



**The Abdus Salam
International Centre for Theoretical Physics**



2156-2

Summer School in Cosmology

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Dark Energy

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Dark Energy/Modified Gravity - A.J.Tolley

A non-exhaustive selection of Dark Energy/Modified Gravity Reviews

The Physics of Cosmic Acceleration - Caldwell and Kamionkowski
-0903.0866

Dark Energy and the Accelerating Universe - Frieman, Turner and Huterer
-0803.0982

Dark Energy and Dark Gravity: Theory Overview - Durrer and Marteens
-0711.0077

Cosmological Tests of Gravity - Jain and Khoury
-1004.3294

Approaches to Understanding Cosmic Acceleration - Silvestri and Trodden
-0904.0024

The Cosmological Constant and Dark Energy - Peebles and Ratra
-astro-ph/0207347

TASI lectures on the cosmological constant - Bousso
-07408.4231

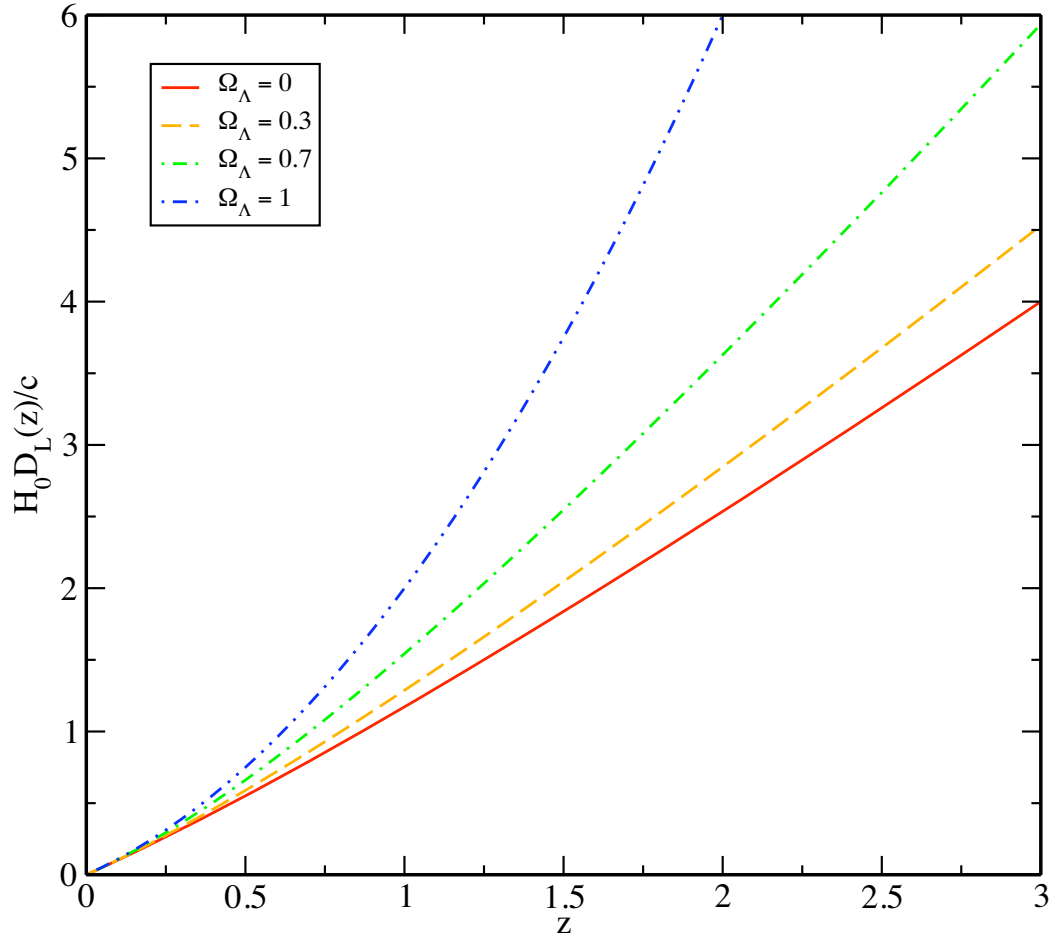
Mapping the Cosmological Expansion - Linder
- 0801.2968

