thors	Energy Range (eV)	Technique	Temperature (K) RT unless specified	Sample				Data Presentation	Remarks Hf
				Film	X-tal	Bulk	Prep		
LT66	0.06-0.25	Ellips				x	MP	$\varepsilon_2/\lambda, \varepsilon_1$	
LTA66	0.1-3.5	Ellips				x	MP	$\varepsilon_2/\lambda, \varepsilon_1$	
Le67	<4	Ellips				x	MP	ε_2/λ	data taken from LT66 and LTA66
GL68	2-5.6	m-θ				x	MP	$\varepsilon_2/\lambda, \varepsilon_1$	
ABF72			1000<T<2200			x		ε at λ = 6500 Å	emissivity
LOW75	0.15-30	Refl	4.2 K for $h\nu$ < 4.4 eV 300 K for $h\nu$ > 4.4 eV		x	x	EP	A,R; KK; $\varepsilon_1, \varepsilon_2, \sigma$, $\mathrm{Im}(\varepsilon^{-1}), \mathrm{Im}(\varepsilon+1)^{-1}$	absorptivity by calorimetry for $h\nu$ < 4.4 eV reflectivity for $h\nu$ > 4.4 eV with synchrotron radiation
LT75	6.5-24.8	m-θ				x	In	R,n,k, $\varepsilon_1, \varepsilon_2$, $\mathrm{Im}(\varepsilon^{-1})$	heating ∿1820 K at ∿10^{-8} Torr in situ
W076	20-250	Trans		x			Ex	μ	optical absorption measurements with synchrotron radiation
BDL77	0.03-3.1	Refl				x		R	also emissivity 400-850 K
LO Unpl	0.12-30		4.2 K for $h\nu$ < 4.4 eV RT for $h\nu$ > 4.4 eV		x			R; KK: n,k, $\varepsilon_1, \varepsilon_2$, $\mathrm{Im}(\varepsilon^{-1})$, μ	absorptivity measured by calorimetry for $h\nu$ < 4.4 eV, reflectivity measured for $h\nu$ > 4.4 eV

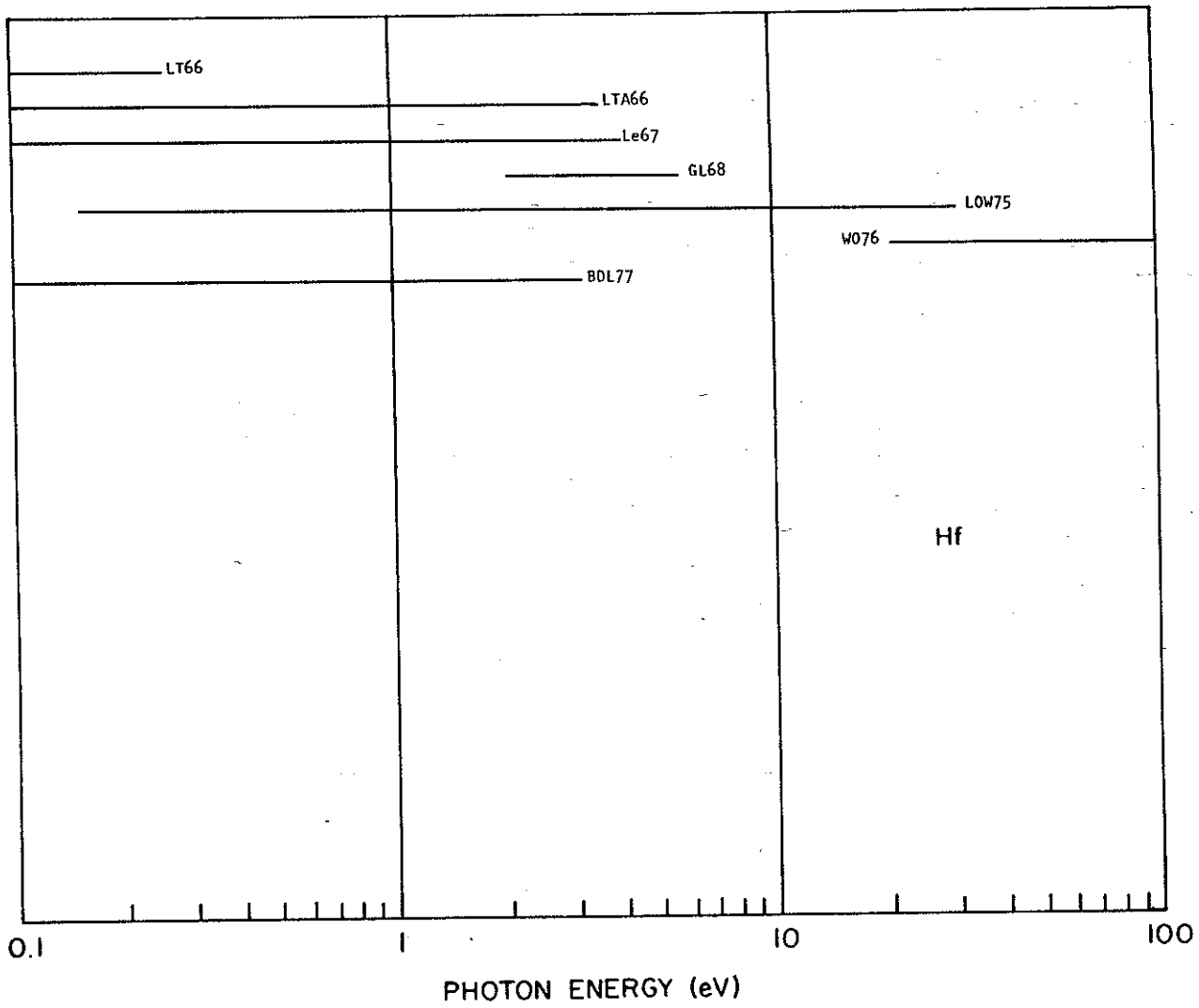

Fig. 68 Survey of available data for Hf

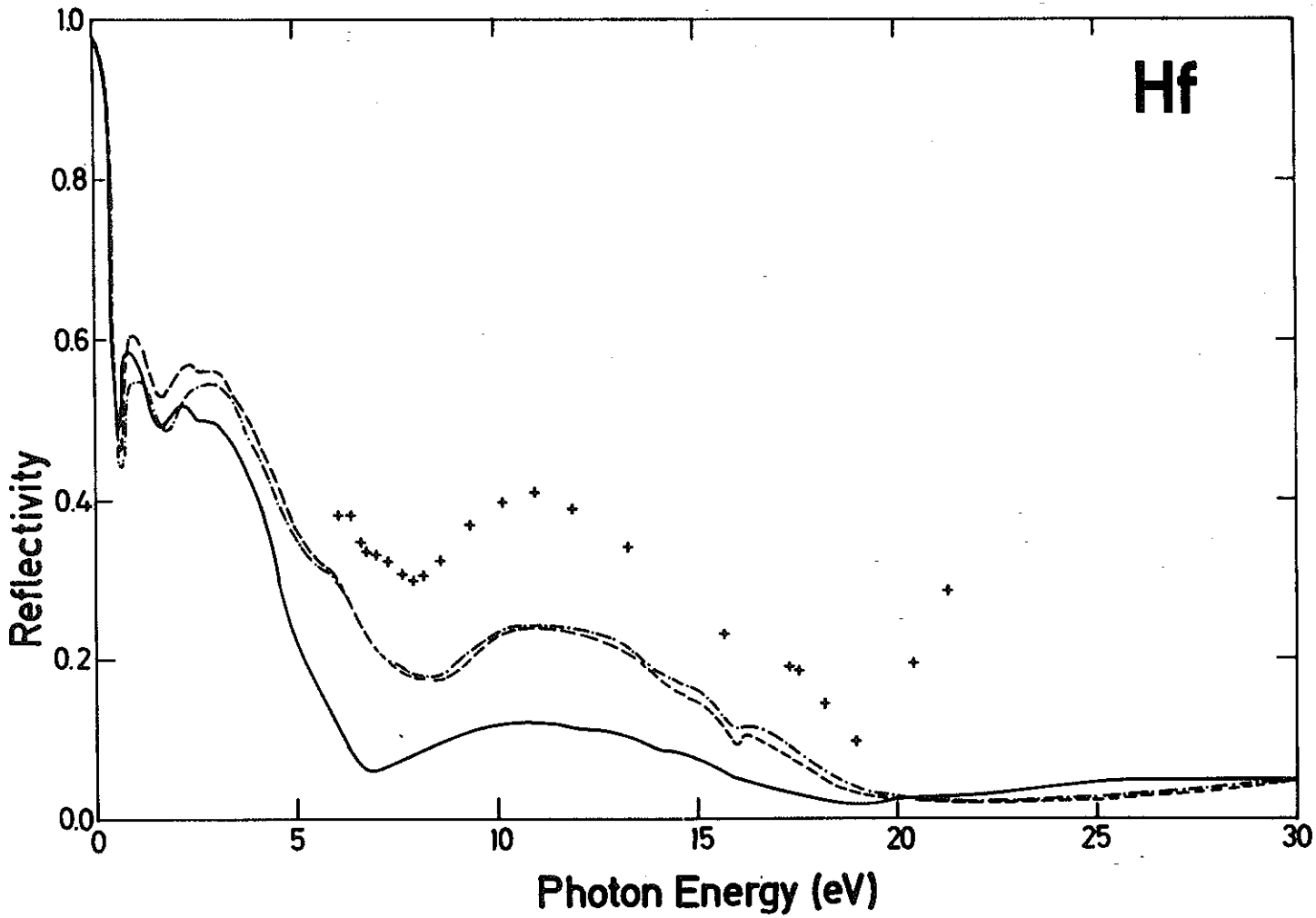

Fig. 69 Reflectivity of Hf. Results for single crystal Hf reported by WOL (unpub) for E∥c (-•-) and E⊥c (---) judged by the authors to be superior to their earlier published polycrystalline data LOW75 (——); single crystal results shown in tabulation for Hf. Polycrystalline data shown as follows: +++ LT75.

