
Strategy to Proceed to Next Phase
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Proceed to the Next Phase

- Activities:
  - Demonstrators and simulators
  - Reviews
  - Produce selection matrices
- Decisions on system components
- Prepare AA-low for SKA_1
- Meet the AIP requirements for AA-mid

Technical Focus

- AA-low element and array design
  - Wide bandwidth, grating lobe control, sensitivity
  - Single element with dual element fall-back
- Low noise amplifiers and matching
  - Ideally differential, single ended fall back
- Low Power
  - Critical throughout the electronic design
- AA-mid front end
  - Mechanical design of Tiles and inter-Tile
- Calibration
  - Essential to performance

Aperture Array Verification Systems

- AAVS
- Series of demonstration systems to prove the designs
  - AA-mid
  - AA-low
- Generally use common processing hardware
- Support multiple element/array options for evaluation

General AAVS Schedule

AA-low	Small element and array demonstrators	AAVS0	2011
	Technology demonstrator & costed sub-system design	AAVS1	2013
	SKA1 full pre-production prototype array	AAVS2	2015
	SKA1 manufacturing data package		2015
AA-mid	Individual tile demonstrators	AAVS0	2011
	Single array performance demonstrator	AAVS1	2013
	multi-array interferometer performance demonstrator	AAVS2	2016
	SKA1 capable costed design		2016
AA system	AA-low and AA-mid AA-CoDR		2011
	SKA2 technology roadmap & costed system design		2014

AA Demonstrators

		Array Scale	Site	Purpose & Comments
AAVS0 2011	AA-low	10-16 elements	Local to developers	Prove electromagnetic performance on full-size elements in small array. Multiple arrays to be built.
	AA-mid	~1m^2 tile	Test chambers	For ORA: prove concept and LNA interface For Vivaldi: refine array and manufacturing techniques
AAVS1 2013/4	AA-low	256-512 elements	Selected SKA site strongly preferred.	Single station to prove complete front-end including the LNA and analogue chain. Show actual T_{sys}, beam performance and time stability.
	AA-mid	256-512 clusters of ≥4 elements		Single station showing beam performance and the limits of analogue power requirements
AAVS2 2015/6	AA-low	~10,000 elements in a single and/or multiple arrays	Selected SKA site.	Pre-production system for SKA_1 AA-low system, testing the actual SKA_1 components. This provides essential input to the PRR. May be configured in one or multiple arrays as required.
	AA-mid	16 stations of 256-512 tiles of ≥4 elements		Multiple stations, similar to AAVS1, to show imaging performance. Final proving for SKA_2. Small numbers of beams for processing reasons.

Date	Milestone/Event	Remarks
Jan 2010	AAVP start	
Q1 2011	AAVS test requirements	Agree tests required of the AAVS
April 2011	**AA CoDR**	Aperture Array system, AA-low and AA-mid, CoDR
May 2011	AA-low front-end review	Review status of the alternative AA-low elements
Oct 2011	AA-low front-end performance appraisal	Select design(s) to take forward to AAVS1
Oct 2011	AA-mid front-end perf. appraisal	Select design(s) to take forward to AAVS1
Nov-Dec	AAVS0 completion and test	Testing small array test systems for AA-low and AA-mid
Dec 2011	AAVS1 digitisation & B/F design appraisal	Digital tile beamformer for AA-low and AA-mid
Dec 2011	AAVS1 CDR critical design review	Approve AAVS1
April 2012	AAVP final report for PrepSKA	Consolidated findings from the PrepSKA work
Q2 2012	***SKA site selection***	*For reference: performed internationally*
Q2 2012	AAVS1 PRR	Production readiness for a small AAVS system
Q3 2012	Start AAVS1 construction	Build AAVS1 on selected SKA site
Q4 2012	Start AAVS1 commissioning	Start test and evaluation process
Q1 2013	SKA1 Subsystem PDR	PDR for AA-low on SKA Phase 1
Q2 2013	AAVS2 PDR	
Q3 2013	AAVS2 CDR	Covers both AA-low and AA-mid
Q4 2014	AAVS2 PRR	This requires the availability of manufacturing information
2013-2014	AAVS-mid interferometer design &build	Detailed scheduling on AAVS TBD
2014	AAVS-mid reports	Report on performance including imaging for AA-mid
2013-2015	AA-low station build	SKA_1 AA-low pre-production manufacture
Q2 2015	AAVS2-mid PDR	Evaluate inclusion of AA-mid in SKA2
Q4 2015	SKA1 subsystem PRR	Approval review for AA-low build in SKA1

Decisions, decisions....

