

MSSelection antenna/baseline syntax

Introduction

It is possible to (de)select antennae (stations in LOFAR terms) and/or baselines in a convenient way using their names, ids, or physical baseline length.

For example:

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[ CR ] S * &
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selects all cross-correlation baselines consisting of core or remote stations, thus deselects auto-correlations and baselines with international stations. The remainder of this note should make clear what this string exactly means knowing that LOFAR core stations are named CSnnn, remote stations RSnnn, and international stations XXnnn.

The antenna/baseline syntax can be used in several places in the LOFAR software suite.

- msselect to create an MeasurementSet from selected baselines of another MS.
- BBS to select the baselines to be used.
- NDPPP to select the baselines to be used or to be (un)flagged.

General syntax

- Whitespace can be given at will.
- The selection is given as a list of groups separated by semicolons. A group can be preceded by an exclamation mark meaning exclusion. It can be used to exclude part of a previous group. If desired, part of that excluded group can be selected again in a subsequent group.
Note that the OR relation is used for ordinary groups, while AND is used for excluded groups. For example:
group1; group2; !group3; group4; !group5
means
group1 OR (group2 AND NOT group3) OR (group4 AND NOT group5)
- A group contains baseline specifications that can be given in two ways: using antenna names/numbers or using physical baseline length ranges.

Antenna names/numbers

- A group consists of one or two lists of antenna specifications separated by an operator telling which correlations to use.
 - a. & means cross-correlations only.
 - b. && means cross- and auto-correlations.
 - c. &&& means auto-correlations only (no second list can be given in this case).If no second list is given, all baselines between the antennae in the first list are selected, otherwise the baselines between the antennae in the first and second list. If a single list without operator is given, all cross-correlation baselines containing the given antennae are selected.

- An antenna list consists of one or more antenna names and/or numbers separated by commas. An antenna number is the index (row number) in the ANTENNA subtable of a MeasurementSet.
- An antenna name can contain the following characters:
 alphabetic digit : . _ + -
 The first character cannot be a digit unless the name contains a colon.
 However, any character (thus also pattern characters, see below) can be used in a name if it is escaped by preceding it with a backslash. An escaped name is ended by whitespace.
- Antennae can be specified with a pattern as used in a shell for file names. Such a pattern has the following special characters:
 - * means zero or more characters
 - ? means a single character
 - square brackets give a choice of characters. A hyphen can be used for ranges and an up-arrow for negation. For example:
 [a-zA-Z0-9] a single letter or digit
 [abcde] one of these 5 letters.
 [^abcde] not one of these letters.
 - curly braces indicate a choice of strings (separated by commas). For example:
 '* {h,cc}' for any name ending in h or cc
 As shown in the last example a pattern has to be enclosed in single or double quotes if it contains a comma (or possibly other special characters).
- An antenna name can be given as an extended regular expression if enclosed in slashes. See the man pages or the web (e.g., <http://www.regular-expressions.info>) for more info on regular expressions.
 For example:
 /CS.*HBA.* / for all HBA core stations
 Note this could somewhat easier be given as a pattern: CS*HBA*
- An antenna number can be a single number or a range with the tilde (~) as separator. The end value is inclusive. For example:
 0~5, 10~12, 18, 20

Physical baseline length

- A group consists of one or more baseline length specifications separated by commas. A specification can be one of the following.
 - < value
 all baselines with physical length < the given value.
 - <= value
 all baselines with physical length <= the given value.
 - > value
 all baselines with physical length > the given value.
 - >= value
 all baselines with physical length >= the given value.
 - value1 ~ value2
 all baselines with physical length >= value1 and <= value2.

- A value is an integer or floating point number, optionally followed by a unit. The default unit is m (meter). If in a range value2 has a unit, value1 defaults to that unit. It is not allowed to have a unit for value1, while not having one for value2.
- Note there is some ambiguity between a range of antenna numbers and a range of baseline lengths. A range of integer numbers represents antenna numbers, while a range of floating point numbers represents baseline lengths. An integer number followed by a unit is also seen as a floating point number. A range containing an integer and a floating number is not allowed.

Some examples

CS*

all cross-correlation baselines containing core stations.

*

all cross-correlation baselines.

* & & &

! *

all auto-correlation baselines (same as no cross-correlations).

! ES*

all baselines except the cross-correlation baselines containing European stations.

CS* &

all cross-correlations between core stations.

CS* & RS*

all cross-correlations between core and remote stations.

CS* & [CR]S*

CS* & CS*, RS*

CS*&; CS*&RS*

all cross-correlations between core and core or remote stations. The lines give various ways to specify it (in order of performance).

CS* && [RE]S*; ! CS001 & [RE]S*; CS001 & RS001

all cross- and auto-correlations between core and remote/European. However, the baselines between CS001 and remote or European stations are excluded with the exception of the baseline between CS001 and RS001.

1~5

1, 2, 3, 4, 5

all cross-correlations baselines containing station numbers 1 till 5.

100.~500.m

100.~500.

100m~500m

.1~.5km

all baselines with a physical length between 100 and 500 meter.

<1km; !100~200m

baselines with a length <= 1000 meter with the exception of lengths between 100 and 200 meter.

<1km; !RT[56]

baselines with a length <= 1000 meter except baselines containing RT5 or RT6.