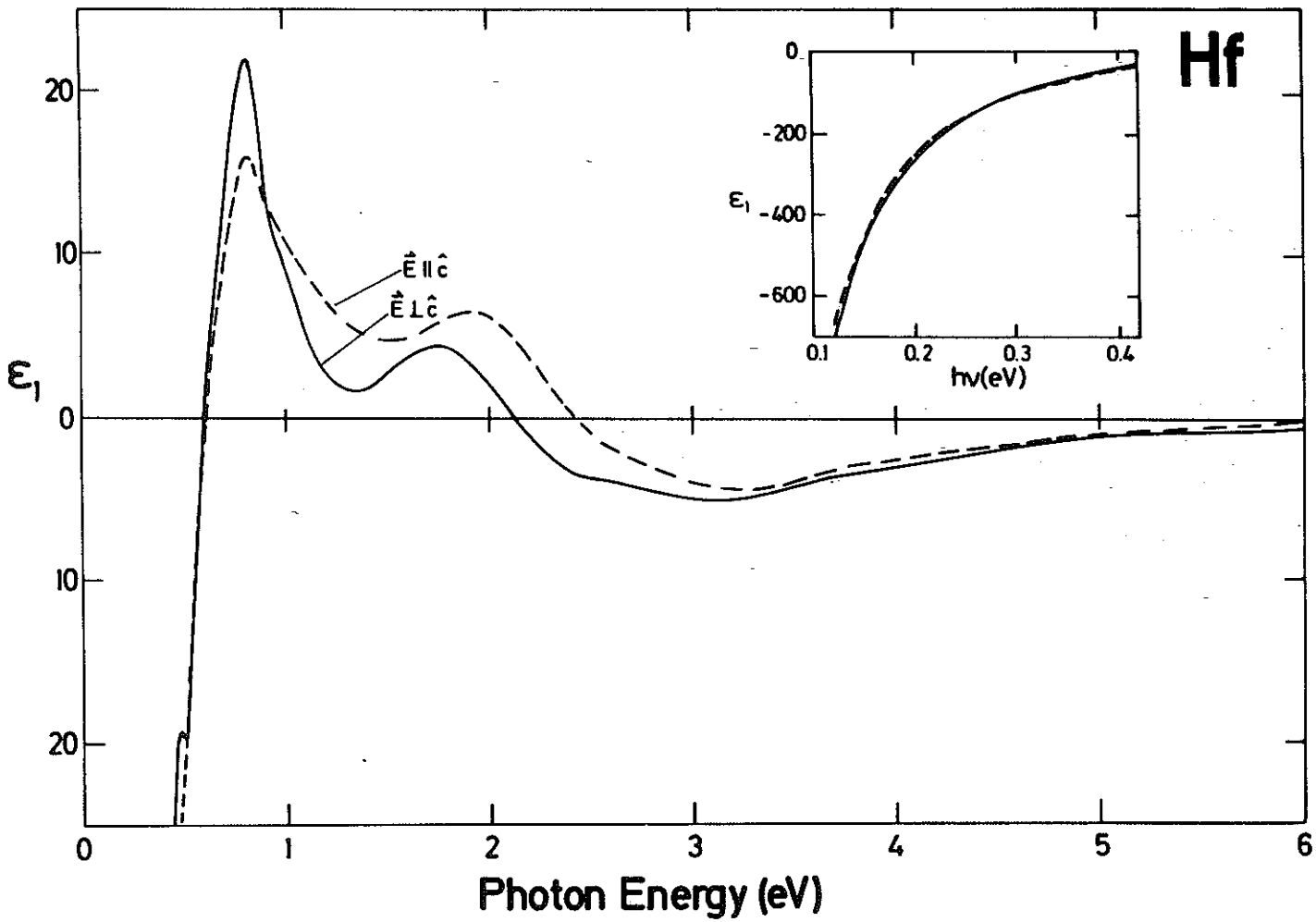

Fig. 70a ε_1 for Hf. Results for single crystal Hf by LOW (unpub) for $\vec{E} \parallel \hat{c}$ (---) and $\vec{E} \perp \hat{c}$ (——) judged by the authors to be superior to their earlier published polycrystalline data LOW75 (Fig 70b); single crystal results shown in tabulation for Hf.

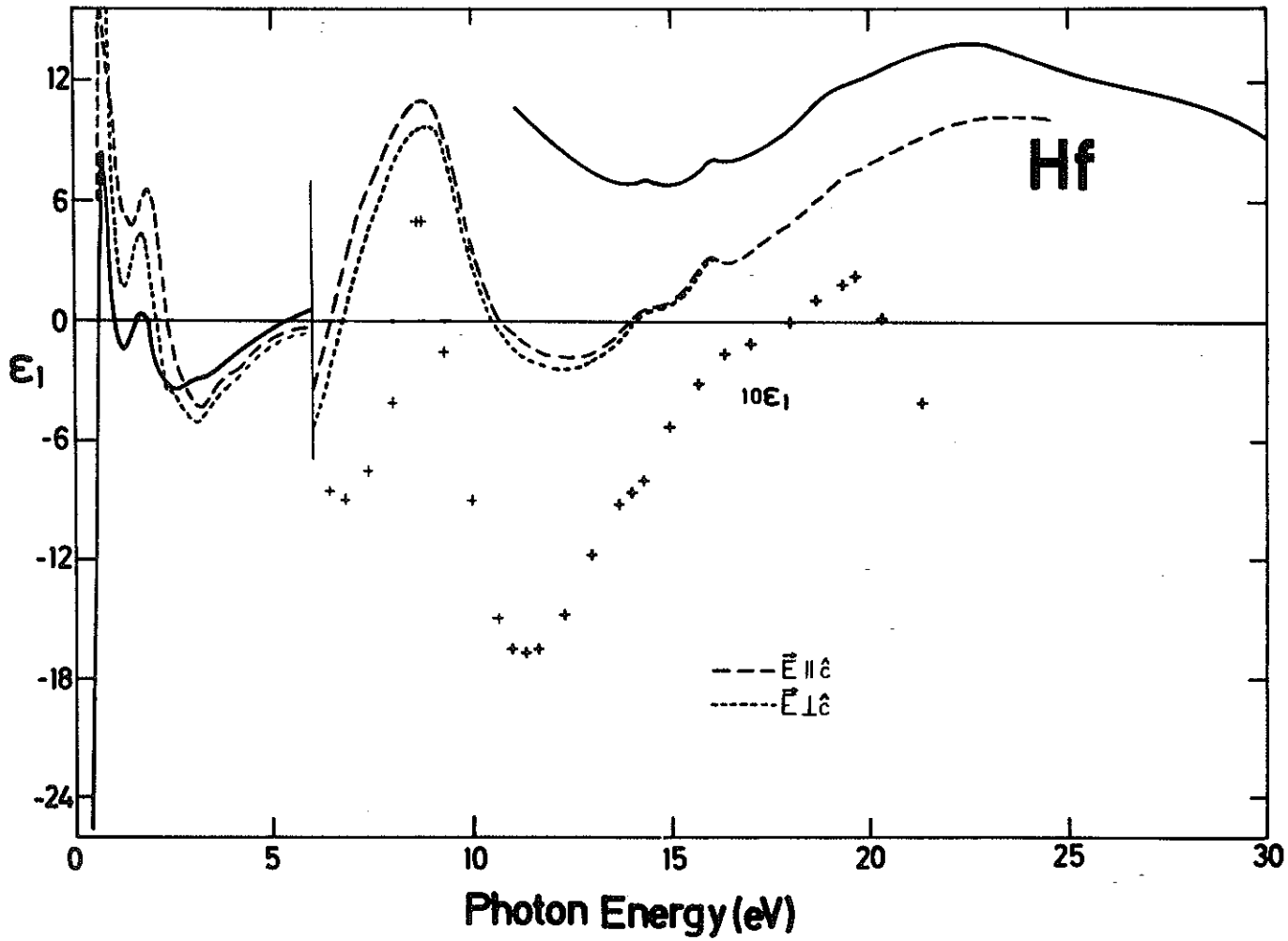

Fig. 70b ε_1 for Hf. Single crystal results (– – – for $\vec{E} \parallel \hat{c}$ and --- for $\vec{E} \perp \hat{c}$) by LOW (unpub) judged to be superior to earlier polycrystalline results (—— LOW75). +++ by LT75.

