



12206 - Starburst-driven shocks and feedback in the near-IR at high resolution

Cycle: 18, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. Mark S. Westmoquette (PI) (ESA Member)	University College London (UCL)	msw@star.ucl.ac.uk
Dr. Linda J. Smith (CoI) (ESA Member)	Space Telescope Science Institute	lsmith@stsci.edu
Prof. John S. Gallagher III (CoI) (AdminUSPI)	University of Wisconsin - Madison	jsg@astro.wisc.edu
Dr. Daniela Calzetti (CoI)	University of Massachusetts	calzetti@astro.umass.edu
Mr. Sungryong Hong (CoI)	University of Massachusetts	shong@astro.umass.edu

VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) NGC-1140	WFC3/IR	2	13-Sep-2010 22:13:01.0	yes
05	(5) NGC-253	WFC3/IR	2	13-Sep-2010 22:13:09.0	yes
04	(3) NGC-2146	WFC3/IR	2	13-Sep-2010 22:13:17.0	yes
03	(2) NGC-5253	WFC3/IR	2	13-Sep-2010 22:13:24.0	yes
02	(4) NGC-1482	WFC3/IR WFC3/UVIS	3	13-Sep-2010 22:13:34.0	yes

11 Total Orbits Used

ABSTRACT

Starburst-driven feedback (both in terms of stellar and supernova activity) is one of the primary engines of galaxy evolution throughout the Universe. Yet, the theoretical foundation of mechanical feedback is, to date, unconstrained by observations. We propose to investigate this fundamental aspect

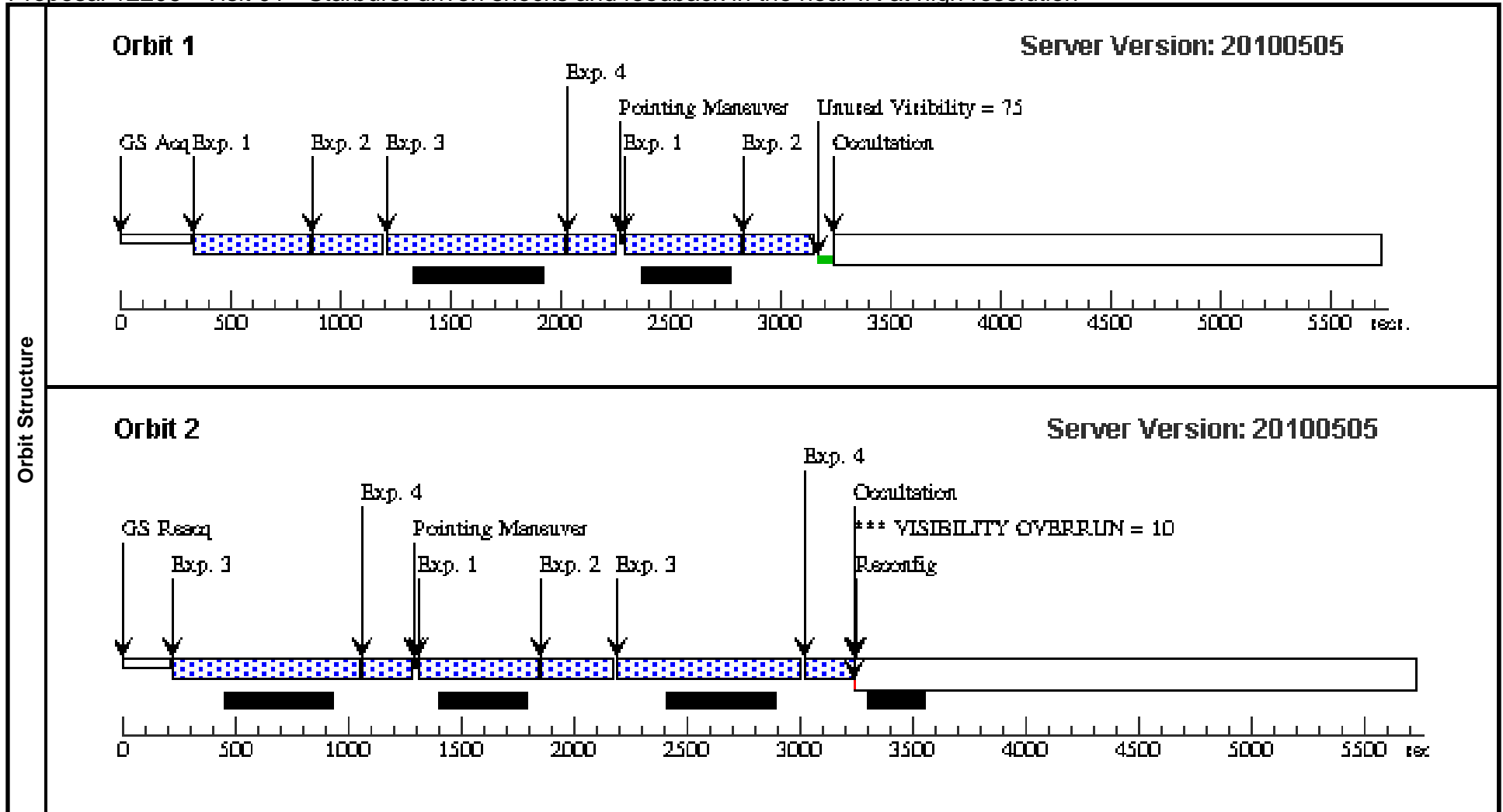
of star formation directly through near-IR narrow-band imaging of Pa-beta emission and the shock-excited [FeII] line in a small but representative sample of nearby (2.5-20 Mpc) starbursts with known H-alpha outflows. These data will allow us to [1] map, and provide a complete census of, the shocks inside and around the starburst regions, and relate these to the potential sources of shocks in the form of the young star-forming regions; [2] measure the supernova (SN) rate in combination with available radio data through calibrations of the [FeII] point-source luminosities, and relate this to the level of mechanical energy deposited by these SNe into the ISM; [3] investigate the relation between the shocked regions and the galaxy morphology, X-ray wind structure, and merger/interaction state, and hence study the conditions under which feedback morphs from a localised process to a galactic-scale phenomenon; [4] study what implications this has on our understanding of star formation histories, and the spatial evolution of star formation in these galaxies. The unprecedented angular resolution, sensitivity, and field-of-view of WFC3/IR is crucial for separating the spatially narrow shock fronts (~ 20 pc $\sim 0.1''$ at 20 Mpc) and for resolving individual SN remnants.

