XMM OPTICAL MONITOR

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XMM-OM EXAMPLE COMMAND SEQUENCES

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1. Introduction

1.1 Purpose.

The purpose of this technical note is to aid discussion of the optimum way to command the XMM-OM instrument. As such, it describes a number of command sequences that have a specific goal (for example, acquiring a field). It suggests the ground commands and expected responses that would be necessary and details the command and data flows within the instrument that occur as a result.

1.2 Scope.

This release of the document describes an example pointing, based on the description given in APP-5 (see below). It consists of an acquisition phase followed by two exposures using different filters and detector window settings.

1.3 Acronyms and abbreviations.

DPU	**D**igital **P**rocessing **U**nit
F/W	**F**ilter **W**heel
ICU	**I**nstrument **C**ontrol **U**nit
OM	**O**ptical **M**onitor
XMM	**X**-ray **M**ulti-**M**irror

1.4 Applicable Documents.

APP-1	Telecommand and Telemetry Specification	XMM-OM/MSSL/SP/0061
APP-2	ICU-DPU Protocol Definition	XMM-OM/MSSL/SP/0014
APP-3	Software Setup for the Blue Detector Electronics	XMM-OM/MSSL/SP/0077
APP-4	TMPSU Electrical Specification	XMM-OM/IALS/SP/0002
APP-5	User Requirements Specification	XMM-OM/MSSL/SP/0030

2. Diagram Notes

2.1 Event Traces

1. ‘Event Trace’ diagrams illustrate each command sequence. They illustrate how events flow from one sub-system to another as a function of time.
2. Time increases down the page.
3. A labelled vertical line represents a sub-system.
4. An ‘event’ is
    a) a single command/datum moving from one sub-system to another. It is represented by a labelled horizontal arrow, e.g.

    b) a block of commands or data sent to achieve a single goal (e.g. moving a filter wheel to a specific position). It is represented by a labelled arrowed rectangle, e.g.

    c) a block of data sent as a response to a block of commands i.e. a ‘handshake’ sequence. It is represented by a labelled double arrowed rectangle, e.g.

2.2 Event Descriptions

All ‘event’ names used here are more fully described (except when stated otherwise) in the following documents.

From	To	Document
Ground	ICU	APP-1
ICU	Ground	APP-1
ICU	DPU	APP-2
DPU	ICU	APP-2
ICU	Filter Wheel	APP-4
ICU	Detector	APP-3

3. Sequences

3.1 Example Pointing.

The example pointing here consists of an acquisiton phase followed by 2 exposures. In turn, each exposure consists of a choose guide star phase followed by an accumulation and tracking phase. Science data is not available for downlinking until the end of the first exposure. The status of science data, filter wheel and detector during the course of the pointing is summarised in the following table. This example can be generalised to a n-exposure sequence by repeating the “between exposures” and “Exposure 2” (with suitable changes in the uplinked configuration) phases as often as required.

<table>
<tr><th rowspan="2">Pointing Phase</th><th rowspan="2">Associated Command Sequences</th><th colspan="2">Detector Status</th><th rowspan="2">Filter Wheel Position</th><th colspan="2">Science Data Status</th></tr>
<tr><th>Windows</th><th>Resolution</th><th>Priority</th><th>Regular</th></tr>
<tr><td>Acquisition</td><td>Acquisition</td><td rowspan="2">Four abutting windows covering the whole detector</td><td rowspan="2">Low</td><td>V Filter</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">Exposure 1</td><td>Choose Guide Stars 1</td><td rowspan="2">Observer Requested</td><td rowspan="2">Exposure 1 Downloading</td><td rowspan="2">-</td></tr>
<tr><td>Accumulate and Track</td><td>Observer requested + guiding</td><td>High</td></tr>
<tr><td>Between Exposures (time permitting)</td><td>Move F/W to Blocked</td><td colspan="2">Off</td><td>Blocked</td><td>-</td><td rowspan="3">Exposure 1 Downloading</td></tr>
<tr><td rowspan="2">Exposure 2</td><td>Choose Guide Stars 2</td><td>Four abutting windows covering the whole detector</td><td>Low</td><td rowspan="2">Observer Requested</td><td rowspan="2">Exposure 2 Downloading</td></tr>
<tr><td>Accumulate and Track</td><td>Observer requested + guiding</td><td>High</td></tr>
<tr><td>Post Pointing</td><td>Move F/W to Blocked</td><td colspan="2">Off</td><td>Blocked</td><td>-</td><td>Exposure 2 Downloading</td></tr>
</table>