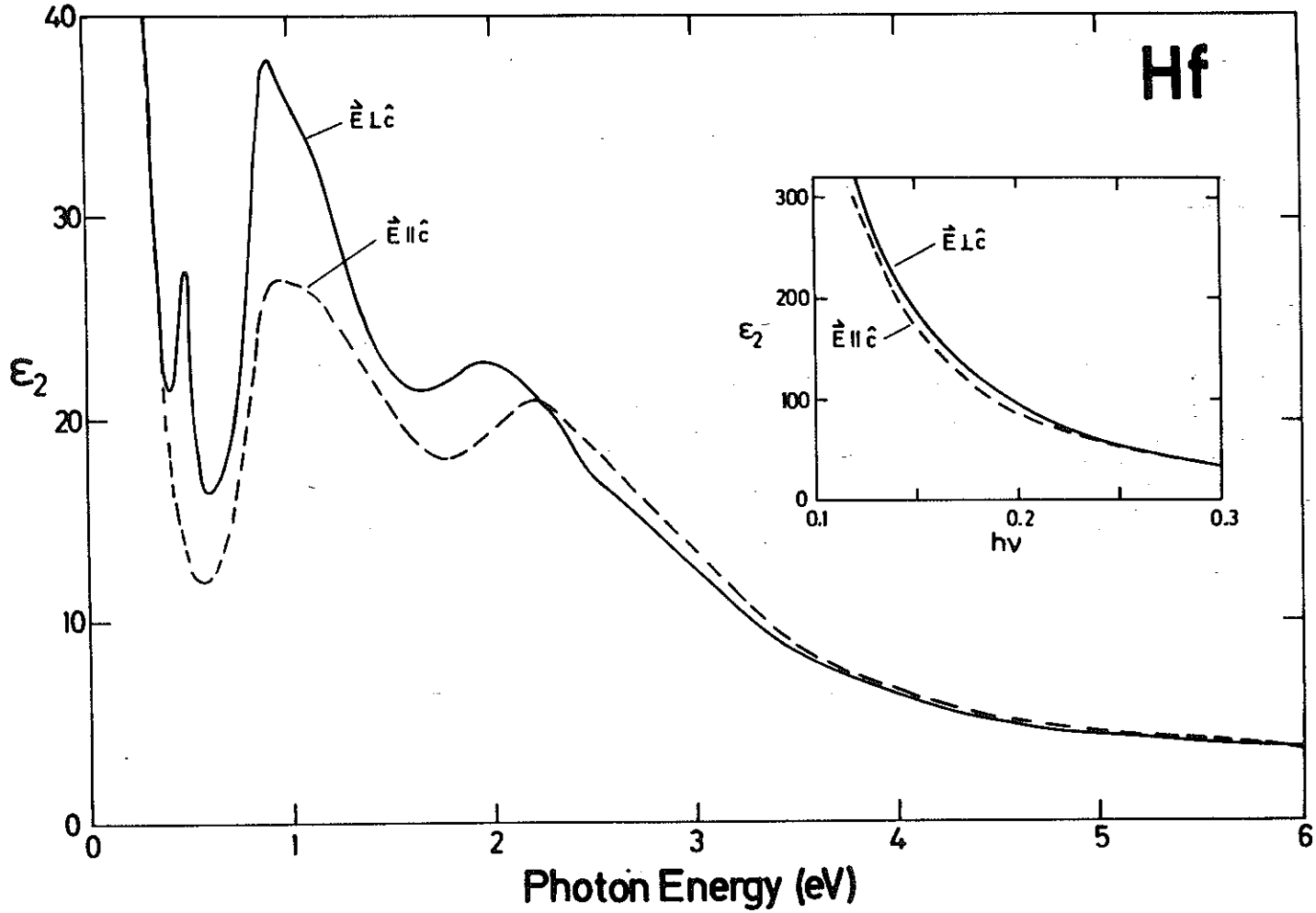

Fig. 71a ε_2 for Hf. Results for single crystal Hf by LOW (unpub) for $\vec{E} \parallel \hat{c}$ (---) and $\vec{E} \perp \hat{c}$ (——) judged by the authors to be superior to their earlier published polycrystalline data LOW75 (Fig 71b); single crystal results shown in tabulation for Hf.

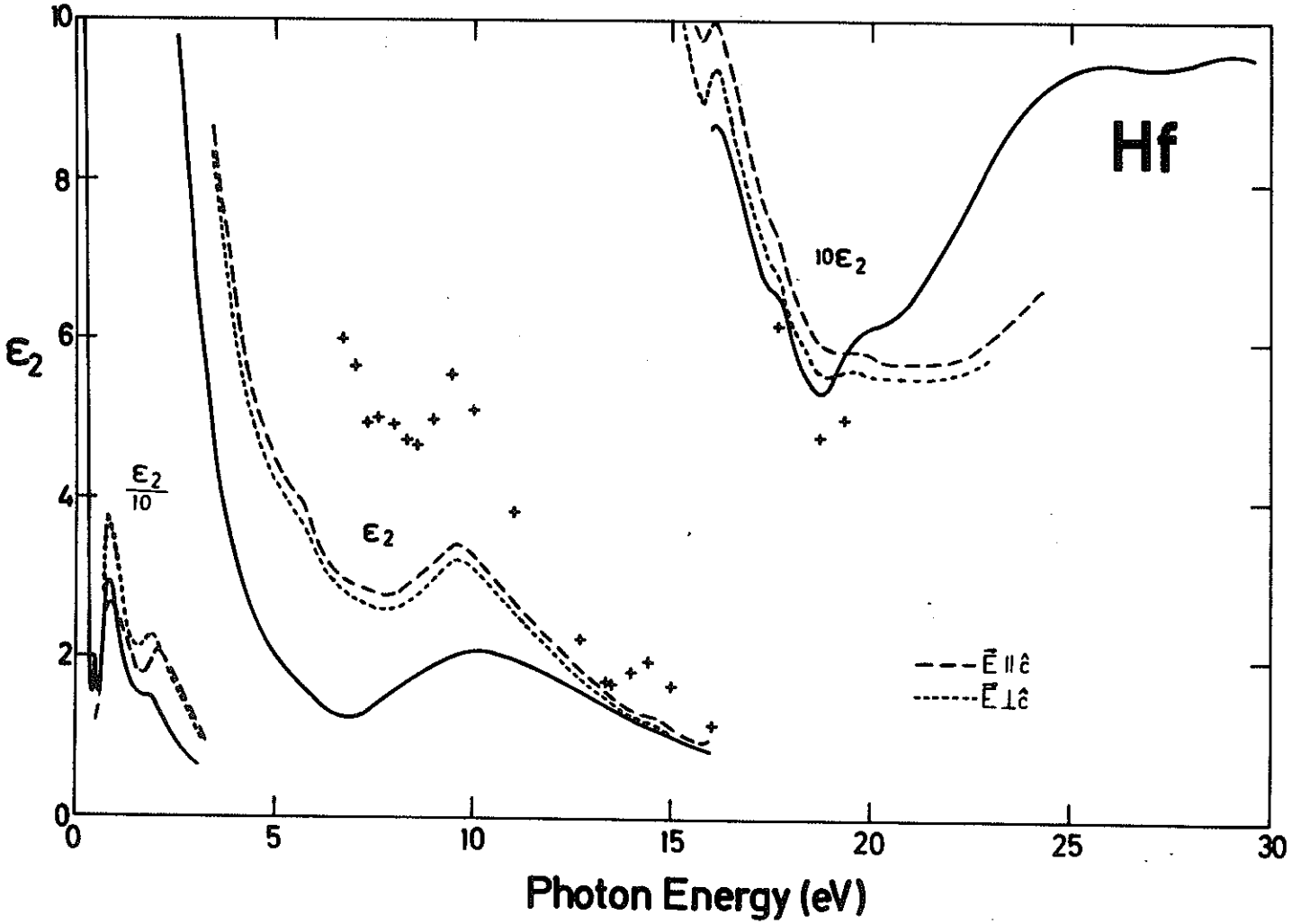

Fig. 71b ε_2 for Hf. Single crystal results (— — — for $\vec{E} \parallel \hat{c}$ and --- for $\vec{E} \perp \hat{c}$) by LOW (unpub) judged to be superior to earlier polycrystalline results (—— LOW75). +++ by LT75.