Dynamics of Dark Energy - Copeland, Sami and Tsujikawa
-0603057

The Cosmological Constant and Dark Energy - Peebles and Ratra
-astro-ph/0207347

Dark Energy in Practice - Sapone
-1006.5694

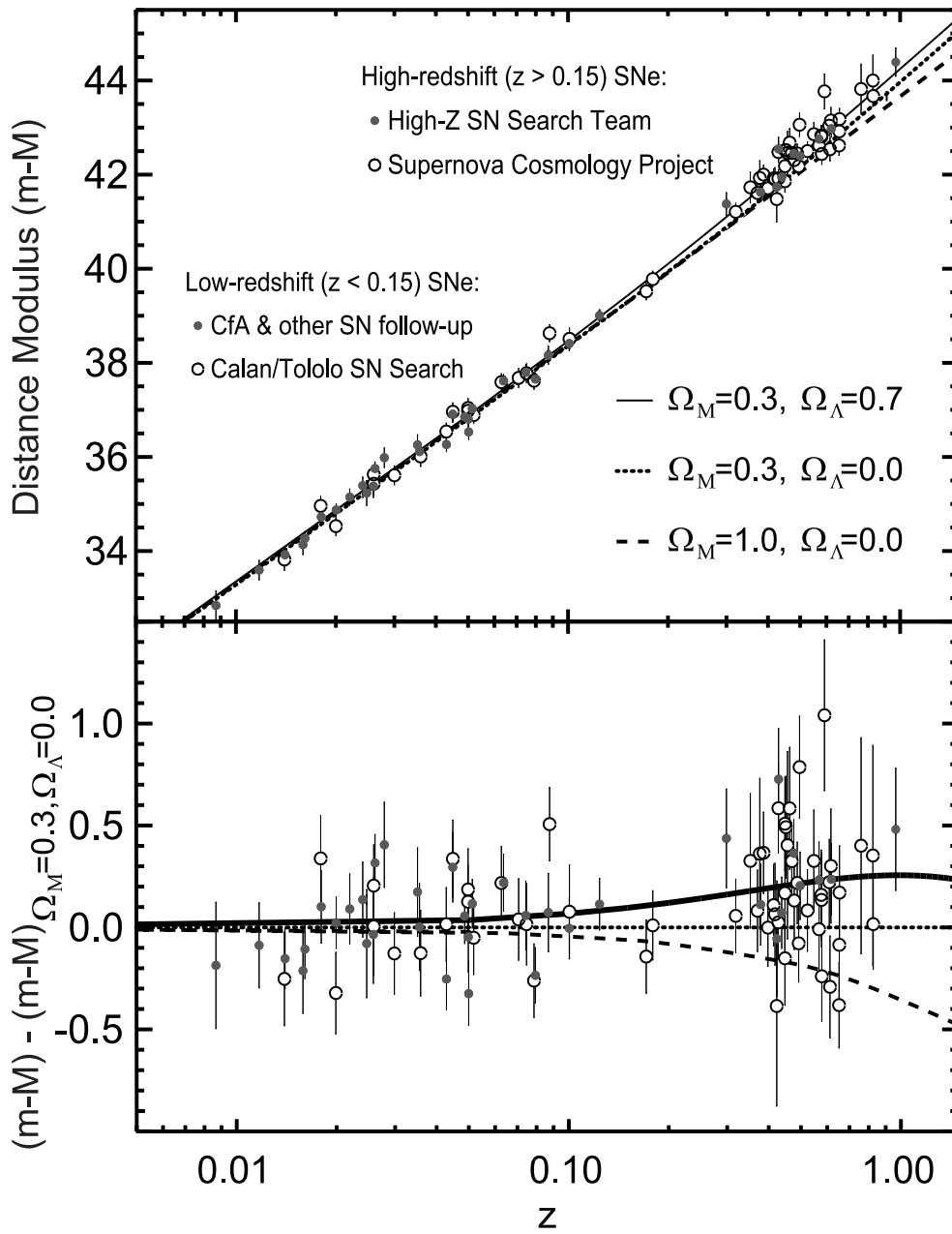
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from Sapone 2010 (1006.5694)

