JUNO

JIRAM Radiation Sequence Architecture and Instrument Main Timing Characterization

OLD CATALOGUE:
JIR-IAPS-UR-001-2015 / INAF/IAPS-2015-04/ ISSUE 3

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ACRONYM & ABBREVIATION LIST

AD	Applicable Document
AI	Action Item
ASI	Agenzia Spaziale Italiana
CDR	Critical Design Review
C&DH	Command and Data Handling
CICD	Communication Interface Control Document
CIDL	Configuration Item Data List
EDAC	Error Detection And Correction
EGSE	Electrical Ground Support Equipment
EM	Electrical Model
ESA	European Space Agency
FM	Flight Model
FSW	Flight SW
GA	Galileo Avionica
HEX	Hexadecimal format
HK	Housekeeping
HW	Hardware
HSSL	High Speed Serial Link
IF	Interface
IR	Infrared
INAF	Istituto Nazionale di Astrofisica
ITAR	International Traffic in Arms Regulations
JSOC	Juno Science Operations Center (at SwRI, Texas)
JPL	Jet Propulsion Laboratory
JIRAM	Jovian Infrared Auroral Mapper
LM	Lockheed Martin
LSSL	Low Speed Serial Link
NA	Not Appicalble
NASA	National Aeronautics and Space Administration
PI	Principal Investigator
RD	Reference Document
RID	Review Item Discrepancy
SC	Spacecraft
SCR	SW Change Request
SDD	SW Design Document

This document was reviewed and approved for export, see Juno-Generic-14-002 and Juno-Generic-14-003.

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DOCUMENT CHANGE LOG

Issue	Date	Pages/Paragraphs affected	Changes Description

The following documents shall be used as reference background and support information. These documents are herein referred as [RD-XX].

Id	*Document Number*	*Description*
[RD-01]	JIR-IFSI-UR-002-2010	JIRAM_Operations_Interface_Control_Document_Issue_05.pdf
[RD-02]	JIRAM-GAF-IC-001	JIRAM-GAF-IC-001_rev6_CICD.pdf
[RD-03]	JIRAM-GAF-TN-027	JIRAM-GAF-TN-027_rev10.pdf

1 PURPOSE OF THE DOCUMENT

The aim of this document is the definition of the JIRAM Radiation Sequence to be used in routine operation on Jupiter.

The Radiation Sequence will allow an acquisition scheme where there is 120-degree relative spacing between three consecutive observations. Other customized pointings are also possible for the three consecutive observations. The absolute nadir offset values used for the three consecutive observations are flexible from sequence to sequence in order to allow coordination with the radiation measurements of other instruments.

In order to properly configure the instrument to achieve the designed science goals and above all to validate the final sequence, three tests have been scheduled to be conducted on the following systems:

1. Selex ES Electrical Model (EM), on ground test.
2. STL at JPL, on ground test
3. JC049, on flight test

2 RADIATION SEQUENCE OFFICIAL TIMELINE FORMAT

(used dates and SeqId are an example)

SeqId = 005
SeqName = JRM_Science
SeqNote = Radiation_Sequence_2015-100T07:59:46.000
SeqStartTime = 2015-04-10T07:59:46.000
SeqEndTime = 2015-04-10T08:02:42.000
SeqDuration = 00:03:49

00:00:00 JRM_SET_PAR(92,153)
00:00:04 JRM_SCI_PAR("SCI_I1_S0",1,1,0,"IDIS_SDIS","HSSL","ENABLE","RN","DISABLE",**0**,0deg,0ms,0ms,"LOW","LOW","POINT",
-90deg,1000ms,1000ms,"LOW","LOW","POINT",0deg,"NO_SUMMED_SCI")
00:00:04 JRM_GET_PAR(6000)
00:00:04 JRM_START_HS_REC
00:00:02 JRM_SCIENCE
00:01:05 JRM_SCI_PAR("SCI_I1_S0",1,1,0,"IDIS_SDIS","HSSL","ENABLE","RN","DISABLE",**0**,0deg,0ms,0ms,"LOW","LOW","POINT",
150deg,1000ms,1000ms,"LOW","LOW","POINT",-120deg,"NO_SUMMED_SCI")
00:00:04 JRM_GET_PAR(6000)
00:00:02 JRM_SCIENCE
00:01:05 JRM_SCI_PAR("SCI_I1_S0",1,1,0,"IDIS_SDIS","HSSL","ENABLE","RN","DISABLE",**0**,0deg,0ms,0ms,"LOW","LOW","POINT",
30deg,1000ms,1000ms,"LOW","LOW","POINT",120deg,"NO_SUMMED_SCI")
00:00:04 JRM_GET_PAR(6000)
00:00:02 JRM_SCIENCE
00:01:05 JRM_STOP_HS_REC
00:00:04 JRM_SET_PAR(92,8174)
00:00:04 JRM_ERROR_LOG

"First Tele-Command Science will be provided to the instrument at the time: SeqStartTime + 00:00:14"
"Second Tele-Command Science will be provided to the instrument at the time: SeqStartTime + 00:01:25"
"Third Tele-Command Science will be provided to the instrument at the time: SeqStartTime + 00:02:36"
"SP_ACQ_DURATION will be 0 at Jupiter, while 30 or 32 will be used until Sc Dynamics are available and for the EM test in Selex."
"SP_NADIR_OFFSET_1 and SP_NADIR_OFFSET_2 values are flexible, but there shall always be a fixed angular separation between them of 90deg (TBC)."

3 RADIATION SEQUENCE MAIN TIMING

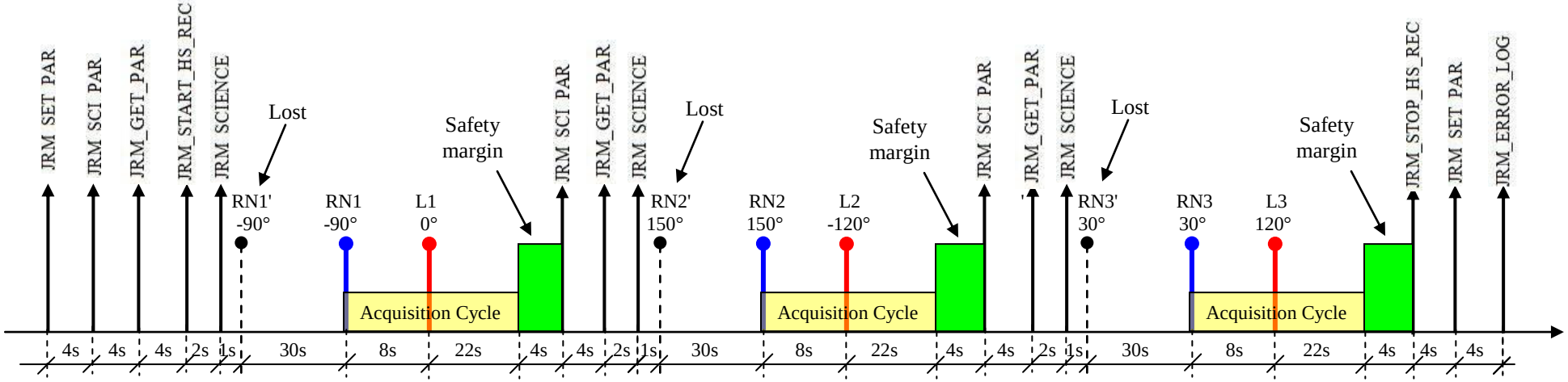

Fig. 3.1 (Sc Dynamics Enabled, worst condition)

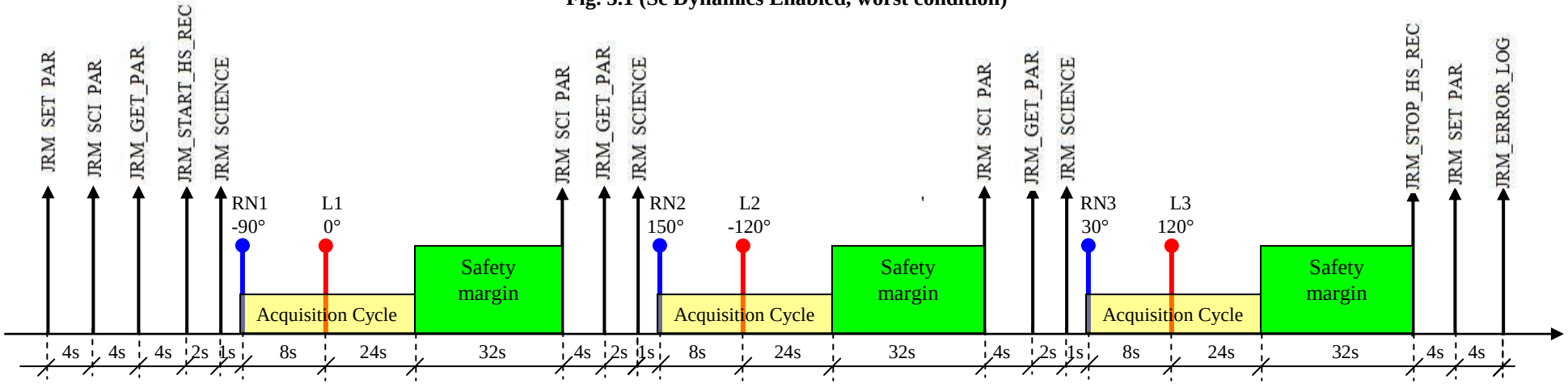

Fig. 3.2 (Sc Dynamics Disabled, Acq_Duration = 32s)