The Acquisition, Choose Guide Stars (1 and 2) and Accumulate and Track command sequences are illustrated below in the sections of the same name. The (OM internal) command sequences associated with downloading the regular data from the two exposures is illustrated in the ‘Science Data Download’ section.

Notes.

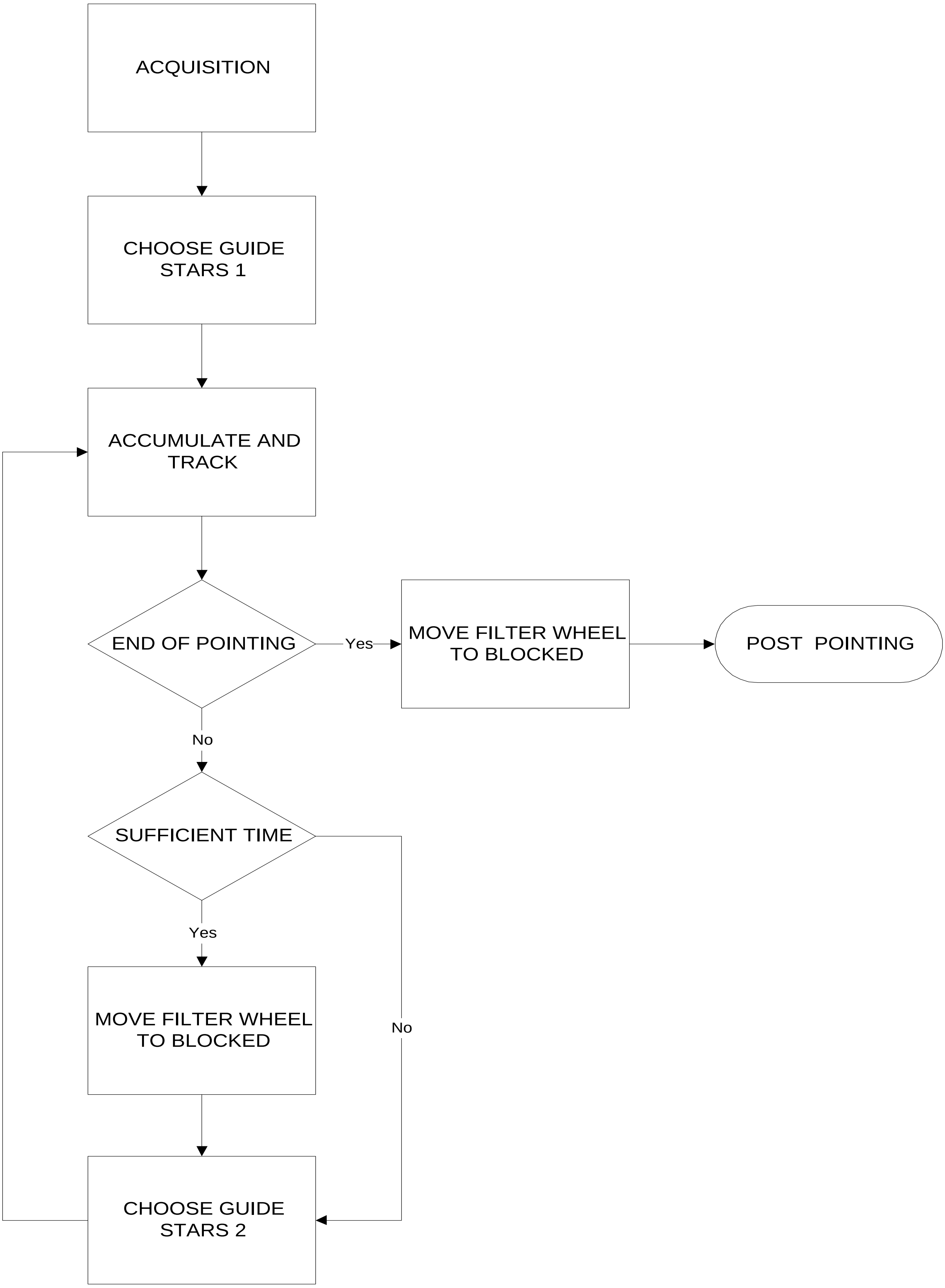
1. This release of the document has assumed a large involvement of the ground in control of the OM. However, it may be possible for the ICU to assume a higher level of autonomy, e.g. it could decide whether to proceed at the end of the Acquisition or Choose Guide Star phases.
2. In this release, the ICU informs ground of critical points in the exposure by forwarding DPU ‘alerts’ as Non-Periodic HK event packets. It may be more appropriate for flags to be set in the housekeeping instead.
3. All the command sequences described below are ‘success assumed’ i.e. there is no discusion of what to do in the event of failure.
4. N.B. The DPU command and alert mnemonics, togther with the code values - and therefore the Task Function Identifiers (FID) - were revised in June ‘96 to make them more systematic. This release uses these new names and codes. As all documents have yet to be modified to reflect this, ‘conversion tables’ are given overleaf.