OBSERVING DESCRIPTION

Exposure times with the IR camera are 3x500s in F128N, 3x200s in F110W, 3x800s in F164N, and 3x300s in F160W for all galaxies except NGC1482. We use the IR-FIX aperture to place the centre of the galaxy near the centre of the IR camera to permit maximum spatial coverage given the unknown orient, and the need to cover the same regions as the previous WFPC2 and ACS imaging. A 3PT SPIRAL dither pattern (based on the WFC3-IR-DITHER-BOX-MIN preset) has been used to sample the point spread function with fractional pixel steps and enable CR and hot pixel rejection. The coords for NGC253 have been offset slightly from the nucleus towards the south-east in order that we cover more of the important southern outflow region.

For NGC 1482, we include exposures in the F657N and F621M filters with the UVIS camera and the UVIS-FIX aperture. The recessional velocity of NGC1482 places the Halpha line just on the red shoulder of the F657N filter where the transmission may be reduced to $\sim 70\%$ on the receding side of the galaxy. We have therefore decided to add a 4th F657N exposure to compensate for the reduced transmission and decrease the IR exposure times accordingly. In order to pack the orbits efficiently, we have had to split the F657N exposure times into 4 unequal lengths and make small dithers instead using manual POSTARG offsets. The NGC1482 exposure times are 3x400s in F128N, 3x200s in F110W, 3x700s in F164N, 3x300s in F160W, 3x200s in F621M, and 2246s in F657N.