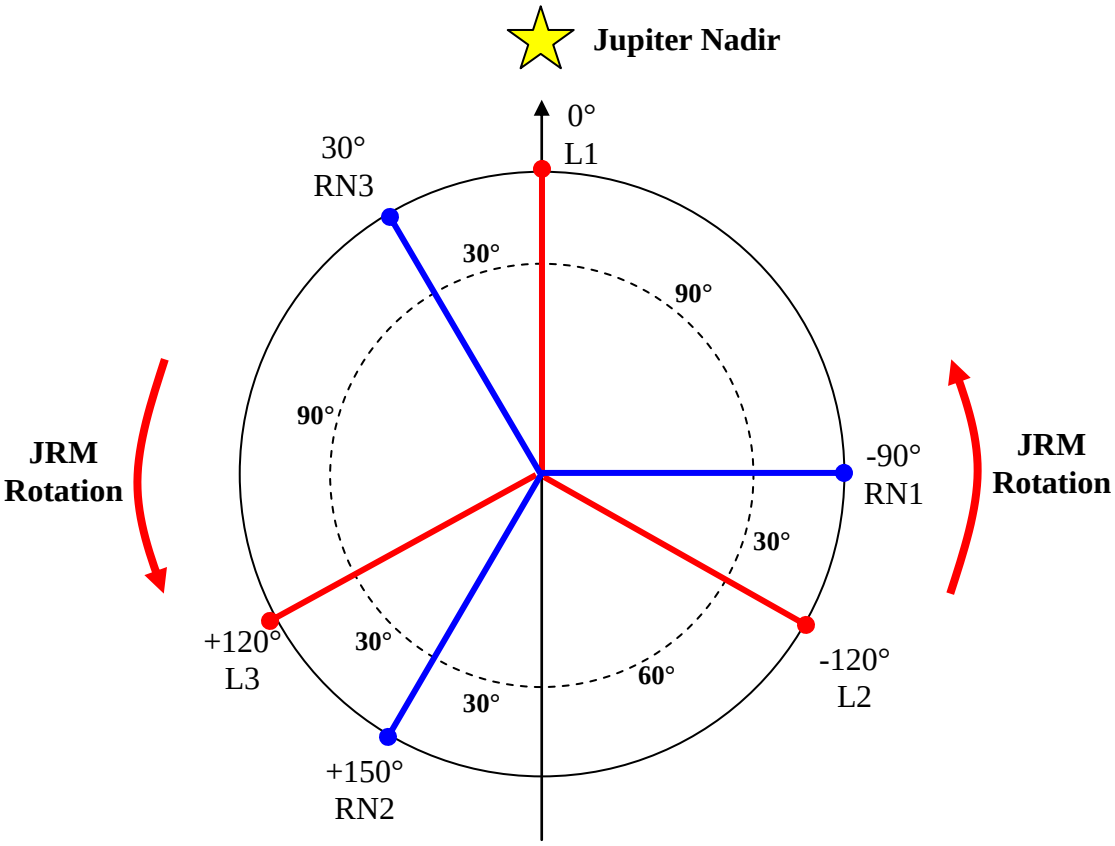

Fig. 3.3 (JIRAM Reference Angles)

4 SELEX-ES, ELECTRICAL MODEL BOUNDARIES TESTS REQUEST

In order to verify the operational limits of JIRAM, a certain number of tests have been designed to be executed on the on ground Electrical Model in Selex. In the following paragraph have been highlighted just the main Tele-Commands and Parameters. The following nomenclature has been adopted:

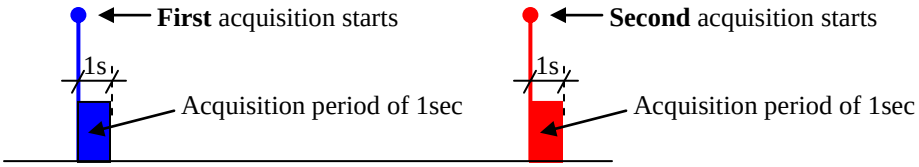

Fig. 4.1

4.1 DEFINITION OF THE MINIMUM DELAY BETWEEN TWO CONSECUTIVE TC-S, IN RELATION TO THE CYCLE DURATION AND EXPOSITION TIMES

4.1.1 TEST_1(THE TC IS REJECTED AS EXPECTED)

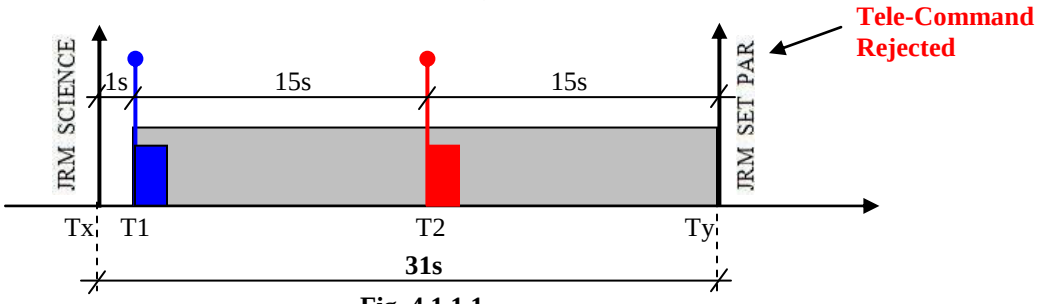

Fig. 4.1.1.1

4.1.1.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I1_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000 (1sec)
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -57343 (-180°)
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 0
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:31 JRM_SET_PAR(74,0) # This Tc is just to simulate the next Tc
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.1.1.2 TEST NOTES

The instrument has rejected the JRM_SET_PAR Tc because the instrument was still in SCINECE. There was not enough margin of time between the end of the cycle and the Tele-Command (JRM_SET_PAR) at the time Ty.
In this condition, the instrument remain in STBY mode until the Power Off.

4.1.2 TEST_2 (PROPERLY EXECUTED 2 TIMES)

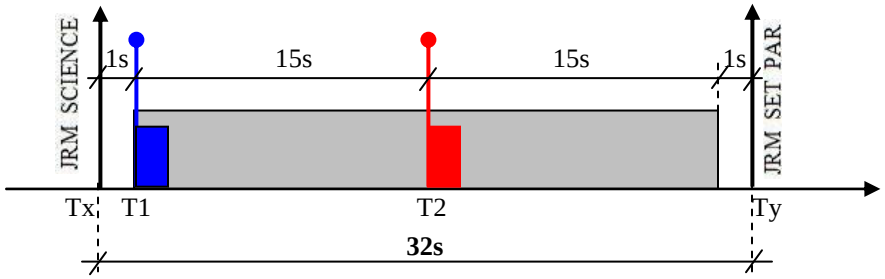

Fig. 4.1.2.1

4.1.2.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I1_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -57343
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 0
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:32 JRM_SET_PAR(74,0) # This Tc is just to simulate the next Tc
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.1.2.2 TEST NOTES

For two times consecutively the instrument has correctly executed the timeline. This same test has been also executed on 02-October-2014 and the Tc was rejected. With one second of margin between the end of the cycle and the subsequent Tele-Command (JRM_SET_PAR) the instrument operate at the limit, sometimes without rejecting the Tc, other times rejecting the Tc.
It would need to run the test several times in order to have a certain statistics of the events.

4.1.3 TEST_3(PROPERLY EXECUTED 2 TIMES)

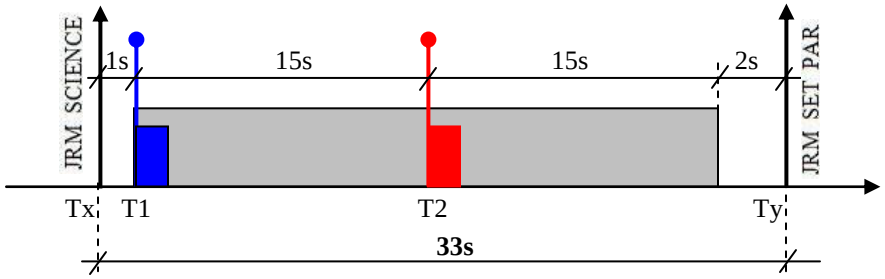

Fig. 4.1.3.1

4.1.3.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I1_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -57343
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 0
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:33 JRM_SET_PAR(74,0) # This Tc is just to simulate the next Tc
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.1.3.2 TEST NOTES

For two times consecutively the instrument has correctly executed the timeline. This same test has been also executed on 02-October-2014 and has failed. With two seconds of margin between the end of the cycle and the subsequent Tele-Command (JRM_SET_PAR) the instrument operate at the limit, , sometimes without rejecting the Tc, other times rejecting the Tc.
It would need to run the test several times in order to have a certain statistics of the events.

4.1.4 TEST_4 (PROPERLY EXECUTED 2 TIMES)

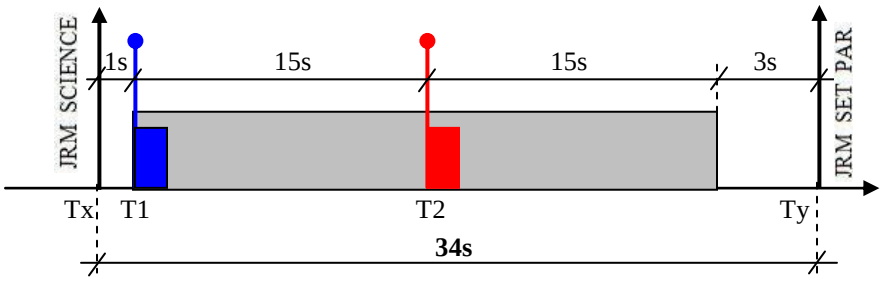

Fig. 4.1.4.1

4.1.4.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I1_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -57343
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 0
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:34 JRM_SET_PAR(74,0) # This Tc is just to simulate the next Tc
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.1.4.2 TEST NOTES

For two times consecutively the instrument has accepted the Tc. This same test has been also executed on 02-October-2014 and has never rejected the Tc.

With ACQ_DURATION = 30 sec, the minimum safe delay between the Tc JRM_SCIENCE and any other subsequent Tc is 34sec.