DPU Alert and Command Mnemonic Conversion Tables

NEW ALERT MNEMONIC	OLD ALERT MNEMONIC
DA_BAD_CMD	DA_BAD_COMMAND
DA_BEGOF_EXP	DA_BEGOF_EXPOSURE
DA_BOTTOM_WHITEDSP	DA_RETURN_FROM_WHITE_DSP
DA_CLK_SYNCH_ERROR	DA_CLOCK_SYNCH_ERROR
DA_DONE_FLD_DATA	DA_ENDOF_FIELD_DATA
DA_ECHO_ICU_CMD	DA_ECHO_ICU_COMMAND
DA_ENDOF_EXP	DA_ENDOF_EXPOSURE
DA_EOS_ABORT	DA_DONE_ABORT
DA_EOS_CALBGD	DA_DONE_CALBGD
DA_EOS_CALDRFT	DA_DONE_CALDRFT
DA_EOS_CMPRS	DA_DONE_COMPRESSION
DA_EOS_DLVRDATA	DA_DONE_DELIVERDATA
DA_EOS_DOWINDOW	DA_DONE_DOWINDOW
DA_EOS_ENG	DA_DONE_ENGINEERING
DA_EOS_GETREF	DA_DONE_GETREF
DA_EOS_INIT_DPU	DA_DONE_INITIALIZE
DA_EOS_LOCATEGS	DA_DONE_LOCATEGS
DA_EOS_MAKEAGS_ID	DA_DONE_MAKEGS_ID
DA_EOS_RSTR_STARS	DA_DONE_RESTORE_STARS
DA_EOS_SCANBS	DA_DONE_SCANBS
DA_EOS_SCANGS	DA_DONE_SCANGS
DA_EOT_ACQUIRE_FLD	DA_ENDOF_FIELD_ACQ
DA_EOT_CHOOSE_GS	DA_ENDOF_CHOOSE_GS
DA_EOT_ENG	DA_ENDOF_ENGINEERING
DA_EOT_INIT_DPU	DA_ENDOF_INIT
DA_EOT_INIT_EXP	DA_ENDOF_INIT_EXP
DA_HBEAT	DA_HEARTBEAT
DA_SCI_HBEAT_ERROR	DA_SCI_HEART_BEAT_ERROR
DA_SCI_RCVR_ERROR	DA_SCI_RECEIVER_ERROR

