

BGV-alignment_plaques-TERRAIN_Fini.xit

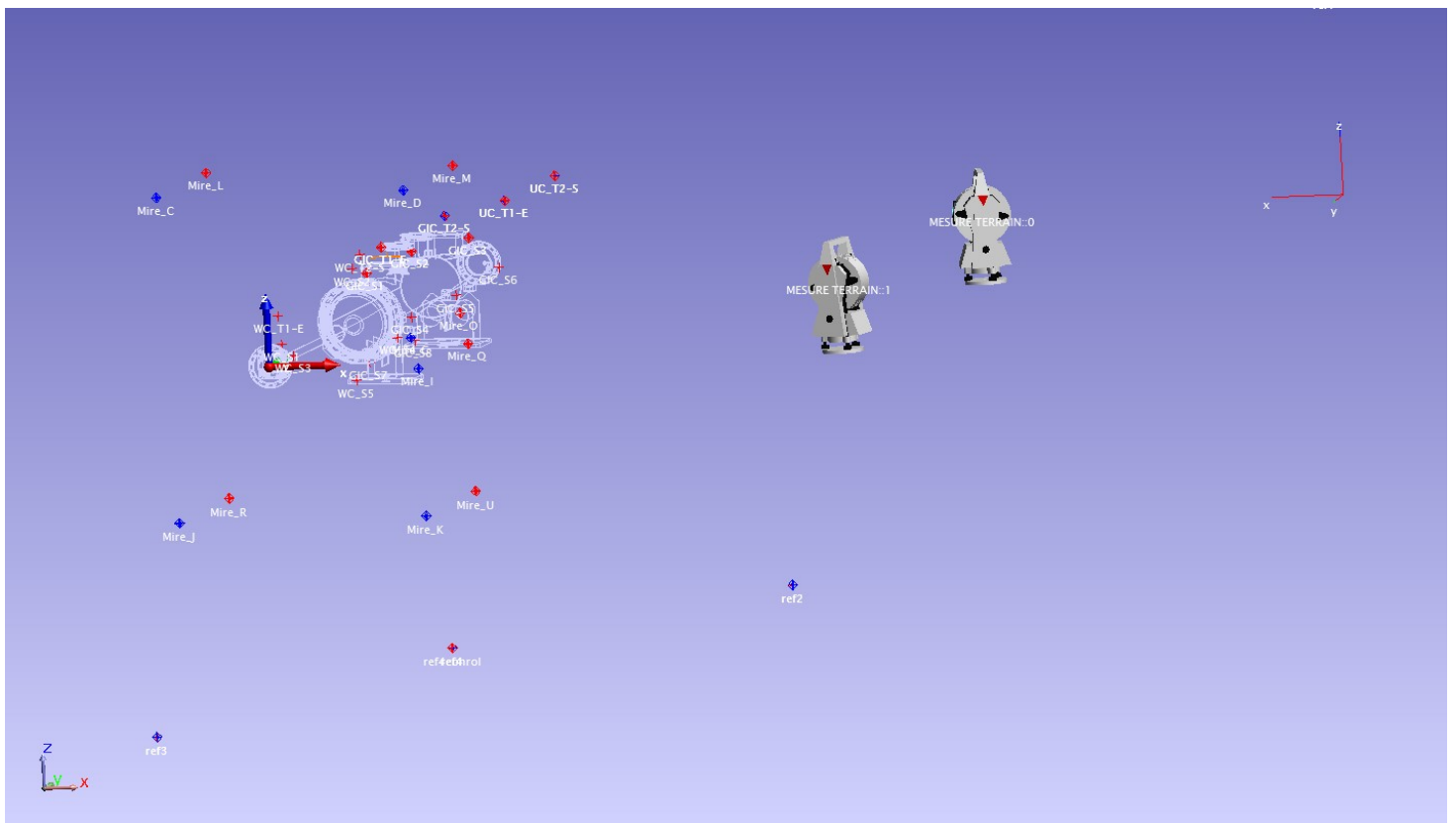