Most sub-systems: “just” design for the specification

AA-low

- Front-end
  - Single/dual element array
  - Array layout design
  - Element type
  - Regular tiles or individual elements
- Signal processing
  - Any analogue beamforming?
  - Location of digitisation
  - Beamform in clusters?

AA-mid

- Front-end
  - Element type
  - Element pitch
  - Single ended or differential LNA
- Signal processing
  - Amount of analogue beamforming
  - Data rate from Tile beamformer to Station Processor

Narrowing the options

There are multiple choices for some sub-systems – **Good**

Choosing the **"Best"** option:

1. **Remove options** when shown (demonstration or simulation) to not be capable of SKA performance e.g.:
   - Too expensive
   - Performance cannot be made adequate
   - Limited life etc.
2. Try not to remove options **unnecessarily early**
3. Use a **selection matrix** make final choices, agree criteria e.g.:
   - Cost
   - Scientific & technical performance
   - Upgradeability
   - Flexibility
   - Power
   - Availability
   - Experience
   - etc.

Principal design option decisions

- AA-low single or dual array *Q1 2013*
  - Decision before SKA_1 PDR
- AA-low antenna element *Q1 2013*
  - 3 current designs
  - Take forward viable ones to AAVS1
  - Decision coincident with single/dual array before SKA_1 PDR
- AA-mid element selection Q4 2014
  - Take forward viable designs through AAVS1
  - Decision prior to AAVS2 PRR
- Processing Architecture *Q1 2013*
  - AAVS0 & 1: not critical for hardware
  - Actual devices as late as possible
  - Decision before SKA_1 PDR

Suggest SKA_1 PDR Q3 2013 for AAV1 results

Management .....

.... over to Andre

Management Aspects

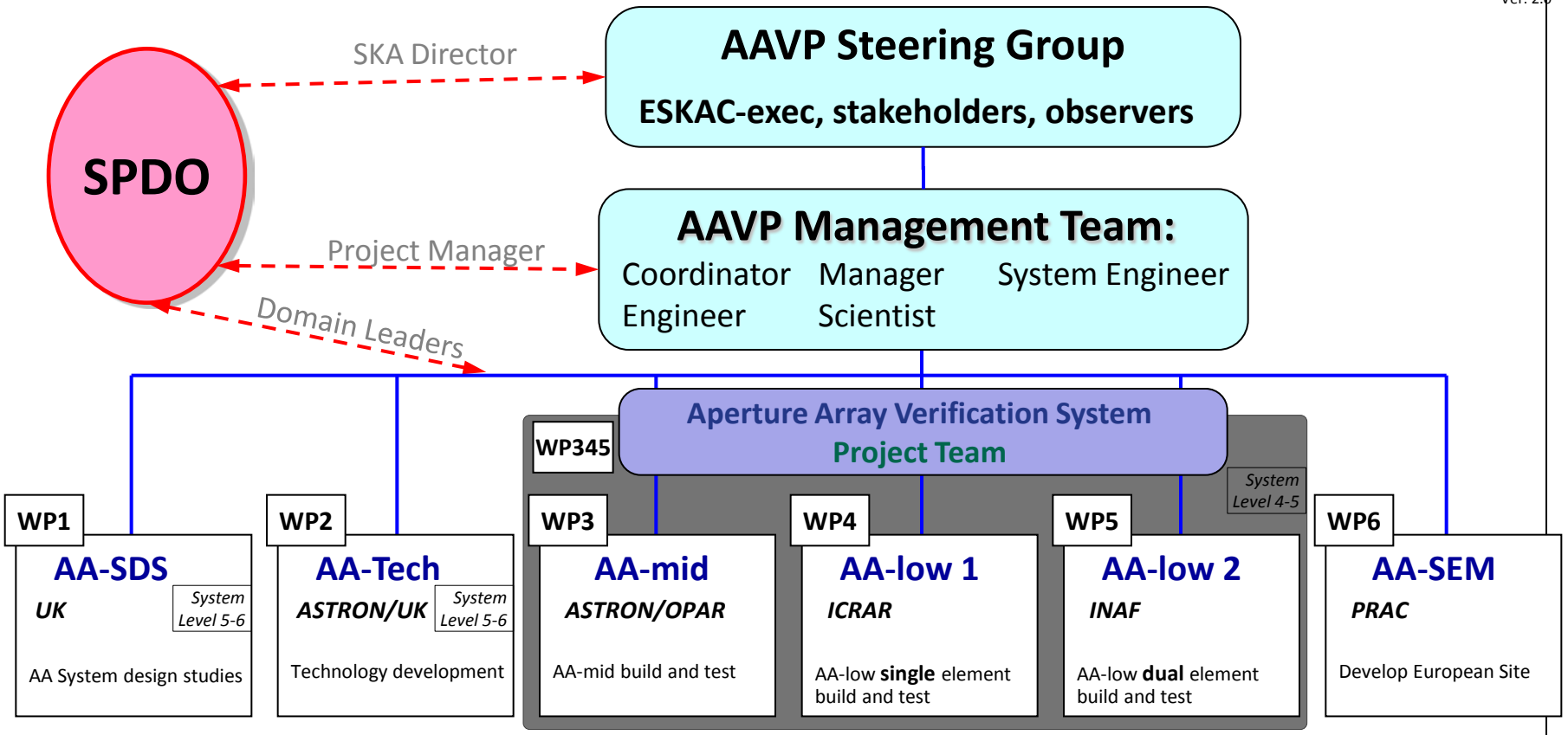
- Overview
  - Current AAVP Structure
  - Transition phase
  - Timeline for Aperture Arrays