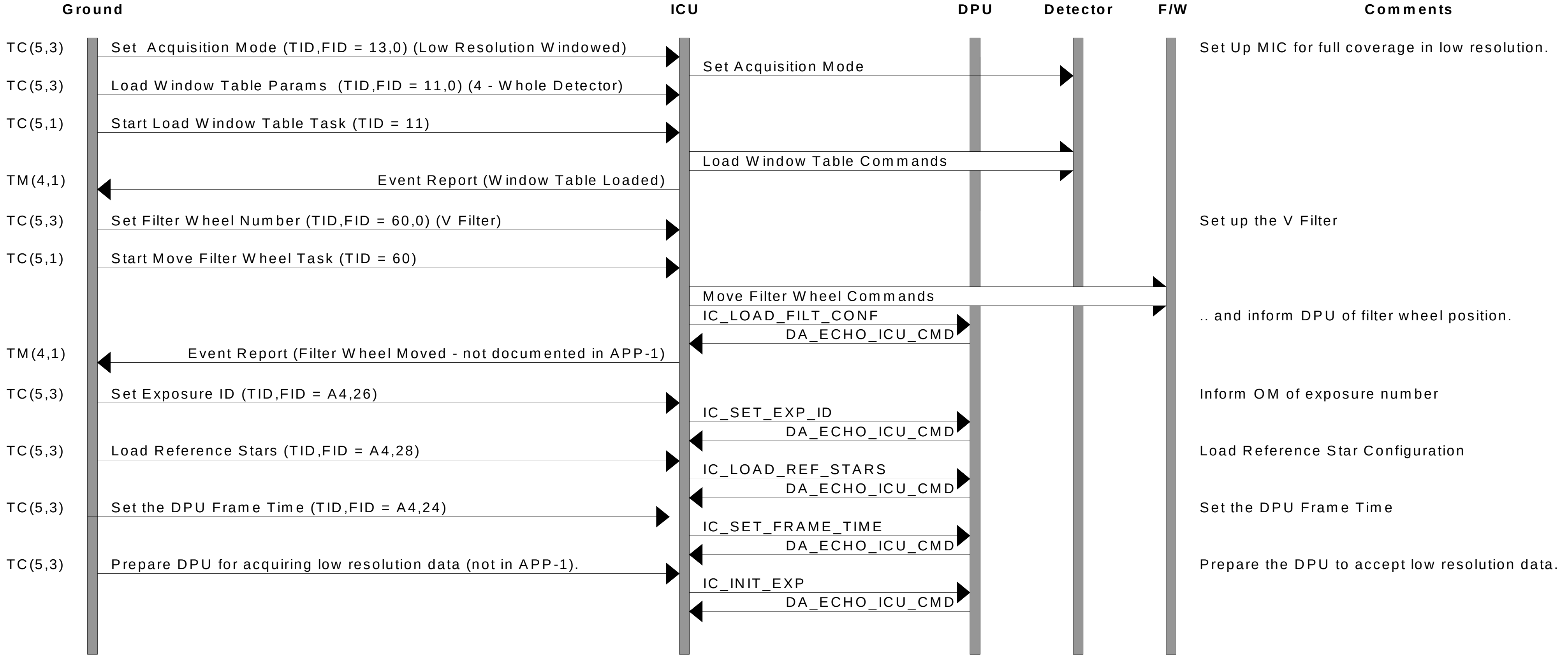
NEW COMMAND MNEMONIC	NEW FID (Hex)	OLD COMMAND MNEMONIC	OLD FID (Hex)
IC_ACQUIRE_FLD	32	IC_ACQUIRE_FIELD	25
IC_CHOOSE_GS	33	IC_CHOOSE_GUIDE_STARS	26
IC_ENBL_LOAD_CODE	03	IC_ENBL_L_CODE	23
IC_GEN_BAD_CMD_ID	0A	IC_GEN_BAD_CID	11
IC_INIT_DPU	30	IC_INITIALIZE_DPU	2C
IC_LOAD_MEM_WDW	2A	IC_LOAD_MEM_WIND	22
IC_LOAD_SCI_WDW	2B	IC_LOAD_SCI_WIND	23
IC_REPORT_TRK	22	IC_REPORT_TRACKING	15
IC_SEL_RAM_BANK	04	IC_SELECT_RAM_BANK	24
IC_SEL_SCI_LNK_TST	0C	IC_SEL_SCI_LINK_TEST	0F
IC_SEND_SCI_CMD	0B	IC_SEND_SCI_COMMAND	28
IC_SET_EXP_ID	26	IC_SET_EXPOSURE_ID	2B
IC_SET_EXP_TIME	25	IC_SET_EXPOSURE_TIME	1A
IC_TRACK_GS	34	IC_TRACK_GUIDE_STARS	27

