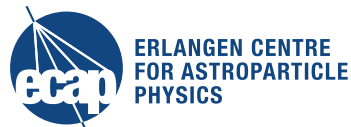


KM3NeT Virtual Education: Virtual Observatory Data Exploration with Aladin Use Case: TXS 0506+056 & Neutrinos

Jannik Hofestädt – December 2018



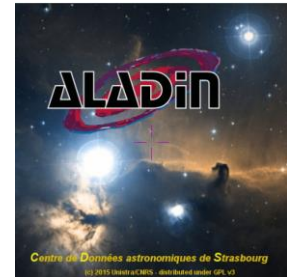


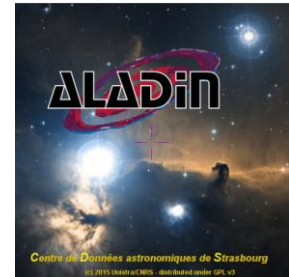
- This tutorial shows how to use the Aladin tool to visualise astronomical images, to superimpose entries from different databases and to correlate the different information.
- Focus: TXS 0506+056 blazar and neutrinos
- As there is no KM3NeT data yet, available data from ANTARES and IceCube are used as example neutrino data
- Considered use cases:
 - visualise neutrinos around: TXS 0506+056
 - match ANTARES and IceCube events in space and time

* TXS 0506+056 is the first known source of high-energy astrophysical neutrinos [Science 361, eaat1378 \(2018\)](#)

- Aladin is an interactive sky atlas that allows:
 - visualise astronomical images
 - superimpose entries from different catalogs & databases

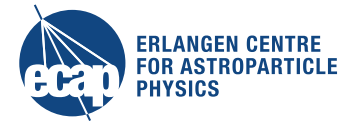
- Powerful tool for: data accessing, exploring and visualizing distributed datasets
 - compliance with existing or emerging VO standards
 - interconnection with other visualisation or analysis tools
 - easy comparison of heterogeneous data





- Two versions of Aladin:
 - Aladin lite which runs in the web browser
 - Aladin desktop with full functionality
- Here we use Aladin desktop
 - download Aladin from <https://aladin.u-strasbg.fr/AladinDesktop/#Download>
→ follow in installation instruction
 - Java Runtime Environment (JRE) should be installed
- Useful links:
 - Main page: <https://aladin.u-strasbg.fr>
 - Some tutorial: <https://www.asterics2020.eu/dokuwiki/doku.php?id=open:wp4:dadiproductrepository>

Aladin: Start Window



Available data → 22455 / 2245 Command Frame ICRS Projection Altoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

Collections → 22455

- Image → 383
- Data base → 5
- Catalog → 20698
- Cube → 9
- Ancillary → 66
- Outreach → 43
- Others → 1248
- Problematic → 3

Aladin Sky Atlas - v10.0

ALADIN is an interactive software sky atlas.
It allows one to visualize digitized images of any part of the sky,
to superimpose entries from astronomical catalogs,
and to interactively access related data and information.

ALADIN

CDS

Aladin is developed by Pierre Fernique,
Thomas Boch, Anaïs Oberto, François Bonnarel and Chaitra.
(c) 2018 Université de Strasbourg/CNRS - developed by CDS, distributed under GPLv3

select from -- all collections --

exp. sort view scan filter grid study wink north hdr multiview match

Last news

New HiPS available:

- DECaLS-DR5 g band (Nov 2018-CDS)
- UKIRT Hemisphere Survey, UHS DR1 J-band WFCAM (6 oct 2018 - WFAU)
- VISTA VIKING - 5 bands (Sept 2018 - CDS)
- DECaLS-DR5 color (July 2018 - CDS)

0 sel / 0 src 0Mb

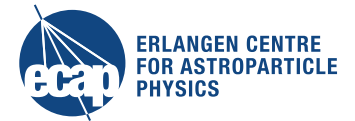
Aladin: Retrieving Data



- 1) SERVER SELECTOR: File → Open server selector (or CTRL + I)
- 2) DATA TREE with select window