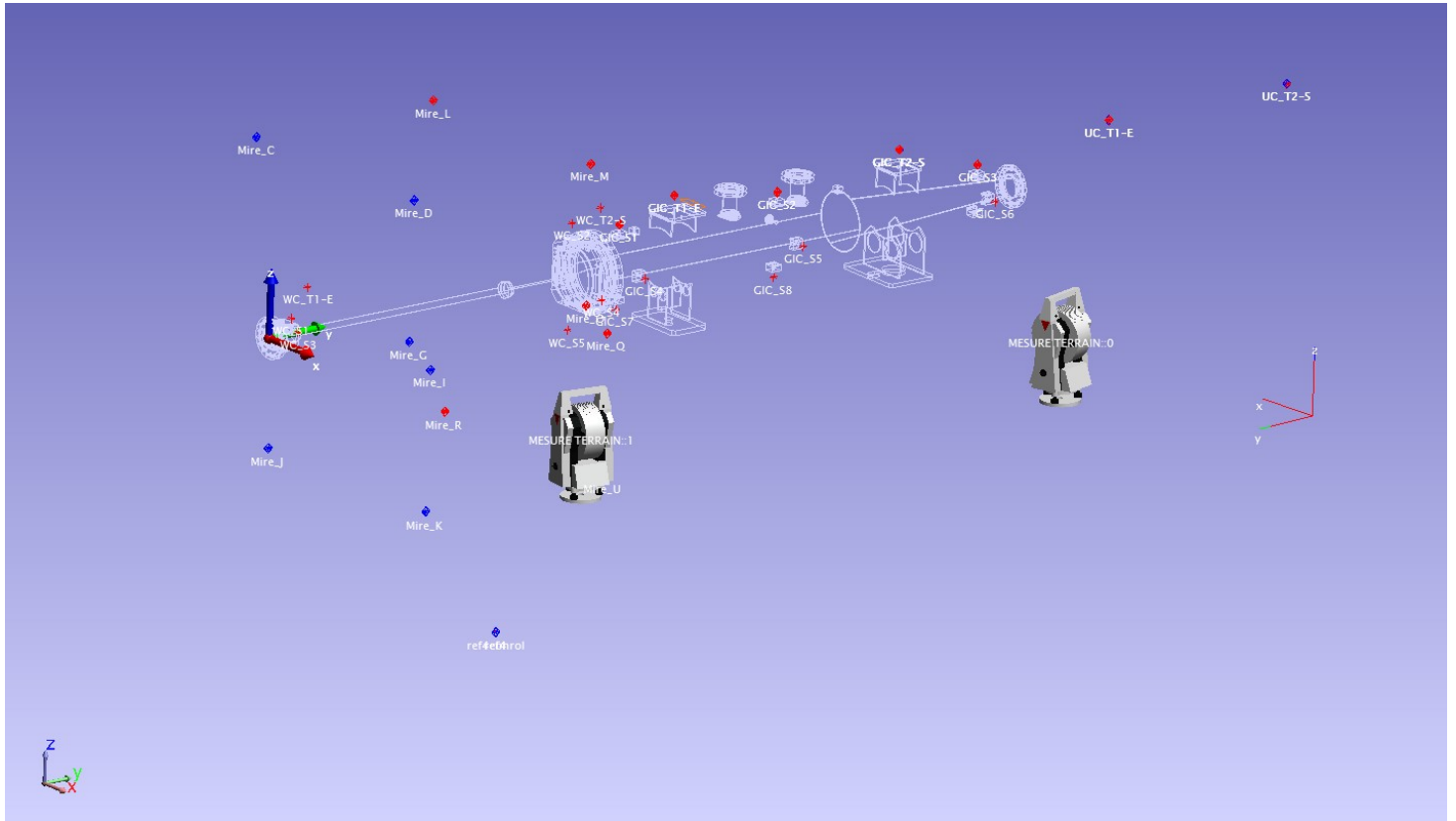
BGV Support Alignment