Management: Current Structure

SKA-AAVP

AAVP Organisation

Ver. 2.0



Management: Current Structure

The AAVP Steering Group:

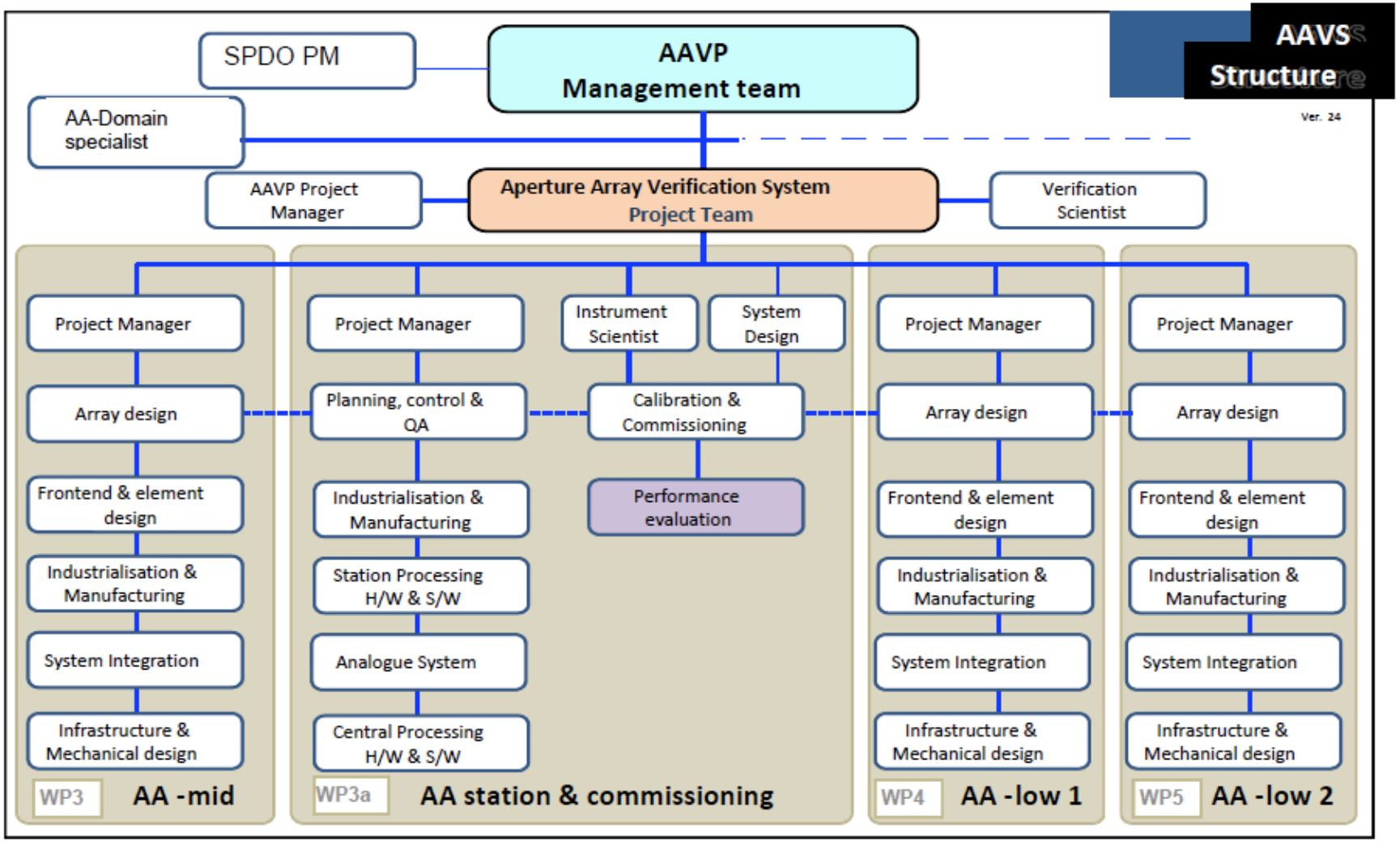
- Political and strategic orientation of the Project;
- The "Description of Work”.
- Annual validation of the realised progress in accordance to the DoW;
- Modifications to the “Description of Work at Work Package level”, including, but not limited to, decisions affecting the potential outcome of the programme.

