WIMP and Dark Matter Searches

We omit papers on CHAMP's, millicharged particles, and other exotic particles.

GALACTIC WIMP SEARCHES

These limits are for weakly-interacting stable particles that may constitute the invisible mass in the galaxy. Unless otherwise noted, a local mass density of 0.3 GeV/cm^3 is assumed; see each paper for velocity distribution assumptions. In the papers the limit is given as a function of the X^0 mass. Here we list limits only for typical mass values of sub-GeV, GeV, 20 GeV, 100 GeV, and 1 TeV. Specific limits on supersymmetric dark matter particles may be found in the Supersymmetry section.

Spin-Independent Cross Section Limits for Dark Matter Particle (X^0) on Nucleon

For m_{X^0} in GeV range

We provide here limits fo m_{X^0} < 5 GeV

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<3 \times 10^{-3}$	90	[1] AALBERS	23A	LZ	SI scatter on Xe
$<4 \times 10^{-7}$	90	[2] AGNES	23	DS50	LDM search via Migdal
$<6 \times 10^{-7}$	90	[3] AGNES	23B	DS50	LDM scatter on nucleons
<0.5	90	[4] ALBAKRY	23	SCDM	LDM via Migdal
<1	95	[5] AMBROSONE	23		DM distortion of CR spectra
<70	90	[6] ANGLOHER	23	CRES	LDM search
$<8 \times 10^{-8}$	90	[7] LI	23F	PNDX	SI light DM limits
$<5 \times 10^{-10}$	90	[8] MA	23A	PNDX	LDM search
<10	90	[9] ADHIKARI	22B	C100	sub-GeV WIMP via SI coupling/Migdal effect
$<1.4 \times 10^{4}$	90	[10] ARMENGAUD	22	EDEL	GeV-scale DM on Ge via Migdal effect
$<5 \times 10^{5}$	90	[11] CUI	22	PNDX	sub-GeV boosted DM
$<6.5 \times 10^{6}$	90	[12] XU	22	CDEX	sub-GeV DM
$<2 \times 10^{-7}$	95	[13] AKERIB	21A	LUX	low mass WIMPs
$<5 \times 10^{6}$	90	[14] ALKHATIB	21	SCDM	light DM
$<1 \times 10^{8}$	95	[15] ANDRIAMIR...	21A		sub-GeV DM on nucleon
$<1 \times 10^{-8}$	90	[16] APRILE	21	XE1T	GeV scale DM
$<8 \times 10^{-4}$	90	[17] AGUILAR-AR...	20C	DMIC	WIMP SI scatter on Si
$<8 \times 10^{-4}$	90	[18] AKERIB	20A	LUX	GeV-scale WIMP search
$<1 \times 10^{-2}$	90	[19] ABDELHAME...	19A	CRES	$CaWO_4$
$<5.4 \times 10^{-6}$	90	[20] AGNESE	19A	SCDM	GeV-scale WIMPs on Ge
<1	90	[21] AKERIB	19	LUX	light DM on Xe via Migdal/brem effect
$<1 \times 10^{-6}$	90	[22] AMOLE	19	PICO	C_3F_8
$<1.6 \times 10^{-3}$	90	[23] APRILE	19C	XE1T	DM on Xe
$<1 \times 10^{-7}$	90	[24] APRILE	19D	XE1T	DM on Xe
<0.1	90	[25] ARMENGAUD	19	EDEL	GeV-scale WIMPs on Ge

$< 1.6 \times 10^{3}$	90	[26] KOBAYASHI	19	XMAS	annual modulation Xe
$< 7 \times 10^{2}$	90	[27] LIU	19B	CDEX	Ge; sub-GeV DM via Migdal
$< 7 \times 10^{-7}$	90	[28] AGNES	18	DS50	GeV-scale WIMPs on Ar
$< 1.5 \times 10^{-5}$	95	[29] AGNESE	18	SCDM	GeV-scale WIMPs on Ge
$< 2 \times 10^{-8}$	90	[30] APRILE	18	XE1T	Xe, SI
$< 4.5 \times 10^{-3}$	90	[31] ARNAUD	18	NEWS	low mass WIMP, Ne
$< 8 \times 10^{-6}$	90	[32] JIANG	18	CDEX	GeV-scale WIMPs on Ge
$< 3 \times 10^{-5}$	90	[33] YANG	18	CDEX	WIMPs on Ge
$< 1 \times 10^{-6}$	90	[34] AKERIB	17	LUX	Xe
$< 1 \times 10^{2}$	90	[35] ANGLOHER	17A	CRES	GeV-scale WIMPs
$< 7 \times 10^{-5}$	90	[36] ANGLOHER	16	CRES	$CaWO_4$
$< 3 \times 10^{-5}$	90	[37] APRILE	16	X100	Xe
$< 4.3 \times 10^{-4}$	90	[38] ARMENGAUD	16	EDE3	GeV-scale WIMPs on Ge
$< 7 \times 10^{-5}$	90	[39] HEHN	16	EDE3	SI WIMP on Ge
$< 6 \times 10^{-5}$	90	[40] ZHAO	16	CDEX	GeV-scale WIMPs on Ge
$< 1 \times 10^{-4}$	90	[41] AMOLE	15	PICO	C_3F_8
$< 8 \times 10^{-5}$	90	[42] XIAO	15	PNDX	WIMPs on Xe
$< 3 \times 10^{-5}$	90	[43] AGNESE	14	SCDM	GeV-scale WIMPs
$< 1 \times 10^{-3}$	90	[44] AKERIB	14	LUX	WIMP on Xe
$< 9 \times 10^{-4}$	90	[45] LI	13B	TEXO	WIMPs on Ge
$< 3 \times 10^{-4}$	90	[46] ARCHAMBAU...	12	PICA	C_4F_{10}
$< 2 \times 10^{-4}$	90	[47] AALSETH	11	CGNT	GeV WIMPs on Ge
$< 5 \times 10^{-4}$	90	[48] AHMED	11B	CDM2	GeV-scale WIMPs on Ge
$< 8 \times 10^{-5}$	90	[49] ANGLE	11	XE10	Xe
$< 5 \times 10^{-4}$	90	[50] AKERIB	10	CDM2	WIMPs on Ge/Si

[1] AALBERS 23A search for e recoil events from GeV scale WIMP scatter on Xe. No signal observed. Limits placed on 6 different models including $\sigma^{SI} < 3 \times 10^{-3}$ for m(χ) $\sim$ 1 GeV via Migdal scattering.

[2] AGNES 23 for for light DM via e recoil/Migdal effect. No signal observed. $\sigma^{SI}(\chi N) < 4 \times 10^{-7}$ pb for m(χ) = 3 GeV.

[3] AGNES 23B search for GeV-scale DM scatter on nucleons in Ar. No signal observed. Limit $\sigma^{SI}(\chi N) < 6 \times 10^{-7}$ pb for m(χ) = 3 GeV.

[4] ALBAKRY 23 search for light DM via Migdal effect. No signal observed. Allow $\sigma^{SI} < 0.5$ pb for m(χ)=1 GeV (see e.g. Fig. 7).

[5] AMBROSONE 23 derive limits on $\sigma(\chi p)$ due to possible DM distortion of cosmic ray spectra in starburst galaxies. Limits placed in σ vs. mass (10^{-3}–10 MeV) plane, the most stringent given above being at 1 keV.

[6] ANGLOHER 23 search for light DM using Si target. No signal observed. Require $\sigma^{SI} <$ 70 pb for m(χ) = 0.3 GeV (see e.g. Fig. 5).

[7] LI 23F searches for SI light DM scatter from Xe. No signal observed. The quoted limit for m(χ) = 4 GeV.

[8] MA 23A search for GeV-scale DM using PandaX-4T. No signal observed. $\sigma(\chi p) < 5 \times 10^{-10}$ pb for m(χ) = 10 GeV.

[9] ADHIKARI 22B search for sub-GeV WIMPs via SI and SD detection; no signal detected; limits placed in m(χ) vs. σ plane for m(χ): 0.2–3 GeV; quoted limit is for m(χ) = 1 GeV.

[10] ARMENGAUD 22 search for GeV-scale DM scatter on Ge at EDELWEISS via Migdal effect; no signal observed; limits placed in $\sigma^{SI}(\chi N)$ vs. m(DM) plane; quoted limit is for m(DM) = 100 MeV.

[11] CUI 22 search for sub-GeV boosted DM at PandaX-II at CJPL; no signal detected; limits set in $\sigma^{SI}(\chi p)$ vs. m(χ) plane; quoted limit for m(χ) = 0.1 GeV.

[12] XU 22 search for sub-GeV boosted DM in CDEX; no signal observed; limits placed in $\sigma(\chi N)$ vs. m(DM) plane; quoted limit is for m(DM) = 0.1 GeV.

[13] AKERIB 21A present new technique for low mass WIMP detection. Require $\sigma^{SI}(p\chi) < 2 \times 10^{-7}$ pb for m(WIMP) 10 GeV.

[14] ALKHATIB 21 search for light DM using SuperCDMS; require $\sigma^{SI}(p\chi) < 5 \times 10^{6}$ for m(DM) = 0.1 GeV.

[15] ANDRIAMIRADO 21A search for upscattered (boosted) sub-GeV DM interacting with proton in PROSPECT detector. No signal observed. Limits placed in $\sigma(\chi N)$ vs. m(DM) plane for m(DM) $\sim$ 1 keV $-$ 0.5 GeV. The listed limit is for m(DM) = 1 keV.

[16] APRILE 21 search for low recoil energy GeV-scale DM in XENON1T with 1.6 keV threshold. No signal in 0.6 t y exposure. Limits placed in $\sigma^{SI}(\chi N)$ vs. m(DM) plane for m(DM) between 3–12 GeV. The listed limit is for m(DM) = 5 GeV.

[17] AGUILAR-AREVALO 20C search for WIMP SI scatter on Si using DAMIC at SNOLab; some excess; limits placed in σ vs m(DM) for m(DM) in 1.2–10 GeV; quoted limit for m(WIMP) = 2 GeV.

[18] AKERIB 20A search for GeV-scale WIMPs via WIMP-nucleon scatter with single photon emission; no signal; limits placed in m(WIMP) vs σ^{SI} plane: for example $\sigma^{SI}(\chi n) < 8 \times 10^{-4}$ pb for m(WIMP) = 2.5 GeV.

[19] ABDELHAMEED 19A search for GeV scale dark matter SI scatter on $CaWO_4$; no signal, limits placed in σ vs. mass plane for m(DM) $\sim$ 0.1–10 GeV. The listed limit is for m(DM) = 1 GeV.

[20] AGNESE 19A search for 1.5–10 GeV WIMP scatter on Ge in CDMSlite dataset. Limits set in a likelihood analysis. No signal was observed. Limit reported for m(χ) = 5 GeV.

[21] AKERIB 19 search for 0.4–5 GeV DM using bremsstrahlung photons and "Migdal" electrons; 1.4×10^{4} kg d exposure of liquid Xe; constraint $\sigma^{SI}(\chi N) < 1$ pb for m(χ) = 5 GeV in light scalar mediator model.

[22] AMOLE 19 search for SI WIMP scatter on C_3F_8 in PICO-60 bubble chamber; no signal: set limit for spin independent coupling $\sigma^{SI}(\chi N) < 1 \times 10^{-6}$ pb for m(χ) = 5 GeV.

[23] APRILE 19C search for light DM scatter on Xe via atomic excitation, ionization (Migdal effect) or bremsstrahlung; no signal, limits placed in σ vs. m(DM) plane for m(DM) $\sim$ 0.085–2 GeV. The listed limit is for m(DM) = 1 GeV.

[24] APRILE 19D search for light DM scatter on Xe via ionization to probe SI, SD, and χe cross sections; with 22 t d exposure, limits placed in various σ vs. m(DM) planes. Quoted limit is for m(DM) = 5 GeV.

[25] ARMENGAUD 19search for GeV scale WIMP scatter on Ge; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 0.045–10 GeV; quoted limit is for m(χ) = 5 GeV.

[26] KOBAYASHI 19 search for sub-GeV WIMP annual modulation in Xe via brems; no signal; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m $\sim$ 0.3–1 GeV; quoted limit is for m(χ) = 0.5 GeV.

[27] LIU 19B seach for sub-GeV DM using Migdal effect on Ge at CDEX-IB; no signal, require $\sigma^{SI}(\chi N) < 7 \times 10^{2}$ pb for m(χ) = 0.1 GeV.

[28] AGNES 18 search for 1.8–20 GeV WIMP SI scatter on Ar; quoted limit is for m(χ) = 5 GeV.

[29] AGNESE 18 search for GeV scale WIMPs using CDMSlite; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m $\sim$ 1.5–20 GeV; quoted limit is for m(χ) = 5 GeV.

[30] APRILE 18 search for WIMP scatter on 1 t yr Xe; no signal, limits set in $\sigma(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 6–1000 GeV; quoted limit is for m = 6 GeV.

[31] ARNAUD 18 search for low mass WIMP scatter on Ne via SPC at NEWS-G; limits set in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m $\sim$ 0.5–20 GeV; quoted limit is for m = 5 GeV.

[32] JIANG 18 search for GeV scale WIMP scatter on Ge; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 3–10 GeV; quoted limit is for m(χ) = 5 GeV.

[33] YANG 18 search for WIMP scatter on Ge; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 2–10 GeV; quoted limit is for m(χ) = 5 GeV.

[34] AKERIB 17 search for WIMP scatter on Xe; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 5–1 × 10^5 GeV; quoted limit is for m(χ) = 5 GeV.

[35] ANGLOHER 17A search for GeV scale WIMP scatter on Al_2O_3 crystal; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 0.15–10 GeV; quoted limit is for m(χ) = 5 GeV.

[36] ANGLOHER 16 search for GeV scale WIMP scatter on $CaWO_4$; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 0.5–30 GeV; quoted limit is for m(χ) = 5 GeV.

[37] APRILE 16 search for low mass WIMPs via ionization at XENON100; limits placed in $\sigma^{SI}(\chi N)$ vs m(χ) plane for m ∼ 3.5–20 GeV; quoted limit is for m(χ) = 5 GeV.

[38] ARMENGAUD 16 search for GeV scale WIMP scatter on Ge; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 4–30 GeV; quoted limit is for m(χ) = 5 GeV.

[39] HEHN 16 search for low mass WIMPs via SI scatter on Ge target using profile likelihood analysis; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 4–30 GeV; quoted limit is for m(χ) = 5 GeV.

[40] ZHAO 16 search for GeV-scale WIMP scatter on Ge; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 4–30 GeV; quoted limit is for m(χ) = 5 GeV.

[41] AMOLE 15 search for WIMP scatter on C_3F_8 in PICO-2L; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 4–25 GeV; quoted limit is for m(χ) = 5 GeV.

[42] XIAO 15 search for WIMP scatter on Xe with PandaX-I; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 5–100 GeV; quoted limit is for m(χ) = 5 GeV.

[43] AGNESE 14 search for GeV scale WIMPs SI scatter at SuperCDMS; no signal, limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 3.5–30 GeV; quoted limit is for m(χ) = 5 GeV.

[44] AKERIB 14 search for WIMP scatter on Xe; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 5–5000 GeV. Limit given for m(χ) = 5 GeV.

[45] LI 13B search for WIMP scatter on Ge; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 4–100 GeV; quoted limit is for m(χ) = 5 GeV.

[46] ARCHAMBAULT 12 search for low mass WIMP scatter on C_4F_{10}; limits set in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m ∼ 4–12 GeV; quoted limit is for m = 5 GeV.

[47] AALSETH 11 search for GeV-scale SI WIMP scatter on Ge; limits placed on $\sigma^{SI}(\chi N)$ for m(χ) ∼ 3.5–100 GeV; quoted limit is for m(χ) = 5 GeV.

[48] AHMED 11B search for GeV scale WIMP scatter on Ge in CDMS II; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m ∼ 4–12 GeV.

[49] ANGLE 11 search for GeV scale WIMPs in Xenon-10; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) ∼ 4–20 GeV; quoted limit is for m(χ) = 5 GeV.

[50] AKERIB 10 search for WIMP scatter on Ge/Si in CDMS II; limits place in $\sigma_{SI}(\chi N)$ vs. m(χ) plane for m ∼ 3–100 GeV. Limit given for m(DM) = 5 GeV.

For m_{X^0} = 20 GeV

For limits from X^0 annihilation in the Sun, the assumed annihilation final state is shown in parenthesis in the comment.

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1 \times 10^{-11}$	90	[1] AALBERS	23	LZ	SI scatter on Xe
$<2 \times 10^{-7}$	90	[2] ABE	23E	XMAS	WIMP search

$<4 \times 10^{-11}$	90	[3] APRILE	23A	XENT	Si WIMP search
$<5 \times 10^{-11}$	90	[4] MENG	21B	PNDX	Xe WIMP search
$<5 \times 10^{-5}$		[5] FELIZARDO	20	SMPL	C_2ClF_5
$<2.2 \times 10^{-10}$	90	[6] WANG	20G	PNDX	Xe TPC
		[7] ANGLOHER	19	CRES	$CaWO_4$
$<7 \times 10^{-5}$	90	[8] KIM	19A	KIMS	NaI
$<3 \times 10^{-7}$	90	[9] KOBAYASHI	19	XMAS	SI WIMP on Xe
		[10] SEONG	19	BELL	$\Upsilon \to \gamma A$, $A \to \chi\chi$
$<3.5 \times 10^{-5}$	90	[11] YANG	19	CDEX	annual modulation Ge
$<2 \times 10^{-7}$	90	[12] ABE	18C	XMAS	X^0- Xe modulation
$<1.44 \times 10^{-5}$	90	[13] ADHIKARI	18	C100	NaI
$<3 \times 10^{-7}$	90	[14] AGNES	18	DS50	X^0-Ar
$<5 \times 10^{-6}$	95	[15] AGNESE	18	SCDM	Ge
$<4 \times 10^{-8}$	90	[16] AGNESE	18A	SCDM	Ge
$<6 \times 10^{-11}$	90	[17] APRILE	18	XE1T	Xe, SI
$<4.5 \times 10^{-3}$	90	[18] ARNAUD	18	NEWS	GeV WIMPs on Ne
$<2 \times 10^{-6}$	90	[19] AARTSEN	17	ICCB	ν, earth
$<2 \times 10^{-10}$	90	[20] AKERIB	17	LUX	Xe
$<1 \times 10^{-3}$	90	[21] BARBOSA-D...	17	ICCB	NaI
$<1.7 \times 10^{-10}$	90	[22] CUI	17A	PNDX	WIMPs on Xe
$<7.3 \times 10^{-7}$	90	AGNES	16	DS50	Ar
$<1 \times 10^{-5}$	90	[23] AGNESE	16	CDMS	Ge
$<2 \times 10^{-4}$	90	[24] AGUILAR-AR...	16	DMIC	Si CCDs
$<4.5 \times 10^{-5}$	90	[25] ANGLOHER	16	CRES	$CaWO_4$
$<2 \times 10^{-6}$	90	[26] APRILE	16	X100	Xe
$<9.4 \times 10^{-8}$	90	[27] ARMENGAUD	16	EDE3	Ge
$<1.0 \times 10^{-7}$	90	[28] HEHN	16	EDE3	Ge
$<5 \times 10^{-6}$	90	[29] ZHAO	16	CDEX	Ge
$<1 \times 10^{-5}$	90	AGNES	15	DS50	Ar
$<1.5 \times 10^{-6}$	90	[30] AGNESE	15A	CDM2	Ge
$<1.5 \times 10^{-7}$	90	[31] AGNESE	15B	CDM2	Ge
$<2 \times 10^{-6}$	90	[32] AMOLE	15	PICO	C_3F_8
$<1.2 \times 10^{-5}$	90	CHOI	15	SKAM	H, solar ν ($b\overline{b}$)
$<1.19 \times 10^{-6}$	90	CHOI	15	SKAM	H, solar ν ($\tau^+\tau^-$)
$<2 \times 10^{-8}$	90	[33] XIAO	15	PNDX	Xe
$<2.0 \times 10^{-7}$	90	[34] AGNESE	14	SCDM	Ge
$<3.7 \times 10^{-5}$	90	[35] AGNESE	14A	SCDM	Ge
$<1 \times 10^{-9}$	90	[36] AKERIB	14	LUX	Xe
$<2 \times 10^{-6}$	90	[37] ANGLOHER	14	CRES	$CaWO_4$
$<5 \times 10^{-6}$	90	FELIZARDO	14	SMPL	C_2ClF_5
$<8 \times 10^{-6}$	90	[38] LEE	14A	KIMS	CsI
$<2 \times 10^{-4}$	90	[39] LIU	14A	CDEX	Ge
$<1 \times 10^{-5}$	90	[40] YUE	14	CDEX	Ge
$<1.08 \times 10^{-4}$	90	[41] AARTSEN	13	ICCB	H, solar ν ($\tau^+\tau^-$)
$<1.5 \times 10^{-5}$	90	[42] ABE	13B	XMAS	Xe
$<3.1 \times 10^{-6}$	90	[43] AGNESE	13	CDM2	Si
$<3.4 \times 10^{-6}$	90	[44] AGNESE	13A	CDM2	Si
$<2.2 \times 10^{-6}$	90	[45] AGNESE	13A	CDM2	Si
		[46] BERNABEI	13A	DAMA	NaI modulation

$<1.2 \times 10^{-4}$	90	[47] LI	13B	TEXO	Ge
		[48] ZHAO	13	CDEX	Ge
$<1.2 \times 10^{-7}$	90	AKIMOV	12	ZEP3	Xe
		[49] ANGLOHER	12	CRES	$CaWO_4$
$<8 \times 10^{-6}$	90	[50] ANGLOHER	12	CRES	$CaWO_4$
$<7 \times 10^{-9}$	90	[51] APRILE	12	X100	Xe
$<7 \times 10^{-7}$	90	[52] ARMENGAUD	12	EDE2	Ge
		[53] BARRETO	12	DMIC	CCD
$<2 \times 10^{-6}$	90	BEHNKE	12	COUP	CF_3I
$<7 \times 10^{-6}$		[54] FELIZARDO	12	SMPL	C_2ClF_5
$<1.5 \times 10^{-6}$	90	KIM	12	KIMS	CsI
$<5 \times 10^{-5}$	90	[55] AALSETH	11	CGNT	Ge
		[56] AALSETH	11A	CGNT	Ge
$<5 \times 10^{-7}$	90	[57] AHMED	11	CDM2	Ge, inelastic
$<2.7 \times 10^{-7}$	90	[58] AHMED	11A	RVUE	Ge
$<3 \times 10^{-6}$	90	[59] ANGLE	11	XE10	Xe
$<7 \times 10^{-8}$	90	[60] APRILE	11	X100	Xe
		[61] APRILE	11A	X100	Xe, inelastic
$<2 \times 10^{-8}$	90	[51] APRILE	11B	X100	Xe
		[62] HORN	11	ZEP3	Xe
$<2 \times 10^{-7}$	90	AHMED	10	CDM2	Ge
$<1 \times 10^{-5}$	90	[63] AKERIB	10	CDM2	Si, Ge, low threshold
$<1 \times 10^{-7}$	90	APRILE	10	X100	Xe
$<2 \times 10^{-6}$	90	ARMENGAUD	10	EDE2	Ge
$<4 \times 10^{-5}$	90	FELIZARDO	10	SMPL	C_2ClF_3
$<1.5 \times 10^{-7}$	90	[64] AHMED	09	CDM2	Ge
$<2 \times 10^{-4}$	90	[65] LIN	09	TEXO	Ge
		[66] AALSETH	08	CGNT	Ge

[1] AALBERS 23 present first limits for WIMP scatter on Xe. $\sigma^{SI}(\chi p) < 1 \times 10^{-11}$ pb for m(χ) = 20 GeV.

[2] ABE 23E search for WIMP scatter on Xe in XMASS. No signal observed. Require $\sigma^{SI} < 2 \times 10^{-7}$ pb for m(χ) = 20 GeV.

[3] APRILE 23A present first results from Xe-nton SI WIMP search. No signal observed. Quoted limit is for m(χ) = 20 GeV.

[4] MENG 21B search for SI WIMP interaction with 3.7 t Xe and 0.63 t yr exposure. No signal observed. Limits placed in m(DM) vs. σ^{SI} plane.

[5] FELIZARDO 20 presents 2014 SIMPLE bounds on WIMP DM using C_2ClF_5 target .

[6] WANG 20G search for SI WIMP scatter on Xe with 132 t d exposure of PANDAX-II .

[7] ANGLOHER 19 search for low mass WIMP scatter on $CaWO_4$; no signal; limits placed on Wilson coefficients for m(χ) = 0.6–60 GeV.

[8] KIM 19A search for WIMP scatter in NaI KIMS experiment; no signal: require $\sigma^{SI}(\chi n) < 7 \times 10^{-5}$ pb for m(χ) = 20 GeV.

[9] KOBAYASHI 19 search for WIMP scatter in XMASS single-phase liquid Xe detector; no signal; require $\sigma^{SI}(\chi N) < 3 \times 10^{-7}$ pb for m(χ) = 20 GeV.

[10] SEONG 19 search for $\Upsilon \to \gamma A$, $A \to \chi\chi$ via CP-odd Higgs; no signal; limits on BF set; model dependent conversion to WIMP-nucleon scattering cross section limits $\sigma^{SI} < 10^{-36}$ cm^2 for m(χ) = 0.01–1 GeV.

[11] YANG 19 search for low mass wimps via annual modulation in Ge; no signal; require $\sigma^{SI}(\chi N) < 3.5 \times 10^{-5}$ pb for m(χ) = 20 GeV.

[12] ABE 18C search for WIMP annual modulation signal for m(WIMP): 6–20 GeV; limits set on SI WIMP-nucleon cross section: see Fig. 6.
[13] ADHIKARI 18 search for WIMP scatter on NaI; no signal; require $\sigma^{SI} < 1.44 \times 10^{-5}$ pb for m(WIMP) = 20 GeV; inconsistent with DAMA/LIBRA result.
[14] AGNES 18 search low mass m(WIMP): 1.8–20 GeV scatter on Ar; limits on SI WIMP-nucleon cross section set in Fig. 8.
[15] AGNESE 18 give limits for $\sigma^{SI}(\chi N)$ for m(WIMP) between 1.5 and 20 GeV using CDMSlite mode data.
[16] AGNESE 18A search for WIMP scatter on Ge at SuperCDMS; 1 event, consistent with expected background; set limit in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m $\sim$ 10–250 GeV.
[17] APRILE 18 search for WIMP scatter on 1 t yr Xe; no signal, limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 6–1000 GeV.
[18] ARNAUD 18 search for low mass WIMP scatter on Ne via SPC at NEWS-G; limits set in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m $\sim$ 0.5–20 GeV.
[19] AARTSEN 17 obtain σ(SI) $< 6 \times 10^{-6}$ pb for m(wimp) = 20 GeV from ν from earth.
[20] AKERIB 17 search for WIMP scatter on Xe; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 5–1×10^5 GeV.
[21] BARBOSA-DE-SOUZA 17 search for annual modulation of WIMP scatter on NaI using an exposure of 61 kg yr of DM-Ice17 for recoil energy in the 4–20 keV range (DAMA found modulation for recoil energy < 5 keV). No modulation seen. Sensitivity insufficient to distinguish DAMA signal from null.
[22] CUI 17A search for SI WIMP scatter; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m $\sim$ 10–1×10^4 GeV using 54 ton-day exposure of Xe.
[23] AGNESE 16 CDMSlite excludes low mass WIMPs 1.6–5.5 GeV and SI scattering cross section depending on *m*(WIMP); see Fig. 4.
[24] AGUILAR-AREVALO 16 search low mass 1–10 GeV WIMP scatter on Si CCDs; set limits Fig. 11.
[25] ANGLOHER 16 search for GeV scale WIMP scatter on $CaWO_4$; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 0.5–30 GeV.
[26] APRILE 16 search for low mass WIMPs via ionization at XENON100; limits placed in $\sigma^{SI}(\chi N)$ vs m(χ) plane for m $\sim$ 3.5–20 GeV.
[27] ARMENGAUD 16 search for GeV scale WIMP scatter on Ge; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 4–30 GeV.
[28] HEHN 16 search for low mass WIMPs via SI scatter on Ge target using profile likelihood analysis; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 4–30 GeV.
[29] ZHAO 16 search for GeV-scale WIMP scatter on Ge; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 4–30 GeV.
[30] AGNESE 15A reanalyse AHMED 11B low threshold data. See their Fig. 12 (left) for improved limits extending down to 5 GeV.
[31] AGNESE 15B reanalyse AHMED 10 data.
[32] See their Fig. 7 for limits extending down to 4 GeV.
[33] XIAO 15 search for WIMP scatter on Xe with PandaX-I; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 5–100 GeV.
[34] This limit value is provided by the authors. See their Fig. 4 for limits extending down to m_{χ^0} = 3.5 GeV.
[35] This limit value is provided by the authors. AGNESE 14A result is from CDMSlite mode operation with enhanced sensitivity to low mass m_{χ^0}. See their Fig. 3 for limits extending down to m_{χ^0} = 3.5 GeV (see also Fig. 4 in AGNESE 14).
[36] See their Fig. 5 for limits extending down to m_{χ^0} = 5.5 GeV.
[37] See their Fig. 5 for limits extending down to m_{χ^0} = 1 GeV.
[38] See their Fig. 5 for limits extending down to m_{χ^0} = 5 GeV.

