,929,802	57,876,240	6,646
105	559,925,550	57,876,507	6,773
106	559,931,661	57,860,487	6,645
107	559,927,647	57,858,966	6,678
108	559,941,104	57,835,789	6,530
109	559,937,476	57,833,596	6,691
110	559,955,401	57,812,817	6,616
111	559,951,906	57,810,467	6,734
112	559,974,692	57,782,664	6,497
113	559,971,312	57,779,885	6,600
114	559,980,121	57,770,020	6,536
115	559,976,175	57,768,832	6,561
116	559,980,601	57,759,597	6,549
117	559,976,345	57,760,108	6,594
118	559,974,182	57,744,175	6,485
119	559,970,384	57,746,105	6,559
120	559,970,357	57,746,108	6,557
121	559,955,084	57,721,790	6,537
122	559,951,326	57,723,924	6,550
123	559,945,291	57,710,863	6,547
124	559,941,645	57,713,310	6,600
125	559,934,187	57,700,986	6,530
126	559,931,712	57,704,451	6,620
127	559,921,815	57,689,774	6,557
128	559,918,291	57,692,211	6,690
129	559,911,810	57,667,586	6,552
130	559,907,623	57,668,453	6,676
131	559,905,359	57,644,178	6,548
132	559,901,282	57,645,517	6,704
133	559,903,982	57,629,370	6,622
134	559,899,728	57,628,921	6,741
135	559,911,339	57,609,955	6,719
136	559,908,235	57,607,039	6,841
137	559,928,372	57,595,569	6,740
138	559,926,085	57,591,986	6,847
139	559,956,086	57,582,246	6,533
140	559,953,563	57,578,807	6,709

Hasil Pengukuran Koordinat dan Elevasi dengan Alat GPS Geodetic			
Poin	X	Y	Z
141	559,972,682	57,567,456	6,519
142	559,969,322	57,564,670	6,696
143	559,985,941	57,553,655	6,527
144	559,983,448	57,550,155	6,686
145	559,998,259	57,543,235	6,531
146	559,995,552	57,540,002	6,596
147	560,004,595	57,539,358	6,524
148	560,003,068	57,535,196	6,648
149	560,014,439	57,534,717	6,523
150	560,013,250	57,530,658	6,613
151	560,026,617	57,532,027	6,521
152	560,026,181	57,527,829	6,595
153	560,039,604	57,527,302	6,599
154	560,039,176	57,531,525	6,525
155	560,052,989	57,532,301	6,508
156	560,053,726	57,528,045	6,644
157	560,072,939	57,534,547	6,529
158	560,073,907	57,530,380	6,679
159	560,097,270	57,537,049	6,491
160	560,098,296	57,532,795	6,683
161	560,107,954	57,536,905	6,506
162	560,107,202	57,532,638	6,696
163	560,119,997	57,532,943	6,495
164	560,118,543	57,528,822	6,769
165	560,138,564	57,522,627	6,512
166	560,136,189	57,519,057	6,690
167	560,156,013	57,512,333	6,456
168	560,154,515	57,508,316	6,637
169	560,176,992	57,500,139	6,504
170	560,174,550	57,496,632	6,691
171	560,195,141	57,490,661	6,511
172	560,193,529	57,486,687	6,615
173	560,210,625	57,483,276	6,550
174	560,209,652	57,479,054	6,653
175	560,220,489	57,479,239	6,529
176	560,218,859	57,475,294	6,678
177	560,230,449	57,475,464	6,526
178	560,228,983	57,471,430	6,666

Hasil Pengukuran Koordinat dan Elevasi dengan Alat GPS Geodetic			
Poin	X	Y	Z
179	560,242,628	57,471,717	6,541
180	560,241,476	57,467,575	6,651
181	560,252,883	57,468,942	6,556
182	560,252,147	57,464,713	6,685
183	560,265,361	57,466,590	6,539
184	560,264,483	57,462,446	6,664
185	560,278,956	57,465,040	6,526
186	560,278,581	57,460,775	6,678
187	560,288,586	57,465,336	6,556
188	560,289,411	57,461,113	6,622
189	560,299,513	57,467,614	6,552
190	560,300,613	57,463,353	6,621
191	560,307,408	57,470,612	6,535
192	560,309,115	57,466,609	6,632
193	560,320,171	57,478,616	6,538
194	560,322,836	57,475,222	6,590
195	560,332,408	57,492,912	6,442
196	560,346,536	57,493,830	6,419
197	560,332,108	57,526,528	6,536
198	560,344,649	57,526,395	6,535

Setelah data koordinat dan elevasi didapat, maka data diolah untuk digunakan dalam analisa data, sehingga terlihat perbedaan koordinat dan elevasi antara kedua alat tersebut.