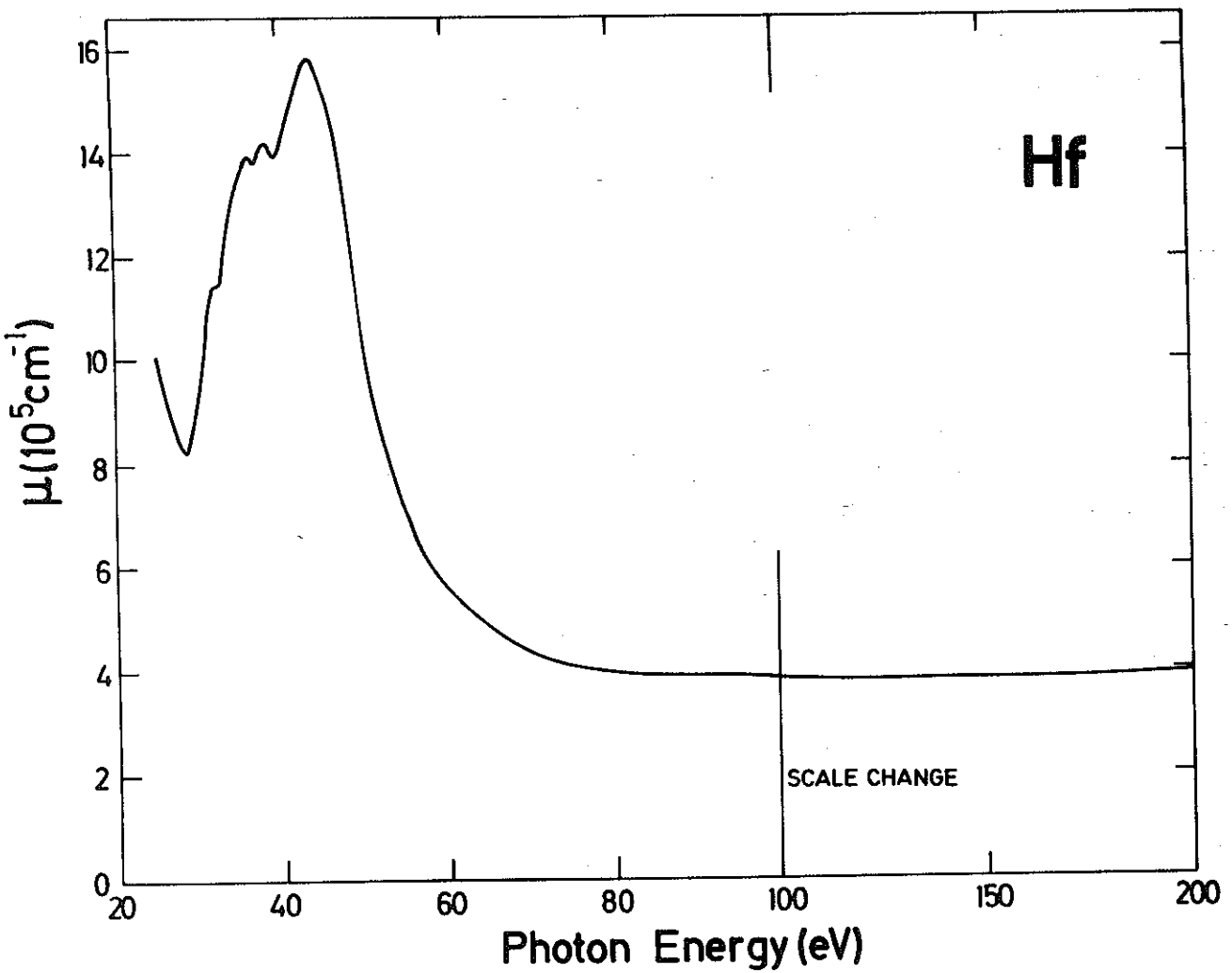

Fig. 72 Absorption coefficient for Hf reported by W076.

Hafnium

single crystal with $\vec{E} \| \hat{c}$. These results by D.W. Lynch, C.G. Olson, and J.H. Weaver (unpub) supersede those of LOW75 [Phys. Rev. B 11, 3617 (1975)]

Energy (eV)	ε_1	ε_2	n	k	$Im(-1/\tilde{\varepsilon})$	$R(\phi=0)$
0.52	-14.71	12.17	1.48	4.11	0.03	.747
0.54	-10.80	12.08	1.64	3.67	0.05	.683
0.56	-7.43	12.06	1.84	3.29	0.06	.615
0.58	-4.23	12.12	2.07	2.92	0.07	.544
0.60	-1.37	12.25	2.34	2.62	0.08	.486
0.62	1.38	12.48	2.64	2.36	0.08	.445
0.64	3.71	13.08	2.94	2.22	0.07	.431
0.66	5.80	13.65	3.21	2.13	0.06	.428
0.68	7.74	14.27	3.46	2.06	0.05	.432
0.70	9.54	15.00	3.70	2.03	0.05	.441
0.72	11.22	15.83	3.91	2.02	0.04	.451
0.74	12.78	16.82	4.12	2.04	0.04	.463
0.76	14.17	18.06	4.31	2.10	0.03	.476
0.78	15.28	19.56	4.48	2.18	0.03	.490
0.80	15.94	21.30	4.61	2.31	0.03	.504
0.82	16.00	23.06	4.69	2.46	0.03	.517
0.84	15.54	24.45	4.72	2.59	0.03	.526
0.86	14.85	25.45	4.71	2.70	0.03	.533
0.88	14.13	26.06	4.68	2.79	0.03	.537
0.90	13.43	26.52	4.64	2.85	0.03	.541
0.93	12.59	26.79	4.59	2.92	0.03	.543
0.95	11.86	26.86	4.54	2.96	0.03	.545
0.98	11.28	26.79	4.49	2.98	0.03	.545
1.00	10.79	26.72	4.45	3.00	0.03	.545
1.02	10.35	26.65	4.41	3.02	0.03	.546
1.05	9.87	26.62	4.37	3.04	0.03	.546
1.08	9.38	26.51	4.33	3.06	0.03	.547
1.10	8.87	26.36	4.28	3.08	0.03	.547
1.15	7.91	25.89	4.18	3.10	0.04	.546
1.20	7.05	25.26	4.08	3.10	0.04	.544
1.25	6.28	24.51	3.97	3.08	0.04	.541
1.30	5.74	23.60	3.87	3.04	0.04	.536
1.35	5.38	22.75	3.79	3.00	0.04	.531
1.40	5.16	21.97	3.72	2.95	0.04	.525
1.45	4.95	21.29	3.66	2.91	0.04	.520
1.50	4.82	20.56	3.60	2.85	0.05	.514
1.55	4.80	19.85	3.55	2.79	0.05	.507
1.60	4.95	19.19	3.52	2.73	0.05	.500
1.65	5.23	18.67	3.51	2.66	0.05	.493
1.70	5.56	18.34	3.52	2.61	0.05	.488
1.75	5.90	18.20	3.54	2.57	0.05	.485
1.80	6.19	18.25	3.57	2.56	0.05	.485
1.85	6.39	18.44	3.60	2.56	0.05	.486
1.90	6.46	18.75	3.63	2.59	0.05	.489
1.95	6.37	19.14	3.64	2.63	0.05	.493
2.00	6.17	19.52	3.65	2.67	0.05	.498
2.05	5.84	19.96	3.65	2.73	0.05	.504
2.10	5.31	20.45	3.64	2.81	0.05	.511
2.15	4.53	20.87	3.60	2.90	0.05	.518

Hf $\vec{E} \parallel \hat{c}$

Energy (eV)	ε_1	ε_2	n	k	Im(-1/$\tilde{\varepsilon}$)	R(ϕ=0)
2.20	3.52	21.07	3.53	2.99	0.05	.526
2.25	2.50	20.92	3.43	3.05	0.05	.531
2.30	1.61	20.58	3.34	3.09	0.05	.534
2.35	0.85	20.12	3.24	3.11	0.05	.536
2.40	0.25	19.63	3.15	3.11	0.05	.537
2.45	-0.30	19.17	3.07	3.12	0.05	.538
2.50	-0.81	18.72	2.99	3.13	0.05	.540
2.55	-1.36	18.24	2.91	3.13	0.05	.542
2.60	-1.78	17.66	2.83	3.12	0.06	.542
2.65	-2.12	17.11	2.75	3.11	0.06	.542
2.70	-2.41	16.60	2.68	3.10	0.06	.542
2.75	-2.72	16.12	2.61	3.09	0.06	.543
2.80	-3.01	15.61	2.54	3.08	0.06	.543
2.85	-3.24	15.10	2.47	3.06	0.06	.543
2.90	-3.46	14.60	2.40	3.04	0.06	.544
2.95	-3.65	14.10	2.34	3.02	0.07	.544
3.00	-3.83	13.61	2.27	3.00	0.07	.544
3.05	-3.98	13.11	2.20	2.97	0.07	.544
3.10	-4.12	12.62	2.14	2.95	0.07	.544
3.15	-4.26	12.10	2.07	2.92	0.07	.544
3.20	-4.35	11.54	2.00	2.89	0.08	.544
3.25	-4.35	10.97	1.93	2.84	0.08	.542
3.30	-4.28	10.44	1.87	2.79	0.08	.538
3.35	-4.16	9.97	1.82	2.73	0.09	.534
3.40	-4.03	9.55	1.78	2.68	0.09	.528
3.45	-3.89	9.16	1.74	2.63	0.09	.523
3.50	-3.73	8.80	1.71	2.58	0.10	.517
3.55	-3.56	8.49	1.68	2.53	0.10	.510
3.60	-3.37	8.22	1.66	2.48	0.10	.503
3.65	-3.21	8.00	1.64	2.43	0.11	.496
3.70	-3.08	7.81	1.63	2.40	0.11	.491
3.75	-2.98	7.62	1.61	2.36	0.11	.486
3.80	-2.88	7.43	1.60	2.33	0.12	.481
3.85	-2.80	7.25	1.58	2.30	0.12	.477
3.90	-2.72	7.08	1.56	2.27	0.12	.473
3.95	-2.66	6.91	1.54	2.24	0.13	.469
4.00	-2.60	6.71	1.52	2.21	0.13	.466
4.05	-2.52	6.51	1.49	2.18	0.13	.461
4.10	-2.41	6.32	1.48	2.14	0.14	.455
4.15	-2.28	6.16	1.46	2.10	0.14	.448
4.20	-2.18	6.02	1.45	2.07	0.15	.442
4.25	-2.09	5.89	1.44	2.04	0.15	.437
4.30	-2.00	5.76	1.43	2.01	0.15	.431
4.35	-1.91	5.63	1.42	1.98	0.16	.426
4.40	-1.83	5.51	1.41	1.95	0.16	.420
4.45	-1.74	5.39	1.40	1.92	0.17	.414
4.50	-1.63	5.27	1.39	1.89	0.17	.407
4.55	-1.53	5.18	1.39	1.86	0.18	.400
4.60	-1.43	5.10	1.39	1.83	0.18	.394
4.65	-1.35	5.03	1.39	1.81	0.19	.388
4.70	-1.27	4.96	1.39	1.79	0.19	.382
4.75	-1.20	4.90	1.39	1.77	0.19	.377
4.80	-1.14	4.84	1.38	1.75	0.20	.373
4.85	-1.07	4.78	1.38	1.73	0.20	.368
4.90	-1.02	4.73	1.38	1.71	0.20	.364
4.95	-0.97	4.67	1.38	1.70	0.21	.360
5.00	-0.93	4.61	1.37	1.68	0.21	.356