[39] LIU 14A result is based on prototype CDEX-0 detector. See their Fig. 13 for limits extending down to m_{X^0} = 2 GeV.

[40] See their Fig. 4 for limits extending down to m_{X^0} = 4.5 GeV.

[41] AARTSEN 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken between June 2010 and May 2011.

[42] See their Fig. 8 for limits extending down to m_{X^0} = 7 GeV.

[43] This limit value is provided by the authors. AGNESE 13 use data taken between Oct. 2006 and July 2007. See their Fig. 4 for limits extending down to m_{X^0} = 7 GeV.

[44] This limit value is provided by the authors. AGNESE 13A use data taken between July 2007 and Sep. 2008. Three candidate events are seen. Assuming these events are real, the best fit parameters are m_{X^0} = 8.6 GeV and $\sigma = 1.9 \times 10^{-5}$ pb.

[45] This limit value is provided by the authors. Limit from combined data of AGNESE 13 and AGNESE 13A. See their Fig. 4 for limits extending down to m_{X^0} = 5.5 GeV.

[46] BERNABEI 13A search for annual modulation of counting rate in the 2–6 keV recoil energy interval, in a 14 yr live time exposure of 1.33 t yr. Find a modulation of 0.0112 ± 0.0012 counts/(day kg keV) with 9.3 sigma C.L. Find period and phase in agreement with expectations from DM particles.

[47] LI 13B search for WIMP scatter on Ge; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 4–100 GeV.

[48] See their Fig. 5 for limits for m_{X^0} = 4–12 GeV.

[49] ANGLOHER 12 observe excess events above the expected background which are consistent with X^0 with mass $\sim$ 25 GeV (or 12 GeV) and spin-independent X^0-nucleon cross section of 2×10^{-6} pb (or 4×10^{-5} pb).

[50] Reanalysis of ANGLOHER 09 data with all three nuclides. See also BROWN 12.

[51] See also APRILE 14A.

[52] See their Fig. 4 for limits extending down to m_{X^0} = 7 GeV.

[53] See their Fig. 13 for cross section limits for m_{X^0} between 1.2 and 10 GeV.

[54] See also DAHL 12 for a criticism.

[55] See their Fig. 4 for limits extending to m_{X^0} = 3.5 GeV.

[56] AALSETH 11A find indications of annual modulation of the data, the energy spectrum being compatible with X^0 mass around 8 GeV. See also AALSETH 13.

[57] AHMED 11 search for X^0 inelastic scattering. See their Fig. 8–10 for limits. The inelastic cross section reduces to the elastic cross section at the limit of zero mass splitting (Fig. 8, left).

[58] AHMED 11A combine CDMS II and EDELWEISS data.

[59] ANGLE 11 show limits down to m_{X^0} = 4 GeV on Fig. 3.

[60] APRILE 11 reanalyze APRILE 10 data.

[61] APRILE 11A search for X^0 inelastic scattering. See their Fig. 2 and 3 for limits. See also APRILE 14A.

[62] HORN 11 perform detector calibration by neutrons. Earlier results are only marginally affected.

[63] See their Fig. 10 and 12 for limits extending to X^0 mass of 1 GeV.

[64] Superseded by AHMED 10.

[65] See their Fig. 6(a) for cross section limits for m_{X^0} extending down to 2 GeV.

[66] See their Fig. 2 for cross section limits for m_{X^0} between 4 and 10 GeV.

For $m_{X^0} = 100$ GeV

For limits from X^0 annihilation in the Sun, the assumed annihilation final state is shown in parenthesis in the comment.

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.5 \times 10^{-11}$	90	[1] AALBERS	23	LZ	SI scatter on Xe
$<2 \times 10^{-8}$	90	[2] ABE	23E	XMAS	WIMP search
$<6 \times 10^{-11}$	90	[3] APRILE	23A	XENT	SI WIMP search
$<6 \times 10^{-11}$	90	[4] MENG	21B	PNDX	Xe WIMP search
		[5] ADHIKARI	20	DEAP	Ar
$<5 \times 10^{-5}$		[6] FELIZARDO	20	SMPL	W
$<4.2 \times 10^{-10}$	90	[7] WANG	20G	PNDX	Xe TPC
$<4 \times 10^{-8}$	90	[8] ABE	19	XMAS	Xe
$<3.9 \times 10^{-9}$	90	[9] AJAJ	19	DEAP	Ar
$<2.3 \times 10^{-6}$	90	[10] ADHIKARI	18	C100	NaI
$<1.14 \times 10^{-8}$	90	[11] AGNES	18A	DS50	Ar
$<2 \times 10^{-8}$	90	[12] AGNESE	18A	CDMS	Ge
$<1.2 \times 10^{-8}$	90	[13] AMAUDRUZ	18	DEAP	Ar
$<9.12 \times 10^{-11}$	90	[14] APRILE	18	XE1T	Xe
		[15] REN	18	PNDX	SIDM at PDX-II
$<1.7 \times 10^{-10}$	90	[16] AKERIB	17	LUX	Xe
$<1.2 \times 10^{-10}$	90	[17] APRILE	17G	XE1T	Xe
$<1.2 \times 10^{-10}$	90	[18] CUI	17A	PNDX	Xe
$<2.0 \times 10^{-8}$	90	AGNES	16	DS50	Ar
$<1 \times 10^{-9}$	90	[19] AKERIB	16	LUX	Xe
$<1 \times 10^{-9}$	90	[20] APRILE	16B	X100	Xe
$<2 \times 10^{-8}$	90	[21] TAN	16	PNDX	Xe
$<4 \times 10^{-10}$	90	[22] TAN	16B	PNDX	Xe
$<6 \times 10^{-8}$	90	AGNES	15	DS50	Ar
$<4 \times 10^{-8}$	90	[23] AGNESE	15B	CDM2	Ge
$<7.13 \times 10^{-6}$	90	CHOI	15	SKAM	H, solar ν ($b\overline{b}$)
$<6.26 \times 10^{-7}$	90	CHOI	15	SKAM	H, solar ν ($W^+ W^-$)
$<2.76 \times 10^{-7}$	90	CHOI	15	SKAM	H, solar ν ($\tau^+ \tau^-$)
$<1.5 \times 10^{-8}$	90	[24] XIAO	15	PNDX	Xe
$<1 \times 10^{-9}$	90	AKERIB	14	LUX	Xe
$<4.0 \times 10^{-6}$	90	[25] AVRORIN	14	BAIK	H, solar ν ($W^+ W^-$)
$<1.0 \times 10^{-4}$	90	[25] AVRORIN	14	BAIK	H, solar ν ($b\overline{b}$)
$<1.6 \times 10^{-6}$	90	[25] AVRORIN	14	BAIK	H, solar ν ($\tau^+ \tau^-$)
$<5 \times 10^{-6}$	90	FELIZARDO	14	SMPL	C_2ClF_5
$<6.01 \times 10^{-7}$	90	[26] AARTSEN	13	ICCB	H, solar ν ($W^+ W^-$)
$<3.30 \times 10^{-5}$	90	[26] AARTSEN	13	ICCB	H, solar ν ($b\overline{b}$)
$<1.9 \times 10^{-6}$	90	[27] ADRIAN-MAR...	13	ANTR	H, solar ν ($W^+ W^-$)
$<1.2 \times 10^{-4}$	90	[27] ADRIAN-MAR...	13	ANTR	H, solar ν ($b\overline{b}$)
$<7.6 \times 10^{-7}$	90	[27] ADRIAN-MAR...	13	ANTR	H, solar ν ($\tau^+ \tau^-$)
$<2 \times 10^{-6}$	90	[28] AGNESE	13	CDM2	Si
$<1.6 \times 10^{-6}$	90	[29] BOLIEV	13	BAKS	H, solar ν ($W^+ W^-$)
$<1.9 \times 10^{-5}$	90	[29] BOLIEV	13	BAKS	H, solar ν ($b\overline{b}$)
$<7.1 \times 10^{-7}$	90	[29] BOLIEV	13	BAKS	H, solar ν ($\tau^+ \tau^-$)
$<3.2 \times 10^{-4}$	90	[30] LI	13B	TEXO	WIMPs on Ge

$<1.67 \times 10^{-6}$	90	[31] ABBASI	12	ICCB	H, solar ν ($W^+ W^-$)
$<1.07 \times 10^{-4}$	90	[31] ABBASI	12	ICCB	H, solar ν ($b\overline{b}$)
$<4 \times 10^{-8}$	90	AKIMOV	12	ZEP3	Xe
$<1.4 \times 10^{-6}$	90	[32] ANGLOHER	12	CRES	$CaWO_4$
$<3 \times 10^{-9}$	90	[33] APRILE	12	X100	Xe
$<3 \times 10^{-7}$	90	BEHNKE	12	COUP	CF_3I
$<7 \times 10^{-6}$		FELIZARDO	12	SMPL	C_2ClF_5
$<2.5 \times 10^{-7}$	90	[34] KIM	12	KIMS	CsI
$<2 \times 10^{-4}$	90	AALSETH	11	CGNT	Ge
		[35] AHMED	11	CDM2	Ge, inelastic
$<3.3 \times 10^{-8}$	90	[36] AHMED	11A	RVUE	Ge
		[37] AJELLO	11	FLAT	
$<3 \times 10^{-8}$	90	[38] APRILE	11	X100	Xe
		[39] APRILE	11A	X100	Xe, inelastic
$<1 \times 10^{-8}$	90	[33] APRILE	11B	X100	Xe
$<5 \times 10^{-8}$	90	[40] ARMENGAUD	11	EDE2	Ge
		[41] HORN	11	ZEP3	Xe
$<4 \times 10^{-8}$	90	AHMED	10	CDM2	Ge
$<9 \times 10^{-6}$	90	AKERIB	10	CDM2	Si, Ge, low threshold
		[42] AKIMOV	10	ZEP3	Xe, inelastic
$<5 \times 10^{-8}$	90	APRILE	10	X100	Xe
$<1 \times 10^{-7}$	90	ARMENGAUD	10	EDE2	Ge
$<3 \times 10^{-5}$	90	FELIZARDO	10	SMPL	C_2ClF_3
$<5 \times 10^{-8}$	90	[43] AHMED	09	CDM2	Ge
		[44] ANGLE	09	XE10	Xe, inelastic
$<3 \times 10^{-4}$	90	LIN	09	TEXO	Ge
		[45] GIULIANI	05	RVUE	

[1] AALBERS 23 present first LZ limits on SI WIMP-nucleon scatter from Xe. $\sigma^{SI}(\chi p) < 2.5 \times 10^{-11}$ pb for m(χ) = 100 GeV.

[2] ABE 23E search for WIMP scatter on Xe in XMASS. No signal observed. Require $\sigma^{SI} < 2 \times 10^{-7}$ pb for m(χ) = 100 GeV.

[3] APRILE 23A present first results from Xe-nton SI WIMP search. No signal observed. Quoted limit is for m(χ) = 100 GeV.

[4] MENG 21B search for SI WIMP interaction with 3.7 t Xe and 0.63 t yr exposure. No signal observed. Limits placed in m(DM) vs. σ^{SI} plane.

[5] ADHIKARI 20 search for SI WIMP scatter from Ar in AJAJ 19 data. No signal observed. Limits placed on σ^p vs. m(WIMP) for various assumed operators and models.

[6] FELIZARDO 20 presents 2014 SIMPLE bounds on WIMP DM using C_2ClF_5 target .

[7] WANG 20G search for SI WIMP scatter on Xe with 132 t d exposure of PANDAX-II .

[8] ABE 19 search for SI DD in single phase Xe; no signal; require $\sigma^{SI}(\chi p) < 4 \times 10^{-8}$ pb for m(χ) $\sim$ 100 GeV.

[9] AJAJ 19 search for SI WIMP-nucleon scatter with 758 tonne day exposure of single phase liquid Ar; no signal: require $\sigma^{SI}(\chi N) < 3.9 \times 10^{-9}$ pb for m(χ) = 100 GeV.

[10] ADHIKARI 18 search for WIMP scatter on NaI;limit set $\sigma^{SI}(\chi p) < 2.3 \times 10^{-6}$ pb for m(χ) = 100 GeV.

[11] AGNES 18A search for WIMP scatter on 46.4 kg Ar; no signal; require $\sigma^{SI}(\chi N) < 1.14 \times 10^{-8}$ pb for m(χ) = 100 GeV.

[12] AGNESE 18A set limit $\sigma^{SI}(\chi N) < 2 \times 10^{-8}$ pb for m(WIMP) = 100 GeV.

[13] AMAUDRUZ 18 search for WIMP scatter on Ar with DEAP-3600; limits set: $\sigma^{SI}(\chi p) < 1.2 \times 10^{-8}$ pb for m(WIMP) = 100 GeV.

[14] APRILE 18 search for WIMP scatter on 1.3 t liquid Xe; no signal; require $\sigma^{SI}(\chi p) < 9.12 \times 10^{-11}$ pb for m(χ) = 100 GeV.

[15] REN 18 search for self-interacting DM at Panda-X-II with a total exposure of 54 ton day; limits set in m(DM) vs. m(mediator) plane.

[16] AKERIB 17 exclude SI cross section $> 1.7 \times 10^{-10}$ pb for m(WIMP) = 100 GeV. Uses complete LUX data set.

[17] APRILE 17G set limit $\sigma^{SI}(\chi p) < 1.2\ 10^{-10}$ pb for m(WIMP) = 100 GeV using 1 ton fiducial mass Xe TPC. Exposure is 34.2 live days.

[18] CUI 17A search for SI WIMP scatter; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m $\sim$ 10–1 $\times 10^4$ GeV using 54 ton-day exposure of Xe.

[19] AKERIB 16 re-analysis of 2013 data exclude SI cross section $> 1 \times 10^{-9}$ pb for m(WIMP) = 100 GeV on Xe target.

[20] APRILE 16B combined 447 live days using Xe target exclude σ(SI) $> 1.1 \times 10^{-9}$ pb for m(WIMP) = 50 GeV.

[21] TAN 16 search for WIMP scatter off Xe target; see SI exclusion plot Fig. 6.

[22] TAN 16B search for WIMP-p scatter off Xe target; see Fig. 5 for SI exclusion.

[23] AGNESE 15B reanalyse AHMED 10 data.

[24] XIAO 15 search for WIMP scatter on Xe with PandaX-I; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 5–100 GeV.

[25] AVRORIN 14 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the Sun in data taken between 1998 and 2003. See their Table 1 for limits assuming annihilation into neutrino pairs.

[26] AARTSEN 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken between June 2010 and May 2011.

[27] ADRIAN-MARTINEZ 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken between Jan. 2007 and Dec. 2008.

[28] AGNESE 13 use data taken between Oct. 2006 and July 2007.

[29] BOLIEV 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken from 1978 to 2009. See also SUVOROVA 13 for an older analysis of the same data.

[30] LI 13B search for WIMP scatter on Ge; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 4–100 GeV.

[31] ABBASI 12 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the Sun. The amount of X^0 depends on the X^0-proton cross section.

[32] Reanalysis of ANGLOHER 09 data with all three nuclides. See also BROWN 12.

[33] See also APRILE 14A.

[34] See their Fig. 6 for a limit on inelastically scattering X^0 for m_{X^0} = 70 GeV.

[35] AHMED 11 search for X^0 inelastic scattering. See their Fig. 8–10 for limits.

[36] AHMED 11A combine CDMS and EDELWEISS data.

[37] AJELLO 11 search for $e^{\pm}$ flux from X^0 annihilations in the Sun. Models in which X^0 annihilates into an intermediate long-lived weakly interacting particles or X^0 scatters inelastically are constrained. See their Fig. 6–8 for limits.

[38] APRILE 11 reanalyze APRILE 10 data.

[39] APRILE 11A search for X^0 inelastic scattering. See their Fig. 2 and 3 for limits. See also APRILE 14A.

[40] Supersedes ARMENGAUD 10. A limit on inelastic cross section is also given.

[41] HORN 11 perform detector calibration by neutrons. Earlier results are only marginally affected.

[42] AKIMOV 10 give cross section limits for inelastically scattering dark matter. See their Fig. 4.

[43] Superseded by AHMED 10.

[44] ANGLE 09 search for X^0 inelastic scattering. See their Fig. 4 for limits.

[45] GIULIANI 05 analyzes the spin-independent X^0-nucleon cross section limits with both isoscalar and isovector couplings. See their Fig. 3 and 4 for limits on the couplings.

For m_{χ^0} = 1 TeV

For limits from X^0 annihilation in the Sun, the assumed annihilation final state is shown in parenthesis in the comment.

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.8 \times 10^{-10}$	90	[1] AALBERS	23	LZ	SI scatter on Xe
$<1 \times 10^{-7}$	90	[2] ABE	23E	XMAS	WIMP search
$<5 \times 10^{-10}$	90	[3] MENG	21B	PNDX	Xe WIMP search
		[4] ADHIKARI	20	DEAP	Ar
$<4 \times 10^{-9}$	90	[5] WANG	20G	PNDX	Xe TPC
$<3 \times 10^{-6}$	90	[6] YAGUNA	19		Ar; I-spin viol DM
$<3.8 \times 10^{-8}$	90	[7] AGNES	18A	DS50	Ar
$<8.24 \times 10^{-10}$	90	[8] APRILE	18	XE1T	Xe
$<2 \times 10^{-9}$	90	[9] AKERIB	17	LUX	Xe
<0.3	90	[10] CHEN	17E	PNDX	$\chi N \to \chi^* \to \chi\gamma$
$<1.2 \times 10^{-9}$	90	[11] CUI	17A	PNDX	SI WIMPs on Xe
$<8.6 \times 10^{-8}$	90	AGNES	16	DS50	Ar
$<2 \times 10^{-7}$	90	AGNES	15	DS50	Ar
$<2 \times 10^{-7}$	90	[12] AGNESE	15B	CDM2	Ge
$<1 \times 10^{-8}$	90	AKERIB	14	LUX	Xe
$<2.2 \times 10^{-6}$	90	[13] AVRORIN	14	BAIK	H, solar ν ($W^+ W^-$)
$<5.5 \times 10^{-5}$	90	[13] AVRORIN	14	BAIK	H, solar ν ($b\overline{b}$)
$<6.8 \times 10^{-7}$	90	[13] AVRORIN	14	BAIK	H, solar ν ($\tau^+\tau^-$)
$<3.46 \times 10^{-7}$	90	[14] AARTSEN	13	ICCB	H, solar ν ($W^+ W^-$)
$<7.75 \times 10^{-6}$	90	[14] AARTSEN	13	ICCB	H, solar ν ($b\overline{b}$)
$<6.9 \times 10^{-7}$	90	[15] ADRIAN-MAR..	13	ANTR	H, solar ν ($W^+ W^-$)
$<1.5 \times 10^{-5}$	90	[15] ADRIAN-MAR..	13	ANTR	H, solar ν ($b\overline{b}$)
$<1.8 \times 10^{-7}$	90	[15] ADRIAN-MAR..	13	ANTR	H, solar ν ($\tau^+\tau^-$)
$<4.3 \times 10^{-6}$	90	[16] BOLIEV	13	BAKS	H, solar ν ($W^+ W^-$)
$<3.4 \times 10^{-5}$	90	[16] BOLIEV	13	BAKS	H, solar ν ($b\overline{b}$)
$<1.2 \times 10^{-6}$	90	[16] BOLIEV	13	BAKS	H, solar ν ($\tau^+\tau^-$)
$<2.12 \times 10^{-7}$	90	[17] ABBASI	12	ICCB	H, solar ν ($W^+ W^-$)
$<6.56 \times 10^{-6}$	90	[17] ABBASI	12	ICCB	H, solar ν ($b\overline{b}$)
$<4 \times 10^{-7}$	90	AKIMOV	12	ZEP3	Xe
$<1.1 \times 10^{-5}$	90	[18] ANGLOHER	12	CRES	$CaWO_4$
$<2 \times 10^{-8}$	90	[19] APRILE	12	X100	Xe
$<2 \times 10^{-6}$	90	BEHNKE	12	COUP	CF_3I
$<4 \times 10^{-6}$		FELIZARDO	12	SMPL	C_2ClF_5
$<1.5 \times 10^{-6}$	90	KIM	12	KIMS	CsI
		[20] AHMED	11	CDM2	Ge, inelastic
$<1.5 \times 10^{-7}$	90	[21] AHMED	11A	RVUE	Ge
$<2 \times 10^{-7}$	90	[22] APRILE	11	X100	Xe
$<8 \times 10^{-8}$	90	[19] APRILE	11B	X100	Xe
$<2 \times 10^{-7}$	90	[23] ARMENGAUD	11	EDE2	Ge
		[24] HORN	11	ZEP3	Xe
$<2 \times 10^{-7}$	90	AHMED	10	CDM2	Ge
$<4 \times 10^{-7}$	90	APRILE	10	X100	Xe
$<6 \times 10^{-7}$	90	ARMENGAUD	10	EDE2	Ge
$<3.5 \times 10^{-7}$	90	[25] AHMED	09	CDM2	Ge

[1] AALBERS 23 give first LZ limits on WIMP-nucleon scatter from Xe. $\sigma^{SI} < 2.8\times10^{-10}$ pb for m(χ) = 1 TeV.
[2] ABE 23E search for WIMP scatter on Xe in XMASS. No signal observed. Require $\sigma^{SI} < 2\times10^{-7}$ pb for m(χ) = 1000 GeV.
[3] MENG 21B search for SI WIMP interaction with 3.7 t Xe and 0.63 t yr exposure. No signal observed. Limits placed in m(DM) vs. σ^{SI} plane.
[4] ADHIKARI 20 search for SI WIMP scatter from Ar in AJAJ 19 data. No signal observed. Limits placed on σ^{p} vs. m(WIMP) for various assumed operators and models.
[5] WANG 20G search for SI WIMP scatter on Xe with 132 t d exposure of PANDAX-II .
[6] YAGUNA 19 recasts DEAP-3600 single-phase liquid argon results in limit for isospin violating DM; for $f_n/f_p = -0.69$, requires $\sigma^{SI}(\chi p) < 3\times10^{-6}$ pb for m(χ) = 1 TeV.
[7] AGNES 18A search for WIMP scatter on 46.4 kg Ar; no signal; require $\sigma^{SI}(\chi N) < 3.8\times10^{-8}$ pb for m(χ) = 1 TeV.
[8] APRILE 18 search for WIMP scatter on 1.3 t Xe; no signal seen; require $\sigma^{SI}(\chi p) < 8.24\times10^{-10}$ pb for m(χ) = 1 TeV.
[9] AKERIB 17 search for WIMP scatter on Xe using complete LUX data set; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m(χ) $\sim$ 5–1 $\times 10^5$ GeV.
[10] CHEN 17E search for inelastic WIMP scatter on Xe; require $\sigma^{SI}(\chi N) < 0.3$ pb for m(χ) = 1 TeV and (mass difference) = 300 keV.
[11] CUI 17A search for WIMP scatter using 54 ton-day exposure of Xe; limits placed in $\sigma^{SI}(\chi N)$ vs. m(χ) plane for m $\sim$ 10–1 $\times 10^4$ GeV.
[12] AGNESE 15B reanalyse AHMED 10 data.
[13] AVRORIN 14 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the Sun in data taken between 1998 and 2003. See their Table 1 for limits assuming annihilation into neutrino pairs.
[14] AARTSEN 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken between June 2010 and May 2011.
[15] ADRIAN-MARTINEZ 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken between Jan. 2007 and Dec. 2008.
[16] BOLIEV 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken from 1978 to 2009. See also SUVOROVA 13 for an older analysis of the same data.
[17] ABBASI 12 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the Sun. The amount of X^0 depends on the X^0-proton cross section.
[18] Reanalysis of ANGLOHER 09 data with all three nuclides. See also BROWN 12.
[19] See also APRILE 14A.
[20] AHMED 11 search for X^0 inelastic scattering. See their Fig. 8–10 for limits.
[21] AHMED 11A combine CDMS and EDELWEISS data.
[22] APRILE 11 reanalyze APRILE 10 data.
[23] Supersedes ARMENGAUD 10. A limit on inelastic cross section is also given.
[24] HORN 11 perform detector calibration by neutrons. Earlier results are only marginally affected.
[25] Superseded by AHMED 10.

For Super-heavy dark matter ($m_{X^0} > 10^{10}$ GeV)

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
	[1] ABREU	23	AUGE	DM decay to photons
	[2] ACEVEDO	23		DM tracks in ancient mica

[1] ABREU 23 search for superheavy DM X decay to $q\overline{q}$ pairs via instanton, then to γs. No signal detected. Exclude m(X) > 3×10^{13} GeV for dark gauge coupling $\alpha_X = 0.09$.
[2] ACEVEDO 23 re-examine data from ancient mica to place limits on superheavy DM in the mass range 10^7–10^{25} GeV. See Fig. 3 for σ^{SI} and σ^{SD} limits.

Spin-Dependent Cross Section Limits for Dark Matter Particle (X^0) on Proton

For m_{X^0} in GeV range

We provide here limits fo m_{X^0} < 5 GeV

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1 \times 10^4$	90	[1] AALBERS	23A	LZ	SD scatter on Xe
$<2 \times 10^5$	90	[2] ADHIKARI	22B	C100	sub-GeV WIMP via SD coupling/Migdal effect
$<9 \times 10^4$	90	[3] ANGLOHER	22	CRES	SD limit using Li
<40	90	[4] ANGLOHER	22A	CRES	SD limit using Li and Al
$<8 \times 10^4$	90	[5] ABDELHAME...	20A	CRES	$LiAlO_2$
$<1 \times 10^6$	95	[6] ABDELHAME...	19	CRES	GeV-scale WIMPs on Li
$<3 \times 10^{-4}$	90	[7] AMOLE	19	PICO	C_3F_8
$<1.7 \times 10^4$	90	[8] APRILE	19C	XE1T	light DM on Xe via Migdal/brem effect
$<8 \times 10^6$	90	[9] ARMENGAUD	19	EDEL	GeV-scale WIMPs on Ge
<70	90	[10] XIA	19A	PNDX	SD WIMP on Xe
<100	90	[11] AGNESE	18	SCDM	GeV-scale WIMPs on Ge
<1	90	[12] AKERIB	17A	LUX	Xe
<0.6	90	[13] FU	17	PNDX	SD WIMP on Xe
<0.2	90	[14] AMOLE	15	PICO	C_3F_8
$<1.6 \times 10^{-1}$	90	[15] ARCHAMBAU...	12	PICA	^{19}F

[1] AALBERS 23A search for GeV-scale WIMP scatter on Xe. No signal observed. Limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane. Quoted limit is for m(χ) = 1 GeV via Migdal scattering.

[2] ADHIKARI 22B search for sub-GeV WIMPs via SI and SD detection; no signal detected; limits placed in m(χ) vs. σ plane for m(χ): 0.2–3 GeV; quoted limit is for SD m(χ) = 1 GeV.

[3] ANGLOHER 22 search for SD WIMP-proton scatter from Li target; no signal detected; limits placed in σ vs. m(WIMP) plane; limit quoted for m(WIMP) = 1 GeV.

[4] ANGLOHER 22A search for spin-dependent DM scatter on Li and Al for m(DM) $\sim$ 0.2–6 GeV; no signal observed; limits set in $\sigma(\chi p)$ vs. m(DM) plane; quoted limit is for m(DM) = 1 GeV.

[5] ABDELHAMEED 20A use $LiAlO_2$ target in CRESST to search for SD WIMP scatter on p; no signal; quoted limit is for m(DM) = 1 GeV.

[6] ABDELHAMEED 19 search for SD WIMP scatter on ^{7}Li; limits placed on $\sigma^{SD}(\chi p)$ for m(χ) $\sim$ 0.8–20 GeV; quoted limit is for m(χ) = 1 GeV.