In General:

Safe_Time_Delay = ACQ_DURATION + 4sec

4.2 DEFINITION OF THE SECOND ACQUISITION, IN RELATION TO THE CYCLE DURATION AND EXPOSITION TIME.

4.2.1 TEST_5 (JIRAM EXECUTES THE DEFAULT ACQUISITION)

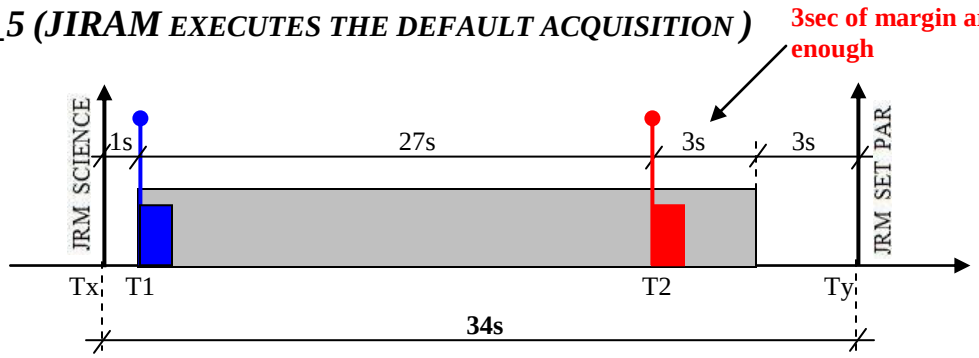

Fig. 4.2.1.1

4.2.1.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I1_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = 0
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = -11469(-36°)
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI")

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:34 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.2.1.2 TEST RESULT

The instrument has executed the default acquisition because the following relation was not verified:

If (NADIR_OFFSET_2<NADIR_OFFSET_1)

Relation_1

Max(S_EXP2+S_DELAY+ReadOut, I_EXP2+I_DELAY+ReadOut)+AcqMargin
<abs (NADIR_OFFSET_2-NADIR_OFFSET_1)/SpinRate

AND

Relation_2

Max(S_EXP_1+S_DELAY+ReadOut, I_EXP_1+I_DELAY+ReadOut)+AcqMargin
<(360-abs (NADIR_OFFSET_2-NADIR_OFFSET_1))/SpinRate

Where:

S/I_EXP2/1	= 1000 ms
S/I_DELAY	= 0 ms
ReadOut	= 1300 ms (time necessary to read the data)
AcqMargin	= 1600 ms (time necessary to process the data)
SpinRate	= 12deg/sec

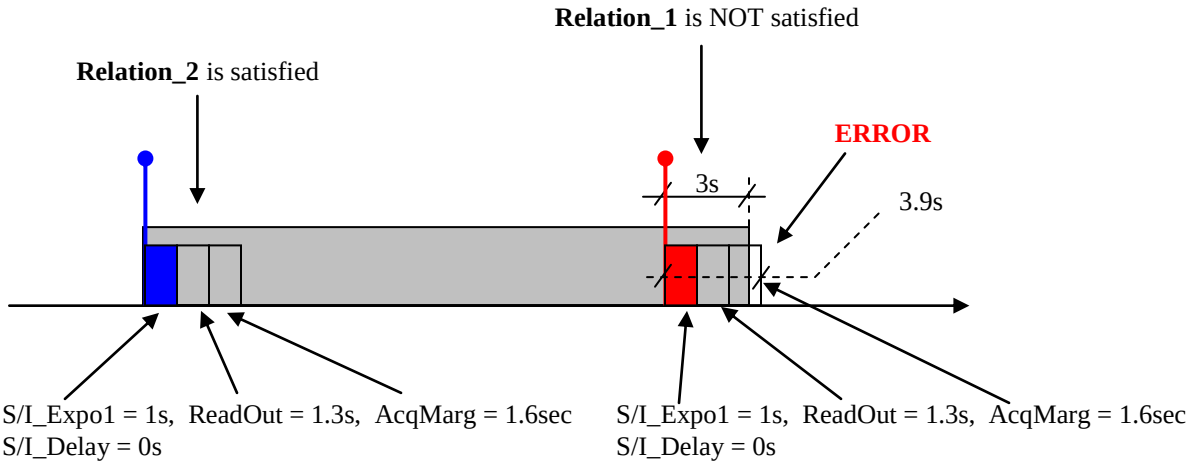

Fig. 4.2.1.1.1

4.2.2 TEST_6 (PROPERLY EXECUTED, BOUNDARY CASE)

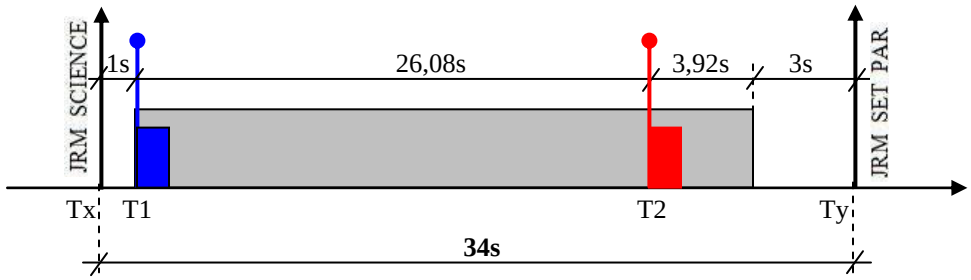

Fig. 4.2.2.1

4.2.2.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I1_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = 0
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = -14973 (-47°)
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI")

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:34 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.3 DEFINITION OF THE MINIMUM DELAY BETWEEN THE TWO ACQUISITIONS, IN RELATION TO THE EXPOSITION TIMES.

4.3.1 TEST_7 (THE INSTRUMENT HAS EXECUTED THE DEFAULT ACQUISITION)

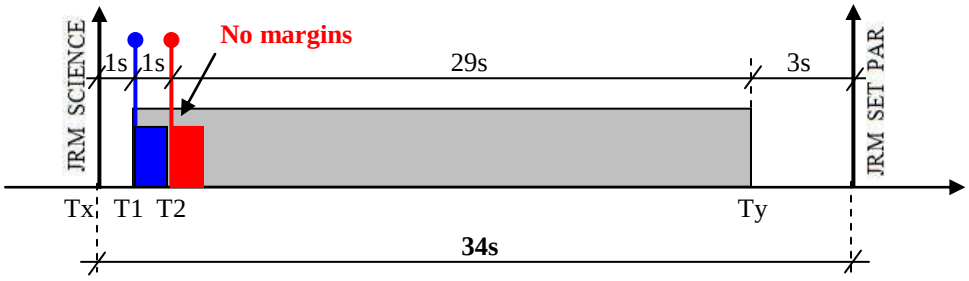

Fig. 4.3.1.1

4.3.1.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR(
                          01_SUB_MODE               = "I1_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = 0
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 3823(12°)
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI")

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:34 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.3.2 TEST_8 (THE INSTRUMENT HAS EXECUTED THE DEFAULT ACQUISITION)

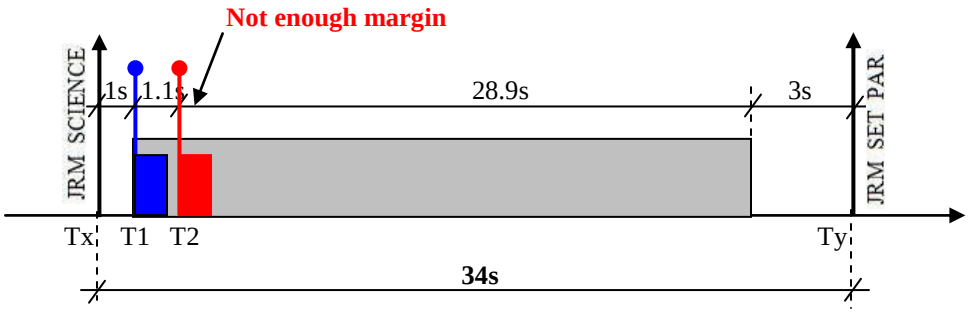

Fig. 4.3.2.1

4.3.2.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR(
                          01_SUB_MODE                = "I1_S1"
                          02_SP_ACQ_N                = 1
                          03_SP_ACQ_REPETITION       = 1
                          04_SP_BKG_REPETITION       = 0
                          05_SP_EN_DIS_COMP          = "IDIS_SDIS"
                          06_SP_SCI_LINK             = "HSSL"
                          07_SP_EN_DIS_SUB           = "ENABLE"
                          08_SP_BKG_RN               = "DARK"
                          09_SP_EN_DIS_DOUC_SCI      = "DISABLE"
                          10_SP_ACQ_DURATION         = 30
                          11_SP_NADIR_DELTA          = 0
                          12_SP_I_EXP_1              = 5000
                          13_SP_S_EXP_1              = 5000
                          14_SP_I_GAIN_1             = "LOW"
                          15_SP_S_GAIN_1             = "LOW"
                          16_SP_M_MODE_1             = "POINT"
                          17_SP_NADIR_OFFSET_1       = 0
                          18_SP_I_EXP_2              = 5000
                          19_SP_S_EXP_2              = 5000
                          20_SP_I_GAIN_2             = "LOW"
                          21_SP_S_GAIN_2             = "LOW"
                          22_SP_M_MODE_2             = "SPIN"
                          23_SP_NADIR_OFFSET_2       = 4205(13.2°)
                          24_SP_SUMMED_SCIENCE       = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:34 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.3.3 TEST_9(THE INSTRUMENT HAS EXECUTED THE DEFAULT ACQUISITION)

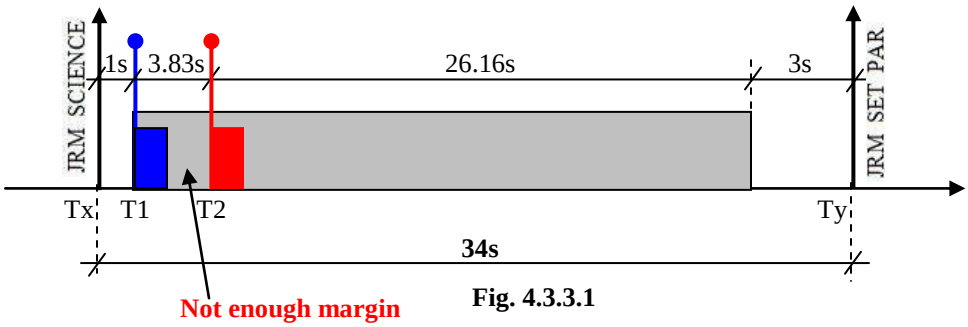

Fig. 4.3.3.1

4.3.3.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I1_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = 0
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 14655(46°)
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:34 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.3.4 TEST_10(PROPERLY EXECUTED, BOUNDARY CASE)

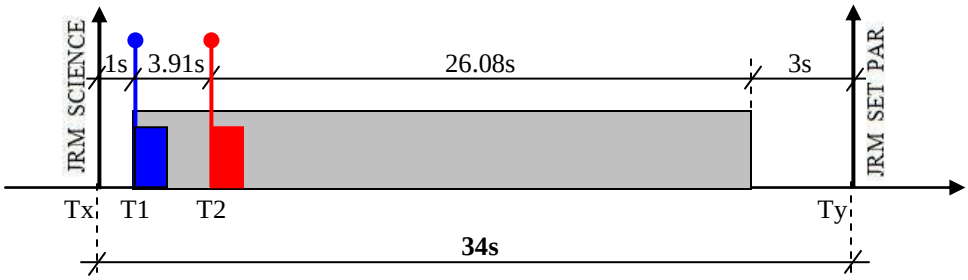

Fig. 4.3.4.1

4.3.4.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I1_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = 0
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 14655(+47°)
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:34 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.3.5 TEST_11(THE INSTRUMENT HAS EXECUTED THE DEFAULT ACQUISITION)