The screenshot displays the Aladin software interface. On the left, a 'Collections' tree is highlighted with a red box, showing a hierarchy of data sources: Collections (22455), Image (383), Data base (5), Catalog (20698), Cube (9), Ancillary (66), Outreach (43), Others (1248), and Problematic (3). A red arrow points from this tree to the main visualization area. The main area shows a star field with a large galaxy, overlaid with the 'ALADIN' logo and 'eCDS' logo. Text in the center reads: 'Aladin Sky Atlas - v10.0. ALADIN is an interactive software sky atlas. It allows one to visualize digitized images of any part of the sky, to superimpose entries from astronomical catalogs, and to interactively access related data and information.' Below this, it states 'Aladin is developed by Pierre Fernique, Thomas Boch, Anaïs Oberto, François Bonnarel and Chaitra. (c) 2018 Université de Strasbourg/CNRS - developed by CDS, distributed under GPLv3'. The interface includes a top bar with 'Available data → 22455 / 2245', a 'Command' field, and dropdowns for 'Frame' (ICRS) and 'Projection' (Aitoff). A right sidebar contains 'Last news' and various tool icons. A bottom toolbar includes 'select', 'from -- all collections --', and various view controls. The bottom status bar shows '0 sel / 0 src 0Mb'.

Aladin: Large Sky Survey Images



Available large sky surveys, e.g. coloured DSS image

Simple commands possible, e.g. select source like 'TXS 0506+056'

The screenshot shows the Aladin software interface. At the top, there is a 'Command' input field with a dropdown arrow, highlighted by a red rectangle. Below it, a list of survey names is visible: DSS, PanSTARRS, SDSS, 2MASS, GALEX, Gaia, Simbad, NED, and a plus sign. The main window displays a large image of a galaxy with the 'ALADIN' logo and 'eDSS' logo overlaid. Text in the center reads: 'Aladin Sky Atlas - v10.0. ALADIN is an interactive software sky atlas. It allows one to visualize digitized images of any part of the sky, to superimpose entries from astronomical catalogs, and to interactively access related data and information.' Below the image, it says 'Aladin is developed by Pierre Fernique, Thomas Boch, Anaïs Oberto, François Bonnarel and Chaitra. (c) 2018 Université de Strasbourg/CNRS - developed by CDS, distributed under GPLv3'. The interface includes a left sidebar with a 'Collections' tree, a top right 'Last news' section, and a bottom right control panel with various sliders and icons.

(c) 2018 Université de Strasbourg/CNRS - developed by CDS, distributed under GPLv3

0 sel / 0 src 0Mb

Aladin: Analysis Tools



Analysis tools

Available data → 22455 / 2245 Command Frame ICRS Projection Altoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

Collections → 22455

- Image → 383
- Data base → 5
- Catalog → 20698
- Cube → 9
- Ancillary → 66
- Outreach → 43
- Others → 1248
- Problematic → 3

Aladin Sky Atlas - v10.0

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select from -- all collections --

exp. sort view scan filter grid study wink north hdr multiview match

select pan dist phot draw tag moc spect filter cross x-y rgb assoc crop cont pixel prop del

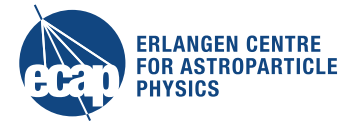
Last news

New HiPS available:

- DECaLS-DR5 g band (Nov 2018-CDS)
- UKIRT Hemisphere Survey, UHS DR1 J-band WFCAM (6 oct 2018 - WFAU)
- VISTA VIKING - 5 bands (Sept 2018 - CDS)
- DECaLS-DR5 color (July 2018 - CDS)

0 sel / 0 src 0Mb

Aladin: Select Sky Position

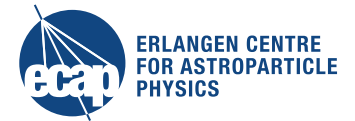


Select interesting source: type 'TXS 0506+056 ENTER'

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0 sel / 0 src 0Mb

Aladin: TXS 0506+056



Available data → 22455 / 2245
in view out view

Command [] Frame ICRS Projection Aitoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

DSS2 color

main viewing window with coloured DSS image around TXS 0506+056

select pan dist phot draw tag moc spect filter cross x-y rgb

epoch size dens. opac. zoom

cont pixel prop del

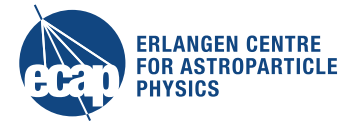
TXS 0506+056
05:09:25.96 +05:41:35.3
48.06' x 36.3'

0 sel / 0 src 222Mb

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Where are we on the sky?