[7] AMOLE 19 search for SD WIMP scatter on C_3F_8 in PICO-60 bubble chamber; no signal: set limit for spin dependent coupling $\sigma^{SD}(\chi p) < 2 \times 10^{-4}$ pb for m(χ) = 5 GeV.

[8] APRILE 19C search for light DM on Xe via Migdal/brem effect; no signal, require $\sigma^{SD}(\chi p) < 1.7 \times 10^4$ pb for m(χ) = 1 GeV.

[9] ARMENGAUD 19 search for GeV scale WIMP scatter on Ge; limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) $\sim$ 0.5–10 GeV; quoted limit is for m(χ) = 5 GeV.

[10] XIA 19A search for WIMP scatter on Xe in PandaX-II; limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) $\sim$ 5–1 $\times 10^5$ GeV; quoted limit is for m(χ) = 5 GeV.

[11] AGNESE 18 search for GeV scale WIMPs with CDMSlite; limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) $\sim$ 1.5–20 GeV; quoted limit is for m(χ) = 5 GeV.

[12] AKERIB 17A search for SD WIMP scatter on Xe using 129.5 kg yr exposure; limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) $\sim$ 6–1 $\times 10^5$ GeV.

[13] FU 17 search for SD WIMP scatter on Xe; limits set in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) $\sim$ 4–1 $\times$ 10^3 GeV.; quoted limit is for m(χ) = 5 GeV.
[14] AMOLE 15 search for WIMP scatter on C_3F_8 in PICO-2L; limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) $\sim$ 4–1 $\times$ 10^4 GeV; quoted limit is for m(χ) = 5 GeV.
[15] ARCHAMBAULT 12 search for SD WIMP scatter in ^{19}F with PICASSO; limits set in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m $\sim$ 4–500 GeV; quoted limit is for m(χ) = 5 GeV.

For m_{χ^0} = 20 GeV

For limits from X^0 annihilation in the Sun, the assumed annihilation final state is shown in parenthesis in the comment.

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 6 \times 10^{-5}$	90	[1] AALBERS	23	LZ	SD scatter on Xe
$< 3.5 \times 10^{-5}$	90	[2] ABBASI	22B	ICCB	IceCube SD limit
$< 1.5 \times 10^{5}$	90	[3] ANGLOHER	22	CRES	SD limit using Li
$< 2 \times 10^{-4}$	90	[4] HUANG	22	PNDX	SD DM limits
$< 9 \times 10^{-5}$	90	[5] AARTSEN	20C	ICCB	SD WIMP on p
$< 2 \times 10^{5}$	90	[6] ABDELHAME...	20A	CRES	$LiAlO_2$
$< 5 \times 10^{-3}$		[7] FELIZARDO	20	SMPL	WIMPs via SIMPLE
$< 3 \times 10^{5}$	95	[8] ABDELHAME...	19	CRES	^{7}Li
$< 2.5 \times 10^{-5}$	90	[9] AMOLE	19	PICO	C_3F_8
$< 2.5 \times 10^{-4}$	90	[10] APRILE	19A	XE1T	Xe, SD
$< 1 \times 10^{-3}$	90	[11] XIA	19A	PNDX	SD WIMP on Xe
< 30	95	[12] AGNESE	18	SCDM	Ge
$< 1 \times 10^{-3}$	90	[13] AKERIB	17A	LUX	Xe
$< 1.32 \times 10^{-2}$	90	[14] BEHNKE	17	PICA	C_4F_{10}
$< 2 \times 10^{-3}$	90	[15] FU	17	PNDX	SD WIMP on Xe
$< 5 \times 10^{-4}$	90	[16] AMOLE	16A	PICO	C_3F_8
$< 2 \times 10^{-6}$	90	[17] KHACHATRY...	16AJ	CMS	8 TeV $pp \rightarrow Z + \not{E}_T$; $Z \rightarrow \ell\overline{\ell}$
$< 1.2 \times 10^{-3}$	90	AMOLE	15	PICO	C_3F_8
$< 1.43 \times 10^{-3}$	90	CHOI	15	SKAM	H, solar ν ($b\overline{b}$)
$< 1.42 \times 10^{-4}$	90	CHOI	15	SKAM	H, solar ν ($\tau^+\tau^-$)
$< 5 \times 10^{-3}$	90	FELIZARDO	14	SMPL	C_2ClF_5
$< 1.29 \times 10^{-2}$	90	[18] AARTSEN	13	ICCB	H, solar ν ($\tau^+\tau^-$)
$< 3.17 \times 10^{-2}$	90	[19] APRILE	13	X100	Xe
$< 3 \times 10^{-2}$	90	[20] ARCHAMBAU...	12	PICA	F (C_4F_{10})
$< 6 \times 10^{-2}$	90	BEHNKE	12	COUP	CF_3I
< 20	90	DAW	12	DRFT	F (CF_4)
$< 7 \times 10^{-3}$		FELIZARDO	12	SMPL	C_2ClF_5
< 0.15	90	KIM	12	KIMS	CsI
$< 1 \times 10^{5}$	90	[21] AHLEN	11	DMTP	F (CF_4)
< 0.1	90	[21] BEHNKE	11	COUP	CF_3I
$< 1.5 \times 10^{-2}$	90	[22] TANAKA	11	SKAM	H, solar ν ($b\overline{b}$)
< 0.2	90	ARCHAMBAU...	09	PICA	F
< 4	90	LEBEDENKO	09A	ZEP3	Xe
< 0.6	90	ANGLE	08A	XE10	Xe
< 100	90	ALNER	07	ZEP2	Xe
< 1	90	LEE	07A	KIMS	CsI

$<$ 20	90	[23]	AKERIB	06	CDMS	^{73}Ge, ^{29}Si
$<$ 2	90		SHIMIZU	06A	CNTR	F (CaF_2)
$<$ 0.5	90		ALNER	05	NAIA	NaI
$<$ 1.5	90		BARNABE-HE...	05	PICA	F (C_4F_{10})
$<$ 1.5	90		GIRARD	05	SMPL	F (C_2ClF_5)
$<$ 35	90		MIUCHI	03	BOLO	LiF
$<$ 30	90		TAKEDA	03	BOLO	NaF

[1] AALBERS 23 yield first SD LZ limits on WIMP-p scatter using Xe. $\sigma^{SD}(\chi p) < 6 \times 10^{-5}$ pb for m(χ) = 20 GeV.

[2] ABBASI 22B search for WIMP annihilation to $b\overline{b}$, $\tau\overline{\tau}$, $\nu\overline{\nu}$ in Sun with 7 years data; no signal; limits set in m(χ) vs. $\sigma^{SD}(\chi p)$ plane for m(χ): 10–100 GeV; quoted limit for $\nu\overline{\nu}$ channel.

[3] ANGLOHER 22 search for SD WIMP-proton scatter from Li target; no signal detected; limits placed in σ vs. m(WIMP) plane.

[4] HUANG 22 search for SD DM scatter on Xe; no signal observed; limits placed in $\sigma(\chi n)$ vs. m(DM) plane; quoted limit is for m(DM) = 20 GeV.

[5] AARTSEN 20C place combined IceCube and Pico-60 velocity-independent limits on spin-dependent WIMP-p scatter $\sigma^{SD}(\chi p) <$ 9–5 pb for m(WIMP) = 20 GeV assuming dominant annihilation to $\tau\overline{\tau}$.

[6] ABDELHAMEED 20A use $LiAlO_2$ target in CRESST to search for spin-dependent WIMP scatter on p; limits set for m(WIMP): 0.3–30 GeV in Fig. 8. Quoted limit is for M(WIMP) = 30 GeV.

[7] FELIZARDO 20 presents 2014 SIMPLE bounds on WIMP DM using C_2ClF_5 target .

[8] ABDELHAMEED 19 uses Li_2MoO_4 target to set limit for spin dependent coupling $\sigma^{SD}(\chi p) < 3. \times 10^5$ pb for m(χ) = 20 GeV.

[9] AMOLE 19 search for SD WIMP scatter on C_3F_8 in PICO-60 bubble chamber; no signal: set limit for spin dependent coupling $\sigma^{SD}(\chi p) < 2.5 \times 10^{-5}$ pb for m(χ) = 20 GeV.

[10] APRILE 19A search for SD WIMP scatter on 1 t yr Xe; no signal, limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m $\sim$ 6–1000 GeV.

[11] XIA 19A search for WIMP scatter on Xe in PandaX-II; limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) $\sim$ 5–1 $\times 10^5$ GeV.

[12] AGNESE 18 give limits for $\sigma^{SD}(p\chi)$ for m(WIMP) between 1.5 and 20 GeV using CDMSlite mode data.

[13] AKERIB 17A search for SD WIMP scatter on Xe using 129.5 kg yr exposure; limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) $\sim$ 6–1 $\times 10^5$ GeV.

[14] BEHNKE 17 show final Picasso results based on 231.4 kg d exposure at SNOLab for WIMP scatter on C_4F_{10} search via superheated droplet; require σ(SD) $< 1.32 \times 10^{-2}$ pb for m(WIMP) = 20 GeV.

[15] FU 17 search for SD WIMP scatter on Xe; limits set in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) $\sim$ 4–1 $\times 10^3$ GeV.

[16] AMOLE 16A require SD WIMP-p scattering $< 5 \times 10^{-4}$ pb for m(WIMP) = 20 GeV; bubbles from C_3F_8 target.

[17] KHACHATRYAN 16AJ require SD WIMP-p $< 2 \times 10^{-6}$ pb for m(WIMP) = 20 GeV from $pp \rightarrow Z + \not{E}_T$; $Z \rightarrow \ell\overline{\ell}$ signal.

[18] AARTSEN 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken between June 2010 and May 2011.

[19] The value has been provided by the authors. APRILE 13 note that the proton limits on Xe are highly sensitive to the theoretical model used. See also APRILE 14A.

[20] ARCHAMBAULT 12 search for WIMP scatter on C_4F_{10}; limits set in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m $\sim$ 4–500 GeV.

[21] Use a direction-sensitive detector.

[22] TANAKA 11 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the Sun. The amount of X^0 depends on the X^0-proton cross section.

[23] See also AKERIB 05.

For m_{X^0} = 100 GeV

For limits from X^0 annihilation in the Sun, the assumed annihilation final state is shown in parenthesis in the comment.

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.5 \times 10^{-4}$	90	[1] AALBERS	23	LZ	SD scatter on Xe
<1	90	[2] ADHIKARI	23C	C100	SD WIMP scatter on I
<25.7	90	[3] SHIMADA	23	NAGE	directional WIMP search
$<2.5 \times 10^{-5}$	90	[4] ABBASI	22B	ICCB	IceCube SD limit
$<2 \times 10^{-4}$	90	[5] HUANG	22	PNDX	SD DM limits
<50	90	[6] IKEDA	21	NAGE	directional gas TPC
$<3.34 \times 10^{-4}$	90	[7] AARTSEN	20C	ICCB	SD WIMP on p
$<6.5 \times 10^{-3}$		[8] FELIZARDO	20	SMPL	WIMPs via SIMPLE
$<4 \times 10^{-5}$	90	[9] AMOLE	19	PICO	C_3F_8
$<4 \times 10^{-4}$	90	[10] APRILE	19A	XE1T	Xe, SD
$<8 \times 10^{-4}$	90	[11] XIA	19A	PNDX	SD WIMP on Xe
$<8 \times 10^{-4}$	90	[12] AKERIB	17A	LUX	Xe
$<5 \times 10^{-5}$	90	[13] AMOLE	17	PICO	C_3F_8
$<3.3 \times 10^{-2}$	90	[14] APRILE	17A	X100	Xe inelastic
$<2.8 \times 10^{-1}$	90	[15] BATTAT	17	DRFT	CS_2
$<1.5 \times 10^{-3}$	90	[16] FU	17	PNDX	Xe
<0.553–0.019	95	[17] AABOUD	16D	ATLS	$pp \to j + \not{E}_T$
$<1 \times 10^{-5}$	90	[18] AABOUD	16F	ATLS	$pp \to \gamma + \not{E}_T$
$<1 \times 10^{-4}$	90	[19] AARTSEN	16C	ICCB	solar ν (W^+W^-)
$<2 \times 10^{-4}$	90	[20] ADRIAN-MAR...	16	ANTR	solar ν (WW, $b\overline{b}$, $\tau\overline{\tau}$)
$<3 \times 10^{-3}$	90	[21] AKERIB	16A	LUX	Xe
$<5 \times 10^{-4}$	90	[22] AMOLE	16	PICO	CF_3I
$<1.5 \times 10^{-3}$	90	AMOLE	15	PICO	C_3F_8
$<3.19 \times 10^{-3}$	90	CHOI	15	SKAM	H, solar ν ($b\overline{b}$)
$<2.80 \times 10^{-4}$	90	CHOI	15	SKAM	H, solar ν (W^+W^-)
$<1.24 \times 10^{-4}$	90	CHOI	15	SKAM	H, solar ν ($\tau^+\tau^-$)
$<8 \times 10^{2}$	90	[23] NAKAMURA	15	NAGE	CF_4
$<1.7 \times 10^{-3}$	90	[24] AVRORIN	14	BAIK	H, solar ν (W^+W^-)
$<4.5 \times 10^{-2}$	90	[24] AVRORIN	14	BAIK	H, solar ν ($b\overline{b}$)
$<7.1 \times 10^{-4}$	90	[24] AVRORIN	14	BAIK	H, solar ν ($\tau^+\tau^-$)
$<6 \times 10^{-3}$	90	FELIZARDO	14	SMPL	C_2ClF_5
$<2.68 \times 10^{-4}$	90	[25] AARTSEN	13	ICCB	H, solar ν (W^+W^-)
$<1.47 \times 10^{-2}$	90	[25] AARTSEN	13	ICCB	H, solar ν ($b\overline{b}$)
$<8.5 \times 10^{-4}$	90	[26] ADRIAN-MAR...	13	ANTR	H, solar ν (W^+W^-)
$<5.5 \times 10^{-2}$	90	[26] ADRIAN-MAR...	13	ANTR	H, solar ν ($b\overline{b}$)
$<3.4 \times 10^{-4}$	90	[26] ADRIAN-MAR...	13	ANTR	H, solar ν ($\tau^+\tau^-$)
$<1.00 \times 10^{-2}$	90	[27] APRILE	13	X100	Xe
$<7.1 \times 10^{-4}$	90	[28] BOLIEV	13	BAKS	H, solar ν (W^+W^-)
$<8.4 \times 10^{-3}$	90	[28] BOLIEV	13	BAKS	H, solar ν ($b\overline{b}$)
$<3.1 \times 10^{-4}$	90	[28] BOLIEV	13	BAKS	H, solar ν ($\tau^+\tau^-$)
$<7.07 \times 10^{-4}$	90	[29] ABBASI	12	ICCB	H, solar ν (W^+W^-)
$<4.53 \times 10^{-2}$	90	[29] ABBASI	12	ICCB	H, solar ν ($b\overline{b}$)
$<7 \times 10^{-2}$	90	[30] ARCHAMBAU...	12	PICA	F (C_4F_{10})
$<1 \times 10^{-2}$	90	BEHNKE	12	COUP	CF_3I

<1.8	90	DAW	12	DRFT	F (CF_4)
$<9 \times 10^{-3}$		FELIZARDO	12	SMPL	C_2ClF_5
$<2 \times 10^{-2}$	90	KIM	12	KIMS	CsI
$<2 \times 10^{3}$	90	[23] AHLEN	11	DMTP	F (CF_4)
$<7 \times 10^{-2}$	90	BEHNKE	11	COUP	CF_3I
$<2.7 \times 10^{-4}$	90	[31] TANAKA	11	SKAM	H, solar ν (W^+W^-)
$<4.5 \times 10^{-3}$	90	[31] TANAKA	11	SKAM	H, solar ν ($b\overline{b}$)
		[32] FELIZARDO	10	SMPL	C_2ClF_3
$<6 \times 10^{3}$	90	[23] MIUCHI	10	NAGE	CF_4
<0.4	90	ARCHAMBAU...	09	PICA	F
<0.8	90	LEBEDENKO	09A	ZEP3	Xe
<1.0	90	ANGLE	08A	XE10	Xe
<15	90	ALNER	07	ZEP2	Xe
<0.2	90	LEE	07A	KIMS	CsI
$<1 \times 10^{4}$	90	[23] MIUCHI	07	NAGE	F (CF_4)
<5	90	[33] AKERIB	06	CDMS	^{73}Ge, ^{29}Si
<2	90	SHIMIZU	06A	CNTR	F (CaF_2)
<0.3	90	ALNER	05	NAIA	NaI
<2	90	BARNABE-HE...	05	PICA	F (C_4F_{10})
<100	90	BENOIT	05	EDEL	^{73}Ge
<1.5	90	GIRARD	05	SMPL	F (C_2ClF_5)
<0.7		[34] GIULIANI	05A	RVUE	
		[35] GIULIANI	04	RVUE	
		[36] GIULIANI	04A	RVUE	
<35	90	MIUCHI	03	BOLO	LiF
<40	90	TAKEDA	03	BOLO	NaF

[1] AALBERS 23 yield first SD LZ limits on WIMP-p scatter using Xe. $\sigma^{SD}(\chi p) < 1.5 \times 10^{-4}$ pb for m(χ) = 100 GeV.

[2] ADHIKARI 23C search for SD WIMP scatter on I. No signal observed. Require $\sigma^{SD}(\chi p) < 1$ pb for m(χ) = 100 GeV.

[3] SHIMADA 23 search for WIMPs in NEWAGE directional detector. No signal observed. Limits placed in $\sigma^{SD}(\chi p)$ vs. mass plane. Quoted limit for m(χ) = 150 GeV.

[4] ABBASI 22B search for WIMP annihilation to $b\overline{b}$, $\tau\overline{\tau}$, $\nu\overline{\nu}$ in Sun with 7 years data; no signal; limits set in m(χ) vs. $\sigma^{SD}(\chi p)$ plane for m(χ): 10–100 GeV; quoted limit for $\nu\overline{\nu}$ channel.

[5] HUANG 22 search for SD DM scatter on Xe; no signal observed; limits placed in $\sigma(\chi n)$ vs. m(DM) plane; quoted limit is for m(DM) = 100 GeV.

[6] IKEDA 21 use direction sensitive TPC NEWAGE to search for SD WIMPs. No signal observed. Limits set in $\sigma^{SD}(\chi p)$ vs. m plane; $\sigma^{SD}(\chi p) < 50$ pb for m(DM) = 100 GeV.

[7] AARTSEN 20C place combined IceCube and Pico-60 velocity-independent limits on spin-dependent WIMP-p scatter $\sigma^{SD}(\chi p) < 3.34 \times 10^{-4}$ pb for m(WIMP) = 100 GeV assuming dominant annihilation to $\tau\overline{\tau}$.

[8] FELIZARDO 20 presents 2014 SIMPLE bounds on WIMP DM using C_2ClF_5 target .

[9] AMOLE 19 search for SD WIMP scatter on C_3F_8 in PICO-60 bubble chamber; no signal: set limit for spin dependent coupling $\sigma^{SD}(\chi p) < 4 \times 10^{-5}$ pb for m(χ) = 100 GeV.

[10] APRILE 19A search for SD WIMP scatter on 1 t yr Xe; no signal, limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m $\sim$ 6–1000 GeV.

[11] XIA 19A search for WIMP scatter on Xe in PandaX-II; limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) $\sim$ 5–1×10^5 GeV.

[12] AKERIB 17A search for SD WIMP scatter on Xe using 129.5 kg yr exposure; limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) $\sim$ 6–1 $\times$ 10^5 GeV.

[13] AMOLE 17 require $\sigma(\text{WIMP-}p)^{SD}$ $<$ 5 $\times$ 10^{-5} pb for m(WIMP) = 100 GeV using PICO-60 1167 kg-days exposure at SNOLab.

[14] APRILE 17A require require $\sigma(\text{WIMP-}p)(\text{inelastic})^{SD}$ $<$ 3.3 $\times$ 10^{-2} pb for m(WIMP) = 100 GeV, based on 7640 kg day exposure at LNGS.

[15] BATTAT 17 use directional detection of CS_2 ions to require σ(SD) $<$ 2.8 $\times$ 10^{-1} pb for 100 GeV WIMP with a 55 days exposure at the Boulby Underground Science Facility.

[16] FU 17 from a 33000 kg d exposure at CJPL, PANDAX II derive for m(DM) = 100 GeV, σ^{SD}(WIMP-p) $< 2 \times 10^{-3}$ pb.

[17] AABOUD 16D use ATLAS 13 TeV 3.2 fb^{-1} of data to search for monojet plus missing E_T; agree with SM rates; present limits on large extra dimensions, compressed SUSY spectra and wimp pair production.

[18] AABOUD 16F search for monophoton plus missing E_T events at ATLAS with 13 Tev and 3.2 fb^{-1}; signal agrees with SM background; place limits on SD WIMP-proton scattering vs. mediator mass and large extra dimension models.

[19] AARTSEN 16C search for high energy νs from WIMP annihilation in solar core; limits set on SD WIMP-p scattering (Fig. 8).

[20] ADRIAN-MARTINEZ 16 search for WIMP annihilation into νs from solar core; exclude SD cross section $<$ few 10^{-4} depending on m(WIMP).

[21] AKERIB 16A using 2013 data exclude SD WIMP-proton scattering $>$ 3 $\times$ 10^{-3} pb for m(WIMP) = 100 GeV.

[22] AMOLE 16 use bubble technique on CF_3I target to exclude SD WIMP-p scattering $>$ 5 $\times$ 10^{-4} pb for m(WIMP) = 100 GeV.

[23] Use a direction-sensitive detector.

[24] AVRORIN 14 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the Sun in data taken between 1998 and 2003. See their Table 1 for limits assuming annihilation into neutrino pairs.

[25] AARTSEN 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken between June 2010 and May 2011.

[26] ADRIAN-MARTINEZ 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken between Jan. 2007 and Dec. 2008.

[27] The value has been provided by the authors. APRILE 13 note that the proton limits on Xe are highly sensitive to the theoretical model used. See also APRILE 14A.

[28] BOLIEV 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken from 1978 to 2009. See also SUVOROVA 13 for an older analysis of the same data.

[29] ABBASI 12 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the Sun. The amount of X^0 depends on the X^0-proton cross section.

[30] ARCHAMBAULT 12 search for WIMP scatter on C_4F_{10}; limits set in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m $\sim$ 4–500 GeV.

[31] TANAKA 11 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the Sun. The amount of X^0 depends on the X^0-proton cross section.

[32] See their Fig. 3 for limits on spin-dependent proton couplings for X^0 mass of 50 GeV.

[33] See also AKERIB 05.

[34] GIULIANI 05A analyze available data and give combined limits.

[35] GIULIANI 04 reanalyze COLLAR 00 data and give limits for spin-dependent X^0-proton coupling.

[36] GIULIANI 04A give limits for spin-dependent X^0-proton couplings from existing data.

For m_{X^0} = 1 TeV

For limits from X^0 annihilation in the Sun, the assumed annihilation final state is shown in parenthesis in the comment.

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1.5 \times 10^{-3}$	90	[1] AALBERS	23	LZ	SD scatter on Xe
<0.2	90	[2] ADHIKARI	23C	C100	SD WIMP scatter on I
$<1.2 \times 10^{-3}$	90	[3] HUANG	22	PNDX	SD DM limits
<200	90	[4] IKEDA	21	NAGE	directional gas TPC
$<4.81 \times 10^{-3}$	90	[5] AARTSEN	20C	ICCB	SD WIMP on p
$<3 \times 10^{-4}$	90	[6] AMOLE	19	PICO	C_3F_8
$<4 \times 10^{-3}$	90	[7] APRILE	19A	XE1T	Xe, SD
$<5 \times 10^{-3}$	90	[8] XIA	19A	PNDX	SD WIMP on Xe
		[9] ALBERT	18C	HAWC	DM annihilation in Sun to long-lived mediator
$<2.05 \times 10^{-5}$	90	[10] AARTSEN	17A	ICCB	ν, sun
$<7 \times 10^{-3}$	90	[11] AKERIB	17A	LUX	Xe
$<2 \times 10^{-2}$	90	[12] FU	17	PNDX	SD WIMP on Xe
		[13] ADRIAN-MAR..	16B	ANTR	solar μ from WIMP annih.
$<1 \times 10^{-2}$	90	AMOLE	15	PICO	C_3F_8
$<1.5 \times 10^{3}$	90	NAKAMURA	15	NAGE	CF_4
$<2.7 \times 10^{-3}$	90	[14] AVRORIN	14	BAIK	H, solar ν (W^+W^-)
$<6.9 \times 10^{-2}$	90	[14] AVRORIN	14	BAIK	H, solar ν ($b\overline{b}$)
$<8.4 \times 10^{-4}$	90	[14] AVRORIN	14	BAIK	H, solar ν ($\tau^+\tau^-$)
$<4.48 \times 10^{-4}$	90	[15] AARTSEN	13	ICCB	H, solar ν (W^+W^-)
$<1.00 \times 10^{-2}$	90	[15] AARTSEN	13	ICCB	H, solar ν ($b\overline{b}$)
$<8.9 \times 10^{-4}$	90	[16] ADRIAN-MAR..	13	ANTR	H, solar ν (W^+W^-)
$<2.0 \times 10^{-2}$	90	[16] ADRIAN-MAR..	13	ANTR	H, solar ν ($b\overline{b}$)
$<2.3 \times 10^{-4}$	90	[16] ADRIAN-MAR..	13	ANTR	H, solar ν ($\tau^+\tau^-$)
$<7.57 \times 10^{-2}$	90	[17] APRILE	13	X100	Xe
$<5.4 \times 10^{-3}$	90	[18] BOLIEV	13	BAKS	H, solar ν (W^+W^-)
$<4.2 \times 10^{-2}$	90	[18] BOLIEV	13	BAKS	H, solar ν ($b\overline{b}$)
$<1.5 \times 10^{-3}$	90	[18] BOLIEV	13	BAKS	H, solar ν ($\tau^+\tau^-$)
$<2.50 \times 10^{-4}$	90	[19] ABBASI	12	ICCB	H, solar ν (W^+W^-)
$<7.86 \times 10^{-3}$	90	[19] ABBASI	12	ICCB	H, solar ν ($b\overline{b}$)
$<8 \times 10^{-2}$	90	BEHNKE	12	COUP	CF_3I
<8	90	DAW	12	DRFT	F (CF_4)
$<6 \times 10^{-2}$		FELIZARDO	12	SMPL	C_2ClF_5
$<8 \times 10^{-2}$	90	KIM	12	KIMS	CsI
$<8 \times 10^{3}$	90	[20] AHLEN	11	DMTP	F (CF_4)
<0.4	90	BEHNKE	11	COUP	CF_3I
$<2 \times 10^{-3}$	90	[21] TANAKA	11	SKAM	H, solar ν ($b\overline{b}$)
$<2 \times 10^{-2}$	90	[21] TANAKA	11	SKAM	H, solar ν (W^+W^-)
$<1 \times 10^{-3}$	90	[22] ABBASI	10	ICCB	KK dark matter
$<2 \times 10^{4}$	90	[20] MIUCHI	10	NAGE	CF_4
$<8.7 \times 10^{-4}$	90	ABBASI	09B	ICCB	H, solar ν (W^+W^-)
$<2.2 \times 10^{-2}$	90	ABBASI	09B	ICCB	H, solar ν ($b\overline{b}$)
<3	90	ARCHAMBAU..	09	PICA	F
<6	90	LEBEDENKO	09A	ZEP3	Xe

< 9	90	ANGLE	08A	XE10	Xe
<100	90	ALNER	07	ZEP2	Xe
< 0.8	90	LEE	07A	KIMS	CsI
< 4 × 10^4	90	[20] MIUCHI	07	NAGE	F (CF_4)
< 30	90	[23] AKERIB	06	CDMS	^{73}Ge, ^{29}Si
< 1.5	90	ALNER	05	NAIA	NaI
< 15	90	BARNABE-HE...05		PICA	F (C_4F_{10})
<600	90	BENOIT	05	EDEL	^{73}Ge
< 10	90	GIRARD	05	SMPL	F (C_2ClF_5)
<260	90	MIUCHI	03	BOLO	LiF
<150	90	TAKEDA	03	BOLO	NaF

[1] AALBERS 23 yield first SD LZ limits on WIMP-p scatter using Xe. $\sigma^{SD}(\chi p) < 2 \times 10^{-3}$ pb for m(χ) = 1 TeV.

[2] ADHIKARI 23C search for SD WIMP scatter on I. No signal observed. Require $\sigma^{SD}(\chi p)$ < 0.2 pb for m(χ) = 1 TeV.

[3] HUANG 22 search for SD DM scatter on Xe; no signal observed; limits placed in $\sigma(\chi n)$ vs. m(DM) plane; quoted limit is for m(DM) = 1 TeV.