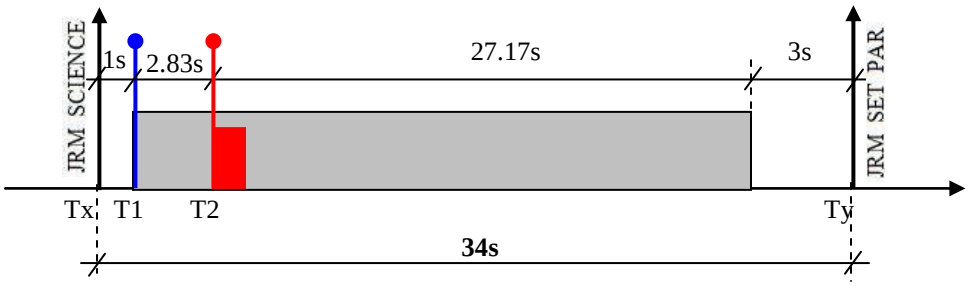

Fig. 4.3.5.1

4.3.5.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR(
                          01_SUB_MODE               = "I1_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "RN"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 0
                          13_SP_S_EXP_1             = 0
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = 0
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 10832 (34°)
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:34 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.3.6 TEST_12(PROPERLY EXECUTED, BOUNDARY CASE)

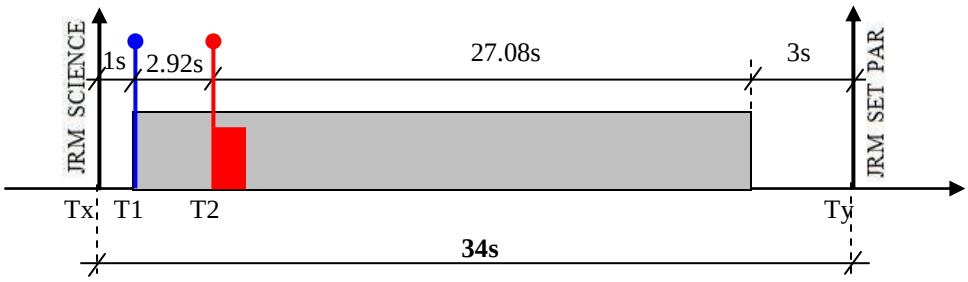

Fig. 4.3.6.1

4.3.6.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR(
                        01_SUB_MODE                 = "I1_S1"
                        02_SP_ACQ_N                 = 1
                        03_SP_ACQ_REPETITION        = 1
                        04_SP_BKG_REPETITION        = 0
                        05_SP_EN_DIS_COMP           = "IDIS_SDIS"
                        06_SP_SCI_LINK              = "HSSL"
                        07_SP_EN_DIS_SUB            = "ENABLE"
                        08_SP_BKG_RN                = "RN"
                        09_SP_EN_DIS_DOUC_SCI       = "DISABLE"
                        10_SP_ACQ_DURATION          = 30
                        11_SP_NADIR_DELTA           = 0
                        12_SP_I_EXP_1               = 0
                        13_SP_S_EXP_1               = 0
                        14_SP_I_GAIN_1              = "LOW"
                        15_SP_S_GAIN_1              = "LOW"
                        16_SP_M_MODE_1              = "POINT"
                        17_SP_NADIR_OFFSET_1        = 0
                        18_SP_I_EXP_2               = 5000
                        19_SP_S_EXP_2               = 5000
                        20_SP_I_GAIN_2              = "LOW"
                        21_SP_S_GAIN_2              = "LOW"
                        22_SP_M_MODE_2              = "SPIN"
                        23_SP_NADIR_OFFSET_2        = 10832 (35°)
                        24_SP_SUMMED_SCIENCE        = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:00:34 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.4 SELEX-ES, ELECTRICAL MODEL DOUBLE SCIENCE TEST

4.4.1 TEST_13(JIRAM REJECTS THE TELE-COMMAND)

I2_S2, SPA_ACQ_N=3, ACQ_DURATION = 36, SP_NADIR_DELTA = 10°, SP_NADIR_OFFSET_1 = -180°, SP_NADIR_OFFSET_2 = 0°

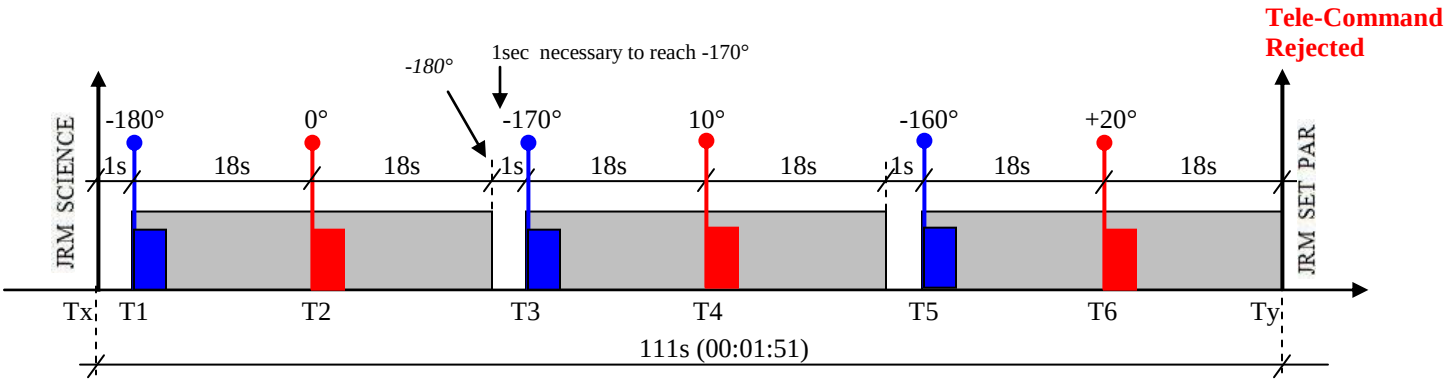

Fig. 4.4.1.1

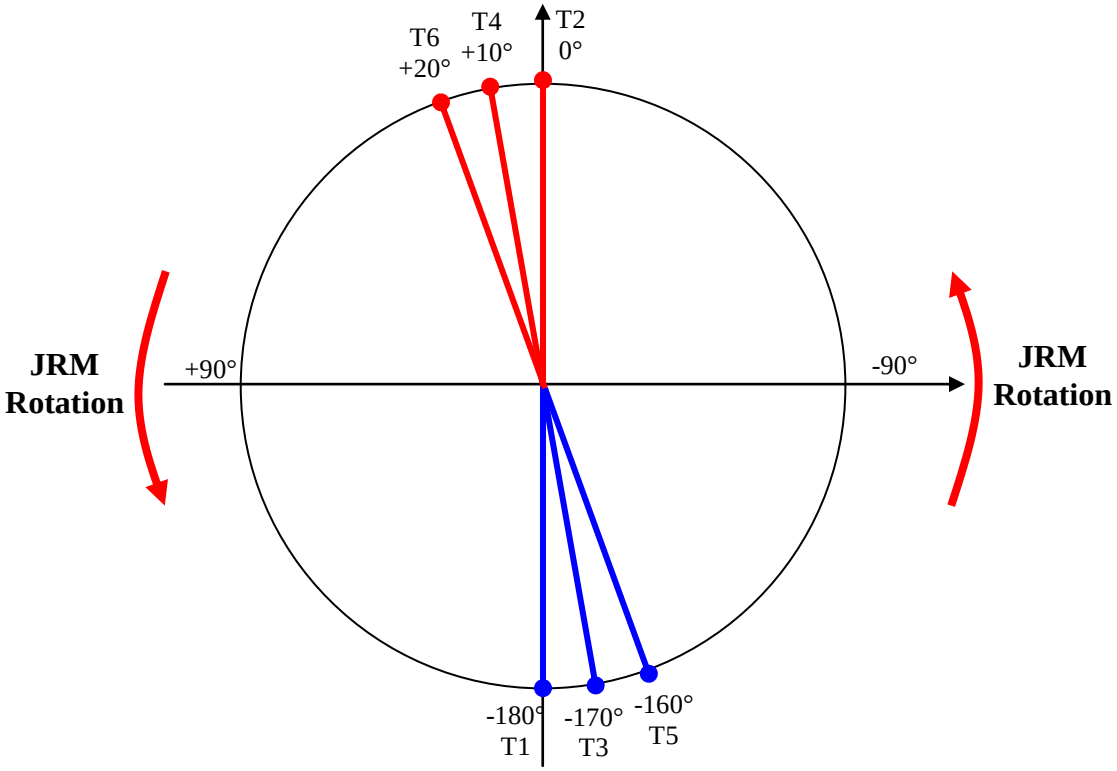

Fig. 4.4.1.2

This document was reviewed and approved for export, see Juno-Generic-14-002 and Juno-Generic-14-003.