Management: Current Structure

The AAVP Management Team:

- Monitor progress of the AAVP activities against the AAVP milestones as agreed by the APSG;
- Concerning the Description of Work:
  - prepare the programme of activities for the Description of Work;
  - make progress reports on the state of advancement of the Project to the APSG;
  - establish the Project Deliverables;
  - present the Project budget to the APSG
- Intellectual Property Register
- Risk Register
- Planning Schedule
- Prepare Reviews

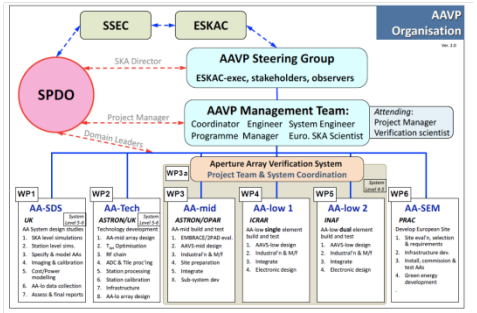
Management: Program Structure

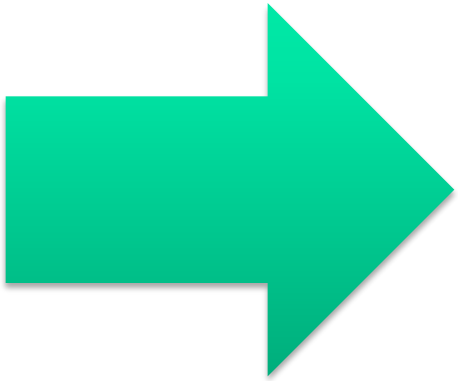


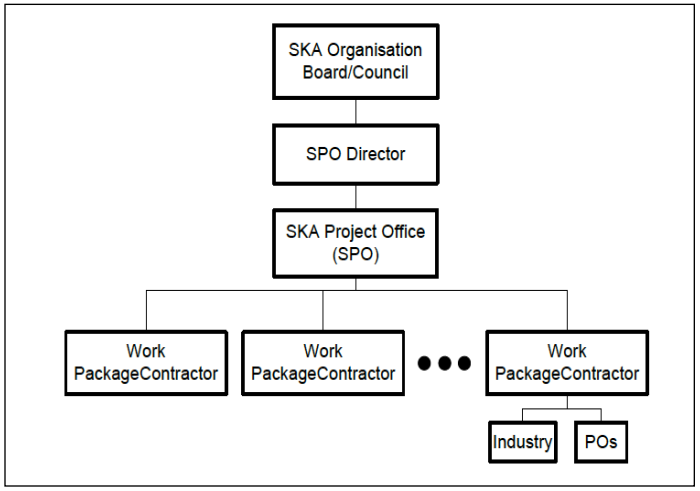
AA : Transition to SPO

- In the course of 2011 SPDO will evolve into a legal entity SPO
- According to the PEP the project governance will change
- For AAVP this means the transformation from a Program to a Work Package carried out by a consortium
- Process must be managed in a way that has minimal impact with the ongoing work
- A transition plan should be in place to guide this