Hf $\vec{E} \parallel \hat{c}$

Energy (eV)	ε_1	ε_2	n	k	$Im(-1/\tilde{\varepsilon})$	$R(\phi=0)$
5.05	-0.88	4.56	1.37	1.66	0.21	.352
5.10	-0.84	4.50	1.37	1.65	0.21	.348
5.15	-0.80	4.44	1.36	1.63	0.22	.345
5.20	-0.76	4.39	1.36	1.61	0.22	.341
5.25	-0.71	4.33	1.36	1.60	0.23	.336
5.30	-0.66	4.28	1.35	1.58	0.23	.332
5.35	-0.61	4.23	1.35	1.56	0.23	.328
5.40	-0.57	4.20	1.35	1.55	0.23	.324
5.45	-0.53	4.16	1.35	1.54	0.24	.321
5.50	-0.50	4.13	1.35	1.53	0.24	.319
5.55	-0.48	4.10	1.35	1.52	0.24	.316
5.60	-0.45	4.07	1.35	1.51	0.24	.314
5.65	-0.44	4.04	1.35	1.50	0.24	.312
5.70	-0.44	4.00	1.34	1.50	0.25	.311
5.75	-0.45	3.95	1.33	1.49	0.25	.310
5.80	-0.44	3.90	1.32	1.48	0.25	.308
5.85	-0.44	3.83	1.31	1.47	0.26	.306
5.90	-0.42	3.76	1.30	1.45	0.26	.303
5.95	-0.40	3.69	1.29	1.43	0.27	.299
6.00	-0.36	3.62	1.28	1.41	0.27	.295
6.05	-0.33	3.57	1.28	1.40	0.28	.291
6.10	-0.30	3.51	1.27	1.38	0.28	.287
6.15	-0.27	3.45	1.26	1.37	0.29	.283
6.20	-0.23	3.39	1.26	1.35	0.29	.278
6.25	-0.18	3.34	1.26	1.33	0.30	.273
6.30	-0.13	3.29	1.26	1.31	0.30	.267
6.35	-0.08	3.26	1.26	1.29	0.31	.263
6.40	-0.04	3.22	1.26	1.28	0.31	.258
6.45	-0.01	3.19	1.26	1.26	0.31	.254
6.50	0.03	3.15	1.26	1.25	0.32	.250
6.55	0.08	3.11	1.26	1.23	0.32	.245
6.60	0.12	3.08	1.27	1.22	0.32	.240
6.65	0.17	3.05	1.27	1.20	0.33	.236
6.70	0.21	3.03	1.27	1.19	0.33	.232
6.75	0.25	3.01	1.28	1.18	0.33	.228
6.80	0.29	2.99	1.28	1.16	0.33	.224
6.85	0.34	2.97	1.29	1.15	0.33	.220
6.90	0.38	2.95	1.30	1.14	0.33	.216
6.95	0.42	2.95	1.30	1.13	0.33	.214
7.00	0.45	2.95	1.31	1.13	0.33	.212
7.05	0.47	2.94	1.31	1.12	0.33	.210
7.10	0.50	2.93	1.32	1.11	0.33	.208
7.15	0.52	2.92	1.32	1.11	0.33	.206
7.20	0.55	2.91	1.33	1.10	0.33	.204
7.25	0.57	2.90	1.33	1.09	0.33	.202
7.30	0.60	2.89	1.33	1.09	0.33	.200
7.35	0.62	2.89	1.34	1.08	0.33	.198
7.40	0.65	2.88	1.34	1.07	0.33	.197
7.45	0.67	2.87	1.35	1.07	0.33	.195
7.50	0.69	2.87	1.35	1.06	0.33	.193
7.55	0.71	2.86	1.35	1.06	0.33	.192
7.60	0.73	2.86	1.36	1.05	0.33	.191
7.65	0.74	2.84	1.36	1.05	0.33	.189
7.70	0.77	2.83	1.36	1.04	0.33	.187
7.75	0.80	2.81	1.36	1.03	0.33	.185
7.80	0.83	2.81	1.37	1.02	0.33	.183
7.85	0.86	2.81	1.38	1.02	0.33	.182

Hf $\vec{E} \parallel \hat{c}$

Energy (eV)	ε_1	ε_2	n	k	Im(-1/$\tilde{\varepsilon}$)	R(ϕ=0)
7.90	0.89	2.81	1.39	1.01	0.32	.180
7.95	0.92	2.82	1.39	1.01	0.32	.179
8.00	0.94	2.83	1.40	1.01	0.32	.179
8.05	0.96	2.84	1.41	1.01	0.32	.178
8.10	0.99	2.85	1.41	1.01	0.31	.178
8.15	1.01	2.86	1.42	1.01	0.31	.178
8.20	1.02	2.87	1.43	1.01	0.31	.178
8.25	1.04	2.89	1.43	1.01	0.31	.178
8.30	1.05	2.90	1.44	1.01	0.30	.179
8.35	1.07	2.92	1.44	1.01	0.30	.179
8.40	1.08	2.94	1.45	1.01	0.30	.180
8.45	1.08	2.95	1.45	1.02	0.30	.181
8.50	1.09	2.97	1.46	1.02	0.30	.181
8.60	1.10	3.00	1.47	1.02	0.29	.183
8.70	1.11	3.04	1.47	1.03	0.29	.184
8.80	1.12	3.08	1.48	1.04	0.29	.186
8.90	1.11	3.13	1.49	1.05	0.28	.189
9.00	1.10	3.19	1.49	1.07	0.28	.193
9.10	1.07	3.24	1.50	1.08	0.28	.197
9.20	1.02	3.30	1.50	1.10	0.28	.201
9.30	0.97	3.34	1.49	1.12	0.28	.206
9.40	0.91	3.38	1.48	1.14	0.28	.211
9.50	0.83	3.42	1.47	1.16	0.28	.216
9.60	0.73	3.45	1.46	1.18	0.28	.222
9.70	0.62	3.44	1.43	1.20	0.28	.227
9.80	0.52	3.41	1.41	1.21	0.29	.230
9.90	0.44	3.37	1.38	1.22	0.29	.233
10.00	0.37	3.32	1.36	1.22	0.30	.235
10.10	0.30	3.28	1.34	1.22	0.30	.237
10.20	0.24	3.22	1.32	1.22	0.31	.238
10.30	0.19	3.17	1.30	1.22	0.31	.240
10.40	0.14	3.11	1.28	1.22	0.32	.240
10.50	0.10	3.05	1.25	1.22	0.33	.241
10.60	0.06	2.99	1.24	1.21	0.33	.241
10.70	0.03	2.93	1.22	1.21	0.34	.242
10.80	0.00	2.88	1.20	1.20	0.35	.242
10.90	-0.03	2.82	1.18	1.19	0.35	.242
11.00	-0.05	2.76	1.16	1.19	0.36	.242
11.10	-0.07	2.71	1.15	1.18	0.37	.241
11.20	-0.09	2.66	1.13	1.17	0.38	.241
11.30	-0.11	2.60	1.12	1.16	0.38	.241
11.40	-0.13	2.55	1.10	1.16	0.39	.241
11.40	-0.13	2.55	1.10	1.16	0.39	.241
11.50	-0.14	2.49	1.09	1.15	0.40	.240
11.60	-0.15	2.44	1.07	1.14	0.41	.239
11.70	-0.16	2.39	1.06	1.13	0.42	.238
11.80	-0.17	2.34	1.04	1.12	0.43	.238
11.90	-0.17	2.29	1.03	1.11	0.43	.237
12.00	-0.18	2.24	1.02	1.10	0.44	.236
12.10	-0.18	2.19	1.00	1.09	0.45	.235
12.20	-0.19	2.14	0.99	1.08	0.46	.234
12.30	-0.19	2.09	0.98	1.07	0.47	.233
12.40	-0.19	2.04	0.96	1.06	0.49	.232
12.50	-0.19	2.00	0.95	1.05	0.50	.230
12.60	-0.18	1.95	0.94	1.04	0.51	.229
12.70	-0.18	1.91	0.93	1.02	0.52	.227
12.80	-0.18	1.86	0.92	1.01	0.53	.225