4.4.1.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR(
                          01_SUB_MODE               = "I2_S2"
                          02_SP_ACQ_N               = 3
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "DISABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "ENABLE"
                          10_SP_ACQ_DURATION        = 36
                          11_SP_NADIR_DELTA         = 3186(10°)
                          12_SP_I_EXP_1             = 5000 (1s)
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -57343(-180°)
                          18_SP_I_EXP_2             = 5000 (1s)
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 0
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:01:51 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.4.2 TEST_14(JIRAM REJECTS THE TC)

I2_S2, SPA_ACQ_N=5, ACQ_DURATION = 36, SP_NADIR_DELTA = 10°, SP_NADIR_OFFSET_1 = -180°, SP_NADIR_OFFSET_2 = 0°

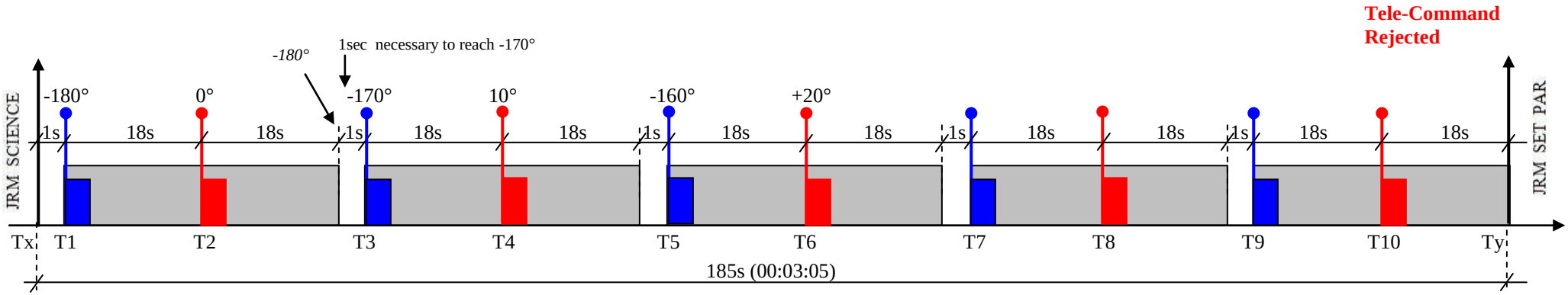

Fig. 4.4.2.1

This document was reviewed and approved for export, see Juno-Generic-14-002 and Juno-Generic-14-003.

4.4.2.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR(
                          01_SUB_MODE               = "I2_S2"
                          02_SP_ACQ_N               = 5
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "DISABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "ENABLE"
                          10_SP_ACQ_DURATION        = 36
                          11_SP_NADIR_DELTA         = 3186(10°)
                          12_SP_I_EXP_1             = 5000 (1s)
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -57343(-180°)
                          18_SP_I_EXP_2             = 5000 (1s)
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 0
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:03:05 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.4.3 TEST_15(PROPERLY EXECUTED)

I2_S2, SPA_ACQ_N=3, ACQ_DURATION = 36, SP_NADIR_DELTA = 10°, SP_NADIR_OFFSET_1 = -180°, SP_NADIR_OFFSET_2 = 0°

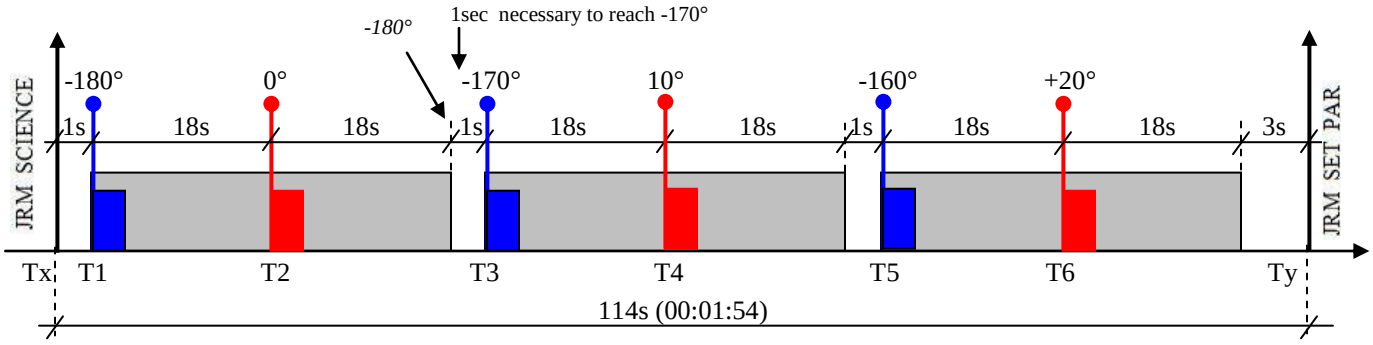

Fig. 4.4.3.1

4.4.3.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR(
                          01_SUB_MODE               = "I2_S2"
                          02_SP_ACQ_N               = 3
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "DISABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "ENABLE"
                          10_SP_ACQ_DURATION        = 36
                          11_SP_NADIR_DELTA         = 3186(10°)
                          12_SP_I_EXP_1             = 5000 (1s)
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -57343(-180°)
                          18_SP_I_EXP_2             = 5000 (1s)
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 0
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:01:54 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.4.4 TEST_16 (PROPERLY EXECUTED)

I2_S2, SPA_ACQ_N=3, ACQ_DURATION = 36, SP_NADIR_DELTA = 10°, SP_NADIR_OFFSET_1 = -180°, SP_NADIR_OFFSET_2 = -90°

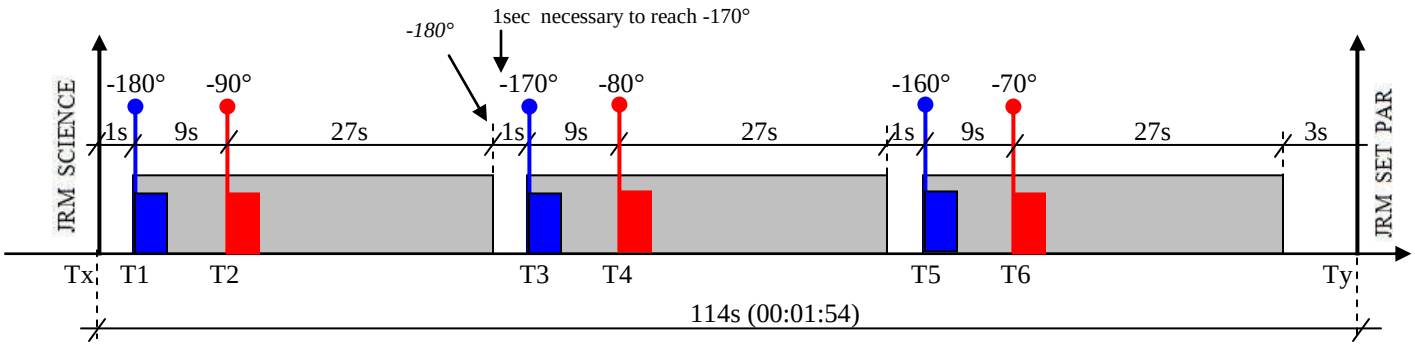

Fig. 4.4.4.1

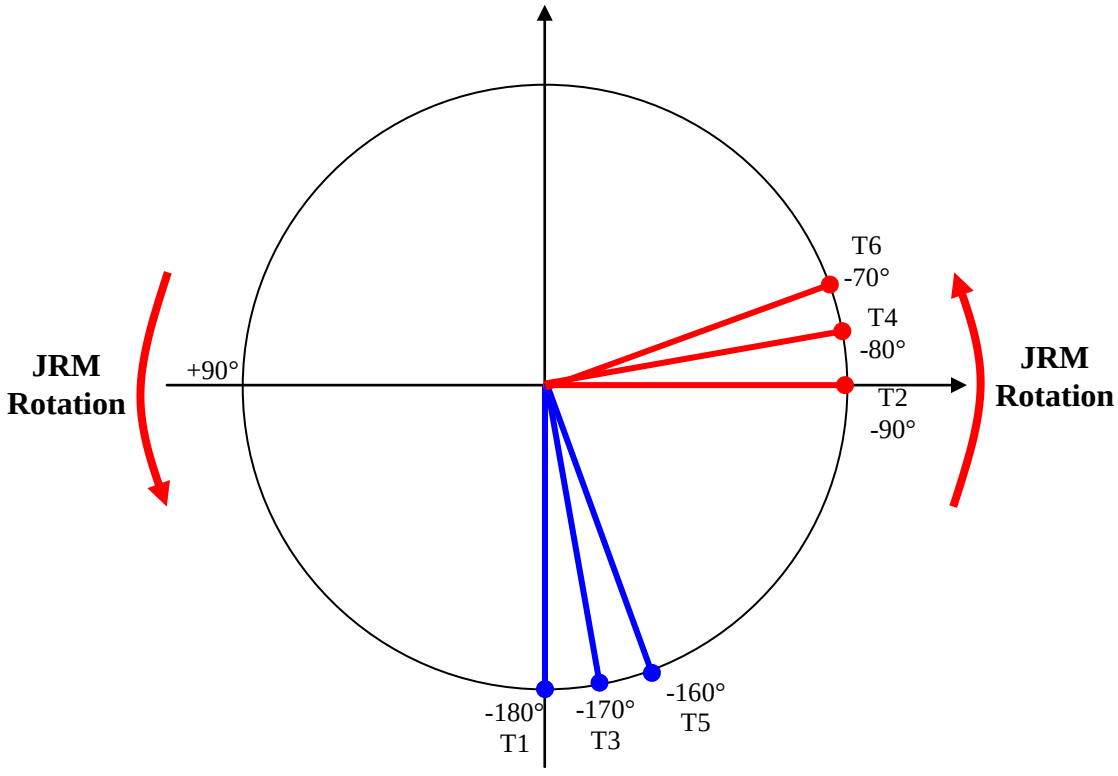

Fig. 4.4.4.2

4.4.4.1 EM SETTING

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR(
                          01_SUB_MODE                = "I2_S2"
                          02_SP_ACQ_N                = 3
                          03_SP_ACQ_REPETITION       = 1
                          04_SP_BKG_REPETITION       = 0
                          05_SP_EN_DIS_COMP          = "IDIS_SDIS"
                          06_SP_SCI_LINK             = "HSSL"
                          07_SP_EN_DIS_SUB           = "DISABLE"
                          08_SP_BKG_RN               = "DARK"
                          09_SP_EN_DIS_DOUC_SCI      = "ENABLE"
                          10_SP_ACQ_DURATION         = 36
                          11_SP_NADIR_DELTA          = 3186(10°)
                          12_SP_I_EXP_1              = 5000
                          13_SP_S_EXP_1              = 5000
                          14_SP_I_GAIN_1             = "LOW"
                          15_SP_S_GAIN_1             = "LOW"
                          16_SP_M_MODE_1             = "POINT"
                          17_SP_NADIR_OFFSET_1       = -57343(-180°)
                          18_SP_I_EXP_2              = 5000
                          19_SP_S_EXP_2              = 5000
                          20_SP_I_GAIN_2             = "LOW"
                          21_SP_S_GAIN_2             = "LOW"
                          22_SP_M_MODE_2             = "SPIN"
                          23_SP_NADIR_OFFSET_2       = -28672(-90°)
                          24_SP_SUMMED_SCIENCE       = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
Tx 00:00:04 JRM_SCIENCE
Ty 00:01:54 JRM_SET_PAR(74,0)
00:00:04 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.5 SELEX-ES, ELECTRICAL MODEL RADIATION SEQUENCE TESTS

