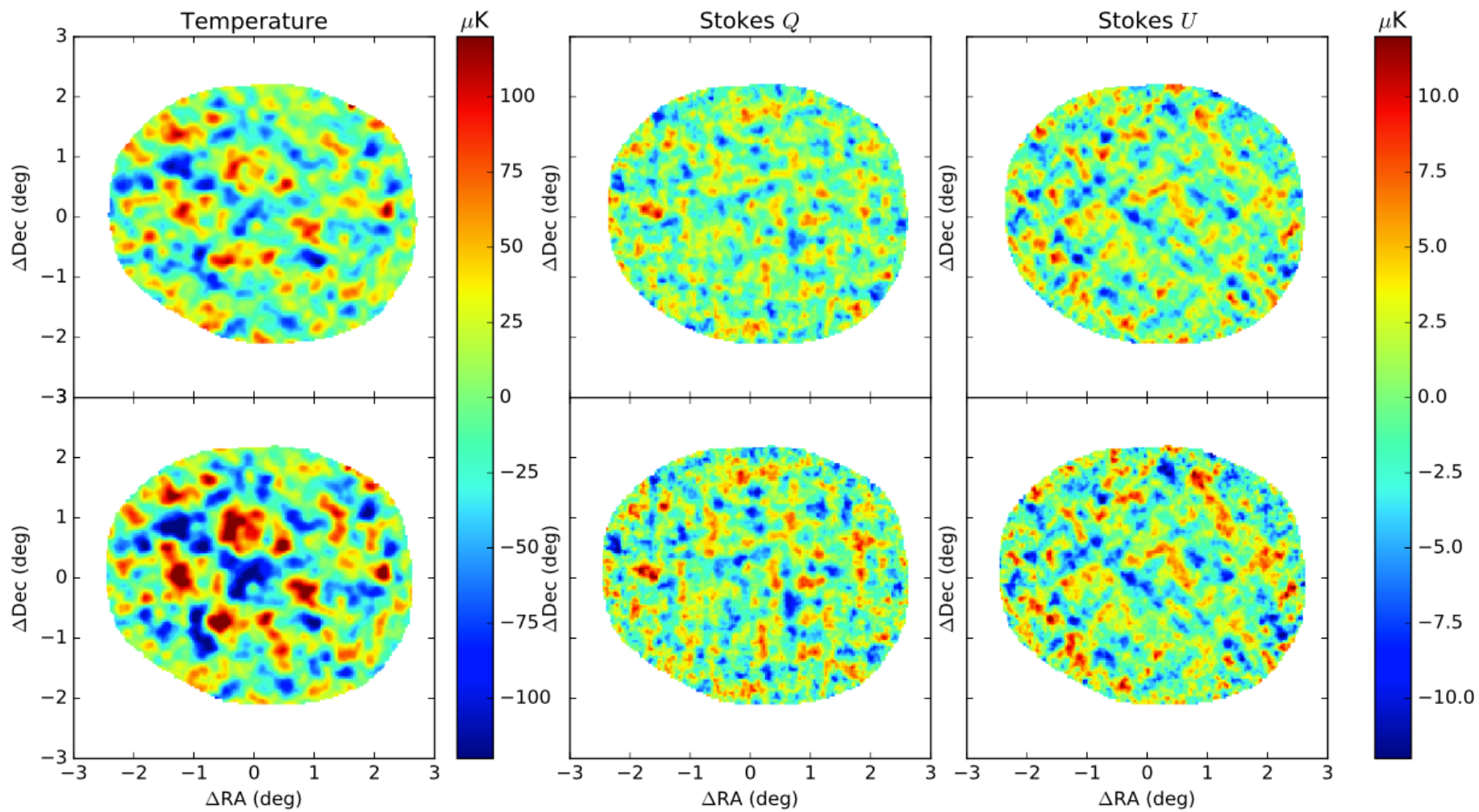


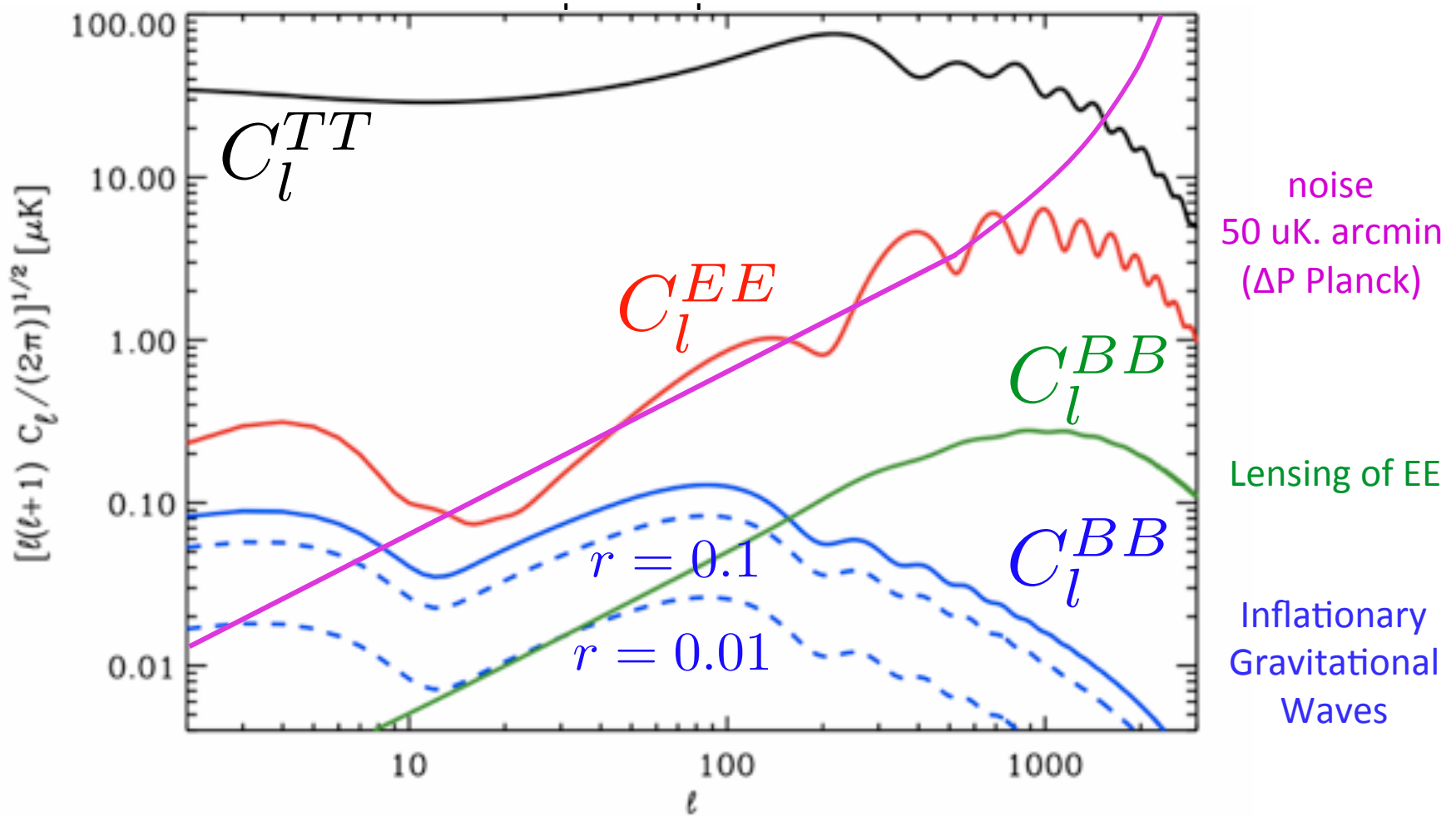
A MEASUREMENT OF THE COSMIC MICROWAVE BACKGROUND *B*-MODE POLARIZATION POWER SPECTRUM AT SUB-DEGREE SCALES FROM 2 YEARS OF POLARBEAR DATA