14/01/2015 P. Dewitte, P. Bestmann

Instrument:AT401 SN 390769

The reference frame is defined locally by the BGVCA_D7L4 and A7L4. The system is oriented to the gravity but the best fit on the theoretical coordinates takes into account only the rotation around the X and Z Axis. The Rotation around the Y axis was fixed in order to install the support vertically (without the theoretical tilt of 0.83deg)

Comment: The theoretical (nominal) position are taken from the CERN DB (in CERN global frame). Then they are transformed to the Local BGV frame: typically one axis is along the theoretical beam axis, and local vertical (gravity).



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Point Group			
DATA_BGV-Alignement Plaque::REF_BGVCA			
Point Name	X	Y	Z
GIC_S1	0.009	1548.877	155.118
GIC_S2	0.485	2248.923	155.079
GIC_S3	1.025	3140.697	105.086
GIC_S4	154.924	1548.757	-0.029
GIC_S5	155.470	2248.730	0.045
GIC_S6	106.046	3140.662	-0.009
GIC_S7	-0.145	1549.013	-154.992
GIC_S8	0.372	2248.951	-154.914
GIC_T1-E	0.214	1788.890	220.115
GIC_T2-S	0.928	2788.081	220.076
UC_T1-E	-1.553	3723.333	169.904
UC_T2-S	-2.191	4513.341	169.680
WC_S1	31.750	69.594	69.521
WC_S2	-0.321	1336.589	195.077
WC_S3	71.711	69.789	29.579
WC_S4	144.908	1365.145	-50.942
WC_S5	-0.049	1336.724	-194.982
WC_T1-E	1.428	160.907	159.826
WC_T2-S	-0.211	1460.596	231.039

Local coordinates of the reference points on the BGVCA_A7L4 and A7L4

Comment: The local frame used here is:
 -- Not tilted
 -- Not sloped
 ==> Our objects appear with a tilt

Point Group			
DATA_BGV-Alignement Plaque::Mires_Plaques			
Point Name	X	Y	Z
Mire_C	-439.979	263.700	574.396
Mire_D	440.021	263.700	574.364
Mire_F	-439.998	263.700	59.396
Mire_G	440.002	263.700	59.364
Mire_H	-440.002	363.700	-59.364
Mire_I	439.998	363.700	-59.396
Mire_J	-440.021	363.700	-574.364
Mire_K	439.979	363.700	-574.396
Mire_L	-439.979	1051.700	574.396
Mire_M	440.021	1051.700	574.364
Mire_N	-439.998	1051.700	59.396
Mire_O	440.002	1051.700	59.364
Mire_P	-440.002	1151.700	-59.364
Mire_Q	439.998	1151.700	-59.396
Mire_R	-440.021	1151.700	-574.364
Mire_U	439.979	1151.700	-574.396

Local coordinates of the support references in tilted system (LHC-Plane)

Comment: Here are given the THEORETICAL values in the Tilted Local BGV frame

Line			
DATA_BGV-Alignement Plaque::Z suivant verticale local (- 0.83 deg)			
	X	Y	Z
Begin	0.000	0.000	-0.000
End	-725.159	-0.000	49994.741
Direction	-0.014503	-0.000000	0.999895
Proj. Ang. (deg.)	Rx from Y	Ry from Z	Rz from X
	90.0000	-0.8310	-180.0000
Length	50000.000		

Control of the correct tilt applied

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Transform			
MESURE TERRAIN::0 - Leica emScon AT401			
# Meas.	18		
Position	X	Y	Z
	2143.887	1799.996	304.145
Rotation	Rx	Ry	Rz
	-0.0709	1.6612	-175.1483
Scale Factor	1.000000		