Aladin: ANTARES Neutrino Data



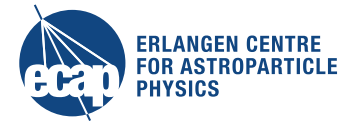
The screenshot shows the Aladin web interface. At the top, there are tabs for 'Available data' (3 / 22457) and 'Command'. Below this is a list of data sources including DSS, PanSTARRS, SDSS, 2MASS, GALEX, Gaia, Simbad, and NED. The main panel displays a star field with a 'SS2 color' label. On the left, a tree view shows a hierarchy of collections, with '2007-2012 ANTARES' and '2007-2010 ANTARES' highlighted. A search bar at the bottom left contains 'select antares' and 'from -- all collections --'. On the right, a 'Data discovery' panel provides instructions on how to use the interface. At the bottom right, a red box highlights the 'zoom' slider, with a red arrow pointing to it and the text 'Zoom out → larger field of view'. The bottom status bar shows '0 sel / 0 src 4fps / 406Mb'.

Available ANTARES data catalogues

Select: ANTARES data

Zoom out → larger field of view

Aladin: ANTARES Neutrino Data



The screenshot shows the Aladin software interface. On the left, a tree view under 'Collections' shows '2007-2012 ANTARES' selected. A search window displays '2007-2012 ANTARES search for cosmic neutrino point sources' with a 'Load' button. The main window shows a star field with a crosshair at the source position. A 'Data discovery' panel on the right explains the data sources. The bottom status bar shows '0 sel / 0 src 4fps / 408Mb'.

Available data → 3 / 22457
in view out view

Collections → 3 / 22455
Catalog → 3 / 20698
org.gavo.dc → 2 / 42
Unknown regime → 2 / 1
2007-2012 ANTARES
2007-2010 ANTARES
VizieR → 1 / 19664
Journal table → 1 / 1808
A+A → 1 / 4858
Neutrinos from C...

Command [] Frame ICRS Projection Aitoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

DSS2 color

2007-2012 ANTARES search for cosmic neutrino point sources Information on dataset
Coverage: 35.65% Reference pub. year: 2014

Access mode & derived prod. in view by criteria + coverage

Load 05 09 25.96560 +05 41 35.3400 37.12°

Available ANTARES data catalogues

Select: ANTARES data

Load ANTARES events around source position

Data discovery

This panel is dedicated to browse, to filter, and to select the data collections that you want to load, to display and to process in Aladin. These collections represents all public astronomical data available on the net: several thousands of astromical image collections, catalogs, tables, spectra provided by the Centre de Données astronomiques de Strasbourg and other data providers over the world compatible with the Virtual Observatory protocols and standards. For each collection, you can select ...

CDS / P / DSS2 / color

epoch size dens. opac. zoom

TXS 0506+056

05:09:25.96 +05:41:35.3
37.12° x 28.08°

© 2018 Université de Strasbourg/CNRS - developed by CDS, distributed under GPLv3 0 sel / 0 src 4fps / 408Mb

Aladin: ANTARES Neutrino Data



Available data → 3 / 22457
in view out view

Command [] Frame ICRS Projection Altoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