3.1.1 Overall Flow Diagram



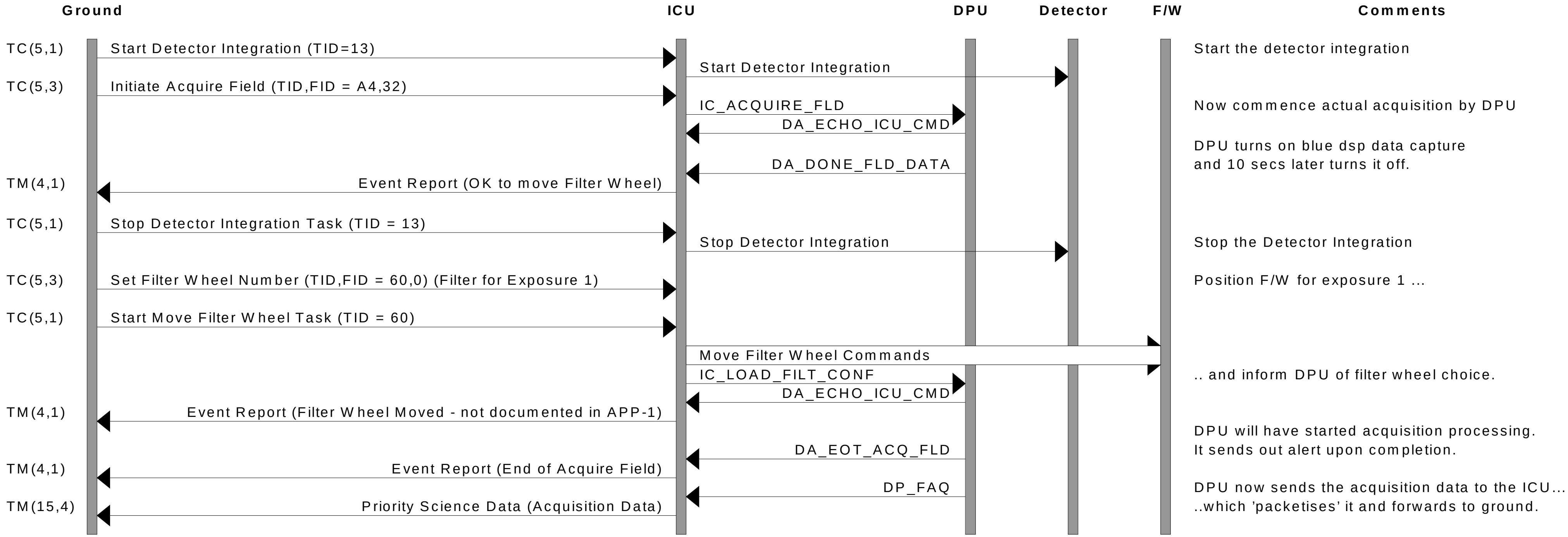
3.1.2 Acquisition.