Observations									
MESURE TERRAIN::0 - Leica emScon AT401									
Collection	Group	Target	Azimuth [deg]	Elevation [deg]	Distance [Millimeters]	Offset1 [Millimeters]	Offset2 [Millimeters]		
MESURE TERRAIN	ST1	UC_T2-S	-303.5326	91.3663	3461.815	19.050	19.050		0'
MESURE TERRAIN	ST1	UC_T1-E	-313.3168	91.5802	2884.125	19.050	19.050		0'
MESURE TERRAIN	ST1	GIC_T2-S	-313.3168	91.5803	2884.125	19.050	19.050		0'
MESURE TERRAIN	ST1	GIC_T2-S	-330.4256	90.6312	2362.413	19.050	19.050		0'
MESURE TERRAIN	ST1	GIC_T1-E	-355.4463	90.5927	2145.707	19.050	19.050		0'
MESURE TERRAIN	ST1	GIC_S3	-323.1846	93.2190	2535.449	19.050	19.050		0'
MESURE TERRAIN	ST1	GIC_S2	-343.3447	92.3243	2194.824	19.050	19.050		0'
MESURE TERRAIN	ST1	GIC_S1	-1.8285	92.2863	2162.889	19.050	19.050		0'
MESURE TERRAIN	ST1	ref1	-244.4345	77.0356	2275.694	19.050	19.050		0'
MESURE TERRAIN	ST1	ref2	-91.7269	95.3426	6458.474	19.050	19.050		0'
MESURE TERRAIN	ST1	ref3	-54.4464	106.9801	4496.069	19.050	19.050		0'
MESURE TERRAIN	ST1	ref4	-27.5602	122.7053	2438.683	19.050	19.050		0'
MESURE TERRAIN	ST1	Mire_Q	-15.9679	99.4906	1853.373	19.050	19.050		0'
MESURE TERRAIN	ST1	Mire_U	-15.9428	114.0890	2010.596	19.050	19.050		0'
MESURE TERRAIN	ST1	Mire_R	-9.2336	106.7965	2795.892	19.050	19.050		0'
MESURE TERRAIN	ST1	Mire_M	-18.9056	79.9669	1884.023	19.050	19.050		0'
MESURE TERRAIN	ST1	Mire_O	-18.8660	95.7212	1872.334	19.050	19.050		0'
MESURE TERRAIN	ST1	Mire_L	-11.3065	82.7551	2705.701	19.050	19.050		0'

Transform			
MESURE TERRAIN::1 - Leica emScon AT401			
# Meas.	15		
Position	X	Y	Z
	2111.087	-302.512	296.511
Rotation	Rx	Ry	Rz
	-1.2991	-1.0380	58.6855
Scale Factor	1.000000		

Observations									
MESURE TERRAIN::1 - Leica emScon AT401									
Collection	Group	Target	Azimuth [deg]	Elevation [deg]	Distance [Millimeters]	Offset1 [Millimeters]	Offset2 [Millimeters]		
MESURE TERRAIN	ST2	UC_T2-S	-55.0492	90.9109	5260.426	19.050	19.050		0'
MESURE TERRAIN	ST2	UC_T1-E	-59.0484	91.0157	4547.978	19.050	19.050		0'
MESURE TERRAIN	ST2	GIC_T2-S	-65.6861	90.4147	3743.777	19.050	19.050		0'
MESURE TERRAIN	ST2	GIC_T1-E	-76.6171	90.4484	2972.818	19.050	19.050		0'
MESURE TERRAIN	ST2	ref1	-20.2555	83.1739	4286.440	19.050	19.050		0'
MESURE TERRAIN	ST2	ref2	-221.5085	97.8771	4395.610	19.050	19.050		0'
MESURE TERRAIN	ST2	ref3	-157.7352	116.0602	2991.149	19.050	19.050		0'
MESURE TERRAIN	ST2	ref4	-90.7878	123.7561	2373.255	19.050	19.050		0'
MESURE TERRAIN	ST2	Mire_I	-99.6573	99.5876	1825.899	19.050	19.050		0'
MESURE TERRAIN	ST2	Mire_K	-99.7944	114.3865	1983.628	19.050	19.050		0'
MESURE TERRAIN	ST2	Mire_J	-106.8094	106.9549	2765.412	19.050	19.050		0'
MESURE TERRAIN	ST2	ref4conrol	-90.7869	123.7560	2373.238	19.050	19.050		0'
MESURE TERRAIN	ST2	Mire_C	-108.7514	82.5049	2627.396	19.050	19.050		0'
MESURE TERRAIN	ST2	Mire_D	-102.4770	79.3526	1787.204	19.050	19.050		0'
MESURE TERRAIN	ST2	Mire_G	-102.6171	95.9811	1772.267	19.050	19.050		0'

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Point Group MESURE TERRAIN::Mires Plaques nontilte			
Point Name	X	Y	Z
Mire_C	-448.263	263.700	567.955
Mire_D	431.645	263.700	580.685
Mire_F	-440.813	263.700	53.009
Mire_G	439.095	263.700	65.739
Mire_H	-439.095	363.700	-65.739
Mire_I	440.813	363.700	-53.009
Mire_J	-431.645	363.700	-580.685
Mire_K	448.263	363.700	-567.955
Mire_L	-448.263	1051.700	567.955
Mire_M	431.645	1051.700	580.685
Mire_N	-440.813	1051.700	53.009
Mire_O	439.095	1051.700	65.739
Mire_P	-439.095	1151.700	-65.739
Mire_Q	440.813	1151.700	-53.009
Mire_R	-431.645	1151.700	-580.685
Mire_U	448.263	1151.700	-567.955