ALADIN

select Data discovery

This panel is dedicated to browse, to filter, and to select the data collections that you want to load, to display and to process in Aladin. These collections represents all public astronomical data available on the net: several thousands of astronomical image collections, catalogs, tables, spectra provided by the Centre de Données astronomiques de Strasbourg and other data providers over the world compatible with the Virtual Observatory protocols and standards. For each

select pan dist phot draw tag moc spect filter cross

org.gavo.dc / antares
 CDS / P / DSS2 / colca

epoch size dens. opac. zoom

05:09:25.96560 +05
180 -90 +90
05:09:25.96 +05:41:35.3
37.12° x 28.08°

ANTARES events

Two layers of datasets:
ANTARES
DSS

select antares
from -- all collections --

coll. sort view scan filter grid study wink north hdr multiview match

Aladin: ANTARES Event Information



ERLANGEN CENTRE
FOR ASTROPARTICLE
PHYSICS

Available data → 3 / 2245
in view out view

Command [] Frame ICRS Projection Altoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

DSS2 color

Use selector tool to select events around TXS 0506+056

Information about selected event: date, distance to source, ...

id	raj2000	dej2000	n_hits	ang_error	epoch_mid
ANTN 050...	77.2	7.4	31	0.6	54601.0453
ANTN 050...	75.7	3.5	24	0.6	55396.0399
ANTN 051...	79.9	4.5	51	0.4	55585.2809
ANTN 045...	74.5	6.5	25	0.4	56143.9039
ANTN 052...	80.2	7.3	51	0.3	56268.3733
ANTN 050...	77.3	1.4	23	0.9	55546.2134
ANTN 045...	73.7	3.0	35	0.3	54742.7352
ANTN 045...	73.5	8.6	63	0.5	54853.5348
ANTN 052...	82.3	5.6	53	0.5	55399.1341
ANTN 051...	79.2	10.5	59	0.6	55957.5662

select antares
from -- all collections...

Search []

org.gavo.dc / antares /
CDS / P / DSS2 / color

TXS 0506+056
05:09:25.96 +05:41:35.3
38.52° x 20.16°

20 sel / 94 src 527Mb

Aladin: ANTARES Event Information



Available data → 3 / 2245
in view out view

Command [] Frame ICRS Projection Altoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

DSS2 color

ndeiguaisgpa

- Field: epoch_mjd
- Value: 54812.2826
- Unit: d
- UCD: time.epoch

Arrival time in UTC TOPOCENTER.

org.gavo.dc / antares / CDS / P / DSS2 / color

epoch size dens. opac.

5° 38.52° x 19.93°

ndeiguaisgpa Search

_r	Δ	id	raj2000	dej2000	n_hits	ang_error	epoch_mjd
1.71407		ANTN_050...	77.2	7.4	31	0.6	54601.0453
2.746181		ANTN_050...	75.7	3.5	24	0.6	55396.0399
2.798782		ANTN_051...	79.9	4.5	51	0.4	55585.2809
2.954311		ANTN_045...	74.5	6.5	25	0.4	56143.9039
3.248675		ANTN_052...	80.2	7.3	51	0.3	56268.3733
4.293543		ANTN_050...	77.3	1.4	23	0.9	55546.2134
4.533878		ANTN_045...	73.7	3.0	35	0.3	54742.7352
4.806417		ANTN_045...	73.5	8.6	63	0.5	54853.5348
4.918701		ANTN_052...	82.3	5.6	53	0.5	55399.1341
5.140885		ANTN_051...	79.2	10.5	59	0.6	55957.5662

select antares from -- all collections...

epoch_mjd

Aladin: ANTARES Event Information



ERLANGEN CENTRE
FOR ASTROPARTICLE
PHYSICS

Available data → 3 / 2245
in view out view

Command Frame ICRS Projection Aitoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

DSS2 color

5° 38.52° x 19.93°

select pan dist phot draw tag moc spect filter cross

Welcome to Aladin, your professional sky atlas.

- Discover all astronomical data available over the net!
- Compare them with your own data.
- Prepare your observation missions.

To start, type any object name, such as M1, and press ENTER...