[4] IKEDA 21 use direction sensitive TPC NEWAGE to search for SD WIMPs. No signal observed. Limits set in $\sigma^{SD}(\chi p)$ vs. m plane; $\sigma^{SD}(\chi p) <$ 200 pb for m(DM) = 1000 GeV.

[5] AARTSEN 20C place combined IceCube and Pico-60 velocity-independent limits on spin-dependent WIMP-p scatter $\sigma^{SD}(\chi p) < 3 \times 10^{-3}$ pb for m(WIMP) = 1 TeV assuming dominant annihilation to WW.

[6] AMOLE 19 search for SD WIMP scatter on C_3F_8 in PICO-60 bubble chamber; no signal: set limit for spin dependent coupling $\sigma^{SD}(\chi p) < 3 \times 10^{-4}$ pb for m(χ) = 1000 GeV.

[7] APRILE 19A search for SD WIMP scatter on 1 t yr Xe; no signal, limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m ∼ 6–1000 GeV.

[8] XIA 19A search for WIMP scatter on Xe in PandaX-II; limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) ∼ 5–1 × 10^5 GeV.

[9] ALBERT 18C search for DM annihilation in Sun to long-lived mediator (LLM) which decays outside Sun, for DM masses above 1 TeV; assuming LLM, limits set on $\sigma^{SD}(\chi p)$.

[10] AARTSEN 17A search for neutrinos from solar WIMP annihilation into $\tau^+\tau^-$ in 532 days of live time.

[11] AKERIB 17A search for SD WIMP scatter on Xe using 129.5 kg yr exposure; limits placed in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) ∼ 6–1 × 10^5 GeV.

[12] FU 17 search for SD WIMP scatter on Xe; limits set in $\sigma^{SD}(\chi p)$ vs. m(χ) plane for m(χ) ∼ 4–1 × 10^3 GeV.

[13] ADRIAN-MARTINEZ 16B search for secluded DM via WIMP annihilation in solar core into light mediator which later decays to μ or νs; limits presented in Figures 3 and 4.

[14] AVRORIN 14 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the Sun in data taken between 1998 and 2003. See their Table 1 for limits assuming annihilation into neutrino pairs.

[15] AARTSEN 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken between June 2010 and May 2011.

[16] ADRIAN-MARTINEZ 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken between Jan. 2007 and Dec. 2008.

[17] The value has been provided by the authors. APRILE 13 note that the proton limits on Xe are highly sensitive to the theoretical model used. See also APRILE 14A.

[18] BOLIEV 13 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the sun in data taken from 1978 to 2009. See also SUVOROVA 13 for an older analysis of the same data.

[19] ABBASI 12 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the Sun. The amount of X^0 depends on the X^0-proton cross section.
[20] Use a direction-sensitive detector.
[21] TANAKA 11 search for neutrinos from the Sun arising from the pair annihilation of X^0 trapped by the Sun. The amount of X^0 depends on the X^0-proton cross section.
[22] ABBASI 10 search for ν_μ from annihilations of Kaluza-Klein photon dark matter in the Sun.
[23] See also AKERIB 05.

Spin-Dependent Cross Section Limits for Dark Matter Particle (X^0) on Neutron

For m_{X^0} in GeV range

We provide here limits fo m_{X^0} < 5 GeV

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1 \times 10^{2}$	90	[1] AALBERS	23A	LZ	SD scatter on Xe
$<1 \times 10^{6}$	90	[2] ANGLOHER	22	CRES	SD limit using Li
<570	90	[3] ANGLOHER	22A	CRES	SD limit using Li and Al
$<1 \times 10^{8}$	90	[4] ABDELHAME...	20A	CRES	$LiAlO_2$
$<1 \times 10^{10}$	95	[5] ABDELHAME...	19	CRES	SD low mass DM on Li
$<2.3 \times 10^{2}$	90	[6] APRILE	19C	XE1T	light DM on Xe via Migdal/brem effect
$<1 \times 10^{-2}$	90	[7] APRILE	19D	XE1T	light DM on Xe via ionization
$<4 \times 10^{4}$	90	[8] ARMENGAUD	19	EDEL	GeV-scale WIMPs on Ge
$<8 \times 10^{-2}$	90	[9] XIA	19A	PNDX	SD WIMP on Xe
<3	90	[10] AGNESE	18	SCDM	GeV-scale WIMPs on Ge
<3	90	[11] JIANG	18	CDEX	GeV-scale WIMPs on Ge
<10	90	[12] YANG	18	CDEX	WIMPs on Ge
$<1 \times 10^{-1}$	90	[13] AKERIB	17A	LUX	Xe
<0.1	90	[14] FU	17	PNDX	SD WIMP on Xe
<20	90	[15] ZHAO	16	CDEX	GeV-scale WIMPs on Ge
<150	90	[16] AHMED	11B	CDM2	GeV-scale WIMPs on Ge

[1] AALBERS 23A search for GeV-scale WIMP scatter on Xe. No signal observed. Limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane. Quoted limit is for m(χ) = 1 GeV via Migdal scattering.
[2] ANGLOHER 22 search for SD WIMP scatter on Li target; no signal detected; limits placed on WIMP-neutron SD scatter versus m(WIMP); limit quoted for m(WIMP) = 1 GeV.
[3] ANGLOHER 22A search for spin-dependent DM scatter on Li and Al for m(DM) $\sim$ 0.2–6 GeV; no signal observed; limits set in $\sigma(\chi n)$ vs. m(DM) plane; quoted limit is for m(DM) = 1 GeV.
[4] ABDELHAMEED 20A use $LiAlO_2$ target in CRESST to search for SD WIMP scatter; no signal; quoted limit is for m(DM) = 1 GeV.
[5] ABDELHAMEED 19 search for GeV-scale WIMP SD scatter on ^{7}Li crystal; set limit $\sigma^{SD}(\chi n)$ for m(χ) $\sim$ 0.8–20 GeV; quoted limit for m(χ) = 1 GeV.
[6] APRILE 19C search for light DM on Xe via Migdal/bremsstrahlung effect; no signal, require $\sigma^{SD}(\chi n)$ <230 pb for m(χ) = 1 GeV.
[7] APRILE 19D search for light DM scatter on Xe via ionization; no signal, limits placed in σ vs. m(DM) $\sim$ 3–6 GeV; quoted limit is for m(DM) = 5 GeV.
[8] ARMENGAUD 19 search for GeV scale WIMP scatter on Ge; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 0.5–10 GeV; quoted limit is for m(χ) = 5 GeV.

[9] XIA 19A search for WIMP scatter on Xe in PandaX-II; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 5–1 $\times$ 10^5 GeV; quoted limit is for m(χ) = 5 GeV.
[10] AGNESE 18 search for GeV scale WIMPs scatter at CDMSlite; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m $\sim$ 1.5–20 GeV; quoted limit is for m(χ) = 5 GeV.
[11] JIANG 18 search for GeV scale WIMP scatter on Ge; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 3–10 GeV; quoted limit is for m(χ) = 5 GeV.
[12] YANG 18 search for WIMP scatter on Ge; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 2–10 GeV; quoted limit is for m(χ) = 5 GeV.
[13] AKERIB 17A search for SD WIMP scatter on Xe with 129.5 kg yr exposure; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 5–1 $\times$ 10^5 GeV; quoted limit is for m(χ) = 5 GeV.
[14] FU 17 search for SD WIMP scatter on Xe; limits set in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 4–1 $\times$ 10^3 GeV.; quoted limit is for m(χ) = 5 GeV.
[15] ZHAO 16 search for GeV-scale WIMP scatter on Ge; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 4–30 GeV; quoted limit is for m(χ) = 5 GeV.
[16] AHMED 11B search for GeV scale WIMP scatter on Ge in CDMS II; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m $\sim$ 4–12 GeV. Limit given for m(χ) = 5 GeV.

For m_{χ^0} = 20 GeV

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 2 \times 10^{-6}$	90	[1] AALBERS	23	LZ	SD scatter on Xe
$< 5 \times 10^{6}$	90	[2] ANGLOHER	22	CRES	SD limit using Li
$< 7 \times 10^{-6}$	90	[3] HUANG	22	PNDX	SD DM limits
$< 5 \times 10^{7}$	90	[4] ABDELHAME...	20A	CRES	$LiAlO_2$
$< 1 \times 10^{-1}$		[5] FELIZARDO	20	SMPL	WIMPs via SIMPLE
$< 8 \times 10^{-6}$	90	[6] APRILE	19A	XE1T	Xe, SD
$< 3 \times 10^{-5}$	90	[7] XIA	19A	PNDX	SD WIMP on Xe
< 1.5	95	[8] AGNESE	18	SCDM	Ge
$< 2.5 \times 10^{-5}$	90	[9] AKERIB	17A	LUX	Xe
$< 7 \times 10^{-5}$	90	[10] FU	17	PNDX	SD WIMP on Xe
< 2	90	[11] ZHAO	16	CDEX	GeV-scale WIMPs on Ge
< 0.09	90	FELIZARDO	14	SMPL	C_2ClF_5
< 8	90	[12] UCHIDA	14	XMAS	^{129}Xe, inelastic
$< 1.13 \times 10^{-3}$	90	[13] APRILE	13	X100	Xe
< 0.02	90	AKIMOV	12	ZEP3	Xe
< 0.06	90	AHMED	09	CDM2	Ge
< 0.04	90	LEBEDENKO	09A	ZEP3	Xe
< 50		[14] LIN	09	TEXO	Ge
$< 6 \times 10^{-3}$	90	ANGLE	08A	XE10	Xe
< 0.5	90	ALNER	07	ZEP2	Xe
< 25	90	LEE	07A	KIMS	CsI
< 0.3	90	[15] AKERIB	06	CDMS	^{73}Ge, ^{29}Si
< 30	90	SHIMIZU	06A	CNTR	F (CaF_2)
< 60	90	ALNER	05	NAIA	NaI
< 20	90	BARNABE-HE...	05	PICA	F (C_4F_{10})
< 10	90	BENOIT	05	EDEL	^{73}Ge
< 4	90	KLAPDOR-K...	05	HDMS	^{73}Ge (enriched)
<600	90	TAKEDA	03	BOLO	NaF

[1] AALBERS 23 yield first LZ limits on SD WIMP-n scatter using Xe. $\sigma^{SD}(\chi n) < 2\times10^{-6}$ pb for m(χ) = 20 GeV.
[2] ANGLOHER 22 search for SD WIMP-neutron scatter from Li target; no signal detected; limits placed in σ vs. m(WIMP) plane.
[3] HUANG 22 search for SD DM scatter on Xe; no signal observed; limits placed in $\sigma(\chi n)$ vs. m(DM) plane; quoted limit is for m(DM) = 20 GeV.
[4] ABDELHAMEED 20A use $LiAlO_2$ target in CRESST to search for SD WIMP scatter on n; limits placed for m(WIMP): 0.3–30 GeV in Fig. 8. Quoted limit is for M(WIMP) = 30 GeV.
[5] FELIZARDO 20 presents 2014 SIMPLE bounds on WIMP DM using C_2ClF_5 target .
[6] APRILE 19A search for SD WIMP scatter on 1 t yr Xe; no signal: limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m $\sim$ 6–1000 GeV.
[7] XIA 19A search for WIMP scatter on Xe in PandaX-II; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 5–1 $\times$ 10^5 GeV.
[8] AGNESE 18 give limits for $\sigma^{SD}(n\chi)$ for m(WIMP) between 1.5 and 20 GeV using CDMSlite mode data.
[9] AKERIB 17A search for SD WIMP scatter on Xe with 129.5 kg yr exposure; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 5–1 $\times$ 10^5 GeV.
[10] FU 17 search for SD WIMP scatter on Xe; limits set in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 4–1 $\times$ 10^3 GeV.
[11] ZHAO 16 search for GeV-scale WIMP scatter on Ge; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 4–30 GeV.
[12] Derived limit from search for inelastic scattering $X^0 + {}^{129}Xe \rightarrow X^0 + {}^{129}Xe^*$(39.58 keV).
[13] The value has been provided by the authors. See also APRILE 14A.
[14] See their Fig. 6(b) for cross section limits for m_{X^0} extending down to 2 GeV.
[15] See also AKERIB 05.

For m_{X^0} = 100 GeV

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<5 \times 10^{-6}$	90	[1] AALBERS	23	LZ	SD scatter on Xe
$<1 \times 10^{-5}$	90	[2] HUANG	22	PNDX	SD DM limits
$<1.5 \times 10^{-1}$		[3] FELIZARDO	20	SMPL	WIMPs via SIMPLE
$<1.5 \times 10^{-5}$	90	[4] APRILE	19A	XE1T	Xe, SD
$<4 \times 10^{-3}$	90	[5] SUZUKI	19	XMAS	^{129}Xe, inelastic
$<2 \times 10^{-5}$	90	[6] XIA	19A	PNDX	SD WIMP on Xe
$<2.5 \times 10^{-5}$	90	[7] AKERIB	17A	LUX	Xe
$<7 \times 10^{-5}$	90	[8] FU	17	PNDX	SD WIMP on Xe
<0.1	90	FELIZARDO	14	SMPL	C_2ClF_5
<0.05	90	[9] UCHIDA	14	XMAS	^{129}Xe, inelastic
$<4.68 \times 10^{-4}$	90	[10] APRILE	13	X100	Xe
<0.01	90	AKIMOV	12	ZEP3	Xe
		[11] FELIZARDO	10	SMPL	C_2ClF_3
<0.02	90	AHMED	09	CDM2	Ge
<0.01	90	LEBEDENKO	09A	ZEP3	Xe
<100	90	LIN	09	TEXO	Ge
<0.01	90	ANGLE	08A	XE10	Xe
<0.05	90	[12] BEDNYAKOV	08	RVUE	Ge

$<$ 0.08	90	ALNER	07	ZEP2	Xe
$<$ 6	90	LEE	07A	KIMS	CsI
$<$ 0.07	90	[13] AKERIB	06	CDMS	^{73}Ge, ^{29}Si
$<$ 30	90	SHIMIZU	06A	CNTR	F (CaF_2)
$<$ 10	90	ALNER	05	NAIA	NaI
$<$ 30	90	BARNABE-HE...	05	PICA	F (C_4F_{10})
$<$ 0.7	90	BENOIT	05	EDEL	^{73}Ge
$<$ 0.2		[14] GIULIANI	05A	RVUE	
$<$ 1.5	90	KLAPDOR-K...	05	HDMS	^{73}Ge (enriched)
		[15] GIULIANI	04	RVUE	
		[16] GIULIANI	04A	RVUE	
		[17] MIUCHI	03	BOLO	LiF
$<$800	90	TAKEDA	03	BOLO	NaF

[1] AALBERS 23 yield first LZ limits on SD WIMP-*n* scatter using Xe. $\sigma(\chi n) < 5 \times 10^{-6}$ pb for m(χ) = 100 GeV.

[2] HUANG 22 search for SD DM scatter on Xe; no signal observed; limits placed in $\sigma(\chi n)$ vs. m(DM) plane; quoted limit is for m(DM) = 100 GeV.

[3] FELIZARDO 20 presents 2014 SIMPLE bounds on WIMP DM using C_2ClF_5 target .

[4] APRILE 19A search for SD WIMP scatter on 1 t yr Xe; no signal, limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m $\sim$ 6–1000 GeV.

[5] SUZUKI 19 search in single phase liquid xenon detector for inelastic scattering X^0 + ^{129}Xe $\rightarrow$ X^0 + ^{129}Xe* (39.58 keV) ; no signal: require $\sigma(\chi n)^{SD} < 4 \times 10^{-3}$ pb for m(χ) = 100 GeV.

[6] XIA 19A search for WIMP scatter on Xe in PandaX-II; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 5–1 $\times 10^5$ GeV.

[7] AKERIB 17A search for SD WIMP scatter on Xe with 129.5 kg yr exposure; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 5–1 $\times 10^5$ GeV.

[8] FU 17 search for SD WIMP scatter on Xe; limits set in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 4–1 $\times 10^3$ GeV.

[9] UCHIDA 14 derived limit from search for inelastic scattering X^0 + ^{129}Xe $\rightarrow$ X^0 + ^{129}Xe(39.58 keV).

[10] The value has been provided by the authors. See also APRILE 14A.

[11] See their Fig. 3 for limits on spin-dependent neutron couplings for X^0 mass of 50 GeV.

[12] BEDNYAKOV 08 reanalyze KLAPDOR-KLEINGROTHAUS 05 and BAUDIS 01 data.

[13] See also AKERIB 05.

[14] GIULIANI 05A analyze available data and give combined limits.

[15] GIULIANI 04 reanalyze COLLAR 00 data and give limits for spin-dependent X^0-neutron coupling.

[16] GIULIANI 04A give limits for spin-dependent X^0-neutron couplings from existing data.

[17] MIUCHI 03 give model-independent limit for spin-dependent X^0-proton and neutron cross sections. See their Fig. 5.

For m_{X^0} = 1 TeV

VALUE (pb)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 5 \times 10^{-5}$	90	[1] AALBERS	23	LZ	SD scatter on Xe

$<$ 6 $\times 10^{-5}$	90	[2] HUANG	22	PNDX	SD DM limits
$<$ 7 $\times 10^{-1}$		[3] FELIZARDO	20	SMPL	WIMPs via SIMPLE
$<$ 1.2 $\times 10^{-4}$	90	[4] APRILE	19A	XE1T	Xe, SD
$<$ 2 $\times 10^{-4}$	90	[5] XIA	19A	PNDX	Xe
$<$ 2.5 $\times 10^{-4}$	90	[6] AKERIB	17A	LUX	Xe
$<$ 4 $\times 10^{-4}$	90	[7] FU	17	PNDX	SD WIMP on Xe
$<$ 0.07	90	FELIZARDO	14	SMPL	C_2ClF_5
$<$ 0.2	90	[8] UCHIDA	14	XMAS	^{129}Xe, inelastic
$<$ 3.64 $\times 10^{-3}$	90	[9] APRILE	13	X100	Xe
$<$ 0.08	90	AKIMOV	12	ZEP3	Xe
$<$ 0.2	90	AHMED	09	CDM2	Ge
$<$ 0.1	90	LEBEDENKO	09A	ZEP3	Xe
$<$ 0.1	90	ANGLE	08A	XE10	Xe
$<$ 0.25	90	[10] BEDNYAKOV	08	RVUE	Ge
$<$ 0.6	90	ALNER	07	ZEP2	Xe
$<$ 30	90	LEE	07A	KIMS	CsI
$<$ 0.5	90	[11] AKERIB	06	CDMS	^{73}Ge, ^{29}Si
$<$ 40	90	ALNER	05	NAIA	NaI
$<$200	90	BARNABE-HE...	05	PICA	F (C_4F_{10})
$<$ 4	90	BENOIT	05	EDEL	^{73}Ge
$<$ 10	90	KLAPDOR-K...	05	HDMS	^{73}Ge (enriched)
$<$ 4 $\times 10^{3}$	90	TAKEDA	03	BOLO	NaF

[1] AALBERS 23 yield first LZ SD limits on WIMP-n scatter on Xe. $\sigma^{SD}(\chi n) < 5\times10^{-5}$ pb for m(χ) = 1 TeV.

[2] HUANG 22 search for SD DM scatter on Xe; no signal observed; limits placed in $\sigma(\chi n)$ vs. m(DM) plane; quoted limit is for m(DM) = 1 TeV.

[3] FELIZARDO 20 presents 2014 SIMPLE bounds on WIMP DM using C_2ClF_5 target .

[4] APRILE 19A search for SD WIMP scatter on 1 t yr Xe; no signal, limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m $\sim$ 6–1000 GeV.

[5] XIA 19A search for WIMP scatter on Xe in PandaX-II; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 5–1 $\times 10^5$ GeV.

[6] AKERIB 17A search for SD WIMP scatter on Xe with 129.5 kg yr exposure; limits placed in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 5–1 $\times 10^5$ GeV.

[7] FU 17 search for SD WIMP scatter on Xe; limits set in $\sigma^{SD}(\chi n)$ vs. m(χ) plane for m(χ) $\sim$ 4–1 $\times 10^3$ GeV.

[8] Derived limit from search for inelastic scattering $X^0 + {}^{129}Xe^* \rightarrow X^0 + {}^{129}Xe^*$(39.58 keV).

[9] The value has been provided by the authors. See also APRILE 14A.

[10] BEDNYAKOV 08 reanalyze KLAPDOR-KLEINGROTHAUS 05 and BAUDIS 01 data.

[11] See also AKERIB 05.

Cross-Section Limits for Dark Matter Particles (X^0) on electron

For m_{X^0} in GeV range

We provide here limits fo m_{X^0} < 5 GeV

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<$ 3 $\times 10^{-3}$	90	[1] AGNES	23A	DS50	LDM scatter on e
$<$ 0.3	90	[2] ARNQUIST	23A	DAMC	LDM search via CCDs

$< 2 \times 10^{-5}$	90	[3] LI	23F	PNDX	light DM limits
		[4] AGOSTINI	22A	GERD	search for superWIMPs
<1000	90	[5] APRILE	22	XE1T	WIMP-e scatter
		[6] BATTAGLIERI	22		BDX-MINI search for light DM from beam dump
$< 2 \times 10^{-9}$	95	[7] BOSE	22		DM-e limits from solar γs
< 100		[8] GHOSH	22		boosted DM-e/DM-ν scatter
		[9] HOCHBERG	22	SNSP	superconducting nanowire search for light DM
		[10] ZHANG	22A	CDEX	light DM search on e in Ge
< 10	90	[11] CHENG	21	PNDX	MeV-scale DM on e
		[12] AKERIB	20	LUX	mirror DM with Xe
$< 8.7 \times 10^{2}$	90	[13] AMARAL	20	SCDM	light DM scatter on e in Si
		[14] APRILE	20	XE1T	excess keV electron recoil in Xe
< 100	90	[15] ARNAUD	20	EDEL	MeV DM scatter on e in Ge
< 0.6	90	[16] BARAK	20	SENS	MeV scale DM scatter from e in Si
$< 2 \times 10^{6}$	90	[17] ABRAMOFF	19	SENS	WIMP-e scatter on Si
		[18] AGUILAR-AR...	19A	DMIC	MeV scale DM scatter on e in Si
$< 1 \times 10^{-4}$	90	[19] APRILE	19D	XE1T	light DM on Xe via ionization
$< 9 \times 10^{-3}$	90	[20] AGNES	18B	DS50	Ar
$< 1 \times 10^{4}$	90	[21] AGNESE	18B	SCDM	$e\chi$ scatter
$< 5 \times 10^{3}$	90	[22] CRISLER	18	SENS	Si CCD
		[23] APRILE	17	X100	Xe, annual modulation

[1] AGNES 23A search for MeV-scale DM scatter from e using Ar. No signal observed. $\sigma(\chi e) < 3 \times 10^{-3}$ pb for m(χ) = 30 MeV.

[2] ARNQUIST 23A search for LDM scatter on e using CCDs. No signal observed. Require $\sigma(\chi e) <$ 0.3 pb for m(χ) = 10 MeV and $F_{DM} = 1$ (Fig. 3b).

[3] LI 23F search for light DM in MeV range via scatter from e. No signal observed. Limits set. The quoted limit is for m(χ) = 0.2 GeV with $F_{DM} = 1$.

[4] AGOSTINI 22 search for superWIMP particles using GERDA detector; no signal observed; limits placed in mass vs coupling plane for m(DM) 0.06–1 MeV.

[5] APRILE 22 place new limits on WIMP-e scatter for dark photon and various multipole moments vs. WIMP mass for various DM models; quoted limit for m(WIMP) = 1 GeV in light mediator model.

[6] BATTAGLIERI 22 search for light MeV scale DM particles produced in JLAB beam dump; no signal observed; limits set in kinetic mixing vs. m(DM) plane for m(DM) $\sim$ 1–200 MeV .

[7] BOSE 22 theoretically derive limits on WIMP-e scatter from solar gamma rays using data of Fermi-LAT; limit quoted for m(WIMP) = 5 GeV.

[8] GHOSH 22 derive limits on sub-GeV boosted DM scatter from e or ν using SuperK/XENON1T data; quoted limit for m(χ) = 1 MeV.

[9] HOCHBERG 22 search for sub-eV or sub-MeV scale DM scatter/absorption on e in superconducting nanowire; no signal observed; limits set in m(DM) vs. cross section plane for sub-MeV-scale DM and in m(DM) vs. kinetic mixing plane for sub-eV-scale DM.

[10] ZHANG 22A search for DM scatter on e using CDEX-10; no signal observed; limits placed on $\sigma(\chi e)$ vs. m(DM) plane for m(DM) $\sim$ 0.07–10 GeV for various simplified models.

[11] CHENG 21 search for MeV-scale DM scatter from e in PANDAX-II. No signal detected. Limits set in $\sigma(\chi e)$ vs. m(DM) plane for two choices of form factors; $\sigma(\chi e) < 10$ pb for m(χ) = 10 MeV and $F_{DM} = 1$.

[12] AKERIB 20 search for mirror DM with LUX 95 d × 118 kg data for mirror e scatter from Xe; no signal, limits placed in kinetic mixing parameter vs. mirror e temperature T ∼ 0.1–0.9 keV plane.
[13] AMARAL 20 search SuperCDMS data for low mass DM scatter from e in Si; no signal; quoted limit $\sigma_e < 8.7 \times 10^2$ pb for m(DM) = 10 MeV with form factor $F_{DM} = 1$.
[14] APRILE 20 report excess at electron recoil around 2–3 keV in Xe; data compared to unforeseen tritium background, and various signal models (bosonic DM, solar axion, and neutrino magnetic moment).
[15] ARNAUD 20 search for MeV DM scattering from e in Ge; no signal; quoted limit is for m(DM) = 10 MeV with form factor $F_{DM} = 1$.
[16] BARAK 20 report search for MeV scale DM scatter from e in Si; limits placed in σ_e vs. m(DM) plane; quoted limit is for m(DM) = 10 MeV and form factor $F_{DM} = 1$.
[17] ABRAMOFF 19 search for MeV-scale WIMP scatter from Si skipper-CCD; limits placed on $\sigma(\chi e)$ for $m(\chi) \sim$ 0.5–100 MeV depending on DM form factors. Limit given for m(DM) = 1 MeV.
[18] AGUILAR-AREVALO 19A search for MeV scale DM scatter from e in Si CCDs at SNO-LAB; no signal, limits placed in σ(e) vs. m(DM) plane for m(DM) ∼ 0.6–100 MeV.
[19] APRILE 19D search for light DM scatter on Xe via ionization; no signal, limits placed in σ on nucleus vs. m(DM) plane for m(DM) ∼ 0.02–10 GeV; quoted limit is for m(DM) = 0.2 GeV.
[20] AGNES 18B search for MeV scale WIMP scatter from e in Ar; no signal, limits set in σ_e vs. $m(\chi)$ plane for m ∼ 20–1000 MeV and two choices of form factor F(DM); quoted limit for $m(\chi)$ = 100 MeV and F = 1.
[21] AGNESE 18B search for $e\chi$ scatter in SuperCDMS; limits placed in $\sigma(e\chi)$ vs. $m(\chi)$ plane for m ∼ 0.3–1 × 10^4 MeV for two assumed form factors and also in m(dark photon) vs. kinetic mixing plane. Limit given for $m(\chi)$ = 1 GeV and F=1.
[22] CRISLER 18 search for $\chi e \to \chi e$ scatter in Si CCD; place limits on MeV DM in σ_e vs. $m(\chi)$ plane for m ∼ 0.5–1000 MeV for different form factors; quoted limit is for F(DM) = 1 and $m(\chi)$ = 10 MeV.
[23] APRILE 17 search for WIMP-e annual modulation signal for recoil energy in the 2.0–5.8 keV interval using 4 years data with Xe. No significant effect seen.

Cross-Section Limits for Dark Matter Particles (X^0) on Nuclei

For m_{X^0} in GeV range

We provide here limits fo $m_{X^0} < 5$ GeV

VALUE (pb)	DOCUMENT ID		COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
	[1] AKIMOV	22	COHERENT search for DM mediators

[1] AKIMOV 22 use COHERENT CsI(Na) detector to search for sub GeV DM particles produced by the Spallation Neutron Source; no signal observed; limits placed in mediator mass vs. coupling plane for leptophobic DM models.