Local coordinates of support references
in vertical system (local Vertical)

Comment: Here are given the THEORETICAL values in the Local BGV frame (Not Tilted)

Note: the Intermediate plates have tilt, but no slope!

Point Group MESURE TERRAIN::ST1			
Point Name	X	Y	Z
GIC_S1	0.782	1548.991	155.194
GIC_S2	0.660	2248.995	155.040
GIC_S3	1.139	3140.690	104.960
GIC_T1-E	-0.147	1788.997	220.164
GIC_T2-S	-0.295	2788.126	220.012
Mire_L	-442.881	1051.875	568.266
Mire_M	437.196	1051.457	580.612
Mire_O	444.364	1051.391	65.724
Mire_Q	444.792	1151.466	-52.893
Mire_R	-427.877	1151.675	-580.573
Mire_U	452.328	1151.453	-567.931
ref1	2913.117	3872.405	844.690
ref2	2898.045	-4585.848	-299.287
ref3	-12.644	-1892.414	-1085.140
ref4	450.225	705.013	-1066.876
UC_T1-E	-1.241	3723.166	169.904
UC_T2-S	-1.983	4513.178	169.785

Measured coordinates of station one (Downstream side)

Comment: Here are given MEASUREMENTS made from Survey Station 1

("Downstream" is according to the Survey convention, i.e. along beam1, which is opposite to the BGV convention)

Note that here we have also measurements of the chamber references (used to setup the Local BGV Frame)

Point Group MESURE TERRAIN::ST2			
Point Name	X	Y	Z
GIC_T1-E	-0.159	1789.008	220.163
GIC_T2-S	-0.314	2788.120	220.012
Mire_C	-440.215	263.489	568.002
Mire_D	440.003	263.822	580.834
Mire_G	447.583	263.637	65.953
Mire_I	447.333	363.478	-53.180
Mire_J	-425.439	363.654	-580.852
Mire_K	454.749	363.666	-568.086
ref1	2913.113	3872.391	844.698
ref2	2898.058	-4585.860	-299.304
ref3	-12.650	-1892.423	-1085.117
ref4	450.243	705.023	-1066.869
ref4control	450.269	705.046	-1066.855
UC_T1-E	-1.249	3723.169	169.892
UC_T2-S	-1.964	4513.195	169.778

Measured coordinates of station two (Upstream side)

Comment: Here are given MEASUREMENTS made from Survey Station 2

("Upstream" is according to the Survey convention, defined by beam1, which is opposite to the BGV convention)

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Best-Fit Transformation (Summary)				
MESURE TERRAIN::ST1 to DATA_BGV-Alignment Plaque::REF_BGVCA				
1/14/2015 11:11:21 AM				
Results	X	Y	Z	Mag
Count	7	7	7	7
Max Error	1.223	0.166	0.128	1.225
RMS Error	0.587	0.111	0.073	0.602
StdDev Error	0.634	0.120	0.079	0.650
Max Error (all)	1.223	0.166	0.128	1.225
RMS Error (all)	0.587	0.111	0.073	0.602
Unknowns	5		Equations	21
Transformation				
Translation	3415.197	1907.414	292.117	3922.644
Rotation (Fixed XYZ)	-0.1522	0.0000	-175.1586	
Rotation (Euler xyz)	-175.1586	0.0128	0.1517	
Rotation (Angle axis)	-0.000056	0.001328	-0.999999	175.1586
Matrix	-0.996432	0.084398	0.000224	3415.197290
	-0.084399	-0.996429	-0.002647	1907.413912
	0.000000	-0.002657	0.999996	292.116610
	0.000000	0.000000	0.000000	1.000000
Scale Factor	1.000000			