4.5.1 TEST_17(PROPERLY EXECUTED)

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")

00:00:04 JRM_ERROR_LOG()
00:00:04 JRM_SET_PAR(92,153) # Mirror on calibration lamp(off)
00:00:04 JRM_SCI_PAR
                         01_SUB_MODE               = "I1_S1"
                         02_SP_ACQ_N               = 1
                         03_SP_ACQ_REPETITION      = 1
                         04_SP_BKG_REPETITION      = 0
                         05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                         06_SP_SCI_LINK            = "HSSL"
                         07_SP_EN_DIS_SUB          = "ENABLE"
                         08_SP_BKG_RN              = "RN"
                         09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                         10_SP_ACQ_DURATION        = 32
                         11_SP_NADIR_DELTA         = 0
                         12_SP_I_EXP_1             = 0
                         13_SP_S_EXP_1             = 0
                         14_SP_I_GAIN_1            = "LOW"
                         15_SP_S_GAIN_1            = "LOW"
                         16_SP_M_MODE_1            = "POINT"
                         17_SP_NADIR_OFFSET_1      = -28672(-90°)
                         18_SP_I_EXP_2             = 5000
                         19_SP_S_EXP_2             = 5000
                         20_SP_I_GAIN_2            = "LOW"
                         21_SP_S_GAIN_2            = "LOW"
                         22_SP_M_MODE_2            = "POINT"
                         23_SP_NADIR_OFFSET_2      = 0(0°)
                         24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
00:00:02 JRM_SCIENCE
00:00:50 JRM_SCI_PAR(
                         01_SUB_MODE               = "I1_S1"
                         02_SP_ACQ_N               = 1
                         03_SP_ACQ_REPETITION      = 1
                         04_SP_BKG_REPETITION      = 0
                         05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                         06_SP_SCI_LINK            = "HSSL"
                         07_SP_EN_DIS_SUB          = "ENABLE"
                         08_SP_BKG_RN              = "RN"
                         09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                         10_SP_ACQ_DURATION        = 32
                         11_SP_NADIR_DELTA         = 0
                         12_SP_I_EXP_1             = 0
                         13_SP_S_EXP_1             = 0
                         14_SP_I_GAIN_1            = "LOW"
                         15_SP_S_GAIN_1            = "LOW"
```

This document was reviewed and approved for export, see Juno-Generic-14-002 and Juno-Generic-14-003.

```
                              16_SP_M_MODE_1             = "POINT"
                              17_SP_NADIR_OFFSET_1       = 47787 (150°)
                              18_SP_I_EXP_2              = 5000
                              19_SP_S_EXP_2              = 5000
                              20_SP_I_GAIN_2             = "LOW"
                              21_SP_S_GAIN_2             = "LOW"
                              22_SP_M_MODE_2             = "POINT"
                              23_SP_NADIR_OFFSET_2       = -38229(-120°)
                              24_SP_SUMMED_SCIENCE       = "NO_SUMMED_SCI"

00:00:02 JRM_SCIENCE

00:00:50 JRM_SCI_PAR(
                              01_SUB_MODE                = "I1_S1"
                              02_SP_ACQ_N                = 1
                              03_SP_ACQ_REPETITION       = 1
                              04_SP_BKG_REPETITION       = 0
                              05_SP_EN_DIS_COMP          = "IDIS_SDIS"
                              06_SP_SCI_LINK             = "HSSL"
                              07_SP_EN_DIS_SUB           = "ENABLE"
                              08_SP_BKG_RN               = "RN"
                              09_SP_EN_DIS_DOUC_SCI      = "DISABLE"
                              10_SP_ACQ_DURATION         = 32
                              11_SP_NADIR_DELTA          = 0
                              12_SP_I_EXP_1              = 0
                              13_SP_S_EXP_1              = 0
                              14_SP_I_GAIN_1             = "LOW"
                              15_SP_S_GAIN_1             = "LOW"
                              16_SP_M_MODE_1             = "POINT"
                              17_SP_NADIR_OFFSET_1       = 9557 (30°)
                              18_SP_I_EXP_2              = 5000
                              19_SP_S_EXP_2              = 5000
                              20_SP_I_GAIN_2             = "LOW"
                              21_SP_S_GAIN_2             = "LOW"
                              22_SP_M_MODE_2             = "POINT"
                              23_SP_NADIR_OFFSET_2       = 38229(120°)
                              24_SP_SUMMED_SCIENCE       = "NO_SUMMED_SCI"

00:00:02 JRM_SCIENCE
00:00:50 JRM_STOP_HS_REC
00:00:04 JRM_SET_PAR(92,8174) # Mirror on default position
00:00:04 JRM_ERROR_LOG()
00:00:04 JIRAM_POWER_OFF
```

4.5.2 TEST_18(PROPERLY EXECUTED)

The aim of this test is to check the exact timing between Tele-Commands and science of acquisitions of the radiation sequence. In order to avoid wrong interpretation of the timing provided by the EM the following strategy has been adopted:

- Double Science Enabled .....Necessary in order to get have timing also of the first acquisition (RN).

- Operative Mode = I2S2 ..... Because I1S1 is not allowed in double science.

- All Exposure Time = 0s .....To be sure that the timing provided by the EM of the acquisition is the start time of the acquisition itself.

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_SET_PAR(111,2)
00:00:04 JRM_STANDBY("ON","ON","ON")

00:00:04 JRM_ERROR_LOG()
00:00:04 JRM_SET_PAR(92,153) # Mirror on calibration lamp(off)
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I2_S2"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "DISABLE"
                          08_SP_BKG_RN              = "RN"
                          09_SP_EN_DIS_DOUC_SCI     = "ENABLE"
                          10_SP_ACQ_DURATION        = 32
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 0
                          13_SP_S_EXP_1             = 0
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -28672(-90°)
                          18_SP_I_EXP_2             = 0
                          19_SP_S_EXP_2             = 0
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "POINT"
                          23_SP_NADIR_OFFSET_2      = 0(0°)
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"


00:00:04 JRM_START_HS_REC
00:00:02 JRM_SCIENCE
```

This document was reviewed and approved for export, see Juno-Generic-14-002 and Juno-Generic-14-003.

```
00:00:50 JRM_SCI_PAR(
                        01_SUB_MODE               = "I2_S2"
                        02_SP_ACQ_N               = 1
                        03_SP_ACQ_REPETITION      = 1
                        04_SP_BKG_REPETITION      = 0
                        05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                        06_SP_SCI_LINK            = "HSSL"
                        07_SP_EN_DIS_SUB          = "DISABLE"
                        08_SP_BKG_RN              = "RN"
                        09_SP_EN_DIS_DOUC_SCI     = "ENABLE"
                        10_SP_ACQ_DURATION        = 32
                        11_SP_NADIR_DELTA         = 0
                        12_SP_I_EXP_1             = 0
                        13_SP_S_EXP_1             = 0
                        14_SP_I_GAIN_1            = "LOW"
                        15_SP_S_GAIN_1            = "LOW"
                        16_SP_M_MODE_1            = "POINT"
                        17_SP_NADIR_OFFSET_1      = 47787 (150°)
                        18_SP_I_EXP_2             = 0
                        19_SP_S_EXP_2             = 0
                        20_SP_I_GAIN_2            = "LOW"
                        21_SP_S_GAIN_2            = "LOW"
                        22_SP_M_MODE_2            = "POINT"
                        23_SP_NADIR_OFFSET_2      = -38229(-120°)
                        24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:02 JRM_SCIENCE

00:00:50 JRM_SCI_PAR(
                        01_SUB_MODE               = "I2_S2"
                        02_SP_ACQ_N               = 1
                        03_SP_ACQ_REPETITION      = 1
                        04_SP_BKG_REPETITION      = 0
                        05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                        06_SP_SCI_LINK            = "HSSL"
                        07_SP_EN_DIS_SUB          = "DISABLE"
                        08_SP_BKG_RN              = "RN"
                        09_SP_EN_DIS_DOUC_SCI     = "ENABLE"
                        10_SP_ACQ_DURATION        = 32
                        11_SP_NADIR_DELTA         = 0
                        12_SP_I_EXP_1             = 0
                        13_SP_S_EXP_1             = 0
                        14_SP_I_GAIN_1            = "LOW"
                        15_SP_S_GAIN_1            = "LOW"
                        16_SP_M_MODE_1            = "POINT"
                        17_SP_NADIR_OFFSET_1      = 9557 (30°)
                        18_SP_I_EXP_2             = 0
                        19_SP_S_EXP_2             = 0
                        20_SP_I_GAIN_2            = "LOW"
                        21_SP_S_GAIN_2            = "LOW"
                        22_SP_M_MODE_2            = "POINT"
                        23_SP_NADIR_OFFSET_2      = 38229(120°)
                        24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"
```

This document was reviewed and approved for export, see Juno-Generic-14-002 and Juno-Generic-14-003.

```
00:00:02 JRM_SCIENCE
00:00:50 JRM_STOP_HS_REC
00:00:04 JRM_SET_PAR(92,8174) # Mirror on default position
00:00:04 JRM_ERROR_LOG()
00:00:04 JIRAM_POWER_OFF
```