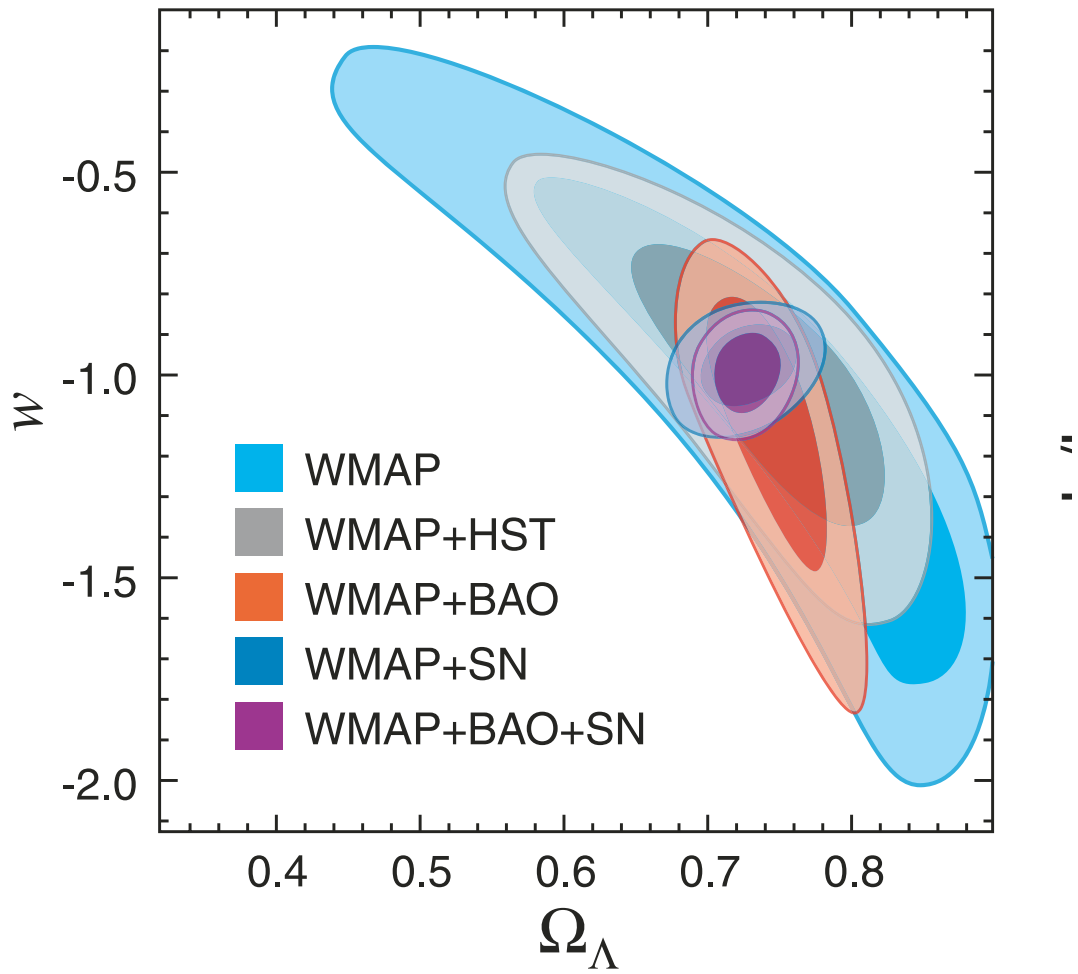
Figure 1: The luminosity distance D_L for a flat cosmology with two components, matter $w_m = 0$ and a cosmological constant $w_\Lambda = -1$ for different values of Ω_Λ .