Dari hasil pengukuran didapat perbedaan koordinat dan elevasi antara kedua alat tersebut, seperti yang disajikan dalam tabel di bawah ini :

Tabel 3. Perhitungan Selisih Koordinat dan Elevasi

No	Koordinat Total Station			Koordinat GPS Geodetic			Selisih Pengukuran Koordinat (mm)	Selisih Pengukuran Elevasi (mm)
	(1)			(2)			(1-2)	(1-2)
	X	Y	Z	X	Y	Z		
1	560,330,206	57,570,538	6,510	560,330,213	57,570,533	6,523	9	13
2	560,337,517	57,572,847	6,554	560,337,524	57,572,846	6,563	7	9
3	560,335,272	57,574,515	6,564	560,335,264	57,574,515	6,572	8	8
4	560,329,155	57,577,720	6,520	560,329,145	57,577,718	6,530	10	10
5	560,325,879	57,582,192	6,543	560,325,872	57,582,197	6,554	9	11
6	560,329,731	57,584,924	6,623	560,329,724	57,584,929	6,632	9	9
7	560,322,848	57,595,360	6,608	560,322,856	57,595,361	6,622	8	14
8	560,319,097	57,597,246	6,528	560,319,090	57,597,248	6,536	7	8
9	560,314,133	57,603,354	6,548	560,314,126	57,603,356	6,561	7	13
10	560,317,398	57,605,952	6,558	560,317,408	57,605,942	6,567	14	9
11	560,306,585	57,612,179	6,569	560,306,593	57,612,181	6,577	8	8
12	560,309,305	57,615,403	6,576	560,309,315	57,615,405	6,587	10	11
13	560,296,035	57,619,097	6,583	560,296,043	57,619,099	6,591	8	8
14	560,284,237	57,628,573	6,655	560,284,230	57,628,578	6,664	9	9
15	560,282,275	57,624,700	6,557	560,282,283	57,624,702	6,570	8	13
16	560,275,888	57,632,425	6,595	560,275,878	57,632,420	6,609	11	14
17	560,273,685	57,628,792	6,570	560,273,678	57,628,791	6,578	7	8
18	560,260,630	57,635,717	6,538	560,260,623	57,635,720	6,547	8	9
19	560,263,032	57,639,373	6,563	560,263,040	57,639,375	6,577	8	14
20	560,255,487	57,639,548	6,541	560,255,497	57,639,549	6,553	10	12
21	560,257,944	57,642,926	6,543	560,257,937	57,642,931	6,552	9	9
22	560,248,655	57,646,209	6,547	560,248,648	57,646,214	6,556	9	9
23	560,251,754	57,649,042	6,510	560,251,762	57,649,044	6,523	8	13
24	560,241,354	57,656,619	6,541	560,241,364	57,656,620	6,550	10	9
25	560,245,016	57,658,850	6,555	560,245,009	57,658,854	6,568	8	13
26	560,236,993	57,665,044	6,544	560,236,986	57,665,048	6,554	8	10
27	560,241,066	57,666,427	6,599	560,241,074	57,666,432	6,608	9	9
28	560,232,757	57,675,679	6,543	560,232,767	57,675,684	6,557	11	14
29	560,236,712	57,677,233	6,631	560,236,705	57,677,242	6,642	11	11