Best fit of station one to BGVCA
References

Best-Fit Transformation (Details)											
MESURE TERRAIN::ST1 to DATA_BGV-Alignment Plaque::REF_BGVCA											
1/14/2015 11:11:21 AM											
Name	On	Nom X	Nom Y	Nom Z	Wt X	Wt Y	Wt Z	dX	dY	dZ	dMag
GIC_S1	X	2.259	1548.877	155.102	1.000	1.000	1.000	0.774	0.113	0.064	0.785
GIC_S2	X	2.734	2248.923	155.056	1.000	1.000	1.000	0.175	0.072	-0.042	0.194
GIC_S3	X	2.549	3140.697	105.060	1.000	1.000	1.000	0.112	-0.007	-0.128	0.170
GIC_T1-E	X	3.406	1788.890	220.089	1.000	1.000	1.000	-0.360	0.107	0.055	0.380
GIC_T2-S	X	4.119	2788.081	220.039	1.000	1.000	1.000	-1.223	0.045	-0.046	1.225
UC_T1-E	X	0.911	3723.333	169.909	1.000	1.000	1.000	0.312	-0.166	-0.005	0.354
UC_T2-S	X	0.270	4513.341	169.694	1.000	1.000	1.000	0.210	-0.163	0.102	0.285

Deviation between measured and theoretical coordinates of support references:



Points: MESURE TERRAIN::Mires_Plaques_nontilte::Mire_R to MESURE TERRAIN::ST1::Mire_R
1/14/2015 12:15:53 PM
dx 3.770, dy -0.025, dz 0.058, dMag 3.770

Points: MESURE TERRAIN::Mires_Plaques_nontilte::Mire_Q to MESURE TERRAIN::ST1::Mire_Q
1/14/2015 12:16:20 PM
dx 3.980, dy -0.234, dz 0.058, dMag 3.987

Points: MESURE TERRAIN::Mires_Plaques_nontilte::Mire_U to MESURE TERRAIN::ST1::Mire_U
1/14/2015 1:01:27 PM
dx 4.065, dy -0.247, dz -0.035, dMag 4.072

Points: MESURE TERRAIN::Mires_Plaques_nontilte::Mire_O to MESURE TERRAIN::ST1::Mire_O
1/14/2015 1:06:03 PM
dx 5.150, dy -0.279, dz -0.078, dMag 5.159

Comment:
we have large deviations on the x coordinates. The reason is that we could not do all translations we wanted (one fixation screw per plate is fixed !)

~~BGV-alignement_plaques-TERRAIN_Fini.xit~~

~~Points: MESURE TERRAIN::Mires_Plaques_nontilte::Mire_M to MESURE TERRAIN::ST1::Mire_M
1/14/2015 1:05:22 PM
dx 5.480, dy -0.214, dz -0.160, dMag 5.486~~

~~Points: MESURE TERRAIN::Mires_Plaques_nontilte::Mire_L to MESURE TERRAIN::ST1::Mire_L
1/14/2015 1:06:46 PM
dx 5.285, dy -2.448, dz 0.304, dMag 5.833~~

~~Points: MESURE TERRAIN::ST1::Mire_L to MESURE TERRAIN::Mires_Plaques_nontilte::Mire_L
1/14/2015 1:09:31 PM
dx -5.277, dy 2.431, dz -0.304, dMag 5.818~~

Points: MESURE TERRAIN::Mires_Plaques_nontilte::Mire_M to MESURE TERRAIN::ST1::Mire_M
1/14/2015 1:18:15 PM
dx 5.549, dy -0.243, dz -0.154, dMag 5.556

Points: MESURE TERRAIN::Mires_Plaques_nontilte::Mire_O to MESURE TERRAIN::ST1::Mire_O
1/14/2015 1:18:32 PM
dx 5.268, dy -0.309, dz -0.091, dMag 5.278

Points: MESURE TERRAIN::Mires_Plaques_nontilte::Mire_L to MESURE TERRAIN::ST1::Mire_L
1/14/2015 1:18:52 PM
dx 5.386, dy 0.175, dz 0.233, dMag 5.394

Comment:
Repeating values:
always take the
latest (see the
timestamp)