Or easier, clic in the main frame and enjoy the sky...

org.gavo.dc / antares / CDS / P / DSS2 / color

epoch size dens. opac. crm

α	Δ	id	raj2000	dej2000	n_hits	ang_error	epoch_mjd
1.71407	ANTN 050...	77.2	7.4	31	0.6	54601.0453	
2.746181	ANTN 050...	75.7	3.5	24	0.6	55396.0399	
2.798782	ANTN 051...	79.9	4.5	51	0.4	55585.2809	
2.954311	ANTN 045...	74.5	6.5	25	0.4	56143.9039	
3.248675	ANTN 052...	80.2	7.3	51	0.3	56268.3733	
4.293543	ANTN 050...	77.3	1.4	23	0.9	55546.2134	
4.533878	ANTN 045...	73.7	3.0	35	0.3	54742.7352	
4.806417	ANTN 045...	73.5	8.6	63	0.5	54853.5348	
4.918701	ANTN 052...	82.3	5.6	53	0.5	55399.1341	
5.140885	ANTN 051...	79.2	10.5	59	0.6	55957.5662	

Search

select antares from -- all collections...

coll. sort view scan filter

n_hits

23 106

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Aladin: IceCube Neutrino Data



Available data → 2 / 2245
in view out view

Command [] Frame ICRS Projection Aitoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

IceCube events
ANTARES events

above horizon for IceCube

Three layers of datasets:
IceCube
ANTARES
DSS

Select: IceCube data

select icecube
from -- all collections...

org.gavo.dc / icecube /
org.gavo.dc / antares /
CDS / P / DSS2 / color

ALADIN
Data discovery tool
This panel is dedicated to browse, to filter, and to select the data collections that you want to load, to display and to process in Aladin. These collections represents all public astronomical data available on the net: several thousands of astronomical image collections, catalogs, tables, spectra provided by the Centre de Données astronomiques de Strasbourg and other data providers over the world compatible with the Virtual Observatory

epoch size dens. opac. zoom
assoc dens. opac. zoom
cont pixel prop del

5° 38.52° x 27.8°

Search

© 2018 Université de Strasbourg/CNRS - developed by CDS, distributed under GPLv3 0 sel / 449 src 13fps / 511Mb

Aladin: IceCube Event Information



Available data → 2 / 2245
in view out view

Command 06:25:18.76 +15:34:47.2

Frame ICRS Projection Aitoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

DSS2 color

IceCube events
ANTARES events

Details for close-by event

38.52° x 25.38°

select icecube
from -- all collections...

_r	evid	nualpha	nudelta	muEloss	muE	nch	mjd
0.256113	J002038+...	77.3445	5.9489	0.1272	960.210022	13	54720.5

Search

1 sel / 449 src 658Mb

Aladin: IceCube Event Information



The TXS 0506+056 blazar was identified due to neutrino detected in 2014-2015 and 2017. Hence, the source does not appear particularly interesting in available public data (IceCube data ≤ 2009).

Available data → 2 / 2245
in view out view

Command 06:25:18.76 +15:34:47.2

Frame ICRS Projection Aitoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

DSS2 color

select pan dist phot draw tag moc spect filter cross x-y rgb assoc dens. opac. crop zoom

epoch size dens. opac. zoom

org.gavo.dc / icecube /
org.gavo.dc / antares /
CDS / P / DSS2 / color

TXS 0506+056

05:09:25.96 +05:41:35.3
38.52° x 20.16°

_r	evid	nualpha	nudelta	muEloss	muE	nch	mjd
0.256113	J002038+...	77.3445	5.9489	0.1272	960.210022	13	54720.5

1 sel / 449 src 658Mb

Aladin: Correlate Neutrino Data



Cross match: ANTARES and IceCube events

Available data → 2 / 2245
in view out view

Command [] Frame ICRS Projection Aitoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

DSS2 color

ALADIN

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- Prepare your observation missions.

To start, type any object name, such as M1, and press ENTER...

Or easier, clic in the main frame and enjoy the sky...

select pan dist phot draw tag moc spect

org.gavo.dc / icecube / q / cone RA nualpha DEC nudelta

org.gavo.dc / antares / q / cone RA raj2000 DEC dej2000

Only positional offset is used to find the matches.