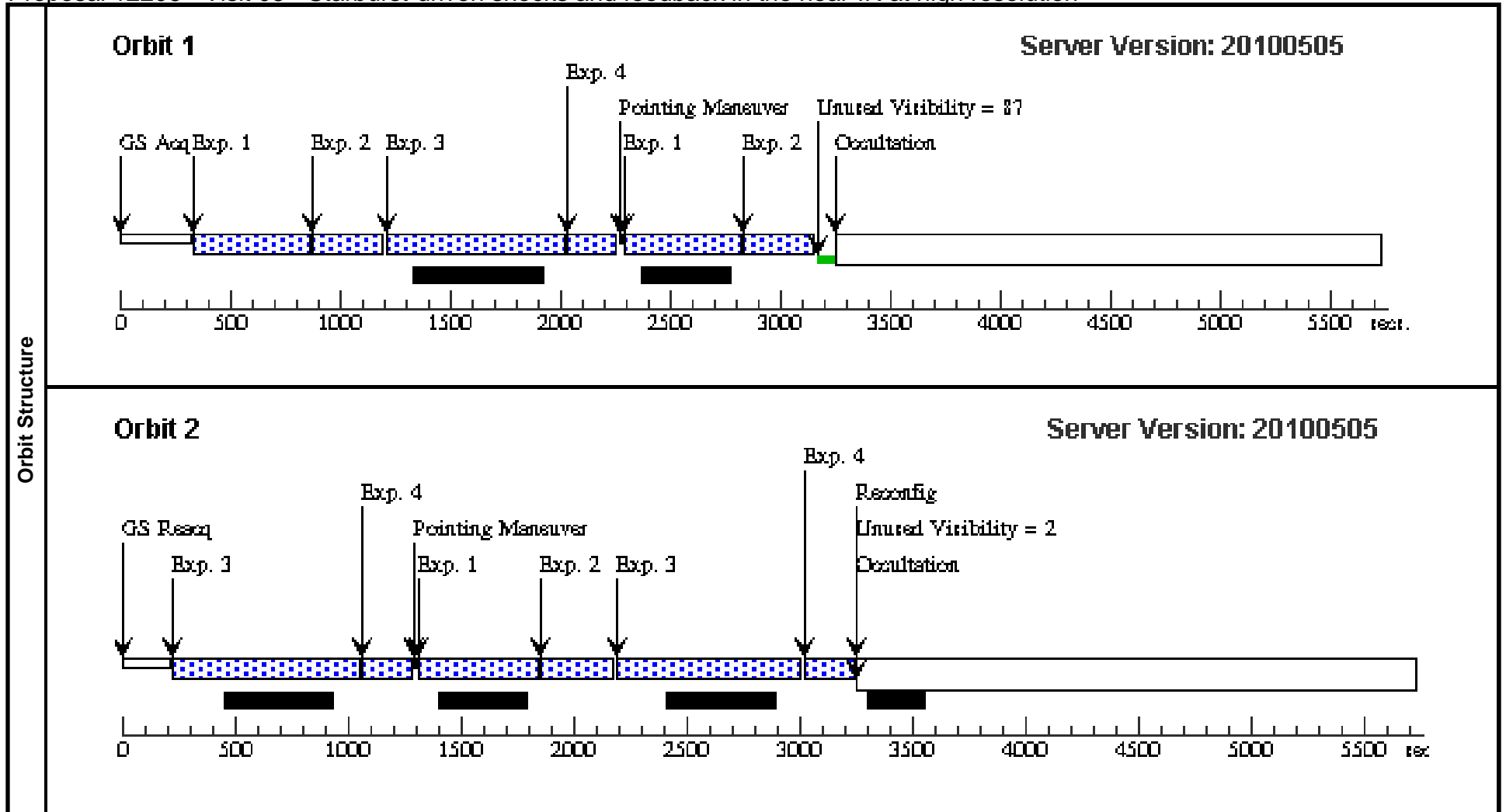
Visit	Proposal 12206, Visit 01, implementation Diagnostic Status: Warning Scientific Instruments: WFC3/IR Special Requirements: PCS MODE FINE <i>Comments: Target: NGC 1140</i>									
	(Visit 01) Warning (Orbit Planner): VISIBILITY OVERRUN									
Diagnosics										
Patterns	#	Primary Pattern	Secondary Pattern	Exposures						
	(1)	Pattern Type=WFC3-IR-DITHER- LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(1-4)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	NGC-1140	RA: 02 54 33.5800 (43.6399167d) Dec: -10 01 39.90 (-10.02775d) Equinox: J2000		V=12.49 J=11.3, H=10.6	Reference Frame: ICRS				
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	N1140 F128 N	(1) NGC-1140	WFC3/IR, MULTIACCUM, IR-FIX	F128N	NSAMP=11; SAMP-SEQ=STEP1 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1] [2]
	2	N1140 F160 W	(1) NGC-1140	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=9; SAMP-SEQ=STEP1 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1] [2]
	3	N1140 F164 N	(1) NGC-1140	WFC3/IR, MULTIACCUM, IR-FIX	F164N	NSAMP=11; SAMP-SEQ=STEP2 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1] [2]
	4	N1140 F110 W	(1) NGC-1140	WFC3/IR, MULTIACCUM, IR-FIX	F110W	NSAMP=8; SAMP-SEQ=STEP1 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1] [2]