3.1.2.1 Acquisition - Part 1.



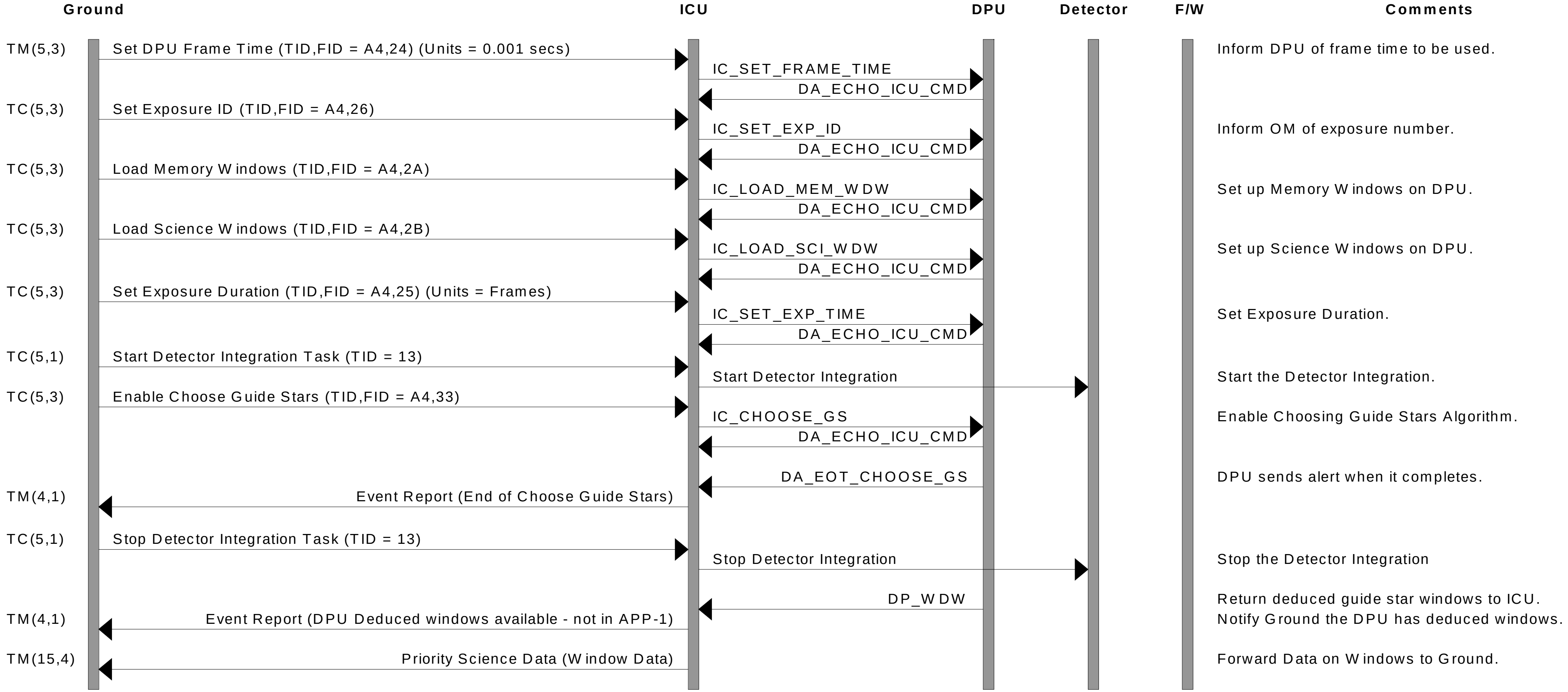
This Command Sequence continues overleaf.