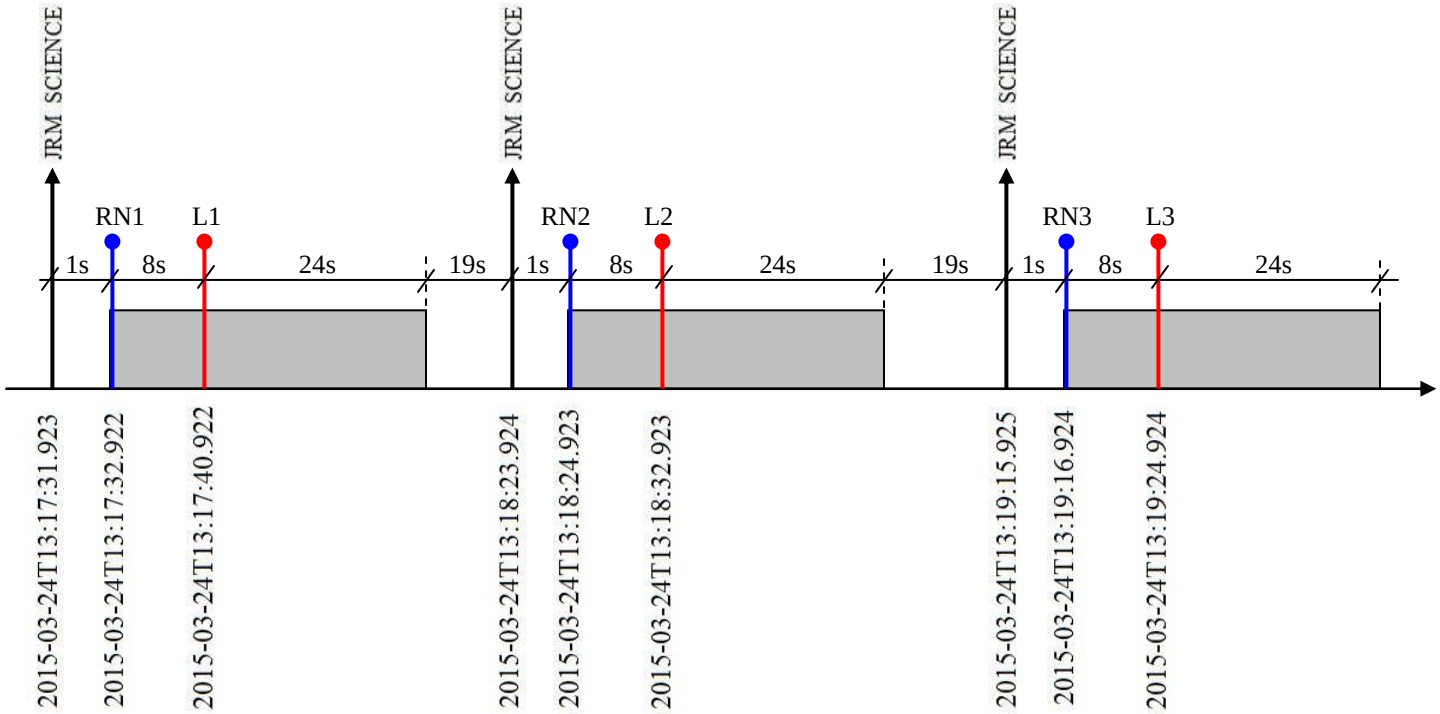

Fig. 4.5.2.1

4.6 SELEX-ES, TELE-COMMAND REJECTION TESTS

4.6.1 TEST_19 (GENERIC TELE-COMMAND IN A WRONG INSTRUMENT STATE)

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I1_S0"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000 (1sec)
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -57343 (-180°)
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 0
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
00:00:04 JRM_SCIENCE
00:00:20 JRM_SET_PAR(74,0) This Tele-Command is rejected
00:00:15 JRM_STOP_HS_REC
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I0_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000 (1sec)
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -57343 (-180°)
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
```

```
                              20_SP_I_GAIN_2            = "LOW"
                              21_SP_S_GAIN_2            = "LOW"
                              22_SP_M_MODE_2            = "SPIN"
                              23_SP_NADIR_OFFSET_2      = 0
                              24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"


00:00:04 JRM_START_HS_REC
00:00:04 JRM_SCIENCE
00:00:35 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.6.1.1 TEST RESULT

The Tele-Command JRM_SET_PAR(74,0) highlighted in red in the timeline, is rejected because the instrument was in SCINECE and not in STBY state. However the Image of the operative mode (I1_S0) has been executed and the Spectrum of the operative mode (I0_S1) has been executed as well.

Concluding: The bad configuration of the timeline (Tele-Command in a wrong position within the timeline) has the only effect of rejecting the bad Tele-Command itself, all the rest will be correctly executed, let's say that it is like it was never there. Of course if the aim of the bad Tele-Command was for example, to change the onboard configuration for a different setting of the Science parameter, this new configuration will be never loaded and the instrument will go ahead with the configuration present before the bad Tele-Command.

This document was reviewed and approved for export, see Juno-Generic-14-002 and Juno-Generic-14-003.

4.6.2 TEST_20 (JRM_STBY FORCED TO BE EXECUTED IN STBY STATE)

```
00:00:00 JIRAM_POWER_ON
00:02:43 JRM_STANDBY("ON","ON","ON")
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I1_S0"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000 (1sec)
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -57343 (-180°)
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
                          23_SP_NADIR_OFFSET_2      = 0
                          24_SP_SUMMED_SCIENCE      = "NO_SUMMED_SCI"

00:00:04 JRM_START_HS_REC
00:00:04 JRM_SCIENCE
00:00:35 JRM_STOP_HS_REC
00:00:04 JRM_STANDBY("ON","ON","ON") This Tele-Command is rejected
00:00:04 JRM_SCI_PAR
                          01_SUB_MODE               = "I0_S1"
                          02_SP_ACQ_N               = 1
                          03_SP_ACQ_REPETITION      = 1
                          04_SP_BKG_REPETITION      = 0
                          05_SP_EN_DIS_COMP         = "IDIS_SDIS"
                          06_SP_SCI_LINK            = "HSSL"
                          07_SP_EN_DIS_SUB          = "ENABLE"
                          08_SP_BKG_RN              = "DARK"
                          09_SP_EN_DIS_DOUC_SCI     = "DISABLE"
                          10_SP_ACQ_DURATION        = 30
                          11_SP_NADIR_DELTA         = 0
                          12_SP_I_EXP_1             = 5000 (1sec)
                          13_SP_S_EXP_1             = 5000
                          14_SP_I_GAIN_1            = "LOW"
                          15_SP_S_GAIN_1            = "LOW"
                          16_SP_M_MODE_1            = "POINT"
                          17_SP_NADIR_OFFSET_1      = -57343 (-180°)
                          18_SP_I_EXP_2             = 5000
                          19_SP_S_EXP_2             = 5000
                          20_SP_I_GAIN_2            = "LOW"
                          21_SP_S_GAIN_2            = "LOW"
                          22_SP_M_MODE_2            = "SPIN"
```

```
                        23_SP_NADIR_OFFSET_2       = 0
                        24_SP_SUMMED_SCIENCE       = "NO_SUMMED_SCI"


00:00:04 JRM_START_HS_REC
00:00:04 JRM_SCIENCE
00:00:35 JRM_STOP_HS_REC
00:00:04 JRM_ERROR_LOG
00:00:04 JIRAM_POWER_OFF
```

4.6.2.1 TEST RESULT

The Tele-Command JRM_STBY highlighted in red in the timeline, is rejected because the instrument was already in STBY state, as expected.

Concluding: It is not allowed to execute the JRM_STBY Tele-Command if the instrument state is already STBY, let's say that it doesn't make any sense to force the instrument to go into STBY when the instrument is already in STBY. For the rest, the timeline was correctly executed: One Image from the operative mode (I1_S0) and One Spectrum from the operative mode (I0_S1).

This test has been requested, even if the result was jut clear, just to be sure that this configuration was wrong. This information has opened a new strategy that could be applied to the Radiation Tele-Command architecture.

5 RADIATION SEQUENCE DATA WORDS OF INTEREST

SETTABLE PARAMETERS OF INTEREST FOR THE RADIATION SEQUENCES

JIRAM Settable Parameters

Index	Mnemonic	Res. Unit	Range (DN)	Default (DN)	Description
	SCI MODE				
0	SP_SUBMODE	NA	See table 8.3.2	I1-S3	Type of acquisition
1	SP_ACQ_N	Acq.	1-65535	120	Number of acquisitions in the session
2	SP_ACQ_REPETITION	Revolutions	1-255	1	Number of SC revolutions between two acquisitions
3	SP_BKG_REPETITION	NA	0-50	10	Period of background acquisition Min=0; Max =50 Cases: 1) If it is set to 0 every JIRAM acquisition is a science acquisition 2) If it is set to 1 every JIRAM acquisition is a background acquisition 3) If it is set to 2 JIRAM performs the sequence: background acquisition science acquisition background acquisition science acquisition 4) If it is set to 3 JIRAM performs the sequence: background acquisition science acquisition science acquisition background acquisition science acquisition science acquisition
4	SP_EN_DIS_COMP	NA	0-3	0	Enable /disable compression for selected Spectral and Imaging submodes 0=IEN_SEN 1=IDIS_SEN 2=IEN_SDIS 3=IDIS_SDIS

JIRAM Settable Parameters

Index	Mnemonic	Res. Unit	Range (DN)	Default (DN)	Description
5	SP_SCI_LINK	NA	0-1	0	Link to send science data to SC. 0=HSSL, 1=LSSL Warning: the nominal link is HSSL, the LSSL can be selected as recovery action and it is valid only if SUB_MODE is: I2-S0 with compression I3-S0 with compression I0-S2 with compression I0-S3 with or without compression
6	SP_EN_DIS_SUB	NA	0-1	1	Enable/disable Background, Dark or ReadoutNoise subtraction. 1=EN 0=DIS If we are in double science this parameter must be set to 0
7	SP_BKG_RN	NA	0-2	2	Background, Dark or Readout Noise in Frame1. If we are in double science this parameter isn't checked. 0=BKG (background with the mirror pointed to SP94 position) 1=RN (acquisition with exposition time=0) 2=DARK (background with the mirror pointed to SP93 position)
8	SP_EN_DIS_DOU_SCI	NA	0-1	0	Enable \disable double science acquisition in the same revolution 0=DIS 1=EN
9	SP_ACQ_DURATION	1 sec	0,27-255	30	Acquisition Cycle duration 0 = use SC Dynamics Else Min=27; Max=255; MU=sec
10	SP_NADIR_DELTA	0.003138 951deg (optical)	0-3186 (0-10 opt. deg)	956 (3 opt. deg)	Nadir delta offset to be incremented each acquisition. This s a >=0 value
11	SP_I_EXP_1	0.2 ms	0-50000	10	Expo time for the imager frame 1
12	SP_I_GAIN_1	See RD3	0-1	0	Gain for the imager frame 1 0= LOW 1= HIGH
15	SP_NADIR_OFFSET_1	0.003138 951 deg (optical)	-/+57343 (-/+180 opt.deg)	-57343 (-180 opt.deg)	Offset to Nadir 1
16	SP_I_EXP_2	0.2 ms	0-50000	10	Expo time for the imager frame 2
17	SP_I_GAIN_2	See RD3	0-1	0	Gain for the imager frame 2 0= LOW 1= HIGH