Proposal 12206 - Visit 01 - Starburst-driven shocks and feedback in the near-IR at high resolution

Tue Sep 14 02:13:42 GMT 2010

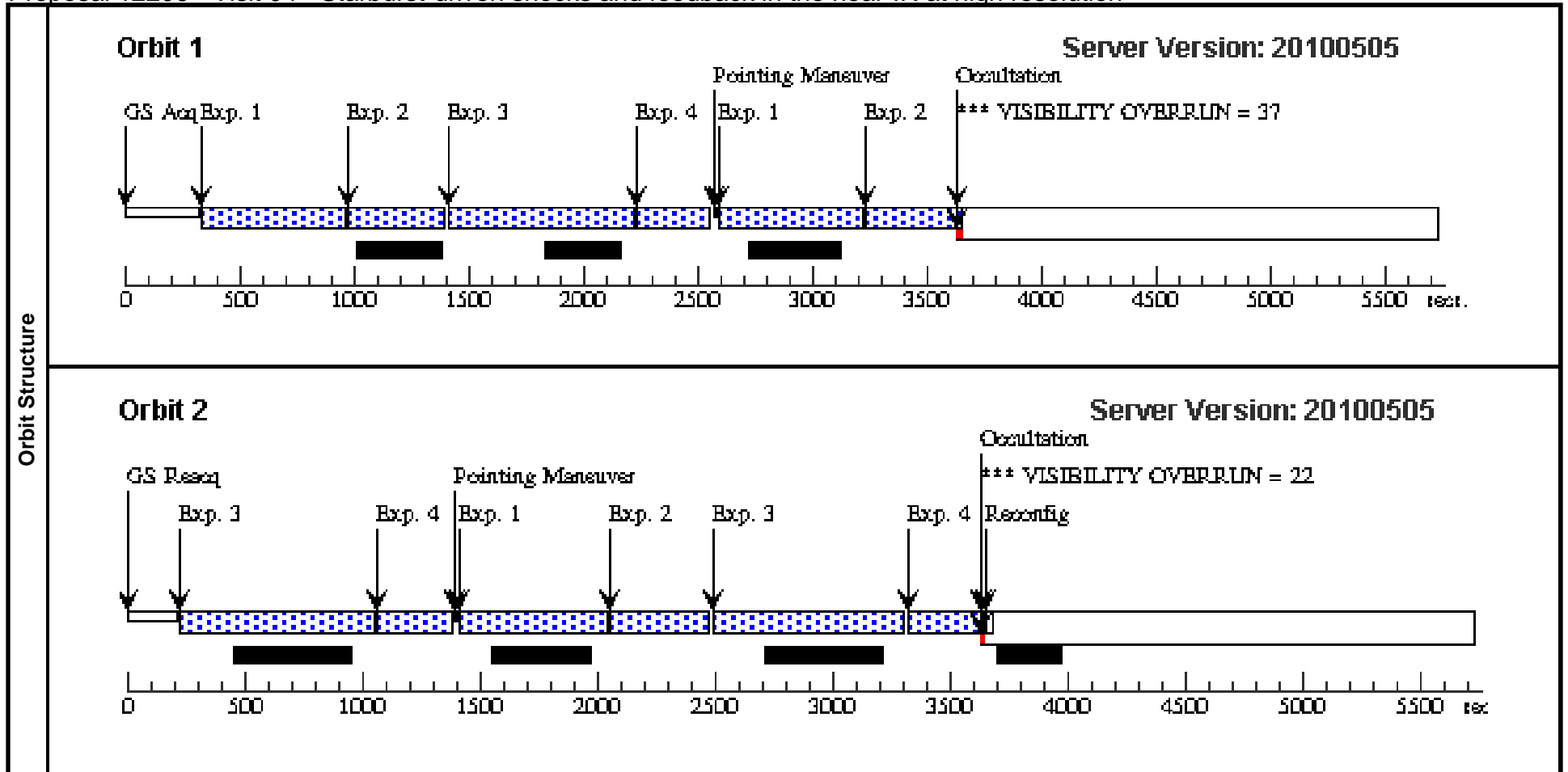
Visit	Proposal 12206, Visit 05, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: PCS MODE FINE Comments: Target: NGC 253									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(1)	Pattern Type=WFC3-IR-DITHER- LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(1-4)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(5)	NGC-253	RA: 00 47 33.6332 (11.8901383d) Dec: -25 17 25.94 (-25.29054d) Equinox: J2000		V=7.07 J=4.8, H=4.1	Reference Frame: ICRS				
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	N253 F128 N	(5) NGC-253	WFC3/IR, MULTIACCUM, IR-FIX	F128N	NSAMP=11; SAMP-SEQ=STEP1 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)]	[1]
									[==>(Pattern 2)]	[2]
									[==>(Pattern 3)]	[2]
	2	N253 F160 W	(5) NGC-253	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=9; SAMP-SEQ=STEP1 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)]	[1]
								[==>(Pattern 2)]	[2]	
								[==>(Pattern 3)]	[2]	
3	N253 F164 N	(5) NGC-253	WFC3/IR, MULTIACCUM, IR-FIX	F164N	NSAMP=11; SAMP-SEQ=STEP2 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)]	[1]	
								[==>(Pattern 2)]	[2]	
								[==>(Pattern 3)]	[2]	
4	N253 F110 W	(5) NGC-253	WFC3/IR, MULTIACCUM, IR-FIX	F110W	NSAMP=8; SAMP-SEQ=STEP1 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)]	[1]	
								[==>(Pattern 2)]	[2]	
								[==>(Pattern 3)]	[2]	