For m_{X^0} = 20 GeV

VALUE (nb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 0.03	90	[1] UCHIDA	14	XMAS	^{129}Xe, inelastic
< 0.08	90	[2] ANGLOHER	02	CRES	Al
		[3] BENOIT	00	EDEL	Ge
< 0.04	95	[4] KLIMENKO	98	CNTR	^{73}Ge, inel.
< 0.8		ALESSAND...	96	CNTR	O
< 6		ALESSAND...	96	CNTR	Te
< 0.02	90	[5] BELLI	96	CNTR	^{129}Xe, inel.

		[6] BELLI	96C	CNTR	^{129}Xe
$< 4 \times 10^{-3}$	90	[7] BERNABEI	96	CNTR	Na
< 0.3	90	[7] BERNABEI	96	CNTR	I
< 0.2	95	[8] SARSA	96	CNTR	Na
< 0.015	90	[9] SMITH	96	CNTR	Na
< 0.05	95	[10] GARCIA	95	CNTR	Natural Ge
< 0.1	95	QUENBY	95	CNTR	Na
<90	90	[11] SNOWDEN-...	95	MICA	^{16}O
$< 4 \times 10^{3}$	90	[11] SNOWDEN-...	95	MICA	^{39}K
< 0.7	90	BACCI	92	CNTR	Na
< 0.12	90	[12] REUSSER	91	CNTR	Natural Ge
< 0.06	95	CALDWELL	88	CNTR	Natural Ge

[1] UCHIDA 14 limit is for inelastic scattering $X^0 + {}^{129}\text{Xe}^* \rightarrow X^0 + {}^{129}\text{Xe}^*$ (39.58 keV).
[2] ANGLOHER 02 limit is for spin-dependent WIMP-Aluminum cross section.
[3] BENOIT 00 find four event categories in Ge detectors and suggest that low-energy surface nuclear recoils can explain anomalous events reported by UKDMC and Saclay NaI experiments.
[4] KLIMENKO 98 limit is for inelastic scattering $X^0\,{}^{73}\text{Ge} \rightarrow X^0\,{}^{73}\text{Ge}^*$ (13.26 keV).
[5] BELLI 96 limit for inelastic scattering $X^0\,{}^{129}\text{Xe} \rightarrow X^0\,{}^{129}\text{Xe}^*$(39.58 keV).
[6] BELLI 96C use background subtraction and obtain $\sigma < 150$ pb (< 1.5 fb) (90% CL) for spin-dependent (independent) X^0-proton cross section. The confidence level is from R. Bernabei, private communication, May 20, 1999.
[7] BERNABEI 96 use pulse shape discrimination to enhance the possible signal. The limit here is from R. Bernabei, private communication, September 19, 1997.
[8] SARSA 96 search for annual modulation of WIMP signal. See SARSA 97 for details of the analysis. The limit here is from M.L. Sarsa, private communication, May 26, 1997.
[9] SMITH 96 use pulse shape discrimination to enhance the possible signal. A dark matter density of 0.4 GeV cm^{-3} is assumed.
[10] GARCIA 95 limit is from the event rate. A weaker limit is obtained from searches for diurnal and annual modulation.
[11] SNOWDEN-IFFT 95 look for recoil tracks in an ancient mica crystal. Similar limits are also given for ^{27}Al and ^{28}Si. See COLLAR 96 and SNOWDEN-IFFT 96 for discussion on potential backgrounds.
[12] REUSSER 91 limit here is changed from published (0.04) after reanalysis by authors. J.L. Vuilleumier, private communication, March 29, 1996.

For $m_{X^0} = 100$ GeV

VALUE (nb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 3.3 \times 10^{-6}$	90	[1] APRILE	21A	XE1T	^{129}Xe, inelastic
$< 3 \times 10^{-3}$	90	[2] UCHIDA	14	XMAS	^{129}Xe, inelastic
< 0.3	90	[3] ANGLOHER	02	CRES	Al
		[4] BELLI	02	RVUE	
		[5] BERNABEI	02C	DAMA	
		[6] GREEN	02	RVUE	
		[7] ULLIO	01	RVUE	
		[8] BENOIT	00	EDEL	Ge
$< 4 \times 10^{-3}$	90	[9] BERNABEI	00D		^{129}Xe, inelastic
		[10] AMBROSIO	99	MCRO	
		[11] BRHLIK	99	RVUE	
$< 8 \times 10^{-3}$	95	[12] KLIMENKO	98	CNTR	^{73}Ge, inelastic

<0.08	95	[13] KLIMENKO	98	CNTR	^{73}Ge, inelastic
<4		ALESSAND...	96	CNTR	O
<25		ALESSAND...	96	CNTR	Te
$<6\ \times 10^{-3}$	90	[14] BELLI	96	CNTR	^{129}Xe, inelastic
		[15] BELLI	96C	CNTR	^{129}Xe
$<1\ \times 10^{-3}$	90	[16] BERNABEI	96	CNTR	Na
<0.3	90	[16] BERNABEI	96	CNTR	I
<0.7	95	[17] SARSA	96	CNTR	Na
<0.03	90	[18] SMITH	96	CNTR	Na
<0.8	90	[18] SMITH	96	CNTR	I
<0.35	95	[19] GARCIA	95	CNTR	Natural Ge
<0.6	95	QUENBY	95	CNTR	Na
<3	95	QUENBY	95	CNTR	I
$<1.5\ \times 10^{2}$	90	[20] SNOWDEN-...	95	MICA	^{16}O
$<4\ \times 10^{2}$	90	[20] SNOWDEN-...	95	MICA	^{39}K
<0.08	90	[21] BECK	94	CNTR	^{76}Ge
<2.5	90	BACCI	92	CNTR	Na
<3	90	BACCI	92	CNTR	I
<0.9	90	[22] REUSSER	91	CNTR	Natural Ge
<0.7	95	CALDWELL	88	CNTR	Natural Ge

[1] APRILE 21A search for inelastic DM scatter off ^{129}Xe nuclei with 0.83 t yr exposure. No signal obseved. Limits placed in $\sigma(\chi$Xe) vs. m(DM) plane for WIMP mass between 20 GeV and 10 TeV.

[2] UCHIDA 14 limit is for inelastic scattering $X^0 +\ ^{129}\text{Xe}^* \rightarrow\ X^0 +\ ^{129}\text{Xe}^*$(39.58 keV).

[3] ANGLOHER 02 limit is for spin-dependent WIMP-Aluminum cross section.

[4] BELLI 02 discuss dependence of the extracted WIMP cross section on the assumptions of the galactic halo structure.

[5] BERNABEI 02C analyze the DAMA data in the scenario in which X^0 scatters into a slightly heavier state as discussed by SMITH 01.

[6] GREEN 02 discusses dependence of extracted WIMP cross section limits on the assumptions of the galactic halo structure.

[7] ULLIO 01 disfavor the possibility that the BERNABEI 99 signal is due to spin-dependent WIMP coupling.

[8] BENOIT 00 find four event categories in Ge detectors and suggest that low-energy surface nuclear recoils can explain anomalous events reported by UKDMC and Saclay NaI experiments.

[9] BERNABEI 00D limit is for inelastic scattering $X^0\,^{129}\text{Xe} \rightarrow\ X^0\,^{129}\text{Xe}$ (39.58 keV).

[10] AMBROSIO 99 search for upgoing muon events induced by neutrinos originating from WIMP annihilations in the Sun and Earth.

[11] BRHLIK 99 discuss the effect of astrophysical uncertainties on the WIMP interpretation of the BERNABEI 99 signal.

[12] KLIMENKO 98 limit is for inelastic scattering $X^0\ ^{73}\text{Ge}\ \rightarrow\ X^0\ ^{73}\text{Ge}^*$ (13.26 keV).

[13] KLIMENKO 98 limit is for inelastic scattering $X^0\ ^{73}\text{Ge}\ \rightarrow\ X^0\ ^{73}\text{Ge}^*$ (66.73 keV).

[14] BELLI 96 limit for inelastic scattering $X^0\ ^{129}\text{Xe} \rightarrow\ X^0\ ^{129}\text{Xe}^*$(39.58 keV).

[15] BELLI 96C use background subtraction and obtain $\sigma <$ 0.35 pb ($<$ 0.15 fb) (90% CL) for spin-dependent (independent) X^0-proton cross section. The confidence level is from R. Bernabei, private communication, May 20, 1999.

[16] BERNABEI 96 use pulse shape discrimination to enhance the possible signal. The limit here is from R. Bernabei, private communication, September 19, 1997.

[17] SARSA 96 search for annual modulation of WIMP signal. See SARSA 97 for details of the analysis. The limit here is from M.L. Sarsa, private communication, May 26, 1997.

[18] SMITH 96 use pulse shape discrimination to enhance the possible signal. A dark matter density of 0.4 GeV cm^{-3} is assumed.

[19] GARCIA 95 limit is from the event rate. A weaker limit is obtained from searches for diurnal and annual modulation.

[20] SNOWDEN-IFFT 95 look for recoil tracks in an ancient mica crystal. Similar limits are also given for ^{27}Al and ^{28}Si. See COLLAR 96 and SNOWDEN-IFFT 96 for discussion on potential backgrounds.

[21] BECK 94 uses enriched ^{76}Ge (86% purity).

[22] REUSSER 91 limit here is changed from published (0.3) after reanalysis by authors. J.L. Vuilleumier, private communication, March 29, 1996.

For m_{χ^0} = 1 TeV

VALUE (nb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 0.03	90	[1] UCHIDA	14	XMAS	^{129}Xe, inelastic
< 3	90	[2] ANGLOHER	02	CRES	Al
		[3] BENOIT	00	EDEL	Ge
		[4] BERNABEI	99D	CNTR	SIMP
		[5] DERBIN	99	CNTR	SIMP
< 0.06	95	[6] KLIMENKO	98	CNTR	^{73}Ge, inel.
< 0.4	95	[7] KLIMENKO	98	CNTR	^{73}Ge, inel.
< 40		ALESSAND...	96	CNTR	O
<700		ALESSAND...	96	CNTR	Te
< 0.05	90	[8] BELLI	96	CNTR	^{129}Xe, inel.
< 1.5	90	[9] BELLI	96	CNTR	^{129}Xe, inel.
		[10] BELLI	96C	CNTR	^{129}Xe
< 0.01	90	[11] BERNABEI	96	CNTR	Na
< 9	90	[11] BERNABEI	96	CNTR	I
< 7	95	[12] SARSA	96	CNTR	Na
< 0.3	90	[13] SMITH	96	CNTR	Na
< 6	90	[13] SMITH	96	CNTR	I
< 6	95	[14] GARCIA	95	CNTR	Natural Ge
< 8	95	QUENBY	95	CNTR	Na
< 50	95	QUENBY	95	CNTR	I
<700	90	[15] SNOWDEN-...	95	MICA	^{16}O
< 1 $\times 10^3$	90	[15] SNOWDEN-...	95	MICA	^{39}K
< 0.8	90	[16] BECK	94	CNTR	^{76}Ge
< 30	90	BACCI	92	CNTR	Na
< 30	90	BACCI	92	CNTR	I
< 15	90	[17] REUSSER	91	CNTR	Natural Ge
< 6	95	CALDWELL	88	CNTR	Natural Ge

[1] UCHIDA 14 limit is for inelastic scattering $X^0 + {}^{129}Xe^* \to X^0 + {}^{129}Xe^*$ (39.58 keV).

[2] ANGLOHER 02 limit is for spin-dependent WIMP-Aluminum cross section.

[3] BENOIT 00 find four event categories in Ge detectors and suggest that low-energy surface nuclear recoils can explain anomalous events reported by UKDMC and Saclay NaI experiments.

[4] BERNABEI 99D search for SIMPs (Strongly Interacting Massive Particles) in the mass range 10^3–10^{16} GeV. See their Fig. 3 for cross-section limits.

[5] DERBIN 99 search for SIMPs (Strongly Interacting Massive Particles) in the mass range 10^2–10^{14} GeV. See their Fig. 3 for cross-section limits.

[6] KLIMENKO 98 limit is for inelastic scattering $X^0\ {}^{73}\mathrm{Ge} \rightarrow X^0\ {}^{73}\mathrm{Ge}^*$ (13.26 keV).
[7] KLIMENKO 98 limit is for inelastic scattering $X^0\ {}^{73}\mathrm{Ge} \rightarrow X^0\ {}^{73}\mathrm{Ge}^*$ (66.73 keV).
[8] BELLI 96 limit for inelastic scattering $X^0\ {}^{129}\mathrm{Xe} \rightarrow X^0\ {}^{129}\mathrm{Xe}^*$(39.58 keV).
[9] BELLI 96 limit for inelastic scattering $X^0\ {}^{129}\mathrm{Xe} \rightarrow X^0\ {}^{129}\mathrm{Xe}^*$(236.14 keV).
[10] BELLI 96C use background subtraction and obtain $\sigma < 0.7$ pb (< 0.7 fb) (90% CL) for spin-dependent (independent) X^0-proton cross section. The confidence level is from R. Bernabei, private communication, May 20, 1999.
[11] BERNABEI 96 use pulse shape discrimination to enhance the possible signal. The limit here is from R. Bernabei, private communication, September 19, 1997.
[12] SARSA 96 search for annual modulation of WIMP signal. See SARSA 97 for details of the analysis. The limit here is from M.L. Sarsa, private communication, May 26, 1997.
[13] SMITH 96 use pulse shape discrimination to enhance the possible signal. A dark matter density of 0.4 GeV cm^{-3} is assumed.
[14] GARCIA 95 limit is from the event rate. A weaker limit is obtained from searches for diurnal and annual modulation.
[15] SNOWDEN-IFFT 95 look for recoil tracks in an ancient mica crystal. Similar limits are also given for ^{27}Al and ^{28}Si. See COLLAR 96 and SNOWDEN-IFFT 96 for discussion on potential backgrounds.
[16] BECK 94 uses enriched ^{76}Ge (86% purity).
[17] REUSSER 91 limit here is changed from published (5) after reanalysis by authors. J.L. Vuilleumier, private communication, March 29, 1996.

Miscellaneous Results from Underground Dark Matter Searches

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] ABE	23A	SKAM	boosted DM limits
		[2] ADAMS	23	PICO	inelastic DM search
		[3] ADHIKARI	23B	C100	BDM/heavy photon DM
		[4] AL-KHARUSI	23	EXO2	UDM search
		[5] APRILE	23	XE1T	Planck scale DM search
		[6] HUANG	23	PNDX	scalar DM via dark mediator decay
		[7] NING	23A	PNDX	boosted LDM
		[8] ADHIKARI	22	DEAP	Planck scale DM multiple scatter on Ar
		[9] ADHIKARI	22D	NAI	COSINE-100 annual modulation DM search
		[10] DAI	22A	CDEX	MeV scale exotic DM
		[11] GU	22	PNDX	absorption of fermion DM
		[12] ZHANG	22	PNDX	light DM search
		[13] AKERIB	21B	LUX	limits on WIMP EFT couplings
		[14] AMARE	21	ANAI	annual modulation on NaI
		[15] WANG	21K	CDEX	DM effective operator limits
		[16] AGOSTINI	20	HPGE	keV-MeV scale super-WIMP absorption in Ge
		[17] ANDRIANAV...	20	FUNK	hidden photon DM search
		[18] CLARK	20		superheavy MIMP DM
		[19] ABRAMOFF	19	SENS	MeV DM e-Si; dark photon Si absorption
		[20] ADHIKARI	19	C100	annual modulation NaI
		[21] AMARE	19	ANAI	annual modulation NaI

$<6.4 \times 10^{-10}$	90	[22] APRILE	19	XE1T	π (Xe)
		[23] BRINGMANN	19		cosmic ray DM
		[24] BRUNE	19		Majoran DM
		[25] CHOI	19	THEO	290 TeV IceCube ν
		[26] HA	19	C100	inelastic boosted dark γ
		[27] KLOPF	19		$n \rightarrow \chi e^+ e^-$
		[28] AARTSEN	18D	ICCB	relic WIMP $\chi \rightarrow \nu X$
		[29] ABE	18F	XMAS	$A' e \rightarrow A' e$
		[30] AGNES	18B	DS50	Ar
		[31] AGNESE	18B	SCDM	MeV DM e-Si; dark photon Si absorption
		[32] AKERIB	18A	LUX	Xe
		[33] ARMENGAUD	18	EDE3	Ge
		[34] KACHULIS	18	SKAM	boosted DM on e
$<1 \times 10^{-12}$	90	[35] AGUILAR-AR...	17	DMIC	γ' on Si
		[36] APRILE	17	X100	Xe
		[37] APRILE	17D	X100	Xe
		[38] APRILE	17H	X100	keV bosonic DM search
		[39] APRILE	17K	X100	$\chi N \rightarrow \chi^* \rightarrow \chi\gamma$
$<4 \times 10^{-3}$	90	[40] ANGLOHER	16A	CRES	$CaWO_4$
		[41] APRILE	15	X100	Event rate modulation
		[42] APRILE	15A	X100	Electron scattering

[1] ABE 23A search for boosted sub-GeV DM using 0.37 Mt·y exposure of SuperK data. No signal observed. Model dependent limits set, see Fig. 3 corrected in ABE 23G erratum.

[2] ADAMS 23 search for inelastic DM scatter in fluorocarbons. No signal observed. Limits placed in σ vs. m(χ) mass splitting plane.

[3] ADHIKARI 23B search for boosted heavy photon DM in MeV range using Cosine-100. No signal observed. Limits placed in coupling vs. mass plane for masses 1–100 MeV.

[4] AL-KHARUSI 23 search for absorption of MeV-scale DM with 234.1 kg·y exposure of ^{136}Xe, triggering beta decay. No signal observed. Limit placed in cross section vs. mass plane for m(χ) = 1.7–11.6 MeV (see Fig. 5).

[5] APRILE 23 search for multiple scatter events from Planck scale-DM particles. No signal observed. Limits set on σ^{SI} and σ^{SD} on n and p.

[6] HUANG 23 search for MeV-scale scalar DM interacting via GeV-scale dark mediator. Limits placed on cross section vs. mass plane.

[7] NING 23A search for boosted LDM arising from η decays which are produced in CR events with 0.63 t·y exposure. No signal observed. Limits placed in $\sigma(\chi N)$ vs. m(χ) plane for various mediator models and branching fraction assumptions (see Fig. 2).

[8] ADHIKARI 22 search for multiple scatter of Planck scale DM on Ar using DEAP detector. No signal observed. Limits placed in mass vs. cross section plane for m(DM): 10^7–10^{19} GeV.

[9] ADHIKARI 22D report search for annual modulation signal of DM in a 173 kg·yr exposure of NaI; result consistent with both the modulation amplitude reported by DAMA/LIBRA and no-modulation .

[10] DAI 22A search for MeV-scale exotic DM interaction with Ge; no signal observed; limits set in m(DM) vs. cross section plane for m(DM) $\sim$ 5–60 MeV in simplified model.

[11] GU 22 use PANDAX to search for absorption of fermionic DM in MeV range in Xe; no signal observed; limits set in m(DM) vs. cross section plane for m(DM) $\sim$ 30–125 MeV.

[12] ZHANG 22 search for light DM scatter on e; no signal observed; limits placed in $\sigma \cdot v$ vs. m(DM) plane for m(DM) $\sim$ 10–180 keV.

[13] AKERIB 21B place limits on 15 WIMP non-relativistic EFT couplings for m(DM): 10–4000 GeV using 3.14 kg d exposure.

[14] AMARE 21 search for WIMP annual modulation signal on NaI target in the Canfranc Underground Laboratory (LSC). With an effective exposure of 313.95 kg y, and a sensitivity of 2.5 σ no signal is observed. Incompatible with DAMA/LIBRA at 3.3 σ level.

[15] WANG 21K use CDEX detector to search for WIMP dark matter scatter on Ge; no signal observed; limits placed on 14 non-relativistic effective operators along with WIMP-pion coupling for m(WIMP) $\sim$ 3–20 GeV.

[16] AGOSTINI 20 search for keV–MeV scale super-WIMP absorption in Ge in GERDA; no signal; limits placed on keV–MeV scale bosonic superWIMPs in coupling vs. mass plane.

[17] ANDRIANAVALOMAHEFA 20 search for hidden photon DM in eV range; place limits in m(DM) vs ln(χ) plane: exclude coupling $\chi \lesssim 1 \times 10^{-12}$ for m(DM) $\sim$ 2.5–7 eV.

[18] CLARK 20 use Majorana and Xe-1-ton data to constrain superheavy multply interacting dark matter (MIMP) in range m$\sim$ 10^8–10^{17} GeV depending on interaction cross section.

[19] ABRAMOFF 19 search for MeV scale DM via DM$-e$ scattering and dark photon DM via absorption in Si; limits set in coupling vs. m(χ) plane and on dark photon in m(A) vs. kinetic mixing parameter plane.

[20] ADHIKARI 19 search for annual modulation signal from WIMP scatter on NaI with 1.7 yr exposure; result consistent with both DAMA/LIBRA and null hypothesis.

[21] AMARE 19 is ANAIS-112 search for WIMP scatter annual modulation on NaI; 157.55 kg yr exposure; result compatible with null hypothesis; confirm goal of reaching sensitivity at 3σ to DAMA/LIBRA result in 5 years.

[22] APRILE 19 search for WIMP-pion scattering in Xe; no signal: require $\sigma(\chi\pi) < 6.4 \times 10^{-10}$ pb for m(χ) = 30 GeV.

[23] BRINGMANN 19 derive theoretically limits on GeV and sub-GeV mass dark matter, in its high energy component generated by interaction with cosmic rays; place limits on σ^{SI} and $\sigma^{SD} < 10^5$ pb.

[24] BRUNE 19 examine possibility of Majoron dark matter; limits placed on Majoron mass vs. coupling from SN1987a and ν-less double beta decay.

[25] CHOI 19 from multimessenger observation finds limit on $\sigma(\nu\chi)$/m(DM) < 5.1×10^{-23} cm^2/GeV based on 290 TeV IceCube neutrino event.

[26] HA 19 search for inelastic boosted MeV scale dark photon using COSINE-100 data; limits placed in m vs. epsilon plane for various mediators.

[27] KLOPF 19 search for DM via $n \rightarrow \chi e^+ e^-$; no signal: limits placed in branching fraction vs. m($e^+ e^-$) plane.

[28] AARTSEN 18D search for long-lived DM particles decaying $\chi \rightarrow \nu X$; no excess seen; for DM masses above 10 TeV, excluding lifetimes shorter than 10^{28} s.

[29] ABE 18F search for keV mass ALPs and hidden photons (HP) scatter on electrons; limits set on mass vs. coupling.

[30] AGNES 18B search for MeV-scale DM scatter on electrons in Ar; no signal; require $\sigma(\chi e) < 9 \times 10^{-3}$ pb for DM form factor F(DM) = 1 and < 300 pb for F(DM) proportional to 1/q^2 for m(χ) = 100 MeV.

[31] AGNESE 18B search for MeV scale DM via DM-e scattering and dark photon DM via absorption in Si; limits set on MeV DM in coupling vs. m(χ) plane and on dark photon in m(A') vs. kinetic mixing plane.

[32] AKERIB 18A search for annual and diurnal modulation of DM scattering rate on electrons for recoil energy between 2 and 6 keVee; no signal found.

[33] ARMENGAUD 18 search for ALP from the Sun and galactic bosonic DM, interacting in Ge; no signal; limits set for 0.8–500 keV DM particles.

[34] KACHULIS 18 search for an excess of elastically scattered electrons above the atmospheric neutrino background in Super-K; limits placed for simple annihilation or decay in the Sun or galactic center producing "boosted" dark matter.

[35] AGUILAR-AREVALO 17 search for hidden photon DM scatter on Si target CCD; limit kinetic mixing $\kappa < 1 \times 10^{-12}$ for m = 10 eV.

[36] APRILE 17 search for WIMP-e annual modulation signal for recoil energy in the 2.0–5.8 keV interval using 4 years data with Xe. No significant effect seen.

[37] APRILE 17D set limits on 14 WIMP-nucleon different interaction operators. No deviations found using 225 live days in the 6.6–240 keV recoil energy range.

[38] APRILE 17H search for keV bosonic DM via $e\chi \rightarrow e$, looking for electronic recoils with 224.6 live days of data and 34 kg of LXe. Limits set on $\chi e e$ coupling for m(χ) = 8–125 keV.

[39] APRILE 17K search for magnetic inelastic DM via $\chi N \rightarrow \chi^* \rightarrow \chi\gamma$. Limits set in DM magnetic moment vs. mass splitting plane for two DM masses corresponding to the DAMA/LIBRA best fit values.

[40] ANGLOHER 16A require q^2 dependent scattering $< 8 \times 10^{-3}$ pb for asymmetric DM m(WIMP) = 3 GeV on $CaWO_4$ target. It uses a local dark matter density of 0.38 GeV/cm^3.

[41] APRILE 15 search for periodic variation of electronic recoil event rate in the data between Feb. 2011 and Mar. 2012. No significant modulation is found for periods up to 500 days.

[42] APRILE 15A search for X^0 scattering off electrons. See their Fig. 4 for limits on cross section through axial-vector coupling for m_{X^0} between 0.6 GeV and 1 TeV. For m_{X^0} = 2 GeV, $\sigma <$ 60 pb (90%CL) is obtained.

X^0 Annihilation Cross Section

Limits are on σv for X^0 pair annihilation for the X^0 mass specified in the footnote when needed.