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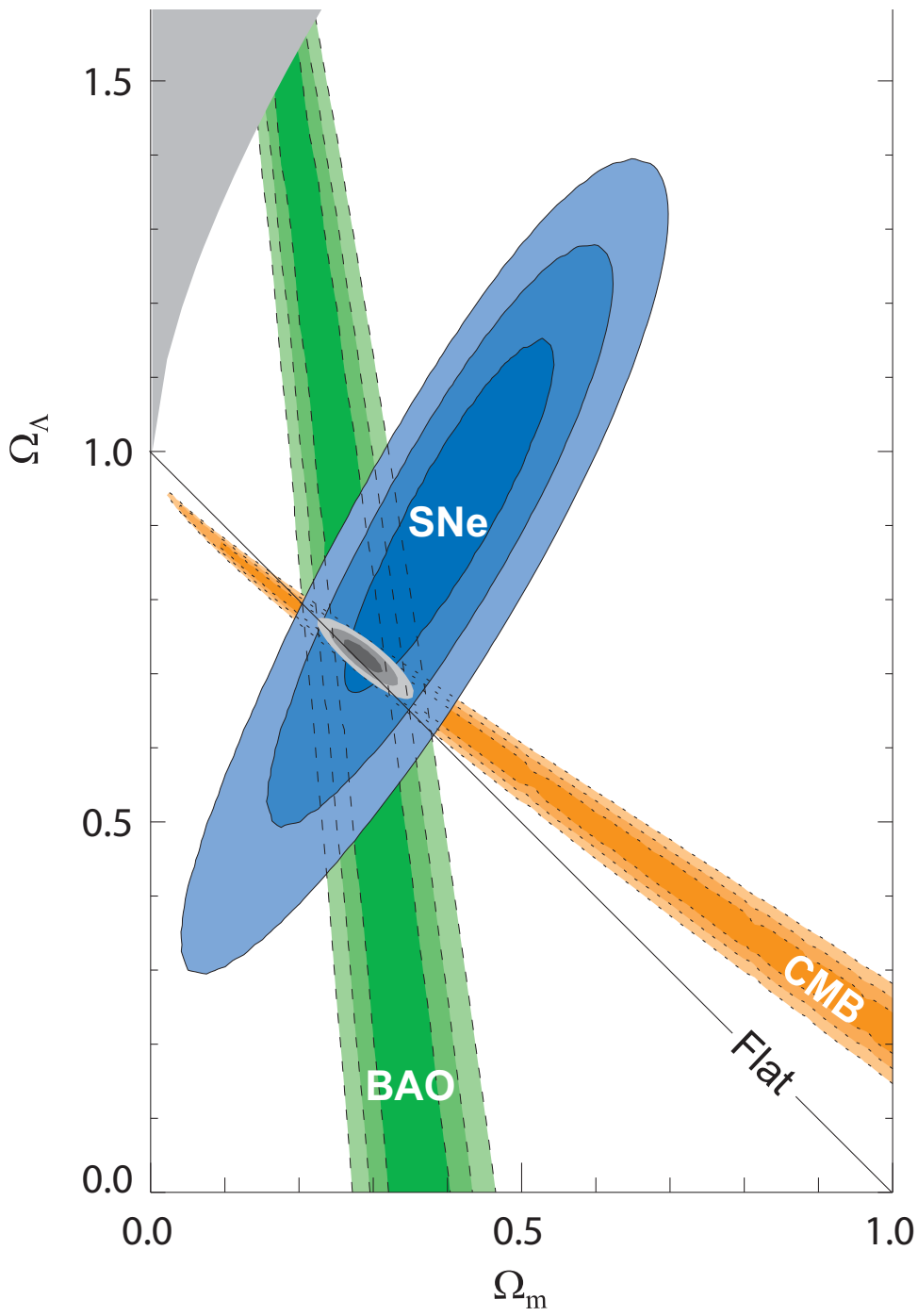