Proposal 12206 - Visit 05 - Starburst-driven shocks and feedback in the near-IR at high resolution

Tue Sep 14 02:13:43 GMT 2010

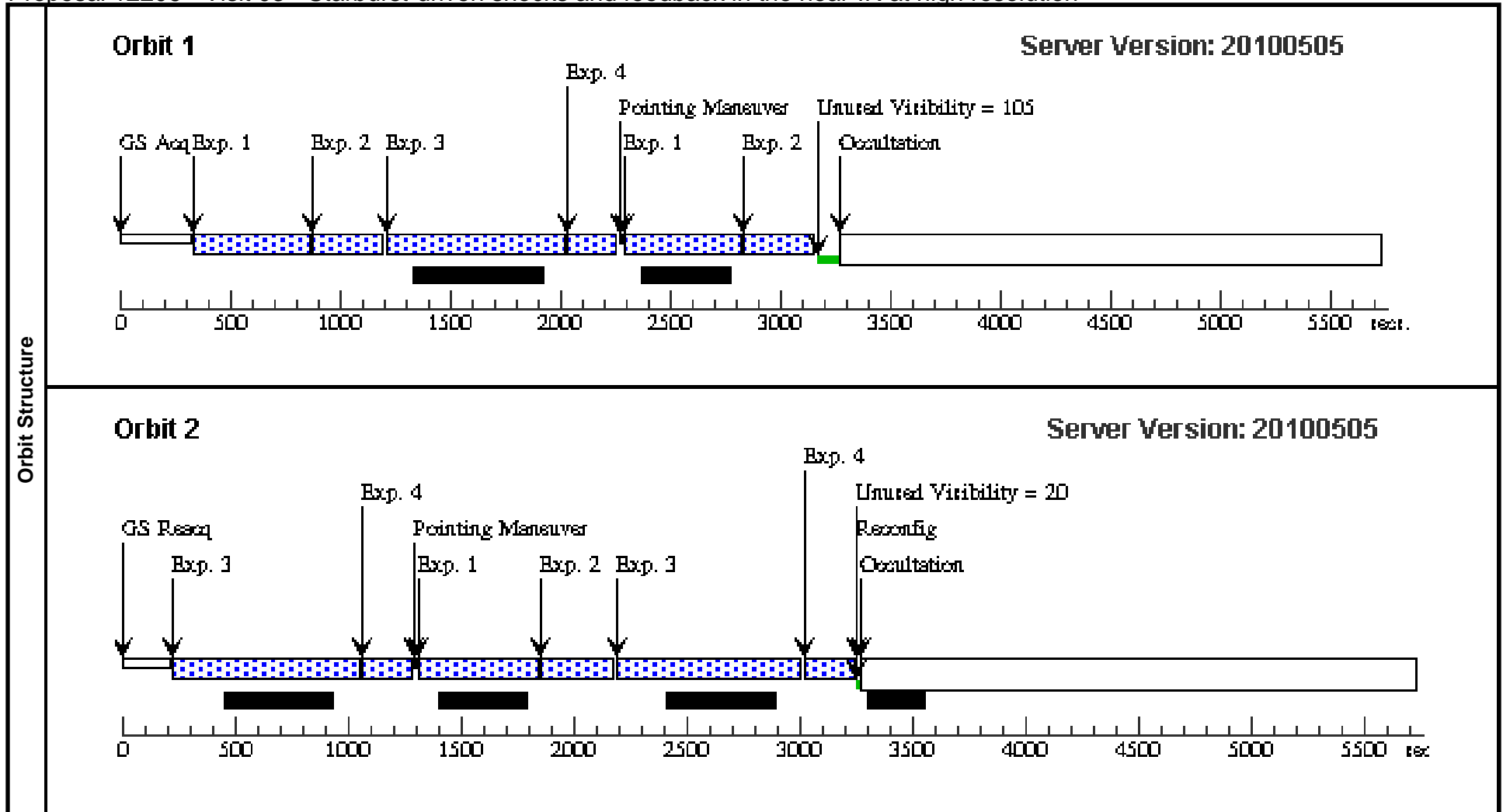
Visit	Proposal 12206, Visit 04, implementation Diagnostic Status: Warning Scientific Instruments: WFC3/IR Special Requirements: PCS MODE FINE <i>Comments: Target: NGC 2146</i>									
	(Visit 04) Warning (Orbit Planner): VISIBILITY OVERRUN (Visit 04) Warning (Orbit Planner): VISIBILITY OVERRUN									
Diagnosics										
Patterns	#	Primary Pattern	Secondary Pattern	Exposures						
	(1)	Pattern Type=WFC3-IR-DITHER- LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	(1-4)						
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	NGC-2146	RA: 06 18 37.7100 (94.6571250d) Dec: +78 21 25.30 (78.35703d) Equinox: J2000		V=10.59 J=8.2, H=7.4	Reference Frame: ICRS				
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	N2146 F128 N	(3) NGC-2146	WFC3/IR, MULTIACCUM, IR-FIX	F128N	NSAMP=12; SAMP-SEQ=STEP1 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1] [2]
	2	N2146 F160 W	(3) NGC-2146	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=10; SAMP-SEQ=STEP1 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1] [2]
	3	N2146 F164 N	(3) NGC-2146	WFC3/IR, MULTIACCUM, IR-FIX	F164N	NSAMP=11; SAMP-SEQ=STEP2 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1] [2]
	4	N2146 F110 W	(3) NGC-2146	WFC3/IR, MULTIACCUM, IR-FIX	F110W	NSAMP=9; SAMP-SEQ=STEP1 00		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1] [2]



Proposal 12206 - Visit 04 - Starburst-driven shocks and feedback in the near-IR at high resolution