VALUE (cm^{3}s^{-1})	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<1 \times 10^{-24}$	90	[1] ABBASI	23A	ICCB	WIMP annihilation to ν's
$<1 \times 10^{-22}$	90	[2] ABBASI	23B	ICCB	PeV WIMP annihilation
$<5 \times 10^{-28}$	95	[3] ABE	23B	MGIC	Wimp annihilation to γ
		[4] ALBERT	23	HAWC	WIMP annihilation to γ in galactic halo
		[5] CHENG	23A		Fermi-LAT and DAMPE combined γ line search
$<2 \times 10^{-25}$	95	[6] FOSTER	23	FLAT	DM annihilation to gamma line
		[7] GUO	23	FAST	DM annihilation in dwarf spheroidal galaxy
		[8] GUO	23A		WIMP annihilation in dwarf spheroidal galaxies
$<2 \times 10^{-26}$	95	[9] LAVIS	23		$b\overline{b}$ + 2HDM+S, m<1000 GeV
$<1.2 \times 10^{-26}$	95	[10] ABDALLA	22	HESS	DM annihilation to gamma rays
		[11] ALBERT	22A	ANTR	PeV-scale DM search
$<1 \times 10^{-27}$		[12] CHAN	22		DM annihilation from Omega Centauri X-rays
$<3 \times 10^{-26}$		[13] EGOROV	22		DM annihilation to radio waves from M31
		[14] MANCONI	22		polarized synchrotron emission from DM annihilation via Planck
$<5 \times 10^{-24}$	95	[15] ABDALLAH	21	HESS	WIMP annihilation in dwarf irregular galaxy
		[16] CIRELLI	21		light DM annihilation producing X-rays
		[17] JOHN	21		cosmic positron spectra limits on leptophilic DM
$<2.5 \times 10^{-27}$	95	[18] ABAZAJIAN	20	FLAT	γ from galactic center
		[19] ABDALLAH	20	HESS	WIMP annihilation in dwarf satellite galaxies

$<1.2 \times 10^{-24}$	90	[20] ABE	20G	SKAM	WIMP annihilation to neutrinos
$<2.2 \times 10^{-24}$	95	[21] ALBERT	20	HAWC	WIMP annihilation to γ
$<5 \times 10^{-24}$	90	[22] ALBERT	20A	ANTR	WIMP annihilation to νs in galactic center
$<1 \times 10^{-23}$	90	[23] ALBERT	20C	ANTR	Antares/IceCube search for WIMP annihilation to νs
$<8 \times 10^{-26}$		[24] ALVAREZ	20	FLAT	dwarf spheroidal; J-distribution
$<2 \times 10^{-26}$	90	[25] HOOF	20	FLAT	WIMP annihilation to γ
		[26] MAZZIOTTA	20	FLAT	DM annihilation in Sun to γ
		[27] ABEYSEKARA	19	HAWC	DM annihilation to γs within galactic substructure
$<0.8 \times 10^{-22}$	95	[28] ALBERT	19B	HAWC	annihilation/decay to γ in M31
$<4 \times 10^{-26}$	95	[29] CHEUNG	19	EDGS	$\chi\chi \rightarrow e^+ e^-$ and $b\overline{b}$
$<7 \times 10^{-27}$	95	[30] DI-MAURO	19	FLAT	Fermi-LAT M31 and M33
		[31] JOHNSON	19	FLAT	P-wave DM; Fermi-LAT
$<2 \times 10^{-26}$	95	[32] LI	19D	FLAT	$\chi\chi \rightarrow \gamma$
$<1 \times 10^{-32}$		[33] NG	19		sterile ν decay/annihilation
		[34] QUEIROZ	19		semi-annihilating DM
$<4 \times 10^{-28}$	95	[35] ABDALLAH	18	HESS	$X^0 X^0 \rightarrow \gamma X$; galactic halo
$<1 \times 10^{-23}$	95	[36] AHNEN	18	MGIC	$X^0 X^0 \rightarrow \gamma X$; Ursa Major II
$<1 \times 10^{-22}$	95	[37] ALBERT	18B	HAWC	$X^0 X^0 \rightarrow \gamma X$; Andromeda
$<1 \times 10^{-26}$	95	[38] CHANG	18A		$\chi\chi \rightarrow b\overline{b} \rightarrow \gamma$
		[39] LISANTI	18	THEO	Fermi, γ; galaxy groups
		[40] MAZZIOTTA	18	FLAT	Fermi-LAT CRE data
$<1.2 \times 10^{-23}$	95	[41] AARTSEN	17C	ICCB	$\chi\chi \rightarrow$ neutrinos
$<1 \times 10^{-23}$	90	[42] ALBERT	17A	ANTR	ν, DM annihilation
$<1.32 \times 10^{-25}$	95	[43] ARCHAMBAU...	17	VRTS	γ dwarf galaxies
$<7 \times 10^{-21}$	90	[44] AVRORIN	17	BAIK	cosmic ν
$<1 \times 10^{-28}$		[45] BOUDAUD	17		MeV DM to $e^+ e^-$
		[46] AARTSEN	16D	ICCB	ν, galactic center
$<6 \times 10^{-26}$	95	[47] ABDALLAH	16	HESS	Central Galactic Halo
$<1 \times 10^{-27}$	95	[48] ABDALLAH	16A	HESS	WIMP+WIMP $\rightarrow \gamma\gamma$; galactic center
$<3 \times 10^{-26}$	95	[49] AHNEN	16	MGFL	Satellite galaxy, m(WIMP)=100 GeV
$<1.9 \times 10^{-21}$	90	[50] AVRORIN	16	BAIK	νs from galactic center
$<3 \times 10^{-26}$	95	[51] CAPUTO	16	FLAT	small Magellanic cloud
$<1 \times 10^{-25}$	95	[52] FORNASA	16	FLAT	Fermi-LAT γ-ray anisotropy
$<5 \times 10^{-27}$		[53] LEITE	16		WIMP, radio
$<2 \times 10^{-26}$	95	[54] LI	16	FLAT	dwarf galaxies
$<1 \times 10^{-25}$	95	[55] LI	16A	FLAT	Fermi-LAT; M31
$<1 \times 10^{-26}$		[56] LIANG	16	FLAT	Fermi-LAT, gamma line
$<1 \times 10^{-25}$	95	[57] LU	16	FLAT	Fermi-LAT and AMS-02
$<1 \times 10^{-23}$	95	[58] SHIRASAKI	16	FLAT	extra galactic
		[59] AARTSEN	15C	ICCB	ν, Galactic halo
		[60] AARTSEN	15E	ICCB	ν, Galactic center
		[61] ABRAMOWSKI	15	HESS	Galactic center
		[62] ACKERMANN	15	FLAT	monochromatic γ
		[63] ACKERMANN	15A	FLAT	isotropic γ background
		[64] ACKERMANN	15B	FLAT	Satellite galaxy
		[65] ADRIAN-MAR...	15	ANTR	ν, Galactic center
$<2.90 \times 10^{-26}$	95	[66,67] ACKERMANN	14	FLAT	Satellite galaxy, m = 10 GeV

$<1.84 \times 10^{-25}$	95	[66,68] ACKERMANN	14	FLAT	Satellite galaxy, $m = 100$ GeV
$<1.75 \times 10^{-24}$	95	[66,68] ACKERMANN	14	FLAT	Satellite galaxy, $m = 1$ TeV
$<4.52 \times 10^{-24}$	95	[69] ALEKSIC	14	MGIC	Segue 1, $m = 1.35$ TeV
		[70] AARTSEN	13C	ICCB	Galaxies
		[71] ABRAMOWSKI	13	HESS	Central Galactic Halo
		[72] ACKERMANN	13A	FLAT	Galaxy
		[73] ABRAMOWSKI	12	HESS	Fornax Cluster
		[74] ACKERMANN	12	FLAT	Galaxy
		[75] ACKERMANN	12	FLAT	Galaxy
		[76] ALIU	12	VRTS	Segue 1
$<1 \times 10^{-22}$	90	[77] ABBASI	11C	ICCB	Galactic halo, m=1 TeV
$<3 \times 10^{-25}$	95	[78] ABRAMOWSKI	11	HESS	Near Galactic center, m=1 TeV
$<1 \times 10^{-26}$	95	[79] ACKERMANN	11	FLAT	Satellite galaxy, m=10 GeV
$<1 \times 10^{-25}$	95	[79] ACKERMANN	11	FLAT	Satellite galaxy, m=100 GeV
$<1 \times 10^{-24}$	95	[79] ACKERMANN	11	FLAT	Satellite galaxy, m=1 TeV

[1] ABBASI 23A search for WIMP-WIMP annihilation to ν's. No signal observed. Require $\langle\sigma{\cdot}v\rangle < 10^{-24}$ cm^3/s for m(χ) $\sim$ 10–10 $\times$ 10^4 GeV for various halo profiles.

[2] ABBASI 23B search for PeV-scale WIMP-WIMP annihilation to μ or b pairs. No signal observed. Require $\langle\sigma{\cdot}v\rangle < 10^{-22}$ cm^3/s for $\chi\chi \rightarrow b\overline{b}$ with m(χ) about 1 PeV or $\langle\sigma{\cdot}v\rangle < 10^{-23}$ cm^3/s for $\chi\chi \rightarrow \mu^+\mu^-$ with m(χ) about 1 PeV.

[3] ABE 23B search for WMP-WIMP annihilation to γ in GC. No signal observed. Require $\langle\sigma{\cdot}v\rangle < 5 \times 10^{-28}$ cm^3/s for m(χ) = 1 TeV or $\langle\sigma{\cdot}v\rangle < 1 \times 10^{-25}$ cm^3/s for m(χ) = 100 TeV.

[4] ALBERT 23 search for WIMP pair annihilation to γ in galactic halo. No signal observed. Limits placed in $\langle\sigma{\cdot}v\rangle$ vs. mass (10–100 TeV) plane for various annihilation channels.

[5] CHENG 23A provide updated combined Fermi-LAT/DAMPE search for gamma line from WIMP annihilation. No signal observed. Limits placed in $\langle\sigma{\cdot}v\rangle$ vs. mass (6–200 GeV) plane for various halo profiles.

[6] FOSTER 23 search for gamma ray line in Fermi-LAT data. No signal observed. Limits placed in $\langle\sigma{\cdot}v\rangle$ vs. m(χ) plane. For Higgsino DM limit see Fig. 12.

[7] GUO 23 search with Five-hundred-meter Aperture Spherical Radio Telescope for synchrotron emission radio signal of DM annihilation from dwarf spheroidal galaxy. No signal observed. Limits set in $\langle\sigma{\cdot}v\rangle$ vs. m(χ) plane for various annihilation final states.

[8] GUO 23A search in public IceCube data for DM annihilation to neutrinos. No signal observed. Limits placed in $\langle\sigma{\cdot}v\rangle$ vs m(χ) plane for various annihilation assumptions.

[9] LAVIS 23 search for 2HDM+S DM and generic spectra using MeerKAT. No signal observed. Limits placed in $\langle\sigma{\cdot}v\rangle$ vs. mass (10–1000 GeV) plane for various annihilation channels.

[10] ABDALLA 22 search for WIMP annihilation in galactic center to gamma rays using HESS; no signal observed; limits set in mass vs $\langle\sigma{\cdot}v\rangle$ plane for dominant annihilation to WW or $\tau\overline{\tau}$. Limit here for $\tau\overline{\tau}$ channel 0.7 TeV mass.

[11] ALBERT 22A search for secluded PeV-scale DM annihilation to four final states; no signal detected; limits placed in $\langle\sigma{\cdot}v\rangle$ vs. m(χ) plane for m(χ): 6–6000 TeV for m(mediator) = 50, 250, and 1000 GeV.

[12] CHAN 22 derive a variety of limits on DM annihilation to various channels resulting in X-rays from dwarf galaxy Omega Centauri. Limits are very dependent on assumed DM density and diffusion coefficient. Quoted limit is for m(WIMP) = 100 GeV annihilating to WW with parameters as in Fig. 4.

[13] EGOROV 22 derives limits on DM annihlation to $b\overline{b}$ or $\tau\overline{\tau}$ via radio signals from M31; quoted limit from $b\overline{b}$ channel with LOFAR telescope as main data source, using parameters as in Fig. 10 (green curve) for m(χ) = 100 GeV.

[14] MANCONI 22 use polarized synchrotron emission data from Planck to constrain WIMP annihilation cross section in Galaxy; limits set in $\langle\sigma{\cdot}v\rangle$ vs. m(DM) plane.

[15] ABDALLAH 21 search for WIMP-WIMP annihilation into 2 monoenergetic γ rays in WLM dwarf irregular galaxy using HESS data. No signal. Limits placed in $\langle\sigma{\cdot}v\rangle$ vs. m(WIMP) plane for a mass of 370 GeV.

[16] CIRELLI 21 derive limits on light DM annihilation to ee, $\mu\mu$, $\pi\pi$ that then produce X-rays using data published by INTEGRAL telescope. Limits placed in $\langle\sigma{\cdot}v\rangle$ vs. m(DM) plane for m(DM) = 1–5000 MeV.

[17] JOHN 21 derive limits on leptophilic DM annihilating to positrons by comparing expected spectra to AMS-02 data. The range m(DM): 60–300 GeV appears excluded for this type of model, see Fig. 3.

[18] ABAZAJIAN 20 derive new limits on WIMP annihilation in galactic center (GC): $\langle\sigma{\cdot}v\rangle < 2.5 \times 10^{-27}$ cm^3/s for m(WIMP) = 50 GeV: seems to rule out WIMP explanation for GC γ excess, favouring an astrophysics origin.

[19] ABDALLAH 20 search for WIMP annihilation in newly discovered by DES dwarf satellite galaxies using HESS; limits placed in $\langle\sigma{\cdot}v\rangle$ vs. m(DM) plane depending on annihilation channel and which dwarf satellite.

[20] ABE 20G search Super-Kamiokande data for WIMP annihilation to neutrinos in galactic center/halo; no signal; limits placed in $\langle\sigma{\cdot}v\rangle$ vs. m(DM) plane depending on annihilation channel and m(WIMP). Reported limit for annihilation to $\nu\overline{\nu}$ at 1 GeV.

[21] ALBERT 20 search for TeV-scale WIMP annihlation to $\gamma\gamma$ in dwarf spheroidal galaxies; no signal; limits placed in $\sigma{\cdot}v$ vs m(WIMP) plane: e.g. $\sigma{\cdot}v < 2.2 \times 10^{-24}$ cm^3/s for m(WIMP) = 1 TeV.

[22] ALBERT 20A search for WIMP annihilation to νs in galactic center using Antares; limits placed in $\sigma \cdot$ v vs m(WIMP) plane e.g. $\sigma \cdot$ v $< 5 \times 10^{-24}$ cm^3/s for m(WIMP) = 1 TeV assuming annihilation dominantly to $\tau\overline{\tau}$.

[23] ALBERT 20C report combined Antares + IceCube search for WIMP annihilation to $\tau\overline{\tau}$; for NFW halo profile report $\sigma{\cdot}v < 1 \times 10^{-23}$ cm^3/s for m(WIMP) = 100 GeV.

[24] ALVAREZ 20 use profiling over J-factor distributions and background to derive new limits on $\sigma \cdot$ v; e.g. $\sigma \cdot$ v $< 8 \times 10^{-26}$ cm^3/s for m(WIMP) = 100 GeV.

[25] HOOF 20 examine γ rays from 27 dwarf spheroidals using Fermi-LAT data; place limits in $\sigma \cdot$ v vs m(WIMP) plane using profile likelihood and marginalized posterior techniques for DM annihilation to $\tau\overline{\tau}$ and $b\overline{b}$; quoted limit uses first technique and $b\overline{b}$ channel for m(WIMP) = 100 GeV; results rule out WIMP explanation of galactic center excess.

[26] MAZZIOTTA 20 use Fermi-LAT pointed-at-Sun data to search for DM annihilation in the Sun to long-lived mediators decaying into gamma rays, i.e. $\chi\chi \rightarrow \phi\phi \rightarrow 4\gamma$. Limits placed on the SI and SD DM-nucleon cross sections in the σ–DM mass plane for DM masses in the range 3 GeV – 1.8 TeV. Limits are evaluated in both cases of equilibrium and non-equilibrium.

[27] ABEYSEKARA 19 search for γs from DM annihilation in galactic substructures with HAWC; no signal, limits placed in J$\langle\sigma{\cdot}v\rangle$ vs. declination plane for m(DM) $\sim$ 1–108 TeV.

[28] ALBERT 19B search for DM signal from M31 galaxy in μ, τ, t, b, W channels using HAWC for m(DM) $\sim$ 1–100 TeV; no signal, limits placed in $\langle\sigma{\cdot}v\rangle$ vs. m(DM) plane.

[29] CHEUNG 19 derive model-dependent bounds on $\langle\sigma{\cdot}v\rangle$ from EDGES data: $< 4\times10^{-26}$ cm^3/s for e^+e^- and $b\overline{b}$ for m(χ) = 100 GeV (including boost factor).

[30] DI-MAURO 19 place limits on WIMP annihilation via Fermi-LAT observation of M31 and M33 galaxies: $\langle\sigma{\cdot}v\rangle < 7 \times 10^{-27}$cm^3/s for m($\chi$) = 20 GeV from M31.

[31] JOHNSON 19 search for γ-rays, 10–600 GeV energy, from P-wave annihilating DM around SgrA* BH using Fermi-LAT; limits set for various models.

[32] LI 19D search for $\chi\chi \rightarrow \gamma$ in Fermi-LAT data; no signal, require $\langle\sigma{\cdot}v\rangle < 2 \times 10^{-26}$ cm^3/s for m(χ) = 100 GeV.

[33] NG 19 search for X-ray line from sterile ν decay/annihilation using NuStar M-31; no signal: limits placed in m(ν) vs mixing angle and $\langle\sigma{\cdot}v\rangle$ vs m(ν).

[34] QUEIROZ 19 examine $\chi\chi \rightarrow \chi SM$ semi-annihilation of DM reaction; limits placed for various assumed SM particles in $\langle\sigma{\cdot}v\rangle$ vs. m(χ) plane.

[35] ABDALLAH 18 search for WIMP WIMP $\rightarrow \gamma X$ in central galactic halo, 10 years of data; limits placed in $\langle\sigma{\cdot}v\rangle$ vs. m(WIMP) plane for m(WIMP): 0.3–70 TeV.

[36] AHNEN 18 search for WIMP WIMP$\rightarrow \gamma X$ from Ursa Major II; limits set in $\langle\sigma{\cdot}v\rangle$ vs. m(WIMP) plane for $b\overline{b}$, W^+W^-, $\tau^+\tau^-$, and $\mu^+\mu^-$ annihilation modes.

[37] ALBERT 18B search for TeV-scale WIMPs with WIMP WIMP $\rightarrow \gamma X$ in Andromeda galaxy using HAWC Observatory; limits set in $\langle\sigma{\cdot}v\rangle$ vs m(WIMP) plane.

[38] CHANG 18A examine $\chi\chi \rightarrow b\overline{b} \rightarrow \gamma$ using Fermi Pass 8 data; no signal; require $\langle\sigma{\cdot}v\rangle < 10^{-26}$ cm^3/s for m(χ) = 50 GeV.

[39] LISANTI 18 examine Fermi Pass 8 γ-ray data from galaxy groups; report m(WMP) > 30 GeV for annihilation in $b\overline{b}$ channel.

[40] MAZZIOTTA 18 examine Fermi-LAT electron and positron spectra searching for features originating from DM particles annihilation into e^+e^- pairs, from 45 GeV to 2 TeV; no signal found, limits are obtained.

[41] AARTSEN 17C use 1005 days of IceCube data to search for $\chi\chi \rightarrow$ neutrinos via various annihilation channels. Limits set.

[42] ALBERT 17A search for DM annihilation to νs using ANTARES data from 2007–2015. No signal. Limits set in $\langle\sigma{\cdot}v\rangle$ vs. m(DM) plane for m(DM) $\sim$ 10–10 $\times$ 10^5 GeV. The listed limit is for m(DM) = 100 TeV.

[43] ARCHAMBAULT 17 set limits for WIMP mass between 100 GeV and 1 TeV on $\langle\sigma{\cdot}v\rangle$ for W^+W^-, ZZ, $b\overline{b}$, $s\overline{s}$, $u\overline{u}$, $d\overline{d}$, $t\overline{t}$, e^+e^-, gg, $c\overline{c}$, hh, $\gamma\gamma$, $\mu^+\mu^-$,$\tau^+\tau^-$ annihilation channels.

[44] AVRORIN 17 find upper limits for the annhilation cross section in various channels for DM particle mass between 30 GeV and 10 TeV. Strongest upper limits coming from the two neutrino channel require $\langle\sigma{\cdot}v\rangle < 6\times10^{-20}$ cm^3/s in dwarf galaxies and $\langle\sigma{\cdot}v\rangle < 7\times10^{-21}$ cm^3/s in LMC for 5 TeV WIMP mass.

[45] BOUDAUD 17 use data from the spacecraft Voyager 1, beyond the heliopause, and from AMS02 on $\chi\chi \rightarrow e^+e^-$ to require $\langle\sigma{\cdot}v\rangle < 1.\times10^{-28}$ cm^3/s for m(χ) = 10 MeV.

[46] AARTSEN 16D search for GeV νs from WIMP annihilation in galaxy; limits set on $\langle\sigma{\cdot}v\rangle$ in Fig. 6, 7.

[47] ABDALLAH 16 require $\langle\sigma{\cdot}v\rangle < 6\times10^{-26}$ cm^3/s for m(WIMP) = 1.5 TeV from 254 hours observation (WW channel) and $< 2\times10^{-26}$ cm^3/s for m(WIMP) = 1.0 TeV in $\tau^+\tau^-$ channel.

[48] ABDALLAH 16A search for line spectra from WIMP + WIMP $\rightarrow \gamma\gamma$ in 18 hr HESS data; rule out previous 130 GeV WIMP hint from Fermi-LAT data.

[49] AHNEN 16 require $\langle\sigma{\cdot}v\rangle < 3\times10^{-26}$ cm^3/s for m(WIMP) = 100 GeV (WW channel).

[50] AVRORIN 16 require $\langle$s.v$\rangle < 1.91\times10^{-21}$ cm^3/s from WIMP annihilation to νs via WW channel for m(WIMP) = 1 TeV.

[51] CAPUTO 16 place limits on WIMPs from annihilation to gamma rays in Small Magellanic Cloud using Fermi-LaT data: $\langle\sigma{\cdot}v\rangle < 3\times10^{-26}$cm^3/s for m(WIMP) = 10 GeV.

[52] FORNASA 16 use anisotropies in the γ-ray diffuse emission detected by Fermi-LAT to bound $\langle\sigma{\cdot}v\rangle < 10^{-25}$cm^3/s for m(WIMP) = 100 GeV in $b\overline{b}$ channel: see Fig. 28. The limit is driven by dark-matter subhalos in the Milky Way and it refers to their Most Constraining Scenario.

[53] LEITE 16 constrain WIMP annihilation via search for radio emissions from Smith cloud; $\langle\sigma{\cdot}v\rangle < 5\times10^{-27}$cm^3/s in ee channel for m(WIMP) = 5 GeV.

[54] LI 16 re-analyze Fermi-LAT data on 8 dwarf spheroidals; set limit $\langle\sigma{\cdot}v\rangle < 2\times10^{-26}$ cm^3/s for m(WIMP) = 100 GeV in $b\overline{b}$ mode with substructures included.

[55] LI 16A constrain $\langle\sigma{\cdot}v\rangle < 10^{-25}$cm^3/s in $b\overline{b}$ channel for m(WIMP) = 100 GeV using Fermi-LAT data from M31; see Fig. 6.

[56] LIANG 16 search dwarf spheroidal galaxies, Large Magellanic Cloud, and Small Magellanic Cloud for γ-line in Fermi-LAT data.

[57] LU 16 re-analyze Fermi-LAT and AMS-02 data; require $\langle\sigma{\cdot}v\rangle < 10^{-25}$cm^3/s for m_m(WIMP) = 1 TeV in $b\overline{b}$ channel .

[58] SHIRASAKI 16 re-anayze Fermi-LAT extra-galactic data; require $\langle\sigma{\cdot}v\rangle < 10^{-23}$cm^3/s for m(WIMP) = 1 TeV in $b\overline{b}$ channel; see Fig. 8.

[59] AARTSEN 15C search for neutrinos from X^0 annihilation in the Galactic halo. See their Figs. 16 and 17, and Table 5 for limits on $\sigma \cdot$ v for X^0 mass between 100 GeV and 100 TeV.

[60] AARTSEN 15E search for neutrinos from X^0 annihilation in the Galactic center. See their Figs. 7 and 9, and Table 3 for limits on $\sigma \cdot$ v for X^0 mass between 30 GeV and 10 TeV.

[61] ABRAMOWSKI 15 search for γ from X^0 annihilation in the Galactic center. See their Fig. 4 for limits on $\sigma \cdot$ v for X^0 mass between 250 GeV and 10 TeV.

[62] ACKERMANN 15 search for monochromatic γ from X^0 annihlation in the Galactic halo. See their Fig. 8 and Tables 2–4 for limits on $\sigma \cdot$ v for X^0 mass between 0.2 GeV and 500 GeV.

[63] ACKERMANN 15A search for γ from X^0 annihilation (both Galactic and extragalactic) in the isotropic γ background. See their Fig. 7 for limits on $\sigma \cdot$ v for X^0 mass between 10 GeV and 30 TeV.

[64] ACKERMANN 15B search for γ from X^0 annihilation in 15 dwarf spheroidal satellite galaxies of the Milky Way. See their Figs. 1 and 2 for limits on $\sigma \cdot$ v for X^0 mass between 2 GeV and 10 TeV.

[65] ADRIAN-MARTINEZ 15 search for neutrinos from X^0 annihilation in the Galactic center. See their Figs. 10 and 11 and Tables 1 and 2 for limits on $\sigma \cdot$ v for X^0 mass between 25 GeV and 10 TeV.

[66] ACKERMANN 14 search for γ from X^0 annihilation in 25 dwarf spheroidal satellite galaxies of the Milky Way. See their Tables II–VII for limits assuming annihilation into e^+e^-, $\mu^+\mu^-$, $\tau^+\tau^-$, $u\overline{u}$, $b\overline{b}$, and W^+W^-, for X^0 mass ranging from 2 GeV to 10 TeV.

[67] Limit assuming X^0 pair annihilation into $b\overline{b}$.

[68] Limit assuming X^0 pair annihilation into W^+W^-.

[69] ALEKSIC 14 search for γ from X^0 annihilation in the dwarf spheroidal galaxy Segue 1. The listed limit assumes annihilation into W^+W^-. See their Figs. 6, 7, and 16 for limits on $\sigma \cdot$ v for annihilation channels $\mu^+\mu^-$, $\tau^+\tau^-$, $b\overline{b}$, $t\overline{t}$, $\gamma\gamma$, γZ, W^+W^-, ZZ for X^0 mass between 10^2 and 10^4 GeV.

[70] AARTSEN 13C search for neutrinos from X^0 annihilation in nearby galaxies and galaxy clusters. See their Figs. 5–7 for limits on $\sigma \cdot$ v for $X^0 X^0 \rightarrow \nu\overline{\nu}$, $\mu^+\mu^-$, $\tau^+\tau^-$, and W^+W^- for X^0 mass between 300 GeV and 100 TeV.

[71] ABRAMOWSKI 13 search for monochromatic γ from X^0 annihilation in the Milky Way halo in the central region. Limit on $\sigma \cdot$ v between 10^{-28} and 10^{-25} cm^3 s^{-1} (95% CL) is obtained for X^0 mass between 500 GeV and 20 TeV for $X^0 X^0 \rightarrow \gamma\gamma$. X^0 density distribution in the Galaxy by Einasto is assumed. See their Fig. 4.

[72] ACKERMANN 13A search for monochromatic γ from X^0 annihilation in the Milky Way. Limit on $\sigma \cdot$ v for the process $X^0 X^0 \rightarrow \gamma\gamma$ in the range 10^{-29}–10^{-27} cm^3 s^{-1} (95% CL) is obtained for X^0 mass between 5 and 300 GeV. The limit depends slightly on the assumed density profile of X^0 in the Galaxy. See their Tables VII–X and Fig.10. Supersedes ACKERMANN 12.

[73] ABRAMOWSKI 12 search for γ's from X^0 annihilation in the Fornax galaxy cluster. See their Fig. 7 for limits on $\sigma \cdot$ v for X^0 mass between 0.1 and 100 TeV for the annihilation channels $\tau^+\tau^-$, $b\overline{b}$, and W^+W^-.

[74] ACKERMANN 12 search for monochromatic γ from X^0 annihilation in the Milky Way. Limit on $\sigma \cdot$ v in the range 10^{-28}–10^{-26} cm^{3}s^{-1} (95% CL) is obtained for X^0 mass

between 7 and 200 GeV if X^0 annihilates into $\gamma\gamma$. The limit depends slightly on the assumed density profile of X^0 in the Galaxy. See their Table III and Fig. 15.

[75] ACKERMANN 12 search for γ from X^0 annihilation in the Milky Way in the diffuse γ background. Limit on $\sigma \cdot$ v of 10^{-24} cm^{3}s^{-1} or larger is obtained for X^0 mass between 5 GeV and 10 TeV for various annihilation channels including $W^+ W^-$, $b\overline{b}$, $g g$, $e^+ e^-$, $\mu^+ \mu^-$, $\tau^+ \tau^-$. The limit depends slightly on the assumed density profile of X^0 in the Galaxy. See their Figs. 17–20.

[76] ALIU 12 search for γ's from X^0 annihilation in the dwarf spheroidal galaxy Segue 1. Limit on $\sigma \cdot$ v in the range 10^{-24}–10^{-20} cm^{3}s^{-1} (95% CL) is obtained for X^0 mass between 10 GeV and 2 TeV for annihilation channels $e^+ e^-$, $\mu^+ \mu^-$, $\tau^+ \tau^-$, $b\overline{b}$, and $W^+ W^-$. See their Fig. 3.

[77] ABBASI 11C search for ν_μ from X^0 annihilation in the outer halo of the Milky Way. The limit assumes annihilation into $\nu\nu$. See their Fig. 9 for limits with other annihilation channels.

[78] ABRAMOWSKI 11 search for γ from X^0 annihilation near the Galactic center. The limit assumes Einasto DM density profile.

[79] ACKERMANN 11 search for γ from X^0 annihilation in ten dwarf spheroidal satellite galaxies of the Milky Way. The limit for $m = 10$ GeV assumes annihilation into $b\overline{b}$, the others $W^+ W^-$. See their Fig. 2 for limits with other final states. See also GERINGER-SAMETH 11 for a different analysis of the same data.

Dark Matter Particle (X^0) Production in Hadron Collisions

Searches for X^0 production in asociation with observable particles (γ, jets, ...) in high energy hadron collisions. If a specific form of effective interaction Lagrangian is assumed, the limits may be translated into limits on X^0-nucleon scattering cross section.