3.1.2.2 *Acquisition - Part 2.*



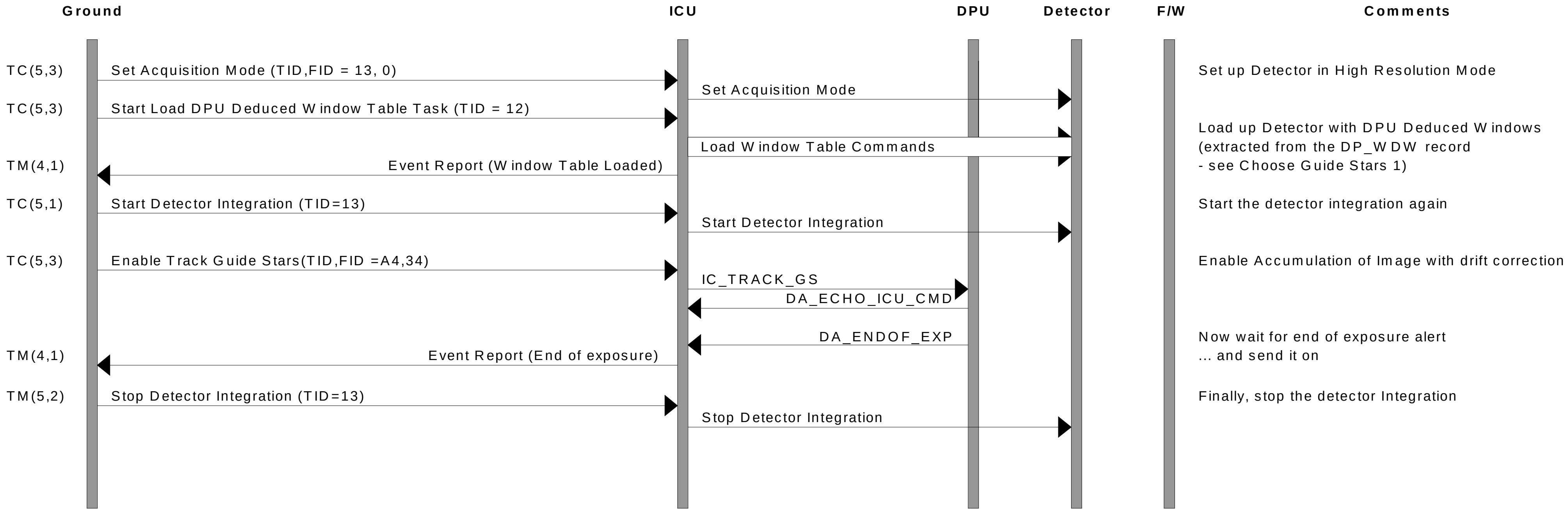
The next Command Sequence executed is "Choose Guide Stars 1"

3.1.3 Choose Guide Stars 1.



The next Command Sequence executed is "Accumulate and Track"