Best-Fit Transformation1 (Summary)				
MESURE TERRAIN::ST2 to MESURE TERRAIN::ST1				
1/14/2015 3:31:36 PM				
Results	X	Y	Z	Mag
Count	8	8	8	8
Max Error	0.019	0.017	0.023	0.027
RMS Error	0.013	0.011	0.012	0.021
StdDev Error	0.014	0.012	0.013	0.023
Max Error (all)	0.019	0.017	0.023	0.027
RMS Error (all)	0.013	0.011	0.012	0.021
	Unknowns	6	Equations	24
Transformation				
Translation	1453.910	-1388.828	253.014	2026.503
Rotation (Fixed XYZ)	-0.6000	-1.4392	58.6732	
Rotation (Euler xyz)	58.6758	-1.2608	0.9175	
Rotation (Angle axis)	0.003242	-0.027578	0.999614	58.6845
Matrix	0.519755	-0.854032	-0.022004	1453.910305
	0.853946	0.520115	-0.016009	-1388.828459
	0.025116	-0.010469	0.999630	253.013625
	0.000000	0.000000	0.000000	1.000000
Scale Factor				1.000000

Best fit of station two to BGVCA
references and local network points

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Best-Fit Transformation1 (Details)
 MESURE TERRAIN::ST2 to MESURE TERRAIN::ST1
 1/14/2015 3:31:36 PM

Name	On	Nom X	Nom Y	Nom Z	Wt X	Wt Y	Wt Z	dX	dY	dZ	dMag
UC_T2-S	X	0.480	4513.178	169.796	1.000	1.000	1.000	0.019	0.017	-0.007	0.027
UC_T1-E	X	1.224	3723.166	169.904	1.000	1.000	1.000	-0.008	0.002	-0.012	0.015
GIC_T2-S	X	2.896	2788.126	219.993	1.000	1.000	1.000	-0.019	-0.006	-0.000	0.020
GIC_T1-E	X	3.046	1788.997	220.143	1.000	1.000	1.000	-0.012	0.011	-0.001	0.017
ref1	X	2925.062	3872.405	802.352	1.000	1.000	1.000	-0.004	-0.014	0.008	0.017
ref2	X	2893.400	-4585.848	-341.286	1.000	1.000	1.000	0.013	-0.012	-0.018	0.025
ref3	X	-28.381	-1892.414	-1084.842	1.000	1.000	1.000	-0.005	-0.009	0.023	0.025
ref4	X	434.705	705.013	-1073.293	1.000	1.000	1.000	0.017	0.010	0.006	0.021

Deviation between measured and theoretical support references

Points: MESURE TERRAIN::ST2::Mire_I to MESURE TERRAIN::Mires_Plaques_nontilte::Mire_I
 1/14/2015 4:02:57 PM

dx -6.517, dy 0.222, dz 0.266, dMag 6.526

Points: MESURE TERRAIN::ST2::Mire_K to MESURE TERRAIN::Mires_Plaques_nontilte::Mire_K
 1/14/2015 4:03:11 PM

dx -6.483, dy 0.034, dz 0.225, dMag 6.487

Points: MESURE TERRAIN::ST2::Mire_J to MESURE TERRAIN::Mires_Plaques_nontilte::Mire_J
 1/14/2015 4:03:22 PM

dx -6.203, dy 0.046, dz 0.257, dMag 6.209

Points: MESURE TERRAIN::ST2::Mire_G to MESURE TERRAIN::Mires_Plaques_nontilte::Mire_G
 1/14/2015 5:37:58 PM

dx -8.490, dy 0.063, dz -0.091, dMag 8.491

Points: MESURE TERRAIN::ST2::Mire_D to MESURE TERRAIN::Mires_Plaques_nontilte::Mire_D
 1/14/2015 5:38:06 PM

dx -8.359, dy -0.122, dz -0.028, dMag 8.360

Points: MESURE TERRAIN::ST2::Mire_C to MESURE TERRAIN::Mires_Plaques_nontilte::Mire_C
 1/14/2015 5:38:15 PM

dx -8.048, dy 0.211, dz 0.070, dMag 8.051

Drift check od Network point ref4

Points: MESURE TERRAIN::ST2::ref4conrol to MESURE TERRAIN::ST2::ref4
 1/14/2015 4:14:47 PM

dx -0.026, dy -0.023, dz -0.014, dMag 0.037