30	560,230,259	57,684,911	6,517	560,230,252	57,684,918	6,530	10	13
31	560,234,441	57,685,686	6,662	560,234,449	57,685,688	6,671	8	9
32	560,228,801	57,694,183	6,514	560,228,794	57,694,190	6,523	10	9
33	560,233,074	57,695,000	6,636	560,233,067	57,695,009	6,652	11	16
34	560,227,843	57,704,593	6,522	560,227,851	57,704,595	6,530	8	8
35	560,231,968	57,704,949	6,627	560,231,978	57,704,954	6,640	11	13
36	560,227,494	57,719,325	6,487	560,227,487	57,719,330	6,496	9	9
37	560,231,745	57,719,341	6,545	560,231,738	57,719,343	6,555	7	10
38	560,227,227	57,730,819	6,520	560,227,235	57,730,820	6,534	8	14
39	560,231,609	57,730,410	6,601	560,231,619	57,730,414	6,612	11	11
40	560,227,109	57,743,302	6,519	560,227,102	57,743,306	6,528	8	9
41	560,231,403	57,743,629	6,624	560,231,396	57,743,634	6,635	9	11
42	560,227,028	57,755,891	6,519	560,227,036	57,755,896	6,532	9	13
43	560,231,164	57,756,535	6,665	560,231,157	57,756,544	6,678	11	13
44	560,226,857	57,767,418	6,550	560,226,850	57,767,425	6,559	10	9
45	560,230,970	57,767,578	6,636	560,230,978	57,767,580	6,649	8	13
46	560,226,380	57,789,570	6,531	560,226,391	57,789,577	6,543	13	12
47	560,230,592	57,789,769	6,659	560,230,600	57,789,778	6,668	12	9
48	560,225,083	57,815,887	6,563	560,225,094	57,815,892	6,572	12	9
49	560,229,379	57,815,771	6,622	560,229,387	57,815,776	6,634	9	12
50	560,223,528	57,841,173	6,571	560,223,537	57,841,175	6,584	9	13
51	560,227,810	57,841,664	6,636	560,227,818	57,841,665	6,649	8	13
52	560,222,026	57,861,671	6,540	560,222,026	57,861,675	6,550	4	10
53	560,226,281	57,862,167	6,563	560,226,281	57,862,171	6,575	4	12
54	560,220,198	57,882,911	6,513	560,220,206	57,882,916	6,524	9	11
55	560,224,413	57,884,177	6,577	560,224,413	57,884,182	6,588	5	11
56	560,218,273	57,903,182	6,556	560,218,273	57,903,191	6,569	9	13
57	560,222,379	57,904,227	6,612	560,222,379	57,904,234	6,623	7	11
58	560,216,009	57,923,212	6,528	560,216,017	57,923,214	6,543	8	15
59	560,220,212	57,924,226	6,541	560,220,212	57,924,233	6,554	7	13
60	560,212,026	57,946,891	6,557	560,212,026	57,946,900	6,568	9	11
61	560,216,144	57,948,025	6,586	560,216,152	57,948,027	6,595	8	9
62	560,205,795	57,964,584	6,536	560,205,795	57,964,589	6,544	5	8
63	560,209,547	57,966,633	6,618	560,209,555	57,966,638	6,631	9	13