Threshold is the source separation in arcsec

0 <= threshold <= 3600

Choose match method

- Best matches
- All matches
- Sources without match

select icecube

from -- all collections...

coll. sort view scan filter grid study wink north hdr multiview match

Search

TXS 0506+056

05:09:25.96 +05:41:35.3
38.52° x 27.8°

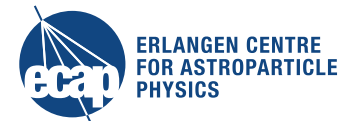
0 sel / 449 src 11fps / 556Mb

select IceCube & ANTARES data

match within radius 1°

cross match

Aladin: Correlate Neutrino Data



Available data → 2 / 2245
● in view ● out view

Command 05:28:47.41 +08:06:11.8

Frame ICRS Projection Aitoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

DSS2 color

IceCube events
ANTARES events
Cross match

Four layers:
XMatch
IceCube
ANTARES
DSS

select icecube
from -- all collections...

coll. sort view scan filter

grid study wink north hdr multiview match

Search

0 sel / 449 src 11fps / 571Mb

Aladin: Neutrino Event Information



ERLANGEN CENTRE FOR ASTROPARTICLE PHYSICS

Available data → 2 / 2245
● in view ● out view

Command 05:50:53.52 +01:08:46.0 Frame ICRS Projection Aitoff

DSS2 color

Use selector tool to select matched events

Hide ANTARES & IceCube layer

Information about cross matched events

dist	r_tab1	evid_tab1	nualpha...	nude1ta...	muELoss...	muE_tab1	nch_tab1	mjd_tab1	r_tab2	id...
28.1476	4.92202	J002157+...	82.3035	5.607	0.6318	5202.799...	23	54840.60...	4.918701	ANTN 0
280.3...	8.229509	J002243+...	85.1655	8.47	1.9683	10745.0	53	54817.60...	8.239072	ANTN 0
323.0...	11.298887	J002324+...	87.723	1.1461	0.217	1861.300...	24	54660.10...	11.38797	ANTN 0
357.812	4.76851	J001937+...	73.587	8.6498	0.2465	3381.699...	21	54790.39...	4.806417	ANTN 0
385.441	5.195157	J002147+...	81.69	2.8066	0.2174	1466.199...	19	54694.60...	5.263545	ANTN 0
463.2...	4.620076	J001939+...	73.689	2.8718	0.2506	1852.099...	26	54956.69...	4.533878	ANTN 0
499.4...	5.039493	J002143+...	81.4665	8.6572	0.1999	1581.300...	23	54573.30...	5.171782	ANTN 0
513.5...	9.473921	J002256+...	85.9965	9.7574	0.6412	4743.600...	24	54768.5	9.53765	ANTN 0
703.2...	13.330071	J002403+...	90.1575	1.8663	0.6147	4899.700...	36	54597.69...	13.428117	ANTN 0

select icecube
from -- all collections...

Search

epoch - 4000 +
size - 1000 +
assoc - 1000 +
dens. - 1000 +
opac. - 1000 +
zoom - 1000 +

115 sel / 566 src 584Mb

Aladin: Filting



Filter matched events that are also time correlated within 100days

The screenshot shows the Aladin software interface. On the left, a dialog box titled "Properties of the filter 'Filter6'" is open. It has a "Filter0" input field and two modes: "Beginner mode" and "Advanced mode". A red arrow points to the "Advanced mode" button with the text "Advanced mode". Below this, there is a "Choose a predefined filter" section with a dropdown menu. Underneath, there is a section for "Or enter your own filter definition" with an example: `eg: ${Bmag}<10 {draw red square}`. A "Pick:" section has a dropdown menu showing "Columns in loaded catalogues..." and a sub-menu with "*Pick a column*". At the bottom of the dialog are "Save filter" and "Load filter" buttons. Below the dialog, there are "Export" and "Create a new plane with all filtered sources" buttons, and a "Show rainbow color table" button. The main window shows a star field with green squares overlaid on some stars. A yellow box highlights the "filter" icon in the right-hand toolbar. Below the star field is a search bar and a table of data. At the bottom right, there is a histogram labeled "dist" with values 28.15 and 3557.