Tue Sep 14 02:13:44 GMT 2010

Visit	Proposal 12206, Visit 03, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: PCS MODE FINE Comments: Target: NGC 5253									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
	(1)	Pattern Type=WFC3-IR-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(1-4)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	NGC-5253	RA: 13 39 55.9000 (204.9829167d) Dec: -31 38 24.00 (-31.64000d) Equinox: J2000		V=10.44 J=9.0, H=8.5	Reference Frame: ICRS				
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	N5253 F128 N	(2) NGC-5253	WFC3/IR, MULTIACCUM, IR-FIX	F128N	NSAMP=11; SAMP-SEQ=STEP100		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)]	[1]
									[==>(Pattern 2)]	[2]
									[==>(Pattern 3)]	[2]
	2	N5253 F160 W	(2) NGC-5253	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=9; SAMP-SEQ=STEP100		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)]	[1]
								[==>(Pattern 2)]	[2]	
								[==>(Pattern 3)]	[2]	
3	N5253 F164 N	(2) NGC-5253	WFC3/IR, MULTIACCUM, IR-FIX	F164N	NSAMP=11; SAMP-SEQ=STEP200		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)]	[1]	
								[==>(Pattern 2)]	[2]	
								[==>(Pattern 3)]	[2]	
4	N5253 F110 W	(2) NGC-5253	WFC3/IR, MULTIACCUM, IR-FIX	F110W	NSAMP=8; SAMP-SEQ=STEP100		Pattern 1, Exps 1-4 (1)	[==>(Pattern 1)]	[1]	
								[==>(Pattern 2)]	[2]	
								[==>(Pattern 3)]	[2]	



Proposal 12206 - Visit 03 - Starburst-driven shocks and feedback in the near-IR at high resolution

Tue Sep 14 02:13:45 GMT 2010

Visit	Proposal 12206, Visit 02, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR, WFC3/UVIS Special Requirements: (none) Comments: Target: NGC 1482 IR+ UVIS (F657N, F621M) observations					
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures	
	(1)	Pattern Type=WFC3-IR-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(8-11)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(4)	NGC-1482	RA: 03 54 38.9000 (58.6620833d) Dec: -20 30 8.10 (-20.50225d) Equinox: J2000		V=12.15 J=9.7, H=8.9	Reference Frame: ICRS
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.					

Proposal 12206 - Visit 03 - Starburst-driven shocks and feedback in the near-IR at high resolution

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	N1482 F621 M	(4) NGC-1482	WFC3/UVIS, ACCUM, UVIS-FIX	F621M		POS TARG -0.1782 9,-2.3939225		200 Secs [==>]	[1]
	2	N1482 F657 N	(4) NGC-1482	WFC3/UVIS, ACCUM, UVIS-FIX	F657N		POS TARG -0.1782 9,-2.3939225		236 Secs [==>]	[1]
	3	N1482 F657 N	(4) NGC-1482	WFC3/UVIS, ACCUM, UVIS-FIX	F657N		POS TARG 0,0		670 Secs [==>]	[1]
	4	N1482 F621 M	(4) NGC-1482	WFC3/UVIS, ACCUM, UVIS-FIX	F621M		POS TARG 0,0		200 Secs [==>]	[1]
	5	N1482 F657 N	(4) NGC-1482	WFC3/UVIS, ACCUM, UVIS-FIX	F657N		POS TARG 0.17829, 2.3939225		670 Secs [==>]	[1]
	6	N1482 F621 M	(4) NGC-1482	WFC3/UVIS, ACCUM, UVIS-FIX	F621M		POS TARG 0.17829, 2.3939225		200 Secs [==>]	[1]
	7	N1482 F657 N	(4) NGC-1482	WFC3/UVIS, ACCUM, UVIS-FIX	F657N		POS TARG 0.35658, 4.787844		770 Secs [==>]	[2]
	8	N1482 F128 N	(4) NGC-1482	WFC3/IR, MULTIACCUM, IR-FIX	F128N	NSAMP=12; SAMP-SEQ=STEP5 0		Pattern 1, Exps 8-11 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2] [3]
	9	N1482 F160 W	(4) NGC-1482	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=9; SAMP-SEQ=STEP1 00		Pattern 1, Exps 8-11 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2] [3]
10	N1482 F164 N	(4) NGC-1482	WFC3/IR, MULTIACCUM, IR-FIX	F164N	NSAMP=13; SAMP-SEQ=STEP1 00		Pattern 1, Exps 8-11 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2] [3]	
11	N1482 F110 W	(4) NGC-1482	WFC3/IR, MULTIACCUM, IR-FIX	F110W	NSAMP=8; SAMP-SEQ=STEP1 00		Pattern 1, Exps 8-11 (1)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2] [3]	

