

CONTENTS

I. INTRODUCTION	11
II. TEST PROGRAMME DESCRIPTION	13
1. INTRODUCTION	13
2. REFERENCE DEVICE PARAMETERS	13
3. TEST SCHEDULE	13
4. NEUTRONICS TESTS	17
4.1 Introduction	17
4.2 Types of neutronic tests	17
4.2.1 Dedicated neutronics tests	17
4.2.2 Supplementary neutronics measurements	19
4.2.3 Neutronics measurements for the basic device	19
4.3 Test space requirements	20
4.4 Instrumentation	21
5. LIQUID BREEDER BLANKETS	23
5.1 Introduction	23
5.2 Liquid metal cooled concepts	25
5.2.1 Technical issues and objectives of tests	25
5.2.2 Strategy and test types	25
5.2.3 Test schedule	27
5.2.4 Blanket concepts to be tested	29
5.2.5 Module design	32
5.3 Water cooled liquid metal blankets	36
5.3.1 Technical issues and objectives of tests	36
5.3.2 Strategy and test types	38
5.3.3 Test schedule	41
5.3.4 Module design	44
5.4 Unresolved issues	50
6. SOLID BREEDER BLANKET	51
6.1 Introduction	51
6.2 Helium-cooled solid breeder blankets	57
6.2.1 European Community programme	57
6.2.2 Japanese programme	74
6.2.3 U.S. programme	83
6.3 Water-cooled solid breeder blankets	99
6.3.1 Introduction	99

6.3.2	Japanese programme	99	4.	UNRESOLVED ISSUES	161
6.3.3	U.S. programme	106	5.	ACTIVITIES FOR THE EDA	161
6.2.4	USSR programme	109	V.	TESTING REQUIREMENTS ON ITER PARAMETERS	163
7.	PLASMA-FACING COMPONENTS	115	1.	INTRODUCTION	163
7.1	Types of tests	115	2.	RECOMMENDATIONS	165
7.2	Test considerations	116	2.1	Time-related parameters: burn, dwell, and continuous operating time	165
7.3	Examples of proposed tests	117	2.2	Neutron fluence	167
7.4	Future effort	120	2.3	Neutron wall load	167
8.	MATERIAL TESTING	122	3.	ANALYSIS AND ASSESSMENT	168
9.	SAFETY ASPECTS OF THE TEST PROGRAMME	127	3.1	Time-related parameters	168
9.1	Safety limitations on testing	127	3.1.1	Time constants and time-dependent behavior	168
9.1.1	Thermal interactions/incompatibilities	127	3.1.2	Continuous operating time	171
9.1.2	Chemical incompatibilities	127	3.1.3	Time-dependent calculations	172
9.2	Safety value from testing	129	3.1.4	Conclusions and overall test requirements	179
9.2.1	Types of tests	129	3.2	Neutron fluence	182
9.2.2	Possible tests	130	3.2.1	Test program schedule	183
3.2.2			3.2.2	Neutron-induced changes in behavior	183
III.	ANCILLARY EQUIPMENT, CONFIGURATION AND MAINTENANCE	133	3.3	Neutron wall load	186
1.	TEST PORTS AND TESTING SPACE	133	VI.	R&D FOR THE TEST PROGRAMME	189
2.	ANCILLARY SYSTEM CONFIGURATION AND SPACE REQUIREMENTS	133	1.	INTRODUCTION	189
3.	MAINTENANCE AND HANDLING REQUIREMENTS	141	2.	KEY ISSUES FOR BLANKETS	189
4.	DESCRIPTION OF ANCILLARY EQUIPMENT	143	3.	LIQUID METAL BLANKETS	190
4.1	Water-cooled LiPb blanket module ancillary equipment	143	3.1	Materials	190
4.1.1	Lithium-lead systems	143	3.2	MHD and heat transfer	190
4.1.2	Pressurized water systems	144	3.3	Tritium recovery and control	191
4.2	Self-cooled liquid metal blanket module ancillary equipment	145	3.4	Thermomechanical response	191
4.3	Gas-cooled solid breeder blanket module ancillary equipment	147	3.5	Safety	191
4.4	Water-cooled solid breeder blanket modules	155	4.	SOLID BREEDER BLANKETS	192
4.4.1	Test module cooling system	155	4.1	Materials	192
4.4.2	Test module tritium recovery system	156	4.2	Tritium behavior	192
4.5	Materials test module ancillary equipment	156	4.3	Compatibility	192
4.4			4.4	Heat transfer and thermal hydraulics	193
IV.	INTERNATIONAL ASPECTS OF THE TEST PROGRAMME	159	5.	NEUTRONICS	193
1.	INTRODUCTION	159			
2.	ASPECTS OF INTERNATIONAL COLLABORATION IN ITER	159			
3.	BASIS FOR THE CONCEPTUAL DESIGN PHASE TEST PROGRAMME	160			