No	Koordinat Total Station			Koordinat GPS Geodetic			Selisih Pengukuran Koordinat (mm)	Selisih Pengukuran Elevasi (mm)
	(1)			(2)			(1-2)	(1-2)
	X	Y	Z	X	Y	Z		
64	560,197,252	57,978,898	6,544	560,197,252	57,978,900	6,553	2	9
65	560,200,437	57,981,849	6,684	560,200,445	57,981,850	6,693	8	9
66	560,190,959	57,985,771	6,562	560,190,959	57,985,775	6,572	4	10
67	560,193,764	57,989,056	6,605	560,193,772	57,989,060	6,617	9	12
68	560,181,872	57,992,912	6,530	560,181,872	57,992,917	6,541	5	11
69	560,183,374	57,997,101	6,580	560,183,374	57,997,106	6,589	5	9
70	560,170,724	57,998,547	6,464	560,170,732	57,998,556	6,473	12	9
71	560,172,159	58,002,533	6,585	560,172,159	58,002,540	6,597	7	12
72	560,158,705	58,002,894	6,549	560,158,705	58,002,896	6,563	2	14
73	560,159,958	58,006,992	6,611	560,159,969	58,006,999	6,620	13	9
74	560,143,410	58,006,316	6,496	560,143,410	58,006,325	6,509	9	13
75	560,144,017	58,010,554	6,674	560,144,025	58,010,559	6,688	9	14
76	560,113,131	58,009,475	6,511	560,113,131	58,009,480	6,520	5	9
77	560,113,626	58,013,758	6,693	560,113,634	58,013,760	6,706	8	13
78	560,083,907	58,010,836	6,520	560,083,907	58,010,837	6,528	1	8
79	560,082,882	58,015,193	6,614	560,082,882	58,015,197	6,625	4	11
80	560,064,028	58,011,606	6,500	560,064,036	58,011,610	6,510	9	10
81	560,063,045	58,015,959	6,589	560,063,045	58,015,964	6,602	5	13
82	560,042,960	58,010,926	6,515	560,042,960	58,010,931	6,524	5	9
83	560,042,459	58,015,272	6,596	560,042,459	58,015,281	6,605	9	9
84	560,028,942	58,006,068	6,512	560,028,950	58,006,075	6,524	11	12
85	560,027,095	58,009,910	6,642	560,027,095	58,009,912	6,653	2	11
86	560,016,648	58,000,070	6,555	560,016,648	58,000,077	6,566	7	11
87	560,013,908	58,003,342	6,702	560,013,916	58,003,351	6,717	12	15
88	560,006,598	57,988,171	6,542	560,006,598	57,988,176	6,553	5	11
89	560,002,610	57,989,839	6,584	560,002,610	57,989,844	6,593	5	9
90	560,002,189	57,973,863	6,470	560,002,189	57,973,865	6,483	2	13
91	559,998,103	57,975,310	6,596	559,998,111	57,975,311	6,605	8	9
92	559,997,171	57,957,528	6,528	559,997,171	57,957,532	6,537	4	9
93	559,993,272	57,959,394	6,606	559,993,280	57,959,398	6,617	9	11
94	559,993,416	57,948,506	6,526	559,993,416	57,948,511	6,539	5	13
95	559,989,526	57,950,426	6,638	559,989,526	57,950,431	6,647	5	9
96	559,984,647	57,932,931	6,525	559,984,655	57,932,940	6,534	12	9
97	559,980,925	57,935,251	6,731	559,980,933	57,935,258	6,743	11	12
98	559,964,161	57,913,199	6,511	559,964,169	57,913,201	6,526	8	15
99	559,961,323	57,916,373	6,644	559,961,334	57,916,380	6,653	13	9
100	559,940,888	57,896,013	6,465	559,940,896	57,896,022	6,474	12	9
101	559,938,122	57,899,348	6,576	559,938,130	57,899,353	6,587	9	11
102	559,934,279	57,888,282	6,533	559,934,279	57,888,287	6,544	5	11
103	559,930,497	57,890,270	6,662	559,930,497	57,890,272	6,671	2	9
104	559,929,794	57,876,239	6,636	559,929,802	57,876,240	6,646	8	10
105	559,925,550	57,876,503	6,764	559,925,550	57,876,507	6,773	4	9
106	559,931,661	57,860,483	6,634	559,931,661	57,860,487	6,645	4	11
107	559,927,639	57,858,961	6,667	559,927,647	57,858,966	6,678	9	11
108	559,941,096	57,835,784	6,521	559,941,104	57,835,789	6,530	9	9
109	559,937,468	57,833,587	6,681	559,937,476	57,833,596	6,691	12	10
110	559,955,393	57,812,810	6,605	559,955,401	57,812,817	6,616	11	11
111	559,951,898	57,810,465	6,725	559,951,906	57,810,467	6,734	8	9
112	559,974,681	57,782,657	6,485	559,974,692	57,782,664	6,497	13	12
113	559,971,304	57,779,876	6,589	559,971,312	57,779,885	6,600	12	11
114	559,980,113	57,770,015	6,523	559,980,121	57,770,020	6,536	9	13
115	559,976,167	57,768,827	6,550	559,976,175	57,768,832	6,561	9	11
116	559,980,593	57,759,595	6,540	559,980,601	57,759,597	6,549	8	9
117	559,976,337	57,760,107	6,584	559,976,345	57,760,108	6,594	8	10
118	559,974,174	57,744,171	6,472	559,974,182	57,744,175	6,485	9	13
119	559,970,376	57,746,101	6,548	559,970,384	57,746,105	6,559	9	11
120	559,970,349	57,746,103	6,544	559,970,357	57,746,108	6,557	9	13
121	559,955,076	57,721,785	6,527	559,955,084	57,721,790	6,537	9	10
122	559,951,318	57,723,915	6,541	559,951,326	57,723,924	6,550	12	9
123	559,945,283	57,710,856	6,538	559,945,291	57,710,863	6,547	11	9
124	559,941,637	57,713,308	6,589	559,941,645	57,713,310	6,600	8	11
125	559,934,179	57,700,979	6,519	559,934,187	57,700,986	6,530	11	11