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WMAP5 Komatsu et al 2008



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Kowalski 2008

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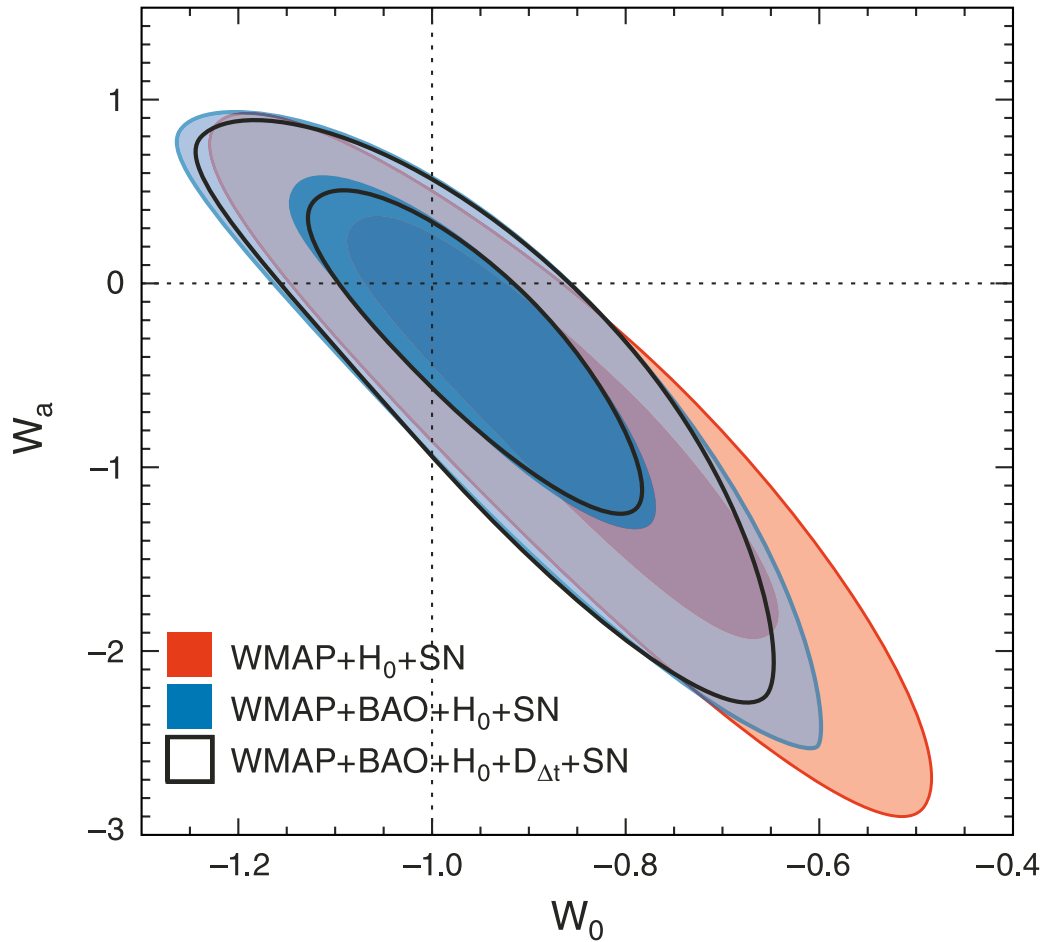


FIG. 13.— Joint two-dimensional marginalized constraint on the linear evolution model of dark energy equation of state, $w(a) = w_0 + w_a(1 - a)$. The contours show the 68% and 95% CL from WMAP+ H_0 +SN (red), WMAP+BAO+ H_0 +SN (blue), and WMAP+BAO+ H_0 + $D_{\Delta t}$ +SN (black), for a flat universe.