...	muE_tab1	nch_tab1	mjd_tab1	_r_tab2	id_ta
...	5202.799...	23	54840.60...	4.918701	ANTN 0
1.9683	10745.0	53	54817.60...	8.239072	ANTN 0
0.217	1861.300...	24	54660.10...	11.38797	ANTN 0
0.2465	3381.699...	21	54790.39...	4.806417	ANTN 0
0.2174	1466.199...	19	54694.60...	5.263545	ANTN 0
0.2506	1852.099...	26	54956.69...	4.533878	ANTN 0
0.1999	1581.300...	23	54573.30...	5.171782	ANTN 0
0.6412	4743.600...	24	54768.5	9.53765	ANTN 0
0.6147	4899.700...	36	54597.69...	13.428117	ANTN 0

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Filter definition & draw option:

$\text{abs}(\text{\$}\{mjd_tab1\} - \text{\$}\{epoch_mjd_tab2\}) < 100$ {draw blue square}

The screenshot shows the Aladin interface with two main windows. The 'Properties' window is titled 'Properties of the filter "Filter9"'. It has a text input field for the filter name, currently 'Filter0'. Below this are 'Beginner mode' and 'Advanced mode' buttons. A 'Choose a predefined filter' section has a dropdown menu. The 'Or enter your own filter definition' section contains the text 'eg: $\text{\$}\{Bmag\} > 10$ {draw red square}'. Under 'Pick:', there are buttons for 'Columns', 'UCDs', 'Actions', 'Maths...', and 'Units...'. A red box highlights the filter definition: $\text{abs}(\text{\$}\{mjd_tab1\} - \text{\$}\{epoch_mjd_tab2\}) < 100$ {draw blue square}. Below this are 'Help' and 'Examples' buttons. At the bottom are 'Save filter' and 'Load filter' buttons. The 'Available columns' window shows a grid of column names: 'XMatch' (dist, _r_tab1, evid_tab1, nualpha_tab1, nudelta_tab1, muELoss_tab1, muE_tab1, nch_tab1, mjd_tab1, _r_tab2, id_tab2, raj2000_tab2, dej2000_tab2, n_hits_tab2, ang_error_tab2, epoch_mjd_tab2), 'org.gavo.dc/icecube/q/cone' (_r, evid, nualpha, nudelta, muELoss, muE, nch, mjd), and 'org.gavo.dc/antares/q/cone' (_r, id, raj2000, dej2000, n_hits, ang_error, epoch_mjd). A 'Close' button is at the bottom. In the background, a table of data is visible with columns: muE_tab1, nch_tab1, mjd_tab1, _r_tab2, id_tab1. A histogram titled 'dist' is also visible in the bottom right corner.

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Result: 10 filtered events

Information about filtered events

dist	_r_tab1	evid_tab1	nualpha...	nude1ta...	muEloss...	muE_tab1	nch_tab1	mjd_tab1	_r_tab2	id_ta
3556....	14.127605	J002327+...	87.9375	15.267	0.1438	985.460022	14	54828.80...	13.146757	ANTN 0
3299....	5.447579	J001927+...	72.9195	2.5182	0.0555	1149.900...	16	54838.60...	4.533878	ANTN 0
3200....	11.924147	J001727+...	65.4345	7.0225	0.2971	3326.899...	35	54682.60...	12.723076	ANTN 0
2474....	9.834859	J002314+...	87.12	4.2266	2.5324	19802.0	33	54717.0	10.138522	ANTN 0
2416....	4.189197	J001946+...	74.154	8.4207	0.0808	1506.0	15	54930.30...	4.806417	ANTN 0
2259....	13.633286	J002315+...	87.1875	15.322	0.1453	1653.400...	17	54831.60...	13.146757	ANTN 0
2256....	13.754784	J002319+...	87.4575	15.223	0.2361	1484.300...	12	54802.0	13.146757	ANTN 0
2173....	4.959622	J001930+...	73.107	3.1173	0.2853	3903.800...	25	54744.30...	4.533878	ANTN 0
2050....	11.096336	J001752+...	67.0065	9.9368	1.6764	14384.0	39	54668.10...	10.728837	ANTN 0

- Aladin is a powerful tool for accessing, visualising and exploring astronomical datasets
- Presented use case: correlating TXS 0506+056 blazar and neutrinos
- Outlook: Aladin also supports a script mode
 - repeating workflow with different parameter values or sources