No	Koordinat Total Station			Koordinat GPS Geodetic			Selisih Pengukuran Koordinat (mm)	Selisih Pengukuran Elevasi (mm)
	(1)			(2)			(1-2)	(1-2)
	X	Y	Z	X	Y	Z		
126	559,931,704	57,704,442	6,606	559,931,712	57,704,451	6,620	12	14
127	559,921,807	57,689,769	6,545	559,921,815	57,689,774	6,557	9	12
128	559,918,280	57,692,206	6,681	559,918,291	57,692,211	6,690	12	9
129	559,911,802	57,667,584	6,543	559,911,810	57,667,586	6,552	8	9
130	559,907,615	57,668,452	6,665	559,907,623	57,668,453	6,676	8	11
131	559,905,351	57,644,174	6,539	559,905,359	57,644,178	6,548	9	9
132	559,901,274	57,645,513	6,691	559,901,282	57,645,517	6,704	9	13
133	559,903,974	57,629,365	6,611	559,903,982	57,629,370	6,622	9	11
134	559,899,720	57,628,916	6,732	559,899,728	57,628,921	6,741	9	9
135	559,911,346	57,609,946	6,707	559,911,339	57,609,955	6,719	11	12
136	559,908,242	57,607,032	6,831	559,908,235	57,607,039	6,841	10	10
137	559,928,364	57,595,567	6,731	559,928,372	57,595,569	6,740	8	9
138	559,926,075	57,591,979	6,836	559,926,085	57,591,986	6,847	12	11
139	559,956,093	57,582,237	6,520	559,956,086	57,582,246	6,533	11	13
140	559,953,570	57,578,802	6,698	559,953,563	57,578,807	6,709	9	11
141	559,972,674	57,567,451	6,506	559,972,682	57,567,456	6,519	9	13
142	559,969,312	57,564,668	6,685	559,969,322	57,564,670	6,696	10	11
143	559,985,948	57,553,654	6,514	559,985,941	57,553,655	6,527	7	13
144	559,983,455	57,550,151	6,672	559,983,448	57,550,155	6,686	8	14
145	559,998,251	57,543,231	6,522	559,998,259	57,543,235	6,531	9	9
146	559,995,544	57,539,997	6,583	559,995,552	57,540,002	6,596	9	13
147	560,004,587	57,539,353	6,510	560,004,595	57,539,358	6,524	9	14
148	560,003,059	57,535,187	6,635	560,003,068	57,535,196	6,648	13	13
149	560,014,431	57,534,710	6,512	560,014,439	57,534,717	6,523	11	11
150	560,013,242	57,530,656	6,599	560,013,250	57,530,658	6,613	8	14
151	560,026,609	57,532,020	6,508	560,026,617	57,532,027	6,521	11	13
152	560,026,167	57,527,820	6,574	560,026,181	57,527,829	6,595	17	21
153	560,039,596	57,527,297	6,586	560,039,604	57,527,302	6,599	9	13
154	560,039,165	57,531,520	6,514	560,039,176	57,531,525	6,525	12	11
155	560,052,981	57,532,299	6,499	560,052,989	57,532,301	6,508	8	9
156	560,053,718	57,528,044	6,635	560,053,726	57,528,045	6,644	8	9
157	560,072,931	57,534,543	6,519	560,072,939	57,534,547	6,529	9	10
158	560,073,899	57,530,376	6,666	560,073,907	57,530,380	6,679	9	13
159	560,097,262	57,537,044	6,482	560,097,270	57,537,049	6,491	9	9
160	560,098,288	57,532,790	6,673	560,098,296	57,532,795	6,683	9	10
161	560,107,946	57,536,896	6,493	560,107,954	57,536,905	6,506	12	13
162	560,107,194	57,532,631	6,685	560,107,202	57,532,638	6,696	11	11
163	560,119,986	57,532,941	6,486	560,119,997	57,532,943	6,495	11	9
164	560,118,535	57,528,815	6,758	560,118,543	57,528,822	6,769	11	11
165	560,138,556	57,522,618	6,499	560,138,564	57,522,627	6,512	12	13
166	560,136,181	57,519,055	6,678	560,136,189	57,519,057	6,690	8	12
167	560,156,000	57,512,328	6,447	560,156,013	57,512,333	6,456	14	9
168	560,154,508	57,508,311	6,628	560,154,515	57,508,316	6,637	9	9
169	560,176,984	57,500,137	6,493	560,176,992	57,500,139	6,504	8	11
170	560,174,542	57,496,631	6,678	560,174,550	57,496,632	6,691	8	13
171	560,195,134	57,490,657	6,498	560,195,141	57,490,661	6,511	8	13
172	560,193,521	57,486,683	6,606	560,193,529	57,486,687	6,615	9	9
173	560,210,617	57,483,271	6,538	560,210,625	57,483,276	6,550	9	12
174	560,209,644	57,479,049	6,644	560,209,652	57,479,054	6,653	9	9
175	560,220,482	57,479,230	6,518	560,220,489	57,479,239	6,529	11	11
176	560,218,851	57,475,287	6,667	560,218,859	57,475,294	6,678	11	11
177	560,230,441	57,475,462	6,517	560,230,449	57,475,464	6,526	8	9
178	560,228,975	57,471,423	6,653	560,228,983	57,471,430	6,666	11	13
179	560,242,621	57,471,708	6,526	560,242,628	57,471,717	6,541	11	15
180	560,241,467	57,467,570	6,638	560,241,476	57,467,575	6,651	10	13
181	560,252,875	57,468,937	6,545	560,252,883	57,468,942	6,556	9	11
182	560,252,140	57,464,711	6,676	560,252,147	57,464,713	6,685	7	9
183	560,265,353	57,466,589	6,527	560,265,361	57,466,590	6,539	8	12
184	560,264,475	57,462,442	6,655	560,264,483	57,462,446	6,664	9	9
185	560,278,948	57,465,036	6,513	560,278,956	57,465,040	6,526	9	13
186	560,278,574	57,460,770	6,669	560,278,581	57,460,775	6,678	9	9
187	560,288,574	57,465,331	6,543	560,288,586	57,465,336	6,556	13	13
188	560,289,403	57,461,104	6,613	560,289,411	57,461,113	6,622	12	9