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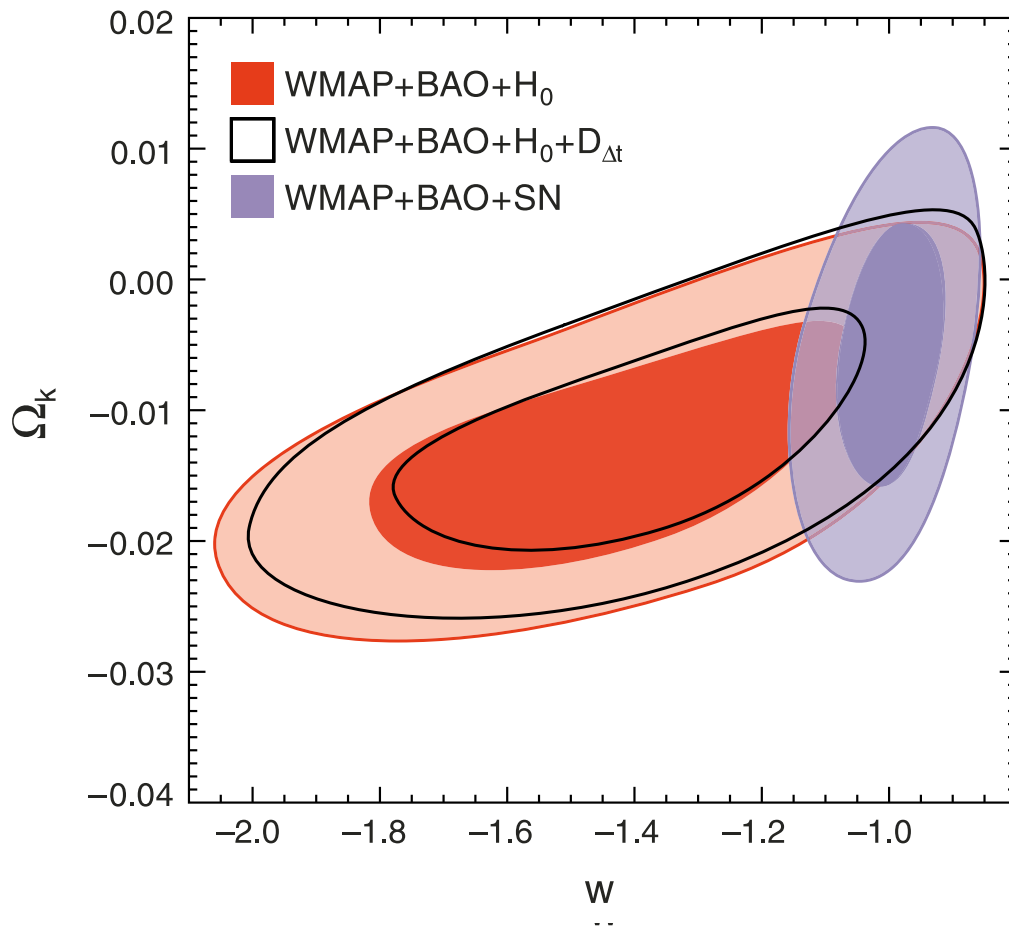


FIG. 12.— Joint two-dimensional marginalized constraint on the time-independent (constant) dark energy equation of state, w , and the curvature parameter, Ω_k . The contours show the 68% and 95% CL from WMAP+BAO+ H_0 (red), WMAP+BAO+ H_0 + $D_{\Delta t}$ (black), and WMAP+BAO+SN (purple).

You can find these on the WMAP
WMAP7 Komatsu et al. 2010
website [http://lambda.gsfc.nasa.gov/
product/map/dr4/parameters.cfm](http://lambda.gsfc.nasa.gov/product/map/dr4/parameters.cfm)

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WMAP Cosmological Parameters

Parameter	Best-fit value	1- σ uncertainty	2- σ uncertainty
H_0	71.9	± 2.4	± 3.2
$\Omega_b h^2$	0.02237	± 0.00015	± 0.00021
$\Omega_c h^2$	0.1191	± 0.0012	± 0.0017
$\Omega_m h^2$	0.143	± 0.004	± 0.006
Ω_k	0	± 0.005	± 0.007
n_s	0.963	± 0.006	± 0.009
$10^{10} A_s$	3.095	± 0.037	± 0.051
τ	0.084	± 0.003	± 0.004
$\ln 10^{10} \frac{A_s}{k^2}$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l < 4)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 4)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 10)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 20)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 40)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 80)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 160)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 320)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 640)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 1280)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 2560)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 5120)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 10240)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 20480)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 40960)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 81920)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 163840)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 327680)$	-2.031	± 0.020	± 0.027
$\ln 10^{10} \frac{A_s}{k^2} (l > 655360)$	-2.031	± 0.020	± 0.027
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