THE POLARBEAR COLLABORATION: P.A.R. ADE<sup>32</sup>, M. AGUILAR<sup>6</sup>, Y. AKIBA<sup>31,19</sup>, K. ARNOLD<sup>15</sup>, C. BACCIGALUPI<sup>25,20</sup>, D. BARRON<sup>34</sup>, D. BECK<sup>1</sup>, F. BIANCHINI<sup>33</sup>, D. BOETTGER<sup>24</sup>, J. BORRILL<sup>5,34</sup>, S. CHAPMAN<sup>12</sup>, Y. CHINONE<sup>14,26</sup>, K. CROWLEY<sup>15</sup>, A. CUKIERMAN<sup>14</sup>, M. DOBBS<sup>28</sup>, A. DUCOUT<sup>26</sup>, R. DÜNNER<sup>24</sup>, T. ELLEFLOT<sup>15</sup>, J. ERRARD<sup>1</sup>, G. FABBIAN<sup>21</sup>, S.M. FEENEY<sup>4,13</sup>, C. FENG<sup>11</sup>, T. FUJINO<sup>35</sup>, N. GALITZKI<sup>15</sup>, A. GILBERT<sup>28</sup>, N. GOECKNER-WALD<sup>14</sup>, J. GROH<sup>14</sup>, T. HAMADA<sup>2,19</sup>, G. HALL<sup>18</sup>, N.W. HALVERSON<sup>3,16,8</sup>, M. HASEGAWA<sup>19,31</sup>, M. HAZUMI<sup>19,31,26,23</sup>, C. HILL<sup>14</sup>, L. HOWE<sup>15</sup>, Y. INOUE<sup>22,19</sup>, G.C. JAEHNIG<sup>3,16</sup>, A.H. JAFFE<sup>13</sup>, O. JEONG<sup>14</sup>, D. KANEKO<sup>26</sup>, N. KATAYAMA<sup>26</sup>, B. KEATING<sup>15</sup>, R. KESKITALO<sup>5,34</sup>, T. KISNER<sup>5,34</sup>, N. KRACHMALNICOFF<sup>25</sup>, A. KUSAKA<sup>29,17</sup>, M. LE JEUNE<sup>1</sup>, A.T. LEE<sup>14,29,30</sup>, E.M. LEITCH<sup>7,27</sup>, D. LEON<sup>15</sup>, E. LINDER<sup>34,29</sup>, L. LOWRY<sup>15</sup>, F. MATSUDA<sup>15</sup>, T. MATSUMURA<sup>26</sup>, Y. MINAMI<sup>19</sup>, J. MONTGOMERY<sup>28</sup>, M. NAVAROLI<sup>15</sup>, H. NISHINO<sup>19</sup>, H. PAAR<sup>15</sup>, J. PELOTON<sup>10</sup>, A. T. P. PHAM<sup>33</sup>, D. POLETTI<sup>25</sup>, G. PUGLISI<sup>25</sup>, C.L. REICHARDT<sup>33</sup>, P.L. RICHARDS<sup>14</sup>, C. ROSS<sup>12</sup>, Y. SEGAWA<sup>31,19</sup>, B.D. SHERWIN<sup>29</sup>, M. SILVA<sup>15</sup>, P. SIRITANASAK<sup>15</sup>, N. STEBOR<sup>15</sup>, R. STOMPOR<sup>1</sup>, A. SUZUKI<sup>14,30</sup>, O. TAJIMA<sup>19,31</sup>, S. TAKAKURA<sup>9,19</sup>, S. TAKATORI<sup>31,19</sup>, D. TANABE<sup>31,19</sup>, G.P. TEPLY<sup>15</sup>, T. TOMARU<sup>19</sup>, C. TUCKER<sup>32</sup>, N. WHITEHORN<sup>14</sup>, A. ZAHN<sup>15</sup>