No	Koordinat Total Station			Koordinat GPS Geodetic			Selisih Pengukuran Koordinat (mm)	Selisih Pengukuran Elevasi (mm)
	(1)			(2)			(1-2)	(1-2)
	X	Y	Z	X	Y	Z		
189	560,299,506	57,467,607	6,542	560,299,513	57,467,614	6,552	10	10
190	560,300,604	57,463,351	6,610	560,300,613	57,463,353	6,621	9	11
191	560,307,400	57,470,605	6,524	560,307,408	57,470,612	6,535	11	11
192	560,309,105	57,466,600	6,623	560,309,115	57,466,609	6,632	13	9
193	560,320,163	57,478,614	6,527	560,320,171	57,478,616	6,538	8	11
194	560,322,828	57,475,220	6,581	560,322,836	57,475,222	6,590	8	9
195	560,332,400	57,492,910	6,433	560,332,408	57,492,912	6,442	8	9
196	560,346,528	57,493,828	6,410	560,346,536	57,493,830	6,419	8	9
197	560,332,101	57,526,521	6,524	560,332,108	57,526,528	6,536	10	12
198	560,344,641	57,526,393	6,522	560,344,649	57,526,395	6,535	8	13
n							198	198
Jumlah							1758	2177
Rata-rata							9	11
Nilai Maks							17	21
Nilai Min							1	8

KESIMPULAN DAN SARAN

Dari hasil analisa nilai selisih pengukuran koordinat menggunakan *Total Station Spectra Fokus 8"* dengan *GPS Geodetik Spectra SP80* adalah 0,009 m, selisih pengukuran elevasi menggunakan *Total Station Spectra Fokus 8"* dengan *GPS Geodetik Spectra SP80* adalah 0,011 m, waktu atau lamanya pengukuran yang dilakukan dengan alat *Total Station Spectra Fokus 8"* ± 6 jam dan waktu atau lamanya pengukuran dengan alat *GPS Geodetic* dengan alat *GPS Geodetic Spectra SP80* ± 2 jam

Dalam penelitian ini dilakukan dalam waktu yang berbeda, untuk penelitian selanjutnya diharapkan dapat dilakukan pengukuran dalam waktu dan hari yang sama, Pengukuran pada penelitian ini dilakukan menggunakan 2 alat ukur yang berbeda, untuk penelitian selanjutnya diharapkan dapat dilakukan pengukuran lebih dari 2 alat ukur yang berbeda.

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