Supporting information for

Standoff Femtosecond Filament-Induced Breakdown Spectroscopy for Classification of Geological Materials

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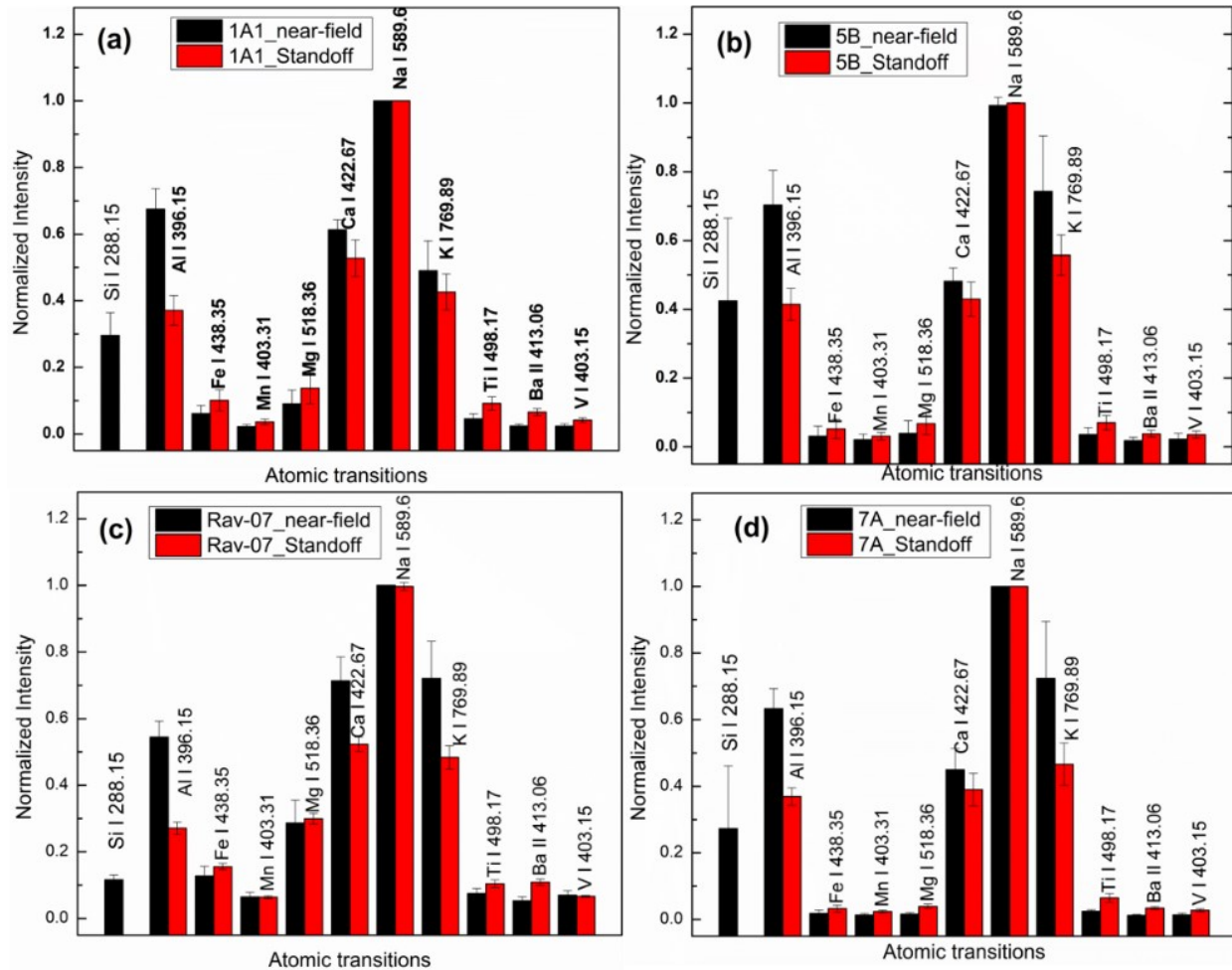Corresponding Author e-mail: **soma_venu@uohyd.ac.in**

Figure 1 Averaged peak-intensity ratios obtained for various major and minor elements present in the (a) Tonalite (1A1), (b) Granite (5B), c) Mafic enclave (Rav-07) and d) Granodiorite (7A) rock samples. The black bars correspond to the ratios obtained in near-field mode whereas red bars indicate the ratios obtained in standoff mode.

Table 1 Mean, deviation and RSD of each elemental peak considered for the correlation analysis. The table also shows the maximum, minimum and average RSD obtained for each sample in the near-field configuration.