Hf $\vec{E} \parallel \hat{c}$

Energy (eV)	ε_1	ε_2	n	k	Im(-1/$\tilde{\varepsilon}$)	R(ϕ=0)
12.90	-0.17	1.82	0.91	1.00	0.54	.224
13.00	-0.17	1.78	0.90	0.99	0.56	.222
13.10	-0.16	1.73	0.89	0.98	0.57	.220
13.20	-0.16	1.69	0.88	0.96	0.59	.218
13.30	-0.15	1.64	0.87	0.95	0.61	.216
13.40	-0.13	1.60	0.86	0.93	0.62	.212
13.50	-0.12	1.55	0.85	0.92	0.64	.209
13.60	-0.10	1.51	0.84	0.90	0.66	.205
13.70	-0.08	1.48	0.84	0.88	0.68	.201
13.80	-0.06	1.44	0.83	0.87	0.69	.196
13.90	-0.04	1.41	0.83	0.85	0.71	.191
14.00	-0.01	1.38	0.83	0.83	0.73	.186
14.10	0.02	1.36	0.83	0.82	0.74	.180
14.20	0.05	1.34	0.83	0.81	0.74	.175
14.30	0.06	1.34	0.84	0.80	0.75	.172
14.40	0.06	1.33	0.83	0.80	0.75	.172
14.50	0.06	1.31	0.83	0.79	0.76	.171
14.60	0.06	1.28	0.82	0.78	0.78	.170
14.70	0.06	1.26	0.81	0.77	0.79	.169
14.80	0.07	1.22	0.81	0.76	0.81	.167
14.90	0.08	1.19	0.80	0.75	0.84	.164
15.00	0.10	1.16	0.79	0.73	0.85	.160
15.10	0.11	1.13	0.79	0.72	0.87	.157
15.20	0.13	1.11	0.79	0.70	0.89	.153
15.30	0.14	1.08	0.78	0.69	0.91	.148
15.40	0.16	1.05	0.78	0.67	0.93	.143
15.50	0.19	1.03	0.78	0.65	0.94	.138
15.60	0.21	1.00	0.79	0.64	0.96	.132
15.70	0.25	0.98	0.79	0.62	0.96	.124
15.80	0.29	0.98	0.81	0.61	0.94	.117
15.90	0.31	0.99	0.82	0.60	0.92	.112
16.00	0.32	1.00	0.83	0.60	0.90	.111
16.10	0.32	1.01	0.83	0.61	0.90	.112
16.20	0.31	1.00	0.83	0.61	0.91	.114
16.30	0.30	0.99	0.82	0.61	0.92	.115
16.40	0.30	0.97	0.81	0.60	0.94	.114
16.50	0.30	0.95	0.80	0.59	0.96	.113
16.60	0.30	0.92	0.80	0.58	0.98	.111
16.70	0.31	0.90	0.79	0.57	1.00	.108
16.80	0.32	0.88	0.79	0.55	1.01	.105
16.90	0.33	0.85	0.79	0.54	1.02	.102
17.00	0.34	0.83	0.79	0.53	1.03	.098
17.10	0.36	0.81	0.79	0.51	1.03	.094
17.20	0.38	0.79	0.79	0.50	1.03	.089
17.30	0.39	0.78	0.80	0.49	1.02	.086
17.40	0.41	0.77	0.80	0.48	1.02	.083
17.50	0.42	0.76	0.80	0.47	1.01	.080
17.60	0.43	0.74	0.80	0.46	1.00	.077
17.70	0.44	0.73	0.80	0.45	1.00	.075
17.80	0.45	0.71	0.80	0.44	1.00	.072
17.90	0.47	0.69	0.81	0.43	0.99	.068
18.00	0.49	0.68	0.81	0.42	0.98	.064
18.20	0.52	0.65	0.82	0.39	0.93	.057
18.40	0.56	0.63	0.84	0.38	0.89	.051
18.60	0.60	0.61	0.85	0.36	0.83	.045
18.80	0.64	0.60	0.87	0.34	0.78	.040
19.00	0.68	0.59	0.89	0.33	0.73	.036

Hf $\vec{E} \parallel \hat{c}$

Energy (eV)	ε_1	ε_2	n	k	Im(-1/$\tilde{\varepsilon}$)	R(ϕ=0)
19.20	0.71	0.59	0.90	0.33	0.70	.033
19.40	0.73	0.59	0.92	0.32	0.67	.031
19.60	0.76	0.59	0.93	0.32	0.64	.030
19.80	0.78	0.59	0.94	0.31	0.62	.028
20.00	0.80	0.59	0.94	0.31	0.60	.027
20.20	0.82	0.58	0.95	0.30	0.58	.026
20.40	0.84	0.58	0.96	0.30	0.56	.024
20.60	0.86	0.57	0.97	0.30	0.54	.023
20.80	0.88	0.58	0.98	0.29	0.52	.023
21.00	0.90	0.57	0.99	0.29	0.51	.022
21.20	0.91	0.57	1.00	0.29	0.49	.022
21.40	0.93	0.57	1.01	0.28	0.48	.021
21.60	0.95	0.57	1.01	0.28	0.47	.020
21.80	0.97	0.58	1.02	0.28	0.45	.020
22.00	0.98	0.58	1.03	0.28	0.44	.020
22.20	1.00	0.58	1.04	0.28	0.43	.020
22.40	1.02	0.58	1.05	0.28	0.42	.020
22.60	1.04	0.59	1.06	0.28	0.42	.020
22.80	1.05	0.60	1.06	0.28	0.41	.021
23.00	1.06	0.61	1.07	0.28	0.41	.021
23.20	1.07	0.61	1.07	0.29	0.40	.021
23.40	1.08	0.62	1.08	0.29	0.40	.022
23.60	1.09	0.64	1.09	0.29	0.40	.022
23.80	1.10	0.65	1.09	0.30	0.40	.023
24.00	1.10	0.65	1.09	0.30	0.40	.023
24.20	1.11	0.66	1.10	0.30	0.39	.023
24.40	1.12	0.67	1.10	0.30	0.39	.024
24.60	1.12	0.67	1.10	0.31	0.39	.024
24.80	1.13	0.68	1.11	0.31	0.39	.025

Hafnium

single crystal with $\vec{E} \perp \hat{c}$. These results by D.W. Lynch, C.G. Olson, and J.H. Weaver (unpub) supercede those of LOW75 [Phys. Rev. B 11, 3617 (1975)]

Energy (eV)	ε_1	ε_2	n	k	Im(-1/$\tilde{\varepsilon}$)	R(ϕ=0)
0.51	-18.31	22.74	2.33	4.87	0.03	.735
0.52	-16.52	20.96	2.25	4.65	0.03	.723
0.53	-14.49	19.46	2.21	4.40	0.03	.705
0.54	-12.18	18.35	2.22	4.14	0.04	.680
0.56	-7.93	17.14	2.34	3.66	0.05	.623
0.58	-3.76	16.52	2.57	3.22	0.06	.559
0.60	-0.25	16.40	2.84	2.89	0.06	.512
0.62	2.99	16.49	3.14	2.62	0.06	.482
0.64	5.70	17.05	3.44	2.48	0.05	.473
0.66	8.23	17.40	3.71	2.35	0.05	.469
0.68	10.76	17.94	3.98	2.25	0.04	.473
0.70	13.22	18.84	4.26	2.21	0.04	.482
0.72	15.47	20.08	4.52	2.22	0.03	.495
0.74	17.45	21.53	4.75	2.27	0.03	.508
0.76	19.25	23.18	4.97	2.33	0.03	.521
0.78	21.02	25.15	5.19	2.42	0.02	.535
0.80	22.35	28.33	5.41	2.62	0.02	.554
0.82	22.33	31.78	5.53	2.87	0.02	.570
0.84	20.81	35.06	5.55	3.16	0.02	.585
0.86	18.51	36.73	5.46	3.36	0.02	.593
0.88	16.20	37.72	5.35	3.53	0.02	.599
0.90	14.12	37.79	5.22	3.62	0.02	.601
0.93	12.14	37.42	5.07	3.69	0.02	.603
0.95	10.69	36.81	4.95	3.72	0.03	.602
0.98	9.58	36.26	4.85	3.74	0.03	.602
1.00	8.57	35.79	4.76	3.76	0.03	.602
1.02	7.66	35.25	4.68	3.77	0.03	.602
1.05	6.81	34.71	4.59	3.78	0.03	.601
1.08	6.01	34.17	4.51	3.79	0.03	.601
1.10	5.18	33.60	4.43	3.80	0.03	.601
1.15	3.66	32.17	4.24	3.79	0.03	.599
1.20	2.54	30.41	4.07	3.74	0.03	.594
1.25	1.96	28.58	3.91	3.65	0.03	.587
1.30	1.78	26.96	3.79	3.55	0.04	.578
1.35	1.70	25.61	3.70	3.46	0.04	.570
1.40	1.77	24.29	3.61	3.36	0.04	.561
1.45	2.20	23.08	3.56	3.24	0.04	.550
1.50	2.78	22.25	3.55	3.13	0.04	.540
1.55	3.36	21.78	3.56	3.06	0.04	.532
1.60	3.75	21.61	3.58	3.01	0.04	.529
1.65	4.08	21.50	3.60	2.98	0.04	.526
1.70	4.29	21.59	3.63	2.98	0.04	.526
1.75	4.36	21.79	3.65	2.99	0.04	.527
1.80	4.25	22.11	3.66	3.02	0.04	.530
1.85	3.92	22.47	3.66	3.07	0.04	.535
1.90	3.31	22.81	3.63	3.14	0.04	.541
1.95	2.55	22.92	3.58	3.20	0.04	.546
2.00	1.71	22.86	3.51	3.26	0.04	.551
2.05	0.91	22.61	3.43	3.30	0.04	.555