JIRAM Settable Parameters

Index	Mnemonic	Res. Unit	Range (DN)	Default (DN)	Description
20	SP_NADIR_OFFSET_2	0.003138 951deg (optical)	-/+57343 (-/+180 opt. deg)	0 (0 opt. deg)	Offset to Nadir 2
22	SP_ACQ_MARGIN_TIME	1 msec	1000-2000	1600	Margin of time needed by FSW(following end of frames) for the elaborations
23	SP_SUMMED_SCIENCE		0-1	0	Enable\Disable the summed science mode 0=No summed science 1= Summed science If this field is set to 1 the SP_ACQ_N wil be set to a number multiple of 4 and SP_EN_DIS_DOU_SCI will be a "don't care" field. In this case the modes Ix-S0 won't be allowed.
25	SP_MOTOR_MODE_1	NA	0-1	0	Motor mode for the frame 1 (Off-Nadir acquisition) 0= POINT 1=DESPIN
26	SP_MOTOR_MODE_2	NA	0-1	1	Motor mode for the frame 2 (Off-Nadir acquisition) 0= POINT 1=DESPIN
	DETECTORS				
70	SP_I_VDETADJ	See RD3	0 – 4095	2194 (2700 mV)	Imaging detector polarization bias
73	SP_IR_STAB_TIME	ms	0-500	200	IR detectors stabilization time
74	SP_I_DELAY	0.2 ms	0-65535	0	Delay for the imager
76	SP_I_X_L_BAND	Pixel	0-6	2	X Coordinate of the first pixel for the imager L band
77	SP_I_Y_L_BAND	Pixel	0-7	1	Y Coordinate of the first pixel for the imager L band
78	SP_I_X_M_BAND	Pixel	0-6	2	X Coordinate of the first pixel for the imager M band
79	SP_I_Y_M_BAND	Pixel	135-142	139	Y Coordinate of the first pixel for the imager M band
82	SP_T_READOUT	msec	1000-2000	1300	IR Readout time
	MOTOR				
92	SP_MOTOR_BOSIGHT_POS	0.003138 951 deg (optical)	0-8190	8174 (+12.8 opt. deg)	Boresight position 0=-12.85714286 deg 8190=12.85086496 deg

TM_HS_SCIENCE OF INTEREST FOR THE RADIATION SEQUENCES

5.1.1 CR-2080 JIRAM_TM_HS_SCIENCE				
Function	**This packet provides the SCI and CAL data via HSSL (nominal)**			
Generation Rules	**Sent to HSSL any time and rate after SCI or CAL mode enter**			
DW (16 bits)	**Field**	**Size (bit)**	**Format**	**Description**
	PRIVATE HEADER			
01	ID	16	Uint16	See Table 8.2
02	LENGTH	16	Uint16	36932 (Maximum size)
03 04	SECONDS	32	Uint32	Datation of TM production time, second See 8.1 for description
05	SUBSECONDS	16	Uint16	Datation of TM production time, subsecond See 8.1 for description
06	COUNTER	16	Uint16	TM sequence counter
07 H	MODE	8	Uint8	Current Mode See Table 8.3.2
07 L	SUBMODE	8	Uint8	Current Submode See Table 8.3.2
	ACQ DATA			
08	ACQ_NUMBER	16	Uint16	Total number of acquisitions in the current session/sequence step Min=1; Max=65535
09	ACQ_COUNT	16	Uint16	Current acquisition number in the current session Min=1; Max= ACQ_NUMBER
10 H	ACQ_REPETITION	8	Uint8	Number of SC revolutions between two acquisitions Min=1; Max=255
10 L	ACQ_DURATION	8	Uint 8	Acquisition Cycle duration 0 = use SC Dynamics Else Min=27; Max=255; Res: 1DN= 1sec
11	SUBFRAME_NUMBER	16	Uint16	Total number of sub-frames for current acquisition phase Min=2; Max=6
12 bit 15-13	SUBFRAME_COUNT	3	Enum	Current sub-frame in the current acquisition Min=1; Max=6
12	DATATION	1	Enum	0=external (nominal)

bit 12				1=internal (recovery)
12 bit 11	WARN_DATATION_STEP	1	Enum	0= OK 1=Out of datation tolerance (same of ERROR #30, see table 8.3.3)
12 bit 10	FRAME_ERROR_FLAG	1	Enum	Flag used to signal there was a timeout error during the acquistion 0=ACQ OK 1=ACQ ERROR
12 bit 9-7	ACQ_TYPE	3	Enum	Type of acquisition 0 = Science 1 = Double Science Frame 1 2 = Double Science Frame 2 3 = Background 4= Dark 5= Readout noise
12 bit 6	CHANNEL_ID	1	Enum	Detector used for the current subframe 0 = Spectrum IR 1 = Image IR
12 bit 5-4	COMP_STATUS	2	Enum	Compression status of the current subframe 0 = Not compressed data 1 = Compressed data 2 = Not compressed data due to error
12 bit 3-2	SUBFRAME_TYPE	**2**	Enum	Type of subframe 0 = ImSubFrame = 128 x144 pixel 1 = SpSubFrameF = 128x112 pixel 2 = SpSubFrameM = 64x112 pixel 3 = SpSubFrameS = 16x112 pixel
12 bit 1-0	ROW_BACK_SUBTRACTION	2	Enum	RICE subtraction 0= Subtraction disabled 1= Background subtraction on
13 bit 15-12	START_NOISY_BITS	4	Uint4	It is the echo of SP_START_NOISY_BITS Set to 0 in case of compression error or not compressed data or JPG compression
13 bit 11-8	END_NOISY_BITS	4	Uint4	It is the echo of SP_END_NOISY_BITS Set to 0 in case of compression error or not compressed data or JPG compression
13 bit 3-0	NOF_NOISY_BITS	4	Uint4	Number of used noisy bits Set to 0 in case of compression error or not compressed data or JPG compression
16	TEXPO	16	Uint 16	Expo time for the used detector Min=0; Max=65535 ;Res=0.2msec ;
17	TDELAY	16	Uint 16	Delay time for the used detector Min=0 ;Max=65535; Res=0.2msec ;
	SCI DATA AND HK			
18 19	SECONDS	32	Uint32	Datation of science and HK acquisition time (when the command of start acquisition is sent to the internal IF), second

				See 8.1 for the description
20	SUBSECONDS	16	Uint16	Datation of science and HK acquisition time (when the command of start acquisition is sent to the internal IF),, subsecond See 8.1 for the description
21	NADIR_OFFSET	16	Iint16	Nadir offset angle (Deg/100) related to the current frame , calculated by the sw (For example NADIR_OFFSET_1 + NADIR_DELTA) Min=0; Max=57343; Res=0.003138951 deg (optical) NB: Used with the sign bit in the word 26 (bit 0) to generate negative angles.
22 Bit 15-8	BKG_REPETITION	8	Uint8	Period of Background acquisition Min=0; Max=50 Cases: 1) If it is set to 0 every JIRAM acquisition is a science acquisition 2) If it is set to 1 every JIRAM acquisition is a background acquisition 3) If it is set to 2 JIRAM performs the sequence: background acquisition science acquisition background acquisition science acquisition 4) If it is set to 3 JIRAM performs the sequence: background acquisition science acquisition science acquisition background acquisition science acquisition science acquisition
22 Bit 7-6	EN_DIS_SUB	2	Enum	Background subtraction enabled 0=EN 1=DIS
22 Bit 5-3	BKG_RN	3	Enum	Type of background 0=BKG (internal background, mirror in BKG position) 1=RN (readout noise, mirror in BOSIGHT position and Texpo=0) 2=DARK (external background, mirror in DARK position)
22 Bit 2-0	EN_DIS_DOU_SCI	3	Enum	Double Science Enabled 0=EN 1=DIS
24H	WIN2_X	8	Uint8	X coordinates of the IMG M band win, 0 in the case of SPE Min=0 Max 255 Res:1IDN=1pixel
24L	WIN2_Y	8	Uint8	Y coordinates of the IMG M band win, 0 in the case of SPE Min=0 Max 255 Res:1IDN=1pixel

25	DET_TEMP	16	Uint16	Temperature for the used detector Min=0; Max=16383; Res: 1DN=TBD K
26 bit 15-13	STATUS_DET	3	Enum	Detector status 0=OFF 1=ON
26 bit 12	STATUS_GAIN	1	Enum	Gain status for the detector 0=LOW 1=HIGH
26 bit 11	M_STATUS_LOOP_ERROR_FLAG	1	Enum	Motor control loop error flag 0=OK 1=ERROR
26 bit 10	M_STATUS_MOTOR_MODE	1	Enum	Despinning mode, acquired from FPA 0=POINT 1=DE-SPIN
26 bit 9	M_STATUS_MOTOR_POWER	1	Enum	Motor power status 0=Motor power off 1=Motor power on
26 bit 8	M_STATUS_ON_OFF	1	Enum	Motor status 0=Motor off 1=Motor on
26 Bit 7-1	Spare	7		
26 Bit 0	NADIR_OFFSET_SIGN	1	Enum	Field used to generate negative angles of Nadir Offset. Used with the word 21. 0= positive or 0 1=negative
27	S_TELESCOPE_MIRROR_TEMP	16	Uint16	Telescope mirror temperature Min=0; Max=16383; Res: See RD3
28	S_SLIT_TEMP	16	Uint16	Slit temperature Min=0; Max=16383; Res: See RD3
29	S_SC_IF_TEMP	16	Uint16	Interface with the S/C temperature Min=0; Max=16383; Res: See RD3
30	S_COLD_RADIATOR_TEMP	16	Uint16	Cold radiator temperature Min=0; Max=16383; Res: See RD3
31	S_SPECTROMETER_MIRROR_TEMP	16	Uint16	Window temperature Min=0; Max=16383; Res: See RD3
32	M_MOTOR_TS	16	Uint16	Motor temperature Min=0; Max=16383; Res: See RD3
33	M_CAL_SOURCE_TEMP	16	Uint16	Calibration sources temperature Min=0; Max=16383; Res: See RD3
34	M_DIFFUSER_CAL_TEMP	16	Uint16	Calibration diffuser temperature Min=0; Max=16383; See RD3