*Draft version May 9, 2017*

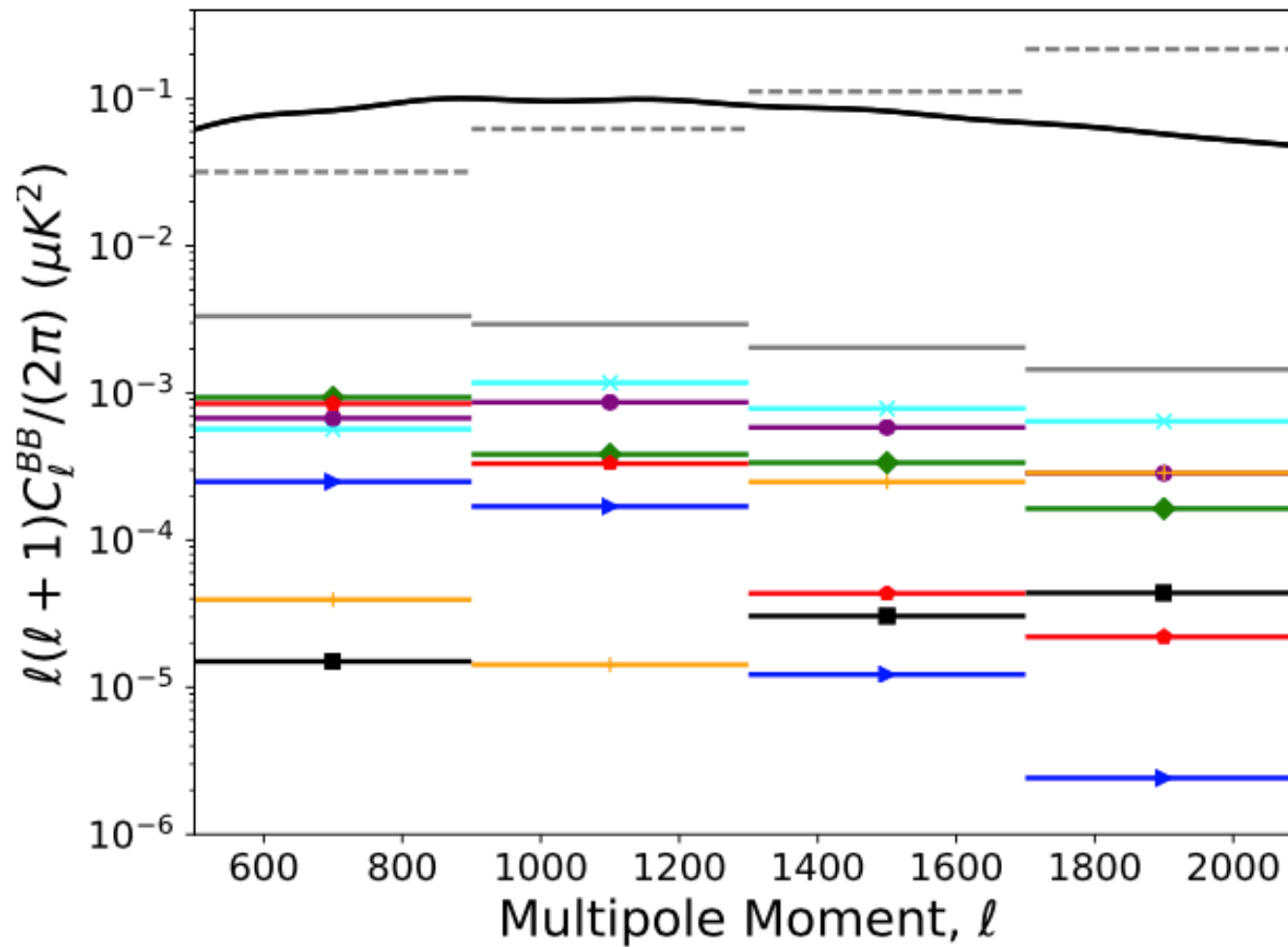
# Maps



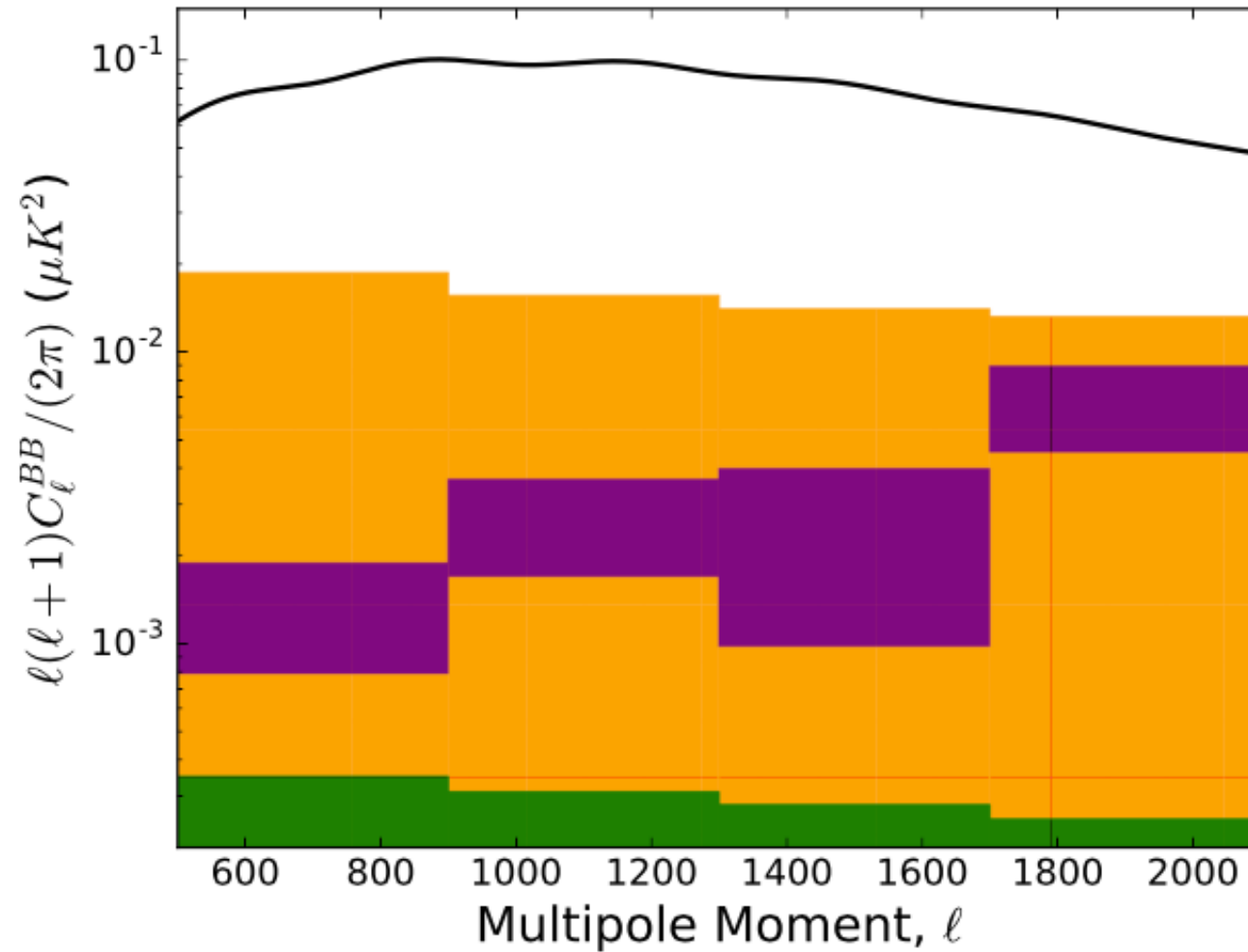


from J. Delabrouille

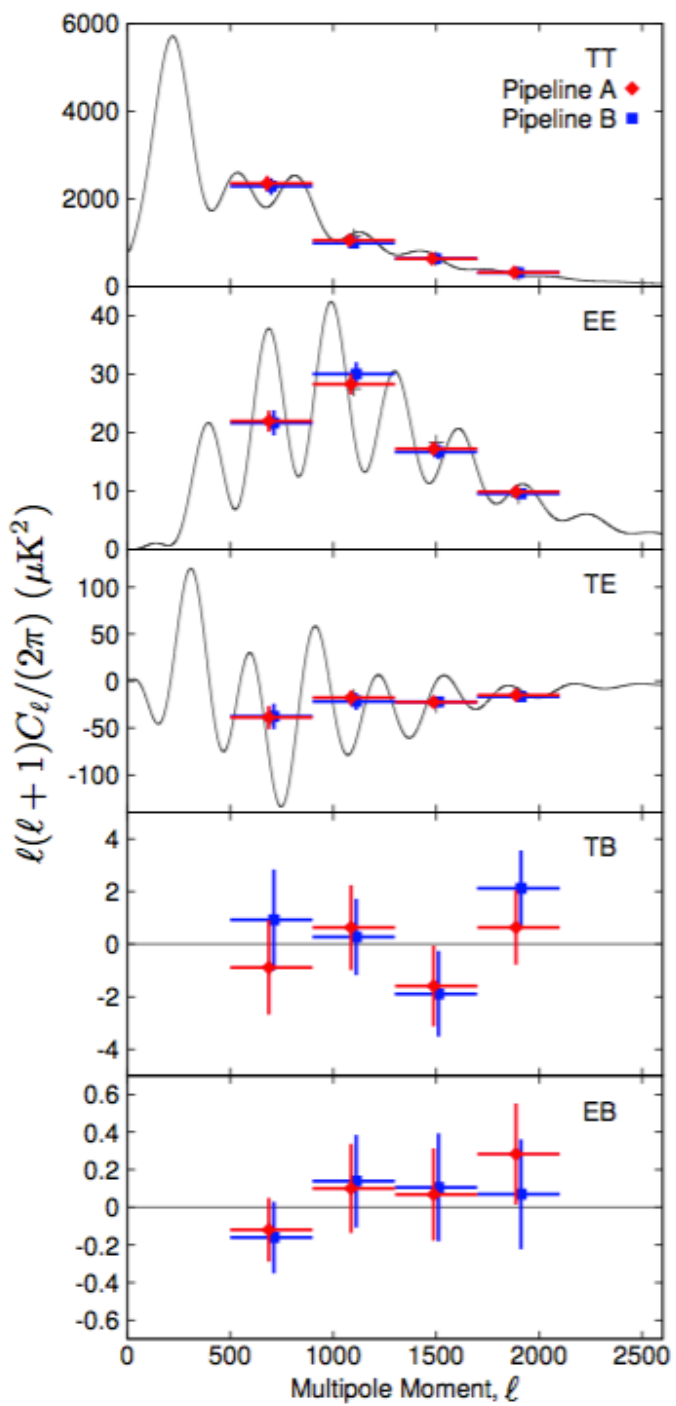
# Instrumental systematics



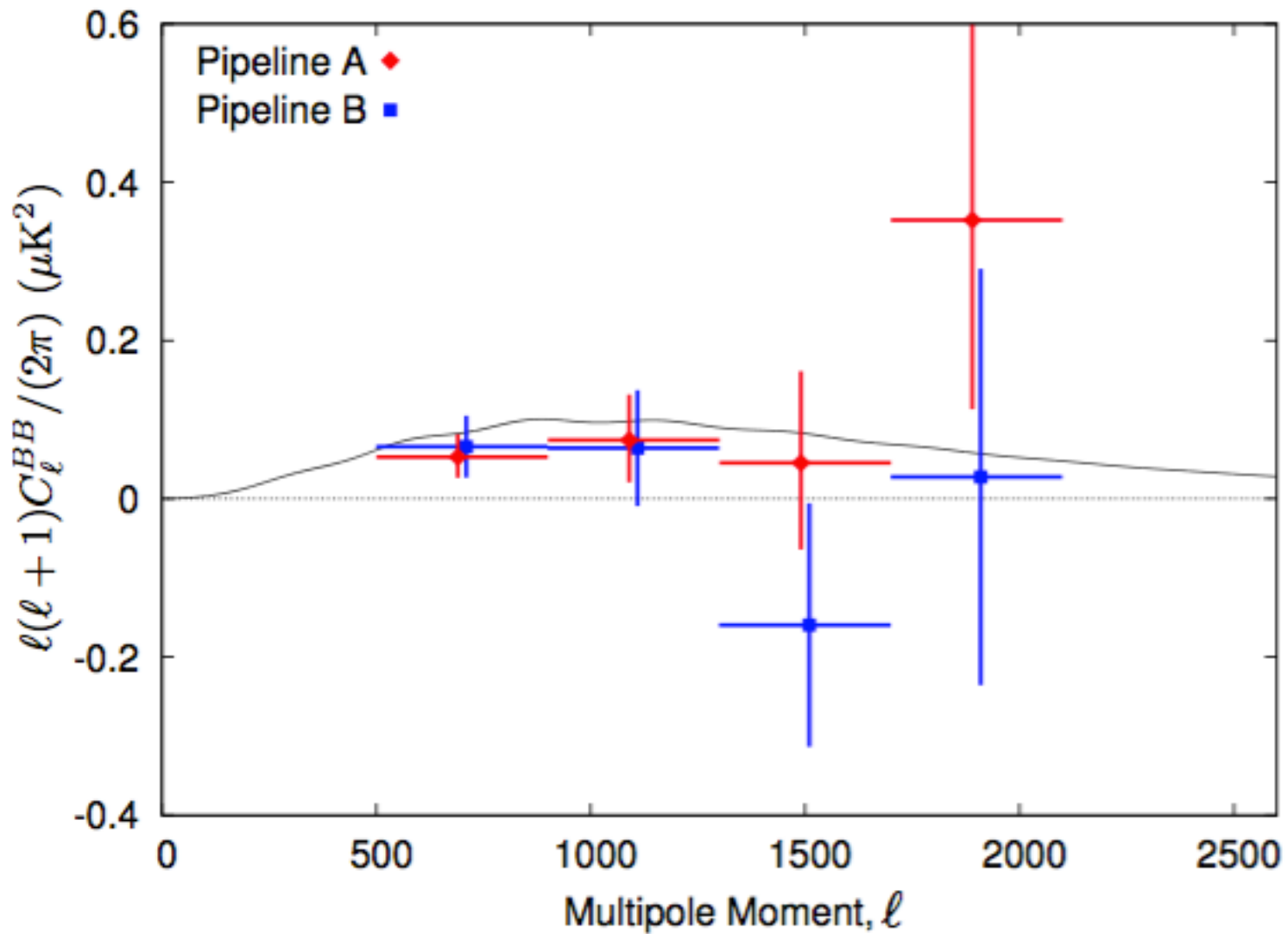
# Foreground systematics



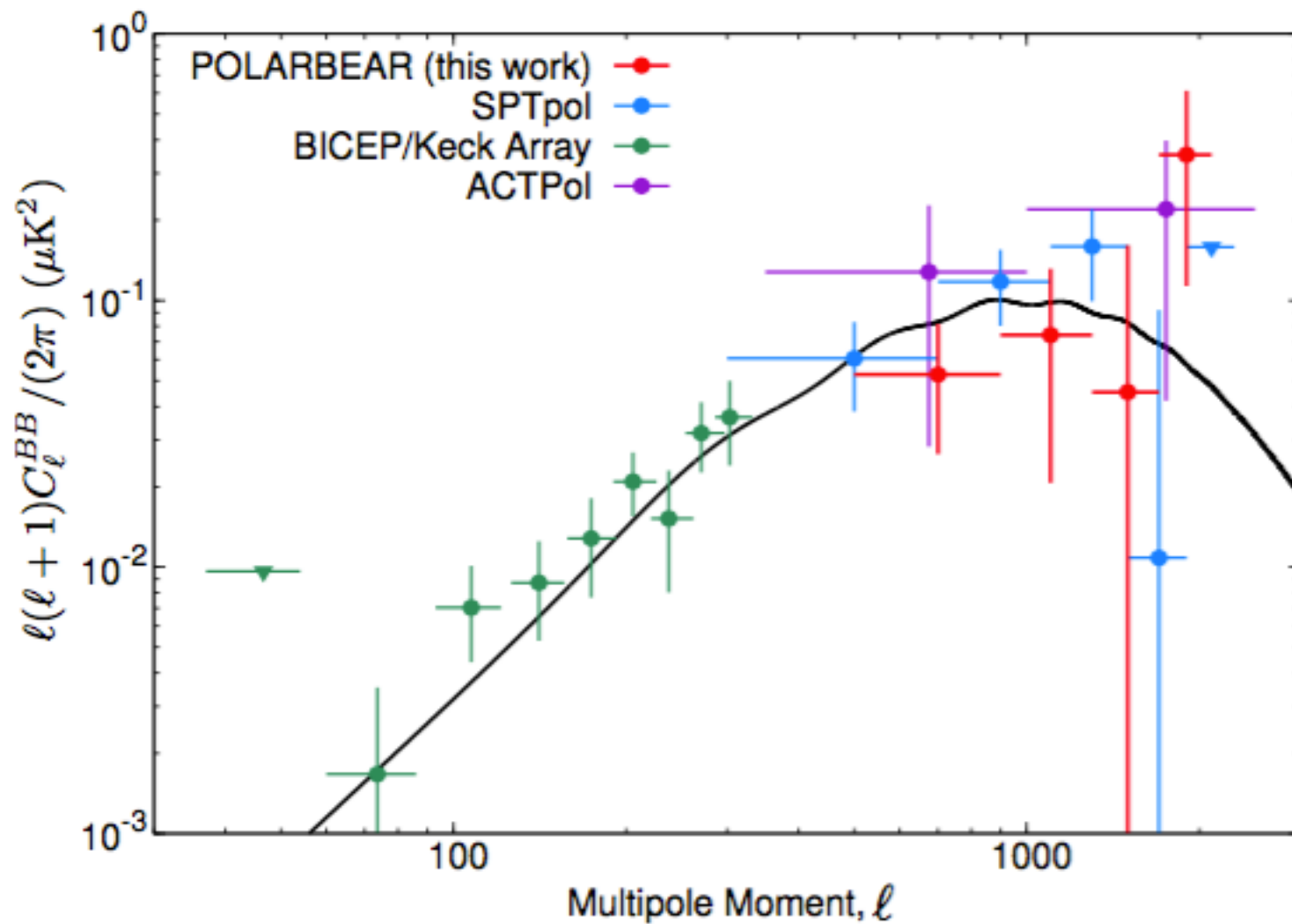