Management: Transition

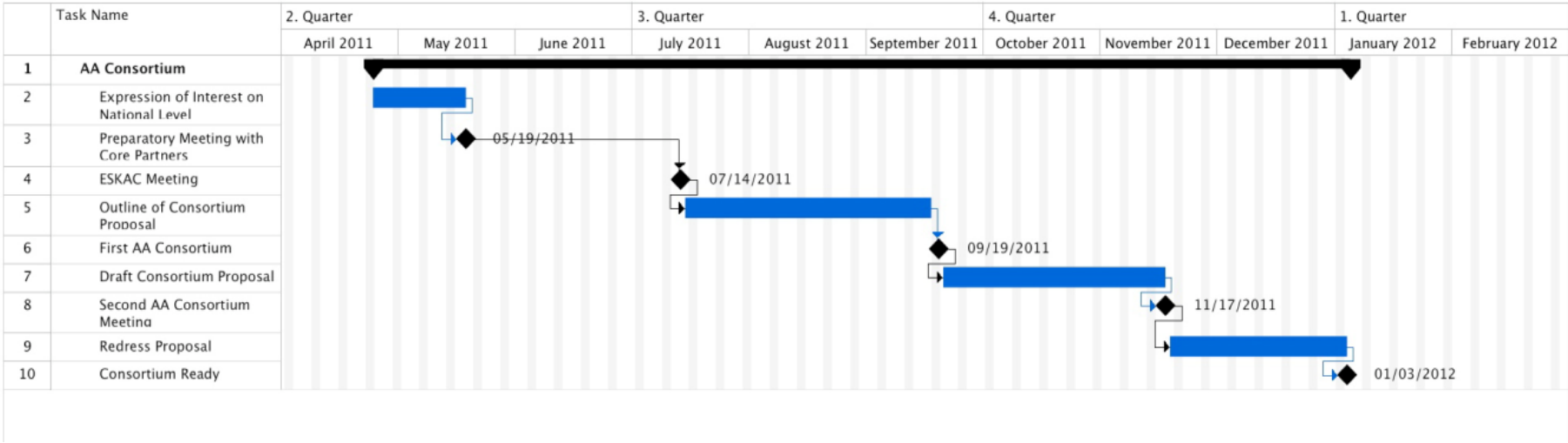






Management: Transition

Tentative Schedule



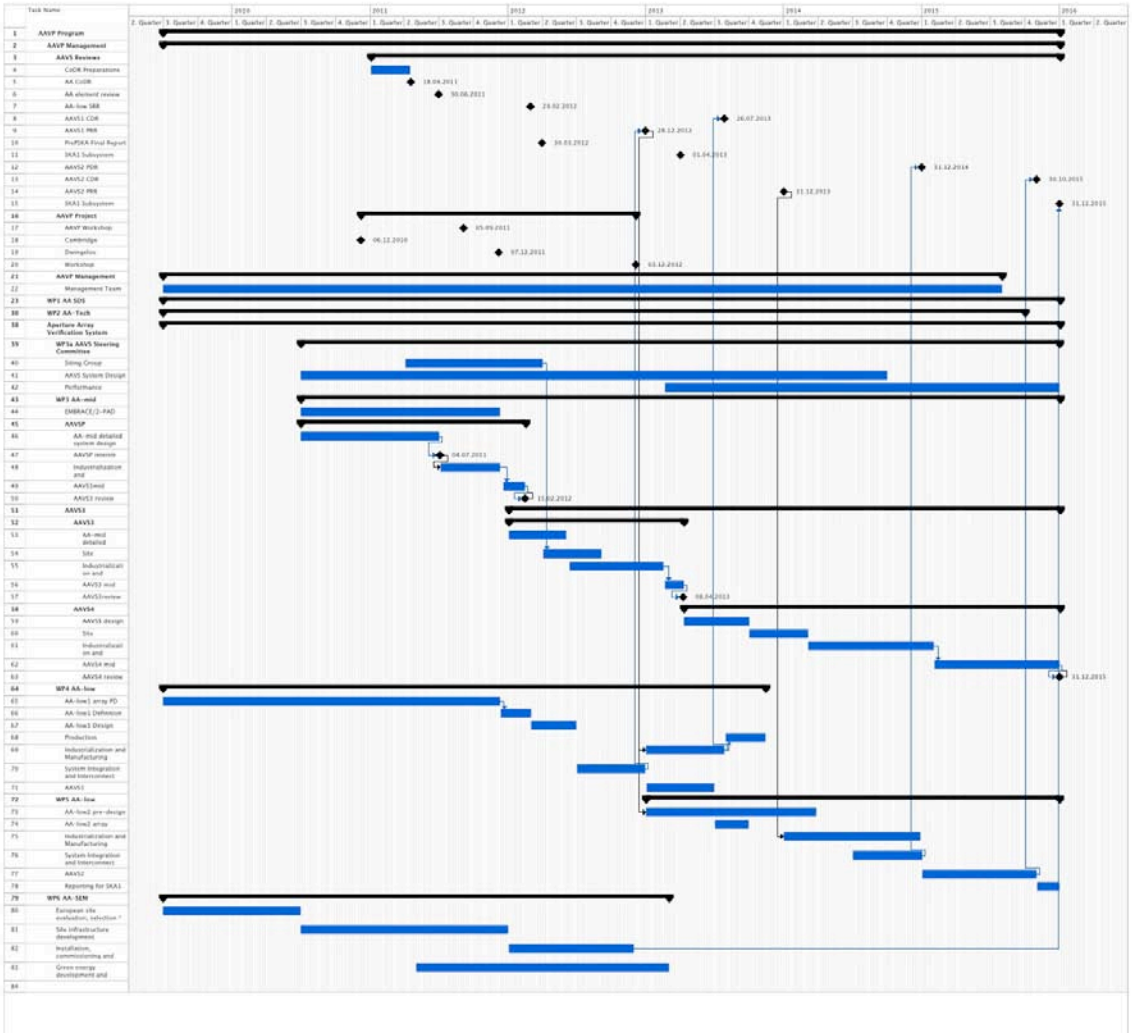
Management Transition

- Aim to minimize impact on ongoing work
- Prepare consortium for SKA_1 and SKA_2
- Agreement ready end 2012:
  - Expression of interest early May
  - Preparation meeting May
  - Summer: European meeting for proposal preparation
  - September: First Consortium Meeting
  - November: Agreement on Consortium
  - December: Signatures