Near-field	1A1			5B			Rav-07			7A		
	Mean	deviation	RSD	Mean	deviation	RSD	Mean	deviation	RSD	Mean	deviation	RSD
Si 288 nm	0.3	0.07	23.14	0.42	0.24	56.59	0.12	0.01	12.13	0.27	0.19	68.57
Al I 396.15	0.68	0.06	9.2	0.72	0.09	12.92	0.55	0.04	7.72	0.64	0.07	10.28
Fe I 438.35	0.06	0.02	39.89	0.03	0.02	47.08	0.13	0.03	20.82	0.02	0.01	54.84
Mn I 403.31	0.02	0.01	29.58	0.02	0.01	63.17	0.07	0.01	18.66	0.01	0.01	37.38
Mg I 518.36	0.09	0.04	45.58	0.04	0.03	64.52	0.29	0.06	21.71	0.02	0.01	31.48
Ca I 428.3	0.13	0.01	9.48	0.08	0.01	17.1	0.22	0.03	15.66	0.07	0.02	27.76
Na I 818.32	0.56	0.03	5.59	0.53	0.08	14.1	0.39	0.06	16.44	0.52	0.07	13.52

peak	Mean	deviation	RSD	Mean	deviation	RSD	Mean	deviation	RSD	Mean	deviation	RSD
K II 460.85	0.21	0.01	6.99	0.16	0.02	12.09	0.14	0.03	18.11	0.13	0.02	13.04
Ti I 498.17	0.05	0.01	32.68	0.04	0.02	55.36	0.08	0.01	16.89	0.03	0	18.52
Max (RSD)			45.58			64.52			21.71			68.57
Min (RSD)			5.59			12.09			7.72			10.28
Average (RSD)			22.46			38.1			16.46			30.6

Table 2. Mean, deviation and RSD of each elemental peak considered for the correlation analysis. The table also shows the maximum, minimum and average RSD obtained for each sample in the standoff configuration.

Standoff	1A1			5B			Rav-07			7A		
peak	Mean	deviation	RSD	Mean	deviation	RSD	Mean	deviation	RSD	Mean	deviation	RSD
Al I 396.15	0.39	0.03	8.02	0.41	0.05	11.25	0.28	0.02	5.69	0.38	0.02	6.17
Fe I 438.35	0.11	0.03	24.01	0.05	0.03	52.58	0.16	0.01	4.66	0.03	0.01	29.68
Mn I 403.31	0.04	0.01	17.86	0.03	0.01	35.75	0.07	0	4.19	0.03	0	15.67
Mg I 518.36	0.15	0.04	26.34	0.07	0.03	46.39	0.3	0.02	4.96	0.04	0.01	14.66
Ca I 422.67	0.55	0.04	7.06	0.43	0.05	11.64	0.53	0.02	3.26	0.4	0.04	10.82
Na I 818.32	0.27	0.03	9.5	0.25	0.03	12.22	0.15	0.01	9.05	0.26	0.03	10.17
K II 460.85	0.23	0.01	5.99	0.19	0.01	5.05	0.12	0.01	6.21	0.14	0.01	6.15
Ti I 498.17	0.1	0.02	17.3	0.07	0.02	29.63	0.11	0.01	8.93	0.07	0.01	15.8
Max (RSD)			26.34			52.58			9.05			29.68
Min (RSD)			5.99			5.05			3.26			6.15
Average (RSD)			14.51			25.57			5.87			13.64

Table 3 individual variance as well as cumulative variance accounted by the first ten PCs in both near field (NF) and standoff (STD) case with normalized and unnormalized datasets rounded to two decimal places as well as the integer.