# “Standard” power spectra



# B mode spectrum



# B mode spectrum & others





# Main systematics

TABLE 5  
SUMMARY OF THE REPORTED POLARBEAR SYSTEMATIC UNCERTAINTIES.

Type	Source of systematics	Effect on $D_{\ell}^{BB}$ [ $10^{-4} \mu\text{K}^2$ ]	Effect on $A_{BB}$
Instrument (Sec. 4.4)	Gain drift	8.5	0.009
	Differential gain	9.3	0.010
	Differential beam size	0.4	0.000
	Differential beam ellipticity	0.1	0.000
	Differential & Boresight pointing	5.7	0.008
	Instrument & Relative polarization angle	6.7	0.008
	Electrical crosstalk	2.5	0.003
	Total	33.3	0.037
Astrophysical foreground	Galactic dust (Sec. 5.1)	$68.5 \pm 123.3$	$0.071 \pm 0.138$
	Galactic synchrotron (Sec. 5.1)	$1.4 \pm 2.1$	$0.002 \pm 0.002$
	Radio & Dusty galaxies (Sec. 5.2)	$13.4 \pm 5.5$	$0.019 \pm 0.005$
	sub total	$78.3 \pm 123.4$	$0.092 \pm 0.138$
Analysis <sup>a</sup>	Ground pickup removal	$0.5 \pm 1.7$	$0.001 \pm 0.002$
	<i>E</i> -to- <i>B</i> leakage due to filter subtraction	2.5	0.003
	sub total	$2.9 \pm 1.7$	$0.003 \pm 0.002$
Total	$81.2 \pm 123.4$	$0.095 \pm 0.138$	
Multiplicative effect	Absolute gain uncertainty (Sec. 6)		$\pm 3.0\%$
	Beam uncertainty (Sec. 6)		$\pm 1.0\%$
	Polarization efficiency (Sec. 3.4)		$\pm 3.3\%$
	Transfer function <sup>a</sup>		$\pm 3.9\%$
	Total		$\pm 6.0\%$

# Lensing of B-modes

$A_L = 0.60_{-0.24}^{+0.26}(\text{stat})_{-0.04}^{+0.00}(\text{inst}) \pm 0.14(\text{foreground}) \pm 0.04(\text{multi})$ , where  $A_L = 1$  is the fiducial  $\Lambda$ CDM value, and the details of the reported uncertainties are explained later in the manuscript.