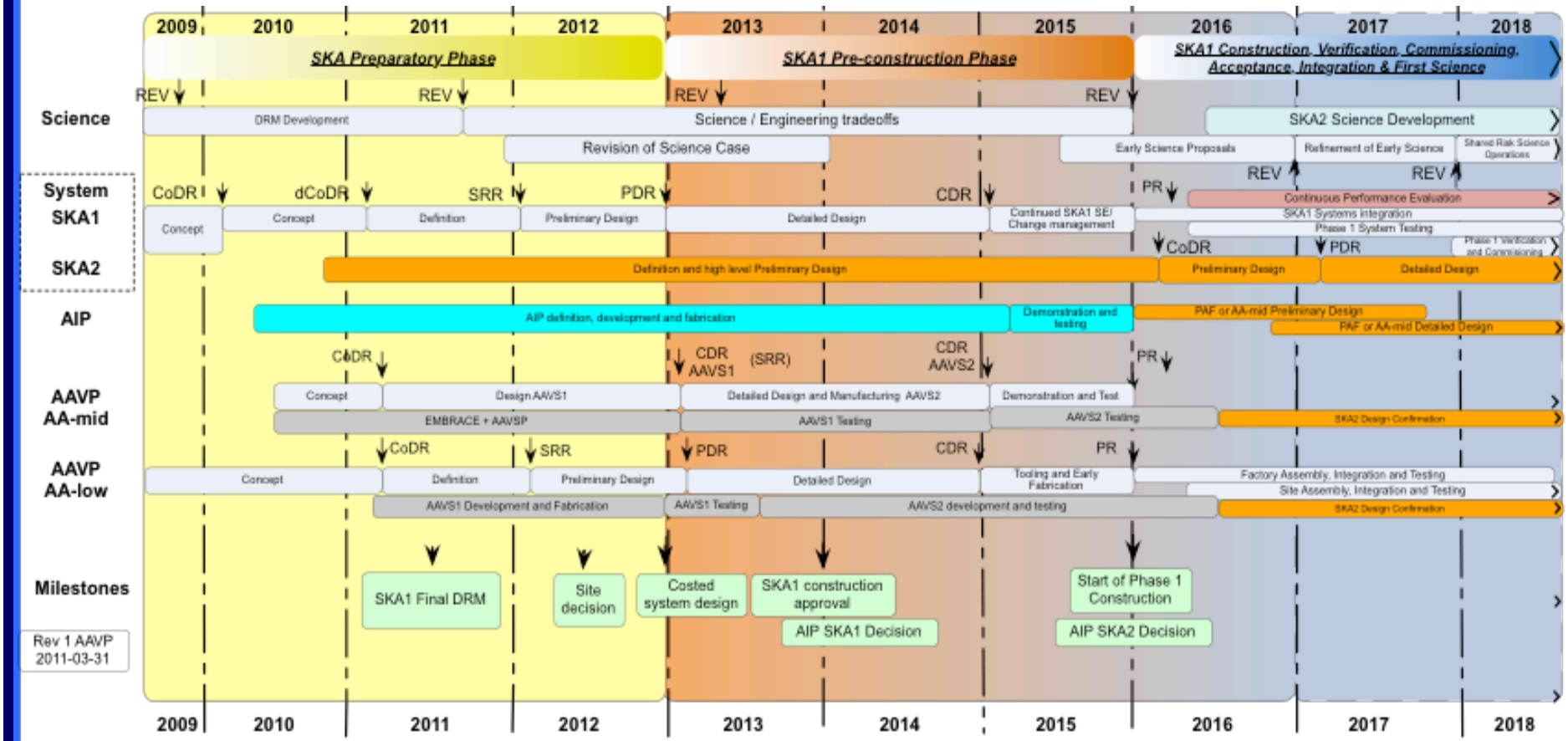
Overall SKA Plan

SKA-AAVP

AAVP Plan



AAVP Plan


2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
SKA Preparatory Phase
SKA1 Pre-construction Phase
SKA1 Construction, Verification, Commissioning, Acceptance, Integration & First Science
Science
System SKA1
SKA2
AIP
AAVP AA-mid
AAVP AA-low
Milestones
REV
DRM Development
Science / Engineering tradeoffs
SKA2 Science Development
Revision of Science Case
Early Science Proposals
Refinement of Early Science
Shared Risk Science Operations
CoDR
dCoDR
SRR
PDR
CDR
PR
Concept
Definition
Preliminary Design
Detailed Design
Continued SKA1 SE/ Change management
Continuous Performance Evaluation
SKA1 Systems Integration
Phase 1 System Testing
Phase 1 Verification and Commissioning
Definition and high level Preliminary Design
Preliminary Design
Detailed Design
AIP definition, development and fabrication
Demonstration and testing
PAF or AA-mid Preliminary Design
PAF or AA-mid Detailed Design
CDR AAVS1
(SRR)
CDR AAVS2
Design AAVS1
Detailed Design and Manufacturing AAVS2
Demonstration and Test
EMBRACE + AAVSP
AAVS1 Testing
AAVS2 Testing
SKA2 Design Confirmation
Tooling and Early Fabrication
Factory Assembly, Integration and Testing
Site Assembly, Integration and Testing
AAVS1 Development and Fabrication
AAVS2 development and testing
SKA1 Final DRM
Site decision
Costed system design
SKA1 construction approval
AIP SKA1 Decision
Start of Phase 1 Construction
AIP SKA2 Decision
Rev 1 AAVP 2011-03-31