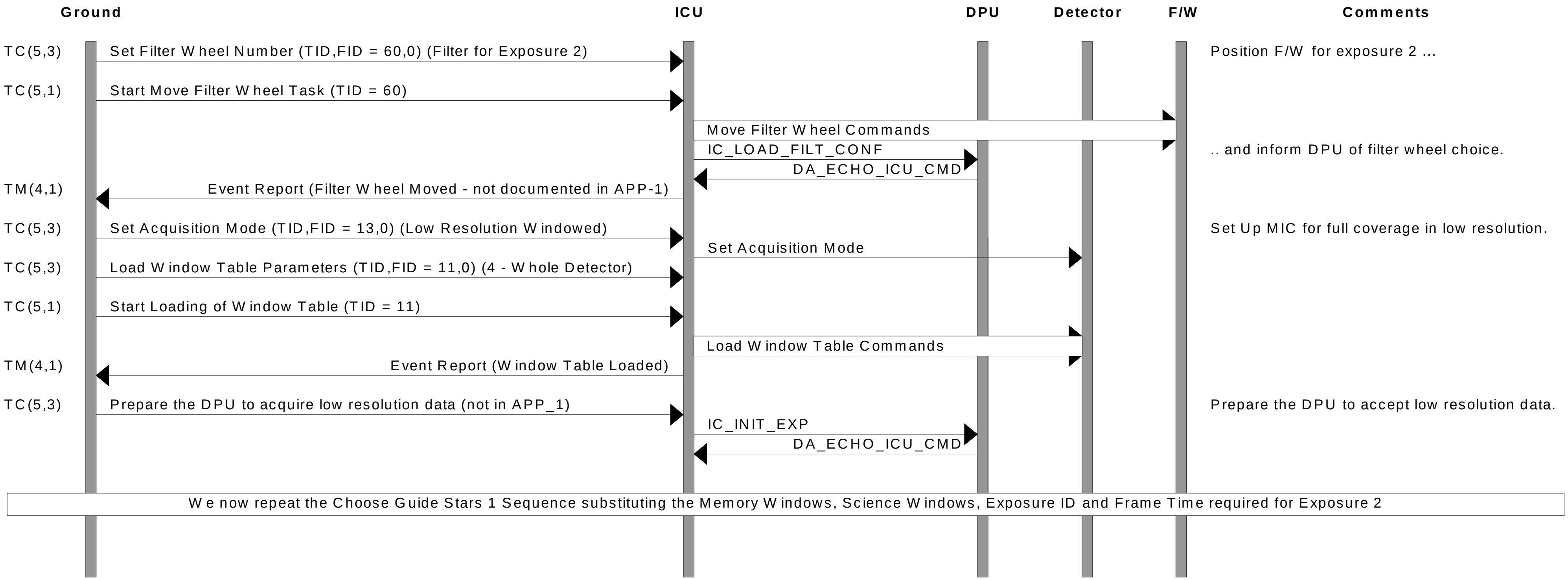
3.1.4 Accumulate and Track.



If we are now at the end of Exposure 1, and there is a time gap before the start of Exposure 2, or we are at the end of the pointing if time permits, we now execute Command Sequence "Move Filter Wheel to Blocked".

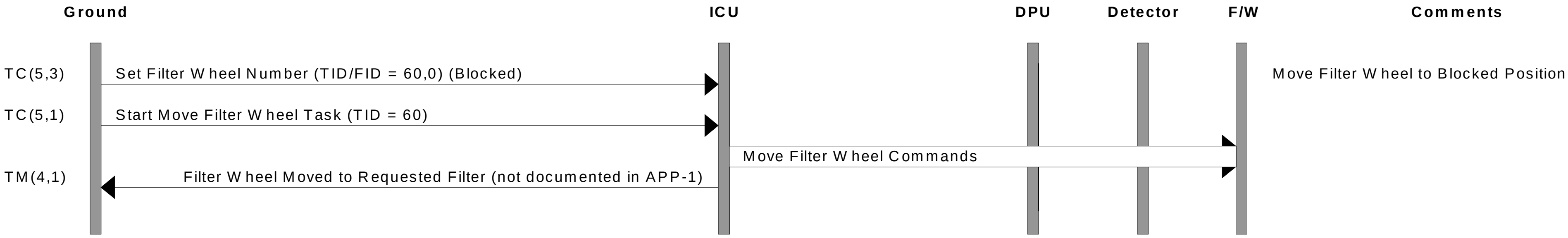
Otherwise we now execute Command Sequence "Choose Guide Stars 2"

3.1.5 Choose Guide Stars 2.



We next execute Command Sequence "Accumulate and Track"

3.1.6 Move Filter Wheel to Blocked.



If we are not in the post-pointing phase, the next Command Sequence executed is "Choose Guide Stars 2"

3.1.7 Science Data Download.

This command sequence commences automatically at the end of exposure 1.