Hf $\vec{E} \perp \hat{c}$

Energy (eV)	ε_1	ε_2	n	k	Im(-1/$\tilde{\varepsilon}$)	R(ϕ=0)
2.10	0.15	22.27	3.35	3.33	0.04	.558
2.15	-0.56	21.85	3.26	3.35	0.05	.560
2.20	-1.22	21.37	3.18	3.36	0.05	.563
2.25	-1.85	20.86	3.09	3.38	0.05	.565
2.30	-2.51	20.27	2.99	3.39	0.05	.568
2.35	-3.10	19.52	2.89	3.38	0.05	.569
2.40	-3.50	18.66	2.78	3.35	0.05	.569
2.45	-3.59	17.84	2.70	3.30	0.05	.565
2.50	-3.62	17.25	2.65	3.26	0.06	.562
2.55	-3.72	16.79	2.60	3.23	0.06	.560
2.60	-3.91	16.33	2.54	3.22	0.06	.560
2.65	-4.07	15.83	2.48	3.20	0.06	.560
2.70	-4.20	15.35	2.42	3.17	0.06	.559
2.75	-4.33	14.88	2.36	3.15	0.06	.559
2.80	-4.45	14.42	2.31	3.13	0.06	.558
2.85	-4.53	13.98	2.25	3.10	0.06	.558
2.90	-4.64	13.58	2.20	3.08	0.07	.558
2.95	-4.80	13.15	2.14	3.07	0.07	.559
3.00	-4.97	12.66	2.08	3.05	0.07	.561
3.05	-5.06	12.12	2.01	3.02	0.07	.561
3.10	-5.08	11.58	1.94	2.98	0.07	.560
3.15	-5.05	11.05	1.88	2.93	0.07	.558
3.20	-4.97	10.56	1.83	2.88	0.08	.555
3.25	-4.85	10.11	1.78	2.83	0.08	.552
3.30	-4.70	9.71	1.74	2.78	0.08	.547
3.35	-4.55	9.36	1.71	2.73	0.09	.542
3.40	-4.42	9.04	1.68	2.69	0.09	.538
3.45	-4.29	8.74	1.65	2.65	0.09	.533
3.50	-4.16	8.45	1.62	2.61	0.10	.529
3.55	-4.03	8.19	1.60	2.56	0.10	.524
3.60	-3.90	7.95	1.57	2.52	0.10	.519
3.65	-3.78	7.72	1.55	2.49	0.10	.515
3.70	-3.67	7.50	1.53	2.45	0.11	.510
3.75	-3.56	7.29	1.51	2.42	0.11	.506
3.80	-3.46	7.10	1.49	2.38	0.11	.501
3.85	-3.35	6.91	1.47	2.35	0.12	.497
3.90	-3.26	6.72	1.45	2.32	0.12	.493
3.95	-3.17	6.54	1.43	2.28	0.12	.489
4.00	-3.08	6.36	1.41	2.25	0.13	.484
4.05	-2.98	6.18	1.39	2.22	0.13	.480
4.10	-2.86	6.01	1.38	2.18	0.14	.474
4.15	-2.75	5.85	1.36	2.15	0.14	.468
4.20	-2.64	5.72	1.35	2.11	0.14	.462
4.25	-2.55	5.59	1.34	2.08	0.15	.457
4.30	-2.45	5.45	1.33	2.05	0.15	.451
4.35	-2.34	5.32	1.32	2.02	0.16	.445
4.40	-2.23	5.21	1.31	1.99	0.16	.438
4.45	-2.13	5.12	1.31	1.96	0.17	.432
4.50	-2.05	5.02	1.30	1.93	0.17	.427
4.55	-1.96	4.92	1.29	1.91	0.18	.421
4.60	-1.87	4.83	1.29	1.88	0.18	.415
4.65	-1.78	4.74	1.28	1.85	0.18	.408
4.70	-1.69	4.66	1.28	1.82	0.19	.402
4.75	-1.60	4.58	1.28	1.80	0.19	.395
4.80	-1.51	4.52	1.28	1.77	0.20	.389
4.85	-1.44	4.47	1.28	1.75	0.20	.384
4.90	-1.38	4.41	1.27	1.73	0.21	.379

Hf $\vec{E} \perp \hat{c}$

Energy (eV)	ε_1	ε_2	n	k	Im(-1/$\tilde{\varepsilon}$)	R(ϕ=0)
4.95	-1.30	4.35	1.27	1.71	0.21	.373
5.00	-1.23	4.30	1.27	1.69	0.21	.367
5.05	-1.17	4.26	1.27	1.67	0.22	.363
5.10	-1.12	4.21	1.27	1.65	0.22	.358
5.15	-1.07	4.16	1.27	1.64	0.23	.354
5.20	-1.01	4.12	1.27	1.62	0.23	.349
5.25	-0.96	4.08	1.27	1.61	0.23	.345
5.30	-0.91	4.05	1.27	1.59	0.23	.341
5.35	-0.88	4.02	1.27	1.58	0.24	.338
5.40	-0.85	3.98	1.27	1.57	0.24	.335
5.45	-0.83	3.94	1.26	1.56	0.24	.333
5.50	-0.79	3.89	1.26	1.54	0.25	.329
5.55	-0.75	3.85	1.26	1.53	0.25	.325
5.60	-0.72	3.82	1.26	1.52	0.25	.322
5.65	-0.70	3.79	1.26	1.51	0.26	.320
5.70	-0.69	3.75	1.25	1.50	0.26	.318
5.75	-0.67	3.71	1.25	1.49	0.26	.315
5.80	-0.65	3.67	1.24	1.48	0.26	.313
5.85	-0.64	3.62	1.23	1.47	0.27	.311
5.90	-0.63	3.56	1.22	1.46	0.27	.309
5.95	-0.60	3.50	1.21	1.44	0.28	.306
6.00	-0.57	3.44	1.21	1.42	0.28	.302
6.05	-0.54	3.38	1.20	1.41	0.29	.298
6.10	-0.51	3.33	1.20	1.39	0.29	.294
6.15	-0.47	3.28	1.19	1.38	0.30	.290
6.20	-0.43	3.23	1.19	1.36	0.30	.285
6.25	-0.40	3.18	1.18	1.34	0.31	.280
6.30	-0.36	3.13	1.18	1.32	0.32	.275
6.35	-0.31	3.08	1.18	1.31	0.32	.270
6.40	-0.26	3.04	1.18	1.29	0.33	.265
6.45	-0.22	3.01	1.18	1.27	0.33	.260
6.50	-0.17	2.97	1.18	1.25	0.34	.254
6.55	-0.12	2.94	1.19	1.24	0.34	.249
6.60	-0.07	2.92	1.19	1.22	0.34	.244
6.65	-0.03	2.91	1.20	1.21	0.34	.241
6.70	0.01	2.89	1.20	1.20	0.35	.237
6.75	0.04	2.87	1.21	1.19	0.35	.233
6.80	0.07	2.86	1.21	1.18	0.35	.230
6.85	0.10	2.84	1.21	1.17	0.35	.227
6.90	0.13	2.82	1.21	1.16	0.35	.224
6.95	0.16	2.80	1.22	1.15	0.36	.221
7.00	0.20	2.78	1.22	1.14	0.36	.217
7.05	0.23	2.77	1.23	1.13	0.36	.214
7.10	0.26	2.75	1.23	1.12	0.36	.211
7.15	0.28	2.74	1.23	1.11	0.36	.209
7.20	0.31	2.72	1.23	1.10	0.36	.206
7.25	0.34	2.70	1.24	1.09	0.36	.203
7.30	0.38	2.68	1.24	1.08	0.37	.199
7.35	0.42	2.68	1.25	1.07	0.36	.196
7.40	0.45	2.67	1.26	1.06	0.36	.194
7.45	0.48	2.67	1.26	1.06	0.36	.192
7.50	0.51	2.67	1.27	1.05	0.36	.190
7.55	0.53	2.67	1.27	1.05	0.36	.189
7.60	0.55	2.67	1.28	1.04	0.36	.187
7.65	0.57	2.66	1.28	1.04	0.36	.185
7.70	0.59	2.65	1.29	1.03	0.36	.183
7.75	0.62	2.64	1.29	1.02	0.36	.182