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
	[1] AAD	23A	ATLS	$H \rightarrow$ invisible search
	[2] AAD	23AF	ATLS	$\overline{t}t + H \rightarrow$ invisible search
	[3] AAD	23AJ	ATLS	extended 2HDM search
	[4] AAD	23BX	ATLS	Ha, $a \rightarrow$ DM search
	[5] AAD	23W	ATLS	dark Higgs model
	[6] AKIMOV	23	COHR	LDM search at SNS
	[7] LIN	23C	KOTO	$\chi \rightarrow \gamma\gamma$ from K^0_L decay
	[8] AAD	22D	ATLS	Z+H with $H \rightarrow$ DM
	[9] AAD	22P	ATLS	$H \rightarrow \chi\chi$ search via VBF
	[10] AGUILAR-AR...	22A	CCM	p dump search for MeV-scale DM
	[11] TUMASYAN	22AA	CMS	$Z' \rightarrow$ DM search
	[12] TUMASYAN	22AG	CMS	strongly interacting DM search
	[13] TUMASYAN	22G	CMS	DM search via VBF to Higgs
	[14] AAD	21AZ	ATLS	DM search in $H \not{E}_T \rightarrow \gamma\gamma \not{E}_T$
	[15] AAD	21BB	ATLS	DM search in $H \not{E}_T \rightarrow b\overline{b} \not{E}_T$
	[16] AAD	21D	ATLS	Dark Higgs
	[17] AAD	21F	ATLS	jet + missing momentum
	[18] AAD	21K	ATLS	photon + DM
	[19] AAD	21O	ATLS	ℓ + jets + $\not{E}_T$ to search for t-pairs + DM
	[20] AAD	21P	ATLS	$\ell^+ \ell^-$ + jets + $\not{E}_T$
	[21] AAD	21S	ATLS	b-jets + $\not{E}_T$
	[22] SIRUNYAN	21A	CMS	$p p \rightarrow Z \chi\chi$; $Z \rightarrow \ell\overline{\ell}$

[23] TUMASYAN	21D	CMS	DM search in jets + $\not\!\!E_T$
[24] SIRUNYAN	20X	CMS	$pp \to Z' \to A(Z')h \to h + \not\!\!E_T$
[25] AABOUD	19AA	ATLS	multi-channel BSM search
[26] AABOUD	19AI	ATLS	$H \to \chi\chi$
[27] AABOUD	19AL	ATLS	$H \to \chi\chi$
[28] AABOUD	19Q	ATLS	single t+$\not\!\!E_T$
[29] AABOUD	19V	ATLS	review mediator based DM searches
[30] BANERJEE	19	NA64	$eN \to eN$+$\not\!\!E$
[31] SIRUNYAN	19AN	CMS	$H\chi\chi \to b\overline{b}\,\not\!\!E_T$
[32] SIRUNYAN	19BC	CMS	LQ LQ $\to \mu j\,\not\!\!E_T$
[33] SIRUNYAN	19BO	CMS	$VV \to Hqq$; $H \to$ DM
[34] SIRUNYAN	19C	CMS	$pp \to t\overline{t}\chi\chi$
[35] SIRUNYAN	19O	CMS	$pp \to \gamma\,\not\!\!E_T$
[36] SIRUNYAN	19X	CMS	$pp \to t\overline{t} + p\!\!\!/_T$; $pp \to t(\overline{t}) + p\!\!\!/_T$
[37] AABOUD	18	ATLS	$pp \to Z\chi\chi$; $Z \to \ell\ell$
[38] AABOUD	18A	ATLS	$pp \to t\overline{t}\,\not\!\!E_T$; $pp \to b\overline{b}\,\not\!\!E_T$
[39] AABOUD	18CA	ATLS	$pp \to V\chi\chi$; $V \to jj$
[40] AABOUD	18I	ATLS	$pp \to$ jet(s) + $\not\!\!E_T$
[41] AGUILAR-AR...	18B	MBNE	$pN \to \chi X$, $\chi = e$, π, or N
[42] KHACHATRY...	18	CMS	$pp \to Z(\ell\ell) + \not\!\!E_T$
[43] SIRUNYAN	18BF	CMS	$pp \to t\,\not\!\!E_T$
[44] SIRUNYAN	18BO	CMS	dijet resonance search
[45] SIRUNYAN	18BV	CMS	$pp \to Z\,\not\!\!E_T$
[46] SIRUNYAN	18C	CMS	$pp \to t\overline{t}\,\not\!\!E_T$
[47] SIRUNYAN	18CU	CMS	$pp \to Z\,\not\!\!E_T$
[48] SIRUNYAN	18DH	CMS	$pp \to \chi\chi h$; $h \to \gamma\gamma$ or $\tau\overline{\tau}$
[49] SIRUNYAN	18S	CMS	$pp \to$ jets $\not\!\!E_T$
[50] AABOUD	17A	ATLS	pp ($H \to b\overline{b}$ + WIMP pair)
[51] AABOUD	17AM	ATLS	$pp \to Z' \to Ah \to h(b\overline{b}) + \not\!\!E_T$
[52] AABOUD	17AQ	ATLS	$pp \to h(\gamma\gamma) + \not\!\!E_T$
[53] AABOUD	17BD	ATLS	$pp \to$ jet(s) + $\not\!\!E_T$
[54] AABOUD	17R	ATLS	$pp \to \gamma\not\!\!E_T$
[55] AGUILAR-AR...	17A	MBNE	$pN \to \chi\chi X$; $\chi N \to \chi N$
[56] BANERJEE	17	NA64	$eN \to eN\gamma'$
[57] KHACHATRY...	17A	CMS	forward jets + $\not\!\!E_T$
[58] KHACHATRY...	17F	CMS	$H \to$ invisibles
[59] SIRUNYAN	17	CMS	$Z + \not\!\!E_T$
[60] SIRUNYAN	17AP	CMS	$pp \to Z' \to Ah \to h + \not\!\!E_T$
[61] SIRUNYAN	17AQ	CMS	$pp \to \gamma + \not\!\!E_T$
[62] SIRUNYAN	17BB	CMS	$pp \to t\overline{t}$+$\not\!\!E_T$; $pp \to b\overline{b}$+$\not\!\!E_T$
[63] SIRUNYAN	17G	CMS	$pp \to j + \not\!\!E_T$
[64] SIRUNYAN	17U	CMS	$pp \to Z\chi\chi$; $Z \to \ell\overline{\ell}$
[65] AABOUD	16AD	ATLS	(W or $Z \to$ jets) + $\not\!\!E_T$
[66] AAD	16AF	ATLS	$VV \to$ forward jets +$\not\!\!E_T$
[67] AAD	16AG	ATLS	ℓ + jets
[68] AAD	16M	ATLS	$pp \to H + \not\!\!E_T$, $H \to b\overline{b}$
[69] KHACHATRY...	16BZ	CMS	jet(s) + $\not\!\!E_T$
[70] KHACHATRY...	16CA	CMS	jets + $\not\!\!E_T$
[71] KHACHATRY...	16N	CMS	$pp \to \gamma$+ $\not\!\!E_T$
[72] AAD	15AS	ATLS	$b\,(\overline{b}) + \not\!\!E_T$, $t\overline{t} + \not\!\!E_T$
[73] AAD	15BH	ATLS	jet + $\not\!\!E_T$

[74] AAD	15CF	ATLS	$H^0 + \not{E}_T$
[75] AAD	15CS	ATLS	$\gamma + \not{E}_T$
[76] KHACHATRY...	15AG	CMS	$t\overline{t} + \not{E}_T$
[77] KHACHATRY...	15AL	CMS	jet + $\not{E}_T$
[78] KHACHATRY...	15T	CMS	$\ell + \not{E}_T$
[79] AAD	14AI	ATLS	$W + \not{E}_T$
[80] AAD	14BK	ATLS	W, $Z + \not{E}_T$
[81] AAD	14K	ATLS	$Z + \not{E}_T$
[82] AAD	14O	ATLS	$Z + \not{E}_T$
[83] AAD	13AD	ATLS	jet + $\not{E}_T$
[84] AAD	13C	ATLS	$\gamma + \not{E}_T$
[85] AALTONEN	12K	CDF	$t + \not{E}_T$
[86] AALTONEN	12M	CDF	jet + $\not{E}_T$
[87] CHATRCHYAN	12AP	CMS	jet + $\not{E}_T$
[88] CHATRCHYAN	12T	CMS	$\gamma + \not{E}_T$

[1] AAD 23A search for $H \rightarrow$ invisible. No signal observed. Results interpreted in terms of several DM Higgs portal simplified models.

[2] AAD 23AF search for $\overline{t}t +$ $H \rightarrow$ invisible with 139 fb^{-1} of data. No signal observed. Limits placed on branching fractions of H decays etc. for various DM mediator models. Result also included in AAD 23A.

[3] AAD 23AJ search for $tW\chi\chi$ production in mediator-extended 2HDM with 139 fb^{-1} of data. No signal observed. Limits placed in m(H) vs. m(mediator) and tan(β) vs. m(H) planes.

[4] AAD 23BX search for $A \rightarrow$ Ha production where $H \rightarrow$ $\tau\overline{\tau}$ and $a \rightarrow$ $\chi\chi$. No signal observed. Limits placed on 2HDM+a model.

[5] AAD 23W search for DM in dark Higgs model via $WW\chi\chi$ final state with 139 fb^{-1} of data. No signal detected. Limits set in m(dark Higgs) vs. m(Z') plane.

[6] AKIMOV 23 search for light DM via COHERENT CsI detector at SNS. No signal observed. For scalar DM model, limits set for m(χ) = 1–300 MeV. Limit of $\sigma(\chi N)$ $<$ 1×10^1 pb set at peak sensitivity m(χ) = 25 MeV.

[7] LIN 23C search for $\chi \rightarrow$ $\gamma\gamma$ decay where $p \rightarrow$ $\chi\chi$ at KOTO. No signal observed. Limits placed on K^0_L branching fraction.

[8] AAD 22D search for Z+H production with $Z \rightarrow$ $l\overline{l}$ and $H \rightarrow$ $\chi\chi$ with 139 fb^{-1} at 13 TeV; no signal found; limits placed in various simplified models depending on Higgs portal and DM mediator.

[9] AAD 22P search for H production via VBF with $H \rightarrow$ $\chi\chi$ with 139 fb^{-1} at 13 TeV; no signal found; limits placed for various Higgs DM portal simplified models.

[10] AGUILAR-AREVALO 22A report search for MeV vector portal and leptophobic DM via scatter on liquid Ar at the Lujan stopped pion source at LANL; no signal detected; limits placed on vector portal and leptophobic DM vs. m(χ): 1–40 MeV.

[11] TUMASYAN 22AA search for Z' decay to dark quarks with 138 fb^{-1} at 13 TeV; no signal observed; limits exclude a wide range of strongly coupled hidden sector models.

[12] TUMASYAN 22AG search for strongly interacting dark matter production via scalar mediator, with SIMP decay to trackless jets with 16.1 fb^{-1} at 13 TeV; no signal detected; limits placed in mass vs. cross section plane for simplified models.

[13] TUMASYAN 22G search for VBF production of Higgs with $H \rightarrow$ $\chi\chi$ with 101 fb^{-1} at 13 TeV, combined with earlier searches, in total 19.7 fb^{-1} at 8 TeV and 140 fb^{-1} at 13 TeV are used; no signal detected; limits placed in mass vs. cross section plane for various Higgs portal simplified models.

[14] AAD 21AZ search for DM in $H \not{E}_T \rightarrow$ $\gamma\gamma \not{E}_T$ events with 139 fb^{-1} at 13 TeV. No signal observed. Limits placed for several simplified models.

[15] AAD 21BB search for DM in $H \not{E}_T \rightarrow b\overline{b} \not{E}_T$ events with 139 fb^{-1} at 13 TeV. No signal observed. Limits placed for several simplified models.

[16] AAD 21D search for $VV + \chi\chi$, $V \rightarrow q\overline{q}$ with 139 fb^{-1} at 13 TeV LHC. No signal detected. Limits placed in dark Higgs boson mass vs. m(Z') plane. Here VV stand for $W^{\pm}W^{\mp}$, ZZ.

[17] AAD 21F search for monojet recoiling against invisibles with 139 fb^{-1} at 13 TeV LHC. No signal detected. Limits placed in various simplified dark matter models.

[18] AAD 21K search for a photon recoiling against dark matter with 139 fb^{-1} at 13 TeV LHC. No signal detected. Limits placed on parameter space of various simplified models.

[19] AAD 21O search for ℓ + jets + $\not{E}_T$ to search for t-pairs + DM particles with 139 fb^{-1} at LHC 13 TeV LHC. No signal detected. Limits placed in the cross-section vs. mediator mass plane, assuming light DM states.

[20] AAD 21P search for $\ell^+\ell^-$ + jets + $\not{E}_T$ in context of various BSM models with 139 fb^{-1} at 13 TeV LHC. No signal observed. Limits placed in parameter space of dark matter models and SUSY.

[21] AAD 21S search for b-jets + $\not{E}_T$ signal from BSM/DM models with 139 fb^{-1} at 13 TeV LHC. No signal observed. Limits placed on parameter space of DM models.

[22] SIRUNYAN 21A search for DM production in association with leptonically decaying Z boson in 137 fb^{-1} at 13 TeV; no signal; limits set in large variety of simplified DM models.

[23] TUMASYAN 21D search for DM and other exotica at CMS in jets + $\not{E}_T$ events with 137 fb^{-1} at 13 TeV. No signal observed. Limits placed for a variety of simplified models.

[24] SIRUNYAN 20X search for DM in $pp \rightarrow Z' \rightarrow A(Z')h \rightarrow h + \not{E}_T$ in CMS at 13 TeV with 35.9 fb^{-1}; no signal; limits placed in σ^{SI} vs. m(χ), and σ, m(A) and tanβ vs m(Z') for considered DM models.

[25] AABOUD 19AA searches for BSM physics in more than 700 event classes with more than 10^5 regions at 13 TeV with 3.2 fb^{-1}; no significant signal.

[26] AABOUD 19AI searches for vector boson fusion $pp \rightarrow Hqq$, $H \rightarrow$ invisible at 13 TeV with 36.1 fb^{-1}; no signal: require B($H \rightarrow$ invisible) $<$ 0.37 (0.28 expected).

[27] AABOUD 19AL perform search in three different channels for $H \rightarrow \chi\chi$ at 7, 8 and 13 TeV; combined result BF($H \rightarrow$ invisible) $<$ 0.26 (0.17 expected).

[28] AABOUD 19Q search for single t + $\not{E}_T$ at 13 TeV with 36.1 fb^{-1} of data; no signal; limits set in σ or coupling vs. mass plane for simplified models.

[29] AABOUD 19V review ATLAS results from 7, 8 and 13 TeV searches for mediator-based DM and DE scalar which couples to gravity; no signal: limits set for large variety of simplified models .

[30] BANERJEE 19 search for dark photon via $eN \rightarrow eN + \not{E}$ in NA64; no signal, limits placed in kinetic mixing ϵ vs. m(DM) plane for m(DM) $\sim$ 0.001–1 GeV.

[31] SIRUNYAN 19AN search at 13 TeV with 35.9 fb^{-1} for $pp \rightarrow H\chi\chi \rightarrow b\overline{b} \not{E}_T$; no signal: limits set in the context of a 2HDM + pseudoscalar (a) model and a baryonic Z' model.

[32] SIRUNYAN 19BC search for DM via LeptoQuark pair annihilation LQ LQ $\rightarrow \mu j\chi\chi \rightarrow \mu j \not{E}_T$ with 77.4 fb^{-1}, 13 TeV; no signal: limits placed in m(χ) vs. m(LQ) plane. Model dependent limits on DM mass up to 600 GeV depending on m(LQ) placed.

[33] SIRUNYAN 19BO search for vector boson fusion $VV \rightarrow qqH$ with $H \rightarrow \chi\chi$ at 13 TeV with 38.2 fb^{-1}; no signal: limits placed for several models. Also search for $H \rightarrow$ invisible at 7, 8, and 13 TeV; no signal: limit placed on BF $<$ 0.19.

[34] SIRUNYAN 19C search for DM via $pp \rightarrow t\overline{t}\chi\chi$ at 13 TeV, 35.9 fb^{-1}; no signal; limits placed on coupling vs. mediator mass for various simplified models.

[35] SIRUNYAN 19O search for $pp \rightarrow \gamma$ at 13 TeV with 35.9 fb^{-1}; no signal: limits placed on parameters of various models.

[36] SIRUNYAN 19X search for $pp \rightarrow t\overline{t} \not{E}_T$ and $pp \rightarrow t \not{E}_T$ + ... at 13 TeV with 35.9 fb^{-1}; no signal: limits placed on χ production σ for various simplified models with m(χ) = 1 GeV.

[37] AABOUD 18 search for $pp \to Z + \not{E}_T$ with $Z \to \ell\ell$ at 13 TeV with 36.1 fb^{-1} of data. Limits set for simplified models.
[38] AABOUD 18A search for $pp \to t\overline{t}\,\not{E}_T$ or $pp \to b\overline{b}\,\not{E}_T$ at 13 TeV, 36.1 fb^{-1} of data. Limits set for simplified models.
[39] AABOUD 18CA search for $pp \to V\chi\chi$ with $V \to jj$ at 13 TeV, 36.1 fb^{-1}; no signal; limits set in m(DM) vs m(mediator) simplified model plane .
[40] AABOUD 18I search for $pp \to j + \not{E}_T$ at 13 TeV with 36.1 fb^{-1} of data. Limits set for simplified models with pair-produced weakly interacting dark-matter candidates.
[41] AGUILAR-AREVALO 18B search for WIMP production in MiniBooNE p beam dump; no signal; limits set for m(χ) $\sim$ 5–50 MeV in vector portal DM model.
[42] KHACHATRYAN 18 search for $pp \to Z(\ell\ell) + \not{E}_T$; no signal ; limits set on effective dark matter interactions and other exotic physics models .
[43] SIRUNYAN 18BF search for $pp \to t\,\not{E}_T$ at 13 TeV and 36 fb^{-1}; no signal; limits placed on DM models involving a flavor changing neutral current, scalar resonance decaying to top quark and DM.
[44] SIRUNYAN 18BO search for high mass dijet resonances at 13 TeV and 36 fb^{-1}; no signal: limits placed on various models, including simplified DM models involving a spin $= 1$ Z' mediator.
[45] SIRUNYAN 18BV search for $pp \to Z\,\not{E}_T$ at 13 TeV; no signal, limits placed for various exotic physics models including DM.
[46] SIRUNYAN 18C search for new physics in $pp \to$ final states with two oppositely charged leptons at 13 TeV with 35.9 fb^{-1}. Limits placed on m(mediator) and top squark for various simplified models.
[47] SIRUNYAN 18CU search for $pp \to Z\,\not{E}_T$ at 13 TeV and 2.3 fb^{-1}; no signal: limits placed for various exotic models including DM .
[48] SIRUNYAN 18DH search for $pp \to \chi\chi h$; $h \to \gamma\gamma$ or $\tau\overline{\tau}$ at 13 TeV, 35.9 fb^{-1}; no signal; limits placed on massive boson mediator Z' in the context of Z'+2HDM and baryonic Z' models. Limits also cast in terms of spin-independent WIMP-nucleon cross section for masses 1–200 GeV.
[49] SIRUNYAN 18S search for $pp \to$ jets $\not{E}_T$ at 13 TeV; no signal: limits placed on simplified dark matter models, on the branching ratio of the Higgs boson to invisible particles, and on several other exotic physics models including fermion portal DM.
[50] AABOUD 17A search for $H \to b\overline{b} + \not{E}_T$. See Fig. 4b for limits set on VB mediator vs WIMP mass.
[51] AABOUD 17AM search for $pp \to Z' \to Ah \to h(b\overline{b}) + \not{E}_T$ at 13 TeV. Limits set in m(Z') vs. m(A) plane and on the visible cross section of $h(b\overline{b}) + \not{E}_T$ events in bins of $\not{E}_T$.
[52] AABOUD 17AQ search for WIMP in $pp \to h(\gamma\gamma) + \not{E}_T$ in 36.1 fb^{-1} of data. Limits on the visible cross section are also provided. Model dependent limits on spin independent DM - Nucleon cross-section are also presented, which are more stringent than those from direct searches for DM mass smaller than 2.5 GeV .
[53] AABOUD 17BD search for $pp \to$ jet(s) $+ \not{E}_T$ at 13 TeV with 3.2 fb^{-1} of data. Limits set for simplified models. Observables corrected for detector effects can be used to constrain other models.
[54] AABOUD 17R, for an axial vector mediator in the s-channel, excludes m(mediator) $<$ 750–1200 GeV for m(DM) $<$ 230–480 GeV, depending on the couplings.
[55] AGUILAR-AREVALO 17A search for DM produced in 8 GeV proton collisions with steel beam dump followed by DM-nucleon scattering in MiniBooNE detector. Limit placed on DM cross section parameter $Y < 2 \times 10^{-8}$ for $\alpha_D = 0.5$ and for $0.01 < m$(DM) $<$ 0.3 GeV.
[56] BANERJEE 17 search for dark photon invisible decay via eN scattering; exclude m(γ') $<$ 100 MeV as an explanation of (g_μ−2) muon anomaly.
[57] KHACHATRYAN 17A search for WIMPs in forward jets $+ \not{E}_T$ channel with 18.5 fb^{-1} at 8 TeV; limits set in effective theory model, Fig. 3.

[58] KHACHATRYAN 17F search for $H \to$ invisibles in pp collisions at 7, 8, and 13 TeV; place limits on Higgs portal DM.

[59] SIRUNYAN 17 search for $pp \to Z + \not{E}_T$ with 2.3 fb^{-1} at 13 TeV; no signal seen; limits placed on WIMPs and unparticles.

[60] SIRUNYAN 17AP search for $pp \to Z' \to Ah \to h + \not{E}_T$ with $h \to b\overline{b}$ or $\gamma\gamma$ and $A \to \chi\chi$ with 2.3 fb^{-1} at 13 TeV. Limits set in m(Z') vs. m(A) plane.

[61] SIRUNYAN 17AQ search for $pp \to \gamma + \not{E}_T$ at 13 TeV with 12.9 fb^{-1}. Limits derived for simplified DM models, effective electroweak-DM interaction and Extra Dimensions models.

[62] SIRUNYAN 17BB search for WIMPs via $pp \to t\overline{t}+\not{E}_T$, $pp \to b\overline{b}+\not{E}_T$ at 13 TeV with 2.2 fb^{-1}. Limits derived for various simplified models.

[63] SIRUNYAN 17G search for $pp \to j + \not{E}_T$ with 12.9 fb^{-1} at 13 TeV; limits placed on WIMP mass/mediators in DM simplified models.

[64] SIRUNYAN 17U search for WIMPs/unparticles via $pp \to Z\chi\chi$, $Z \to \ell\overline{\ell}$ at 13 TeV with 2.3 fb^{-1}. Limits derived for various simplified models.

[65] AABOUD 16AD place limits on $VVXX$ effective theory via search for hadronic W or Z plus WIMP pair production. See Fig. 5.

[66] AAD 16AF search for $VV \to (H \to$ WIMP pair) + forward jets with 20.3 fb^{-1} at 8 TeV; set limits in Higgs portal model, Fig. 8 .

[67] AAD 16AG search for lepton jets with 20.3 fb^{-1} of data at 8 TeV; Fig. 13 excludes dark photons around 0.1–1 GeV for kinetic mixing 10^{-6}–10^{-2}.

[68] AAD 16M search with 20.3 fb^{-1} of data at 8 TeV pp collisions; limits placed on EFT model (Fig. 7) and simplified Z' model (Fig. 6).

[69] KHACHATRYAN 16BZ search for jet(s) + $\not{E}_T$ in 19.7 fb^{-1} at 8 TeV; limits set for variety of simplified models.

[70] KHACHATRYAN 16CA search for WIMPs via jet(s) + $\not{E}_T$ using razor variable; require mediator scale > 1 TeV for various effective theories.

[71] KHACHATRYAN 16N search for γ + WIMPs in 19.6 fb^{-1} at 8 TeV; limits set on SI and SD WIMP-p scattering in Fig. 3.

[72] AAD 15AS search for events with one or more bottom quark and missing E_T, and also events with a top quark pair and missing E_T in pp collisions at $E_{\rm cm}$ = 8 TeV with L = 20.3 fb^{-1}. See their Figs. 5 and 6 for translated limits on X^0-nucleon cross section for m = 1–700 GeV.

[73] AAD 15BH search for events with a jet and missing E_T in pp collisions at $E_{\rm cm}$ = 8 TeV with L = 20.3 fb^{-1}. See their Fig. 12 for translated limits on X^0-nucleon cross section for m = 1–1200 GeV.

[74] AAD 15CF search for events with a H^0 ($\to \gamma\gamma$) and missing E_T in pp collisions at $E_{\rm cm}$ = 8 TeV with L = 20.3 fb^{-1}. See paper for limits on the strength of some contact interactions containing X^0 and the Higgs fields.

[75] AAD 15CS search for events with a photon and missing E_T in pp collisions at $E_{\rm cm}$ = 8 TeV with L = 20.3 fb^{-1}. See their Fig. 13 (see also erratum) for translated limits on X^0-nucleon cross section for m = 1–1000 GeV.

[76] KHACHATRYAN 15AG search for events with a top quark pair and missing E_T in pp collisions at $E_{\rm cm}$ = 8 TeV with L = 19.7 fb^{-1}. See their Fig. 8 for translated limits on X^0-nucleon cross section for m = 1–200 GeV.

[77] KHACHATRYAN 15AL search for events with a jet and missing E_T in pp collisions at $E_{\rm cm}$ = 8 TeV with L = 19.7 fb^{-1}. See their Fig. 5 and Tables 4–6 for translated limits on X^0-nucleon cross section for m = 1–1000 GeV.

[78] KHACHATRYAN 15T search for events with a lepton and missing E_T in pp collisions at $E_{\rm cm}$ = 8 TeV with L = 19.7 fb^{-1}. See their Fig. 17 for translated limits on X^0-proton cross section for m = 1–1000 GeV.

[79] AAD 14AI search for events with a W and missing E_T in pp collisions at E_{cm} = 8 TeV with L = 20.3 fb^{-1}. See their Fig. 4 for translated limits on X^0–nucleon cross section for m = 1–1500 GeV.

[80] AAD 14BK search for hadronically decaying W, Z in association with $\not{E}_T$ in 20.3 fb^{-1} at 8 TeV pp collisions. Fig. 5 presents exclusion results for SI and SD scattering cross section. In addition, cross section limits on the anomalous production of W or Z bosons with large missing transverse momentum are also set in two fiducial regions.

[81] AAD 14K search for events with a Z and missing E_T in pp collisions at E_{cm} = 8 TeV with L = 20.3 fb^{-1}. See their Fig. 5 and 6 for translated limits on X^0–nucleon cross section for m = 1–10^3 GeV.

[82] AAD 14O search for ZH^0 production with H^0 decaying to invisible final states. See their Fig. 4 for translated limits on X^0–nucleon cross section for m = 1–60 GeV in Higgs-portal X^0 scenario.

[83] AAD 13AD search for events with a jet and missing E_T in pp collisions at E_{cm} = 7 TeV with L = 4.7 fb^{-1}. See their Figs. 5 and 6 for translated limits on X^0-nucleon cross section for m = 1–1300 GeV.

[84] AAD 13C search for events with a photon and missing E_T in pp collisions at E_{cm} = 7 TeV with L = 4.6 fb^{-1}. See their Fig. 3 for translated limits on X^0-nucleon cross section for m = 1–1000 GeV.

[85] AALTONEN 12K search for events with a top quark and missing E_T in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 7.7 fb^{-1}. Upper limits on $\sigma(tX^0)$ in the range 0.4–2 pb (95% CL) is given for m_{X^0} = 0–150 GeV.

[86] AALTONEN 12M search for events with a jet and missing E_T in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 6.7 fb^{-1}. Upper limits on the cross section in the range 2–10 pb (90% CL) is given for m_{X^0} = 1–300 GeV. See their Fig. 2 for translated limits on X^0-nucleon cross section.

[87] CHATRCHYAN 12AP search for events with a jet and missing E_T in pp collisions at E_{cm} = 7 TeV with L = 5.0 fb^{-1}. See their Fig. 4 for translated limits on X^0-nucleon cross section for m_{X^0} = 0.1–1000 GeV.

[88] CHATRCHYAN 12T search for events with a photon and missing E_T in pp collisions at E_{cm} = 7 TeV with L = 5.0 fb^{-1}. Upper limits on the cross section in the range 13–15 fb (90% CL) is given for m_{X^0} = 1–1000 GeV. See their Fig. 2 for translated limits on X^0-nucleon cross section.

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KLOPF	19	PRL 122 222503	M. Klopf *et al.*	(PERKEO II Collab.)
KOBAYASHI	19	PL B795 308	M. Kobayashi *et al.*	(XMASS Collab.)
LI	19D	PR D99 123519	S. Li *et al.*	
LIU	19B	PRL 123 161301	Z.Z. Liu *et al.*	(CDEX Collab.)