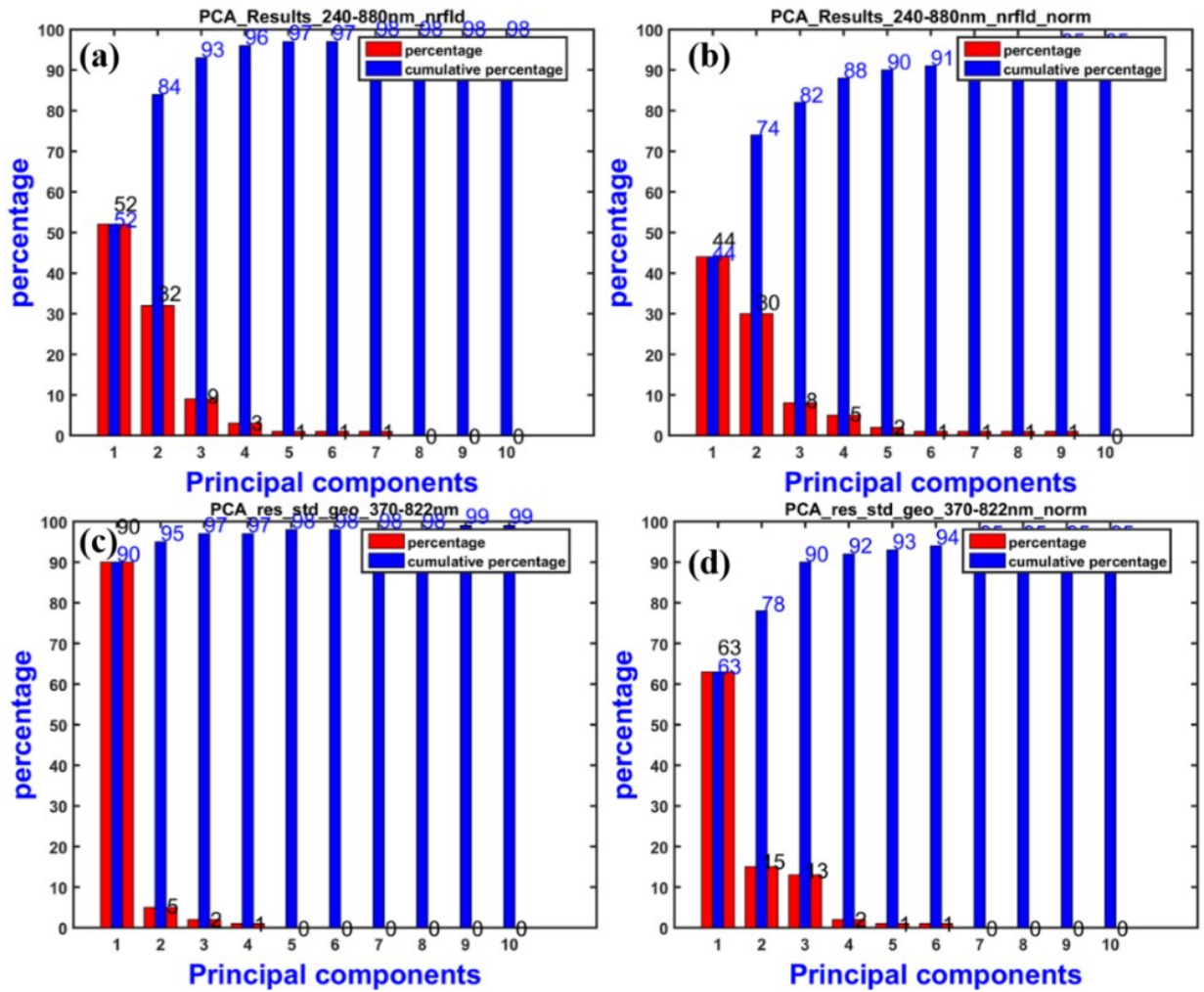|	PCs (Rounded to two decimal places)				Cumulative PCs (Rounded to two decimal places)				PCs (Rounded to integer)				Cumulative PCs (Rounded to integer)			
	NF	NF (Norm)	STD	STD (Norm)	NF	NF (Norm)	STD	STD (Norm)	NF	NF (Norm)	STD	STD (Norm)	NF	NF (Norm)	STD	STD (Norm)
1	51.79	43.99	89.94	62.88	51.79	43.99	89.94	62.88	52	44	90	63	52	44	90	63
2	31.76	29.97	4.79	14.79	83.55	73.96	94.73	77.67	32	30	5	15	84	74	95	78
3	9.27	8.49	1.84	12.6	92.82	82.46	96.57	90.27	9	8	2	13	93	82	97	90
4	2.88	5.42	0.82	2.04	95.7	87.88	97.39	92.3	3	5	1	2	96	88	97	92
5	0.91	2.2	0.46	1.11	96.6	90.08	97.85	93.41	1	2	0	1	97	90	98	93
6	0.68	1.36	0.26	0.66	97.28	91.44	98.11	94.07	1	1	0	1	97	91	98	94
7	0.58	1.19	0.23	0.46	97.87	92.63	98.34	94.53	1	1	0	0	98	93	98	95
8	0.3	1.05	0.13	0.33	98.17	93.68	98.46	94.86	0	1	0	0	98	94	98	95
9	0.2	0.88	0.08	0.2	98.37	94.56	98.54	95.06	0	1	0	0	98	95	99	95
10	0.13	0.44	0.06	0.14	98.5	95	98.6	95.2	0	0	0	0	**98**	**95**	**99**	**95**

Figure 2 First ten principal components obtained in PCA analysis of (a) un-normalized and (b) normalized fs LIBS data obtained in near-field (c) un-normalized and (d) normalized fs FIBS data obtained in standoff configuration.