Hf $\vec{E} \perp \hat{c}$

Energy (eV)	ε_1	ε_2	n	k	Im(-1/$\tilde{\varepsilon}$)	R(ϕ=0)
7.80	0.65	2.64	1.30	1.02	0.36	.180
7.85	0.68	2.63	1.30	1.01	0.36	.178
7.90	0.71	2.63	1.31	1.00	0.35	.176
7.95	0.74	2.64	1.32	1.00	0.35	.175
8.00	0.77	2.65	1.33	1.00	0.35	.174
8.10	0.80	2.67	1.34	1.00	0.34	.173
8.20	0.84	2.69	1.35	0.99	0.34	.173
8.30	0.88	2.71	1.36	0.99	0.33	.172
8.40	0.90	2.74	1.38	0.99	0.33	.173
8.50	0.93	2.77	1.39	1.00	0.32	.173
8.60	0.95	2.80	1.40	1.00	0.32	.174
8.70	0.97	2.84	1.41	1.01	0.32	.176
8.80	0.98	2.88	1.42	1.02	0.31	.178
8.90	0.98	2.93	1.43	1.03	0.31	.181
9.00	0.98	2.98	1.43	1.04	0.30	.184
9.10	0.97	3.04	1.44	1.06	0.30	.188
9.20	0.93	3.11	1.45	1.08	0.30	.193
9.30	0.87	3.17	1.44	1.10	0.29	.199
9.40	0.79	3.21	1.43	1.12	0.29	.204
9.50	0.71	3.24	1.42	1.14	0.29	.209
9.60	0.63	3.25	1.40	1.16	0.30	.214
9.70	0.55	3.26	1.39	1.17	0.30	.218
9.80	0.46	3.25	1.37	1.19	0.30	.223
9.90	0.36	3.23	1.34	1.20	0.31	.227
10.00	0.28	3.18	1.32	1.21	0.31	.230
10.10	0.21	3.12	1.29	1.21	0.32	.232
10.20	0.15	3.07	1.27	1.21	0.33	.234
10.30	0.10	3.01	1.25	1.21	0.33	.235
10.40	0.06	2.96	1.23	1.20	0.34	.235
10.50	0.02	2.90	1.21	1.20	0.34	.236
10.60	-0.02	2.84	1.19	1.20	0.35	.237
10.70	-0.05	2.79	1.17	1.19	0.36	.237
10.80	-0.08	2.73	1.15	1.19	0.37	.237
10.90	-0.10	2.68	1.13	1.18	0.37	.238
11.00	-0.13	2.62	1.12	1.17	0.38	.237
11.10	-0.14	2.56	1.10	1.16	0.39	.237
11.20	-0.16	2.51	1.08	1.16	0.40	.237
11.30	-0.18	2.46	1.07	1.15	0.41	.236
11.40	-0.19	2.40	1.05	1.14	0.41	.236
11.50	-0.20	2.35	1.04	1.13	0.42	.235
11.60	-0.21	2.30	1.03	1.12	0.43	.235
11.70	-0.22	2.25	1.01	1.11	0.44	.234
11.80	-0.22	2.20	1.00	1.10	0.45	.233
11.90	-0.23	2.15	0.98	1.09	0.46	.232
11.90	-0.23	2.15	0.98	1.09	0.46	.232
12.00	-0.23	2.10	0.97	1.08	0.47	.231
12.10	-0.24	2.05	0.96	1.07	0.48	.230
12.20	-0.24	2.01	0.94	1.06	0.49	.229
12.30	-0.24	1.96	0.93	1.05	0.50	.228
12.40	-0.23	1.91	0.92	1.04	0.52	.226
12.50	-0.23	1.87	0.91	1.03	0.53	.225
12.60	-0.23	1.82	0.90	1.02	0.54	.223
12.70	-0.22	1.78	0.89	1.00	0.55	.221
12.80	-0.21	1.74	0.88	0.99	0.57	.219
12.90	-0.21	1.69	0.87	0.98	0.58	.217
13.00	-0.20	1.65	0.86	0.97	0.60	.215
13.10	-0.19	1.61	0.85	0.95	0.61	.213

Hf $\vec{E} \perp \hat{c}$

Energy (eV)	ε_1	ε_2	n	k	Im(-1/$\tilde{\varepsilon}$)	R(ϕ=0)
13.20	-0.19	1.57	0.83	0.94	0.63	.211
13.30	-0.18	1.52	0.82	0.92	0.65	.208
13.40	-0.16	1.48	0.82	0.91	0.67	.205
13.50	-0.14	1.44	0.81	0.89	0.69	.201
13.60	-0.12	1.40	0.80	0.88	0.71	.196
13.70	-0.10	1.37	0.80	0.86	0.73	.192
13.80	-0.08	1.34	0.79	0.84	0.75	.188
13.90	-0.06	1.30	0.79	0.83	0.77	.183
14.00	-0.03	1.27	0.79	0.81	0.79	.177
14.10	0.00	1.25	0.79	0.79	0.80	.170
14.20	0.02	1.24	0.79	0.78	0.81	.165
14.30	0.04	1.23	0.80	0.77	0.81	.162
14.40	0.05	1.22	0.80	0.77	0.82	.160
14.50	0.05	1.21	0.79	0.76	0.83	.160
14.60	0.05	1.19	0.79	0.75	0.84	.159
14.70	0.06	1.16	0.78	0.74	0.86	.157
14.80	0.06	1.13	0.77	0.73	0.88	.154
14.90	0.08	1.10	0.77	0.72	0.90	.150
15.00	0.09	1.08	0.77	0.70	0.92	.147
15.10	0.10	1.05	0.76	0.69	0.94	.144
15.20	0.11	1.03	0.76	0.68	0.96	.140
15.30	0.13	1.00	0.76	0.66	0.98	.135
15.40	0.15	0.98	0.76	0.65	1.00	.130
15.50	0.17	0.95	0.76	0.63	1.02	.125
15.60	0.20	0.93	0.76	0.61	1.03	.119
15.70	0.23	0.91	0.77	0.59	1.03	.112
15.80	0.27	0.90	0.78	0.58	1.01	.104
15.90	0.30	0.91	0.80	0.57	0.99	.099
16.00	0.31	0.93	0.81	0.58	0.96	.099
16.10	0.31	0.94	0.81	0.59	0.96	.101
16.20	0.29	0.94	0.80	0.59	0.97	.103
16.30	0.28	0.92	0.79	0.58	0.99	.104
16.40	0.28	0.90	0.78	0.57	1.01	.102
16.50	0.29	0.87	0.78	0.56	1.03	.100
16.60	0.29	0.85	0.77	0.55	1.05	.097
16.70	0.30	0.83	0.77	0.54	1.06	.095
16.80	0.31	0.81	0.77	0.53	1.07	.092
16.90	0.32	0.79	0.77	0.52	1.08	.089
17.00	0.34	0.77	0.77	0.50	1.09	.085
17.10	0.35	0.75	0.77	0.49	1.09	.081
17.20	0.37	0.74	0.77	0.48	1.08	.077
17.30	0.39	0.73	0.78	0.47	1.07	.073
17.40	0.40	0.72	0.78	0.46	1.06	.071
17.50	0.41	0.70	0.78	0.45	1.06	.068
17.60	0.42	0.69	0.79	0.44	1.05	.065
17.70	0.43	0.68	0.79	0.43	1.05	.063
17.80	0.45	0.66	0.79	0.42	1.04	.060
17.90	0.46	0.64	0.79	0.41	1.03	.057
18.00	0.48	0.63	0.80	0.39	1.01	.053
18.10	0.50	0.61	0.80	0.38	0.98	.050
18.20	0.52	0.61	0.81	0.37	0.95	.047
18.30	0.54	0.60	0.82	0.36	0.93	.044
18.40	0.55	0.59	0.82	0.36	0.90	.041
18.50	0.57	0.58	0.83	0.35	0.87	.039
18.60	0.59	0.57	0.84	0.34	0.84	.036
18.70	0.61	0.57	0.85	0.33	0.81	.034
18.80	0.63	0.56	0.86	0.33	0.79	.032

Hf $\vec{E} \perp \hat{c}$

Energy (eV)	ε_1	ε_2	n	k	Im(-1/$\tilde{\varepsilon}$)	R(ϕ=0)
18.90	0.65	0.56	0.87	0.32	0.76	.031
19.00	0.67	0.56	0.88	0.32	0.74	.030
19.20	0.70	0.56	0.89	0.32	0.70	.028
19.40	0.72	0.57	0.90	0.31	0.68	.027
19.60	0.74	0.56	0.91	0.31	0.65	.025
19.80	0.76	0.56	0.92	0.30	0.63	.024
20.00	0.78	0.56	0.93	0.30	0.61	.023
20.20	0.80	0.56	0.94	0.30	0.59	.023
20.40	0.82	0.56	0.95	0.29	0.57	.022
20.60	0.83	0.56	0.96	0.29	0.55	.021
20.80	0.85	0.56	0.97	0.29	0.54	.021
21.00	0.87	0.56	0.97	0.29	0.53	.020
21.20	0.88	0.56	0.98	0.28	0.51	.020
21.40	0.90	0.55	0.99	0.28	0.50	.019
21.60	0.92	0.56	1.00	0.28	0.48	.019
21.80	0.93	0.56	1.00	0.28	0.47	.019
22.00	0.95	0.56	1.01	0.28	0.46	.019
22.20	0.96	0.56	1.02	0.28	0.45	.018
22.40	0.98	0.56	1.03	0.27	0.44	.018
22.60	0.99	0.57	1.03	0.27	0.43	.018
22.80	1.01	0.57	1.04	0.28	0.43	.019
23.00	1.02	0.58	1.05	0.28	0.42	.019
23.20	1.03	0.59	1.05	0.28	0.42	.019
23.40	1.04	0.60	1.06	0.28	0.41	.020
23.60	1.05	0.60	1.06	0.28	0.41	.020
23.80	1.06	0.61	1.07	0.29	0.41	.021
24.00	1.07	0.62	1.07	0.29	0.41	.021
24.20	1.08	0.62	1.08	0.29	0.40	.021
24.40	1.09	0.63	1.08	0.29	0.40	.022
24.60	1.09	0.64	1.09	0.30	0.40	.022
24.80	1.10	0.65	1.09	0.30	0.40	.023