NG	19	PR D99 083005	K.C.Y. Ng *et al.*	
QUEIROZ	19	JCAP 1904 048	F.S. Queiroz, C. Siqueira	
SEONG	19	PRL 122 011801	I.S. Seong *et al.*	(BELLE Collab.)
SIRUNYAN	19AN	EPJ C79 280	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19BC	PL B795 76	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19BO	PL B793 520	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19C	PRL 122 011803	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19O	JHEP 1902 074	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19X	JHEP 1903 141	A.M. Sirunyan *et al.*	(CMS Collab.)
SUZUKI	19	ASP 110 1	T. Suzuki *et al.*	(XMASS Collab.)
XIA	19A	PL B792 193	J. Xia *et al.*	(PandaX-II Collab.)
YAGUNA	19	JCAP 1904 041	C. Yaguna	
YANG	19	PRL 123 221301	L.T. Yang *et al.*	(CDEX Collab.)
AABOUD	18	PL B776 318	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18A	EPJ C78 18	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18CA	JHEP 1810 180	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18I	JHEP 1801 126	M. Aaboud *et al.*	(ATLAS Collab.)
AARTSEN	18D	EPJ C78 831	M.G. Aartsen *et al.*	(IceCube Collab.)
ABDALLAH	18	PRL 120 201101	H. Abdallah *et al.*	(H.E.S.S. Collab.)
ABE	18C	PR D97 102006	K. Abe *et al.*	(XMASS Collab.)
ABE	18F	PL B787 153	K. Abe *et al.*	(XMASS Collab.)
ADHIKARI	18	NAT 564 83	G. Adhikari *et al.*	(COSINE-100 Collab.)
AGNES	18	PRL 121 081307	P. Agnes *et al.*	(DarkSide-50 Collab.)
AGNES	18A	PR D98 102006	P. Agnes *et al.*	(DarkSide-50 Collab.)
AGNES	18B	PRL 121 111303	P. Agnes *et al.*	(DarkSide-50 Collab.)
AGNESE	18	PR D97 022002	R. Agnese *et al.*	(SuperCDMS Collab.)
AGNESE	18A	PRL 120 061802	R. Agnese *et al.*	(SuperCDMS Collab.)
AGNESE	18B	PRL 121 051301	R. Agnese *et al.*	(SuperCDMS Collab.)
Also		PRL 122 069901 (errat.)	R. Agnese *et al.*	(SuperCDMS Collab.)
AGUILAR-AR...	18B	PR D98 112004	A.A. Aguilar-Arevalo	(MiniBooNE Collab.)
AHNEN	18	JCAP 1803 009	M.L. Ahnen *et al.*	(MAGIC Collab.)
AKERIB	18A	PR D98 062005	D.S. Akerib *et al.*	(LUX Collab.)
ALBERT	18B	JCAP 1806 043	A. Albert *et al.*	(HAWC Collab.)
ALBERT	18C	PR D98 123012	A. Albert *et al.*	(HAWC Collab.)
AMAUDRUZ	18	PRL 121 071801	P.A. Amaudruz *et al.*	(DEAP-3600 Collab.)
APRILE	18	PRL 121 111302	E. Aprile *et al.*	(XENON1T Collab.)
ARMENGAUD	18	PR D98 082004	E. Armengaud *et al.*	(EDELWEISS-III Collab.)
ARNAUD	18	ASP 97 54	Q. Arnaud *et al.*	(NEWS-G Collab.)
CHANG	18A	PR D98 123004	L.J. Chang, M. Lisanti, S. Mishra-Sharma	(PRIN)
CRISLER	18	PRL 121 061803	M. Crisler *et al.*	(SENSEI Collab.)
JIANG	18	PRL 120 241301	H. Jiang *et al.*	(CDEX Collab.)
KACHULIS	18	PRL 120 221301	C. Kachulis *et al.*	(Super-Kamiokande Collab.)
KHACHATRY...	18	PR D97 099903	V. Khachatryan *et al.*	(CMS Collab.)
LISANTI	18	PRL 120 101101	M. Lisanti *et al.*	(PRIN, MIT, MICH)
MAZZIOTTA	18	PR D98 022006	M. Mazziotta *et al.*	(Fermi-LAT Collab.)
REN	18	PRL 121 021304	X. Ren *et al.*	(PandaX-II Collab.)
SIRUNYAN	18BF	JHEP 1806 027	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18BO	JHEP 1808 130	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18BV	EPJ C78 291	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18C	PR D97 032009	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18CU	JHEP 1801 056	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18DH	JHEP 1809 046	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18S	PR D97 092005	A.M. Sirunyan *et al.*	(CMS Collab.)
YANG	18	CP C42 023002	L.T. Yang *et al.*	(CDEX Collab.)
AABOUD	17A	PL B765 11	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17AM	PRL 119 181804	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17AQ	PR D96 112004	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17BD	EPJ C77 765	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17R	EPJ C77 393	M. Aaboud *et al.*	(ATLAS Collab.)
AARTSEN	17	EPJ C77 82	M.G. Aartsen *et al.*	(IceCube Collab.)
AARTSEN	17A	EPJ C77 146	M.G. Aartsen *et al.*	(IceCube Collab.)
Also		EPJ C79 214 (errat.)	M.G. Aartsen *et al.*	(IceCube Collab.)
AARTSEN	17C	EPJ C77 627	M.G. Aartsen *et al.*	(IceCube Collab.)
AGUILAR-AR...	17	PRL 118 141803	A. Aguilar-Arevalo *et al.*	(DAMIC Collab.)
AGUILAR-AR...	17A	PRL 118 221803	A.A. Aguilar-Arevalo *et al.*	(MiniBooNE Collab.)
AKERIB	17	PRL 118 021303	D.S. Akerib *et al.*	(LUX Collab.)
AKERIB	17A	PRL 118 251302	D.S. Akerib *et al.*	(LUX Collab.)
ALBERT	17A	PL B769 249	A. Albert *et al.*	(ANTARES Collab.)
Also		PL B796 253 (errat.)	A. Albert *et al.*	(ANTARES Collab.)
AMOLE	17	PRL 118 251301	C. Amole *et al.*	(PICO Collab.)
ANGLOHER	17A	EPJ C77 637	G. Angloher *et al.*	(CRESST Collab.)

APRILE	17	PRL 118 101101	E. Aprile *et al.*	(XENON100 Collab.)
APRILE	17A	PR D96 022008	E. Aprile *et al.*	(XENON100 Collab.)
APRILE	17D	PR D96 042004	E. Aprile *et al.*	(XENON100 Collab.)
APRILE	17G	PRL 119 181301	E. Aprile *et al.*	(XENON Collab.)
APRILE	17H	PR D96 122002	E. Aprile *et al.*	(XENON100 Collab.)
APRILE	17K	JCAP 1710 039	E. Aprile *et al.*	(XENON100 Collab.)
ARCHAMBAU...	17	PR D95 082001	S. Archambault *et al.*	(VERITAS Collab.)
AVRORIN	17	JETP 125 80	A.D. Avrorin *et al.*	(BAIKAL Collab.)
BANERJEE	17	PRL 118 011802	D. Banerjee *et al.*	(NA64 Collab.)
BARBOSA-D...	17	PR D95 032006	E. Barbosa de Souza *et al.*	(DM17 Collab.)
BATTAT	17	ASP 91 65	J.B.R. Battat *et al.*	(DRIFT-IId Collab.)
BEHNKE	17	ASP 90 85	E. Behnke *et al.*	(PICASSO Collab.)
BOUDAUD	17	PRL 119 021103	M. Boudaud, J. Lavalle, P. Salati	
CHEN	17E	PR D96 102007	X. Chen *et al.*	(PandaX-II Collab.)
CUI	17A	PRL 119 181302	X. Cui *et al.*	(PandaX-II Collab.)
FU	17	PRL 118 071301	C. Fu *et al.*	(PandaX-II Collab.)
Also		PRL 120 049902 (errat.)	C. Fu *et al.*	(PandaX-II Collab.)
KHACHATRY...	17A	PRL 118 021802	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	17F	JHEP 1702 135	V. Khachatryan *et al.*	(CMS Collab.)
SIRUNYAN	17	JHEP 1703 061	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17AP	JHEP 1710 180	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17AQ	JHEP 1710 073	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17BB	EPJ C77 845	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17G	JHEP 1707 014	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17U	JHEP 1709 106	A.M. Sirunyan *et al.*	(CMS Collab.)
AABOUD	16AD	PL B763 251	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	16D	PR D94 032005	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	16F	JHEP 1606 059	M. Aaboud *et al.*	(ATLAS Collab.)
AAD	16AF	JHEP 1601 172	G. Aad *et al.*	(ATLAS Collab.)
AAD	16AG	JHEP 1602 062	G. Aad *et al.*	(ATLAS Collab.)
AAD	16M	PR D93 072007	G. Aad *et al.*	(ATLAS Collab.)
AARTSEN	16C	JCAP 1604 022	M.G. Aartsen *et al.*	(IceCube Collab.)
AARTSEN	16D	EPJ C76 531	M.G. Aartsen *et al.*	(IceCube Collab.)
ABDALLAH	16	PRL 117 111301	H. Abdallah *et al.*	(H.E.S.S. Collab.)
ABDALLAH	16A	PRL 117 151302	H. Abdallah *et al.*	(H.E.S.S. Collab.)
ADRIAN-MAR...	16	PL B759 69	S. Adrian-Martinez *et al.*	(ANTARES Collab.)
ADRIAN-MAR...	16B	JCAP 1605 016	S. Adrian-Martinez *et al.*	(ANTARES Collab.)
AGNES	16	PR D93 081101	P. Agnes *et al.*	(DarkSide-50 Collab.)
AGNESE	16	PRL 116 071301	R. Agnese *et al.*	(SuperCDMS Collab.)
AGUILAR-AR...	16	PR D94 082006	A. Aguilar-Arevalo *et al.*	(DAMIC Collab.)
AHNEN	16	JCAP 1602 039	M.L. Ahnen *et al.*	(MAGIC and Fermi-LAT Collab.)
AKERIB	16	PRL 116 161301	D.S. Akerib *et al.*	(LUX Collab.)
AKERIB	16A	PRL 116 161302	D.S. Akerib *et al.*	(LUX Collab.)
AMOLE	16	PR D93 052014	C. Amole *et al.*	(PICO Collab.)
AMOLE	16A	PR D93 061101	C. Amole *et al.*	(PICO Collab.)
ANGLOHER	16	EPJ C76 25	G. Angloher *et al.*	(CRESST-II Collab.)
ANGLOHER	16A	PRL 117 021303	G. Angloher *et al.*	(CRESST-II Collab.)
APRILE	16	PR D94 092001	E. Aprile *et al.*	(XENON100 Collab.)
APRILE	16B	PR D94 122001	E. Aprile *et al.*	(XENON100 Collab.)
ARMENGAUD	16	JCAP 1605 019	E. Armengaud *et al.*	(EDELWEISS-III Collab.)
AVRORIN	16	ASP 81 12	A.D. Avrorin *et al.*	(BAIKAL Collab.)
CAPUTO	16	PR D93 062004	R. Caputo *et al.*	
FORNASA	16	PR D94 123005	M. Fornasa *et al.*	(Fermi-LAT Collab.)
HEHN	16	EPJ C76 548	L. Hehn *et al.*	(EDELWEISS-III Collab.)
KHACHATRY...	16AJ	PR D93 052011	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16BZ	JHEP 1612 083	V. Khachatryan *et al.*	(CMS Collab.)
Also		JHEP 1708 035 (errat.)	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16CA	JHEP 1612 088	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16N	PL B755 102	V. Khachatryan *et al.*	(CMS Collab.)
LEITE	16	JCAP 1611 021	N. Leite *et al.*	
LI	16	PR D93 043518	S. Li *et al.*	
LI	16A	JCAP 1612 028	Z. Li *et al.*	
LIANG	16	PR D94 103502	Y.-F. Liang *et al.*	
LU	16	PR D93 103517	B-Q. Lu, H-S. Zong	
SHIRASAKI	16	PR D94 063522	M. Shirasaki *et al.*	
TAN	16	PR D93 122009	T.H. Tan *et al.*	(PandaX Collab.)
TAN	16B	PRL 117 121303	A. Tan *et al.*	(PandaX Collab.)
ZHAO	16	PR D93 092003	W. Zhao *et al.*	(CDEX Collab.)
AAD	15AS	EPJ C75 92	G. Aad *et al.*	(ATLAS Collab.)
AAD	15BH	EPJ C75 299	G. Aad *et al.*	(ATLAS Collab.)
Also		EPJ C75 408 (errat.)	G. Aad *et al.*	(ATLAS Collab.)

AAD	15CF	PRL 115 131801	G. Aad *et al.*	(ATLAS Collab.)
AAD	15CS	PR D91 012008	G. Aad *et al.*	(ATLAS Collab.)
Also		PR D92 059903 (errat.)	G. Aad *et al.*	(ATLAS Collab.)
AARTSEN	15C	EPJ C75 20	M.G. Aartsen *et al.*	(IceCube Collab.)
AARTSEN	15E	EPJ C75 492	M.G. Aartsen *et al.*	(IceCube Collab.)
ABRAMOWSKI	15	PRL 114 081301	A. Abramowski *et al.*	(H.E.S.S. Collab.)
ACKERMANN	15	PR D91 122002	M. Ackermann *et al.*	(Fermi-LAT Collab.)
ACKERMANN	15A	JCAP 1509 008	M. Ackermann *et al.*	(Fermi-LAT Collab.)
ACKERMANN	15B	PRL 115 231301	M. Ackermann *et al.*	(Fermi-LAT Collab.)
ADRIAN-MAR...	15	JCAP 1510 068	S. Adrian-Martinez *et al.*	(ANTARES Collab.)
AGNES	15	PL B743 456	P. Agnes *et al.*	(DarkSide-50 Collab.)
AGNESE	15A	PR D91 052021	R. Agnese *et al.*	(SuperCDMS Collab.)
AGNESE	15B	PR D92 072003	R. Agnese *et al.*	(SuperCDMS Collab.)
AMOLE	15	PRL 114 231302	C. Amole *et al.*	(PICO Collab.)
APRILE	15	PRL 115 091302	E. Aprile *et al.*	(XENON Collab.)
APRILE	15A	SCI 349 851	E. Aprile *et al.*	(XENON Collab.)
CHOI	15	PRL 114 141301	K. Choi *et al.*	(Super-Kamiokande Collab.)
KHACHATRY...	15AG	JHEP 1506 121	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15AL	EPJ C75 235	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15T	PR D91 092005	V. Khachatryan *et al.*	(CMS Collab.)
NAKAMURA	15	PTEP 2015 4 043F01	K. Nakamura *et al.*	(NEWAGE Collab.)
XIAO	15	PR D92 052004	X. Xiao *et al.*	(PandaX Collab.)
AAD	14AI	JHEP 1409 037	G. Aad *et al.*	(ATLAS Collab.)
AAD	14BK	PRL 112 041802	G. Aad *et al.*	(ATLAS Collab.)
AAD	14K	PR D90 012004	G. Aad *et al.*	(ATLAS Collab.)
AAD	14O	PRL 112 201802	G. Aad *et al.*	(ATLAS Collab.)
ACKERMANN	14	PR D89 042001	M. Ackermann *et al.*	(Fermi-LAT Collab.)
AGNESE	14	PRL 112 241302	R. Agnese *et al.*	(SuperCDMS Collab.)
AGNESE	14A	PRL 112 041302	R. Agnese *et al.*	(SuperCDMS Collab.)
AKERIB	14	PRL 112 091303	D.S. Akerib *et al.*	(LUX Collab.)
ALEKSIC	14	JCAP 1402 008	J. Aleksic *et al.*	(MAGIC Collab.)
ANGLOHER	14	EPJ C74 3184	G. Angloher *et al.*	(CRESST-II Collab.)
APRILE	14A	ASP 54 11	E. Aprile *et al.*	(XENON100 Collab.)
AVRORIN	14	ASP 62 12	A.D. Avrorin *et al.*	(BAIKAL Collab.)
FELIZARDO	14	PR D89 072013	M. Felizardo *et al.*	(SIMPLE Collab.)
LEE	14A	PR D90 052006	H.S. Lee *et al.*	(KIMS Collab.)
LIU	14A	PR D90 032003	S.K. Liu *et al.*	(CDEX Collab.)
UCHIDA	14	PTEP 2014 063C01	H. Uchida *et al.*	(XMASS Collab.)
YUE	14	PR D90 091701	Q. Yue *et al.*	(CDEX Collab.)
AAD	13AD	JHEP 1304 075	G. Aad *et al.*	(ATLAS Collab.)
AAD	13C	PRL 110 011802	G. Aad *et al.*	(ATLAS Collab.)
AALSETH	13	PR D88 012002	C.E. Aalseth *et al.*	(CoGeNT Collab.)
AARTSEN	13	PRL 110 131302	M.G. Aartsen *et al.*	(IceCube Collab.)
AARTSEN	13C	PR D88 122001	M.G. Aartsen *et al.*	(IceCube Collab.)
ABE	13B	PL B719 78	K. Abe *et al.*	(XMASS Collab.)
ABRAMOWSKI	13	PRL 110 041301	A. Abramowski *et al.*	(H.E.S.S. Collab.)
ACKERMANN	13A	PR D88 082002	M. Ackermann *et al.*	(Fermi-LAT Collab.)
ADRIAN-MAR...	13	JCAP 1311 032	S. Adrian-Martinez *et al.*	(ANTARES Collab.)
AGNESE	13	PR D88 031104	R. Agnese *et al.*	(CDMS Collab.)
AGNESE	13A	PRL 111 251301	R. Agnese *et al.*	(CDMS Collab.)
APRILE	13	PRL 111 021301	E. Aprile *et al.*	(XENON100 Collab.)
BERNABEI	13A	EPJ C73 2648	R. Bernabei *et al.*	(DAMA Collab.)
BOLIEV	13	JCAP 1309 019	M. Boliev *et al.*	
LI	13B	PRL 110 261301	H.B. Li *et al.*	(TEXONO Collab.)
SUVOROVA	13	PAN 76 1367	O.V. Suvorova *et al.*	(INRM)
		Translated from YAF 76 1433.		
ZHAO	13	PR D88 052004	W. Zhao *et al.*	(CDEX Collab.)
AALTONEN	12K	PRL 108 201802	T. Aaltonen *et al.*	(CDF Collab.)
AALTONEN	12M	PRL 108 211804	T. Aaltonen *et al.*	(CDF Collab.)
ABBASI	12	PR D85 042002	R. Abbasi *et al.*	(IceCube Collab.)
ABRAMOWSKI	12	APJ 750 123	A. Abramowski *et al.*	(H.E.S.S. Collab.)
ACKERMANN	12	PR D86 022002	M. Ackermann *et al.*	(Fermi-LAT Collab.)
AKIMOV	12	PL B709 14	D.Yu. Akimov *et al.*	(ZEPLIN-III Collab.)
ALIU	12	PR D85 062001	E. Aliu *et al.*	(VERITAS Collab.)
ANGLOHER	12	EPJ C72 1971	G. Angloher *et al.*	(CRESST-II Collab.)
APRILE	12	PRL 109 181301	E. Aprile *et al.*	(XENON100 Collab.)
ARCHAMBAU...	12	PL B711 153	S. Archambault *et al.*	(PICASSO Collab.)
ARMENGAUD	12	PR D86 051701	E. Armengaud *et al.*	(EDELWEISS Collab.)
BARRETO	12	PL B711 264	J. Barreto *et al.*	(DAMIC Collab.)
BEHNKE	12	PR D86 052001	E. Behnke *et al.*	(COUPP Collab.)
Also		PR D90 079902 (errat.)	E. Behnke *et al.*	(COUPP Collab.)

BROWN 12 PR D85 021301 A. Brown *et al.* (OXF)
CHATRCHYAN 12AP JHEP 1209 094 S. Chatrchyan *et al.* (CMS Collab.)
CHATRCHYAN 12T PRL 108 261803 S. Chatrchyan *et al.* (CMS Collab.)
DAHL 12 PRL 108 259001 C.E. Dahl, J. Hall, W.H. Lippincott (CHIC, FNAL)
DAW 12 ASP 35 397 E. Daw *et al.* (DRIFT-IId Collab.)
FELIZARDO 12 PRL 108 201302 M. Felizardo *et al.* (SIMPLE Collab.)
KIM 12 PRL 108 181301 S.C. Kim *et al.* (KIMS Collab.)
AALSETH 11 PRL 106 131301 C.E. Aalseth *et al.* (CoGeNT Collab.)
AALSETH 11A PRL 107 141301 C.E. Aalseth *et al.* (CoGeNT Collab.)
ABBASI 11C PR D84 022004 R. Abbasi *et al.* (IceCube Collab.)
ABRAMOWSKI 11 PRL 106 161301 A. Abramowski *et al.* (H.E.S.S. Collab.)
ACKERMANN 11 PRL 107 241302 M. Ackermann *et al.* (Fermi-LAT Collab.)
AHLEN 11 PL B695 124 S. Ahlen *et al.* (DMTPC Collab.)
AHMED 11 PR D83 112002 Z. Ahmed *et al.* (CDMS Collab.)
AHMED 11A PR D84 011102 Z. Ahmed *et al.* (CDMS and EDELWEISS Collabs.)
AHMED 11B PRL 106 131302 Z. Ahmed *et al.* (CDMS Collab.)
AJELLO 11 PR D84 032007 M. Ajello *et al.* (Fermi-LAT Collab.)
ANGLE 11 PRL 107 051301 J. Angle *et al.* (XENON10 Collab.)
Also PRL 110 249901 (errat.) J. Angle *et al.* (XENON10 Collab.)
APRILE 11 PR D84 052003 E. Aprile *et al.* (XENON100 Collab.)
APRILE 11A PR D84 061101 E. Aprile *et al.* (XENON100 Collab.)
APRILE 11B PRL 107 131302 E. Aprile *et al.* (XENON100 Collab.)
ARMENGAUD 11 PL B702 329 E. Armengaud *et al.* (EDELWEISS-II Collab.)
BEHNKE 11 PRL 106 021303 E. Behnke *et al.* (COUPP Collab.)
GERINGER-SA... 11 PRL 107 241303 A. Geringer-Sameth, S.M. Koushiappas
HORN 11 PL B705 471 M. Horn *et al.* (ZEPLIN-III Collab.)
TANAKA 11 APJ 742 78 T. Tanaka *et al.* (Super-Kamiokande Collab.)
ABBASI 10 PR D81 057101 R. Abbasi *et al.* (IceCube Collab.)
AHMED 10 SCI 327 1619 Z. Ahmed *et al.* (CDMS II Collab.)
AKERIB 10 PR D82 122004 D.S. Akerib *et al.* (CDMS II Collab.)
AKIMOV 10 PL B692 180 D.Yu. Akimov *et al.* (ZEPLIN-III Collab.)
APRILE 10 PRL 105 131302 E. Aprile *et al.* (XENON100 Collab.)
ARMENGAUD 10 PL B687 294 E. Armengaud *et al.* (EDELWEISS-II Collab.)
FELIZARDO 10 PRL 105 211301 M. Felizardo *et al.* (The SIMPLE Collab.)
MIUCHI 10 PL B686 11 K. Miuchi *et al.* (NEWAGE Collab.)
ABBASI 09B PRL 102 201302 R. Abbasi *et al.* (IceCube Collab.)
AHMED 09 PRL 102 011301 Z. Ahmed *et al.* (CDMS Collab.)
ANGLE 09 PR D80 115005 J. Angle *et al.* (XENON10 Collab.)
ANGLOHER 09 ASP 31 270 G. Angloher *et al.* (CRESST Collab.)
ARCHAMBAU... 09 PL B682 185 S. Archambault *et al.* (PICASSO Collab.)
LEBEDENKO 09A PRL 103 151302 V.N. Lebedenko *et al.* (ZEPLIN-III Collab.)
LIN 09 PR D79 061101 S.T. Lin *et al.* (TEXONO Collab.)
AALSETH 08 PRL 101 251301 C.E. Aalseth *et al.* (CoGeNT Collab.)
Also PRL 102 109903 (errat.) C.E. Aalseth *et al.* (CoGeNT Collab.)
ANGLE 08A PRL 101 091301 J. Angle *et al.* (XENON10 Collab.)
BEDNYAKOV 08 PAN 71 111 V.A. Bednyakov, H.P. Klapdor-Kleingrothaus, I.V. Krivosheina
Translated from YAF 71 112.
ALNER 07 PL B653 161 G.J. Alner *et al.* (ZEPLIN-II Collab.)
LEE 07A PRL 99 091301 H.S. Lee *et al.* (KIMS Collab.)
MIUCHI 07 PL B654 58 K. Miuchi *et al.*
AKERIB 06 PR D73 011102 D.S. Akerib *et al.* (CDMS Collab.)
SHIMIZU 06A PL B633 195 Y. Shimizu *et al.*
AKERIB 05 PR D72 052009 D.S. Akerib *et al.* (CDMS Collab.)
ALNER 05 PL B616 17 G.J. Alner *et al.* (UK Dark Matter Collab.)
BARNABE-HE... 05 PL B624 186 M. Barnabe-Heider *et al.* (PICASSO Collab.)
BENOIT 05 PL B616 25 A. Benoit *et al.* (EDELWEISS Collab.)
GIRARD 05 PL B621 233 T.A. Girard *et al.* (SIMPLE Collab.)
GIULIANI 05 PRL 95 101301 F. Giuliani
GIULIANI 05A PR D71 123503 F. Giuliani, T.A. Girard
KLAPDOR-K... 05 PL B609 226 H.V. Klapdor-Kleingrothaus, I.V. Krivosheina, C. Tomei
GIULIANI 04 PL B588 151 F. Giuliani, T.A. Girard
GIULIANI 04A PRL 93 161301 F. Giuliani
MIUCHI 03 ASP 19 135 K. Miuchi *et al.*
TAKEDA 03 PL B572 145 A. Takeda *et al.*
ANGLOHER 02 ASP 18 43 G. Angloher *et al.* (CRESST Collab.)
BELLI 02 PR D66 043503 P. Belli *et al.*
BERNABEI 02C EPJ C23 61 R. Bernabei *et al.* (DAMA Collab.)
GREEN 02 PR D66 083003 A.M. Green
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ULLIO 01 JHEP 0107 044 P. Ullio, M. Kamionkowski, P. Vogel

BENOIT	00	PL B479 8	A. Benoit *et al.*	(EDELWEISS Collab.)
BERNABEI	00D	NJP 2 15	R. Bernabei *et al.*	(DAMA Collab.)
COLLAR	00	PRL 85 3083	J.I. Collar *et al.*	(SIMPLE Collab.)
AMBROSIO	99	PR D60 082002	M. Ambrosio *et al.*	(Macro Collab.)
BERNABEI	99	PL B450 448	R. Bernabei *et al.*	(DAMA Collab.)
BERNABEI	99D	PRL 83 4918	R. Bernabei *et al.*	(DAMA Collab.)
BRHLIK	99	PL B464 303	M. Brhlik, L. Roszkowski	
DERBIN	99	PAN 62 1886	A.V. Derbin *et al.*	
		Translated from YAF 62 2034.		
KLIMENKO	98	JETPL 67 875	A.A. Klimenko *et al.*	
		Translated from ZETFP 67 835.		
SARSA	97	PR D56 1856	M.L. Sarsa *et al.*	(ZARA)
ALESSAND...	96	PL B384 316	A. Alessandrello *et al.*	(MILA, MILAI, SASSO)
BELLI	96	PL B387 222	P. Belli *et al.*	(DAMA Collab.)
Also		PL B389 783 (errat.)	P. Belli *et al.*	(DAMA Collab.)
BELLI	96C	NC C19 537	P. Belli *et al.*	(DAMA Collab.)
BERNABEI	96	PL B389 757	R. Bernabei *et al.*	(DAMA Collab.)
COLLAR	96	PRL 76 331	J.I. Collar	(SCUC)
SARSA	96	PL B386 458	M.L. Sarsa *et al.*	(ZARA)
Also		PR D56 1856	M.L. Sarsa *et al.*	(ZARA)
SMITH	96	PL B379 299	P.F. Smith *et al.*	(RAL, SHEF, LOIC+)
SNOWDEN-...	96	PRL 76 332	D.P. Snowden-Ifft, E.S. Freeman, P.B. Price	(UCB)
GARCIA	95	PR D51 1458	E. Garcia *et al.*	(ZARA, SCUC, PNL)
QUENBY	95	PL B351 70	J.J. Quenby *et al.*	(LOIC, RAL, SHEF+)
SNOWDEN-...	95	PRL 74 4133	D.P. Snowden-Ifft, E.S. Freeman, P.B. Price	(UCB)
Also		PRL 76 331	J.I. Collar	(SCUC)
Also		PRL 76 332	D.P. Snowden-Ifft, E.S. Freeman, P.B. Price	(UCB)
BECK	94	PL B336 141	M. Beck *et al.*	(MPIK, KIAE, SASSO)
BACCI	92	PL B293 460	C. Bacci *et al.*	(Beijing-Roma-Saclay Collab.)
REUSSER	91	PL B255 143	D. Reusser *et al.*	(NEUC, CIT, PSI)
CALDWELL	88	PRL 61 510	D.O. Caldwell *et al.*	(UCSB, UCB, LBL)